Section 3: Climate Change and the Woodlands Partnership Region

The need for immediate action to address the global climate crisis presents an imperative, and an opportunity, for the Woodlands Partnership to focus programs and outreach activities on solutions that will protect the vital functions and values of the region's forests. Addressing climate change – and the need for both mitigating the problem and adapting to its impacts – necessitates a many-pronged approach. The Woodlands Partnership could concretely address climate issues in the Partnership region by promoting, funding, and coordinating research on a variety of approaches and practices. These various avenues should include forest conservation (prevention of forestland conversion); protection of old-growth forests, preserves, and wildlands; sustainable and climate-focused forest management; management and control of invasive plants, insect species and diseases; and promotion of a Local Wood movement that would enable local processing, manufacturing, and sale of wood products and could include the promotion of wood reuse and recycling. As the Woodlands Partnership seeks to develop programs and grant-funded projects, any activities that would support the Commonwealth of Massachusetts to meet its state climate goals would be prime candidates for implementation by the Partnership.

Science, Policy, and Solutions

Future climate change scenarios, about which there is broad scientific consensus, predict higher average annual temperatures and increased precipitation in the northeastern United States in the next 50–100 years, marked by an increased variability and intensity of weather events. [1] Generally, shorter, warmer winters with less snowfall are predicted, as well as hydrological changes including an increase in extreme rain events and flooding, increased precipitation during winter, earlier peak stream flows in spring, and increased drought during the growing season.[2] An increase in other extreme weather events like windstorms, hurricanes, and ice storms are also predicted, as well as species range shifts and growing impacts from invasive plants, insects, and diseases.[3] **These changes will lead to new and increased pressures on the forests of Massachusetts, but, importantly, the 3.3 million acres of forest in the state also represent one of the best tools currently available to address climate change.** "Natural climate solutions" including "avoided forest conversion," "natural forest management" and reforestation are among low-cost, easily available and effective solutions.[4] Forests sequester (remove from the atmosphere) large quantities of carbon dioxide annually, store carbon above and below ground for long time periods,[5] and can help mitigate some of the effects of climate change.

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[1] Cardwell et al. 2020. *Massachusetts State Forest Action Plan.* Department of Conservation and Recreation.
[2] Massachusetts State Hazard Mitigation and Climate Adaptation Plan. 2018.
[3] Janowiak, Maria. 2019. *What's at Risk? Implications of Climate Change in Massachusetts' Forests*. Presentation to Massachusetts Department of Conservation and Recreation (Forestry Division); Swanston et al. 2018. *Vulnerability of Forests of the Midwest and Northeast United States to Climate Change*. Climatic Change 146: 103–116.
[4] Griscom, B., Adams, J., Ellis, P., Houghton, R., Lomax, G., Miteva, D., … Fargione, J.(2017) Natural Climate Solutions. *Proceedings of the National Academy of Sciences of the United States of America.* https://doi.org/10.1073/pnas.1710465114
[5] Moomaw, William R., Susan A. Masino, and Edward K. Faison. 2019. Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. *Frontiers in Forests and Global Change*, 2:27, 1-10.

As perhaps the most critical environmental issue of our time, the subject of climate change is a central focus of the Woodlands Partnership. With its location in the most heavily forested region in the state, the Partnership should play a critical role in guiding and promoting research, policy, and on-the-ground practices that address climate issues. The diverse array of forest types in the Partnership region provide opportunity for research to better understand climate impacts on our forests, as well as to test and demonstrate the effectiveness of various land management and silvicultural practices available to promote forest health and resiliency.

