September 21, 2023

Dear Massachusetts Executive Office of Energy and Environmental Affairs:

Standing Trees, RESTORE: The North Woods, and Save Massachusetts Forests submit the following comments to inform the development of Climate-Oriented Forest Management Guidelines.Standing Trees is an incorporated nonprofit with members and supporters across Massachusetts and New England, dedicated to advancing policy and legal solutions that protect and restore New England’s native forests. Standing Trees seeks to hold state and federal agencies accountable for their actions that affect public lands, and to ensure that land-managers and policymakers follow the latest climate and biodiversity science. Thank you for providing this comment opportunity.

The Massachusetts Executive Office of Energy and Environmental Affairs requested responses to the questions below, and we have addressed each one in the following pages.

* What role should humans play in optimizing carbon storage and sequestration in forests?

To advance other objectives such as clean water, habitat for rare species, or wood products?

* What is your definition or concept of forest reserves? What, if any, is the role of human intervention in maintaining reserve conditions?
* According to the [Massachusetts Climate Change Assessment (2022)](https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-ii-statewide-report/download#page=108) *degraded forest health is expected due to warming temperatures, changing precipitation, increasing pest occurrence, and more frequent and intense storms*. What types of forest vulnerability do you think require effort to preserve, protect, fortify and/or enhance our state forest lands? What management practices or approaches do you suggest to make the forests of Massachusetts more resilient to the conditions projected by the Climate Change Assessment?

**QUESTION 1: What role should humans play in optimizing carbon storage and sequestration in forests? To advance other objectives such as clean water, habitat for rare species, or wood products?**

Massachusetts should lead by example and put its public forests off limits to timber harvest. The extent of the “role” that humans should play is to facilitate the natural recovery of old-growth ecosystems through management that emphasizes the continuity and dominance of natural processes. Creating, expanding, and strengthening ecological reserves on Massachusetts state lands should be viewed as a major opportunity for the Healey administration to lead by example at the regional, national, and global levels.

Recent scientific advances conclusively demonstrate that the restoration and protection of large, intact, interconnected, structurally complex, old-forest ecosystems are essential strategies in the fight against climate change and extinction.[[1]](#footnote-1) One of the most important ways to protect and restore mature and old forest ecosystems at scales large enough to provide essential habitat, support natural disturbance regimes, and produce high quantities of essential ecosystem services including carbon storage, flood and drought mitigation, and water quality enhancement, is to permanently protect public lands from logging and associated impacts.

During the summer of 2023, countless New Englanders experienced climate chaos first hand as record rains flooded many parts of the region. Earlier in the year, researchers at Dartmouth and the University of Vermont published a paper predicting that extreme precipitation in the Northeast US will increase more than 50% by 2100 due to climate change.[[2]](#footnote-2) This research is in keeping with the conclusions of many other scientists in New England: increasing precipitation and resultant flooding are likely to be the costliest impacts of climate change in the region.

Given the direct connection between forest age, water absorption, and flood mitigation, the State of Massachusetts has the unique ability, opportunity, and obligation to be a leader in helping to overcome the flooding that is expected to increase with climate change by expanding and strengthening reserves on public lands. Even better, the same management practices that improve flood mitigation – namely, allowing forests to grow old and removing and recontouring roads – have enormous co-benefits for carbon sequestration and storage, biodiversity, water quality, recreation, and more. The protection and restoration of intact forests is a rapidly deployable, low-cost, and scientifically-proven strategy to simultaneously meet climate mitigation, adaptation, and resilience goals.

**Today’s forests in context**

Despite the clear scientific evidence for increased amounts of old, wild forest, only 3% of New England, ***and just 1% of Massachusetts***, is managed to permanently protect or restore old forest conditions, with a primary emphasis on supporting native biodiversity, natural processes, and climate stabilization.[[3]](#footnote-3) For comparison, more than 10% of New York’s forests are managed to become old forests, a decision that was made 125 years ago by the New York state legislature and affirmed by the state’s citizens.[[4]](#footnote-4) On the other hand, approximately 26% of New England is conserved as woodlands (managed forests for timber and other uses) or for agricultural applications. This large discrepancy in the *type* of conservation practiced in New England shows a long running bias that DCR has an opportunity to correct.

