Protecting and restoring forests on New England's public lands
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April 13, 2022

To: Senate Committee on Natural Resources and Energy
Re: Please support H606 with amendments

> *"We are between two forested worlds–the natural forest of pre-settlement North America and the recovered forest of the future… The earlier forested world is not dead. We are studying and struggling to preserve its living remnants. And we do not believe that the future forest is powerless to be born. These remnants–with our help–will become the seeds from which a renewed forest spreads."*
>
> - Mary Byrd Davis

Dear Chairman Bray and Honorable Members of the Committee:

Founded in Vermont in 2020, Standing Trees is a nonprofit organization dedicated to protecting and restoring New England's native ecosystems. We write to endorse H606, with recommended changes, as a critical measure to help Vermont meet its climate, resilience, and biodiversity goals. Indeed, the latest climate and biodiversity science suggests that the measures in H606 *are the bare minimum* of what's necessary to rise up to the challenges of our moment in history.

Standing Trees respectfully requests that you vote to amend and approve H606.

<u>Recommended Changes to H606</u>

1. Please re-insert the following red italicized text from the version that was first introduced in the House:

   §2802. CONSERVATION GOALS (b) Reaching 30 percent by 2030 and 5p0 percent by 2050 shall include a mix of ecological reserve areas, biodiversity reserve areas biodiversity conservation areas, and natural resource management areas. In order to support an ecologically functional landscape with sustainable production of natural resources and recreational opportunities, the approximate percentages of each type of conservation category shall be guided by the conservation targets within Vermont Conservation Design, including the use of ecological reserve areas to protect highest priority natural communities and maintain or restore old forests ***across at least nine percent of Vermont forestland.***

2. Conservation category definitions should include a clear association with its respective GAP status categories
   - Ecological reserve area = GAP 1

- Biodiversity conservation area = GAP 2
- Natural resource management area = GAP 3

Proposed amendments are in red italics:

§ 2801.DEFINITIONS

As used in this section:

(1) "Ecological reserve area," ***or GAP 1 according to the USGS Status Code Assignment,*** means an area having permanent protection from conversion of natural land cover and is managed to maintain a natural state within which natural ecological processes and disturbance events are allowed to proceed with minimal interference.

(2) "Biodiversity conservation area," ***or GAP 2 according to the USGS Status Code Assignment,*** means an area having permanent protection from conversion of natural land cover for the majority of the area and is managed for the primary goal of sustaining species or habitats. These areas may include regular, active interventions to address the needs of particular species or to maintain or restore habitats.

(3) "Natural resource management area," ***or GAP 3 according to the USGS Status Code Assignment,*** means an area having permanent protection from conversion of natural land cover for the majority of the area but that is subject to long-term sustainable forest management.

Vermont's forests are not on track to recovery. H606 can help correct this.

Vermont's intact forests are the state's greatest natural asset in the fight against climate change. And yet, a century and a half since Vermont was 80% deforested by European settlers, our forests are still in the early stages of recovery. Today, less than 1/10 of 1% of Vermont's landscape resembles the complex, interconnected, biodiverse forests that evolved over millennia alongside Vermont's sophisticated indigenous cultures.[1] Elk, caribou, wolverine, wolves, catamounts, and salmon, once common in Vermont, have either been entirely eliminated or have long since failed to naturally reproduce in our state. By any historical measure of ecosystem health, Vermont's ecosystems remain in the ICU.

Despite the clear scientific evidence for increased amounts of old, wild forest, only 3% of Vermont (and a similar amount across New England) is managed to permanently protect or restore old forest conditions, with a primary emphasis on supporting native biodiversity, natural processes, and climate stabilization.[2] (For comparison, more than 10% of New York's forests are managed to become old forests.[3]) On the other hand, approximately 26% of Vermont is conserved as woodlands (managed forests for timber and other uses) or for

[1] "Vermont Conservation Design – Natural Community and Habitat Technical Report" (Zaino et al 2018)

[2] "Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good" (Moomaw et al, 2019)

[3] "Getting to 30x30: Guidelines for Decision-makers" (Rosa and Malcom, 2020)

agricultural applications. This large discrepancy in the *type* of conservation practiced in Vermont can begin to be corrected with H606.

