

Wood Future: Forestry, Carbon, and Wood Architecture in Northern Ontario

by

Michael Damini

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APPROVED/APPROUVÉ

Thesis Examiners/Examineurs de thèse:

Mark Baechler
(Thesis Advisor / Directeur(trice) de thèse)

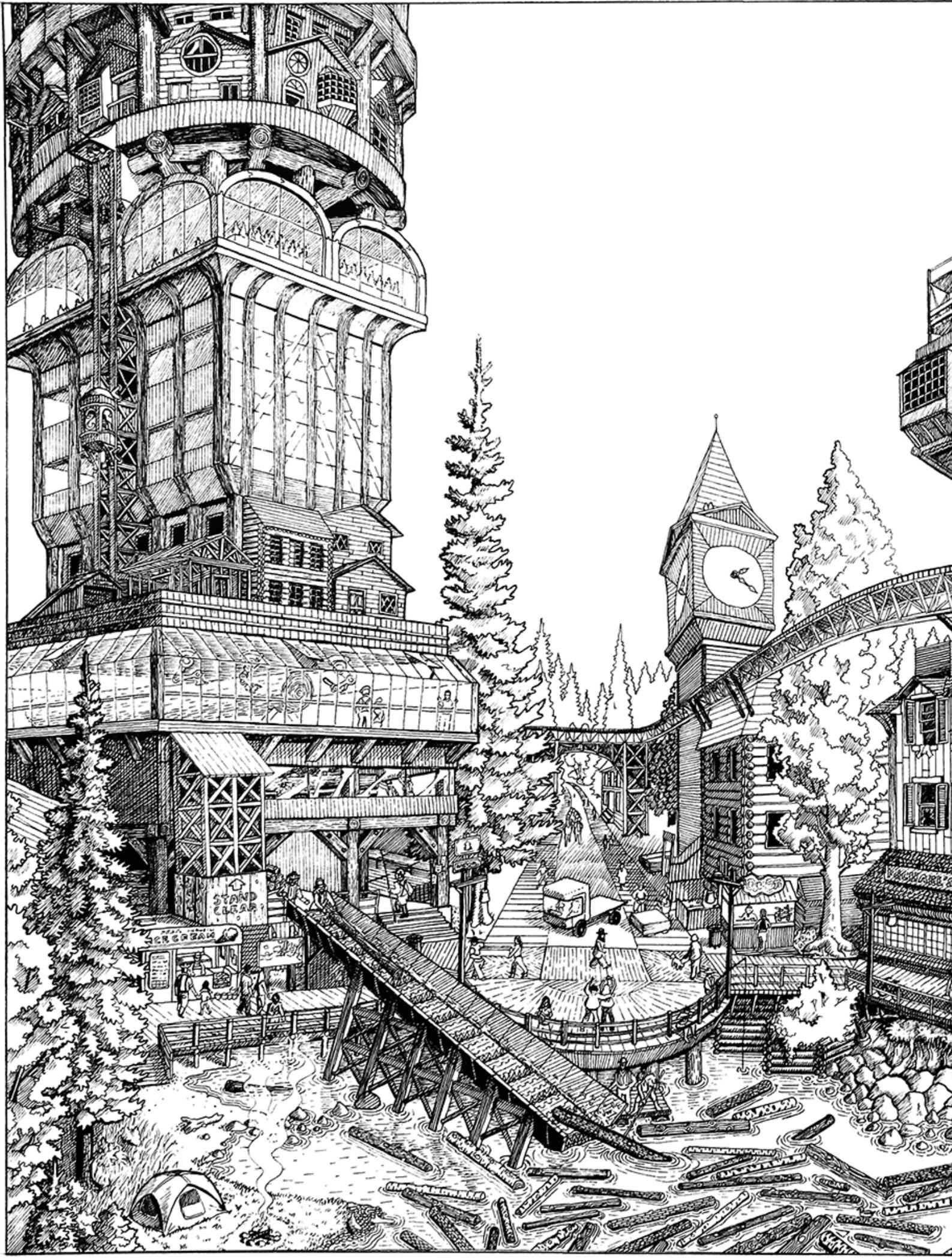
Mark Kuhlberg
(Thesis Second Reader / Deuxième lecteur(trice) de thèse)

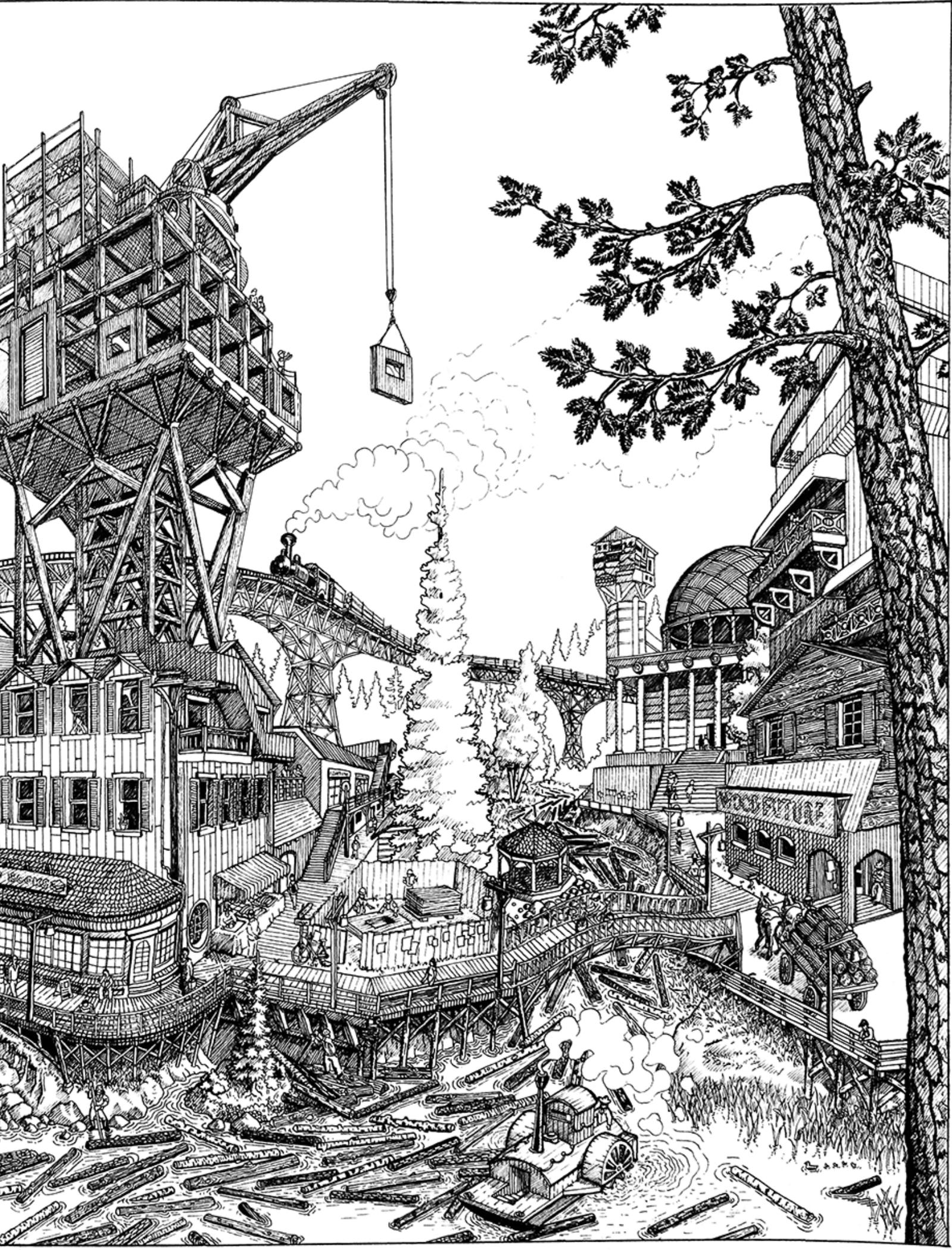
Menna Agha
(External Examiner / Examineur(trice) externe)

Approved for the Office of Graduate Studies
Approuvé pour le Bureau des études supérieures
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**Figure 01. Wood Future Dreamscape
(Previous spread)**

ABSTRACT

This thesis explores the interconnected past, present, and future of forestry and wood architecture in Northern Ontario through a graphic narrative. This narrative is a method of research that explores subjects by reading and visualizing subject matter and synthesizing it through illustration to create a narrative alongside a textual literary review. Through this method of storytelling, it aims to answer the following question: How can Northern Ontario build upon the history of its forestry to evolve wood architecture and culture towards a sustainable future? The planet is faced with a climate crisis. Northern Ontario's forestry industry holds a key to combat climate change by sequestering carbon while rejuvenating its communities through sustainable forest management and wood architecture. This thesis recounts the two-century long relationship of forests, forest industry, and wood architecture in Northern Ontario to design a new sawmill and fabrication centre.

KEYWORDS

Wood Architecture, Forestry, Wood Culture, Sawmill, Northern Ontario, Graphic Narrative, Drawing

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PREFACE

This thesis is an exploration into the forest history of Ontario and its relationship with architecture. Being from Timmins, Ontario, I have been a lifelong witness to logging, milling, and reforestation. The intent of this thesis is to be a clear, engaging look at the forest industry with the hopes of encouraging the increased use of responsible forestry and wood architecture moving forward.

The motivation behind this is the planet's freefall into climate change catastrophe. I believe this is the most pressing issue the world faces and I want this thesis to inspire change. I believe we all need to work towards a better future with everything we do, and every decision we make.

Writing this narrative, I was repeatedly filled with self-doubt at the idealistic future I was presenting, which restrained me from diving too deep into creating a complete fictional utopia. I have been deeply inspired by various fictitious works from authors such as Hayao Miyazaki, Gene Rodenberry, and Ursula K. LeGuinn. While drawing on these provide a imaginative view on the future and our attitudes towards the environment, leaving reality too far behind risks a level of arrogance. I strived for a middle ground of realism and hopefulness.

In order to explore this history and tell this story, I chose drawing as the lens and medium. I have spent hundreds of hours on these drawings with the hopes of creating engaging, thoughtful images that could act independently of the written narrative and reach larger audience because of it. I have always had a passion for drawing and I have leaned on this passion to deliver this project with all the effort and heart I have to give.

Thank you for reading,

Michael Damini

WOOD FUTURE

FORESTRY, CARBON, AND ARCHITECTURE IN NORTHERN ONTARIO

INTRODUCTION

Climate change disaster is on our doorstep, and Northern Ontario has an underutilized carbon storage solution: wood architecture through the revitalization of Ontario's abandoned sawmills. The practice of sustainable forestry and the creation of wood products are part of the solution to slow climate change.¹ The Ontario Government has published that Northern Ontario is currently at the beginning of a resurgence in the forestry industry and will soon be a significant contributor to sustainable, renewable architectural materials.² Accepting this theory, I will use a graphic narrative to frame the history of Northern Ontario's forestry industry and its impact on architecture and the forest. Through this, a narrative will form that brings Northern Ontario's past to its present, and then speculate a 'wood future' developed through the following question: *How can Northern Ontario build upon the history of its forestry to evolve wood architecture and culture towards a sustainable future?*

'Wood Future' is defined for our purposes as a societal goal of using wood architecture to strike a better harmony with the environment and is formed as a response to climate change. In 2021, the United Nations released a critical report from the IPCC (Intergovernmental Panel on Climate Change) that put the planet on a "red alert" to reduce emissions by 2030 or the planet will suffer irreparable damages.³ These damages come in the form of rising global temperatures, catastrophic weather events, and ecological devastation. The emissions in question are greenhouse gasses, namely carbon dioxide and methane, and a large part of the former comes from the construction industry which can be addressed through architectural design and construction methods and materials.⁴ In addition to reducing the carbon dioxide being emitted, the planet can also practice sustainable forestry that sequesters carbon into wood products.⁵ Both approaches can be sought in Northern Ontario through its forests and buildings. With these strategies in mind, the planet's emissions can be addressed on two fronts with one response: wood architecture made from sustainably grown wood products.

Wood architecture as a sustainable response to lessen the carbon footprint of buildings is not a new idea: the Canadian Building Code is already being amended to allow for wooden high rise construction as engineering

1 Bruce King, *The New Carbon Architecture: Building to Cool the Climate* (Gabriola Island, BC, Canada: New Society Publishers, 2017), 25.

2 Ontario, "Sustainable Growth: Ontario's Forest Sector Strategy," ontario.ca, accessed November 16, 2021, <http://www.ontario.ca/page/sustainable-growth-ontarios-forest-sector-strategy>.

3 "UN Climate Report a 'Red Alert' for the Planet: Guterres," *UN News*, February 26, 2021, <https://news.un.org/en/story/2021/02/1085812>.

4 "Manifestos on the Climate Crisis," *Canadian Architect* (blog), November 1, 2020, <https://www.canadianarchitect.com/manifestos-on-the-climate-crisis/>.

5 S J Colombo, J Chen, and M T Ter-Mikaelian, "Carbon Storage in Ontario's Forests, 2000-2100," n.d., 8.

pushes the limits on what wood can do.⁶ Engineered wood products such as cross-laminated-timber are emerging as a glimmer of hope in architecture, and have already proven their carbon-capturing potential: a tonne of timber stores a larger amount of carbon than is produced when making a tonne of concrete.⁷ However, despite the precedent being set over a decade ago, wood buildings remain in the realm of high end architecture – as of 2020, only 0.5 percent of new non-residential buildings are being constructed with timber.⁸ This strikingly low number is due in large part to environmentally-minded architecture not being as profitable of a business model for designing and constructing by architects and developers. This will slowly change with time, but can be helped along by establishing precedents.⁹

Northern Ontario is well positioned for this study. It has the forests as well as the forestry history to support and inform an evolution of wood architecture. Two-thirds of Ontario is covered in forest, which accounts for two percent of the planet's forests overall, and the majority of this forest resides in Northern Ontario.¹⁰ It is no surprise then that Ontario has had a rich history of forest industry. Ontario has had an active timber trade for over two hundred years that has supplied the province with lumber, paper, and pulp while contributing to one of Canada's biggest exports.¹¹ This history has transformed the natural and built landscape of Ontario, although not always for the better.

Forests and forestry have an innate conflict that often sees one thrive at the other's expense. However, more recently in Ontario's history, forests and forestry have begun to find harmony through sustainable forest management.¹² This has made wood a truly renewable resource, and opened forestry up to sequester tonnes of carbon dioxide over the next one hundred years.¹³ It is this key that unlocks the possibilities of the thesis question. Through sustainable forest management, Northern Ontario has an opportunity to store carbon and provide renewable material alternatives through their wood products.

In order to see the next evolution of this Wood Future within Northern Ontario, I delved into its past: the story of the timber trade in Ontario, and the buildings and forms related to this process. From its inception, the

6 Emily Chung, "Wood Highrises: 2 Environmental Benefits for the Price of 1," *CBC News*, February 6, 2020, <https://www.cbc.ca/news/science/what-on-earth-newsletter-wood-buildings-climate-migrants-1.5454418>.

7 Alex de Rijke, "Engineered Timber: A Manifesto," *Architects' Journal* 229, no. 4 (February 5, 2009): 37–40.

8 Galina Churkina et al., "Buildings as a Global Carbon Sink," *Nature Sustainability* 3, no. 4 (April 2020): 269–76, <https://doi.org/10.1038/s41893-019-0462-4>.

9 Patrik Söderholm, "The Green Economy Transition: The Challenges of Technological Change for Sustainability," *Sustainable Earth* 3, no. 1 (June 22, 2020): 6, <https://doi.org/10.1186/s42055-020-00029-y>.

10 Ontario, "Sustainable Growth."

11 R. S Lambert et al., *Renewing Nature's Wealth; a Centennial History of the Public Management of Lands, Forests & Wildlife in Ontario, 1763-1967*, (Toronto? Ontario Dept. of Lands and Forests, 1967), 35.

12 "Forest History Society of Ontario - MNR History," accessed November 23, 2021, <http://www.ontarioforesthistorystory.ca/index.php/mnrf-history>.

13 Colombo, Chen, and Ter-Mikaelian, "Carbon Storage in Ontario's Forests, 2000-2100," 25.

forestry industry in Canada has supplied the material for its own advancement. One of the first requests ordered from the British Colonies' woodlands was timber for shipbuilding, which then allowed more timber to be shipped back to Europe.¹⁴ Another great request of the forest industry was to build railways that would facilitate moving logs where rivers wouldn't allow. This self-advancement is seen in the architecture of forestry itself. The industry generated the typology of buildings in two ways: creating forms to support the proliferation of the industry, and forms created from the industry's products. An early and vivid example of this is the log cabin. Although Scandinavian in origin, the log cabin thrived across Ontario.¹⁵ The wood required was abundant and the simple construction allowed for quick housing for forestry camps. This model of building was further developed through sawmills that sprang up all over the province, as well as various other industrial forms such as jack ladders, chutes, and rafts.¹⁶ The buildings were borne of the materials and tools at hand using skills honed through lifetimes in the forestry industry. This idea supports the concept of a Wood Future in Northern Ontario: inspiration from the past to drive the future.

The research recounts the history of forestry and its relationship to architecture and speculates on where that relationship could lead. I then present this as a graphic narrative to explore these ideas through drawing alongside a written narrative. In this way, the narratives can become reflexive of each other, and allow for self-analysis. The creation of this twinned narrative will be able to regard itself and move beyond history to speculate as to where the story goes next.

As a continuation of the research, the design project builds upon the past to answer the research question. The history that survives today comes in the form of ruined mills, archival photographs, and a recovering landscape. Many towns in Northern Ontario had economies heavily dependent on forestry, but the industry has since waned. The industry has seen many ups and downs, but the latest 'down' is due to a few different factors: the economic value of the Canadian dollar against the U.S. currency, increased duties costs at the U.S. border, the decline of the newspaper industry, and the housing recession of 2008 are few primary causes.¹⁷ As a result, sawmills have closed, and towns have turned to other industries. Some small mills centralized, creating plants that process high volumes at efficiency and choking out smaller mills during times of economic hardship. The design project imagines the redesign of the town of Temagami to establish precedent for other Northern Ontario towns that once flourished with the industry. The program is a new sawmill and fabrication centre that serves the

14 Lambert et al., *Renewing Nature's Wealth; a Centennial History of the Public Management of Lands, Forests & Wildlife in Ontario, 1763-1967*, 25.

15 T. Ritchie, *Canada Builds, 1867-1967* (Toronto: University of Toronto Press, 1967), 13.

16 Frank Rasky, *Industry in the Wilderness: The People, the Buildings, the Machines -- Heritage in Northwestern Ontario*, The Dundurn Local History Series 1 (Toronto, [Ontario] ; Dundurn Press Limited, 1983), 45.

17 Greg Keenan, David Parkinson, and Brent Jang, "Paper Trail: The Decline of Canada's Forestry Industry," *The Globe and Mail*, December 5, 2014, <https://www.theglobeandmail.com/report-on-business/economy/paper-trail-the-fall-of-forestry/article21967746/>.

town and surrounding communities. This reflects the architectural echoes created by the original impact of the local sawmill. This mill and fabrication centre allows for the material and manufacturing processes to remain local, further reducing emissions caused by transportation. Furthermore, the project imagines new wood products and vernacular that take advantage of the new twenty-first century sawmill. It dreams of new wood architecture as produced from this mill and envisions a future of environmentally beneficial buildings.

APPROACH

The methodological approach to the thesis is research-creation through graphic narrative alongside a textual narrative/literary review. The combined narrative can be read through the text, through the drawings, or a combination of both. The research-creation methodology works by synthesizing the literary review through a visual, architectural language. For each panel, the concepts are researched, critically considered, and developed to graphically create part of the narrative. This combination of literary review and drawing is a method of research that explores this subject through a new light and can bring history and speculation into the graphical language of architecture.

The graphic medium is a powerful tool for the communication of architectural form space. Jason Dittmer and Alan Latham from University College London argued three claims about the medium of graphic narrative and its connection to space: first, that both graphic illustrations and spatial installations can produce narratives, second, that the relationship between sequential spaces forms a narrative itself of how they are shown, and third, artistic reinterpretation of familiar spaces whether through artistic installation or graphic narrative has political potential to instill new sensibilities in the observer.¹⁸ Through these claims, the thesis uses the sequential graphic illustrations to create an expressive narrative that links history to space and space to speculation.

¹⁸ Jason Dittmer and Alan Latham, "The Rut and the Gutter: Space and Time in Graphic Narrative," *Cultural Geographies* 22, no. 3 (2015): 442.

CHAPTER ONE

BEFORE FOREST INDUSTRY: PRIOR TO 1800

Forestry and its relationship with architecture is a history that begins when forestry became an established industry by the British colonies around the start of the 19th century. To comprehend that start, this story begins with the first peoples of Canada before European colonies were formed.

The lands that would eventually become Ontario were managed by indigenous groups before colonization for time immemorial, long before the timber trade started. Although no ownership was recognised, the de facto rights to the land belonged to the First Nations that lived in the area.¹ The question of who owned the land was not asked because it wasn't part of the first people's worldview. The First Peoples held the belief that they "did not claim absolute ownership of the lands, only the right to their use,"² This belief is an important distinction that frames the relationship that indigenous peoples had with forest management in a critical light as 'eco-centric', that is, considering themselves and the lands as part of one ecosystem.³ In contrast, many of the ideas about forest management developed by Western colonizers put human activity at the centre, and by doing so establish a framework of human ownership, human action and human impact.

The technical practices employed in forestry by first peoples were learned from the lands themselves. Trees were chosen with careful consideration to harvest based on the size and health of the tree and the environment.⁴ There was a spiritual understanding that the lands provided for the people, and so the people were invested in maintaining those lands for the continuation of their existence. The trees were cut down using stone axes⁵ and then shaped, sometimes by tools made from beaver teeth.⁶ The tools allowed for complicated craftwork and met the needs of the indigenous peoples for creation of tools and shelter. The First Peoples used wood in their architecture to create a variety of forms by using various parts of the tree. Large trees were difficult to cut, so smaller saplings were used for

1 Sara Teitelbaum and Stephen Wyatt, "Is Forest Certification Delivering on First Nation Issues? The Effectiveness of the FSC Standard in Advancing First Nations' Rights in the Boreal Forests of Ontario and Quebec, Canada," *Forest Policy and Economics* 27 (February 1, 2013): 23–33, <https://doi.org/10.1016/j.forpol.2012.09.014>.

