Towards climate smart forestry

Increasing carbon storage in the working forests of Canada and the United States

November 2023

The Forest Stewardship Council® U.S. (FSC® US) national office, with support from our colleagues at FSC Canada, embarked on a journey to identify just how big of an impact our practices are having on carbon storage on a regional level in Canada and the United States in forests that are also supplying the critical forest products we depend on for everyday life. This report aims to advance the knowledge base about that question with a preliminary analysis of FSC practices — including case studies from major forest regions in Northern California, Western Canada, and the Gulf Coast.

Contents

The Forest Stewardship Council US is solely responsible for the contents of this report and the research that underpins it.

Glossary

Carbon dioxide equivalent (CO_2e) – A measure used to compare environmental impact based on global warming potential (GWP) by converting amounts of various activity or pollution into the equivalent amount of carbon dioxide with the same global warming potential.

Conservation Areas Network – Those portions of the working forest for which conservation is the primary and, in some circumstances, exclusive objective.

Even and uneven-aged forest management – Working forests are usually managed in either an even-aged or an uneven-aged system. An even-aged system is one where the dominant trees in each management unit (or stand) of the forest are all of the same or similar age due to harvesting the entire area at the same time. An uneven-aged system is one where there is a greater diversity of tree age classes in the forest, typically due to selective harvesting that removes some trees in an area but not all.

ForTab Harvest Scheduling Model – A planning tool that prescribes what areas of forest to harvest and when.

High Conservation Value Areas – Zones and physical spaces which possess and/or are needed for the existence and maintenance of the below identified High Conservation Values, pioneered by FSC:

- **HCV1 - Species Diversity.** Concentrations of biological diversity, including endemic species and rare, threatened, or endangered species that are significant at global, regional, or national levels.
- **HCV 2 - Landscape-level ecosystems and mosaics.** Intact forest landscapes and large landscape-level ecosystems and ecosystem mosaics that are significant at global, regional, or national levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance.
- **HCV 3 - Ecosystems and habitats**. Rare, threatened, or endangered ecosystems, habitats or refugia.
- **HCV 4 - Critical ecosystem services**. Basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes.
- **HCV 5 - Community needs**. Sites and resources fundamental for satisfying the basic necessities of local communities or Indigenous Peoples (for example, for livelihoods, health, nutrition, water), identified through engagement with these communities or Indigenous Peoples.
- **HCV 6 - Cultural values**. Sites, resources, habitats, and landscapes of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or Indigenous Peoples, identified through engagement with these local communities or Indigenous Peoples.

Old-growth forest[1] – The oldest seral stage in which a plant community is capable of existing on a site, given the frequency of natural disturbance events, which may include very old examples of long-lived early- or mid-seral species. The onset of old growth varies by forest community and region; long-lived in the boreal can be very different than in California, for example. Depending on the frequency and intensity of disturbances, and site conditions, old-growth forests will have different structures, species compositions, age distributions, and functional capacities than younger forests. Old-growth stands and forests include:

- Type 1 Old Growth: three acres or more that have never been harvested and that display old-growth characteristics.
- Type 2 Old Growth: 20 acres (8.1 ha) or more that have been harvested, but that have retained (through any harvesting activities) significant old-growth structure and functions.

Opening size restraint – Limitation on the size of an area of forest to be cut down in one harvest operation implemented as part of an even-aged forest management system.

Responsible forest management – Management that is environmentally sound, socially beneficial, and economically prosperous, as defined by the Forest Stewardship Council's 10 Principles.

Riparian forest buffer – A riparian forest buffer is an area adjacent to a stream, lake, or wetland that contains a combination of trees, shrubs, and/or other perennial plants and is managed differently from the surrounding landscape. Riparian buffers protect water quality and stream habitat.

Scope 3 emissions – Scope 3 emissions are all indirect emissions not included in scope 2 emissions (which are indirect emissions from the generation of purchased energy) that occur in the value chain of a company tracking and reporting its carbon emissions, including both upstream (from suppliers) and downstream (due to sales of products and services) emissions.

Selective management – The continual creation or maintenance of uneven-aged or multi-cohort stands by means of occasional replacement of single trees or small groups of trees with regeneration from any source. This is one type of an uneven-aged forest management system.

Working forest – Forestland that is actively managed to produce a desired outcome, such as timber, wildlife habitat, recreation, carbon sequestration, water quality and quantity, or preservation of cultural values, or other objectives.

1. This definition of old-growth forest comes from the FSC-US Forest Management Standard. As such, it applies to forests in the United States. Old-growth forests in a Canadian context may be defined differently, especially in the boreal forest.

Letter from the presidents of the Forest Stewardship Council Canada and US national offices

Life on Earth depends on forests.

Forests provide the air we breathe and water we drink. 80% of terrestrial biodiversity lives in forests, and 1.6 billion people rely on forests for their livelihoods. Forests store vast amounts of carbon, with massive additional potential to mitigate the worst impacts of climate change. They support cultural and religious traditions for Indigenous Peoples and local communities around the world.

At the same time, deforestation and forest degradation release vast quantities of stored carbon and are a major driver of climate change. Deforestation alone is responsible for up to 20% of global carbon emissions.

Today, the economic value of forests largely comes from what we take out of them: wood for lumber and furniture, and pulp for tissue, paper, and packaging drive the economic value of most working forests. These resources are critically important, but they only represent part of the true value of forests.

Because of the global nature of supply chains and global demand for forest products, deforestation is not an issue a single country can solve.

At the Forest Stewardship Council (FSC), we are offering a way to enable forests to meet the rising demand for products while continuing to play their part in abating the climate crisis.

As the world's most trusted forest certification system, FSC has worked for nearly 30 years to help markets recognize the true value of forests. By choosing FSC-certified products, consumers and companies can support responsible management.

Now FSC is building an ambitious new program to value forests for not only what we take out of them, but also for what we leave behind, such as clean water, carbon storage, and biodiversity.

Our objective is to use the power of markets to value forests fully, and in the process, to tackle some of the biggest challenges facing humanity. Just as forests are more than wood and fiber, they are also more than simply stores of carbon. With five billion acres of managed forest around the world, FSC sees potential at scale to address intersecting issues of climate change and biodiversity collapse.

In short, FSC is offering a way to protect the full range of forest values, even as we use forest products every day. These values include carbon and, just as importantly, biodiversity, water, and the rights of Indigenous Peoples and local communities.

