List of Links and References related to the **CounterAct Climate Change** program

**“Mitigate Climate Change by Protecting Forests”**

presented by Ralph S. Baker, Ph.D. on **Thursday, July 30, 2020**

**Recordings of a recent speaker series hosted by *Climate Action Now of Massachusetts* and *Save Massachusetts Forests*:**

1. [Protecting Massachusetts Forests: Part 1 - How Massachusetts Forests Help Save the Climate, Dr. William R. Moomaw](https://youtu.be/7HJrWMAuCeg)
2. [Protecting Massachusetts Forests: Part 2 - Our Massachusetts Forests: To Cut or Not to Cut, Michael Kellett and Dr. Bill Stubblefield, May 19, 2020](https://www.youtube.com/watch?v=ViXO7E1-oAg&t=1s)
3. [Protecting Massachusetts Forests: Part 3. Bioenergy and Forests, Dr. Mary S. Booth, June 9, 2020](https://www.youtube.com/watch?v=SuNFKicUfmc&t=4s)
4. [Protecting Massachusetts Forests: Part 4. Forests and Brain Health: Emerging Research, Dr. Susan A. Masino, June 16, 2020](https://www.youtube.com/watch?v=Qykaq_2Zvt0&t=1)

**Related Links**

1. [http://www.climateandlandusealliance.org/scientists-statement/](https://massforestrescue.us19.list-manage.com/track/click?u=ca351cbe4b6ecfd7950eb2fc0&id=806d38c2a0&e=a29d0df910). “**Five Reasons That the Earth’s Climate Depends on Forests: Statement from Scientist Signatories” (2019). *Climate and Land Use Alliance.***
2. <http://www.maforests.org/>. **Protect Massachusetts and New England Forests**. Photo essay revealing state sponsored forest destruction in Massachusetts, by Chris Matera, PE., Massachusetts Forest Watch.
3. [www.maforests.org/DFW.pdf](http://www.maforests.org/DFW.pdf).  Chris Matera, J. William Stubblefield and Barthold Bouricius,

“MASSACHUSETTS STATE PUBLIC FORESTS *A Status Update: State Sponsored Forest Destruction Continuing and Increasing and the Need for Genuine Protection*” (2020). *Massachusetts Forest Watch.*

1. <https://news.mongabay.com/2020/03/record-high-global-tree-cover-loss-driven-by-agriculture/>. Liz Kimbrough, “Record-high global tree cover loss driven by agriculture” (2020). *MONGABAY*.
2. <https://www.stand.earth/latest/forest-conservation/primary-forests/risky-business-canada-props-wood-pellet-export-false>. “Risky business: Canada props up wood pellet export as a false climate solution” (2020). *STAND.EARTH*.
3. “Tribute to Beth Adams, Coordinator of *Massachusetts Forest Rescue Campaign*”, presented by Ralph S. Baker, Ph.D. at Bio4Climate *Blessed Unrest* Zoom Conference, May 9, 2020: <https://youtu.be/gbFHo65hWCY>
4. RESTORE: The North Woods website: [restore.org](http://restore.org)
5. Biodiversity for a Livable Climate website: <https://bio4climate.org/>
6. *Burned:* Are Trees the New Coal? Documentary film produced by Alan Dater and Lisa Merton of Marlborough, VT. <https://burnedthemovie.com/>

**Key Reference:**

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 <https://www.frontiersin.org/articles/10.3389/ffgc.2019.00027/full>

*Climate change and loss of biodiversity are widely recognized as the foremost*

*environmental challenges of our time. Forests annually sequester large quantities of*

*atmospheric carbon dioxide (CO2), and store carbon above and below ground for long*

*periods of time. Intact forests—largely free from human intervention except primarily*

*for trails and hazard removals—are the most carbon-dense and biodiverse terrestrial*

*ecosystems, with additional benefits to society and the economy. Internationally, focus*

*has been on preventing loss of tropical forests, yet U.S. temperate and boreal forests*

*remove sufficient atmospheric CO2 to reduce national annual net emissions by 11%.*

*U.S. forests have the potential for much more rapid atmospheric CO2 removal rates*

*and biological carbon sequestration by intact and/or older forests.*

**Additional References from** “THE NEGATIVE IMPACTS OF FOREST MANAGEMENT:

Selected Citations” Compiled by Michael Kellett, RESTORE: The North Woods. Reproduced by permission.

