Indicator 5.22.

Total Forest Ecosystem Carbon Pools and Fluxes

What is the indicator and why is it important?

The United States emitted a gross 6.0 billion metric tons of CO_2 in the year 2006. Because plants use carbon dioxide in the photosynthesis process, forests provide a primary vehicle to sequester carbon from the atmosphere. During this process, the carbon becomes part of the plant mass. Once forest biomass dies, carbon remains in the forest ecosystem and cycles through standing dead trees, downed dead wood, duff and litter, and finally soil carbon pools. Thus, managing forest ecosystems to sequester carbon reduces the net amount of carbon dioxide accumulating in the atmosphere. Less carbon dioxide in the atmosphere may help reduce the possibility and extent of human-induced climate change. In contrast, forests can also serve as a net emitter of CO_2 during years of extreme wildfires or widespread disturbance. In addition to showing current estimates of carbon pools, this indicator provides estimates of annual forest carbon storage changes (fluxes) that may be subtracted from the gross emissions to estimate net emissions.

What does the indicator show?

All carbon pools, with the exception of soil carbon, are estimated using the Forest Service's Forest Inventory and Analysis (FIA) measured data or imputed data, along with inventory-to-carbon relationships, developed using information from ecological studies. Thus, trends of volume and area in other indicators based on FIA data should be consistent with this information. Forest ecosystem carbon stocks in the United States continue to represent a substantial carbon pool of more than 156,000 Tg CO_2e (fig. 22-1), with live trees and organic soil carbon levels accounting for most of this stock. The forest carbon stock is equivalent to more than 25 years of CO_2 emissions in the United States. The live tree carbon stock is concentrated on the West coast, Rocky Mountains, Appalachian Mountains, and in other areas of the Eastern United States (fig. 22-2).

Figure 22-1. Total carbon stocks by forest ecosystem component in the United States, 1990–2007 (Tg CO_2e).

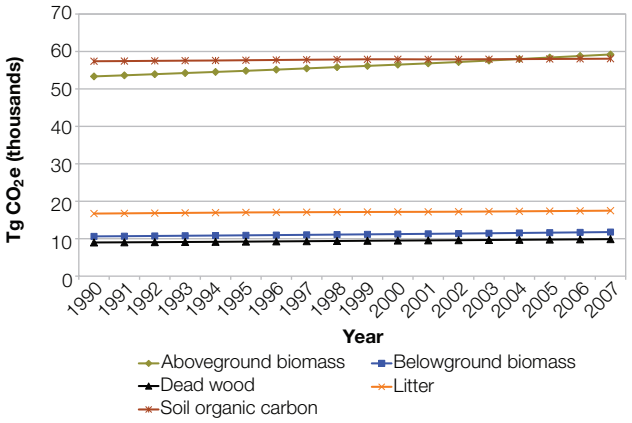
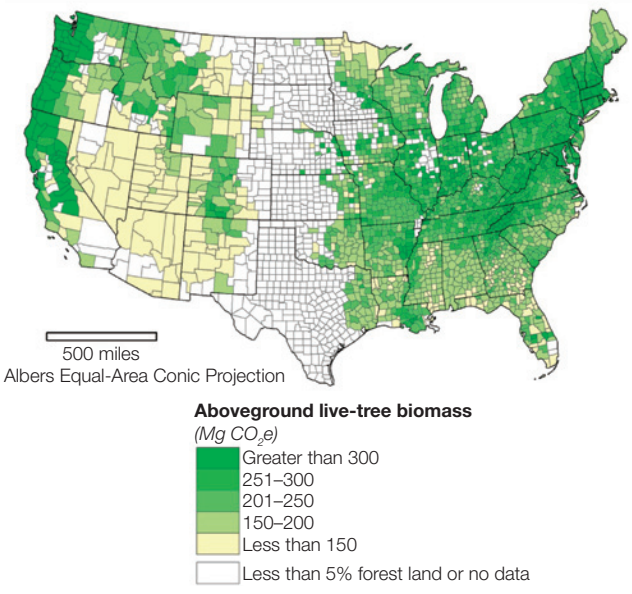


Figure 22-2. Forest aboveground live biomass carbon stocks by county for United States, 2006 (Mg CO_2e).



In terms of annual changes or carbon flux, both above- and below-ground forest ecosystem living biomass components account for most of annual carbon sequestration (fig. 22-3). These rates of sequestration have remained rather static since 2000. The spatial distribution of forest sequestration is evenly distributed within forested regions of the country (fig. 22-4). U.S. forests offset more than 11 percent of total U.S. CO_2 emissions in 2006. This rate of offset has remained relatively constant for the past two decades (fig. 22-5). Overall, the tremendous forest carbon stocks of the United States continue to gradually increase, increasing GHG emissions continue to greatly outpace what forests can sequester annually.

What has changed since 2003?

Total forest ecosystem carbon stocks were maintained with positive increases from forest area expansion and growth. Despite these increases, total U.S. GHG emissions still outpaced forest ecosystem gains.

Figure 22-3. Percent of total carbon stock by forest ecosystem component sequestered annually in the United States, 1990–2006.

