

The Government of Natural Resources

Science, Territory,
and State Power in Quebec,
1867–1939

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FOREWORD

Science in Action

Graeme Wynn

CANADA WAS “*Made Modern*.” According to an important recent collection of essays edited by historians of science Edward Jones-Imhotep and Tina Adcock, this means two things.¹ First: the country brought into being by the British North America Act of 1867 was shaped by a specific set of late-nineteenth- and early-twentieth-century circumstances. These included the rise of the nation-state as a territorial and social entity; a growing conviction that the world could be improved by human intervention; the transformation of subjects into citizens; the development of new ways of administering society and space; a reorientation from the past to the future; the acceptance of the market as an arbiter of value; the embrace of rationality as an organizing principle for human affairs; and a broad liberal commitment to individualism, personal freedom, and formal equality. Together, these traits constituted a “will to modernize” – an injunction to use the human and non-human resources of the nation to realize its potential.²

Second: modernization, as a process driven by the spirit of improvement, is ongoing, a goal to be pursued, rather than a destination to be achieved. As such, it implies continuing engagement. Even places that have “always been modern,” as signified above, have work to do if they aspire to remain modern through time. In a country as large and as diverse as Canada, the challenges and results of this work were, and are, deeply uneven, especially as the country that came into being in 1867 was no *tabula rasa*. Indigenous people had occupied much of this northern territory for millennia before the mid-nineteenth century. Their ways of life, their traditions, their spiritual and intellectual beliefs, their connections with the environments in which

they lived were, generally, radically different from those of the newcomers, and the worlds of which those people were a part.³

Nor were “newcomers” of a piece. Many claimed several generations of familial connection to the land they occupied in 1867. Others counted their time in the new confederation in weeks or months rather than years. Many things differentiated them, beyond the length of their exposure to Canadian air. Some recent arrivals were refugees from deeply entrenched, fundamentally conservative, but crumbling and threatened settlements on the agricultural margins of the United Kingdom; some were fleeing urban poverty or the threat of immiseration as industrialization undermined the bases of their livelihoods; yet others – through birth, education, occupation, curiosity, or chance – were fully cognisant of the intellectual, commercial, and political currents quickening the mid-nineteenth-century Atlantic world.⁴ In some Canadian settings, settlers clung to remnants of old-world traditions; in others, immigrants seemed to abjure their pasts with abandon.

Modernity was complex, shape-shifting, evolving; with change at its heart, it could hardly be otherwise. Changes precipitated by the commitment to progress had radically different impacts, across space and through time; they were variously embraced and/or resisted; and they left markedly different, “often inequitable imprints on gendered, racialized, classed, aged and aging, and regionalized bodies.”⁵ Study after detailed study of early Canadian development has shown (as contributors to *Made Modern* recognize) that “learning to be modern could be difficult, stressful, and even frightening,” and that some resisted the threat it presented by adopting behaviours that later historians have characterized as “anti-modernist.”

Stéphane Castonguay’s examination of the ways in which science, territory, and state power became entangled in the administration of Quebec’s natural resources before the Second World War both narrows and broadens the wide-ranging conversation about science, technology, and modernity broached in *Made Modern*. Although Castonguay’s book is replete with comparative allusions to other provinces of Canada, its focus is resolutely on Quebec. It is also, and equally resolutely, concerned with the exploitation of that province’s “natural resources” – its minerals and trees, its fish and game, and its agricultural potential.⁶ Both books engage repeatedly with science, technology, and the environment, but they tend to do so in different ways, using different vocabularies and working at different scales. These differences are due, in part, to the different provenances of the two books, one the work of a single author, the other a collection of discrete contributions. But there is more to it than this. Published originally in French, in 2016, *The Government of Natural Resources* bears the identifiable traces, even in translation, of a distinctive style of discourse; it draws on ideas less familiar to anglophone

than to francophone scholarship; and its arguments turn on concepts that warrant brief contextualization here. Foremost among these, perhaps, is the widely, but variously, used term “technoscience.”

Seeking a novel and intelligible framework for understanding historical patterns common to science, technology, and medicine in the West since the Renaissance, the English historian of medicine John V. Pickstone focused on their ways of knowing the world: natural history as description and classification; analysis as the physical or intellectual taking apart of objects or systems to identify their elements; and experimentalism as the rearrangement or recombination of elements to produce new entities.⁷ Although Pickstone saw natural history, analysis, and experimentalism as broadly sequential ways of knowing, he was at pains to point out that, over time, each new, dominant form *displaced* (reduced the importance of) rather than *replaced* its predecessor; science, technology, and medicine are typically plural enterprises.

Alongside this tripartite classification, Pickstone placed “technoscience.” Although he drew upon Bruno Latour’s formulation in his 1987 book *Science in Action*, his use of the term was less radical than Latour’s. Both scholars take technoscience to mark the intricate entanglements of science, technology, and society, but the latter synthesizes ideas developed by the philosophers Gaston Bachelard in France and Gilbert Hottois in Belgium with a raft of contemporary work in science and technology studies to dissolve the distinction between people and things, challenge the divide between nature and culture, and deem humans, microbes, and machines “actants” equally capable of exercising power and shaping scientific networks. Pickstone generally used “technoscience” in a more restricted sense, to emphasize the synergetic collaborations of government, academic (scientific), and commercial interests.

Intent on making his point about the potential significance of such collaborations, Pickstone located the apogee of technoscience in the “dense intertwining of universities, industry and government” in massive organizations or projects, and exemplified these with the CERN high-energy particle accelerator in Geneva or, more broadly, by reference to the “military-industrial” and “medico-industrial” complexes that have dominated the production of scientific commodities (as well as academic and industrial worlds) through most of the last seventy-five years. But Pickstone the historian was quick to acknowledge that such collaborations have antecedents. Early voyages of exploration sponsored by monarchs, commercial adventurers, or the state (think of Queen Isabella and Columbus, the Dutch East India Company, or the voyage of the *Beagle*) were technoscientific enterprises with inventorial purposes. More concertedly, academic, government, commercial, scientific, and technical interests came together in nineteenth-century Britain to address,

through analysis and experimentation, difficult challenges of steamship building and transoceanic telegraph communication.⁸ Until the middle years of the nineteenth century, however, technoscientific networks “were still very marginal to government, to the direction of work in most universities, and to most industrial companies.”⁹

Collaborations between science and technology have certainly been integral to the development of Canada. The first fishermen, explorers, traders, and colonizers to reach the northeastern foreland of the American continent depended upon the (then) sophisticated technology, refined through the ages, of the sailing vessels that carried them across the Atlantic, and the nascent science of celestial navigation. As they entered the territory, they borrowed Indigenous technologies (most famously the snowshoe and the canoe), drew knowledge from Indigenous informants, and used early scientific instruments such as the astrolabe and the quadrant to inscribe their developing, increasingly systematized knowledge on maps and charts. By the latter decades of the eighteenth century, new technologies (the chronometer, the sextant) allowed more accurate measurement of the world. Whether their knowledge was represented in maps, books, sketches, collections, or the accumulation of a more intricate awareness of local surroundings, people knew the territory that would become Canada through this extended period as natural historians. They sought to inventory, describe, and classify what they had. Yet insofar as state and commercial interests were involved in this project (think of the support France offered explorers and seigneurs or of the activities of the Hudson’s Bay Company), those inclined to broad conceptualizations might discern nascent forms of technoscience at work.¹⁰

