

NH Current Use Board

## Forest Carbon Markets 101 1/23/24

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**Securing Northeast Forest Carbon Program**

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## Securing Northeast Forest Carbon Program

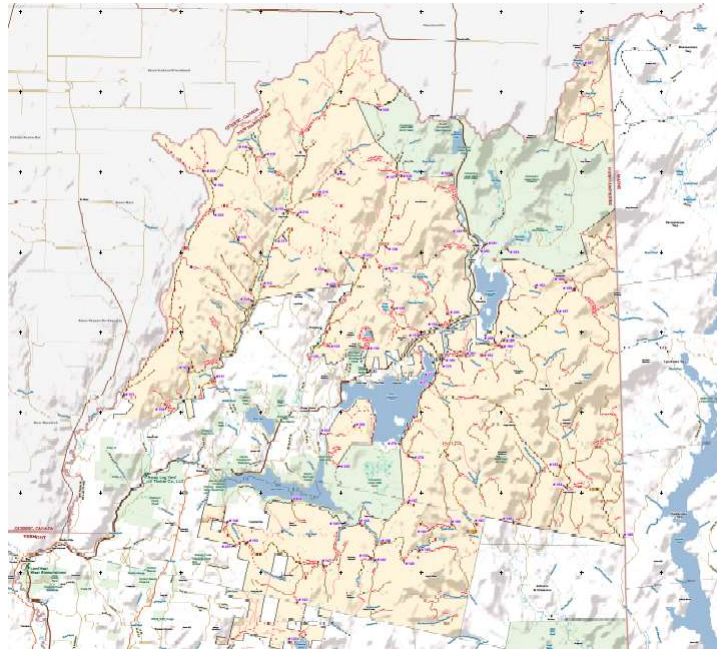
Securing Northeast Forest Carbon Program is a project of the North East State Foresters Association funded through a grant from the USDA Forest Service

### www.northeastforestcarbon.org

#### About this project

The Securing Northeast Forest Carbon Program is a cooperative effort among the State forestry offices in Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont to secure as much of the private forest carbon in the northeast region as possible in a 3-year period (2021-2024). The focus is on working forestland carbon. Each State Forester's office has a forest carbon lead staffer and others will be trained as well in how to encourage private forest owners in the region to secure their forest carbon through carbon sales in the voluntary and compliance

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**In 2001, the Trust for Public Land optioned the International Paper owned CT Lakes Headwaters property – 171,500 acres In 2003:**

- Sold 146,400 acres (about 229 sq miles) to a private landowner, The Connecticut Lakes Realty Trust (Lyme Timber), to be managed as a working forest with land use restrictions;
- Designated and conveyed to the State of New Hampshire through the Dept. of Natural and Cultural Resources, 269 miles of the 424+ mile network of gravel roads on the property to be managed for public access, recreation and forest management activities;
- Conveyed 25,000 acres to the State of New Hampshire through the Fish and Game Dept. to protect highly sensitive natural areas;
- Conveyed 100 acres to the State of New Hampshire through the Dept. of Natural and Cultural Resources, through fee simple sale to accommodate future expansion of the Deer Mountain Campground which abuts the working forestland;
- Sold a conservation easement on the working forest 146,400 acres through a \$11,500,000 grant from the federal Forest Legacy Program, \$2 million from LCHIP and \$10,000,000 through the State Capital Budget.

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# A little background on forest carbon...



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$CO_2 + \text{water} + \text{sunlight} = \text{sugar} + \text{water} + O_2$

Glucose  
C6H12O6

Source: healthjade.com

Trees can help mitigate climate change by sequestering  $CO_2$  from the atmosphere and storing the carbon in wood and soil

THE FOREST CARBON CYCLE

Trees take in  $CO_2$  from the atmosphere and store some of the carbon in wood

$CO_2$  gets emitted back to the atmosphere from respiration, decomposition, and combustion

Carbon taken in by trees gets cycled around the forest and used by other organisms or converted to different forms

**HALF**  
of the dry weight of wood is carbon that was removed from the atmosphere by the growing tree.

Monthly mean  $CO_2$  concentration  
 Mauna Loa 1958 - 2020

Seasonal variation

$CO_2$  fraction in dry air ( $\mu\text{mol/mol}$ )

Departure from yearly average

Year

Data: Dr. Peter Tans, NOAA/ES&R, [www.esr.noaa.gov/gmd/ccgg/trends/](http://www.esr.noaa.gov/gmd/ccgg/trends/) and Dr. Ralph Keeling, Program Manager, <http://scrippsco2.ucsd.edu/>, Accessed: 2020-10-21

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# Quick Carbon Terminology Primer

