October 13th, 2020

Standing Trees Vermont:
Facts and figures for Background Materials

What are old forests and why are they important?

- The 2018 Vermont Conservation Design report by the Agency of Natural Resources describes old forests as:

Definition

> *Old forests are biologically mature forests, often having escaped stand-replacing disturbance for more than 100 years… [that exhibit] …complex stand structures that include a broad distribution of tree diameters, multiple vertical vegetative layers, natural canopy gaps, abundant coarse woody material (reflecting the diameters of the standing trees) in all stages of decay and numerous large standing dead trees. It is expected that old forests operate under natural disturbance regimes and may include small areas of regenerating forest as a result of these disturbances.*

Ecological Function

> *Historically, the vast majority of Vermont's landscape was old forest, and it is the original habitat condition for many species. 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.*
>
> *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.*[1]

The state of forest protection and management in Vermont:

- In Vermont, as in New England as a whole, only approximately 2% of the land area is permanently managed to become old forest, for the benefit of biodiversity, clean water, and carbon storage, with logging and other resource extraction prohibited

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

(Moomaw et al, 2019)[2]. This includes wilderness areas on the Green Mountain National Forest, state natural areas like the summits of Camels Hump and Mt. Mansfield, as well as private lands with a forever-wild conservation easement.

- Approximately 20% of Vermont's forestland is publicly owned. These public lands are split between federal (11%, primarily the US Forest Service but also the US Fish and Wildlife Service), state (8%, primarily the Depts of Forests, Parks and Recreation and Fish and Wildlife) and municipal (1%) management.[3] Vermont's public lands constitute the largest blocks of conserved forest in Vermont, and are held and managed in the public trust.
- Of the 80% of Vermont that is privately owned, only a small fraction is permanently protected from resource extraction and managed for biodiversity and ecosystem services with a forever-wild conservation easement.[4]
- A 2018 report by the State of Vermont's Agency of Natural Resources, "Vermont Conservation Design" (VCD), calls for 9% of Vermont's forests to be managed to become "old forest." The VCD report states that "Although there are small patches of old forest scattered around the state, old forest is absent in Vermont as a functional component of the landscape. In most forests, passive restoration will result in old forest conditions. In some cases, active forest management may be beneficial to promote forest composition and structure suitable for subsequent passive restoration"[5].

<u>Carbon storage and Vermont forests:</u>

- Forests and other natural sinks (like wetlands) currently sequester 50% of Vermont's annual carbon emissions.[6]
- Vermont's forests have the potential to sequester and store 2.3-4.2 times *more* carbon than they currently extract from the atmosphere if we change practices to emphasize passive management (i.e. no timber harvest) (Keeton et al, 2011)[7].
- In the US, timber harvest accounts for 85% of the carbon lost from forests each year. Forest conversion to other uses (residential development, agriculture, etc.) accounts for only 3% of carbon loss, nationally (Harris et al, 2016)[8].

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[2] Moomaw WR, Masino SA and Faison EK (2019) Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. Front. For. Glob. Change 2:27.doi: 10.3389/ffgc.2019.00027

[3] Loeb and D'Amato (2020). Large landscape conservation in a mixed ownership region: opportunities and barriers for putting the pieces together. Biological Conservation https://doi.org/10.1016/j.biocon.2020.108462

[4] Ibid

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

[6] Final Report, Vermont Forest Carbon Sequestration Working Group (Jan 2020)

[7] Keeton, W. S., Whitman, A. A., McGee, G. C., and Goodale, C. L. (2011). Late-successional biomass development in northern hardwood-conifer forests of the Northeastern United States. Forest Sci. 57, 489–505. doi: 10.1093/forestscience/57.6.489

[8] Harris, N. L., Hagen, S. C., Saatchi, S. S., Pearson, T. R. H.,Woodall, C.W., Domke, G.M., et al. (2016). Attribution of net carbon change by disturbance type across forest lands of the conterminous

- The largest one percent of trees account for 30% of all the aboveground living biomass in the US (Lutz et al, 2018)[9].
- In the Mid-Atlantic and Northeast US (Virginia to Maine), protected areas like Wilderness, National Parks, and similar designations that prohibit resource extraction (amounting to just 5% of the total land area), account for 30% of all forest carbon storage in the entire region.[10]

Biodiversity and old forests:

- In the Northeast US, forests of more than 170 years of age store the largest amount of carbon and exhibit the greatest species richness (Thom et al, 2019).[11]
- Large, intact, old forests of New England harbor a greater diversity of birds and other wildlife than nearby managed forests. Species such as pine marten, wood thrush, red-eyed vireo, ovenbird, cerulean warbler, and a variety of salamanders depend on large blocks of intact, unmanipulated forest for their survival (Askins, 2014)[12].
- Native trout species thrive in old forests that deposit large amounts of woody debris in streams and rivers, increasing habitat diversity and complexity (Keeton, 2018)[13].

