



Landscape Trees and Global Warming

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We all hear a great deal these days about global warming and its potential problems. And, we who work with landscape and urban trees have heard claims that we can greatly reduce these problems by planting and caring for trees. Certainly trees are good for our environment. But can trees make a difference in global warming? If so, how do they have an effect and how many trees are needed?

First, what is global warming (the "greenhouse effect")? Certain gases, sometimes called "greenhouse gases", occur in our atmosphere naturally and help trap radiation and warm the air and land. But since the 1800's, humans have been causing large amounts of these gases to be released into the atmosphere, with carbon dioxide being the most abundant, along with methane. The main sources of carbon dioxide from our modern society are the burning of coal and oil in power plants and gasoline in automobiles. Clearing and burning of forests also releases considerable carbon dioxide.

The theory behind global warming is that increasing greenhouse gases are causing a general warming over the earth that is affecting global climate. Carbon dioxide in the atmosphere certainly has increased, and a consensus seems to have emerged amongst scientists, policymakers, and citizens that warming and climate change is occurring.

To reduce carbon dioxide buildup and its effects on global warming, we can either reduce carbon dioxide emissions (mainly burn less fossil fuels), or we can re-absorb carbon dioxide from the air. Trees enter the picture here because they can be used to take carbon dioxide out of the air. All plants make food out of carbon dioxide from the air, water, and solar energy through the process of photosynthesis. This food is then used to make most of the body of the plant, including roots, leaves, stem or trunk, and flowers and fruit.

Trees (and shrubs) are unique among plants in that they have a woody stem and roots that get bigger every year and these woody parts last for decades or even centuries. Since this wood is mainly made of carbon from carbon dioxide, tree stems and roots are good, long-term storage places for carbon. Annual plants (such as corn, tomatoes, annual grasses) and many non-woody perennial plants (such as perennial grasses, clover, alfalfa) are not good places for long-term carbon storage. Most of the carbon dioxide they absorb is re-released within one to several growing seasons as leaves, stems, and roots die and decay.

So, trees can take carbon dioxide out of the air and store it as carbon in wood. How many trees would it take to absorb all of the carbon dioxide put out by the United States in a year? On the average the U.S. releases 4.8 tons of carbon per person per year as carbon dioxide, as compared to 4.3 tons for Canada, 2.0 for Japan, and 0.2 for Nigeria (figures for 1989 from

Oak Ridge National Laboratory). This amounts to a total of about 1.2 billion tons of carbon that would need to be absorbed each year in the U.S. alone. According to Rowntree and Nowak (see their article on urban forests and carbon dioxide in the October 1991 Journal of Arboriculture), all of the urban trees in the entire U.S. only contain 800 million tons of carbon, so in 18 months the U.S. puts out as much carbon as is stored in all of our urban trees.

Planting 44 million more urban trees per year in the U.S. for the next 50 years, for a total of 2.2 billion trees, would replace trees lost to mortality and increase urban tree cover by 5% (see Rowntree and Nowak 1991). Those 2.2 billion trees, however, would only store an additional 150 million tons of carbon. At current rates, 59.8 billion tons of carbon would have been emitted in the U.S. over those 50 years, 400 times more carbon than would have been stored. The situation is made worse by the fact that these figures assume that all of the trees planted must remain alive and healthy to keep absorbing carbon dioxide.

So, planting 44 million trees per year for fifty years would result in absorbing one quarter of one percent of the carbon dioxide the U.S. would emit over the next fifty years. These figures are not presented to belittle the idea of planting trees to help ease environmental problems. But we should not be planting trees in U.S. cities and towns thinking that we are absorbing great amounts of carbon dioxide and reducing global warming. Landscape tree planting or even rural tree planting in the U.S. can not make a significant dent in absorbing the carbon dioxide we release.

The only way that U.S. citizens can significantly affect global warming is by changing their behavior to reduce greenhouse gas emissions, mainly by reducing the use of fossil fuels (coal, oil and gas). And this is where trees can play an important part. Trees planted to properly shade a building reduce energy use for air conditioning by up to 70%. Well-placed trees that slow the wind can reduce energy use for heating by 30%. Trees in living snowfences reduce the energy needed to plow roads and parking lots. These are just some of the ways that trees can be used to save energy, thereby reducing fossil fuel use and carbon dioxide emission.

Arborists and other tree people across the country should be promoting appropriate tree planting, both urban and rural, because of the many benefits trees provide. Trees certainly are not the answer to the global warming problem, but they can play an important part in reducing fossil fuel consumption and carbon dioxide emission. Few pollution fighting tools provide such diverse benefits at such a low cost for such a long period of time..

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