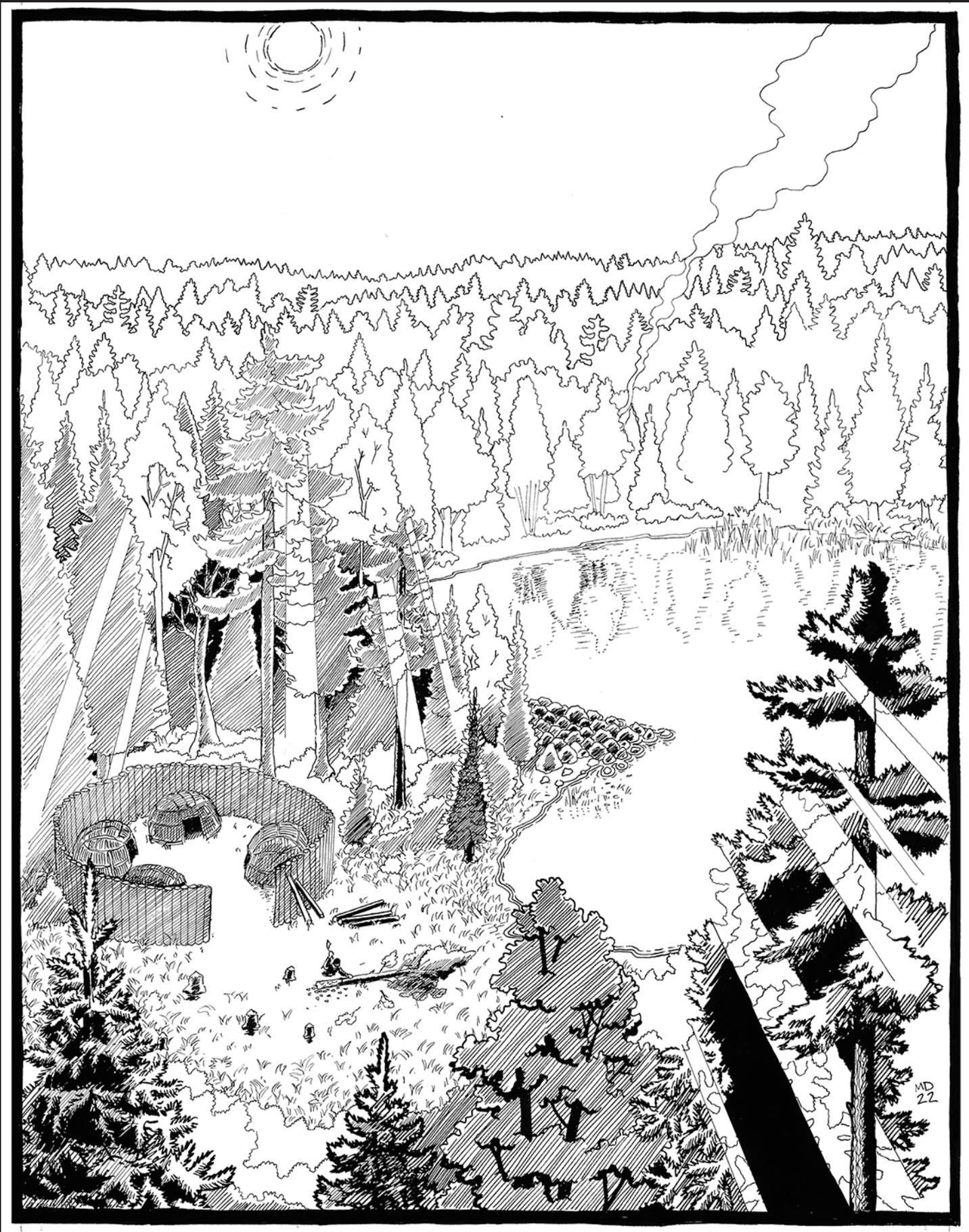
2 Olive Patricia Dickason and William Newbigging, "Towards Confederation for Canada, Towards Wardship for First Peoples: A Concise History of Canada's First Nations," in *Roads to Confederation* (University of Toronto Press, 2017), 65, <https://doi.org/10.3138/j.ctv1n35b24.7>.

3 Reginald Parsons and Gordon Prest, "Aboriginal Forestry in Canada," *THE FORESTRY CHRONICLE* 79 (August 1, 2003): 780, <https://doi.org/10.5558/tfc79779-4>.

4 Mark Kuhlberg, ed., "Challenges, Conflicts and Cooperation: The Ministry of Natural Resources and Forestry's Completed History with Ontario's First Nations," *Forest History Society of Ontario*, 2017, 2, http://www.ontario-foresthistorystory.ca/files/mnrf_history_relations_with_first_nations.pdf.

5 "The Old Occupation of Lumberjack," *The French-Canadian Genealogist*, accessed December 20, 2021, <https://www.tfcg.ca/old-occupation-lumberjack>.

6 Kuhlberg, "Challenges, Conflicts and Cooperation," 3.



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22

Figure 02. Forests before colonization.

structure along with bark and leaves.⁷ These wood products were utilized often in combination with hides and furs to insulate the structure.⁸ These materials created many types of architecture: permanent structures that were used in the winter, and nomadic, portable structures used in the summer for hunting expeditions. The most prominent type of permanent architecture in Ontario was the longhouse, built by setting a large perimeter of saplings into the ground and bending them into a curved vaulted roof. This was then covered in pieces of bark and reinforced with more saplings. Permanent First Nations settlements also occasionally built palisades along the perimeters of their communities, once again using saplings set into the ground. For temporary shelters, indigenous groups of the Ontario area favoured the wiigwam, a small dome-like structure. Like the longhouse, wiigwams were built using a sapling structure and covered in birch bark, but at a much smaller scale, allowing them to be built more quickly and easily.⁹ The vernacular of these structures illustrate the properties of wood products that would continue to shape wood architecture: long, slender beams that support an exterior skin.

The role of the forest in the first people's lives was a relationship of dependence, but with deep understanding and respect for the lands that sustained them rather than pure utilization or domination. The indigenous worldview placed themselves among the natural ecosystems rather than being an outside observer of it. Because of this, forest management in these times could not even be defined as such. Rather, the first peoples had values entrenched in their culture and language that guided them to manage their relationship with the forest rather than managing the forest itself.¹⁰ The forest was respected for providing wood as well as being the home of the animals they hunted. Some groups would say a prayer or offer tobacco to the forest for the resource they were taking from it.¹¹ Although the relationship with the forest was based on appreciation and respect, sometimes that was expressed through controlled destruction to foster food production. Indigenous groups would start small forest fires, referred to today as cultural burning, to promote growth and regeneration, agricultural preparation, or to drive animals for hunting.¹² For the forest, cultural burning could clear dead, dry wood, and make way for new growth, or allow current trees to grow bigger. This also prevented the build up of flammable materials that could lead to large, uncontrollable forest fires later. The practice of cultural burning did however release sequestered carbon into the atmosphere as carbon dioxide but offset this by allowing for new growth that would store

7 "First Nations," accessed December 20, 2021, <http://www.ontarioarchitecture.com/Firstnations.htm>.

8 Kuhlberg, "Challenges, Conflicts and Cooperation," 3.

9 "First Nations."

10 Parsons and Prest, "Aboriginal Forestry in Canada," 781.

11 Parsons and Prest, 780.

12 "Gov't Disregard of Indigenous Prescribed, Cultural Burns 'Created This Catastrophe': Advocates," *CTV News*, July 27, 2021, <https://www.ctvnews.ca/climate-and-environment/gov-t-disregard-of-indigenous-prescribed-cultural-burns-created-this-catastrophe-advocates-1.5525057>.



Figure 03. Surveying the land.

carbon and by preventing larger fires that would release exponentially more carbon.¹³ On the scale of anthropogenic, geologic change, the first peoples' forestry practices did not have an impact of significance on the forests of Ontario.

The evolution of technology in the 18th century was not seen largely in forestry but instead in the surveying of the land that would build the foundations of the future forest industry. Although forestry was not an industry yet, harvesting trees still took a step forward. Settlers brought the iron axe with them from Europe, a stronger but mechanically similar version of the stone axe. For surveying, agents of the Hudson's Bay Company were tasked to survey the lands beyond Upper and Lower Canada, known as Rupert's Land, which now includes Northern Quebec, Northern Ontario, and large parts of Manitoba, Saskatchewan, Alberta, and the Territories.¹⁴ These surveyors used finely crafted sextants and watches brought from Britain, which were valued over their own lives due to their high cost and localized production.¹⁵ Despite the value placed on the equipment, this method of surveying was prone to small errors both on the part of the surveyor and the instrument, leading to inaccurate maps and border disputes. Later surveying in the 19th century slowly increased in accuracy and developed tools better suited to surveying the land rather than the nautical equipment they had been using. These chiefly included the circumferentor which had a compass built in and the theodolite which used a telescope in a similar way to the sextant. Companies in Toronto started manufacturing these instruments providing easier access for surveyors to buy and maintain equipment.¹⁶

The British Crown was given claim to the lands by France. In turn, the Crown gave logging rights to prospective settlers on the condition that the land be cleared for agriculture to support the colonies. Timber harvesting was done at a small scale to provide fellow settlers with much needed building materials.¹⁷ No large-scale industry was done yet, but Britain claimed the largest stands of trees for future harvest for ship building.

13 Kelly Boutsalis, "The Art of Fire: Reviving the Indigenous Craft of Cultural Burning," *The Narwhal*, accessed December 20, 2021, <https://thenarwhal.ca/indigenous-cultural-burning/>.

14 Peter Broughton, "The Accuracy and Use of Sextants and Watches in Rupert's Land in the 1790s," *Annals of Science* 66, no. 2 (2009): 211, <https://doi.org/10.1080/00033790902743001>.

15 Broughton, 213.

16 Randall C. Brooks and William J. Daniels, "Surveying Instrument Makers of Central Canada," *Canadian Journal of Civil Engineering* 20, no. 6 (December 1, 1993): 1039, <https://doi.org/10.1139/193-134>.

17 Ken Drushka and the Forest History Society, *Canada's Forests: A History* (Montreal: McGill-Queen's University Press, 2003), 22-24.

CHAPTER TWO

THE TIMBER TRADE BEGINS: 1800 – 1840

The start of the nineteenth century defined the beginning of cutting and processing wood at an industrial scale across Ontario. This was due in part to American Revolution, which resulted in British loyalists moving from the United States to the remaining British North American colonies and bringing with them capital and skills.¹ This started and flourished in Eastern Ontario and Ottawa became the focal point of the timber trade thanks to the Ottawa River that powered the mills and connected the city with distant timberlands. Companies of forest workers would venture to remote tracts of land that they had purchased the logging rights to. The lumber party would build a shelter and spend a winter cutting down trees. In the spring, they would drive the logs to town to be milled. This was done by hauling logs on sleighs by horses and floating the logs down rivers.

The phenomenal growth of the timber industry at the start of the nineteenth century is regarded by historians as the start of the ‘timber trade’ that kicked off a period of significant growth in the Ottawa Valley. This start is attributed to the efforts of American entrepreneur Philemon Wright, who in 1806 successfully navigated a timber raft down the Ottawa river to Quebec City to be exported to Britain.² Timber rafts were commonly used to float loads of timber down rivers or across bodies of water. Forest workers would cut trees and flatten the sides of the resulting logs to ‘square’ the timber. This allowed an easier assemblage of a timber raft, as the square lumber could be more easily lashed together. These rafts could be enormous in size and act as mobile base for the forest workers to travel back with their product. The products would be sold as is or milled into other products. At the start of the timber trade, sawlogs were simply the product, as they could be turned into other products or used as is in log construction. As the industry and Canadian society evolved, square timbers were preferred, and this gradually changed to sawn boards.³

The timber trade was further bolstered by an increase of trade because of the Napoleonic Wars. Britain was cut off from its Baltic lumber by France and turned to its colonies for imports.⁴ Forest companies, eager to get a paycheck from the deep pockets of the crown, jumped at the opportunity. Shipping wood to Europe was an expensive process that resulted in a small profit margin. By 1820, Britain imported four times more lumber from North American colonies than anywhere else.⁵

1 Ken Drushka and the Forest History Society, *Canada's Forests: A History* (Montreal: McGill-Queen's University Press, 2003), 27-28.

2 Lambert et al., *Renewing Nature's Wealth; a Centennial History of the Public Management of Lands, Forests & Wildlife in Ontario, 1763-1967*, 33.

3 Drushka et al, 30.

4 Drushka et al., 29.

5 Lambert et al., 35.

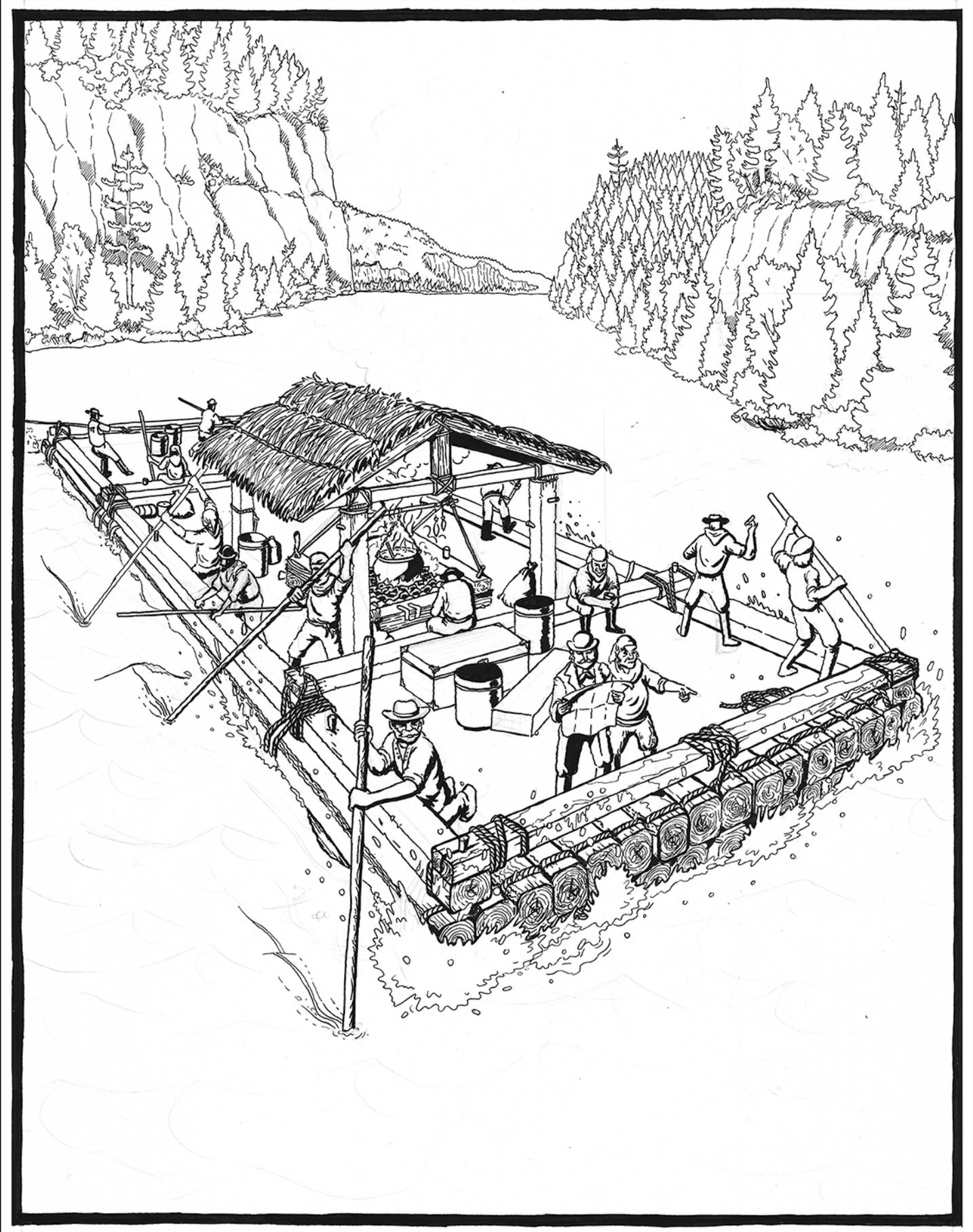


Figure 04. Timber rafting down river.

The technology of harvesting this high volume of lumber remained simple. The use of metal axes allowed large trees to be more easily harvested for construction. The abundance of wood and the simplicity of construction made log construction an efficient vernacular for building quickly.⁶ The lightly processed form of the tree was very evident in these building forms, connecting them directly to the forest that surrounded them. This is seen in the architecture of the forest industry itself, as well as the buildings of then Upper Canada. Forest workers used the plentiful material to build timber slides to avoid river rapids. Timber slides were constructed as long, straight wooden chutes to bypass turbulent stretches of rivers that were used to transport logs. The logs instead were directed to the slide and slid along through the forest to a calmer part of the river. This was crucial for log drivers to avoid log jams that were dangerous and costly to clear. Outside the industry, French and British colonists made log houses for basic shelter. The design of this form is attributed to Swedish and Finnish settlers, as well as German settlers coming north from Pennsylvania.⁷ This was an easy form to produce on the frontier and became the dominant form for structures. In 1831, about 75 percent of dwellings in Ontario were log constructions.⁸ Although the log cabin represented the majority of buildings, it was by no means the extent of architecture in the province. Formal buildings were crafted with a lot more design, making local materials work to suit architectural traditions that the colonies brought from Europe.⁹ Ontario's formal architectural style resembled that of European styles but remained years behind due to the geographical distance.

Settlers continued to join the colonies of Upper Canada. To encourage long-term settlement and growth of the colony, Britain allowed settlers to buy land and have the exclusive rights to cut and sell the trees on it – if they settled on the land. Timber companies were not allowed to cut trees on bought land, and instead had to procure special logging rights. To clear farmland more quickly, settlers would instead burn the trees and sell the resulting ash to make potash fertilizer.¹⁰

As burgeoning timber companies continued to claim resources with little to no oversight, the then government of Upper Canada took the opportunity to control and generate revenue from the seemingly limitless land. They established the department of Crown Lands to oversee the distribution and claims to various natural resources. For the nascent forest industry, the Department of Crown Lands controlled claims to timberlands and collected fees and duties from wood cutters.¹¹

6 Alan Gowans, *Building Canada; An Architectural History of Canadian Life*, (Rev. and Enl. Ed.) (Toronto, Oxford University Press, 1966: Toronto, Oxford University Press, 1966), 5.

7 Gowans, 7.

8 Brian Coffey, "From Shanty to House: Log Construction in Nineteenth-Century Ontario," *Material Culture* 16, no. 2(1984):69.

9 Gowans, 21.

10 Drushka et al., 25-26.

11 "Forests and Forest Management" *An Updated (1967 -2017) History of the Ontario Ministry of Natural Resources and Forestry*, Forest History Society of Ontario, <https://ontarioforesthistorystory.ca/index.php/mnrf-history>.

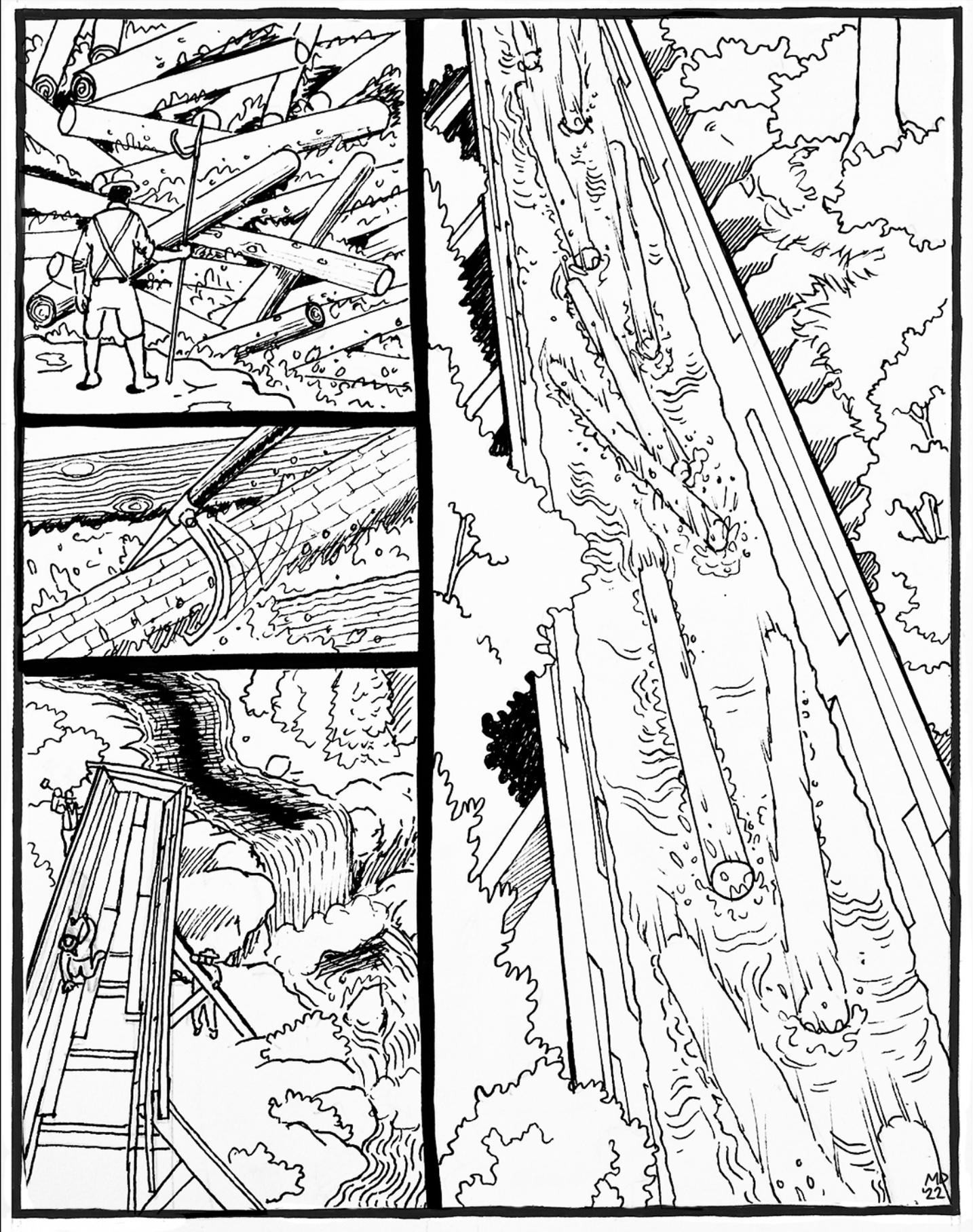


Figure 05. Construction of a timber slide.

