

CENTER FOR BIOLOGICAL DIVERSITY • DEFENDERS OF WILDLIFE

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Submitted via web portal: <https://cara.ecosystem-management.org/Public/CommentInput?Project=51806>

Re: Comments on Draft EIS for Forest Plan Revision – Forest Service Must Comply with NEPA, MUSYA, and NFMA in Analyzing the Plan’s Impact on Carbon Stores

Dear Supervisor Stewart:

Please accept the following comments on the GMUG’s Draft Plan and Draft Environmental Impact Statement on behalf of the Center for Biological Diversity and Defenders of Wildlife. These comments supplement those submitted previously by the Center and Defenders.

I. Legal Background

A. The Forest Service’s NEPA Obligations.

Under the National Environmental Policy Act (NEPA), every federal agency that takes a major federal action “significantly affecting the quality of the human environment” is required to create a detailed statement discussing: (i) the environmental impact of the proposed action; (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented; (iii) alternatives to the proposed action; (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.¹ When, as with the GMUG Forest Plan, any significant environmental impacts might result from the proposed action, the agency must complete a meticulous environmental impact statement (EIS).²

NEPA imposes “action forcing procedures ... requir[ing] that agencies take a *hard look* at environmental consequences.”³ The sufficiency and utility of an EIS rely heavily on the scope and depth of the analysis of environmental impacts. The EIS must include the full scope of environmental effects, including direct, indirect, and cumulative impacts.⁴ To ensure that the

¹ 42 U.S.C. § 4332(2)(C)(i)–(v).

² *Sierra Club v. Van Antwerp*, 661 F.3d 1147, 1153 (D.C. Cir. 2011) (citing *Sierra Club v. Peterson*, 717 F.2d 1409, 1415 (D.C. Cir. 1983)); *see also* 40 C.F.R. §§ 1508.11, 1508.27 (1978).

³ *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989) (citations omitted) (emphasis added).

⁴ 40 C.F.R. §1508.25(a)(c)(1)–(3) (1978). The terms “effects” and “impacts” are used synonymously in the CEQ regulations interpreting NEPA. 40 C.F.R. § 1508.8 (1978). Although CEQ issued a final rulemaking in July 2020 fundamentally rewriting those regulations, the new rules apply only “to any NEPA process begun *after* September 14, 2020,” or where the agency has chosen to “apply the regulations in this subchapter to ongoing activities.” 40 C.F.R. § 1506.13 (2020) (emphasis added). Scoping on this project began 2018, long before September 14, 2020.

agency has taken the required “hard look,” courts hold that the agency must utilize “public comment and the best available scientific information.”⁵

NEPA also requires agencies to explain opposing viewpoints and their rationale for choosing one viewpoint over the other.⁶ Courts will set aside a NEPA document where the agency fails to respond to scientific analysis that calls into question the agency’s assumptions or conclusions.⁷

The agency must “provide a full and fair discussion of significant environmental impacts” in order to “inform decisionmakers and the public of the reasonable alternative which would avoid or minimize adverse impacts.”⁸ This includes numerous factors on context and intensity set out at 40 C.F.R. § 1508.27 (1978). Among these are the degrees to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.⁹

To take the required “hard look” at impacts, an EIS must “study, develop, and describe” reasonable alternatives to the proposed action.¹⁰ This alternatives analysis “is the heart of the environmental impact statement.”¹¹ The “touchstone” for courts reviewing challenges to an EIS

See Forest Service, Notice of Intent to revise the Grand Mesa, Uncompahgre and Gunnison Land and Resource Management Plan and to prepare an Environmental Impact Statement (Apr. 3, 2018). Further, the Draft EIS does not indicate that the agency is opting to use the 2020 CEQ NEPA regulations. For example, the Draft EIS purports to disclose the proposed plan’s cumulative effects, a term the 2020 regulations specifically eliminated. *See, e.g.,* GMUG Plan Revision Draft EIS at 1 (“this draft environmental impact statement discloses the potential direct, indirect, and cumulative environmental impacts of implementing the draft revised forest plan and alternatives”). Where agencies have applied the pre-2020 NEPA regulations to actions approved before September 14, 2020, the courts have as well. *See, e.g., Bair v. California Dep’t of Transp.*, 982 F.3d 569, 577 n.20 (9th Cir. 2020) (“Because [the agency at issue] applied the previous [NEPA] regulations to the Project, so do we.”). In any event, the 2020 regulations have been challenged as illegal in at least four pending lawsuits, and this administration has proposed to restore key components of the 1978 regulations. *See, e.g., Environmental Justice Health Alliance v. CEQ*, Case 1:20-cv-06143 (S.D.N.Y. Aug. 6, 2020); *Wild Virginia v. CEQ*, Case 3:20-cv-00045-NKM (W.D. Va. July 29, 2020); *Alaska Community Action on Toxics v. CEQ*, Case 3:20-cv-05199-RS (N.D. Ca. July 29, 2020); *State of California v. Council on Environmental Quality*, Case No. 3:20-cv-06057 (N.D. Cal. Aug. 28, 2020); Council on Environmental Quality, NEPA Implementing Regulation Revisions, 88 Fed. Reg. 55,757 (Oct. 7, 2021) (proposing to restore, inter alia, the 1978 regulations’ definition of impacts, including cumulative impacts).

⁵ *Biodiversity Cons. Alliance v. Jiron*, 762 F.3d 1036, 1086 (10th Cir. 2014) (internal citation omitted).

⁶ 40 C.F.R. § 1502.9(b) (1978) (requiring agencies to disclose, discuss, and respond to “any responsible opposing view”).

⁷ *See Ctr. for Biological Diversity v. U.S. Forest Serv.*, 349 F.3d 1157, 1168 (9th Cir. 2003) (finding Forest Service’s failure to disclose and respond to evidence and opinions challenging EIS’s scientific assumptions violated NEPA); *Seattle Audubon Soc’y v. Moseley*, 798 F. Supp. 1473, 1482 (W.D. Wash. 1992) (“The agency’s explanation is insufficient under NEPA – not because experts disagree, but because the FEIS lacks reasoned discussion of major scientific objections.”), *aff’d sub nom. Seattle Audubon Soc’y v. Espy*, 998 F.2d 699, 704 (9th Cir. 1993) (“[i]t would not further NEPA’s aims for environmental protection to allow the Forest Service to ignore reputable scientific criticisms that have surfaced”).

⁸ *Id.* §§ 1502.1, 1502.14 (1978); *accord California v. Block*, 690 F.2d 753, 767 (9th Cir. 1982).

⁹ 40 C.F.R. § 1508.27(b)(5) (1978).

¹⁰ 42 U.S.C. § 4332(2)(C)(iii), (2)(E).

¹¹ 40 C.F.R. § 1502.14 (1978).

under NEPA “is whether an EIS’s selection and discussion of alternatives fosters informed decision-making and informed public participation.”¹²

NEPA’s implementing regulations require that an agency “[r]igorously explore and objectively evaluate *all* reasonable alternatives.”¹³ The agency’s purpose and need statement sets the parameters for what constitutes a reasonable alternative.¹⁴ Although agencies “enjoy[] considerable discretion” in defining their objectives and are not required to consider an unlimited number of alternatives,¹⁵ they may not dismiss an alternative unless they have, in “good faith,” found it to be “too remote, speculative, or impractical or ineffective,”¹⁶ or not “significantly distinguishable from the alternatives already considered.”¹⁷ Further, “[t]he existence of a viable but unexamined alternative renders an environmental impact statement inadequate.”¹⁸ The agency’s obligation to consider reasonable alternatives applies to citizen-proposed alternatives.¹⁹ Courts routinely set aside agency NEPA analysis, including those by the Forest Service, where the agency arbitrarily failed to consider a reasonable alternative.²⁰

Courts hold that an alternative may not be disregarded merely because it does not offer a complete solution to the problem.²¹ Even if additional alternatives would not fully achieve the project’s purpose and need, NEPA “does not permit the agency to eliminate from discussion or consideration a whole range of alternatives, merely because they would achieve only some of the

¹² *California v. Block*, 690 F.2d 753, 767 (9th Cir. 1982).

¹³ 40 C.F.R. § 1502.14 (emphasis added); *see also New Mexico*, 565 F.3d at 703 (quoting same); *Custer Cty. Action Ass’n v. Garvey*, 256 F.3d 1024, 1039 (10th Cir. 2001) (agencies must “rigorously explore all reasonable alternatives ... and give each alternative substantial treatment in the environmental impact statement.”).

¹⁴ *See Dombeck*, 185 F.3d at 1174–75.

¹⁵ *Colo. Env’tl. Coal. v. Salazar*, 875 F. Supp. 2d 1233, 1245 (D. Colo. 2012).

¹⁶ *Colo. Env’tl. Coal. v. Dombeck*, 185 F.3d 1162, 1174 (10th Cir. 1999) (quotation omitted).

