

# Climate Change, Forest Carbon & Carbon Markets



Forests are one natural solution to climate change because they remove carbon dioxide (CO<sub>2</sub>) - a potent greenhouse gas (GHG) - from the atmosphere and store the carbon in trees, other plants and soil. Increasing the amount of carbon stored in forests and harvested wood products reduces atmospheric CO<sub>2</sub> from human-caused carbon emissions<sup>1</sup>, mitigating the effects of climate change while sustaining the other critical ecological, social, and economic services that forests provide.

## Trees sequester and store carbon

Through photosynthesis, living trees take CO<sub>2</sub> from the air and store it to grow and maintain their trunks, branches, leaves, and roots. Conversely, standing dead trees and dead downed wood and forest floor litter slowly emit carbon as they decay. Some of this released carbon is used by insects, fungi, trees, and other organisms for energy and growth. Trees that are burned in a forest fire or felled for use as firewood release carbon into the air, and also feed into the carbon cycle.



Figure concept from Forest Carbon working Group

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<sup>2</sup> and sequestration<sup>3</sup>. Plus diversity is a good strategy for climate resilience and forest health, too.

**Forests of the Northeast store the equivalent of ~54 years of the region's current annual GHG emissions**

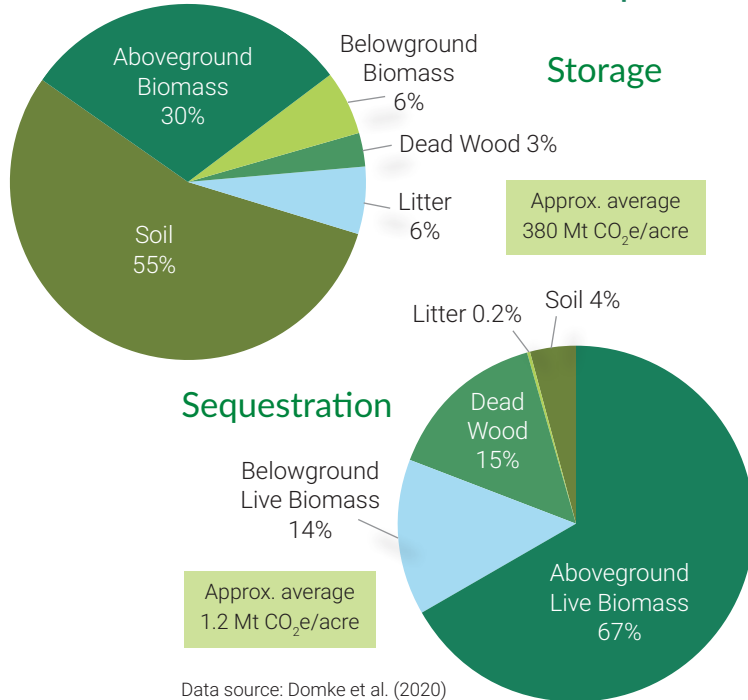
1. Carbon emissions - When carbon is released into the atmosphere. This occurs when fossil fuels or wood burns or decays.
2. Carbon storage - is the total amount of carbon contained in a forest both aboveground (mostly trees) and below ground (mostly soil) at a given time.
3. Carbon sequestration - is the process of removing carbon from the atmosphere through photosynthesis and storing it in another form that cannot immediately be released - wood. It is the rate of carbon uptake from the atmosphere.

## Forest management and forest carbon

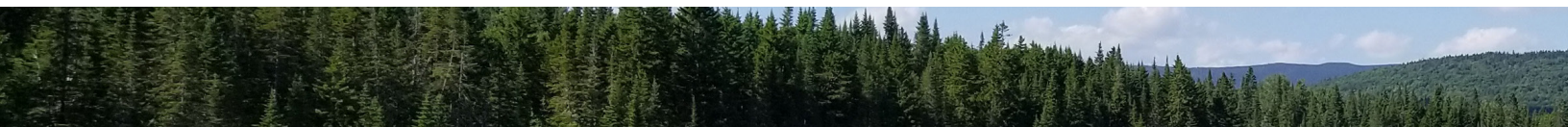
Harvesting trees can initially decrease the amount of carbon stored in the system, but it creates opportunities for greater carbon sequestration and long-term carbon storage. Harvesting trees removes carbon from the forest, but in the Northeast where natural regeneration is prevalent (and if natural regeneration is successful), 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 for the duration that it remains as wood. Plus, use of wood in construction instead of concrete, steel, or fossil fuels reduces global carbon emissions while supporting our local forest economy and helping to keep forests as forests. Wood that is landfilled releases its carbon at a very slow rate. This means that the amount of carbon stored in wood products in use and in landfills accumulates over time, and contributes to the overall importance of the forests in keeping CO<sub>2</sub> out of the atmosphere.

Landowners may wish to include maintaining or increasing forest carbon as a forest management goal, which can be combined with other goals like growing timber, improving forest health, and/or supporting wildlife. To achieve carbon goals, a landowner may require financial incentives. There are carbon offset markets, where carbon sequestered and stored by the forest are monetized and sold to another entity. There are also payments for practices, like in the Natural Resource Conservation Service's Environmental Quality Incentives Program (EQIP) program.