Pickstone’s ways of knowing also help to illuminate Canadian technoscientific history. The natural history impulse persisted well into the nineteenth century. We find it expressed in *The Canadian Naturalist: A Series of Conversations on the Natural History of Lower Canada*, a book published in 1840 by Henry Gosse, based on his time as a farmer in Compton, Canada East, where he was known as “that crazy Englishman who goes about picking up bugs.”¹¹ It drove the specimen-collecting enthusiasms and countryside excursions of countless members of natural history societies that flourished across the country in the second half of the century; indeed, the Natural History Society of Prince Edward Island, formed to awaken “interest in the study of natural objects,” came into being as late as 1889.¹² When the Geological Survey of the United Provinces of Canada was founded in 1842, its mandate was to furnish “a full and scientific description of the country’s rocks, soils, and minerals, to prepare maps, diagrams, and drawings, and to collect specimens to illustrate the occurrences.”¹³ This remained an important commitment of the Geological Survey of Canada long after Confederation,

as its employees fanned out to “read the rocks” across the new nation’s territory.¹⁴

Even in the 1840s, however, the first director of the Geological Survey, William Logan, deployed the analytical methods he had developed in Wales to produce accurate cross-sections of strata beneath the surface and to infer the ages of rocks.¹⁵ Canadians also began to alter the hydrology of rivers and streams, experimenting in hope of increasing the runs of salmon in dry seasons; a couple of decades later, Canadian fish hatcheries began to gather and fertilize fish eggs, using techniques developed in Germany and refined in France in the eighteenth and nineteenth centuries, to restore stocks and introduce fish to new lakes and rivers.¹⁶ In the 1860s, Samuel Wilmot, a farmer, merchant, and local government official in Newcastle Township, Canada West, built several wooden troughs in the basement of his farmhouse and piped in water from nearby Wilmot Creek to hatch the spawn of four salmon. With Confederation, the federal government began to support his efforts, and in 1868 he became a fishery overseer in the Department of Marine and Fisheries, with special responsibility for his hatchery.¹⁷ Within ten years, Wilmot claimed that his expanded and elaborate labyrinth of ponds and raceways – intended to boost the commercial salmon fishery – was “the most complete and systematically arranged fish-breeding establishment on the continent.”¹⁸

This was no small thing, and in its combination of science, government support, and commercial orientation, it offered a portent of things to come. Defining technoscience as “the interlacing of science and technique, both in artifacts and in the networking of actors” (Introduction, note 9), Castonguay focuses his inquiries, in the pages that follow, on this period of emergent “inventive, intense and self-perpetuating synergies” among academic, industrial, and state interests. Although his work certainly considers the roles of science and government in shaping nature, and the ways in which the state and its agents defined, inventoried, and extracted natural resources, he eschews extended engagement with Latour’s concerns about the dissolution of the nature-culture divide, hybridity, and so on.¹⁹ His interest – as he has written elsewhere – is on that period when “government leaders wanted to enlarge and diversify the state apparatus to intervene more directly in the nation’s economic affairs,” and scientists convinced decision-makers that their research “was the key to national prosperity by solving problems related to industrial production and resource conservation.”²⁰

In Canada (as in much of the rest of the developed world), these commitments flourished between 1870 and 1939, years marked by the rapid advance and growing institutionalization of science, heated debates about the nature and purpose of education, and concerted efforts to extend and

consolidate the administrative powers of the state. As Britain and other European countries established new universities and polytechnics, and created departments and degrees for the advancement of scientific knowledge and training, some Canadians began to question the practicality of prevailing, traditional, liberal arts models of education rooted in religion and metaphysics.

Setting the terms of a discussion that would transform universities and Canadian education in the decades to come, in 1870 J.W. Dawson, principal of McGill University, described the move from “mere apprenticeship” in the industrial arts to advanced intellectual training in science as “the greatest educational movement of our time.” Mathematicians, physicists, chemists, botanist, zoologists, and geologists were appointed piecemeal in universities across the country in the decades that followed. Many began in departments of Natural Science; the first chemists at McGill University were in the medical school, and Chemistry only attained departmental status in that institution in 1908. Meanwhile, provincial school systems wrestled with the challenges of training students in agriculture, mechanics, and manufacturing. On the eve of the First World War, a Royal Commission outlined a blueprint for education in schools combining “intellectual development with preparation for entrance into industrial society,” but policy-makers fumbled the implementation of thoroughly modern curricula for technical education.²¹

In a country still heavily dependent upon the extraction of natural resources, instrumental views of science prevailed. It was valuable insofar as it facilitated economic growth. To this end, the University of Toronto appointed a professor of agriculture in 1852 – but his tenure was short-lived as practical farmers resisted book learning. A few years later, the *École d’agriculture de Sainte-Anne-de-la-Pocatière* opened its classrooms and model farm in the district of Kamouraska; some 573 students enrolled between 1859 and 1912, but the college awarded only 16 diplomas and 27 certificates of aptitude.²² By the third quarter of the nineteenth century, there was more inclination to accept science in action as a spur to productivity. The Ontario School of Agriculture was established in 1874 and was followed by similar establishments in Nova Scotia (Truro, in 1885) and Quebec (Oka, in 1893). By 1890, there were five Dominion Experimental Farms across the country mandated to conduct “experiments or researches as might benefit agriculture.”²³ In a similar vein, and after much wrangling, a School of Practical Science was affiliated with University College in the University of Toronto in 1878. As the so-called Second Industrial Revolution gathered momentum in Canada from the 1880s, science was increasingly valued for its practical applications. Driving home the point, in 1894, the president of the Royal Society of Canada, the geologist G.M. Dawson, observed that the country was still

“perhaps too young to afford public support to purely abstract researches in such subjects as chemistry, physics or biology, however valuable their possible results may be to the general knowledge of the world.”²⁴

As Suzanne Zeller has noted, however, these end-of-the-century years saw “engineers applying hydroelectricity’s marvellous powers to everyday tasks; chemists refining, even synthesizing nature through pulp and paper, aniline dye, and textile industries; urban planners meeting unprecedented biochemical demands for sanitation systems; and a host of other science-based miracles.”²⁵ Theoretical knowledge was now valuable currency. Technical know-how, acquired by observation and practice in any field, was increasingly exposed as inadequate by the “new light which scientific research is constantly throwing upon the subject.”²⁶ Wealthy industrialists funded university laboratories and professorships, existing programs were upgraded, and new ones (such as the School of Mining and Agriculture at Queen’s University, opened in 1893) were established. As the twentieth century wore on, science, “in its new guise as industrial research ... intertwined the interests of governments, educators, business, and labour.”²⁷ Indeed, a 1949 history of chemistry in Canada gives most of its 500 pages to industrial chemistry and includes a chapter on chemistry and public services, “an account of the growth and nature of the National Research Council Laboratories, Experimental Farms, Forest Products Laboratories, other Federal laboratories [and] Provincial Research Councils.”²⁸

Although its title suggests that Stéphane Castonguay’s book is more centrally concerned with efforts by the government of Quebec (the provincial state) to administer and regulate the exploitation of natural resources within its bounds than it is with the interconnections among university researchers, corporate interests, and society, a couple of caveats are in order. First, it is clear that the story told here, of science in the service of the state, is not a simple tale of instrumentalization. Science as an institution retained a form of agency and produced its own conditions of possibility within the state, especially as experimentalism displaced analysis as the dominant way of knowing in Canadian science and technology from the 1890s. And, second, although the pages that follow focus quite consistently on programs and policies formulated and implemented by civil servants (and beyond them, politicians) charged with responsibility for the development, extraction, or stewardship of the provincial estate, they also demonstrate that modernization of the state’s capacity to administer its resources depended on the development, within government departments, of scientific expertise previously centred in the universities – and that by the early decades of the twentieth century, government scientists exercised considerable influence over institutions of higher education.

