# A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Master of Science

Changing Subsistence in Mid-Twentieth Century Alaska: An Analysis and Interpretation of Fish and Game Records Along the Yukon River

Cécile TANG

June, 2016

Budapest

Erasmus Mundus Masters Course in Environmental Sciences, Policy and Management





This thesis is submitted in fulfilment of the Master of Science degree awarded as a result of successful completion of the Erasmus Mundus Masters course in Environmental Sciences, Policy and Management (MESPOM) jointly operated by the University of the Aegean (Greece), Central European University (Hungary), Lund University (Sweden) and the University of Manchester (United Kingdom).

## Notes on copyright and the ownership of intellectual property rights:

(1) Copyright in text of this thesis rests with the Author. Copies (by any process) either in full, or of extracts, may be made only in accordance with instructions given by the Author and lodged in the Central European University Library. Details may be obtained from the Librarian. This page must form part of any such copies made. Further copies (by any process) of copies made in accordance with such instructions may not be made without the permission (in writing) of the Author.

(2) The ownership of any intellectual property rights which may be described in this thesis is vested in the Central European University, subject to any prior agreement to the contrary, and may not be made available for use by third parties without the written permission of the University, which will prescribe the terms and conditions of any such agreement.

(3) For bibliographic and reference purposes this thesis should be referred to as:

Tang, C. 2016. *Changing Subsistence in Mid-Twentieth Century Alaska: An Analysis and Interpretation of Fish and Game Records Along the Yukon River.* Master of Science thesis, Central European University, Budapest.

Further information on the conditions under which disclosures and exploitation may take place is available from the Head of the Department of Environmental Sciences and Policy, Central European University.

# Author's declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.



Cécile TANG

## CENTRAL EUROPEAN UNIVERSITY

## **ABSTRACT OF THESIS** submitted by:

Cécile Tang

for the degree of Master of Science and entitled: Changing Subsistence in Mid-Twentieth Century Alaska: An Analysis and Interpretation of Fish and Game Records Along the Yukon River

Month and Year of submission: June 2016.

Throughout its long history, subsistence has been extremely important to Alaska's Indigenous communities - in ways that go beyond the simple notion of harvesting wild resources for sustenance. Rather, it is a unique way of life enabled by a variety of food procurement and processing strategies, giving rise to a resilient food system. Yet, little is known about how people adapt their subsistence practices to wider social, economic and political forces, or the events that would stress these practices and require adjustments or transformations. This thesis addresses this research gap by examining the evolution of subsistence activities in 25 Alaska Native communities during a unique period of great political, economic and social changes; the mid-twentieth century. Belonging to the discipline of historical ecology, this research offers an analysis and interpretation of 236 historical survey records. It is the first attempt in academia to establish reference conditions of subsistence harvests from mid-twentieth century Alaska, providing valuable insight on the adaptation strategies of subsistence users to changing social, political and economic contexts. It includes the role of sled dogs, preyswitching, outpost gardening and store-bought food. The ability to have a variety of food options, whose flexibility can adapt to new and complex challenges, is fundamental to the future of subsistence users and their practices. The Polar Regions are amongst the first impacted by climate change, and subsistence practices and food systems will need to continue to adapt and evolve in the face of such new challenges.

**Keywords:** Subsistence practices; Alaska rural communities; Subsistence food systems; Food security; Foodshed; Portfolio Strategy; Historical ecology

# TABLE OF CONTENTS

A	CKNO	WLED	GEMENTS	IX
L	<u>IST OI</u>	F TABL	ES	X
L	IST OI	F FIGU	RES	XI
L	<u>IST OI</u>	F MAPS	·	XII
A	BBRE	VIATIC	ONS	XIII
<u>1</u>	INT	RODUC	CTION	1
	1.1	BACKG	ROUND AND PROBLEM DESCRIPTION	1
	1.2	RESEA	RCH AIM	2
	1.3	RESEA	RCH OBIECTIVES	2
ACKI LIST LIST ABBI 1 IN 1 1 1 1 2 LI 2 2 2 2 2		1.3.1	Objective 1: Reviewing Available Knowledge on Subsistence Practices in Alaska	2
		1.3.2	Objective 2: Analysing and Interpreting Historical Records	2
ACI LIS LIS ABI 1	1.4	Scope	AND LIMITATIONS	3
	1.5	METHO	DDOLOGY OVERVIEW	3
	1.6	THESIS	STRUCTURE	4
<u>2</u>	LITI	ERATU	RE REVIEW	5
A L L L L L A L A L L L A L A L A L A L	2.1	SUBSIS	TENCE IN ALASKA: DEFINITION, CHARACTERISTICS AND KEY CONCEPTS	5
		2.1.1	What is Subsistence?	5
			2.1.1.1 A Lifeway: Definition Challenges	5
			2.1.1.2 Legal Definition	6
		2.1.2	Alaska's Food System	7
			2.1.2.1 Traditional and Localized Patterns	7
		213	2.1.2.2 Contemporary Subsistence Practices	8 10
		2.1.3	2131 The Foodshed	10
			2.1.3.2 The Portfolio Strategy	10
LI: LI: AE 1	2.2	CHANC	GES IN MID-TWENTIETH CENTURY ALASKA	12
		2.2.1	1959: Alaska Statehood	12
		2.2.2	New Economic Opportunities	13
		2.2.3	Demographic Boom and Transition	14
		2.2.4	Increasing Rural/ Urban Divide	14
		2.2.5	Nutrition Transition and Coming Out of the Foodshed	15
		2.2.6	Competition and Cumulative Stressors	15
		2.2.7	Research Gap	16
	2.3	Politi	cs and the Governance of Subsistence Practices in Alaska	17
		2.3.1	Pre-European Times	17
		2.3.2	Early-European Contact	18
		2.3.3	1850s-1950s: Pre-Statehood Alaska-U.S. Kelationship	19
		2.3.4	Mid-1 wentieth Century: Legislation under Statehood	21
		2.5.5	1978- 100ay: The Division of Subsistence The "Dual Management System" of Dreatings	23
	24	2.3.0 I 1755 A	THE DUAL-MANAGEMENT OF FIACUCES	24 25
	2.4			(二)

<u>3</u>	<u>HIS'</u>	<b>FORICAL RECORDS: THE ANNUAL SURVEYS OF NATIVE FOOD</b>	26
	3.1	THE STUDY AREA: THE YUKON RIVER AS A TRANSECT	26
	3.2	SURVEY RECORDS: CONTENT, FORMAT AND QUALITY	27
		3.2.1 Survey Content	29
		3.2.2 Survey Format	30
		3.2.3 Survey Quality	30
	3.3	STATUS AND ROLE OF THE SURVEY RESPONDENTS: TEACHERS	30
	3.4	ANNUAL SURVEYS: METHODOLOGY FOR ANALYSIS AND INTERPRETATION	32
		3.4.1 Historical Ecology	32
		3.4.2 Historical Proxy Data: Survey Limitations	32
		3.4.3 Ethnographic Analogy	33
		3.4.4 Record Transcription	34
		3.4.5 Quantitative Data Analysis	34
		3.4.5.1 Human and Dog Populations	35
		3.4.5.2 Total Amount of Country Foods Harvested	35
		3.4.5.3 Per-capita Amount of Native Foods Harvested	35
		3.4.5.4 Number of Food Kinds	36
		3.4.5.5 Classes of Food Kinds	36
		3.4.5.6 Biodiversity Indices and "True Diversities"	37
<u>4</u>	<u>RES</u>	ULTS AND DISCUSSION: HISTORICAL RECORDS IN CONTEXT	40
	4.1	Amount of Subsistence Harvests	40
	4.2	Per-Capita Subsistence Harvests	41
	4.3	FOOD KINDS ALONG THE YUKON RIVER	43
		4.3.1 Portfolio Composition of the Lower-Yukon	48
		4.3.2 Portfolio Composition of the Central-Yukon	52
		4.3.3 Portfolio Composition of the Upper- Yukon	54
	4.4	FOOD SECURITY	57
		4.4.1 Subsistence Food Systems: Erosion or Prevalence?	57
		4.4.2 Sharing and Inequality	59
		4.4.3 Trade and Industries	61
		4.4.4 Double-Edged Stores	62
		4.4.5 Teacher's Perspective on Food Security	65
		4.4.6 Drivers of Destabilization	67
	4.5	Portfolio Strategies	68
		4.5.1 Seasonality and Prey-Switching	68
		4.5.2 Transfer Payments and Aid	70
		4.5.3 Employment Opportunities	71
		4.5.4 Controlled Dog Populations	72
		4.5.5 Preservation Methods and Secondary Products	73
		4.5.6 Travel Distances	76
		4.5.7 Outpost Agriculture	77
	4.6	LIMITATIONS	78
<u>5</u>	<u>CON</u>	ICLUSIONS AND RECOMMENDATIONS	80
	5.1	FUTURE RESEARCH OPPORTUNITIES	80
	5.2	Conclusion	80
6	REF	ERENCES	А
-			~*

# <u>7</u> <u>APPENDICES</u>

7.1	APPENDIX 1: EXAMPLES OF NATIVE FOOD SURVEYS	G
7.2	APPENDIX 2: RECORD TRANSCRIPTION INTO METADATA	J
7.3	APPENDIX 3: METHODOLOGY FOR QUANTITATIVE DATA- TOTAL AMOUNT OF NATIV	Е
Foo	DS HARVESTED	Μ
7.4	APPENDIX 4: METHODOLOGY FOR QUANTITATIVE DATA- NUMBER OF FOOD KINDS	Ν
7.5	APPENDIX 5: METHODOLOGY FOR QUANTITATIVE DATA- CLASSES OF FOOD KINDS	Q
7.6	Appendix 6: Results	R

G

# Acknowledgements

First and foremost, I would like to express my deepest gratitude to my supervisor Dr. Philip Loring (University of Saskatchewan) for formulating this research topic with me and providing me advice, ideas and support. The opportunity to contribute to this research has been very rewarding, and has opened my eyes to a completely new field. I have learnt a great deal not just on this topic, but also more generally about interdisciplinary research and academia.

I would also like to express my gratitude to my co-supervisors, Dr. Craig Gerlach (University of Calgary) and Dr. Aleh Cherp (Central European University) for their valuable time and feedback. My sincere appreciation to Dr. Martin Gallagher (University of Manchester) for his guidance on the literature review, and Dr. Diane Beaudreau (University of Alaska Fairbanks) for her help and advice on handling data.

I would like to thank the administrative staff of both the Central European University and the University of Saskatchewan: Gyorgyi Puruczky, Krisztina Szabados, Irina Herczeg and Irene Schwalm. In addition to the constant help and support I have received from them throughout my MESPOM studies, they made sure my travels between all the partner universities went smoothly.

More generally, my sincere gratitude goes towards all those involved in the making of the Erasmus Mundus MESPOM program, which is – looking back to this two-year journey – much more than a degree. Here I would also like to thank the European Commission for providing me the financial means to be part of this wonderful journey. The Central European University has also provided me with a travel grant used towards the expenses of this thesis, for which I am grateful.

And last but not least, my warmest thanks to my family and friends who have supported me and made me who I am today.

To the MESPOM family - with whom it was a pleasure to share this unique journey.

To Ryan - who funnily enough found himself accompanying me throughout MESPOM.

To my sister Céline - my role model in many ways, and best friend.

To my parents - whose contribution cannot be put in words.

To 爷爷.

# List of Tables

Table 1 Percentage of households participating in subsistence activities in rural areas of Alaska (2012).      9
Table 2 Alaska's rural and urban population numbers and percentages in 2000 and 2012 25
Table 3 Years of annual surveys for each community, color-coded by the quality of the record (1941-1972).
Table 4 Methodology: Different levels at which the number of food kinds harvested is calculated: community, region and river
Table 5 Methodology: Formulas and conversion to true diversities of three biodiversity indices
Table 6 Example of the trade-off between species-level resolution and dominance magnitude for the categories "salmon" and "berries"
Table 7 Community-year incidence of categories listed as food kinds across all 25 communities (1941-1972).45
Table 8 Regional values: S $_{\mbox{Region}}$ , S $_{\mbox{River}}$ and the number of unique species
Table 9 Average true diversities of food kinds for each region and their resulting magnitudeof dominance, calculated without communities of $\leq 5$ survey years.46
Table 10 Biodiversity indices and true diversities of food kinds for Lower-Yukon communities, and their resulting magnitude of dominance.48
$Table \ 11 \ \textbf{Results for Lower-Yukon communities: prevalence and preference (1941-1972) 50}$
Table 12 Biodiversity indices and true diversities of food kinds for Central-Yukon communities, and their resulting magnitude of dominance.52
Table 13 Results for Central-Yukon communities: prevalence and preference (1941-1972)54
Table 14 Biodiversity indices and true diversities of food kinds for Upper-Yukon communities, and their resulting magnitude of dominance.55
Table 15 Results for Upper-Yukon communities: prevalence and preference (1941-1972)56
Table 16 Schoolteacher's perceived adequacy of winter food supply: Percentage and count of responses over the entire dataset.    59
Table 17 The order of preference of the top 5 preservation methods of country food harvests along the Yukon River, by region
Table 18 Presence of secondary products listed as individual food kinds on the annual surveys.   76
Table 19 Counts and percentages of survey records of high, medium and low quality, for each of the three regions and the overall dataset

# List of Figures

Figure 1 Example of a subsistence 'calendar': The seasonal subsistence round of Alaska Natives of the Yukon Circle
Figure 2 Total amount of harvested food by region over time, for 12 communities with ≥ 10 survey years (1941-1972)- A, B and C denoting statistically significant differences41
Figure 3 Human populations of 25 Alaska Native communities (1941-1972)
Figure 4 Per-capita amount of harvested food by region over time, for 12 communities with $\geq$ 10 survey years (1941-1972)- A and B denoting statistically significant differences43
Figure 5 The mid-twentieth century portfolio of country harvest options available along the Yukon River: 72 species grouped into 6 classes
Figure 6 Community-Year incidence of individual species reported as food kinds across all 25 communities (1941-1972)
Figure 7 Class distribution of each region's number of species: Lower-Yukon (53), Central- Yukon (37) and Upper-Yukon (40)
Figure 8 Class distribution of each region's number of unique species: Lower-Yukon (23), Central-Yukon (6) and Upper-Yukon (10)
Figure 9 Prevalence tables for Alakanuk and Scammon Bay: The Lower-Yukon communities with the lowest and highest magnitudes of dominance respectively 49
Figure 10 Harvesting marine mammals in the Lower-Yukon: variation across location and time
Figure 11 Prevalence tables for Grayling and Shageluk: the Central-Yukon communities with the lowest and highest magnitudes of dominance respectively
Figure 12 Schoolteacher's perceived adequacy of winter food supply: Percentages of responses by region
Figure 13 Country Food Harvests and Income in Alaskan Communities: An Inverse Relationship
Figure 14 The variety of preservation methodology reported in the annual surveys (counts of occurrence)
Figure 15 Change over time in travel distances between community (Beaver and Shageluk) and grounds for hunting and fishing: Distances and trend lines

# List of Maps

Mar	<b>)</b> 1	Alaska	Native	population	at the	time of	f significant	t direct	contact w	vith Euro	peans19

# Abbreviations

AEWC	Alaska Eskimo Whaling Commission
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ANS	Alaska Native Service
BIA	Bureau of Indian Affairs
FSB	Federal Subsistence Board
IRA	Indian Reorganization Act
NARA-AR	National Archives Records Administration- Alaska Region
MMPA	Marine Mammal Protection Act
Tukey HSD	Tukey Honest Significant Difference (a post-hoc statistical test)

## 1 Introduction

## 1.1 Background and Problem Description

Subsistence practices in Alaska date back to when human settlements were first established in the region, more than 11 000 years ago. Throughout its long history, the practice of harvesting wild resources within the community's foodshed (Kloppenburg *et al.* 1996) has evolved beyond the mere need for sustenance (Schumann and Macinko 2007). Instead, subsistence denotes a unique way of life that encompasses cultural, physical, mental and spiritual elements on which Alaska Natives' livelihood and wellbeing depend (Thornton 1998; Loring and Gerlach 2009). In many ways, subsistence can be considered the backbone of the economic and cultural lifeway of Northern communities. Contemporary subsistence is still widely practiced in North America, albeit impacted by larger market forces, social shifts and a tumultuous history of political legislation.

The dynamism and ever-evolving nature of subsistence practices cannot be emphasized enough. Indeed, Alaska Natives have never ceased to adapt their practices to short-term environmental fluctuations, long-term climatic shifts, changing management regimes and the legacy of a tumultuous struggle in regards to subsistence and land rights (Binford 2002b; McNeeley 2009; Loring and Gerlach 2010b). This ability, illustrated by a variety of food resources, is the true source of resilience in subsistence communities (Kofinas *et al.* 2010). Alaska has one of the most challenging climates of the planet - it is, after all, commonly called 'the last frontier' – and this ability to adapt has enabled communities to survive throughout centuries of change.

Understanding the capacity of Northern communities to adapt is necessary to better prepare subsistence food systems to future challenges, such as climate change (Keskitalo 2012). Yet, people and communities in Alaska face many other challenges, including worrying health trends and high costs of food and fuel (Gerlach *et al.* 2011). These are intrinsically linked to food security, in which subsistence plays a central role. The know-how of subsistence practices was passed across generations through secular and sanctified oral tradition for the most part of history (Arnold 1976). Unfortunately, at least in the sense of our scientific understanding of Indigenous lifeways, this absence of written literature means that limited qualitative and quantitative knowledge exists concerning how people adapt their subsistence practices to wider social, economic and political forces, as well as the events that would stress their practices and require adjustments or transformations. Thus, there are important research gaps that need to be addressed.

### 1.2 Research Aim

This thesis aims to examine the evolution of subsistence harvesting practices in rural Alaskan communities, specifically in response to the rapid contextual change that impacted all facets of community life (political, economic, social) in the mid-twentieth century. It is the first attempt in academia to establish reference conditions of subsistence harvests from that period in time. In doing so, this research aims to shed light on how a combination of stressors can destabilize a traditional food system located at the crossroad between food security, community unity and spiritual wellbeing. The nature of this topic requires an in-depth review of existing literature as well as a qualitative and quantitative analysis and interpretation of historical records.

## 1.3 Research Objectives

To achieve its aim, this thesis has two complementary objectives.

## 1.3.1 Objective 1: Reviewing Available Knowledge on Subsistence Practices in Alaska

My first objective is to provide a thorough review of the available knowledge regarding subsistence practices in Alaska, as well as the historical context and the conceptual frameworks relevant to the aim of this thesis. These findings, presented in Chapter 2 'Literature Review', are organised into three sections: 1) the definition of subsistence and key concepts, 2) changes in mid-twentieth century Alaska, and 3) the political governance of subsistence practices.

This review paints the contextual picture to better understand the historical records analysed in this thesis ('Objective 2').

#### 1.3.2 Objective 2: Analysing and Interpreting Historical Records

The analysis of a set of 236 historical records forms a case study embedded within the theoretical and historical frameworks presented in the review ('Objective 1'). The set of records spans from the 1940s to the 1970s, and covers 25 Alaska Native communities located along the Yukon River. Their analysis and interpretation, both qualitative and quantitative in nature, have not been attempted before. Based on these historical records, my second objective is to analyse and interpret the shift in subsistence practices during the mid-twentieth century, including:

- a) Evaluating (to the extent possible) the magnitude of country foods harvested annually by Alaska Native communities located along the Yukon River, on a per-community basis.
- b) Evaluating (to the extent possible) the magnitude of country foods harvested on a percapita basis.
- c) Determining the breadth and diversity of subsistence resources utilized by Yukon River communities overall.
- d) Determining the breadth and diversity of subsistence resources utilized by each region (Lower-, Central- and Upper-Yukon).
- e) Identifying the elements that enhance or undermine food security in mid-twentieth century Alaska.
- f) Exploring the strategies utilized by subsistence communities to meet their food needs through country foods.

## 1.4 Scope and Limitations

The geographic scope of this thesis is Alaska. The historical surveys give particular attention to the Yukon River, a geographical feature whose importance is further explained in 3.1 "The Study Area: The Yukon River as a Transect". In terms of temporal scope, this research focuses on mid-twentieth century, a time of great change for Alaska's residents and food ways (outlined in 2.2 'Changes in Mid-Twentieth Century Alaska'). Yet, it would be highly misleading to attempt to isolate three decades of subsistence practices from its historical and present context, therefore contextual information from other periods of time is also provided within the literature review.

As alluded to in '1.3 Research Objectives' above, this thesis combines theoretical knowledge of multiple concepts related to subsistence with survey records as a case study. This is a first attempt to analyze these records, and explore the meaning of the information they provide within their contextual setting. The records are considered proxy data, due to multiple limitations associated with historical surveys (see 3.4.2 'Historical Proxy Data: Survey Limitations'). Yet this does not negate the unique value of historical records when interpreted with caution.

## 1.5 Methodology Overview

The methodology for the literature review is a directed reading of existing literature, searching for a combination of key words (i.e. "subsistence", "Alaska", "land claims", "food systems",

"traditional", "Athabascan", "food security") in published journals, books and reports. These are complemented with inputs and literature suggestions from my supervisors.

The methodology regarding historical research ('Objective 2') involves the analysis of 236 historical records and comprises a number of steps: compilation, data analysis, and interpretation of surveys. The detailed methodology of each step is described in 3.4 'Annual Surveys: Methodology'.

## 1.6 Thesis Structure

This thesis is structured into five chapters. The first is the introduction, which is the current chapter. The second chapter is the literature review. The review covers 1) subsistence practices in Alaska, 2) the dramatic changes of mid-twentieth century, and 3) the fierce struggle for land claims and governance (as outlined in '1.3.1 Objective 1'). The third chapter presents the historical records. It touches upon their content, format, quality, geographic context, limitations and the analysis methodology. The fourth chapter exhibits the results of the analysis and interpretation. It also discusses them in relation to their contextual setting and the concepts previously introduced (this part is at the crossroad of the two objectives). Finally, the fifth and last chapter includes recommendations for future research and the conclusion.

## 2 Literature Review

## 2.1 Subsistence in Alaska: Definition, Characteristics and Key Concepts

This first section of Chapter 2 defines subsistence and describes Alaska's unique food system. It also introduces concepts that are later used in the analysis and interpretation of survey records. The aim is to introduce the topic of subsistence, from the central functional roles it plays within Alaska Native communities to its defining structural characteristics.

#### 2.1.1 What is Subsistence?

#### 2.1.1.1 A Lifeway: Definition Challenges

It is a tough task attempting to define subsistence, which has been evolving over an extensive period of time, and alongside human evolution itself, from a foreign perspective (see Schumann and Macinko (2007) for a discussion on this matter). This is mainly because the term has been used by non-Natives to capsulize what was (and still is) for Alaska Natives an entire way of life (Case 1989). Indeed, academic writing on pre-contact Alaska states time and time again that subsistence is, since the first human settlements in the region 11 000 years ago, a lifeway that goes beyond simple sustenance (Thornton 2001; Wolfe 2004; Holthaus 2012; White 2013). It is an integral part of the fabric of Native existence itself, and "without it, there would be no culture, no traditions, perhaps no community, and certainly no means of giving expression to the spiritual aspects of Native life"<sup>1</sup>.

From the beginning of human settlements in Alaska, subsistence has been central to their cultural, physical, mental and spiritual capacity to navigate the natural world (Arnold 1976; White 2013). Over generations, people developed practices to meet food needs as well as to express themselves spiritually and artistically, through both a conscious as well as mystical understanding of their local environment. This is illustrated by the artistic and cultural manifestations of wild harvest use, such as non-edible animal parts utilised to make clothing items (i.e. fur, skin) or candles for light (i.e. beluga oil). More importantly, subsistence encompasses cultural and moral values: resourcefulness, respect for humans (i.e. sharing one's harvest with the entire community) and a deeper respect for the intricate interrelationships that link humans to animals and the broader environment (Berger

<sup>&</sup>lt;sup>1</sup> Daniel K. Inouye, U.S. Senator, Hawaii. Remarks at the National Forum of Alaska Natives (1999).

1985; Case 1989). The word *subsistence* is used to define these values and practices, yet no single word can correctly depict this intricate web of elements (Berger 1985).

The difference in cultural approaches between Indigenous and non-Indigenous people is the reason why many conflate subsistence with mere existence. In the words of author Gary Holthaus (2012), subsistence is a fundamental pillar of the Indigenous "functional culture"<sup>2</sup>. "Functional culture" refers to a complex and balanced web of wisdom, intuition, spirituality and tradition, which creates a whole cultural entity that operates within greater natural systems, with harmony and horizontal transcendence as its ultimate purpose. Non-Indigenous people (including myself) generally have difficulty relating to such a cultural system, due to the mainly "structural" form of non-Native cultures. Broadly speaking, this type of culture is characterized by structured knowledge and hierarchy (with humans separated from the environment), serving the purpose of growth. I argue that the very need to define subsistence is a product of a society where governance is dominated by a "structural culture" worldview.

#### 2.1.1.2 Legal Definition

Both U.S. federal and state law today define the term *subsistence* as:

"The customary and traditional uses of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools or transportation; for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption; and for the customary trade, barter or sharing for personal or family consumption."

 $(AS 16.05.940(33))^3$ 

When a clear definition is needed literature usually refers to this legal one. Although useful, many consider it somewhat rigid and profoundly inadequate (Lonner 1980; Wolfe 2004; Heaton 2012). Jenkins (2015) provides valuable insight into the limitations and challenges of the terms used within this definition such as "barter" and "customary trade". Furthermore, state and federal regulators define subsistence patterns as "customary and traditional" if they were practiced before 1971, when

<sup>&</sup>lt;sup>2</sup> Holthaus (2012), who worked for more than two decades with Alaska Natives, provides a thorough description of what he defines as a "functional" and "structural" culture, as well as their differences. He goes further by depicting how sustainability can be achieved only through a change in our culture and worldview. <sup>3</sup> See: Alaska Statutes- Section 16.05.940: Definition 33.

the Alaska Native Claims Settlement Act (ANCSA) was passed. This temporal divide, however, does not adequately reflect the flexibility and evolving nature of resource use patterns for subsistence users (Loring and Gerlach 2010b).

According to its legal definition, subsistence fish and game cannot be sold on commercial markets to contribute towards profit-maximization. Instead, it constitutes a productive traditional economy integrated to the annual work routine of Alaskan residents aiming to provide for the nutritional needs of the family and the community (Wolfe 2000; 2004; Fall 2012). Indeed, the common practice of sharing one's wild harvests has been an aspect of subsistence arguably from the very beginning (Sahlins 1974; Gintis 2005). This productive economy, while nowadays interacting with larger market economies, minimizes food risks and insecurities (Lonner 1980). It also continues the profound and complex belief system that includes and respects wildlife (Holthaus 2012). However, it is interesting to note that the actual impact of larger economies on non-market fishing economies in Alaska has been an area of increasing controversy and debate (see 2.1.2.2 'Contemporary Subsistence Practices').

While recognizing the inadequacy of this definition to portray a subsistence lifeway and all the elements it entails, for the purpose and scope of this thesis the term *subsistence* is defined as such. This ensures that a consistent definition is used throughout this research, which is especially important when discussing the political governance of subsistence practices.

#### 2.1.2 Alaska's Food System

A food system is defined as "the total range of activities, social institutions, material inputs and outputs, cultural beliefs, and traditions within a social group that interact in the production, distribution, and consumption of food" (Goodman *et al.* 2000; Gerlach *et al.* 2011). The Alaskan food system is unique as country foods (those produced from the land, and generally serving the purpose of subsistence therefore also referred to as subsistence foods) are an integral part of this system for both rural and urban residents (Usher 1976).

#### 2.1.2.1 Traditional and Localized Patterns

Although above I refer to one Alaskan food system, perhaps talking about more localized food *systems* is more adequate. Traditionally, the cultural, social and economic autonomy of all communities was generated by harvesting a flexible combination of sea mammals, terrestrial mammals, birds, fish, and plant resources from formal or informal gardens (Gerlach *et al.* 2011). Yet,

harvest patterns present important geographical differences (Arnold 1976). In fact, one of the main challenges identified in the literature in regards to characterizing Alaska's subsistence practices, is their very localized – hence distinct – nature. Resulting from a unique combination of physical, ecological, cultural and economic elements, these practices generate links to specific wildlife populations as well as localized systems of food production and distribution. Wolfe (2004) provides a comprehensive overview of the localized nature of subsistence systems still found today, with case studies demonstrating that locality can be an essential regulatory tool.

