



The Forests of Canada

Seeing the Forests for the Trees

Susan Herrington

Introduction

A sound theoretical and practical understanding of the size, type, extent, and health of Canadian forests has always been a challenge. Canada's forests were and still are immense, covering 4,440,000 km² and representing 10 percent of all the world's forests.¹ Moreover, significant cultural factors have also hampered knowledge of Canadian forests leading to their depletion. Prior to the twentieth century, Canada's image as a cornucopia of natural resources with huge and seemingly endless forests exacerbated their destruction. If there was an infinite supply of trees, for construction, trade, and fuel, then there was little need to know how many trees existed. The unknown combined with global trade, public/private forestry partnerships, and industrial advances worked together to institutionalize ignorance.

Once the notion of the endless Canadian forests was questioned, methods were developed to quantify and manage its forests. Ken Drushka notes that conservation efforts were imported to Canada from older societies in Europe and Asia: "French-speaking intellectuals, politicians, and lumbermen in Quebec were heavily influenced by conservation thought in nineteenth century France. English-speaking Canadians received their ideas primarily from Germany, via the United States."² Allen Barton and Peder Anker have also linked Canadian forest conservation to the constellation of nationalistic ambitions envisaged by nineteenth-century British colonialism.³ Yet, the actual task of quantifying and managing forests in Canada faced numerous political, technological, and cognitive challenges. These challenges put forest conservation in Canada behind other countries, such as India, the United States, and Germany.

Spanning the nineteenth century to the start of World War II, the following reveals how the unknown served as a consistent backdrop to both forest depletion and early conservation efforts. In Canada, provinces and territories manage most of the country's forests. The forests administered by British

Columbia, in particular, provide specific examples of ruthless entrepreneurship that combine with scientific forestry in the shadow of the unknown. Indeed, this nescience was amplified by British Columbia's late formation as a Canadian province as well as its mountainous terrain and old-growth trees.

After World War II, forest advocates and professional foresters were able to successfully argue that a conflict existed between the corporate hunger for timber and the long-term economic health of the provinces.⁴ Policies supporting short-term profits were slowly replaced by long-term forestry management plans, and Canada began to see a reversal in forest depletion. Today there are more forests in Canada than there were seventy-five years ago.⁵ Nonetheless, the years preceding World War II provide a revealing account of how such an essential natural reserve, such as forests, has been fraught by the unknown.

The Endless Forests

During the eighteenth and nineteenth centuries British North America (now Canada) was thought to contain some of the most extensive and untouched natural reserves of trees available in the world. The British practiced broad arrow policies, the marking of trees with axe strikes, to reserve their use by the navy. Likewise, in 1728 the position of Surveyor General of His Majesty's Woods was established to designate forest reserve areas for the Crown.⁶ Despite these practices, it was thought that Canada had so many trees that not knowing the extent of its forests was immaterial.

During this time, forests were not only cleared for lumber, but it was also thought that their clearing would ameliorate Canada's cold climate.⁷ The theory of climate progress held that by clearing and settling land, cold temperatures could be moderated. According to the widely read *History of the Rise and Fall of the Roman Empire* by Edward Gibbons (1776–1789), "Canada, as this day, was an exact picture of ancient Germany," and through forest clearing and settlement shorter winters and milder temperatures could be attained.⁸ Even as late as 1862 *The New York Evening Post* reported that since the felling of forests in New Brunswick, the severity of cold temperatures had been abated and winters had been shortened by two months.⁹ Unfortunately, in the colonists' haste to convert forestland to farmland fire was used. Slash and burn methods sometimes produced disastrous results. One quarter of the province of New Brunswick, for example, was burned to the ground by a runaway fire in 1825.

When Canada gained independence in 1867, knowledge of its forests was not subjected to what Suzanne Zeller calls the Victorian inventory sciences, a systematic cataloging of phenomena that enabled their exploitation. Forests were rarely the subject of this inventory science because they were thought to be seemingly endless. In fact trees often interfered with data

collection performed in other sciences. For example, while conducting a magnetic survey of British North America, Sir John Henry Lefroy wrote that he was “acquiring and antipathy to trees, which every settler seems to possess.”¹⁰ Added to this general distaste of Canada’s trees were factors such as the unbridled trading of Canadian lumber, the ownership patterns of forestlands, and the industrialization of forestry practices. These factors exacerbated the impacts of this ignorance and eventually led to the need to quantify Canada’s unknown forest reserves.

Trading the Forests

From the outset of its discovery by Europeans, Canada was valued for fur and lumber. Many of its trees were ideal for ship construction and they were harvested for British and French navy ships.¹¹ The Ottawa Valley had abundant supplies of white pine trees, which were essential for building tall straight masts, and the Great Lakes region contained numerous oaks species that were critical to building resilient hulls. After the English conquest on the Plains of Abraham (1759) and the Treaty of Paris (1763), British colonization spread rapidly in Canada, as did the consumption of its forests. With the Napoleonic Wars (1789–1815) Canadian timber became increasingly valuable to British military might. At the same time, colonists viewed the dense forests as obstacles to settling the land. As a result, a mutually beneficial pattern of land settlement was established where land was steadily cleared of trees for farming, and the harvested timber was milled for export to the United Kingdom.

