

An aerial photograph of a rugged, mountainous coastline. The mountains are covered in sparse vegetation and snow, with a few small settlements visible. The coastline is jagged, with several peninsulas and inlets. The water is a pale, milky blue, and the sky is a clear, light blue. The overall scene is serene and remote.

Chasing the North Port Radium, NWT

A Landscape Architecture Design Practicum
by Marie E. Levesque

Chasing the North | Port Radium, NWT

by

Marie Elizabeth Levesque

A Practicum submitted to the Faculty of Graduate Studies of
The University of Manitoba
in partial fulfilment of the requirements of the degree of

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture
University of Manitoba
Winnipeg

Copyright © 2013 by Marie Elizabeth Levesque

All photographs and images have been produced by the author, unless otherwise stated.

Please Note: for optimal viewing experience, please use the 'two up continuous' or 'two page view' display.

ABSTRACT

There are currently very few examples of northern Canadian landscape architecture. There is even less literature on the subject. This design practicum follows a broad exploration of the Canadian North in an attempt to understand how the discipline of landscape architecture may insert itself as a profession capable of functioning in a northern environment. Key design issues specific to the North have been identified through a review of literature and personal experience working in the North, and have been categorized in three main areas: socio-economic, socio-cultural and physical environment. A framework of considerations for northern landscape architecture has been proposed and applied to the research process, supporting a holistic approach. A design has been proposed for the historic mine site of Port Radium, Northwest Territories. The design tests the applicability of landscape architecture in the North and follows the proposed framework, considering the history and future of the site from a socio-economic, socio-cultural and environmental perspective.



Figure 1: sunrise with moon - Great Bear Lake (2007)

Acknowledgements

I would first and foremost like to thank those special people, throughout the course of my studies at the University of Manitoba, who have shown me the possibilities of landscape architecture. I believe I have found a place where I belong.

To my Manitoba and Ontario families for the support, encouragement and confidence;
To my sister for the distractions that were always welcomed;
To my brother for the many trips to Library and Archives Canada;
To my mother and father for keeping me on track;
To 'Momily' for the conversations;
And to Jared for believing in me, thank you.

To my advisory committee for the valuable input;
To Anna Thurmayr for the perspective and balance;
To Dr. Marcella Eaton for the inspiration and strength;
And to Dr. Ian Mauro for being my external advisor, thank you.

To those who have helped make this practicum possible;
To Dr. Colin MacDonald for his time and photographs of the site;
To Leah for the four years of friendship and advice;
And to my friends and colleagues in studio, thank you.

Thank you all.

Table of Contents

Abstract.....	i
Acknowledgements.....	iii
Table of Contents.....	iv
Preface - Chasing the North.....	vi
part one: introduction.....	2
part two: Approach.....	5
part three: Assumptions & Limitations.....	8
part four: Exploring the Idea of the North.....	11
.one: perspective	
.two: representation	
.three: people	
.four: the North as place	
.five: definitions	
.six: the Canadian North: an introduction to the Territories	
part five: Landscape Architecture in the North.....	52
.one: precedents	
.two: opportunities	
.three: framework approach	
.four: cultural landscapes	
part six: Port Radium.....	71
.one: a caution	
.two: industry & institution	
.three: environment	
.four: human	
.five: significance	
.six: regional context	
.seven: alternative recommendations	

part seven: Design.....	123
.one: impetus & inspiration	
.two: design	
.three: experiential description	
.four: circle	
.five: paths	
.six: past, present & future	
.seven: testing adaptive growing conditions	
.eight: embracing the cultural landscape approach	
part eight: Conclusion.....	148
List of Figures.....	152
References.....	156
Appendix: Glossary of the North.....	166

preface | Chasing the North

Before returning to school to pursue my Master's degree in Landscape Architecture, I worked as a Geophysical Technician based out of Yellowknife in the Northwest Territories. I was part of a group of people paid to explore the Canadian North as part of a preliminary exploration phase in the mining process. I have walked across the frozen tundra, felt the wind whip across my face atop a snow-covered esker, and witnessed the glow of the midnight sun.

Although the remuneration was good, I was never quite satisfied with the work that had brought me to some of the most remote places in Canada. While my days were filled with exploring the indescribably beautiful landscape, my fieldwork was always focused on what was beneath the surface, looking down instead of looking out across the land.

Since boarding my last flight out of Yellowknife I have been chasing the North. I have been captivated by these landscapes and the solitude. Feeling connected to something that is greater than me, greater than anything I have ever known. This practicum has allowed me to re-visit my passion - to go back to the place I love, if only through books, films and photographs.

This is about chasing the North - moving one step closer to understanding one of our country's most elusive northern secrets. This work is about realizing my *southern perspective*, while being humble and being pragmatic. This land is about more than snow and ice. This practicum is about landscape architecture.

So, what is this all really about? This is, as it has always been, about the North and landscape architecture.

Canada is seen, nationally and internationally, as being 'of the North'. This is often seen as nordicity. What do people actually mean by the North? What are the stories of the North? And what does North really mean? What can landscape architecture offer to the northern landscape?

Neither isolated nor uncharted, the North has been explored and exploited by the Europeans (later Canadians) for several centuries. The North has also been inhabited and respected by the guardians of the North - the Inuit, First Nations and Métis. The North is not a homogeneous blanket of snow and ice. The North is not easily defined. I seek to understand the complexities of the North – the dreams, realities and histories locked in the frozen landscape – and the potential for landscape architecture to grow as a profession within the North.

Port Radium, a former uranium-mining town in the Northwest Territories has been selected as the site in, and on, which my explorations will take shape. The site itself, once a busy and productive source of mineral extraction, has been reclaimed by the Northern landscape. The land has been altered and scarred, blanketed by snow, bulldozed, and covered with waste-rock. Keeping its past a secret. Through the study of, and design proposal for Port Radium, I hope to show the possibilities that may be offered through landscape architecture as applied to a northern site.

The work presented for this practicum is only the start of what may be a lifelong pursuit of studying and understanding the North and our place as landscape architects in the northern context. "Landscape architectural work in the North offers the opportunity to modify our existing language, theories, tools, and overall understanding of the nature of design" (Bradshaw, 2009, p.183). Through our attempts to understand the North, we invariably begin to develop an increased sense of respect for this often misunderstood terrain. To this end, I hope to engage in a dialogue between the profession of landscape architecture and the North, that we may all have a better understanding of the North.



Figure 2: sky over Port Radium (2007)



part one

Introduction

Canada is a northern country. As one of only eight member states of the Arctic Council established in 1996, Canada is part of an elite group of nations that are defined by their Nordic qualities. Through the literature that will be discussed in the text that follows, it is evident that Canadians have historically romanticized notions of the North. The northern Aboriginal peoples, including Inuit, Métis and First Nations, inhabiting northern communities have largely been ignored, with the exception of stereotypical representation through the media and sub-standard treatment by the federal government. Through the ebb and flow of public and government interest in the Canadian North, the diverse and ecologically sensitive northern landscape remains constant as a homeland for Northern Aboriginal Peoples.

Landscape architecture may be defined as “the deliberate act of arranging the land to shape environments that sustain human life and enrich the human experience” (Riley, 1992, quoted in Eaton, 1997). This definition may be expanded to include all forms of life, not just human life (Eaton, 1997). The intent of this practicum is to encourage a dialogue with the landscapes of the North and the discipline of landscape architecture by providing a foundation of themes and concepts. The work aims to explore the significant potential that landscape architecture can make to northern development and design by addressing the main areas of socio-economic (presented as ‘institution and industry’), environmental (presented as ‘environment’), and socio-cultural (presented as ‘human’) concern in the North. The methodology used in this practicum follows the research design approach common to the practice of landscape architecture (van den Brink and Bruns, 2012; Millburn and Brown, 2003; Preece, 1991; Jones, 1970) which involves a continual interplay between research and creative inspiration, closely related to the *interactive research/design process* identified

by Milburn and Brown (2003). Incorporation of research into this design practicum follows aspects of each of the five design models outlined by Milburn and Brown including artistic, intuitive, adaptive, analytical and systematic integration (2003). "I've always seen landscape architects as being more 'all-encompassing' in their way of looking than other disciplines" (Buggey, 2012). This approach has been selected and presented in an attempt to make knowledge, including a general understanding of various northern conditions, accessible for both the landscape architect and the general public.

Acknowledgement and identification of the vast areas of northern research is not exhaustive in this work. This practicum does not present itself as an authority of any one area of northern research. It is a preliminary exploration of the North. It is to be viewed as a learning tool, making general knowledge of the North accessible while identifying additional sources of research should the reader require a more detailed understanding of a specific topic - this is encouraged.

The practicum represents three, parallel, foci: a broad introduction of Northern Canada and the potential for the specific practice of northern *landscape architecture*; the significance of the historic site of the Port Radium mine in the Northwest Territories; and, a design proposal to initiate discussions regarding a re-design of the remediated site. The practicum is informed by the possibilities offered by the discipline of landscape architecture.

Capitalizing 'North' throughout the document follows the approach presented by Sherrill Grace in *Canada and the Idea of North* (2002), recognizing the North as a human construct: "...It has become part of ... the 'habitus', and we have learned to accept it as a given" (p.15). The Canadian North is not something that should be accepted as a given. We owe this region and the people who live there a large amount of respect and understanding.

Port Radium has been selected for the design and demonstration of the relevance of landscape architecture in the North. In 2007, I had the opportunity to visit the site as part of my work experience. Port Radium is a former uranium mining settlement on the

eastern shore of Great Bear Lake, Northwest Territories. Opened in 1932, Port Radium was, at one time, the world's largest producer of high-grade uranium ore. Historical mining practices throughout the North are often downplayed, if known at all. Although government publications do not acknowledge the full history of the site (see *Big Picture 2010 – Contaminated Sites in the NWT, Indian and Northern Affairs*, 2010), Port Radium directly contributed to the secretive United States (US)-Canada initiative, known as the Manhattan Project, by supplying uranium ore to nuclear research and testing facilities throughout North America and parts of Europe (van Wyck, 2010; Chenowith, 1997).

The proposed design at Port Radium aims to acknowledge the history of the site while at the same time addressing the socio-cultural and environmental issues of the 'ephemeral' mine including misconceptions, misrepresentations, and a balance between the economic potential and environmental sensitivity of the North.

At the scale of the site, landscape architecture may offer design possibilities aimed at reconciling tensions between the Sahtu Dene peoples from the community of Déline and the Canadian Government, surrounding government acknowledgement of the community's involvement in the unsafe former mining activities and contamination concerns at Port Radium. Through the proposed design of Port Radium, the site may be revealed as a site of cultural importance and of national and international significance.

The intention of this practicum is to present a framework – a foundation of knowledge of Northern Canadian conditions – from which future design and development may draw upon. While the design proposal for Port Radium is theoretical within the context of an academic document, other landscape architects and landscape design students wishing to embark on projects in the Canadian North may use the research presented as a guide for their own personal inspirations and research.

part two

Approach

This design practicum is based on the multi-phased, iterative approach common to the practice of landscape architecture. As mentioned in the Introduction, this approach follows the interactive research/design process discussed by Milburn and Brown and involves a continual interplay between research and creative inspiration, including artistic, intuitive, adaptive, analytical and systematic integration of research (2003). The design approach involves a multidisciplinary exchange of ideas and relevant knowledge required to obtain the information necessary to make design decisions on a site. This is commonly known in the discipline as the *design process*.

Study of the Canadian North extends across many disciplines. Addressing in detail all of the identified disciplines and sources of knowledge would result in a practicum that is too broad, and could take a lifetime to complete. For this reason, a glossary of terms was created. The glossary follows the approach taken by the *Metapolis Dictionary of Advanced Architecture* (Gausa, 2003) and has been compiled according to the literature consulted. As applied to the North it is an index of both historic and emerging terms, thoughts and processes that have surfaced through research and personal reflection. The glossary represents an ongoing process of broad research on the North, which was necessary to understand the context of both the North as a whole and the selected site of Port Radium.

The study of the Canadian North and Port Radium follows the framework proposed in this work which provides a theoretical lens that identifies key themes that are important to landscape architecture in the North. Research has been focused upon three central areas of influence: socio-economic (the institution and industry), socio-cultural

(the human) and environmental (the environment). This process of categorizing the North carries throughout the document as an important organizational tool. It has been used to structure the research in relation to subject areas, and to categorize the process of site analysis for Port Radium.

The theoretical framework guided design development both in site-specific research and idea generation. The framework also acted as a measure of assessing the design process, testing the applicability of the proposed design of the site and its level of success, in addressing and ensuring that industry and institution, human and environment were considered equally, in as much as is possible.

Review of existing research included literature, film, photography, maps and government publications. Geospatial techniques have been applied to specific areas of research to better represent and communicate the interplay between the three areas of influence presented in the framework. Due to limited accessibility of site-specific records, some extrapolations and interpretations have been made, as discussed in the following section.

A design proposal was then undertaken for the site of Port Radium. Using the interactive research/design approach proposed by Milburn and Brown (2003), the design of the site was a result of an interplay between ongoing research and creative inspiration. The theoretical framework developed for this practicum served as a guide to inform both research and creative inspiration.



Figure 3: fog over Great Bear Lake

Credit: Colin MacDonald

part three

Assumptions & Limitations

The difficulty in tackling a project broadly focused in the North is the wealth of cross-disciplinary information available. Though acknowledgement is given to multiple interpretations, definitions and meanings of the North – spiritual and otherwise, several key interpretations were made with respect to the Canadian North. The first is that the North is certainly more remote and less densely populated than major southern Canadian cities. From this point, it becomes clear that for many remote northern locations, accessibility is a major challenge that extends to economic limitations.

The second interpretation is that there are many environmental factors which limit northern development, such as harsh climatic conditions and a limited growing season. For much of the North, exposed bedrock, limited soil and scarcity of lumber make typical construction and development both expensive and difficult.

The third understanding is that the role of the northern Aboriginal people, in any northern development, should not be overlooked. The northern Aboriginal peoples possess invaluable traditional ecological knowledge (TEK - see glossary) and hold legitimate, legal claims to the landscapes of the Canadian North (see Figure 31a-e). The challenge for landscape architects, in a northern context, is in the investigation of these interpretations and resolving limitations of them to provide sensitive design that reflects the complexity of the North.

Although I have had the opportunity to travel to the Northwest Territories on several occasions, this has by no means made me remotely close to being an expert of the North. I recognize the many limitations that are intrinsic to design work that occurs without site visits. Unfortunately, this is the case on many projects throughout the world. It can be seen as

more problematic when dealing with all of the issues related to the North. I have identified three potential limitations that result from being in the south while designing in the North.

The first potential limitation is the remote location of the selected site. Site accessibility is restricted by cost, climate extremes limiting travel to a few months, and ongoing proprietary mineral exploration in the area. Since a site visit was not feasible, research by proxy presented the second constraint involving a reliance on remote sensing, GIS and photographic study.

The third and final limitation was the lack of contact and communication with the Dene Aboriginal peoples. Attempts to communicate with the community of Déline were made at the outset of the practicum. Although communication was not successful until the final stages of the design phase, it is recognized that collaboration with northern aboriginal communities is paramount to achieve a balanced and sensitive design.

Historic activities on the site include the Dene population of the nearby community of Déline on the western shore of Great Bear Lake. Prior to site remediation, the environmental conditions of the site left the Dene fearful of traditional hunting and gathering activities due to the potential contamination of local flora and fauna. Most importantly, the landscape of Great Bear Lake and the surrounding area is considered a sacred area for the Dene people who value this land for its spiritual, social, cultural and food source. Ideally, community consultation and participation would provide a grounded foundation to base design upon.

I recognize this as a major limitation of this practicum. Although community involvement was not feasible, the proposed design was completed to a suitable level able to convey opportunities and alternatives, potentially not yet considered by the public. It is acknowledged that if the design were to be taken on professionally or academically at a PhD level, collaborative community and expert consultation would most definitely occur.

The breadth of extant, pertinent information on the broad study of the North is almost immeasurable and continually expanding. A preliminary study was undertaken to explore ideas of the North. Research then focused on the Northwest Territories and Port Radium.

Landscape architecture may help unlock the unseen potential of sites, of places in the North, and to reveal and express the complex interplay between the institution, the individual and the physical environment. The challenge for the southern landscape architect lies in being aware of, and accepting the limitations of their approach upon a northern project, while acknowledging the need for further study and collaboration. This project is a *beginning* in my personal understanding of the complexities of the North and northern Aboriginal people and their communities, through the acknowledgement of a southern perspective. It is a brief introduction to the rich historical and cultural legacies of this land, meant to inspire landscape architects, to promote a collaborative presence in the North, and ultimately to encourage a dialogue between the profession of landscape architecture and the North.

NOTE:

In 2012, the Government of Canada began the process of archiving, removing or otherwise limiting access to specific online educational resources and publications. On January 1, 2013, the Government of Canada updated all online content. This has proven to be a major limitation in providing specific references that were consulted prior to January 1, 2013.

part four

Exploring the Idea of the North

The vast and varying northern landscape exists in the subconscious of some as isolated, remote, desolate and sinister (Grace, 2002; Abel and Coates, 2001; Lopez, 2001; Honderich, 1987; Woodford, 1972). To others, the North elicits beautiful imagery of a frozen landscape, rich with resources, calling for adventure. To others still, the North is home (Grace, 2002; Abel and Coates, 2001; Lopez, 2001; Honderich, 1987).

The North is both a qualitative and quantitative aspect of our country. It is as much a source of our economic profitability as it is that extra something that defines Canada as a unique country (Abel and Coates, 2001). The definition of the North is largely dependent on perspective, geography, convenience, experience and economics.

Researching the North requires a sensitive and cautious approach since much of the historical exploration, research and publication of the North has largely been undertaken by people who have little experience with, or have simply never been. “The ‘North’ poses the problem of the relationship between geographic realities and the world of imagination, since those who have written and read about it in Europe and America, have, for the most part, never been there” (Chartier, 2006, p.35). In this sense, it is dangerously easy to propose and support uneducated views of the North. Daniel Francis states, “To a Canadian, North is an idea, not a location; a myth, a promise, a destiny” (1997). This would appear to be a southern-based perspective of the North. Perhaps the northern Aboriginal people who call the North home do not share the same views. The onus is on the landscape architect to acknowledge this, and consult literature and northern Aboriginal communities to represent a balanced, multi-perspective view (see *Tri-Council Policy Statement - S.6. Research*

Involving Aboriginal Peoples for more information, Government of Canada, 2010).

The challenge exists to provide a unanimous definition of the North. What makes this so difficult are the many interpretations of the word 'North'. "The Canadian North is arguably a psychological region – a self-defined place, where people are in the north because they feel that they are ... The self-definition of northern depends a good deal on a feeling of distinctiveness from and resentment towards the south" (Mulvihill et al, 2001, p.613). Understanding the North is not an easy task. This chapter explores the concepts of the North from a southern-based, white female, Canadian perspective. The literature presented reflects a largely southern-based North American perspective. This is not mentioned to claim a preferential position. Rather, it is stated to frame the context and the inevitable limitations of working in a foreign context, even within ones home country. As Canadian geographer Louis-Edmond Hamelin says: "There are so many Norths in the North!" (Hamelin, 1978, p. 282). There are many differing perspectives and definitions of exactly where and what 'North' is. What follows is a brief, non-exhaustive, exploration of some of these perspectives, definitions and representations.

"We seek to describe what is Canadian about the Canadian North, rather than trying to describe what is northern about most of Canada" (Coates and Morrison, 2001, p.35). The definition and delineation of the North is not a simple task. For something that would appear to be embedded in our national psyche, Canadians appear to have great difficulty in putting into words exactly what North means, beyond a romanticized notion of Canadiana.

Public and government interest in the Canadian North follows an ebb and flow cycle, mimicking and often driven by the boom and bust cycles of northern mineral exploration and extraction (Abel and Coates, 2001). Prior to Canadian Prime Minister Stephen Harper's (2006-current) increased interest in the North – including the unveiling of 'Canada's Northern Strategy' in 2009 - the last large-scale, government prompted Northern boom was guided by John Diefenbaker and his 'new vision' for Canada (1957-1963)

(Bone, 2008; Grace, 2002).

With increased political and scientific interest in the Canadian North, and in Canada's role as a circumpolar nation, comes a new wave of interest in everything North. The Franklin Expedition, the feasibility of the Mackenzie Gas Pipeline Project, looming climate change, arctic sovereignty, and the unveiling of new northern National Parks have all brought about a renewed interest in all things North.

In *Canada and the Idea of North*, Sherill Grace provides an in-depth study of the historical portrayal and multiple meanings of the North through various forms of media in an attempt to appreciate and understand how Canadians represent and continue to understand as North (2002). Since most Canadians have not and will not have the privilege of visiting the North, those who endeavor to portray it often bias our visions of the North.

The challenge in quantifying or delineating the North is nothing new. Attempts to establish an understanding of the North extends across many disciplines. In *Canadian Nordicity – It's Your North, Too* (1978), Canadian geographer Louis Edmond Hamelin proposes a complete set of terms to describe the North; in 2000, Statistics Canada published a paper on the statistical 'best fit' of the southern boundary of the North. The creation of the geographic distinctions between 'us' and 'them', the southerners and the northerners, has led to contradicting and often conflicting interpretations of the boundaries, policies and (mis)representations of the North.

part four.one

Perspective

Through perspective and representation, we are able to interpret and react to our surroundings. In the most general sense, perspective is the specific filtered lens through which an individual views the world including people, places and things. Perspective is a catalyst for experience. To share a specific perspective requires a form of communication, or representation. It is important to consider that representation of all forms – scientific, governmental, photographic, for example, are nothing more than forms of communicating a certain perspective.

The portrayal and definition of the North have always been subject to perspective. When perspectives of the same concept begin to diverge the opportunity for contradiction and conflict may surface. This has often been at the root of many of the misconceptions of the North. Which perspective of North is right? What does it mean to be Northern? Where is North? Lopez eloquently states that “The perceptions of many people wash over the land like a flood leaving ideas hung up in the brush, like pieces of damp paper to be collected and deciphered. No one can tell the whole story” (1986, p.273). There may not be a singular or correct definition of North. We may attempt to answer these questions by considering perspective, amongst other things.

‘North’ holds many meanings. “The desire to know, name, identify, represent North persists, and the picture remains tantalizingly incomplete” (Grace, 2002, p.49). Directionally or cartographically speaking, North refers to the direction toward the geographic North Pole, on a two-dimensional plane this is often considered ‘up’. This concept of ‘North’ may be applied to any position on the earth: Winnipeg, Manitoba is north of Minneapolis, Minnesota;

Caracas, Venezuela is north of Buenos Aires, Argentina; and Oslo, Norway is north of Cape Town, South Africa.

The concept of the North-as-place, specifically as a cold and often frozen or snow-covered landscape, is strictly a concept belonging to the Northern Hemisphere. Opposite to the Northern Hemisphere, moving northward in the Southern Hemisphere indicates an increase in temperature and species richness.

Perspectives of the North vary geographically within Canada: “The indigenous peoples of the North see their land as neither a frontier nor a wilderness, but as a home. The lack of attention paid to this point of view reveals the extent to which the North is understood in southern terms” (Mulvihill et al., 2001; Sandlos, 2001 quoted in Wynn, 2007, p.416). In *Northern Realities*, James Lotz discusses the use of ‘inside’ and ‘outside’ from an interesting perspective: “Every visitor to the north hears it sooner or later. The word is ‘outside’. The word is used in a very ambivalent way – ‘outside’ is somewhere that is desirable, but also threatening” (1970, p.22). The following excerpt by Lotz has been selected because it indicates three important points.

The precise location of ‘outside’ is hard to define. It does not seem to mean a specific place or places. Whitehorse is not ‘outside’ but Vancouver is. The word seems to refer to a place with a milder climate and a greater range of amenities. It is an imaginary place, but cities like Edmonton and Vancouver come close to the image. The northern Eskimos [sic] and Indians [sic] do not seem to use the term, although young people among them are beginning to do so. For older Eskimos, the ‘inside’ and the ‘outside’ are right where they are.

If the area south of sixty is ‘outside’, people living north of sixty must be ‘inside’. ‘Inside’ can be a friendly place, a place where you belong. Or it can be a prison. The idea of people being ‘inside’, or being trapped, and yet relishing their prison, is part of the paradox of the north.

James Lotz, 1970, p. 22

Firstly, the use of the term 'Eskimo' and 'Indian' indicates the historical representation of the now Inuit and First Nations people of Canada. Both Eskimo and Indian are indeed derogatory terms prescribed by European settlers and are a generalization of an entire group of people occupying a specific geographical range. Secondly, Lotz identifies something that was, at the time of publishing, already occurring in the northern regions of Canada: southern influences on the new generations of Inuit, Métis and First Nations people. The awareness of 'inside' and 'outside' as two distinctly different geographical and situational entities by the Inuit, Métis and First Nations youth indicates the disparity between northern and southern Canada. Thirdly, Lotz reveals his southernness through his description of people being trapped 'inside' the North – yet relishing their prison. This is likely to be a perspective common to many people both at the time of publishing and today.

There exists a discrepancy of perspective between 'us' and 'them' – even the use of 'us' is subject to perception. For those in the southern cities and provinces lying close to the Canada-US border, 'them' undoubtedly refers to the northerners, the distant people inhabiting the North. For those in the North, 'us' refers to the people of the North. Perspective must be respected and treated cautiously. Even the use of 'we' and 'our' has the ability to convey a sense of exclusivity and authority (Grace, 2002). Northern Canada has largely been presented through a southern perspective. "The we, my, us, or our that is tacitly assumed as authoritative speaker or attentive listener rarely lives north of sixty and cannot possibly inhabit the North. One result of the southernness of North, of course, is that ideas of North tend to serve southern Canadian interests, be they psychological, spiritual, physical, material, or political" (Grace, 2002, p.16).

part four.two

Representation

The great significance of representation is in the ability to convince a person or group, of another person or group's perspective. Representation may take form in many ways, through written or spoken work, art, music, video, audio, scientific or government publications, cartographic mapping, or eidetic mapping. "North represents 'Eskimos' [sic], Indians, the RCMP, white male romantics, adventurers, explorers, etc ... and colourful 'characters' ... It is only very recently that northern voices have begun to be heard in their own speech, arts, and politics" (Grace, 2002, p.17). When accessing a form of representation it is important to acknowledge the source and consider the perspective from which it has been created.

The North has, for many years, been represented as part of our Canadian national identity, as a constant theme in the Canadian self-narrative (Grace, 2002; Arnold, 2012). We propagate our 'northernness' through art, music, literature, television and politics – even our national anthem contains the lyrics 'Our True North Strong and Free'. The pitfall of most of these representations of the North is that authors and the audience are reporting and receiving the media, respectively, from a southern perspective (Grace, 2002). We, the Canadian South, have historically produced a significant body of literature and media on a subject that we largely do not fully comprehend. Only recently have the voices of native northerners – Inuit, Métis, First Nations and non-aboriginal – begun to be self-represented and acknowledged. As Grace says, "Native northerners play an increasing part in the representation of North, even when that part is limited to an acknowledgement of their prior exclusion" (2002, p.43). This section explores the various forms of representation of the North, in an attempt to reveal differing perspectives.

part four.two

Representation: Mapping

Maps are too often considered to be unquestionable, accurate representations of the truth (see *How to Lie With Maps* by Monmonier, 1991). On mapping, Lopez states that: “To a modern traveler the arctic landscape can seem numbingly monotonous, but this impression is gained largely from staring at empty maps of the region...” (1986, p.284). In reality, a map is no different than a photograph in that it reflects the perspective of the person or persons responsible for its creation. A map shows only exactly what it intends to show.

The Earth Science Sector of Natural Resources Canada – formerly the Geological Survey of Canada (GSC) – has extensively mapped the North, producing numerous geological maps. Established in 1842, the GSC was tasked with preparing a comprehensive inventory and assessment of the mineral wealth of Canada that would later extend to include forestry research, economic values of mineral deposits and topographical mapping of the entire country (Natural Resources Canada, 2012). This in itself illustrates a complete lack of understanding of the complexity and diversity of the North and its people. It valued resource potential which is at the heart of the Canadian economy. Canada has been slow to appreciate the cultural value of people and place.

In the representation titled *Inuit View to the South* from Rudy Wiebe’s *Playing Dead* an alternative perspective is presented as an alternative map of the North (Grace, 2002, p.82). Unfortunately, copyright for this illustration could not be obtained. Please refer to *Canada and the Idea of North* by Sherrill Grace (2002, p.82).

In 1970, Lotz asserted, “it is the electronic media that are opening up the north and replacing vagueness with precision” (p. 25). The advent of Google Maps and digital

mapping technologies has allowed for an increased awareness of the variability of the North, moving away from Lopez's empty maps of monotonous representation.

Why are the majority of Canadians still unaware of the variability of Canada's northern landscapes? Perhaps we still seem to have a sense of aversion to the North, or at the very least, no interest in familiarizing ourselves with the biophysical, socio-cultural and industrial North? "I have long been intrigued by that incredible tapestry of tundra and taiga ... I've read about it, written about it and even pulled up my parka once and gone there. Yet like all but a very few Canadians, I guess, I've had no real experience with the north. I've remained of necessity an outsider, and the north has remained for me a convenient place to dream about, spin tall tales about and, in the end, avoid" (Glen Gould, 1967). Unless required to research or travel to the North for employment, Canadians generally continue to possess no urge to engage the North. We are happy, it seems, to relish in the dream of the North - not willing to spoil the happy memory through discovery.

The best representation of the Earth is spherical; a globe is able to most-accurately represent true distance, direction, shape and area (USGS, 2006). "I traveled everywhere with maps, no one of which was ever entirely accurate. They were the projection of a wish that the space could be this well organized" (Lopez, 1986, p.279). With reference to cartography, a projection refers to the planar representation of spherical data through the application of mathematics and geometry. Including the globe, there are 18 different projections that are classified as spherical (globe), cylindrical (Mercator, for example), pseudo-cylindrical (Robinson), azimuthal (Orthographic) or conic (Lambert, Equidistant)(ESRI, 2012; USGS, 2006). Distortions of a combination of distance, direction, shape and size are inherent in each projection type (Figure 4a, 4b). The Mercator and Orthographic projections are the most commonly used projections representing the North.

part four.two

Representation: Mapping Projections

The cylindrical Mercator projection is one of the most familiar projections used. It is also one of the most misleading. In the Mercator projection, distance is accurate only along the great circle, which is most often aligned with the equator. Distortion of area, distance and shape increases as one moves towards the poles (USGS, 2006). These are the most significant limitations of the Mercator projection as representative of not only the Canadian North, but any northern nation.

The Robinson projection attempts to balance the size and shape of high-latitude lands but falls short. Though slightly better than the Mercator projection with respect to distance, the Robinson projection still misrepresents scale and distorts northern landmasses (USGS, 2006).

The azimuthal Orthographic projection depicts the Earth as it would appear on a photograph taken from space (USGS, 2006). Directions are accurate only when taken from the centre point of the projection, and scale then decreases along all points radiating from the centre point. The Orthographic projection represents perspective and is not an equal area representation. Areas and shapes are increasingly distorted moving away from the centre point (USGS, 2006).

Another azimuthal projection, the Lambert Azimuthal Equal Area is the projection commonly used for circumpolar representations, including maps produced by the Arctic Council and various government agencies (USGS, 2006). Circumpolar maps use the centre of the North Pole as the zero-point or centre point. The Lambert Azimuthal Equal Area projection is not perspective based, nor is it equidistant.

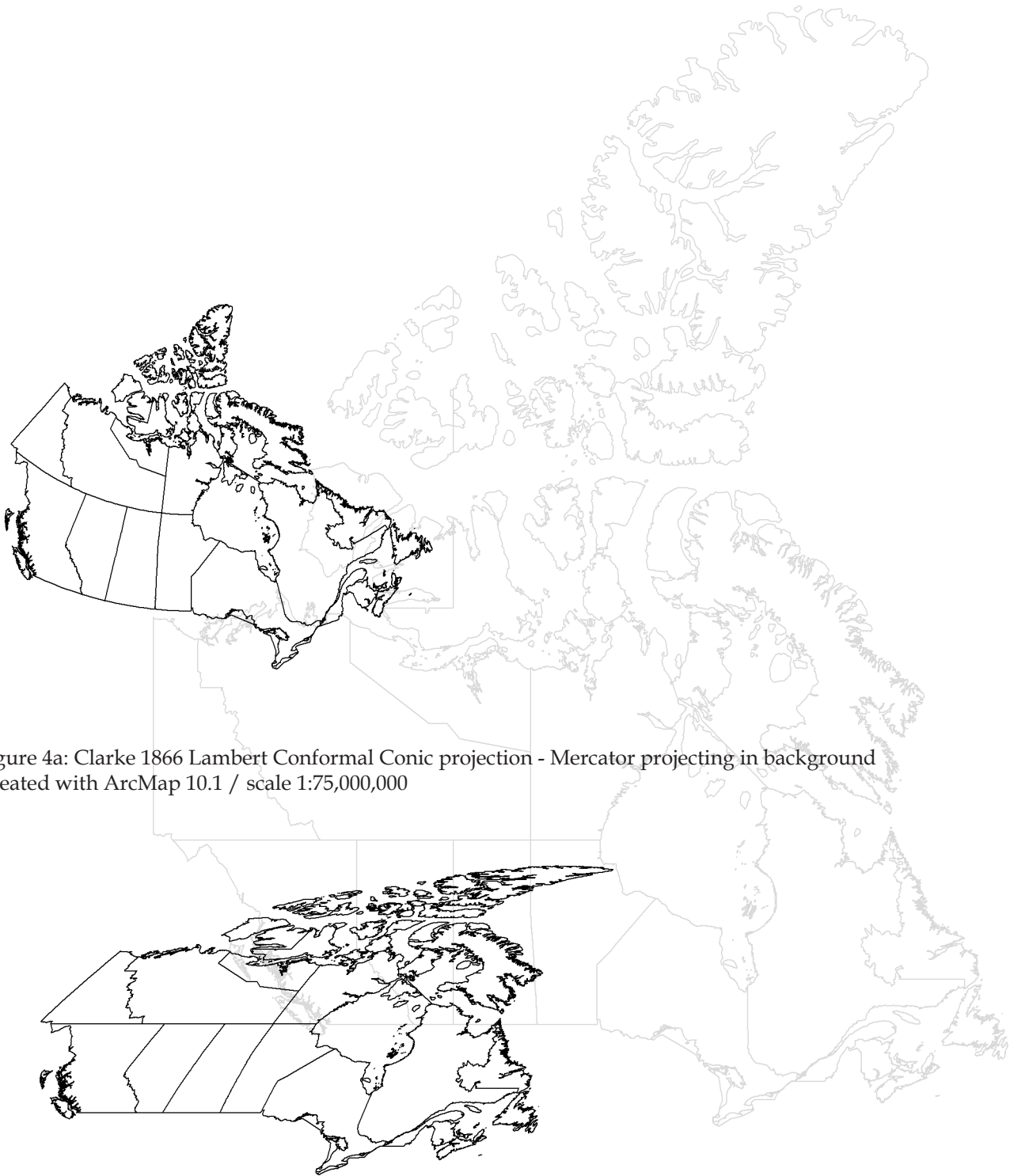


Figure 4a: Clarke 1866 Lambert Conformal Conic projection - Mercator projecting in background
Created with ArcMap 10.1 / scale 1:75,000,000

Figure 4b: Robson Sphere projection, Mercator projection in background
Created with ArcMap 10.1 / scale 1:75,000,000

The area of landmass is represented in true proportion to the same areas on the Earth, with similar Orthographic distortions of scale and shape, increasing away from the centre point. For more information on the history and types of map projections, see *Flattening the Earth: Two Thousand Years of Map Projections* by John Snyder (1997).

The limitations of the popular Mercator projection may be partly to blame for Canada's lack of attention to its northernmost North. "We have come to think of the Arctic as vast because in the familiar Mercator projection it stretches from one side of the world to the other. The suggestion that the region never comes together, however, that its various sections are 'a world apart' is false" (Lopez, 1986, p. 284). In *Arctic Imperative – Is Canada Losing the North?*, John Honderich asserts that "We are victims of a 'Mercator mind-set'...a fundamentally 'British view' of the Arctic" (1987, p. 9). While both authors stated their claims more than twenty years ago, it can be argued that the majority of Canadians continue to hold on to this representation, enforced through our education systems which tend to rely on textbooks that use the Mercator projection. Without looking at a map, Canadians possess a mental or eidetic map, of the vast and homogeneous North.

The Mercator projection has led people to believe that the Canadian North is remote and less significant than it is in reality. The inflated size of the North represented in Mercator projections is inaccurate. Additionally, by Mercator standards, the Canadian North is relatively insignificant in terms of overall national presence. "When we picture Canada on a standard flat world map based on Mercator's projection, the true North...is always at the upper left-hand side, tapering off to end abruptly at the top edge. Parts of the Arctic archipelago, particularly Ellesmere Island, are often cut off" (Honderich, 1987, p.9). The use of the circumpolar map helps to rectify this distorted view and reinforces the significance of the Canadian North, of Canada as a nation, and as a major player in the intergovernmental Arctic Council.

part four.two

Representation: Media

Historically, the British, and subsequent Canadian government has been the main source of a variety of portrayals of the North. Northern rhetoric often supported views of northern Canada as a “new world to conquer ... a great vault, holding in its recesses treasures to maintain and increase material living standards” (Coates, 1985, p. 199; Wynn, 2007). While in some ways correct – northern Canada does hold economically lucrative diamond, rare earth mineral and metal deposits, this view lacks the sensitivity deserved to both the landscape and the people who inhabit it. Most northern-themed media has taken the same southern perspective: the North serving the needs of the South (Grace, 2002).

In an ongoing, multidisciplinary study of the genres and forms in which the concept of North, or the ‘idea of North’, appears, Daniel Chartier has identified over 600 literary works and films (2007). According to Chartier: “Figures of the Inuit, settler, Scandinavian, Viking, Amerindian, artist, gold digger, trader, missionary and explorer, in particular, have been used to ‘northify’ works” (2007, p. 45). Chartier goes on to list several additional elements that are frequently employed in the media to convey a sense of ‘northernness’ such as “icebergs, polar bears, the northern lights, the absence of reference points, desolation, the predominance of the colours blue and white, the snow, and the absence of trees” (2007, p.45). While this may not be groundbreaking information, it is interesting and not entirely out of place as an accurate representation of any one aspect of northernness. It is important to recognize that these ‘northern’ elements are often used singularly to represent an entire northern setting. In this sense, the act of ‘northify-ing’ using one or more of the abovementioned elements represents a stereotypical and incomplete depiction of the North.

Representation of the North has largely been a southern-biased endeavor. *Northern Visions: New Perspectives on the North in Canadian History* (Abel and Coates, 2001) is a comprehensive investigation of the histories and realities of the North, with specific respect to, and for the First Nations, Métis and Inuit of the North. Kelm posited that “through television, Hollywood movies, and the news media, Canadians may well feel that they know northern First Nations better than they ever have, and yet what we learn from these sources seldom moves above the level of stereotype” (Kelm, in Abel and Coates, 2001, p.77). Our sense of nationalism is largely defined by our indescribable ‘northernness’, and this has historically been perpetuated for decades, through many forms of media.

There is an increasing number of successful Inuit, Métis and First Nations media emerging from the Canadian North that is beginning to reverse the longstanding negative historic stereotypes. The North is now being represented, created and produced by the people of the North (Grace, 2002). Some examples include Nunavut-born Zacharias Kunuk’s award winning *Atanarjuat the Fast Runner* (2001), *Qaggiq* (Gathering Place, 1989), *Nunaqpa* (Going Inland, 1991), *Saputi* (Fish Traps, 1993), and documentaries *Nipi* (Voice, 1999), *Nanugiurutiga* (My First Polar Bear, 2001) and *Kunuk Family Reunion* (2004); as well as Isuma’s 13-part TV series *Nunavut* (Our Land, 1995) (Isuma Distribution, 2006). Kunuk has received the National Arts Award, National Aboriginal Achievement Award and was awarded the Order of Canada in 2005. Unfortunately, after 20 years, Kunuk’s production company, Isuma Productions was placed in receivership in 2011 (CBC, 2011).

part four.three

People

The population geography of Canada's North provides an insight into the area's cultural and economic duality. As the homeland of a number of Aboriginal peoples, the North provides a cultural refuge allowing Indian, Inuit, and Métis to maintain a geographic connection with their traditional lifestyle and, in some cases, to establish different forms of self-government. On the other hand, the North represents a last wilderness for some southern Canadians and is often understood as a resource frontier. What is unfolding is a struggle to find a compromise between the two visions of the North.

Robert Bone, 2008, p.119

The government influence over the public perception of the North is strong. Much of the historically negative treatment of native northerners, including Inuit, Métis and First Nations by the Canadian Government has been censored (Abel and Coates, 2001). From displacing Inuit to remote Arctic locations to satisfy Ottawa's need to assert sovereignty over the North to the multitude of negative effects of colonization of the North, the Canadian Government has played a large role in oppressing, controlling and generally ignoring the true inhabitants of the North. The main government presence across the North has historically taken shape through RCMP outposts, Hudson's Bay Company trading posts and general expeditions and surveys (Bone, 2008; Abel and Coates, 2001).

The National Film Board of Canada (NFB) produced a film in 1952 titled *Land of the Long Day*. This film represents the southern belief that the people of the North were not only resilient but also completely open to adapting to the southern way of life (Flaherty, 1922; Wynn, 2007, p. 318). Narrated by John Drainie, *Land of the Long Day* claims to tell the

story of the Tununermiut people of North Baffin Island. The main 'character' Idlouk "would have told it in his native Eskimo [sic]" (Flaherty, 1922). It is not clear if the narration has been written by a non-Inuit, or translated directly, or a combination of both.

Not everyone was quick to accept the manipulated portrayal of the northern way of life. "The Eskimos [sic] generally have drifted into a state of lack of initiative and confusion. The once healthful and resourceful Eskimo has been exploited to such a degree that he now lives a life comparable to that of a dog" (quoted in Wynn, 2007, p. 318). Taking these comments made by RCMP Inspector Henry Larsen into consideration, *Land of the Long Day* can be considered to be a less than honest, fictional production.

Two examples of literature published in direct opposition to the image of the easily adaptable Inuit include Farley Mowat's *People of the Deer* (1952) and Richard Harrington's *The Face of the Arctic* (1952) (Wynn, 2007). In *People of the Deer*, Mowat questions the Canadian Government's ability to address the problems created by the Hudson's Bay Company, the RCMP, and various churches, and recognizes their respective roles in reducing the northern peoples to starvation and externally induced self-destruction (Wynn, 2007).

Between the years of 1953 and 1958, Inuit families were displaced and relocated to northern Arctic locations, often facing starvation and death (Wynn, 2007; Kelm, 2001 in Abel and Coates, 2001, p.80). During this time, the government sold the relocation idea through the strategic selection of scholarly and popular publications. "Inuit history was rewritten to include a High Arctic homeland based on the archaeological discoveries of Thule remains on Ellesmere Island. Current Inuit social conditions were defined as pathological and in need of extreme remedial measures ... the Inuit's connection to their land was ignored by government officials who preferred to depict the Inuit as nomads. Finally, the High Arctic relocations were packaged and presented to the public as necessary and successful" (Kelm, 2001 in Abel and Coates, 2001, p.80). Colonization, such as in the case of the

community of Deline, Northwest Territories, has negatively impacted the way of life of the northern Aboriginal by displacement, introducing economy-based systems, illness and death (CDUT, 2005). All the while, southern Canadians have been under false impressions of the northern Aboriginal through inaccurate representation in the media.

The portrayal of the 'happy-go-lucky-Eskimo [sic]', "the kind, simple and brave Nanook [sic]" (Flaherty, 1922), depicted in Robert Flaherty's *Nanook of the North* is another example of the misrepresentation of the northern way of life for the Inuit. The introductory remarks, footage selection, even the choice of music in the film production of *Nanook of the North*, presents the 'Eskimo' as a caricature, a fascinating folly of the distant North, more exploitative fiction than anything. As mentioned earlier, northern northerners have recently begun to significantly contribute to, and counter stereotypical representations of the North and the people who live there (Grace, 2002). Nunavut-born Zacharias Kunuk, for example, is president and co-founder of Canada's first Inuit-owned, independent production company, founded in 1991 (Igloodik Isuma Productions, 2006). Kunuk's work includes his first film feature, *Atanarjuat the Fast Runner* (2001), winner of the Camera d'Or at Cannes in 2001.

In 1995, the Canadian Government officially recognized the rights of Aboriginal groups to self government (AANDC, 2010). Ongoing land and resource negotiations and self-government negotiations reflect the constitutional rights of Aboriginal groups and typically involve the federal government, territorial government and one or more Aboriginal groups (AANDC, 2010). Negotiations can include a variety of considerations such as resource revenue, legal status and powers of Aboriginal government, economic development, and land ownership. Currently, the Northwest Territories is divided into six settlement regions: Deh Cho Region, Gwich'in Settlement Area, Inuvialuit Settlement Region, North Slave Region, Sahtu Settlement Area, and South Slave Region. There are four Comprehensive Claim agreements in the NWT, including the Sahtu Dene and Méis Land Claim Agreement (see 'Land Claims' p.198 and Figure 30a-e).

part four.four

The North as Place

As discussed, the North as place has been represented in multiple forms ranging from the dream-like vision of the uninhabitable, desolate, harsh, frozen environment to the magnificent and very real northern portion of an already Northern Canada. In recent decades, likely due to the pressures of looming environmental change and economic development, scientific research expeditions and mineral exploration and mining have taken the place of trade and policing in the North. Despite considerable improvements in communication and consultation with northern Aboriginal peoples and a more realistic and balanced north-south perspective of the North, the Canadian Government continues to perpetuate southern-biased perspectives.

On the *Natural Resources Canada Polar Continental Shelf Program* website, the text reads: "The very elements that make the Arctic so alluring – its remoteness; its stark, cold beauty; and its infinite mysteries – can also make it forbidding and dangerous, a dangerous place to conduct research" (Natural Resources Canada, 2013). While to many the North is an exciting prospect of adventure, we should be trying to break from this mold, challenging the notions of the North as stark, forbidding and dangerous. Although these sentiments may reflect an eidetic impression of the North on a *personal* level, the presentation of Northern rhetoric should be minimized, especially as produced by a scientific body, since it is not proposing a complete representation and understanding of the North but, rather, another example of a romanticized notion of the North.

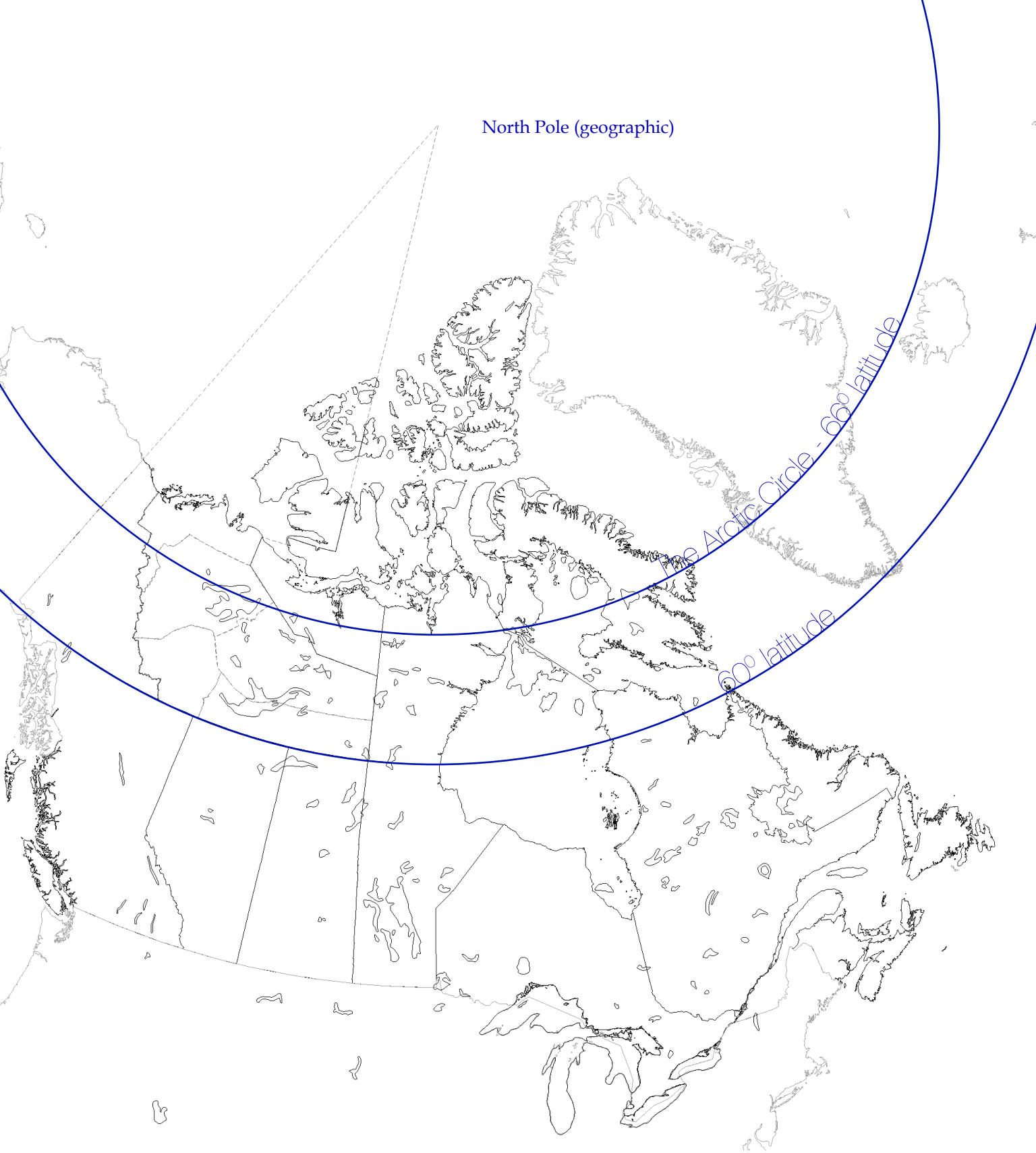


Figure 5: latitude circles of the North

part four.five

Definitions

The North pervades our subconscious through multiple historical and contemporary representations, reflecting various points of perspective. "Representations of 'North' are discovered like layers of discourse, laid down by different cultures, and picked up on and shaped by different aesthetic movements" (Chartier, 2006, p.35). Definitions depend on perspective. It is not surprising that, although many consider the North to be north of 60 degrees latitude, there is no unanimous definition of what constitutes North.

