

# Forest Carbon



Paul Catanzaro

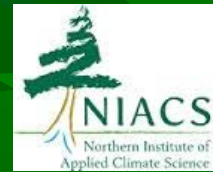
Tony D'Amato

UMassAmherst



# Thank You!

- Thank you to our partners for additional support



- Funding for the printing of this publication was provided by the Renewable Resources Extension Act



# Carbon Terms

- Carbon Storage :

The amount of carbon that is retained in a carbon pool within the forest.

- Carbon Sequestration:

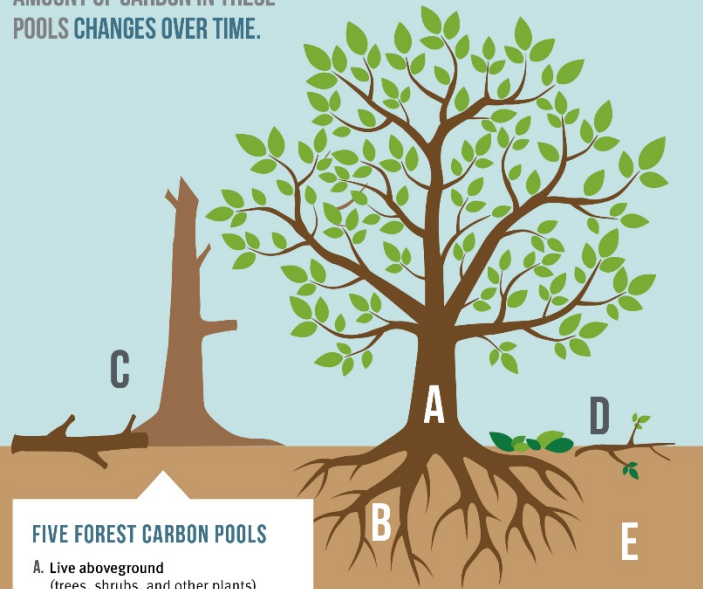
The process of removing carbon from the atmosphere for use in photosynthesis, resulting in the maintenance and growth of plants and trees.



# Carbon Pools

## WHERE IS CARBON STORED IN A FOREST?

A FOREST STORES CARBON IN DIFFERENT POOLS, AND THE AMOUNT OF CARBON IN THESE POOLS CHANGES OVER TIME.



### FIVE FOREST CARBON POOLS

- A. **Live aboveground**  
(trees, shrubs, and other plants)
- B. **Live belowground**  
(roots)
- C. **Deadwood**  
(standing dead trees [snags] and downed logs)
- D. **Litter**  
(leaves, needles, and small branches)
- E. **Soil organic matter**  
(organic material in the soil, such as dead and decayed biomass [e.g., plant material and insects])

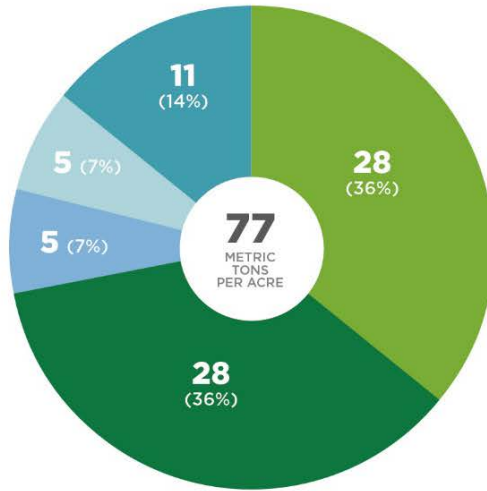
Factors that influence the amount and proportion of carbon in each of these pools:

- the age of the forest
- the species of trees making up the forest
- natural and human disturbances
- soil characteristics (e.g., texture and drainage)
- past agricultural land-use history