<p><b>Carbon storage</b> total amount of carbon in an entity (tree, acre of forest, cord of wood) Synonyms: stock, density</p>	<p><b>Carbon sequestration</b> the process of taking CO<sub>2</sub> from the atmosphere and storing it Synonyms: absorbed, took in, storage rate, change in storage</p>	<p><b>Carbon emissions</b> the opposite of sequestration (CO<sub>2</sub> release back to atmosphere) Cellular respiration (metabolism, CO<sub>2</sub>) Decomposition (CO<sub>2</sub>, CH<sub>4</sub>) Combustion (CO<sub>2</sub>, CH<sub>4</sub>)</p>	<p><b>Carbon sequestration + carbon emissions = carbon flux</b> the change in carbon storage Negative flux = net sequestration = <b>carbon sink</b> Positive flux = net emissions = <b>carbon source</b></p>
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For easier comparisons, we convert carbon and other greenhouse gases to the same units = **carbon dioxide equivalent (CO<sub>2</sub>e)**

**Helpful conversions**  
1 metric ton (Mt) = 1 Mg = 1000 Kg = 2,205 lbs  
1 Mt C = 3.67 Mt carbon dioxide equivalent (CO<sub>2</sub>e)  
1 Mt C per ha = 1.49 Mt CO<sub>2</sub> per acre  
Wood is ~50% carbon by dry weight



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

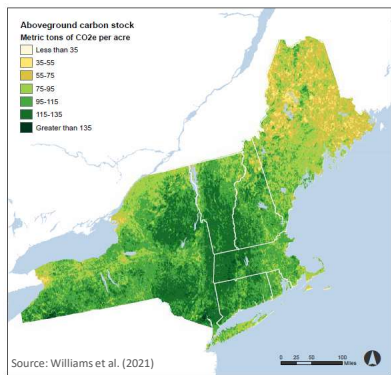
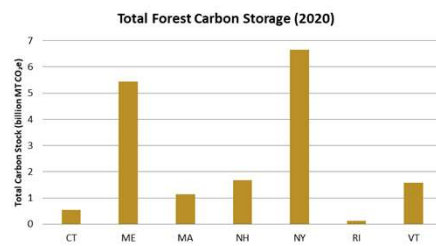
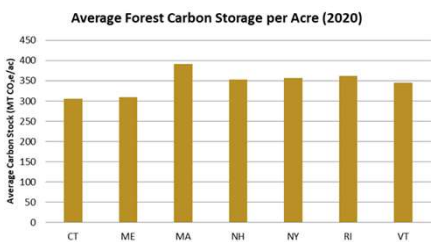


FIGURE 3. Above ground carbon stocks, expressed in metric tons of CO<sub>2</sub>e per acre, smoothed from the original dataset with focal statistics that average over a 3 km x 3 km block. The highest value in the original, 30 m resolution map is 200 metric tons of CO<sub>2</sub>e per acre.  
Source: Williams et al. (2021)



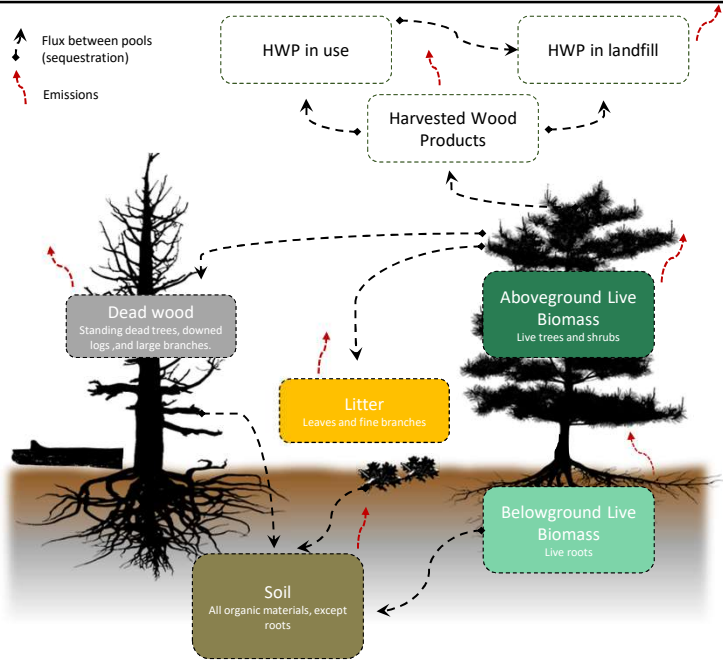
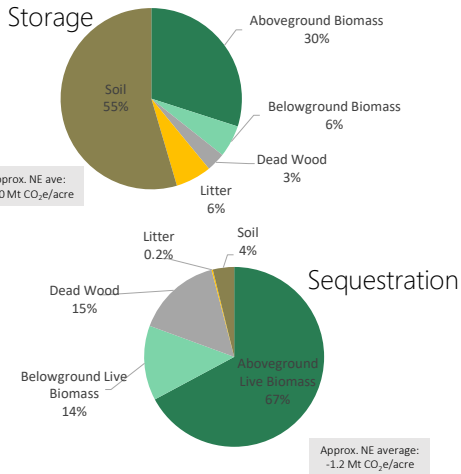
As of 2020, the NE forests stored 17.2 billion Mt CO<sub>2</sub>e