Massachusetts is hardly the only state in the Northeast considering whether to update its goals for forest management. The Vermont legislature recently passed H126, which sets a goal for a minimum of 10% of the state to be managed in ecological reserves that will recover old forests, pursuant to the Vermont Conservation Design report.

Massachusetts was historically 90% forested, and it remained that way for millennia prior to European arrival. [[5]](#footnote-5) Although New England’s indigenous communities developed a sophisticated culture and cleared and managed some of the New England landscape with fire, recent science demonstrates that their impacts were highly concentrated, with the majority of historic New England forests primarily impacted by forces such as wind, ice, and beavers.[[6]](#footnote-6) Much of Massachusetts’ landscape evolved with relatively little human influence over thousands of years since the last glaciation.

We can measure our progress towards forest ecosystem restoration against several large landscape conservation visions that have gained traction in the past fifteen years. In 2006, Wildlands and Woodlands, a program of Harvard Forest and Highstead Foundation, produced a widely supported vision for New England that included a goal for 10% of all regional forestlands to be conserved as wildlands. Fifteen years later, only 3% of New England is in wildlands, and relatively little progress has been made toward the 10% goal, despite excellent progress towards conserving forests for extraction of wood products.

In 2018, Vermont Conservation Design, a project of the Vermont Departments of Fish and Wildlife and Forests, Parks and Recreation set a target of at least 9% of Vermont forests (and 15% of Vermont’s matrix forests) to be managed as or to become old forests. Vermont Conservation Design suggests an ideal scale for old forest conservation of 4,000-acre blocks or greater.[[7]](#footnote-7) Massachusetts should pursue a similar goal, with public lands serving as the primary tool to recover old-growth ecosystems at a large scale.

**Intact forests are our greatest assets in the fight against climate change and extinction**

Based on the rapid decline of wildlife populations[[8]](#footnote-8) and the rapid degradation of the climate,[[9]](#footnote-9) scientists have suggested that much more aggressive measures must be taken to stave off climate and extinction catastrophe. The 2019 Global Deal for Nature (the inspiration for “30x30”) calls for 30% of lands and waters to be permanently protected by 2030 to maintain and restore biodiversity, with an additional 20% percent conserved to stabilize the climate.[[10]](#footnote-10) This vision was partially endorsed by the Biden Administration in Executive Order 14008, “Tackling the Climate Crisis at Home and Abroad,” and federal agencies are now determining how they will meet this challenge. The late Harvard professor E.O. Wilson’s HalfEarth vision calls for 50% of the earth’s terrestrial and aquatic ecosystems to be put in protected areas, and this vision has been endorsed by recent scientific papers.[[11]](#footnote-11)

Old forests have value for habitat and production of ecosystem services at all scales, but to restore highly functioning and resilient native ecosystems, it’s important to note the importance of restoring old forest conditions in large, connected blocks. Large blocks of relatively unfragmented forests are rare in Massachusetts, and it’s even rarer to find large blocks where consistent management is facilitated by single ownership. Therefore, public lands present the most logical areas to make the long-term commitment that is necessary to restore Massachusetts’ native, old forests.

**The importance of recovering old-growth forests on public lands**

The USDA Forest Service Climate Adaptation Plan recognizes that “[m]any forests with old-growth characteristics have a combination of higher carbon density and biodiversity that contributes to both carbon storage and climate resilience. They are often viewed as ideal candidates for increased conservation efforts, and are frequently found within areas designated as wilderness or roadless or other management areas where timber harvest is precluded” (emphasis added).[[12]](#footnote-12)

Private forests in New England have, on average, 30% lower aboveground carbon,[[13]](#footnote-13) and lower structural complexity than public lands.[[14]](#footnote-14) The vast majority of public and private forests are unprotected from logging.[[15]](#footnote-15) This means that the unique values of intact mature and old-growth forests, including water quality enhancement, biodiversity, and carbon storage, are vulnerable to future management decisions. Old-growth represents a tiny fraction of forests in each region of the United States outside of Alaska, demonstrating the need for policies that put a greater percentage of forests on a path to recover late successional forests. Old-growth amounts to just .4% of forests in the Northeast US as a whole, and less than 1/10 of 1% in Massachusetts.[[16]](#footnote-16) Today, just .03% of trees in the New England states are over 150 years of age.[[17]](#footnote-17)