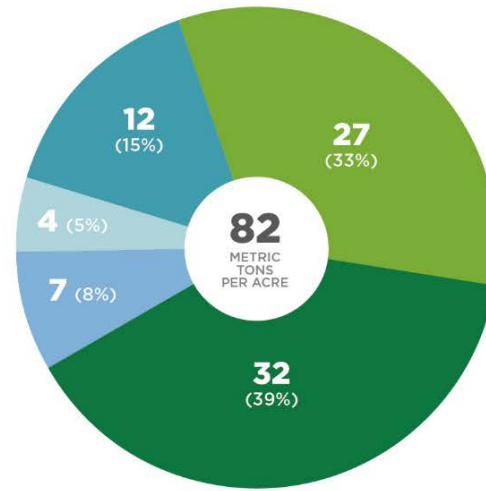


■ Soil Organic   
 ■ Live Aboveground   
 ■ Live Belowground   
 ■ Deadwood   
 ■ Litter

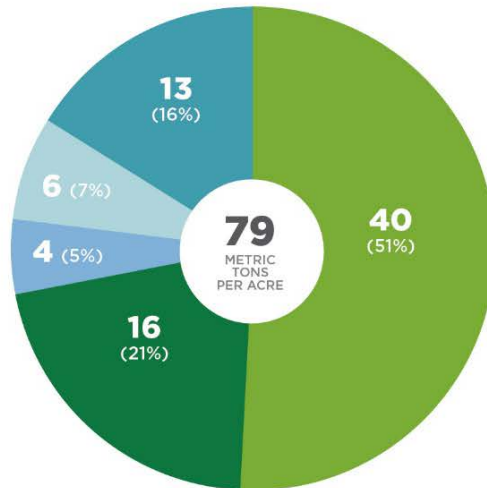
### NORTHERN HARDWOOD



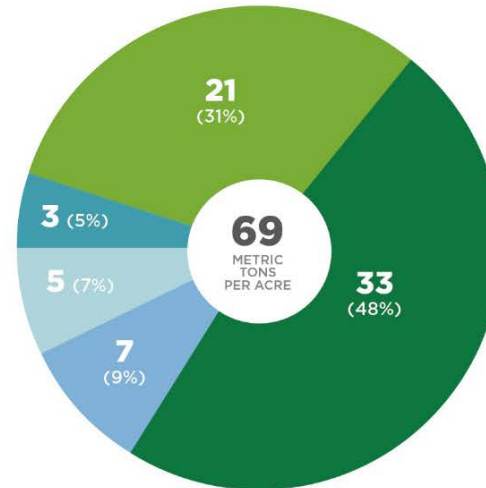