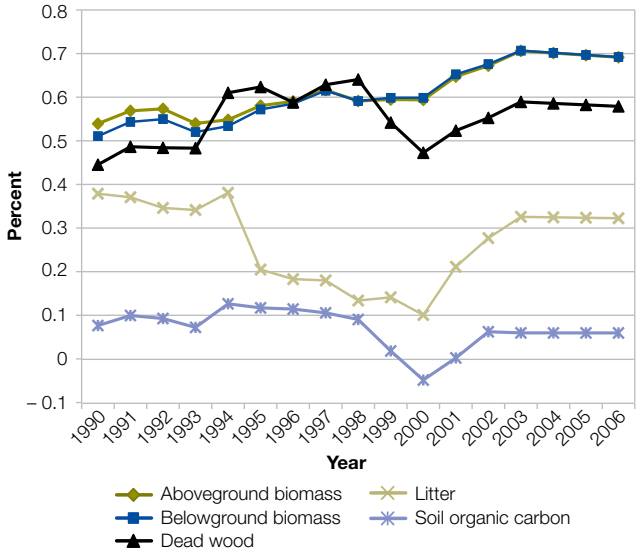


Figure 22-5. Total greenhouse gas emissions versus total forest ecosystem sequestration in the United States, 1990–2006 (Tg CO_2e).

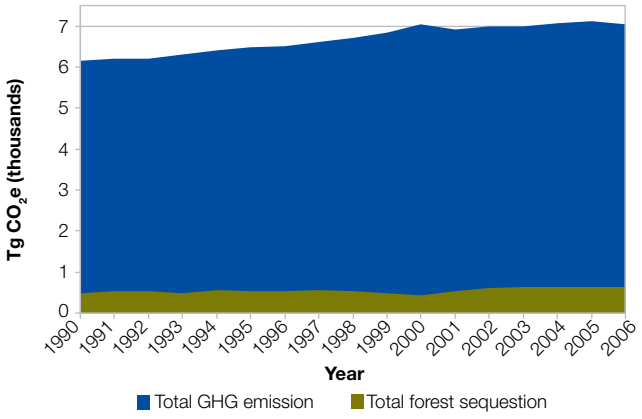
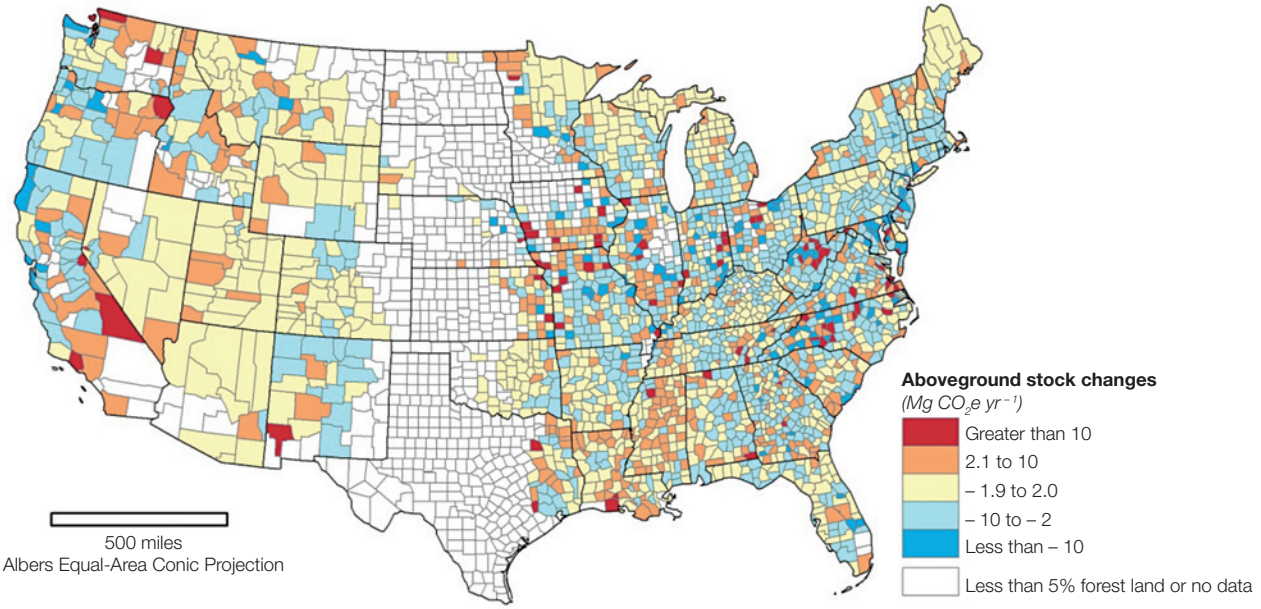


Figure 22-4. Total forest ecosystem carbon stock annual flux by county in the United States, 2006 (Mg CO_2e per year).



Note: In conformance with IPCC reporting protocols, carbon sequuestration is denoted by negative numbers (blue) while carbon emissions to the atmosphere are represented by positive numbers (red).