Old forests and watershed health:

- Old forests naturally filter and absorb phosphates, reducing phosphorus loading downstream that cause water quality problems (as in Lake Champlain) (Keeton, 2018)[14].
- Old, wild forests store water that maintain baseflows in streams and rivers through drought periods (like the summer of 2020) and capture runoff and prevent erosion during extreme rainfall events that are predicted to become more common in Vermont with climate change (Zellmer, 2012)[15] (Wemple, 2007)[16].

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[9] Lutz, J. A., Furniss, T. J., Johnson, D. J., Davies, S. J., Allen, D., Alonso, A., et al. (2018). Global importance of large-diameter trees. Glob. Ecol. Biogeogr. 27,849–864. doi: 10.1111/geb.12747

[10] Lu et al 2013. A Contemporary Carbon Balance for the Northeast Region of the United States. dx.doi.org/10.1021/es403097z | Environ. Sci. Technol. 2013, 47, 13230−13238

[11] Thom et al. 2019. The climate sensitivity of carbon, timber, and species richness covaries with forest age. Global Change Biology 25:2446–2458.

[12] Askins, R. A. (2014). Saving the World's Deciduous Forests: Ecological Perspectives From East Asia, North America, and Europe. New Haven, CT: Yale University Press.

[13] William Keeton, "Forest-Stream Interactions in Eastern Old-Growth Forests," in *Ecology and Recovery of Eastern Old Growth Forests (2018)*

[14] Ibid

[15] Sandra Zellmer, *Wilderness, Water, and Climate Change* (2012)

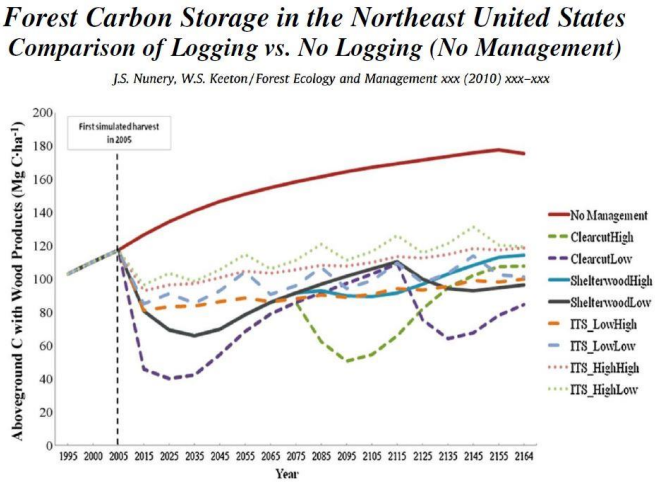
[16] Beverly Wemple et al, *Hydrology and Water Quality in Two Mountain Basins of the Northeastern US: Assessing Baseline Conditions and Effects of Ski Area Development* (2007)

Logging proposals threaten Vermont's most intact forests:

- The Green Mountain National Forest is home to the largest roadless areas in Vermont and harbors one third of all of the highest priority conservation target acreage in the 2018 Vermont Conservation Design report.
- The forests of central and southern Vermont, particularly those within the Green Mountain National Forest, store more carbon than most other forests in New England given their relatively long history of recovery since clearing occurred. Significant harvesting has not occurred in many locations in 75-150 years, making these forests among the most mature in the region, and well on their way to achieving old forest characteristics.
- In the last several years, in a dramatic change from recent management, the Green Mountain National Forest has approved (or nearly approved) 40,000-acres of logging with more in the works.[17] This is equivalent in area to four times the size of the City of Burlington and nearly the same physical footprint of Washington, DC (~43,000-acres). Dozens of miles of roads will be constructed or reconstructed to facilitate these projects, facilitating the spread of invasive species, creating connectivity barriers and edge habitat that harm interior forest species, and inviting illegal trespassers on motorized vehicles.
- Logging on the Green Mountain National Forest is proposed within eight different inventoried roadless areas, a Congressionally-designated National Recreation Area, and along the boundaries of Congressionally-designated wilderness areas, jeopardizing the values Congress sought to protect. Although similar roadless areas are protected elsewhere in the US, the Green Mountain National Forest (like the nearby White Mountain National Forest) is abusing a loophole in the 2001 Roadless Area Conservation Rule that does not extend protections to roadless areas identified more recently than 2001. Consequently, many of the Forest's most ecologically intact areas – some of the most intact, biodiverse, and carbon-dense forests in all of New England – will soon fall victim to logging.

[17] See the GMNF website for full descriptions of the South of Route 9, Early Successional, Robinson, and Somerset Integrated Resource Projects.