Or an average of 339.4 Mt CO<sub>2</sub>e/acre

Carbon stock and flux data are for 2018, includes all forest carbon pools. Emissions data gathered per state and year varies; estimates are approximate. Carbon data source: Domke et al. 2020

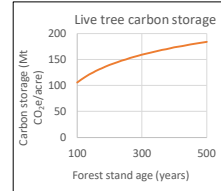
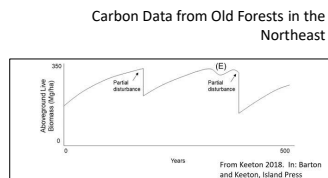
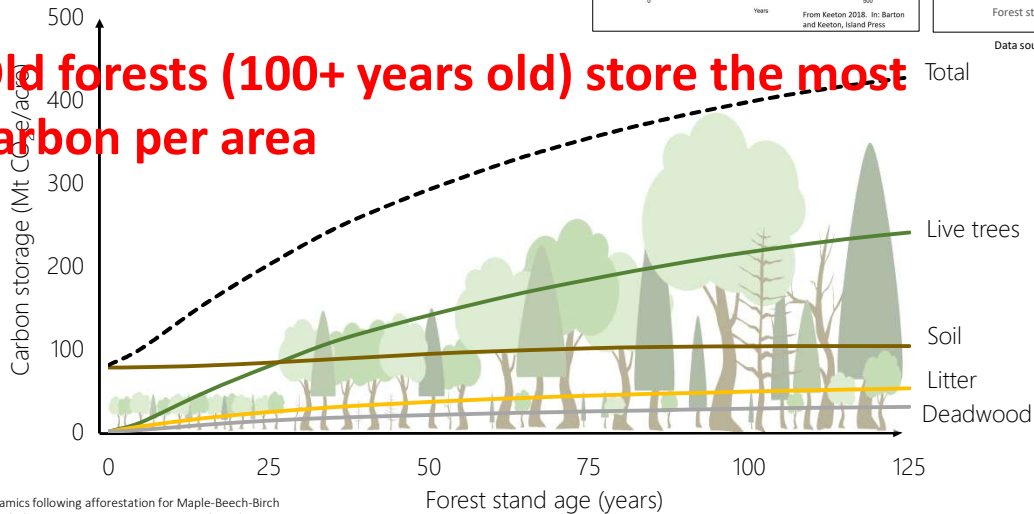
# Forest carbon pools



Data source: Domke et al. (2020)

Carbon storage varies over forest stand development

**Old forests (100+ years old) store the most carbon per area**

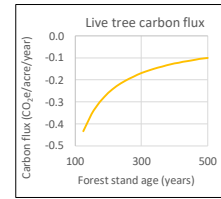
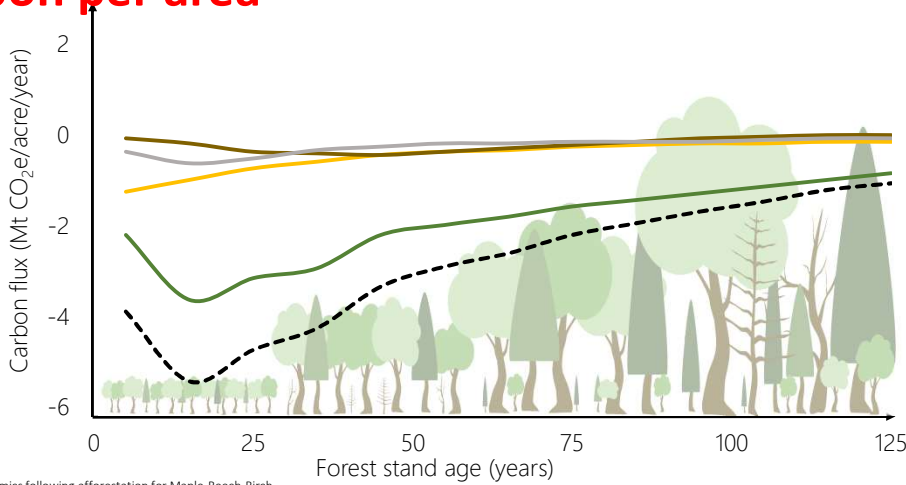


Data source: Keeton et al. 2011

Note: carbon dynamics following afforestation for Maple-Beech-Birch forest, does not include management. Data source: Smith et al. 2006.