Two sets of factors give rise to these localized patterns. On one hand, each community would harvest wild catch from its surrounding territory (or "foodshed", a concept discussed below in 2.1.3 'Key Concepts'). This surrounding environment establishes opportunities and constraints that dictate subsistence practices through its environmental, physical and biological characteristics (i.e. climate, biodiversity). On the other hand, people's preferences and the community's cultural and economic traditions mediate the relationship between these opportunities and the actual subsistence practices (Wolfe 2004). In reality, not all potential country foods are harvested and consumed. Hence this localized nature gives rise to a multitude of food systems scattered across the state and dictated by both the physical and living features of each territory.

#### 2.1.2.2 Contemporary Subsistence Practices

Although altered by multiple forces and stressors, subsistence today is still (albeit to various degrees) governed by traditional and localized patterns. It is through subsistence hunting and fishing that many Indigenous people keep their cultures and traditions alive. This is the case for Aleut, Athabaskan, Alutiiq, Euroamerican, Haida, Inupiat, Tlingit, Tsimshian, and Yup'ik communities (Wolfe 2000; Ikuta 2007; Sakakibara 2009). For instance, the Tlingit of Southeast Alaska still engage in the annual subsistence harvest of herring roe on hemlock branches in Sitka Sound (Brock and Turek 2007), while Arctic coastal villages still conduct communal bowhead whale hunts (Suydam and George 2004). The resulting harvests remain important sources of nutrition and both formal and informal employment (Wolfe 2004; Fall 2012).

Contemporary subsistence is part of a rural "mixed subsistence market economy" characterized by a combination of subsistence activities and cash generating paid employment (i.e. tourism, guided hunting, service sector). Typically, families invest a small portion of their household income towards technologies for harvesting country foods (Wolfe 2000), more specifically towards equipment, supplies and fuel required to participate in harvests and hunts.

Subsistence is particularly important for Alaska's rural areas, where households are still highly dependent on wild food harvests because incomes are low, store prices are high, and imported foods are unreliable, of poor quality and variety. This is increasingly true the more remote a community is, as discussed in more detail in 4.4.4 'Double-Edged Stores'. Table 1 shows that most rural residents (which form 17% of the state's population as of 2012) take part in the harvesting of wild game (60%) and fish (83%), yet a higher portion uses these subsistence harvests (86% and 95% respectively). This is due to the common practice of sharing harvests with extended family and the community, especially with households unable to fish or hunt, such as elders, the disabled, as well as single parents with young children (Tait 2001; Wheelersburg 2008; Fall 2012). Wolfe and Walker (1987) estimate than 30% of a community's households actually harvests 70% of its wild foods supply, specifically to have the ability to provide for those that are unable to do so. Both state and federal law regulate contemporary subsistence (more details in 2.3 'Politics and the Governance of Subsistence Practices in Alaska').

Table 1 Percentage of households participating in subsistence activities in rural areas of Alaska (2012).

Percentage of households participating in subsistence activities in rural areas of Alaska (2012)										
Area	Harvesting game (%)	Using game (%)	Harvesting fish (%)	Using fish (%)						
Arctic	63	92	78	96						
Interior	69	88	75	92						
South-central	55	79	80	94						
Southeast	48	79	80	95						
Southwest	65	90	86	94						
Western	70	90	98	100						
Total rural	60%	86%	83%	95%						

Source: Publication from the Division of Subsistence, Alaska Department of Fish and Game written by Fall (2012).

Despite its importance for rural communities, it is interesting to note that the vast majority of food consumed in Alaska today does not originate from country foods. In fact, subsistence harvests represents 1.1% of the total food harvested in the state annually, while 98.2% is sold commercially (mostly fisheries), and often to foreign markets (Fall 2012). The remaining 0.7% is for personal use fishing, general hunting and sport fishing by Alaskans, and sport fishing and hunting by non-residents. This competition between profit-oriented corporate structures and the non-market

customary trade purposes of subsistence economies has given rise to increasing debate in the literature. Jenkins (2015) examines the contradictions in the legislation that give rise to this competition. The author focuses on the Chinook salmon fishing in the Yukon River, which has been declining in both number and size.

## 2.1.3 Key Concepts

#### 2.1.3.1 The Foodshed

Food and locality are intertwined in robust ways and central to all subsistence cultures, since harvest patterns are tied to specific places by ecology, customs, community and economy. The best way to understand this is by using the concept of a foodshed. Analogous to the ecological concept of a watershed, it has proved useful for understanding food supply and movements within a food system. The term was first described by Hedden (1929) as the "dikes and dams" guiding the food flowing from producers to consumers. It was prompted by a transportation crisis that highlighted the disconnect between the two in New York City.

Since then, the term *foodshed* has been used as the geographical concept linking the processes of food harvest, distribution, preparation and consumption at the individual, community and higher societal levels (Kloppenburg *et al.* 1996; Feagan 2007). It respects "the integrity and proximity of particular socio-geographic spaces, where the procurers, preparers and consumers of food are linked not just by economy but by community (...)" (Loring 2007). In regards to Alaska's localized subsistence patterns, the foodshed concept gives a geographical demarcation between different communities. It is understood that within the clear yet flexible boundaries of each foodshed, a community is traditionally able to exert its self-sufficiency, and more importantly its self-determination and autonomy (Loring 2007; Ackerman-Leist 2013). Arnold (1976) points out that these boundaries between groups were understood and protected.

Interestingly this metaphor can be used in reverse; for cases when contextual and often bigger political, social and economic changes, along with the growing influence of today's global food system, erodes this idea of a foodshed solely formed by local foodways (Loring 2007). As such some argue that contemporary subsistence does not exist anymore due to this erosion and the influence, small or large, of the global food system within all rural communities in Alaska (Huntington 1992). This phenomenon can be termed "coming out of the foodshed", and is characterised by a loss of local control over the food system (further discussed in 2.2.5 'Nutrition

Transition and Coming Out of the Foodshed'. Loring (2007) provides an example by looking into the destructive process of this phenomenon in Minto.

## 2.1.3.2 The Portfolio Strategy

Wolfe (2004) uses the term *local store* to refer to "the natural storehouse" of country foods available within a community's foodshed. Not only did this comment on the poor quality and variety of produce offered in most village stores (see 4.4.4 'Double-Edged Stores'), it also established a valuable metaphor equating hunting and fishing grounds to stores, which is particularly useful for understanding the portfolio strategy.

Similarly to shopping behaviour, subsistence users adapt and change their harvest behaviour to various external elements. This includes, for instance, focusing on different species at different times of the year, and subsistence 'calendars' around the world are known to have strong seasonal components (see an example in Figure 1) (Hoogenraad and Robertson 1997; Bohan 2009; Retnowati *et al.* 2014). People also would harvest only the amount necessary (similar to doing a weekly shop), and switching prey when certain species are low (rare items are more expensive) (Nelson 1983). When a prey population is high, the community may harvest it more heavily (2-for-1 specials for produce of high supply). The underlying strategy is a conscious attitude of exerting preference towards certain food kinds at certain times, such to avoid the depletion of options for future usage (or future harvests in the case of subsistence). Consequently, each community can be understood as having a portfolio of food options, from which seasonal harvests adequately reflect human preference as well as the availability of each food kind.

The population of prey species often fluctuates due to natural patterns of population cycles. Therefore, this flexibility in food options ensures stability in food consumption despite variability in population dynamics, environment, weather, climate, economy, governance and politics. People have, for the past 11 000 years, adapted their practices to environmental fluctuations, climatic shifts, and many different political regimes. Over time, the portfolio strategy leads to dynamic, innovative and ever-evolving subsistence practices, therefore enhancing food security.

Yukon Circle Annual Cycle												
Primary Seasonal Activity						•••• Secondary Seasonal Activity					/	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Moose	•••											•••
Fishing				•••						• • • •	• •	
Bear												
Muskrat												
Hare	-	•••	• • • •	••				•••				
Furbearers										•••		
Waterfowl				•••						•••		
Wood Cutting			_	••••	• • • •	• • • •	• • • •	•••				
Plants/Berries					•••					•••		
Garden				•	••••	••••	••••	•••	••••			

Figure 1 Example of a subsistence 'calendar': The seasonal subsistence round of Alaska Natives of the Yukon Circle.

Secondary seasonal activities present throughout the year are diverse, providing alternatives for times when primary food sources are less abundant.

Source: Figure taken from Loring and Gerlach (2010b), with original information as described in Caulfield (1983).

## 2.2 Changes in Mid-Twentieth Century Alaska

Mid-twentieth century Alaska was a period of great political, economic and social change. The word subsistence itself was popularized at that time, when land claims formed a prominent issue on the agendas of Alaska Natives and both state and federal agencies (White 2013). In this second section I provide a brief overview of these changes, giving the historical context of the survey records.

## 2.2.1 1959: Alaska Statehood

In the early nineteenth century, the U.S. government's interest in Alaska started to grow, and in 1867 the nation purchased it from the Russian Empire for USD 7.2 million (Golder 1920; Farrar 1922; MacMaster and Kushner 1976). However, it only officially became a state in 1959 under the Alaska Statehood Act<sup>4</sup>. In many ways, mid-twentieth century is a tumultuous period during which many political efforts were made to address pressing issues in the spheres of land allotment, subsistence rights, education and health care. Sadly, they were of limited success at best, and profoundly ill-founded at worst.

<sup>&</sup>lt;sup>4</sup> See: Public Law 85-508, 72 Stats. 339, July 7th 1958.

As Alaska Native communities were unsatisfied by the federal land claims resulting from this Act (notably related to the building of the TransAlaska oil pipeline), attempts to formalize a land settlement that would satisfy all parties followed. In 1971, the U.S. Congress passed the Alaska Native Claims Settlement Act (ANCSA), which addressed some of their land claims, and lead to the eventual construction of the oil pipeline (Arnold 1976)<sup>5</sup>. In regards to subsistence, statehood brought on a new layer of legislation (see 2.3.4 'Mid-Twentieth Century: Legislation under Statehood').

#### 2.2.2 New Economic Opportunities

Following statehood American businesses expanded to this new territory. This expansion was mostly to Sitka, which was envisioned by many as the "capital of the northern territory" and thriving from commerce and mining activities (Hinckley 1969)<sup>6</sup>. New commercial ties were formed and strengthened over time, most notably in the commercial fishing, mining (gold, copper, zinc, silver and coal), logging and oil industries (Norris 2002; Wolfe 2004). In the context of World War I (1914-18), the Great Depression (1930s) and World War II (1939-45), Alaska's booming industries attracted many to its rapidly expanding urban centres.

As a direct consequence, mid-twentieth century Alaska's policies were principally directed towards economic stimulation, using tax revenues from oil producers and shippers. During the global 1973 oil crisis, a considerable oil boom took place in Alaska from the mid-1970s to the early 1980s. This period was characterized by the expansion of governmental services and increased investments in capital construction projects (Wolfe and Walker 1987). The economic boom eventually ended in 1986 as a result of declining oil prices and state spending (Wolfe and Walker 1987).

Although subsistence fishing and hunting still provided a reliable economic base for many rural Alaskan residents in the 1980s (Wolfe 1984; Fall 1990), the short-lived economic boom may have caused negative impacts on their traditional subsistence practices (Wolfe and Walker 1987). Thus a rural economy previously solely reliant on subsistence harvests gradually shifted towards a "mixed subsistence market economy" (Wolfe 2004), an economy described in 2.2.4 'Increasing Rural/ Urban Divide'.

<sup>&</sup>lt;sup>5</sup> Arnold (1976) covers the historical claims Alaska Natives had to the land, as well as the history of the passage of the bill.

<sup>&</sup>lt;sup>6</sup> Hinckley (1969) gives a thorough description of Sitka in the 1860s, a thriving urban center attracting many from continental US.

#### 2.2.3 Demographic Boom and Transition

Not surprisingly, this economic boom was accompanied by rapid population growth, especially through migration from continental U.S. as people sought better economic opportunities (Mead 1978; Naske 1994). In fact, Alaska was the most rapidly growing state of the country in the early 1980s, with an overall population boom of 30% from 1980 to 1985 (Williams 1987). Additionally, Alaska had the country's highest birth rate, with the total fertility rate of 2.42 children per woman, compared to 1.87 for the nation as a whole for the same time period (Williams 1987).

This demographic boom was concentrated in urban centres, changing Alaska's societal fabric in many ways. One important change was an increasing divide between rural and urban areas.

#### 2.2.4 Increasing Rural/ Urban Divide

With the economic and demographic booms taking place around new urban areas - where 67% of Alaskans were living by 1990 (CENSUS'90 1992), and 80% by 2000 (Wolfe 2000) – two coexistent systems emerged:

- (1) In urban settlements a system based on "industrial capitalism" that followed continental U.S.'s industrial revolution, and
- (2) In rural settings a traditional subsistence system altered towards a "mixed subsistence market economy" (Wolfe 2004).

A "mixed subsistence market economy" is characterised by a system of mutually supportive cash and country foods (Caulfield 2002). Typically incomes from wage employment and government transfer payments (albeit often overstated) enable rural households to engage in subsistence practices while simultaneously providing purchasing power to buy store food.

This duality in realities – one relatively modern and industrial, the other traditional and domestic – was an important shift from the traditional subsistence system that had characterized Alaska's food system until now (Usher 1976). Yet I argue here that instead of a clear divide, we see a spectrum of realities where the practice of subsistence gradually declines. On one end of the spectrum, we see a decreased reliance on subsistence foods in growing urban centres due to the rise of new foodways (i.e. imported foods). On the opposite end, far and isolated communities – often inaccessible for a good portion of the year - were still fully engaged in what is known as customary and traditional subsistence. Between these two ends, the position of a community along the spectrum depended not only on its size, but also its proximity to roads or the opportunity for air transit. Furthermore,

recent studies suggest that mixed economic livelihood in Alaska is not a transition but a persistent economic system (BurnSilver *et al.* 2016).

This duality was much more blurred at the individual and family level due to important social, cultural and kinship relations between urban and rural residents. Food systems research often addresses rural and urban issues separately. Yet, this masks the nuances arising from trans-local transactions, sharing, co-op style purchasing and seasonal migration patterns that are widespread between rural and urban residents (Reed 1995; Tacoli 1998; Gerlach *et al.* 2011).

#### 2.2.5 Nutrition Transition and Coming Out of the Foodshed

A community's increased inclusion and participation within the global food system during the midtwentieth century had two inter-connected manifestations. The first is termed *nutrition transition*, a phenomenon that accompanies the influence of "mixed subsistence market economies" and globalisation on households. It is defined by a transition from traditional foodways to ones that are industrially produced (Popkin and Gordon-Larsen 2004). Indeed, many households in rural communities across Alaska meet their food needs with an increasing share of processed foods bought from stores. These are typically of lower nutritional quality and cultural relevance, in addition to involving higher costs. There is increasing evidence of the various physical, health, economic and mental costs associated to such a transition in the literature (Bjerregaard *et al.* 2004; Graves 2004; Bersamin *et al.* 2006).

The second is the "coming out of the foodshed" phenomenon. Using the metaphor in reverse (see 2.1.3.1 "The Foodshed' above), it symbolises the erosion of a community's control over its food system, thus its increased vulnerability to larger market dynamics (Caulfield 2002; Wilk 2006). This phenomenon also has disastrous impacts on nutritional, psychological and cultural well-being, which undermines community self-reliance (see the case study of Minto provided in Loring (2007)).

## 2.2.6 Competition and Cumulative Stressors

Increasing competition for wild resources arose from their multiple uses. The urban-based hunters and fishers did not primarily rely on wild harvests for food (referred to as nonsubsistence users), thanks to better economic opportunities, higher incomes, lower store prices, and a substantial amount of imported food. Yet their numbers continued to grow (2.2.3 'Demographic Boom and Transition' above), and hence had a real advantage over rural residents still relying on subsistence harvests. As these urban-based sportsmen accessed rural areas to fish and hunt, Alaska saw a growing competition between subsistence and nonsubsistence users of wild resources.

The combination of multiple forces of different nature (statehood, new economic opportunities, a demographic explosion, and an increased participation in the global food market) permanently altered the subsistence food system on which many communities relied on. In many ways, those who continued to harvest country foods were increasingly disadvantaged throughout the mid-twentieth century. That is not to say no Alaska Native benefited from this era of development, since many sought economic opportunities in growing cities both permanently and seasonally.

#### 2.2.7 Research Gap

A permanent shift in traditional subsistence practices resulting from the combination of the various changes and stressors examined above is undeniable. Yet, there is little written literature regarding how subsistence evolved during that time (see Hall *et al.* (1985) and Gerlach (1996) for two important exceptions). Indeed, subsistence practices and their adaptation to contextual change were passed on across generations through both secular and sanctified oral traditions for the most part of history (Arnold 1976; Minc 1986; White 2013). This accumulation of community knowledge leaves few written traces, making it impossible to adequately understand the flexibility of subsistence practices for the most part of history.

Alaska faces many challenges, such as the rising costs of food and fuel, the rapid and irreversible changes to landscape and weather patterns, social and political debates relating to land access and development, and worrying health trends (i.e. diabetes, alcoholism) (Gerlach *et al.* 2011). Climate change is also an important issue facing communities of the North (Lynch and Brunner 2007; Keskitalo 2012; Loring *et al.* 2015). Considering these immense challenges, a better understanding of the resilience and flexibility of subsistence activities is needed. Therefore, it is important to examine how they responded to the immense political, economical and social transformations that took place in mid-century Alaska. In order to address this gap, this thesis provides an analysis and interpretation of historical records in Chapter 4 (addressing 'Objective 2').

## 2.3 Politics and the Governance of Subsistence Practices in Alaska

To better contextualize the impact of mid-twentieth century events on subsistence practices, we need to understand how these practices are governed and regulated. Governance outlines the hunting and fishing rights, and although defining subsistence is challenging (see 2.1.1 'What is Subsistence?'), there's no uncertainty as to what subsistence has come to symbolize for Alaska Natives, that is "unique hunting and fishing rights as well as the complex web of cultural practices, social relationships and economic rewards associated with those rights" (Case 1989). In this last section of my literature review, I provide a temporal outline of governance regimes relevant to Alaska Native subsistence, and their evolution.

## 2.3.1 Pre-European Times

Humans settled in Alaska long before the first Russians arrived on board of ships. Until their arrival, Alaska Natives extensively occupied the land and harvested necessary resources – including food. A set of localized food systems developed as a result of two sets of factors, one defined by the environmental conditions of a community's foodshed, the other by its cultural traditions (see 2.1.2.1 "Traditional and Localized Patterns"). The governance of subsistence practices was generally applied at the community-level, since each community harvested from a portfolio of food options within their flexible but identifiable foodshed (Wolfe 2004). Leaders (or "chiefs") with authority over others were able to organize and motivate people in subsistence production (Fall 1987). The leaders were also knowledgeable of supernatural power and had generous personalities (Fall 1987). Limited information exists on the management system of resources in pre-European times; Nelson (1983) does however discuss several important conservation-oriented practices among Athabascan peoples; likewise, Huntington (1992) notes that some communities would defend their hunting areas from outsiders.

Two features are worth highlighting. The first is the potlatch<sup>7</sup>, arguably the main political feature characterizing traditional subsistence use. An important community ritual, it is a public distribution of gifts that commemorates a life event (i.e. recovery from illness, death), honours a person (i.e. spouse), or heals a tear in the community's social fabric (i.e. following injury, insult, murder) (McKennan 1959; Guedon 1981). More importantly, it is a statement of values central to Alaska

<sup>&</sup>lt;sup>7</sup> See an ethnographic description, analysis and interpretation of the potlatch and its importance in the Athabascan village of Tanacross provided by Simeone (2002).

Natives: kinship, sharing, reciprocity and respect. Simeone (2002) notes that this community ritual has survived to this day as an expression of resilience and traditional values. It is in fact, one of the "solutions that have enabled many American Indian individuals and communities to preserve a positive sense of community identity in spite of overwhelming odds" (Simeone 2002). The second feature is inter-community trade, which existed between communities located far from each other. Coastal and inland communities would exchange goods, which also allowed the spread of ideas and cultures between very different groups (Spencer 1959).

#### 2.3.2 Early-European Contact

The earliest contact between Alaska Natives and Europeans dates back to 1741 with the landing of Vitus Bering, which led to the arrival and establishment of Russian traders in scattered trading posts and settlements (Fleming 1992; Crowell 1994). The Aleut/ Unangan are believed to be the first to have significant direct contact with the newcomers, the last being the Inupiat in the far North a century later in 1850 (see the time of significant contact between Europeans and the different Alaska Native groups on Map 1). Two differing versions of what happened following the initial time of contact is found in the literature.

On one hand, some state that despite sporadic contact with both Russian and American hunters, traders and whalers, Indigenous communities were not heavily influenced and continued as the primary landowners (Gibson 1976; Fleming 1992). However, these academics do acknowledge that some southern, northern and interior groups (i.e. Aleut, Tlingit and Inupiat) suffered from a limited amount of disease and violence. On the other hand, Arnold (1976) highlights that "the Aleuts had suffered terrible cruelties and mass killing at the hands of the Russian hunters", who wanted to exploit their hunting skills and forced many into slavery using modern firearms. Thus some Alaskan communities experienced a similar pattern shared by many Indigenous groups across the globe, in which disease and violence led to demographic collapse (i.e. the Aboriginal Tasmanians) (Norris 2002; Madley 2004).

The first version of early European contact suggests that most Alaska Natives were able to adapt their cultural patterns such that subsistence and foraging remained the primary economic model of survival (Langdon 1991). Hence, prior to the 1850s, most Alaskan communities were still relying on and organized by the traditional economic systems of wild food harvesting, production and distribution (Wolfe 2004). Consequently, the localized governance systems in place were predominantly undisturbed. The second version depicts a social situation where shamans and traditional healers didn't have the power to heal the new disease outbreaks. Adding on the violence brought by the power struggle between early Europeans and Indigenous chiefs, many perished, leaving the traditional societal structure and lifeway irreversible changed. Williams (2009b) explains that epidemic diseases "crippled communities for months at a time", largely impacting their ability to build up subsistence food storages for winters. Missionaries, replacing the powerless shamans and healers, built orphanages for the children of those that perished to disease or violence, which contributed to the larger erosion and eradication of traditional language and culture. I discuss the role of missionaries and mission schools in 2.3.3 below.



Map 1 Alaska Native population at the time of significant direct contact with Europeans. Source: Eric Sandberg, Alaska Department of Labour and Workforce Development, Research and Analysis Section, February 2013

## 2.3.3 1850s- 1950s: Pre-Statehood Alaska-U.S. Relationship

Although Alaska did not become a state until 1959, the roots of subsistence legislation precede statehood. Indeed, Alaska Natives were guaranteed by the 1867 Treaty of Cessions to be "admitted to the enjoyment of all the rights, advantages and immunities of citizens of the United States". Furthermore, they could remain undisturbed in the land they occupied until their title was

confirmed by future legislation<sup>8</sup> (Philip 1981). From 1884 onwards, financial aid from the federal government enabled the founding of schools and cooperative trading posts, and more legislation aimed at improving the living conditions of Alaska Natives were passed during Roosevelt's presidency in the 1930s and 40s.

Unfortunately, this noble effort was not consistent throughout the subsequent presidencies. Even more regrettably, literature suggests a different reality for Alaska Natives. Mostly categorized as "uncivilized" and without formal recognition as U.S. citizens, they were not considered as aboriginal groups with any land rights (Norris 2002). Consequently, and in the absence of established treaties regarding these rights, they could make no land claims. This arises mainly from the federal government's ambiguity in determining its responsibilities to Indigenous people of Alaska (Case 1984). This ambiguity led to all Alaskan Indigenous societies being subjected to "colonial and genocidal pressures" (Williams 2009a), such as the destruction of Indigenous religions and education pathways due to Christian missionaries and boarding schools.

The role of missionaries and mission schools, which lead to a collective trauma still felt today, is worth pointing out. The nineteenth century marked the arrival of different denominations of Christianity in Alaska. Previously Russian Orthodox missionaries were present, but mostly in areas where the Russian fur companies had the strongest presence. Nineteenth century American missionaries had a whole new approach to evangelism. Following a "Mission Plan" drafted by leaders of different denominations, Alaska's territory was divided such that each denomination was assigned a region to set up missions and schools (Williams 2009b). The consequences of this plan, and subsequent ones throughout the nineteenth century, are still felt today. Mission schools were an inherent part of the federal effort to "civilize" and assimilate Indigenous people into the mainstream lifeways of the Anglo-American society at the time. Very punitive measures were used to eradicate Indigenous languages, and Alaska Native shamanism was considered dangerous and evil. Each denomination and or/mission had a different method to achieve its goal of "extending his Kingdom among men" (Williams 2009b). Yet, as a whole, mission schools and missionaries largely disrupted the religious landscape of Alaska, as well as family organization and Indigenous languages (Barnhardt 2001; Williams 2009b).

<sup>&</sup>lt;sup>8</sup> See: the Alaska Organic Act of May 17<sup>th</sup> 1884.

From 1906 onwards through the Alaska Native Allotment Act, legal action taken by individual Alaska Natives allowed them to retain up to 160 acres of land. This entitled each to land individually rather than of common tribal property, which further increased Alaska Natives' powerlessness in regards to land. Indeed, the U.S. Congress enacted legislation placing the entire Alaskan territory under its laws relating to customs, commerce and navigation in 1868. Literature suggests that due to the fishing economy, supported by federal legislation, competition for fisheries (i.e. salmon) increased and threatened the livelihood of subsistence communities (Gruening 1954). At the same time, job discrimination against Alaska Natives oppressed any economic alternative brought by the economic development taking place in Alaska's urban centres.

After granting U.S. citizenship to Alaska Natives in 1924, an increasing number of attempts to address the issues associated with land access and rights were undertaken. The Indian Reorganization Act of 1934 (IRA, part of the New Deal), encouraged the use of reservations as Native homelands where communities could somehow self-govern their economic system. Amended in 1936, it attempted to specifically account for Alaska Native needs by protecting their land use and harvest opportunities. However this failed due to opposition (i.e. from foreign settlers), limited funds and poor administration (Helm 1976; Philip 1981).

#### 2.3.4 Mid-Twentieth Century: Legislation under Statehood

The incorporation of Alaska as a new U.S. state in 1959 (see 2.2.1 '1959: Alaska Statehood') brought on a new layer of legislation and ambiguity in terms of land access and regulation. The state's new constitution put forth equal access to natural resources by stipulating "wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for their common use"<sup>9</sup>. This did not resolve the conflicts arising from competing uses of resources, nor the land claims of the various entities (the state, the federal government and the residents). In 1970, President Nixon declared to the Congress on Indian Affairs that "the time has come to break decisively with the past and to create the conditions for a new era in which the Indian future is

<sup>&</sup>lt;sup>9</sup> See: Article VIII 'Natural Resources', §3 'Common Use' of the Alaska Constitution, ratified by the People of Alaska the 24<sup>th</sup> of April 1956, and which became operative with Formal Proclamation of Statehood the 3<sup>rd</sup> of January 1959. Available online at <u>http://ltgov.alaska.gov/Mallott/services/alaska-constitution.html</u>.

determined by Indian acts and Indian decisions"<sup>10</sup>. This realization that Indigenous people were denied an effective voice in the planning and implementation of federal programs characterises the government's self-determination policy, the Indian Self-Determination and Education Assistance Act of 1975 being its centrepiece.

Relevant to subsistence, three regulatory regimes were established to give Alaska Natives an "effective voice": 1) the Alaska National Interest Lands Conservation Act (ANILCA in 1980), 2) the Marine Mammal Protection Act (MMPA in 1972) and 3) the Alaska Eskimo Whaling Commission (AEWC in 1977). These, along with other efforts, aimed at establishing practices of co-managing wildlife, where public authorities and Indigenous people could peacefully resolve conflicts and effectively manage natural resources.

Still, literature does point out to the fundamental cultural differences between the two approaches (Huntington 1992). On one hand, state bureaucracies develop written rules based heavily on the results of scientific research, with those responsible for the science segregated from those managing the resources and/or enforcing regulations. On the other hand, in Indigenous systems research and management go hand in hand, as parts of an intrinsic web that links harvesting, managing, regulating and sharing. This web isn't governed by written rules, but instead by recognized community values to which it is natural for everyone to adhere to. These two approaches reflect the differences between a "functional" and a "structural" culture defined by Holthaus (2012). Their differences led to difficulties in respecting and validating the other system's knowledge and management values. To tackle this, the ANILCA represents the political will to prioritize Alaska Natives' subsistence practices above all other uses.

