

Tracks, Tunnels and Trestles: An Environmental History of the Construction of the
Canadian Pacific Railway

by

Heather Anne Longworth
B.A., Acadia University, 2007

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF ARTS

in the Department of History

© Copyright Heather Anne Longworth, 2009.
University of Victoria

All rights reserved. This thesis may not be reproduced in whole or in part, by photocopy
or other means, without the permission of the author.

Tracks, Tunnels and Trestles: An Environmental History of the Construction of the
Canadian Pacific Railway

by

Heather Anne Longworth
B.A., Acadia University, 2007

Supervisory Committee

Dr. Richard Rajala, Supervisor
(Department of History)

Dr. Eric Sager, Departmental Member
(Department of History)

Supervisory Committee

Dr. Richard Rajala, Supervisor
(Department of History)

Dr. Eric Sager, Departmental Member
(Department of History)

Abstract

The construction of the Canadian Pacific Railway (CPR) was not a conquest of man over nature as some historians have suggested and the driving of the last spike did not cement that victory. By studying the CPR from an environmental perspective, it becomes obvious that the relationship between the people and the environment in the mountains was two-fold: workers had an effect on the environment through fires, deforestation, excavation, and blasting, and the environment likewise had an effect on workers through the hardships of weather, challenging terrain, avalanches, and floods. Shortcuts, such as steep grades and wooden bridges, taken by the CPR throughout construction to save money and time, as well as the poor route choice, had unintended consequences for the operation of the railway. Massive deforestation and fires had repercussions for the watershed of the eastern Rocky Mountains and the choice of Rogers Pass meant that the CPR had to deal with numerous avalanches and deep snow. Steep grades and lines that were easily flooded or open to avalanches resulted in the deaths of numerous workers and expensive repairs to engines and the track. The construction of the CPR also had a notable impact on western Canada as it opened up the land to tourism, settlement, agriculture, and the lumber and mining industries. In building and operating the line, the CPR had to learn to adapt to the environment in order to carry out repairs quickly and get trains through.

Table of Contents

Supervisory Committee	ii
Abstract	iii
Table of Contents	iv
List of Figures	v
Acknowledgements	vi
Chapter I.....	1
Introduction and Historiography.....	1
Chapter II	27
Hacking through the Bush: Surveying and Choosing a Route	27
Chapter III.....	47
A Fight with Nature: The Construction of the CPR, 1883-1885	47
The Ongoing Struggle: The First Years of Operation, 1886-1916	87
Conclusion	130
Maps and Images	135
Bibliography	145

List of Figures

Figure 1: Map of British Columbia Showing the Canadian Pacific Railway	135
Figure 2: Canadian Pacific Railway construction camp, British Columbia, 1884	136
Figure 3: Canadian Pacific Railway construction camp at summit of the Selkirks.....	136
Figure 6: Canadian Pacific Railway trestle bridge under construction west of Calgary..	138
Figure 7: Train on Stoney Creek Bridge, British Columbia, 1885.	138
Figure 8: Building the Mountain Creek bridge	139
Figure 9: Corry Brothers tunnel during Canadian Pacific Railway construction	139
Figure 10: Canadian Pacific Railway snowshed under construction	140
Figure 11: Canadian Pacific Railway snowshed under construction.....	140
Figure 12: Canadian Pacific Railway snowshed on east slope of Selkirk Summit.....	141
Figure 13: Canadian Pacific Railway workers with Engine 365 derailed by snow slide, Rogers Pass, British Columbia, 1897	141
Figure 14: Devastation on Canadian Pacific Railway track after snow slide	142
Figure 15: Snow slide over track between Rogers Pass and Glacier	142
Figure 16: Snow plough on Canadian Pacific Railway line, between Rogers Pass and Glacier.....	143
Figure 17: Work train on the blue cut above Patricia Siding during building of Spiral Tunnel	143
Figure 18: Canadian Pacific Railway construction at west portal of Connaught Tunnel, 1914.....	144

Acknowledgements

This thesis has been a long journey and while I did not go through the same challenges as those who built and operated the CPR, like them, I had a lot of people that helped and supported me along the way. These people are too numerous to mention them all, but there are some who must be acknowledged:

- My twin sister, Susan Longworth, who came up with the idea for this thesis when all I knew was that I wanted to do something with Canadian environmental history. She continually motivated me and was always there to edit and listen to the discoveries and struggles throughout my research.
- Anne Dance for her editing and encouragement.
- My supervisory committee for all their time and hard work: Dr. Richard Rajala, Dr. Eric Sager, and Dr. James Lawson.
- My family and friends who hosted me on my research trips to Ottawa, Vancouver, Calgary, and Edmonton.

Lastly, this thesis is dedicated to all those surveyors, planners, construction workers, and those who operated and repaired the line, especially those whom I have come to know and appreciate throughout my research. Your strength, courage, and spirit in face of some of the most difficult geographic obstacles and weather are still incredible and inspirational today.

HAL

Chapter I Introduction and Historiography

“All I can say is that the work was well done in every way,” general manager William Van Horne announced in 1885, after the last spike was driven to complete the Canadian Pacific Railway (CPR).¹ Van Horne’s victorious declaration was far from correct: the 2400 mile line had been built as quickly as possible, taking shortcuts such as steep grades, wooden bridges, portions of unballasted track, and sections through the mountains that would be difficult to keep open during the winter.² The photograph of Donald Smith hammering in the final spike is one of the best known photographs in Canadian history, celebrating a victory of man over nature. But the victory was short-lived; the track closed that first winter and numerous problems with avalanches, weather, and fires disrupted service during the first decades of operation.

The history of the CPR is not simply one of man conquering nature, but one of humankind’s diverse relationships with nature, where the environment shaped the construction and operation of the CPR as much as the workers had an impact on the environment through deforestation and grading. Difficulties with the environment along the route forced the CPR to build new tunnels, reduce grades, and build snowsheds on the mainline. This study will differ from other CPR histories in emphasizing the role of the environment in the construction and operation of the track, looking at the CPR as an adaptation to nature which was not wholly successful, and examining the cultural perceptions of railway workers and travellers toward nature. The environmental history of the CPR remains relevant to a modern-day Canada where the idea of total control of

¹ William Van Horne cited in Edmund E. Pugsley, “Pioneers of the Steel Trail: Two Streaks of Rust,” *Maclean’s*, June 15, 1930, 74.

² Valerie Knowles, *From Telegrapher to Titan: The Life of William C. Van Horne* (Toronto: Dundurn Group, 2004), 204.

nature persists. Nevertheless, nature can never be completely tamed and, as in the case of the CPR, attempts to do so often create unforeseeable problems. Examining the most difficult section of track, the mainline between Calgary and Craigellachie, it becomes apparent that both the environment and the workers had an impact on each other during the construction and improvements to the mainline from 1883 to 1916.

In order to understand changes in the historiography of the CPR and make comparisons with other railways, it is important to have a basic understanding of the history of Canada's first transcontinental railroad. When British Columbia joined Confederation in 1871, Prime Minister Sir John A. Macdonald promised a railway to link that province with eastern Canada. Hugh Allan's Canadian Pacific Railway Company was awarded the contract to build the line but Macdonald and the Conservatives were ousted in the Pacific Scandal when it was discovered that Allan had given them campaign funds.³ From 1873 on, under the supervision of Sandford Fleming, the surveying process, initiated by Macdonald, was half-heartedly supported by Alexander Mackenzie's Liberals. The only construction accomplished in the next five years was the Pembina branch line which carried construction materials from the American lines to Winnipeg.⁴ In 1878, with Macdonald's re-election, the construction of the CPR began in earnest. The federal government contracted the Fraser Canyon section in British Columbia to Andrew Onderdonk in 1880. The new syndicate, consisting of President George Stephen, James J. Hill, Richard B. Angus, Douglas McIntyre, and John S. Kennedy, signed a contract with the government to build the rest of the track, receiving twenty-five million dollars, twenty

³ Bill McKee and George Klassen, *Trail of Iron: The CPR and the Birth of the West, 1880-1930* (Vancouver: Douglas & McIntyre, 1983), 16.

⁴ David Cruise and Alison Griffiths, *Lords of the Line* (Markham, Ontario: Viking, 1988), 76-77.

five million acres of suitable land, and other concessions.⁵ On February 16, 1881 the CPR was incorporated.

The line was to pass north of Lake Superior, travel across the prairies, cross through the Yellowhead Pass on the border of Alberta and British Columbia, and then follow the Thompson and Fraser Canyons to Burrard Inlet. However, the syndicate decided to move the line south through the Kicking Horse Pass, a shorter route that required fewer expensive bridges between Winnipeg and Calgary. The new route, moreover, opened an area with no established business interests, ensuring the syndicate's undisputed control.⁶ Major Albert Rogers discovered the pass through the Selkirk Mountains that bears his name on July 24, 1882, making this route feasible.⁷

The construction of the CPR proceeded in three sections at once. The Lake Superior section, under contractor John Ross, faced the difficulty of bogs and muskegs and the hard rock of the Canadian Shield. The second section began at Winnipeg, traversed the rolling prairies to Calgary, and then continued through the mountains. James Ross, the contractor in charge of this section and thus a prominent figure in this thesis, dealt with steep grades, high bridges, avalanches, and tenacious, sticky blue clay saturated with water. The British Columbia section under Onderdonk also posed problems as the roadbed and tunnels had to be carved out of canyon cliffs using black powder and nitroglycerine, resulting in the deaths of numerous workers, especially the Chinese.

⁵ McKee and Klassen, 18-19. Norman Kittison was not named to reduce the number of American addresses and Donald Smith was not named as he had voted against Macdonald during the Pacific Scandal. Pierre Berton, *The National Dream: The Great Railway, 1871-1881* (Toronto: McClelland and Stewart, 1970), 350.

⁶ Cruise and Griffiths, 102 and Pierre Berton, *The Last Spike: The Great Railway, 1881-1885* (Toronto: McClelland and Stewart, 1971).

⁷ Berton, *The Last Spike*, 162.

Building a transcontinental railway was an expensive process and the company was soon desperate for money, especially when land sales did not go as expected. The CPR asked the government for a loan of \$22,000,500.00 in early 1884 and this relief bill passed at the end of February.⁸ By 1885, the CPR was in trouble again and the government balked at lending it more money. The CPR, nevertheless, began to show its usefulness when Van Horne organized the transportation of troops over the completed sections of the line to quell the North-West Rebellion in March. With the railway's role in national development demonstrated and corporate and national interests united, the CPR aid bill passed in the House of Commons in July and the CPR was able to finish construction of the mainline.⁹

The railway was completed with the last spike hammered in at Craigellachie on November 7, 1885, but the work was far from over. The CPR was then closed for the winter of 1886 and observations were made on the paths of avalanches for snowsheds to be built in 1886 and 1887. The first train west departed Montreal on June 28, 1886, arriving at Port Moody on July 4, 1886.¹⁰ In the following decades, the mainline was improved with the additions of steel bridges, snowsheds, and tunnels; and branch lines were constructed.

The historiography of the CPR has changed as much as the railway itself. The first romantic accounts of the railway emphasized the triumph of Canada's first transcontinental. Metanarratives replaced these accounts in the mid-twentieth century, taking into account finances, challenges faced by the railway, and the important players

⁸ Ibid., 253, 258.

⁹ Ibid., 402.

¹⁰ Robert D. Turner, *West of the Great Divide: An Illustrated History of the Canadian Pacific Railway in British Columbia, 1880-1986* (Victoria: Sono Nis Press, 1987), 23.

in the story. More recent and detailed themes followed focusing on regions, labour relations, tourism, and environmental factors and consequences. The labour and environmental sources provide the main base for this thesis as they examine construction work, camp conditions, and the human relationship with nature.

Early monographs written about the CPR romanticized the endeavour. First published in 1916, Keith Morris's *The Story of the CPR* portrays a triumphant view of the CPR: "The path was steep, and at times they [the CPR workers] stumbled over jagged rocks which lay as barriers in the course, but their indomitable spirit remained unbroken and they reached the summit of their aspirations on this eventful November day."¹¹ Extolling the efforts of the great men of the CPR, Morris sees the CPR doing "noble work" in fulfilling the national destiny of Canada.¹² Likewise, R.G. Macbeth celebrates the victory of CPR workers over nature in his *The Romance of the Canadian Pacific Railway*: "That army [of CPR workers] was to use high explosives and unbounded physical energy, but it was with a purpose to enrich and not to devastate the county. It was to use ploughshares instead of swords, but its victories were to be certain and enduring."¹³ For Macbeth, the railway brings Canada into the modern world and any damage done to nature or any cost in workers' lives mattered little in comparison.¹⁴ The most famous romantic history, John M. Gibbon's *Steel of Empire*, argues that the CPR completed the search for a North West passage, uniting the country and connecting Britain to the Orient using trains and steamships.¹⁵ Gibbon sees the CPR as building a

¹¹Keith Morris, *The Story of the Canadian Pacific Railway* (New York: Arno Press, 1981), 69.

¹² *Ibid.*, 123, 128.

¹³ R.G. MacBeth, *The Romance of the Canadian Pacific Railway* (Toronto: Ryerson Press, 1924), 261.

¹⁴ *Ibid.*, 261.

¹⁵ John M. Gibbon, *Steel of Empire: the Romantic History of the Canadian Pacific* (Toronto: McClelland and Stewart, 1937), 406.

nation, its strong and able leadership overcoming mountains, political opposition, and financial difficulties.¹⁶ Edmund Pugsley interviewed labourers for a five-part *Maclean's* miniseries on the construction and early operation of the CPR. In 1930, he realized that little had been written about “the men who by sheer grit fought their way through wilderness and mountains, ignoring untold hardship, exposures, and dangers, *sans* any but the most primitive of comforts, yet without murmur or complaint.”¹⁷ Although he romanticizes the experiences of these men, Pugsley reveals the tasks and challenges of workers and engineers. Despite their glorification of the CPR, romantic histories are useful from an environmental perspective: they provide a detailed picture of construction and show, that in the decades following the completion of the railway, many Canadians saw the CPR as a victory over impossible landscapes and financial problems.

Economic histories of the CPR illustrate the financial challenges, the close relationship between the railway and the government, and the spread of civilization. Harold Innis argues that the CPR, as “a vital part of the technological equipment of western civilization, has increased to a very marked extent the productive capacity of that civilization.”¹⁸ In tracing how the growth of settlement and agriculture were influenced by climate, geography, and topographical features, Innis provides important environmental insights.¹⁹ Settlement extended from along waterways further inland with the coming of the railway, Innis relates, in a process that resulted in “the direction of

¹⁶ *Ibid.*, 399, 406.

¹⁷ Edmund E. Pugsley, “Pioneers of the Steel Trail: At the Throttle of the First Continental,” *Maclean's*, June 1, 1930. For other interviews with CPR workers see Robert D. Turner, *Railroaders. Recollections from the Steam Era in British Columbia* (Victoria: Provincial Archives of British Columbia, 1981) as well as other instalments of Pugsley’s *Pioneers of the Steel Trail* such as “Fighting the Snow Menace” (August 15, 1930) and “Two Streaks of Rust” (June 15, 1930).

¹⁸ Harold Innis, *A History of the Canadian Pacific Railway* (Toronto: University of Toronto Press, 1971), 294.

¹⁹ Innis, *A History of the Canadian Pacific Railway*, 1.

energy to the conquest of geographic barriers.”²⁰ Innis’ staple theory also provides a point of entry for the environmental historian, arguing that settlement and transportation spread across the country following the extraction of primary resources such as fish, furs, lumber, wheat, and minerals.²¹ The CPR opened the west to agriculture, promoting logging and the extraction of mineral deposits. Like many CPR histories, however, his story becomes one of man conquering nature.²² A different, more critical approach is taken by Robert Chodos, who emphasizes the subsidies Canadian Pacific received from the federal government from the time of construction through to the late twentieth century. From a political economy perspective, then, the CPR and the government had a unique relationship. As Chodos puts it, at times “the state appears to be an arm of Canadian Pacific,” at others, “Canadian Pacific appears to be an arm of the state.”²³ These economic histories are crucial to understanding the financial difficulties and shortcuts that the CPR took, but this approach too falls short of the social and environmental analysis of this thesis; labourers are absent and nature is portrayed only as something to be defeated.²⁴

Many of the best known works on the CPR followed in the decades leading up to the one hundredth anniversary of the last spike. These grand narratives covered the history of the CPR from the conception of the idea through to the last spike or the present

²⁰ Innis, *A History of the Canadian Pacific Railway*, 287.

²¹ Harold Innis, *Problems of Staple Production in Canada* (Toronto: Ryerson Press, 1933), 11-14.

²² Innis, *A History of the Canadian Pacific Railway*, 287.

²³ Robert Chodos, *The CPR: A Century of Corporate Welfare* (Toronto: J. Lewis & Samuel, 1973), 148.

²⁴ As well as looking at the issue on an economic scale, historians have identified the personalities behind the construction of the CPR. Biographies are useful for seeing the railway’s impact on the life of an individual, challenges faced, and achievements; however, they must be reconceptualised to give the environment a role and show the different reactions of surveyors, labourers, and contractors to nature and the work around them. See Knowles’ *From Telegrapher to Titan*; Lorne Green, *Chief Engineer: Life of a National Builder – Sandford Fleming* (Toronto: Dundurn Press, 1993); William F.E. Morley, “Tom Wilson of the Canadian Rockies,” *Alberta History* 54, no.1 (2006); and Robert Lampard, “Robert George Brett: ‘We Shall Not Look Upon His Like Again,’” *Alberta History* 51, no. 2 (2003).

day. These historians emphasized the history of great men and gave more attention to finance than to construction details. Despite being commissioned by the CPR, J. Lorne McDougall's 1968 history is "a study of Canada as a nation as well as one of the Canadian Pacific" that intends to show the CPR "warts and all."²⁵ McDougall provides a sympathetic but accurate history of the CPR; he too focuses, however, on the great men of the CPR, the economics of the railway and its importance to Canada while neglecting the people who actually built and operated the line.²⁶

Pierre Berton's works, *The National Dream* and *The Last Spike* are amongst the most famous histories of the CPR. Published between 1970 and 1971, these works depict the CPR as an instrument to unite the nation.²⁷ Berton sees the construction of the railway as a national dream that would lead to "the filling up of the empty spaces and the dawn of a new Canada."²⁸ From an environmental history standpoint, this is problematic as the spaces were not empty. Indeed, they were occupied by Indigenous people and wildlife, and while the new Canada would have better shipping and faster transportation, it would come at the cost of hundreds of worker's lives as well as a vast transformation of the land. *The National Dream* is the only work that deals extensively with the CPR from the conception of a transcontinental line to the incorporation of the CPR under George Stephen, and is valuable for its account of surveying. It also demonstrates how the CPR overcame doubters and political opposition. *The Last Spike*, focusing on the period from

²⁵ J. Lorne McDougall, *Canadian Pacific: A Brief History* (Montreal: McGill University Press, 1968), 1, 6.

²⁶ John A. Eagle, *The Canadian Pacific Railway and the Development of Western Canada, 1896-1914* (Kingston, Ontario: McGill-Queen's University Press, 1989), xii.

²⁷ This is problematic in itself as on one hand the railway united the country in terms of shipping and transportation, but on the other hand, the CPR has also been seen in the west as an agent of central Canadian imperialism especially in regards to its freight rates. See Chodos, 41-58. However, seeing the CPR as a great Canadian corporation despite the eastern domination of the west and seeing the CPR as giving Canada a "new sense of identity and world image" are still popular arguments. Jim Lotz, *Canadian Pacific* (London: Bison Books, 1985), 6.

²⁸ Berton, *The National Dream*, 11.

1881 to 1885, gives the most attention to construction in all regions of the railway as well as the financial, political, and development aspects of the story. Berton's work also has a social dimension, including stories of construction workers and contractors. Yet in describing the impact of construction on the environment, Berton sees rivers and mountains merely as obstacles to be conquered for the sake of progress, and thus the description of the land seems only to provide a backdrop to make the victory more glorious.²⁹ Moreover, ending the story with the last spike and emphasizing the conquest of nature, as this thesis will show, neglects the avalanches, floods, and forest fires that plagued the CPR in the following decades.

Along with Berton's works, William Kaye Lamb's *History of the Canadian Pacific Railway* is well-recognized. It traces the idea of a transcontinental railway through the construction phase and explores Canadian Pacific's growth in shipping, mining, tourism, and airlines until the 1970s. Another history of great men, Lamb's account rarely goes below the level of contractors. Following in the footsteps of Berton, Lamb argues that "no single organization has contributed more to the country's development in the ninety years" since the CPR mainline was completed.³⁰ Lamb too phrases his history of the CPR in positive terms, portraying presidents as geniuses and glossing over criticisms of the railway; however, his work is significant for this thesis in the amount of construction detail he incorporates.

In their *Trail of Iron*, Bill McKee and Georgeen Klassen argue that "more than any other human agency, the CPR shaped the development of most aspects of social,

²⁹ "As winter gave way to spring, every mile of the right of way was throbbing with activity ... trees toppling, stumps flying sky-high, boulders splintering, and always the stench of smoke and horse manure blotting out the subtler scent of the cedar forest." Berton, *The Last Spike*, 335.

³⁰ W.K. Lamb, *History of the Canadian Pacific Railway* (New York: Macmillan, 1977), 438.

political, and economic life in the West.”³¹ In focusing on the construction and improvement of the mainline and the CPR’s role in immigration, settlement, lumber industry, mining, and agriculture, McKee and Klassen emphasize the negative aspects, such as the occupation of Indigenous land, along with the positive aspects, like improved communication across Canada. Written to celebrate the one hundredth anniversary of the tracks reaching Calgary, this work follows tradition in upholding Berton’s premise that a transcontinental train fulfilled a national dream.³² Like McKee and Klassen, John A. Eagle focuses extensively on the development of the west in regards to agriculture and settlement along the line. The years 1896-1914, he argues, “can be aptly described as ‘the CPR West’ for in this period the CPR played a crucial role in the region’s settlement – both urban and rural – and its economic development.”³³ These two works are important for an environmental history of the line, showing the drastic changes the CPR brought to the prairies by encouraging farming and providing an irrigation system near Calgary; however, the environmental history of the prairie and settlement is beyond the scope of this thesis.

The last of the “great men” histories, *Lords of the Line* by David Cruise and Alison Griffiths, provides an in-depth look at the six most prominent presidents of the CPR from George Stephen to Ian Sinclair. Although this work says little of the construction workers, it provides insight into the advantages and challenges of heading a large company and the difficulties that each president confronted from construction to competition and dieselization. Cruise and Griffiths conclude that the CPR “has survived because of its ability to find, with amazingly few exceptions, the right leader at the right

³¹ McKee and Klassen, 185.

³² *Ibid.*, 6, 185.

³³ Eagle, 261.

time.”³⁴ This approach, while useful to business historians, neglects the role of the workers in building and running the line, and therefore is of little value to the environmental historian.

In addition to national histories of the CPR and those of great men, work on the railway has been explored regionally and these regional histories have become increasingly prevalent in the last decades of the twentieth century. The mountains are a popular topic for CPR histories as many mountain communities sprang up because of the railway. Frank Anderson was among the first to write a history of Rogers Pass from early explorations of the region to the opening of the Trans-Canada highway in 1962. In dealing primarily with the snow and avalanche problems posed by the pass, Anderson gives agency to nature. Unlike the grand narratives, Anderson shows that nature bested the railway in the pass, forcing the CPR to build the Connaught Tunnel to avoid Rogers Pass.³⁵ John Woods also focuses on the “snow wars” in this region and era, arguing that the snow hazard has only been reduced and not solved, and pointing out the environmental problems of construction from devil’s club to forest fires to avalanches.³⁶ J.D. McDonald’s *Rails and Killer Snows* gives a detailed picture of the CPR’s operations in Rogers Pass from 1885 to the construction of the Connaught Tunnel. He explores both the beauty of the pass which led to the development of tourism along the line as well as the heavy cost in lives and damage to the track from natural disasters. McDonald shows that the CPR lines were both spectacular and dangerous.³⁷ Most recently, Ruby Nobbs’

³⁴ Cruise and Griffiths, 457.

³⁵ Frank W. Anderson, *Frontier Guide to the Incredible Rogers Pass* (Calgary: Frontier Publishing, 1968), 44.

³⁶ John G. Woods, *Snow War: An Illustrated History of Rogers Pass, Glacier National Park, B.C.* (Ottawa: National and Provincial Parks Association of Canada, 1983), 2, 3, 36, and 49.

³⁷ J.D. McDonald, *Rails and Killer Snows: The Saga of Rogers Pass* (Rossland, B.C.: Rossland Historical Museum Association, 1997), 2-7.

collection of histories about Revelstoke from the Palliser Expedition through the operation of the CPR to the opening of the Revelstoke Railway Museum in 1993 illustrates how closely the CPR and the town were connected and the community's responses to disasters on the line.³⁸ These regional histories are important for this thesis in giving nature a more central role; however, they rarely give firsthand accounts of what it was like to work in these conditions, nor do they provide a detailed history of the construction of the mainline between 1883 and 1885.

Three regional histories focusing in-depth on the technological challenges of the passage through Selkirk Mountains, provide important explanations of changes made to the mainline to counteract avalanches and reduce heavy grades. Floyd Yeats examines the Big Hill near Field and the troubles such as runaway trains caused by its 4.5 per cent grade, which was far above the desired 2.2 per cent grade.³⁹ John Marsh provides a detailed picture of how the construction of the Spiral Tunnels and the Connaught Tunnel were carried out and how they improved the line.⁴⁰ Graeme Pole focuses on the Spiral Tunnels from the construction along Big Hill to the tunnel improvements in the 1950s.⁴¹ These works are valuable for this thesis in explaining the improvements to the mainline and in emphasizing the details of their construction.

More sweeping regional narratives, covering larger sections of the mountains yield similarly useful insights. In examining the Rocky Mountains from the construction

³⁸Ruby Nobbs, *Rail Tales from the Revelstoke Division* (Revelstoke, B.C.: R. Nobbs, 2000). A former CPR archivist has written another book of short histories covering the entire track from 1880-1970. See David Laurence Jones, *Tales of the CPR* (Calgary: Fifth House, 2002).

³⁹Floyd Yeats, *Canadian Pacific's Big Hill* (Calgary: British Railway Modellers of North America, 1985), 1.

⁴⁰John S. Marsh, "The Spiral and Connaught Tunnels," in *The CPR West: The Iron Road and the Making of a Nation*, ed. Hugh A. Dempsey (Vancouver: Douglas and McIntyre, 1984), 174-184. See also J.A. Beatty, "CP Rail's Connaught Tunnel," *Canadian Rail* 271 (1974): 227-235.

⁴¹Graeme Pole, *The Spiral Tunnels and the Big Hill: A Canadian Railway Adventure* (Vancouver: Altitude Publishing, 1995).

of the CPR to the 1970s, albeit with little attention to construction, Adolph Hungry Wolf provides a rare glimpse at environmental impacts.⁴² Omer Lavallée and Roger Burrows examine the construction and improvements to the mainline between Calgary and Kamloops from 1880 to the 1988 construction of the Mount Macdonald Tunnel. They see weather as an environmental problem but the landscape is portrayed as conquerable.⁴³ The Selkirks are another popular region for CPR historians. Edmund Pugsley, in examining the impact of avalanches and the expense of running the line and making improvements, argues that choosing the Kicking Horse Pass over the Yellowhead Pass was a disaster. “The permanent handicap of this re-routing would now continue for all time,” he observes, “not only requiring expensive extra motive power, roadbed and bridges, but running the constant hazard of avalanche-infested mountain steeps.”⁴⁴ Booth and Steed both trace the engineering and geographic obstacles the CPR faced in the Selkirks from tunnels and bridges to snow and fires.⁴⁵ These larger regional histories are excellent sources in arriving at an understanding of how smaller regions relate to the entire project, illustrating that mainline construction and improvements were only a small part of the CPR’s long history in the mountains.

The CPR’s story in British Columbia is a favourite topic of railroad historians, illustrating how the line opened up the interior, environmental and geographic challenges

⁴² Adolph Hungry Wolf, *Rails in the Canadian Rockies* (Invermere, B.C.: Good Medicine Books, 1979), 6.

⁴³ Omer Lavallée and Roger G. Burrows, *Challenge: Calgary to Kamloops* (Canada: Canadian Pacific Railway, 1988), 13.

⁴⁴ Edmund E. Pugsley, *The Great Kicking Horse Blunder* (Vancouver: Evergreen, 1973), vii.

⁴⁵ Jan Booth, *Canadian Pacific in the Selkirks: 100 Years in Rogers Pass*, 2nd ed. (Calgary: British Railway Modellers of North America, 1991); Roger G. Steed. *Canadian Pacific in the Selkirks*. Vol. 2. (Calgary: British Railway Modellers of North America, 1993). By focusing on types of engines and challenging sections of railway operations, railway buffs reveal the struggles the CPR had in daily operations of the line such as the Big Hill. This focus is important for environmental history as it shows how the CPR adapted to the geographic challenges of the route with technology such as heavier engines and snowploughs as well as the switch to diesel.

the CPR faced in this region, and its effect on Indigenous people. Roger Burrows provides an unusual history of the CPR by investigating the track mile-by-mile, pointing out bridges, snowsheds, tunnels, stations, and natural landmarks, a useful tool in knowing the route and measuring distances.⁴⁶ Barrie Sanford places the history of the CPR in British Columbia into context with the construction of other railways, allowing the reader to see the similarities and differences between the CPR and the nearby lines.⁴⁷ In the triumphant vein of great narratives, Robert Turner notes changes in CPR operations in British Columbia in connection with the 100th anniversary of the last spike. The CPR, he argues, “has evolved from a frontier-era transcontinental with a sometimes tenuous service through a wilderness of mountains and canyons to a modern transcontinental system of enormous capacity and reliability.”⁴⁸ While this conclusion may be overly optimistic, Turner is careful to note the many environmental challenges the CPR faced throughout its years of operations. The latest work to deal with the CPR in British Columbia is *Spuzzum*, which explains the impact of construction and operation of the CPR and CNR on the Nlaka’pamux along the Fraser Canyon. The Nlaka’pamux helped to build and supply the CPR, and their communities also experienced the death of workers, the dangers of explosives, and the growth of White settlement.⁴⁹ Thus, regional histories as a whole are useful for a social and environmental history of the CPR, depicting the impact of the railway on communities, the natural obstacles the railway

⁴⁶ Roger Burrows, *The CPR Mainline Route from the Rockies to the Pacific*, vol.1, *Railway Mileposts: British Columbia* (Vancouver: Railway Milepost Books, 1981).

⁴⁷ Barrie Sanford, *The Pictorial History of Railroading in British Columbia* (Vancouver: Whitecap Books, 1981).

⁴⁸ Turner, *West of the Great Divide*, 311.

⁴⁹ Andrea Laforet and Annie York, *Spuzzum: Fraser Canyon Histories, 1808-1939* (Vancouver: UBC Press, 1998), 84-91. Another useful detailed history of the construction of the CPR in the Fraser Canyon is Leigh Gordon, “Steel Rails and Canyon Walls,” *Canadian West* 2 (1985): 14-23.

faced, and the ongoing struggle to maintain and improve the line under challenging weather conditions.⁵⁰

The most recent histories of the CPR have been associated with new types of history: labour history, social history, tourism, and environmental history. The first labour history of Canadian railway camps, Edwin W. Bradwin's *The Bunkhouse Man*, illustrates the poor, unsanitary living conditions and the problems of wages with hidden deductions. "If we are to maintain ideals of a national character, we can ill afford to subvert the workers of the camps," Bradwin observed.⁵¹ Dempsey's edited collection of histories of the CPR in the west also contributes to labour and social history; Regehr examines how weather affected construction in the mountains, Roy investigates racism towards Chinese workers and how their lives were treated cheaply, and Dempsey studies the impact of the CPR on the prairies for Indigenous people, most notably in terms of fires and loss of game.⁵² Omer Lavallée's *Van Horne's Road* similarly goes beyond the great men history of metanarratives, focusing on the construction procedures and including detailed letters from section contractors to Van Horne.⁵³ *They Built the Railway*, a television miniseries, also goes below the level of great men to provide a

⁵⁰ Along with regional histories, works exploring the surveys of the CPR are important in order to understand the challenges of trying to plot the best possible route through relatively unknown territory from rough weather and the prickly devil's club to near-drownings and starvation. See Frank Leonard, "'A Closed Book': The Canadian Pacific Railway Survey and North-Central British Columbia," *Western Geography* 12 (2002): 163-184; Harold Palmer, *Early Explorations in British Columbia for the Canadian Pacific Railway* (Philadelphia: Geographical Society of Philadelphia, 1918); Don W. Thompson, *Men and Meridians*, vol. 2 (Ottawa: Information Canada, 1972).

⁵¹ Edmund W. Bradwin, *The Bunkhouse Man, a Study of Work and Pay in the Camps of Canada, 1903-1914* (New York: Columbia University Press, 1928), 295.

⁵² Patricia E. Roy, "A Choice Between Evils: The Chinese and the Construction of the Canadian Pacific Railway in British Columbia," in Dempsey, 15-22. T.D. Regehr, "Letters from the End of Track," in Dempsey, 41-49. Hugh A. Dempsey, "The Fearsome Fire Wagon," in Dempsey, 57-63.

⁵³ Omer Lavallée, *Van Horne's Road: An Illustrated Account of the Construction and First Years of Operation of the Canadian Pacific Transcontinental Railway* (Montreal: Railfare, 1974).

picture of railway tasks and surveying; however, it does not discuss camp conditions.⁵⁴

Social and labour histories are important in understanding what challenges and conditions people faced in interacting with nature. This thesis will build on these histories by investigating the conditions of work camps, examining the tasks of construction, and showing how workers interacted with their superiors and the environment around them.⁵⁵

Of more direct relevance to this thesis is the work done by geographers and ecologists since the 1960s in studying the impact of the CPR on nature and investigating the consequences for human and animal populations living near the railway.

Environmental studies tend to focus almost entirely on Banff National Park and the impact of White men on nature in that region. J.G. Nelson and A.R. Byrne studied the railway's involvement in forest fires and floods in the Bow Valley, and their effects.⁵⁶

Byrne argued in his doctoral dissertation that Banff “was to a large extent a product of the railway” because of deforestation (due to fires and lumbering), the development of tourism, and the opening of “a frontier landscape where natural resources were being exploited.”⁵⁷ Using aerial photographs, dendrochronology, fire reports, and historical accounts, ecologists Johnson, Fryer, and Heathcott observe an increase in both manmade

⁵⁴ *They Built the Railway*, DVD, directed by Andrew Gregg (Toronto: Parallel Film & Television Productions, 2004).

⁵⁵ Tourism is another recent focus of CPR history, although one that this thesis will not consider. Hart argues that the CPR laid the “groundwork for Canadian tourist promotion... the CPR put Canada on a highway and made it better known to both the world and itself.” E.J. Hart, *The Selling of Canada: The CPR and the Beginnings of Canadian Tourism* (Banff, Alta.: Altitude, 1983), 176. Advertising also played a role in promoting the CPR as a line to a hunter's or fisherman's paradise and beautiful mountain scenery. Mark H. Choko, and David L. Jones, *Posters of the Canadian Pacific* (Richmond Hill, Ontario: Firefly Books, 2004).

