



An aerial view of clear-cut logging in the Emerald Edge. © Chris Crisman

# Emerald Edge Carbon Map

## A Powerful Tool to Optimize Forest Carbon Storage

The Emerald Edge is the world's largest coastal temperate rainforest, spanning Alaska, British Columbia, Washington State and Oregon — more than 40 million hectares of lush forest, rivers, islands and mountain streams. The region is a globally important carbon storehouse, pulling an estimated 300 million metric tons of carbon out of the atmosphere annually — equal to the annual energy usage of 58 million houses,<sup>1</sup> which is more than the population of all of Canada, plus Washington state, Oregon and Alaska combined.

With the right forest management and protection practices, the Emerald Edge can store substantially more carbon, playing a critical role in addressing human-caused climate change. And better forest practices also create more resilient, biodiverse ecosystems and vibrant and healthy human communities. Yet to-date, land managers have lacked precise information about the current carbon stocks, the risks to their loss and the geographic information that might determine the best locations for projects that could protect or store even more carbon.

That is until the launch of the Emerald Edge Carbon Map, an innovative, interactive map that integrates a suite of forest carbon datasets, overlaid with land ownership and jurisdictional information, resulting in a powerful tool to pinpoint the most impactful and

actionable natural climate solutions and opportunities for sequestering carbon across the region.

The Emerald Edge Carbon Map embodies The Nature Conservancy's (TNC) and Nature United's<sup>2</sup> dedication to translating scientific research into practical action and fostering collaboration among communities, industry, governments and Indigenous Peoples.



Machine stacking timber in Craig, Alaska. One of the most powerful aspects of the Emerald Edge Carbon Map lies in its potential to equip private landowners, Indigenous Peoples, public agencies and local communities to make informed and data-driven decisions regarding land use and resource management.

© Chris Crisman

<sup>1</sup>U.S. Environmental Protection Agency. (March 2022). Greenhouse Gas Equivalencies Calculator. Energy and the Environment. [epa.gov/energy/greenhouse-gas-equivalencies-calculator](https://epa.gov/energy/greenhouse-gas-equivalencies-calculator)

<sup>2</sup> Nature United is the Canadian affiliate of The Nature Conservancy.



# The Emerald Edge Carbon Map embodies The Nature Conservancy's (TNC) and Nature United's dedication to translating scientific research into practical action and fostering collaboration among communities, industry, governments and Indigenous Peoples.

## Our values expanded:

- Decision-making power
- Natural resource stewardship capacity
- Diversified and sustainable local economies
- Forest managers using sustainable practices, balancing carbon storage, biodiversity, wildlife habitat and community well-being

The Emerald Edge Carbon Map is built on cutting edge high-resolution carbon mapping technologies and represents a first-of-its-kind mapping that can help assess current forest carbon stocks, risks of carbon loss, the flux of carbon over time, sequestration rates and potential conservation opportunities. The development of such a robust landscape-level tool fills an implementational gap, giving TNC, Nature United and their partners the ability to make data-driven decisions about actionable natural climate solution (NCS) projects that can store additional carbon beyond what would occur in a business-as-usual scenario (i.e. achieving additionality).

**Natural climate solutions (NCS):** *protection, restoration, and improved land management activities that avoid greenhouse gas emissions and/or increase carbon storage across forests, wetlands, grass lands, peatlands, agricultural lands, and marine systems.*

