OVERVIEW: CATF'S FOREST & CLIMATE SYSTEMS PROGRAM

The Clean Air Task Force is dedicated to understanding and promoting climate and air quality benefits of forests. CATF seeks to promote policies and projects that maximize the climate benefits of existing forests, manage forests sustainably for climate change mitigation, and reduce harmful air pollution and urban heat island effects.

Source: Maine Forest Service.

Forests Provide a Range of Climate Benefits

Forests sequester roughly nine billion tons of CO_2 each year – but they impact climate change in a variety of other ways as well. CATF is working to advance science-based analyses of the various mechanisms by which forests affect climate.

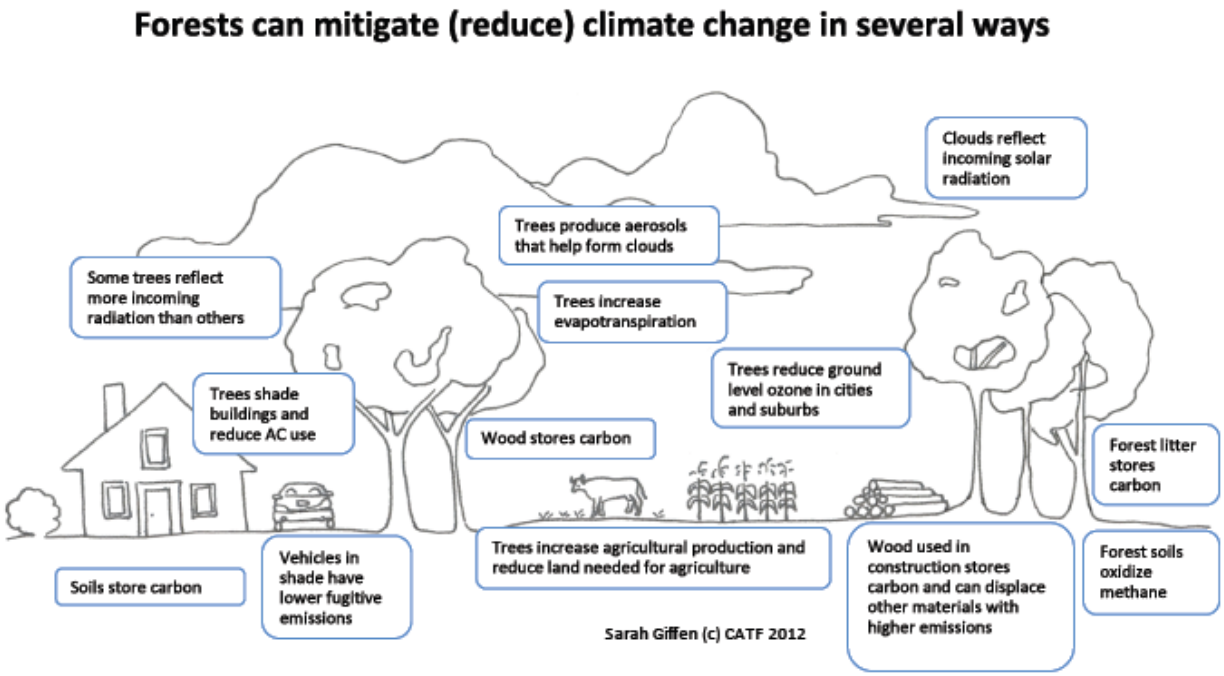
These include:

- Production of volatile organic compounds which form aerosols and contribute to the formation of clouds (and may lengthen their lives as well);
- Reduction of ground level ozone in urban and suburban environments;
- Oxidization of methane (a greenhouse gas over 20 times more potent than CO_2);
- Changing the reflectance of the earth's surface, thus influencing the amount of solar radiation that is absorbed and reemitted;
- Decreasing energy use in cities by lowering urban temperatures and shading or sheltering nearby buildings;
- Substitution of wood for other materials with higher lifecycle emissions of greenhouse gases;
- Influencing the productivity of agricultural activities.