¹⁷ “NEPA does not require agencies to analyze the environmental consequences of alternatives it has in good faith rejected as too remote, speculative, or impractical or ineffective.” *New Mexico ex rel. Richardson v. BLM*, 565 F.3d 683, 708 (10th Cir. 2009) (quotation omitted). Moreover, “an agency need not consider an alternative unless it is significantly distinguishable from the alternatives already considered.” *Id.* at 708-09.

¹⁸ *Westlands Water Dist. v. United States DOI*, 376 F.3d 853, 868 (9th Cir. 2004).

¹⁹ *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217-19 (9th Cir. 2008) (finding EA deficient, in part, for failing to evaluate a specific proposal submitted by petitioner); *Colo. Env’tl. Coal. v. Dombeck*, 185 F.3d 1162, 1171 (10th Cir. 1999) (agency’s “[h]ard look” analysis should utilize “public comment and the best available scientific information”) (emphasis added).

²⁰ *See, e.g., See High Country Conservation Advocates v. United States Forest Serv.*, 951 F.3d 1217, 1224-27 (10th Cir. 2020) (finding Forest Service NEPA analysis failed to consider a reasonable alternative concerning roadless area protection, and ordering the lower court to vacate the agency’s decision); *New Mexico ex rel. Richardson v. BLM*, 565 F.3d 683 (10th Cir. 2009) (setting aside BLM’s EIS concerning oil and gas leasing in the Otero Mesa area); *Wilderness Workshop v. U.S. Bureau of Land Management*, 342 F. Supp. 3d 1145 (D. Colo. 2018) (BLM’s range of alternatives violated NEPA by omitting any option that would meaningfully limit oil and gas leasing and development within the planning area); *Colorado Environmental Coalition v. Salazar*, 875 F. Supp. 1233 (D. Colo. 2012) (BLM was obliged to consider an alternative requiring extraction of oil and gas to be conducted through extended-reach multilateral wells).

²¹ *Natural Resources Defense Council, Inc. v. Morton*, 458 F.2d 827, 836 (D.C. Cir. 1972).

purposes of a multipurpose project.”²² If a different action alternative “would only partly meet the goals of the project, this may allow the decision maker to conclude that meeting part of the goal with less environmental impact may be worth the tradeoff with a preferred alternative that has greater environmental impact.”²³

The courts also require that an agency adequately and explicitly explain any decision to eliminate an alternative from further study.²⁴

B. NEPA Requires Agencies to Disclose Climate Impacts of Proposed Actions.

NEPA requires agencies to undertake meaningful consideration of greenhouse gas emissions (GHGs) and carbon sequestration (carbon storage).²⁵ As the Ninth Circuit has held, in the context of fuel economy standard rules:

The impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct. Any given rule setting a CAFE standard might have an “individually minor” effect on the environment, but these rules are “collectively significant actions taking place over a period of time.”²⁶

Courts have held that a “general discussion of the effects of global climate change” does not satisfy NEPA’s hard-look requirement.²⁷

Further, courts have ruled that federal agencies must consider indirect GHG emissions resulting from agency policy, regulatory, and fossil fuel leasing decisions. For example, agencies cannot ignore the indirect air quality and climate change impact of decisions that would open up access to coal reserves.²⁸ A NEPA analysis that does not adequately consider the indirect effects of a proposed action, including climate emissions, violates NEPA.²⁹ The disclosure of merely the

²² *Town of Matthews v. U.S. Dep’t of Transp.*, 527 F. Supp. 1055 (W.D. N.C. 1981).

²³ *North Buckhead Civic Ass’n v. Skinner*, 903 F.2d 1533, 1542 (11th Cir. 1990).

²⁴ *See Wilderness Soc’y*, 524 F. Supp. 2d at 1309 (holding EA for agency decision to offer oil and gas leases violated NEPA because it failed to discuss the reasons for eliminating a “no surface occupancy” alternative); *Ayers v. Espy*, 873 F. Supp. 455, 468, 473 (D. Colo. 1994).

²⁵ *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008). We use the terms “carbon storage” and “carbon sequestration” interchangeably.

²⁶ *Id.*, 538 F.3d at 1216 (quoting 40 C.F.R. § 1508.7 (1978)). *See also WildEarth Guardians v. BLM*, 870 F.3d 1222, 1237 (10th Cir. 2017) (failure to disclose climate impacts of various alternatives “defeated NEPA’s purpose”).

²⁷ *High Country Conservation Advocates v. U.S. Forest Serv.*, 52 F. Supp. 3d 1174, 1189-90 (D. Colo. 2014).

²⁸ *See Mid States Coal. For Progress v. Surface Transp. Bd.*, 345 F.3d 520, 532, 550 (8th Cir. 2003); *High Country Conservation Advocates*, 52 F. Supp. 3d at 1197-98; *Montana Environmental Information Center v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074 (D. Mont. 2017), *amended in part, adhered to in part*, 2017 WL 5047901 (D. Mont. 2017).

²⁹ *Ctr. for Biological Diversity v. Bernhardt*, 982 F.3d 723, 2020 U.S. App. LEXIS 38033, *20 (9th Cir. 2020).

volume of GHG emissions is insufficient; agencies must also disclose the impacts of those emissions.³⁰

NEPA requires “reasonable forecasting,” which includes the consideration of “reasonably foreseeable future actions ... even if they are not specific proposals.”³¹ That an agency cannot “accurately” calculate the total emissions expected from project implementation is not a rational basis for cutting off its analysis. As the Ninth Circuit has explained, “[b]ecause speculation is ... implicit in NEPA,” agencies may not “shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry.”³² The D.C. Circuit has echoed this sentiment, rejecting the argument that it is “impossible to know exactly what quantity of greenhouse gases will be emitted” and concluding that “agencies may sometimes need to make educated assumptions about an uncertain future” in order to comply with NEPA’s reasonable forecasting requirement.³³

Agencies cannot allege that they can forego quantify the project’s climate impacts by relying on NEPA regulations concerning “incomplete or unavailable information.” Those NEPA provisions require the agency to identify the information as such, to “make clear that such information is lacking,” and nonetheless include the information in the NEPA document if the overall costs of obtaining it are not “exorbitant” and the information is “essential to a reasoned choice among alternatives.”³⁴

The 2016 final CEQ *Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Review* provides useful direction on the issue of federal agency review of greenhouse gas emissions as foreseeable direct and indirect effects of a proposed action.³⁵ The CEQ guidance provides instructs agencies to conduct a lifecycle greenhouse gas analysis that quantifies GHG emissions and storage because the modeling and tools to conduct this type of analysis are available:

If the direct and indirect GHG emissions can be quantified based on available information, including reasonable projections and assumptions, agencies should consider and disclose the reasonably foreseeable direct and indirect emissions when analyzing the direct and indirect effects of the proposed action. Agencies should disclose the information and any assumptions used in the analysis and explain any uncertainties. To compare a project’s estimated direct and indirect emissions with GHG emissions from the no-action alternative, agencies should draw on existing, timely, objective, and authoritative analyses, such as those by the Energy Information Administration, the Federal Energy Management

³⁰ *Utah Physicians For A Healthy Env’t v. United States BLM*, 2021 U.S. Dist. LEXIS 57756 (D. Utah Mar. 24, 2021).

³¹ *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1079 (9th Cir. 2011) (citation omitted).

³² *Id.* (citations omitted).

³³ *Sierra Club v. Federal Energy Regulatory Commission*, 863 F.3d 1357, 1373-74 (D.C. Cir. 2017).

³⁴ 40 C.F.R. § 1502.22.

³⁵ Notice available at 81 Fed. Reg. 51,866 (Aug. 5, 2016); full guidance attached as Ex. 1, and available at https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nea_final_ghg_guidance.pdf (last viewed Nov. 24, 2021).

Program, or Office of Fossil Energy of the Department of Energy. In the absence of such analyses, agencies should use other available information.³⁶

The guidance further specifies that estimating GHG emissions is appropriate and necessary for actions such as the management of federal forests, including logging projects.

In addressing biogenic GHG emissions, resource management agencies should include a comparison of estimated net GHG emissions and carbon stock changes that are projected to occur with and without implementation of proposed land or resource management actions. This analysis should take into account the GHG emissions, carbon sequestration potential, and the changes in carbon stocks that are relevant to decision making in light of the proposed actions and timeframes under consideration.³⁷

The guidance shows that CEQ expects that agencies will perform such analysis at a programmatic or plan level, and also at the level of an individual project (such as an individual prescribed burn).

Biogenic GHG emissions and carbon stocks from some land or resource management activities, such as a prescribed burn of a forest or grassland conducted to limit loss of ecosystem function through wildfires or insect infestations, may result in short-term GHG emissions and loss of stored carbon, while in the longer term a restored, healthy ecosystem may provide long-term carbon sequestration. Therefore, the short- and long-term effects should be described in comparison to the no action alternative in the NEPA review.³⁸

Although the Trump administration withdrew the 2016 CEQ guidance, President Biden on January 20, 2021 rescinded that Trump Executive Order, and directed CEQ to “review, revise, and update” its 2016 climate guidance.³⁹ On February 19, 2021, CEQ effectively reinstated the 2016 GHG guidance:

CEQ will address in a separate notice its review of and any appropriate revisions and updates to the 2016 GHG Guidance. In the interim, agencies should consider all available tools and resources in assessing GHG emissions and climate change effects of their proposed actions, including, as appropriate and relevant, the 2016 GHG Guidance.⁴⁰

³⁶ *Id.* at 16 (citations omitted).