CHAPTER THREE

INCREASING DEMANDS: 1840 – 1900

As Ontario became more industrialized, it was able to access its natural resources to a much greater extent. This occurred at a time when the United States was rapidly expanding and had already depleted many of its own forest resources. Naturally, the United States became a major importer of Canadian wood products.¹ This put a great demand on Ontario's forest industry, which once again grew to meet it. The Ottawa Valley saw the rise of 'lumber barons' that became famously wealthy from their trade. The seemingly inexhaustible forests provided tonne after tonne of timber if one had the means to harvest it.

The shanty or shantyhut was an architectural symbol of the early forest industry. This simple, squat, log building was quick to assemble in the wilderness and became the seasonal home to the workers of the timber trade. Not as permanent or pleasant as the log cabin of the settler, the shanty consisted of a windowless cabin made from logs, roofed with bark, and patched with moss. This crude form featured a cooking pit in the middle and a hole in the roof for smoke to escape. The building was limited in its functions but provided enough shelter for sleeping, eating, and preparing for a day's work in the forest. Loggers, 'bushers', 'cutters', or 'timber beasts' as they were sometimes called, were renowned for their rough, survivalist lifestyle, and their resourcefulness.² The simple structure of the shanty could be built in as little as a day, but any extra details like patching holes and hanging a proper door took extra time but could still be accomplished in the span of a week.³ This use of wood as quick, reliable construction was echoed to more complex and permanent structures. However, despite being hardy and versatile, log structures tended to settle and warp with changes to temperature and humidity. In Britain, where many of the settlers emigrated from, this phenomenon did not greatly affect log structures as much as it did in Ontario's climate and seasons. This issue was manageable, but an alternative to log construction was adopted. Timber framing allowed wood to move and settle with more freedom and still used the readily available material. Between log structures and timber framing, wood was the main building material of virtually all structures in Ontario for the rest of the century.⁴

Various technological strides were seen in forest industry as well. The greatest examples of this were advancements in the mills that processed the wood, and the implementation of railways to bring transport logs and wood products across the province, in addition to a few types of steamboats and tractors. The sawmills that had previously utilized water wheels

1 Ken Drushka and the Forest History Society, *Canada's Forests: A History* (Montreal: McGill-Queen's University Press, 2003), 38.

2 Frank Rasky, *Industry in the Wilderness: The People, the Buildings, the Machines* (Toronto, Dundurn Press Limited, 1983), 31-33.

3 Brian Coffey, "From Shanty to House: Log Construction in Nineteenth-Century Ontario," *Material Culture* 16, no. 2(1984):63.

4 T. Ritchie, *Canada Builds, 1867-1967*. (Toronto, University of Toronto Press, 1967): 168.

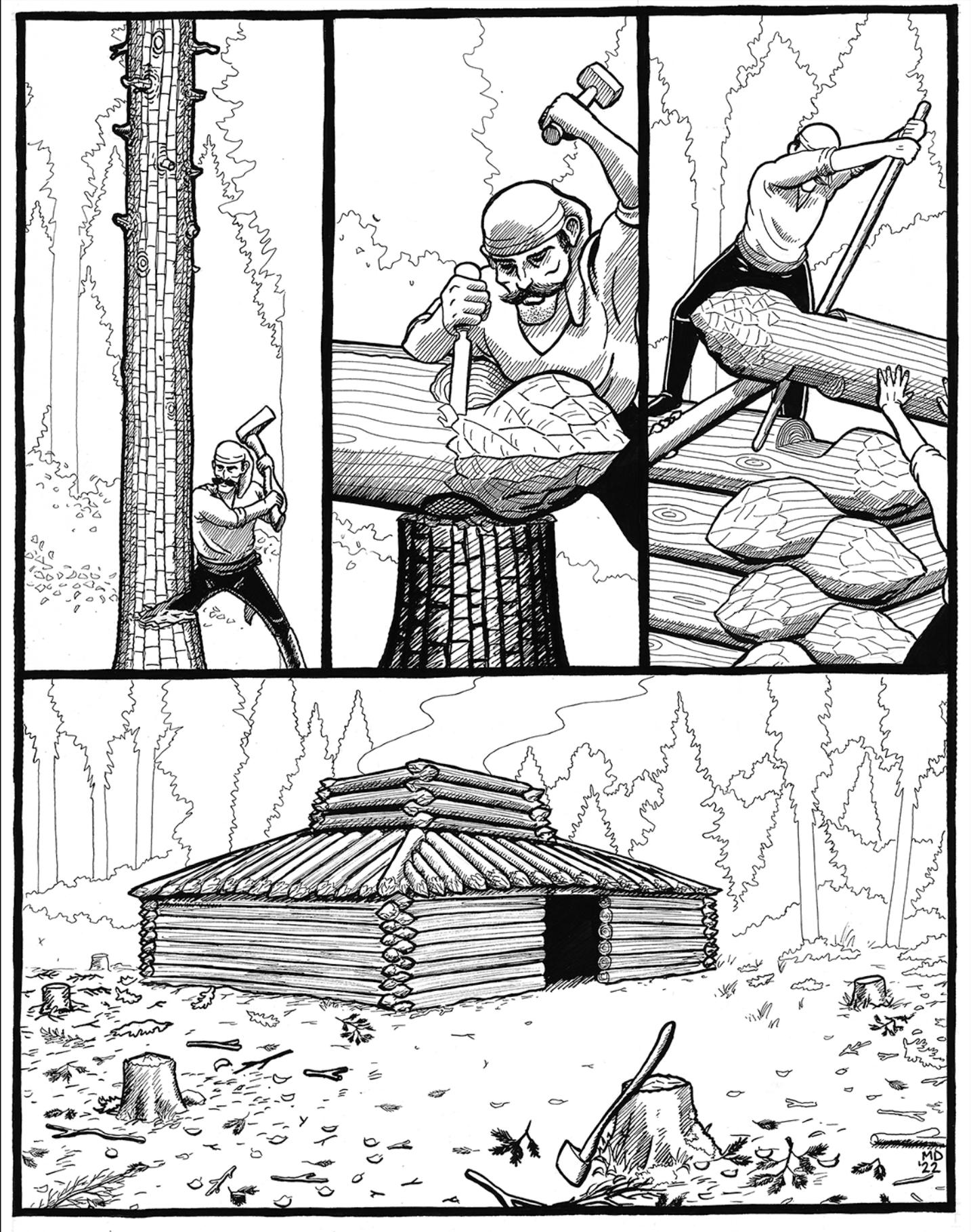


Figure 06. Building a shanty.

switched to simple steam engines powered by burning the waste from the mill. The railways, which also utilized the steam engine, were products of the wood industry itself. Massive amounts of wood were used for ties, bridges, boxcars, stations, and fuel for the early steam engines.⁵ In this way, the forest industry provided the products to build its own infrastructure. In addition to hauling logs to be milled, the railways also allowed for the “rootless” to easily join in logging work and other frontier work that facilitated logging. This romantic lifestyle of living on the edge of the wilderness helped turn wanderers into industry workers, further supporting the industry.⁶ This self-perpetuation exemplified the versatility and potential of the wood industry.

The timber trade blazed its way across Ontario with its new powerful machines. It was at this point, towards the end of the nineteenth century, that the industry’s large-scale effects on the environment were recognised. Lumber workers left a heavy trail of environmental destruction in their wake. The forests in Southern Ontario were stripped of all mature pine. Stands of timber would be high graded; any unusable trees were left where they were. Branches or bark would be cut off good timber and left to rot in the forest or burned where they fell.⁷ The waste became prone to fires, and the fires from the slash-and-burn practices often spread beyond control. Vast stretches of Southern Ontario were quickly becoming deforested, an inevitable consequence seen by immigrant settlers from Europe.⁸ This led to the timber trade reaching farther north for stands of timber, relying on Ontario’s seemingly unending forests.⁹ Despite this albeit temporary solution, the disturbance to the forest was still noted as significant and needing to be addressed. This started many conservation groups that worked on ways to reforest lands for logging and recreation and protect those that had been so far spared the axe. Their efforts did not directly affect the profitable lumber industry for decades, but they did prompt the Ontario government to create Algonquin Park in 1893, the first provincial park.¹⁰ This served as safeguarded location for lumber as well as a place for the public to enjoy Ontario’s forests.

From the perspective of Southern Ontario policymakers, the province was considered to be a land of farming. When the forest industry continued to grow, it changed the image of Ontario. Suddenly, the scope and potential of the timber trade was recognised as Northern Ontario became an accessible part of the province. As the Clerk of Forestry put in his 1899 special report, “Until quite recently, Ontario was regarded as a purely agricultural country, adapted only to agriculture, in which timber was not considered an agricultural crop.”¹¹ This revelation prophesied Ontario’s future with the forest industry as being a cornerstone in its economy and culture.

5 Drushka et al., 33-35.

6 Rasky, 31.

7 Richard S. Lambert, Paul Pross, Ontario, and Department of Lands and Forests. *Renewing Nature’s Wealth* (Toronto: The Hunter Rose Company, 1967): 156.

8 Drushka et al., 43.

9 Lambert et al., 138.

10 Lambert et al., 277.

11 Lambert et al., 9.

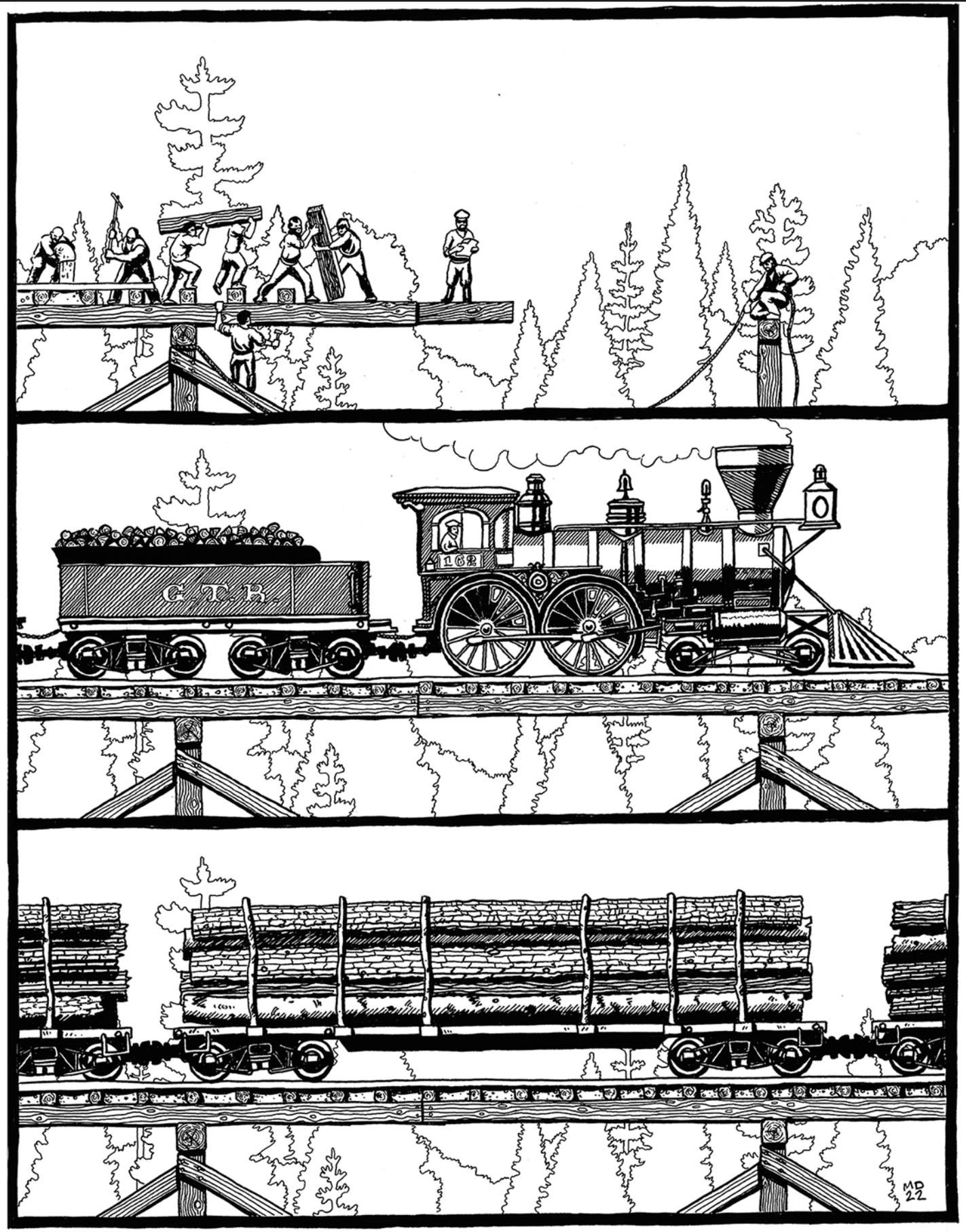


Figure 07. Completing the Grand Trunk Railway.

CHAPTER FOUR

RISE OF PULP AND PAPER: 1900 – 1945

The turn of the twentieth century was a revolutionary time for forests and forestry in Ontario. The timber trade was expanding, and forestry practices were evolving to keep up with it. Despite growth, the forest industry gradually came to grips with a disturbing truth: the timber previously thought to be endless was quickly becoming depleted. These developments also changed the public perception towards nature. The exploitation of Canada's resources started being seen as a limited venture: although the country had vast, untapped potential, the effects of deforestation and environmental disturbance were recognised as symptoms of finite capitalization.¹ Many companies pivoted from timber to pulp and paper, which used trees that were previously undesirable for lumber.² This marks the beginning of a shift towards environmentalism in Ontario, along with private companies adopting forestry practices.

As the timber trade expanded from the Ottawa Valley to Northern Ontario, frontier entrepreneurs seized the opportunity to cash in on the previously inaccessible timber. This was necessary to keep up with demands given the near-exhausted state of timberlands in Southern Ontario. They built sawmills across Northern Ontario, helping turn tiny camps into burgeoning towns with their businesses.³ Around the north shore of Lake Huron, various mills were consolidated into one large newsprint company under the name 'Spanish River Pulp and Paper.' This company grew to meet increasing newsprint demands and became the largest newsprint company in the country. Their operations oversaw the entire wood process from logging trees to making paper. As Ontario timber harvests had exploded in scale, Spanish River Pulp and Paper conducted investigations into their own harvests and the state of its controlled woodlands. They found that, at their current rate of harvest, their business could not be sustained, and they would be ruined in a decade. They turned to the Ontario government for assistance, but the province had no interest in helping private companies, despite leasing the land. So, Spanish River Pulp and Paper hired a forester; an expert on silviculture and managing woodlands. This was a relatively new and revolutionary idea for a private company to employ foresters. Other companies of the wood industry were simply continuing to cut and mill with little to no regard for the woodlands, and all the regard to increasing profit margins.⁴ The new forester, like many that would work across Ontario,

1 George Altmeyer, "Three Ideas of Nature in Canada, 1893-1914," *Journal of Canadian Studies* 11, no. 3 (1976): 32-34.

2 Ken Drushka and the Forest History Society, *Canada's Forests: A History* (Montreal: McGill-Queen's University Press, 2003), 42.

3 Frank Rasky, *Industry in the Wilderness: The People, the Buildings, the Machines* (Toronto, Dundurn Press Limited, 1983), 28.

4 Mark Kuhlberg, "'We Are the Pioneers in This Business': Spanish River's Forestry Initiatives after the First World War," *Ontario History* 93, no. 2 (2001): 150-152.

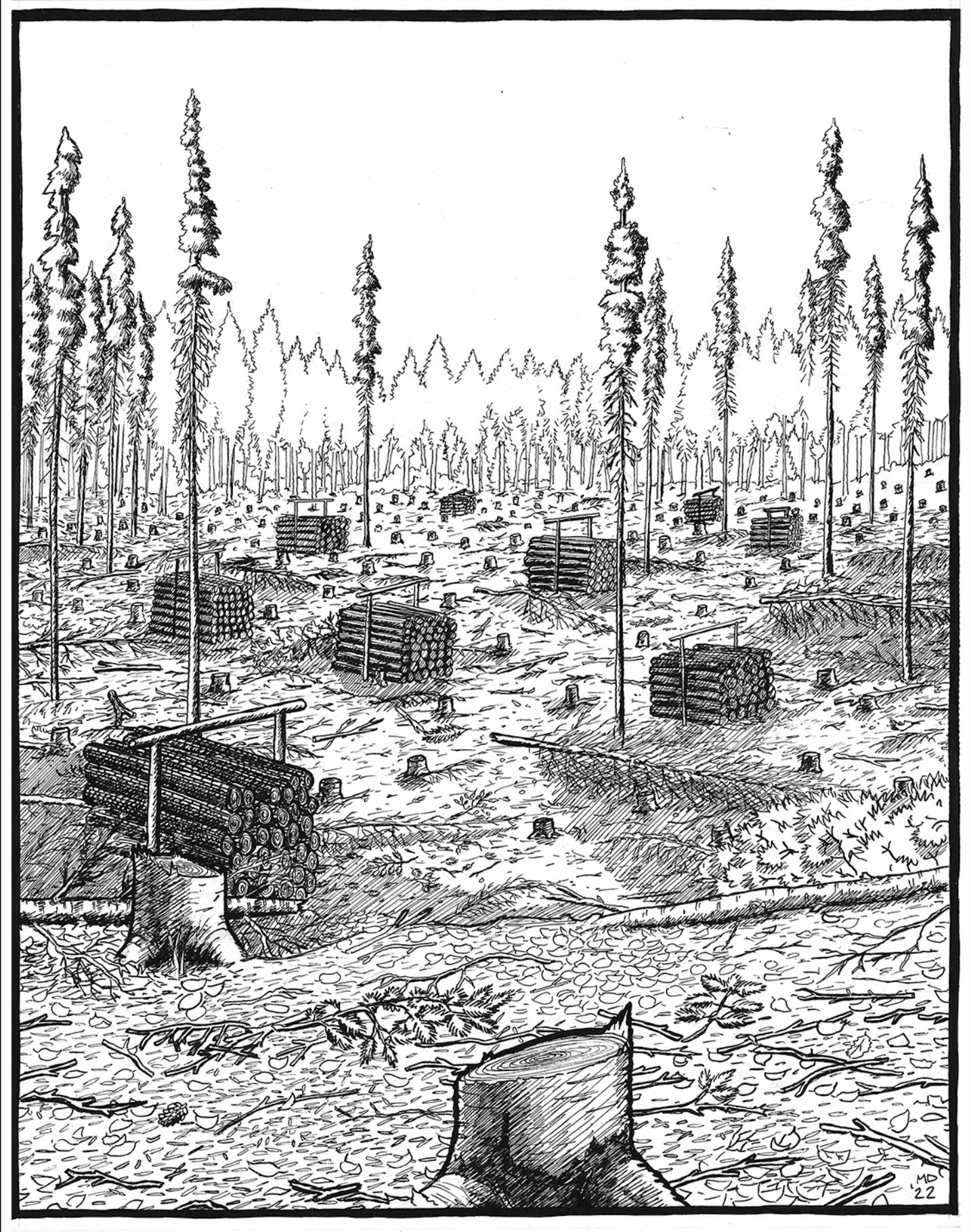


Figure 08. High-graded timberlands.

quickly found the flaws in the company practices. The loggers of Spanish River Pulp and Paper would cut the largest mature spruce trees (the ideal species for pulp and paper) and remove them from the forest, but it was the large, mature spruce that bore seeds that ensured regrowth of spruce in the area. This method provided a large yield of wood in the short term but crippled future productivity, as well as the health of the forest.⁵ This practice, and countless others made by the company, were changed by their resident forester and new company policy was made for managing their woodlands. This preceded any provincial forestry policy by decades. Forest management practices were significantly developed during this period by other private companies looking to build continuous, renewable industry. The Kimberly-Clark Corporation pioneered forest management techniques at their Spruce Falls pulp mill in Kapuskasing, Ontario. These practices were beyond provincial regulations and are regarded now as accepting a larger responsibility in environmental conservation when the provincial government did not.⁶ Although these companies were motivated by ensuring the continuation of its profits, they recognised that their business depended on the health of the forests they were harvesting from. This showed the first steps towards using the forests as a theoretical renewable resource.⁷

Further activism from conservationists and forest workers alike led to the province enacting the Forest Fires and Prevention Act in 1917 to combat increasingly dangerous and destructive wildfires. Part of this new policy saw the creation of strict policies, teams of rangers as well as another architectural form for the lumber industry: the fire tower. Fire towers were built across Northern Ontario to keep watch over the forests and raise an alarm by telephone at the sight of a fire. The structure consisted of a small wooden hut at the top of skeletal wooden structure. Later towers used steel scaffolding to reduce the sway of the structure.⁸ These towers were surpassed by aerial surveillance and were mostly dismantled by the twenty-first century.

During the First World War, a new demand was placed upon the Canadian lumber industry: Britain requested thousands of forestry workers from Ontario and the rest of Canada to serve the Crown in the forests of Europe. Sourcing lumber from Canada was inefficient for the war effort, so Britain formed the Canadian Forestry Corps to travel across the Atlantic and cut trees across Great Britain and France. This lumber was used to build and rebuild trenches and tunnels at a feverous pace to keep up with the shifting front lines of war.⁹

5 Mark Kuhlberg, “‘We Are the Pioneers in This Business’: Spanish River’s Forestry Initiatives after the First World War,” *Ontario History* 93, no. 2 (2001): 154.

6 Mark Kuhlberg, “‘A Forestry Program That Cannot Be Equalled in Canada’: Kimberly-Clark’s Extraordinary Silvicultural Project in Northern Ontario, 1928-1976,” *Ontario History* 112, no. 2 (2020): 241, <https://doi.org/10.7202/1072239ar>.

7 Drushka et al., 53.

8 Richard S. Lambert, Paul Pross, Ontario, and Department of Lands and Forests. *Renewing Nature’s Wealth* (Toronto: The Hunter Rose Company, 1967): 212-214.

