Many Reasons to Add Cattle Barn Lot to Mount Washington Forest Reserve

MOUNT WASHINGTON, MASSACHUSETTS

REPORT PREPARED FOR MASSACHUSETTS
DEPARTMENT OF CONSERVATION AND RECREATION
BY GREEN BERKSHIRES, INC.
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Cattle Barn Lot sugar maple forest in fall colors. View from East Street, Mount Washington, Massachusetts.

PART 1

Executive Summary

The Massachusetts Department of Conservation and Recreation (DCR) plans a timber harvest on the 362-acre Cattle Barn Lot it owns in the town of Mount Washington. The Cattle Barn Lot lies within 847 acres donated to the state known as the Intemann land. DCR's primary goals are to sell timber and to convert the mature forest there to a young forest suitable for hunting game birds and prey animals. The timber harvest area appears to be larger than described in DCR's materials, and more trees are marked for cutting than shown in DCR's board feet totals. DCR has other reasons for the harvest, as well. DCR's reasons for the harvest are not supported by forest ecology science or economics. The Cattle Barn Lot meets all the state's criteria for a forest reserve. It has many ecological features identified in the state's BioMap as exceptional and worthy of protection. Two tree species to be logged in the Cattle Barn Lot are sugar maple and white ash. An extensive sugar maple forest there is unique on state land in the town. The Lot is a likely refugium for the sugar maple species which is declining in the northeast. It is also a refugium for animal, amphibian, fish, bird, and insect species. The sugar maple forest should be preserved, not timbered. Some white ash trees have survived despite local infestation by the Emerald Ash Borer and could be genetically resistant to it, so should not be logged. The state has committed to expand forest reserves on public and private lands. The town select board and a majority of residents through a petition have asked the state to consider adding the Cattle Barn Lot and surrounding Intemann land to the Mount Washington Forest Reserve. Doing so would increase the Mount Washington Forest Reserve to 112% of its current size at no cost or delay.

PART 2

Introduction

DCR INTENDS to solicit bids for a timber harvest on a 362-acre parcel of land that it owns in the town of Mount Washington. **(Figure 1)** The project area, labeled the Cattle Barn Lot, is located in the Karner Brook Watershed, at the north end of the South Taconic Plateau, in the southwestern corner of the state. It lies within a 536-acre parcel donated to the state in 1959 by Cornelia Intemann. Between 1958 and 1961, she donated a total of 847 mostly contiguous acres. **(Figure 2)**

Collectively, these Intemann parcels comprise the only large state-owned forest block in Mount Washington not included in the Mount Washington Forest Reserve. **(Figure 3)**

The Mount Washington select board asked DCR to halt the logging plans, and, instead, to consider adding the Cattle Barn Lot and surrounding Intemann land to the Mount Washington Forest Reserve. A petition signed by 60% of voters made the same request.

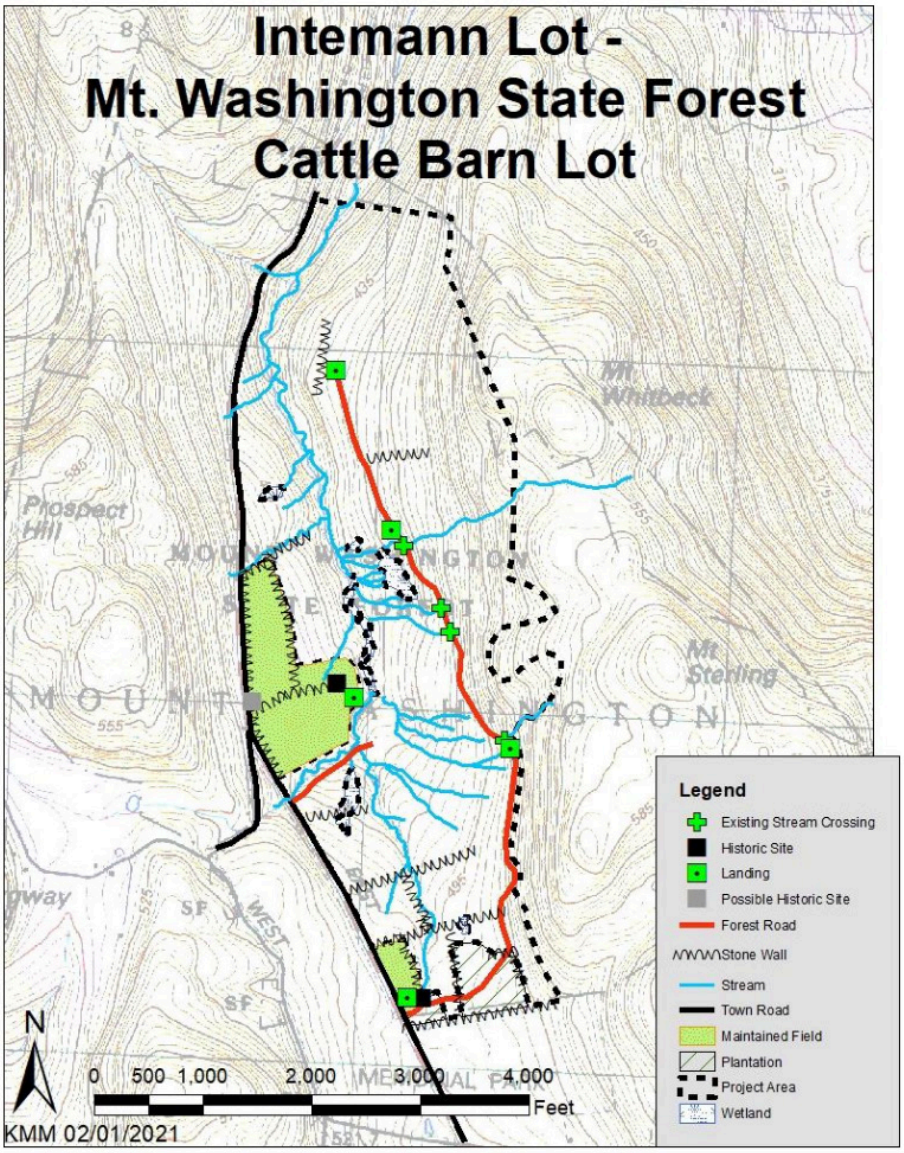


Fig. 1: Cattle Barn Lot project area. Source: Massachusetts Department of Conservation and Recreation, Bureau of Forest Fire Control and Forestry. Cattle Barn Lot Forest Management Proposal. June 30, 2021.

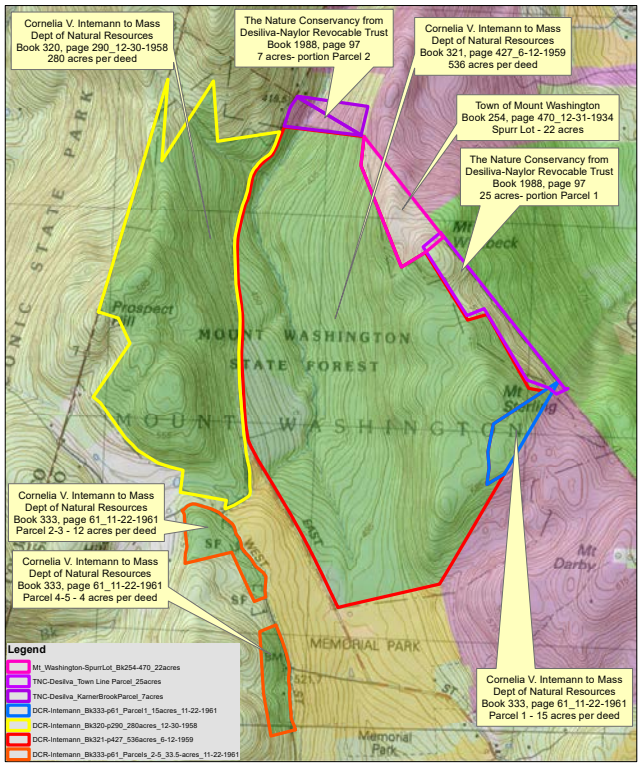


Fig. 2: Cattle Barn Lot project area.

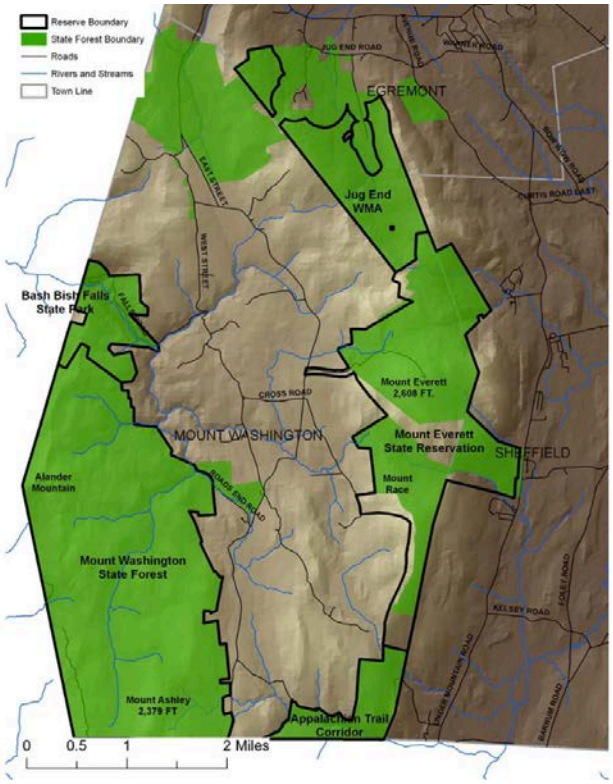


Fig. 3: Intemann land is only large state-owned parcel in Mount Washington not included in Mount Washington Forest Reserve. Source: de la Crétaz, A.L, Kelty, M., and Fletcher, L. 2009. Massachusetts Forest Reserves Long Term Ecological Monitoring Program: Mount Washington Forest Reserve, Massachusetts Executive Office of Energy and Environmental Affairs, Department of Conservation and Recreation, p. 2.

This report shows how the ecological characteristics of the Cattle Barn Lot and surrounding Intemann land meet all the state's criteria for adding land to the Mount Washington Forest Reserve. It makes the case for why adding the land to the Mount Washington Forest Reserve is a more appropriate choice than timber harvesting to help the state meet its climate mitigation goals and preserve other ecosystem functions and services. It describes consequences of logging to the Cattle Barn Lot. It explains the weak economic argument behind the plan to harvest timber there. It outlines deficiencies in the materials DCR produced for the timber harvest. It ends with conclusions and recommendations. This report was prepared by Green Berkshires, Inc. in support of the position of the select board and majority of full-time residents.

PART 3

Background

In 2021, DCR's Bureau of Forest Fire Control and Forestry filed a Forest Management Proposal for the Cattle Barn Lot in Mount Washington, announcing its intent to solicit bids for timber harvests on about 275 acres of the 362-acre parcel.[1] The same day, it released a Forest Restoration Prescription for the property.[2]

In 2022, DCR approved a Forest Cutting Plan for the Cattle Barn Lot, and a copy was sent to the Mount Washington Conservation Commission.[3] The plan entailed two timber harvests: one covering 174 acres and the other 25 acres. An amended Plan released later by DCR omitted the 25-acre area.

On the 174 acres, 458,000 board feet and 350 cords of cordwood are to be removed. Of the total board feet, 58% come from two tree species: sugar maple (121,000 board feet) and white ash (145,000 board feet). **(Figure 4)** The other species to be harvested are red oak, red maple, black and yellow birch, and black cherry. The trees species to be cut for cordwood are not listed. The acreage to be harvested appears to be larger than described because trees are marked for cutting up to 60 feet higher in elevation than stated in DCR's materials. **(Figures 26–27)** A number of trees are marked for cutting but not included in the final board feet tally. The white ash total is likely understated because the Cutting Plan notes that in one 13-acre area all ash will be harvested, both marked and unmarked.[4] So, the total acreage and board feet to be cut are not known to the public.

Products to be Harvested*

Species	Mbf/Cds		Mbf/Cds
White Pine		Red Maple	52.000
Red Pine		Sugar Maple	121.000
Pitch Pine		Red Oak	125.000
Hemlock		Black Oak	
Spruce		White Oak	
Other Sftwd.		Other Hdwd.	
White Ash	145.000	Total Mbf	458.000
Beech		Cordwood (Cds)	350.000
White Birch		SW Pulp (Tons)	
B & Y Birch	10.000	HW Pulp (Tons)	
Black Cherry	5.000	Chips (Tons)	

Fig 4: Tree species, board feet, and cords to be harvested from Cattle Barn Lot. Source: Massachusetts Department of Conservation and Recreation, Bureau of Fire Control and Forestry. Cattle Barn Lot Forest Cutting Plan, December 2, 2022, p. 4 of 6.

In 2023, the office of Governor Maura Healey announced a Forests as Climate Solution initiative. DCR put all its logging projects, statewide, on hold while a Climate Forestry Committee was convened of scientists and foresters to offer recommendations for managing state-owned forests in furtherance of the state's statutory mandates to offset greenhouse gas emissions.[5]

In June 2024, the town of Mount Washington learned that the moratorium had been lifted, and that the plan to log the Cattle Barn Lot had resumed.

A month later, in July 2024, the town's select board sent a letter to the Executive Secretary of Energy and Environmental Affairs and the DCR Commissioner asking for a halt to the logging plan, and consideration, instead, for adding the Cattle Barn Lot to the existing Mount Washington Forest Reserve.[6]

A petition in support of the select board's position was circulated among full- and part-time residents, and at least one adult in 70% of the town's households signed it.

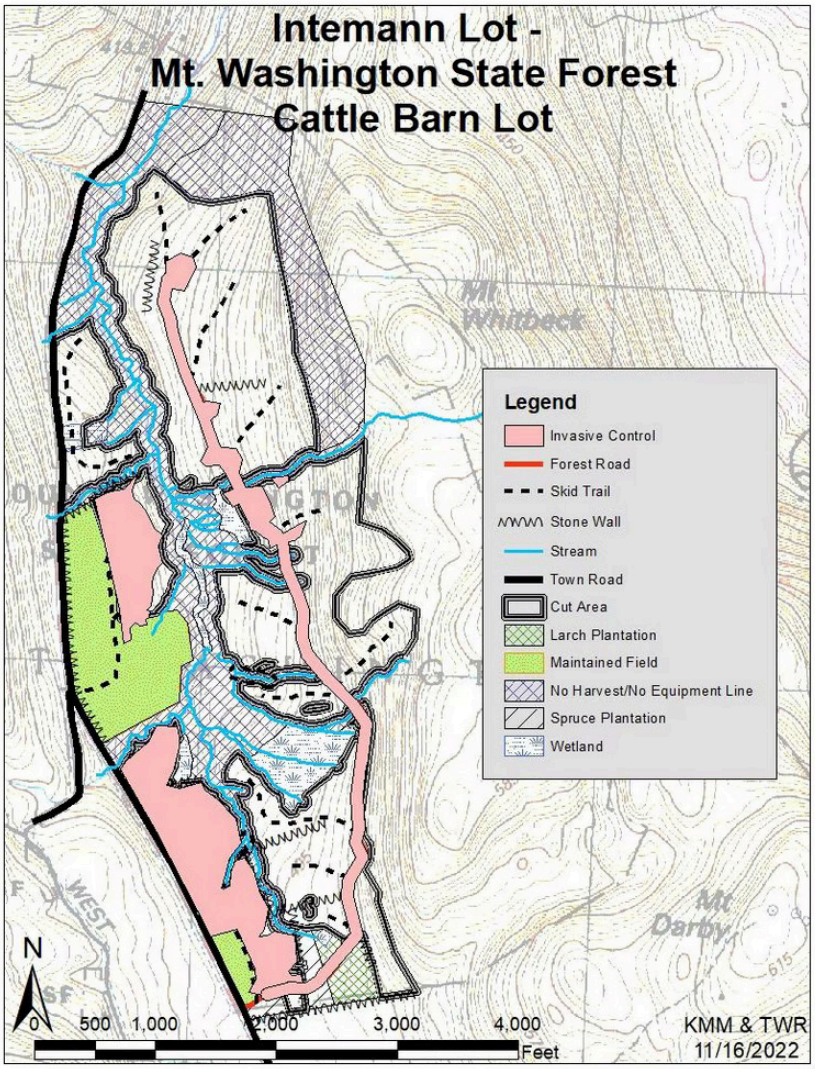


Fig. 5: Cattle Barn Lot areas and old logging road treated with herbicides, shown in pink. Source: https://www.mass.gov/guides/southern-berkshires-forest-management-projects

(A number of second-home owners could not be reached in the brief time allotted to collect signatures.) It was presented to state officials at an August 2024 meeting.[7]

Meanwhile, town residents discovered by chance that within the Karner Brook Watershed two large areas of forest dominated by sugar maple and white ash and an area along an old logging road paralleling Karner Brook had been treated with herbicides, covering an estimated 45 acres in the Cattle Barn Lot. **(Figure 5)** Around this time, a scientist brought attention to the significance of sugar maples in the Cattle Barn Lot.

As a resource for state officials making decisions about the ultimate status of the property, Green Berkshires, Inc., a local nonprofit environmental group, offered to gather information about the ecological attributes of the Cattle Barn Lot. It contracted with scientists to conduct a botanical survey of the Cattle Barn Lot, to investigate the presence of salamanders, to assess the health of the sugar maple forest in the Lot, and to evaluate whether the project area's wetlands and water resources had been mapped adequately. Reports on those four studies were submitted to DCR in early 2025. Green Berkshires hired the New England Water Science Center of the U.S. Geological Survey (USGS) to do a LiDAR scan of the hydrologic features of the Karner Brook Watershed on the South Taconic Plateau, at a 1-meter scale, and the interpretation of that scan is due in March 2025.

Green Berkshires is in the process of hiring an environmental sciences consulting firm to conduct an assessment of the aquatic life in the perennial and intermittent

streams of the Watershed. It plans, also, to hire a hydrogeologist from the same firm.

Beyond the Cattle Barn Lot and the Karner Brook Watershed, Green Berkshires has asked the Woodwell Climate Research Center to produce a map of woody biomass, soil, and wetland carbon across the entire South Taconic Plateau, and to calibrate different carbon densities with historic land uses. This project will begin in the spring of 2025, and a report will be peer-reviewed and issued in 2026.

