



REPORT

CUTTING IT CLOSE:

HOW UNSUSTAINABLE LOGGING IN CANADA'S BOREAL FOREST THREATENS INDIGENOUS RIGHTS, WILDLIFE, AND THE GLOBAL CLIMATE



Acknowledgments

A heartfelt thanks to the numerous individuals who helped in the research, drafting, and review of this report. Any mistakes are wholly the responsibility of the author, and review does not necessarily mean endorsement of the report. NRDC maps were provided by Lance Larson. Special thanks to Liz Barratt-Brown, Shelley Vinyard, Mitchell Beer, Charlotte Adams, and Jay Blair for research, analysis, and technical support, and to Mary Annaïse Heglar for her patient and detailed editing. This report has benefitted immensely from the careful review and input of Valérie Courtois, Emily Cousins, Philippa Duchastel de Montrouge, Brendan Guy, Margie Kelly, Olivier Kolmel, Niel Lawrence, Franz Matzner, Amy Moas, and Sasha Stashwick. We are incredibly grateful to the Atikamekw of Opitciwan and the Waswanipi Cree for welcoming us into their communities and sharing with us their stories, efforts, and knowledge.

This report is dedicated to the Indigenous Peoples who fight every day to protect their lands and ways of life. We would also like to thank the numerous organizations, communities, and individuals across Canada who work tirelessly to safeguard the boreal forest for future generations.

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About NRDC

The Natural Resources Defense Council is an international nonprofit environmental organization with more than 3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. Visit us at nrdc.org.

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Executive Summary

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Just below the frozen Arctic Circle, the boreal forest crowns the earth's Northern Hemisphere with a ring of deep green, primarily coniferous, trees. This forest stretches across Canada, Alaska, Russia, and Scandinavia, accounting for one-third of the world's forested areas.^{1,2} Canada boasts a quarter of the world's intact forests, with a boreal region spanning more than 1 billion acres from Newfoundland and Labrador to the Yukon Territory.³ It is home to more than 600 Indigenous communities, whose cultural identities are entwined with the forest, and to many non-Indigenous communities who continue to rely on the forest.⁴ The boreal is also important habitat for iconic species

such as the boreal caribou, Canada lynx, and moose,^{5,6,7} and it is an essential nesting ground for hundreds of migratory bird species that enrich the skies of North America.⁸ The region also provides vital ecosystem services, including pristine freshwater bodies that millions of Canadians rely on for drinking water.⁹

Furthermore, the boreal's benefits extend far past Canada. The trees and rich soils create a powerful carbon sink that extracts carbon dioxide from the atmosphere and stores it, helping to mitigate global climate change.¹⁰ If we want to avoid the worst impacts of climate change, an intact boreal is an essential ally.

Unfortunately, Canada's federal, provincial, and territorial governments are failing to protect the boreal and its vast ecological riches. They have allowed unsustainable logging to threaten Indigenous ways of life, iconic boreal species, and the global climate. Every day, logging companies push farther into intact forest regions, destroying complex old-growth ecosystems that had never previously been impacted by industrial development and leaving behind degraded landscapes.¹¹ Between 1996 and 2015, more than 28 million acres of boreal forest were logged, an area roughly the size of Ohio.¹²

- 1 R. E. Taggart and A. T. Cross, "Global Greenhouse to Icehouse and Back Again: The Origin and Future of the Boreal Forest Biome," *Global and Planetary Change* 63, no. 3-4 (2009): 115-121.
- 2 Tähti Pohjanmies et al., "Impacts of Forestry on Boreal Forests: An Ecosystem Services Perspective," *Ambio* 46, no. 7 (November 2017): 743-755, p. 743.
- 3 Jeffrey V. Wells and Peter J. Blancher, "Global Role for Sustaining Bird Populations," in *Boreal Birds of North America: A Hemispheric View of Their Conservation Links and Significance* (Berkeley and Los Angeles: University of California Press, 2011), p. 7.
- 4 International Boreal Conservation Campaign (hereinafter IBCC), "People of the Boreal," Pew Charitable Trusts (May 31, 2016), <http://www.pewtrusts.org/en/research-and-analysis/collections/2016/05/people-of-the-boreal>.
- 5 Also known as the boreal woodland caribou.
- 6 Hinterland Who's Who, "Canada Lynx," 1993, <http://www.hww.ca/assets/pdfs/factsheets/canada-lynx-en.pdf>.
- 7 Monte Hummel and Justina C. Ray, *Caribou and the North: A Shared Future* (Toronto: Dundun Press, 2008).
- 8 Jeffrey V. Wells and Peter J. Blancher, "Global Role for Sustaining Bird Populations."
- 9 Mark Anielski and Sara Wilson, *Counting Canada's Natural Capital: Assessing the Real Value of Canada's Boreal Ecosystems*, Canadian Boreal Initiative and The Pembina Institute (2009), p. 47, <https://www.cbd.int/financial/values/canada-countcapital.pdf>. Roy MacGregor, "The Story of the Ottawa River: Priceless and Precarious," *The Globe and Mail* (July 24, 2015), <https://www.theglobeandmail.com/news/national/the-story-of-the-ottawa-river-priceless-and-precious/article25669037/>. Mississippi-Rideau Source Protection Region, "Drinking Water in Ottawa," <https://www.mrsourcewater.ca/en/ottawa> (accessed May 11, 2018). CBCL Limited, St. John's Regional Drinking Water Study: Final Report (January 2016), <http://www.stjohns.ca/sites/default/files/files/publication/Regional%20Drinking%20Water%20Study%20FINAL%20REPORT.pdf>. The City of Calgary, "Calgary's Water Supply," <http://www.calgary.ca/UEP/Water/Pages/Water-and-wastewater-systems/Water-treatment/Water-supply.aspx> (accessed May=11, 2018).
- 10 Matt Carlson, Jeff Wells, and Dina Roberts, *The Carbon the World Forgot: Conserving the Capacity of Canada's Boreal Forest Region to Mitigate and Adapt to Climate Change*, Boreal Songbird Initiative and Canadian Boreal Initiative (2009), p. 8-9, www.borealbirds.org/sites/default/files/pubs/report-full.pdf.
- 11 Yan Boucher et al., "Cumulative Patterns of Logging and Fire (1940-2009): Consequences on the Structure of the Eastern Canadian Boreal Forest," *Landscape Ecology* 32, no. 2 (February 2017): 361-375, p. 367-368.
- 12 National Forestry Database, "Silvicultural Statistics by Province/Territory, 1990-2015, A. Area Harvested: Clearcut," nfdp.ccfm.org/data/compendium/html/comp_61e.html. U.S. Census Bureau, "State Area Measurements and Internal Point Coordinates," www.census.gov/geo/reference/state-area.html (accessed May 10, 2018). National Park Service, "Grand Canyon," www.nps.gov/grca/learn/management/statistics.htm (accessed May 10, 2018).

More than 90 percent of logging in Canada's boreal is done by clearcutting.¹³ Large-scale clearcutting is an especially destructive forestry practice that removes nearly all trees from an area.¹⁴ A single clearcut can reduce as much as nearly 5,000 acres from tall, lush greenery to stumps. Forests can take centuries to regain even close to their original biodiversity, complexity, and ecosystem services after a large clearcut, if they ever do.¹⁵

THE IMPACTS

This widespread logging threatens many Indigenous Peoples' cultures and relationships to the land. Some communities have only a fraction of their territory left intact.¹⁶ While Canadian governments have made progress toward reconciliation and the establishment of Nation-to-Nation relationships with Indigenous Peoples, too often Indigenous Peoples are largely excluded from decisions about development in their traditional territories.¹⁷ Communities do not always have recourse to prevent logging operations on their land and often receive no compensation for the resulting degradation and lost resources.¹⁸ Yet Indigenous Peoples continue to assert their rights to determine the future of their territories.

To protect their homelands and to express their goals, objectives, and aspirations as Nations, many Indigenous Peoples are leading land-use planning initiatives to care for the boreal forest. Indigenous-designed protected areas, frameworks for caribou management, monitoring programs, and other initiatives have become models for sustainable economic development across Canada.

Logging has also taken a devastating toll on wildlife. Boreal caribou, which require large tracts of mature forest and are particularly sensitive to human disturbance, have been hit especially hard. According to the federal government's boreal caribou Recovery Strategy, for a 60 percent chance of long-term survival, boreal caribou require ranges that are less than 35 percent disturbed.¹⁹ Yet across Canada, disturbance levels are well beyond this threshold. Only 14 of Canada's 51 boreal caribou ranges are currently considered sufficient to support self-sustaining caribou populations.²⁰ Without strong habitat protection measures, ongoing habitat loss will threaten the future of boreal caribou in these ranges. The federal government also reported that, since the release of the Recovery Strategy in 2012, caribou populations have continued to decline across the country.²¹ Caribou act as an "umbrella species," which means their protection also safeguards other boreal wildlife.²² These animals are also bellwethers for the broader health of the forest, so their decline is particularly alarming. If caribou habitat continues to deteriorate, that will have negative ramifications for species like the Canada lynx, the American marten, and hundreds of birds—all of which perform essential ecosystem functions. Yet no province or territory has created meaningful protection plans.²³ In fact, some provinces have even reversed progress toward caribou protection, further jeopardizing the future of this species—and the boreal itself.

Unsustainable logging is also undermining Canada's international commitments to limit the greenhouse gas emissions causing global climate change, including its own pledge under the historic 2015 Paris Agreement. Logging in the boreal impacts the global climate in two ways. First, it removes vegetation and soils that continuously absorb greenhouse gases, diminishing the boreal's powerful potential for carbon sequestration.²⁴ Second, over time it releases the vast stores of carbon that have been captured in those soils.²⁵ According to Natural Resources Defense Council (NRDC) estimates, clearcutting across the boreal forest releases on average more than 26 million metric tons (Mt) of carbon dioxide into the atmosphere each year. That's equivalent to the annual emissions of nearly 5.5 million passenger vehicles, or 3.7 percent of

13 Between 1996 and 2015, more than 25.3 million acres of boreal forest were clearcut. This estimate is based on clearcut logging done in the provinces where most logging activity takes place in the boreal forest: Newfoundland and Labrador, Quebec, Ontario, Manitoba, Saskatchewan, and Alberta. National Forestry Database, "Silvicultural Statistics."

14 Andrew Park et al., *A Cut Above: A Look at Alternatives to Clearcutting in the Boreal Forest*, Wildlands League (February 2005), p. 9, <http://wildlandsleague.org/attachments/A%20Cut%20Above.pdf>. Natural Resources Canada, "Clearcutting in the Forest," <http://www.nrcan.gc.ca/node/9513> (accessed May 11, 2019).

15 L. A. Vernier et al., "Effects of Natural Resource Development on the Terrestrial Biodiversity of Canadian Boreal Forests," *Environmental Review* 22 (2014): 457-490.

16 See, e.g., Cree First Nation of Waswanipi, "The Mishagamish Protected Area Proposal" (2011), <https://www.eeyouconservation.com/the-mishagamish-protected-area-proposal/>.

17 Reconciliation is an ongoing effort among governments, individuals, and institutions within Canada to redress the historical and systemic wrongs inflicted on Indigenous Peoples throughout the country's history.

18 See, e.g., "Nitaskinan: No Progress With Québec, the Atikamekw Maintain Blockade," *NewsWire* (June 28, 2012), <http://www.newswire.ca/news-releases/nitaskinan-no-progress-with-quebec-the-atikamekw-maintain-blockade-510434361.html>.

19 Environment Canada, *Recovery Strategy for the Woodland Caribou* (Rangifer tarandus caribou), *Boreal Population, in Canada*, Species at Risk Act Recovery Series (2012), p. 22-23, http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs%5Fcaribou%5Fboreal%5Fcaribou%5F0912%5F01%2Epdf.

20 Environment Canada, "Species Profile: Caribou Boreal Population," http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=636 (accessed May 10, 2018).

21 Environment Canada, Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou (Rangifer tarandus caribou), *Boreal Population in Canada for the Period 2012-2017*, Species at Risk Act Recovery Strategy Series (2017), <http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=7037FCE4-L>.

22 Orphé Bichet et al., "Maintaining Animal Assemblages Through Single-Species Management: The Case of Threatened Caribou in Boreal Forest," *Ecological Applications* 26, no. 2 (March 2016): 612-623.

23 Jacqueline Hebert et al., *Progress Report on the State of Boreal Caribou Critical Habitat Protection in Canada*, Wildlands League (2017), p. 8, <http://wildlandsleague.org/media/Wildlands-Progress-Report-Final-Oct4-high-res.pdf>.

24 Sebastiaan Luyssaert, et al., "Old-Growth Forests as Global Carbon Sinks," *Nature* 455, no. 7210 (2008).

25 J. James and R. Harrison, "The Effect of Harvest on Forest Soil Carbon: A Meta-Analysis," *Forests* 2016, no. 7 (2016): 308.



Clearcutting across the boreal forest releases on average more than 26 million metric tons of carbon dioxide into the atmosphere each year. That's the equivalent of the annual emissions of nearly 5.5 million passenger vehicles, or 3.7 percent of Canada's total emissions in 2016.

Canada's total emissions in 2016.²⁶ Despite these impacts, Canada does not fully account for logging's substantial emissions in its national greenhouse gas inventories. Instead it overstates the climate benefits associated with Harvested Wood Products (HWPs) and does not include the vast release of carbon from the soil logging causes.²⁷ Even if these emissions were adequately counted, Canada does not have a national strategy to limit its carbon emissions. Therefore, there is little opportunity to hold logging companies accountable for their climate impact.

INDUSTRY PRACTICES AND INTERNATIONAL DEMAND

Canada's logging industry is driven largely by international demand. More than half of all Canadian forest products are exported—two-thirds of which go to the United States.²⁸ As a result, the international marketplace has a substantial stake in the sustainability of Canada's logging industry. Many of the sourcing policies for U.S. companies that purchase boreal forest products include commitments to protect intact forests, threatened and endangered species, and Indigenous communities. Major companies have called on Canada to create policies in consultation with Indigenous Peoples to ensure that their purchases will not come at the expense of the boreal forest, its inhabitants, and its plant and animal species.²⁹

Given the global demand for responsibly sourced forest products, sustainable practices can be a boon for the forest industry. Since 1994, the Forest Stewardship Council (FSC), for example, has proved that a credible certification system can reward more sustainable management. About 25 percent of boreal forest under commercial logging operation in Canada is FSC-certified, meaning these operations take measures to promote conservation, maintain biodiversity, and seek input from local and Indigenous communities.³⁰ In addition, companies like Rayonier are leading the way in developing business models that thrive on boreal protection.³¹ These examples show that companies do not need to rely on destructive or unsustainable practices.

26 Government of Canada, "Greenhouse Gas Sources and Sinks: Executive Summary 2018," <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2018.html#es-3> (accessed June 15, 2018). Joshua Axelrod, "Pandora's Box: Clearcutting in the Canadian Boreal Unleashes Millions of Tons of Previously Uncounted Carbon Dioxide Emissions," Natural Resources Defense Council (hereinafter NRDC) (2018), p. 11, <https://www.nrdc.org/sites/default/files/pandoras-box-clearcutting-boreal-carbon-dioxide-emissions-ip.pdf>.

27 Environment and Climate Change Canada, *National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada* (2018) p. 165-66, <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2018>.

28 Natural Resources Canada, "Statistical Data: Trade," <https://cfs.nrcan.gc.ca/statsprofile/trade/ca> (accessed May 10, 2018). Natural Resources Canada, "Statistical Data: Domestic Economic Impact," <https://cfs.nrcan.gc.ca/statsprofile/economicimpact/ca> (accessed May 10, 2018).

29 Ben & Jerry's, "Hey, Canada! Protect Woodland Caribou!" October 18, 2017, <https://www.benjerry.com/whats-new/2017/10/protect-woodland-caribou>. Gap Inc, "Boreal Letter," http://www.gapincustainability.com/sites/default/files/Gap_Inc_Boreal_Letter.pdf (accessed June 26, 2018).

30 Forest Stewardship Council Canada (hereinafter FSC Canada), "Moving Towards Motion 65: FSC to Engage on New Forest Management Standard," FSC Newsroom (April 26, 2016), <https://ca.fsc.org/en-ca/newsroom/id/557>.

31 See, e.g., Wildlands League, "Collaboration Leads to Solutions for Threatened Woodland Caribou and Jobs" (May 18, 2016), <http://wildlandsleague.org/news/collaboration-leads-to-solutions-for-threatened-woodland-caribou-and-jobs/>. Chief Bruce Archibald, et al., "Joint Statement on Abitibi River Forest," Wildlands League (March 22, 2018), <http://wildlandsleague.org/news/statement-on-arf/>.



RECOMMENDATIONS

Unsustainable boreal logging is harmful, both for today and for tomorrow. Canada will benefit significantly by embracing a healthier future and more responsible models of forest management. NRDC recommends the following:

- Canada should foster and support Indigenous-led land-use planning and decision-making on Indigenous lands, fully respecting Indigenous knowledge, sovereignty, and rights, including the right to free, prior, and informed consent (FPIC).
- Provincial and territorial decision makers should implement mandatory protections for critical caribou habitat.
- Where critical caribou habitat is left unprotected, the federal government should step in to safeguard it.
- Policymakers should improve measurement of greenhouse gas emissions associated with boreal logging and require companies to implement forestry practices that minimize emissions.
- Canada's federal and provincial governments should implement policies to increase the boreal forest's resilience to climate change.
- Corporate buyers of boreal forest products should ensure their sourcing policies and decisions are aligned with boreal protection and Indigenous sovereignty.

I. Introduction

Canada's boreal is a natural wonderland full of rare intact, old-growth forests. North of the U.S. border, mixed-wood forests give way to conifers such as pine, fir, spruce, and larch. Moving farther north, the growing season shortens, winters lengthen, and the soil becomes a hard permafrost. Species like caribou, Canada lynx, and American marten roam the landscape.^{32,33} This is Canada's boreal forest, one of the last great forests on earth and home to hundreds of Indigenous communities, along with many non-Indigenous communities that continue to rely on the forest.³⁴ The boreal forest's importance extends even beyond those communities that rely on it daily. As the 1998 Canada Forest Accord, signed by forest ministers across the country and industry representatives states, "Our forest heritage is part of our past, our present, and our future identity as a nation."³⁵



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The Canadian boreal's vast intact forests and wild landscapes once seemed endless. But they are now rapidly disappearing. This international treasure is under threat from destructive and unsustainable logging practices that degrade more than 1 million acres of boreal forest every year.³⁶ Each day, the Canadian logging industry pushes deeper into intact forests, with devastating impacts for communities across Canada, especially for many Indigenous Peoples. This runaway logging is also destroying the habitat of treasured species, such as the boreal caribou, and undermining global efforts to combat climate change. Despite these dire threats, Canada's federal, provincial, and territorial governments have continually failed to implement policies that would encourage more sustainable practices.

This report examines the Canadian boreal's immense value and the threats it faces from unsustainable logging. We also highlight efforts to safeguard the boreal, including by Indigenous Peoples and industry leaders, along with the stake all Canadians have in sustaining a healthy boreal. We call on Canada's governments to engage, Nation-to-Nation, with Indigenous Peoples to implement more sustainable policies and land-use plans. Last, we urge companies sourcing from the boreal forest to ensure that their purchases do not come at the expense of this vital ecosystem.

II. The Value of the Boreal Forest

With vast areas generally free of large-scale human disturbance, Canada's boreal region holds a quarter of the world's intact forests—a larger proportion than even the Amazon rainforest.³⁷ It is home to hundreds of Indigenous communities whose cultures have remained inextricably linked to the forest for millennia. The Canadian boreal is also habitat for thousands of species of mammals, fish, birds, and insects, including globally iconic species like the boreal caribou. In addition, the region provides essential ecosystem services for Canadians and the world, with some of the purest freshwater lakes and rivers on earth, and an immense capacity to store climate-disrupting carbon dioxide.^{38,39}

32 Tähti Pohjanmies et al., "Impacts of Forestry on Boreal Forests." University of California Museum of Paleontology, "The Forest Biome," <http://www.ucmp.berkeley.edu/exhibits/biomes/forests.php> (accessed May 10, 2017).

33 Hinterland Who's Who, "Marten," <http://www.hww.ca/assets/pdfs/factsheets/marten-en.pdf>. Hinterland Who's Who, "Canada Lynx." Orphé Bichet et al., "Maintaining Animal Assemblages."