³⁷ *Id.* at 26 (citations omitted).

³⁸ *Id.* at 18.

³⁹ Executive Order 13,990 (Jan. 20, 2021), Sec. 7(e), 86 Fed. Reg. at 7042, attached as Ex. 2.

⁴⁰ Council on Environmental Quality, National Environmental Policy Act, Guidance on Consideration of Greenhouse Gas Emissions, 86 Fed. Reg. 10,252 (Feb. 19, 2021), attached as Ex. 3, and available at <https://www.govinfo.gov/content/pkg/FR-2021-02-19/pdf/2021-03355.pdf> (last viewed Nov. 24, 2021).

Further, whatever the state of federal guidance, the underlying requirement from federal caselaw to consider climate change impacts under NEPA, including indirect and cumulative combustion impacts and loss of sequestration foreseeably resulting from decisions that facilitate logging, has not changed.⁴¹

The Interagency Social Cost of Carbon was developed specifically to provide agencies with a way to quantify and compare those impacts, and agencies have regularly used this method to disclose the climate impacts of federal actions. Courts have found agency action arbitrary and capricious where agencies failed to explain why they refused to use the social cost of carbon.⁴²

C. The Forest Service’s Obligations Under MUSYA, NFMA, and the 2012 Planning Rules

The National Forest Management Act (“NFMA”) directs the Secretary of Agriculture (“Secretary”) to develop, maintain and revise management plans for units of the National Forest System.⁴³ The plans must provide for the multiple use and sustained yield of the products and services obtained from the Forest in accordance with the Multiple–Use Sustained–Yield Act of 1960 (“MUSYA”).⁴⁴

NFMA requires that:

In developing, maintaining, and revising plans for units of the National Forest System pursuant to this section, the Secretary shall assure that such plans—

- (1) provide for multiple use and sustained yield of the products and services obtained therefrom in accordance with the Multiple-Use Sustained-Yield Act of 1960 [16 U.S.C. 528–531], and, in particular, include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness; and

⁴¹ See *S. Fork Band Council of W. Shoshone v. United States Dept. of Interior*, 588 F.3d 718, 725 (9th Cir. 2009); *Ctr. for Biological Diversity*, 538 F.3d at 1214-15; *Mid States Coalition for Progress*, 345 F.3d at 550; *WildEarth Guardians v. United States Office of Surface Mining, Reclamation & Enf’t*, 104 F. Supp. 3d 1208, 1230 (D. Colo. 2015) (coal combustion was indirect effect of agency’s approval of mining plan modifications that “increased the area of federal land on which mining has occurred” and “led to an increase in the amount of federal coal available for combustion.”); *Diné Citizens Against Ruining Our Env’t v. United States Office of Surface Mining Reclamation & Enf’t*, 82 F. Supp. 3d 1201, 1213-1218 (D. Colo. 2015); *High Country Conservation Advocates*, 52 F. Supp. 3d at 1174; *Utah Physicians For A Healthy Env’t*, 2021 U.S. Dist. LEXIS 57756, at *15-*23.

⁴² *High Country Conservation Advocates*, 52 F. Supp. 3d at 1190-93 (finding Forest Service violated NEPA by failing to disclose the climate impacts via the social cost of carbon); *Wildearth Guardians v. Bernhardt*, 2021 U.S. Dist. LEXIS 20792, CV 17-80-BLG-SPW (D. Mont. Feb. 3, 2021) at *25-*31 (finding Office of Surface Mining violated NEPA by failing to disclose the climate impacts via the social cost of carbon). See also CEQ, 2016 NEPA Climate Guidance (Ex. 1) at 32-33 (noting the appropriateness of monetizing climate impacts).

⁴³ 16 U.S.C. § 1604(a).

⁴⁴ 16 U.S.C. §§ 528–531. See also, 16 U.S.C. §§ 1604(b), (d), and (e) (NFMA provisions concerning preparation of management plans, including the need to provide for multiple uses).

- (2) determine forest management systems, harvesting levels, and procedures in the light of all of the uses set forth in subsection (c)(1), the definition of the terms “multiple use” and “sustained yield” as provided in the Multiple-Use Sustained-Yield Act of 1960, and the availability of lands and their suitability for resource management.⁴⁵

“Multiple use” means:

The management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.⁴⁶

The Forest Service’s Planning Rules implementing NFMA requirements mandate that plans must take into account “system drivers, including ... climate change” and “reasonably foreseeable risks to ecological ... sustainability.”⁴⁷ The Rules require that Forest Service address “measurable changes on the plan area related to climate change” in its plan monitoring program.⁴⁸ Plans must also provide for “ecosystem services,” which include “regulating services such as long term storage of carbon.”⁴⁹

In preparing a Forest Plan Revision, the agency must also undertake a “baseline assessment of carbon stocks” for the management unit.⁵⁰ As the Forest Service stated in its response to comments on the Rule:

The rule sets forth an adaptive land management planning process informed by both a comprehensive assessment and the best available scientific information. Section 219.6(b)(3)-(4) requires responsible officials to identify and evaluate information on climate change and other stressors relevant to the plan area, along with a baseline assessment of carbon stocks, as a part of the assessment phase. Section 219.8(a)(1)(iv) requires climate change be taken into account when the

⁴⁵ 16 U.S.C. § 1604(e) (“required assurances”).

⁴⁶ 16 U.S.C. § 531(a).

⁴⁷ 36 C.F.R. §§ 219.8(a)(1)(iv), 219.10(a)(7).

⁴⁸ *Id.* at § 219.12(a)(5)(vi).

⁴⁹ *Id.* at §§ 219.10, 219.19.

⁵⁰ 36 C.F.R. § 219.6(b)(4); *see also* Forest Carbon and Conservation Management: Integration with Sustainable Forest Management for Multiple Resource Values and Ecosystem Services (Pinchot Institute, May 2015), at 6-7, attached as Ex. 4.

responsible official is developing plan components for ecological sustainability. When providing for ecosystem services and multiple uses, the responsible official is required by § 219.10(a)(8) to consider climate change. Measureable changes to the plan area related to climate change and other stressors affecting the plan area are to be monitored under § 219.12(a)(5)(vi). Combined with the requirements of the Forest Service Climate Change Roadmap and Scorecard, these requirements will ensure that Forest Service land management planning addresses climate change and supports adaptive management to respond to new information and changing conditions.⁵¹

Plans must include desired conditions (“description[s] of specific social, economic, and/or ecological characteristics of the plan area ... toward which management of the land and resources should be directed”) (DCs) and objectives (“concise, measureable, and time-specific statement[s] of a desired rate of progress toward a desired condition or conditions.”).⁵² The Rules also require that plans must ensure that “[t]imber harvest [for any purpose] would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources.”⁵³

The Rules also provide that “[n]o timber harvest for the purposes of timber production may occur on lands not suited for timber production.”⁵⁴ Land is not suited for timber production if “[t]imber production would not be compatible with the achievement of desired conditions and objectives established” by the relevant plan.⁵⁵ In balancing the factors for consideration in the suitability analysis, the Forest Service must provide justification for elevating production goals over other factors.⁵⁶ More broadly, the Rules require the use of “the best available scientific information to inform the planning process.”⁵⁷

II. The Need to Manage National Forests for Carbon Sequestration and Carbon Storage

A. The Climate Crisis

The climate crisis is the overriding environmental issue of our time, threatening to drastically modify ecosystems, alter coastlines, worsen extreme weather events, degrade public health, and cause massive human displacement and suffering. Its impacts are already being felt in the United States, and recent studies confirm that time is running out to forestall the catastrophic damage

⁵¹ Forest Service, 2012 Forest Planning Rule, 77 Fed. Reg. 21,162, 21,194 (Apr. 9, 2012)

⁵² 36 C.F.R. §§ 219.7(e)(1)(i) & (ii).

⁵³ *Id.* at § 219.11(d)(3).

⁵⁴ *Id.* at § 219.11(d)(1).

⁵⁵ *Id.* at § 219.11(a)(1)(iii).

⁵⁶ *Citizens for Envtl. Quality v. U.S.*, 731 F. Supp. 970, 988 (D. Colo. 1989) (“if production goals are to be given greater weight in the suitability analysis, then adequate reasons must be set forth for so doing. Defendants must provide justification for allowing production goals, or any other factor required by [the NFMA] and the regulations, to weigh more heavily than other factors.”).