The studies described in this report were developed to quantify one important forest value – carbon sequestration – that has a broad and growing market value. These studies and others have consistently found that the practices required by FSC certification are associated with additional carbon storage in the forest. There is now a growing body of evidence that FSC is an important part of forest-based climate action.

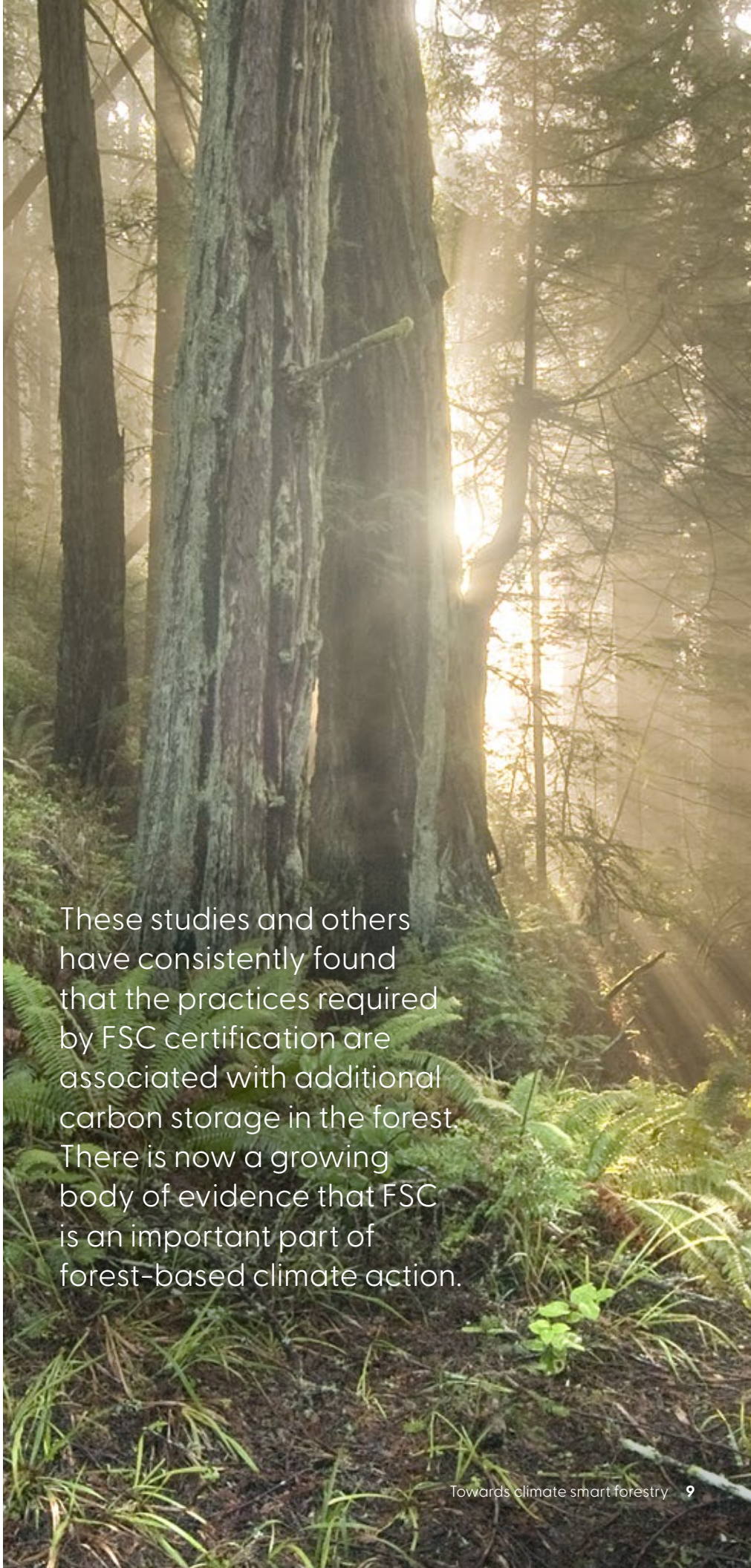
In the months and years ahead, FSC will move aggressively in Canada and the United States and around the world to further develop our Climate & Ecosystem Services Program. With the FSC Ecosystem Service Procedure as its backbone, the program will offer practical tools for markets to value forests and develop nature-based solutions to climate change.

We look forward to working with you to advance credible solutions to challenges facing our planet.

Sincerely,

Francois Dufresne
President,
Forest Stewardship
Council Canada

Derik Frederiksen
President,
Forest Stewardship
Council US



Executive summary

The Forest Stewardship Council, the world's most trusted forest certification, is an independent nonprofit organization founded in 1993 to promote environmentally sound, socially beneficial, and economically prosperous management of forests. FSC sets standards by which forests are certified, offering assurance to consumers and businesses that the wood, paper and fiber products they buy originate from well-managed forests. More than 3,000 companies and 150 million acres (60,700,000 ha) of forestland are FSC certified in the United States and Canada.

This report examines how forest management in Canada and the United States can play its part in addressing the climate crisis and provide the forest-based products people use every day.

The three case studies detailed in this report conclude that FSC-certified forests in Canada and the United States store more carbon on average compared to forests managed to baseline practices alone. This result confirms other similar findings from independent research conducted by Ecotrust and Ontario Nature.

As governments and companies in Canada and the United States move to address climate change, these studies suggest that FSC has a role to play. Priorities for additional research include quantifying the carbon benefits of FSC-certified forests at the landscape or jurisdictional levels for use in Scope 3 emissions reporting, and quantifying additionality associated with FSC at the scale of a forest carbon project. This research suggests potential benefits associated with FSC-certified management that warrant further exploration.

The case studies include a mixed pine forest in the Gulf Plain region of the Southeast United States, a mixed boreal forest in western Canada, and a redwood region in coastal Northern California, part of the Pacific Coast region of the United States.

These studies were developed to better understand how FSC certification can support and enhance investments in nature-based solutions to climate change. The results find that management to FSC requirements alone – without additional practices enhancing carbon storage – yields climate benefits. By requiring practices such as increased buffers along rivers and streams, protection of High Conservation Values, restrictions on opening sizes, and maintenance of a Conservation Areas Network, FSC certification is associated with additional carbon storage.

The results for each case study should be evaluated on an eco-regional basis, as they speak to the potential for additional carbon storage at that scale.

