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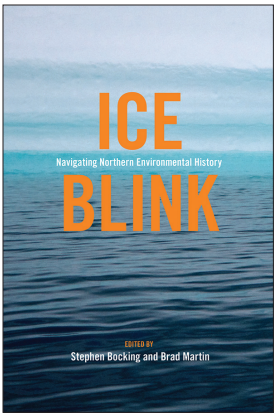

ICE BLINK: NAVIGATING NORTHERN ENVIRONMENTAL HISTORY Edited by Stephen Bocking and Brad Martin

ISBN 978-1-55238-855-6

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Introduction

Navigating Northern Environmental History

Stephen Bocking

Ice blinks—white glare under clouds, indicating light-reflecting ice beyond the horizon—are a distinctive feature of the northern environment. Long used by travellers for navigation, they are one way in which people have known the north and made their way within it. As natural features that gain their meaning through their use by humans living and travelling in the north, they also exemplify the links between people and nature in this place.

Today, however, the dominant image of northern Canada is not that of the reliable relation between ice and sky represented by ice blinks, but of turmoil: a place being transformed by larger forces of environmental change. Models predict, satellites track, and northerners testify to the consequences of rapid warming, transforming ice and polar bears into icons of global change. Expectations of an ice-free ocean are encouraging exploitation of oil, gas, and other resources, and exploration of new shipping routes. Territorial claims have gained urgency, as nations map the seabed. Indigenous peoples seek a sustainable economy, a secure environment, and a say in the region's future. Throughout, a changing environment—ice,

water, tundra, forests, minerals, wildlife—remains central to northern plans, hopes, and anxieties.

This image of unprecedented change has tended to encourage the assumption that northern change stems mainly from a changing climate—implying that before the current era of global warming the north was a static landscape, almost outside history. But a longer view can challenge this image by demonstrating that we are witnessing today only the latest episode in a century of historic change, and that this history has encompassed much more than the consequences of a changing global climate. Consider what we see if we extend our gaze ever deeper into twentieth-century northern history. In recent decades we have seen the evolution of Indigenous self-government, with land claims and regional governments reconfiguring northern power and authority. Before that, in the late 1970s, came expectations of transformation through a new northern oil-and-gas economy. The decade before, Prime Minister John Diefenbaker sketched in his "northern vision" his ambition to integrate the region into the Canadian state and economy—supplanting the Cold War view of the north as a military frontier. Even earlier, dreams of a pastoral economy based on reindeer, followed by airplanes and mineral discoveries, inspired diverse visions of the future of the north. Before that, the Klondike Gold Rush briefly promised instant wealth. Change, often viewed at the time as unprecedented, has been a constant during this century.

This volume presents novel perspectives on this century of transformation. It is the product of a new generation of northern scholars collaborating on the study of the environmental history of northern Canada. Mainly based outside the region—in southern Canada and the United States—they, like northern travellers perceiving an ice blink, are seeking an understanding of conditions at a distance. The stories they tell concern the evolving relations between people and the northern environment: how this environment has changed over time, how human activities have affected this environment while being themselves shaped by it, and how culture, knowledge, and interests have been tied to these relations. As we will see, these stories, while akin to those of environmental historians elsewhere, take distinctive forms in the north. Some of them are of newcomers: railway promoters capitalizing on Klondike fever, surveyors seeking mineral deposits, pilots tracing transportation routes, technicians installing surveillance systems, miners exploiting landscapes, scientists

tracking contaminants. Several chapters consider the Canadian state: its efforts to impose a pastoral economy, supermarket food in place of fresh meat, or community economic development in place of traditional ways of life. Others concern Indigenous people: their identities, ways of life, and evolving relations with the land, the state, scientists, and the wider world. Our authors have pursued these stories across the north: from Quebec and British Columbia to the territories and the High Arctic, while paying careful attention to the links between these places and the rest of the world. They (and the volume itself) therefore express an inclusive understanding of the north, encompassing not just the Canadian Arctic, or an arbitrary administrative region such as the territories above latitude 60° north, but those places customarily imagined as northern Canada. (We discuss in more detail below the varied definitions of the north as a physical and an imagined place.) They also demonstrate the interdisciplinary character of environmental history, linking environmental change with social and political history, geography and anthropology, and the history of science and technology. To help us navigate this century of northern environmental history, we have arranged these chapters into three eras: the colonial, modern, and contemporary north.

Forming Northern Colonial Environments

Even while drawing on universalizing discourses of imperialism and progress, colonization nevertheless took a distinctive form in the north, which became evident in human-environment relations. In the western Arctic, commercial harvesting depleted bowhead whale populations, as well as caribou, polar bears, and musk oxen. In the east, whalers, traders, and missionaries brought new technology, while the fur trade and the Hudson's Bay Company reshaped Inuit environmental and economic relations. Novel biota from the south included disease, with often devastating impacts on communities. With agricultural expansion encountering the limits imposed by soil, climate, and distance, other ways of colonizing northern environments became more prominent. Visions of a domesticated north focused on caribou and musk oxen. A royal commission examined the potential, and in 1922 Wood Buffalo National Park was established, providing space for experiments in transferring and managing

bison. Conservation became an instrument of sovereign authority, exercised in a dispute with Denmark involving musk ox hunting on Ellesmere Island. Game reserves, the Northwest Game Act of 1917 and 1929, and the Migratory Birds Convention Treaty infringed on Indigenous hunting activities. Ideas from elsewhere guided these initiatives: ecological theory, sport hunting narratives, and the notion of Indigenous people as irrationally wasteful. The government also initiated a series of scientific surveys.[1]

Economic interests took much of the initiative in reshaping relations between people and the northern environment. In 1920, the discovery of oil at Fort Norman revived interest in northern minerals, two decades after the Klondike Gold Rush. Airplanes promised speed and access (displacing dog teams, canoes, and feet), and a new view of and control over the landscape. Industry sponsored surveys, the federal government provided maps and aerial photos, and discoveries followed: silver and pitchblende east of Great Bear Lake in 1932, and the following year, gold north of Great Slave Lake. Northern colonization gained a distinctive form: scattered sites of exploitation, lasting only as long as the market required. Industrialization (although constrained by geography and ecology) remade northern environments and communities, while drawing the region into global economic networks: exporting commodities, importing capital, machinery, and expertise.[2]

Four of our authors examine this era in northern environmental history. Jonathan Peyton presents a novel perspective on the Klondike, from the point of view of aspiring capitalists and miners in the Stikine region of northern British Columbia. Competing interests proposed railroads to the gold fields, and governments granted concessions, imagining an all-Canadian route. But these plans failed, as did those of most travellers. Yet these schemes—too readily dismissed as irrelevant—had historical significance. Surveys and practical experience eventually catalyzed new ways of linking the Stikine to the world. These failed railroads therefore had consequences, influencing perceptions of the region and its future.