The term 'north' holds many meanings. Cartographically speaking North refers to the direction toward the geographic north pole. On a standard geopolitical map, North is considered to be anything north of 60 degrees latitude (Figure 5).

There are two distinct types of definitions of the North. Those that are static and those that are dynamic. There are a number of predominantly static indices that may be used to define the North such as temperature, permafrost, soil availability, latitude, geopolitical boundaries, temperature, climate zones, plant hardiness zones, growing seasons, average solar radiation values, permafrost boundaries, population, and accessibility (transportation) (Figure 6).

For many others, a dynamic definition or expression of North is most fitting (Figure 8). According to Canadian scholar and researcher of Sherrill Grace: "North is multiple, shifting and elastic; it is a process, not an external fixed goal or condition" (2002, p.16). These views are not limited to the strict definition of North, but also include the overall meaning of the North. Various definitions of the North only strengthen the argument that no distinct northern boundary and definition exists. Canada is entirely North, with varying degrees of nordicity.

part four.five

Definitions: Hamelin's North

Quebec-born geographer Louis-Edmond Hamelin has extensively studied the North, both in Canada and across the globe and has published several texts on the interpretations and significance of 'North'. Hamelin's work relating to the study of 'North' is based on conceptual frameworks and general assumptions that can be summarized by North being a circumpolar entity with variable boundaries, requiring a new and specific vocabulary (Chartier, 2006). Additionally, Hamelin's North is a sum total of its physical, social and cultural parts (Chartier, 2006). Although written over thirty years ago, pre-dating the establishment of Canada's third territory of Nunavut, Hamelin's work remains relevant to the ongoing study of the North.

According to Hamelin, the North has evolved influenced by environmental climate change, over time. The evolution of 'North' centers upon two main ideas: the gradual 'denorthification' of the North since the 17th century, and the 'receding of the north' through the discovery of territories and development (Chartier, 2006, p.35).

In *Canadian Nordicity - It's Your North, Too* (1978), Hamelin proposes a new language, a complete set of terms, to define and epitomize the North. Hamelin states "definitions of the North are primarily functions of criteria chosen to embrace the situation" (Faucher, 1973, p.3, quoted in Hamelin, 1978, p.15). Recognizing that the boundaries and 'principle elements' of the North are not universal across all regions and within the Canadian population, Hamelin proposes a method of addressing the inherent variability within the northern region as a whole.

Nordicité, or nordicity in English, is the term most central to Hamelin's study of the North. According to him, the definition of the term is as follows:

The name applied to the polarity of the northern hemisphere. The northern quality as applied to a place, a characteristic, or even a population. There are varying degrees of nordicity, starting from a zero point, complete anordicity. A false nordicity, or a deficiency in nordicity might be recorded; nordicity can also be adjusted. As a function of the area under consideration, nordicity may be climatic, biogeographical, geographical (all-embracing), or psychological. In its approach, mental nordicity may be instinctive, empirical, deductive, imitative, or rational; it may also be theoretical, normative, or applied. Geographical nordicity can be calculated and expressed in VAPO. Apart from present or static nordicity, one can think in terms of former or future nordicities.

Louis Hamelin, 1978, p. 333

In studying over twenty possible criteria to delineate high-latitude regions, Hamelin ultimately selected ten criteria, or 'converging factors', to assess degrees of nordicity: latitude, summer heat above 5.6°C, annual cold below 0°C, types of ice, total precipitation, development of the vegetation cover, accessibility, number of inhabitants or regional population density, and the degree of economic activity (Hamelin, 1978, p.18).

VAPO, or valeurs polaires (polar values) are the units used to express geographical nordicity. Polar values are numerically calculated, to a maximum value of 100, for each of the ten selected criteria and then totaled to determine overall nordicity. For example, the North Pole scores a maximum value of 100 in all ten criteria, registering a total VAPO of 1000 (Hamelin, 1978, p.19 and 334).

The benefit of Hamelin's VAPO strategy for classifying rates and ranges of nordicity is in the flexibility of the classification. Regions of similar VAPO values are identified and connected - creating VAPO isolines, which are then mapped. The variability of specific northern zones is dependent upon the selected scale of the map.

According to Hamelin: "The polar index ... used to establish the southern limits of the North (200 VAPO isoline) allows every site within the North to be quantified, and general gradients of areal nordicity to be established. It also allows other isoline thresholds and limits of zonal regions to be specified" (Hamelin, 1978, p.70). The application of the VAPO-nordicity assessment gives rise to the creation of new, flexible representations of the North.

Hamelin has dedicated his life to Northern research. He has a prolific body of work that should not go un-noticed. Hamelin's VAPO index and programme for identifying gradients of nordicity is useful in challenging the accepted fixed, static definition of the North.

Perhaps more important is Hamelin's concluding points from this publication (1978). "An honest awareness of the North would encourage the introduction of profound constitutional changes in each of the ten political units that comprise the North, and especially within the federal government ... And then, perhaps, the North will seem more like a country worth knowing and liking, rather than one to be cold-shouldered, or, at best, exploited" (p. 283). Over thirty years ago, Hamelin recognized the danger of treating the North as a homogeneous entity over which the Canadian Government and public at large, stationed in the south, exerted control. He also recognized the great potential, not only economic and political but social, cultural and geographical, locked in the North. The key to unlocking these northern potentials is not only recognition from the south but an equilibrium of perception between the permanent and temporary populations of the North (Hamelin, 1978).

part four.five

Definitions: Statistics Canada

According to the 2000 report by the Geography Division of Statistics Canada, the boundary between northern and southern Canada does not follow the 60th parallel. The rationale for the report, according to Statistics Canada, stems from recognizing “a common delineation of the north for statistical analysis purposes evolved from research to devise a classification to further differentiate the vast non-metropolitan areas that cover 96% of Canada’s land area” (McNiven and Puderer, 2000, p.1). Statistical analysis was performed according to an average of 16 selected indices: boreal forest, heating degree-days, growing degree-days, discontinuous permafrost, agroclimatic resource index, Thornthwaite summer concentration of thermal efficiency, population ecumene (inhabited land), agriculture ecumene, all season road and railway transportation networks, accessibility index, living cost differential, resourced areas and Native North, OECD (Organization for Economic Co-operation and Development) rural north, and Revenue Canada Northern and Intermediate tax zones. The 16 indicators were evaluated based on comparisons to work by Hamelin, amongst others (McNiven and Puderer, 2000)(Figure 7).

The average point of intersection of all 16 indices, represented as lines, and the meridians of longitude resulted in the North-South Line. Smoothing the data refined the boundary line to its final state. For more information on the specific methodology used and additional information, please refer to *Delineation of Canada’s North: An Examination in the North-South Relationship in Canada* by McNiven and Puderer (2000). The report reveals three specific boundaries: the South Transition Line, North-South Line, and North Transition Line. Transition Zones were calculated based on one standard deviation from the mean. It is interesting to note that the North Transition Line follows a similar path to the boundary line between plant hardiness zones 1 and 2.

part four.five

Definitions: Dynamic North

For me the North Pole is a bore. I am fascinated by the fact that Magnetic North cannot be located with absolute precision except of its movement, and I am intrigued by its power ... As an image of constant movement and energy, Magnetic North represents perfectly what I understand as the discursive formation of North. To accept the Magnetic North is to accept North as multiple and always changing and to respect the diversity and heterogeneity of our home and native land.

Sherrill Grace, 2002, p.263

Many disciplines propose their own definitions of northern Canada. According to McNiven and Puderer, "A wealth of geographic information is available that potentially delineates regions of the country according to various climatic, biotic and socio-economic aspects" (2000, p.2). Plant hardiness, soil availability, temperature normals and permafrost boundaries are some of the common indicators of more static, north-south boundaries. Although a growing number of research projects, such as the 2000 Statistics Canada study, indicate a move toward decreased reliance on the 'north of 60' definition of the boundary of the North, the likelihood of abandoning the political boundary across the 60th parallel is low.

Building upon Hamelin's concept of a dynamic definition, Sherrill Grace proposes defining the North according to the magnetic north pole as opposed to the fixed yet arbitrary geographic North Pole. A holistic, synthesized approach to delineating the North-South boundary seems logical and most appropriate but may not be the easiest or most efficient method for certain disciplines that prefer to function within a simplified boundary.



Figure 6: compilation of various static indices (permafrost, growing season, plant hardiness zone, wind speed, glacial extent, cryosolic soil range to name a few)



Figure 7: proposed North-South Boundary with transition boundaries

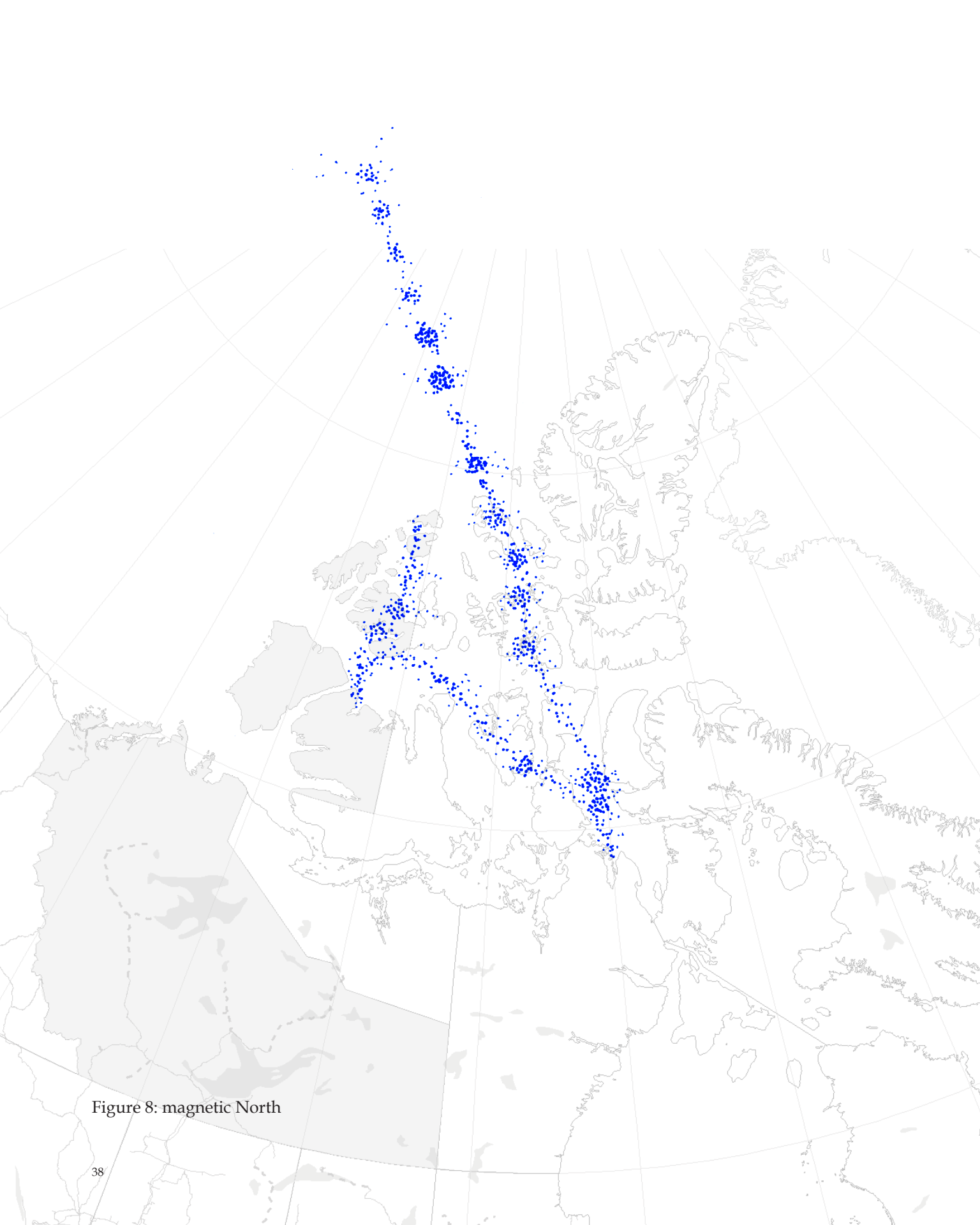
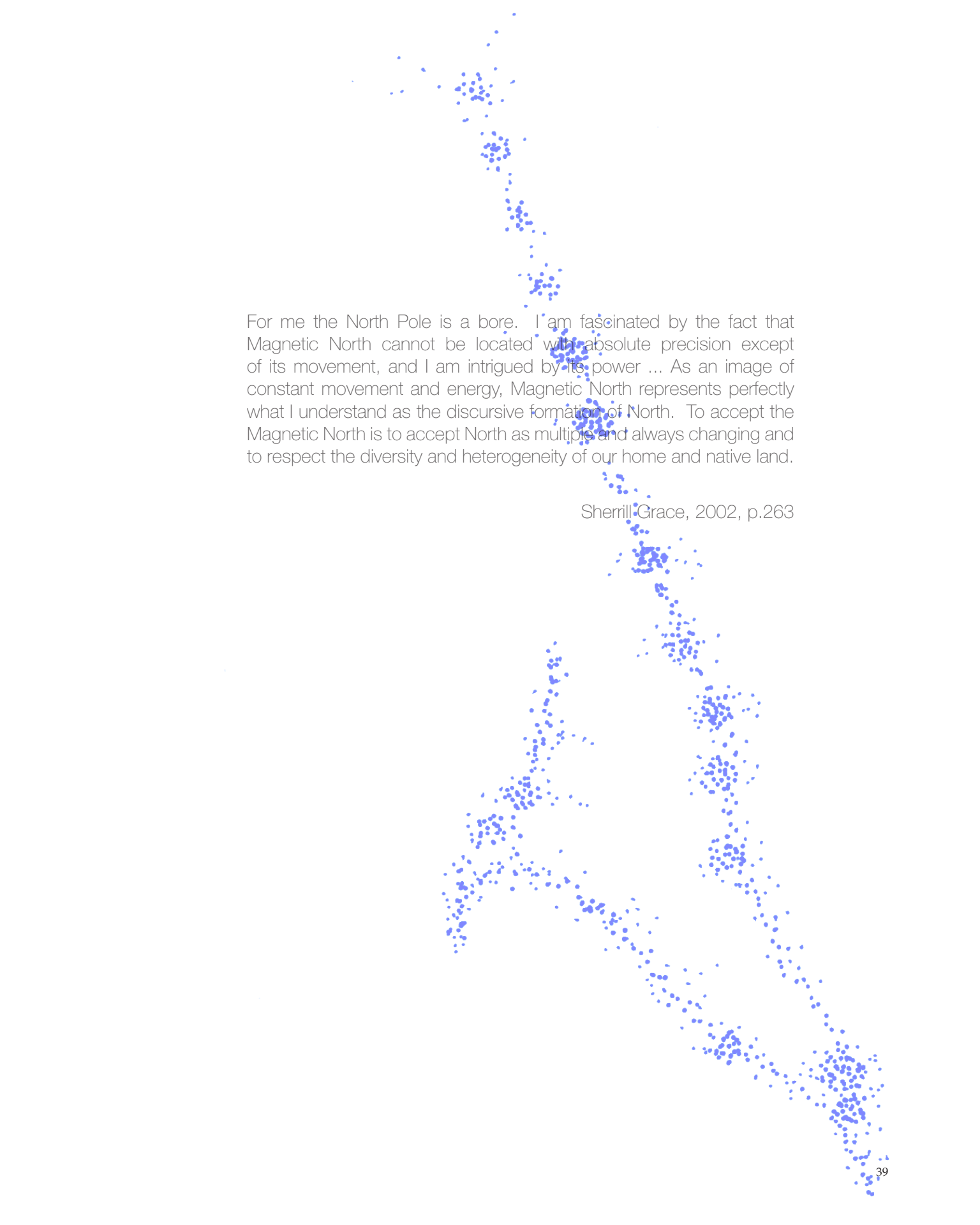


Figure 8: magnetic North



For me the North Pole is a bore. I am fascinated by the fact that Magnetic North cannot be located with absolute precision except of its movement, and I am intrigued by its power ... As an image of constant movement and energy, Magnetic North represents perfectly what I understand as the discursive formation of North. To accept the Magnetic North is to accept North as multiple and always changing and to respect the diversity and heterogeneity of our home and native land.

Sherrill Grace, 2002, p.263

part four.six

The Canadian North: an introduction to the Territories

There are currently three official northern territories in Canada: Northwest Territories, Yukon Territory and Nunavut. According to Statistics Canada, the total population of the three territories sits at 113,100: just 0.32% of the total population of Canada (34,880,500) (Statistics Canada, 2012). The disparity between the largest collective land mass and smallest total population for the entire northern region of Canada feeds the popular conception of northern Canada as vastly isolated, unpopulated and otherwise barren land.

The British Government established the Northwest Territories in 1880. Boundary amendments to the Northwest Territories included shifting of the southern boundary to latitude 60° N, caused by land redistribution to the new provinces of Manitoba, Saskatchewan, Alberta and the Yukon Territory, finally ending in 1999 with the establishment of Nunavut. The Northwest Territories presently occupies 1,346,106 km² of Canada's northern land with a population of 41,462. The capital of the Northwest Territories is Yellowknife and has a population of 19,155 (Government of the Northwest Territories, 2012)(Figure 10).

The Yukon Territory was created through relocation of land from the Northwest Territories and was declared an official territory in 1898 under the Yukon Territory Act. Dawson City was named the capital city and was considered the largest city west of Winnipeg, Manitoba at that time. Whitehorse was named the new capital city in 1953 and has a current population of 25,403. The Yukon Territory occupies 661,848 km² of Canada's northwest with a population of 33,897 (Government of Yukon, 2011). The newest addition to the Canadian territories is Nunavut. Occupying 1,932,254 km² of Canada's northeast, Nunavut has a population of 34,028. The capital city of Nunavut is Iqaluit, with a population

of 7250 (Government of Nunavut, 2012).

Aside from the capital of Yellowknife, the Northwest Territories has one village, two settlements, four towns, 11 hamlets, four charter communities and 10 designated authorities (Government of Northwest Territories, 2011). The Yukon Territories has one city, seven towns and five local advisory areas not including Whitehorse (Government of Yukon, 2011). The Government of Nunavut has not listed established communities by classification. Based on 2009 government data Nunavut has 11 communities with a population greater than 1000, seven communities between 500 and 1000 population, and six communities with populations below 500 (Government of Nunavut, 2012).

There are three major cities in Canada's north: Iqaluit, Yellowknife and Whitehorse (Figure 9). The Canadian Government identifies the 'priority economic sectors' of all three cities and territories to be: diamonds; energy; mining and exploration; mining, oil and gas; fur, agriculture and fisheries; innovation and technology; and, tourism. For the purposes of comparison, the Canadian Government identifies the 'priority economic sectors' of Manitoba to be: aerospace; agribusiness; biotechnology and life sciences; energy; financial services; information and communications technology; mining, minerals and petroleum; transportation equipment manufacturing; and, wood processing. It is noted that more than 50% of Canada's northern industry is directly related to natural resources, compared to approximately 20% of Manitoba's industry (Government of Canada, 2013; Government of Manitoba, 2013).

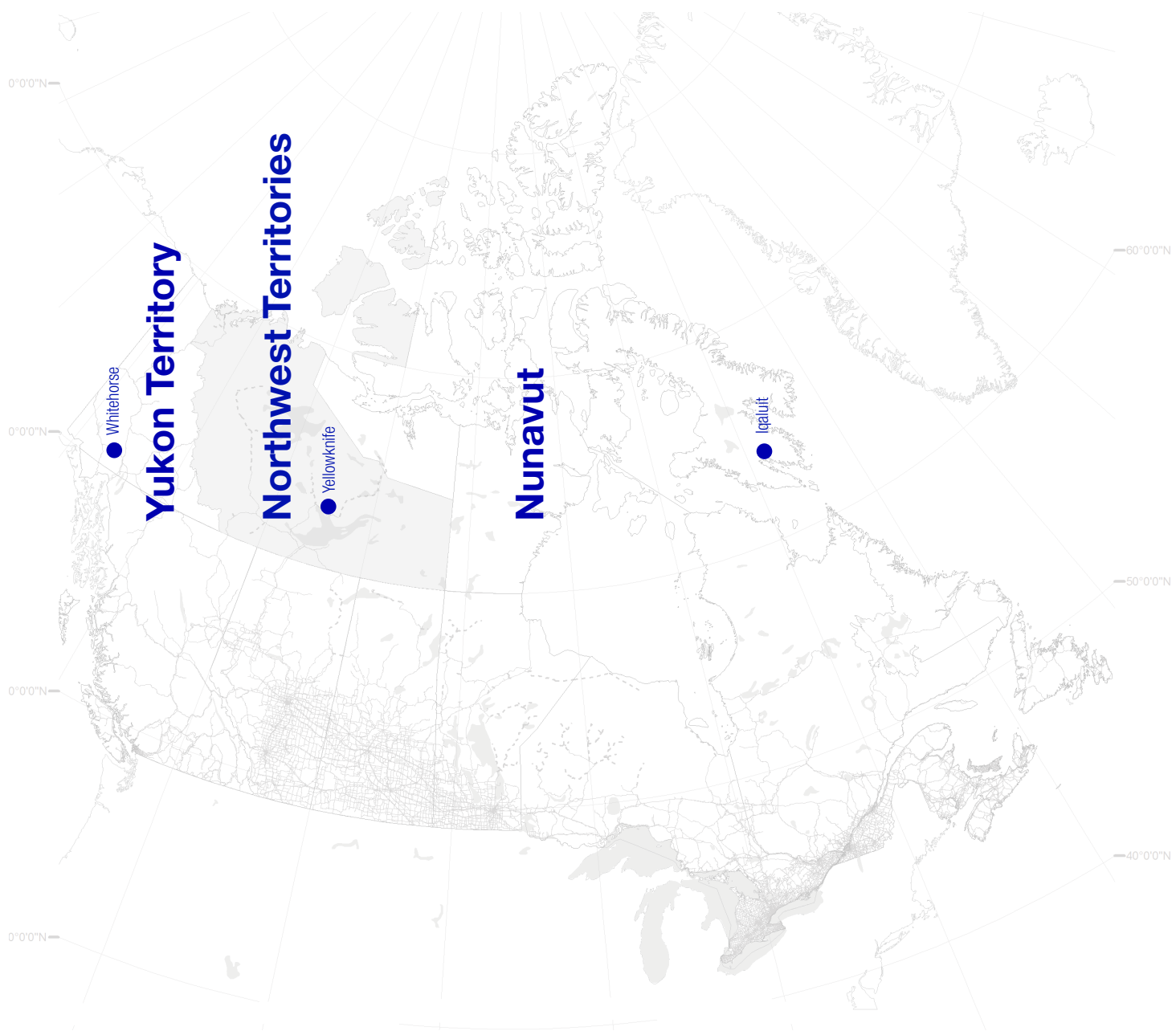


Figure 9: Canada's northern territories



Figure 10: The Northwest Territories



Figure 11: looking out across Cameron Bay (Great Bear Lake) in spring 2007



Figure 12: postglacial topographic features - seen from a helicopter, flying over the tundra near Diavik Diamond Mine, NWT (2006)



Figure 13: caribou migration across frozen Great Bear Lake at Cameron Bay (2007)



Figure 14: aerial view from helicopter: caribou migration across frozen lake near Diavik Diamond Mine, NWT (2006)



Figure 15: final stages of breakup of ice on Great Bear Lake (2007)



Figure 16: fog across horizon and snow-covered tundra of NWT (2006)



Figure 17: fishing on Great Bear Lake (2007)



Figure 18: mineral exploration at Port Radium (2007)



Figure 19: vegetation indicative of the Taiga Shield High Subarctic Ecoregion - note the morphology of the spruce trees (2007)



Figure 20: Radium Hills High Subarctic Ecoregion (2007)



Figure 21: daybreak on tundra (2006)



Figure 22: waste-rock pile at Diavik Diamond Mine, NWT - the human made relief creates a unique microclimate on the otherwise flat tundra (2006)



Figure 23: facing southwest looking across Great Bear Lake (2007)



Figure 24: aerial view from helicopter: open pit at Diavik Diamond Mine, NWT (2006)

part five

Landscape Architecture in the North

Is there a place for landscape architecture in the North? “There are only a few landscape architects working and living in the North and the majority of their work to date focuses on town planning, national and territorial parks planning, and land claim settlements” (Bradshaw, 2009, p. 135). In 2011 the *Arctic Food Network* project proposed by the Lateral Office design firm was the recipient of the Holcim Gold Award (2011) and the Arctic Inspiration Prize (2012) and will be featured in the upcoming international Venice Architecture Biennale (2014). With construction beginning in 2012, this project represents an emerging body of conceptual work being done by various design firms in the Canadian North. However, to date there are very few realized, or constructed examples of specific *landscape architecture* projects in the North, beyond the conceptual phase.

The historical and cultural legacies of northern landscapes present challenging opportunities for the profession of landscape architecture. Decommissioned, abandoned or long-term mining and exploration operations often leave a legacy of environmental contamination and distrust among northern Aboriginals. The practice of landscape architecture in a northern context may be able to provide and strengthen sensitive cultural, historical and ecological relationships with one of the most valuable aspect of the North – the land.

There is great potential for landscape architecture to provide meaningful designs in the cross-cultural northern landscape. Tensions between northern Aboriginal communities and globally driven economic development provide opportunities for design-based solutions.

part five.one

Precedents

One of the few examples of landscape architecture in the North can be found at the Northwest Territories Legislative Assembly building in Yellowknife, Northwest Territories (Figure 25a-c). The Legislative Grounds were designed by Cornelia Hahn Oberlander and completed in 1994. The site was “carefully chosen to reflect the beauty of the flat, scrub landscape” and the design was based on the least intervention approach (Oberlander, 2012). The key issues associated with the project included accessibility, sensitive wetland conditions and lack of available topsoil. The project was the first true landscape design project in the North and reflects the ability of landscape architects to address and design the challenging northern landscape through minimal intervention.

Although Yellowknife is one of the most populated cities in the Canadian North, Oberlander’s design is a significant precedent of landscape architecture that illustrates an approach that could be applicable to much of Northern Canada.

More recently, Oberlander collaborated on the design of a community school in the town of Inuvik, situated above the Arctic Circle. Completed in 2012, the Inuvik School design further illustrates the potential of Oberlander’s approach to landscape architecture in the North. The innate connection between landscape architecture and the dynamic landscape situates the profession in an exciting and important position in the North. Although applicable to southern design conventions, Oberlander’s principles and approach to landscape architecture in the North provide design solutions unique to this northern landscape, balancing the limiting factors of industry and institution, the human and the environment with sensitive design nuances.



Cornelia Hahn Oberlander O.C. FASLA, FCSLA, BCIA

Figure 25a: NWT Legislative Assembly Building and grounds (completed in 1994)



Cornelia Hahn Oberlander O.C. FASLA, FCSLA, BCLA

Figure 25b: wetland conditions and selected vegetation



Cornelia Hahn Oberlander O.C. FASLA, FCSLA, BCLA

Figure 25c: incorporating the building into the flat, scrub landscape

part five.two

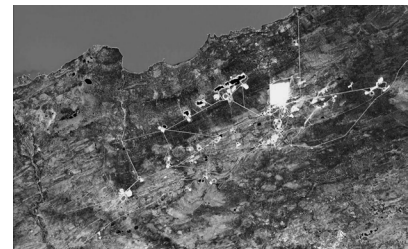
Opportunities

Decommissioned, abandoned or orphaned mines across the Northwest Territories – and the North at large – present opportunities for landscape architecture interventions. It has been estimated that over 10,000 abandoned mines exist across the country (MackKasey, 2000). Currently, over 85 mines both historical and operational, are scattered across the NWT (NWT Chamber of Mines, 2012). Several decommissioned and soon-to-be decommissioned mines in the NWT are identified as opportunities for landscape architectural interventions. Opportunities exist at Pine Point Mine, Giant Mine, Diavik, and Port Radium.

landscape architecture considerations
(Rio Tinto, 2013; AANDC, 2010)

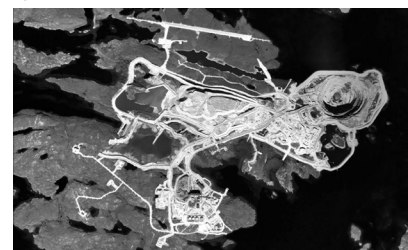
taiga shield ecoregion
continuous permafrost
below treeline
shoreline of Great Slave Lake
proximity to Yellowknife
limited vegetation species
prepare for renewed activity

Pine Point Mine, NWT
60°49'33.07" N 114°32'29.32" W
corporation: cominco ltd. (historic)
tamerlane ventures inc. (current)
commodity: lead + zinc
mine footprint: approx. 50 km²
opened: 1964
closure: 1987* assessed for re-opening
mine type: underground + surface (proposed)



taiga shield ecoregion
continuous permafrost
100 km above treeline
unique tundra setting
+8000 lakes in region
short growing season
little topsoil development
species migration
aboriginal consultation

Diavik Diamond Mine, NWT
64°30'41.00" N 110°17'23.00" W
corporation: rio tinto
commodity: diamonds
mine footprint: approx. 9 km²
opened: 2000
closure: 2020
mine type: open pit + underground
reclamation status: progressive



taiga shield high boreal
jack pine + mixed spruce
ground freezing (As₂O₃)
pit walls + tailings
future mining museum
proximity to Yellowknife
Ingraham Trail
+10 years remediation
+unknown freezing system

Giant Mine, NWT
62°30'18.61" N 114°20'19.67" W
corporation: royal oak mines (receivership); miramar
commodity: gold
mine footprint: approx. 10 km²
opened: 1948
closure: 2004
mine type: open pit + underground
reclamation status: under review



Figure 26: opportunities for landscape architecture to address mining operations across the North

part five.three

Framework Approach

Several questions have framed my research, challenging and informing my design process throughout the course of this practicum. The following questions are but a few them:

- Is there a place for landscape architecture in the North?
- What are the parameters within which landscape architecture must perform in the North?
- What are the limiting factors?
- What makes the North unique from a design perspective?
- Why has there been a lack of landscape design influence in the North?

There are a number of challenges facing design and development in the North (Figure 29). While these may be considered to be negative limitations for development from a southern-based perspective, these elements are not inconveniences for design. They are real and characteristic of the unique northern environment, as experienced by its residents. The following represents a preliminary evaluation of the challenges facing landscape architecture in the North:

- Permafrost
- Limited growing season
- Land claim settlements
- Mineral exploration and mining
- Daylight hours
- Accessibility
- Decreased soil availability
- Reduced species (vegetation; plant hardiness zones 0-1)
- Expense + availability of material (including lumber)
- Species migration
- Sensitivity
- Slow ecological response time
- Site disturbance

These may be considered to be limiting factors or constraints or, in another sense, merely a new set of parameters within which landscape architecture must function. It is often through constraints that new and creative ideas emerge.

Northern Canadian settlements have traditionally expanded under the pressure of previous diamond and gold rushes, and along with the emerging oil and gas rushes, the federal government anticipates the creation of deep-sea ports and military bases. However, with this urgency to expand, there is little vision of development beyond economic expediency and efficiency.

Lateral Office, 2010

At the small scale, in his 2009 study and proposal for a healing centre in Pangnirtung, Nunavut, Cameron Bradshaw outlined the results of community consultation that revealed: “works . . . at the detailed level are very limited and generally viewed as unsuccessful by local residents [who] suggested they were [sic] sufficient proof that more landscape architectural work was needed” (p. 136). Existing examples of mine sites, remote Aboriginal communities and developed centers like Yellowknife, make this point quite clear. We can and should do better. Improved integration of the three categories of consideration (industry and institution, individual and environment) is necessary for the future of landscape architecture in the North. If we strive for better design in the southern regions of Canada, why can we not do the same in the North?

The three areas for consideration mentioned above are industry and institution (Figure 30a-e), human environment (Figure 31 a-e), and physical environment (Figure 32 a-e). This framework proposes a connection between these three areas of knowledge of the North. The main themes that have been identified, as they pertain to landscape architecture in the North, relate to: location, accessibility, environmental limiting factors, mining and mineral exploration, and the Northern Aboriginal people.

institution + industry

politics
responsibility
perspective
perception
definition
mining + exploration
motivation
research
profitability
economy
government

drained landscape
oil + gas
receptorship
ownership
market values
funding
remediation
'ephemeral' mining
money
control
'spin'
academia
climate change
wages
self-serving
autonomous

human

politics
accessibility
circumstance
perception
learning
awareness
Northern Aboriginal Peoples
history
experience
connections to the land
dreams
community
perspective
culture

media
conflict
self governance
inside/outside
representation
landscape voices
mapping
evolution
vulnerability
elders
tek / tk
understanding
oral tradition
fear
isolation
time
substance abuse
depression
cultural landscape
tourism

environment

permafrost
climate
sensitivity
precautionary principle
variability
balance
remediation
change
natural + human exchange
limiting factors
natural resources

days with sunlight
non-renewable resources
amplification
days of darkness
pioneer species
disturbance
temperature
boundaries
albedo
climate change
accumulation
geomorphology
contamination
aruroa borealis
flora + fauna
taiga
tundra
ecoregions
treeline
snow morphology
hunting + trapping
growing season

Figure 27: identifying challenges facing landscape architecture in the North

institution + industry

accessibility
Northern Aboriginal Peoples

human

connections to the land
culture
politics

environment

mining + exploration
economy
government
climate / change
limiting factors (environmental)

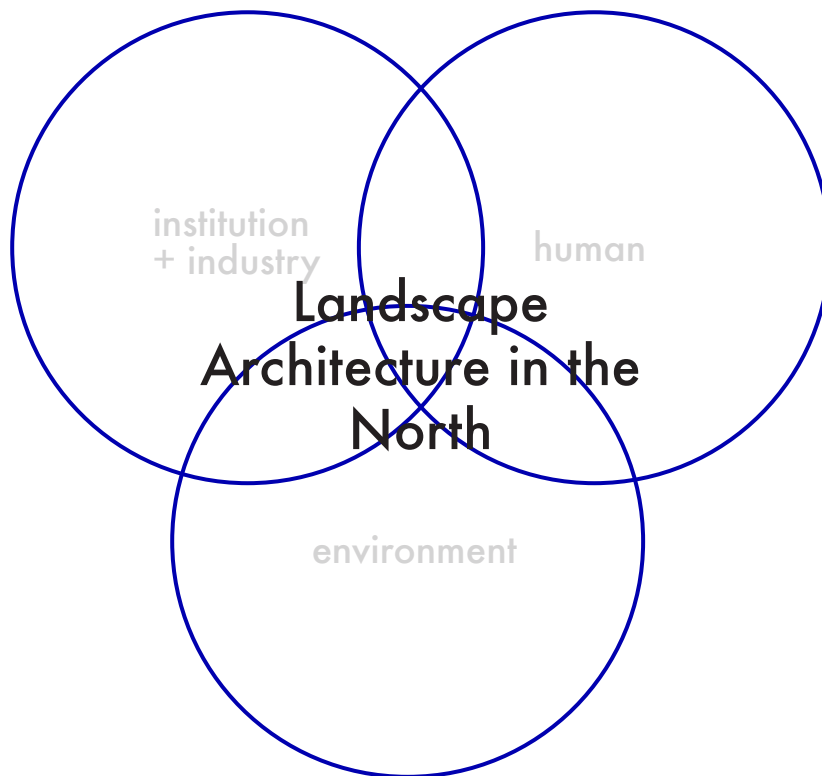


Figure 28: framework approach to landscape architecture in the North - a holistic design approach considering (1) industry + institution, (2) the human, and (3) the environment

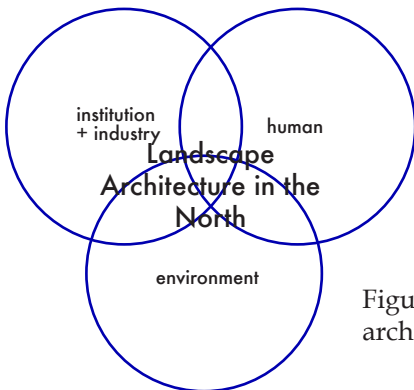
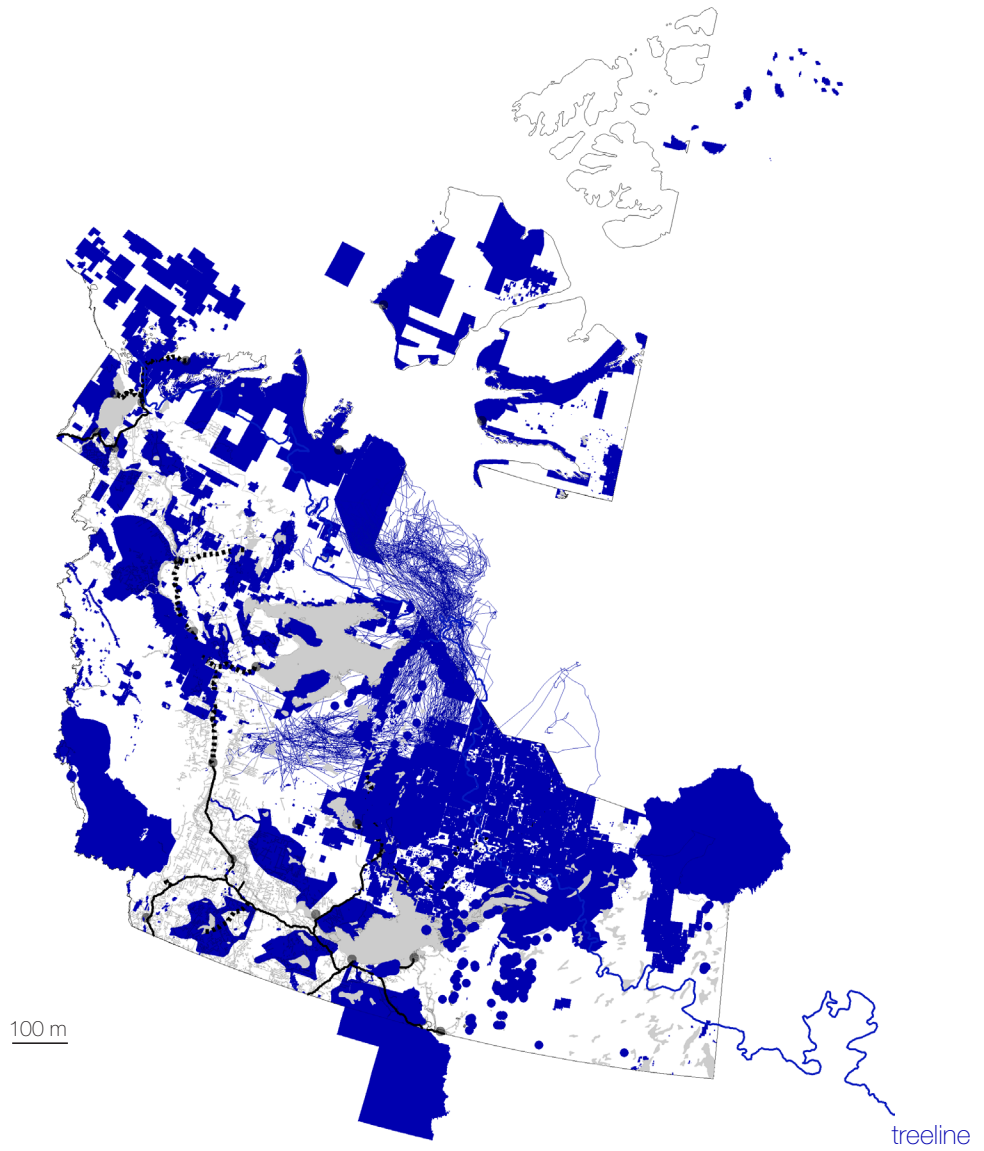


Figure 29: compilation of three main areas of concern for landscape architecture in the North

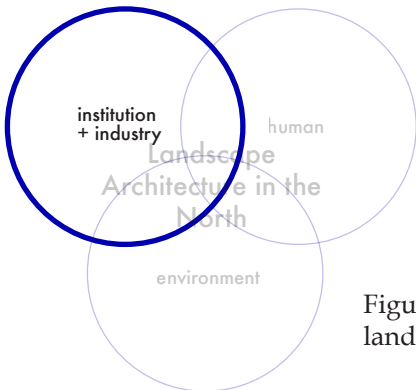
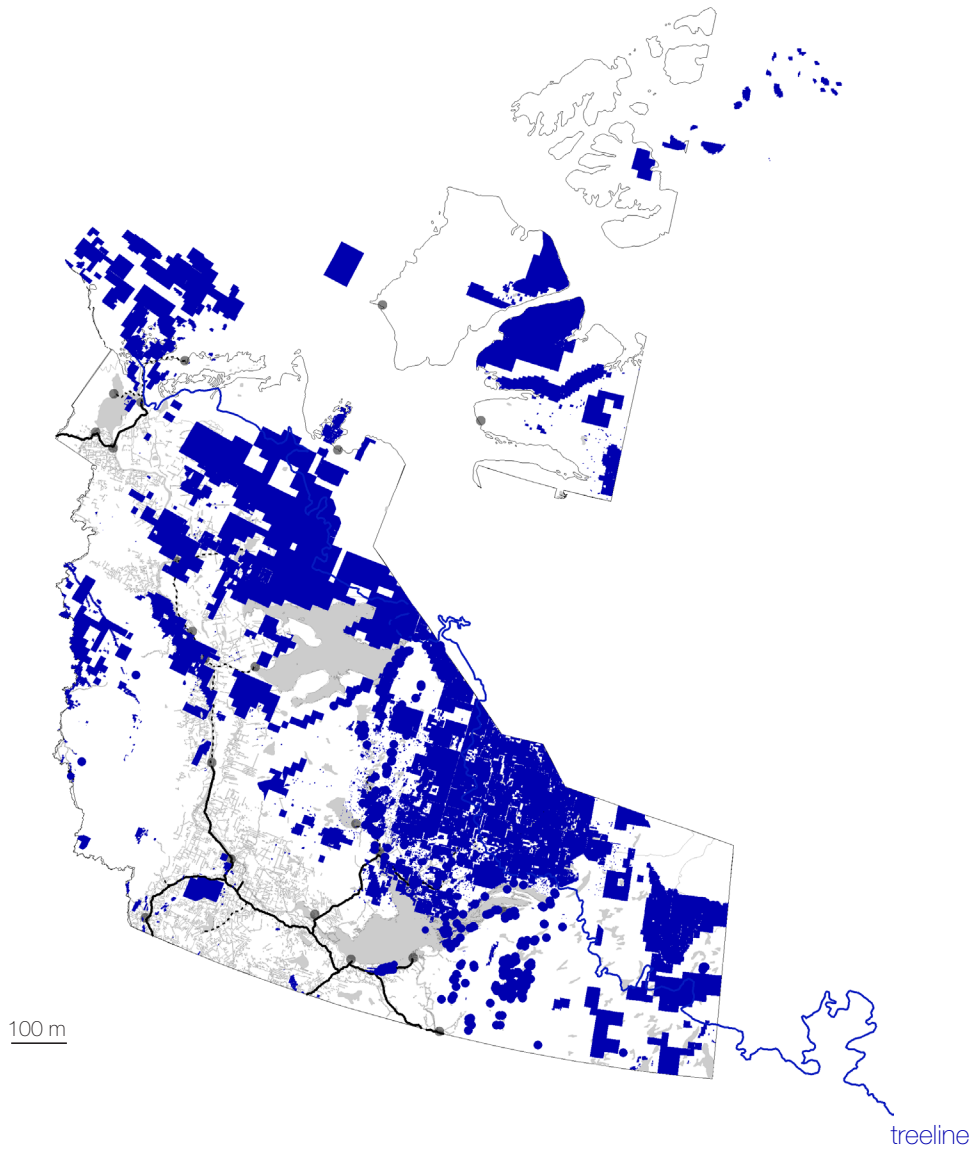


Figure 30a: mining + exploration as one of the major challenges facing landscape architecture in the North

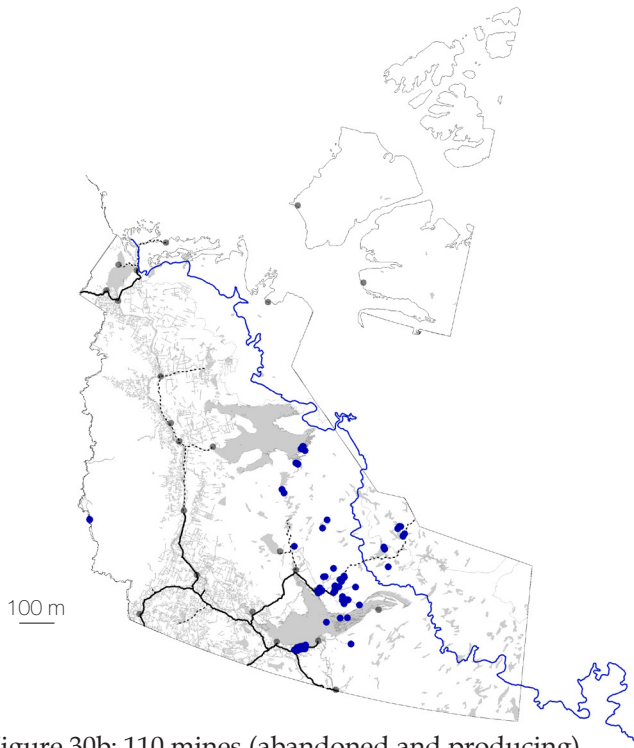


Figure 30b: 110 mines (abandoned and producing)

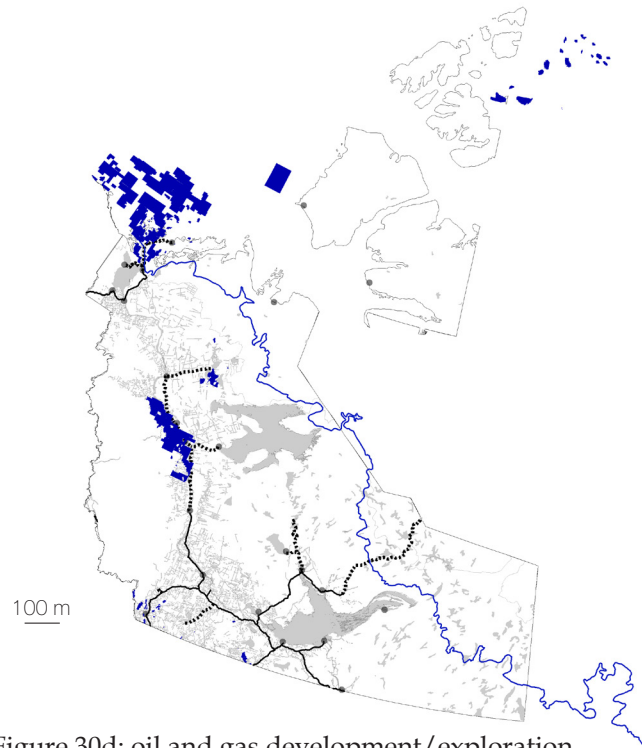


Figure 30d: oil and gas development/exploration leases

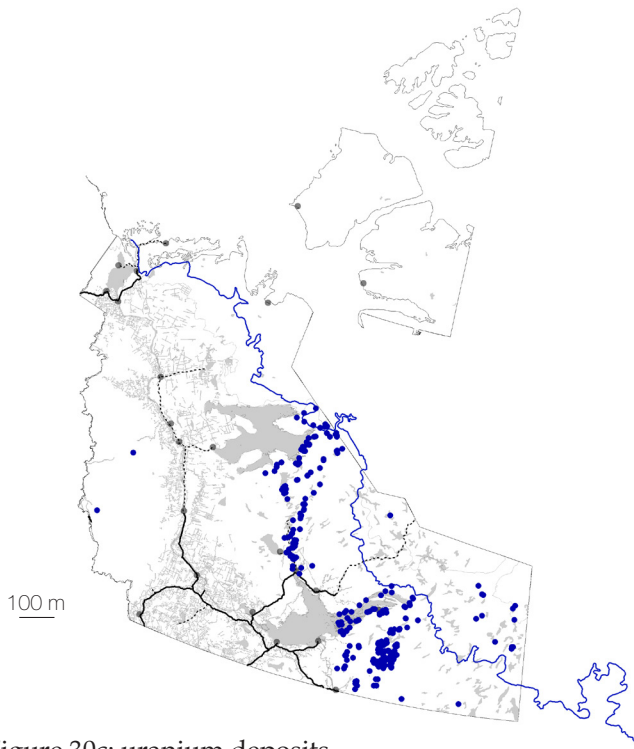


Figure 30c: uranium deposits

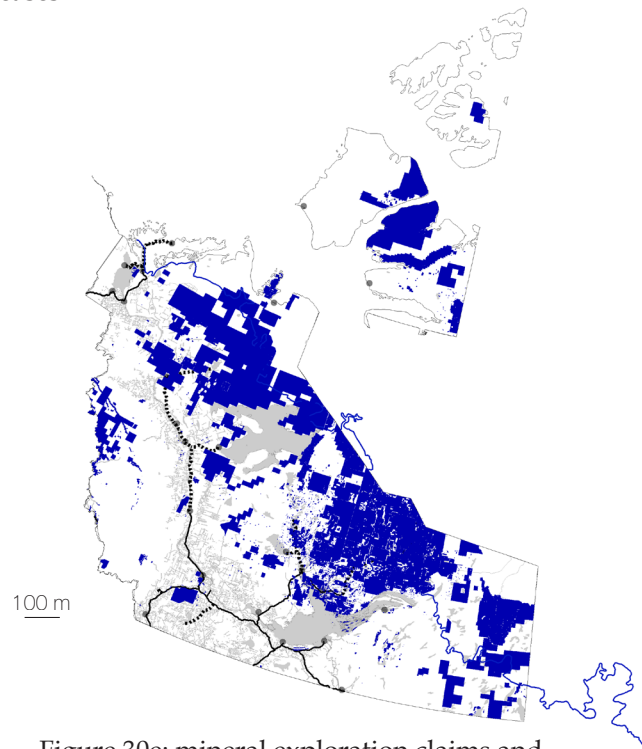


Figure 30e: mineral exploration claims and permits - expired and current (illustrative of historic activity)