Moreover, the MMPA prohibits the exploitation of marine mammals, with an important exemption going towards subsistence harvesting. The AEWC, differing from the two above, was formed as an organized response to a ban on bowhead whale hunting imposed by the International Whaling Commission. Following an effective political and scientific campaign, the ban was lifted and Native communities are actively participating in the monitoring and management of whaling activities, as well as the enforcement of regulations.

<sup>&</sup>lt;sup>10</sup> Richard Nixon : « Special Message to the Congress on Indian Affairs », July 8, 1970. Accessible online by Gerhard Peters and John T. Woolley, *The American Presidency Project*, http://www.presidency.ucsb.edu/ws/?pid=2573.

#### 2.3.5 1978- Today: The Division of Subsistence

Taking into consideration the dramatic contextual changes of the mid-twentieth century, the state of Alaska formally established a subsistence program to document the existing subsistence practices and patterns in 1978 (Fall 1990). This was partly motivated by the need to mediate the growing competition between the urban and rural residents (as discussed in 2.2.4 'Increasing Rural/ Urban Divide' and 2.2.6 'Competition and Cumulative Stressors').

Therefore, 1978 can be considered a crucial turning point regarding both the availability and the quality of information relevant to this topic. The new Division of Subsistence of the Alaska Department of Fish and Game took on this role. It had a comprehensive and complex mission, primarily to compile data and conduct studies to gather different types of information in regards to all aspects of subsistence fish and game harvesting (AS 16.05.094)<sup>11</sup>. In order to achieve its multi-faceted mission, the division has an active research program since 1980, which combines ethnographic and applied anthropological methods to advance the department's understanding of subsistence (Fall 1990). Along with the federal subsistence statute passed in 1980, both the state and federal statutes aim to offer preference and protection of customary and traditional practices to rural Alaskan communities, while catering to the urban demands of leisure fishing and hunting.

Today, the Division's mission remains "to scientifically quantify, evaluate, and report information about customary and traditional uses of Alaska fish and wildlife resources"<sup>12</sup>. Additionally, this information is available online via two platforms. The first is a series of over 350 Technical Papers, which provide background information on subsistence across the state. Occasionally they contain information regarding specific challenges encountered, or a specific wild harvest resource (i.e. report on salmon fishery by Simeone and Fall (2003)). The second is a database called the "Community Subsistence Information System" <sup>13</sup> which contains the summarized results of systematic household surveys conducted by the Division. Thanks to these platforms the wealth of information regarding subsistence in Alaska post-1978 improved greatly.

<sup>&</sup>lt;sup>11</sup> See: Alaska Statutes- Section 16.05.094.

<sup>&</sup>lt;sup>12</sup> As stipulated on its webpage <u>http://www.adfg.alaska.gov/index.cfm?adfg=divisions.subsoverview</u>

<sup>&</sup>lt;sup>13</sup> Accessible online at <u>http://www.adfg.alaska.gov/sb/CSIS/</u>
## 2.3.6 The "Dual-Management System" of Practices

A unique feature of contemporary governance of subsistence practices in Alaska is the "dualmanagement system", which deserves some discussion. Subsistence use exists today alongside other legally recognized types of fish and game uses such as commercial fishing, sport fishing, personal use fishing and general hunting. However, subsistence is given the highest priority in both federal and state law, meaning that regulatory restrictions for subsistence appear last in cases where fish and game stocks are unable to support all above mentioned uses. This fuels one of Alaska's most prominent debates: who qualifies for subsistence use and how these are defined and managed (Naske 1994; Sacks 1995).

Although federal and state laws use the same definition of subsistence (provided in 2.1.1.2 'Legal Definition'), they differ in defining who can participate in subsistence harvesting. On one hand, under state law all state residents have qualified to participate since 1989 (from 1978-1989 only rural residents were qualified). On the other, and in wake of this state law, federal law stipulates that only rural Alaska residents are qualified, and this is enforced on federal lands (national parks, national wildlife refuges, national forests, and Bureau of Land Management property), under the management of the Federal Subsistence Board (FSB) (Fall 2012). Consequently, state and federal agencies manage subsistence independently from each other, each on their respective land. Broadly speaking, the state subsistence program enables many users a limited opportunity to engage in subsistence harvests state-wide. While the federal program offers few users greater subsistence opportunities, often geographically limited to the proximity of their communities. This dual subsistence management is the result of three decades of laws formulation, political compromises and adjustments (Bryner 1995).

The FSB designated five urban (also referred to as nonsubsistence) areas: (1) around Fairbanks, (2) Anchorage, (3) Juneau, (4) Ketchikan, (5) Valdez (Map 2). These were defined as areas "where dependence on subsistence is not a principal characteristic of the economy, culture and way of life" (AS 16.05.258(c)<sup>14</sup> and 5 AAC 99.015<sup>15</sup>). With the majority of Alaskans residing in these urban areas, only 17% of Alaska's population could therefore participate in subsistence fishing and hunting in 2012, down from 20% in 2000 (Table 2).

<sup>&</sup>lt;sup>14</sup> See: Alaska Statutes- Section 16.05.258(c).

<sup>&</sup>lt;sup>15</sup> See: Title 5 (Fish and Game), Chapter 99 (Subsistence Uses), Section 15 (Joint Board nonsubsistence areas).



Map 2 Subsistence and nonsubsistence use areas in Alaska (light blue and dark blue respectively), as identified by the FSB.

Source: Alaska Department of Fish and Game website http://www.adfg.alaska.gov

Regardless of whether translating the urban/rural divide into legislation regulating subsistence is adequate, modern bureaucracies have proved to be slow at recognizing and dealing with the integral and communal characteristics of subsistence economies (Huntington 1992). Similarly, Alaska Native socio-political organizations are poorly equipped to efficiently deal with subsistence management bureaucracies at the state and federal levels (Thornton 2001).

	20	00	2012			
Population	Numbers	Percentage	Numbers	Percentage		
Urban	498 882	80%	607 442	82%		
Rural	123 118	20%	124 856	17%		
Total	622 000	100%	732 298	100%		

Table 2 Alaska's rural and urban population numbers and percentages in 2000 and 2012.

Source: Publications from the Division of Subsistence, Alaska Department of Fish and Game (Wolfe 2000; Fall 2012).

# 2.4 Literature Review: Summary

Subsistence practices are central to Alaska Natives' way of life, providing a portfolio of strategies to harvest country foods throughout millennia of change. Today, they are an integral part of the state's food system. Such practices are part of what is known as a "mixed subsistence market economy", and are regulated by both state and federal law. The mid-twentieth century was a period of great political, economic and social change for the state, but little is known regarding subsistence during that time.

# 3 Historical Records: The Annual Surveys of Native Food

In this third chapter the necessary background information regarding the survey records is provided. I first introduce the study area, before detailing the content and format of the surveys. I then briefly discuss the education system of Alaska in the mid-twentieth century, which is worth a mention since schoolteachers were responsible for reporting the surveys. Finally, the detailed methodology used throughout the analysis and interpretation is explained.

# 3.1 The Study Area: The Yukon River as a Transect

There are many reasons why I have chosen to focus on the Yukon River. First of all, it is a defining geographic, ecological and cultural feature of Northwest North America shared by Canada and the state of Alaska. The river's drainage encompasses over 850 000 km<sup>2</sup> and includes dozens of tributaries and distributaries (Loring and Gerlach 2010a). It is, therefore, one of the most noteworthy features of the state in terms of connecting people and places. Additionally, it provides a natural up- and down-river transect that impacts the fishing activities of the bordering communities (i.e. Chinook salmon). Finally, communities across the state are very diverse and scattered. Having the "Great River" (as it is called in the native Gwich'in Athabascan language) as a 'geographical transect' allows for the research to uncover information that would otherwise be masked at the state level. This thesis looks into records originating from 25 communities located along the Yukon River.

In addition to considering the 25 Alaska Native communities as a whole, this thesis analyses regional trends by separating them into 3 regions: the Lower-, Central- and Upper-Yukon (see the regions in Map 3, next page). The divide between the Lower- and Central-Yukon reflects the separation between two management areas identified by the Alaska Department of Fish and Game<sup>16</sup>. The second divide, separating the Central- from Upper-Yukon, was established under the guidance and expertise of my supervisor Dr. Philip Loring. This considered the fact that Tanana is ecologically and culturally more similar to the other communities of the Central-Yukon, than Upper-Yukon communities like Rampart.

<sup>&</sup>lt;sup>16</sup> The two management areas in question are mapped on p.75 of: *Annual Management Report Yukon and Northern Areas 2005* (June 2011), Alaska Department of Fish and Game: Juneau, AK, USA. Available online: <u>http://www.adfg.alaska.gov/fedaidpdfs/fmr11-36.pdf</u> (accessed on May 18th 2016).

The communities are, in alphabetical order:

- Lower-Yukon region (8 communities):
  - Alakanuk, Chaneliak<sup>17</sup>, Emmonak, Hooper Bay, Kotlik, Mountain Village, Pilot Station and Scammon Bay.
- Central- Yukon region (5 communities):
  - o Galena, Grayling, Kaltag, Shageluk and Tanana.
- Upper-Yukon region (12 communities):
  - Arctic Village, Beaver, Birch Creek, Canyon Village, Chalkyitsik, Circle, Eagle, Fort Yukon, Minto, Rampart, Steven's Village, and Venetie.



Map 3 Geographic scope of this thesis: 25 communities spread across three regions of the Yukon River. The Lower-, Central- and Upper- Yukon with 8, 5 and 12 communities respectively.

Map created using KML files downloaded from the Alaska State Geo-spatial Data Clearinghouse (<u>http://www.asgdc.state.ak.us/</u>). I added Canyon Village and Chaneliak myself.

# 3.2 Survey Records: Content, Format and Quality

Annual surveys originating from 25 communities located along the Yukon River were obtained from the U.S. National Archives Records Administration- Alaska Region (NARA-AR) located in

<sup>&</sup>lt;sup>17</sup> The residents of Chaneliak moved to Kotlik in the 1960s, when the channel from Norton became too shallow for barge traffic.

Anchorage. For this thesis, a total of 236 survey records were compiled and considered for analysis. These span a period of time from the 1940s to the 1970s. Each community has on average 9 nonconsecutive years of records, but the total number of years varies from 1 to 24. As for the temporal distribution, the most frequently reported years are from 1957 to 1967, with records originating from more than 10 communities. Table 3 presents how the 236 records are distributed in terms of time, location and quality (the latter is explained in 3.2.3 'Survey Quality').





Colour code: Green= high, orange= medium, red= low quality (see 3.2.3 for the definition). Note that not all consecutive years are represented.

There are two main reasons as to why we see gaps in survey years for each community. The first is that schoolteachers failed to send their annual surveys to the Bureau of Indian Affairs (BIA). Perhaps new teachers were not aware of this responsibility, or forgot this task, or even lost the surveys. Many factors could have influenced the ability of teachers to record fish and game harvests and send them onwards. Another reason would be that no schoolteachers were assigned to the community during those years, and thus no one was present to record these surveys. This is reinforced by Nelson (1986), who spent one year in Chalkyitsik in 1969. He noted that following the school's construction in 1941, there was one teacher during one year, after which many years went by before another teacher came. He added that during the period when the school wasn't operating, people went back to the much more mobile lifestyle required by the seasonality of subsistence species.

### 3.2.1 Survey Content

Entitled the "Annual Survey of Native Foods", each record presents a table listing: the kinds of food harvested (i.e. chum salmon, grouse), the geographic location of the harvest, the harvest method (i.e. fish nets, gun), the quantity gathered by the community, and the method of preservation (i.e. smoked, dried). Furthermore, the table is accompanied by a list of items to fill in:

- "Number of people dependent on this supply"
- "Number of work dogs dependent on this supply"
- "Comment in adequacy of supply (...)"
- "What sources of native food will be available during the winter (...)"
- "Should the food supply be adequate for the coming winter"

In their reports, authors often provide glimpses of their personalities by commenting on community life, political matters, and other interesting elements they encounter during their time in the community. Such comments and insights are provided in many sections of Chapter 4 Results and Discussion: Historical Records in Context'. Specific surveys are referred to using the following format: "quote" (Community name 'year). For example, a quote from the record originating from Minto in 1960 is followed by (Minto '60). The complete reference is then provided within the footnotes, according to NARA-AR referencing guidelines.

Finally, at the bottom of each survey we find the name of the community, the author's name, the report date and the period of time it covers (generally from October to the October of the

following year). About 30% of all the records were handwritten. Please find scanned examples of the surveys in 7.1 'Appendix 1: Examples of Native Food Surveys'.

### 3.2.2 Survey Format

The format of the surveys changed twice over time. An "early" format, which is also the least detailed, was used from the start of these surveys in 1941 for a few years (until 1945-1948 depending on the community). Subsequently, a "transition" format was sometimes used, again for a few years until the early 1950s. Finally, during the 1950s a final "later" format was introduced to all communities. Containing more details than the previous two; this "later" one was used until the last annual surveys reported in 1972. The surveys stopped in 1972 for unknown reasons, but it could be related to the passing of ANCSA in 1971. Please find a scanned example of each of the three formats in Appendix 7.1-A, Appendix 7.1-B and Appendix 7.1-C.

### 3.2.3 Survey Quality

To facilitate analysis and interpretation, as well as better understanding one of the limitations of this set of historical records, I have established a rough ranking criteria for assessing record quality (see Table 3). High quality (green) indicates a completed record with minor data holes, which does not impact the quantitative nor qualitative information of the survey. Medium quality (orange) is assigned to records that contain the most important elements, but some additional information is needed to make it complete. Low quality (red) is used when important data is missing.

# 3.3 Status and Role of the Survey Respondents: Teachers

The status of the authors of these records is worth exploring in more detail. In July 1941, the director of education for the BIA V. R. Farell sent out a circular letter to Alaska Native Service (ANS) teachers working in Alaska Native communities. He wrote that "with the probability of reduced shipping facilities and the need for the maximum home production and storage of food it is important that we have a survey of the quantity of garden vegetables and other locally available foods produced and stored during the current season"<sup>18</sup>. All ANS teachers were expected to obtain the information from community leaders (or at the very least supply a realistic and adequate harvest

<sup>&</sup>lt;sup>18</sup> Farrel, V. E. Director of Education, Office of Indian Affairs, Juneau, AK, to "Teachers", File 917, Ag. Statistics & Production: Beaver 1933-66, RR, RG75, NARA-AR.

estimate), and send them onwards to the BIA. Two surveys were sent, one on "Native Food" and another on "Garden Activity" (only the former is within the scope of this thesis; for an analysis of the latter, see Loring and Gerlach (2010b)).

The history of schooling for Alaska Native people is an interesting topic that, once again, points to the uniqueness of the state. The long-lasting impact of missionaries and mission schools were previously mentioned in 2.3.3 '1850s- 1950s: Pre-Statehood Alaska-U.S. Relationship'. Barnhardt (2001) provides a comprehensive overview of the events that shaped the policies and practices of education in Alaska. For the purpose of this thesis, I would like to draw a parallel between the governance of subsistence practices (as seen in 2.3 Politics and the Governance of Subsistence Practices in Alaska'), and the one governing education in the early-twentieth century. Both were rooted in the common federal belief system that endorsed the government's control on nearly all aspects of American Indigenous life, including but not limited to education, religion, land access and use (Darnell 1979). Hannah Breece, a schoolteacher whose assignment to Alaska lasted 14 years, starts her memoirs stating "my job was to bring them [the people to whom I was being sent] benefits now available to them from civilization and from Uncle Sam's care for his less fortunate children" (Jacobs 2011)<sup>19</sup>. This belief system is reflected in part by the educational practice of "assimilation through segregation". Under this practice, colonial Americans attempted to "assimilate" Alaska Native students into mainstream society by segregating then from their communities and sending them to boarding schools (Barnhardt 2001).

By the mid-twentieth century, the federal Bureau of Education assumed the responsibility for the social welfare and education of most rural Native people. It consequently expanded many of its services, including education but also medical services and stores. However, the overarching belief system remained one of transforming Alaska Natives into civilized (and Christian) Americans. As schoolteacher Hannah Breece puts it, her role was to "help them overcome ignorance, poverty, disease and superstition" (Jacobs 2011). Simultaneously, many treaties and acts were enacted to address this ill-founded approach. However, change was a slow process. It is within this context and considering the education system and philosophy to which the ANS schoolteachers belong to, that I analyse and interpret these records.

<sup>&</sup>lt;sup>19</sup> Jane Jacobs edited the book "A Schoolteacher in Old Alaska" which provides the memoirs of her grandaunt Hannah Breece. This book was published following Hannah's passing.

# 3.4 Annual Surveys: Methodology for Analysis and Interpretation

#### 3.4.1 Historical Ecology

The overarching methodology used to interpret these records can be framed within the discipline of historical ecology. At the interface between ecology and historical geography, this discipline studies past historic ecosystems by tracing "the on-going dialectical relations between human acts and acts of nature, made manifest in the landscape" (Crumley 1994). Although not used for ecosystem restoration purposes, I follow the guidelines of Egan's Historical Ecology Handbook (2005) since this discipline allows for a framework in which I can establish pre-1971 reference conditions from the harvest records. This thesis is the first attempt in academia to establish reference conditions of subsistence harvests from mid-twentieth century Alaska. The intent of establishing reference conditions is not to suggest subsistence practices were static in the past. Rather, this research acknowledges that they are constantly changing, and the concept of reference conditions is used to see how such changes occurred.

#### 3.4.2 Historical Proxy Data: Survey Limitations

It is necessary to recognize that all historical ecology techniques have their limitations, which depend on the temporal and spatial scales of the matter studied (Egan 2005). For the purpose of this research, the historical records are considered proxy data. The wealth of information they offer in regards to subsistence practices and harvests along the Yukon River is valuable and unique, yet this thesis recognizes their limits and challenges as well.

"What a text *says* may seem straightforward, while what it *means* is obscured by the cultural assumptions and discursive practices of an earlier age."

# Egan (2005)

Deciphering the actual meaning of written records should be done with caution. Therefore, in all of the decisions I have had to make when transcribing and interpreting these records, I have erred in the direction of conservative estimations. Thus my findings, if anything, underestimate rather than overestimate subsistence harvests and food kind diversities.

One especially difficult challenge is that the 236 surveys present different reporting methodologies and authors. It is clear from the records that the turnover rate of the schoolteachers was extremely high. The longest number of consecutive years an ANS schoolteacher reported for a village was six (Robert L. Jennings, in Tanana from 1945- 1950). Two schoolteachers reported for five consecutive years, four for four years, and twenty for three years. However the vast majority reported for one or two annual surveys (88 and 26 schoolteachers respectively). This raises the important question as to whether such a short residence time within a community is sufficient to obtain (or estimate) correct subsistence harvest data. Not only does this point to a teacher's ability to seek information or estimate quantities, but also to the community's willingness to share harvest information. Looking into "Garden Activity" surveys, Loring and Gerlach (2010b) note that often schoolteachers incorrectly assessed food quantities, which gave the BIA a false image of chronic famine. Additionally, the high turnover rate of authors gives rise to a variety of reporting techniques. This means the usage of different units to report harvest quantities, or the occasional misinterpretations of survey questions.

Finally, the difference in the number of survey records available from one community to the next impacts the feasibility of performing quantitative data analysis (see Table 3). Indeed, many communities have less than 5 survey years on which we attempt to obtain information regarding their portfolio and subsistence practices. More caution should be exerted when interpreting these records' contents.

#### 3.4.3 Ethnographic Analogy

Despite their limitations, these annual surveys provide us unique and valuable insights on midtwentieth century subsistence. Yet, historical records, similar to archaeological artefacts, are here with us in the present. Thus, my interpretation is guided not only by historical ecology guidelines, but also by ethnographic analogy. This means that the present serves the past by strategically using knowledge from better-known times to make projections to less well-known times (see Binford (2002a), Binford (2001) and Shanks and Tilley (1992) regarding this framework for ethnographic purposes). Inference through analogy enables us to interpret the meaning of historical records with the knowledge of contemporary behaviour in communities of the North American North. Any information extracted from the surveys is therefore interpreted and understood based on what the academic literature provides on contemporary Alaska Natives behaviour and lifestyle, and on the expertise of my supervisors Dr. Philip Loring and Dr. Craig Gerlach.

#### 3.4.4 Record Transcription

The record transcription stage was spread over three months. Each record was first ranked by quality (see Table 3), and the written information compiled into an Excel datasheet entitled "METADATA". A snapshot of this datasheet and a description of its columns is provided in 7.2 'Appendix 2: Record Transcription into METADATA'.

METADATA was filled in using the exact written words of the schoolteachers. However, in some specific cases it differed from these. This was the case for the following:

- Food kind: this usually happened when a certain species has common names (i.e. "Little black" refers to blackfish, therefore "blackfish" is added to METADATA).
- Method of preservation: this usually happened when the methods are in essence the same (i.e. "Eaten", "Table use" and "Consumed fresh" are all added to METADATA as "Consumed fresh").
- **Method of taking** (meaning the harvest method): this usually happened when the methods are in essence the same (i.e. "Hand picked", "Picked" and "Pick").
- Geographical location of harvest: aiming to capture the proximity of the harvest in relation to the location of the community (independent of which exact community the report comes from), I applied the same template across communities. If the place of salmon harvest for Alakanuk was written as a radius of 40 miles around it, this information is added as "Community- 40 miles radius" on METADATA. Similarly, in cases where only the name of the community (i.e. "Minto") was indicated as a geographical name, these would be changed to "Community" on METADATA. In some instances, the written geographic name is reported as is, especially when specific location names are given (i.e. "East Fork Valley").

The full list of these specific cases is provided in Appendix 7.2-C.

# 3.4.5 Quantitative Data Analysis

As a general approach to the quantitative data analysis conducted, all values are the most conservative estimates. This means that, considering the limits of the data, I calculated at the lowest resolution, harvest amounts and diversities.

#### 3.4.5.1 Human and Dog Populations

Two lines on the surveys provide the numbers of people and dogs:

- "Number of people dependent on this supply"
- "Number of work dogs dependent on this supply"

In some instances, no values were reported (9 instances for people, 2 for dogs). In cases when human population value for year n was lacking, the population number from year n-1 or n+1 was used<sup>20</sup>.

#### 3.4.5.2 Total Amount of Country Foods Harvested

The total amount of harvested food within a community for a given year is calculated as the sum of reported amounts for each individual food kind (in pounds). However, due to occasional inconsistencies in the method of reporting, there are some special cases. For example; when another unit is used instead of pounds (i.e. gallon, jar), or the number of individuals harvested is provided instead of weight (i.e. 10 bears, 5 geese). In these cases I have used conversion rates as well as estimates of species weight (these are listed in 7.3 'Appendix 3: Methodology for Quantitative Data- Total Amount of Native Foods Harvested'). The total amount includes quantities reported for what are considered secondary products (i.e. oil, lard; see the complete list in Appendix 7.4-B).

#### 3.4.5.3 Per-capita Amount of Native Foods Harvested

The per-capita amount (in pounds) is calculated by dividing the total amount of harvest food by the community's population (3.4.4.1 and 3.4.4.2 above). This does not take into account the number of dogs, due to uncertainties regarding their consumption and nutritional needs. There is the likelihood of dogs being fed specific meat/fish depending on its availability and overall abundance in the community. There is also evidence that dogs are culled during times of hardship, meaning foods harvested for them are available to people if necessary (more on this matter in 4.5.4 'Controlled Dog Populations' in 'Portfolio Strategies').

<sup>&</sup>lt;sup>20</sup> This was the case for Eagle '60, Hooper Bay '44 '47 '48 '49, Kotlik '72 and Steven's Village '61.

# 3.4.5.4 Number of Food Kinds

The number of food kinds, based on their presence/absence on annual surveys, was calculated for different levels (Table 4). Further information regarding the detailed calculation methodology of each one is provided in 7.4 'Appendix 4: Methodology for Quantitative Data- Number of Food Kinds'. Note that secondary products listed on the reports (i.e. oil, lard) were excluded from the number of food kinds (see the complete list of secondary products in Appendix 7.4-B).

Table 4 Methodology:	Different level	s at whi	ch the	number	of food	kinds	harvested	is
calculated: community	, region and riv	er.						

Notation	Description	Further Information
$oldsymbol{S}_{ ext{Community-Year}}$	The number of different food kinds recorded in a community for a given year.	Appendix 7.4-A
<b>S</b> Community	The average number of different food kinds recorded in a community over the years.	Appendix 7.4-C
$m{S}_{ ext{Community}}$	The number of different food kinds recorded in a community over the years.	Appendix 7.4-D
$oldsymbol{S}_{ ext{Region}}$	The number of different food kinds recorded in a region over the years.	Appendix 7.4-E
<b>S</b> <sub>River</sub>	The number of different food kinds recorded overall for the Yukon River over the years.	Appendix 7.4-F

 $\boldsymbol{S}$  denotes species richness at different spatial and temporal scales.

# 3.4.5.5 Classes of Food Kinds

The food kinds were further classified into six groups:

- Terrestrial small mammals
- Terrestrial big mammals
- Fish (including "clams")
- Botanicals (including "mouse food")
- Birds (including "birds eggs")
- Marine mammals

The full list of food kinds in each class is provided in 'Appendix 5: Methodology for Quantitative Data- Classes of Food Kinds'.

# 3.4.5.6 Biodiversity Indices and "True Diversities"

The records show that different food kinds are reported in a community over the years for which surveys are conducted. However, not all species are harvested equally. While some are present on every annual survey conducted in a community, others appear less often. The absence of a species from a survey may be either a true absence (the species was not harvested that specific year), or a false absence (the species was harvested, but for a certain reason wasn't reported) (Gotelli and Colwell 2011). Although I use the term "presence/absence data" to indicate incidence data, I have to emphasize that the food kinds listed on the records are, actually, "presence data" (see 3.4.2 'Historical Proxy Data: Survey Limitations' for a number of factors that could lead to false absences).

Using the listed food kinds as presence/absence data, I use the combination of three biodiversity indices to capture this relative prevalence (or dominance) of certain species. Their formulas are provided in Table 5. These indices represent diversities of different order:

- Species Richness (diversity of order 0): This is simply the number of species reported within a community (the species count). However, it differs from S <sub>Community</sub> because it never includes "berries" or "salmon" (whereas these are excluded from S <sub>Community</sub> only if specific species of that category were mentioned for that community at any year).
- Shannon's Index (diversity of order 1): This index, along with the Simpson's index, is the most widely used measure of biodiversity in the literature since the 1950s. Yet Shannon (1948), in his widely cited publication, did not write about indices but instead about mutual entropy. This is why the Shannon's Index is also referred to as entropy or marginal entropy.
- Simpson's Index (diversity of order 2): Simpson was arguably the first to introduce an index into the field of ecology, but others inspired his work (Gorelick 2006). Shannon's and Simpson's indices have both stood the test of time and are regarded as the premier measures of ecological diversity (Lande 1996; Magurran 2004).

Shannon's and Simpson's indices are not actual diversity values. Instead, they are entropies that need to be converted into an effective number of species. This enables us to – considering them along species richness – achieve a unified and intuitive interpretation of diversity. Simply put, raw diversity indices do not share the common set of intuitive mathematical properties of diversity. To achieve this we can derive the effective numbers of species (referred throughout this thesis as "true

diversities") from these indices. See Jost (2006) for more discussion into this matter, as well as the practical importance of this transformation. The conversion formulas are provided in Table 5.

Shannon's Index is arguably the "fairest" measure since it weights each species exactly by its frequency, without favouring either rare or common species. The Simpson's Index pays the most attention to dominant species. Therefore, the true diversity value derived from the Simpson's Index will always be smaller than the one derived from the Shannon's Index. And, the latter is always inferior to the Species Richness value.

Table 5 Methodology: Formulas and conversion to true diversities of three biodiversity indices.

INDEX	TRUE DIVERSITY	
Index x:	Diversity in terms of x:	
Species richness $x \equiv \sum_{i=1}^{S} p_i^0$	x	
Shannon entropy $x \equiv -\sum_{i=1}^{5} p_i \ln p_i$	exp(x)	
Gini–Simpson index $x \equiv 1 - \sum_{i=1}^{S} p_i^2$	1/(1-x)	

p<sub>i</sub>: The frequency of the food kind *i* within a community, over all survey years<sup>21</sup>. Source: Table directly taken from Jost (2006).

Consequently, the difference between the three true diversity values can be interpreted as a magnitude of dominance within the community. I therefore include in the result tables a column named "Magnitude of Dominance", which is the difference between the true diversities converted from the Shannon's Index, and the ones converted from the Simpson's Index.