34 IBCC, "People of the Boreal."

35 "Canada Forest Accord," Natural Resources Canada (1998), <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/10360.pdf>.

36 National Forestry Database, "Silvicultural Statistics."

37 Jeffrey V. Wells and Peter J. Blancher, "Global Role for Sustaining Bird Populations."

38 The Pew Charitable Trusts, *A Forest of Blue: Canada's Boreal* (2011), <http://borealscience.org/wp-content/uploads/2012/06/report-forestofblue.pdf>.

39 Natural Resources Canada, "Forest Carbon," <http://www.nrcan.gc.ca/forests/climate-change/forest-carbon/13085> (accessed May 10, 2018).



THE IMPORTANCE OF INTACT FORESTS

Intact forests are large stretches of forest unaffected by roads or other large-scale human disturbances, and they have exceptional ecological value.⁴¹ In contrast to many fragmented forests, these forests are structurally complex, creating diverse habitat for a broad range of wildlife.⁴² Their complexity makes them more resilient to disturbances and alterations in climate.⁴³ Among their many ecological services, intact forests help to regulate local and regional weather as well as water flow.⁴⁴ They are also particularly effective at sequestering and storing carbon, making them essential in the fight against climate change.⁴⁵

The boreal forest contains primarily coniferous trees including pine, fir, spruce, and larch.³⁷

EXTENT OF THE NORTH AMERICAN BOREAL ZONE



THE TERRITORIES OF INDIGENOUS PEOPLES

The Canadian boreal forest has been the homeland for many Indigenous Peoples since long before European settlement. Today more than 600 Indigenous communities live in the boreal region and depend on intact, healthy forests.⁴⁶ As the Poplar River First Nation's 2010 Land Management Plan stated, "Like our ancestors, we are the caretakers of this land and we know once the resources from the land are depleted we will have nothing. We have been told by our elders to keep the land as it was when the Creator made it."⁴⁷

40 Ralph E. Taggart and Aureal T. Cross, "Global Greenhouse to Icehouse and Back Again," p. 115.

41 James E. M. Watson et al., "The Exceptional Value of Intact Forest Ecosystems," *Nature Ecology & Evolution* 2 (April 2018): 599-610.

42 Yves Bergeron and Nicole J. Fenton, "Boreal Forests of Eastern Canada Revisited: Old Growth, Nonfire Disturbances, Forest Succession, and Biodiversity," *Botany* 90, no. 6 (2012): 509-523, p. 516.

43 Peter Potapov et al., "The Last Frontiers of Wilderness: Tracking Loss of Intact Forest Landscapes from 2000 to 2013," *Science Advances* 3, no. 1 (January 2017): e1600821.

44 James E. M. Watson et al., "The Exceptional Value of Intact Forest Ecosystems."

45 Ibid.

46 IBCC, "People of the Boreal."

47 Pimachiowin Aki Corporation, *Pimachiowin Aki World Heritage Project: The Land That Gives Life*, Nomination for Inscription on World Heritage List (2015), http://pimachiowinaki.org/sites/default/files/docs/Pim_Aki_Dossier_2015_tk301_LR%20Jun%209.pdf (accessed May 10, 2018).



Jody Linklater learning how to harvest quills from a porcupine from elder Gradie Sterriah of Ross River in shared Kaska/Sahut lands on the border of the Yukon and Northwest Territories.



Josh Barichello and Robby Dick of Ross River, YK, drum on the Canol Trail on the border of the Yukon and Northwest Territories in shared Kaska/Sahtu lands.

“Like our ancestors, we are the caretakers of this land and we know once the resources from the land are depleted we will have nothing. We have been told by our elders to keep the land as it was when the Creator made it.”

–Poplar River First Nation’s 2010 Land Management Plan

The boreal’s rich resources provide for these Indigenous communities. The forest furnishes an abundance of roots, fruits, wild rice, and berries.⁴⁸ It also supports animals like caribou, hare, deer, geese, and salmon. These and other resources continue to be essential sources of food, clothing, shelter, medicines, and household goods.⁴⁹ The boreal also holds immense spiritual and cultural significance for many Indigenous Peoples. Sacred sites large and small are found throughout the boreal forest, including landscape features and burial grounds.⁵⁰ Boreal fauna, in particular, are closely tied to Indigenous lore, traditions, and place names.⁵¹ For instance, for the Innu, the Caribou Master controls the fate of the human world,⁵² and caribou are a source of both physical and spiritual nourishment.⁵³ The loon, meanwhile, is central to Anishinaabe and Cree creation stories.⁵⁴



The loon holds great spiritual significance to many Indigenous Peoples.

A healthy boreal forest also provides economic opportunities for Indigenous communities. Indigenous Guardians programs, for example, employ members of communities as “moccasins on the ground” to monitor and protect species and habitats and to maintain cultural sites.⁵⁵ The programs unite boreal protection, economic growth, and Indigenous sovereignty and reconnect youth with elders and the land, creating a new generation of advocates for protecting Indigenous territories. Indigenous Guardians programs are funded by local communities, provincial and federal governments, and nongovernmental organizations

48 Amanda Karst, *Conservation Value of the North American Boreal Forest From an Ethnobotanical Perspective*, Canadian Boreal Initiative, David Suzuki Foundation, and Boreal Songbird Initiative (2010).

49 Mark Q. Sutton, *Introduction to Native North America: 4th Edition* (New York: Routledge, 2016): 88, 98.

50 See, e.g., IBCC, “First Nations Negotiator Honors Ancestors by Protecting Boreal Forest,” The Pew Charitable Trusts (May 31, 2016), <http://www.pewtrusts.org/en/research-and-analysis/analysis/2016/05/31/first-nations-delegate-honors-ancestors-by-protecting-the-boreal-forest> (accessed May 10, 2018). Michael Beresford, Jessica Brown, and Nora Mitchell, “The Protected Landscape Approach: Linking Nature, Culture and Community,” International Union for Conservation of Nature (2005): 202.

51 Michael Beresford, Jessica Brown, and Nora Mitchell, “The Protected Landscape Approach.”

52 Winona LaDuke, *All Our Relations: Native Struggles for Land and Life* (Chicago: Haymarket Books 1999), p. 51.

53 Tipatshimuna, “Introduction to the Innu,” Virtual Museum of Canada, http://www.tipatshimuna.ca/1000_e.php (accessed May 24, 2018).

54 Michael Beresford, Jessica Brown, and Nora Mitchell, “The Protected Landscape Approach.”

55 Indigenous Leadership Initiative, “Indigenous Guardians Program,” <https://www.ilinationhood.ca/our-work/guardians/> (accessed May 10, 2018).



George River in Northern Québec at the Mushuau-nipi camp.

“Our identity, our culture is more conducive to the sustainability of traditional activities (than outside logging operations).”

**–Chief Christian Awashish,
Atikamekw First Nation of Opitciwan**

(NGOs).⁵⁶ A study of two such programs in the Northwest Territories found that every dollar invested generated \$2.50 in social, economic, cultural, and environmental benefits.⁵⁷ With stable core funding from a partner like the federal government, this return on investment could increase to \$3.70 or more.⁵⁸ There are currently about 30 Guardians programs across Canada, and Indigenous leaders are advocating for the creation of a National Indigenous Guardians Network.^{59,60} The federal 2017–2018 budget committed \$25 million over five years as an initial investment in this initiative.⁶¹

Sustainable, Indigenous-led resource management, including logging, offers an important means for many communities to develop economically on their own terms. Indigenous logging operations often look substantially different from those of the large outside companies, since they incorporate the values and respect for the land that have guided Indigenous stewardship for millennia. The Atikamekw of Opitciwan, for example, co-own and operate their own logging mill, which allows the community to retain some economic benefit from their forests. The sawmill’s logging area is significantly smaller than other companies’, and logging proceeds much more slowly and sustainably, with a focus on the Atikamekw’s close ties to the land. In the words of Opitciwan Chief Christian Awashish, “The pressure of forestry development would not be as great as it is now . . . if we managed the territory ourselves.” The Atikamekw “have to maintain a balance, a habitat for animals . . . Our identity, our culture is more conducive to the sustainability of traditional activities” than outside logging operations.⁶²

CANADA’S 2020 BIODIVERSITY GOALS AND TARGETS

Under the 2010 Convention on Biological Diversity’s Aichi Biodiversity Targets, Canada committed to conserve at least 17 percent of its land and inland waters, along with 10 percent of marine areas, by 2020.⁶³ In 2015 it adopted the *2020 Biodiversity Goals and Targets for Canada* in part to honor that commitment, which became Target I.⁶⁴ Canada’s *Pathway to Canada Target I Initiative* places great significance on the creation of Indigenous Protected and Conserved Areas (IPCAs).⁶⁵ To support this effort, an advisory group known as the Indigenous Circle of Experts (ICE) was formed. In 2018, ICE released a report that identified the central role that “Indigenous knowledge, systems, legal traditions, and cultural practices” will play in achieving the target.⁶⁶ These Target I efforts received a significant boost in 2018 when the Canadian government allocated \$1.3 billion over the next five years to nature conservation, in large part supporting its Target I commitment.⁶⁷ There is, however, much work left to be done. Today, only 10.6 percent of Canada’s total landmass and 12 percent of the boreal is protected.⁶⁸

56 See, e.g., Dehcho First Nations et al., *Analysis of the Current and Future Value of Indigenous Guardian Work in Canada’s Northwest Territories*, Social Ventures Australia (November 2016), p. 29, <http://www.ilinationhood.ca/wp-content/uploads/2016/11/value-in-indigenous-guardian-work-nwt.pdf>.

57 Ibid.

58 Ibid.

59 Indigenous Leadership Initiative, “Indigenous Guardians Network Receives Funding in Federal Budget,” press release (March 22, 2017), <https://www.ilinationhood.ca/2017/03/22/release-federal-budget-indigenous-guardians/>.

60 Indigenous Leadership Initiative, “Indigenous Guardians Program.”

61 Indigenous Leadership Initiative, “Indigenous Guardians Network Receives Funding.”

62 Chief Christian Awashish, interview by Jennifer Skene, Opitciwan, Quebec, February 20, 2018.

63 Convention on Biological Diversity, “COP 10 Decision X/2: Strategic Plan for Biodiversity 2011–2020,” October 2010.

64 Conservation 2020, “Pathway to Canada Target I: Introduction,” <http://www.conservation2020canada.ca/the-pathway/> (accessed May 10, 2018).

65 Conservation 2020, “Pathway to Canada Target I: Who We Are,” <http://www.conservation2020canada.ca/who-we-are/> (accessed May 10, 2018).

66 Indigenous Circle of Experts, *We Rise Together: Achieving Pathway to Canada Target I Through the Creation of Indigenous Protected and Conserved Areas in the Spirit and Practice of Reconciliation* (2018), p. III, https://static1.squarespace.com/static/57e007452e69cf9a7af0a033/t/5ab94aca6d2a7338ecb1d05e/1522092766605/PA234-ICE_Report_2018_Mar_22_web.pdf.

67 Government of Canada, *Budget 2018*, <https://www.budget.gc.ca/2018/docs/plan/chap-04-en.html#Protecting-Canadas-Nature-Parks-and-Wild-Spaces> (accessed May 11, 2018).

68 Canadian Parks and Wilderness Society, *From Laggard to Leader? Canada’s Renewed Focus on Protecting Nature Could Deliver Results* (2017), p. 4, <http://cpaws.org/uploads/CPAWS-Parks-Report-2017.pdf>. The Canadian Press, “Canada Boreal Forest Protection Expanded in 2013 but Concerns Remain,” CBC (January 5, 2014), <http://www.cbc.ca/news/canada/canada-boreal-forest-protection-expanded-in-2013-but-concerns-remain-1.2484843>.



The American marten, a tiny but fierce hunter, favors old-growth forests and avoids disturbed areas.⁶⁹



The snowshoe hare is so vital to the Canada lynx that the lynx's population trends mirror those of the snowshoe hare.⁷⁰



Approximately one-third of all North America's landbirds, shorebirds, and waterfowl breed in the boreal forest.^{71,72}

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THE WILDLIFE OF THE BOREAL

The boreal forest is home to some of North America's most treasured wildlife. More than 85 mammal species live in Canada's boreal forest, including black bears, American martens, and Canada lynx.⁷³ Species like the boreal caribou rely on undisturbed forest habitat, which means that their fate depends on a healthy boreal.⁷⁴ Conversely, the forest's ecological function is dependent on wildlife. Scientists believe, for example, that the way the snowshoe hare consumes plants and shrubs stimulates plant growth.⁷⁵ The hare is also vital prey for larger predators like the Canada lynx.⁷⁶

Each summer, up to 3 billion migratory birds comprising 325 species breed and nest in the boreal forest.⁷⁷ In the fall, as many as five billion birds migrate south from the boreal for the winter. Some fly immense distances to return to the boreal forest every summer, traveling from regions as remote as South America and Antarctica.^{78,79} This wide array of migratory birds is drawn to the Canadian boreal by the prime breeding habitat and abundance of insects and fish that thrive in the boreal wetlands, lakes, and rivers.⁸⁰

Boreal waters support about 130 fish species.⁸¹ Some, like the Atlantic salmon, have disappeared from many other parts of the continent.⁸² The Canadian boreal is also habitat for approximately 32,000 insect species.⁸³ Bees and monarch butterflies pollinate boreal plants and help to decompose dead vegetation.⁸⁴ Insects are also important food sources for animals, including birds and fish.⁸⁵

69 Hinterland Who's Who, "Marten."

70 L. A. Vernier et al., "Effects of Natural Resource Development on the Terrestrial Biodiversity of Canadian Boreal Forests."

71 Jeffrey V. Wells and Peter Blancher, "Global Role for Sustaining Bird Populations." Peter Blancher and Jeffrey Wells, *The Boreal Forest Region: North America's Bird Nursery*, p. 3. Jeff Wells et al., *Boreal Birds Need Half*.

72 Edward Cheskey, Jeffrey Wells, and Susan Casey-Lefkowitz, *Birds at Risk: The Importance of Canada's Boreal Wetlands and Waterways*, Nature Canada, Boreal Songbird Initiative, and NRDC (2011), p. 11-12, <https://www.borealbirds.org/publications/birds-risk-importance-canadas-boreal-wetlands-and-waterways>.

73 Hinterland Who's Who, "Boreal Forest."

74 Committee on the Status of Endangered Wildlife in Canada, *COSEWIC Assessment and Status Report on the Caribou Rangifer tarandus, Newfoundland Population, Atlantic-Gaspésie Population, Boreal Population*, Species at Risk Public Registry (2014), http://www.registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=2769.

75 Hinterland Who's Who, "Boreal Forest," Canadian Wildlife Federation, <http://www.hww.ca/en/wild-spaces/boreal-forest.html> (accessed May 11, 2018). Charles J. Krebs, Stan Boutin, and Rudy Boonstra (eds.), *Ecosystem Dynamics of the Boreal Forest* (Oxford: Oxford University Press, 2001): 113.

76 L. A. Vernier et al., "Effects of Natural Resource Development on the Terrestrial Biodiversity of Canadian Boreal Forests," p. 471.

77 Jeff Wells et al., *Boreal Birds Need Half: Maintaining North America's Bird Nursery and Why It Matters*, Boreal Songbird Initiative and Ducks Unlimited, p. 8 (2014),

http://www.borealbirds.org/sites/default/files/pubs/birdsneedhalf_0.pdf. Boreal Songbird Initiative, "What Is a Boreal Bird," <https://www.borealbirds.org/what-is-boreal-bird> (accessed May 11, 2018).

78 Peter Blancher and Jeffrey Wells, *The Boreal Forest Region: North America's Bird Nursery*, p. 6-7.

79 Boreal Songbird Initiative, "Migrations to Distant Destinations," <https://www.borealbirds.org/boreal-bird-migrations> (accessed May 11, 2018).

80 Ibid.

81 Hinterland Who's Who, "Boreal Forest."

82 The Pew Charitable Trusts, *A Forest of Blue*, p. 11.

83 Ibid.

84 Ibid.

85 Ibid.



FREQUENT FLYER: THE ARCTIC TERN

The Arctic tern is the Phileas Fogg of birds.⁸⁶ Each year it flies farther than any other bird on the planet, covering a round-trip distance of almost 22,000 miles from the Arctic to Antarctica in search of eternal summer.⁸⁷ The boreal forest provides essential breeding grounds for approximately half of North America's Arctic terns, which return each year to their boreal hatching sites to nest and raise their young before again departing for Antarctica.⁸⁸



BOREAL BELLWETHER: THE BOREAL CARIBOU

The boreal caribou holds an iconic status in Canada's national consciousness, and not only because it is North America's version of Santa's Christmastime reindeer.⁸⁹ In Canada, the caribou has year-round significance. As Minister of Environment and Climate Change Catherine McKenna has stated, "Few symbols of Canada's natural heritage could be stronger."⁹⁰ Canadians have only to reach into their wallets to see the boreal caribou's antlered visage emblazoned on the Canadian quarter.

Boreal caribou are an ecotype of woodland caribou, which is one of four subspecies of caribou in Canada.⁹¹ They are permanent residents of the boreal region and live in groups of about a dozen individuals.⁹² Throughout the year, boreal caribou require large tracts of intact old-growth forest for protection and food—particularly the lichens found primarily in mature forests.⁹³ They have also been central to the ways of life of Indigenous Peoples for thousands of years.⁹⁴

Yet boreal caribou have been declining across Canada for decades as a result of habitat loss. Nationally listed as threatened since 2003, caribou continue to face an uncertain future, in large part due to logging.⁹⁵



GHOST OF THE NORTH: THE CANADA LYNX

Often compared to a shadow or a ghost, the Canada lynx is an elusive boreal predator. A cousin of the bobcat, it resembles a giant gray housecat with tufted ears and a stubby, black-tipped tail. The Canada lynx's range was greatly curtailed throughout the 20th century due to habitat destruction and fragmentation from logging and other industries.⁹⁶ While the lynx historically thrived in 25 U.S. states in addition to Canada, it has now disappeared from much of the United States, making the Canadian boreal forest a critical refuge.⁹⁷

86 Phileas Fogg is the fictional protagonist of Jules Verne's *Around the World in 80 Days*, who circumnavigates the globe in a hot-air balloon.

87 Boreal Songbird Initiative, "Arctic Tern," <http://www.borealbirds.org/bird/arctic-tern> (accessed May 11, 2018).

88 Peter Blancher and Jeffrey Wells, *The Boreal Forest Region: North America's Bird Nursery*, p. 4.

89 The European reindeer and boreal caribou are members of the same species, *Rangifer tarandus*. European reindeer are typically domesticated. Monte Hummel and Justina C. Ray, *Caribou and the North*, p. 31-32.

90 Environment and Climate Change Canada, "Government of Canada Releases Action Plan on Boreal Caribou and Encourages Collaboration on Protection Efforts," <https://www.newswire.ca/news-releases/government-of-canada-releases-proposed-federal-action-plan-on-boreal-caribou-and-encourages-collaboration-on-protection-efforts-637057973.html> (accessed May 11, 2018).

91 The three other subspecies are the Peary caribou, barren-ground caribou, and Grant's caribou. Environment Canada, *Recovery Strategy for the Woodland Caribou, Boreal Population*, p. 2. The boreal caribou is distinct from the mountain woodland caribou, which spends a substantial portion of the year in higher-elevation alpine and subalpine regions. Environment Canada, *Recovery Strategy for the Woodland Caribou, Southern Mountain Population* (Rangifer tarandus caribou) in Canada, Species at Risk Act Recovery Strategy Series (2014), p. 2, https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_woodland_caribou_bois_s_mtn_pop_0114_e.pdf. Barren-ground and mountain caribou both face significant pressure due to development. Barren-ground caribou and southern mountain caribou are federally listed as threatened, while northern mountain caribou are listed as being of special concern. Committee on the Status of Endangered Wildlife in Canada, *COSEWIC Assessment and Status Report on the Caribou Rangifer tarandus Barren-Ground Population in Canada*, Species at Risk Public Registry, 2016, https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Caribou%20Barren-ground_2016_e.pdf. Environment Canada, *Recovery Strategy for the Woodland Caribou, Northern Mountain Population* (2012), https://www.sararegistry.gc.ca/virtual_sara/files/plans/mp_woodland_caribou_northern_mountain_population_e.pdf.