⁵⁶ J.G. Nelson and A.R. Byrne, “Man as an Instrument of Landscape Change: Fires, Floods and National Parks in the Bow Valley, Alberta,” *Geographical Review* 56 (1966): 226-238.

⁵⁷ A.R. Byrne, *Man and the Landscape Change in the Banff National Park Area before 1911* (Calgary: University of Calgary, 1968), 139, 151. Nelson also describes the impact of the CPR in terms of fires, loss of wildlife, and tourism in J.G. Nelson, “Man and Landscape Change in Banff National Park: A National Park Problem in Perspective,” in *Canadian Parks in Perspective*, ed. J.G. Nelson (Montreal: Harvest House, 1969), 65-84.

fires and lightning fires during CPR construction, arguing that most railway fires would have been accidentally set as workers would not want to endanger bridges.⁵⁸ Binnema and Niemi argue that the Stoney were excluded from Banff National Park in the interests of tourism, hunting, game conservation, and assimilation, discussing how fires and depletion of game disrupted the Stoney's way of life.⁵⁹ Taking these studies as a point of departure, this thesis will place more emphasis on fire and deforestation in causing problems for the railway and construction workers through avalanches, floods, and rockslides.

In examining the construction of other North American railways, it becomes evident that the CPR borrowed construction techniques and faced similar geographic and financial obstacles. Most early North American railways of this period were poorly built with sharp curves, ties that rotted quickly, and improperly ballasted roadbeds.⁶⁰ In this context, it becomes obvious that the CPR executives made similar decisions such as wooden bridges and unballasted portions of the track to save time and money, decisions that would have repercussions in the first years of operation. North American railways differed from those in Britain in three ways: lines grew along with settlement rather than being constructed only between principal industrial centres; railways worked with the landscape, taking sharper curves and using steeper grades which required heavier

⁵⁸ E.A. Johnson, G. I. Fryer, and M. J. Heathcott "The Influence of Man and Climate on Frequency of Fire in the Interior Wet Belt Forest, British Columbia," *The Journal of Ecology* 78 (1990): 408-409.

⁵⁹ Ted Binnema and Melanie Niemi, "Let the Line Be Drawn Now': Wilderness, Conservation, and the Exclusion of Aboriginal People from Banff National Park in Canada," *Environmental History* 11 (2006): 724. Colpitts examines how attitudes to wildlife in the west changed according to economic or subsistence needs and briefly looks at the CPR promoting the abundance of wildlife available for hunting in the Canadian west. This promotion of hunting did nothing to help the shortage of animals caused by habitat loss. George Colpitts, *Game in the Garden: A Human History of Wildlife in Western Canada to 1940* (Vancouver: UBC Press, 2002), 119-120.

⁶⁰ ⁶⁰ Richard White, "*It's Your Misfortune and None of My Own*": *A History of the American West* (Norman: University of Oklahoma Press, 1991), 250.

engines; and lack of capital encouraged shoddy construction.⁶¹ The CPR had much in common with the three most northern American transcontinental railways. The first American transcontinental was completed in seven years in 1869 with the linking of the Union Pacific and Central Pacific from the Missouri River to Sacramento.⁶² The CPR and the Central Pacific –Union Pacific were similar in terms of being the first lines to the Pacific Ocean in their countries, having financial difficulties, and facing geographic challenges such as avalanches and carving roadbeds out of cliffs. The CPR copied techniques like building the initial line as cheaply as possible, improving it later with profits, and building different sections at the same time.⁶³ Both transcontinentals received enormous amounts of financial aid in the form of subsidies and land grants, but had problems selling land and stocks and faced unforeseen obstacles to construction.⁶⁴

The second transcontinental, the Northern Pacific, like the CPR faced geographic challenges such as steep grades and blue clay, but the CPR had fewer financial problems, a shorter construction period, and fewer management turnovers. Incorporated in 1864, the Northern Pacific was not completed until 1883, and had five presidents in thirteen years of construction compared to the CPR's one president for the five year construction period.⁶⁵ Like the CPR, the Northern Pacific had great financial troubles; the 1873

⁶¹ James E. Vance, *The North American Railroad: Its Origin, Evolution and Geography* (Baltimore: John Hopkins University Press, 1995), 5-51. Vance argues that "The nature and placement of the route often seems in the writing of historians to be determined by actions taken in the boardroom and recorded in the minutes, rather than stemming from terrain, settlement fabric, economic activity, and operating characteristics of locomotives...." Vance, 4.

⁶² White, 250.

⁶³ Vance, 192.

⁶⁴ Stephen E. Ambrose, *Nothing Like it in the World: The Men Who Built the Transcontinental Railroad, 1836-1869* (New York: Simon and Schuster, 2000), 321. This is an excellent detailed account of the construction process.

⁶⁵ Louis Tuck Renz, *The History of the Northern Pacific Railroad* (Fairfield, Wash.: Ye Galleon Press, 1980), 79.

bankruptcy of a financier forced the reorganization of the company.⁶⁶ Like the CPR, the third transcontinental, James J. Hill's Great Northern, confronted challenges in the Rocky Mountains; however, the Great Northern had few financial problems in extending the St. Paul Railway to the Pacific in 1893.⁶⁷ The Great Northern did better financially than most railways and was the sole transcontinental constructed without significant government aid.⁶⁸ The CPR, then, adopted American techniques like rapid, cheap building of a single line in sections but still struggled with unforeseen geographic challenges and financial problems that were common of railroads in this era.

The environment played a significant role in the construction and operation of early Canadian lines, especially winter which delayed construction, and could disrupt daily operations. Three of Canada's first railways set the stage for the construction of the CPR, progressing from a simple short line to complex inter-provincial lines. Built between 1832 and 1836, the St. Lawrence and Champlain Railway, Canada's first, traversed relatively flat land between La Prairie on the St. Lawrence and St. John on the Richelieu, and required few bridges.⁶⁹ Completed in 1856 after four years of construction, the Grand Trunk Railway between Montreal and Toronto was British North America's longest early line incorporating five small railways. Winter delayed construction, doubling cost estimates.⁷⁰ Worse yet, the railway's traffic potential was exaggerated, and winter conditions made year-round operations difficult.⁷¹ Built in sections between the 1858 and 1876, the Intercolonial connected New Brunswick and

⁶⁶ Ibid., 47.

⁶⁷ Claire Strom, *Profiting from the Plains: The Great Northern Railway and Corporate Development of the American West* (Seattle: University of Washington Press, 2003), 13.

⁶⁸ White, 256.

⁶⁹ Robert Legget, *Railways of Canada* (Newton Abbot, England: David & Charles, 1973), 21.

⁷⁰ Nick and Helma Mika, *Illustrated History of Canadian Railways* (Belleville, Ontario: Mika Publishing Company, 1986), 50-52.

⁷¹ Legget, 45.

Nova Scotia with Ontario and Quebec. Sandford Fleming, the Intercolonial superintendent, argued for more durable but expensive iron bridges instead of wood. He got his way, but the Intercolonial went over its estimated cost.⁷² The CPR copied techniques like incorporating smaller lines and building sections simultaneously but encountered similar problems with finances and weather.

The White Pass and Yukon Railway, built in twenty-five months (1898-1900) to take gold prospectors from Skagway to Whitehorse, was the only other Canadian line to approach the CPR in terms of difficult construction and operation conditions.

Construction workers faced forty degree below weather, large amounts of snow, and the dangers of dangling from ropes to set explosives.⁷³ Financial difficulties were inevitable with some sections costing \$120,000 per mile.⁷⁴ The battle with winter continued long after construction for this line as well as the CPR.

The CPR had an advantage being the only transcontinental railway in Canada for the first decades of its operation and therefore did not struggle to make a profit during the early years of operation as did the Canadian Northern Railway (CNoR) and the Grand Trunk Pacific (GTP). These two new transcontinental railways were not needed at the same time and the outbreak of the First World War further reduced their chances of financial stability. The CNoR, built between 1898 and 1915, had an unusual priority for a transcontinental “to build the main trunk lines on the prairies... then to develop an extensive branch-line network... and finally to build the transcontinental connections.”⁷⁵

⁷² Wood bridges lasted approximately twelve years unless destroyed by fire. Green, 51.

⁷³ Roy Minter, *The White Pass: Gateway to the Klondike* (Toronto: McClelland and Stewart, 1987), 222 and 239.

⁷⁴ *Ibid.*, 233.

⁷⁵ T.D. Regehr, T.D. *The Canadian Northern Railway: Pioneer Road of the Northern Prairies 1895-1918* (Toronto: Macmillan: 1976), 163. Regehr argues that the story of the CNoR is not just one of a railway that

One of Canada's worst ecological disasters was a 1913 rock slide caused by the CNoR's construction along the Fraser, which damaged the coastal salmon fishery as well as that of the Carrier First Nations upstream.⁷⁶ The railway never overcame its financial troubles and was nationalized in 1918 with the GTP as Canadian National Railways.

The GTP, planned and built from Moncton, New Brunswick to Prince Rupert between 1902 and 1914, involved a similar story of blunders, including ending the line at Prince Rupert in the hope that the northern terminus would attract business from the Orient.⁷⁷ The GTP had no land grants to help finance building and had to deal with the heavy rock and blue clay.⁷⁸ Like the CNoR, the GTP had the advantage of the Yellowhead Pass, yet suffered financial problems during its first years of operation because of the First World War. Thus, the CPR had many geographic and financial similarities with other Canadian railways, but being the first was able to make a profit during its first years of operation and therefore repay its debts, while expanding and improving its lines.

While the existing historiography of North American railways has much to say about government relations and business practices, its focus on the environment leaves much to be desired. Environmental history is a new field of history, especially in Canada, but one that is flourishing as historians realize the importance of the environment in human history. Environmental history grew out of the growing environmental

got into trouble and had to be nationalized, but one of a railway which responded to the needs of Canadians. Regehr, xiii.

⁷⁶ Laforet and York, 99-101. See also Matthew Evenden, "Social and Environmental Change at Hells Gate, British Columbia," *Journal of Historical Geography* 30 (2004), 144.

⁷⁷ Donald MacKay, *People's Railway: A History of Canadian National* (Vancouver: Douglas and McIntyre, 1992), 9-10. Frank Leonard argues that the failure of the GTP in building and operating the line to the Pacific is the product of "a thousand blunders," which senior and junior GTP managers carried out." Frank Leonard, *A Thousand Blunders: the Grand Trunk Pacific Railway and Northern British Columbia* (Vancouver: UBC Press, 1996), 5.

⁷⁸ Leonard, *A Thousand Blunders*, 9, 52, 81.

consciousness of the 1960s and 1970s, the rise of ecology emphasizing the role of humans in ecosystems, the focus of the *Annales* School on the environment's role in human history, and the emergence of world history highlighting relationships between peoples and geographic areas.⁷⁹ Environmental history took off later in Canada than the United States because until recently, French and British institutions and ideologies were seen as shaping Canadian history instead of 'New World' influences.⁸⁰ Historians began to rethink Canadian history and realize that the "non-human environment... made history in active ways that "go well beyond the previous acknowledgements of the roles of animals and geography."⁸¹ Canada offers a unique and intriguing case for environmental history: "It is the second largest nation in the world, home to diverse ecosystems, and neighbour to three oceans. It is the embodiment of the developed world, though much of it remains, by global standards, undeveloped."⁸² Canadian environmental history has grown rapidly in the past few years but much work still remains to be done.

Railways have rarely been examined from the lens of environmental history. This perspective allows us to study the relationship between natural history and human history. Environmental history is "about the role and place of nature in human life."⁸³ For most CPR historians, nature is just the background for a story of human achievement, but an "ecologically minded and socially sensitive approach will give us a more humble view of human agency... creating a link between history and matters of everyday existence,

⁷⁹ David Freeland Duke, *Canadian Environmental History: Essential Readings* (Toronto: Canadian Scholars' Press, 2006), 6-7.

⁸⁰ Chad Gaffield and Pam Gaffield, *Consuming Canada: Readings in Environmental History* (Toronto: Copp Clark, 1995), 2.

⁸¹ Gaffield and Gaffield, 2.

⁸² Alan MacEachern and William J. Turkell, *Method and Meaning in Canadian Environmental History* (Toronto: Nelson Education, 2009), xiii-xiv.

⁸³ Donald Worster, "Doing Environmental History," in *The Ends of the Earth: Perspectives on Modern Environmental History*, ed. Donald Worster (Cambridge: Cambridge University Press, 1988), 292.

survival, and struggle.”⁸⁴ In applying this approach to the CPR, it is evident that the company confronted enormous environmental challenges in building the line and keeping it open through all weather and natural catastrophes. This thesis will examine in-depth how topography and extreme weather shaped the route and had an impact on workers as well as the consequences of construction on the environment.

Environmental history “is a tool for telling better histories” and this thesis will ask how paying attention to dirt, humans, trees, animals, and water can change our understanding of the line.⁸⁵ Studying the environment is useful for understanding the consequences of decisions made by CPR managers at various times, both for the environment and for the CPR workers. As William Cronon puts it, environmental history attempts “to reconstruct the endless layers of change that we and the earth have traced upon each other.”⁸⁶ Cronon goes on to assert that such narratives are “essential to our understanding of history and the human place in nature” because they connect actions and consequences and make us care about those consequences.⁸⁷ This thesis attempts to contribute to this endeavour, examining the relationship between the environment and CPR workers and how the decisions of the CPR had consequences not only for the operation of the line, but for the land itself.

⁸⁴ Ted Steinberg, “Down to Earth: Nature, Agency, and Power in History,” *The American Historical Review* 107 (June 2002): 820.

⁸⁵ Ellen Stroud, “Does Nature Always Matter: Following Dirt Through History,” *History and Theory* Theme Issue 42 (December 2003): 80-81.

⁸⁶ William Cronon, “The Uses of Environmental History,” *Environmental History Review* 17 (3): 19.

⁸⁷ William Cronon, “A Place for Stories: Nature, History, and Narrative,” *The Journal of American History* 78 (Mar. 1992): 1350-1375.

Most histories of western North America portray the region as “profoundly gendered... a place where men conquered Mother Nature.”⁸⁸ The West has been studied from an environmental perspective in terms of resource extraction but railways also need to be studied because, as Samuel P. Hays points out, “transportation investment not only provided opportunities for enhanced production of goods and services but also enhanced transformation of the environment.”⁸⁹ Therefore, environmental history is a useful lens for exploring how the West has changed over time, as well as exploring the place of humans and the environment in the development of the West.

It is important to look at both the effects of the environment on CPR workers and their impact on the environment. To research only the impact on the environment would be to disregard the importance of heat, cold, snow, mountains, and rivers on the lives of the labourers and operations of the line. In seeking to provide a more complete picture, this thesis examines the relationship between the environment and the CPR workers between Calgary and Craigellachie during the construction of the mainline (1883-1885) and the early upgrades to this line (1886-1916). It argues that the environment shaped the construction and improvements to the mainline, and people in turn despoiled the environment through deforestation, fire, excavation, and the use of explosives. It also argues that the poor route choice and the shortcuts the CPR took during construction created problems for the early operation of the line, ones that came at the cost of workers’ lives and damage to engines and the track. The line then required repairs which took a further toll on the environment.

⁸⁸ Nancy Quam-Wickham, “Rereading Man’s Conquest of Nature: Skill, Myths, and the Historical Construction of Masculinity in Western Extractive Industries,” *Men and Masculinities* 2 (October 1999): 135.

⁸⁹ Samuel P. Hays, “Toward Integration in Environmental History.” *Pacific Historical Review* 70 (2001): 62.

The surveying process through the mountains, examined in the second chapter, reveals the complex relationship between men and nature. Weather, insects and difficult terrain all had an effect on surveyors. These men also had an impact on the environment through deforestation and fires. The environment played a critical role in route-choice decisions, as did financial considerations and the desire to shorten the line at every opportunity.

The construction through the mountains, investigated in the third chapter, shows the CPR trying to dominate nature, yet never fully succeeding. Avalanches, floods, and snow constantly interfered with construction. The environment had a significant impact on the lives of workers who lived in primitive conditions, endured all weather, and confronted daily hazards in the tasks they performed. The landscape was deforested by fires to clear paths for railways and by the use of trees to create ties and bridges. Dirt was excavated and graded for tunnels and cuttings, and black powder was used to dig tunnels through rock. The CPR took shortcuts, like using wooden bridges and steep grades, which would have to be replaced during the early years of operation. Some workers admired the scenery while others realized that they were tearing the land apart, yet most were too involved in their work to realize what they were doing or they ignored the impact of their work on the environment in the name of progress.

The years following the completion of the line, studied in the fourth chapter, are filled with examples demonstrating that the environment defied the CPR's conquest of nature in the mountains. Confronted by a severe, unstable, unpredictable environment, the CPR had to adapt constantly with new technology or revise the route. Forest fires were a problem for the CPR as sparks could escape from locomotive smokestacks, setting

fires that could delay trains or, even worse, destroy the wooden ties and bridges. Fires led to increased floods and destroyed wildlife habitat, resulting in the loss of game for Indigenous people. Tracks were difficult to maintain due to rockslides, mudslides, and avalanches which could result in the deaths of train crews. Snowsheds were quickly built in 1886 and 1887 to protect the track from avalanches so that the CPR could keep the line open in the winter. These required more wood and could also be a fire hazard, nor were they completely effective or indestructible. In order to combat these difficulties, wooden bridges were replaced with iron or canyons were filled in with gravel to provide a path for the train. The Spiral Tunnels and the Connaught Tunnel were built to reduce the grade of the line and avoid problems caused by snow and avalanches. The CPR achieved no permanent control over nature and still struggles with snow and avalanches today.

Prior to this, however, the line had to be surveyed. The following chapter will investigate the impact of the environment on surveyors, the effects of the surveyors on nature, the route choice, and the contract between the government and the CPR.

Chapter II Hacking through the Bush: Surveying and Choosing a Route

The complex relationship between the environment and the CPR in the mountains began in 1871 when surveyors sought the most favourable route for the line. It was not an easy task, nor a matter of the surveyors simply conquering the land. Instead, they had to adapt to harsh working and living conditions in a remote region that they found both beautiful and dangerous. The first part of this chapter will examine the impact of the unknown environment on survey parties as well as the impact the surveyors had on the environment. The next section will investigate the surveyors' reasons for choosing the route and geography's influence upon this choice. Finally, the chapter explores different perceptions of the railway and the route choice, setting the stage for the railway's construction. The surveying process began the relationship between the CPR and nature. In this relationship, the environment would take a toll on the surveyors through difficult terrain, severe weather conditions, isolation, and geographic challenges, and the surveyors, in turn, would have an impact on the landscape through deforestation, fires, and the opening of the west to Euro-Canadian development. Geography was not the only factor in selecting the line. Finances had a heavy influence as the CPR aimed to conquer nature as cheaply as possible, a course of action that would have consequences for the first thirty years of operation.

Surveying the route for the Canadian Pacific was a challenging enterprise as little was known about the land through the mountains of Alberta and British Columbia. Sandford Fleming, a Scottish engineer and the chief engineer for the Intercolonial Railway, took charge of the surveying process. Surveyors encountered steep terrain covered in Cedar, Spruce, and Douglas Pine, with a maze of rivers, streams and swamps

threaded through the foothills and mountains. Surveyors had to consider grades, curves, climatic conditions, water supply, avalanche routes, and the quality of timber along a feasible line.⁹⁰ After finding possible routes, lines were cleared and measured using the sixty-six foot long Gunter's chain and then the benefits and disadvantages of each were weighed to decide a final route.⁹¹ In addition to the Kicking Horse Pass, discovered by James Hector during the Palliser expedition in 1858, and Eagle Pass, discovered by Walter Moberly in 1865, six mountain passes were surveyed by Parties Q, R, S, and T for the CPR between 1871 and 1876: Howse, Peace River, Pine River, Smoky River, Yellowhead and Athabasca.⁹² The last pass to be discovered and surveyed for the CPR was the one discovered by and named for Major A.B. Rogers in 1882.

Surveying these passes required a great deal of equipment as well as men and pack horses. R.M. Rylatt was in charge of supervising food and equipment for Party S surveying in the Rocky Mountains between 1871 and 1873. His party consisted of four surveyors, sixteen Euro-Canadians (mostly axemen to blaze the trail), eight Indigenous packers, a hunter, and forty-five pack animals. While keeping accounts and organizing instruments, clothing and food, he reflected, "I had all the work I could contend with, and frequently more."⁹³ Sparse human populations in the mountains and the isolating geography ensured that all the food, apart from the fish or game obtained by the surveyors, had to be packed in and cached at different locations. Food stores, consisting

⁹⁰ Katherine Gordon, *Made to Measure: A History of Land Surveying in British Columbia* (Winlaw: Sono Nis Press, 2006), 213.

⁹¹ Thompson, 86.

⁹² Sandford Fleming, *Report on Surveys and Preliminary Operations on Canadian Pacific Railway up to Jan. 1877 to Hon. Alexander Mackenzie, Premier and Minister of Public Works, Canada* (Ottawa: MacLean, Roger and Co., 1877), 12-15. All CPR survey parties throughout Canada were named after letters of the alphabet.

⁹³ R.M. Rylatt, *Surveying the Canadian Pacific: Memoir of a Railroad Pioneer* (Salt Lake City: University of Utah Press, 1991), 11, 13.

of beef, salt pork, ham, bacon, flour, beans, rice, split peas, raisins, sugar, coffee, tea, currants, and dried apples lacked variety, although fishing and hunting provided some alternatives.⁹⁴ Rylatt reported that his men complained about food and lack of sugar throughout the winter and during a confrontation, he hacked off three fingers of a man who had gone through the stores, thinking that Rylatt was hiding food.⁹⁵ Charles Hanington wrote to his brother that the “C.P.R. rations amount to 4 lbs. 5 oz. a day and it is all eaten. The air in these mountains [is] giving us a great appetite.”⁹⁶ Several parties ran short of various items or exhausted their supplies entirely. Hanington’s party surveying the Smoky River had several dogs die of starvation and Major Rogers was so stringent with food that his parties had to ration strictly so it would last.⁹⁷ Provisions also ran short when parties lost their way or were held up by snowstorms. Tom Wilson, who had been sent by Rogers to survey Bear Creek and then meet up with the party in ten days, found himself low on food and supplies when he got lost: “I had no idea of how much further I had to travel to where he [Rogers] would be waiting for me with more food. I had neither gun nor revolver with which to replenish my stores and I had barely a day’s food left.”⁹⁸ Animals also stole food from the surveyors, as Ashdown Green and

⁹⁴ Ibid., 48. Sometime the cached provisions were not even used: “The provisions cached last fall in Howes [sic] Pass are doomed to remain there to rot, about 3000 pounds in all. Too much valuable time and labor would have to be consumed in getting them out.” Rylatt 58-9.

⁹⁵ Ibid., 48-50.

⁹⁶ Charles F. Hanington, letter to his brother, January 13, 1875, Charles F. Hanington Fonds, Library and Archives Canada MG29-B5 File 1.

⁹⁷ C.F. Hanington, Diary, March 5 1875, C.F. Hanington Fonds, British Columbia Archives E/C/H19A and Albert L. Rogers, “Major A.B. Rogers’ First Expedition up the Illecillewaet Valley, in 1881, Accompanied by his Nephew, A. L. Rogers” in *The Selkirk Range*, ed. A.O. Wheeler, vol. 1 (Ottawa: Government Printing Bureau, 1905), 418-419.

⁹⁸ Thomas E. Wilson, “The Last of the Pathfinders,” unpublished manuscript, 46, Thomas E. Wilson Fonds, Glenbow Archives M-4223.

Party S discovered when their unattended horses ate their flour and an “Indian dog... stole all the bacon he could.”⁹⁹

Scurvy also became a problem as only currants gave the surveyors vitamin C. In April 1873, several members of Party S developed scurvy as did Rylatt. “My mouth is in a dreadful state,” he wrote, “the gums being black, the teeth loose, and when pressed against any substance, they prick at the roots like needles... My legs are also becoming black below the knee... I feel like an old man, and have a disinclination for anything like exertion.”¹⁰⁰ On the recommendation of Indigenous people, surveyors used spruce tree roots as a remedy.¹⁰¹ Thus, the challenging environment and lack of settlement in the mountain region meant that provisions had to be estimated in advance; and lack of variety of provisions as well as bad weather and an unknown geography meant that many surveyors suffered from food shortages and lack of vitamins.

The environment had an impact on surveyors in four ways: through geographical challenges, weather, insects, and isolation. Surveyors had difficult terrain to traverse: they tramped through undergrowth, stumbled over fallen logs, climbed rocky cliffs, crossed deep streams, forded rivers, and slipped down snowy hills. Walter Moberly described a difficult day in the Columbia Valley: “We had a most fatiguing climb up the steep, thickly-wooded mountain side; the black flies were tormenting, the day was excessively hot, and though there was perpetual snow far above us and the Columbia in sight below, not a drop of water could we obtain.”¹⁰² Flora could also make life difficult

⁹⁹ Ashdown Green, Diary, July 10 1872, Ashdown Green Fonds, British Columbia Archives MS-0437.

¹⁰⁰ Rylatt, 166. He also wrote “it is not very comforting to be sick in the mountains, but to be sick and all alone makes the chills creep down my back. These mountains are inhospitable enough for a man in full vigor.” Ibid., 76.

¹⁰¹ Ibid., 182.

¹⁰² Walter Moberly, *The Rocks and Rivers of British Columbia* (London: H. Blacklock and Co, 1885), 80.

for the parties. J. H. Secretan described the torment inflicted by Devil's Club, a notorious plant for surveyors in British Columbia. It "grows to be ten or twelve feet high," he observed, "the muscular stalks and the under side [sic] of its immense leaves being armed with formidable spikes. After slashing your way through a mile or two of these a day, you generally sit up all night picking the festering spikes out of your knees."¹⁰³ In following in the footsteps of surveyors while examining Rogers Pass with Sandford Fleming in 1883, George Grant wrote that his journey through swamps, prickly thorns, precipices, and steep bluffs allowed him "to understand what they [Moberly and Rogers] had suffered."¹⁰⁴

Harsh weather made the challenging terrain even more difficult, and long nights in camp could be miserable. In surveying Tête Jaune Cache in British Columbia, J.H. Secretan said that it "rained there night and day continuously – until it snowed. I remember quite well that our blankets and spare clothes were mildewed from constant moisture."¹⁰⁵ In summer, intense heat wore the surveyors down and dehydrated them. Winter cold numbed their hands and faces and prevented parties from travelling, and damp weather made everyone wet and miserable.¹⁰⁶ Surveyors slept in tents or exposed to the elements on boughs on top of snow, covered only with blankets.¹⁰⁷ Travelling during winter thaws or the spring could be difficult as the snow and ice melted rapidly. Moberly recalled the difficulty of travel when the snow was soft on the ground, and fell from the

¹⁰³ J.H. Secretan, *Canada's Great Highway: From the First Stake to the Last Spike* (Toronto: Longmans, Green & Co., 1924), 53.

¹⁰⁴ George M. Grant, "The Canada Pacific Railway," *Century Illustrated Monthly Magazine*, October, 1885.

¹⁰⁵ Secretan, 53.

¹⁰⁶ Ashdown Green, Diary, December 24, 1871 and June 30, 1872, Ashdown Green Fonds, British Columbia Archives MS-0437 and Moberly, *The Rocks and Rivers of British Columbia*, 80.

¹⁰⁷ Charles F. Hanington, letter to his brother, January 14, 1875, Charles F. Hanington Fonds, Library and Archives Canada MG29-B5 File 1.

trees above the surveyors and got “down our necks, in a way far from pleasant.”¹⁰⁸ That discomfort paled in comparison to the hazards of crossing partially frozen streams. “The 1st of the new year was a most unpleasant day,” Moberly reported, “and we all succeeded in having a bath or two, in the river [Gold River], as the ice was not strong.”¹⁰⁹ Moberly fell through the ice again on the Salmon River Arm when he was ahead of his party, nearly drowning when thin ice and lack of assistance made it hard to climb out.¹¹⁰ Melting snow and heavy rains also caused creeks to swell, stranding parties for days.¹¹¹ Spring and summer meant the return of black flies, mosquitoes and other insects, their torments featured in nearly every surveyor’s journal. Rylatt recalled that his “face, hands and... legs were blistered and sore by the stings of the clouds of misquitoes [sic] that beset my path” and that at night, after a thunderstorm, they got into his “mouth and nostrils, so dense were they.”¹¹²

Isolated from the outside world, surveyors struggled to get news of family and current events. Letters, often brought by other parties or new arrivals to the surveying process, took weeks or months to arrive. R.M. Rylatt spent a great deal of time worrying about his invalid wife. Upon receiving a letter from a friend telling him the newspaper had announced her death, he wrote in his journal, “It was a shock, yet I hardly felt it just then.”¹¹³ Surveyors had to take on tasks they normally would not do in civilization. As one member of a survey party put it, “being your own “bootmaker, laundryman, tailor, barber and everything else gets my goat.”¹¹⁴ Getting lost in the mountains, a common

¹⁰⁸ Moberly, *The Rocks and Rivers of British Columbia*, 71.

¹⁰⁹ *Ibid.*, 71.

¹¹⁰ *Ibid.*, 71-72.

¹¹¹ Marcus Smith, Diary, June 18, 1880, Marcus Smith Fonds, British Columbia Archives MS-1496.

¹¹² Rylatt, 69, 73.

¹¹³ *Ibid.*, 118.

¹¹⁴ Wilson, 3.

occurrence, intensified the surveyors' feelings of isolation. "All mountain streams wind considerably and therefore in the dense timber it is difficult to keep a sense of direction," Tom Wilson wrote. "If one can see the peaks then it is easy but since entering the heavy timber I had not been able to see a peak."¹¹⁵ Charles Hanington spent several anxious days in March 1875 when he and his party lost their way. Homesick, he wrote anxiously to his brother that he was not entirely sure of their location: "I have been thinking of the 'dearest sport on earth to me,' [referring to his brother, Edward,] of our Mother and Father, of all my brothers and sisters and friends, of the happy days at home."¹¹⁶ Isolation also meant survey parties rarely received word of events in the outside world. Moreover, when injured, members of the party went without medical assistance.¹¹⁷ Both Ashdown Green and R.M. Rylatt sprained their ankles and had to rest in camp until they recovered.¹¹⁸ The environment, then, had a tremendous impact on surveyors as the challenging terrain slowed their progress, the weather interfered with work or made surveyors miserable, the black flies and mosquitoes infuriated them, and the remote region isolated the men from their families, medical assistance, and the outside world.

Surveyors and the CPR, as a part of John A. Macdonald's plan to incorporate the west and its Indigenous people into confederation, were instruments of internal colonialism. Surveying was central to the process of the government taking control of the west, a way of claiming land for the railway and for white settlement while Indigenous people were pushed onto reserves. Despite the changes the railway would bring,

¹¹⁵ Ibid., 44.

¹¹⁶ Charles F. Hanington, letter to his brother, March 15, 1875, Charles F. Hanington Fonds, Library and Archives Canada MG29-B5 File 1.

¹¹⁷ George M. Grant, *Ocean to Ocean: Sandford Fleming's Expedition through Canada in 1872*, rev. ed. (Toronto: Radisson Society of Canada, 1925), 407.

¹¹⁸ Ashdown Green, Diary, October 30 1871, Ashdown Green Fonds, British Columbia Archives MS-0437 and Rylatt, 39.

Indigenous people were instrumental to the surveyors as guides, packers, and cooks throughout the mountains, and both Walter Moberly and Marcus Smith used their canoes to travel.¹¹⁹ Moberly trusted his “ever faithful Indians” to help him hunt and guide him through unexplored mountain passes.¹²⁰ Fleming also praised the Indigenous people, reporting that “many of them rendered valuable service in various ways, in connection with the work of exploration.”¹²¹ Others, however, looked down on the Indigenous people or mistreated them. A contract Major Rogers made with Chief Louie near Kamloops to recruit ten men stipulated that they work without complaining. Moreover, if any came back without a good report then the church would receive his wages and he would receive one hundred lashes.¹²² These ten, subsisting on limited rations, had to carry one hundred pound packs through difficult terrain consisting of perpendicular rocks, swamps, and devil’s clubs. They also had to swim down the Columbia River beside a raft, convincing Major Rogers’ nephew, Albert, that “for the fear of the penalty of returning without their letters of good report, our Indians would have deserted us.”¹²³

The indigenous role in surveying was part of a longer process of engagement with the Euro-Canadian economy that had begun with the fur trade. Rylatt, however, saw that the railway meant the coming of more drastic change for the Indigenous people: “more projected Railroads, more wedges of civilization are being inserted through their very midst, and the end may not be just yet, but it will assuredly soon be, - ‘Enter the ranks of

¹¹⁹ Marcus Smith, Diary, 1874-1876, Marcus Smith Fonds, British Columbia Archives MS-1496 and Noel Robinson and Walter Moberly, *Blazing the Trail through the Rockies: the Story of Walter Moberly and His Share in the Making of Vancouver* (Vancouver: News-Advertiser, 1915), 28.

¹²⁰ Robinson and Moberly, 72.

¹²¹ Sandford Fleming, *Progress Report on the Canadian Pacific Railway Exploratory Survey to Hon. H.L. Langevin, Minister of Public Works* (Ottawa, n.p., 1872), 16.

¹²² Major A.B. Rogers, Diary, April 28, 1881, A.B. Rogers Fonds, Glenbow Archives Microfilm Rogers and Berton, *The Last Spike*, 145-148.

¹²³ Albert Rogers, 419.

progress or die.”¹²⁴ Progress, for Rylatt, was both inevitable and positive no matter the havoc change brought to Indigenous lives. Although the coming of the railway eventually meant fewer freedoms for the Indigenous people, they played a significant role in helping the surveyors discover the best route for the line through a land unknown to Euro-Canadians, in transporting their provisions over challenging territory, and in finding game.

When they were not complaining about the weather, the mosquitoes and the devil’s club, and had time to take in their surroundings, surveyors had differing views on the environment. While all admired the beauty of the region, some saw the advantages of natural resources and the eventual victory of their work over nature. Others saw that the landscape would not easily be conquered by the railway. Expressing a typical view of landscape as commodity potential when wintering in the Selkirks in 1871-1872, Walter Moberly observed that the “dense forest of magnificent trees of the usual description met with in these mountains, such as will doubtless be of great value in future for the supply of the prairie country... provided that civilization does not bring with it destructive bush fires.”¹²⁵ He saw the land as full of natural resources to be exploited; however, he also recognized that the construction and operation of the line could bring damaging forest fires. Tom Wilson depicted the work of surveyors and coming of the railway in triumphant terms. He and his colleagues were “indomitable spirits, who, eight hundred miles from civilization and facing the unknown dangers of an unknown land, blazed a

¹²⁴ Rylatt, 164.