True Diversity Shannon's Index - True Diversity Simpson's Index = Dominance Degree

<sup>&</sup>lt;sup>21</sup> Reported food kinds that refer to categories are ignored (i.e. fowl, meat). Including them increases the indices in terms of true diversity values, which contradicts with the overall approach of this research to provide the most conservative estimates. Two exceptions are made for "berries" and "salmon" (see reasons in main text).

These "Magnitude of Dominance" values indicate a spectrum from communities with a homogenous food portfolio (high value) to those with a heterogeneous one (low value). In other words the higher the magnitude of difference between the two biodiversity indices, the more dominance of a few species is present within the portfolio, and consequently the more homogenous the portfolio is from year to year. Conversely, if the magnitude of dominance is low, this means that no species are dominant in terms of food harvests, and therefore the food system is more heterogeneous (a higher difference in harvest from year to year). Each species' level of dominance is subsequently illustrated in prevalence tables. These show the proportion of years for which a community harvests a specific food kind, allowing a visual interpretation of the homogeneity of a food portfolio.

For the categories "salmon" and "berries", I was faced with a trade-off between species-level resolution and the dominance magnitude. Instead of considering each reported species, I pool them together to look at the prevalence of "salmon" and "berries" overall – therefore losing the resolution at species-level. This allows for an accurate feel of how prevalent "salmon" and "berries" were. Consider the example provided in Table 6; if Chinook salmon is recorded in half of the survey years, and Chum salmon in the other half, keeping them at the species level would result in prevalence levels of 0.5 for each species. Note that prevalence is the proportion of years for which a community harvests a specific food kind. However, pooling them together shows the prevalence level of salmon as 1. This allows us to overcome reporting discrepancies at the species level, in addition to adequately assess the use of salmon within communities.

Table	6	Example	of	the	trade-off	between	species-level	resolution	and	dominance
magn	ituo	de for the c	ate	gorie	s "salmon'	" and "ber	ries".			

	ORIGINAL	POOLED
Year 1	Chinook salmon	Salmon
Year 2	Chum salmon	Salmon
Year 3	Chinook salmon	Salmon
Year 4	Chum salmon	Salmon
Prevalence	Chinook salmon is reported in 2/4 years:	Salmon is reported in 4/4 years:
calculations	• Prevalence <sub>Chinook</sub> = 2/4= 0.5	Prevalence <sub>Salmon</sub> = 4/4= 1
and values	Chum salmon is reported in 2/4 years:	
	• Prevalence <sub>Chum</sub> = 2/4= 0.5	

Prevalence= the proportion of years for which a community harvests a specific food kind.

# 4 Results and Discussion: Historical Records in Context

This fourth chapter of my thesis provides the results and discussion simultaneously, such that the historical records are analyzed and interpreted within their context. Quantitative results and qualitative analysis are discussed, shedding light on different aspects of subsistence in mid-twentieth century Alaska (addressing 'Objective 2').

# 4.1 Amount of Subsistence Harvests

People engaged in contemporary subsistence activities are part of a "mixed subsistence market economy", increasingly influenced by a rapidly changing, interconnected and globalized world (see 2.2.4 'Increasing Rural/ Urban Divide'). To shed light on this matter, this thesis seeks to evaluate (to the extent possible) the magnitude of country foods harvested annually by Alaska Native communities located along the Yukon River (see 'Objective 2-a').

The average magnitude of annual country harvests per-community is 98 000 pounds, and 78 000 pounds when obvious outliers are not considered. However, harvests vary greatly across communities and years. Unfortunately, this thesis is not able to explore any change in magnitude of resource use over time. Indeed, no trend is apparent when looking at the total amount of harvested food for the 25 communities (figure provided in Appendix 7.6-A). Yet, it is worth mentioning that perhaps there does not need to be one. These results could suggest many things; one explanation is that societal changes did disrupt local subsistence practices but people were sufficiently flexible and adaptable such that these disruptions aren't evident in harvest data. Another interpretation is that mid-twentieth century harvests were always highly variable, possibly due to a wide variety of social and ecological factors that interact in complex ways. They could also suggest that harvest quantities are not declining within that time frame.

Due to the limited number of years for which surveys are reported for many communities, some analysis below focuses on the subset communities for which more than 10 years of survey records are available. 12 communities meet this criterion, 4 in each region (number of survey years shown in parenthesis):

- Lower-Yukon: Emmonak (10), Mountain Village (14), Pilot Station (10), Hooper Bay (23).
- Central-Yukon: Tanana (11), Galena (13), Kaltag (15), Shageluk (24).
- Upper-Yukon: Beaver (14), Minto (12), Steven's Village (15), Venetie (14).

Figure 2 shows that the average total amount of harvests within regions (only taking into consideration the 12 communities listed above) was highly variable from year to year. Again, there's no apparent trend. Nevertheless, we can see a statistically significant difference between the yearly averages of the three regions. Conducting a one-way ANOVA between the three regions suggests that one or more are significantly different (p-value < 0.001). A post-hoc Tukey HSD (Honest Significant Difference) test finds that each region is statistically significantly different from the other two (p-values for Central/Lower: 0.0010; Central/Upper: 0.0126; Lower/Upper: 0.0010) (detailed results of this statistical analysis can be found in Appendix 7.6-B). Therefore, these results support that the Lower-Yukon harvests the most country foods in terms of weight, followed by the Central-Yukon, and finally the Upper-Yukon.



Figure 2 Total amount of harvested food by region over time, for 12 communities with  $\geq$  10 survey years (1941-1972)- A, B and C denoting statistically significant differences.

# 4.2 Per-Capita Subsistence Harvests

The mid-twentieth century is a period of demographic boom in Alaska, during which urban population increased greatly due to migration flows from continental U.S. (see 2.2.3 'Demographic Boom and Transition'). This increase is also noticeable in rural communities (Figure 3). Indeed, although population numbers remain relatively stable for many communities, a few exhibit a steadily increasing population. It is the case in Hooper Bay (the biggest community in terms of population), Mountain Village and Shageluk. This is due to a combination of two factors: higher birth rate and migration from other areas. However, the relative contribution of each factor is unknown.

Addressing 'Objective 2-b', the average per-capita subsistence harvests along the Yukon River during the mid-twentieth century is 480 pounds. Yet, similarly to the total amounts harvested above, this varied greatly in time and space. This variability is illustrated by the per-capita harvests per region, averaged across the 4 communities with more than 10 survey years (Figure 4). Unfortunately, this thesis is not able, once again, to address the change in per-capita harvests over time. Nevertheless, a one-way ANOVA suggests one or more differences between the regional per-capita harvests over time (p-value < 0.001). A post-hoc Tukey HSD test finds that while per-capita harvests are significantly lower in the Upper-Yukon, there is no statistically significant difference between the Lower- and Central-Yukon regions (p-values for Central/Lower: 0.2747; Central/Upper: 0.0010; Lower/Upper: 0.0051) (detailed results of this statistical analysis can be found in Appendix 7.6-C).



Figure 3 Human populations of 25 Alaska Native communities (1941-1972).

Note that while Figures 2 to 4 give us an indication of the amount of harvests available for each individual and by community, all values should be taken with caution considering the fact that they are based on estimates, and the multiple inconsistencies in reporting methodologies.



Figure 4 Per-capita amount of harvested food by region over time, for 12 communities with  $\geq$  10 survey years (1941-1972)- A and B denoting statistically significant differences.

# 4.3 Food Kinds Along the Yukon River

Harvest levels and compositions depend on species availability, the effectiveness of harvest technologies and accumulated environmental knowledge (Fall *et al.* 2013). The variety of food kinds recorded on each survey, treated as presence/absence data, provides us interesting insights on the breadth and diversity of country harvest options available along the Yukon River. I discuss these findings below, thus addressing 'Objective 2-c'. S <sub>River</sub> = 72 (Table 8), meaning that the overall breadth of the portfolio of country harvests options is 72 species. When grouped into the 6 classes, their order is as follows: botanicals, fish species, small terrestrial mammals, birds, big terrestrial mammals and finally, marine mammals (Figure 5).



Figure 5 The mid-twentieth century portfolio of country harvest options available along the Yukon River: 72 species grouped into 6 classes.



Figure 6 Community-Year incidence of individual species reported as food kinds across all 25 communities (1941-1972).

Note the difference in scale of the two figures.

Figure 6 further illustrates the variety of options from which people can decide what and when to harvest. Their community-year incidence (presence in any community on any survey year) shows the prevalence of a few species. Indeed, moose, whitefish, rabbit, cranberries and blueberries collectively account for more than 1/3 of the total incidences of country foods, and 1/2 when adding salmon species. However, food kinds with low community-year incidence (such as pike, raspberries, clams and crane) should not be overlooked. They represent, along with many other "rarely" utilized subsistence food sources, secondary food sources that are utilized when the main or culturally preferred sources are insufficient or not available. As mentioned in 2.1.3.2 "The

Portfolio Strategy', this flexibility is the source of resilience of a subsistence food system. In this sense, the prevalent food kinds and those harvested to a lesser extent are just as important in order to achieve food security.

Furthermore, eight food kinds were not reported at the species-level, but at the categories-level. This can be due to the survey respondent's inability to identify specific species. It could also be because they felt it was unnecessary to report species when the whole category was overwhelmingly harvested and consumed. Either way, salmon, berries and birds were reported many times (124, 41 and 27 respectively) (Table 7). This may be a reflection of their importance in the diet of subsistence communities located along the Yukon River.

Table 7 Community-year incident	ce of categories	s listed as food	l kinds across	s all 25
communities (1941-1972).				

Reported Food Kind	Community-Year Incidence
Salmon	124
Berries	41
Waterfowl	27
Birds	23
Fowl	21
Fish	18
Meat	6
Other foods	4

The surveys also shed light on the breadth of subsistence resources utilized by the three regions. Arnold (1976) describes that "generally speaking, the food resources of the interior were far less abundant than along the coastal areas". Indeed, a difference in regional portfolio breadth is suggested by the S <sub>Region</sub> values and the true diversities (Table 8 and Table 9). Table 8 shows that the number of reported species in the Lower-Yukon is significantly superior to the one for both the Central- and the Upper- Yukon (53, 37 and 40 respectively).

# Table 8 Regional values: S Region , S River and the number of unique species.

Region	S River	S Region	Number of unique species
Lower		53	23
Central	72	37	6
Upper		40	10

Table 9 Average true diversities of food kinds for each region and their resulting magnitude of dominance, calculated without communities of  $\leq 5$  survey years.

	True I	Diversities: Ave	erages	Magnitude of Dominance
Region	From Shannon's	From Simpson's	From Species Richness	Div from Shannon's - Div from Simpson's
Lower	17.87	15.57	27.00	2.30
Central	14.81	13.23	22.00	1.58
Upper	14.42	12.15	22.60	2.27

Similarly, Table 9 shows the average true diversity values calculated from the Shannon's Index, the Simpson's Index, and the Species Richness. All three are superior for Lower-Yukon communities, relative to the other two regions. It is worth pointing out that biodiversity values for Central-Yukon are lower than expected. Perhaps this region simply does have fewer harvest options. However, it could also be due to an underestimate considering the low number of survey years originating from this region. Indeed, the Central-Yukon has a much lower number of survey records (67 instead of 84 and 85), which potentially skews the analysis because there are fewer "samples" catching the actual diversity over time. This may influence the regional average magnitude of dominance, as well as the species richness values and the true diversities (this limitation is one of many that are reintegrated in 4.6 'Limitations', located at the very end of this Chapter 4 'Results and Discussion').

The number of unique species, by which I mean species only reported in one of the three regions, suggests important regional differences in portfolio composition. Table 8 shows that nearly half of the number of Lower-Yukon species can be attributed to unique species that are absent from the Central- and Upper-Yukon (23 species out of 53), such as marine mammals. The full list of unique species by region is provided in Appendix 7.6-D. We can also look at the proportion of each class within a region's portfolio of food option (Figure 7 and Figure 8). Fish, botanicals and birds are all widely represented classes in the three regions. The Lower-Yukon is the only region to have marine mammals, which is consistent with the fact that this region is the only one located along the coastline. If we compare Central-Yukon species to those found in the Upper-Yukon, we notice that the portfolio of the Upper region has a wider share of small terrestrial mammals. The Central region's portfolio, however, has a larger share of botanicals. This becomes even more evident in

Figure 8, which shows the same six classes but only for considering a region's unique species. Most of the unique species of the Central-Yukon are botanicals, while small terrestrial mammals form the majority for the Upper-region. Furthermore, while only three classes are represented in these two regions, the Lower-Yukon has unique species in all six classes.



Figure 7 Class distribution of each region's number of species: Lower-Yukon (53), Central-Yukon (37) and Upper-Yukon (40).



Figure 8 Class distribution of each region's number of unique species: Lower-Yukon (23), Central-Yukon (6) and Upper-Yukon (10). Same legend as Figure 7 above.

Although salmon, berries, small mammals, fowl and (to a lesser degree) moose were widely harvested all along the Yukon River, the records suggest very different food portfolios across and within the three regions. Therefore, they support the existence of very localized patterns of subsistence, which are an important feature of subsistence in Alaska (see 2.1.2.1 'Traditional and Localized Patterns'). Addressing 'Objective 2-d' of this thesis, these inter- and intra-regional subsistence patterns are further explored in the three sub-sections below.

# 4.3.1 Portfolio Composition of the Lower-Yukon

The Lower-Yukon exhibits the highest harvested amounts of country resources and the largest portfolio of food options (as previously mentioned). Similar to patterns of harvest magnitude, the portfolio breadths of individual communities also vary greatly (Table 10). Scammon Bay, Hooper Bay, Chaneliak and Mountain Village are particularly diverse in food kinds (Table 10-B). Additionally, they exhibit the highest magnitudes of dominance, meaning that the food portfolios of these communities are the most homogenous in the Lower-Yukon (Table 10-C).

	A Biod	liversity Ind	lices	<b>B</b> Tru	ue Diversiti	<b>C</b> Magnitude of Dominance		
Community (n)	Shannon's Index	Simpson's Index	Species Richness	From Shannon's	From Simpson's	From Species Richness	Div fr Shannon from Sim	rom I's - Div Ipson's
Alakanuk (7)	2.65	0.92	20.00	14.16	13.03	20.00	1.13	Ο
Chaneliak (6)	2.93	0.94	29.00	18.65	15.69	29.00	2.96	
Kotlik (5)	2.88	0.94	21.00	17.74	15.63	21.00	2.12	$\mathbf{O}$
Emmonak (10)	2.72	0.93	23.00	15.20	13.53	23.00	1.68	Ο
Mountain Village (14)	2.90	0.94	29.00	18.17	15.84	29.00	2.34	$\mathbf{O}$
Pilot Station (10)	2.89	0.94	24.00	17.96	16.40	24.00	1.57	Ο
Scammon Bay (9)	3.07	0.94	32.00	21.48	18.04	32.00	3.43	
Hooper Bay (23)	2.97	0.94	32.00	19.45	16.47	32.00	2.98	

Table 10 Biodiversity indices and true diversities of food kinds for Lower-Yukon communities, and their resulting magnitude of dominance.

(n) being the number of survey years.

Pie charts provide visualizations for the magnitude of dominance, relative to the other communities within this region (Fully white for the 1<sup>st</sup> 20<sup>th</sup>-percentile; <sup>1</sup>/<sub>4</sub> black for the 2<sup>nd</sup> 20<sup>th</sup>-percentile; <sup>1</sup>/<sub>2</sub> black for the 3<sup>rd</sup> 20<sup>th</sup>-percentile; <sup>3</sup>/<sub>4</sub> black for the 4<sup>th</sup> 20<sup>th</sup>-percentile; fully black for the 5<sup>th</sup> 20<sup>th</sup>-percentile).

Prevalence tables for the communities with the lowest and highest magnitudes of dominance (Alakanuk and Scammon Bay respectively) in Figure 9 further illustrate this. As we can see from the tables, more than half of the food kinds in Alakanuk are reported in 50% of the years, whereas this drops to one third in Scammon Bay. Thus the latter relies more on a few dominant species, meaning that the overall portfolio of the community is more homogenous (it varies less from year to year). Conversely, Alakanuk has fewer dominant food kinds, and hence a more heterogeneous food portfolio. The portfolios of the other Lower-Yukon communities fall between these two.



Figure 9 Prevalence tables for Alakanuk and Scammon Bay: The Lower-Yukon communities with the lowest and highest magnitudes of dominance respectively. Prevalence= the proportion of years for which a community harvests a specific food kind.

					Commur	nity				
		Alaka	Clance nut	Toul	Enning	Nillase Stillase	Pilor S.	Bass Lation	Hoope.	Bay
A		Salmonberries	0.7	0.3	0.8	0.8	0.9	0.3	0.4	0.8
	es	Blueberries	1	0.5	0.4	0.1	0.9	0.7	0.2	0.2
	erri	Cranberries	0.1	0.5	0.4	0.5	0.9	0.8		0.2
	B	Blackberries	0.7	0.5	0.6	0.7	0.1		0.4	0.8
		Crowberries	0.1				0.1			
B		Chinook/King salmon	1	1	1	1	1	1	1	1
	nor	Coho/ Silver salmon	2	1	2	3	2	3		
	Salr	Chum/Dog salmon	1	1		2	1	2	2	1
	0,	Humpy/ Pink salmon						4	2	
C	ar	Berries	X			X	X		X	X
	' ye	Moose	X							
	rery	Salmon	X	X	X	X	X	X	X	
	d er	Seal	X			X			X	X
	ste	Whitefish			X			X		
	l bi	Sheefish								
	kir	Rabbit				X		X		
	poc	Ptarmigan						X		
	Å	Tom Cod							X	

Table 11 Results for Lower-Yukon communities: prevalence and preference (1941-1972).

(A) Prevalence of specific berries for all survey years (1= listed in all years; prevalence level shown by the blue bars), (B) Ranking of prevalence in harvesting specific salmon species, established by the number of years a species is listed throughout all survey years for each community (1<sup>st</sup>= bright orange to 4<sup>th</sup>=pale yellow), (C) Prevalent food kinds, meaning those present on every annual survey conducted in a community.

\* Community with  $2 \le 3$  and  $\le 5$  years of survey records

Looking deeper into the diversity of food kinds, every community in the Lower-Yukon consumes a variety of berries. With the exception of Scammon Bay, all the communities show a high prevalence towards a combination of at least two kinds of berries (>0.5) (Table 11-A). For instance, blueberries and cranberries are present in most surveys originating from Pilot Station. For Emmonak and Hooper Bay, we see salmonberries and blackberries. In fact, for the majority of the Lower-Yukon communities (5 out of 8), berries are listed every year (Table 11-C). Salmon is another food kind listed every year for the vast majority of places (7/8). Note that whenever specific salmon species were mentioned, Chinook salmon was mentioned the most (consistently across all 8 communities), followed by Chum and Coho salmon (Table 11-B). Pink salmon, reported to a lesser degree in Pilot Station and Scammon Bay, is not mentioned anywhere else along the Yukon River. The other prevalent food kinds (those that are reported every year) vary a lot depending on the community

Year	Alakaı	nuk	Char	neliak	Emm	onak	Hooper Bay		Ko	tlik	Moui Villa	ntain age	Pilot Station	Scan Ba	nmon ay
1941							W								
1944							В								
1945			W	S											
1947							В								
1948							В	Be							
1949			W				В	Be							
1950							В	Be							
1951							В								
1952			W				В								
1953							В								
1954							В				S			S	
1955					S						S	В			•
1956											S				
1957							W				S	В		S	W
1958			W		S	В	W				S	W		S	В
1959							W								
1960	В						W				S			S	
1961							W				S	W		S	Wal
1962					S	В	В				S				
1963					S	W					S				
1964					S	W								S	
1965					S	W					S				-
1967					S	W								S	
1969					S	W									•
1970					S	W								S	W
1971		S							S					S	В
1972					S					•					

(Table 11-C). While seal is a prevalent food kind in four locations, moose, rabbit, ptarmigan and specific fish species are prevalent in a few places.

Figure 10 Harvesting marine mammals in the Lower-Yukon: variation across location and time.

**S**: Seal, **B**: Beluga, **W**: Whale, **Wal**: Walrus, **Be**: Bearded seal. Note that not all consecutive years are represented.

Finally, marine mammals are only reported in the Lower-Yukon (see Figure 8, and the full list in Appendix 7.6-D). Five species are mentioned: Seal, Oogruk (a bearded seal), Whale, Beluga and Walrus. Their occurrence in the records varied greatly across time and location (Figure 10). For example, none are reported from Pilot Station, possibly due to its distance from the coastline (see community locations on Map 3). Yet Mountain Village (which doesn't have a coastline in close proximity) harvested seal, beluga and whale nearly every year for a decade. This can be due to a number of factors: a larger foodshed area or cultural elements. While seal is mentioned in all the other communities (except Pilot Station), Hooper Bay seems to rely more on Beluga and Whale.

The reason why seal is mentioned to a lesser degree is unclear. However, whether it is due to environmental or cultural factors, we see that subsistence practices can differ quite significantly between communities in close proximity. This, once again, supports the presence of localized subsistence patterns within a region.

# 4.3.2 Portfolio Composition of the Central-Yukon

There are only five communities in Central-Yukon, compared to eight and twelve in the other regions. This translates into a relatively low number of survey records: 67 whereas the Lower- and Upper-Yukon have 84 and 85 respectively (see Table 3). As previously stated, this likely impacts the regional true diversity values and the magnitude of dominance relative to the other regions, given that there are fewer observations of the portfolio over time (see Table 9). This data limitation will be mentioned again at the end of this Chapter 4 'Results and Discussion'.

The influence of this limitation can also be noticed within the region (Table 12-A); we find the lowest true diversity values in Grayling (with 4 survey years) and the highest in Shageluk (with 24 survey years) (Table 12-B). Although this influences the magnitude of dominance calculated for each community (Table 12-C), prevalence tables for Grayling and Shageluk suggest various degrees of homogeneity in terms of food portfolio from one year to another (Figure 11).

Community	A Biod	diversity Ind	ices	<b>B</b> Tr	ue Diversitie	<b>C</b> Magnitude of Dominance		
(n)	Shannon's Index	Simpson's Index	Species From Richness Shannon's		From Simpson's	From Species Richness	Div from Shannon's - Div from Simpson's	
Grayling (4)	2.49	0.91	15.00	12.02	11.33	15.00	0.68	Ο
Tanana (11)	2.62	0.92	16.00	13.77	12.70	16.00	1.07	Ο
Galena (13)	2.51	0.90	20.00	12.25	10.46	20.00	1.79	
Kaltag (15)	2.87	0.94	22.00	17.69	16.17	22.00	1.52	
Shageluk (24)	2.74	0.93	30.00	15.55	13.61	30.00	1.94	

Table 12 Biodiversity indices and true diversities of food kinds for Central-Yukon communities, and their resulting magnitude of dominance.

(n) being the number of survey years.

Pie charts provide visualizations for the magnitude of dominance, relative to the other communities within this region (Fully white for the 1<sup>st</sup> 20<sup>th</sup>-percentile; <sup>1</sup>/<sub>4</sub> black for the 2<sup>nd</sup> 20<sup>th</sup>-percentile; <sup>1</sup>/<sub>2</sub> black for the 3<sup>rd</sup> 20<sup>th</sup>-percentile; <sup>3</sup>/<sub>4</sub> black for the 4<sup>th</sup> 20<sup>th</sup>-percentile; fully black for the 5<sup>th</sup> 20<sup>th</sup>-percentile).



Figure 11 Prevalence tables for Grayling and Shageluk: the Central-Yukon communities with the lowest and highest magnitudes of dominance respectively.

Prevalence= the proportion of years for which a community harvests a specific food kind.

Despite this limitation, the reported food kinds still provide us great insight into the localized subsistence patterns of Central-Yukon communities. For instance, surveys from the Central-Yukon exhibit the highest diversity of berries compared to the other two regions (ten kinds of berries mentioned as opposed to five) (Table 13-A). Shageluk reports seven kinds on its own, with bilberries and currants not reported in any of the 24 other communities. Similar to the Lower-Yukon, people consume salmon throughout the region, as it is consistently reported every year for 4 of the 5 villages (Table 13-C). Chinook, Coho and Chum salmon seem to be harvested with equal prevalence, with Sockeye salmon consumed to a lesser degree (Table 13-B). Big terrestrial mammals are also prevalent, such as moose in four instances and bear in Kaltag (Table 13-C). This is quite different from the Lower-Yukon, where more than half of reported prevalent species are aquatic (see Table 11-C).

Table 13 Results for Central-Yukon communities: prevalence and preference (1941-1972).



(A) Prevalence of specific berries for all survey years (1= listed in all years; prevalence level shown by the blue bars), (B) Ranking of prevalence in harvesting specific salmon species, established by the number of years a species is listed throughout all survey years for each community (1<sup>st</sup>= bright orange to 4<sup>th</sup>=pale yellow), (C) Prevalent food kinds, meaning those present on every annual survey conducted in a community.

\* Community with  $2 \le 3$  and  $\le 5$  years of survey records

### 4.3.3 Portfolio Composition of the Upper-Yukon

Although the Upper-Yukon encompasses the most communities, seven out of twelve have less than six years of survey records. Again, this naturally impacts the true diversity values and the magnitude of dominance of the region. In general communities with few survey records showed low magnitudes of dominance (and therefore more heterogeneous portfolios). This is the case for Arctic Village, Birch Creek, Canyon Village, and Rampart (Table 14-C). This is mainly due to having fewer food kinds being reported, and is one of the many limitations of the data provided by the annual surveys. Still, the biodiversity indices and true biodiversity values suggest varying levels of food diversity within the region (Table 14). Arctic Village, for instance, has true diversity values between 7.38 and 9, as estimated from five survey years. While the true diversity values of Chalkyitsik, also with five survey years, are significantly higher: between 12.46 and 17.

	A Biod	iversity Ind	ices	<b>B</b> Tri	ue Diversiti	Magnitude of C Dominance		
Community (n)	Shannon's Index	Simpson's Index	Species Richness	From Shannon's	From Simpson's	From Species Richness	Div fr Shannon from Sim	om 's - Div pson's
Arctic Village (5)	2.07	0.86	9.00	7.93	7.38	9.00	0.55	Ο
Beaver (14)	2.75	0.92	27.00	15.57	12.93	27.00	2.64	
Birch Creek (2)	2.02	0.86	8.00	7.56	7.20	8.00	0.36	Ο
Canyon Village (2)	2.14	0.88	9.00	8.49	8.00	9.00	0.49	Ο
Chalkyitsik (5)	2.66	0.92	17.00	14.32	12.46	17.00	1.86	
Circle (8)	2.33	0.89	14.00	10.23	9.31	14.00	0.92	Ο
Fort Yukon (2)	2.43	0.91	12.00	11.31	10.67	12.00	0.65	Ο
Minto (12)	2.74	0.92	20.00	15.52	13.11	20.00	2.42	
Rampart (1)	1.39	0.75	4.00	4.00	4.00	4.00	0.00	Ο
Eagle (5)	2.37	0.89	13.00	10.66	9.39	13.00	1.27	$\bullet$
Steven's Village (15)	2.79	0.93	26.00	16.28	13.48	26.00	2.80	
Venetie (14)	2.67	0.92	26.00	14.48	11.93	26.00	2.56	

Table 14 Biodiversity indices and true diversities of food kinds for Upper-Yukon communities, and their resulting magnitude of dominance.

(n) being the number of survey years.

Pie charts provide visualizations for the magnitude of dominance, relative to the other communities within this region (Fully white for the  $1^{st} 20^{th}$ -percentile; <sup>1</sup>/<sub>4</sub> black for the  $2^{nd} 20^{th}$ -percentile; <sup>1</sup>/<sub>2</sub> black for the  $3^{rd} 20^{th}$ -percentile; <sup>3</sup>/<sub>4</sub> black for the  $4^{th} 20^{th}$ -percentile; fully black for the  $5^{th} 20^{th}$ -percentile).

Similar to the other two regions, berries are still widely consumed. Rosehip, solely found in this region, is recorded in six communities (Table 15-A). Additionally, a variety of ten food kinds are prevalent in Upper-Yukon communities, which is the highest for any region (Table 15-C). Moose is prevalent in seven communities, and other big terrestrial mammals like caribou and bear are also prevalent, although in fewer places. Trout is prevalent in Arctic Village, rabbit in Fort Yukon, and ducks in Eagle. Salmon is prevalent in five communities; Chum salmon is reported the most, and this perhaps is because it is common for people in this region to keep dog teams (Table 15-B).