As Andrew Stuhl explains, domesticating northern wildlife implied not only a new view of northern landscapes but a novel interest in scientific advice. In 1926, Robert and Alf Erling Porsild arrived from Denmark to begin the Canadian Reindeer Project. They travelled to Alaska to learn about its reindeer industry, and then surveyed the north to identify a suitable range. Their project itself became an experiment in both applied

botany and a new role for the state: managing the relations between northerners and their landscape. National policy was now expressed through an animal peculiarly suited to both the environment and the state's priorities. Their work illustrates how science could become the basis not only for surveying but manipulating resources, a task rendered feasible by reducing the landscape to just a few variables. Yet this conjunction of biology and policy would quickly pass, as changing northern state and scientific priorities rendered the reindeer project a relic of an earlier era.

Tina Adcock examines another aspect of the sense of change that overtook the north during the interwar era. Guy Blanchet and George Douglas—two seasoned northern travellers—worked as prospectors and geological surveyors, helping to build the new resource economy. Yet they regretted the passing of another north: remote from the modern world, where hard travel on land and water could preserve one's vital spirit. Their thoughts and experiences illustrate the complexity of responses to technological and environmental change: while many welcomed faster and easier travel and new economic opportunities, this also provoked disquiet, doubt, and a sense of loss.

Even as airplanes became essential to northern travel and transformation, aviators and their machines had to adapt to environmental realities. Marionne Cronin examines how pilots and other employees of Canadian Airways translated experience in the northern environment into technological change. Her view of northern aviation focuses on the technology itself, as material articulations of values, ideas, and power. Northern geography, including rivers and lakes, determined flying routes and landing sites, and weather and other challenges required airplanes to be modified if they were to work properly. The north did not simply receive, but actively reshaped technology from elsewhere.

Transformations and the Modern North

The Second World War and the postwar era transformed relations between humans and northern nature. Wartime imperatives remade the north into a military zone defined by access and mobility, evident in airfields, the CANOL pipeline, and the Alaska Highway. During the Cold War, the north remained a strategic environment, now as a bulwark between the

superpowers. By 1957 three radar systems, including the Distant Early Warning Line, had brought the region within the North American defence system. Canada also asserted its own view of the north as national territory through aerial photography, mapping, weather observations, and military exercises, and the northern environment defined the Canadian military's vocation as the winter warfare specialist within the Western alliance. Science became a strategic necessity: Cold War requirements accelerated collection of climate and terrain data, and encouraged the study of human responses to the northern environment. The Arctic Institute of North America promoted and coordinated research on both strategic and scientific priorities.[3]

Modernization and development soon joined strategic defence as northern imperatives. The Department of Northern Affairs and National Resources, created in 1953, focused federal efforts, as new highways and other links, as well as an expanding mining economy, tightened the region's ties to global markets while degrading local environments. The Geological Survey, the Fisheries Research Board, and other agencies redefined the northern landscape in terms of the resources demanded by these markets. Strategic and economic initiatives typically bypassed Indigenous communities, perpetuating a view of the north as an unoccupied space to be transformed in response to priorities formed elsewhere. Nevertheless, these communities experienced profound environmental and social change. Low prices disrupted the fur trade economy, and reports of hardship, starvation, and disease captured national attention. For the federal government, intervention became an imperative: replacing hunting and trapping with integration within the Canadian state and economy. Social, educational, and health services were expanded, communities relocated or consolidated into larger settlements, wildlife became subject to management, and Indigenous peoples were encouraged to take up wage employment. These initiatives marginalized Indigenous interests, knowledge, and values, and provoked reaction: anger and frustration over hunting regulations, and assertions of resource rights. By the 1960s, this program of social and environmental engineering had begun to unravel.[4] Three of our chapters provide insights into this period in northern history.

Amidst these transformations, the hunting and sharing of country foods remained central to Indigenous ways of life. So did uncertainty: wildlife migrations, and variations in climate and other aspects of the

environment, led to hunger, particularly when accompanied by disease. As Liza Piper explains, food has also been essential to relations between Indigenous communities and newcomers. Depletion of musk ox, caribou, and walrus by explorers, whalers, trappers, and traders justified conservation initiatives that complicated and often criminalized food gathering. Motivated by belief in the inherent deficiency of a non-agricultural diet, the mid-century state engaged in "food colonialism." Health initiatives guided by nutritional science, social programs (such as family allowances), and education encouraged northerners to adopt southern food ways: gardening rather than trapping, canned food in place of fresh meat, residential school cafeterias instead of family hunting trips. Piper demonstrates how food links bodies to environments, and people to the politics of colonialism.

Tina Loo begins her chapter with a witness to starvation. In the early 1950s, reports of desperation, including Richard Harington's photos of dying Inuit and Farley Mowat's *People of the Deer*, provoked the Canadian government to take responsibility for northern social conditions. Its mandate expanded to include transformation of the north into a modern society, populated by citizens amenable to administration. Concepts of sustainable community development that had gained currency elsewhere linked northern economic priorities to issues of power and poverty, with expert knowledge applied to improving peoples' lives. Loo presents this history of northern development as a history of hope. Yet these efforts also fell short of their promise: defining development as a technical matter, they failed to challenge the political and economic forces and structures that defined northern existence.