In addition to the Napoleonic wars, the American War of Independence (1776) greatly accelerated Britain’s reliance on Canadian timber. The American Revolution severed Britain’s access to forests in the thirteen colonies and it also forced many loyalists—knowledgeable in the latest clearing and milling techniques—to relocate to Canada. Moreover, the British had always relied on Scandinavian forests for shipbuilding resources, but with the French blockade of the Baltic Sea in 1807 it was forced to turn to Canada as its main source for naval lumber. According to Donald MacKay, these two pivotal events marked “Canada’s evolution from a resource base of fur to lumber.”¹²

Britain’s insatiable hunger for Canadian lumber and the notion that its forests were endless continued well into the nineteenth century. Indeed, Canadian forests were perceived as never ending sources of lumber, forests that could be cleared in perpetuity for exportation and use by the colonists to build fences and other structures. With the outbreak of famine in Ireland during the 1840s an unusual exchange emerged between timber exportation to the UK and emigration to Canada. Ship owners in the timber industry frequently returned to Canada from Britain with empty vessels, but with the Great Irish Famine they

were increasingly returning to Canada with human cargo. Once timber was unloaded from Canadian ships at ports in Ireland and Britain, they were hastily converted into passenger ships for those desperate to reach North America. According to MacKay, “once a ship discharged its timber, loose boards were laid over the bilges as temporary flooring and rows of rough berths little bigger than dog kennels were fitted into place and covered with straw for bedding.”¹³

Canada’s most western province, British Columbia, did not join the Confederation until 1871. The federal government promoted fishing and farming, but it was the lumber trade that held the most promise for settling and developing the province.¹⁴ British Columbia’s old-growth Douglas fir and western red cedar, cedar-hemlock forests, and sub-boreal spruce trees were particularly valuable. Douglas Fir trees were ideal for construction purposes, providing stronger, lighter, and more durable lumber than the timber logged in the east.¹⁵ Likewise, its seemingly infinite supply of softwood trees was the species of choice for the pulp-and-paper making process. The forests were vast as well, covering 80 million hectares of land, and older than any other forests in Canada. Some stands dated back over 1,000 years, representing one-quarter of the world’s remaining ancient temperate rain forests.

British Columbia’s late-coming as a province and its ocean access resulted in an immediate exposure of its forests to global trade. Whereas the eastern provinces saw a gradual increase in trade with other countries, British Columbia with its location on the Pacific Rim was abruptly launched into the international forest market. The opening of Asian markets, such as Japan, and the successful completion of Panama Canal in 1914, facilitated trade with Asia and Europe. As a result the Province witnessed global trade at an unprecedented pace and scale.¹⁶ The combination of global access to its forests and the idea that these forests were endless incited unparalleled greed as well. In 1905 the provincial government opened Crown land forests to international speculators, and within two years approximately 4 million hectares were staked out for harvesting, primarily by American companies.¹⁷ The local sentiment was no better. A writer in *The British Columbia Lumberman* contended, “to hell with the land—clear-cut right to the back and get out!”¹⁸ Why the Province would enable such unbridled harvesting of its forests is partly explained by the public/private partnerships that emerged between provincial governments and private companies harvesting forests throughout Canada.

Owning the Forests

In 1846 Britain established Crown ownership of land, which now covers 89 percent of Canada. Britain granted the management of these Crown lands to individual provinces, which in turn granted licenses to private lumber companies

to harvest Crown land forests. Lumber companies avoided land taxes, and the profits made by provinces (through the administration of licenses and other fees) paid for basic infrastructure needs, such as roads, dams, and railroads.¹⁹ New Brunswick, Ontario, and Quebec were among the first to administer their Crown land forests, with the remaining provinces and two territories joining this system in the latter part of the nineteenth century. This established a unique relationship between government, private sector companies, and the making of industrial Canada. This partnership still prevails today and is in stark contrast to the largely private ownership, management, and harvesting of forests in the United States.

With Canadian Confederation in 1867, the pre-confederate relationship between provinces eager to develop Canada at an industrial scale and lumber companies keen to make a profit strengthened. Crown land was owned and managed by the provincial and federal governments. Provinces administered licenses and fees for harvesting and the federal government managed international trade. Together private enterprise and governmental mandates sought to maximize forest revenues.²⁰ Accelerating the liquidation of forests into profit was viewed as benefiting both sides, and provinces took special steps to ensure that the forest industry was profitable. For example, lumber companies were not required to pay government fees until they sold their harvested lumber. Likewise, provinces did not compel lumber companies to reforest cleared land. Reforestation had long been practiced in other countries; however, the Canadian forests were seemingly so extensive they did not need replanting. Harvested land was simply rented to farmers or other private industries that benefited from the clearing.