9 Jensen Edwards, “Cutting down the Kaiser: How Canadian Lumberjacks Helped Win the First World War,” *Boundary Creek Times*, November 6, 2019, sec. News, <https://www.boundarycreektimes.com/news/cutting-down-the->

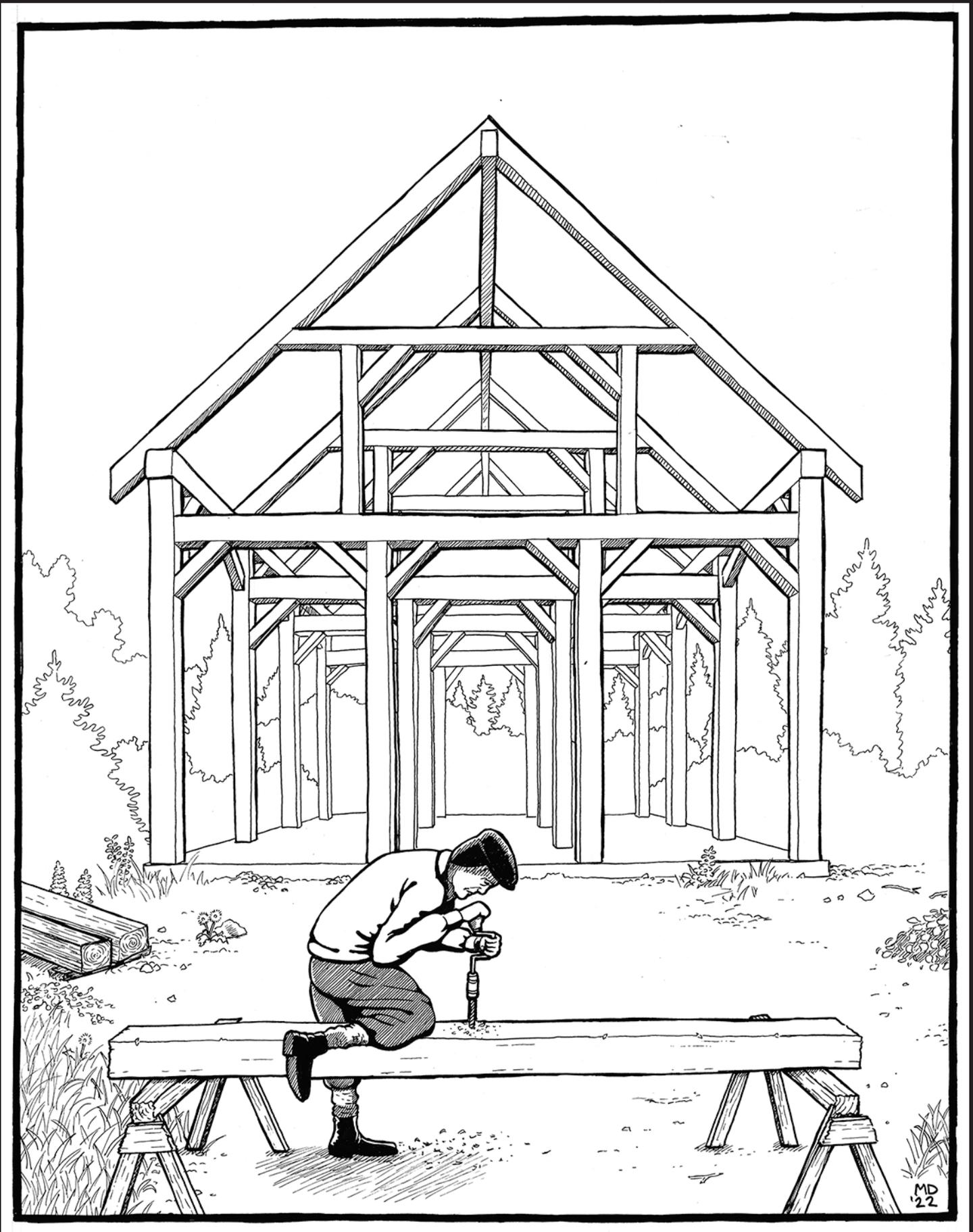


Figure 09. A timber framed house in construction

Alongside forest management practices, technology in the timber trade advanced significantly in the early twentieth century. Steam, diesel, and gasoline engines were quickly replacing horses as heavyweight log haulers. Four-wheel drive trucks, steam-powered sleighs, and diesel tractors were used to pull logs from the bush to rivers or roads. Many of these were enormously powerful, liable to break down far away from mechanics and part manufacturers in the city. One machine that shined above the rest for its use and uniqueness was the alligator, a steam-winchd amphibious boat that could portage itself from one body of water to another.¹⁰

The architecture of Ontario began to emerge as its own identity in the 1920s. For a long time in Canada, high-end architecture would follow in the footsteps of European vernacular that were tread years or decades earlier.¹¹ However, patterns in styles emerged from the construction of buildings that used the available wood materials local to Ontario. These materials were cut from similar trees, milled to similar regulations, and crafted by similar means; patterns that were consistent with the naturally emergent style of a geographic area.¹² This was the ongoing circumstances of architecture in Ontario until large enough timber was not available or too costly in price, at which point the style diverged from the European vernacular. Due to the timber available, residential construction also shifted from balloon framing to platform framing, which did not require such large pieces. Similarly, plywood became a widespread building material. Producing plywood could also be done from smaller trees than the ones sought for heavy timber, and utilized more of the tree, making it a more efficient use of resources.¹³ This further changed Ontario's building vernacular to reflect the forests that provided the primary resources for them. This inadvertent departure from European construction set Ontario on a course that helped build its own culture in the design and construction of its architecture.

kaiser-how-canadian-lumberjacks-helped-win-the-first-world-war/.

10 Frank Rasky, *Industry in the Wilderness: The People, the Buildings, the Machines* (Toronto, Dundurn Press Limited, 1983), 34-35.

11 Gowans, *Building Canada; An Architectural History of Canadian Life*. 118.

12 John J. G. Blumenson, *Ontario Architecture: A Guide to Styles and Building Terms (1784-1984)* (Markham, Ont: Fitzhenry & Whiteside, 1989), 185.

13 T. Ritchie, *Canada Builds, 1867-1967*. (Toronto, University of Toronto Press, 1967): 171.

CHAPTER FIVE

ENTER SUBURBIA: 1945 – 1973

After World War II, Ontario's forest industry underwent enormous changes. A post-war housing boom raised lumber prices. Mechanization in the industry evolved using new technology, new policies were made to ensure sustained yields of wood, and Forest Management Licenses were created to give government oversight to private forest companies.

With the demands of the war over, government policy makers took a hard look at Ontario's growing deforestation of key species used by the industry. In the Ottawa Valley, sawmills were too far from the resources they were built to process and were dismantled. Conservation efforts protected and reforested some areas but could not outpace the destruction being caused by the logging industry.¹ It was now very apparent that the forests had limits, and that the industry was quickly approaching them. The federal government subsidized costs for a sustained yield regime that limited the allowable annual harvest based on the amount of growth in the young forest.² This worked for a time but failed to address some of the larger issues at play. Current regulations were designed for cutting red and white pine, which were already nearly depleted in Southern Ontario. Many forest companies switched to jack pine and spruce for timber, which grew faster and not as tall. This meant that there was less time between harvests, although the dimensional lumber produced was not as large. This presented two issues to the Ontario government: they did not have detailed policy in regard to provincial licensing for the use of these species as lumber, and pulp and paper companies already sought stands of jack pine and spruce for their products.³ This required careful negotiations and policy making that stood in the way of meaningful conservation and reforestation efforts that continued to develop, albeit more slowly.

The Second World War brought significant advancements in many fields of technology. These technologies were quickly adapted for non-military uses during and after the war. For the forest industry of Ontario, this meant an evolution of mechanization in practices. New hydraulic log lifting machines further reduced and eventually eliminated the use of horses in the forest. Chainsaws replaced the crosscut saw as a quick way to fell trees. Mills achieved automation through mass-produced loaders and conveyors.⁴ These changes dramatically increased the efficiency of each worker in the forest industry, allowing them to keep up with the growing demands of the post-war housing boom.

1 Richard S. Lambert, Paul Pross, Ontario, and Department of Lands and Forests. *Renewing Nature's Wealth* (Toronto: The Hunter Rose Company, 1967): 212-214

2 Ken Drushka and the Forest History Society, *Canada's Forests: A History* (Montreal: McGill-Queen's University Press, 2003), 59.

3 Lambert et al., 421-423.

4 Drushka et al., 58.

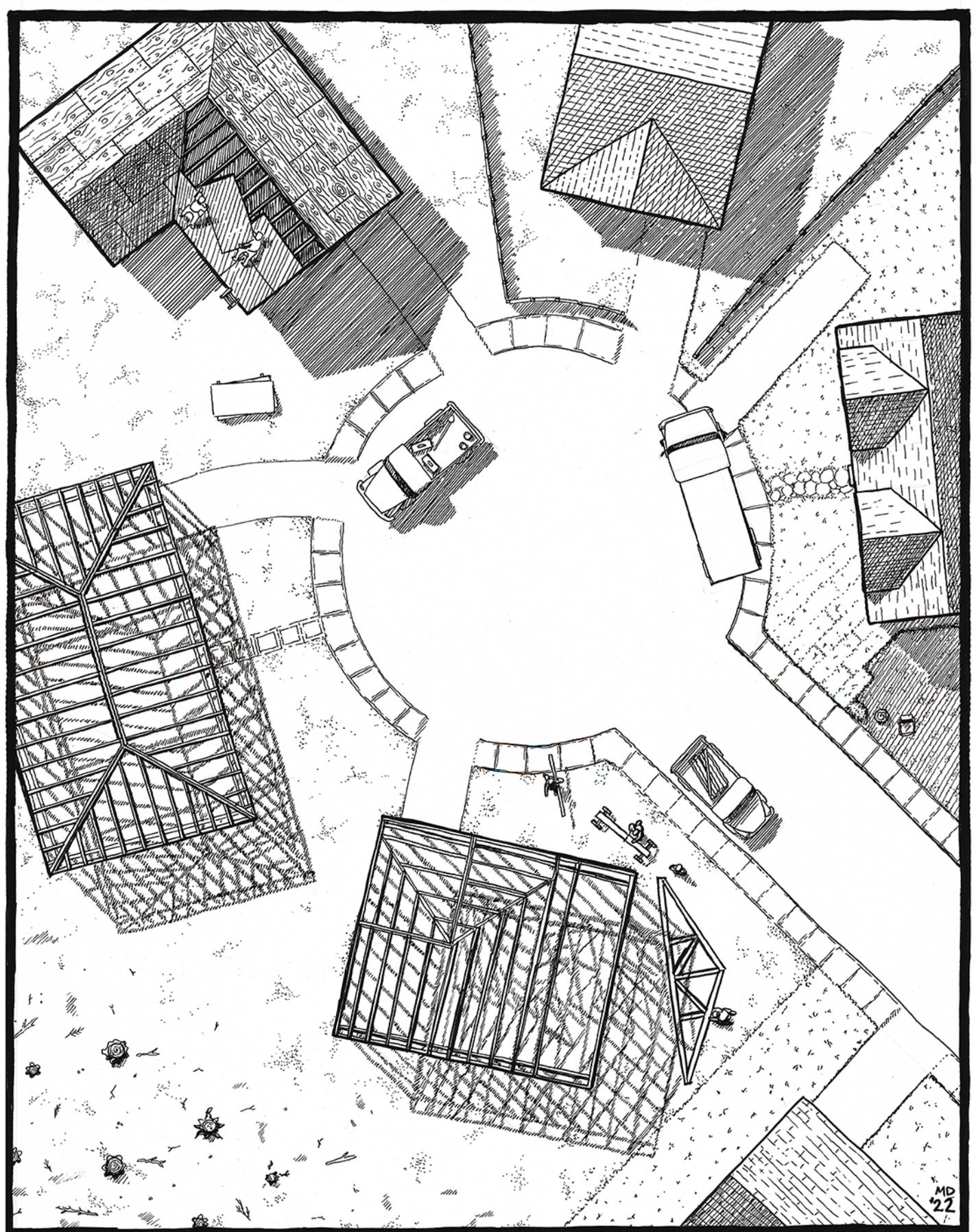


Figure 10. Building Suburbia

The lumber that wasn't exported was used in Ontario in new ways. New adhesives developed during wartime allowed for better laminated and bonded wood products. This included better plywood, chipboard, and glue-laminated timber. These materials opened new possibilities for architects and builders to design with more freedom using wood, incorporating dramatic curves and spans that were previously only obtainable with steel.⁵ This aided in the development of a regional modernist style in Ontario. As this architecture flourished, it started to embody its own distinctive nature, apart from the international modernist influence. Ontario's architecture has always been a little unique in comparison to the European styles it was emulating due to the available building materials, but until this point that uniqueness was simply a side effect. The 1950s and 60s saw a development in Ontario architecture that embraced its historical background, wood materials, and created a unique style out of preference, not necessity.⁶

Towards the end of this period there was a growing rise in environmentalism worldwide that garnered criticism of industrial capitalism. This is often associated with Rachel Carson's 1962 publication, *Silent Spring*, which warned of environmental destruction. In Canada, this movement placed environmental practices as permanent recurring issue in national politics.⁷ This prompted the creation of many more provincial parks to preserve ecologies as well as protect valuable timber for controlled harvest.

5 T. Ritchie, *Canada Builds, 1867-1967*. (Toronto, University of Toronto Press, 1967): 177-179.

6 Gowans, *Building Canada; An Architectural History of Canadian Life*. 164-165.

7 Katrin MacPhee, "Canadian Working-Class Environmentalism, 1965-1985," *Labour* 74 (June 18, 2019): 127-128.



Figure 11. Mechanization in the forest industry

CHAPTER SIX

THE DAWN OF CONSERVATION: 1975 – 2000

The forest industry had gradually come to a point of self-realization. The further timber harvesting expands, the higher the need for forest management practices, and the understanding that the forest does not give these resources but are robbed of them. From here, a paradox was recognised: humankind lives in nature, but also against it.¹ Nature forms our environment and supplies our resources, but by taking them we are diminishing nature. Forestry workers, as the figurative axe head of the wood industry, are more familiar with this existential condition than anyone. They see firsthand the disturbance done by widespread cutting but rely on the same devastating production to earn a living and feed their families. This put them in the precarious position of embracing environmental practices, but never the label of the ‘environmentalist’, which was associated with idealistic, but ignorant metropolitan thinkers, or as one forestry worker puts it, “Somebody from Toronto with a great big suit on and doesn’t have a clue of what’s going on.”² Inversely, the same thinkers from Southern Ontario commonly believed that it was the blue collar forestry workers who were ignorant of environmental practices. The contrast of these viewpoints made productive discussion around forest policy an uphill struggle.³

Conservation in forestry was not a new concept, but it had scarcely been implemented over decades of forest industry production. There were cases of conservation throughout Ontario’s forest history, such as the efforts by the Spanish River Pulp and Paper company and the Kimbly-Clark Corporation, but by and large the industry operated without prioritized silviculture, despite the efforts of conservationists. European foresters, primarily from Germany, started schools of forestry across North America. This included the University of Toronto’s Forestry Program, which studied silviculture.⁴ The efforts of the Forestry program went largely unappreciated for decades, as national and provincial governments were slow to legislate change. The sustained yield regime, while a step in the right direction, struggled to be effective due to a lack of information about the state of the forest. Furthermore, the volumes harvested from old growth forests were far greater than new growth but were calculated with the same policy. These issues led to inaccuracies in allowable harvest levels and necessitated an increase in applied conservation practices.⁵ Foresters and conservationists produced reports and proposals at the Ontario government’s request to

1 Thomas Dunk, “Talking About Trees: Environment and Society in Forest Workers’ Culture,” *The Canadian Review of Sociology and Anthropology* 31, no. 1(1994): 22.

2 Dunk, 28.

3 Dunk, 29.

4 Ken Drushka and the Forest History Society, *Canada’s Forests: A History* (Montreal: McGill-Queen’s University Press, 2003), 44.

5 Drushka et al., 62-64.



Figure 12. Protesting forest industry

address these issues. The most significant and impactful of these was a 1976 study titled *Forest Management in Ontario* by University of Toronto Professor of Forestry Kenneth A. Armson. It recommended the adoption of Forest Management Agreements between the province and private companies. These agreements gave the companies a more secure contract for the timber lands they were cutting, but also increased their responsibilities to manage the forest in accordance with environmental assessments.⁶ Ontario adopted this recommendation into legislation in 1980.⁷ This established landmark improvements in forestry that laid the groundwork for forestry moving into the twenty-first century.

Despite better forestry practices and growth, Northern Ontario started to suffer economically. Northern Ontario mills and mines were an economic powerhouse for most of the twentieth century, supporting the province as it grew. Towns that were built around a single industry had flourished but were now in decline.⁸ The economic downturn is due to many factors, including foreign competition, American softwood duties, and anti-logging groups. As Canadians spent more time recreationally in the forests, environmental activism increased, and the government responded by setting various restrictions for logging companies.⁹ This, along with the previous factors and rising costs due to inflation, caused the lumber industry to wane. Timber had become less profitable, being sustained only by the American markets. The pulp and paper industry continued however, maintaining itself as a strong enough export internationally to survive. Despite this, logging companies suffered in Canada and struggled to compete with foreign markets.¹⁰ To further exacerbate these issues, attempts for government assistance were ignored or poorly implemented, likely due to the growing separation between the work done in the industry to the national conversation. Part of this included a symbiotic relationship between pulp and paper mills and lumber mills. The pulp and paper mills bought wood chips from the lumber mills, who used the money to offset costs. Policy for the wood industry was discussed and legislated in the political hubs of Toronto and Ottawa, physically and socially removed from the subject of its changes, the resource hinterlands.¹¹ Many mills across Northern Ontario closed due to this and other factors, causing the towns that they supported to slump and left them with a critical decision: develop other industries, or accept a slow decline towards dereliction.

6 “Forests and Forest Management,” An Updated (1967 – 2017) History of the Ontario Ministry of Natural Resources and Forestry, Ontario Forestry History. Accessed November 23, 2021. 9. <http://www.ontarioforesthistor.ca/index.php/mnrf-history>.

7 “Forests and Forest Management,” 10.

8 Steven C High, *One Job Town: Work, Belonging, and Betrayal in Northern Ontario* (Toronto, University of Toronto Press, 2018), 4.

9 Drushka et al., 65.

10 Gilles Simard, “The Logging Industry: Supply Sawmills and Pulp and Paper Plants,” Statistics Canada. Last modified May 7, 2002, <https://www150.statcan.gc.ca/n1/pub/25f0002m/25f0002m2000001-eng.htm>

11 Steven C High, *One Job Town: Work, Belonging, and Betrayal in Northern Ontario* (Toronto, University of Toronto Press, 2018), 5.

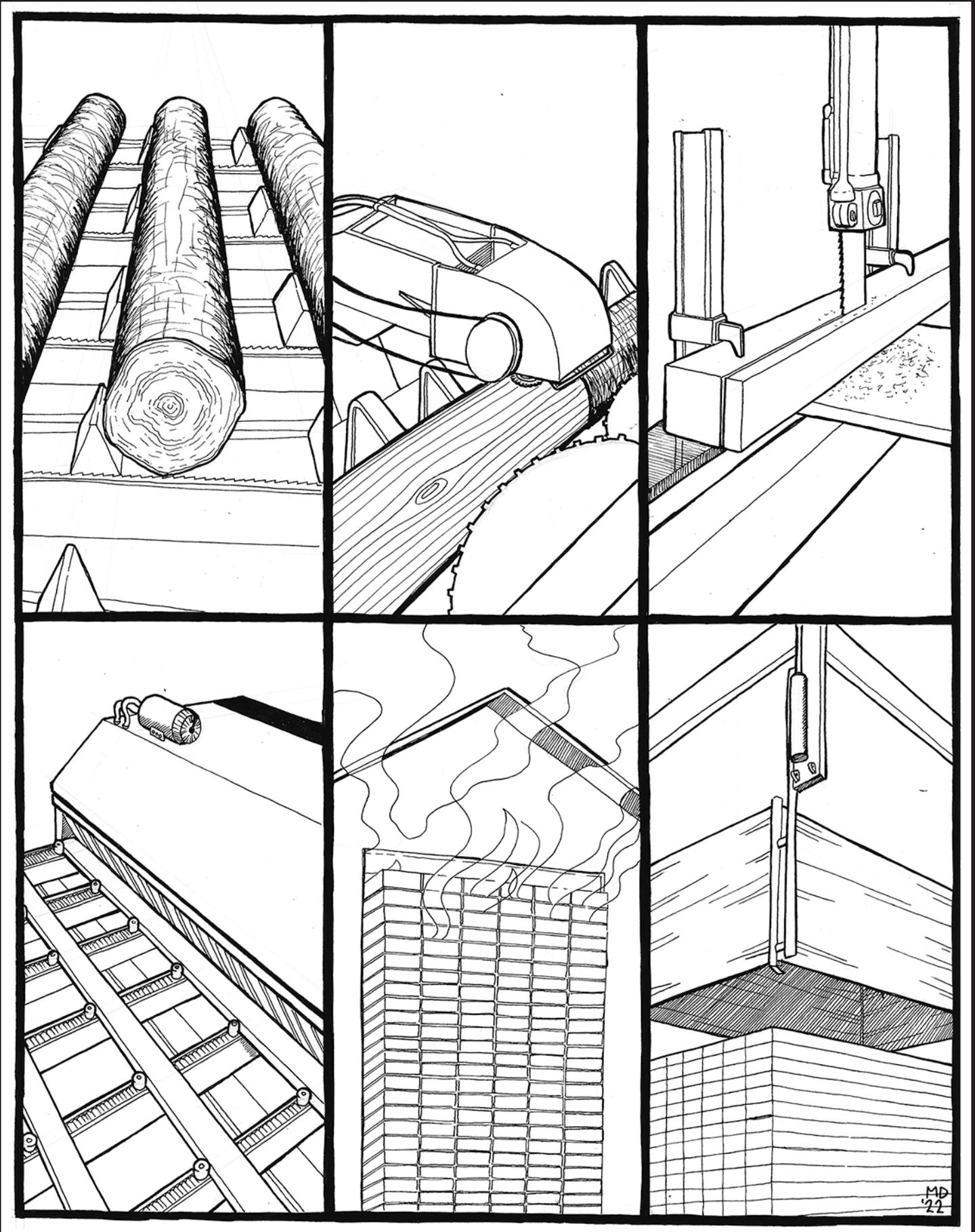


Figure 13. The twentieth century saw mill process.

CHAPTER SEVEN

NEW WOOD PRODUCTS: 2000 – 2020

The turn of the twenty-first century was a turbulent period for Northern Ontario's forests. Human activity by means of climate change threatened the forest through a steady rise in greenhouse gasses, causing an increase in invasive pests and forest fires. However, the same forests were recognised for their significance in ecological and environmental value. In 2007, Canada's Boreal Forest was determined by climate scientists to be the "largest terrestrial carbon storehouse in the world" and must be protected at all costs.¹ This revelation, although borne out of desperation from the threat of climate change, represented a glimmer of hope for change.

