July 20, 2023

[Address Block]

Re: ANPR

Dear XX,

Please accept these comments, submitted on behalf of [partner groups], and the Southern Environmental Law Center ("SELC"), regarding the U.S. Forest Service's Advanced Notice of Proposed Rulemaking ("ANPR") regarding "Forest Service Functions" under 36 C.F.R. Part 200. The ANPR requests public feedback on how the agency "should adapt current policies to protect, conserve and manage the national forests and grasslands for climate resilience, so that the Agency can provide for ecological integrity and support social and economic sustainability" in the face of our changing climate.[1]

This ANPR is the latest in a series of encouraging actions taken by the Biden Administration showing the federal government is serious about the climate crisis and the unique role that mature and old-growth forests (MOG) play in mitigating climate change and providing resilience to its effects. It follows up on the Forest Service's response to Executive Order 14,072, which requires the agency (along with the Bureau of Land Management) to conduct and publish an inventory of mature and old-growth federal forests,[2] followed by an analysis of the threats they face and development of "policies … to institutionalize climate-smart management and conservation strategies that address threats to mature and old-growth forests on Federal lands."[3] Following the release of the draft inventory this spring, the agency is seeking input regarding its obligations under that Executive Order. This is a generational opportunity to realign the agency's practices with the realities of a changing climate and the legacies of past inappropriate management.

The agency must address the threats to MOG comprehensively, including those from its own actions. We recognize that this will be a difficult transition for the Forest Service because it requires changes to core beliefs about the agency's mission. This difficulty is reflected in the agency's ambivalence about the scope of its job under the Executive Order. First, the Secretary's June 2022 memorandum (SM 1077-44) conspicuously omitted timber harvest as a threat, and explicitly claimed timber harvest was no longer "[a] primary threat to old growth stands on national forests."[4] The agency's emphasis on external threats makes an implicit argument that conserving MOG primarily requires active intervention—doing *more* vegetation management. That is not true everywhere, and it is not true in the East.

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[1] Organization, Functions, and Procedures; Functions and Procedures; Forest Service Functions, 88 Fed. Reg. 24,497, 24,498 (Apr. 21, 2023).
[2] Exec. Order 14,072 § 2(b), 87 Fed. Reg. 24,851, 24,851 (Apr. 22, 2022) ("EO 14,072").
[3] *Id.* § 2(c).
[4] U.S. Dep't of Agric., Secretary's Memorandum 1077-004, Climate Resilience and Carbon Stewardship of America's National Forests and Grasslands (June 23, 2022) ("SM 1077-004"), at 2.

In the ANPR, however, the agency acknowledged the threat of "past and current management practices, including ecologically inappropriate vegetation management and fire suppression . . . ."[5] In these comments, we focus considerable attention on how and why current vegetation management practices are harming MOG. In doing so, we do not mean to minimize the threats posed by external factors like wildfire or to suggest that all current management practices are harmful. However, we know that the agency is already paying attention to external threats and restoration needs that require active management. We hope to shine a light on the internal threats that are not getting that same attention.

Put simply, Forest Service projects are consistently targeting mature and old-growth forests for timber production—sometimes explicitly, sometimes in the guise of early successional habitat creation, and sometimes to pay for other restoration or fuels work in the same project. In areas of the country with low wildfire risk, timber harvest is the *greatest* threat to MOG and its associated values, like stored carbon and biodiversity. It is also the threat that the Forest Service can most effectively abate, and at much less cost than fighting wildfires.

Addressing the threat posed by current forestry practices does not mean that forestry is no longer relevant. To the contrary, the agency's mission—caring for our national forests to the benefit of the greatest number in the long term—is more relevant and urgent than ever. But the Forest Service must radically update its thinking about what forestry means in a changing climate. In the words of the Executive Order, the Forest Service must "deploy climate-smart forestry practices and other nature-based solutions to improve the resilience of our lands. . . ."[6] Forestry is the application of science-based methods to achieve a landowner's goals. *Climate-smart* forestry therefore requires reconsideration of not only our methods, but also our goals. Federal forests play an indispensable role in any realistic pathway to achieving net-zero emissions and avoiding the worst effects of climate change—effects that would undermine all the ecological, recreational, and economic values derived from those forests. To achieve the greatest good for public landowners in the long term, the Forest Service must prioritize stable carbon storage, ecological restoration, and protection of biodiversity.

If consummated with meaningful change, the undertaking initiated by this ANPR will be the most important work that the Forest Service will do in our lifetimes. If the agency fails to meet this moment, however, it will resign itself to (literally) putting out fires as forest-dependent economies collapse and species vanish into extinction. We therefore engage with the ANPR's questions with hope, but also with apprehension. We urge this administration to act boldly and quickly.

The ANPR's request for input is broken down into four categories of inquiry:

1. How the Forest Service should "[r]ely[] on Best Available Science, including Indigenous Knowledge (IK), to inform agency decision making."
2. "How might explicit, intentional adaptation planning and practices for climate resilience on the National Forest System be exemplified, understanding the need for differences in

[5] 88 Fed. Reg. at 24,503.
[6] EO 14,072, *supra* note 2, at § 1.

approach at different organizational levels, and different ecological scales, and in different ecosystems?"

3. "How might the Forest Service use the mature and old-growth forest inventory (directed by E.O. 14072) together with analyzing threats and risks to determine and prioritize when, where, and how different types of management will best enable retention and expansion of mature and old-growth forests over time?"
4. "How might the Forest Service better identify and consider how the effects of climate change on National Forest System lands impact Tribes, communities, and rural economies?"[7]

This set of questions invites a broad reconsideration of what the agency is and the priors that inform its pursuit of "the greatest good for the greatest number in the long term." We are pleased to see the Forest Service explore an expansive, deliberate approach to its stewardship of the country's greatest climate mitigation resource. That said, the Forest Service must also seize the narrower, tangible opportunity to develop concrete policies around its vegetation management operations that can be implemented in the near term.

Accordingly, our comments primarily address the ANPR's queries about the management and protection of mature and old-growth forests (question 3 above), particularly those in the Southeast. We describe the necessary outcomes and our recommended policy approaches to achieve them, and we explain how potential policies will play out in the East (and, particularly, in the Southern Appalachians). In the process of explaining and justifying our recommendations, we offer suggestions addressing other questions asked by the ANPR, including how MOG forest protection aids climate adaptation and resilience efforts, and how the Forest Service should use the Best Available Scientific Information (BASI) to further the maintenance and recruitment of MOG forests.

I. Executive Summary

Climate change is the defining crisis of our time. It will stress countless ecological relations among species and their habitats—including humans. The full extent of its consequences is not yet knowable. But we know that the fate of our forests will play a significant role in whether the planet can avoid and weather the worst of it.

Forests act as a brake on climate change's primary engine by pulling carbon from the atmosphere—carbon that would otherwise trap more heat close to the Earth's surface—and they sequester that carbon in plant matter and soil. Older forests do this best. Older forests also less combustible, and they shelter critical reserves of biodiversity. As a result, they provide resistance and resilience to change. Conservation of older forests is therefore critical to any serious attempt to address the crisis.

Federal forests are the single biggest carbon stock managed by the federal government. The Forest Service is responsible for 144 million acres of those forests, spanning both dry, fire-prone systems and moist, productive systems. The Forest Service's policy framework must not

[7] 88 Fed. Reg. at 24,502–03.

only provide for increasing the stability of carbon stored in dry, historically fire-suppressed systems, but it must also take advantage of the immense potential to increase storage in *already* stable systems, like those most common in our Eastern forests.

Eastern forests have a valuable, if small, reserve of old growth, which must be conserved and cannot responsibly be sacrificed for short-term economic or other supposed benefits. Perhaps even more importantly, however, our landscape has abundant mature forests. Due to a long history of rotational timber harvest, forests in this region are much younger than they should be and store much less carbon than they are capable of storing. In short, mature Eastern forests already store massive amounts of carbon, they can continue to sequester large amounts of carbon, and they are relatively unlikely to lose that carbon to natural disturbance. On the timescale relevant to achieving net-zero emissions, therefore, these forests are the surest tool in the agency's toolbox. Allowing mature forests to continue aging would also have tremendous co-benefits for biodiversity and ecological restoration goals, helping to restore old-growth forest conditions to their historical dominance on the landscape.

At the same time, we recognize that not all mature forests should be treated the same way. Even forests at low risk of disturbance may be appropriate candidates for active management interventions—for example, to restore characteristic species composition.

Our recommendations are intended to account for the diverse contexts found across the National Forest System (NFS). We support the community comments submitted by Silvix Resources in that regard. Below (pp XYZ), we emphasize how the recommended regulatory and policy changes should affect management of Eastern forests. In summary, we recommend as follows:

1. <u>Substantive Rule</u>: The Forest Service should conclude this effort with a substantive rulemaking. While we expect the scope of that rule to be broader than just MOG conservation, it must *at least* provide direction for conserving existing old-growth forests and for identifying mature forests that will continue on a trajectory toward old-growth conditions. The final rule should solidify the interim policy (see recommendation #3 below) and accommodate local and regional strategies for climate smart forestry (see recommendation #4 below).

2. <u>"North star" of Ecological Integrity</u>: The Forest Service should also take this opportunity to clarify that all project-level vegetation management decisions should contribute to the restoration (or maintenance) of ecological integrity. Ecological integrity, defined as being within the natural range of variation, provides the reference condition to guide restoration of MOG. The agency could set this "north star" as part of the substantive rulemaking, but it could also accomplish the same end separately through an interpretive rule or even through a batch amendment to forest plans. Regardless of its form, this direction should be accompanied by a decision support tool to help local decisionmakers determine whether a project will contribute to ecological integrity.

3. <u>Interim Policy</u>: Until the rulemaking is finalized, the agency should implement an interim policy. To the extent MOG is harvested in the near term, the lost carbon will not be

replaced for decades. The Forest Service cannot afford to squander that resource thoughtlessly through uncoordinated local decisions. An interim policy must at least cover existing old-growth forests, prohibiting harvest except as needed to maintain old-growth characteristics or for cultural use by Native nations. Ideally, the policy would also provide a screening mechanism for proposals affecting mature forests.

4. Development of Local Strategies: The Forest Service should direct Regional or subregional development of strategies for climate-smart forestry, including climate-smart prescriptions that are intended to meet other ecological and social objectives while retaining carbon stored in older forests to the greatest extent possible. These strategies could be developed as a "toolkit" or implemented directly through programmatic projects. If mature forests are not addressed by the interim policy, they should be addressed here.

5. Program Oversight: Finally, the Forest Service should set up a program (with adequate funding requested in the budget) to oversee MOG conservation. Among other things, the program would be responsible for monitoring and adaptive management.

II. Background on Mature and Old-Growth Forests in the Southeast

Although the Forest Service must develop a nationwide policy framework to conserve mature and old growth forests, we agree that "the appropriate science-based practices that will sustain resilient forests and stabilize forest carbon are place specific."[8] Our recommendations address both scales—the need for consistent direction across the NFS and the need for local innovation. In this section, our goal is to highlight some of the place-specific science and trends relevant to conservation of MOG forests in Eastern forests and their role in climate mitigation and adaptation. Conversations regarding forest policy often revolve around western forests at high risk of catastrophic fire, but the relative stability and rich biodiversity of mature Eastern forests, and particularly those of the Southern Appalachians, deserve special weight in the agency's policymaking.

Four premises must factor into the policy discussion around these forests: First, mature and old-growth forests in the East, and in the Southern Appalachians in particular, are of extremely high value for biodiversity and carbon storage; not to mention recreation, clean drinking water, scenic, and economic uses. Second, because of a history of logging that far exceeded natural disturbance levels, Eastern forests overall are in younger condition than they ought to be, and there is therefore extraordinary potential for increasing the proportion and improving the condition of mature and old-growth forests on these lands—and the many values that come with those forests. Third, as compared to forests nationwide, Eastern forests have a low risk of climate-driven catastrophic disturbance, which means that the benefits of conserving mature and old-growth forests will be relatively stable and long term. And, fourth, the greatest ongoing threat to mature and old-growth forests in the East is ecologically inappropriate logging.

a. The value of Southeastern MOG forests

[8] SM 1077-004, *supra* note 4, at 2.

Southeastern mature and old-growth forests play an outsized role in providing habitat, carbon storage, climate resilience benefits, and connection with nature. To design a policy that effectively protects these forests and evaluate the tradeoffs necessary to do so, it is important to understand the nature and scale of these values. Below, we briefly survey the benefits healthy MOG forests in our region provide and highlight how these benefits are largely irreplaceable and irreplicable on relevant timescales.

i. Current and future carbon storage

Forests are the largest form of terrestrial biomass globally, as well as the most significant terrestrial contributor to atmospheric carbon removal.[9] Each year, forests remove about a third of the atmospheric carbon emitted through combustion of fossil fuels worldwide and 10–15 percent of the United States economy's total greenhouse gas emissions.[10] In the United States, federal forestland is the largest carbon sink in the federal government's control. Some 45% of all above-ground, living biomass in the continental United States is in national forests.[11]

And within that landscape, mature and old-growth forests do the heavy lifting. The largest 1% of trees store half of all aboveground forest biomass worldwide, although that figure is somewhat lower—somewhere closer to 30 or 40%—in the United States due to the temperate climate of the most productive U.S. forests and legacies of logging.[12] "Mature, multi-aged forests" store far more carbon per unit of land area than young forests.[13] Their remarkable carbon density is only achieved through decades of accumulation, which continues at significant rates even after peaking during the first few decades of a forest's maturation.[14] The Forest Service's data for the Southeast shows that net primary productivity for most forest types peaks between forty and sixty years of age but then levels off at approximately seventy percent of the peak rate, which can be sustained for a century or more.[15] Older forests are therefore valuable because they store massive volumes of carbon *and* continue to sequester additional carbon at significant rates.

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[9] U.S. Global Change Research Program, *Second State of the Carbon Cycle Report: A Sustained Assessment Report*, Ch. 9, 1 (2018), *available at* https://carbon2018.globalchange.gov/chapter/9/.

[10] EO 14,072, *supra* note 2, at § 1.

[11] DellaSala et al., *Mature and Old-Growth Forests Contribute to Large-Scale Conservation Targets in the Coterminous United States,* Front. in Forest & Glob. Change (Sept. 28, 2022), at 8.

[12] James A. Lutz et al., *Global Importance of Large-Diameter Trees,* 27 Global Ecol & Biogeog. 849, 861 (2018). *See also* David J. Mildrexler et al., *Large Trees Dominate Carbon Storage in Forests East of the Cascade Crest in the United States Pacific Northwest*, Front. in Forests & Glob. Change (Nov. 5, 2020), at 2.

[13] Beverly E. Law et al., *Creating Strategic Reserves to Protect Forest Carbon and Reduce Biodiversity Losses in the United States*, Land (May 2022), at 4.

[14] *Id.*

[15] *See generally* Richard A. Birdsey et al., U.S. Dep't of Agric., Forest Service, Rocky Mtn. Res. Station, Assessment of the Influence of Disturbance, Management Activities, and Environmental Factors on Carbon Stocks of U.S. National Forests, Gen. Tech. Rep. RMRS-GTR-402.

The United States is counting on forests' carbon storage to achieve net zero emissions by 2050.[16] Protecting and restoring old-growth forests is the cheapest and most effective policy available to the federal government to maximize carbon storage across the landscape. Although young forests can sequester carbon at an impressive rate, the removal of mature and old forests to make room for new growth results in carbon losses that do not break even for many decades, if ever.[17] In fact, even 120 years after a hypothetical harvest, the resulting regenerated forest has not "caught up" with the scenario where that same forest was never harvested, even accounting for carbon that remains stored in forest products from that harvest.[18]

Not only are Eastern forests suitable for storing *current* levels of carbon in a stable manner; they also can do the same for additional carbon. Because these forests skew young due to historical logging, current "forest carbon densities are much lower than their potential."[19] Allowing second-growth forests to mature into old growth is key to realizing the carbon-capturing potential of Eastern forests. It will also restore ecosystems and benefit wildlife and biodiversity.

Existing forests' value as a climate change mitigator is especially significant given the relevant time scale. To avert the worst impacts of climate change, it matters *when* and *how soon* a given amount of carbon can be kept or removed from the atmosphere—not just that it eventually will be. The value of each unit of atmospheric carbon sequestered diminishes as time passes: Once further climatic "tipping points" are reached, feedback cycles of warming and volatility will occur that cannot be reversed by removing the same amount of atmospheric carbon that was responsible for their initiation.[20] This dynamic makes it critical that forests currently storing the highest amounts of carbon—mature and old-growth forests—are managed to prevent release of that carbon. Hypothetical sequestration by regenerated forests distant decades cannot be compared to the value of carbon being sequestered in the near term and stored *right now*. The MOG forests least likely to release carbon in disturbance events should therefore be most protected from harvest.

ii. Habitat and Biodiversity

The forests of the East, and particularly those of the Southern Appalachians, are home to unique ecosystems and a startling number of species of plants and animals, many of which are imperiled or whose Southern Appalachian populations are globally significant.[21] North-south corridors as well as elevational gradients provide resilience by facilitating migration. At higher

[16] Nat. Res. Def. Council, Clean Energy Now for a Safer Climate Future: Pathways to Net Zero in the United States by 2050 (2023), at 7.
[17] *See* Law et al., *supra* note 13, at 5, fig.2 (reproduced *infra* at TKpage).
[18] *Id.*
[19] *Id.* at 3.
[20] *Id.* at 6.
[21] *See* S.K. Erlandson et al., *Limited Range-Filling Among Endemic Forest Herbs of Eastern North America and Its Implications for Conservation with Climate Change*, Front. In Ecol. & Evolution (December 2021), at 2 ("In Eastern North America, a major center of endemism for plants and animals of deciduous forests is the Southern Appalachian Mountains hotspot.").

elevations, the Southern Appalachians serve as the southernmost extent of many species' ranges. And because these southern populations and ecosystems are often isolated from their northern counterparts, threats to MOG forests (including climate change) threaten their extirpation from the Southeast, making the entire species more vulnerable.[22]

Without discounting the importance of other structural conditions to overall species richness, MOG forests are primarily responsible for providing the distinct conditions that support our region's rare species. Mature and old-growth forests contain complex ecosystem dynamics important to the life cycles of a broad range of terrestrial and aquatic taxa. Simply put, large old trees "are not simply enlarged versions of young trees and large young trees cannot duplicate all the functional roles that large old trees can play."[23] Instead, older trees and mature forests are integral to complex ecosystem dynamics. For example, living older trees offer nesting habitat to interior forest species, whereas both standing snags and downed stumps of dead mature trees provide habitat for imperiled species that is not found elsewhere.