Table 15 Results for Upper-Yukon communities: prevalence and preference (1941-1972).

(A) Prevalence of specific berries for all survey years (1= listed in all years; prevalence level shown by the blue bars), (B) Ranking of prevalence in harvesting specific salmon species, established by the number of years a species is listed throughout all survey years for each community (1<sup>st</sup>= bright orange to 4<sup>th</sup>=pale yellow), (C) Prevalent food kinds, meaning those present on every annual survey conducted in a community.

\* Community with  $\leq$  5 years of survey records

**\*\*** Community with  $\leq 2$  years of survey records

The unique species of the Upper-Yukon are worth exploring in more detail. Some schoolteachers reported cabbage, carrots, potatoes and turnips on the records, which haven't appeared on surveys originating from the other two regions. Agriculture is in fact one of the many portfolio strategies that enable Alaska Natives to meet their food needs during tough times. Although they are introduced, their presence on "Native Food" surveys points to the integral role they have within a wider portfolio of strategies (more on this in 4.5.7 'Outpost Agriculture'). Furthermore, the mentioning of products from outpost community gardens attests to people's creativity and

innovation to achieve food security. I have previously discussed the many changes taking place in mid-twentieth century Alaska, as well as the lower magnitude and diversity of food harvests in the Upper-Yukon. Yet, despite this, incorporating new opportunities (i.e. utilizing garden produce) illustrates how subsistence practices have never ceased to evolve and adapt to new realities.

### 4.4 Food Security

Achieving food security through country foods is the goal of all subsistence communities throughout the world. In fact, the purpose for conducting annual surveys during mid-twentieth century Alaska was to estimate the adequacy of food supplies, hence food security. Food security is therefore a central theme that needs to be discussed. One schoolteacher reported, it is "pretty hard to starve these people as long as there is fish and (...) game" (Shageluk '41)<sup>22</sup>. While certainly true, this statement likely over-simplifies the realities and challenges that Alaska Natives faced achieving food security during this time of rapid social change. In the following section, I identify and discuss the elements that enhance or undermine food security in mid-twentieth century Alaska (addressing 'Objective 2-e').

#### 4.4.1 Subsistence Food Systems: Erosion or Prevalence?

Literature suggests that a combination of multiple stressors has impacted the ability of rural Alaska Native communities to meet their food needs from country foods and achieve food security (Gerlach and Loring 2013a). Nutrition transition and coming out of the foodshed, discussed in 2.2.5, are both phenomena known to impact many rural communities. The survey records propose that this is indeed the case during the mid-twentieth century for some communities located along the Yukon River, illustrated by the growing reliance of people on store-bought items (see 4.4.4 'Double-Edged Stores' below). This erosion of a traditional subsistence food system is noticed in Kaltag '58, where the author "rather doubt[ed] that [the food supply] will be [adequate for the coming winter] as the store did not get any winter supplies. Also our men had very little income this summer"<sup>23</sup>. This points to the community's inability to attain food security from country harvests during that particular year. It is interesting to see that this inability may also arise from a conscious

<sup>&</sup>lt;sup>22</sup> Herman L. Larson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>23</sup> Rose Cohen, Training assistant of Adult Education, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Kaltag 1944-63, RR, RG75, NARA-AR

preference towards store foods over subsistence foods. One schoolteacher wrote: "Natives not hunting this year, [they] prefer buying" (Galena '44)<sup>24</sup>.

Yet, evidence of the prevalence of subsistence food systems is also provided in the records. As mentioned in 2.1.3.2 "The Portfolio Strategy', the remarkable flexibility of a food system based on country foods has ostensibly enabled people to survive and thrive for the past 11 000 years. One particular survey pointed to this ability to rely on a variable yet stable food portfolio by noting that "supply for the coming winter [is] adequate. [It's] pretty hard to starve these people so long as there is fish and no forest fires to kill off game" (Shageluk '41)<sup>25</sup>. In Galena "many families are living in winter camps and have been doing well in hunting their food. They live cheaper and seem to be healthier and happier" (Galena '47)<sup>26</sup>. In Beaver the schoolteacher stated "Native food supply [is] always adequate" (Beaver '41)<sup>27</sup>. These comments indicate that food security was achieved through subsistence practices in the 1940s, and that communities enjoyed a variety of food kinds.

The perception of annual food security can be interpreted from the respondents' answers to whether "the food supply [will] be adequate for the coming winter". My analysis shows that in ~41% of the entire set of records, annual country foods were reported as sufficient for upcoming winter times (see Table 16). Inadequate quantities were reported in ~19%, and possible adequacy ("Maybe") in ~7%. I classified the remaining as "Unknown", which comprises of records where the author did not answer this question, or answered it in such a way that it was impossible to determine the adequacy of the supply (i.e. "Harvest near an average year"). Looking at the perceived adequacy, as determined by the proportions of these four answers ("Yes", "Maybe", "No" and "Unknown") pre- and post-statehood, did not yield significant differences. Interestingly, the relative percentage of these four answers did vary by region. Figure 12 shows that the percentage of "Unknown" adequacy was relatively similar for all three regions. However, the percentage of "Yes" (meaning winter food supply will be adequate) in records originating from Upper-Yukon communities was significantly lower. Conversely, its percentage of the response "No" was

<sup>&</sup>lt;sup>24</sup> Virginia J. Crawford, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Galena 1944-64, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>25</sup> Herman L. Larson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>26</sup> Alma Bezich, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Galena 1944-64, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>27</sup> Frank H. Mishon, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Beaver 1941-67, RR, RG75, NARA-AR

considerably higher. In fact, there seems to be an indication of an increased perception of food insecurity from the Lower-Yukon to the Upper Yukon. This indication is worth noting considering how the Upper-Yukon also exhibits the least diversity of food kinds, the lowest harvest amounts, and the lowest per-capita harvest amounts (see the analysis and discussion above in 4.1 'Amount of ', 4.2 'Per-Capita Subsistence Harvests' and 4.3 'Food Kinds Along the Yukon River'). These measures all seem to point to decreasing food security as you move inland along the Yukon River.

Table	16 Schoolteacher	's perceived	adequacy	of v	winter	food	suppl	y: 1	Percentage	and	count
of resp	oonses over the en	ntire dataset	•								

Response	%	Count			
Yes	41.1	97			
Unknown	33.5	81			
Maybe	6.8	16			
No	18.6	44			
Total	100	236			



Figure 12 Schoolteacher's perceived adequacy of winter food supply: Percentages of responses by region.

This figure shows the four categories of responses to "will the food supply be adequate for the coming winter".

# 4.4.2 Sharing and Inequality

One element that contributes to the resilience of subsistence food systems, and hence to food security, in Alaska is the practice of sharing and dividing the harvest (Magdanz et al. 2002). Records
from Shageluk explicitly mentioned sharing: that moose and bear meat were divided amongst villagers by the potlatch method (Shageluk '44 '45 '46). Although such practices have not been reported elsewhere, it would be misleading to assume they are absent from other communities. Indeed, the potlatch was the main political feature characterising traditional subsistence use, and sharing harvests was, and still is, a common practice (see 2.3.1 'Pre-European Times').

Many teachers noted, however, that country harvests are sometimes unevenly distributed within the communities. It is hard to determine from these records alone if this is a rising trend specific to that period in time, but it is definitely an element that stands out from the surveys. One quote from an Arctic Village report exemplified this issue: "for all but a few families the supply is adequate. Because of the selling system (credit) the few families make out fairly well" (Arctic Village '60)<sup>28</sup>. In Galena the teacher remarked that the supply is adequate "though some will be on short rations as usual" (Galena '64)<sup>29</sup>. In Emmonak "some will have not enough because [of] lack of money or poor fur hunting" (Emmonak '55)<sup>30</sup>. A schoolteacher in Hooper Bay explicitly wrote: "supply is adequate if distribution was equal (...) the major proportion of the wealth is in the hands of 2/3 of the population" (Hooper Bay '55)<sup>31</sup>.

None of the surveys mentioned different social classes or addressed any hierarchical organization of people within the community, which leaves these comments open to various interpretations. It could well be that some level of inequity is unavoidable, but these observations could also indicate a rise of new social inequalities accompanying the economic and demographic booms of the mid-twentieth century, and the transition to a "mixed subsistence market economy". Finally, it is also plausible that teachers over-estimated the problem because they were simply not aware of the extent to which harvests were shared.

<sup>&</sup>lt;sup>28</sup> Marie B. Mott, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Arctic Village 1960-64, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>29</sup> Charles J. Evans, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Galena 1944-64, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>30</sup> Betty Suy, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>31</sup> Ivan G. Myers, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

#### 4.4.3 Trade and Industries

Trade was extensive among Alaska Native communities long before Europeans arrived (as mentioned in 2.3.1 'Pre-European Times'). Yet, the economic opportunities of the mid-twentieth century brought on a new wave of trade across larger distances (see 2.2.2 'New Economic Opportunities').

The annual surveys acknowledge inter-community trade as one of many strategies by which people achieved food security. One teacher noted, for example, that Chaneliak residents "purchase reindeer meat from other villages" (Chaneliak '45)<sup>32</sup>; another noted from Steven's Village that people sell a lot of dried salmon strips (Steven's Village '60)<sup>33</sup>. While this contributes to a resilient food system by providing an additional source of country foods or income, the records also suggest that sale of country foods could negatively impact food security. A schoolteacher explained that fish being sold instead of being dried for future consumption is the reason for hunger during the coming winter (Minto '58)<sup>34</sup>. Although it is unknown if, in this case, the fish was sold to other villages or bigger markets, it suggests a trade-off existed between a resilient subsistence food system and the cash inflow provided by commercial opportunities. Furthermore, the inclusion of communities into larger markets can make them vulnerable to the markets' demand and price fluctuations. This vulnerability is noted in Shageluk, where "dried dog salmon which would otherwise find a good market in the village is very much less in demand and those people with this fish for sale have what amounts to a surplus" (Shageluk '58)<sup>35</sup>.

Other industries are also mentioned in the records, suggesting various degrees of inclusion within the mid-twentieth century industrial development taking place in Alaska as a whole. One community's sources of revenue included the fur trade and "the barter for school wood" (Venetie '41)<sup>36</sup>. Another is noted as having an adequate food supply thanks to being "one of the best self

CEU eTD Collection

<sup>&</sup>lt;sup>32</sup> Melvina H. Kopp, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Chaneliak 1941-58, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>33</sup> Marjorie E. Sinclair, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>34</sup> Dorothy F. Pentecost, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Minto 1941-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>35</sup> Louis J. Slattery "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>36</sup> John Fredson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Venetie 1941-72, RR, RG75, NARA-AR

supplied villages in this district, the canning industry also help[ing] the economy of the village" (Alakanuk '60)<sup>37</sup>.

#### 4.4.4 Double-Edged Stores

Stores play an important role in achieving food security by offering an alternative source of food when country harvests are low, as well as offering items not available from the land (i.e. rice and flour mentioned in Arctic Village surveys). Situations of low subsistence harvests can arise quite unexpectedly, especially due to fluctuating prey populations. Throughout the twentieth century, country foods shared an increasing partnership with store produce. Heaton (2012) goes as far as calling this partnership "subsistence shopping", and discusses its central role in drawing Alaska Natives into a consumer-oriented economy and the mainstream consumer culture. Stores were explicitly mentioned on 24/236 survey records (10 times in Upper- and Lower-Yukon, 4 times in Central-Yukon). These 24 records originate from 4, 5 and 3 different communities from the Upper-, Lower- and Central-Yukon respectively. The temporal spread of these 24 records span from 1941 to 1971 (11 pre-statehood counts and 13 post-statehood counts). These values should be interpreted with caution, since not all schoolteachers reported stores in communities that surely had this infrastructure. However, that stores were only mentioned in 10% of the records suggests that overall, the reliance on store-bought foods was still sporadic during this period. The increased reliance on store-bought foods that has emerged since, while providing one measure of food security (as previously explained), also has the long-term effect of undermining overall food security by increasing a community's vulnerability and reliance on external sources (Loring 2007). Consequently, stores are in reality a strategy to cope with short-term unforeseen food shortages, while undermining the long-term self-reliance of communities. Furthermore, items sold in stores are often poor in nutrition, as well as cultural relevance.

This double-edged reality of store-bought foods is portrayed throughout the surveys. On one hand, schoolteachers commented on the convenience and importance of having them available. In Emmonak a teacher reported: "even though there has been little native food put up, I feel that there is a fairly substantial purchase power within the village. There are 3 stores in town from which

<sup>&</sup>lt;sup>37</sup> Victor L. Suazo, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Alakanuk 1960-71, RR, RG75, NARA-AR

food can be purchased" (Emmonak '70)<sup>38</sup>. Another, from Alakanuk, noted that there was "plenty of money to buy food at the store" (Alakanuk '69)<sup>39</sup>. A couple of years later, the new teacher in this same community explained that the "winter supply of fresh meat will be low [due to a] flood [which] killed off most of small game. The three stores are amply supplying the village with meats and staples" (Alakanuk '71)<sup>40</sup>. Similarly, in Steven's Village country foods supply "does not always carry through spring. Then it is bought from the store, or other Natives who have enough" (Steven's Village '41)<sup>41</sup>. A report from Hooper Bay explicitly stated that "the store will be very important. The Native food supply is very limited" (Hooper Bay '67)<sup>42</sup>.

On the other hand, the surveys point to the inadequacy of stores to provide the food quantity and quality necessary. It is reported that "the store usually runs out by spring time" in Shageluk (Shageluk '65)<sup>43</sup>; while in Kaltag there is a store but it's not operating (Kaltag '51)<sup>44</sup>. One teacher assigned to Chalkyitsik explained that the community "never has supply on hand to meet needs even though some families have the means to buy. What little supplies the store gets exhausted in a few days [...]"(Chalkyitsik '61)<sup>45</sup>. This lack of supplies is reinforced in Richard Nelson's account of the two stores providing the community during his stay in 1969-70. The author writes that neither stores located in Chalkyitsik are large nor well stocked, such that people generally order merchandise by mail from Fort Yukon or Fairbanks (Nelson 1986).

Moreover, store-bought food, while providing one measure of food security, does not embody the social, spiritual and communal values embodied by traditional subsistence foods (Gerlach *et al.* 2011). Despite this, commercial food of low cultural relevance and nutritional value is mentioned in

<sup>&</sup>lt;sup>38</sup> Charles R. Hukill, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>39</sup> R. D. Stevanus, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Alakanuk 1960-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>40</sup> Thomas H. Edwards, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Alakanuk 1960-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>41</sup> Dorothy Henry, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>42</sup> Unknown author, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>43</sup> Jack K. Taylor, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>44</sup> Harold E. Grose, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Kaltag 1944-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>45</sup> Jean R. Frank, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Chalkyitsik 1947-67, RR, RG75, NARA-AR

the records as early as 1947, when a schoolteacher remarks that "meat is not so plentiful - they [referring to the Alaska Natives of Chalkyitsik] will have to be taught how to buy white man's food. They will need to be taught to buy food which will be healthful, rather than the candy, carbonated drinks, crackers etc. which most of them buy now" (Chalkyitsik '47)<sup>46</sup>.

The disparity in regards to the price of store foods also has to be pointed out, as it is an important socioeconomic difference between different areas within the state. Today store items are cheaper in nonsubsistence areas compared to rural subsistence areas (Caulfield 2002; Wolfe 2004; Gerlach and Loring 2013b). This was most likely the case throughout the twentieth century. A number of factors are at play: lower competition amongst stores, higher volume of demand and lower distribution costs. Thus, locality and geography play a key role in determining store prices, such that the bigger the distance between communities from supply sources, the decreasing in volume, quality and diversity of produce. Consequently, income and country food harvests are inversely related, such that communities with lower per-capita income depend more on country food harvests (Figure 13). This is yet another challenge facing subsistence communities far from Alaska's urban centres.

#### Relationship between per-capita income and wild food harvests



Figure 13 Country Food Harvests and Income in Alaskan Communities: An Inverse Relationship

Source: Graph taken from Wolfe (2004)

<sup>&</sup>lt;sup>46</sup> Helen M. Beaver, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Chalkyitsik 1947-67, RR, RG75, NARA-AR

#### 4.4.5 Teacher's Perspective on Food Security

Schoolteachers' perspective on food security is evident in their many witty comments and suggestions, and as such are worth exploring in more detail. A few teachers felt inadequately informed to form an accurate opinion on the sufficiency of food supplies for the upcoming winter (see also 3.4.2 'Historical Proxy Data: Survey Limitations'). One respondent assigned to Emmonak started his report with "please consider the following statement as being seemingly true and quite general in nature" (Emmonak '63)<sup>47</sup>. Others relied on the village chief's expertise, reporting for example that the "Chief said it was enough food" (Beaver '64)<sup>48</sup>, or the "Chief of the council feels the supply [is] inadequate" (Shageluk '65)<sup>49</sup>. Another simply stated "since this is my first year in the village I have no basis on which to judge" (Kaltag '62)<sup>50</sup>. In one instance, the schoolteacher wrote that "Natives [are] reluctant to give information" on moose harvest quantities (Emmonak '63)<sup>51</sup>. Overall, many found "it next to impossible to so much as estimate the pounds of various kinds of foods consumed" (Chaneliak '48)<sup>52</sup>.

Still, the authors of the reports provided a wide range of opinions and suggestions in regards to food supply. One believed "that the people need the Fish and Game Commission to visit as there was considerable moose taken [in Steven's Village]. They need to be reminded about Game Laws" (Steven's Village '60)<sup>53</sup>. Conversely, in Shageluk the teacher suggested that the state should "stop the white man from hunting in this area" (Shageluk '71)<sup>54</sup>. In one particularly political statement, a

<sup>&</sup>lt;sup>47</sup> Robert S. Henry, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>48</sup> Principal Teacher (name unknown), "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Beaver 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>49</sup> Jack K. Taylor, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>50</sup> R. Peterson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Kaltag 1944-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>51</sup> Robert S. Henry, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>52</sup>Esther S. Travis, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Chaneliak 1941-58, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>53</sup> Marjorie E. Sinclair, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>54</sup> Dick Wiegand, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

teacher opined that the supply is "inadequate because too many boys entered war work for big wages", therefore the solution to "increase supply [is] by stopping the war" (Minto '44)<sup>55</sup>.

Often, teachers also put forth underlying reasons for food shortages. Some pointed to the lack of tools, time or labor force: "too many widows. Not enough men to put in fish wheels. Not enough equipment (boats, motors)", noted one teacher (Circle '52)<sup>56</sup>. Others questioned the willingness of people, citing "laziness" as a challenge (Circle '55)<sup>57</sup> and explaining that residents "could get fish wheels out in time and work harder at all of the jobs" (Minto '54)<sup>58</sup>. One teacher remarked that "many feel the food is available if the people are willing to work to get it" (Emmonak '62)<sup>59</sup>. Another still explained that "conservation must be taught also. People must understand that they are depleting [their] own food supply by not being good conservationists" (Steven's Village '49)<sup>60</sup>. Following a year where food supplies were low due to increased employment opportunities; a teacher in Hooper Bay wrote that trapping activities have resumed since "the men seemed to have learnt a lesson" (Hooper Bay '53)<sup>61</sup>. One report listed three reasons for food shortage: "bad luck, ill health or failure to use foresight necessary in acquiring various foods at time [when] they are available, in other words negligence in preparing for long winter" (Chaneliak '48)<sup>62</sup>.

These various comments should be considered in the context of colonial attitudes regarding Indigenous people and also the education system established in Alaska Native communities during the mid-twentieth century (see 3.3 'Status and Role of the Survey Respondents: Teachers'). Following assimilation policies that disregarded Indigenous cultural characteristics, it is unsurprising

<sup>&</sup>lt;sup>55</sup> C. W. Holland, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Minto 1941-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>56</sup> Lillian D. Walker, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Circle 1945-57, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>57</sup> W. E. Rasmussen, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Circle 1945-57, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>58</sup> Jans H. Forshaug, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Minto 1941-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>59</sup> James C. Henriksen, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>60</sup> Fred E. Bailey, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>61</sup> Robert J. Grant, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>62</sup> Esther S. Travis, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Chaneliak 1941-58, RR, RG75, NARA-AR

that BIA teachers, mostly assigned for one or two years within a community, could form very inaccurate understandings of local culture.

#### 4.4.6 Drivers of Destabilization

The various societal changes taking place in mid-twentieth century Alaska undoubtedly impacted the way people relate to their environment and consequently how they relate to food. Statehood, conflicts, mission schools, competition and reduced mobility are a few examples of these drivers of destabilization (these were addressed in Chapter 2 'Literature Review').

The need of men for the purpose of conflict and war is reported in two instances as a direct cause of reduced country harvests, in the communities of Minto and Circle. This is further supported when a teacher noticed an "unusually good fishing year [... when] most returned to their fish camps after abandoning them during the war" (Galena '46)<sup>63</sup>. Legislation regulating subsistence practices brought on by statehood is also a destabilizing driver that in some cases limited people's ability to hunt or fish. In Kotlik, for instance, food was in short supply during two periods of 1963 due to low fishnet yields. The teacher "suspects the local fish are away spawning [and] break-up nets are too dangerous to tend – then it is illegal to have a net in the water until the commercial fishing seasons opens" (Kotlik '63)<sup>64</sup>. Although no evidence of subsistence fishing ever being considered illegal is found in the literature, this comment points, to the very least, to the difficulty that some rural residents had with adapting to new state policies. Indeed, the clarity and communication of rules and regulations may have been limited due to their rapidly shifting nature.

In Shageluk '71, the author suggested stopping the "white man" from hunting in this area to increase local harvest amounts. Considering the often-ambiguous legislative framework regulating subsistence hunting and other legally recognized hunting activities, it is unsurprising that the surveys mention competition arising between subsistence and nonsubsistence users. Competition with commercial fishing is alluded to in Emmonak:

"The 1962 commercial fishing season was a good one and more people seemed to have more money than before. However, subsistence fishing for salmon seemed less than adequate for the 1962-63 winter. As a result,

<sup>&</sup>lt;sup>63</sup> Alma Bezich, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Galena 1944-64, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>64</sup> John Logan, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Kotlik 1962-72, RR, RG75, NARA-AR

many people were buying fish in the late winter and very early spring so their extra money of the previous fall netted them little in any gain foodwise. There were many families who had already spent their cash earnings and suffered for it."

(Emmonak '63)<sup>65</sup>

### 4.5 Portfolio Strategies

The existence of subsistence practices today attests to people's ability to innovate, adapt, and evolve their strategies during times of stress. Against all odds, and despite the multiple stressors of mid-twentieth century Alaska, people continue to harvest country foods as a means to meet nutritional, cultural and spiritual needs. More than the specific harvest technologies or specific species populations, it is the strategy of flexibility that gives rise to resilience. Nevertheless, the historical records provide evidence of key strategies utilized during the mid-twentieth century, which are explored in this section (addressing 'Objective 2-f').

#### 4.5.1 Seasonality and Prey-Switching

Seasonality is a fundamental characteristic of subsistence practices (see the example of a subsistence 'calendar' in Figure 1). Richard Nelson's account from his fieldwork in Chalkyitsik in 1969-70 further demonstrates it:

"They followed a pattern which is common to many Athabascan groups, traveling far up to the headwaters in fall, staying in the upriver country until spring, then floating down the river and spending the summer fishing in the downriver regions."

#### Nelson (1986)

Prey-switching happens when a particular and often preferred food kind is in low abundance. Therefore a higher share of the annual subsistence harvests originates from other prey species and food kinds. Considering the seasonal patterns of subsistence practices, and the many ecological and environmental fluctuations that take place within the wider landscape, this ability to switch preys is fundamental to a community's ability to face food shortages. There are two main elements that decrease prey population numbers.

<sup>&</sup>lt;sup>65</sup> Robert S. Henry, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

The first is the natural population cycle of each prey species, which is mentioned in the records: the "moose and caribou goes in cycles, some years there is plenty" in Steven's Village '41<sup>66</sup>, while in Beaver the schoolteacher commented that the "rabbit cycle is on decline" (Beaver '44)<sup>67</sup>. Similarly, a Venetie survey remarked that supplies of caribou, moose, rabbit and squirrel were "some years good other times almost nil" (Venetie '48)<sup>68</sup>. Population dynamics of fish is noticed in Shageluk, where the "annual fish yield on the Innoko River varies considerably from year to year" (Shageluk '44)<sup>69</sup>. Such natural cycles in population abundance can also be found in the literature. For instance, furbearers such as muskrats and snowshoe hares are known to follow a marked decadal cycle of expansion and contraction (Viljugrein *et al.* 2001). Furbearers were especially low in abundance during the late 1940s and early 1950s, which caused a harvest emphasis on other food kinds, such as produce from gardens (see 4.5.7 'Outpost Agriculture') (Loring and Gerlach 2010b).

The second type of element that decreases prey populations is environmental (i.e. weather, fires, water levels dynamics). Environmental factors can change the range within which prey populations inhabit. These are also mentioned in the surveys: "high water drove moose inland. Hunters got very few, and are worried" (Birch Creek '67)<sup>70</sup>. High waters were also reported as the reason for reduced fish yields (Chalkyitsik '61 '62, Kaltag '63), waterfowl harvests (Kaltag '63) and berry quantities (Beaver '62). Early cold weather impacted the amount of moose harvests in Minto '47. An important point to make is that each species reacts to environmental changes differently. For instance, one report commented "this was a good year for fish and moose, but weather has caused a very heavy loss in berries" (Mountain Village '65)<sup>71</sup>. Considering that each food kind has different environmental requirements, diversifying food sources is an important strategy to achieve food security.

CEU eTD Collection

<sup>&</sup>lt;sup>66</sup> Doi 1941-0 <sup>67</sup> Frai 67, RI

<sup>&</sup>lt;sup>66</sup> Dorothy Henry, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>67</sup> Frank H. Mishon, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Beaver 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>68</sup> Judith R. Melin, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Venetie 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>69</sup> Constance H. Dickman, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>70</sup> Clifford Boram, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Birch Creek 1964-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>71</sup> Jordon R. Slate, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Mountain Village 1944-65, RR, RG75, NARA-AR

#### 4.5.2 Transfer Payments and Aid

Transfer payments of various natures are explicitly mentioned in 16 of the 236 survey records. For instance: "ADC payments" (Minto '59 and Beaver '55), "aid" (Steven's Village '61), "welfare/ government checks" (Beaver '52 '55 '56 '67, Kaltag '59 and Hooper Bay '55), and "food stamps" (Hooper Bay '72). Looking at their regional spread, 4/16 occurred in records originating from both the Central- and the Lower-Yukon regions, while the remaining 8 from the Upper-Yukon. Although this fact should be taken with caution, perhaps it suggests an actual higher occurrence of transfer payments in the Upper region. This would be in agreement with the relative food insecurity experienced in the Upper-Yukon by comparison to lower regions: less diversity of food kind, lower per-capita harvest amounts, heightened perception of inadequacy of food supplies (as determined in 4.2 'Per-Capita Subsistence Harvests', 4.3 'Food Kinds Along the Yukon River' and 4.4.1 'Subsistence Food Systems: Erosion or Prevalence?'). Although payment values weren't reported, their mentioning indicates that transfer payments were incorporated within the strategies to acquire food. One report, for instance, estimated that "with the various welfare and other income in the form of checks the [supply] should be adequate" (Beaver '67)<sup>72</sup>. Another stated that winter supply would be adequate "if those in need can secure credit or funds for cash purchases" (Emmonak  $(65)^{73}$ .

Additionally, school programs providing hot lunches to children are mentioned in Pilot Station, Shageluk and Steven's Village. A teacher commented that the "situation would be much worse too, if school lunch wasn't served. This is indeed a great help, as pre-school children also come to enjoy it" (Steven's Village '49)<sup>74</sup>. In Pilot Station it is mentioned that "the school lunch program supplements the home supply" (Pilot Station '62)<sup>75</sup>. Although not a strategy per se, such lunch programs are additional sources of food during schooldays.