Carbon sequestration varies over forest stand development

**Forests 25-70 years old sequester the most carbon per area**



Data source: Keeton et al. 2011

Note: carbon dynamics following afforestation for Maple-Beech-Birch forest, does not include management. Data source: Smith et al. 2006.

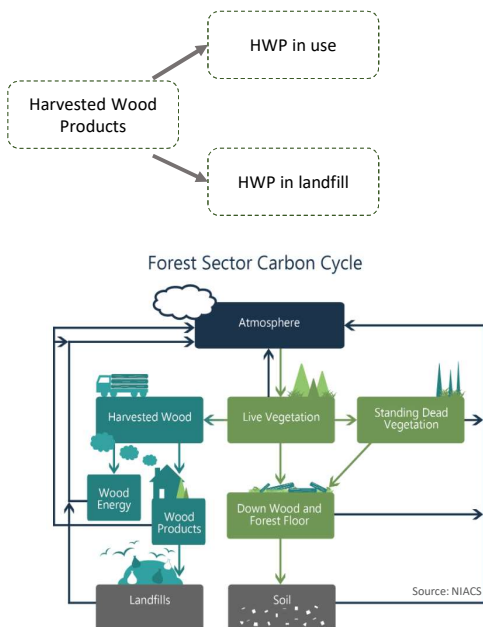
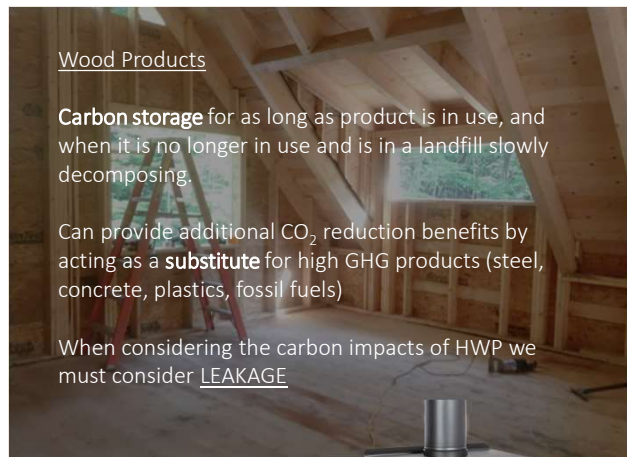


Figure: The forest sector carbon cycle includes forest carbon pools and carbon transfer between pools. Modified from Heath et al. (2) and United States Department of Agriculture (3).



Wood Products

**Carbon storage** for as long as product is in use, and when it is no longer in use and is in a landfill slowly decomposing.

Can provide additional CO<sub>2</sub> reduction benefits by acting as a **substitute** for high GHG products (steel, concrete, plastics, fossil fuels)

When considering the carbon impacts of HWP we must consider LEAKAGE



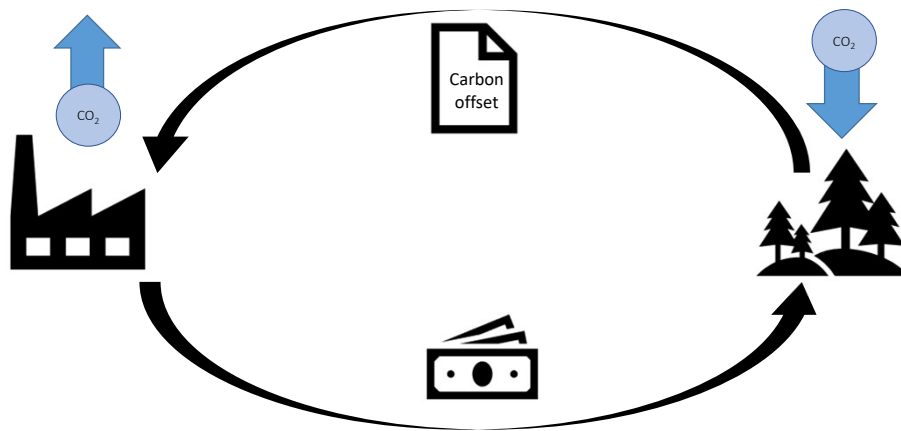
# Forest Carbon Markets Overview

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## What is the purpose of forest carbon offsets?