92 Environment Canada, "The Boreal Caribou Recovery Strategy: Summary Fact Sheet," Species at Risk Public Registry, <https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=DEB6552A-1> (accessed May 11, 2018).

93 Environment Canada, *Recovery Strategy for the Woodland Caribou, Boreal Population*, p. 9.

94 Environment and Climate Change Canada, *Action Plan for the Woodland Caribou* (Rangifer tarandus caribou), *Boreal Population, in Canada*, Species at Risk Act Action Plan Series (2018), p. ii, http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/ActionPlanWoodlandCaribouBorealPopulationFederalActions-v00-2018Feb-Eng.pdf.

95 Committee on the Status of Endangered Wildlife in Canada, *COSEWIC Assessment and Status Report on the Caribou Rangifer tarandus, Newfoundland Population, Atlantic-Gaspésie Population, Boreal Population*, p. viii.

96 Colorado Parks & Wildlife, "Lynx Reintroduction" (June 2014), <https://cpw.state.co.us/Documents/Research/Mammals/LynxFactSheet.pdf>.

97 Ibid.

A VITAL RESOURCE FOR CLIMATE CHANGE MITIGATION

The boreal forest plays a vital role in mitigating climate change by absorbing and storing greenhouse gas emissions. The global boreal forest contains more carbon per acre than any other forest biome in the world—including tropical forests.⁹⁸ Canada's boreal holds more than 12 percent of the world's land-based carbon stock—as much as 300 billion tons.⁹⁹ That's equivalent to over three decades worth of global carbon dioxide emissions from burning fossil fuels.¹⁰⁰

The Canadian boreal forest is extremely effective at storing atmospheric carbon for long periods, even thousands of years,¹⁰¹ due to its short summers and high soil acidity, which slow rates of decomposition.¹⁰² While tropical forests hold most of their carbon in trees and other aboveground biomass, boreal forests hold up to 95 percent of their carbon in soils, wetlands, and peatlands.¹⁰³ Absent human-caused impacts, this carbon has largely remained locked up, even as the forest continues to absorb more.¹⁰⁴ While the boreal does release carbon through natural processes and disturbances like decomposition and forest fires, this carbon release is far less than what can result from the addition of impacts from industrial activities, which also decrease the boreal forest's capacity to store additional carbon. (See "Logging's Impacts on the Boreal Forest," below).

In addition to its extraordinary carbon storage capacity, the boreal forest continually removes carbon from the atmosphere, absorbing an estimated 113.4 million metric tons¹⁰⁵ of carbon dioxide each year. That's equal to the annual emissions of 24 million passenger vehicles.¹⁰⁶ Contrary to some assumptions, healthy old-growth forests continue to accumulate biomass for centuries, and older trees grow at an exponential rate, absorbing more and more carbon as they do.¹⁰⁷ As a result, older forests generally store more carbon than younger ones, making them a particularly valuable resource in the global fight against climate change.¹⁰⁸



98 Robert T. Watson et al., *Special Report on Land Use, Land Use Change, and Forestry*, Intergovernmental Panel on Climate Change (2000), http://www.ipcc.ch/ipccreports/sres/land_use/index.php?idp=0.

99 R. Lal, "Soil Carbon Sequestration Impacts on Global Climate Change and Food Security," *Science* 304, no. 5677 (June 2004): 1623-1627. The global terrestrial carbon stock is often estimated at 2,500 gigatons. *Ibid.*, p. 1623. Recent studies of the boreal forest carbon stock have found a median value, based on existing research, of 1,095 gigatons. Corey J. A. Bradshaw and Ian G. Warkentin, "Global Estimates of Boreal Forest Carbon Stocks and Flux," *Global and Planetary Change* 128, no. 27 (May 2015): 26. With 28 percent of the boreal located in Canada, we estimate that around 12.3 percent of the global terrestrial sink, or 306.6 gigatons, is located in Canada's boreal forest. Natural Resources Canada, "8 Facts About Canada's Boreal Forest," <http://www.nrcan.gc.ca/forests/boreal/17394> (accessed May 11, 2018).

100 Global greenhouse gas emissions from burning fossil fuels totaled around 9.2 gigatons in 2014, and we have used this number in our calculations. Tom Boden, Bob Andres, and Gregg Marland, "Global CO₂ Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring," Carbon Dioxide Information Analysis Center, http://ediac.ess-dive.lbl.gov/ftp/ndp030/global.1751_2014.ems (accessed June 15, 2018).

101 IBCC, "Carbon Storage in Canada's Boreal Forest" (June 2012), <http://mbwatercaucus.org/wp-content/uploads/2012/06/BorealForest-CarbonMaps.pdf>. Matt Carlson, Jeff Wells, and Dina Roberts, *The Carbon the World Forgot*.

102 Ross W. Gorte, *Carbon Sequestration in Forests*, Congressional Research Service (2009), p. 6, <https://fas.org/sgp/crs/misc/RL31432.pdf>.

103 Corey J. A. Bradshaw and Ian G. Warkentin, "Global Estimates of Boreal Forest Carbon Stocks."

104 IBCC, "Carbon Storage in Canada's Boreal Forest." Matt Carlson, Jeff Wells, and Dina Roberts, *The Carbon the World Forgot*, p. 8-9.

105 This boreal region estimation is based on estimates finding that the mean carbon flux (sequestration) for the Canadian boreal region is 0.056 Mg C/hectare per year. Canada's boreal region covers 552 million hectares (slightly more than the area covered by boreal forest), resulting in total positive flux of 30.9 million metric tons of carbon per year. Converted to carbon dioxide, this totals 113.4 million metric tons per year. Bradshaw and Warkentin, "Global Estimates of Boreal Forest Carbon Stocks," p. 29.

106 U.S. Environmental Protection Agency, "Greenhouse Gas Equivalencies Calculator," www.epa.gov/energy/greenhouse-gas-equivalencies-calculator (accessed May 11, 2017).

107 Sebastiaan Luyssaert, et al., "Old-Growth Forests as Global Carbon Sinks," p. 213-215. N. L. Stephenson, et al., "Rate of Tree Carbon Accumulation Increases Continuously With Tree Size," *Nature* 507, no. 7490 (March 6, 2014).

108 *Ibid.*

NRDC estimates that the Canadian boreal forest holds more than 12 percent of the world's land-based carbon stock—as much as 300 billion tons.

FRESHWATER RESOURCES: THE LIFEBLOOD OF THE BOREAL

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The Canadian boreal region is the largest source of unfrozen freshwater on the planet and has the greatest number of long, undammed rivers in North America.¹⁰⁹ Boreal water bodies are largely free from invasive species, and the quality of this water is among the highest on earth.¹¹⁰ The region contains more than 197 million acres of unpolluted surface freshwater, 1.5 million lakes, and 294 million acres of wetlands.^{111,112,113} Lakes and rivers that flow through the boreal region provide drinking water for millions of Canadians, including the residents of Ottawa, St. John's, and Calgary.^{114,115,116,117}

Boreal freshwater bodies are also major ocean tributaries. Nearly half of all freshwater that flows into Canada's coastal waters passes through the boreal region before emptying into the Arctic, Atlantic, and Pacific Oceans.¹¹⁸ For example, one of the largest boreal rivers,

the Mackenzie River, accounts for 11 percent of the freshwater that flows into the Arctic Ocean.¹¹⁹ Lakes and rivers also increase regional precipitation and regulate local temperatures throughout the year.¹²⁰

Wetlands also perform essential ecological functions for many Canadian communities.¹²¹ Because water moves so slowly through them, boreal wetlands essentially act as the world's largest water filters. They have the capacity to remove a significant quantity of chemicals, sediments, phosphorus, and nitrogen deposited by rainwater and runoff before water enters drinking water sources.¹²² These wetlands also store excess water in years of heavy rain, providing flood control for communities across Canada. During droughts, wetlands create a more stable water supply by slowly releasing this water.¹²³

THE ECONOMIC VALUE OF THE BOREAL

Canada's boreal region provides immense economic benefits. Each year, according to estimates from 2002, Canada receives free nonmarket ecosystem services from the boreal that exceed \$700 billion in value.¹²⁴ This dwarfs the economic contribution of the logging industry.¹²⁵ These ecosystem services come in the form of carbon storage, flood control, pest control, subsistence, recreation, and municipal water use.¹²⁶

109 Boreal Songbird Initiative, "Conservation Values of the Boreal Forest," <https://www.borealbirds.org/conservation-values-boreal-forest> (accessed June 15, 2018).

110 The Pew Charitable Trusts, *A Forest of Blue*, p. 6.

111 *Ibid.*, p. 9.

112 Hinterland Who's Who, "Boreal Forest."

113 Mark Anielski and Sara Wilson, *Counting Canada's Natural Capital*.

114 Roy MacGregor, "The Story of the Ottawa River: Priceless and Precarious".

115 Mississippi-Rideau Source Protection Region, "Drinking Water in Ottawa".

116 CBCL Limited, *St. John's Regional Drinking Water Study: Final Report* (January 2016).

117 The City of Calgary, "Calgary's Water Supply".

118 Kara L. Webster et al., "Impacts and Prognosis of Natural Resource Development on Water and Wetlands in Canada's Boreal Zone," *Environmental Review* 23, no. 1 (2015): 78-131, <http://www.nrcresearchpress.com/doi/full/10.1139/er-2014-0063#.V9db8ZMrKR>.

119 Shusen Wang, Fuqun Zhou, and Hazen A. J. Russell, "Estimating Snow Mass and Peak River Flows for the Mackenzie River Basin Using GRACE Satellite Observations," *Remote Sensing* 9, no. 3 (2017): 256.

120 The Pew Charitable Trusts, *A Forest of Blue*, p. 13.

121 *Ibid.*, p. 7.

122 D. Pelster et al., "Water and Nutrient Inputs, Outputs, and Storage in Canadian Boreal Forest Wetlands: A Review," *Journal of Environmental Engineering and Science* 7, S1 (2008): 35-50. Jeff Wells et al., *Manitoba's Blue Mosaic: Six Aquatic Strongholds of Manitoba's Boreal Forest*, Boreal Songbird Initiative and Ducks Unlimited Canada (2014), p. 6, http://www.ducks.ca/assets/2012/06/nv6_wet.pdf.

123 Jeff Wells et al., *Manitoba's Blue Mosaic*, p. 6. Hinterland Who's Who, "Boreal Forest."

124 Anielski and Wilson, *Counting Canada's Natural Capital*, p. 3.

125 In 2015, the logging industry's contribution to Canada's real GDP was \$21.1 billion. Natural Resources Canada, "Statistical Data: Domestic Economic Impact."

126 Anielski and Wilson, *Counting Canada's Natural Capital*.



III. Logging's Impacts on the Boreal Forest

The annual rate of logging in Canada has fallen from its high in the 1990s and early 2000s, heavily influenced by the decline of print media.¹²⁷ However, the total footprint of logging in the boreal continues to expand each year as the industry pushes north into forests previously untouched by industrial operations, reducing the amount of remaining intact forest every day.¹²⁸ Between 1996 and 2015, more than 28 million acres of boreal forest were logged—an area roughly the size of Ohio (see Table 1).^{129,130}

More than 90 percent of boreal logging is done by clearcutting.¹³¹ While methods can vary, large-scale clearcutting is an especially devastating forestry practice that removes nearly all the trees from a given area.¹³² These clearcut areas can reach about 5,000 acres, or about six times the size of Central Park in New York.¹³³ Clearcutting specifically targets older forests for their commercial value, reducing the proportion of more mature, old-growth stands—the highest-quality habitat and the very trees we need to mitigate climate change.¹³⁴ Intact, old-growth forests in the southern boreal, which are more biodiverse than those in the north, also contain more commercially viable timber. As a result, they have been hit hardest by the logging industry, with devastating impacts on wildlife.¹³⁵

Due to the cold temperatures and short summers, boreal trees grow slowly.¹³⁶ The ecosystem dynamics and structural diversity that make old-growth forests so unique and valuable come only with the long passage of time. Therefore, areas that have suffered large clearcuts can take centuries to return to their pre-logging condition—if they ever do.¹³⁷ In the meantime, the wildlife that rely on complex, old-growth ecosystems often struggle to survive in the degraded habitat.¹³⁸

127 National Forestry Database, “Silvicultural Statistics.”

128 Wynet Smith and Ryan Cheng, *Time Series Analysis of Anthropogenic Disturbance in the Broadback River Watershed, Quebec*, Global Forest Watch (October 2016), <https://www.nrdc.org/sites/default/files/broadback-watershed-bulletin-20161019.pdf>.

129 National Forestry Database, “Silvicultural Statistics.”

130 U.S. Census Bureau, “State Area Measurements and Internal Point Coordinates.”

131 “National Forestry Database, “Silvicultural Statistics.”

132 Greenpeace, *Consuming Canada's Boreal Forest: The Chain of Destruction From Logging Companies to Consumers* (2007), p. 19, www.greenpeace.org/canada/Global/canada/report/2007/9/consumingthe-boreal-forest-t.pdf. Andrew Park, et al., *A Cut Above*, p. 9. Natural Resources Canada, “Clearcutting in the Forest.”

133 See, e.g., Ontario Ministry of Natural Resources and Forestry, *Annual Report on Forest Management 2012–2013* (2014), <https://www.ontario.ca/page/annual-report-forest-management-2012-2013>. “Central Park,” *Encyclopedia Britannica*, <https://www.britannica.com/place/Central-Park-New-York-City> (accessed July 10, 2018).

134 Yan Boucher et al., “Cumulative Patterns of Logging and Fire,” p. 370.

135 L. A. Vernier et al., “Effects of Natural Resource Development,” p. 458.

136 University of California Museum of Paleontology, “The Forest Biome.”

137 L. A. Vernier et al., “Effects of Natural Resource Development,” p. 476.

138 Ibid.

The effects of logging on plants, soil, and animals differ from the impacts of natural disturbances, to which forests have adapted over thousands of years.¹³⁹ For instance, clearcutting typically targets older stands of trees and has a greater impact on species diversity and composition.^{140,141} Clearcutting also damages soils, which can change natural patterns of plant succession and composition.¹⁴² This can lead to a decline in lichens, mosses, and other species that are important food for wildlife like boreal caribou.¹⁴³ In the Canadian boreal, clearcutting has also been shown to benefit invasive species that aggressively dominate the consumption of organic materials.¹⁴⁴

The logging industry relies heavily on replanting efforts that create tree stands that are less biologically and structurally diverse and less resilient to future disturbances like extreme weather and climate change than the trees that have been removed.¹⁴⁵ This exacerbates clearcutting impacts because even when these forests regrow, many have been turned into monoculture tree plantations that do not have the same ecological health as intact, multispecies forest ecosystems. One 2012 study argued that “the widespread application of even-aged, single species management at all scales of boreal forest management interferes with fundamental ecological processes that maintain ecosystem integrity in boreal forests.”¹⁴⁶

TABLE 1: ACRES OF BOREAL FOREST LOGGED, 1996–2015¹⁴⁷

Province	Logged Area 1996–2015 (acres)	Area Equivalent	Average Acres Logged Per Day	Area Equivalent
Quebec	13,100,000	2 times bigger than Vermont	1,800	4,802 NHL hockey rinks
Ontario	8,750,000	2.5 times bigger than Connecticut	1,200	3,201 NHL hockey rinks
Alberta ¹⁴⁸	3,810,000	3 times bigger than Grand Canyon National Park	522	1,392 NHL hockey rinks
Saskatchewan	972,000	Rhode Island	133	355 NHL hockey rinks
Newfoundland and Labrador	848,000	Yosemite National Park	116	309 NHL hockey rinks
Manitoba	635,000	2 times bigger than Los Angeles	87	176 NHL hockey rinks
Total Boreal Loss	28,200,000	Ohio	3,860	10,298 NHL hockey rinks

DEGRADATION VERSUS DEFORESTATION

In assessing the health of managed forests, Canada’s federal government and industry focus on a single indicator: “deforestation.” This term, however, has a narrow definition, and it drastically downplays the impact of logging on the boreal forest.¹⁴⁹ Deforestation refers to the conversion or changing of a forested area into something else—usually farmland, roads, or some other form of built environment.¹⁵⁰ Forest “degradation,” on the other hand, covers any human activity that diminishes the health of a forest, including by reducing biodiversity, undermining ecosystem services, and altering the forest’s structure.¹⁵¹ While the Canadian government often fails to mention forest degradation statistics, its consequences—including carbon emissions, species loss, and water pollution—can be just as severe as those of deforestation.¹⁵²

139 Sylvie Gauthier et al., “Boreal Forest Health and Global Change.” L. A. Vernier et al., “Effects of Natural Resource Development.” Dominic Cyr et al., “Forest Management is Driving the Eastern North American Boreal Forest Outside its Natural Range of Variability.” *Frontiers in Ecology and the Environment* 7, no. 10 (2009): 519–524.

140 Ibid.

141 See, e.g., Maxim Larrivé, Lenore Fahrig, and Pierre Drapeau, “Effects of a Recent Wildfire and Clearcuts on Ground-Dwelling Boreal Forest Spider Assemblages,” *Canadian Journal of Forest Research* 35 (2005): 2575–2588, p. 2584. Marijke van Kuijk, Francis E. Putz, and Roderick Zagt, *Effects of Forest Certification on Biodiversity*, Tropenbos International (2009), pp. 19–22.

142 Gerald Niemi et al., “Ecological Sustainability of Birds in Boreal Forests,” *Conservation Ecology* [online] 2, no. 2 (1998): 17. Sybille Haeussler et al., “Silvicultural Disturbance Severity and Plant Communities of the Southern Canadian Boreal Forest,” *Silva Fennica* 36, no. 1 (2002): 307–327.

143 Sybille Haeussler et al., “Silvicultural Disturbance Severity.”

144 Ibid.

145 Ibid. Yves Bergeron and Nicole J. Fenton, “Boreal Forests of Eastern Canada Revisited.” Sylvie Gauthier et al., “Boreal Forest Health and Global Change,” p. 820.

146 Yves Bergeron and Nicole J. Fenton, “Boreal Forests of Eastern Canada Revisited,” p. 518.

147 National Forestry Database, “Silvicultural Statistics.”

148 Numbers do not reflect forest degradation for oil and gas development, which is significant in Alberta.

149 Natural Resources Canada, *The State of Canada’s Forests: Annual Report 2016* (2016), p. 18, <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/37265.pdf>.

150 Food and Agriculture Organization of the United Nations, “Deforestation,” <http://www.fao.org/docrep/009/j9345e/j9345e07.htm> (accessed May 11, 2018).

151 Ian Thompson et al., “An Operational Framework for Defining and Monitoring Forest Degradation,” *Ecology and Society* 18, no. 2 (2013): 20, <https://www.ecologyandsociety.org/vol18/iss2/art20/>.

152 Food and Agriculture Organization of the United Nations, “Forest Degradation.”

WILDFIRES: PART OF THE NATURAL ECOSYSTEM

Wildfires are vital to disturbance cycles that have long played an important role in boreal forest ecosystem dynamics. Vegetation and wildlife have adapted to them.¹⁵³ For instance, the cones of some tree species, such as jack pine and lodgepole pine, require heat from fire to release seeds; fire also releases nutrients that facilitate seed germination and plant growth.¹⁵⁴ Unlike most clearcutting, wildfires generally leave dead and burned wood, which provides habitat for many species.¹⁵⁵ They also produce more complex disturbance edges, which are more favorable to biodiversity.¹⁵⁶

In those limited circumstances when the forest is located near a community, logging can serve as a mechanism for reducing the size and destructiveness of wildfires near homes and other structures since it removes flammable materials.¹⁵⁷ However, clearcut logging and monoculture replanting often exacerbate wildfires, and studies have shown that intact forest areas experience less severe fires than logged areas.^{158,159}

LOGGING'S HUMAN RIGHTS COST

Since so much of the boreal forest is made up of Indigenous territories, protecting the boreal forest is inseparable from protecting Indigenous rights.¹⁶⁰ As the 2018 Indigenous Circle of Experts report stated, “The right to a healthy environment is a pillar right upon which the exercise of other Indigenous rights depends. If environmental degradation occurs, it threatens the rights and responsibilities of Indigenous Peoples, as well as the well-being of nature and peoples.”¹⁶¹

Because of colonial legacies related to land rights and the fact that many remaining commercially viable forests in Canada are located on Indigenous lands, Indigenous Peoples often suffer the worst of Canada’s unsustainable logging. Logging, for example, undermines the traditional relationships Indigenous Peoples have had with species like boreal caribou.¹⁶²

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A logging road and clearcut near Waswanipi, QC.

