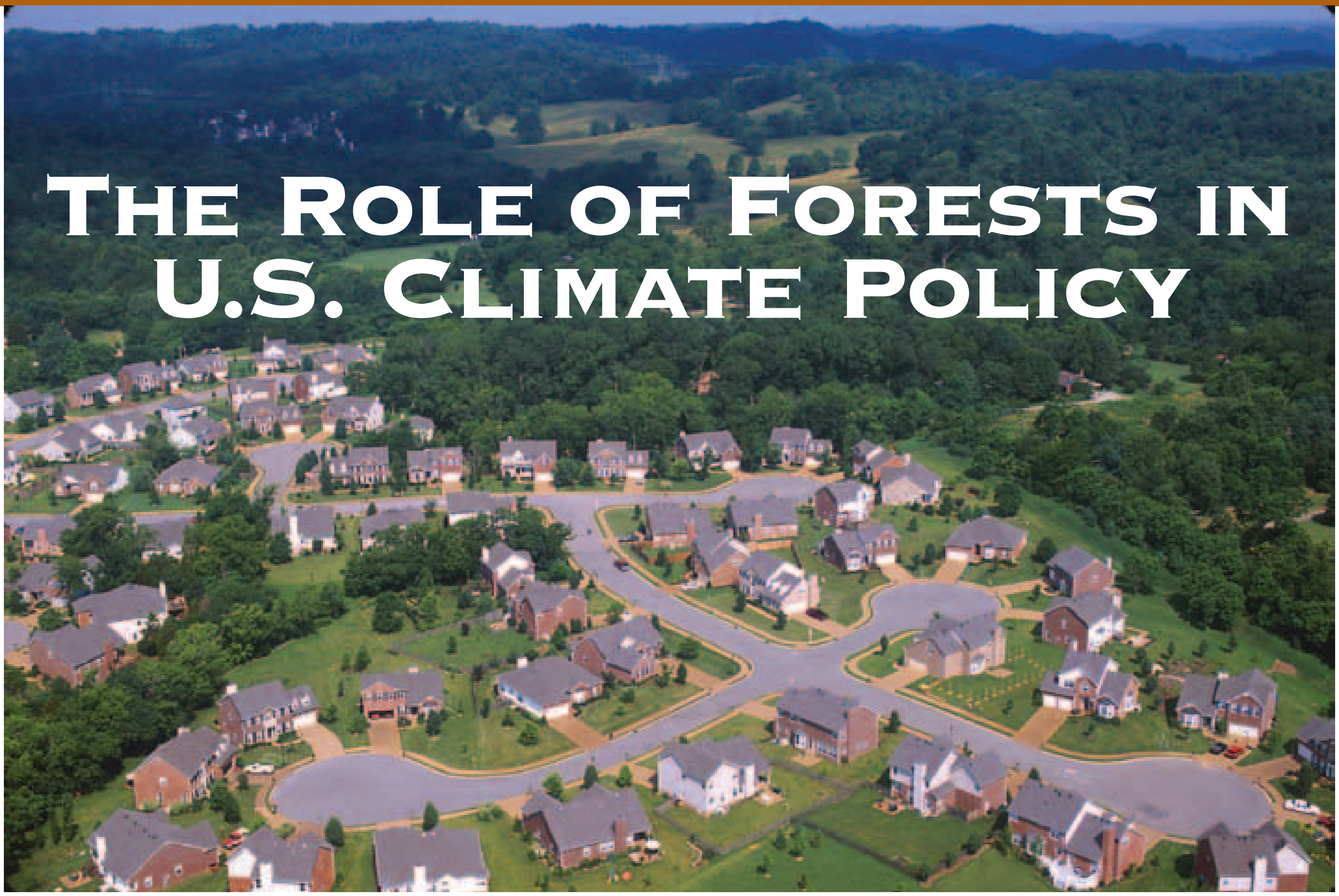
The Role of Forests in U.S. Climate Policy



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Deforestation in America occurs on 1.5 million acres annually.