By the twentieth century, Castonguay's "technoscientific agents" played dramatically increased roles in constructing both the state apparatus and the effective territory of Quebec. This book is thus centrally concerned with issues of state formation and the organization and administration of space for different purposes; it is about governmentality and territoriality. These are large and well-worn topics, shaded with variant meanings. Some authors approach state formation as a process and document it by tracing the development of that "constellation of agencies and offices" created to articulate sovereign power. Others see the state as an agency of moral regulation and emphasize its role in the progressive, pervasive, and effective extension of social as well as political authority.²⁹ This latter formulation, associated with neo-Marxist sociology and sometimes described as a Durkheimian-Marxist perspective, comes closest to the idea of "governmentality" formulated by Michel Foucault and substantially adopted by Castonguay: here we have an understanding of power that goes beyond the top-down extension of state authority to include forms of social regulation exercised by disciplinary institutions and forms of knowledge.

In dealing with territoriality, Castonguay draws upon the ideas of two contrasting scholars, one American and one Swiss. From the University of Wisconsin geographer Robert Sack, who considered territoriality as a spatial strategy and defined it as the assertion and enforcement of control over a particular geographical area, Castonguay develops his approach to understanding the ways in which people instantiate their claims to resources by defining the spaces over which they have jurisdiction. From the Paris-born, University of Geneva-based geographer and theorist Claude Raffestin, who saw territoriality as "a set of relationships rooted in ties to the material environment and other people or groups, and mediated by existing techniques and representations," Castonguay draws his interest in exploring how scientists constructed territorialities for the identification and extraction of natural resources and disciplined people by defining codes of conduct for land settlement and resource exploitation.³⁰

This is an unusual combination. Few scholars in the English-speaking world have paid much attention to Raffestin's work, and it is probably less known in Europe among scholars working in French than it is to those whose language is Italian.³¹ Although both Sack and Raffestin made territoriality/*territorialité* a central focus of their inquiries, there are significant differences in their deployment of the term. Indeed, the political geographer Alexander Murphy has warned against seeing their positions as different views of the same phenomenon. Writing out of a discipline, Anglo-American geography, obsessed "with documenting and modelling locations, distances, flows, and networks," Sack was at pains to argue that "formalized or institutionalized

spatial arrangements and partitions matter as well ... [and that] geography needed to go beyond treating them as objects of analysis and explain why they come into being and how they influence what happens.” Accepting the modern conception of territories as discrete, bounded, identifiable spaces, Sack recognized them as deliberate human creations intended “to achieve certain social ends,” and believed that the process of their creation – territoriality – offered an important window on circumstances important to the shaping of human societies.³²

Raffestin, an independent-minded individual who draw inspiration from an eclectic range of scholars, held a rather broader and looser view of *territorialité* than Sack’s analytic-behavioural conception of territoriality.³³ Influenced to some degree by the work of Jean Gottman, Michel Foucault, and Henri Lefebvre, as well as several continental philosophers and social theorists, Raffestin adopted a relational, post-positivist position that defies easy classification. He argues that “space becomes territory when it emerges out of social interaction,” and insists that studies of territory are properly concerned with any “geographically-organized human activity.”³⁴ In Alexander Murphy’s thoughtful assessment, Sack is interested in “territorial divisions – actual or aspirational – and the processes that produce them,” whereas Raffestin focuses on “the context within which social actions are embedded – a context that necessarily shapes territorial outcomes.”³⁵ Given Raffestin’s aversion to the objectivist and essentializing tendencies of spatial analysis in which Sack’s work was rooted, their approaches are not easily reconciled.

Yet as Murphy acknowledges, the ideas of these two theorists overlap and there are potential synergies to be found in their shared interests in “power, iconography, and social relations.” Castonguay works this ground, bringing his perspective as a historian of science to bear on Raffestin’s and Sack’s efforts to investigate how state and territory are mutually constructed. He begins with the observation (made by Thongchai Winichakul in his doctoral dissertation on the mapping of Siam) that maps often serve as models for, rather than models of, what they purport to represent.³⁶ Seen in this light, maps do more than represent space: they allow territories to be imagined in particular ways and facilitate acceptance of that vision. Cartographers make maps, but field scientists from several different disciplines also survey territories, to assess their productivity (by describing the human and natural resources they contain), and to develop plans for their rational use. Once scientists have enumerated the qualities of a territory, its “soil fertility, geological formations, ore deposits, or plant or animal species,” Castonguay writes, “the state can define spaces, either to put them to a particular use or to protect resources for future exploitation or for conservation, often for the privilege of an exclusive group of users.”

This was a multi-faceted enterprise. Fieldworkers coursed through spaces of interest to the state. Scientists and technicians with training in agronomy, botany, ecology, geology, fisheries, hydrology, forestry, pedology, zoology, and so on fanned out to evaluate assets; surveyors and engineers assisted their work, laying out roads, identifying sites for strategic construction, and defining limits and borders. The individual presence of each of these workers in any one place might be relatively fleeting, but as representatives of the state, they helped to legitimize its territorial interests. Other civil servants directed their attention to human populations, enumerating them, placing them on public lands, and legitimating their claims to particular parts of the whole. Another group of state officials – wardens with various warrants for surveillance and protection – travelled far and wide through newly valued terrain, making evident, on a local and daily basis, the authority of the state against those who would ignore or push back against its presence. Elsewhere, in government offices, fish hatcheries, experimental farms, demonstration sites, and laboratories, other scientists and technicians systematized, codified, and added to information from the field, before conveying what they had learned to settlers and workers on the resource frontiers, thus further impressing the hand of the state on affairs in its territory. Broadly, those who worked in offices and laboratories sought to acquire and codify information while those engaged in the field generally had more immediate, material concerns as they hatched fish, stocked rivers, cultivated nurseries, planted trees, and tested plant varieties – but the concerns of the two groups intersected and fed back one upon another. Beyond all of this, politicians and bureaucrats formulated, drafted, and ultimately oversaw the implementation of policies and regulations governing state resources. These were the technoscientific agents – the disparate group whose deployment and activities shaped construction of the Quebec state and its territory – around whom Castonguay builds the argument of this book.

Starting with a foray into the public accounts of Quebec, Castonguay offers an outline of the relative importance of the government's technoscientific expenditures between 1896 and 1940. The numbers of "agents" in each of the major resource sectors were never large, but they rose from barely 100 at the turn of the century to almost 750 in 1939. Generally there were more employees beyond Quebec City than within the corridors of government; agriculture and forestry were the dominant employees; and the mix of expenditures (for educational, descriptive, and experimental purposes) differed considerably over time within and among each of the resource sectors. Given the vastness of Quebec's natural resource estate, these few technoscientific agents achieved remarkable things. To take but one example, sixteen years after legislation initiating such activity, 60 percent of the province's leased

forest had been inventoried, and there were silviculture plans for almost three-quarters of this area.