PART 4

Reasons to Add Cattle Barn Lot to Mount Washington Forest Reserve

4.1

Mount Washington Forest Reserve can be enlarged to help meet Healey Administration's acreage goals for Statewide Forest Reserve System

The Mount Washington Forest Reserve was one of the original forest reserves established by Massachusetts. A report on the Reserve's baseline characteristics was released in 2009.[8]

The Reserve is centered in Mount Washington, with some land in the neighboring towns of Sheffield and Egremont. According to the baseline report, it consists of most of the Mount Washington State Forest (3,630 of 4,585 acres), all of Bash Bish Falls State Park (410 acres), a section of the Appalachian Trail Corridor (350 acres), all of Mount Everett State Reservation (1,650 acres), and two-thirds of the Jug End State Reservation and Wildlife Management Area (780 acres). Altogether, the Reserve acreage is 6,820 acres.[9] As noted earlier, a map in the baseline report shows that none of the Intemann land along East Street is included in the Reserve. **(See Figure 3)**

With certain exceptions, the ages of the trees and forests in the Mount Washington Forest Reserve are not disjunct from those found on the rest of the South Taconic Plateau. There are old-growth Eastern hemlock patches within the Reserve,[10] and a regionally rare dwarf-pitch pine community on the eastern summits of the Reserve,[11] with many tree cores showing ages over 100 years old.[12]

For most of the Forest Reserve, though, at the time of the baseline report, the tree ages ranged between 47 and 116, as measured in the 39 Continuous Forest Inventory (CFI) plots within the Reserve.[13] This is a slightly wider age range than the 65 to 95 year spread for most forests statewide, as noted in the 2020 *Massachusetts State Forest Action Plan*.[14]

Three timber harvests on the land were undertaken prior to the Reserve designation.[15]

4.2

Massachusetts recognizes value of forests to mitigate climate change and for other ecosystem functions and services

The U.S. Forest Service (USFS) estimates that Massachusetts forests store 89 tons of carbon per acre.[16] The Nature Conservancy (TNC) and Massachusetts Audubon Society suggest a higher number, about 100 tons of carbon on the average acre.[17] In either case, our forests have among the highest carbon stocks per acre in New England.[18]

The 2020 *State Forest Action Plan* notes that "the bulk of carbon storage is occurring in Massachusetts forests

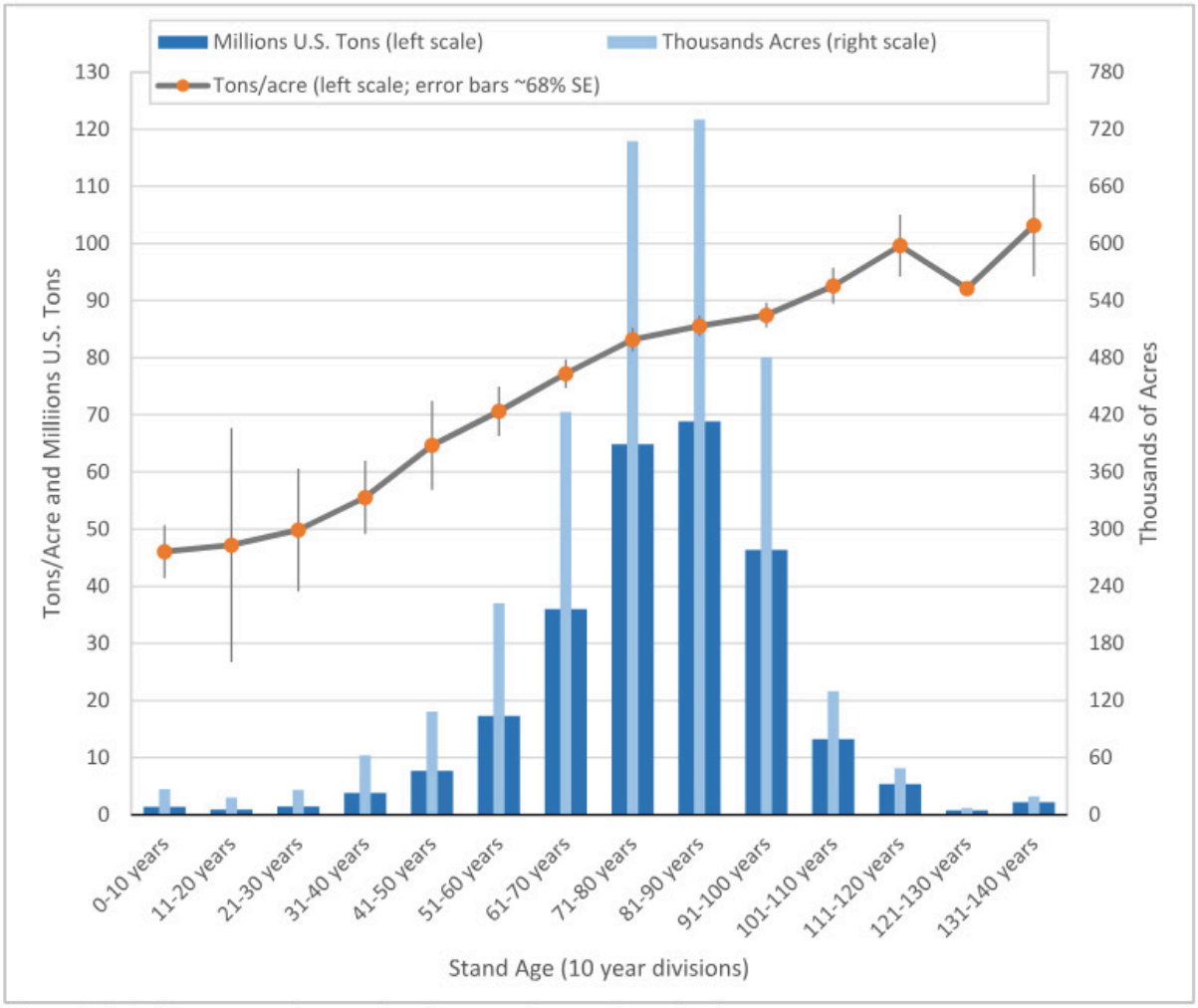


Fig. 6: Carbon storage by age class in Massachusetts forestlands (data: FIA EVALIDator 2018). Source: Massachusetts Executive Office of Energy and Environmental Affairs, Department of Conservation and Recreation, Bureau of Forest Fire Control and Forestry. 2020. Massachusetts State Forest Action Plan, p. 81.

between 70 and 100 years old." **(Figure 6)** The Plan goes on to say: "This suggests that our relatively young Massachusetts forests have considerable potential to sequester additional carbon as they age, mostly in the living biomass and dead wood pools."[19]

In December 2020, Massachusetts released a 92-page decarbonization roadmap to achieve net-zero greenhouse gas emissions by 2050.[20] The roadmap establishes:

> In order to achieve Net Zero, the Commonwealth will need to develop a robust and reliable source of active carbon sequestration – the ability to remove carbon dioxide from the atmosphere and store millions of tons of it each year by 2050 and thereafter. … While both biological and technological processes can sequester carbon dioxide from the atmosphere, and will almost certainly be necessary to achieve Net Zero, forests across the region represent the largest and most locally impactful opportunity to obtain required carbon removal services.[21]

Two years later, in December 2022, the state released a *Clean Energy and Climate Plan for 2050* that lays out pathways to achieve net-zero greenhouse gas emissions by 2050. [22]

The preamble to the chapter on natural and working lands is unequivocal:

> Natural and working lands (NWL) and the ecosystem services they provide must continue to be protected as Massachusetts pursues actions to achieve the Net Zero limit. Carbon sequestration from the growth of trees and the accumulation of organic matter in healthy soils and wetlands provide valuable and cost-effective removal of carbon dioxide emissions and storage of carbon, as well as many other valuable ecosystem services.[23]

In June 2023, the Healey Administration launched its *Forests as Climate Solutions Initiative* "to ensure Massachusetts' forests are managed to optimize carbon sequestration and mitigate climate harms as part of meeting the state's aggressive climate goals."

The accompanying press release quotes Governor Maura Healey:

> The climate crisis is here, and conserving our forests is one of the most important natural climate solutions we can pursue to fight this threat.

Climate Chief Melissa Hoffer is also quoted:

> Forests have to be at the forefront of our climate strategy. Trees can sequester carbon for centuries – we have a responsibility to use the best science to ensure that their potential for carbon sequestration and storage is reflected in our approach.[24]

As part of this Initiative, the administration convened a Climate Forestry Committee of distinguished scientists and foresters to offer recommendations on how forests should be used to advance the state's climate goals.[25]

In January 2024, the *Report of the Climate Forestry Committee: Recommendations for Climate-Oriented Forest Management Guidelines* was released,[26] describing consensus among the committee's members on two key points:

> The Committee strongly agreed that carbon storage is typically greatest in old forests and disproportionately in the largest trees, and that Massachusetts forests can continue to accumulate additional carbon for many decades if undisturbed, thus underscoring the importance of forest reserves for protection of carbon storage."[27]
>
> The Committee generally agreed that passive management would confer greater increases in carbon stocks compared with active management. That is, allowing forests to grow and age through passive management is typically the best approach for maximizing carbon storage.[28]

In June 2024, a *Response to the Report of the Climate Forestry Committee* was issued, with a clear mission for the state:

> To reach net zero by 2050 the Commonwealth will look to forests to sequester approximately half of the projected residual emissions. As such, forests are an essential climate solution to the Commonwealth.[29]

4.3

Massachusetts has committed to increase forest reserve acreage

An early mention of forest reserves in Massachusetts was a short item in the July 28, 2000 edition of the *Berkshire Eagle*:

> Legislation to establish old growth forest reserves in the Commonwealth passed the Senate. Sen. Andrea F. Nuciforo Jr., D-Pittsfield, co-sponsored the bill.[30]

The clip explains that the bill prohibits both active timber management practices and expanded recreational use in those reserves.

In 2002, acting governor Jane Swift signed a law funding the development and management of bioreserves in Massachusetts.[31]

Two years later, in 2004, Massachusetts received certification for its sustainable management of publicly-owned forestland from the international Forest Stewardship Council.[32] It was the first state in the nation to submit its forestry program for this Green Certification.[33] Two conditions of the certification were to identify High Conservation Value Forests[34] and to establish large Forest Reserves.[35]

A year after, in 2005, a group of scientists centered primarily at Harvard University and the University of Massachusetts proposed setting aside 250,000 acres as wildland reserves, mostly on public land.[36]

This was followed in 2006 by an announcement from the Secretary of Environmental Affairs that Massachusetts had designated nine reserves on 50,000 acres, and would establish smaller reserves on an additional 50,000 acres over the next two to three years.[37] The *Boston Globe* carried the story.[38] The purpose of the forest reserves was to increase the diversity of forest habitat and enable forest change through natural succession and natural disturbance.[39] Active management and commercial timber harvests were not permitted.[40] The Mount Washington Forest Reserve was one of the initial nine reserves.[41]

In 2008, DCR announced that 7,149 acres had been set aside for the Mount Washington Forest Reserve,[42] as part of approximately 9,695 acres for Forest Reserves in the entire Southern Berkshire District.[43]

By 2009, as shown in the baseline report produced that year, the acreage for the Mount Washington Forest Reserve had been adjusted down slightly to 6,820 acres (not all of it in Mount Washington.)[44]

In 2010, DCR issued *Forest Futures Visioning Process Recommendations of the Technical Steering Committee*. This report devoted several pages to recommendations for managing forest reserves:

> Supporting natural processes and the resulting biodiversity are the primary ecosystem service goals for large forest reserves.[45]
>
> Management of large forest reserves should allow ecological processes to determine the long-term structure, composition, function, and dynamics of the forest to the maximum extent possible.[46]
>
> …in general the [Technical Steering Committee] recommends forest reserve management with the least amount of human intervention. When in doubt, or where there is disagreement among qualified ecologists and foresters, the default management prescription should be to do nothing (*i.e.*, a 'humble and hands off approach' as prescribed by Foster et al. (2005)). Natural processes, such as disturbance, should be allowed to play out unimpeded by human activities or intervention.[47]

Later that year, the Massachusetts DCR announced that the total area of large forest reserves would be increased from 40,000 to 185,000 acres.[48]

In 2012, DCR produced *Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines*, with a section on forest reserves:[49]

> The primary purpose of setting aside large areas of forest as Reserves is to allow forests to develop relatively unimpeded by human disturbance and to create late successional habitat. Given a sufficient amount of time without major disturbances, the forest will develop characteristics associated with true old growth forest.[50]
>
> The dominant ecosystem service objectives in Reserves will be:
>
> - biodiversity expansion, including complex forest systems;

- carbon sequestration, and;
- provision of wilderness recreation opportunities.[51]

The list accompanying the *Management Guidelines* showed that DCR had set aside 111,227 acres of forest reserves, about 36% of the lands it managed at that time.[52]

For some years afterward, there was not much public discussion about expanding forest reserves.

However, by 2024, the governor's Climate Forestry Committee had brought the topic back to the foreground with a recommendation in its report of expanding the number and size of forest reserves, to "at least 10% of the forest in Massachusetts (of all ownerships)…"[53]

The *Response to the Report of the Climate Forestry Committee*, issued later that year, affirmed the recommendation:

> To realize the carbon, habitat, and other benefits forest reserves provide, the Commonwealth, in collaboration with other forest landowners, will seek to establish reserves on 10% of all the forested land in Massachusetts, about 300,000 acres across all ownerships, as recommended by the CFC. This represents more than a doubling of the amount of land currently held in reserves.[54]

Within a few months, the Healey Administration had launched a grant program to fund acquisitions of land for forest reserves.[55] In December 2024, it announced it had awarded a total of $5 million to 11 organizations, with a 50% match, to add 1,424 acres at 13 sites to the state's forest reserve system.[56]

4.4

Cattle Barn Lot meets all criteria for adding it to Mount Washington Forest Reserve

In its 2012 document *Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines*, DCR established eleven criteria for adding land to forest reserves.

The most favorable units of land for designation as additional forest reserves are those:

1.) with least fragmented tracts of land;

2.) with the highest amount of forest interior;

3.) that are well buffered from development;

4.) that are contiguous with other protected land;

5.) that represent a major ecological setting in the Commonwealth;

6.) that conserve ecological and evolutionary processes;

7.) that are large enough at a regional scale to capture a range of ecological processes;

8.) that provide redundancy within each ecological land unit;

9.) with limited recreational infrastructure;

10.) with a low density of officially designated trails, and;

11.) that contain special attributes, such as old growth or continuously forested sites.[57]

As this report will show, the DCR-owned Cattle Barn Lot in Mount Washington meets all these criteria.

The evaluation criteria used to qualify properties for the 2024 grant program were very similar to those of 2012, but with weighted considerations:

> Landscape considerations (30%) such as the forest's contribution to water quality protection,

connection to existing protected landscapes, proximity to existing State Forest Reserves or other lands managed explicitly for ecological integrity, and overall ecological contribution to intact, interconnected habitats with limited forest fragmentation as identified through BioMap Forest Core, BioMap Landscape Blocks, DEP Drinking Water Supply designations and other GIS data.

Ecological contributions (30%) such as whether the forest supports sensitive wildlife or wildlife habitats, unique natural communities and/or overall biodiversity that is associated with intact forest canopy, forest structural complexity or late seral characteristics.

Size and configuration (20%) of properties. Proposed reserves of a variety of sizes will be considered… Small forested properties that benefit special status species or forest stands that contribute to the overall protection and function of landscape corridors, or core forest habitats will be considered.

Ecological conditions (10%) that are consistent with low levels of past or present disturbance… Forest stands with minimal invasive plant, animal, and/or pathogen populations, or other anthropogenic stressors to ecosystem health present will be prioritized.

Public passive recreational access (10%) is encouraged.[58]

The major differences between the criteria of 2012 and 2024 are that small properties are now considered eligible for reserve status, and public passive recreational access is encouraged. All 13 properties for which grants were awarded in December 2024 are smaller than the Cattle Barn Lot, with two being just 16 acres in size, and the largest 275 acres.[59]

This report uses the 2012 criteria to show how the Cattle Barn Lot and Intemann land meet the general criteria. It will be evident that the properties meet the 2024 criteria, as well.

A forest stewardship plan prepared for Mount Washington in 2024, and partly funded by DCR, provides a general overview of the town's environment:

The Town of Mount Washington is located on the Southern Taconic Plateau of the Appalachian Mountain Range. The plateau and surrounding region are of global ecological significance. It is a watershed for three states and encompasses over 56 square miles of relatively intact forest, stream, and wetland biodiversity. For this reason, the residents of the Town of Mount Washington have made the protection and stewardship of their town's natural resources a top priority.

Regionally, Mt. Washington is a unique and special bastion of relatively intact, conserved forestland. With ~80% of the land here protected from development, it has one of the highest ratios of conserved land in the State, and stands out for its high levels of native plant, insect, and wildlife biodiversity. After the heavy deforestation from charcoaling and colonial times, these woods are now protected, relatively intact, and have high levels of ecological function and connectivity.

Conservation organizations like The Nature Conservancy, The Trustees of Reservations, and the Berkshire Natural Resources Council have worked hard over decades to protect and conserve this impressive amount of land up on the Mountain. Combined with State Forests, Conservation Restrictions, and Wildlife Conservation Easements, this makes Mt. Washington an outstanding example of intact forest with high levels of biodiversity. In our current times of a changing climate and increased forest fragmentation, Mt. Washington is one of the best places in the Commonwealth where we can see intact,

> biodiverse forests and invest conservation resources and planning efforts to help keep it that way.[60]

The 36,000-acre[61] South Taconic Plateau is part of the Taconic Mountains, which run north and south along the western boundary of Massachusetts. The Plateau rises about 1,000 feet (in some places more or less) from the surrounding lowlands that spread eastward to the Housatonic River and westward to the Hudson River.[62] In a booklet on its Berkshire Taconic Landscape Program, TNC writes that at the intersection of Massachusetts, Connecticut, and New York is a "steep-sided mountain plateau that stands like an island amidst gently rolling lowlands."[63] This is the South Taconic Plateau.

4.4.1

Least fragmented tracts of land

The Plateau's perimeter is rimmed with mountains, creating a valley down its center. It is mostly forested, with some fields along the roads. Houses are located for the most part in the central valley.

The town of Mount Washington is the third smallest town in Massachusetts in terms of population, with 144 voters as of April 2024. It is 14,329 acres in size,[64] nearly 59% of which are owned by the Commonwealth of Massachusetts. Additionally, TNC and Berkshire Natural Resources Council (BNRC) own protected land. Numerous property owners have safeguarded their land with conservation easements. Altogether, nearly 79% of the land in town has some form of permanent protection from development.[65] The town has adopted the Scenic Mountains Act. Its recently updated bylaw prohibits construction near water and wetlands except by special permit.[66] And, as has been the case since its first bylaw was adopted in 1970, the town prohibits most commercial operations.[67]

According to the *2020 State Forest Action Plan*: "In western Massachusetts, the largest interior forest tracts are found in the Berkshire Uplands and the Taconic Mountains."[68]

As noted earlier, the Cattle Barn Lot, site of the planned timber harvest, is part of a donation of 847 mostly contiguous acres by Cornelia Intemann to DCR's predecessor agency in the middle of the last century. **(See Figure 2)**

The Intemann land is surrounded by large tracts owned by the Commonwealth, BNRC, the nonprofit Van der Smissen Memorial Trust, and the State of New York. To its east, up on the ridgeline, are two small properties owned by the town of Mount Washington and TNC, respectively. At its north end, it shares a boundary with two small privately-held parcels.

The Cattle Barn Lot and the Intemann land are designated Critical Natural Landscape, as is nearly 96% of Mount Washington.[69] Both properties lie within a large Landscape Block **(Figure 7)** defined by the state:

> Landscape Blocks, the primary component of Critical Natural Landscapes, are large areas of intact and connected forest, wetland, river, and coastal habitat that sustain healthy populations of countless species.[70]

4.4.2

Highest amount of forest interior

The state defines Forest Core: "The most intact forests of Massachusetts, least impacted by development and essential for animals and plants dependent on remote habitat."[71]

It defines forest interior more specifically as forest land that is greater than 100 meters from local roads.[72]

Some of the land to be logged within the Cattle Barn Lot lies along East Street in Mount Washington, but much of the land where the logging will take place qualifies as forest interior, with a somewhat smaller subset labeled Forest Core. The state's BioMap 3 shows Forest Core to the east of Karner Brook, which runs through the center of the Cattle Barn Lot. **(Figure 8)**

A report prepared for DCR explains a key value of interior forests:

> Interior forest provides important habitat: for example, songbird nesting success is greater for some species further from forest edge and the disturbances associated with human dominated areas, which have more opportunistic predators such as raccoons, as well as cats and dogs.[73]

Certain bird species found in the Cattle Barn Lot are known to depend upon interior forest habitat, among them the Scarlet Tanager, Louisiana Waterthrush, and Ovenbird. The Pileated Woodpecker is an interior forest species that requires large trees,[74] and can be heard there in the spring.

Salamanders, too, depend upon forest interiors. A book authored by herpetologist Dr. Michael Klemens and others explains: "A few species are considered forest interior (core forest) specialists, such as the Jefferson salamander [and the] northern spring salamander."[75] Research that he submitted to Green Berkshires, Inc. identifies spring salamanders in the upper Karner Brook Watershed.[76]

Recently, Dr. Klemens wrote:

> Jefferson salamanders have been recorded from the Mount Washington plateau (Bogart and Klemens 1997 and 2008). This is an upland forest species and if a proper search was conducted in the late winter-early spring of vernal pools and swamps in the Karner Brook headwaters it would quite likely reveal populations within the Karner Brook watershed.[77]

The Jefferson Salamander is listed as a Species of Special Concern, protected under the Massachusetts Endangered Species Act.[78]

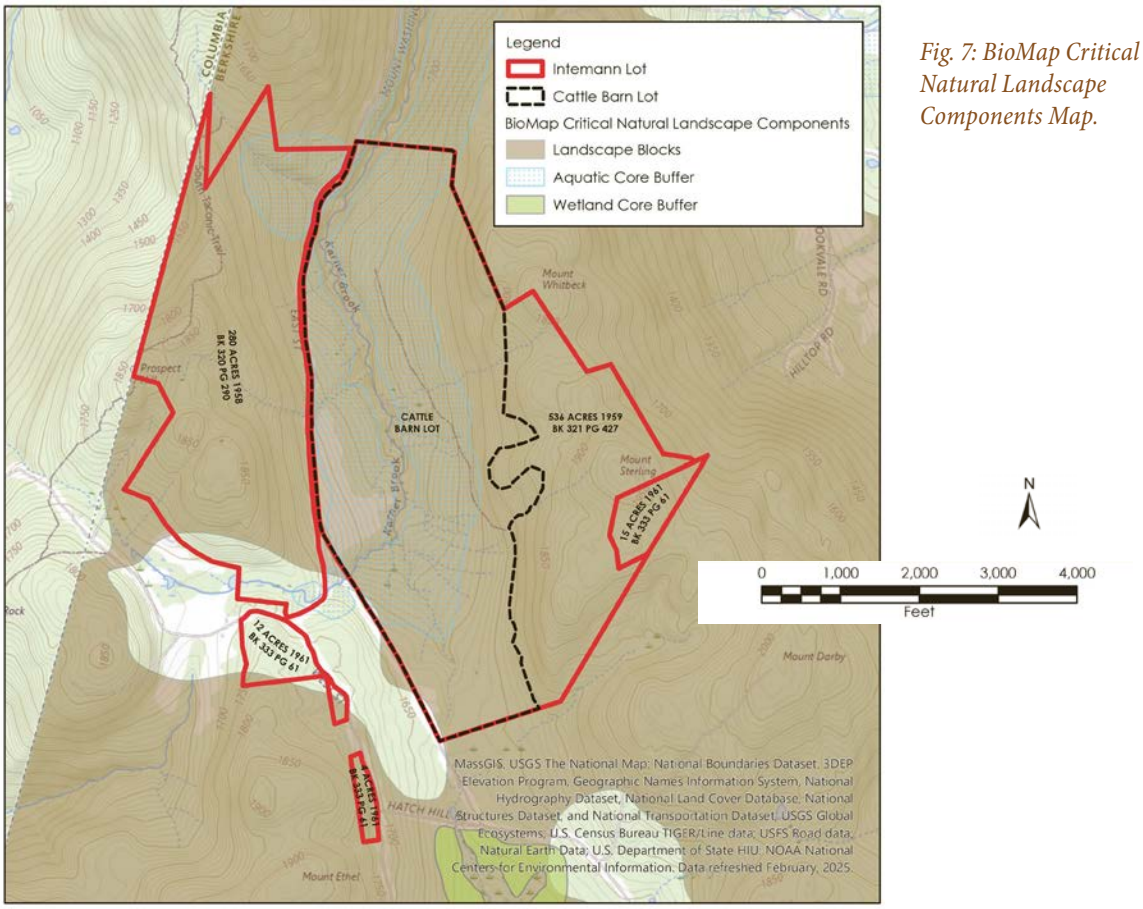


Fig. 7: BioMap Critical Natural Landscape Components Map.