### OAK-PINE



### SPRUCE-FIR

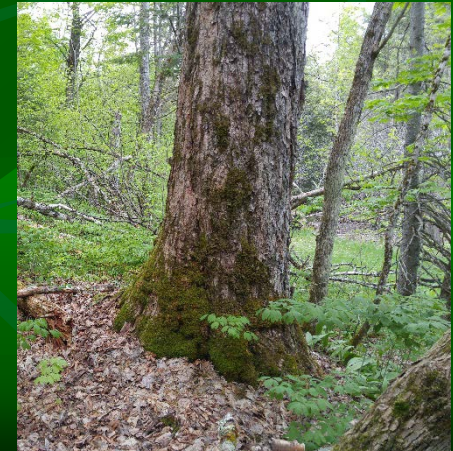
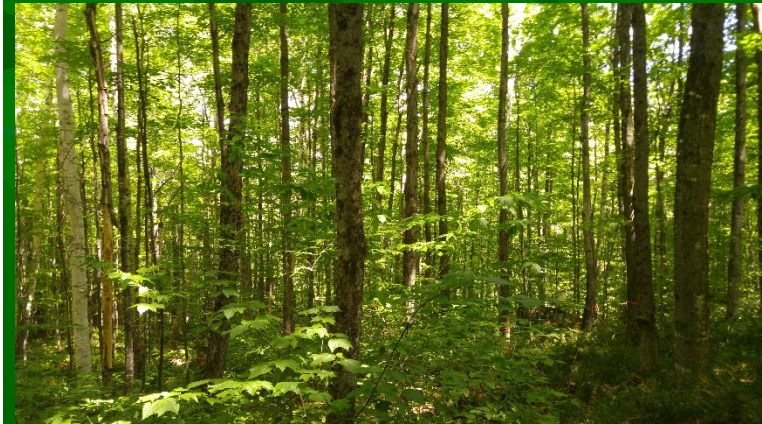
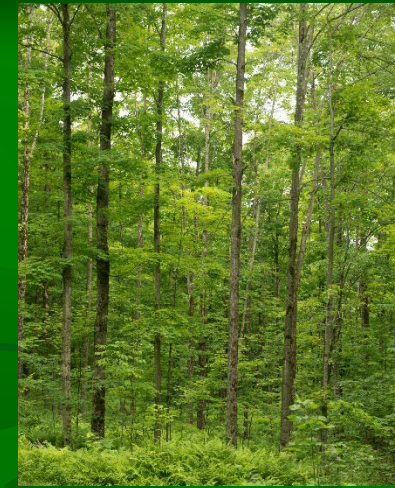
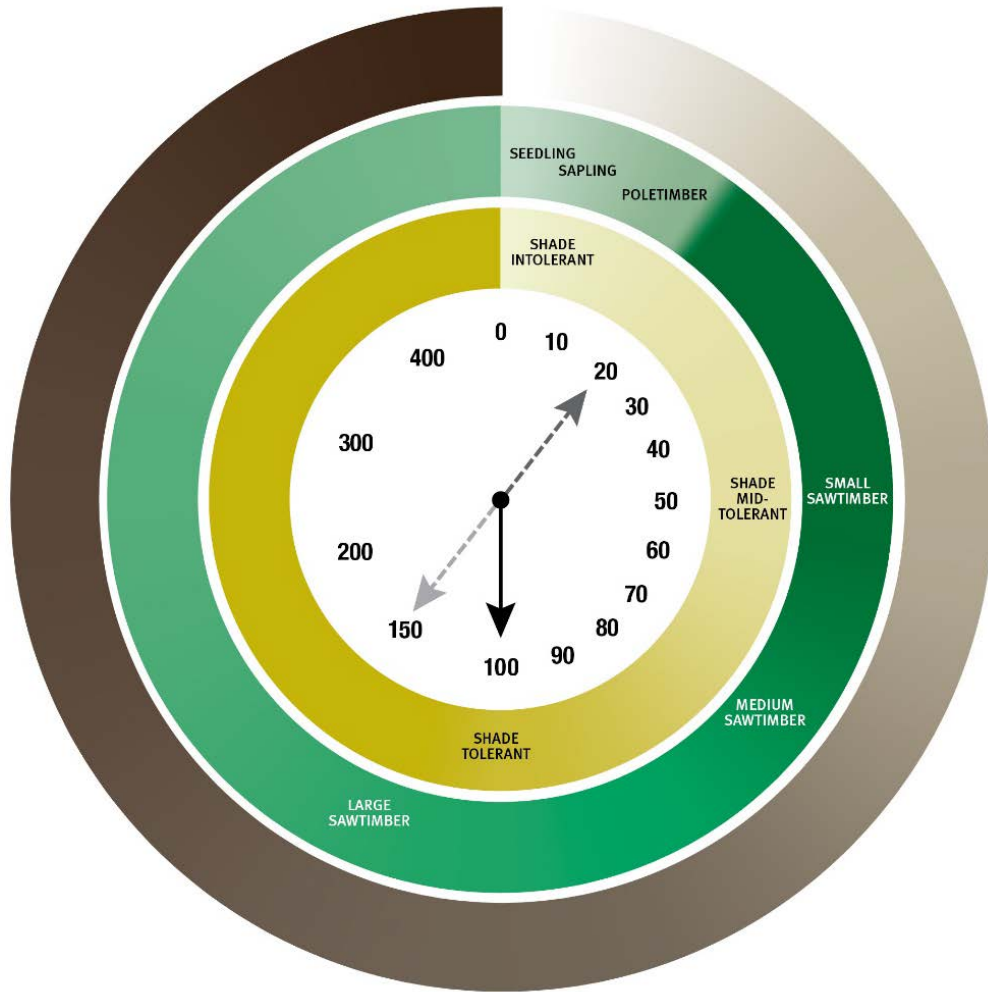