153 Natural Resources Canada, “Fire Ecology,” <http://www.nrcan.gc.ca/forests/fire-insects-disturbances/fire/13149> (accessed May 11, 2018).

154 Ibid.

155 S. J. Hannon and Pierre Drapeau, “Bird Responses to Burning and Logging in the Boreal Forest of Canada,” *Studies in Avian Biology* 30 (July 2005): 97-115. Mathieu Bouchard and David Pothier, “Long-Term Influence of Fire and Harvesting on Boreal Forest Age Structure and Forest Composition in Eastern Québec,” *Forest Ecology and Management* 261, no. 4 (February 15, 2011): 811-820.

156 Karen A. Harper et al., “Edge Influence on Vegetation at Natural and Anthropogenic Edges of Boreal Forests in Canada and Fennoscandia,” *Journal of Ecology* 103, no. 3 (May 2015): 550-562. Per-Anders Esseen et al., “Factors Driving Structure of Natural and Anthropogenic Forest Edges From Temperate to Boreal Ecosystems,” *Journal of Vegetation Science* 27, no. 3 (May 2016): 482-492.

157 See generally: James K. Agee and Carl N. Skinner, “Basic Principles of Forest Fuel Reduction Treatments,” *Forest Ecology and Management* 211, no. 1-2 (2005): 84. Scott L. Stephens et al., “The Effects of Forest Fuel-Reduction Treatments in the United States,” *BioScience* 2, no. 6 (June 2012): 549. But see: Stephen R. Mitchell, Mark E. Harmon, and Kari E. B. O’Connell, “Pacific Northwest Ecosystems,” *Ecological Applications* 19, no. 3 (2009): 653-54. Dylan W. Schwilk et al., “The National Fire and Fire Surrogate Study: Effects of Fuel Reduction Methods on Forest Vegetation Structure and Fuels,” *Ecological Applications* 19, no. 2 (2009): 301 (suggesting that fuel reduction treatments, while useful for reducing risk of severe wildfires, can have unintended or undesired impacts on net carbon balance and introduction of invasive species).

158 Carter Stone, Andrew Hudak, and Penelope Morgan, “Forest Harvest Can Increase Subsequent Forest Fire Severity,” *Proceedings of the Second International Symposium on Fire Economics, Planning, and Policy: A Global View* (2004): 532. Jonathan R. Thompson, Thomas A. Spies, and Lisa M. Ganio, “Reburn Severity in Managed and Unmanaged Vegetation in a Large Wildfire,” *Proceedings of the National Academy of Sciences* 104, no. 25 (June 19, 2007): 10746.

159 Curtis M. Bradley, Chad T. Hanson, and Dominick A. DellaSala, “Does Increased Forest Production Correspond to Higher Fire Severity in Frequent-Fire Forests of the Western United States?” *Ecosphere* 7, no. 10 (2016): 1-13.

160 Nature Canada, “Indigenous Peoples of the Boreal Forest: Connected to the Land, Birds and Water,” <https://naturecanada.ca/news/indigenous-peoples-of-the-boreal-forest-connected-to-the-land-birds-and-water/> (accessed May 11, 2018).

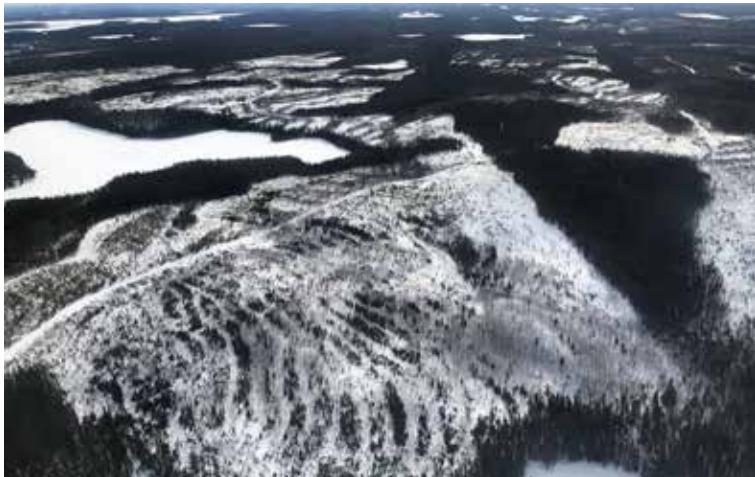
161 Indigenous Circle of Experts, *We Rise Together*.

162 See, e.g., Environment Canada, “The Innu,” Aboriginal Traditional Knowledge Summary Reports on Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6E917976-1#_a102 (accessed May 11, 2018).

Despite logging's devastating impact on Indigenous Peoples, many Nations and communities are largely excluded from decision making about development in their territories.¹⁶³ This is particularly true for larger-scale landscape planning. This exclusion undermines Indigenous rights established internationally and adopted nationally.

Canadian courts have held that Indigenous Peoples must be consulted “in good faith” about development on their lands, and that projects must make “accommodations” when there are impacts on Indigenous Peoples’ rights.¹⁶⁴ The Canadian Supreme Court has held that these consultations must be done “with the intention of substantially addressing the concerns of the aboriginal peoples whose lands are at issue.”¹⁶⁵ However, the right to consultation and accommodation is often poorly acknowledged and executed in practice.¹⁶⁶ Furthermore, these rights do not give Indigenous Peoples the right to determine the extent of resource extraction on their land.

Recent developments may one day grant Indigenous Peoples greater management control. Under Prime Minister Justin Trudeau, Canada has committed to “a renewed, nation-to-nation relationship with Indigenous Peoples, based on recognition, rights, respect, co-operation, and partnership.”¹⁶⁷ In 2016, Canada announced its full support of the United Nations (UN) *Declaration on the Rights of Indigenous Peoples*. This declaration enumerates, among other things, the right to free, prior, and informed consent (FPIC). Article 32 of the *UN Declaration* states that signatory governments “shall consult and cooperate in good faith with the indigenous peoples concerned . . . in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources.”¹⁶⁸ Canada’s adoption of the *UN Declaration* may mean that Indigenous communities will eventually have the right to bar industrial development in their territories.



Logged land on Atikamekw territory.

INDIGENOUS-LED BOREAL PROTECTION

Indigenous leadership is providing models for sustainable economic development, including plans for land use, boreal caribou management, Guardians programs, and Indigenous-run protected areas. Valérie Courtois, Director of the Indigenous Leadership Initiative, stated, in Canada “the most innovative, boldest creative conservation solutions have all come from Indigenous Peoples.”¹⁶⁹ Many Indigenous communities are also asserting their right to FPIC to protect their homelands and ways of life from unwanted industrial development. As Canada strives to meet its international commitment to protect 17 percent of its land by 2020, promoting Indigenous leadership and heeding communities fighting for a voice in decision making on their land is critical.¹⁷⁰

The Fort Nelson First Nation in British Columbia has demonstrated the kind of boreal caribou protection leadership that the provinces have largely lacked. The Nation’s 2017 Medzih¹⁷¹ Action Plan (MAP) to protect and recover caribou populations within its traditional territory is Canada’s first and only recovery plan to spatially identify and protect critical boreal caribou habitat in compliance with federal law.¹⁷² With the MAP, Fort Nelson First Nation has embraced its responsibility to protect boreal caribou through sustainable economic development and caribou recovery initiatives and shown Canada’s governments a workable model for meaningful caribou protection.

163 See, e.g., Presse Canadienne, “Judge Issues Injunction to Stop Logging on Atikamekw Territory,” *Montreal Gazette* (August 23, 2017), <http://montrealgazette.com/news/quebec/judge-issues-injunction-to-stop-logging-on-atikamekw-territory>.

164 *Haida v. British Columbia* [2004] 3 SCR 511.

165 *Delgamuukw v. British Columbia*, [1997] 3 S.C.R. 1010, Para. 168.

166 See, e.g., Presse Canadienne, “Judge Issues Injunction.”

167 “New Ministers Support Renewed Relationship with Indigenous Peoples,” Office of Justin Trudeau, Prime Minister of Canada, press release (August 24, 2017), <https://pm.gc.ca/eng/news/2017/08/28/new-ministers-support-renewed-relationship-indigenous-peoples>.

168 U.N. General Assembly, *United Nations Declaration on the Rights of Indigenous Peoples*, A/RES/61/295 (March 2008), http://www.un.org/esa/socdev/unpfi/documents/DRIPS_en.pdf.

169 Valérie Courtois, interview by Jennifer Skene, Washington, DC, April 10, 2018.

170 Indigenous Leadership Initiative, “Backgrounder: Indigenous Conservation Is Central to Achieving Canada’s International Conservation Commitment” (February 26, 2018), <https://www.ilinationhood.ca/2018/02/26/backgrounder-indigenous-conservation-is-central-to-achieving-canadas-international-conservation-commitment/>.

171 Meaning “boreal caribou.”

172 Fort Nelson First Nation, “Fort Nelson First Nation Releases Medzih Action Plan to Prevent Loss of Boreal Caribou in BC,” press release (October 4, 2017), http://www.fortnelsonfirstnation.org/uploads/1/4/6/8/14681966/map_press_release_final_04oct17.pdf.

***“The most innovative, boldest creative conservation solutions
have all come from Indigenous Peoples.”***

–Valérie Courtois, Director of the Indigenous Leadership Initiative

© Jennifer Skene



Animal skins drying by the O’Sullivan River near Waswanipi, QC.

The Lutsel K’e Dene First Nation in the Northwest Territories worked with Canadian governments to develop a proposal in 2015 for the Thaidene Nene (“Land of the Ancestors”) National Park Reserve, a 3.5 million-acre protected area.¹⁷³ The effort also resulted in an agreement with the Northwest Territories and Canada for the creation of a nearby 2.9 million-acre territorial park. Combined, the two parks will be larger than the state of Vermont.¹⁷⁴ The region is an important habitat for numerous species including barren-ground caribou, moose, bears, and songbirds. The Lutsel K’e Dene will co-manage the park reserve, providing employment in park stewardship and tourism as part of the National Indigenous Guardians Network.¹⁷⁵ Thaidene Nene provides a model for sustainable, diversified, Indigenous-led economic development.

In 2011, Poplar River First Nation in Manitoba created a government-endorsed land-use plan that protects 90 percent of its traditional territory.¹⁷⁶ This region spans 2 million acres, most of which is intact forest.¹⁷⁷ The Poplar River First Nation was also integral in the campaign to have Pimachiowin Aki (“The Land That Gives Life”) named a World Heritage Site. Pimachiowin Aki is an intact forest that stretches across 7 million acres and contains the traditional territories of four Anishinaabe communities.¹⁷⁸ In July 2018, after more than fifteen years of lobbying by these Anishinaabe communities, Pimachiowin Aki became the first mixed cultural and natural World Heritage site in Canada.¹⁷⁹

173 “Thaidene Nene: Land of the Ancestors,” <http://landoftheancestors.ca/> (accessed May 11, 2018). Parks Canada, “Proposed Thaidene Nënë National Park Reserve” (last modified November 10, 2017), <https://www.pc.gc.ca/en/pn-np/cnnp-cnnp/thaidene-nene/chrono>. International Boreal Conservation Campaign, “First Nations Negotiator Honors Ancestors by Protecting Boreal Forest.”

174 International Boreal Conservation Campaign, “First Nations Negotiator Honors Ancestors by Protecting Boreal Forest.”

175 Indigenous Leadership Initiative, “Indigenous Guardians Video,” <https://www.ilinationhood.ca/our-stories/indigenous-guardians-video/> (accessed May 11, 2018).

176 Manitoba Government, “Province Permanently Designates Largest Area of Protected Land in More Than a Decade,” press release (June 16, 2011), <http://news.gov.mb.ca/news/index.html?archive=&item=11766>.

177 Pascal Badiou et al., *Conserving the Last Great Forest Is Possible: Here’s How*, International Boreal Conservation Science Panel (July 2013), p. 13, <http://borealscience.org/wp-content/uploads/2013/07/conserving-last-great-forests1.pdf>.

178 United Nations Educational, Scientific and Cultural Organization, “Pimachiowin Aki,” <http://whc.unesco.org/en/tentativelists/6253/> (accessed May 11, 2018). Pimachiowin Aki World Heritage Project, “Our Future,” <http://pimachiowinaki.org/our-future> (accessed May 11, 2018).

179 Gloria Galloway, “Anishinaabe Territory Straddling Manitoba and Ontario Named Canada’s First Mixed UNESCO World Heritage Site,” *The Globe and Mail* (July 1, 2018), https://www.theglobeandmail.com/politics/article-anishnaabe-territory-straddling-manitoba-and-quebec-named-canadas/?utm_medium=Referrer:Social+Network+/+Media&utm_campaign=Shared+Web+Article+Links.



Pimachiowin Aki, which lies in Anishinaabe territory, became Canada's first mixed cultural and natural World Heritage site in Canada in 2018.

In 2013, the Sahtu Dene and Métis in the Northwest Territories finalized the Sahtu Land Use Plan, which protects more than 70 million acres of boreal forest.¹⁸⁰ The plan was developed by the Sahtu Land Use Planning Board and approved by both the federal and territorial governments. In drafting the plan, the board worked with communities, industry, and NGOs and incorporated both Indigenous and Western knowledge and science.¹⁸¹ As the board wrote, the plan “provides a unique opportunity to reconcile the different world views and systems of laws and beliefs . . . bring[ing] communities and government together in a collaborative decision-making process to integrate their different values into one plan that guides land use for the region.”¹⁸²

The Atikamekw in Quebec have fought to protect their homeland despite being continuously shut out of decision making for their territory. In 2012, after years of failed attempts to negotiate with the Quebec government, the Atikamekw communities of Opitciwan and Wemotaci erected roadblocks to stop logging operations in their territory and assert their right to FPIC.¹⁸³ Two years later, the Atikamekw Nation declared its sovereignty over 19.7 million acres of land between Montreal and Lac Saint-Jean.¹⁸⁴ Shortly afterward, they announced any logging in the region would require their consent.¹⁸⁵ Members of the Opitciwan community, in particular, are continuing to fight against unapproved logging in their territory and are exploring legal avenues to protect their way of life.

Like the Atikamekw, the Moose Cree First Nation in Ontario is asserting its right to FPIC in the face of government intransigence. The Moose Cree are working to protect and restore the North French River watershed, which spans 1.6 million acres across Ontario and constitutes 10 percent of the Moose Cree's traditional territory.¹⁸⁶ Over decades, the region has been impacted by mineral exploration, logging, and road construction. In 2002, the Moose Cree declared the North French River to be permanently protected. Ever since, they have defended the area from industrial development.¹⁸⁷ In 2017, the Moose Cree unanimously rejected an exploratory drilling proposal that could degrade the region.¹⁸⁸ Due to this opposition, Ontario placed its review of the project on hold, pending consultations with the community.¹⁸⁹

These initiatives are only a fraction of the Indigenous-led campaigns to protect the boreal. While these campaigns are diverse, they are all examples of how Indigenous communities are empowering themselves to assert their rights to their land and create healthy futures for their people. Canada's federal and provincial governments should follow their lead to protect the country's treasured landscapes and paint a brighter future for Canada and the rest of the world.

180 Sahtu Land Use Planning Board, *Sahtu Land Use Plan* (2013), https://sahtulanduseplan.org/sites/default/files/final_sahtu_land_use_plan_april_29_2013.pdf.

181 Sahtu Land Use Planning Board, “About Us,” <https://sahtulanduseplan.org/about-us> (accessed May 11, 2018).

182 Sahtu Land Use Planning Board, *Sahtu Land Use Plan*.

183 “Nitaskinan: No Progress With Québec, the Atikamekw Maintain Blockade,” *Newswire* (June 28, 2012), <http://www.newswire.ca/news-releases/nitaskinan-no-progress-with-quebec-the-atikamekw-maintain-blockade-510434361.html>.

184 Stephanie Marin, “Atikamekw Say They Won't Allow Forestry Work on Their Land Without Approval,” CBC (September 24, 2014), <http://www.cbc.ca/news/indigenous/atikamekw-say-they-won-t-allow-forestry-work-on-their-land-without-approval-1.2776780>.

185 Ibid.

186 Moose Cree First Nation, “Drilling Project Unanimously Rejected by Moose Cree: Community Calls on Ontario to Withdraw the Exploration Permit,” press release (May 16, 2017), http://www.moosecree.com/documents/may2017_niobay_pressrelease.pdf.

187 Anna Baggio, “It's Time for Ontario to Protect the North French River,” *Huffington Post* (February 9, 2016), http://www.huffingtonpost.ca/anna-baggio/north-french-river_b_9168700.html.

188 Moose Cree First Nation, “Drilling Project Unanimously Rejected.”

189 Ainslie Cruickshank, “Battle Brewing Over Niobium Mine Bid in Northern Ontario,” *The Star* (July 30, 2017), <https://www.thestar.com/news/gta/2017/07/30/battle-brewing-over-niobium-mine-bid-near-james-bay.html>.

FORESTRY AFFECTING THE WASWANAPI CREE'S BROADBACK RIVER VALLEY HOMELAND

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Approximately 500 miles north of Montreal at the southern end of James Bay, the Broadback River watershed region teems with wildlife, clear waters, old-growth trees, and a beautiful forest-floor mosaic of plants and moss. The Broadback is habitat for species like the Canada lynx, golden eagle, and marten and is one of the final refuges for two threatened boreal caribou herds.^{190,191,192,193}

The area around the Broadback River is part of Eeyou Istchee, the traditional territory of the Crees. The Cree First Nation of Waswanipi has relied on and stewarded this ecological gem for millennia. Waswanipi Chief Marcel Happyjack stated in 2016 that the “Cree way of life still connects us very strongly to the land.”¹⁹⁴ Melanie Neeposh, the former Waswanipi Youth Chief explained, “All of the traditional cultural activities that we practice out there on the land, that’s who we are, that’s us. Our culture’s out there on the Broadback. Our identity’s out there on the Broadback. That’s why it’s so special and so crucial to protect.”¹⁹⁵

Logging has already taken a devastating toll on the Broadback region and the Waswanipi Cree. Between 1980 and 2015, the disturbed area in the Broadback River watershed grew by 280 percent, from 113,000 to 429,000 acres.¹⁹⁶ During that same period, more than 2,000 miles of roads were built in the watershed.¹⁹⁷ Mandy Gull, the Deputy Chief for the Cree Nation Government stated, “When we see these large spaces that are clearcuts . . . we often consider them to be dead zones. There’s no wildlife in these areas. The vegetation doesn’t grow back.”¹⁹⁸

Today only 10 percent of the Waswanipi Cree’s traditional territory remains intact, and logging companies continue to push into the remaining undisturbed portion in the Broadback.¹⁹⁹ The Waswanipi Cree have 62 traditional traplines, which are areas essential for subsistence hunting, each managed by a Cree tallyman.²⁰⁰ Only three of these traplines remain unfragmented by roads and clearcuts.²⁰¹

While Quebec has protected some areas of Eeyou Istchee, these protections are far from sufficient. As Chief Happyjack explained, Quebec’s efforts don’t “protect what should really be protected.”²⁰²

For more than 15 years, the Waswanipi have asked the Quebec government to safeguard the Mishigamish, a 1.2 million-acre region with some of the last intact forest the Waswanipi have left, as an essential means of “protecting the traditional Cree way of life.”²⁰³ In 2011 they submitted the Mishigamish Protected Area Proposal to the Quebec government.²⁰⁴

Since then, the threat to the Mishigamish has only increased. In a 2015 agreement between the Cree Nation Government and the Quebec government, the latter expressed its intention to have “meaningful discussions” with the Cree Nation Government and Waswanipi Cree “regarding options for additional protective measures in the Broadback region,” including the Mishigamish.²⁰⁵ Yet the Quebec government through the Broadback Task Force has met with Cree leaders to discuss the Mishigamish only once, back in 2015, and has failed to meaningfully respond to requests for further discussions.

In early 2018, Quebec released a logging plan that would allow clearcutting in and near the Mishigamish, undermining myriad commitments the government has made to the Cree.²⁰⁶ Urgent action is needed to stop this plan and permanently protect this spectacular region of intact forest.

190 Hinterland Who’s Who, “Canada Lynx.”

191 Cornell Lab of Ornithology, “Birds of North America: Golden Eagle,” <https://birdsna.org/Species-Account/bna/species/goleag/introduction> (accessed May 11, 2018).