Vermont's Climate Action Plan, released in December, 2021, makes a recommendation to:

> *"Invest in strategic conservation in order to increase the pace of permanent conservation towards 30x30 targets (described in federal report* Conserving and Restoring America the Beautiful*), with Vermont Conservation Design acting as the guiding plan for prioritization of efforts."*

Additionally, the Vermont Climate Action Plan recommends:

- *"Statewide landscape connectivity and forest blocks conservation planning through robust support of the Staying Connective Initiative and use of Vermont Conservation Design and TNC's Resilient and Connected Landscape in state program prioritization frameworks."*
- *"Through permanent conservation coupled with both active and passive restoration efforts on both public and private lands, allow approximately 9% of Vermont's forest to become (or be maintained as) old forest, specifically targeting 15% of the matrix forest within the highest priority forest blocks identified in Vermont Conservation Design to achieve this condition."*
- *"Identify and protect climate refugia."*

Vermont was historically 90-95% forested, and it remained that way for millennia prior to European arrival.[4] Although the Abenaki people and other 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.[5] Much of Vermont's landscape evolved with relatively little human influence over thousands of years since the last glaciation.

Vermont's wild forests reached an abrupt end during the eighteenth and nineteenth centuries, when European-American settlers deforested much of the region. In a short span of time, Vermont went from over 90% forested to over 80% deforested.[6] Today, it's often reported that Vermont is 76% forested, a seemingly miraculous rebound.[7] But this claim is misleading at best. The "76%" figure says nothing of the age, structure, composition, logging frequency, or fragmentation of Vermont's present-day forest, which bears little resemblance to what was historically present. At present, the Green Mountain National Forest alone has approved upwards of 40,000 acres of logging in the decade ahead. Yet none of this forest degradation will count against the 76% statistic.

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[4] "Wildlands and Woodlands, Farmlands and Communities: Broadening the Vision for New England" (Foster et al 2017)

[5] "Conservation implications of limited Native American impacts in pre-contact New England" (Oswald et al, 2020)

[6] Foster et al 2017

[7] "Large Landscape Conservation in Vermont: Opportunities and barriers for putting the pieces together" (Loeb and D'Amato 2017)

We can measure Vermont's 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 (the percentages of conserved wildlands vs woodlands across New England is nearly identical to Vermont, as highlighted in the previous paragraph).[8]

In 2018, Vermont Conservation Design, a project of the 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.[9] Unfortunately, Vermont Conservation Design is a good idea that lacks a sufficient plan and timeline for implementation, as well as coordination between state and federal land managing agencies.

More recently, based on the rapid decline of wildlife populations[10] and the rapid degradation of the climate,[11] 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 in GAP 1 and 2[12] protected areas,[13] by 2030 to maintain and restore biodiversity, with an additional 20% percent conserved to stabilize the climate.[14] 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.

Protect and Restore Forests for Maximum Climate Mitigation, Adaptation, and Resilience

Forests are Vermont's greatest asset as we look to create a more resilient future, naturally sequestering an amount of carbon equivalent to half of the state's annual emissions, providing essential habitat for our native biodiversity, and reducing the impacts of droughts and floods.

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[8] See Loeb and D'Amato 2017

[9] See Zaino et al 2018

[10] "Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction" (Ceballos et al 2020)

[11] "Climate Change 2021: The Physical Science Basis" (Working Group I contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change)

[12] The US Geological Survey maintains the nation's protected area database and has created a "GAP Status Code Assignment" to categorize types of conservation across all land ownerships, public and private. These categories are an essential tool for standardizing and comparing conservation, and Vermont's conservation metrics should be designed to match the national model.

[13] "Getting to 30x30: Guidelines for Decision-makers" (Rosa and Malcom 2020)

[14] "A Global Deal for Nature: Guiding principles, milestones, and targets" (Dinerstein et al, 2019)

On the global scale, forest protection represents approximately *half or more* of the climate change mitigation needed to hold temperature rise to 1.5 degrees Celsius.[15] Vermont may be a small state, but its temperate deciduous forests are among the planet's most effective carbon sinks. Taking bold steps to increase forest protection and restoration will greatly impact Vermont's carbon emissions and will position Vermont to make significant contributions in the global fight against climate change.