## Forest carbon pools



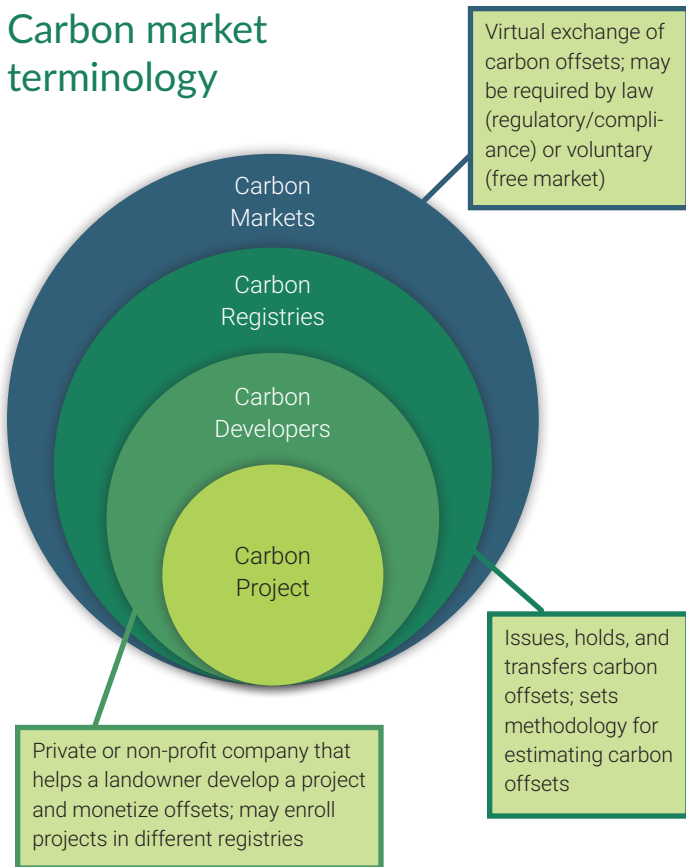
Data source: Domke et al. (2020)



## Forest carbon markets

Forest carbon markets allow for businesses, municipalities, and other organizations to purchase carbon credits to offset their CO<sub>2</sub> and other GHG emissions. A forest carbon credit is created when landowners undertake specific projects to increase their forests' ability to absorb CO<sub>2</sub> and store carbon. The projects are then verified and monetized in the marketplace for forest carbon. Reducing emissions of CO<sub>2</sub> and other GHG's can be difficult and expensive, so forest carbon offset markets provide these entities with an alternative to reduce their impacts on climate change. In this way, the increased CO<sub>2</sub> intake by forests is used to offset CO<sub>2</sub> emissions by another entity. Ideally, both emission reduction and offset purchase should occur.

## Carbon market terminology



## Carbon offset programs for small landowners

Forest carbon market opportunities for landowners that own smaller acreages are becoming available and several entities offer programs for smaller landowners.

For an up-to-date list of carbon market programs and their requirements please go to:

[www.northeastforestcarbon.org/forest-carbon-financial-markets](http://www.northeastforestcarbon.org/forest-carbon-financial-markets)

## How can landowners participate in a forest carbon market?

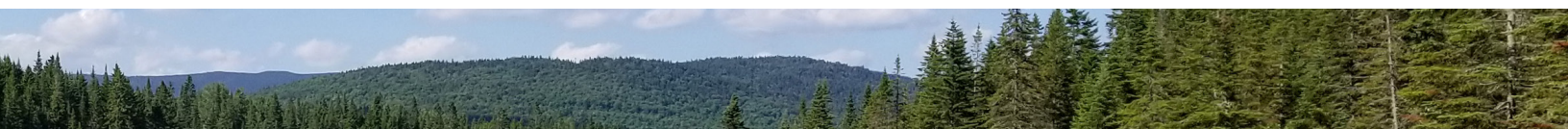
Landowners can sell their carbon credits directly through a forest carbon market, but undertaking a carbon offset project is expensive, so many landowners participate through forest carbon programs where third-party companies assist with the up-front and ongoing costs of the project in exchange for a share of the revenues. Lengthy contracts are involved in these forest carbon projects for most programs.

## Three main types of carbon offset projects can be used to participate in carbon markets:

- 1 Avoided conversion:** protecting the forest from future development to keep the carbon in the forest's trees and soils. These projects usually include the establishment of a conservation easement or the transfer of private land to public ownership. In order to qualify, easements cannot be too restrictive on the timber and its management.
- 2 Afforestation, reforestation, or revegetation:** growing new trees to remove CO<sub>2</sub> from the air and store carbon. For these projects, trees are planted and/or conditions are created that will encourage the growth of trees in an area previously absent of trees.
- 3 Improved forest management:** using practices that increase the amount of CO<sub>2</sub> removed from the air and carbon stored in an existing forest. Strategies to do this might include setting aside a reserve area, harvesting less frequently to grow larger trees, thinning to allow remaining trees more room to grow, and/or increasing the diversity of species and age classes (i.e., forest structure). This is the most common forest carbon offset type.

## To be considered a valid carbon offset project:

- The amount of CO<sub>2</sub> absorbed by a forest, and/or the amount of carbon it stores, must be higher than it would have been had the project never taken place;
- There cannot be a loss of forest carbon in another area (e.g., a landowner reduces the number of trees cut in one forest, but more trees are cut elsewhere to compensate (called leakage);
- It must have a long-term time commitment to ensure the additional CO<sub>2</sub> absorption isn't short-lived; and
- It must be periodically checked to verify that the impact of the project continues to meet the carbon credits awarded.



Securing Northeast Forest Carbon Program (SNFCP) is a cooperative program of the State Foresters from Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont funded through a USDA Forest Service grant. The goal of SNFCP is to educate forest landowners, foresters, and managers in the 7-state region about the importance of forest carbon, how it can be included as a management goal, and ways that carbon management can be financed.

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For more information go to  
[www.northeastforestcarbon.org](http://www.northeastforestcarbon.org)  
or scan the code to take you there.



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Funded through a grant from the USDA Forest Service.  
The North East State Foresters Association is an equal opportunity provider.

ADAPTED FROM publications produced by the VT Dept. of Forests,  
Parks & Recreation and NY Dept. of Environmental Conservation