<sup>&</sup>lt;sup>72</sup> Nelson M. Page, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Beaver 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>73</sup> Unknown author, Principle Teacher, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>74</sup> Fred E. Bailey, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>75</sup> Aloy H. Brawner, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Pilot Station 1953-71, RR, RG75, NARA-AR

#### 4.5.3 Employment Opportunities

Employment is an element of the portfolio strategy that can be, similar to stores, considered double-sided. "Mixed subsistence market economies" involve cash inflow through seasonal or permanent employment in other sectors (see 2.2.4 'Increasing Rural/ Urban Divide'). This contributes greatly to the purchasing power of households, and many schoolteachers comment on the ability to meet food needs thanks to cash income. In Tanana "many men [...] have worked on construction - with money saved and unemployment they should get along nicely" (Tanana '56)<sup>76</sup>. While in Emmonak "almost everyone who could worked at the local co-op (Frozen Fish) this summer", such that "even though there has been little Native food put up, [...] there is a substantial purchase power" (Emmonak '70)<sup>77</sup>. In Hooper Bay "any of the local people were able to obtain work here" during the summer of 1959<sup>78</sup>. Hence people utilized employment opportunities to increase food options, such that the income enabled them to buy from stores – thereby "creating" additional food sources when country harvests are low (see 4.4.4 'Double-Edged Stores').

Another reality in regards to employment can also be detected in the records. In Kaltag, for example, the food supply was inadequate in 1944 because "most of the Natives worked at Galena until it was too late to store food for winter"<sup>79</sup>. Twenty years later, food supply was sufficient "since most of the villagers live on white man's food out of a can with an income or credit" (Kaltag '63)<sup>80</sup>. Similarly, men in Hooper Bay did not fish as they should have during summer 1953 because "they were notified that very few would be called for cannery work, but they persisted in hanging around the village during the day in hopes a representative would appear and hire them" (Hooper Bay '53)<sup>81</sup>. These comments translate a decreased ability of some to be self-reliant on subsistence foods because of work opportunities, which Loring (2007) notes as an important factor in the nutrition transition (see 2.2.5 'Nutrition Transition and Coming Out of the Foodshed'). Despite the many

<sup>&</sup>lt;sup>76</sup> Richard J. Francis, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Tanana 1945-56, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>77</sup> Charles R. Hukill, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Emmonak 1955-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>78</sup> John F. Gordon, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>79</sup> Alice S. Wilson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Kaltag 1944-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>80</sup> David Hanson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Kaltag 1944-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>81</sup> Robert J. Grant, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

benefits of employment, it also increases people's vulnerability to external factors (i.e. fluctuations in industry prospects). It also points to an increased reliance on income from employment to purchase food from stores. Over time, this may alter the belief system of Alaska Natives within which land is a central part of.

#### 4.5.4 Controlled Dog Populations

Dogs are a somewhat unexpected or perhaps overlooked element of the Alaska Native portfolio strategy, since they are mainly associated with transporting people and goods. In addition to this transport service, they apparently provided communities with something of a buffer during times of food shortage. That is, records show that in hard years, they would either be culled or allowed to starve. This makes the foods that had been harvested for dogs available for people, and freeing some of people's time to harvest for themselves where they would have been harvesting for their dogs.

In Steven's Village, for example, following low levels of country foods harvests in 1949, "several have already disposed of several dogs and considering disposing more"<sup>82</sup>. In Kaltag, the schoolteacher estimated that "it takes 300 pounds of fish to feed one dog through the winter", therefore "many [...] will be shot before spring" (Kaltag '63)<sup>83</sup>. One schoolteacher noticed that the number of dogs is decreasing fast in Venetie in 1948, possibly due to the "lack of proper food, hard work and the treatment of long trips"<sup>84</sup>. What stands out is the practice of culling dogs when food is scarce, such that more fish are available for Alaska Natives. In Hooper Bay, the number of dogs in 1957 was nearly half the dog population of 1955 (200 and 365 respectively). The human population was still relatively the same (415 and 402), however the food supply, which was considered adequate in 1955<sup>85</sup>, was deemed inadequate in 1957<sup>86</sup>.

<sup>&</sup>lt;sup>82</sup> Fred E. Bailey, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>83</sup> David Hanson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Kaltag 1944-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>84</sup> Judith R. Melin, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Venetie 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>85</sup> Ivan G. Myers, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>86</sup> John F. Gordon, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

This strategy makes sense because dogs need little resources to keep while providing a reliable method of transport. They also have a (relatively) fast reproduction rate, which allows for a quick and finely tuned solution to meet food needs at times when sources are unexpectedly scarce. It has also been noted that dogs were sometimes fed with commercial dog feed and at army garbage dumps (Steven's Village '62 '63 '64 and Galena '58 '59).

#### 4.5.5 Preservation Methods and Secondary Products

The knowledge of different preservation methods is an important part of the portfolio strategy as well, such that food kinds can be stored for shorter or longer periods of time depending on the anticipated quality and/or quantity of food. Although one schoolteacher reported that "meat supply [is] poor due to fear of spoilage" (Circle '55)<sup>87</sup>, in reality, the records reflect a wide range of preservation techniques being used. 48 methods are mentioned in the dataset (note that some may be similar to each other, i.e. "Freezing", "Freezing in freezer", "Freezing in pond") (Figure 14).

The preservation methods the most widely reported (>100 counts) throughout the entire dataset was in the following order: drying, freezing, consumed fresh, salting, smoking and canning (Figure 14). Nelson (1986) reinforces the importance of drying food by observing in Chalkyitsik that "most people have a drying rack, a roofed structure with fencing of slates for walls, in which fish and meat are hung to dry". Interestingly, when looking at them at the regional scale, the Upper-Yukon exhibited a different order of "preferred" preservation methods. While the other two regions had the exact same order for their top five methods, 'salting' and the usage of 'barrels' accounted for much more in the Upper-Yukon (Table 17).

Moreover, while 24/48 and 25/48 methods were found on records originating from the Lower- and the Central-Yukon respectively, the Upper-Yukon exhibited a significantly larger variety (34/48). Due to the many limitations of the data, and especially the inconsistencies in reporting style and format, it is unclear how this could be interpreted. Perhaps it is a reflection of people's ability to innovate and find diversified techniques to preserve food, considering the fact that Upper-Yukon communities have less species and food kinds to harvest and consume (as seen throughout this Chapter 4). This diversification allows for a better stability of a food supply, should one particular preserving technology fail, or be disrupted by external factors (i.e. weather).

<sup>&</sup>lt;sup>87</sup> W. E. Rasmussen, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Circle 1945-57, RR, RG75, NARA-AR



Figure 14 The variety of preservation methodology reported in the annual surveys (counts of occurrence).

Note that each food kind reported for a community during a particular year may have been preserved in many ways (i.e. Moose in Kaltag '50 was frozen, buried and cured). Note the difference in scale of the two figures.

Order of Preference	% of counts	Lower	% of counts	Central	% of counts	Upper
1	34	Drying	23	Drying	30	Drying
2	27	Freezing	21	Freezing	16	Salting
3	13	Consumed fresh	9	Consumed fresh	13	Freezing
4	5	Canning	8	Canning	11	Consumed fresh
5	5	Smoking	8	Smoking	6	Barrels
			Samo			

Table 17 The order of preference of the top 5 preservation methods of country food harvests along the Yukon River, by region.

Note that the % values show the % of a particular method being reported amongst the total regional counts of occurrence.

The surveys also show a variety of secondary products available by region. I use the term *secondary product* to refer to any bonus (by-) product resulting from country harvests, in addition to meat and fish consumed. These can be used for cooking or preserving food (i.e. tallow, oil), but are also important contributors to daily life by providing light (i.e by burning whale, seal or beluga oil) and items for barter or sale (i.e. clothing products). Although not all schoolteachers reported these, we can still detect an interesting storyline from those that did. While products from fish are used throughout the Yukon River (Table 18), the Lower-Yukon also hunts a multitude of marine mammals (beluga, seal, whale), while the Upper-Yukon harvests terrestrial mammals (moose, bear). These are consistent with the food kinds described in 4.3 'Food Kinds Along the Yukon River' and the regional subsistence patterns explored in sections 4.3.1, 4.3.2 and 4.3.3.

Table 18 Presence of secondary products listed as individual food kinds on the annual surveys.

	Secondary Product	Lower Region	Central Region	Upper Region
Torrootrial	Bear grease			Р
mammale	Moose lard			Р
mammais	Tallow (fat)		Р	Р
Fich	Fish oil	Р	Р	Р
ГІЗП	Fish fats		Р	Р
	Mukluk (a boot)	Р		
	Whale oil	Р		
Marina	Beluga oil	Р		
mammale	Seal oil	Р		
mammais	Blubber	Р		
	Muktuk (whale blubber)	Р		
	Oogruk oil	Р		
	Seal dogruk	Р		

P denotes presence, understood to be when it is listed in at least one record.

## 4.5.6 Travel Distances

Travel distances from a community to fishing and hunting grounds are part of the portfolio strategy by playing on the "flexibility" of the foodshed's borders. Only 20 out of the total 236 surveys had actual distance values reported in miles.



Figure 15 Change over time in travel distances between community (Beaver and Shageluk) and grounds for hunting and fishing: Distances and trend lines.

To attempt to detect changes in these distances through time, I will focus on the communities that have more than five years of distance data. Two communities fit this criterion, Beaver (10 surveys) and Shageluk (7 surveys), located in the Upper- and Central-Yukon respectively. By looking at the maximal travel distance reported for both communities, and despite years with no data, there seems to be an increasing trend (see both trend lines on Figure 15). Obviously, due to the small sample size, it's hard to say if this is the reality along the Yukon River overall, though traveling farther for game is reported in conjunction with the impacts of climate change (Loring *et al.* 2010; McNeeley and Shulski 2011). Similarly, it's difficult to determine if the Upper-Yukon communities do exhibit a steeper increase in distance compared to Central-Yukon communities (which is what the trend lines may suggest).

#### 4.5.7 Outpost Agriculture

The BIA promoted community gardens for agricultural production during the mid-twentieth century. It was deemed a failure, as gardens were 'abandoned' when subsistence activities such as fishing and hunting required people's time and effort (Loring and Gerlach 2010b). This frustration is translated in the records; one schoolteacher lamented that despite the efforts done at school, "it would be a great help and advantageous to the people, if they could understand what value a garden is to them" (Steven's Village '49)<sup>88</sup>. Another commented; "it will take considerable time to get the people to really go into gardening as they are not an agricultural people" (Minto '50)<sup>89</sup>. Overall, many felt "better gardening would be a great help" (Venetie '41)<sup>90</sup>. Noting how Shageluk is a "wonderful spot for small berries", the author of the 1951<sup>91</sup> report suggests sending berry plants to compensate for poor berry harvests.

Yet, in reality small-scale agriculture is one of many portfolio strategies used as an additional food source during hard times, as well as being an essential part of the household's food system. The presence of potatoes, cabbages, carrots and turnips on these historic records of "Native Foods" in the mid-twentieth century speaks to their consideration as an integral part of the portfolio of food

<sup>&</sup>lt;sup>88</sup> Fred E. Bailey, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>89</sup> Robert J. Grant, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-63, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>90</sup> Robert J. Grant, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>91</sup> L. A. Kress, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

options. In Tanana the available food came from "moose, fish, berries put up and garden produce stored (Tanana '48)<sup>92</sup>. In Hooper Bay, the teacher noticed that all families practiced gardening (Hooper Bay '44)<sup>93</sup>. A schoolteacher in Shageluk estimated that despite little food being available for the winter of 1950, "with the good garden we had here together with a few gardens in the village, we have a good supply of fresh cabbages and rutabagas" (Shageluk '50)<sup>94</sup>. Similarly, in Steven's Village "larger domestic gardens [are] planned" to compensate for the poor fish and moose season encountered in 1953 (Steven's Village '53)<sup>95</sup>. In fact, Loring and Gerlach (2010b) explain that many villages renewed gardening initiatives in order to complement their other traditional subsistence activities. The underlying intent being to increase both the quality and quantity of locally-produced food. Such a strategy reduces people's vulnerabilities to external markets and economic forces, raises the nutritional value of local foods, and hence contributes to better individual and community health (Loring and Gerlach 2010b).

#### 4.6 Limitations

In this last section of Chapter 4, I would like to reiterate the main challenges and limitations encountered during this analysis and interpretation, which have been mentioned throughout this thesis. First, we should keep in mind the limited ability of teachers to accurately report harvests and practices. Many were assigned to a community for one or two years, therefore had limited time to fully understand people's societal realities and harvest practices. Their high turnover rate also gave rise to a variety of reporting techniques and inconsistencies in recording styles. Additionally, while the majority of the annual surveys were considered of high quality (~66%), some were of medium or low quality (~27% and ~7% respectively) (Table 19). Furthermore, the format of the surveys themselves changed two times, giving rise to three sets of questions worded slightly differently (see 3.2.2 'Survey Format'). Overall, this limits the ability to evaluate long-term change over time, across the Yukon River and the three regions. Finally, the lower number of survey records originating

<sup>&</sup>lt;sup>92</sup> Robert Lee Jennings "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Tanana 1945-56, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>93</sup> Lee J. Bubb, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>94</sup> L. A. Kress, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Shageluk 1941-71, RR, RG75, NARA-AR

<sup>&</sup>lt;sup>95</sup> Herman O. Johnson, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Steven's Village 1941-67, RR, RG75, NARA-AR

from the Central-Yukon makes quantitative analysis particularly difficult. This has implications for the number of reported food kinds, biodiversity indices, as well as the true diversity values. Considering all the limitations and challenges listed above, I would like to emphasize that all decisions regarding interpretation of questionable data were intentionally conservative.

	Quality level	Lower-Yukon		Central- Yukon		Upper-Yukon		Over	all
		Count	%	Count	%	Count	%	Count	%
1	High	57	67.9	50	74.6	48	56.5	155	65.7
2	Medium	25	29.8	14	20.9	24	28.2	63	26.7
3	Low	2	2.4	3	4.5	13	15.3	18	7.6
	Total	84		67		85		236	

Table 19 Counts and percentages of survey records of high, medium and low quality, for each of the three regions and the overall dataset.

## 5 Conclusions and Recommendations

#### 5.1 Future Research Opportunities

Since the analysis and interpretation conducted in this thesis is the first academic attempt to establish reference conditions in regards to subsistence practices in mid-twentieth century Alaska, a few areas of research in need of further exploration emerges from this research. Comparing the percommunity and per-capita harvest magnitudes to the levels of contemporary subsistence in Alaska would be beneficial at estimating change over time. Contemporary harvest data is available online from the Alaska Department of Fish and Game website. Additionally, a much more complete picture of the resiliency and inter-connected strategies utilized in the mid-twentieth century could arise if results presented here are combined with those from the "Garden Surveys". At present, there is an evolving picture of how flexible subsistence practices were, are, and need to be in the future. The more knowledge we have about the flexibility of subsistence food systems, and the contemporary stressors that require them to adapt, the more effective policies can be formulated. Indeed, this knowledge is crucial when formulating policies and regulations in regards to subsistence practices, such that they allow the ever-evolving nature of strategies to harvest country foods to take course. This will undoubtedly shed light on food insecurities in the North, and contribute to their overall resiliency and flexibility in the face of new challenges and uncertainties.

#### 5.2 Conclusion

The ability to harvest country foods has enabled the survival of countless communities throughout the ages, as well as their cultural flourishing and success. This thesis, by focusing 25 communities located along the Yukon River, provides qualitative and quantitative evidence of portfolio strategies utilized by subsistence communities to achieve food security. These strategies include preyswitching, the use of sledge dogs, stores and outpost agriculture. This research asserts that a community's resilience ultimately arises from its capacity to innovate and adapt its subsistence activities within new political, societal and economic conditions. Through the analysis and interpretation of 236 survey records within their historical context, it also provides evidence that historic records can offer valuable insights about the past, and should therefore be considered when contemplating actions to take in the future. By examining a slice in time of a traditional food system that was in the midst of rapid societal change across a unique 'geographical transect' – the Yukon River –, this thesis identified the Upper-Yukon to be less food secure compared to the Lower- and the Central-Yukon. Characterized by lower magnitudes of total food harvests, lower per-capita harvests and lower diversities in food options, the Upper-Yukon seems to have more challenges in terms of achieving food security throughout the mid-twentieth century. Overall, this research highlights the importance of flexibility in a variety of options for communities worldwide that rely on subsistence harvesting. Moreover, belonging to the discipline of historical ecology, it provides evidence that historical records can present valuable information to better understand the present as well as increase preparedness in the face of future uncertainties and new challenges.

### 6 References

- Ackerman-Leist, P. (2013). Rebuilding the Foodshed: How to Create Local, Sustainable, and Secure Food Systems. Chelsea Green Publishing.
- Arnold, R. D. (1976). Alaska Native Land Claims. Alaska Native Foundation Anchorage, AK.
- Barnhardt, C. (2001). A History of Schooling for Alaska Native People. *Journal of American Indian Education* **40**(1): 1-30.
- Berger, T. R. (1985). Village Journey: The Report of the Alaska Native Review Commission. New York, Hill and Wang.
- Bersamin, A., B. R. Luick, E. Ruppert, J. S. Stern and S. Zidenberg-Cherr (2006). Diet Quality among Yup'ik Eskimos Living in Rural Communities Is Low: The Center for Alaska Native Health Research Pilot Study. *Journal of the American Dietetic Association* **106**(7): 1055-1063.
- Binford, L. R. (2001). Constructing Frames of Reference: An Analytical Method for Archaeological Theory Building Using Ethnographic and Environmental Data Sets. Univ of California Press.
- Binford, L. R. (2002a). Chapter I: Translating the Archaeological Record. In Pursuit of the Past. Berkeley, University of California Press.
- Binford, L. R. (2002b). Hunters in a Landscape. In Pursuit of the Past. Berkeley, University of California Press: 109-143.
- Bjerregaard, P., T. K. Young, E. Dewailly and S. O. Ebbesson (2004). Indigenous Health in the Arctic: An Overview of the Circumpolar Inuit Population. Scandinavian journal of public health 32(5): 390-395.
- Bohan, H. (2009). The People of Cascadia: Pacific Northwest Native American History. 4Culture.
- Brock, M. and M. F. Turek (2007). *Sitka Sound Subsistence Herring Roe Fishery, 2002, 2003, and 2006.* Alaska Department of Fish and Game, Division of Subsistence.
- Bryner, W. M. (1995). Toward a Group Rights Theory for Remedying Harm to the Subsistence Culture of Alaska Natives. *Alaska Law Review* 12: 293.
- BurnSilver, S., J. Magdanz, R. Stotts, M. Berman and G. Kofinas (2016). Are Mixed Economies Persistent or Transitional? Evidence Using Social Networks from Arctic Alaska. *American Anthropologist* **0**: 1-9.
- Case, D. S. (1984). Alaska Natives and American Law. Fairbanks, AK, University of Alaska Press.
- Case, D. S. (1989). Subsistence and Self-Determination: Can Alaska Natives Have a More Effective Voice. *University of Colorado Law Review* **60**: 1009.
- Caulfield, R. A. (1983). Subsistence Land Use in Upper Yukon Porcupine Communities, Alaska: Dinjii Nats' Aa Nan Kak Adagwaandaii. Technical Paper No. 16. Fairbanks, Alaska Department of Fish and Game, Division of Subsistence.
- Caulfield, R. A. (2002). Food Security in Arctic Alaska: A Preliminary Assessment. Sustainable food security in the Arctic: State of knowledge. Occasional Publication(52): 75-92.
- CENSUS'90 (1992). 1990 Census of Population: General Population Characteristics, Alaska, U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census.

- Crowell, A. L. (1994). World System Archaeology at Three Saints Harbor: An 18th Century Russian Fur Trade Site on Kodiak Island, Alaska. University of California, Berkeley.
- Crumley, C. L. (1994). *Historical Ecology: Cultural Knowledge and Changing Landscapes*. Santa Fe, School of American Research Press.
- Darnell, F. (1979). Education among the Native Peoples of Alaska. Polar Record 19(122): 431-446.
- Egan, D. (2005). The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems. Island Press.
- Fall, J. A. (1987). The Upper Inlet Tanaina: Patterns of Leadership among an Alaskan Athabaskan People, 1741-1918. University of Alaska Press.
- Fall, J. A. (1990). The Division of Subsistence of the Alaska Department of Fish and Game: An Overview of Its Research Program and Findings: 1980-1990. *Arctic Anthropology* **27**(2): 68-92.
- Fall, J. A. (2012). Subsistence in Alaska: A Year 2012 Update. Anchorage: Division of Subsistence, Alaska Department of Fish and Game.
- Fall, J. A., N. S. Braem, C. L. Brown, L. B. Hutchinson-Scarbrough, D. S. Koster and T. M. Krieg (2013). Continuity and Change in Subsistence Harvests in Five Bering Sea Communities: Akutan, Emmonak, Savoonga, St. Paul, and Togiak. *Deep Sea Research Part II: Topical Studies* in Oceanography 94: 274-291.
- Farrar, V. J. (1922). The Background of the Purchase of Alaska. *The Washington Historical Quarterly*: 93-104.
- Feagan, R. (2007). The Place of Food: Mapping out the 'Local' in Local Food Systems. *Progress in human geography* **31**(1): 23-42.
- Fleming, C. M. (1992). American Indians and Alaska Natives: Changing Societies Past and Present. Cultural competence for evaluators: A guide for alcohol and other drug abuse prevention practitioners working with ethnic/racial communities 1.
- Gerlach, C. S. (1996). Historical Archaeology and the Early Twentieth Century Reindeer Herding Frontier on the Northern Seward Peninsula, Alaska. Ublasaun: First Light. J. Schaaf and T. Smith. Fairbanks, U.S. Department of the Interior, National Park Service: 1890-1940.
- Gerlach, C. S. and P. A. Loring (2013a). Rebuilding Northern Foodsheds, Sustainable Food Systems, Community Well-Being, and Food Security. *International Journal of Circumpolar Health* 72.
- Gerlach, C. S., P. A. Loring, A. Turner and D. E. Atkinson (2011). Food Systems, Environmental Change, and Community Needs in Rural Alaska. North by 2020: Perspectives on Alaska's Changing Social-Ecological Systems. A. L. Lovecraft and H. Eicken. Fairbanks, AK, University of Alaska Press: 111-134.
- Gerlach, S. C. and P. A. Loring (2013b). Rebuilding Northern Foodsheds, Sustainable Food Systems, Community Well-Being, and Food Security. *International Journal of Circumpolar Health* 72.
- Gibson, J. R. (1976). Imperial Russia in Frontier America: The Changing Geography of Supply of Russian America, 1784-1867. Oxford University Press.

- Gintis, H. (2005). Moral Sentiments and Material Interests: The Foundations of Cooperation in Economic Life. MIT press.
- Golder, F. A. (1920). The Purchase of Alaska. The American Historical Review 25(3): 411-425.
- Goodman, A. H., D. L. Dufour and G. H. Pelto (2000). *Nutritional Anthropology: Biocultural Perspectives* on Food and Nutrition. Mayfield Publishing Company Mountain View, CA.
- Gorelick, R. (2006). Combining Richness and Abundance into a Single Diversity Index Using Matrix Analogues of Shannon's and Simpson's Indices. *Ecography* **29**(4): 525-530.
- Gotelli, N. J. and R. K. Colwell (2011). Estimating Species Richness. *Biological diversity: frontiers in measurement and assessment* **12**: 39-54.
- Graves, K. (2004). Resilience and Adaptation among Alaska Native Men. International Journal of Circumpolar Health 63(1).
- Gruening, E. (1954). The State of Alaska: A Definitive History of America's Northernmost Frontier, New York: Random House.
- Guedon, M.-F. (1981). Upper Tanana River Potlatch. Handbook of North American Indians. Vol 6 Subarctic. J. Helm. Washington, D.C., Smithsonian Institution: 557-581.
- Hall, E. S., S. C. Gerlach and M. B. Blackman (1985). In the National Interest: A Geographically Based Study of Anaktuvuk Pass Inupiat Subsistence through Time. North Slope Borough.
- Heaton, J. W. (2012). Athabascan Village Stores: Subsistence Shopping in Interior Alaska, 1850– 1950. Western Historical Quarterly 43(2): 133-155.
- Hedden, W. P. (1929). How Great Cities Are Fed. Boston, New York, Health and Company.
- Helm, J. (1976). The Indians of the Subarctic, a Critical Bibliography.
- Hinckley, T. C. (1969). The United States Frontier at Sitka, 1867-1873. *The Pacific Northwest Quarterly* **60**(2): 57-65.
- Holthaus, G. (2012). Learning Native Wisdom: What Traditional Cultures Teach Us About Subsistence, Sustainability, and Spirituality. University Press of Kentucky.
- Hoogenraad, R. and G. J. Robertson (1997). Seasonal Calendars from Central Australia. Windows on Meteorology: Australian Perspective. E. K. Webb. Melbourne, Australia, CSIRO Publishing: 34-41.
- Huntington, H. P. (1992). Wildlife Management and Subsistence Hunting in Alaska. Belhaven Press.
- Ikuta, H. (2007). Iñupiaq Pride: Kivgiq (Messenger Feast) on the Alaskan North Slope. *Études/Inuit/Studies*: 343-364.
- Jacobs, J. (2011). A Schoolteacher in Old Alaska: The Story of Hannah Breece. Vintage Canada.
- Jenkins, D. (2015). Impacts of Neoliberal Policies on Non-Market Fishing Economies on the Yukon River, Alaska. *Marine Policy* **61**: 356-365.
- Jost, L. (2006). Entropy and Diversity. Oikos 113(2): 363-375.
- Keskitalo, E. C. H. (2012). Climate Change and Globalization in the Arctic: An Integrated Approach to Vulnerability Assessment. Earthscan.

- Kloppenburg, J., J. Hendrickson and G. W. Stevenson (1996). Coming in to the Foodshed. *Agriculture and human values* **13**(3): 33-42.
- Kofinas, G. P., F. S. Chapin, S. BurnSilver, J. I. Schmidt, N. L. Fresco, K. Kielland, S. Martin, A. Springsteen and T. S. Rupp (2010). Resilience of Athabascan Subsistence Systems to Interior Alaska's Changing Climate *Canadian Journal of Forest Research* 40(7): 1347-1359.
- Lande, R. (1996). Statistics and Partitioning of Species Diversity, and Similarity among Multiple Communities. *Oikos*: 5-13.
- Langdon, S. J. (1991). The Integration of Cash and Subsistence in Southwest Alaskan Yup'ik Eskimo Communities. *Senri Ethnological Studies*.
- Lonner, T. (1980). Subsistence as an Economic System in Alaska. Theoretical and policy implications. Anchorage: Alaska Department of Fish and Game, Technical Paper (67).
- Loring, P., S. Gerlach, D. Atkinson and M. Murray (2010). Ways to Help and Ways to Hinder: Governance for Successful Livelihoods in a Changing Climate. *Arctic.*
- Loring, P. A. (2007). Coming out of the Foodshed: Fhange and Innovation in Rural Alaskan Food Systems. University of Alaska Fairbanks.
- Loring, P. A. and C. Gerlach (2010a). Food Security and Conservation of Yukon River Salmon: Are We Asking Too Much of the Yukon River? *Sustainability* **2**(9): 2965-2987.
- Loring, P. A. and S. C. Gerlach (2009). Food, Culture, and Human Health in Alaska: An Integrative Health Approach to Food Security. *Environmental Science & Policy* **12**(4): 466-478.
- Loring, P. A. and S. C. Gerlach (2010b). Outpost Gardening in Interior Alaska: Food System Innovation and the Alaska Native Gardens of the 1930s through the 1970s. *Ethnobistory* 57(2): 183-199.
- Loring, P. A., S. C. Gerlach and H. J. Penn (2015). "Community Work" in a Climate of Adaptation: Responding to Change in Rural Alaska. *Human Ecology*: 1-10.
- Lynch, A. H. and R. D. Brunner (2007). Context and Climate Change: An Integrated Assessment for Barrow, Alaska. *Climatic Change* 82(1-2): 93-111.
- MacMaster, R. E. and H. L. Kushner (1976). Conflict on the Northwest Coast: American-Russian Rivalry in the Pacific Northwest, 1790-1867, JSTOR.
- Madley, B. (2004). Patterns of Frontier Genocide 1803–1910: The Aboriginal Tasmanians, the Yuki of California, and the Herero of Namibia. *Journal of Genocide Research* 6(2): 167-192.
- Magdanz, J. S., C. J. Utermohle and R. J. Wolfe (2002). The Production and Distribution of Wild Food in Wales and Deering, Alaska. Division of Subsistence, Alaska Department of Fish and Game Juneau, AK.
- Magurran, A. E. (2004). Measuring Biological Diversity. *African Journal of Aquatic Science* **29**(2): 285-286.
- McKennan, R. A. (1959). *The Upper Tanana Indians*. New Haven, Connecticut, Yale University Publications in Anthropology.
- McNeeley, S. M. (2009). Seasons out of Balance: Climate Change Impacts, Vulnerability, and Sustainable Adaptation in Interior Alaska. University of Alaska Fairbanks.