The DEW Line was the most ambitious element of the postwar militarization of the north. It was an unprecedented exercise: both materially, with construction equipment and workers transported to sites across the region; and technically, as devices and practices perfected in southern laboratories were installed in the north. As Matthew Farish and Whitney Lackenbauer explain, this fusion of science and security demanded a new form of expertise, embodied in the Western Electric engineers and technicians who conceived, assembled, and tested this complex system in an unfamiliar and challenging environment. Like dams and other projects, the DEW Line epitomized the ideology of high modernism, in which military and corporate forms of power are embodied in technology. But while

this system reconfigured the north as part of continental defence, the region imposed its own requirements: getting southern technology to work in northern environments demanded improvisation and local knowledge.

Environmental History and the Contemporary North

By the late 1960s, the future of the northern environment had become a matter of active debate. Some foresaw rapid development, especially of its energy resources, and continued integration into global markets. In 1961, the Canada Oil and Gas Land Regulations set the terms for petroleum exploration. Activity expanded after 1968, when oil was found in Alaska, raising hopes for geologically similar regions in Canada, including the Mackenzie Delta/Beaufort Sea and High Arctic regions. Hydroelectric projects in British Columbia, Manitoba, Quebec, and Labrador, and oil sands development in northeastern Alberta, illustrated the provinces' belated interest in their own "forgotten" norths. They also testified to how many now viewed the north as an energy-rich hinterland—a prospect welcomed in Ottawa and the provincial capitals, but one that aroused concern and controversy elsewhere. Protection of the northern environment became a national issue, encouraged by both the wider emergence of environmentalism in Canada and elsewhere and by specific concerns about threats to "fragile" northern ecosystems. These concerns also testified to the influence of science on views of the northern environment. Although this notion of a fragile north soon faded, by the 1990s global change, including contaminants, depletion of stratospheric ozone, and especially climate change had begun to dominate scientific perceptions of this environment.[5]

For many, however, the assertion of Indigenous authority over land, water, and wildlife became central to their vision of the future of the north. Land claim negotiations and self-government agreements provided opportunities for Aboriginal people to regain authority over land and resources, restoring ties between place and livelihood ruptured by state interventions. By 1973 Dene, Métis, Inuvialuit, and Inuit had formed representative organizations, initiating a dramatic political evolution rooted in a longer history of resistance to the state. New resource management institutions drew on both scientific and Indigenous knowledge, including a

view of northern landscapes not as uninhabited wildernesses but as social and cultural systems.[6] Aboriginal environmental politics have continued to evolve, through activism, legal affirmation of treaty rights, development of co-management arrangements, and the assertion of Indigenous knowledge. Evolving views of the relations between people, economies, and the northern environment have also been important, including affirmation of the central role of hunting and food gathering in Indigenous communities, and the place of Indigenous people in circumpolar environmental affairs.

Five chapters examine this era in northern environmental history. We begin in northern Quebec, where a lengthy history of exploitation of furs, forests, minerals, and rivers has reflected the imperatives of both global resource demands, and, more recently, Quebec nationalism. Exploring the consequences of this history for people and the land, Hans Carlson takes us on his travels with the Cree. His companions' stories record the ties between place, livelihood, and culture, and their efforts to negotiate their past, present, and uncertain future. In 1975, the James Bay and Northern Quebec Agreement provided the legal basis for the Cree to pursue their way of life in terms of their own practices and knowledge. Development has nevertheless transformed their relations with the land, creating a new politics in which they have both adapted to and challenged change—in part by forming links with other places, as in 1990, when they brought their opposition to the Great Whale hydroelectric project to New York City, travelling via Odeyak (a canoe-kayak hybrid). These travels are also, as Carlson explains, an opportunity to reflect on the ties between personal history and the history of a place, stories of the past and present events, and memory, meaning, and the land.

From Quebec, we travel west to the Yukon. Land claims and self-government agreements under the 1993 Yukon Umbrella Final Agreement established Indigenous authority over much of the territory and its resources. As Paul Nadasdy explains, however, these agreements have also reshaped how people relate to the land, to animals, and to each other. Because they are based on territorial jurisdiction—the foundation of modern states—they have required Aboriginal people to think territorially: to become managers and to create bureaucracies framed in the language of maps. But in doing so they risk neglecting the social relations between

people and animals that once formed the basis of land-use practices, in effect securing their future at the expense of their past.

Mines have a finite lifespan, and scores of abandoned sites now lie scattered across the north—sixty-four in the Yellowknife region alone. Many still release contaminants, forming a toxic "landscape of exposure" with lasting environmental and social impacts. As Arn Keeling and John Sandlos explain, understanding this legacy requires linking the histories of labour and of landscape to form a perspective on mining more elaborate than the simple cycles of boom and bust. Such a view also accommodates distinctive features of the industry in the north, including remote locations and the presence of Indigenous people, whose ways of life render them more vulnerable to contaminants and to damage to local living resources. Today, rising mineral prices are encouraging efforts to reopen or remediate some mines. Keeling and Sandlos identify in these efforts the continuing influence of the past on the future of northern mining: when these "zombie" mines are brought back to life, so too are memories of the conflicts they once provoked.

Northern contaminants come not only from mines and other local sources, but from more distant places. In my chapter, I explain how these substances—including radioactive fallout, particulates, and pesticides and other persistent organic pollutants—have encouraged new scientific perspectives and methods, novel environmental and health initiatives, and a new relationship between Indigenous peoples, scientists, and governments. This is partly a story of surprise; the discovery of contaminants in northern ecosystems, animals, and food confounded assumptions about what "belongs" in the northern environment. While contaminants gave scientists an opportunity to extend their historical role as interpreters of the northern environment, Indigenous communities and institutions asserted their own perspectives on these substances and their significance to food, health, and knowledge. Contaminants thus provide an opportunity to examine the distinctive social dynamics and structures of northern environmental knowledge, and the material relations between the north and the rest of the world.