Source: Maine Forest Service.

Forests are already mitigating climate change. For example, the amount of carbon stored in US forests is 25 times larger than US annual carbon emissions, and each year those forests sequester the approximate equivalent of 11% of US annual emissions. **While this existing**

function and others are almost universally taken for granted, they are not guaranteed and could be reduced either by land use changes or as a result of climate change itself. The drought, insect epidemics, and forest fires in the Intermountain West show how forests can transition from reducing climate change by sequestering carbon to exacerbating it.

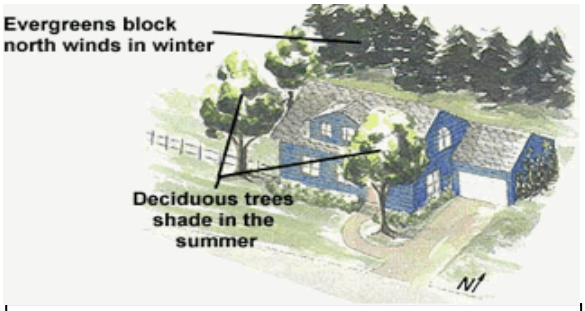


Beyond the important effort to maintain existing functions, forests have the capacity to reduce climate change further. For example, the results from the analysis by Pan, et al. (2011) shows that eliminating tropical deforestation could result in forests sequestering approximately half of global anthropogenic emissions of CO_2. Nair and Nair (2003) estimated that if agroforestry practices were expanded to suitable areas in the US, by 2025 agroforestry could sequester an estimated 90 Mt of carbon per year in soils and biomass (99 million US tons of carbon per year).

Urban forestry experts have demonstrated that trees in urban and suburban areas can dramatically reduce energy consumption for air conditioning and reduce particulate matter and other air pollutants. These are but a few of the several ways that forests can reduce climate change while also improving air quality.

However, the interactions between forest influences and other factors which affect climate are complex, and our knowledge on a number of topics is incomplete. Because scientists advise that we need to take action that can stabilize and then reduce GHG levels as soon as possible, and certainly within the next two to three decades, **the challenge is to determine what can be done now that will be effective in reducing climate change** while more complete information is developed on topics where our knowledge is imperfect.

CATF Action



Source: Maryland Department of Natural Resources.

CATF is engaged on this topic and has developed detailed recommendations on the sources and uses of biomass fuels in the northeastern US that will reduce greenhouse gas levels within the next 20-30 years (as well as over longer timescales). Previous discussions of this topic have for the most part been greatly oversimplified, with proponents of using biomass arguing that emissions from burning biomass should not count when calculating net effects while opponents assert that burning wood is worse than burning coal. Neither position is either entirely true or entirely false – the climate value of biomass depends upon the types of biomass fuels used and the uses to which they are put. Policy-makers, forest managers and environmental groups struggle to sort out these conflicting claims. CATF researched the issue extensively and developed an analysis that is summarized in the following table.

Overview of sources and uses of woody biomass in the northeastern US that may be presumed to reduce global warming within 20-30 years (Note that the two columns are largely independent of one another; that is, except where specifically noted, a particular source does not need to be used for the use with the corresponding number – so, fuel source #1 could be used for any of the purposes identified and still yield benefits within 20-30 years although pairing fuel source #1 with use #1 would maximize benefits)

Maximum reductions in GHGs	Sources of Biomass Fuel	Use Displaced	Maximum reductions in GHGs
	1) Wood that would otherwise be burned to dispose of it, e.g., wood from land clearing and some qualifying fire hazard reduction operations	1) Heating with oil (includes thermally led CHP that displaces oil)	
	2) Wood from qualifying biomass plantations	2) Generating electricity with coal	
	3) Wood that would otherwise be left to decompose, e.g., slash from logging operations	3) Heating with natural gas	
	4) Potentially whole tree chips from decadent stands which are replaced with fast growing species and used to displace oil heat	4) Generating electricity with natural gas provided that the biomass fuel is from Source 1 or 2 above	
Lesser reductions in GHGs			**Lesser reductions in GHGs**

The conclusions regarding climate-beneficial uses of biomass fuels (the right-hand column) are based on conditions generally prevalent in the northeastern portion of the US. For areas of the world with faster rates of forest growth, chips from trees harvested strictly for biomass fuels may prove beneficial for a broader list of uses. In areas with slower growth rates, there may be no possibility that using such chips even to displace oil in thermal applications will reduce GHG levels within 20 to 30 years.