⁵⁷ 36 C.F.R. § 219.3.

that will result from 1.5 degrees Celsius of warming.⁵⁸ More recent studies have confirmed that climate change is accelerating, making the need to protect carbon stores even more urgent than it was just a few years ago.⁵⁹

Climate change is impacting Colorado now. Climate change is impacting Colorado now. Most of the state has warmed one or two degrees Fahrenheit in the last century. Snowpack on average is declining. Fire season is lengthening. Drought periods are occurring more often.⁶⁰ I-70 will be closed for weeks due to landslide cause by heavy rainfall following a fire; both heavy rain and fire are increasing in the state due to climate change. Policymakers and legislators have responded by requiring Colorado to adopt a climate action plan that calls for a 25% reduction in greenhouse gas emissions by 2025 and a 50% reduction by 2030. In the southwestern United States, including Colorado, other observed and projected impacts include warmer temperatures, lower soil moisture levels, increased frequency and intensity of wildfires, and increased competition and demand for scarce water resources.⁶¹

The Forest Service needs to be part of the solution to the climate crisis, not part of the problem.

B. President Biden Requires Prompt Action to Assess and Reduce Climate Pollution.

On the day he was inaugurated, President Biden committed to overturning the prior administration's failure to address, and its outright denial of, the climate emergency.

It is, therefore, the policy of my Administration to listen to the science; to improve public health and protect our environment; to ensure access to clean air and water; to limit exposure to dangerous chemicals and pesticides; to hold polluters accountable, including those who disproportionately harm communities of color and low-income communities; *to reduce greenhouse gas emissions; to bolster resilience to the impacts of climate change*; to restore and expand our national treasures and monuments; and to prioritize both environmental justice and the creation of the well-paying union jobs necessary to deliver on these goals.

To that end, this order directs all executive departments and agencies (agencies) to immediately review and, as appropriate and consistent with applicable law, take action to address the promulgation of Federal regulations and other actions

⁵⁸ See IPCC, Summary for Policymakers, Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways (2018), attached as Ex. 5.

⁵⁹ See, e.g., H. Fountain, Climate Change Is Accelerating, Bringing World 'Dangerously Close' to Irreversible Change, The New York Times (Dec. 4, 2019), attached as Ex. 6.

⁶⁰ See EPA, What Climate Change Means for Colorado (Aug. 2016), available at <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-co.pdf>, and attached as Ex. 7.

⁶¹ See Fourth National Climate Assessment (2018), Chapter 25: Southwest, available at <https://nca2018.globalchange.gov/chapter/25/> (last viewed Nov. 24, 2021).

during the last 4 years that conflict with these important national objectives, and *to immediately commence work to confront the climate crisis.*⁶²

Days later, President Biden further committed to taking swift action to address the climate crisis. Per Executive Order 14,008, he recognized that “[t]he United States and the world face a profound climate crisis. We have a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize the opportunity that tackling climate change presents.”⁶³ Pres. Biden announced that under his administration,

The Federal Government must drive assessment, disclosure, and mitigation of climate pollution and climate-related risks in every sector of our economy, marshaling the creativity, courage, and capital necessary to make our Nation resilient in the face of this threat. Together, we must combat the climate crisis with bold, progressive action that combines the full capacity of the Federal Government with efforts from every corner of our Nation, every level of government, and every sector of our economy.⁶⁴

Addressing the need for the accurate assessment of climate costs, Pres. Biden announced on day one that “[i]t is essential that agencies capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account.”⁶⁵

The President also re-established the Interagency Working Group on the Social Cost of Greenhouse Gases, on which the Secretary of Agriculture serves.⁶⁶ The President directed the Working Group to publish interim values for the social cost of carbon by February 19, 2021.⁶⁷ The Working Group that month set that price at \$51/ton at a 3% discount rate.⁶⁸

C. The Need to Manage the National Forests as a Carbon Reserve

To avoid the most extreme impacts of climate change, it is not enough to move beyond carbon fuel consumption, the Forest Service must also substantially increase forest protection in order to pull large quantities of CO₂ out of the atmosphere. This process is known as carbon sequestration or carbon storage.

⁶² Executive Order 13,990, 86 Fed. Reg. 7037 (Jan. 20, 2021) (Ex. 2) at Sec. 1 (emphasis added).

⁶³ Executive Order 14,008, 86 Fed. Reg. 7619 (Jan. 27, 2021), attached as Ex. 8.

⁶⁴ *Id.* at 7622 (Sec. 201).

⁶⁵ Executive Order 13,990 (Ex. 2), 86 Fed. Reg. at 7040, Sec. 5(a) (emphasis added).

⁶⁶ *Id.*, Sec. 5(b).

⁶⁷ *Id.*, Sec. 5(b)(ii)(A).

⁶⁸ Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 (Feb. 2021), attached as Ex. 9, and available at https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf (last viewed Nov. 24, 2021).

Scientific studies support the need for forests, including national forests, to play a key role in responding to the climate crisis by responding to the need for carbon storage. For example, a 2018 National Academies of Sciences study states that removing carbon dioxide out of the air will be crucial to meeting global climate goals, and a 2018 study by The Nature Conservancy reports that forests and other natural systems in the U.S. could offset as much as 21% of total national greenhouse gas emissions.⁶⁹ The *United States Mid-Century Strategy for Deep Decarbonization*, released in 2016 by the Obama White House, states that federal lands will play an important role in preserving carbon storage and calls for quickly mobilizing federal lands towards this goal.⁷⁰

The *United States Mid-Century Strategy for Deep Decarbonization* explains the importance of managing federal lands for decarbonization:

Covering 28 percent of U.S. land and comprising nearly 20 percent of the annual U.S. carbon sink, federal lands provide an important opportunity to quickly sequester carbon at scale while programs to support carbon sequestration on private lands are gaining momentum (Zhu and McGuire 2016; Zhu, Zhiliang, and Reed 2012, 2014). Building on important progress over the past several years, federal agencies can both begin to track carbon dynamics on federal lands as part of their agency-wide GHG inventories and put in place management guidance to increase carbon sequestration potential. Federal grassland and forest carbon fluxes are reported in the U.S. GHG Inventory, and federal agencies have begun to incorporate carbon sequestration and emissions estimates into land management plans.... These data and federal processes can provide the foundation for developing and implementing guidance to include land carbon sequestration as one of the management priorities for federal lands. Research and data-supported management practices for carbon sequestration and resilience can be integrated into long-term strategic plans, such as BLM Resource Management Plans and National Forest System Land Management Planning. Management priorities could include replanting understocked forests, promoting forest expansion where ecologically sound, and promoting agroforestry in federal grassland and pasture where appropriate.... Land managers should include carbon as a consideration for maintaining and enhancing landscape health in order to avoid undermining carbon mitigation efforts elsewhere.... To date, there has not been an assessment of additional carbon sequestration potential on federal lands. As management

⁶⁹ Sierra Club, Tackling Climate Change: A Climate Change Adaptation and Carbon Dioxide Removal Landscape Analysis (Feb. 2019) at 14, attached as Ex. 10, and available at <https://content.sierraclub.org/grassrootsnetwork/sites/content.sierraclub.org/activistnetwork/files/teams/documents/Tackling%20Climate%20Change%20Report%20Feb%202019.pdf> (last viewed Nov. 24, 2021).

⁷⁰ *Id.*; and see White House, *United States Mid-Century Strategy for Deep Decarbonization* (2016), at 15, listing the need to “[q]uickly scale up forest restoration and expansion on federal lands” as a “Long-term U.S. Mid-Century Strategy Priority”; *id.* at 70: “Federal lands will play an important role in preserving carbon stocks and providing early action.”; and *id.* at 82 listing “quickly mobilizing federal lands” as a “Priority for Policy, Innovation, and Research” towards achieving 2050 goals.” The White House Report is attached as Ex. 11, and available at https://unfccc.int/files/focus/long-term_strategies/application/pdf/mid_century_strategy_report-final_red.pdf (last viewed Nov. 24, 2021).

guidance is developed, assessing the full potential contribution of federal lands to our 2050 goals can help guide future policy priorities.⁷¹

Federal public land management practices and policies can enable those lands to achieve net carbon neutrality and ultimately serve as a source of negative carbon emissions by drawing down atmospheric carbon levels. Such practices will result in greater carbon storage, with associated preservation of expansive natural forests, reduced timber harvest, increases in tree species favoring late successional forest, and reduced risk of wildfire. In addition to enhancing the carbon storage potential of U.S. public lands, such practices will have the added benefit of preserving more interconnected habitat for wildlife species as they adapt to a rapidly changing climate.

D. A Carbon Storage Alternative in NEPA Planning

To achieve these critical climate goals, and to satisfy the Forest Service's obligations under NEPA, MUSYA, NFMA and the 2012 Planning Rules, we request that the Forest Service develop a carbon storage alternative for the Final EIS for the GMUG National Forest Plan Revision. We recommended that such an alternative contain strong plan-level guidance and prescriptions for protection and restoration of old-growth, proforestation, afforestation and reforestation.⁷² This would facilitate a shift of federal subsidies away from logging toward investments in resilient, carbon-rich ecosystems that provide wildlife habitat and steady sources of clean water. An alternative that maximizes long-term carbon storage on public lands would also require changes in management, including restoring fire as a key ecological process.⁷³

We urge that this alternative include but not be limited to:

- Identification of the adverse impacts of climate change on the national forest;⁷⁴
- Recognition of the need for the Forest Service to protect the national forests by managing it to slow climate change and mitigate its causes, here and as part of the national forest

⁷¹ White House, *United States Mid-Century Strategy for Deep Decarbonization* (Ex. 11) at 83.