The *Massachusetts 2050 Decarbonization Road Map*, a comprehensive study by the Commonwealth that looks at ways the state can reach its goal of reaching Net Zero greenhouse gas emissions by 2050, emphasizes the central importance of the preservation, health, and sustainable management of forests to meet this climate goal: "…forests across the region represent the largest and most locally impactful opportunity to obtain required carbon removal services."[6] As they grow, through their biological processes, forests continuously sequester carbon from the atmosphere, storing that carbon in live vegetation, organic matter on the forest floor (leaves and dead wood), and in the soil.[7] The forests of Massachusetts are projected to have the ability to sequester about 5 million metric tons of greenhouse gases per year from now through 2050, which represents about 7% of the state's current emissions and about half of the residual emissions that will be allowable in 2050.[8] The forests of Massachusetts are estimated to currently store 100 million metric tons of carbon,[9] although the amount of carbon sequestered and stored by a particular forest is affected by factors such as forest type, age, and site conditions.[10] Additionally, soils are currently estimated to store about four times as much carbon in the state as forests; wetlands are also estimated to store more carbon than forests, although covering only about 20% of the land area that forests do.[11] Despite these impressive carbon sequestration and storage capacities found in the Commonwealth's natural resources, the *Decarbonization Roadmap* emphasizes, "even with the best land and timber management and conservation strategies, Massachusetts' natural resources alone are unlikely to be able to sequester the amount of carbon needed to achieve Net Zero. Other carbon dioxide removal methods including both direct air capture and the protection of natural resources in neighboring states will need to be pursued."[12]

By investing in programmatic development, outreach, and education to municipal and private woodland owners, and by further engaging Indigenous stakeholders and other partners to participate in the Woodlands Partnership, the Partnership will strive to enhance forest conservation, climate-informed forest stewardship, and rural economic sustainability in the region. Some concrete initiatives that have been explored by the Partnership thus far include: establishment of climate-informed demonstration sites at Town Forests in member municipalities where education and outreach events can be hosted and climate-smart forestry practices can be piloted; development of a suite of online resources or "Virtual Forest Center" connecting diverse forest owners to stewardship assistance as a precursor to a physical

[6] Ismay et al. 2020. *Massachusetts 2050 Decarbonization Roadmap*. Massachusetts Executive Office of Energy and Environmental Affairs and The Cadmus Group.
[7] Ibid.
[8] Ibid.
[9] Ibid.
[10] Cardwell et al. 2020. *Massachusetts State Forest Action Plan.* Department of Conservation and Recreation.
[11] Ismay et al. 2020. *Massachusetts 2050 Decarbonization Roadmap*. Massachusetts Executive Office of Energy and Environmental Affairs and The Cadmus Group.
[12] Ibid.

Forest Center; and support for ongoing multi-organization progress to make Northwest Massachusetts a leader in preparing for climate change.

Forest Conservation and Protection of Wildlands

Forest land conversion for development represents the greatest threat to the greenhouse gas sequestration and carbon storage potential of Massachusetts forests. Developing land essentially permanently limits potential future sequestration and storage, in addition to releasing stored carbon through tree removal and soil disturbance.[13] Dedicating significant areas to intact forest ecosystems is essential for addressing climate change.

The Harvard Forest *Wildlands and Woodlands vision for New England* calls for 70% of forests in New England to be permanently protected by 2060 with 10% of this forest designated as wildlands, which it defines as "large landscape reserves subject to minimal human impact and shaped by natural processes."[14] Wildlands are envisioned as ranging in size from 5,000 to 1 million acres and would "slow the pace of climate change by supporting complex, aging forests that can store twice as much carbon as young forests" and act as benchmarks and sources of insight into natural dynamics.[15] Research has shown that many forests do not slow their storage of carbon as they mature, rather, carbon uptake often increases over time, and protecting forests as wildlands could increase carbon sequestration and storage.[16]

Much of the remaining old growth forest in Massachusetts, about 72%, is located in the 21-town region, with key areas of old growth located within or adjacent to the Mohawk Trail State Forest, Savoy Mountain State Forest, Monroe State Forest, and Mount Greylock State Reservation.[17] A 2006 study found trees between 325 and 488 years old in these areas, much older than the typical surrounding forest age of 60 to 150 years.[18] These old growth stands should be highly prioritized for permanent protection, and could form the core of reserve areas, set aside from logging or other human disturbance.[19]

A potential partner organization is the Northeast Wilderness Trust, a land trust committed to identifying priority lands for protection based primarily on ecological value and climate resilience potential that works with landowners and partner organization to preserve these areas in a "forever-wild" state (with no or minimal management).[20] Northeast Wilderness Trust offers forever-wild conservation easements to land trusts through their Wildlands Partnership program, as well as wild carbon credits. The Trust notes, "The bulk of land conservation work across the Northeast has been oriented toward conserving