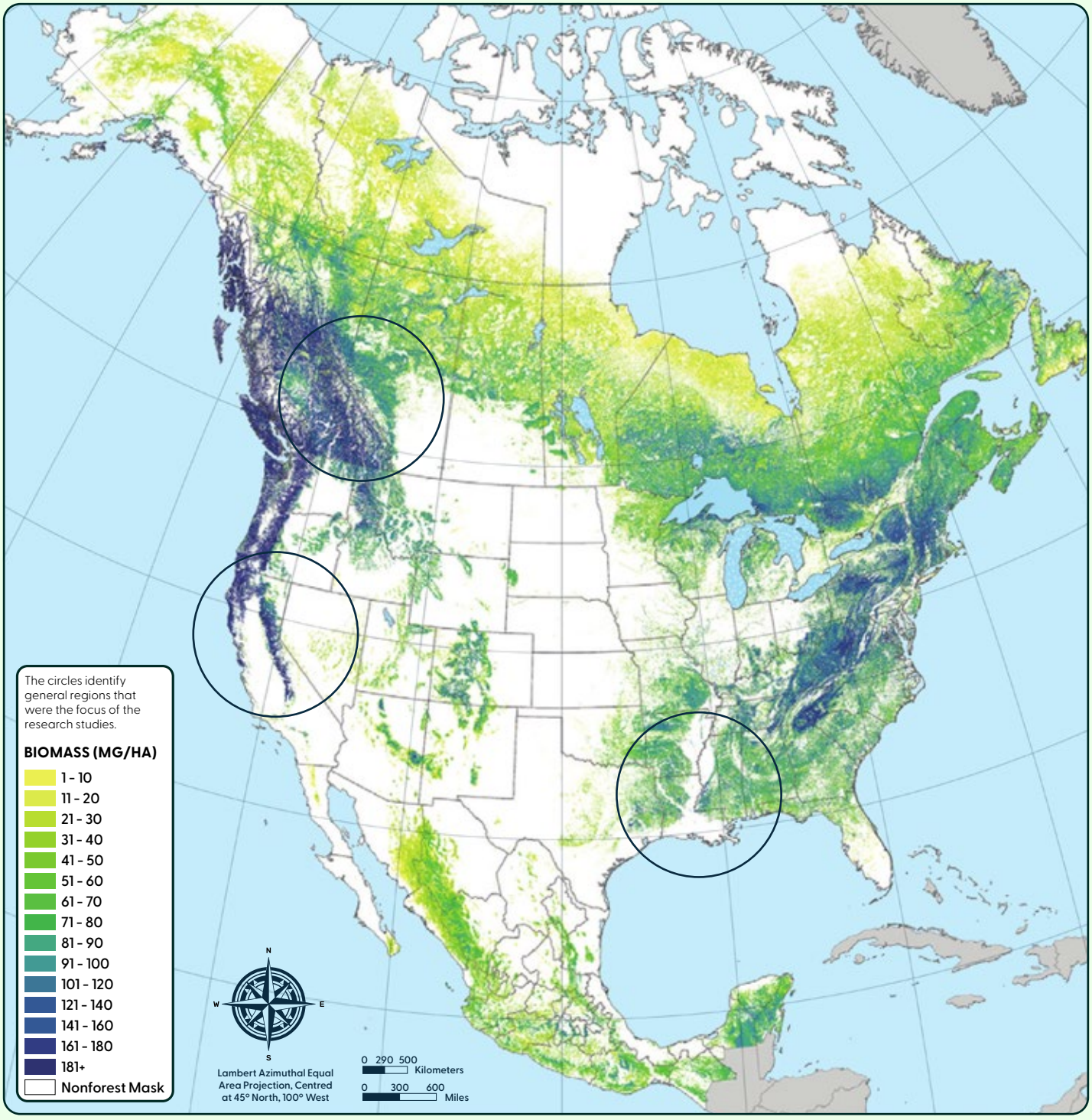
Each study helps answer the question: What is the potential carbon impact of FSC-certified management in specific eco-regions relative to common practices?

To calculate the results, the team at SCS Global Services – hired by the Forest Stewardship Council US – used a peer-reviewed model (ForTab) to quantify two simplified policy scenarios: 1) Common practice, as required by regulations and "best management practices," which set the baseline; and 2) Practices required by FSC certification.

Because baseline practices are typically set at the state or provincial level, the results of these studies would vary across political boundaries.

A summary of the methodology and results can be found on page 12.

Hectares (ha) of Aboveground Forest Biomass Across North America. Figure source: Kevin McCullough, U.S. Forest Service. North American Biomass and Disturbance Mapping Working Group, 2014.



Mixed boreal forest in Canada

FSC includes a requirement that 10% of the landscape is maintained within a Conservation Areas Network*. This constraint tended to emphasize older forest stands.

This difference in policies resulted in an additional 0.28 Tonnes CO_2e per acre (.68 Tonnes CO_2e per hectare) in the final period of the 40-year planning horizon.

There was an increasing divergence between the two harvest policies (FSC and provincial baseline requirements) throughout the planning horizon, suggesting additional carbon storage in FSC-certified forests over longer time horizons.

Due to data limitations, the analysis did not include the contribution of below-ground biomass, which is significant in the soils in the boreal region.

Mixed pine forest in the Gulf Plain region of the Southeast United States

Based on FSC requirements, a maximum opening size constraint was applied to FSC-certified management, preventing harvesting of adjacent stands during a "green-up period."

There was an average of an additional 1.00 Tonnes of CO_2e per acre (2.47 Tonnes per hectare) of FSC-certified forests over a 20-year planning horizon, using only the opening size constraint, compared to common practice.

The addition of larger riparian buffers increases the amount of carbon that remains in the FSC-certified forests to an average of an additional 23.00 Tonnes CO_2e per acre (56.81 Tonnes CO_2e per hectare), when compared to baseline buffers, resulting in 22% additional carbon storage in FSC-certified forests. This shows the potential for increased carbon through additional landscape protection when combining the green-up and riparian constraints, although it would need to be studied further.

Redwood region in coastal Northern California

The comparison was made between uneven-age (selective) management following FSC requirements and even-age management using the California Forest Practices rules.

The FSC scenario also includes maintenance of High Conservation Value forests that are unavailable for harvest, comprising 5% of the landscape in addition to the riparian buffers.

Under these scenarios, the FSC requirements result in an additional 146 Tonnes CO_2e per acre (360.62 Tonnes CO_2e per hectare), compared to California Forest Practices rules alone, over a 20-year planning horizon, which is approximately 59% more on average.

FSC does not require uneven-age management, although it is commonly practiced by FSC-certified managers in the eco-region.

The results of these studies are strongly influenced by the spatial arrangement of the stands and the initial age classes of the reference forests.

