

## THE CANADIAN MOUNTAIN ASSESSMENT: WALKING TOGETHER TO ENHANCE UNDERSTANDING OF MOUNTAINS IN CANADA

Graham McDowell, Madison Stevens, Shawn Marshall, et al.

ISBN 978-1-77385-510-3

**THIS BOOK IS AN OPEN ACCESS E-BOOK.** It is an electronic version of a book that can be purchased in physical form through any bookseller or on-line retailer, or from our distributors. Please support this open access publication by requesting that your university purchase a print copy of this book, or by purchasing a copy yourself. If you have any questions, please contact us at [ucpress@ucalgary.ca](mailto:ucpress@ucalgary.ca)

**Cover Art:** The artwork on the cover of this book is not open access and falls under traditional copyright provisions; it cannot be reproduced in any way without written permission of the artists and their agents. The cover can be displayed as a complete cover image for the purposes of publicizing this work, but the artwork cannot be extracted from the context of the cover of this specific work without breaching the artist's copyright.

**COPYRIGHT NOTICE:** This open-access work is published under a Creative Commons licence. This means that you are free to copy, distribute, display or perform the work as long as you clearly attribute the work to its authors and publisher, that you do not use this work for any commercial gain in any form, and that you in no way alter, transform, or build on the work outside of its use in normal academic scholarship without our express permission. If you want to reuse or distribute the work, you must inform its new audience of the licence terms of this work. For more information, see details of the Creative Commons licence at: <http://creativecommons.org/licenses/by-nc-nd/4.0/>

**UNDER THE CREATIVE COMMONS LICENCE YOU MAY:**

- read and store this document free of charge;
- distribute it for personal use free of charge;
- print sections of the work for personal use;
- read or perform parts of the work in a context where no financial transactions take place.

**UNDER THE CREATIVE COMMONS LICENCE YOU MAY NOT:**

- gain financially from the work in any way;
- sell the work or seek monies in relation to the distribution of the work;
- use the work in any commercial activity of any kind;
- profit a third party indirectly via use or distribution of the work;
- distribute in or through a commercial body (with the exception of academic usage within educational institutions such as schools and universities);
- reproduce, distribute, or store the cover image outside of its function as a cover of this work;
- alter or build on the work outside of normal academic scholarship.



**Acknowledgement:** We acknowledge the wording around open access used by Australian publisher, **re.press**, and thank them for giving us permission to adapt their wording to our policy <http://www.re-press.org>



Receiving gifts of the mountains, Vermilion Lakes, Banff National Park. Photo courtesy of Paul Zizka, 2017.

## CHAPTER 4

# Gifts of the Mountains

**CO-LEAD AUTHORS:** Brenda Parlee, Wanda Pascal

**CONTRIBUTING AUTHORS:** Ashley-Anne Churchill, Goota Desmarais, Megan Dicker, Erika Gavenus, Jiaao Guo, Nina Hewitt, Eric Higgs, Pnnal Bernard Jerome, Patricia Joe, Gùdia Mary Jane Johnson, Stephen Johnston, Sydney Lancaster, Keara Lightning, Brandy Mayes, Graham McDowell, Tim Patterson, Sophie Pheasant, Brooklyn Rushton, María Elisa Sánchez, Niiyokamigaabaw Deondre Smiles, Tonya Smith, Lauren Somers, Madison Stevens, Daniel Sims, Hayden Melting Tallow, Gabrielle Weasel Head, Nicole J. Wilson, Kristine Wray

**CHAPTER REVIEW EDITOR:** Thomas McIlwraith

*“Your care and celebration will carry on into the next generations so that the gifts are reciprocal—you give the gift and you accept the gift”—Elder Gùdia Mary Jane Johnson, Lhu'ààn Mân Ku Daí (LC 4.1)*

### 4.1 Introduction

#### 4.1.1 Gifts and benefits

Mountain regions in Canada offer important contributions to the wellbeing of human communities. As an alternative to the conventional language of resources or ecosystem services, this chapter conceptualises these contributions as ‘gifts of the mountains’. This focus on ‘gifts’ suggests a relationship built on reciprocity, in which benefits flow from mountains to people and people give back to the mountains through care and stewardship. In speaking about gifts of the mountains we aim to acknowledge and foreground First Nations, Métis, and Inuit worldviews, which often emphasise deep reciprocal relations with mountainous places and the physical resources,

spiritual importance, and cultural identity they provide. That is, the worldviews of those who have occupied mountain regions and neighbouring areas in lands now referred to as Canada since time immemorial, and are among those who currently live in mountain areas. However, we also emphasise that many non-Indigenous individuals and communities are connected to mountains in both tangible and intangible ways, including economic, cultural, spiritual, and emotional connections. Ultimately, the framing of this chapter is premised on the idea that people and mountains exist in relationships and is rooted in the recognition that the land, water, and wildlife are gifts that require reciprocal care and stewardship for current and future generations.



Gùdia Mary Jane Johnson, Lhu'ààn  
Mân Ku Daí, 2022, LC 4.1

*\* Due to the CMA's unique approach to engaging with multiple knowledge systems, we suggest that readers review the Introduction prior to reading subsequent chapters.*



Our framing of gifts is something that ‘has been written about and communicated previously; for example, some anthropologists citing west coast and northern communities talk about how mountain environments give of themselves willingly with the promise of stewardship and care in return (Nadasdy, 2007). Reciprocal connections are also evident in Indigenous teachings such as those of “Netukulimk”, which is a way of life in which Mi’kmaq take what is needed to support physical and emotional well-being while assuming responsibilities to do so without jeopardising the integrity, diversity, or productivity of the environment (The Confederacy of Mainland Mi’kmaq, 2014). Likewise, participants in the Canadian Mountain Assessment (CMA) Learning Circle spoke eloquently about the kinds of gifts provided by mountains: water, plants, foods such as berries and meat, medicines, peacefulness and serenity, room to play, as well as non-renewable resources for trade, tools, and other materials needed for everyday life. In exchange, as Daniel Sims, Tsay Keh Dene First Nation, notes, mountains expect respect (LC 4.2). Respect implies care and proper treatment on the part of users of mountain places—a kind of moral obligation (Ignace & Ignace, 2020, pp. 142–143)—and Indigenous oral histories from many parts of Canada describe the harms that befall disrespectful users of mountains, their environments, and the non-human kin that live in these places (e.g., Brightman, 1993; Cruikshank, 2005a).

In assessing the state of gifts of the mountains in Canada, this chapter also includes consideration of the products derived from mountains for the benefit of regional and global economies, including consumer benefits. This includes mineral extraction, the harvesting of timber, hydroelectric development, and commercial fishing of rivers, lakes, and oceans. We also call attention to how these benefits from mountains are not always respected in the spirit of reciprocity, with an understanding that a reciprocal model premised on kinship relations with the land and its non-human kin is often incongruent with predominant modes of resource extraction and consumerism (see, e.g., McIlwraith 2012). Indeed, as Gabrielle Weasel Head, Kainaiwa, Blackfoot Confederacy explained, this consumer paradigm has resulted in widespread abuse of the gifts of the mountains and disregard for the principles of respect and reciprocity (LC 4.3). Furthermore, Indigenous Peoples are among those who have historically borne greater costs and experienced fewer benefits from the extractive activities undertaken in mountain areas in Canada.

Many kinds of gifts have been lost or degraded as a result of the pressures of colonisation, resource development, climate change, and other forms of environmental change. These stresses that present as ecological losses (e.g., species extirpations), hazards (e.g., flooding, forest fires) or circumstances of poor health (e.g., due to bioaccumulation of contaminants) have socio-economic, cultural, spiritual, and health implications for both Indigenous and non-Indigenous communities. These dynamics are discussed in greater depth in Chapter 5.

Some mountain gifts, although degraded, are being restored or recovered (Hobbs & Cramer, 2008). Indigenous Peoples are playing a leadership role in many of these restoration initiatives, including those described as ecocultural restoration. “Ecocultural restoration explicitly includes humans as active participants in restored landscapes through recovering ecosystem structure, composition, processes, and function, along with traditional, time-tested, ecologically appropriate and sustainable Indigenous cultural practices that helped shape ecosystems” (Martinez, 2018, p. 170). This is not only healing of the land; it also involves the restoration of values and

uses of mountain environments that have been and continue to be marginalised, such as those of Indigenous Peoples, the original stewards of mountains in the lands now referred to as Canada.

Many predominantly non-Indigenous communities are also working to cultivate more sustainable relations with mountain areas and the myriad benefits they provide, including progressive human-wildlife coexistence programs and climate actions initiatives in towns such as Canmore and Banff, Alberta, in the Montane Cordillera region. Despite some positive developments and opportunities, the preponderance of unsustainable uses of mountain environments and increasing pressures from climate change and other anthropogenic stressors presents growing challenges for those who depend on gifts of the mountains (Adler et al., 2022; Fast, 2014; Nitschke, 2008).

This chapter begins by describing some of the immaterial and intangible gifts that mountains provide to the health and wellbeing of individuals and communities, including gifts related to feelings of well-being, spiritual beliefs, healing activities and outcomes, art, and teachings (Sec. 4.2–4.4). These intangibles, commonly overlooked in standard accounting or valuation, can frame or inform the physical relationships and benefits people receive from mountains (Satterfield et al., 2013; Studley, 2012).

We then turn to other kinds of physical gifts of the mountains, including provision of food and medicines to humans through relationships with plant, fungi, and animal species (Sec. 4.5). Gifts of water from the mountains, including glaciers, snow, and freshwater are crucial to the well-being of mountain communities and flow downstream to the benefit of a large proportion of the population of Canada (Sec. 4.6). The direction of human movement in mountain environments often flows in reverse, from lowlands to highlands, bringing people into the mountains for tourism and recreation activities. This delivers important economic benefits to mountain communities (Sec. 4.7). Economically, mountains are also sources of materials and energy for much of Canada, in the form of timber and other gifts of the forests, rocks and minerals, and sources of energy (Sec. 4.8).

We also consider the many ways in which mountains protect people, both from natural

hazards and from the consequences of our own activities, including by providing gifts such as carbon sequestration and biodiversity conservation, disaster resilience and sanctuary, and sites of resurgence, particularly for Indigenous Peoples. The chapter concludes with our assessment of the state of knowledge about mountains and the gifts they provide (Sec. 4.9).

## 4.2 Gifts of Identity and Wellbeing

### 4.2.1 *Emotional and physical wellbeing of mountain communities*

Mountain environments and regions are strongly interconnected with the spiritual and cultural identities of both Indigenous and non-Indigenous peoples, as the previous chapter on Mountains as Homelands has detailed. The concept of cultural landscape is often used to consider how cultural identities and practices are interwoven with physical mountain environments (Baird, 2013; Prosper, 2007). These strong interconnections, although largely intangible (felt rather than seen), are nurtured in ceremonies such as feasts and potlaches, water ceremonies, pilgrimages, and in day-to-day practices such as harvesting, travel, and “being” on the land (Cuerrier et al., 2015; Prosper, 2007). As noted in Chapter 3 (Sec. 3.2), mountains are often places where creation occurred and where spirits are encountered. They engender strong connections to physical and cultural landscapes. Gwich’in elder Elizabeth Wright from Tetlit Zheh (Fort McPherson) described her feelings of well-being and security that come from living in the mountains and being surrounded by food resources and family members.

I like living here, [...] I like my backyard that I could just make a fire anytime I want and you can't do that in Inuvik, [...] and it's quiet, I like it quiet [...] anybody can get on a skidoo and go, you know and—then you can get into your truck and drive up the mountains! You could just, you see something different every time you go up there. I just love that drive, you can go to 8 Miles and get fish, I mean even if you have no food in Inuvik, who are you gonna phone? You know I can go to my brothers and get caribou meat, you know,



I could probably visit any of these houses and ask for bannock and somebody will have bannock (Luig, 2015, p. 256).

Similarly, during the Learning Circle, Brandy Mayes of Kwanlin Dün First Nation described her appreciation for being able to live near the mountains in her own Traditional Territory, and the ways in which going into the mountains to walk, sit quietly, pray, gather berries and medicine, or simply be present have supported her own physical, spiritual, and emotional wellbeing: “call it your playground, your spiritual place.” “I feel like the mountains give you gifts sometimes in ways that you don’t understand that they give you gifts, until later you can look back and reflect on what that gift was” (LC 4.4).

Many other people, and not only Indigenous Peoples, have strong personal and cultural connections associated with mountains, which nourish the wellbeing and identities of these communities. Mountains in Canada have mentally, emotionally, and physically inspired people from across many cultures in search of opportunities for adventure, living with nature, or a sense of identity in mountain places. This includes people seeking and pursuing active lifestyles such as mountain climbing, skiing, or hiking (see Sec. 4.7). Spending time in mountainous settings is therapeutic and can elicit demonstrable physical, emotional, and spiritual benefits. Many contemporary lifestyle trends have led individuals and communities to seek the healing power of nature in mountainous regions, and even to seek refuge, asylum, and redemption in these places. It is common to hear people of all backgrounds speak of a ‘connection’ to mountain places.

As early as the 18th and 19th centuries, these settings were believed to have the “power to cure the human psyche while simultaneously pro-

viding redemption” (Osama, 2019). Mountains as therapeutic landscapes provide diverse benefits to those who imagine them, dwell within their shadows and peaks, or visit them from time to time (Gastaldo et al., 2004). Acknowledging how healing processes are grounded in places, Gastaldo et al. (2004) observe that therapeutic landscapes are a kind of ‘landscape of the mind’, constituted by individuals through a web of emotions and social relations that include real and imagined sites and actors that live within them (Gastaldo et al., 2004, p. 170). For example, the Canadian Alpine Club “urged Canadians to become mountain climbers so that they might stand face to face with Infinitude and learn spiritual truths which would be otherwise denied them” (Altmeyer, 1976, p. 31). These landscapes of the mind are among the push-pull factors that drive tourism and immigration to mountain regions, given their connection to people’s identities and imaginations. Indeed, the memories of such places can evoke strong connections to place and, by extension, shape mental health. Notably, ideas about the importance of time spent in natural areas implies that there are areas that are less natural (e.g., urban environments), and this points to the social and cultural constructions inherent in these worldviews (Gastaldo et al., 2004; Locke, 2006).

For many, mountains in Canada, particularly the Rocky Mountains in western Canada, within the Montane Cordillera region, hold particular symbolic and imaginative power. These mountains are associated with Canadian identity, embedded in historical and colonial stereotypes and icons. For instance, Moraine Lake and the Valley of the Ten Peaks graced the Canadian \$20 bill for many years. Such iconography has been a source of unity for settlers in the building and marketing of the colonial state. As the previous chapter on Mountains as Homelands has articulated, mountain narratives have helped newcomers to Canada to make homes and find a sense of belonging and wellbeing in the mountains, in part by dispossessing and delegitimizing the presence of Indigenous Peoples. This history has been problematic for those who have suffered from the associated cultural erasure, including separation from the mountain gifts that have sustained First Nations, Métis, and Inuit cultures since time immemorial (Francis, 1992).

The promotion of such Canadian stereotypes has fostered dichotomies of belonging and not-belonging that influenced many sectors of the economy and socio-political institutions. A clear case in point is Banff National Park. Linnard notes:

Banff National Park is most commonly and powerfully represented as a place intended for wealthy tourists to experience leisure and for “all Canadians” to encounter “the essence of Canada,” representations that emphasise transience, leisure, safety and abstract notions of nature and nation. These institutional narratives of place validate management decisions that alienate residents and motivate them to assert special claims to belonging that distinguish between the local who belongs and those who are out of place (Linnard, 2015, p. 1).

Among these institutional narratives is the Canadian Pacific Railway, which made mountain landscapes accessible in real and imagined ways. Although celebrated in Canadian non-Indigenous history, railroad landscapes are sites and sources of trauma for others including Indigenous Peoples (Binnema & Niemi, 2006) and Chinese railway workers (Chan, 2008):

The Chinese workers first came here for the railway, and they were forgotten people in many ways, because they didn't have a name, because they came in such huge numbers, because they were virtually indentured labour, like slaves, and they died in great numbers as well. But they contributed an enormous amount to the building of this country. Without the railway, you wouldn't have this country of Canada. (Li, 2000, p. 158, cited in Chan, 2008)

Many others are often made invisible in mountain lifestyle stereotypes, but nonetheless have important connections; those with physical and mental disabilities are however, becoming more visible and included through “nature interventions.”

Whether during single day trips, weekend or week-long, these nature interventions provided adaptive experiences such as hiking in the foothills regions or the high

alpine regions of the Rocky Mountains, canoeing or kayaking. Adapted equipment, such as the Trail Rider, a single-tyre wheelchair designed to allow individuals living with physical disabilities to explore the outdoors assisted by 2–6 volunteers or ‘sherpas’, facilitated inclusion of all (Jakubec et al., 2016).

On the whole, it is important to recognize the many ways in which mountains have featured in the identities and cultures of different communities and to acknowledge the diversity as well as conflict between different kinds of intangible connections of people to mountain environments, and how the identities of some social groups may be well represented, valued, and protected in narratives of mountains, whereas the identities and connections of others are poorly represented. These incongruencies are not only visible in popular culture but also translate into decisions about resource use and management, with implications for human wellbeing.

## 4.3 Gifts of Art

### 4.3.1 Mountains as sites of creative inspiration and dialogue

The scale and grandeur of mountain environments has also been an ongoing source of inspiration and content for many of the most recognized artists in Canada. Imagery of mountains and mountain environments captured by artists has contributed to (and been utilised in the manufacture of) Canada as an idea in popular culture and for political ends (Anderson, 2007, p. 246). The art-historical view of Canadian painting within the country's visual culture from the 1920s to the 1980s often reinforced this association of wilderness landscape and national identity (Stanworth, 2013, p. 69).

Some of the most iconic and well recognized work of this nature has been produced by the artists known as the Group of Seven. Their work was related to the rise of middle-class tourism across the country; for example, when Lawren Harris and A. Y. Jackson embarked on a painting trip to Jasper in 1924, hiking and packhorse trips were already an important part of tourism and promotional literature for the area (Jessup, 2002, p. 155).

Though each member forged his own unique style, as a group, these painters tended toward expressions of the “Euro-Canadian wilderness sublime” (Bordo, 2007, p. 332) in work capturing landscapes, including mountain subjects. Many works of the Group of Seven represent “wilderness” as space devoid of human intervention, occupation, or even passing presence. As Jonathan Bordo notes, “Euro-Canadian wilderness as a system of representation—an ethos—will be marked by this absence” (Bordo, 2007, p. 332). As such, these works both erase Indigenous presence and territory, and set the landscape represented as something entirely apart from human life—something to be observed and preserved, rather than dynamic environments full of life with which one would have an ongoing relationship. In this sense, the landscapes of the Group of Seven manifest the social construction of ‘wilderness’ as part of a persistent national iconography of “Canadianness” (Stanworth, 2013, pp. 68; 86) which could be harnessed to both nationalist pride and the claiming of vast territories as uniquely “Canadian” lands within settler-colonial borders.

The impact of the Group of Seven’s work on the popular imagination in Canada and internationally cannot be underestimated (Cole, 2007, p. 129; Lord, 2007, p. 121; Reid, 2007, pp. 101–102). Notions of the sublime in landscape and of the separation of humanity from the “wild” aspects of nature have informed settler politics, economics, and leisure activities in mountain environments for generations. As Candace Hopkins and Lucia Sandromán note:

Landscape is not a neutral phenomenon, but a device framed by the particular perspective from which it is seen. There is nothing stable about this familiar subject, and there is a difference between the spaces we inhabit and the natural environment, and a difference between the experience of the land that constitutes a place and “place” as a site of memory and affection (Hopkins & Sandromán, 2014, p. 35).

The perspective as captured so effectively by the Group of Seven has its roots in European conceptions of human relationships to land and resources, and indeed to the conception of what constitutes civilization as it stands in opposition

to wilderness (Payne, 2007, p. 160). The dichotomy set up in this understanding of human relationships to mountain spaces (and any other environment) has had profound real-world impacts: from urban planning and resource development, to the shaping of property laws and ideas of land ‘ownership’, to the recognition of Traditional Territories and lifeways, including access and use of mountain places for food, travel, medicines, and income (Colpitts & Devine, 2017, pp. 2–4; 7; Payne, 2007, pp. 153–156).

Contemporary artists, both Indigenous and non-Indigenous, have also drawn inspiration from the mountains in the creation of their work, but often to very different effect than the Group of Seven. Indeed, contemporary artists may take their cues in making work from a desire to express concern or critique popular (settler) perceptions of mountain environments as untouched wilderness, devoid of Indigenous history, or as sites impacted by resource extraction. Here, we offer a few examples of the range of creative expression inspired by relationships with—and created within—mountain environments.

Alana Bartol is a multidisciplinary settler artist based in Calgary Alberta.<sup>1</sup> She has created several inter-related bodies of work since 2020, examining mining in the Eastern Slopes of the Rockies and its ongoing impact on the environment. *To Dig Holes and Pierce Mountains, Hag’s Taper, and Coal Futures* all address the lasting impacts of coal mining in the Crowsnest Pass. A residency and exhibition titled *Processes of Remediation: art, relationships, nature* at the University of Lethbridge in 2021 brought these works together.

Rebecca Belmore is an internationally recognized multidisciplinary artist and member of the Lac Seul First Nation (Anishinaabe). She has dedicated her practice to speaking difficult truths to government and settler society regarding the treatment of Indigenous Peoples and the erasure of their stories. In 1991, Belmore sketched out and built *Ayum-ee-aawach Oomama-mowan: Speaking to Their Mother*, a 1.8 m wide, 2.1 m long conical megaphone she created to speak to the land (Fig. 4.1). As the Banff Centre describes it,

1 A Tour of Alana Bartol’s *Processes of Remediation: art, relationships, nature*: <https://www.youtube.com/watch?v=sXLrQaWzpUA>





Figure 4.1: Rebecca Belmore *Ayum-ee-aawach Oomama-mowan: Speaking to Their Mother* (1991). Gathering, Johnson Lake, Banff National Park, Banff, Alberta, 26 July 2008. Photo: Sarah Ciurysek Presented by the Walter Phillips Gallery as part of the exhibition 'Bureau de Change,' 12 July–29 September 2008. Courtesy of Walter Phillips Gallery, Banff Centre for Arts and Creativity. Purchased with the support of the York Wilson Endowment Award, administered by the Canada Council for the Arts Accession #P08 0001 S.

Before Belmore first spoke into the megaphone, the sculpture was carried through the woods and assembled in a meadow near Johnson Lake in the Bow Valley [in Banff National Park]. Her words echoed through the mountains and, she hoped, reached Mother Earth.

The piece was a response to the Oka Crisis of 1990—a protest against a proposed golf course on Mohawk territory in Quebec. But after its 1991 debut at the *Between Views and Points of View* exhibition at our Walter Phillips Gallery, it was used to address the land at political demonstrations from coast to coast (Frizzell, 2016).

While created in the Rockies, this work also travelled across the country, as a symbol and call to expression:

Stopping at reserves and significant sites, Belmore encouraged the local community to address the land through her megaphone in their own language. The piece is well travelled, having spoken to a clear-cut forest, Indigenous land claims, and even making it as far as Parliament Hill (Frizzell, 2016).

Belmore's relationships with the land and with other-than-human beings permeate her work to create calls for justice for Indigenous Peoples and to reflect on the violence that permeates settler-colonialism as a system. Her work can be seen as a "powerful testimony to art as a process of concretizing acts of remembering and resistance" (Tuer, 2007, p. 338).

Braiding knowledges has been a conceptual tool used in the CMA; this powerful visual metaphor embodies the desire both to recognize and

elevate multiple ways of knowing and understanding human relationships to the land, and to mountains specifically (see Section 1.2.3). It seems fitting, then, to turn to the work of Megan Musseau as a third example of the kind of work that is being created to interrogate the interrelationships of traditional and contemporary Indigenous knowledges, and forms of knowledge transmission, that rely on an understanding of dynamic reciprocity with the land. Musseau is an L'nu woman, artist, and dancer from Elmas-tukwek, Ktaqmkuk territory (Bay of Islands, Newfoundland). She nourishes an interdisciplinary arts practice by working with customary art forms and new media, such as basketry, beadwork, land-based performance, video, and installation (Musseau, n.d.). She has exhibited and completed land-based performances across the country, including at the Banff Centre (Musseau, n.d.). Musseau's endurance performance, "when they poison the bogs we will still braid sweetgrass," was created on Sacred Buffalo Guardian Mountain (Banff, AB) in 2017. In this work, the artist braids neon flagging tape in the landscape, a reference both to logging and other types of resource extraction, and the traditions of land-based learning and use of natural materials in L'nu traditional practices.

A similar work, *Me'ki'tetmek na Maqmikewminen*, was created in collaboration with drummer Jennie Duval in Duntara, Newfoundland, for the 2019 Bonavista Biennale; as the curator's discussion of the work notes,

Each component of the work draws on a community of nurturing Indigenous women, emphasising collective agency and culminating in an offering that reciprocates the generosity of the land. The embodied knowledge of Musseau's action, her rigorous commitment to the process of communal shared learning, and the transmission of knowledge through art and language, is in generous relationship to Ktaqmkuk—acting in defiance of settler-colonial systems, and in the process, actively decolonizing (Hills, 2019).

These are but a few examples of the historical and contemporary ways in which mountain locales have fostered creativity. It would be worthwhile

to investigate the connections between mountains and the gifts of art and creativity in a fully developed, systematic and inclusive way. It is possible that such a study could foster nuanced conversations about the capacity for creative work to encourage better conversations between Indigenous and non-Indigenous individuals and communities regarding the sharing of the many gifts which mountain environments provide. Likewise, such work may have the potential to support a deeper, more reciprocal and respectful approach to these environments among a broad population.

#### **4.3.2 Mountains as sites of art institutions and programs**

Mountain environments have long served settler populations as places of retreat and creative rejuvenation, often associated with urban tourists seeking an "untainted" environment (Jessup, 2002, pp. 146–147; Fig. 4.2). Banff National Park has been associated with the creation of a national identity and the idea of "Canadianness" especially in the aftermath of the First World War (Anderson, 2007, pp. 245–246), and so became a strategic choice for the location of a school of the arts (Reichwein, 2005, pp. 50–52; 55; Reichwein & Wall, 2017, pp. 203–205). The original Banff Centre for Continuing Education was founded in 1933 as a summer school through the University of Alberta. In time the school became autonomous, and the programs were expanded to include painting and other fine arts disciplines; Donald Cameron, the director from 1936–1966, was instrumental in the crafting of the image of the school and its environment, in concert with marketing efforts by the National Film Board and Banff National Park (Reichwein, 2005, pp. 57–58).

