VNRC
VERMONT NATURAL RESOURCES COUNCIL

Audubon
VERMONT

April 8, 2024

Christopher Mattrick
Rochester District Ranger
Green Mountain National Forest
99 Ranger Road
Rochester, Vermont 05767

Dear Chris:

Please accept the following comments from the Vermont Natural Resources Council (VNRC), Audubon Vermont, and Dr. Bill Keeton on the Preliminary Environmental Assessment (EA) and Opportunity to Comment for the Telephone Gap Integrated Resource Project (Telephone Gap IRP) within the Green Mountain National Forest (GMNF), Rochester, and Middlebury Ranger Districts.[1]

Audubon Vermont (Audubon) is a state program of the National Audubon Society, a nonprofit organization with a mission of protecting birds and conserving the places birds (and people) need to thrive. VNRC is a nonprofit organization working to protect and enhance Vermont's natural environment, sustainable working landscapes, and rural character. Dr. Keeton is Professor at the University of Vermont and his research foci include forest carbon management, climate change impacts on forest ecosystems, ecologically-based silvicultural systems, structure and function of old-growth and riparian forests, natural disturbance ecology, restoration ecology, forest biodiversity, and sustainable forest management policy and practice in the U.S. and internationally.

Our collective interests in the Telephone Gap IRP are to promote forest management practices to optimize benefits for biodiversity, wildlife habitat, climate resilience, carbon storage, natural resource and water quality protection, and the public's use and enjoyment of the GMNF, including sustainable recreation and procurement of local forest products.

We have a shared interest in implementing the Forest Plan and we greatly appreciate that the Forest Service has included several alternatives (Alternatives C and D) based on the comments that we

[1] These comments were developed with the valuable assistance of Tim Duclos of Audubon Vermont, Karina Dailey of the Vermont Natural Resources Council, and Dr. William Keeton, Professor of Forest Ecology and Forestry at the University of Vermont. Special appreciation is also given to Craig Howie, VNRC Legal and Policy Intern.

submitted along with other interested members of the public. These alternatives provide the benefits and effects of a diverse spectrum of management options, including promoting ecological forestry and diverse management goals while protecting and recruiting late-successional/old-growth forests for late seral habitat conditions, diverse age class representation, and resilient forests that can provide carbon storage, while meeting other forest plan objectives.

This Integrated Resource Project offers an exciting opportunity for the Forest Service to balance timber harvesting and the co-benefits of providing wood products for the local and regional economies, while enhancing forest health and diversity through ecological forestry management. Moreover, this project provides an exciting, perhaps first in nation opportunity, to implement a "triad approach" to mitigate greenhouse gas emissions and to demonstrate how to protect old growth forests and enhance and retain structurally and biologically diverse forests that support late successional forest characteristics that are resilient to climate change and offer increased biodiversity and ecosystem services. We hope the following comments are helpful and will inform the development of the final decision on the Telephone Gap IRP EA.

## **Detailed Comments**

Alternative C is the alternative that tracks most closely to the recommendations that we provided during the scoping period. We commend the Forest Service for taking a very hard look at our scoping comments, and for having detailed discussions with our team, including Mr. Duclos and Dr. Keeton, to develop the underpinning of a suggested "triad approach" as documented in *Telephone Gap IRP Alternative Development Process Summary.* James Donahey, in particular, deserves much credit for his interest and involvement in developing the triad approach.

The Telephone Gap IRP includes a wide variety of forest and natural resources management activities that we support based on their ecological, social, and economic benefits.
Examples include late-successional forest enhancement, crown release/snag/down deadwood creation, climate-focused oak forest restoration and sustainability through prescribed burning, aspen/birch stand enhancement, conversion of plantations to site-endemic species compositions, enhancement of the coniferous component in mixed woods stands, stream barrier removal and steam crossing improvements, and trail system renovation and improvements.

In the scoping comments that we submitted in 2023, we recommended that the Forest Service develop an alternative that would offer diverse age-class management and timber harvesting opportunities, while balancing greater protection and recruitment potential for late-successional/old-growth forests and reducing overall harvesting extent and intensity in the project area. We recommended developing and applying a triad approach for stands greater than 80 years of age. This triad approach would utilize site productivity and stand structure/composition criteria to evaluate the developmental condition and potential of mature stands. Based on this evaluation, as well as a tradeoff analysis of timber production and habitat diversity goals, mature stands would be allocated to either commercial timber management (e.g., regeneration harvesting, commercial thinning), light silvicultural interventions that promote development of old-forest characteristics (Keeton et al. 2018) or fully-protected reserve inclusions.