In the longer term, sustained yield forestry ensures that using biomass to substitute for fossil fuels will yield GHG benefits. As the Intergovernmental Panel on Climate Change stated in a report:

> "In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber, or energy from the forest, will generate the largest sustained mitigation benefit." (http://www.ipcc.ch/ipccreports/ar4-wg3.htm).

Climate benefits will be maximized when energy is produced from biomass residues that are the byproduct of sustained yield forestry operations, and when those operations harvest timber for long-lived wood products.

CATF is also analyzing other ways that forests influence climate as well as the interactions among factors, so that combined effects of all forest influences within a region are clearly understood.

In addition, work is also needed to determine how to integrate these findings into practice, including urban forestry, agroforestry, and forest management to produce timber.

CATF intends for its actions to promote sustainable forest management – a set of principles and practices that define the bounds of responsible forestry and call attention to environmental, economic, and social values. For temperate and boreal forests, sustainable forest management has been defined through the Montreal Process, a set of principles endorsed by the US and eleven other countries that calls for actively managing forests in ways that further the three legs of the sustainability stool. Under this approach, it is not enough to simply serve economic, social, or environmental objectives; rather, management must concurrently serve all three. This does not mean that every acre must be harvested or alternatively preserved in its natural state, but rather that every acre should serve a purpose in meeting the three objectives of sustainable management, and that the combination of activities across the landscape should optimize the benefits for environmental, economic, and social conditions.

The results of the Montreal Process, which were endorsed by the US and 11 other nations through the Santiago Declaration, specifies what constitutes "sustainable" management in temperate forests. The topics covered include specifications for achieving the following:

Criterion 1 - Conservation of biological diversity
Criterion 2 - Maintenance of productive capacity of forest ecosystems
Criterion 3 - Maintenance of forest ecosystem health and vitality
Criterion 4 - Conservation and maintenance of soil and water resources
Criterion 5 - Maintenance of forest contribution to global carbon cycles
Criterion 6 - Maintenance and enhancement of long-term multiple socio- economic benefits to meet the needs of societies
Criterion 7 - Legal, policy and institutional

After an extensive search of the literature and discussions with academics, CATF has concluded that while there is a great deal of basic research and modeling of individual forest influences being conducted, the work of synthesizing the results with a focus on climate benefits, particularly in a way useful to decision makers, is not being effectively accomplished. For example, to our surprise the effects of agroforestry practices and urban forestry practices on climate change – beyond local microclimates – remain largely unexplored.

CATF is uniquely positioned to contribute to this effort because it is:

- Primarily focused on climate issues and related energy policy.
- Committed to following the facts and the best scientific information wherever it leads, even if it contradicts conventional wisdom.
- Known for finding creative solutions to complex problems.
- Experienced at synthesizing information for decision makers and bringing scientists together to contribute to this effort.
- Staffed with experts who are uniquely qualified to contribute to this effort, including R. Alec Giffen, a forest ecologist and former Director of the Maine Forest Service; Jonathan Lewis, an attorney with extensive experience on issues related to bieonergy and public policy; and Ann Gosline, an attorney with a special interest in urban and agroforestry issues.

Source: Maine Forest Service.

For a presentation on forests and climate systems, please see http://www.catf.us/resources/presentations/files/Forestry_and_Climate_Systems.pdf and for a more complete description of the CATF Forestry and Climate Systems Program, please see http://www.catf.us/climate/land_use_and_bioenergy/forests/CATF_Forestry_and_Climate_Systems_Program.pdf.