V.G. Marshall. 2000. Impacts of Forest Harvesting on Biological Processes in Northern

Forest Soils. Forest Ecology and Management 2000; 133:43-60

[https://doi.org/10.1016/S0378-1127(99)00297-2](https://doi.org/10.1016/S0378-1127%2899%2900297-2)

*Soil is the habitat of plant roots and the home of numerous microflora, including viruses,*

*bacteria, fungi and blue-green algae, and a host of animals from unicellular protozoans to*

*small vertebrates. Simple communities of soil organisms, present from the earliest stages of*

*forest soil genesis, become more complex and grow to astronomical numbers in mature*

*forest soils. Here, they are essential for the maintenance and productivity of these soils,*

*which unlike agricultural systems, generally receive less mechanical treatments and chemical*

*inputs. The soil microflora and fauna complement each other in the comminution of litter,*

*mineralization of essential plant nutrients, and conservation of these nutrients within the soil*

*system. Harvesting directly affects these processes through the reduction and redistribution*

*of organic matter, compaction, changes in plant cover, and modification of microclimate, all*

*of which affect the distribution, composition and activity of the soil biological communities….*

*[A]ll practices generally affect soil organisms over the short term. Changes over the longerterm*

*are less obvious… It is therefore prudent to discourage any qualitative or quantitative*

*changes in the soil biota.*

B. F. Allan, F. Keesing, and R. S. Ostfeld. 2003. Effect of Forest Fragmentation on Lyme

Disease Risk. Conservation Biology, 17(1), 267–272. doi:10.1046/j.1523-1739.2003.01260.x

*Forest destruction and fragmentation in the United States recently have been shown to*

*reduce mammalian species diversity and to elevate population densities of white‐footed*

*mice (Peromyscus leucopus). One potential consequence of reduced species diversity and*

*high mouse density in small fragments is an increase in human exposure to Lyme disease.*

*Increased risk of exposure to this disease is expected because of the role of the white‐footed*

*mouse as the principal natural reservoir of the Lyme bacterium, Borrelia burgdorferi.*

*Blacklegged ticks (Ixodes scapularis) feeding on mice have a higher probability of becoming*

*infected with the bacterium than do ticks feeding on any other host species…. We found a*

*significant linear decline in nymphal infection prevalence with increasing patch area and a*

*significant exponential decline in nymphal density with increasing patch area. The*

*consequence was a dramatic increase in the density of infected nymphs, and therefore in*

*Lyme disease risk, with decreasing forest patch size. We did not observe a similar*

*relationship between the density of larval ticks and patch size. These results suggest that by*

*influencing the community composition of vertebrate hosts for disease‐bearing vectors,*

*habitat fragmentation can influence human health.*

David R. Foster and David A. Orwig. 2006. Preemptive and Salvage Harvesting of New

England Forests: When Doing Nothing Is a Viable Alternative. Conservation Biology Volume

20, No. 4, 959–970 DOI: 10.1111/j.1523-1739.2006.00495.x

http://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/publications/pdfs/

Foster\_ConservationBio\_2006.pdf

*Although intuitive support exists for the development of “protection forests” through*

*silvicultural approaches to increase the resistance and resilience of forests to pests,*

*pathogens, and natural disturbances, empirical data to support the approach are lacking.*

*Not only is there sparse evidence that such approaches achieve their goals of increasing*

*resistance and resilience, little evidence suggests that natural disturbances yield negative*

*functional consequences. Therefore, current management regimes aiming to increase long*

*term forest health and water quality are ongoing “experiments” lacking controls. In many*

*situations good evidence from true experiments and “natural experiments” suggests that the*

*best management approach is to do nothing.*

Bill Moomaw and Danna Smith. 2017. The Great American Stand: US Forests and the

Climate Emergency. Dogwood Alliance. https://www.dogwoodalliance.org/wpcontent/

uploads/2017/03/The-Great-American-Stand-Report.pdf

*Since the establishment of the U.S. Forest Service, logging and subsequent loss of forests to*

*other uses have been replaced with utilitarian harvesting practices, known as the principle of*