4.4.3

Well buffered from development

The Cattle Barn Lot is unfragmented; mostly forest interspersed with two fields along East Street. It is completely protected within the state-owned Intemann land to the east, west, and north, and by land owned by a nonprofit to the south. There are no house lots adjacent to the Cattle Barn Lot.

The encompassing Intemann land is similarly buffered from development. To the north, it is protected by land owned by TNC. To the northeast, a contiguous parcel is owned by the Town of Mount Washington, known as the Spurr lot. To the east is a small sliver of land owned by TNC. (A deed shows ownership by TNC;[79] the online Massachusetts Interactive Property Map shows BNRC as its owner.) To the southeast is the large Mount Darby parcel owned by BNRC. To the south, it is buffered by the nonprofit Van der Smissen Memorial Trust (established by Cornelia Intemann.) To the southwest and west, the Intemann property is bordered by several privately-owned properties, and, along a long stretch of the west boundary, it borders protected land owned by the State of New York.

4.4.4

Contiguous with other protected land

See 4.4.3.

4.4.5

Represents major ecological setting in the Commonwealth

The Cattle Barn Lot is part of a landscape that is recognized by multiple organizations, including the Commonwealth, TNC, and others as an exceptional ecological

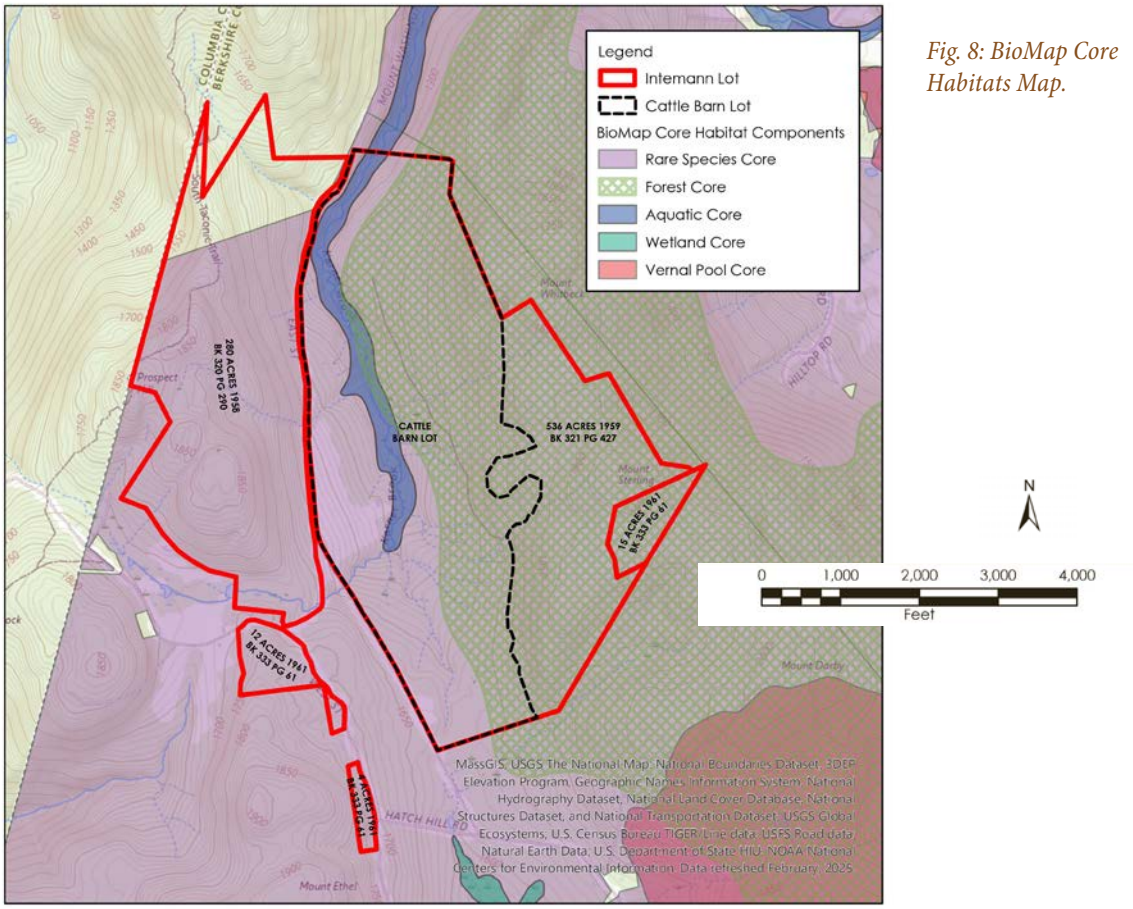


Fig. 8: BioMap Core Habitats Map.

setting in Massachusetts and regionally.

On its Berkshire Wildlife Linkage website, TNC writes:

> The forests of the Berkshire and Taconic Highlands of Western Massachusetts link the Green Mountains of Vermont to the Hudson Highlands of New York, creating a connected corridor of habitat for wide-ranging species such as black bear, moose and bobcat, as well as many other important plants and animals. This geography—known as the Berkshire Wildlife Linkage—has an estimated 75% forest cover and includes the most intact forest ecosystem in southern New England. The Linkage sits within the northern range of the Appalachian Mountains, one of the most resilient, diverse and productive places on Earth.
>
> Forest cores like these often overlap with critical wetlands surrounding streams and rivers, all of which are some of the most resilient to climate change.
>
> This diversity of habitats and ecosystems in such a small area makes the Berkshire Wildlife Linkage among the most important areas in all of New England for long-term survival of rare and endangered species—and all species.[80]

The Massachusetts chapter of TNC created the Berkshire Taconic Landscape Program in recognition of the intact environment of the South Taconic Plateau and its immediate surroundings.[81] The Cattle Barn Lot is at the northern end of the Plateau.

The Commonwealth's BioMap database enumerates the

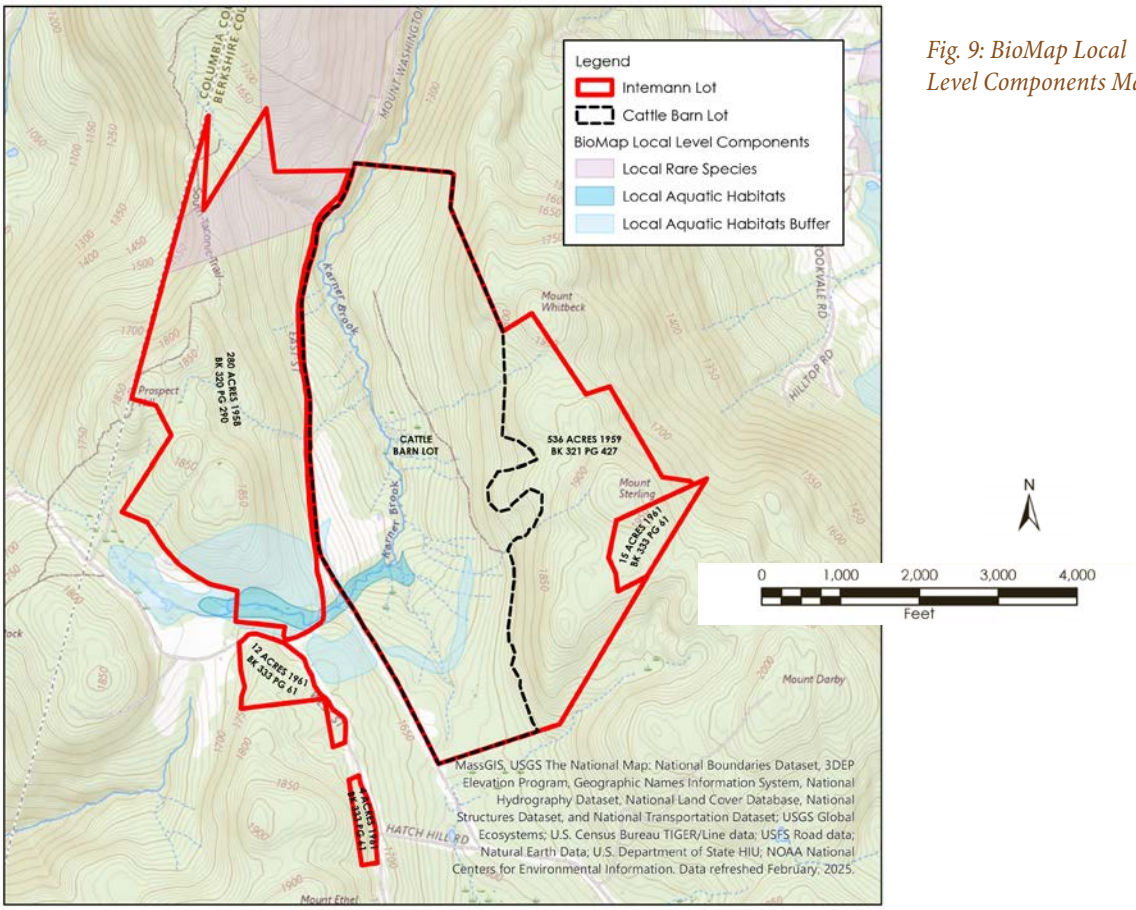


Fig. 9: BioMap Local Level Components Map.

exceptional ecological features in the 14,329.4 acres that comprise the town of Mount Washington. The maps for these features show their specific locations on the Cattle Barn Lot and Intemann land:

BioMap Core Habitat (see Figure 8):
12,782.2 acres

- Percent of Mount Washington Covered by Core Habitat: 89.2%
- BioMap Core Habitat Protected in Mount Washington: 10,701.7 acres or 74.7%
- Rare Species Core: 12,618.9 acres
- Forest Core: 9,237.6 acres
- Aquatic Core: 358.3 acres
- Wetland Core: 130.4 acres
- Vernal Pool Core: 3,244.5 acres
- Priority Natural Communities: 60.5 acres

BioMap Critical Natural Landscape (see Figure 7):
13,551.8 acres

- Percent of Mount Washington Covered by Critical Natural Landscape: 94.6%
- BioMap Critical Natural Landscape Protected in Mount Washington: 10,797.7 acres or 75.4%
- Landscape Blocks: 13,454.5 acres
- Aquatic Core Buffer: 1,711.6 acres
- Wetland Core Buffer: 314.2 acres

BioMap Local Components (Figure 9):
2,797.8 acres

- Percent of Mount Washington Covered by Local Components: 19.5%
- BioMap Local Components Protected in Mount Washington: 1,865.8 acres or 13.0%
- Local Landscapes: 0.0 acres
- Local Wetlands: 18.0 acres
- Local Wetland Buffer: 115.1 acres
- Local Rare Species Core: 131.0 acres

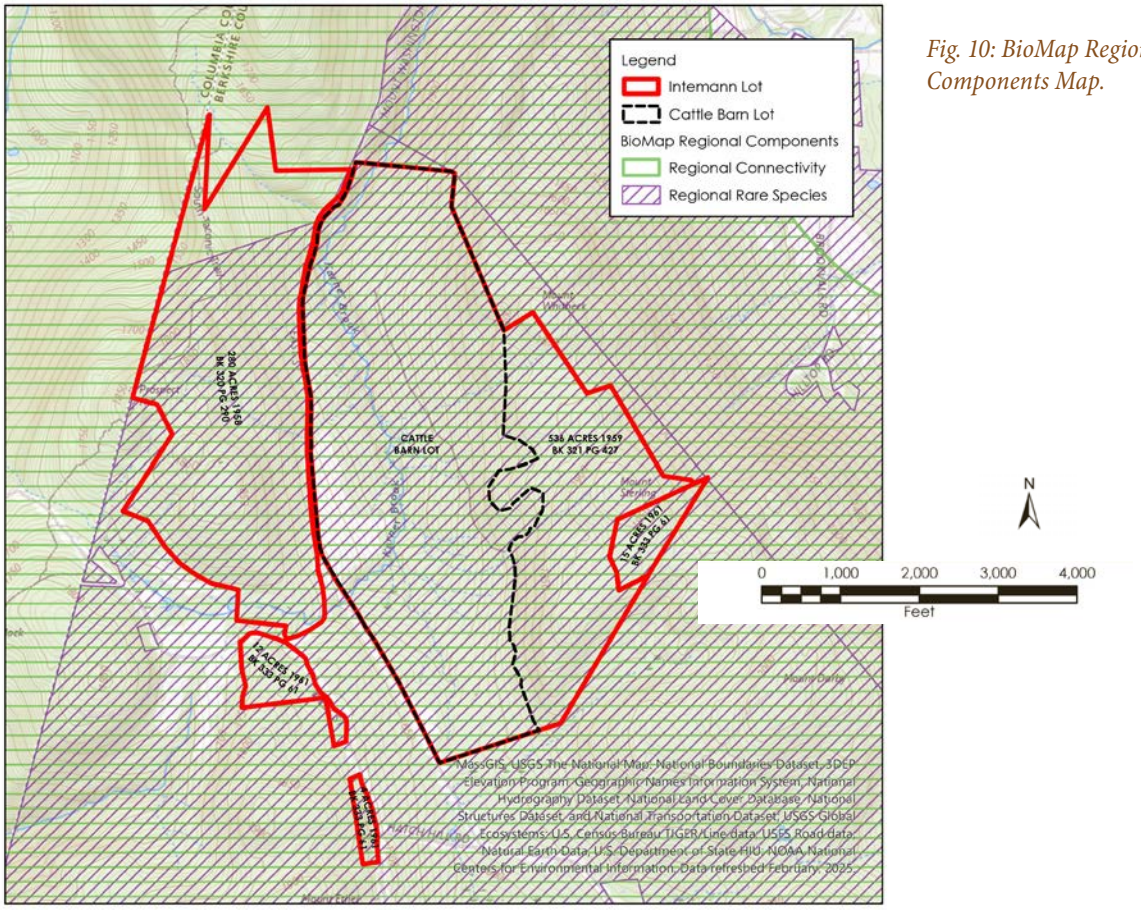


Fig. 10: BioMap Regional Components Map.

BioMap Regional Components (Figure 10): 14,329.4 acres

- Percent of Mount Washington Covered by Regional Components: 100.0%
- BioMap Regional Components Protected in Mount Washington: 11,003.1 acres or 76.8%
- Regional Connectivity: 14,329.4 acres
- Regional Rare Species Core: 12,598.6 acres.[82]

The Cattle Barn Lot lies within the Karner Brook Watershed. The area is part of the Karner Brook Watershed Area of Critical Environmental Concern (ACEC) **(Figure 11)** and is mapped by the state as Priority Habitat of Rare Species, and Estimated Habitat of Rare Wildlife. **(Figure 12)**

4.4.6

Conserves ecological and evolutionary processes

The Cattle Barn Lot and Intemann land lie on both sides of Karner Brook, and are within the Karner Brook Watershed. The Brook and the intermittent streams that feed into it flow over a geologic substrate called Walloomsac Formation that lies in the valley running north and south through the center of Mount Washington.[83] **(Figure 13)**

Karner Brook flows northward off the Plateau through a steep gorge into the lowlands of the Egremont valley. The Brook supports fish species that are listed as Species of Greatest Conservation Need in the Massachusetts State Wildlife Action Plan: Blacknose Dace, Slimy Sculpin, and native Brook Trout.[84] Brown trout are also found there.

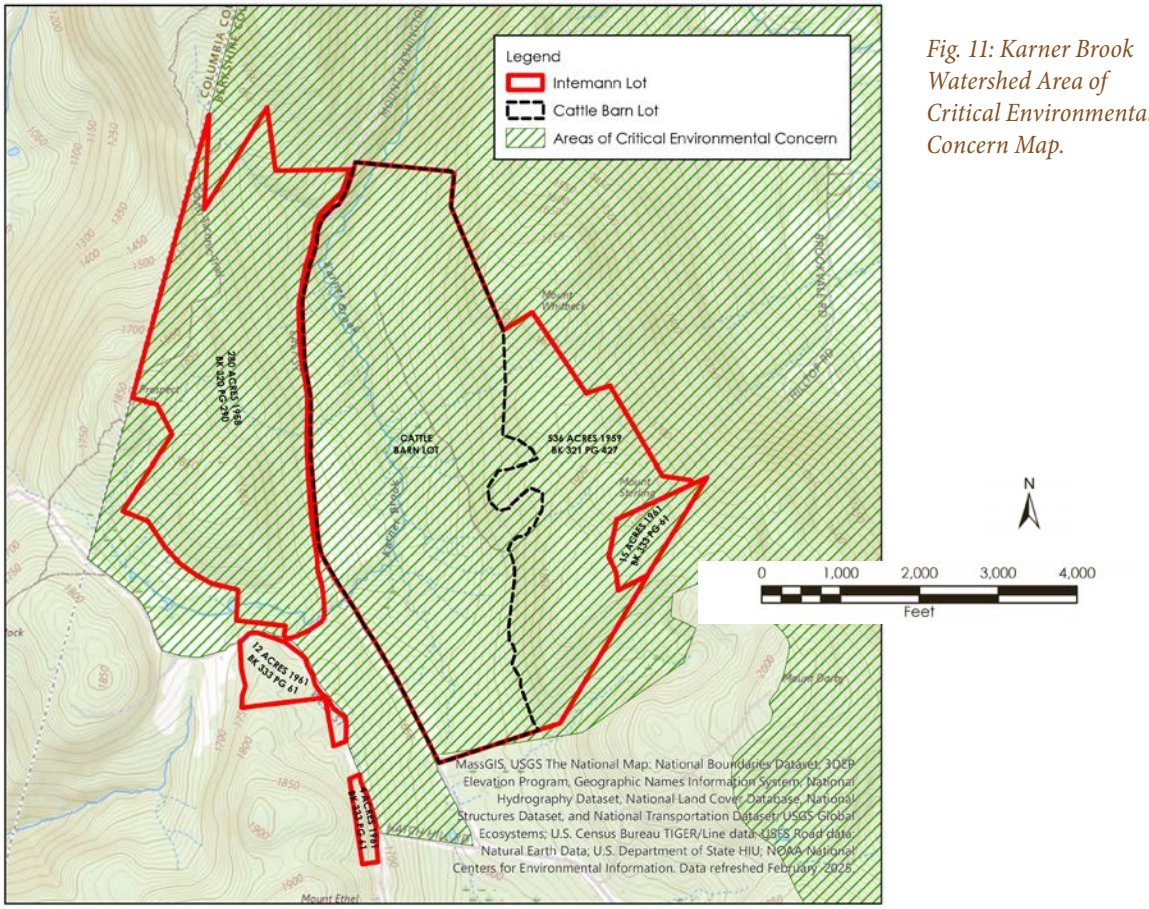


Fig. 11: Karner Brook Watershed Area of Critical Environmental Concern Map.