*Around the world, FSC requires 10% of certified forest areas to be designated as part of a Conservation Areas Network to maintain and enhance High Conservation Values, ecosystem services, and other environmental and cultural values. While this requirement is in place in FSC Canada's National Forest Stewardship Standard, it is not yet a requirement in the United States. It will become a requirement in the upcoming revised US National Forest Stewardship Standard, which is expected to be approved for use in 2024. As a result, the coastal northern California study included an assumption of 5% retention of High Conservation Value forests, which is an estimate based on a broad understanding of existing FSC-certified practices in the region.

How to use the results of this study

The studies described in this report are the first of their kind for FSC, although they further validate previous work by Ecotrust and Ontario Nature. Collectively, they contribute to a growing body of evidence that the practices required to be FSC certified are associated with additional carbon storage in the forest.

Nonetheless, they are only a step on a long journey to truly quantify the impacts of FSC-certified management. For people and organizations committed to climate action and responsible forest management, these studies support a set of actions:

Use FSC-certified products and policies, even in the absence of data about specific forests and supply chains. Even with the conservative assumptions made in these studies, the peer-reviewed model found that FSC-certified forests stored additional carbon. In reality, many harder-to-model FSC requirements may also support additional carbon storage, as well as biodiversity conservation, watershed protection, and other forest values.

Consider FSC in Scope 3 emissions research to further explore climate benefits associated with FSC sourcing and supply chains. As models develop for emissions factors and other quantification tools, explore ways for the models to differentiate between different types of forest management. Consider how to incorporate management practices such as buffer widths, opening sizes, green-up constraints, retention requirements, and requirements to maintain High Conservation Values and a Conservation Areas Network.

Support development of high-quality public data sources, such as the US Forest Service's Forest Inventory and Analysis program. While many forest managers have excellent data, they may be understandably wary of sharing it. To quantify forest carbon dynamics in the future, open sources of high-quality data will be key to moving quickly to compare across regions and to conduct analyses at landscape and jurisdictional scales.

Add FSC to forest carbon projects to promote integrity and quality and as a means to conserve and enhance co-benefits such as biodiversity, water, and rights for Indigenous People and local communities. There is a strong move towards quality and integrity in voluntary and compliance carbon markets that is resulting in closer evaluation of projects and methodologies. FSC offers a strong partner to help advance these important objectives.

Use the FSC Ecosystem Services Procedure to quantify benefits, including carbon, biodiversity, and water, associated with FSC-certified forest management. The procedure is in use around the world, offering a way to generate credible claims about FSC-certified forests.

Introduction

Life on Earth depends on forests to produce the air we breathe, clean water we drink, and to store vast amounts of carbon in their biomass and soils. As we face the brink of a climate catastrophe, responsible forest management offers an opportunity to sequester additional carbon while also maintaining and enhancing the "co-benefits" generated by forests, including ecosystem services such as water and biodiversity.

Forest management is an umbrella term for the practices of engaging with forests, from planning and harvesting to replanting and conservation. Responsible forest management can restore and maintain healthy forests while also ensuring forests are managed in ways that are economically viable and socially beneficial.

If done responsibly, forestry management is also an effective tool to address the climate crisis, as healthy, well-managed forests can draw down massive amounts of carbon from the atmosphere and store it for years. In higher-latitude forests alone – like those found in Canada and the United States – responsible forest management can deliver the carbon savings equivalent to removing 185 coal-fired power plants.[4]

The science is clear, responsible forest management is an effective strategy to increase how much carbon can be stored in forests across Canada and the United States. How this applies in practice to individually managed working forests, such as those under FSC certification, is less well understood.

Some evidence already exists: a study shows that FSC-certified working forests store an average of 29% more carbon than onventionally managed forests across Oregon and Washington,[2] and in 2022, a field study by Ontario Nature validated a large amount of additional carbon stored in FSC-certified forests in Ontario, Canada.[3]

To deepen the understanding and validate findings, FSC set out to answer the question: What is the potential carbon impact of FSC-certified management in specific eco-regions relative to common practices? To answer it, three case studies are presented in this report.

As we face the brink of a climate catastrophe, responsible forest management offers an opportunity to sequester additional carbon while also maintaining and enhancing the "co-benefits" generated by forests, including ecosystem services such as water and biodiversity.

FSC-certified management in the Southeast US

2. https://ecotrust.org/tipping-the-balance-to-more-carbon-storage/
3. https://ontarionature.org/evaluating-carbon-storage-in-fsc-designated-conservation-lands-blog/
4. https://www.pnas.org/doi/10.1073/pnas.1710465114

What is FSC?

FSC was founded in 1993 as an independent, member-led, non-profit organization that protects forests for future generations.

FSC sets standards under which forests and companies are certified, protecting water quality, prohibiting harvest of rare old-growth forests, preventing loss of natural forest cover, limiting the use of highly hazardous chemicals, and more. Its mission is to promote environmentally sound, socially beneficial, and economically prosperous management of the world's forests, as defined in the 10 Principles guiding FSC. FSC's vision is that by 2050 a new forest paradigm is realized, where the true value of forests is recognized and fully incorporated into society worldwide.

FSC has the most extensive certified supply chain network, with more than 50,000 businesses certified globally, enabling connections between markets and responsible forest management.

What is the FSC Ecosystem Services Procedure

Forests provide a number of essential services, including oxygen, clean water, biodiversity, and more: the benefits provided by forests (technically referred to as "forest ecosystem services") are many and essential to human well-being. FSC has recently developed a new tool – the Ecosystem Services Procedure (FSC-PRO-30-006) – that allows FSC-certified forest owners and managers to identify, measure, and third-party verify the positive impacts of responsible forest management based on five categories of ecosystem services.

The FSC Forest Management Standards already require forest managers to maintain and conserve or enhance and restore ecosystem services and environmental values. The FSC Ecosystem Services procedure offers a framework for verifying impacts of this management and approving FSC ecosystem services claims that can be used by forest managers to access ecosystem services markets and other financial benefits.

The FSC Ecosystem Services Procedure can be used to validate claims that include the following:

- **Biodiversity Conservation**
  - Restoration of natural forest cover
  - Conservation of intact forest landscapes
  - Maintenance of ecologically sufficient Conservation Areas Networks
  - Conservation of natural forest characteristics
  - Restoration of natural forest characteristics
  - Conservation of species diversity
  - Restoration of species diversity
- **Carbon Sequestration and Storage**
  - Conservation of forest carbon stocks
  - Restoration of forest carbon stocks
- **Watershed Services**
  - Maintenance of water quality
  - Enhancement of water quality
  - Maintenance of the capacity of watersheds to purify and regulate water flow
  - Restoration of the capacity of watersheds to purify and regulate water flow

Claims can be used by sponsors within and beyond their value chains to quantify impacts as part of larger nature-positive strategies.