The representation of the Banff School and the national park surrounding it can be seen as evolving over time to suit the needs of governments in relation to the purpose or utility of mountain spaces. It served to define a national identity focussed on the prosperity and mobility that positioned creative leisure time as a sign of national success but which also commodified the flora, fauna, and other natural features, reinforcing stereotypes of 'wilderness' and 'nature' as both restorative and inspiring (Cronin, 2006, pp. 78–81; Reichwein & Wall, 2017, pp. 206–207; Saari, 2015,



Figure 4.2: Holidays in Canada Poster by Canadian Pacific, 1925, by Leonard Richmond. Marc Choko collection. Library and Archives Canada, e000009456.

pp. 405–406). Today, the internationally recognized Banff Centre for Arts and Creativity offers themed and self-directed residencies in contemporary fine art practices, curatorial research and writing, music, and performance. Additionally, the school’s mandate has expanded to include executive leadership programming, retreats, academic conferences, performing arts, and the world-renowned Banff Mountain Book and Film Festival. Its administrative and curatorial branch includes Indigenous-specific arts residencies, programming and leadership training.<sup>2</sup>

Banff Centre’s vision statement includes the aim:

To experience the power of the mountains, particularly our home on Sacred Buffalo Guardian Mountain, supported by talented

<sup>2</sup> <https://www.youtube.com/watch?v=sL9yKVeYZBQ&t=156s>

employees and thought leaders, to envision and to create, and be in relationship with our environment and each other.

This statement and associated programs are indicative of an evolution in thinking with respect to the Centre’s relationship with overlapping communities and its environment. The expanded Indigenous leadership and programming are also positive steps toward working in a more expanded and reciprocal way. This shift may foster deeper relationships and respectful communication between settler and Indigenous communities more broadly over time.

Other artist residency opportunities have become available in mountain environments in western Canada and elsewhere. The participation of Parks Canada in most of these residencies provides an overarching connection between this varied group of residencies; this ongoing association of mountain parks with creative and recreational opportunities has informed Parks Canada’s marketing and policies for decades. Examples of these residencies include the Gushul Residency Program in Blairmore, Alberta which operates out of the Gushul Studio and Cottage, owned by the University of Lethbridge and the Caribou Artists’ Cabin Program within Mount Revelstoke National Park. Gros Morne Summer Music has also offered music and performance programming in the setting of Gros Morne National Park since 2003.<sup>3</sup>

#### 4.4 Gifts of Teaching and Pedagogy

Mountain landscapes elicit storytelling practices that are central means of both spiritual and socio-cultural learning amongst Indigenous Peoples who are connected to mountain regions (Cruikshank, 2005; Isaac, 2016; Solomon, 2022), and increasingly recognized as salient pedagogical contexts in Western education (Landrum et al., 2019). Mountains have inspired teachings around spiritual and metaphysical beings and realms. As one example, metaphysical entities such as “Big-foot” of the Canadian Rockies, figure in current discourse around education as illustrated by a teaching-oriented session, “Teaching with Big-foot” scheduled for the 2023 American Association

<sup>3</sup> <https://www.gmsm.ca/about-gmsm>

of Geographers annual meeting, and related Special Issue of *The Geography Teacher* (Education Specialty Group, AAG 2022). Indigenous Peoples, of course, also have long traditions of honouring metaphysical and spiritual mountain beings.

This section of the CMA highlights the gifts of mountains to current pedagogy at Canadian teaching institutions, as well as with respect to Indigenous teachings. Beginning with Indigenous approaches to mountain teachings, the section then explores the traditions of scientific and arts-based pedagogies in institutional settings.

Indigenous ways of teaching and learning in mountains have sustained First Nations, Métis, and Inuit peoples for millennia, guiding their traditions, land stewardship and cultures (Solomon, 2022). We may draw insights specifically about education from some examples and approaches in which Indigenous knowledges are shared and embedded in learning and practices of First Nations, Métis, and Inuit Peoples of mountain regions in the land now known as Canada. These resources reflect approaches to learning and pedagogy that flow from a connection to mountains, some of which we highlight below. (For a longer discussion of these and other approaches, see Chapter 3 and Sec. 1.2)

The physicality of mountains provides other kinds of learning opportunities related to ecosystem health. Mountains might be viewed as natural laboratories that can demonstrate the effects of orogeny on landforms and of elevation on water, ice (Church, 2010; Ives & Barry, 1974; Owens & Slaymaker, 2004), and biota (Turner et al., 2003). The effects of global changes such as climate warming are often highly visible in mountains, from glacier retreat to species range shifts (Parrott et al., 2022; Tito et al., 2020). Mountains can thus serve as early warning systems and as foci for understanding environmental changes.

Mountains instruct observers and visitors in the physicality of the environments (Fig. 4.3). Ecosystem patterns, for example, are influenced by elevation and its interplay with ruggedness and local relief, slope aspect, and moisture-bearing winds. In British Columbia, better illumination on south-facing aspects leads to drought tolerant plant communities more than on north-facing aspects, and this pattern of community composition changes with distance from the coast as snow depth and snowpacks decrease. Learners can engage with diverse and contrasting geographies, given integral connections between mountains and lowlands peoples and environments (see Sec.



Figure 4.3. One of two glaciology huts constructed in the 1970s to house researchers in Sentinel Bay, Garibaldi Provincial Park. Photo courtesy of Nina Hewitt, 2022.

2.6). In the Pacific Maritime region, for example, are the homelands of many distinctive First Nations groups (e.g., Doyle-Yamaguchi & Smith, 2022; Kew, 2010; Reimer, 2003) who speak a notable diversity of languages (Gessner et al., 2018), each of which holds distinct teachings grounded in relationships with mountain landscapes (see Chapter 1, Fig. 1.3). Both the mountains themselves and the people who know them, offer opportunities and challenges that enrich learning experiences about complex biophysical and socio-ecological environments.

#### 4.4.1 *Storytelling and narrative*

Oral traditions have been key to knowledge production and sharing in many Indigenous cultures in what has come to be known as Canada since time immemorial. These oral knowledge traditions include diverse kinds of story and narrative (Cruikshank, 2005), many of which include observations of the natural world, teachings embedded in local knowledge and which are meant to be passed on to future generations (Isaac, 2016). As Learning Circle participant Gùdia Mary Jane Johnson (Lhù ààn Ku Daí) described, songs and stories are set in places and mountains are central to many of those storied places (LC 4.5). ‘Welila’ogwa Irene Isaac, a Kwakwaka’wakw (Kwakiutl) writer and educator, notes how “Indigenous stories,” in her community “influence young people to become knowledgeable and responsible citizens.” (Isaac, 2016).

Through story, mountains have fostered rich narratives that have sustained Indigenous Peoples and cultures over generations. Among the Kwakwaka’wakw, stories specified seasonal timings for harvesting materials from montane populations of Western redcedar, related to tree elevation on the mountain (Kwakwaka’wakw educator, Aitken, Emily [Gwixsisalas], 2016). In *Do*

*Glaciers listen? Local knowledge, Colonial Encounters and Social Imagination*, anthropologist Julie Cruikshank writes about the role of narrative among the Tlingit peoples of the Mount Saint Elias ranges, Alaska and northern British Columbia, who shared stories, grounded in the community, to educate citizens about appropriate behaviour around mountain glaciers (Cruikshank, 2005). Cooking grease, for instance, such as frying bacon or traditional, fatty foods like moose, was discouraged near glaciers because it was believed to trigger surges and endanger community safety. Cruikshank suggests possible interpretations for these beliefs, but notes that it is the method of sharing around storytelling, and what the stories say about local meaning and the construction of knowledge, that matters (and see Simpson, 2014). Importantly, stories often convey local protocols that recognize reciprocity between nature and culture. This contrasts with the approach taken by European visitors to the region, beginning in the 18th century, who followed “Enlightenment” values popular in their society. They strove to separate nature from culture and treated glaciers as inanimate objects to be measured and characterised with recently developed instrumentation (Cruikshank, 2005, p. 10). Enlightenment values prevailed and persisted in schools established within the Canadian settler state and defined modes of scientific inquiry, discrediting local knowledge systems, until recently.

In addition to stories, Indigenous knowledges are also represented in pictographs and petroglyphs (rock art) throughout mountainous areas in Canada, including numerous sites in British Columbia in the Pacific Maritime region, and throughout the Canadian Arctic (Vastokas, 2012), that signify a broad tradition of recorded knowledge on less well-preserved materials like wood, fibre, hide and bone. Among the mountains and lowlands along the Fraser River delta and BC Gulf Islands (Pacific Maritime), the Marpole culture produced a “plentiful variety of stone and bone carvings in the shape of ceremonial bowls, effigies and utensils that are distinct forerunners of the style and iconography of historic west coast native art” from ca. 500 BCE to 500 CE (*Norval Morrisseau—Rock Art*, 2006). Pictographs and Petroglyphs are known to have provided material sites and imaginaries for Indigenous teaching and learning. For example, rock writings in the Stein





Hayden Melting Tallow,  
Siksika Nation, Blackfoot  
Confederacy, 2022, LC 4.6



Leon Andrew, Nę K'ə Dene  
Ts'ili, 2022, LC 4.7



Pnnal Bernard Jerome,  
Micmacs of Gesgapegiag,  
2022, LC 4.8



River Valley reflect the animation of the natural world. They are associated with places of power and have been likened to writings (York et al., 1993). Artistic traditions within storytelling are recognized today through a writing competition for Indigenous youth (aged 14–29) that includes a program for those who “prefer to work through painting, drawing and photography” (Indigenous Arts and Stories, Historical Canada, 2023).<sup>4</sup>

#### 4.4.2 Sacredness

Attitudes of respect and sacredness are common, and metaphysical beings appear in teachings with specific reference to mountain spaces. For example, the glacier-fed Ts'il'os (Chilko) Lake (referred to above) is considered a living ancestor by the traditional land holders, the Tsilhqot'in Nation (Mack, 2022). Elders who participated in the Learning Circle explained that sacred teachings of mountains are often held in songs. Elder Gùdia Mary Jane Johnson, Lhù ààn Ku Dań, shared songs which identify mountain places of her grandfather's land and Traditional Territory, including streams and valleys and the stories that took place there (LC 4.5). In the Blackfoot way, as Hayden Melting Tallow, Siksika, Blackfoot Confederacy, explained, sacred songs link mountain place names and Medicines, such as Paahtómahksikimi (Waterton Lakes), where the sacred beaver bundles originated, and Nínaiistáko, Chief Mountain (Fig. 4.4). These songs of mountain places, the “highlights of our territory,” he explains, tell the People where they are from (LC 4.6). Leon Andrew, an Elder of the Nę K'ə Dene Ts'ili Nation, shared that the Mountain Dene People also hold the mountains as sacred in their songs, from songs to share joy in nature and being in the mountains to documenting oral history (LC 4.7).

The Ktunaxa Nation believe that a grizzly bear spirit goes to dance during the winter months along the Jumbo Pass and Horseshoe Glacier, BC, within their traditional lands in the East Kootenays. The spiritual and cultural significance of such legacies has been trivialised in settler-colonial discourses, as may be illustrated by events surrounding settler-colonial plans for a slated development, the “Jumbo Glacier ski resort” (Low & de Kleer, 2022) in which the spirit bear's importance was questioned and downplayed, prompting this reaction from one Ktunaxa citizen: “We are the ones that have to prove our rights to the land. It's ridiculous, right? If we say that a space ... or place is sacred within the boundaries of our territory, then just accept that. Four hundred generations of existence here and you are going to question me about the sacredness of a place?” (in conversation with the production team of the documentary film *Jumbo Wild*, Bullfrog Films (2015), at 32:40 mins).

#### 4.4.3 Land-based learning and healing

Just as practices of learning are grounded on and from the land itself (Simpson, 2014), mountains themselves, and the many animal, plant, and supernatural beings therein, hold essential teachings which emerge

4 <http://www.our-story.ca/>. Also <https://twitter.com/IndigArtStories>



Figure 4.4: View over Paahtómahksikimi (Waterton Lake), known to the Siksikaitisitapi (Blackfoot Nations) as a sacred site in the mountains, where the People were originally gifted the beaver bundle, an important source of Blackfoot knowledge and identity. The townsite of Waterton Park is now situated on the shore of the lake, serving as the headquarters for Waterton Lakes National Park (established in 1895), which receives around 500,000 visitors per year. Photo courtesy of Madison Stevens, 2022.

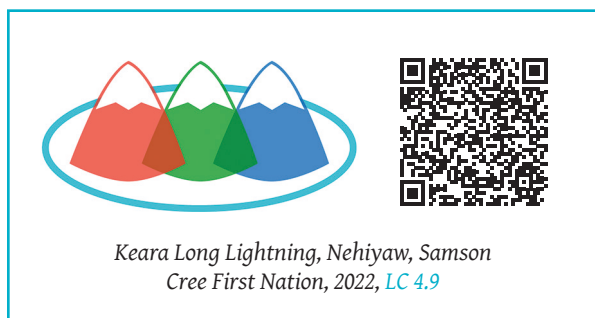
through different kinds of relationships and experience. During the CMA Learning Circle, Elder Pnnal Bernard of the Micmacs of Gesgapegiag described some of the teachings provided by mountain spirits, including the Little People, guardians of the Micmac from the high peaks, and spirits who dwell in the foothills. These leaders offer moral lessons about collaboration, good intentions, and well-being (LC 4.8).

Reconnecting with the Land and its teachings is essential to heal the community of decades of

colonial dispossession. Tsilhqot'in Nation member Trevor Mack (2022) discusses the importance of mountain spaces in the healing and remembering among his community, particularly their youth. Mack presents a video of community Elder, Gilbert Solomon, filmed on location at Ts'il?os (Chilko) lake, in which Solomon says "You see the beautiful, powerful mountains here? ... Mountain itself is healing you.... Mountain is very important—they keep giving us water... So we come down here to this island to help people—to help

wake you up....” (Solomon, 2022). Mack then recounts a “trip to Sacred Mountain” and Ts’il?os lake to educate youth through journey. He says “... along that trip, song was created, and every single day we got to learn the language ... every new day.” They brought with them “knowledge carriers who knew the stories of Ts’il?os... and of the Land,” as well as plant “medicine carriers,” all of whom helped to contextualise the experience within the community’s traditions. Through this experience, they were able to “honour supernatural beings, and in that process, heal our communities.” (Mack, 2022)

Cultures of stewarding the land and its inhabitants are central to many North American Indigenous mountain cultures, such as those around the Nass River of the mountainous region of Northern British Columbia, on the border between the Montane Cordillera and Boreal Cordillera regions (Reid et al., 2021), and are embedded into their teachings, through storytelling. Among the Kwakwaka’wakw Peoples of the coastal areas and neighbouring mountains of northeastern Vancouver Island and mainland British Columbia, “It was story that educated us about conservation and it was conservation that guided the story. There was little impact on the natural environment because the stories passed down from generation to generation teach us to ‘take only what you need.’ For the lessons, the students took care not to collect too many plants and displayed gratitude to the plants and animals for providing them with food” (Isaac, 2016, unpaginated). Significantly, where stewardship and care for the mountains and the plant medicines they provide are concerned, Keara Lightning, Nehiyaw, Samson Cree First Nation, reminds us that relationships with the mountains and those plants matter (LC 4.9).



These lessons and attitudes speak to the rich cultural legacies of teaching and learning produced by Indigenous Peoples through their intimate connections with mountain places. Such lessons and attitudes are distinct from Western ways of knowing in an educational context (Ahenakew, 2016; Battiste & Youngblood Henderson, 2009) and are grounded in experiences on the land (Simpson, 2014). It is possible, however, that these approaches could be meaningfully brought into conversation with Western, settler-colonial education systems to inform more holistic, place-based and respect-centred approaches to teaching and inform understandings of decolonial perspectives and land stewardship.

#### 4.4.4 Challenges to Indigenous-led teaching and learning in Canada

Indigenous Peoples’ abilities to pass on ways of knowing within their own communities, let alone be enabled to shape settler-colonial educational systems, have been severely disrupted by the continuing processes of colonisation and dispossession, from the intergenerational impacts of residential schools, to the ongoing systemic racism, exclusion, and inequity in the educational system (Graham, 2010; Isaac, 2016; United Nations Department of Economic and Social Affairs, Indigenous Peoples, 2017). In Canadian settler-colonial schools, Indigenous teachings have been either absent from or seriously misrepresented (Battiste, 2000, 2002; Snively & Williams, 2016), a pattern of exclusion and erasure (Ahenakew, 2016) that has left impoverished common understandings of mountain peoples and environments. Moreover, the situation in Canada echoes experiences of mountain peoples around the world, from the Andes, to the Himalayas, to the Caucasus, and beyond, who have been excluded and marginalised, often in exchange for lowland security; and who face growing challenges associated with patterns of global change (Grover et al., 2015; IRIN, 2012; Price, 2013). Thus, while mountains have wonderful gifts to offer knowledge and education, this must be considered in light of ongoing legacies of dispossession.

In Canadian educational settings, the situation is changing slowly in response to the UN Declaration on the Rights of Indigenous Peoples (UN General Assembly 2007, Articles 14.1 and



15.1),<sup>5</sup> the recommendations from the Permanent Forum on Indigenous Issues, Education (UNPFII no date), and Canada's Truth and Reconciliation Commission (TRC) (2015) Calls to Action. Jurisdictions are actively working to align curriculum and learning materials with these calls, for example, in primary and secondary schools, with Indigenous Education Resources provided by the BC Government, e.g., a series of learning modules entitled *Continuing Our Learning Journey* (Government of British Columbia, n.d.); and for higher education institutions, with the development of Indigenous strategic plans, teaching funds and resources,<sup>6</sup> and renewed investments in hiring, units, and programs dedicated to advancing Indigenous studies.<sup>7</sup>

Nevertheless, Indigenous teaching and learning in mountain education faces numerous ongoing challenges at non-Indigenous institutions. First, methods of Indigenous teachings and local knowledge sharing are difficult to reconcile with classroom-based Western education systems, being lived, rather than written, as in Western systems (Simpson, 2014; Wong et al., 2020).

Second, incorporation of teachings into curriculum risks misappropriation of knowledge and culture unless it is Indigenous-led; that is, driven by Indigenous Peoples. But this in turn creates a risk of overburdening Indigenous teachers and learners who are expected to do most of this work (Daigle, 2019). Daigle offers some solutions to these problems, including investing in permanent, paid

positions for Elders and other Indigenous Knowledge Holders, and asking non-Indigenous educators to do the work of learning about colonial systems to address its legacies in the classroom. However, institutions will no doubt continue to struggle with these challenges, even with such investments.

Finally, and perhaps most importantly, simply embedding decolonial perspectives into classrooms, creating spaces for Indigenous students and faculty, and acknowledging past harms alone will fail to achieve meaningful change. Gaudry and Lorenz note that current reconciliatory practice at post-secondary institutions often revolve around minimally impactful "Indigenous inclusion," whereas the goal should be a move requiring the academy "to fundamentally reorient knowledge production based on balanced power relations between Indigenous peoples and Canadians..." (Gaudry & Lorenz, 2018, p. 226). This is necessary to move Canadian higher education beyond a "Spectacle of Reconciliation" and toward reckoning with colonialism as ongoing process enabled by institutional "reconciliatory rhetoric" that treats it as an historical relic (Coulthard, 2014; Daigle, 2019). Education must move beyond assimilation and integration of Indigenous knowledges within settler-colonial systems (Ahenakew, 2016; Battiste & Henderson, 2009), and toward Indigenous educational self-determination (Coulthard, 2014; Nadasy, 1999).

#### 4.5 Gifts of Foods and Medicines

The mountain regions of Canada support a rich diversity of peoples, plants, animals, waters, and practices woven together within food and medicinal systems. For Indigenous Peoples in Canada, mountains have long traditions as harvesting sites. Trips into the mountains or time at mountain camps often involve the harvesting and managing of multiple foods and medicines. For example, Goota Desmarais, Inuit, Kinneqat, Nunavut offers an introduction to the importance of mountains as providers of gifts of food and medicine to her People (LC 4.10). Despite ecological shifts, socio-political barriers to access, and changing diets, foods and medicines from mountains remain central to nourishing people (Kuhnlein et al., 2006). Goota also explained her community's ongoing tradition of gathering to

---

5 UNDRIP Article 14.1 states: "Indigenous peoples have the right to establish and control their educational systems and institutions providing education in their own languages, in a manner appropriate to their cultural methods of teaching and learning." Article 15.1 states: "Indigenous peoples have the right to the dignity and diversity of their cultures, traditions, histories and aspirations which shall be appropriately reflected in education." And see: <https://www.un.org/development/desa/indigenouspeoples/mandated-areas1/education.html>

6 See, e.g., University of British Columbia, Centre for Teaching and Learning, Indigenous Initiatives <https://indigenousinitiatives.cltt.ubc.ca/>

7 See, e.g., University of Victoria: Indigenous Studies Program <https://www.uvic.ca/humanities/indigenous/index.php>; at UBC: First Nations and Indigenous Studies Department <https://fnis.arts.ubc.ca/> and Institute for Critical Indigenous Studies <https://cis.arts.ubc.ca/people/>



Goota Desmarais, Inuit,  
Kinngat, Nunavut, 2022,  
LC 4.10 and LC 4.11



Pnnal Bernard Jerome,  
Micmacs of Gesgapegiag,  
2022, LC 4.12



share a picnic at the base of the ᐱᐱᐱ, qaqqaq (mountain), while they wait to harvest ducks and geese as they fly overhead. She reflected on the joy of these gatherings, illustrating that these kinds of harvesting experiences in the mountains offer gifts beyond the physical sustenance provided by the harvest, providing space to share knowledge and connect as families and communities (LC 4.11).

#### 4.5.1 Plants, Fungi, and Medicinal Species

Numerous plant species in mountain regions provide gifts of food and medicine to many people, including First Nations, Métis, and Inuit Peoples (Fig. 4.5). Plant-based foods in general, though often overlooked in accounts of peoples who hunt and fish extensively (Oberndorfer et al., 2017), provide crucial sources of energy from carbohydrates along with essential vitamins, minerals, and dietary fibre (Turner et al., 2000; Tushingham et al., 2021). Plants can also provide a more consistently accessible source of food during times of fish and game scarcity (Turner et al., 2000). In regions like the Eastern Subarctic, where mountain plants might not directly contribute as much to human diets, they can still be central to practices of fishing and hunting (Oberndorfer et al., 2017). For peoples of the Montane Cordillera, the edible bulbs of yellow avalanche lilies (*Erythronium grandiflorum*) and camas are harvested in large quantities primarily from montane regions (Cross, 1996; Turner et al., 2000). Berries and fruits are also abundant plant-based foods found across mountain regions. For the Gitksan and Wet'suw't'en peoples of the Pacific Maritime region, black huckleberries are the central plant resource of their seasonal round, being harvested in large quantities for eating, trading, and sharing during feasts (Trusler & Johnson, 2008).

In the Atlantic Maritime and Boreal Shield regions, bakeapples (*Rubus chamaemorus*), also known cloudberry remain central to social customs and economic exchange among the community of Charlottetown, Labrador (Karst & Turner, 2011), recently renamed NunatuKavummiut. While some plant-based foods occur at particular sites and elevations of mountains (Karst & Turner, 2011), others can be found at multiple points along the slopes, providing opportunities to extend harvesting seasons by travelling upward through space (Turner, 2014). Sharing his own experiences of growing up in the Micmac territory of Gesgapegiag, Elder Pnnal Bernard Jerome described the way steep mountain slopes offer diverse gifts of food and medicine in close proximity, from sugar maple (*Acer saccharum*) to medicinal plants. These gifts, traditionally known and stewarded by women, are reciprocated with offerings of tobacco and ceremonies (LC 4.12). Gitksan and Wet'suw't'en maintained black huckleberry (*Gaylussacia baccata*) patches at various elevations and locations, possibly as a buffer against conditions, such as drought or late frosts, that might differ across elevations (Trusler & Johnson, 2008). In these ways, harvesting and cultivating plant foods along the slopes of mountains can provide greater flexibility in the seasonal round and resilience to shocks.

Maintaining the abundance and quality of these plant-based foods requires concerted effort and specific knowledge. Mary Thomas,



Figure 4.5: Huckleberries (*Vaccinium* spp.) growing along Munro Lake in Pinecone Burke Provincial Park, ancestral lands of Coast Salish-speaking peoples. Photo courtesy of Erika Gavenus, 2020.

Secwépemc, shares that the lower portion of lily bulbs were removed and replanted, and regular tilling, weeding, and repropagating likely contributed to the productivity of the lilies (Turner et al., 2000). Interruptions to regular root harvesting, along with the compaction of soil caused by grazing cattle, have left previously productive areas devoid of harvestable roots (Turner et al., 2000). Controlled burns were used to promote the growth of multiple root vegetables and to keep shrubs from inundating meadows (Turner et al., 2000). Gitksan and Wet'suwet'en also used periodic burning of the landscape to maintain the presence and productivity of black huckleberries (Trusler & Johnson, 2008). The precise timing of the burning varied among groups, and Trusler and Johnson suggest the timing was likely specific to sites as well (2008). With the restrictions on berry patch burning imposed by the BC forest

service, many of the higher elevation black huckleberry patches of the Gitksan and Wet'suwet'en have been overtaken by more fire sensitive shrubs (Trusler & Johnson, 2008). Among the Métis of southeast Labrador pickers know not to pull the bakeapple stalks out from the ground and some follow the practice of picking all berries that are ripe—not “picking through” for the largest, there are concerns that interruptions to being on the land may cause loss of collective knowledge and social protocols among younger generations (Karst & Turner, 2011).

The nutritional value of medicinal plants, fungi, and berries has been assessed in some regions through case study research as in northern Canada and British Columbia; in addition to providing necessary daily nutrients, they are protective against many kinds of chronic illnesses including Type II diabetes (Kuhnlein, 1989;



Kuhnlein et al., 2004; Kuhnlein & Chan, 2000). Less is known about their value and use in other mountain regions.