⁷² "Proforestation" involves growing additional existing forests as intact ecosystems. This mitigates climate change through carbon sequestration and storage as well as promoting habitat protection and biodiversity. "Afforestation" involves planting new forests and "reforestation" involves replacing forests on de-forested lands. A sound carbon sequestration strategy would maximize all three of these practices.

⁷³ Any Plan goals concerning fuel reduction are not to the contrary. Scientific evidence suggests that anthropogenic climate change is contributing to a longer fire season and more acres burned, which releases carbon into the atmosphere. Any assumption that mechanical thinning and treatment will, in the long run, avoid the carbon emissions associated with more frequent high severity fires is flawed. "Thinning," and other forms of commercial logging, cause a substantial net loss of forest carbon storage now, and a net increase in carbon emissions relative to no logging, and logging can increase fire intensity rather than reduce it. Bradley, C. M., C. T. Hanson, and D. A. DellaSala. 2016. *Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western United States?* *Ecosphere* 7(10):e01492. 10.1002/ecs2.1492 at 7, 9, attached as Ex. 12.

⁷⁴ These include but are not limited to full analysis of impacts on snowpack, treeline, water availability, drought, temperature, wildfire, pests, and additional adverse impacts on flora and fauna and the human environment. *See e.g.*, EPA, *What Climate Change Means for Colorado* (Aug. 2016) (Ex. 7).

system, by minimizing carbon and greenhouse gas emissions and maximizing carbon sequestration and carbon storage;

- Management of the national forest for net carbon neutrality and ultimately as a carbon sink;
- Recognition that old forests accumulate and store vast quantities of carbon and are usually carbon sinks; trees accumulate and store carbon over their entire lifespan and old trees store carbon better than growing trees; and old forests accumulate carbon in soils;
- Recognition that conserving unmanaged wild forests and permanently protecting the forest and allowing it to grow free from direct human manipulation is one of the most effective methods to address the climate crisis;
- Elimination or significant reduction of timber harvest and increasing the rotation intervals for any remaining timber harvest to delay harvests;
- Elimination of mechanical thinning of trees other than suppressed small diameter trees or suppressed saplings;
- Reforestation of degraded forest lands and do not conduct post-fire logging;
- In making decisions about both “restoration” and timber harvest levels, optimizing carbon storage and sequestration by undertaking analysis that quantitatively evaluates the whole-ecosystem carbon balance based on the best available scientific information, and takes into account:
 - the synthesis presented in Anderson, M.G. 2019. Wild Carbon: A synthesis of recent findings. Northeast Wilderness Trust. Montpelier, VT USA regarding the value of mature trees and their soils with regard to carbon storage and sequestration
 - how the timing in changes in carbon storage and sequestration resulting from decisions comports with the need for urgent carbon reductions identified in the 2018 report from the IPCC. (Intergovernmental Panel on Climate Change (IPCC), Special Report on Global Warming of 1.5 °C (SR15) (October 2018), available at <https://www.ipcc.ch/sr15/download/>. See IPCC, Global Warming of 1.5 °C (Oct. 2018), available at <http://www.ipcc.ch/report/sr15/>);
- Determination of acres available for timber harvest and timber harvest volumes, and a selection of alternatives, based on the factors set forth above.

III. The Forest Service’s Analysis of Carbon Storage Violates NEPA.

The Forest Service should consider a carbon storage alternative for the GMUG National Forest because it meets the purpose and need for the Forest Plan revision. The alternative is

“significantly distinguishable” from the other alternatives already considered, and it is not “too remote, speculative, or impractical or ineffective.”⁷⁵

The Draft EIS defines the GMUG plan revision’s purpose and need as:

- (1) Provide strategic, adaptive direction;
- (2) Contribute to social and economic sustainability;
- (3) Maintain or restore ecological integrity; air, soil, and water; and riparian areas, taking into account stressors such as wildland fire, insects and disease, and changes in climate;
- (4) Provide ecological conditions to maintain biodiversity, including additional consideration for threatened and endangered species, species of conservation concern, and species of public interest like big game; and
- (5) Integrate resource management for multiple uses and ecosystem services.⁷⁶

The carbon storage alternative meets the Forest Plan Revision purpose and needs. It would comply with NFMA. Indeed, we discuss below why NFMA *requires* adoption of an alternative prioritizing a response to climate change. The proposed alternative would guide natural resource management activities on the forest for the next 10 to 15 years, and would address the need to for change in management direction by responding to climate change.

Given that the adverse impacts of climate change on the forest are caused by excessive carbon emissions into the atmosphere, and that carbon sequestration can offset these emissions and hence reduce this cause, it follows that maximizing carbon sequestration promotes the protection of terrestrial ecosystems and habitat, and watersheds and water, which the plan identified as Forest Plan Revision purposes. Further, making the maximum effort to protect the climate would respect cultural and traditional landscapes and uses by doing the most to ensure that those uses could continue in the face of the climate crisis. Watershed and ecosystem health would also benefit from an increase in carbon storage and a reduction in carbon pollution. By reducing the harms caused by the climate crisis, the carbon storage alternative will also ensure that there will be multiple uses and resources left to manage.

For these reasons, the Forest Service should have considered in detail the carbon storage alternative.

A. The Forest Service Must Consider a Carbon Storage Alternative, Violating NEPA.

As noted above, agencies may not dismiss an alternative that meets a project’s purpose and need unless they have, in “good faith,” found it to be “too remote, speculative, or impractical or

⁷⁵ *Colo. Env’tl. Coal. v. Dombeck*, 185 F.3d 1162, 1174 (10th Cir. 1999) (quotation omitted).

⁷⁶ GMUG Plan Revision Draft EIS, Vol. 1, at 5-6.

ineffective,”⁷⁷ or not “significantly distinguishable from the alternatives already considered.”⁷⁸ Because “[t]he existence of a viable but unexamined alternative renders an environmental impact statement inadequate,”⁷⁹ the Forest Service should consider this alternative in the Forest Plan Revision Final EIS.⁸⁰

The Forest Service cannot argue that managing to maximize carbon storage does not meet the Plan’s purpose and need. A relatively stable climate is a necessary pre-condition for the GMUG National Forest providing ecosystem services, contributing to social and economic stability, and maintaining or restoring ecological integrity and biodiversity, and that a relatively stable climate will not be possible unless the Forest Service and other agencies take all steps necessary via an all government approach, as directed by President Biden’s executive order, to limit the worst impacts of climate change.

In sum, any Forest Service dismissal of the proposed carbon storage alternative would be arbitrary and capricious.

B. The Forest Service’s Failure to Take a Hard Look at Carbon Storage Impacts Violates NEPA.

The Draft EIS contains some discussion of carbon storage, but that discussion fails to take the hard look at the impacts of each alternative, as NEPA requires.

First and foremost, we note the arbitrary and capricious nature of the Forest Service’s handling of carbon storage in the GMUG plan revision Draft EIS as compared to the way the Carson National Forest plan revision Final EIS addresses the issue.

The Carson FEIS contains a five-page section addressing the carbon storage impacts of the plan that includes a quantification of the estimated carbon stocks for each alternative, allowing at least a modest comparison among them those alternatives.⁸¹ The Carson NF’s analysis includes a bar graph displaying the “[l]ost potential storage of carbon because of disturbance on the Carson NF

⁷⁷ *Colo. Env’tl. Coal. v. Dombeck*, 185 F.3d 1162, 1174 (10th Cir. 1999) (quotation omitted).

⁷⁸ “NEPA does not require agencies to analyze the environmental consequences of alternatives it has in good faith rejected as too remote, speculative, or impractical or ineffective.” *New Mexico ex rel. Richardson v. BLM*, 565 F.3d 683, 708 (10th Cir. 2009) (quotation omitted). Moreover, “an agency need not consider an alternative unless it is significantly distinguishable from the alternatives already considered.” *Id.* at 708-09.

⁷⁹ *Westlands Water Dist. v. United States DOI*, 376 F.3d 853, 868 (9th Cir. 2004).

⁸⁰ Courts regularly set aside EISs where agencies fail to consider a range of reasonable alternatives. *See, e.g., High Country Conservation Advocates v. United States Forest Serv.*, 951 F.3d 1217, 1224-27 (10th Cir. 2020) (finding Forest Service NEPA analysis failed to consider a reasonable alternative concerning roadless area protection, and ordering the lower court to vacate the agency’s decision); *New Mexico ex rel. Richardson v. BLM*, 565 F.3d 683 (10th Cir. 2009) (setting aside BLM’s EIS concerning oil and gas leasing in the Otero Mesa area); *Wilderness Workshop v. U.S. Bureau of Land Management*, 342 F. Supp. 3d 1145 (D. Colo. 2018) (BLM’s range of alternatives violated NEPA by omitting any option that would meaningfully limit oil and gas leasing and development within the planning area); *Colorado Environmental Coalition v. Salazar*, 875 F. Supp. 1233 (D. Colo. 2012) (BLM was obliged to consider an alternative requiring extraction of oil and gas to be conducted through extended-reach multilateral wells).