Responsible forest management in Canada and the United States

A rapidly changing policy landscape and innate differences among forest ecosystems require a flexible and agile approach to responsible forest management. If landowners can't earn a living from their forests, there may be pressure to cut them down to find profit from agriculture or real estate development instead. This cannot happen; the latest United Nations Intergovernmental Panel on Climate Change, the 6th Assessment Report (2023),[5] identifies forest management as one of the best immediate solutions to curb further global warming. Some Canadian provinces and U.S. states already have policies and targets in place for addressing climate action through improved management of forests.[6]

More support for responsible forest management is urgently needed. As a major source of both supply and demand for forest products, Canada and the United States are uniquely positioned to lead the charge globally on responsible management that sequesters additional carbon, protects other forest benefits, and delivers forest products to the market. This is especially true when considered through a global lens, as increased sourcing of wood products from tropical, developing nations can contribute to deforestation and degradation, further exacerbating the climate crisis.

There has been limited research on how the different management methods of working forests in Canada (predominantly public land) and the United States (predominantly private land) can impact forest carbon storage. This relative lack of research must be addressed as the demand for paper and wood products rises, and the need to address climate change through forest management also grows. This study begins to resolve this information void.

5. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf
6. Canada: https://natural-resources.canada.ca/our-natural-resources/forests/sustainable-forest-management/sustainable-forest-management-canada/24361
   USA: https://www.fs.usda.gov/nrs/highlights/2172

FSC impact categories	Why it's matters
Zero deforestation	Healthy forests are: · A source of rich biodiversity · Important wildlife habitat · Carbon sinks, crucial to fighting climate change
Biodiversity conservation	· Biodiversity makes up ecosystems, which are essential regulators of climate from the regional to the global level
Safeguarding of High Conservation Values	· Once lost, some High Conservation Values may be irreplaceable · High Conservation Values are crucial to maintaining balanced local ecosystems and providing for communities · Old-growth forests may sequester more carbon
Community rights, including the rights of Indigenous Peoples	· Local communities often have historical ties to forested lands · Many rely on access to resources provided by forests · Traditional ecological knowledge can result in management practices that sequester additional carbon

Meeting the Paris Climate Agreement's goal of limiting global warming to 1.5°C by 2030 requires both reducing carbon emissions and drawing down the carbon that is already in the atmosphere. Forest management is one of the few methods of sequestering carbon that is widely practiced today and shows considerable potential as a cost-effective and scalable way to address the climate crisis.

Understanding carbon storage in FSC-certified forests in Canada and the United States

The goal

FSC hired SCS Global Services (SCS) to quantify the effects of different forest management approaches on carbon storage among several forests in Canada and the United States. The researchers at SCS designed a study to compare carbon storage under FSC forest management practices and under requirements set by provincial and state governments, as well as state-level Best Management Practices (in the US) for water quality. Collectively these practices were known here as "common practice." The goal was to find out if FSC-certified forests store additional carbon above common practice, representing a practical climate solution.

The three FSC-certified forests were chosen because they are representative of some of the key working forest regions found across Canada and the United States.

The scientists

Dr. Kevin Boston, Forest Engineer and Carbon Verifier at SCS: Dr. Bost on is an adjunct professor at Humboldt State University and a registered professional forester in California.

Christie Pollet-Young, Managing Director, Greenhouse Gas Verification Program, SCS: Ms. Pollet-Young has over 20 years of experience in forestry, including forest management, forest ecology research, conservation planning, and carbon offset verification in both tropical and temperate climes.