Indigenous oral histories, practices of harvesting (gathering) and uses of plants as medicine has been well documented, particularly in British Columbia (Peacock & Turner, 2000; Turner, 1984, 1988, 2020). In northern Canada, in the Richardson Mountains of the Boreal Cordillera, for example, there is also a growing number of examples of ethnobotanical knowledge of Gwich'in and Sahtú communities. Ethnobotanical studies, by the Gwich'in Social and Cultural Institute and related research celebrates the complexity of knowledge about plants of the *dthaa* (Tetli't Gwich'in name for the Richardson Mountains) (Andre & Fehr, 2001; Parlee & Berkes, 2006).

Uprety and colleagues found that medicinal plants are found throughout boreal forests in Canada (Uprety et al., 2012). While the most prolific and widespread plants were listed most frequently as having medicinal properties, other plants used as medicine are highly specific to locations and elevations (Uprety et al., 2012), as explained by Elder Pnnal Bernard Jerome, Micmacs of Gesgapegiag (LC 4.12). In many cases, the locations, relationships, and harvesting practices are imperative to the medicinal qualities and guarded from public sharing (Uprety et al., 2012). Cuerrier et al. (2019) found through their work with Inuit living in Kangiqsualujuaq, Nunavik, and Nain, Nunatsiavut, within the Eastern Subarctic mountain region, that less than half of the

identified medicinal plants are used in both communities, and that there is often low specificity in medicinal plant uses—specific plants are used for multiple purposes, and multiple plants are used for a single ailment.

While discussions of foods and medicines can be highly focused on physical health (e.g., the precise micronutrients and chemicals contributing to healing and nourishment; Fig. 4.6), foods and medicines gifted by mountains support people in other ways (Turner, 2014). Appreciating how mountains nourish and heal beyond the physical gifts of food and medicines is an ongoing space for learning. Keara Lightning, Nehiyaw, Samson Cree First Nation, describes relationships with mountains, and others, themselves as healing (LC 4.13); and Wanda Pascal, Teetl'it Gwich'in, shares that the activity of picking berries and being on the land relieved pain and healed an injury (LC 4.14). Oberndorfer et al. (2017) explain: “The value and utility of plants is at the systems level, in how plants function as one of many strands that connect people to fish, birds, soils, berries, and other people, as well as to aesthetics, memory, emotion, and cultural values.” Similarly, Norton et al. (2021) learn through their work within the self-governing Inuit region of Nunatsiavut that in relationship with people, plants fill multiple roles. They are used as indicators of seasonal change, offer markers of memories and histories, reflect customary laws, support being on the land and living off the land, and provide a means for practising and renewing shared values.

The value and practices of harvesting plants, fungi, and berries to Indigenous Peoples have been little documented in academic research (see, however, Armstrong et al., 2018, 2022); this gap is in part attributable to gender biases in anthropology and other disciplines that value male knowledge practices and have been chronically preoccupied with larger species (Díaz-Reviriego et al., 2016; Kuhnlein, 2017; Parlee & Berkes, 2006; Parlee et al., 2018). It is a significant concern in many regions that Indigenous Knowledge related to the use of medicinal plants has been eroded in Canada due to the impacts of colonisation. Agriculture, forestry, mining, urbanisation and tourism have significantly impacted the capacity for Indigenous women to continue to harvest berries and plants to contribute to their communities' health and livelihood.

Table 4.1: Teetl'it Gwich'in Names for Berries valued in the Gwich'in Region (Richardson Mountains and Mackenzie Delta). Adapted from Andre & Fehr (2001); nB. L. Parlee (2006).

<i>Gwich'in</i>	<i>Common English</i>	<i>Latin</i>
Natl'at	Cranberry	<i>Vaccinium vitis-idaea</i>
Jak na	Bog blueberry	<i>Vaccinium uliginosum</i>
Nakal	Cloudberry	<i>Rubus chamaemorus</i>
Nichih	Rosehips	<i>Rosa acicularis</i>
Ts'iiivii ch'ok	Juniper berries	<i>Juniperus communis</i>
Deetree jak	Black currant	<i>Ribes hudsoniaum</i>
Nee'uu	Red currant	<i>Ribes triste</i>
Shis jak	Red bearberry	<i>Arctostaphylos rubra</i>
Dineech'uh	Crowberry	<i>Empetrum nigrum</i>



Figure 4.6: Rosehips (*Rosa* spp.), a common addition to medicinal teas, ripening upon the Chilcotin Plateau, T̓silhqot'ın Nen and Dakelh Territory. Photo courtesy of Erika Gavenus, 2021.

Much of the land in British Columbia, including Pacific Maritime and Montane Cordillera mountain regions, does not fall under the ownership, control or management of First Nations but is considered Crown land; approximately 94% of the province's land is designated as provincial Crown land, 1% is "federal Crown land," and the remaining 5% is private land (Hamilton, 2012, p. 6; Kamieniecki, 2000). First Nations in British Columbia and in many parts of Canada are afforded rights to harvest plants, fungi and berries on public or Crown land for their personal use but have limited opportunity to develop them for commercial use. "Explicit rights to harvest, manage, and charge fees for NTFPs on public land have only been granted by the provincial government to those who hold a Community Forest Agreement or First Nations Woodland Licence. Private forest landowners have rights to all forest resources on their lands and some large forest companies manage access to NTFPs on these lands" (Hamilton, 2012, p. 5).

The resurgence and recovery of knowledge is happening in numerous areas as a result of research partnerships, entrepreneurship, forest management protections (e.g., Indigenous protected areas and parks) as well as various kinds of biodiversity conservation initiatives in mountain regions. Indigenous management practices based on decades of knowledge and practices are particularly valuable in this resurgence (Berkes & Turner, 2006; Gavin et al., 2018). Cultural burning, or the use of fire to shape mountain landscapes, has been used by many Indigenous groups in mountains to support the production of berries and other plants (Hoffman et al., 2022; Ignace et al., 2017). This practice has been widespread in many parts of British Columbia including mountain regions. The vegetation communities of the Skeena and Bulldey Valleys around Hazelton for example, have been shaped by cultural burning. It is estimated that the Gitskan and Wet'suwet'en peoples have been using cultural burning for at least 1000 years (pre-European contact) to influence productivity of key plants. The principal berry species managed by burning were black huckleberry (*Vaccinium membranaceum* Dougl.) and low-bush blueberry (*V. caespitosum* Michx.). Soapberries (*Shepherdia canadensis* (L.) Nutt.) may also have been managed by burning at least in some

locations. The other main function of burning was to clear areas around village sites (Gottesfeld, 1994).

This is true in other regions further west towards the coast. As described by the late Lil'wat elder Baptiste Ritchie from the Stl'atl'imx region of British Columbia: "They [the Stl'atl'imx, Lil'wat or Lillooet] burned them [the hills] so that they would get good crops there. They told others who went there, 'Do the same at your place, do the same at your place.' Their hills were just like a garden" (Peacock & Turner, 2000, p. 133).

There is potential for many Indigenous and other communities to develop local economies from the harvesting, processing, and marketing of plants for food and medicines. In their assessment of factors relating to successful commercial development of chanterelle harvesting on northern Vancouver Island within the Pacific Maritime region, Ehlers and Hobby (2010) note potential trade-offs between further developing mushroom harvesting and the interests of the timber industry—namely the age at which trees are harvested. Most chanterelle harvesting takes place on land that has been designated as Crown Land, which, as discussed above, has implications for who has the authority to regulate how the harvesting happens, and potentially expands.

Informed by examples internationally, there is widespread concern in Canada about intellectual property rights associated with medicinal plants and the potential impact that commercialization of the resources could have on the sustainability of various species and the practices and uses of local people (Tsing, 2015). Elder Gùdia Mary Jane Johnson, Lhu'ààn Mán Ku Daí, shared concerns about the commodification of these traditional foods and medicines. She described the escalating fervour to harvest lucrative morel mushrooms, which each year brings people from all over the world to recently burned sites in the mountains of her territory to search for morels. She explained that members of her community are careful about guarding their knowledge of mushroom foraging places, sharing the harvest but avoiding sharing harvest locations with outsiders in particular. "There's economic value," she explained, "but there are other values that are equal or of more value than the economic values that are usually tagged on to anything on the land"

(LC 4.15). Seasonal closures of commercial harvesting of huckleberry in parts of the Kootenay, within the Montane Cordillera, began in 2017 due to concerns raised by the Ktunaxa Nation, and others, that the harvest was harming bears (Government of British Columbia, 2022). One anonymous reviewer offered this as an example of how precarious the gifts of the mountains can be “if not managed with sustainability and holistic benefits in mind.”

In describing foods as gifts from the landscape, Enrique Salmón notes the importance of how such gifts are received and practices of reciprocity (Salmón, 2012). Such reciprocity can take the form of offerings, which are often foods and medicines themselves (Andrews et al., 2012; Uprety et al., 2012). Controlled burning and returning bones can maintain the cycling of nutrients, just as salmon returning to their spawning grounds bring influxes of marine-based nutrients to mountain forests (Haskell, 2018; Hocking & Reynolds, 2011; Louis, 2021; Wagner & Reynolds, 2019). Gabrielle Weasel Head, Kainaiwa Nation, Blackfoot Confederacy, shared that guardianship of mountains and the responsible use of gifts are also required (LC 4.16). In these ways, along with many others, receiving gifts from the mountains comes with responsibilities to the mountains.

#### 4.5.2 *Wildlife*

Wild species, including wild animals, are among those gifts that contribute significantly to the well-being of communities in Canada (Nadasdy, 2007). While some animals use high mountain areas as their permanent homes, others are visitors to mountains, moving into highland areas along their migrations or during specific seasons. Mountains provide these animals with respite from heat, plants for foraging, and safety from predators. They are a source of food security and economic livelihood to many peoples. For example, within the Taiga Cordillera the mountain woodland caribou move to higher elevations of the Selwyn Mountains in summer for calving season (Andrews et al., 2012). Caribou meat is a staple food and trade item for the Shuta Got’ine, or Mountain Dene, and hunters take advantage of mountain ice patches as reliable places to find caribou seeking refuge from heat and insects (Andrews et al., 2012). Smaller game, such as ground squirrels and grouse, are also harvested during the same trips and used as food (Andrews et al., 2012). Goota Desmarais, Inuit, Kinngat, Nunavut, shared that waterfowl and eggs are also harvested from mountain areas (LC 4.17).

Within the Montane Cordillera mountain region, the Salish had camps from which bighorn sheep were hunted, and along the Rocky Mountain Front the Blackfoot hunted bighorn sheep in the winter (Zedeno et al., 2021). In the southwestern Canadian Rockies region, the Ktunaxa hunted mountain herds of bison, who moved into alpine areas during the summers (Reeves, 1978) (Fig. 4.7). Place names and archaeological records suggest that the physical features of the mountains were often used to facilitate successful hunts—driving caribou up against cliffs or bison into depressions left by ice (Andrews et al., 2012; Reeves, 1978). Among the Iskut First Nation within the Boreal Cordillera region, McIlwraith finds moose hunting to be “the central activity of life” with tasks—camping,



*Gùdia Mary Jane Johnson,  
Lhu'ààn Mân Ku Daí,  
2022, LC 4.15*



*Gabrielle Weasel Head,  
Kainaiwa Nation, Blackfoot  
Confederacy, 2022, LC 4.16*



*Goota Desmarais, Inuit,  
Kinngat, Nunavut,  
2022, LC 4.17*



*Gùdia Mary Jane Johnson,  
Lhu'ààn Mân Ku Daí,  
2022, LC 4.18*



cutting and drying meat, feasting—undertaken with “passion and vigour” (McIlwraith, 2008, p. 125).

While practices and protocols for hunting continue, many of these wildlife populations have declined significantly in the last fifty to a hundred years, for multiple and interrelated reasons including development, deforestation, and additional hunting pressures (Andrews et al., 2012; Oetelaar, 2014). Elder Gùdia Mary Jane Johnson, Lhu'ààn Mân Ku Dań described her Nation's observations of and responses to declines in Dall Sheep populations, explaining the value of Elders in the herd and her Nation's efforts to lobby the Yukon Government to reduce trophy hunting as a contributing factor to population decline (LC 4.18). People can also find it harder to fit hunting trips into schedules that are increasingly determined

by seasonal and full-time wage work (McIlwraith, 2008).

Numerous studies have revealed the significant nutritional contribution of wild species when harvested; moose, elk, mountain caribou are among those species important in the Rocky Mountains and foothills regions. In the mountains of northern Canada (e.g., Yukon, Northwest Territories and Nunavut) where access to market food alternatives is very limited, traditional and country food are fundamental to food security (Kuhnlein et al., 2004). Many sources of wild meat are also critical to health; Inuit and First Nations who consume higher levels of wild meat and other traditional foods in their diets report greater levels of well-being and evidence lower levels of chronic illness (e.g., heart disease and Type II diabetes) when compared to those more dependent



Figure 4.7: Plains bison (*Bison bison*), also known as buffalo, have been vital to the cultures and lifeways of Nations living along the Rocky Mountain Front since time immemorial. Photo courtesy of Madison Stevens, 2019.



## THE MAN WHO TURNED INTO A CARIBOU

Indigenous Peoples have well developed knowledge systems that reflect generations of living on the land; this knowledge includes well developed insights about wildlife ecology in mountain regions. This close relationship is deeply embedded in oral histories that detail the kinship between people and animals. One good example is the story from the Tetlit Gwich'in elder about a person becoming a caribou.

*Story: The Man Who Turned into a Caribou*

There was a man whose medicine was the caribou and he went and hunted the caribou. Suddenly, as he was shooting at the last of the caribou going by, the men in the group saw that there was no man. They ran along after him to see what happened. They found his clothes on the ground and an extra caribou running away. The men were very confused and upset about this, but there was nothing they could do. The next year they went to the same

spot, where there was a caribou crossing, and again they saw the caribou. But one caribou did not follow the others. He turned back into the lake and swam towards an island. One man took a canoe and went after him. Now this man who went after the caribou was the father of the man who had disappeared the year before. When the man got to the island, to his amazement he heard the caribou calling to him saying, "Father, father don't shoot me! I'm going to swim to the shore and when I get to the shore, throw a stone at me." The man, who was startled and rather alarmed by this, returned in his canoe to the shore. The caribou swam after him and when the caribou got to the shore, the man threw a stone at it. Lo and behold! The caribou turned back into his son again, and stood there, naked and shivering on the beach (Benson & Department of Cultural Heritage, Gwich'in Tribal Council, 2019, p. 4).

on non-wild meats (Kuhnlein et al., 2004; Wil-lows, 2005). "The Inuit dietary survey conducted by the Centre for Indigenous Peoples, Nutrition and the Environment demonstrated that days with country food provided more protein and micronutrients than days without country food, and that carbohydrate intake, particularly refined carbohydrates, increased on days without country food" (Egeland et al., 2009, p. 12). However, wild meat is not a universal solution, given the cost of the tools, fuel, and other resources required; many women, including single mothers, are particularly excluded from access to wild meat in many regions. In one study, Inuit (up to 45% within age groups) reported that they could not afford to go hunting or fishing (Lambden et al., 2006).

Country foods are expensive to acquire relative to store-bought foods, with gear being a large investment. The high cost of equipment is not only a limitation, but often means that acquiring country foods is not profitable, potentially costing the hunter more money than purchasing equivalent

foods at the store. This cost discrepancy is made worse by the fact that store-bought foods receive federal subsidies divided among national taxpayers, while country foods costs fall only on the individual hunter, or immediate family. (Hoover et al., 2016)

Many iconic wild species also feature prominently in Indigenous cultures and spiritual well-being. The Spirit Bear (*Ursus americana*) is among those species of significance to Indigenous Peoples in the mountain regions of British Columbia. "People in Haíl~zaqv territory live and harvest food resources among grizzly bears, indeed sharing salmon, berries, and other foods with them. The grizzly bear is present in ceremony through masks, songs, dances, issuing reminders as an enforcer for Haíl~zaqv people to conduct themselves respectfully" (Clark et al., 2021)." Threats on the Spirit Bear associated with Pacific salmon declines, and forest ecosystem loss as well as trophy hunting) have echoing impacts in the Haíl~zaqv and other communities.

Gwich'in and Sahtu hunters have documented the cycles of Porcupine and Bluenose caribou pop-

ulation change, triggers of caribou stress and poor health, and good management practices for caribou in the Richardson and Mackenzie Mountains (Parlee & Caine, 2018). Similar to forest ecosystem management and the recovery of intact forests, there is growing evidence that the leadership of Indigenous Peoples is key to ensuring the sustainability of wildlife (Schuster et al., 2019). Some key examples include the mountain caribou in British Columbia (Lamb et al., 2022) and grizzly bear in the eastern slopes of the Rocky Mountains.

### 4.5.3 Fisheries

Among the wildlife supported by mountains, fish from alpine lakes to coastal regions benefit from the aquatic habitats, food and nutrients, and spawning grounds provided by mountains (Fig. 4.8). These fish, in turn, support fisheries that are central to livelihoods, identities, and continuance of many communities across Canada (Armstrong & William, 2015; Ommer & Coasts Under Stress Research Project Team, 2007)



Figure 4.8: The Bella Coola River flows through Nuxalk Territory from the coastal mountains to the North Bentinck Arm. Salmon travel the river to return to their spawning grounds, and the river once supported large returns of eulachon. The surrounding mountains, including Nusatsum Mountain in the photo, play a central role in the health of the river and the fish who travel along it. Photo courtesy of Erika Gavenus, 2021.

Fish of the mountains, including species like cutthroat trout (*Oncorhynchus clarkii*) and char (*Salvelinus spp.*), whitefishes (*Coregoninae spp.*), and burbot (*Lota lota*), often find refugia in cold, clear waters of mountain streams and alpine lakes (Sinnatamby et al., 2020). Some trout, like westslope cutthroat (*Oncorhynchus clarkii lewisi*), Athabaskan rainbow (*Onchorhynchus mykiss spp.*), and bull (*Salvelinus confluentus*) also rely on groundwater seeps for overwintering in mountain regions (Sinnatamby et al., 2020). Mountain fish can be an important part of harvesting trips. Megan Dicker, an Inuit woman from Nunatsiavut, describes the importance of returning to the Torngat Mountains for hunting and fishing for Inuit who have grown up in southern communities following relocation:

There is still such a strong connection there for people of my generation who go there [Torngat Mountains]. People still go there every year to hunt and to fish and to just go. Just to be. Go just to be there, to spend time there. They have those camps all along the way from our communities north to the tip of Labrador where people go camp. Most people go in the summer months by boat, but people have also been going by skidoo on the ice this spring. So even though nobody lives there permanently anymore, people still go back. It's like a pilgrimage. Something that they need. Something that was taken from them. (LC 4.19)

Within the academic literature, much of the focus on mountain fishing considers angling or recreational fishing. In particular, the stocking of mountain lakes with fish preferred by anglers has received significant attention for the cascading ecological effects of such introductions (Parker et al., 2001; Pearson & Goater, 2008; Weidman et al., 2011). This research focus has generated considerable insights into the complexity of alpine aquatic systems (Heinle et al., 2021; Macdonald et al., 2014; Paul & Post, 2001). Jeanson and colleagues (2021) have also offered insights into the social complexity of these same systems. The revealed complexity has complicated efforts, thus far, to make more generalised predictions about how cumulative impacts—such as shifting temperatures, pressure from anglers, or removal of



introduced species—are likely to affect fish of the mountains and the relationships we have with them (Ripley et al., 2005; Sinnatamby et al., 2020).

Mountains also offer gifts to fishes of the lowlands, including marine species such as herring (*Clupea pallasii*), and anadromous species such as eulachon (*Thaleichthys pacificus*) and salmon (*Oncorhynchus spp.*) which spawn in estuaries and lower reaches of rivers originating in coastal mountains (COSEWIC, 2013; Moody, 2008). Bodaly et al. (1984) similarly note the connection between mountain activities and pike and walleye in Northern Manitoba. For many of these fish, the freshwater and nutrients that flow from mountains, snowpack, and glaciers are critical to their survival and successful spawning (Pitman et al., 2020). At the same time sediment loading (Pentz & Kostaschuk, 1999), shifting flows and timing (Rand et al., 2006), and contaminants from mountain activities (Reid et al., 2021) can pose significant risks to these lowland fish and associated fisheries. Brandy Mayes, Kwanlin Dün First Nation, explains the detrimental effects of historically unprecedented flooding on salmon populations in her Nation's Traditional Territory (LC 4.20). Contamination of fish in mountains is also documented and is an area of concern for restoration of mountain fish populations (Orr et al., 2012; Rudolph et al., 2008). Attending to these multiple pressures, across landscapes and at times jurisdictions, remains a space for significant learning. Tulloch et al. (2022) offer one approach for bringing terrestrial and marine pressures together in assessing risks for Pacific salmon and herring. How such



assessments can inform decisions within fisheries management and land use deserves further attention and conversation.

Finally, there are the fish which travel between the highlands and lowlands. Tim Patterson, Lower Nicola Indian Band, Scwéxmx, Nlaka'pamux (Thompson) Nation, noted that some lowland fish, particularly eulachon in the Pacific Maritime region, make this journey following harvest, with extensive networks of 'grease trails' shaping mountains and relationships among First Nations (LC 4.21). Other fish, most notably Atlantic salmon (*Salmo salar*) and Pacific salmon (*Oncorhynchus spp.*), make the long journey from sea to mountainous spawning habitats where they have a tremendous effect on those systems, as Brandy Mayes (Kwanlin Dün First Nation) described:

In our world, salmon feed everything. Not us, not just us. They feed the land, they feed the bears, and everything that survives on salmon. Between the birds that live on the land, and the squirrels, and the trees, and everything. (LC 4.20)

While there is increasing attention in the reviewed academic literature to the multiple ways that salmon, and other anadromous fish, nourish and shape mountain spaces (Hassan et al., 2008; Hocking & Reynolds, 2011; Wagner & Reynolds, 2019), Gende et al. (2002) along with Levi et al. (2012) note that the implications of dramatically

reduced salmon returns on mountain systems have received limited attention in academic literature. Yet, these changes are widely observed by those who live alongside and depend on salmon, on both Pacific and Atlantic coasts. Elder Pnnal Bernard Jerome, Micmacs of Gesgapegiag, described protracted activism by Micmac communities to protect declining Atlantic salmon habitat and place limits on the recreational sport fishing industry, returning the salmon to Micmac stewardship (LC 4.22). Likewise, sharing observations from Kwanlin Dün territory, Brandy Mayes (Kwanlin Dün First Nation) says:

We're looking at all of these different ways that climate change and the environment is changing from one species [salmon], from the warming of the weather. And, now we are at: "What are we going to do? What is it going to do? What is going to happen?" We already know culturally, the impacts. We always went to salmon camp. Not only was it just about eating better food and a healthy diet and having that food come through every year. It was about your social aspects of salmon camp: what you taught and the stories were passed down to your children and that family connection. And knowing, when you've all gathered together, what was happening up and down the river. Coming together in ceremony and meeting. You look at that species, by not having it coming back every year in the abundance that it was—we used to take tens of thousands before the dam went in, and then we were still at five thousand, twelve hundred. We're at two hundred salmon a year coming back, and counting only nineteen redds. If you guys know what nineteen redds are, it's the spawning, where they lay their eggs. Nineteen. Last year we had five. That's only that many salmon that are spawning, and what's going to survive out of that to make it back? To make it back to the ocean and come back and then keep feeding everything along the way? (LC 4.20)

In the Pacific Maritime region, the Wuikinuxv Nation in collaboration with academic researchers and fisheries scientists have shared an ecosystem-based management approach for fishing activities

that centres the needs of bears alongside the needs of humans (Adams et al., 2021). Principles of fisheries governance that have been shared by Indigenous Peoples across Canada (Atlas et al., 2021; A. J. Reid et al., 2021, 2022; M. Reid et al., 2022) often highlight the importance of managing marine or lower-river fishing activities with regard to sharing with humans and non-humans upriver. However, such principles remain largely absent in approaches to fisheries governance that have long privileged single-species management (M. Reid et al., 2022) and potentially hindered by gaps in Western science’s understanding of how anadromous fish influence the productivity of mountain systems (Gende et al., 2002).

Broadly, the reviewed academic literature primarily casts the use of foods and medicines from mountains as practices of the past, with a focus on practices of Indigenous Peoples. Notably absent from the reviewed academic literature is reference to local knowledge and practices held by non-Indigenous multi-generational populations. The approach of the CMA, therefore, does not necessarily represent what is known about foods and medicines of the mountains among these populations if it falls outside of academic literature. Scholars and practitioners within the movement of Indigenous food sovereignty have rightfully criticised the over-emphasis and intellectual curiosity with Indigenous food practices of the past that too often occurs alongside the under-scrutiny of the colonial processes that interrupted such practices and the discounting of contemporary efforts to renew them (Coté, 2016). In general, there seems to be a gap in the literature with regard to the foods and medicines currently given by mountains, the food practices that take people into the mountains, and how those foods and practices might be expected to change looking forward. The knowledge shared during the Learning Circles included more references to current practices and gifts. In cases wherein sharing such information aligns with the responsibilities of mountain stewardship and respectful relationships, there is much to be learned with regard to the continued gifts of foods and medicines.

## 4.6 Gifts of Water

Mountains, sometimes referred to as the world’s ‘water towers’, are recognized globally as import-

ant sources of freshwater (Viviroli et al., 2007). This is because mountains receive more precipitation than surrounding lowlands, experience less evapotranspiration due to lower temperatures and less vegetation, and store water as snow and ice from which summer meltwater subsidises dry-season streamflow (Barnett et al., 2005; Viviroli et al., 2003). Mountain water resources are critical for both mountain populations and those who live hundreds or even thousands of kilometres downstream (Immerzeel et al., 2020; Viviroli et al., 2020).

### 4.6.1 Gifts of freshwater

In Canada, many communities and industries rely on water resources derived from mountains. From the perspective of water demand relative to local supply, this is particularly true in southwestern Canada, e.g., in semi-arid areas such as the Okanagan Valley and the southern Canadian Prairies (Mitchell et al., 2021). But water from mountains matters in myriad ways across mountain systems. For example, Patricia Joe of Kwanlin Dün First Nation described the connection between the mountains, the Yukon River, and its people:

We come from the Yukon River, the biggest artery in the Yukon, and it connects us to all the communities. But we would not be river people if it wasn’t for the mountain people. It’s the mountains that made the river.