Such insights are important because they point to the larger truth, central to Castonguay's analysis, that the effectiveness of Quebec's technoscientific agents turned less upon direct policing and overt control than it did upon the establishment of "soft powers" that allowed people to make use of territories and resources within norms or regulatory frameworks built, increasingly, upon common understandings and shared interests. By tracing, in sequence through four chapters, the twinned histories of resource exploitation and governance in the province's agricultural, forestry, mining, and wildlife sectors, Castonguay shows how evolving terms of territorial occupation and exploitation supported the spatial and political expansion of the Quebec state, and how these terms followed a similar dynamic across the four sectors. "Far from grappling with a vast, undifferentiated territory," he writes in conclusion, Quebec's public administration identified and organized "a series of spaces" that its "technoscientific personnel were constantly reconstructing," in accordance with their evolving knowledge, industry needs, and political requirements.

There is much more of interest and substance about the varied trajectories of development in each of these resource sectors in the pages that follow, but let this précis suffice. Castonguay is an informed and spirited guide to these intricacies and to the role of technoscience in the elaboration and modernization of the Quebec state, its administrative capacities, and its territory. Other scholars, especially environmental historians, working on similar issues in other parts of the country might well bear this study in mind, not as a template but as inspiration. There is virtue in the combination of perspectives that Castonguay brings to bear in this work. Historical geography, environmental history, and science and technology studies have too often sought comfort in their own familiar silos, when they might, as here, have benefited from more adventurous interaction. Likewise, the scale and compass of this work is valuable not only for the insights it garners by considering several resource/economic sectors at the provincial scale but also for reminding us that ambition is a virtue. Transcendent, and useful, understanding of the large questions looming before us, about the conjoined fates of humanity and Earth that sustains us, will not come from timid inquiries.

In sum, Castonguay's analysis works on several fronts. Not least, it reveals the development of a robust and effective state apparatus in Quebec before the Second World War. The trajectory of these developments was of course unique, in detail, to Quebec – but it had its broad-form counterparts across the country. From New Brunswick to British Columbia, provincial governments ushered in new patterns and forms of resource management in the

seventy years or so after Confederation. In this respect, Quebec was a province much like the others, one “entirely committed,” in Castonguay’s words, “to the national technoscientific enterprise.” To adapt a slogan from the Quiet Revolution, the period of rapid change and modernization of Quebec society after 1960, the technoscientific agents discussed in these pages may not, in 1939, have been “masters of their own house” – but they had done much to familiarize themselves and others with the place, and had successfully erected a bureaucratic frame upon which subsequent transformations might be hung.³⁷ In telling this story, Castonguay gives us good reason – to borrow a phrase from Jones-Imhotep and Adcock – to think again about how “science and technology have formed the sites for Canadians to imagine, renounce, and reshape themselves as modern.”³⁸

Introduction

DURING THE NINETEENTH century, Western governments were deeply involved in technical and scientific activities aimed at intensifying exploitation of natural resources and stimulating industrial development.¹ Exploration, surveying, and mapmaking, which had been scientific activities at the forefront of territorial conquests in preceding centuries, acquired new strategic value in the wake of the Industrial Revolution. Following the French example, Great Britain and the United States financed expeditions to identify ore deposits likely to power the engines of manufacturing and the railway industry.² In addition to identifying coal and iron deposits, the geological and topographic surveys made it possible to organize the territory and communication infrastructure for emerging industrial economies. Like these Western powers, the Province of Canada was committed to defraying the salaries of geologists to discover deposits of coal to be used to maintain the colony's industrialization.³ It also laid the foundations for a national statistical system and took astronomical observatories under its aegis to provide navigational aid.⁴ The colonial state took many other similar initiatives to bring into its service individuals with scientific skills and techniques. Some, such as surveyors and wood cutters, joined the nascent public service. Others continued to work in civil society, including fish culturists, who operated their own hatcheries, and agronomists working for agricultural societies to spread agronomic information and develop techniques for eliminating insect pests or increasing crop yields.⁵

However, it was not until the late nineteenth century that the Canadian public administration undertook to systematically employ scientists to define

the terms for exploitation of natural resources and occupation of the territory.⁶ In the first decades following Confederation, a number of departments established scientific services to support the Canadian federal state's missions, such as the Meteorological Service in 1871 and the Experimental Farm in 1886. Initially, these services were run by naturalists with no formal training, but the creation of applied-science faculties and the emergence of research in Canadian universities, as well as the arrival in Canada of graduates from European and American universities, resulted in an influx of academically trained scientists to the civil service. Indeed, an observer of the time noted the pleasant scholarly atmosphere in the national capital early in the twentieth century.⁷ Evidence of the transformation of Canadian universities and of state scientific services was the 1908 amendment to the federal statute governing the civil service to the effect that positions were to be filled according to the criteria of competency and merit, and no longer by virtue of patronage.⁸

Thanks to its financial resources, the federal administration was able to offer academically trained scientists permanent positions as civil servants in its different departments. Its constitutional responsibilities conferred taxation powers that enabled it to have a substantial source of revenue. At the same time, these responsibilities legitimized interventions in numerous areas, including some that were devolved constitutionally to the provinces. Initially less well endowed in terms of financial resources and human capital, provincial governments welcomed the federal government's incursion into their fields of jurisdiction, although they sometimes had to resort to the courts to protect their prerogatives. Their main lever was the administration of Crown lands, which, although a major source of revenue, raised concerns with regard to stewardship, especially because long-term availability of natural resources would be compromised if exploitation was left to private interests. Worse yet, information surrounding the availability of these resources was often deficient, which might negatively affect the possibilities of drawing revenues from them. This problem seemed even more serious because broad swaths of territory were being granted to entrepreneurs who were more interested in land speculation than in extraction of natural resources, thereby hindering the construction of a prosperous national industrial base.

Like its provincial peers, Quebec possessed little means and few people with scientific and technical training when it was created in 1867. The Canadian federal state had inherited the main elements of the administration of the Province of Canada, and the departments of the Quebec government had to limit their technoscientific activities to the collection and dissemination

of information.⁹ They turned to university professors and the federal state scientists to obtain the information they needed to formulate and implement their policies, sometimes funding local associations for the dissemination and application of knowledge. At the turn of the twentieth century, however, a number of departments set up scientific and technical services and acquired the capacity to hire individuals with academic credentials, at a time when the provincial public administration was undergoing pronounced growth.¹⁰ Not only was the Quebec state now in a position to offer stable positions to university students enrolled in scientific and technical programs, but it was also undertaking the production of knowledge as its personnel travelled through the country to document and describe – through maps, surveys, plans, and reports – the province’s riches and oversee their extraction.

The creation of scientific and technical services did more than sanction the instrumental function of science. Although the Quebec state was now endowed with *dispositifs* to frame the relations among the population, the territory, and the resources that it sought to “improve,” the territorialities that its interventions produced necessitated a constant renewal of its knowledge base.¹¹ In addition to defining the terms for exploitation of natural resources and occupation of the territory, science had to produce its conditions of possibility within the state apparatus.