Laurie A. Wayburn

Like many schoolchildren, I learned that years ago a squirrel could cross the country from the Atlantic to the Pacific Ocean never touching the ground, using our magnificent forests as an aerial highway. After massive clearing and development for agriculture, cities, and roads, those forests are now a tattered patchwork, and are nonexistent in many places. More than a squirrel's dilemma, though, the loss and altering of America's forests have created both an enormous challenge to climate health and an opportunity for climate policy and action.

More than 30 percent of U.S. forests have been converted to other uses from their pre-European settlement extent, and some 1.5 million acres of U.S. forests continue to be cleared for development annually, more than double annual farmland loss (Smith et al. 2003; USDA 2007). The clearing of America's virgin forests released more than 20 billion metric tons (Pg) of carbon dioxide, totaling over 74 Pg CO_2 since 1850 alone (Houghton 2003). If present trends continue, the United States will lose 75 million acres of forestland over 50 years, emitting another almost 20 Pg CO_2 from deforestation—*not counting* the losses of future forest sequestration, watersheds essential for drinking water, habitats for species' survival, and other ecological and economic benefits.

Forests play a dual role in global climate change, both sequestering vast quantities of carbon dioxide as they grow (sinks) and releasing it when disturbed by harvest, conversion, or natural phenomena (sources). The global urgency of maintaining and restoring forests as carbon sinks was highlighted as the first recommendation for action in the 1997 Kyoto Protocol (Article 2).

Forest loss and degradation generate 20 percent of current annual CO_2 emissions globally—the second largest source of excess CO_2 emissions after fossil fuels. Historic forest loss adds even more impact—over 40 percent of *all* anthropogenic (human-caused) CO_2 in the atmosphere today (Fisher et al. 2007). While CO_2 emissions from deforestation are immediate, reabsorption (sequestration) takes tens of thousands of years (Denman et al. 2007). Our vast temperate forests contained some of the most productive and largest carbon sinks globally, yet U.S. forest carbon stocks remain far below their historic potential, currently at 10 to 50 percent of their pre-colonial levels (Rhemtulla et al. 2009).

While this forest loss is part of the climate problem, forest conservation is part of the climate solution. Existing forests continue to play a critical role in combating global climate change as U.S. forests currently sequester more than 13 percent of all domestic emissions annually (US EPA 2009). On this basis alone—not to mention the vast potential of restoring carbon stocks across the landscape—maintaining domestic forests as part of U.S. climate policy is highly significant to the national carbon budget (figure 1).

Indeed, the comprehensive inclusion of domestic forests in national climate policy is essential to achieving the country's goals to stabilize and reduce net emissions of CO_2. U.S. forests, conserved and managed for resilience to a changing climate, can reduce emissions by up to 1.6 billion tons of CO_2 annually while contributing the majority of projected renewable energy supplies in the next 50 years—at costs equal to or below those for other emissions reductions efforts.

Forests affect many other emissions sectors: energy, manufacturing (e.g., paper and other forest products), construction, landfills, and transportation. Forest woody biomass is used increasingly in energy plants where it is combusted and CO_2 is emitted. Forest products disposed in landfills add to methane emissions, with 67 times the global warming impact of CO_2.

Harnessing the Climate Benefits of Forests

Without an understanding of net gains and losses in and from forests, one cannot ensure real and quantifiable climate benefits. Forest sector accounting must be integrated with accounting for other related sectors. Global action on deforestation and forest depletion has been stymied by a lack of legal, economic, scientific, and social infrastructure. However, now that the United States is poised to reenter international negotiations on climate change in Copenhagen for the 2009 meeting of the United Nations Framework Convention on Climate Change (UNFCCC), there is a unique opportunity to set an example.

The United States can restore much of its once vast forest carbon banks by addressing the suite of forest-related climate issues comprehensively, and be a model for global action. California is pioneering this approach under its economy-wide cap on greenhouse gases in the 2006 Global Warming Solutions Act (AB 32).