By 1907, 40 percent of British Columbia's budget came from forest revenues.²¹ Since timber profits meant financial gains for the Province, access to Crown land forests by industry was simple. For example, the Province made it extremely easy to acquire licenses to harvest Crown lands. No inventory on the number, age, or condition of trees was requested of private individuals or companies seeking to fell Crown forests. To claim a license all that was required was the setting of a post at the corner of land slated for harvesting and the publication of its location in the *British Columbia Gazette*.²²

Likewise, with the passing of the Lands Act of 1901, pulp leases for the pulp and paper industry were made very cheap. On the Queen Charlotte Islands, for example, rental rates for pulp and paper were 2 cents per acre compared with 22 cents per acre for timber leases.²³ According to Richard Rajala, "the Queen Charlotte Islands represented the clearest example of hinterland resources being drawn off without appreciable local benefit."²⁴ Like other parts of British Columbia, the Queen Charlotte Islands had been home to Aboriginal people who were not only relocated onto reserves, but they were prohibited from using their ancestral forest lands. Throughout British Columbia, Aboriginal

land became Crown land, and even Aboriginal reserves were considered government land.

Access to forests by First Nations people became increasingly restricted as lumber companies moved into the Province. This had a devastating impact on their lives. The Haida people, for example, not only used timber for practical purposes like firewood, but they also possessed deep spiritual connections to their forests, developing a highly sophisticated carving and building tradition. While the prices for timber and pulp leases appeared cheap from a Western perspective, many First Nations people could not afford them, and some corporations hired private rangers to patrol their leased land against Aboriginal intrusions.²⁵

Factory Forests

The unknown extent of Canadian forests made its severest impacts when coupled with industrial developments, such as railroad expansion and pulp and paper production. The rate and extent of forest consumption were fueled by the idea of not only an endless forest, but that every tree could be put into production. For example, the pulp and paper industry used stands of spruce and fir, which were deemed unsuitable for lumber.²⁶ Forests, which had been logged for lumber typically, left less suitable species of trees standing, so the entire forest was not cleared. With the development of the pulp and paper industry, pulp wood companies returned to previously logged land and harvested remaining stands, in some cases completely denuding the area. Pulp and paper mills also required more permanent and expensive infrastructure. The sawmills used by earlier lumber companies were relatively portable. Sawmills could be “shuttled around the country in pursuit of a receding timber supply.”²⁷ In contrast, the pulping process implied a substantial investment of physical and human capital, and one that eventually necessitated the creation of mill towns. The industry’s permanent mill towns tended to deplete the forests closest to town. As a result, an unsustainable condition prevailed in which loggers had to increasingly look further from town to find trees.

As Canada expanded westward and connected its resources to cities and ports with a transcontinental railway, thousands of hectares of Crown land forests were granted to railroad companies. Forests were cleared for the tracks and the tracks themselves, as well as the elaborate trestle systems needed to navigate the steep valleys of the west, were made of timber. The industrial-scale deployment of wood-burning locomotives, which consumed large quantities of timber, also depleted the forests.²⁸ Yet, the biggest destroyers of forests in Canada were railroad related fires. Sparks from tracks started uncontrollable blazes in remote and largely inaccessible locations. These

runaway fires destroyed more than six times the amount of forests than the lumber industry.²⁹

In British Columbia the impacts of the unknown, coupled with industrialization, were particularly acute. According to Rajala, compared to other Provinces, its forests were subjected to more advanced technological harvesting methods and tools, and also a factory style work ethic.³⁰ By the early twentieth century, overhead logging systems and steam powered dragging cables had been developed. Once felled by these aerial systems, trees were dragged along a skid row by a steam powered winch to a mill or transfer point where they could be loaded onto railroad cars and later trucks. These inventions enabled companies to rapidly fell entire stands of trees while also shortening the time timber was removed from the forests and put into production. Since they coincided with the rise of British Columbia's forest industry, these technological developments became commonplace in the province, and thus, so did clear-cutting.³¹ With the introduction of chainsaws from Germany in 1930 as well as the internal combustion engine, this factory forest model flourished.³²

The forest industry in British Columbia was marked by an increasingly intensified division of labor, expanding mechanization of all phases of work, and ultimately a shift from highly skilled labor to less skilled labor. This created a factory-like environment in forests and for the lumbermen who even today exercise substantially less control over their work conditions than previous generations. Working in this factory forest, lumbermen suffered the same fate as those working in the indoor factory. The mechanization of the forest industry resulted in a dilution of skills and a restructuring of labor that decreased workers' autonomy.³³ In effect, the status of the lumberjack as an independent skilled worker who was highly knowledgeable of forests and timber cutting was replaced with unskilled crews, men who typically shuffled between logging, railroad work, and road construction. In fact, the term "skid row," which now means a run-down area of a town where people down on their luck congregate, owes its origins to the skid rows in logging towns of the Pacific Northwest.