The 2018 Vermont Conservation Design Natural Community and Habitat Technical Report, produced by the Departments of Forests, Parks and Recreation and Fish and Wildlife, puts it this way:

> *"As a result of the persistent structural and vegetative complexity above ground and the diverse biome belowground and associated complex biotic and abiotic relationships that develop over time, old forests also protect water quality, and sequester and store carbon, provide opportunities for adaptation of species and community relationships to climate and other environmental changes, and an ecological benchmark against which to measure active management of Vermont's forests.[16]*

Forest Carbon

There is a common misconception that young forests are better than old when it comes to removing carbon in the atmosphere. First of all, old forests store much more carbon than young forests, and they continue to sequester carbon over time.[17,18,19] What's more, the rate of carbon sequestration also increases as trees age.[20]

Today, despite tree cover across nearly 80% of the state, Vermont's forests do not produce high levels of ecosystem services due to current management practices, including harvest frequency and intensity, and are still recovering from extensive clearing in the eighteenth and nineteenth centuries. A 2019 paper by Harvard Forest researchers found that:

> *"Among land uses, **timber harvesting [has] a larger effect** on [aboveground carbon] storage and changes in tree composition than did forest conversion to non-forest uses [emphasis added]… Our results demonstrate a large difference between the landscape's potential to store carbon and the landscape's current trajectory [emphasis added]."*[21]

In Vermont, the state's trees sequester approximately 50% of the state's annual CO^2 emissions.[22] However, by substantially increasing the amount of forests protected from both

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[15] "Unexpectedly Large Impact of Forest Management and Grazing on Global Vegetation Biomass," (Erb et al 2018)
[16] See Zaino et al 2018
[17] "Re-evaluation of forest biomass carbon stocks and lessons from the world's most carbon-dense forests," (Keith et al 2009)
[18] "Old-growth forests as global carbon sinks," (Luyssaert et al 2008)
[19] "Older eastern white pine trees and stands sequester carbon for many decades and maximize cumulative carbon," (Masino et al 2021)
[20] "Rate of tree carbon accumulation increases continuously with tree size," (Stephenson et al 2014)
[21] "Social and biophysical determinants of future forest conditions in New England, Effects of a modern land-use regime" (Duveneck and Thompson, 2019)
[22] Vermont Agency of Natural Resources, Vermont Climate Action Commission (2018):

development *and* logging, Vermont can pull much larger large quantities of CO^2 out of the atmosphere.[23]

Northeast secondary forests have the potential to increase biological carbon sequestration 2.3–4.2-fold.[24] A 2011 paper by UVM Professor Bill Keeton found that:

> *"…there 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]."*[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] which is only about 25–35% of the lifespan of many of the common tree species in these forests.[27] Because of our remarkable forest ecosystems here in Northeastern North America, several global studies have highlighted the unique potential of our temperate deciduous forests to contribute on the global stage to climate stabilization and resilience.[28, 29]

Put simply: carbon sequestration in Vermont is only just getting started – the greatest gift we can give our forests is time.

Climate Resilience and Provisioning of Ecosystem Services

Old forests sequester and store the most carbon, so perhaps it should come as no surprise that they 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 from flooding, purify drinking water at

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[23] See Erb et al 2018

[24] "Late-Successional Biomass Development in Northern Hardwood-Conifer Forests of the Northeastern United States" (Keeton et al 2011).

[25] See Keeton et al 2011

[26] Forest Inventory and Analysis National Program, Forest Inventory EVALIDator web-application Version 1.8.0.00. U.S. Department of Agriculture, Forest Service, Northern Research Station, US Forest Service (2019)

[27] See Moomaw et al, 2019

[28] "A Global Safety Net to reverse biodiversity loss" (Dinerstein et al, 2020)

[29] "Areas of global importance for terrestrial biodiversity, carbon, and water" (Jung et al, 2020)

low cost, and maintain base flows and low temperatures in rivers during hot summers for the benefit of fish and wildlife.