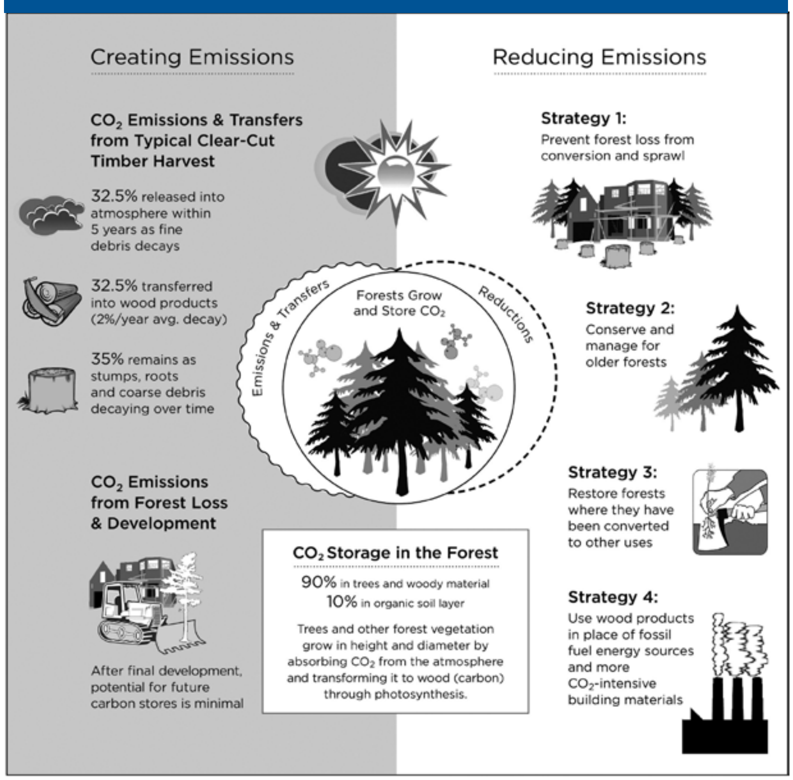
Over the next several decades, emissions reductions from U.S. forests will be particularly valuable to serve as a counterbalance to increasing emissions from other sectors. Efforts to reduce fossil fuel consumption and emissions will take time as we develop and implement new energy and efficiency-increasing technologies, even as global emissions are rising.

The energy efficiency provisions of the 2009 American Recovery and Reinvestment Plan (HR 1) are projected to cost more than $23.1 billion to achieve emissions reductions of up to 50 million metric tons of carbon annually—only about 3 percent of that available from forests each year (ICF International 2009). When contrasted with the costs of avoiding deforestation, carbon emissions reductions from forests can be achieved at only a fraction of the cost of emissions reductions from energy efficiency measures. Combined with the global carbon market, it is clear that market forces could be used effectively to maintain and increase net carbon stocks, reversing current trends.

Key Actions for a National Climate Policy

Four key actions are needed in the forest sector. Some are immediate in their impact, and others are more relevant in the medium and long term.

FIGURE 1
The Forest Carbon Cycle



Source: The Pacific Forest Trust

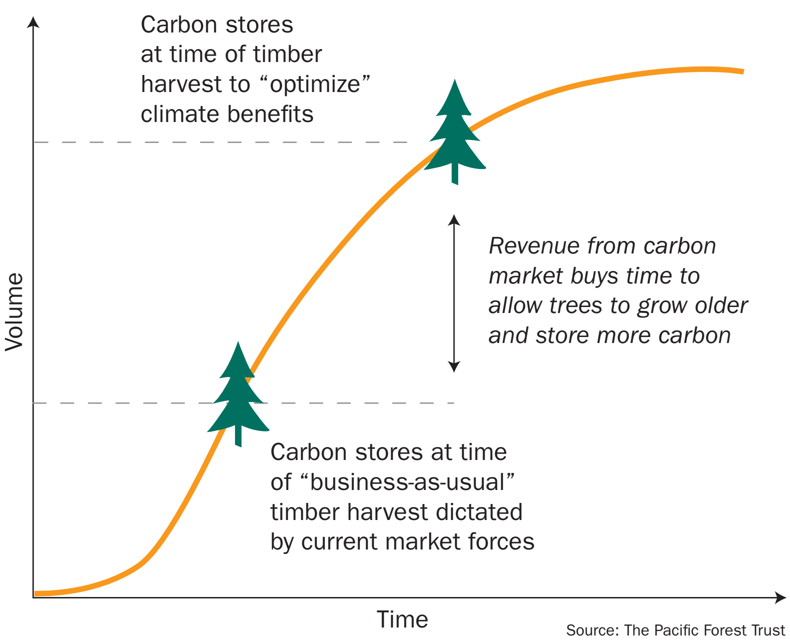
Conserving the Forestland Base

Conserving existing forestland is essential to avoid releasing additional emissions into an overloaded atmosphere, and to provide the necessary base for future sequestration. As with all efforts to reduce CO2 emissions, there is a cost to conservation, but it is well within the ranges of projected costs for other sectors.