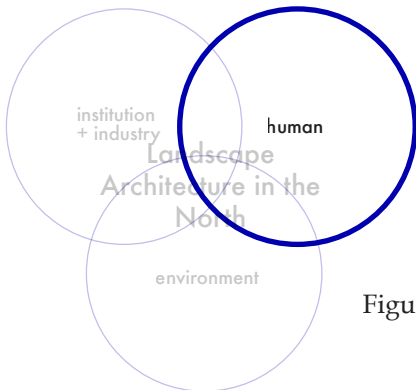
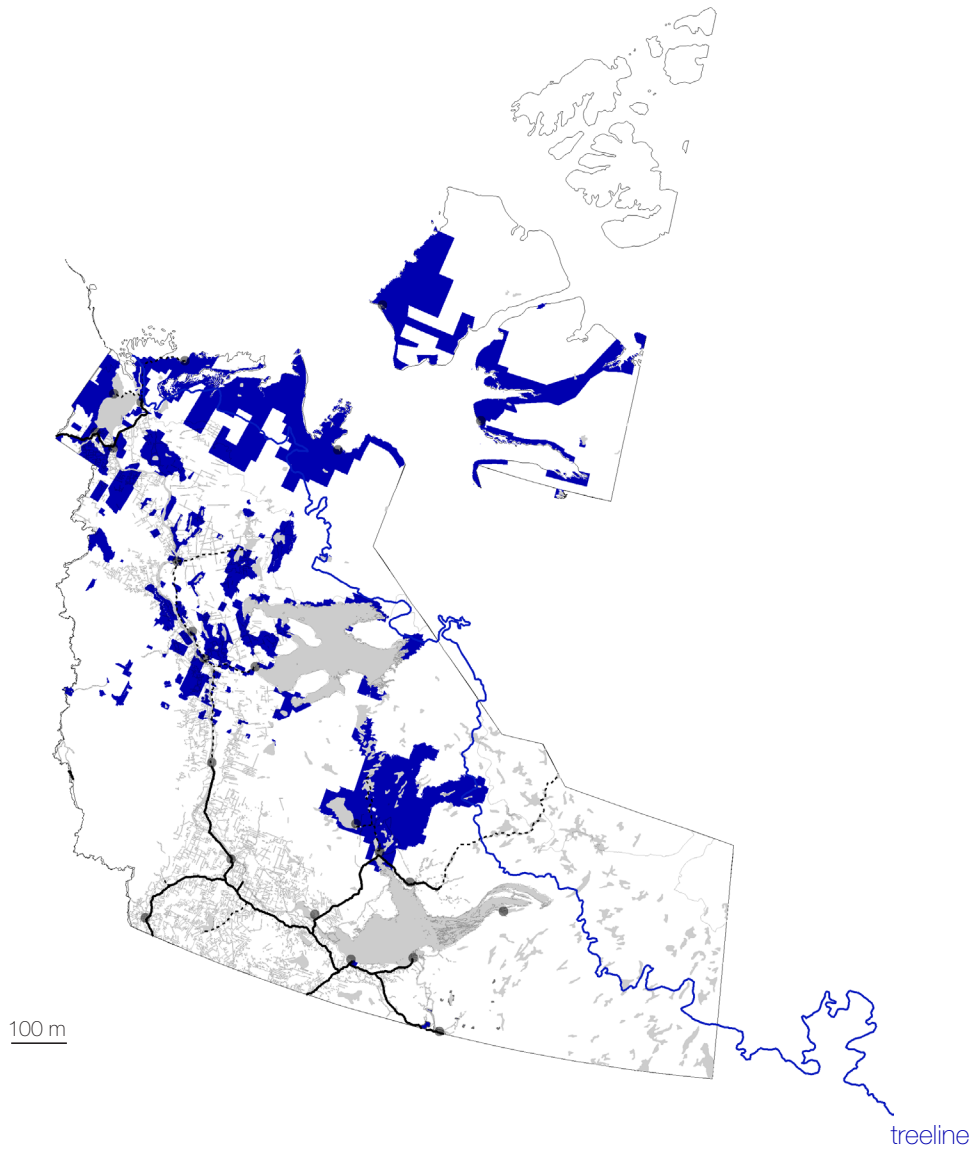


Figure 31a: awareness of Northern Aboriginal land claims

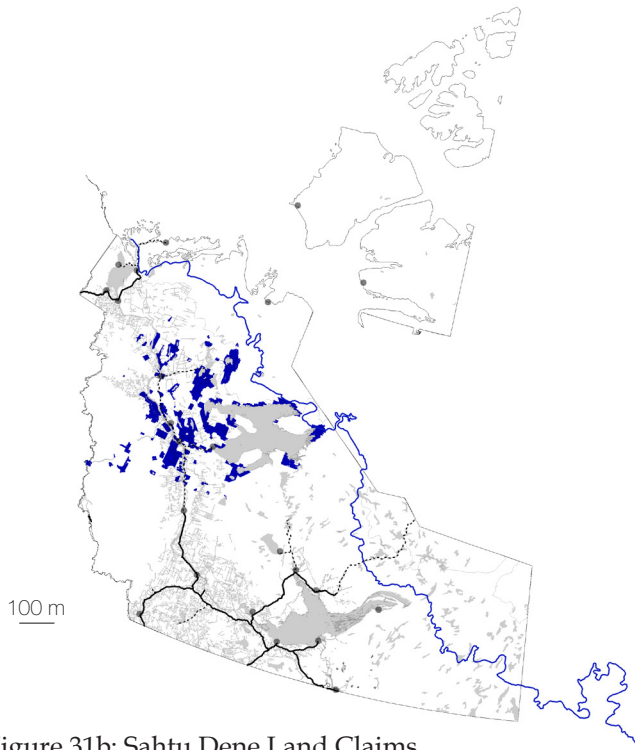


Figure 31b: Sahtu Dene Land Claims

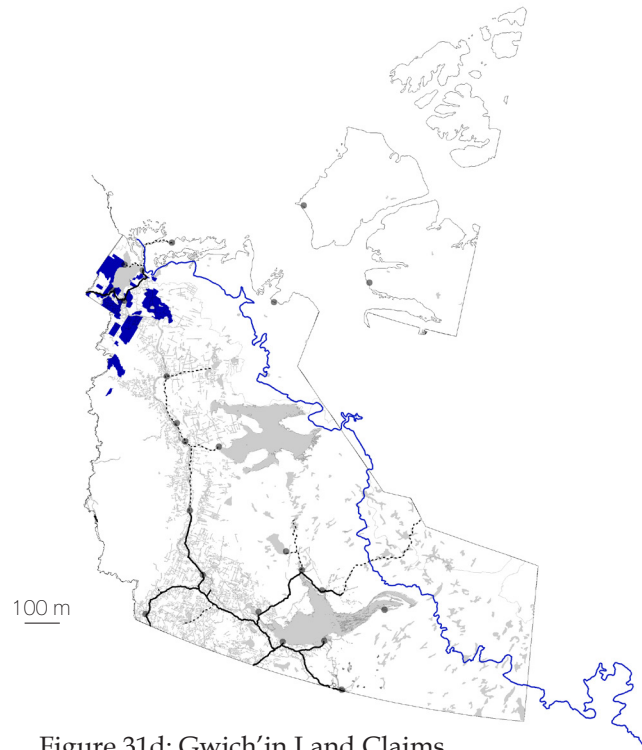


Figure 31d: Gwich'in Land Claims

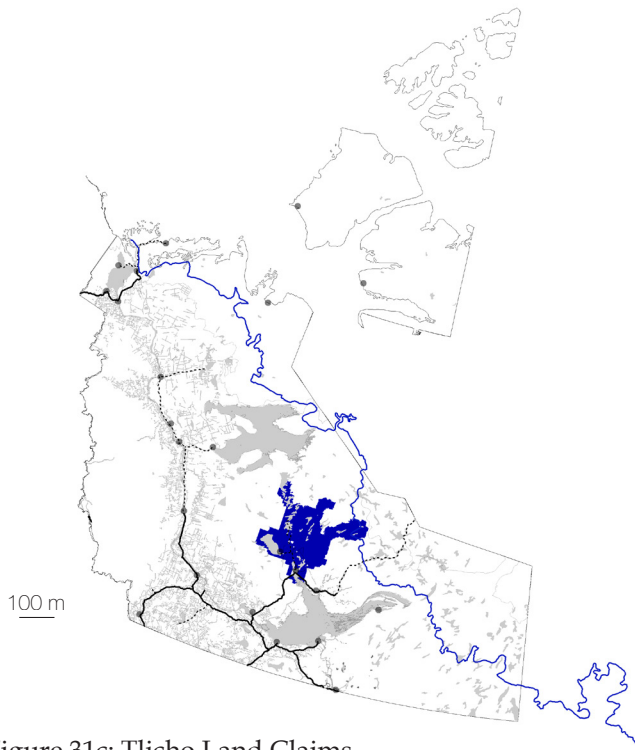


Figure 31c: Tlicho Land Claims

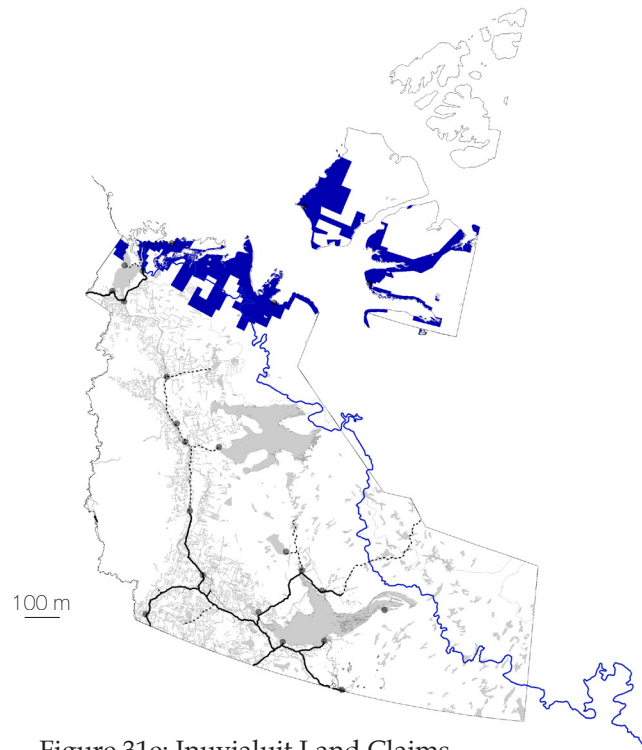


Figure 31e: Inuvialuit Land Claims

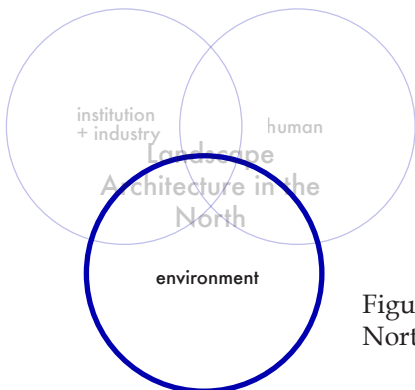
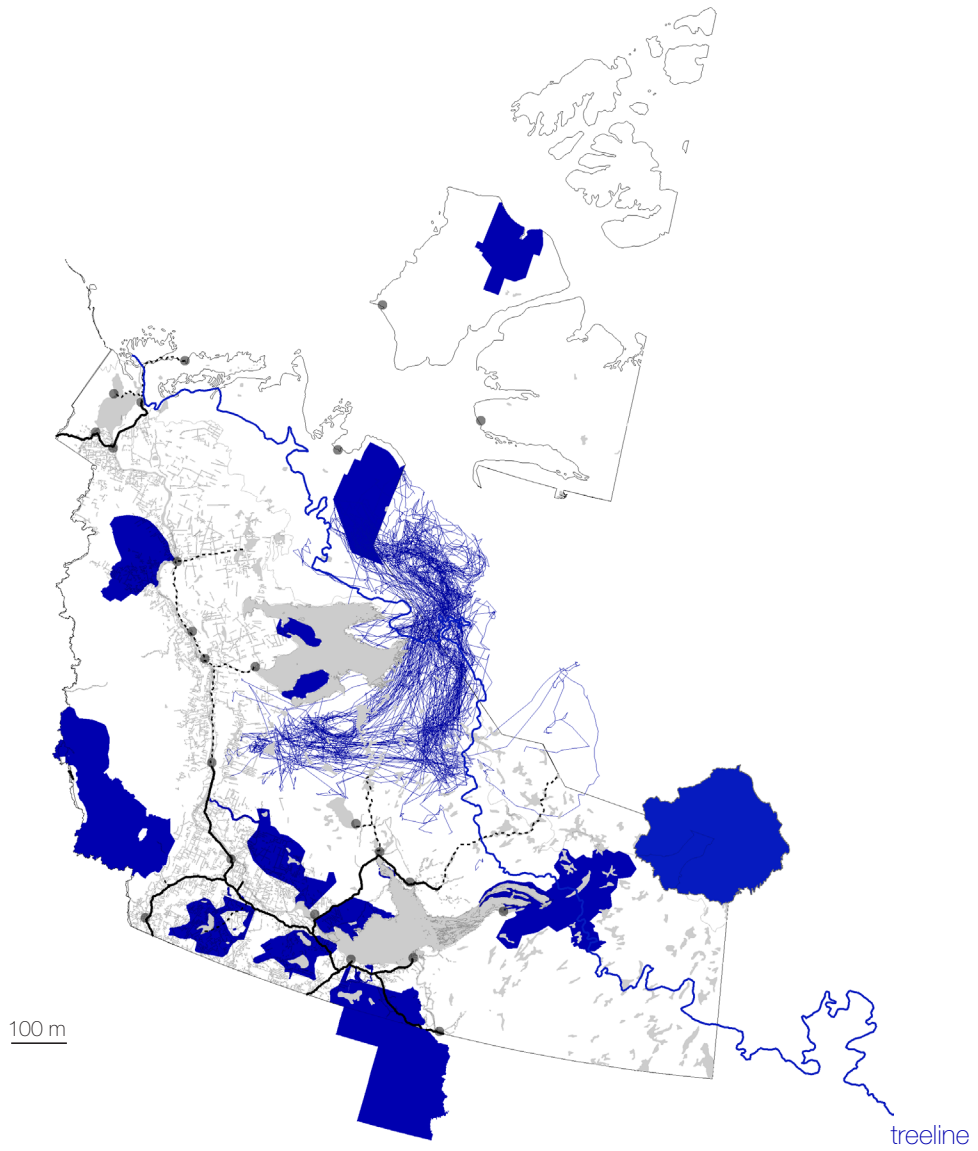


Figure 32a: environmental considerations for landscape architecture in the North - protected areas + parks

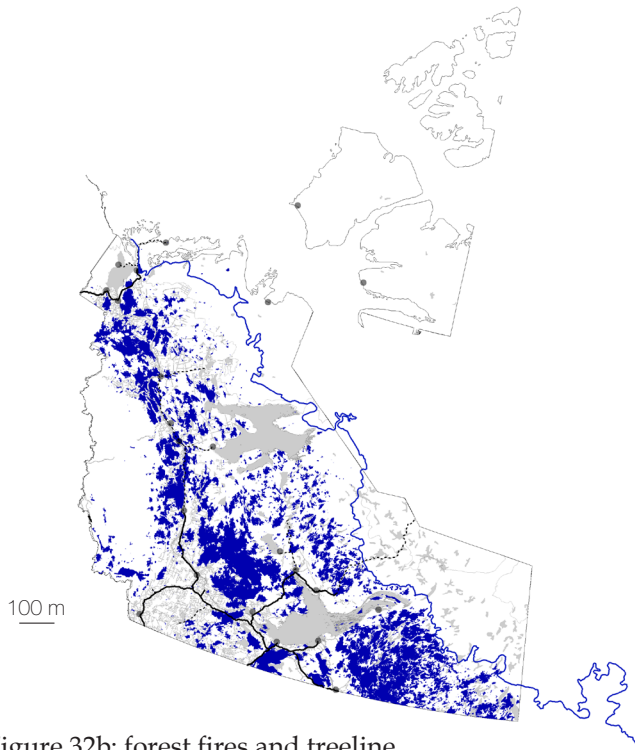


Figure 32b: forest fires and treeline

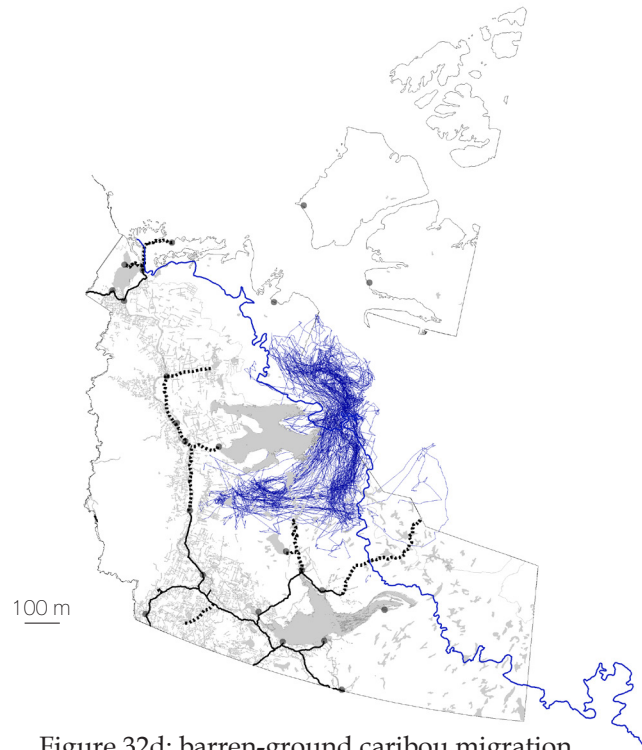


Figure 32d: barren-ground caribou migration

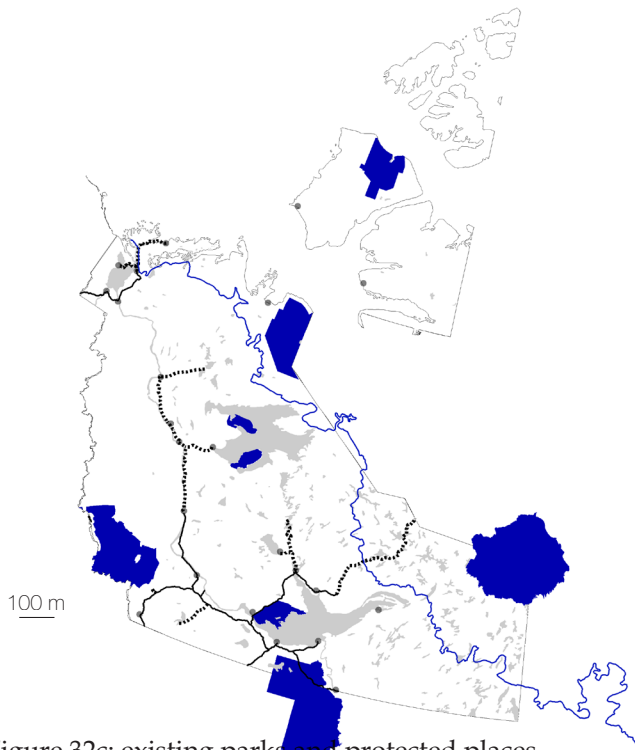


Figure 32c: existing parks and protected places

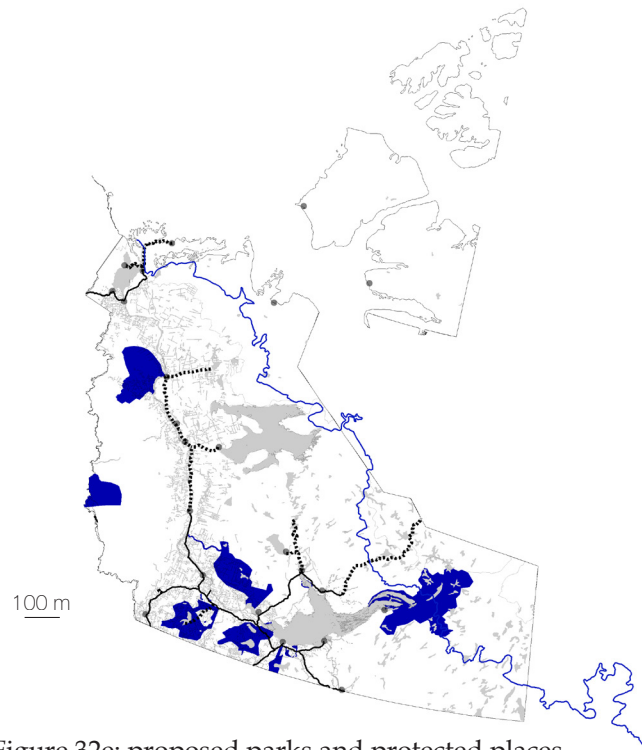


Figure 32e: proposed parks and protected places

Historically, northern development has favored the institution. This can be seen at most historic mine sites, such as Port Radium, where the driving force for development was financial gain. Little to no regard was paid to the human and physical environment. As a result, these sites are often immersed in controversy and contamination, and can no longer function as productive or culturally meaningful landscapes. Landscape architecture affords the potential to provide a platform on which to ameliorate the present condition.

In *The Canadian North: Issues and Challenges* (2008), Robert Bone states: “While Western culture sees humans at the top of a hierarchical arrangement of living creatures, Aboriginal culture views the world from a holistic perspective where all life is seen as a series of relationships among equals” (p. 225). The challenge in this context is to recognize at every scale, all three areas of influence – institution and industry, human environment, and physical environment, and to propose designs that strive to achieve a holistic balance in as much as is possible.

Applying the proposed framework to future design process may ensure a more balanced approach to research and creative development of landscape architecture in the North. The framework is a basic structure which may be added to, altered and strengthened depending on the specific project and its associated factors pertaining to industry and institution, human, and environment. I believe that through sensitive and sensible design, landscape architecture may address the discord between environment, industry and institution, and human concerns of the North.

part five.four

Cultural Landscapes

Cultural landscapes were first legally defined by the World Heritage Centre (WHC) at the 1992 World Heritage Convention. According to the WHC, cultural landscapes are landscapes which represent “the combined works of nature and of man [sic] ... [cultural landscapes] are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic, and cultural forces, both external and internal” (World Heritage Centre, 2012). While the existence of cultural landscapes is not new, our recognition of them has been a relatively recent development. The cultural landscape is as much about the experience within the landscape as it is about the landscape itself (Wagner, 2000).

The cultural landscape approach allows for present-day society to recognize specific landscapes with distinct character and unique, and valuable stories from our past (Wagner, 2000). These cultural landscapes need not be supposed as ancient sites (eg: Historic Centre of Florence, Italy; Stonehenge, Avebury and Associated Sites, England). The definition provided by the WHC is as applicable to ancient cultural landscapes as it is to landscapes that are relatively new, or young, by comparison. Historic mine sites, RCMP cabins, schools, churches, banks and many other built structures are included in this list. However, it should be noted that parks and open spaces are also considered cultural landscapes (eg: Nahanni National Park, Canada; Galapagos Islands, Ecuador; Sinharaja Forest Reserve, Sri Lanka)(UNESCO, 2013).

In a sense, all landscapes may be considered cultural landscapes. In *Arctic Dreams*, Barry Lopez wrote “It is precisely what is invisible in the land that makes what is merely empty space to one person a place to another. The feeling that a particular place is suffused with memories, the specific focus of sacred and profane stories, and that the whole landscape is a congeries of such places, is what is meant by a local sense of the land (1987, p. 250)”. Writing from an ecophilosophical perspective, Sven Arntzen stated “If cultural landscape is defined as an environment affected by human activity, then it makes sense to ask whether all areas on earth are cultural landscapes” (2002, p.29). Arntzen distinguishes three ways of understanding cultural landscapes: “the humanly modified landscape in the broad sense as any landscape that has the physical or visible marks of human activity, the humanly modified landscape in the narrow sense as a landscape where the marks of human activity are subject to the land’s limiting conditions, and the landscape in the immaterial or symbolic sense of influencing people’s views of themselves, of their history and identity, etc” (2002, p.43). The challenge for landscape architects is how and why to intervene with design. The decision to select one site over another, to propose one design over another, and to create new interpretations of old stories imbedded in the landscape is not an easy one to make.

part six

Port Radium

Port Radium presents itself as a unique northern cultural landscape, a site which holds multiple dialogues, and a layering of Aboriginal and institutional inscriptions, on the land. At the moment, these dialogues are left fractured and fragmented.

Today, Port Radium sits silent and inactive – aside from the occasional burst of mineral exploration activity. No buildings remain. All that is left of the once fully functional town is a legacy of environmental contamination and distrust among the Dene Aboriginal peoples from the nearby community of Déline. A lone plaque situated on a granite outcrop reveals the history of the site as part of a Parks Canada, *National Historic Event* (NHE) collection of historic mining activities across Canada.

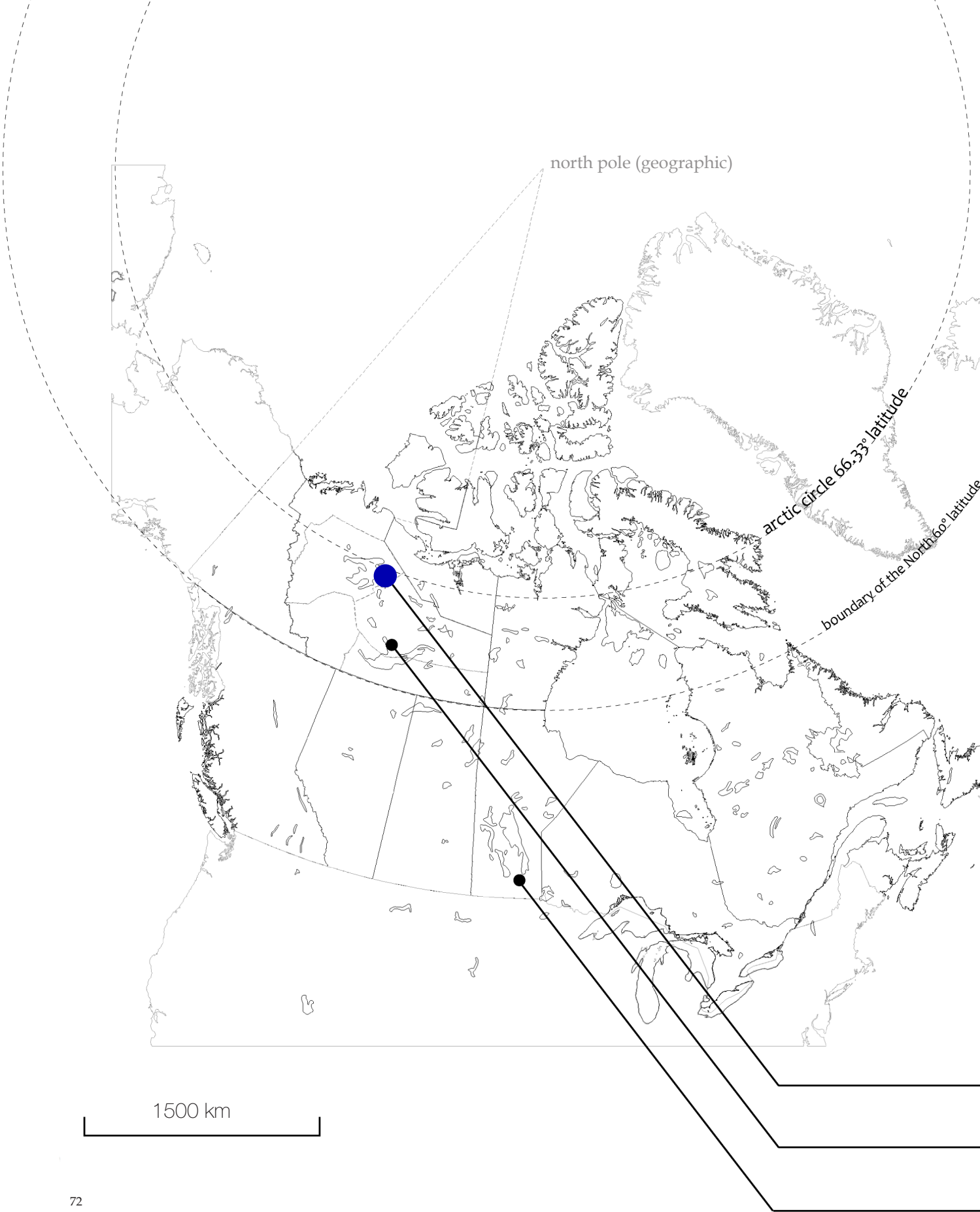
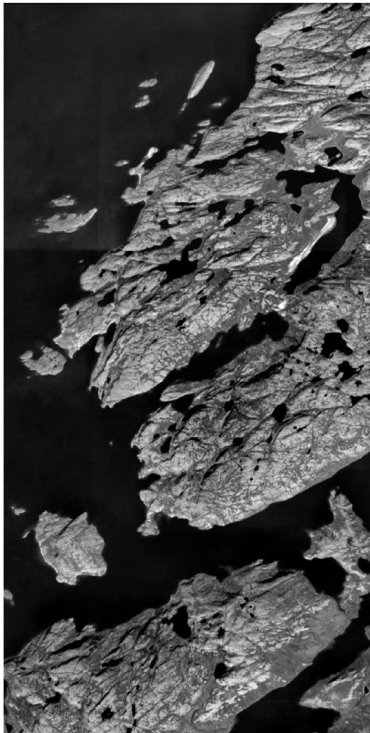
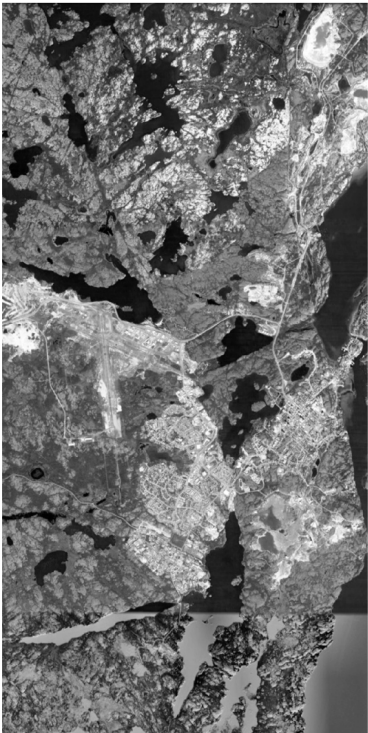


Figure 33: Canadian context - Port Radium, NWT

Port Radium, NWT
66° 05'04.61" N
118° 02'03.49" W
elevation: 167 m



Yellowknife, NWT
62° 29'51.17" N
114° 27'51.71" W
elevation: 206 m



Winnipeg, MB
49° 53'50.40" N
97° 07'40.84" W
elevation: 230 m



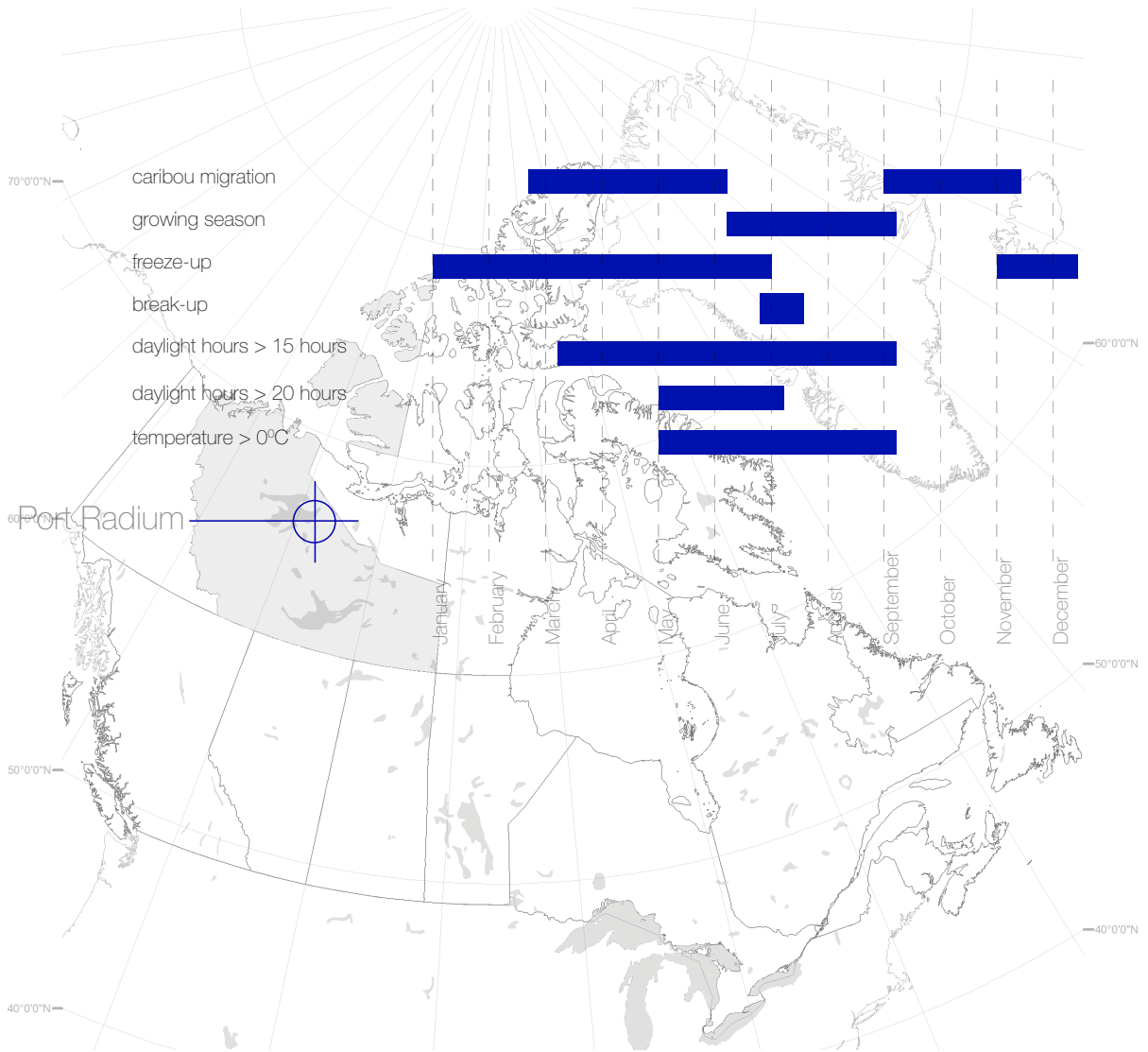


Figure 34: mapping Port Radium - cycles and oscillations of the seasons

part six.one

A Caution

The literature and mapping data available for the former Eldorado Mining Limited mine at Port Radium, NWT is limited or otherwise restricted. There are, however, several publications that are regarded as the general authority on the history of Port Radium, including Robert Bothwell's *Eldorado-Canada's National Uranium Company* (1987). While the corporate biography seems concise and comprehensively researched, researcher and author Peter C. van Wyck points to the conditions under which Bothwell performed his own research.

According to van Wyck: "Bothwell's work is considered the authoritative, historical datum for virtually all research ... that touches on this history; that is, the work of a single author under contractual arrangement with a corporate body has come to constitute the field of historical facts for all questioning pertaining to Eldorado" (2010, p.15). While there are additional sources of qualitative and quantitative research available, the *Canada-Déline Uranium Table (CDUT) Final Report 2005*, for example discussing various aspects of the history and lasting legacy of Port Radium, the general consensus is that there is no consensus. Many records from operations at Port Radium have been lost and many more are inaccessible to the general public (Bothwell, 1987; van Wyck, 2010).

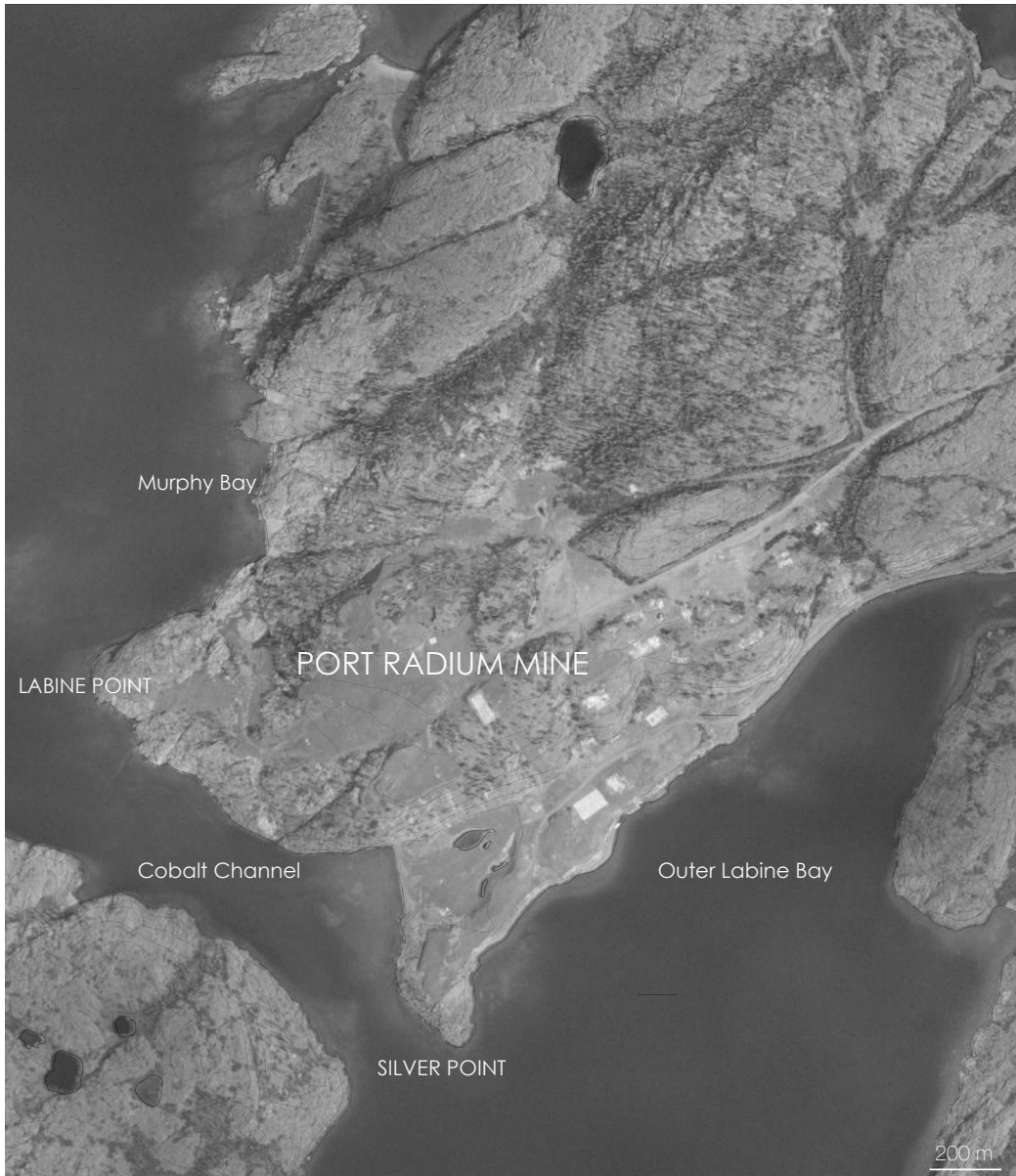


Figure 35: Port Radium - site context

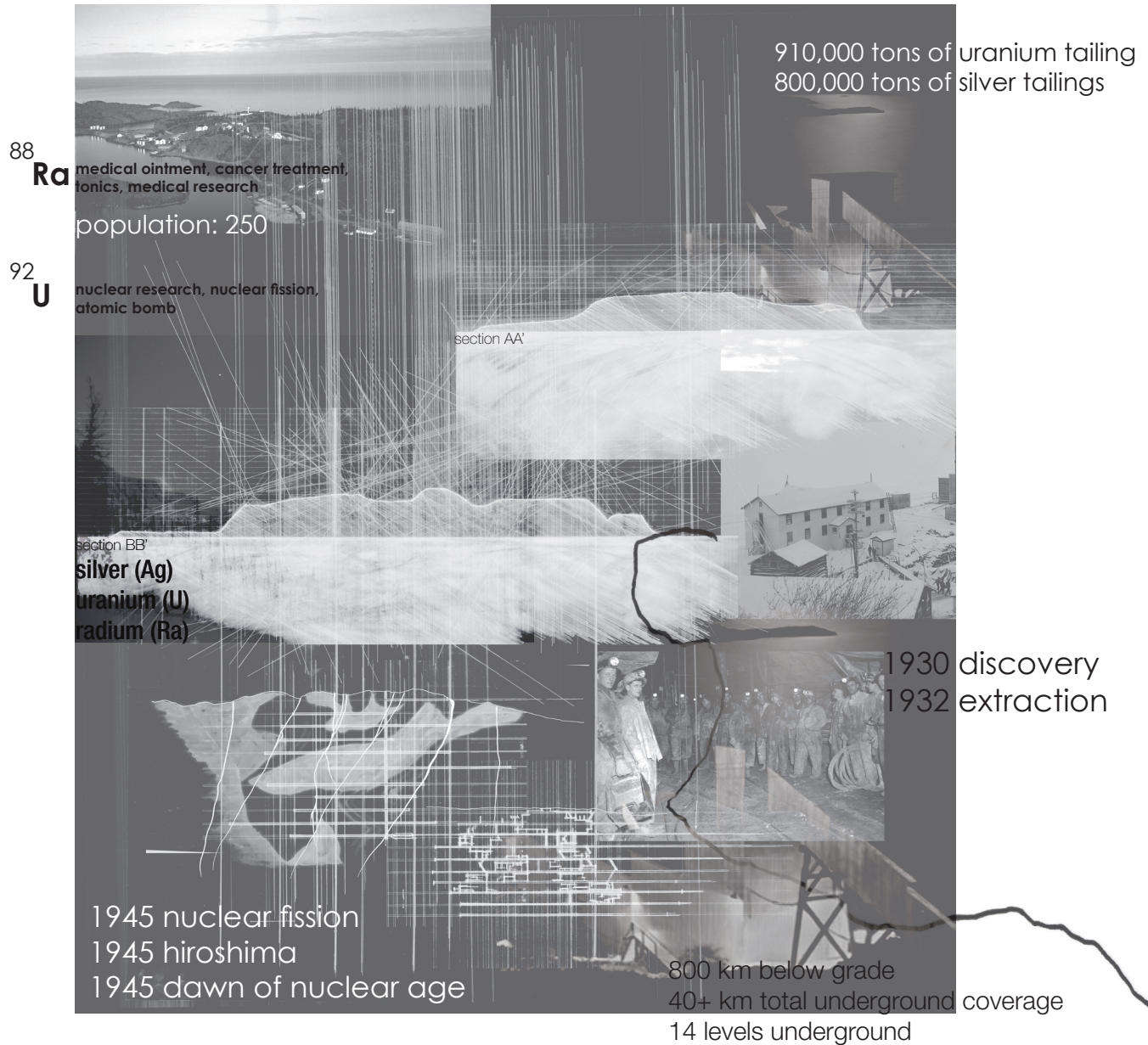
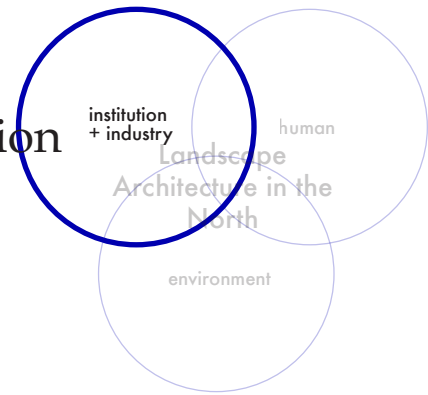


Figure 36: collage of site context (historical)

part six.two Industry & Institution



Port Radium is a significant yet little known northern mine site. During the course of its brief existence, the activity, infrastructure, and the raw ore extracted on-site have held national and global importance, directly and indirectly influencing medical research, nuclear energy development, mining development and northern transportation.

Port Radium has historically mined silver, copper, radium and uranium. It was Canada's first uranium mine, responsible for the development of Canada's first company-owned mining town, housing over 200 residents at its peak level of operation. In 1932 the mine was opened and operated by the Eldorado Mining Company. Before being sold to the Government of Canada in 1942, Eldorado supplied radium to the global market for medical research (van Wyck, 2010; CDUT Report, 2005; Bothwell, 1987).

Due to the drastic decrease in the market value of radium, and high operational costs, Eldorado closed the mine in 1940. The site was re-opened by the Government of Canada and began producing uranium for the Manhattan Project and Allied atomic bomb program (1942-1960) (van Wyck, 2010; CDUT Report, 2005; Chenoweth, 1997; Ashbrook and Smart, 1980). Research suggests that uranium from Port Radium contributed to the creation the atomic bombs dropped on Hiroshima and Nagasaki, respectively (van Wyck, 2010; CDUT Report, 2005; Chenoweth, 1997; Ashbrook and Smart, 1980). In 1960, after two decades of uranium supply for nuclear research, active mining ceased and Port Radium was closed. The site was used to support nearby silver mining operations between 1964 and 1982 when the mine was demolished (CDUT, 2005). Over the course of the life

of the mine, approximately 910,000 tons of uranium tailings and 800,000 tons of silver tailings were dumped into Great Bear Lake and the surrounding area (van Wyck, 2010; Government of Canada, 2009).

Underground mining reached a depth of over 800 m with a total of 14 km of underground channels, shafts, and excavated material (Piper, 2007). Currently, several exploration companies are staking claims in the region in an attempt to find additional mineral deposits.

It is believed that in addition to contaminating the sacred waters of the Great Bear Lake and surrounding land, both Eldorado and the Canadian Government employed the Sahtu Dene from the community of Déline to work at Port Radium in unsafe conditions, with increased exposure to radioactive waste (van Wyck, 2010; CDUT 2005).

In the early 1980s, the community of Déline began to learn about the environmental and health risks associated with radium and uranium exposure. As a result of elevated cancer rates within the Dene population, the community of Déline is often referred to as the Village of Widows and has been the subject of a documentary of the same name (Blow, 1999). While government, Dene and general publications have resulted in unsettled and varied opinions on the effects of the mining activities at Port Radium, the significance of exploiting the Earth for materials used for destruction and death, has not been lost on the Dene Peoples (CDUT, 2005; Blow, 1999).

In a relatively short time, the former mine site at Port Radium directly contributed to global medical and scientific research, the war efforts of WWII, nuclear research, and Northern Canadian development. Now the site is deserted with nothing more than a plaque signaling its significant yet conflicted past.



Figure 37: sacks of pitchblende concentrate awaiting shipment at Port Radium, Great Bear Lake, 1939
Credit: © Finnie/NWT Archives/N1979-063-0081



Figure 38: miners underground at Port Radium, 1946
Credit: Busse/NWT Archives/N1979-052-3348



Figure 39: aerial view of Eldorado Mining and Refining minesite, Port Radium, 1946
Credit: Busse/NWT Archives/N1979-052-3338



Figure 40: buildings on the Eldorado Mining Limited minesite, Port Radium, c. 1940s
Credit: Busse/NWT Archives/N1979-052-3379



Figure 41: Eldorado pitchblende mining camp at Port Radium, Echo Bay, Great Bear Lake, 1939
©Finnie/NWTArchives/N-1979-063-0080



Figure 42: aerial photographs of Port Radium mine site on Great Bear Lake, c. 1930s
Credit: Edm. Air Museum Ctte./NWT Archives/ N-1979-003-0600



Figure 43: several vessel frozen in, Port Radium
Credit: Busse/NWT Archives/N1979-052-3297



Figure 44: a sign with a jar of used sand from the first atom bomb explosion July 16, 1945, on display in Port Radium
Credit: Busse/NWT Archives/N1979-052-4877



Figure 45: facing North toward Inner Labine Bay, Port Radium, c. 1936.
Credit: Edm. Air Museum Ctte./NWT Archives/N-1979-003-0089



Figure 46: facing North toward Inner Labine Bay, Port Radium, 2012
Credit: Colin MacDonald



Figure 47: dismantling the historic RCMP outpost at Port Radium (2007)



Figure 48: aerial view of Port Radium, 2006
Credit: Colin MacDonald

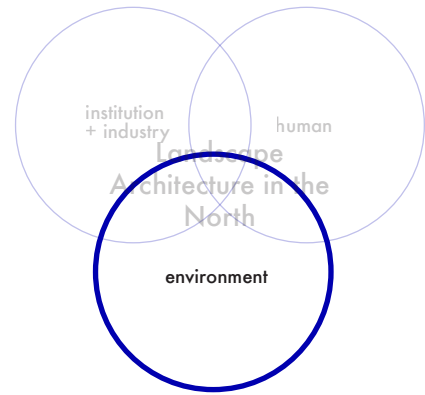


Figure 49: remnant concrete foundations from former site operations, Port Radium, 2007
Credit: Louis Covello



Figure 50: mine adit filled with debris, Port Radium (2007)

part six.three Environment



Port Radium is within the transition zone between the boreal forest and tundra, at the northern limit of the treeline (Figure 51c). Port Radium is located within the Taiga Shield High Subarctic Ecozone, which has been further classified by the Government of the Northwest Territories as the Radium Hills High Subarctic Ecoregion (2008). The region is dominated by volcanic and intrusive Precambrian bedrock. Additional characteristics specific to this region include cliffs and rugged terrain, with hills often exceeding 300 m in elevation to the southern reaches, minimal soil availability, peat plateaus and horizontal fens, and is dissected by many deep fjords (Government of the Northwest Territories, 2008). To date, there have been no large-scale studies of species biodiversity in the area; most surveys tend to focus on one species such as the Bluenose-East barren ground caribou (Northern Environmental Consulting, 2004).

part six.three

Environment: Hydrology

Port Radium and the surrounding region are part of the Mackenzie River drainage basin. Regional rivers drain to the Arctic Ocean by means of the Mackenzie River.

