

1725), is egregious enough that the publisher of the book should fix it in future editions by simply removing the word “Petrine.”

In the end, however, this minor deficiency does not detract significantly from the overall value of the book. *Settlers on the Edge* is a first-rate monograph that provides a sophisticated analysis of the experience of migrants to the north.

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***The Industrial Transformation of Subarctic Canada.* By Liza Piper. Vancouver: UBC Press, 2009. xviii + 403 pp. Illustrations, appendices, glossary, notes, bibliography, index.**

In this book Liza Piper captures with detail and insight an essential episode in northern environmental history. Between 1920 and 1960 the lakes of northwestern Canada—Lake Winnipeg, Lake Athabasca, Great Slave Lake, and Great Bear Lake—were thrown open to exploitation. Miners, fishermen, scientists, and pilots flowed north, imposing an imperfect colonization. Aboriginal treaties and the exercise of government and scientific authority cleared the way for a new economy based on the export of living and nonliving wealth: fish, gold, and uranium. One consequence was a transformed environment: mining wastes dumped in lakes, depleted fish populations, forests reduced to charcoal. But this was not just a story of despoiling a fragile landscape. Even as newcomers tied the region to the rest of the world, they were forced to adapt to many environmental challenges, from harsh weather to spring breakup. In this history the lakes themselves were essential participants, serving and shaping these efforts, functioning as travel routes, resources, and waste repositories.

In telling this story Piper provides an immensely valuable perspective not just on northern history, but on the practice of environmental history itself. Her book joins other recent accounts of the environmental history of western and northern Canada by Tina Loo, Kathryn Morse, John Sandlos, Bill Turkel, and others. Piper, like her colleagues, pays particular attention to evolving social and scientific ideas, and to the shifting relations and conflicts between government, private interests, and communities. In doing so, she draws on a remarkably wide range of sources, both published and archival. She also exhibits an impressive sensitivity for the meanings embedded in both action and language. But where she especially excels is in situating this history in a specific place, and in invoking its material

basis in living organisms: lakes and rivers, water and ice, earth and fire. This history has dirt under its fingernails.

Colonization

Industrialization, Piper reminds us, expands most readily across prepared ground. The federal government, acting in concert with industry, played a central role in these preparations, surveying aerial routes and waterways, and promoting construction of transportation infrastructure, including airfields and aircraft, tugs and barges. Equally important was a new legal landscape. Treaties 5, 8, and 11 permitted new environmental, economic and cultural relationships to emerge on the lakes and their surrounding landscapes. As Piper explains, these arrangements enabled the region's resources to be redefined as of national and not merely local significance—a transformation that involved the imposition of state authority, a scientific framework imposed from outside, and the demands of an international market. The contrast with the southern Prairies is interesting; instead of permanent communities based on agriculture and linked by railways, northern industrial sites were linked by air and water, and existed only as long as their products remained in demand.

Some of the implications of this twentieth century colonization became especially evident in conservation initiatives. Environmental historians have amply demonstrated that conservation has often been about more than sustainable resource use. Preferential access to resources for some at the expense of historically marginalized groups has been important and social inequalities have been perpetuated through regulation of resource use. Piper extends this theme, demonstrating the impact of new ways of knowing and using nature. Conservationist ideas and language encouraged not just controls on exploitation, but the imposition of industrial practices, and the marginalization of Aboriginal fisheries. This was a process rooted in place, with industrial and Aboriginal fisheries assigned to different areas within the lakes. Supposedly intended to protect the local fisheries, in practice this segregation undermined it, while excluding Aboriginals from the commercial industry. It also protected the industrial fisheries—an outcome justified by the argument that small producers posed the greatest risk to fish stocks. Yet residents contested this imposition of external authority. By asserting their own claims to the Great Slave Lake fishery, they set a precedent for eventual Dene participation in local resource management.

Networks

Industrialization demanded movement of people, knowledge, resources, and power. This movement, in turn, required networks of roads, waterways, and flying routes tying the lakes to each other and to the rest of the world. The history of these networks is, in part, a story of technological change from dogsleds to aircraft and, in fuels, from fish (as dog food) and wood to oil—a transition, as Piper shows, often portrayed in photos of old and new technologies placed side by side. These networks also opened the region to outside economic, political and cultural forces. In the 1930s—a boom time in the North, if nowhere else—global demand for gold and uranium accelerated expansion of these networks, with the additional consequence of enabling industrial fisheries to reach more distant lakes. The Second World War, and then the Cold War, tied the region even more tightly to distant centres, particularly as uranium became a strategic necessity. But these networks had consequences beyond the flow of materials. They also served as conduits for both knowledge (including techniques of geological exploration and approaches to understanding ecosystems and lakes developed at Oxford and in Europe and America) and for newcomers; experts and workers poured through them into the region, or left just as quickly in response to opportunities elsewhere.