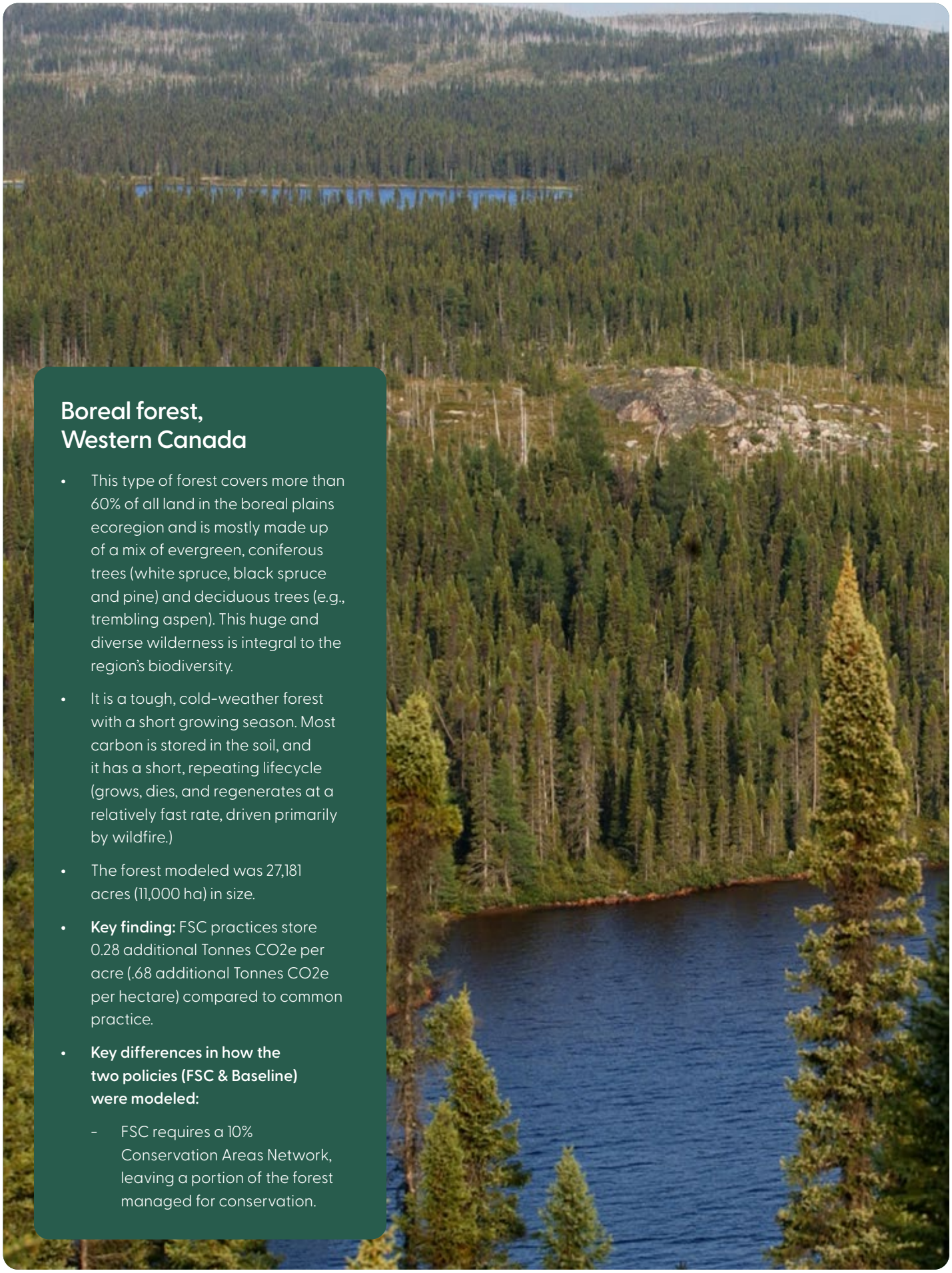
The forests

The following three pages define the three forest types which were chosen.

The goal was to find out if FSC-certified forests store additional carbon above common practice, representing a practical climate solution.

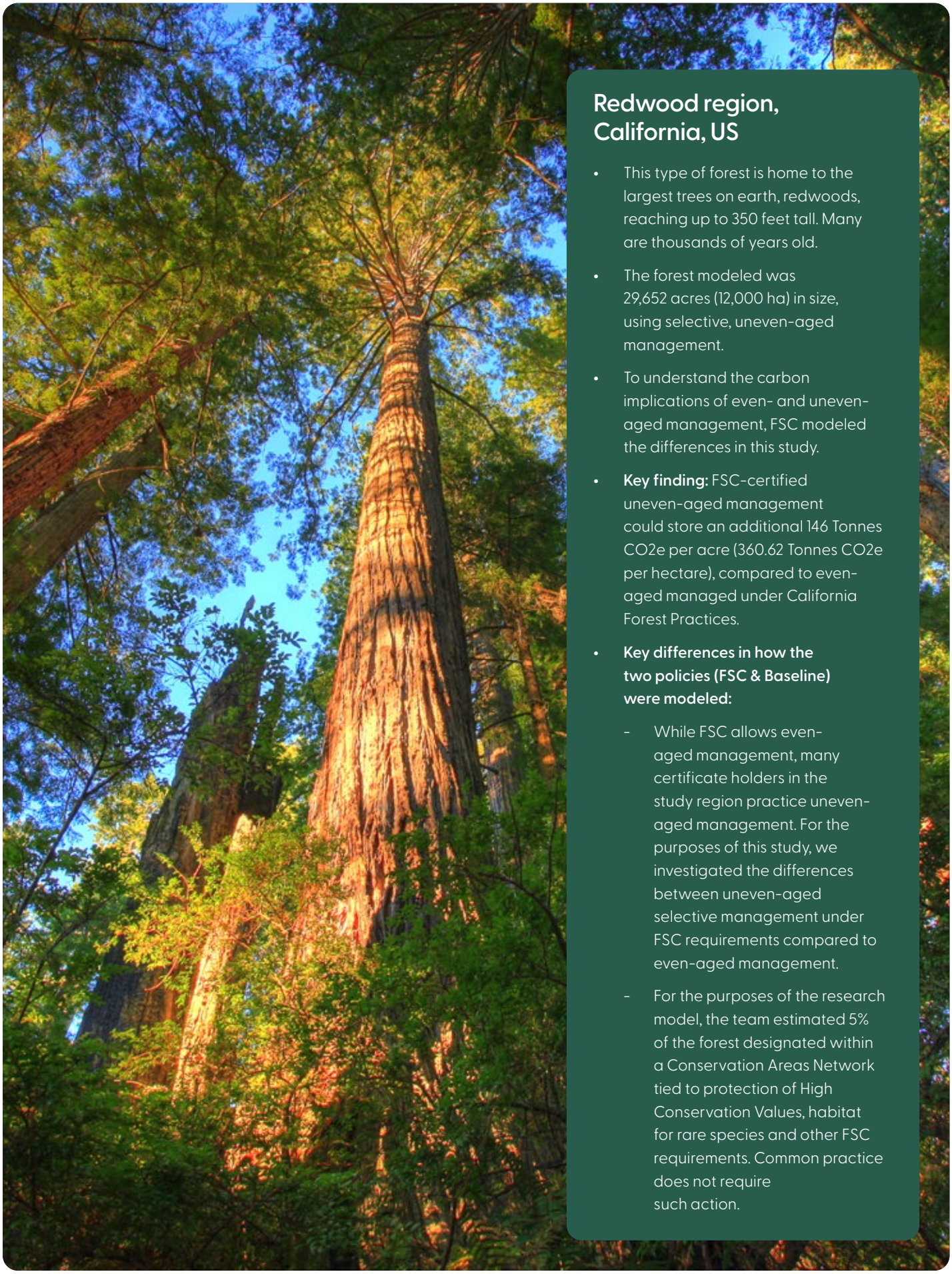
Gulf Coastal Plain, Southeastern US

- This type of forest is mixed, with pine being the most dominant tree species. The landscape is also characterized by wetlands, salt marshes, and swamps.
- The forest modelled was 4,942 acres (2,000 ha) in size.
- **Key finding:** FSC practices stored an additional 1.00 Tonnes of CO2e per acre (2.47 Tonnes CO2e per hectare) compared to common practice.
- **Key differences in how the two policies (FSC & Baseline) were modeled:**
  - For the purposes of the research model, the team used FSC's Southeast US guidelines for maximum opening size and green-up constraints that limit the size of openings that can be created when harvesting trees. They result in limits on harvesting adjacent stands.



Boreal forest, Western Canada

- This type of forest covers more than 60% of all land in the boreal plains ecoregion and is mostly made up of a mix of evergreen, coniferous trees (white spruce, black spruce and pine) and deciduous trees (e.g., trembling aspen). This huge and diverse wilderness is integral to the region's biodiversity.
- It is a tough, cold-weather forest with a short growing season. Most carbon is stored in the soil, and it has a short, repeating lifecycle (grows, dies, and regenerates at a relatively fast rate, driven primarily by wildfire.)
- The forest modeled was 27,181 acres (11,000 ha) in size.
- **Key finding:** FSC practices store 0.28 additional Tonnes CO_2e per acre (.68 additional Tonnes CO_2e per hectare) compared to common practice.
- **Key differences in how the two policies (FSC & Baseline) were modeled:**
  - FSC requires a 10% Conservation Areas Network, leaving a portion of the forest managed for conservation.



