March 5, 2012 [address of Dr Mel Tyree revised March 21, 2012]

EPA Scientific Advisory Board (SAB) Biogenic Carbon Emissions Panel
c/o Dr. Holly Stallworth
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Re: Comments on The SAF Task Force Report *Managing Forests because Carbon Matters*

Dear EPA SAB Biogenic Carbon Emissions Panel:

The SAF Task Force Report *Managing Forests because Carbon Matters: Integrating Energy, Products, and Land Management Policy* (Malmsheimer et al. 2011) (hereafter Report) was prepared to influence decision making by policy makers. Although the Panel is not making policy, you are evaluating the scientific basis of the EPA Framework for biogenic carbon accounting, which in turn will inform policy. Presumably, this scientific review includes the Report, on which we would therefore like to comment.

The Report recognizes the role of forest management in mitigating climate change by increasing carbon storage and reducing carbon emissions. We agree with the Report that (i) US energy and environmental policy should be linked, (ii) keeping forests as forests is a primary strategy, and (iii) using wood for products and energy may sometimes help to reduce overall greenhouse gas emissions.

However, the Report's four premises make very broad assertions about the effects of wood use on forest carbon and hence on the atmosphere. These premises will hold only in special circumstances so policies that assume universal applicability may not have the intended effect. Premises 2 and 4, in particular, make general assertions about the climate benefits of wood-based bioenergy that bear closer scrutiny.

Premise 2. *Energy produced from forest biomass returns to the atmosphere carbon that plants absorbed in the relatively recent past; it essentially results in no net release of carbon as long as overall forest inventories are stable or increasing (as is the case with US forests).*

Forest inventories in the US have increased only in recent decades. Until 1950, US forests were net carbon emitters from timber harvest and land clearing, and forest-related anthropogenic emissions substantially exceeded (1.6-fold) those from fossil fuel combustion (Birdsey et al. 2006, Boden et al. 2011). A portion of those historic forest emissions persists in the atmosphere today, and some will linger for thousands of years. (Archer et al. 2009).

The "carbon debt and dividend" concepts introduced by Fargione et al. (2008) and the Manomet study (Walker et al. 2010) offer a helpful framework for assessing net emissions and sequestration over time. From a 1950 reference point, we may conclude that today's US forests have an accrued carbon dividend (Strauss 2011), but if the assessment begins earlier we see substantial unpaid debt. As recovering US forests continue to repay past carbon debts, it is insufficient to merely balance today's biogenic emissions with concurrent absorption, given the unprecedented high atmospheric CO_2 concentrations (IPCC 2007).

The time course of carbon release and reabsorption also matters. Contrary to the Report's static definitions of carbon neutrality (Table 5-7), the process of achieving carbon flux neutrality often extends over many decades (Zanchi et al. 2010, Cherubini et al. 2011, McKechnie et al. 2011).

As energy demand and associated emissions rise, delays of several decades in offsetting emissions are likely critical, due to the proximity of climate thresholds that could trigger rapid and irreversible warming (IPCC 2007, Allen et al. 2009, IEA 2011). The Alaskan spruce bark beetle outbreak exemplifies a climate-induced, ecological threshold crossing (CCSP 2009).

In addition to temporal considerations, choice of spatial extent and baseline also influence conclusions about net carbon emissions from wood energy. The Report favors a landscape over a stand-level approach, but defines landscape as both "wood supply area" (pp. S31-32) and "US forests" (Premise 2). A landscape definition that includes all forests in a region or nation allows forest carbon increases outside the bioenergy woodshed to mask reductions on lands providing the feedstock. Such an approach would fail to identify actual climate effects arising from increased bioenergy use.

These *ex*-woodshed forest carbon increases would net out if they were present in both the without-biomass baseline and the with-biomass scenario. However, the Report apparently favors current forest carbon stocks as a fixed baseline. Assessment of near-term climate impacts requires knowing whether "growth and harvesting of the biomass for energy captures carbon above and beyond what would be sequestered anyway" (Searchinger et al. 2009, p. 527). The European Environment Agency accepted this view (EEA 2011) because only this type of management can generate additional forest growth to offset biogenic emissions.

Premise 4: *Fossil fuel–produced energy releases carbon into the atmosphere that has resided in the Earth for millions of years; forest biomass–based energy uses far less of the carbon stored in the Earth thereby reducing the flow of fossil fuel–based carbon emissions to the atmosphere.*

This statement is true but irrelevant to avoiding a tipping point in atmospheric carbon if fossil carbon stocks are maintained at the expense of carbon stored by plants and soils. Wood combustion typically releases more CO_2 per unit energy produced than fossil fuels at the stack (Walker et al. 2010), and fossil and biogenic CO_2 have identical atmospheric effects. Thus, maintaining forest carbon stocks is no less important than keeping fossil fuels in the ground.

Many US forests have the capacity to continue serving as an active sink for decades more (Rhemtulla et al. 2009, Bisbing et al. 2010, Hoover and Heath 2011). Benefits from maintaining the forest sink often exceed those from substituting bioenergy for fossil fuels (Harmon et al. 1990, McKinley et al. 2011) even in most fire-prone, western forests (Hudiburg et al. 2011). Given the small fossil fuel reductions achieved by use of biofuels, promoting forest carbon sequestration may be a superior strategy (Jaeger and Egelkraut 2011).

It is possible to increase forest carbon stocks while also generating bioenergy (and products) (Gutrich and Howarth 2007, Hennigar et al 2008, Nunery and Keeton 2010). Such management should explicitly balance emissions against sequestration in source forests, rather than assuming that emissions are zero whenever regional inventories are stable.

A realistic assessment of the impact of biomass utilization on forest sinks can help to prioritize feedstock with the least net emissions. One already clear observation is that mill and

logging residues have a lower global warming potential than expanded forest thinnings, because residues would quickly decompose anyway (Walker et al. 2010, Zanchi et al. 2010). These benefits are contingent on protection of residual stands, soils, and dead wood pools to maintain ecosystem function (Forest Guild Biomass Working Group 2010).

Forests can play an important role in climate change mitigation, and emerging research is helping us to better understand applicable constraints. By asserting that carbon emissions from wood energy are neutral with respect to global warming potential whenever national or regional forest stocks are stable, and that fossil fuel emissions and biogenic emissions have qualitatively different climate impacts, the Report oversimplifies a very complex topic. This could mislead forest managers and policy makers about the conditions under which wood-based energy can help mitigate climate change.

Sincerely,

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