Allows entities to reduce emissions more quickly than they could otherwise by purchasing offsets where carbon is actively being sequestered or emissions avoided

Helps to finance forest management, restoration, conservation, tree planting, and other activities



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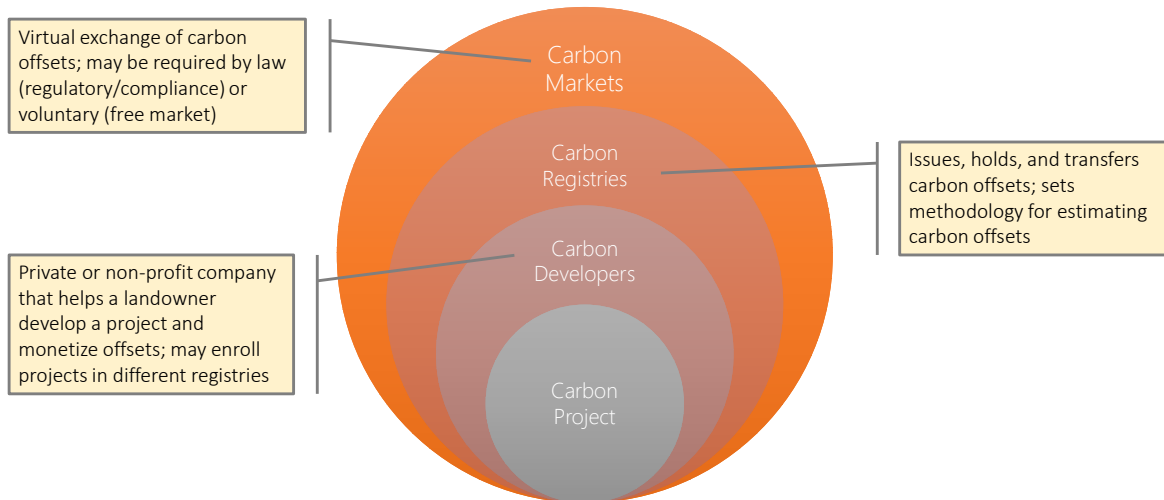
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Currently, there are three categories of actions for forest carbon offsets



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## Carbon market terminology



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## Two Types of Carbon Markets

- Required by law in some states
- Regulated transaction of offsets
- Centralized market, registry, and standard
- Set offset price
- Emitters are required to reduce their emissions but can either buy allowances from other regulated emitters or carbon offsets
- Allowances decline over time for gradual reductions in emissions



100 years +  
commitment



Forest offsets are allowed, but to date, no enrolled forest projects

The Regional Greenhouse Gas Initiative  
an initiative of Eastern States of the US



Carbon markets

40 years +/-  
commitment



- Not required by law
- Not regulated
- No centralized market or registry
- No requirement for the use of a registry or standard
- No set offset price, depends on what buyers will pay
- Open to everyone: individuals, companies
- No requirement for buyers to reduce emissions over time

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CA Air Resources Board compliance carbon offset market – estimated 2022 value = \$3.7 billion

Voluntary carbon offset market – estimated 2022 value = \$2.5 billion

2021 voluntary market – nearly \$2 billion  
2020 voluntary market – \$520 million

## Carbon Registries

- Carbon projects are registered and tracked through carbon registries that monitor offset trading and retirement
- Registries have specific protocols for developing, verifying, and selling carbon offsets that must be adhered to
- Registries are not required in the voluntary market, but help buyers trust the integrity of the offset



Projects must follow detailed methods that have been approved by the registry and open to public comment



Not just forests – there are methods for a range of project types



Registries allow the public to view carbon projects, documentation, and offsets traded

Item		Projects									
Project ID	Project Name	Project Status	Project Type	Project Location	Project Size (tCO2e)	Project Start Date	Project End Date	Project Status	Project Type	Project Location	Project Size (tCO2e)
ACR004	California	Massachusetts	Trade Credits	Massachusetts	Forest Carbon	10k	2015	2020	Verified	Massachusetts	10k
ACR021	HA	Blue Source	Blue Source	Massachusetts	Forest Carbon	10k	2015	2020	Verified	Massachusetts	10k

# Carbon Developers

➤ private or non-profit company that helps a landowner develop a project and sell offsets

Larger forestlands

Smaller forestlands



For larger forestlands, projects may be able to enroll under California ARB market/registry or in voluntary market registries (e.g., ACR)

\*not exhaustive; there may be newer developers or developers for specific types of projects there are not included here



Approved under California's ARB market/registry



Independent market, registry, and developer  
In process of approval with VCS registry



Approved under ACR registry



In process of approval with VCS registry

Urban Forests



For more information and links to these developers, see [www.northeastforestcarbon.org](http://www.northeastforestcarbon.org)

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# Key Requirements for Carbon Offsets

Real

Additional

Verifiable

Permanent

Enforceable

Because a carbon offset

- 1) Is not a physical object that is bought and sold
- 2) Is used to offset actual emissions made elsewhere

Measuring, tracking, and evaluating forest carbon must adhere to strict criteria

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# Two types of leakage

**Activity-shifting leakage:**  
Carbon project results in an increase in harvest on another property owned by the landowner

- In all programs, must enroll or at least declare all other properties owned

**Market leakage:**  
Carbon project results in an increase in harvest on another property or location

- Varies by program, most require % of offsets for leakage deduction based on reduction in harvest



Period	Baseline wood products summed over 20-yr crediting period (tons CO <sub>2</sub> )	Project wood products summed over 20-yr crediting period (tons CO <sub>2</sub> )	Project decrease in wood products relative to baseline (%)	Applicable leakage factor (%)
2017-2037	340,725	22,603	-93%	40%

Example of market leakage deduction for MA Tri-City Carbon Project

- 13,536-acre project in cities of Westfield, Holyoke, and West Springfield

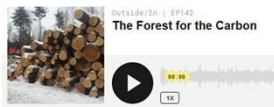
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There is a lot of debate over carbon offsets right now, which likely means that they will continue to evolve...