(LC 4.23)

The Montane Cordillera region is an often-cited example of an important mountain water tower in western Canada. The apex of the Columbia Icefield in the Canadian Rockies represents a rare hydrological “triple point,” with meltwaters from the Icefield flowing west to the Pacific, east to the



Atlantic, via Hudson Bay, and north to the Arctic, via the Athabasca and Mackenzie River systems. Waters from this icefield reach five of Canada's thirteen provinces and territories, where they play an essential role in ecological, municipal, agricultural, and industrial water resources. The westward-flowing Columbia River system is also a critical hydrological artery for the U.S. Pacific Northwest, with much of its flow derived from mountain headwaters in Canada. These headwaters are sacred and are imbued with cultural value for numerous Indigenous populations of western North America (e.g., Atlas et al., 2021; Awume et al., 2020).

The Columbia Icefield is a signature feature of the Canadian Rockies, but glaciers and snowfields along the entire expanse of the continental divide serve as the wellspring for much of western North

America's water supply. Runoff from the eastern slopes of the Rocky Mountains (Fig. 4.9) contributes disproportionately to the flow in the Bow, North Saskatchewan, Athabasca, and Peace River systems, flows which are heavily drawn upon for agriculture and industry (e.g., Demuth & Pietroniro, 2003; Schindler & Donahue, 2006; Marshall et al., 2011; Toth et al., 2009). A recent study compiled municipal water sources in Alberta and found that 232 of 567 communities rely on snow- and glacier-fed rivers from the Rocky Mountains (Anderson & Radic, 2020).

Similarly, the western slopes of the Rockies and several other ranges within the Montane Cordillera and Pacific Maritime regions are critical sources of water to downstream communities and hydroelectric facilities. Immerzeel et al. (2020) ranked global mountain basins in terms of their



Figure 4.9: The Athabasca River flowing from mountain water towers in the Canadian Rockies, Alberta. Photo courtesy of Graham McDowell, 2016.

importance to water supply. They conclude that the Fraser River basin, which spans the Pacific Maritime and Montane Cordillera regions, is the most important mountain water tower in North America, based on the extensive mountain water resources in this region's hydrological system (Supply Index) and the high demand for that water (Demand Index). The Columbia River Basin was assessed as the second most critical mountain water tower. The Columbia River is the most heavily dammed river system on earth, and hydroelectric dams in the Canadian portion of the Columbia provide 58% of British Columbia's electricity (BC Hydro, n.d.).

Water is much more than simply a material substance. Water holds complex meanings and values for all human communities (Strang, 2004) and hydrosocial relations with mountain waters are diverse and complex. In Canada, mountain water is valued for environmental, spiritual, cultural, economic and political reasons including tourism (Romeo et al., 2021), habitat for fish (Turner & Clifton, 2009) and a source of drinking water (Anderson & Radic, 2020) or water for various industrial uses including agriculture and mining (Laidlaw, 2018; Schindler & Donahue, 2006).

Much of the literature on human-water relationships in mountain regions in Canada focuses on Indigenous knowledges and relationships with water, often understood as a living entity (Wilson & Inkster, 2018). While focusing on Tlingit and northern Athapaskan peoples' relationships with glaciers in the St. Elias Mountains (Pacific Maritime and Boreal Cordillera), Cruikshank highlights the place of water in local traditions as well as the central role of human-water-glacier relationships in everyday life (Cruikshank, 2005). Nancy Turner and Elder Helen Clifton (Gitga'at (Coast Tsimshian) Nation of Hartley Bay, BC) (Pacific Maritime) discuss human-water relationships as they share Secwépemc elder Mary Thomas's recollection of "her own mother breaking off stems of swamp gooseberry (*Ribes lacustre*) during a summer drought, dipping these in the water of a mountain creek and invoking rain" (Turner & Clifton, 2009, p. 183). Research with Stelat'en First Nation (Montane Cordillera) also indicates concerns about the impacts of climate change on water and fish (Sanderson et al., 2015).

Parlee and Martin (2016) review existing documentation of Indigenous knowledge of the Peel

River Watershed (Taiga Cordillera), a sub-watershed of the Mackenzie River Watershed highlight the importance of water to the Teetl'it Gwich'in, Vuntut Gwich'in, Tr'ondëk Hwëch'in and Northern Tutchone. They discuss the value of the rivers in the Peel watershed as transportation corridors and the fish in the rivers as important to the food security of families who utilised the area. Furthermore, they document changes in water quality and levels (e.g., riverbank erosion, fluctuating water levels) and concerns about the impacts of development and climate change on the watershed and the fish that rely on it. Finally, Wilson, Tr'ondek Hwech'In Elder Angie Joseph-Rear, and others (Wilson et al., 2019) discuss the importance of mountain water sources (traditional drinking water sources) near Tombstone Territorial Park in Yukon (Taiga Cordillera) for the spiritual, cultural, and physical health of the Tr'ondek Hwech'In.

The complexity of hydrosocial relations means that climate change has cascading socio-cultural, political, and ecological implications for human communities. For instance, mountain communities that rely on glacially fed rivers for municipal drinking water supplies are potentially vulnerable to reduced streamflow resulting from deglaciation (e.g., in Alberta; Anderson & Radic, 2020). Climate impacts on the snowpack mountains within the Capilano and Seymour watersheds that supply water to Metro Vancouver are also of concern for long-term planning (Mood & Smith, 2021). While Canada has been noted to suffer from the "myth of abundance" (Sprague, 2007), these examples illustrate the importance of paying attention to the implications of water scarcity for mountain communities and those outside mountain regions that rely on these water sources.

Water governance is also an important topic related to hydrosocial relationships. There is limited literature on water governance in mountain regions in Canada. Challenges in water governance may prevent the protection of water. For instance, weak governance is at the heart of Canada's water problems including significant jurisdictional overlap and conflict (Bakker, 2011). Furthermore, Indigenous Peoples have inherent water rights, authorities, and responsibilities to water (Craft, 2017; McGregor, 2014), and yet are frequently excluded or marginalised within colonial water governance frameworks in Canada

including specific examples from mountain regions (Arsenault et al., 2018; Simms et al., 2016; Wilson, 2020). Indigenous Peoples are also articulating approaches to water governance—rooted in their Indigenous governance systems that centre water as a living entity (Wilson & Inkster, 2018). These issues are not specific to mountain regions; however, future literature should consider the specificities of governance in these regions.

#### **4.6.2 Gifts of wetlands**

Wetlands provide a variety of gifts or ecosystem services: water quality improvement, flood risk mitigation, water retention, support for biodiversity, and carbon management (Zedler & Kercher, 2005). They are key stops for migratory species, they host specialised species adapted to living in very specific conditions, and they provide for landscape heterogeneity. In mountains in Canada, wetlands have been described as acting as kidneys for the Earth (Bai et al., 2013), playing a critical role in cleaning water of excessive nutrients and polluting chemicals. Wetlands in the mountains are also important flood risk mitigators, as seen in Westbrook et al. (2020), who describe the 2013 flood in Kananaskis region of southern Alberta, in the Montane Cordillera. Wetlands retain runoff water, allowing for a slower release of water through time and buffering the input to downstream areas.

Wetlands also comprise key wildlife habitat in mountain regions. They provide habitat for moose and elk calving, as well as beaver, which are landscape architects and have shaped much of the low- and mid-elevation wetlands in the mountains in Southern Alberta (Morrison et al., 2014). Wetlands are also a stop for migratory species for resting, drinking water, and feeding as well as nesting areas for birds. By providing landscape heterogeneity these ecosystems allow for protection of habitat-specific species, and can act as a natural barrier to break up homogeneity in landscapes, particularly above the treeline. If undrained and well conserved, wetlands act as natural fire breaks and refuges for communities during wildfires, which are becoming more common. Wetlands may potentially act as climate refugia as species ranges shift by buffering temperature swings (Stralberg et al., 2020).

Wetlands can also capture large amounts of carbon, demonstrating the resilience of mountain environments. Studies of the carbon accumulation rates in peatlands in the mountain regions of Canada are scant; however, it has been shown that despite lower carbon content, long-term carbon accumulation rates of mountain peatlands may be similar to that of boreal lowland peatlands as the peat is usually denser (Cooper et al., 2012). Peat in the Rocky Mountains started to accumulate after the last glaciation, and the ages range from 3800 to 12,000 years ago (Cooper et al., 2012; Gardner & Jones, 1985; Mercer, 2018). The estimated average depth of peat in the Canadian Rocky Mountains is 50–100 cm (Mercer, 2018; Tarnocai et al., 2011). The mean long-term accumulation rates for peatlands in the foothills of the Canadian Rockies are estimated to be about  $25 \text{ gC m}^{-2} \text{ yr}^{-1}$ , which are similar to carbon storage rates of peatlands in Colorado (Chimner & Cooper, 2003; Wickland et al., 2001; Yu et al., 2003). Further inventorying and carbon accounting of peatlands in the mountain regions of Canada are needed to understand their carbon sequestration capabilities.

Anthropogenic impacts including climate change are affecting and will continue to alter important functions of wetlands and specifically peatlands in sensitive world regions like mountains. Current and predicted changes to mountain wetland ecosystems are discussed in Chapter 5, Sec. 5.10.3.

### **4.7 Gift of Mountain Spaces and Terrain for Tourism and Recreation Activities**

#### **4.7.1 Nature and adventure tourism economies**

Mountain regions across the world are popular for tourism and recreation activities, as mountains hold rich socio-ecological diversity and inspiring landscapes that create opportunities for reflection and adventure (Romeo et al., 2021). The same holds true for mountain regions across Canada (Mitchell et al., 2021), which have grown in popularity with rising visitation numbers (IUCN, 2020). Mountains in Canada have drawn people from across many cultures seeking opportunities for physical adventure and an escape from everyday



life (Fig. 4.10). Mountain-based tourism and recreation activities in Canada include, but are not limited to, sight-seeing, hiking, mountaineering (e.g., rock climbing, ice climbing, alpine climbing, ski mountaineering, via ferrata), skiing (e.g., backcountry, alpine, cross country, kite-assisted), water-based activities (e.g., swimming, paddleboarding, canoeing, kayaking, rafting, sailing), biking (road and mountain), camping, fishing and hunting, and mechanised recreation (e.g., snowmobiles, all-terrain vehicles/quads, helicopters, snowcats for skiing), which occur across different seasons depending on conditions.

Today this is a multi-million dollar industry in Canada in places such as the Rocky Mountains of western Canada and the associated “adventure culture” economy (e.g., clothing, retreats, artwork) is worth many more million dollars per annum. In Canada, over half of national park visits occur in the seven so-called mountain parks

(Banff, Jasper, Mount Revelstoke, Glacier, Yoho, Kootenay, and Waterton Lakes) annually, and in a pre-COVID-19 era, \$1.48 billion was generated annually from tourism activities in Alberta’s Rocky Mountains alone (Alberta Government, 2012). Tourism and recreation activities in mountain regions across Canada emerged with the establishment of Rocky Mountain National Park in 1886 as the introduction of railways brought elite European and North American travellers to Banff’s hot springs (Draper, 2000). Since then, tourism and recreation development has been steady across mountain regions in Canada, with many communities transitioning away from economies based on mining and forestry, towards those based on tourism and recreation (Héritier, 2003; Nepal & Jamal, 2011).

With the increase in tourism and recreation opportunities in mountain regions across Canada, many urbanites have flocked to mountain



Figure 4.10: Mount Rundle and Sacred Buffalo Guardian Mountain (foreground) in Banff National Park, a popular destination in the Montane Cordillera region. Photo courtesy of Graham McDowell, 2022.

communities in pursuit of leisure and recreation lifestyles that cannot be found in urban environments (Pavelka, 2017). As with any transition, there are social and ecological trade-offs associated with moving towards a tourism-dependent economy, which is further discussed in Chapter 5. However, a holistic understanding of the economic, social, and environmental implications of mountain-based tourism and recreation across mountain regions in Canada, particularly in Northern and Eastern mountain ranges, is still lacking, and too little is known about how tourism revenues flow back to local communities.

Beyond the economic importance of tourism and recreation in mountain regions, tourism and recreation activities provide diverse benefits to people. Earlier work by Bratton et al. (1979) examines the reason why people are drawn to the

sport of mountaineering in Canada and found that people participate in mountaineering activities for a social outlet, health and fitness, excitement, relaxation, competitive and non-competitive achievement, and the love of nature. Further, it is recognized that participating in tourism and recreation activities in nature can enhance pro-environmental behaviour and stewardship behaviours by strengthening the relationship between humans and nature, as seen in recreational fishermen in British Columbia (Jeanson et al., 2021).

In essence, tourism and recreation activities in mountain regions provide humans with a gift of reconnecting with the natural world through movement and play. In Canada, beliefs and behaviours during recreational activities are driven by each individual person's experience in nature



Figure 4.11: Backcountry skiers ascending a slope above Lake McArthur in Yoho National Park. Photo courtesy of Madison Stevens, 2023.



and can be influenced by the species with which they interact and the habitats they use for recreation (Jeanson et al., 2021; Stoddart, 2011). For example, trail users in Banff, Jasper, Kootenay, and Yoho national parks (Fig. 4.11) were likely to support the closure of a particular area for conservation efforts, such as for a female bear with cubs (Elmeligi et al., 2021). Yet, the mountains are not equally accessible and do not provide tourism and recreation gifts to everyone, as Goota Desmarais (Inuit, Kinngat, Nunavut), stated, “only the rich could use the mountains, you need a vehicle and you need money to buy passes” (LC 4.24).

#### **4.7.2 Challenges and drawbacks of mountain recreation**

Important aspects of the history of tourism and recreation activities in Canada require more focused consideration, including the sometimes extractive history and characteristics of tourism and recreation in mountain regions across Canada, as well as the ways in which the benefits of tourism and recreation are often experienced in unequal ways. The mountain adventure economy has been described as prioritising the values of white, wealthy tourists with disproportionate benefits being captured by corporations who market mountain lifestyles to Canadian and global markets. Other social groups, including Indigenous Peoples who have long histories and connections to mountain environments, have seen little economic benefit and often experienced harm. This occurs when adventure activities conflict in time and place with Indigenous Peoples’ access or uses, or physically impact or degrade places of cultural value and importance.

Importantly, the establishment of formal protected areas in Canada, such as National and Provincial Parks, for conservation and tourism

purposes has led to the displacement and exclusion of Indigenous Peoples from their homelands (Binnema & Niemi, 2006), contributing to current and historical marginalization of Indigenous knowledges and ways of living. For example, with the “discovery” of the Cave and Basin Hot Springs by Canadian Pacific Railway surveyors, the Banff Springs Reserve was created in 1885, later extended to Lake Minnewanka in 1887, and further expanded in 1902, creating barriers for Indigenous Peoples to access traditional hunting grounds and restricting the right to hunt for subsistence purposes (Binnema & Niemi, 2006). With the further establishment of National Parks for tourism and conservation purposes, such as Banff National Park, came further exclusion of Indigenous ways of knowing and interacting with the natural landscape, pushing Indigenous Peoples to reserves and away from their homelands in the mountains (Binnema & Niemi, 2006).

More recent protected area developments have aimed to work in partnership with local Indigenous groups to ensure connection and culture is upheld. This was seen with the recent development of Torngat Mountains National Park (Inuktitut: Tongait KakKasuangita SilakKijapvinga) located on the homelands of Inuit Peoples, which was developed in partnership with Inuit members of Nunatsiavut and Nunavik who have traditionally used the land for hunting and gathering (Maher & Lemelin, 2011). While Torngat Mountains National Park is currently co-managed between Parks Canada and the Inuit communities of Nunatsiavut and Nunavik, it is important to recognize that Inuit members in Labrador were historically dispossessed and relocated from their traditional harvesting areas within the current park boundaries, and as such “the park should be viewed as a tremendous gift from the people of Nunatsiavut to Canada” (Maher & Lemelin, 2011).

Since the 1980s, there has been a growing effort towards healing the impacts of historic conservation efforts, with the need to reshape and develop new kinds of protected areas in ways that improve representation and equity of benefits for Indigenous Peoples. Co-management agreements, ranging from advisory roles to shared governance and consensus-based decision-making have developed in some mountain regions such as those in the Yukon Territory. Although less common in southern regions such as Alberta and

British Columbia, commitments of the federal government to meet global Aichi Targets (e.g., Target 1) for biodiversity conservation have catalysed a movement towards Indigenous Protected and Conserved Areas (IPCAs) (Zurba et al., 2019). IPCAs are lands and waters where Indigenous governments have the primary role in protecting and conserving ecosystems through Indigenous laws, governance and knowledge systems. Culture and language are the heart and soul of an IPCA. IPCAs vary in terms of their governance and management objectives (Zurba et al., 2019).

The exclusion of Indigenous Peoples is not the only cost that tourism and recreation development has on mountains in Canada. Recreation and tourism development and activity impacts both human (i.e., local communities) and non-human animal populations (i.e., flora and fauna) in mountain regions in Canada through disturbance and displacement (Gaudreau, 1990; Ladle et al., 2019; St-Louis et al., 2013), which is further discussed in Chapter 5. Some key examples of this conflict exist in respect of recreational versus subsistence hunting and fishing (Binnema & Niemi, 2006; Colton, 2005; Mason et al., 2022), recreational vehicle use (e.g., off-roading, mudding) (Kadykalo, 2022; Kershaw, 2008; Liddle, 1997; Pigeon et al., 2016; Yarmoloy, 1986), as well as less extractive activities (e.g., trail riding), that by virtue of a human presence may indirectly and directly fragment wildlife habitats and create problems of human-wildlife conflict (Geng, 2021; Loosen et al., 2023; Thornton & Quinn, 2009).

Participating in mountain-based tourism and recreation activities also involves people engaging with significant risk, which can be fatal given the circumstances of exposure to mountain hazards. For example, 1088 incidents and 1377 fatalities were reported in the Alpine Club of Canada's search and rescue database from 1970–2005, with 92% of incidents occurring in mountain regions in British Columbia and Alberta (Curran-Sills & Karahalios, 2015; Wild, 2008). This database shows that hiking and mountaineering result in more than half of all casualties that yield any type of morbidity, whereas mountaineering, skiing, ski mountaineering, or snowboarding account for almost two thirds of all fatalities (Curran-Sills & Karahalios, 2015). However, further research is needed to assess how mountain towns and communities are dealing with the impact of these

natural hazards. For example, with increased tourism, especially by visitors who are not particularly experienced with outdoor safety and travel, it is important to assess how to properly educate and conduct preventative intervention to avoid an increased number of search and rescue efforts, which can tax the funds and resources of small mountain communities.

While there has been some research trying to capture the intricacies of tourism and recreation as gifts in mountain regions across Canada, there is a lack of geographic diversity in the literature. To date, much of the tourism literature, based on a review by McDowell and Hanly (2022), is spatially concentrated in the Montane Cordillera and Pacific Maritime regions within Canada, with only a small body of literature published in other mountain regions. While there are still many research gaps in the Montane Cordillera and Pacific Maritime regions, attention should also be focused on the other mountain regions to increase knowledge on the social, environmental, and economic impacts of tourism and recreation, both positive and negative. Further, more attention should be given to examining how we can transition tourism and recreation economies away from extractive practices that commodify the gift of space and terrain towards reciprocal practices with the mountains and mountain communities.

#### **4.8 Gifts and Benefits of Forests, Materials, and Energy Sources**

This section focuses specifically on the material benefits provided by mountains. This includes a summary of the different kinds of reciprocal relationships of benefit and stewardship that exist between Indigenous Peoples and forests and energy resources. Forests, like water resources, can be exploited for commercial benefits, feeding urban and global markets. As such, the idea of gifts and gifting, particularly in which people and mountains exist in a reciprocal relationship of care, is uncomfortably suited to a discussion of energy and materials (e.g., forests and minerals) extracted from mountain environments. Yet these materials are also part of ongoing reciprocal relations and meanings for Indigenous Peoples, and offer more-than-material gifts to some non-Indigenous communities through traditions of sustainable use and harvest. The

practice of community forestry can be sustainable and not extractive, but this is not typical of Western economic systems, where the gifts and benefits tend to leave the community.

Recognizing the multiple ways in which these materials are used and managed, this chapter posits that mountains provide for different peoples in ways that reflect different engagements with mountains and different views of the environment in economic practices. In this subsection, then, the notion of gifts is complicated by the observation that for many people mountains provide benefits in the form of commodities, energies, and employment. This section shows some of the benefits that emerge from mountain environments for many, though not all, people in Canada. In doing so, we recognize that talking about gifts and benefits is often a narrow distinction which depends on the perspective from which one views the topic in question. We thus call for further critical attention to how large-scale resource extraction is sometimes incongruent with the principles of cultural, social, ecological, and economic sustainability.

#### 4.8.1 Forests

Mountain forests are composed of trees and plants that grow in unique assemblages and physiological growth patterns, much different than those found at lower elevations. Mountain forests contain distinct ecological zones which present challenging conditions for the growth of trees, including harsh climates, strong winds, and unique and variable hydrological conditions (see also Chapter 2). In some areas within mountain forests, hardy trees show their ability to adapt on the edge of life itself. It is here, for example, that trees demonstrate the phenomenon of *krummholz*, trees with stunted growth patterns shaped by the harsh conditions of persistent mountain winds and freezing temperatures. Due to their extent and composition, mountain forests can be significant centres of above-ground carbon storage. For example, the mountain-focused analysis of Mitchell et al. (2021) reveals that the Pacific Maritime, Montane Cordillera, and Interior Hills Central regions all have above-ground carbon storage well in excess of the average above-ground carbon storage of non-mountainous areas

of Canada (5.5, 4.5, and 3.4 times the national average, respectively).

Forested landscapes at different altitudes are understood, used, and managed to maximise the diversity of benefits of those ecosystems; as described by Turner et al. (2003), the diversity of forest resources which can be found at different altitudes is reflected in the social organisation of Indigenous Peoples. These ecological edges are described by Turner et al. as:

Ecological edges can be understood as places where one habitat type changes to another, which are at the same time zones of specialised habitat with unique biological species. They can also be realised temporally as periods of time where one stage gives way to another. Ecological edges, in other words, are both places in and of themselves, as well as markers for the transition from one type of ecosystem to another, or from one phase to another within a single ecosystem. Thus, mixed habitat patches and zones where different successional stages abut one another can be areas of unique ecological diversity and interchange. (Turner et al., 2003, p. 456)

The uses of these ecological edges are intertwined with cultural institutions such as spiritual ceremony. The seasonal sharing of these resources, for example, from different mountain forest habitats in different ways, within and across different communities, is a fundamental dimension of the Coast Salish potlatch (Turner et al., 2003).

Within mountain forests are trees with special qualities that have been prized for thousands of years, first by Indigenous Peoples and later by settlers and within global economies (Fig. 4.12). Some notable examples in British Columbia include: yellow cedar (*Chamaecyparis nootkatensis*), prized for its tight grain and resistance to decay, making it an excellent material for building; whitebark pine (*Pinus albicaulis*), a tree that is struggling at the brink of extinction across its range that plays an important role in supporting birds and small mammals with its pinenuts, particularly Clark's nutcracker (*Nucifraga columbiana*); subalpine fir (*Abies lasiocarpa*); and mountain hemlock (*Tsuga mertensiana*) (Laroque & Smith, 2005). In subalpine



Figure 4.12: Forest on the Traditional Territory of the Lil'wat and Squamish Nations, near present-day Whistler, BC. Photo courtesy of Madison Stevens, 2018.

forests, just below the alpine treeline, tree island regeneration occurs. Here, trees regenerate in 'island' formations, with older trees providing cover from the snow and supporting early season snowmelt, helping to create the conditions necessary for seedlings to persist and regenerate (Brett & Klinka, 1998). While the unique conditions of mountain forests make them fragile and slow to recover after disturbances (Brett & Klinka, 1998), these forests have long been cared for by Indigenous Peoples across Canada.

Traditional uses of trees by Indigenous Peoples in mountains across Canada are numerous and diverse. In eastern Canada for example, the forests of the Gaspé and Laurentians have long

supported the livelihoods of diverse peoples including the Mi'kmaq. Mi'kmaq peoples use trees to construct the poles in order to fish. Black ash (*Fraxinus nigra*) is the type of tree that has been most commonly used, but is now also very scarce throughout Mi'kma'ki. "[An elder] leaves behind tobacco as an offering of respect to the Earth. The trees are then used to make spears in order to catch the fish" (Graham, 2015, p. 36).

One of the most prominent trees honoured by Indigenous Peoples of western Canada is yellow cedar, which is known by many, including the Nuu-chah-nulth Nations (a collective name for the people "all-along-the-mountains" of the western coast of Vancouver Island), to be a Tree

of Life (Earnshaw, 2016). Due to its close grain patterns and resistance to rot and decay, yellow cedar is the preferred wood for crafting many items, including shelter, subsistence tools, clothing, ceremonial regalia, and art (Earnshaw, 2016). Yellow cedar wood is sought for carving by many Indigenous artists, and also valued for its bark and roots, which are used for many purposes including crafting baskets and clothing as well as ropes and twines by various Indigenous Peoples. Yellow cedar is also important ceremonially, as for example, the boughs are dried and ground to make a smudge.

Yellow cedar is just one of the many trees valued for each part by Indigenous Peoples; and within traditional Indigenous healthcare systems each tree and plant has a purpose and a role in healthcare for human and non-human beings. Some trees in mountain areas, like Sitka spruce (*Picea sitchensis*) for example, provide buds with medicinal properties that are prepared as teas and decoctions used for both preventative and curative health and healing (Lil'wat Nation, 2017). Other trees like Balsam fir (*Abies balsamea*) contain medicinal pitch (sap), which is used as both an external and internal medicine amongst various Indigenous Nations. Growing amongst alpine trees are numerous medicinal plants and fungi. For example, in Lil'wat Nation, more than 100 species growing in mountains were noted by Indigenous herbalists as having important medicinal qualities (Lil'wat Nation, 2017).