Furthermore, we supported the development of an alternative that recognized the desire to manage for early seral forests while encouraging old, late-seral forest conditions as an important goal. Those goals would be aligned with the Vermont Conservation Design. We suggested there need not be a false dichotomy. Early and late seral forests are not mutually exclusive, and there should be an alternative that enhances both early seral and late habitats to levels commensurate with the stated goals of the forest plan while recognizing that late-seral habitats across managed landscapes (such as the diverse backcountry designation) complement and provide important connectivity and diverse forest representation beyond what is represented on Congressionally designated wilderness areas within the GMNF.

### **Implementing a Proposed "Triad" Model for Mature, Late-Mature, and Old-Growth Stands:**

We see an exceptional opportunity to demonstrate how management and safeguards for late-successional forests can be integrated into complex, multi-functional forest management planning such as the Telephone Gap IRP. Such demonstration would test and provide guidance for similar efforts across the nation as part of President Biden's call for a national inventory and protection strategy for late-successional and old-growth forests. It would be precent setting in terms of down-scaling and operationalizing the directives around old forest conservation and restoration currently under consideration by the Biden Administration/U.S. Forest Service for a National Forest Planning Amendment. Also, it would inform the current debate about how best to restore old forest conditions, demonstrating how active silvicultural approaches can complement passive conservation within integrated public lands management.

To achieve these goals, we proposed a three-prolonged strategy - or triad approach - consisting of three allocation categories: 1) fully protected reserve inclusions (sometimes called "forest aging areas"), 2) old forest recruitment stands, and 3) commercially managed mature stands.

A. Category One: The first category would have little or no silvicultural management, except in rare circumstances where activities like invasive species control and hazard tree removal are needed. In particular circumstances (rare in Vermont), prescribed burning also may be an appropriate management tool for certain fire-dependent natural communities. This category would apply to all stands currently >150 years old within the project area, as well as a subset of those late-mature stands (120 -150 years old) already exhibiting a high degree of structural complexity development.

B. Category Two: The second category would have the objective of providing the source stands from which old, high biomass, structurally complex forests will recruit over coming decades. Here low intensity silvicultural approaches specifically designed to promote old forest characteristics would be employed. This would be assigned to a significant proportion of stands in the 120 to 150 age range, as well as some in the 80 to 120 age range.

C. Category Three: The third category would emphasize commercial management objectives and would be applied primarily to stands in the 80 to 120 age range, although some in the 120 to 150 might also be classified in this way. This category might also encompass the various adaptive management approaches proposed for the Green Mountain and Finger Lakes National Forests.

In addition to Category One, we recommended an alternative in which the oldest forests within the proposed treatment areas – specifically those over 120 years old, which as a function of their age are most likely to currently exhibit old forest conditions—would be managed in ways that facilitate old forest characteristics and recruitment, either passively or actively (Zaino et al. 2018)

We recommended science-based guidance that tree age alone is not necessarily the definitive element by which superior forests for ecological value can be identified. (D'Amato and Cantanzaro 2022). We proposed that stands 80-120 years of age receive treatments that balance commercial management with approaches that facilitate old forest recruitment. Also, any stands greater than 80 years old should be evaluated for existing old forest attributes and strategies in these stands should be compatible with enhancing old forest characteristics, tailored to address stand-specific attributes that are lacking. (Keeton et al. 2018, D'Amato and Cantanzaro 2022).