¹²⁵ Moberly, *The Rocks and Rivers of British Columbia*, 70.

trail for the progress of civilization, that bonds of steel might unite a divided continent.”¹²⁶

Surveyors frequently found themselves in awe of the surrounding mountains, a sublime landscape of grand scale and power. “Standing upon a narrow ridge at that great elevation, mid nature crowned by solitude,” Albert Rogers wrote in recalling his experience atop Syndicate Peak, “a man feels his weakness and realizes how small is human effort when compared with the evidence of nature’s forces.”¹²⁷ Rylatt had a similar experience staring at the magnificent peaks: “It is impossible to do other than stand and gaze with awe, and sigh as we are reminded of our own littleness.”¹²⁸ For these two surveyors, the mountains represented the power that nature could have over men, a monumental landscape that the railway would not easily conquer. Most members of surveying parties, however, saw nature only as something to be admired for the splendid views that the railway would make available to others. George M. Grant wrote that the mountains “offer innumerable scenes, seldom to be found within the same compass, for the artist to depict and for every traveller to delight in.”¹²⁹ Like Moberly’s view of natural resources, this was a commodity view of the landscape as a source of revenues from future tourism. Both Grant and Moberly anticipated the changes the railway would bring, but in distinctly material terms. None of the surveyors lamented that the view they were taking in could be ruined by the coming of the railway. Instead, they believed that the

¹²⁶ Wilson, 1.

¹²⁷ Albert Rogers, 421. Syndicate Peak as well as peaks later named after those instrumental in building the CPR, such as George Stephen (Mount Stephen) and William Van Horne (Van Horne Range), were part of the process of colonialism where Indigenous names for the mountains were ignored in favour of those honouring the men who ‘conquered’ the mountains or English names describing the mountain (Castle Mountain and Cathedral Mountain).

¹²⁸ Rylatt, 17.

¹²⁹ Grant, *Ocean to Ocean*, 263-264.

CPR would bring progress and civilization and allow travellers to see these views in comfort without suffering through the surveyors' experiences.

Just as the environment had an impact on the surveyors, these men, though they did not realize it, had an impact on the environment through deforestation, fires, and clearing brush. Trailblazing, their most common and necessary task, took up a great deal of time. "Was out all afternoon blazing trail, the mud and brush and fallen timber is very dense," wrote Moberly near Placid River.¹³⁰ Trails had to be wide enough for pack animals to travel over. Axemen felled timber and hacked limbs off trees, removing the brush and logs so that horses could pass through. When Fleming and Grant met up with Moberly in 1872, Grant admired the work of Moberly's men who "passed on ahead, axes in hand, to improve the trail a little. It certainly needed all the improvement it got, and a good deal more than they could give in an afternoon."¹³¹

Fires used to clear a path through the underbrush contributed to the destruction of the surveying process, although it is difficult to determine their origin and if they were made by miners or surveyors. The Indigenous people travelling with Moberly told him that bush fire "was a certain indication that white men were in that neighbourhood, for the Indian is careful not to burn the forest in which the white men so recklessly and wantonly destroys."¹³² Fires had long been a part of the landscape, a technique used by Indigenous people to improve paths, increase production of certain foods, clear campsites, and improve hunting by creating meadows for game. Unlike the surveyors, the Indigenous people took measures to control fires by burning in the early spring or late fall, using fire breaks and backfires, and taking wind, weather conditions, and time of day

¹³⁰ Walter Moberly, *Diary*, July 24, 1872, Walter Moberly Fond, British Columbia Archives E/C/M721.

¹³¹ Grant, *Ocean to Ocean*, 272.

¹³² Robinson and Moberly, 80.

into account.¹³³ The surveyors' fires were only set to clear a path, though they often burned an entire region instead of a path, and Indigenous members of Moberly's party saw them as wasteful. Through several acts of carelessness with fire and hacking the bush to 'improve' the land, surveyors began the process of destruction in the name of progress, a process which would be intensified by the construction of the CPR.

The surveying process began with Fleming gathering information from those who had knowledge of the land through which the railway could pass. He received information on the Peace River country and the Rocky Mountains from Malcolm McLeod who had journals, letters, and reports from the HBC on the area.¹³⁴ Fleming collected reports from the survey parties describing the advantages and disadvantages of various lines. The two favoured passes through the mountains were the Yellowhead Pass and Howse Pass. Fleming chose the former, a decision which angered Walter Moberly who, claiming greater knowledge of the country, preferred Howse Pass. He expressed his disappointment that the line would pass so far north "leaving the future trade and commerce of the immense belt of the richest and most important portion of the country... to be tapped and drawn away into United States channels by American railways."¹³⁵ For Moberly, looking ahead to the future economic structure of Canada, proximity to the American railways ranked high in selecting a route.

The physical geography of the landscape was also critical in selecting the right route for the railway. To minimize the duration and cost of construction, the railway needed to pass through the mountains with the fewest bridges and tunnels. Canyons and

¹³³ Peter J. Murphy, *History of Forest Fires and Prairie Fire Control Policy in Alberta* (Edmonton: Alberta Energy and Natural Resources, 1985), 34.

¹³⁴ Malcolm McLeod, "All Aboard for the West! Or The Canadian Pacific Railway and Its Pioneers," unpublished manuscript, Malcolm McLeod Fonds, British Columbia Archives MS-1249.

¹³⁵ Robinson and Moberly, 76.

rivers were to be avoided, and tunnels used sparingly in reducing the curvature and gradient. The shortest route with the least severe grades and fewest curves would increase the speed of operation and require fewer locomotives to help trains climb large hills or slow them down on the descent. This logic determined Fleming's choice of the Yellowhead Pass which he had seen on his 1872 trip across the country with Grant, who described the pass as "a pleasant open meadow." Grant thought that "so favourable a Pass as the Yellow Head could hardly have been hoped for."¹³⁶ R. McLennan, the man tasked with the Yellowhead Pass surveys, informed Fleming that the line would have "moderate curves" and "no grades will exceed fifty feet per miles, and for great distance will range from fifteen to twenty five feet per mile, which will allow for some undulations in rising or falling, to follow the benches or terraces in the different valleys."¹³⁷ Similar in length to the Yellowhead, Howse Pass had more severe gradients and curves as well as potential construction difficulties.¹³⁸ Thus, the physical landscape influenced but ultimately did not determine the route for the railway. Other factors besides the imperative to reduce tunnels and bridges and find the shortest and straightest route with the best grades had to be considered.

Despite Fleming's recommendation of the Yellowhead Pass to the Federal Government, George Stephen and the Syndicate had different priorities. American interests, length of the line, and the appeal of penetrating a region with no established businesses played a role in changing the route. Like Moberly, Sir John A. Macdonald was anxious about American railways. As he explained to George Stephen, "I am very uneasy

¹³⁶ Grant, *Ocean to Ocean*, 275.

¹³⁷ R. McLennan to Fleming, March 23 1872, in Fleming, *Progress Report on the Canadian Pacific Railway Exploratory Survey to Hon. H.L. Langevin, Minister of Public Works*, 47-48.

¹³⁸ Fleming, *Report on Surveys and Preliminary Operations on Canadian Pacific Railway up to Jan. 1877 to Hon. Alexander Mackenzie, Premier and Minister of Public Works, Canada*, 12.

about the movements of the Northern Pacific and the Yankee Government. The latter is of course anxious to sell to the highest bidder and the N.P. is beyond a doubt anxious to get a foothold into Canada.”¹³⁹ As engineer Harry William Dudley Armstrong recalled, the Northern Pacific U.S. line “was not far south of the Boundary; had our great transcontinental been located so far north as the 59th parallel the U.S. line would have branched into our territory and occupied a very large area of our best farming and ranching country.”¹⁴⁰ It became essential for the CPR to place the line closer to the American border to cut off competition from American lines and prevent them from gaining access to Canadian land or resources. A more southerly line also had the advantages of giving the CPR complete control over a region with no established business interests. The Yellowhead was out, then, as the CPR opted for the more southerly Kicking Horse Pass through the mountains. Implementing that strategy, however, meant gaining Parliament’s permission to place the route through a different pass. Approval, providing “that the pass be not less than one hundred miles from the boundary between Canada and the United States of America,” came on May 17, 1882.¹⁴¹

Major Rogers, hired to find a pass through the Selkirk Mountains in 1881, made many suggestions for a CPR route through the Selkirks, from a tunnel under Rogers Pass to placing the line away from rivers, but these were ignored in favour of building the line cheaply. Rogers set out with his nephew and party from the west and travelled up the Illecillewaet River. The party spent five days crossing the remains of avalanches which

¹³⁹ Sir John A. Macdonald, Letter to George Stephen, October 19, 1881, George Stephen Fonds, Library and Archives Canada MG29-A20.

¹⁴⁰ Harry William Dudley Armstrong, manuscript, Harry William Dudley Armstrong Fonds Library and Archives Canada MG30-B26.

¹⁴¹ Canada, “An Act to Authorize the Construction, on certain Conditions, of the Canadian Pacific Railway through some Pass other than the Yellow Head Pass” in *Contract between the Government of the Dominion of Canada and the Canadian Pacific Railway Company Also the Consolidated Railway Act (1879) and the Act of 1881 Amending It.* (Ottawa: Maclean, Roger, 1882), 141.

“had left a clean path behind them, crushing timber into match wood for several hundred feet on the opposite sides of the mountains,” but they were determined to find a route despite the avalanches.¹⁴² Making it to the top of Syndicate Peak but running short of food, they were forced to turn back; nevertheless, they were confident that a pass existed. The following spring, Major Rogers set out from the east and on July 24, 1882 reached the summit of the Selkirks by following the Beaver River. He figured that “an easy line of 2% grade can be had all the way up from the East.”¹⁴³ Major Rogers was well aware of the problems caused by avalanches in this region and even suggested a tunnel to reduce the elevation. “The work from Summit west will not be fearfully heavy but the high grade will take us up to where the snow slides will trouble us,” he noted. “Very many of them do not come down far enough to interfere with a line... but we could encounter them on the high grade.”¹⁴⁴ Avoiding a costly tunnel, the CPR opted for a pass which could be built rapidly at a low cost, a decision which would be reversed thirty years later with the construction of the Connaught Tunnel.

This was not the only advice of Major Rogers which the company disregarded. According to Tom Wilson, who surveyed the line with Major Rogers and Major Hurd, higher operating costs of the line would have been avoided by following the route they had proposed. If the CPR had not placed the line so close to the Beaver River at Beaverfoot Divide, floods would not have occurred and lengthening the mileage on the Big Hill would have saved the enormous costs of building the Spiral Tunnels and lowering the grade twenty years later.¹⁴⁵ The CPR, however, adopted the cheapest and

¹⁴² Albert Rogers, 419.

¹⁴³ Major A.B. Rogers, Diary, July 24, 1882, A.B. Rogers Fonds, Glenbow Archives Microfilm Rogers.

¹⁴⁴ Major A.B. Rogers, Diary, July 25, 1882, A.B. Rogers Fonds, Glenbow Archives Microfilm Rogers.

¹⁴⁵ Wilson, 38.

quickest route. Rogers' work made the CPR happy; his new southerly route through the pass which bears his name had the distinct advantage of being 100 miles shorter than the previous route through the Yellowhead Pass, enabling the CPR to compete with American lines by transporting goods more quickly over a shorter line.

Following the revisions to the line, the CPR was built from Winnipeg across the southern prairies to Calgary. From there it travelled along the Bow River through the Gap into the Rocky Mountains [Figure 1]. The train reached Banff and Laggan (Lake Louise) and then followed Bath Creek to Stephen and the Continental Divide. It passed through Hector and descended the Big Hill to Field, following the Kicking Horse River until Golden, British Columbia, where the Kicking Horse River flowed into the Columbia River. The line continued along the Columbia River to Beavermouth and then climbed the Selkirks following Beaver River through Rogers Pass and down the Illecillewaet River to Glacier. Upon reaching Revelstoke the track crossed the Columbia and travelled into the Monashee Mountains, crossing Eagle Pass and arriving at Craigellachie where it met the track laid by Onderdonk and his men from the west. A notable aspect of this line from an environmental perspective was how its path followed the channels of rivers through the mountains.

Not everyone was content with this new, shorter line, despite its proximity to the United States. Under the pseudonym Philo Veritas, William Kingsford, a civil engineer who was excluded from nation building projects under the Conservatives after faithfully serving Alexander Mackenzie, published an 1885 pamphlet condemning the choice of Rogers Pass over the Yellowhead Pass as a "gigantic blunder." The change, he wrote, "will... come to be known... and there will arise... an outcry of discontent, which no

political dexterity can deaden, and before which, incompetence, meanness, and the service of the hired defender will quail and sink abashed.”¹⁴⁶ The disgruntled Kingsford pointed out that freight costs would be increased as the Yellowhead Pass was only 3646 feet above sea level compared to the Kicking Horse Pass and Rogers Pass which were 5300 feet and 4600 feet above sea level respectively.¹⁴⁷ He also declared quite falsely that the Yellowhead Pass was “free from every trace of difficulty of snow, ice or avalanches.”¹⁴⁸ Civil engineer George A. Keefer had reported to Fleming that there were signs of snowslides through the Yellowhead Pass and “on the more exposed portion, or on the plateau further west... snow sheds will be required.”¹⁴⁹ Even so, the Yellowhead Pass was not as notorious as Rogers Pass for avalanches. Kingsford pointed out that it would be difficult to keep the railway open all winter in the mountains and exaggerated the feebleness of snowsheds, saying that each shed was like a “fragile house of cards, in view of the forces against which the railway would have to contend.”¹⁵⁰ He called for the CPR to release the statement of curves and grades along the new line, suggesting that they would be extreme. As the railway was being completed, Kingsford called for it to be diverted around the Columbia River to avoid Rogers Pass.¹⁵¹ The railway downplayed the worries about avalanches for Rogers Pass and the mountains, thinking that snowsheds, if necessary, would hold up against the slides.

¹⁴⁶ William Kingsford, *The Canadian Pacific Railway: an Appeal to Public Opinion against the Railway Being Carried across the Selkirk Range, that Route Being Objectionable from the Danger of Falls from Glaciers and Avalanches, also, generally on other Matters* (Montreal: W.M. Drysdale, 1885), 38.

¹⁴⁷ *Ibid.*, 48.

¹⁴⁸ *Ibid.*, 48.

¹⁴⁹ George A. Keefer, *Memoranda Respecting the Winter Climate of the Rocky Mountains in Fleming, Report on Surveys and Preliminary Operations on Canadian Pacific Railway up to Jan. 1877 to Hon. Alexander Mackenzie, Premier and Minister of Public Works, Canada*, 354.

¹⁵⁰ Kingsford, 53.

¹⁵¹ *Ibid.*, 53.

Like the surveyors, most Canadians at this time saw the railway as a transformative technology that would speed up travel and transportation of goods and bring civilization to the wilderness. They bought into the speeches of railway promoters such as Thomas C. Keefer, who argued that “speed, economy, regularity, safety, and convenience – an array of advantages unequalled are combined in the Railway system.”¹⁵² Railways, capable of transporting more goods with less jolting or cost than a horse and cart and faster so produce would not spoil, would open new markets for farmers. They would make resource extraction easier as logs and minerals could be shipped in large quantities with less difficulty. Railways could cover remote regions which steamboats could not reach and operate throughout the year, not just when the waterways were clear of ice. Trains could operate in all weather, would have few competitors in winter, and “working the whole year round, without delay of lockage, wind or tide, fog, frost, or rain, they... can compete with ordinary canals in price, while they can make two trips, to one on the canal, in less than half the time.”¹⁵³ More importantly for this thesis, Keefer declared that “modern improvements have enabled the Locomotive to clamber over mountains and penetrate the most remote corners of the land.”¹⁵⁴ For promoters such as Keefer, rail technology had limitless potential in conquering distance and nature’s constraints. This vision would not be realized without unanticipated problems from snow and avalanches to floods and fires.

The CPR’s contract with Ottawa gave the CPR free access to a great deal of land and the natural resources needed to build the railway, including all stone and timber

¹⁵² Thomas C. Keefer, “Philosophy of Railroads” (Montreal: Armour & Ramsay, 1850) in T. C. Keefer, *Philosophy of Railroads*, ed. H.V. Nelles (Toronto: University of Toronto, 1972), 11.

¹⁵³ *Ibid.*, 13.

¹⁵⁴ *Ibid.*, 14.

needed for ties, stations, repair shops, and snow sheds.¹⁵⁵ According to British Columbia's terms of Confederation with the Canadian Government, the CPR would be granted "public lands along the line of the railway throughout its entire length in British Columbia, not to exceed, however, twenty miles on each side of the said line" which would form the forty mile railway belt throughout the province.¹⁵⁶ Opposing interests saw the contract as overly generous as it gave the CPR a monopoly for twenty years. The Canadian Government agreed to pay British Columbia "from the date of the Union the sum of one hundred thousand dollars per annum, in half-yearly payments in advance" for the land in the railway belt.¹⁵⁷ The Federal Government's contract with the CPR stated the continuous line should be built with a "gauge of four feet eight and one-half inches."¹⁵⁸ The Federal Government also "extinguish[ed] the Indian title affecting the lands herein appropriated" and gave the land to the railway.¹⁵⁹ Provided with this public bounty, the CPR would have free reign to use all resources near the railway in whatever manner it chose, from burning brush to clearing a path to using timber for ties and gravel for ballasting.

With these enormous powers in place, the stage was set for the construction of the CPR through the mountains to begin in 1883. The mainline had been built west from Winnipeg to Calgary and a new route through the mountains had been chosen and approved by the government through Kicking Horse Pass, Rogers Pass, and Eagle Pass.

¹⁵⁵ *Canada Contract between the Government of the Dominion of Canada and the Canadian Pacific Railway Company Also the Consolidated Railway Act (1879) and the Act of 1881 Amending It* (Ottawa: Maclean, Roger, 1882), 17.

¹⁵⁶ *British Columbia Legislative Assembly, Papers in Connection with the Construction of the Canadian Pacific Railway* (Victoria: Richard Wolfenden, 1880), 142.

¹⁵⁷ *Ibid.*, 142.

¹⁵⁸ *Canada Contract between the Government of the Dominion of Canada and the Canadian Pacific Railway Company*, 17.

¹⁵⁹ *Ibid.*, 9.

Land had been taken from the Indigenous people and given to the CPR to clear a path for the railway or to extract resources. The work of the surveyors had changed from finding a route to measuring an exact line through the mountains and figuring out how to eliminate most tunnels and other challenges to construction. No longer would survey parties find themselves isolated in nature, but they would usually be within a day or two's walk of construction camps where the chopping of axes and the hammering of spikes could be heard. Most Canadians were eager for the railway to open up the wonders of the remote corners of the nation, to improve transportation and communication, and to bind the nation with a band of steel. For them this construction work was for the sake of progress and civilization, no matter the cost to the Indigenous people, the workers, or the land itself.

Chapter III A Fight with Nature: The Construction of the CPR, 1883-1885

The two and a half year period of construction through the mountains presented CPR workers with daunting challenges in the human effort to dominate nature. Visitors to the End of Track greatly admired the construction process, but had little idea of the CPR worker's experience, living in hastily built work camps through all weather, and being exhausted from working long days with the ever-present dangers of rock falls and avalanches triggered by explosions. This chapter investigates the experiences of construction workers as well as the impact that process had on the environment through deforestation, fires, excavating soil, and blasting. The construction details in this chapter are included to give a sense of the reality of the work undertaken by the CPR, a story given too little attention by other historians. The chapter then investigates how the construction workers, engineers, and visitors to the End of Track perceived the relation between nature and railway construction. Most people of the day saw the construction of the CPR as a victory over the mountains, no matter the cost to the environment or the loss of human life. That victory, however, was far from complete. The CPR achieved no permanent control over nature, especially during the winter, and decisions made during construction would have implications for workers, settlers, and travellers as well as for the environment.

The CPR created problems for itself during the construction and early years of operation by taking shortcuts which lessened its control over the landscape. These shortcuts were due to the poor placement of the route, financial problems, and the haste to build the line. Contractors were paid a sum for completing a task, such as building a section of track or digging a tunnel, and through this process, incentives to hurry and

complete tasks cheaply were plentiful. William Van Horne wrote to James Ross in 1884 that the CPR was running short on money and needed to reduce costs:

Our funds for completing the work are closely limited and we do not intend to fully finish the railway as we go along. The Operating Dept. is expected to follow up the tracklayers at frequent intervals and to do just as much work toward finishing as may be necessary to make the track safe for operation and to provide only such buildings, etc, as may be absolutely necessary for the immediate future.¹⁶⁰

Bridges were made of wood rather than more durable iron. Steep grades were used to avoid tunnels. By taking shortcuts the CPR would finish the line by November 1885, escaping further debt but only at the cost of the workers' lives during both construction and operation. Accidents would damage trains and injure workers, requiring years of labour and expenses to repair the lines. These shortcuts and repairs took an ecological toll on the resources in the mountains through diversions of streams, removal of dirt and rocks, and excessive deforestation. At times, the CPR adapted to the landscape by taking measures such as placing the line near the mountainside where snowsheds could be used to reduce the effects of avalanches. During its early years of operation, the CPR would continue to learn that it needed to work with the environment to succeed in the mountains, and that failure to do so meant costly mistakes.

Living conditions varied greatly from camp to camp throughout this region. Camps were constantly moving, both as the End of Track progressed further into the mountains and as men moved ahead to work on bridges and tunnels: "As contractors and engineers got finished with the work on their particular sections," wrote engineer Peter Turner Bone, "they moved their camps again and again on new contracts. The way this moving worked out was like a game of leapfrog over all; for the camp which was to the rear...

¹⁶⁰ William Van Horne to James Ross, May 17, 1884, Canadian Pacific Railway Fonds, Library and Archives Canada MG28-III 20. [Hereafter cited as CPR Fonds, LAC].

was moved on ahead of all the others.”¹⁶¹ The camp closest to the End of Track housed the construction train which included “thirteen carriages, viz.: 1, a truck; 2, a boarding car; 3, a cooking car; 4, 5, 6, 7, 8, and 9, all boarding cars; 10, blacksmith’s shop, 11 and 12, store cars; 13 contractor’s car.”¹⁶² The construction train was used when time constraints made it impossible to set up camps due to the rapid progression of track building. The boarding cars were two stories high with the mess on the lower floor and sleeping accommodations on the upper floor for eighty men.¹⁶³ Attached to this train were twenty-one flat cars, also known as trucks, and the engine which could be detached to fetch construction supplies.

When a small party of engineers went ahead to survey the exact line, they took two tents: one was used as the office and sleeping quarters for the engineers, and the other became the dining room and quarters of the cook and the axemen.¹⁶⁴ Setting up new camps required time and was complicated by snow. Peter Bone wrote of his move to Beaver River: “we had first to clear from the site for each tent some two feet of snow; like excavating a cellar for a house before starting to build it. When the tents were set up, we packed snow round the sides. This was quite a help in keeping out the cold.”¹⁶⁵ A log house was later built to replace the tents as Bone remained there supervising the construction of bridges.

Large temporary construction camps consisted of tents and shanties [Figures 2 and 3]. In the center of the camp were the dining tents, cooks’ quarters, office tent, and quarters

¹⁶¹ Peter Turner Bone, *When the Steel Went Through: Reminiscences of a Railroad Pioneer* (Toronto: Macmillan, 1947), 88.

¹⁶² William Henry Barneby, *Life and Labour in the Far, Far West: Being Notes of a Tour in the Western State, British Columbia, Manitoba, and the North-West Territory* (London, n.p., 1884), 267.

¹⁶³ J.M. Gibbon and Stephen Pardoe, “The Construction of the Canadian Pacific Railway,” in *Engineering Wonders of the World*, vol. 1, edited by Archibald Williams (London: Thomas Nelson and Sons, n.d), 266.

¹⁶⁴ Bone, 72.

¹⁶⁵ *Ibid.*, 97.

for the sub-contractor, bookkeeper, and foreman, surrounded by lines of two-man tents and with big horse tents and wagons to one side.¹⁶⁶ Worker Morley Roberts described a camp by the Kicking Horse River which was “decorated with a medley of various-shaped tents... so that it was difficult at night for a stranger to avoid tripping himself up with the pegs and ropes, or half strangling himself with the stays carried from the ridge-poles to the trees growing about the encampment.”¹⁶⁷ The head contractors and bosses lived on the other side of road of the camp in log buildings. Both construction camps and the construction train segregated bosses, contractors, and engineers from the rest of the workers.

The more permanent camps were more like small towns and had many wood buildings. North West Mounted Policeman Sam Steele wrote that the camp at Laggan had “several small stores, a few saloons, the post office and boarding-house for the company.”¹⁶⁸ Permanent camps were established for the winter as well. At Beaver River, Steele managed to have the company build him “a good log building... [that] was very strong, with cells for thirty prisoners... a court-room, two rooms for myself, a mess for the staff of the road, excellent quarters for my men, and stables.”¹⁶⁹ Labourer Stephen Pardoe described the workers’ barracks at Beaver mouth in winter:

Built of long logs of cedar and Douglas firs, it was about 80 feet long and some 20 wide, contained two long double tiers of bunks with a narrow passage between, and provided sleeping room for about one hundred men... there was only just room to sleep, and no provision at all for cleanliness or comfort. The roof was made of ‘shakes’ (long rough boards spilt from the straight-grained cedar logs with axe and wedge). The warmth from within melted the snow, which lay several feet deep

¹⁶⁶ Gibbon and Pardoe, 265.

¹⁶⁷ Morley Roberts, *The Western Avernus* (London: Smith, Elder and Co., 1887), 74.

¹⁶⁸ Samuel B. Steele, *Forty Years in Canada: Reminiscences of the Great North-West, with Some Account of His Service in South Africa* (London: Herbert Jenkins, 1915), 187.

¹⁶⁹ *Ibid.*, 191.

above us, making it necessary in soft weather to wring out one's blankets carefully before rolling up in them for the night.¹⁷⁰

More exposed than the contractors or Mounted Police, workers had to adapt to primitive conditions and were more at risk for the spread of illness, which will be discussed in depth later.

Given the temporary nature of camps, little was done to clean up after the men had left. Everything useful was quickly packed either on a train to the End of Track or on horseback, leaving rubbish and useless items behind. Professor G.G. Ramsay, a visitor to the End of Track, described the remains of a construction camp at the Kicking Horse flats: "there are manifold traces... that man has been here encamped: the oozy ground reeks with garbage, broken plates and meats; above all, with innumerable empty cans... which are the universal token of man's presence in these western regions."¹⁷¹ The improper disposal of waste eventually led to health problems for workers.

Food was less problematic for the construction workers than it had been for the surveyors. Supplies came west via the United States (to avoid the incomplete Lake Superior section) and then up the Pembina branch to Winnipeg and west to the End of Track. Clint Boardman, an employee of Langdon, Shepherd and Co., one of the contractors of the line near Calgary, wrote to the *Canadian Gazette* in 1883 describing the one to two cars of supplies arriving each day: meat came from Milwaukee, three times a week a butcher supplied fresh beef, 300 sacks of flour from Manitoba weighing 100 pounds each were required by each camp to make bread every week, and butter came

¹⁷⁰ Gibbon and Pardoe, 273-274.

¹⁷¹ G.G. Ramsay, "Over the Rocky Mountains by the Canadian Pacific Line in 1884" *Macmillan's Magazine*, December 1884.

from Ontario.¹⁷² The rest of the food consisted of canned fruits and vegetables, onions, potatoes, sugar, and stale eggs which Boardman then divided into daily lots for each of the camps.¹⁷³ The food as described by Stephen Pardoe was “generally good and plentiful. Beef and pork, beans and potatoes, bread and hot biscuits, syrup, tea, and coffee, were the mainstays, heartily consumed three times a day.”¹⁷⁴ Camp food did not vary greatly, however, and the quality depended greatly on the cook. One of the few surviving accounts giving insight into worker relations is Morely Roberts’ *The Western Avernus*. Finding the food unpalatable at Corey’s camp, Roberts switched to Robinson and Early’s camp, hoping for better meals.¹⁷⁵

Although prohibited along the right of way, liquor could still be sneaked in by bootleggers. The North West Mounted Police, under Sam Steele, was employed to deal with this liquor traffic. Determined that liquor not impede construction, Steele decided to “enforce the laws to the limit” and punish “those who were under the influence... in a way that would deter others.”¹⁷⁶ This made some workers unhappy but it also decreased the number of accidents that could have occurred had the men shown up to work inebriated. Despite Steele’s best efforts to enforce abstinence, occasional drinking sprees away from the track continued as the men kept up the pace.¹⁷⁷ The isolation of the region meant little variety in food and fewer opportunities for alcohol consumption than in cities; however, construction camps had access to more supplies on a regular basis than

¹⁷² Clint Boardman, “Building the CPR” *Alberta History* 49, no. 1 (Winter 2001): 24.

¹⁷³ Boardman, 24.

¹⁷⁴ Gibbon and Pardoe, 265.

¹⁷⁵ Morley Roberts, *The Western Avernus* (London: Smith, Elder and Co., 1887), 81-82.

¹⁷⁶ Steele, 187.

¹⁷⁷ Berton, 243.

did surveyors, which eliminated the chances of the men going hungry or becoming ill with scurvy.

Camp conditions were far from ideal, however, contributing to other health problems for the workers. Camps, built hastily as temporary accommodations, were not always complete when the men arrived. “Men are compelled to lie on the ground for probably two or three nights,” Clint Boardman observed. “Coming from the south, it causes a great deal of pneumonia, which has carried off a few to the subsequent beyond, but in a few more days the sickness will be slight, as the climate is healthy.”¹⁷⁸ The climate may have been healthy, but undisposed sewage and feces seeped into the drinking water, making many workers ill with fever, diarrhoea, and worse. Typhoid, called mountain fever, was most prevalent in the mountainous sections because construction camps there were larger and crews remained at one site longer due to the bridges or tunnels which had to be built. Father Coccola, a missionary to these camps, wrote that “Small hospitals were crowded here and there, giving patients all possible help. The Medical Department was under Doctors Orton and Brett with a staff of young doctors visiting the camps regularly trying to keep down disease caused by dampness and bad sanitation.”¹⁷⁹

The spread of typhoid through contaminated water became an issue for the people of Calgary as well. An 1883 letter written to the editor of the *Calgary Herald* cautioned people that cases had been imported by diseased CPR workers coming to Calgary, warning readers to avoid milk contaminated by cows drinking bad water, and to keep

¹⁷⁸ Boardman, 24.

¹⁷⁹ Father Nicolas Coccola, *They Call Me Father: Memoirs of Father Nicholas Coccola* (Vancouver: UBC Press, 1988), 100.

their homes clean.¹⁸⁰ Despite the efforts of the doctors, several workers died of typhoid. Mark Watts, a labourer from the End of Track who was sent home instead of being treated in the mountains, died in a Calgary hospital without making it to his wife and family in Winnipeg. The *Calgary Herald* was outraged that this had happened “especially when the doctors connected with the Construction Company are drawing such a large pay for looking after the health of the employees.”¹⁸¹ According to Granville Cuningham, a British engineer who visited the End of Track, workers were charged seventy-five cents a month for medical fees in order to cover medicine, doctors, and hospital treatment.¹⁸² Thus, the poor sanitation of the temporary camps not only contaminated water in the Rocky Mountains, but made both construction workers and residents of Calgary ill with typhoid, with fatal results for some.

Wages lured workers to the mountain construction camps, yet the CPR wanted to keep pay at a minimum to reduce construction costs. Construction workers in the Rocky Mountains came from Canada, the United States, Ireland, England, Poland, Sweden, Russia, Germany, and Italy.¹⁸³ Morley Roberts decided to go to the Rocky Mountains after he found a sign in St. Paul, Minnesota advertising good wages and work for two years. He spent the last of his money to buy food and a railway ticket costing \$8.50 to the End of Track to begin work.¹⁸⁴ Labourers were paid only for the days they worked, they bought clothing and supplies at company stores, and if they wanted to quit, they had to

¹⁸⁰ ‘Scalpel’ (pseudonym), letter to the editor, *Calgary Herald: Miner and Ranche Advocate and General Advertiser*, October 19, 1883, unpaginated.

¹⁸¹ “Died at the Hospital,” *Calgary Herald: Miner and Ranche Advocate and General Advertiser*, August 6, 1884.

¹⁸² Granville Carlyle Cuningham, “The Rocky-Mountain Division of the Canadian Pacific Railway” in *Construction and Working*, ed. James Forrest (London: Institution of Civil Engineers, 1886), 65.

¹⁸³ Turner, 17-18. Chinese labourers were only hired on Andrew Onderdonk’s section of the track along the Fraser and Thompson Rivers to Craigellachie.

¹⁸⁴ Roberts, 50.

pay board until a train east could be arranged and then pay their fare home as well.¹⁸⁵ The labourers were paid two dollars for a ten-hour work day minus five dollars a week for board and monthly medical fees.¹⁸⁶ Wages were a source of controversy between James Ross, the head contractor in the mountains, and William Van Horne, who was irked by Ross' offer of \$2.00 a day to men in Duluth. Van Horne wrote that this was causing "demoralization among John Ross's men on the Lake Superior Section" and that labourers should be paid only \$1.75 per day with \$10.00 board.¹⁸⁷ For Van Horne, this measure would save the company a considerable amount of money and reduce its financial problems. However, Ross did not implement those changes and the mountain section remained the highest paid. Although the men on the mountain section made more money than elsewhere on the line, they would have accumulated little in the way of savings once board, purchases at company stores, transportation, and the occasional alcohol binge away from track were taken into account.

The construction through the Rocky Mountains and Selkirk Mountains was organized into sections; each with a portion of track or a particular task such as bridge building to complete. The contractors under James Ross were assigned sections of the line between one and five miles long depending on the task they were performing.¹⁸⁸ Contractors often hired sub-contractors to carry out certain tasks such as cutting ties. The task of building the railway roughly followed this order: survey teams marked out the exact route of the line, gangs made a wagon road to transport supplies, teams cleared and

¹⁸⁵ Berton, 276.

¹⁸⁶ Cuningham, 65. Morley Roberts recalled being paid "two dollars and a quarter for ten hours, and had to pay five dollars a week for board. They did not make us pay for lodging as may be imagined." Roberts, 77-78.

¹⁸⁷ William Van Horne to James Ross, September 10 1883, CPR Fonds, LAC.

¹⁸⁸ Cuningham, 52-53.

graded the line for the track, work gangs laid the track, and other gangs were used to build bridges in advance of the track or to work on tunnels. When a section was finished, the contractor and his men would then pass the teams ahead of them and begin all over again with the next assigned section.

The working conditions in these camps varied greatly depending on the type of work performed. A typical daily schedule for the track layers was as follows: awakened at dawn, the men had breakfast while the horses were fed, then they worked five hours until noon and after dinner they worked five more hours until supper and then went to bed exhausted.¹⁸⁹ Most other workers followed a similar dawn to dusk schedule unless the weather interfered, although bridge gangs sometimes worked through the night to get a bridge finished in time for the track to cross it the following day. Bridges and tunnels could also hold up track laying as there was no easy way to transport material around them, idling track crews until these structures could be completed.