In this book, I explore the role of technoscientific activities in modernizing the intervention mechanisms of the Quebec state. For sectors related to the exploitation of natural resources, I reconstruct the activities of the scientific services and take a closer look at the integration of technosciences into governmental operations and at actions taken by scientists and technicians involving the territory and its resources. This portrait of the emergence and development of technoscientific activity in the Quebec public administration is intended to provide an understanding of some of the ways in which the state grew and functioned and to uncover how technoscience influenced appropriation and occupation of the territory, notably through practices that made the government of natural resources possible. Through this study of developments in mining and geology, timber cutting and forestry, hunting and fishing activities and wildlife management, and agricultural production and agronomy, I examine how exploitation of natural resources was built into a subject of knowledge and a tool of government, and I unravel the interweaving of two co-extensive phenomena: the production of state territorialities by technoscience, as well as the process of state formation and expansion of the state’s administrative capacities.

THE TERRITORIALITIES OF THE SCIENTIFIC STATE:
 REPRESENTATIONS OF NATURE
 AND THE “GOVERNMENT OF MEN AND THINGS”

Political geographers have moved away from their traditional focus on state borders and territorial sovereignty to become interested in the spatial practices of state institutions.¹² The construction and reconstruction of territories through which the state seeks to govern by “knowing and administering the lives and activities of the persons and things” remains, however, a largely ignored phenomenon.¹³ For instance, historical geographers of social cartography have analyzed enumeration and statistical techniques without investigating the spatial foundations of these instruments of power.¹⁴ Conversely, once their interest moved beyond the question of borders as determinants of international relations, political geographers studied the territorial bases of state power.¹⁵ Among other things, for the state to be able to fulfill its fundamental functions – defence, order, and taxation – the representation of the space over which it has power becomes integral to its legitimacy in terms of affirming its sovereignty, ensuring the loyalty of its subjects, and protecting the ownership of its resources.¹⁶ Too often, political geographers have limited their understanding of the relations between state and the territory to instrumentalization of the latter by the former, notably for regulation of the circulation of goods, individuals, and even ideas.¹⁷ The power of the state, from this perspective, resides in its capacity to define a space and circumscribe the mobility of people and things to that space. However, the conditions for shaping the territory in order to instrumentalize it remain obscure.

Under what conditions, then, is the construction of a territory capable of building state power? The geography of territoriality proposes two complementary approaches to this question.¹⁸ In the view of Robert Sack, territoriality is understood on the basis of the strategies that social actors articulate to influence and control resources and populations by defining the space upon which their jurisdiction is exerted.¹⁹ Claude Raffestin sees territoriality, rather than simply the result of a deliberate strategy, as Sack theorizes, as a system that produces relations between social groups and material environments, which are modulated by mediators (instruments or representations, for example).²⁰ Raffestin asks us to appreciate the indeterminate nature of territorial production and to examine the significance of territories and the actions that produce them. Although Sack’s approach targets mainly the outcomes of territorial production with regard to both objectives and results of territorial practices, it has the merit of emphasizing the asymmetry of power relations in a relational system, notably for territories whose

functionalities and materialities endure to the point of rigidifying the borders and characteristics of contested spaces.²¹

To understand the relations between state and territory, I propose, following both Raffestin and Sack, to investigate how these two entities are mutually constructed.²² Here, it seems instructive to explore how historians of science address the territorial enterprise of a state that, through its scientific activity, seeks to produce and govern spaces to affirm its sovereignty. Notably, analysis of national – and nationalist – maps has made it possible to consider the terms of construction of a statist territory through the sciences that define its contours.²³ Cartographic projects have therefore been the subject of numerous analyses that have revealed the normative dimension of this descriptive scientific activity.²⁴ Rather than an objective a priori that the cartographer would simply reproduce, the correspondence to reality of a map results from the material shaping of the territory made possible by actions undertaken on the basis of that very cartographic representation. It is as if one were representing less what is there than what one wishes to represent or show: “A map anticipated a spatial reality, not vice versa. In other words, a map was a model for, rather than a model of, what it purported to represent.”²⁵ Finally, a map performs an eminently nationalist function, in that it aims to lend unity and coherence to a territory the cartographic representation of which it is intended to disseminate to populations otherwise dispersed throughout a series of discrete spaces.²⁶ A national map, however, does not just provide an image of a state in search of legitimacy, but functions above all as a means by which such an entity may effectively be imagined, propagated, and circulated.²⁷

Scientific production of a territory goes beyond cartography to include surveying activities that provide a description of the territory, assigning to it productive functions related to the human and natural resources enumerated.²⁸ The territory that is represented is intended to be rationally organized to both serve the needs of the state and facilitate occupation of that territory. Two spatial dimensions of scientific activity must be underlined. First, surveying activities proceed from a territorial undertaking because they require demarcation of that territory. Once the qualities of a territory are enumerated – for instance, soil fertility, geological formations, ore deposits, or plant or animal species – the state can define spaces, either to put them to a particular use or to protect resources for future exploitation or for conservation, often for the privilege of an exclusive group of users.²⁹

In addition, the production of inventories presumes the circulation of state agents – explorers, surveyors, census takers, naturalists – through the territory to define borders, evaluate assets, measure and assign lots, and trace out and open roads. Like land agents responsible for allocating timber limits

and collecting revenues on public lands, explorers mark out the space by their presence, as brief as it might be. Indeed, as representatives of the state, these civil servants are invested with a certain legitimacy in the definition of uses and users of the territory and its resources. Aside from explorers, the definition of larger or smaller parcels of land, in the form of timber limits, reserves, or parks, requires the deployment of state agents who, endowed with a degree of legal authority, are responsible for protecting the functions of the territory.³⁰

Although historians and geographers have emphasized the role of surveying and mapmaking in the rise of the modern state, the state's authority is also based on the material organization of the territory.³¹ In this respect, science acts not solely through the force of its ideas but also because putting those ideas into practice gives form to an environment that participates in the "government of men and things" by making these entities visible.³² At the core of the materialization and shaping of the environment are legibility practices used by a state to make up for the disorderliness of nature and society, which contradicts the representations of its technoscientific and political enterprise.³³ Whether by regulation of extractive practices or improvement of the environment, the state inscribes on the landscape the standards and norms formulated by its personnel to oversee access to the territory and use of its resources. Similar work contributes to the simplification and normalization of the territory, and its legibility is increased by the distancing or smoothing over of what would otherwise be considered irregularities, ordinarily attributed to uncontrolled natural phenomena or resistant populations.³⁴ In this respect, technoscientific activity plays a decisive role: the elements of the landscape that it makes visible become targets of state intervention, opening the potential to regulate occupation of the territory, thereby facilitating extraction of natural resources and increasing state revenues. Similarly, through the naturalization of categories proposed by the state apparatus, technoscientific activity enables the legitimation of the social order on which this very apparatus depends.³⁵

STATE FORMATION: ADMINISTRATIVE CAPACITIES AND THE GOVERNMENT OF CONDUCTS

How do technoscientific activities that are spatial practices, such as cartography and surveying, the circulation of civil servants, and improvement of the environment, reinforce state power? By representing and intervening in the territory and its natural resources, the state manifests its capacity to govern not only an environment but also its populations, human and non-human,

to regulate their conducts, and to circumscribe, through human or non-human entities, their freedom to act. In the exercise of this action at a distance resides the government of natural resources. With the accumulation of knowledge, the acquisition of qualified personnel, the establishment of infrastructure, and the deployment of *dispositifs* in the field, the state expands its administrative capacities. It is built on a territory that it governs at the same time as it creates it, by delineating it and defining its forms and linkages.