*“sustainable forest management.” This principle asserts that as long as trees are not*

*harvested at a rate that exceeds regrowth, there is a “sustained yield.” On private lands,*

*where the lion’s share of industrial logging occurs in the United States, “sustainable*

*management” has largely been reduced to measuring acres and growth-to-harvest ratios.*

*Many point to a relatively stable acreage of forests in the United States over the past one*

*hundred years and a positive growth-to-harvest ratio as evidence of “sustainable” forestry.*

*This measure of “sustainability” fails to consider many other important factors such as ageclass*

*distribution, fragmentation, long-term carbon storage and biodiversity that affect the*

*ecological functioning of forests across large landscapes.*

*One consequence of this narrow “sustainability” focus is that only trees with commercial*

*value are desirable in a forest. In many cases, this has led forest managers to focus on fastgrowing,*

*early successional species that regenerate well in large openings (i.e., clear-cuts).*

*This can result in greatly reduced tree, plant, and animal biodiversity.*

*(p. 27-28)*

Robert T. Perschel, Alexander M. Evans and Marcia J. Summers. 2007. Climate Change,

Carbon, and the Forests of the Northeast. Forest Guild

<http://www.forestguild.org/publications/research/2007/ForestGuild_climate_carbon_forests.pdf>

*Reserves and other unmanaged natural areas serve another important role as genetic*

*reserves. Genetic diversity will help species adapt to climate change as new traits are called*

*upon to match up with new habitat. More intensive silvicultural systems reduce the number*

*of rare alleles (a measure of genetic variation) and hence the future genetic potential and*

*ability to adapt. While rare alleles may reduce current growth or form, they also represent*

*traits that may be beneficial to species as the environment changes.*

*Although a considerable portion of the Northeast’s forest landscape is not under active*

*management, only five percent is designated as non-managed reserves. In addition to*

*habitat, biodiversity, recreation, and other values, these reserves are important for carbon*

*storage. Forests store more carbon as they age due to high levels above and below ground.*

*Recent studies indicate forests can accumulate carbon for far longer periods than previously*

*thought. Although many protected areas are on public lands, there are additional*

*opportunities to expand reserve lands that will mature and accumulate carbon for long*

*periods, barring certain disturbances. Many of the region’s forests are on a recovery*

*trajectory toward greater concentrations of on-site carbon. Protecting more of these mature*

*forests while sequestering carbon would also protect key habitat conditions, ecosystem*

*functions, and recreational experiences not found on the managed landscapes. (p. 26)*

N. L. Stephenson, A. J. Das, R. Condit, S. E. Russo et al. 2014. Rate of Tree Carbon

Accumulation Increases Continuously with Tree Size. Nature: doi:10.1038/nature12914

(2014). <http://www.nature.com/nature/journal/vaop/ncurrent/abs/nature12914.html>

*[L]arge, old trees do not act simply as senescent carbon reservoirs but actively fix large*

*amounts of carbon compared to smaller trees; at the extreme, a single big tree can add the*

*same amount of carbon to the forest within a year as is contained in an entire mid-sized tree.*

Dartmouth College. 2014. Logging Destabilizes Forest Soil Carbon Over Time, Dartmouth

Study Finds. Public Release 2 December 2014. http://www.eurekalert.org/pub\_releases/2014-

12/dc-ldf120214.php

*Despite scientists' growing appreciation for soil's role in the global carbon cycle, mineral soil*

*carbon pools are largely understudied and previous studies have produced differing results*

*about logging's impact. For example, the U.S. Forest Service assumes that all soil carbon*

*pools do not change after timber harvesting.*

*Dartmouth researchers looked at how timber harvesting affects mineral soil carbon over 100*

*years following harvest in the northeastern United States, where soils account for at least 50*

*percent of total ecosystem carbon storage….*

*The results showed…there was a significant relationship between the time since forest*

*harvest and the size of the carbon pools, which suggested a gradual decline in carbon*

*across the region that may last for decades after harvesting and result in increased*

*atmospheric carbon dioxide.*

Jared S. Nunery and William S. Keeton. 2010. Forest Carbon Storage in the Northeastern

United States: Effects of Harvesting Frequency and Intensity Including Wood Products,