Logging is the single greatest influence on the amount and extent of mature forests across the US, and is easily the most preventable and avoidable threat to mature forests. Timber harvest drives 86% of annual forest carbon losses in Massachusetts and the Northeast US. A study led by Harvard researchers found that “[i]t is land use, not climate change, that has the greatest influence on carbon dynamics in New England over the next 50 years. Despite not being a significant part of the region’s economy, timber harvesting is projected to have a greater impact on carbon stocks and species composition than forest loss to development.”[[18]](#footnote-18)

**Protect forests from logging for climate mitigation, climate resilience, and biodiversity**

Old forests store much more carbon than logged forests, and they continue to sequester carbon over time.[[19]](#footnote-19),[[20]](#footnote-20),[[21]](#footnote-21) What’s more, the rate of carbon sequestration also increases with tree age[[22]](#footnote-22) and with stand age.[[23]](#footnote-23) There is significant capacity for secondary forests to accumulate vast amounts of carbon in the centuries ahead if we allow them to grow to their full ecological potential, a practice now widely referred to as *proforestation*.[[24]](#footnote-24),[[25]](#footnote-25) Forests in temperate zones such as in the Eastern U.S. have a particularly high untapped capacity for carbon storage and sequestration because of high growth and low decay rates, along with exceptionally long periods between stand replacing disturbance events, similar to the moist coastal forests of the Pacific Northwest. Further, because of recent recovery from an extensive history of timber harvesting and land conversion for agriculture in the 18th, 19th, and early 20th centuries, median forest age is about 75 years,[[26]](#footnote-26) which is only about 25–35% of the lifespan of many of the common tree species in these forests. Several global studies have highlighted the unique potential of eastern US temperate deciduous forests to contribute on the global stage to climate stabilization and resilience.[[27]](#footnote-27),[[28]](#footnote-28)

Northeast US secondary forests have the potential to increase carbon storage two to four-fold according to a 2011 paper:

*“…[T]here is a significant potential to increase total carbon storage in the Northeast’s northern hardwood-conifer forests. Young to mature secondary forests in the northeastern United States today have aboveground biomass (live and dead) levels of 107 Mg/ha on average (Turner et al. 1995, Birdsey and Lewis 2003). Thus, assuming a maximum potential aboveground biomass range for old-growth of approximately 250–450 Mg/ha, a range consistent with upper thresholds in our data set and the lower threshold observed at Hubbard Brook,* ***our results suggest a potential to increase in situ forest carbon storage by a factor of 2.3–4.2****, depending on site-specific variability. This would sequester an additional 72–172 Mg/ha of carbon [emphasis added].”[[29]](#footnote-29)*

A 2023 study led by Richard Birdsey at the Woodwell Climate Research Center found that “middle-aged Eastern U.S. forests could continue to accumulate carbon for many decades or several centuries in the absence of harvesting, with relatively low risk of natural disturbances… [O]ur results indicate a potential increase of about 100% over current biomass stocks by 2100.”[[30]](#footnote-30)

In addition to their carbon benefits, old forests are also the most resilient to changes in the climate, produce the highest outputs of ecosystem services like clean water, and are superior at reducing the impacts of droughts and floods. These services protect downstream communities, purify drinking water at low cost, and maintain base flows and low temperatures in rivers during hot summers for the benefit of fish and wildlife.

In areas of the US where precipitation is on the rise due to climate change, frequent flooding and phosphorus-driven water quality degradation are among the costliest environmental crises. Mature and old forests naturally mitigate against flooding and drought by slowing, sinking, and storing water that would otherwise rapidly flow into our streams, rivers, and lakes.[[31]](#footnote-31) Scientists have also shown that old forests are exceptional at removing phosphorus, a nutrient that causes eutrophication and harmful algal blooms that threaten aquatic and human health.[[32]](#footnote-32)

Protecting headwaters, many of which are located in public lands, has been identified by state governments as one of the top priorities to mitigate the effects of natural disasters and climate change.[[33]](#footnote-33) After Tropical Storm Irene ravaged the Northeast US in 2011, the Vermont Department of Forests, Parks, and Recreation commissioned a report entitled “Enhancing Flood Resiliency of Vermont State Lands.” According to the report:

*“There may be a tendency to assume that lands in forest cover are resilient to the effects of flooding simply by virtue of their forested status. However, forest cover does not necessarily equate to forest health and forest flood resilience. Headwater forests of Vermont include a legacy of human modifications that have left certain land areas with a heightened propensity to generate runoff, accelerate soil erosion, and sediment streams. These legacy impacts affect forest lands across the state... The quality of [today’s] forests is not the same as the pre-Settlement old growth forests. The legacy of early landscape development and a history of channel and floodplain modifications continue to impact water and sediment routing from the land.”[[34]](#footnote-34)*

A recent peer-reviewed study of forests in the Northeastern US and upper Midwest found that:

*“[Older forests] simultaneously support high levels of carbon storage, timber growth, and species richness. Older forests also exhibit low climate sensitivity…compared to younger forests… Strategies aimed at enhancing the representation of older forest conditions at landscape scales will help sustain [ecosystem services and biodiversity] in a changing world… Although our analysis suggests that old forests exhibit the highest combined [ecosystem services and biodiversity (ESB)] performance, less than 0.2% of the investigated sites are currently occupied by forests older than 200 years.* ***This suggests a large potential to improve joint ESB outcomes in temperate and boreal forests of eastern North America by enhancing the representation of late‐successional and older forest stand structures****…[emphasis added]”[[35]](#footnote-35)*

Areas protected from extraction preserve and restore the greatest levels of biodiversity across the globe.[[36]](#footnote-36),[[37]](#footnote-37),[[38]](#footnote-38),[[39]](#footnote-39) Large blocks of intact forest minimize harmful vectors for the spread of invasive species, and allow natural disturbances to play out across a sufficiently large landscape to ensure that there is a mix of early and late successional habitats required by the full spectrum of forest-dependent species.

Decision-makers and the public should understand that Massachusetts’ old-growth forests are *natural forests* composed of trees of all age classes, standing dead and downed wood, and canopy gaps from natural disturbances including wind, ice, fire, and beavers. Much of Massachusetts’ community of life evolved over millennia within these remarkable original forests alongside the region’s indigenous cultures. In just the blink of an eye, a combination of overhunting and habitat loss following European settlement led to the disappearance of wide-ranging carnivores and other species. Many of the nation’s most imperiled bird and bat species, including the federally endangered Northern Long-eared Bat, are adapted to interior forests and rely upon complex forest structure for their survival, including standing snags and large living trees.[[40]](#footnote-40) Indeed, the availability of dead, dying, and downed wood (increasingly removed from forests for biofuels, mass timber, or other uses of so-called “low-grade wood”) is critical for the health of many species.[[41]](#footnote-41)

Significant national attention has focused on the value of protecting existing old growth forests. While such protections are overdue and critically important, we cannot meet climate goals by focusing on old growth stands alone, since they comprise a tiny fraction of North America’s forests after centuries of logging and conversion following European settlement. Fortunately, restoring old growth forests is a low cost, scientifically proven, rapidly deployable strategy that can be applied at scale. Especially in forest types with a low-frequency of high-intensity disturbances, including most of Massachusetts, all that’s typically required to restore old forest conditions is time.[[42]](#footnote-42)

**Debunking carbon myths about timber harvest, tree planting, and biomass**

In May 2020, a group of 200 climate scientists submitted a letter to US Congressional leadership to disprove claims that new varieties of forest products and biofuels are carbon neutral or effective at storing carbon:

*“We find no scientific evidence to support increased logging to store more carbon in wood products, such as dimensional lumber or cross-laminated timber (CLT) for tall buildings, as a natural climate solution… Furthermore, the scientific evidence does not support the burning of wood in place of fossil fuels as a climate solution. Current science finds that burning trees for energy produces even more CO2 than burning coal, for equal electricity produced, and the considerable accumulated carbon debt from the delay in growing a replacement forest is not made up by planting trees or wood substitution… We need to increase growing forests to more rapidly close the gap between emissions and removal of CO2 by forests, while we simultaneously lower emissions from our energy, industrial and agricultural sectors.”[[43]](#footnote-43),[[44]](#footnote-44)*

Due to misrepresentation in reporting, the carbon impacts of timber harvest are vastly underappreciated by decision-makers and the general public. Timber harvest, wood product manufacturing, and even biomass burning are often considered carbon neutral because of an erroneous built-in assumption that forests will regrow at some point in the future, capturing the atmospheric carbon that was emitted previously.