In our scoping comments we also suggested harvest strategies that could be compatible with enhancing old forest characteristics, forest bird habitat, and carbon storage (Hagenbuch et al. 2011, Keeton 2006, Ford and Keeton 2017, D'Amato and Cantanzaro 2022), such as:

- Single-tree and group selections [0.1 to 0.5-acre openings with retention in larger openings]
- Irregular shelterwood method
- Variable-density thinning
- Crown release of dominant and co-dominant canopy trees
- Downed large woody debris retention and enhancement
- High levels of structural retention after regeneration harvesting
- Retention and recruitment of large diameter (>20" dbh) standing dead trees (snags)

**<u>Support for Alternative C (or D as Another Option) to Implement the Triad Approach</u>**

We are pleased to see the development of Alternative C in response to our recommendations. We feel that Alternative C represents a significantly improved approach to forest management over previous proposals. In essence, we see Alternative C as a robust and "good faith" attempt to apply the principles of ecological forest management (so called 'ecological forestry' or 'ecological silviculture'; Littlefield et al. 2024, Palik et al. 2020) that closes the gap between previously proposed management action and what current science tells us is necessary in terms of forest management to improve the health of forested ecosystems in the Northeastern U.S.

Alternative D mirrors Alternative C in many ways, but reduces the overall number of acres that would be harvested by reducing skid road distances and access to more remote stands. There would be positive results in the reduction of overall temporary road construction, less opportunity for the spread of invasive species, and less potential impacts to water quality, but there would trade offs in the ability to manage certain stands that have identified forest health issues. Since Alternative D incorporates many of the ecological forestry principles that we supported in our comments, we believe it is an acceptable alternative for selection; however, our comments will mostly focus on Alternative C since it tracks most closely with what we initially suggested to the Forest Service.

We support Alternative C, as opposed to Alternative B, because it involves fewer acres of proposed harvest treatments, greater retention of trees, and greater proportion of unharvested areas within stands, and it offers a reduction in commercial timber harvest treatments and involves greater focus on enhancing late successional forest conditions. Alternative C is also stronger because of its incorporation of explicit guidance for and land allocations to old forest restoration through development over time of forest structural complexity. This, together with protection of stands already exhibiting old forest characteristics, is consistent with forthcoming direction at the national level for management of the National Forest System. We commend the Forest Service for proposing both active (silvicultural) and passive approaches to late-successional forest enhancement. This includes the direction in Alternatives C to identify stands with the greatest potential to develop late successional structure, based on characteristics such as presence of trees older than 100 years, density of large-diameter trees, and evidence of multi-storied forest canopies, large diameter snags, and abundant downed wood.

We see this as a great and vital opportunity for the Forest Service to demonstrate the application of ecological forestry at scale and in ways that model an approach to forest management that seeks to restore complexity of forest structure and species composition to the Vermont landscape; for balanced benefits towards biodiversity, climate change resiliency, carbon sequestration and storage, and supporting the procurement of local forest products.

Specifically, we wish to commend the following proposed actions captured in Alternative C on the basis that these changes stand to result in increased benefit of forest health and greater biodiversity in comparison to Alternative B:

1) Elimination of Old Growth Stands from Harvest: Eliminating from harvest additional stands that co-occur with state-mapped old growth forest areas; such forests already represent the desirable complexity of forest structure (age class diversity, large diameter trees, snags, down coarse and fine woody material) and species composition that are most likely to offer ideal habitat for both avian and greater biodiversity within interior forest systems. In essence, the conditions within these stands represent the ideal conditions we wish to restore to the greater forest ecosystem through forest management in areas where such conditions are lacking. It is our understanding that approximately 20 acres were removed from harvesting across all alternatives because they met the State's definition of old growth forest, and we support this decision.

2) Deferred Harvest: Eliminating from harvest additional stands that exhibit existing late successional forest characteristics; 814 stand acres of such forests have been removed from consideration of entry under alternative C; under alternative B, these stands would receive harvest, which we feel would negatively impact current stand conditions. Late successional forests have high value for both avian and greater biodiversity within these interior forest systems. Alternative C (as opposed to Alternative B) demonstrates a commendable level of consideration and a measurable conservative approach to remove these stands from harvest given their superior ecological value in their current condition - honoring the fact that without management intervention they are likely to continue to improve towards a desirable condition in the relative near-term.

It is our preference that any stands above 150 years old should fall into the deferred harvest category. Appendix C suggested that 311 acres of old forest over 150 years old would be harvested, but after consulting with James Donahey, it is our understanding that the current data does not suggest that those 331 acres meet the thresholds for late-successional forest to be set aside in the first category of the triad. Rather, these stands may represent younger stands with just a couple of old trees represented. It is our understanding that during subsequent field diagnosis, which will occur prior to any harvest, that the Forest Service will then determine, at the finest resolution and degree possible, whether those stands have the physical attributes described in the mitigation measure of late-successional/old growth forest to be set aside as Category 1 areas. We support this approach.