The mountains provided new obstacles for the workers fresh from the prairies, from weather-related challenges to the need to use dynamite to tunnel. In September 1883, snow storms came early and “imbued the new men of the country with horror and dread. They argued, if the winter is like this in September, what must it be like when the winter months set in.”¹⁹⁰ Hundreds of men left the country, decimating crews until new men arrived from Winnipeg and the United States. The winter of 1883-1884 was long-lasting with deep snow still on the ground in June.¹⁹¹ Then an extremely wet summer

¹⁸⁹ Gibbon and Pardoe, 265.

¹⁹⁰ William McCardell, “Reminiscences of a Western Pioneer: Explorations through the Rocky Mountains”, unpublished manuscript, 345, William McCardell Fonds, Glenbow Archives M4056.

¹⁹¹ Cuningham, 51. 1883-1884 was an El Niño year, combined with the Krakatoa eruption. See Mike Davis, *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* (London: Verso, 2001). The 1883 eruption of Krakatoa released fine ash into the upper atmosphere: “mean annual global temperatures dropped by one-half to one degree Fahrenheit in 1884, and this cool period is believed to have

followed. Sam Steele recalled “rain fell nearly every day for at least two months,” yet work progressed whether it was wet or dry and sometimes Steele noted from company books “the men averaged more than ten hours per day per month; some of them had thirteen or fourteen hours per day to their credit.... If it rained too hard for an hour or two they made up for it when it slackened.”¹⁹² Rain in combination with the melting snow pack of the previous winter meant that rivers were swollen for the entire summer. The fall of 1884 was a dry one, until the first snow fell on September 28.¹⁹³ Workers had to quickly adjust to the bone-chilling cold. The lowest temperatures recorded were -40F at the Kicking Horse Pass on December 30, 1883, and in the following winter -42F in the Columbia Valley on December 24, 1884, and -48F in the Rocky Mountains.¹⁹⁴ Extreme winter weather complicated the construction process as ice piled around the piers of bridges, streams flooded their banks and ice and snow accumulated on the peaks, eventually triggering slides. The summer of 1885 was dry; however, heavy autumn rains fell as construction drew to an end.¹⁹⁵ CPR workers had to learn to carry out their tasks with great caution through all sorts of weather in order to complete the track quickly and survive.

Working on tunnels and bridges were some of the most dangerous tasks, but even chopping down trees or laying tracks took an exhausting toll on the workers. On the Corry Brothers’ Tunnel the workers dug through sand, clay and gravel on three different levels. Morley Roberts recalled that only those on the top level did not have the threat of

continued through the 1880s and part of the 1890s.” Alexander E. Gates and David Ritchie, *Encyclopedia of Earthquakes and Volcanoes*, 3rd ed. (New York: Facts on File, 2007).

¹⁹² Steele, 190. This summer was so wet that William McCardell went so far as to question whether the “explosive turmoil” of the dynamite “rent the clouds or not.” McCardell, 388.

¹⁹³ Cuningham, 51 and Bone, 125.

¹⁹⁴ Cuningham, 51.

¹⁹⁵ Bone, 125.

anything falling on them. However, the lowest gang was constantly in danger of rocks falling from the two benches above:

I never felt safe, for every minute or so would come the cry, 'Look out below!' or 'Stand from under!' and a heavy stone would come thundering down the slope right at us. I had been working three days, and on the third day a rock about a foot through, weighing perhaps 80 lb., came over without anyone crying out until very late. It came down and seemed about to drop right where I stood, so I made a prodigious jump on the instant... and struck my right knee under the cap on the end of the wheelbarrow handle just as the stone buried itself in the ground where I had been standing.¹⁹⁶

Roberts injured his knee and was unable to work for five days, then worked part time until he recovered fully. Others were not so lucky. Engineer Peter Bone recalled a cave-in at the Corry Brothers' Tunnel which resulted in one man losing his life.¹⁹⁷ James Ross wrote that men refused to work in that tunnel when two men were killed by falling debris when the headings met and "the timber commenced cracking, crushing the wall plates, and splitting the posts."¹⁹⁸

Working on bridges high above the water also posed dangers. Bone remembered laying out the work for the bridge over Cedar Creek, using a rope to climb the cliffs where the bridge was to be placed: "On one occasion Stuart and I were standing on a ledge clinging to the rope when a big chunk of hardened snow thundered down on top of us. It knocked us off our perch and sent us sliding down the rope at lightning speed to the ground below."¹⁹⁹ Bridges were slippery in winter and could flood or be washed away in storms or in the spring thaw, presenting bridge gangs with the challenge of avoiding the dangerous waters below.

¹⁹⁶ Roberts, 76.

¹⁹⁷ Bone, 90.

¹⁹⁸ James Ross to Van Horne, October 7, 1884, CPR 1, File 6749 in Regehr, 42.

¹⁹⁹ Bone, 104.

Some men, unfamiliar with physical outdoor labour, found the mountain conditions particularly difficult and exhausting. Nova Scotian George Van Buskirk hoped to get work as a clerk in a construction camp but was first employed in preparing a camp site. “Putting up large tents and chopping down big trees for shanties and having to shoulder the trees with a strong labouring man – trees about 24 ft. long and nearly a foot thick,” he informed his mother. “I can tell you it took the perspiration out of me, but I pulled through. My hands are quite raw and stiff.”²⁰⁰ Winter conditions made things more difficult and uncomfortable: “Steadily... snowflakes fell, so soft, so wet, and so impalpable that one hardly knew whether it was snowing or raining, except that, as one climbed wearily over the path back to camp in the dark, an incautious misstep proved the depth was greater than in the morning.”²⁰¹ Working ten-hour days in the mountains left the men physically exhausted, compounding the many dangers like falling rocks and slippery bridges that they had not faced on the prairies.

The most hazardous job of railway construction involved carrying dynamite and nitro-glycerine along the track to excavate tunnels and cuttings. Men who carried nitro-glycerine were called ‘Glycerine monkeys,’ receiving fifteen dollars a day to risk their lives.²⁰² Thankfully, there were relatively few accidents in dealing with explosives. Steele noted that only two mishaps occurred, “a clear proof of the care exercised by the contractors, who would never employ any but the most experienced rock foreman.”²⁰³ The first accident occurred when a rock from a distant blast killed ‘Dago’ who kept the dynamite warm so that it would not become unstable. The second accident was due to the

²⁰⁰ George Van Buskirk to mother, June 17, 1884, George Van Buskirk Fonds, Glenbow Archives M610.

²⁰¹ Gibbon and Pardoe, 273.

²⁰² McCardell, 389.

²⁰³ Steele, 191.

carelessness of a worker who used a steel drill to remove a rock that had fallen into a drill hole containing dynamite; it struck a spark and several people died in the resulting explosion.²⁰⁴

Dynamite was also sometimes blamed for causing avalanches, the force of the blast triggering loose snow which would pick up more snow as well as trees and rocks. Father Coccola wrote about an avalanche at Rogers Pass: “The continual blasting was the cause of it. Glaciers which never moved... came down with a tremendous roaring; by the pressure of the air one of those avalanches [crossed the valley and]... rose up many hundred feet on the other side burying a construction train with 19 men.”²⁰⁵ Engineer Granville Cuninghame wrote that the mountain-formation in the Kicking Horse Pass, where the lower elevations were covered in thin soil and timber on a slippery surface of shale and the upper part of the mountains were bare allowing snow to accumulate, meant that slides were “no unusual occurrence.”²⁰⁶ Avalanches were a scary experience for all workers. Surveyor Charles Æneas Shaw wrote about his experience with a snowslide:

We got about half-way there [to the cache] when it arrived with a terrific roar and a blast of wind that threw us all down. For a few minutes the darkness of Egypt surrounded us. When we could see again we found that where our camp had stood the slide was pile a couple of hundred feet deep. It had filled the valley of Blaeberry full to the opposite side, and had mowed down that thick growth of four-foot spruce timber as if it had been so many pipestems.²⁰⁷

Fortunately, all of Shaw’s party survived with enough supplies and blankets to continue to their horse camp. Others were not so lucky. James Ross wrote that avalanches stripped trees and that some of the workers involved in one incident were “caught in the tail of the

²⁰⁴ Gibbon and Pardoe, 274-275.

²⁰⁵ Coccola, 100.

²⁰⁶ Cuninghame, 51.

²⁰⁷ Charles Æneas Shaw, *Tales of a Pioneer Surveyor*, ed. Raymond Hull (Don Mills: Longman Canada, 1970), 162-163.

storm and were blown off their feet and could not draw their breath for some little time afterwards.”²⁰⁸

Several bad avalanches in the late winter and early spring of 1885 created problems for the CPR workers hurrying to finish the track that year. On February 19, 1885 the *Calgary Herald* reported three slides, one six miles west of the summit of the Selkirks which killed Robert Miller, a cook at McKenzie’s camp; a second which buried three men alive at McDermott’s camp; and the third which swept Hill’s store off the summit [Figure 4].²⁰⁹ These slides sparked rumours that the “line of route was being slightly changed on account of the danger from avalanches. Instead of seeking the centre of the passes the road was being led along the mountain side, the rock being scooped out to afford some shelter to the trains.”²¹⁰ The rumour proved correct as the C.P.R. placed the line closer to the mountains to give it more protection. In another slide less than a week later, another contractor, Holt, lost \$65,000 worth of supplies. The *Herald* reported that the “workmen on the road seem panic-stricken and many of them are refusing to work on account of the danger; others are striking for higher wages, the demand being for \$3.50 per day.”²¹¹ This fear, coupled with escalating discontent, culminated in the big strike at Beavermouth in March.

The workers became increasingly anxious not just about the slides and washouts which threatened their lives, but that by February 1885 they were not even being paid to do this dangerous work. Throughout February and March, Sergeant Sam Steele received

²⁰⁸ James Ross to Van Horne, letter, March 4, 1885, CPR 1, file 9116 in Regehr, 45.

²⁰⁹ “Avalanches in the Mountains.” *Calgary Herald: Miner and Ranche Advocate and General Advertiser*, February 19, 1885.

²¹⁰ “The C.P.R. in the Rockies,” *Calgary Herald: Miner and Ranche Advocate and General Advertiser*, February 26, 1885.

²¹¹ *Ibid.*

an increasing number of complaints from the workers about unpaid wages and warned both James Ross and Sir John A. Macdonald.²¹² As Peter Bone explained, “the men were unpaid because the company did not have the money to pay the contractors; and the contractors consequently couldn’t pay the men the wages which were due to them.”²¹³ The men from the most remote construction camp began the march to Beavermouth, then the End of Track. Father Coccola tried to stop the men: “I assured them that settlement would be made soon, but by wasting time their cheque would be only smaller on the next pay day, that the company had no desire to defraud them of their dues.”²¹⁴ According to a worker, William McCardell, “Hundreds of men of every class assembled at that point [Beavermouth], where the rottenest type of liquor was dispensed freely, and this contributed to the turmoil.”²¹⁵ Steele was sick with typhoid at this point in time. Constable Kerr saw a man provoking workers to make an attack on the Mounted Police barracks, tried to arrest them, but was overpowered. Ross told the workers that he would feed them that day but if they did not disperse by night he would charge them for their meals and hold them responsible for damage done to company property.²¹⁶ According to his own account, Steele got up from his sick bed and went out with a British Columbia Police Magistrate, who read the Riot Act. “Listen to this, and keep your hands off your guns, or I will shoot the first man of you who makes a hostile movement,” Steele said, succeeding in persuading the men to disperse.²¹⁷ The strike leaders were brought to Steele and fined \$100 or six months in prison with hard labour.²¹⁸ The Mounted Police had

²¹² Steele, 196.

²¹³ Bone, 105.

²¹⁴ Coccola, 101.

²¹⁵ McCardell, 403.

²¹⁶ Ross quoted in Regehr, 50.

²¹⁷ Steele, 200.

²¹⁸ *Ibid.*, 200.

proven valuable as an instrument of state authority, one fully capable of defending the interests of capital and national government when class conflict threatened the nation-building process. Borrowing every dollar he could, Ross paid the tracklayers so the work could continue, paying the rest of the men the next day.²¹⁹ The strike was not a complete waste of energy for the men. As McCardell explained the strike “convinced officials of the C.P.R. that they must get busy and fix matters up, or else complete dissolution would be the result of the great enterprise.”²²⁰ The strike also showed that workers were capable of protest against unfair treatment and dangerous working conditions. Through the strike, workers found a way to express their grievances about the lack of pay and the risky, avalanche-prone environment in which they worked.

The construction of the CPR had a tremendous impact on the environment through deforestation, fire and blasting just as the environment had an impact on the workers themselves through avalanches, turbulent rivers, and challenging terrain [Figure 5]. Those surveying the final line just ahead of the workers faced similar challenges to the surveyors who had come before them. In 1883, Charles Æneas Shaw, placed in charge of the line from Calgary to the Summit of the Rocky Mountains, forded the icy Bow River near Calgary: “The moment I stepped out of the water my clothes froze solid; I rolled myself up in a blanket while Perry and Kenley gathered enough dry willows to build a fire and thaw me out, and I then got into dry clothes.”²²¹ Shaw’s party surveyed the Rocky Mountains all winter (1883-1884) narrowly escaping the 1884 avalanche which wiped out their camp. The area near the Kicking Horse River called the ‘Golden Stair’

²¹⁹ Ross quoted in Regehr, 50-51.

²²⁰ McCardell, 404.

²²¹ Shaw, 138. These surveyors planned and oversaw bridges and eliminated tunnels as construction was beginning in the mountains. They had close ties with James Ross in planning the exact route and this is why they are mentioned in his chapter and not the preceding one.

created numerous problems for surveyors and their horses as the trail zigzagged up one side of a gorge and down the other side. Shaw slipped off the back of his horse when it reared after being scared by hornets and William McCardell, who was travelling with Major Rogers and an engineering party in the winter, saw a horse miss a step and fall off the path.²²² The horse fell hundreds of feet into the Kicking Horse and was later found dead downstream. Sir Sandford Fleming, who made an 1883 journey to see and approve Rogers Pass for the CPR, also had difficulties with his horses in this region and spent the night wet after a day of crossing streams.²²³ Following in the footsteps of the surveyors of the 1870s, these men improved upon the existing line for the railway while dealing with difficult terrain, rushing rivers, and challenging mountain winters.

Clearing brush and trees to make a wide path for the railway was the first step of construction. Axemen had cleared a small path for the surveyors but this path needed to be widened by axes, saws, and burning debris. Fires were the fastest way to dispose of slash and fit with the CPR's plans for a hasty construction. Shaw recalled completing the survey to "the Great Divide when some of the men who were clearing the right of way started a bush fire. It had been a very dry season, and there were piles of brush and timber all along the line; the whole valley was soon in a blaze."²²⁴ Out of control, the fire burned for several days and "some of the men and teams working on the line were burned,"

²²² Shaw, 149-150 and McCardell, 361.

²²³ Sandford Fleming, *England and Canada: A Summer Tour between Old and New Westminster* (London: Sampson Low, Marston, Seale and Rivington, 1884) 238-243. Fleming's diary of this time is critical of the rough path along the Kicking Horse River: "Down and up gorges hundreds of feet deep, across rocky slides where the pack horses had to clamber over or between sharp rocks... About half way to the end of our journey, the trail to avoid a series of impassable precipices... ascended a long steep hill to an elevation of 700 or 800 feet." Sandford Fleming, *Diary*, August 31, 1883, Sandford Fleming Fonds, Library and Archives Canada MG29-B1 Vol. 83.

²²⁴ Shaw, 147.

Shaw wrote.²²⁵ Fleming and George Grant encountered fires on their 1883 trip to Rogers Pass. Grant wrote that after leaving Calgary they saw that the “endless teaming for the thousands of men engaged in construction had cut up the rude trail, and it was ‘terribly dusty;’ and forest fires were mingling their dense smoke with the dust.”²²⁶ Enough rain fell to put out the fires and get rid of the dust, yet they still passed smouldering fires. Fleming wrote that they passed through many miles of burnt wood but the “air was still and quiet, otherwise we would have ran the risk of blackened trunks falling around us, possibly upon the animals or ourselves, even at the best seriously to have impeded our progress.”²²⁷ After a trip to the End of Track in 1884, Professor G.G. Ramsay was critical of the procedure of creating a path by burning the thick forests:

Whole tracts have been devastated by fires; but the fires have only added to the confusion. They have done nothing in the way of clearance; they have only added hideousness to the scene, burning down nothing right through and bringing down thousands of blackened trunks to strew the ground. All is charred and dismal.²²⁸

Ramsay was not alone in his condemnation of this practice; two other visitors to the End of Track expressed shock at the careless use of fire. Henry Whatley Tyler, president of the Grant Trunk Railway and thus familiar with railway construction practices, visited the End of Track in 1885. Appalled by the large fires, he wrote to his wife, Margaret: “One distressing feature of this country is the continual burning of the forest. Apparently every one going through here, thinks he has a right to burn and destroy, and the mountain

²²⁵ Ibid., 148. The fires endangered the lives of workers. Roberts recalled arriving at the End of Track to work and having to “tramp along the verge of a big mountain fire which was crackling and smouldering from the banks of the river to the mountain tops.” Roberts, 67.

²²⁶ George M. Grant, “The CPR by the Kicking Horse Pass and the Selkirks: VI. The Summit,” *Week*, February 21, 1884, 182.

²²⁷ Fleming, *England and Canada: A Summer Tour between Old and New Westminster*, 248.

²²⁸ Ramsay, 124.

sides everywhere bear testimony to the destruction tendency of irregenerate [sic] men.”²²⁹ Noticing fires from Canmore on, Tyler was “horrified” to discover that the fires were not associated with clearing, but “had been lighted in my honour, as Richard, our car-attendant, and several Ry [railway] men had agreed that it would be right to celebrate our visit by means of a Presidential Blaze!”²³⁰ Likewise, a distressed James Holme observed after his 1883 trip that “some immense fires in the pine forests have been raging for weeks, and have filled the whole country with smoke like a fog. This has been caused by the men on the railroad who out of carelessness (or intentionally) have set huge forests on fire.”²³¹ Those who criticized the burning of forests did so because they saw the practice as a wasteful use of resources from which a profit could be made and not because they were interested in preserving the forests for future generations. There were several large fires throughout the construction (1883, 1885, and 1886) around Rogers Pass, yet, once wooden bridges were built, the CPR had to be careful about burning.²³² Driven by the CPR’s pressure for haste, contractors used careless methods to clear the debris and underbrush as quickly as possible, actions that harmed the habitat along the track, destroyed some of the natural beauty of the region, endangered the lives of the workers themselves, and had eventual repercussions for the watershed of the Bow Valley.

After clearing, the track had to be levelled so that the train would travel more smoothly and quickly along as flat a grade as possible through the mountains. Stephen Pardoe recalled that after the timber had been cleared from the path the work “consisted

²²⁹ Henry Whatley Tyler, letter, June 28, 1885, Henry Whatley Tyler Fonds, Library and Archives Canada MG29 – A31 Vol.1 File 4. Also see Berton, *The Last Spike*, 287.

²³⁰ Ibid. Berton, *The Last Spike*, 287.

²³¹ James Holme, “Journey to the Rocky Mountains, 1883” *Alberta History* 48, no. 2 (Spring 2000): 15.

²³² Johnson, Fryer and Heathcott, 408-409. Byrne writes that railway construction workers “seem to have been especially careless with campfires.” See Byrne, 100. It is also important to note that throughout construction and early operation conditions in the mountains were warmer and dryer and thus it was easier for fires to start and spread. Byrne, 150.

mainly of blasting out the stumps that remained, then picking loose and shovelling away the earth that covered the rock, and drilling and blasting out the solid rock itself down to the required level.”²³³ The process of grading was carried out with the help of horses or mules. Malcolm McCrimmon and his partner A. Quigley obtained a contract for grading various sections through the prairies and the mountains. Describing the procedure, McCrimmon related that “slush scrapers, wheel scrapers and fresnos [scrapers which discharged dirt] were used usually with two teams and scrapers forming a unit. A scraper holder held the scraper until it was full, then the teamsters dumped the loaded scraper at the proper place on the grade.”²³⁴ Wheel scrapers were used in cuts where four horses ploughed furrows the length of the cut and then three horses (a snap team) pulled the wheel scraper. When the scraper was full, “two men jumped high to pull the Johnson [bar] down at the same time crying, ‘Snap.’ The teamster handling the snap team released his hook on the double-tree [hitch]. The team on the scraper then started for the ‘dump’ of fill.”²³⁵

Explosives, used to make cuttings and tunnel through hills, provided the railway with a shorter, flatter line. To make a railway cutting, the men cut troughs through hills which measured a width of twenty-two feet with sloping sides.²³⁶ Crystallized limestone was the most challenging rock encountered through the mountains, requiring the use of dynamite or nitro-glycerine. Drilling was done by hand and only nine lineal feet a day could be drilled by two strikers and one holder compared to sixteen to eighteen feet

²³³ Gibbon and Pardoe, 273.

²³⁴ Malcolm McCrimmon and Sheilagh S. Jameson, *Story of Malcolm McCrimmon (1851-1928) Pioneer Railroad Contractor*, unpublished manuscript, 4, MacCrimmon Family Fonds, Provincial Archives of Alberta PR1963.3/1.

²³⁵ *Ibid.*, 4.

²³⁶ Cuningham, 55.

through other rock.²³⁷ The CPR built an explosives factory near Kicking Horse Lake to provided dynamite for cuttings and tunnels through the mountains. Nitro-glycerine, used near the factory, was too dangerous to transport great distances and black powder was used on shale rocks as dynamite exploded too quickly and its “force... spent between the layers of the rock and through fissures.”²³⁸

Removing dirt, rock, and gravel from these tunnels was an enormous task which required much effort on the part of the workers and their animals, changing the landscape forever. In the 44¼ miles between the summit of the Rocky Mountains and the Kicking Horse River, workers excavated 1,496,917 cubic yards of earth, solid rock, and loose rock for an average of 33,086 cubic yards per mile.²³⁹ 361, 983 cubic yards were removed from the 17 ¾ miles between the mouth of the Kicking Horse River and the first crossing of the Columbia River for 20,393 cubic yards per mile.²⁴⁰ Between the First Crossing of the Columbia and the mouth of the Beaver River, 27,500 cubic yards were removed per mile.²⁴¹ This combination of clearing the brush, setting forest fires, blasting through rock and excavating dirt led to the transformation of the environment on a large scale. The CPR would have an even greater impact on the forests and creeks of the mountain region when it repaired the mainline in the late nineteenth century, as improved technology allowed it to wash away entire hillsides with hydraulic nozzles.

After this tremendous expenditure of effort, laying the track was one of the fastest tasks along the line if all the bridges and cuttings had been completed in time for the rails

²³⁷ Ibid., 55. Cuttings were made to take the train through rocky areas or hills to keep the train on a relatively level grade.

²³⁸ Ibid., 55.

²³⁹ Ibid., 56. The breakdown was as follows: “solid rock, 256,834 cubic yards; loose rock, 115,371 cubic yards; earth, 988,255 cubic yards; hard pan, 136,457 cubic yards.”

²⁴⁰ Ibid., 56. The railway excavated 646 cubic yards of solid rock, 1,011 cubic yards of loose rock, 341.336 cubic yards of earth and 341, 336 of hard pan.

²⁴¹ Ibid., 56.

to go through. Visitors to the End of Track were astonished at the coordination with which track laying was carried out. The process, Clint Boardman wrote, “is simply immense, and everything works like a clock. Each man knows his place, and even knows which identical spike remains for him to drive, or the identical tie for him to put in position.”²⁴² Supplies were laid on a hand-truck but sleepers (or ties), the pieces of wood that went horizontally under the rails, were sent ahead by horse teams and were thrown by the side of the grade and then put into position and spaced.²⁴³ Fifteen sleepers went to each rail. When the hand-trucks reached the last of the newly laid rails, William Henry Barneby wrote,

Six men on either side of the truck each seize a rail between them and throw it down in exact position; a couple of others gauge these two rails, in order to see that they are correct; four men following with spikes place one at each of the four ends of the rails; four others screw in the two fishplates; another four follow with crow-bars, to raise the sleepers whilst the spikes are being hammered in. All work in order, and opposite to each other on each separate rail. After these come more men with hammers and spikes to make the rail secure; but the truck containing the rails, &c., passes on over these two newly-laid ones before this is done.²⁴⁴

Under constant pressure from the contractors, the workers had to keep moving so that those behind them did not catch up. Between 90 and 300 men took part in this process along one section of track while others were grading ahead or fixing the telegraph line.²⁴⁵ Three different weights of rails were used. The rail used until three and a half miles west of the summit of the Rocky Mountains was sixty pounds a yard and from there to Kicking Horse Valley it was seventy pounds a yard.²⁴⁶ The rail was supposed to be sixty pounds per yard through the Columbia Valley but Thomas Shaughnessy,

²⁴² Boardman, 23.

²⁴³ Gibbon and Pardoe, 267.

²⁴⁴ Barneby, 268-269.

²⁴⁵ Cuningham, 61 and Barneby, 269. Bigger numbers were used on the prairies near Calgary where construction progressed more rapidly along the flatter landscape than it did in the mountains.

²⁴⁶ Cuningham, 61.

the general purchasing agent of the CPR, could not obtain sixty pound rails and had to send fifty-six pound rails.²⁴⁷ The tracks laid west from Calgary in June 1883 reached the Columbia Valley by November 10th, the first crossing of the Columbia River by December 1, and Beavermouth by December 26th. The railway progressed at about one and a half miles per day before construction stopped for the winter.²⁴⁸ By the end of May 1884, the last spike had been driven in the North West Territories and the first spike from the east in British Columbia.²⁴⁹

In addition to forest fires, deforestation occurred at a rapid rate because enormous amounts of lumber went into the fabrication of ties and bridges and later snowsheds. Railways inevitably took a toll on surrounding forests, but the CPR's need to build quickly and cheaply added to the destruction. Fortunately, abundant forests through this region freed the CPR from shipping wood west as they did on the prairies. With the grant from the Canadian government enabling the company to use whatever resources they needed along the line, at no cost, the CPR consumed the forests along the track. William McCardell and Dan Martin got a subcontract from Mr. Douggan to cut between 15,000 and 20,000 ties near Stony Creek Bridge. They hired nine French Canadians and a cook and worked fast before winter set in to "make good standard ties as per the specifications of the railway company."²⁵⁰ Some contractors cut more ties than were needed, further deforesting the mountains. Anxious to save the railway extra costs, Van Horne wrote to Ross to warn him that in each section there was a "large surplus of high price timber on hand after the completion of tracklaying and temporary

²⁴⁷ Thomas Shaugnessy to James Ross, October 20, 1884, CPR Fonds, LAC.

²⁴⁸ Cuningham, 61.

²⁴⁹ "The Last Spike," *Calgary Herald: Miner and Ranche Advocate and General Advertiser*, May 28, 1884.

²⁵⁰ McCardell, 402.

bridges... Contractors who are supplying the material are pretty sure to crowd an excessive quantity towards the end unless they are closely watched.”²⁵¹ According to British Engineer Cuningham, eight-foot-long, six-inch-thick ties made from spruce and jack pine were laid three thousand to the mile.²⁵² With 290.3 miles between Calgary and Craigellachie, some 870 900 ties were used on this section of the railway.

Three sawmills were constructed in this section of the mountains to cut timber, mostly for bridges. The first of these was at Laggan (Lake Louise), the second on Kicking Horse Lake, at Palliser, halfway between Field and Golden.²⁵³ This second steam-powered mill served the section of track between the Kicking Horse River and Golden, cutting the region’s abundant white spruce, whereas Douglas fir was employed in the Columbia Valley bridges and culverts.²⁵⁴ A third steam-powered mill, built at the mouth of the Beaver River in 1884, served the section from Beaver River to Craigellachie.²⁵⁵ Sawmills also cut lumber for stations along the line, and telegraph poles. Station building followed rapidly in the path of the track layers. Wood also went into fences to hold back snow from drifting onto the tracks, and to line tunnels so they would not cave in. In addition to forest fires set intentionally to clear the right-of-way or carelessly to enjoy a good blaze, the CPR deforested the mountains along the line to cut down on costs of materials and shipping in order to make ties, build

²⁵¹ William Van Horne, letter to James Ross, September 15, 1885, CPR Fonds, LAC.

²⁵² Cuningham, 61. 2, 640 ties to the mile is the number given by Pardoe and Gibbon a few decades later but they give no information on size and spacing of rails. Gibbon and Pardoe, 266. According to this estimate, the number of ties used would be 766 392 between Calgary and Craigellachie.

²⁵³ Cuningham, 52, Ken Drushka, *Tie Hackers to Timber Harvesters* (Madiera Park, British Columbia: Harbour Publishing, 1998), 22-23, and William Van Horne, letter, August 10, 1885, CPR Fonds, LAC.

²⁵⁴ Cuningham, 52 and Drushka, 23. Horses brought logs cut in the Kicking Horse Valley to the river by horses and logs were then floated to the mill. This mill provided wood for five bridges and the lining of several tunnels. See Drushka, 23.

²⁵⁵ Drushka, 23. Snow was a problem in this region and men had to dig out felled trees from the snow “before they could be bucked and skidded to the mill.” Ibid., 23.

bridges, culverts, and stations, and to line tunnels. Forest consumption on this scale would later have repercussions for wildlife and the watershed in the eastern foothills of the Rocky Mountains as will be seen in chapter four.

Numerous wooden bridges required along the route through the mountains further deforested the hillsides and valleys. Pile foundations supported the first bridges along the Bow River.²⁵⁶ The CPR built trestle, truss, and pile bridges throughout the mountains from readily available wood. A pile-driving gang drove the piles into position using a steam-powered “hammer weighing 2,000 lbs., until there was not more than ½-inch penetration under a blow given by this weight falling through 25 feet.”²⁵⁷ Five workers drove up to fifteen piles a day. The main-posts, sills, and caps and often the floor timbers and ties were hewed near the bridge and then framed and erected [Figure 6]. Van Horne was unhappy to hear that hewed ties were being used near Calgary as he wanted first-class wooden bridges which could only be made with sawn ties.²⁵⁸

The Kicking Horse Sawmill produced floor-timbers, deck-material and other pieces. The CPR brought in eastern white pine for bridge timber and stringers, and oak for trusses. Workers near Calgary astonished visitor Clint Boardman with their speed at building bridges, but higher bridges in the mountains took a great deal more time and effort.²⁵⁹ Long delays occurred in building large trusses [Figure 7]. Temporary pile bridges were often constructed so the track laying could pass through, the trusses going up at greater leisure after the track had passed by; however, it was not possible

²⁵⁶ Bone, 56.

²⁵⁷ Gibbon and Pardoe, 279.

²⁵⁸ William Van Horne to James Ross, November 3, 1883, CPR Fonds, LAC.

²⁵⁹ Boardman, 23.

to do this in difficult high places.²⁶⁰ To avoid delays, bridge building also continued through the winter. Crews cut holes in the ice and erected temporary scaffolding, but this was dangerous work as men could slip and fall off the bridge.

Ideally, the bridges along this part of the line should have been made of iron or steel as wooden bridges had a lifespan of approximately twelve years and were a constant fire hazard, whereas iron and steel were much less destructible. However, iron was expensive and would have had to be shipped out west. The wooden bridges built in a hurry near Calgary were “reported to be in bad condition,” Van Horne reported to Ross, emphasizing the need for better quality: “West of the Summit we will have to use very heavy locomotives and it is exceedingly important that the timber structures be of the very best possible description and secure beyond the possibility of a doubt.”²⁶¹ But when Ross requested permission for iron bridges at certain locations, Van Horne refused. “It will be necessary on account of time and immediate outlay to construct... the Columbia Bridges out of timber,” he explained, “and I do not think we can safely trust any of the Bridge Works to complete the iron trestle for the Skookum-Chuk in time.”²⁶² Two weeks later, Van Horne wrote that iron bridges in the Selkirks would “add enormously to the expense of the structures.”²⁶³ Iron was a luxury that the CPR could not afford during construction. The company was prepared to replace these bridges in the following decades once profits from passengers and freight improved its financial situation. The trees continued to fall, then, for structures that would soon be replaced.

²⁶⁰ Gibbon and Pardoe, 279.

²⁶¹ William Van Horne to James Ross, July 11, 1884, CPR Fonds, LAC.

²⁶² William Van Horne to James Ross, October 6, 1884, CPR Fonds, LAC.

²⁶³ William Van Horne to James Ross, October 20, 1884, CPR Fonds, LAC.

Having crossed the Bow, the CPR confronted the Kicking Horse and the Columbia Rivers. The six-foot deep Kicking Horse River required nine crossings to find the best side for the railway, six of them within twelve miles of each other, whereas building piers in the deeper Columbia River was more difficult.²⁶⁴ The sixty-two miles between the summit of the Rocky Mountains and the first bridge over the Columbia required 8,039 lineal feet of bridges and trestle-work.²⁶⁵

The most complicated and highest bridges on the line were between Donald and the summit of the Selkirks. Their construction reveals that the CPR's control over nature was not easily achieved, nor was it permanent. Mountain Creek Bridge, the first and largest of these bridges encountered going west, had an easy approach on both sides [Figure 8]. Bone worked on this 1200 foot long, 150 foot high bridge with a central span of 150 feet and two smaller thirty feet truss spans, recalling it required the most timber of any bridge.²⁶⁶ Cedar Creek Bridge, smaller at 100 feet long and 100 feet high, proved more difficult. Here "the approaches were steep rocky cliffs, and the laying out of the work involved the use of a rope in climbing these cliffs."²⁶⁷ The next bridges were "Raspberry [sic], 120 feet long and 67 feet high; Surprise, 430 feet long and 164 feet high; Cut Bank, 195 feet long and 71 feet high; Snow Bank, 146 feet long and 51 feet high; Stoney Creek, 490 feet long and 286 feet high; and Cascade Creek, 350 feet long and 67 feet high" [Figure 7].²⁶⁸ Surprise Creek Bridge, the highest bridge of the line, was one of the highest in the world at the time. James Ross wrote of problems with the footings of

²⁶⁴ Cuninghame, 58.

²⁶⁵ *Ibid.*, 60

²⁶⁶ Bone, 103-104. Ross wrote that Mountain, Surprise, Stoney Creek, and twelve other bridges together used four or five million feet of timber. Ross to Van Horne, June 21, 1885 in Lavallée, 206.

²⁶⁷ Bone, 104.

²⁶⁸ Newton H. Chittenden, *Settlers, Miners and Tourists Guide from Ocean to Ocean by the C.P.R., the Great Trans-Continental Short Line through a Region of Unsurpassed Attractions for Settler, Miner and Tourist* (Ottawa: J. Hope & Co., 1885), 74.

Stoney, Skookumchuk and Surprise Creek Bridges which he moved up the slopes after spring torrents that swept trees, debris, and rocks down the mountains.²⁶⁹ The five high bridges near the Illecillewaet came next, noteworthy in that their trestles curved.²⁷⁰ The crossing of the Illecillewaet near Albert Canyon proved especially troublesome, costing the CPR dearly. “The river bed at this crossing was full of large boulders, which made the driving of piles almost impossible,” Bone recalled. “Wet weather had set in, and the Illicilliwaet [sic] became a raging torrent. Just as the bridge was about to be completed, it was swept away.”²⁷¹ Once again, the CPR had difficulty in controlling nature. Rebuilt entirely, this second bridge withstood the river and the track crossed the river. The last bridges Bone supervised, small ones near Eagle River, proved less challenging compared to his mountain structures.