⁸¹ Carson Forest Plan Revision Final EIS (2021), Vol. 1, at 255-60, excerpts attached as Ex. 13.

by alternative, compared to average carbon stocks between 1990 and 2011.”⁸² The Carson FEIS’s response to comments contains additional data comparing the impacts of each alternative on carbon storage.⁸³ While the Carson FEIS’s analysis is not sufficient to comply with NEPA, it is arbitrary and capricious for the Forest Service to attempt to quantify the carbon storage differences among alternatives in one forest plan in the New Mexico, and then not to do it for the plan for a nearby forest at nearly the same time. At an absolute minimum, the Forest Service must explain why it chose one path for the Carson and another for the GMUG. The agency failed to do so.

Second, while the Draft EIS contains a few pages carbon storage,⁸⁴ acknowledging the role that forests play in that process, that does not amount to a hard look because the Draft EIS fails to: disclose how each alternative impacts the ability of the forest to store carbon; *quantify* those different impacts in terms of carbon stored, via a life-cycle carbon analysis; and *disclose* the climate impacts of those differences using a metric such as the social cost of carbon. The Draft EIS fails to do any of these things.

The Draft EIS estimates carbon stocks on the forest from 2006-2015, but no further, without explaining why it present no data from the last five years.⁸⁵ The Draft EIS also states: “While timber harvesting does play a role in disturbance and the carbon cycle, it is a very small percentage of changes in the overall carbon cycle of the GMUG,” although the data the agency uses to support this assertion is from 1991–2011, and so is a decade out of date.⁸⁶

The Draft EIS specifically declines to quantify either the volume of GHG pollution that could be sequestered or released via logging, or the impacts from that pollution, by alternative or by any other measure. “Given the scale of effects of the proposed action (timber harvest and fuels treatments) in the context of the GMUG landscape, the effects disclosure is qualitative.”⁸⁷ Again, this contradicts the approach taken by the Carson National Forest, without explanation, and contradicts CEQ guidance and caselaw. Any subsequently prepared NEPA document must undertake a quantitative analysis.

One apparent excuse the Forest Service provides for failing to quantify climate impacts is the there is a “debate” about the impacts of logging and fire on carbon storage.

Under all alternatives, an active timber and prescribed fire program would be implemented. While these activities release carbon in the short term, they may result in long-term carbon sinks as treated areas revegetate. However, the net effect is debated in the best available science. As noted in figure 22, however, the

⁸² *Id.*, at 258.

⁸³ Carson Forest Plan Revision FEIS, Vol. II, Appx. A, at 70 (including a bar graph that illustrates that “all action alternatives have a greater potential for carbon loss per year from disturbance (tree removal, insects, disease, and fire)” than the no action alternative), included in Ex. 13.

⁸⁴ GMUG Plan Revision Draft EIS at 249-52.

⁸⁵ GMUG Plan Revision Draft EIS at 249-50.

⁸⁶ *Id.* at 250.

⁸⁷ *Id.* at 251.3.

absolute percentage of national forest disturbed by timber harvest and prescribed fire on the GMUG is less than 0.5 percent; accordingly, less than 0.5 percent of GMUG carbon stocks are affected by active vegetation management.⁸⁸

Note that 0.5 % of GMUG carbon stocks would equal nearly 2 million tons of carbon, a significant amount.

Rather than refer to peer reviewed science, the Forest Service relies on a four-year-old master's thesis presentation, that in relevant part apparently relies on no studies more recent than 2014, to argue that the science concerning whether fire and logging impact carbon storage over the long term is unsettled. The Draft EIS states:

According to a 2017 study, Carbon Sequestration in Colorado's Lands: An Integrated Spatial and Policy Analysis, "the long-term net carbon impacts of fire mitigation are debated in the literature, largely because fire mitigation generally results in short-term carbon losses or emissions. While several studies suggest potential for a long-term net carbon benefit (Hurteau and North, 2010; North and Hurteau 2011; Volkova et al. 2014), others conclude long-term net negative impacts on carbon stocks (Campbell and Ager 2013; Campbell et al. 2012; Mitchell et al. 2009). Others remain undecided about the carbon impacts of fire mitigation treatments (Reinhardt and Holsinger 2010)." It is assumed for the purposes of this analysis that the long-term effects of timber harvest on carbon stocks is also debated.⁸⁹

The Forest Service's analysis ignores the fact that more recent studies agree that maintaining forests rather than cutting them down can help reduce the impacts of climate change. "Stakeholders and policy makers need to recognize that the way to maximize carbon storage and sequestration is to grow intact forest ecosystems where possible."⁹⁰ One report concludes:

*Allowing forests to reach their biological potential for growth and sequestration, maintaining large trees (Lutz et al 2018), reforesting recently cut lands, and afforestation of suitable areas will remove additional CO2 from the atmosphere. Global vegetation stores of carbon are 50% of their potential including western forests because of harvest activities (Erb et al 2017). Clearly, western forests could do more to address climate change through carbon sequestration if allowed to grow longer.*⁹¹

A June 2020 literature review from leading experts on forest carbon storage reported:

⁸⁸ GMUG Plan Revision Draft EIS at 251.

⁸⁹ GMUG Plan Revision Draft EIS at 251-52.

⁹⁰ Moomaw, *et al.*, Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good, *Frontiers in Forests and Global Change* (June 11, 2019) at 7 (emphasis added), attached as Ex. 14. The Draft EIS fails to address or cite this study.

⁹¹ T. Hudiburg *et al.*, Meeting GHG reduction targets requires accounting for all forest sector emissions, *Environ. Res. Lett.* 14 (2019) (emphasis added), attached as Ex. 15. The Draft EIS fails to address or cite this study.

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).⁹²

Two experts in the field stated this year:

Recent projections show that to prevent the worst impacts of climate change, governments will have to increase their pledges to reduce carbon emissions by as much as 80%. We see the next 10 to 20 years as a critical window for climate action, and believe that *permanent protection for mature and old forests is the*

These studies demonstrate that the best available science holds that protecting large and old trees is a key element for protecting a forest's carbon storage capacity. The Forest Service ignores all of this science, in violation of NEPA's hard look.

Further, the Forest Service may not throw up its hands at the difficulty of quantifying and comparing the carbon storage impacts of varying alternatives. President Biden's Executive Order 14,008 explicitly requires that the "Federal Government must drive *assessment, disclosure*, and mitigation of climate pollution and climate-related risks in every sector of our economy." (Emphasis added.) Here, the agency's decision to fail to quantify carbon storage impacts undermines that order.

Further, CEQ's 2016 climate guidance, which was effectively reinstated in February 2021, states that "when addressing climate change agencies should consider ... [t]he potential effects of a proposed action on climate change as indicated by assessing GHG emissions (e.g., to include, where applicable, *carbon sequestration*)."⁹³ CEQ's guidance also recognized that models and other products existed *five years ago*, including those developed and used by the Forest Service, to estimate the carbon sequestration effects of agency actions: "These tools can provide estimates of GHG emissions, including emissions from fossil fuel combustion and estimates of GHG emissions and carbon sequestration for many of the sources and sinks potentially affected by proposed resource management actions."⁹⁴

As discussed above, federal courts have also ruled that agencies are required to disclose the climate impacts of their actions.

In addition, the Forest Service's approach also violates NEPA because methods exist that would allow the agency to quantify climate impacts. For example, a 2018 study concludes that carbon storage impacts can be estimated, accounted for, and factored into a model that calculated the net

⁹² B. Law, et al., *The Status of Science on Forest Carbon Management to Mitigate Climate Change* (June 1, 2020), attached as Ex. 16. The Draft EIS failed to address or cite this study.

⁹³ CEQ, 2016 NEPA Climate Guidance (Ex. 1), at 4 (emphasis added).

⁹⁴ *Id.*, at 12, and footnote 29.

amount of carbon lost due to forest logging in Oregon over two five-year periods.⁹⁵ This is precisely the type of analysis the Forest Service should, and could, have undertaken for the GMUG National Forest.

Other reports and agency analysis demonstrate that quantifying climate impacts at the Forest level can be done because it *has* been done. A report from Dr. DellaSala addresses carbon stores from wood products and concluded that logging old-growth forest under the Tongass National Forest's 2016 Forest Plan would result in net annual CO₂ emissions totaling between 4.2 million tons and 4.4 million tons, depending on the time horizon chosen.⁹⁶ The Bureau of Land Management more than a decade ago completed an EIS for its Western Oregon Resource Management Plan in which that agency also predicted the net carbon emissions from its forest and other resource management programs.⁹⁷ Because agencies and academics have quantified and compared the carbon emissions of alternative logging proposals, NEPA requires the Forest Service to do so here.