The planet was going through severe changes to its climate as a result of human activity. This period of humans being agents of geologic change was coined the Anthropocene by chemist Paul Crutzen in the 1990s.² One of the major impacts of the Anthropocene was global warming from greenhouse gas emissions. The planet warmed an average of 1.1 degrees Celsius since pre-industrial times, which marked the significant start of burning fossil fuels and mass emissions of carbon dioxide, a greenhouse gas. The planet's forests and their ecosystems were in significant danger of harm and destruction. Increasing global temperatures had caused more frequent and extreme forest fires, droughts and floods.³ Ontario is home to about two percent of the world's forests and was at an increasing risk of these dangers.⁴

However, it was Ontario's forests, among others, that had the potential to mitigate and even reverse climate change. Ontario's forestry and forestry management practices could take in and store carbon dioxide in the form of carbon through protecting forests and peatlands as well as sustainably harvesting timber.⁵ Although Ontario's forests only represent part of Canada, climate action by Ontarians is critical due to the large industry and population, Ontario's emissions are the highest of the provinces, and have the most room for improvement.⁶

By the end of the century, Ontario's forests are projected to increase their sequestered carbon in both forests and wood products significantly,

1 Penni Mitchell, "No more silent spring," *Herizons* 21, no. 4. Gale Academic OneFile (accessed March 22, 2022), <https://link.gale.com/apps/doc/A216848747/AONE?u=subd78095&sid=bookmark-AONE&xid=a6d53c24>.

2 S. George Philander, "Anthropocene," in *Encyclopedia of Global Warming & Climate Change*, 2nd ed., 3 vols. (Thousand Oaks: SAGE Publications, Inc., 2012), 62–63, <https://doi.org/10.4135/9781452218564>.

3 "COP26: Pivotal Progress Made on Sustainable Forest Management and Conservation | UNFCCC," accessed December 23, 2021, <https://unfccc.int/news/cop26-pivotal-progress-made-on-sustainable-forest-management-and-conservation>.

4 Ontario, "Sustainable Growth."

5 Brian J. Stocks, *Climate Change, Carbon Sequestration, and Forest Fire Protection in the Canadian Boreal Zone*, Climate Change Research Report ; CCR-20 (Peterborough, Ont: Science and Information Resources Division, Ministry of Natural Resources, 2011), 19.

6 Stephen John Colombo, William C. Parker, and Nancy Luckai, *The Effects of Forest Management on Carbon Storage in Ontario's Forests*, Climate Change Research Report (Ontario Ministry of Natural Resources, 2005), 3.

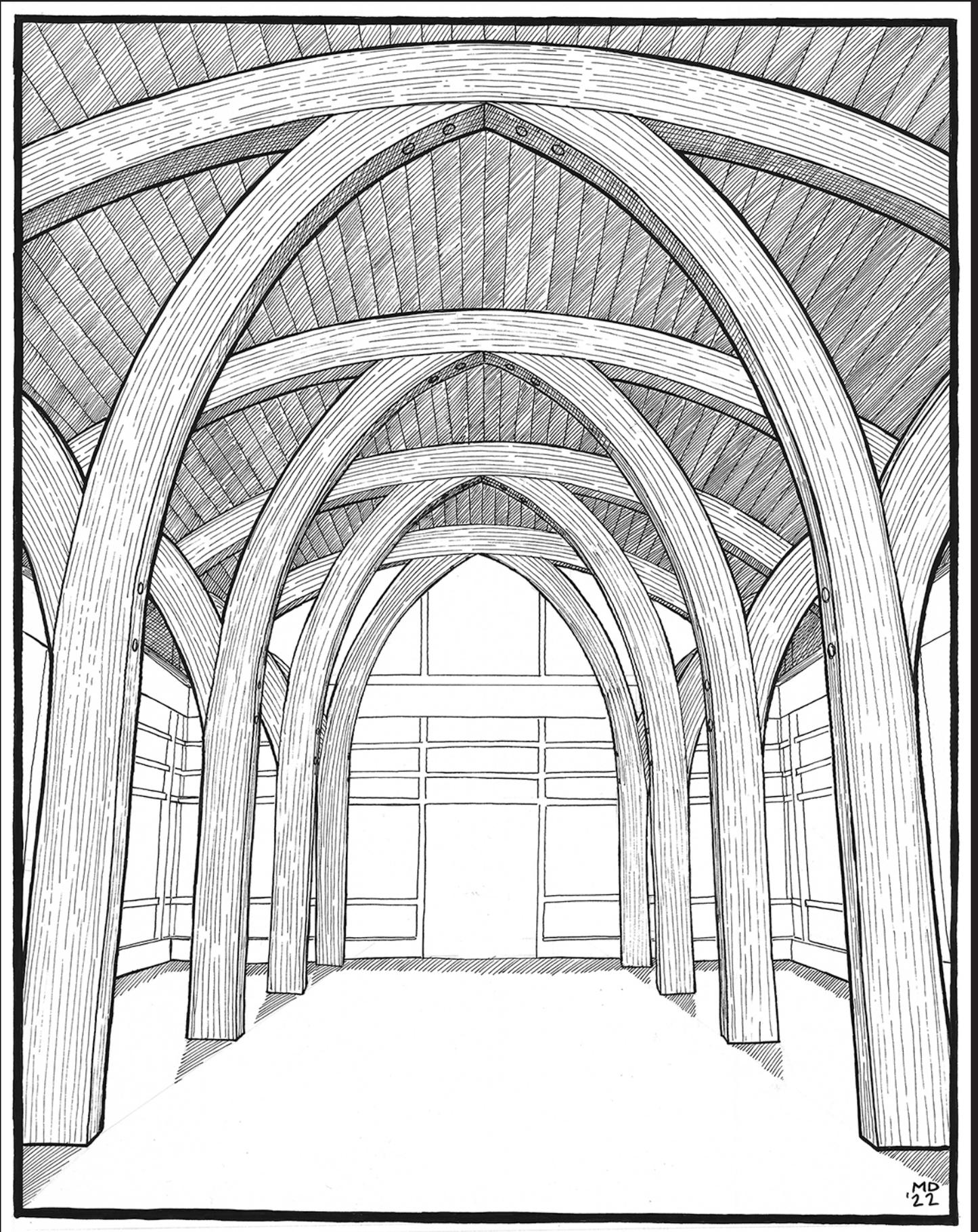


Figure 14. Glue laminated columns at the North Bay Hospital.

sequestering an average of 4.3 million tonnes per year.⁷ This average is nearly ten percent of the greenhouse gas emissions Ontario produced in 2019.⁸ This percentage was projected to increase as Ontario continued to reduce various sources of emissions.

According to Bruce King's *The New Carbon Architecture*, the greenhouse gas emissions of buildings have traditionally only considered the operational costs of the building which accounted for about 80 percent of the building's lifelong carbon impact, and not the embodied carbon, or carbon footprint, of the building's construction.⁹ This led to significant developments in building technology and energy efficiency, reducing the operational impact of buildings. As operational impacts were reduced however, the embodied carbon became the relatively larger issue. King estimated that as the world works to reach the goals of the 2016 Paris Climate Agreement that includes a carbon-free built environment by 2050, "embodied carbon emissions [will] eclipse operational carbon emissions".¹⁰

Mass timber was slowly on the rise in Ontario. This was accelerated by the construction of a new cross-laminated timber factory in St. Thomas. This factory aims to shorten the supply chain from distant CLT factories to make mass timber projects more accessible in Ontario.¹¹ This factory was made possible by partnerships in the forest industry with the clear intent of mutual support. This set a hopeful precedent of new possibility within the wood industry.

The mill towns that laid the groundwork for future growth had not been so fortunate. As the wood industry evolved into the twenty-first century, costs rose. Some corporations of the wood industry consolidated milling to fewer mills run more efficiently. Smaller, local mills could not compete financially, and their businesses suffered and closed. The high costs of the trade came from a few factors. The electricity used to power the mills was costly and unstable at the high volume required. Mills with inconsistent electricity were at the mercy of the power grid, which they couldn't directly upgrade or fix. Mill licensing and operation was a lengthy and costly bureaucratic process unto itself that also put unrealistic demands on small mills. Some of the roads that accessed woodlands that were once subsidized by the province were now the responsibility of the loggers, adding an extra cost onto the forest companies.¹² The result of these closures meant that mass timber buildings were sourcing its timbers from distant mills and fabrication centres which raised costs and made prospective developers much more apprehensive about pursuing the material.

7 Colombo, Chen, and Ter-Mikaelian, "Carbon Storage in Ontario's Forests, 2000-2100," 7.

8 Environment and Climate Change Canada, "Greenhouse Gas Sources and Sinks: Executive Summary 2021," program results, April 12, 2021, <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2021.html>.

9 King, *The New Carbon Architecture*, 10.

10 King, 11.

11 Lloyd Alter, "Element5 CLT Factory Opens in Ontario, Gets FSC Certification," *TreeHugger*. Updated May 5, 2021, <https://www.treehugger.com/elements5-clt-factory-ontario-fsc-certification-5181112>

12 "Ontario Forest Industries Association: Mill Closures Across Ontario a Devastating Blow" *CCNMatthews Newswire*, Toronto. November 30, 2005.



Figure 15. Reforestation.

CHAPTER EIGHT

TEMAGAMI: 2020 – 2022

Rising costs made many sawmills financially vulnerable in the early twenty-first century. Larger, centralized sawmills survived due to an economy of scale in their production. Smaller mills could not remain profitable between the high cost of operations and the low prices of their larger, more efficient competitors. This caused a wave of shutdowns across Ontario in the late 1990s and early 2000s. These closures left the towns they had once supported crippled or turning to other industries. Temagami, Ontario is one such case that exemplifies the forest industry's rise and fall.

Temagami is located on highway 11, north of North Bay, and about a 500 kilometre drive straight north from Toronto. Like many former mill towns in Ontario, it has a long forest industry history. Temagami was home to great stands of white and red pine, which were the most profitable variety in the timber trade. This made it a prime location for the forest industry, and a host of conflict that came along with it. In the 2020s, the Temagami area consists of a small town, an indigenous reserve, seasonal cottage community, a provincial park, and gigantic lake system surrounded by forest. Despite logging in the area, all that's left of the forest industry in the town of Temagami itself is a couple ruined mills.

One of the more significant mills that operated in the area was the Milne sawmill, once run by Milne and Sons Lumber Company. The mill employed 152 people and processed 32 percent of the Temagami area lumber harvest before its closure in 1990. Two years prior, the mill employed about 1 in 6 permanent Temagami residents.¹ The mill was closed in part due to rising tensions of the logging done on old growth forests in the Temagami area. The Ontario government had regulated logging rights on old growth and traditionally indigenous lands with little oversight or care. A history of protests from environmental and indigenous activists had raised enough public outcry that government closed the mill.² The logging rights in the area were sold to distant mills as there was no other sizeable mill in the area. Decades later, the remnants of the mill served as distant reminder of the industry.

In 2003, over a decade after the Milne sawmill closure, another business venture attempted to revive the forest industry in Temagami. Temagami Forest Products Ltd. received conditional approval from the Ministry of Natural Resources to begin operations. They specifically processed white birch and employed 63 people before closing in 2006 due to bankruptcy.³

1 Sheri Aikenhead, "A Wilderness Tug of War," *Maclean's*, February 29, 1988, 8.

2 Patrick Matakala, "Decision-Making and Conflict Resolution in Co-Management: Two Cases from Temagami, Northeastern Ontario" Ph.D. diss., (University of British Columbia, 1995): 50-51.

3 "Mill Closed for Restructuring and New Owner," *Ottertooth News*, October 26, 2005. <http://www.ottertooth.com/Temagami/News/newsbriefs-048.htm>

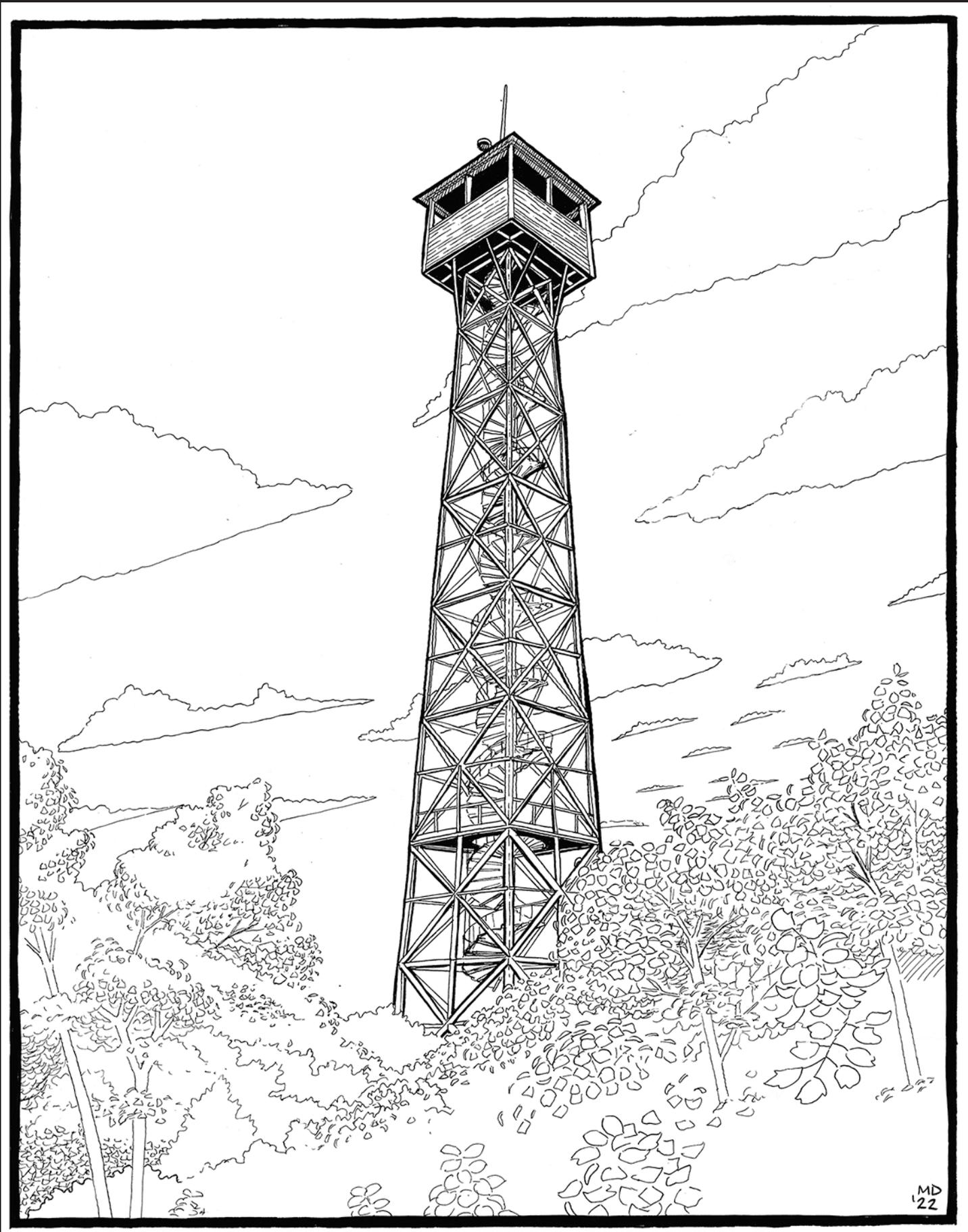


Figure 16. Temagami's iconic fire tower.

Once again, Temagami's industrial aspirations were dashed.

Across Northern Ontario, similar shutdowns have left communities in the same position. In 2005, over two thousand forest workers lost their job due to mill closures and downsizing. At the time, the Ontario Forest Industries Association blamed the provincial government for not supporting its own industries.⁴ The mills that remained in Northern Ontario were plagued with a sense of insecurity, and for the next decade potential investors were wary of taking on the risk posed by the wavering industry. This affected the communities connected to these mills, including Temagami, by casting a grim shadow over any prospect of longevity or growth.⁵

4 "Ontario Forest Industries Association: Mill Closures Across Ontario a Devastating Blow" CCNMatthews Newswire, Toronto. November 30, 2005.

5 Steven C High, *One Job Town: Work, Belonging, and Betrayal in Northern Ontario* (Toronto, University of Toronto Press, 2018): 194-195.

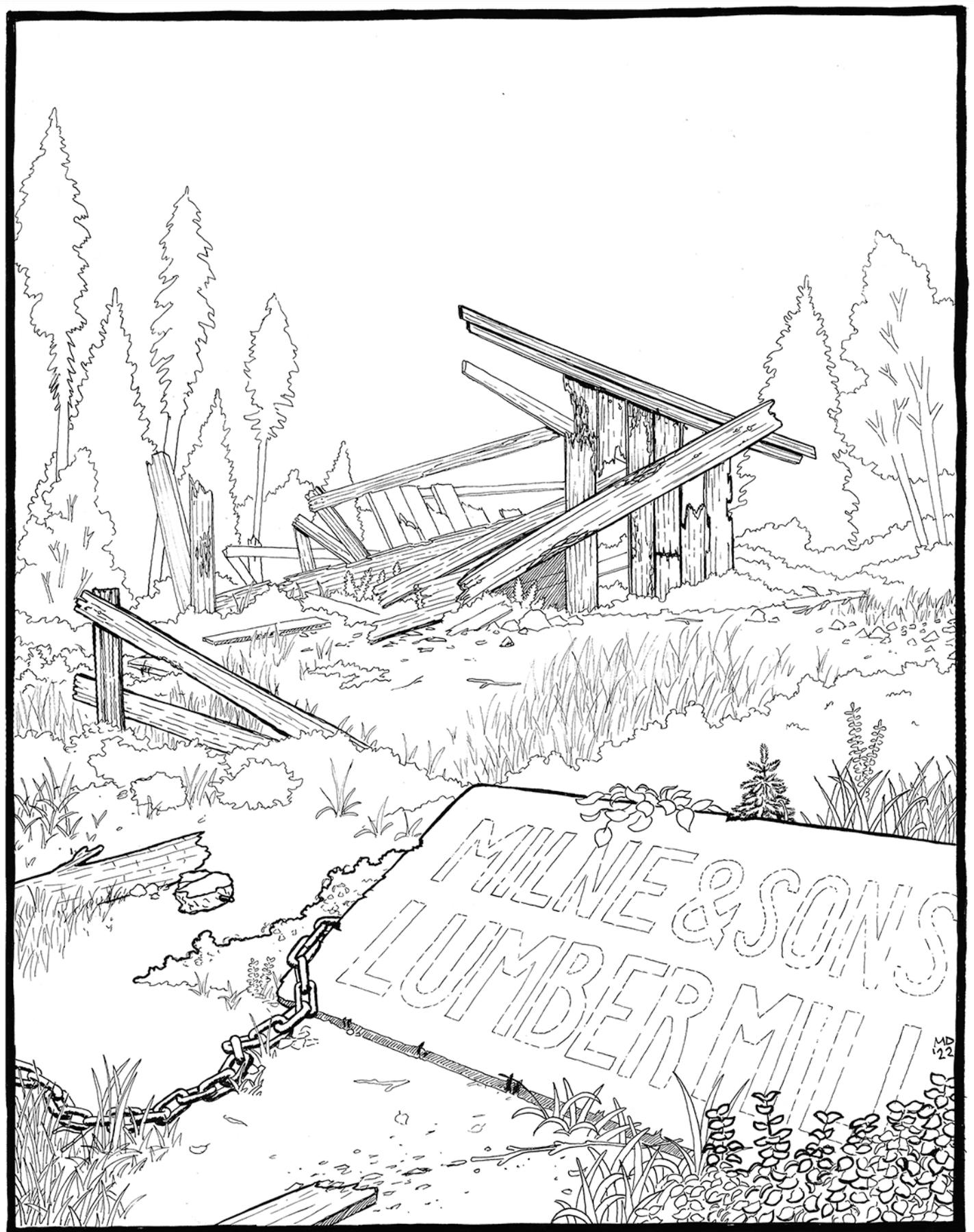


Figure 17. A sawmill in ruins

CHAPTER NINE

RISE OF MASS TIMBER: 2023 – 2036

The forestry industry and wood architecture in Northern Ontario have had significant developments and were at a hopeful state looking to the future. Forestry industry, wood products, and wood architecture begin existing as one interconnected system. Over two centuries of forest industry in conflict with Ontario's forests had reached a place of relative balance and harmony. For the first time since the industry began at the start of the nineteenth century, the forests and the industry were growing without detriment to the other.

Provincial policy for forest management continued to hone its practice while streamlining licensing and audits for forest resource companies. Ontario's extensive updates to its Tree Seed Transfer Policy in 2017 bore fruit as data was collected about its impact.¹ This ensured that reforestation efforts were successful so that Ontario's revitalized forest industry could be sustained. The Policy continued to receive regular updates to give the foresters of private companies the information required for reforesting strategies.

Another policy ensured the accelerated reforestation in riparian areas. The health of rivers suffer when the trees around them are cut. The ecologies of various rivers depend on the shade, structure, and nutrients of old-growth forests on their banks. Although cutting along the banks of rivers has been outlawed in Ontario decades ago, many rivers still suffer from previously cut shores, as the old growth forests they relied upon take decades to re-establish. This has become even more critical with rising global temperatures. Careful measures to accelerrate old-growth forest along certain rivers protect the flow of water to continue, protecting the forest ecology as well.

As mass timber continued to rise in popularity the 2020s, forest industry entrepreneurs made new partnerships to advance the value-added wood industry across Ontario. The provincial government was prompted to increase the annual allowable cut for forest management licenses but remained well within sustainable limits. This increase was driven by high lumber demands from across North America that were seeking environmentally responsible building materials. Cross-laminated, glue-laminated, and dowel-laminated timber factories across Canada were in high demand, inspiring many communities to foster local industry that could compete with the long lead times for materials. In addition to building materials, the newly formed forest companies produced wood products, such as biomass fuel and woodcrete.