The conservation easement is a commonly used legal tool to reduce or prevent development and dedicate land to productive, natural conditions. Assuming an easement cost of $500 to $1,000 per acre and using a discount rate of 3 percent, conserving the standing carbon on 75 million acres of forestland would protect more than 5.4 billion tons of carbon at a cost of $4 to $8 per ton in 2009 dollars, only 1 percent of the cost of energy efficiency tons funded under HR 1.

Conserving and stewarding large-scale private forests for their net carbon storage offers the co-benefits of preserving vital watersheds and biodiversity. With its significant forest base, the United States could provide substantial emissions reductions to compliance buyers within the global carbon market. In 2008, this market transacted over $60 billion, and it is expected to grow substantially. This should be a key tool in complementing public investment to prevent and reverse deforestation.

FIGURE 2
Forest Carbon Stores Over Time



Source: The Pacific Forest Trust

Increasing the Average Age of Forests

U.S. forests hold, on average, substantially less carbon stock than they did 150 to 200 years ago. Forest age and carbon stock are highly correlated, with older forests holding and annually accumulating more carbon than younger forests. Restoring older forests will restore carbon stocks.

Changing current forest management to focus on longer harvest intervals would allow forest carbon stocks to increase with forest age. In working forests, this could be achieved by incremental decreases in the percentage of forest growth harvested. This will increase actual yields of timber products as well, by harvesting the growth from a larger base. Of course, time is money in forestry as in all business, and providing the money through the sale of emissions reductions from those older forests is a key role for the carbon market (figure 2).

Replanting Former Forests

More than 300 million acres of historic forestland have been converted since 1630 (Smith et al. 2003). Reforesting even 20 percent of these former forests, especially along riparian areas of major watersheds such as the Mississippi or Chesapeake, would bring multiple benefits—in addition to tens of millions of tons of carbon sequestration in the next 50 years. Tree planting programs have the potential to contribute up to 50 million additional tons of carbon storage over the next 20 to 30 years (Birdsey, Alig, and Adams 2000). Reforestation can also be used for establishing biomass energy sources through crop switching on low-value agricultural lands for a net increase in average carbon stocks.

Restoring Forest Resilience and Sustaining Energy

Restoring natural resilience by promoting the ecological integrity of forests will provide other key benefits as we contend with the effects of global climate change. Perhaps most important, improved forest health means improved watershed health. With the increasing variability of weather patterns and a general drying trend predicted for much of the United States, managing forests to protect healthy watersheds becomes even more vital. Maintaining the ecological integrity of forests through diverse species composition, structurally complex stands, and heterogeneous age-class distributions will promote forests that are more resilient (Millar, Stephenson, and Stephens 2007).

Changes in forest practices, from clear cutting to more selective harvesting, will result in higher carbon stocks while maintaining sustainable timber supplies.

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Typically, such restoration produces low-value wood not economically viable to harvest for many products, but it can be used for biomass energy. Biomass plays a substantial role in the nation's energy supply, contributing 142 billion kilowatt hours. This is 47 percent of renewable energy, and over 3 percent of total U.S. energy consumption. Nearly 87 percent of this biomass was derived from wood in 2003 (Perlack et al. 2005). Biomass is expected to increase to more than 60 percent of all renewable energy consumption over the next two decades, or 13 percent of total consumption (US DOE 2009).

If this biomass is produced in a "closed loop"—wherein the emissions caused by the harvesting and combustion of woody biomass are fully reabsorbed in the next cycle of growth—fewer net CO_2 emissions will result than those created through burning fossil fuels. Conversely, if older forests with their greater carbon stocks are replaced with energy plantations, or demand for other wood products is simply shifted to other forests (creating emissions "leakage"), then a closed loop is unlikely to be achieved.