Both the territory and natural resources constitute objects of knowledge and targets of political intervention that the state invests with representations and infrastructure, thus intruding in the landscape and society.³⁶ Does this mean that the state controls the population and the territory? The issue seems to be less about state power and more about the strategies that shape “practical objects” for governmental interventions. What matters is not outright control but regulation of access to and uses of the territory and its resources.³⁷ Furthermore, as anthropologist James Scott shows, the simplifying maneuvers of states are often circumvented by local populations that mobilize “*metis* knowledge” to subvert the natural and social order that the political and technoscientific authorities seek to establish.³⁸ Therefore, one needs to understand how populations participate in this “order of things” in order to identify the territorial strategies upon which the state depends to augment its political power.

A similar perspective is pervasive in studies on governmentality that examine the state less as an autonomous institution than as the exercise of power grasped analytically and expressed relationally. Governing does not simply mean controlling. On the contrary, a relational analysis of power recognizes that individuals have the freedom to act within limits predefined by knowledge that participates in the “normation” of conducts.³⁹ In this perspective, a central power is not said to spread its influence through society by expanding state control techniques. Furthermore, to explain the governmentalization of the state – the means by which the administrative apparatus undertakes to understand and manage the lives and activities of people within a territory – these studies posit that the state takes over fields of power and social groups that are already governing – that are involved in “shap[ing] and administer[ing] ... the lives of individuals in pursuit of various goals.”⁴⁰ Understanding power and its effects, which are negative or productive depending on whether it simply oppresses segments of the population or generates capacities for action among individuals, thus requires taking into account a multiplicity of self-governing actors.

Although governmentality studies seek to understand how the state aims to transform the density and vitality of certain territories and to make their populations productive, the land and its riches remain concretely and materially

absent from these reflections.⁴¹ Spatial and political theorist Stuart Elden reminds us, however, that statistics as a technique of government is based on spatial distribution. Because it ceases to be a static terrain and becomes “a vibrant entity, with its ‘specific qualities’ which too can be measured,” territory is central to governmentality, in Elden’s view.⁴² This perspective provides an understanding of how the qualities and the geometric and relational properties of the territory are the subject of calculational strategies (mapping, ranking, measuring, defining, normalizing, regularizing, networking) similar to those employed to regulate populations. Governing, knowing, and regulating the population and the territory flow from a single political rationality, the territory being understood in its relations with the population.

Geographers have recently emphasized the need to incorporate space into our understanding of the government of conducts⁴³ and to comprehend territory as political technology, drawing from the writings of philosopher Michel Foucault an illustration of the articulation between territory and governmentality.⁴⁴ Foucault shows that security mechanisms formulated in the nineteenth century, which succeeded those implemented to discipline bodies or police and control territory, were based on organizing the environment to facilitate “liberal” circulation in the perspective of the “government of men and things.” What a *dispositif* problematizes is the environment (*milieu*) – the space of conducts – that the state seeks to organize in order to govern populations starting from the identification of regularities. Governmentality is thus distinct from sovereignty and discipline. Each in its own way, these political rationalities have made the exercise of power possible, the former by targeting “a set of legal subjects capable of voluntary actions,” the latter by taking on “a multiplicity of organisms, of bodies capable of performances.”⁴⁵ Rather than targeting the territory and the subjects living in it, as sovereignty does, or training and correcting the body of the individual, as discipline does, governmentality is exerted over a population, “a multiplicity of individuals who are and fundamentally and essentially only exist biologically bound to the materiality within which they live.”⁴⁶ Territory and population, indivisible, are concurrently the subject of problematizations by technoscientific activities that expand the administrative capacities of the state both through the *dispositifs* that they deploy and through the government of conducts that they engender, or through the mechanisms of knowledge that they elaborate to make these entities visible and to act on them.⁴⁷ Following a Latourian epistemology, post-humanist geographers even ask us to consider “men and things” necessarily and together: nature and society form hybrid networks, integrating processes that are both human and natural, both mechanical and organic.⁴⁸

THE TERRITORY OF THE QUEBEC
PUBLIC ADMINISTRATION AND ITS RICHES

In this book, I examine the technoscientific activities of the Quebec state that accompanied the development of economic sectors linked to the exploitation of natural resources. My goal is to specify the role of these activities in the functioning of the administrative apparatus between 1867 and 1939. Far from being confined to the margins of the state apparatus, where their role would be limited to data collection, technoscientific activities were a driving force in modernizing the mechanisms of state intervention. Furthermore, the territorialities that they shaped during the formulation and implementation of state interventions contributed, in their turn, to the formation of the state. By actively defining new terms for occupation of the territory and exploitation of natural resources, technoscientific activities thus supported the spatial and political expansion of the state.

The territory of the province of Quebec has been the subject of numerous studies by geographers and jurists, whether to establish the conditions of its occupation or to account for the delimitation of its borders.⁴⁹ In the half-century that followed the creation of the province of Quebec, the territory remained fluid, due to the proliferation of settlement frontiers and the indeterminate status of its legal boundaries. The boundaries were extended first in 1898, when the federal government ceded to the province – at the time defined by the borders of Lower Canada (Canada East) – the northwest district of Abitibi, and removed a part in the northeast, on the coast of Labrador. Then, in 1912, the northern district of Ungava was added. In both cases, changes to the territory of Quebec resulted from actions taken by the governments in London and Ottawa. Quebec governments played a more active role in the shaping of the territory by financing construction of the railway and colonization societies, even though initially it was the Catholic Church authorities that carried out this latter form of territorial expansion.⁵⁰ As the old settlement parishes in the Laurentian plain became overcrowded, people struck out to conquer the Appalachian and Laurentian plateaus in the first quarter of the nineteenth century. In the second half of the century, settlement began to expand to Témiscouata, Témiscamingue, and Lac-Saint-Jean, regions with a climate and soil more favourable to farming than the Canadian Shield. After the addition of the Abitibi and Ungava districts to the territory of the province, urban settlements sprang up in these regions, thanks to the economic activities spurred by the extraction of mineral resources.⁵¹

Few authors have seen the territory of the province of Quebec, with its shifting contours, as a subject propitious to analysis of the role of knowledge,

legal or scientific, in the functioning of the state and the evolution of its administrative apparatus. Jurists have discussed the legal and historical difficulties behind a precise definition of the territory of Quebec, but such analysis implies that it would be possible to remove all ambiguity behind comprehension of what this territory is and should be as a space for exercising exclusive jurisdictions.⁵² Geographers have explored how different phases of settlement gave rise to differentiated occupation of the territory in terms of the full or partial settlement of regions, the activities that took place in them, and the creation of distinct landscape formations.⁵³ More rarely have scholars addressed interventions by the Quebec government linked to exploitation of natural resources and occupation of the territory. One exception is the historical atlas aptly titled *Le territoire*.⁵⁴ The contributors to this book are interested specifically in territorial formations related to the mining and forestry industries, fish and game activities, and agricultural modernization, and they emphasize the impacts of these activities on the landscape, their articulation with a constantly evolving urban space, and their integration with the Laurentian ecumene and the continental economy.