Great Bear Lake has a shoreline of approximately 2,720 km, excluding islands, and is approximately 32,000 km² in size with depths reaching a maximum of 450 m. Average lake depth is approximately 72 m. The residence time (the amount of time a water molecule remains part of the system) is 125 years with an overall catchment area of 114,717 km² (Department of Fisheries and Oceans, 2012; Johnson, 1994).

Site drainage into Great Bear Lake at Port Radium occurs in the Cobalt Channel and Inner Labine Bay. Due to the steep topography of the site, much of the runoff drains from the upper hills toward the east, and must pass through waste rock and tailings before entering Labine Bay (CDUT, 2005). Annual site runoff at Port Radium is approximately 36,000 m³.

There are many small lakes within the area. Port Radium is a unique setting due to many deep, cold fjords that dissect the region (Government of the Northwest Territories, 2008). Approximately 20-30% of the Port Radium area is covered with sedge and shrub-dominated horizontal fens with thin peat layers.

part six.three

Environment: Geology & Soil

Glaciers once covered the entire Taiga Shield. The postglacial Glacial Lake McConnell once covered the Taiga Plains, flooding Great Slave Lake and the surrounding Taiga Shield. Postglacial features include drumlins, eskers, frost-shattered boulder piles, glacial striations, and glacial till deposits (Government of the Northwest Territories, 2008). Remnant shorelines and step-like pebble beach ridges show traces of ripple marks, indicating the geologic history of the area (Lindsey, 1952).

The greater Taiga Shield High Subarctic Ecoregion features till plains and Precambrian bedrock outcrops reaching elevations of over 500 m (Figure 51a). Granitoid, intrusive and metamorphic bedrock plains are found in the northwest portion of the region (Government of the Northwest Territories, 2008). Outwash plains and postglacial features such as eskers are common. Permafrost is continuous to the north and discontinuous to the south. Soil availability is low due to exposed bedrock; soils are either Brunisols or Cryosols (Government of the Northwest Territories, 2008).

Indicative of the Taiga Shield High Subarctic Ecozone - Radium Hills High Subarctic Ecoregion, the greater area of Port Radium is approximately 20 x 150 km in size and is characterized by volcanic and intrusive Precambrian bedrock. The site is within an area of banded calcareous and cherty argillite, chert, bedded tuff, quartzite, thin limy beds, conglomerate and agglomerate (Mursky, 1972). The dominant minerals found at and near Port Radium are uranium, copper, manganese and silver.

In *The Highway of the Atom*, van Wyck states that the initial discovery of pitchblende was reported in *The Northern Miner* in October 1930:

Radium ore at Great Bear Lake - Pitchblende, and ore of uranium, from which radium is derived, is reported to occur at Great Bear Lake. The LaBine discovery south of Hunter Bay shows several seams of a lustrous black mineral which is coated with a brilliant yellow weathering product. The black mineral is said to be pitchblende and the yellow mineral is probably an oxide of uranium.

in Peter van Wyck, 2010, p.104

part six.three

Environment:Vegetation

Vegetation species at Port Radium are limited by climate and soil availability. As with many Taiga Shield High Subarctic regions, Port Radium supports open, spruce-shrub woodlands. Black spruce and white spruce are the dominant tree species; trembling aspen are typically uncommon but can be found in stunted groves on southern slopes (Government of the Northwest Territories, 2008). Additional vegetation species found at Port Radium and the greater region are listed. The Government of the Northwest Territories has produced an extensive list of species included in the *Ecological Regions of the Northwest Territories Taiga Shield* report (2008). For a complete list, please refer to this document.

Taiga Shield High Subarctic Ecoregion

Common names:

white spruce
black spruce
larch / tamarack
ground birch
willow
bog cranberry
red bearberry
black crowberry
cotton grass
northern Labrador tea
cotton-grass
moss
lichen

Shrub Heath; Shrub – Heath Woodland

Trees:

Picea mariana
Picea glauca (on alluvium and outwash)
Pinus banksiana (mainly High Boreal / Mid-Boreal)
Betula papyrifera

Shrubs:

Vaccinium vitis-idaea
Vaccinium uliginosum
Ledum palustre ssp. *decumbens*
Loiseleuria procumbens
Arctostaphylos alpina (High Subarctic)
Salix bebbiana
Salix pyrifolia
Viburnum edule
Ribes triste
Rubus idaeus

Mosses and Lichens:

Polytrichum piliferum
Pleurozium schreberi
Cetraria nivalis
Cladonia mitis
Cladonia amaurocraea
Alectoria nitidula (High Subarctic)
Alectoria ochroleuca (High Subarctic)
Cornicularia divergens
Cetraria cucullata (High Subarctic)
Stereocaulon paschale

part six.three

Environment: Terrestrial Mammals

Since Port Radium is located in the Taiga Shield High Subarctic Ecoregion characterized as a forest-tundra transition zone, the region typically sees species from both forest and tundra habitats. A general list of species (common name) is included (Government of the Northwest Territories, 2008).

Taiga Shield High Subarctic Ecoregion

Mammals:

barren-ground caribou
muskox
moose
black bear
grizzly bear (transition zone)
lynx
tundra wolf
red fox
Arctic fox
marten
otter
weasle (short-tail and least)
beaver
porcupine
Arctic ground squirrel
mouse, vole, lemmeing (unstable; unknown)
snowshoe hare
Arctic hare
shew (masked and barren-ground)
bat

part six.three

Environment: Aquatic Species

Approximately 32,000 km² in size, Great Bear Lake contains only 15 species of fish (Johnson, 1994). The dominant species is trout – often the top prize of the many local, yet remote fishing lodges. The remaining 14 fish species are: lake whitefish, cisco, round whitefish, walleye, northern pike, longnose sucker, grayling, deep-water sculpin, slimy sculpin, 9-spine stickleback, Chum salmon and Coho salmon (only one specimen has been found) (Johnson, 1994; Department of Fisheries and Oceans, 2012). Zooplankton and benthos species are also found in Great Bear Lake.

part six.three

Environment: Climate

The climate at Port Radium is moderated by Great Bear Lake. Climate data for the area, including Déline, is limited. Historical climate information from Environment Canada is unavailable for Port Radium, and the data available for Déline represents a brief period from 1999 to the present. Analysis of the climatic conditions of Déline has been provided as they may be considered representative of similar conditions at Port Radium, although not accounting for the potential development of site-specific micro-climates.

The mean annual temperature of Déline is approximately -7.5°C with mean summer and winter temperatures of 9°C and -24.5°C , respectively. Temperatures can fluctuate between -25°C and $+20^{\circ}\text{C}$ throughout the year. Mean annual precipitation ranges from 200 and 300 mm with an annual average rainfall value of 166 mm. Precipitation is predominantly in the form of snow between the months of September and May. Wind speeds rarely exceed 5 m/s with the strongest winds from the east. Port Radium receives an average of 12.7 hours of sunlight (daylight hours) with 3.0 daylight hours in December and 23.6 daylight hours in June. The growing season at Port Radium, determined by the frost-free days with temperature greater than 5.6°C , is relatively short, lasting between 80 and 120 days. The average growing season starts in mid-May and ends in August. (Environment Canada, 2012; WeatherSpark, 2012).

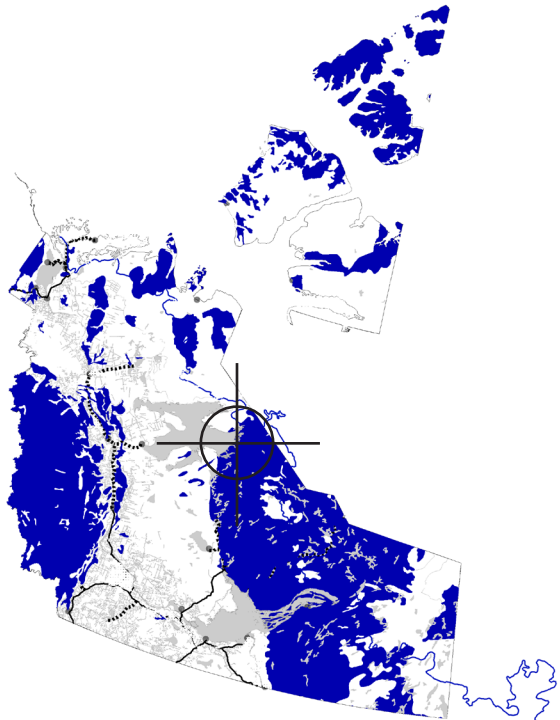


Figure 51a: geology pertaining to Port Radium, NWT

- part of the Canadian Shield
- approximately >75 % rock outcrop
- intrusive rock
- undivided, granitoid rock
- Bear Province (geologic)

100 m

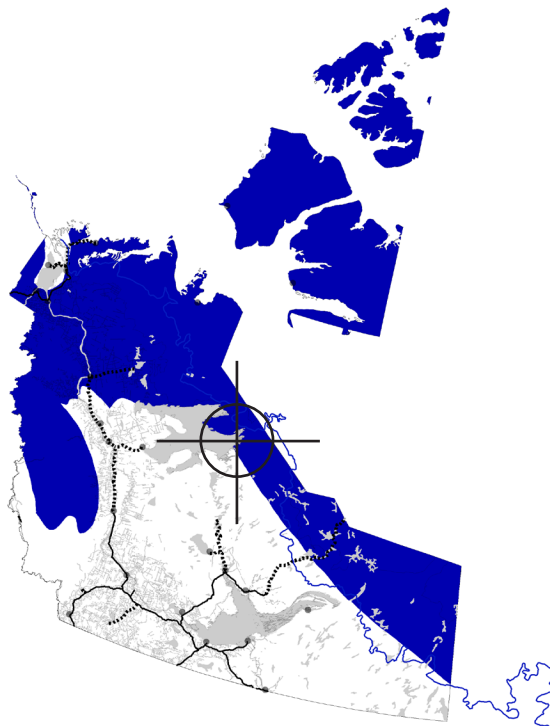


Figure 51b: permafrost pertaining to Port Radium, NWT

- continuous permafrost zone (90-100 % coverage)
- at boundary of continuous / extensive discontinuous (50-90 % coverage)

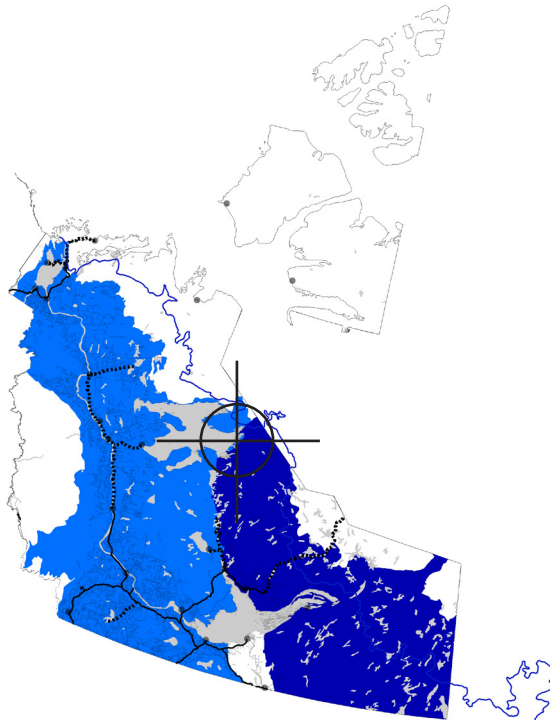
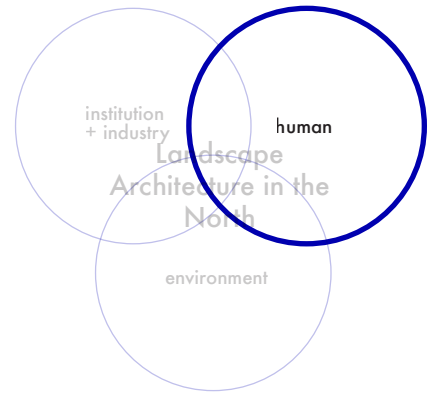


Figure 51c: ecozones pertaining to Port Radium, NWT

- within Taiga Shield Ecozone
- at boundary of Taiga Shield / Taiga Plains
- just below treeline

part six.four Human



Since 1900, Port Radium has seen a flourish of Euro-Canadian activity. The area was first visited by J.M. Bell in 1900 and was not surveyed again until 1930 when Gilbert LaBine and E.C. St. Paul discovered pitchblende at what is now known as LaBine Point (van Wyck, 2010, CDUT, 2005). Following this discovery, Port Radium experienced a large influx of prospectors and businessmen trying to stake their claims to the next big mineral deposit. It is estimated that over 3,000 claims were staked in the early 1930s (Mursky, 1973). Mineral prospecting and surveys by the Geological Survey of Canada did not cease following LaBine's discovery. The site saw intermittent field surveys from 1931 to 1964. In 2005, the Alberta-based mineral exploration company, Alberta Star Development Corporation, initiated an exploration project at Port Radium and the surrounding area.

During the early years at Port Radium, many of the workers came from Manitoba, specifically from Winnipeg (Bothwell, 1987). In 2007, during my time at the Alberta Star exploration camp near Port Radium, the final stages of the government site remediation were underway. The former RCMP outpost cabin was disassembled by Rick Muyres and transported to Norman Wells, NWT as part of an exhibit (NWT Mining Heritage Society, 2010). Several Winnipeg Free Press newspapers dating from 1935 were found within the RCMP outpost cabin.

part six.four

Human: Sahtu Dene

The Dene People live across the Canadian North including parts of the Alaskan coast, and are part of a larger group of Aboriginal cultures known as the Athapaskan People. The Dene Nation is subdivided into groups relating to the area in which the Dene Peoples live and is comprised of the Dogrib (Tlicho), Chipewyan, Gwich'in, Slavey and Sahtu (Hare) Dene (Canadian Encyclopedia, 2012). The word 'Sahtu' refers to Great Bear Lake: "The Dene people have lived, since time immemorial, on and around the shores of Great Bear Lake" (CDUT, 2005, p.2). The Sahtu Dene lived a traditional lifestyle, based on cultural and economic relationships between people and land until approximately 50 years ago, relying on Great Bear Lake as a spiritual and provisional source. "The Sahtu provides not only physical sustenance ... but also the spiritual and cultural sustenance that comes from practicing the skills and lifestyle of their ancestors" (CDUT, 2005, p.3). Great Bear Lake remains central to the Dene community as a spiritual focus and traditional territory of the Sahtu Dene Peoples (CDUT, 2005).

Port Radium is located in the Sahtu Settlement Area, in the Sahtu-Mackenzie region, on the eastern shoreline of Great Bear Lake - approximately 400 km north of Yellowknife. A part of the Sahtu Dene and Métis Land Claim Agreement, the Sahtu-Mackenzie region includes a total of 5 communities in the NWT including Colville Lake, Fort Good Hope, Norman Wells, Tulita and Déline. (Déline First Nation, 2013; Sahtu Secretariat, 2012).

Attempts to communicate with the community of Déline (Figure 52) were made at the outset of this practicum. Unfortunately, community consultation was not possible given initial communication issues, travel, and funding constraints. This is mentioned as a limitation of



Déline First Nation
65° 11'17.54" N
123° 25'33.77" W
elevation: 157 m

Formerly Fort Franklin (changed in 1993)
Chief: Leonard Kenny
Language: Aboriginal - Slavey / Denewa
Population: 472

Deline First Nation, 2013; Statistics Canada, 2006 with updates to 2012

Figure 52: context map showing Déline and Port Radium, NWT

this project, one that would be remedied if the work was to move beyond the practicum stage. In an attempt to gain an understanding of the site and its history from the Sahtu Dene people who were impacted by the mining activities of Port Radium, without actually visiting the community, the 2005 *Canada-Deline Uranium Table Final Report* (CDUT) was examined. An analysis of Dene oral history, and extensive community involvement was a large part of this initiative as they were partners - it was a valuable resource for this practicum.

For many years, before the discovery of pitchblende (variety of uraninite), the Sahtu Dene held great trust and respect for the land, holding “intimate and direct links to the lands and waters in and around Great Bear Lake” (CDUT, 2005, p.2). It is said, through oral tradition, that a local Dene man known as Old Beyonnie was the first to discover pitchblende – later passing his sample on to LaBine (CDUT, 2005).

The Dene provided support to mining operations at Port Radium until around 1960 (CDUT, 2005; van Wyck, 2010). The Dene assisted with the transportation of goods to and from the mine, provided lumber for fuel, building materials, food and labor for the site operations. Additionally, Dene women often contributed with manual labor, food preparation and making clothes and crafts to sell at Port Radium (van Wyck, 2010; CDUT, 2005). A hospital was erected on the site, which provided health services to the mine employees, as well as to the Déline Dene.

In the early 1980s, the Dene began to learn about the environmental and human health risks associated with radium and uranium exposure. The community of Déline was also unaware of their involvement in the production of uranium ore used for atomic research, a resource from their land that was ultimately used in the atomic bomb dropped on Hiroshima in 1945 (CDUT, 2005). For these reasons, wide-spread fear and grief fill the Dene in Déline to this day (CDUT, 2005).

According to community interviews held as part of the studies established for the CDUT Final Report, oral histories within Déline are “permeated by stories of loss and death.

A general sense of disorder and confusion is clearly evident in the oral histories; people often seem overwhelmed ... The perceptual link between exposure to mining activities and illness and death affects people's sense of harmony with nature. This in turn has undermined the Dene worldview that they live in a world where things unfold in a natural way, which in the past resulted in a sense of confidence and positive outlook" (CDUT, 2005, p.36). Other negative impacts of the mining activities at Port Radium in Déline focus around colonization including transitioning to a cash-based economy, to a normative, Canadian school system and non-traditional food sources (CDUT, 2005). The introduction of a Euro-Canadian lifestyle included an introduction to a range of previously foreign illnesses (CDUT, 2005). The Dene land will forever be changed by the initial discovery of pitchblende over a century ago.

As part of the Sahtu Dene and Metis Comprehensive Land Claim Agreement (1993), the Dene First Nation (including the members of the community of Déline) holds surface land claims in the Port Radium area. According to van Wyck, "At least part of the political apparatus of the community of Déline supports the renewal of uranium production on Dene land. Exploration and drilling activity in recent years, involving not just Alberta Star, but a number of other exploration and mining firms, confirms the ongoing and future interest in Dene land at Great Bear Lake" (2010, p.196). Whether actively mined or explored for mineral potential, the lasting legacy of mining at Port Radium, the power of destruction found within the land, health implications for those who worked there, and ongoing contamination concerns, has become a part of the Dene oral tradition. A new cultural landscape has emerged - one with a conflicting and disturbing history.

part six.four

Human: Contamination

Former mining operations at the Port Radium site resulted in a number of contaminated areas ranging in levels of impact. While some contaminant pathways and specific volumes of waste are unknown or difficult to obtain, the CDUT Final Report suggests that past mining and processing activities have impacted approximately 0.2 km² of land (CDUT, 2005). Potential sources of contamination included the McDonough Tailings Basin, the leach plant, various tailings disposal areas, waste rock disposal areas and the former discharge area for the McDonough Basin. Government remediation of the site commenced in 2007 and was completed in 2008/2009. A discussion of remediation activities is included later in this section. As part of an overall understanding of the extent to which the site was contaminated, a summary of the CDUT findings of the environmental studies carried out at Port Radium is listed below. Specific discussion of water quality and on-site radiation exposure has been included as it reflects the two most influential areas of public concern.

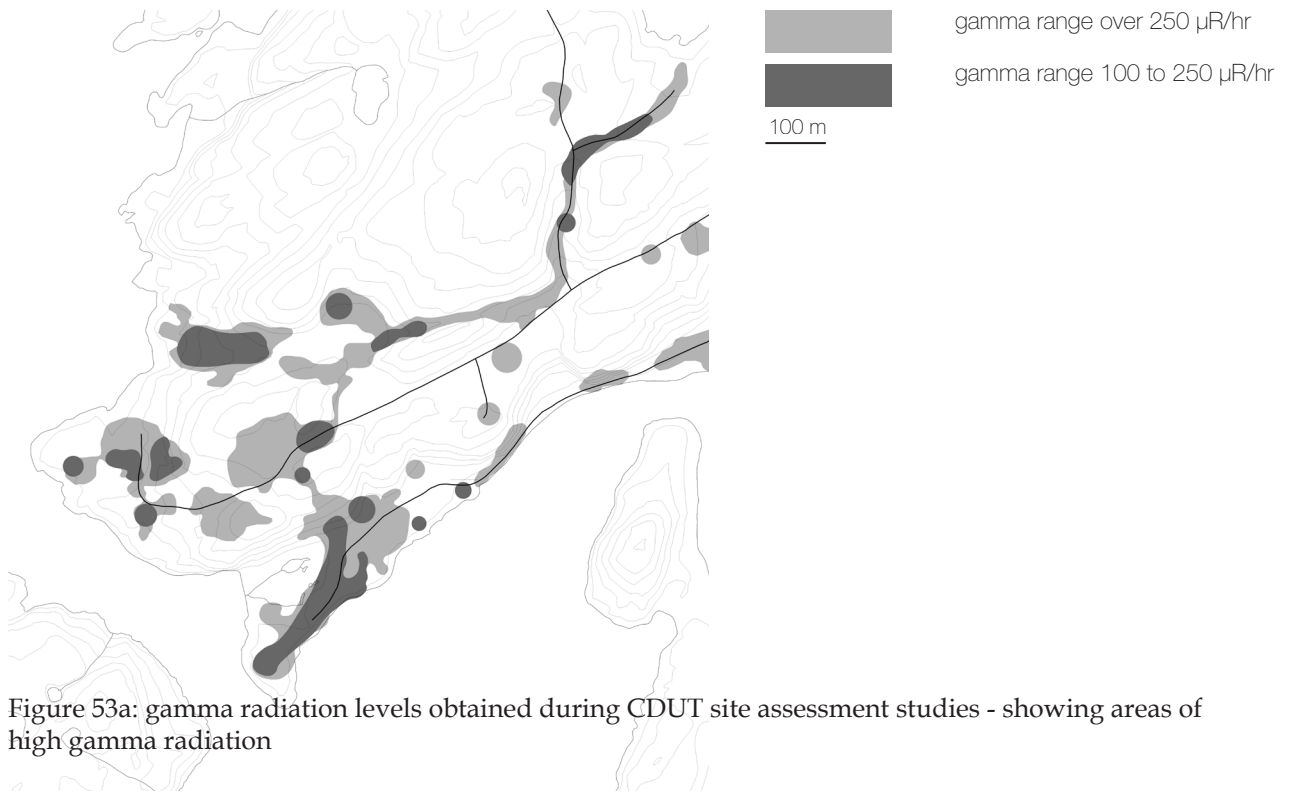


Figure 53a: gamma radiation levels obtained during CDUT site assessment studies - showing areas of high gamma radiation

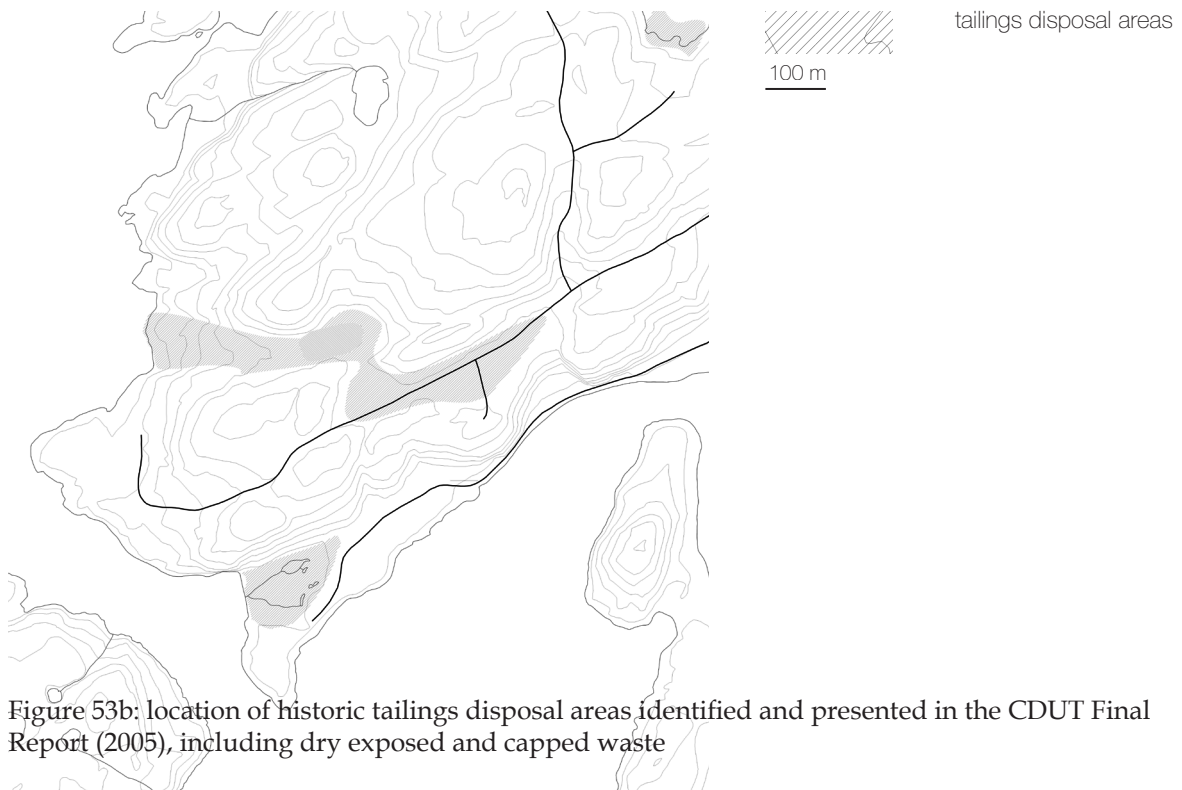


Figure 53b: location of historic tailings disposal areas identified and presented in the CDUT Final Report (2005), including dry exposed and capped waste

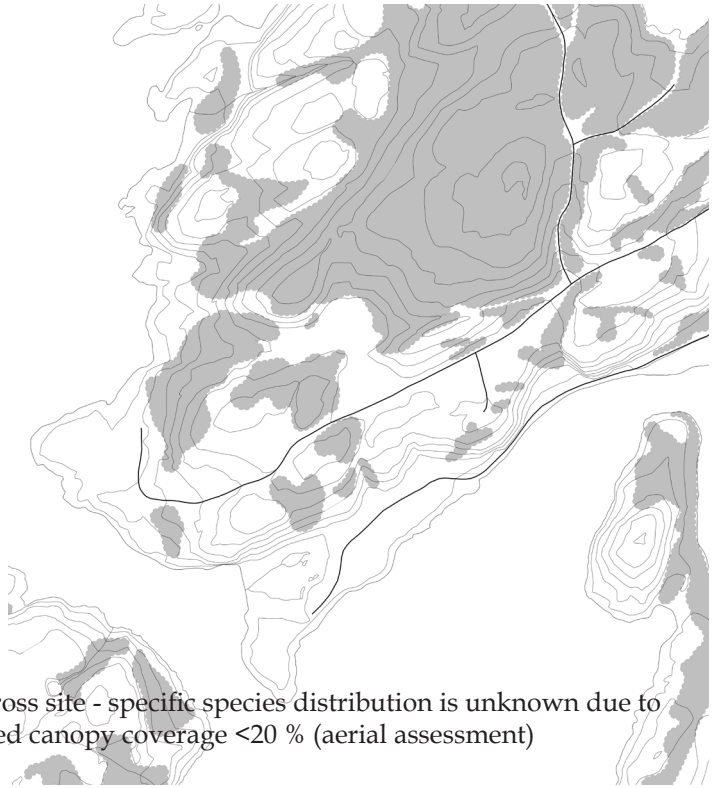


Figure 53c: estimated vegetative cover across site - specific species distribution is unknown due to limited literature on the subject / estimated canopy coverage <20 % (aerial assessment)

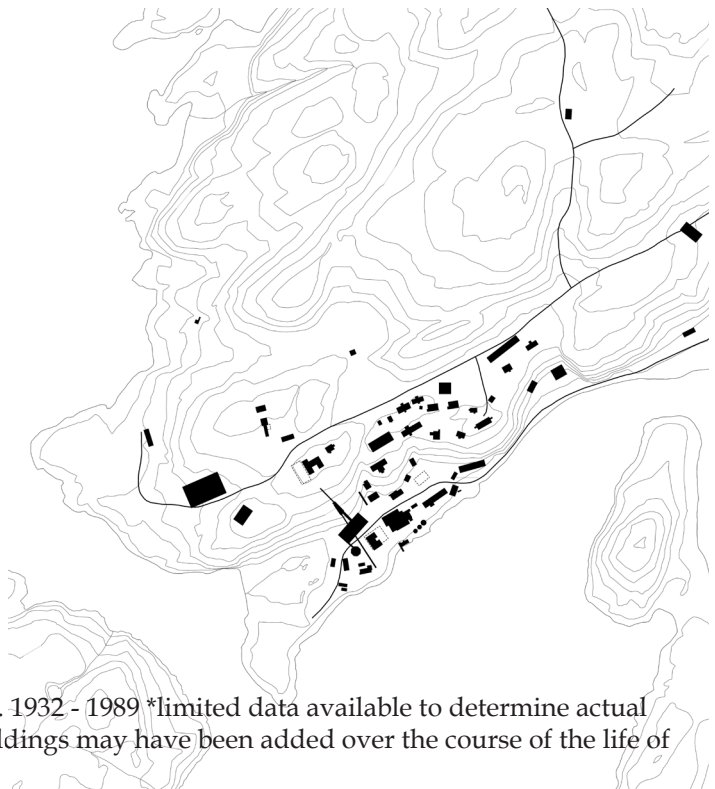


Figure 53d: location of former buildings c. 1932 - 1989 *limited data available to determine actual dates and project development (some buildings may have been added over the course of the life of the mine)

part six.four

Human: Contamination

Water Quality

Water quality has been significantly impacted both on-site and in Great Bear Lake. During the course of Eldorado's mining activity at Port Radium, approximately 1.7 million tons of mine tailings were dumped into the lake (van Wyck, 2010). These tailings remain on the lakebed; however, their specific location is unknown. According to the CDUT Final Report, the tailings are concentrated around Cobalt Channel to the north-west and south-east of the former mine site. The CDUT Final Report states that the lakebed tailings are not likely to move, or will move to deeper sections of the lake (2005).

Following the Canadian Council of Ministers of Environment (CCME) guidelines, exceedances of aluminum, arsenic, copper, lead, selenium, silver, zinc and Radium-228 were found across the site. The Report stresses that these exceedances may be a result of natural background levels, not directly caused by the mining operations. Despite the exceedances, according to the report the overall water quality in Great Bear Lake is good (CDUT, 2005).

Surface and groundwater studies revealed elevated levels of contamination in areas where water is in direct contact with tailings (Figure 53b). Surface samples contained higher metal concentrations than those found in Great Bear Lake – approximately 5 to 100 times higher for some metals (CDUT, 2005). This is significant when considering most surface water will eventually discharge into the lake, although natural attenuation of some contaminants may occur, lowering the metal content before entering the lake.

part six.four

Human: Contamination Radiation

On-site gamma radiation measurements (Figure 53a) indicate background radiation levels to be approximately 10 to 15 $\mu\text{rem/h}$ ($100 \mu\text{rem} = 1 \mu\text{Sv}$) with impacted sites measuring between 20 to 74 $\mu\text{rem/h}$. Radon measurements indicate minimal dust fall and low background levels. According to the results from radiation dose reconstruction studies and modeling, published in the CDUT Final Report, air quality on-site is relatively clean and not impacted by local site conditions (2005). All hypothetical human receptor-radiation exposure scenarios modeled, showed radiation exposure levels below the prescribed regulatory limit set by the Canadian Nuclear Safety Commission (CNSC)(CDUT, 2005).

The safety of traditional foods was another focus of study, which included sampling of caribou, snowshoe hare, grouse, ptarmigan, fish and berries from the Déline community. Results considered bioaccumulation rates, and indicated that traditional food sources are at low risk and safe for human consumption (CDUT, 2005).

	Exposure Duration (months)	Incremental Radiation Exposure ($\mu\text{Sv/y}$)	Compared to CNSC Prescribed Regulatory Limit ($\mu\text{Sv/y}$)
camper (adult)	3 months	917	-83; below limit
camper (child)	3 months	591	-409; below limit
inspector	2 days/week	30	-970; below limit
fisherman / hunter	1 week/year	100	-900; below limit
lodge employee	2 months	700	-300; below limit

Table 1: gamma dose exposure based on CDUT Final Report 2005

part six.four

Human: Contamination Summary

GBL water quality	<ul style="list-style-type: none"> -continued impact -metal concentrations increase with proximity to shore -metal and radionuclide levels adjacent to site below CCME guidelines -low impact on fish and other aquatic life -overall water quality good
GBL sediments	<ul style="list-style-type: none"> -tailings located in immediate vicinity of mine site -additional tailings located 500 m north-west of Murphy Bay -tailings located in deeper parts of GBL -tailings not likely to move
Fish	<ul style="list-style-type: none"> -liver and muscle tissue studies show contaminant levels at or below Health Canada (2002) human consumption guidelines -study included assessment of whitefish and lake trout
Sub/Surface water	<ul style="list-style-type: none"> -groundwater in contact with tailings has highest level of contamination -impacted groundwater fairly inaccessible and immobile -surface water and runoff above CCME guidelines for some metals
Vegetation	<ul style="list-style-type: none"> -metal concentrations highest in plants in Cobalt Channel drainage area -snow lichen and green reindeer lichen samples show high concentrations of arsenic and uranium
Soil	<ul style="list-style-type: none"> -elevated metal levels in mine-impacted sites -significant difference between tailings/waste rock sites and control sites -elevated levels of uranium, chromium and arsenic
Radiation	<ul style="list-style-type: none"> -gamma radiation largest contributor to mine-related doses -on-site air quality relatively clean; not impacted by local site conditions -dust levels extremely low
Ecological Risk Assessment	<ul style="list-style-type: none"> -aquatic biota not affected by metal and radionuclide levels in GBL -arsenic, copper and uranium levels in water overlying McDonough Lake Tailings Containment Area high but immobile -arsenic concentrations potential issue for fox, scaup duck and hare -primary exposure pathway for terrestrial biota attributed to consumption of contaminated vegetation -cobalt and uranium concentrations in Cobalt drainage area and Murphy Tailings a concern for local species (hare) -radionuclide levels not concern -no adverse impacts on caribou
Human Risk	<ul style="list-style-type: none"> -all hypothetical receptor scenarios below CNSC exposure guidelines -hypothetical metal intake scenarios within acceptable intake levels for non-carcinogenic contaminants (arsenic, antimony, uranium, lead, nickel, molybdenum, copper, cobalt) -risk of carcinogenic properties of arsenic low; below national exposure levels
Traditional Food	<ul style="list-style-type: none"> -traditional foods are safe to eat -levels of radiation in food sources within guidelines; no human health effects expected -low levels of radium-226 and uranium found in all mammal, bird and fish samples -low levels of uranium in all food items; similar to NWT average

Table 2: summary of findings from CDUT 2005 Final Report (prior to remediation)

part six.four

Human: Remediation

Although the mine at Port Radium had been decommissioned in 1982, improved remediation standards led the Déline First Nation to act on their concerns regarding their land and their people, in a call for further site assessment and remediation. Following recommendations presented in the CDUT Final Report (2005), the Canadian Government commenced further site remediation in 2007 (Figure 56-61). According to Aboriginal Affairs and Northern Development Canada, successful remediation of Port Radium was completed in 2008/2009 and included the following activities:

- covering waste rock
- covering/capping tailings to prevent oxidation
- reducing gamma levels on-site
- removing asbestos and hydrocarbons
- covering exposed waste
- closing mine openings
- removing dock in Inner Labine Bay
- re-grading site to create 'naturalized' shoreline
- demolishing all structures on-site
- demolishing all historic foundations

The primary method of remediation at Port Radium consisted of capping, covering and burying contaminants on-site. "What was left ... was buried on site in safe locations using safe methods ... as these materials could be safely taken care of on site, there was no need to remove them" (Government of Canada, 2009). The waste rock, considered to be of no danger to the environment was left on site. Waste rock containing elevated levels of radiation was covered with uncontaminated fill, ultimately lowering radiation levels.

As mentioned earlier in the practicum, historical mining operations included the generation of over 910,000 tons of uranium tailings, deposited in Great Bear Lake and over 800,000 tons of silver tailings were dumped in the McDonough Lake tailings containment area (TCA)(van Wyck, 2010). Both tailings areas have been considered stable and contained - no leaching into the water table or Great Bear Lake is expected. The tailings cap at Silver Point was re-graded to remove surface pooling. Uncontaminated waste rock underlain by a geo-textile layer was used to prevent drainage of the tailings into nearby Cobalt Channel (Government of Canada, 2009).

Aboriginal Affairs and Northern Development Canada (AANDC) has released a public document indicating the status of the remediation of Port Radium (2009). According to this document, the site is considered safe. Although the publication states that humans can remain on-site for a maximum of three consecutive months, signs will continue to be displayed on-site indicating that access is restricted (Government of Canada, 2009). The drinking of water from Great Bear Lake and the eating of edible plants and animals at Port Radium are considered safe. Additionally, "Long term monitoring is a very important commitment in the Port Radium Remediation Plan. For the first four years of monitoring, inspectors will travel to the site twice a year to make sure that the site remains in a stable condition, and that the remediation solutions are working" (Government of Canada, 2009). The Canadian Nuclear Safety Commission is also involved in site monitoring. Port Radium will be monitored indefinitely.



Figure 54: sign posted at Port Radium, NWT (2007)



Figure 55: restricted access to former mining facilities at Port Radium, NWT (2007)



Figure 56: remediation activities 2007-2009
Credit: Dawn Curtis / AANDC



Figure 57: remediation activities 2007-2009
Credit: Dawn Curtis / AANDC



Figure 58: remediation activities 2007



Figure 59: remediation activities 2007-2009
Credit: Colin MacDonald



Figure 60: Port Radium, post-remediation - the site is covered with waste-rock
Credit: Colin MacDonald



Figure 61: Port Radium, post-remediation - the site is covered with waste-rock
Credit: Dawn Curtis / AANDC

part six.five

Significance of Port Radium

What makes Port Radium significant? In re-tracing Canada's nuclear history in *The Highway of the Atom*, van Wyck captures the importance of Port Radium as the source of the atom itself:

This piece of marginal Canadian history ought to be looked at ... After having spent some number of years writing about the other end of the process - the placelessness of spent nuclear materials - I began to think about [Port Radium,] this place in the North of Canada, about how it is connected with southern history, and about what exactly this Highway of the Atom might really be. This is a piece of marginal history only because the south has never been interested in knowing about it.

Peter van Wyck, 2010, p.104

The impacts of the radioactive elements mined from the site extend beyond this place, to include a number of other cities and countries in the world. Perhaps the site including its history and location has remained unknown to most Canadians because of the complex history it possesses. Much like the North itself, the history of Port Radium is mysterious and inaccessible for many. However, this should be considered a site of national and international significance, not despite its controversy but because of it.

In a regional, territorial and national context, Port Radium was in many ways a mine that initiated many developments in policy, research and development. For example, the Northern Transportation Company Limited (NTCL), expropriated by the federal government in 1944, was initially established by Eldorado Mines Limited in 1934 to provide transportation services for the workers at Port Radium. The NTCL went on to provide support to the construction of the Distant Early Warning Line (DEW Line) in the 1950s and remains active

today as one of the most important northern transportation companies in Canada (CDUT, 2005; NTCL, 2012).

According to the Canadian National Capital Commission (NCC), “a cultural landscape approach not only supports the way we care for our cultural environment but it also contributes to understanding the formation of local and national identities” (NCC, 2013). Port Radium should be considered a cultural landscape for the many reasons listed above and especially because of the way in which the site and its activities contributed to our national identity, if only briefly. Recognizing the complete history of Canada should include not only the events we are proud of, but also the mistakes we have made in order to continue to develop as a nation.

This material passed through the North of Canada, leaking as it went, into the productive centres of World War II, and subsequently extended itself over the morning skies of Hiroshima and Nagasaki, and back again into the community of Great Bear Lake in the form of cancers, stories, addictions, and depressions; hauntings.

Peter van Wyck, 2010, p.26

part six.six

Regional Context

Due to the isolated northern location of Port Radium, the reliance on additional regional points of interest for increased exposure is important. Without other nearby facilities, this site may remain silent and unexplored.

The Northern Aboriginal Dene community of Déline is one such site. Formerly known as Fort Franklin, Déline has a strong connection to the history of the Port Radium site – before, during and after its mining operation.

Several hunting and fishing lodges operate on Great Bear Lake. For example, Plummer’s Arctic Lodges is a Canadian owned and operated northern outfitter that has several facilities along the shore of Great Bear Lake. With over seven outposts along the shores of the McTavish Arm of the lake, Plummer’s Lodges offers increased potential for site visibility and interaction (Figure 62).

These fly-in, all-inclusive lodges are operational for specific parts of the year depending on the activity, and must adhere to government regulated fishing and hunting quotas. Tourists visiting these remote sites are often from the United States and Canada, although some other international tourism does exist. The cost of being immersed in the remote northern landscape can run anywhere from \$3000 to \$7500 per week, depending on the desired adventure (Plummer’s Arctic Lodges, 2012).

According to the official Northwest Territories tourism site: “The cultural heritage of the Sahtu Dene and Metis is carefully preserved in small communities that welcome visitors” (Government of the Northwest Territories, 2013). Access to small, remote communities may be difficult, but some outfitters may offer travel packages including several stops to

communities such as Déline, Norman Wells, Colville Lake, Fort Good Hope, and Tulita.

Eco-tourism is defined by the International Ecotourism Society as “responsible travel to natural areas that conserves the environment and improves the well-being of local people” (1990, n.p.). Canoeing, hiking and camping across the northern landscape are all forms of eco-tourism that are promoted in the Northwest Territories.

A more recent method of northern tourism, flightseeing, allows visitors to gain a better understanding of the sheer magnitude of the many varied northern landscapes. One of my most memorable experiences at Port Radium was a helicopter ride over the main site where I was able to spot an old tennis court - long since abandoned, seemingly in the middle of nowhere. In addition to allowing for a birds-eye experience of the vast natural landscapes of the remote Canadian North, flightseeing can also allow for tourists to view historic, human-made landscape features and perhaps more modern, unconventional human traces on the land.

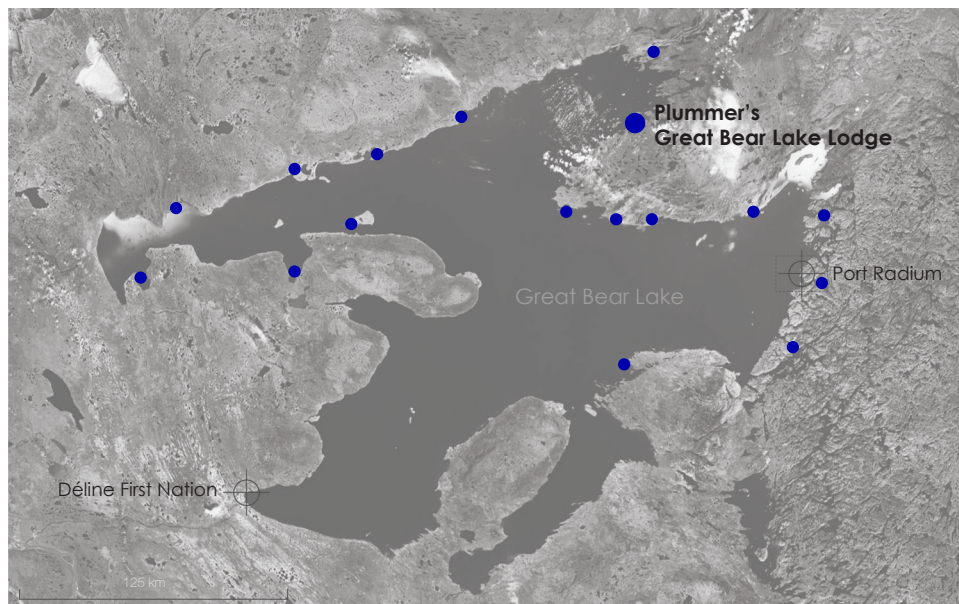


Figure 62: location of Plummer's Arctic Lodges Plummer's Great Bear Lake Lodge (main fishing lodge) and additional outposts - note proximity to Port Radium

part six.seven

Alternative Recommendation

Other historic sites in the region include the Sahoyue-Edacho National Historic Site on the west side of Great Bear Lake, and Tukut Nogait National Park to the north. Sahoyue-Edacho National Historic Site was designated a national historic site in 1996 due to its cultural values, including oral histories and physical relics of trails and cabins that represent the lifestyle and land-use of the Sahtu Dene (Parks Canada, 2012).

In 1973, Port Radium was designated as part of a National Historic Event (NHE) included in a collection of sites across Canada. The plaque at the former Eldorado Mine at Port Radium reads:

Uranium Industry – Gilber LaBine's discovery of pitchblende on the shore of Great Bear Lake in May 1930 led to the opening of Canada's first uranium mine. Production, geared to the extraction of radium for medical science, was carried on from 1933 to 1940. The Port Radium mine, re-opened in 1942 under Government auspices to produce uranium for the Allied atomic bomb programme, remained in operation until 1960. The development of nuclear powered generating stations in the post-war period has proven a stimulus to the Canadian uranium industry centered on the rich deposits of northern Saskatchewan and Ontario.

Parks Canada, 1973

For the same reasons that support the Sahoyue-Edacho National Historic Site, it is recommended that Port Radium be considered for a National Historic Site designation. The site along the shore of Great Bear Lake possesses similar landscape and cultural qualities as those found in the Sahoyue-Edacho National Historic Site.

Further, the Dene involvement in the logistical support and transportation of the Port Radium mining activities is now an embedded cultural experience, a part of the Dene culture, to be passed down through oral tradition. Recognizing the interaction between the Canadian Government, Sahtu-Dene and the landscape demands national attention.

Establishing Port Radium and its environs as a National Historic Site will have legal implications with respect to limiting resource development within the area. National Historic Sites fall under the protection of the Canada National Parks Act, which restricts development and removal of natural objects. An official appeal to designate Port Radium as a National Historic Site would require extensive feasibility studies of the mineral exploration and mining industry within the region, with future exploration and possible mining to be prohibited within the site boundaries. In addition, the Canada National Parks Act would have to be consulted closely.

This approach was considered at the outset of the practicum. Throughout the research and creative design process it was decided that the history of the site demanded additional development, designing beyond what is currently considered as an accepted National Historic Site by Parks Canada. As such, the discussion of historical site designation has been mentioned to provide an alternative option for increasing awareness of Port Radium as a significant cultural landscape, should the proposed design not be feasible, and to provide inspiration for future designers to push the Parks Canada national designation of the site beyond what is currently accepted.



Figure 63: abandoned mining equipment near Port Radium, NWT

part seven

Design Proposal

The study and design of Port Radium has always been about so much more than remediation or restoration. The site represents more than a legacy of contamination; a secretive Canadian government operation as part of the allied atomic bomb mission; a disregard for Dene First Nations land and people; the first modern mine in the Northwest Territories from which the entire mining and exploration industry grew; the challenges faced with living and working in remote locations of the Canadian North; or, the beauty and sensitivity of the vast northern landscape. Port Radium represents all of these things at once. It is found at the point of union of the cultural landscape, the drained and industrial landscape, the pristine landscape and the sacred landscape.

- How can the history of the site be preserved when there are no longer any physical traces of the mining activities?
- Following remediation, how can the history of the site be revealed?
- Who will visit the site?
- Who cares?
- How can the history of the site be preserved given that it has been deemed 'successfully remediated'?
- Is there anything else we can do in the North, aside from technological installations?
- If a path is built, will anyone use it?

Following the CDUT community interviews several recommendations were made including “the desire for public recognition from the federal government for the contribution of Déline Dene people to the Port Radium mine, and the legacy that this involvement has had on the community ... this would be a potentially significant contributor to the healing process” (2005, p. vii). The design strives to acknowledge the contributions of the Déline

community as well as the global impacts of the historical mining activities at Port Radium.