Old-growth and mature forests are especially invaluable to imperiled species: As forests age, they become more spatially and structurally heterogenous and complex, providing more species with more of the microhabitats and resources necessary in different periods of their life histories.[24] Older forests nationwide are essential for the conservation of threatened and endangered species,[25] and Eastern forests in particular are disproportionate reservoirs of amphibian, bird, and carnivore diversity, including imperiled species.[26] For example, "most vulnerable bird species need large intact forests," and even "relatively small fragments [of mature forest] can still have substantial biodiversity value if protected at the highest levels."[27] The sheer number of at-risk species in the Southern Appalachians drives home how important these older forests are. The Nantahala and Pisgah National Forests recently identified 359

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[22] *See* U.S. Forest Serv., Environmental Impact Statement for the Revised Land and Resource Management Plan, George Washington National Forest (2014) ("GWNF FEIS"), at 3-116 (discussing isolated bird populations); U.S. Forest Serv., Final Environmental Impact Statement for the Land Management Plan, Nantahala and Pisgah National Forests (2023) ("NPNF FEIS"), at 3-259 (discussing relict populations of Carolina Flying Squirrel in high elevation spruce-fir and northern hardwood forests), and 3-324 (relict populations of spotfin chub).

[23] David B. Lindenmayer et al., *New Policies for Old Trees: Averting a Global Crisis in a Keystone Ecological Structure*, 7 Conservation Letters Volume 1, 61–69 (2014), https://doi.org/10.1111/conl.12013.

[24] William R. Moomaw et al., *Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good*, Front. For Glob. Change, at 5 (June 2019).

[25] *See* Polly C. Buotte et al., *Carbon sequestration and biodiversity co-benefits of preserving forests in the western United States*, 30 Ecol. Applications 2 (2020), https://doi.org/10.1002/eap.2039 (finding that the studied mature forests had the "highest proportional area of terrestrial vertebrate habitat for species listed as threatened or endangered by the U.S. Fish and Wildlife Service," as well as the "highest proportion of habitat designated as critical for threatened or endangered species survival").

[26] Albert J. Meier et al., *Biodiversity in the Herbaceous Layer and Salamanders in Appalachian Primary Forests*, *in* Eastern Old-Growth Forests, Prospects for Rediscovery and Recovery (1996); Michael R. Pelton, *The Importance of Old Growth to Carnivores in Eastern Deciduous Forests*, *in* Eastern Old-Growth Forests, Prospects for Rediscovery and Recovery (1996); J. Christopher Haney and Charles P. Schaadt, *Functional Roles of Eastern Old Growth in Promoting Forest Bird Diversity*, *in* Eastern Old-Growth Forests, Prospects for Rediscovery and Recovery (1996).

[27] Beverley E. Law et al., *Creating Strategic Reserves to Protect Forest Carbon and Reduce Biodiversity Losses in the United States*, 11 Land 2022, 5, 721 (2022), https://doi.org/10.3390/land11050721.

federally listed species and species of conservation concern on that landscape. The George Washington National Forest similarly identified 295 listed or at-risk species on a similarly sized forest. Most of these species are associated, at least for some critical portion of their life cycle, with mature or old-growth forests. For example, on the Nantahala National Forest, which is the most significant global hotspot for salamander diversity, the Forest Service recently noted that "the best opportunity to maintain, restore, or enhance habitat for terrestrial salamanders is within mature and old growth forests."[28] The need for stable old-growth and mature forest conditions will only increase as the climate crisis accelerates and pressure on at-risk species intensifies.

Loss of these benefits to harvest simply cannot be mitigated in the near term. Studies have found that nest boxes are insufficient to replace the nesting opportunities provided by large old trees when placed in the same ecosystem.[29] Similarly, the retention of coarse woody debris and snags after logging, while important, is ecologically inadequate to compensate for the lost trees and dramatic changes to the microclimate.[30] For example, federally listed endangered and threatened forest bat species rely on exfoliating bark, roosting opportunities, and optimum foraging conditions and are, therefore, less present in intensively managed older forests.[31] Likewise, management guidelines for the retention of coarse woody debris "may not provide adequate habitat" for amphibians and other forest-floor vertebrates that depend on decaying logs and log fragments.[32] Old-growth forest dynamics and structural characteristics, in their entirety, are what make them so valuable to species, and these characteristics also occur, albeit to a lesser degree, in recovering mature forests.

iii. Stability and resilience of Eastern forests

Eastern forests are especially valuable as carbon sinks and biodiversity refugia because they experience less (and less severe) large-scale disturbance than most forests of the western United States.[33] Upland dry forest communities in the East occur in small pockets interspersed with mesic forests, and the landscape is therefore less able to carry fire. When natural disturbances do occur, intact old-growth ecosystems prove more resilient than younger, even-aged forests because secondary growth is available to quickly fill gaps in the canopy.[34]

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[28] NPNF FEIS, *supra* note 22, at 3-358.

[29] David B. Lindenmayer et al., *Are Nest Boxes a Viable Alternative Source of Cavities for Hollow-Dependent Animals? Long-Term Monitoring of Nest Box Occupancy, Pest Use and Attrition.*, Biol. Conserv., 142, 33–42 (2009), http://dx.doi.org/10.1016/j.biocon.2008.09.026.

[30] *Id.*; G. Wilhere, *Simulations of Snag Dynamics in an Industrial Douglas-fir Forest*, 174 Forest Ecol. Manage., 521–39 (2003), https://doi.org/10.1016/S0378-1127(02)00069-5.

[31] D. Russo et al., *Reconsidering the Importance of Harvested Forests for the Conservation of Tree-Dwelling Bats*, 19 Biodiversity and Conservation 2501–15 (2010), https://doi.org/10.1007/s10531-010-9856-3.

[32] Sally R. Butts & William C. McComb, *Associations of Forest-Floor Vertebrates with Coarse Woody Debris in Managed Forests of Western Oregon*, 64 The Journal of Wildlife Management 1, 95-104 (2000), https://doi.org/10.2307/3802978.

[33] Moomaw et al, *supra* note 24, at 3.

[34] Sebastian Luyssaert et al., *Old-growth Forests as Global Carbon Sinks*, Nature (2008), at 2.

Meanwhile, fallen trees continue to store carbon (and provide valuable habitat) for many decades, and much of the carbon in downed woody debris is transported into soil during decay.[35]

In fact, because mature and old-growth forests resist fire and storm disturbance, they will become increasingly important as buffers against disturbances that are more often fatal to younger forests—particularly wildfire. In wetter forests, older forests and larger trees also typically contain more moisture and thus take longer to ignite than younger or industrially managed forests.[36] In fire-adapted forests, multi-aged, mature stands are associated with less severe and smaller fires than younger, single-aged ones; the structural complexity of their canopies acts as a natural brake on the spread and severity of wildfire.[37] Older trees that do ignite survive and continue growing more often than younger ones.[38] Conserving mature and old-growth forests is therefore especially important for forest resilience as fire and storm intensities increase because more of the young forests that would have otherwise aged into maturity will suffer age-resetting disturbances. Relative to forests nationwide, therefore, Eastern forests' capacity to sequester and store carbon is stable. These ecosystems have low climate "velocity," meaning they will remain relatively intact and productive despite anticipated changes to our climate.

This can be quantified through disturbance return intervals, which are probabilistic measures of the average length of time between disturbance on any acre of a given forest type. Take cove forests, for example—the largest single ecological system in the Southern Appalachians. The Nantahala-Pisgah National Forest recently estimated that the return interval for *all* disturbance types in cove forests, including gap-phase dynamics (which actually increase carbon storage rather than causing losses) was 211 years.[39] The Forest Service also modeled *future* disturbance at larger spatial scales (greater than ½ acre). The return interval for such disturbance in cove forests was modeled at an astonishing 25,000 years.[40] Needless to say, storing carbon in cove forests is a safe bet over the timeframe that matters most for avoiding the worst effects of climate change. Even in systems with shorter return intervals for low severity disturbance, catastrophic disturbance is infrequent. For example, even highly fire-adapted systems like longleaf pine forests can be managed on a trajectory to reach old-growth conditions with prescribed fire.

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[35] U.S. Dep't of Agric., Forest Serv., The Seen and Unseen World of the Fallen Tree (1984), at 19, 43, *available at* https://www.fs.usda.gov/research/treesearch/5625.
[36] P.M. Brown et al., *Identifying old trees to inform ecological restoration in montane forests of the central Rocky Mountains, USA*, Tree Ring Research (2019) 75(1): 34–48, https://doi.org/10.3959/1536-1098-75.1.34.
[37] Daniel Binkley et al., *The Role of Old-Growth Forests in Frequent-Fire Landscapes*, 12 Ecol. & Soc'y 18 (2007), at 12 ("The loss of old-growth structure in frequent-fire landscapes commonly leads to uncharacteristically severe wildfires …").
[38] U.S. Dep't of Agric., Forest Serv., Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival in the Blue and Wallowa Mountains (2002), at 6–7 (showing decreasing mortality rates from given severities of fire as tree diameters increase).
[39] Southern Environmental Law Center, et al., Notice of Objection to the Revised Land Management Plan for the Nantahala and Pisgah National Forests, at 49–50 (Mar. 22, 2022) (citing values calculated using the Disturbance Return Interval Spreadsheet provided by the Forest Service).
[40] *Id.* at 50.

Eastern forests' stability is important not only for carbon stocks, but also for species. Intact old-growth forests are uniquely capable of providing valuable habitat for sensitive species despite the increases in average temperature and intense weather events expected to occur with climate change.[41] Structurally complex forests, and especially old-growth forests, can be cooler than other forest types during the high heat of spring and summer months in the northern hemisphere.[42] The vertical structure of mature and old-growth forests, denser canopy cover, and moisture retention in downed trees are among the factors that keep older forests slightly cooler and more humid than other forest types.[43] Studies have found that spring and summer temperatures are reduced by as much as 2.5–5°C in the old-growth forests of the Pacific Northwest[44]—a temperature disparity that could mean survival for heat-sensitive species. Studies focusing on climate-sensitive birds found that species associated with "significant negative effects of summer warming" had ill effects reduced and "even reversed" where the species had access to high proportions of old-growth forest.[45] These old-growth microrefugia are "most important when macroclimate conditions are at the extremes of their distribution"[46]—a critical consideration for the Southern Appalachians, where many species' ranges are at their southernmost extent and/or isolated by altitude: "Even when the magnitude of thermal buffering is overcome by macroclimate warming, consistently 'cold' microrefugia are still more hospitable than anywhere else in the landscape, and thus might buy time for species to move or adapt."[47]

In addition, forests store significant amounts of excess moisture, both in trees themselves and in deep, dense soils and woody debris. Water storage and absorption limits the sedimentation and erosion impacts of severe storms, protecting fragile aquatic habitats. Conversely, even relatively low levels of timber harvest are associated with increased disruption and destruction of those habitats due to sedimentation and landslides.[48] Stored moisture can also be slowly released to help the surrounding ecosystem weather the prolonged periods of drought anticipated as

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[41] *See, e.g.*, Matthew G. Betts et al., *Old-Growth Forests Buffer Climate-Sensitive Bird Populations from Warming*, 24 Diversity & Distributions 439, 443 (2017) ("Our most striking findings were that … population declines of both species for which significant negative effects of summer warming were detected were reduced and even reversed in landscapes with high proportions of old-growth forest and … there was a positive correlation between the strength of climate warming effects on bird population trends and the degree to which old growth forest buffers populations from warming.").

[42] Frey et al., *Spatial models reveal the microclimatic buffering capacity of old-growth forests*, 2 Science Advances 4 (2016), https://doi.org/10.1126/sciadv.1501392.

[43] *Id.*

[44] *Id.*; *see also* Christopher Wolf et al., *Temporal Consistency of Undercanopy Thermal Refugia in Old-Growth Forest*, 307 Agric. & Forest Methodology (September 15, 2021), https://doi.org/10.1016/j.agrformet.2021.108520 ("[O]ld-growth forest structure was associated with cooler [spring and summer] temperatures (relative to all vegetation present) on the order of 3–5°C.").

[45] Betts et al, *supra* note 41, at 439–47.

[46] Wolf et al., *supra* note 44, at 5.

[47] *Id.* at 24.

[48] British Columbia Ministry of Forests, Landslide Risk Case Studies in Forest Development Planning and Operations (2004), at 1

climate change advances.[49] The largest trees are again responsible for the lion's share of this vital ecosystem service.[50] And because forests retain and regulate the transfer of moisture to and from the atmosphere, deforestation itself makes drought more severe by disrupting hydrologic cycles.[51] To the extent this has already occurred, the role existing and future MOG forest plays in mitigating volatile precipitation patterns will only become more important.

Old-growth and mature forests also contain a larger proportion of resources for some forest-associated species as compared to younger, less dense woodlands. This is especially true for food and nesting site availability.[52] As species face increasing stress from a changing climate, and become less tolerant of other stressors, it is especially important to protect places where resources are more abundant.

Taking advantage of Eastern forests' stability is inexpensive and simple: "[M]any forests do not require management to help them remain healthy and in a state of net carbon sequestration or long-term storage."[53]

iv. Social and economic value

It is impossible to completely capture the value, in dollar terms, of healthy mature forests. But as the Forest Service understands, some ecosystem services associated with mature and old-growth forests can be quantified.[54] Several are particularly relevant to the Southern Appalachians.

First, recreation is a vital component of economic activity throughout the National Forest System. Nationally, recreational visitors to national forests "generated $10.1 billion in local spending and supported 153,800 jobs."[55] This is doubly true in the Southern Appalachians, where recreation dwarfs the economic output associated with timber. For example, the total economic impact of trout fishing *alone* in North Carolina's mountains was $334 million in

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[49] Anthony D'Amato & Paul Catanzaro, Restoring Old Growth Characteristics to New England and New York's Forests (2021), at 8.
[50] Dominick A. DellaSala, Earth Island Inst., Comment Letter on Request for Information on Federal Old-Growthj and Mature Forests EO 14072 (Aug. 15, 2022), at 13.
[51] *Id.*
[52] Braunisch et al., *Temperate Mountain Forest Biodiversity under Climate Change: Compensating Negative Effects by Increasing Structural Complexity*, 9 PLoS ONE 5 (2014).
[53] Lauren Cooper & David MacFarlane, *Climate-Smart Forestry: Promise and Risks for Forests, Society, and Climate*, PLOS Climate (2023), at 6–7.
[54] *Ecosystem Services*, U.S. Dep't of Agric. (last accessed July 17, 2023), https://www.fs.usda.gov/research/managingland/ecosystem.
[55] *Outdoor Recreation*, U.S. Dep't of Agric. (last accessed July 7, 2023), https://www.fs.usda.gov/research/environment/recreation.

2014.[56] Mountain biking, rock climbing, and paddling combined for another $115 million.[57] In contrast, the sold value of timber from the Nantahala–Pisgah National Forests in 2016 was a mere $1.17 million; the total economic value of timber activities was only $7.6 million.[58] At the agency's highest estimate of theoretical economic value—which would require quintupling current levels of logging—timber activities would contribute a maximum of $49 million in economic activity.[59] Even adding hunting to the mix (on the basis that timber management is often argued to have co-benefits for game wildlife management), the picture does not change much: Hunting accounts for only about 1% of visitation to these forests.[60]

The national forests are the anchors for the economic benefits of recreation, although the economic benefits redound primarily to local communities. More than half of forest users surveyed by the Forest Service in 2018 said they visited the Nantahala and Pisgah National Forests to engage in hiking and sightseeing. Twelve percent of forest users reported cycling; 14 percent reported using the forest to view wildlife. The Southern Appalachian national forests are perennially among the most highly visited Forest Service units in the country,[61] in part because they are within a day's drive of half the country's population.[62] But these forests would not draw such high numbers of visitors if not for the unique settings provided by their relatively intact and impressive older forests. For example, the Nantahala-Pisgah receives more than five times the annual visitation of the Allegheny National Forest,[63] which has historically been more heavily logged and fragmented by roads and special uses, although it is similarly situated in its proximity to population centers.

Extractive logging is not *additive* to the ecosystem services provided by the national forests; it is in *tension* with those other services. Logging and associated roads result in area closures, noise and scenic impacts, and growth of thickets of vegetation that can choke trails and are nearly impassable for recreational users. It often causes sedimentation of trout streams and

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[56] N. Carolina Wildlife Res. Comm'n, *Mountain Trout Fishing: Economic Impacts on and Contributions to North Carolina's Economy* (2015), at iv, *available at* https://www.ncwildlife.org/Portals/0/Fishing/documents/Mountain%20Trout%20Fishing%20Economic%20Impacts%20on%20and%20Contributions%20to%20North%20Carolinas%20Economy.pdf.

[57] James N. Maples & Michael J. Bradley, Outdoor Alliance, *The Economic Influence of Human Powered Recreation in North Carolina* (2017), *available at* https://www.outdooralliance.org/nantahalapisgah-economic-reports.

[58] NPNF FEIS, *supra* note 22, at 3-610, 3-616.

[59] *Id.* at 3-616.

[60] *Id.* at 3-607 to 3-608.

[61] U.S. Forest Serv., Nantahala and Pisgah National Forests Revised Land and Resource Management Plan (January 2023) ("61sed Forest Plan"), at 14.

[62] U.S. Forest Serv., Nantahala and Pisgah National Forests Assessment (March 2014) ("NPNF Assessment"), at 116, *available at* https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd532825.pdf.