There is, however, an abundant literature in economic and social history on natural resources industries in Quebec, and governmental policies are often mentioned.⁵⁵ People employed in the mining, forestry, and fishery industries have been of interest to labour historians studying the struggles and living conditions of workers, notably in the towns and villages created for them to live in, which were to shape new communities.⁵⁶ Historians have also examined the fish and game clubs, analyzing the social relations underlying exploitation of the wildlife resources and of society by elite sportsmen.⁵⁷ Finally, given the significant amount of capital necessitated by extraction of natural resources, business historians have paid attention to companies and the relationships that they maintain with governments and local communities.⁵⁸ Although they are more interested in the socio-political landscape than the natural environment, social and economic historians of natural resources industries have highlighted social inequalities and labour struggles that have had consequences for development of the territory. Moreover, they have shown a certain sensitivity to the material dimension of the territory and to resources and their inscription in the regional imagination.

In general, historians focus on a single sector, without necessarily trying to investigate how state interventions and territorial transformations underlying the exploitation of different natural resources follow a similar dynamic. Furthermore, when historians investigate state interventions related to resource exploitation, their studies are usually limited to an assessment of the impacts on the economic development of the province. Sometimes, they address the lives and actions of chief scientists or directors of science services,

but without paying due attention to how technoscientific activities, governmental policies, and regulatory measures play out in the field, especially with regard to how they shape the landscape or the pace of resource exploitation. Transversal studies of these sectors are rare, especially when it comes to understanding the formation of territorialities and state interventions.⁵⁹

It must be said that historical research on the Quebec state, especially for the period covered here, is generally limited to denouncing its lack of financial resources and the absence of capable civil servants, with a concomitant incapacity to engage in economic activity other than by selling off its natural resources. After a lean period following Confederation – punctuated with short intervals of prosperity but characterized mainly by the Great Depression of 1873 and repeated economic crises – the Liberal regime that ruled uninterrupted from 1897 to 1936 made influxes of foreign capital the cornerstone of the province’s industrial development.⁶⁰ This strategy of support for exploitation of natural resources was based on promoting and publicizing the province’s “natural riches,” as well as granting timber limits, mining claims, and hydroelectric sites – which nevertheless remained in the public domain – at rock-bottom prices.⁶¹ The Liberal governments left the path entirely open to private initiative, as had preceding governments, most of them Conservative, that had led the province since 1867. Whereas the Conservative governments counted on railway construction and modernization of agriculture to stimulate settlement, integrate remote regions, and keep the French Canadian population within the province, the Liberal governments of Félix-Gabriel Marchand, Simon-Napoléon Parent, Lomer Gouin, and Alexandre Taschereau were more interested in stopping emigration to the United States by welcoming foreign investments. For these Liberal premiers, foreign investments guaranteed the creation of factories and industrial jobs and helped to increase state revenues, which depended in large part on royalties from extraction of natural resources and leases on vast stretches of land.⁶² Contemporaries criticized this strategy, loudly accusing the government of selling the province at a discount to foreign capital, for which they would have preferred to substitute indigenous capital – although its availability remained uncertain.⁶³ They also denounced the fact that many ministers and premiers in Liberal governments were, conveniently, sitting on the boards of directors of major corporations that benefited from the largesse of the Quebec state.

Aside from providing studies of a few political figures, the historiography portrays the Quebec state of this period as non-interventionist, poorly coordinated, and under-funded, with Ontario often presented as the contemporary example of a modern, efficient public administration.⁶⁴ The Quebec public administration thus appears to have operated with an absence of logic and planning; its fundamental approach to economic and social affairs

was apparently based on *laissez-faire* and omnipotent private enterprise capable of manipulating the state's levers.

A few remarks are in order. First, even in a *laissez-faire* political system, the state remains responsible for “the structures and regulations that made such free action possible.”⁶⁵ Therefore, in the nineteenth and early twentieth centuries, governments that claimed to subscribe to economic liberalism, in Canada and elsewhere, multiplied their interventions in economic affairs. They both instituted a regulatory framework to guarantee protection of and respect for private property and funded, partially or entirely, the construction of roads, canals, and railways to facilitate circulation of goods and people.⁶⁶ The study of governmentality is interesting precisely because it seeks to understand the means implemented by the state to resolve the dilemma of “governing less to govern better.”

Second, it must be noted that the history of the Quebec public administration is, in many respects, similar to that of the other Canadian provinces. In Ontario and British Columbia, to mention only two, the functioning of the public administration was initially characterized by the absence of financial control and the incapacity to enforce laws, as well as by insufficient human resources, not to mention the fact that those who obtained positions in the civil service did so through the dubious mechanisms of patronage and political partisanship.⁶⁷ These two provinces began to modernize their bureaucracies only in the early twentieth century by, among other things, instituting civil service commissions and appointing professionals on the basis of their competency.⁶⁸ In this, they were following the example of the federal administration, which founded its Public Service Commission in 1908. It should also be noted that research on the economic history and the history of public administration of Quebec has shown that the interventionism of the Quebec government compared favourably with that of Ontario well before the onset of the Quiet Revolution.⁶⁹ Notably, Quebec invested in occupation of the territory and exploitation of natural resources in the decades that followed Confederation. And it is precisely in these sectors that technoscientific activity, whose terms and scope remain to be elucidated, took shape.

Finally, even if for the period under study *laissez-faire* and private enterprise dictated governmental interventions, the state had to have intellectual resources to respond to this demand. Where did they come from? How did they act? What were their “effects of power”?⁷⁰ Depending on the sector under study, the Quebec government may appear to have been less well coordinated and more underfunded than the Ontario government. In hydroelectricity production and distribution, for example, the early nationalization of this industry in Ontario encouraged more interventionism and the development of expertise for expansion in the sector.⁷¹ Similarly, discoveries

of ore deposits around Sudbury and in northeastern Ontario in the late nineteenth century led the provincial government to invest immediately in the mining sector, first by creating the Bureau of Mines in 1891, then the School of Mining in Kingston in 1893.⁷² Although it was founded in 1883, the Quebec Bureau of Mines began to expand only forty years later. That the early creation of institutions was not a guarantee of sustained interventions is also evidenced in the forestry sector, but to the disadvantage of Ontario this time. That province's public administration was granted a bureau of forestry in 1898 and a first professional forest manager in 1905, but it increased its personnel to supervise the exploitation and development of the forestry sector only after the Second World War.⁷³ In contrast, as soon as the Quebec forestry service was founded, in 1909, it began to undertake silvicultural work.⁷⁴ Finally, exploitation of wildlife resources in Quebec was also extensively supervised by agents of the provincial administration, whereas Ontario seems to have relied more on the federal administration.⁷⁵ Therefore, to determine the terms and scope of the state's technoscientific activities, we must consider the conditions related to the exploitation of each resource and the institutional ecology of education and research in each sector.⁷⁶

HOW THIS BOOK IS ORGANIZED

In the five chapters of this book, I examine the conditions under which the state of Quebec and its territory were constructed through the deployment and activities of its technoscientific agents. My approach is based on an analysis of the institutional ecology of the scientific institutions in the state apparatus and on a political and historical geography of governmental interventions by the Quebec state around the exploitation of natural resources. I illustrate how technoscientific activities participated in the formation of territorialities and the growth in administrative capacities by and for the government of natural resources. I focus on the activities of civil servants as they formulated and implemented programs and policies, yet I do not lose sight of realities in the field, where those outside the public administration were active in exploiting natural resources, limiting their accessibility to facilitate or impede extraction, or protecting and conserving them for future use.⁷⁷