The corporate factory model and its dedication to efficiency rationalized the continued clear cutting of British Columbia's forests well into the early twentieth century. The logic of this factory model when combined with the endless forest ethos proved to be insurmountable to even the earliest initiatives seeking to conserve the forests. For example, with the passing of the Forest Act of 1912, British Columbia was mandated to begin managing its forestlands. The Act required a professional forester to oversee harvesting on crown lands. Unfortunately, the forest industry had already firmly established steam-powered overhead logging systems throughout the Province. Logging companies argued that they were unable to adapt to any other harvesting practices other than clear cutting. Foresters were sympathetic to their position, recognizing

“that logging on public lands must conform to the technologies that had been developed solely in accordance with a corporate concept of efficiency that gave no consideration to resource perpetuation.”³⁴ Thus, clear-cutting prevailed, even under the watch of a professional forester.

Quantifying the Forests

The task of quantifying Canada’s forests emerged as an awareness of their depletion became overwhelmingly evident. Canada’s extensive railroad system increased people’s knowledge of forest liquidation. As early as 1871, the first Prime Minister of Canada, Sir John A. MacDonal, noted that the “immense masses of timber passing my windows every morning constantly suggests to my mind the absolute necessity there is for looking into the future of this great trade. We are recklessly destroying the timber of Canada and there is scarcely a possibility of replacing it.”³⁵ One of the first voices of concern, however, came from lumbermen. They called upon the government to take action against runaway fires started by locomotives and settlers eager to clear forested land.

By the early twentieth century, laypeople witnessed forest destruction firsthand by car. They protested for legislation to curb the forest industry’s insatiable desire for wood and reduce fires started by careless clearing and trains. They also demanded reforestation as conducted in other countries. In response, governmental agencies studied forest management and inventory methods in the United States, India, and Europe.³⁶ However, forest management in Canada faced many obstacles. There was not only the size of its Crown land forests in comparison to a relatively small population, but also quantifying the unknown implied numerous political, technical, and cognitive challenges.

Political Conditions

In the late nineteenth century provinces began to pass legislation restricting when settlers could use fire, and fire towers were established in remote areas to detect smoke from afar. Across the country, provinces required that fire rangers be stationed along railway corridors to spot smoke and flames.³⁷ These fire lookout stations eventually evolved into lookout cabins and towers located deep in the forest interior. On the management side, in 1901 the Canadian Forestry Branch was established and in 1906 the Dominion Forest Reserves Act was passed enabling the Forestry Branch to oversee Canada’s forests. Tree

planting and soil conservation were some of the Department's first projects, and over fifty million seedlings were distributed to farmers in the prairie provinces. Numerous conservation programs and legislation emerged demonstrating a reformed relationship between private forest industries and government. Yet, programs and policies were fragmented across the country as knowledge about the extent and conditions of forests was spotty.

A more comprehensive assessment of Canadian forests was not realized until 1909 when Parliament established the Commission of Conservation. One of the Commission's first mandates involved providing information regarding Canada's natural resources and conducting inventories to determine how much of Canada's forests remained.³⁸ Yet, despite the active quantification of the unknown, knowledge did little to curtail the forestry practices established during the endless forest period. According to Allen Barton, for Canada, "the forestry question is not a study of success when compared to many of the other commonwealth countries and the United States . . . In Canada politicians and the timber industry turned the multiuse forest into the uni-interest of timber extraction."³⁹

British Columbia is a good case in point. In 1918 the Commission completed its forest inventory of the Province and found that 32 million hectares of cut-over forest was incapable of regeneration, two-thirds of the forestlands had been destroyed by fire, and that a substantial amount of forests should be protected.⁴⁰ Since harvested lands were not reforested, by the 1920s only a quarter of the logged land in British Columbia's coastal forests was regenerating, and clear cutting was producing fifty times more useless species than before.⁴¹ Harvesting techniques were also identified as contributing to the failure of forest regeneration. British Columbia's Chief Forester found that the overhead systems used in the forest factory model were "responsible for large areas of cut-over land not restocking."⁴²

Despite the dire information about its forests, no legislation regulating factory methods or reforestation programs emerged. With little provincial support, the early conservation movement in British Columbia gained its momentum from average citizens. A major impetus in this movement was the advent of the automobile. Lumber roads were converted into Forest Service Roads, so motorists could access even very remote areas and witness destruction. Traveling by car people could see firsthand the devastating effects of clear-cutting: raw earth scarred by the movement of heavy machinery with tangled roots, overturned trunks, and shreds of bark strewn about.

In reaction, a variety of grassroots organizations emerged to protest forest destruction. These grassroots organizations helped publicize the fact that forests were not endless, and they demanded that the Province take responsibility for their reforestation.⁴³ To quell public outcry, the Green Timbers Urban

Forest was inaugurated in Surrey in 1930. With much publicity, more than 120 Douglas fir and Sitka Spruce were planted for reforestation purposes. By the 1940s Green Timbers had produced 6 million trees that restocked 2 million hectares of clear-cut land.⁴⁴ An arboretum and experimental plots were later added as well as a forestry training and education center.