The objectives or design intentions for Port Radium focus on presenting the site as a place of national and international significance. The desire to create a graceful, subtle and sensitive design that represents the history of the site and the Dene Aboriginal people and others who have been impacted by the site has proved difficult. Nonetheless, the following objectives were established at the outset of the research phase.

- Recognize Port Radium as a culturally significant landscape
- Recognize Port Radium as a historically significant site
- Enable an engagement between the past, present and future
- Ensure the history of site is not lost – acknowledge Deline Dene involvement
- Celebrate the landscape of the North
- Educate on the existence and importance of mining development in the North

The proposed design of Port Radium attempts to address the socio-cultural (human), political (institution & industry), and environmental (environment) aspects of the site – including historical, present and future considerations. The design strives to acknowledge the historical importance of Port Radium while simultaneously addressing the ongoing legacy of the post-industrial, mined landscape including an acknowledgement of the hesitation of the Canadian Government to recognize former site activities, and the fear that many continue to have about the site.

Several possible design alternatives have been considered and include:

Do Nothing

- Leave site as it is
- Improve signage

Do Something Small

- Minimal intervention
- Art installation
- Scientific apparatus
- Research outpost
- Outlook point

Do Something Large

- Full-scale restoration of town site
- Full-scale park design
- Hotel & recreation centre
- Artist retreat
- Education retreat
- Propose site as National Historic Site

part seven.one

Impetus & Inspiration

Government remediation efforts completed in 2009 have caused an ecological disturbance to the site. The characteristic slow response time in the North is evident by the low number of pioneer species present. Vegetation that had started to establish itself at Port Radium following the mine closure and demolition in 1989 was eliminated during the 2007-2009 remediation project.

The objective of this practicum proposal was to create a design that represented the history of Port Radium, balanced by the social, political and environmental connections to the site: to address the feelings of disempowerment for the people of Déline; to acknowledge the events made possible by the mining of the site; to begin to introduce vegetation that was once part of the ecology of the site by providing a more sensitive approach to 'remediation', which is to do more than simply bury the site.

This material passed through the North of Canada, leaking as it went, into the productive centres of WWII, and subsequently extended itself over the morning skies of Hiroshima and Nagasaki, and back again into the community of Great Bear Lake in the form of cancers, stories, addictions and depressions; hauntings.

Peter van Wyck, 2010, p.26



Figure 64: inspiration drawn from the physical 'highway of the atom' - various locations where uranium ore was transported during Port Radium mining operations

The site is a re-imagining of the physical 'highway of the atom' as expressed by Peter van Wyck (2010)(Figure 64). Radiating from the centre of the design at the site of the first mine shaft erected at Port Radium, the paths theoretically represent and extend to, specific locations around the world where the uranium extracted from this mine was used in various capacities including:

- Port Hope, Ontario (processing and refining the uranium ore)
- New York City, New York (nuclear fission research)
- Oak Ridge, Tennessee (nuclear fission research)
- Los Alamos/Alamogordo, New Mexico (detonation of the first nuclear bomb 'Trinity')
- Déline, NWT (significant community involvement in mining operations and transport of the ore; sacred land used to produce uranium ore)
- Hiroshima, Japan (world's first atomic bomb of mass destruction)

part seven.two

Design

Lines, or paths of recycled metal from mine sites nearby bend across the surface of the site, guiding to the water's edge. As the veins disappear into the waters of Great Bear Lake it takes a moment to realize the subtle inscriptions etched into the metal. Europe. Port Hope. New York City. Oak Ridge. Los Alamos. Déline. Hiroshima. These are the places that have been touched by the North - somehow altered by the material mined from Port Radium. This is the start of the highway of the atom. The proposed design is about choice, exploration and discovery. A healing place for some; an act of recognition for others.

This problem belongs to all of us. It is a problem for memory ... how to bring into memory, and thus bear witness to, events that, culturally speaking, we do not wish to remember, or to be remembered for.

Peter van Wyck, 2010, p.197



an opening to the underground mine that has since been filled



fireweed (one of the first pioneer species to emerge) begins its process on the site

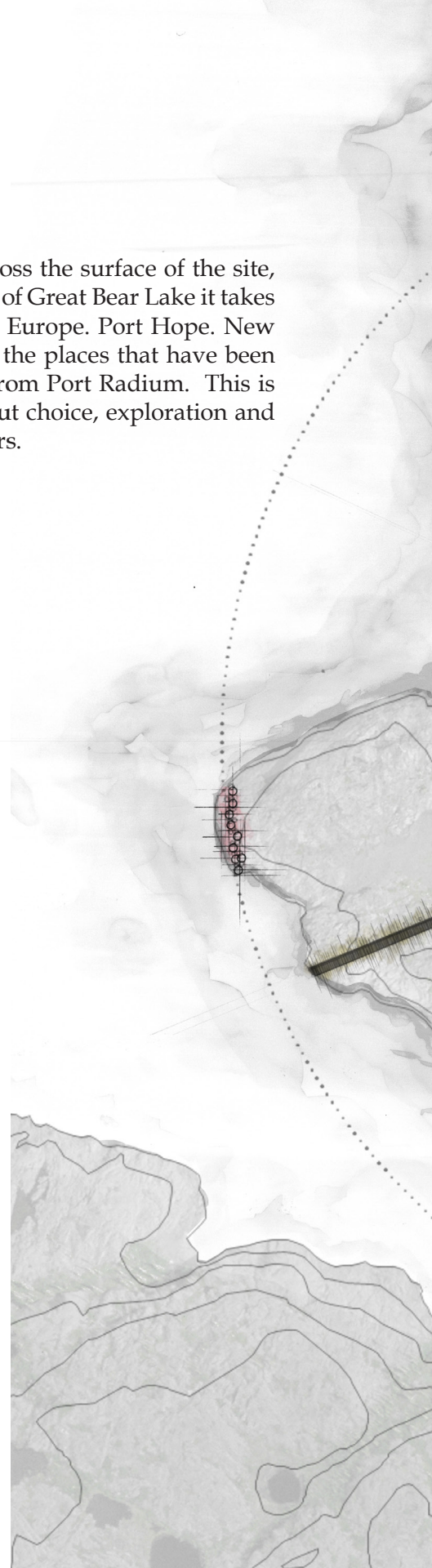
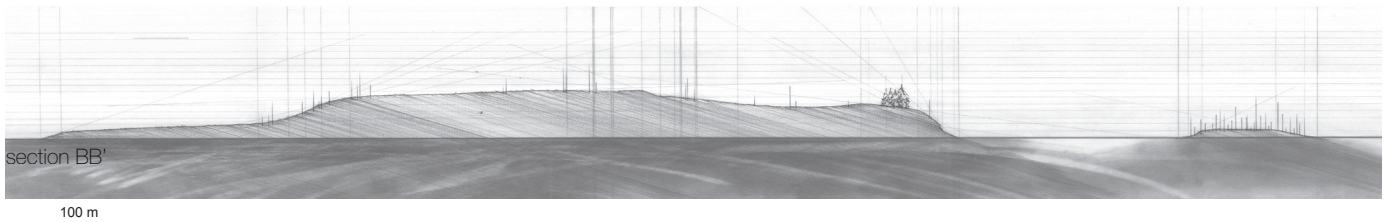
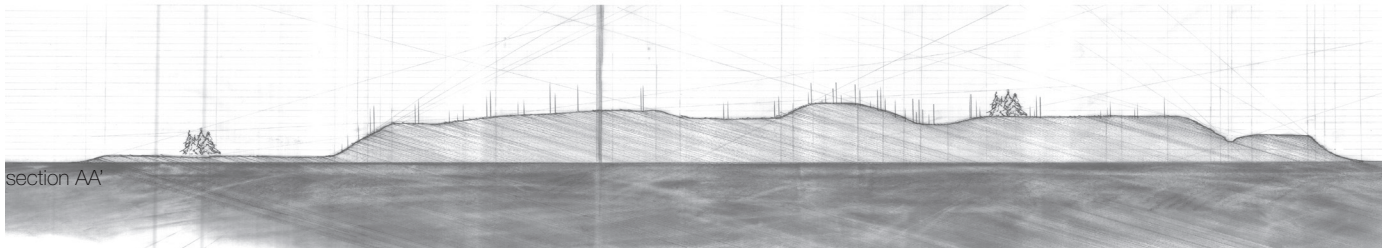


Figure 65: site plan



100 m



left: mixed moss and lichen
right: mountain avens



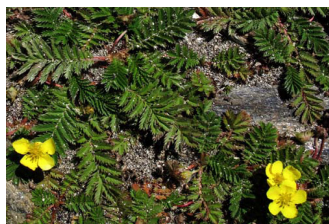
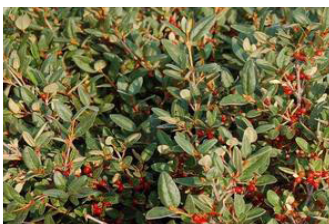
left: labrador tea
right: fireweed



left: mountain cranberry
right: indian paintbrush



left: tall cottongrass
right: prickly saxifrage



left: soapberry
right: silverweed



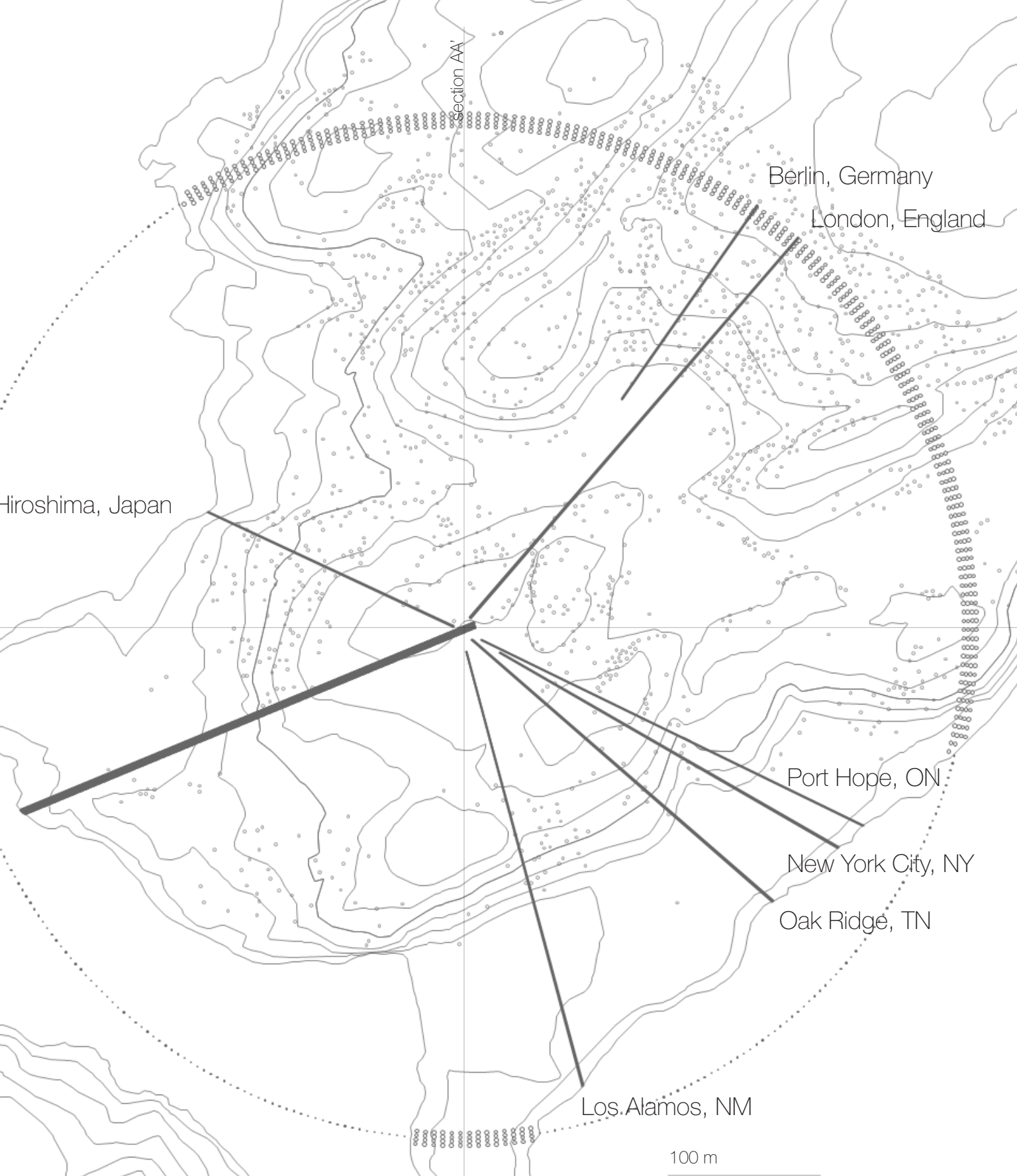


Figure 66: site plan showing path connections



Epilobium angustifolium L.
Fireweed



Picea mariana
Black Spruce
Picea glauca
White Spruce

this page: proposed planting
opposite: anticipated additional plant growth

Figure 67: proposed plantings



Ledum groenlandicum
Labrador Tea



Eriphorum angustifolium Honck.
Tall Cotton-Grass



Senecio pauperculus Michx.
Balsam Goundsel



Potentilla anserina
Silverweed



Dryas integrifolia
White Mountain-Avens



Castilleja raupii
Indian Paintbrush



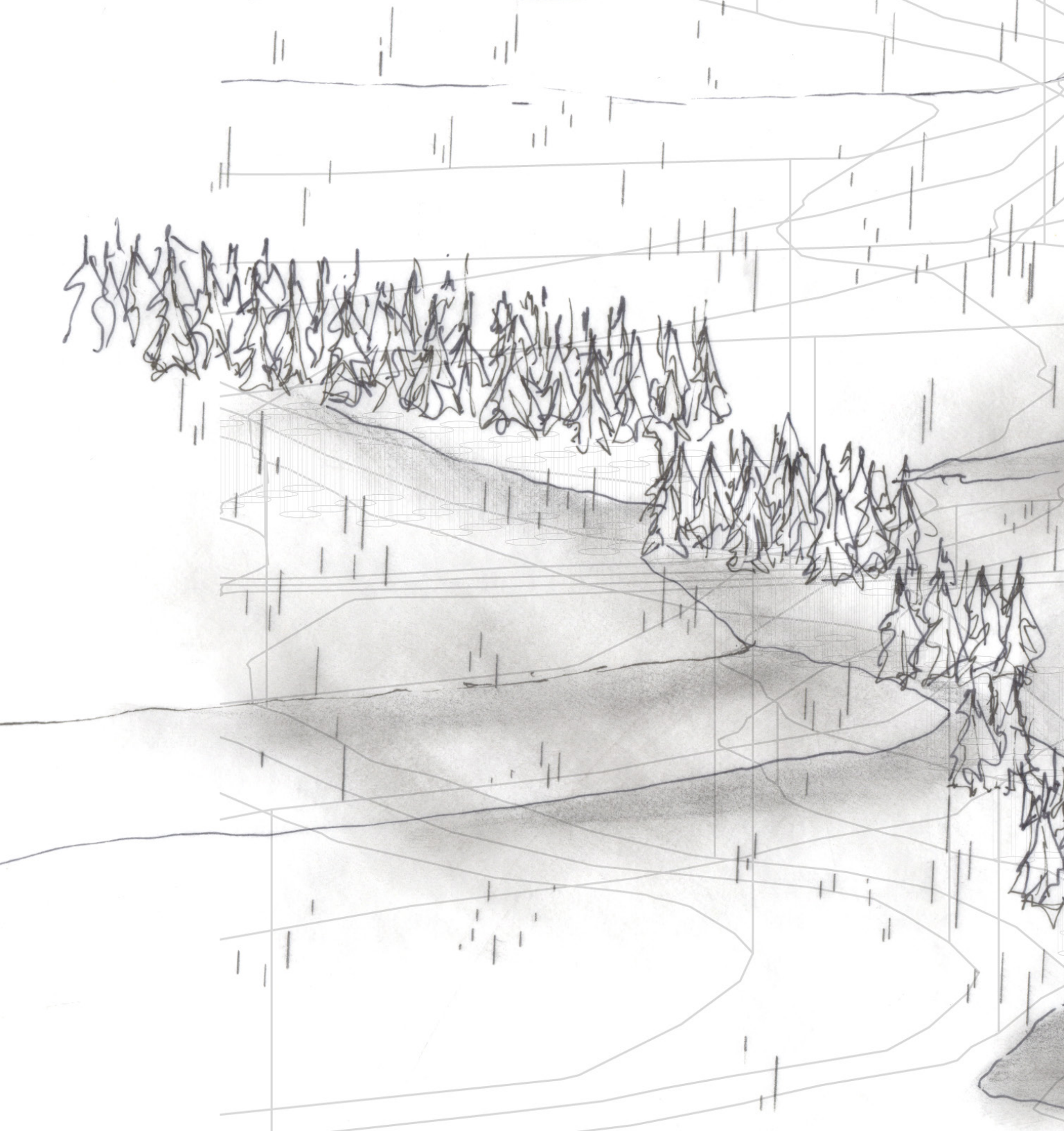


Figure 68: sketch of proposed design, near Labine Bay
Figure 69: proposed design when viewed at night; light installation

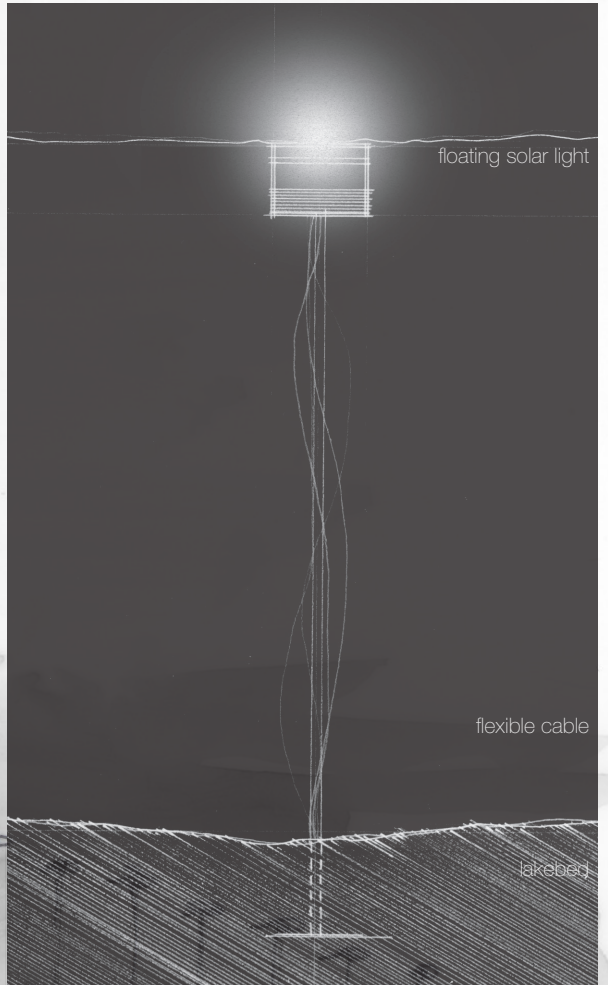
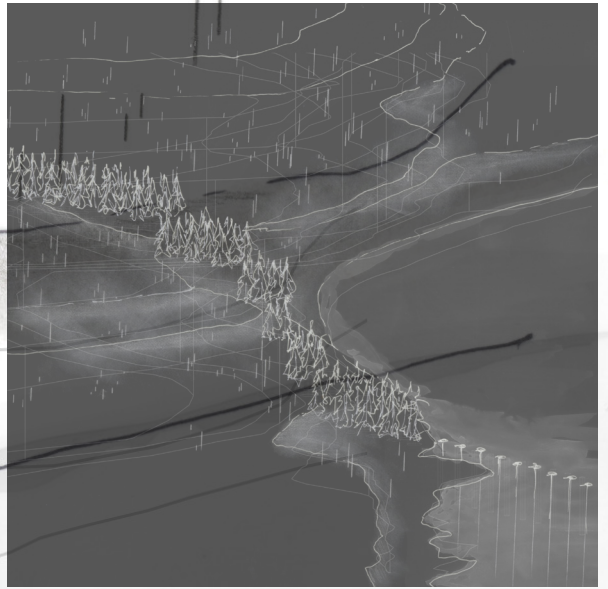
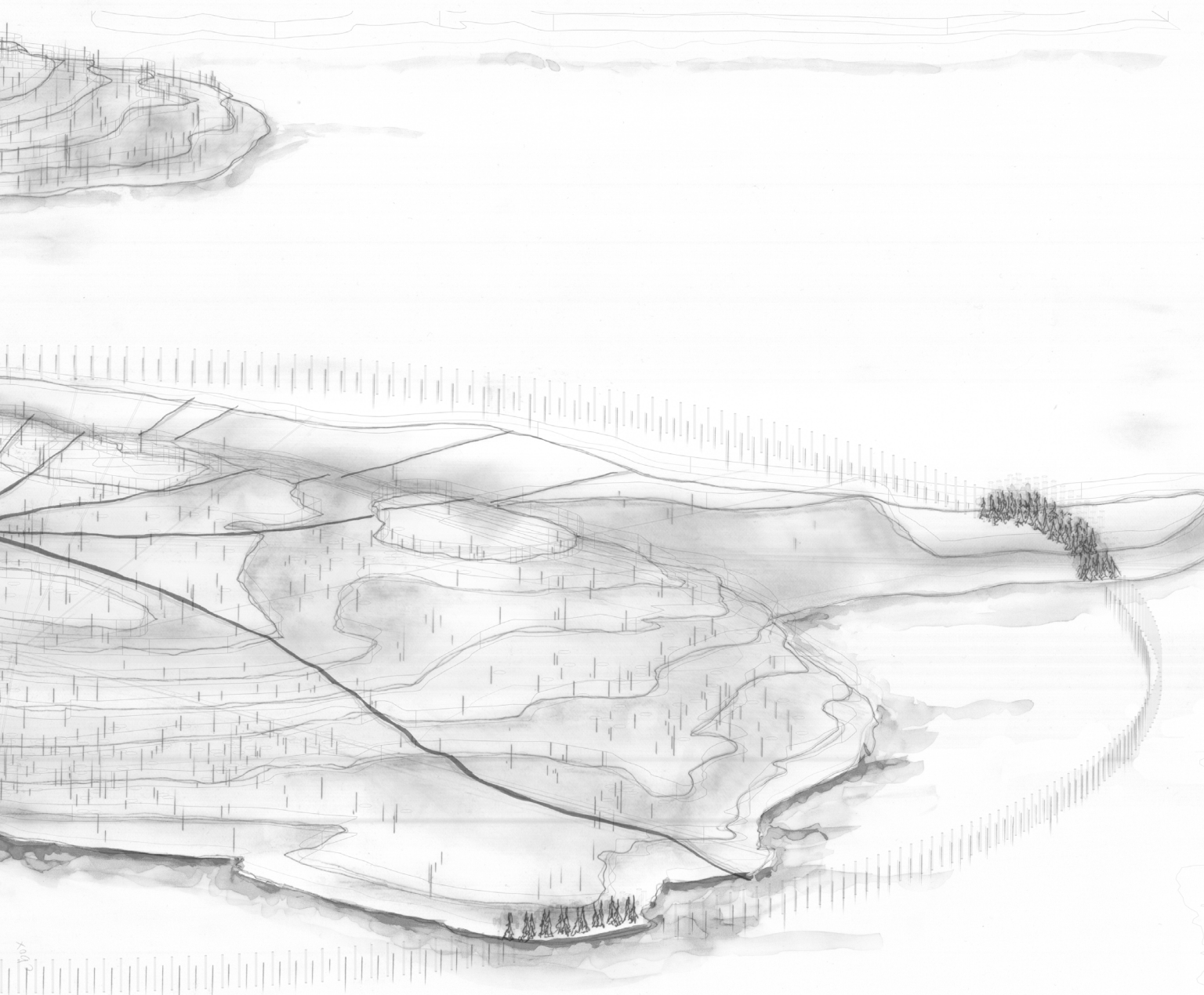




Figure 70: aerial view of proposed design



part seven.three

Experiential Description

Like the veins of the uranium ore mined beneath the ground, the lines radiating from the original site of extraction represent the seams of those places touched by the material from the site. Each vein, or path, points to specific locations along the 'highway of the atom', from Port Radium to Déline, to Port Hope for refining, to research facilities in Canada and the US, and ultimately to Hiroshima.

The design is about choice, exploration and discovery, and it echoes Oberlander's approach of minimal intervention. The site is un-programmed allowing for unique interpretations guided only by the traces of reclaimed metal on the surface, and minimal plantings. The design for Port Radium may become a healing place for some, an act of recognition for others.

The proposed design has been considered to be viewed from above by bush pilots as they transport prospectors, or by tourists embarking on a flightseeing tour of the North, as a somewhat mysterious indication of the significant history of the site - signaling that something has happened here before. Or, to be experienced on the ground, as an act of discovery in an isolated setting, to explore the site as a whole or to merely follow one vein as it radiates outward, extending and disappearing into the water's edge, contemplating the history of the site while immersed in the spectacular landscape (Figure 71).

The circular planting of black spruce saplings and fireweed draw the eye from above, while encouraging additional plant growth and succession on the ground. Core boxes have been used to retain soil in the otherwise gravel-covered area. Here, experimental ground-cover mats have been laid, in an attempt to promote soil stabilization, retention, and the

establishment of moss and lichen coverage.

The site is animated by the cycles that are unique to the northern environment, barely perceptible during the winter months when the landscape is frozen and blanketed by snow. With the breakup of Great Bear Lake and the thawing of snow and ice in the spring, the site begins to awaken from its slumber. The subtle plantings begin their annual cycle of growth, absorbing the sun's energy throughout the limited growing season. During the day blooms of pink, white, purple and yellow native flowers reveal the fleeting subarctic summer - already preparing for the winter to come.

During the night the lake is illuminated with subtle emissions of light radiated from the self-sustaining, solar light installation. The design oscillates in unison with the landscape and the seasons.

Figure 71: perspective of proposed design - looking across Great Bear Lake to Déline



part seven.four

The Circle

The circular planting ring is 10 m wide with a radius of 365 m. The form has been inspired by many aspects of the history of the site including: the study of the blast radius of the atomic bomb dropped on Hiroshima, Japan; the atomic structure of the uranium atom; and, the prominence of the circle in Aboriginal culture. Intending to leave site interpretation up to the individual, no single influence has been emphasized over another.

The radius of the circle has been informed by the area of highest historical contamination and mining activity at Port Radium. The center of the circle has been anchored at the site of the No.1 mineshaft - the first vertical shaft erected on-site. The radius of the circle is marked on ground by a 10 m wide ring or band of vegetation.

Black spruce saplings and transplanted trees from the area are proposed to be planted within the excavated ring, with four trees spanning the 10 m distance, spaced 2 m apart. Fireweed will also be planted within the 10 m ring in an effort to encourage site vegetation and the establishment of favorable growing conditions for additional plant species.

part seven.five

The Paths

The paths, created using a combination of reclaimed metal and weathering (Cor-Ten) steel, extend to the water's edge, where inscriptions of the name of a city and country along the 'highway of the atom', can be found, etched on the metal surface. One of the objectives of the proposal was to be less rigid in the approach of conveying the historical significance of Port Radium - to resist forcing the story of the site, because there are many narratives. Rather, the intention was to allow for participants to engage in the mystery of the site and make their own connections, with minimal guidance.

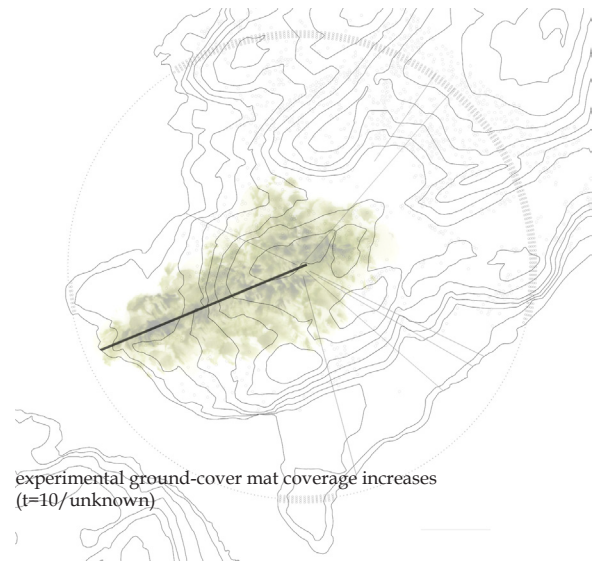
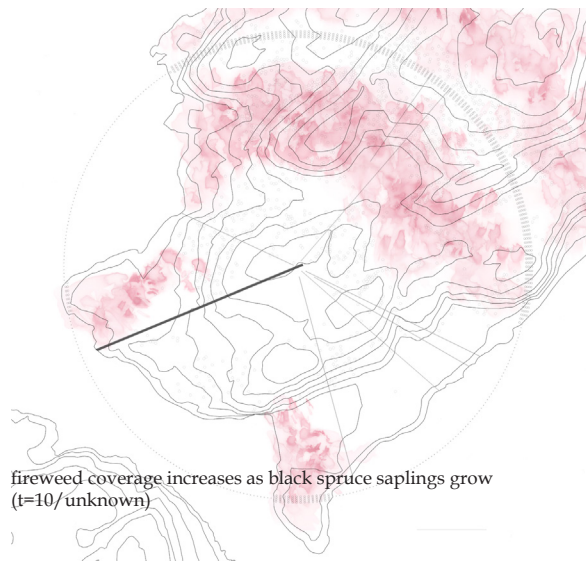
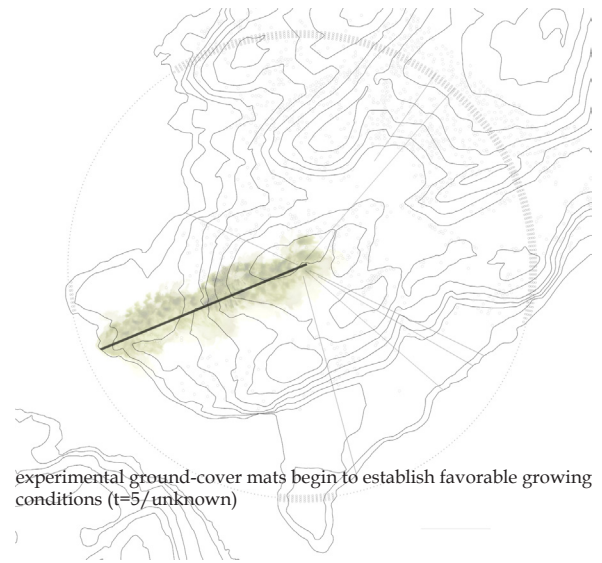
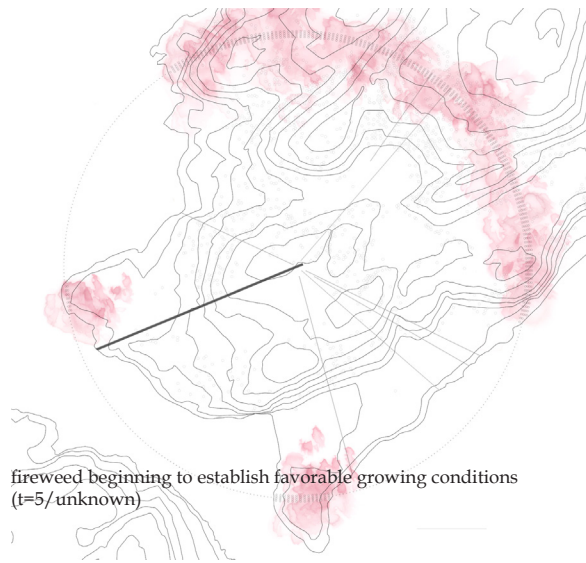
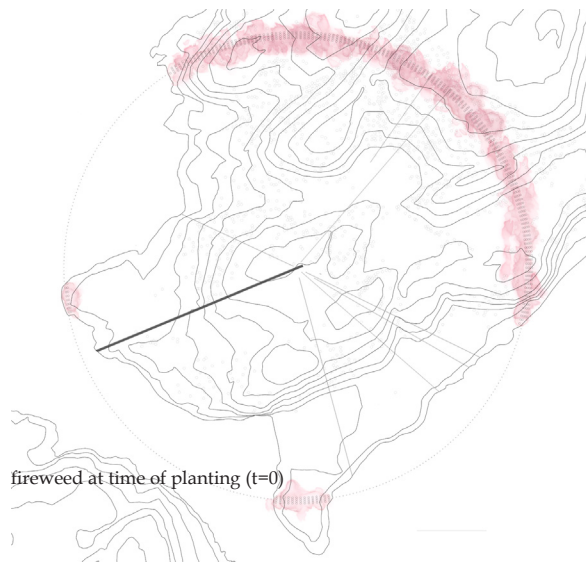
With future participatory design including Déline and other groups, this proposal may continue to evolve. The font, size, language, length and detail of the inscriptions may vary depending on future community input. In addition to the name of the city and country, perhaps a brief inscription of the specific use of the uranium at each site may be useful.

part seven.six

Past, Present & Future

The present and future of the site are honoured through the long-term plan to vegetate the site, proposed in such a way as to work with the overall geometry of the design. The circular ring of trees is proposed as a visual cue that something is different – that something has happened at the site. The geometry and dimension of the pattern in which the trees are planted will be visible from an altitude of approximately 30,000 ft (9.1 km). This design move was to explicitly address site visibility and recognition. The community of Déline has a deep connection to the site, however, not many other people do. Those who do not live in Déline would likely approach the area from the air, visiting a nearby hunting/fishing lodge, or prospecting for mineral deposits. The geometry of the vegetated segments of the circle is related to the intersection point of all six paths – at the site of the first head frame and mineshaft. It is anticipated that the proposed planting of vegetation, in addition to the metal paths, will evolve with the site for several decades, as a subtle yet engaging reference to the history and significance of this place (Figure 72).

Figure 72: proposed evolution of site (time unknown) - increased coverage of fireweed and ground cover encouraged by proposed plantings



part seven.seven

Testing Adaptive Growing Conditions

Soil availability is one of the most common environmental limiting factors affecting vegetation strategies in the North. Following remediation at Port Radium, surface conditions primarily consist of complete coverage by waste-rock. In an area of high disturbance that already has very little available soil, proposing introduced vegetation presents a challenge.

The Canada Mortgage and Housing Corporation (CMHC), with the assistance of the Yellowknife-based landscape architectural firm Avens Associates Ltd., has produced one of the few pieces of literature on the subject of vegetative restoration and planting techniques in the North. *Northern Landscaping – A guide to restoring the plants and soil in northern communities* (2002) includes a brief discussion of several techniques for transplanting vegetation in a northern climate. In addition to a discussion of the uses of various northern grasses and herbaceous species, moss and lichen have been listed as significant pioneer species, able to stabilize site conditions following a disturbance: "Mosses are an important factor in conserving nutrients as they are extremely efficient in intercepting all atmospheric deposition of nitrogen etc." (CMHC, 2002, n.p.). Lichen are also successful in a range of conditions, including bare rock and low stability soils. Both lichen and moss have not been used in any large scale landscape architectural projects in the North (CMHC, 2002). "Transplanting 'carpets' of moss has not worked well in the south, as bugs live under the carpet, then animals dig up the moss for the bugs. It may work better in the North" (CMHC, 2002). Drawing inspiration from the ideas presented in the CMHC document, this design proposes a method of testing the use of ground-cover mat transplants taken from uncontaminated surrounding areas (Figure 73).

The Déline path has been selected for the experimental vegetative 'mat'. Abandoned core boxes collected from the surrounding area are proposed as soil holding cells, over which transplanted ground-cover mats from selected nearby sites will be laid. These mats will consist of a mix of moss, lichen and low-lying herbaceous plants.

As mentioned, fireweed (*Epilobium angustifolium* L.) has been selected to be planted along with the gridded black spruce (*Picea mariana*), within the 10 m wide ring of the circle. As fireweed is considered a pioneer species, it is expected that additional species may populate the site, following the stabilization of growing conditions. Fireweed is successful in gravel sites and often naturally occurs with black spruce (Shebitz, 2003; Milburn, 2002; CMHC, 2002).



experimental ground cover mats

- | | |
|------------------------------|-------------------------------|
| moss: | lichen: |
| <i>Leptobruym pyriforme</i> | <i>Trapeliopsis granulose</i> |
| <i>Bryum sp.</i> | <i>Baeomyces rufus</i> |
| <i>Psilopilum laevigaton</i> | <i>Dectylina arctica</i> |
| <i>Ceratodon purpureus</i> | |
| <i>Pohlia atropurpurea</i> | perennial: |
| <i>Anisothecium beginale</i> | <i>Dryas octopetala</i> |
| <i>Funaria hygrometrica</i> | <i>Cassiope tetragona</i> |

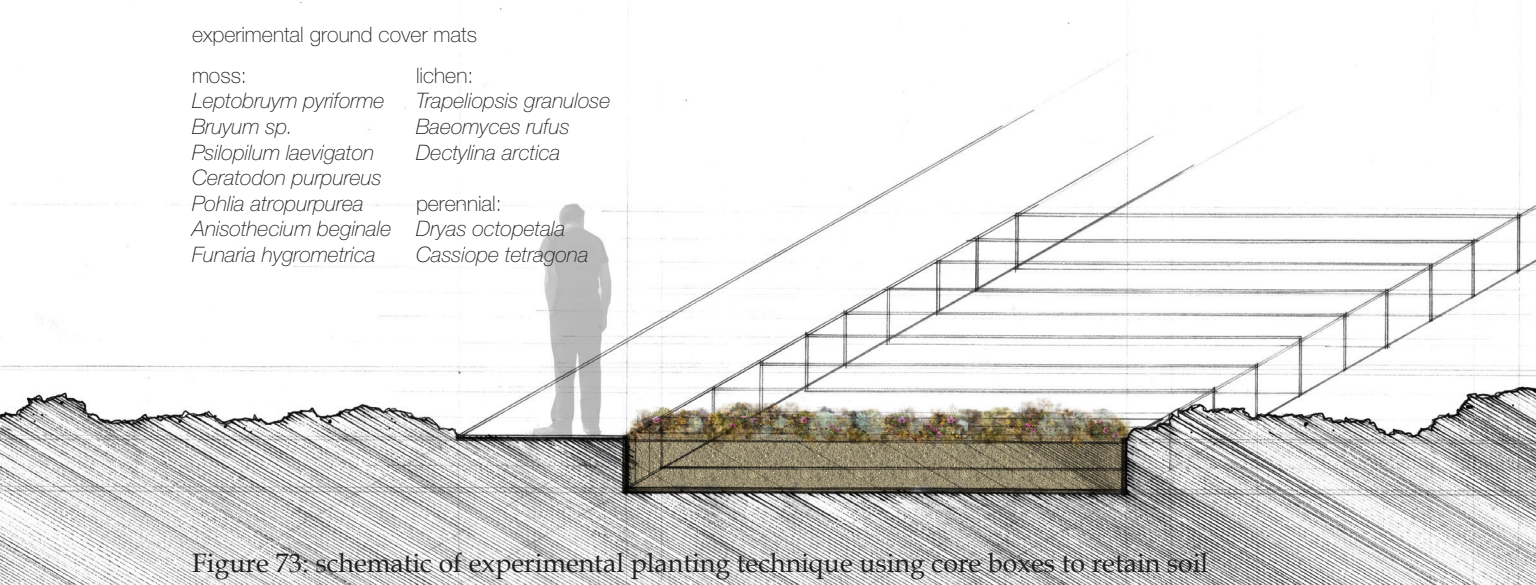


Figure 73: schematic of experimental planting technique using core boxes to retain soil

part seven.eight

Embracing the Cultural Landscape Approach

Cultural landscapes may be landscapes that include built structures and those which are devoid of structures. As mentioned earlier, every landscape may be considered to be a cultural landscape. Although Port Radium was once a moderately developed mining town, with a population of approximately 200-250 people, the mine closure and subsequent remediation activities have removed all vertical traces of its past. However, before the establishment of the mine, Great Bear Lake and its shoreline was a pristine and sacred landscape of the Sahtu Dene peoples (CDUT, 2005).

Addressing the cultural aspects of the site, given that most traces of human activity have been buried by waste rock, proved difficult. I was motivated by one of the guiding ideas behind the approach toward cultural landscapes, “the commitment of the landscape architects to use their understanding of the site’s evolution as the springboard for creative new ways to protect and celebrate the past” (Zvonar and Shearer in *Landscapes*, 2012, p.9). My challenge was to find a new way of representing the significance of the site by applying what I have learned during the course of this degree program.

“Change is an inherent part of the nature of the landscape, and that includes cultural aspects as well as natural aspects” (Buggey, 2012, p.32). The use of vegetation and geometry has been considered as an alternative to re-building structures or adding vertical signage on the site. The intent is to encourage an evolution of the landscape by promoting vegetation growth and increased human visibility and engagement. While vegetation has been proposed, the design is not exclusively focused on site remediation, as is portrayed through the proposed paths and overall site visibility.

The intent is for the design to address the concerns of the Dene Deline, including the health and safety of their land once undeveloped by humans, while simultaneously addressing the history of the site, using vegetation and hard surface materials to address each of these issues.

part eight

Conclusion

For the very large majority of Canadians, the North remains a stranger in the house, and this atmosphere is far from encouraging the taking of appropriate steps. Mentally, most Canadians have shown themselves to possess little nordicity; the South is far from understanding everything northern in the North. The future of the North is often defined in terms of a false dilemma: to decelerate development or to continue in the same direction. A better choice would be to start in a new direction, despite constitutional entanglements, top-heavy administration, and the dead weight of habit and stereotypes.

Louis Hamelin, 1978, p.281

The northern realities are far different than the existing, misconceived impressions of a virginal, pristine, inaccessible, and savagely beautiful landscape survived by only a few brave souls. This southern-perspective pays little regard to the people who have inhabited the true North for several millennia, and this attitude only limits our growth and strength as a Northern nation (Grace, 2002). For something that is embedded in our national anthem, we generally understand and show little regard for the “True North Strong and Free”. Canada is entirely a northern nation. It is not a matter of north versus south. Rather, following Hamelin’s argument, the human ecuneme from which these perspectives originate is nothing more than an area of ‘denorthification’: a region of the North that has become highly populated.

“A wider understanding of an environment that unpredictably oscillates between freeze and thaw, dark and light, accessible and inaccessible, tradition and technology would allow for infrastructural opportunities that maintain soft, multivalent, and malleable characteristics” (Lateral Office, 2010). This project began with my southern-based desire to *chase the North*, to improve my personal understanding of the landscapes and Aboriginal peoples of the North, and to encourage a dialogue between landscape architects and the

landscapes of the North. I have come to realize that this is not an easy task and is one that requires a sensitive and collaborative approach. Through the course of this practicum, it has become evident that the definition of North is as elusive as landscape architecture is in the North. The challenges for landscape architects in the North are complex and many; however, through thoughtful consideration, seemingly minimal designs can have a profound impact on the northern environment. Whereas the answer for some designers may be a top-down, heavy-handed approach to design intervention in the North, I believe the most successful designs are those which follow the theoretical framework proposed in this practicum, considering the *sensitive balance* between industry and institution, human and environment. Designs that emerge from studying the conditions of the site and engage in the least intervention method, as illustrated by Oberlander's design of the NWT Legislative Assembly Building grounds, are better suited to the fragile Northern environment and may be more flexible to future change.

As part of the design process, a framework approach has been proposed and applied throughout the practicum. The theoretical model presents a method of systematically identifying and understanding concepts pertaining to the cultural landscapes of the North, according to the three key themes identified: industry and institution, human, and environment. This framework also provides a practical application as a guide for evaluating the overall success (breadth and depth) of site-specific analysis in the North, as part of the landscape architecture design process. Applying the theoretical framework to the design proposal for Port Radium has allowed for a clear assessment of the design process. According to this framework, the research and design objectives of the site have successfully acknowledged industry and institution, human, and environmental factors influencing the cultural landscape of Port Radium. I hope that this framework will inspire future designers working in the North to recognize the interplay between, and better integrate the industry and institution, the human and the environment.

While future development depends on holistic planning practices encompassing industry and institution, environment, and the human, an opportunity exists for the relic and cultural landscapes of northern development. Port Radium is one such site. The 'ephemeral' mining activities in the North are anything but. The land is forever changed due to mineral exploration and mining. We must acknowledge the significance of the North, of our dependence on it for more than climate moderation and economic profitability, but also for our dreams, for our identity and for the sake of the people who have been living in the North for millennia.

Landscape architecture has a place in the Canadian North, as a profession not only focused on best practices for the future, but also on creating new opportunities for historically significant and extensively mined, drained landscapes scattered across the North. The theoretical framework and design of Port Radium proposes a new way of analyzing and approaching landscape architecture in the northern environment, as a call to landscape architects and future designers to challenge the current boundaries of the southern-focused profession - to embrace the North.



Figure 74: Port Radium mine site on a winter night
Credit: Busse/NWT Archives/N1979-052-3305



List of Figures

- Figure 1: sunrise with moon - Great Bear Lake (2007), ii
- Figure 2: sky over Port Radium (2007), 0-1
- Figure 3: fog over Great Bear Lake / Credit: Colin MacDonald, 7
- Figure 4a: Clarke 1866 Lambert Conformal Conic projection - Mercator projecting in background
Created with ArcMap 10.1 / scale 1:75,000,000, 21
- Figure 4b: Robson Sphere projection, Mercator projection in background
Created with ArcMap 10.1 / scale 1:75,000,000, 21
- Figure 5: latitude circles of the North, 29
- Figure 6: compilation of various static indices, 36
- Figure 7: proposed North-South Boundary with transition boundaries, 37
- Figure 8: magnetic North, 38
- Figure 9: Canada's northern Territories, 42
- Figure 10: The Northwest Territories, 43
- Figure 11: looking out across Cameron Bay (Great Bear Lake) in spring 2007, 44
- Figure 12: postglacial topographic features - seen from a helicopter, flying over the tundra near Diavik Diamond Mine, NWT (2006), 45
- Figure 13: caribou migration across frozen Great Bear Lake at Cameron Bay (2007), 46
- Figure 14: aerial view from helicopter: caribou migration across frozen lake near Diavik Diamond Mine, NWT (2006), 46
- Figure 15: final stages of breakup of ice on Great Bear Lake (2007), 47
- Figure 16: fog across horizon and snow-covered tundra of NWT (2006), 47
- Figure 17: fishing on Great Bear Lake (2007), 48
- Figure 18: mineral exploration at Port Radium (2007), 48
- Figure 19: vegetation indicative of the Taiga Shield High Subarctic Ecoregion - note the morphology of the spruce trees (2007), 49
- Figure 20: Radium Hills High Subarctic Ecoregion (2007), 49
- Figure 21: daybreak on tundra (2006), 50
- Figure 22: waste-rock pile at Diavik Diamond Mine, NWT - the human made relief creates a unique microclimate on the otherwise flat tundra (2006), 50
- Figure 23: facing southwest looking across Great Bear Lake (2007), 51
- Figure 24: aerial view from helicopter: open pit at Diavik Diamond Mine, NWT (2006), 51
- Figure 25a: NWT Legislative Assembly Building and grounds (completed in 1994), 54
- Figure 25b: wetland conditions and selected vegetation, 55
- Figure 25c: incorporating the building into the flat, scrub landscape, 55
- Figure 26: opportunities for landscape architecture to address mining operations across the North, 56
- Figure 27: identifying challenges facing landscape architecture in the North, 59
- Figure 28: framework approach to landscape architecture in the North - a holistic design approach considering (1) industry + institution, (2) the human, and (3) the environment, 60
- Figure 29: compilation of three main areas of concern for landscape architecture in the North, 61
- Figure 30a: mining + exploration as one of the major challenges facing landscape architecture in the North, 62
- Figure 30b: 110 mines (abandoned and producing), 63
- Figure 30c: uranium deposits, 63
- Figure 30d: oil and gas development/exploration leases, 63
- Figure 30e: mineral exploration claims and permits - expired and current (illustrative of historic activity), 63

Figure 31a: awareness of Northern Aboriginal land claims, 64

Figure 31b: Sahtu Dene Land Claims, 65

Figure 31c: Tlicho Land Claims, 65

Figure 31d: Gwich'in Land Claims, 65

Figure 31e: Inuvialuit Land Claims, 65

Figure 32a: environmental considerations for landscape architecture in the North - protected areas + parks, 66

Figure 32b: forest fires and treeline, 67

Figure 32c: existing parks and protected places, 67

Figure 32d: barren-ground caribou migration, 67

Figure 32e: proposed parks and protected places, 67

Figure 33: Canadian context - Port Radium, NWT, 72-73

Figure 34: mapping Port Radium, NWT, 74

Figure 35: Port Radium - site context, 76

Figure 36: collage of site context (historical), 77

Figure 37: sacks of pitchblende concentrate awaiting shipment at Port Radium, Great Bear Lake, 1939
Credit: © Finnie/NWT Archives/N1979-063-0081, 80

Figure 38: miners underground at Port Radium, 1946 / Credit: Busse/NWT Archives/N1979-052-3348, 80

Figure 39: aerial view of Eldorado Mining and Refining minesite, Port Radium, 1946 / Credit: Busse/NWT Archives/N1979-052-3338, 81

Figure 40: buildings on the Eldorado Mining Limited minesite, Port Radium, c. 1940s / Credit: Busse/NWT Archives/N1979-052-3379, 81

Figure 41: Eldorado pitchblende mining camp at Port Radium, Echo Bay, Great Bear Lake, 1939
©Finnie/NWTArchives/N-1979-063-0080, 82

Figure 42: aerial photographs of Port Radium mine stie on Great Bear Lake, c. 1930s / Credit: Edm. Air Museum Ctte./NWT Archives/ N-1979-003-0600, 82

Figure 43: several vessel frozen in, Port Radium / Credit: Busse/NWT Archives/N1979-052-3297, 83

Figure 44: a sign with a jar of used sand from the first atom bomb explosion July 16, 1945, on display in Port Radium /Credit: Busse/NWT Archives/N1979-052-4877, 83

Figure 45: facing North toward Inner Labine Bay, Port Radium, c. 1936. / Credit: Edm. Air Museum Ctte./NWT Archives/N-1979-003-0089, 84

Figure 46: facing North toward Inner Labine Bay, Port Radium, 2012 / Credit: Colin MacDonald, 85

Figure 47: dismantling the historic RCMP outpost at Port Radium (2007), 86

Figure 48: aerial view of Port Radium, 2006 / Credit: Colin MacDonald, 86

Figure 49: remnant concrete foundations from former site operations, Port Radium, 2007 / Credit: Louis Covello, 87

Figure 50: mine adit filled with debris, Port Radium (2007), 87

Figure 51a: geology pertaining to Port Radium, NWT, 96

Figure 51b: permafrost pertaining to Port Radium, NWT, 97

Figure 51c: ecozones pertaining to Port Radium, NWT, 97

Figure 52: context map showing Deline and Port Radium, NWT, 100

Figure 53a: gamma radiation levels obtained during CDUT site assessment studies, 104

Figure 53b: location of historic tailings disposal areas, 104

Figure 53c: estimated vegetative cover across site (aerial assessment), 105

Figure 53d: location of former buildings c. 1932 - 1989, 105

Table 1: gamma dose exposure based on CDUT Final Report 2005, 107

Table 2: summary of findings from CDUT 2005 Final Report (prior to remediation), 108

- Figure 54: sign posted at Port Radium, NWT (2007), 111
- Figure 55: restricted access to former mining facilities at Port Radium, NWT (2007), 111
- Figure 56: remediation activities 2007-2009 / Credit: Dawn Curtis / AANDC, 112
- Figure 57: remediation activities 2007-2009 / Credit: Dawn Curtis / AANDC, 112
- Figure 58: remediation activities 2007, 113
- Figure 59: remediation activities 2007-2009 / Credit: Colin MacDonald, 113
- Figure 60: Port Radium, post-remediation - the site is covered with waste-rock / Credit: Colin MacDonald, 114
- Figure 61: Port Radium, post-remediation - the site is covered with waste-rock / Credit: Dawn Curtis / AANDC, 115
- Figure 62: location of Plummer's Arctic Lodges Plummer's Great Bear Lake Lodge (main fishing lodge) and additional outposts - note proximity to Port Radium, 119
- Figure 63: abandoned mining equipment near Port Radium, NWT, 122
- Figure 64: inspiration drawn from the physical 'highway of the atom' - various locations where uranium ore was transported during Port Radium mining operations, 126
- Figure 65: site plan, 128-129
- Figure 66: site plan showing path connections, 130-131
- Figure 67: proposed plantings, 132-133
- Figure 68: sketch of proposed design, near Labine Bay, 134-135
- Figure 69: proposed design when viewed at night; light installation, 135
- Figure 70: aerial view of proposed design, 136-137
- Figure 71: perspective of proposed design - looking across Great Bear Lake to Déline, 139
- Figure 72: proposed evolution of site (time unknown) - increased coverage of fireweed and ground cover encouraged by proposed plantings, 143
- Figure 73: schematic of experimental planting technique using core boxes to retain soil, 145
- Figure 74: Port Radium mine site on a winter night / Credit: Busse/NWT Archives/N1979-052-3305, 152-153

Please Note:

Photographs and drawings have been produced by the author, unless otherwise stated. All copyrights have been obtained, where required. Permission to use personal photographs has been granted and credit has been given, where required. If there are any concerns or discrepancies with the work that has been presented and referenced in this practicum please do not hesitate to contact the author.