[13] Ibid.
[14] Aber et al. 2010. *Wildlands and Woodlands: A Vision for the New England Landscape*. Petersham, Mass.: Harvard Forest, Harvard University.
[15] Ibid.
[16] Ibid.
[17] D'Amato, A.W., Orwig, D.A., and Foster, D.R. (2006). New Estimates of Massachusetts Old-growth Forests: Useful Data for Regional Conservation and Forest Reserve Planning. Northeastern Naturalist. 13(4): 495-506.
[18] Ibid.
[19] Ibid.
[20] Northeast Wilderness Trust. 2022. Wilderness Conservation. https://newildernesstrust.org/wilderness-conservation/

managed woodlands and farms, not natural areas. The Wilderness Trust was founded to help restore and preserve new wilderness areas on private land and to champion the wilderness area."[21]

Sustainable and Climate-focused Forest Management

Active forest management maintains land as forest, and in many cases may prevent the conversion of land to non-forest uses by generating needed income for landowners (preventing the sale, subdivision and development of land). Although harvesting wood on a forested parcel does release carbon, sustainable and climate-focused forest management techniques can increase the capacity of some forests to sequester and store carbon long-term, and some techniques may lead to faster rates of carbon sequestration after a harvest than the stand was capable of pre-harvest.[22] By 2030, the State of Massachusetts hopes to incentivize 20% of private forest and farm owners to adopt climate-smart management practices that balance carbon sequestration and storage with increased resilience.[23]

Exemplary Forestry, an approach to forestry developed by the New England Forestry Foundation, emphasizes practices that prioritize the long-term health of the forest and the highest standards of sustainability to "enhance the role forests can play to mitigate climate change, improve wildlife habitat and biodiversity, and grow and harvest more sustainably produced wood."[24] Under Exemplary Forestry management techniques, forests grow a higher volume of wood and are able to sequester and store increased amounts of carbon from the atmosphere.[25] Climate-Smart Forestry (CSF) is an emerging approach to forestry that is being implemented by organizations like Mass Audubon and other conservation organizations that utilize forest management to create habitat conditions for specific wildlife and bird species.[26] CSF practices aim to promote forest adaptation and resiliency to changing climate conditions. Strategies include a focus on maintaining the health and vigor of current tree species, modifying forest management practices to increase levels of stored carbon, increasing structural complexity and tree species diversity in the forest to maximize opportunities for recovery and adaptation, favoring or even planting species and genotypes that are adaptable to projected climate change conditions, and removal of invasive plant species to promote native growth. In general, CSF uses strategies that "involve actions that restore or sustain compositional, structural, and functional diversity to stands, so as to provide flexibility and the potential to shift stand development in different directions as warranted by evolving conditions." [27] One example of a climate-smart technique that might be employed by a forester, Variable Density Thinning, is detailed in the sidebar at right.

[21] Northeast Wilderness Trust. 2022. About. https://newildernesstrust.org/about/

[22] Ismay et al. 2020. *Massachusetts 2050 Decarbonization Roadmap*. Massachusetts Executive Office of Energy and Environmental Affairs and The Cadmus Group.

[23] Baker et al. 2022. Massachusetts Clean Energy and Climate Plan for 2025 and 2030.

[24] New England Forestry Foundation. 2022. Exemplary Forestry. https://newenglandforestry.org/learn/initiatives/exemplary-forestry/

[25] Ibid. Exemplary Forestry standards call for an average stocking of ~25 cords of merchantable wood per acre on managed forest lands. Across 16 New England counties, average stocking on privately owned forest land is less than this benchmark. https://newenglandforestry.org/learn/initiatives/30-percent/

[26] Mass Audubon. 2022. Climate-Smart Forestry. https://www.massaudubon.org/our-conservation-work/ecological-management/habitat-management/climate-smart-forestry

[27] Palik, Brian J., Anthony W. D'Amato, Jerry F. Franklin, and K. Norman Johnson. 2021. *Ecological Silviculture: Foundations and Applications*. Long Grove, Illinois: Waveland Press.

