Data Submitted (UTC 11): 4/8/2024 4:00:00 AM
First name: J. William
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Comments: Dear Sirs,

Please accept the attached comment concerning carbon flows and stocks connected with the proposed Telephone Gap Integrated Resource Project.

Sincerely,

J. William Stubblefield

My comments concern carbon flows and stocks in forests in general and in the GMNF in particular as described in the The Preliminary Environmental Assessment (PEA) and the updated Forest Carbon Assessment (CFA 2024) for the Telephone Gap Project, and, most importantly, the carbon flows between forest and atmosphere that are of vital importance for addressing the worsening climate emergency.

Terminology:

The CFA 2024 and the PEA employ a confusing set of definitions relating to forest carbon stocks and flows that hinder understanding and sometimes work at cross purposes. Rather than trying to resolve this tangled mix of definitions, I use the following terminology:

Carbon stocks are the amounts of carbon contain in various reservoirs or pools at a given time, and carbon flows are transfers of carbon from one pool to another. Stocks are measured in units of mass, and flows are measured in units of mass per unit time; sometimes stocks or flows are given per unit area. For a given forest, what matters for the climate is the average long-term forest carbon stock summed over all carbon reservoirs or pools within the forest comprised of living and dead biomass above and below ground as well as any free carbon that may be present. This forest carbon stock and the atmosphere are engaged in a dynamic interchange with carbon moving in both directions. Carbon moves into the forest via photosynthesis and moves out of the forest through a variety processes, which include respiration by living cells in plants, animals, and all other organisms (including decay organisms,) as well as losses from disturbance such as fire, storms, deforestation or harvest, together with much smaller flows of organic materials carried away by air or water. Respiration refers to the metabolic breakdown of food molecules to release energy for biological processes. For most organisms, respiration produces CO2, but some microorganisms produce methane instead when no oxygen is available.

Carbon sequestration occurs when carbon input exceeds carbon output so that the average forest carbon stock increases over a significant period of time; carbon sequestration is the same as accumulating or storing carbon in a carbon sink. For those of us concerned with the future of civilization, however, a significant period of time is very long time indeed (Archer et al. 2009, Solomon et al. 2009). The brutal fact is that our long-term climate future is dominated by the total amount of carbon dioxide added to the atmosphere during the fossil-energy era, and it doesn[rsquo]t make very much difference whether it[rsquo]s added now or a decade from now, and plenty of disruption is already baked in. It is now abundantly clear (IPCC 2023) that it is not only necessary to dramatically reduce fossil carbon emissions into the atmosphere but also to remove enormous quantities of carbon from the atmosphere if we are to avoid a grim future of increasingly dangerous and long-lasting climate disruption.

Most so-called [ldquo]climate-smart[rdquo] forestry practices, such as non-commercial thinning, longer intervals between harvests, and more durable wood products do nothing more than shift the time when CO2 is released into the atmosphere by a few decades at most with little effect on climate change. That is why some are proposing and getting funding to harvest wood and lock it away in [ldquo]wood vaults[rdquo] (Zeng & Hausmann 2022) in what seems to be an act of desperation. More viable options, such as wildland forest reserves and reduced consumption of wood products are gaining traction, even among foresters (Littlefield et al. 2024), and reserve expansion should be a policy priority in all national forests. Many of us, myself included, love the warm and wonderful beauty of wood, but wood is a finite resource and must be recognized as such. The only reliable way to keep more carbon in forests is also the most obvious: reduce the removal of carbon from forests.

Growth and Mortality of Trees and Forests

Recent years have seen a growing body of scientific evidence showing that forests add more and more carbon as they age and continue to do so for centuries (Zhou et al. 2006, Luyssaert et al. 2008, Keeton et al. 2011, Pan et al. 2014, Curtis & Gough 2018, Leverett et al. 2021, Law et al. 2022, Birdsey et al. 2023). There is also evidence that many trees grow faster as they age (Stephenson et al. 2014), as suggested by metabolic scaling theory (Enquist et al. 1999, Enquist et al. 2009), and it is not surprising that carbon is concentrated in the largest trees in forests around the world, with the largest 1% containing 38% of total tree biomass in temperate plots studied by Lutz et al. (2018). These finding show that there is significant potential to store much more carbon in forests over decades and centuries, especially in mature and old forests, if they are allowed to continue growing and conditions don[rsquo]t change too much.