192 Hinterland Who’s Who, “Marten.”

193 Tyler Rudolph et al., *Status of Woodland Caribou* (Rangifer tarandus caribou) in the James Bay Region.

194 Chief Marcel Happyjack, “Statement on COMEX Public Hearing, Waswanipi.” <http://www.waswanipi.com/en/chief-message/452-chief-marcel-happyjack-statement-on-comex-public-hearing-waswanipi-january-19-2016>.

195 NRDC, “The Call to Protect One of the Last Untouched Stretches of the Boreal Forest” (January 31, 2017), <https://www.nrdc.org/stories/call-protect-one-last-untouched-stretches-boreal-forest>.

196 Wynet Smith and Ryan Cheng, *Time Series Analysis of Anthropogenic Disturbance*, p. 12-13.

197 Ibid. p. 7.

198 NRDC, “The Call to Protect One of the Last Untouched Stretches of the Boreal Forest.”

199 “Wynet Smith and Ryan Cheng, *Time Series Analysis of Anthropogenic Disturbance*,” p. 22.

200 *James Bay and Northern Quebec Agreement (JBNQA)* (1975), Section 24.

201 Kevin Dougherty, “Waswanipi Cree of Northern Quebec Make Last Stand to Save Their Forest,” *Montreal Gazette* (September 4, 2015), <http://montrealgazette.com/news/local-news/waswanipi-cree-of-northern-quebec-make-last-stand-to-save-their-forest>.

202 Chief Marcel Happyjack, “Statement on COMEX Public Hearing, Waswanipi.”

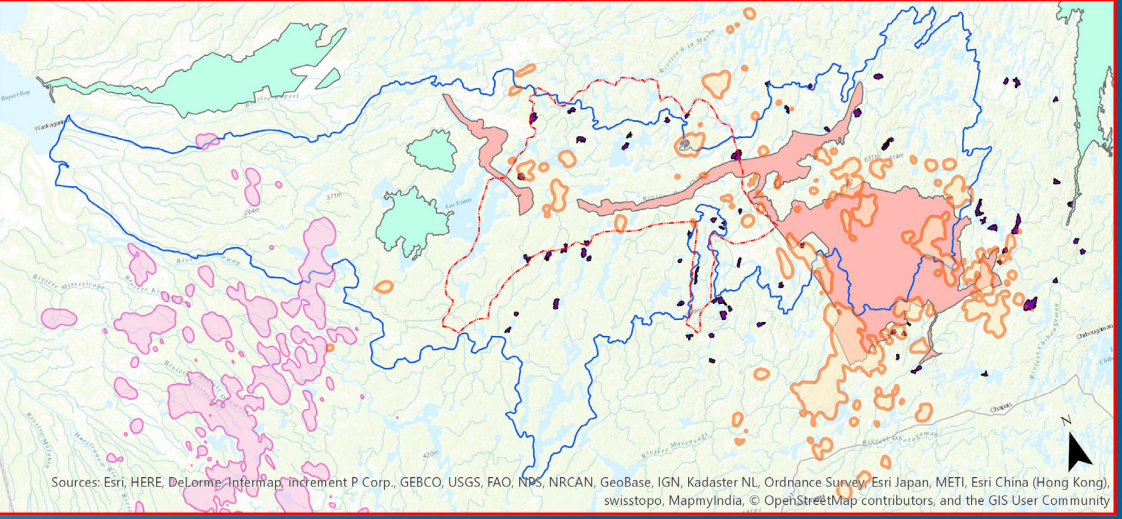
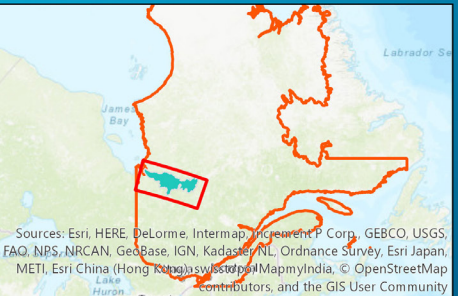
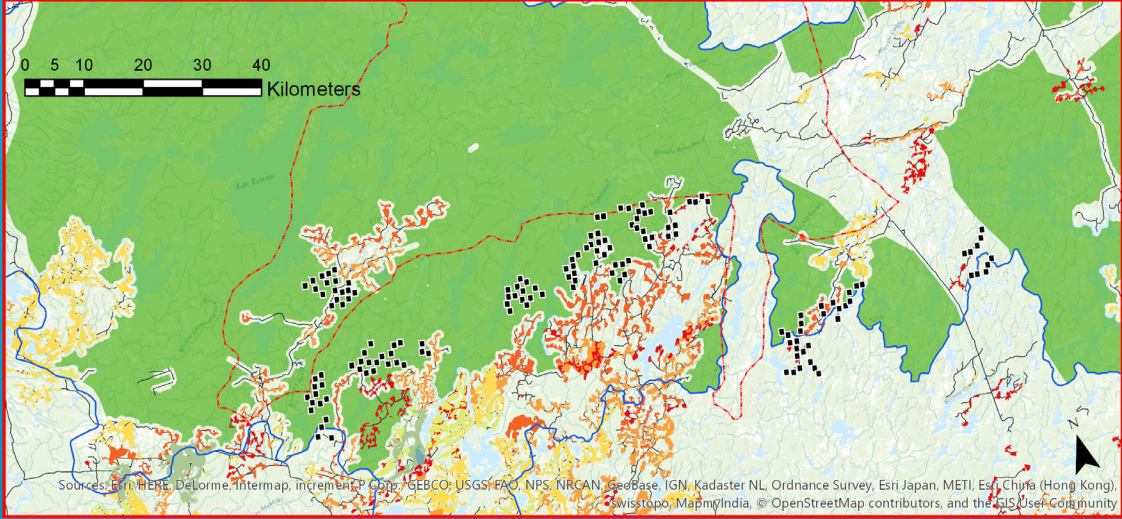
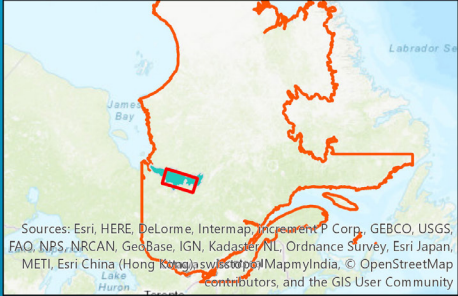
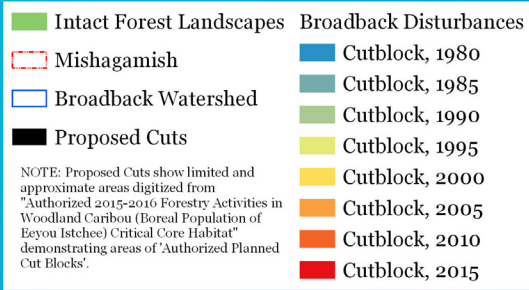
203 Cree First Nation of Waswanipi, “The Mishigamish Protected Area Proposal.”

204 Ibid.

205 *Agreement to Resolve the Baril-Moses Forestry Dispute Between the Cree Nation of Eeyou Istchee and the Gouvernement du Québec* (2015), <https://www.autochtones.gouv.qc.ca/actualites/2015/documents/entente-cris/entente-baril-moses-en.pdf>.

206 Ministère des Forêts, de la Faune et des Parcs, “Consultation Publique sur les Plans d’Aménagement Forestier Intégré Opérationnels du Nord-du-Québec” (February 16, 2018), <http://mffp.gouv.qc.ca/les-forets/consultation-public-partenaires/consultation-plans-damenagement-forestier-integre/consultation-publique-pafio-nord-du-quebec/>.

DISTURBANCES, PLANNED CUTS, AND CARIBOU HABITAT IN THE BROADBACK WATERSHED



LOGGING'S IMPACT ON FRESHWATER RESOURCES

Logging does not impact only the land. It can devastate the boreal's freshwater resources as well, harming the millions of Canadians who rely on them. Logging and the accompanying road construction can erode soils, which increases sediment runoff into waterways. This sediment can increase mercury levels, which can harm fish nursery habitat and poison drinking water,²⁰⁷ and phosphorus levels, which can increase harmful algal blooms.²⁰⁸ In addition, logging near water bodies increases water temperatures and radiation levels, further disturbing fragile aquatic ecosystems.²⁰⁹ Logging and road construction also slow surface and groundwater flows, altering wetland hydrology.²¹⁰

SPECIES IMPACTS: BOREAL CARIBOU AS THE FOREST'S CANARY IN THE COAL MINE

Over the past several decades, logging has severely impacted the boreal forest's wildlife. Clearcut logging degrades mature forests and leaves ranges greatly diminished for species like the American marten, Canada lynx, wolverine, and boreal caribou.²¹¹ These animals rely on food like lichens and sheltering features such as woody debris and tree cavities found primarily in old-growth forests. In degraded areas, they struggle to survive.²¹²

Even degradation of a relatively small area can fragment large, contiguous stretches of forest into smaller, isolated patches.²¹³ When habitat is fragmented, the ratio of a forest's area to its disturbed edges decreases, meaning more of the forest is located near a disturbance.²¹⁴ This exposes more of the forest to "edge effects," which include wind and weather disturbances, encroachment by invasive species, and changes in sunlight and humidity.²¹⁵ Fragmentation also isolates species populations, undermining their genetic health and resilience to environmental changes.²¹⁶ These impacts result in forest areas with far less ecological value than intact forests.



Logging's impact on wildlife is best illustrated by the decline of boreal caribou. Caribou are an "indicator species," a barometer for the health of the boreal forest more broadly, because they require large tracts of intact forest and are particularly sensitive to human disturbance.²¹⁷ The animals will generally not venture within 2.8 miles of disturbed areas, which attract predators like wolves and bears.^{218,219} Due to their substantial habitat requirements, caribou also act as an "umbrella species," a species whose protection in turn safeguards the habitat of other boreal wildlife.²²⁰

Boreal caribou have declined significantly due to habitat loss, particularly from logging, and now occupy only half of their historic range.^{221,222} Scientists have found that it can take up to 80 years following an industrial disturbance for habitat to become sufficiently mature for boreal caribou to return, although if forests are clearcut and fail to recover their former characteristics, caribou may not return at all.²²³

207 J. C. Croke and P. B. Hairsine, "Sediment Delivery in Managed Forests: A Review," *Environmental Reviews* 14, no. 1 (2006): 59-87.

208 David P. Kreuzweiser et al., "Impacts and Prognosis of Natural Resource Development on Aquatic Biodiversity in Canada's Boreal Zone," *Environmental Reviews* 21, no. 4 (2013): 227-229.

209 The Pew Charitable Trusts, *A Forest of Blue*, p. 34.

210 Herb Hammond, *Maintaining Whole Systems on Earth's Crown: Ecosystem-Based Conservation Planning for the Boreal Forest* (Slocan Park, BC: Silva Forest Foundation, 2009).

211 L. A. Vernier et al., "Effects of Natural Resource Development," p. 471.

212 Ibid.

213 Nick M. Haddad, "Habitat Fragmentation and Its Lasting Impact on Earth's Ecosystems," *Science Advances* 1, no. 2 (March 2015): e1500052.

214 Valerie S. Bansbach et al., "Edge Effects on Community and Social Structure of Northern Temperate Deciduous Forest Ants," *Psyche: A Journal of Entomology* (2012). Andrew F. Bennett and Denis A. Saunders, "Habitat Fragmentation and Landscape Change," in *Conservation Biology for All* (N. S. Sodhi and P. R. Ehrlich, eds., Oxford: Oxford University Press 2010).

215 William F. Laurance et al., "Habitat Fragmentation, Variable Edge Effects, and the Landscape-Divergence Hypothesis," *PLoS One* 2, no. 10 (2007): e1017.

216 Nick M. Haddad, "Habitat Fragmentation."

217 Environment and Climate Change Canada, *Action Plan for the Woodland Caribou*.

218 Tyler Rudolph et al., *Status of Woodland Caribou (Rangifer tarandus caribou) in the James Bay region of northern Quebec*. Dave Hervieux et al. "Widespread Declines in Woodland Caribou (*Rangifer tarandus caribou*) Continue in Alberta," *Canadian Journal of Zoology* 91, no. 12 (2013): 872-882.

219 Committee on the Status of Endangered Wildlife in Canada, *COSEWIC Assessment and Status Report on the Caribou Rangifer tarandus, Newfoundland Population, Atlantic-Gaspésie Population, Boreal Population*, p. 17.

220 Orphé Bichet et al., "Maintaining Animal Assemblages."

221 Committee on the Status of Endangered Wildlife in Canada, *COSEWIC Assessment and Status Report on the Caribou Rangifer tarandus, Newfoundland Population, Atlantic-Gaspésie Population, Boreal Population*, p. 59.

222 Environment Canada, *Recovery Strategy for the Woodland Caribou, Boreal Population*, p. 2.

223 Canadian Parks and Wilderness Society, "Looking for Action: Caribou Losing Ground" (2014), p. 8, http://cpaws.org/uploads/CPAWS_Caribou_Report_2014.pdf. Justina C. Ray, *Defining Habitat Restoration for Boreal Caribou in the Context of National Recovery: A Discussion Paper*, Environment Canada (2014), p. 19-20, https://registrelep-sararegistry.gc.ca/virtual_sara/files/Boreal%20caribou%20habitat%20restoration%20discussion%20paper_dec2014.pdf.

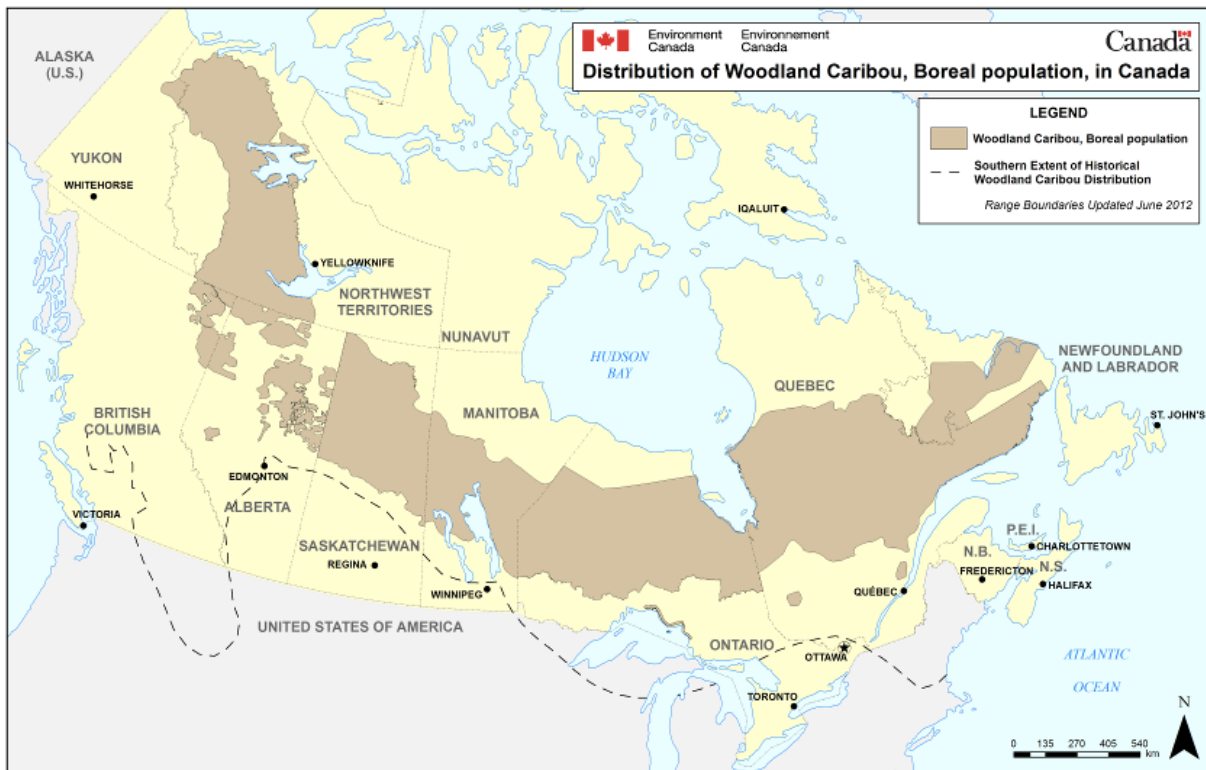


Lichens are vital food sources for boreal caribou and are found more abundantly in old-growth forests.²²⁴

the Recovery Strategy, as of 2012 the recovery of all 51 ranges was “technically and biologically feasible” if the proper protection measures were taken.²²⁹ As such, the federal government called on provinces and territories to develop detailed conservation plans based on Western and Indigenous knowledge and science for each of Canada’s 51 boreal caribou populations by October 2017.²³⁰ However, as of publication, no province or territory has finalized a plan in compliance with the Recovery Strategy.²³¹ Even worse, some provinces have reversed previous progress. The provincial and territorial failure to protect critical boreal caribou habitat was acknowledged in a 2018 report issued by the federal government under the Species at Risk Act.²³² Without policies that protect the critical habitat of this species, scientists and government reports predict that populations will continue to decline.²³³

The federal government’s 2012 boreal caribou Recovery Strategy, created to address the species’ threatened status, determined that boreal caribou require ranges less than 35 percent disturbed in order to have a 60 percent chance of long-term survival.²²⁵ Yet boreal caribou habitat and populations have continued to decline, and today only 14 of Canada’s 51 boreal caribou ranges are currently considered sufficient to support self-sustaining populations.²²⁶ Reports say that more than 30 percent of the country’s boreal caribou could disappear in the next 15 years if current trends continue.²²⁷

The 2012 Recovery Strategy sought to push provinces and territories to protect boreal caribou habitat, urging “immediate action” in critical habitat areas with declining boreal caribou populations.²²⁸ According to



224 Environment Canada, *Recovery Strategy for the Woodland Caribou, Boreal Population*, p. 9.

225 Ibid.

226 Environment Canada, “Species Profile: Caribou Boreal Population.”

227 Committee on the Status of Endangered Wildlife in Canada, *COSEWIC Assessment and Status Report on the Caribou Rangifer tarandus, Newfoundland Population, Atlantic-Gaspésie Population, Boreal Population*, p. xvii. Environment Canada, “Species Profile: Caribou Boreal Population.”

228 Environment Canada, *Recovery Strategy for the Woodland Caribou, Boreal Population*.

229 Ibid. p. 19.

230 Ibid.

231 Environment Canada, *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population in Canada for the Period 2012-2017*, Species at Risk Act Recovery Strategy Series (2017), <http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=7037FCE4-1>.

232 Environment Canada, *Progress Report on Unprotected Critical Habitat for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada*, Species at Risk Act Critical Habitat Report Series (2018), http://registrelep-sararegistry.gc.ca/virtual_sara/files/reports/Chr-WoodlandCaribouBoreal-v00-2019April-Eng.pdf.

233 Environment Canada, *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population in Canada for the Period 2012-2017*.