Images of melting sea ice have made climate change the most obvious link between the north and the rest of the planet. Emilie Cameron considers its implications for northerners, their livelihoods, and their "right to be cold." Climate science implies certain ideas about time, space, and

action: it focuses on the future, seeks prediction and adaptation, and assumes that local places are self-evident. It also implies that, however useful Indigenous knowledge may be in relation to these places, it has little to add to global perspectives. However, a more critical perspective on scale and knowledge can open up other ways of understanding northern climate change. One way is by encouraging an awareness of the history of climate science itself, including its formation in the context of colonization, and the local character of its "global" perspective. As Cameron explains, this awareness can also provide a basis for enabling northerners to contribute to a more inclusive understanding of the consequences of global change for the north.

These chapters examine episodes drawn from a century of northern environmental history. Lacking features familiar elsewhere—agriculture and settlement, industrialization and urbanization, roads and railroads—this can be challenging terrain for historians. Certain enduring questions have guided them—questions that relate to themes of interest to environmental historians elsewhere, but also raise issues distinctive to this region. For example, how has the northern environment changed over time as a result of natural forces or human activities? What has been the place of Indigenous people in human-environment relations in the north? What distinctive roles has the state played in northern environmental relations? How has technology influenced how people relate to the northern environment? What role has human experience played in these relations? How has knowledge both shaped and been influenced by these relations? How has movement—of nature, people, their products and ideas—been a factor in northern history? And finally, how have the identities of northern places and spaces themselves been formed?

Environmental Change

Changing northern environments today are commonly interpreted in terms of human impacts on the global environment, especially climate change. The place in climate models of ice, the Arctic Ocean, and methane released from permafrost, the role of ice cores in studies of the changing atmosphere, and assessments of impacts on endangered wildlife testify to how scientific interpretations of the northern environment

are contributing to our understanding of global environmental change. Its geopolitical and economic consequences—new sea routes and resource development opportunities, a "contest" for northern territory, impacts on local uses of sea ice and other features—testify to its social implications.

This novel image of an open and vulnerable north stems, in part, from the perception that the region has been insulated by its distance from industry and human populations—that it is, in effect, the last relic of a once pristine planet. However, while current global changes may be unprecedented, the north has known change across a range of scales and time periods since long before the current era. Dramatic fluctuations in animal populations—including caribou, as well as, famously, lemmings and the predators they support—are a distinctive feature of northern ecosystems, even in the absence of human activities. Environmental change itself has thus often been ambiguous, sparking debate as to whether specific instances are "natural" features of northern landscapes and wildlife or the result of human activity. In the 1950s, for example, apparent declines in caribou populations captured attention. At the time, many attributed this to hunting; yet, before and since, other explanations have been considered, including population cycles, changes in migration routes, and other human impacts, such as harassment by aircraft, fire, or mineral exploration near calving areas. Similar ambiguities have been evident in debates regarding fire: its origins as a natural phenomenon, in Indigenous firing practices, or in the intervention of outsiders—and whether fire inflicts damage on northern landscapes, or is a natural and normal aspect of northern environmental change, a distinction that has often had political implications.[7]

Indigenous people have also accumulated a history of change: hunting caribou and other species, with potentially significant impacts, or harvesting wood and manipulating fire to create optimum habitat for wildlife, including bison and moose. Nonetheless, the arrival of newcomers provoked unprecedented change. By the early 1900s, walrus and bowhead whale populations in the western Arctic had collapsed, with serious consequences for local human populations; other species also felt the impacts of the whaling industry, including caribou, polar bears, and musk oxen. Robert Peary and other explorers, as well as hunters supplying the musk ox robe trade, also depleted populations. These impacts reflected both economic imperatives and different views of nature. While Indigenous

peoples recognized ecological variability and distributed hunting activities accordingly, newcomers responding to the demands of southern markets tended to focus their harvesting in specific areas, depleting local populations. Diverse views of nature were also expressed in conservation initiatives, which, in seeking to manage or minimize change, often provoked it. The 1916 Migratory Birds Convention disrupted seasonal Indigenous hunting activities, while Kluane and other wildlife reserves excluded hunters from traditional territories. Experiments in stocking game—including bison in Wood Buffalo National Park and reindeer in the northwestern Arctic—affected landscapes, wildlife, and those who had traditionally relied on them.[8]

The war and postwar era witnessed a new order and scale of environmental change. The construction of the Alaska Highway left a disrupted and polluted landscape exposed to disease, sport hunting, fire, and development. Cold War activities, from building the DEW Line in the 1950s to training flights over Labrador in the 1980s, imposed additional impacts on local sites and regions. Mining development had diverse and often devastating consequences, transforming northern environments from the Klondike to the Yellowknife region to northern Ontario. These impacts were felt throughout the cycle of prospecting, exploitation, and abandonment, exhibiting the implications of changing mining practices. Prospectors, road crews, and trappers burned northern forests, often intentionally to expose the rock. In 1940, C. H. D. Clarke commented that "Fire is the thing to fear"—less because of concerns regarding forests, as in temperate regions, than because of its impacts on caribou. Mining wastes were dumped in lakes and their fish populations were depleted. More recently, seismic lines, oil spills, and tundra defaced with tire tracks have accompanied petroleum exploration, while dams have drowned rivers and forests, disrupted flow regimes, and released mercury from the soil. These consequences together testify to the distinctive environmental changes imposed by energy developments across the north.[9]