The fact that every living thing is certain to die eventually doesn[rsquo]t mean that the probability of doing so increases with age, although that is the case for our pets and ourselves. The process of increasing mortality risk with age is called senescence, but not all organisms senesce, and many tree species may l be examples of organisms in which the probability of death remains essentially constant or even increases once a certain size or age is reached (Bauditsch 2008). In any event, there is no foundation in ecological science for the notion that forests become tired and decrepit with age and need some [ldquo]chainsaw medicine[rdquo] to keep them vibrant and healthy, even though foresters often suggest as much.

Indeed the very opposite may be true; the longer conditions allow forests to persist, the more richly connected, diverse, and resilient they become. This is a venerable idea in ecology that is gaining both empirical and theoretical support (e.g. Hatton et al. 2024).

Thresholds of Concern:

Two broad issues related to forest carbon are listed in Table 3.7 (PEA, pp. 59-60) along with their [ldquo]thresholds of concern.[rdquo] The first is that [ldquo]Timber harvesting of forested stands, especially with mature or late successional forest attributes, may [actually, will] reduce GMNF forest[rsquo]s ability to sequester carbon and mitigate greenhouse gas emissions.[rdquo] One threshold of concern is that [ldquo]Level of carbon loss results in GMNF to shift from a carbon sink to a carbon source.[rdquo] Really? We need be concerned only when the entire GMNF shifts from sink to source? Obviously, significant harm to sequestration capacity occurs long before the arrival of such an extreme situation, and arguably well before the other stated threshold: [ldquo]Level of carbon removed if allowable sale quantity harvested is realized.[rdquo]

The second issue focuses on emissions: [ldquo]Harvest of trees and prescribed fire will increase carbon emitted into the atmosphere.[rdquo] And the thresholds of concern are that emission levels have [ldquo]a measurable adverse effect[rdquo] or exceed [ldquo]the amount emitted if an [ldquo]allowable sale quantity harvest is realized,[rdquo] with the ASQ amounting to 19.7 million board feet per year based on the outdated Forest Plan of 2006, which didn[rsquo]t even mention carbon sequestration. Harvesting between 143,992 metric tons (Alternative D) and 213,401 metric tons (Alternative B) of carbon dioxide equivalent (to say nothing of the risible

2,202,244 metric tons of the 15-year total ASQ considered reasonable by the outdated Forest Plan) as listed in Table 3.10, the great bulk of which end up in the atmosphere over the next few decades, certainly looks like a significant environmental impact.

Estimating the size of this impact, or the [ldquo]social cost of carbon[rdquo] (SCC) is fraught with complications and depends on how much value is placed on future generations. In 2020, New York adopted an estimate of $125 per metric ton of CO2 released into the atmosphere, and this is likely a serious underestimate. A comprehensive analysis reported in Nature suggested a value of $185 (Rennert et al. 2022), and this is similar to estimates accepted by the federal government (EPA 2023). The SCC, of course, continues to increase over time as carbon emissions grow and more potential future harms are realized. Whichever estimate we may choose, we are talking about tens of millions of dollars, if not more. Surely, this is a [ldquo]measurable adverse effect[rdquo] and of considerable significance. Only Alternative A with no harvest fails to exceed the threshold of concern, and should be the only acceptable alternative.

These concerns emphasize the need for an undated Forest Plan that is far more cognizant of the global climate emergency. They also provide another compelling reason for a full Environmental Impact Statement for the Telephone Gap Project.