[63] *Compare* U.S. Forest Serv., Nat'l Visitor Use Monitoring, Regional Annual Visitation Estimate for Nantahala–Pisgah Nat'l Forests (2018), https://apps.fs.usda.gov/nvum/results/U0801101.aspx/FY2018/VE02?filename=Regional_Visitation&format=PortableDocFormat, *with* U.S. Forest Sev., Nat'l Visitor Use Monitoring, Regional Annual Visitation Estimate for Allegheny Nat'l Forest (2020), https://apps.fs.usda.gov/nvum/results/A09019.aspx/FY2020/VE02?filename=Regional_Visitation (showing 5.15 million forest visits for the Nantahala–Pisgah in 2018 versus 905,000 forest visits for the Allegheny in 2020).

generally degrades the natural setting and remote character for recreational use. To be sure, timber harvest can be used to restore the ecological trajectory of degraded stands, and thus can be seen as complementary to future recreation. And there is plenty of good restoration work happening in the East. However, as discussed further below, much of what is called "restoration" is no more than business-as-usual rotational timber production.

Second, mature and old-growth forests on Eastern national forests provide the critical ecosystem service of clean drinking water. Drinking water from headwaters in national forests had an estimated economic value to the communities it serves of $3.7 billion per year as of 2014, according to the Forest Service.[64] According to the Forest Service, 180 million people (more than half of the United States) "rely on federal forestlands to capture and filter their drinking water."[65] In the South, water from NFS lands in and upstream of the Southern Region serves at least 19 million people.[66] The Forest Service identifies its Pacific Northwest, Eastern and Southern regions as having "the most watersheds with very high importance to surface drinking water supplies."[67] Of those, the Southern region is home to the greatest number of "high" quality watersheds for clean water and the fewest watersheds rated "very low" for water quality.[68] And the South's "very-high" quality watersheds are concentrated in southwestern North Carolina and northeastern Georgia, in regions of national forestland the draft inventory identifies as containing the most mature and old growth forest.[69]

Third, and perhaps most importantly during a summer when global temperature records are falling on a daily basis,[70] mature and old-growth forests provide extraordinarily valuable carbon storage and sequestration. These benefits must be accounted for in this rulemaking using the Social Cost of Greenhouse Gas, or SC-GHG.[71] The Council on Environmental Quality's latest NEPA guidance is explicit that this measurement is necessary for federal actions with significant greenhouse gas effects—like this one—"to translate climate impacts into the more accessible metric of dollars [and] allow decision makers and the public to make comparisons, help evaluate the significance of an action's climate change effects, and better understand the tradeoffs associated with an action and its alternatives."[72] CEQ and the Interagency Working

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[64] Remarks of Tom Tidwell, Chief, U.S. Forest Serv., at N. Amer. Forest Comm'n (Oct. 29, 2014), *available at* https://www.fs.usda.gov/speeches/state-forests-and-forestry-united-states-0.

[65] *Water Facts*, U.S. Dep't of Agric. (last accessed June 6, 2023), https://www.fs.usda.gov/managing-land/national-forests-grasslands/water-facts.

[66] Peter Caldwell et al., U.S. Forest Serv., Quantifying the Role of National Forest System Lands in Providing Water for the Southern United States (September 2014), at 13.

[67] Ericka Mack et al., U.S. Forest Serv., Forests to Faucets 2.0 (February 2022), at 16.

[68] *Id.* at 19.

[69] *Id.* at 19, fig.6; *see Mature and Old Growth Forests: Forest Service Climate Risk Viewer*, U.S. Forest Serv. (last accessed July 17, 2023), https://storymaps.arcgis.com/collections/87744e6b06c74e82916b9b11da218d28?item=8 ("Draft Inventory Data Viewer") (showing firesheds with medium levels of old growth and high levels of mature forest in the far southwestern edge of North Carolina).

[70] Brad Plumer & Elena Shao, *Heat Records are Broken Around the Globe as Earth Warms, Fast*, N.Y. Times (July 6, 2023), https://www.nytimes.com/2023/07/06/climate/climate-change-record-heat.html.

[71] This concept is an expansion of the Social Cost of Carbon, with which more readers may already be familiar.

[72] Council on Envt'l Quality, National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change, 88 Fed. Reg. 1196, 1198 (Jan. 9, 2023) ("CEQ Interim Guidance"). CEQ

Group on the Social Cost of Greenhouse Gases have provided agencies with appropriate guidance for completing this analysis, which CEQ notes "is a simple and straightforward calculation that should not require additional time or resources."[73] Contextualizing carbon costs is especially appropriate here, where the Forest Service will undoubtedly consider the economic effects of potential policies on industries—effects that will be more obvious, acute, and traceable than the policy's diffuse but substantial climate benefits.

Any accounting of the value of existing federal MOG forests should also reflect that existing MOG forest benefits are not fungible; they are nearly impossible to provide on other lands on relevant timescales. Proforestation—protecting and building on the MOG forest we already have—avoids the need to provide MOG-associated benefits through reforestation or afforestation, which both require repurposing land that might be in food production or being put to some other necessary use. Prioritizing the protection of MOG benefits where they already exist therefore reduces the costs of competing for scarce land resources on the private market and forces fewer compromises with other axes of economic productivity. Moreover, the value of existing MOG forests *on public land* is unique: Unlike private forestlands, which are subject to market forces making it practically impossible for them to provide the benefits associated with MOG, public forests are intended to be managed for the benefit of the entire public, including the diffuse benefits that markets do not internalize. A shift away from sawtimber production and toward small the production of small diameter materials as a byproduct of restoration may reduce receipts, but the Forest Service is not a market participant.

b. The status quo for MOG forests in the Southeast

Old-growth forests remain rare in the Southeast, [74] though they are best-represented on federal public lands.[75] Once the dominant forest successional class, recent scholarship estimates that approximately three percent of the Southern Blue Ridge Region is currently in old-growth condition.[76] In 2018, the Southern Appalachian Forest Coalition estimated that more than 45,000 hectares of old growth was present on national forests in our region.[77] This includes about 90,000 acres on the Nantahala and Pisgah National Forests; 13,500 on the Chattahoochee

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specifically recommends agencies use a support document developed by the Interagency Working Group on the Social Cost of Greenhouse Gases. *See* IWG SC-GHG, U.S. Gov't, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 (February 2021), https://www.whitehouse.gov/wpcontent/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

[73] CEQ Interim Guidance, *supra* note 72, at 1203.

[74] NPNF Revised Forest Plan, *supra* note 61, at 84.

[75] D.A. DellaSala et al., *Mature and Old-Growth Forests Contribute to Large Scale Conservation Targets in the Coterminous United States*, Front. For Glob. Change (2022), at 2 ("What remains [of old-growth forests] is largely on federal lands."); *see also* NPNF FEIS, *supra* note 22, at 3-133 tbl.38 (comparing relative age class composition of private and public forests in Western North Carolina, showing how all age classes greater than 100 years old are better represented on public forests).

[76] Robert E. Messick, Sam L. Davis, *Global Importance of Imperiled Old-Growth Forests With an Emphasis on the Southern Blue Ridge Mountains*, Editor(s): Dominick A. DellaSala, Michael I. Goldstein, IMPERILED: THE ENCYCLOPEDIA OF CONSERVATION (2022).

[77] Ecology and Recovery of Eastern Old Growth Forests 292 (Andrew M. Barton & William S. Keeton eds., 2018).

National Forest, 9,300 on the Cherokee National Forest; and 60,000 on the George Washington and Jefferson National Forests.[78] While this is a significant resource, it is nowhere near those forests' natural range of variation (NRV) for old growth.[79] In this subsection we describe the historic state of old growth in our region, the status quo, and how logging (both prior to acquisition and thereafter) has contributed to the difference between the two.

In the Southern Appalachians, old growth should cover at least half of the total forested acres. In its most recent estimate of NRV in that landscape, completed during the Nantahala–Pisgah forest plan revision, the Forest Service's modeling suggested that under a characteristic natural disturbance regime, old forests would occupy about 489,600 acres[80] of the 1-million-acre forest. This estimate, however, is much too low. The model was built using an assumption that gap-phase dynamics (the primary driver of forest regeneration in the Southern Appalachians) in the past reset affected acres to "early" forest conditions, when in fact old forests with small gaps remain in old-growth condition.[81] The best available science indicates a much higher NRV for old growth in Eastern forests.[82]

Still, even using the agency's implausibly low estimate of NRV for old growth, around half of the Southern Appalachians should be in old condition. Field inventories conducted since the 1990s, however, have confirmed only about 90,000 acres of old growth on the Nantahala-Pisgah. In other words, there is a 400,000-acre deficit of old growth on this single forest unit—40% of the landscape. The deficit is even *higher* on other Southeastern forests, because the Nantahala–Pisgah has a relatively high level of remnant old growth compared to the forests named above.

The Forest Service's recent statistical inventory also confirms old growth is drastically underrepresented relative to the NRV in the East. The draft inventory considers a fireshed (the inventory's 250,000-acre unit of spatial analysis) to be "high" in old growth if more than 75,000 acres, or roughly 30%, of that fireshed is old growth.[83] Not one fireshed in the Southern Appalachians has "high" old growth levels.[84] Instead, firesheds in the Southern Appalachians are

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[78] SAFC 2018 Survey Dataset.

[79] The revised Nantahala–Pisgah Forest Plan describes a desired condition under NRV for old growth on those forests' landscapes as between 430,000 and 560,000 acres. NPNF Revised Forest Plan, *supra* note 61, at 66 tbl.3.

[80] *See id.* This figure is the sum of the midpoints of the percentage ranges given as the NRV for each forest type applied to the midpoint of each forest type's estimated acreage on the landscape. See NPNF FEIS, *supra* note 22, at 3-389 tbl.128.

[81] *See* Southern Environmental Law Center, et al., Notice of Objection to the Revised Land Management Plan for the Nantahala and Pisgah National Forests, 47–55 (Mar. 22, 2022).

[82] *See* C.G. Lorimer & A.S. White, Scale and Frequency of Natural Disturbances in the Northeastern US: Implications for Early Successional Forest Habitats and Regional Age Distributions. 185 Forest Ecol. & Mgmt. 41–64 (2003) (estimating NRV for northern hardwood forests—a common forest type throughout the Appalachians—at 70–89% old growth).

[83] *See* Draft Inventory Data Viewer, *supra* note 69 ("Where any Forest Service land containing old-growth or mature forests exists in a fireshed, the entire fireshed is depicted with a corresponding color. Low (0–25,000 acre), intermediate (25,000–75,000), and high (75,000–250,000) classes are portrayed for ease of display.").

[84] *See id.* (showing highest old growth levels in North Carolina and Georgia at "intermediate" levels, or between 25,000 and 75,000 acres).

depicted as having (at most) between 10% and 29% old growth—the "medium" range used by the draft inventory. As discussed below, the FIA-based inventory is probably overinclusive as compared to field-verifiable old growth. But even using a reference condition that is too low for old growth and a current condition that is likely too high, the inventory confirms that we don't have nearly as much old growth as we ought to.[85]

The old-growth deficit is also highest in the forest community types that should have the most old growth. Cove forests, for example, have the least old growth of any widespread forest community type in the Southern Appalachians, even though they should have the most.[86] The opposite is true for drier forests, which have the highest levels of old growth (although still underrepresented as compared to NRV) even though they should have the least.[87] The reason for this disparity is simple: moist, productive forests experience the least natural disturbance and therefore the highest NRV for old growth, but they are also the community types under the greatest pressure for logging. This disparity, therefore, highlights the obvious driver of departure in Eastern forests: Historically, *logging is the reason* we don't have as much old growth as we ought to.

It is of course true that logging was the primary threat to old growth prior to federal acquisition, but it has continued to be true under Forest Service management. At the time of their purchase, the eastern national forests included more than 900,000 acres of old growth, much of it in the Southern Appalachians. But only a fraction of that acreage remains in old growth conditions today, including within protected areas, such as Joyce Kilmer Memorial Forest. Joyce Kilmer is perhaps the most famous old-growth forest in the East. Since the tract containing Joyce Kilmer was acquired, it has been reduced by logging from 98 percent old growth to just 36 percent today.

The Forest Service briefly began to reckon with its failure to protect old growth in 1989, when Chief Robertson stated that "[o]ld growth on the National Forests will be managed to provide … for present and future generations" not just "industrial raw material" but also

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[85] To be sure, the criteria and output of the draft inventory for old growth and the Nantahala–Pisgah modeling's "old" forests are not identical, but they do overlap. *Compare* NPNF FEIS, *supra* note 22, at 3-119, tbl.32 (showing onset of modeled "old" structural class ranging from 110–150 years) *with* USDA & Dep't of Int., Mature and Old Growth Forests: Definition, Identification, and Initial Inventory on Lands Managed by the Forest Service and Bureau of Land Management (April 2023), at 43 tbl.15 (showing "minimum criteria" for Region 8 old growth types found in the Southern Appalachians ranging from 100 to 140 years). *See also* NPNF FEIS at 3-389, tbl.128.

[86] Modeling data used by the Forest Service to revise the forest plan for the Nantahala–Pisgah National Forests indicates that only 3,000 acres out of 233,000 acres of cove forest on the landscape are currently "old." The NRV range for cove forests on that landscape indicates there should be between 107,000 and 125,500 acres of old cove forests. *See* NPNF FEIS, *supra* note 22, at 3-389 tbl.128 (applying 46–54% range to a 233,000-acre total). For reasons discussed in our objection to the revised plan, *supra* note 81, and elsewhere in these comments, that range is highly conservative.

[87] *See* NPNF FEIS, *supra* note 22, at 3-387 ("The driest [forest] types, the pines and dry oak … are close to desired conditions for old forest after 10 years. In contrast, most of the more mesic types, representing 70% of the Nantahala & Pisgah NFs, are moving slower toward the desired conditions for old forest."). The Nantahala–Pisgah's modeling data shows that landscape's Shortleaf Pine forests will be about 11% old after 10 years—1420 acres out of 13,345 total. NPNF FEIS, *supra* note 22, App'x D at D-15. The NRV for old Shortleaf Pine forests is between 17–33%. *See id.* at 3-389 tbl. 128.

biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, [and] water quality."[88] Following the issuance of that statement, Region 8 led an effort in the 1990s to define and provide guidance for inventorying old growth forests in the Southern Region. It identified 16 old-growth forest community types in Region 8.[89] While those field definitions have been useful in sharpening project-level discussions, the Region 8 guidance stopped short of protecting old growth. It instead left decisions about old growth to the planning and project levels, to be made in light of public participation.

Deferring decisions about whether to log old growth forests (and the even more difficult decisions about how to restore old growth) to plans and projects has not been effective. As discussed below, the agency's most recent forest plan in the Southern Appalachians explicitly declines to protect existing old growth, instead protecting much younger forests as "future" old growth, and a parade of projects continues to harvest old-growth and nearly-old-growth forests for timber production. These local decisions have provoked extremely bitter conflicts because old-growth forests are so rare in the East. Forest advocates have participated in official inventories and even made their own efforts to seek out and catalog old growth on the landscape so it can be protected.

Although there have been many efforts to define and inventory old growth, with disagreements around methodology and results for exactly how much old growth there is or used to be, they all agree on one thing: There ought to be more of it. Fortunately, there can be more old growth if mature forests are properly managed. Many forests logged in the late 19th and early 20th centuries will, if allowed, continue to age into maturity and even old growth conditions in coming decades.[90]

As reflected by the draft inventory and other datasets, "mature" forest is somewhat better represented in our region and across the country.[91] The draft inventory indicates the forests on Eastern federal lands have some firesheds with "high" levels of mature forest—that is, levels greater than 30 percent. Six firesheds in the East comprise greater than 30 percent mature forest and at least 10 percent old growth. This is corroborated by the Nantahala–Pisgah analysis, which shows close to half the landscape—484,000 acres—comprises "late" forests. This is not a one-to-one comparison because "late" forests include even-aged conditions that do not have the structural characteristics used to define mature forests for the inventory. But late forests are substantially higher than the midpoint of late forests' NRV range—about 158,000 acres.[92]

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[88] F. Dale Robertson, Chief, U.S. Forest Serv., Position Statement on National Forest Old Growth Values (Oct. 11, 1989), at 1.
[89] Glen Gaines et al., U.S. Forest Serv., Region 8 Old Growth Guidance, Amendment 5 to 1994 NPNF Forest Plan (1997), at 3.
[90] *See* NPNF FEIS, *supra* note 22, at 3-188.
[91] U.S. Forest Serv & Bureau of Land Mgmt., Mature and Old-Growth Forests: Definition, Identification, and Initial Inventory on Lands Managed by the Forest Service and Bureau of Land Management (April 2023) ("Draft Inventory Report"), at 6 tbl.1.
[92] *See* SELC Objection, *supra* note 81, at 40. The current and NRV acreages were derived from independent analysis of the National Forests in North Carolina's modeling data.

Presumably, the same will be true (although likely to a lesser extent) of the subset of late forests that qualify as mature.[93]

The surplus of late-aged forests, taken together with the deficit of old growth described above, illustrates that Eastern forests are still recovering from historical and current logging and must be allowed to age further to restore ecological integrity.

Mature forests vary widely and resist simple management paradigms. First, their physical characteristics vary greatly. Operative age-based definitions by forest type vary by several decades, so even a single stand of the same age might contain some mature forests and some immature forests.[94] Within the "mature" categorization, some forests are on the cusp of old growth, while others are barely entering the understory reinitiation phase. Second, their relative importance also varies. Mature forests are not yet old growth, yet they "may contain some but not all the structural attributes [found] in old-growth forests."[95] In some systems, old growth is so rare that mature forests are vital to provide those missing structural elements. Some mature forests occur in areas that have other important ecological values, while others occur in landscapes that are more degraded by past uses. And, third, their need for management varies. Due to the effects of past logging, mature forests may or may not be composed of species characteristic of that forest type.