The bridge building process was the only way the CPR could shorten the line through the mountains and avoid long detours. Finances dictated that the rivers would be bridged with wood, free for the taking, instead of the more expensive, sturdy, and practical iron or steel. This decision had implications for the forest and animals along the line as thousands of trees were cut down for these temporary bridges, as will be seen in the next chapter. Wooden bridges would become a problematic shortcut for the CPR in its first twenty years of operation as they were fire hazards and unable to handle storms as well as iron bridges. In the end, the CPR would take costly measures to replace them all.

Another problematic section in the mountains was the Big Hill between Hector and Field, a shortcut down a steep incline by which the CPR eliminated Major Rogers’ proposed tunnel through Mount Stephen. The grade along the entire line was 2.2 per cent

²⁶⁹ James Ross cited in Regehr, 43.

²⁷⁰ Bone, 108.

²⁷¹ Ibid., 110.

but in the case of the Big Hill line it reached 4.5 per cent. William Van Horne wrote to James Ross before the CPR got permission for this grade:

The temporary line question is a very delicate one with the Government. Mr. Dickey recently reported to Mr. Schreiber [general managers of government railways] that the permanent line proposed was impracticable, but fortunately Mr. Schreiber took a different view of it. It is highly important that nothing should be said about the impracticability of the so called permanent line, lest the Government should cut off our estimates entirely.²⁷²

The Canadian Government approved the line and with that decision the CPR featured the “steepest grades for any standard-gauge railroad” in the world. The Big Hill, intended to be a temporary measure, lasted twenty-five years.²⁷³ The CPR installed a system of safety switches to prevent accidents and allow runaway trains to enter side spurs and not run off the tracks or into other trains. In time, this shortcut would come back to create problems for the CPR. Even during construction there were runaway trains on the hill. In 1884, Professor G.G. Ramsay wrote of a runaway train carrying 270 construction workers, all of whom jumped off while “the train, rushing at forty or fifty miles an hour down the new-laid track, and scorning a side line up the hill turned open to intercept the runaway, ‘jumped’ the rails at the curve close to the second crossing over the river, and dashed straight on into a precipitous face of rock.”²⁷⁴ The Big Hill could also be a fire hazard, the extra locomotives required to make a “superhuman effort” to bring trains up the hill scattering sparks everywhere.²⁷⁵ The Big Hill shortcut saved the CPR money during

²⁷² William Van Horne, letter to James Ross, June 11, 1884, CPR Fonds, LAC. CPR Historian, Omer Lavallée, wrote that this steep line would allow the company to observe climatic conditions and geographic challenges, such as avalanches, before deciding where to place this line. Lavallée, 180.

²⁷³ Berton, *The Last Spike*, 293. Berton also wrote that no “major line exceeded a four per cent grade” although one “freak” scenic railway had “grades as high as seven percent.” Van Horne had argued that the Northern Pacific and Santa Fe lines built switchbacks of 4.5 per cent but these were used for a short period compared to the twenty-five years of the Big Hill. Berton, *The Last Spike*, 293.

²⁷⁴ Ramsay, 126.

²⁷⁵ Gibbon and Pardoe, 277.

construction but proved costly in future years not only in the construction of the Spiral Tunnels to make the tracks safer, but in human lives and loss of locomotives.

It was difficult to find a good path for the railway down the Valley of the Illecillewaet River as the paths of avalanches crossed the track. James Ross designed a series of loops in the track which lengthened the line but brought the railway safely through the valley. The Loops descended 522 feet in seven miles and were considered “a clever piece of engineering” by many who travelled over the line.²⁷⁶ One traveller wrote that the loops were a great solution, “where the line, running on lofty trestles, keeps turning back on itself in order to get down into the valley. On it goes, making a trestled curve, then back on a lower level parallel with the spot started from... until six lines of railway hang over one another.”²⁷⁷ The construction of the loops was a prime example of the CPR having to modify its plans to adapt to the landscape.

At other locations the CPR took a more forceful approach, tunnelling through the mountains. Digging tunnels was the most time consuming process of construction. Workers dug seven tunnels from the summit of the Rocky Mountains west, totalling 2,152 feet in length.²⁷⁸ There were no machines to do the work of men; instead, holes were drilled in the rock and filled with dynamite, black powder, or nitroglycerine. Pardoe recalled “the hammers went on the drill, stopping every now and then while the drill-holder scraped out the powdered rock from the depths of the hold with a long thin rod flattened at the end.”²⁷⁹ When the hole was too deep for striking, workers used a long

²⁷⁶ Canadian Pacific Railway Company, *The Challenge of the Mountains* (Montreal: Canadian Pacific Railway Company, 1909), 60. Charles T. Ford, *From coast to coast a farmer's ramble through Canada, and the Canadian Pacific railway system* (Exeter, England: Bearne Brothers, 1899), 19.

²⁷⁷ Charles Garner (writing under pseudonym Stuart Cumberland), *The Queen's Highway from Ocean to Ocean* (London S. Low et al, 1887), 23.

²⁷⁸ Cuninghame, 56.

²⁷⁹ Gibbon and Pardoe, 274.

churn-drill. The holes were then filled with powder and fuses and the cry “fire” alerted everyone to take cover while the fuses went off. For William McCardell the process reflected an unyielding nature giving way to the power of technology. “Echoing through the mountain corridors, was the explosive roar of nitro-glycerine,” he wrote, “blowing its way through hard granite formation that seemed determined not to let these rock drillers pave the way for the throbbing Iron Horse that was making its way down to the Pacific.”²⁸⁰ After the explosion, men cleared the debris from the tunnel and smashed the large boulders down to a smaller size so they could be carted away. The tunnels, twenty-two feet high and sixteen feet wide, involved the removal of twelve cubic yards of material per lineal foot.²⁸¹ The first tunnel, at the foot of the Big Hill, required tons of dynamite to penetrate fissured crystalline limestone. The work went slowly; just six and a half feet were dug each week at each entrance to the 130 foot tunnel, with gangs working day and night to finish it in ten weeks.²⁸²

The second tunnel, known as the Corry Brothers’ Tunnel for the engineers in charge of its construction, was the most difficult and longest at 470 feet [Figure 8]. Moreover it curved at nine degrees through a variety of difficult material. Morley Roberts, who worked on the tunnel, recalled that the hill contained three different layers of material: “gravel on the top, then a thick stratum of extremely tenacious blue clay, and beneath that lay a bed of solid concrete [boulders] which required blasting.”²⁸³ The work, carried out from both entrances, was extremely difficult. As Cuninghame related, “streams and springs from the mountain slope make their way down through the soil, and working out

²⁸⁰ McCardell, 388.

²⁸¹ Cuninghame, 56. Tunnels were so high because the Canadian Railway Act stated that there had to be seven feet above the freight cars so that brakemen could sit on the roof without harming themselves.

²⁸² *Ibid.*, 56-57.

²⁸³ Roberts, 76.

in the veins of the sand, and between the boulder-drift and the blue clay, cause deep excavations, which result in sudden and disastrous ‘slides.’”²⁸⁴

The CPR had difficulty subduing the environment as nature did not always behave as anticipated. Tunnel collapses were a prime example of the CPR’s plans not working out, repairs slowing the pace of construction. Although timbered, the east end of the Corry Brothers’ Tunnel collapsed on July 23, 1883 “tearing out 30 lineal feet of timber lining and bringing down about 15,000 cubic yards of material” and had to be dug out all over again.²⁸⁵ Yet again in October, when the track was about to be laid, a second slide occurred at the east end bringing down approximately nine thousand cubic yards of material.²⁸⁶ William Van Horne wrote to James Ross after this collapse, saying that when he saw the clay tunnel he feared that there was “not sufficient timber in it. A blue clay six-mile tunnel always requires about double the amount of timber that is necessary for one through gravel, loose rock, or earth.”²⁸⁷ He demanded that once supplies arrived and the ground was frozen the “tunnel should be restored to its original section and solidly timbered because we cannot afford to have any difficulty with it after spring.”²⁸⁸ The tunnel was then completely timbered, 780 board feet of lumber being used to line each foot of the passage.²⁸⁹

Like the Corry Brothers’ Tunnel, the other tunnels progressed at an agonizingly slow pace. Working in teams of twenty four with one foreman, nine drillers, one dump man,

²⁸⁴ Cuninghame, 57.

²⁸⁵ *Ibid.*, 57 and Roberts, 76.

²⁸⁶ Cuninghame, 57. The cause of the second slide was that the air from the open tunnel caused blue clay to swell which exerted pressures on the timber making them collapse.

²⁸⁷ William Van Horne to James Ross, October 20, 1883, CPR Fonds, LAC.

²⁸⁸ *Ibid.*

²⁸⁹ Cuninghame, 57. As the tunnel was 470 feet long, this would mean that 336, 600 board feet of lumber were used to timber the entire tunnel. This tunnel lasted until 1906 when it collapsed and in the 1950s the hill was completely removed and the shell of the tunnel acted as a shelter for the train. See Lavallée, 187.

eleven shovellers, and two drivers, the men dug the third and fourth tunnels, 337 feet and 298 feet respectively, through slate shale from July to September 1883 under the supervision of the Muir Brothers. The men worked eleven hour shifts, each day progressing just three feet and three inches.²⁹⁰ The fifth tunnel, 360 feet, was driven through gravel and shale while tunnels six and seven, 97 feet and 460 feet, through solid rock and gravel, had to be partially timbered.²⁹¹ Tunnel seven was also difficult; involving a ten degree curve it took six months to complete.

The dynamite factory at Kicking Horse Lake was kept busy providing ninety tons of explosives for these tunnels in 1884 before being moved to the Columbia Valley.²⁹² Charcoal, used as an absorbent in dynamite prior to its replacement by wood-pulp, was “not sufficient for the high grade of powder... [and the] charcoal-gas evolved on explosion rendered the air in tunnels very bad, and delayed the men at work.”²⁹³ The charcoal gas was yet another danger the workers faced in addition to avalanches, falling rocks, disease, and accidents along the line. Although the CPR tried to avoid digging these costly and time-consuming tunnels, it was impossible to steer clear of them in the mountains without having the track take long detours. The CPR had to find the best methods and types of explosives to tunnel through different types of rock, gravel, and soil, and encountered problems with tunnels collapsing. In digging these tunnels, the workers despoiled the environment by removing rocks and dirt and deforesting the hillside to make supports for tunnels; consequently these actions had an impact on the workers themselves when unstable tunnels collapsed or when explosives injured workers.

²⁹⁰ Cuningham, 58.

²⁹¹ *Ibid.*, 56-58.

²⁹² Gibbon and Pardoe, 275-276.

²⁹³ Cuningham, 62.

The landscape in which the railway labourers toiled was one of the most beautiful in Canada, but few realized their long-lasting impact on it. Most of the workers had never seen such mountains before. Upon first seeing the mountains surveyor Charles Shaw wrote, “the Rocky Mountains on either side tower up into the sky, an awe-inspiring sight. I thus fulfilled my boyhood dream of visiting the Rockies.”²⁹⁴ Likewise, George Van Buskirk wrote to his mother upon reaching the End of Track:

After loading up I had to walk 10 miles over the hardest road it was ever my luck to see – nothing but rock and mud up to my knees; but then the scenery was magnificent, tremendous mountains towering up on each side capped with snow, some of them wooded and some just solid rock and at the bottom of the gorge the Kicking Horse River rushed foaming and leaping along over rocks and boulders. (The scenery out here for wilderness and grandeur is well worth what I have gone through).²⁹⁵

Most workers were aware of the beauty of their surroundings. Some wrote home about it, others took time to sketch the mountain grandeur. But this beauty around them did not conflict with their work. William McCardell, recalling an animated scene of hardworking teamsters, explosions, and rumbling wagons, described a profoundly impressive and “soul stirring picture of frontierism.”²⁹⁶ Bone echoed this ideology of progress, calling the End of Track “a real live community” and “a hive of industry.”²⁹⁷ Visitors to the End of Track were fascinated with this work. Even Henry Whatley Tyler, who had objected to the forest fires, found the work “very interesting.”²⁹⁸ Most workers saw no discontinuity between the splendour around them and the work they carried out because their efforts were made in the name of progress and civilization. Newton Chittenden, visiting the track

²⁹⁴ Shaw, 127.

²⁹⁵ George Van Buskirk, letter, June 17, 1884, George Van Buskirk Fonds, Glenbow Archives M 610.

²⁹⁶ McCardell, 389.

²⁹⁷ Bone, 43.

²⁹⁸ Henry Whatley Tyler, letter, June 28, 1885, Henry Whatley Tyler Fonds, Library and Archives Canada MG29 – A31 Vol.1 File 4.

in 1884, found the country beautiful and the railway construction as bringing progress: “mountains swarmed with men... levelling... trees, preparing the way with axe, pick, shovel, and powder, by tunnels under mountains and avalanches, and bridges over roaring rivers, for the steam engine, the greatest developing and civilizing agency of the age.”²⁹⁹ Sam Steele, writing about a trip out west after the track was completed, saw towns springing up along the line: “It was the same all over western Canada, and we, who had been the pioneers of this glorious change, were permitted by Providence to see the fruits of our labours and our hardships.”³⁰⁰ Professor G.G. Ramsay wrote that later travellers would travel in comfort and doubted that they would “experience the same fresh sense of pleasure, the same awe at the apparently insurmountable obstacles which Nature has placed in the way of man’s progress, [and] the same admiration of the human ingenuity and power which have overcome them,” as those who had visited the track during construction.³⁰¹ This popular vision of the railway equated destruction along the track to the human capacity to conquer nature with a band of steel.

It was rare for workers themselves to realize what their work was doing to the environment around them. Morley Roberts admired the beauty of the Rocky Mountains as he travelled to the End of Track to begin work but as he saw the work going on there, he realized the destructive impact of the railway:

Round me I saw the primæval [sic] forest torn down, cut and hewed and hacked, pine and cedar and hemlock. Here and there lay piles of ties, and near them, closely stacked, thousands of rails. The brute power of man’s organised civilisation had fought with Nature and had for the time vanquished her. Here lay the trophies of battle.³⁰²

²⁹⁹ Chittenden, 74-75.

³⁰⁰ Steele, 412.

³⁰¹ Ramsay, 129.

³⁰² Roberts, 61.

Months later, however, Roberts was too absorbed in his work smoothing the sides of a cutting. He wrote that he had admired glorious scenery in past “But now while I was working, I became mechanical and base, the mountain opposite was painful and I longed for a change of scene, an hour with the plain and prairie.”³⁰³ Exhausted, he was too involved in his work to realize the large-scale destruction going on around him anymore. His work became mechanical. Most workers, their faces to the grindstone, could not see what they were doing from a broader perspective, while new arrivals or visitors to the End of Track often dismissed the deforestation and fires as signs of progress.

On his 1883 trip to Rogers Pass, Sandford Fleming, unlike his surveyors a decade earlier, realized that the railway opening the mountain region would inevitably prevent others from experiencing the land as he had. “In the ages to come how many trains will run to and from sea to sea with millions of passengers,” he reflected. “Thoughts crowd upon me with the peaceful scene before us as the sun sinks behind the serrated Selkirk Mountains, and I do not think that I can ever forget the sight as I then gazed upon it.”³⁰⁴ The solitude of the mountains as the first surveyors saw it would be shattered. But most late nineteenth century Canadians had no qualms about the destructive nature of the work, seeing instead a way for man to defeat nature and connect the country.

Building the track quickly was a wise decision financially but it came with both ecological and human costs. Although visitors to the End of Track were impressed with the rapidity of construction, some were worried about the hurried construction process. “I looked over the whole of the line laid yesterday,” Barnaby wrote, “and I cannot help thinking that had a little more time been bestowed on it, the result would have been a

³⁰³ Ibid., 83.

³⁰⁴ Fleming, *England and Canada: A Summer Tour between Old and New Westminster*, 257.

better job. However, it is wonderful to think that such an extent of line can, within one day's work, be laid in any form at all."³⁰⁵ Professor Ramsay had the opportunity to ride in an open car over a new section of track:

In a few minutes we are like charcoal burners, covered with thick layers of wood-cinders from the engine. We go rattling and wobbling over fifteen miles of new-laid track, through the same glorious scenery of mountain, rock, and forest. The impenetrable forest comes up to the very line: there is no passable foot of ground but the line itself, and the clearance which has been made for forty feet each side of it. The line ahead of us, half laid and unballasted, looks like a pair of wavy ribbons laid down casually on the ground.³⁰⁶

The CPR's shortcuts meant that in the first decade of the operation, many sections of the line had to be rebuilt and re-ballasted, further straining the local ecology as more trees had to be cut down for ties to replace the poorly built parts and more dirt and gravel had to be excavated. However, without these shortcuts the CPR could have gone bankrupt and the line may not have been completed in a timely matter if at all. Thus, the CPR decided to build the line cheaply at a high environmental cost, a cost which was not taken into consideration by the nineteenth century mindset.

On November 7th, 1885, the last spike was hammered in at Craigellachie but not everyone saw it as the triumphant completion of a fine railroad. Unlike the gold spike used by American railroads, the CPR used a simple iron one. Donald A. Smith bent the first spike and had to hammer in a second. Sam Steele recalled that "Smith seized the heavy sledge hammer provided for the occasion and with vigorous strokes drove the spike which united the great Dominion from ocean to ocean."³⁰⁷ Surveyor J.H. Secretan, wrote triumphantly of the last spike: "all honour to the officers and men of the Canadian Pacific Railway, who carried to success this wonderful undertaking in the face of every

³⁰⁵ Barneby, 282.

³⁰⁶ Ramsay, 127.

³⁰⁷ Steele, 235.

known danger and difficult from ‘The driving of the first Stake to the driving of the last Spike.’³⁰⁸ The workers posed for their own photograph of the last spike after the dignitaries had left, knowing they were the ones who had actually built the line. While the country celebrated, some continued to express doubts about the hurried construction of the railway. An early traveller on the CPR before the line closed for the first winter wrote:

Was it a fact that the railway was really open; or, if a fact, was it other than a delusive one? For, how long was the railway open? Sympathy, indeed, would the poor deluded traveller have deserved who attempted to reach the Pacific Coast, by the Canadian Pacific Railway, even a few weeks after the announcements of the opening. The road-bed was not finished; the rails were laid temporarily for the sake of passing over a few distinguished men, and then the whole mountain section was closed up.... Already (in December, 1885) the rails and track have been swept away in many places in the Selkirk Range by devastating snow-slides.³⁰⁹

The last spike was not a conclusive victory of man over nature. The CPR closed its lines for the first winter, unwilling to begin operations in the harshest season of the year. Throughout the two and a half years of construction from Calgary to Craigellachie the environment had an impact on the CPR workers through weather, avalanches, geography, and dangerous working conditions while the CPR workers despoiled the environment through forest fires, deforestation, explosions, and the excavation of dirt and other material. Often the actions of the workers, driven by the CPR’s mandate for haste and the contractors’ need for profit, had an impact on themselves; explosions triggered avalanches and poor sanitary practices led to typhoid. The exact death toll in the mountain section is unknown. Many died of typhoid or in accidents on the Big Hill, a few died from mishaps with dynamite or in drowning while building bridges, and several died

³⁰⁸ Secretan, 249.

³⁰⁹ M.P. *A Winter Trip on the Canadian Pacific Railway: Christmas and New Year in the Snow, 1885-1886* (Cheltenham: John J. Banks, 1886), 2-3.

in tunnel collapses and in avalanches. Other workers suffered from typhoid and survived or were injured in accidents. Construction took a toll on the men, but the number of deaths was few compared to those that would occur in the mountain section in the early years of operation as a result of the route and the CPR's inability to dominate the environment. The CPR still thought it could conquer nature when the last spike was driven, but the first three decades of operation were to show otherwise. The route choice and shortcuts like wooden bridges, the Big Hill and poor ballasting would create trouble for the CPR. Moreover, the CPR would have to adapt to the conditions of the mountains and the route choice by building snowsheds, using snowploughs, dealing with forest fires, replacing bridges, and digging new tunnels. Nature would prove difficult to subdue.

Chapter IV The Ongoing Struggle: The First Years of Operation, 1886-1916

The construction of the CPR was associated with progress and technological triumph because the railway opened the west to settlement, appeared to have conquered the mountains, brought in tourists, and facilitated the extraction of natural resources. The lens of environmental history allows us to see that the triumphalist, progressivist vision is not necessarily accurate; progress came at a cost to the landscape, the wildlife of the region, the lives of the Indigenous people, and the lives of the railway workers themselves. The story did not end with the driving of the last spike, a symbol of man conquering nature, because the CPR faced many challenges posed by the environment in the first three decades of operation. This chapter will investigate the CPR's effect on the environment through fires, logging, flooding, snowsheds, and repairing and improving the mainline with new bridges, hydraulic fillings, and the Spiral and Connaught Tunnels. It will also explore how CPR workers adapted to winter weather, dealt with fires and avalanches, and learned to make quick repairs to tracks damaged by weather and natural catastrophes so that trains could get through without long delays. Lastly, it will identify passengers' views on the relationship between the CPR and nature. In its relationship to the environment, the CPR never achieved a complete victory. Despite an ongoing process of learning and adaptation to an unpredictable environment marked by severe weather fluctuations, the CPR faced an ongoing struggle to maintain year-round operations and deal with catastrophes along the line, a struggle that still continues today. The shortcuts that the CPR had taken during construction, such as the Big Hill, the placement of the line, and the choice of Rogers Pass, created problems throughout the operation of the

line. The CPR was troubled by fires, floods, avalanches, and numerous accidents, resulting in injuries, deaths, and expensive repairs.

Throughout the construction and operation of the line, the CPR was concerned with finances. The company aimed to spend the least amount of money possible on the construction and took shortcuts to reduce costs. Although deeply in debt by early 1885, the CPR received enough help from the Federal Government to complete the line. With that, on July 1, 1886 the CPR paid the government \$29 million, including \$19 million in cash and the balance of over six million acres of the Company's land grant at \$1.50 per acre, redeeming "all outstanding loans."³¹⁰ The CPR did well financially from 1886-1916 and had money to build hotels and branch lines, improve the track, replace wooden bridges with iron and steel and undertake two major projects: the building of the Spiral and Connaught Tunnels. The main goal of the CPR, as a capitalist corporation, was to develop profits. By taking shortcuts and using natural resources along the line for ties, bridges, snowsheds, and repairs to these structures, the CPR maximized profits at little cost to itself but at an enormous cost to the environment. Cost-cutting, however, had unintended consequences as forest depletion increased its vulnerability to floods and avalanches. Employees would lose their lives as a result, and damaged trains and tracks had to be replaced.

Fires along the track during operation caused by sparks and cinders escaping from the engines' smokestacks were a common occurrence, causing a great deal of trouble; they ruined the spectacular scenery for passengers, delayed trains, and damaged bridges. Travellers remarked frequently on the burnt forests they saw from the train. Mrs. Arthur Spragge, a passenger in 1886, wrote "The mountain sides all through the district have

³¹⁰ Lavallée, 292.

been completely burnt over by forest fires, and presented nothing but ugly lines of bare poles, relieved somewhat by the bright colouring of the undergrowth.”³¹¹ The worst time to travel was the hot, dry period of late July through August. William Van Horne avoided those weeks, instead taking his family on a trip in September 1886 when the “heat and forest fires will probably be over.”³¹² Nearly every passenger was appalled at the destruction of the forests and how ugly they looked as the train passed by. Naturalist J.M. Macoun wrote of his 1890 trip: “The whole mountain side had a few years before this been burned over, and the second growth timber was as yet very small, the dense undergrowth effectually concealed the burnt logs with which the ground was strewn.”³¹³

In 1888, Edward Roper, an Englishman touring Canada with his family, encountered many fires on his trip. He described the desolate, scorched scene of the Kicking Horse Valley:

The smoke hung heavily about once beautiful valleys, where the fire was still raging. Burnt logs, burnt trees, charred and smoking ruin, met our eyes on every side. The telegraph poles were in flames here and there, and the bridges we crossed were only saved from destruction by the utmost exertions of the ‘section men,’ who are stationed in gangs along the line to protect them.³¹⁴

Due to all these fires, Roper’s train stopped before each bridge to ensure its safety before crossing. After numerous delays at several bridges, the train stopped because a burning tree had fallen across one bridge in front of the train. “Hours were occupied in removing this obstruction,” wrote Roper. “Where the number of men came from to do it was a mystery to us; but come they did, and with axe and handspike laboured hard, in the midst

³¹¹ Mrs. Arthur Spragge, *From Ontario to the Pacific by the C.P.R.* (Toronto: C. Blackett Robinson, 1887), 173.

³¹² William Van Horne to wife, August 19, 1886, William Van Horne Fonds, Library and Archives Canada, MG29-A60 Vol. 87 File 15.

³¹³ J.M. Macoun, “Naturalist in the Gold Range,” *Ottawa Naturalist*, Nov. 1890, 141.

³¹⁴ Edward Roper, *By Track and Trail: A Journey through Canada* (London: W.H. Allen & Co., 1891), 138.

of smoke and fire, until the job was accomplished.”³¹⁵ Roper’s train crossed the bridge safely, but the Englishman lamented the fact that the fires ruined “the most sublime mountain scenery on the continent.”³¹⁶ Another passenger, W.S. Caine, a British Member of Parliament who was writing about his trip for his constituency newspaper, *Barrow News*, wrote of the many forest fires he saw for which “sparks from Canadian Pacific railway engines are mainly responsible.”³¹⁷ He explained that when the trunks of big cedars, hollowed out from an earlier fire, were reached by a new fire, they drew “like a factory chimney” and the fall of the large burning trunk gave the fire “a fresh start.”³¹⁸ In addition to destroying the scenery, Caine found the fires “disagreeably hot to the passengers on board” as the train rushed through the blazes.³¹⁹

The most memorable fire involving a passenger train occurred during the trip of the second transcontinental east. On July 2, 1886, this train encountered a forest fire and a burning pile of firewood stacked by the line fell, derailing the locomotive. The *Calgary Herald* reported that the train “narrowly escaped destruction at Beaver... The passengers state the rails spread and the train was thrown off the track [and] before it could be got off the way two passenger coaches and mail car were burned. Considerable baggage was also lost.”³²⁰ Blaming the engineer and fireman, the CPR discharged them, saying the accident could have been avoided.³²¹ The CPR, then, encountered numerous problems with fires in the first years of operation, most of its own creation, which resulted in delays, discomfort

³¹⁵ Ibid., 139.

³¹⁶ Ibid., 140.

³¹⁷ W.S. Caine, *A Trip Around the World in 1887-1888* (London: Routledge, 1888), 114.

³¹⁸ Ibid., 114.

³¹⁹ Ibid., 114.

³²⁰ “Canadian News,” *Calgary Herald: Miner and Ranche Advocate and General Advertiser*, July 17, 1886.

³²¹ Ibid.

for passengers, damage to bridges and engines, and the need for emergency crews to carry out repairs.

Since most of the railway was built of wood, the CPR took serious precautions to protect tracks and bridges from fires. One traveller, William Green of the Royal Geographic Society, noted that mountains were divided into five mile sections “under the charge of a special gang of ten or twelve navvies and their ‘boss.’”³²² These men lived in log houses with wives, who cooked and washed for them. Bridges also had special watchmen who lived in small huts nearby and received three dollars a day to “examine the whole length of the bridge after the passage of each train to see that no injury has occurred or that it has not caught fire.”³²³ Water barrels were placed along the bridge to extinguish any sparks. Some bridges, such as Stony Creek Bridge, also had iron hoses running alongside the rails to extinguish fires.³²⁴ Should a fire get beyond his control, the watchman had access to a phone to call a section gang. The CPR poured gravel and sand along the bottoms of bridges and trestles to further reduce the chance of them going up in flames. While the wreck of the second transcontinental east was being cleared, a watchman reported that Surprise Creek Bridge was threatened by fire and although it caught fire three times, the gang managed to save it.³²⁵ The CPR, then, took great care to avoid fires destroying the track and delaying trains but at a great ongoing expense to the company. Had the CPR taken the expense of building iron bridges between 1883 and 1885, the company would not have needed to hire these watchmen, nor would bridges have faced the constant threat of burning.

³²² William Spotswood Green, *Among the Selkirk Glaciers* (London: Macmillan, 1890), 91.

³²³ *Ibid.*, 92.

³²⁴ William Henry Barneby, *The New Far West and the Old Far East: Being Notes of a Tour in North America, Japan, China, Ceylon, etc.* (London: E. Stanford, 1889), 29.

³²⁵ Harry Abbott to William Van Horne, July 12, 1886, cited in Lavallée, 285.

Construction and forest fires had consequences for wildlife in the mountains; animals were hunted for food and fires and logging destroyed their habitats. Before the railway was completed, the Reverend George Grant admitted that the construction had an impact on game. “Between the Stonies and the work connected with tracklaying and the prospecting of miners,” he wrote, “every kind of game must have been driven out of the valley of the Bow; but to the north good sport can still be had.”³²⁶ The destruction of game in the foothills of the Rocky Mountains had an impact on the Indigenous people who lived in the area. An Indian Agent wrote of the impact on the Stoney near Calgary:

The hunt of these Indians for fur-bearing animals and game has not been attended with the same success since the railway was built. The latter had the effect of driving the animals to much more distant parts than they were formerly wont to frequent, and to these points, when the Indians have followed them and game in sufficient quantity to sustain life was not found, relief has had at times to be sent by the Department to the hunters, to enable them to return to their reserve.³²⁷

The acting Indian Agent for the Blood Agency, Carnegie de Balinhard, observed that due to the railway and settlement the Stoney had to travel “a long way before they can find game, and on several occasions relief has had to be sent out to help to bring them in, owing to failure in the game supply.”³²⁸ Some travellers along the line realized the impact of fires on animals as well. A traveller from Australia noted that many animals died in forest fires. “Creeping things and burrowing animals,” Charles Garner noted, “find no shelter in their holes. The ground is red-hot, and they would bake where they lay within. So, creeping out, they find themselves enveloped in a circle of flame, and meet their fate

³²⁶ George M. Grant, “The CPR by the Kicking Horse Pass and the Selkirks: V. The Mountains of the Bow River,” *Week*, February 7, 1884, 151.

³²⁷ Canada, *Annual Reports of the Department of Indian Affairs, 1886* (Ottawa: Maclean, Roger & Co., 1887), lii.

³²⁸ *Ibid.*, 135.

accordingly.³²⁹ Large animals also had difficulties escaping the fire. Bears, deer, and cougars ran frantically, trying to reach safe ground. Birds also died as there was “no safety in flight; they either lose their way in the smoke, or rush blindly into the devouring flames.”³³⁰ Hence, forest depletion and fires started by the CPR resulted in the deaths of many animals as well as the loss of their habitat, with serious consequences for the hunting practices of Indigenous people along the line.

Sparks escaping from engines’ smokestacks wreaked havoc on the prairies around Calgary as well as on the mountain forests, upsetting farmers and settlers by destroying the long grass and crops. Magnus Begg, the Indian agent near Calgary, noted that the CPR’s engines “caused a good deal of damage to the grass on the Stoney and Blackfoot reserves by fire, the fires having run over part of both reserves.”³³¹ Byam Godsal, a recent settler near Calgary, wrote “I can quite understand the old settlers disliking the train coming into the country – it lowers the price of everything they can produce, it brings down wages, besides burning up the country through which it passes.”³³² The last thing desired by farmers on the dry prairies were sparks destroying their crops and land.

With growing numbers of people angry at the number of fires in the mountains and prairies, William Van Horne tried to defend his company against the accusations of Mr. E. Deville, the Surveyor General to the Minister of the Interior, who examined the causes of fires in mountains. Although some conflagrations were started by locomotives, argued Van Horne, campfires, Indians, and prospectors were more to blame.³³³ The CPR

³²⁹ Charles Garner, *The Queen’s Highway from Ocean to Ocean*, (London: S. Low et al, 1887), 156.

³³⁰ Garner, 156.

³³¹ Canada, *Annual Reports of the Department of Indian Affairs, 1885* (Ottawa: Maclean, Roger & Co., 1887), 75.

³³² Byam M. Godsal to father, August 9, 1883, Godsal Family Fonds, Library and Archives Canada, MG 40 M20.

³³³ William Van Horne to A.M. Burgess, January 1, 1887, CPR Fonds, LAC.

used wood for fuel in the mountains in order to clear the land in the vicinity of the railway.³³⁴ Although Van Horne denied it, wood burning engines caused more sparks than coal burning ones, and the CPR used netting on both to reduce the chance of escaping sparks.³³⁵ Once the trees near the line were cleared, the CPR switched to coal in the mountains because it had access to coal deposits in this region. Whether burning wood or coal, netting was not an effective measure of fire prevention in itself and pressure from local citizens and governments would force the CPR to take further precautions.

Inefficient fire guards, massive depletion of forests, and the type of coal used were identified as the main causes of CPR-induced fires in the 1890s. Assistant secretary of the Department of the Interior, R.A. Rutan, wrote that “the local fire guard is sometimes ineffecent [sic].” Ploughing three or four furrows around buildings provided inadequate protection against fires driven for several miles by high prairie winds. Rutan also argued that too much valuable timber was being lost, especially in the dry seasons: “Year by year hundreds if not thousands of acres of this timber are being destroyed. In ten years from now there is every liklehood [sic] that the whole of the spruce areas [into]... the mountains will be destroyed unless the fires are checked.” Finally, Rutan warned that in addition to destroying property and valuable forests, these fires diminished rainfall, advocating the introduction of large fire breaks both on the prairies and in the mountains.³³⁶

³³⁴ Ibid. By 1910, wood was rarely used and coal was preferred. See Buck, 116.

³³⁵ Ibid.

³³⁶ R.A. Rutan to A.M. Burgess, January 29, 1896, William Pearce Fonds, University of Alberta Archives 74-164-125.

William Pearce, the Department of the Interior's chief advisor for the North West, advised that by burning superior quality Canmore coal instead of Lethbridge coal, fires could be reduced but that "it took a long fight on behalf of the management to compel the engine drivers to use it [Canmore coal] on the Main Line [because] it required a great deal more attention in the stoking and looking after the engine [than]... Lethbridge coal."³³⁷ The CPR haphazardly adopted certain fire prevention and suppression measures but in the face of the company's general lack of interest in protecting anything but its own property it fell to the Forestry Branch of the Department of the Interior to construct fire guards, hire fire rangers, build roads to better access fires, create tool caches to fight fires, and erect watchtowers.³³⁸

British Columbia and the North West Territories introduced legislation to further reduce fires; however, the CPR protested these changes and it was not until the 1912 Railway Act that these measures were enforced. In 1896, British Columbia passed an "Act to Preserve the Forests from Destruction by Fire" which required all smokestacks to have a screen "of iron or steel wire netting, the size of the wire used... to be not less than ... three sixty-fourth parts of an inch in diameter, and shall contain... twenty-two wires to the square inch."³³⁹ In stating the exact measurements of the netting, the province hoped to reduce the number of sparks that escaped. In addition, every engine-driver was to "see that all such appliances as are above mentioned are properly used and applied, so as to prevent the unnecessary escape of fire from any such engine, so far as it is reasonably

³³⁷ William Pearce to E.F. Stephenson, July 25, 1898, William Pearce Fonds, University of Alberta Archives 74-164-125. Pearce is referring to lignite coal which was an inferior grade of coal and more likely to cause fire than better grades. (Murphy, 174).