The stability of forest carbon stocks cannot be separated from ecosystem stability. Managing forests for short-term gains in tons of carbon or biomass alone, without full-cycle accounting or a goal of restoring resilience, will likely lead to greater instability in ecosystems and greater emissions. Conversely, managing for carbon gains within the context of also managing for more stable, robust, resilient ecosystems will achieve more durable results as this carbon is embedded in a dynamic, cyclic, living system.

Accounting for Forest Carbon Banks

Accounting for forest carbon is relatively simpler than for many other emissions sectors. It is based on three key factors: the amount of forestland; the characteristics of trees on that land; and knowledge of "growth and yield" (growth of trees and their timber product yield). These factors are well documented in the United States and form the basis for the multi-billion dollar forest products industry.

Effective accounting also entails establishing a national baseline for forest climate benefits and integrating actions in the forest sector with those under a national cap-and-trade program. With such a baseline of net forest carbon stocks, we can measure gains and losses. Then individual emissions reductions projects can demonstrate a positive impact for the atmosphere, contributing to net gains not only on a particular property, but for the nation as a whole. A national baseline strengthens the integrity and credibility of emissions reductions and accounting in forests.

Indeed, the United States has long sought to include forests in its national carbon accounting as part of our international negotiations, as this would greatly strengthen our ability to meet national targets within an international framework. However, because the treatment of carbon accounting in U.S. forests has not been as comprehensive as in other sectors, such as energy or transportation, the global community and international carbon markets have not embraced the inclusion of forests within the U.S. portfolio.

Within this global context, the challenge is to establish a comprehensive and integrated approach for the forest sector (figure 3). In the energy sector, for example, individual generation facilities are given reduction mandates within an overall sectoral limit. Thus, individual actions meet a clearly defined goal within a sector limit and are part of an overall monitoring system to achieve that goal.

The same can be done for forests with the national baseline as the sector limit, by focusing forest monitoring on the two key areas of carbon loss: conversion and regular harvest. Harvest and growth data are available from federal data on federal lands and from large, private forestland owners that maintain data as part of their regular business. The high concentration of ownership of regularly managed forests makes this a feasible task (36 percent of private forest is owned by less than 1 percent of owners). And, land conversion data are already collected at the county and state level.

Federal Forest Management

At the federal level, the Forest Inventory Analysis (FIA) is the best data set. Although designed for purposes other than monitoring carbon, the data can be extrapolated to assess changes in forest carbon stocks. From a climate perspective, management choices on federal lands are essential, since they are large and relatively unfragmented, and are not threatened by conversion or development. These lands currently hold the largest carbon stocks per acre, as well as the greatest potential for increases in both net stocks and the resilience of these stocks. Since these lands are governed through federal ownership and policy mechanisms, they are well suited for establishing national objectives to address climate change. This could be accomplished through executive order.

Given the significant emerging threats to watershed and habitat due to climate change, these federal forests can serve as cornerstones for landscape-level management strategies to promote forest resilience and sustain these vast carbon banks. Their public trust mandate and positive role as the bulwark of carbon sinks make them an ideal anchor for forest sequestration to meet national commitments.