In short, some mature forest stands are more ecologically significant and in better health than others. This great variety among mature forests sets for the Forest Service the difficult but important task of distinguishing stands with high value as future old growth from those that could benefit from (or provide benefits associated with) active management. As discussed in greater detail below, the Forest Service has not often chosen the right mature stands. In fact, it has frequently targeted the wrong ones.

c. Threats to Southeastern MOG forests

Conserving a resource requires a full understanding of what threatens it and how those threats undermine its value. Even before that, it requires understanding what constitutes a "threat" and distinguishes threats from dynamic elements that contribute to the resource's ecological value. Although natural disturbances—fire, disease, storms, and insects—may constitute a threat to forests, they do so only above certain thresholds of frequency, distribution, and size. Below those thresholds, these events are not "threats" but rather an expected and even ecologically necessary part of the ecosystems to which the forests belong. As the Forest Service

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[93] To see how the draft inventory's "mature" forests overlap with the Nantahala–Pisgah model's "late" forests, *Compare* NPNF FEIS, *supra* note 22, at 3-119, tbl.32 (showing "late" forests ranging from 80–140 years) *with* Draft Inventory Report, *supra* note 91, at 57–58 (providing a "walkdown" factor for mature forest onset ages relative to old growth onset ages of between .76 and .93 for Region 8 forest types, which, as applied to the old growth ages described *supra* in note 85, yields a range of about 80–120 years). Note, however, that the inventory's grouping of forest types makes it difficult to make a direct comparisons with the NPNF FEIS's analysis—"Region 8 Southern Hardwoods" includes both bald cypress and yellow poplar, for instance. *Id.* at 58.
[94] *See* NPNF FEIS, *supra* note 22, App'x D at D-22–23 (showing a "late seral" range of 80–130 years for pitch pine and 90–130 years for intermediate oak).
[95] Draft Inventory Report, *supra* note 91, at 5.

recognizes, part of ecological restoration is the restoration of characteristic disturbance processes, including fire, storms, and pest/disease.[96] Thus, under an ecological restoration framework, active management would be directed at restoring those natural processes (including characteristic wildfire) and intervening further only where natural disturbance processes are not operating in a manner sufficient to maintain ecological integrity.

We observe from the ANPR and other publications that the Forest Service regards fire and disease as the greatest threats to mature and old-growth forests.[97] Regardless of whether this is true in a national sense, it is not true in the Southeast. Any policy oriented toward the protection of MOG forest must account for the distinct land-use histories and disturbance regimes of the diverse forest landscapes the Forest Service manages. A policy framework that encourages active management to mitigate the effects of fire suppression by removing wood may be appropriate in some forest types in some ecoregions, but it would be mismatched to the needs of Eastern forests, where conserving older forests demands a more supportive approach (whether by passive management or management tailored to accelerate development of old-growth characteristics) to remedy the effects of aggressive historical timber production.

i. The Effects of Typical Timber Harvests

Eastern forests' relatively low risk of widespread canopy loss due to natural disturbance means that relatively little timber harvest can be justified in the name of preventing or mitigating threats from natural disturbance. The greatest threat to MOG forests and carbon stored on federal lands in the East, instead, is ecologically inappropriate timber harvest—a threat the Forest Service controls and is exclusively capable of abating.[98]

A comparison of emissions from fire and timber harvest in Western states shows logging that is responsible for greater carbon losses than fire on a per-acre basis in most scenarios. Only the least intense forms of logging (below about 30% tree removal) release similar amounts of carbon compared to wildfire.[99] And where forests are more carbon dense, carbon losses to harvest outpace those from fire even more significantly: "Locations with high-harvest rates and carbon dense forests … see higher carbon losses from harvest than fire compared to areas … with low harvest rates and carbon sparse forests."[100] Applying this conclusion to the East, where wildfires are of low to mixed severity, regeneration harvests are common, forests are very carbon dense, we would expect the differential between carbon lost to harvest versus fire to be especially high. And according to the Forest Service's data, it is: Between 1990 and 2011, the Forest Service estimates all fires on the Nantahala–Pisgah National Forests (prescribed and

[96] FSH 1909.12, ch. 23.11b–c (fire and disturbance generally); NPNF FEIS, *supra* note 22, App'x D at D-56 (storms, insects, and disease).
[97] *See, e.g.*, 88 Fed. Reg. at 24,499 ("[O]ver the past 15 years data shows that disturbance driven primarily by wildfire and insect [sic] and disease has adversely impacted more than 25 percent of the 193 million acres across the National Forest System.").
[98] *See generally* Birdsey et al., *supra* note 15.
[99] Kristina J. Bartowitz et al., *Forest Carbon Emission Sources Are Not Equal: Putting Fire, Harvest, and Fossil Fuel Emissions in Context*, Front. In Glob. Change (May 2022), at 8.
[100] *Id.* at 9.

wildfire) "resulted in the loss of approximately 0.21 metric tons [of carbon] per acre."[101] In contrast, ecosystem carbon losses resulting from harvest over the same period were almost three times as high: 0.57 tons per acre.[102] Those differences become even clearer on a per-acre-treated basis: Prescribed burning on the Nantahala–Pisgah emits on average 34,600 metric tons of carbon per year from a burn footprint of 8,116 acres.[103] The average annual harvest on those forests during the last 10 years has removed about 44,500 metric tons of timber volume from the forest each year from a harvest footprint of about 800 acres.[104] Of that figure, 25,300 metric tons will have been emitted after 10 years. This shows that on our carbon-dense landscape, typically low-intensity fire emits 4.2 metric tons of carbon per acre treated, while harvest emits net 31.6 metric tons per acre treated in the first decade (even accounting for carbon stored in wood products).

In addition to depleting carbon stocks, harvest often degrades MOG by introducing non-native invasive species ("NNIS"), destabilizing soils, and impairing water quality. Even where NNIS are controlled and best management practices ("BMPs") for mitigating soil disturbance are implemented and fully effective, moreover, logging as typically practiced on the Southern Appalachian national forests degrades both forest structure and composition.

Disturbance processes determine both structure and function, and typical logging projects in the Southern Appalachians do not mimic the scale or pattern of natural disturbances. Unlike "thinning" projects in the West, logging in Eastern forests typically initiates regeneration of entire stands, with natural regeneration determining the composition of the future stand. These young, even-aged stands benefit some wildlife species in the first decade, but those benefits soon fade. Moreover, the period between stem exclusion and understory reinitiation is of little additive value at the landscape level because closed-canopy stands are common—a legacy of historical logging. Although regeneration harvest is characterized as "restoration" of early successional habitat, which is generally believed to be underrepresented on national forest lands in the East, it is not ordinarily used to restore gaps and openings at the patch sizes and distributions appropriate for the relevant forest community types.

In addition, logging in the East—particularly in mesic forest systems—frequently results in the cumulative degradation of species composition and landscape-scale diversity. Some tree species are highly competitive after large-scale disturbance (logging) at the expense of other native tree species. For example, in Southern Appalachian mesic oak and mixed hardwood stands, timber harvest almost invariably results in increased dominance by tulip poplar. While tulip poplar is native, its uncharacteristic dominance is bad for the forest overall because the benefits of diversity (like soft and hard mast production) are diminished. To be sure, monitoring and follow-up treatments can mitigate this harm, but such treatments are routinely omitted, probably because they are costly and "out of sight, out of mind." And, of course, forests are more

[101] NPNF FEIS, *supra* note 22, at 3-25.
[102] *Id.* at 3-29.
[103] NPNF Assessment, *supra* note 62, at 84.
[104] NPNF FEIS, *supra* note 22, at xv, tbl.i (showing activity levels for intermediate thinning and young forest creation over the last 10 years).

than the sum of their trees. Ground-disturbing logging also tends to degrade the diversity of the herb and shrub layers, particularly in areas with rich soils.

This is not to say that every instance of logging is damaging to forest structure and composition. For example, the Forest Service has had better luck with dry forest community restoration, where natural disturbances tend to occur at a scale more similar to logging and prescribed fire can help guide the compositional trajectory of the future stand. Mesic forests, however, continue to be targeted preferentially for timber production because they can more viably be logged commercially. Even under a "restoration" paradigm, the Forest Service has stated that it will continue with these logging practices, which it knows are "locally" inappropriate, perpetuating these harms.[105]

1. Harvest of Old-Growth Forests

Again, old-growth forests are now extremely rare in the East. Nevertheless, the Forest Service continues to cut the few remaining acres of old growth left on public lands. As noted above,[106] substantial old growth on national forest lands has been logged since acquisition. The Forest Service's recent inventory reveals that about half the extant old growth is located on "other" lands—that is, lands that are not protected as wilderness or inventoried roadless areas.[107] In project after project, old-growth forests have been proposed for regeneration harvest, with more in the current timber sale pipeline. There is no legitimate ecological justification for this ongoing elimination of an underrepresented and important forest condition.

For example, the ongoing Southside Project on the Nantahala National Forest in North Carolina includes regeneration logging of existing old growth. After members of the public pointed out that the project proposed to cut old growth, the agency conducted its own surveys and concluded the public was correct. Nevertheless, the Forest Service moved forward with the project over strenuous objections and public outcry. In fact, after the initial offer received no bids, the agency cut the advertised price in half and reoffered the old growth for sale.[108] During the second bid process, a local conservation group offered to pay the Forest Service to leave the old growth intact, but the agency refused.[109] Astoundingly, in rejecting the conservation group's offer, the agency insisted that old growth is not actually rare but "[w]hat is rare in the area is young forest," thereby justifying logging old growth to create early successional habitat.[110] To be clear, the Forest Service is gaslighting the public about the rarity and importance of old growth, and it is trading existing old growth (which is vanishingly rare, despite the agency's attempt to

[105] U.S. Forest Serv., Record of Decision for the Land Management Plan for the Nantahala–Pisgah National Forests (February 2023), at 63.
[106] CITE point back to Joyce Kilmer citation.
[107] Draft Inventory Report, *supra* note 91, at 6.
[108] Sarah Honosky, *Timber sale of 98 acres in Nantahala National Forest ignites environmentalist concerns*, The Asheville Citizen-Times (Aug. 17, 2022), https://www.citizen-times.com/story/news/local/2022/08/17/55-k-timber-sale-nantahala-national-forest-sparks-some-frustrations/10330565002/.
[109] *Id*. (including acknowledgement from the Forest Service that the sale includes old growth).
[110] *Id*.

conflate old and mature forests to dilute the concern) for early successional habitat, which can be created literally anywhere. That is a very bad trade.

The Southside project was not an unusual proposal. A succession of projects in the Southern Appalachians shows that old growth is repeatedly on the chopping block. For example, the Buck Project on the Nantahala National Forest proposed logging existing old growth,[111] which was dropped only after consistent pressure from local conservation groups.[112] Old-growth logging was also proposed as part of the Upper Warwoman Project on the Chattahoochee National Forest in Georgia, though it too was dropped after local groups raised the issue with the Forest Service.[113]

During the last 20 years, a parade of projects on the Nantahala-Pisgah and Cherokee National Forests show just how commonplace old-growth logging proposals are. While some include only small acreages, they epitomize the creeping threat of timber production—a death by a thousand cuts. These include:

- The Horseshoe Project (Nantahala Ranger District, Nantahala National Forest; Decision 2006), which proposed logging 5 acres of old-growth oak forest on Cliff Ridge. Conservation groups alerted the Forest Service to the presence of the exceptionally old forest at the site, and the five acres were dropped from the project in the project decision.
- The Globe Project (Grandfather District, Pisgah NF; Decision 2008), which proposed to log 11 acres of old-growth oak forest in Unit 33-11. Conservation groups completed plots demonstrating old-growth age structure and consistency with the Region 8 Guidance for Conserving and Restoring Old-Growth Forest. Unit 33-11 was dropped as part of the appeal resolution agreement.
- The Harmon Den Project (Appalachian District, Pisgah NF; Decision 2010), which proposed to log 39 acres of old-growth oak-hickory forest in Unit 451-12. Conservation groups did field work and provided data showing the stand had an uneven age structure with six canopy species attaining ages over 160 years of age and individual trees up to 240 years old present. Unit 451-12 was removed from the project as part of the appeal resolution agreement.
- The Upper Santeetlah Project (Cheoah Ranger District, Nantahala NF; Decision 2011), which proposed logging 40 acres of exceptional old-growth forest in Unit 51-6. Unit 51-6 is composed of Rich Cove and Northern Hardwoods forest and canopy trees frequently exceed four feet in diameter in the stand, with the largest specimens exceeding five feet in diameter. Forest Service land acquisition documents show that the entire watershed was "virgin" at the time of Forest Service purchase in 1937. A single visit with Forest Service decision makers was sufficient in having the Unit 51-6 removed from the project and designated as "small patch old-growth". The old-growth designation was removed in

[111] *See* Letter from Hurston Nicholas, Forest Service, to Amelia Burnette, Southern Environmental Law Center (Dec. 13, 2019) (explaining that old-growth harvests were removed from the project).

[112] *Id*.

[113] Specifically, boundaries for stand 36/022 were redrawn, reducing the stand from 202 to 137 acres, to protect existing old growth. *See* U.S. Forest Serv., Decision Notice and Finding of No Significant Impact, Upper Warwoman Landscape Management Project (2015), at 5, *available at* https://www.fs.usda.gov/project/?project=8722.

the 2023 RLRMP for Nantahala and Pisgah National Forests and 51-6 is again in the suitable timber base.

- The Haystack Project (Nantahala Ranger District, Nantahala NF; Decision 2011), which proposed logging 36 acres of old-growth oak forest in three units. Conservation groups documented old-growth structure in all three areas. The Forest Service voluntarily removed Unit 140-9 at the request of conservation groups. Old-growth forest in Units 106-27 and 106-31 were removed as part of the appeal resolution for the project.
- The Armstrong Creek Project (Grandfather District, Pisgah NF; Decision 2012), which proposed to log 11 acres of old-growth forest in Unit 248-18. The FS VEG database indicated the forest was over 130 years old. A field trip with conservation groups and Forest Service representatives documented many trees over 200 years old. Unit 248-18 was not included in the project decision.
- The Clarke Mountain Project (Watauga Ranger District, Cherokee National Forest; Decision 2012), which proposed to log 40 acres of old-growth oak forest on Ripshin Ridge. Conservation groups documented old-growth age structure and trees up to 398 years old. The old-growth forest was not included in the project decision.
- The Stoney Creek Project (Watauga Ranger District, Cherokee National Forest; Decision 2014), which proposed to log 60 acres of old-growth dry oak forest on Holston Mountain. Conservation groups documented that despite their small diameter, many oaks exceeded 200 years in age. The prescription for the site was changed from timber harvest to understory treatment and prescribed burn.
- The Mossy Oak Project (Nantahala Ranger District, Nantahala NF; Decision 2016) which proposed to log 12 acres of stunted old-growth oak forest in Unit 133-17. Conservation groups documented old-growth age structure and shared the data with the Forest Service during scoping and EA comments. The Forest Service only agreed to spare cutting the stand during the project objection process.
- The Southside Project (Nantahala Ranger District, Nantahala NF; Decision 2018), which, proposed to log 25 acres of old-growth oak forest in Unit 35-41. Conservation groups documented that many of the canopy trees in the unit are over 200 years old. Despite this information, formal objections by multiple organizations and individuals, and the agency's own admission that the stand met the criteria for old-growth forest in the Region 8 Guidance on old-growth, the Forest Service chose to cut Unit 35-41. The timber was sold for $550/acre.
- The Buck Project (Tusquitee Ranger District, Nantahala NF; Decision 2019), which proposed to log approximately 30 acres of old-growth forest in two areas. Conservation groups documented old-growth structure in the two old-growth stands and shared the data with the Forest Service. The documented old-growth was removed from the project prior to the Decision. Several areas of mature forest with trees exceeding 150 years are still scheduled to be cut in the project.
- The Crossover Project (Tusquitee Ranger District, Nantahala NF; Decision pending), which proposed to log approximately 81 acres of old-growth forest dominated by red oak and white oak. Many of these units were reported to be old-growth forest by the FS VEG database and field inspection confirmed the accuracy of the database in this case. Conservation groups shared data on the age and importance of these forests during scoping. We are hopeful that the old growth will not be in the final decision.

Notably, most of these projects (excluding Southside) were modified in response to public pressure or objection. While we are grateful for those modifications, they came at a high cost. First, the staff time invested in preparing these old-growth stand for harvest was wasted. The projects could have accomplished more for economic and social purposes if that time had been better spent. Second, and more importantly, these proposals undermined public trust. Over time, they have taught members of the public that if they value old growth, they must look over the Forest Service's shoulder in every project, and organize opposition whenever it is targeted. That is no way to earn the social license to take action at larger scales.

These examples reflect data, not mere anecdote. In connection with the Forest Service's 2020 NEPA rulemaking, we completed a review of all 71 EA-level timber projects across the Southern Appalachians decided between 2009 and 2019. That review revealed that 18 projects (25%) included old growth as a potentially significant issue.[114] Only about 2.5% of the Southern Appalachian national forests are in old growth condition (45,000 hectares, or 111,200 acres, out of about 4.5 million acres total). Working on the back of the envelope, therefore, timber sales are about 10 times more likely to include proposals for old growth logging than random chance.

At the project level, the reason for these proposals is simple: When old-growth forests are located on lands considered "suitable" for timber production, agency staff see it as their job to regenerate those forests through timber harvest, generally starting with the oldest stands. Many staff do not recognize or look for old growth characteristics, and some are actively deciding that timber priorities are more important than old growth. Very rarely are they considering whether healthy, mature forests ought to be maintained on a trajectory to restore old growth. That very idea is inconsistent with the premises of timber production.

Forest plans, unfortunately, do not avoid the problem. Among the Southern Appalachian National Forests, only the George Washington includes any plan-level limitation on regeneration harvest of old growth, and even then only for some forest types.[115] The more recent Nantahala–Pisgah Forest Plan in North Carolina—the only plan in this ecoregion to be revised with the 2012 planning rule's novel emphasis on ecological integrity[116]—is even less help. It designates a protected "old-growth network," but the network consists mostly of younger forests. Indeed, the network was designed to capture areas where timber harvest was otherwise "unlikely to be prioritized."[117] Large tracts and thousands of acres of known, existing old growth were left out of the old-growth network, and whether to log those areas was left entirely to the unconstrained discretion of district rangers.[118]

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[114] S. Env't L. Ctr., Comments on Proposed Rule, National Environmental Policy Act (NEPA) Compliance (Aug. 25, 2019), App'x 3, "Analysis of Southern Appalachian Projects," at 9 tbl.6

[115] U.S. Forest Serv., George Washington National Forest, Revised Land and Resource Management Plan (2014) at B-7.