These new products widened the scope of harvestable species, as both

¹ Ontario Ministry of Northern Development, Mines, Natural Resources, and Forestry, "Ontario Tree Seed Transfer Policy, ". <https://www.ontario.ca/page/ontario-tree-seed-transfer-policy> (Accessed February 15, 2022)

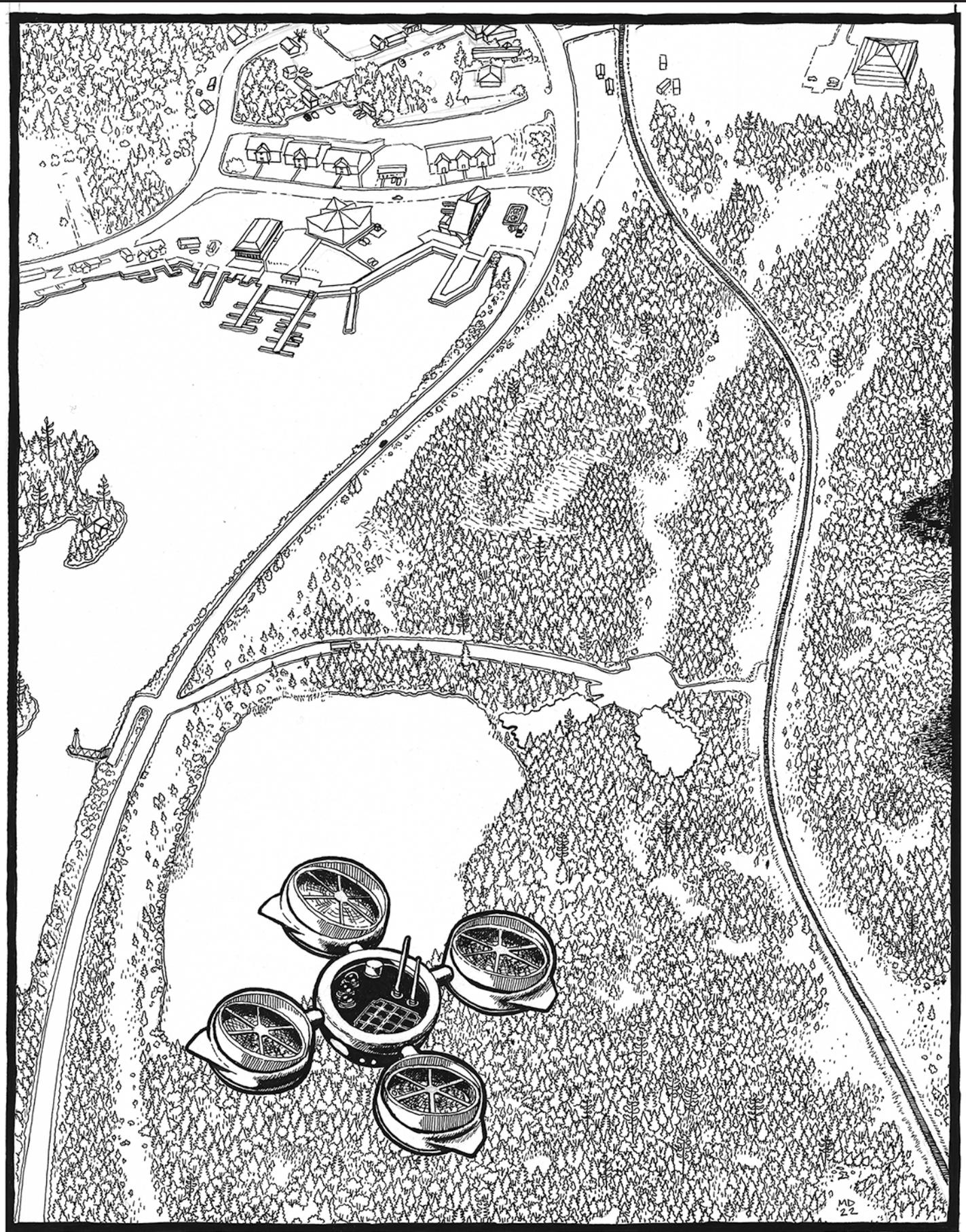


Figure 18. Drones' eye view of a new mill

biofuel and woodcrete could be made from a variety of plant matter. This allowed forest workers to increase efficiency and use more of the forest. Previously, the branches and plant matter cut from harvested trees that were too small or leafy to use for lumber or paper were considered waste. Now, they too became a valuable wood product. This had an unintended benefit within the forestry practices of the forest industry: the increased efficiency of harvest meant that foresters could be more stringent when marking suitable trees for harvest.

Despite the positive developments and the actions of foresters, climate change still threatened the forests of Ontario. Growing environmental concerns called for lower carbon footprints of the construction industry. Many builders chose mass timber as material that sequestered carbon and therefore could have a negative carbon footprint. This was a dramatic shift from the incredibly damaging carbon footprint of concrete or steel.² Although many new constructions chose mass timber, these materials were often made in remote factories that still needed to be transported to site which added to its footprint. In addition, public perception of wood architecture was still disconnected with the forest industry. The engrained environmentalism from the 1970s that perforated the forest industry had become a lingering stigma.³ New policy was aimed in the right direction but had to combat heavy criticism from environmental groups that saw any actions in the forest as harmful. This prompted builders to seek local materials and foster relationships within their own communities.

2 Alex de Rijke, "Engineered Timber: A Manifesto," *Architects' Journal* 229, no. 4 (February 5, 2009): 37–40.

3 Steven C High, *One Job Town: Work, Belonging, and Betrayal in Northern Ontario* (Toronto, University of Toronto Press, 2018)

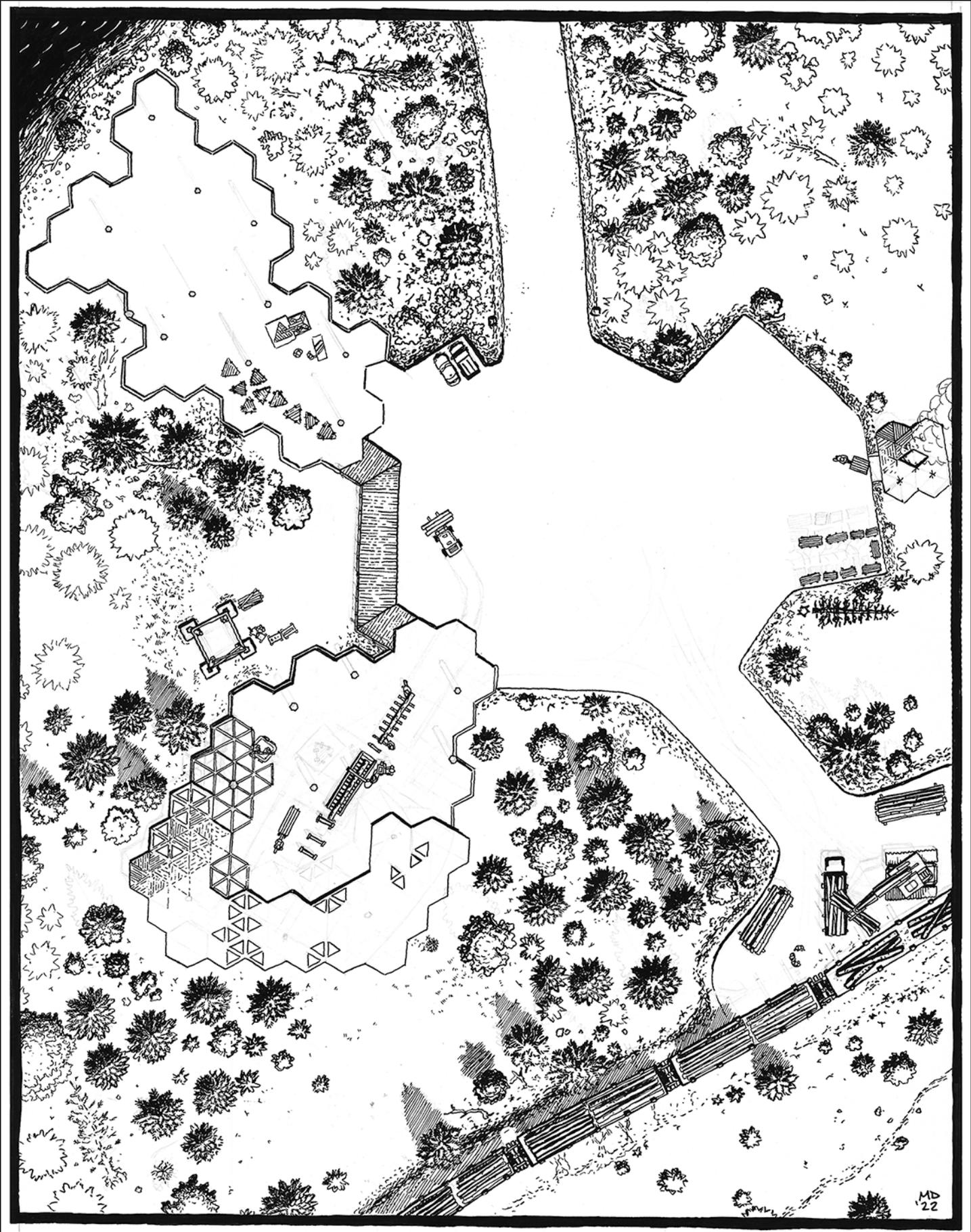


Figure 19. A site for a new forest resource processing facility.

CHAPTER TEN

NEW DAY IN TEMAGAMI: 2037 – 2042

In the late 2030s, the town of the Temagami seized the opportunity to garner local industry once again. Like many former mill towns across Ontario, it had space, workers, and adjacent forests to support small-scale wood processing. This led to growth for the town as well as new reputation for being the first of many former mill towns to flourish with new mass timber buildings.

In 2037, an agreement was reached between a small forest company, the municipality of Temagami, and the Ontario Ministry of Northern Development, Mines, Natural Resources, and Forestry. It allowed this new company, Wood Fabrications Ltd., to develop a small area of land just off Highway 11, south of Temagami and north of Finlayson Point Provincial Park. The proposed plan was to build a small sawmill and fabrication centre to serve Temagami and the surrounding communities. The site of the new facilities was purposefully situated for the twenty-first century evolution of the forest industry. The area of land it was planned on was designated by the municipality of Temagami for future development. It had partly been cleared decades earlier for roads and power lines, and still had clear areas to build to minimize forest impact. It lies between the community of Temagami, once bolstered by the timber trade, and Finlayson Point Provincial Park, a protected space borne in reaction to the industry's devastation. These adjacencies represented the newfound principles of modern forestry: a harmony between nature and society. This positions the mill and fabrication centre to serve both.

The program of the Wood Fabrications facilities was proposed as a small-scale multi-use forest resource processing facility. The goal of Wood Fabrications was to provide Temagami and its surrounding communities with value-added wood products. The extent of these products would be determined by the needs of the community. For basic products, the company would sell dimensional lumber, wood chips, pellets, and biofuel. As these would be regularly produced, the program would incorporate automation to increase the efficiency of their creation. Making these products required a spacious building with various processing machines as well as a separate building that contained a kiln for drying and seasoning the wood. The more advanced products and services that the company offered was custom prefabricated mass timber components. This included cross-laminated, glue-laminated, and dowel-laminated panels, beams, and columns. These would be assembled in the fabrication centre; a separate building from the mill. The fabrication centre was designed to include a workshop, storage, design offices, and a customer storefront. This offered a complete host of wood product services and allow room for future growth. The workshop needed to be big enough for any components that they might be required

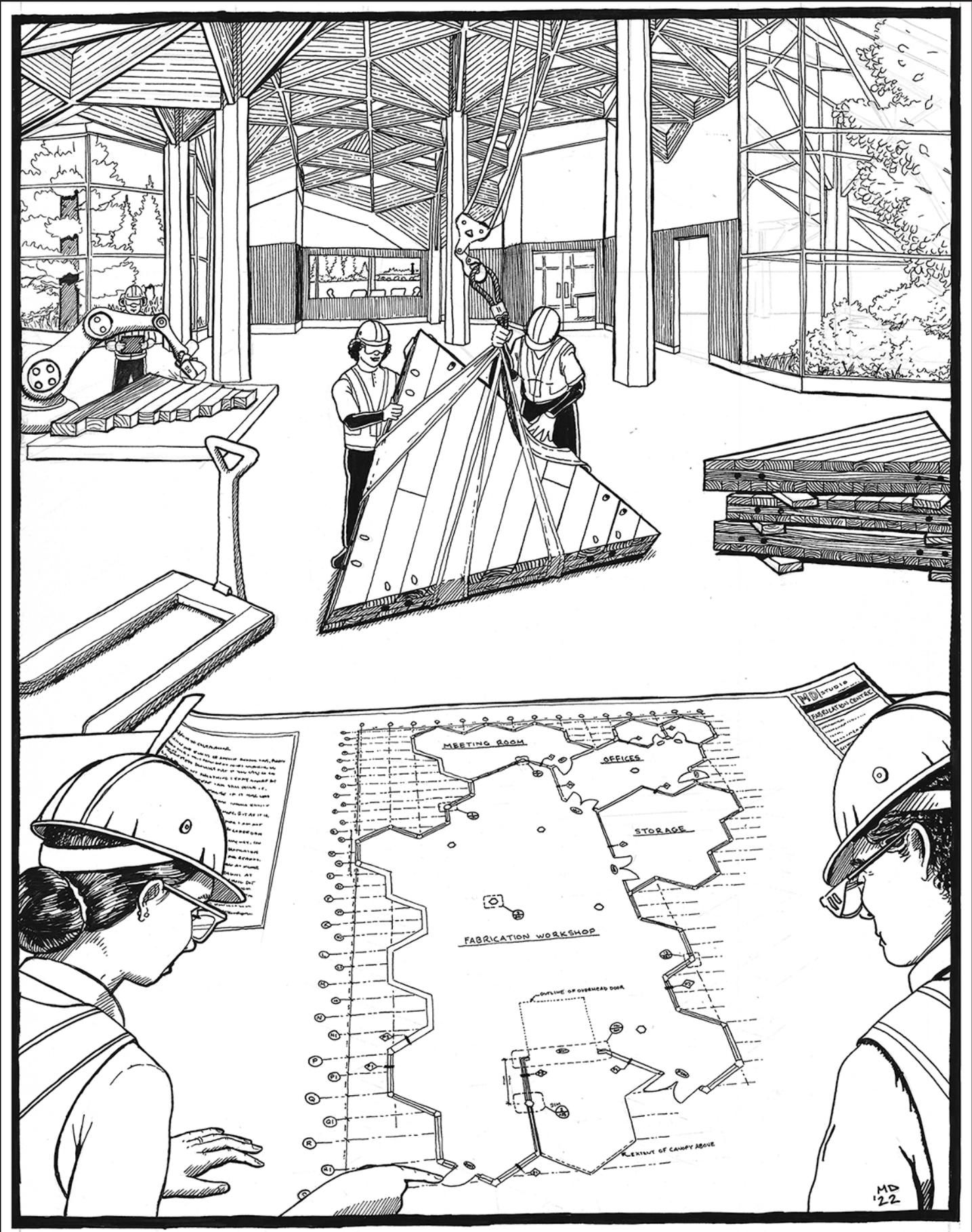


Figure 20. Constructing the fabrication centre.

to build. The size and shape of these components was commonly limited to the dimensions of available transportation. As the facilities would be connected to Lake Temagami, Highway 11, and the Northern Ontario Railway, the workshop was sized to accommodate the largest dimensions of a barge, transport truck, and railcar.

To deliver these services, the program also called for connections to the adjacent transportation channels. Firstly, a road needed to connect the facilities to the highway. Secondly, a simple railway station was to be built so that the company could take advantage of the existing system for incoming logs and outgoing products. Finally, to connect to Temagami's vast waterfront community, docks were needed to load and unload barges. These connections would give the company a few avenues of transportation when working on different projects.

The company's stance on celebrating and promoting forestry also became part of their planned program. The site would be visible from the highway and lake when traveling to Temagami and had the opportunity to be an icon for the community. Wood Fabrications embraced this and placed an emphasis on representing the history of the forest industry in the design. This was not a defined program element but instead an ongoing goal to give appreciation for the journey that forests and forest industry took to reach a more harmonious relationship. In this way, the facilities could act as both a service for wood resources and a museum of forestry.

Before any the design process began, Wood Fabrications hired foresters to map the site of the facilities to better sit within the forest. In this way, the facility would be better integrated with the forest and not dominate it. This symbolism of harmony is used again to reinforce the tenets of modern forestry and act as a constant reminder of the facilities silent partner: the boreal forest that makes it all possible. To develop a plan for the site, the foresters scanned and catalogued the flora to determine which were the most critical seed-bearing plants and contributed the most to local ecology. These trees were given priority protection during construction to ensure they would thrive, and the design of the facility was placed to give the trees and their root structures adequate room. Trees that were not deemed as ecologically significant were cut and stored to be processed in the mill once it was built.

The design of the facilities sought inspiration from the forest and forest industry. As the project would sit in the forest, the design needed to reflect that integration with the trees. The footprint of the mill and fabrication centre gave careful clearance of protected trees but remained as close as feasible to benefit from forests protection. Both the main buildings used parametric modelling to create a flowing shape from this footprint. A triangular grid was used to create a continuous wall, roof, and canopy on each building that rises from the ground to create swooping openings before connecting back to the earth. In plan, the triangular grid was designed in even equilateral triangles and took inspiration from the wooden bracing of the forest industry's historic forms. To support this canopy, columns inspired by

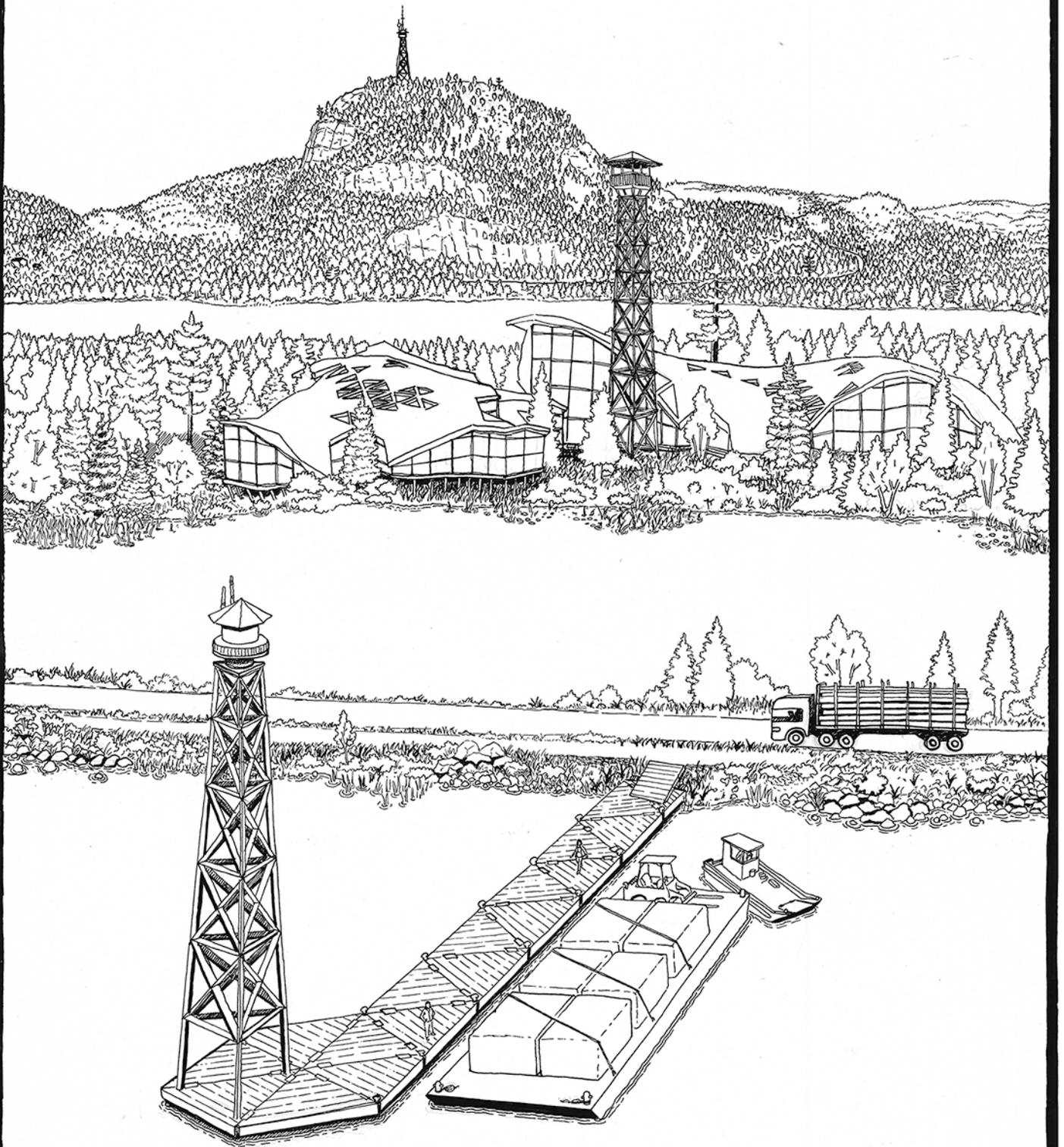


Figure 21. Loading the barge and the view across the lake.

red pines were placed strategically throughout the buildings in non-uniform intervals to reflect the natural forest. The structural members of the grid were parametrically designed to be visually heavier near the columns and thin out as they stretch away from them, and the grid itself was populated with triangular panels and skylights to create a mosaic that emulated the dappled light shining through the branches of a stand of tall red pine.

To connect with the town and be a symbol of forestry, the design also included a drone communication and lookout tower beside the sawmill and fabrication centre. The tower was designed as an homage to the fire towers that once watched over Ontario's forests as well as the fire tower that remains in Temagami. The tower featured a recharging hub and antenna for forestry drones, as well as a scenic lookout for the mill's visitors and staff. The loading docks for the facility would also feature a smaller tower to visually connect with the main one and offer a landmark for boaters to spot from afar.

Construction started with a small, portable mill moved to site to process the trees that would be cleared for the road, rail, and building site. The railway that once ran parallel to the highway was redirected to run along the east edge of the site, to allow for road access for this and future developments. A road was built from the highway to the building site to allow for construction equipment and materials to be brought in to build the mill and fabrication centre buildings. Construction was done with care using the lightest machinery possible to not disturb the environment more than necessary. Despite this, the project was built quite quickly due to the use of prefabrication for the structural members and panels, all of which were made using laminated timber techniques. Once the canopies were built, the buildings were used to fabricate the remaining parts of the project: the dock, towers, and storage building. The mill and fabrication centre opened in 2042 after a thorough inspection and certification process.