Redwood region, California, US

- This type of forest is home to the largest trees on earth, redwoods, reaching up to 350 feet tall. Many are thousands of years old.
- The forest modeled was 29,652 acres (12,000 ha) in size, using selective, uneven-aged management.
- To understand the carbon implications of even- and uneven-aged management, FSC modeled the differences in this study.
- **Key finding:** FSC-certified uneven-aged management could store an additional 146 Tonnes CO2e per acre (360.62 Tonnes CO2e per hectare), compared to even-aged managed under California Forest Practices.
- **Key differences in how the two policies (FSC & Baseline) were modeled:**
  - While FSC allows even-aged management, many certificate holders in the study region practice uneven-aged management. For the purposes of this study, we investigated the differences between uneven-aged selective management under FSC requirements compared to even-aged management.
  - For the purposes of the research model, the team estimated 5% of the forest designated within a Conservation Areas Network tied to protection of High Conservation Values, habitat for rare species and other FSC requirements. Common practice does not require such action.

Methods used to study forest management practices in working forests

FSC and SCS gathered data from the forest managers, including tree species, topographic maps, rivers and streams, and the age of the standing trees in the forest. While each case study was built on data shared by FSC-certified forest managers, it was generalized to represent FSC in that eco-region (rather than offering any specific market intelligence about the forest manager in question). The names of the certified forest managers are being withheld to protect the confidentiality of their data.

A model was then created to predict how much carbon could be stored and how much wood could be harvested from the forest over the next 20 years, comparing these numbers under FSC forest management practices with those under common practice (i.e., the baseline).

Constraints applied by FSC practices included Conservation Areas Networks and areas to be managed for High Conservation Values, riparian buffers (areas surrounding streams and other water bodies) that are protected from harvesting, maximum tree opening sizes, and more.

The model used is the peer-reviewed ForTab Harvest Model[7], developed by the studies' lead researcher, Dr. Kevin Boston with the intention of being widely applicable to real, working forests in Canada and the United States—rather than solely theoretical models.

While the ForTab Harvest Model is not comprehensive in assessing all carbon pools in a given forest (i.e., it does not take carbon stored in the ground into account, which often stores a large part of forest carbon), it shows the potential for carbon benefits of responsible forest management using FSC-certified practices.

Results: Gulf coastal plain, Southeastern US

The model found that the FSC-certified forest in the Gulf Coastal Plain would store an additional 1.00 Tonnes of CO2e per acre (2.47 Tonnes CO2e per hectare) over a 20-year period compared to what the forest would store under common practices.

FSC practices also allowed forest managers to continue harvesting at a similar rate to conventionally managed forests, yielding an economically feasible way to sell wood while delivering the extra carbon storage benefit.

There were two practices that encouraged more carbon storage in the forest.

First, restricting the size of forest clearings that could be created during harvesting. The stricter FSC guidelines here increased carbon storage in the model.

Second, a larger riparian buffer under FSC practice: a zone preventing cutting around rivers and streams to protect biodiversity and water quality and quantity, and to avoid erosion.

Results: Boreal forest, Western Canada

In this boreal forest in western Canada, the model showed that forest management under FSC practices can store an extra 0.28 Tonnes CO2e per acre (0.68 Tonnes

7. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=Jq1x5jwAAAAJ&citation_for_view=Jq1x5jwAAAAJ:KlAtU1dfN6UC

CO2e per hectare) over the 40-year planning period, when compared to the common practice requirements alone.

While this difference in additional carbon storage is minimal, it is based on very conservative assumptions. No differences in soil carbon were included due to a lack of readily available data. And few requirements of the FSC Canada National Forest Stewardship Standard are quantitative in nature, making it difficult to include them in the modeling exercise.

The biggest difference that yielded the higher carbon storage under FSC practices was a 10% Conservation Areas Network requirement, which is an area FSC requires to be designated and managed to protect environmental and cultural values.

It is likely this study undervalues the true carbon impact of FSC. Nonetheless, FSC practices have the potential to improve overall carbon storage throughout the boreal forest in Canada. Already, over 20 million acres of forests in western Canada are FSC certified. Although more research would be required to validate the result, this study suggests that if FSC practices were adopted by all forest managers in the western boreal, up to 20 million additional tons of carbon could be stored per year, equivalent to emissions from over 240,000 tanker trucks' worth of gasoline.[8]

Results: Redwood region, coastal Northern California

Selective management is common in FSC-certified forests of northern California, but it is not required. There are a limited number of certificate holders in the region practicing even-aged management in full compliance with FSC requirements.