According to the Karner Brook Watershed ACEC nomination proposal:

> In 1985, the Department of Fisheries and Wildlife conducted a fish count for Karner Brook that recorded the presence of blacknose dace and slimy sculpin. The slimy sculpin is known as an indicator fish that can survive only in cold, clean, well oxygenated water. In addition to these species, both Karner Brook and Fenton Brook support large reproducing populations of brook trout and brown trout.[85]

According to MassWildlife:

> In Massachusetts, Brook Trout inhabit flowing, highly oxygenated, cold-water streams. Brook Trout have more rigid temperature requirements than do Brown Trout, Rainbow Trout, or Atlantic Salmon. They generally do not tolerate water temperatures exceeding 68°F for extended periods of time. Studies in Massachusetts indicate that the optimum range for maximum activity and feeding is 55°-65°F. Stream populations spawn over gravel riffles composed of coarse sand or stones up to 4 inches in diameter.
>
> Any activities which decrease water quality, increase temperature or cause siltation of spawning habitat are detrimental to this sensitive species. Some populations rely on springs as refuge areas during the warmest periods of the year; if the flow of such springs is altered or reduced, it may result in the loss of the population.[86]

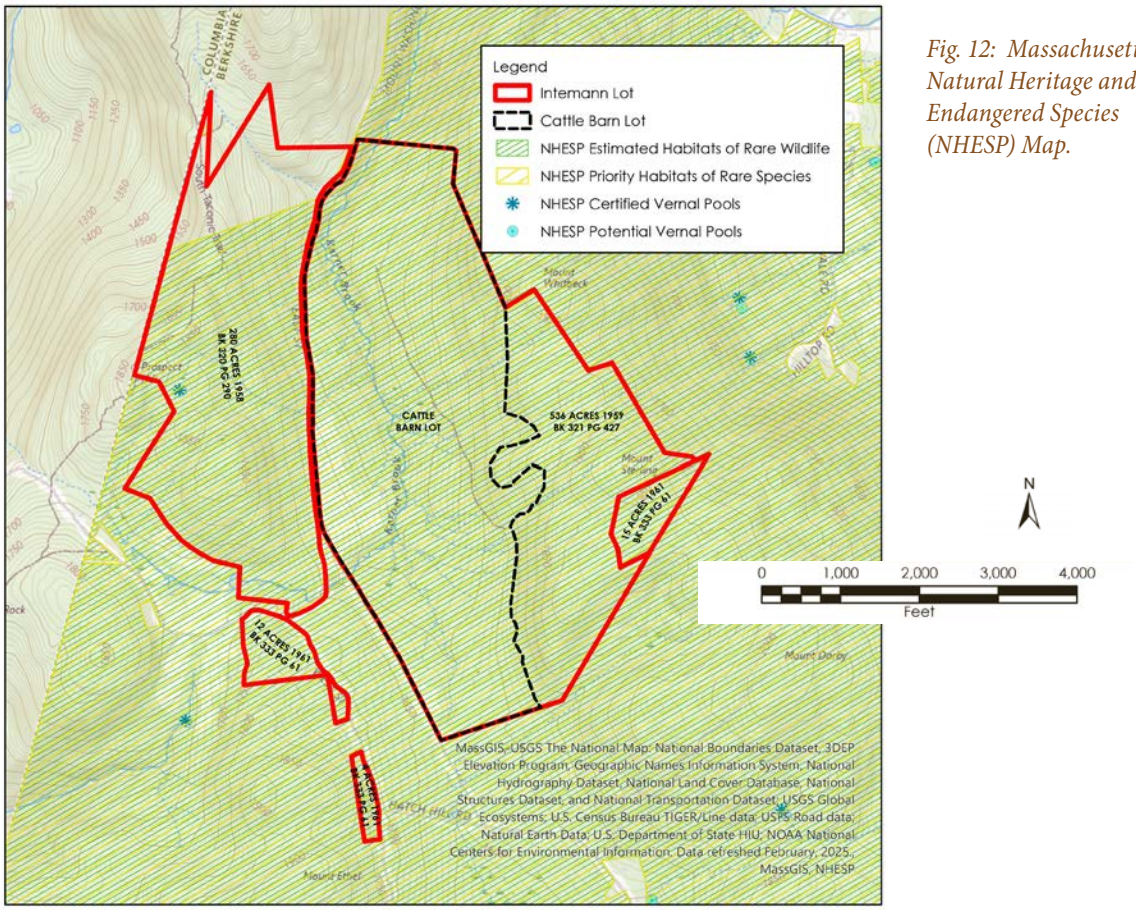


Fig. 12: Massachusetts Natural Heritage and Endangered Species (NHESP) Map.

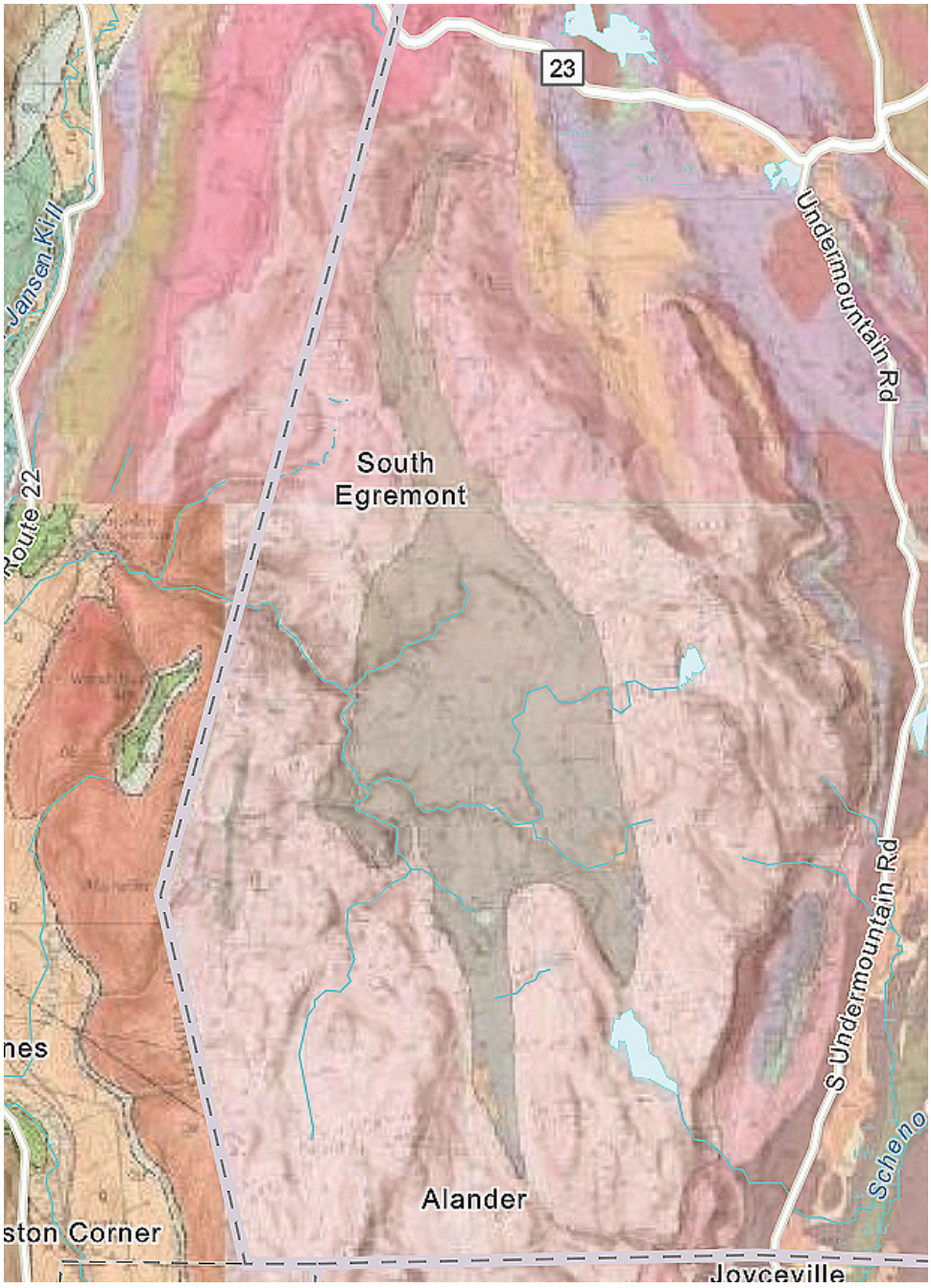


Fig. 13: Surficial geology of South Taconic Plateau, showing Walloomsac Formation under Karner Brook at north end of town of Mount Washington, Massachusetts, and through the town's central valley. Source: U.S. Geological Survey.

The Karner Brook Watershed ACEC designation document spells out the dependence of the lower watershed's wetlands, floodplains, and fens upon Karner Brook:

> The heart of the Karner Brook Watershed ACEC is the surface waters of Karner Brook and its tributaries that rise from the Southern Berkshire Taconic Mountains and adjacent uplands. From its source in the Town of Mount Washington, Karner Brook flows north and east into a system of wetlands, floodplains and fens to Smiley's Pond (identified as Mill Pond on the USGS topographic map).
>
> The largest and most significant wetland areas of the ACEC are located in the Mount Washington Road floodplain area… these wetlands, also

referred to as calcareous fens, are extremely rare natural communities, and provide important rare species habitat.

Calcareous fens are among the most threatened natural communities in the state. [87]

The Brook feeds into Mill Pond, which is an Important Bird Area.[88] As reported in the *Bird Observer*:

Although only Mill Pond is officially designated as an IBA, the Karner Brook Watershed and the watershed's surrounding upland landscape have considerable ecological significance for a number of rare plant and other wildlife species other than birds.

Without question, Mill Pond IBA has been significant for many years for supporting nesting Common Moorhen, a species of special concern in Massachusetts.

In addition to Common Moorhen, Pied-billed Grebe, a threatened species in Massachusetts, has recently been recorded at Mill Pond during the nesting season, and the presence of calling individuals strongly suggests the possibility of local nesting. Virginia Rail, another wetland species preferring cattail-lined ponds such as Mill Pond for nesting, is a regular and common breeder at this IBA.

Despite its small size, the Mill Pond IBA is an important wetland habitat type in a region where

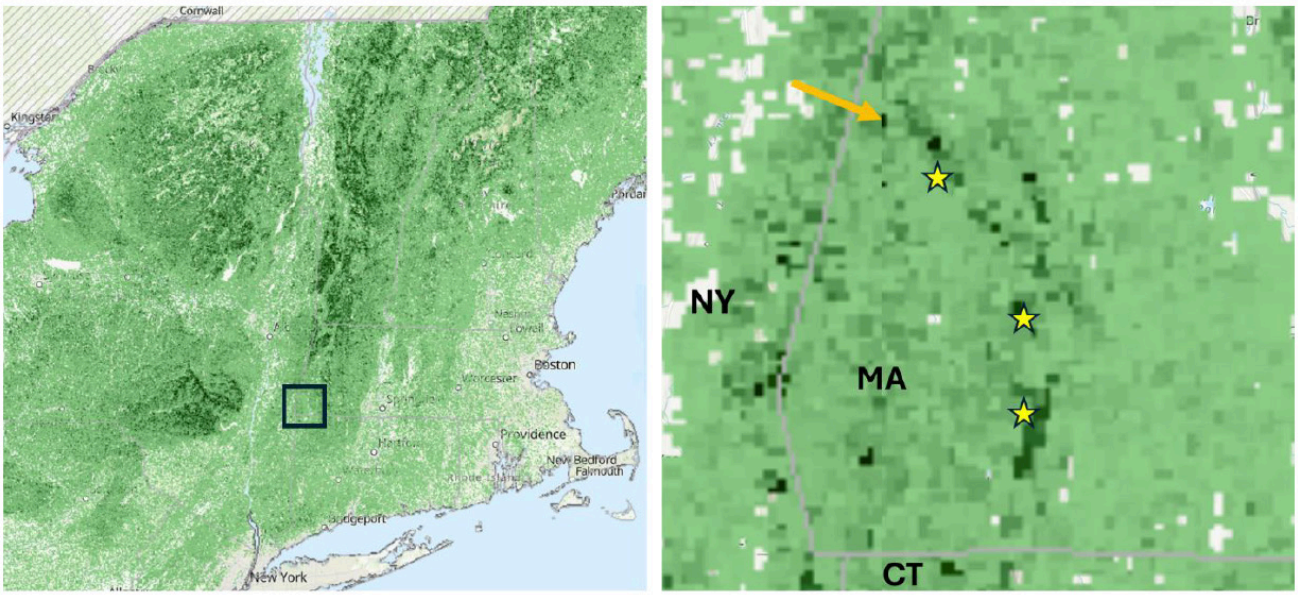


Fig. 14: Contemporary sugar maple abundance—regional abundance (left) and enlargement of the part of the image in the black box in southwestern MA (right). Dark green indicates high abundance of sugar maple, light green indicates low abundance, and sugar maple is absent or present in trace amounts in forests in the grey/white areas. In the image on the right, light grey lines indicate the state boundaries between NY, MA and CT; Yellow stars indicate summits of Mounts Darby, Everett and Race (from north to south, respectively), which are on the eastern edge of the town of Mount Washington; The orange arrow points to the Cattle Barn Lot sugar maple stand (a small dark green pixel). Source: Lee E. Frelich, Ph.D. 2025. Report on the Cattle Barn Lot sugar maple forest, Mount Washington, Massachusetts, p. 5. Prepared for Green Berkshires, Inc.

much of the undeveloped natural landscape is forested. "Pocket wetlands," such as Mill Pond, are especially significant in regions where such habitat is otherwise scarce. Besides hosting breeding freshwater marsh birds, Mill Pond is attractive to a variety of migrating waterfowl, some of which such as Gadwall, American Wigeon, and American Coot are often scarce elsewhere in Berkshire County.

In addition to offering viewing opportunities for various waterbird species, Mill Pond supports healthy populations of beavers and muskrats, an opportunity for comparative studies of these two aquatic furbearers. A number of rare and endangered plant species are also found in the fens associated with the Karner Brook Watershed ACEC.[89]

4.4.7

Large enough at a regional scale to capture a range of ecological processes

The $5 million set aside in 2024 by the Healey Administration for lands to be added to the state's forest reserve total was spent on properties as small as 16 acres, and none larger than 275 acres. All 13 parcels, however, were connected to larger conserved areas.[90] This policy change since forest reserves were first established recognizes the value of smaller parcels connected to larger protected landscapes.

The Cattle Barn Lot and the Intemann land are an inextricable part of the larger ecologically significant landscape, as documented in 4.4.5 above.

Together, these properties represent 847 acres, which, if added to the Mount Washington Forest Reserve, would increase the acreage to 7,667 acres, or 112% of the Reserve's current size.

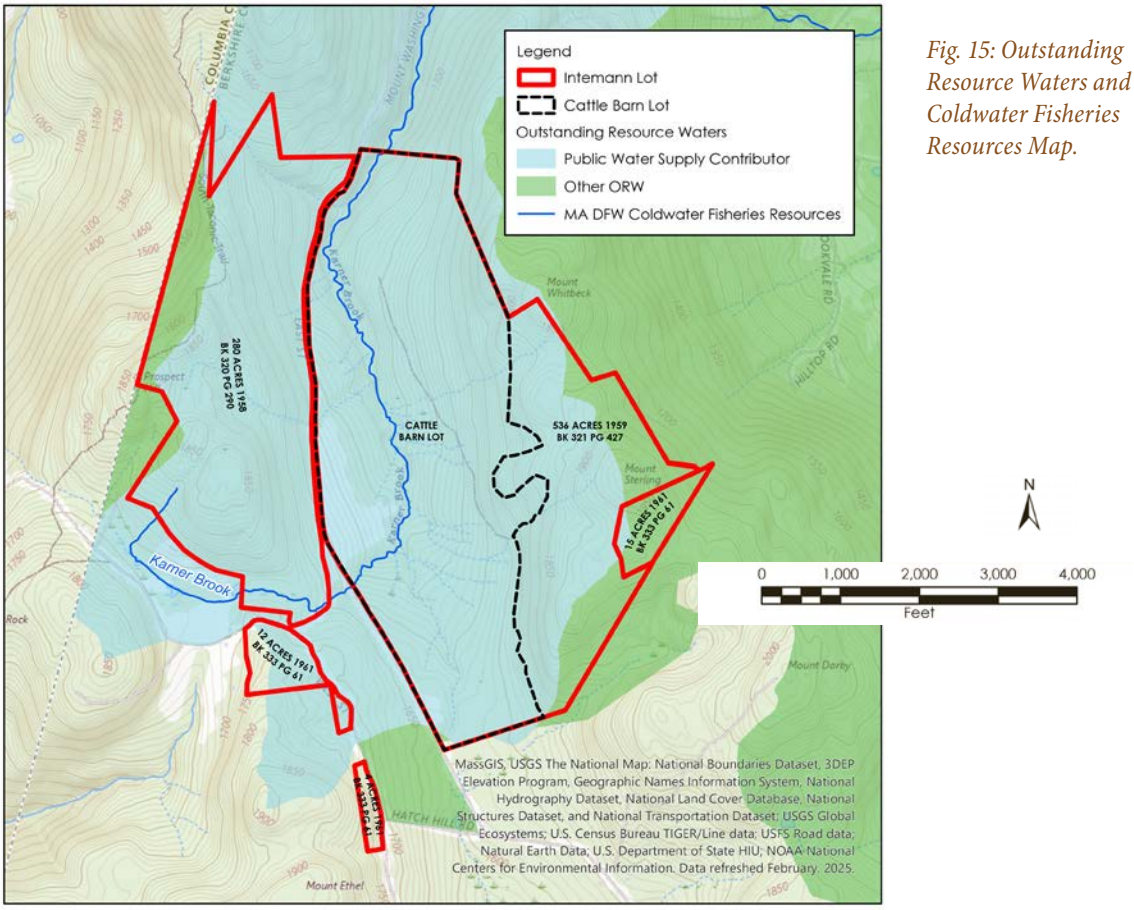


Fig. 15: Outstanding Resource Waters and Coldwater Fisheries Resources Map.

If added to the Mount Washington Forest Reserve, the Cattle Barn Lot, in particular, and the Intemann land, generally, would bring the upper Karner Brook Watershed and all its associated ecosystem functions and services under the umbrella of the Reserve.

4.4.8

Provides redundancy within each ecological land unit

Redundancy has multiple meanings, but the definition that most applies here is that if an area is struck by a natural disturbance, other areas can continue to support biodiversity and ecological functions. In addition to the Walloomsac Formation underlying the center of the South Taconic Plateau from the north almost down to the state line shared with Connecticut, the soil types throughout that center core are fairly consistent, too.[91] Consequently, the tree species mix there is generally consistent, too, consisting primarily of Eastern hemlock and red maple; some oaks, white ash, birches, and black cherry; with occasional white pine, such as are found on the Intemann land.[92]

Sugar maple is not an abundant species in Mount Washington **(Figure 14)** and is seen most frequently as old specimens along roadsides and around private homes. So, the sugar maple forest in the Cattle Barn Lot is a functional ecosystem but does not represent a redundant species in Mount Washington or on state-owned properties within the town. A paper in the journal *Conservation Biology* points out that "functional groups with little or no redundancy warrant priority conservation effort."[93]

4.4.9

Limited recreational infrastructure

There is no recreational infrastructure in the Cattle Barn Lot or the Intemann land.

4.4.10

Low density of officially designated trails

There are no officially designated or blazed trails in the Cattle Barn Lot or the Intemann land.

There are no access trails to any of the surrounding four mountains from the Cattle Barn Lot or the larger Intemann parcel.

Although it's possible to bushwhack through the Cattle Barn Lot and Intemann land, the only open access is an old logging road east of Karner Brook, originating on East Street in Mount Washington. At present, it looks like a path, and it is used by hunters during the hunting seasons.

4.4.11

Contains special attributes

4.4.11.1

Karner Brook Watershed is exceptional

The headwaters of Karner Brook Watershed emerge in a small area defined by Prospect Hill and Mount Fray to the west, and Mount Sterling and Mount Whitbeck to the east. The Watershed land features many wetlands, seeps, and springs, as well as numerous intermittent streams that flow into the perennial Karner Brook. According to the document designating the Karner Brook Watershed as an ACEC:

> It is important to note here that numerous minor and seasonal streams and springs are found throughout the watershed and are an integral part of the hydrology of the area.
>
> Because of the hydrology of the ACEC noted above, all of the surface waters and wetlands located within the ACEC watershed are important to preserving and maintaining the high quality and integrity of the ACEC.[94]

A preliminary report of visits to the Cattle Barn Lot by wetland consultants Stockman Associates LLC amplifies the unusual characteristics of the watershed:

> During the site visits, significant observations were made regarding the water dynamics in several sections of the intermittent streams and

channels. Notably, areas exhibited sustained water flow and saturation. Saturation and inundation were also observed within various wetland and seep habitats. These observations were made despite the prevailing Level 3 Critical Drought conditions that affected the broader region.

This phenomenon illustrates the intricate groundwater hydrology associated with the wetland-stream complex that permeates the entire lot. The ability of these ecosystems to retain water during dry periods speaks volumes about their resilience and connectivity to subterranean water.[95]

The Karner Brook Watershed is the only watershed within Mount Washington that is almost completely surrounded by protected land.

Karner Brook is designated as a Coldwater Fisheries Resource. It is also a Class A Outstanding Water Resource that serves as a public water supply for Egremont. **(Figure 15)** Karner Brook is the only brook in Mount Washington that flows directly through a public water treatment plant.

Karner Brook feeds a regionally rare calcareous fen in the lowlands of Egremont that supports numerous populations of state-listed species.[96]

4.4.11.2

Cattle Barn Lot sugar maple forest is exceptional

4.4.11.2.1

Cattle Barn Lot hosts only sugar maple forest on state land in Mount Washington

The Mount Washington Forest Reserve is dominated by stands of oak hardwoods and hemlock hardwoods.[97] According to the state's 2009 baseline study of the 6,820-acre Reserve, within the Reserve there is a five-acre sugar maple stand located in the Jug End Wildlife Management Area.[98] It is the only sugar maple stand in the Reserve, and it is in Egremont, not Mount Washington. So there are no sugar maple stands on state land within Mount Washington, with one exception: the Cattle Barn Lot.

As will be shown, the sugar maple stand in the Cattle Barn Lot is a special attribute as stipulated in the state's forest reserve criteria list. At approximately 175 acres in size, its uniqueness, large size, resilience, biodiversity, and capacity to mitigate consequences of climate change justify the Cattle Barn Lot's inclusion in the Mount Washington Forest Reserve.