Although forest management may reduce carbon storage in the short-term, management may be essential in many cases for increasing the options for, and the resiliency of the forest in the face of a changing climate and new forest threats such as diseases and invasive species.[28] Palik et al. write in *Ecological Silviculture*, "It is important to recognize that carbon mitigation is one of many objectives being addressed on a given landscape, and a singular focus on maximizing on-site carbon stores may conflict with the achievement of other ecological objectives. For example, carbon management often focuses on promoting and maintaining highly stocked forest conditions; however, such conditions may represent a significant deviation from historical, multiscale patterns in forest density and may increase vulnerability to disturbance events."[29]

SIDEBAR

Example of a Climate-Smart Forestry Technique in a Northern Hardwoods Forest

Variable Density Thinning (VDT) is a silvicultural technique that can be employed to increase structural and age diversity in a forest stand, and may be employed to improve the resiliency, health, and carbon storage potential of a stand. Because the dominant forest state in the region was historically old-growth, uneven-aged forest (150–300+ years old), and because the dominant forest in the region is currently second-growth, younger forest (60–150 years old), the majority of forests in Massachusetts are in a simplified state in terms of structure and species composition. VDT attempts to shift a forest stand to a more heterogeneous state by using techniques that emulate small- to medium-scale natural disturbances like wind events.[30] Three categories of management areas are utilized: skip areas (designated areas of the forest that are kept unmanaged as reserves, often around wetlands or areas of ecological significance); gap areas (small- to medium-sized gaps that promote new tree growth); and the matrix forest, where thinning is utilized.[31]

Gap creation has the goal of increasing structural and species diversity in the forest and promoting understory and midstory growth. Under the natural range of variability for the region, it is expected that about 3% of northern hardwood forests will be in the seedling-sapling stage (1–15 years old) at any given time.[32] Live legacy trees should also be retained in gaps for continuity and as seed sources.[33] Increased species diversity promoted by gap creation can enhance the resiliency of the forest in the face of disturbances, as more diverse communities distribute risk among a greater number of species,

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[28] Ibid.
[29] Palik, Brian J., Anthony W. D'Amato, Jerry F. Franklin, and K. Norman Johnson. 2021. *Ecological Silviculture: Foundations and Applications*. Long Grove, Illinois: Waveland Press.
[30] Ibid.
[31] Ibid.
[32] Lorimer, Craig G. and Alan S. White. *Scale and Frequency of Natural Disturbances in the Northeastern US: Implications for Early Successional Forest Habitats and Regional Age Distributions.* 2003. Forest Ecology and Management 185:41–64.
[33] Palik, Brian J., Anthony W. D'Amato, Jerry F. Franklin, and K. Norman Johnson. 2021. *Ecological Silviculture: Foundations and Applications*. Long Grove, Illinois: Waveland Press.

reducing the likelihood that an entire system will be affected.[34] Thinning in the matrix forest concentrates on removing low-quality, diseased, competing, or less desirable trees adjacent to larger, more vigorous, or more desirable trees. Desirable trees might include dominant canopy trees with vigorous crowns, trees with structural wildlife benefits such as cavities, hard or soft mast-producing trees (beech, oak, black cherry), trees more tolerant of drought conditions in the face of climate change (oaks), or trees that are not currently or potentially facing outbreaks of invasive insects or diseases. Thinning can help the forest be more resilient in the face of climate change by reducing moisture stress for the retained trees in the face of periods of drought by allowing the retained trees to grow more vigorously and potentially have more resources to face disturbances. Thinning can also increase old-growth characteristics in the forest by concentrating growth on a fewer number of trees, thereby more quickly increasing the number of large trees present in the forest; old-growth stands have been found to have larger overstory trees than second-growth forests.[35]