Despite these efforts, private companies themselves were still not encumbered to manage or reforest harvested lands or involve themselves in fire management. In the United States agreements were made that mandated fire protection by government in exchange for conservation forest practices by industry.⁴⁵ According to Rajala, in Canada, no clearly defined and mutually beneficial models of management emerged. Provinces, instead of the federal state, controlled Crown lands. Thus, forest management and the regulation of forest industries fell to the whims of local politics that consistently supported short-term, corporate profit over long-term sustainability.⁴⁶ It was not until 1947 with the Forest Management Act that companies were required to submit cutting and management plans on leased lands.⁴⁷ Nonetheless, the creation of management plans for forests posed numerous technological and cognitive challenges.

Technical Hurdles

The conservation movement marked the conclusion of the endless forest ethos in Canada and the commencement of attempting to know the extent and condition of its forests. As a consequence the quest to quantify its trees became paramount. The unknown implied technological advances to account for and understand Canada's vast forests. Early forest inventory techniques involved substantial groundwork, and it was slow. Traveling by horseback, foot, and canoe, data collection and analysis of approximately 20 hectares of forests typically took about a month, whereas an aerial inspection could cover 80 hectares in one day.⁴⁸

In 1918 the first aerial inspections of forests in Canada took place for the purposes of fire detection.⁴⁹ But the usefulness of airplanes expanded greatly at the conclusion of World War I, when Canada found itself with a surplus of planes. In 1919 Great Britain donated over one hundred planes to Canada in support of civil operations such as forestry and photographic surveying. Aerial inspections for inventory were ideal for Canada's huge and largely inaccessible forests, and they saved time and money.

By the late 1920s, two methods evolved in Canada to obtain inventory estimates: aerial sketching and aerial photography.⁵⁰ Sketching provided a fast and inexpensive method for determining a rough estimate of a forest's age and health. Like other forms of sketching, it collapsed data collection and analysis

into one task completed by the sketcher. A rough map of the area was mounted on a board in an open cockpit and the sketcher would draw timber by categories.⁵¹ Sketching experts, like Holly Parsons from Ontario, developed the art of sketching in colors based on his view from an altitude of 3,500 feet. Revealing the working process for aerial sketching, he notes that

the colour and density of the crowns of the trees not only tell you the species but the age, class, and in many cases the quality of the timber underneath. You could not see much of what was under the crowns but the various intensities of green would tell you whether it was spruce, white pine or red pine, hard maple or tamarack. As to the heights of the stands, if the crown cover was fairly consistent you knew it was a mature stand. If you could see holes in the stand you knew it was over-mature. If the crown cover was flat but coming up almost to the height of mature stands, you knew it was an advanced second-growth stand of timber, usually the result of a forest fire.⁵²

Unfortunately, aerial sketching was a highly subjective method for inventory analysis, and was entirely dependent on the skills of the lone sketcher. It was practiced until the early 1940s, until it was replaced by aerial photography.

Aerial photography emerged as critical to determining forest inventory during the early twentieth century. In 1919 Ellwood Wilson, a European trained forestry engineer, installed an Eastman K-I camera on one of the St. Maurice Forest Protective Association planes in Quebec. The photograph produced proved to be extremely valuable in revealing the unknown. Writing to *The New York Times* in 1921 Wilson noted that more than 10,000 square miles of Quebec had been photographed providing “rapid stock-taking of timber lands.”⁵³ Species and types of timber could be identified, documented, and analyzed. Once estimates of forest inventory were established, Wilson was convinced that the unknown could be known. He contended that “we shall remove the whole realm of speculation, we shall know how much timber we have and where it is located, and how much can safely be removed, and yet keep the industries dependent on the running forest.”⁵⁴ Wilson went on to establish Fairchild Aerial Surveys of Canada (renamed Fairchild Aviation in 1926) and the federal government promoted the use of aerial photography to determine a forest’s extent, age, and quality, and potential yield.

One of Canada’s greatest contributions to the field of forest inventory analysis was the development of oblique aerial photography.⁵⁵ In 1922 and 1925 experimental reconnaissance flights of previously mapped forests were taken in Ontario. Instead of taking photographs directly down, these flights took pictures of the forests at an angle. It was soon realized that these back-up images were extremely valuable in their own right. Oblique photographs covered more land area than direct ground shots, and they revealed both horizontal

as well as vertical information. As long as the aerial oblique depicted the horizon line, a perspective grid and the principles of linear perspective could be employed to create a map that contained both vertical and horizontal information to scale.⁵⁶ This enabled foresters to determine tree heights and ground area conditions, and even topographic maps could be constructed from these oblique images, providing information regarding the accessibility of stands.⁵⁷

The fact that the horizon line must be captured in the image to determine the scale of oblique aerial photographs limited their use in provinces such as British Columbia. British Columbia's mountainous terrain made aerial analysis difficult. The steep coastal and interior mountain ranges of the province often blocked the horizon, preventing the imposition of a perspective grid onto the photograph.⁵⁸ To make matters worse, the province was witnessing the unprecedented industrial-style clearing of forests that outpaced inventory studies, making these studies outdated upon their completion.⁵⁹

Despite these technical feats, knowing the extent and type of forests in Canada was only a part of the challenge in determining the unknown. Surveys provided data on forests, but in order to manage these facts and determine what would be saved and what would be cut, a theory was needed. Scientific forestry arose to meet this challenge developing the theory of sustained yield, a method of dealing with the unknown. Unfortunately, this is a theory that governmental agencies, scientists, and eventually environmentalists struggled with for most of the twentieth century.