4.4.11.2.2

Cattle Barn Lot is likely climate refugium for sugar maple

During four days in September and October of 2023, botanist Charles Eiseman surveyed the Cattle Barn Lot. In his report, he wrote that the slopes flanking Karner Brook are best classified as Northern Hardwood-Hemlock-White Pine Forest, although both white pine and hemlock are scarce. **(Figure 16)** He observed that sugar maple is the dominant tree species throughout the Lot, with white ash somewhat less abundant. East of Karner Brook, on the slopes higher up Mount Sterling and Mount Whitbeck, he saw a red oak forest.[99]

Mr. Eiseman's observations about the prevalence of sugar maple in the Cattle Barn Lot prompted Green Berkshires to ask noted forest ecologist and sugar-maple expert Dr. Lee Frelich to visit the site, which he did in November 2024. His purpose was to assess the ecological significance, current condition, and threats to the ecological integrity of the sugar maple forest there.

In his subsequent report, Dr. Frelich starts by describing the characteristics of the sugar maple forest in the Lot:

…much of the low-lying areas along Karner Brook are covered with the Northern hardwood-Hemlock-White pine forest vegetation type as defined by the Massachusetts vegetation classification (Swain and Kearsley 2014). Within this forest type is a core stand heavily dominated by sugar maple that lies in the lowlands on either side of Karner Brook.

The sugar maple core stand is second growth and now at the mature even-aged stage of stand development, with relatively evenly spaced large sugar maple canopy trees, with some white ash, black cherry, northern red oak and small amounts of other tree species.

The ecological legacy of the core stand and surrounding area is mostly intact, meaning that the stand was resilient to logging disturbance, able to 'remember' its pre-disturbance condition, and is on a path of recovery rather than divergence to an alternate state (Johnstone et al. 2016). The stand is about halfway through the process of recovering to conditions similar to those present prior to European settlement, after experiencing removal of most of the canopy about a century ago, as indicated by the generally good ecological health of the forest and high level of biodiversity in the core stand (Eiseman 2024).

If left alone, the stand will gradually progress to uneven-aged stages of stand development over the next 100 years, as is typical for old, even-aged sugar maple stands (Frelich 2002).[100]

Dr. Frelich then goes on to describe the landscape context of the Cattle Barn Lot sugar maple forest:

Although sugar maple is widespread in western Massachusetts, stands with high sugar maple dominance, like the core stand in the Cattle Barn Lot, are uncommon in the immediate area. Consequently, surrounded by varied types of oak and pine forests, this sugar maple forest makes a high contribution to local biodiversity within the valley where it sits. Furthermore, the physiographic setting of the core sugar maple stand is unusual at a larger, more regional scale…

An enlargement of the area surrounding the Cattle Barn Lot…shows that the Cattle Barn Lot sugar maple stand…is locally isolated from the other areas with high sugar maple abundance.

Thus, the Cattle Barn Lot sugar maple forest, being in a valley bottom location, grows on a unique landform and is a distinct ecosystem type from the other nearby sugar maple-dominated areas.[101]

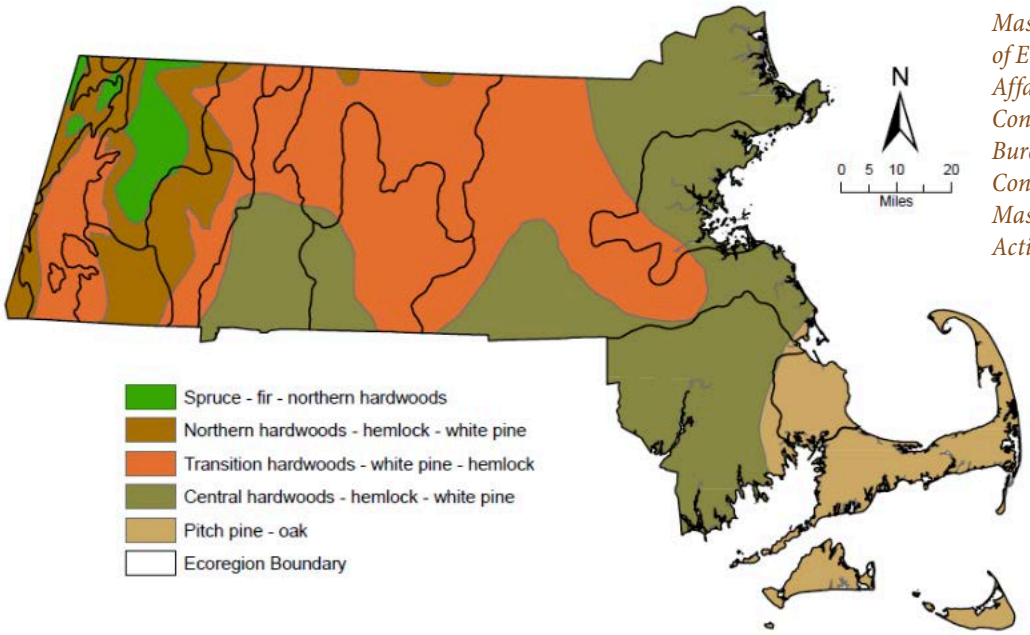


Fig. 16: Massachusetts forest types (modified from Westveld et al. 1956). Source: Massachusetts Executive Office of Energy and Environmental Affairs, Department of Conservation and Recreation, Bureau of Forest Fire Control and Forestry. 2020. Massachusetts State Forest Action Plan, p. 30.

Dr. Frelich continues by describing the unique cooling effects of sugar maple stands in valley bottom locations such as found along Karner Brook in the Cattle Barn Lot:

> Good evidence is presented showing that the cool spot is driven by the abundance of sugar maple. Its dome-shaped crown architecture and horizontal leaf arrangement increase the albedo (near-infrared reflectance by the canopy) and cause high evapotranspiration rates, both of which lead to a cooling effect by sugar maple on the local climate during the growing season. Thus, the cooling effect of sugar maple and their growth on landform positions that are cooler than surrounding areas reinforce each other.
>
> In the Cattle Barn Lot, dome-shaped canopies of sugar maple are clearly visible. It is important to not disturb this crown structure at this time—the large canopy domes have just developed in the last few decades. Moreover, plenty of water is available to the core stand to maintain sugar maple's high rate of evapotranspiration in this valley-bottom location with a brook flanked by slopes, along with intermittent streams and seepages that occur throughout the core stand and surrounding area.
>
> Furthermore, dense shade cast by sugar maple, due to its high LAI (leaf area index) helps to cool the stand, and, finally, cold air drainage and pooling occurs at night in this valley-bottom location which has slopes in all four cardinal directions from the core stand.[102]

Dr. Frelich next explains the role that the Cattle Barn Lot sugar maple forest can play in mitigating climate change:

> The relevance of all of this is that the Cattle Barn Lot sugar maple forest is a likely climate refugium for sugar maple…for forests in a warming climate. As such, the core sugar maple forest should be defended as a refugium from future climate change rather than allowed to undergo a transition by facilitating a conversion to species adapted to a warmer and drier climate such as white and red oak.
>
> A projected increase in precipitation, combined with the valley-bottom location, seepages and high water-holding capacity of the soil in the Cattle Barn Lot sugar maple stand are all consistent with this being a current and future climate refugium location for sugar maple.[103]

He then sums up his conclusion:

> The core sugar maple stand is likely to persist in a warming climate. The crown architecture and leaf arrangement of sugar maple (dome effect) leads to a local cooling effect, and in addition the valley-bottom location is a climate refugium with cold air drainage and pooling, as well as good water supply.[104]

This means that not only does the sugar maple forest in the Cattle Barn Lot have a unique status as the only one on state land in Mount Washington, it also offers a characteristic that wasn't included on the original attributes list for Forest Reserves, but is now front and center to public concern: as a likely refugium, it will help to mitigate climate change, and help the state to meet its climate mitigation agenda.

4.4.11.2.3

Cattle Barn Lot sugar maple forest is climate refugium for other species

A recent report, written by five scientists, including two members of Governor Healey's Climate Forestry Committee, references two major research studies to conclude:

> With heatwave frequency and severity projected to increase, the capacity of forests to buffer

Fig. 17: Northern spring salamander habitat in Karner Brook, September 2024. Source: D. Quinn/Michael W. Klemens LLC.

> against temperature extremes and provide refugia is increasingly recognized as important to sustaining biodiversity in a warming world.[105]

In her preliminary assessment of the wetland resources of the Cattle Barn Lot, wetland scientist Emily Stockman of Stockman Associates LLC addresses the refugium value of the Lot from the vantage of the forest in drought conditions:

> The persistence of hydrological features during times of drought serves as a vital refuge for many wildlife species. It allows them access to critical water sources and habitat that might otherwise be unavailable, highlighting the ecological significance of these areas even in challenging climatic conditions. This ongoing availability of water resources in such habitats not only supports local biodiversity but also plays an essential role in maintaining the overall health of the ecosystem.[106]

Herpetologist Dr. Michael Klemens was hired by Green Berkshires, Inc. to study the salamander populations in the upper Karner Brook Watershed (more or less to the boundary between Mount Washington and Egremont.) Over the course of two days, his team found a vibrant population of 1,567 salamanders of three species in the watershed, a number "unusual when compared to many other areas of Massachusetts and Connecticut."[107] **(Figure 17)**

In his report, he focuses on the Northern spring salamander:

> Spring salamanders were recently delisted in Massachusetts. This delisting may have been premature as climate change modelling by Klemens et al (2021: Conservation of Amphibians and Reptiles in Connecticut) predicts that spring salamanders will undergo a large range retraction in Connecticut and adjacent Massachusetts due to climate change…
>
> If climate change data had been considered in the delisting of the spring salamander in Massachusetts, the precautionary principle, a central tenet of resiliency planning, may well have warranted their retention on the Commonwealth's

list of endangered, threatened, and special concern species.

Suffice to say Karner Brook in its present state provides excellent habitat for this species. Klemens et al (2021) also state that the Taconic Plateau of the tri-State region, because of its size and number of perched swamps, could serve as a refuge for this species as the planet warms. The high elevation perched wetlands in the Town of Mount Washington are integral to maintaining the cold groundwater fed seepages that coalesce and form the headwaters of Karner Brook.[108]

So, the Karner Brook Watershed offers a ecosystem function not just as a refugium for species serviced by the characteristics of the sugar maple forest, but more generally for amphibian and other species that depend upon – in the words of Dr. Klemens – "…the mature forested habitat, steeply graded and shaded ravine, stable cool water temperatures, and the presence of numerous tributary streams and seeps."[109]

4.4.11.2.4

Sugar maple seedlings absorb more carbon dioxide

A special attribute of sugar maple seedlings is worth mentioning here.

In their book *Forests in Time*, forest ecologists Dr. David Foster (a member of the governor's Climate Forestry Committee) and Dr. John Aber write that studies conducted at Harvard Forest demonstrate that late-successional tree species like sugar maple show the most growth in response to the presence of atmospheric carbon dioxide. After a single growing season, among seven species of seedlings, sugar maple grew much faster than any of the other six species in the presence of atmospheric carbon dioxide.[110] **(Figure 18)**

4.4.11.2.5

Sugar maple forest exhibits robust resiliency

In his report, as excerpted above, Dr. Frelich explains ways the Cattle Barn Lot sugar maple forest is resilient in the face of climate change. It has other indicators of resilience, as well.

Here is a useful definition of resilience:

> In an ecological sense, resilience describes the persistence of ecosystem structure and function in the face of changing conditions. Ecosystems are characterized as having high resilience if they maintain structure and function following disturbance… some studies suggest that biological diversity (and in particular functional redundancy) positively influences ecosystem resilience.[111]

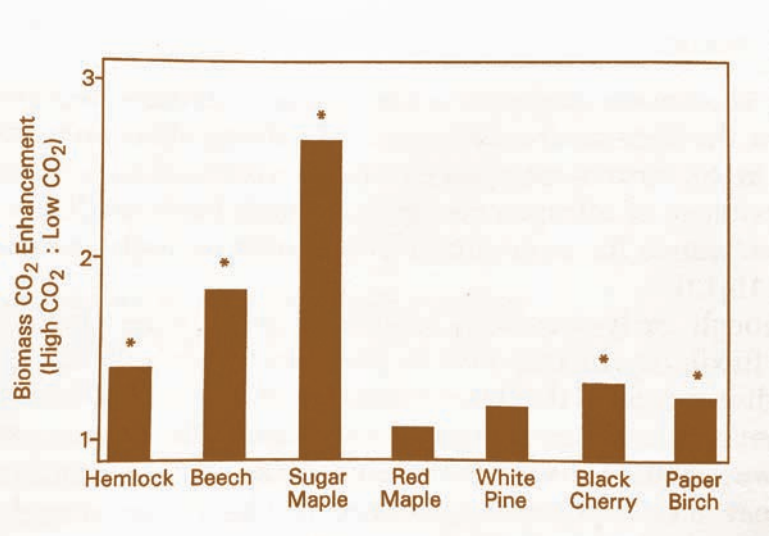


Fig. 18: Carbon dioxide enhancement ratios of total seedling biomass after one growing season; temperate forest species ranked from left to right in order of decreasing shade tolerance. Asterisks designate significant differences between growth at ambient and elevated carbon dioxide for that species. Data from Bazzaz et al. 1990. Source: David R. Foster and John D. Aber, Editors. Forests in Time: The Environmental Consequences of 1,000 Years of Change in New England (New Haven: Yale University Press, 2004), p. 334.

The Cattle Barn Lot sugar maple forest is well-adapted for its environment. TNC's booklet on its Berkshire Taconic Landscape Program has an apropos quote about trees:

> Trees always thrive best amid the conditions they have chosen for themselves, through many years of selection and elimination. Jens Jensen, 1939.[112]

The Karner Brook Watershed is laced with intermittent streams, channels, wetlands, springs, and seeps that support an environment suitable for sugar maples. According to the U.S. Department of Agriculture's (USDA) online resources: "Sugar maple…typically grows best on deep, moist, fertile, well-drained soils. Sugar maple is commonly associated with alluvial…soils."[113] The trees are perched up on the streambanks, above the water table, and are "relatively deep-rooted, with many extensively-branched laterals"[114] that stabilize both the trees and the banks.

It is their affinity for these conditions that enable sugar maple forests to be resilient under drought conditions. In the fall of 2024, a drought extended for several months throughout the region, eventually being classified as a Level 3 Critical Drought.[115] Despite it, wetland scientist Emily Stockman and forest ecologist Dr. Lee Frelich saw and described a sugar maple forest with cool, moist soils.

The sugar maple species is also resilient under the dominant type of natural disturbance that occurs in this region.

DCR's 2009 baseline report for the Mount Washington Forest Reserve states: "The most common natural disturbances in this area are windstorms (hurricanes), snow and ice, insects, and disease."

According to the USDA, "[e]xcept for bud losses, sugar maple is not highly susceptible to insect injury and serious outbreaks are not common."[116] There were apparently a couple of significant ice storms in the first half of the 20th century, but none recently.[117] A study of the landscape and regional impacts of hurricanes in New England found that between 1620 and 1997 no major hurricanes passed over the South Taconic Plateau.[118] None have swept through here since.

The 2009 DCR report notes "there is no record of wind damage" from the 39 forest monitoring CFI plots in the Reserve.[119] (CFI plots were first established on state land in 1957.) Nonetheless, Dr. Charles Canham, forest ecologist and senior scientist at the Cary Institute of Ecosystem Studies, writes that severe winds are the most common natural disturbance in northeastern forests.[120]

During their investigation of old-growth sites in western Massachusetts, including here on the South Taconic Plateau, researchers Dr. Anthony D'Amato and Dr. David Orwig found the dominant natural disturbance regime here to be relatively frequent, low-intensity events such as windstorms that create "small, isolated canopy openings resulting from the death of single canopy trees or small groups of trees."[121]

Sugar maples trees are resilient because they are very shade-tolerant.[122] They have a leaf structure that maximizes light capture in low-light environments.[123] Just as important, though, their seedlings and saplings are also shade-tolerant and can thrive under the closed canopy of a mature forest. A plant guide from the USDA's Natural Resources Conservation Service notes a distinction between sugar maple seedlings in young stands (such as after a timber harvest of the type planned by DCR for the Cattle Barn Lot) and in more mature forests:

> Sugar maple is shade-tolerant but seedlings in dense young stands may survive for only 5 years; those in older stands commonly persist for many years. Such a bank of abundant seedlings and saplings can remain suppressed until gaps are created by windfall or other disturbances, where they typically respond vigorously and rapidly to release.[124]

Dr. Canham wrote a paper about his research on the adaptation of sugar maples saplings in an old-growth forest in the Adirondacks:

> [One] distinct pattern of growth by which individuals of shade-tolerant tree species reach canopy height…depends on the recognized ability of shade-tolerant species to persist as suppressed saplings beneath a closed canopy and respond to periodic openings in the canopy created by the death of overstory trees.[125]
>
> …even small, single-tree gaps can have a significant effect on growth rates of saplings of *Acer saccharum* [sugar maple] in a relatively large area of the understory.[126]
>
> The ability to withstand suppression appears to be an essential trait for a life history that allows *Acer saccharum* to exploit the relatively short-lived pulses of resources created by small canopy openings.[127]

A study of factors contributing to poor sugar maple regeneration after timber harvests found: "Canopy gaps form naturally due to mature-tree mortality from old age, windfall, lightning, diseases, and insects, but the primary mode by which these gaps are created in many managed forests is tree removal from selection harvesting."[128] The Harvard Forest study cited in *Forests In Time* shows that sugar maple seedlings don't respond well to larger gaps:

> Sugar maple seedling performance decreased with increasing gap size. Shoot growth and percent seedling survival were both greater in the understory than in canopy gaps…[129]

The seedlings in the Harvard Forest study were grown without competition from other species such as hay-scented fern so it was the direct influence of the change in environment that reduced growth and survival—greater light, increased temperatures, and perhaps a combination of temperature and greater air movement increasing drought stress.[130]

The significance here is that, unlike pioneer, i.e. early successional, species such as paper birch, sugar maple does not depend upon larger disturbed openings in order to take root and mature. (Dr. D'Amato and Dr. Orwig found no historical evidence of stand-replacing natural disturbances here that would otherwise clear a landscape to make it suitable for pioneer species habitat.)[131] Sugar maple does best in an environment of natural disturbances. Under these conditions, trees exhibit resilience at a stand level. Saplings will survive for long periods of time under a closed canopy, and will take advantage of periodic, small canopy gaps caused by natural disturbances like storm events to eventually reach canopy height. If left alone, they will mature, and eventually develop old-growth characteristics, with the potential to survive for several centuries.

A study looking at forest diversity and ecosystem functioning concludes: "…it is probable that natural forests are more resistant and more resilient to wind damage because of their mixed structure due to variations in age and species."[132]

In general: "Natural disturbances can enhance the structural heterogeneity of forests, create habitats for species-rich assemblages of high conservation value and increase the long-term resilience of forests to future stressors."[133]

In a forest protected from timber harvests and shaped by natural disturbances, a late-successional species like sugar maple can survive for 300 to 400 years.[134]

According to the *Southern Berkshire District Forest Resource Management Plan*:

> The desired condition for the Forest Reserves are late-successional native forests where forest succession and natural disturbances are allowed to proceed relatively free of human intervention.[135]

4.4.11.2.6

Sugar maple forest supports biodiversity

The dominance of sugar maple and white ash in Karner Brook Watershed indicates that the site is richer in nutrients.[136] Unlike many plants, the leaves of sugar maple typically contain relatively high levels of calcium, magnesium, and potassium when shed in autumn.[137] Sugar maples generate heavy leaf litter,[138] and their leaves decompose quickly on the forest floor. In fact, their decay rate is among the fastest of any species in northern hardwood forests, second only to red maple.[139] Thus, sugar maples offer robust nutrient cycling, returning nutrients to the soil, and providing a rich soil for other plants.

The USDA's online encyclopedia notes that the roots of sugar maple take advantage of not only ectotrophic mycorrhizae (fungi that wrap around the roots and enable an exchange of nutrients between the tree and the fungi), but also endotrophic or arbuscular mycorrhizae (fungi that penetrate the cells of the tree's roots and help it absorb nutrients from the soil).[140] So, the sugar maples foster mycorrhizal networks that support their own resilience, and benefit other species.

Sugar maples also contribute to the resilience and biodiversity of a forest by hosting birds, animals, and insects. In his book, Dr. Canham makes the point: "The accelerated rate of decay of maple leaves creates an entirely different forest floor habitat for vertebrates and invertebrates that live there."[141]

In his report, Dr. Frelich writes:

> Within the area of interest, large sugar maple stands like that found in the Cattle Barn Lot are locally rare, since the stand is surrounded by a variety of oak and oak-pine forests. Therefore, this core stand contributes to the high level of local biodiversity, by hosting a number of species with high fidelity to the sugar maple forest type. Furthermore, the core stand is in a physiographic setting that is unusual for sugar maple more broadly across the landscape.