These developments also had indirect consequences, including new geographies of exploitation, production, and control. Newcomers affected certain regions more than others: coastal areas attracted whalers, and mineral-rich regions attracted prospectors. Other areas, including much of the eastern Arctic, tended to be bypassed. Development catalyzed regional transformation, as roads and aviation routes opened up new areas. In

the Klondike, and ever since, northern miners have displaced wildlife, which, combined with shifting patterns of subsistence, has affected the wellbeing of Indigenous people. The movement of agricultural species and diseases together formed a "broken frontier" of ecological imperialism, with consequences for both ecosystems and Indigenous communities. Efforts to adapt food plants and animals from elsewhere to northern conditions, while often unsuccessful, have sometimes had significant local impacts—as seen, for example, in the clearing for grazing of winter caribou habitat in northern Saskatchewan, with lasting consequences for the local Indigenous economy. Diseases have formed their own history of environmental and social change. A history of disruption of northern communities by pathogens, often in combination with hunger and other hardships, culminated in epidemics of influenza, measles, and other afflictions in the twentieth century, often brought north by military or industrial operations. In many communities, epidemics catalyzed the transition into the modern world, along with new economic activities, health, and social services.[10] This history has blurred the boundaries between nature and humans: environmental change has affected humans as much as other species; hybrid landscapes have formed in which people and their consequences touch every part of nature, and nature is present in every aspect of human activities; and northerners and the northern environment have shaped the effects of interventions such as community relocations and hunting regulations.

The Indigenous North

Northern Canada is an Indigenous landscape. Historians have described the relations between Indigenous ways of life and the northern environment: how people travelled, hunted, shared food, organized their communities, and formed knowledge about the world. Much of this study has been framed in the context of colonization: treaties, resource exploitation, expansion of education, health, and social services, community relocation and other aspects of the extension of southern authority into the north. Colonization has taken a distinctive form in the north compared to elsewhere in North America. Throughout this history, Indigenous people and newcomers have formed relations mediated by or with consequences for

nature. Early in the twentieth century, explorers like Peary relied on Indigenous technology and survival strategies. Fur traders formed economic relations with Inuit trappers, tying their wellbeing to factors beyond their control, including fluctuations in fox populations and foreign demands for furs. Official views on Indigenous people evolved over the decades: from encouraging traditional subsistence activities, to, by the 1950s, more firmly interventionist policies, motivated by the ambitions of an activist state, a declining fur trade, signs of destitution, and a tendency to view Indigenous people as wasteful and irrational. Wildlife conservation reworked hunting, food sharing, and other aspects of community life. Relocation, whether motivated by insecurities about sovereignty, conservation concerns, or the desire to avoid welfare dependency, disrupted relations with the environment. So did residential schools and resettlement of Inuit from camps to larger communities, illustrating how colonization merged environmental and social change.[11]

However, Indigenous people have not been passive recipients of colonization, but active participants in shaping the north and their place within it. Land claims and treaty negotiations, devolution of authority to territorial governments, legal decisions, co-management arrangements, and the planning of national parks and reserves have provided the basis for asserting authority over environmental relations, including hunting, fishing, and the regulation of development. To assert their claims, Aboriginal groups have had to demonstrate their indigeneity in particular places. In the 1970s, the Inuit Land Use and Occupancy Project showed how their hunting and travel experience could be translated into cartography, and Thomas Berger's Mackenzie Valley Pipeline Inquiry assembled testimony regarding the experience and meaning of landscapes. Energy projects have prompted changes in northern governance to be more consistent with Indigenous ways of life. For example, the James Bay and Northern Quebec Agreement was intended to ensure that Cree culture would continue, even while opening the region to hydroelectric development. This has also encompassed a reconsideration of the environmental impacts of development: not in terms of an imagined, pristine nature, but in relation to how people use and understand the environment, and equitable ownership and access to benefits. This acknowledges that country foods—caribou, seals, walrus, fish—remain essential in many northern communities, reinforcing the relevance of Indigenous knowledge and ways of life.[12]

Indigenous people have also had to work out relations with interests beyond their control, including industry, governments, and scientists. Their implications have been evident in, for example, land claims, co-management agreements, and other aspects of the long-term process of transferring political power to Aboriginal people. But while ensuring that hunting and other traditional activities can continue, these have also been reframed in terms of science, property, and bureaucracy, potentially undermining the ways of life they were intended to preserve. Indigenous knowledge still often carries less weight within management systems accustomed to quantitative models, particularly when their combination is seen as merely a technical task, neglecting the power relations that accompany knowledge.[13] Animal rights activism has undermined the sealskin and fur trades, fuelling distrust between Inuit communities and environmental groups. Other tensions have arisen regarding polar bears and claims regarding their status as an endangered species. Indigenous people have also asserted their interests internationally, including, as already noted, their opposition to the Great Whale Project; more recently, they have used circumpolar institutions to express their views regarding contaminants, climate change, and sustainable development.

The State

Throughout the twentieth century, the evolving state in northern Canada—its capabilities, roles, and objectives—has had consequences for people's relations with the environment. This became evident even in one of the state's primary roles: asserting territorial sovereignty. It has often had environmental dimensions: hunting regulations in the 1910s, military activities during and after the Second World War, mapping and aerial surveys, scientific activities (with scientists asserting a Canadian presence in the north), and the Arctic Waters Pollution Prevention Act of 1970. State efforts to reshape the northern economy have also had environmental consequences. In the 1920s, an emerging federal wildlife bureaucracy attempted to conserve and domesticate musk oxen and reindeer. In subsequent decades, support for resource development (through surveys, transportation facilities, and financial incentives) redefined the northern landscape as part of the national economy. Economic development became part

of colonization, as educational, health, and social services transformed communities, ways of life, and relations with the landscape and wildlife. These interventions, often justified in scientific terms, marginalized local customs and attitudes, advancing a view of species, especially caribou, as production units enabling efficient use of the northern landscape. In the 1970s, as environmental concerns became prominent, the state responded by extending the mechanisms of administrative rationalism into the north through regulations and environmental impact assessment.