Forest Ecology and Management. Volume 259, Issue 8, 31 March 2010, pp. 1363 1375

<http://www.sciencedirect.com/science/article/pii/S0378112710000058>

*Temperate forests are an important carbon sink, yet there is debate regarding the net effect*

*of forest management practices on carbon storage…. We used the USDA Forest Service’s*

*Forest Vegetation Simulator to project stand development over a 160 year period under nine*

*different forest management scenarios…. The simulation results show a clear gradient of*

*increasing C sequestration as forest management intensity ranges from high (clearcut) to low*

*(ITS\_HighLow and No Management)…. Mean C sequestration in the no management*

*scenario was significantly higher (p < 0.01) than all other scenarios as indicated by ANOVA*

*and multiple comparison tests.*

Mary S. Booth. 2014. Trees, Trash, and Toxics: How Biomass Energy Has Become the

New Coal. Partnership for Policy Integrity http://www.pfpi.net/wpcontent/

uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf

*Comparison of permits from modern coal, biomass, and gas plants shows that even the*

*“cleanest” biomass plants can emit > 150% the nitrogen oxides, > 600% the volatile organic*

*compounds, > 190% the particulate matter, and > 125% the carbon monoxide of a coal*

*plant per megawatt-hour, although coal produces more sulfur dioxide (SO2). Emissions from*

*a biomass plant exceed those from a natural gas plant by more than 800% for every major*

*pollutant.*

*Biomass power plants are also a danger to the climate, emitting nearly 50 percent more CO2*

*per megawatt generated than the next biggest carbon polluter, coal. Emissions of CO2 from*

*biomass burning can theoretically be offset over time, but such offsets typically take decades*

*to fully compensate for the CO2 rapidly injected into the atmosphere during plant operation.*

*Compounding the problem, bioenergy facilities take advantage of gaping loopholes in the*

*Clean Air Act and lax regulation by the EPA and state permitting agencies, which allow them*

*to emit even more pollution. Electricity generation that worsens air pollution and climate*

*change is not what the public expects for its scarce renewable energy dollars.*

Henry Woolsey, Andrew Finton, and James DeNormandie. 2010. BioMap2: Conserving the

Biodiversity of Massachusetts in a Changing World. Mass Department of Fish & Game and

The Nature Conservancy http://www.mass.gov/eea/docs/dfg/nhesp/land-protection-andmanagement/

biomap2-summary-report.pdf

*Forest interior habitat—identified in BioMap2 as Forest Core—is widely recognized as*

*critically important for species sensitive to forest fragmentation and is becoming increasingly*

*scarce in highly populated regions of the country like Massachusetts…. Many bird species*

*that breed in Massachusetts are sensitive to forest fragmentation, including Ovenbirds,*

*Scarlet Tanagers, and many woodland warblers. Negative results of fragmentation include*

*edge effects such as nest predation by species associated with development such as skunks,*

*raccoons, and house cats; and nest parasitism by species such as the Brown-headed*

*Cowbird that lay their eggs in the nests of other bird species and reduce their reproductive*

*success. Forest interior habitats also support a wide range of native plants, animals, and*

*ecological processes sensitive to other edge effects such as noise and light pollution from*

*roads and development, invasive species establishment, and alterations to wind, heat, and*

*other climate variables…. Thirty-eight percent of the total Forest Core area remains*

*unprotected; these areas are high priorities for land protection since they provide important*

*habitat for forest interior and other species.” (pp. 48-49)*

Bill Moomaw and Danna Smith. 2017. The Great American Stand: US Forests and the

Climate Emergency. Dogwood Alliance. https://www.dogwoodalliance.org/wpcontent/

uploads/2017/03/The-Great-American-Stand-Report.pdf

*U.S. forests produce about 28 percent of the world’s wood pulp and 17 percent of*

*roundwood, more than any other country in the world. The United States is also now the*

*world’s largest manufacturer and exporter of wood pellets as an alternative to coal for*

*generating electricity in Europe, placing added demands on a resource already under stress.*

*Yet, ironically, government and industry in the United States often promote the logging of*

*forests on both public and private land as a climate solution, ignoring the imperative to*

*accelerate forest protection and restore degraded ecosystems.*

*(p. 13-14)*