## CONSERVATION BENEFITS OF THE MAP:

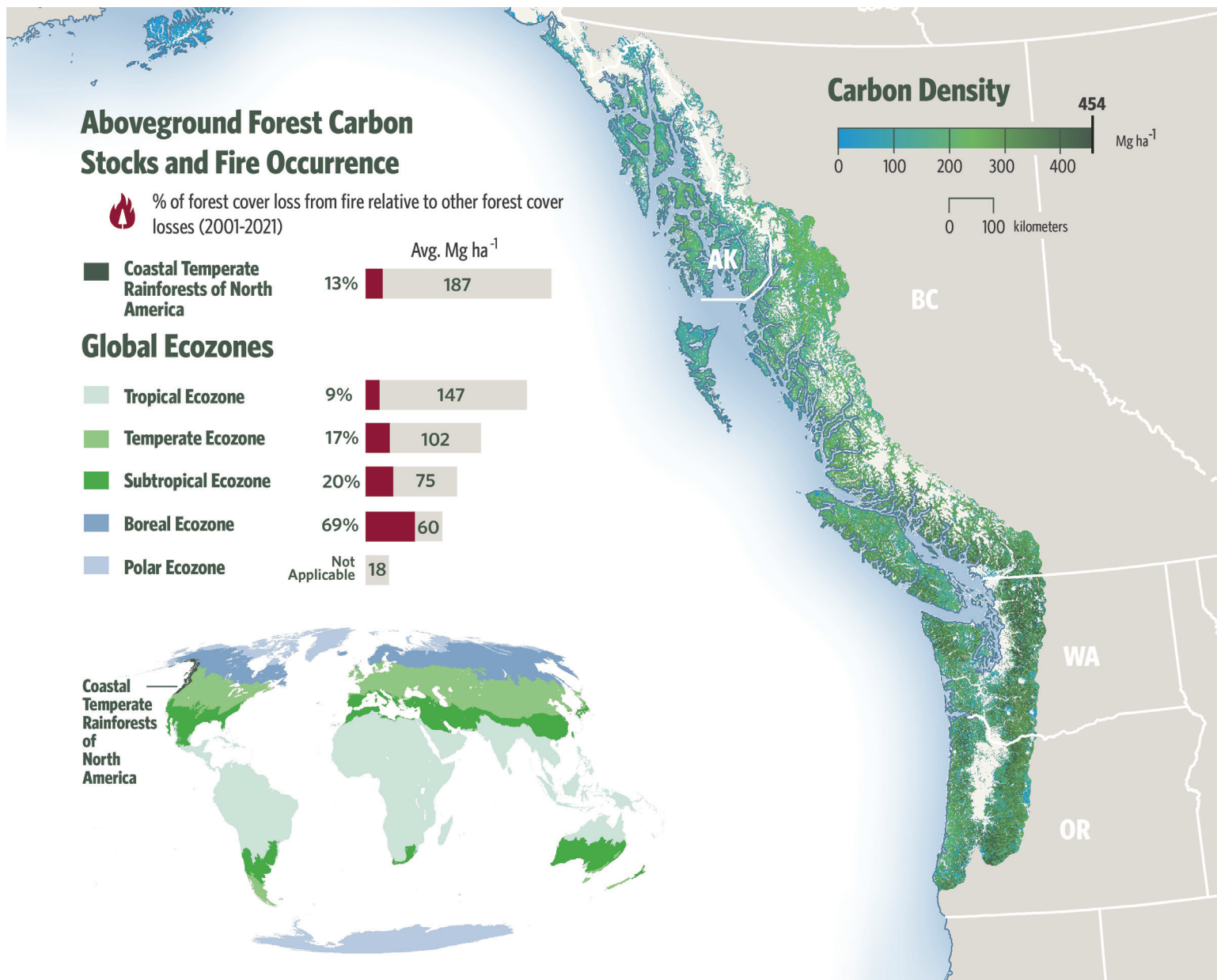
One of the most powerful aspects of the Emerald Edge Carbon Map lies in its potential to equip private landowners, Indigenous Peoples, public agencies and local communities to make informed and data-driven decisions regarding land use and resource management. By integrating data on land management designations, ownership and regulatory constraints, the map equips decision-makers with insights crucial for sustainable land-use planning.

## Informing TNC, Nature United and Their Partners

In two decades of working in the Emerald Edge, TNC and Nature United have seen the transformative impact of deep, trust-based partnerships between Indigenous Peoples and local communities and conservation groups, producing lasting benefits for both people and the planet. Building on these relationships and with a grant from the Bezos Earth Fund, the Emerald Edge program has developed a natural climate solutions (NCS) database of community-based projects. The Emerald Edge Carbon Map is an important source of data to inform these projects and help determine their carbon and actionable NCS potential—and the map can also help bring forward future project ideas and help identify First Nations, Tribes or landowners with whom TNC and Nature United might prioritize relationship building to explore actionable NCS projects together.



The Watchman Totem Pole guards the Kitasoo/Xai'xais Big House in Klemtu, British Columbia, Canada. © Jason Houston



The global context of the Emerald Edge: carbon dense with low risk of carbon loss to wildfire. The units in this global ecozone comparison figure are in aboveground live biomass (AGB). Carbon stored in the Emerald Edge region's trees and referenced in the Carbon Map are measured in CO<sub>2</sub>e (CO<sub>2</sub> equivalent). © Erica Simek Sloniker

## How Can the Carbon Map Determine Additionality?

How can land managers and project investors be sure that forest conservation projects truly result in more carbon sequestration than would be achieved otherwise? The Emerald Edge Carbon Map utilizes a spatial approach to prevent overestimation of carbon benefits, assigning lands categories (see Table 1 on next page) representing the likely ability for forest management changes. That ability is based on the area's level of already established management restrictions, such as national or provincial parks and legal protections around riparian zones. Areas without these restrictions or with management directives that allow active timber harvest are generally considered potentially available for NCS projects with additionality. This information allows decision-makers to prioritize interventions that offer significant carbon sequestration and storage gains, thus optimizing the impact of conservation efforts. By considering these factors, policies, voluntary or regulatory carbon markets, and incentive programs can be strategically employed to influence forest management choices and encourage conservation actions that genuinely contribute to meeting climate mitigation goals.

THE CARBON MAP’S KEY FINDINGS:

The Emerald Edge Carbon Map integrates a robust suite of datasets capturing land-management designation, ownership and regulatory restrictions overlaid with satellite-derived forest carbon and flux datasets. The Carbon Map compares forest carbon conservation across different geographical designations, such as countries, states/provinces, land ownership types, and land-management designations. The primary focus of TNC and Nature United research within the carbon map is on identifying areas where action can be taken for effective natural climate solutions. The term “NCS Action Category 1” (NCS 1) is used to characterize these areas (see Table 1).