Forests in Theory

Scientific forestry emerged as forestry schools were established across Canada in the early twentieth century. The University of Toronto started the first school in 1907 under the leadership of the German trained forester Bernhard Fernow, and forestry schools in other provinces followed. Scientific forestry and its educational institutions transformed the ambiguities of the unknown into a set of theories. However, due to their close ties with industry, forest knowledge was strongly tied to the supply and demand needs of the market. As schools of forestry collaborated with forestry companies, theories such as sustained yield became central to their approach to forest management.⁶⁰ Indeed, sustained yield is one of the major knowledge claims of scientific forestry, and is practiced worldwide.⁶¹

The theory of sustained yield posits that by prescribing an annual "allowable cut of wood volume, trees could be harvested at an increasing rate without depleting a province's forest resource."⁶² Wood volume is the amount of wood in a tree measured from inside the bark.⁶³ Because trees grow and

there is great variation in this growth, forests were not as easy to quantify as other commodities. For example, the shorter the rotation time, the smaller the volume becomes, but volume also depends on other factors. A thousand hectares of forests on 100 years of rotation might have an allowable cut of 10 hectares each year, but an allowable cut every 25 years might yield more volume or less, depending on the trees species, weather, pests, fires, and the age of the forest.⁶⁴

In 1912, foresters in the British Columbia Forest Service introduced the concept of sustained yield to the Province. However, sustained yield did not transform from a theoretical concept to a practical working tool until decades later when it was mandated by government.⁶⁵ For example, for most of the twentieth century, pulp and paper companies, the biggest consumers of forests, were not compelled to supply the government with inventories. Sustained yield plans were required with the passing of the Pulpwood Conservation Act in 1929.⁶⁶ However, this Act was politically contentious and deemed ineffective. It was not until 1976 that sustained yields became a standard measure to determine rates of cuts in British Columbia.⁶⁷ Unfortunately, as Drushka notes, the sustain yield theory was originally devised for naturally occurring old-growth forests, not regenerated ones. When sustained yield theories were practiced on second-growth forests, they resulted in declines in timber volumes.⁶⁸

Fadzilah Majid-Cooke points out that “it is the relationship between the two sets of uncertainties (biological and temporal) that makes regeneration a particular problematic issue for forestry. The irony is that, precisely because of such uncertainties, there is also room for negotiating claims about reality.”⁶⁹ Particularly in the first half of the twentieth century there was little knowledge about the regeneration of forests under different conditions with certain species, and the way time factors into forest quality. Under the condition of ignorance, many claims about sustained yield were informed by the politics of knowledge, rather actual knowledge. Even professional foresters who were hired to manage forests, operate forest product laboratories, and establish forest reserves were largely beholden to local politics that supported powerful corporations.

Another problem with the theory of sustained yield is its privileging of a forest’s market value over other values. Production and consumption are unquestioned in sustained yield analyses.⁷⁰ Thus, non-market values, such as the intrinsic value of trees, are not factored into the equation. The Green Timbers forest is a good example of market values supplanting intrinsic values. Located on British Columbia’s border with Washington State, Green Timbers was once one of only two old-growth forests left on the Pacific Highway that ran 2,000 miles between Vancouver and southern California.⁷¹ The patch of forest got its name for the view it afforded. When traveling south on Pacific

Highway to the United States the huge trees of this forest framed a majestic view of Mount Baker. By the first decade of the twentieth century Green Timbers had become a popular resting stop for travelers driving between Canada and the United States.

In 1912 M. B. King bought a lease to harvest Green Timbers for his new high-speed electric mill.⁷² The alacrity in which King was able to fell parts of this forest and the rapid rate that his electric mill processed these trees alarmed residents living in the area. Since Green Timbers was situated on acreage that was owned as part of the Dominion railroad lands, the federal government was enlisted. In 1913 the Surrey Board of Trade wrote to the Department of Interior requesting that it preserve Green Timbers, stressing that “it was necessary to emphasize the urgency of the situation.”⁷³ Several attempts were made by concerned residents to encourage an agreement between the federal government and King, but public concern only strengthened King’s position.

By 1926 the last stand of trees remained bordering 60 meters on either side of the Pacific Highway. Unfortunately, as public outcry escalated to save the forest, so did King’s exchanges for keeping it. King’s original demand was \$350,000 in cash plus timber leases three times the size of Green Timbers. Two months later he raised the cash amount to \$500,000, and finally he asked for \$30,000 every year for the next twenty years plus a lease exchange four times the size of Green Timbers.⁷⁴ Advocates writing in support for Green Timbers cited U.S. legislation that preserved forests for their own sake. The trees in and of themselves had value. However, letters from Ottawa revealed that the Canadian government could only understand the preservation of this forest as a tourist destination at best, and one that could not be exchanged for King’s demands.⁷⁵ The government declined King’s final request and in 1929 the last remaining trees were clear-cut. By 1930 King had processed this timber and closed the mill.

