

# Plantations Drink Streams Dry



Rows of pine trees planted for harvest ©istockphoto.com/Matt Dula

Jackson, R.B. et al. 2005. Trading water for carbon with biological carbon sequestration. *Science* 310:1944-1947.

Planting trees is no panacea for global warming. Although touted as a guilt-free way to offset carbon emissions, plantations have hidden environmental costs. New research shows that stands of fast-growing trees can drink streams completely dry and leave soil salty or acidic.

“The trade-offs of plantations should ideally be taken into account when negotiating carbon exchange agreements,” says Robert Jackson of Duke University in Durham, North Carolina, who with nine coauthors reports this work in *Science*.

Most plantations are afforestation projects, where trees are planted on land

that was not forested historically. In addition, plantations are often monocultures of evergreens such as pine and eucalyptus that grow year-round and get big fast, which means they are likely to be heavy users of water and soil nutrients.

To see how afforestation affects streams, the researchers compared stream flow in nearby catchments with and without plantations in 26 long-term study sites around the world. Similarly, to see how afforestation affects soil, the researchers compared soil

chemistry in adjacent plots with and without plantations in 114 sites in 16 countries. The afforestation projects studied ranged in age from newly planted to 50 years old.

The stream flow comparison showed that plantations use a tremendous amount of water. Overall, afforestation of grasslands, shrublands or croplands reduced stream flow by about two-fifths. Worse, stream flow was reduced by half in catchments with plantations that were 10 to 20 years old, and about one-tenth of the streams were completely dry year-round.

Besides guzzling water, plantations can also degrade soil by making it saltier or more acidic. Overall, afforestation of grasslands or shrublands doubled the sodium in soil. In addition, afforestation made the soil more acidic in 85 percent of the study sites, decreasing the pH by up to 1.6 units.

The environmental impact of plantations varies with factors including climate and soil type and can even be beneficial in some cases. Notably, reforestation can improve both the quantity and quality of water in areas where cropland had replaced forest. Thus, the researchers recommend evaluating carbon-trading afforestation projects on a site-by-site basis. “As demand increases for land to accommodate plantations, more comprehensive environmental planning will be needed to avoid problems and to manage land successfully and sustainably,” they say.



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