A technique that could be combined with VDT to increase old-growth characteristics of a second-growth stand is the retention and active creation of snags (standing dead trees) and coarse woody materials (fallen dead trees and large branches) in the forest. One of the primary ways that second-growth forests differ from old-growth forests is that old-growth stands have higher degrees of structural complexity, particularly due to the presence of much higher volumes of downed coarse woody material and snags.[36] These elements develop in forests over time due to natural disturbances caused by wind, fire, insects and diseases, and as the result of competition-based mortality.[37] In New England, 41 species of birds and mammals use standing trees with decay present or standing dead trees, including a variety of woodpeckers, owls, and songbirds, and mammals such as bats, squirrels, porcupines, opossums, raccoons, and ermines.[38] Up to 40% of birds in North America are cavity nesters, and primary cavity excavators like woodpeckers most often excavate dead or decaying wood.[39] The retention or creation of coarse woody material can benefit small animals that use downed woody material as cover, such as voles, shrews, ermine, snakes, and salamanders; black bears, bobcats, foxes, skunks and other mammals may also use large hollow logs as dens.[40] Fungi and invertebrates are hosted by downed woody material, which can increase biodiversity in the forest and act as a food source for many vertebrate species. Adding structure and material to the forest floor increases moisture retention, adds organic matter to the soil, provides nurse logs for the germination of certain species like yellow birch, and can potentially inhibit deer browse of some seedlings. Fallen logs also store carbon and can provide soil erosion control.[41]

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[34] Swanston, Christopher W. et al. 2018. *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers*. Second Edition. USDA Forest Service General Technical Report NRS-87-2.
[35] D'Amato, Anthony, David Orwig, and David Foster. 2008. *The Influence of Successional Processes and Disturbances of the Structure of* Tsuga Canadensis *Forests*. Ecological Applications 18(5): 1182–1199.
[36] Ibid.
[37] Ibid.
[38] DeGraaf, R. M. and A. L. Shigo. 1985. *Managing Cavity Trees for Wildlife in the Northeast*. USDA Forest Service General Technical Report NE-101.
[39] McComb, Brenda C. 2016. *Wildlife Habitat Management: Concepts and Applications in Forestry*. Second edition. Oregon State University: CRC Press.
[40] Ibid.
[41] Palik, Brian J., Anthony W. D'Amato, Jerry F. Franklin, and K. Norman Johnson. 2021. *Ecological Silviculture: Foundations and Applications*. Long Grove, Illinois: Waveland Press.

Local Wood

How wood is used post-harvest influences its carbon footprint—if wood is used to produce durable goods like furniture, building insulation, and cross-laminated timber, its carbon will continue to be stored for decades or even centuries. As noted elsewhere in this document, Massachusetts currently exports the majority of its annual timber out-of-state for processing, and then imports an estimated 98% of all the wood products it consumes from out-of-state sources.[42] If wood harvested in the Partnership region could be processed and sold locally on a more regular basis, this could have huge climate benefits through the reduction of emissions associated with shipping wood out of state for processing and importing wood and wood products into the state from around the world.

Carbon Markets and Payments for Ecosystem Services

As climate change progresses, payments for ecosystem services, particularly those services that can help mitigate the effects of climate change, will likely continue to gain momentum in the state and could greatly benefit the 21-town region. Forests provide a wide range of ecosystem services in addition to wood products and outdoor recreation—they clean the air, filter water supplies, control floods and erosion, sustain biodiversity and genetic resources, and sequester and store carbon from the atmosphere.[43] These services have tremendous economic value—in their absence, humans are forced to engineer costly systems to perform the same functions that otherwise occur naturally. The Massachusetts Audubon Society has estimated the nonmarket value of the services natural areas provide within the state (i.e., flood control, climate mitigation, water filtration) at billions of dollars annually.[44]

The Woodlands Partnership has the potential to facilitate a shift towards increased payments for ecosystem services in the 21-town region by advocating with local and state representatives, securing climate-focused grants, and promoting or connecting municipalities and other landowners with initiatives such as the:

- The Pilot Forest Climate Resilience Program (Mass Audubon) and related climate-smart forestry practices developed with DCR and numerous conservation partners to address climate adaptation and managing forests for carbon;
- Exemplary Forestry practices developed around the needs of umbrella wildlife species and to sustainably grow more wood (NEFF);

[42] *Massachusetts Forest Action Plan: An Assessment of the Forest Resources of Massachusetts*, UMass Amherst and MA DCR, June 2010.