[116] *See* 36 C.F.R. § 219.8 (2012).

[117] NPNF FEIS, *supra* note 22, at 3-393.

[118] U.S. Forest Serv., Final Environmental Impact Statement for the Land Management Plan for the Nantahala–Pisgah National Forests (January 2022), App'x A, Response to Comments, at 45–47 (explaining that under the chosen alternative, the old growth network would be fixed at the plan level, meaning additional old growth protections would be left to the discretion of project supervisors).

2. Harvest of Mature Forests

Harvest of mature forests is also common in the Southern Appalachian national forests, especially over the last 30 years. This is due partly to well-intentioned efforts to increase rotational periods for stands. But it is also a response to the financial need to ensure that projects include enough large, high-value trees to be worth timber companies' while. The agency's habit of targeting mature forests (especially hardwood coves and mesic oak forests) is a significant obstacle to the goals of this rulemaking, as these forests store more carbon and could, if allowed to continue aging, replace the missing old growth that is so badly underrepresented in these forest types. Further, regeneration harvest in these areas is hardest to justify for other reasons: Such harvests are not typical of the dominant disturbance regime,[119] and they are highly likely to degrade both structure and composition. Thus, harvest in these mature forests threatens not only carbon stores but also ecological integrity.

Some examples from the Chattahoochee National Forest: On the Toccoa Ranger District, the Brawley Mountain Woodland Project cut several mature dry-oak stands. These harvests were intended to create open woodlands, but the site was inappropriate for the conversion and has required intense and expensive follow-up treatments—a loss of mature forest values that benefited only a few generalist wildlife species.[120] More recently, the Cooper Creek Watershed Project decision proposed regeneration harvests of mature stands, many of which were in mesic areas and in generally healthy forests. The agency failed to survey some potential old-growth stands, and one existing old-growth stand was proposed for thinning harvest, which would have negated several of the criteria that qualified it as old growth.[121] That stand was only dropped from the project after Georgia ForestWatch raised the alarm. And on the Conasauga Ranger District, the Fightingtown Creek Early Successional Habitat Project proposed to harvest several healthy, mature stands on mesic sites.[122]

Below are yet more projects that degraded MOG forests on the Pisgah–Nantahala National Forests. The list is not at all comprehensive, but it highlights examples that are unambiguously unjustifiable as an ecological matter. In particular, regeneration harvest of healthy, mature rich cove forests is inconsistent with restoring forest structure for that ecosystem, and it degrades species composition by shifting the composition of the future canopy and by creating an extraordinarily high risk of spreading invasive species:

- Welch (Nantahala), 2005. This project cut forest of at least 120 years of age in the Rich Cove, Mesic Oak, Northern Hardwood, and High Elevation Red Oak ecozones. Two

[119] These forests are characterized in maturity by the creation of small openings due to single-tree falls; large-patch canopy loss is typically rare. NPNF Revised Forest Plan, *supra* note 61, at 57–59 (describing disturbance regimes within NRV for cove and mesic oak forests).
[120] U.S. Forest Serv., Environmental Assessment, Brawley Mountain Woodland Project (2008), at 56, 61, 125–33.
[121] Letter from Georgia ForestWatch to Andrew L. Baker, Dist. Ranger, Chattahoochee National Forest (Feb. 5, 2016), at 27–30, 81, *available at* https://www.sierraclub.org/sites/default/files/sce/georgia-chapter/Issues/Wildlands/Cooper%20Creek%202.5.16%20comments-website.pdf.
[122] U.S. Forest Serv., Environmental Assessment, Fightingtown Creek Early Successional Habitat Project (2017), at 2 (describing abundant mature forest in the area relative to ESH).

areas that were clearcut were recognized as Natural Heritage Natural Areas (NHNAs) by North Carolina at Kirby Knob and Pinnacle Bald.

- Stecoah Gap (Cheoah), 2005. This project cut mature Rich Cove and Mesic Oak forest.
- Stateline (Appalachian), 2005. This project cut mature Rich Cove and Mesic Oak forest.
- Horseshoe (Nantahala), 2006. This project cut rich cove stands of exceptional species richness and tree height and introduced the non-native invasive plant garlic mustard.
- Baldwin Gap (Pisgah), 2007. This project cut mesic oak stands of greater than 100 years of age. Harvested stands have serious infestations of multiple non-native invasive plants. Shope Creek (Appalachian), 2007. This project cut two mesic oak stands, one of them very old with trees up to 140 years of age and the other of the rare Basic-Oak Hickory community type. Both stands are now heavily infested with a variety of non-native invasive plants that the Forest Service is spending large sums of money to attempt to control.
- Fatback (Nantahala), 2008. This project cut mature Rich Cove Forest.
- Horsebridge (Nantahala) 2010. This project cut mature Rich Cove Cove and Mesic Oak Forest.
- Haystack (Nantahala) 2011. This project cut Rich Cove Forest in a Natural Heritage Natural Area.
- Brushy Ridge (Pisgah) 2011. This project cut mature Mesic Oak Forest. Logging units now have high densities of several species of non-native invasive plants.
- Courthouse (Pisgah) 2013. This project cut Mesic Oak and Rich Cove Forest and resulted in critical BMP failures, landslides, and major sediment deposition into Courthouse Creek.
- Buckwheat (Nantahala) 2013. This project cut mature Rich Cove and Mesic Oak Forest.
- Mossy Oak (Nantahala) 2016. This project cut mature Rich Cove Forest and almost old-growth Mesic Oak Forest inside a Natural Heritage Natural Area.
- Buck Project (Tusquite) 2019. This project cut mature Rich Cove Forest, Acidic Cove Forest, and Mesic Oak Forest up to 120 years of age and of exceptional diversity and also resulted in over 8 miles of road construction.[123]
- Southside (Nantahala) 2018. Cuts old growth and stands over 120 years of age, impacts green salamander habitat, cuts forest in a designated Special Interest Area.
- Lickstone (Pisgah) Ongoing - proposes cutting mature Rich Cove and Mesic Oak Forest.

Other recent examples of projects targeting mature forest include the South Redbird Project on the Daniel Boone National Forest in Kentucky and Upper Cheat River Project on the Monongahela National Forest in West Virginia.[124]

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[123] *See* U.S. Forest Serv., Buck Project Environmental Assessment (2020), at 61–62.

[124] *See* U.S. Forest Serv., South Red Bird Wildlife Habitat Enhancement Project Environmental Assessment (2020), at 38–43 (describing nature and extent of silvicultural treatments); U.S. Forest Serv., Upper Cheat River Environmental Assessment (2022), at 35–38 (the same).

Indeed, it is hard to find an example of a project in the Southern Appalachians that does not include regeneration harvest of mature forests. According to Forest Service data, the most common disturbance affecting carbon stocks on Southeastern national forest is overwhelmingly timber harvest.[125] Timber harvest is responsible for ninety percent of the change in carbon stocks on the Daniel Boone National Forest, eighty-three percent of the change on the Chattahoochee National Forest, and seventy-one percent of the change on National Forests in North Carolina.[126] In our experience, in fact, the agency often will preferentially harvest in nearly-old-growth stands even when younger mature stands are available, rejecting those reasonable alternatives based on the dogma that older stands need to be regenerated. Without intervention, the Forest Service's current decision-making practices will continue to trade current and future old-growth forests (and ecological integrity) for timber volume and early successional habitat.

ii. Fire

The Department has stated that a "primary threat to old-growth stands on national forests is no longer timber harvesting, but rather catastrophic wildfire and other disturbances resulting from the combination of climate change and past fire exclusion."[127] Similarly, as the Forest Service turns its attention to assessing threats systematically, we are aware that it has focused on the Malheur example, where a significant acreage of old growth was recently affected by severe fire. On the one hand, the creation of complex early of mature and old forests by wildfire is, at some level, characteristic and desirable. In other words, a forest with ecological integrity should experience stand-replacement fire in mature and old forests without that fire qualifying as a "threat" because there would be enough old and aging forests to absorb the loss. On the other hand, the threat of *uncharacteristic* severe wildfire is serious and increasing.

Increased wildfire risk is attributable primarily to a warming climate.[128] This is an existential threat to the Forest Service's statutory mandate to provide for the multiple uses of our national forests in the long term. None of those uses—not wildlife, clean water, recreation, nor timber—can be provided sustainably at current levels as the world warms. As the Biden Administration has recognized, this threat requires an urgent, whole-of-government response to cut net GHG emissions.[129] This must be accomplished in the short term—by 2050.[130] It would be irresponsible—even suicidal—to adopt management strategies that will only pay off (if ever) in the longer term.

[125] *See* Birdsey et al., *supra* note 15.

[126] *Id.*

[127] SM 1077-004, *supra* note 4, at 2.

[128] EPA, *Climate Change Indicators: Wildfires* (last updated Mar. 21, 2023), https://www.epa.gov/climate-indicators/climate-change-indicators-wildfires.

[129] *Fact Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies*, The White House (Apr. 22, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/.

[130] *Id.*

As a result, the threats posed by climate change cannot be met with chainsaws alone.[131] Ecoregions that can provide stable and increasing carbon storage must be managed to take full advantage of their potential, within the bounds of ecological integrity. Areas with highest risk of catastrophic disturbance should be managed adaptively to increase stability. On the other hand, areas with higher stability (i.e., landscapes dominated by relatively moist forests) should be accruing carbon in mature and old forests.

Unfortunately, current Forest Service policy and incentives are not leading to the right outcomes. The agency's drumbeat to increase the "pace and scale" of restoration has, predictably, resulted in efforts to ramp up active management across the board. Perversely, the greatest volume of timber comes from Regions 8, 6, and 9, in that order. These, of course, are the Regions with the greatest share of moist, productive forests.

To put a point on the problem, timber harvest is resulting in increased carbon emissions from forests that are not otherwise at risk of losing carbon to wildfire, with no expectation that those losses can be offset by new growth on the timescale relevant to avoiding the worst effects of climate change. The Forest Service is therefore contributing to the greatest risk factor it says is threatening mature and old forests nationwide, when it should be mitigating that threat.

Here in the East, the risk of uncharacteristically severe wildfire is low, especially in the relatively mesic forests of the Southern Appalachians. Analysis of fire disturbance in the Great Smoky Mountains shows that the vast majority of naturally occurring fire in the Southern Appalachians does not reset the forest's structural age in a manner that would cause the "loss" of mature or old-growth forests. [132]

To be sure, the Southeast is home to a wide variety of forest types, and fire is much more frequent and important in some forest types than others. Even in the Southern Appalachians, some relatively small pockets can be adapted to stand replacement fire, but they are the exception rather than the rule. And, notably, the risk of large-scale (i.e., patch-creating) wildfire is lowest in forest types with the highest productivity highest in shortleaf and pitch-pine forests.[133] In addition, the vast pine forests of the lower piedmont and coastal plain, are fire-dependent.[134] Even in systems where fire is more common and necessary, however, it can be (and is increasingly) managed by use of low intensity prescribed burns, much to the Forest Service's credit. Combined with judicious mechanical treatment to remedy the effects of past logging and fire suppression in appropriate circumstances, these are interventions that garner

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[131] Indeed, treatments justified along these lines are minimally effective at reducing fire risk, and to the minor degree they are effective, they only remain so for a little over a decade. Larger, more mature trees are more resilient and resistant to fire than younger ones. Even in the event of high-severity fire, dead trees continue providing habitat as snags and continue to sequester carbon for decades. Law et al., *supra* note 13, at 7.

[132] *See* Steven P. Norman, U.S. Forest Serv., Landscape Patterns of Wildfire and Prescribed Fire on the Pisgah and Nantahala Forests (2021), at 16 (explaining that just 8,950 burned acres out of 121,150 surveyed experienced fire severe enough to create new forest patches, totaling just 150 acres of forest patch across the study area).

[133] NPNF FEIS, *supra* note 22, App'x D at D-60.

[134] *See* Robert J. Mitchell et al., *Future Climate & Fire Interactions in the Southeastern Region of the United States*, Forest Ecol. Mgmt., at 2–4 (2014), http://dx.doi.org/10.1016/j.foreco.2013.12.003 (describing fire ecology of pine forest types of the Southeastern Piedmont and Coastal Plain).

broad public support and are well rooted in the best available science. In summary, in the East, there is less of a need to act to *prevent* uncharacteristic fire, and more of a need to restore *more* fire to appropriate ecosystems.

It is therefore rare in our region that the threat of total loss of a carbon-dense MOG stand from fire will justify vegetation removal to reduce fire risks. Nor is public safety a compelling justification for widespread logging. Risks to the WUI from can be better addressed by focusing on smart WUI planning and structural hardening in the few areas where unusual risk exists.[135]

The preceding discussion should not be read to argue against thinning or improvement treatments in appropriate forest types to address departure caused by fire suppression, or restoration of dry forest communities through removal of uncharacteristic vegetation and reintroduction of prescribed fire. Where that work is occurring in our landscape, we have supported it and will continue to do so. But the timber sale program writ large is not focused on these kinds of priorities. Simply put, preventing wildfire risk is not a sound justification for the timber program as currently implemented in the East. A policy focused on reducing such risk would therefore not be a good fit for the East.

iii. Insects and Disease

Similar to fire, some level of mortality from insects and disease in the Southeast is both within NRV and therefore desirable. And, in general, MOG is more resilient to pests and disease when it comes to carbon storage. Larger trees are often able to resist disease—and thus continue storing carbon—for longer than smaller ones. Root disease, for example, may take decades to kill larger trees, which often continue functioning normally above ground until only 25 percent of their root systems remain alive.[136] But pests and disease can pose threats to MOG, including in stands that have lost resilience to native pests because of inappropriate logging in the past and due to the spread of non-native pests.

First, endemic pests can affect some stands more than others. Eastern forests are typically composed of mixed species, which limits the spread and impact of infestation by most pests. Monotypic pine forests, however, are vulnerable to stand-level infection by the southern pine beetle. Closed-condition pine forests are more likely to be afflicted than open pine forests. Thinning has been shown to be an effective way to protect these forests from total loss to pine beetle infestations.[137] Such forests, especially after a beetle kill, are also among the most susceptible to stand-replacement wildfire.[138] Even so, this is to some degree within the bounds of ecological integrity. The Forest Service has noted that this dynamic—beetle infestations

[135] Law et al., *supra* note 13, at 7.
[136] U.S. Dep't of Agric., Forest Serv., Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival in the Blue and Wallowa Mountains (2002), at 34.
[137] Sharon M. Hood et al., *Fortifying the Forest: Thinning and Burning Increase Resistance to a Bark Beetle Outbreak and Promote Forest Resilience*, 26 Ecol. Applications 1984, 1994 (2016).
[138] NPNF FEIS, *supra* note 22, App'x D at D-60.

followed by fire—may be "the natural cycle for these xeric pine communities to regenerate."[139] Some high-risk stands, however, are the product of past plantation forestry. In those (and perhaps other limited) circumstances, substantial thinning may be appropriate.

Impacts from non-native pests also pose a particular threat to Eastern forests.[140] These include dutch elm disease, hemlock woolly adelgid, emerald ash borer, and oak wilt—among others.[141] Climate change "will likely result in increased impacts from native and non-native pests" alike.[142] Though harvest may sometimes be appropriate to mitigate the spread or damage from non-native pests, adaptive management may indicate the need for a wide variety of actions short of regeneration harvest, including direct treatment of affected trees, prescribed fire, and compositional treatments.[143] Novel pests and disease typically affect individual species in mixed species stands, mimicking the effects of gap-phase dynamics and *accelerating* the development of old-growth structural characteristics, without threatening the mature or old-growth status of the stand. While unfortunate and worth combating, the risk of non-native pests and disease generally does not justify heavy harvest of MOG.

iv. Storms

In the Southern Appalachians, canopy loss to wind and storms has a relatively low return interval and typically occurs at small scales—a single tree or a small cluster of trees at a time. When it occurs, downed trees initiate new cycles of regeneration and serve as habitat and nutrients themselves, contributing to the complex, heterogenous structure of mature and old growth forests. The frequency of severe storms is expected to increase as a result of climate change, even as forests in our region are expected, on average, to become drier.[144]

The complex forest structures characteristic of old growth are associated with greater resistance to storms: Even-aged stands experience greater damage than uneven-aged stands, which are "often older, and comprised of species mixes, and often of natural rather than planted origin."[145]

Manipulating stocking levels and stand composition may determine susceptibility to windthrow from high severity storms to some degree.[146] For example, loblolly pine has been shown to experience less mortality than long-leaf pine following severe hurricanes characteristic of its growing range.[147] But active management—for instance, harvesting a stand with the intention of restocking it with more resilient trees—will often also make the impacts of those

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[139] *Id.*
[140] *Id.* at 3-436.
[141] *Id.* at 3-436–37.
[142] *Id.* at 3-440.
[143] *Id.*
[144] *Id.*, App'x D at D-63.
[145] S.J. Mitchell, *Wind as a Natural Disturbance Agent in Forests: A Synthesis*, Forestry (2013), at 150.
[146] McNulty et al., Forests and Climate Change in the Southeast USA, in Climate of the Southeast United States: Variability, Change, Impacts, and Vulnerability (K. Ingram et al. eds., 2013), at 175, *available at* https://www.srs.fs.usda.gov/pubs/ja/2013/ja_2013_mcnulty_001.pdf.
[147] *Id.*

storms worse, particularly in mountainous areas, by destabilizing soil. Clear-cutting increases the risk of landslides, the density of roads, and siltation in sensitive aquatic habitats.[148] Studies conducted in tropical forests also showed that forest fragmentation—an unavoidable result of harvest and related roadbuilding—increased the vulnerability of remaining stands to storm disturbance.[149] Very little, if any, silvicultural management could be justified solely as mitigating disturbance from storms.

In summary, external threats—fire, pests and pathogens, and storms—do not pose a serious threat to the integrity of MOG forest structure and, indeed, are a landscape-scale driver for the restoration of characteristic MOG structure.