### A Nonprofit Promised to Preserve Wildlife. Then It Made Millions Claiming It Could Cut Down Trees.

The Massachusetts Audubon Society has managed its land as wildlife habitat for years. Here's how the carbon credits it sold may have fueled climate change.

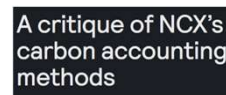


### Systematic over-crediting in California's forest carbon offsets program

Grayson Badgley, Jeremy Freeman, Joseph J. Hamman, Barbara Hays, Anna T. Trugman, William R.L. Andergass, Danny Cullenward

doi: <https://doi.org/10.1101/2021.04.28.441870>

Now published in *Global Change Biology* doi: [10.1111/gcb.15943](https://doi.org/10.1111/gcb.15943)



### The U.S. Is About to Go All in on Paying Farmers and Foresters to Trap Carbon

The problem is, it's unclear if "Carbon Offsets" even work



1. These Trees Are Not What They Seem: [www.bloomberg.com/](https://www.bloomberg.com/)
2. A Nonprofit Promised to Preserve Wildlife. Then It Made Millions Claiming It Could Cut Down Trees: [www.propublica.org/](https://www.propublica.org/)
3. The U.S. Is About to Go All in on Paying Farmers and Foresters to Trap Carbon: [www.rollingstone.com](https://www.rollingstone.com/)
4. Rethinking Forest Carbon Offsets: [www.carvinstitute.org/](https://www.carvinstitute.org/)
5. Systematic Over-crediting in California's Forest Carbon Offsets Program: [www.biorxiv.org/](https://www.biorxiv.org/)
6. A Critique of NCX's Carbon Accounting Methods: [www.carbonplan.org/](https://www.carbonplan.org/)
7. A Framework to Ensure that Voluntary Carbon Markets Will Truly Help Combat Climate Change: [www.brookings.edu/](https://www.brookings.edu/)
8. The Forest for the Carbon: [http://outsideinradio.org/](https://outsideinradio.org/)
9. John Oliver: <https://www.youtube.com/watch?v=6p8rAbFkpW0>

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## Forest Carbon Sale Projects 2005



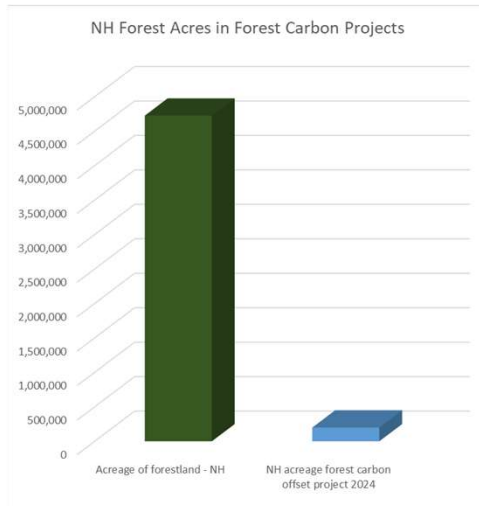
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## Forest Carbon Sale Projects 2020



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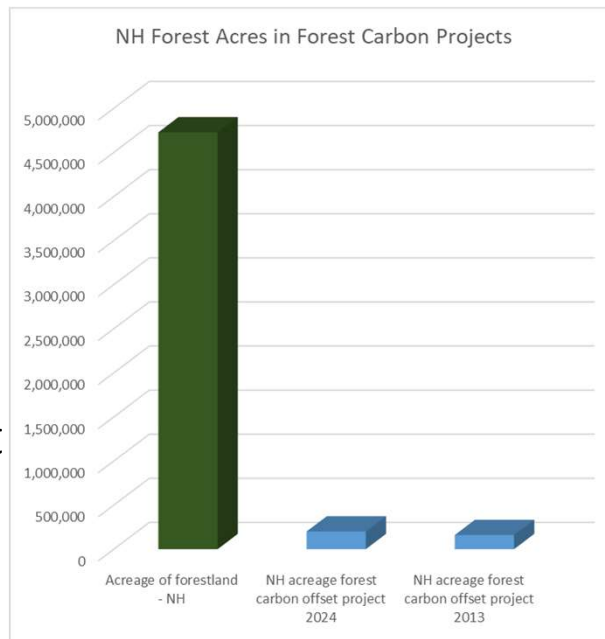
Acreage of forestland in NH under forest carbon offset project contract in 2024 – Approximately 200,000 acres