The activities of the state in the north paralleled those elsewhere in Canada (albeit with, in the territories, the federal government acting in the place of a provincial government): partnerships with economic interests, formation of educational and social services, management of wildlife and other resources. All were aspects of the wider expansion of the state since the 1940s. In the north, as elsewhere, the state has also imposed boundaries on nature, and on particular ways of knowing, managing, and regulating. But the northern state has also exhibited distinctive features—the product of local history and geography: poor agricultural prospects, concern with territorial authority, dispersed settlements requiring transportation networks, and the presence of other agencies, such as the Hudson's Bay Company, the military, and the resource industries. Today, the state's relations with Indigenous communities through land claims, co-management arrangements, and novel approaches to managing national parks have exemplified the status of the north as a terrain of experimentation in governance.

Technology

As generations of historians have shown, people everywhere have used technology to live within, exploit, and transform nature. In the north, it has enabled survival, with Indigenous clothing, shelter, sleds, komatiks, and other objects and practices together forming a distinct technological tradition. This tradition's displacement by devices from elsewhere, even as the north has been colonized, illustrates how technological change has been tied to social and environmental transformation. Yet new technology could also support older traditions: snowmobiles have enabled hunters to continue their practices after moving to larger communities.[14]

But northern technology is more than tools. Indigenous fire-making and other practices, and, more recently, industrial equipment—airplanes, dams, buildings, and research instruments—have created new environments. This became especially evident in transportation technology; within little more than a generation, feet, canoes, and dogsleds co-existed with and then were displaced by airplanes. Airplanes and communication technologies distributed resource extraction, military operations, and other activities (and their impacts) more widely across the landscape, making distance itself essential to experiencing the north. Airplanes, aerial photography, and mapping also encouraged many to view the north as a resource-rich hinterland, lacking people and history, but legible and amenable to management—linking northern history to the global role of fossil fuels in the conversion of the natural world into resource commodities. Photography presented the north as an object of knowledge and as Canadian territory, overseen by an always-present state.[15] Technology has also enabled some to be almost indifferent toward the north, with adaptation replaced by self-contained environments equipped with "southern" amenities.

Technological change has not been an autonomous force, but one shaped by institutions, ideas, and the environment. Mining companies had adopted airplanes by the 1920s, but the Geological Survey only embraced their potential in the 1950s. A shift on the part of prospectors from using aircraft mainly for transport to developing aerial survey techniques required not only new instruments but new ideas about what counted as useful knowledge.[16] Throughout this history, the environment—rivers to follow, lakes to land on, frigid cold requiring special engine care—demanded adaptation and influenced the design of aviation networks. Technology generated demand for itself: as flying routes spread throughout the north, aviators and prospectors required topographic and geological maps based on aerial surveys. It also reinforced social and racial distinctions: for several decades, it was mainly white men who flew, installed radar facilities, and operated scientific equipment.

Experience

As environmental historians elsewhere have noted, nature is also known and formed through experience: what people see, sense, and feel through their bodies.[17] In the north, Indigenous and newcomers' ways of life and the consequences of colonization, technological change, and landscape transformation have been shaped by how people have experienced this environment. Indigenous people have done so through activities defined by the seasons: movement, hunting and sharing food, and raising families; through their relations with animals; and through their knowledge of the landscape. Colonization has been experienced through residential schools, wildlife management, and other interventions. More recently, experience with climate change has inspired novel perceptions of cold and ice that can no longer be taken for granted, together with nervousness about the prospect of unstoppable change. Links between experience and landscape have also been evident in the lives of newcomers. Some found extreme hardship; others, a sense of ease—contrasting experiences that often stemmed from intimacy with or distance from the northern environment. Experience has inspired diverse perceptions of the north: as a harsh, unforgiving terrain, a place inspiring feelings of wonder and a sense of the sublime, a pristine but fragile ecosystem exhibiting dramatic variations in abundance and productivity, or a stockpile of resources. This experience has been framed in terms of distance, time, or winter and other seasons, forming views of the north as a place of extremes that regulate human activities, including arrivals and departures.[18]

Historical change has been experienced in many ways. Through their experiences, northern miners established new connections to nature, even underground, as well as novel patterns of production and consumption, importing most of what they ate and producing only for export. Technological change was also experienced in many ways. Graham Rowley recalled his experience in the late 1930s in the British Canadian Arctic Expedition: "We had to live in the ways the Inuit had evolved, and to travel by dog team in land that was still unexplored. There was the excitement of the unknown and of finding what lay over the next hill."[19] In contrast, flying was described as a "profound leap into a new dimension," transforming time and space.[20] (But when this experience became routine, pilots, once the focus of romantic imagining and excitement, became

mere cogs in a large flying machine.) The significance of experience has also been evident in the history of northern science, including methods of travel and fieldwork. And, as noted below, experience has been tied to the evolving authority of knowledge. Even in the postwar era, northern scientific experience has been viewed in terms of adventure and heroic masculinity—of bodies and machines wresting knowledge from a challenging environment.[21]

Knowledge

Throughout northern history, knowledge has shaped how people and institutions understand and act in the northern environment. For much of the twentieth century, it has been a terrain for scientists—usually from elsewhere—accumulating knowledge across a range of disciplines. This history includes evolving scientific practices: surveys, experiments, and aerial photography. Northern scientists have accumulated an extensive record of field research, which we can interpret in terms of the history of field sciences—ecology, geology, wildlife science, oceanography, and climatology—in the north and elsewhere. These practices have implied novel ways of seeing and knowing. For example, aerial surveys demonstrated how technology combined with knowledge to impose a more distant, less intimate view of the north, emphasizing some landscape features while obscuring others.[22] The northern environment has itself influenced research topics, methods, and results, demonstrating the importance of place to scientific practices and knowledge. Some habitats, such as the Mackenzie Delta and "polynyas" (areas of ocean that remain free of ice), have attracted particular attention from scientists, remaking these places and their phenomena as objects of research. They have also tended to define the arctic environment itself as anomalous compared to temperate regions.