III. Understanding and Improving Upon the Draft Inventory

The report and inventory released earlier this year (April 2023) approximates the distribution of MOG across federal forestlands.[150] It both defines mature and old-growth forest (*what* MOG is) and then identifying and inventorying stands that met that definition (roughly *where* MOG is, and *how much* of it there is). Though the resulting inventory is a useful starting point, we agree that it is only the beginning of the agency's work to identify and assess the conditions of MOG forests—work which should continue beyond the development of policy in monitoring and adaptive management. Our discussion of the inventory here is therefore not meant to criticize the agency's hard work, which produced an inventory in a relatively short period. Rather, we hope understanding its limits will prevent the agency from drawing unsupported conclusions, clarify the scope of needed policy changes, and guide ongoing efforts to make the inventory and future monitoring more robust. What can we rely on it for? And what questions does it leave unanswered—questions that may require further screening at the project level?

To start, the minimum thresholds set for many forest types we are familiar with are lower than we expected. In other words, we suspect that the inventory may be somewhat more inclusive than a would be verifiable in the field. For example, because most of the variables chosen to evaluate mature forests are productivity-based, we believe the inventory overcounts MOG conditions in highly productive forests (for example, cove forests) and thus undercounts it in less productive forest types (such as an oak stand on a ridge, which would produce smaller trees at the same level of maturity). This is significant because much of our remaining old growth is found on generally unproductive sites, which is likely what saved them from harvest. A broad inventory was an appropriate first step, but the agency should be careful that it does not distort the agency's sense of how (relatively) rare these forests are in relation to their natural range of variation.

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[148] *See* NPNF FEIS, *supra* note 22, at 3-36.

[149] Naomi B. Schwartz et al., *Fragmentation Increases Wind Disturbance Impacts on Forest Structure and Carbon Stocks in a Western Amazonian Landscape*, Ecological Applications (2017), at 8–9.

[150] Draft Inventory Data Viewer, *supra* note 69; Draft Inventory Report, *supra* note 91.

The inventory may also overestimate existing old growth because the stand ages provided by FIA plot data are inconsistent with the Region 8 guidance for evaluating old growth conditions. FIA data collection requires coring a tree that is, in the surveyor's judgment, representative of the stand age; it "does not necessarily include the oldest trees" in a stand.[151] Region 8 guidance, however, requires coring the oldest trees in the stand.[152] In second-growth mature forests of the Southeast, where there are fewer distinct age classes in the canopy, this difference might not matter as much. But mixed age classes in the canopy is a defining feature of old growth forests. Thus, this difference is likely to create distortion. A tree that is "representative" of a truly old-growth, multi-aged forest may be the same age as a tree that is "representative" of a younger but even-aged mature forest. To the extent that measured tree age serves as a proxy for stand condition, the analysis might impute old growth characteristics to a stand that is actually younger.

Along these lines, we also note that some thresholds for mature forest onset appear *higher* than the same thresholds for old growth identification. We think this may be because the Forest Service started with Region 8 old growth criteria, identified FIA plots meeting those criteria, and then derived mature forest thresholds by stepping down from real-world data in those plots, which in many cases still yielded a higher figure for mature forest than the minimum thresholds for old growth that pointed to those plots in the first place. The inventory ended up with one set of criteria set according to Region 8's standards (for old growth) and another set (for mature forest) derived from the plots those standards pointed to. The agency should remain mindful of how it allows these two sets of standards to inform each other and deploy consistent methods.

The thresholds may also be compromised to some degree by the type groupings used to characterize forests in our region, which apply the same criteria to forest types with distinct productivity characteristics. For example, red cedar and loblolly pine forests are evaluated using the same thresholds, despite those two forest types aging in materially different ways. The category of "Region 8 Oaks" is similarly heterogenous and difficult to say anything useful about as a group; oaks in our region exhibit dramatically different growth characteristics depending on species and where they grow.

Second, the inventory is far more useful at the national scale than at regional or local scales. The exclusive use of FIA plot data to map MOG forest within 250,000-acre firesheds may give us a good sense of how much MOG is in the country and a coarse sense of where it is more abundant. But as the scale of inquiry shrinks, so too does the sample size of FIA plots informing that analysis. This is particularly problematic in regions like the Southeast, which have many forest types sliced and diced into different categories. The more thinly the data are sliced, the less statistically likely it becomes that a fireshed's classification accurately characterizes MOG conditions for a particular forest type in that area. In short, the inventory's use of FIA plot data

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[151] Jens T. Stevens et al., *Average Stand Age from Forest Inventory Plots Does Not Describe Historical Fire Regimes in Ponderosa Pine and Mixed-Conifer Forests of Western North America*, PLoS One (2016), 10.1371/journal.pone.0147688.

[152] Region 8 Old Growth Guidance, *supra* note 89, at 23 ("The exception is that the age of the stands should be determined based on the oldest age class as opposed to the 'representative stand age.'").

yields a useful statistical analysis of MOG nationwide, but it is not especially helpful as a map. Keeping this in mind, the Forest Service's policy framework should accommodate further opportunities to evaluate MOG's spatial distribution using remote sensing and machine learning. This will be critical to inform departure analysis relative to NRV and to monitor trends over time. Until more reliable spatial data is available, ground-truthing and public input will remain critical to ensure that MOG is not impacted unknowingly.

Third, and as discussed in greater detail elsewhere, the inventory compares the percentages of MOG in firesheds to other firesheds. It does not help the public or the Forest Service understand how the quantities of MOG depicted in a fireshed relate to the percentages that *should* be in that fireshed under the NRV. Future versions of the inventory should contextualize MOG levels in terms of departure from reference conditions.

IV. Adaptation and Resilience

The ANPR asks how the Forest Service can plan for climate resilience and adaptation across its activities.[153] Because MOG forests provide diverse microclimates, resilient habitat, and refugia for rare species, protecting and expanding healthy MOG forests should be a major component of the answer to these questions: "Idiosyncratically, the highly dynamic nature of late successional forests may itself add adaptive capacity to eastern landscapes. The dynamics of these systems will certainly shift in the future as disturbance regimes change. … However, complex interactions between late successional forests and disturbances will provide subsidies to the system, even when disturbance effects are severe and undesirable for economic objectives."[154]

In addition, the agency must identify and minimize activities that tend to jeopardize the health and ecosystem services and health of its forests. These benefits are especially significant within MOG forests, but poor management decisions threaten adaptation and resilience across all structural classes.

a. Road problems

The growing size and continuing deterioration of the Forest Service's road system threatens the adaptation and resilience of aquatic ecosystems and dispersal-limited species. In previous comments throughout this process, we have identified the Forest Service's road networks as a particular threat to the forests' ecological integrity.[155] To recap, roadbuilding and the subsequent failure to appropriately maintain or decommission those roads is associated with a significant increase in landslide risk,[156] which will only increase as intense rain and wind events become more common in our region. Short of a landslide, undersized culverts and poorly

[153] 88 Fed. Reg. at 24,502.
[154] Ecology & Recovery of Eastern Old-Growth Forests, *supra* note 77, at 302.
[155] *See, e.g.*, Letter from S. Env't L. Ctr. to William Hohenstein, Director, Office of Energy & Env't Pol'y, USDA re: Docket No. USDA-2021-0003 (Apr. 29, 2021), at 13–14.
[156] British Columbia Ministry of Forests, Landslide Risk Case Studies in Forest Development Planning and Operations (2004), at 1.

maintained BMPs are likely to be overwhelmed by those events, causing sedimentation and erosion of fragile streambeds, making it difficult or impossible for sensitive aquatic species to survive or navigate in their streams. Almost 90% of sedimentation associated with silvicultural treatments can be traced to the roads used to access the treatment site.[157] Soil compaction and ruts, additionally, make soils unproductive and cause losses in stored soil carbon.[158] Across the Southeastern forests, these impacts are commonplace. Of particular concern are "temporary" roads, which are built on an ad hoc basis and are seldom decommissioned to return the affected area to resource production. Instead, they continue to degrade water quality and destabilize soil long after they have served their purpose. Because they are not official system roads, they receive no regular maintenance, even when they are causing resource damage.

Roads also facilitate the transmission of non-native invasive species (NNIS), which threaten ecosystem integrity—and thus a forest's adaptive capacity and resilience to climate change—by displacing or competing with species critical to the functioning of that ecosystem.[159]

And as the Forests' draft Travel Analysis Reports show, the Pisgah and Nantahala have profound road funding deficits—they have approximately 12.5% and 14% of the funding needed to maintain their road systems to standard, respectively—and a backlog that is extraordinarily high even compared to other national forests.[160] The maintenance backlog is a proxy for risk to waters. The longer roads go unmaintained, the more likely they are to have failing BMPs that affect waters. The planning record shows unmistakably that sediment impacts in violation of mandatory state BMP performance standards are ubiquitous on the Forests' most neglected roads (namely, the low-service, usually dead-end roads in wilderness inventory areas). A 2015 survey of roads in wilderness inventory areas showed that 40% of stream crossings and other BMPs directly affecting intermittent or perennial streams violated the prohibitions on accelerated erosion in a stream crossing or visible sediment directly entering the stream.[161] Barriers to aquatic organism passage were also ubiquitous. Of the pipe-culverted streams with summer flow depth of 4 inches or greater, none were passable for small fish (and therefore were also barriers to mussels). Only 14% of crossings were passable for salamanders. In addition, chronic lack of maintenance leads to acute failures during storm events.[162]

To maximize the adaptation and resilience of the forests it manages, the Forest Service must commit to minimizing the damage caused by existing roads and future roadbuilding. The best way to do this is to follow through with the Travel Management Rule's commitment to

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[157] S.M. Hood et al., *Universal Soil Loss Equation (USLE) – Predicted Soil Loss for Harvesting Regimes in Appalachian Hardwoods*, 19 N. J. of Applied Forestry, issue 2, at 53, 56 (2002).
[158] Cooper & MacFarlane, *supra* note 53, at 7.
[159] NPNF Revised Forest Plan, *supra* note 61, at 87.
[160] U.S. Forest Serv., Pisgah National Forest Transportation System Analysis (TAP) Report (Oct. 2012); Nantahala National Forest Transportation System Analysis Process (TAP) Report (Sept. 2015), Attachments 9 & 10 to DEIS Comments.
[161] U.S. Forest Serv., Analysis of Forest Road Conditions and the Impact on Water Quality and Aquatic Organisms in the Pisgah–Nantahala National Forests (2015). Attachment 31 to DEIS Comments.
[162] S. Env't L. Ctr., The Wilderness Soc'y, MountainTrue, Defs. of Wildlife, Comments on the Nantahala and Pisgah National Forests Draft Land Management Plan and Draft Environmental Impact Statement, at 210–11 (reflecting independent survey results), Attachment XX.

identify the minimum road system and actually implement the needed changes. In other words, the Forest Service must be willing to live within its means. In the East, that means the agency should be shrinking the suitable timber base rather than continuing to build roads and raising the high water mark of rotational logging.

In the short term, we recognize that new funding will make it possible to address many deferred maintenance needs. We are excited about this possibility and recommend that the agency make every effort to make allocation decisions transparently and with public input. Even more importantly, we caution that infrastructure funding is likely to be ephemeral. Accordingly, it must not be used to raise the high-water mark of road access yet again, exacerbating maintenance backlogs when the money runs out.

b. Promotion of ecological integrity

In adopting the 2012 Planning Rule, the Forest Service made the pursuit of ecological integrity central to the long-term management of national forests. The same approach should be used to guide climate resilience policies and resolve any tension between, for instance, carbon storage goals and habitat goals.[163] The latest IPCC Assessment Report confirms that "maintaining ecosystem integrity and its biodiversity are essential to an effective response to a changing climate."[164] The Forest Service should accordingly promote adaptation and resilience by ensuring that forest management and planning are carried out consistent with ecological integrity, which the agency has determined means managing forests for the achievement of conditions within their natural range of variation ("NRV") to the greatest extent possible.[165] Indeed, adaptability and resilience are built into the agency's definition of ecological integrity, which partly depends on an ecosystem's ability to "withstand and recover from most perturbations imposed by natural environmental dynamics or human influence."[166] In historically exploited forests that are at low risk of catastrophic disturbance, like those in the East, restoring NRV is equivalent to protecting and restoring old growth forests. The NRV concept also accommodates active management to decrease the risk of uncharacteristic wildfire and restore characteristic disturbance regimes in high-risk areas.

Pursuing ecological integrity in terms of the NRV is not just backward-looking. In the Forest Service's own words, "[t]he natural range of variation is a guide to understanding how to restore a resilient ecosystem with structural and functional properties that will enable it to persist into the future."[167] Although climate change's effects on the precise functional, structural, and compositional characteristics of our forests remain unknown, the Forest Service must chart a course based on what we do know. The basic structural characteristics of Southeastern mesic forests within their NRV, for instance, are unlikely to change—frequent, large-scale disturbances

[163] Cooper & MacFarlane, *supra* note 53, at 8.
[164] Law et al., *supra* note 13, at 2 (quoting IPCC, Summary for Policymakers, in Climate Change 2022: Impacts, Adaptation, and Vulnerability).
[165] 36 C.F.R. § 219.8; *id.* § 219.19. *See also* FSH 1909.1, ch. 12.15a.
[166] 36 C.F.R. § 219.19.
[167] FSH 1909.12 Ch. 23.11.

are not and will not become essential to their ecological integrity on any timescale relevant to this rulemaking. They will continue to be characterized by relatively low velocities of change.

Despite the adoption of ecological integrity into agency policy, however, the Forest Service has not been taking concerted action to restore conditions within the NRV. New forest plans describe what integrity looks like, but they do not preclude taking actions at the project level that can cumulatively undermine integrity. And, at the project level, other incentives (besides restoration) are at play. Projects are initiated and designed for a variety of local reasons, including commercial considerations. These locally important reasons are often in tension with (or at least require compromises with) restoration goals. To return to an example mentioned above, the Fightingtown Creek ESH project illustrates just how ubiquitous this problem is. The project proposed ecologically inappropriate harvest of healthy mature forests, but local advocates did not even object because other aspects of the project were supportable. To be clear, even in our least controversial projects, the Forest Service often asks the public to acquiesce to the sacrifice of healthy, mature forests in order to accomplish other needed work. This culture of compromise has become so ingrained that many staff see it as an inevitability, but cumulatively these projects come at an unnecessary cost to the conservation and restoration of MOG.

Finally, project-level debates in the East are often framed around the supposed need to restore early successional habitat. Regeneration harvest of mature and old-growth forests are pitched by the agency as necessary to restore this condition, which NRV analyses have shown is underrepresented in the East. Yet while these projects may create habitat for early successional associates, they are not restoring forest structure, because they create large openings inconsistent with structural conditions created by the dominant disturbance regimes in Eastern forests. Over time, these conditions add up to a landscape-scale departure from NRV—lots of uncharacteristic large openings and few characteristic small gaps. If the Forest Service is serious about ecological integrity, then projects intended to restore structure must do so by creating conditions at the levels, patch sizes, configurations, and distribution consistent with those created by dominant disturbance regimes. Continued greenwashing of business-as-usual timber sales as "restoration" will not engender trust from the public, and it will not improve ecological outcomes.

V. Best Available Science relevant to calibrating a useful MOG policy

To inform the design and implementation of its policy for maintaining and expanding MOG forests, the ANPR also asks for help identifying and synthesizing the best available scientific information—including Indigenous Knowledge—to "improve and strengthen our management practices and policies to promote climate resilience."[168] It also asks how it might "better operationalize adaptive management" to account for climate change and the uncertainty it introduces. We address each set of questions in turn below, focusing primarily on how best to use and when best to incorporate different kinds of information.

a. Establishing the NRV for MOG in Southeastern forests

[168] 88 Fed. Reg. at 24,502.

We are pleased to see the Forest Service committed to pursuing a MOG policy that is consistent with its commitments to maintain and restore ecological integrity on federal forests.[169] Ecological integrity means the condition of being within the NRV,[170] defined by the expected range of characteristics created by dominant disturbance regimes and exhibited by a particular forest type in the absence of human intervention.[171]

NRV is fundamental to understanding how much MOG ought to be on the landscape for any forest type and to provide a baseline for departure analysis—determining where there are deficits and surpluses of various structural conditions. Such analyses, even if not available comprehensively for the entire NFS, are essential to provide a compass bearing for policymaking related to MOG forests.

As noted above, old growth in the East is vanishingly rare, even though it ought to be the dominant structural condition across the landscape: The 1-million-acre Nantahala-Pisgah landscape has only about 90,000 acres of old growth—about 400,000 short of NRV—even by the agency's too-low estimate. At the same time, mature forests are likely overrepresented. Although not a one-to-one stand-in for mature forests, the Nantahala–Pisgah analysis shows 484,000 acres of late-aged forests on the same landscape—a surplus of over 300,000 acres.[172]

It would be inappropriate to conclude that "surplus" mature forests can be regenerated in large quantities, because they are also the stock needed to restore the missing old growth component. However, not all mature forests are of equal value. NRV can also serve as a reference condition to determine whether a mature forest is on a good trajectory to age into healthy old-growth forest. Some mature forest, for example, may be uncharacteristic for the forest type, meaning active management can be helpful rather than harmful to its ecological integrity. Distinguishing between forests on a trajectory toward characteristic old-growth condition (composition and structure) and those that are not is one way to balance multiple-use imperatives and meet ESH goals in ways that are less damaging to the ecological benefits MOG forests provide. We provide specific recommendations for screening projects in mature forests below.

b. *Carbon accounting and NRV*

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[169] *See* 88 Fed. Reg. at 24,498 (noting that the ANPR "[u]ses the Planning Rule's definition[] of ecological integrity") and 24,502 (seeking input concerning the agency's duty to "provide for ecological integrity"); 36 C.F.R. § 219.8 (2012).

[170] 36 C.F.R. § 219.19.

[171] FSH 1909.12, Ch. 23.11a; 23.1. In the forest planning context, the agency's handbook prescribes the following definition for NRV: "Spatial and temporal variation in ecosystem characteristics under historic disturbance regimes during a reference period. The reference period considered should be sufficiently long to include the full range of variation produced by dominant natural disturbance regimes, often several centuries, for such disturbances as fire and flooding and should also include short-term variation and cycles in climate. 'Natural range of variation' (NRV) is a term used synonymously with historic range of variation or range of natural variation. … The NRV can help identify key structural, functional, compositional, and connectivity characteristics, for which plan components may be important for either maintenance or restoration of such ecological conditions." FSH 1909.12.05.

