



What is the relationship between carbon and carbon dioxide?

The relationship between carbon sequestration and carbon storage is important. In the northeast U.S. it is desirable to make sure our forests store a large amount of carbon and that the annual rate of carbon sequestration is high, however, these two processes peak at different stages of forest development. **Older forests store more carbon than younger forests, but they sequester carbon at a slower rate than younger forests.** Age and structural diversity within a forest and across the landscape is the best way to maximize both storage and sequestration. Having a diversity of ages is a good strategy for climate resilience and wildlife habitat.

When a tree releases stored carbon through respiration, decomposition, or combustion, the carbon rejoins oxygen to make carbon dioxide (CO₂), which is released back to the atmosphere. Converting the carbon in a tree to the equivalent amount of CO₂ makes it easier to compare greenhouse gas mitigation strategies. Therefore, forest carbon is usually expressed as carbon dioxide equivalent (CO₂e). To convert carbon to CO₂e, multiply the amount of carbon by 3.67. This is because a molecule of CO₂ is 3.67 times heavier than a single carbon atom (Figure 6).

Because trees take in CO₂ but use the carbon to make wood, wood stores more than its weight in equivalent CO₂:

1 Mt of dry wood is equal to 0.5 Mt of carbon because dry wood is about 50% carbon. Because the CO₂ molecule is heavier than a carbon atom, this is equivalent to 1.8 Mt CO₂ that was taken out of the atmosphere by the growing tree.

Figure 1

The common unit for CO₂ is a metric ton (Mt - also called a 'tonne'; about 2,205 lbs). One metric ton of CO₂ can be visualized as a cube measuring 27 feet on all sides (about 729 cubic yards). This is equivalent to the amount of CO₂ the average person in the northeast emits through day-to-day activities over three weeks. For large quantities, CO₂ may be expressed as a million metric tons (MMt).