The Status of Science on Forest Carbon Management to Mitigate Climate Change (June 1, 2020)

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Forest Carbon and Climate Change

1. To keep climate and temperatures within a safe range, it is necessary to simultaneously **reduce emissions** of greenhouse gases from all sources, including fossil fuels and bioenergy, and **accelerate storage** of atmospheric carbon in forests, soils and other plant-based systems. To prevent the most serious consequences of climate change, removals of atmospheric carbon dioxide must equal additions no later than 2050, and must not exceed emissions after that (IPCC 2018, 2019).

2. *Increasing cumulative carbon in forests is essential for keeping carbon dioxide out of the atmosphere.* It has been found world-wide that forests hold half of the carbon in the largest 1% diameter trees (Lutz et al, 2018), and can store twice the carbon they do now (Erb et al. 2018). Increasing forest reserves and allowing forests to meet their ecological carbon storage potential (proforestation) are the most effective climate mitigation strategies (Law et al. 2018; Moomaw et al 2019). Letting forests grow and halting land conversions would bring carbon dioxide removal rates closer to current emission rates globally (Houghton and Nassikas, 2018).

3. *Increased harvesting of forests for wood products and burning wood for bioenergy adds more carbon dioxide to the atmosphere than growing secondary forests and protecting older forests.* It takes at least 100 to 350+ years to restore carbon in forests degraded by logging (Law et al. 2018, Hudiburg et al. 2009). If we are to prevent the most serious consequences of climate change, we need to keep carbon in the forests because we don't have time to regain it once the forest is logged (IPCC, 2018).

4. *We have to get the Carbon accounting right*:
   a. It is essential that independent carbon cycle experts provide analysis for federal policy decisions. *65% of the forest carbon removed by logging Oregon's forests in the past 115 years has been returned to the atmosphere,* just 19% is stored in long-lived products and 16% is in landfills (Hudiburg et al. 2019). Half of harvested carbon is emitted to the atmosphere almost immediately after logging (Harmon, 2019). Increased harvesting of forests does not provide climate change mitigation.
   b. *Context of forest carbon emission sources* - Harvest is the major source of forest emissions in the US. Across the lower 48 states, direct harvest-related emissions are 7.6 times higher than all-natural disturbances (e.g., fire, insects) combined (Harris et al. 2016). In the West Coast states (OR, CA, WA), harvest-related emissions average 5 times fire emissions for the three states combined (Hudiburg et al. 2019).
   c. *There is absolutely no evidence that thinning forests increases biomass stored (Zhou et al. 2013).* It takes decades to centuries for carbon to accumulate in forest vegetation and soils (Sun et al. 2004, Hudiburg et al. 2009, Schlesinger 2018), and it takes decades to centuries for dead wood to decompose. We must preserve medium to high biomass (carbon-dense) forest not only because of their carbon potential but also because they have the greatest biodiversity of forest species (Krankina et al. 2014, Buotte et al. 2019, 2020).
   d. Burning wood for energy produces as much or more emissions as burning coal, so it is not an effective climate mitigation solution (Law et al. 2018, Hudiburg et al. 2011, 2019, Sterman et al. 2018). It always takes

longer for the forest to regrow and recover all of the carbon released than the age of the forest that was harvested (Schlesinger 2018). It is incorrect to describe burning of wood for energy as *carbon neutral*, because it increases carbon emissions now, when we can least afford such increases to the atmosphere. Alternatively, if the original trees continued to grow, without logging, there would be more than twice as much carbon in the trees and that much less in the atmosphere.

e. Especially troubling is the export of woodchips from deciduous forests in the Southeastern USA to Europe. These forests are rich in biodiversity. They have taken many decades to grow, constitute a large standing crop of carbon, and one that will also take many decades to recover.
f. Building or converting a power facility to use beetle and fire-killed trees ("salvage logging") immediately releases CO_2 to the atmosphere while causing severe damage to wildlife habitat (DellaSala and Hanson 2015) and soils. Once the dead trees have been burned, harvesting live trees would be required to sustain the supply needed to run the facility. This will not keep carbon out of the atmosphere.

Proposed Solutions

To address climate, biodiversity and additional ecosystem service needs, we propose designating carbon reserves on both public and private lands, and concentrating forest product production on specified timberlands - a two-track solution.

The current system where most *forestlands* are available for logging keeps too many trees at a smaller size that do not store much carbon. Providing incentives to lengthen rotation harvest cycles will increase carbon storage in production forests, and reduce atmospheric carbon dioxide.

Forest carbon accounting and verification should be done as part of climate and forest policy implementation and in Environmental Impact Analysis by independent groups of scientists with carbon accounting expertise following life cycle assessment protocols (Hudiburg et al. 2019).

Aligning policies with climate goals is essential. Rescind the requirement that all federal agencies treat forest bioenergy as carbon neutral if it comes from sustainably managed forests and remove subsidies for bioenergy facilities. ‘Sustainable forest management’ refers only to maintaining harvested biomass at or below the rate of annual growth. It does not maximize accumulated forest carbon storage or maintain full biodiversity and other ecosystem services.. The US government should re-engage in the Paris Climate Agreement by enhancing and maintaining natural carbon sinks.

Proposals for Federal Forest Lands

How can public lands policy be improved to help meet climate goals?

1. Establish Federal Forest Carbon Reserves on public forestlands with moderate to high carbon density potential. Old growth forests and roadless areas on public lands should be included in a federal carbon reserve. For example, the Tongass National Forest in Alaska contains approximately 10% of all carbon stored in US forests (USFS, 2020). The carbon stored in 9.2 million acres of at-risk roadless areas on the Tongass has a potential value of at least $234 million in future carbon markets, which exceeds the one-time timber value by orders of magnitude (DellaSala and Burma, 2020). Protecting more public lands from logging benefits private landowners by reducing competition for lower cost timber on public lands.
2. Redirect the billions of dollars currently being spent annually on harvesting public forestlands into a green jobs program to help communities become more fire-safe. Enhance the Youth Conservation Corps and/or establish a CCC. For example, the corps could work with independent expert groups to quantify and verify forest carbon on federal and private lands, help with fire-planning in communities via defensible space and home hardening, monitor forest usage and roadside idling during peak fire season, and remove old timber roadbeds that are impacting watersheds.

Proposals for Private Lands

How do we help communities that have become reliant on forests while reaching the goal of successful climate mitigation?

1. Rural counties with higher proportions of protected public lands that emphasize tourism and recreation have higher per capita incomes and more jobs than those that rely on logging (Rasker 2017). Enhance eco-friendly tourism and recreation in the vicinity of national forests and parks.
2. The USFS found in a survey that most private non-industrial land owners do not really want to cut their timber, but have to for financial reasons (USFS 2016). Forest Carbon Reserves on non-industrial private lands could be encouraged by providing incentives (subsidies, health care or tax abatements) to private land owners to manage for increased carbon storage.
3. Carbon offsets programs for landowners. A carbon offsets program has been demonstrated in California using private lands across the country (Anderson et al. 2017), and a California-type offsets program has been demonstrated to be feasible and sustainable for forest lands within Oregon (Law et al. 2018) and Alaska (e.g., Sealaska Native Corporation carbon transaction).

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