[172] *See supra* note 93.

The Forest Service's MOG policymaking must be based on an accurate accounting of the carbon stored by MOG forests. It must also properly compare the carbon lost to natural disturbance against what is lost as a result of harvest and other forms of active management. And it must account for the opportunity cost of proforestation when considering how carbon storage will take to break even after harvest.

The greatest threat to carbon stored by MOG is harvest; this is true nationwide as well as in the Southeast: Timber harvest is responsible for five times as much emitted carbon as all other forms of disturbance combined.[173] Agency staff often offer reasons not to worry about this loss at the project level, but the reasons are not based in the best available science. Some analyses assume wood products "lock in" carbon gains that might have otherwise been lost to mortality events. But the math underlying these justifications for harvest does not hold up. Although some carbon is stored in wood products, we have seen these figures overrepresented in some contexts to give the impression harvest in MOG forests has minimal, or even salutary effects on that forest's overall climate impact.[174]

This impression is also supported by misleading descriptions of young forests' role in the carbon cycle: They sequester carbon at faster rates than old forests, but they store far less per unit of land area.[175] Although carbon sequestration rates peak during the early decades of a forest's development, speed is no substitute for lost volume or the time it took that volume to accumulate. Harvested mature stands on a particular site sequestered similar amounts of carbon at a similar speed early in their own development—but over many decades, they continued to store much more carbon even as the overall *rate* of sequestration (as opposed to the *amount*) for the stand levelled off. This distinction is critical and is due to the presence of older trees—as trees get older and larger, they remove increasing amounts of carbon from the atmosphere.[176] Indeed, this is why carbon densities (stored carbon) in the Southeast are relatively low even if sequestration rates are relatively high (due to young trees).[177] When these trees are harvested, much of this stored carbon is emitted to the atmosphere, and it cannot be recaptured quickly. The vast majority of forests' above-ground carbon is stored in the oldest and largest trees.[178]

Calculations suggesting this carbon debt can be repaid by "locking in" carbon in wood products overestimate how much carbon actually remains in wood products and underestimate the carbon cost of the harvest and production processes that create them. Further, the amount of carbon stored in harvested wood is also highly dependent on the end use of the wood product.

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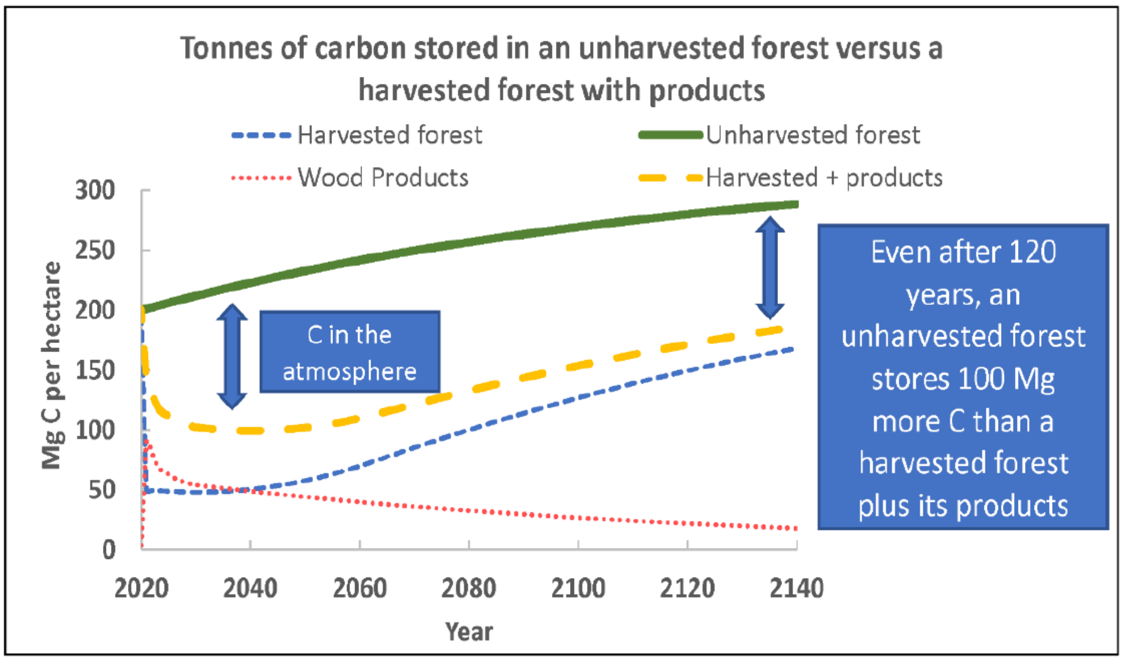
[173] N.L. Harris et al., *Attribution of net carbon change by disturbance type across forest lands of the conterminous United States*, 24 (2016), https://cbmjournal.biomedcentral.com/articles/10.1186/s13021-016-0066-5.
[174] *See, e.g.*, NPNF FEIS, *supra* note 22, at 3-24 ("Carbon can also be transferred and stored outside of the forest system in the form of wood products, further influencing the amount of carbon entering the atmosphere.").
[175] *See* Moomaw et al., *supra* note 24, at 4.
[176] Stephenson, N.L. et al., *Rate of tree carbon accumulation increases continuously with tree size*, Nature (2014). (finding that "[e]ach year a single tree that is 100 cm in diameter adds the equivalent biomass of an entire 10–20 cm diameter tree.").

[177] *See* Law et al., *supra* note 13, at 3.

[178] *Id.* at 4.

The Forest Service determined in its 2014 planning assessment of the Nantahala and Pisgah National Forests in North Carolina—forests that emphasize sawtimber production over other kinds of wood products—that just twelve percent of harvested carbon remained stored in wood products after fifty years.[179] Another 18 percent remained stored in landfills. In the short term, especially after accounting for production and harvest losses, wood products appear to store carbon *less* effectively than dead trees, which release carbon slowly while providing habitat and other ecosystem services for decades after death.[180]

Adding the carbon stored in wood products (which diminishes over time) to the carbon sequestered by young forests (which, like the forest it replaced, slows over time) shows that timber harvest, far from increasing carbon storage potential, both emits carbon and precludes the achievement of "replacement" benefits on any timescale relevant to the exigencies of the climate crisis. The regenerated forest may simply never catch up, as explained in the figure below from Law et al. (2019).



At some point after harvest, it is theoretically possible that a new post-harvest stand will catch up with the carbon lost directly to harvest activities, transportation, and processing. But in the absence of harvest, that stand would have kept sequestering more carbon, even if at slightly

[179] *See* U.S. Forest Service, Southern Region, *Assessment for the Nantahala and Pisgah National Forests* (March 2014), at 83 (showing 5,460 metric tons remaining after 50 years in primary wood products out of 44,489 metric tons of carbon in harvested timber). Combined with wood waste stored in landfills, the total proportion of carbon that remains sequestered in *any* form after 50 years is about 30 percent.

[180] Law et al., *supra* note 13, at 7. *See also* Mark E. Harmon et al., *Combustion of Aboveground Wood from Live Trees in Megafires, CA, USA*, Forests (2022), at 19 ("The fact that the vast majority of aboveground woody biomass is not combusted raises the question of when fire-killed trees actually release their carbon. If dead trees are allowed to remain in place, the natural decomposition process could take many decades to centuries to release fire-killed carbon.").

slower rates. The break-even point will come, if at all, only many decades down the road. That will be too late.

As with the MOG inventory, carbon stocks data must be placed in useful context beyond simply tabulating how much carbon is being sequestered or could be stored. The agency should also comprehensively analyze how those figures compare to the reference condition for carbon storage across its forests, identifying where and for what forest types additional carbon storage potential is greatest. Carbon storage potential (i.e., NRV for carbon stocks) should be developed for forest types and productivity classes in order to inform the agency's effects analysis when considering alternative policy options pursuant to this rulemaking.

We specifically recommend that the Forest Service use site-specific historical logging data—records of volume removed from particular areas—to help it compare extant timber volumes to those present on the landscape prior to the massive clearcutting that liquidated primary forests of the eastern United States in the late 19th and early 20th centuries. Such historical data is an important source of error checking when developing carbon NRV estimates that are otherwise based on modeling rather than observation.

c. Monitoring and adaptive management

Even the most rigorous analysis ahead of time cannot obviate the need for timely monitoring data and the incorporation of that information into subsequent decision processes. Nowhere is this more true than for a policy centrally concerned with adaptation in the face of climate uncertainty. Adaptive management requires three things—a clear set of measurable expectations about the effects of the decision, monitoring data to understand whether the decision's outcomes are consistent with the expectations, and a clear framework for adjusting the decision if they are not. As part of any new policy commitments stemming from this ANPR, the Forest Service must not only spell out its expectations as it develops a supporting EIS—it must also commit to monitoring trends and sharing that data with the public. It must further demonstrate it is willing to change course or adjust its initial strategies if monitoring reveals its choices are not yielding the expected outcomes. Monitoring requires commitment. As recommended and discussed in greater detail below, the agency should create and fund a program responsible for monitoring MOG trends, because otherwise it will be pushed to the backburner in favor of other program work. With that note of caution, we are excited to participate in the development of new monitoring tools, such as GEDI analysis and machine learning, to follow MOG trends more nearly in real time.

d. Indigenous knowledge related to the maintenance of mature and old-growth forests

As part of its request for input on key performance measures and indicators to inform adaptive management, the Forest Service seeks comments specifically on how to "braid together IK [Indigenous Knowledge] and western science" and "improve [its] ability to integrate IK for climate resilience."[181] Although our organizations are not able to speak to Native nations'

[181] 88 Fed. Reg. at 24,502.

substantive policy preferences or advocate on their behalf, we support an effort by the Forest Service to incorporate Indigenous Knowledge ("IK") into its forest management practices—especially those regarding mature and old growth forests and climate resilience. Any such efforts should embody the following values and goals: respect for Indigenous people and practices; establishing and maintaining relationships with Indigenous people; designing a formal process to implement IK; respect for the privacy of Native nations and potential confidentiality concerns around IK; and support for capacity-building related to the implementation of IK.

We believe the best place to start is ensuring that for all decision-making processes concerning land or resources in which Native nations have interests, agency policy requires the affirmative solicitation and inclusion of any IK that those Native nations or individuals wish to offer. This should occur at any point in the agency's processes where scientific information is typically solicited or considered. The Forest Service should understand, however, that Native nations may make decisions using different kinds of processes and on different timeframes than may neatly fit into federal bureaucratic processes. The agency's incorporation of IK should therefore be more flexible and ongoing. This is consistent with our call for an interim policy to preserve the agency's options as it works on a final substantive policy in light of the best available science and Native nations' priorities and insights.

As a general matter, the Forest Service must approach relationships with Native nations with respect and humility, and collection and use of IK must be driven by Indigenous communities. There must be a preliminary understanding that there is no definitive IK perspective on scientific or policy questions. Conflicts around Indigenous Knowledge, where they exist, must be articulated and, to the extent possible, resolved by the communities where that knowledge originates, and using their own decision processes—not under the Forest Service's roof. Additionally, Native nations must set the parameters by which the Forest Service acquires and disseminates IK. The Forest Service should reach out to Native communities early in any given process to glean how to best manage areas of interest, including potential concerns about confidentiality of IK.

Because information-gathering and public education processes are core to the Forest Service's mandates, opportunities for incorporation of IK into the agency's processes should be extensive. This means going beyond giving advanced notice to interested parties for specific projects or merely ensuring a document reflecting IK is somewhere in the project record; the Forest Service should engrain IK into decisionmaking processes. Its decision documents should reflect serious consideration of conflicts between IK and Western science where they arise and credit IK for choices that reflect or rely on its conclusions. In implementing these principles, again, the Forest Service must be conscious of Native nations' potential interests in confidentiality and privacy.

Agencies must also build capacity—internally and among knowledge holders—to productively incorporate IK into decisionmaking processes. This process starts with the Forest Service supporting knowledge holders who may not have experience navigating or advocating within the processes the Forest Service uses to make decisions. Support should manifest in the forms requested by knowledge holders and their communities.

The Forest Service also seeks comment on how to integrate IK and BASI as part of its broader efforts to increase the efficacy of the agency's climate resiliency policies and to best calibrate associated adaptive management. More specific recommendations to that effect, in addition to the first principles described in this section, are included in our policy recommendations below.

VI. Recommendations

The Forest Service's response to EO 14,072 must meet several criteria to be successful.

First, the policy must provably increase carbon storage above the business-as-usual baseline. It is not good enough to do some hand-waving around the fact that carbon is accumulating on NFS lands. What matters is whether carbon storage has been optimized consistent with principles of ecological integrity. In other words, are NFS lands' total storage capacity growing as fast as they could be, on the timeline that matters?

Second, the policy must produce outcomes consistent with ecological integrity—i.e., the condition of being within the NRV for the applicable forest type. Derivation of an ecological reference model begins with an understanding of historical disturbance regimes, and, if those are not possible to maintain, future disturbance regimes. FSH 1909.12, sec. 12.14. In other words, the necessity to consider climate velocity is already built into agency policy. Restoring ecological integrity is thus entirely consistent with the goal of increasing carbon in stable storage on NFS lands in mature and old forests—increasing carbon stored through proforestation in stable systems and mitigating risk (increasing stability) in high-risk systems.

Third, the policy must be consistent with the need to protect vulnerable communities from wildfire risk. At the same time, it should differentiate between discrete areas in the immediate vicinity of such communities, where conditions outside of NRV might be appropriate, and the vast majority of national forest lands, where restoring ecological integrity is the best strategy for reducing the risk of uncharacteristic wildfire. The WUI, as currently defined, is incapable of making that distinction, especially in the East.

Fourth, the policy must recognize the differences between old-growth and mature forests. Our remaining old growth is rare and there are very few plausible justifications for harvest. Mature forests as defined for the inventory exhibit much more variability and occur in a wider range of contexts, yet open-ended discretion has not been sufficient (nor will it be) to ensure that enough of the healthiest mature forests continue on a trajectory to restore the missing old growth. So, while mature forests should not be subject to precisely the same policy limitations as old growth, they still must be protected to a significant degree by this process.

Fifth, the policy must provide a consistent nationwide framework for conserving MOG, but it must accommodate regional and local differences and encourage local innovation. As explained below, local officials must have a goal and sideboards to ensure that their projects contribute to national-scale goals. But within that framework, local needs and opportunities will vary, and officials should have room to innovate and develop appropriate conservation tools.

Sixth, it must provide for adaptation and improvement as new and better data is gathered and interpreted by the agency. In the EIS, the Forest Service will articulate its expectations for ecological and carbon storage outcomes, including how MOG levels will respond to the policy in light of the balance of active and passive management prescriptions and natural disturbance. The EIS will also disclose expectations about how NFS management will contribute to various pathways to net zero emissions.[182] As monitoring methods improve and more data are collected, the Forest Service should adjust incentives and expectations of line officers in order to stay on track. Indeed, annual performance targets should be refined to allow this recalibration over time.

Seventh, the policy must be just. It must incorporate indigenous knowledge and priorities when establishing reference conditions and identifying monitoring indicators. It must also protect the economic health of local communities dependent on national forests, to the extent compatible with the overriding need to restore ecological integrity and mitigate the potentially devastating effects of climate change. The policy should ideally provide some certainty in the level and type of forest products that will be available as byproducts of restoration. Conserving MOG means that the mix of products should shift appreciably toward small diameter materials. However, the Forest Service owes the timber markets as much consistency and predictability as it can provide. To the extent that dislocations are expected, the administration must be fully committed to assisting just transitions. For example, local communities should supply much of the workforce for needed restoration treatments.

Eighth, and finally, the policy must begin conserving MOG immediately, and its protections must be durable. Both are necessary to ensure that the policy is capable of protecting MOG forest over the timescales where its protection is critical to mitigating climate change. Waiting is not an option. In addition, once in place, there can be no waffling. Intermittent or short-term protections for a resource that cannot quickly be regenerated are hardly protections at all. The benefits of conserving and recruiting MOG forests must be allowed to accumulate over the next several decades, while the harm of needlessly liquidating them can be done in an instant.

To best satisfy these criteria, we recommend as follows:

1. The Forest Service Should Promulgate a Substantive Rule for MOG Conservation.

The Forest Service should conclude this effort with a substantive rulemaking. At a minimum, the rule should provide direction for conserving existing old-growth forests and for identifying mature forests that will be managed on a trajectory to restore old-growth conditions. The policy should be supported by an EIS.

Currently, the Forest Service has no generally applicable policy requirement to conserve old-growth or mature forests. There is no regulatory protection for old growth, much less mature forests. A patchwork of regional guidance documents help to define old growth, but they do not limit the agency's discretion to continue logging it. Similarly, the Forest Service has no policy requiring local officials to prioritize retention of carbon in the older forests and trees where most of it is stored. In the recent words of the Nantahala and Pisgah National Forests, "[n]o applicable

[182] CITE TK Pathways

legal or regulatory requirements or established thresholds exist for management of forest carbon or GHG emissions."[183] Not only is there no requirement to prioritize carbon storage at the project level; there is not even a requirement to weigh it against other goals.

The Forest Service's performance targets, or key performance indicators (KPIs), do not fill this gap. Currently, the KPIs include crude incentives for timber volume and acres treated—targets that can be met only by active management, often including logging MOG. There are no countervailing targets for MOG conservation. When silviculturalists go into the woods, in other words, there is nothing to tell them that their job includes identifying stands for old growth restoration. And, while we support the new KPI for the Terrestrial Condition Assessment, it will be impossible to timely relate broad-scale monitoring of ecological conditions to project-level decisions. This new KPI will not overcome line officers' short-term incentives to meet volume and acreage targets.