- McNeeley, S. M. and M. D. Shulski (2011). Anatomy of a Closing Window: Vulnerability to Changing Seasonality in Interior Alaska. *Global Environmental Change* **21**(2): 464-473.
- Mead, R. D. (1978). Journeys Down the Line: Building the Trans-Alaska Pipeline. Doubleday Books.
- Minc, L. D. (1986). Scarcity and Survival: The Role of Oral Tradition in Mediating Subsistence Crises. *Journal of Anthropological Archaeology* 5(1): 39-113.
- Naske, C.-M. (1994). Alaska: A History of the 49th State. University of Oklahoma Press.
- Nelson, R. K. (1983). Make Prayers to the Raven. University of Chicago Press.
- Nelson, R. K. (1986). Hunters of the Northern Forest: Designs for Survival among the Alaskan Kutchin. University of Chicago Press.
- Norris, F. B. (2002). *Alaska Subsistence: A National Park Service Management History*. Alaska Support Office, National Park Service, US Department of the Interior.
- Philip, K. R. (1981). The New Deal and Alaskan Natives, 1936-1945. *Pacific Historical Review* **50**(3): 309-327.
- Popkin, B. M. and P. Gordon-Larsen (2004). The Nutrition Transition: Worldwide Obesity Dynamics and Their Determinants. *International journal of obesity* 28: S2-S9.
- Reed, L. (1995). Diet and Subsistence in Transition: Traditional and Western Practices in an Alaskan. *Athapaskan Village: University of Oregon* **265**.
- Retnowati, A., E. Anantasari, M. A. Marfai and A. Dittmann (2014). Environmental Ethics in Local Knowledge Responding to Climate Change: An Understanding of Seasonal Traditional Calendar Pranoto Mongso and Its Phenology in Karst Area of Gunungkidul, Yogyakarta, Indonesia. *Procedia Environmental Sciences* 20: 785-794.
- Sacks, J. D. (1995). Culture, Cash or Calories: Interpreting Alaska Native Subsistence Rights. *Alaska* L. Rev. 12: 247.
- Sahlins, M. D. (1974). Stone Age Economics. Aldine Transaction Publishers.
- Sakakibara, C. (2009). 'No Whale, No Music': Inupiaq Drumming and Global Warming. *Polar Record* **45**(04): 289-303.
- Schumann, S. and S. Macinko (2007). Subsistence in Coastal Fisheries Policy: What's in a Word? *Marine Policy* **31**(6): 706-718.
- Shanks, M. and C. Y. Tilley (1992). Re-Constructing Archaeology: Theory and Practice. Psychology Press.
- Shannon, C. E. (1948). A Mathematical Theory of Communication. *The Bell System Technical Journal* **27**: 379-423, 623-656.
- Simeone, W. E. (2002). *Rifles, Blankets, and Beads: Identity, History, and the Northern Athapaskan Potlatch.* University of Oklahoma Press.
- Simeone, W. E. and J. A. Fall (2003). Patterns and Trends in the Subsistence Salmon Fishery of the Upper Copper River, Alaska. Alaska Department of Fish and Game, Division of Subsistence.
- Spencer, R. F. (1959). The North Alaskan Eskimo: A Study in Ecology and Society, Bureau of American Ethnology Bulletin 171. Washington, Dc: Us Government Printing Office. Reprint 1976, New York, Dover.

- Suydam, R. S. and J. C. George (2004). Subsistence Harvest of Bowhead Whales (Balaena Mysticetus) by Alaskan Eskimos, 1974 to 2003. Unpublished Report SC/56/BRG12. Cambridge, UK: IWC.
- Tacoli, C. (1998). Rural-Urban Interactions; a Guide to the Literature. *Environment and urbanization* **10**: 147-166.
- Tait, H. (2001). Inuit in Canada: Findings from the Aboriginal People's Survey– Survey of Living Conditions in the Arctic. Harvesting and Country Food: Fact Sheet. *Statistics Canada: Ottawa*.
- Thornton, T. F. (1998). Alaska Native Subsistence: A Matter of Cultural Survival. *Cultural Survival Quarterly* 22: 29-34.
- Thornton, T. F. (2001). Subsistence in Northern Communities: Lessons from Alaska. *The Northern Review* **23**(2001): 82-102.
- Usher, P. J. (1976). Evaluating Country Food in the Northern Native Economy. Arctic: 105-120.
- Viljugrein, H., O. C. Lingjærde, N. C. Stenseth and M. S. Boyce (2001). Spatio Temporal Patterns of Mink and Muskrat in Canada During a Quarter Century. *Journal of Animal Ecology* 70(4): 671-682.
- Wheelersburg, R. P. (2008). The Need to Conduct Studies of Swedish Saami Reindeer-Herding Subsistence Behaviours: A Case of Indigenous Resource-Use Rights. Northern Review(28): 161-180.
- White, J. L. (2013). Subsistence in Alaska. Native Voices Rising: A Case for Funding Native-Led Change. L. T. Delgado: 38.
- Wilk, R. (2006). *Fast Food/Slow Food: The Cultural Economy of the Global Food System*. Lanham, Rowman Altamira Press.
- Williams, G. (1987). Population Growth and Migration in Alaska. A. D. o. Labor.
- Williams, M. S. T. (2009a). A Brief History of Native Solidarity. *The Alaska Native Reader. History, Culture, Politics.* M. S. T. Williams. Durham and London, Duke University Press: 202-216.
- Williams, M. S. T. (2009b). The Comity Agreement: Missionization of Alaska Native People. The Alaska Native Reader. History, Culture, Politics. M. S. T. Williams. Durham and London, Duke University Press: 151-162.
- Wolfe, R. J. (1984). Commercial Fishing in the Hunting-Gathering Economy of a Yukon River Yup'ik Society. *Etudes Inuites- Inuit Studies Québec* 8: 159-183.
- Wolfe, R. J. (2000). Subsistence in Alaska: A Year 2000 Update. *Alaska Department of Fish and Game, Division of Subsistence, Juneau.*
- Wolfe, R. J. (2004). Local Traditions and Subsistence: A Synopsis from Twenty-Five Years of Research by the State of Alaska. Alaska Department of Fish and Game, Division of Subsistence.
- Wolfe, R. J. and R. J. Walker (1987). Subsistence Economies in Alaska: Productivity, Geography, and Development Impacts. *Arctic Anthropology*: 56-81.

## 7 Appendices

## 7.1 Appendix 1: Examples of Native Food Surveys

Y OF NATIVE FOOD-SUMMER OF 194 SU. Quantity Method of Remarks Preserving Kind of Food in Village (Pounds) FISH 2,250 lb. Dryt Smoked Season; Some In a few fam Dry & smoked 2,200 lb. MEATS 1540# Dried Secure more as needed moose meat Dried 61 300# 11 11 ar meat \*WILD FRUITS & VEG. Cranberries 1800 # Frozen OTHER FOODS 1750 # Root cellar Should be more Potatoes TOTAL- - - - - - -Number of people dependent on this supply 155 nontrationary A shoos Mumber, of work dogs dependent on this supply /37 . Comment on adequacy of supply--if inadequate what could be done to increase supply? Less fish should be sol mare potatoes & Cabbage should be grown. d be sold. What source of native food will be available during the winter. e.g. reindeer, fish, etc. Moose, bear; Caribou maybe Black fish from lakes under ice. \*Other than those raised in the Garden. min Station Reported by Cuttollan Date of report Sept. 27, 1941

Appendix 7.1-A Example of an "early" format survey. C. W. Holland, ANS Schoolteacher, "Survey of Native Food- Summer of 1941", File 917, Ag. Statistics & Production: Minto 1941-63, RR, RG75, NARA-AR.

<pre>1.FISH (list principal</pre>	<pre>1.Fi5H (list principal</pre>	Kind of Food	Quantity gathered in Village during year (rounds)	Method of Preserving	As of Oct. 1 1950	Remarks
kinds used)       drying         salmon, Som cod, needls       drying         ish, lush fish, white       55000         salting       burying         2.%EATS(list separately)       burying         princinal kinds used)       drying         seal, oogruk, leftak       drying         salting       drying         3.**WILD FRUTS & VEG.       drying         (list kinds)       salting         salmon berries       5000         salmon berries       5000         food berries       food         salmon berries       5000         salmon berries       5000         salmon berries       5000         salmon berries       5000         salting in place       salting         ead blue berries       5000         salting in place       salting         ead blue berries       5000         food       drying, salting         salting in place       salting         eegl & oogruk oil       6000         segs       500 doz         water gles       food         food       drying, salting         seel & oogruk oil       6000         segss <td< td=""><td>kinds used)       drying         salmon, form cod, needls       drying         fish, lush fish, white       55000       salting         herring &amp; little black       burying       salting         yring       sent, occrus, leftak       burying         sent, occrus, leftak       gent       drying         3.**Wild FRUTHS &amp; VEG.       drying       drying         3.**Wild FRUTHS &amp; VEG.       drying       drying         dock &amp; other greens       6000       drying, salting         dock &amp; other greens       6000       drying, salting         % offlet Frods (list       biood       drying, salting         % offlet Frods (list       6000       drying, salting         % occruk oil       6000       drying, salting         % Number of work dogs dependent o</td><td>1.FISH (list principal</td><td></td><td></td><td></td><td></td></td<>	kinds used)       drying         salmon, form cod, needls       drying         fish, lush fish, white       55000       salting         herring & little black       burying       salting         yring       sent, occrus, leftak       burying         sent, occrus, leftak       gent       drying         3.**Wild FRUTHS & VEG.       drying       drying         3.**Wild FRUTHS & VEG.       drying       drying         dock & other greens       6000       drying, salting         dock & other greens       6000       drying, salting         % offlet Frods (list       biood       drying, salting         % offlet Frods (list       6000       drying, salting         % occruk oil       6000       drying, salting         % Number of work dogs dependent o	1.FISH (list principal				
<pre>addition, took field, look field is a line of the second sec</pre>	<pre>mained, ton too, here is it is a string</pre>	kinds used)		davring		
<pre>18</pre>	<pre>155. 1055 1151 separately</pre>	salmon, tom coa, needle	55000	solting		PANES STORES
<pre>2. MEATS (list separately principal kinds used)</pre>	<pre>Aligned to the set of the se</pre>	herring & little black		hurving		
<pre>principal kinds used) seal. coeruk, leftak white whale and rabbit 78000 drying 3.**WILD FRUTTS &amp; VEG. (list kinds) salmon berries. black and blue berries. slack and blue berries. food &amp; other greens 4.OTHER FOODS(list kinds.Incl.fats &amp; cile) eggs fowl 6000 drying, salting seal &amp; coeruk oil 6000 drying, salting seal &amp; coerus of people dependent on this supply. <u>300</u> 8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply.) Adequate. Good fish run 9. What source of native food will be available during the winter, e.g., r reindeer, fish, etc. (Use other side for comments if necessary) Most of above named fish at various times during season. Seel late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be otherined, and the normal purchases through the store should the food supply be adequate for the coming winter <u>Yes</u>. **Other than those raised in the garden. Station <u>ES 37 Hooper Bay</u> Paperted by <u>Ollin 0. pruett</u> Date of Report <u>4/18/E1</u>_covering period from Oct. 1, 19 <u>Aq</u> to Sept. 30, 19 <u>so</u>. Make report in duplicate, retaining one copy for your files.</pre>	<pre>principal kinds used) sent. coernet, leftsk white whale and rabbit 78000 drying 3.**TID FRUTTS &amp; VEC. (list kinds) selmon berries. black and blue berries. black and blue berries. black sent blue berries. black inds. Incl.fats &amp; cile) excs. fowl</pre>	2 MEATS(list separately				
<pre>seal, oozruk, leftak white whale and rabbit 78000 drying 3.**WILD FRUTTS &amp; VEG. (list kinds) salmon berrises, black and blue berrises black inds, Incl.fsts &amp; cils) excs 500. doz rester glack fowl 6000 drying, selving seal &amp; oogruk cil 6000 drying, selving % What source of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply ) Adequate. Good fish ru % What source of native food will be available during the winter, e.e., or i foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter  ***Other than those raised in the garden.  Make report in duplicate, retaining one copy for your files. </pre>	sen1. copruk, leftak         white while and rabbit       78000         3.**WILD FRUTHS & VEG.         (list kinds)         salmon berrise, black         and blue berrise, black         seal & cogruk dil         6000       drying, salting         seal & cogruk dil         6000       drying, salting         seal & cogruk kill very good         6. Number of people dependent on this supply.         6. Number of work dogs dependent on this supply.         3. Comment on adequacy of supply - if inadequate whet could be done to increase supply? (Use other side for comments if necessary)         (See enclosed suggestion for quantities req	principal kinds used)				
<pre>white whale and rabbit 78000 drying 3.**WILD FRUITS &amp; VEG. (list kinds) salmon berries, black and blue berries, black and blue berries, black salmon berries, black and blue berries, black and blue berries, black inds, Incl.rsts &amp; cils) ecgs fowl 6000 drying, selfing ecgs 6000 drying, selfing seel &amp; cogruk cil 6000 sealing in pokee &amp; berrels 5. TOTAL151500 6. Number of people dependent on this supply.<u>entire-village (515)</u>. 7. Number of work dogs dependent on this supply.<u>500</u>. 8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequecy of supply Adequate. Good fish ru 9. What source of native food will be available during the winter, e.g., reindeer, fish, etc. (Use other side for comments if necessary.) Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>Yeas</u>. **Other than those raised in the garden. Station <u>ES 37 Hooper Bay</u> Reported by <u>Ollin 0. Pruett</u>. Date of Report <u>4/18/51</u>covering period from Oct. 1, 19_Ag to Sept. 30, 19_50</pre>	<pre>white whale and rabbit 78000 drying dry</pre>	seal, oogruk, leftak				
3.**WILD FRUITS & VEG. (list kinds) salmon berries, black and blue berries, black and blue berries, black salmon berries, black and blue berries, black salmon berries, black and blue berries, black kinds, Incl./Fats & cils) 9.8555 9.8555 9.8555 9.8555 9.85555 9.85555 9.85555 9.85555 9.85555 9.85555 9.855555 9.855555 9.855555 9.855555 9.855555 9.8555555 9.8555555 9.8555555 9.8555555 9.8555555 9.85555555 9.85555555 9.855555555 9.855555555 9.855555555 9.855555555 9.855555555 9.85555555555555 9.8555555555555555555555555555555555555	3.**WILD FRUITS & VEG.         1ist kinds)         salmon berries, black         and blue berries         dook & cher greens         4.OTHER FOODS (list         kinds, Incl.fats & cile)         9886         fowl         9886         6000         9886         1         6000         9886         1         9886         1         9886         1         9886         1         6000         1         9886         1         6000         1          1	white whale and rabbit	78000	drying		
<pre>3.**WILD FRUITS &amp; VEG. (list kinds) salmon berries. black and blue berries 6000 freezing dock &amp; other greens 4.OTHER FOUS(list kinds.Incl.fsts &amp; cile) ergs 500.doz water glass fowl 6000 drying, salting seel &amp; cogruk cil 6000 deving, salting fowl 6000 deving the poly of the poly o</pre>	<pre>3.**TILD FRUITS &amp; VEG. (list kinds) salmon berries, black and blue berries, black and blue berries, black kinds.Incl.fats &amp; cils) excs</pre>					
(list kinds)       6000       freezing         and blue berries.       6000       freezing         dock & other greens       6000       drying, salting         9665       500 doz       mater gless         fowl       6000       drying, salting         seel & cogruk cil       6000       drying, salting         5. TOTAL151500       6000       drying, salting         5. TOTAL151500       6000       drying, salting         6. Number of people dependent on this supply.       supply.       300         7. Number of work dogs dependent on this supply.       300       supply.         8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessery.)       (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply) Adequate. Good fish run         9. What source of mative food will be aveilable during the winter, e.g., are indeer, fish, etc. (Use other side for comments if necessary)         Most of above named fish et various times during season. Seal late in winter:         10. Considering food on hand, the anticipated additional supply of Mative foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winterYes	(list kinds)	3.**WILD FRUITS & VEG.				
<pre>salmon berries, black</pre>	<pre>salmon berries. black <u>6000</u> freezing <u>6000</u> freezing <u>6000</u> &amp; other greens 4.0THEN FO0.5(list kinds. Incl./Fits &amp; cils) <u>9885</u> <u>500 doz</u> <u>mater glass</u> fowl <u>6000</u> drying, selting <u>seel &amp; cogruk cil 6000</u> sealing in pokes &amp; barrels 5. TOTAL151500 6. Number of people dependent on this supply.<u>entire.willage (515)</u>. 7. Number of work dogs dependent on this supply.<u>300</u>. 8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequecy of supply) Adequate. Good fish run 9. What source of native food will be aveilable during the winter, e.g., e.g., reindeer, fish, etc. (Use other side for comments if necessary) Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>Yes</u>. ***Other than those raised in the garden. Station <u>ES 37 Hooper Bay</u> Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> _covering period from Oct. 1, 19<u>40</u> to Sept. 30, 19<u>50</u>. Make report in duplicate, retaining one copy for your files.</pre>	(list kinds)				and the second line of the
and blue berries <u>5000</u> <u>freezing</u> dock & other greens <u>4</u> , (OTHER FOODS(List kinds, Incl. Fats & oils) <u>eggs</u> <u>500 doc</u> <u>water glass</u> <u>fowl</u> <u>6000</u> <u>drying, salting</u> <u>seel &amp; oogruk oil</u> <u>6000</u> <u>dealing in pdkee &amp; barrels</u> <u>5. TOTAL151509</u> <u>6. Number of people dependent on this supply.<u>entire willage (315)</u>. 7. Number of work dogs dependent on this supply.<u>500</u> 8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply) Adequate. Good fish run 9. What source of native food will be available during the winter, e.g., w reindeer, fish, etc. (Use other side for comments if necessary) Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>yea</u></u>	<pre>and blue berries <u>5000</u> <u>Treating</u> dook &amp; other greens</pre>	salmon berries, black				
dock & other greens         4. OTHER FOODS (list         kinds. Incl.fsts & cills)         eggs       500 doz         fowl       6000         seal & oogruk oil       6000         sealing in pdkee & barrels         5. TOTAL151500         6. Number of people dependent on this supplyentire_willege (318).         7. Number of work dogs dependent on this supply         8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.)         (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply) Adequate. Good fish run Seal & oogruk kill very good, berries more plentiful. Families low only if did in 9. What source of native food will be available during the winter, e.g., or reindeer, fish, etc. (Use other side for comments if necessary)         Most of above named fish at various times during season. Seal late in winter foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter	dock & other greens         4. OTHER FOODS (list         kinds. Incl., fsts & oils)         9568       500. doz         fowl       6000         sealing in pokee & barrels         5. TOTAL151509         6. Number of people dependent on this supply.         7. Number of work dogs dependent on this supply.         8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.)         (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply) Adequate. Good fish run 9. What source of native food will be available during the winter, e.g., greindeer, fish, etc. (Use other side for comments if necessary)         Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>yeas</u> .         ***Other than those raised in the garden.         Station ES 37 Hooper Bay         Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> .         Make report in duplicate, retaining one copy for your files.	and blue berries	6000	freezing		
<ul> <li>4.0THER FOODS(List kinds, Incl. Fats &amp; cils)</li> <li>eggs</li></ul>	<ul> <li>4. OTHER FOODS(11st kinds.Incl.fsts &amp; cils)</li> <li>eggs</li> <li>fowl</li> <li>6000</li> <li>drying, saling</li> <li>seel &amp; cogruk cil</li> <li>6000</li> <li>dealing in pokes &amp; barrels</li> </ul> 5. TOTAL151500 6. Number of people dependent on this supply. <u>entire willage (315)</u> . 7. Number of work dogs dependent on this supply. <u>500</u> 8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply) Adequate. Good fish run Seal & cogruk kill very good, berries more plentiful. Families low only if did r 9. What source of native food will be available during the winter, e.g., g reindeer, fish, etc. (Use other side for comments if necessary) Most of above named fish at various times during season. Seal late in winter 10. Considering food on hend, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter **Other than those raised in the garden. Station <u>ES 37 Hooper Bay</u> Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>40</u> to Sept. 30, 19 <u>50</u> Make report in duplicate, retaining one copy for your files.	dock & other greens				
Kinds, Hol, 1905 & CHS7         eggs       500 doz       water glads         fowl       6000       drying, salting         seal & cogruk oil       6000       sealing in pdkes & barrels         5. TOTAL151500	Kinds. Hel. 1918 & 01187         9685       500. doz       water glass         fowl       6000       drying, salting         9881 & cogruk cil       6000       dealing in pokes & barrels         5. TOTAL151500       6. Number of people dependent on this supply.entire willage (315).         7. Number of work dogs dependent on this supply       300         8. Comment on adequacy of supply - if inadequate what could be done to increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply) Adequate. Good fish run 's guide you in estimating adequacy of supply) Adequate. Good fish run 's equive for the source of native food will be available during the winter, e.g., gereindeer, fish, etc. (Use other side for comments if necessary)         Most of above named fish at various times during season. Seal late in winter foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter yeas         ***Other than those raised in the garden.         Station ES 37 Hooper Bay         Reported by       Ollin 0. Pruett         Date of Report 4/18/51       covering period from Oct. 1, 19 ag to Sept. 30, 19 50.         Make report in duplicate, retaining one copy for your files.	4. OTHER FOUNS (list			A STORAGE	
<ul> <li><u>by the state of the s</u></li></ul>	Excs       1000       drying, selling         seel & courue cil       6000       dealing in polece & befrele         5. TOTAL151500       6. Number of people dependent on this supply	kinds, Incl. 19ts & Olle	500 dog	water cla		
<ul> <li>1000 sealing in place &amp; barrels</li> <li>seal &amp; cogruk cil 6000 sealing in place &amp; barrels</li> <li>5. TOTAL151500</li> <li>6. Number of people dependent on this supply</li></ul>	10%1       0000       Sealing in pdkes & barrels         Seal & cogruk oil       6000       Sealing in pdkes & barrels         5. TOTAL151500       6. Number of people dependent on this supply	- CEES	5000	druing gal	ting	
<ul> <li><u>seal &amp; cogruk oil</u></li></ul>	<ul> <li><u>seal &amp; cogruk oil</u></li></ul>	TOWL	0000	Jak Jak May Deca	dings 0 hos	mala
<ul> <li>8. Comment on adequacy of supply - 11 Indequate the books of the termination increase supply? (Use other side for comments if necessary.) (See enclosed suggestion for quantities required per year, per person to guide you in estimating adequacy of supply) Adequate. Good fish run Seal &amp; cogruk kill very good, berries more plentiful. Families low only if did not supply and the source of native food will be available during the winter, e.g., a reindeer, fish, etc. (Use other side for comments if necessary)</li> <li>Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>Yes</u>.</li> <li>**Other than those raised in the garden.</li> <li>Station <u>ES 37 Hooper Bay</u></li> <li>Reported by <u>Ollin 0. Pruett</u></li> <li>Date of Report <u>4/18/51</u> covering period from Oct. 1, 19<u>49</u> to Sept. 30, 19<u>50</u>.</li> </ul>	<ul> <li>8. Comment on adequacy of supply - 11 Inducquate whet contacts in the rest of the second of the state of the state of the second of the state of the sta</li></ul>	5. TOTAL _151500 6. Number of per	bple dependent on this	supply. <u>ent</u>	ire-ville;	<del>39-(315)-</del> '
<ul> <li>9. What source of native food will be available during the winter, e.g., a reindeer, fish, etc. (Use other side for comments if necessary)</li> <li>Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>Yes</u>.</li> <li>**Other than those raised in the garden.</li> <li>Station <u>ES 37 Hooper Bay</u></li> <li>Reported by <u>Ollin 0. Pruett</u></li> <li>Date of Report <u>4/18/51</u> covering period from Oct. 1, 19<u>49</u> to Sept. 30, 19<u>50</u>.</li> </ul>	<ul> <li>9. What source of native food will be available during the winter, e.g., a reindeer, fish, etc. (Use other side for comments if necessary)</li> <li>Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>yes</u>.</li> <li>**Other than those raised in the garden.</li> <li>Station <u>ES 37 Hooper Bay</u></li> <li>Reported by <u>Ollin 0. Pruett</u></li> <li>Date of Report <u>4/18/51</u> covering period from Oct. 1, 19<u>49</u> to Sept. 30, 19<u>50</u>.</li> <li>Make report in duplicate, retaining one copy for your files.</li> </ul>	5. TOTAL _151500 6. Number of per 7. Number of wor	bple dependent on this wk dogs dependent on t	supply. <u>ent</u>	ire villa, 300	<del>ge (315) </del> * 
<ul> <li>Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>Yes</u>.</li> <li>**Other than those raised in the garden.</li> <li>Station <u>ES 37 Hooper Bay</u></li> <li>Reported by <u>Ollin 0. Pruett</u>.</li> <li>Date of Report <u>4/18/51</u> covering period from Oct. 1, 19<u>49</u> to Sept. 30, 19<u>50</u>.</li> <li>Make report in duplicate, retaining one copy for your files.</li> </ul>	<ul> <li>Most of above named fish at various times during season. Seal late in winter 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>ves</u>.</li> <li>**Other than those raised in the garden.</li> <li>Station <u>ES 37 Hooper Bay</u> Reported by <u>Ollin 0. Pruett</u>.</li> <li>Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u>.</li> <li>Make report in duplicate, retaining one copy for your files.</li> </ul>	5. TOTAL _151500 6. Number of peo 7. Number of wor 8. Comment on ad increase supp (See enclosed to guide you	bple dependent on this which dogs dependent on the lequacy of supply - if bly? (Use other side f i suggestion for quant in estimating adequa scool herries more p	supply. <u>_ent</u> his supply inadequate or comments ities requir cy of supply lentiful. F	ire villa 300 what could if necessa ed per yea ) Adequate amilies 10	d be done to ery.) ar, per person w only if did r
<ul> <li>10. Considering food on hand, the anticipated additional supply of hadrve foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>ves</u>.</li> <li>**Other than those raised in the garden.</li> <li>Station ES 37 Hooper Bay</li> <li>Reported by <u>Ollin 0. Pruett</u>.</li> <li>Date of Report <u>4/18/51</u> covering period from Oct. 1, 19<u>49</u> to Sept. 30, 19<u>50</u>.</li> <li>Make report in duplicate, retaining one copy for your files.</li> </ul>	<ul> <li>10. Considering food on hand, the anticipated additional supply of Matrix foods to be obtained, and the normal purchases through the store should the food supply be adequate for the coming winter <u>yes</u>.</li> <li>**Other than those raised in the garden.</li> <li>Station ES 37 Hooper Bay</li> <li>Reported by <u>Ollin 0. Pruett</u></li> <li>Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u>.</li> <li>Make report in duplicate, retaining one copy for your files.</li> </ul>	5. TOTAL151500 6. Number of peo 7. Number of wor 8. Comment on ad increase supp (See enclosed to guide you Seal & cogruk kill very 9. What source of reindeer, fit	bple dependent on this rk dogs dependent on this rk dogs dependent on t lequacy of supply - if oly? (Use other side f i suggestion for quant i n estimating adequa good, berries more p of native food will be sh, etc. (Use other si	supply. <u>ent</u> his supply. <u>ent</u> inadequate or comments ities requir cy of supply lentiful. Fe available d de for comme	ire villa, 300 what could if necessa ed per yea ) Adequate amilies lo uring the nts if ne	ge (315) the done to pry.) ar, per person the Good fish run the only if did run winter, e.g., g cessary)
foods to be obtained, and the normal purchases on ough the out should the food supply be adequate for the coming winter ves **Other than those raised in the garden. Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	foods to be obtained, and the hormal purchases unloge the boar should the food supply be adequate for the coming winter <u>yes</u> . **Other than those raised in the garden. Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	5. TOTAL151500 6. Number of peo 7. Number of wor 8. Comment on ad increase supp (See enclosed to guide you Seal & oogruk kill very 9. What source of reindeer, fit Most of above named	bple dependent on this rk dogs dependent on this rk dogs dependent on t dequacy of supply - if bly? (Use other side f d suggestion for quant in estimating adequa good, berries more p of native food will be sh, etc. (Use other si fish at various time	supply. <u>ent</u> his supply. <u>ent</u> inadequate or comments ities requir cy of supply lentiful. F: available d de for comme s during sear	ire ville, 300 what could if necess ed per yea ) Adequate amilies ic uring the nts if nea son. Seal	<pre>ge (315) * d be done to ery.) ar, per person s. Good fish rur winter, e.g., g cessary) L late in winter puly of Native</pre>
**Other than those raised in the garden. Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Meke report in duplicate, retaining one copy for your files.	<pre>should the lood supply be decedute for the county</pre>	5. TOTAL151500 6. Number of peo 7. Number of wor 8. Comment on ad increase supp (See enclosed to guide you Seal & oogruk kill very 9. What source of reindeer, fill Most of above named 10. Considering	bple dependent on this which dogs dependent on this which dogs dependent on the lequacy of supply - if bly? (Use other side f is suggestion for quant in estimating adequate good, berries more put of native food will be sh, etc. (Use other sit fish at various time food on hand, the anti	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fr available d de for comme s during sear cipated addi	ire villag 300 what could if necess ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through	<pre>ge (315) * d be done to ery.) ar, per person e. Good fish rur ww only if did r winter, e.g., g cessary) t late in winter prly of Native the store</pre>
**Other than those raised in the garden. Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Meke report in duplicate, retaining one copy for your files.	**Other than those raised in the garden. Station ES 37 Hooper Bay Reported by Ollin O. Pruett Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	5. TOTAL151500 6. Number of peo 7. Number of wor 8. Comment on ad increase supp (See enclosed to guide you Seal & oogruk kill very 9. What source of reindeer, fill Most of above named 10. Considering if foods to be	bple dependent on this which dogs dependent on this which dogs dependent on the lequacy of supply - if bly? (Use other side f is suggestion for quant in estimating adequate good, berries more put of native food will be sh, etc. (Use other sit fish at various time food on hand, the anti- obtained, and the norm	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fr available d de for comme s during sear cipated addi gal purchases for the com	ire villa, 300 what could if necess ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through ing winte	<pre>ge (315) * d be done to ery.) ar, per person e. Good fish rur ww only if did r winter, e.g., g cessary) t late in winter pply of Native the store r yes **</pre>
Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	<ul> <li>seal &amp; cogruk cil</li> <li>5. TOTAL151500</li> <li>6. Number of peod</li> <li>7. Number of word</li> <li>8. Comment on addincrease supply (See enclosed to guide yot)</li> <li>Seal &amp; cogruk kill very</li> <li>9. What source of reindeer, fill</li> <li>Most of above named</li> <li>10. Considering a foods to be should the foods</li> </ul>	bple dependent on this where the state of the second secon	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fe available d de for comme s during seat cipated addi pal purchases for the com	ire villay 300 what could if necessa ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through ing winte	the done to ery.) ar, per person a. Good fish run ww only if did r winter, e.g., g cessary) L late in winter pply of Native the store r <u>yes</u> ,
Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	Station ES 37 Hooper Bay Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	<ul> <li>seal &amp; oogruk oil</li> <li>5. TOTAL _151500</li> <li>6. Number of peod</li> <li>7. Number of word</li> <li>8. Comment on addincrease supply (See enclosed to guide yot)</li> <li>Seal &amp; oogruk kill very</li> <li>9. What source of reindeer, fith Most of above named</li> <li>10. Considering foods to be should the formation of the second to be should the formation of the second to should the formation of the second to second to second the second to be should the formation of the second to second the second to second the second to be should the formation of the second to second the second to second the second to be should the formation of the second to second to second the second to second the second to second the second to second to second to second to second the second to second to second to second to second the second to second</li></ul>	byle dependent on this where does dependent on this where does dependent on the dequacy of supply - if bly? (Use other side f is suggestion for quant in estimating adequate good, berries more p. of native food will be sh, etc. (Use other si fish at various time food on hand, the anti obtained, and the norm bod supply be adequate sed in the garden.	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fe available d de for comme s during sear cipated addi al purchases for the com	ire villay 300 what could if necess ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through ing winte	<pre>ge (315) ' ge (315) ' d be done to ery.) ar, per person e. Good fish rur ww only if did r winter, e.g., g cessary) L late in winter pply of Native the store r yes ' </pre>
Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	Reported by <u>Ollin 0. Pruett</u> Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>49</u> to Sept. 30, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	<ul> <li>seel &amp; oogruk oil</li> <li>5. TOTAL _151500</li> <li>6. Number of peod</li> <li>7. Number of word</li> <li>8. Comment on addincrease supply (See enclosed to guide yot)</li> <li>Seal &amp; oogruk kill very</li> <li>9. What source of reindeer, fith</li> <li>Most of above named</li> <li>10. Considering a foods to be a should the form</li> <li>**Other than those raid</li> </ul>	by the serdent of this of the serdent of the serdent on the serdent on the serdence of supply - if the suggestion for quant is the stimating adequation of the series more profinative food will be sh, etc. (Use other series the series that the series the	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fr available d de for comme s during sea cipated addi al purchases for the com	ire villay 300 what could if necessa ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through ing winte	<pre>ge (315) ' d be done to ery.) ar, per person e. Good fish rur ww only if did r winter, e.g., g cessary) L late in winter pply of Native the store r<u>yes</u>,</pre>
Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>40</u> to Sept. 90, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	Date of Report <u>4/18/51</u> covering period from Oct. 1, 19 <u>A9</u> to Sept. 90, 19 <u>50</u> . Make report in duplicate, retaining one copy for your files.	<ul> <li>seal &amp; oogruk oil</li> <li>5. TOTAL151500</li> <li>6. Number of peod</li> <li>7. Number of word</li> <li>8. Comment on addincrease supply (See enclosed to guide yot)</li> <li>Seal &amp; oogruk kill very</li> <li>9. What source of reindeer, fith</li> <li>Most of above named</li> <li>10. Considering foods to be should the formation of the station ES 37 Hooper</li> </ul>	by the set of the set	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fr available d de for comme s during sea cipated addi al purchases for the com	ire villay 300 what could if necessa ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through ing winte	<pre>ge (315) ' d be done to ery.) ar, per person e. Good fish rur wonly if did r winter, e.g., g cessary) L late in winter pply of Native the store r<u>yes</u>,</pre>
Make report in duplicate, retaining one copy for your files.	Make report in duplicate, retaining one copy for your files.	5. TOTAL151500 6. Number of peo 7. Number of wor 8. Comment on ad increase supp (See enclosed to guide yot Seal & oogruk kill very 9. What source of reindeer, fit Most of above named 10. Considering foods to be should the fit **Other than those raid Station ES 37 Hooper Reported by Ollin 0.	by the set of the set	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fr available d de for comme s during sear cipated addi al purchases for the com	ire villay 300 what could if necessa ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through ing winte	<pre>ge (315) ' ge (315) ' d be done to ery.) ar, per person s. Good fish rur wondy if did r winter, e.g., g cessary) L late in winter pply of Native the store r yes '</pre>
		<ul> <li>seal &amp; oogruk oil</li> <li>5. TOTAL151500</li> <li>6. Number of peod</li> <li>7. Number of word</li> <li>8. Comment on addincrease supply (See enclosed to guide yot)</li> <li>Seal &amp; oogruk kill very</li> <li>9. What source of reindeer, fill</li> <li>Most of above named</li> <li>10. Considering foods to be should the foods to</li></ul>	bple dependent on this where the set of the	supply supply his supply inadequate or comments ities requir cy of supply lentiful. Fe available d de for comme s during sear cipated addi al purchases for the com h Oct. 1, 19,	ire villay 300 what could if necess ed per yea ) Adequate amilies lo uring the nts if ne son. Seal tional su through ing winte	<pre>ge (315) ' ge (315) ' d be done to ery.) ar, per person s. Good fish rur ow only if did r winter, e.g., g cessary) L late in winter pply of Native the store r yes ' . 30, 19<u>50</u>.</pre>