Conclusion

Knowing forests as large and diverse as Canada’s is no small undertaking. The endless forest era, and later, the quantification of forests were both shaped by the unknown. Unfortunately, Canada’s reputation as a world supplier of lumber and pulp commodities, coupled with private harvesting of public forests at an industrial scale and rate helped perpetuate ignorance. Once the image of the endless forest faded, Canada still faced numerous political, technical, and cognitive obstacles that made forest knowledge imperfect, if not corrupt. British Columbia suffered considerably. Its late development as a province, its free-wheeling forest industry, and laissez-faire politics enabled forest depletion to

unfold with few restrictions. Even when inventory analyses were mandated by the federal government, British Columbia's mountainous terrain posed technical challenges, making early inventories of its forest difficult. Once scientifically trained foresters introduced the theory of sustained yield to determine allowable cuts of forests, the unknown became explicitly tied to the use-value of trees. This is not surprising given that scientific forestry developed as a practice where knowledge and economic profit were closely intertwined.

Unlike some natural reserves, such as oil, forests have numerous values. The trees of a forest are resource commodities, and they also offer animal and plant habitats; some people treasure trees for their intrinsic value. They have worth in and of themselves. Forests also play a spiritual role in First Nations practices and are a symbol of Canadian culture. Ironically, during the height of forest liquidation in British Columbia, forests became emblematic of the Province, appearing in art from painting to poetry. The deputy minister of forests even declared British Columbia the "forest province of a forest nation."⁷⁶ Despite these competing ideals, forests continue to be valued culturally, and they are still the cornerstones of the Canadian economy. Yet, if there is one place that is equally plagued by the unknown, it is the global market.

Notes

1. See Ken Drushka, *Canada's Forest: A History* (Durham, NC, 2003), vii. Canada has ten major forest regions, including the dense boreal forests in the north, diverse mixed-wood forests in the Great Lakes-St. Lawrence region, the Acadian maritime forests in Nova Scotia, Prince Edward Island, New Brunswick, and the ancient forests of British Columbia's coast.
2. *Ibid.*, 43.
3. See Gregory Allen Barton, *Empire Forestry* (Cambridge, UK, 2002) and Peder Anker, *Imperial Ecology: Environmental Order in the British Empire, 1895–1945* (Cambridge, MA, 2001).
4. Monique M. Ross, *Forest Management in Canada* (Calgary, 1995), 69–70.
5. Drushka, *Canada's Forest*, vii.
6. *Ibid.*, 23. The French also introduced reservation systems for naval lumber. As early as 1670, New France established the first conservation ordinances in North America to protect its oak and elm trees.
7. Suzanne Zeller, *Inventing Canada: Early Victorian Science and the Idea of a Transcontinental Nation* (Toronto, 1987), 172–173. See also Suzanne Zeller "Environment, Culture, and Reception of Darwin in Canada, 1859–1909," in *Disseminating Darwinism: The Role of Place, Race, Religion, and Gender*, ed. Ronald L. Numbers and John Stenhouse, 91–122 (New York, 1999).
8. Quoted from Zeller, *Inventing Canada*, 98.
9. *Ibid.*, 173.
10. *Ibid.*, 126.

11. Donald MacKay, *Heritage Lost: The Crisis in Canada's forests* (Toronto, 1985), 44.
12. *Ibid.*, 17. By 1823 British North America included Lower Canada, Upper Canada, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland, and the Labrador Coast. The Northwest Territories were considered British possessions, and Britain jointly administered the Oregon Territory with the United States.
13. Donald MacKay, *Flight from Famine, The Coming of The Irish to Canada* (Toronto, 1990), 199. Also see Marianna O'Gallagher, *Grosse Ile, Gateway to Canada, 1832–1937* (Sainte Foy, Quebec, 1984).
14. A. B. Robinson, *Witch Hunt in the B.C. Woods* (Kamloops, BC, 1995), 23.
15. Richard A. Rajala, *Clearcutting the Pacific Rain Forest: Production, Science, and Regulation* (Vancouver, BC, 1998), introduction.
16. Drushka, *Canada's Forest*, 39.
17. Rajala, *Clearcutting the Pacific Rainforest*, 99.
18. MacKay, *Heritage Lost*, 76.
19. Drushka, *Canada's Forest*, 30.
20. Rajala, *Clearcutting the Pacific Rainforest*, 1.
21. Robinson, *Witch Hunt*, 31.
22. *Ibid.*, 29.
23. Richard R. Rajala, *Up-Coast: Forests and Industry on British Columbia's North Coast, 1870–2005* (Victoria, BC, 2006), 23.
24. *Ibid.*, 7.
25. *Ibid.*, 42.
26. Ross, *Forest Management*, 60. There are five non-private land ownership categories in Canada: federal (Dominion land), provincial government (Crown land), local government, private (non-Aboriginal), and Aboriginal (Indian Reserves and traditional territories).
27. MacKay, *Heritage Lost*, 5.
28. Drushka, *Canada's Forest*, 34.
29. MacKay, *Heritage Lost*, 204.
30. Rajala, *Clearcutting the Pacific Rain Forest*, 79.
31. *Ibid.*, 81.
32. B.C. Provincial Museum Modern History Exhibits, 4.
33. Rajala, *Clearcutting the Pacific Rain Forest*, 222.
34. *Ibid.*, 89.
35. Quoted from Drushka, *Canada's Forest*, 43.
36. Barton, *Empire Forestry*.
37. Richard A. Rajala, *Feds, Forests, and Fire A Century of Canadian Forestry Innovation* (Ottawa, 2005), 14.
38. Rajala, *Feds, Forests, and Fire*, 13.
39. Barton, *Empire Forestry*, 163.
40. Drushka, *Canada's Forest*, 41.
41. MacKay, *Flight from Famine*, 116.
42. Rajala, *Clearcutting the Pacific Rain Forest*, 112.
43. *Ibid.*, 165.
44. B.C. Forest Service Department of Land, 6.
45. Rajala, *Clearcutting the Pacific Rain Forest*, 89.