### **Industrial forestry**

As Indigenous lands in Canada began to swell with incoming colonists, many of whom supported the government's violent land grabs starting from the 18th century in the east, forest resources were one of the major drives for the expansion of colonial empires. Under Canada's model of federalism, the constitutional division of powers dictates that the Provinces and Territories are responsible for regulations and permitting on forest lands. Licences and ownership to log across Canada have often been done with willful ignorance of Indigenous Peoples' ownership of their lands, following the colonial doctrine of *terra nullius* ('empty land'), which has significant implications in Canadian laws to this day (Borrows, 2015). The development of Canada's forestry sector is closely entangled with the steady erosion of Indigenous

Peoples' rights within their territories, through instances such as the creation of 'Indian Reserves' under the *Indian Act*, the traumatic removal of Indigenous children from their lands as part of the Residential School System and the Sixties Scoop, in parallel with the creation of logging rights to Indigenous territories (Smith & Bulkan, 2021).

Forestry regulations and property rights differ across provincial and territorial lines in Canada, with each province featuring distinct histories of how the logging industry came to be in its early days. For example, British Columbia's forest tenure system dates back to the 1865 *Land Ordinance Act*, which was the first piece of legislation enabling companies to do logging on public lands without alienating the land from provincial ownership (the 'Crown') (FLNRORD, 2019). Forestry companies operating in British Columbia and elsewhere where lands are publicly held, are granted legal rights to log in the form of concession licences. In British Columbia, these rights are granted in exchange for taxes in the form of stumpage (a complex and graduated fee) and 'royalties' (*ad valorem* taxes), a system which has been in place since the 1884 *Timber Act* (FLNRORD, 2019). Throughout the 1900s, logging in Canada became increasingly regulated, with logging concessions that are either volume-based, providing companies with a fixed volume of timber to log from an area shared with other licensees, or area-based, which is a more secure concession type wherein companies are given more responsibilities in exchange for long-term rights to a fixed area of forest to log (Rajala, 1998).

As technologies for logging improved, the development of oligopolistic forestry industries across Canada followed in lockstep the investments in capital-intensive mills during the 20th century. In British Columbia, Ben Parfitt (2005; 2007; 2010) has documented the steady erosion of regulatory control in the forestry sector, documenting how powerful lobbying and consolidated ownership by forestry companies led to the erosion of monitoring compliance with forest laws and regulations. In other provinces, powerful companies like J.D. Irving Ltd. control a significant amount of the logging rights in New Brunswick (Mullally & MacDonald, 2017). In British Columbia and elsewhere, natural resources sectors have experienced ongoing risk to legal tenures to resources due to outstanding Aboriginal title, with

activities of the forestry industry being contested by Indigenous Peoples and local communities whose rights have been often disregarded by those in control of logging in their homelands (Brody, 1981; Hayter, 2004; Natcher, 2009; Pasternak, 2017).

Various levels of government have largely failed to implement protection for Aboriginal rights, which include the rights to fishing, hunting, trapping, and gathering, in a way that is satisfying for many Indigenous Peoples (Smith & Bulkan, 2021). Moreover, Canada's forest resource peripheries have become increasingly dependent on global markets for forest products (Hayter, 2004; Hayter & Barnes, 2012). British Columbia's forest industry, for example, is heavily export-oriented, sending huge volumes of unprocessed timber for processing elsewhere. Exports from British Columbia forests increased in value from \$36 billion CDN in 2014 to 47 billion in 2018 (Bautista, 2020). As such, global markets increasingly dictate the activities of local mills and logging (Hayter & Barnes, 2012). In complex and intersecting ways, then, commercial forestry, and acts of reforestation, reflect a capitalist reciprocity rather than a gift exchange. Extraction of forest products provides jobs and materials for sale—provisions from mountain environments—on which a forest economy supports communities.

### **Community forestry**

As the global climate crisis becomes more immediate, a partial response to some of the challenges for conventional logging in Canada has emerged in the form of community forests. Community forestry is one way that forest-dependent communities in the mountain areas of Canada are striving to have more of a say over the logging practices happening in their homelands. Community forestry is one way to protect the gifts that montane forests provide as unique contributors to the wellbeing of networks of relations. Community forestry has emerged following a history of the Canadian forestry industry bringing fewer benefits for people that live near forests. The purpose of many community forestry initiatives across Canada is to restore and strengthen the relationships that people have with the gifts of the forest, including protecting aspects of forests that have been disregarded and/or diminished by industrial forestry practices.

Community forestry across mountain areas takes on many different forms, due to the different governance regimes of forestry in each of Canada's provinces and territories. However, the common thread of community forests is to create more benefits from forestry for local communities. Benefits may include increasing the capture of monetary benefits by local communities, increasing participation in the stewardship of forests, or enhancing ecological stewardship. Within community forest arrangements, the gifts of forests may be enhanced through means such as: increasing the ability of Indigenous Peoples to practise collective cultural stewardship; maintaining access to culturally important sites, places of spiritual importance and burial grounds; increasing the ability for community members to have a say about when and where logging happens; enhancing protection for forest foods, medicines, game, wildlife habitat and biodiversity; maintaining access for recreation; protection for community watersheds and sources of drinking water; and enhancing protective aspects of forests and mitigating the risk of forest fires and disease outbreaks. Community foresters select which objectives are the most important to them in the management of their forest, and pursue processes based on meeting these objectives. Community forestry stakeholders include both rights holders, who are Indigenous Peoples with longstanding ancestral connections with their territory, and stakeholders, who are people who may also have long standing connections with mountain forests but are not Indigenous and thus rarely have ancestral connections to place dating back more than a few generations (Bulkan et al., 2022). Both Indigenous Peoples and local communities have been engaging with community forests to protect their mountain forests, creating varied experiences and outcomes.

The creation of community forests involves legal aspects of forestry governance. The first consideration for community forest proponents is to determine who will be involved in the community forest, and where the community forest will be located. In Canada, 91.4% of the forests are held as public Crown Land, with ownership claimed by the provincial governments (Lawler & Bullock, 2017). The provinces issue permissions for logging in the form of area-based and volume-based concession licences, which vary from province



## COMMUNITY FORESTS ON UNCEDED TERRITORY: LIL'WAT NATION'S SPE'LKÚMTN COMMUNITY FOREST IN BRITISH COLUMBIA

In British Columbia (Pacific Maritime region), most Indigenous Peoples deny the provincial government claims on their territories, saying that their rights have never been ceded through treaty. Across other parts of Canada, historical treaties exist and, yet, the fulfilment of treaty obligations by Canadian and provincial governments remains an ongoing concern and challenge (Asch 2014). In many places, various levels of government deny the legal claims of Indigenous Peoples to their territories, which has led to a series of court cases in the Supreme Courts of Canada and Provinces that have clarified who has a responsibility to uphold Aboriginal title rights in decisions made about Indigenous Peoples' territories, including decisions about the issuing of tenures and logging (Gunter, 2022). While the progression of Indigenous Peoples' rights proceeds slowly within the court system, some Indigenous Nations have chosen to participate in the forestry sector as community forest licence holders to seek immediate involvement in how forests are being stewarded (Smith & Bulkan, 2021).

Indigenous Peoples have been closely involved with the creation of community forests in British Columbia in particular, where they have long been excluded

from involvement in and benefits from the forestry sector on their territories. Approximately half of the community forest arrangements in the province involve a partnership between Indigenous Peoples and local communities who co-inhabit areas and work together to meet shared goals (BCCFA, 2022). One such example is the Spe'lkúmtn Community Forest in Lil'wat Nation Territory, Pemberton, BC, which is a partnership between the Lil'wat Nation and the Municipality of Pemberton. Through co-managing forests around the local villages, the newly created Spe'lkúmtn Community Forest will practise forest fire mitigation through thinning forest stands, protect the botanical resources of Lil'wat Nation, including food and medicinal plants and fungi, and cultural trails and sites alongside recreational values for multiple forest users. Though the community forest managers must ensure the long-term economic profitability of the association to continue to exist through time, they are also focusing on enhancing non-market values from the forest to bolster their social licence to operate and support amongst Lilwat7u'l (Lil'wat Nation members) and non-Indigenous locals.

to province. Many of the forest licences across Canada have been held by large forestry companies for decades, and so one challenge for community foresters is to find volumes of wood fibre that are available for including in their licence areas (Gunter, 2022). Another challenge is to involve each of the affected rights holders and stakeholders, which is a task that requires working across a variety of forest values held by diverse individuals and groups (Doyle-Yamaguchi & Smith, 2022).

Community forests compete with large forestry companies that were consolidated during the 1900s, and thus face economic pressures to meet bottom line business objectives while also maintaining environmental and social objectives (Rajala, 2006). For many community forests, the only mills in proximity are owned by big forestry conglomerates (labelled the 'Majors'), and thus the benefits of wood processing cannot be easily captured by the community forest licensees

themselves (BCCFA, 2022; Smith & Bulkan, 2021). There are few economic incentives available for community forests to protect non-timber values, and protecting and enhancing the gifts of the forests often comes at an economic cost to community forest operators (Gunter, 2022; Smith & Bulkan, 2021). Moreover, because community forests are unique to place and community, they risk falling into the 'local trap', where assumptions are made that local communities are best positioned to manage their local forests, when in fact they may not have the capacity or will to do so (Duinker & MacLellan, 2017).

Yet, community forests in mountain regions have demonstrated success in redistributing the benefits from forestry to local communities. For example, in 2019, \$16 million was redistributed from respondents to a British Columbia community forest survey to local community groups, supporting initiatives such as community infrastructure, youth groups, or reinvestment of

profits back into the forest via ecosystem restoration (Gunter, 2022). In British Columbia, community forests are also found to produce 76% more jobs per cubic metre of wood cut than industry average, be more proactive in mitigating climate change and wildfire risk, and facilitate partnerships between Indigenous and non-Indigenous communities (BCCFA, 2022). While British Columbia is a national leader in community forestry, other provinces including Quebec, Nova Scotia, and New Brunswick have also demonstrated interest in establishing community forest programs (Bouthillier et al., 2022; Duinker & MacLellan, 2017; Fortier et al., 2013).

While community forests mature beyond the early phase of development, there is a need to assess common experiences across ecological zones, and to consider, for example, how montane regions across Canada may feature similar or diverse experiences based on their unique conditions. To date, there is no research comparing experiences of community forests in mountain regions of Canada.

#### 4.8.2 Minerals and hydrocarbons

Beneath the forest roots holding mountain slopes in place, the very bedrock of the mountains has provided important material and spiritual contributions to First Nations, Métis, and Inuit Peoples since time immemorial, from caves that serve as sacred sites, to carving stones, to the rocks used for making tools. Even placenames can reflect the rocks and minerals which make up the mountains. Learning Circle participant Sophie Pheasant, Anishinaabe, offered a story about the name of an Anishinaabe community in the La Cloche mountain range called Wawaskinaga (Birch Island), in reference to the mountain range that shines in the sunlight because of the quartz faces of its peaks (LC 4.25). Similarly, Elder Pnnal Bernard Jerome, Micmacs of Gesgapegiag, shared a story about a place called Pipestone Mountain, where the gathering of stone for making pipes (known as catlinite in Western science) is a sacred process carefully stewarded by Micmac Elders with the knowledge and permission to pass on these protocols for respectful use (LC 4.26).

Within the context of industrial economies, people also derive from mountain places economically significant natural industrial (non-metallic)

and metallic mineral and rock resources, and hydrocarbon-based (fossil fuel) energy resources. Excluding fossil fuels, the entire Canadian mining industry produced goods valued at approximately \$47 Billion in 2021 (Natural Resources Canada (NRC); Prospectors & Developers Association of Canada (PDAC)), of which >30% was attributable to mines located within the Cordilleran mountain regions alone. Here we review these natural ‘gifts’, covering only the most economically significant, and describe the links between deposit types and the geological processes responsible for the development of mountain regions in Canada. We follow with a brief look at energy and mineral deposits which may gain economic significance in the near future.

We also consider how the extraction of these gifts can impact other values and meanings embodied in the landscape. Sophie Pheasant’s story of Wawaskinaga (above) illustrates this well: one of the quartz peaks which gave the community its name no longer exists because of the mining activities undertaken to extract the rock and minerals of the mountain top, which fundamentally affects the community’s identity and sense of place. In her own home on Manitoulin Island, the industrial extraction of limestone also shows the risks of extracting resources which are fundamentally non-renewable, “it’s not something we can grow back,” and the tradeoffs between using these resources and being able to receive and benefit from other gifts of the mountains, such as habitat for caribou and other wildlife.

*Sophie Pheasant,*  
Anishinaabe,  
2022, [LC 4.25](#)



*Pnnal Bernard Jerome,*  
Micmacs of Gesgapegiag,  
2022, [LC 4.26](#)

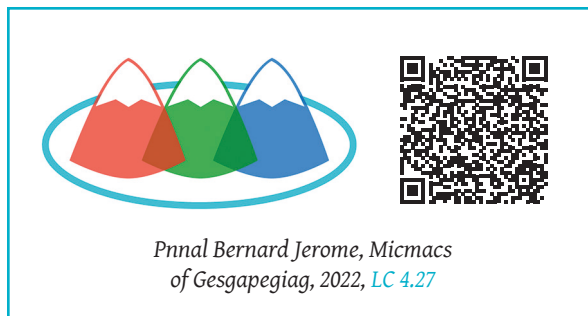


### 4.8.3 Sedimentary deposits and quarries

Industrial mineral resources include minerals that are not sources of metals, fuel, or gemstones. They include chemical and biogenic sedimentary rocks, evaporites, terrigenous clastic rocks including various clays, and a number of other elements and rocks. Sand and gravel constitute the most common industrial materials mined from our mountainous regions. Although most widely used in construction, and specifically in concrete production, sand and gravel uses are almost infinite and include drainage, road beds, filtration systems, glass and fibreglass, and hydraulic fracking in oil and gas production. Much of our sand and gravel are products of glacial processes. Because of their topographic relief and high elevation, glaciers and glaciation-related sand and gravel deposits are particularly common in the high-elevation mountainous regions of Canada. Canadian sand and gravel production is worth \$2.3 billion dollars annually, of which more than a third is sourced from mountains in Canada.

Another required component of cement and concrete is limestone. During the Paleozoic, 300 to 540 Ma, North America lay far to the south within the tropics (Irving, 1977) and was commonly covered by shallow tropical seas characterised by coral reefs and lime mud deposits that lithified into and are now preserved as thick limestone and dolomite sequences. Mountain building processes resulted in the exhumation and exposure of these sequences within the Cordilleran mountain regions of western Canada and the southeastern half of the Atlantic Maritime and Boreal Shield mountain region (i.e. Appalachians) where they are now mined for the manufacturing of cement, but also for building stone, aggregate, soil conditioning, and the neutralisation of chemical and industrial waste.

Numerous other industrial minerals are either exposed within mountain regions or are attributable to the processes responsible for the development of the mountains. Examples include Bentonite and other 'swelling' clays which originate as volcanic ash erupted from volcanoes that were present during the formation of the Cordilleran mountain regions of western Canada and the southeastern half of the Atlantic Maritime and Boreal Shield region; and Evaporites (Gypsum and salt) that crystallised out of the shallow and



occasionally ephemeral tropical seas that used to cover the continent and which were subsequently deformed and exposed for mining during orogeny. Certain volcanic rocks have also been valued for their importance as materials for sweat lodges since time immemorial, as Elder Pnnal Bernard Jerome (Micmacs of Gesgapegiag) explains. These perforated lava rocks are considered sacred in Micmac culture, because they come from the belly of Mother Earth, and release that spirit to the People in the process of conducting a sweat lodge (LC 4.27).

The geological processes responsible for the formation of mountains give rise to several types of carving stones that have long been valued by Indigenous Peoples. Rocks that are easy to carve, durable, and heat resistant are invaluable for use in cooking, heating, and for use as lamps. Such carving stones have also long been used in carvings as a means of recording and passing along Indigenous knowledges, particularly among the Inuit (Beauregard et al., 2012; Rathwell & Armitage, 2016). The most common carving stones are serpentinite and soapstone (talc schist) that most formed through the metamorphism of ultramafic rocks (peridotite) and, more rarely, dolomite. Most elaborate carvings are restricted to soapstone (>80% talc). Small carving stone quarries are found throughout the Arctic Cordillera with notable, high-quality carving stone quarries in Markham Bay (southern Baffin Island) and Qikiqtarjuaq (east coast southern Baffin). Industrial soapstone and serpentinite quarries are present in the Appalachian mountains of Quebec. Haida argillite is a black carving stone unique to the west coast and to the Haida Nation. Quarried on Haida Gwaii, it consists of weakly metamorphosed dark grey to black shale and is attributable to the tectonic process that gave rise to the Cordilleran mountain systems. Like soapstone and serpentinite, Haida argillite carvings



record cultural knowledge as well as being used to depict family crests (Barbeau, 1957).

Stones like chert have also provided important material contributions to First Nations, Métis, and Inuit Peoples for use in making tools and as trade items. Learning Circle participant Megan Dicker, Inuit, Nunatsiavut, explained that the Torngat mountains of Northern Labrador are the source of Ramah Chert, a stone highly valued by flintknappers which was used locally to make arrowheads and other implements and also traded around the world as an important component of both ancient and modern economies (LC 4.28).

#### 4.8.4 Metallic mineral deposits

Metallic minerals (those that contain and can be processed to provide one or more metals, excluding the iron-containing metals and alloys), are common within mountain regions in Canada and include both base metals—Copper (Cu), Lead (Pb), Tin-Tungsten (Sn-W), and Zinc (Zn)—and precious metals—Gold (Au) and Silver (Ag). Metalliferous deposits characterise: continental margins, forming during rifting and ocean formation; oceanic crust, most commonly forming adjacent to the spreading ridges along which oceanic lithosphere is formed; volcanic arcs, where they result from the interaction of igneous intrusions and explosive volcanoes with groundwater; and active collisional orogens, where they are products of crustal metamorphism and deformation.

Both the Cordilleran mountain regions of western Canada and the Atlantic Maritime and Boreal Shield region orogens developed on pre-existing rifted continental margins, characterised by rift and passive margin-related Sedimentary Exhalative (SedEx) mineral deposits (Goodfellow & Lyndon, 2007). Examples of these large volume,

sedimentary-hosted, Pb-Zn-Ag deposits include the 1.4 Ga Sullivan deposit of southeastern British Columbia, the Paleozoic Faro deposit of Yukon, and Mississippian-age ‘Windsor’ deposits in Nova Scotia.

Slivers of oceanic lithosphere are commonly trapped and preserved within orogenic belts during ocean closure. The most common oceanic mineral deposits found within these oceanic slivers are volcanogenic massive sulphide (VMS) deposits. We now recognize that such Cu, Zn, (minor Pb), Ag, and Au-rich VMS deposits, which originate at oceanic spreading ridges as ‘Black Smokers’, are present along the length of the Cordilleran mountain regions of western Canada and the Atlantic Maritime and Boreal Shield region orogens, but the Bathurst deposit of New Brunswick (van Staal et al., 2003) is by far the largest and most economically important such deposit.

The most economically important ‘volcanic arc deposits’ are the large volume, low-grade ‘Porphyry’ deposits that are spatially and genetically associated with granitoid intrusions. These Cu (minor Mo, Au, Ag, Sn-W) deposits characterise the Cordilleran mountain regions of western Canada and the Atlantic Maritime and Boreal Shield region orogens, but they are particularly well-developed in central British Columbia (McMillan et al., 1995). Only 20% of known Canadian deposits have been mined, in part because of the socio-economic and environmental costs associated with such deposits: they require large, open-pit mines and result in significant piles of acidic tailings that require long-term management.

Lode gold deposits occur in both volcanic arcs and collisional orogens. Deposits include orogenic shear zone and fault-hosted, intrusion-related and epithermal volcano-hosted deposits (Nelson & Colpron, 2007). 80% of Canada’s gold production comes from the Canadian Shield, but important deposits characterise both the Atlantic Maritime and Boreal Shield orogen and Cordilleran mountain regions of western Canada. Epithermal deposits are largely restricted to the younger and less deeply eroded western Cordilleran mountain regions. Given the history of exploitation during the gold rush era, and its connection to settlement and dispossession of Indigenous Peoples, deposits of gold and other valuable minerals known to Indigenous communities may be closely guarded



secrets. Daniel Sims, Tsay Keh Dene First Nation, shared (without disclosing detail or locations) that his community holds knowledge of such deposits within the mountains of their Traditional Territory, and maintains unspoken agreements to prevent this knowledge from ending up in the hands of entities who might seek to extract profit. In this tradition, the offering expected for extracting gold is not tobacco (commonly offered to reciprocate gifts of harvest), but blood (LC 4.29).

#### 4.8.5 Fossil fuels deposits

Energy (fossil fuel) deposits, including oil, natural gas, and sedimentary coal deposits, are commonly found in mountain regions and originate from the same geological processes responsible for mountain formation. More than 80% of Canadian coal is associated with the Cordilleran mountain regions of western Canada and the southeastern portion of the Atlantic Maritime and Boreal Shield mountain region. Thickening of the crust during collisional orogenesis results in the development of fringing ‘foreland’ basins. Slow subsidence of these swampy basins provides an ideal setting for the burial, preservation, and thermal maturation of organic material, giving rise to thick and continuous coal seams. Numerous mountain communities in western Canada had their origins in coal mining, including Canmore, Grand Cache, Beaver Mines, many communities in the East Kootenays of British Columbia, and the ghost town of Bankhead, outside of Banff.

Coal deposits along the margins of orogenic belts are typically less thermally mature and are mined primarily for electricity production, accounting for 47% of Canada’s coal production. Coal deposits located closer to the interior of an orogen are typically more thermally mature

‘metallurgical’ coal used in the production of steel and account for 53% of production. Thermal coal used in Canadian energy production decreased ~50% between 2008 and 2018 and is to be phased out entirely by 2030. 95% of Canada’s metallurgical coal is exported.

The burial, heating, and thermal maturation of organic-rich marine shales during ocean closure and collisional orogenesis liberates liquid and gaseous hydrocarbons. The elevated topography of mountainous orogens results in a hydrostatic head that promotes fluid flow, entraining hydrocarbons and driving them out toward the fringing foreland basins where they collect in structural and stratigraphic traps. Hence, the large amounts of oil and natural gas found in northern Alberta and northeastern BC are direct products of the growth of the Cordilleran orogen, including the enormous oil sand deposits of northeastern Alberta.

#### 4.8.6 Renewable energy

There are also established and emerging renewable energy development opportunities in mountain regions in Canada; gifts of hydropower, wind, solar, and geothermal energy as well as other renewables (e.g. wood pellets) (Jessop et al., 1991; Majorowicz & Grasby, 2021). Renewables have been highlighted as essential alternatives to fossil fuels and represent an opportunity for communities, particularly those in western Canada, to reduce their carbon footprint.

Hydroelectric power has long been associated with mountain areas in Canada, and remains the most significant source of renewable energy provided by mountains. This gift is particularly important in the provinces of British Columbia and Quebec, where hydroelectricity is the dominant source of energy in the electricity grids. Alberta also generates significant hydroelectricity, but it makes up less than 10% of the provincial electricity supply. However hydropower developments are associated with habitat destruction (Barbarossa et al., 2020; Reid et al., 2019) and the alteration or loss of mountain homelands (Randell, 2022). Emissions of methane, a potent greenhouse gas, can also result from the decomposition of organic materials retained in reservoirs (Deemer et al., 2016; St. Louis et al., 2000). The distribution

of existing hydropower infrastructure across Canada can be examined using the Canadian Hydropower Interactive Map.

Wind energy is also produced in the vicinity of mountainous areas in Canada, particularly in areas that funnel prevailing or katabatic winds. At present, the most significant mountain-related wind development is found along the southeastern edge of the Montane Cordillera region, east of Crowsnest Pass, see the Canadian Wind Turbine Interactive Map. Solar potential in mountain areas is thought to be less important than adjacent lowlands, and accordingly mountain areas in Canada currently see little in the way of large-scale solar installations. Likewise, while mountain geology can produce geothermal hotspots (e.g., Sulphur Mountain in Banff National Park), the production of geothermal energy in mountain areas is currently limited due to the distributed nature of the resource and difficulties associated with extraction (B. Hayes, personal communication, 24 October 2022).

Notwithstanding extensive hydroelectricity generation, the relatively paucity of clean energy projects in mountain areas could change significantly in the years ahead, as the clean energy transition unfolds (Canadian Energy Regulator, 2021). Communities such as Squamish, BC, are illustrative of the kinds of clean energy trends that could be seen in other mountain communities in the years ahead, including a growing focus on clean energy generation as well as the scaling of carbon capture and storage and other mitigation technologies.

Renewables are essential for addressing the climate crisis and are largely supported by the public in Canada (Donald et al., 2022). However, some communities and landowners continue to have reservations about clean energy development, with aesthetic concerns, political views, and employment in the non-renewable energy sector influencing opposition (Sherren et al., 2019). As well, biodiversity conservation advocates and Indigenous Peoples have in some cases protested the development of hydroelectric dams, due to their proximate impacts on the wellbeing of mountain communities and ecosystems and the flooding of traditional lands (Bakker & Hendriks 2019). Such tensions and tradeoffs warrant further research in mountains in Canada.

## 4.9 Conclusions

This chapter offers examples of the gifts and benefits provided by mountains to individual and community users. The examples in this chapter remind us that we know a great deal about the health benefits that come from spending time in the mountains. For Indigenous Peoples, the ongoing connections to Lands and the food, medicines, and waters are numerous, profound, and complex. We also understand that people who recreate in the mountains gain health benefits from doing so. We know much about different approaches to teaching in the mountains. Some teachings and pedagogical practices are embedded in the principles of land-based education; other approaches, including field schools, encourage the study of the sciences and the arts situated in place. We also have a good understanding of the ways in which colonial practices have alienated Indigenous Peoples from their Lands. There is, likewise, a direct relationship between the colonial practices of alienation from Lands and the extractive processes that are used to derive commercial benefits from the energy and material resources of the mountains.

Mountain environments also contain features that help in ecosystem restoration. Some of these features, like wetlands and forests, help all of us by storing carbon and slowing climate change. Other features help mountain environments overcome the damage created by human activities. These are the natural regenerative actions that come with the passage of time.