References

- Abel, Kerry M., and Kenneth Coates. *Northern Visions: New Perspectives on the North in Canadian History*. Peterborough, Ont.: Broadview, 2001. Print.
- Aitken, Alec E. Module 1: Concepts of Nordicity. Bachelor of Circumpolar Studies 311 - Module 1. University of the Arctic, N.d.
- "Albedo." Albedo. N.p., n.d. Web. 15 Nov. 2012. <<http://www.eoearth.org/article/Albedo?topic=54300>>.
- "ArcGIS Explorer - Map Projections." ArcGIS Explorer - Map Projections. ESRI, n.d. Web. 25 Nov. 2013. <http://webhelp.esri.com/arcgisexplorer/1500/en/map_projections.htm>.
- "Arctic Council." Home. Arctic Council Chairmanship Secretariat 2007-2013, n.d. Web. 23 Mar. 2013. <<http://www.arctic-council.org/index.php/en/>>.
- "ArcticNet - Research Projects Phase 3." ArcticNet - Research Projects Phase 3. ArcticNET - Government of Canada, n.d. Web. 23 Mar. 2013. <<http://www.arcticnet.ulaval.ca/research/phase3.php>>.
- Arnold, Samantha. "Constructing an Indigenous Nordicity: The "New Partnership" and Canada's Northern Agenda." *International Studies Perspectives* 13 (2012): 105-20. Print.
- Amtzen, Sven. "Cultural Landscape and Approaches to Nature-Ecophilosophical Perspectives." (2001): 27-49. Telemark University College. Web. 28 Feb. 2013. <http://www.eki.ee/km/place/pdf/KP2_03amtzen.pdf>.
- Ashbrook, A.W., and B.C. Smart. "A Review and Update of Refining Practice in Canada." Advisory Group Meeting Organized by the International Atomic Energy Board Held in Paris 1979. Proc. of Production of Yellow Cake and Uranium Fluorides. Vienna: International Atomic Energy Agency, 1980. 261-88. Print.
- Assembly of First Nations. Report 1: An Introduction to the Science of Climate Change. Ottawa: Assembly of First Nations, 2006. Print.
- Avens Associates Ltd. *Northern Landscaping - A Guide to Restoring the Plants and Soil in Northern Communities*. Rep. Yellowknife: CMHC, 2002. Print.
- "Average Weather For Deline, Northwest Territories, Canada." Average Weather For Deline, Northwest Territories, Canada. Vector Magic Inc., n.d. Web. 12 Jan. 2013. <<http://weatherspark.com/averages/28410/Deline-Northwest-Territories-Canada>>.
- BBC Human Planet - Life in the Deep Freeze. Prod. Dale Templar and Brian Leith. BBC One, 2011.
- Bell, J.Mackintosh. "Explorations in the Great Bear Lake Region." *The Geographical Journal* 18.3 (September 1901): 249-58. JSTOR. Web. 2 Oct. 2012. <<http://www.jstor.org/stable/1775131>>.
- Bickel, Lennard. *The Deadly Element - The Story of Uranium*. New York: Stein and Day, 1979. Print.
- Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.
- Bothwell, Robert. *Eldorado, Canada's National Uranium Company*. Toronto: University of Toronto, 1984. Print.

- Bradshaw, Cameron. *Sailivik: A Place of Tranquility*. Thesis. University of Manitoba, 2009. Winnipeg: University of Manitoba, 2009. Print.
- Briggs, David J., and Peter Smithson. *Fundamentals of Physical Geography*. London: Hutchinson, 1985. Print.
- Brodsky, Harold. "Collecting Maps That Lie." *Journal of Geography* 93.3 (1994: May/June): 136-40. Print.
- Buggey, Susan, and Stewart, John. "In Conversation." *Landscapes* 14.1 (Fall 2012): 32. Print.
- Canada. Aboriginal Affairs and Northern Development Canada. *Sahtu Dene and Metis Comprehensive Land Claim Agreement*. Government of Canada, 1993. Web. 25 Jan. 2013. <<http://www.aadnc-aandc.gc.ca/eng/1100100031147/1100100031164>>.
- Canada. Deline First Nation / Indian and Northern Affairs Canada. *Canada-Deline Uranium Table Final Report - concerning Health and Environmental Issues Related to the Port Radium Mine*. N.p.: n.p., 2005. Print.
- Canada. Department of Fisheries and Oceans. *Freshwater Institute. Great Bear Lake*. By Lionel Johnson. Department of Fisheries and Oceans, 2011. Web. 5 Dec. 2012. <<http://www.dfo-mpo.gc.ca/Library/278603.pdf>>.
- Canada. Indian and Northern Affairs Canada. *Big Picture 2010: Contaminated Sites in the NWT*. Ottawa: Minister of Public Works and Government Services Canada, 2010. Print.
- Canada. Indian and Northern Affairs Canada. *How Has the Port Radium Remediation Project Made the Site Safer for People, Animals, and the Environment?* Ottawa: Minister of Indian Affairs and Northern Development and Federal Interlocutor for Metis and Non-Status Indians, Winter 2009. Print.
- Canada. Minister of Justice. *Northwest Territories and Nunavut Mining Regulations*. C.R.C., C.1516 - Last Amended on July 28, 2008, n.d. Web. 18 Nov. 2012. <<http://laws-lois.justice.gc.ca>>.
- Canada. Parks Canada. *National Historic Sites of Canada System Plan*. N.p.: Her Majesty the Queen in Right of Canada, 2000. Print.
- Canada's Northern Strategy. Government of Canada, n.d. Web. 2 Mar. 2013. <<http://www.northernstrategy.gc.ca/index-eng.asp>>.
- "Canadian Environmental Assessment Act, 2012Â (S.C. 2012, C. 19, S. 52)." Legislative Services Branch. N.p., n.d. Web. 18 Dec. 2012. <<http://laws-lois.justice.gc.ca/eng/acts/C-15.21/index.html>>.
- "Canadian Environmental Assessment Agency - Who We Are." Government of Canada, Canadian Environmental Assessment Agency. N.p., n.d. Web. 22 Dec. 2012. <<http://www.ceaa-acee.gc.ca/default.asp?lang=En>>.
- "Canada's Industry ." Canada's Industry. Canadian Association of Petroleum Producers, 2012. Web. 23 Mar. 2013. <<http://www.capp.ca/canadaIndustry/Pages/default.aspx>>.
- "CG Special Feature - Sir John Franklin Expedition." CG Special Feature - Sir John Franklin Expedition. Canadian Geographic, n.d. Web. 23 Mar. 2013. <<http://www.canadiangeographic.ca/specialfeatures/franklinexpedition/>>.

- Chartier, Daniel. "Towards a Grammar of the Idea of North: Nordicity, Winterity." (2006): n. pag. Web. 22 Nov. 2012. <<http://septentrio.uit.no/index.php/nordlit/article/viewFile/1498/1406>>.
- Chenoweth, William L. "Raw Material Activities of the Manhattan Project on the Colorado Plateau." *Nonrenewable Resources* 6.1 (1997): 33-40. New Mexico Bureau of Geology and Mineral Resources. Web. 20 Feb. 2013. <http://geoinfo.nmt.edu/publications/openfile/downloads/OFR200-299/226-250/241/ofr_241.pdf>.
- "Climate Change." Government of Canada, Environment Canada. Government of Canada, 15 Feb. 2013. Web. 18 Feb. 2013. <<http://www.ec.gc.ca/cc/>>.
- Coates, Kenneth, and Judith Powell. *The Modern North: People, Politics, and the Rejection of Colonialism*. Toronto: J. Lorimer, 1989. Print.
- Coates, Kenneth S., and Morrison, William R. Winter and the shaping of Northern History: Reflections from the Canadian North. In Abel, Kerry M., and Kenneth Coates. *Northern Visions: New Perspectives on the North in Canadian History*. Peterborough, Ont.: Broadview, 2001. 23-37. Print.
- Cohen, Daniel. *The Manhattan Project*. Brookfield, CT: Millbrook, 1999. Print.
- Cowan, W.R., and W.O. Mackasey. *Rehabilitating Abandoned Mines in Canada: A Toolkit of Funding Options Prepared for NATIONAL ORPHANED/ABANDONED MINES INITIATIVE*. Rep. Sudbury: Cowan Minerals, October 2006. Print.
- "Cultural Landscape." UNESCO World Heritage Centre. UNESCO, n.d. Web. 2 Feb. 2012. <<http://whc.unesco.org/en/culturallandscape/>>.
- Davis, T. Neil. *Permafrost: A Guide to Frozen Ground in Transition*. Fairbanks, AK: University of Alaska, 2001. Print.
- Dearden, Philip, and Rick Rollins. *Parks and Protected Areas in Canada: Planning and Management*. Toronto: Oxford UP, 1993. Print.
- "The Definition of Elder." *Feathers in the Wind*. Ontario Metis Family Records Center, 2010. Web. 5 Jan. 2013. <<http://www.omfrc.org/newsletter/issue16-june2010.pdf>>.
- "Dene Nation." *The Canadian Encyclopedia*. N.p., 2012. Web. 01 Apr. 2013. <<http://www.thecanadianencyclopedia.com/articles/dene-nation>>.
- "Deline Current Conditions." *Current Conditions and Forecasts - Northwest Territories*. Environment Canada, 2013. Web. 25 Jan. 2013. <http://www.weatheroffice.gc.ca/city/pages/nt-22_metric_e.html>.
- Division of Earth and Life Studies - National Research Council. *Advancing the Science of Climate Change*. Washington, D.C.: National Academies, 2010. Print. *America's Climate Choices: Panel on Advancing the Science of Climate Change*.
- Eaton, Marcella. 1997. *Philosophy and Design in Landscape Architecture*. PhD Thesis. Edinburgh College of Art - Heriot-Watt University. Edinburgh: 1997. Print.
- Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

- "Ecosystem Framework." EcoZones, EcoRegions, and EcoDistricts. Agriculture and Agri-Food Canada, n.d. Web. 5 Jan. 2013. <<http://sis.agr.gc.ca/cansis/nsdb/ecostrat/hierarchy.html>>.
- Eliot, T. S., T. S. Eliot, Anne Hodgson, and Philip Mairet. *Little Gidding*. London: Faber and Faber, 1942. Print.
- Environment and Natural Resources. 2012. *Species at Risk Biologist*. Government of the NWT, Yellowknife, NT. NWT Species at Risk Range Maps.
- Environment and Natural Resources. 2008. NWT Center for Geomatic. Government of the Northwest Territories. *Boundaries of National Parks in the Northwest Territories*.
- Environment and Natural Resources. 2008. NWT Protected Areas Strategy, Department of, Government of the Northwest Territories. NWT Protected Areas Strategy Areas of Interest.
- ESRI 2012. ArcMAP: Release 10.1. Redlands, CA: Environmental Systems Research Institute.
- Evans, M.S. "The Large Lake Ecosystems of Northern Canada." *Aquatic Ecosystem Health & Management* 3.1 (2000): 65-79. Web. 24 Oct. 2012. <<http://dx.doi.org/10.1080/14634980008656992>>.
- Farman, Jason. "Mapping the Digital Empire: Google Earth and the Process of Postmodern Cartography." *News Media & Society* 12.6 (2010): 869-88. Print.
- Gamache, Isabelle, and Serge Payette. "Latitudinal Response of Subarctic Tree Lines in Recent Climate Change in Eastern Canada." *Journal of Biogeography* 32 (2005): 849-62. Print.
- Gausa, Manuel. *The Metapolis Dictionary of Advanced Architecture: City, Technology and Society in the Information Age*. Barcelona: Actar, 2003. Print.
- Gaddis, John Lewis. *The Cold War: A New History*. New York: Penguin, 2005. Print.
- "Geological Survey of Canada." Government of Canada, Natural Resources Canada. N.p., n.d. Web. 23 Mar. 2013. <<http://www.nrcan.gc.ca/earth-sciences/about/organization/organization-structure/geological-survey-of-canada/9590>>.
- Google. (2013). *Google Earth Software (Version 7.0)* [Software]. Available from <http://www.google.com/earth/download/ge/agree.html>.
- Gould, Glen. "The Idea of North." *The Solitude Trilogy*. CBC. 1967. Radio.
- "Government of Canada." *The Canadian Arctic*. N.p., n.d. Web. 11 Oct. 2012. <http://www.canadianinternational.gc.ca/united_kingdom-royaume_uni/bilateral_relations_bilaterales/arctic-arctique.aspx?lang=eng>.
- Government of Canada. "Mining & Minerals in the Northwest Territories and Nunavut." *The North*. Aboriginal Affairs and Northern Development Canada, 23 Apr. 2012. Web. 23 Mar. 2013. <<http://www.aadnc-aandc.gc.ca/eng/1100100036000/1100100036004>>.
- Grace, Sherrill. *Canada and the Idea of North*. Montreal: McGill-Queen's UP, 2001. Print.
- Hamelin, Louis Edmond. *Canadian Nordicity: It's Your North Too*. Montreal: Harvest House, 1978. Print.

- Hanes, Sandra M., Ricard Clay Hanes, and Lawrence W. Baker. *Cold War*. Detroit: Thomson/Gale, 2004. Print.
- Honderich, John. *Arctic Imperative: Is Canada Losing the North?* Toronto: University of Toronto, 1987. Print.
- "The Internet Map Archive." *The Probert Encyclopaedia*. N.p., n.d. Web. 01 Mar. 2013. <<http://www.probertencyclopaedia.com/photolib/maps/>>.
- "Industry Sector Profiles." *Entrepreneurship, Training and Trade*. Government of Manitoba, n.d. Web. 18 Mar. 2013. <<http://www.gov.mb.ca/ctt/profiles/index.html>>.
- "Interpreting the Results of the Sunrise/sunset Calculator." Government of Canada. National Research Council Canada. National Research Council Canada, 10 Dec. 2012. Web. 16 Feb. 2013. <<http://www.nrc-cnrc.gc.ca/eng/services/sunrise/calculator.html>>.
- Johnson, Karen L., Linda Fairfield, and Robert R. Taylor. *Wildflowers of Churchill and the Hudson Bay Region*. Winnipeg: Manitoba Museum of Man and Nature, 1987. Print.
- Johnson, Lionel. "Great Bear Lake." (n.d.): n. pag. Rpt. in *The Book of Canadian Lakes*. Ed. R.J. Allen, M. Dickmen, C.B. Grey, and V. Cromie. Burlington: Canadian Association on Water Quality, 1994. 549-59. Print.
- Jona. "Emerging Arctic Landscapes: Jona." *Emerging Arctic Landscapes: Jona*. Bergen Arkitektkskole, 18 Dec. 2011. Web. 25 Oct. 2012. <<http://emergingarcticlandscapes.blogspot.ca/search/label/Jóna>>.
- Jones, J. Christopher. *Design Methods: Seeds of Human Futures*. London: Wiley-Interscience, 1970. Print.
- Kelm, Mary-Ellen. *Change, Continuity, Renewal: Lessons from a Decade of Historiography on the First Nations of the Territorial North*. In Abel, Kerry M., and Kenneth Coates. *Northern Visions: New Perspectives on the North in Canadian History*. Peterborough, Ont.: Broadview, 2001. 77-90. Print.
- Krupnik, Igor, Rachel Mason, and Tonia W. Horton. *Northern Ethnographic Landscapes: Perspectives from Circumpolar Nations*. Washington, D.C: Arctic Studies Center, National Museum of Natural History, Smithsonian Institution in Collaboration with the National Park Service, 2004. Print.
- Kwong, Y.T.J. *Uranium: Facts, Myths and Phobias*. Rep. no. MPERG Report 2009-1. Whitehorse: Yukon Geological Survey, 2009. Print. Mining and Petroleum Environment Research Group.
- L., Johnson. "The Great Bear Lake: Its Place in History." *Arctic* 28 (1975): 231-44. Print.
- Lackenbauer, P. Whitney., Matthew James Farish, and Jennifer Arthur-Lackenbauer. *The Distant Early Warning (DEW) Line: A Bibliography and Documentary Resource List*. [Calgary]: Arctic Institute of North America, 2005. Print.
- Land of the Long Day*. Dir. John Drainie. National Film Board of Canada, 1952.
- Lateral Office. "Next North: Infrastructure for a Shifting Landscape." *Next North*. Cambridge Galleries, Canada, n.d. Web. 2 Mar. 2013. <<http://lateraloffice.com/NEXT-NORTH-2011>>.
- Lindsey, Alton A. "Vegetation of the Ancient Beaches above Great Bear and Great Slave Lakes." *Ecology* 33.4 (October 1952): 535-49. JSTOR. Web. 24 Oct. 2012. <<http://www.jstor.org/stable/1931528>>.

- Lopez, Barry Holstun. *Arctic Dreams: Imagination and Desire in a Northern Landscape*. New York: Charles Scribner's Sons, 1986. Print.
- Lotz, Jim. *Northern Realities; Canada-U.S. Exploitation of the Canadian North*. Chicago: Follett, 1971. Print.
- MacDonald, Colin, PhD. *Great Bear Lake State of Knowledge of the Terrestrial Environment - Prepared for The Sahtu Renewable Resources Board*. Tech. N.p.: Northern Environmental Consulting, March 2004. Print.
- Mackasey, W.O. *Abandoned Mines in Canada*. Rep. Sudbury: WOM Geological Associates, 2000. Print. Prepared for Mining Watch Canada.
- "Map Projections." USGS Map Projections. National Mapping Division, USGS, 3 Aug. 2006. Web. 22 Nov. 2012. <<http://egsc.usgs.gov/isb/pubs/MapProjections/projections.html>>.
- McNiven, Chuck, and Henry Puderer. "Delineation of Canada's North: An Examination of the North-South Relationship in Canada." *Geography Working Paper Series 3rd ser.* (2000): n.p. Web.
- Milburn, Alexandra. "Wild and Wacky Plants of the NWT." *Government of the Northwest Territories - National Library of Canada Cataloguing in Publication Data*, 2002. Web. 5 Dec. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/wacky_plants.pdf>.
- Milburn, Lee-Anne S., and Robert D. Brown. "The Relationship between Research and Design in Landscape Architecture." *Landscape and Urban Planning* 64.1-2 (2003): 47-66. ScienceDirect. Elsevier, 2003. Web. 19 Feb. 2013. <<http://www.sciencedirect.com.proxy1.lib.umanitoba.ca/science/article/pii/S0169204602002001>>.
- Moore, Peter. D., and Garratt, Richard. *Tundra*. New York: Facts on File, 2008. Print.
- Monmonier, Mark S. *How to Lie With Maps*. Chicago: University of Chicago, 1991. Print.
- Mulvihill, Peter R., Douglas C. Baker, and William R. Morrison. "A Conceptual Framework for Environmental History in Canada's North." *Environmental History* 6.4 (October 2001): 611-26. JSTOR. Web. 7 Nov. 2012. <<http://www.jstor.org/stable/3985257>>.
- Mursky, G. *Geology of the Port Radium Map-Area, District of Mackenzie*. Ottawa: Geological Survey of Canada - Department of Energy, Mines and Resources, 1973. Print. Memoir 374.
- Nanook of the North. Dir. Robert J. Flaherty. EOne Films, 1922.
- Neuendorf, Klaus K.E., James P. Mehl, Jr., and Julia A. Jackson, eds. *Glossary of Geology*. 5th ed. Virginia: American Geological Institute, 2005. Print.
- News, CBC. "Igloolik Isuma Productions Going out of Business." *CBCnews*. CBC/Radio Canada, 08 July 2011. Web. 02 Apr. 2013. <<http://www.cbc.ca/news/canada/north/story/2011/07/08/isuma-productions-business.html>>.
- Newstats. "2011 Census of Canada Data." *NWT Bureau of Statistics*. Government of the Northwest Territories, 2011. Web. 18 Mar. 2012. <<http://www.statsnwt.ca/census/2011/>>.

- NTCL. "Our History." Northern Transportation Company (NTCL). N.p., 2012. Web. 18 Mar. 2012. <<http://www.ntcl.com/about-us/history/>>.
- Nunavut Bureau of Statistics. "Nunavut Quick Facts." Government of Nunavut, 2012. Web. 18 Mar. 2012. <<http://www.stats.gov.nu.ca/en/home.aspx>>.
- "NWT Archives Port Radium Photo Gallery." NWT Archives Port Radium Photo Gallery. N.p., n.d. Web. 15 Oct. 2012 <<http://www.pwnhc.ca/research/photogallery/Galleries/Communities/Port%20Radium%20Gallery/port%20radium0003.html>>.
- NWT Chamber of Mines. "Our Industry." Mining North. NWT and Nunavut Chamber of Mines, 2011. Web. 22 Feb. 2012. <http://www.miningnorth.com/?page_id=9>.
- NWT Mining Heritage Society. "Pics from Mining History." NWT Mining Heritage Newsletter 4 (Sept. 2010): 2. 2010. Web. 19 Jan. 2013. <<http://www.nwtminingheritage.com/files/frontend-newsletters-default/Newsletter2010d.pdf>>.
- Oberlander, Cornelia. "Yellowknife Legislative Assembly Building." Cornelia Hahn Oberlander. N.p., n.d. Web. 16 Dec. 2012. <<http://www.corneliaoberlander.ca/#/yellowknife/4528785176>>.
- Page, David. *Advanced Text-book of Physical Geography*. Edinburgh: W. Blackwood and Sons, 1864. Print.
- "Parks Canada Glossary." Parks Canada. N.p., 15 Apr. 2009. Web. 19 Feb. 2013. <<http://www.pc.gc.ca/docs/pc/poli/princip/gloss.aspx>>.
- Pelling, Mark. *Adaptation to Climate Change: From Resilience to Transformation*. London: Routledge, 2011. Print.
- "Permafrost." Government of Canada, Natural Resources Canada. Natural Resources Canada, n.d. Web. 15 Jan. 2013. <<http://www.nrcan.gc.ca/earth-sciences/climate-change/landscape-ecosystem/permafrost/230>>.
- Piper, Liza. "Subterranean Bodies - Mining the Large Lakes of North-west Canada, 1921-1960." *Environment and History* 13 (2007): 155-86. JSTOR. Web. 7 Nov. 2012. <<http://www.jstor.org/discover/10.2307/20723614?uid=2&uid=4&sid=21101838567481>>.
- "Plant Hardiness Zones in Canada." Plant Hardiness Zones in Canada. Agriculture and Agri-Food Canada, 06 Dec. 2010. Web. 11 Jan. 2013. <<http://sis.agr.gc.ca/cansis/nsdb/climate/hardiness/intro.html>>.
- "Plummers Arctic Lodges | Lake Trout Fishing." Plummers Arctic Lodges | Lake Trout Fishing. N.p., 2011. Web. 22 Jan. 2013. <<http://www.plummerslodges.com/>>.
- "Polar Continental Shelf Program." Natural Resources Canada. Government of Canada, n.d. Web. 18 Jan. 2013. <<http://www.nrcan.gc.ca/earth-sciences/products-services/polar-shelf-services/11617>>.
- Ponte, Alessandra. "Alessandra Ponte: Journey to the North of Quebec: Understanding (McLuhan's) Media." Winter 2012 Lecture Series from McGill's School of Architecture. Montreal. McGill Podcasts. McGill University, 2 May 2012. Web. 10 Oct. 2012. <<http://podcasts.mcgill.ca/architecture-2/alessandra-ponte-journey-to-the-north-of-quebec-understanding-mcluhans-media/>>.

- Ponte, Alessandra. "Journey to the North of Quebec - Understanding (McLuhan's) Media." *Architectural Association Files 63* (2011): n. pag. Print.
- Pratt, Angela. "Treaties vs. Terra Nullius: "Reconciliation," Treaty-Making and Indigenous Sovereignty in Australia and Canada." *Indigenous Law Journal* 3 (Fall 2004): 43-60. Web. 23 Mar. 2013. <<https://tspace.library.utoronto.ca/bitstream/1807/17116/1/LJ-3-Pratt.pdf>>.
- Preece, R. A. *Designs on the Landscape: Everyday Landscapes, Values, and Practice*. London [England: Belhaven, 1991. Print.
- "Public Safety Canada: About Disaster Mitigation." Government of Canada, Public Safety Canada. N.p., 20 Feb. 2012. Web. 23 Mar. 2013. <<http://www.publicsafety.gc.ca/prg/em/ndms/aboutsnac-eng.aspx>>.
- "SAHTU COMMUNITIES Colville Lake - Deline - Fort Good Hope - Norman Wells & Tulit'a." Sahtu Communities. Sahtu Secretariat Incorporated, 2012. Web. 1 Mar. 2013. <<http://www.sahtu.ca/#sahtu-communities/c119b>>.
- "Saoyú-?ehdacho National Historic Site of Canada." *HistoricPlaces.ca - HistoricPlaces.ca*. Parks Canada, n.d. Web. 5 Dec. 2012. <<http://www.historicplaces.ca/en/rep-reg/place-lieu.aspx?id=13033>>.
- Scott, Peter A., Roger I.C. Hansell, and William R. Erickson. "Influences of Wind and Snow on Northern Tree-line Environments at Churchill, Manitoba, Canada." *Arctic* 44.4 (1993): 316-23. Web. 24 Oct. 2012. <<http://www.jstor.org/stable/40511433> .>.
- Searle, D. Richard. *Phantom Parks: The Struggle to save Canada's National Parks*. Toronto: Key Porter, 2000. Print.
- Silje. "Emerging Arctic Landscapes: Silje." *Emerging Arctic Landscapes: Silje*. N.p., 17 Dec. 2011. Web. 15 Jan. 2013. <<http://emergingarcticlandscapes.blogspot.ca/search/label/Silje>>.
- Simin, Davoudi. *Planning for Climate Change : Strategies for Mitigation and Adaptation for Spatial Planners*. N.p.: Earthscan, 2009. Print.
- Singh, V. P., Pratap Singh, and Umesh K. Haritashya. *Encyclopedia of Snow, Ice and Glaciers*. Dordrecht: Springer, 2011. Print.
- Shebitz, Daniela. "Fireweed Plant Data Sheet." *Plant Data Sheet*. University of Washington, 16 Apr. 2003. Web. 16 Jan. 2013. <<http://depts.washington.edu/propplnt/Plants/epilobium.htm>>.
- Snyder, John P. *Flattening the Earth: Two Thousand Years of Map Projections*. London: University of Chicago, 1997. Print.
- Somba Ke: The Money Place. Dir. David Henningson. Prod. Don Dixon. By Petr Cizek. *Filmakers Library*, 2007.
- "Statement of Canada's Arctic Foreign Policy (booklet)". *Foreign Affairs and International Trade Canada (DFAIT)*. Web. 02 Dec. 2011. <http://www.international.gc.ca/polar-polaire/canada_arctic_foreign_policy_booklet-la_politique_etrangere_du_canada_pour_arctique_livret.aspx?lang=eng>.
- "Statistics Canada." *Land and Freshwater Area, by Province and Territory*. Government of Canada, n.d. Web. 11 Oct. 2012. <<http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/phys01-eng.htm>>.

- Stonehouse, Bernard. *Animals of the Arctic: The Ecology of the Far North*. New York: Holt, Rinehart & Winston, 1971. Print.
- Stothart, Paul. *Fact\$ & Figure\$ 2011 of the Canadian Mining Industry*. Rep. N.p.: Mining Association of Canada, 2011. Print.
- Tahkokallio, Paivi, ed. *Arctic Design - Opening the Discussion*. Vaasa Finland: University of Lapland, 2012. U Arctic. University of Lapland. Web. 25 Jan. 2013. <<http://www.ulapland.fi/loader.aspx?id=e253ba11-dcd0-41ce-b394-f6530226eb82>>.
- "The Distant Early Warning Line Clean-up Project." Government of Canada: Canada News Centre. Department of National Defense, 29 June 2009. Web. 23 Mar. 2013. <<http://news.gc.ca/web/article-eng.do?m=/index>>.
- "Thomas Rodney Berger." - *The Canadian Encyclopedia*. N.p., n.d. Web. 23 Mar. 2013. <<http://www.thecanadianencyclopedia.com/articles/thomas-rodney-berger>>.
- Timoney, K.P., G.H. La Roi, S.C. Zoltai, and A.L. Robinson. "The High Subarctic Forest-tundra of Northwest Canada: Position, Width, and Vegetation Gradients in Relation to Climate." *Arctic* 45.1 (1992): 1-9. Web. 24 Oct. 2012. <<http://www.jstor.org/stable/40511186> .>.
- The Canadian Trade Commissioner Service. "Canadian Trade Commissioner Service - Alberta, Northwest Territories and Nunavut." *Sector Snapshots*. Government of Canada, 15 Mar. 2013. Web. 18 Mar. 2013. <<http://www.tradecommissioner.gc.ca/eng/alta/sector-snapshots.jsp>>.
- "UCMP - University of California Museum of Paleontology." *Introduction to Lichens*. University of California, n.d. Web. 25 Jan. 2013. <<http://www.ucmp.berkeley.edu/fungi/lichens/lichens.html>>.
- "Uranium." *ARCHIVED: Periodic Table of the Elements*. National Research Council Canada, 23 June 2003. Web. 23 Mar. 2013. <<http://www.nrc-cnrc.gc.ca/eng/education/elements/el/u.html>>.
- Van Den Brink, Adri, and Diedrich Bruns. "Strategies for Enhancing Landscape Architecture Research." *Landscape Research I* First Article (2012): 1-14. Taylor Francis Online. 2012. Web. 19 Feb. 2013. <<http://www.tandfonline.com.proxy1.lib.umanitoba.ca/doi/pdf/10.1080/01426397.2012.711129>>.
- Van Wyck, Peter C. *The Highway of the Atom*. Montreal: McGill-Queen's UP, 2010. Print.
- Village of Widows*. Dir. Peter Blow. Prod. Gil Gauvreau. Lindum Films, 1999.
- Vitebski, Piers. "The Arctic Is...A Homeland." (n.d.): n.p. Web. 25 Nov. 2012. <<http://www.thearctic.is/documents/homeland.pdf>>.
- Wagner, Jennifer. *The Palisades Centre - Jasper National Park: An Adaptive Rehabilitation of a Cultural Landscape*. Thesis. University of Manitoba, 2000. Winnipeg: University of Manitoba, 2000. Print.
- "Weather Patterns of the Yukon, Northwest Territories and Western Nunavut." *NavCanada*. N.p.: NavCanada, n.d. 51-81. Print.
- "Welcome to the Dene Nation and Assembly of First Nations NWT." *Dene Nation*. Dene Nation, n.d. Web. 29 Dec. 2012. <<http://www.denenation.com/>>.

- "Welcome to the NWT State of the Environment Report on the Web." State of the Environment Report. Government of the Northwest Territories, updated to 2012. Web. 23 Mar. 2013. <http://www.enr.gov.nt.ca/_live/pages/wpPages/SOE_Welcome.aspx>.
- Wells, H. G. *The Last War: A World Set Free*. Lincoln: University of Nebraska, 2001. Print.
- "What Is Ecotourism?" The International Ecotourism Society. N.p., 2012. Web. 22 Jan. 2013. <<http://www.ecotourism.org/what-is-ecotourism>>.
- "What We Manage." Cultural Landscapes in Canada's Capital Region. National Capital Commission Government of Canada, n.d. Web. 28 Jan. 2013. <<http://www.canadascapital.gc.ca/property-management/what-we-manage/cultural-landscapes-canadas-capital-region>>.
- Winnipeg Free Press FP Markets on 01.14.13 Winnipeg Free Press, 2013. Print.
- Woo, Ming-Ko, Paul Modeste, Lawrence Martz, Joe Blondin, Bob Kochtubajda, Dolphus Tutcho, John Gyakum, Alphonse Takazo, Chris Spence, Johnny Tutcho, Peter Di Cenzo, George Kenny, John Stone, Israel Neyelle, George Baptiste, Morris Modeste, Bruce Kenny, and Walter Modeste. "Science Meets Traditional Knowledge: Water and Climate in the Sahtu (Great Bear Lake) Region, Northwest Territories, Canada." *Arctic* 60.1 (March 2007): 37-46. JSTOR. Web. 10 Jan. 2013. <<http://www.jstor.org/stable/40513156> .>.
- Woodin, Sarah J., and Mick Marquiss. *Ecology of Arctic Environments*. Oxford: Blackwell Science, 1997. Print.
- "World Map of the Koppen-Geiger Climate Classification Updated." World Maps of Koppen-Geiger Climate Classification. Institute for Veterinary Public Health, n.d. Web. 17 Jan. 2013. <<http://koeppen-geiger.vu-wien.ac.at/present.htm>>.
- Wynn, Graeme. *Canada and Arctic North America: An Environmental History*. Santa Barbara, CA: ABC-CLIO, 2007. Print.
- Yukon Bureau of Statistics. "Population and Dwelling Census 2011." Government of Yukon, 2011. Web. 5 Apr. 2012. <<http://www.eco.gov.yk.ca/stats/pdf/2011PopulationDwellings.pdf>>.
- "Zacharias Kunuk." IsumaTV. N.p., n.d. Web. 01 Apr. 2013. <<http://www.isuma.tv/isuma-productions/zacharias-kunuk>>.
- Zvonar, John, and Wendy Shearer. "Reading Mysteries." *Landscapes* 14.4 (2012): 9. Print.

appendix

A Glossary of The North

Introduction

What makes the North unique is its vastness, both in landmass and potential for scholarship and cross-cultural, multidisciplinary design.

When I first began to explore the North through literature, film, art and maps, I began to realize how many fascinating areas of northern research there truly are. The breadth of pertinent information of the North is continually expanding - extending to almost every discipline imaginable: from politics to meteorology, sociology to environmental history, women's studies to geology; and, climate change. For every book, paper, film and map I researched I found many others I considered to be equally valuable to my understanding of the North.

The practice of landscape architecture often involves cross-disciplinary collaboration to gather appropriate knowledge into the realm of the discipline. Inspired by the collaborative inventory of architectural terms in *The Metapolis Dictionary of Advanced Architecture* (2003), this section attempts to provide an inventory of multi-disciplinary topics pertaining to the study of the North.

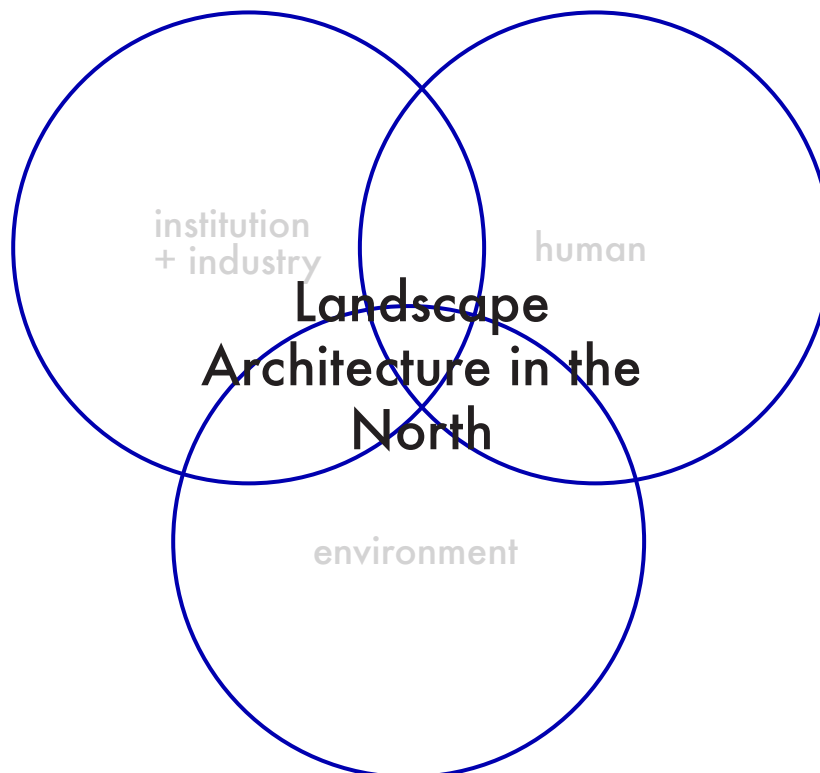
This is an exploration of the North. The intent is to present areas, themes, and topics proposed as valuable to framing landscape architecture in a northern context. These have been discovered through research and personal experience based on my time spent working in the North. Entries have been added as they emerge and represent the foundational background from which further study and design are presented. This practicum does not present itself as an authority of any one area. I relinquish the science and specific research to those better capable of communicating these subjects, as a matter

of their own expertise. Consultation with experts is encouraged.

Any issue or debate taken with the inclusion, exclusion or representation of one or more entries is encouraged, as this in turn reinforces the purpose of the practicum – promoting a dialogue with the North, and those interested in North.

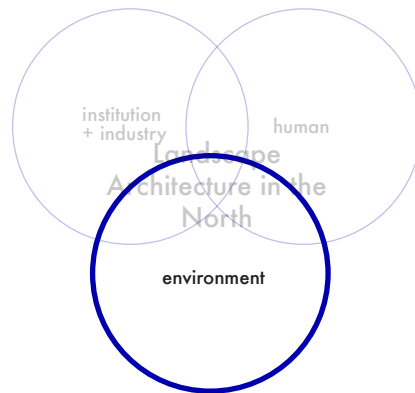
A brief introduction to the three main areas of significance that frame the practicum (see part five.three Framework Approach) is followed by a collection of terms, topics, definitions and points of interest pertaining to the North. Entries are organized alphabetically and are accompanied by a brief definition and suggested references, where available.

Where more information is offered, discussion may be lengthy. Where information is limited or has not been considered of a primary concern to this design process, additional references are provided. In some cases, more than one term may be used to refer to the same idea. Some entries may simply refer the reader to another section.



appendix

A Glossary of The North Environment



The Earth has existed for millions of years before humans. The Earth does not depend on the human race to survive. In a very simplified form of Maslow's Hierarchy, the productive landscapes of the Earth are the basis on which all others, human and institution may exist. Therefore, the environment(s) of the North is presented as the first area of significance. Central to the study and design of the North is that which makes it unique: the environment.



related: reflectivity, net radiation

Adaptation [vegetation]

North of 60 can also be considered to be the region characterized by the group of plant species classified as predominantly Zone 0. These plants have adapted to the harsh climatic conditions of the North. According to Avens Associates Ltd. (in CMHC, 2002): "Northern plants are adapted to make the best possible use of the cold, thin and easily-eroded northern soils. Even though concentrations of inorganic nitrogen are low in Arctic soils, these soils do have large stocks of both structural and soluble organic nitrogen. Northern plants are able to acquire nutrients at low levels and are efficient in utilizing nutrients once acquired. Plant development can be interrupted by events such as freezing and ice encapsulation only to continue successfully on the return of favourable conditions" (n.p.).

Avens Associates Ltd. *Northern Landscaping - A Guide to Restoring the Plants and Soil in Northern Communities*. Rep. Yellowknife: CMHC, 2002. Print.

Albedo

Rate of reflection of incoming solar radiation, albedo refers to the reflectivity of a surface. Complete reflectivity is indicated by an albedo of 1.0. Snow and ice cover have high albedo values (0.4 to 0.95), which create a positive feedback with incoming solar radiation.

"Albedo." Albedo. N.p., n.d. Web. 15 Nov. 2012. <<http://www.eoearth.org/article/Albedo?topic=54300>>.

Suggested Reading:

Briggs, David J., and Peter Smithson. *Fundamentals of Physical Geography*. London: Hutchinson, 1985. Print.

Arctic

Traditional homeland of the Inuit. The Arctic is characterized by tundra or polar desert conditions with extremely short and cold summer months. The Arctic loses more energy from the Earth's surface than it receives incoming solar energy, resulting in a net cooling effect. According to climatologists, the Arctic refers to regions where the average temperature does not exceed 10°C.

Moore, Peter. D., and Garratt, Richard. *Tundra*. New York: Facts on File, 2008. Print

Arctic Circle

Accepted southern border of the Arctic. The Arctic Circle is a major circle of latitude found on most geographic maps. The Arctic Circle is the parallel of latitude found 660 north of the equator, marking the latitude above which the sun does not set on the summer solstice.

Aurora borealis

Mixing of particles from solar flares and Earth atmosphere, occurring in the Earth's ionosphere (80 km above the Earth's surface). The atmospheric interaction causes an emission of light, often seen as dancing bands of green, blue or red light in the sky.

Page, David. *Advanced Text-book of Physical Geography*. Edinburgh: W. Blackwood and Sons, 1864. Print.

related: land of the midnight sun, sunlight

Bedrock

Solid rock underlying unconsolidated surface material. The depth to bedrock can be shallow or deep. At the site of Port Radium, the bedrock is relatively shallow - often visible as outcrops. Depth to bedrock may be considered a limiting factor in structural development of housing.

Neuendorf, Klaus K.E., James P. Mehl, Jr., and Julia A. Jackson, eds. Glossary of Geology. 5th ed. Virginia: American Geological Institute, 2005. Print.

Boundaries and Barriers

Real or perceived; physical or psychological; natural or human-made. Boundaries may prevent or reduce accessibility and have the ability to cause a sense of isolation. Human-made or ecological boundaries or barriers may fragment communities, disrupt natural migration routes and may cause stress on an ecosystem.

Breakup

Referring to early spring where thick ice sheets covering lakes and coastlines begin to break up and melt. Modes of transportation that rely on ice roads are no longer feasible following breakup. Breakup often marks the end of the winter field-exploration season.

Canadian Environmental Assessment Act

The Canadian Environmental Assessment Act (CEAA) was implemented by the Agency in 1995 as a regulatory document used to guide project development and approval as it pertains to the environment. A controversial, amended Act was unveiled in 2012 and is now known as the Canadian Environmental Assessment Act 2012. Controversy surrounds the relaxed regulations and newly expedited approval process.

*Note: As of April 26, 2012 a new proposal for environmental assessment legislation was tabled. The Canadian Environmental Assessment Act came into force on July 6, 2012.

"Canadian Environmental Assessment Act, 2012" (S.C. 2012, C. 19, S. 52).
Legislative Services Branch. N.p., n.d. Web. 18 Dec. 2012. <<http://laws-lois.justice.gc.ca/eng/acts/C-15.21/index.html>>.

Canadian Environmental Assessment Agency

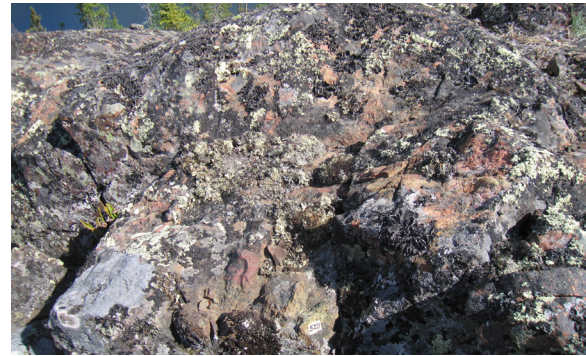
The Agency is a federal body under the direction of the Minister of the Environment. The primary duty of the Agency is to perform environmental assessments (EA) for proposed projects that may alter the environment, and assist in decision making and project approval.

"Canadian Environmental Assessment Agency - Who We Are." Government of Canada, Canadian Environmental Assessment Agency. N.p., n.d. Web. 22 Dec. 2012. <<http://www.ceaa-acee.gc.ca/default.asp?lang=En>>.

Carrying Capacity

Measure of capacity of an ecological or man-made environment to support a population while maintaining productivity and the ability of renewal. The carrying capacity of the Canadian North is low.

Bone, Robert M. The Canadian North: Issues and Challenges. Don Mills, Ont.: Oxford UP, 2009. Print.



related: Environmental Assessment,
Environmental Impact Assessment

Climate

The climate of the subarctic region of Canada is characterized by mean annual air temperatures of between -10°C and -6.5°C with mean annual precipitation ranging from 20 to 40 cm (rain) and 150 to 200 cm (snow). The frost-free growing season is between 50 and 80 days in length (Timoney et al., 1992). With limited historical data (1999 to present), the following averages can roughly represent the historical averages of Port Radium:

Daily Average: -5.50°C

Rainfall: 166 mm

Snowfall: 153 cm

Wind Speed: 11 km/h

Dominant Wind Direction: W

Average Vapour Pressure: 0.5 kPa

Timoney, K.P., G.H. La Roi, S.C. Zoltai, and A.L. Robinson. "The High Subarctic Forest-tundra of Northwest Canada: Position, Width, and Vegetation Gradients in Relation to Climate." *Arctic* 45.1 (1992): 1-9. Web. 24 Oct. 2012. <<http://www.jstor.org/stable/40511186>>.

"Deline Current Conditions." *Current Conditions and Forecasts - Northwest Territories*. Environment Canada, 2013. Web. 25 Jan. 2013. <http://www.weatheroffice.gc.ca/city/pages/nt-22_metric_e.html>.

related: environmental change,
global warming, greenhouse gases,
permafrost degradation, carbon
dioxide

Climate Change

Widely accepted concept pointing to increasing global temperatures and subsequent adverse impacts to environmental and human world. While the act of climate change has been proven to occur naturally throughout the history of the Earth (evident through periods of glaciation) current beliefs directly connect human consumption and reliance on carbon dioxide emitting vehicles with increased temperatures. Regardless of the cause, the effects of climate change in northern regions of the world will be magnified, as much as double that of areas closer to the equator. This is due to ecological sensitivity and slow response time in the North.

"Climate Change." Government of Canada, Environment Canada. Government of Canada, 15 Feb. 2013. Web. 18 Feb. 2013. <<http://www.ec.gc.ca/cc/>>.

Simin, Davoudi. *Planning for Climate Change : Strategies for Mitigation and Adaptation for Spatial Planners*. N.p.: Earthscan, 2009. Print.

Assembly of First Nations. *Report 1: An Introduction to the Science of Climate Change*. Ottawa: Assembly of First Nations, 2006. Print.