Carbon in Harvested Wood Products:

Considerable emphasis is placed on the purported importance of carbon stored in harvested wood products (HWP). At any given time, of course, there is a large pool of carbon that is associated with humans, either in active use or in the waste stream, but the size of this HWP stock is always shrinking from fire or decay and only grows by removing more carbon from forests. The overall amount of carbon kept out of the atmosphere only increases when the replacement of harvested carbon in the donor forest exceeds the loss of carbon from fire and decay plus all the losses incurred during harvest and manufacture. Only a small fraction of harvested biomass ends up in the HWP pool. As shown in Table 3-10 (PEA p. 63), the amount of carbon estimated to still be present in the HWP pool after 100 years under current conditions is subtracted from total harvest quantities to obtain [ldquo]net harvest emissions.[rdquo] But this makes little sense because the 100 year cut off date is entirely arbitrary and meaningless as far as the climate is concerned. Moreover, conditions certainly won[rsquo]t remain the same. Higher temperatures and larger and more frequent storms are both expected consequences of climate change; the former will increase decay rates and the latter will increase the rate at which wood must be replaced.

Pro-logging groups often speak of the potential of increasing the average durability or residence time of carbon in the HWP as a means of climate mitigation, but even if average durability is increased by an optimistic few decades there would still be little effect on the climate. It[rsquo]s rather like moving money from a fund that is always growing to one that is always shrinking in the hope that leaving it in there longer will overcome the losses. The struggle for a stabilized climate is a long term one and not a once-and-done deal of meeting some particular goal, such as net-zero by 2050 or the size of the HWP pool in a hundred years, and then getting back to normal. The total amount of carbon dioxide released during the fossil-energy era must be kept to a minimum. The world[rsquo]s forests can help if we set aside sizable areas as permanent climate reserves (Law et al. 2022).

Another argument for increasing the size of the HWP pool is that wood could, in principle at least, substitute for more carbon intensive materials, such as steel or cement. Leaving aside the potential for reducing the carbon costs of producing steel and cement, there is little reliable evidence that increased wood usage would actually displace rather than supplement alternative materials. In any event, the issue of substitution has been a controversial one beset with inflated claims of high displacement factors that fail to survive close scrutiny, see Leturcq (2020) on the [ldquo]Myth of Substitution.[rdquo] Here, as elsewhere, there is no mention of literature expressing views that run counter to those advanced in in the Telephone Gap documents.

Foregone Sequestration:

The section on [ldquo]Lost Growth Potential[rdquo] (PEA, p. 64) raises additional concerns and more confusion. Noting that the proposed harvest methods are mostly [ldquo]selective uneven-aged or thinning (81 to 95 percent of total treatments),[rdquo] it is then concluded that [ldquo]Past studies in similar hardwood-dominated forests in the northeastern U.S. indicate thinning may have little to no effect on net primary productivity or even increase carbon accrual compared to un-thinned stands,[rdquo] citing Hoover and Stout (2007) in support. What is not mentioned is that this study showed only that no thinning or non- commercial thinning narrowly focused on the removal of the smallest trees showed a significant increase in net primary productivity, while any thinning that included removal of merchantable timber (as is overwhelmingly the case in the Telephone Gap Project) showed no significant increase or an actual decrease over the 25-year course of the study. Trees remaining after a harvest may show a burst of new growth as a result of more light or water, but the removal of large trees leaves a carbon stock deficit that may require decades to replace. It may be further noted that trees surviving a thinning event are likely to suffer increased mortality because of higher wind velocities and greater fire risk in more open forests.

As shown in table 3-10 (PEA, p. 63), estimated foregone sequestration over 20 years are reported as 41,474, 36,793, and 27,240 metric tons of carbon dioxide for Alternatives B, C, and D, respectively, compared to the no-harvest Alternative A. These are serious underestimates. Twenty years is really [ldquo]short-term[rdquo] compared to the decades or even centuries required to restore the carbon stock to pre- harvest levels, but rather than estimate foregone sequestration over much longer and more reasonable time frames, it is claimed that [ldquo]Over the long-term (50 to 100 years) timber harvesting (including clearcutting) does not typically have negative effects on total carbon storage,[rdquo] citing Davis et al. (2009) and Nunery and Keeton (2010) to this effect. First note that [ldquo]50 to 100 years[rdquo] is certainly not [ldquo]long- term[rdquo] where forests and their effects on the climate are concerned since many trees can survive for centuries, and forests are potentially everlasting. Note also that the Nunery and Keeton study actually shows the opposite: unharvested forests continued to add carbon over the entire 160 years of the reported simulation while accumulating much more carbon as any of the wide variety of alternative logging regimes considered. Finally, the study by Davis et al. doesn[rsquo]t actually show that timber harvesting usually has no effect on [ldquo]total carbon storage[rdquo] over [ldquo]50 to 100 years.[rdquo] The Davis et al. study is based on Net Primary Production (NPP) [ldquo]estimated as a biomass or C assimilation rate, i.e. photosynthesis minus autotrophic [plant] respiration (Ra)[hellip][rdquo] As such, NPP measures how fast a forest is adding biomass but tells us nothing about how big the carbon stock is, just as the interest rate on your savings account tells you how fast your current savings are growing but not the size of your account.