In this chapter, we also looked at both the regenerative power of mountain environments and their resilience in the face of the rapid pace of human action. We observed further that mountains offer the gift of sanctuary for many Indigenous Peoples. In the Sahtú region of present-day Northwest Territories (Taiga Cordillera region), for example, Saoyú-?ehdacho has long been considered a place of refuge with material as well as spiritual value. It was designated a national historic site of Canada in 1997. “Its cultural values, expressed through the interrelationship between the landscape, oral histories, graves and cultural resources, such as trails and cabins, help to explain and contribute to an understanding of the origin, spiritual values, lifestyle, and land-use



of the Sahtu Dene” (Parks Canada, 2019). Megan Dicker, Inuit, Nunatsiavut, shared a story during the CMA Learning Circle about the role of mountains as places of sanctuary, providing protection and safe harbour (LC 4.30).

This chapter has also raised important questions of equity, reciprocity, and sustainability. As illustrated, the ways in which people manage and value the gifts of the mountains differ considerably, from forms of engagement grounded in reciprocity and sustainable use to highly unsustainable levels of extraction for short-term gain. Certainly, then, their use can engender tensions and tradeoffs among different values, systems, and groups. For example, access to mountain spaces for snowmobiling may exclude Indigenous hunters, while the sacredness of a mountain

## Glossary

**Benefit:** A benefit is understood as something given or provided by a mountain environment where the receiver is not necessarily obligated to return the gift. In other words, a benefit is received or taken for the use or advantage of the person who receives it. A benefit might be the wood extracted from a forest by logging or the ore miners dig out of a mine. In this chapter, the idea of gifts is complemented by the idea of benefits.

**Community forestry:** The term community forestry refers to a model of forest management in which decisions about a given forest area are led and implemented by local communities, at local scales. While

meadow may discourage or prevent ski touring. In thinking about gifts, it is therefore critical to consider circumstances where the benefits accrued by one group result in costs or the exclusion of others. Such considerations are also important when thinking about the distributional effects of increasing pressures on mountains, the focus of the next chapter.

Despite what we have learned through this chapter, there are notable gaps in our assessment efforts (Table 4.2). More work is needed to clarify what is known about these and other topics relevant to our understanding of gifts of the mountains.

We conclude this chapter where it began—by calling attention to the importance of reciprocal relations with mountainous places. Ultimately, as summarised by Learning Circle participant Megan Dicker, Inuit, Nunatsiavut, if you take care of the mountains, they will do the same for you (LC 4.31).

Table 4.2: Examples of topics not thoroughly assessed in this chapter

Renewable Energy, including geothermal energy
Last chance tourism and the intersections of environmental change and recreation
Equity issues with recreation in mountain spaces, including access issues
Gifts of mountain freshwater ecosystems
Parks and protected areas

approaches vary among communities, typically, community forests are managed to support a range of benefits, including but not limited to the provision of timber and non-timber forest products, including: medicinal plants; recreational, spiritual, and/or aesthetic values; and protection of habitat for wildlife.

**Gift:** A gift is understood as something given or provided within a reciprocal relationship. A gift might be food in the form of a hunted animal, received in exchange for respect shown to the animal and the place in which it is harvested. In this chapter, the idea of benefits is complemented by the idea of gifts.

**Hydrosocial:** Hydrosocial relationships refer to the complex relationships between humans and water that go beyond understanding water as simply a material substance or H<sub>2</sub>O. The hydrosocial cycle emphasises water's different physical forms and cultural meanings and the processes through which water and society are co-produced. Linton and Budds describe the hydrosocial cycle, as "the process by which alterations or manipulation of water flows and quality affect social relations and structure, which, in turn, affect further alteration of water" (Linton & Budds, 2014, p. 175).

**Non-timber forest products (NTFP):** Non-timber forest products (NTFPs) are the diverse biological goods

beyond timber which derive from forest ecosystems. These include medicinal plants and wild foods (plant, animal, and fungi); grasses, shrubs, barks, and other fibres used for building and materials; and more. NTFPs may be cultivated directly by humans (e.g., maple plantations), harvested in wild forest ecosystems without deliberate intervention, or stewarded and encouraged by practices such as cultural burning that support healthy populations of valued species.

**Water Governance:** Water governance is the set of regulatory processes, mechanisms, and institutions through which political actors influence environmental decisions, actions, and outcomes (Bakker, 2003).

## References

- Adams, M. S., Connors, B., Levi, T., Shaw, D., Walkus, J., Rogers, S., & Darimont, C. (2021). Local Values and Data Empower Culturally Guided Ecosystem-Based Fisheries Management of the Wuikinuxv Bear-Salmon-Human System. *Marine and Coastal Fisheries*, 13(4), 362–378.
- Adler, C., Wester, P., Bhatt, I., Huggel, C., Insarov, G., Morescroft, M., Muccione, V., Prakash, A., Alcántara-Ayala, I., Allen, S., Bader, M., Bigler, S., Camac, J., Chakraborty, R., Sanchez, A., Cuvil, N., Drenkhan, F., Hussain, A., Maharjan, A., & Werners, S. (2022). IPCC WGII Sixth Assessment Report Cross-Chapter Paper 5: Mountains. In H.-O. Pörtner, D. C. Roberts, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, V. Löschke, A. Möller, A. Okem, & B. Rama (Eds.), *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 2273–2318). Cambridge University Press. doi:10.1017/9781009325844.022
- Ahenakew, C. (2016). Grafting Indigenous Ways of Knowing Onto Non-Indigenous Ways of Being: The (Underestimated) Challenges of a Decolonial Imagination. *International Review of Qualitative Research*, 9(3), 323–340. <https://doi.org/10.1525/irqr.2016.9.3.323>
- Aitken, Emily [Gwixsisalas]. (2016). Seasonal Wheel: The Kwakwaka'wakw Ebb and Flow of Life. In G. Snively & W. L. Williams (Eds.), *Knowing Home: Braiding Indigenous Science with Western Science* (pp. 165–170). University of Victoria Press. <https://ecampusontario.pressbooks.pub/knownhome/chapter/chapter-10/>
- Alberta Government. (2012). *Tourism Works for Alberta: The Economic Impact of Tourism in Alberta 2012*. Tourism Research and Innovation Branch, Alberta Tourism, Parks and Recreation. <https://open.alberta.ca/dataset/0f815981-c329-4133-b651-3fef3cb18a0c/resource/3047a7d9-de8a-4e60-b18d-439fb6576796/download/2012-economic-impact-tourism-alberta-2012.pdf>
- Altmeyer, G. (1976). Three ideas of nature in Canada, 1893–1914. *Journal of Canadian Studies*, 11(3), 21–36.
- Anderson, B. (2007). Staging Antimodernism in the Age of High Capitalist Nationalism. In J. O'Brien & P. White (Eds.), *Beyond Wilderness: The Group of Seven, Canadian Identity, and Contemporary Art* (pp. 245–246). McGill-Queen's University Press.
- Anderson, S., & Radic, V. (2020). Identification of local water resource vulnerability to rapid deglaciation in Alberta. *Nature Climate Change* 10, 933–938. <https://doi.org/10.1038/s41558-020-0863-4>
- Andre, A., & Fehr, A. (2001). *Gwich'in Ethnobotany: Plants Used by the Gwich'in for Food, Medicine, Shelter and Tools*. Gwich'in Social and Cultural Institute and Aurora Research Institute.
- Andrews, T. D., Mackay, G., Andrew, L., Stephenson, W., Barker, A., Alix, C., & Tulita, S. E. (2012). Alpine Ice Patches and Shuhtagot'Ine Land Use in the Mackenzie and Selwyn Mountains, Northwest Territories, Canada. *Arctic*, 65(5), 22–42. <https://doi.org/10.14430/arctic4183>
- Armstrong, C. G., Dixon, W. M., & Turner, N. J. (2018). Management and traditional production of beaked hazelnut (k'áp'xw-az', *Corylus cornuta*; Betulaceae). *Human Ecology*, 46, 547–559. <https://doi.org/10.1007/s10745-018-0015-x>
- Armstrong, C. G., Earnshaw, J., & McAlvay, A. C. (2022). Coupled archaeological and ecological analyses reveal ancient cultivation and land-use in Nuchatlaht (Nuuchah-nulth) territories in the Pacific Northwest. *Journal of Archaeological Science*, 143(105611). <https://doi.org/10.1016/j.jas.2022.105611>
- Armstrong, J., & William, G. (Eds.). (2015). *River of Salmon Peoples*. Theytus Books.
- Arsenault, R., Diver, S., McGregor, D., Witham, A., & Bourassa, C. (2018). Shifting the Framework of Canadian Water Governance through Indigenous Research Methods: Acknowledging the Past with an Eye on the Future. *Water*, 10(1), 49. <https://doi.org/10.3390/w10010049>



- Asch, Michael. 2014. *On Being Here to Stay: Treaties and Aboriginal Rights in Canada*. Toronto: University of Toronto Press.
- Atlas, W., Ban, N. C., Moore, J. W., Tuohy, A., Greening, S., Reid, A. J., Morven, N., White, E., Housty, W. G., Housty, J. A., Service, C. N., Greba, L., Harrison, S., Sharpe, C., Butts, K. I. R., Shepert, W. M., Sweeney-Bergen, E., Macintyre, D., Sloat, M. R., & Connors, K. (2021). Indigenous Systems of Management for Culturally and Ecologically Resilient Pacific Salmon (*Oncorhynchus* spp.) Fisheries. *Bioscience*, 71(2), 186–204.
- Awume O, Patrick R, Baijius W. (2020) Indigenous Perspectives on Water Security in Saskatchewan, Canada. *Water*; 12(3):810. <https://doi.org/10.3390/w12030810>
- Bai, J., Cui, B., Cao, H., Li, A., & Zhang, B. (2013). Wetland Degradation and Ecological Restoration. *The Scientific World Journal*, 2013, e523632. <https://doi.org/10.1155/2013/523632>
- Baird, M. F. (2013). 'The breath of the mountain is my heart': indigenous cultural landscapes and the politics of heritage. *International Journal of Heritage Studies*, 19(4), 327–340.
- Bakker, K. (2003). *Good governance in restructuring water supply: A handbook*. Federation of Canadian Municipalities. [http://www.w7b.org/userfile/file/good\\_governance\\_WaterSupply.pdf](http://www.w7b.org/userfile/file/good_governance_WaterSupply.pdf)
- Bakker, K. (2011). *Eau Canada: The Future of Canada's Water*. UBC Press.
- Bakker K, Hendriks R. Contested Knowledges in Hydroelectric Project Assessment: The Case of Canada's Site C Project. *Water*. 2019; 11(3):406. <https://doi.org/10.3390/w11030406>
- Barbarossa, V., Schmitt, R. J. P., Huijbregts, M. A. J., Zarfl, C., King, H., & Schipper, A. M. (2020). Impacts of current and future large dams on the geographic range connectivity of freshwater fish worldwide. *Proceedings of the National Academy of Sciences*, 117(7), 3648–3655. <https://doi.org/10.1073/pnas.1912776117>
- Barbeau, M. (1957). *Haida Carvers in Argillite*. National Museum of Canada, Bulletin No. 139.
- Barnett, T. P., Adam, J. C., & Lettenmaier, D. P. (2005). Potential impacts of a warming climate on water availability in snow-dominated regions. *Nature*, 438(7066), 303–309. <https://doi.org/10.1038/nature04141>
- Battiste, M. (2000). Maintaining Aboriginal identity, language, and culture in modern society. In M. Battiste (Ed.), *Reclaiming Indigenous voice and vision* (pp. 192–208). UBC Press.
- Battiste, M. (2002). *Indigenous knowledge and pedagogy in First Nations education: A literature review with recommendations*. National Working Group on Education and the Minister of Indian Affairs, Indian and Northern Affairs Canada (INAC). [http://www.afn.ca/uploads/files/education/24\\_2002\\_oct\\_marie\\_battiste\\_indigenousknowledgeandpedagogy\\_lit\\_review\\_for\\_min\\_working\\_group.pdf](http://www.afn.ca/uploads/files/education/24_2002_oct_marie_battiste_indigenousknowledgeandpedagogy_lit_review_for_min_working_group.pdf)
- Battiste, M., & Youngblood Henderson, J. (Sa'ke'j). (2009). Naturalizing Indigenous Knowledge in Eurocentric Education. *Canadian Journal of Native Education*, 32(1), 5–18. <https://doi.org/10.14288/CJNE.V32I1.196482>
- Bautista, L. (2020). *2019 Economic State of British Columbia's Forest Sector* (pp. 1–25). Ministry of Forests, Lands, Natural Resource Operations and Rural Development.
- BC Hydro. (n.d.). *Columbia Region*. <https://www.bchydro.com/energy-in-bc/operations/our-facilities/columbia.html>
- BCCFA. (2022). *Community Forest Indicators 2022: Measuring the Benefits of Community Forestry*. British Columbia Community Forest Association. <https://bccfa.ca/wp-content/uploads/2022/10/BCCFA-Indicators-2022-final-web-1.pdf>
- Beauregard, M., Ell, J., Pikor, R., & Ham, L. (2012). Nunavut carving stone deposit evaluation program (2010–2013): Third year results. *Summary of Activities*, 151–162.
- Benson, K., & Department of Cultural Heritage, Gwich'in Tribal Council. (2019). *Gwich'in Knowledge of Porcupine caribou: State of Current Knowledge and Gaps Assessment*. Department of Cultural Heritage, Gwich'in Tribal Council. <https://thelastgreatherd.com/wp-content/uploads/2020/06/GTC-current-knowledge-and-gaps-assessment.pdf>
- Berkes, F., & Turner, N. J. (2006). Knowledge, learning and the evolution of conservation practice for social-ecological system resilience. *Human Ecology*, 34(4), 479–494.
- Binnema, T., & Niemi, M. (2006). Let the Line Be Drawn Now': Wilderness, Conservation, and the Exclusion of Aboriginal People from Banff National Park in Canada. *Environmental History*, 11(4), 724–750. <https://doi.org/10.1093/envhis/11.4.724>
- Bodaly, R. A., Hecky, R. E., & Fudge, R. J. P. (1984). Increases in Fish Mercury Levels in Lakes Flooded by the Churchill River Diversion, Northern Manitoba. *Canadian Journal of Fisheries and Aquatic Sciences*, 41(4), 682–691. <https://doi.org/10.1139/f84-079>
- Bordo, J. (2007). Jack Pine: Wilderness Sublime or the Erasure of the Aboriginal Presence from the Landscape. In J. O'Brian & P. White (Eds.), *Beyond Wilderness: The Group of Seven, Canadian Identity, and Contemporary Art* (pp. 331–334). McGill-Queen's University Press.
- Borrows, J. (2015). The durability of terra nullius: Tsilhqot'in nation v. British Columbia. *UBCL Rev.*, 48, 701.
- Bouthillier, L., Chiasson, G., & Beaulieu, H. (2022). The difficult art of carving space(s) for community forestry in the Quebec regime. In J. Bulkan, J. Palmer, A.M. Larson, & M. Hobley (Eds.), *Routledge Handbook of Community Forestry*. (1st ed.). Routledge. <https://doi.org/10.4324/9780367488710>
- Bratton, R. D., Kinnear, G., & Koroluk, G. (1979). Why Man Climbs Mountains. *International Review for the Sociology of Sport*, 14(2), 23–36. <https://doi.org/10.1177/101269027901400202>

- Brett, R., & Klinka, K. (1998). A Transition from Gap to Tree-Island Regeneration Patterns in the Subalpine Forest of South-Coastal British Columbia. *Canadian Journal of Forest Research-Revue Canadienne De Recherche Forestière*, 28(12), 1825–1831. <https://doi.org/10.1139/cjfr-28-12-1825>
- Brightman, R. (1993). *Grateful Prey: Rock Cree Human-Animal Relationships*. University of California Press.
- Brody, H. (1981). *Maps and dreams: Indians and the British Columbia frontier*. Waveland Press Inc.
- Bulkan, J., Palmer, J., Larson, A. M., & Hobley, M. (2022). Old World and New World collision. In J. Bulkan, J. Palmer, A. M. Larson, & M. Hobley, *Routledge Handbook of Community Forestry* (1st ed., pp. 141–145). Routledge. <https://doi.org/10.4324/9780367488710-12>
- Canadian Energy Regulator. (2021). *Canada's Energy Future 2021*. Government of Canada.
- Chan, J. (2008). Who Built the Canadian Pacific Railway? Chinese Workers from Hoisan. *Canadian Folk Music Bulletin*, 42(1), 14–21.
- Chimner, R. A., & Cooper, D. J. (2003). Carbon dynamics of pristine and hydrologically modified fens in the southern Rocky Mountains, 81(5), 477–491. <https://doi.org/10.1139/B03-043>
- Church, M. (2010). The trajectory of geomorphology. *Progress in Physical Geography: Earth and Environment*, 34(3), 265–286. <https://doi.org/10.1177/0309133310363992>
- Clark, D., Artelle, K., Darimont, C., Housty, W., Tallio, C., Neasloss, D., Schmidt, A., Wiget, A., & Turner, N. (2021). Grizzly and polar bears as nonconsumptive cultural keystone species. *FACETS*, 6(1), 379–393. <https://doi.org/10.1139/facets-2020-0089>
- Cole, D. (2007). Artists, Patrons, and Public: An Enquiry into the Success of the Group of Seven. In J. O'Brian & P. White (Eds.), *Beyond Wilderness: The Group of Seven, Canadian Identity, and Contemporary Art* (pp. 129–133). McGill-Queen's University Press.
- Colpitts, G., & Devine, H. (2017). Introduction: Migration and Transformation in the Canadian West. In G. Colpitts & H. Devine (Eds.), *Finding Directions West: Readings that Locate and Dislocate Western Canada's Past* (1st ed., pp. 1–18). University of Calgary Press. <https://doi.org/10.2307/j.ctv64h781>
- Colton, J. W. (2005). Indigenous tourism development in northern Canada: Beyond economic incentives. *The Canadian Journal of Native Studies*, 25(1), 185–206.
- Cooper, D. J., Chimner, R. A., & Merritt, D. M. (2012). Western Mountain Wetlands. In *Wetland Habitats of North America* (pp. 313–328). University of California Press. <https://doi.org/10.1525/9780520951419-024>
- COSEWIC. (2013). *COSEWIC Assessment and Status Report on the Eulachon, Nass/Skeena population, Thaleichthys pacificus in Canada* (pp. xi + 18 pp.). [https://wildlife-species.canada.ca/species-risk-registry/virtual\\_sara/files/cosewic/sr\\_eulakane\\_eulachon\\_nass-skeena\\_1213\\_e.pdf](https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_eulakane_eulachon_nass-skeena_1213_e.pdf)
- Coté, C. (2016). “Indigenizing” Food Sovereignty. Revitalizing Indigenous Food Practices and Ecological Knowledges in Canada and the United States. *Humanities*, 5(57). <https://doi.org/10.3390/h5030057>
- Coulthard, G. S. (2014). *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition*. University of Minnesota Press.
- Craft, A. (2017). Giving and receiving life from Anishinaabe nibi inaakonigewin (our water law) research. In J. Thorpe, S. Rutherford, & L. A. Sandberg (Eds.), *Methodological Challenges in Nature-Culture and Environmental History Research* (pp. 105–119). Routledge.
- Cronin, J. K. (2006). The Bears Are Plentiful and Frequently Good Camera Subjects: Postcards and the Framing of Interspecies Encounters in the Canadian Rockies. *Mosaic—A Journal for the Interdisciplinary Study of Literature*, 39(4), 77–92.
- Cross, M. P. (1996). *Bighorn sheep and the Salish world view: A cultural approach to the landscape*. [Master's thesis, University of Montana]. ProQuest Dissertations Publishing.
- Cruikshank, J. (2005). *Do Glaciers Listen?: Local Knowledge, Colonial Encounters, and Social Imagination*. UBC Press.
- Cuerrier, A., Clark, C., & Norton, C. H. (2019). Inuit plant use in the eastern Subarctic: Comparative ethnobotany in Kangiqsualujjuaq, Nunavik, and in Nain, Nunatsiavut. *Botany*, 97, 272–282. <https://doi.org/dx.doi.org/10.1139/cjb-2018-0195>
- Cuerrier, A., Turner, N. J., Gomes, T. C., Garibaldi, A., & Downing, A. (2015). Cultural keystone places: conservation and restoration in cultural landscapes. *Journal of Ethnobiology*, 35(3), 427–448.
- Curran-Sills, G. M., & Karahalios, A. (2015). Epidemiological Trends in Search and Rescue Incidents Documented by the Alpine Club of Canada from 1970 to 2005. *Wilderness & Environmental Medicine*, 26(4), 536–543. <https://doi.org/10.1016/j.wem.2015.07.001>
- Daigle, M. (2019). The spectacle of reconciliation: On (the) unsettling responsibilities to Indigenous peoples in the academy. *Society and Space*, 37(4), 703–721. <https://doi.org/10.1177/0263775818824342>
- Deemer, B. R., Harrison, J. A., Li, S., Beaulieu, J. J., Del-Sontro, T., Barros, N., Bezerra-Neto, J. F., Powers, S. M., dos Santos, M. A., & Vonk, J. A. (2016). Greenhouse Gas Emissions from Reservoir Water Surfaces: A New Global Synthesis. *BioScience*, 66(11), 949–964. <https://doi.org/10.1093/biosci/biw117>
- Demuth, M. N., & Pietroniro, A. (2003). The impact of climate change on the glaciers of the Canadian Rocky Mountain eastern slopes and implications for water resource-related adaptation in the Canadian prairies “Phase I”—Headwaters of the North Saskatchewan River Basin. *Holocene*, 4322, 96.
- Díaz-Reviriego, I., González-Segura, L., Fernández-Llamazares, Á., Howard, P. L., Molina, J. L., & Reyes-García, V. (2016). Social organization influences the exchange and species richness of medicinal plants in Amazonian homegardens. *Ecology and Society*, 21(1).

- Donald, J., Axsen, J., Shaw, K., & Robertson, B. (2022). Sun, wind or water? Public support for large-scale renewable energy development in Canada. *Journal of Environmental Policy & Planning*, 24(2), 175–193, DOI: 10.1080/1523908X.2021.2000375
- Doyle-Yamaguchi, E., & Smith, T. (2022). Following the Lílwat pathway towards reciprocal and relational forest research in Lílwat Indigenous Territory, British Columbia, Canada. In J. Bulkan, J. Palmer, A. M. Larson, & M. Hopley (Eds.), *Routledge Handbook of Community Forestry*. Routledge.
- Draper, D. (2000). Toward Sustainable Mountain Communities: Balancing Tourism Development and Environmental Protection in Banff and Banff National Park, Canada. *AMBIO: A Journal of the Human Environment*, 29(7), 408–415. <https://doi.org/10.1579/0044-7447-29.7.408>
- Duinker, P., & MacLellan, L. (2017). The local trap and community forest policy in Nova Scotia: Pitfalls and promise. In R. Bullock, G. Broad, & L. Palmer (Eds.), *Growing Community Forests*. University of Manitoba Press.
- Earnshaw, J. T. K. (2016). *Cultural forests of the Southern Nuu-chah-nulth: Historical ecology and salvage archaeology on Vancouver Island's West Coast* [Master's thesis, University of Victoria]. <https://dspace.library.uvic.ca/handle/1828/7291>
- Egeland, G. M., Charbonneau-Roberts, G., Kuluguqtuq, J., Kilabuk, J., Okalik, L., Soueida, R., & Kuhnlein, H. V. (2009). Back to the future: Using traditional food and knowledge to promote a healthy future among Inuit. *Indigenous Peoples' Food Systems*, 9–22.
- Ehlers, T., & Hobby, T. (2010). The chanterelle mushroom harvest on northern Vancouver Island, British Columbia: Factors relating to successful commercial development. *BC Journal of Ecosystems and Management*, 11(1 & 2), 72–83.
- Elmeligi, S., Nevin, O. T., Taylor, J., & Convery, I. (2021). Visitor attitudes and expectations of grizzly bear management in the Canadian Rocky Mountain National Parks. *Journal of Outdoor Recreation and Tourism*, 36(100444), nan. <https://doi.org/10.1016/j.jort.2021.100444>
- Fast, T. (2014). Stapled to the front door: Neoliberal extractivism in Canada. *Studies in Political Economy*, 94(1), 31–60.
- Films, B. (2015). Jumbo Wild. *Documentary Film. Patagonia, Sweetgrass Productions*. <http://www.bullfrogfilms.com/catalog/jwild.html>
- FLNRORD. (2019). *FLNRORD Research Program Annual Report: Fiscal Year 2019/20* (p. 32). British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development. [https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/research/research-program/flnrod\\_research\\_group\\_annual\\_report\\_2019-2020.pdf](https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/research/research-program/flnrod_research_group_annual_report_2019-2020.pdf)
- Fortier, J., Truax, B., Gagnon, D., & Lambert, F. (2013). Root biomass and soil carbon distribution in hybrid poplar riparian buffers, herbaceous riparian buffers and natural riparian woodlots on farmland. *SpringerPlus*, 2(1), 539. <https://doi.org/10.1186/2193-1801-2-539>
- Francis, D. (1992). *The Imaginary Indian: The Image of the Indian in Canadian Culture*. Arsenal Pulp Press.
- Frizzell, S. (2016, May 25). *Creative Voices: 1991—Rebecca Belmore Gave the Voiceless a Megaphone*. Banff Centre for Arts and Creativity. <https://www.banffcentre.ca/articles/creative-voices-1991-rebecca-belmore-gave-voiceless-megaphone>
- Gardner, J. S., & Jones, N. K. (1985). Evidence for a Neoglacial Advance of the Boundary Glacier, Banff National Park, Alberta. *Canadian Journal of Earth Sciences*, 22(11), 1753–1755. <https://doi.org/10.1139/e85-185>
- Gastaldo, D., Andrews, G. J., & Khanlou, N. (2004). Therapeutic landscapes of the mind: Theorizing some intersections between health geography, health promotion and immigration studies. *Critical Public Health*, 14(2), 157–176. <https://doi.org/10.1080/09581590410001725409>
- Gaudreau, L. (1990). Environmental Impacts of Recreation on Natural Areas and Living Resources. *Loisir et Société / Society and Leisure*, 13(2), 297–324. <https://doi.org/10.1080/07053436.1990.10715356>
- Gaudry, A., & Lorenz, D. (2018). Indigenization as inclusion, reconciliation, and decolonization: Navigating the different visions for indigenizing the Canadian Academy. *AlterNative: An International Journal of Indigenous Peoples*, 14(3), 218–227.
- Gavin, M. C., McCarter, J., Berkes, F., Mead, A. T. P., Sterling, E. J., Tang, R., & Turner, N. J. (2018). Effective Biodiversity Conservation Requires Dynamic, Pluralistic, Partnership-Based Approaches. *Sustainability*, 10(6), Article 6. <https://doi.org/10.3390/su10061846>
- Gende, S. M., Edwards, R. T., Willson, M. F., & Wipfli, M. S. (2002). Pacific Salmon in Aquatic and Terrestrial Ecosystems: Pacific salmon subsidize freshwater and terrestrial ecosystems through several pathways, which generates unique management and conservation issues but also provides valuable research opportunities. *BioScience*, 52(10), 917–928. [https://doi.org/10.1641/0006-3568\(2002\)052\[0917:PSIAAT\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2002)052[0917:PSIAAT]2.0.CO;2)
- Geng, D. (2021). *Managing national park visitor experience and visitor-wildlife coexistence: a case study of Banff National Park* [Doctoral dissertation, University of British Columbia].
- Gessner, S., Herbert, T., & Parker, A. (2018). *Recognizing the Diversity of BC's First Nations Languages* (pp. 273–289). First Peoples' Cultural Council. <http://www.tandfonline.com/doi/abs/10.1080/09500782.2011.577218>
- Goodfellow, W., & Lyndon, L. (2007). *GEOSCAN Search Results: Fastlink*. <https://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=328384>