3.7% of NH forestland

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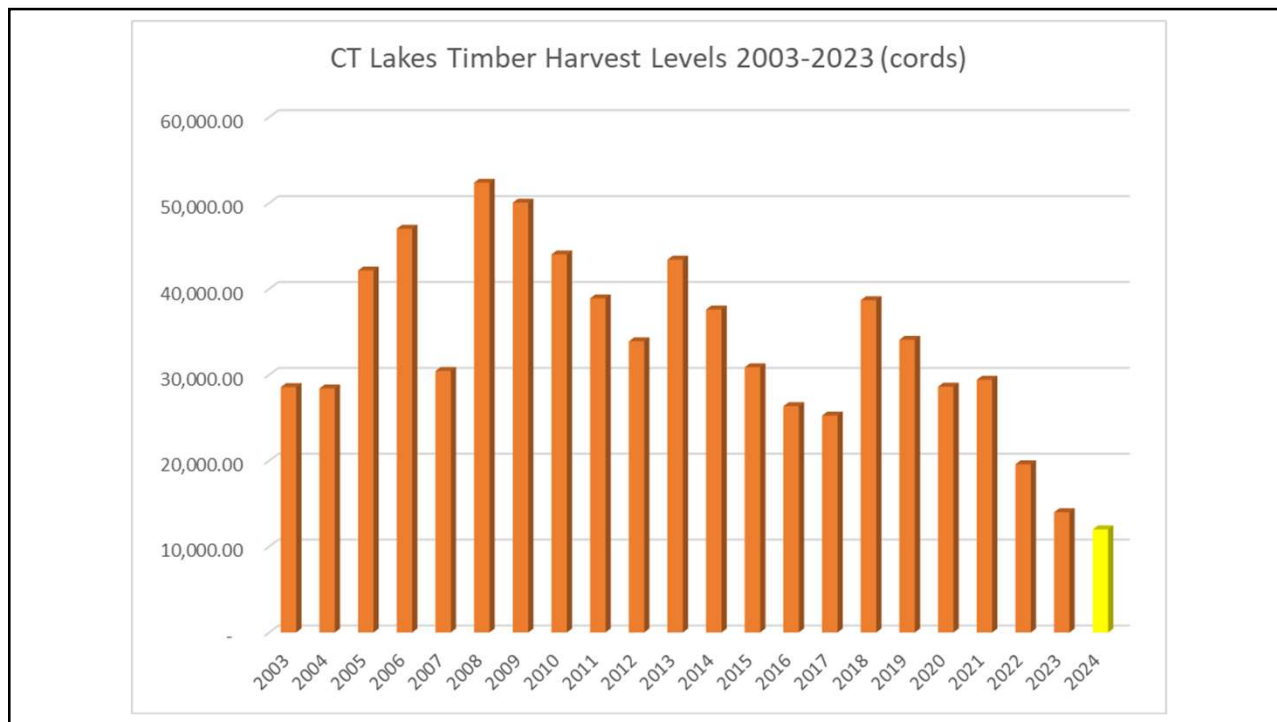
Acreage of forestland in NH under forest carbon offset project contract 2013 - 2024