3) Late Successional Enhancement Harvest and Non-Commercial Treatment: Supporting the application of ecological silviculture methods that serve to accelerate the development of desirable old forest characteristics on stands that are on a current trajectory towards old forest conditions but have a greater gap between current condition and such old forest conditions. A total of 4,780 stand acres are proposed for management according to these methods and we appreciate that these prescriptions are "designed to retain a greater extent of these [late successional forest] features where they exist and accelerate the development of these [late successional forest] feature where they are absent." (*See p. 22 of Preliminary EA*). Alternatives C and D translate the old-growth restoration approaches we recommended (see Ford and Keeton 2017, Keeton et al. 2018) into a set of specific practices (e.g. variable density thinning, crown release, etc.) consistent with USFS silvicultural guides. We commend this ground-breaking - for eastern deciduous forests - new approach to operationalize accelerated development of late seral/old-growth characteristics.

We value the application of ecological forestry as a viable tool with which land managers can emulate natural disturbance regimes in ways that artificially accelerate the development of older forest conditions on the landscape. These older forest conditions are vital for achieving greater biodiversity as well as climate resiliency; critically, the need for greater biodiversity and climate resiliency is, temporally, more immediate and pressing than forests are capable of developing on their own and in the time necessary to head off the biodiversity and climate crisis currently unfolding. In other words, scientific consensus tells us that, in these forest systems, resource managers can intervene to help forests develop desirable old forest conditions. This does not replace the need to support old forest conditions that happen as part of Forest Service designations, such as wilderness areas, where natural processes unfold over time. It is our understanding that on 62% of total National Forest Service lands within the project, no harvest treatment would occur, and these lands will help contribute to Vermont Conservation Design's old forest targets. Our organizations fully support having a balanced mix on the landscape, where there are robust opportunities to support passive management regimes, and other areas where management can enhance old forest conditions.

As such, we commend the proposed application of accepted ecological silviculture practices, including Silviculture with Birds in Mind (Hagenbuch et al. 2011) established practices, on 4,780 stand acres with the aim of improving forest health and resiliency through emulating natural disturbance regimes (so called natural dynamics silviculture). Notably, many treatments will introduce varying levels of young forest habitat- specifically in cases where >1-acre openings are established - conditions which will be suitable for young forest bird species. Functionally, these openings will contribute towards young forest targets for the project area in addition to proposed even-aged regeneration treatments.

4) Additional Timber Harvest Treatments: We prefer alternative C over Alternative B given that Alternative C proposes a reduction of even-aged and two-aged regeneration treatments in areas that already exhibit desirable late-successional conditions. As is the case with Alternative C, we would like to see such regeneration treatments occur in degraded stands and those of already early-seral conditions. Importantly, young forests are rare on this landscape and, as a cover type, contribute important habitat to a particular suite of bird species, and greater flora and fauna, that are in substantial decline - due, in part, to lack of young forest habitat. When considering the Late Successional Enhancement Harvest and Non-commercial Treatments that involve creation of forest openings 1-acre and larger, such treatments will also contribute functional young forest habitat to the forest - reducing the ecological imperative to create such conditions through even-aged management where late-successional conditions already exist. Rather, we appreciate that, under Alternative C, even-aged treatments are more focused in largely degraded stands and those with declining paper birch and aspen.

We also support the effort to adhere to Vermont Conservation Designs target of 3-5% young forest on this landscape. According to the EA, proposed even-aged treatments within the project area would contribute 1,442 acres, 1,013 acres, and 992 stand acres of regenerating forests under Alternatives B, C, and D, respectively: representing 4.5%, 3.1%, and 3.1% of the forested NFS lands within the project area respectively by alternative.