A USDA website describes the birds and animals that use sugar maple trees:

> Numerous species of songbirds nest in sugar maple. Cavity nesters such as the black-capped chickadee excavate nest cavities or utilize preexisting cavities. The common flicker, pileated woodpecker, and screech owl also nest in maples.[142]
>
> Sugar maple is commonly browsed by white-tailed deer [and] moose. … The red squirrel, gray squirrel, and flying squirrels feed on the seeds, buds, twigs, and leaves of sugar maple. The porcupine consumes the bark and can, in some instances, girdle the upper stem.[143]

Sugar maples don't need insects to pollinate. They appear to be pollinated by wind, instead, but, as noted by the USDA plant guide, "the early-produced pollen may be important to the biology of bees and other pollen-dependent insects because many insects, especially bees, visit the flowers.[144] (Some sugar maple seed may also be dispersed by water.)[145]

The sugar maple forest in the Cattle Barn Lot has all the characteristics of a stable, resilient ecosystem, that, left undisturbed, will mature into a forest with old-growth characteristics. In the absence of human-caused disturbances, sugar maples have been documented to live to 300 or more years of age.

4.4.11.3

Left alone, Cattle Barn Lot will develop old-growth forest characteristics

In his report, Dr. Frelich writes:

> The core sugar maple forest in the Cattle Barn Lot is a FOG (future old growth) stand of sugar maple with a largely intact ecological legacy, that, if left alone, will develop via natural stand development processes into secondary old growth with many features of primary old growth forest.[146]

In a subsequent email, Dr. Frelich addresses the assertion by DCR foresters that even-aged trees in the Cattle Barn Lot forest warrant selective harvesting to create an uneven-aged stand:

> [F]orest managers think they can accelerate the development of uneven-aged conditions by creating gaps in the canopy via logging (in my book making the demographic transition from even aged to uneven aged). However, all sugar maple stands will get to that stage on their own, and in this case the damage caused by spreading the earthworms into the stand via logging equipment is not worth getting to an uneven-aged condition faster. That damage consists of disrupting mycorrhizal associations, leaching loss of nutrients (N, P, K, Ca, Mg), soil erosion, and more extreme soil temperatures--warmer and drier in summer and colder in winter--that are stressful for sugar maple, and wiping out the standing crop of tree seedlings and many native plant species.[147]

Forest ecologist Dr. Edward Faison concurs:

> Unless the primary goal is to manage a forest for wood products, there is no need to do this. Forests develop vertical diversity over time on their own and grow just fine without management. Following single tree falls and other mortality from natural disturbances, understory trees will respond and grow more vigorously. Management simply speeds up a process that would occur naturally, and it comes at a considerable loss to carbon stores and other ecological attributes.[148]

PART 5

Responses to DCR's Reasons to Log Cattle Barn Lot

The three documents issued by DCR for the Cattle Barn Lot project and an explanatory sign at the entrance to the logging road itemize numerous goals for the timber harvest plan:

1.) To create a young forest habitat to benefit game birds and other foraging wildlife;[149]

2.) To increase resistance and resilience of trees and forests to mitigate and adapt to effects of climate change;[150]

3.) To diversify the landscape,[151] and manage forest ecosystem health and biodiversity;[152]

4.) To maintain and enhance soil and water resources;[153]

5.) To control invasive plants;[154]

6.) To salvage and pre-salvage dead and dying white ash to capture their potential lost value, and;[155]

7.) To provide raw materials for the local wood products industries.[156]

5.1

DCR wants to replace sugar maple forest with habitat for game birds and prey animals

On page 3 of DCR's Forest Restoration Prescription is the following information:

- Wildlife Specific Management: Yes;

- Targeted Species: Young forest species such as American woodcock, chestnut sided warbler and ruffed grouse, and;
- Goals: Create conditions for young forest habitat to benefit avian and other wildlife by increasing foraging opportunities.[157]

In other words, DCR has a wildlife management goal of converting the mature Cattle Barn Lot forest, dominated by sugar maple, white ash, and oak, to a young open forest that provides habitat for game birds and deer. Woodcock and ruffed grouse are popular game birds for hunters.

This explains why the Ruffed Grouse Society donated $29,780 for herbicide treatment of the Lot.[158]

It also explains why DCR never mentioned deer browse as a problem in its materials: DCR wants more, not fewer, deer for hunters.

But the bigger surprise is that DCR is willing to discard an intact, healthy sugar maple forest ecosystem, along with the habitat of amphibians, aquatic species, and interior nesting birds, in order to replace it with a new ecosystem that favors game species and prey animals. Protecting natural ecosystems is part of DCR's mission, whereas creating young successional habitat for hunting has traditionally been a priority of MassWildlife.

According to the sign at the logging road entrance, DCR wants to create an environment for pioneer tree species. This means it wants to create a new type of forest by encouraging the growth of birches, alder, poplars, and willows, which typically are the first species to repopulate an area that has been disturbed by logging.

5.2

Left alone, Cattle Barn Lot will better help mitigate effects of climate change than if logged

DCR has stated that it plans to log the Cattle Barn Lot to increase the resistance and resilience of trees and forests there to mitigate and adapt to the effects of climate change.[159] In fact, there is a great deal of evidence that the opposite outcome after logging will occur. Left alone, the Cattle Barn Lot is likely to resist a shift of species due to climate warming, it is likely to retain its resilience, and it will store more carbon to help mitigate the effects of climate change than if it is logged.

The management forester spearheading the Cattle Barn Lot Forest Cutting Plan has proposed preparing the Cattle Barn Lot for a warmer future by planting southern tree species such as the paw paw.[160]

Forest ecologist Dr. Canham wrote a book titled *Forests Adrift: Currents Shaping the Future of Northeastern Trees*, in which he analyzes his findings during 40 years of studying forests. He discounts the severity of climate change effects on the health of northeastern forests, writing:

> My sense is that there is close to consensus among forest ecologists that those models vastly overestimate the pace of future shifts in tree species distributions under climate change.
>
> …one of the most distinctive features of northeastern tree species is their ability to tolerate, at least as adults, enormous variations in temperature and on timescales as short as day to day. With few exceptions all of the northeastern tree species can be found across a very wide range of mean annual temperature.
>
> …there is currently little evidence to suggest that warmer climates in the Northeast will shorten the expected life spans of the current canopy trees.
>
> …even fairly extreme climate change scenarios will have little immediate impact on the distribution and abundance of tree species in northeastern forests.
>
> The bottom line is that the growth and survival of both saplings and canopy trees of almost all of the species are sufficiently insensitive to variation in either temperature or precipitation that displacement by more southerly species generally takes two hundred to three hundred years.

> …I have a hard time imagining the circumstances that would justify the efforts of a modern-day Johnny Appleseed spreading seeds or planting seedlings of southern tree species in northeastern forests.
>
> Climate change almost certainly is an existential threat to these forests, but my research suggests that its influence on the distribution and abundance of our native tree species will pale in comparison to the effects of many other human activities, at least for the next two hundred to four hundred years.[161]

He concludes:

> The broad patterns of forest succession triggered by past land use history, combined with the pervasive but highly selective effects of timber harvesting and the decimation of individual species by pests and pathogens, swamp likely climate change effects in northeastern forests for at least the next two hundred years.[162]

Regarding resilience, DCR staff foresters argue that selectively cutting mature trees in the Cattle Barn Lot will make the forest more resilient to the effects of climate change. Section 4.4.11.2.5 of this report directly addresses the resiliency of the type of forest found in the Cattle Barn Lot.

Numerous forest ecologists have researched the role of forests in this era of climate change, and studied the specific effects of logging in mature forests. Over the past few decades, they have published many peer-reviewed studies on their findings and conclusions. Some are summarized in sections below.

The topic of logging to mitigate and adapt to the effects of climate change on the Cattle Barn Lot can be considered both from the perspective of forests releasing carbon emissions to the atmosphere when logged and from that of capturing carbon dioxide emissions out of the atmosphere and converting those through photosynthesis to stored carbon.

On the first point, the state's 2020 *Land Sector Report* explains:

> The major human processes that cause forest carbon emissions to the atmosphere are forest loss and forest harvesting...[163]

It states that "[the] typical commercial harvest in the Commonwealth removes 30 to 80% of live carbon."[164] Since about 50% of a tree's dry mass is carbon, the upper end of that spread is a confusing statistic. But if the report is using "live carbon" to mean live trees then DCR's plan to remove 30% to 50% of the forest basal area in the Cattle Barn lot fits within that definition. (Basal area is the cross-sectional area of trees at breast height, considered to be 4–4.5 feet above ground.)

The state's 2050 *Decarbonization Roadmap Study* gives this explanation of carbon loss from harvesting:

> The fate of harvested or removed biomass represents a key consideration in the carbon balance of any forest disturbance. All forest removals are initially assumed to result in the release of the entire removed stock into the atmosphere, with 14% lost regardless of subsequent use during cutting and removal.[165]

That 14% statistic only applies to the removal of wood. As will be shown in section 5.4, forest floor carbon losses as a result of timber harvests have been found to be about 36% in hardwood forests such as that of the Cattle Barn Lot.

On the second point, the *Massachusetts 2020 Decarbonization Roadmap* states:

> While both biological and technological processes can sequester carbon dioxide from the atmosphere, and will almost certainly be necessary to achieve Net Zero, forests across the region represent the largest and most locally

impactful opportunity to obtain required carbon removal services.[166]

In research reported in a recent paper titled *Middle-aged forests in the Eastern U.S. have significant climate mitigation potential*, forest ecologist Dr. Richard Birdsey and others study the carbon storage potential of middle-aged forests, defined as between the ages of 20 and 100 years. Among their findings:

> Middle-aged forests in the Eastern U.S. have attained about half of their potential carbon stocks.
>
> Our results indicate that Eastern U.S. forests can continue to act as C sinks for many decades and likely for a century or more if protected from harvest or disturbance and/or carefully managed to protect existing C stocks and allow future stocks to attain their potential magnitude.
>
> [M]ajor areas of Eastern forests could roughly double accumulated biomass over time periods from decades to centuries if protected from harvesting and major disturbances.

The scientists conclude that managing these middle-aged forests for old-growth characteristics "holds great promise" for maximizing the storage of carbon.[167]

In 2009, the baseline report on the Mount Washington Forest Reserve gave 47-116 years as the age spread. The ages in the Cattle Barn Lot are generally in the same range, so it can be assumed that the Birdsey definition and findings apply there.

The following three subsections summarize research from studies addressing the value of trees and forest as they age.

5.2.1

Old trees sequester more carbon dioxide and store more carbon than young trees

In Massachusetts, "forest carbon is primarily stored in the wood of tree boles, but also in bark, branches, foliage, root systems, standing and down dead wood, understory vegetation, forest floor litter and duff, and soil" according to the 2020 *State Forest Action Plan*.[168]

That Plan offers a useful graphic to show the distribution of carbon stored in the different carbon pools:

> The Intergovernmental Panel on Climate Change (IPCC) defines forest carbon in five pools…half of carbon stored in Massachusetts forests is in the live vegetation (51%), both the above and below ground (including coarse roots) pools. The next largest carbon pool in Massachusetts forests is in the upper one meter of organic soil layers (34%), followed by the litter layer (9%), and dead wood (6%) pools.[169] **(Figure 19)**

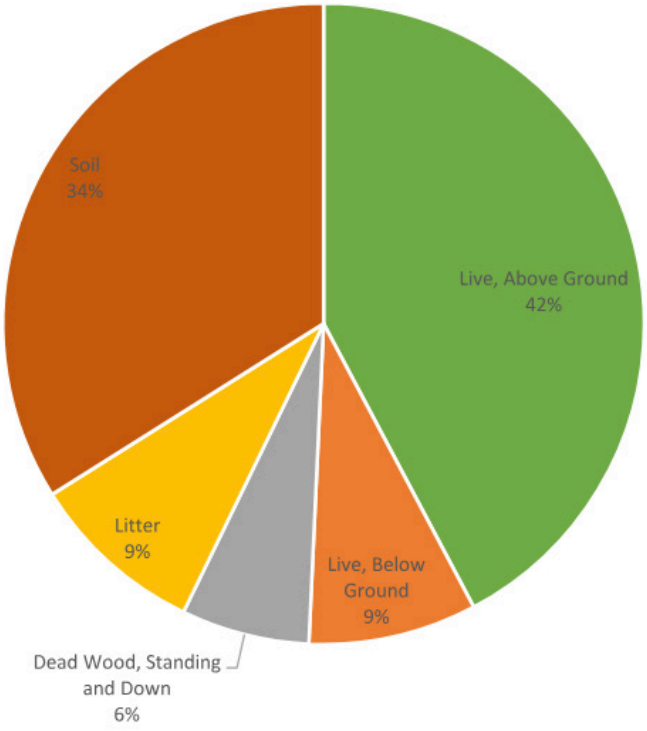


Fig. 19: Proportion of carbon storage in Massachusetts forest lands in the five Intergovernmental Panel on Climate Change pools (FIA EVALIDator 2018). Source: Massachusetts Executive Office of Energy and Environmental Affairs, Department of Conservation and Recreation, Bureau of Forest Fire Control and Forestry. 2020. Massachusetts State Forest Action Plan, p. 79.

The Plan notes that other reports show that "the magnitude of the soil organic carbon pool is likely larger than estimated" by the IPCC.[170]

The Plan also describes the results of a meta-analysis published in 2004:

> ...the sequestration rate and total store of carbon in a forest are closely linked to the age of the forest. A meta-analysis of worldwide carbon studies found that, "with notable exceptions, carbon pool sizes increased with age in all biomes, including soil carbon." The researchers also synthesized published carbon sequestration rates. They found that in the first 10 years after a disturbance, the forest was a source of carbon to the atmosphere, intermediate aged forests had the fastest sequestration rates, and older forests continued to sequester carbon, albeit at a slower rate.[171]

The DCR Cattle Barn Lot Forest Management Proposal identifies a purpose of the proposed timber harvest as using silvicultural techniques to enhance carbon stock management. Separate from the fact that DCR is using silviculture not to ensure continuity of forest conditions in the Cattle Barn Lot but to change them (see section 5.1), this is consistent with the position of DCR's foresters that a value of timber harvests is increase the carbon dioxide uptake of trees and forests.

Contradicting their position, numerous scientific papers show that, in fact, old trees sequester more carbon dioxide and store more carbon than young trees. Sequestering carbon dioxide is a term generally used to mean the rate at which a tree's photosynthesis process takes up carbon dioxide from the atmosphere. In this review, that will be the meaning unless stated otherwise. Storing carbon means the amount of carbon held in the live or dead biomass, either above or below ground. In a mature sugar maple, it takes about one metric tonne of atmospheric carbon dioxide to deposit 0.27 tons of carbon in the tree.[172]

The research reviewed for this report shows that while young trees generally (but not always) sequester carbon dioxide at a faster rate proportional to their size than old trees, the latter, since they are usually larger, sequester more carbon dioxide per year than young trees, and they also store much more carbon.

In a paper titled *Rate of tree carbon accumulation increases continuously with tree size*, thirty-eight scientists write:

> …we conducted a global analysis in which we directly estimated mass growth rates from repeated measurements of 673,046 trees belonging to 403 tropical, subtropical and temperate tree species, spanning every forested continent.
>
> For all continents, aboveground tree mass growth rates (and, hence, rates of carbon gain) for most species increased continuously with tree mass (size). [All six tree species to be logged in the Cattle Barn lot had positive growth rates.]
>
> In absolute terms, trees 100 cm in trunk diameter typically add from 10 kg to 200 kg of aboveground dry mass each year (depending on species), averaging 103 kg per year. This is nearly three times the rate for trees of the same species at 50 cm in diameter…
>
> …empirical observations and metabolic scaling theory both indicate that, on average, total tree leaf mass increases as the square of trunk diameter. A typical tree that experiences a tenfold increase in diameter will therefore undergo a roughly 100-fold increase in total leaf mass and a 50-100-fold increase in total leaf area…
>
> Thus, although growth efficiency often declines with increasing tree size, increases in a tree's total leaf area are sufficient to overcome this decline and cause whole-tree carbon accumulation rate to increase.[173]

In a study of the carbon storage capacity of trees in six national forests, it was found that large-diameter trees (≤21 inches diameter at breast height (dbh)) accounted for just 3% of the total number of trees, but stored 42% of all aboveground carbon.[174]

This is consistent with studies showing that, globally, "about half aboveground carbon is concentrated in a small proportion of large trees (1% - 5% of total stems.)"[175]

The reason for this is clear: "As large trees grow larger, small increases in diameter add a relatively large amount of volume and biomass."[176]

5.2.2

Old forests continue to accumulate and store carbon

Drawing upon data from 519 forests around the world, scientists from Europe and the United States report in a paper titled *Old-growth forests as global carbon sinks*:

> We find that in forests between 15 and 800 years of age, net ecosystem productivity (the net carbon balance of the forest including soils) is usually positive. Our results demonstrate that old-growth forests can continue to accumulate carbon, contrary to the long-standing view that they are carbon neutral.
>
> The currently available data consistently indicate that carbon accumulation continues in forests that are centuries old.
>
> Consistent with earlier studies, biomass continues to increase for centuries irrespective of whether forests are boreal or temperate. In the course of succession, plants compete for resources and self-thinning (or thinning by humans in the case of managed forests) occurs, so the older stands contain a relatively small number of individuals, although of course these trees tend to be large.
>
> The present paper shows that old-growth forests are usually carbon sinks. Because old-growth forests steadily accumulate carbon for centuries, they contain vast quantities of it. They will lose much of this carbon to the atmosphere if they are disturbed, so carbon-accounting rules for forests should give credit for leaving old-growth forest intact.[177]

5.2.3

Old forests accumulate and store more carbon than young forests

The state's 2020 *Land Sector Report* notes: "Most dominant trees in the Commonwealth's forests are young, between 100 and 150 years, and are accelerating their growth."[178] Left alone, those trees will continue to mature, and increase their uptake of carbon dioxide and storage of carbon.

Forest ecologist Dr. Richard Birdsey writes:

> When climate benefits are explicitly considered, the research points strongly to letting these forests grow—protecting and expanding the massive portion of sequestered carbon they represent.[179]

Dr. Birdsey worked in the USFS for 40 years,[180] was a lead author of two Special Reports for the Intergovernmental Panel on Climate Change,[181] and is a senior scientist at the Woodwell Climate Research Center.[182] He was a member of the governor's Climate Forestry Committee.

Woodwell Climate Research Center's website sums up the value of old forests in simple terms:

> Although younger forests grow faster proportionally, they are not adding as much carbon in a single year as older forests with large trees. Additionally, mature forests continue to pack away carbon year over year in their soils, which is largely protected from effects of

disturbance. Cutting down a mature forest creates a "carbon debt" that can take decades—centuries in some cases—to recoup, and in the meantime those mature trees are no longer sequestering carbon each year.

"Forests are like naturally occurring factories, delivering to the planet the unique service of carbon sequestration. Trees of all sizes, but particularly large old trees, are the equivalent of warehouses where the goods produced—tons of carbon—are stored over time," says Woodwell Climate Carbon Program Director, Dr. Wayne Walker. "Like any warehouse where valuable goods are stored, these natural carbon reserves deserve all the protection we can provide. Their loss could effectively bankrupt our efforts to avoid the worst impacts of climate change."[183]

At the Birmingham University Institute of Forest Research in England, for the past seven years, a team of researchers led by atmospheric scientist Rob MacKenzie has been pumping carbon dioxide into an oak forest to simulate the predicted atmosphere in 2050 and study the effects on the trees. The BBC reports the story:

Contrary to some previous analyses, their study suggests that trees can actually absorb more carbon as they age. It's a finding that highlights the immense importance of mature, temperate forests in terms of climate regulation.

What's more, for the first time, MacKenzie and his fellow forest-watchers have also shown that microscopic organisms living on these trees capture methane, another greenhouse gas harmful to the atmosphere. "[We] found the trees are providing another unexpected service for us," says MacKenzie. "The canopy hosts microbes, and these microbes eat the methane."

The results of the experiment so far show that mature forests exposed to elevated levels of CO_2 not only continue to capture carbon as they age, they also store it for longer than trees exposed to lower levels of CO_2, by growing extra bark.

When exposed to the volume of CO_2 that scientists estimate will be present in our atmosphere by the 2050s, the wood production of the trees increased by 10%.

These findings help to reveal the important role that mature forests will play as carbon stores and natural climate solutions in the coming decades. The fact that the microbes living in the canopies of these mature oaks also consume methane is an added bonus to mitigating the effects of human emissions. This process was first discovered in 2024 right in this patch of English woodland and it means that forests are even more important in the fight against climate change than scientists previously understood.[184]

For a paper examining the net effects of harvesting frequency on forest carbon storage in the northern hardwood region of the northeastern United States, the authors used Forest Inventory and Analysis (FIA) plots and stratified those plots "to select only financially mature stands ready for harvest at the beginning of the simulation period," and then ran nine different forest management scenarios over 160-year simulation periods. Defining sequestration to mean total carbon stocks, rather than uptake rates, they find:

The results supported…our first hypothesis that passive management sequesters more C [carbon] than active management…

…numerous studies have concluded that the replacement of older forests with younger forests result in a net release of C to the atmosphere (Harmon et al., 1990; Schulze et al., 2000). Our results support these latter findings…

We showed that even with consideration of

> C sequestered in harvested wood products, unmanaged northern hardwood forests will sequester 39 to 118% more C than any of the active management options evaluated. This finding suggests that reserve-based approaches will have significant C storage value.[185]

If left alone, the Cattle Barn Lot will store significant amounts of carbon and help mitigate the effects of climate change. TNC writes about the region:

> The Berkshire Wildlife Linkage has some of the largest amounts of above-ground biomass—plants and soil that will absorb carbon and hold onto it—in all of New England.[186]

5.3

Logging will damage ecosystem health and biodiversity

DCR states that a purpose of the Cattle Barn Lot logging project is to manage forest ecosystem health and biodiversity.[187] It offers related purposes, as well: to diversify the landscape,[188] and to maintain structural and species diversity in the Lot.[189]

Regarding forest ecosystem health, forest ecologist Dr. Richard Birdsey takes a different position, saying:

> One of the largest threats facing mature and old-growth forests in the US is logging, which is a threat that humans can reduce instantly, simply by changing policy.[190]

A study titled *Adaptation and mitigation capacity of wildland forests in the northeastern United States* reports:

> Timber harvesting is the leading forest disturbance and cause of adult tree mortality in the northeastern United States…[191]

Forest ecologist Dr. Canham notes that in northeastern forests, logging accounts for 58 percent of the mortality of adult trees.[192]

Regarding structural and species diversity, there have been several important studies showing that unmanaged forests have greater tree age diversity and structural complexity than managed forests.