Appendix 7.1-B Example of a "transition" format survey. Ollin O. Pruett, ANS Schoolteacher, "Annual Survey of Native Food", File 917, Ag. Statistics & Production: Hooper Bay 1941-72, RR, RG75, NARA-AR.

Kind of Food • FISH (list separatel kinds used)	Give geographical, name of place where fish and meats are taken, and method	Quantity gath- ered in village	Method of	On hand
Kind of Food • FISH (list separatel kinds used)	fish and meats are taken, and method	ejered in village		
Kind of Food • FISH (list separatel kinds used)	taken, and method	denting and and and	Preserving	as of
Kind of Food • FISH (list separatel kinds used)	Lanen, dua methou	during year		UCC. 1,
. FISH (list separatel kinds used)	of taking	(nounds)		(pounds)
	y	(promuc)		
almon, Chum	Lower Yukon Net:	15,000	drying	3,000
King	11 11 11	1,500	dry-salt	250
Coho		1,500	dry-salt	250
hitefish	ŭ ŭ ŭ	1 13,000	smoke	300
. MEATS (list separate .ly kinds used	2		rotten	3,500
ear	Filot Station gu	in 1,000		
oose		2,000		
ADDITS		100 -		an das des Des que des per les las
(list kinds used)	all a state and		- NT24 713	
lueberries	Hand picked	1 1 500 -	Sugar	750
almonberries	11 11	250	11	100
ranberries	11 11	1.500	Ħ	900
<pre>. OTHER FOODS  (list kinds, incl.  fats &amp; oils)</pre>				
ucks and Geese	guns	5 000 -		
lank Fish - Lin Cod	traps	1,000		an and two has been been been
nee Fish	nets	2.500 -		
. TOTAL		45,850		9,000
<ol> <li>Number of work d</li> <li>Comment on adequire increase supply?</li> <li>What source of N reindeer, fish, Moose, whitefind</li> </ol>	ogs dependent on this acy of supply - if in (Use other side for Freezer ative food will be av etc. (Use other side sh, shee fish. bl	adequate what co comments if nec- comments if nec- callable during the for comments if ackfish. rabb	eld be done essary.) ne winter, e necessary.) its, ptarm	to
10. Considering food foods to be obta should the food	on hand, the anticip ined, and the normal supply be adequate fo In all probabilit	ated additional : purchases throug r the coming win	supply of Na the store, ter?	itive
** Other than those	raised in the garden		10.17	
tation Filot Stati	on, Alaska			
ate of ReportNov. 6, ake report in triplica orward the original on	67 covering period f te, send original and to the Area Office,	rom Oct. 1, 1966 l copy to Distr Juneau, & retain	_ to Sept. 3 Lot Office w l copy for	0, 19 <mark>67</mark> . Tho will your file.

Appendix 7.1-C Example of a "later" format survey. Robert Jones, ANS Schoolteacher, "Annual Survey of Native Foods", File 917, Ag. Statistics & Production: Pilot Station 1953-71, RR, RG75, NARA-AR.

	A1		÷	800	fx Comn	nunity							2
_	A	B	-	C	D	F	F	G	н			K	
	~							G				14	-
1	Community	Year .	•	Date of Report	Author of F	Period Co	# Native	# Dogs 🖵	Comment of adequacy of supply	Sources av	Supply adequate?	Food Kind	Geographical Name
2	Arctic Village	19	60	01 October 1960	Marie B. Mott	59-10-01 ~ 60-09-30	90	75	The supply of meat is adequate when the caribou are around, which is mostly all the time		For all but a few families the supply is adequate. Because of the selling system (credit) the few families make out fairly well. Additional rice and flour could be used.	Trout	Old John Lake
3	Arctic Village	19	60									Whitefish	Old John Lake, Local lakes
4	Arctic Village	19	60									Pike	Local lakes
5	Arctic Village	19	60									Grayling	East Fork
6	Arctic Village	19	60									Caribou	East Fork Valley
7	Arctic Village	19	60									Moose	East Fork Valley
8	Arctic Village	19	61	01 October 1961	Marie B. Mott	60-10-01 ~ 61-09-30	80	75	Village people depend entirely on caribou		Yes	Trout	Old John Lake
9	Arctic Village	19	61									Whitefish	Local lakes
10	Arctic Village	19	61									Pike	Local lakes
11	Arctic Village	19	61									Grayling	Local lakes
12	Arctic Village	19	61									Caribou	East Fork
13	Arctic Village	19	61									Moose	East Fork
14	Arctic Village	19	62	15 October 1962	Marie B. Mott	61-10-01 ~ 62-09-30	90	100	if caribou pass through the supply is adequate		Yes, if the caribou winter in the vicinity	Whitefish	Chandalar Reservation
15	Arctic Village	19	62									Trout	Old John Lake
16	Arctic Village	19	62									Caribou	North end of Chandalar Reservation + vicinity
17	Arctic Village	19	62									Muskrat	North end of Chandalar Reservation + vicinity
18	Arctic Village	19	62									Blueberries	North end of Chandalar Reservation + vicinity
19	Arctic Village	19	63	01 October 1963	Frederick A. Goranson	62-10-01 ~ 63-09-30	85	70	Meat supply is ok if enough migrate by in fall, and if enough winter nearby	Caribou, if they winter nearby. Ocassionally a moose	If caribou winter nearby in sufficient quantities	Whitefish	Chandalar
20	Arctic Village	19	63									Grayling	Chandalar
21	Arctic Village	19	63									Trout	Old John Lake
22	Arctic Village	19	63									Caribou	Arctic Area
23	Arctic Village	19	63									Moose	Arctic Area
24	Arctic Village	19	63									Blueberries	Arctic Area

## 7.2 Appendix 2: Record Transcription into METADATA

Appendix 7.2-A Snapshot of the "METADATA" spreadsheet, which offers a compilation of all the information reported on the 236 records on Annual Surveys of Native Foods. Considering each listed "food kind" as a unique data point, each line was a different data point as reported in the surveys.

## Appendix 7.2-B The METADATA Spreadsheet: a description of each column

COLUMN TITLE	DESCRIPTION
Community	Name of the community/ village/ station.
Year:	Year for which the survey was written, in general the period covered is from October of a particular year (19xx) to the September of the following year (19xx+1). The Year recorded in this column would be "19xx+1".
Date of Report	Date at which the survey was written.
Author of Report	Name of the author and his/her position (if available).
Period covered	As previously stated in general the period covered is from October of a particular year (19xx) to the September of the following year (19xx+1).
	Number of people dependent on this supply.
# Natives	If the number is written as "X+"[1], X is reported as is.
	If the number of written as "X in part"[2], X is reported as is.
	Number of dogs dependent on this supply.
# Dogs	If the number is written twice, the printed number is chosen (versus written in pencil).
	If the number is written as "approx. X", X is reported as is.
	If the number is written as "X, plus Y puppies"[3], the number reported is the
Commonts of	SUM OF X and Y. Posponso to "Question & Commonts on adequacy of supply, if inadequate what
adequacy of supply	could be done to increase supply?"
Sources available	Response to "Question 9. What source of Native food will be available during the winter, e.g. reindeer, fish, etc."
Supply adequate?	Response to "Question 10. Considering food on hand, the anticipated additional supply of Native foods to be obtained, and the normal purchases through the store, should the food supply be adequate for the coming winter?"
Food Kind	Kind of food reported (i.e. Fish, Bear, Blueberries).
	Name of place where fish and meats are taken (i.e. Yukon River).
Geographical Name	* Appears within the same column of "Method of Taking" in surveys but separated in two columns in the Excel compilation to facilitate future analysis.
Method of Taking	Method of taking fish and meats (i.e. gun, net, snare).
Quantity	Quantity gathered in village during year (in pounds). * At times reported in other units, or by the number of individual animals
	caught.
Method of Preservation	Method of preserving the food kind (i.e. Smoking).
Quantity on hand as of	The quantity of harvest on hand as of the previous October of the year for which the
01/10/19XX	* When applicable as this is not required on every survey.
	This column is present on the early format of the survey, and also reports any other
Remarks	additional information written on surveys that doesn't go in any other column in the later surveys.
[1] Arctic Village 1964	

[2] Beaver 1952

[3] Steven's Village 1949

Appendix 7.2-C List of cases when the information added to METADATA differs from the exact words reported on the surveys. Table I: Food kind, Table II: Method of preservation, Table III: Geographic location of harvest and Table IV: Method of taking.

Column:	"Food Kind"	II	Column: "Method of Preservation			
As reported on the survey	As added to METADATA		As reported on the survey	As added to METADA		
Eggs	Birds eggs		They don't	Consumed fresh		
Greens	Green		Table use	Consumed fresh		
Wild birds	Birds		Eaten	Consumed fresh		
White whale	Beluga/ white whale		Table	Consumed fresh		
Wild fowl	Fowl		Sugar	Preserved in sugar		
Little black	Blackfish		Sugared	Preserved in sugar		
Dock	Sourdock		Oil	Preserved in oil		
Sourdox	Sourdock		Nil	None		
Miscellaneous	Other foods		Raw	Consumed fresh		
Jack fish	Pike		Used immediately	Consumed fresh		
Mossberries	Crowberries					
Chicken	Ptarmigan					
Humpback	Humpy/ Pink salmon					
Stickleback	Needlefish					
Jackfish	Pike					
Lampreys	Eels					
Lake trout	Trout					

nout			
ographic Name"	IV	Column: "Me	ethod of Taking"
As added to METADATA		As reported on the survey	As added to METADATA
Near community		Shotgun	Gun
Community		Hand picked	Pick
Around community		Picked	Pick
Around community		Shot	Shoot
Mouth of Yukon River		Spear	Native spear
Yukon River			

to METADATA

Column: "Geograp

As reported on the

survey

Near Minto

Around Minto

All around Minto

Mouth of Yukon

Minto

Yukon

# 7.3 Appendix 3: Methodology for Quantitative Data- Total Amount of Native Foods Harvested

Appendix 7.3-A List of special cases when calculating the total amount of harvested food within a community for a given year.

Total amount harvested					
As reported on the survey	Quantity added to the total amount	Survey			
"Dry wt. X" in pounds	X pounds	Minto 1954			
If amounts are not reported in pounds or any other unit	0 pounds	Overall			
"Negligible"	0 pounds	Overall			
"Very little"	0 pounds	Overall			
"There's no way to make an accurate guess"	0 pounds	Overall			
"Use immediately"	0 pounds	Overall			
"Hard to estimate"	0 pounds	Overall			
"Available soon"	0 pounds	Overall			
"Unknown"	0 pounds	Overall			
"Not estimable"	0 pounds	Overall			
"Even less"	0 pounds	Beaver 1964			
"X dozen" referring to birds eggs	Excluded	Hooper Bay			

#### Additional exceptions and special cases

If two surveys exist covering the same period of time, quantities of the most recent survey applies (Venetie 1956)

When the amount are not reported in pounds but in another unit, the following conversion rates apply:

1 ton= 2000 pounds

1 gallon= 8.345406 pounds (assuming the density of water=1)

1 guart= 2.08 pounds

1 jar= 0.3 pounds (assuming a small jelly har of 5 oz)

1 barrel= 100 pounds

The quantities reported for store produce is excluded.

When the amount of a food kind is reported by the number of individuals harvested instead of quantity in pounds, the following weights are used. These are the most conservative values taken from the species fact sheets available online from the Alaska Department of Fish and Game at:

http://www.adfg.alaska.gov/index.cfm?adfg=animals.listall

Duck -- Arlequin duck[1]: 1.3 lbs (female) Geese -- Brant Geese[2]: 2 ½ lbs (lightest sub-species) Rabbit/ Hare -- Snowshoe hare[3]: 3 lbs Moose -- Moose[4]: 800 lbs (small adult female) Bear -- Black bear[5]: 180 lbs (smaller than brown bear, in spring) Seal -- Spotted seal [6]: 200 lbs Water fowl -- consider weight estimated for duck Lush/ Burbot: 3lbs

[1] Beaver 1964, Pilot Station 1971 [2] Beaver 1964 ; Shageluk 1971 [3] Beaver 1964 ; Venetie 1971 ; Shageluk 1971 [4] Birch Creek 1967 ; Shageluk 1971 [5] Birch Creek 1967 ; Shageluk 1971 [6] Hooper Bay 1972

# 7.4 Appendix 4: Methodology for Quantitative Data- Number of Food Kinds

Appendix 7.4-A Detailed methodology for calculating S Community-Year.

	$oldsymbol{S}$ Community- Year (Referred as S throughout this table)					
Definition	The number of different food kinds recorded in a community for a given year.					
	<ul> <li>The value is based on two sources:</li> <li>1. Each food kind written on the table of the survey, <u>whether specific quantities gathered</u> are given or not (and even if "none" is written in the quantity column – it's highly possible that none has been harvested yet OR that all has been consumed). In other works, we assumed all listed items are [Present]</li> <li>2. Each food kind written in column "Sources available" which answers Q9 of the survey.</li> </ul>					
	and sheefish, therefore S =3). Even if a category name is listed (i.e. source 1 lists salmon, geese, birds and fish -> S =4)					
	If a food kind from source 1 is repeated in source 2, they count as one same food type in S (i.e. source 1 lists moose, caribou and sheefish; source 2 lists sheefish -> S =3).					
Calculation	If a food kind from source 2 isn't present in source 1, it counts as one food type in S (i.e. source 1 lists moose, caribou and sheefish; source 2 lists sheefish and salmon -> S =4).					
	In cases when a category name appears within source 1, it counts as one food type in S (i.e source 1 lists caribou (1000 pounds), fish (500 pounds) and meat (2000 pounds) -> S =3)					
	Category name refers to: o Meat o Fish					
	<ul> <li>o Berries</li> <li>o Birds/Fowl: This category includes both terrestrial and waterfowl</li> <li>o Waterfowl: This category includes duck, eider, goose, loon and swan</li> </ul>					
	In cases when a category name appears within source 2, and on the condition that no species of the category is mentioned in source 1, it counts as two food types in S					
	Example 1: source 1 lists salmon and sheefish, source 2 lists fish and meat (worth 2) -> S =4 Example 2: source 1 lists salmon and sheefish, source 2 lists fish -> S <sub>Community-Year</sub> =2					
	S value includes all food kinds from source 1 and 2 as explained above					
and	S value includes the recorded food kind "Other foods", and "Birds eggs"					
Exclusions	S value excludes the reported food kinds that are secondary products resulting from the harvests (see next table).					
Appendix 7.4-B Food kinds reported that are considered secondary products, and therefore excluded from the calculated number of food kinds.

Secondary Products					
o "Bear grease"	o "Muktuk" (whale blubber)				
o "Beluga oil"	o "Oogruk oil"				
o "Blubber"	o "Seal dogruk"				
o "Fish fats"	o "Seal oil"				
o "Fish oil"	o "Tallow" (fat)				
o "Moose lard"	o "Whale oil"				
o "Mukluk" (a boot)	o "Leftak" (unknown element)				

### Appendix 7.4-C Detailed methodology for calculating $\overline{S}$ Community.

	Community (Referred to as S in this table)
Definition	The average number of different food kinds recorded in a community over the years (for which surveys are obtained)
Calculation	The S values are calculated from S $_{\text{Community-Year}}$ values of a certain community
Calculation	Excel formula: =ROUND(AVERAGE(\$G\$51:\$G\$55),0)

## Appendix 7.4-D Detailed methodology for calculating S Community.

	$m{S}$ Community (Referred to as S throughout this table)
Definition	The number of different food kinds recorded in a community over the years (for which surveys are obtained)
Calculation	The S values are calculated from pivot tables (Excel) representing all the food kinds recorded for a certain community (those taken into consideration to calculate each respective S <sub>Community-Year</sub> values)
	S excludes secondary products, as well as "Other foods"
	S excludes the category name if a specific species of that category is mentioned for that community at any year (i.e. "Meat" is excluded from S if "Moose" and "Bear" are included)

Appendix 7.4-E Detailed methodology for calculating S Region.

	${f S}_{ m Region}$ (Referred to as S throughout this table)				
Definition	The number of different food kinds recorded in a region over the years (for which surveys are obtained)				
	The S values are calculated from S $_{\text{Community-Year}}$ values, pooled together by region				
	"Snowshoe Hare" pooled with "Rabbit"				
	"Sucker" pooled with "Eels"				
Calculation	"Cod fish" pooled with "Tom cod"				
	"Spruce Chicken"pooled with "Grouse"				
	"Eider duck" pooled with "Duck"				
	Species salmon species mentioned in a survey year are pooled with "Salmon"				

Appendix 7.4-F Detailed methodology for calculating S River.

	<b>S</b> River (Referred to as S throughout this table)				
Definition	The number of different food kinds recorded overall for the Yukon River over the years.				
Calculation	The S values are calculated from S $_{\mbox{Community-Year}}$ values, pooled together across the dataset				
	"Snowshoe Hare" pooled with "Rabbit"				
	"Sucker" pooled with "Eels"				
	"Cod fish" pooled with "Tom cod"				
	"Spruce Chicken"pooled with "Grouse"				
	"Eider duck" pooled with "Duck"				

# 7.5 Appendix 5: Methodology for Quantitative Data- Classes of Food Kinds

Appendix 7.5-A List of food kinds for each of the 6 classes.

CLASS	FOOD KIND	CLASS	FOOD KIND	
Terrestrial Small	Mink Otter Lynx Marten Porcupine Rats Squirrel Beaver Muskrat Rabbit		Goose tongue * Mouse food Seeds Sourdock/ Wild spinach Stalk Green Bilberries Currants Huckleberries Roseberries	A type of seaweed
Terrestrial Big	Reindeer Deer Bear Caribou Moose	Botanicals	Cabbage Carrots Potatoes Turnips Blueberries	
	Clams Herring Humpy/ Pink salmon Needlefish Tom cod Rockfish Char Blackfish Chinook/King salmon		Cranberries Crowberries Rhubarb Wild fruits & veg Raspberries Rosehips Root Salmonberries Blackberries	
Fish	Chum/Dog salmon Coho/ Silver salmon Grayling Lush/ Burbot Pike Sheefish Trout Whitefish	Birds	Birds eggs Crane Loon Swan Ducks Geese Grouse Ptarmigan	
	Sockeye/ Red salmon Lingcod Eels	Marine mammals	Beluga/ White whale Oogruk/ Bearded Seal Seal Walrus Whale	

#### 7.6 Appendix 6: Results





Note that Alakanuk, Hooper Bay and Mountain Village are plotted against the secondary axis (all are highlighted by a yellow glow).

ONE-WAY ANOVA					
Source of Variation	Sum of Squares	DF	Mean of Squares	F	Р
Between	2.00E+11	2	9.99E+10	24.93	5.27E-09
Error	2.96E+11	74	4.01E+09		
Total	4.96E+11	76			
	TUKEY HS	SD			
Treatment	Tukey HSD	Tukey HSD	Tukey HSD		
Pair	Q statistic	P-value	Inference		
Central/Lower	5.8529	0.0010053	** p<0.01		
Central/Upper	4.1331	0.0126331	* p<0.05		
Lower/Central	9.9283	0.0010053	** p<0.01		

Appendix 7.6-B Detailed results of the one-way ANOVA and post-hoc Tukey Test for the regional harvest amounts.

Results generated by http://statistica.mooo.com/OneWay Anova with TukeyHSD get data



Boxed-plot (left) and plot of the regional means with 95% Confidence Intervals (right) B: Lower; A: Central; C: Upper

		ANOVA			
Source of Variation	Sum of Squares	DF	Mean of Squares	F	Р
Between	1,490,245.87	2	745,122.94	11.7958	3.58E-05
Error	4,674,458.11	74	63,168.35		
Total	6,164,703.98	76			
	TUKEY H	SD			
Treatment	Tukey HSD	Tukey HSD	Tukey HSD		
Pair	Q statistic	P-value	Inference		
Upper/Lower	4.572	0.0051462	** p<0.01		
Central/Upper	6.741	0.0010053	** p<0.01		
Lower/Central	2.1907	0.2746747	Insignificant		

Appendix 7.6-C Detailed results of the one-way ANOVA and post-hoc Tukey Test for the regional per-capita harvest amounts.

Results generated by http://statistica.mooo.com/OneWay Anova with TukeyHSD get data



Plot of the regional means with 95% Confidence Intervals. A: Lower; B: Central; C: Upper

1 1	,	11	c
List of un	ique species by reg	jion	
Lower	Central	Upper	
Beluga/ White whale	Bilberries	Cabbage	
Birds eggs	Currants	Carrots	
Clams	Deer	Char	
Crane	Huckleberries	Lynx	
Goose tongue	Rockfish	Marten	
Green	Roseberries	Porcupine	
Herring		Potatoes	
Humpy/ Pink salmon		Rats	
Loon		Squirrel	
Mink		Turnips	

Mouse food Needlefish

Otter Reindeer Seal Seeds

Stalk Swan Tom cod Walrus Whale

Oogruk/ Bearded Seal

Sourdock/ Wild spinach

### Appendix 7.6-D List of unique species for the Lower-, Central- and Upper-Regions.