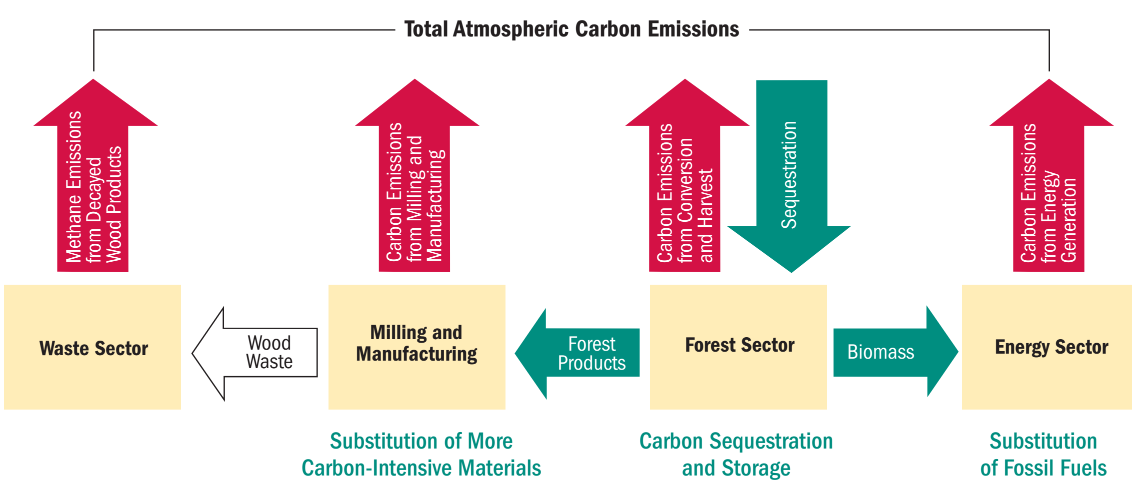
Private Forest Options

Privately owned forests face many of the same natural threats to the stability of their carbon stores as federal forests, but they also face threats from market forces: higher competing values from development and agriculture drive deforestation, annual return demands drive depletion.

Critical to the success of private forests in cap and trade is establishing a minimum threshold or baseline from which market forces can effectively raise the net level of carbon through a trading system. This is an effective equivalent to setting a limit for emissions from other sectors, and then using market forces, via trading, to reward those entities that reduce net emissions the greatest amount and at the fastest rate.

Emissions reductions from forests must be equivalent to those in other sectors to be tradable.

FIGURE 3
Integrating Forest Carbon Tracking with Other Economic Sectors



Source: The Pacific Forest Trust

The Kyoto Protocol calls for such reductions to be permanent, defined as enduring at least 100 years. However, there are few legal means to require such long-term actions, because the legal construct known as the Law Against Perpetuities normally prohibits contracts of more than 99 years. A conservation easement is an exception that does ensure perpetual legal commitments, and thus makes an ideal market incentive to help ensure that lands remain as forest, reducing risk and providing added assurances and market credibility.

Conservation easements regularly allow forest management in protected working forests. This enables key management goals to be met for climate and other conservation purposes, such as adaptation, thus reinforcing both the underlying legal durability and natural durability of emissions reductions. In compliance systems developing at the state level, e.g., California and the New England states of the Regional Greenhouse Gas Initiative (RGGI), markets have demonstrated a marked preference for the additional rigor, quality, and permanence of forest emissions reductions from lands protected by conservation easements.

Conservation easements on working forests are typically valued at 40 to 50 percent of fee title, adding substantially to the revenues from timber harvesting and emissions reductions. Sales of emissions reductions in California's pre-compliance carbon markets increase net present value by an estimated $2,000 per acre. Adding the value of easements used to anchor these lands creates three income streams for landowners, increasing competitiveness relative to conversion pressures.

Conclusion

Conservation and restoration of higher levels of carbon stocks in U.S. forests are key components of any comprehensive approach to achieving the contemplated goals of climate policy. Sustaining these vast and vital lands will both restore the squirrels' highway and directly reduce threats leading to forest loss and depletion. Ensuring the health of forests and their carbon stocks depends on the resilience of forest ecosystems. Restoring resilient forest carbon stocks will also protect and restore watersheds, provide for wildlife and fisheries habitat, and contribute to the nation's renewable energy supply. Linked but separate policies for federal and private forestlands allow for the most effective strategies to be used for each. Conservation easements are a key tool for land use and climate planning on private lands, providing significant incentives for landowners to participate in national efforts to increase the climate benefits of forests.

ABOUT THE AUTHOR

LAURIE A. WAYBURN *is cofounder and president of the Pacific Forest Trust, which is based in San Francisco, California. She was the Kingsbury Browne Fellow at the Lincoln Institute in 2009–2010. Her fellowship working paper on which this article is based,* Forests in United States Climate Policy: A Comprehensive Approach, *is available on the Web site (www.lincolninst.edu). Contact: lwayburn@pacificforest.org*

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