A 2023 study by scientists at Harvard University, Boston University, and the Highstead Foundation compares carbon and structural complexity on lands protected and unprotected from timber harvesting, using USDA forest research plots in the northeastern states. The study defines wildlands as "lands secured…with the intent to be shaped by natural processes and free from active management, including timber harvesting." The scientists write:

> Our results suggest that wildland forests have greater carbon storage, similar carbon sequestration (i.e. forest growth) rates, and generally higher stand-level structural complexity relative to unprotected forests.
>
> Wildland forests generally showed greater structural complexity than unprotected forests as four structural variables (no. of large live and dead trees, maximum tree height, and diversity of diameter size classes) were greater in wildlands overall…
>
> Protection status (and resulting forest conditions), in other words, is a critical factor when considering the climate adaptation and mitigation capacity of forests.
>
> Our results suggest the need for forest managers… to reexamine the rush to incorporate more management for climate adaptation and mitigation in northern temperate forests that are not specifically being managed for wood products and to consider instead the multiple benefits of stricter protection and allowing natural processes to do more.[193]

An earlier study by 12 National Park Service (NPS) scientists and a University of Maine scientist reached the same conclusions after analyzing land cover and forest vegetation data from nearly 25,000 NPS and USFS permanent research plots distributed throughout the eastern United States. They compared data from park forests where logging is largely prohibited, against adjacent unprotected forests, referred to as matrix forests. Their study, published in 2016, was the first of its kind to cover such a large area in the United States:

> Results of this study indicate that park forests, where logging is largely prohibited, preserve areas of regionally significant older forest habitat. Park forests consistently had greater proportions of late-successional forest, greater live tree basal area, greater densities of live and dead large trees, and considerably larger volume of coarse woody debris. Park forests also had lower tree growth and mortality rates than matrix forests…[194]

A 2018 study comparing forests in 39 eastern national parks where the natural processes had been left largely undisturbed with surrounding forests open to timber harvest found that tree species diversity was greater in the national parks:

> Higher tree diversity has been associated with greater ecosystem function and services…and increased diversity of forest flora and fauna. Higher tree diversity can also provide greater forest resilience…[195]

Different species of trees "also produce snags and logs that differ widely in decomposition rates and patterns resulting in more structural diversity."[196]

A study on forest biodiversity, ecosystem functioning and the provision of ecosystem services "…confirms that forest type and trees species richness affect forest biodiversity and that forest diversity can be an important factor in ecosystem function and the provision of ecosystem services."[197]

Ecosystem functions are the natural processes and interactions within an ecosystem that keep it healthy and stable. Nutrient cycling and maintaining a diverse mix of habitats and species are examples of ecosystem function. Ecosystem services are those attributes of forests that directly benefit the human population. Clean water, flood control, and carbon capture to mitigate climate change are examples of forest-based ecosystem services.

Maintaining biodiversity is, indeed, a purpose mentioned throughout DCR's documents about the Cattle Barn Lot timber harvest. DCR's Forest Cutting Plan will entail selective cutting of a mix of tree species. The silviculture type identified in the DCR-BOFF Forest Restoration Prescription is a combination of individual tree and group selection.[198] The 2016 study referenced earlier explains the effects of these silviculture types on biodiversity:

> While these practices are an improvement ecologically over even-aged management, selective forestry still causes adverse effects on biodiversity, as it is somewhat limited in its ability to reproduce forest responses to natural disturbances, such as tip-up mounds and coarse woody debris.
>
> Selective forestry practices also reduce abundance of dead wood and large-diameter trees compared with unmanaged forests. Dead wood, including dead standing trees (snags) and [coarse woody debris], is a vital structural component of forests for many organisms, including small mammals, birds, invertebrates, fungi, amphibians, lichens, and tree seedlings. Additionally, large-diameter live and dead trees are preferentially occupied over small-diameter trees by a range of vertebrate species.[199]

Numerous studies confirm that: "Structural heterogeneity provided by standing and downed coarse woody debris and old trees increases biological diversity in forest ecosystems."[200]

In 1999, researchers looked at the structural characteristics of old-growth, maturing, and partially-cut northern hardwood forests dominated by sugar maple. They found that old-growth stands had about twice the volume of downed coarse woody debris than in either of the other two forest stages. In their paper, they note:

> In northern hardwood stand types in New England, approximately one-half to one-third of indigenous amphibian and mammal species relay on logs for some aspect of their life histories. Coarse woody debris also provides favorable germination and establishment sites of some vascular plants and substrate for bryophytes and fungi. Large, old trees provide specialized habitat for arthropods, nesting, denning and foraging habitat for birds and mammals, and persistent or unique substrate for epiphytic bryophytes and lichens.[201]

In the 2023 Harvard/Boston University/Highstead study, the scientists address directly the issue of whether lands subject to active management (including timber harvesting) support more or less biodiversity than forests left alone to mature:

> Structural complexity, including age class diversity, is directly related to biodiversity, due to the greater number of habitat niches and resources in the varying sizes of live and dead biomass and varying successional stages. Older forests with more deadwood generally result in a greater diversity of lichens and fungi compared to younger and less complex forests. Vertebrate and invertebrate animal diversity…eventually reach their highest levels of species richness in older, more complex forests. [202]

Another study follows on the same theme:

> …large live trees eventually create large-diameter snags and downed wood that continue to store carbon for decades and contribute directly to biodiversity by providing unique specialized habitats such as hollow trees and logs, and microenvironments.[203]

Although sugar maples don't depend upon pollinators to regenerate, "pollinator species such as honeybees and stingless bees use old growth forest for nesting in cavities in large trees."[204]

5.4

Logging will threaten soil and water resources

DCR writes that a purpose of the Cattle Barn Lot logging project is to maintain and enhance soil and water resources.[205]

Logging equipment disturbs forest floors by uprooting and compacting the top layer, thus damaging the mycorrhizal networks, and reducing the health of the forest.

The release of carbon from the soil is another effect of forest-based logging. The organic matter in forest floors also plays an important role in nutrient cycling and water retention.

The 2020 *Land Sector Report* offers a reminder: "The emphasis on live carbon neglects soil organic carbon, which constitutes at least half of the terrestrial carbon pool in Massachusetts.[206]

That number is broadly consistent with a meta-analysis of 75 studies that compares carbon amounts in soils within harvested and unharvested forests situated in temperate zones, and estimates that about half of the Earth's carbon is in forests, and, of that, two-thirds is held in soil pools. That analysis finds that timber harvests cause significant changes to carbon storage in the forest floor. "The overall effect of harvest on forest floor carbon storage was remarkably consistent among studies…The principal predictor of variation in harvest impacts on carbon storage was tree species composition," with hardwood forest floors losing 36%.[207]

Logging creates a high risk of erosion as another threat to soils and to hydrological features.

The Karner Brook Watershed ACEC designation document has a paragraph on the erosion risks within the Watershed:

> Natural hazard areas located within the ACEC include floodplains and high erosion areas. … Erosion hazard areas are defined here as soils with slopes of over 15 percent, identified by the US Department of Agriculture Soil Conservation Service (SCS) Soil Survey of Berkshire County. These areas are located predominantly on the mountain ridges above Karner and Fenton Brooks…[208]

DCR's Forest Management Proposal for the Cattle Barn Lot acknowledges that there are steep slopes within the project area: "Along the eastern boundary of the project there may be isolated areas where the slope exceeds 40%."[209]

According to DCR's Forest Restoration Prescription: "Stand has moderate to steep grades located on lower slopes occupying ravine of Karner Brook…" In a 238-acre portion of the project, the slopes are "steep (15-45%)" with a "very high run off class." The soils there are LdE (931E) Lanesboro-Dummerston association. The risk of erosion is described by DCR as "moderate."[210]

In its report on the Cattle Barn Lot, wetlands consulting firm Stockman Associates addresses the risks of erosion in the Karner Brook Watershed, caused both by natural processes and human activity:

> Stockman Associates noted considerable channel incision and bank erosion through the site. These features reflect the steep gradients and are indicative of high-volume, high-velocity water flows that occur during wetter periods of the year. Such characteristics emphasize the dynamic nature of the observed stream and channel systems.
>
> Bank erosion is also a feature of the soil types throughout the site. The predominate mapped soil type is the steep, very stony Lanesboro-Dummerston association, 931E (USDA NRCS Web Soil Survey).
>
> The mapped soil type exhibits a whole soil K factor of 0.32. K factor values range from 0.02 to 0.69, with higher values indicating increased susceptibility to sheet and rill erosion caused by water, assuming all other factors remain constant.
>
> Additionally, the United States Department of Agriculture (USDA) has classified this soil type as having a severe rutting hazard rating for forestry applications. This classification denotes the potential for surface rut formation resulting from the operation of forestry equipment. It is important to note that soil displacement and puddling, encompassing soil deformation and compaction, may occur concurrently with rutting. A 'severe' designation signifies that ruts are likely to form readily.
>
> Natural erosion associated with gradient and soil type can be exacerbated by anthropogenic impacts which alter drainage patterns, expose soils, and increase sediment loading.
>
> The unstable eroding channels observed along the main skid road, channels, and the rutting formed within secondary trails are examples of such anthropogenic alterations to the landscape. Increased sediment loading is a significant concern given the Coldwater Fisheries Resource designation of Karner Brook.[211]

MassWildlife has identified Coldwater Fisheries in which the fish population is composed of resident species (i.e. the streams are not stocked with fish for anglers.) The state considers these to have high conservation value.[212] Karner Brook is such a Coldwater Fishery. **(See Figure 15)**

As noted earlier, native brook trout survive in only the coldest and cleanest water. In fact, brook trout serve as

Figs. 20–21: (Top) Herbicide treatment in 13-acre sugar maple-white ash stand of Cattle Barn Lot, cut area 3. (Below) Bird's nest in same area. Source: Photos by Eleanor Tillinghast, August 9, 2024.

indicators of the health of the watersheds they inhabit, according to a nonprofit dedicated to their protection.[213] As observed in a newspaper article: "Without ideal stream habitat and shading trees overhead, a degree or two could render a waterway section troutless.[214] For this reason, robust native brook trout populations are now found in only 5% of streams in their historical habitat in the Eastern United States.[215] Removal of trees along the perennial and intermittent streams in the Karner Brook Watershed risks raising the water temperature and threatening the habitat of native brook trout and other fish species found there.

5.5

Logging will bring in more invasives

DCR's Cattle Barn Lot Forest Restoration Prescription states: "A high priority for this project is to control invasive plants which are present throughout the project area."[216]

Last summer, DCR resorted to spraying herbicides over an area of approximately 45 acres of the Cattle Barn Lot. The herbicide treatment was focused on two forested areas closest to East Street and along the old

logging road beginning at East Street and wrapping around to the east of Karner Brook. **(See Figure 5)** It appears that the one-time treatment was not part of a multi-year plan to eliminate invasives, but was, rather, to enable easier access to the forests where harvesting will take place. **(Figures 20–21)** As noted earlier, the treatment was funded through a $29,780 grant from the Ruffed Grouse Society.[217] There is no mention in DCR's materials about seeking grants for all the years into the future needed to finally knock down the dense thicket of invasives in parts of the Cattle Barn Lot forest lying on the west side of Karner Brook.

To the east of Karner Brook, where there is less evidence of human-caused disturbance over the years, there are almost no invasive plants. The invasives on that side of the Brook are concentrated along the old logging road and skid roads. The map produced by DCR of the areas treated with herbicides shows the distinctions between areas infested with invasives and those largely free of invasives. **(See Figure 5)**

If the Cattle Barn Lot is logged, invasives will spread into the areas not currently infested. A Google search online offers a useful AI paragraph:

> Yes, logging equipment can bring invasive species into new areas. Logging equipment, like trucks and skidders, can carry seeds, plant fragments, and earthworms from one site to another. This can introduce invasive species into areas where they weren't previously present.

Another invasive that logging equipment will bring to the east side of Karner Brook is non-native earthworms. Native earthworms are rare in the northern forests of the United States.[218] Non-native earthworms are present in many forests.

In his report, Dr. Frelich writes extensively on his observations of non-native earthworms in the Cattle Barn Lot:

> In the areas of the Cattle Barn Lot that I walked, there was little evidence of non-native earthworm presence in cut areas 2, 4, or 6, east of Karner Brook. There was more evidence in cut areas 1, 3, and 5, on the west side of the brook.[219]

Dr. Frelich uses Mr. Eiseman's map segments to describe his locations. **(Figure 22)** The three cut areas east of Karner Brook have almost no invasive plants; nor, apparently, do they show much sign of non-native earthworm invasion. The areas where he saw the greatest evidence of earthworms are areas of heaviest invasive plant cover.

A number of studies have been conducted to understand the effect of earthworms on temperate forests. One study comparing sites with and without worms in a forest dominated by sugar maple notes: "Earthworms can eliminate the forest floor, which is considered to be a key component of the inherent stability of many forest ecosystems."[220]

All trees in our region form symbiotic relationships with mycorrhizae (fungi). The mycorrhizae surround the fine roots of the trees in the upper layer of the soil. They increase the uptake of nutrients by the trees, and foster the exchange of nutrients among the trees and with their nearby seedlings.

As noted earlier, sugar maples are one of the few tree species in which mycorrhizae infiltrate and grow inside the fine roots.[221] These mycorrhizae are called arbuscular mycorrhizae. Earthworms disturb these roots and thus disrupt nutrient uptake and cycling.[222] Studies have shown that mycorrhizal colonization is significantly higher in forest stands without earthworms than in those with the worms.[223]

Earthworms also consume leaf litter, which means fewer nutrients are available to feed the sugar maples and other species.[224]

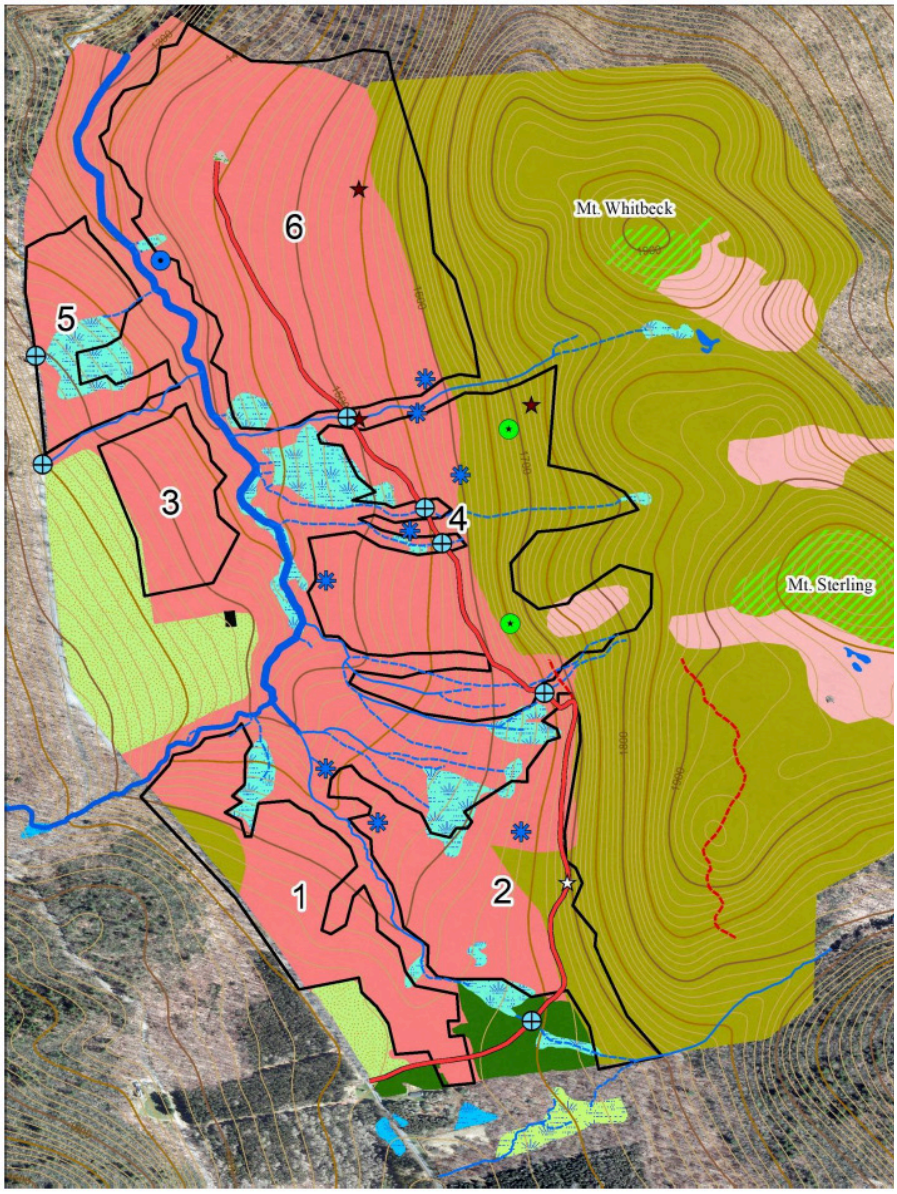


Fig. 22: Cattle Barn Lot six cut area boundaries copied from last page of DCR's Forest Restoration Prescription. Source: Eiseman, C. 2024. Ecological Survey of the Cattle Barn Lot. Prepared for Green Berkshires, Inc.

5.6

Some Cattle Barn Lot white ash trees may show resilience against Emerald Ash Borer

In recent years, Emerald Ash Borer beetles have been infesting white ash trees in western Massachusetts. DCR wants to "salvage and pre-salvage dead and dying white ash to capture their potential lost value" in the Cattle Barn Lot.[225] The Forest Management Proposal lists the Emerald Ash Borer as the top reason the Cattle Barn Lot was chosen for harvest.

White ash is a popular hardwood in the wood products industry.

More white ash - 145,000 board feet - is coming out of the Cattle Barn Lot than any other tree species. And that number is certainly an undercount since white ash trees not marked for cutting will be removed, too.[226]

A group of researchers, including a USDA scientist, recently wrote a paper reviewing the history of Emerald Ash Borer management and research, and cautioned: …"thinning (removal of ash trees) practices should be

carefully considered because they may accelerate EAB spread or result in a much greater ash decline compared to a scenario without management."[227]

In his botanical report on the Cattle Barn Lot, Mr. Eiseman writes:

> From an ecological perspective…the benefits of removing most or all of this forest's ashes are questionable. Cutting the healthiest trees risks eliminating individuals that have some genetic resistance to emerald ash borer attack, and removing dead and dying trees deprives the forest of valuable habitat for insects and the animals that feed on them or use snags and logs for den or nest sites. One hopes that DCR is balancing these long-term considerations with the short-term anthropocentric ones.[228]

The Governor's Climate Forestry Committee report echoes this argument:

> The Committee found no ecological rationale for salvage harvesting on public land.
>
> Several members of the Committee argued that state lands should play an important role in efforts to preserve species (e.g., ash) in the landscape. They stated that it is important for state land managers to consider forgoing pre-salvage harvesting to allow individual trees with natural genetic immunity or resistance to survive and continue the existence of these species.[229]

In 2006, forest ecologists Dr. David Foster and Dr. David Orwig wrote a paper based on research that examines the effects of tree salvage on forest ecosystems:

> Over the last century pest and pathogen outbreaks have occurred with increasing frequency in New England… Insect and disease outbreaks often lead to increased harvesting of the host species, including preemptive cutting before the arrival of the damaging organism and post-mortality salvage logging. [Such harvesting] may generate more profound ecosystem disruption than the pest or pathogen itself.
>
> Salvage logging produces substantial ecosystem response as biomass is removed, leaf area and canopy cover are further reduced, and changes in the soil environments increase metabolic and chemical processes. The consequences are reduced biotic control over hydrology and nutrient cycling and more abrupt and substantial changes in forest composition and structure. Salvage harvesting turns a natural event and process into a forest management operation.[230]

Their study reviews the effects of salvaging in response to infestation by the woolly adelgid in hemlocks (HWA):

> Results from this study and others indicate that logging initiated stronger ecosystem changes than HWA-induced mortality due to abrupt and larger microenvironmental and vegetation changes, soil scarification, and the presence of extensive slash. … Following logging…there was a much greater increase in shade-intolerant seedlings, herbs, and shrubs, red maple (*Acer rubrum* L.) sprouts, and invasive species.[231]

Another study addresses other impacts of salvage harvesting:

> Ground-based salvage equipment can compact soil, damage understory vegetation, and magnify erosion. Such effects can reduce soil water holding capacity and increase soil saturation. After moderate-severity disturbances, such as insect outbreaks with partial canopy mortality, salvage logging further decreases transpiration and infiltration by

> killing remaining overstory and understory vegetation. This may result in wetter ground, increased overland flow, greater propensity to soil disturbance (e.g., rut formation) by machinery, and ultimately increased surface runoff.[232]

A meta-analysis by 29 scientists of studies analyzing the effect of salvage logging on biodiversity concludes:

> [S]alvage logging has strong and negative effects on many taxonomic groups, particularly those associated with dead wood, and ... it is thus not consistent with biodiversity conservation goals.[233]

In the Cattle Barn Lot, most of the white ash trees are dead or dying due to the Emerald Ash Borer, but there are some trees that have survived the wave of pests. They should be off limits for harvesting, to increase the chances that a few live trees will reproduce with genetic resilience to the beetle.