Ideas about what counts as knowledge in the north have also changed over time. One persistent question has been whether the north is distinctive: if knowledge and techniques developed elsewhere can be applied there, and whether knowledge from the north is valid outside the region.[23] A related question has concerned who can provide authoritative knowledge about the north. Claims to speak as an expert on the north were

once based on ample northern experience, and on exhibiting self-reliance, endurance, and the ability to use Inuit technology and ways of travel and survival. For much of the twentieth century, this knowledge was produced by RCMP officers (the "government's eyes and ears"), trappers, traders, and others who submitted reports regarding the abundance of wildlife and other matters of concern to the state, the Hudson's Bay Company, or other interests. Authoritative knowledge was defined as the product of individuals who had demonstrated endurance and self-reliance in the north—people like W. H. B. Hoare, who between 1924 and 1926 conducted the first government-sponsored study of caribou. But this relation between experience and authority was eventually undermined by new technologies and forms of knowledge: airplanes, scientific equipment, and theories framed in terms of scientific disciplines. Advanced training elsewhere—not arduous experience in the north—became the basis upon which one could speak with authority on northern matters. By the 1950s, northern knowledge had become the province of experts trained in the south, applying new theories and techniques: cosmopolitan knowledge triumphing over (albeit still drawing on) local knowledge. The aerial perspective itself became defined as objective and authoritative: a disembodied, disinterested view from above. Knowledge has linked northern Canada to the rest of the world. Imperial, continental, and international research networks, and disciplines that aspire to global relevance, have shaped scientists' questions, methods, and identities (as northern scientists, or as merely, say, ecologists or entomologists who happen to work in the north).[24] With their colleagues elsewhere, northern scientists, too, shared this postwar confidence in expertise as a source of rational and efficient solutions to social challenges.

In practice this has often meant that science has served as the sharp edge of southern intervention, imposing legibility, linking control over knowledge to control over territory. Science has been closely tied to the evolution of northern resource exploitation—as in, for example, the transition from managing the fur trade in the 1940s to managing wildlife in the 1950s, and the accompanying shift from Elton's Oxford ecology to North American wildlife biology. Other aspects of this evolution have included the shift from soil surveys in the interwar era to postwar geological surveys, and the emerging role in the 1970s of environmental science in administering resource development through surveys, impact assessments,

regulations, and public hearings. Even more recently, expertise in ice engineering, pipeline construction, and other activities specific to the region have given the energy industry the ability to operate in ever-more-difficult places, illustrating how science may not just implement but expand northern economic ambitions.

Close ties developed between science and northern administration, as federal agencies, including the Defence Research Board, the Canadian Wildlife Service, and the Fisheries Research Board, adopted a firmly scientific identity, with research embodying not only knowledge but policy. Other areas of expertise, including anthropology and nutrition, have further supported government initiatives. Science has also supported claims to the north as national territory. The presence of scientists asserted Canada's occupation of the Arctic, while during the Cold War "survival science" enabled the military to operate throughout the region.[25] In the early postwar era, ecologists claimed that northern animal populations provided an opportunity for Canada to make a distinctive contribution to science, while physicists made a similar assertion regarding ionospheric research—each group capitalizing on Canada's "natural advantage" in northern research.[26] Through such means, scientists contributed to asserting Canada's cognitive sovereignty over its north, reinforcing the principle that knowing it meant owning it. Yet, more recently, ice core studies and analysis of the role of the Arctic in global climate have redefined the north as a site for constructing not only national, but global knowledge. Knowledge has also often been contested. Scientists have acted as policy advocates, challenging dominant interests and assumptions, asserting the urgency of protecting "fragile" northern ecosystems, debating forest fire control, or experimenting with community-based research.[27] During the Mackenzie Valley Pipeline Inquiry in the 1970s, knowledge helped define opposing views regarding northern resource development, exemplifying how struggles over northern futures have often turned on the politics of knowledge.

Indigenous knowledge and practices have been central to these issues of northern knowledge and expert authority. The relation between science and Indigenous knowledge has been one of the more contentious issues in the politics of northern knowledge. Scientists have asserted evolving and sometimes contradictory perspectives on Indigenous knowledge. Early in the century, explorers relied on Inuit knowledge and technology

to survive; surveyors and mapmakers "discovered" the north by translating what Indigenous people already knew; and conservation initiatives, like those of the Hudson's Bay Company, drew upon Cree knowledge. But as scientists began to serve as agents of colonialism and modernization, they often marginalized Indigenous knowledge while reframing northern homelands as territories ready for exploitation. For example, on northern lakes such knowledge—though essential to mining and transportation—was dismissed, while science justified an industrial fishery that depleted fish populations and displaced local fishers.[28] Scientific attitudes have often been at odds with Indigenous values, with wildlife conservation influenced by racial stereotyping, the "sportsmen's code" of ethical hunting, and the view of wildlife as a "crop" to be managed. Scientific techniques have been similarly contentious: Dene and Inuit have viewed counting, tagging, radio collars, and the handling of live animals as disrespectful.[29] Indigenous knowledge has itself been an object of research, with the north serving as a laboratory for anthropologists. However, scientists and holders of Indigenous knowledge have also created opportunities to collaborate respectfully—in land claims research, land and wildlife management, and other fields.

Indigenous knowledge has also provided a new way of understanding northern knowledge by enabling a post-colonial history of science, in which Indigenous perspectives provide not just data but a new way of understanding history. This encompasses distinctive ways of understanding the environment and history through community-based research, storytelling, and oral traditions, and collaboration between academics and Indigenous peoples. This has required reconsidering ideas considered fundamental to Western society: of humans as uniquely rational, sentient, and distinct from nature, and of knowledge as the product of specialized inquiry. Instead, humans are thought to share the landscape with other sentient species, linked by relationships of respect and reciprocity, with knowledge gained through experience and passed from generation to generation.[30]

Mobility

Movement has been essential to northern places and lives. It is intrinsic to northern nature: migrations of birds, whales, caribou, and other species; currents of air and water that link the north to global climate systems; substances put in motion by humans, including radioactive fallout and other contaminants. Movement has been similarly essential to northern human history: long-distance Indigenous trading relationships, and voyages of exploration, colonization, and exploitation, as people and ships travelled to the north and resources were shipped out.[31] Northern history thus echoes the significance of mobility in environmental history: the flows of people, species, materials, capital, knowledge, and influence that have formed the basis for the relations between cities and regions, imperial networks, resource economies, and global institutions.