**Other Considerations**:

- We support the clarification that the forest plan standards and guidelines require the retention of cavity, den and nest trees, and snags during harvest operations (Forest Plan, Section 2.3.7 Wildlife, pp. 27 to 29).
- We support the specific design features and mitigation measures (preliminary EA, Appendices A and B) that provide for retention of logging slash throughout harvest areas; we value that forest timber and wildlife biologist staff will work together to design such features.
- We support that under alternative C, there is proposed non-commercial treatment on 464 acres consisting of crown release and creation of snags and down woody material. This opportunity to improve forest habitat for birds and greater wildlife would be missed in Alternatives B and A.
- We support efforts to undertake winter harvesting so as to reduce the impact of harvest operations on breeding birds, with the understanding that climate change is presenting a challenge to continuing to achieve low-impact winter harvest.
- We only support management in Pittenden roadless area that would maintain roadless area characteristics and allow for future wilderness consideration. Harvest treatments under

Alternatives C and D would use modified methods designed to retain more trees throughout the area.

**Water Quality:**

Overall, with the exception of Alternative A, Alternative D would provide the least impact to aquatic resources (less harvesting in wetlands, less road construction, less log landings, and less impact on surface water features).

As stated in our prior comment letter, we continue to encourage full dam removal to increase benefits to aquatic and terrestrial wildlife, while maximizing the river's freedom of movement and ability to achieve a natural equilibrium. A partial dam removal allows for aquatic organism passage, but constricts the channel and does not allow the river to move nor reconnect with the floodplain.

The EA states that proposed management activities have the potential to impact 1,430 acres of mapped wetlands within the project area. Mapped wetlands in Vermont have not been ground truthed and in many circumstances are not an accurate depiction of the actual characteristics on the landscape and should therefore be only utilized as a preliminary planning tool. We also recommend integrating the recently incorporated VT DEC NWI Otter Creek wetland data into the FMP to increase accuracy of wetland locations and further refine the treatment areas and access options. The proposed 1,430+/- acres of mapped wetlands within the project area is a significant number and further clarification is needed to understand more specifically what management activities are proposed in these areas beyond the proposed dam removal, culverts replacement, and timber harvest treatment areas.

Prior to any treatment we recommend ground truthing wetlands for identification of State significant natural communities, RTE or sensitive wetland types such as vernal pools, bogs, fens and headwater wetlands. These sensitive natural areas are particularly sensitive to changes in hydrology, compaction, and invasive species introduction associated with forest management practices. Wetlands and greater riparian conditions also provide important and unique habitat for a particular suite of birds and greater flora and fauna, both within and around such areas. Additionally, we would like to ensure that appropriate protections including continued forest canopy cover and the surrounding upland habitat adjacent to headwater streams and vernal pools are maintained to support viable amphibian breeding habitat, bird habitat, and greater levels of biodiversity overall. These buffer protections are also vital for maintaining habitat for native brook trout and ensuring closed canopy conditions around headwater streams to create suitable cold-water conditions and also help reduce sedimentation.

We appreciate that the EA addresses GMNF efforts to locate skid roads, skid trails, and landings to direct water flow away from riparian corridors and avoid steep terrain (slopes above 30 percent) and locate landings at least 100 feet from all wetlands, including seasonal pools, and design and manage them to not contribute sediment to any water body.

Additionally, we continue to recommend that long-term water quality monitoring and invasive species monitoring commence for a 5-year period (baseline data collection pre-harvest and subsequent data collection 5 years post-harvest) to ensure adequate protection of GMNF ecosystems.

**Carbon Assessment:**

General Comments:

The supporting documents for the Environmental Assessment include a "Forest Carbon Assessment." This document provides an interesting overview of forest carbon science as it pertains to the management of the Green Mountain and Finger Lakes National Forests. However, the Carbon Assessment is not specifically linked to any of the proposed Alternatives, nor does it provide an analysis or projection of carbon outcomes associated with the proposed management options. Instead the document frames its literature review and choice of conclusions very clearly in terms of one particular point of view. This argument – which is highly controversial within the field of carbon science and forestry (see Nunery and Keeton 2010; Keeton 2018) – supports more intensive forest management and lessens the importance of carbon storage in older forest structures. An opportunity is missed repeatedly to articulate a more balanced review of carbon science encompassing both sequestration and storage services in forests. A balanced review would favor Alternatives C and D, whereas the overly biased (in our opinion) view articulated in the Carbon Assessment would favor Alternative B. We wonder whether that was the purpose behind the framing of this document.