The excuse that the GMUG National Forest need not analyze carbon storage impacts because the science is allegedly inconclusive also ignores the fact that the *Carson* National Forest at least attempted such an analysis. Further, we are aware of no guidance, regulation, or caselaw that allows a federal agency to ignore an impact of an agency action in a NEPA analysis because of the science is "uncertain." If the Forest Service is aware of any such authority, it should cite it. Courts hold that agencies may not "shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry."⁹⁸ The agency has models, and can explain their limitations to inform the public and the decisionmaker. The Forest Service's failure to do so violates NEPA

To the contrary, NEPA requires that agencies identify "incomplete or unavailable" information as such, to "make clear that such information is lacking," and nonetheless include the information in the NEPA document if the overall costs of obtaining it are not "exorbitant" and the information is "essential to a reasoned choice among alternatives."⁹⁹ Here, the information is neither incomplete nor unavailable, the Forest Service has simply chosen, arbitrarily, to deprive the public of the data. Because the climate crisis is the pre-eminent environmental (and social, and public health, etc.) issue of our time, the Forest Service cannot assert that the Plan's climate

⁹⁵ See B. Law et al. *Land use strategies to mitigate climate change in carbon dense temperate forests*. Proceedings of the Nat'l Academy of Sciences, vol. 115, no. 14 (Apr. 3, 2018) at 3664 ("Our LCA [life-cycle assessment] showed that in 2001–2005, Oregon's net wood product emissions were 32.61 million tCO₂e [tons of carbon dioxide equivalent in net GHG emissions] (Table S3), and 3.7- fold wildfire emissions in the period that included the record fire year (15) (Fig. 2). In 2011–2015, net wood product emissions were 34.45 million tCO₂e and almost 10-fold fire emissions, mostly due to lower fire emissions."). Attached as Ex. 17.

⁹⁶ D. DellaSala. *The Tongass Rainforest as Alaska's First Line of Climate Change Defense and Importance to the Paris Climate Change Agreements*. 2016. At 14. Attached as Ex. 18.

⁹⁷ See Bureau of Land Management, *Western Oregon Proposed RMP Final EIS (2009)* at 165-181, excerpts attached as Ex. 19.

⁹⁸ *N. Plains Res. Council*, 668 F.3d at 1079 (9th Cir. 2011) (citation omitted).

⁹⁹ 40 C.F.R. § 1502.22(a).

impact is not “essential to a reasoned choice among alternatives.” The Forest Service can and should have undertaken an analysis of the impacts of the alternatives on carbon stores.

In addition, while alleging that the science around carbon storage is uncertain, the Draft EIS appears to assume that whatever the impacts, in the long run, forests will recover from logging and so the carbon storage impacts from logging will be nil.

However, over the very long term (centuries) for carbon, the effects of management and natural disturbances on the regional carbon balance are assumed to be neutral, assuming that similar vegetation regrows on the disturbed area and that disturbances remain the same. However, increased wildfire and drought severity and frequency due to climate change may result in the forest becoming a net source of carbon. The net effects on forest health and carbon sequestration have a high degree of uncertainty, primarily because of uncertainty in the magnitude of future climate change and the complex interactions of the forest with disturbances, changes in temperature and precipitation, and ecological processes.¹⁰⁰

The assumption that the carbon storage issue will be a wash in the long run is not supported by the best available science. As one prominent researcher explains: “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).”¹⁰¹

The Draft EIS fails to take the required hard look, because had it considered and quantified the carbon sequestration and carbon storage capabilities of wilderness, for example, it might have developed and/or chosen an alternative with greater recommended wilderness. Instead, it rejected alternatives with the greatest wilderness, without apparent consideration of these factors.

We note that CEQ’s guidance on evaluating climate change in NEPA documents explicitly states:

Agency decisions are aided when there are reasonable alternatives that allow for comparing GHG emissions and carbon sequestration potential, trade-offs with other environmental values, and the risk from – and resilience to – climate change inherent in a proposed action and its design.¹⁰²

The Forest Service failed to heed this direction, undermining its evaluation of alternatives in violation of NEPA.

The Forest Service should conduct a life-cycle analysis to address all upstream (project implementation) and downstream (processing and transport of wood products) emissions, which may be considerable. Logging itself is a fossil-fuel intensive process; so are transporting logs to

¹⁰⁰ GMUG Plan Revision Draft EIS at 251-52.

¹⁰¹ B. Law, *et al.*, The Status of Science on Forest Carbon Management (Ex. 16) (emphasis added).

¹⁰² CEQ, 2016 NEPA Climate Guidance (Ex. 1), at 15.

the mill, milling products, and transporting wood products to market.¹⁰³ All of these are reasonably foreseeable carbon pollution impacts of thinning. Failure to address these facts and this best available science, and failure to undertake the necessary life cycle analysis, violates NEPA's hard look mandate.

In sum, the Forest Service's analysis of the extent to which the plan provides for the "ecosystem service" of "long term storage of carbon," 36 C.F.R. §§ 219.10, 219.19, is lacking. This flaw also violates the NFMA and NEPA requirements to base decisions on the best available scientific evidence. The Forest Service's failure to take a hard look at the impacts of the various alternatives on carbon storage and sequestration violates NEPA.

C. The GMUG National Forest Is Required by Law to Manage the Forest for Carbon Sequestration.

Despite these plan components and the agency's duty to address climate change and carbon storage, it does not appear the Plan or the Draft EIS considered improving carbon stability through active restoration of the forest to improve resilience or evaluate the carbon emissions from timber harvesting in comparing alternatives, especially with regard to its impacts on the carbon carrying capacity of the forest.

As noted above, the 2012 Forest Planning rules mandate that the agency disclose existing information relevant to a baseline assessment of carbon stocks for the forest management unit.¹⁰⁴ But it does not appear the Forest Service took the hard look at these factors in developing this Plan.

Further, the agency's failure to adopt a plan mandating significant levels of carbon storage violates the Forest Planning Rules' requirement that the Forest Service consider climate change and *sustainability* in the planning process.¹⁰⁵ The Rules require that plans must ensure that "[t]imber harvest [for any purpose] would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources."¹⁰⁶ As climate change has the potential to adversely affect every item on that list, harvesting (logging) important carbon sinks is inconsistent with protecting these interests as doing so would exacerbate the climate crisis.

Importantly, the requirement that Forest Plans provide for sustainability, and that plans must ensure that timber harvests be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, and other resources, has no balancing factor.¹⁰⁷ This is not a factor to consider, but a regulatory requirement that the Forest Service must follow—regardless of other

¹⁰³ The Draft EIS asserts that the greenhouse gas emissions from logging will be slight. GMUG Plan Revision Draft EIS at 243. This is not a life-cycle analysis as it fails to address the GHG emissions from transport, milling, etc., the timber.

¹⁰⁴ See *Pinchot Institute Report* (Ex. 4) at 6-7.

¹⁰⁵ 36 C.F.R. §§ 219.8 & 219.10.

¹⁰⁶ 36 C.F.R. § 219.11(d)(3).

¹⁰⁷ 36 C.F.R. § 219.11(d)(3).

interests at play. And, due to the importance of carbon sequestration in reducing the widespread ecological impacts of climate change, § 219.11(d)(3) should be applied to ensure the optimization of carbon sequestration in the plan area.¹⁰⁸

The Rules also provide that “[n]o timber harvest for the purposes of timber production may occur on lands not suited for timber production.”¹⁰⁹ Land is not suited for timber production if “[t]imber production would not be compatible with the achievement of desired conditions and objectives established” by the relevant plan.¹¹⁰

Because timber production releases carbon in the harvest process, reduces the carbon storage capacity of the forest and reduces its potential for carbon sequestration (which is not fully or timely replaced by replanting), it adds carbon to the atmosphere and is not compatible with the objective of sustaining a healthy forest ecosystem.

Inasmuch as NFMA and MUSYA require management plans provide for “multiple use and sustained yield,” these laws require the Forest Service to manage the national forest for maximum carbon storage and carbon sequestration with minimum carbon emissions. The goal should be to make the forest a net carbon sink, and, moreover, to help serve the purpose of offsetting, to the maximum extent possible, the carbon emissions of the U.S. that are contributing to global climate change. Given the adverse impacts of climate change on the health of the national forest, the agency should manage for carbon sequestration and storage the greatest use, for without reducing the adverse impacts of climate change the other uses of the forest (*e.g.* wilderness, recreation and timber) are all impaired, reduced and undermined.