³³⁸ Richard A. Rajala, *Feds, Forests and Fires: A Century of Canadian Innovation* (Ottawa: Canada Science and Technology Museum, 2005), 15-16.

³³⁹ British Columbia, "An Act to Preserve the Forests From Destruction by Fire," in *The Selkirk Range*, ed. A.O. Wheeler vol. 1 (Ottawa: Government Printing Bureau, 1905), 431.

possible to do so.”³⁴⁰ Failure to comply could bring fines up to \$50.00.³⁴¹ The CPR and other companies protested and a 1902 amendment eliminated any reference to wire mesh screens, but fines were higher.³⁴²

Likewise, the North West Territories passed the “Prairie Fires Ordinance” in 1903, dictating that smokestack netting and ash pan nettings must be kept “in good repair and kept closed and in proper place” and sixteen feet wide fireguards extending 300 feet on either side of the centre of the railway had to be kept free from “weeds and other inflammable materials.”³⁴³ Railway employees were prohibited from burning the land along the right-of-way and those who started fires had to assign at least four watchmen and put them out or be penalized up to \$100.00.³⁴⁴ The CPR challenged this legislation and the Supreme Court ruled that the ordinance was “*ultra vires* in so far as it related to the prevention of fires caused by sparks from... railways subject to the Dominion Railway Act.”³⁴⁵ The relevant Railway Act clause stated only that the right of way be kept clear from inflammable material, leaving the specifics of fire prevention unresolved. Since the CPR had a national charter, the problem had to be fixed through federal institutions.

The Board of Railway Commissioners, established by the Federal Government’s Railway Act of 1903, made provisions for a fire guard 300 feet wide on either side of the track, prohibited the use of lignite coal, and made provisions for spark arrestors

³⁴⁰ Ibid., 432.

³⁴¹ Ibid., 432.

³⁴² John Vye Parminter, “An Historical Review of Forest Fire Management in British Columbia,” (M.F. Essay, University of British Columbia, 1978), 20.

³⁴³ North-West Territories, “Prairie Fires Ordinances,” William Pearce Fonds, University of Alberta Archives, 74-164-39.2. The CPR kept the track clear and inspectors such as Thomas Kilpatrick noted the areas that needed “trimming” or “clearing” in their work journals. T.K. Kilpatrick, journal, October 1, 1908, T.K. Kilpatrick Fonds, Glenbow Archives, M7919-57.

³⁴⁴ North-West Territories, “Prairie Fires Ordinances,” William Pearce Fonds, University of Alberta Archives, 74-164-39.2.

³⁴⁵ Murphy, 121.

(netting).³⁴⁶ Once again the CPR protested and no measures were implemented throughout a long series of hearings. Not until May 22, 1912 did the Board of Railway Commissioners pass Order No. 16570 which further defined lignite coal, enforced the construction of fire guards, regulated the burning of debris along the track, required employees to report and extinguish fires, and stipulated that forest rangers should be maintained by railway companies. The railways gained partial relief from these requirements where oil was used for fuel.³⁴⁷ Board of Railway Commissioners chief fire inspector, Clyde Leavitt, had the authority to enforce these provisions, and within a few years the fire issue went from “a free floating crisis, a hysteria of rhetoric, to a fixable problem,” as Stephen Pyne puts it.³⁴⁸ After years of resistance to legislation, the CPR had little choice but to comply with the 1912 Railway Act.

Fires were not the only problem facing the citizens near Calgary; deforestation on the eastern side of the Rocky Mountains caused by CPR logging for ties and bridge material, and clearing the right-of-way, had a worrisome impact on the area’s watershed. In reducing rainfall runoff, forests serve an important function in controlling flooding and erosion along riverbanks. J.S. Dennis, a surveyor for the Department of the Interior, explained that the forest on the eastern foothills of the Rocky Mountains sheltered the annual precipitation “from the evaporating influences of hot winds and strong sunlight, gradually gives it up to feed the numerous springs... which... form the larger streams bringing this water to points where it can be utilized for irrigation purposes.”³⁴⁹ On

³⁴⁶ Murphy, 140 and Parminter, 49.

³⁴⁷ Murphy, 174-175, Parminter, 51, and Stephen Pyne, *Awful Splendour: A Fire History of Canada* (Vancouver: UBC Press, 2007), 191.

³⁴⁸ Pyne, 190-191.

³⁴⁹ J.S. Dennis to Secretary of the Department of the Interior, June 18 1896, William Pearce Fonds, University of Alberta Archives 74-164-414.

hillsides stripped of timber, the precipitation would run off quickly and the water would go to waste. Dennis, consistent with conservationism's abhorrence of waste, recommended that no more timber permits be given out in this region. Agreeing, William Pearce warned that "If the timber is not preserved on the foothills of the mountains then goodbye to ever rendering much of the portion to the east of the said foothills habitable." Pearce's more immediate concern was the danger of his property along the Bow River flooding if there were no trees to hold back the water:

Without timber every stream along the foothills is liable to produce a flood similar to that furnished by Nose Creek last year, or Pot Hole River... Had those streams been timbered, the flooding would probably not have been material in other words, the discharge of the run-off would have occupied more days than it did hours. Imagine the Bow River with all its tributaries, in the foothills and the base of the mountain being denuded of timber, the entire Bow River which averages a mile in width would hardly be sufficient for the discharge; also try to figure out what the cost of bridging such a stream would be.

Pearce was not opposed to logging but worried about the long term effects to the settlers around Calgary, especially as that region depended entirely on the Bow River to maintain its agriculture.³⁵⁰

Such concerns were justified. Incessant rain and melting snow caused the worst flood in June 1902 near Banff. The CPR could not operate for six days and it was likely that forest fires from the construction of 1883-1885 were partially to blame as the water drained rapidly into rivers with no trees to hold it back.³⁵¹ Geographers Nelson and Byrne noted that floods along the Bow River occurred in 1897, 1923, and 1932 as foothills denuded of vegetation became chutes for the torrents of water.³⁵² Flooding was also accompanied by a fear of drought during dry periods for the farmers near Calgary.

³⁵⁰ William Pearce to Secretary of the Department of the Interior, May 23, 1903, William Pearce Fonds, University of Alberta Archives 74-164-414.

³⁵¹ Eleanor Luxton, *Banff: Canada's First National Park* (Banff: Summerthought, 1975), 58.

³⁵² Nelson and Byrne, 234-236.

Clearly, logging begun and continued by the CPR and other companies resulted in long term problems for the watershed of the eastern foothills of the Rocky Mountains, leading to flooding in some areas and the danger of even more flooding if deforestation continued.

The CPR was not immune to problems of its own creation, as floods washed away bridges, creating delays while the structures were repaired or rebuilt entirely. A series of 1894 floods exacerbated by the deforestation along the track resulted in disaster, reported the *Kootenay Mail*: “East of Revelstoke... All the bridges over the Kicking Horse and Bow River are said to be down, and... no trains are coming from the east.”³⁵³ These torrents also washed out a tunnel at Ross’ Peak, caused two rockslides, and flooded the Mud Creek and Flat Creek bridges.³⁵⁴ The rocks supporting the bridge near Revelstoke “began to sink” but workers dumped in fifty-two carloads of rocks and saved the bridge.³⁵⁵ Melting snows also damaged the tracks. In the spring of 1887, Quartz Creek overflowed, washing away 300 feet of track leading to the engine house as well as 150 feet of the main line.³⁵⁶ Henry Hyde recalled a later flood from melting glaciers, one so great it burst through a beaver dam and washed away approximately one hundred feet of track.³⁵⁷ Fortunately, the CPR had measures in place to monitor floods and fires and a watchman spotted the water. Minutes later, “news of the catastrophe was sent to every station on the division, and all trains in transit were temporarily side-tracked.”³⁵⁸ Work gangs arrived and cleared the track, building a new trestle in eight hours so that trains

³⁵³ “Floods and Disasters,” *Kootenay Mail*, June 9, 1894, 3.

³⁵⁴ *Ibid.*, 3.

³⁵⁵ *Ibid.*, 3.

³⁵⁶ Alexander Henry Cameron Fonds, scrapbook, June 25, 1887, AHC Fonds, BSA.

³⁵⁷ Henry M. Hyde, “Sitting Up with the Mountain Division,” *Technical World Magazine*, October, 1909, 138.

³⁵⁸ *Ibid.*, 139.

could pass through the next morning. In the end the CPR would fall victim to its own forest exploitation strategies, compounding the legacy of its earlier decision to build bridges of wood and locate the line close to the valley-bottom rivers.

The most pressing construction project following the completion of the mainline involved the provision of snowsheds to counteract the effects of avalanches on the track and enable the CPR to operate year-round. The Selkirks received more snow than the mountain ranges of western British Columbia because they were higher and intercepted warm, moist air currents from the Pacific Ocean, and the cold air of this region turned this moisture into precipitation.³⁵⁹ Two and a half weeks after the driving of the last spike, an overly confident Van Horne wrote, “We have avoided all of the serious snow slides in the Selkirks and after a careful examination of the few small ones we do touch, I am satisfied that nothing extraordinary in the way of sheds will be required.”³⁶⁰ Van Horne had underestimated the snowslide problem in the mountains. Those who moved to mountain communities, like missionary Alexander Henry Cameron, were astonished at the strength of these avalanches: “Huge fragments of rock were...carried along like pebbles... When the timber line was reached the roar was increased to a thundering din...The immense trees of the forest were levelled like so much stubble and the avalanche ploughed its path through leaving not a stick standing.”³⁶¹

In the winter of 1885-1886, with the track closed, camps were set up in the mountains to observe the paths of snowslides and determine the number and location of

³⁵⁹ Granville Carlyle Cuninghame, “Snow slides in the Selkirk Mountains,” *Transactions of the Canadian Society of Civil Engineers* (Montreal: John Lovell and Sons, 1887) n.p..

³⁶⁰ William Van Horne to H.P. Bell, November 26, 1885, CPR Fonds, LAC.

³⁶¹ Alexander Henry Cameron, diary, December 13, 1887, Alexander Henry Cameron Fonds, United Church of Canada British Columbia Conference (Bob Stewart) Archives. [Hereafter cited as AHC Fonds, BSA].

snowsheds required. A rainy December brought a few large slides, and then as the temperature fell, the dry winter slides of January and February came down. Engineer G. C. Cuningham investigated these slides, one of which extended for 500 feet, was fifteen to twenty feet deep, and weighed twenty-five pounds per cubic foot.³⁶² Living among these snowslides was dangerous. Not only was the weather cold, but snowslides occurred near the shack housing the observers. “One came close to our camp this morning going very fast,” wrote Cuningham, “where it struck the bottom of the valley it spurted up and flung the snow in large compact pieces over 300 feet, within twenty feet of our kitchen.”³⁶³ Both snowfall and snowslides buried the track for most of the winter. Snowslides also damaged bridges and other structures. On February 13, the trestle across Snow Bank Creek, 146 feet in length and fifty-one feet high, was “clear swept out by slide passing down the gorge, with the exception of 3 openings at east end and 1 opening at west end.”³⁶⁴ The slide extended 700 feet into the valley below. March and April slides were generally caused by melting snow. Reporting his findings to the Canadian Society of Civil Engineers, Cuningham wrote that the rock in the Selkirks crumbled more easily under the weather because it contained clay and slate shales of the lower carboniferous system, thus a great deal of debris fell into valley bottoms under avalanches, leaving fissures on the mountainsides.³⁶⁵ Gales played a role in avalanches,

³⁶² G.C. Cuningham, Journal, January 6, 1886, Cascade Camp Fonds, British Columbia Archives P/ER/C16.9. According to H.B. Muckleston, the Assistant Engineer for the Pacific Division, snow in the Selkirks could weigh up to fifty pounds per cubic foot in the spring. (H.B. Muckleston, “A Short Description of the Canadian Pacific Railway through the Selkirks,” in *The Selkirk Range*, ed. A.O. Wheeler, vol. 1 (Ottawa: Government Printing Bureau, 1905), 428..

³⁶³ G.C. Cuningham, Journal, January 29, 1886, Cascade Camp Fonds, British Columbia Archives P/ER/C16.9.

³⁶⁴ G.C. Cuningham, Journal, February 13, 1886, Cascade Camp Fonds, British Columbia Archives P/ER/C16.9.

³⁶⁵ Granville Carlyle Cuningham, “Snow slides in the Selkirk Mountains,” *Transactions of the Canadian Society of Civil Engineers* (Montreal: John Lovell and Sons, 1887) n.p.

brushing snow off exposed parts of mountains and collecting it in pockets and basins which might form snowslides. Cuningham noted that there were two types of slides. The gully slide started from a narrow mountain cleft and spread over the valley, and the bench slide began with snow accumulating on a wide bench slipping over the edge, rushing down in a wide track, and bringing down more snow than a gully slide.³⁶⁶

Snowshed construction began in the late spring of 1886, passengers offering various opinions on their chance of success against avalanches. The snowsheds followed the principle “that they should offer no resistance to the slide” since avalanches were so heavy that structures could not withstand their force.³⁶⁷ Thus, the sheds were built to continue the slope of the mountain so that the avalanche would pass safely over the track. Travellers noticed snowshed crews busy at work, assembling the structures over the line between passing trains [Figure 9]. Passengers with no experience of snowslides tended to see snowsheds as being a perfect solution. “The sheds as constructed would afford complete immunity from danger or obstruction,” one observed, “as the train would go under them as through a tunnel, the avalanche of snow shooting harmlessly over the top of them.”³⁶⁸ Mrs. Arthur Spragge took a more cautious view of the snowsheds. “Their general effect is one of marvellous power and endurance,” she noted, “and they will, no doubt, be severely tested by the might rush of avalanches... sliding down the mountain sides, and, it is to be hoped, continuing their course over the roofs of the sheds in the

³⁶⁶ Ibid.

³⁶⁷ Ibid.

³⁶⁸ Cumberland, 162. Likewise Dean Carmichael, a passenger in 1888 described snowsheds as having “massive strength” and imagined avalanches shooting over sheds. Dean Carmichael, *A Holiday Trip: Montreal to Victoria and Return via the Canadian Pacific Railway* (N.p.: Self-published, 1888), 20.

valleys below.”³⁶⁹ The winter of 1886-1887 would prove if the sheds would allow the CPR to operate through the winter.

In studying avalanches, the CPR developed many designs and techniques to keep the snow and debris passing over the sheds without destroying the tracks. Passenger Hearn noted that after the avalanche courses were studied, means were “devised to turn them out of their ancient paths by “glance cribs” or “dividing cribs.” The former diverted slides from the line; the latter broke slides up and dispersed them to each side.³⁷⁰ There were five basic types of snowsheds, generally made of cedar or Douglas fir, according to Pacific Division Assistant Engineer H.B. Muckleston. The most common type, used when the surface sloped at a steep angle, involved an uphill side held by a retaining crib of cedar logs which supported one end of the rafters and a framed bent supporting the other end [Figure 10].³⁷¹ The bents were supported by heavy beams of timber driven into the earth. The second kind of shed, used on flatter slopes, featured a smaller crib and the third type had no crib. The fourth kind of shed, the “valley type,” served where slides could occur on either side of the track. Cribs were built on both sides and the rafters laid on top.³⁷² The final kind of shed, built sturdily with trussed rafters, was used in deep cuts or places where avalanches would fall vertically on the shed.³⁷³ Therefore, in observing the courses of avalanches, the CPR realized the importance of adapting their structures to work with the landscape, providing the least resistance to slides.

³⁶⁹ Spragge, 167-168.

³⁷⁰ Lafcadio Hearn, “A Winter Journey to Japan,” *Harper’s News Monthly Magazine*, November 1890, 865.

³⁷¹ Muckleston, 428. A crib is a framework of logs often filled with dirt or stones. A bent is a transverse frame supporting the roof of the snowshed. For example, see Figure 10. The crib is the partially finished wall on the left side and the bent is the support work on the right side of the roof.

³⁷² *Ibid.*, 428.

³⁷³ *Ibid.*, 428.

Unfortunately, time did not permit the completion of all the snowsheds in the summer of 1886. That winter engineers went back to observe the effects of avalanches on the newly built sheds. In this, the first winter the line was open, it took a great deal of effort for work gangs to clear the snow. The sheds held up well for the most part in a very snowy early winter. William Van Horne wrote triumphantly to George Stephen in January that the railway was operating well despite a few small slides over open track, and that the “snow sheds are doing their work perfectly, the avalanches have no effect whatever upon them.”³⁷⁴ However, his triumph was short-lived. On February 28, 1887 tragedy struck when a Mount Carroll slide came down on the “opposite camp covering up two engines, snow plow and caboose and 17 men.”³⁷⁵ Eleven men survived this disaster, but six died of suffocation in the snow. Slides became more frequent after that as more storms hit, followed by warmer weather that caused the melting snow to slip. Some sheds began to show wear and tear under the avalanches: Shed No. 12 suffered damage from a heavy slide which broke three planks and a post and filled the shed with snow “for about fifty feet and about 8 ft deep on crib side and level with roof on gallery side.”³⁷⁶ Clearing these slides and repairing sheds was dangerous work, as one avalanche might be followed by another.

Construction of snowsheds continued through 1887 as the CPR tried to protect the track where the worst slides had descended, but building snowsheds posed dangers to workers, though not as many as clearing avalanches. W.S. Caine estimated that 3000 men worked on the sheds, romanticizing their experience. “Right well these fellows live,” he

³⁷⁴ William Van Horne to George Stephen, January 19, 1887, CPR Fonds, LAC.

³⁷⁵ J. E. Griffiths, journal, February 28, 1887, Cascade Camp Fonds, British Columbia Archives P/ER/C16.9.

³⁷⁶ J. E. Griffiths, journal, March 8, 1887, Cascade Camp Fonds, British Columbia Archives P/ER/C16.9.

remarked, “with three good meat meals a day, and the finest air in the world for sauce.”³⁷⁷ Caine ignored the dangers of the work both from slides and the heights at which the men toiled. Among the construction accidents that year, one man fell from a snowshed in Rogers Pass and broke his collarbone. Another fell sixteen feet from a snowshed roof at Cascade, British Columbia, injuring his spine.³⁷⁸ Later that year, a slide wrecked 250 feet of Shed No. 14’s roof and a second avalanche came down while men were busy with repairs, breaking one Finnish worker’s neck and crushing another’s leg.³⁷⁹ Although sheds enabled the CPR to operate throughout the winter, they were far from a perfect solution. The CPR had chosen a difficult, avalanche-prone route through the mountains, and some workers had to pay the cost with their lives, especially in the winter.

Snowsheds contributed to further deforestation in the mountains, a costly problem that likely had unintended consequences for the CPR as there were fewer trees to decelerate snowslides [Figure 11]. The mill at Beavermouth cut an enormous amount of timber for the sheds. Between 1886 and 1898, fifty-five sheds were built measuring from six feet in length (Shed No. 30 which was removed in 1899) to 3099 feet in length for Shed No. 19.³⁸⁰ In total, the length of the snowsheds amounted to 5.85 miles. The sheds built in 1886-1887 consumed 25 000 000 board feet of sawed lumber and 1 140 000 lineal feet of round timber, according to engineer Thomas Keefer.³⁸¹ The amount of

³⁷⁷ Caine, 106.

³⁷⁸ Alexander Henry Cameron Fonds, scrapbook, November 1 and 24, 1887, AHC Fonds, BSA.

³⁷⁹ Alexander Henry Cameron Fonds, scrapbook, December 19, 1887, AHC Fonds, BSA.

³⁸⁰ Thomas O. Kilpatrick, notebook, Thomas O. Kilpatrick Fonds, British Columbia Archives MS-0323.

³⁸¹ Thomas C. Keefer, “The Canadian Pacific Railway” (address at the American Society of Civil Engineers 1888, June 28, 1888). This number is subject to debate. CPR Historian Omer Lavallée gives 17, 768, 800 FBM as the exact amount but says that does not include piling and round timber. See Lavallée, 241. Ken Drushka rounds this figure up to eighteen million. See Drushka, 23.

wood used appalled some observers. Passenger Henry Finck commented on the waste of wood:

On passing the snow-sheds it is interesting to study their appearance and note with what an apparently lavish waste of timber they have been constructed. But it must be remembered that timber is more abundant here, and that the trees that had to be cut down to make room for the track more than sufficed for all the sleepers, sheds, and other protective bulwarks against snow, landslides or avalanches.³⁸²

As the CPR had chosen a route troubled by avalanches, it had to spend a great deal of money building and repairing the sheds which protected the track and enabled year-round operation. In 1888, Keefer put the construction cost of the sheds at about \$2 900 000, with \$200 000 needed to complete the system.³⁸³ Usual wear and tear from snowsheds was expensive enough to repair, let alone dealing with sheds severely damaged or carried away by slides. Four snowsheds, Nos. 6, 23, 41, and 42, were carried away entirely by avalanches, three of those in March 1900.³⁸⁴ Thomas O. Kilpatrick, superintendent of the CPR in Revelstoke, was in charge of noting and carrying out these repairs, specifying which braces had to be replaced, which posts had to be blocked, which holes needed filling, and what old rotting timber had to be replaced with new wood.³⁸⁵ By 1905, Kilpatrick had spent \$899, 480.00, an amount that can be in part attributed to the logging of the hillsides.³⁸⁶ With fewer trees present to hold the snow and rocks in place and to slow slides down, their severity increased. Although the CPR saved 100 miles by

³⁸² Henry Theophilus Finck, *The Pacific Coast Scenic Tour, from Southern California to Alaska, the Canadian Pacific Railway, Yellowstone Park and the Grand Canyon* (New York: Charles Schreiber and Sons, 1890), 265.

³⁸³ Thomas C. Keefer, "The Canadian Pacific Railway" (address at the American Society of Civil Engineers 1888, June 28, 1888). This number is also debatable. Passenger William Webb's estimate of \$3,000,000 echoes Keefer's figure. William Seward Webb, *California and Alaska and over the Canadian Pacific Railway*, 2nd ed. (New York: G.P. Putnam's Sons, 1891), 183-184. Former CPR archivist Omer Lavallée gives the figure as \$ 1,126,034 but this likely includes only the construction in 1886-1887. See Lavallée, 241.

³⁸⁴ Thomas O. Kilpatrick, notebook, Thomas O. Kilpatrick Fonds, British Columbia Archives MS-0323.

³⁸⁵ T.K. Kilpatrick, journal, September 24, 1895, T.K. Kilpatrick Fonds, Glenbow Archives, M7919-8.

³⁸⁶ Thomas O. Kilpatrick, notebook, Thomas O. Kilpatrick Fonds, British Columbia Archives MS-0323.

choosing Rogers Pass, it paid the price, both in building expensive sheds and in workers' lives, as this pass required the most sheds of any section on the line.

Like wooden bridges, snowsheds were great fire hazards and were therefore equipped with fire measures, adding to the CPR's financial burden. With forest fires and sparks escaping from engines, there were always worries that snowsheds would go up in flames. Passenger William Green noted that the sheds were inspected after every train passed and that each contained a "complete system of water-pipes and coils of hose in case of a fire."³⁸⁷ Long sheds were also broken into short lengths separated by fire breaks. Each break was covered by a split fence which consisted of "heavy V-shaped cribs, to guide the slide over the adjacent sheds."³⁸⁸ Workers patrolled the snowsheds to check for any signs of fire, and firebreaks reduced the chance of forest fires spreading to the sheds. Nevertheless, on August 1, 1901, two snowsheds near Three Valley Lake, No. 50 (330 feet) and No. 50A (forty-nine feet), went up in flames after a train passed en route to Revelstoke.³⁸⁹ The *Kootenay Mail* attributed the fire to "a spark from the engine firing the dry timber. A fire started in one shed would rapidly pass to the other."³⁹⁰ By taking a shortcut over Rogers Pass which reduced the length of the line, the CPR saved money during construction. However, this decision and the choice to build wooden bridges and snowsheds created problems for the operation of the line as sparks could escape through the smokestack netting and destroy the numerous wooden structures, both sheds and bridges, along this section, delaying traffic and requiring the expense of building new structures.

³⁸⁷ Green, *Among the Selkirk Glaciers*, 92.

³⁸⁸ Muckleston, 428.

³⁸⁹ Thomas O. Kilpatrick, notebook, Thomas O. Kilpatrick Fonds, British Columbia Archives MS-0323 and "Snowsheds Burned: Railway Traffic Interrupted," *Kootenay Mail*, August 2, 1901, 1.

³⁹⁰ *Ibid.*, 1.

Snowslides showed that the CPR was not victorious over nature, causing frequent delays by destroying bridges and by damaging trains. Missionary Alexander Henry Cameron noted on January 15, 1887 that the “train from the east is 13 hours behind time and a wrecked bridge with several snow slides will deter the trains from the west for many hours.”³⁹¹ Several snowslides at the end of February 1887 resulted in the deaths of five of Cameron’s parishioners when their snowplough jumped the track one and a half miles east of Rogers Pass.³⁹² These slides also wiped out the bridges at “Snow Bank, Raspberry, and two other places, containing 80,000 feet of timber” and a “strong force of framers and carpenters” worked quickly to rebuild them so trains could come through.³⁹³ Avalanches, especially in areas not protected by snowsheds, could force trains off the track, damaging engines and injuring or killing the engineer and brakemen [Figures 12 and 13]. Maintaining the track and repairing engines was an expensive measure undertaken by the CPR to keep trains running in the mountains.

In fighting an annual winter battle against the snow, the CPR adopted sophisticated ploughing technology. Wedge snowploughs were used in 1886 and 1887 to push the snow off the tracks. The CPR then switched to more efficient rotary ploughs, a Canadian invention, which came on the market in 1888.³⁹⁴ The rotary ploughs allowed the CPR to reduce the size of their snow crews and to clear deep snow easily. Their rotating plates caught snow and sent it through an output chute over the banks along the tracks. Snowploughs could not be used in many avalanches as rocks and tree trunks could be caught in the blades jamming the plough, but they were useful devices for clearing the

³⁹¹ Alexander Henry Cameron Fonds, diary, January 15, 1887, AHC Fonds, BSA.

³⁹² Alexander Henry Cameron Fonds, diary, March 4, 1887, AHC Fonds, BSA.

³⁹³ Alexander Henry Cameron Fonds, scrapbook, February 28, 1887, AHC Fonds, BSA.

³⁹⁴ McDonald, 14.

line after a big storm [Figures 14 and 15]. Despite the ploughs, it was not uncommon for the trains to be delayed while the ploughs cleared the drifts. A big February 1907 storm near Glacier stalled several trains “with their complement of weary and benumbed passengers,” reported the *Mail-Herald*. “Eight snow ploughs within a stretch of 40 miles are endeavouring to break a way through, but if the thaw continues the possibility is that traffic may be suspended indefinitely.”³⁹⁵ Driving snowploughs was also a dangerous task as rails were slippery and slides could come down at anytime. One of the snowploughs clearing the track near Glacier “left the rails and plunged 20 feet down the bank, the sudden severe jolting causing the stove inside the car to break adrift and strike with great force a man named Sawicki, who was standing near, inflicting injuries to his right thigh which is badly fractured.”³⁹⁶ Despite such incidents, by using improved, innovative technology and having work crews at the ready, the CPR was able to maintain service through all but the worst winter conditions in the mountains.

Despite suffering several minor slides during the first thirty years of operation, the CPR was lucky to only deal with two severe avalanches which made them rethink the Rogers Pass route. The first, occurring on February 4, 1899, at Rogers Pass Station, drove into three boarding cars and “threw them over the round house which it hardly wrecked, and with its gathered debris rushed at the station house and completed its dreadful mission.”³⁹⁷ Fortunately, most of the work crew was absent at the time, but seven people were killed including the day operator, Cator, his wife, Ethel, and their children, Charlie,

³⁹⁵ “Traffic Difficulties: Severe Injuries on a Snow Plough,” *The Mail-Herald*, February 9, 1907, 1.

³⁹⁶ *Ibid.*, 1.

³⁹⁷ “An Awful Avalanche that almost wiped out Rogers Pass on Tuesday,” *Kootenay Mail*, February 4, 1889, 1.

aged four, and Ethel, nearly three years old.³⁹⁸ Poorly located in its exposure to avalanches, the Rogers Pass Station was moved west to a meadow after this catastrophe.

The worst avalanche of all, the one that made the CPR rethink its decision to go through Rogers Pass, occurred on March 4, 1910. A work train and rotary snowplough were working at clearing a slide which had come down on March 3rd near shed No. 17 on the summit of Rogers Pass, the first in the region in several years, when another slide came down. It had been snowing constantly for many days on the high mountain slopes but not in lower altitudes so nobody expected the lower hills would be affected by the spring thaw.³⁹⁹ Several gangs, working in a deep cutting clearing the track when the avalanche came down, could not escape. The slide, over 600 feet long with a depth of thirty feet in some places, destroyed over 600 feet of shed.⁴⁰⁰ Bill LaChance, the fireman of the rotary snowplough, described the slide:

Well, the snow got a hold of me and what it didn't do to me... It pulled me out twice me length the way it felt, and then it just doubled me all up and rolled me. I was trying to keep rolling up, in a ball to go with the snow. It caught this leg and just turned it around and it would roll me up and stretch me out and double me up. Then the pressure came on, oh, just like as if there were tons on top of me... Now all the time I am in that I don't get one breath, because the snow was just packed right tight to my face... When I threw my hand out, why I had fresh air up there. I dug myself out, and I thought this leg, my right leg, was broken.⁴⁰¹

Johnny Anderson, the railroad foreman, who had left to call in to Glacier about the progress of the work crew, came back to discover the slide and heard LaChance calling for help. After the avalanche was discovered, bells rang in Revelstoke and Golden calling men to help recover the bodies. These men took the train as far as it could go and then

³⁹⁸ Ibid., 1.

³⁹⁹ "Awful Avalanche of Death," *The Mail-Herald*, March 5, 1910, 1.

⁴⁰⁰ Ibid., 1.

⁴⁰¹ Bill LaChance, interview by Imbert Orchard, March 9, 1965, in *Railroaders: Recollections from the Steam Era in British Columbia*, ed. Robert D. Turner (Victoria: Provincial Archives of British Columbia, 1981), 11.

walked. “Arriving at the scene of the disaster,” the *Golden Star* noted, “there was nothing to indicate that a railway or anything appertaining to a railway had ever been laid in the valley: railway, snowsheds, rotaries, engines, telegraph – all were buried under a huge mass of snow.”⁴⁰² All the digging was done by hand as rotary ploughs would damage the bodies. “It was a most gruesome spectacle,” the *Golden Star* reported. “A toboggan was lowered into the cutting on which the bodies were raised to the top of the snow bank to await removal to Revelstoke... The great field of ice and snow and the towering peaks gave man a very small place in the perspective.”⁴⁰³ A third slide came down, carrying 600 feet of Shed No. 14 away while the tracks were still being cleared from the March 4th avalanche. Rotary ploughs could not be used due to the timbers of the shed blocking the track and thus passenger trains had to be diverted through the Crows Nest Pass.⁴⁰⁴

These disasters had a profound effect on the people of mountain communities as family, friends, and neighbours constantly risked their lives to keep the track open. Sixty-two men, mostly locals, were killed in the March 4th slide and the towns of Revelstoke and Golden went into mourning for the victims of the worst slide in the history of the CPR; Revelstoke had a huge public funeral for the victims when most of the bodies were recovered. The Coroner’s inquest declared the disaster “an accident, pointing out that evidence showed a slide had not been known there for many years. It was no more dangerous working there that night than any other part of the road.”⁴⁰⁵ In the years following this catastrophe, the CPR developed plans for a tunnel under Rogers Pass that

⁴⁰² “With the Golden Men at the Slide,” *Golden Star*, March 10, 1910, unpaginated.

⁴⁰³ *Ibid.*

⁴⁰⁴ “Ghastly Holocaust,” *Mail-Herald*, March 9, 1910, 1.

⁴⁰⁵ “Coroner’s Inquest,” *Mail-Herald*, March 12 1910, 1.

would eliminate many snowsheds and reduce the risk of further accidents and deaths on the Pass.

Aside from catastrophic avalanches, the CPR faced numerous other minor operational problems caused by the weather and geography of the mountain regions which affected their daily operations. Rock slides occurred year-round whereas mudslides and the breakup of ice happened during winter thaws and spring. Rock slides occurred when boulders shaken loose from their beds in the mountains rolled down towards the tracks, gathering momentum and loose rocks. Passenger Edward Roper's 1888 trip was the worst ever as he encountered nearly every catastrophe the CPR had to deal with. His train met a rock slide after leaving Banff. "Suddenly the train was brought up with a jerk by the air brake," he wrote, throwing passengers from their seats. A "stone as big as a man's head came crashing through the window of the car, fortunately without harming anyone. Then we heard stones pouring down the mountain-side on our left, thundering against the wheels of our car, and bombarding the side of it."⁴⁰⁶ During the delay of several hours, Roper went outside to have a look: "The whole train, from end to end, was imbedded up to the axles in stones of all sizes, and with pieces of timber, logs, and branches of trees."⁴⁰⁷ Another slide was described by passenger Thomas Scattergood, a guest at the CPR's Mount Stephen House at Field in 1900. "Stones about 2½ miles east of this [hotel]... detain all trains," he wrote. "We walked down to see it and found sure enough 7 places where the land had slid and covered the track in one place to the depth of 16 ft with an immense mass of rock, dirt and debris."⁴⁰⁸ He wrote that the eastbound train

⁴⁰⁶ Roper, 135.

⁴⁰⁷ Ibid., 135.

⁴⁰⁸ Thomas Scattergood to son, August 16, 1900, British Columbia Archives MS-1021.

had been delayed for five and a half hours while a short track was built around the slide and the westbound train was also stuck.⁴⁰⁹

Springtime mudslides also created problems for the CPR, derailing trains and causing delays. In May 1894, the Pacific Express ran into no less than four slides on its way to the Pacific coast. The first, near Beaver Creek Station, destroyed part of a small bridge, delaying the train by four hours. The train then ran into a second slide at Albert Canyon, throwing the tender off the track.⁴¹⁰ After the train was righted, it made its way to Twin Butte where “an immense slide of mud, boulders and trees... completely derailed the engine and slightly damaged the mail car”⁴¹¹ A construction train brought the train the rest of the way as the engine had “carried away about 200 feet of track.” As the westbound train left Revelstoke, it was blocked by yet another “monster mud slide” at Craigellachie.⁴¹² Delays like this slowed the passenger, shipping, and mail service despite the CPR’s efforts to understand and cope with its operating environment. When slides struck, the call went out for work gangs to lay tracks around slides while mountain gangs worked to clear the debris and repair the mainline.