[43] Balloffet, N; Deal, R; Hines, Sarah; Larry, B; Smith, N. 2012. *Ecosystem Services and Climate Change*. (February 4, 2012). U.S. Department of Agriculture, Forest Service, Climate Change Resource Center.

[44] Mass Audubon. 2020. *Losing Ground: Nature's Value in a Changing Climate*.

- The Forest Legacy Program, for which DCR has submitted a successful application to the U.S. Forest Service to make the 21-town Partnership region eligible for this federal competitive conservation funding program in which easements can be purchased from willing sellers;
- The Resilient Lands Initiative, a new state 10-year plan that aims to reduce vulnerability to climate impacts, increase land conservation (No Net Loss of Farms and Forests), and power a green economy through state programs and grants; and,
- The Wild Carbon Credits program (Northeast Wilderness Trust), a carbon offset credits program specifically geared toward land permanently conserved with a Forever-Wild Conservation Easement.

Forest Carbon Offset Projects for Municipalities and Landowners

A growing field in the realm of payments for ecosystem services are carbon markets. In the 21-town region, developing and increasing access to carbon markets could result in job growth in the inventory, qualification, verification, marketing, and sale of carbon credits,[45] and carbon markets could provide additional income to landowners and create an incentive for private landowners to sustainably manage their forests.

Through carbon markets, landowners who commit to manage their forests, over a very long time period, for increased (additional, over the previous business-as-usual scenario) carbon storage have the potential to sell this additional stored carbon as "carbon credits." Landowners can sell these credits to companies or individuals interested in offsetting their own carbon emissions. A successful forest carbon project can create sustainable revenue for a town or individuals over many years. Currently, a carbon project in New England typically needs at least 3,000 acres of well-stocked forest for revenue to exceed the initial development costs, meaning that aggregate projects are often needed, in which several landowners or municipalities bundle multiple landholdings to make the project viable.[46] However, there are several emerging companies and initiatives focused on making carbon projects accessible to smaller landowners, which may gain traction over time, e.g., the Family Forest Carbon Project, developed by The Nature Conservancy and American Forest Foundation; Forest Carbon Works; and Natural Capital Exchange (NCX). In Massachusetts, Mass Audubon provides technical assistance and outreach to municipalities interested in forest carbon offset projects through their Climate-Smart Forestry program.[47]

There are several examples of successful aggregate carbon projects in New England. To date, there are no established projects located in the 21-town region, although a state grant helped to fund the towns of Williamstown and Conway to explore the potential for a carbon credit program with local landowners. Initiated in 2014 by the cities of Holyoke, West Springfield, and Westfield, the **Tri-City Carbon Sequestration program**, centered at Bear Hole Reservoir, is the first municipal aggregate carbon

[45] Wildlands and Woodlands, A Vision for the New England Landscape. http://www.wildlandsandwoodlands.org/home
[46] Mass Audubon. 2022. Climate-Smart Forestry. *Carbon Offset Case Studies*. https://www.massaudubon.org/our-conservation-work/ecological-management/habitat-management/climate-smart-forestry
[47] Mass Audubon. 2022. Climate-Smart Forestry. https://www.massaudubon.org/our-conservation-work/ecological-management/habitat-management/climate-smart-forestry

project in the U.S. The project covers 13,500 acres of forest and reservoir land and is expected to offset about 242,000 tons of carbon and generate more than $2 million in income for the cites between 2019 and 2029. In Vermont, the **Cold Hollow Carbon project**, initiated in 2019, has been a successful aggregate project involving 10 private landowners and covering 7,500 acres. Landowners are expected to receive $25-$47 per acre from an initial carbon credit sale, and revenue from carbon storage sales will be shared among participants based on acreage, stocking levels, and harvests, with a small percentage allotted to Vermont Land Trust, the administrator of the project.