In Vermont, frequent flooding and phosphorus-driven water quality degradation are two of our most costly environmental crises, and both are compounded by climate change. 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.[30] Scientists have also shown that old forests are exceptional at removing phosphorus, the nutrient driving the Lake Champlain water quality crisis.[31]

Protecting headwaters is identified by the state of Vermont as one of the top five priorities to mitigate the effects of natural disasters and climate change.[32] After Tropical Storm Irene ravaged Vermont in 2011, the 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 [emphasis added]."*[33]

A study by UVM researcher Dominik Thom 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 [emphasis added]."*
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> *"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]…"*[34]

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[30] "Enhancing Flood Resiliency of Vermont State Lands" (Underwood and Brynn, 2015)

[31] "Forest Stream Interactions in Eastern Old-Growth Forests" in *Ecology and Recovery of Eastern Old Growth Forests* (Warren et al 2018)

[32] "Vermont Stronger: Vermont Hazard Mitigation Plan" (Vermont Emergency Management, 2018)

[33] "Enhancing Flood Resiliency of Vermont State Lands" (Underwood and Brynn, 2015)

[34] "The climate sensitivity of carbon, timber, and species richness covaries with forest age in boreal–temperate North America" (Thom et al 2019)

Forest biodiversity

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 New England's forest-dependent species.

According to the 2018 Vermont Conservation Design Natural Community and Habitat Technical Report:

> *"The state's native flora and fauna that have been here prior to European settlement are adapted to this landscape of old, structurally complex forest punctuated by natural disturbance gaps and occasional natural openings such as wetlands or rock outcrops. The complex physical structure of old forests creates diverse habitats, many of which are absent or much less abundant in younger forests."*[35]

Decision-makers and the public should understand that what we call "old forests" are Vermont's *natural forests*. As such, much of Vermont's community of life evolved over millennia within these remarkable original forests. 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 such as Vermont's iconic catamount along with wolves and wolverines. Elk and caribou met a similar fate. Some species we might take for granted today, such as bear, moose, beaver, and loons, were on the brink of extirpation only a short while ago. Lynx, Northern Long-eared Bat, and pine marten currently teeter on the edge. Salmon, once prolific in Vermont rivers, have failed to naturally reproduce for many decades. Many of Vermont's imperiled bird species are adapted to interior forests and reliant upon complex forest structure for their survival, including standing snags and large living trees.[36] Indeed, the availability of dead and dying trees 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, from bats to pine marten to invertebrates.[37]

Our native ecosystems preserve – and present the opportunity to restore – the greatest levels of biodiversity. Although passive management is most often all that's required to restore old forest conditions,[38] it takes centuries to develop forest complexity, requiring permanent protection from timber harvest if restoration is to be successful. [39,40,41, 42]

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[35] See Zaino et al 2018

[36] "The Critical Importance of Large Expanses of Continuous Forest for Bird Conservation" (Askins 2015)

[37] "The living dead: acknowledging life after tree death to stop forest degradation" (Thorn et al 2020)

[38] See Zaino et al 2018

[39] "The exceptional value of intact forest ecosystems" (Watson et al 2018)

[40] "Wilderness areas halve the extinction risk of terrestrial biodiversity" (DiMarco et al 2019)

[41] "A Global Safety Net to reverse biodiversity loss" (Dinerstein et al 2020)

[42] "Eastern national parks protect greater tree species diversity than unprotected matrix forests" (Miller et al 2018)

Conclusion

Permanently protecting Vermont's forests to improve carbon storage, increase climate resilience, and support biodiversity is a low cost, rapidly scalable, and proven technology that lawmakers have 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 Vermont to keep pace with its western neighbor.

Old 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. H606 is a critical measure to help implement Vermont's Climate Action Plan and Vermont Conservation Design, among other long-range plans.

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.

Standing Trees appreciates your careful consideration of this testimony, and respectfully requests your support for H606.

Sincerely,

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