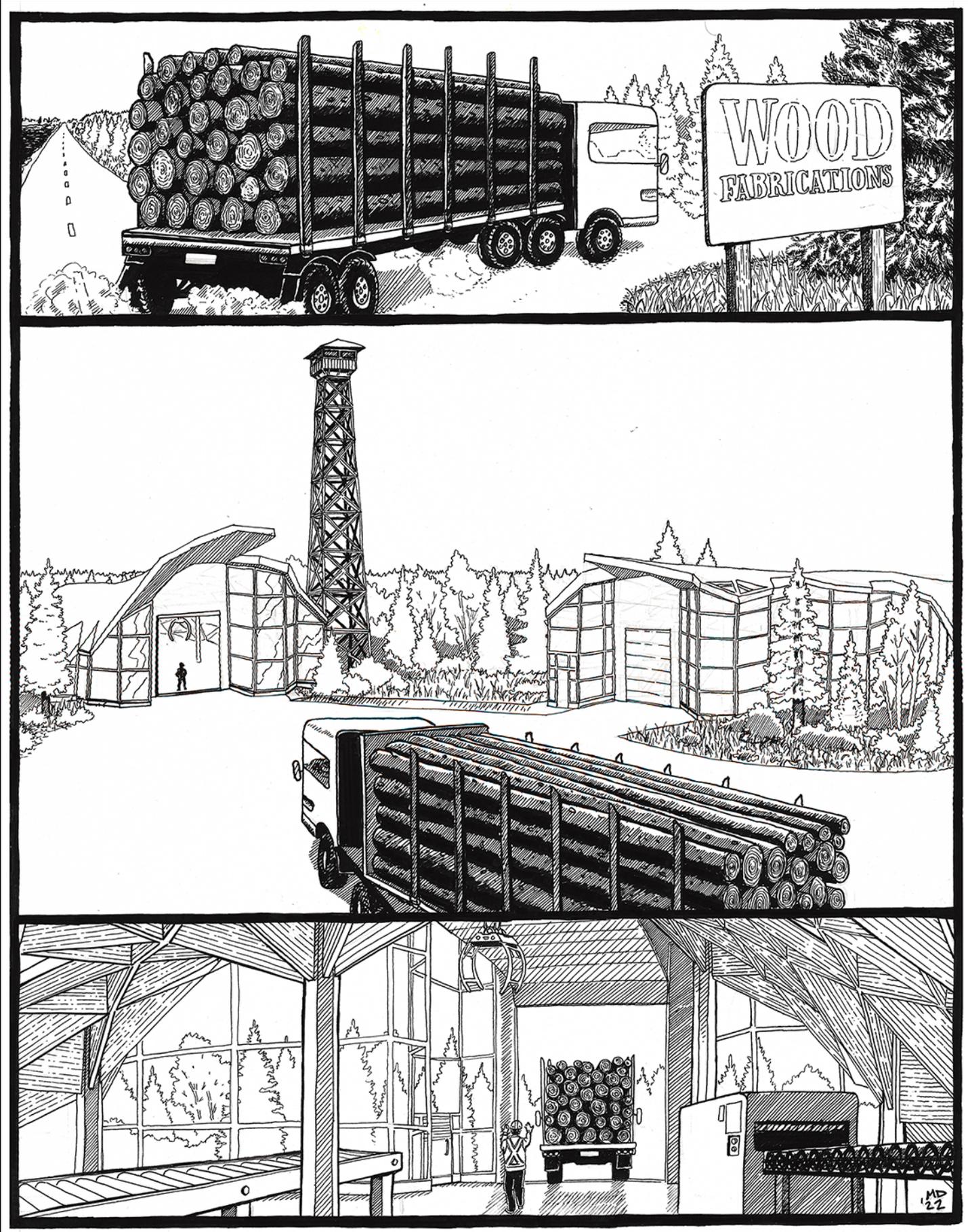


Figure 22. Delivery to the new mill and fabrication centre

CHAPTER ELEVEN

CONCLUSION: TOWARDS A WOOD FUTURE: 2043 – 2057

The facilities of Wood Fabrications Ltd. saw a steady rise in production due to the continued rise in mass timber and forest products. They produced various value-added wood products for its community and collaborated on many mass timber projects across Northern Ontario. This had a tremendous impact on many similar towns who followed suit. On a global scale, the facilities have joined the international movement to reduce emissions to acceptable levels.

Wood Fabrications became deeply integrated with the Temagami community. Day to day operations at the facilities include producing dimensional lumber for household use to provide a small, steady source of income between bigger fabrication projects. The company became known to the town through their work on a few high-end cottage properties on Lake Temagami, providing precedents for future developments. When the local elementary school needed renovations, the district school board opted for a design-build project with a North Bay architecture firm. Noting the success of this project, the municipality turned to Wood Fabrications to rebuild the Temagami Marina and effectively change the face of the town. These projects gave legitimacy and momentum to the business which in turn provided opportunities for more projects.

Each project provided new opportunities to push the limits of mass timber with next-generation custom designed CLT panels. The panels were made in the fabrication workshop by timbers cut in the sawmill. These custom components would then be assembled on a project site to provide an efficiently designed and fabricated building structure and envelope. Wood Fabrications also began working with architects and builders on projects to fabricate more advanced components that included electrical and mechanical systems with the end goal of creating prefabricated building systems that saved time, money, and material. The versatile robotic arms of the fabrication centre, rather than single function machines, were continually adapted to new uses. This provided an increased longevity of the facility's fixed equipment, further reducing waste.

The facilities at Wood Fabrications Ltd. also evolved since their construction to adapt to new technologies and business. The business and the community collaborated on creating a culture of monumentality to the site. Relics of forest history were erected on site, including an old steam train, a replica lumberjack shanty, and a display of historic tools. The artefacts serve to strengthen visitors' understanding of forest history and perpetuate the important lessons that the mill and fabrication centre were built on. Wood Fabrications also frequently hosts tours to promote forestry and wood architecture. This has aided in creating transparency between the forest industry

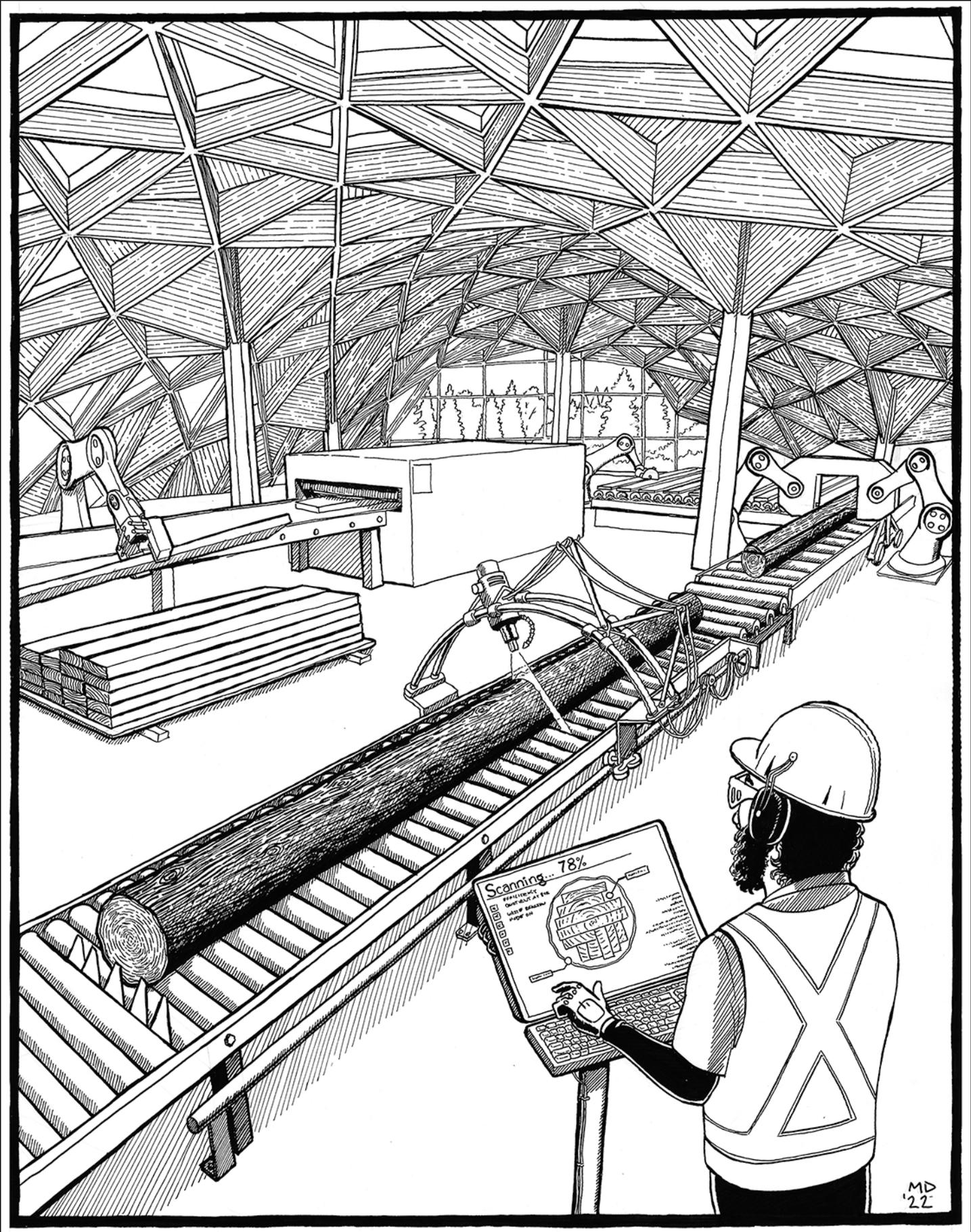


Figure 23. Scanning and milling in the new mill.

and the public, aiding in environmental thinking.

From the precedent made in Temagami, other towns in Northern Ontario that used to thrive on the forest industry were interested in replicating their success. Local economic development organizations offered incentives for companies looking to create forest resource processing facilities. Some of these were designed to fill niche markets and specialized in specific wood products to increase efficiency. Others, like Wood Fabrications in Temagami, offered a wide variety of services at a smaller scale. These facilities offered jobs and value added wood products to their communities. The new mills gave many towns that were victim to mill and mine closure a second chance at industry.

The forest sector in Northern Ontario flourished in the 2040s. Investments in the industry and improved public perception allowed the industry to push improved policy guided by rigorously designed forestry principles. By the mid twenty-first century, the harvest tonnage was almost double the volume compared to the 2010s. This amount was still a sustainable yield as predicted by foresters years earlier. The large harvest volume locked carbon dioxide into wood products for decades, and continued growth and reforestation ensured carbon was continually captured. As other provinces followed suit, Canada now leads the world in greenhouse gas emission reductions.

Over the past two decades, Wood Fabrications in Temagami has helped facilitate the sequestering of ten thousand metric tonnes of carbon dioxide through custom prefabricated construction projects. These include many lakefront cottages for remote workers moving north to escape the congestion of the big cities, small, intimate suburbs for Temagami's increasing population, and institutions that want facilities that reflect their community. By building with prefabricated pieces, these projects did not need to clear excess area around them for typical construction. They sit within the forest itself, allowing the forest to continue growth with minimal disturbance.

Temagami has always felt close to nature through its community stretched across the long arms of the lake. The new constructions further embrace that closeness, and allow for their residents to develop a greater appreciation for the forests that sustain them. They are physically closer to the less disturbed nature, and their built environment is made from it. This acts as a catalyst for the happiness and wellbeing of the residents, not only by being around natural material, but by knowing the environment is less impacted. This has become engrained in the community's identity and a point of pride for residents.

The planet is making great strides in 2057 as people choose to combat climate change with every decision they make. The planet was forced to evolve its industries and built environment to work with the earth instead of against it, but once they did they unlocked new, wondrous opportunities. Instead of a future of shining steel and blinking lights, people created a more serene future of warm wood and thriving ecologies. Wood architecture

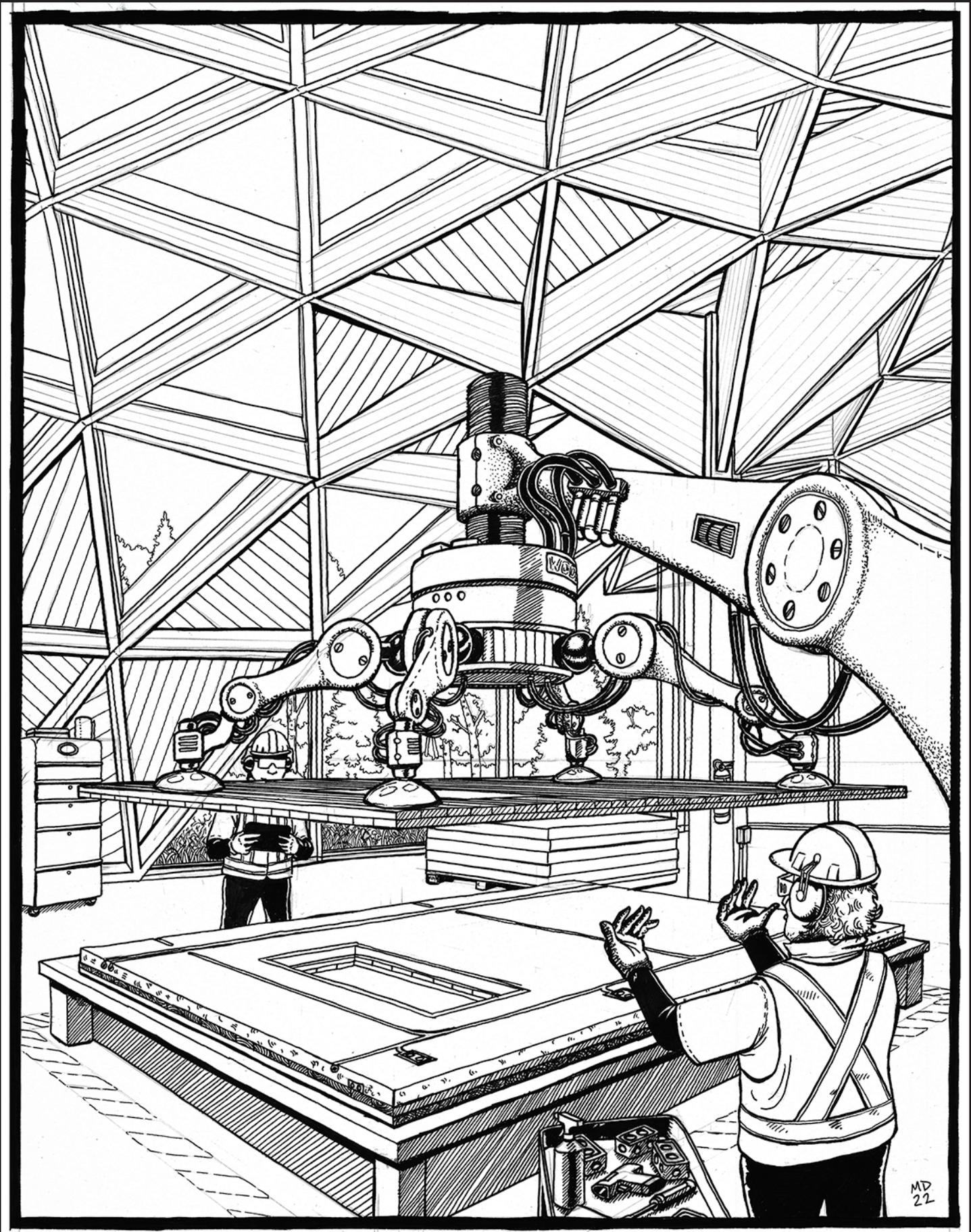


Figure 24. The Fabrication Centre at work.

is now the prevalent choice for most construction, locking away centuries of emissions in its fabrication. Forestry continues to develop nuanced strategies to understand the trees that planet depends on. The forests of Northern Ontario, locked in a tug-of-war with the forest industry, thrived now together in harmonious balance, towards a wood future.

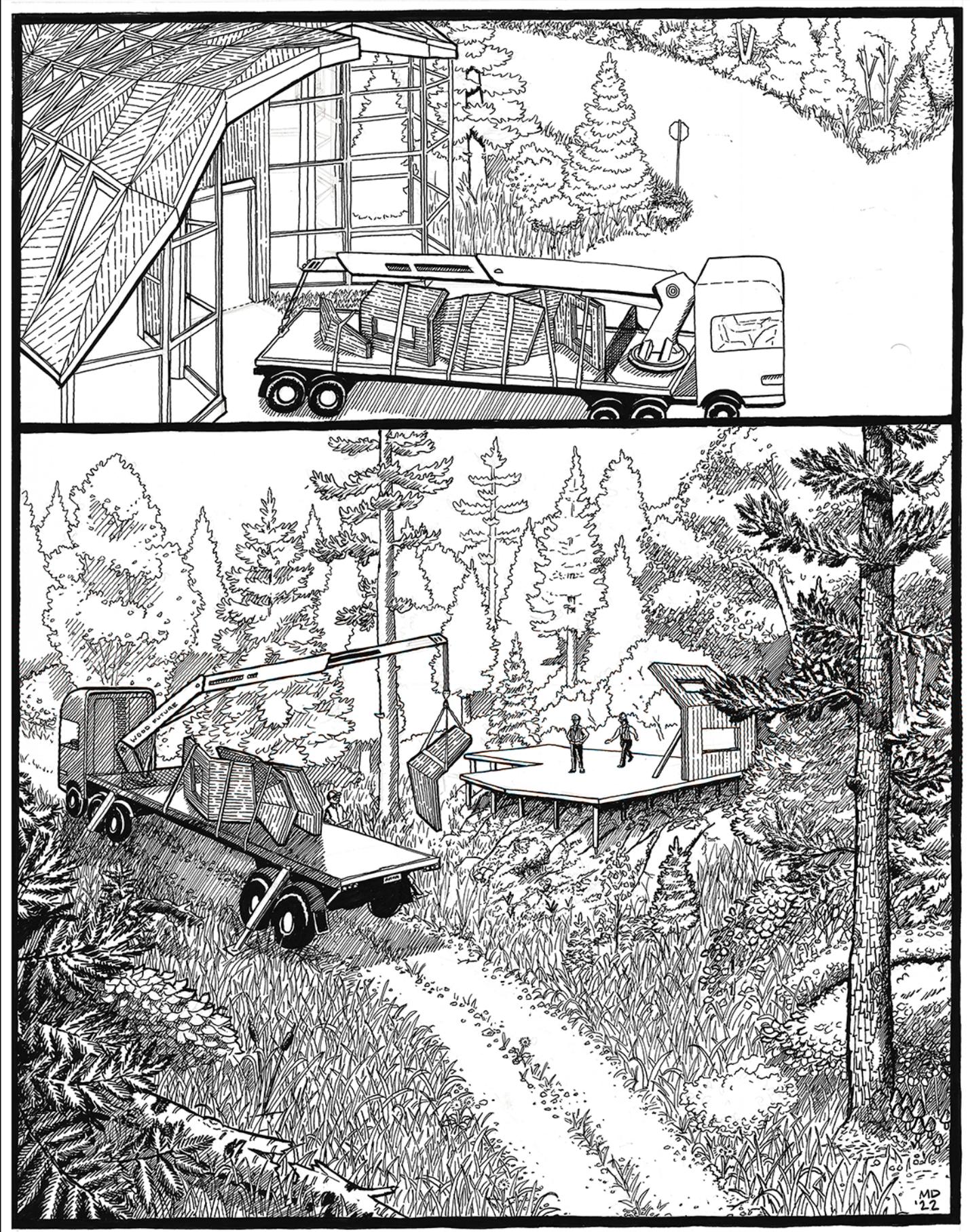


Figure 25. Building with wood in the forest.



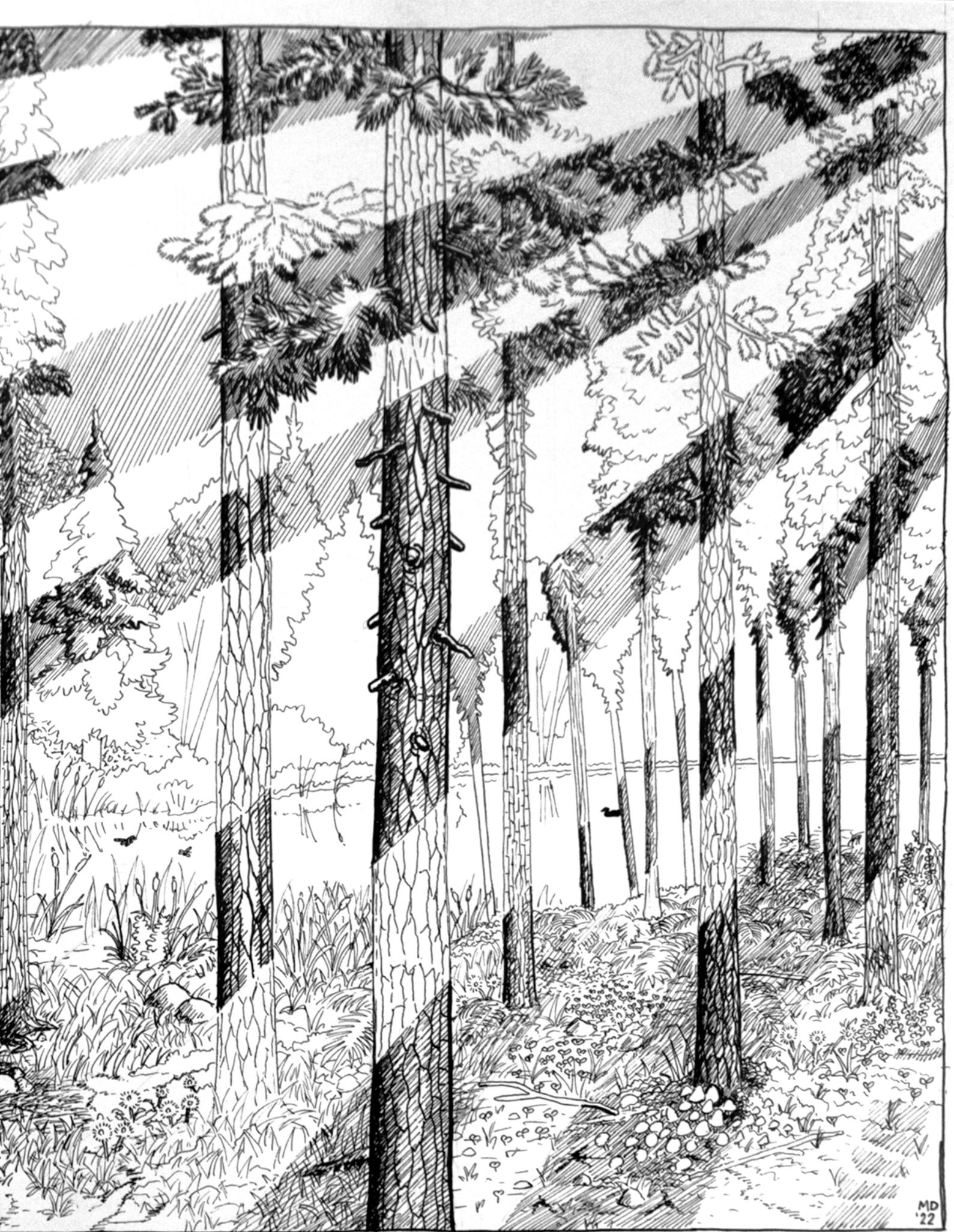


Figure 26. Forest Harmony
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APPENDIX A: HISTORICAL PHOTOS

In order to bridge the gap between the literature and the visual exploration through drawings, historical photos were used to support this process. The following photographs are some of the most influential to the work of this thesis.