As Piper explains (drawing on Harold Innis and other scholars of Canadian transportation and communication), these networks are essential to understanding development itself as an interaction between local circumstance and outside forces. Roads, waterways, and flight routes embody motion and connections, themes central to the environmental history of this region. Extracting resources required severing the links between fragments of nature and their environment, setting these fragments in motion, and establishing new connections, defined in terms of technology, economic value, or state authority.

Adaptation

But these networks could also be ruptured. Some things remained beyond control, not least the seasonal transformations of water and ice. Railroads (the Hudson Bay Railway excepted) were unsuited to this landscape; small ships, barges and aircraft were better able to accommodate storms, freeze-up, break-up, flooding, and other challenges. The changing environment forced its way into newcomers' awareness, instilling surprise and anxiety, confirming expectations of a rash and unpredictable wilderness. It also demanded adaptation. The lakes especially exhibited the importance of

change and variation, and of the processes by which newcomers adapted industrial and transportation techniques to the northern environment.

This is not, then, simply a history of humans dominating nature. Of course, mining had many damaging consequences, with the lakes serving as convenient repositories for whatever industry no longer required. Yet industries were also forced to adapt. Piper constructs a portrait of industrialization as a process that is sensitive to place, a process that erases some links between humans and nature, but also creates new material relationships that integrated culture and nature. This was evident at several scales—from the presence of water and living matter within mineshafts, to the industrial geographies that extended across the region. Ultimately, the boundaries between industry and nature were blurred, as local resources such as wood, gravel, ice, and moss were used in mining and fishing, thereby creating unexpected amalgams of living and non-living materials.

Knowledge

Exploitation and adaptation required knowledge. Piper provides a finely textured analysis of the role of knowledge in the history of this region. She demonstrates how aerial surveys and mapping distanced observers from the landscape; how geological study emphasized spatial patterns, as mandated by resource survey requirements; how fisheries scientists struggled to apply general theory to local conditions; and, more generally, how science, with its aura of objectivity, reinforced state authority. Technology, especially, contributed to the imposition of new scientific perspectives. Airplanes and aerial photography privileged economic resources, reinforced Canada's national claims, and dismissed the earlier human history of the region, while new prospecting techniques, including airborne electromagnetic and Geiger surveying, wrenched features of particular geological interest out of their local context.

The political implications of northern knowledge became particularly evident in the evolution of relations between colonial authorities and Aboriginal peoples. Just as it did for northern explorers like Mackenzie and Hearne, indigenous knowledge proved essential to mining and northern transportation. And yet this knowledge was also often dismissed. Thus, with Aboriginal fishers viewed as prone to wasteful practices, and scientific knowledge providing an "objective" and reliable basis for management, state authorities were slow to respond to local concerns regarding overfishing. Instead, science, ostensibly in the service of conservation,

proved able to justify an industrial fishery that extracted wealth at the expense of local domestic fisheries and the fish populations themselves.

Piper also considers how knowledge practices reflected both circumstances specific to this region (including the support of postwar resource surveys and federal agencies such as the Fisheries Research Board) as well as more cosmopolitan factors, such as scientists' ambitions to apply concepts developed elsewhere. For example, fisheries scientists used theories about the shape and chemistry of lakes to derive principles for predicting fish populations and levels of sustainable exploitation. These theories were based on the work of limnologists that had studied very different environments in Europe and the United States, and on the ideas of Oxford ecologist Charles Elton (although here Piper exaggerates, as have other historians, Elton's influence on postwar Canadian field biology). Piper thus extends our understanding of the geography of northern knowledge, including the role of the north as a kind of experimental ground for applying science from elsewhere and illuminates the cognitive colonization that paralleled political and economic relations between north and south.

Place

This history is above all a history of a place in which lakes form the defining element. These lakes served as the objects of industrialization—openings in the landscape that were essential to imposing a new order of exploitation. They are also the windows through which this exploitation, and its consequences, can be observed. Situating the history of northern Canada in this way illuminates another dimension of industrialization: that it was not necessarily the industries themselves that were resisted by residents, but the geographies of exploitation, production, and control they implied. The significance of spatial patterns, in turn, underlines questions that should be of interest to all northern historians—questions about how the North itself has come to be defined as a distinct region, and how its relations with the rest of the world have been constructed through diverse social and cognitive processes. Piper's remarkable book will prove essential to work on both questions.

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