Provinces with some of the most at-risk caribou populations are among the most egregious laggards on implementing protections. In Ontario, for example, boreal caribou range deterioration has been documented for more than 80 years.²³⁴ Only two of the province's 13 woodland caribou ranges currently have sufficient undisturbed habitat to sustain caribou in the long term.²³⁵ Without action, it is estimated that the boreal caribou will be locally extinct in Ontario within 76 years.²³⁶ Yet in July 2013, the Ontario Ministry of Natural Resources gutted its previously renowned Endangered Species Act (ESA) by exempting logging companies from the law's core provisions that protected Ontario's most vulnerable species.²³⁷ In particular, these exemptions allow logging companies to harm or harass caribou and destroy their habitat as long as the

companies are operating under an approved forest management plan. In addition, logging companies are only required to mitigate impacts rather than act to benefit species; this enables them to abandon efforts at boreal caribou recovery.²³⁸ The Ontario government extended these exemptions for two more years in 2018, making action by Ontario's new government elected in June 2018 even more urgent.²³⁹

In Quebec, boreal caribou also face ongoing habitat loss and population declines. In 2015, Quebec's chief forester found that 70 percent of studied caribou habitat was currently too disturbed to support caribou populations in the long term.²⁴⁰ Without policy changes, this decline will only increase, the chief forester concluded, as "the current management strategies will provoke, in the long run, a decrease in the remaining habitat where caribou self-sufficiency is still possible."²⁴¹ Quebec's 2016 action plan for the management of forest-dwelling caribou committed to "immediate" steps to protect boreal caribou. However, the government failed to establish timetables or an implementation plan and gave little guidance as to what habitat would be protected.²⁴² The plan did lead to the creation of a protected area for caribou habitat in Quebec's Montagnes Blanches region in November 2017.²⁴³ While this is an important step, the Montagnes Blanches protection plan still allows mineral exploration and does not include certain critical habitat areas.²⁴⁴ Meanwhile, the province has moved its northern logging limit, opening up more land to logging and potentially leaving even more critical caribou habitat vulnerable to degradation.²⁴⁵

In Alberta, woodland caribou populations—both boreal and mountain ecotypes—are declining at an estimated rate of 50 percent every eight years.²⁴⁶ Each herd's habitat is between 57 and 96 percent degraded—far above the 35 percent threshold mentioned earlier.²⁴⁷ In May 2018, Alberta, in collaboration with the Tallcree First Nation, designated four new parks in the province's northern region, creating the largest contiguous boreal protected area in the world.²⁴⁸ However, across the rest of the province, boreal caribou remain largely unprotected. In 2018, Alberta's environment minister announced the province was suspending consideration of potential protected areas in its northwestern region and requested more time to complete range plans, despite worsening conditions in caribou habitat.²⁴⁹

234 Committee on the Status of Endangered Wildlife in Canada, *COSEWIC Assessment and Status Report on the Caribou Rangifer tarandus, Newfoundland Population, Atlantic-Gaspésie Population, Boreal Population*.

235 Ministry of Natural Resources & Forestry (MNRF), *State of the Woodland Caribou Resource Report*, Species at Risk Branch (2014), p. 47, <https://dr6j45jk9xcmk.cloudfront.net/documents/3970/sowerr-p2-final-aoda-01072015.pdf>.

236 That is, within 91 years of 2003. James A. Schaefer, "Long-Term Range Recession and the Persistence of Caribou in the Taiga," *Conservation Biology* 17, no. 5 (2003): 1435-1439.

237 Government of Ontario, O. Reg. 176/13: GENERAL (May 31, 2013), <https://www.ontario.ca/laws/regulation/r13176>.

238 *Ibid.*

239 Ontario Environmental Registry, "Amendments of Ontario Regulation 242/08 (General Regulation - Endangered Species Act, 2007) relating to forest operations in managed Crown forests, incorporating species recently listed to the Species at Risk in Ontario List, and safe harbour," <https://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTMzNzgx&statusId=MjAINDg5&language=en> (accessed June 15, 2018).

240 Bureau du Forestier en Chef, *Caribou Forestier: Effet des Stratégies Actuelles d'Aménagement Forestier sur les Taux de Perturbation de l'Habitat*, Avis du Forestier en Chef (March 2014), p. 5, http://forestierenchef.gouv.qc.ca/wp-content/uploads/2015/05/avis_caribou_perturbation_mai2015-pdf.pdf.

241 *Ibid.* p. 19.

242 Ministère des Forêts, de la Faune et des Parcs, *Plan d'Action pour l'Aménagement de l'Habitat du Caribou Forestier* (April 2016), <https://mffp.gouv.qc.ca/publications/faune/napperon-caribou-forestier-2016.pdf>.

243 Alexandre Shields, "Une Aire Protégée de 10,000 km² pour le Caribou Forestier," *Le Devoir*, (November 28, 2017), <http://www.ledevoir.com/societe/environnement/514079/aire-protgee-pour-le-caribou-forestier>.

244 *Ibid.*

245 Ministère des Forêts, de la Faune et des Parcs, "Comparaison de la Limite Territoriale des Forêts Attribuables en Vigueur à Partir du 1er Avril 2018 et de la Limite de 2002," http://mffp.gouv.qc.ca/publications/forets/connaissances/carte_it_compare.pdf (accessed May 13, 2018).

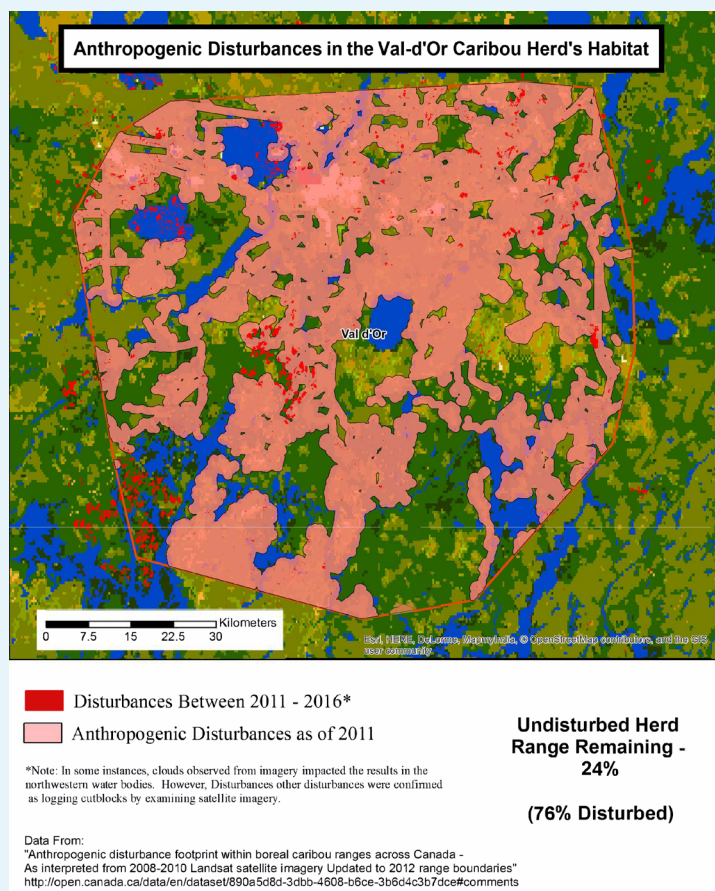
246 Dave Hervieux et al., "Widespread Declines in Woodland Caribou," p. 872.

247 Environment Canada, *Recovery Strategy for the Woodland Caribou, Boreal Population*, p. 68.

248 David Thurton, "Alberta Now Has World's Largest Expanse of Protected Boreal Forest," CBC (May 15, 2018), <https://www.cbc.ca/news/canada/edmonton/alberta-wildland-parks-boreal-forest-1.4663633>.

249 The Canadian Press, "Alberta Suspends Caribou Protection Plan, Asks for Assistance from Ottawa," CBC (March 19, 2018), <http://www.cbc.ca/news/canada/edmonton/alberta-caribou-plan-shannon-philips-1.4583526>.

THE VAL-D'OR HERD: A CAUTIONARY TALE



In a particularly striking example of caribou loss, one of Quebec's southernmost caribou populations, the Val-d'Or herd, has declined by almost 80 percent over the past 60 years. The population had around 80 individuals in 1955 and has now dwindled to approximately 18.²⁵⁰ These remaining Val-d'Or caribou are struggling to survive in a range that is 76 percent disturbed—more than double the 35 percent threshold they need for a 60 percent chance of survival.²⁵¹

Quebec has consistently promoted industrial development in the Val-d'Or range, despite more than 30 years of strong scientific evidence of the herd's decline and warnings from First Nations.²⁵² While management plans for the Val-d'Or region have been in place since 1989, they have consisted of insufficient, piecemeal solutions. When Quebec finally did create a caribou reserve in 2009, it was only one-third the size of what scientists recommended and had already been degraded by recreational development.²⁵³

Even when the herd's numbers reached an alarming low of 30 individuals in 2008, Quebec continued permitting development.²⁵⁴ In 2017 the government announced—and then retracted due to public outcry—a plan to remove the remaining Val-d'Or caribou to a zoo as a last resort that would also allow the continued degradation of the herd's habitat.²⁵⁵ Just one month later, the Quebec government approved a logging road in the herd's critical habitat, over the objections of First Nations and its own scientists.²⁵⁶

In early 2018 the Quebec government made the announcement that it was not going to take action to try to recover the herd.²⁵⁷ The chiefs of the Algonquin Anishinabeg Nation Tribal Council denounced the decision and the Quebec government's failure to consult with them. The chiefs demanded that Quebec immediately designate a protected area for the herd and reiterated that the boreal caribou is central to their way of life. More than 13,000 individuals have petitioned Quebec to reverse its decision.²⁵⁸ The sad fate of the Val-d'Or herd is an illustration of what could happen across Quebec—and all of Canada—if governments do not act to protect this iconic, and important, species. There is a beacon of hope, and it is coming from Indigenous Peoples in the region. In June 2018, the Lac Simon, Kitisakik, and Long Point Algonquin First Nations announced a partnership with the federal and Quebec governments to, among other initiatives, restore habitat in the area, monitor the Val-d'Or herd's population, and conduct research.²⁵⁹ This is another example of Indigenous Peoples providing leadership after years of government inaction and demonstrates the need to facilitate Indigenous leadership across Canada before conditions become as dire as those in Val-d'Or.

250 Ministère des Forêts, de la Faune et des Parcs, *Rapport Préliminaire du Diagnostic de la Zone Habitat Résiduel en Paysage Perturbé de Val-d'Or*, (March 2018), p. 16, <https://mfp.gouv.qc.ca/documents/faune/diagnostic-habitat-residuel-Val-dOr.pdf>.

251 Ibid.

252 Équipe de Rétablissement du Caribou Forestier, "Le Caribou Forestier," Canadian Wildlife Federation, Fondation de la Faune du Québec, and Nature Québec, p. 5, http://collectifcaribou.ca/images/documents_site/DEPII_Fichescaribou.pdf (accessed May 13, 2018). Marcel Paré, *État de la Situation de la Harde de Caribou de Val-d'Or*, Ressources Naturelles et Faune Québec (November 15, 2011), <http://chaireafd.uqat.ca/midiForesterie/pdf/20111115PresentationMarcelPare.pdf>.

253 L'Action Boréale de l'Abitibi-Témiscamingue (ABAT), "Projets d'Attribution d'un Statut Permanent de Réserve de Biodiversité pour Sept Territoires et de Réserve Aquatique pour un Territoire dans la Région Administrative de l'Abitibi-Témiscamingue" (December 2012), http://www.bape.gouv.qc.ca/sections/mandats/8reserves_abitibi-témiscamingue/documents/DMI7.pdf.

254 Louise Grondin, "Testimony before the Standing Committee on Environment and Sustainable Development" (June 18, 2015), <http://www.ourcommons.ca/DocumentViewer/en/41-2/ENVI/meeting-63/evidence>.

255 Jonathan Montpetit, "Zoo Backs Out of Quebec Government's Caribou-Moving Scheme," CBC (June 6, 2017), <http://www.cbc.ca/news/canada/montreal/caribou-val-or-mine-zoo-move-1.4148081>.

256 Alexandre Shields, "Caribous: Québec a Ignoré des Avis de ses Experts," *Le Devoir* (May 5, 2017), <http://www.ledevoir.com/societe/environnement/498049/caribous-forestiers-de-val-d-or>. Assembly of First Nations of Quebec and Labrador, "Val-d'Or Woodland Caribou: Another Example of the Failure to Consult First Nations" (June 9, 2017), <https://www.newswire.ca/news-releases/val-dor-woodland-caribou-another-example-of-the-failure-to-consult-first-nations-627480713.html>.

257 Alexandre Shields, "Québec Laissera les Caribous de Val-d'Or Disparaître," *Le Devoir* (March 9, 2018), <http://www.ledevoir.com/societe/environnement/522185/quebec-laissera-les-caribous-de-val-d-or-disparaître>.

258 Action Caribous Val-d'Or, "Ne Condamnez Pas à Mort les Derniers Caribous de Val-d'Or!" <https://www.caribous-valdor.com/> (accessed July 10, 2018).

259 Environment and Climate Change Canada, "Conservation Commitment on the Boreal Caribou: Val-d'Or Population," June 21, 2018, <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/publications/conservation-boreal-caribou-val-dor.html>.



FOREST DEGRADATION'S IMPACT ON MIGRATORY BIRDS

Forest degradation has taken an alarming toll on migratory bird habitat.²⁶⁰ Many bird species that rely on the boreal forest are now listed under Canada's Species at Risk Act (SARA). This includes treasured songbirds such as the olive-sided flycatcher and the iconic Canada warbler (pictured), which have declined by more than two-thirds.²⁶¹ If this rapid destruction of vital migratory bird nesting habitat continues, the skies throughout the Western Hemisphere could become much less musical.²⁶²

MINING THE BOREAL FOREST²⁶³

Across Canada, the extraction of potash, copper, gold, and other minerals is degrading intact boreal forest. Approximately 80 percent of Canada's mining operations occur in the boreal region, creating additional threats to the forest.²⁶⁴

Mining occurs in multiple stages.²⁶⁵ After prospecting and staking, companies move onto a potential mining site to take physical samples through methods that include drilling. Next comes mine construction, which brings roads, more extensive drilling, and the development of tailings ponds that will contain highly concentrated toxic heavy metals and other waste materials. The ore is then mined and processed, with the valuable minerals separated from waste materials. When mining is completed, the mine closure and remediation process can take decades and requires ongoing monitoring.²⁶⁶

Each stage of the mining sequence impacts the boreal ecosystem.²⁶⁷ Mining practices strip vegetation, destroy habitat, erode soil, and create noise pollution, which can disrupt wildlife behavior like mating and migration.²⁶⁸ Mining also releases contaminants like lead, arsenic, and cyanide into the ground, air, and waters, which can persist long after a mine has closed.²⁶⁹ In addition, the associated road construction dramatically expands the reach of the degradation, fragments the forest, and makes the area more vulnerable to future disturbances.

Tailings ponds are among the most dangerous features of mining infrastructure. These open-air reservoirs can leach toxins like mercury, arsenic, and lead into the surrounding environment. Human consumption of these contaminants through drinking water and food sources like fish can cause cancer, birth defects, heart disease, and other health impacts.²⁷⁰

Tailings ponds also pose a risk of breaching, even after a mine's closure, with disastrous effects on the surrounding environment and communities. In 2014, a tailings pond for the Mount Polley gold and copper mine in British Columbia failed, spilling more than 2.6 billion gallons of toxic materials, including arsenic, lead, and mercury, into surrounding lakes and creeks.²⁷¹ The auditor general of British Columbia determined that the spill was due to poor environmental compliance and regulatory enforcement. And it has had severe implications for

260 North American Bird Conservation Initiative Canada, *The State of Canada's Birds*, Environment Canada, 2012, p. 11, http://www.stateofcanadasbirds.org/State_of_Canada's_birds_2012.pdf. P. Blancher, *The Importance of Canada's Boreal Forest to Landbirds*, The Canadian Boreal Initiative and the Boreal Songbird Initiative (2003).

261 Jeff Wells et al., *Boreal Birds Need Half*.

262 North American Bird Conservation Initiative Canada, *The State of Canada's Birds*. P. Blancher, *The Importance of Canada's Boreal Forest to Landbirds*.

263 Does not include oil and gas development.

264 MiningWatch Canada, "The Boreal Below: Mining Issues and Activities in Canada's Boreal Forest Region, Executive Summary" (May 2008), p. 2, https://miningwatch.ca/sites/default/files/Boreal_Below_2008_ES_web.pdf.

265 Ibid. p. 4.

266 Alisha Hiyate, "Why Mine Closure Matters and Why It Gets Ignored," *Canadian Mining Journal* (January 1, 2018), <http://www.canadianminingjournal.com/features/mine-closure-matters-gets-ignored/>.

267 MiningWatch Canada, "The Boreal Below: Mining Issues."

268 Graeme Shannon et al., "A Synthesis of Two Decades of Research Documenting the Effects of Noise on Wildlife," *Biological Reviews* 91, no. 4 (November 2016): 982-1005.

269 MiningWatch Canada, "The Boreal Below: Mining Issues."

270 See CBC News, "Tailings Ponds for Mining and Oilsands Waste: FAQs" (August 5, 2014), <http://www.cbc.ca/news/technology/tailings-ponds-for-mining-and-oilsands-waste-faqs-1.2727889>. The Sierra Fund, *Mining's Toxic Legacy: An Initiative to Address Mining Toxins in the Sierra Nevada* (March 2008), http://www.sierrafund.org/wp-content/uploads/MININGS_TOXIC_LEGACY_2010printing_4web.pdf.

271 CBC News, "Tailings Ponds for Mining and Oilsands Waste: FAQs."

surrounding communities.²⁷² It destroyed Indigenous Peoples' traditional fisheries and reduced their access to sacred lands and plant resources around the affected water bodies.²⁷³ Communities are still uncertain about the quality of their water and the long-term health impacts of the spill, especially since much of the toxic material still remains in the environment.²⁷⁴ Despite ongoing environmental harms from the disaster, in 2016, less than two years later, the mine and its tailings pond were returned to full operation.²⁷⁵

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THE CLIMATE IMPACT OF CLEARCUTTING IN THE BOREAL

Under the historic 2015 Paris Agreement, more than 190 countries, including Canada, agreed to limit global temperature rise to 2 degrees Celsius above preindustrial levels, and to pursue efforts to limit this increase to 1.5 degrees Celsius.²⁷⁶ The Paris Agreement also identified the world's forests as vital tools for achieving these goals. Yet, by clearcutting the boreal forest, Canada is undermining its commitment. In a 2017 report and technical paper, NRDC concluded that each year, clearcutting accounts for 12 percent of the annual emissions Canada agreed to cut by 2030 under the Paris Agreement.²⁷⁷

Logging the boreal impacts the global climate in two ways. First, it removes vegetation and soils that continuously absorb greenhouse gases, diminishing the boreal's significant potential to continue to sequester carbon.²⁷⁸ Second, it gradually releases the vast stores of carbon previously captured in boreal soils.²⁷⁹ The loss of forest cover increases soil temperature and decreases water transpiration, increasing decay and therefore carbon emissions. In addition, by loosening the soil, logging can lead to the release of previously locked up carbon.²⁸⁰

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Canadian Prime Minister Justin Trudeau speaking at the 2015 meeting of the United Nations Framework Convention on Climate Change in Paris.

NRDC developed a model to estimate the long-term carbon impact of clearcutting in the boreal forest. It showed that a clearcut acre of boreal forest acts as a net source of carbon dioxide for 13 to 27 years following harvest. According to our estimates, each year clearcutting across the boreal forest releases, on average, more than 26 million metric tons (Mt) of carbon dioxide into the atmosphere—equivalent to the annual emissions of nearly 5.5 million passenger vehicles or 3.7 percent of Canada's total reported emissions in 2016.²⁸¹ Our analysis found that, even assuming successful forest regeneration following clearcutting, Canada's boreal forest is not recovering fast enough to offset the carbon dioxide emissions from clearcutting (see "How Well Is the Boreal Forest Recovering?" below).

272 Amnesty International, "A Breach of Human Rights: Human Rights Impacts of the Mount Polley Mine Disaster, British Columbia, Canada" (May 2017), p. 11, http://www.amnesty.ca/sites/amnesty/files/FINAL_May%2024_Mount%20Polley%20briefing.pdf.

273 Ibid. p. 5. Janis Shandro et al., *Health Impact Assessment for the 2014 Mount Polley Mine Tailings Dam Breach: Screening and Scoping Phase Report*, (January 2016), <http://www.fnha.ca/Documents/FNHA-Mount-Polley-Mine-HIA-SSP-Report.pdf> (accessed May 10, 2018).

274 Dan Lewis, "3 Years After Mount Polley, It's Still Business as Usual for B.C. Mining," *Huffington Post*, (August 4, 2017), http://www.huffingtonpost.ca/dan-lewis/2/the-next-mount-polley-will-be-business-as-usual-for-b-c-mining_a_23063671/ (accessed May 13, 2018).

275 Amnesty International, "A Breach of Human Rights," p. 15.

276 United Nations Framework Convention on Climate Change, Paris Agreement, Article 5 (2015).

277 Joshua Axelrod, "Pandora's Box," p. 11.

278 Sebastiaan Luyssaert, et al., "Old-Growth Forests as Global Carbon Sinks."

279 J. James and R. Harrison, "The Effect of Harvest on Forest Soil Carbon."

280 Chelsea L. Petrenko and Andrew J. Friedland, "Mineral Soil Carbon Pool Responses to Forest Clearing in Northeastern Hardwood Forests," *Bioenergy* 7, no. 6 (November 2015): 1283-1293.