The truth is much more complicated, and much less favorable to the climate. Assumptions of carbon neutrality fail to account for the fact that it would likely take decades or centuries to reach carbon parity, when we only have a short period of time to reduce overall emissions. Furthermore, these assumptions ignore the forgone carbon sequestration that would have occurred had the forest remained intact.[[45]](#footnote-45) In most cases, 30% to 50% of stored forest carbon is lost immediately at the time of timber harvest in manufacturing and initial use.[[46]](#footnote-46) Eighty-six percent of carbon lost from Northeast US forests, annually, stems from logging, and just 3% from conversion of forests to other land uses.[[47]](#footnote-47) Recent studies estimate that logging-related emissions in the US are now larger than those of the commercial and residential sectors, combined.[[48]](#footnote-48) A recent paper found that the “substitution benefits of using wood versus more fossil fuel-intensive materials have been overestimated by at least an order of magnitude.”[[49]](#footnote-49)

Meanwhile, widely circulated reports on New England forest carbon flux, including one recently released by Clark University and The Nature Conservancy, fail to measure carbon lost from logging, instead taking a myopic view that only accounts for carbon lost when forest is converted to parking lots, homes, or other development.[[50]](#footnote-50) Such narrow assessments of forest management impacts are biased towards maintaining the status quo of timber harvest in New England, despite the fact that logging is the greatest driver of carbon loss in the region.[[51]](#footnote-51)

Massachusetts does not need to use state lands to replicate or compete with the wood products produced by states like Maine or provinces like Quebec. Private lands provide the vast majority of wood products in New England, which allows us to manage state lands to maximize values that are rare or absent in private forests. Just .3% of the total wood harvested from New England comes from Massachusetts state lands, according to 2022 numbers from the USDA.[[52]](#footnote-52)

Another myth worth busting is that of tree planting as a climate solution. Planting makes sense along highly eroded rivers, streams, and lakeshores, where buffers of plantings are critical for reducing erosion and nutrient runoff, especially in agricultural areas. Our cities and towns also benefit immensely from tree plantings, particularly in disadvantaged communities where shade and green space are often harder to come by. However, planting is commonly sold as a climate solution, when in fact its effectiveness as a carbon storage or biodiversity strategy is questionable at best. Tree planting at scale sounds great, but it functions better as a public relations ploy than in practice. Planted trees have a high mortality rate, they require land that may be better used for other purposes, and they often become monocrop plantations that are biological deserts.[[53]](#footnote-53) Numerous recent studies confirm that it’s far superior to prioritize the protection of existing forests over tree planting as a climate or biodiversity solution.[[54]](#footnote-54), [[55]](#footnote-55)

Harvesting and burning biomass for electricity is another misguided use of forests, releasing 1.5 times more carbon than coal for an equivalent amount of energy.[[56]](#footnote-56) At a time when we need to be shifting to low carbon energy, burning biomass results in *more* emissions of greenhouse gases, accelerating climate change.[[57]](#footnote-57) After harvesting and burning, it takes decades or centuries for forest carbon levels to be restored,[[58]](#footnote-58) and this is based on a shaky assumption that a forest is able to regrow and regain its former age and structural complexity, an assumption that something that is not supported with monitoring or enforcement. The reported carbon impacts of biomass electricity also often fail to measure the forgone carbon sequestration that would have taken place had the forest remained intact.

Aside from the climate impacts, the human health issues of biomass burning are significant. The American Lung Association has issued a formal policy of opposition to biomass energy, writing:

*“[We do] not support biomass combustion for electricity production, a category that includes wood, wood products, agricultural residues or forest wastes, and potentially highly toxic feedstocks, such as construction and demolition waste. Burning biomass can emit recognized air pollutants, including particulate matter and other carcinogens, which cause premature death and endanger respiratory health.”[[59]](#footnote-59)*

A 2017 study conducted in New England on the climate impacts of pellet stoves concluded that their benefits are tied to the amount of sawmill residues used in their manufacturing, and whether or not the overall amount of timber harvest increases due to their use:

*“An industry-average pellet feedstock mix (50% sawmill residues, 50% pulpwood) appeared to generate heat that was at least at parity with fossil-fuel heating alternatives when harvest levels remain unchanged due to pellet production. If harvest levels increase due to pellet production, using pellet heat increased GHG emissions. If baseline harvest levels drop (e.g., following the loss of low-grade markets), GHG emissions from pellet heat would at least remain stable relative to fossil alternatives.”*[[60]](#footnote-60)

It's hard to imagine a scenario where overall harvests would not go up with increased reliance on biomass electricity or pellet stoves. A recent letter from climate scientists to world leaders suggests that if the global community sourced “just an additional 2% of…energy from wood, it would need to double its commercial wood harvests.”[[61]](#footnote-61) In Europe, biomass electricity power plants constructed in the last decade have led to a 49% increase in harvested area and a 69% decline in forest biomass for the period of 2016–2018 relative to 2011–2015.[[62]](#footnote-62)

**QUESTION 2: What is your definition or concept of forest reserves? What, if any, is the role of human intervention in maintaining reserve conditions?**

Forest reserves, by definition, are areas that are protected from logging. The Collins Dictionary defines forest reserves as “an area of forest set aside and preserved by the government as a wilderness, national park, or the like.”[[63]](#footnote-63) The Massachusetts Executive Office of Environmental Affairs previously defined forest reserves as “portions of state lands where commercial harvesting of wood products is excluded…”[[64]](#footnote-64) We see no reason to change these definitions – doing so would only confuse and complicate management, and make it more difficult for Massachusetts to compare its own management practices with that of other jurisdictions.

**QUESTION 3: According to the Massachusetts Climate Change Assessment (2022) *degraded forest health is expected due to warming temperatures, changing precipitation, increasing pest occurrence, and more frequent and intense storms*. What types of forest vulnerability do you think require effort to preserve, protect, fortify and/or enhance our state forest lands? What management practices or approaches do you suggest to make the forests of Massachusetts more resilient to the conditions projected by the Climate Change Assessment?**

We strongly question and disagree with the Massachusetts Climate Change Assessment’s finding that “degraded forest health is expected due to warming temperatures, changing precipitation, increasing pest occurrence, and more frequent and intense storms.” This statement conveys a fundamental misunderstanding of forest ecology. As stated previously in this comment letter, forest health increases as forests age, and tree mortality is essential to healthy forest composition, function, and processes. Tree mortality is only a problem from the perspective of someone who wants to harvest trees for wood products. The Climate Change Assessment’s finding seems to have been written by someone looking through the lens of timber harvesting. If “Climate-Oriented Forest Management” is the goal, however, then this finding is fundamentally biased and flawed. Recent studies have found that Massachusetts forests are at relatively low risk for negative impacts from climate change.[[65]](#footnote-65) In order to facilitate forest resilience, adaptation, and evolution in the face of a changing climate, managers should seek to maintain large, intact blocks where logging is prohibited.

It is logging – not wind, water, insects, fire, or disease – that poses a far greater threat to forest health from ecological, climate mitigation and resilience, and public health perspectives.

**Conclusion**

Permanently protecting public forests to improve carbon storage, increase climate resilience, and support biodiversity is a low cost, rapidly scalable, and proven technology that DCR has the power to implement today. More than a century since New York amended its state constitution to protect the Adirondack and Catskill Forest Preserves as “forever wild,” few if any would question the foresight of the elected officials who put that bold vision in motion. Today, 10% of the Empire State’s forests are managed as wild forests. It’s long past time for the Bay State to keep pace with its western neighbor.

Wild forests are only more valuable in today’s rapidly-changing world than they were a century ago, and the science supporting their protection and restoration has improved exponentially. If we fail to take bold action today, future generations will justifiably wonder why we were so timid in the face of the climate and extinction crises.

To prevent additional climate and biodiversity catastrophe, the state of Massachusetts should immediately expand and strengthen protections for state public lands through rulemaking and other means.

Sincerely,

/s/

Zack Porter

Executive Director

Standing Trees

Montpelier, Vermont

/s/

Michael Kellett

Executive Director

RESTORE: The North Woods

Concord, Massachusetts

/s/

Janet Sinclair

Save Massachusetts Forests Concerned Citizens of Franklin County

Greenfield, Massachusetts

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