The Woodlands Partnership in the Context of Recent Massachusetts State Policy

In 2020, The Commonwealth of Massachusetts set forth both a *Forest Action Plan* focusing on the sustainable management of forest resources in the era of rapid climate change, and the *Massachusetts 2050 Decarbonization Roadmap*, a guide for the state to approach carbon neutrality by mid-century. In 2022, the Commonwealth produced the Massachusetts Clean Energy and Climate Plan for 2025 and 2030, as required by the Global Warming Solutions Act (2008) and the 2021 Massachusetts Climate Law. These policy documents are guides for the Woodlands Partnership to address its goals of supporting local forest conservation, promoting sustainable forestry practices as an economic driver, and improving the fiscal sustainability of the 21 communities in our region. Excerpts from these documents are contained in the Appendix**,** and the full documents can be downloaded from the internet.

The MTWP as a component of the *Massachusetts State Forest Action Plan, 2020.*

The *Forest Action Plan* acknowledges the immediate challenges of climate change, the conversion of our forested landscapes to other uses, the detrimental effects of invasive plants, insects, and diseases, and the disconnect between local wood production and consumption of forest products. To address these issues, the *Forest Action Plan* embraces a set of 10 goals of increasing the resistance and resilience of forests in responding to climate change, managing forests to enhance their biodiversity and ecosystem functionality, supporting sustainable forest management, optimizing urban tree canopies, enhancing forest-people connections, increasing the conservation of forest lands, enhancing the ecosystem services provided by healthy soil, water, and air resources, supporting the appropriate use of prescribed fire in forest management, supporting forestry-conservation stakeholders, and enabling a legal framework to accomplish these goals. The Woodlands Partnership is relevant to all of these goals, and our mission embraces them.

The Woodlands Partnership, in a region of both great biological diversity and great economic development need, is viewed in the *Forest Action Plan* as a public instrument for conserving the region's forests through protective measures, encouraging sustainable forestry practices, promoting forest-based economic development, increasing municipal financial stability, and bringing new sources of funding and assistance to the public from the Commonwealth and U.S. Forest Service.

The *Forest Action Plan* recognizes the Woodlands Partnership as both a priority and accomplishment. Chapter 1 of the Action Plan identifies the Partnership as being in the most important categories for amounts of land in: DCR Forest Preserves, Parklands, and Woodlands; Spruce Fir and Northern Hardwood Forests; Diversity of Forest types, BioMap2 Core Habitat, Forest Core, and Critical Natural Landscape; Conservation Assessment and Prioritization System Index of Ecological Integrity; Nature Conservancy Resilient Landscape Analysis; and Massachusetts Interior Forests (more than 100 meters

from a road). Later chapters identify the Partnership region as having the highest concentration of Prime Forest Lands, timber harvest acreage, and timber harvest rate (acres/mi^2).

In Chapter 6 of the plan, furthermore, The Department of Conservation and Recreation lists 40% of the towns within the Partnership as being Priority Urban Forest based on their Massachusetts Sustainable Community Forestry Score, percent of population below poverty level, wildland urban interface, and 303d (Clean Water Act) list of impaired waters. These municipalities include Adams, Buckland, Hawley, Monroe, North Adams, Rowe, Shelburne, and Williamstown, representing 38% of the towns in the Woodlands Partnership region.

The forests of the Woodlands Partnership region are generally considered to be in the Moderate to High categories of conserved and managed, providing ecosystem services. The region essentially contains the entire high elevation forest resources of the Commonwealth, with a disproportionate share of lands above 2,200-feet covered by the Northern Forest type dominated by red spruce and balsam fir.

The Woodlands Partnership is specifically mentioned in the *Forest Action Plan* "Strategies Matrix" under GOAL 6: Increase land base of conserved forests (keep forests as forests), "Strategy 44: Support the Mohawk Trail Woodlands Partnership and forest conservation in Northern Berkshire and Western Franklin counties." The matrix points out the resources available should be from State, Federal, Municipal, and non-governmental sources. State and Federal programs associated with the Woodlands Partnership include Management Forestry, Forest Legacy Program, and Service Forestry. The national priorities of supporting the Woodlands Partnership include conserving forest landscapes, protecting forests from threats, and enhancing public benefits.