Winter thaws also wrecked havoc on the railway. Edward Roper’s 1888 train encountered several damaged bridges due to the breakup of ice during a warm spell. He wrote, “It appeared that the Bow River was jammed full of logs and broken ice; that a freshet had arisen, and that all this accumulation had been washed down against the bridge, which, two nights ago, had partly broken away. Fortunately, pile-driving machinery and plenty of help were near.” Impressed with the quick work of the repair

⁴⁰⁹ Ibid.

⁴¹⁰ “Mud Slides Demoralise the Mail Service,” *Kootenay Mail*, May 26, 1894, 2.

⁴¹¹ Ibid., 2.

⁴¹² Ibid., 2.

gangs, Roper was nevertheless nervous passing over the bridge and held his breath until the train reached the other side. Unfortunately after another couple of miles “there was a rumble and a bang! Most of us were flung from our seats... we soon discovered that the next crossing of the Bow River was down too.” The train had stopped just in time to avoid an accident. Passengers were ordered to cross the bridge on foot while carrying their luggage. A worried Roper noted that the track over the bridge “was twisted out of form by the accumulation of ice and logs pile against the upper side. The roadway was something like eighteen feet above the raging torrent, and was wet and slippery with half-melted snow, while there was blowing a hard, cold gale.” In the end the CPR provided a hand car for the baggage and ladies. When the passengers made it to safety on the other side they waited without shelter for a train to take them west.⁴¹³

The CPR’s methods of track monitoring, communication and crew deployment, essential aspects of its search for efficiency in an unstable, unpredictable environment, could not prevent the inevitable accidents related to weather, human error, malfunctions, and poor route choice. Most accidents were minor and very few resulted in deaths of passengers. In 1897, eastbound and westbound trains collided in the Calgary yard because the former, carrying dynamite, was “unable to slow up in time as the brakes would not ‘bite’ owing to a frosty rail.”⁴¹⁴ Luckily the dynamite did not explode and the engineers and firemen of both trains jumped to safety. The region’s geography contributed to other accidents. Passenger Frederick Williams’ train was delayed as the freight train in front of it rounded a corner and crashed into a runaway eastbound freight,

⁴¹³ Roper, 126-128.

⁴¹⁴ “Smash: Head End Collision in the Calgary Yard” *Calgary Herald: Miner and Ranche Advocate and General Advertiser*, November 8, 1897.

killing one brakeman and severely injuring the other brakeman and engineer.⁴¹⁵

Engineers, firemen, and brakemen were especially vulnerable to injury or death in accidents. In order to reduce the number of accidents, deaths, and damage to trains, the CPR began developing plans to build new tracks and tunnels to make the most difficult sections, such as the Big Hill at Field, safer.

One aspect of the company's improvement program involved the replacement of wooden bridges with iron and steel structures, both stronger and less prone to fire damage. Passenger Edward Watkin commented that the CPR, like other pioneer railways, underwent "many improvements. Profits from its passenger and shipping services enable the company to afford the iron or steel bridges. Ballast is laid... Iron or steel bridges are substituted for timber, [and] low gorges spanned by trestles are, one by one, filled."⁴¹⁶ The wooden bridge over Cascade Creek which had been "swept away six times" was replaced by a masonry arch which was expected to "withstand all attacks."⁴¹⁷ Cribs were put in place to funnel avalanches and slides under bridges. The Cedar Creek, Raspberry, Surprise, Stoney, and Snow Bank bridges were replaced by steel structures with stone piers.⁴¹⁸ Using iron and steel reduced forest depletion along the track as bridges no longer had to be constantly repaired and replaced but other aspects of track improvement only deepened the CPR's ecological footprint.

By filling in ravines to create track beds over creeks, the CPR saved the expense of iron and steel and did away with weak wooden trestles; however, the landscape was

⁴¹⁵ Frederick D. Williams, "Trip from London to Vancouver 1897," unpublished manuscript, British Columbia Archives MS-2440.

⁴¹⁶ Edward William Watkin, *Canada and the States: Recollections, 1851 to 1886* (London: Ward, Lock & Co., 1887), 54.

⁴¹⁷ William Vaux, "The Canadian Pacific Railway from Laggan to Revelstoke, B.C.," in the *Proceedings of the Engineer's Club of Philadelphia*, vol. XVII, no.2 (Philadelphia: Engineer's Club of Philadelphia, 1900), 80.

⁴¹⁸ Muckleston, 427.

ruined by moving an enormous amount of dirt, diverting streams, and using powerful hydraulic systems to wash away the hillsides. Earth, brought to the stream by shovels and trains, was dumped between logs to form a dirt bridge which the train could traverse. The filling process, recalled Muckelston, “involved diverting streams through pipe culverts laid in trenches excavated in the stream bed to pass under the filling.”⁴¹⁹ Far worse for the environment was the hydraulic method of washing tons of earth, gravel, and rock down the hillside into the filling to create a track bed. This method, used at Mountain Creek, cost half as much as dumping but could only be done between June and October. Water was brought down a flume to a flume-box and from there an iron pipe led the water to the nozzle. The filling was “confined within the proper limits by means of logs, laid, in rows one above the other, and thus the embankment rose, tier above tier, the slope being kept well within the angle of repose and the logs soon sprouting and forming a network of roots, firmly binding the mass together.” Boulders up to eighteen inches in diameter could be moved by water, requiring only nine men: “one at the monitor [operating the nozzle], two to keep the sluices clear, and six to prepare and lay the logs at the edge of the filling and to level off the material as it falls.” Engineer William Vaux reported in 1900 that the filling at Mountain Creek amounted to 300,000 cubic yards, “leaving but 75,000 yet to be filled.”⁴²⁰

Diverting streams under bridges and filling in ravines with rock and sediment had implications for the fish population of the region. Regulating and diverting rivers can dry up streams or alter ecosystems and limit the food available to fish, leading to a decline in

⁴¹⁹ Muckelston, 426.

⁴²⁰ Vaux, 82-84.

the fish population and this likely happened to some extent in the mountains.⁴²¹ The building of the Canadian Northern Railway contributed to two rock slides in 1913 and 1914 along the Fraser Canyon which had catastrophic implications for Fraser River salmon, changing the river's flow and making it impossible for the salmon to pass through Hells Gate.⁴²² While no such catastrophe can be attributed to the CPR, the hydraulic method of shifting earth and rocks would have changed the flow of streams and fish would have had to swim through pipe culverts to gain access to the other side of the stream. The diversion of water likely had an impact on the riparian shrubs and trees, reducing their extent and thus raising water temperatures. The CPR's alteration of streams would also have an impact on wildlife, especially bears, as they would have less access to fish or to berry bushes dependent on the stream. Thus, the CPR placed cost-cutting measures above the environment once again by filling in valleys, a process of riparian area destruction that would have long-term consequences for fish and wildlife.

In addition to having to replace wooden bridges with iron ones or hydraulic filling, the CPR had to deal with the other shortcuts it had taken during construction. The decision to have a steep grade on the Big Hill at Field instead of a tunnel was one that would haunt the CPR and its workers. Trains first began to run away during the construction of the Big Hill. In 1884, one small construction outfit "ran away, climbed the rail at a curve, plunged down to the river below, and killed three men."⁴²³ Accidents were not just costly in lives, but in locomotives. An October 1902 accident at Field occurred when Engine 409 collided with the eastbound extra as well as the westbound

⁴²¹ D.B. Osmundson, R.J. Revel, V.L. Kamara, and J. Pitlick, "Flow-Sediment-Biota Relations: Implications for River Regulation Effects on Native Fish Abundance" *Ecological Applications* 12 (December 2002): 1719-1739.

⁴²² Evenden, 130-53.

⁴²³ Charles Frederick Carter, "The Passing of the Big Hill," *World's Work*, vol. XX (June, 1910): 13030.

train descending the hill.⁴²⁴ All three engines were badly damaged and the CPR made costly repairs. Snow conditions made the hill even more dangerous. A big slide in 1907 near the third safety switch on the hill kept Engine 97 at Lake Louise for eight hours, forcing the CPR to bring the rotary snow plough from Rogers Pass to open the track.⁴²⁵ Sometimes descending trains went so fast that switch-tenders were unable to reach the levers and divert the train into a safety track. In 1904, Engineer Jack Ladner's train missed the safety tracks and "bounded over the ties for a few yards, then swung toward the mountain-side and went over... the engine buried itself, turning up a rock two-thirds the size of a box car."⁴²⁶ Ladner and his fireman died in the accident, their bodies recovered after two days of digging.

Not only was the Big Hill expensive in terms of accidents, but the steep grade meant that the CPR had to operate several extra expensive locomotives to help pull trains up the hill and to slow them coming down the hill. Trains could go faster without the Big Hill (on which the speed limit was eight miles an hour for passenger trains and six miles for freight trains as boxcars were harder to control) and thus the CPR could shorten transportation times to better compete with American transcontinentals.⁴²⁷ In 1907, a contract to build two spiral tunnels on the Big Hill was given to Macdonnell, Gzowski and Company of Vancouver, which would extend the line between Hector and Field to eight miles from four.⁴²⁸ Built from September 1907 to August 1909, at a cost of \$1,270,000, the tunnels reduced the grade at Field, cutting the CPR's coal costs as extra

⁴²⁴ T.K. Kilpatrick, journal, October 4, 1902, T.K. Kilpatrick Fonds, Glenbow Archives, M7919-41

⁴²⁵ "Field," *Mail-Herald*, March 27, 1907, 1.

⁴²⁶ Carter, 13033-13034.

⁴²⁷ Carter, 13032.

⁴²⁸ "A \$1,000,000 Being Spent On the Engineering Feat at Field – The Heavy Grade of Famous Big Hill to be Overcome," *Mail-Herald*, September 4, 1907, 2.

locomotives would not be needed.⁴²⁹ The CPR would also be able to reduce personnel on the Big Hill, as fewer engine crews and switch-tenders would be needed. In overcoming the poor decision of the Big Hill, the Spiral Tunnels were expected to reduce operating costs, travel time and accidents.

Working in tunnels was inherently dangerous, the powder used to blast through rock adding to the hazards. Construction began in late 1907 and by the next year workers were clearing the approaches to the four ends of the tunnels as miners and drillers prepared to attack the rock.⁴³⁰ “The bustle and constant detonations of exploding powder make the scene one of great animation and hustle,” reported the *Mail-Herald*, contrasting the hectic activity to “the primeval wilderness and solemn grandeur of the scene of operations.”⁴³¹ Several fatal accidents occurred during the construction of the tunnels. In May 1908, after charges had been blown, a Galician went in to pick at the rock ahead of the other workers; when his pick struck an undetonated cartridge he was “blown to pieces.”⁴³² Another accident at the end of September 1908 occurred to worker Richard Dart, who was raising an air pipe when the casing connecting the lengths broke, “striking him in the chest, breaking several ribs, one of which pierced his lung and caused his death.”⁴³³ Despite the risks of injuries and deaths, workers needed to use a great deal of explosives in order to get through the difficult rock.

⁴²⁹ Carter, 13029 and “A \$1,000,000 Being Spent”, 2.

⁴³⁰ “Reduce Big Hill: Tunnel Work Between Hector and Field in Operation,” *Mail-Herald*, January 8, 1908, 1.

⁴³¹ “Reduction of Heavy Grade,” *Mail-Herald*, April 4, 1908, 3.

⁴³² “Killed in Field Tunnel: Struck an Unexploded Cartridge with Fatal Result,” *Mail-Herald*, May 20, 1908, 1.

⁴³³ “Accident at Field,” *Golden Star*, October 3, 1908.

The tunnels were built through crystallized limestone, a hard and brittle rock that rendered “drilling operations difficult.”⁴³⁴ In addition, water seeped through crevices in the rock, slowing the progress on the down-grade ends of the tunnels [Figure 16]. The high altitude and snowy weather made conditions worse.⁴³⁵ Tunnel No. 1, 3,225 feet long, curved under Cathedral Mountain with a difference in levels between the portals of fifty-four feet.⁴³⁶ Tunnel No. 2 under Mt. Ogden was 2,922 feet long with a fifty foot difference between portals.⁴³⁷ The tunnels were driven from both ends using an old-style Jumbo steam engine and then progressing to steam shovels to quicken the work. Only minor problems were encountered, recalled chief assistant engineer J.E. Schwitzer, although a great quantity of lumber was required “on account of striking slides in the rock and a little trouble was experienced from water, but this was kept under control at the upper ends with two small steam-pumps.”⁴³⁸ The heading of each tunnel met on May 22, reducing the maximum grade from 4.5 percent to 2.2 percent. Now two engines could pull 982 tons up the hill, whereas four engines had been needed to haul 700 tons up the Big Hill.⁴³⁹ Operating profits, then, had permitted the company to overcome the steep geography of the Big Hill, reducing accidents and improving the CPR’s ability to compete with other lines.

⁴³⁴ Canadian Pacific Railway Company, *Railroading through the Canadian Pacific Rockies: The Connaught and Spiral Tunnels* (Canada: Canadian Pacific, 1923), 3.

⁴³⁵ *Ibid.*, 3.

⁴³⁶ *Ibid.*, 3.

⁴³⁷ *Ibid.*, 3. The first tunnel was built through Lower Cambrian quartzites and the second through Middle Cambrian limestone. John A. Allan, “Annotated Guide: Bankhead to Golden” in *Transcontinental Excursion CI: Toronto to Victoria and Return via Canadian Pacific and Canadian Northern Railways Part II* (Ottawa: Government Printing Bureau, 1913), 196.

⁴³⁸ J. E. Schwitzer, “Reduction of the Kicking Horse Pass Grade on the CPR,” *Canadian Railway and Marine World*, October, 1900, 710-711.

⁴³⁹ *Ibid.*, 711.

The Connaught Tunnel, built through Mount Macdonald between 1913 and 1916 to eliminate the dangers of Rogers Pass, required extensive surveying, dangerous work, and the diversion of dirt and water to create a safer path for the railway. It was built for many of the same reasons as the Spiral Tunnels – to reduce the grade and the number of accidents that resulted in loss of lives and damage to trains, but the most prominent reason was to eliminate the most avalanche-prone section of track along with four and a half miles of snowsheds. The tunnel was part of the double-tracking of Rogers Pass, reducing the bottleneck there and allowing the CPR to better compete with other lines on better grades.⁴⁴⁰ Leslie Kerry helped survey a tunnel under Rogers Pass and locate a new east entrance to reduce the tunnel from seven miles to five and cut construction costs.⁴⁴¹ Worried about spring snowslides, the crew posted a guard to shout a warning. As Kerry recalled, “Many times we were caught in the forward end of the slide, but just managed to get clear and at no time was anyone of us caught, or rather injured from the slide.”⁴⁴²

With the survey complete, construction began from both the east and west entrances in August 1913, under the contractors Foley, Welch and Stewart. A pioneer bore measuring seven by nine feet was driven parallel to the centre line of the tunnel, crosscuts from the bore to the main tunnel every 750 to 1000 feet allowing drilling to be carried out at several points at once while workers continued mucking with air-operated shovels, in other parts of the main tunnel.⁴⁴³ This bore later became the ventilation shaft for the tunnel. Like the Spiral Tunnels, the Connaught Tunnel was built from both

⁴⁴⁰ Gary George Backler and Trevor D. Heaver, “The Timing of a Major Investment in Railway Capacity: CPR’s 1913 Connaught Tunnel Decision,” *Business History* 24 (1982): 301, 313.

⁴⁴¹ Leslie Kerry to Sheila Jameson, October 10, 1968, Leslie Kerry Fonds, Glenbow Archives M627.

⁴⁴² Ibid. Kerry also mentioned that one year surveying was halted for six weeks until conditions improved.

⁴⁴³ “Rogers Pass Tunnel of the CPR,” *The Canadian Engineer*, April 23, 1914, 623 and Canadian Pacific Railway Company, *Across Canada: An Annotated Guide to the Country Served by the Canadian Pacific Railway and Its Allied Interests: Western Lines* (Montreal: Canadian Pacific Railway, 1924), 60.

entrances. Five hundred men worked on the tunnel, 300 from the west entrance and 200 from the east. Drills penetrated the rock on the eastern entrance of the main tunnel easily but the western entrance was composed of a thick “quicksand type” mud which had to be removed by steam shovel. After workers cleared the mud from the western entrance, they reached a rock so hard that drills would not stand up to it [Figure 17]. The Swedish steel drill would be “dulled after a few minutes use,” Kerry observed, and not until softer rock was encountered did the work proceed at a “rapid rate.” In fact, the workers broke the world record for drilling at about twenty-eight feet a day, and then exceeded it. The west entrance was timbered but the mud and glacial moraine the workers encountered trickled through the timbers until hay was stuffed into the holes. Workers operated three drills at a time in an entrance along with the foreman and three muckers. Dump cars and mules hauled away mud and debris and workers blasted approximately sixteen holes each eight hour shift, digging out eight feet per shift until they reached better material. Electric fans were used to circulate air and remove dust from drills and clear poisonous gases from powder shots going off. Compressed air, used to clear gases from the tunnel, became a matter of debate between subcontractors McIlwee & Sons of Colorado and the CPR. The subcontractors wanted to use more compressed air to clear tunnels and not just to run drills, whereas the CPR, less concerned about workers’ health than the expense, thought they were using too much compressed air.⁴⁴⁴

Like the construction of 1883-1885, accidents occurred in tunnelling as the workers were dealing with dangerous materials. George A. Crane, a Connaught Tunnel worker, recalled “usually each morning there would be some wounded negroes – head injuries, to bring out of the tunnel. No Workman’s Compensation or steel helmets in

⁴⁴⁴ Kerry to Sheilagh Jameson, October 10, 1968, Leslie Kerry Fonds, Glenbow Archives M627.

those days.”⁴⁴⁵ Leslie Kerry recalled a time he realized all the dynamite in the hold had not gone off so he told the Bulgarian foreman and left the tunnel. A loud blast occurred as the drill hit the dynamite, killing the foreman and another man.⁴⁴⁶ The use of dynamite, then, had an impact on the workers, who were constantly in danger of injuries from explosions and falling rocks, as well as an impact on nature.

In addition to the usual impact of tunnelling on the environment through displacement of rocks and dirt and the depletion of forests to timber the tunnel, the CPR also diverted the Illecillewaet River for the Connaught Tunnel. The river, especially when snow melted in the spring, “presented a serious handicap as its original channel crossed the location for the approaches at a point where a deep cutting had to be excavated to secure the necessary route for a considerable distance.”⁴⁴⁷ The CPR did not want the river to encroach on the railway so workers dug a mile long trench and diverted the stream “past the cutting to a point where an arched culvert... turn[ed] the water under the tracks again into the old creek bed on the right side of the railway.”⁴⁴⁸ This diversion was not as effective as the CPR hoped as once again nature was not conquered so easily. The Illecillewaet flooded due to heavy rain and melting glaciers on September 5, 1931, filling the mouth of the tunnel with ten to twelve thousand cubic yards of mud and debris.⁴⁴⁹ The CPR workers spent five days digging out the entrance.

The east and west entrances of the tunnel met on December 19, 1915, coming within half-an-inch of each other, a difficult task for a five-mile tunnel.⁴⁵⁰ The surveyors

⁴⁴⁵ George A. Crane to Dr. Longman, March 5, 1961, George A. Crane Fonds, Glenbow Archives M286.

⁴⁴⁶ Leslie Kerry to Sheilagh Jameson, October 10, 1968, Leslie Kerry Fonds, Glenbow Archives M627.

⁴⁴⁷ “Rogers Pass Tunnel of the CPR,” 624.

⁴⁴⁸ *Ibid.*, 624.

⁴⁴⁹ Turner, *West of the Great Divide*, 174.

⁴⁵⁰ “May Make Golden Divisional Centre,” *Golden Star*, December 23, 1915.

and engineers had done their job well. The centre of the tunnel was then dug out until the whole length was twenty-nine feet wide and twenty-three feet high, suitable for double-tracking.⁴⁵¹ On December 9, 1916, the tunnel was open to oil burning locomotives, the smoke they made cleared out by diesel-propelled fans.⁴⁵² Eighteen new miles of mainline were also built so that the tunnel would run straight from Cambie through Mount Macdonald, emerging in the Beaver Valley. The tunnel shortened the distance by four and a third miles, lowered the grade approximately 600 feet, eliminated about five miles of sheds as well as the loops near Glacier, and allowed the trains to make faster times, using less fuel and avoiding dangerous avalanches.⁴⁵³ The construction cost the CPR six million dollars but reduced expenditures on fuel, in repairing and building snowsheds, and in hiring snow-clearing gangs for Rogers Pass.⁴⁵⁴

Living conditions on the Spiral Tunnels and Connaught Tunnel projects were better than the 1883-1885 camps but the work was still dangerous. The approximately 600 men engaged in digging the Spiral Tunnels and laying tracks lived in two large camps which, in contrast to the primitive and temporary nature of the construction camps of the 1880s, had electric lights as well as “bunkhouses, cookhouses, engineering staff, executive offices and stores.”⁴⁵⁵ Beneath the supervising directors were the engineering and commissariat staff, the sappers and miners who moved material, and the artillery staff who worked with black powder. There was also a medical team, to whom the workers paid a dollar a month in medical fees.⁴⁵⁶ The Connaught Tunnel workers lived in

⁴⁵¹ Ibid.

⁴⁵² “Great Tunnel is now Open to all Traffic,” *Mail-Herald*, December 16, 1916, 1.

⁴⁵³ McDonald, 26.

⁴⁵⁴ Canadian Pacific Railway Company, *Railroading through the Canadian Pacific Rockies: The Connaught and Spiral Tunnels*, 4.

⁴⁵⁵ “Reduction of Heavy Grade,” *Mail-Herald*, April 4, 1908, 3.

⁴⁵⁶ “Field Tunnel: Expect Work to be Completed early Next Year,” *Mail-Herald*, October 24, 1908, 1.

two model villages on both sides of Mount Macdonald complete with electric light, hot and cold water, sanitary plumbing, roomy dining rooms and sleeping quarters, and emergency hospitals.⁴⁵⁷ Engineers and clerks still lived in separate quarters. The CPR was able to improve living conditions because of better technology and the proximity to mountain communities. It was easier to get food and building materials which could be sent by train. It is also likely that the actions of the Industrial Workers of the World (IWW) on other railway lines had an impact on the CPR's decision to improve sanitation for the construction of the Connaught Tunnel. On March 7, 1912, IWW construction workers protested wages and poor sanitary conditions by walking out on the Canadian Northern Railway, compelling the Canadian Government to "promise to enforce sanitary regulations."⁴⁵⁸ The CPR, then, had little choice but to continue to improve sanitary conditions, hoping that by doing so the men would be less likely to strike.

The passengers' views on the relationship between the CPR and the environment varied depending on their experiences. Nearly every passenger lamented what forest fires had done to the mountain scenery, yet most made no association between the construction of the CPR and the deforestation along the track. Many, especially the CPR's promoters, saw the building of the CPR as a complete victory over nature. The Duke of Argyll, Canada's fourth governor general, said that thanks to Major Rogers and the CPR the Selkirk range had "been conquered" and the task had been done "in less time than many governments would take to talk of it...Nowhere can finer scenery be enjoyed from the

⁴⁵⁷ "Daylight Through Selkirks Tomorrow," *Mail-Herald*, December 18, 1915, 2 and "Rogers Pass Tunnel of the CPR," 624.

⁴⁵⁸ Mark Leier, *Where the Fraser River Flows: The Industrial Workers of the World in British Columbia* (Vancouver: New Star Books, 1990), 52.

window of a car than upon this line.”⁴⁵⁹ Lady Macdonald was impressed with the “perfect control” of the CPR. “Nearly five thousand miles have we travelled so safely, easily and comfortably that it all seems a dream,” she wrote, “and I can hardly realize how much space we really traversed because it was done without any trouble.”⁴⁶⁰

Some passengers thought back to those who built the line. William Barneby, who had toured the line during construction, made a trip a few years later, describing the railway as a “marvellous piece of engineering skill.” Elaborating, Barneby found it “astonishing how this continuous chain of passes could have been discovered, which led to the construction of this wonderful line... among mountains thousands of feet above the level of the sea, far away from any civilization.”⁴⁶¹ Canada’s fifth governor general, the Marquis of Lansdowne, remarked at a Winnipeg banquet that the CPR had been a “stupendous” task and that Canadians should take pride in those who “never doubted the possibility of this great achievement” and in the “enterprise and skill of those responsible... for the construction.”⁴⁶² Journalist Alexander Begg wrote that the CPR was “in magnitude and difficulty of execution one of the greatest, if not the greatest, achievement of human labour that the world has ever seen.”⁴⁶³ The CPR was seen as bringing civilization to a little-known wilderness by wisely designing a good, cheap line and then improving it.

⁴⁵⁹ John Douglas Southerland Campbell, *Our Railway to the Pacific* (London: Isbister and Co, 1886), 18.

⁴⁶⁰ Lady Agnes Macdonald to William Van Horne, January 1886, William Van Horne Fonds, Library and Archives Canada MG29-A60 Vol. 87 File 7.

⁴⁶¹ William Henry Barneby, *The New Far West and the Old Far East*, 29.

⁴⁶² Henry Charles Keith Petty-Fitzmaurice, *Canadian North-West and British Columbia: Two Speeches* (Ottawa: Department of Agriculture, 1886), 31.

⁴⁶³ Alexander Begg, *Canada and its National Highway: A Paper Read before the Society of Arts, March 23, 1886* (London: W. Trounce, 1886), 11.

Mountains, trees, and rivers were admired by all passengers. Bishop George Hills wrote that the “scenery in the Mountains was very fine and impressive.”⁴⁶⁴ The mountains so impressed passenger Dean Carmichael that he declared “How in the world any engineer ever had the courage to span a railroad in such a country is what amazes me.”⁴⁶⁵ Another passenger wrote that the CPR’s undertaking in the mountain was so “stupendous” that people should forgive the CPR for any delays.⁴⁶⁶ Farmer Charles Ford wrote that the scenery of the mountains became “bolder, more magnificent and entrancingly varied and beautiful,” as one travelled.⁴⁶⁷ Even members of the Ottawa Naturalist Club disregarded the impact of the CPR on the environment and saw it as a way “for new lovers of nature to come and enjoy the wonderful land.”⁴⁶⁸ If anything, some passengers wished that the train would go slower to they could fully enjoy the scenery as “the mind is stunned... so fast do grandeur of form, and beauty in details, crowd upon your view and demand your attention as the train speeds through gorge and over mountain.”⁴⁶⁹ Unless something happened on the journey, most passengers were unaware of any possible danger. For example, Mrs. Alexander Sinclair Henderson admired the “wonderful bends and twists in the line.... running close to the side of the river” without considering the fact that the railway could, and did, flood because of the placement of line.⁴⁷⁰ CPR guidebooks stated that there “will be no hardships to endure,

⁴⁶⁴ Bishop George Hills, journal, June 17 1899, Anglican Archives of the Provincial Synod of British Columbia and the Yukon, PSA 1889.

⁴⁶⁵ Carmichael, 15-16.

⁴⁶⁶ CDR, *Across America: From Manitoba to Vancouver* (Brighton: J.G. Bishop, 1877), 6.

⁴⁶⁷ Charles T. Ford, *From Coast to Coast a Farmer's ramble through Canada, and the Canadian Pacific Railway System* (Exeter, England: Bearn Brothers, 1899), 17.

⁴⁶⁸ Dr. James Fletcher, “Mountain Sprites,” *Ottawa Naturalist*, March 1908, 228.

⁴⁶⁹ Ernest Ingersoll, *An Excursion to Alaska by the Canadian Pacific Railway* (Montreal: Passenger Department Canadian Pacific Railway, 1887), 14.

⁴⁷⁰ Mrs. Alexander Sinclair Henderson, diary, September 5, 1912, Mrs. Alexander Sinclair Henderson fonds, Glenbow Archives M 504.

no difficulties to overcome, and no dangers or annoyances whatever. You shall see mighty rivers, vast forests, boundless plains, stupendous mountains, and wonders innumerable; and you shall see all in comfort.”⁴⁷¹ Some passengers like Mrs. Spragge realized the CPR was not perfect but that humans were “small and feeble... beside the works of God.”⁴⁷² Edward Roper, whose trains were delayed by fires, rockslides, and washed out bridges, was one of few passengers to realize the problems that continued to plague the CPR. While some passengers saw the CPR as a victory over nature, those who encountered problems on the line were able to see that the victory was not as complete as the CPR pretended.

The first thirty years of operation were a trying time for the CPR. Forced to adapt to operating in a rough, complex, and unpredictable environment, the company developed a combination of methods to reduce the number of fires along the track, hired gangs to do quick repairs and clear snow, built snowsheds and stronger iron bridges, and used technology such as snowploughs to keep the tracks open year-round. The CPR continued to have an impact on the environment through forest depletion, fires, hydraulic fillings, and digging and displacing dirt and rocks from tunnels. Choices made by the CPR regarding the environment had an impact on the lives of workers and the people near the railway; deforestation in the eastern Rocky Mountains could cause flooding and then drought in the watershed of Calgary, and the deaths of approximately 200 CPR workers in thirty years have been attributed to the poor choice not to build a tunnel under Rogers

⁴⁷¹ Canadian Pacific Railway Company, *The Canadian Pacific, the New Highway to the Orient across the Mountains, Prairies and Rivers of Canada* (Montreal: General Passenger Department of the Canadian Pacific Railway, 1893), 9.

⁴⁷² Spragge, 62.

Pass.⁴⁷³ Settlers near the railway were prepared to condemn the environmental consequences of CPR construction, such as fires and deforestation, if they were affected by them. Numerous farmers wrote in about fires and the consequences of deforestation on the watershed, and reporters protested the loss of lives in Rogers Pass. The CPR was not a complete victory hammered in by the last spike, but one of the CPR learning to operate in a difficult environment and respond to the consequences of previous decisions and actions by quickly carrying out repairs, implementing fire measures and building the Spiral and Connaught Tunnels.

⁴⁷³ Eagle, 145.

Conclusion

The driving of the last spike remains a prominent event in Canadian history, one typically interpreted as a challenging technological enterprise which linked the country together and cemented Confederation. The last spike, however, does not tell the entire history of the CPR. The surveying, construction, and first thirty years of operation reveal the complex relationship between the CPR and the environment.

The relationship between nature and the CPR began with the surveyors. They confronted relatively unknown territory through the mountain passes, isolation, harsh weather, scurvy and challenging terrain. Surveyors also had an impact on the environment by clearing brush, setting fires and opening the west to the railway, Euro-Canadian settlement and resource extraction. The surveyors did not have an easy task, nor did they conquer the environment. Both sides took a toll on one another as surveyors destroyed trees and bush and the difficult terrain caused injuries or, on occasion, drowning. Geography played an important role in the selection of the line, but so did finances as the CPR decided to build as cheaply as possible, using the resources granted by the Federal Government, and this parsimony created early operational problems. For the most part, Canadians believed this line would be completely victorious over the remote regions of the west but construction proved that nature would not be so easily tamed.

The relationship between the CPR and nature in the mountains was cemented during the construction. The CPR had an impact on the environment through fires to clear the right of way, deforestation for ties, bridges, and to clear a path, excavation to open tunnels and create cuttings, and blasting through rock. The man-made environment of the

camps took a toll on workers through disease, and the physical environment took a toll on men through falling rocks, avalanches, and destroying parts of the line, such as bridges, which had just been built. The CPR took shortcuts by using wooden bridges and steep grades, which created problems during the first years of operation. Few workers and visitors to the End of Track saw the damage the CPR was doing to the environment. Most saw the work as progress and the last spike as confirming the CPR's victory over nature. But the CPR was already having problems in controlling nature during the construction phase, as the Corry Brothers' tunnel collapsed, the bridge at Albert Canyon washed away as soon as it was built, and snow and avalanches delayed the building process.

The first thirty years of operation would indeed demonstrate time and again that the CPR had no permanent control over nature, and that meant further environmental disruption through fires, logging for snowsheds, and hydraulic filling to eliminate some bridges. Fillings were necessary to eliminate cheap wooden bridges and sheds had to be built to divert avalanches, primarily because of the poor decision to place the line through Rogers Pass with no tunnel. The environment, in addition to the shortcuts and poor choices made by the CPR, continued to create problems for the CPR through floods, avalanches, rock slides, mud slides, and snow which resulted in damage to many trains not to mention the significant toll on the lives of engineers, brakemen, firemen, and work gangs. The poor financial decisions to use wooden ties, bridges, and snowsheds depleted the region, worsening floods and avalanches and creating more problems for the CPR. Even passengers experienced problems with delays due to snow, rock slides, avalanches, and washed out bridges. Nature was not simply managed, but the CPR had to learn to

work with nature by deploying gangs to clear snow from the tracks, adopting snowploughs, and repairing tracks quickly to get trains through without long delays.

The construction of the CPR has left a legacy of enormous consequences for the economy of the west, one based on agriculture, resource extraction and the tourist trade that developed around the CPR hotels, recreation, and national parks in the mountains. The CPR thus created a “geography of capital” as William Cronon puts it, linking resources to markets, hinterlands to cities, and producers to consumers.⁴⁷⁴ As people turned increasingly to cars, buses, and airplanes in the 1960s, the CPR applied to discontinue passenger service and VIA rail took over in 1977.⁴⁷⁵ The CPR continues to ship goods and resources despite the loss of its unprofitable passenger service.

The construction of the CPR also opened the west to white settlement. Communities like Calgary and later Vancouver were essentially created by the CPR, and the company shaped much of their future expansion. Smaller mountain communities like Golden and Revelstoke sprang up during the construction and housed engineers and railway crews necessary for operation. The CPR brought increasing numbers of white people to the west, not only tourists, but thousands who would settle in cities or farm the land.

It is beyond the scope of this thesis to undertake three areas of research that would take this environmental history of the CPR further. The following have been covered by historians like Turner and Eagle, but there is a need to approach several topics from an explicitly environmental perspective. First, historians should undertake the investigation of the other sections of the CPR, especially the Lake Superior Section and the section

⁴⁷⁴ William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W.W. Norton and Company, 1991), 180.

⁴⁷⁵ Turner, *West of the Great Divide*, 272.

along the Fraser and Thompson Rivers in British Columbia. Like the line through the mountains, these sections posed numerous challenges to construction. Workers on the Lake Superior section had problems with muskegs and those along the Fraser Canyon section had to carve a path out from the cliffs for the train. Both sections resulted in deaths of numerous workers, especially the Chinese in British Columbia. These divisions also demonstrate that nature was not completely conquered by the CPR as rock slides were a frequent occurrence along the Fraser Canyon and the Lake Superior section was easily flooded. Secondly, the wider impact of the CPR on the western environment through their farming and irrigation initiatives around Calgary as well as its mining and lumber operations require further analysis. This thesis has only been able to focus on the railway itself but these actions also had long term impacts on the landscape.

Lastly, there is a need for an environmental history of the CPR that stretches past the construction of the Connaught Tunnel to the present day, including notable events such as the conversion to diesel from coal, the decline of the passenger service in the 1960s and early 1970s, and the building of the Mount Macdonald Tunnel in 1984. This would enable people to appreciate the changes in railway technology and to see that the CPR still struggles with nature today through floods and snow. The building of the Mount Macdonald Tunnel between 1984 and 1988 is notable because the CPR worked with Parks Canada in Glacier National Park to reduce environmental damage, including the planting of 431,000 deciduous trees as well as 181,000 coniferous seedlings.⁴⁷⁶ Forced to confront its ecological footprint, at least within national parks, the CPR responded to a new, more critical perspective among Canadians on the relationship between technology and the environment.