Figures:



- *Description and source*: see caption above

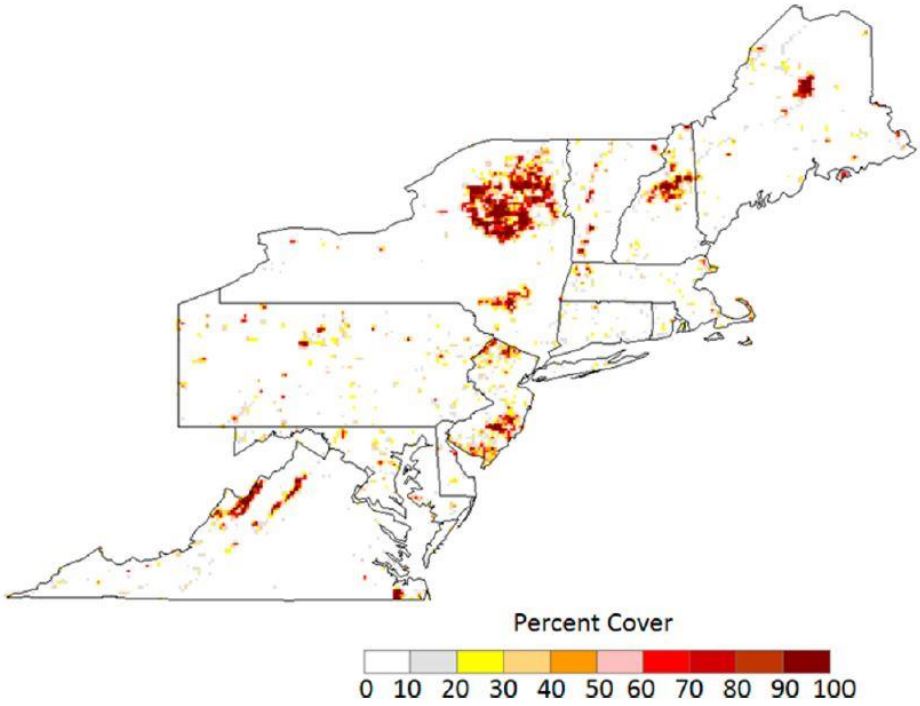
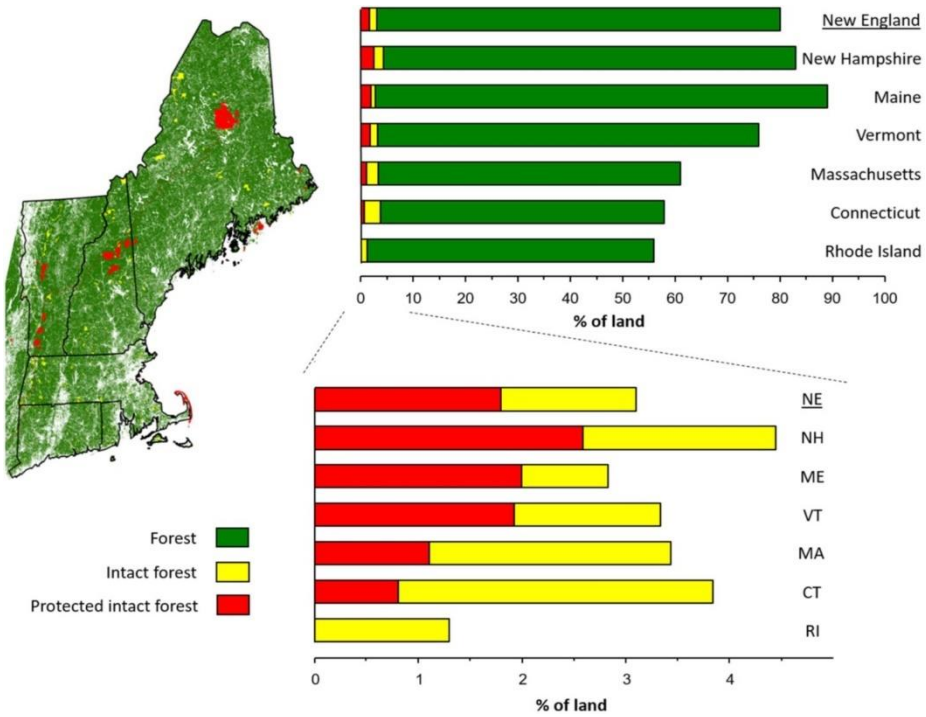


Figure 5. Distribution of protected areas[51] across the northeastern United States.

- *Description*: In the Mid-Atlantic and Northeast US (Virginia to Maine), protected areas like Wilderness, National Parks, and similar designations that prohibit resource extraction (amounting to just 5% of the total land area), account for 30% of all forest carbon storage in the entire region.
Source: Lu et al 2013. A Contemporary Carbon Balance for the Northeast Region of the United States. dx.doi.org/10.1021/es403097z | Environ. Sci. Technol. 2013, 47, 13230−13238

- *Description*: Map shows carbon storage density (darker green equals more carbon) with New England circled in red. New England is clearly among the most important regions in the US in terms of carbon storage.
  Source: NASA - https://earthobservatory.nasa.gov/features/ForestCarbon



- *Description*: In Vermont, as in New England as a whole, only approximately 2% of the land area is managed primarily for the benefit of biodiversity, clean water, and carbon storage, with logging and other resource extraction prohibited.
  Source: Moomaw WR, Masino SA and Faison EK (2019) Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. Front. For. Glob. Change 2:27.doi: 10.3389/ffgc.2019.00027