281 Government of Canada, "Greenhouse Gas Sources and Sinks: Executive Summary 2018." Joshua Axelrod, "Pandora's Box," p. 11.



Logging disturbs boreal soils, releasing previously locked up carbon into the atmosphere.

Like the federal government, provinces are undermining commitments to mitigate greenhouse gas emissions (see Table 2). In Quebec, with clearcuts averaging 407,000 acres each year, the yearly cut can be expected to release 11.2 million Mt of carbon dioxide over the next 27 years.^{282,283} When cumulative cutting impacts are analyzed across an 85-year period—the time Quebec allows between harvests on the same area of forest—these emissions equate to 10.7 Mt/year, on average. This is equivalent to 13 percent of total provincial emissions in 2015.²⁸⁴ That’s nearly 62 percent of the 17.3 Mt of annual emissions the province has promised to cut by 2020.²⁸⁵ In Ontario, which sees an average of 318,000 acres clearcut each year, the yearly cut can be expected to release at least 8.7 Mt of carbon dioxide over the next 27 years.^{286,287} When the cumulative impact is analyzed over an 85-year period, these emissions equate to 8.3 Mt/year, on average, or 31 percent of the 27 Mt in annual emissions the province has promised to cut by 2020.²⁸⁸

Despite logging’s significant effect on the boreal’s ability to store carbon, Canada does not report the full extent of carbon emissions associated with logging in its National Inventory Reports (NIR) to the United Nations Framework Convention on Climate Change (UNFCCC), upon which the Paris Agreement is built.²⁸⁹ Canada is beginning to acknowledge that woody debris from logging results in carbon emissions. However, its reports to the UNFCCC still overstate the climate benefits associated with Harvested Wood Products (HWPs) and do not account for the vast release of carbon from the soil logging causes.²⁹⁰ Similarly, Canada’s national climate change plan, the Pan-Canadian Framework on Clean Growth and Climate Change, hints at characterizing logging as a means of mitigating national carbon emissions.²⁹¹ Yet even if logging’s full carbon footprint were counted, Canada has little opportunity to hold companies accountable for logging’s climate impact, as it lacks a strategy for limiting national carbon emissions.

282 The acreage figure is based on a 10-year average from 2005–2014. National Forestry Database, “Silvicultural Statistics.”

283 Joshua Axelrod, “Pandora’s Box.”

284 Cumulative analysis of emissions curves generated by a black spruce-dominated boreal forest model with a moderate forest recovery assumption was done for an 85-year period (Quebec’s current harvest rotation period), resulting in 907 Mt of emissions. This equates to 10.7 Mt/year, on average, over that time period. Quebec’s reported annual greenhouse gas emissions were 80.1 Mt in 2015. Environment and Climate Change Canada, “Greenhouse Gas Emissions by Province and Territory,” www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=18f3bb9c-1 (accessed May 13, 2018).

285 Government of Quebec, *Quebec in Action: Greener by 2020* (2012), p. 48, www.mddelcc.gouv.qc.ca/changements/plan_action/pacc2020-en.pdf.

286 The acreage figure is based on a 10-year average from 2005–2014. National Forestry Database, “Silvicultural Statistics.”

287 Joshua Axelrod, “Pandora’s Box.”

288 The analysis used for Quebec above was applied to Ontario, resulting in 708 Mt of emissions over the 85-year period analyzed. This equates to 8.3 Mt/year, on average, over that time period. Ontario committed to reducing greenhouse gas levels 15% from 1990 emissions levels by 2020, from 177 million tons to 150 million tons. Ontario Ministry of the Environment, *Go Green: Ontario’s Action Plan on Climate Change* (August 2007), p. 7, <http://www.climateontario.ca/doc/workshop/2011LakeSimcoe/Ontarios%20Go%20Green%20Action%20Plan%20on%20Climate%20Change.pdf>.

289 Ministry of Environment and Climate Change Canada, “National Inventory Report 1990–2015: Greenhouse Gas Sources and Sinks: Executive Summary,” www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=662F9C56-1#land (accessed May 13, 2018).

290 Environment and Climate Change Canada, *National Inventory Report 1990–2016: Greenhouse Gas Sources and Sinks in Canada* (2018) p. 165–66.

291 Environment and Climate Change Canada, *Pan-Canadian Framework on Clean Growth and Climate Change*.

IMPACTS OF CLIMATE CHANGE AND THE NEED TO PRESERVE FOREST RESILIENCE

The impacts of climate change on the Canadian boreal are likely to be significant.²⁹² As the global boreal becomes stressed by higher temperatures, its ability to hold its vast carbon stores will come under threat. Because large, intact forests are more resistant to disturbances and changing conditions, a healthy boreal forest will be far more capable of withstanding these impacts and therefore retaining its carbon storage capacity than one that has been degraded by industrial activity.²⁹³ For example, intact forests tend to experience milder temperature changes, are more resistant to invasive species,²⁹⁴ and have greater species adaptability as a result of their genetic diversity.²⁹⁵ Large, connected intact forest ecosystems will also assist species as they migrate to adapt to changing conditions.²⁹⁶ Protecting large, intact boreal forest ecosystems and their carbon storage capacity, therefore, is more vital than ever to help to prevent even more dramatic changes in the global climate.

TABLE 2: AVERAGE ANNUAL AREA CLEARCUT AND ESTIMATED ASSOCIATED CO₂ EMISSIONS

Province	Quebec	Ontario	Alberta	Newfoundland & Labrador	Saskatchewan	Manitoba	Totals
Annual Harvested Area (acres) ²⁹⁷	407,000	318,000	190,000	32,000	35,000	25,000	1,007,000
CO ₂ Emissions Associated With Annual Harvest (million metric tons) ²⁹⁸	11.2	8.7	3.4	0.9	0.6	0.5	25.3

HARVESTED WOOD PRODUCTS: AN UNPROVEN AND MISLEADING CLIMATE SOLUTION

Provincial and federal governments have touted harvested wood products (HWPs) as climate “solutions.”²⁹⁹ They have made misleading claims that because HWPs retain the carbon that was originally stored in the logged wood, sustainably managed forests are always a carbon sink.³⁰⁰ However, the studies cited to support this claim caution that this is true only under very strict conditions. For example, according to the Intergovernmental Panel on Climate Change (IPCC), the mitigation potential of carbon storage in HWPs is contingent on preventing deforestation and degradation and suppressing disturbances.³⁰¹ In addition, the carbon contained in HWPs must be greater than the carbon that was expended to produce, transport, and dispose of them.³⁰² These conditions are rarely met in large parts of Canada’s boreal forest.³⁰³ Furthermore, the harvested trees’ lost carbon sequestration potential further undermines the climate value of HWPs. Moreover, these claims assume that the carbon remains stored in the HWPs for long periods, which is inaccurate in many cases.³⁰⁴ While further study is needed, the purported climate value of HWPs diverts attention from logging’s real impact on the Canadian boreal forest’s capacity to sequester and store carbon and the role the forest plays in the in the global fight against climate change.

292 Sylvie Gauthier et al., “Boreal Forest Health and Global Change,” p. 820.

293 Matt Carlson, Jeff Wells, and Dina Roberts, *The Carbon the World Forgot*, p. 19.

294 Ibid.

295 James E. M. Watson et al., “The Exceptional Value of Intact Forest Ecosystems,” p. 604.

296 Ibid. p. 601.

297 These figures have been rounded to the nearest 1,000 acres.

298 These are not “yearly” CO₂ emissions, but represent the total amount of CO₂ released over a 13- to 27-year period for a single year of clearcut disturbances. Models for creating these estimates were developed from data from R. F. Grant, et al., “Net Ecosystem Productivity of Temperate and Boreal Forests after Clearcutting—A Fluxnet-Canada Measurement and Modelling Synthesis,” *Tellus B* 62B, no. 5 (2010): p. 475-496. Onil Bergeron, et al., “How Does Forest Harvest Influence Carbon Dioxide Fluxes of Black Spruce Ecosystems in Eastern North America?” *Agricultural and Forest Meteorology* 148, no. 4 (2008): p. 537-548.

299 Food and Agriculture Organization of the United Nations, “Carbon Storage in Harvested Wood Products (HWP),” <https://www.unece.org/forests/outlook/carbonstorage.html> (accessed May 13, 2018).

300 Ontario Ministry of Natural Resources and Forestry, “Ontario’s Crown Forests: Opportunities to Enhance Carbon Storage?” p. 8. See also: Québec Ministère des Ressources Naturelles et de la Faune, *Forests: Building a Future for Quebec* (2008), p. 18, <https://mern.gouv.qc.ca/english/publications/forest/consultation/green-paper.pdf>. *Canadian Climate Forum, Canadian Forest Products: Contributing to Climate Change Solutions*, p. 5.

301 Gert Jan Nabuurs et al., “Forestry,” in *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (B. Metz et al., eds) (New York, NY: Cambridge University Press, 2007), p. 550.

302 Ibid.

303 Stith T. Gower, “Patterns and Mechanisms of the Forest Carbon Cycle,” *Annual Review of Environment and Resources* 28 (November 2003): p. 194.

304 Ann Ingerson, “Carbon Storage Potential of Harvested Wood: Summary and Policy Implications,” *Mitigation and Adaptation Strategies for Global Change* 16, no. 3 (2011): 307-323.

HOW WELL IS THE BOREAL FOREST RECOVERING?

Canada's annual federal reports claim that "[t]he regeneration rate on harvested [public] lands in Canada is nearly 100 percent when artificial and natural regeneration rates are combined."³⁰⁵ These metrics for successful recovery paint a rosy, but misleading, picture. Regeneration does not mean that the forest has returned to its preharvest condition. In Ontario, for example, the logging industry and the Ministry of Natural Resources and Forestry consider a forest successfully regenerated if a mere 40 percent of the harvested area's tree capacity has grown back.³⁰⁶ In addition, little information is available on the actual conditions of these postharvest areas. Studies indicate that conditions in regenerated forests may, in fact, be a far cry from those that existed before the logging occurred.³⁰⁷

Simple tree regrowth does not replace an intact forest's ability to support wildlife and perform ecosystem functions like carbon sequestration. The new forest composition may be vastly different from its preharvest condition.³⁰⁸ Ideally, clearcut forests would regrow to mirror their preharvest state with similar species of vegetation and canopy density as well as a return of displaced wildlife. Unfortunately, the limited scientific literature examining postharvest outcomes in the boreal forest points to a very different reality. Research has found, for example, forests that regenerate after intensive harvesting "retain less biological and structural diversity than those originating from natural disturbances in which rapidly changing habitats and high species turnover enhance the adaptation potential to new environmental conditions."³⁰⁹ Regeneration statistics, therefore, belie the true impact that logging has on forests.^{310,311}

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A largely single-species regenerating forest in Quebec.

305 Natural Resources Canada, *The State of Canada's Forests 2016*, p. 24.

306 Ontario Ministry of Natural Resources, "Forest Management Program," in *2011 Annual Report of the Office of the Auditor General of Ontario* (2011), p. 322, 327, <http://www.auditor.on.ca/en/content/annualreports/arreports/en13/405en13.pdf>.

307 Yves Bergeron and Nicole J. Fenton, "Boreal Forests of Eastern Canada Revisited."

308 Ibid.

309 Sylvie Gauthier et al., "Boreal Forest Health and Global Change," p. 820.

310 See, e.g.: Natural Resources Canada, *The State of Canada's Forests 2016*, p. 12.

311 Sylvie Gauthier et al., "Boreal Forest Health and Global Change," p. 820.

IV. Canada's Logging Industry: International Demand and Domestic Challenges

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Logs piled up at a Resolute mill near Lebel-Sur-Quévillon, QC.

Extensive logging across the boreal feeds Canada's forest products industry. This industry is one of the world's largest producers of forest products, including newsprint, wood pulp, and printing and writing paper.³¹² While international demand for newsprint has plummeted since 2000, Canada remains the world's leading producer, accounting for approximately 12 percent of the global total.³¹³ Companies in Canada are also expanding their production of forest biomass, placing more pressure on the boreal and increasing logging's climate impacts.³¹⁴ Canada is also one of the world's top producers of softwood lumber, which is used primarily to build homes.³¹⁵ Increasingly, international consumers are calling on Canada to ensure that their forest products do not come at the expense of Indigenous communities fighting to protect their traditional territories, boreal species, and the global climate.³¹⁶ To maintain its international market share and its reputation, Canada should heed these calls for increased boreal protection.

THE U.S. MARKET IS A DRIVER OF BOREAL LOGGING

International demand for wood products, especially demand from the United States, is a major driver of the Canadian forest industry's continued push into undisturbed boreal forest. The international market accounts for more than half of the revenue Canada brings in from the industry, with two-third of this export revenue coming from the United States.^{317,318} The impact of U.S. demand is even more pronounced in boreal provinces. The United States imports 80 percent of the combined forest product exports from Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Newfoundland and Labrador (see Table 3). Canada's eastern provinces of Ontario and Quebec, which account for more than 75 percent of forestry activities in Canada's boreal forest,³¹⁹ are even more dependent on the U.S. market.

312 Natural Resources Canada, *The State of Canada's Forests, Annual Report 2017* (2017), <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/38871.pdf>.

313 Natural Resources Canada, "Forest Products and Applications," <http://www.nrcan.gc.ca/forests/industry/products-applications/13317> (accessed May 13, 2018).

314 Duncan Brack, *The Impacts of the Demand for Woody Biomass for Power and Heat on Climate and Forests*, Chatham House (February 2017), <http://www.chathamhouse.org/sites/default/files/publications/research/2017-02-23-impacts-demand-woody-biomass-climate-forests-brack-final.pdf>, p. 9-10. Natural Resources Canada, "Forest Bioenergy," <https://www.nrcan.gc.ca/forests/industry/bioproducts/13325> (accessed June 16, 2018).

315 Natural Resources Canada, "Forest Products and Applications."

316 Ben & Jerry's, "Hey, Canada! Protect Woodland Caribou!" Gap Inc, "Boreal Letter."

317 Natural Resources Canada, *The State of Canada's Forests 2016*, p. 49.

318 Natural Resources Canada, "Statistical Data: Trade." Natural Resources Canada, "Statistical Data: Consumption," <https://cfs.nrcan.gc.ca/statsprofile/consumption> (accessed May 13, 2018).

319 National Forestry Database, "Silvicultural Statistics."

TABLE 3. UNITED STATES' SHARE OF FOREST PRODUCTS SOURCED FROM CANADA'S BOREAL FOREST BY REVENUE IN 2015 (IN CAN\$)³²⁰

	Total Revenue (\$M)	Exports to U.S. 2015 (\$M)	% of Industry Revenue From Exports to U.S.	Total Exports 2015 (\$M)	% of Industry Revenue From All Exports	% of All Exports That Go to U.S.
Canada	63,300	22,100	35%	32,600	51.6%	67.8%
Boreal Provinces ³²¹	40,900	16,100	39.4%	20,000	48.9%	80.6%
Quebec	17,800	7,580	42.5%	9,252	51.9%	81.9%
Ontario	13,400	4,170	31.2%	4,406	33.0%	94.7%

Many of the U.S. companies that purchase boreal products have sourcing policies intended to protect intact forests, threatened and endangered species, and Indigenous communities. Major purchasers have expressed increasing concern regarding Canada's insufficient boreal habitat protections.³²² Since October 2017, when provinces and territories failed to meet a federal deadline for enacting boreal caribou habitat recovery plans, 21 companies with a combined annual revenue of more than \$140 billion have called on Canada to act.³²³ They have voiced their desire for "materials that are free of controversy and have been acquired through sustainable harvesting," and asked for "robust caribou habitat protection plans that are grounded in science" and created in consultation with Indigenous Peoples.³²⁴ This action from a variety of sectors demonstrates a growing desire in the international marketplace to purchase forest products that do not jeopardize boreal ecosystems.³²⁵

A FOREST INDUSTRY IN TRANSITION

Industry groups representing some of the largest logging companies operating in Canada argue that protections for the boreal would harm the industry's profits and thus cause job losses and lower wages. However, a closer look at government employment data and industry reports reveals this argument to be a red herring, distracting from the larger systemic challenges the industry faces.

Canada's forest industry is changing. Two decades ago, forest products accounted for 3 percent of Canada's gross domestic product.³²⁶ In 2015 they accounted for just over 1 percent.³²⁷ Canada's forestry trade surplus has fallen by nearly half over the past 15 years, declining from CAN\$38 billion in 2000³²⁸ to CAN\$21.5 billion in 2015.³²⁹ Twenty of the 50 paper mills operating in 2000 have shut down.³³⁰ From 2004 to 2014, Canada's forest products industry shed more than a third of its jobs.³³¹

These changes are largely due to reduced global demand for paper and newsprint resulting from the seismic shift toward digital media and increased paper recycling over the past decade. The Forest Products Association of Canada's own study in July 2015 pointed to declining demand as the primary cause of job losses and plant closures in Ontario.³³² This global change in demand has forced the industry to restructure, affecting workers and communities and leading to facility closures.³³³ Industry leaders have acknowledged that this trend is unlikely to reverse.³³⁴

In order to cut costs to survive, the industry has invested in increased automation, slashing jobs and salaries in the process. In Quebec and Ontario, the amount of lumber harvested per worker increased by 67 percent between 2007 and 2015.³³⁵

³²⁰ Natural Resources Canada, "Statistical Data: Trade." Natural Resources Canada, "Statistical Data: Domestic Economic Impact."

³²¹ Includes Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Newfoundland and Labrador.

³²² Ben & Jerry's, "Hey, Canada! Protect Woodland Caribou!" Gap Inc, "Boreal Letter."

³²³ Ibid.

³²⁴ Ibid.

³²⁵ Ibid.

³²⁶ Greg Keenan, David Parkinson, and Brent Jang, "Paper Trail: The Decline of Canada's Forestry Industry," *Globe and Mail* (December 5, 2014), <https://www.theglobeandmail.com/report-on-business/economy/paper-trail-the-fall-of-forestry/article21967746/>.

³²⁷ Natural Resources Canada, "Indicator: Gross Domestic Product," <http://www.nrcan.gc.ca/forests/report/economy/16556> (accessed May 12, 2018).

³²⁸ Greg Keenan, David Parkinson, and Brent Jang, "Paper Trail."

³²⁹ Natural Resources Canada, "How Does the Forest Industry Contribute to the Economy?" <http://www.nrcan.gc.ca/forests/report/economy/16517> (accessed May 12, 2018).

³³⁰ Greg Keenan, David Parkinson, and Brent Jang, "Paper Trail."

³³¹ Natural Resources Canada, "Statistical Data: Domestic Economic Impact."

³³² Evan Capluck and Jasmin Thomas, *A Detailed Analysis of Productivity Trends in the Forest Products Sector in Ontario, 2000-2013: Sunset Industry or Industry in Transition*, Centre for the Study of Living Standards (July 2015), <http://www.csls.ca/reports/csls2015-06.pdf>.

³³³ Greg Keenan, David Parkinson, and Brent Jang, "Paper Trail." Natural Resources Canada, "Statistical Data: Employment," <https://cfs.nrcan.gc.ca/statsprofile/employment/ca> (accessed May 11, 2018). Evan Capluck and Jasmin Thomas, *A Detailed Analysis of Productivity Trends*.

³³⁴ Greg Keenan, David Parkinson, and Brent Jang, "Paper Trail." Statista, "Demand for Newsprint Paper in North America from 2010 to 2016 (in Million Metric Tons)," <https://www.statista.com/statistics/596545/demand-for-newsprint-paper-in-north-america/> (accessed May 13, 2018).

³³⁵ Natural Resources Canada, "Statistical Data: Employment." Natural Resources Canada, "Statistical Data: Management," <https://cfs.nrcan.gc.ca/statsprofile/forest/ca> (accessed June 15, 2018).