And oddly, the assessment is largely focused on disturbance vulnerabilities, particularly forest fire, which are only indirectly relevant to northeastern forests. Much of the assessment is grounded in research on western fire-prone systems. Thus, the extrapolation that the GMNF should be managed more intensively to reduce disturbance vulnerabilities -- and that such management would decrease the risk of carbon fluxes to the atmosphere -- is entirely inappropriate. While reducing stand densities on drought prone sites is certainly relevant for certain Eastern systems, such as pine and sometimes oak, the science has also shown that older stands with complex canopies – especially in mesic temperate and hemi-boreal forests - may be more resilient to climate change (Thom et al. 2019). The latter science has shown that old, complex forest structures are able to buffer below canopy microclimates, providing more resilient carbon storage. In short, we question the Carbon Assessment's over-emphasis on arguments favoring intensified management to reduce risks of carbon flux. That line of reasoning is highly uncertain and largely not germane or not related to disturbance regimes on the GMNF. Again, we propose that a "portfolio of carbon forestry" (Keeton 2018) approaches inherent within the triad model – ranging from approaches emphasizing carbon storage in older forests to those favoring carbon uptake and substitution effects from more actively managed forests -- would be best to minimize risks while maximizing net climate benefits.

Specific comments:

Our review of the Carbon Assessment found instances where the document could be strengthened generally or revised specifically to reflect a more accurate understanding of carbon science that is not biased towards any one perspective within the field. Our comments in this section are intended to guide such revisions.

- The assessment should more clearly articulate its intended purpose and how it should be used. On page 2, the document states "this assessment can help land managers to understand carbon stocks, fluxes, and impacts of disturbances at the forest level and can inform project and programmatic National Environmental Policy Act (NEPA) analyses." But the assessment does not provide a thorough, balanced, or accurate accounting of the carbon benefits associated with older, more complex forest structures, nor does it detail the high degree of uncertainty in management to reduce disturbance vulnerabilities as applied to moderate to high precipitation forests in the Northeast. Rather, a reader could easily conclude that active management is always preferable (in terms of carbon) when, in fact, the science has clearly shown that this is not true (Fahey et al. 2010).

- The assessment inaccurately states that carbon stocks "may decline due to forest aging in the coming decades without additional disturbance." This is categorically incorrect. Carbon sequestration (uptake) rates may slow, but stocks will not decline. The sentence undermines the carbon storage value and likelihood of net positive accumulation of old forest structures (Keeton et al. 2011). Positive Net Ecosystem Productivity in mature and old stands is likely for many decades to come; complex late-successional landscapes under-going gap phase development have been show to maintain positive Net Ecosystem Productivity for centuries in northern hardwood-conifer ecosystems (Fahey et al.2015).

- The assessment states that "Model results suggest that GMFL NFs non-soil carbon stocks would have been approximately 0.39 percent higher in 2011 if harvests had not occurred since 1990. This is an interesting conclusion and seems to run counter to later arguments that somehow active management should be emphasized for net carbon benefits. However, we ask for clarification regarding the number reported. Is the correct number 0.39 of one percent, or 39%? If the former (an order of magnitude lower), then the difference may be negligible or not significant. The more important question is how increased rates of harvesting over the next decade will affect carbon stocks.

- We agree that while "natural disturbance frequency is expected to increase, it is difficult to predict how future disturbances will affect forest carbon." This is particularly true in our region, where disturbance vulnerabilities are much less certain on a site-by-site basis than in the fire-prone western systems referenced by the assessment.

- The document states that "maximizing ecosystem carbon stocks can create undesirable tradeoffs with other environmental benefits (Littlefield and D'Amato 2022), and in some landscapes may result in lower carbon benefits where longer-term carbon stability becomes compromised. Maximizing carbon is therefore not necessary for, and is often counter to, achieving effective carbon stewardship." The phrasing here is an example of argument construction to deemphasize the carbon value associated with Categories 1 and 2 in our proposed triad model. Better phrasing, and more consistent with the full suite of studies on this topic, would stress the value of maximizing carbon stocks while balancing other uses and employing climate-adaptive forestry to reduce vulnerabilities.