The MTWP as a component of the *Massachusetts 2050 Decarbonization Roadmap*

The *Decarbonization Roadmap "*comprised four sector-specific analyses focused on buildings, transportation, non-energy emissions, and the carbon sequestration potential of Massachusetts' natural and working lands, as well as a separate economic and health impact analysis." To attain carbon neutrality, the Commonwealth anticipates the need to have the ability to both remove and sequester massive amounts of carbon dioxide from the atmosphere.

The conservation and sustainable management of forested landscapes are essential elements in navigating the *Decarbonization Roadmap.* While sustainable forest management can result in continuation of carbon sequestration and providing ecosystem services, the *Roadmap* points out that conversion from forested to non-forest land uses usually results in a persistent release of carbon dioxide into the atmosphere. The *Roadmap* time horizon is only 30 years, however, "a more complete accounting of land use impacts on human and natural systems is needed to understand the long-term systemic effects and the balance of ecosystem benefits given these dynamics."

The *Roadmap* states that "using harvested wood to produce durable goods and materials can maintain a portion of the removed carbon in storage for years (e.g., paper produced from pulp), to decades (e.g., furniture), to over a century (e.g., cross-laminated timber or insulation in buildings), reducing the emissions associated with the original removal activity, perhaps dramatically." However, according to the *Roadmap,* the burning of woody biomass as a source of electricity or heat is problematic and is highly dependent on the amounts of fossil fuel carbon that would be displaced.

The *Roadmap* points out that forest soils play a vital role in the storage of carbon and its long-term sequestration, storing up to four times the amount of carbon than that in living trees. The report stresses the necessity of protecting and properly managing forest soils and wetlands that provide this function. The *Roadmap* also recommends increasing natural carbon stocks through afforestation, reforestation, forest management, and natural ecosystem restoration, as well as implementing regenerative farming practices that increase soil carbon stocks on managed farm and pasture lands.

While the *Massachusetts 2050 Decarbonization Roadmap* doesn't mention the Woodlands Partnership specifically, there is a clear role for the Partnership to play and recommendations for actions that are identical to the forest lands conservation and sustainable forest management missions of the Partnership. As a public body of the Commonwealth of Massachusetts, the Mohawk Trail Woodlands Partnership embraces the principles and directives of both the *2050 Decarbonization Roadmap* and the *2050 Forest Action Plan*.

The MTWP as a component of the *Massachusetts Clean Energy and Climate Plan for 2025 and 2030* (2025/2030 CECP)

The 2025/2030 CECP outlines the Commonwealth's plans to achieve its emissions reduction requirements in 2025 and 2030, based on the goals of the *Massachusetts 2050 Decarbonizing Roadmap*. The plan recognizes "the important role that carbon sequestration will play in achieving net-zero emissions [and] includes goals and actions to reduce greenhouse gas emissions and increase carbon sequestration on natural and working lands (NWL)." The plan notes that "every policy designed to achieve the greenhouse gas emissions reduction targets has been developed with a lens that focuses on delivering positive outcomes for environmental justice populations," in order to ensure that the economic and environmental benefits that the plan envisions are available to all. Many of the goals of the 2025/2030 CECP are highly relevant to and could be supported by the Woodlands Partnership, including:

- Increasing permanent conservation of undeveloped land and water (including wetlands) to at least 28% of Massachusetts by 2025 and 30% by 2030, translating to an additional 167,000 acres of conserved or permanently protected land in the state by 2030.
- Incentivizing 20% of private forest and farm owners to adopt climate-smart management practices by 2030 that balance increased carbon sequestration and storage with increased resilience to disturbance.
- Planting trees in at least 5,000 acres of urban areas by 2025 to increase carbon sequestration and provide urban cooling and stormwater management.
- Planting trees in at least 16,100 acres of riparian areas to expand tree cover along bodies of water and retain transitional habitats along farm fields.
- Achieve no net loss of stored carbon in wetlands by 2030 through improved wetland protection policies, active wetland restoration, and conservation of wetlands and wetland-adjacent lands.
- Incentivizing a 5% increase in utilization of harvested wood in long-lived durable products between 2025 and 2030.