Division of Earth and Life Studies - National Research Council. *Advancing the Science of Climate Change*. Washington, D.C.: National Academies, 2010. Print. *America's Climate Choices: Panel on Advancing the Science of Climate Change*.

Pelling, Mark. *Adaptation to Climate Change: From Resilience to Transformation*. London: Routledge, 2011. Print.

"IPCC - Intergovernmental Panel on Climate Change." IPCC - Intergovernmental Panel on Climate Change. N.p., n.d. Web. 23 Mar. 2013. <<http://www.ipcc.ch/>>.

Contamination

Negative alteration of an ecosystem or environment through the addition of toxic and/or harmful substances. Often the by-product of large-scale 'mega-projects' and mining and refining procedures. Safe levels of contamination in groundwater, potable water, air and soil are established and regulated by the Canadian Environmental Assessment Agency through the Canadian Environmental Assessment Act, 2012.

SEE: Canadian Environmental Assessment Agency /Act; Time; Canada-Deline Uranium Table Final Report 2005

Ecodistrict

Also known as land resource areas, ecodistricts are ecoregions that have been further subdivided and classified by relatively similar biophysical and climatic conditions.

"Ecosystem Framework." EcoZones, EcoRegions, and EcoDistricts. Agriculture and Agri-Food Canada, n.d. Web. 5 Jan. 2013. <<http://sis.agr.gc.ca/cansis/nsdb/ecostrat/hierarchy.html>>.

Ecoregion

Ecoregion classification is a method of classifying ecologically similar areas, characterized by geology, soil, vegetation, climate, water and natural and human factors. Canada is divided into 15 distinct ecozones. The Northern Canadian ecozones are: Arctic Cordillera, Northern Arctic, Southern Arctic, Boreal Cordillera, Hudson Plains, Taiga Cordillera, Taiga Plains, and Taiga Shield.

"Ecosystem Framework." EcoZones, EcoRegions, and EcoDistricts. Agriculture and Agri-Food Canada, n.d. Web. 5 Jan. 2013. <<http://sis.agr.gc.ca/cansis/nsdb/ecostrat/hierarchy.html>>.

Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

Ecozone

Ecozones are very generally classified geographic areas sharing similar physiographic and ecological similarities. Ecoregions are more specific than ecozones.

"Ecosystem Framework." EcoZones, EcoRegions, and EcoDistricts. Agriculture and Agri-Food Canada, n.d. Web. 5 Jan. 2013. <<http://sis.agr.gc.ca/cansis/nsdb/ecostrat/hierarchy.html>>.

Great Bear Lake

Largest freshwater lake entirely within Canadian borders. Approximately 31,000 km² in area. Part of the great lakes of Canada, sometimes classified as a northern 'great lake'. Sacred body of water, of cultural significance to the Dene First Nation; provider of food and transport. Each 'arm' of the lake represents a Hudson's Bay Company employee who had contributed to the Franklin Expedition: Peter Dease, Robert McVicar, John McTavish, James and George Keith, and Edward Smith.

Van Wyck, Peter C. *The Highway of the Atom*. Montreal: McGill-Queen's UP, 2010. Print.

Bell, J.Mackintosh. "Explorations in the Great Bear Lake Region." *The Geographical Journal* 18.3 (September 1901): 249-58. JSTOR. Web. 2 Oct. 2012. <<http://www.jstor.org/stable/1775131>>.

Johnson, Lionel. "Great Bear Lake." (n.d.): n. pag. Rpt. in *The Book of Canadian Lakes*. Ed. R.J. Allen, M. Dickmen, C.B. Grey, and V. Cromie. Burlington: Canadian Association on Water Quality, 1994. 549-59.



related: Hamelin, Middle Arctic,
Low Arctic, Near North, Far North,
Extreme North



High Arctic

A polar desert due to low levels of precipitation and less than two snow-free months (extremely short growing season). High, middle and low or sub-Arctic terms indicate relative degrees of Arctic conditions: the low or sub-Arctic has the least extreme, Arctic conditions (comparatively mild with a longer growing season and increased species diversity).

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Ice

Important to transportation and access for many remote communities. Ice floats and far-reaching ice cover play an important role in the habitat of many northern species, most notably the polar bear. Ice road truck transport is often less expensive than air transport. Climate change is threatening to shorten or stop ice road access altogether. An interesting material to consider for design, both as a material for temporary art installations and long-term integration in landscape design.

Koppen classification

A global climatic classification system developed by Russian German Wladimir Koppen in 1881 and refined later by Rudolf Geiger in 1961. The accepted, updated name for the classification system is the Koppen-Geiger Climate Classification. The system uses 5 main climatic classifications, 6 additional sub-classifications for precipitation and 6 additional sub-classifications for temperature. The approximate location of Port Radium, Northwest Territories is classified 'Dft'; meaning a main climate of snow, fully humid precipitation, and cool summer temperatures.

"World Map of the Koppen-Geiger Climate Classification Updated." World Maps of Koppen-Geiger Climate Classification. Institute for Veterinary Public Health, n.d. Web. 17 Jan. 2013. <<http://koeppen-geiger.vu-wien.ac.at/present.htm>>.

Landscapes

The Canadian North is not a homogeneous landscape. With 4 secondary ecoregion classifications and over 150 ecoregions in the Northwest Territories alone, the Northern landscapes are varied and distinct. Some unique landscape features that may be characteristic of northern arctic and subarctic environments include postglacial terrain and unique vegetation morphology:

-pingo	-glacier	-tundra
-ice wedge polygon	-drumlin	-treeline / tree-less
-esker	-permafrost	-stunted vegetation

Lichen

Lichens are the result of a symbiotic (mutually beneficial) association between fungi and algae or cyanobacteria. Lichens reproduce both sexually and asexually, and may grow in areas with little soil. Lichens are often found in the tundra environment and act as an insulating ground cover and source of food for animals.

"UCMP - University of California Museum of Paleontology." Introduction to Lichens. University of California, n.d. Web. 25 Jan. 2013. <<http://www.ucmp.berkeley.edu/fungi/lichens/lichens.html>>.

Limiting factors

Factors that limit or have the potential to restrict development. Limiting factors may be environmental (ecological) or other (social). Some environmental limiting factors that extend to development limiting factors include: depth to bedrock, short growing season, long and cold winters, freezing temperatures, permafrost, lumber scarcity, climate change.

Mackenzie River

Canada's largest river, connecting Great Bear Lake and Great Slave Lake. Draining to the Arctic Ocean at the Mackenzie Delta. The main tributaries of the Mackenzie River are: Liard River, Root River, Peel River, Keele River, Carcajou River, Mountain River, Great Bear River and the Arctic Red River. The Mackenzie River has been identified and proposed as the route for the Mackenzie Gas Pipeline Project – a project that has encountered strong opposition since its inception in the 1970s.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Migration

The movement of organisms from one location to another, usually in search of more favorable conditions. Permanent human migration 'in' to the Canadian North has remained constant over time and may be showing signs of decline. Aside from those who reside in the North, most human migration is temporary due to work or research. Mammalian migration and migration routes, most notably the barren-ground caribou, in the North are being threatened by northern development projects.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Net Energy Balance

Global balance between incoming (absorbed) solar radiation and outgoing (emitted) radiation from the Earth. Annually, incoming solar radiation is absorbed at a higher rate than the Earth can emit radiation, resulting in net radiative heating of Earth centered around the equator. This is balanced by a net radiative cooling at the poles. When an imbalance is experienced, it is corrected by atmospheric and/or oceanic heat transport.

Net Energy Balance Equation

$$Q = \Delta K + \Delta L$$

where ΔK : difference between incoming and outgoing shortwave radiation

where ΔL : difference between incoming and outgoing longwave radiation

Page, David. *Advanced Text-book of Physical Geography*. Edinburgh: W. Blackwood and Sons, 1864. Print.

Non-renewable Resource

Resource from the Earth that cannot be re-created or restored once used. Oil and natural gas deposits, mineral deposits and arguably freshwater are all examples of non-renewable resources.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Permafrost

Ground that is continually frozen (at or below 0°C) for at least two consecutive years. Soil moisture in permafrost conditions is in the form of ice. Permafrost may range in thickness from decimeters to upwards of 700 kilometers. Permafrost may be classified as continuous (90-100%) or discontinuous. Approximately half of the Canadian landscape is covered with permafrost. Permafrost degradation is an indicator of climate change and is a concern in the North for development.

"Permafrost." Government of Canada, Natural Resources Canada. Natural Resources Canada, n.d. Web. 15 Jan. 2013. <<http://www.nrcan.gc.ca/earth-sciences/climate-change/landscape-ecosystem/permafrost/230>>.

Davis, T. Neil. *Permafrost: A Guide to Frozen Ground in Transition*. Fairbanks, AK: University of Alaska, 2001. Print.



Plant hardiness zones

Indicates specific areas, classified according to climate, where a select range of plant species - trees, shrubs, and flowers - will survive. Zones are classified from 0 to 9 with Zone 0 experiencing the most extreme and harsh growing conditions. Most of the Canadian North (above 60° latitude) is classified as Plant Hardiness Zone 0. Plant hardiness zones may be used in conjunction with zone and/or boundary classifications of other disciplinary professions to create additional delineation of northern Canada.

"Plant Hardiness Zones in Canada." Plant Hardiness Zones in Canada. Agriculture and Agri-Food Canada, 06 Dec. 2010. Web. 11 Jan. 2013. <<http://sis.agr.gc.ca/cansis/nsdb/climate/hardiness/intro.html>>.

Port Radium

Former uranium mine site located on the eastern shore of Great Bear Lake, approximately 400 km north of Yellowknife, Northwest Territories. Opened in 1932 following the discovery of pitchblende by Gilbert Labine in 1930. Site of national and international significance. Currently one of multiple cross-Canada sites commemorated as a National Historic Event (NHE) by Parks Canada. Port Radium historically mined silver, radium and uranium ore from underground mining operations. Port Radium was visited by many dignitaries and influential people such as: Lord Tweedsmuir, Prince Phillip and AY Jackson.

Canada. Deline First Nation / Indian and Northern Affairs Canada. Canada-Deline Uranium Table Final Report - concerning Health and Environmental Issues Related to the Port Radium Mine. N.p.: n.p., 2005. Print.

Bone, Robert M. The Canadian North: Issues and Challenges. Don Mills, Ont.: Oxford UP, 2009. Print.

Van Wyck, Peter C. The Highway of the Atom. Montreal: McGill-Queen's UP, 2010. Print.

Precautionary principle

Ecological and sociological principle which dictates that erring on the side of caution is the best procedure when uncertainty exists. To exercise the precautionary principle in the northern development of megaprojects would mean many projects would not be possible since there is a large level of uncertainty in northern development and environmental response to hazards. Unfortunately not many industries/institutions exercise the precautionary principle and as a result many projects often include environmental hazards (spills, contamination). This is particularly important in the potential development of deep-sea ports and the opening of the Northwest Passage.

Radium Hills High Subarctic Ecoregion

Port Radium is located within the Radium Hills HS Ecoregion, a refined classification of the Taiga Shield High Subarctic Ecoregion. According to the Government of the Northwest Territories, "The Radium Hills HS Ecoregion rises sharply from the eastern shores of Great Bear Lake; steep, sparsely vegetated rock barrens, ancient beach ridges and deep fjords are its main features" (2008). The RHHS Ecoregion is defined by a transition from rugged bedrock hills to bedrock plains. Climate is moderated by the nearby Great Bear Lake. Important characteristics of the RHHS Ecoregion are:

- volcanic and intrusive Precambrian bedrock dominated
- hills exceeding 300 m in elevation found in southern reaches
- mix of coarse boulders and glacial till and fine-textured lacustrine sediment
- coarse-textured Brunisols and Cryosols (in wet depressions)
- minimal soil availability; found only in bedrock fractures or wetlands
- vegetation control by parent material (exposed bedrock): rock lichen communities common
- trembling aspen uncommon and occurring in stunted groves on southern slopes to extreme south
- open spruce-shrub woodlands with bilberry, mountain cranberry, black crowberry, common and red bearberry, dwarf birch, green alder, lichens and mosses
- peat plateaus
- horizontal fens with sedges, cotton-grasses, Labrador tea



-dissected by deep fjords; polygonal peat wetlands
-cliffs and rugged terrain serve as nesting sites for Bald Eagles, Golden Eagles, Peregrine Falcon and Rough-legged Hawks

Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

Remediation

Clean up of contaminated sites following industrial activity. Remediation can include: point source removal of contaminants, natural attenuation of contaminants, removal of impacted soil or groundwater, using micro-organisms or plants (phytoremediation) to aid in the uptake and sequestering of contaminants. Remediation regulations are provincial and territorial with some larger projects falling under federal jurisdiction. Although coverage by waste-rock and/or geotextile is considered an efficient and effective method of remediation in the North, where accessibility is a concern, there is great potential for innovative remediation strategies.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Response Time

The time required for an ecosystem to adapt to change - either natural or anthropogenic. Example: the time required for an ecosystem to re-establish following wildfire. In the Canadian North, ecological response time is slow, much slower than response times of more temperate climates.

Sensitivity

Ecological and human reaction to positive/negative change. Sensitivity in the northern context is high due to slow response time.

SEE: Time

Snow

Snow performs a necessary ecological function in the North. Snowpack insulation prevents plant exposure to harsh winds and freezing temperatures. Snow provides a habitat for many northern organisms. Spring melt of snow is crucial to local and regional water balances and directly influences the hydrology of an area. Snow albedo, or reflectivity, contributes to the local and global net energy/radiation budget. As with ice, snow is an interesting material to consider for design.

SEE: Net Energy Balance

Singh, V. P., Pratap Singh, and Umesh K. Haritashya. *Encyclopedia of Snow, Ice and Glaciers*. Dordrecht: Springer, 2011. Print.

Species / Bio-Diversity

Number and variety of species found in a given area. From a southern perspective, Northern species diversity is comparatively low due to harsh climatic conditions and low overall ecosystem productivity. However, species diversity in the North is not limited to only a few species as some may believe.

SEE: Net Energy Balance

Woodin, Sarah J., and Mick Marquiss. *Ecology of Arctic Environments*. Oxford: Blackwell Science, 1997. Print.

Stonehouse, Bernard. *Animals of the Arctic: The Ecology of the Far North*. New York: Holt, Rinehart & Winston, 1971. Print.



related: Species Richness

Species at Risk (SAR)

Species under stress to point of threatening reproductive capabilities – potential to become extinct. SAR in the Northwest Territories include: Bowhead whale, collared pika, dolphin-union caribou, grey whale, grizzly bear, Peary caribou, polar bear, wood bison, wolverine, woodland caribou, barn swallow, common nighthawk, Canada warbler, short-eared owl, and the Northern wolfish to name a few.

Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

Stewardship

Management of environmentally sensitive areas or heritage resources in such a way as to preserve ecological integrity for future generations.

SEE: Parks Canada

Subarctic

Largest natural region in North America, containing the boreal forest and characterized by long, cold winters and short but warm summers. Region below the Arctic often delineated by the tree line. Sub-Arctic regions generally have a longer growing season and can have temperatures that exceed 100C (Moore, 2008). Sub-Arctic regions extend north of the Arctic Circle, although the term 'Arctic' is often applied to all regions above 660 latitude. The Subarctic region has a low evapotranspiration rate, poor drainage and large permafrost coverage.

Bone, Robert M. The Canadian North: Issues and Challenges. Don Mills, Ont.: Oxford UP, 2009. Print.

Sunlight

Dependent upon the Earth's axial tilt, northern geographic areas experience up to 15-24 sunlight hours a day in the summer months and 15-24 sunless (dark) hours a day in the winter months. This may influence vegetation growth and species distribution. Additionally, the psychological effects of constant sunlight or darkness may cause depression, anxiety or other negative health effects.

Bone, Robert M. The Canadian North: Issues and Challenges. Don Mills, Ont.: Oxford UP, 2009. Print.

Taiga

According to the Government of Northwest Territories, the Taiga is a Level 1 Ecoregion that is further divided into three main, level 2 ecoregions: the Taiga Cordillera, Taiga Plains and Taiga Shield. The Taiga Ecoregion, along with the Northwestern Forested Mountains Ecoregion occupies the area between the 60th parallel and the tree-line.

Bone, Robert M. The Canadian North: Issues and Challenges. Don Mills, Ont.: Oxford UP, 2009. Print.

Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

Taiga Plains

The Taiga Plains (TP) is a Level 2 Ecoregion (Ecozone, according to Canadian Ecosystem Classification equivalent) further divided into four level 3 ecoregions: Taiga Plains High Subarctic, Taiga Plains Low Subarctic, Taiga Plains High Boreal, and the Taiga Plains Mid-Boreal Ecoregion. The TP covers 480,753 km² and occurs mainly in the Northwest Territories and northern Alberta. Similar to the TS, the TP drains to the Arctic Ocean via the Mackenzie River. The Mackenzie River Delta is within the TP Ecoregion. Some characteristics of the TP are:

related: Land of the Midnight Sun,
Summer Solstice (June 21)

- extensive peatlands
- over 100,000 lakes averaging less than 10ha in size
- level upland areas; undulating, boulder-scattered, till plains (post-glacial landscape)
- long and cold winters; short and cool summers
- limited plant growth
- luvisolic, gleysolic, cyrosolic, burnisolic and regosolic soils

Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

Taiga Shield

The Taiga Shield (TS) is a Level 2 Ecozone (Ecozone, according to Canadian Ecosystem Classification equivalent) further divided into four level 3 ecoregions: Taiga Shield High Subarctic, Taiga Shield Low Subarctic, Taiga Shield High Boreal, and the Taiga Shield Mid-Boreal Ecoregion. Generally, the Taiga Shield Ecozone covers approximately 29% of the Northwest Territories landmass at 330 082 km². Some characteristics of the TS are:

- post-glacial landforms (drumlins, eskers, flutings)
- over 200,000 lakes
- drains to the Arctic Ocean via Great Slave Lake, Great Bear Lakes and the Mackenzie River
- long and cold winters; short and cool summers
- limited tree growth
- permafrost
- fire-dominated vegetative environment

Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

Taiga Shield High Subarctic

Forming a crescent across the upper third of the TS Ecozone. Characterized by continuous permafrost and associated ice-wedge polygonal ground features. The TSHS is black spruce dominated with white spruce found closer to the tree line and lichen dominated on the tundra. Forest fires are common and required for tree regeneration.

Ecological Regions of the Taiga Shield Report. Government of the Northwest Territories, 2008. Web. 1 Mar. 2013. <http://www.enr.gov.nt.ca/_live/documents/content/Taiga_Shield_Report.pdf>.

Time

The concept of time in the North is important both environmentally and socially. Due to climatic and environmental factors, the time required for ecological growth and change is great: it takes a long time for northern ecosystems to respond to changes (natural or anthropogenic). Northern Aboriginal communities do not approach the concept of time in the same way as non-Aboriginal people: Aboriginal communities see the passing of time as a qualitative, experiential process rather than the ticking hands on a clock.

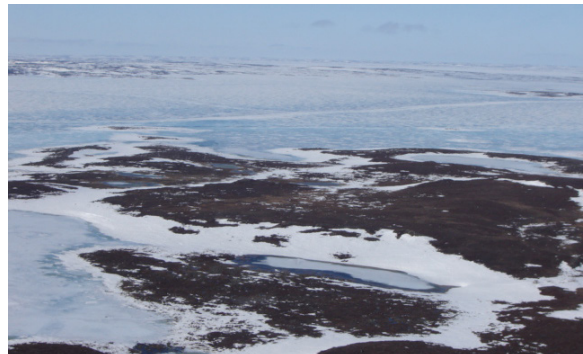
SEE: Response Time

Tree Line

Visible transitional zone marking the region where trees are no longer capable of growing. No trees are capable of growth north of the tree-line. Trees found within the tree line zone are often stunted in growth, compared to similar species found at more southern latitudes.

Tundra

Landscapes dominated by low-lying ground cover with an absence of tree growth. Tundra conditions are formed in areas of extreme cold and are found in high latitude (polar) regions and high altitude (mountain) regions. Tundra mammals include: seals, polar bears, caribou, musk ox, lemming, voles and other small rodents, and arctic hare.



Water

Hydrological studies of water drainage (flow) at the site, local and regional (watershed) level are crucial in understanding, preventing or mitigating the transport of contaminants. Identification of the local watershed region and drainage routes must be considered in northern development. Degrading freshwater sources has environmental and socio-cultural implications: the Aboriginal peoples consider some bodies of water to be sacred and valuable sources of food and income.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Wilderness

From Parks Canada: "An enduring natural area of sufficient size to protect pristine ecosystems which may serve physical and spiritual well being. It is an area where little or no evidence of human intrusion is permitted so that ecosystems may continue to evolve" (National Wilderness Colloquium, 1988).

National Wilderness Colloquium Tampa, Fla. Wilderness Benchmark 1988: Proceedings of the National Wilderness Colloquium, Tampa, Florida, January 13-14, 1988. Asheville, NC: U.S. Dept. of Agriculture, Forest Service, Southeastern Forest Experiment Station, 1989.

"Parks Canada Glossary." Parks Canada. N.p., 15 Apr. 2009. Web. 19 Feb. 2013. <<http://www.pc.gc.ca/docs/pc/poli/princip/gloss.aspx>>.

Wildlife

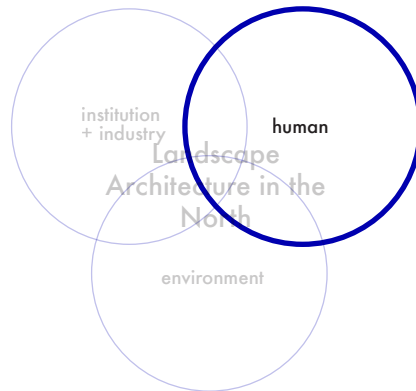
Animals in the Canadian North are specifically adapted to the harsh climatic conditions of the North. Many animals have specific winter adaptations to further adapt. For example, the ptarmigan, arctic hare and arctic fox all grow white winter coats to camouflage themselves in the snow. The grizzly bear hibernates during the coldest winter months.

Wind

Wind is one mode of sediment transport and physical weathering. For the site of Port Radium, prevalent winds are from the West-Southwest. Wind speed and direction are important in designing environmentally sensitive mining operations: wind is a highly successful vector of airborne contaminants. Wind also plays an important role in snow distribution and accumulation in forested areas and along the tree line. Snow accumulation is crucial for the insulation of some vegetative species.

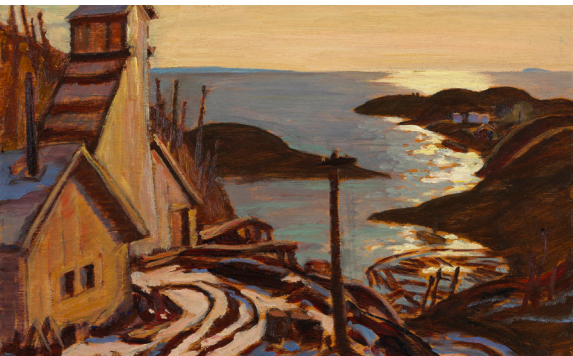
appendix

A Glossary of The North Human



Following environment is the socio-cultural, or human domain. Aboriginal hunter-gatherer relationships with the land are intimate and respectful, compared to the highly technological-economical-political driven large-scale development of the land. Our relationship with the Earth is based on survival, which inevitably extends to quality of life. Historically, the connection between northern aboriginal peoples and the land have been far less damaging than the relationships between Euro-Canadian explorers and the land.

A.Y. Jackson
Radium Mine, Great Bear Lake, 1938
Oil on wood, 26.5 x 34.2 cm
National Gallery of Canada, Ottawa
© Courtesy of Carleton University Art
Gallery, Ottawa, Ontario
Photo © NGC



A.Y. Jackson
Eldorado Mines, LaBine Point, 1938
Oil on wood, 26.4 x 34.1 cm
National Gallery of Canada, Ottawa
© Courtesy of Carleton University Art
Gallery, Ottawa, Ontario
Photo © NGC

Aboriginal

According to the Canadian Government and Constitution, the term 'aboriginal' refers to three main groups: Indians, Metis and Inuit. Unlike the term 'Eskimo', the use of 'Indian', Metis and Inuit Aboriginal recognizes the distinct cultural characteristics of each aboriginal group. 'Indian' is used in the Constitution Act of 1982; however, First Nations is a more accepted term. Northern Aboriginal Peoples include Inuit, Métis and First Nations.

Canada. Aboriginal Affairs and Northern Development Canada. *Sahtu Dene and Metis Comprehensive Land Claim Agreement. Government of Canada*, 1993. Web. 25 Jan. 2013. <<http://www.aadnc-aandc.gc.ca/eng/1100100031147/1100100031164>>.

Advertising

Appealing to the Canadian psyche and our intrinsic association with the North, many Canadian companies use northern stereotypes to attract consumers. For example, the Moslon Canadian "I am Canadian" commercial, aired in 2000, used Canadian and northern stereotypes (igloo, fur trade, dog sled, eating blubber) to rally a sense of nationalism. Some advertising techniques are balanced on the edge of iconography and stereotyping racism.

SEE: Stereotype, Racism, Daniel Chartier

Accessibility

Many northern communities are not accessible by road or rail. In some cases, air transport is the only form possible. During the winter months, travel by snowmobile or ice roads may be possible, depending on location and climate. Climate change has recently shortened or prevented the ice road season, limiting the amount of import/export reaching the remote northern communities. Accessibility is directly related to cost of living: more remote locations must pay a higher price for importing goods (oil, gas, food, medical supplies).

SEE: Isolation

AY Jackson / Group of Seven

A member of the Canadian artists known as the Group of Seven, AY Jackson sketched and painted many northern Canadian landscapes. Jackson visited the Great Bear Lake region of Northwest Territories, including Port Radium and produced several sketches and two oil paintings of the operational mine site. The Group of Seven was a collection of Canadian artists who captured various Canadian landscapes through paintings and sketches.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

BBC Human Planet

The British Broadcasting Corporation (BBC) 2011 television production of *Human Planet* represents the daily life of the Inuit and northern inhabitants across the globe. The BBC Arctic episode of *Human Planet* more sensitively displays footage of Inuit people. Both the Flaherty and the BBC show footage of several Inuit men building an igloo. Compared to *Nanook of the North*, the BBC's production appears more respectful and far less exploitative – often using interview footage of the Inuit to explain various aspects of arctic life. The BBC attempts to educate people about the Inuit in a more balanced way, directly consulting and working with the Inuit; the Inuit speak for themselves.

BBC *Human Planet - Life in the Deep Freeze*. Prod. Dale Templar and Brian Leith. BBC One, 2011.

Canada-Déline Uranium Table – Final Report (2005)

Joint project with the Déline First Nation and Government of Canada – Indian and Northern Affairs (now Aboriginal Affairs and Northern Development). Completed in 2005, this project spanned 5 years and included Aboriginal community consultation, baseline studies, traditional knowledge consultation and scientific modeling. The objective of the CDUT was to gather information and make recommendations on remediation and successful closure of the Port Radium mine site located on Great Bear Lake, Northwest Territories.

Canada. Deline First Nation / Indian and Northern Affairs Canada. Canada
Deline Uranium Table Final Report - concerning Health and
Environmental Issues Related to the Port Radium Mine. N.p.: n.p.,
2005. Print.

Canada and the Idea of North

Influential book by Sherrill E. Grace, published in 2002, provides an extensive investigation of the various forms and meaning of representation of the Canadian North.

Grace, Sherrill. Canada and the Idea of North. Montreal: McGill-Queen's UP,
2001. Print.

Canadian psyche

The components of the conscious and subconscious of the human mind that contain elements – whatever they may be – that appeal to our self-definitions as Canadian citizens. Our inherent sense of being Canadian.

related: Bob and Doug McKenzie
(SCTV); various Canadian beer
commercials

Common Characteristics of the North

The North is not a homogeneous landscape. Although there are multiple definitions and classifications of 'North', several universal physical and human characteristics apply to the North as a whole:

Physical Characteristics

- slow biological growth
- permafrost
- cold environment
- wilderness
- remoteness
- vast geographic area
- fragile environment
- climate change

Human Characteristics

- high cost of living
- sparse population
- population stabilisation
- few highways
- Aboriginal population
- settling land claims
- financial dependency
- reliance on imported foods

Bone, Robert M. The Canadian North: Issues and Challenges. Don Mills, Ont.:
Oxford UP, 2009. Print.

Community

Aboriginal peoples have a strong sense of community. In the Canadian North, this sense of community seems to help stave off feelings of isolation and despair. Traditional Aboriginal communities share in food collection and production. Elders are often respected and regarded as the central focus of the community. Outside, non-Aboriginal and non-northern influences threaten to change the community dynamic.

Connection to the Land

The Aboriginal peoples have a deep-rooted, spiritual and cultural connection to the land. Northern Aboriginal communities have relied on the land to provide shelter, food and spiritual outlet for centuries.

Culture

A group united by its shared practices, beliefs, values, goals and general way of living. The Canadian North is an interesting meeting-ground for several cultures: northern Aboriginal, northern non-Aboriginal, and non-northern. The sub-cultures of mining, environmental protection, and mega-project development often conflict.

Cultural landscape

Combined works of nature and human-kind: "A set of ideas and practices, embedded in a place. This definition is used to capture the relationship between the intangible and tangible qualities of these [cultural landscapes]" (Government of Canada, National Capital Commission, 2004). All landscapes may be considered cultural landscapes, as is the principle taught in landscape architecture curriculum.

Wagner, Jennifer. The Palisades Centre - Jasper National Park: An Adaptive Rehabilitation of a Cultural Landscape. Thesis. University of Manitoba, 2000. Winnipeg: University of Manitoba, 2000. Print.

"What We Manage." Cultural Landscapes in Canada's Capital Region. National Capital Commission - Government of Canada, n.d. Web. 28 Jan. 2013. <<http://www.canadascapital.gc.ca/property-management/what-we-manage/cultural-landscapes-canadas-capital-region>>.

"Cultural Landscape." UNESCO World Heritage Centre. UNESCO, n.d. Web. 2 Feb. 2012. <<http://whc.unesco.org/en/culturallandscape/>>.

Daniel Chartier

In an ongoing, multidisciplinary study of the genres and forms in which the concept of North, or the 'idea of North', appears, Daniel Chartier has identified over 600 literary works and films (2007). According to Chartier: "Figures of the Inuit, settler, Scandinavian, Viking, Amerindian, artist, gold digger, trader, missionary and explorer, in particular, have been used to 'northify' works" (2007, p. 45). Chartier goes on to list several additional elements that are frequently employed in the media to convey a sense of 'northernness' such as "icebergs, polar bears, the northern lights, the absence of reference points, desolation, the predominance of the colours blue and white, the snow, and the absence of trees" (2007, p.45). This is nothing new – a first grade art project on depicting the North will likely yield similar results – but it is interesting and not entirely out of place as an accurate representation of any one aspect of northernness. It is important to recognize that these 'northern' elements are often used singularly to represent an entire northern setting. In this sense, the act of 'northify-ing' works using one or a selection of the abovementioned elements represents a stereotypical and incomplete depiction of the North.

Chartier, Daniel. "Towards a Grammar of the Idea of North: Nordicity, Winterness." (2006): n.p. Web. 22 Nov. 2012. <<http://septentrio.uit.no/index.php/nordlit/article/viewFile/1498/1406>>.

Definition

The concept of the North, of northernness, is a confounding one; a true testament to paradox and perspective. This vast and varying arctic landscape exists in the subconscious of some as isolated, remote, desolate and sinister; to others, it elicits beautiful imagery of a frozen landscape, rich with resources and calling for adventure. To others still, the North is home. The North is both a qualitative and quantitative part of our country. It is as much a source of our economic profitability as it is that extra something that defines Canada as a unique country (Abel and Coates, 2001). For some, North means snow and so it follows that anywhere that experiences snow is considered Northern. The winter months in most of Canada, of snow and freezing temperatures, surely qualifies as a Northern experience. Even some of the northern states in the US stake a claim of northernness and nordicity – particular scenes from the award-winning 1996 film Fargo comes to mind. For Statistics Canada and much of the scientific community, a static definition is all but required. Northern limits have been defined by plant hardiness, temperature, soil availability and latitude to name a few. For many others, a dynamic definition or expression of North is most fitting. According to Grace: "North is multiple, shifting and elastic; it is a process, not an external fixed goal or condition" (2002, p.16). These sentiments of dynamism are not limited to the strict definition of North, but also include the overall meaning of the North.

SEE: Hamelin, Statistics Canada, Plant Hardiness Zones, Koppen Classification, Climate

Grace, Sherrill. *Canada and the Idea of North*. Montreal: McGill-Queen's UP, 2001. Print.

Coates, Kenneth S., and Morrison, William R. *Winter and the shaping of Northern History: Reflections from the Canadian North*. In Abel, Kerry M., and Kenneth Coates. *Northern Visions: New Perspectives on the North in Canadian History*. Peterborough, Ont.: Broadview, 2001. 23-37. Print.

Déline

Northern Aboriginal (Dene) community located on western shore of Great Bear Lake. Population: approximately 700. Formerly named Fort Franklin. In North Slavery language, Déline means 'where the water flows'.

Woo, Ming-Ko, Paul Modeste, Lawrence Martz, Joe Blondin, Bob Kochtubajda, Dolphus Tutcho, John Gyakum, Alphonse Takazo, Chris Spence, Johnny Tutcho, Peter Di Cenzo, George Kenny, John Stone, Israel Neyelle, George Baptiste, Morris Modeste, Bruce Kenny, and Walter Modeste. "Science Meets Traditional Knowledge: Water and Climate in the Sahtu (Great Bear Lake) Region, Northwest Territories, Canada." *Arctic* 60.1 (March 2007): 37-46. JSTOR. Web. 10 Jan. 2013. <<http://www.jstor.org/stable/40513156> .>.

Canada. Deline First Nation / Indian and Northern Affairs Canada. Canada Deline Uranium Table Final Report - concerning Health and Environmental Issues Related to the Port Radium Mine. N.p.: n.p., 2005. Print.

Demographics

In 2008 the population across the Canadian North sat at 1.5 million people and constituted approximately 5% of the Canadian population. Over 90% of the Northern population resides in the Provincial North (below the 60th parallel). The population of the North has remained at or near 1.5 million people for the past 25 years, indicating stagnant growth. Non-Aboriginal northern people account for over 80% of the population and are typically focused in only a few cities and resource-based towns.

Population Density (2006)

Canada: 3.5 persons / km²

North: 0.10 persons /

*Canadian pop. density roughly 35 x Northern pop. density

*indicates that the North has a low carrying capacity for human life

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Dene

Aboriginal people of the western Subarctic of Canada. Dene peoples are traditionally hunter-gatherers and survive off the land by hunting and trapping, fishing, and gathering berries. The Dene Nation has existed for over 30,000 years. Several dialects of Dene language exist, and form five distinct tribes: Gwich'in, Sahtu, Deh Cho, Tlicho and Akaitcho. The Dene community at Déline (formerly Fort Franklin) are Sahtu Dene.

"Welcome to the Dene Nation and Assembly of First Nations NWT." Dene Nation. Dene Nation, n.d. Web. 29 Dec. 2012. <<http://www.denenation.com/>>.



Distance

A physical reality and a state of mind; a mental construct (Waiser in Abel and Coates, 2001). Distance is related to isolation and accessibility and is particularly significant in the Canadian North. "Distance has been tamed more quickly on the map than in the mind" (Geoffrey Blainey in Abel and Coates, 2001).

Abel, Kerry M., and Kenneth Coates. *Northern Visions: New Perspectives on the North in Canadian History*. Peterborough, Ont.: Broadview, 2001. Print.

Drained landscape

The post-industrial landscape. Often contaminated and permanently negatively altered from its original state. The dying space, the buried space. The used-up landscape that has served its [economic or other] purpose.

Jona. "Emerging Arctic Landscapes: Jona." *Emerging Arctic Landscapes: Jona*. Bergen Arkitektsskole, 18 Dec. 2011. Web. 25 Oct. 2012. <<http://emergingarcticlandscapes.blogspot.ca/search/label/Jóna>>.

Dreams

While it may be argued that the northern inhabitant may also possess dreams of the northern landscape, the nature of the dream is much different than those of the southerner. The Northern Aboriginal people may dream of the North as their home and sacred land; the Torontonians likely dream of the barren and mysterious North as a source of adventure or capital.

Dualism

The meanings and experiences of the North are infinite. Bone (2008) identifies two main distinct perceptions of the North as (1) a resource frontier or (2) an Aboriginal homeland. Northern dualism can often be attributed to cultural or individual perceptions. Northern dualism exists where resource and government sector economies operate within the same space (Northern Canada) with very different goals and values. Experiential dualism also exists in the northern context. For example, the vastness of the Northern landscape exists simultaneously with the sense of isolation and singularity experienced by the individual. Consider the dualism of the cultural perception of the North from the northern aboriginal perspective and the southern perspective.

SEE: Frontier, Perception

Ecotourism

Responsible (as much as possible) travel by non-local/visitors to specific environmentally significant areas. Often the goal of ecotourism is to increase awareness and support conservation of 'natural' areas of interest.

Examples:

Arctic Adventure Company Canada: trips to Qikiqtarjuaq, Nunavut
Arctic Kingdom Polar Expeditions Inc. Canada: Arctic Canada cruises, safaris
Plummer's Arctic Lodges Canada: hunting/fishing vacation packages (NWT)

"Plummers Arctic Lodges | Lake Trout Fishing." Plummers Arctic Lodges | Lake Trout Fishing. N.p., 2011. Web. 22 Jan. 2013. <<http://www.plummerslodges.com/>>.

"What Is Ecotourism?" The International Ecotourism Society. N.p., 2012. Web. 22 Jan. 2013. <<http://www.ecotourism.org/what-is-ecotourism>>.

Ecumene

Area of landscape that is permanently inhabited by humans.

See: Hamelin

Education

There exists a need for better education on the significance of the Canadian North for both Aboriginal and non-Aboriginal peoples and Northerners and non-Northerners. An equalized, educated Canadian society will be better able to make decisions regarding northern development.

Elders

A member of an Aboriginal community recognized as having knowledge of traditional culture - including spiritual and social traditions specific to the community. Elders are challenged with the task of passing down cultural traditions to the newer generations of Aboriginal members within the community.

"The Definition of Elder." Feathers in the Wind. Ontario Metis Family Records Center, 2010. Web. 5 Jan. 2013. <<http://www.omfrc.org/newsletter/issue16-june2010.pdf>>.

Ephemeral

Referring to a brief, momentary event in time: typically lasting a single day. Many aspects of life in the North, both human and non-human, are ephemeral in the broader, experiential sense of impermanence: snow morphology, migratory wildlife, and some human settlements.

related: Evanescent, Fleeting, Impermanent, Transient, Temporary, Fleeting, Lightness

SEE: Ephemeral Mining & Exploration, Time

Escape

A personal experience with the North. When faced with a major life-changing event, I sought out a Northern expedition – one where I understood and relished in the inevitable solitude and vastness – to challenge myself and re-focus my life. In a positive sense, I sought to escape to the North. I believe my experience not to be unique: many people escape to the vast northern landscape for various reasons.

Eskimo

Once an accepted term of European origin used to broadly refer to 'northern Indians'. Now considered to be a racist, uneducated term that has been replaced by the more specific and appropriate terms Inuit, Metis and Aboriginal.

SEE: Nanook of the North, Inuit, Aboriginal

Farley Mowat

In *People of the Deer*, Mowat points blame at the Canadian Government's inability to address the problems created by the Hudson's Bay Company, the RCMP and various churches and for their roles in reducing the northern peoples to starvation and externally induced self-destruction (Wynn, 2007).

SEE: Stereotype, Relocation History

Wynn, Graeme. *Canada and Arctic North America: An Environmental History*. Santa Barbara, CA: ABC-CLIO, 2007. Print.

Fear

Fear experienced in the Canadian North is often caused by being in the Canadian North, due to feelings of isolation and being in a vast, unpopulated landscape. For these reasons, fear is typically experienced only by those who are not from the North.

Food Security

Food security refers to the challenge to maintain sufficient and uncontaminated game, fish and vegetation year round to supply the northern Aboriginal communities that rely on traditional food sources to survive. Some historical instances of starvation in Arctic communities prove that traditional food security is something that is not to be taken for granted.

Fort Franklin

Former name of present Déline community. Name changed to Déline in 1993.

Frontier

Unsettled or undeveloped territory; a new field for exploitative or developmental activity (Merriam-Webster, 2012). The North is often considered a frontier – uncharted territory waiting for discovery. This vision may include economic, social, or cultural potentials and is a term applied to the Western cultural mindset.

Geographic North

Geographic north is a fixed, static point of reference – the convergence point of all lines of longitude in the northern hemisphere. True north is the direction from any given location to the north geographic pole.

Glen Gould

Canadian pianist and composer. Created a spoken word composition entitled *The Idea of North* (1967).

Gould, Glen. "The Idea of North." *The Solitude Trilogy*. CBC. 1967. Radio.

Google Maps

The advent of Google Maps and digital mapping technologies has allowed for an increased awareness of the variability of the North, moving away from Lopez's empty maps of monotonous representation. However, many northern communities and unpopulated areas are lacking the high-resolution satellite imagery available for larger cities.

Health

Community health in Aboriginal and non-Aboriginal northern communities is extremely important to northern development. There are a number of factors that can affect community, and individual, health such as: depression, substance abuse, physical abuse, poor nutrition and lack of exercise. The influences of the southern population and differing quality of life have raised questions in traditional Aboriginal communities, which now face the challenge of adapting to a more modern way of life.

History

Northern history may include a range of timescales and disciplines including: geologic history with a magnitude of several million years, aboriginal history, history of exploration and colonization. The history of the exploration, settlement and development of the Canadian North extends beyond the scope of this project. There is a large body of extant literature on the history of the Canadian North.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Coates, Kenneth, and Judith Powell. *The Modern North: People, Politics, and the Rejection of Colonialism*. Toronto: J. Lorimer, 1989. Print.

Coates, Kenneth S., and Morrison, William R. *Winter and the shaping of Northern History: Reflections from the Canadian North*. In Abel, Kery M., and Kenneth Coates. *Northern Visions: New Perspectives on the North in Canadian History*. Peterborough, Ont.: Broadview, 2001. 23-37. Print.

Influx

Consistent, seasonal changes in northern populations due to non-Aboriginal workers flocking to mining and exploration jobs in northern Canada. High wages and minimal job qualifications lure many southern Canadian citizens to the North for work. Influxes of southern Canadian citizens cause stress on existing Northern infrastructures that have not accounted for such variability.



“inside/outside”

Terms used by northerners to describe entering and exiting the North. To be 'inside' is to be within the North.

SEE: James Lotz

Inuit

Term used by northern aboriginal peoples historically inhabiting the Canadian high arctic regions. Currently approximately 45,000 Inuit live in 53 communities in the Canadian Arctic. Inuit means the people. Inuktitut is the language spoken by the Inuit.

Isolation

A geographic as well as social concern. Remote communities and reduced accessibility may result in feeling isolated, trapped or otherwise disconnected from a greater society. Isolation is most often experienced by non-aboriginal populations in remote northern communities. The feeling of being disconnected from the greater society; completely alone. Feelings of isolation are related to fear, depression and panic and are often experienced by non-northern visitors. Northern Aboriginal peoples do not experience isolation in the same way that non-northern immigrants do as a result of cultural differences. However, with increasing external [non-northern] influences, these new and unknown feelings of isolation may be the source of substance abuse and mental health issues affecting northern Aboriginal communities.

Lotz, Jim. Northern Realities; Canada-U.S. Exploitation of the Canadian North. Chicago: Follett, 1971. Print.

James Lotz

In Northern Realities, James Lotz discusses the use of 'inside' and 'outside' from an interesting perspective: "Every visitor to the north hears it sooner or later. The word is 'outside'. The word is used in a very ambivalent way – 'outside' is somewhere that is desirable, but also threatening" (1970, p.22).

Lotz, Jim. Northern Realities; Canada-U.S. Exploitation of the Canadian North. Chicago: Follett, 1971. Print.

Landscape voices

The voices of those who have experienced the landscape. Each individual brings their own set of experiences with them as they traverse the landscape, invariably leaving a trace of their presence written somewhere in the dialogue of the place. The layering of a multitude of landscape voices - of those of the people who have passed over the landscape and of the landscape responding with its own narrative - enriches the sense of the place.

related: Glen Gould

Silje. "Emerging Arctic Landscapes: Silje." Emerging Arctic Landscapes: Silje. N.p., 17 Dec. 2011. Web. 15 Jan. 2013. <<http://emergingarcticlandscapes.blogspot.ca/search/label/Silje>>.

Louis-Edmond Hamelin

Quebec-born geographer Louis-Edmond Hamelin has extensively studied the North, both in Canada and across the globe and has published several literary works on the interpretations and significance of 'North'. According to Charter, Hamelin's work relating to study of 'North' is based on conceptual frameworks and general assumptions that can be summarized by North being a circumpolar entity with variable boundaries, requiring a new and specific vocabulary. Additionally, Hamelin's North is a sum total of its physical, social and cultural parts (Charter, 2006). Although written over thirty years ago, pre-dating the establishment of Canada's third territory of Nunavut, Hamelin's work remains relevant to the ongoing study of the North.

related: Nordicity

Hamelin, Louis Edmond. Canadian Nordicity: It's Your North Too. Montreal: Harvest House, 1978. Print.

Magnetic North

Dependent upon Earth's magnetic field, magnetic north is a dynamic position rather than a static, or fixed, point. The difference between true north (geographic) and magnetic north is referred to as magnetic declination.

SEE: Canada and the Idea of North (2002) Sherrill Grace; Geographic North

Mapping

On mapping, Lopez states that: "To a modern traveler the arctic landscape can seem numbingly monotonous, but this impression is gained largely from staring at empty maps of the region..." (1986). In reality, a map is no different than a photograph in that it reflects the perspective of the person or persons responsible for its creation. A map shows only exactly what it intends to show. "We have come to think of the Arctic as vast because in the familiar Mercator projection it stretches from one side of the world to the other. The suggestion that the region never comes together, however, that its various sections are 'a world apart' is false." (Lopez, 1986, p. 284). In Arctic Imperative – Is Canada Losing the North?, John Honderich asserts that "We are victims of a 'Mercator mind-set'...a fundamentally 'British view' of the Arctic" (1987, p. 9). While both authors stated their claims more than twenty years ago, it can be argued that the majority of Canadians continue to hold on to this representation. Without looking at a map, Canadians possess a mental map, an eidetic map, of the vast and homogeneous North.

See: circumpolar representation, GSC, google maps

Lopez, Barry Holstun. Arctic Dreams: Imagination and Desire in a Northern Landscape. New York: Charles Scribner's Sons, 1986. Print.

Migrant Workers

Due to the high wages and seasonal work associated with the mining and mineral exploration industry, the Canadian North experiences fluctuations in population and economic growth. In many cases, workers arrive from cities outside of the territories. This transient influx of migrant-workers raises concern among the local aboriginal and non-aboriginal populations over job availability and fair hiring policies.

Nanook of the North

The portrayal of the 'happy-go-lucky-Eskimo' – "the kind, simple and brave Nanook" (Flaherty, 1922) – in Robert Flaherty's Nanook of the North exists as evidence of the misrepresentation of the northern way of life for the Inuit. The introductory remarks, footage selection, even the choice of music in the film production of Nanook of the North presents the 'Eskimo' as a caricature, a fascinating folly of the distant North: more exploitative fiction than anything.

SEE: Eskimo

Nanook of the North. Dir. Robert J. Flaherty. EOne Films, 1922.

Nexus landscape

The landscape that represents and encapsulates the connection between human and non-human activity. The convergence of historical landscape narrative with contemporary human-landscape activity. Northern nexus landscapes are those which involve Aboriginal and non-Aboriginal communities with the surrounding natural environment.

Jona. "Emerging Arctic Landscapes: Jona." Emerging Arctic Landscapes: Jona. Bergen Arkitektskole, 18 Dec. 2011. Web. 25 Oct. 2012. <<http://emergingarcticlandscapes.blogspot.ca/search/label/Jóna>>.



No-Horizon

Point at which the winter sky and snow-covered, tree-less terrain match in colour giving no indication of a horizon. Only experienced on flat or subtly undulating terrain such as the tundra in low-light or overcast conditions. Where the blue-white of the snow blends in to the blue-white of the sky.

Nordicity / Nordicité

Nordicité, or nordicity in English, is the term most central to Hamelin's study of the North. According to Hamelin, the definition of the term is as follows:

[Nordicity is] The name applied to the polaricity of the northern hemisphere. The northern quality as applied to a place, a characteristic, or even a population. There are varying degrees of nordicity, starting from a zero point, complete anordicity. A false nordicity, or a deficiency in nordicity might be recorded; nordicity can also be adjusted. As a function of the area under consideration, nordicity may be climatic, biogeographical, geographical (all-embracing), or psychological. In its approach, mental nordicity may be instinctive, empirical, deductive, imitative, or rational; it may also be theoretical, normative, or applied. Geographical nordicity can be calculated and expressed in VAPO. Apart from present or static nordicity, one can think in terms of former or future nordicities.

Hamelin, Louis Edmond. Canadian Nordicity: It's Your North Too. Montreal: Harvest House, 1978. Print.

Northern Icons / Imagery

Northern icons are used to convey a sense of 'northernness' in society and can commonly be found in literature and other forms of media. Some northern icons include: igloos, snow, ice, polar bears, fur pelts, mukluks, Indians, dog sleds, whale hunts, trapping and hunting.

SEE: Canada and the Idea of North

Northern Visions

A collection of papers on the subject of the Canadian North and the historical study of northern discovery and development.

Abel, Kerry M., and Kenneth Coates. Northern Visions: New Perspectives on the North in Canadian History. Peterborough, Ont.: Broadview, 2001. Print.