- Gottesfeld, L. M. J. (1994). Aboriginal burning for vegetation management in northwest British Columbia. *Human Ecology*, 22(2), 171–188. <https://doi.org/10.1007/BF02169038>
- Government of British Columbia. (2022). *Huckleberry harvesting* [Government]. Government of British Columbia. <https://www2.gov.bc.ca/gov/content/industry/crown-land-water/crown-land/crown-land-uses/huckleberry-harvesting>
- Government of British Columbia. (n.d.). *Indigenous education resources | Building Student Success—B.C. Curriculum*. Retrieved January 19, 2023, from <https://curriculum.gov.bc.ca/curriculum/indigenous-education-resources#learning-journey>
- Graham, B. (2015). *Talking Trees-Sustainable Narratives of the Logging and Forestry Industries in Nova Scotia and New Brunswick and their Relationships with Mi'kmaq Peoples* [Honours Thesis, Dalhousie University]. <https://dalspace.library.dal.ca/bitstream/handle/10222/56643/Bridget%20Graham-SUST4900Honours.pdf?sequence=1>
- Graham, L. (2010). Reconciling Collective and Individual Rights: Indigenous Education and International Human Rights Law. *UCLA Journal of International Law and Foreign Affairs* 15(1), 83–109. <https://ssrn.com/abstract=1680605>
- Grover, V., Borsdorf, A., Breuste, J., Tiwari, P., & Frangetto, F. (2015). *Impact of Global Changes on Mountains: Responses and Adaptation*. Responses and Adaptation, CRC Press. <https://www.routledge.com/Impact-of-Global-Changes-on-Mountains-Responses-and-Adaptation/Grover-Borsdorf-Breuste-Tiwari-Frangetto/p/book/9780367377908>
- Gunter, J. (2022). Community forestry in British Columbia, Canada: History, successes, and challenges. In J. Bulkan, J. Palmer, A. M. Larson, & M. Hopley (Eds.), *Routledge Handbook of Community Forestry*. Routledge.
- Hamilton, E. (2012). Non-Timber Forest Products in British Columbia: Management Framework and Current Practices. *Journal of Ecosystems and Management*, 13(2).
- Haskell, C. A. (2018). From salmon to shad: Shifting sources of marine-derived nutrients in the Columbia River Basin. *Ecology of Freshwater Fish*, 27(1), 310–322. <https://doi.org/10.1111/eff.12348>
- Hassan, M. A., Gottesfeld, A. S., Montgomery, D. R., Tunnicliffe, J. F., Clarke, G. K. C., Wynn, G., Jones-Cox, H., Poirier, R., Macisaac, E., Herunter, H., & Macdonald, S. J. (2008). Salmon-Driven Bed Load Transport and Bed Morphology in Mountain Streams. *Geophysical Research Letters*, 35(4). <https://doi.org/10.1029/2007GL032997>
- Hayes, B. (2022, October 24). [Personal communication].
- Hayter, R. (2004). 'Requiem for a "local" champion: Globalization, British Columbia's forest economy and MacMillanBloedel'. In A.A. Lehtinen, J. Donner-Amnell, & B. Saether (Eds.), *Politics of Forests: Northern Forest-Industrial Regimes in the Age of Globalization*. Routledge.
- Hayter, R., & Barnes, T. J. (2012). Neoliberalization and Its Geographic Limits: Comparative Reflections from Forest Peripheries in the Global North. *Economic Geography*, 88(2), 197–221.
- Heinle, K. B., Eby, L. A., Muhlfeld, C. C., Steed, A., Jones, L., D'Angelo, V., Whiteley, A. R., & Hebblewhite, M. (2021). Influence of water temperature and biotic interactions on the distribution of westslope cutthroat trout (*Oncorhynchus clarkia lewisi*) in a population stronghold under climate change. *Canadian Journal of Fisheries and Aquatic Sciences*, 78.0(4), 444–456. <https://doi.org/10.1139/cjfas-2020-0099>
- Héritier, S. (2003). Tourisme et activités récréatives dans les parcs nationaux des montagnes de l'Ouest canadien: Impacts et enjeux spatiaux (Parcs nationaux Banff, Jasper, Yoho, Kootenay, Lacs Waterton, Mount Revelstoke et des Glaciers) / Recreative activities and tourism in Canada's Rockies National parks: spatial issues and impacts (Banff, Jasper, Yoho, Kootenay, Waterton Lakes, Mount Revelstoke and Glacier National Parks). *Annales de Géographie*, 112(629), 23–46.
- Hills, M. (2019). *Me'ki'tetmek na Maqmikewminen*. Meagan Musseau. <https://meaganmusseau.com/Me-ki-tetmek-na-Maqmikewminen>
- Historica Canada. (2023). *Indigenous Arts and Stories*. <http://www.our-story.ca/>
- Hobbs, R. J., & Cramer, V. A. (2008). Restoration ecology: interventionist approaches for restoring and maintaining ecosystem function in the face of rapid environmental change. *Annual Review of Environment and Resources*, 33(1), 39–61.
- Hocking, M. D., & Reynolds, J. D. (2011). Impacts of Salmon on Riparian Plant Diversity. *Science*, 331(6024), 1609–1612. <https://doi.org/10.1126/science.1201079>
- Hoffman, K. M., Christianson, A. C., Dickson-Hoyle, S., Copes-Gerbitz, K., Nikolakis, W., Diabo, D. A., McLeod, R., Michell, H. J., Mamun, A. A., & Zahara, A. (2022). The right to burn: Barriers and opportunities for Indigenous-led fire stewardship in Canada. *FACETS*, 7(1), 464–481.
- Hoover, C., Ostertag, S., Hornby, C., Parker, C., Hansen-Craik, K., Loseto, L., & Pearce, T. (2016). The continued importance of hunting for future Inuit food security. *Solutions*, 7(4), 40–50.
- Hopkins, C., & Sandromán, L. (2014). Invented Landscapes. In J. Dees, I. Hofmann, C. Hopkins, & L. Sandromán, *Unsettled Landscapes* (pp. 35–48). SITE Santa Fe.
- Ignace, M., & Ignace, C. R. E. (2020). A Place Called Pípsell: An Indigenous Cultural Keystone Place, Mining, and Séwepemc Law. In N. J. Turner (Ed.), *Plants, Peoples, and Places: The Roles of Ethnobotany and Ethnoecology in Indigenous Peoples' Land Rights in Canada and Beyond* (pp. 131–150). McGill-Queen's University Press.
- Ignace, M., Ignace, R. E., & Turner, N. J. (2017). Re Secwépemcúlecws-kucw: How We Look(ed) after Our Land. In M. Ignace & R. E. Ignace (Eds.), *Secwépemc*

- People, Land, and Laws: Yerᕿ7 re Stsq'ey's-kucw* (pp. 145–219). McGill-Queen's University Press/Shuswap Nation Tribal Council.
- Immerzeel, W. W., Lutz, A. F., Andrade, M., Bahl, A., Bie-mans, H., Bolch, T., Hyde, S., Brumby, S., Davies, B. J., Elmore, A. C., Emmer, A., Feng, M., Fernández, A., Har-itashya, U., Kargel, J. S., Koppes, M., Kraaijenbrink, P. D. A., Kulkarni, A. V., Mayewski, P. A., ... Baillie, J. E. M. (2020). Importance and vulnerability of the world's water towers. *Nature*, 577(7790), 364–369. <https://doi.org/10.1038/s41586-019-1822-y>
- IRIN. (2012, May 8). *Nepal: Mountain dwellers "neglected."* <https://www.refworld.org/docid/4fad057d2.html>
- Irving, E. (1977). Drift of the major continental blocks since the Devonian. *Nature*, 270(5635), Article 5635. <https://doi.org/10.1038/270304a0>
- Isaac, I. 'Welila'ogwa. (2016). Chapter 14—Storytelling is our Textbook and Curriculum Guide. In G. Snively & W.L. Williams (Eds.), *Knowing Home: Braiding Indigenous Science with Western Science, Book 1 G* (pp. 211–232). University of Victoria Press. <https://ecampusontario.pressbooks.pub/knowninghome/chapter/chapter-5/>
- IUCN. (2020). *Canadian Rocky Mountain Parks: 2020 Conservation Outlook Assessment*. IUCN World Heritage Outlook. <https://worldheritageoutlook.iucn.org/>
- Ives, J. D., & Barry, R. G. (Eds.). (1974). *Arctic and Alpine Environments* (1st ed.). <https://doi.org/10.4324/9780429330827>
- Jakubec, S. L., Carruthers Den Hoed, D., Ray, H., & Krishnamurthy, A. (2016). Mental well-being and quality-of-life benefits of inclusion in nature for adults with disabilities and their caregivers. *Landscape Research*, 41(6), 616–627.
- Jeanson, A. L., Cooke, S. J., Danylchuk, A. J., & Young, N. (2021). Drivers of pro-environmental behaviours among outdoor recreationists: The case of a recreational fishery in Western Canada. *Journal of Environmental Management*, 289.0(0401664, du5), 112366. <https://doi.org/10.1016/j.jenvman.2021.112366>
- Jessop, A. M., Ghomshei, M. M., & Drury, M. J. (1991). Geothermal Energy in Canada. *Gemics*, 20(44322), 369–385. [https://doi.org/10.1016/0375-6505\(91\)90027-S](https://doi.org/10.1016/0375-6505(91)90027-S)
- Jessup, L. (2002). The Group of Seven and the Tourist Landscape in Western Canada, or the More Things Change .... *Journal of Canadian Studies*, 37(1), 144–179. <https://doi.org/10.3138/jcs.37.1.144>
- Kadykalo, A. N. (2022). *Evaluating evidence-informed decision-making in the management and conservation of British Columbia's fish and wildlife resources* [Doctoral dissertation, Carleton University].
- Kamieniecki, S. (2000). Testing Alternative Theories of Agenda Setting: Forest Policy Change in British Columbia, Canada. *Policy Studies Journal*, 28(1), 176–189. <https://doi.org/10.1111/j.1541-0072.2000.tb02022.x>
- Karst, A. L., & Turner, N. J. (2011). Local Ecological Knowledge and Importance of Bakeapple (*Rubus chamaemorus* L.) in a Southeast Labrador Métis Community. *Ethnobiology Letter*, 2, 6–18.
- Kershaw, R. (2008). *Exploring the Castle: Discovering the backbone of the world in southern Alberta*. Rocky Mountain Books Ltd.
- Kew, M. (2010). Northwest Coast Indigenous Peoples in Canada. In *The Canadian Encyclopedia*. Historica Canada. Article Published November, 17.
- Kuhnlein, H., Erasmus, B., Creed-Kanashiro, H., Englberger, L., Okeke, C., Turner, N., Allen, L., & Bhattacharjee, L. (2006). Indigenous peoples' food systems for health: Finding interventions that work. *Public Health Nutrition*, 9(8), 1013–1019. <https://doi.org/10.1017/PHN2006987>
- Kuhnlein, H. V. (1989). Nutrient values in indigenous wild berries used by the Nuxalk people of Bella Coola, British Columbia. *Journal of Food Composition and Analysis*, 2(1), 28–36.
- Kuhnlein, H. V. (2017). Gender roles, food system biodiversity, and food security in Indigenous Peoples' communities. *Maternal & Child Nutrition*, 13, e12529.
- Kuhnlein, H. V., & Chan, H. M. (2000). Environment and contaminants in traditional food systems of northern indigenous peoples. *Annual Review of Nutrition*, 20, 595–626.
- Kuhnlein, H. V., Receveur, O., Soueida, R., & Egeland, G. M. (2004). Arctic Indigenous Peoples Experience the Nutrition Transition with Changing Dietary Patterns and Obesity. *The Journal of Nutrition*, 134(6), 1447–1453. <https://doi.org/10.1093/jn/134.6.1447>
- Ladle, A., Avgar, T., Wheatley, M., Stenhouse, G. B., Nielsen, S. E., & Boyce, M. S. (2019). Grizzly Bear Response to Spatio-Temporal Variability in Human Recreational Activity. *Journal of Applied Ecology*, 56(2), 375–386. <https://doi.org/10.1111/1365-2664.13277>
- Laidlaw, D. K. (2018). Indigenous water rights & global warming in Alberta. In J. Ellis (Ed.), *Water Rites: Reimagining Water in the West* (pp. 64–83). University of Calgary Press.
- Lamb, C., Willson, R., Richter, C., Owens-Beck, N., Napoleon, J., Muir, B., McNay, R. S., Lavis, E., Hebblewhite, M., Giguere, L., Dokkie, T., Boutin, S., & Ford, A. T. (2022). Indigenous-Led Conservation: Pathways to Recovery for the Nearly Extirpated Klinse-Za Mountain Caribou. *Ecological Applications* 32(5). <https://doi.org/10.1002/eap.2581>
- Lambden, J., Receveur, O., Marshall, J., & Kuhnlein, H. (2006). Traditional and market food access in Arctic Canada is affected by economic factors. *International Journal of Circumpolar Health*, 65(4), 331–340. <https://doi.org/10.3402/ijch.v65i4.18117>
- Landrum, R. E., Brakke, K., & McCarthy, M. A. (2019). The pedagogical power of storytelling. *Scholarship of Teaching and Learning in Psychology*, 5(3), 247–253.
- Laroque, C. P., & Smith, D. J. (2005). Predicted short-term radial-growth changes of trees based on past climate on Vancouver Island, British Columbia. *Dendrochron-*

- logia*, 22(3), 163–168. <https://doi.org/10.1016/j.dendro.2005.04.003>
- Lawler, J. H., & Bullock, R. C. L. (2017). A Case for Indigenous Community Forestry. *Journal of Forestry*, 115(2), 117–125. <https://doi.org/10.5849/jof.16-038>
- Levi, T., Darimont, C. T., Macduffee, M., Mangel, M., Paquet, P., & Wilmers, C. C. (2012). Using Grizzly Bears to Assess Harvest-Ecosystem Tradeoffs in Salmon Fisheries. *Plos Biol*, 10(4), e1001303. <https://doi.org/10.1371/journal.pbio.1001303>
- Li, J. N. (2000). *Canadian Steel, Chinese Grit*. Paxlink Communications, Inc.
- Liddle, M. (1997). *Recreation ecology: the ecological impact of outdoor recreation and ecotourism*. Chapman & Hall Ltd.
- Lilwat Nation. (2017). *I Wa7 Cát'nem: Celebration: Lilwat Nation Annual Report 2017* (pp. 1–60). <https://lilwat.ca/wp-content/uploads/2015/03/Lilwat-Nation-AR17.pdf>
- Linnard, A. J. (2015). *Justice on the Rocks: (Re)writing People and Place in Banff National Park*. <https://yorkspace.library.yorku.ca/xmlui/handle/10315/34788>
- Linton, J., & Budds, J. (2014). The hydrosocial cycle: Defining and mobilizing a relational-dialectical approach to water. *Geoforum*, 57, 170–180.
- Locke, H. (2006). The spiritual dimension of moving to the mountains. In L. A. G. Moss (Ed.), *The Amenity Migrants: Seeking and Sustaining Mountains and their Cultures* (pp. 26–34). CABI.
- Loosen, A., Capdevila, T. V., Pigeon, K., Wright, P., & Jacob, A. L. (2023). Understanding the role of traditional and user-created recreation data in the cumulative footprint of recreation. *Journal of Outdoor Recreation and Tourism*, 100615.
- Lord, B. (2007). The Group of Seven: A National Landscape Art. In J. O'Brian & P. White (Eds.), *Beyond Wilderness: The Group of Seven, Canadian Identity, and Contemporary Art* (pp. 115–122). McGill-Queen's University Press.
- Louis, S. (2021). Sensory access at sxxnitk: Blockages, fluidities and futures. *Journal of Environmental Media*, 2(1), 9.1–9.16. [https://doi.org/10.1386/jem\\_00057\\_1](https://doi.org/10.1386/jem_00057_1)
- Low, J., & de Kleer, L. (2022). The disregard of First Nations' Concerns: Analyzing the environmental assessment of Jumbo Glacier resor. *Trailsix*, 16, 73–83.
- Luig, T. (2015). *Ontological Security, Movement, and Well-being: Teet'it Gwich'in Experiences of Life Transformations*. University of Alberta.
- Macdonald, R. J., Boon, S., Byrne, J. M., Robinson, M. D., & Rasmussen, J. B. (2014). Potential Future Climate Effects on Mountain Hydrology, Stream Temperature, and Native Salmonid Life History. *Canadian Journal of Fisheries and Aquatic Sciences*, 71(2), 189–202. <https://doi.org/10.1139/cjfas-2013-0221>
- Mack, T. (Director). (2022). *Video clip, "Trevor Mack" and "Trip to Sacred Mountain" with Tsilhqot'in member, Trevor Mack* In *"Towards Legal Recognition for Non-Human Relations, Webinar 2: Supernatural Beings and Sacred Places."* <https://allard.ubc.ca/about-us/events-calendar/towards-legal-recognition-non-human-relations-webinar-2-supernatural-beings-and-sacred-places>
- Maher, P. T., & Lemelin, R. H. (2011). Northern Exposure: Opportunities and Challenges for Tourism Development in Torngat Mountains National Park, Labrador, Canada. *Polar Record*, 47(240), 40–45. <https://doi.org/10.1017/S0032247409990581>
- Majorowicz, J., & Grasby, S. E. (2021). Deep Geothermal Heating Potential for the Communities of the Western Canadian Sedimentary Basin. *Energies*, 14(3), Article 3. <https://doi.org/10.3390/en14030706>
- Marshall, S. J., White, E., Demuth, M. N., Bolch, T., Wheate, R., Menounos, B., Beedle, M. J., & Shea, J. M. (2011). Glacier Water Resources on the Eastern Slopes of the Canadian Rocky Mountains. *Canadian Water Resources Journal*, 36(2), 109–134. <https://doi.org/10.4296/cwrj3602823>
- Martinez, D. (2018). Redefining sustainability through kincentric ecology: Reclaiming Indigenous lands, knowledge, and ethics. In M. Nelson & D. Shilling (Eds.), *Traditional ecological knowledge* (pp. 139–174). Cambridge University Press.
- Mason, C. W., Carr, A., Vandermale, E., Snow, B., & Philipp, L. (2022). Rethinking the Role of Indigenous Knowledge in Sustainable Mountain Development and Protected Area Management in Canada and Aotearoa/New Zealand. *Mountain Research and Development*, 42(4), A1-A9.
- McDowell, G., & Hanly, K. (2022). The state of mountain research in Canada. *Journal of Mountain Science*, 19(10), 3013–3025. <https://doi.org/10.1007/s11629-022-7569-1>
- McGregor, D. (2014). Traditional Knowledge and Water Governance: The ethic of responsibility. *AlterNative: An International Journal of Indigenous Peoples*, 10(5), 493–507. <https://doi.org/10.1177/117718011401000505>
- McIlwraith, T. (2008). "The Bloody Moose Got up and Took off": Talking Carefully about Food Animals in a Northern Athabaskan Village. *Anthropological Linguistics*, 50(2), 125–147.
- McIlwraith, T. (2012). A Camp is a Home and Other Reasons Why Indigenous Hunting Camps Can't Be Moved Out of the Way of Resource Developments. *Northern Review*, 36(2), 97–126.
- McMillan, W., Thompson, J., Hart, C., & Johnston, S. (1995). Regional geological and tectonic setting of porphyry deposits in British Columbia and Yukon Territory. *Metallurgy and Petroleum*, 5V 46.
- Mercer, J. J. (2018). *Insights into mountain wetland resilience to climate change: An evaluation of the hydrological processes contributing to the hydrodynamics of alpine wetlands in the Canadian Rocky Mountains* [Master's thesis, University of Saskatchewan]. <https://doi.org/10.13140/RG.2.2.12825.47205>
- Mitchell, M. G. E., Schuster, R., Jacob, A. L., Hanna, D. E. L., Dallaire, C. O., Raudsepp-Hearne, C., Bennett, E. M., Lehner, B., & Chan, K. M. A. (2021). Identifying key ecosystem service providing areas to inform national-scale conservation planning. *Environmental Research Letters*, 16(1), 014038. <https://doi.org/10.1088/1748-9326/abc121>

- Mood, B. J., & Smith, D. J. (2021). A multi-century July–August streamflow reconstruction of Metro Vancouver’s water supply contribution from the Capilano and Seymour watersheds in southwestern British Columbia, Canada. *Canadian Water Resources Journal*, 46(3), 121–138. <https://doi.org/10.1080/07011784.2021.1931458>
- Moody, Megan. (2008). *Eulachon past and present* [Master’s thesis, University of British Columbia]. [http://nuxalk.net/media/eulachon\\_moody.pdf](http://nuxalk.net/media/eulachon_moody.pdf)
- Morrison, A., Westbrook, C. J., & Bedard-Haughn, A. (2014). Distribution of Canadian Rocky Mountain Wetlands Impacted by Beaver. *Wetlands*, 35(1), 95–104. <https://doi.org/10.1007/s13157-014-0595-1>
- Mullally, S., & MacDonald, K. (2017). Call the Doctor? Understanding Health Service Trends in New Brunswick, Part I, 1918–1950. *Journal of New Brunswick Studies / Revue d’études sur le Nouveau-Brunswick*, 8. <https://journals-lib-unb-ca.ezproxy.library.ubc.ca/index.php/JNBS/article/view/25879>
- Musseau, M. (n.d.). *Biography*. Meagan Musseau. Retrieved December 22, 2022, from <https://meaganmusseau.com/Biography>
- Nadasdy, P. (1999). The Politics of Tek: Power and the “Integration” of Knowledge. *Arctic Anthropology*, 36(1/2), 1–18.
- Nadasdy, P. (2007). The Gift in the Animal: The Ontology of Hunting and Human-Animal Sociality. *American Ethnologist*, 34(1), 25–43.
- Natcher, D. C. (2009). Subsistence and the Social Economy of Canada’s Aboriginal North. *Northern Review*, 30, Article 30.
- Nelson, J., & Colpron, M. (2007). Tectonics and metallogeny of the British Columbia, Yukon and Alaskan Cordillera, 1.8 Ga to the present. In: Mineral Deposits of Canada: A Synthesis of Major Deposit-Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods., *GAC Special Publication*, 5. <https://data.geology.gov.yk.ca/Reference/81666#InfoTab>
- Nepal, S. K., & Jamal, T. B. (2011). Resort-Induced Changes in Small Mountain Communities in British Columbia, Canada. *Mountain Research and Development*, 31(2), 89–101. <https://doi.org/10.1659/MRD-JOURNAL-D-10-00095.1>
- Nitschke, C. R. (2008). The cumulative effects of resource development on biodiversity and ecological integrity in the Peace-Moberly region of Northeast British Columbia, Canada. *Biodiversity and Conservation*, 17(7), 1715–1740.
- Norval Morrisseau—Rock Art. (2006, 2011). Native Art in Canada: An Elder’s Stories About Ojibwa Art and Culture. <https://www.native-art-in-canada.com/rock-art.html>
- Norton, C. H., Cuerrier, A., & Hermanutz, L. (2021). People and Plants in Nunatsiavut (Labrador, Canada): Examining Plants as a Foundational Aspect of Culture in the Subarctic. *Economic Botany*, 75(3), 287–301.
- Oberndorfer, E., Winters, N., Gear, C., Ljubicic, G., & Lundholm, J. (2017). Plants in a “Sea of Relationships”: Networks of Plants and Fishing in Makkovik, Nunatsiavut (Labrador, Canada). *Journal of Ethnobiology*, 37(3), 458–477. <https://doi.org/10.2993/0278-0771-37.3.458>
- Oetelaar, G. A. (2014). Worldviews and human–animal relations: Critical perspectives on bison–human relations among the Euro-Canadians and Blackfoot. *Critique of Anthropology*, 34(1), 94–112. <https://doi.org/10.1177/0308275X13510187>
- Ommer, R. E., & Coasts Under Stress Research Project Team. (2007). *Coasts Under Stress: Restructuring and social-ecological health*. McGill-Queen’s University Press.
- Orr, P. L., Wiramanaden, C. I. E., Paine, M. D., Franklin, W., & Fraser, C. (2012). Food Chain Model Based on Field Data to Predict Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) Ovary Selenium Concentrations from Water Selenium Concentrations in the Elk Valley, British Columbia. *Environmental Toxicology and Chemistry*, 31(3), 672–680. <https://doi.org/10.1002/etc.1730>
- Osama, M. (2019). Asylum: A Place of Refuge. *Marwah Osama: Architecture & Design*. <https://www.marwahosama.com/asylum>
- Owens, P., & Slaymaker, O. (2004). *Mountain Geomorphology* (1st ed.). Routledge. <https://doi.org/10.4324/9780203764824>
- Parfitt, B. (2005). *Getting More from our Forests: Ten Proposals for Building Stability in BC’s Forestry Communities*. Canadian Centre Policy Alternatives.
- Parfitt, B. (2007). *True partners*. desLibris. <https://policycommons.net/artifacts/1215317/true-partners/1768416/>
- Parfitt, B. (2010). Managing BC’s forests for a cooler planet: Carbon storage, sustainable jobs and conservation. *Managing BC’s Forests for a Cooler Planet: Carbon Storage, Sustainable Jobs and Conservation*. <https://david Suzuki.org/science-learning-centre-article/executive-summary-managing-bcs-forests-cooler-planet-carbon-storage-sustainable-jobs-conservation/>
- Parker, B., Schindler, D., Donald, D., & Anderson, R. (2001). The Effects of Stocking and Removal of a Nonnative Salmonid on the Plankton of an Alpine Lake. *Ecosystems*, 4(4), 334–345. <https://doi.org/10.1007/s10021-001-0015-2>
- Parks Canada. (2019). “Saoyú-?ehdacho National Historic Site of Canada.” Canada’s Historic Places. Accessed 29 July 2023: <https://www.historicplaces.ca/en/rep-reg/place-lieu.aspx?id=13033>
- Parlee, B., & Berkes, F. (2006). Indigenous knowledge of ecological variability and commons management: A case study on berry harvesting from Northern Canada. *Human Ecology*, 34(4), 515–528.
- Parlee, B. L. (2006). *Dealing with ecological variability and change: Perspectives from the Denesoline and the Gwich’in of northern Canada* [Doctoral dissertation, The University of Manitoba].