The 2012 planning rule's requirements related to ecological integrity, furthermore, do not function as a substitute for other missing policies. In historically exploited systems like forests in the East, restoring ecological integrity should result in retention and recruitment of old growth and healthy mature forests, which would also increase carbon storage levels. But even if plans drafted under the 2012 planning rule were sufficiently prescriptive to ensure these outcomes, implementation would be too slow. A full cycle of plan revisions and a new generation of projects would take decades to accomplish, missing the critical window to mitigate climate-forcing emissions. More importantly, 2012-rule plans *don't* ensure good outcomes. While newer plans include rhetoric about ecological restoration, they don't limit project-level discretion or ensure that projects will cumulatively contribute to ecological restoration (which would include MOG conservation).

As a result, projects continue to target MOG in ways described above that undermine ecological integrity. The pursuit of local goals (including commercial viability) without policy sideboards results in the logging of existing old growth or healthy mature forests that could otherwise have contributed to restoration of old growth. This is true even where those forests are located in areas of high biodiversity or other sensitive contexts. Whenever the stand is in a management area where timber production is allowed, its other ecological values and contexts are typically subordinated to timber.

Although local stakeholders and experts are often aghast at these project-level choices, higher-level agency officials are generally unaware of their adverse effects. Such effects are sanitized and downplayed in official documents, while the needs for the project are emphasized. What is often missing is any acknowledgement that those needs could have been met elsewhere, without threatening high-value mature and old-growth forests. The disconnect between agency policymakers' perceptions of local projects and stakeholders' perceptions of those same projects is largely responsible for a chronic deterioration of trust, as stakeholders ask for correction over and over while officials fail to acknowledge that there is even a problem.

[183] CITE TK

In contrast, there are encouraging examples where the agency is getting it right and rebuilding trust, and they happen to be in the few contexts where there are substantive protections for MOG. Despite the lack of an overarching policy framework for MOG conservation, there are a few types of projects where large, old trees are required to be retained. For example, Collaborative Forest Landscape Restoration Program ("CFLRP") projects must maximize the retention of large and old trees.[184] In part because these limitations take inappropriate logging of MOG off the table, these projects tend to be more successful in outcome and in securing public support. Most stakeholders agree that the removal of small diameter materials and restoration of species composition, without financing those treatments by selling healthy mature and old trees, shows the agency at its best. The Forest Service should learn from its successes and extend similar substantive sideboards to all projects.

We recognize that CFLRP projects are also more successful because they come with additional funding. Outside of the CFLR context, the need to meet competing local objectives, including primarily the need to make timber sales commercially viable, is a serious constraint on Forest Service effectiveness in meeting national goals like MOG conservation. It is also a fixture of agency culture—a constraint that many agency staff would apparently prefer to keep as is. But it is a fiction: The value of wood products already falls short of paying for needed management, even when management prescriptions tilt toward commercial viability. In other words, the Forest Service already invisibly subsidizes every successful timber sale. If we're going to subsidize the work, let's subsidize the work that needs to be done. That means putting guardrails around projects to ensure that commercial considerations do not result in compromising ecological outcomes.

To be sure, the gap between treatment cost and wood products' value will only increase with a shift toward ecological restoration and MOG conservation. We believe that the Forest Service should have its eyes open to this reality during the rulemaking process. However, with the additional funding available right now, this is the best opportunity the agency has had to decouple commercial considerations from its ecological priorities. For too long, funding levels have constrained line officers' options—forcing them to choose between commercially viable projects or doing less work. As a result, they have entangled commercial programs of work with ecological objectives (e.g., justifying rotational timber production as creating early successional habitat). New funding makes it possible to break that cycle. The agency can conserve MOG while still doing other needed work. In the process, it will learn the true cost of that other work, which can inform future appropriations requests. In those future requests, we are confident the Forest Service can show that paying for needed treatments is a good value proposition: Conserving MOG forests has an extraordinarily high social value (which can be quantified using the SC-GHG, discussed above). In other words, protecting MOG has a tremendous return on investment, even if it necessitates additional funding for other treatments.

With that background, we turn to the contents of a MOG rule. We recognize that the scope of the rule may be broader than just MOG conservation. However, it should at least address protections for MOG. As noted above, mature and old-growth forests should be

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[184] 16 U.S.C. § 7303(b)(1)(D), (E)(ii). *See also id.* §§ 6512(f); 6591b(b); 6591d(b) (similar limitations in HFRA).

conserved by separate policy limitations. And, in general, the final rule should solidify the interim protections described in more detail below (viz., narrow exceptions for harvest in old growth forests and appropriate filters for harvest in mature forests). The final rule should also build on local strategies to maximize MOG retention while meeting other social and economic objectives (also discussed further below).

Ideally, the policy should operate retroactively (at least in some defined circumstances). Recently, the Forest Service has increasingly approved large, long-lived projects without site-specific analysis or due consideration of cumulative climate impacts. The concept for these projects is that the Forest Service will identify particular stands for treatment in the future, during implementation. To the extent that these so-called "condition-based management" projects allow the harvest of MOG forests, they should be subject to the final rule. Otherwise, impacts to MOG and cumulative carbon impacts that would be prohibited by the policy could nevertheless continue for decades.

Finally, the policy should be supported by an Environmental Impact Statement.[185] An EIS, as noted elsewhere in these comments, should articulate the expected effects for MOG and ecological integrity, setting a compass direction for monitoring and adaptive management. Further, an EIS is needed to support tiered project-level decisionmaking. No matter what choice the agency makes here, its timber sale program has significant cumulative effects on national-scale goals of MOG conservation and carbon storage and emissions on NFS lands, yet those effects are not disclosed in project-level analyses or forest plan analyses. This policymaking effort is an opportunity not only to develop policy direction, but also programmatic analysis to which future projects can tier.

2. <u>The Forest Service Should Set Ecological Integrity as its "North Star."</u>

During this process, some stakeholders will ask the agency to prioritize passive management to restore missing old growth and maximize carbon retention. Others will ask the agency to prioritize active management to address wildfire risk. Both are in a dark room, trying to describe an elephant by touch. The elephant is ecological integrity. "If each had a candle and went in together / The differences would disappear."[186]

Restoration of ecological integrity is the only concept that can resolve the tension between the needs for action and inaction. Where some observers see harm in action and others see risk in inaction, ecological integrity simply means taking action in the right places and refraining from acting in the wrong places.

The agency could set this "north star" as part of the substantive rulemaking, but it could also accomplish the same end separately through a lean interpretive rule or even through a batch amendment to forest plans. Regardless of its form, this direction should be accompanied by a

[185] NEPA § 102(2)(C); 40 C.F.R. § 1502.
[186] Coleman Barks, *The Essential Rumi* (1985) (adaptation of Rumi, *The Elephant in a Dark Room* (ca. 1258)).

decision support tool (ideally through revision of FSM 2020) to help local decisionmakers determine whether a project will contribute to ecological integrity.[187]

As part of the substantive rule, ecological integrity could function as a condition determining the applicability of limitations on MOG harvest. For example, as discussed in connection with the interim policy below, some limitations on the purposes or types of harvest in mature forests could be conditioned on whether MOG is within characteristic levels for the relevant ecological community type at the appropriate scale. As part of a substantive batch plan amendment, a requirement to contribute to ecological integrity, *including* MOG conservation, could be made a standard for all vegetation management projects.

If developed in an interpretive rule, the Forest Service would clarify that existing legal mandates necessitate coordinated efforts to restore to ecological integrity and that the agency will exercise its project-level discretion accordingly. The agency would interpret relevant statutes, regulations, and the Executive Order to explain that restoration of ecological integrity, including MOG conservation, is essential to provide for sustainable delivery of all the goods and ecosystem services derived from the national forests, from carbon storage to wildlife to wood products to clean water.

To be clear, requiring projects to contribute to ecological integrity would complement, but would not substitute for, substantive requirements relating to MOG conservation. Because NRV describes landscape level conditions, it is difficult to objectively criticize a single project as inconsistent with ecological integrity. One step in the "wrong" direction can be consistent with—or, at least, not preclude—overall progress toward ecological integrity, but many steps in the wrong direction will cause further degradation. In practice, it is often easier (or more commercially viable) to take a series of steps in the wrong direction. For example, the objective of creating early successional habitat in Eastern forests—a goal that, on its face, is consistent with ecological integrity—leads local staff to propose projects that sacrifice healthy mature and old-growth forests to make large clearings that are not consistent with the patterns expected under dominant disturbance regimes. Still, while not sufficient, setting this north star is necessary as an organizing principle for coordinated agency action, and to give agency staff clarity of purpose and thereby improve morale.

Finally, we recommend that Forest Service provide for incorporation of IK into the development of reference conditions. The development of reference conditions should reflect IK's insights and include consideration of traditional management practices. In addition, the Forest Service should identify measurable indicators of NRV based on tribes' cultural uses. For example, we have learned from the Eastern Band of Cherokee Indians that small white oaks are culturally important for basketry, suggesting that white oak regeneration could be an appropriate indicator of ecological integrity. Priorities regarding where and how IK and cultural practices are incorporated into NRV should be set by the Indigenous communities where such knowledge originates, and the Forest Service should seek out this counsel at every stage of reference condition development.

[187] Attach comments that include the sample decision support tool and include pincite in this FN.

3. The Forest Service Should Immediately Adopt an Interim Policy to Protect MOG.

We are realistic about the time that substantive rulemaking could take. But for all the same reasons that rulemaking is needed, an interim policy is needed *now*. The Forest Service's projects continue to degrade ecological integrity, carbon storage capacity, and public trust, seemingly without recognition of the problem by policymakers. This is the agency's opportunity to reverse those trends and build the capital for a rulemaking that can address MOG conservation along with a broader suite of related issues with buy-in from all major constituencies. To put a point on it, the Forest Service will not be able to earn support for doing more work until it proves it understands and can overcome the reasons that much of its current work has been harmful and controversial.

In addition, an interim policy is critical to preserve the agency's options. To the extent MOG is harvested in the near term, the lost carbon will not be replaced for decades. The Forest Service cannot afford to squander that resource thoughtlessly through uncoordinated local decisions. An interim policy would preserve the vital option of maintaining carbon stored in stable, healthy systems while final policy is developed.

Finally, an interim policy is a chance for the Forest Service to develop and refine workable solutions for a final policy. While we believe that the specific elements of the interim policy discussed here are viable and essential, there may be room for improvement. Relatedly, application of interim policy will provide space for the development of local strategies for climate smart forestry (specifically incorporating place-based IK), which can be reflected in a final rule.

As explained in the community comments submitted by Silvix Resources, we support the so-called Connecticut model for MOG policy, which differentiates between old growth and mature forests and provides more stringent protections for old growth. An interim policy must *at minimum* prohibit harvest in existing old-growth forests, except as needed to maintain old-growth characteristics or for cultural use by Native nations. No matter what ecological system or ecoregion is at issue, old growth is ecologically critical, socially precious, and rare by comparison to NRV.[188] It should be protected from harvest except in these narrowly drawn exceptions.

The interim policy should address mature forests separately. As explained in more detail above, a policy regarding mature forests is essential because the agency has not shown it can identify and conserve healthy mature forests or restore old-growth forests without such a policy. As compared to old growth, however, mature forests vary widely in their current conditions and in their contexts, so the policy must be more discriminating. In brief, the policy should provide a screening process for projects affecting mature forests that accounts for both context and condition.

[188] See CITE TK REPORT. Pinyon-juniper forest may be an exception. The inventoried abundance of old P-J forests may point to a definitional problem, but even if there are abundant old P-J forests, this would be the exception proving the rule. Unlike the systems where old growth is rarest, these forests have not been under commercial logging pressure.

First, with respect to context, the policy should establish conditions under which the screening process applies. We recommend that the policy apply across the board, but the agency might also consider limiting the screening process to ecological systems where there is a need to conserve mature forests by reference to NRV—i.e., where there is not enough mature forest relative to the reference condition. If the Forest Service pursues this approach, it should apply whenever either mature forests *or* old-growth forests are underrepresented (or, possibly, where mature and old-growth forests combined are underrepresented). Conserving mature forests is important in its own right, of course, but it is also the only strategy capable of restoring old-growth forests. Where up-to-date NRV analysis is lacking, the Forest Service should assume that MOG is underrepresented. Because MOG is "fast out, slow in," the precautionary principle is in this context the appropriate response to uncertainty.

Second, in the contexts where it applies, the policy should adopt a screening process to allow some activities but restrict others depending on the purpose of the treatment or the condition of the affected stand(s). One approach would focus on identifying the subset of mature forests subject to limitations. This is the "mature plus" concept—a recognition that some mature forests are more deserving of special consideration. For example, the policy could provide special protection for mature forests that are closer to achieving old-growth status as measured by age or structural proxies, or it could impose limitations where mature forests occur within areas of additional conservation importance,[189] relatively low climate velocity, or both. While we would support efforts to explore this approach, it could prove cumbersome with the need to develop exceptions or qualifications.

The agency could accomplish the same end by focusing on the type of treatments allowed in mature forests generally. Specifically, projects could be screened by asking whether the treatment has a permissible purpose, including:

- Restoration of structure consistent with the patch size, proportions, and distribution expected under dominant disturbance regimes;
- Restoration of species composition;
- Restoration of function or process (including restoration of characteristic wildfire regimes with risk mitigation treatments);
- Restoration of connectivity;
- Maintaining or improving habitat for rare and listed species; or
- Cultural use by First Nations.

Delimiting the purposes that justify harvest would functionally exclude mature stands from treatment that are least in need of harvest.

Alternatively, and perhaps simplest of all, projects could be screened with a single criterion—whether the treatment has a noncommercial purpose that cannot be met by another prescription or in another location with less harm to mature forest characteristics. If not, then the treatment would be allowed. Under this approach (our preference at this early stage), harvest of

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[189] *See*, *e.g.*, North Carolina Natural Heritage Program, Conservation Planning Tool: Biodiversity / Wildlife Habitat Assessment, available at https://www.ncnhp.org/documents/biodiversity-and-wildlife-habitat-assessment/open.

mature forest would be allowed where needed to meet a wide variety of local needs, but not merely to ensure commercial viability. This would be an explicit effort to decouple commercial and ecological considerations in deciding where and how to act, which is critical to ensuring that local projects are in fact coordinated to contribute to restoration and MOG conservation goals.

4. Development of Local Strategies:

The policy recommendations discussed above create bounded discretion. They give line officers a goal to aim for and broad sideboards, but they leave considerable room for local priority setting. Currently, however, the Forest Service lacks the tools necessary to use that flexibility effectively. A long-running emphasis on commercial factors has produced a simplistic and incomplete set of silvicultural prescriptions,[190] and data-gathering by prescription foresters is geared to support the selection of that limited set of tools. Silvicultural prescriptions are biased toward regeneration harvest and associated preparatory and follow-up treatments.

The Forest Service should direct Regional or subregional development of strategies for climate-smart forestry, including climate-smart prescriptions that are intended to meet other ecological and social objectives while retaining carbon stored in MOG forests to the greatest extent possible. The goal would be to identify local needs and effective prescriptions, as well as guidance for identifying which stands are appropriate for which treatments. These should include prescriptions for proforestation and intermediate treatments that maximize retention of old and mature trees. Rather than pushing foresters toward a heavier treatment (like regeneration harvest) whenever compatible with a silvicultural objective, these prescriptions would answer the question of how to meet the objective with a lighter hand.

New prescriptions would be invaluable to foresters who are considering whether alternative prescriptions could accomplish ecological goals with less harm to the mature/old characteristics of the stand. We suggest that the prescriptions be developed as a "toolkit" that could be used to inform revised directives (FSM 2470 or regional issuances under FSH 2409.17). New prescriptions could also inform the development of new KPIs, such as an acreage target for proforestation that could be annually adjusted (along with other KPIs) in an adaptive management strategy to stay within the expected programmatic effects of MOG conservation and carbon storage.

Local strategies could also be developed and implemented directly through mid-scale, programmatic projects. Similar to CFLRP projects, units could identify priority treatments for local ecological needs that also retain mature and old growth characteristics to the greatest extent possible.

As noted in the preceding section, we believe that an interim policy should address both old-growth and mature forests. However, if the interim policy does not address mature forest conservation, the need to address mature forests through local strategies will be even more urgent.

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[190] Silvicultural prescriptions are biased toward regeneration harvest and associated preparatory/follow-up treatments. *See* FSH 2409.17.

Development of local strategies should be a transparent, collaborative process involving stakeholders and local experts. Here, too, the agency should include direction to solicit and incorporate IK. Native nations have "centuries if not millennia" of experience[191] interacting with and managing forests, and they may offer strategies and insight missed by other stakeholders. Inclusion of Native expertise is important not only for the knowledge it adds to the work, moreover, but also for the due respect it shows to those with a unique connection to the land.

5. Stand Up and Fund a New Program with Oversight of MOG Conservation.

Finally, if this effort is going to be successful, it will require a shift in multiple agency practices. It's not as simple as making a rule and walking away. If the Forest Service is a slow-turning ship, then MOG conservation will require a steady hand on the rudder. The agency should therefore stand up a new program (and request adequate funding in the budget) that would have responsibility for MOG conservation and restoration. Program staff would assist in the development of regional strategies, provide support in implementation of interim policy direction at the project level, develop a proposed rule and supporting documentation, revise the applicable Directives, and propose new KPIs. The program would also oversee monitoring and adaptive management for MOG conservation.

The program should invite multi-party, collaborative monitoring to ensure that monitoring gets done and to keep stakeholders on the same page about MOG outcomes. We recommend an additional, government-to-government role for Native nations in oversight of MOG conservation efforts. Just as Native nations should be consulted in developing reference conditions and indicators, they should also be involved in monitoring and interpretation of the information it produces.

VII. Conclusion

Thank you again for your efforts to involve the public in this important decision. We look forward to working with you throughout the process, and we urge you to move forward quickly. Please contact us if we can provide any further information or clarification.

Sincerely,

[191] Raychelle Aluaq Daniel et. al, *What is "Indigenous Knowledge" and Why Does it Matter? Integrating Ancestral Wisdom and Approaches into Federal Decision-Making* THE WHITE HOUSE (Dec. 2, 2022), https://www.whitehouse.gov/ostp/news-updates/2022/12/02/what-is-indigenous-knowledge-and-why-does-it-matter-integrating-ancestral-wisdom-and-approaches-into-federal-decision-making/.