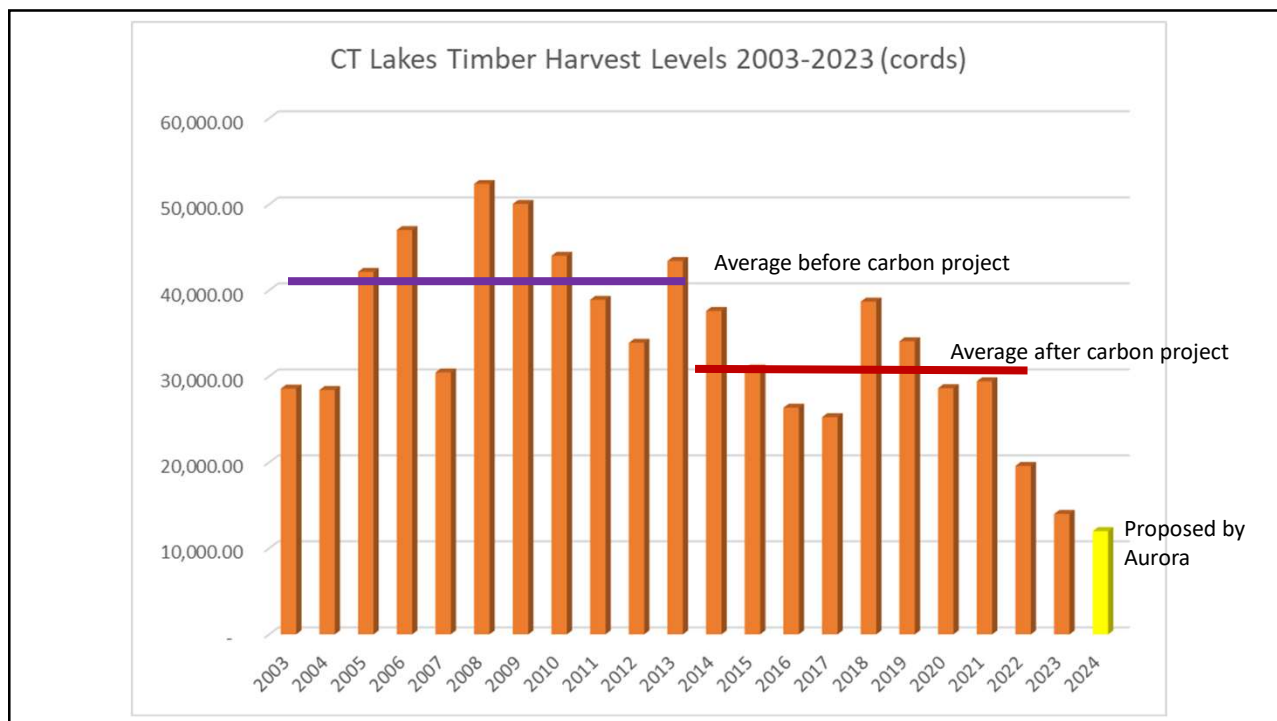
13% GROWTH IN 11 YEARS

1.2% PER YEAR

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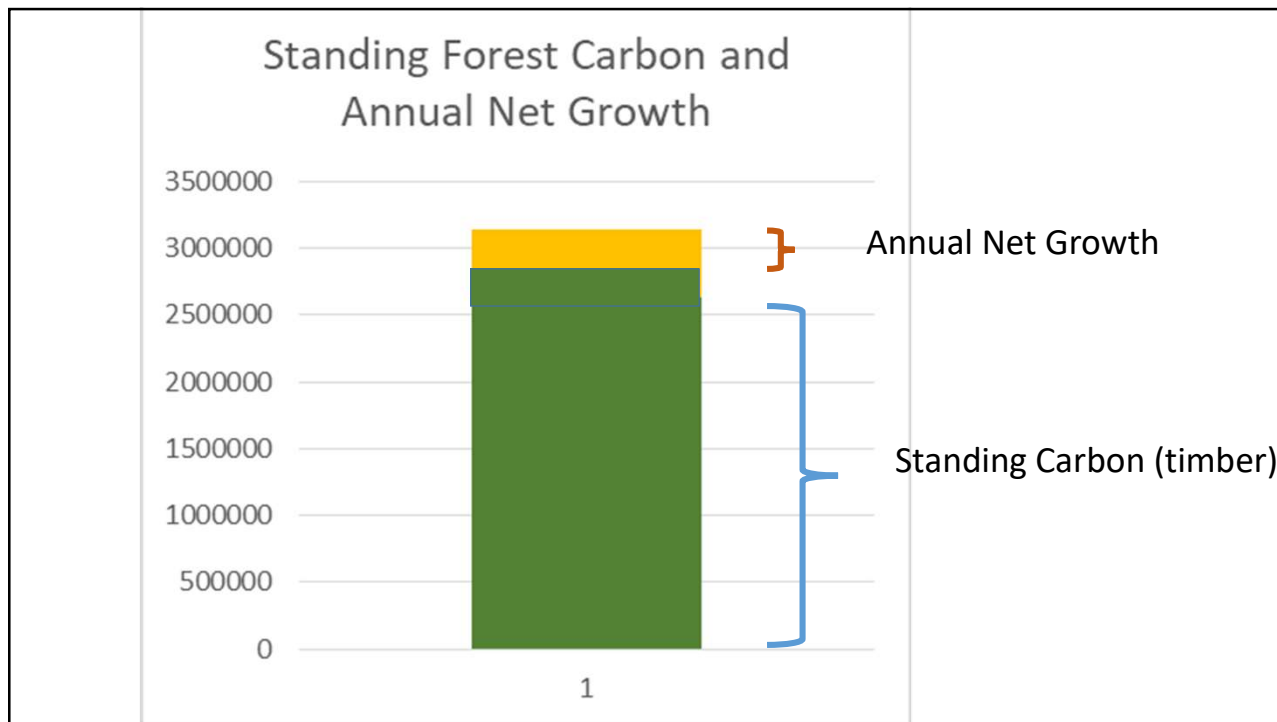


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