Throughout the twentieth century, markets and other economic institutions have compelled movement. The Klondike Gold Rush was founded on the mobility of ideas about monetary policy and wealth, risk, and opportunity; the networks of transport and mercantile exchanges that carried miners north and supplied them also linked the region to more distant natures and economies. A decade after the rush, the Mackenzie region was busy with whalers and fur traders responding to global demand, with dramatic impacts on local species and people. As the north became embedded within the global economy, transportation, commercial, and administrative networks formed an "industrial circuitry" across the north. During the Second World War, the military mobilized the north with roads and airfields, and radium was shipped from Great Bear Lake to Manhattan Project facilities. In the postwar era, modernity itself became mobility and technology was celebrated for eliminating perceptions of the north as remote and inaccessible—that is, as immobile. Networks of transport and communication have been linked to the spatial extension of political and economic power, with airplanes, radio, even the Alouette satellite essential to incorporating the north into the nation. Power became defined in terms of mobility, exercised by relocating Indigenous people, or by detecting and restricting the movement of those defined as outsiders—hunters from Greenland in the 1910s and Soviet bombers in the 1950s. Mobile ideas have had other consequences: the concept of citizenship motivated interventions in the lives of Indigenous

people; and, more recently, environmental and animal rights activism has affected an Inuit economy already tied to global fur and sealskin markets.[32] Knowledge from elsewhere, its mobility underpinned by the institutions and disciplines of modern science, has displaced less mobile, "local" forms of knowledge, but the emerging status of Indigenous knowledge as both local and mobile has also become evident in circumpolar environmental negotiations.

Making Northern Places

Definitions of the north are many and varied. The ideas they represent about this place—where it is, who is there, its past and future—can help guide us as we navigate northern environmental history. Canadian governments have long defined the north merely in terms of degrees of latitude: the latitude 60° north that marks the southern boundary of the territories, or the mapping of "provincial norths" as the regions above 55° north. Of course, these administrative conveniences do not correspond to physical conditions; geographers have, accordingly, proposed classifications of regions within the North, such as the Arctic and Subarctic, or Louis-Edmond Hamelin's mapping of extreme, far, middle and near norths, and his construction of an index of nordicity. Other definitions of the North in terms of its "essential" characteristics have often reflected perspectives prevalent during particular historical episodes. Some have been framed in relation to geography and ecology, or social interests and identities, or in terms of the north as an imagined space in literary, artistic, and cartographic works.[33]

Many observers have described the north in terms of its physical features and species: boreal forest, permafrost, tundra, ice; caribou, polar bears, narwhals, walruses. Seasonal cycles—dark, cold winters, brief but brilliant summers—define Inuit rhythms of moving, harvesting, and socializing. Extreme conditions and great distances have inspired images of the north as difficult and dangerous, challenging explorers, and, more recently, the energy industry. Scientists have drawn a variety of boundaries between north and south, defining it in terms of climate, the tree line, permafrost—or even, in ionospheric study, in terms of a line running through Ottawa, making nearly all of Canada part of the north. They have

also noted distinctively fragile, relatively unproductive ecosystems that are slow to recover from disturbance, animals that exhibit dramatic cycles in abundance, and mass caribou migrations. These observations reflected their view of the north as extreme, an anomaly in relation to "normal" temperate environments. Some of these generalizations, like those regarding "fragile" ecosystems, have also become matters of debate.[34]

The north is not just a physical but an imagined space onto which people have projected ideas and ambitions, often in the service of particular interests in the south. Many have traced national identity itself to the northern climate and environment, calling on Canadians to embrace their nordicity. It has also often been defined as the region exempted from national development: a marginal space beyond the frontier of agricultural settlement and the one remaining region in which Indigenous people constitute a majority. But above all, ideas about the north have always been subject to change and challenge, exhibiting the shifting nature of colonialism itself. Some imagined here a pastoral economy based on those species most suited to this landscape, reindeer and musk oxen—that is, until prospectors redefined the north in terms of its geology. Others found freedom and opportunities for strenuous, masculine adventure—an antidote to southern civilization, or even (inspired by beliefs regarding the environment, health, and racial and cultural superiority) its rejuvenation. Some perceived a "mysterious north," the site of inexplicable phenomena such as mass migrations by lemmings and uncountable herds of caribou. By the 1950s, other ambitions had come to the forefront: to survey the north and make it legible, and to control, rather than adapt to, this "fickle" environment. Cold War strategists saw the north not as a place but an exposed flank, its vast spaces safeguarding southern cities. Economic interests saw a resource hinterland, viewing northern water and minerals only in terms of the materials themselves, and not their social context. Environmentalists considered the north the last Canadian wilderness, a pristine space requiring protection. The distinctive relationship between Quebec and its north, with the development of James Bay becoming a nationalistic imperative, illustrates the significance of provincial contexts to northern places. Different views of the north have implied contrasting economic and political interests and preferences, as Thomas Berger illustrated by invoking visions of the north as a homeland and as a resource frontier. Contradictory perspectives have been evident even within particular groups,

such as wildlife managers, who combined anti-modernist sentiments with faith in bureaucratic management. Perceptions of the relations between the north and elsewhere have also been important: once an outpost of the British Empire, then integrated within North America and dominated by the United States, and most recently part of a circumpolar region defined by the Arctic Council and other agencies.[35]

While it is helpful to distinguish these distinct themes in northern environmental history, it must also be remembered that they have always been closely related. Environmental change has been tied to the activities of Indigenous people and the state; technology has shaped experience in the north; and knowledge has had diverse material consequences, while contributing to ideas about northern places. Mobility of many kinds has been a consistent presence throughout. The following chapters demonstrate these relations in particular times and places. In our conclusion, we will also return to these themes, to consider how these chapters advance our understanding of the environmental history of northern Canada.

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