The period covered ranges essentially from 1867 to 1939, even though I sometimes turn back to developments in the Quebec public administration just after the Province of Canada was established, when institutions were created for the production, application, and dissemination of knowledge likely to stimulate the expansion and industrialization of the British colony. The analysis concludes in 1939, on the eve of the Second World War. Radical

changes to organization of the sciences within the federal administration during the war had repercussions for scientific institutions across the country in the following decades, including within provincial administrations.⁷⁸ Other factors militate in favour of this upper time limit, which was a time of endogenous scientific development within the Quebec state apparatus. First, a number of provincial scientific services undertook the construction of laboratories in Quebec City. Second, a vast survey was undertaken under the aegis of economist Esdras Minville, a professor at the *École des hautes études commerciales* in Montreal; this operation mobilized academic and state scientists to take stock of the exploitation of agricultural, forestry, mining, fishery, and wildlife resources.⁷⁹ These developments were another manifestation of the “*vire d’un temps nouveau*” in which, under the Union nationale government elected in 1936, the French Canadian scientific community finally found the political authorities turning an attentive ear to its demands for consolidation of its institutions.⁸⁰

In [Chapter 1](#), I provide a transversal overview of the development of governmental services linked to the exploitation of agricultural, forestry, mining, and wildlife resources; the recruitment and training of specialized personnel; and their activities within the public administration.⁸¹ This overview offers an opportunity to describe the ecology of educational and scientific institutions on exploitation of natural resources in Quebec, and to shed light on the organization and operations of a technoscientific bureaucracy. Here, I examine the formation of the state in its literal sense: the administrative apparatus grew in size, budget, and personnel in order to engage in various technoscientific activities, with the creation of governmental services and the implementation of measures affecting exploitation of natural resources and occupation of the territory.

In the next four chapters, I explore the role of technoscience in the expansion of the administrative capacities of the Quebec state, focusing on how scientists constructed territorialities through which national riches were to be located and extracted. My aim is not to provide highlights of state science in Quebec but to use case studies to demonstrate the different conditions for production of territorialities through which technoscientific activity contributed to the formation of the state. In addition to drawing on textual and iconographic analysis from the printed cartographic and archival sources in the collections of state and university institutions and industrial associations, I use data from the public accounts and departmental annual reports to decipher the spatiality of the technoscientific practices of civil servants for the government of natural resources.

In [Chapter 2](#), I address the efforts of the Quebec state to stimulate mining development. The Geological Survey of Canada had been reporting and

inventorying mineral resources in Quebec since its foundation in 1842; some forty years later, the Bureau of Mines of the Quebec Department of Crown Lands undertook the exploration of the province's territory. The provincial government itself had to set the priorities for this work and direct the explorations where it seemed possible to establish, if not a mining operation, at least settlements on the newly acquired lands. The idea was to take over a territory not simply by describing or defining it, nor even by mapping it, but by probing the subsurface with a view to extracting its riches. Whereas maps from the Geological Survey of Canada indicated only rock formations, the Quebec Bureau of Mines turned out to be more concerned with the cartography of mining centres in the province, both real and potential. The maps produced by geologists from the Bureau of Mines no longer portrayed natural geological entities in continuity with the rock formations of other Canadian provinces – which, incidentally, integrated Quebec into a pan-Canadian whole. Instead, they showed the territory of the province as a coherent set of mineralogical resources to be exploited and toward which the industry was to be directed. Industrial and economic concerns influenced the bureau's approach during its early years, when it lacked specialized personnel. Later, the addition of geologists and the creation of geological and cartographic divisions within the bureau led to the performance of fundamental work that, by inventing a mining space, oriented both exploitation of the province's underground riches and detailed exploration of the mineral belts.

The strategies of the Department of Crown Lands with regard to the leasing of forestland and, in parallel, the management of conflicts between forestry businesses and the colonization movement are the subject of [Chapter 3](#). One of the first tools used by the Quebec government to keep settlers away from the forest was the creation of reserves and parks. These territories, delimited to protect trees as a resource over the long term, were added to the forest regime in force since the mid-nineteenth century, based on the awarding of timber limits to companies for the immediate cutting of wood. In addition to delimiting timber limits, the surveyors of the Department of Crown Lands classified the territory to separate land for settlement from forestland deemed inappropriate for farming. At a time when a pulp and paper industry was emerging that was both voracious and less selective with regard to species of trees consumed, the introduction of scientific forestry in the early twentieth century had the effect of putting the forest regime on a different footing. As a consequence, relations between settlers and the forestry industry were to be redefined. The Forest Service of the Department of Lands and Forests, which was also responsible for creating and running the forestry school attached to Université Laval, made reforestation a tool for training its personnel

and providing settlers with wood through township reserves. Thanks to their location in settlement areas, as well as to the tree species used for reforestation, these reserves grew a pulpwood forest for the paper industry. This shaping of the landscape was a supplementary step in the separation of the land for the agricultural and forestry sectors and functioned to distance settlers from the territories allocated to holders of timber limits.

In many respects, [Chapter 4](#) illustrates how the exploitation of wildlife resources was based on an approach similar to that used for the forest: creation of reserves and improvements of Crown lands. Yet, surveillance was central to two additional governmental strategies based on the regulation of human and non-human populations: access to the territory for fish and game clubs and fish stocking through pisciculture activities. The commissioner of Crown lands proceeded to lease out vast domains to private fish and game clubs in exchange for an annual rent, to which sportsmen also added royalties for permits and catch. Once leased, these lands became spaces where the clubs enjoyed exclusive catching rights, often to the detriment of other users. Conflicts arose between Indigenous people and Euro-Canadian settlers, on the one hand, and elite sportsmen who wandered through the backcountry to harvest game and fish that the “locals” used for food or trade, on the other hand. Although successive governments justified such arrangements by arguing that they would otherwise have to spend money for the stewardship and protection of wildlife, they nevertheless provided financial assistance to private fish and game clubs for the surveillance and improvement of the leased territories. Fish and game wardens travelled through the country to regulate human populations involved in exploitation of wildlife. Similarly, the Fisheries and Game Service recruited biologists to oversee regulation of animal populations. Through its hatcheries and pisciculture activities, the service was able to shape the aquatic landscape so that sufficient numbers of fish were available to maintain the attractiveness of Quebec’s watercourses as a “sportsmen’s paradise” to welcome populations of fish anglers from abroad.

In [Chapter 5](#), I examine governmental interventions in agriculture. During the period under study, the state shaped an agronomic space through regionalization of agricultural production and the formation of subjects – commercial farmers – as the development of dairy husbandry and the adoption of other kinds of specialized production were bringing the agricultural economy out of the doldrums. In comparison to the three sectors studied in previous chapters, research in agriculture started relatively late, even though the Department of Agriculture opened a laboratory for dairy control and soil analysis in 1888. Although technoscientific interventions in agriculture revolved mainly around education and extension activities, they nevertheless

shaped the agricultural landscape over the long term, notably after the arrival of “official agronomists.” Once the Department of Agriculture had hired graduates from the agricultural schools of the province’s universities, dissemination of agricultural knowledge rested on the interventions of civil servants rather than members of civil society. Although the agronomic space reproduced the territorialities of political representation and the boundaries of electoral ridings, the activities of the Agronomic Service left an imprint on the agrarian landscape, notably through the formation of specialized producers and the geographic anchoring of agricultural specialties such as fruit growing and poultry production.

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