Forests in Massachusetts:
A Tool to Prevent and Prepare for Climate Change

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Background

Forests are a defining feature of Massachusetts, covering 3 million acres (over 60% of the state's land area)[1]. From the Berkshires to Cape Cod, there are many different types of forests, and all provide important natural and economic values, including clean air, drinking water, recreational opportunities, habitat for fish and wildlife, timber and other forest products, and community character that contributes to quality of life and property values. The annual ecosystem service value of Massachusetts' forests is estimated at more than $3.8 billion[2].

Reductions in fossil fuel use are the biggest action needed to tackle climate change. However, forests also play a critical role, both by reducing and removing heat-trapping greenhouse gases (preventing climate change) and helping nature and people adapt to unavoidable climate changes already underway (preparing for climate change). Forests in Massachusetts hold and store considerable amounts of carbon. They:

- Sequester (absorb) ~7% (4.6 million metric tons CO_2e) of the state's gross annual carbon emissions[3];
- Store ~100 tons of C (367 metric tons CO_2e) on the average acre[3];
- Continue to increase the mass of carbon storage over time as forests grow.

When forests are lost, all of these values are lost with them. The extent of land coverage in forests peaked around 1980 and has declined ever since due to conversion to development. About 24,700 acres of forestland were developed between 2012 and 2017[1]. Much of this development is low-density residential development (sprawl), which impacts more acres and has higher road and community services costs than more compact development.

Net Zero and the Massachusetts Clean Energy and Climate Action Plan

The MA Executive Office of Energy and Environmental Affairs (EEA) established a net zero greenhouse gas (GHG) emissions limit for 2050, including an emissions reduction goal of at least 85 percent below 1990 levels. Net Zero emissions is defined as "A level of statewide greenhouse gas emissions that is equal in quantity to the amount of carbon dioxide or its equivalent that is removed from the atmosphere and stored annually by, or attributable to, the Commonwealth…" Next, Massachusetts will release the 2030 Clean Energy and Climate Plan, which sets state goals and programs to achieve Net Zero. **This is a significant opportunity to develop policies that advance forests and urban trees in mitigating and adapting to climate change.**

Cross-cutting benefits of forest conservation:

Emissions reduction: Protection and enhancement of forests through land conservation, smart growth, tree planting in urban and suburban areas, and good forest management practices are necessary for Massachusetts to reduce emissions enough to achieve its Global Warming Solutions Act goals.

- Forested land stores and continues to sequester additional carbon, with the capacity to absorb and offset even more of Massachusetts' greenhouse gas emissions through additional land protection and well-planned forest management.
- Keeping forest as forest avoids carbon emissions from land use conversion.
- Trees in the right locations around buildings and along streets reduce heating and cooling costs and urban heat island effects.
- Sustainable management of forests yields wood products that can substitute for more carbon-intensive energy sources and building materials.
- Where forestland conversion is necessary, management of agricultural soils, suburban yards, and road right-of-ways with carbon in mind can impact to what extent land is a greenhouse gas source versus sink.

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[1] Mass Audubon, *Losing Ground: Nature's Value in a Changing Climate*, 2020.
[2] The Trust for Public Land, *The Return on Investment in Parks and Open Space in Massachusetts*, 2013.
[3] Annual carbon sequestration, 2010: Methods taken from Gu et al. 2019 and applied to Massachusetts. MA annual emissions, 2017: Appendix C: Massachusetts Annual Greenhouse Gas Emissions Inventory: 1990-2017 (https://www.mass.gov/lists/massdep-emissions-inventories). Gu H, Williams CA, Hasler N, Zhou Y (2019) "The Carbon Balance of the Southeastern Forest Sector as Driven by Recent Disturbance Trends", Journal of Geophysical Research – Biogeosciences, 124, doi:10.1029/2018jg004841.
[4] Massachusetts Executive Office of Energy and Environmental Affairs *Determination of Statewide Emissions Limit For 2050*, 2020. (https://www.mass.gov/doc/final-signed-letter-of-determination-for-2050-emissions-limit)
[5] See forest cores and landscape blocks in: MA Department of Fish and Game and The Nature Conservancy, *BioMap2*, 2010.

Adaptation: Forests and other vegetated areas also play critical roles in helping communities adapt to climate change. Their impact on water resources is particularly vital given increased frequencies of both droughts and intense storms that cause floods, and with more precipitation falling as rain than as snow in winter.

- Precipitation infiltrates better into forests than virtually any other land cover, providing recharge to drinking water supplies and rivers and reducing flood peaks and drought impacts.
- Forests, wetlands, naturally vegetated buffers along streams, trees, and constructed wetlands in developed areas filter and infiltrate stormwater runoff, reducing erosion, pollution, and flooding.
- The use of nature-based (green) instead of, or alongside, constructed (grey) infrastructure in preparing for severe storms and flooding improves community safety, minimizes costs, and reduces carbon emissions associated with concrete and other construction practices.

Action Recommendations:

Nature should be regarded as its own sector, with its own emissions reductions and storage goals. Specifically, the role of forests in climate change adaptation and emissions reduction, should be recognized in policies and carbon accounting stemming directly from the Global Warming Solutions Act, and in state agency actions across the board. Align policies across agencies and increase attention on, and support for, action at the municipal level. New programs should be considered to assist communities, land trusts, and landowners; support cooperative efforts; and incentivize local actions in order to retain trees wherever they occur.

Specific areas recommended for focus include the following:

1. Protect forest blocks, especially those that are large or interconnected[5], with the most carbon stored and the best ability to be resilient.
   - Continue state land protection and landowner conservation assistance programs at current or increased levels.
   - Require compensatory mitigation for disturbances to large, intact forests that accounts for fragmentation, edge effects, and the loss of future carbon sequestration.

2. Support more compact forms of development and protect areas that act as nature-based infrastructure:
   - Assist municipalities in adopting innovative land use regulations and incentives, e.g. Natural Resource Protection zoning, mixed-use and infill/redevelopment zoning, and low impact development regulations.
   - Revise the MEPA greenhouse gas thresholds to address greenhouse gas impacts of development projects smaller than 50 acres, including requiring accounting of both aboveground carbon and carbon in soils.

3. Reduce energy usage by maintaining trees around buildings and planting new trees where needed, and by substituting wood for non-renewable materials:
   - Enhance funding for tree planting programs.
   - Support municipal land use regulations and incentives to retain trees on building sites.
   - Promote sustainable and local uses of wood for construction and thermal energy.

4. Consider carbon sequestration and climate change adaptation in state-funded forest management plans and outreach materials, as well as in the type of forest management promoted to private landowners and implemented on public lands.

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