46. Rajala *Up Coast*, 23–24.
47. MacKay, *Heritage Lost*, 113.
48. *Ibid.*, 72.
49. Rajala, *Feds, Forests, and Fire*, 35.
50. *Ibid.*, 39.
51. *Ibid.*, 40.
52. Mackay, *Heritage Lost*, 73.
53. Rajala, *Feds, Forests, and Fire*, 40.
54. Ellwood Wilson, “Canada Saving Forests to Keep up Paper Supply,” *The New York Times*, March 20, 1921, Sunday, Section: Special Features, 2.
55. Gerard H. Matthes, “Oblique Aerial Surveying in Canada,” *Geographical Review* 16, no. 4 (1926): 569.
56. Matthes, *Oblique Aerial Surveying in Canada*, 572.
57. O. M. Miller, “Planetabling from the Air: An Approximate Method of Plotting from Oblique Aerial Photographs,” *Geographical Review*, 21, no. 2 (April, 1931): 201.
58. *Ibid.*
59. James Thrower, *An Historical Summary of Forest Inventory Samplings Designs in British Columbia* (Victoria, BC, 1992), 3.
60. Rajala, *Clearcutting the Pacific Rain Forest*, 63.
61. W. Young, “Development of Sustained-Yield Forest Management in British Columbia,” in *The History of Sustained Yield Forestry: A Symposium*. Western Forestry Center, Portland, Oregon, October 18–19, 1983, ed. Harold Steen (Santa Cruz, CA, 1984), 221–222. Today, the theory of sustained yield has proven to be an unsatisfactory method to determine when and what amount of forest can be harvested, particularly in the temperate rain forests of British Columbia, yet a more detailed and site specific system for ensuring sustainable harvesting has yet to be realized. See Scott Prudham, *Knock on Wood: Nature as Commodity in Douglas Fir Country* (New York, 2004), 162–163. This book is dedicated to forests in the United States, but both countries employed sustained yield in forest management practices throughout the twentieth century.
62. Canadian Forestry Service, *Canada: A Forest Nation* (Ottawa, 1973), 1.
63. B. D. Haddon, *A Guide to Canadian Forest Inventory Terminology and Usage* (Chalk River, Ontario, 1989), 44.
64. Eli Sowpow, *Seeing the Forest: A Survey of Recent Research on Forestry Management in British Columbia*, Working Paper for the Western Resources Program of the Institute for Research on Public Policy (1985), 51.
65. Young, *Development of Sustained-Yield Forest Management*, 222.
66. MacKay, *Heritage Lost*, 109.
67. Young, *Development of Sustained-Yield Forest Management*, 223.
68. Drushka, *Canada’s Forest*, 63.
69. Fadzilah Majid-Cooke, “The Politics of Sustained Yield Forest Management in Malaysia: Constructing the Boundaries of Time, Control and Consent,” *Geoforum*. 26, no. 1 (1996): 449.
70. *Ibid.*, 446.
71. H. R. Christie and F. E. Buck, “Ninth Memorandum on Green Timbers—A Review,” unpublished report (1926), 1. Ironically, the paving of Pacific Highway intensified the popularity of Green Timbers. Five times as many people stopped to marvel at the giant

trees after it was paved. See David J. Sandquist, *The Giant Killers: Forestry and Recreation in Green Timbers Forest, Surrey, B.C.* (Burnaby, BC, 2000), 69.

72. Christie and Buck, Memorandum, 2.

73. Ibid.

74. Ibid., 4.

75. Ibid., 1.

76. R. G. Mckee, "Canada's Pacific Forests," *Unasylva: The International Journal of Forestry and Forest Industries* 1, no. 4 (1958): 1.