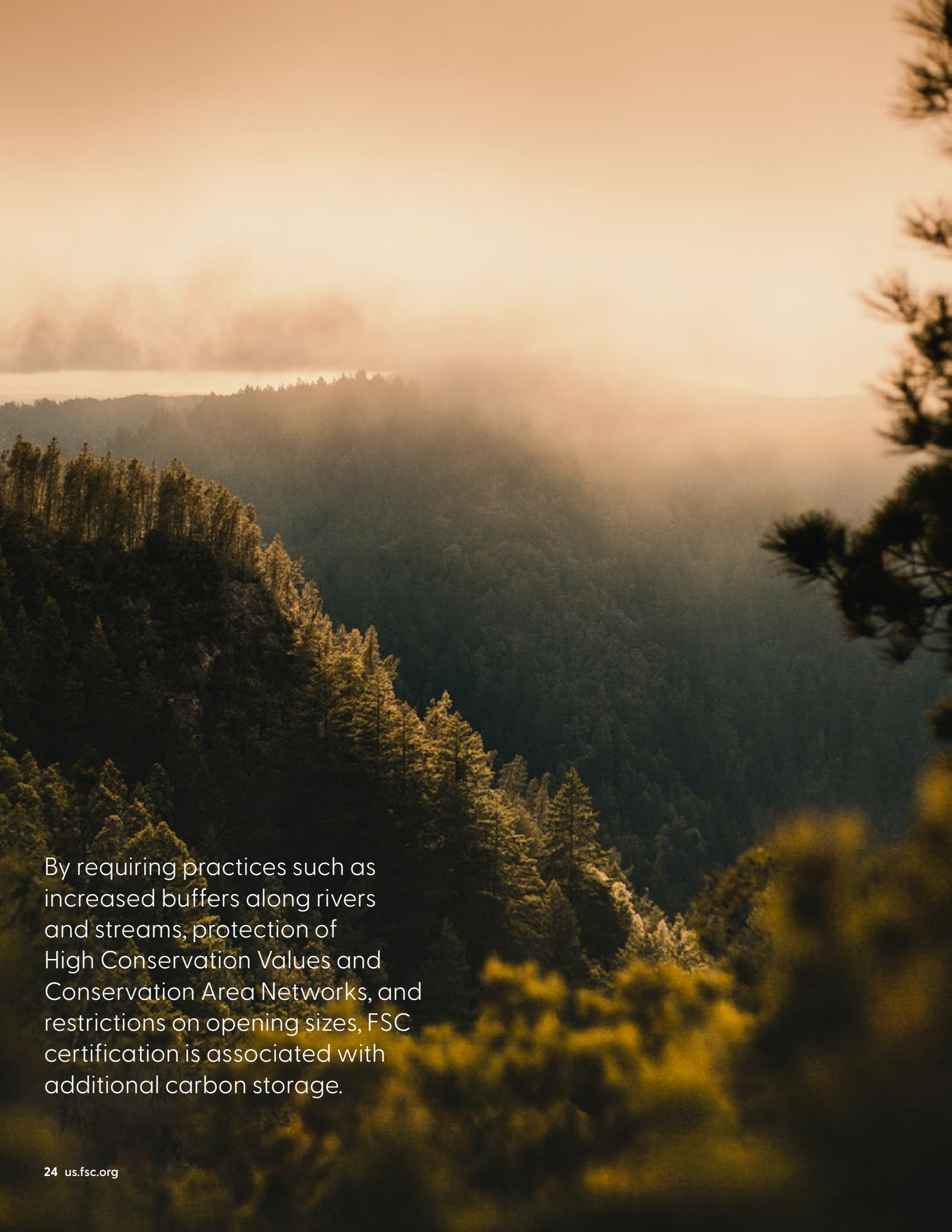
While FSC does not require one particular style of management, in the narrow context of this study, we wanted to understand the potential differences with respect to carbon storage. As a result, the northern California study modeled the additional carbon that would be stored in an FSC-certified forest using selective, uneven-aged management practices, compared to a forest managed in compliance with California's Forest Practice Rules relying on even-aged management.

The model found that using FSC practices and switching to uneven-aged forest management could store an additional 146.00 Tonnes CO2e per acre (360.62 Tonnes CO2e per hectare), over the 20-year planning period.

The study identified two practices that delivered significant additional carbon storage: High Conservation Value areas and uneven-aged timber harvesting practices.

While future versions of the FSC US National Forest Stewardship Standard will require a 10% Conservation Areas Network, this is not currently required in the US standard. Instead, FSC currently requires forest managers to identify and protect High Conservation Values areas. The range of areas conserved under this requirement varies widely from one forest region to another. However, in the redwood region of northern California, we selected 5% as a reasonable average estimate to use in the modeling. In the redwood region, the requirement to protect and maintain High Conservation Values typically results in protection for old-growth trees, as well as areas managed for biodiversity.

8. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator



By requiring practices such as increased buffers along rivers and streams, protection of High Conservation Values and Conservation Area Networks, and restrictions on opening sizes, FSC certification is associated with additional carbon storage.

Key conclusion

FSC-certified forests stored more carbon, while providing a sustainable supply of forest products.

Forests are a precious resource. They are the source of everyday products – lumber, toilet tissue, hand towels, office paper, furniture, packaging, and much more – that can be biodegradable, reusable, and sustainable. Forests are also one of the most important tools needed in the fight against the climate crisis. While forests are a key solution, they can also contribute to climate change through deforestation, wildfires, and poor management. As this report shows, the forest management practices designed by FSC can help store additional carbon while also protecting forest benefits and supplying products to the market.

This report examined three distinct forest biomes in Canada and the United States. The studies were developed to understand better how FSC certification can support and enhance investments in nature-based solutions to climate change. The results find that management to FSC requirements alone – without additional practices to enhance carbon storage – can yield climate benefits. By requiring practices such as increased buffers along rivers and streams, protection of High Conservation Values and Conservation Area Networks, and restrictions on opening sizes, FSC certification is associated with additional carbon storage.

What do these results mean? They mean consumers don't need to choose between using forest products responsibly and a livable climate. Under FSC practices, the world can have both.

Canadian and US consumers can either drive deforestation abroad or help create incentives for responsibly managed forests at home. As companies and governments work to quantify Scope 3 carbon emissions, these three studies show that FSC warrants closer investigation. And as voluntary and compliance carbon markets move towards higher levels of quality and integrity, FSC offers a trusted platform on which to build carbon projects.

These studies – along with independent studies by Ecotrust and Ontario Nature – found that FSC-certified management is associated with additional carbon storage. Given the broad and growing interest in forest carbon accounting, there is a need for new tools to support reliable and high-integrity claims that markets can use about the benefits of FSC-certified management and FSC-certified products in the marketplace.

Responsible forest management is an important part of the climate action puzzle. This report moves the conversation one step forward by suggesting that FSC-certified management has a role to play. While additional research is needed before companies and governments can incorporate FSC into carbon accounting practices, there is now a strong basis to support further exploration.

And in the interim, there is a strong rationale for applying the precautionary principle – relying on FSC as a natural climate solution as the evidence base and tools continue to develop.

Acknowledgments

The Forest Stewardship Council US wishes to thank the project sponsors. Without their financial support, this work would not have been possible. Sponsors include:

- Cascades
- DPR Construction
- Fox Foundation
- Google
- IKEA
- International Paper
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- Kruger
- Lowe's
- Miller Hull Partnership
- Procter & Gamble

We also wish to thank the project advisory body, who provided invaluable input throughout the research and report development. We sincerely appreciate the time and expertise they invested in this work:

- Spencer Plumb, Verra
- Dave Chaffin, Kimberly-Clark
- Andrew Dempsey, REI
- David Diaz, Ecotrust
- Ronnie Drever, Nature United
- Geoff Guest, Amazon
- Christoph Leibing, IKEA
- Ryan Poole, DPR Construction
- Martha Stevenson, WWF-US
- Christopher Reeves, Procter & Gamble

While we incorporated input from the advisory body, the Forest Stewardship Council US is solely responsible for the contents of this report and the research that underpins it.

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