However, according to the Canadian System of National Accounts, employment in the logging industry in these provinces declined from 18,575 to 11,200 workers over the same period, and average salaries declined from \$45,741 to \$42,773 (see Table 4).³³⁶ In 2015, the logging industry in Ontario and Quebec maintained a harvest nearly identical to 2007 levels, while cutting its payroll for forest workers by 44 percent.³³⁷

	2007	2015	Change
Workers Employed ³³⁸	18,575	11,200	-40%
Total Payroll (CAN\$) ³³⁹	\$849,644,000	\$479,054,000	-44%
Per Capita Wage (annual) ³⁴⁰	\$45,741	\$42,773	-6.5%
Total Volume Harvested (cubic meters) ³⁴¹	44,090,000	44,388,000	+1%
Labor Productivity (cubic meters/worker) ³⁴²	2,373 m ³	3,963 m ³	+67%

When the logging industry blames conservation efforts for its troubles, it is creating a scapegoat. As a recent publication finds, the logging industry’s “manufactured uncertainty” about the need for and impacts of conservation measures “negatively affects forestry-dependent communities by deflecting attention from the real and ubiquitous issues facing the future of Canada’s forest products sector, including the actual causes behind local mill closures and job loss, which are not primarily supply-side driven.”³⁴³ Instead of trying to undermine conservation efforts, logging companies should confront their actual economic challenges and seek solutions. They should focus on the need for economic diversification and mechanisms by which to relieve burdens on the workers who have borne the brunt of the industry’s hardships.

THE FOREST STEWARDSHIP COUNCIL: A BETTER DIRECTION FOR THE FOREST INDUSTRY

Just as the landscape-level protections created in partnership with Indigenous Peoples are essential to meaningfully protecting the boreal forest, industry must also be at the forefront of generating solutions to safeguard this precious resource. The Forest Stewardship Council (FSC) is an international nonprofit organization established in 1994 to create standards certifying responsible logging operations.³⁴⁴ It is the world’s most credible independent certifier of responsibly managed forests, rewarding companies that implement sustainable practices.³⁴⁵

FSC’s Canada chapter promotes less destructive, more responsible logging in the boreal forest. To obtain FSC certification in a given area in Canada, logging companies must promote conservation, maintain biodiversity, and seek input from local and Indigenous communities. Today, about 25 percent of boreal forest under commercial operation in Canada is FSC-certified.³⁴⁶

While the FSC’s forest management requirements are the strongest in Canada, they continue to evolve based on new knowledge and concerns. The FSC has begun moving toward requiring protection of intact forests and is updating its National Forest Management Standard to include more stringent caribou and Indigenous cultural landscape indicators.^{347,348} FSC Canada has also strongly advocated for incorporating Indigenous voices in decisions affecting forests and waters, including conservation decisions. In October 2017, for example, the FSC endorsed the addition of a chapter to the North American Free Trade Agreement recognizing and supporting Indigenous rights.³⁴⁹

336 Natural Resources Canada, “Statistical Data: Employment.”

337 Ibid. Natural Resources Canada, *The State of Canada’s Forests: Annual Report 2009* (2009), <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/30071.pdf>. Natural Resources Canada, *The State of Canada’s Forests 2017*.

338 Natural Resources Canada, “Statistical Data: Employment.”

339 Ibid.

340 Ibid.

341 Natural Resources Canada, *The State of Canada’s Forests 2009*.

342 Natural Resources Canada, “Statistical Data: Employment.”

343 Julee Boan et al., “From Climate to Caribou: How Manufactured Uncertainty Is Affecting Wildlife Management,” *Wildlife Society Bulletin* 42, no. 2 (2018): 366-381, p. 376.

344 FSC, “What Is FSC?” <https://ic.fsc.org/en/what-is-fsc> (accessed May 13, 2018).

345 Swedish FSC Council, “Choose Wood and Paper Products That Protect Forests,” http://www.wwf.se/source.php/1117074/fsc_eng.pdf (accessed May 23, 2018).

346 FSC Canada, “Moving Towards Motion 65.”

347 FSC, “Motion 65: High Conservation Value 2 (HCV2)—Intact Forest Landscapes (IFL) Protection,” FSC General Assembly 2014 (September 7–14, 2014), <http://ga2014.fsc.org/motion-updates-205.motion-65-high-conservation-value-2-hcv2-intact-forest-landscapes-ifl-protection>.

348 FSC Canada, “Forest Management Standard Revision,” <https://ca.fsc.org/en-ca/standards/forest-management-standard-revision-01> (accessed May 13, 2018).

349 FSC Canada, “FSC Canada Strongly Supports Proposal to Include Chapter on Rights of Indigenous Peoples in NAFTA Now Under Renegotiation” (October 19, 2017), <https://ca.fsc.org/en-ca/newsroom/press-releases/id/801?platform=hootsuite>.



While there are other certification systems used by the forest industry in Canada, namely the industry-created and funded Sustainable Forest Initiative (SFI), none match the FSC's credibility. Among its critical weaknesses, the SFI allows companies to engage in ecologically damaging practices, including the unsustainable conversion of intact, natural forests to monoculture tree plantations, and has no protections for old-growth forests. The SFI also fails to adequately protect threatened and endangered species and does not meaningfully incorporate standards to mitigate logging's effects on climate change.³⁵⁰

Unfortunately, the FSC has come under attack from industry trade groups and logging companies in Canada who argue that its policies hurt their access to important wood sources and thereby impact their operations and bottom lines.³⁵¹ Some companies have allowed their FSC certificates to expire or are threatening to remove their forests from FSC certification, as the Quebec Forest Industry Council did in October 2015.³⁵² The following month, Canada's largest logging company, Resolute Forest Products, questioned the "viability" of the FSC and criticized the organization's policies, including its support for protecting intact forests and boreal caribou.³⁵³

Now more than ever, FSC certification is a critical tool for moving the forest industry toward more sustainable management of Canada's forests. Customers are increasingly pressuring international companies to sell responsibly sourced products. As a result, companies with billions of dollars in purchasing power have looked to the FSC to show customers that their purchases do not endanger intact boreal forests and the communities and iconic wildlife that depend on them. Logging companies and industry associations need to work with the FSC to protect the boreal forest and build Canada's reputation as a source of sustainable forest products.

RAYONIER: CREATING A BETTER MODEL FOR SUSTAINABLE LOGGING

The forestry company Rayonier is distinguishing itself for its work to promote more sustainable logging and protect Indigenous rights. Rayonier is building on the legacy of Tembec, the forest products company it acquired in 2017.³⁵⁴ In addition to operating many FSC-certified tenures in Ontario and Quebec, Tembec worked with environmental organizations on conservation initiatives for almost two decades.³⁵⁵ Now, Rayonier is partnering with the FSC, Indigenous Peoples, environmental NGOs, and local officials in Ontario and Quebec to create forest management plans that protect boreal caribou.³⁵⁶

350 Sustainable Forestry Initiative, "SFI 2015–2019 Forest Management Standard" (January 2015), <http://www.sfiprogram.org/files/pdf/2015-2019-standardsandrules-section-2-pdf/>.

351 FSC, "FSC Abandons Proposal of Mediation Involving Resolute Forest Products and Asks FSC Board of Directors to Take Action" (February 4, 2016), <https://ic.fsc.org/en/news-updates/id/1417>.

352 FSC Canada, "FSC Canada Responds to Quebec Forest Industry Council's Premature Concerns" (November 24, 2015), <https://ca.fsc.org/en-ca/newsroom/id/497>.

353 Resolute Forest Products, "Resolute Announces Reinstatement of FSC Certification in Ontario" (November 25, 2015), <http://resolutefp.mediaroom.com/2015-11-25-Resolute-Announces-Reinstatement-of-FSC-Certification-in-Ontario>.

354 "Rayonier Advanced Materials Completes Acquisition of Tembec," *Business Wire* (November 20, 2017), <https://www.businesswire.com/news/home/20171120005292/en/Rayonier-Advanced-Materials-Completes-Acquisition-Tembec>.

355 World Wildlife Fund Canada, *A Collaborative Approach Between WWF and Tembec on Forest Certification in the Gordon Cosens Forest: A Model for Forest Certification in Canada* (2004), p. 1, http://awsassets.wwf.ca/downloads/tembec_hcvf_overview_nov2004.pdf.

356 Wildlands League, "Collaboration Leads to Solutions." Chief Bruce Archibald et al., "Joint Statement on Abitibi River Forest".

V. Recommendations

This report urges policymakers to partner with Indigenous communities to take immediate action to protect boreal forests through mandatory and enforceable boreal caribou protections and Indigenous-led management. Second, to embrace its reputation as an international climate leader, Canada should formally recognize logging's climate impacts and incorporate these impacts into national greenhouse gas emissions calculations and a national strategy to limit carbon emissions. Finally, this report points to the international marketplace as a powerful force to encourage Canadian governments to implement these policies.

Canada should foster and support Indigenous-led land-use planning

Having lived sustainably with Canada's boreal landscapes for thousands of years, Indigenous Peoples are in a unique position to lead broadly beneficial land-use plans for the boreal forest. First, the process of reconciliation must include guaranteeing Indigenous Peoples' right to free, prior, and informed consent and the power to refuse resource development in their homelands. In addition, the numerous successful Indigenous-led land-use planning processes have demonstrated that a community-based governance model can instigate long-term protection that considers all stakeholder interests and empowers communities to protect their territories and craft their own economic futures. Governments at all levels should act to position Indigenous-led land-use planning—including caribou protection plans—as central to their policies to protect the boreal forest.

Taking these actions not only will promote Indigenous Peoples' rights in their territories but will also provide more certainty about where industry can operate.³⁵⁷ The federal government has the opportunity to facilitate the creation of Indigenous-led protected areas through the \$1.3 billion it has already allocated toward Canada's international commitment to protect at least 17 percent of its land by 2020.³⁵⁸ This should include dedicated funding for Indigenous land-use planning and other Indigenous-led conservation initiatives.

Provincial and territorial decision makers should implement mandatory protections for critical caribou habitat across the boreal forest

One of the most urgent and practical ways to ensure a healthy future for the broader boreal forest is to protect critical caribou habitat. Canadian provinces and territories should meet their obligations to submit caribou range protection plans that satisfy the critical habitat requirements of the 2012 boreal caribou Recovery Strategy. They should craft and implement these plans in partnership with Indigenous Peoples. In addition, provinces and territories should ensure that the protections around critical boreal caribou habitat are mandatory and enforceable.³⁵⁹ Loopholes that undermine species protection laws should be closed.³⁶⁰

Moreover, provinces and territories should immediately stop logging in the ranges that have already passed the 35 percent disturbance threshold and work to restore habitat in those ranges. Further destruction and degradation in these areas risks the local extinction of many of Canada's boreal caribou herds.

Canada's federal government should step in to safeguard unprotected critical caribou habitat

Both the Canadian federal government's 2012 boreal caribou Recovery Strategy and its 2017 progress report on this strategy make clear that boreal caribou populations have continued to decline since the species was listed as threatened in 2003.³⁶¹ While the federal government took an important step in releasing its 2018 report highlighting provincial inaction, it has not yet used its most effective legal tools to enforce protections. The Canadian government should, therefore, meet its obligation under SARA to continue to regularly document through subsequent reports where critical boreal caribou habitat remains unprotected, and to identify steps to remedy the situation.³⁶² In the absence of adequate provincial protections, the federal government should implement "safety net" orders that stop destructive activities in severely threatened ranges until provinces and territories complete land-use plans that include mandatory protections against habitat degradation.

357 Canadian Parks and Wilderness Society, Manitoba Chapter, "New Provincial Commitment for Indigenous Land Use Planning Good News for Communities, Conservation" (November 24, 2015), <http://cpawsemb.org/news/new-provincial-commitment-for-indigenous-land-use-planning-is-good-news-for>.

358 Government of Canada, *Budget 2018*, <https://www.budget.gc.ca/2018/docs/plan/chap-04-en.html#Protecting-Canadas-Nature-Parks-and-Wild-Spaces> (accessed May 11, 2018).

359 Jacqueline Hebert et al., *Progress Report on the State of Boreal Caribou Critical Habitat Protection*.

360 Ibid.

361 Environment Canada, *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

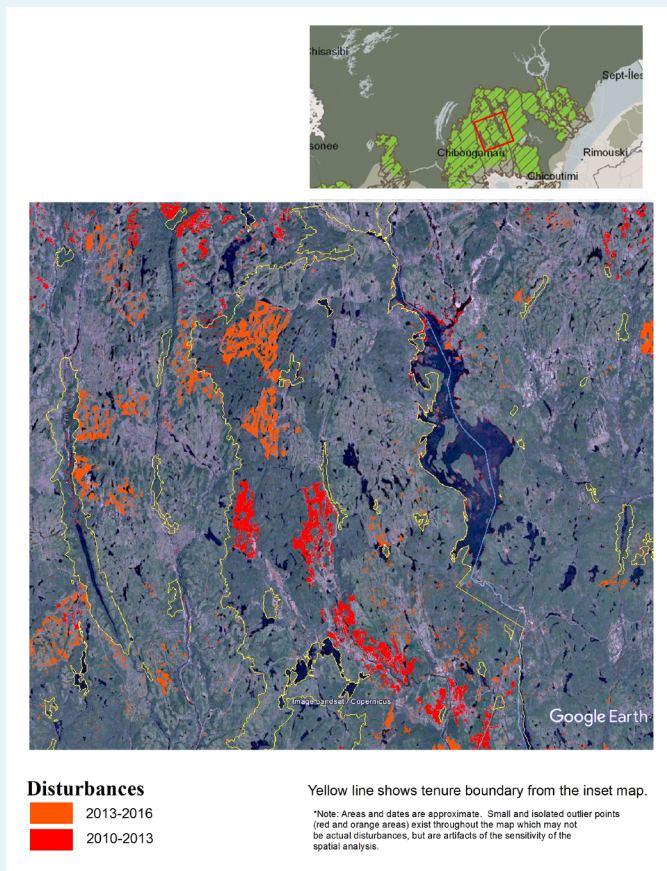
362 Government of Canada, *Species at Risk Act*, S.C. 2002, c. 29.

VOLUNTARY COMMITMENTS HELP, BUT ARE NOT ENOUGH

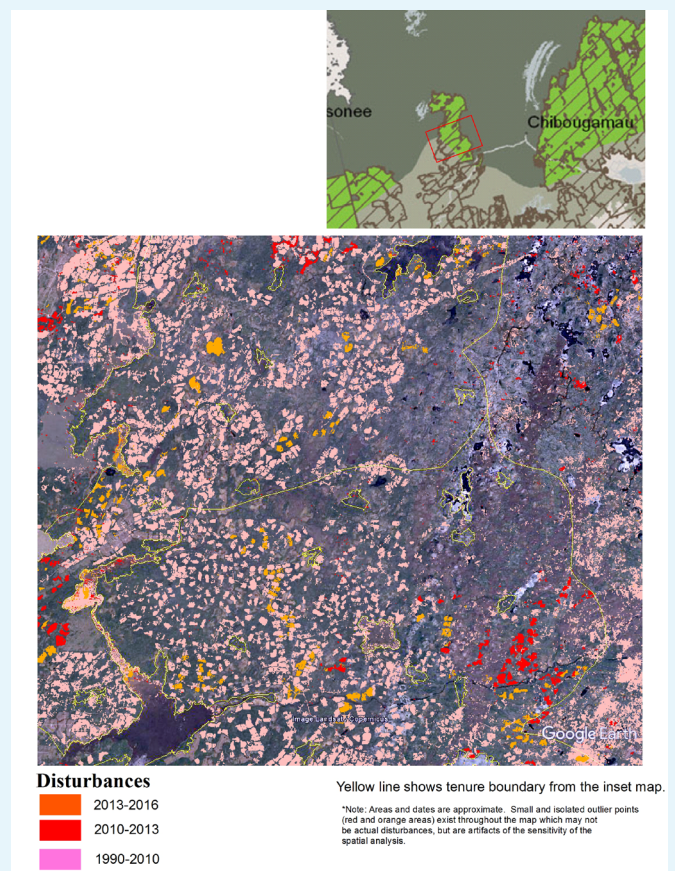
In 2010, logging companies and NGOs signed the Canadian Boreal Forest Agreement (CBFA), with the intent to implement more stringent sustainability standards on 178 million acres of Canada's boreal forest. Signatories agreed to a three-year suspension (2010–2013) of logging activity on 71.6 million acres of boreal forest that is critical caribou habitat. Many NGO signatories emphasized that the CBFA would give governments the opportunity to accelerate caribou habitat protection plans and expressed hope that the three-year moratorium would become permanent.³⁶³ In return for the logging companies' participation, the NGOs agreed to suspend boycotts against their products.³⁶⁴ The agreement was initially lauded as a world-class conservation initiative.

The CBFA spurred some important industry action. For example, Weyerhaeuser partnered with Indigenous, provincial, and municipal governments in Saskatchewan to propose a 741,000-acre protected area in the Mossy River watershed and conserve a 988,000-acre area of habitat for caribou.³⁶⁵ However, satellite imagery revealed evidence that logging continued in areas meant to be covered by the voluntary moratorium (see maps below).³⁶⁶ Additionally, by 2013, the provinces still had not created any protected areas identified under the CBFA, and the three-year pact lapsed without permanent measures to conserve these regions.³⁶⁷ The creators of the CBFA also did not incorporate any Indigenous voices into the agreement. The CBFA reveals the inadequacy of voluntary agreements in the absence of official government participation or mechanisms for enforcement.

DISTURBANCES IN REGIONS COVERED BY THE CBFA MORATORIUM



Region north of Lac Saint-Jean within the CBFA's moratorium area.³⁶⁸



An area of the CBFA moratorium south of the Broadback River watershed.³⁶⁹

363 *The Canadian Boreal Forest Agreement* (May 10, 2010), http://cbfa-efbc.ca/wp-content/uploads/2014/12/CBFAAgreement_Full_NewLook.pdf.

364 *Ibid.*

365 CBFA, "Innovative Collaboration Achieves Conservation for Caribou and Supports Prosperous Forest Communities in East Central Saskatchewan" (July 7, 2016), <http://cbfa-efbc.ca/innovative-collaboration-achieves-conservation-for-caribou-and-supports-prosperous-forest-communities-in-east-central-saskatchewan/>.

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Canada’s federal and provincial decision makers should improve measurement of greenhouse gas emissions associated with logging in Canada’s boreal forest and develop forestry practices to minimize carbon emissions

As a first step to limiting greenhouse gas emissions associated with boreal logging, Canada should adopt transparent, scientifically credible methods to properly account for logging’s greenhouse gas emissions. These data should then be included in provincial, national, and international greenhouse gas inventories and climate plans and be used to bring logging under a national strategy to regulate carbon emissions. In addition, these measurements should serve as the basis for designing “climate safe” forestry practices in partnership with Indigenous Peoples. These practices should protect large-scale intact forest areas, promote forest recovery, ensure biodiversity preservation, and maximize carbon sequestration and storage.

Canada’s federal and provincial governments should implement policies to increase the boreal forest’s resilience to climate change

The boreal forest’s resilience to climate change over the next century will be dependent upon the management decisions made today. In the face of global climate change, it is imperative that Canada’s governments implement policies to promote a healthy, resilient boreal forest through protecting intact forests and recovering degraded landscapes. In addition, Canadian policymakers should expand research on how the boreal forest will adapt to climate change and incorporate these findings into land-use planning. This will not only help protect plant and animal species from the stresses of climate change but also help to ensure the forest’s carbon remains stored in a healthy, complex ecosystem.

Corporate buyers of boreal forest products should ensure their sourcing policies and decisions are aligned with boreal protection and Indigenous sovereignty

The international marketplace—particularly companies in the United States—has the economic power to urge Canada’s federal, provincial, and territorial governments to protect the boreal forest’s ecologically and culturally important landscapes. Accordingly, companies that source from the boreal forest should use their market power to encourage conservation solutions and sustainable development and promote Indigenous rights. International companies should call on federal, provincial, and industry leaders to ensure that Indigenous Peoples’ rights to their land are respected and implement policies that account for logging’s climate impacts. They should also push Canada’s governments to implement mandatory and enforceable laws to protect critical boreal caribou habitat and ensure that no more than 35 percent of each caribou range is degraded.

CONCLUSION

The boreal forest is a global treasure. Its importance to Indigenous Peoples, wildlife, and the global climate cannot be overstated. Yet, by failing to safeguard this treasure, Canada’s federal and provincial governments are playing fast and loose with this irreplaceable ecosystem, gambling with its future.

On the international stage, the Canadian federal government has depicted the country as an environmental leader and promised to create a new Nation-to-Nation relationship with Indigenous Peoples. It’s time for Canada to live up to its commitments and ideals by protecting the boreal and respecting the self-determination of the Indigenous Peoples who live there. We need action now. Every day without it has consequences. Protecting the boreal means a healthier future for species, Indigenous Peoples, and the planet.