- From the assessment: "Natural disturbance frequency is expected to increase, but it is difficult to predict how future disturbances will affect forest carbon." This conclusion seems at odds with the latter strategy that is almost entirely focused on reducing vulnerability through active management. There are many papers that have argued for a portfolio of adaptive management strategies including core reserves and restoration, rather than sole reliance on silvicultural management. The key is to spread risks while maximizing benefits. No one strategy, such as timber harvest, accomplishes this. Hence the need for Alternative C or D.

- From the assessment: "For example, reducing tree densities in overstocked stands will decrease carbon to lower the risk of carbon losses from mortality and wildfire." There may be particular drought prone sites or rarer fire-adapted natural communities (e.g. oak, white pine, pitch pine, etc.) on the GMFL NF where this would be true, but the statement is largely <u>not relevant</u> here. It is a false flag. It sets up an argument for reducing densities in older stands with high carbon stocking. This argument is not scientifically supportable for most of the mesic northern hardwood-conifer stands encompassed by the proposed project.

- From the assessment: "Carbon stewardship actions that increase carbon stocks in live vegetation, dead wood, and soils, should not elevate the risk of disturbance that could cause widespread carbon emissions back to the atmosphere. Carbon stabilization refers to the reductions in the risk of either carbon emissions or reduced sequestration capacity from natural disturbance or biotic stressors resulting from carbon stewardship actions that increase the residence time of carbon in the ecosystem." This statement needs to be qualified. Most of this is relevant only to fire-prone forests, of which there are few within the proposed project areas. There is almost no science to support this statement for mesic (moderate precipitation) forests, except on droughty sites.

- From the assessment: "These vulnerabilities can stem from past land use, such as past clearing and subsequent forest regrowth, that may simplify the species composition or structural diversity of the ecosystem, or from a shift away from natural disturbance regimes such as frequent low-intensity fires, resulting in altered stand development and the buildup of hazardous fuels. Other disturbances such as insect epidemics and drought, can undercut efforts to maintain or increase carbon storage (Goodwin et al. 2020). Carbon stabilization can be enhanced by forest management actions which contribute to forest resilience and adaptability, although several factors, such a drought and growing space, can hinder this ability." Again, the carbon assessment focuses on an alleged need to reduce disturbance risk, which is highly misleading in the context of the proposed project. It constructs a poorly supported argument for more intensive management at the expense of a balanced approach such as the triad we have proposed. The assumption that harvest can reduce disturbance vulnerability, or that we know how to do this, is vastly overstated for Vermont forests.

- From the assessment: "Timber harvest initially reduces the amount of forest carbon by physically removing live above ground biomass from the forest, but can transfer carbon to wood products or energy use, while increasing the productivity and health of remaining trees (Sathre and O'Connor 2010, D'Amato et al. 2011, and Oliver et al. 2014). Careful planning of treatments can have longer-term benefits that reduce future risk of wildfires and tree mortality, thus optimizing carbon benefits (Krofcheck et al. 2019)." Again, we highlight the one-sided nature of the presentation here. The statement ignores a vast body of literature on the carbon benefits of lightly managed or conserved forests (Urbano and Keeton 2017, Thom and Keeton 2020). We suggest revision to present a more balanced view of the science.

- From the assessment: "In the eastern U.S., the proportion of long-lived timber products is lower than in other regions (e.g., Pacific region; Oswalt et al. 2019), which means the HWP C turnover time tends to be shorter. Instead, the eastern market is dominated by short-lived pulp and bioenergy products (Dugan 2021). This means the effect of long-lived wood products in reducing net carbon emissions is lower than in other regions of the U.S." We agree with this statement and suggest it is important. It highlights the value of a multi-prolonged approach (e.g. like Alternative C) that achieves carbon benefits through a variety of management categories.

- Section 1.4 is entitled "Forest Management for Carbon Optimization." This section completely missed a large portion of the literature on carbon forestry. There is nothing about retention, extended rotations, or less intensive silviculture, which the literature has shown to increase net carbon storage even when accounting for wood products (Nunery and Keeton 2010, Thom and Keeton 2020). Those methods also would support the less intensive alternatives in the Environmental Assessment, such as Alternatives C and D. Almost this whole section is specific to western fire-prone forests. These are largely NOT the carbon forestry approaches used by forest carbon project in Eastern U.S. forests. We suggest that the assessment should be revised to include a thorough review of Improved Forest Management as reported in the literature on Natural Climate Solutions (e.g. Fargione et al. 2018, Drever et al. 2021).