### OAK-HICKORY



Take home: Soil organic and Live aboveground pools are very important

# FOREST SUCCESSION & DEVELOPMENT CLOCK



# Land Use Decisions Impacting Forest Carbon

1. Future use of the land



2. Forest management



# Decision 1: Future of the Land

## *Forest Conversion*

- Forest conversion is the biggest loss of forest carbon benefit
  - Removes live aboveground, deadwood, and litter
  - Stumping, grading, and plowing decrease soil carbon
- Losses often permanent...or at least long-term
- It is also the loss of **many** other forest benefits



# Decision 2: Forest Management

- Passive
- Active

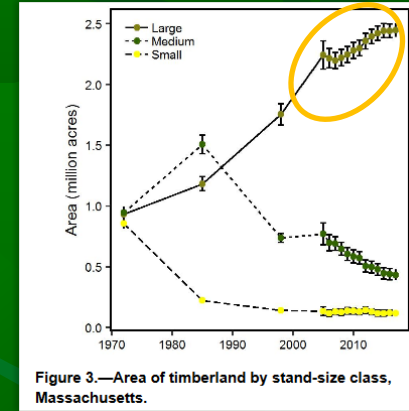
# Passive Approach

- Let nature take its course. No timber harvesting.
- Implement strategies to help resiliency (e.g., invasive plant control)
- **Maximize carbon storage** & continue sequestration
- Prioritize rich, productive, protected sites embedded within landscapes with low fragmentation



# Passive Trade-Off: Forest Resiliency

- Forest Resiliency
  - Site (e.g., slope position)
  - Tree species (e.g., ash, hemlock)
  - Forest structure (e.g., even-aged)



- Species in decline
- Wood products
  - If not here, then where?
  - Substitution



# Active Forest Management

- Impacted Pools

- Live aboveground (AGC) (it depends on how much you remove!)

- Litter pools (20% -36% reduction)

- BMPs are effective at protection of soil carbon



# Active Trade-Off: Carbon Storage

- Removal of logs from the forest temporarily reduces the carbon storage of a forest.



# Removal to Growth Ratio

Region	Amount of Wood Removed (cubic feet)	Amount of Wood Growth (cubic feet)
Southern New England		
Connecticut	1	6.1
Massachusetts	1	5.3
Rhode Island	1	5.9
Northern New England		
Maine	1	1.4
New Hampshire	1	1.8
Vermont	1	2.1
New England		
Region-wide average	1	1.8

Data source: USDA Forest Service, Forest Inventory and Analysis Unit (2017)

# Taking Both a Passive & Active Approach

- It doesn't have to be all of one or the other!! We need both approaches !!
- Multiple scales
  - Entire property
  - Stands within a property
  - Retention trees within a stand
- Review each parcel individually and determine its characteristics (Species, structure, site quality, landscape position)



# Take-homes

- Encourage landowners to engage in conservation-based estate planning!



- Balance carbon tradeoffs
- Protect soil & above ground carbon pools > BMPs and silvicultural strategies

# Thank you!

- For a free copy(ies): [paulcat@umass.edu](mailto:paulcat@umass.edu)
- Download a PDF: [masswoods.org/carbon](http://masswoods.org/carbon)