Perception

Public and government interest in the Canadian North follows an ebb and flow cycle, mimicking and often driven by the boom and bust cycles of northern mineral exploration and extraction (Abel and Coates, 2001). Prior to Canadian Prime Minister Stephen Harper's (2006-current) increased interest in the North – including the unveiling of 'Canada's Northern Strategy' in 2009– the last large-scale, government prompted Northern boom was overseen by John Diefenbaker and his 'new vision' for Canada (1957-1963). With increased political and scientific interest in the Canadian North and in Canada's role as a circumpolar nation, comes a new wave of North popularity. In the past few years, Canada has experienced a renewed interest in the North. The most prominent and newsworthy northern projects at present include: finding the shipwrecks of the doomed Franklin Expedition of 1854; renewed talk of the feasibility of the Mackenzie Gas Pipeline Project; looming climate change related to the North; the unveiling of new northern National Parks; and, an increase in awareness of First Nation and Inuit rights and relationships with the Canadian government.

Coates, Kenneth, and Judith Powell. The Modern North: People, Politics, and the Rejection of Colonialism. Toronto: J. Lorimer, 1989. Print.

Abel, Kerry M., and Kenneth Coates. Northern Visions: New Perspectives on the North in Canadian History. Peterborough, Ont.: Broadview, 2001.



Perspective

'North' holds many meanings. Directionally or cartographically speaking, North refers to the direction toward the geographic North Pole, on a two-dimensional plane this is often considered 'up'. This concept of 'North' may be applied to any position on the earth: Winnipeg, Manitoba is north of Minneapolis, Minnesota; Caracas, Venezuela is north of Buenos Aires, Argentina; and Oslo, Norway is north of Cape Town, South Africa. Perspectives of the North vary geographically within Canada: "The indigenous peoples of the North see their land as neither a frontier nor a wilderness, but as a home. The lack of attention paid to this point of view reveals the extent to which the North is understood in southern terms" (Mulvihill et al., 2001; Sandlos, 2001; Wynn, 2007). Northern Canada has largely been presented through a southern perspective. "One result of the southernness of North, of course, is that ideas of North tend to serve southern Canadian interests, be they psychological, spiritual, physical, material, or political (Grace, 2002, p.16).

Grace, Sherrill. Canada and the Idea of North. Montreal: McGill-Queen's UP, 2001. Print.

Wynn, Graeme. Canada and Arctic North America: An Environmental History. Santa Barbara, CA: ABC-CLIO, 2007. Print.

Physical Abuse

Sadly, physical abuse is also common in many northern communities. Often physical abuse is directed toward community elders or female spouses where the victims feel helpless in reporting any crime.

Polar Bears

A typical stereotype of the Canadian North. Polar bears are used as a universal symbol of northernness and permeate all forms of media. In reality, the polar bear habitat and natural range is limited to specific geographic locations of the North.

Population

According to Statistics Canada, the total population of the three territories sits at 113 100: just 0.32% of the total population of Canada (34 880 500). The disparity between the largest collective land mass and smallest total population for the entire northern region of Canada reinforces the vision of northern Canada as vastly isolated, unpopulated and otherwise barren land (Statistics Canada, 2012).

SEE: Northwest Territories, Yukon Territory, Nunavut

"Statistics Canada." Land and Freshwater Area, by Province and Territory. Government of Canada, n.d. Web. 11 Oct. 2012. <<http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/phys01-eng.htm>>.

Proximity

In the North, proximity to other communities is rare. In some cases, northern communities are in close proximity to small to medium-scale mining and exploration projects or large-scale megaprojects (hydro, oil and gas). Proximity and isolation are closely related.

SEE: Isolation

Quality of Life

Quality of life refers to the general well-being of humans, and varies across the Canadian North and is dependent upon the source of funding available. Different than standard of living which is based on income and general level of wealth. Mining and mineral exploration camps and sites that are more permanent often boast high-quality steak dinners with satellite TV and all the modern comforts of home. Conversely, Inuit and northern aboriginal communities often struggle to satisfy the basic necessities of life.

The rate and role of Federal and Territorial Government subsidy for northern aboriginal communities is an ongoing process, continually changing in scope and availability. The role of self-governance in northern aboriginal communities also contributes to this constantly changing but ever-present issue.

Racism

Prejudice and discrimination against northern Aboriginal peoples is evident in many mining and exploration projects.

SEE: stereotypes

Relocation of northern Aboriginals

Between the years of 1953 and 1958, Inuit families were displaced and relocated to northern Arctic locations, often facing starvation and death (Wynn, 2007; Kelm, 2001 in Abel and Coates, 2001, p.80). During this time, the government sold the relocation idea through the strategic selection of scholarly and popular publications. "Inuit history was rewritten to include a High Arctic homeland based on the archaeological discoveries of Thule remains on Ellesmere Island. Current Inuit social conditions were defined as pathological and in need of extreme remedial measures...the Inuit's connection to their land was ignored by government officials who preferred to depict the Inuit as nomads. Finally, the High Arctic relocations were packaged and presented to the public as necessary and successful" (Kelm, 2001 in Abel and Coates, 2001, p.80).

See: Arctic Sovereignty

Abel, Kerry M., and Kenneth Coates. *Northern Visions: New Perspectives on the North in Canadian History*. Peterborough, Ont.: Broadview, 2001. Print.

Remote Hunting and Fishing Lodges

There is an increasing trend for tourists to pay for outdoor outfitters to fly to remote, northern lodges for hunting and fishing.

Representation

Representation may take form in many ways; through written or spoken work, art, music, video, audio, scientific or government publications, cartographic mapping, or eidetic mapping to name a few. When accessing a form of representation it is important to acknowledge the source and consider the perspective from which it has been created. The North has, for many years, been represented as part of our Canadian national identity, as a constant theme in the Canadian self-narrative (Grace, 2002, Arnold, 2012). We propagate our 'northernness' through art, music, literature, television and politics – even our national anthem contains the lyrics 'Our True North Strong and Free'. Canadians should exercise caution, however: "The 'North' poses the problem of the relationship between geographic realities and the world of the imagination, since those who have written and read about it in Europe and America have, for the most part, never been there" (Chartier, 2006). The pitfall of most of these representations of the North is that authors and the audience are reporting and receiving the media, respectively, from a southern perspective. We, the Canadian South, have historically produced a significant body of literature and media on a subject that we largely do not fully comprehend. Only recently have the voices of native northerners – Inuit, First Nations and non-aboriginal – begun to be self-represented. As Grace says, "Native northerners play an increasing part in the representation of North, even when that part is limited to an acknowledgement of their prior exclusion" (2002, p.43).

SEE: Daniel Chartier, *Nanook Of The North*, BBC, Farley Mowat, Ay Jackson, *Canada and the Idea of North*

Coates, Kenneth, and Judith Powell. *The Modern North: People, Politics, and the Rejection of Colonialism*. Toronto: J. Lorimer, 1989. Print.

Grace, Sherrill. *Canada and the Idea of North*. Montreal: McGill-Queen's UP,

Respect

Respect for the North is practiced by the northern Aboriginal and non-aboriginal inhabitants of the North, though it is owed by all Canadians.

Snow-Blind

Condition whereby the human eyes are blinded (temporary or permanent) due to the reflection of the sun off the snow. Sunglasses are mandatory for outdoor exploration in the North during the winter months.

Social issues

In northern Aboriginal and non-Aboriginal communities alike, social issues have the potential to become magnified due to feelings of isolation and distance – proximity to other large communities and connections to greater society. The most prevalent social issues common to northern communities are substance abuse, depression and physical abuse, often involving elders.

Canada. Deline First Nation / Indian and Northern Affairs Canada. Canada-Deline Uranium Table Final Report - concerning Health and Environmental Issues Related to the Port Radium Mine. N.p.: n.p., 2005. Print.

Solitude

Different than isolation in that in the northern context, solitude refers to a less negative experience of being alone: a self-reflective sense of peace in the vast landscape. Willingly removing oneself from society, immersing in the northern landscape.

Statistics Canada definition

According to the 2000 report by Geography Division of Statistics Canada, the boundary between northern and southern Canada does not follow the 60th parallel. The report reveals three specific boundaries: the South Transition Line, North-South Line, and North Transition Line. Transition Zones were calculated based on one standard deviation from the mean. It is interesting to note that the North Transition Line follows a similar path to the boundary line between plant hardiness zones 1 and 2. Statistical analysis was performed according to an average of 16 selected indices: Boreal forest, heating degree-days, growing degree -days, discontinuous permafrost, agroclimatic resource index, Thornthwaite summer concentration of thermal efficiency, population ecumene (inhabited land), agriculture ecumene, all season road and railway transportation networks, accessibility index, living cost differential, resourced areas and Native North, OECD (Organization for Economic Co-operation and Development) rural north, and Revenue Canada Northern and Intermediate tax zones. The 16 indicators were evaluated based on comparisons to work by Hamelin, among others.

McNiven, Chuck, and Henry Puderer. "Delineation of Canada's North: An Examination of the North-South Relationship in Canada." Geography Working Paper Series 3rd ser. (2000). Print.

Stereotype

An oversimplified opinion, prejudiced attitude or uncritical judgment held by a group of people (Merriam Webster, 2012). Northern stereotypes are often influenced by derogatory racial generalizations. The most common northern Aboriginal stereotype is that of the lazy, drunk Aboriginal. The danger of these stereotypes is that they are often based on a very small minority of the population yet have negative effects on the entire population. The National Film Board of Canada (NFB) produced a film in 1952 titled Land of the Long Day. This film represents the southern belief that the people of the North were not only resilient but also completely open to adapting to the southern way of life (Flaherty, 1922; Wynn, 2007, p. 318). Narrated by John Drainie, Land of the Long Day purportedly tells the story of the Tununermiut people of North Baffin Island, as the main 'character' Idlouk 'would have told it in his native Eskimo' (BBC, 1952).

It is not clear if the narration has been written by a non-Inuit or translated directly, or a combination of both. Two examples of literature published in direct opposition to the image of the easily adaptable Inuit include Farley Mowat's *People of the Deer* (1952) and Richard Harrington's *The Face of the Arctic* (1952).

SEE: Eskimo

Land of the Long Day. Dir. John Drainie. National Film Board of Canada, 1952.

Substance Abuse

A common issue in Aboriginal and non-Aboriginal northern communities, often caused by feelings of depression and isolation. Substance abuse may include alcohol or drugs, although in some cases availability and price drive individuals to turn to more common, household items such as gasoline or mouthwash. Most pharmacies and drug stores in northern communities only sell products with alcoholic content or potential for drug use behind the counter (nail polish remover, hair spray, mouthwash).

TEK

Traditional Ecological Knowledge (TEK). Refers to a specific subset of Traditional [Aboriginal] Knowledge (TK) focusing on knowledge and values relating to the human relationship with the environment. Recently, TEK and TK have been considered legitimate fields of expertise. Employing Traditional Ecological Knowledge in conjunction with scientific research may provide a more holistic approach to better understand the complex issues of the northern environment.

Terra Nullis

Latin for 'empty lands' or land that belongs to no one. Early European explorers and settlers of the New World (later Canada) considered the newly discovered land to be devoid of human life and applied the doctrine of terra nullis to justify the appropriation of land from the legitimate claims of the aboriginal peoples. In the context of this practicum, Terra Nullis has a contemporary use. Extending beyond the use by European explorers, the term can be applied to the Canadian North as a land that is free and full of challenge. A landscape that affects the individual, holds many meanings and is a source of political and social conflict – but a landscape that belongs to no one. The Canadian North belongs to everyone.

Pratt, Angela. "Treaties vs. Terra Nullius: "Reconciliation," Treaty-Making and Indigenous Sovereignty in Australia and Canada." *Indigenous Law Journal* 3 (Fall 2004): 43-60. Web. 23 Mar. 2013. <<https://tspace.library.utoronto.ca/bitstream/1807/17116/1/LJ-3-Pratt.pdf>>.

The World Set Free

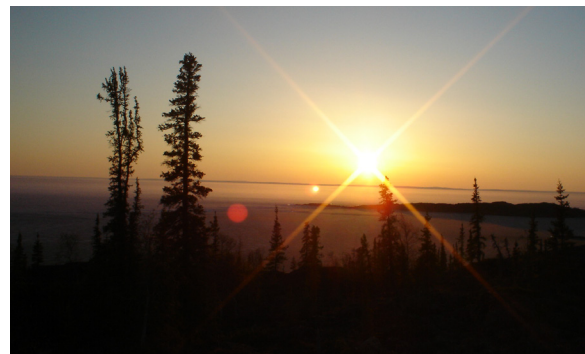
Written by H.G. Wells in 1913, published in 1914. Written under the shadow of WWI, *The World Set Free* touches on technological advances, energy sources and, to a degree, prophesizes the advent of the nuclear bomb following the discovery of nuclear fission. The novel is said to have influenced physicist Leo Szilard who worked on discovering the neutron chain reaction in the 1930s.

Wells, H. G. *The Last War: A World Set Free*. Lincoln: University of Nebraska, 2001. Print.

Thomas Berger

Canadian lawyer, judge and humanitarian. Served as commissioner of the Mackenzie Gas Pipeline Inquiry from 1974 to 1977. Author of 1977 report *Northern Frontier, Northern Homeland* that strongly recommended against approving the Mackenzie Gas Pipeline. Berger also had a significant role in the 1982 amendments to the Canadian Constitution with respect to aboriginal and treaty rights.

"Thomas Rodney Berger." - *The Canadian Encyclopedia*. N.p., n.d. Web. 23 Mar. 2013. <<http://www.thecanadianencyclopedia.com/articles/thomas-rodney-berger>>.



TK

Traditional Knowledge (TK). Refers to Aboriginal knowledge passed down through generations. Traditional Knowledge encompasses all aspects of Aboriginal culture (natural and social environments) and includes a specific subset of environmental knowledge known as Traditional Ecological Knowledge (TEK).

SEE: TEK

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Traditional Food

Many Aboriginal communities rely on traditional food for survival. Hunting, trapping, fishing and gathering berries taken directly from the land are the main sources of traditional food. Climate change and contamination from major projects – oil, gas, hydro and mineral exploration – is threatening many traditional food sources.

“us” “them” “we”

There exists a discrepancy of perspective between ‘us’ and ‘them’ – even the ‘us’ is subject to perspective. For those in the southern cities and provinces lying close to the Canada-US border, ‘them’ undoubtedly refers to the northerners, the distant people inhabiting the North. For those in the North, ‘us’ refers to the people of the North. The use of ‘we’ and ‘our’ has the ability to convey a sense of exclusivity and authority (Grace, 2002).

Grace, Sherrill. *Canada and the Idea of North*. Montreal: McGill-Queen's UP, 2001. Print.

Village of Widows

A controversial 1999 documentary directed by filmmaker Peter Blow. The film highlights the involvement of the Sahtu Dene Aboriginal peoples in the operation of the former uranium mine at Port Radium, Northwest Territories. The film reveals that the ore mined at Port Radium was used to create the atomic bombs dropped on Hiroshima and Nagasaki and captures a Dene pilgrimage to Hiroshima where the Dene community expresses its regret for taking part in something so destructive. The film tells of the subsequent suffering of the Dene community of Déline and the high cancer and death rates within the community, due to what is believed to be unsafe exposure to radioactive waste during the operational years of Port Radium.

Village of Widows. Dir. Peter Blow. Prod. Gil Gauvreau. Lindum Films, 1999.

Visitors

Those ‘outsiders’ who travel to the North for a finite amount of time. Visitors may be individuals or corporations.

Vulnerability

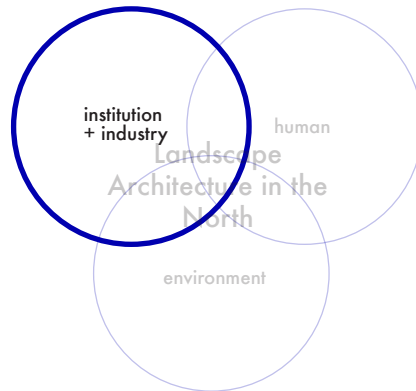
Open to attack, injury or pain. Ecologically, the North is vulnerable to contamination and negative impacts of development. The North is specifically vulnerable to the effects of climate change due to the slow response time of the northern environment. The northern Aboriginal peoples are vulnerable to the annual influx of southern Canadian influences, prejudices and standards of living which do not match the historical, cultural northern-Aboriginal way of life.

Wages & Industry

Industry driven demand for manual and physical laborers in remote northern locations has led to many jobs with high wages and minimal job requirements and qualifications. Many jobs are seasonal and attract high volumes of southern Canadian citizens.

appendix

A Glossary of The North Industry & Institution



Through technology and evolution, the role of the institution emerges as the third area of significance. Increasing standards and quality of living and economic development have resulted in large institutions showing an increased interest in expanding profit margins. This often involves exploring ‘uncharted territories’, such as exploration and mining in the North. Burgeoning population levels worldwide and looming climate change have challenged environmental and economic government policy. Additionally, our inherent need to claim ownership of property has led to an increased number of institutional stakeholders interested in the North. For the purposes of this practicum, institution here refers to government, industry, academic research, and corporation.



Abandoned mines

Mine sites that have been abandoned with no decommissioning procedures or plans in place. Often historical mines which were operational and abandoned prior to current mining regulations and legislation. Examples: Port Radium, NT (uranium); Giant Mine, NT (gold with arsenic waste); Britannia Mine, BC (copper, zinc and gold with acid rock drainage); Lynn Lake Mine, MB (nickel-copper with sulphide tailings and acid rock drainage)

Several government programs have been established to attempt to deal with abandoned mine sites:

Crown Contaminated Sites Program, BC (2002/2003): \$180 million allocated
Federal Contaminated Sites Program, INAC/AANDC: \$555 million allocated
Ontario Abandoned Mines Rehabilitation Program: \$117 million allocated

Cowan, W.R., and W.O. Mackasey. Rehabilitating Abandoned Mines in Canada: A Toolkit of Funding Options - Prepared for NATIONAL ORPHANED/ABANDONED MINES INITIATIVE. Rep. Sudbury: Cowan Minerals, October 2006. Print.

Aboriginal Affairs and Northern Development Canada (AANDC)

Formerly Indian and Northern Affairs Canada (INAC), AANDC is a federal government department that supports Aboriginal peoples and Northern Canadians. The role of AANDC is to meet the Canadian Government's obligations and commitments to the First Nations, Inuit and Métis, and for fulfilling the constitutional responsibilities in the North.

Canada. Aboriginal Affairs and Northern Development Canada. Sahtu Dene and Metis Comprehensive Land Claim Agreement. Government of Canada, 1993. Web. 25 Jan. 2013. <<http://www.aadnc-aandc.gc.ca/eng/1100100031147/1100100031164>>.



Adit

Entrance tunnel to underground mine.

Arctic Council

"The Arctic Council is a high-level intergovernmental forum to promote cooperation, coordination and interaction among the Arctic States" (Arctic Council Mandate, 2012). The Arctic Council was formed in 1996 following the Ottawa Declaration which tasked the council with promoting interaction among the Arctic States and including all Arctic Indigenous communities on common Arctic issues such as development and environmental protection. Member states are: Canada, Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, Russian Federation, Sweden and the United States of America.

"Arctic Council." Home. Arctic Council Chairmanship Secretariat 2007-2013, n.d. Web. 23 Mar. 2013. <<http://www.arctic-council.org/index.php/en/>>.

Arctic Sovereignty

Exerting government control over a geographic populated area. Europeans have historically asserted sovereignty over Canada and the North through exploration and settlement. Historically, European and later Canadian governments asserted sovereignty in the North through fur trade, Anglican and Roman Catholic missions and later by erecting remote northern RCMP outposts. The Canadian Government also controversially relocated 17 aboriginal families from Baffin Island to the Arctic Archipelago to claim sovereignty. Currently, the Canadian government faces Arctic sovereignty concerns due to the debate over legitimate claims to the Northwest Passage.

SEE: Northwest Passage, Relocation

Honderich, John. Arctic Imperative: Is Canada Losing the North? Toronto: University of Toronto, 1987. Print.

Boom/Bust Cycles

Referring to resource industry, most commonly the mineral and oil and gas sectors. Since mining is the largest private sector employer in the territories, with a value of \$2.25 billion in 2006, the Canadian North is susceptible to economic fluctuations: the Northern economy is directly and completely dependent upon its major economy (Bone, 2008). Three boom/bust cycles exist:

- (1) non-renewable resource cycle following the opening and closing of a mine or resource enterprise
- (2) construction period associated with the start-up of a megaproject
- (3) cyclical slowdown of global economy

Boom/bust cycles drive the mineral exploration and mining industry and can be the cause for rapid exploration activity and mine start-up as well as mine abandonment and exploration crashes.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Canada's Northern Strategy

Canadian Governmental Document outlining anticipated strategy and vision for development of the Canadian North: "We have a clear vision for the North and are working to ensure the region achieves its rightful place within a strong and sovereign Canada" (Hon. Chuck Strahl, P.C., M.P. Minister of Indian Affairs and Northern Development, 2009). The integrated Northern Strategy is based on four equal priorities:

- (1) exercising Arctic Sovereignty
- (2) promoting social and economic development
- (3) protecting environmental heritage
- (4) improving and devolving northern governance

Canada's Northern Strategy. Government of Canada, n.d. Web. 2 Mar. 2013.
<<http://www.northernstrategy.gc.ca/index-eng.asp>>.

Circumpolar World

Parts of countries in the northern hemisphere that contain Arctic or Sub-Arctic environments (Bone, 2008).

SEE: Arctic Council

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Cold War

Approximately dated from the end of the Second World War (WWII) to 1991. The Cold War was a prolonged period of political and military tension between global superpowers, following the invention of the atomic bomb and nuclear warfare. Many arctic surveillance stations were constructed for national security purposes during this time.

Gaddis, John Lewis. *The Cold War: A New History*. New York: Penguin, 2005. Print.

Hanes, Sandra M., Ricard Clay Hanes, and Lawrence W. Baker. *Cold War*. Detroit: Thomson/Gale, 2004. Print.

Crown Land

Land that is owned by the federal government. The use of 'crown' reflects the parliamentary democracy of Canada and its constitutional monarchy which holds the Queen as Sovereign.

DEW line

Distance Early Warning Line. Series of radar stations across the Canadian and American North that formed a radar network responsible for warning North American governments of potential airborne attacks from the North Pole. Established during the Cold War, from the 1950s to 1960s, the DEW Line consisted of 42 isolated radar stations and was primarily proposed and funded by the United States of America. 21 DEW Line sites were decommissioned in the early 1960s under the responsibility of the department of Aboriginal Affairs and Northern Development (formerly Indian and Northern Affairs). All DEW Line sites were decommissioned in 1993 and replaced by the North Warning System (Government of Canada, 2009). With improved environmental standards, the Department of National Defense (DND) and the Inuit community have been tasked with complete DEW Line site cleanup. Current budget estimates for DEW Line site closures and remediation sit close to \$580 million.

"The Distant Early Warning Line Clean-up Project." Government of Canada: Canada News Centre. Department of National Defense, 29 June 2009. Web. 23 Mar. 2013. <<http://news.gc.ca/web/article-eng.do?m=/index>>.

Lackenbauer, P. Whitney., Matthew James Farish, and Jennifer Arthur-Lackenbauer. *The Distant Early Warning (DEW) Line: A Bibliography and Documentary Resource List*. [Calgary]: Arctic Institute of North America, 2005. Print.

Disaster mitigation

Eliminating or reducing the impact and risk of natural and human-made hazards. Proactive rather than reactive. The Canadian Government - Public Safety Canada outlines the 'all-hazards approach' that considers all possible risks and impacts of specific activities. Mining disaster mitigation depends on thorough site analysis and project scope description and may involve a complete Environmental Impact Assessment (EA/EIA). In cases where there exist one or more unknown variables, the precautionary principle should be exercised. This is not often the case for megaprojects and northern development.

SEE: Canadian Environmental Assessment Agency, Precautionary Principle

"Public Safety Canada: About Disaster Mitigation." Government of Canada, Public Safety Canada. N.p., 20 Feb. 2012. Web. 23 Mar. 2013. <<http://www.publicsafety.gc.ca/prg/em/ndms/aboutsnac-eng.aspx>>.

Economy

The Canadian North is economically governed by a non-renewable resource-based economy. The Northwest Territories economy is no exception. The gross domestic product (GDP), or measure of total market value of all goods/services produced in the NWT per year, indicates overall growth of the economy. In 2011, the NWT GDP sat at \$3.31 billion, up from \$2.08 billion in 1999 (Government of the Northwest Territories, 2012). The sectors that experience the most growth include mining and oil and gas, and construction to a lesser extent. Corporate profits make up 25% of the income-based GDP in the NWT – twice the national average. The NWT is experiencing 'income leakage' whereby migrant workers take income earned within the NWT elsewhere.

SEE: Mining

"Welcome to the NWT State of the Environment Report on the Web." State of the Environment Report. Government of the Northwest Territories, updated to 2012. Web. 23 Mar. 2013. <http://www.enr.gov.nt.ca/_live/pages/wpPages/SOE_Welcome.aspx>.

Ephemeral Mining & exploration

Mineral exploration and mining projects are bound by law to adhere to strict environmental regulations. There are also specific guidelines for mine closure, decommissioning and remediation where necessary. Generally, mineral exploration activity should be environmentally inconspicuous - ephemeral - leaving no trace of its activity. Many 'ghost' abandoned exploration camps are scattered across the North in areas where no mineral deposit has been found or deemed economically viable.

Franklin Expedition

Ill-fated British-led expedition to find Northwest Passage. Sir John Franklin began his search in 1845 with 182 men and two ships, the HMS Terror and HMS Erebus. Both ships, Sir Franklin and the entire crew were never seen again. It is presumed that Franklin died in 1847 and some of the remaining crew turned to cannibalism for survival, eventually succumbing to starvation and exposure. In 2012, the Canadian Government announced a new full-scale search for the lost ships in the Northwest Passage.

SEE: Northwest Passage

"CG Special Feature - Sir John Franklin Expedition." CG Special Feature - Sir John Franklin Expedition. Canadian Geographic, n.d. Web. 23 Mar. 2013. <<http://www.canadiangeographic.ca/specialfeatures/franklinexpedition/>>.

Geologic Survey of Canada (GSC)

The Earth Science Sector of Natural Resources Canada – formerly the Geological Survey of Canada (GSC) – has extensively mapped the North, producing numerous geological maps. Established in 1842, the GSC was tasked with preparing a comprehensive inventory and assessment of the mineral wealth of Canada and would later extend to include forestry research, economic values of mineral deposits and topographical mapping of the entire country.

"Geological Survey of Canada." Government of Canada, Natural Resources Canada. N.p., n.d. Web. 23 Mar. 2013. <<http://www.nrcan.gc.ca/earth-sciences/about/organization/organization-structure/geological-survey-of-canada/9590>>.

Government

There are currently three official northern territories in Canada: Northwest Territories, Yukon Territory and Nunavut. The Canadian Government and Inuit and Aboriginal peoples have been working towards reaching an agreement on Territorial Self-Governance. The Yukon became the first territory to devolve responsibilities on land and resource management from the federal government. In the Northwest Territories, under the Comprehensive Land Claims Agreement, authority is granted to Aboriginal peoples in managing their land and resources.

Land Claims

Agreements between the Canadian Government and Aboriginal peoples over the rights to land claims. Specific to Port Radium and Great Bear Lake: Sahtu Dene and Métis Comprehensive Land Claim Agreement 1994 to confirm the desired objectives:

- to provide for certainty and clarity of rights to ownership and use of land and resources;
- to provide the specific rights and benefits in this agreement in exchange for the relinquishment by the Sahtu Dene and Metis of certain rights claimed in any part of Canada by treaty or otherwise;
- to recognize and encourage the way of life of the Sahtu Dene and Metis which is based on the cultural and economic relationship between them and the land;
- to encourage the self-sufficiency of the Sahtu Dene and Metis and to enhance their ability to participate fully in all aspects of the economy;
- to provide the Sahtu Dene and Metis with specific benefits, including financial compensation, land and other economic benefits;
- to provide the Sahtu Dene and Metis with wildlife harvesting rights and the right to participate in decision making concerning wildlife harvesting and management;
- to provide the Sahtu Dene and Metis the right to participate in decision making concerning the use, management and conservation of land, water and resources;
- to protect and conserve the wildlife and environment of the settlement area for present and future generations; and
- to ensure the Sahtu Dene and Metis the opportunity to negotiate self-government agreements.



With respect to mining operations, under section 10.1.1 of The Land Claim Agreement 1994 it states that the Government will pay the Sahtu Tribal Council an annual amount for resource royalties equal to 7.5% for the first \$2.0 million of resource royalties received by government in the given year.

Canada. Aboriginal Affairs and Northern Development Canada. Sahtu Dene and Metis Comprehensive Land Claim Agreement. Government of Canada, 1993. Web. 25 Jan. 2013. <<http://www.aadnc-aandc.gc.ca/eng/1100100031147/1100100031164>>.

Mackenzie Gas Project

A proposed 1,196 km pipeline system moving natural gas obtained from the Mackenzie Delta region to southern provinces and states across North America. Currently the project has not received approval and has been the cause of heated debate between environmentalists, scientists, politicians and Aboriginal communities for over 30 years.

Manhattan Project

A top-secret, American project initiated in 1942 as a reaction to intelligence reports of Hitler's atomic research towards creating the atomic bomb. Albert Einstein, Enrico Fermi and Leo Szilard all participated in the Manhattan Project. The sole purpose of the Manhattan Project was to collect scientists and researchers and beat Hitler to discovering the atomic bomb. The project was initiated by President Theodore Roosevelt and placed under the direction of J. Robert Oppenheimer and General Leslie R. Groves of the United States of America. The Manhattan Project was a success, producing the world's first atomic bomb in 1945; two atomic bombs were dropped on Nagasaki and Hiroshima, Japan. Although there are conflicting reports, it is assumed that the Canadian Government participated in the Manhattan Project. Atomic research was being undertaken at McGill University in Montreal, Quebec – using uranium ore obtained from the Port Radium mine in the Northwest Territories. Approximately 86% of the uranium required for the Manhattan Project was obtained from Port Radium and the Congo (Van Wyck, 2010).

Van Wyck, Peter C. The Highway of the Atom. Montreal: McGill-Queen's UP, 2010. Print.

Chenoweth, William L. "Raw Material Activities of the Manhattan Project on the Colorado Plateau." Nonrenewable Resources 6.1 (1997): 33-40. New Mexico Bureau of Geology and Mineral Resources. Web. 20 Feb. 2013. <http://geoinfo.nmt.edu/publications/openfile/downloads/OFR200-299/226-250/241/ofr_241.pdf>.

Cohen, Daniel. The Manhattan Project. Brookfield, CT: Millbrook, 1999. Print.

Market value for ore

The mining industry in the Canadian North is subject to the current market value of the metal or non-metal that is mined. At the time of writing this practicum, the following commodity prices were recorded (per troy ounce):

NYMEX	Gold	\$1669.40
	Silver	\$31.11
	Platinum	\$1686.00
	Copper	\$3.63

In the Winnipeg Free Press, 6 of 9 of the most active trade companies in the Toronto Stock Exchange (TSX) on Tuesday, January 15, 2013 were mining or resource related: Uranium One, Aurizon Mines, Research in Motion, Bombardier, Paladin Energy, B2 Gold, Denison Mines, Manulife Financial, TAG Oil.

Winnipeg Free Press FP Markets on 01.14.13 Winnipeg Free Press, 2013. Print.

Mineral Exploration

According to AANDC, “mineral exploration is a sequential process of information gathering that addresses the mineral potential of a given area” (2013). Mineral exploration is the first step in the mining process: once a deposit has been found and confirmed through scientific analysis - deemed to be economically productive - mining may begin.

NWT Chamber of Mines. “Our Industry.” Mining North. NWT and Nunavut Chamber of Mines, 2011. Web. 22 Feb. 2012. <http://www.miningnorth.com/?page_id=9>.

Stothart, Paul. Fact\$ & Figure\$ 2011 of the Canadian Mining Industry. Rep. N.p.: Mining Association of Canada, 2011. Print.

Canada. Minister of Justice. Northwest Territories and Nunavut Mining Regulations. C.R.C., C.1516 - Last Amended on July 28, 2008, n.d. Web. 18 Nov. 2012. <<http://laws-lois.justice.gc.ca>>.

Government of Canada. “Mining & Minerals in the Northwest Territories and Nunavut.” The North. Aboriginal Affairs and Northern Development Canada, 23 Apr. 2012. Web. 23 Mar. 2013. <<http://www.aadnc-aandc.gc.ca/eng/1100100036000/1100100036004>>.

Mining

Extraction of non-renewable metallic or non-metallic resources from the Earth. Mining in Canada includes: gold, copper, zinc, nickel, cobalt, uranium, diamonds, oil sands, aluminum, coal, lead, zinc, potash, salt, gypsum, and iron.

Canada. Minister of Justice. Northwest Territories and Nunavut Mining Regulations. C.R.C., C.1516 - Last Amended on July 28, 2008, n.d. Web. 18 Nov. 2012. <<http://laws-lois.justice.gc.ca>>.

Government of Canada. “Mining & Minerals in the Northwest Territories and Nunavut.” The North. Aboriginal Affairs and Northern Development Canada, 23 Apr. 2012. Web. 23 Mar. 2013. <<http://www.aadnc-aandc.gc.ca/eng/1100100036000/1100100036004>>.

Mining / Mineral Claim

The securing of mineral rights on crown land. Mineral claims are required prior to subsurface investigation and extraction. The Eldorado mine at Port Radium, Northwest Territories set a precedent for the ownership of surface and mineral rights. Following the boom of radium and uranium at Port Radium (1930s), which was privately owned, the Canadian Government changed legislation to reflect Crown Land and government ownership of mineral rights. Mineral rights can, therefore, only be leased from the Canadian Government.

Canada. Minister of Justice. Northwest Territories and Nunavut Mining Regulations. C.R.C., C.1516 - Last Amended on July 28, 2008, n.d. Web. 18 Nov. 2012. <<http://laws-lois.justice.gc.ca>>.

Mining Regulations

All northern Canada Crown Land is managed according to the Territorial Land Act (1985). AANDC is the governing body responsible for mining activity in the Northwest Territories, including: regulatory issues, mineral policy, exploration, mine development and mine production, land claims, mine reclamation and statistics on mineral activity and trends.

Information on specific mining regulations in the Northwest Territories and Nunavut can be found in the Northwest Territories and Nunavut Mining Regulations document, current as of December 10, 2012 and last amended on July 28, 2008.



Motivation

The motivation behind development projects – government or otherwise – should be identified. In almost all cases, the motivation behind development is financial.

Northern Living Allowance

Deductions provided by the Canada Revenue Agency for residents of approved northern Canadian zones. Deductions can be applied for residency (living in a prescribed zone) and travel benefits. Some 'intermediate zones' allow for 50% of the full northern resident deductions allowed. Currently, all places in the Yukon, Nunavut and the Northwest Territories qualify for full deductions.

Northern Transportation Company Limited (NTCL)

Created to supply constant air and water support to the Port Radium mine on Great Bear Lake, the NTCL is a lasting legacy of Port Radium (CDUT Report, 2005). Started as Northern Waterways Limited, with one wooden tug and two wooden barges in 1934, the NTC was purchased in 1936 by Eldorado Mines – responsible for Port Radium, NT. The first steel vessel on the Mackenzie River was introduced in 1937. The Government of Canada purchased Eldorado Mines, including Port Radium, as well as the NTCL in 1949.

The NTCL also participated in transporting materials and goods for the DEW Line.

Van Wyck, Peter C. *The Highway of the Atom*. Montreal: McGill-Queen's UP, 2010. Print.

Bothwell, Robert. *Eldorado, Canada's National Uranium Company*. Toronto: University of Toronto, 1984. Print.

NTCL. "Our History." Northern Transportation Company (NTCL). N.p., 2012. Web. 18 Mar. 2012. <<http://www.ntcl.com/about-us/history/>>.

Northwest Passage

The shortest international shipping route connecting the Atlantic and Pacific Oceans, through the arctic waters off the Canadian Archipelago. Although many expeditions were attempted, two of the most memorable historic expeditions were undertaken by Sir John Franklin and Roald Amundsen in 1845 and 1903, respectively. Amundsen was the first to successfully navigate the passage, completing his expedition in 1906.

The threat of climate change and melting sea-ice may potentially unlock the Northwest Passage, opening a heated debate over arctic sovereignty and control over the passage. Currently, Canada claims the Northwest Passage to lie within Canadian navigable waters, falling under Canadian jurisdiction.

SEE: Franklin Expedition

Honderich, John. *Arctic Imperative: Is Canada Losing the North?* Toronto: University of Toronto, 1987. Print.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Northwest Territories

The British Government established the Northwest Territories in 1880. Boundary amendments to the Northwest Territories included shifting of the southern boundary to latitude 60° N, caused by land redistribution to the new provinces of Manitoba, Saskatchewan, Alberta and the Yukon Territory, finally ending in 1999 with the establishment of Nunavut. The Northwest Territories presently occupies 1 346 106 km² of Canada's northern land with a population of 43 283; the capital of the Northwest Territories is Yellowknife and has a population of 19 155.

Newstats. "2011 Census of Canada Data." NWT Bureau of Statistics. Government of the Northwest Territories, 2011. Web. 18 Mar. 2012. <<http://www.statsnwt.ca/census/2011/>>.

Nunavut

The newest addition to the Canadian territories is Nunavut. Occupying 1 932 254 km² of Canada's northeast, Nunavut has a population of 31 000. The capital city of Nunavut is Iqaluit, with a population of 7250.

Nunavut Bureau of Statistics. "Nunavut Quick Facts." Government of Nunavut, 2012. Web. 18 Mar. 2012. <<http://www.stats.gov.nu.ca/en/home.aspx>>.

Orphaned Mines

Mines which are no longer operational and do not have an owner, or mine owners are not financially capable to properly remediate the site.

See: abandoned mines

Ownership

The ownership of land, mineral rights, and ownership of potential environmental disasters must all be considered before any project development proposal.

Oil & gas

Oil and gas exploration and mining occurs across Canada. According to the Canadian Association of Petroleum Producers (CAPP), "Canada's northern territories have large, untapped resources of crude oil and natural gas" (2012). In 2011, the Northwest Territories and Yukon spent \$0.12 billion on industry exploration and development. In the same year, 10,500 barrels of oil were produced per day in the Northwest Territories. Offshore oil and gas is expected to increase in the high Arctic as the Northwest Passage begins to free-up.

"Canada's Industry ." Canada's Industry. Canadian Association of Petroleum Producers, 2012. Web. 23 Mar. 2013. <<http://www.capp.ca/canadaIndustry/Pages/default.aspx>>.

Parks Canada

Parks Canada has been known as the Dominion Parks Branch, National Parks Branch, Parks Canada, Canadian Parks Service and Parks Canada Agency. Canada was the first country in the world to establish a national park system. Parks Canada was initially established in 1911 as the Dominion Parks Branch. The concept of the national park was a direct result of the discovery of the thermal springs at Banff National Park. Prior to the National Park designation, the thermal springs at Banff were privately owned, which created immense tension between those who believed to have rightful claim to the discovery. In 1930, the federal government established the National Parks Act, ensuring no future park creation or existing park alterations be made by anyone other than Parliament. In 1964 the first statement of national parks policy was tabled in the House of Commons. In 1970, Parks Canada adopted the natural region system plan to guide park expansion activities. This was the first National Parks System Plan to be approved. In 1976, Canada joins the World Heritage Convention: Nahanni National Park is designated the world's first Natural World Heritage Site by UNESCO. A revised National Parks Policy introduces 'ecological integrity' as a guiding principle in 1979: the principle of ecological integrity is made into law in 1988. On February 19, 2001 the Canada National Parks Act (CNPA) was proclaimed in Parliament. The Act limits commercial development in national park communities. Recent Parks Canada activity includes the establishment of the Naats'ihch'oh National Park Reserve on August 22, 2012. Canada now has 44 national parks. Parks Canada is also responsible for: National Parks, National Historic Sites, National Marine Conservation Areas, Cultural Heritage and Natural Heritage.

Parks Canada Mandate:

On behalf of the people of Canada, we protect and present nationally significant examples of Canada's natural and cultural heritage, and foster public understanding, appreciation and enjoyment in ways that ensure the ecological and commemorative integrity of these places for present and future generations.

Searle, D. Richard. *Phantom Parks: The Struggle to save Canada's National Parks*. Toronto: Key Porter, 2000. Print.

Canada. Parks Canada. *National Historic Sites of Canada System Plan*. N.p.: Her Majesty the Queen in Right of Canada, 2000. Print.

Dearden, Philip, and Rick Rollins. *Parks and Protected Areas in Canada: Planning and Management*. Toronto: Oxford UP, 1993. Print.

Phantom Parks by Rick Searle

2000 publication focusing on a critical assessment of the state of Canada's national parks. Rick Searle challenges the success of the mandate of Parks Canada, pointing the finger at not one but multiple causes of environmental degradation.

Searle, D. Richard. *Phantom Parks: The Struggle to save Canada's National Parks*. Toronto: Key Porter, 2000. Print.

Placer Mining

Placer: a surficial mineral deposit formed through concentration of mineral particles from weathered debris (often found in historic and/or active aquatic environments). Commonly heavy and durable minerals such as gold. Placer mining is a form of surface mining that includes the extraction and concentration of heavy metals or minerals from placer deposits. Can involve dredging.

Neuendorf, Klaus K.E., James P. Mehl, Jr., and Julia A. Jackson, eds. *Glossary of Geology*. 5th ed. Virginia: American Geological Institute, 2005. Print.

Polar Nation

Possessing Arctic and Sub-Arctic natural environments, Canada is a Polar Nation and part of the polar world.

SEE: Arctic Council

Politics

The political climate is constantly changing. Political agendas may vary and alter existing regulations and procedures pertaining to northern development. It is important that the Canadian Government remain consistent with its Northern Strategy. Politics must balance the tension and driving forces behind industry and corporations with the sensitive northern environment.

Provincial North

The portion of the Canadian North that is located within the provincial boundaries. Accessibility is greater in the Provincial North due to existing infrastructure and available funding.

Bone, Robert M. *The Canadian North: Issues and Challenges*. Don Mills, Ont.: Oxford UP, 2009. Print.

Radium (Ra)

Pitchblende was discovered by Henri Becquerel in 1896. That same year, Marie and Pierre Curie discovered the element radium – isolating it from pitchblende deposits. Radium is a soft, silvery element that is obtained from uranium ore and can be found in Canada, USA, Australia and Africa. Given the same mass of uranium and radium, radium is over 1,000,000 times more radioactive.

Used to treat many medical conditions in the 1930s such as gout, rheumatism, arthritis, leukemia, angina and high blood pressure. Radium cancer therapy became widely popular and consisted of inserting radium into cancer cells. Currently, cobalt-60 has replaced medical radium due to its known health implications.

SEE: Port Radium

Bothwell, Robert. Eldorado, Canada's National Uranium Company. Toronto: University of Toronto, 1984. Print.

"Radium." ARCHIVED: Periodic Table of the Elements. National Research Council Canada, 19 Mar. 2012. Web. 23 Mar. 2013. <<http://www.nrc-cnrc.gc.ca/eng/education/elements/el/ra.html>>.

Van Wyck, Peter C. The Highway of the Atom. Montreal: McGill-Queen's UP, 2010. Print.

Remediation

The mitigation of contamination, removal of point sources of contamination and exposure pathways following mining processes. Some historic mine sites have significant levels of contamination that have been left un-addressed and not remediated due to lack of ownership - many former mining companies no longer exist and cannot be contacted or held accountable for environmental clean-up costs. In some cases the federal government must step in and begin the process of remediation.

Research

Scientific research is crucial to future northern development policies and procedures. Ongoing Arctic and Sub-Arctic field research is taking place across the Canadian North. There are approximately 50 field stations across Northern Canada. Based on recent governmental cuts to science, research and development it is possible that this number is considerably lower. There are, however, several active Northern research associations and projects. ArcticNet is a collaborative group of academic and government researchers focused on studying the impacts of climate change in the coastal Arctic. In 2007, the Canadian Government proposed building a world-class Arctic research station located in the Canadian Arctic. To date the project has not been completed.

"ArcticNet - Research Projects Phase 3." ArcticNet - Research Projects Phase 3. ArcticNET - Government of Canada, n.d. Web. 23 Mar. 2013. <<http://www.arcticnet.ulaval.ca/research/phase3.php>>.

Responsibility

The issue of responsibility is significant in northern development where many megaprojects are often undertaken by absentee, global corporations with no vested interest in environmental protection or remediation. For many former mines and mining operations that have long since been abandoned, the responsible party/parties are often no longer associated with the industry, making the responsibility of remediation difficult. In some cases, the federal government must step in and assume responsibility. Government mining legislation and regulations have been adapted to include remediation responsibilities as well as preservation of certain environmental areas of significance.

Surface Mining

Mining of mineral deposits at or near the surface. Surface mining involves the repeated removal of layers of surface material.

Example: Diavik Diamond Mine Open-Pit Operations – Northwest Territories

Tailings

Mining byproduct. Portion of ore that has been degraded or processed beyond the point of economic value. Tailings often contain heavy metals and contaminants which contribute to acid rock drainage.

Underground Mining

Extracting mineral deposits below the surface using tunnels or shafts. Several techniques exist and depend on the access techniques applied to reach the ore.

Example: Vale Limited Thompson Nickel Mine – Thompson, Manitoba
Eldorado Mining and Refining Limited Port Radium Operations

Uranium (U)

Discovered in 1789 by chemist Martin Klaproth. Uranium was often considered a waste product of mining radium from pitchblende. Uranium has two naturally occurring isotopes, U-235 and U-238: nuclear fission was first observed with U-235, in 1938 in Berlin. Uranium is used in nuclear weapons which can release large amounts of energy. The National Research Council Canada scientist George Lawrence worked on a nuclear reactor in the early 1940s – using uranium from Port Radium. Unfortunately, Lawrence's prototype did not become the first nuclear reactor in the world and was beat by Enrico Fermi in Chicago in 1942. Energy from nuclear fission of uranium produces nearly 20% of the world's electricity. 20 kg of uranium can produce as much energy as 400,000 kg of coal.

SEE: Port Radium

"Uranium." ARCHIVED: Periodic Table of the Elements. National Research Council Canada, 23 June 2003. Web. 23 Mar. 2013. <<http://www.nrc-cnrc.gc.ca/eng/education/elements/el/u.html>>.

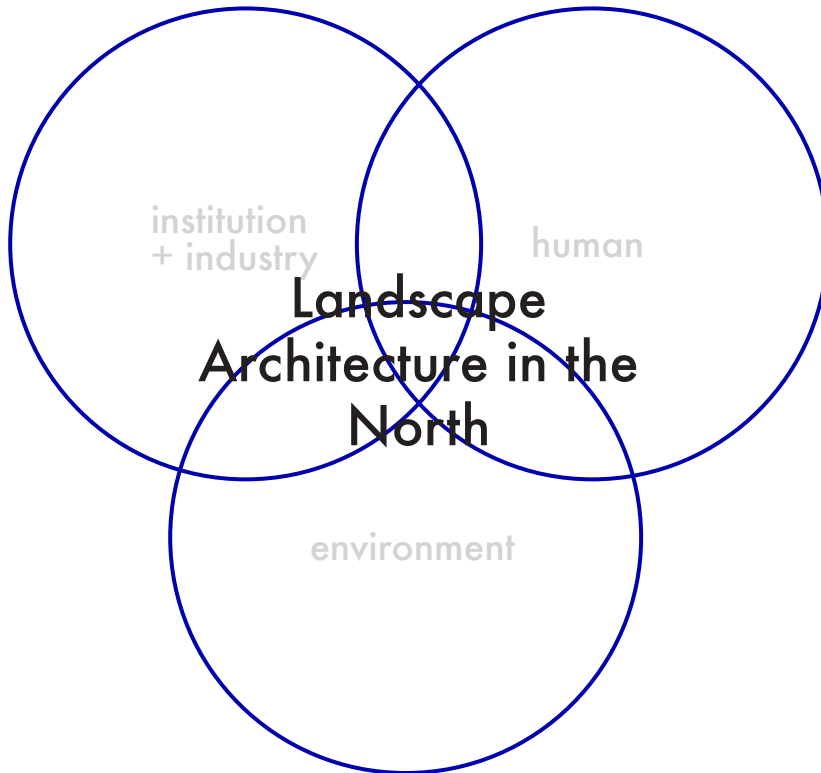
Yukon Territory

The Yukon Territory was created through relocation of land from the Northwest Territories and was declared an official territory in 1898 under the Yukon Territory Act. Dawson City was named the capital city and was considered the largest city west of Winnipeg, Manitoba at that time. Whitehorse was named the new capital city in 1953 and has a current population of 25 403. The Yukon Territory occupies 661 848 km² of Canada's northwest with a population of 33 928.

Yukon Bureau of Statistics. "Population and Dwelling Census 2011." Government of Yukon, 2011. Web. 5 Apr. 2012. <<http://www.eco.gov.yk.ca/stats/pdf/2011PopulationDwellings.pdf>>.



appendix
A Glossary of The North
Afterward



During the final design development and at the time of submitting this practicum, additional terms, themes, inspirations and ideas emerged. These have not been included in the glossary but are indicative of the ongoing process of researching, and being inspired by the North. The terms include:

Oscillation
Growing season
Great Bear River
Esker

Amplification (+ climate change)
Glaciation
Invasive species
Drumlin

Liminal
Moss
Pitchblende
Thermokarst

Monomictic
Climax community
Solstice

Pioneer species
Disturbance
Cryosolic soil