TABLE 1

NCS ACTION	DESCRIPTION	DEFINITION	EXAMPLES CATEGORY
1	Available for action	Development areas	Private industrial forests, timber tenures, National Forest adaptive management areas
2	Not currently available	Administratively protected	Habitat protections, riparian and wetland buffers, existing forest carbon projects
3	Not available	Protected areas	National parks, provincial parks, wilderness areas

Using the map, TNC and Nature United determined the Emerald Edge’s temperate rainforests encompass approximately 13 million hectares of forests that hold the potential for NCS action (NCS Action Category 1). These forests currently hold a total aboveground carbon of about 4,900 (±640) megatons CO<sub>2</sub>e.<sup>3</sup> The average carbon density of these forests across the Emerald Edge is 370 metric tons CO<sub>2</sub>e per hectare. Analysis indicates that these forests acted as a net carbon sink, absorbing 130 megatons (Mt) CO<sub>2</sub>e per year between 2001 and 2021, balancing the 91 Mt CO<sub>2</sub>e per year lost primarily due to timber harvest. The net carbon sink of the Emerald Edge’s forests is on average 36 Mt CO<sub>2</sub>e a year.<sup>4</sup>

By providing a high-resolution and spatial representation of carbon conservation opportunities, the map enables users to identify, quantify and prioritize areas with substantial carbon additionality potential. **In a new article<sup>5</sup> published in the journal Communications Earth & Environment, the authors show that a conservative 10% increase in improved forest management and conservation within the coastal temperate rainforests could contribute 9.1 Mt CO<sub>2</sub>e annually. This corresponds to approximately 5.2% of the 2030 land-based climate commitments made by the United States and Canada combined.** With commitments and policies on decarbonization already under way in both countries that would achieve much of their target goals, 5.2% represents a significant amount to help complete their plans for emissions reductions.

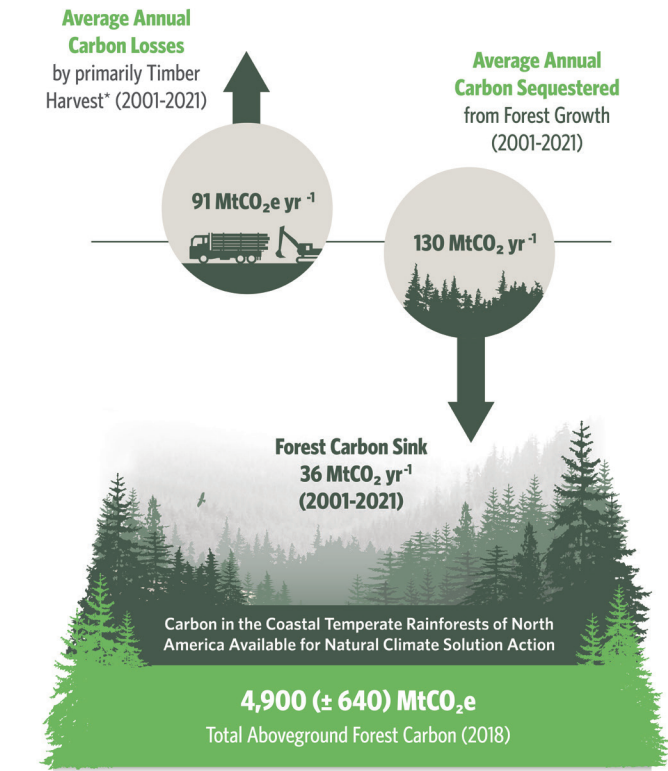
THE FUTURE OF THE CARBON MAP:

The Nature Conservancy and Nature United are committed to iteration and updates of the carbon map as new annual carbon data become available or as land-use and jurisdictional designations change. They are exploring methods and data sources to integrate co-benefits (such as biodiversity) in future versions of the map and are also committed on an ongoing basis to seeking user, stakeholder and Indigenous Peoples and local community feedback and addressing any potential concerns.

TNC, Nature United and their partners seek to develop holistic carbon sequestration strategies that are in line with community well-being. The Emerald Edge Carbon Map strives to have impact beyond the global benefit of emission reductions by also helping landowners and local communities in their own climate resilience.

To explore the carbon map, please visit:  
[maps.tnc.org/emerald-edge-carbon-map](https://maps.tnc.org/emerald-edge-carbon-map)

To provide feedback, please contact:  
**Ronnie Drever**, [cdrever@tnc.org](mailto:cdrever@tnc.org)



The forest carbon balance of the Emerald Edge available for Natural Climate Solution (NCS) action. © Erica Simek Sloniker / TNC

<sup>3</sup> CO<sub>2</sub>e is a metric measure used to compare the emissions from various greenhouse gases—by converting amounts of these gases to the equivalent amount of carbon dioxide with the same global warming potential.

<sup>4</sup> These results have been converted to two significant figures and therefore do not sum exactly.

<sup>5</sup> Shanley, C.S., Graves, R.A., Drever, C.R. et al. Mapping forest-based natural climate solutions. Commun Earth Environ 5, 502 (2024).