In terms of the climate, we are interested in how much carbon has accumulated in the forest and how much more could be added going forward. In mathematical terms, what matters is the cumulative carbon stock curve (as in Birdsey et al. 2023), that is, the size of the carbon stock over time, and NPP is the first derivative or slope of that curve which may be increasing or decreasing depending on carbon losses from all causes, including all respiration (and not just Ra,) as well as disturbances such as fire or storms and human activities of which deforestation and harvesting have been by far the most important during the 400 years since the European invasion. (Note that Figure 9 in the CFC 2024 purports to show Total Accumulated Carbon but actually shows a rate, i.e. the amount of carbon added each year. Carbon stocks increased every year since 1950 but the rate of increase peaked in the 1980s, according to this figure.) As already noted, what matters for the climate is the long term average size of the forest carbon stock.

Carbon Accounting across Managed and Unmanaged Lands:

Reference to carbon accumulation on unmanaged land to support logging on actively managed land is misleading and unfair. If we want to understand how logging affects carbon dynamics, we need to focus on actively managed lands themselves. Matched comparisons between passively managed and actively managed lands provide information about differences between the the two approaches, but mushing all lands together in order to [ldquo]provide context[rdquo] simply confuses matters. Something similar happens whenever Bill Gates walks into a room full of people [ndash] average wealth shoots up, but nobody is better off. In 2006, according to Appendix D of the outdated Forest Plan, there were roughly 190,000 acres of [ldquo]lands suitable or tentatively suitable for timber production,[rdquo] and our focus must be on these lands if we want to understand how active management has affected carbon dynamics. Aside from direct comparisons with passively managed land, what happens elsewhere is simply irrelevant.

This is a very common and widespread obfuscation (Mackey et al. 2022, Peng et al. 2023). Everything is fine as long as more wood or carbon is added by growth somewhere in the forest, whether it is under active management or not. This makes it look like logging is having a smaller effect on managed lands than it actually is. By this logic, I should be able to spend down my savings as long as the total of everyone[rsquo]s savings increases even more.

Conclusion:

The discussions of carbon flows and stocks in the PEA and CFC 2024 documents are unnecessarily sloppy, repetitive, convoluted, confusing, and difficult to understand. They reveal too much inside- forestry group think and too little engagement with scientific literature outside of the forestry bubble, especially in terms of ecology and climate science. Most importantly, there is an overall failure to fully grasp and deal with the implications of global climate disruption for current and future forest management. There is a clear and present need for an updated Forest Plan that fully incorporates current understanding of ecology and climate science before further treatments are planned or approved. Ideally, the Telephone Gap Project would be postponed until after such a plan was developed, otherwise the inadequate PEA should be abandoned in favor of a comprehensive Environmental Impact Statement.

Underlying everything is the assumption that wood production is by far the most important benefit forests provide. This mostly unspoken assumption has been fundamental to US Forest Service policy since its founding in 1905 under the leadership of Gifford Pinchot who believed that America[rsquo]s forests were so vast and productive that, under careful management, they could provide all the wood products the nation could ever need. Pinchot[rsquo]s stirring words [ndash] [ldquo]the greatest good to the greatest number for the longest time[rdquo] [ndash] first uttered more than a century ago are still inspiring today, but they must be understood in the context of the biophysical realities we now face. Pinchot[rsquo]s cornucopian vision must be tempered by the recognition that forests are a limited resource that must serve many needs extending far beyond wood products. Now, more than ever, our forests are needed to address the present and growing crises of climate disruption and biodiversity decline by protecting more of them so they can get on with their essential work of storing carbon and supporting biodiversity.

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