- Parlee, B. L., & Caine, K. J. (2018). *When the caribou do not come: Indigenous knowledge and adaptive management in the Western Arctic*. UBC Press.
- Parlee, B. L., Sandlos, J., & Natcher, D. C. (2018). Undermining subsistence: Barren-ground caribou in a “tragedy of open access.” *Science Advances*, 4(2), e1701611.
- Parlee, B., & Martin, C. (2016). *Literature Review: Local and Traditional Knowledge in the Peel River Watershed*. Tracking Change Project.
- Parrott, L., Robinson, Z., & Hik, D. (Eds.). (2022). *State of the Mountains Report* (Vol. 5). Alpine Club of Canada.
- Pasternak, S. (2017). *Grounded authority: The Algonquins of Barriere Lake against the state*. University of Minnesota Press.
- Paul, A., & Post, J. (2001). Spatial Distribution of Native and Nonnative Salmonids in Streams of the Eastern Slopes of the Canadian Rocky Mountains. *Transactions of the American Fisheries Society*, 130(3), 417–430. [https://doi.org/10.1577/1548-8659\(2001\)130<0417:SDONAN>2.0.CO;2](https://doi.org/10.1577/1548-8659(2001)130<0417:SDONAN>2.0.CO;2)
- Pavelka, J. (2017). Are They Having Fun Yet? Leisure Management Within Amenity Migration. *World Leisure Journal*, 59(1), 21–38. <https://doi.org/10.1080/16078055.2016.1277610>
- Payne, C. (2007). How Shall We Use These Gifts? In J. O’Brian & P. White (Eds.), *Beyond Wilderness: The Group of Seven, Canadian Identity, and Contemporary Art* (pp. 153–160). McGill-Queen’s University Press.
- Peacock, S. L., & Turner, N. J. (2000). “Just Like a Garden”: Traditional Resource Management and Biodiversity Conservation on the Interior Plateau of British Columbia. In *Biodiversity and Native America* (pp. 133–179). University of Oklahoma Press.
- Pearon, K. J., & Goater, C. P. (2008). Distribution of Long-Toed Salamanders and Introduced Trout in High- and Low-Elevation Wetlands in Southwestern Alberta, Canada. *Ecoscience*, 15(4), 453–459. <https://doi.org/10.2980/15-4-3127>
- Pentz, S., & Kostaschuk, R. (1999). Effect of placer mining on suspended sediment in reaches of sensitive fish habitat. *Environmental Geology*, 37(1), 78–89.
- Pigeon, K. E., Anderson, M., MacNearney, D., Cranston, J., Stenhouse, G., & Finnegan, L. (2016). Toward the restoration of caribou habitat: understanding factors associated with human motorized use of legacy seismic lines. *Environmental management*, 58(5), 821–832.
- Pitman, K. J., Moore, J. W., Sloat, M. R., Beaudreau, A. H., Bidlack, A. L., Brenner, R. E., Hood, E. W., Pess, G. R., Mantua, N. J., Milner, A. M., Radić, V., Reeves, G. H., Schindler, D. E., & Whited, D. C. (2020). Glacier Retreat and Pacific Salmon. *BioScience*, 70(3), 220–236. <https://doi.org/10.1093/biosci/biaa015>
- Price, M. F. (Ed.). (2013). *Mountain geography: Physical and human dimensions*. University of California Press.
- Prosper, L. (2007). Wherein lies the heritage value? Rethinking the heritage value of cultural landscapes from an Aboriginal perspective. *The George Wright Forum* 24(2), 117–124.
- Rajala, J. (1998). *Bringing back the white pine*. J. Rajala.
- Rajala, R. (2006). *Up-coast: Forests and industry on British Columbia’s north coast, 1870–2005*. Royal BC Museum.
- Rand, P. S., Hinch, S. G., Morrison, J., Foreman, M. G. G., MacNutt, M. J., Macdonald, J. S., Healey, M. C., Farrell, A. P., & Higgs, D. A. (2006). Effects of River Discharge, Temperature, and Future Climates on Energetics and Mortality of Adult Migrating Fraser River Sockeye Salmon. *Transactions of the American Fisheries Society*, 135(3), 655–667. <https://doi.org/10.1577/T05-023.1>
- Randell, H. (2022). The challenges of dam-induced displacement: Reducing risks and rethinking hydropower. *One Earth*, 5(8), 849–852. <https://doi.org/10.1016/j.oneear.2022.07.002>
- Rathwell, K. J., & Armitage, D. (2016). Art and artistic processes bridge knowledge systems about social-ecological change: An empirical examination with Inuit artists from Nunavut, Canada. *Ecology and Society*, 21(2), art21. <https://doi.org/10.5751/ES-08369-210221>
- Reeves, B. O. K. (1978). Bison Killing in the Southwestern Alberta Rockies. *Plains Anthropologist*, 23(82), 63–78.
- Reichwein, P. (2005). Holiday at the Banff School of Fine Arts: The Cinematic Production of Culture, Nature, and Nation in the Canadian Rockies, 1945–1952. *Journal of Canadian Studies*, 39(1), 49–73. <https://doi.org/10.1353/jcs.2006.0010>
- Reichwein, P., & Wall, K. (2017). Mountain Capitalists, Space, and Modernity at the Banff School of Fine Arts. In G. Colpitts & H. Devine (Eds.), *Finding Directions West: Readings that Locate and Dislocate Western Canada’s Past* (pp. 203–232). University of Calgary Press. <https://doi.org/10.2307/j.ctv64h781>
- Reid, A. J., Carlson, A. K., Creed, I. F., Eliason, E. J., Gell, P. A., Johnson, P. T. J., Kidd, K. A., MacCormack, T. J., Olden, J. D., Ormerod, S. J., Smol, J. P., Taylor, W. W., Tockner, K., Vermaire, J. C., Dudgeon, D., & Cooke, S. J. (2019). Emerging threats and persistent conservation challenges for freshwater biodiversity. *Biological Reviews*, 94(3), 849–873. <https://doi.org/10.1111/brv.12480>
- Reid, A. J., Eckert, L. E., Lane, J.-F., Young, N., Hinch, S. G., Darimont, C. T., Cooke, S. J., Ban, N. C., & Marshall, A. (2021). “Two-Eyed Seeing”: An Indigenous framework to transform fisheries research and management. *Fish and Fisheries*, 22(2), 243–261. <https://doi.org/10.1111/faf.12516>
- Reid, A. J., Young, N., Hinch, S. G., & Cooke, S. J. (2022). Learning from Indigenous knowledge holders on the state and future of wild Pacific salmon. *FACETS*, 7, 718–740. <https://doi.org/10.1139/facets-2021-0089>
- Reid, D. (2007). Introduction to the Group of Seven. In J. O’Brian & P. White (Eds.), *Beyond Wilderness: The Group of Seven, Canadian Identity, and Contemporary Art* (pp. 101–107). McGill-Queen’s University Press.
- Reid, M., Collins, M. L., Hall, S. R. J., Mason, E., McGee, G., & Frid, A. (2022). Protecting our coast for everyone’s future: Indigenous and scientific knowledge support marine spatial protections proposed by Central Coast



- First Nations in Pacific Canada. *People & Nature*, 4, 1052–1070. <https://doi.org/10.1002/pan3.10380>
- Reimer, R. (Yumks). (2003). Alpine Archaeology and Oral Traditions of the Squamish. In R. Carlson (Ed.), *Archaeology of Coastal British Columbia: Essays in honour of Professor Philip M. Hobler* (pp. 45–59). Archaeology Press.
- Ripley, T., Scrimgeour, G., & Boyce, M. (2005). Bull Trout (*Salvelinus Confluentus*) Occurrence and Abundance Influenced by Cumulative Industrial Developments in a Canadian Boreal Forest Watershed. *Canadian Journal of Fisheries and Aquatic Sciences*, 62(11), 2431–2442. <https://doi.org/10.1139/F05-150>
- Romeo R., Russo, L., Parisi F., Notarianni M., Manuelli S., Carvao S., & UNWTO. (2021). *Mountain tourism—Towards a more sustainable path*. FAO, the World Tourism Organization (UNWTO),. <https://doi.org/10.4060/cb7884en>
- Rudolph, B.-L., Andreller, I., & Kennedy, C. J. (2008). Reproductive Success, Early Life Stage Development, and Survival of Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) Exposed to Elevated Selenium in an Area of Active Coal Mining. *Environmental Science & Technology*, 42(8), 3109–3114. <https://doi.org/10.1021/es072034d>
- Saari, P. J. (2015). Marketing Nature: The Canadian National Parks Branch and Constructing the Portrayal of National Parks in Promotional Brochures, 1936–1970. *Environment and History*, 21(3), 401–446. <https://doi.org/10.3197/096734015X14345369355863>
- Salmón, E. (2012). *Eating the Landscape*. The University of Arizona Press.
- Sanderson, D., Picketts, I. M., Déry, S. J., Fell, B., Baker, S., Lee-Johnson, E., & Auger, M. (2015). Climate change and water at Stellat'en First Nation, British Columbia, Canada: Insights from western science and traditional knowledge. *The Canadian Geographer / Le Géographe Canadien*, 59(2), 136–150. <https://doi.org/10.1111/cag.12142>
- Satterfield, T., Gregory, R., Klain, S., Roberts, M., & Chan, K. M. (2013). Culture, intangibles and metrics in environmental management. *Journal of environmental management*, 117, 103–114.
- Schindler, D. W., & Donahue, W. F. (2006). An impending water crisis in Canada's western prairie provinces. *Proceedings of the National Academy of Sciences*, 103(19), 7210–7216. <https://doi.org/10.1073/pnas.0601568103>
- Schuster, R., Germain, R. R., Bennett, J. R., Reo, N. J., & Arcese, P. (2019). Vertebrate biodiversity on indigenous-managed lands in Australia, Brazil, and Canada equals that in protected areas. *Environmental Science & Policy*, 101, 1–6. <https://doi.org/10.1016/j.envsci.2019.07.002>
- Sherren, K., Parkins, J.R., Owen, T., Terashima, M. (2019). Does noticing energy infrastructure influence public support for energy development? Evidence from a national survey in Canada, *Energy Research & Social Science*, 51: 176–186. DOI:10.1016/j.erss.2019.01.014.
- Simms, R., Harris, L., Joe, N., & Bakker, K. (2016). Navigating the tensions in collaborative watershed governance: Water governance and Indigenous communities in British Columbia, Canada. *Geoforum*, 73, 6–16. <https://doi.org/10.1016/j.geoforum.2016.04.005>
- Simpson, A. (2014). *Mohawk Interruptus: Political Life Across the Borders of Settler States*. Duke University Press.
- Sinnatamby, R. N., Cantin, A., & Post, J. R. (2020). Threats to At-Risk Salmonids of the Canadian Rocky Mountain Region. *Ecology of Freshwater Fish*, 29(3), 477–494. <https://doi.org/10.1111/eff.12531>
- Smith, T., & Bulkan, J. (2021). A 'New Relationship'? Reflections on British Columbia's 2003 Forest Revitalization Plan from the perspective of the Lilwat First Nation. *Land Use Policy*, 105, 105345. <https://doi.org/10.1016/j.landusepol.2021.105345>
- Snively, E. (2016). Chapter 5—Representations of Indigenous Science in Textbooks, Curriculum Resources, and Government Documents. In G. Snively & W.L. Williams (Eds.), *Knowing Home: Braiding Indigenous Science with Western Science Book One* (pp. 73–85). University of Victoria Press. <https://ecampusontario.pressbooks.pub/knownhome/chapter/chapter-5/>
- Solomon, G. (2022). Video clip with Tsilhqot'in Nation Elder, Gilbert Solomon speaking about mountains in spiritual recovery and learning in the Ts'il'os (Chilko) River region. In “Towards Legal Recognition for Non-Human Relations, Webinar 2: Supernatural Beings and Sacred Places”. *Centre for Law and the Environment*. <https://allard.ubc.ca/about-us/events-calendar/towards-legal-recognition-non-human-relations-webinar-2-supernatural-beings-and-sacred-places>
- Sprague, J. B. (2007). Great wet north? Canada's myth of water abundance. In K. Bakker (Ed.), *Eau Canada: The future of Canada's water*. (pp. 23–36). UBC Press.
- St. Louis, V. L., Kelly, C. A., Duchemin, É., Rudd, J. W. M., & Rosenberg, D. M. (2000). Reservoir Surfaces as Sources of Greenhouse Gases to the Atmosphere: A Global Estimate. *BioScience*, 50(9), 766. [https://doi.org/10.1641/0006-3568\(2000\)050\[0766:RSASOG\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2000)050[0766:RSASOG]2.0.CO;2)
- Stanworth, K. (2013). Revisioning the “Culture of Nature” in Canadian Visual Culture Studies: John Russell and An/Other Case of Modern Art. *Journal of Canadian Studies*, 47(3), 67–92.
- St-Louis, A., Hamel, S., Mainguy, J., & Cote, S. D. (2013). Factors Influencing the Reaction of Mountain Goats Towards All-Terrain Vehicles. *Journal of Wildlife Management*, 77(3), 599–605. <https://doi.org/10.1002/jwmg.488>
- Stoddart, M. C. J. (2011). Grizzlies and Gondolas: Animals and the Meaning of Skiing Landscapes in British Columbia, Canada. *Nature + Culture*, 6(1), 41–63. <https://doi.org/10.3167/nc.2011.060103>
- Stralberg, D., Arseneault, D., Baltzer, J. L., Barber, Q. E., Bayne, E. M., Boulanger, Y., Brown, C. D., Cooke, H. A., Devito, K., Edwards, J., Estevo, C. A., Flynn, N., Frelich, L. E., Hogg, E. H., Johnston, M., Logan, T., Matsuoka, S. M., Moore, P., Morelli, T. L., ... Whitman, E. (2020). Climate-change refugia in boreal North America: What, where, and for how long? *Frontiers in Ecology and the Environment*, 18(5), 261–270. <https://doi.org/10.1002/fee.2188>

- Strang, V. (2004). *The meaning of water*. Berg.
- Studley, J. (2012). Uncovering the intangible values of earth care: Using cognition to reveal the eco-spiritual domains and sacred values of the peoples of eastern Kham. In B. Verschuuren, R. Wild, J. McNeely, & G. Oviedo (Eds.), *Sacred natural sites: Conserving Nature and Culture* (pp. 107–118). Earthscan.
- Tarnocai, C., Kettles, I. M., & Lacelle, B. (2011). *Peatlands of Canada* (No. 6561). <https://doi.org/10.4095/288786>
- The Confederacy of Mainland Mi'kmaq. (2014). *Mission & Netukulimk—Mi'kmaq Conservation Group*. <https://mikmaqconservation.ca/mission-netukulimk/>
- Thornton, C., & Quinn, M. S. (2009). Coexisting with cougars: public perceptions, attitudes, and awareness of cougars on the urban-rural fringe of Calgary, Alberta, Canada. *Human-Wildlife Conflicts*, 3(2), 282–295.
- Tito, R., Vasconcelos, H. L., & Feeley, K. J. (2020). Mountain Ecosystems as Natural Laboratories for Climate Change Experiments. *Frontiers in Forests and Global Change*, 3(38). <https://doi.org/10.3389/ffgc.2020.00038>
- Toth, B., Corkal, D. R., Sauchyn, D., Van Der Kamr, G., & Pietroniro, E. (2009). The Natural Characteristics of the South Saskatchewan, River Basin: Climate, Geography and Hydrology. *Prairie Forum*, 34(1), 95–127.
- Trusler, S., & Johnson, L. M. (2008). “Berry Patch” as a Kind of Place—The Ethnoecology of Black Huckleberry in Northwestern Canada. *Human Ecology*, 36(4), 553–568. <https://doi.org/10.1007/s10745-008-9176-3>
- Tsing, A. L. (2015). *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton University Press. <https://doi.org/10.1515/9781400873548>
- Tuer, D. (2007). Performing Memory: The Art of Storytelling in the Work of Rebecca Belmore. In J. O'Brian & P. White (Eds.), *Beyond Wilderness: The Group of Seven, Canadian Identity, and Contemporary Art* (pp. 338–340). McGill-Queen's University Press.
- Tulloch, V. J. D., Adams, M. S., Martin, T. G., Tulloch, A. I. T., Martone, R., Avery-Gomm, S., & Murray, C. C. (2022). Accounting for direct and indirect cumulative effects of anthropogenic pressures on salmon- and herring-linked land and ocean ecosystems. *Philosophical Transactions B*, 377(20210130). <https://doi.org/10.1098/rstb.2021.0130>
- Turner, N. J. (1984). Counter-irritant and other medicinal uses of plants in Ranunculaceae by native peoples in British Columbia and neighbouring areas. *Journal of Ethnopharmacology*, 11(2), 181–201.
- Turner, N. J. (1988). “The Importance of a Rose”: Evaluating the Cultural Significance of Plants in Thompson and Lillooet Interior Salish. *American Anthropologist*, 90(2), 272–290.
- Turner, N. J. (2014). *Ancient Pathways, Ancestral Knowledge: Ethnobotany and Ecological Wisdom of Indigenous Peoples of Northwestern North America*. McGill-Queen's University Press.
- Turner, N. J. (2020). *Plants, Peoples, and Places: The Roles of Ethnobotany and Ethnoecology in Indigenous Peoples' Land Rights in Canada and Beyond*. McGill-Queen's University Press.
- Turner, N. J., & Clifton, H. (2009). “It's so different today”: Climate change and indigenous lifeways in British Columbia, Canada. *Global Environmental Change*, 19(2), 180–190. <https://doi.org/10.1016/j.gloenvcha.2009.01.005>
- Turner, N. J., Davidson-Hunt, I. J., & O'Flaherty, M. (2003). Living on the edge: Ecological and cultural edges as sources of diversity for social—Ecological resilience. *Human Ecology*, 31(3), 439–461.
- Turner, N. J., Ignace, M. B., & Ignace, R. (2000). Traditional Ecological Knowledge and Wisdom of Aboriginal Peoples in British Columbia. *Ecological Applications*, 10(5), 1275–1287. [https://doi.org/10.1890/1051-0761\(2000\)010\[1275:TEKAWO\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2000)010[1275:TEKAWO]2.0.CO;2)
- Tushingham, S., Barton, L., & Bettinger, R. L. (2021). How ancestral subsistence strategies solve salmon starvation and the “protein problem” of Pacific Rim resources. *American Journal of Physical Anthropology*, 175, 741–761. <https://doi.org/10.1002/ajpa.24281>
- United Nations Department of Economic and Social Affairs, Indigenous Peoples. (2017). *UN Permanent Forum on Indigenous Issues*. <https://www.un.org/development/desa/indigenouspeoples/mandated-areas1/education/recs-education.html>
- Uprety, Y., Asselin, H., Dhakal, A., & Julien, N. (2012). Traditional use of medicinal plants in the boreal forest of Canada: Review and perspectives. *Journal of Ethnobiology and Ethnomedicine*, 8(1), 7. <https://doi.org/10.1186/1746-4269-8-7>
- van Staal, C., Wilson, R., Rogers, N., Fyffe, L., Langton, J., McCutcheon, S., McNicoll, V., & Ravenhurst, C. (2003). Geology and Tectonic History of the Bathurst Supergroup, Bathurst Mining Camp, and Its Relationships to Coeval Rocks in Southwestern New Brunswick and Adjacent Maine—A Synthesis. In W. Goodfellow, S. McCutcheon, & J. Peter (Eds.), *Massive Sulfide Deposits of the Bathurst Mining Camp, New Brunswick, and Northern Maine* (Vol. 11). Society of Exploration Geophysicists.
- Vastokas. (2012). Pictographs and Petroglyphs. *The Canadian Encyclopedia*. <https://www.thecanadianencyclopedia.ca/en/article/pictographs-and-petroglyphs#>
- Viviroli, D., Dürr, H. H., Messerli, B., Meybeck, M., & Weingartner, R. (2007). Mountains of the world, water towers for humanity: Typology, mapping, and global significance: Mountains as Water Towers for Humanity. *Water Resources Research*, 43(7). <https://doi.org/10.1029/2006WR005653>
- Viviroli, D., Kumm, M., Meybeck, M., Kallio, M., & Wada, Y. (2020). Increasing dependence of lowland populations on mountain water resources. *Nature Sustainability*, 3(11), 917–928. <https://doi.org/10.1038/s41893-020-0559-9>
- Viviroli, D., Weingartner, R., & Messerli, B. (2003). Assessing the Hydrological Significance of the World's

- Mountains. Source: *Mountain Research and Development Mountain Research and Development*, 2302300322(23). <http://www.bioone.org/doi/full/10.1659/0276-4741%282003%29023%5B0032%3AATHSOT>
- Wagner, M. A., & Reynolds, J. D. (2019). Salmon increase forest bird abundance and diversity. *PLOS ONE*, 14(2), e0210031. <https://doi.org/10.1371/journal.pone.0210031>
- Weidman, R. P., Schindler, D. W., & Vinebrooke, R. D. (2011). Pelagic Food Web Interactions Among Benthic Invertebrates and Trout in Mountain Lakes. *Freshwater Biology*, 56(6), 1081–1094. <https://doi.org/10.1111/j.1365-2427.2010.02552.x>
- Westbrook, C. J., Ronnquist, A., & Bedard-Haughn, A. (2020). Hydrological functioning of a beaver dam sequence and regional dam persistence during an extreme rainstorm. *Hydrological Processes*, 34(18), 3726–3737. <https://doi.org/10.1002/hyp.13828>
- Wickland, K. P., Striegl, R. G., Mast, M. A., & Clow, D. W. (2001). Carbon gas exchange at a southern Rocky Mountain wetland, 1996–1998. *Global Biogeochemical Cycles*, 15(2), 321–335. <https://doi.org/10.1029/2000GB001325>
- Wild, F. J. (2008). Epidemiology of Mountain Search and Rescue Operations in Banff, Yoho, and Kootenay National Parks, 2003–06. *Wilderness & Environmental Medicine*, 19(4), 245–251. <https://doi.org/10.1580/07-WEME-OR-141.1>
- Willows, N. D. (2005). Overweight in Aboriginal Children: Prevalence, Implications, and Solutions. *International Journal of Indigenous Health*, 2(1), 76–86.
- Wilson, N. J. (2020). Querying Water Co-Governance: Yukon First Nations and Water Governance in the Context of Modern Land Claim Agreements. *Water Alternatives*, 13(1), 93–118.
- Wilson, N. J., Harris, L. M., Joseph-Rear, A., Beaumont, J., & Satterfield, T. (2019). Water Is Medicine: Reimagining Water Security Through Tr'ondek Hwech'in Relationships to Treated and Traditional Water Sources in Yukon, Canada. *Water*, 11(3). <https://doi.org/10.3390/w11030624>
- Wilson, N. J., & Inkster, J. (2018). Respecting water: Indigenous water governance, ontologies, and the politics of kinship on the ground. *Environment and Planning E: Nature and Space*, 1(4), 516–538. <https://doi.org/10.1177/2514848618789378>
- Wong, C., Ballegooyen, K., Ignace, L., Johnson, M. J. (Gùdia), & Swanson, H. (2020). Towards reconciliation: 10 Calls to Action to natural scientists working in Canada. *FACETS*, 5(1), 769–783. <https://doi.org/10.1139/facets-2020-0005>
- Yarmoloy, C. P. (1986). *The impact of off-highway recreation vehicles on big game: management implications for Alberta's eastern slopes* [Master's thesis, University of Calgary].
- York, A., Arnett, C., & Daly, R. (1993). *They write their dream on the rock forever: Rock writings of the Stein River Valley of British Columbia* (1. print). Talonbooks.
- Yu, Z., Vitt, D. V., Campbell, I. D., & Apps, M. J. (2003). *Understanding Holocene peat accumulation pattern of continental fens in western Canada*. 81, 267–282. <https://doi.org/10.1139/B03-016>
- Zedeno, M., Pickering, E., & Lanoe, F. (2021). Oral tradition as emplacement: Ancestral Blackfoot memories of the Rocky Mountain Front. *Journal of Social Archaeology*, 21(3), 306–328. <https://doi.org/10.1177/14696053211019837>
- Zedler, J. B., & Kercher, S. (2005). Wetland Resources: Status, Trends, Ecosystem Services, and Restorability. *Annual Review of Environment and Resources*, 30(1), 39–74. <https://doi.org/10.1146/annurev.energy.30.050504.144248>
- Zurba, M., Beazley, K. F., English, E., & Buchmann-Duck, J. (2019). Indigenous Protected and Conserved Areas (IPCAs), Aichi Target 11 and Canada's Pathway to Target 1: Focusing Conservation on Reconciliation. *Land*, 8(1), 10. <https://doi.org/10.3390/land8010010>