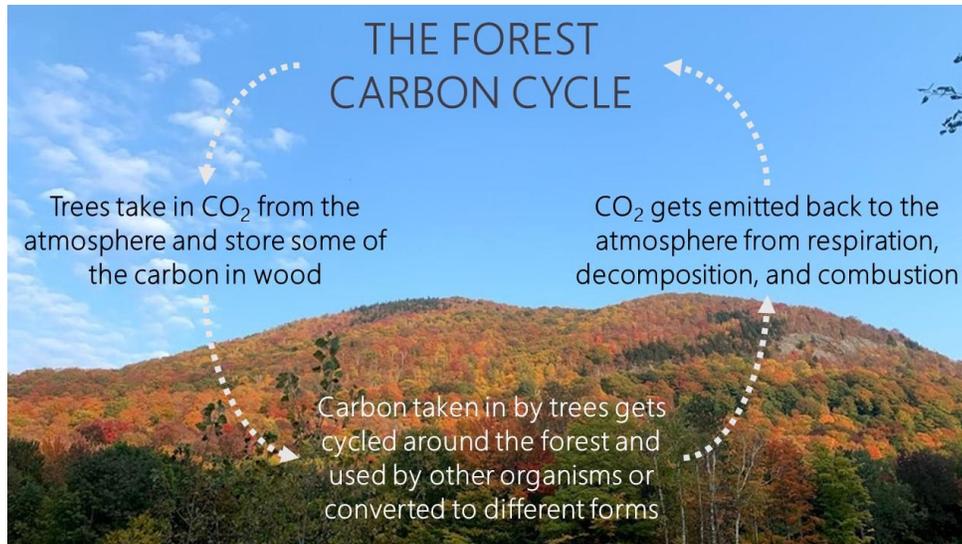


Trees, Carbon, and Climate Change

Trees are carbon sequestration and storage machines

Through photosynthesis, living trees take carbon dioxide (CO₂) from the air to grow and maintain their trunks, branches, leaves, and roots. Conversely, dead trees and leaves on the forest floor emit carbon back into the air as they decay. Some of this released carbon is used by insects, fungi, trees, and other organisms for energy and growth. Even trees that are burned in a forest fire or felled for use as firewood release carbon into the air, feeding into the carbon cycle.



Older forests store more carbon than younger forests, but they sequester it at a slower rate. This means that age diversity within a forest and across the landscape is the best way to maximize both carbon storage and sequestration. Plus diversity is a good strategy for climate resilience, too.

There are many houses in Vermont built with wood that contains carbon that was sequestered by trees hundreds of years ago

Harvesting trees removes carbon from the forest, but other trees will quickly occupy the newly created space and sequester carbon as they grow, sometimes at an accelerated rate. Harvested wood that is used for long-lived products like furniture, flooring, and building materials, stores the carbon as long as it is in use. Plus, use of wood in construction or heating instead of concrete, steel, or fossil fuels reduces carbon emissions while supporting our local forest economy and helping to keep forests as forests.

Terminology

Carbon sequestration

The rate at which carbon from the air is taken in by trees and stored in wood and soil.

Think of this as the amount of money you deposit into your bank account each month.

Carbon emissions

The rate at which carbon is released to the atmosphere. This occurs when wood decays or burns.

Think of this as the amount of money you withdraw from your bank account each month.

Carbon storage

The total amount of carbon contained in a tree or a forest.

Think of this as the amount of money in your bank account. If sequestration (deposits) is larger than emissions (withdrawals), your bank account increases in size.

Trees, Carbon, and Climate Change

While forests can help us reduce CO₂ in the air, they are only one part of the solution to addressing climate change

On average, an acre of Vermont's forest stores about 300-400 metric tons (Mt) of CO₂ and sequesters an additional metric ton each year². The diagram below shows how the average annual sequestration rate of Vermont's forests compares to emissions from an average car and average Vermonter.



About 12 acres of forest will remove the same amount of CO₂ that an average Vermonter emits in a year.

Trees provide critical benefits in a changing climate

In the summer, trees provide shade and help to lessen temperature extremes. In the winter, trees act as a windbreak from cold winds and reduce home heating demands. Their roots hold soil and prevent erosion. By sucking up water from the soil, trees help cycle and filter water. Their leaves intercept air pollution that can be harmful to our health. And of course, trees also provide food and shelter to many insects, fungi birds, people, and wildlife.



Have you noticed that it is always cooler under a tree on a hot summer day?

Trees can help us, but climate change poses a threat to forest health and the ability to sequester and store carbon

The burning of fossil fuels, which releases carbon that has been stored deep in the Earth for thousands of years, is causing changes to the climate. From more extreme rainfall events to warmer winters with less snow, we are already seeing climate change in Vermont. Trees have adapted to tolerate a wide range environmental conditions. However, forests that face a lot of stressors or have trees in poor health may not be able to withstand future changes. It is important that we keep forests healthy, reduce stressors and other vulnerabilities, and understand how to help forests adapt to climate change.

Looking for more information on Vermont's Forests and Climate Change? Check out Vermont Department of Forests, Parks, and Recreation's Forests and Climate Change page: fpr.vermont.gov/forest/climate-change

¹ Image concept: The Forest Carbon Working Group

² Refer to the *Vermont Forest Carbon Inventory* (Kosiba, 2021) for more specific values and analysis.