PINEMAP

Southern Pine Plantations Store Carbon:
Insights for Forest Landowners

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Mapping the future of southern pine management in a changing world

Trees store carbon as they grow. They strip it from the air we breathe. This is important because carbon (in the form of CO_2) is rising in our atmosphere. Carbon dioxide is removed from the atmosphere through plant growth and ocean life—we call them "carbon sinks" (Fig. 1 Carbon Cycle). Across the country, forests store 13% of our carbon emissions in the U.S. each year—and about 1/3 of that carbon is absorbed solely by southeastern forests. Nearly a third of all U.S. forests, some 214 million acres, are located in the South and of those forests, nearly 80% are privately owned by families, individuals, investment firms and industry.

THE CARBON STORAGE PROBLEM

Atmospheric carbon dioxide (CO_2) has increased in the U.S. and worldwide from the use of fossil fuels and land use changes since the 1700's. Atmospheric CO_2 levels have increased from approximately 280 parts per million (ppm) in 1800 to over 400 ppm today. The burning of fossil fuels through electricity, transportation, and industry has increased atmospheric CO_2 and led to an imbalance of carbon exchange between the atmosphere and natural sinks. This imbalance in the carbon cycle is contributing to increases in global temperatures and a more variable climate.

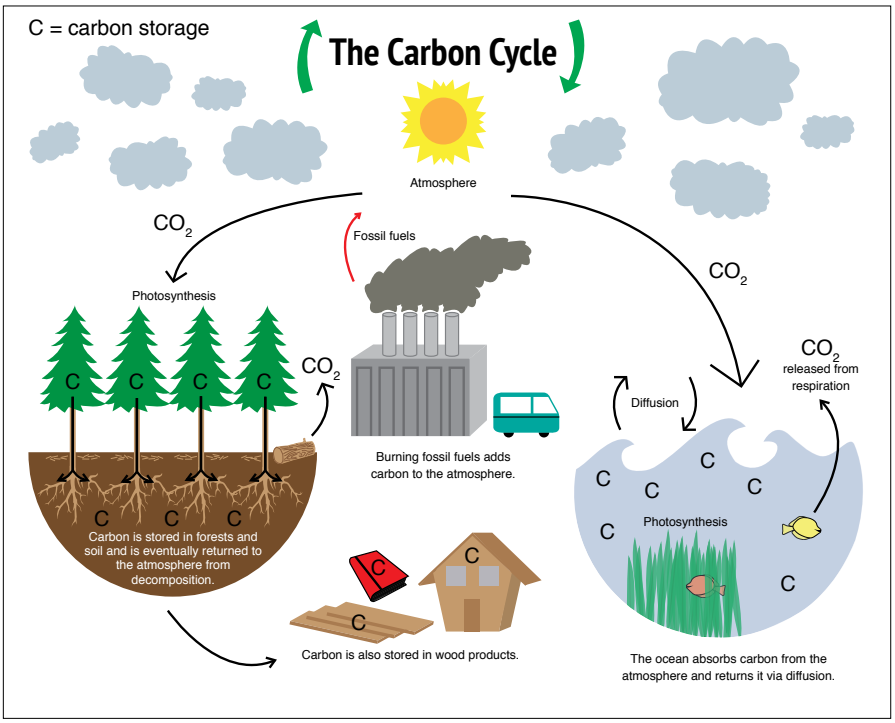

Figure 1. Carbon Cycle

Carbon dioxide that occurs naturally cycles among carbon sinks that absorb carbon as part of the natural carbon cycle. These carbon sinks include the atmosphere, oceans, soil, plants, and animals. However, additional carbon from the burning of fossil fuels and loss of forests (land use changes) exceed the amount that would naturally cycle through the planet and have increased atmospheric concentrations to unprecedented levels. Forests (including vegetation, soils, and harvested wood) offset some of the greenhouse gas emissions that are produced annually in the United States by approximately 13%, making them very important for helping to reduce global CO_2 levels.

HOW DO FORESTS STORE CARBON?

Forests soak up carbon dioxide through photosynthesis—a process where energy from the sun is turned into sugars and is a critical building block for tree growth. The needles and leaves (as well as buds and stems) are the solar collectors where light, water, and CO_2 are converted to oxygen and sugars (6). Photosynthesis drives tree growth and carbon storage into the tips of stems all the way to the roots (9, 6).

USDA United States Department of Agriculture
National Institute of Food and Agriculture

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Privately owned loblolly pine (Pinus taeda L.) plantations in southeastern Oklahoma (McCurtain County).

Trees store (sequester) carbon as long as they are actively growing; once a tree dies some stored carbon is released back into the atmosphere. However, the majority of carbon will still remain in the tree tissues or ultimately end up in the soil. Soil microbes convert fallen needles, leaves, and decomposing wood into soil carbon and atmospheric carbon as they "feed". Carbon can be stored in trees and soil for hundreds of years or as wood products in homes and other structures.

THE SOUTHERN PINE CARBON STORY: GROW MORE WOOD, STORE CARBON FASTER

Private forest landowners are important players in southern forests where they are majority owners. Often, landowners choose to plant loblolly pine for financial benefit, wildlife, and aesthetic reasons. Southern pine plantations have produced more wood than any other region in the United States. In the past 5 decades through better forest management (planting improved genetics, and other silivicultural techniques) (3, 2, 10). Intensified management increased growth (4, 5, and 8), and carbon storage.

Landowners have already made substantial efforts to store carbon in their trees through sustainable management. The recent economic slow down has forced some landowners to maintain their trees for longer rotations—essentially storing more carbon on the stump to be used as solid wood products into the future. Should future policy changes favor a market for Carbon in forests there may be additional financial opportunities to be compensated for that carbon. Currently voluntary markets exist but are only cost effective for the largest properties willing to be qualified and become "certified" as sustainably managed forests, typically with longer rotations and signing a long-term contract. Until such time, landowners engaged in long term management practices of their southern pine forests will have to find their own reward or be reconciled by the existing market returns in storing carbon in trees and wood products for the public good.

SUMMARY

Trees naturally store carbon. Southern pine plantations account for approximately ~33% or one-third of the nation's annual carbon stored in all of the United States' forests. Southern Pine plantations represent a partial solution in storing atmospheric CO_2 through enhanced tree growth and wood products. Southern pine landowners can play a significant role in helping regulate or minimize climate change impacts (through carbon storage). Good forest management practices provide landowners with healthy and resilient forests that are better prepared for future climate change.

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