The Forest Service’s failure to elevate carbon sequestration use above timber production goals in particular is inconsistent with the 2012 NFMA rule requirements that climate change, sustainability, and the long-term storage of carbon be considered in the planning process. To put it in MUSYA terms, optimizing the carbon sequestration use of the national forest(s) “will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; ... with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.”¹¹¹

In exercising its discretion to balance uses under MUSYA, and the plan for those uses under NFMA, the Forest Service cannot rationally ignore the urgent need to manage the forests in a manner that not only maintains or improves carbon carrying capacity, but optimizes the carbon carrying capacity of the forests in a manner consistent with making the near term reductions in

¹⁰⁸ See *Pinchot Institute Report* (Ex. 4) at 15: “Developing optimization models in which maximizing carbon stocks is the objective function, subject to constraints to limit any diminishment of other forest resource uses and values, could help identify unexpected opportunities to enhance forest carbon stocks with a minimum of tradeoffs to other environmental, economic, and social values.”

¹⁰⁹ 36 C.F.R. § 219.11(d)(1).

¹¹⁰ 36 C.F.R. § 219.11(a)(1)(iii).

¹¹¹ 16 U.S.C. § 531(a).

carbon emissions that the October 2018 IPCC report¹¹² identifies as critical. Forest protection in the U.S. is a vital part of achieving those reductions. More logging occurs in U.S. forests than in any other nation in the world, making the U.S. the largest global problem in terms of carbon emissions from logging.¹¹³ Greenhouse gas emissions from the U.S. constitute about one-quarter of the global total, and much of this is the result of fossil fuel extraction from federal public lands, including 41% of all coal extraction that occurs in the U.S.¹¹⁴ Increased forest protection could account for approximately *half* of the climate change mitigation needed to keep global temperature rise to 1.5 degrees Celsius or less.¹¹⁵

The purpose and need that the 2012 forest planning rules were promulgated to address specifically included: “Contribut[ing] to ecological, social, and economic sustainability by ensuring that all plans *will be responsive* and can adapt *to issues such as the challenges of climate change*; the need for forest restoration and conservation, watershed protection, and species conservation; and the sustainable use of public lands to support vibrant communities.”¹¹⁶ Notably, this specific purpose and need was defined distinctly from the purpose and need to emphasize restoration to make the lands resilient to climate change.¹¹⁷

The Forest Service has in the past articulated its position regarding how to balance carbon reduction benefits with other land uses as follows: “Taking any tradeoffs into account, the Forest Service will work with partners *to sustain or increase carbon sequestration and storage* in forest and grassland ecosystems and to generate forest products that reduce and replace fossil fuel use. The Forest Service will balance its mitigation efforts with all other benefits that Americans get from healthy, resilient forests and grasslands, such as wildlife habitat, wood fiber, water quantity and quality, and opportunities for outdoor recreation.”¹¹⁸

The emergency need for reductions described in the 2018 IPCC report makes clear that the value of the forests for climate mitigation (i.e. reducing carbon emissions) is even higher than realized at the time the National Roadmap was developed in 2011. In balancing the value of using forest lands to maximize carbon storage and sequestration to mitigate climate change, the Forest

¹¹² Available at https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.

¹¹³ Hansen, M.C., et al. 2013. High-resolution global maps of 21st-century forest cover change. *Science* 342: 850-53. Attached as Ex. 20; Prestemon, J.P., et al. 2015. The global position of the U.S. forest products industry. U.S. Forest Service, e-Gen. Tech. Rpt. SRS-204.

¹¹⁴ See, e.g., 81 Fed. Reg. 17,720, 17,224 (Mar. 30, 2016); Stockholm Environment Institute, *How would phasing out U.S. federal leases for fossil fuel extraction affect CO₂ emissions and 2°C goals?* (May 2016). Available at <https://mediamanager.sci.org/documents/Publications/Climate/SEI-WP-2016-02-US-fossilfuel-leases.pdf> (last viewed Nov. 24, 2021).

¹¹⁵ Erb, K.H., et al. 2018. Unexpectedly large impact of forest management and grazing on global vegetation biomass. *Nature* 553: 73-76. Attached as Ex. 21. Griscom, B.W., et al. 2017. Natural Climate Solutions. Proceedings of the National Academy of Sciences, Vol. 114, at 11645-50. Attached as Ex. 22.

¹¹⁶ 77 Fed. Reg. at 21,164 (emphasis added).

¹¹⁷ See *id.*

¹¹⁸ National Roadmap for Responding to Climate Change, FS-957b (February 2011), at 20 (emphasis added).

Service cannot rationally discount the extreme urgency identified by the 2018 IPCC report, nor the role of land conservation in achieving the reductions necessary by 2030.

Further, to the extent that the Service is balancing the value of mitigation via increased carbon storage and sequestration against purely economic benefits (such as benefits from the sale of logged or salvaged timber), the Service should conduct an explicit cost-benefit analysis to ensure that there are in fact net economic benefits when the impacts of not avoiding carbon emissions are taken into account. In other words, the agency should monetize the value of avoided emissions that are being forsaken for the economic activity, using a tool such as the social cost of carbon. The Draft EIS fails to do so.

Due to the failure of the Draft EIS to provide an assessment specifically of how the timing, extent, and certainty of changes in net carbon emissions under each alternative compare against the urgent need for reductions by 2030, it does not provide an adequate basis for the Forest Service to assert that it is rationally balancing the benefits of climate mitigation efforts with other benefits, let alone optimizing climate mitigation efforts.

Finally, because of the severe impacts of climate change on the lands and resources in the national forest, timber production and the resulting near term carbon emissions from timber production make this Plan incompatible with the uses of those lands for resources such as fish and wildlife, and related desired conditions and objectives.¹¹⁹ In the Draft EIS, the Forest Service has failed to address how timber harvest could be carried out in a manner consistent with the urgent need to reduce carbon emissions, and “in a manner consistent with the protection of soil, watershed, fish, [and] wildlife ... resources.”¹²⁰ The agency’s failure to do so violates NFMA, MUSYA, and the 2012 Forest Planning Rule.

Conclusion.

Thank you for your attention to these issues. We look forward to continuing to participate in the planning process.

Sincerely,



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¹¹⁹ 36 C.F.R. § 219.11(a)(1)(iii).

¹²⁰ 36 C.F.R. § 219.11(d)(3).

TABLES OF EXHIBITS

- Exhibit 1. CEQ, *Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Review* (2016)
- Exhibit 2. Executive Order 13,990 (Jan. 20, 2021)
- Exhibit 3. Council on Environmental Quality, National Environmental Policy Act, *Guidance on Consideration of Greenhouse Gas Emissions*, 86 Fed. Reg. 10,252 (Feb. 19, 2021).
- Exhibit 4. Forest Carbon and Conservation Management: Integration with Sustainable Forest Management for Multiple Resource Values and Ecosystem Services (Pinchot Institute, May 2015)
- Exhibit 5. IPCC, Summary for Policymakers, *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways* (2018)
- Exhibit 6. H. Fountain, *Climate Change Is Accelerating, Bringing World ‘Dangerously Close’ to Irreversible Change*, *The New York Times* (Dec. 4, 2019)
- Exhibit 7. EPA, *What Climate Change Means for Colorado* (Aug. 2016)
- Exhibit 8. Executive Order 14,008, 86 Fed. Reg. 7619 (Jan. 27, 2021)
- Exhibit 9. Interagency Working Group on Social Cost of Greenhouse Gases, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990* (Feb. 2021)
- Exhibit 10. Sierra Club, *Tackling Climate Change: A Climate Change Adaptation and Carbon Dioxide Removal Landscape Analysis* (Feb. 2019)
- Exhibit 11. White House, *United States Mid-Century Strategy for Deep Decarbonization* (2016)
- Exhibit 12. Bradley, C. M., C. T. Hanson, and D. A. DellaSala. 2016. *Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western United States?* *Ecosphere* 7(10):e01492. 10.1002/ecs2.1492
- Exhibit 13. Carson Forest Plan Revision Final EIS (2021) (excerpts)

- Exhibit 14. Moomaw, *et al.*, Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good, *Frontiers in Forests and Global Change* (June 11, 2019)
- Exhibit 15. T. Hudiburg *et al.*, Meeting GHG reduction targets requires accounting for all forest sector emissions, *Environ. Res. Lett.* 14 (2019)
- Exhibit 16. B. Law, et al., The Status of Science on Forest Carbon Management to Mitigate Climate Change (June 1, 2020)
- Exhibit 17. B. Law et al. *Land use strategies to mitigate climate change in carbon dense temperate forests*. Proceedings of the Nat'l Academy of Sciences, vol. 115, no. 14 (Apr. 3, 2018)
- Exhibit 18. D. DellaSala. The Tongass Rainforest as Alaska's First Line of Climate Change Defense and Importance to the Paris Climate Change Agreements. 2016
- Exhibit 19. Bureau of Land Management, Western Oregon Proposed RMP Final EIS (2009) (excerpts)
- Exhibit 20. Hansen, M.C., et al. 2013. High-resolution global maps of 21st-century forest cover change. *Science* 342: 850-53
- Exhibit 21. Erb, K.H., et al. 2018. Unexpectedly large impact of forest management and grazing on global vegetation biomass. *Nature* 553: 73-76
- Exhibit 22. Griscom, B.W., et al. 2017. Natural Climate Solutions. Proceedings of the National Academy of Sciences, Vol. 114, 11645-50