Figure 27. "Saw Mill, Arran Tp., Bruce Counry, Ont." 1923.



Figure 28. "Sawmill at Keewatin Lumber Co. near Kenora, Ont." 1936.



Figure 29. "Exterior of mill, saw mill, grist mill, and shingle mill, established by Isaac Currie in 1860 on the Fall River." 1870.

Figure 30. "Old Timber Slide, St. Anthony Lumber Co., Algonquin Park, Ont." 1936.



Figure 31. "Hollinger Mine. Timber yards. Transporting mine timbers to the lumber yards by horse wagons. Timmins, Ontario, 1936" 1936.



Figure 32. "Lumber camp at Coniston." Date unknown.

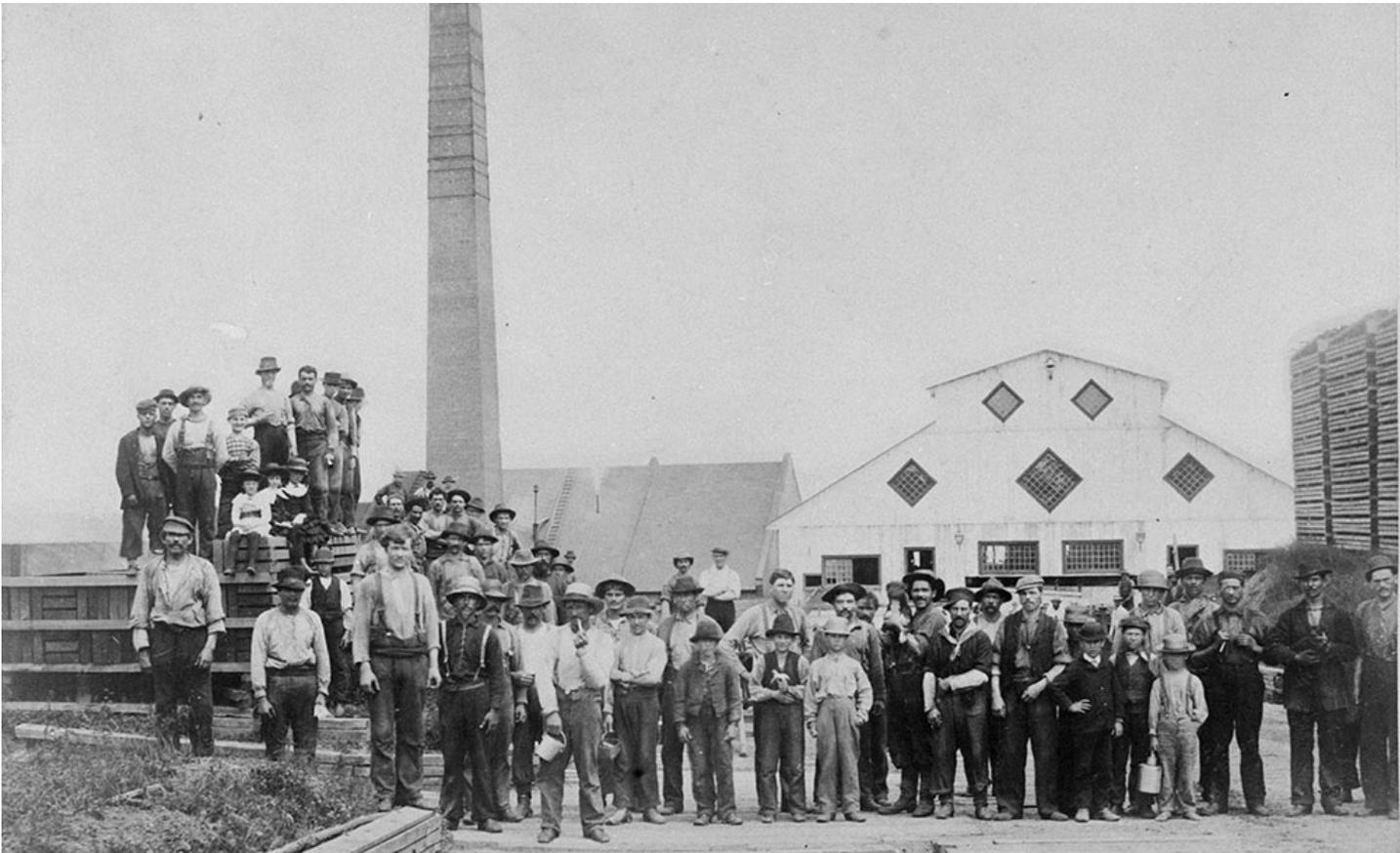


Figure 33. "Ritchie Sawmill's Workers" 1908.



Figure 34. "Men feeding the jackladder at Temagami, Gillies Bros. sawmill. Mill shut down permanently on Nov. 1957 and dismantled in about 1970." Date Unknown.

Figure 35. "Jackladder of Gillies Brothers Temagami sawmill on Cassels Lake, Ont." 1957-



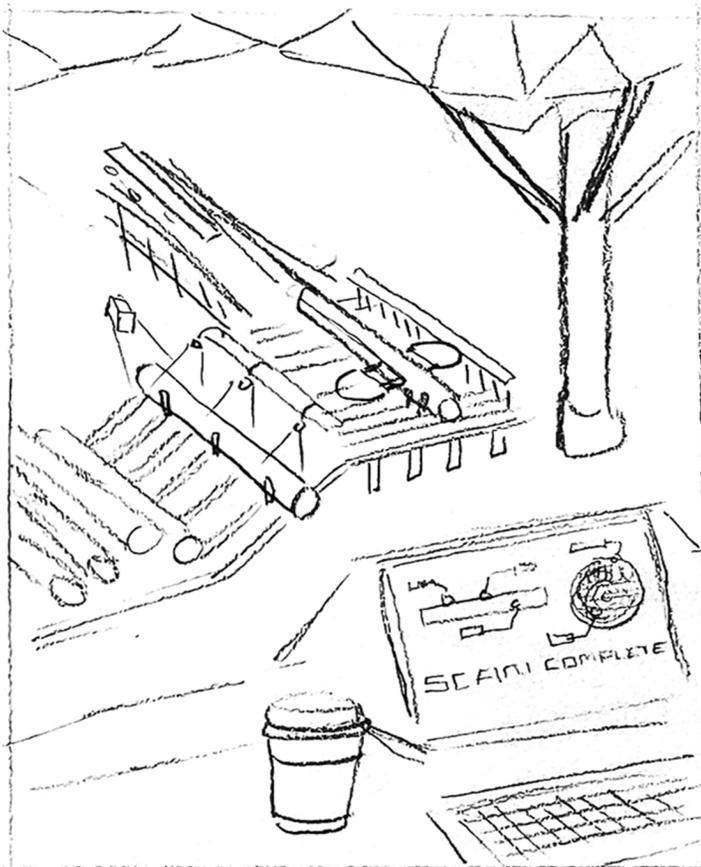
Figure 36. "Cooking on a JR Booth Platform." 1880.



Figure 37. "Construction of a flume at Pine Portage." Date unknown.

APPENDIX B: PROCESS WORK

Each drawing in the graphic narrative was developed as an interpretation of the literature and historical photos. This development produced many iterations of sketches and computer modelling before producing a final piece. In this appendix, a selection of this process is documented.



SAWMILL PROCES

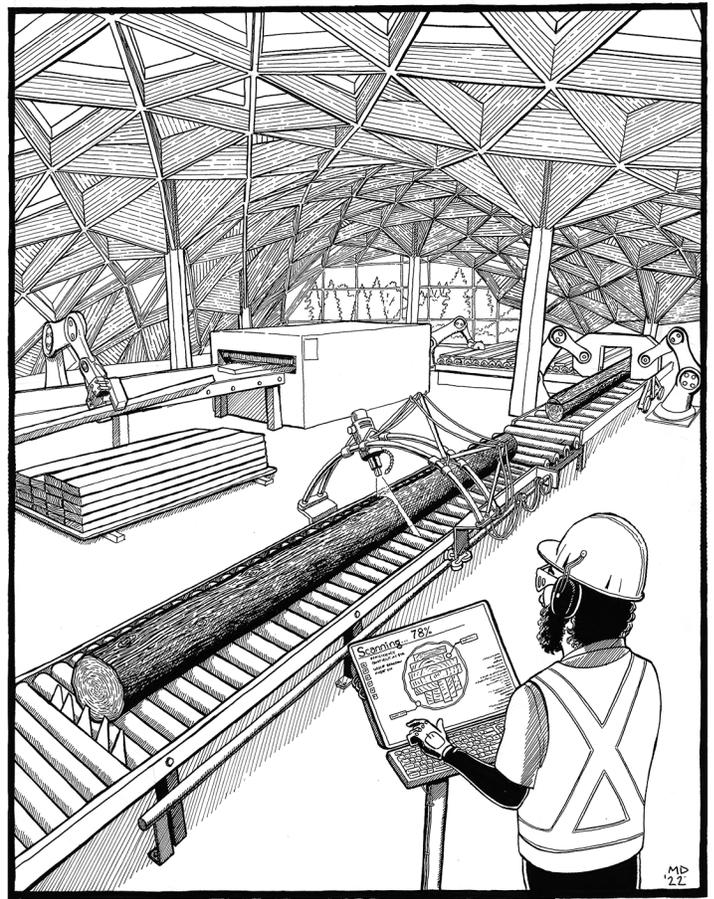
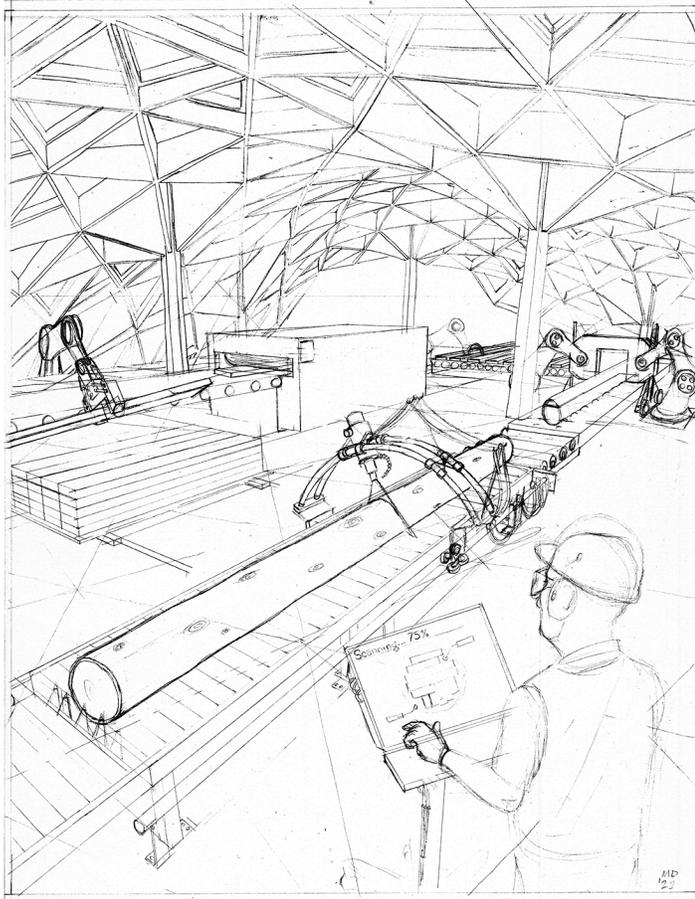
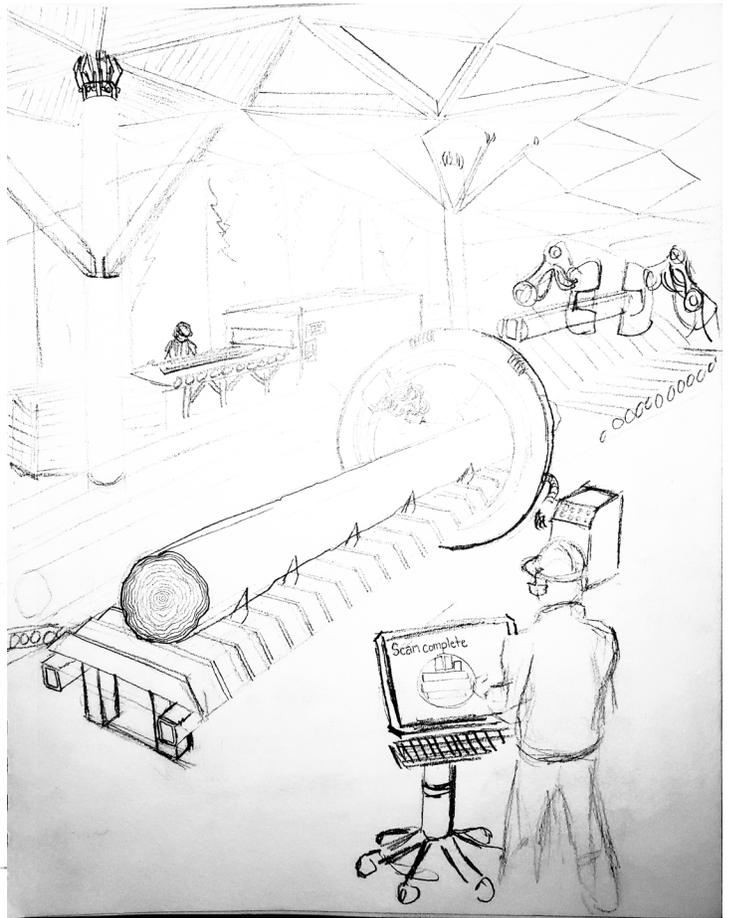


Figure 38. Process work to develop the new mill interior.

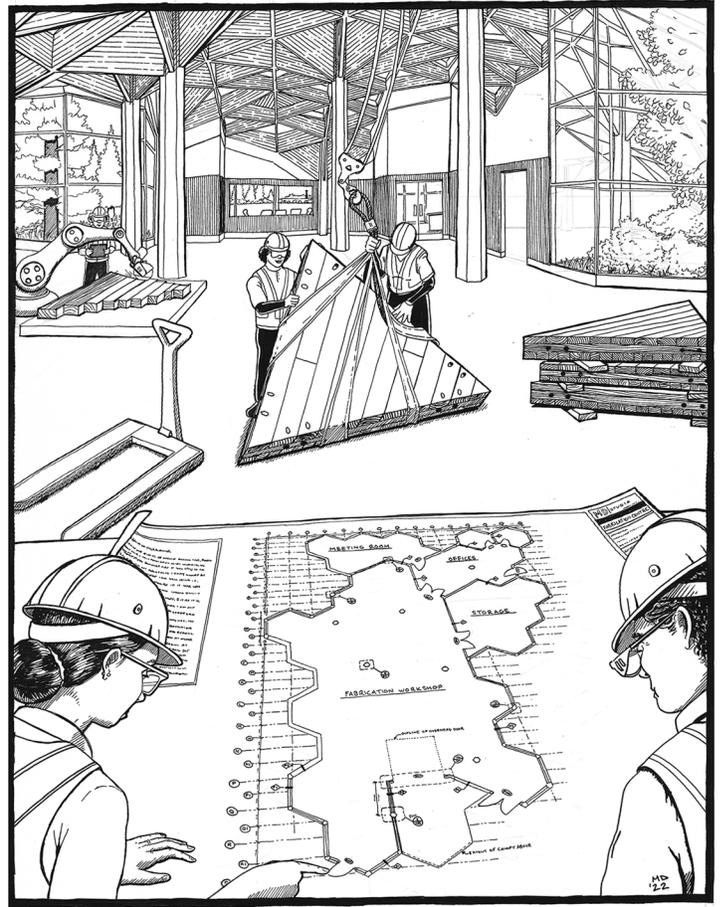
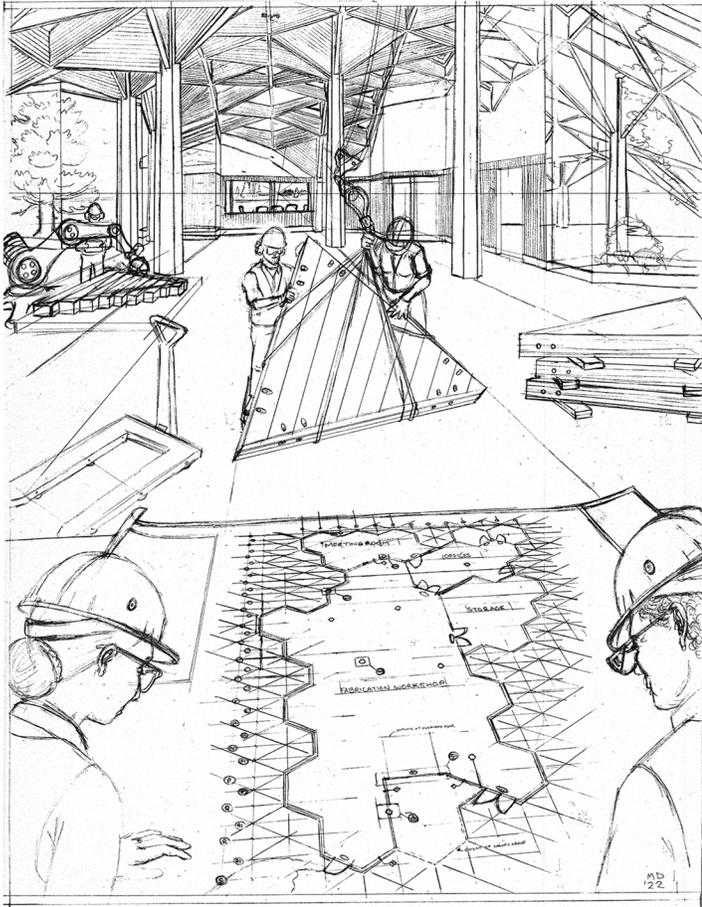
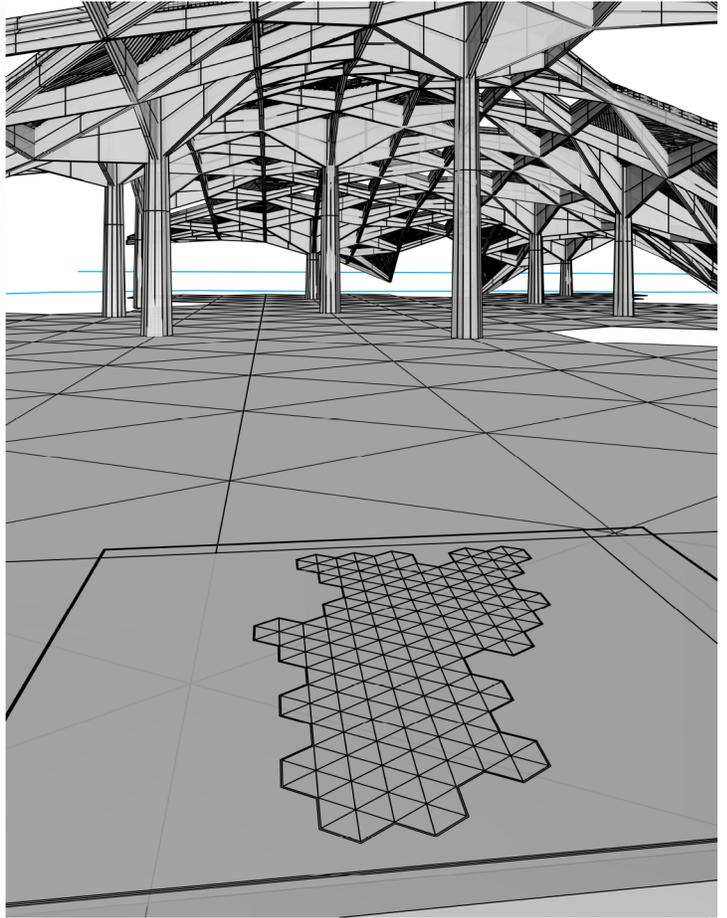
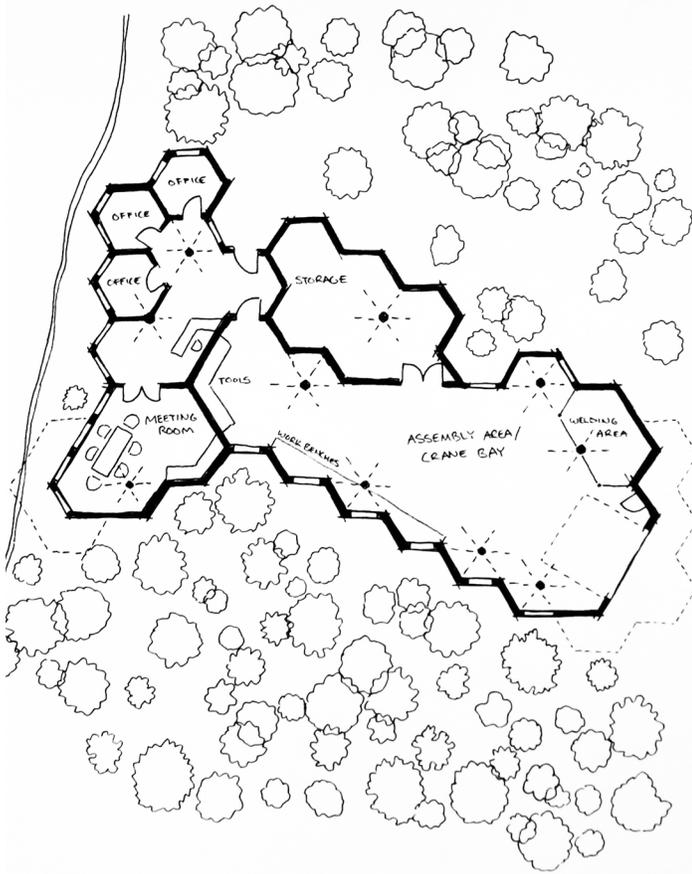


Figure 39. Process work to develop the construction of the fabrication centre.