⁴⁷⁶ Booth, 1.

The relationship between the CPR and the environment cannot simply be one of conquest, ending with the driving of the last spike. Throughout the surveying, construction of the mainline and early upgrades to the track, the environment and the CPR had an impact one another. The environment played a role in the placement of the line and shaped its construction and improvements. Surveyors and CPR workers despoiled the environment through fire, deforestation, blasting, and excavation and the environment took a toll on the lives of these workers, the trains, and the track. Shortcuts, especially deforestation, could worsen the effects of floods and avalanches on the line and steep grades increased accidents. Avalanches, snow, mud, floods, and rockslides showed that the CPR could not entirely control nature although it could join east and west together. The CPR had to learn to adapt to the environment in order to get the trains through and still struggles with winter storms today. The fact that the line was built and has seen over 120 years of operation is testament to the thousands of workers who faced some of the most challenging weather and geography in Canada. As the Marquis of Lansdowne said, “no one who has not threaded of maze of mountains through which your line runs... can have any idea of the stupendous character of the task.”⁴⁷⁷ The construction and operation of the CPR in the mountains was not a victory over nature, but an adaptation to the difficult weather and environment which could not have been carried out without the help of these workers.

⁴⁷⁷ Petty-Fitzmaurice, 31.

Maps and Images



Figure 1: Map of British Columbia Showing the Canadian Pacific Railway (Source: The Canadian Pacific Railway Company, *The Province of British Columbia, Canada: Its Resources, Commercial Position and Climate and Description of the New Field Opened up by the Canadian Pacific Railway* (N.P., 1886).)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO14069&SE=1535&RN=4&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=14795&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 2: Canadian Pacific Railway construction camp, British Columbia, 1884 (Smyth Brothers) (Source: Glenbow Archives NA-782-9) Note the uneven track.

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO14069&SE=1535&RN=6&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=67220&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 3: Canadian Pacific Railway construction camp at summit of the Selkirks, 1885 (O.B. Buell) (Source: Glenbow Archives NA-4140-41)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO14069&SE=1535&RN=5&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=14802&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 4: Avalanche at Mackenzie's Canadian Pacific Railway construction camp in the Selkirk range, British Columbia, February 8, 1885 (Smyth Brothers) (Source: Glenbow Archives NA-782-16)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO14860&SE=1547&RN=0&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=33538&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 5: Canadian Pacific Railway construction crew in the Rockies, British Columbia, ca. 1885-1889 (Source: Glenbow Archives NB-4-2)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15046&SE=1551&RN=1&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=81925&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 4: Canadian Pacific Railway trestle bridge under construction west of Calgary, Alberta, 1882 (Source: Glenbow Archives PA-3687-1)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15186&SE=1552&RN=0&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=67210&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 5: Train on Stoney Creek Bridge, British Columbia, 1885. This is a continuous Howe Truss of four spans. Glenbow Archives NA-4140-31.

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15307&SE=1555&RN=1&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=14799&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 6: Building the Mountain Creek bridge, Canadian Pacific Railway line, British Columbia, 1884. Glenbow Archives NA-782-13. This is a trestle bridge.

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15402&SE=1556&RN=0&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=14793&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 7: Corry Brothers tunnel during Canadian Pacific Railway construction in the mountains, British Columbia, ca. 1884-1885 (Smyth Brothers) (Sources: Glenbow Archives NA-782-7)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15506&SE=1558&RN=0&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=85555&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 8: Canadian Pacific Railway snowshed under construction east of Selkirk Summit, British Columbia, ca. 1886-1888 (Source: Glenbow Archives NA-4428-14)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15506&SE=1558&RN=1&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=85557&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 9: Canadian Pacific Railway snowshed under construction east of Selkirk Summit, British Columbia, ca. 1886-1888 (Source: Glenbow Archives NA-4428-16)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15768&SE=1561&RN=2&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=85558&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 10: Canadian Pacific Railway snowshed on east slope of Selkirk Summit, British Columbia, ca 1886-1888 (Source: Glenbow Archives NA-4428-17)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15872&SE=1563&RN=0&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=85566&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 11: Canadian Pacific Railway workers with Engine 365 derailed by snow slide, Rogers Pass, British Columbia, 1897 (Glenbow Archives NA-4428-25)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO15986&SE=1565&RN=0&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=85591&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 12: Devastation on Canadian Pacific Railway track after snow slide, one hundred yards east of Mile 403, Albert Canyon area, British Columbia, April 11, 1904 (Source: Glenbow Archives NA-4432-7) This avalanche, three miles east of Albert Canyon, killed Kenneth Dodd and Thomas Downie when cars were swept off track.

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO16078&SE=1566&RN=7&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=18257&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 13: Snow slide over track between Rogers Pass and Glacier, British Columbia, 1914 (L.L. Kerry) (Source: Glenbow Archives NA-1248-31)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO16515&SE=1570&RN=19&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=18260&NR=0&NB=1&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 14: Snow plough on Canadian Pacific Railway line, between Rogers Pass and Glacier, British Columbia, 1914 (L.L. Kerry) (Source: Glenbow Archives Na-1248-34)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO16780&SE=1573&RN=0&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=18898&NR=0&NB=0&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 15: Work train on the blue cut above Patricia Siding during building of Spiral Tunnel, ca. 1908-1909 (Source: Glenbow Archives)

http://ww2.glenbow.org/search/archivesPhotosResults.aspx?AC=GET_RECORD&XC=/search/archivesPhotosResults.aspx&BU=&TN=IMAGEBAN&SN=AUTO17008&SE=1576&RN=20&MR=10&TR=0&TX=1000&ES=0&CS=0&XP=&RF=WebResults&EF=&DF=WebResultsDetails&RL=0&EL=0&DL=0&NP=255&ID=&MF=WPEngMsg.ini&MQ=&TI=0&DT=&ST=0&IR=18252&NR=0&NB=2&SV=0&BG=&FG=&QS=ArchivesPhotosSearch&OEX=ISO-8859-1&OEH=ISO-8859-1

Figure 16: Canadian Pacific Railway construction at west portal of Connaught Tunnel, 1914 (L.L. Kerry) (Source: Glenbow Archives NA-1248-26)

Bibliography

Primary Sources

Published

- Allan, John A. "Annotated Guide: Bankhead to Golden." In *Trancontinental Excursion C1: Toronto to Victoria and Return via Canadian Pacific and Canadian Northern Railways*. Part II. Ottawa: Government Printing Bureau, 1913.
- Barneby, William Henry. *Life and Labour in the Far, Far West: Being Notes of a Tour in the Western State, British Columbia, Manitoba, and the North-West Territory*. London, 1884.
- Barneby, William Henry. *The New Far West and the Old Far East: Being Notes of a Tour in North America, Japan, China, Ceylon, etc.* London: E.Stanford, 1889.
- Begg, Alexander. *Canada and its National Highway: A Paper Read before the Society of Arts, March 23, 1886*. London: W. Trounce, 1886.
- Boardman, Clint. "Building the CPR." *Alberta History* 49, no. 1 (Winter 2001): 23-25.
- Bone, Peter Turner. *When the Steel Went Through: Reminiscences of a Railroad Pioneer*. Toronto: Macmillan, 1947.
- British Columbia. "An Act to Preserve the Forests From Destruction by Fire." In *The Selkirk Range*, edited by A.O. Wheeler. Vol. 1. Ottawa: Government Printing Bureau, 1905.
- British Columbia Legislative Assembly. *Papers in Connection with the Construction of the Canadian Pacific Railway*. Victoria: Richard Wolfenden, 1880.
- Caine, W.S. *A Trip Around the World in 1887-1888*. London: Routledge, 1888.
- Campbell, John Douglas Southerland. *Our Railway to the Pacific*. London: Isbister and Co, 1886.
- Canada. *Annual Reports of the Department of Indian Affairs, 1885*. Ottawa: Maclean, Roger & Co., 1886).
- Canada. *Annual Reports of the Department of Indian Affairs, 1886*. Ottawa: Maclean, Roger & Co., 1887.
- Canada. Parliament. *Contract between the Government of the Dominion of Canada and the Canadian Pacific Railway Company Also the Consolidated Railway Act (1879) and the Act of 1881 Amending It*. Ottawa: Maclean, Roger, 1882.

- Canadian Pacific Railway Company. *Across Canada: An Annotated Guide to the Country Served by the Canadian Pacific Railway and Its Allied Interests: Western Lines*. Montreal: Canadian Pacific Railway Company, 1924.
- Canadian Pacific Railway Company. *Railroading through the Canadian Pacific Rockies: The Connaught and Spiral Tunnels*. Canada: Canadian Pacific, 1923.
- Canadian Pacific Railway Company. *The Canadian Pacific, the New Highway to the Orient across the Mountains, Prairies and Rivers of Canada*. Montreal: General Passenger Department of the Canadian Pacific Railway, 1893.
- Canadian Pacific Railway Company. *The Challenge of the Mountains*. Montreal: Canadian Pacific Railway Company, 1909.
- Carmichael, Dean. *A Holiday Trip: Montreal to Victoria and Return via the Canadian Pacific Railway*. N.p.: Self-published, 1888.
- Carter, Charles Frederick. "The Passing of the Big Hill," *World's Work*, Vol. XX (June, 1910).
- CDR [pseud.] *Across America: From Manitoba to Vancouver*. Reprinted from the Brighton Herald of January 15 and 22, 1887. Brighton: J.G. Bishop, 1877.
- Chittenden, Newton H. *Settlers, Miners and Tourists Guide from Ocean to Ocean by the C.P.R., the Great Trans-Continental Short Line through a Region of Unsurpassed Attractions for Settler, Miner and Tourist*. Ottawa: J. Hope & Co., 1885.
- Coccola, Nicolas. *They Call Me Father: Memoirs of Father Nicolas Coccola*. Edited by Margaret Whitehead. Vancouver: University of British Columbia Press, 1988.
- Cunningham, Granville Carlyle. "Snow slides in the Selkirk Mountains." *Transactions of the Canadian Society of Civil Engineers*. Montreal: John Lovell and Sons, 1887.
- Cunningham, Granville Carlyle. "The Rocky-Mountain Division of the Canadian Pacific Railway." In "Construction and Working," edited by James Forrest. London: Institution of Civil Engineers, 1886.
- Finck, Henry Theophilus. *The Pacific Coast Scenic Tour, from Southern California to Alaska, the Canadian Pacific Railway, Yellowstone Park and the Grand Canyon*. New York: Charles Schreiber and Sons, 1890.
- Fleming, Sandford. *England and Canada: A Summer Tour between Old and New Westminster*. London: Sampson Low, Marston, Seale and Rivington, 1884.

- Fleming, Sandford. *Progress Report on the Canadian Pacific Railway Exploratory Survey to Hon. H.L. Langevin, Minister of Public Works*. Ottawa, n.p., 1872.
- Fleming, Sandford. *Report on Surveys and Preliminary Operations on Canadian Pacific Railway up to Jan. 1877 to Hon. Alexander Mackenzie, Premier and Minister of Public Works, Canada*. Ottawa: MacLean, Roger and Co., 1877.
- Fletcher, Dr. James. "Mountain Sprites." *Ottawa Naturalist*, March 1908, 225-231.
- Ford, Charles T. *From coast to coast a farmer's ramble through Canada, and the Canadian Pacific railway system*. Exeter, England: Bearne Brothers, 1899
- Garner, Charles (also known as Stuart Cumberland). *The Queen's Highway from Ocean to Ocean*. London S. Low et al, 1887.
- Gibbon, J. M. and Stephen Pardoe. "The Construction of the Canadian Pacific Railway." In *Engineering Wonders of the World*. Vol. 1, edited by Archibald Williams. London: Thomas Nelson and Sons, n.d.
- Grant, George M. *Ocean to Ocean: Sandford Fleming's Expedition through Canada in 1872*. Rev. ed. Toronto: Radisson Society of Canada, 1925.
- Grant, George M. "The Canada Pacific Railway." *Century Illustrated Monthly Magazine*, October, 1885.
- Grant, George M. "The CPR by the Kicking Horse Pass and the Selkirks: V. The Mountains of the Bow River." *Week*, February 7, 1884, 150-152.
- Grant, George M. "The CPR by the Kicking Horse Pass and the Selkirks: VI. The Summit." *Week*, February 7, 1884, 150-152.
- Green, William Spotswood. *Among the Selkirk Glaciers*. London: Macmillan, 1890.
- Hearn, Lafcadio. "A Winter Journey to Japan." *Harper's News Monthly Magazine*. Nov. 1890.
- Holme, James." Journey to the Rocky Mountains, 1883." *Alberta History* 48, no. 2 (Spring 2000): 10-18.
- Hyde, Henry M. "Sitting Up with the Mountain Division." *Technical World Magazine*, October, 1909, 138-141.
- Ingersoll, Ernest. *An Excursion to Alaska by the Canadian Pacific Railway*. Montreal: General Passenger Department of the Canadian Pacific Railway, 1887.

- Keefer, Thomas C. *Philosophy of Railroads*. Edited by H.V. Nelles. Toronto: University of Toronto Press, 1972.
- Keefer, Thomas C. The Canadian Pacific Railway. Address at the American Society of Civil Engineers, Milwaukee, Wisconsin, June 28, 1888.
- Kingsford, William. *The Canadian Pacific Railway: an Appeal to Public Opinion against the Railway Being Carried across the Selkirk Range, that Route Being Objectionable from the Danger of Falls from Glaciers and Avalanches, also, generally on other Matters*. Montreal: W.M. Drysdale, 1885.
- Macoun, J.M. "A Naturalist in the Gold Range." *Ottawa Naturalist*, Nov. 1890, 139-147.
- Moberly, Walter. *The Rocks and Rivers of British Columbia*. London: H. Blacklock and Co, 1885.
- Muckleston, H.B. "A Short Description of the Canadian Pacific Railway through the Selkirks." In *The Selkirk Range*, edited by A.O. Wheeler. Vol. 1. Ottawa: Government Printing Bureau, 1905.
- P., M. *A Winter Trip on the Canadian Pacific Railway: Christmas and New Year in the Snow, 1885-1886*. Cheltenham: John J. Banks, 1886.
- Petty-Fitzmaurice, Henry Charles Keith Petty-Fitzmaurice. *Canadian North-West and British Columbia: Two Speeches*. Ottawa: Department of Agriculture, 1886.
- Ramsay, G.G. "Over the Rocky Mountains by the Canadian Pacific Line in 1884." *Macmillan's Magazine*, December 1884.
- Roberts, Morley, *The Western Avernus*. London: Smith, Elder and Co, 1887.
- Robinson, Noel and Walter Moberly. *Blazing the Trail through the Rockies: the Story of Walter Moberly and His Share in the Making of Vancouver*. Vancouver: News-Advertiser, 1915.
- Rogers, Albert L. "Major A.B. Rogers' First Expedition up the Illecillewaet Valley, in 1881, Accompanied by his Nephew, A. L. Rogers." In *The Selkirk Range*, edited by A.O. Wheeler. Vol. 1. Ottawa: Government Printing Bureau, 1905.
- "Rogers Pass Tunnel of the CPR" *The Canadian Engineer*, April 23, 1914, 621-24.
- Roper, Edward. *By Track and Trail: A Journey through Canada*. London: W.H. Allen & Co., 1891.
- Rylatt, R. M. *Surveying the Canadian Pacific: Memoir of a Railroad Pioneer*. Salt Lake City: University of Utah Press, 1991.

Secretan, J.H.E. *Canada's Great Highway: From the First Stake to the Last Spike*. Toronto: Longmans, Green & Co., 1924.

Shaw, Charles Aeneas. *Tales of a Pioneer Surveyor*. Edited by Raymond Hull. Don Mills: Longman Canada, 1970.

Schwitzer, J.E. "Reduction of the Kicking Horse Pass Grade on the CPR," *Canadian Railway and Marine World*, October, 1909: 710-711.

Spragge, Mrs. Arthur. *From Ontario to the Pacific by the C.P.R.* Toronto: C. Blackett Robinson, 1887.

Steele, Samuel B. *Forty Years in Canada: Reminiscences of the Great North-West, with Some Account of His Service in South Africa*. London: Herbert Jenkins, 1915.

Watkin, Edward William. *Canada and the States: Recollections, 1851 to 1886*. London: Ward, Lock & Co., 1887.

Webb, William Seward. *California and Alaska and over the Canadian Pacific Railway*. Second edition. New York: G.P. Putnam's Sons, 1891.

Vaux, William. "The Canadian Pacific Railway from Laggan to Revelstoke, B.C." In the *Proceedings of the Engineer's Club of Philadelphia*. Vol. XVII, No.2. Philadelphia: Engineer's Club of Philadelphia, 1900.

Unpublished

Anglican Provincial Synod of British Columbia Archives

Bishop George Hills Journal, 1888-1899. Anglican Archives of the Provincial Synod of British Columbia and the Yukon PSA 1889.

British Columbia Archives

G.C. Cuninghame Journal, 1885-1886. Cascade Camp Fonds. British Columbia Archives P/ER/C16.9.

Ashdown Green Diary, 1871-1872. Ashdown Green Fonds. British Columbia Archives MS-0437.

J. E. Griffiths Journal, 1886- 1887. Cascade Camp Fonds. British Columbia Archives P/ER/C16.9.

C.F. Hanington Diary, 1875. C.F. Hanington Fonds. British Columbia Archives E/C/H19A.

Thomas O. Kilpatrick Notebook. Thomas O. Kilpatrick Fonds. British Columbia Archives MS-0323.

Malcolm McLeod Manuscript. "All Aboard for the West! Or The Canadian Pacific Railway and Its Pioneers." Malcolm McLeod Fonds. British Columbia Archives MS-1249.

Letter from Thomas Scattergood to his son, August 16, 1900. British Columbia Archives MS-1021.

Marcus Smith Diary, 1874-1880. Marcus Smith Fonds. British Columbia Archives MS-1496.

Frederick D. Williams Manuscript. "Trip from London to Vancouver 1897." British Columbia Archives MS-2440.

Glenbow Archives

Letter from George A. Crane to Dr. Longman, March 5, 1961. George A. Crane Fonds, Glenbow Archives M286.

Mrs. Alexander Sinclair Henderson Diary, 1912. Mrs. Alexander Sinclair Henderson Fonds, Glenbow Archives M 504.

Letter from Leslie Kerry to Sheilagh Jameson, October 10, 1968. Leslie Kerry Fonds. Glenbow Archives M627.

T.K. Kilpatrick Journal, 1895. T.K. Kilpatrick Fonds. Glenbow Archives, M7919-8.

T.K. Kilpatrick Journal, 1902. T.K. Kilpatrick Fonds. Glenbow Archives, M7919-41.

T.K. Kilpatrick Journal, 1908. T.K. Kilpatrick Fonds. Glenbow Archives, M7919-57.

William McCardell Manuscript. "Reminiscences of a Western Pioneer: Explorations through the Rocky Mountains." William McCardell Fonds. Glenbow Archives M4056.

Major A.B. Rogers Diary, 1881-1882. A.B. Rogers Fonds. Glenbow Archives Microfilm Rogers.

Thomas E. Wilson Manuscript. "The Last of the Pathfinders." Thomas E. Wilson Fonds, Glenbow Archives M-4223

Letter from George Van Buskirk to his mother, June 17, 1884. George Van Buskirk Fonds. Glenbow Archives M610.

Library and Archives Canada

Harry William Dudley Armstrong Manuscript. Harry William Dudley Armstrong Fonds. Library and Archives Canada MG30-B26.

Sandford Fleming Diary, 1883. Sandford Fleming Fonds. Library and Archives Canada MG29-B1 Vol. 83.

Godsal Family Fonds. Library and Archives Canada, MG 40 M20.

Canadian Pacific Railway Fonds. Library and Archives Canada MG28-III 20.

Charles F. Hanington Fonds. Library and Archives Canada MG29-B5 File 1.

Letter from Lady Agnes Macdonald to William Van Horne, January 1886. William Van Horne Fonds. Library and Archives Canada MG29-A60 Vol. 87 File 7.

Letter from Sir John A. Macdonald to George Stephen, October 19, 1881. George Stephen Fonds. Library and Archives Canada MG29-A20.

Henry Whatley Tyler Fonds. Library and Archives Canada MG29 – A31 Vol.1 File 4.

Provincial Archives of Alberta

Malcolm McCrimmon and Sheilagh S. Jameson Manuscript.” Story of Malcolm McCrimmon (1851-1928) Pioneer Railroad Contractor.” MacCrimmon Family Fonds. Provincial Archives of Alberta PR1963.3/1.

United Church of Canada British Columbia Conference (Bob Stewart) Archives

Alexander Henry Cameron Diary, 1885-1887, Alexander Henry Cameron Fonds, United Church of Canada British Columbia Conference (Bob Stewart) Archives.

Alexander Henry Cameron Scrapbook, 1887, Alexander Henry Cameron Fonds, United Church of Canada British Columbia Conference (Bob Stewart) Archives.

University of Alberta Archives

Letter from J.S. Dennis to the Secretary of the Department of the Interior, June 18 1896. William Pearce Fonds. University of Alberta Archives 74-164-414.

Letter from William Pearce to E.F. Stephenson, July 25, 1898. William Pearce Fonds. University of Alberta Archives 74-164-125.

Letter from William Pearce to the Secretary of the Department of the Interior, May 23, 1903. William Pearce Fonds. University of Alberta Archives 74-164-414.

North-West Territories. "Prairie Fires Ordinances." William Pearce Fonds. University of Alberta Archives, 74-164-39.2.

Letter from R.A. Rutan to A.M. Burgess, January 29, 1896. William Pearce Fonds. University of Alberta Archives 74-164-125.

Newspapers

Calgary Herald (Calgary, Alberta)

Golden Star (Golden, British Columbia)

Kootenay Mail (Revelstoke, British Columbia)

Mail Herald (Revelstoke, British Columbia)

Secondary Sources

Articles

Backler, Gary George and Trevor D. Heaver. "The Timing of a Major Investment in Railway Capacity: CPR's 1913 Connaught Tunnel Decision." *Business History* 24 (1982): 300-314.

Beatty, J.A. "CP Rail's Connaught Tunnel." *Canadian Rail* 271 (1974): 227-235.

Binnema, Ted and Melanie Niemi. "'Let the Line Be Drawn Now': Wilderness, Conservation, and the Exclusion of Aboriginal People from Banff National Park in Canada" *Environmental History* 11 (2006): 724-750.

Cronon, William. "A Place for Stories: Nature, History, and Narrative." *The Journal of American History* 78 (Mar. 1992): 1347-1376.

Cronon, William. "The Uses of Environmental History." *Environmental History Review* 17 (3): 1-22.

Evenden, Matthew. "Social and Environmental Change at Hells Gate, British Columbia." *Journal of Historical Geography* 30 (2004), 130-53.

Gordon, Leigh. "Steel Rails and Canyon Walls." *Canadian West* 2 (1985): 14-23.

Hays, Samuel P. "Toward Integration in Environmental History." *Pacific Historical Review* 70 (2001): 59-67.

- Johnson, E.A., G. I. Fryer, and M. J. Heathcott. "The Influence of Man and Climate on Frequency of Fire in the Interior Wet Belt Forest, British Columbia." *The Journal of Ecology* 78 (1990): 403-412
- Lampard, Robert. "Robert George Brett: 'We Shall Not Look Upon His Like Again.'" *Alberta History* 51, no. 2 (2003): 13-22.
- Leonard, Frank. "'A Closed Book': The Canadian Pacific Railway Survey and North-Central British Columbia." *Western Geography* 12 (2002): 163-184.
- Morley, William F. E. "Tom Wilson of the Canadian Rockies." *Alberta History* 54, no.1 (2006): 2-9.
- Nelson, J.G. and A.R. Byrne. "Man as an Instrument of Landscape Change: Fires, Floods and National Parks in the Bow Valley, Alberta" *Geographical Review* 56 (1966): 226-238.
- Osmundson, D.B., R.J. Revel, V.L. Kamara, and J. Pitlick, "Flow-Sediment-Biota Relations: Implications for River Regulation Effects on Native Fish Abundance." *Ecological Applications* 12 (December 2002): 1719-1739.
- Pugsley, Edmund E. "Pioneers of the Steel Trail: At the Throttle of the First Continental." *Maclean's*, June 1, 1930, 5, 69.
- Pugsley, Edmund E. "Pioneers of the Steel Trail: Fighting the Snow Menace." *Maclean's*, August 15, 1930, 16, 55.
- Pugsley, Edmund E. "Pioneers of the Steel Trail: Two Streaks of Rust." *Maclean's*, June 15, 1930, 14, 74-75.
- Quam-Wickham, Nancy. "Rereading Man's Conquest of Nature: Skill, Myths, and the Historical Construction of Masculinity in Western Extractive Industries." *Men and Masculinities* 2 (October 1999): 135-151
- Steinberg, Ted. "Down to Earth: Nature, Agency, and Power in History." *The American Historical Review* 107 (June 2002): 798-820.
- Stroud, Ellen. "Does Nature Always Matter: Following Dirt Through History." *History and Theory* Theme Issue 42 (December 2003): 75-81.

Monographs

- Ambrose, Stephen E. *Nothing Like it in the World: The Men Who Built the Transcontinental Railroad, 1836-1869*. New York: Simon and Schuster, 2000.

- Anderson, Frank W. *Frontier Guide to the Incredible Rogers Pass*. Calgary: Frontier Publishing, 1968.
- Berton, Pierre. *The Last Spike: The Great Railway, 1881-1885*. Toronto: McClelland and Stewart, 1971.
- Berton, Pierre. *The National Dream: The Great Railway, 1871-1881*. Toronto: McClelland and Stewart, 1970.
- Booth, Jan. *Canadian Pacific in the Selkirks: 100 Years in Rogers Pass*. 2nd ed. Calgary: British Railway Modellers of North America, 1991.
- Bradwin, Edmund W. *The Bunkhouse Man, a Study of Work and Pay in the Camps of Canada, 1903-1914*. New York: Columbia University Press, 1928.
- Burrows, Roger. *The CPR Mainline Route from the Rockies to the Pacific. Vol.1, Railway Mileposts: British Columbia*. Vancouver: Railway Milepost Books, 1981.
- Byrne, A.R. *Man and the Landscape Change in the Banff National Park Area before 1911*. Calgary: University of Calgary, 1968.
- Chodos, Robert. *The CPR: A Century of Corporate Welfare*. Toronto: J. Lewis & Samuel, 1973.
- Choko, Mark H. and David L. Jones. *Posters of the Canadian Pacific*. Richmond Hill, Ontario: Firefly Books, 2004.
- Colpitts, George. *Game in the Garden: A Human History of Wildlife in Western Canada to 1940*. Vancouver: UBC Press, 2002.
- Cronon, William. *Nature's Metropolis: Chicago and the Great West*. New York: W.W. Norton and Company, 1991.
- Cruise, David and Alison Griffiths. *Lords of the Line*. Markham, Ontario: Viking, 1988.
- Davis, Mike. *Late Victorian Holocausts: El Niño Famines and the Making of the Third World*. London: Verso, 2001.
- Dempsey, Hugh A, ed. *The CPR West: The Iron Road and the Making of a Nation*. Vancouver: Douglas and McIntyre, 1984.
- Drushka, Ken. *Tie Hackers to Timber Harvesters*. Madiera Park, British Columbia: Harbour Publishing, 1998.

- Duke, David Freeland Duke, *Canadian Environmental History: Essential Readings*. Toronto: Canadian Scholars' Press, 2006.
- Eagle, John A. *The Canadian Pacific Railway and the Development of Western Canada, 1896-1914*. Kingston, Ontario: McGill-Queen's University Press, 1989.
- Gaffield, Chad and Pam Chaffield. *Consuming Canada: Readings in Environmental History*. Toronto: Copp Clark, 1995.
- Gates, Alexander E. and David Ritchie. *Encyclopedia of Earthquakes and Volcanoes*. 3rd ed. New York: Facts on File, 2007.
- Gibbon, John M. *Steel of Empire: the Romantic History of the Canadian Pacific*. Toronto: McClelland and Stewart, 1937.
- Gordon, Katherine. *Made to Measure: A History of Land Surveying in British Columbia*. Winlaw: Sono Nis Press, 2006.
- Green, Lorne. *Chief Engineer: Life of a National Builder – Sandford Fleming*. Toronto: Dundurn Press, 1993.
- Hart, E. J. *The Selling of Canada: The CPR and the Beginnings of Canadian Tourism*. Banff, Alta.: Altitude, 1983.
- Hungry Wolf, Adolf. *Rails in the Canadian Rockies*. Invermere, B.C.: Good Medicine Books, 1979.
- Innis, Harold. *A History of the Canadian Pacific Railway*. Toronto: University of Toronto Press, 1971.
- Innis, Harold. *Problems of Staple Production in Canada*. Toronto: Ryerson Press, 1933.
- Jones, David Laurence. *Tales of the CPR*. Calgary: Fifth House, 2002.
- Knowles, Valerie. *From Telegrapher to Titan: The Life of William C. Van Horne*. Toronto: Dundurn Group, 2004.
- Lamb, W.K. *History of the Canadian Pacific Railway*. New York: Macmillan, 1977.
- Laforet, Andrea and Annie York. *Spuzzum: Fraser Canyon Histories, 1808-1939*. Vancouver: UBC Press, 1998.
- Lavallée, Omer and Roger G. Burrows. *Challenge: Calgary to Kamloops*. Canada: Canadian Pacific Railway, 1988.

- Lavallée, Omer. *Van Horne's Road: An Illustrated Account of the Construction and First Years of Operation of the Canadian Pacific Transcontinental Railway*. Montreal: Railfare, 1974.
- Legget, Robert F. *Railways of Canada*. Newton Abbot, England: David & Charles, 1973.
- Leier, Mark. *Where the Fraser River Flows: The Industrial Workers of the World in British Columbia*. Vancouver: New Star Books, 1990.
- Leonard, Frank. *A Thousand Blunders: the Grand Trunk Pacific Railway and Northern British Columbia*. Vancouver: UBC Press, 1996.
- Lotz, Jim. *Canadian Pacific*. London: Bison Books, 1985.
- Luxton, Eleanor. *Banff: Canada's First National Park*. Banff: Summerthought, 1975.
- MacBeth, R.G. *The Romance of the Canadian Pacific Railway*. Toronto: Ryerson Press, 1924.
- MacEachern, Alan and William J. Turkell, *Method and Meaning in Canadian Environmental History*. Toronto: Nelson Education, 2009).
- MacKay, *People's Railway: A History of Canadian National*. Vancouver: Douglas and McIntyre, 1992.
- McDonald, J.D. *Rails and Killer Snows: The Saga of Rogers Pass*. Rossland, B.C.: Rossland Historical Museum Association, 1997.
- McDougall, J. Lorne. *Canadian Pacific: A Brief History*. Montreal: McGill University Press, 1968.
- McKee, William and Georreen Klassen. *Trail of Iron: The CPR and the Birth of the West, 1880-1930*. Vancouver: Douglas & McIntyre, 1983.
- Mika, Nick and Helma. *Illustrated History of Canadian Railways*. Belleville, Ontario: Mika Publishing Company, 1986.
- Minter, Roy. *The White Pass: Gateway to the Klondike*. Toronto: McClelland and Stewart, 1987.
- Morris, Keith. *The Story of the Canadian Pacific Railway*. New York: Arno Press, 1981.
- Murphy, Peter J. *History of Forest Fires and Prairie Fire Control Policy in Alberta*. Edmonton: Alberta Energy and Natural Resources, 1985.

- Nelson, J.G. "Man and Landscape Change in Banff National Park: A National Park Problem in Perspective. In *Canadian Parks in Perspective*, edited by J.G. Nelson. Montreal: Harvest House, 1969.
- Nobbs, Ruby. *Rail Tales from the Revelstoke Division*. Revelstoke, B.C.: R. Nobbs, 2000.
- Palmer, Harold. *Early Explorations in British Columbia for the Canadian Pacific Railway*. Philadelphia: Geographical Society of Philadelphia, 1918.
- Pole, Graeme. *The Spiral Tunnels and the Big Hill: A Canadian Railway Adventure*. Vancouver: Altitude Publishing, 1995.
- Pyne, Stephen. *Awful Splendour: A Fire History of Canada*. Vancouver: UBC Press, 2007.
- Pugsley, Edmund E. *The Great Kicking Horse Blunder*. Vancouver: Evergreen, 1973.
- Rajala, Richard A. *Feds, Forests and Fires: A Century of Canadian Innovation*. Ottawa: Canada Science and Technology Museum, 2005.
- Renz, Louis Tuck. *The History of the Northern Pacific Railroad*. Fairfield, Washington: Ye Galleon Press, 1980.
- Regehr, T.D. *Letters from the End of Track*, in *The CPR West: The Iron Road and the Making of a Nation*, ed. Hugh A. Dempsey (Vancouver: Douglas and McIntyre, 1984), 37-54.
- Regehr, T.D. *The Canadian Northern Railway: Pioneer Road of the Northern Prairies 1895-1918*. Toronto: Macmillan: 1976.
- Sanford, Barrie. *The Pictorial History of Railroading in British Columbia*. Vancouver: Whitecap Books, 1981.
- Steed, Roger G. *Canadian Pacific in the Selkirks*. Vol. 2. Calgary: British Railway Modellers of North America, 1993.
- Strom, Claire. *Profiting from the Plains: The Great Northern Railway and Corporate Development of the American West*. Seattle: University of Washington Press, 2003.
- Thompson, Don W. *Men and Meridians*. Vol. 2. Ottawa: Information Canada, 1972.
- Turner, Robert D. *Railroaders. Recollections from the Steam Era in British Columbia*. Victoria: Provincial Archives of British Columbia, 1981.

Turner, Robert D. *West of the Great Divide: An Illustrated History of the Canadian Pacific Railway in British Columbia, 1880-1986*. Victoria: Sono Nis Press, 1987.

White, Richard. "*It's Your Misfortune and None of My Own*": *A History of the American West*. Norman: University of Oklahoma Press, 1991.

Woods, John G. *Snow War: An Illustrated History of Rogers Pass, Glacier National Park, B.C.* Ottawa: National and Provincial Parks Association of Canada, 1983.

Worster, Donald. "Doing Environmental History." In *The Ends of the Earth: Perspectives on Modern Environmental History*, edited by Donald Worster. Cambridge: Cambridge University Press, 1988.

Vance, James E. *The North American Railroad: Its Origin, Evolution and Geography*. Baltimore: John Hopkins University Press, 1995.

Yeats, Floyd. *Canadian Pacific's Big Hill*. Calgary: British Railway Modellers of North America, 1985.

Unpublished Manuscripts

Parminter, John Vye. "An Historical Review of Forest Fire Management in British Columbia." M.F. Essay, University of British Columbia, 1978.

Multimedia

They Built the Railway. DVD. Directed by Andrew Gregg. Toronto: Parallel Film & Television Productions, 2004.