- Section 2.2 is entitled "Carbon in Harvested Wood Products." We suggest that this suggestion has little relevance as currently presented. Most studies have concluded that wood products are not a strong carbon sink in northeastern systems. Sink strength might increase substantially if we produce more durable wood products and shift to mass timber applications. But this section misses the opportunity to present those approaches or what they might require for management. Implications might include, in some cases, management for higher quality, larger dimension timber, which would argue for the more balanced alternatives we have proposed.

- From the assessment: "Increasing the proportion of bioenergy products in the Eastern Region may be a viable option for reducing carbon emissions (Dugan 2021)." We suggest that it also may not be. Please provide a balanced discussion of the wood bioenergy debate. So much depends on whether overall harvest intensity increases and the effects on net carbon storage at landscape scales (Mika and Keeton 2015; Buchholz et al. 2019). Again, this section appears to make selective use of the literature to support a pre-conceived point of view or management agenda.

- On page 18 there is a lot of discussion of forest fires that is only indirectly relevant. We suggest this should be removed or the relevance better explained.

- Section 3.2 is entitled "Effects of Forest Aging." We recommend that this section should focus on Net Ecosystem Productivity (NEP) rather than Net Primary Productivity (NPP). NEP is ultimately the currency that best describes the net climate benefits of forests and carbon forestry (Fahey et al 2015).

- The assessment states that "In the eastern U.S., old-growth forests are likely small carbon sinks, though some may be neutral or potentially small carbon sources, depending on forest type, regional variation, disturbance, and carbon methodology (Bradford and Kastendick 2010, Desai et al. 2005, Finzi et al. 2020, Gunn et al. 2014, Halpin and Lorimer 2016, and Hollinger et al. 2021)." This section misses or de-emphasizes the carbon storage value of old forests (McGarvey et al. 2015). They are reservoirs of carbon storage that otherwise would flux to the atmosphere if harvested. The section misleadingly focuses on carbon uptake rather than storage, despite decades of research showing this is a red herring (Keeton 2018). It fails to present contemporary research on net carbon fluxes from landscapes dominated by older, late-successional forests (Fahey et al. 2015). Thus, it fails to evaluate the literature that would support old forest conservation and restoration, as articulated in Alternatives C and D.

- The assessment states that "Even though the oldest forests take up carbon more slowly than younger forests, decades of carbon accumulation make these forests high with carbon stocks, especially in the forest floor and downed woody carbon pools (Hoover et al. 2012, Hoover and Smith, 2023, and Gray et al. 2016)." Please cite other literature on the full diversity of carbon pools in old forests, not just downed wood. There is a large body of literature, for example, on the disproportionate carbon storage in large trees. It is the large tree component that gives old forests their exceptionally high carbon storage (Keeton et al. 2011).

➢ Section 4.1 is entitled "Prospective Forest Aging Effects." We recommend substantially revising this section. As currently presented it side-steps a vast literature showing that net climate benefits will increase as the proportion of older forests increases. We question why the Carbon Assessment seems so reluctant to present this well-supported fact.

**Conclusion:**

The Forest Service has the unique and precedent setting opportunity to implement a project that enhances forest health and diversity through ecological forestry management practices. If the Forest Service were to select Alternative C or D, this project would provide an exciting, perhaps first-in-nation opportunity, to implement a "triad approach" to mitigate greenhouse gas emissions and demonstrate how to protect old growth forests, and enhance and retain structurally and biologically diverse forests that support late successional forest characteristics that are resilient to climate change. Furthermore, by shifting to this approach, the Forest Service has the opportunity to select an approach that provides a balanced, flexible model for climate adaptive forest management while reducing disturbance vulnerabilities and contributing to climate change mitigation through increased net carbon stocking on the national forests.

We appreciate your consideration of our comments and implore you to shift towards Alternative C or D to implement these opportunities and showcase them to the public. We are available to discuss this further and to respond to any questions you may have about our comments.

Sincerely,

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