Another benefit of leaving live white ash in place is that spongy moths tend to avoid this species.[234] Thus white ash might be more likely than some other tree species to survive widespread spongy moth infestations in the future, increasing the chances of maintaining a diversity of tree species on state land in Mount Washington.

Scientists have observed that "chemical control is one of the most important and effective EAB management practices,…[and] poses a valuable control option in natural forests, protecting treated trees as well as their untreated neighboring trees and helping to conserve ash genetic diversity.[235] A forest health expert who walked through the Cattle Barn Lot suggested this option and pointed out trees that would benefit.

5.7

This timber sale won't resurrect fading local forest products industry

One of DCR's two top goals for the Cattle Barn Lot timber harvest is to provide raw materials for the local wood products industries.[236]

DCR's Forest Restoration Prescription for the Cattle Barn Lot lists as a priority: "Supply of local wood products to rural economy and employment opportunities for local contractors to provide project services including timber harvesting, vegetation control and excavation."[237]

The website of DCR's Bureau of Forest Fire Control and Forestry claims "[f]orestry and related industries support almost 38,000 jobs, $3.1 billion in labor income, $3.8 billion in value-add, and $9.2 billion in output.[238]

Regarding forestry in Massachusetts, those numbers are misleading because they represent everyone in the state who works with wood, such as house framers, cabinet makers, and others who purchase wood products that originate from out-of-state producers.

In fact, forestry is a remnant industry in Massachusetts and Berkshire County, and is projected to continue as such. As of December 2024, there were 293 Massachusetts residents licensed as timber harvesters,[239] down from 332 in 2024.[240] and 62 Massachusetts residents licensed as private foresters.[241] This is a grand total of 355 jobs. (Separately, there are 31 foresters on public payrolls, 28 of them at the Executive Office of Energy and Environmental Affairs.)

Of the timber harvesters licensed in Massachusetts, 23 live in Berkshire County.[242] This number is confirmed by the November 2024 IBIS*World* industry report which shows 23 loggers employed in Berkshire County.[243] **(Figure 23)** Of the private foresters, eight live in Berkshire County.[244] This is a total of 31 jobs in Berkshire County.

The 2020 *State Forest Action Plan* has this to say about sawmills:

> Local wood production (the number and total output of sawmills) has declined precipitously in the last 30 years in Massachusetts.[245]

An industry report shows 17 sawmills in Massachusetts, and only one in Berkshire County.[246] **(Figures 24–25)** For the entire state, there are 227 people employed in that industry. In five years, that total is expected to drop to 146 workers. That single Berkshire-based

Logging in Massachusetts

November 2024

County	Employment	Annual Growth Rate (2023-24)	Share of State
Hampden County	90	3.4%	28.1%
Worcester County	88	8.6%	27.5%
Hampshire County	24	0.0%	7.5%
Berkshire County	23	0.0%	7.2%
Essex County	22	10.0%	6.9%
Suffolk County	20	0.0%	6.3%
Franklin County	19	0.0%	5.9%
Middlesex County	15	0.0%	4.7%
Plymouth County	15	-6.3%	4.7%
Barnstable County	6	0.0%	1.9%

Fig. 23: Twenty-three logging industry employees in Berkshire County. Source: IBISWorld. US Industry State Report MA11331. Logging in Massachusetts. November 2024, p. 6.

establishment must be a one-person operation because the industry report lists no employment and no wages for sawmill operations in this county.

Forest support services is another category of jobs. In Berkshire County, there are nine establishments in that industry, and 10 people employed in it. There are 100 such businesses statewide.[247]

These numbers may not give a fully accurate picture of the timber harvesting industry in Massachusetts. A 2020 survey of licensed timber harvesters funded by DCR, and which DCR staff helped to craft, showed that respondents worked an average of 33 weeks a year, and more than 20% had not worked in the previous 18 months. Just 45% said that all their income came from logging. The average age of the loggers who responded to the survey was 52. The survey was administered by the New England Forestry Foundation, which wrote that the number of responses showed it was "a robust sample that [was] likely capturing the realities faced by the timber harvester community."[248]

Every job matters to the local economy, and, especially, to the person who holds it. This is not to diminish the value in any way, but it is obvious that, contrary to the emotional resonance of the word "local," local timber harvesting and wood production are not significant drivers of the Berkshire economy.

The further reality is that timber harvested in Berkshire County for the most part leaves the state. The 2020 *State Forest Action Plan* notes:

> An increasing proportion of Massachusetts wood is being exported to northern New England, Canada, and even overseas.[249]
>
> Most timber leaves Massachusetts for processing by larger sawmills (>15MMBF/year) in the surrounding states and Quebec. In addition, Massachusetts logs are containerized and sold in the international timber market.[250]

Sawmills & Wood Production in Massachusetts

November 2024

County	Establishments	Annual Growth Rate (2023-24)	Share of State
Hampshire County	6	0.0%	35.3%
Bristol County	3	0.0%	17.6%
Hampden County	3	0.0%	17.6%
Plymouth County	2	0.0%	11.8%
Worcester County	2	0.0%	11.8%
Barnstable County	1	0.0%	5.9%
Berkshire County	1	0.0%	5.9%
Essex County	1	0.0%	5.9%
Franklin County	1	0.0%	5.9%
Middlesex County	1	0.0%	5.9%

Sawmills & Wood Production in Massachusetts

November 2024

County	Employment	Annual Growth Rate (2023-24)	Share of State
Hampshire County	52	-10.3%	22.9%
Bristol County	48	-12.7%	21.1%
Hampden County	38	-5.0%	16.7%
Worcester County	26	-3.7%	11.5%
Plymouth County	18	-10.0%	7.9%
Suffolk County	14	-12.5%	6.2%
Essex County	10	-9.1%	4.4%
Norfolk County	10	-9.1%	4.4%
Barnstable County	5	0.0%	2.2%
Franklin County	4	0.0%	1.8%

Figs. 24–25: One sawmill establishment and no employees in Berkshire County. Source: IBISWorld, US Industry State Report MA32111. Sawmills & Wood Production in Massachusetts. November 2024, pp. 6, 7.

The commercial value of the Cattle Barn Lot is not major. During the November 2022 obligatory tour of the area to be logged, the DCR management forester, in response to a question, said the value of the project is $100,000, with half for the contractor, 8% to the town, and the rest to the state.[251] A calculation done the next year put the total value at about $128,000.

Either way, the monetary value doesn't compensate for the loss of regional ecosystem functions and services provided by an intact forest.

Additionally, it makes no sense to prop up a declining local forestry industry at the expense of sequestering atmospheric carbon dioxide and storing carbon for the benefit of all Massachusetts residents.

PART 6

Deficiences in DCR Cattle Barn Lot Materials

The major deficiency in the DCR Cattle Barn Lot materials is the significant failure to identify fully the wetlands features in the areas targeted for timber harvest. In the late fall of 2024, wetlands scientists at Stockman Associates visited the site over five days. The survey was preliminary because it was done outside the growing season, during a Class 3 Severe Drought, and did not cover the entire project area. Nonetheless, the preliminary findings are unequivocal, with locations documented on accompanying maps:

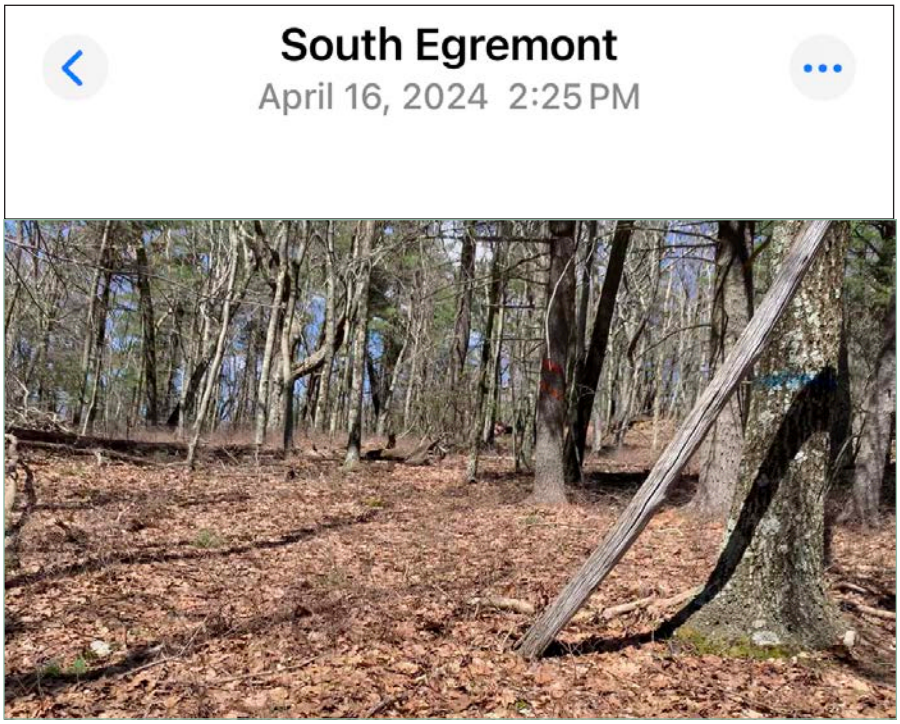
> Based on the preliminary assessment, Stockman Associates identified thirteen (13) Bordering Vegetated Wetlands, nine (9) jurisdictional intermittent streams, six (6) potential seeps, three (3) seeps, and two (2) channels not depicted within the cut areas indicated on the MA DCR project map.
>
> In addition, Stockman Associates identified Bordering Vegetated Wetlands, jurisdictional intermittent streams, channels, and a potential vernal pool located outside of the depicted cut areas. These features establish jurisdiction under the MA [Wetlands Protection Act], indicate the complexity of the hydrology within the Cattle Barn Lot, and/or signify that the proposed no harvest/no equipment filters may need to be expanded to ensure the protection required by the MA Forestry BMP Manual.

The report notes that, due to the time of year of the survey, indicators were unavailable that might confirm other jurisdictional areas.

The second deficiency in DCR's materials is that the exact acreage of the planned logging operation and the true number of board feet to be removed are not clear.

DCR's Forest Management Proposal gives 1,680 feet as the upper elevational limit of the harvest. In fact, trees are marked up another 60 feet up the Mount Whitbeck and Mount Sterling slopes, to 1,740 feet, as shown in photos. **(Figures 26–27)** So the project area may be larger but that can't be determined without more explicit information.

More board feet than are tallied will be in the final count. According to the Forest Restoration Prescription, all trees marked with blue are to be cut; those



Figs. 26–27: A video and a screenshot were taken within a minute of each other, together showing a sugar maple in the foreground marked for cutting at 1,740 feet. The image of the tree is taken from the video. The video and the screenshot of the elevation were taken using an iPhone. Additional screenshots confirming the elevation were taken immediately thereafter. Source: Photos by Eleanor Tillinghast, April 16, 2024.

with blue Xs are not tallied in the total count. Scanning through photos taken at the site, a number of trees are marked with blue Xs.[252] Furthermore, as noted earlier, the Forest Cutting Plan acknowledges that in at least one cutting area of the plan all white ash will be cut, whether marked or unmarked.[253] From DCR's materials, there's no way to know how substantial those differences might be.

In DCR's materials, there is insufficient information about measures planned to avoid damaging impacts to the Aquatic Core, the Aquatic Core Buffer, the Local Aquatic Habitats, the Local Aquatic Habitats Buffer, the Coldwater Fisheries, the Outstanding Resource Waters, and the hydrological system that makes the Karner Brook Watershed so unique.

DCR acknowledges that trees will be cabled out of wetlands. Without knowing the locations of all hydrological features subject to the state's Wetlands Protection Act, there's no way to anticipate or plan for possible impacts from the forestry operations.

DCR acknowledges steep slopes in work zones, but the erosion hazard is described only as moderate, whereas Stockman Associates points out, as noted earlier, that the USDA has classified the soil type listed in DCR's materials as having a severe rutting hazard rating for forestry applications. The 'severe' designation signifies that ruts are likely to form readily. Such ruts create high risk for erosion.

Trees will have to be cabled off Mount Sterling and Mount Whitbeck, where the mid-level slopes are very steep. Winching out the cut trees will raise the risks to slopes, soils, neighboring trees, and understory. The trees on those slopes are predominately oak, which has a leaf with the slowest rate of disintegration of any tree in that forest. The leaf litter consequently makes the slopes very slippery, as anyone hiking there will discover. This means the machine operators will undoubtedly have to anchor their equipment to prevent it slipping downhill. None of this is addressed in DCR's materials.

The effects of extensive deer grazing and browsing evident in the Cattle Barn Lot are not addressed in DCR's materials. The simple reason could be that DCR doesn't want to draw attention to the negative biodiversity impacts caused by deer overabundance because, as shown in its *Forest Restoration Prescription*, it wants to redesign the forest habitat there to encourage the presence of more, not fewer, deer for hunters.

Authors of a paper titled *Direct and indirect effects of white-tailed deer in forest ecosystems* observe: "Because ungulates [deer] interact strongly with plants, greatly affecting their distribution or abundance, they act as keystone herbivores to restructure whole ecological communities."[254]

Other researchers examining factors that contribute to poor sugar maple regeneration after timber harvest write that their study results "contribute to a growing body of evidence that sugar maple might be decreasing in dominance across its range in northeastern United States and parts of Canada." They point out that "intense browsing by white-tailed deer…is often cited as the major cause of regeneration failure after harvesting." And, indeed, their research confirms that "[b]rowsing by white-tailed deer had stronger effects on densities of sugar maple saplings than canopy openness or cover of non-tree vegetation."[255]

Deer like sugar maple seedlings and saplings. As other investigations show, deer also "…reduce both growth and reproduction of individual herbs like trillium,"[256] showy and yellow lady's slippers and other orchids.[257]

In fact, deer have altered the forest understory at the Cattle Barn Lot. Mr. Eiseman observes in his report on the botany there that the "the dominant understory plants, native and nonnative, are species that deer avoid eating."[258]

Deer browsing's effect on understory plant communities can affect macro-invertebrates, insects, birds, and mammals, too.[259]

The study on effects of white-tailed deer in forest ecosystems notes:

> …changes in plant diversity affect insect species diversity, because plant and insect diversity are often positively correlated.
>
> …high deer densities appear to represent a clear and present threat to biological diversity.[260]

Forest ecologist Dr. Canham writes in his book *Forests Adrift*: "Studies have also documented much lower rates of invasion by nonnative plants like garlic mustard…and stiltgrass…when deer are excluded."[261]

Recommendations are that forests "be allowed to mature naturally to the point where they become inferior deer habitat."[262] DCR may not appreciate this advice because it wants superior deer habitat in the Cattle Barn Lot. Nonetheless, to foster the health and biodiversity of the sugar maple forest there, Dr. Frelich's prescription for protecting small plots of tree seedlings with exclosures should be seriously considered.[263]

The area to the east of Karner Brook, especially up the slopes of Mount Sterling and Mount Whitbeck, has almost no invasives. Logging activity is the most direct route for introducing invasives into an area. There's no realistic discussion in the DCR materials about how to prevent the spread of invasives. Perhaps that's because it is widely understood that there is no way to prevent invasives from being tracked in by logging equipment.

DCR's materials also fail to explain what is meant in the Forest Restoration Prescription by "excavation." Specifically, the Prescription lists as a potential economic benefit "employment opportunities for local contractors to provide project services including…vegetation control and excavation."[264]

The Cattle Barn Lot is situated in one of the most significant ecological zones on the South Taconic Plateau and in the region. In every respect it is exceptional. This is not a place for a logging operation. Instead, the land, slopes, wetlands, hydrology, and tree and other species should be protected.

PART 7

Conclusions and Recommendations

Regardless of DCR's big-picture claims of managing the Cattle Barn Lot to boost its climate change adaptability, biodiversity, and resilience, the bottom line is that DCR wants to sell valuable timber and convert an extensive sugar maple forest – and the only one on state land in Mount Washington – into early-successional habitat suitable for hunting birds and animals.

To support those goals – and perhaps with an additional goal of avoiding controversy – DCR chose to omit jurisdictional wetland features on its project map, to downsize the scope of impacts by minimizing the acreage to be cut and the number of board feet to be removed, and to avoid accounting for the full damage that could be reasonably anticipated to slopes, soils, and the diversity of species that rely upon the special attributes of the site.

Realistically, if the area in the Karner Brook Watershed were properly delineated during the growing season, the jurisdictional attributes would preclude practically all logging activity because of the challenges of navigating heavy equipment to bypass those many features within and outside the designated cutting areas.

At the August 2024 meeting between state and local officials in the Mount Washington town hall, participants discussed the possibility of compromise, whereby some areas on the Intemann land might be suitable for logging, and others would be off limits. Reports by a forest ecologist, a botanist, amphibian experts, and a wetlands consulting firm provided by Green Berkshires, Inc. to DCR, along with the many other scientific papers and books cited in this report show that the Cattle Barn Lot, on the Intemann land east of East Street, is an exceptional place that should be protected, not logged.

Working within a limited time frame in order to gather as quickly as possible useful information about the Cattle Barn Lot for DCR, Green Berkshires, Inc. did not contract for any research on the 280 acres that are also part of the Intemann land, on the west side of East Street. **(See Figure 2)** That area is upslope of East Street, and has few if any wetland features, with only two streams marked on maps. It could be an appropriate location for a timber harvest. Or it could be added to the Mount Washington Forest Reserve along with the Cattle Barn Lot and the small number of remaining state-owned acres toward the summits of Mount Sterling and Mount Whitbeck.

For nearly 20 years, the administrations of successive Massachusetts governors have recommended putting blocks of ecologically significant land into protected Forest Reserves. Most recently, Governor Healey's administration has made the explicit connection between Forest Reserves and fostering old-growth characteristics to increase carbon dioxide sequestration and carbon storage as a cheap, immediate, and effective way to moderate the effects of climate change.

As has been explained in this report, the science shows that leaving forests alone to continue sequestering atmospheric carbon dioxide in live trees and to store carbon in live and dead standing trees and downed logs, and in soils is the best way to accumulate the most carbon. It is also the best way to develop structural complexity and resilience and to maintain biodiversity in a forest.

The sugar maple forest in the Cattle Barn Lot is relatively young at this point and can continue to grow for two or three centuries, accumulating increasing amounts of carbon throughout that time. A mature forest 120 years old can store over three times the amount of carbon as

Two sugar maples marked for cutting in Cattle Barn Lot, east of Karner Brook. Source: Photo by Eleanor Tillinghast, August 25, 2024.

a young forest 20 years old. It's worth remembering that even the foresters on Governor Healey's Climate Forestry Committee concur that old trees and old forests hold the most carbon.

Furthermore, we know now that the sugar maple forest in the Cattle Barn Lot is a likely climate refugium not just for sugar maples but also for species like salamanders that depend upon cool, moist, protected places for their habitat, for fish that need cold, clear, clean water, and for birds that need interior forests for protection against edge predators.

The state's BioMap and additional research showcase the extraordinary features of the Karner Brook Watershed and the Intemann land surrounding it. How many areas in Massachusetts have so many ecologically exceptional characteristics? The Nature Conservancy extols the regionally significant nature of this Plateau for good reason.

This report has presented evidence showing that each of DCR's reasons to log the Cattle Barn Lot is not supported by forest ecology science or a significant local forestry industry. Given all the ecosystem functions and services of the Cattle Barn Lot, along with the ecological features of the Intemann land shown in the BioMap datalayers, adding the 847 acres to the existing Mount Washington State Forest is more consistent with major state priorities than logging off the core of the property for $100,000, $128,000, or however much revenue is truly expected, and destroying the characteristics that make the place exceptional.

As noted earlier, ten million dollars were just spent by the state and donors ($5 million from the state with an equal match from the sponsoring groups) to acquire 1,424 acres as forest reserves. Expanding the state's forest reserve system by adding the 847 Intemann acres to the Mount Washington Forest Reserve would cost nothing.

Back in 2010, the *Forest Visioning Futures* report said, when in doubt, or where there is disagreement among qualified ecologists and foresters, the default management prescription should be to do nothing. It's better to leave the forest alone to mature into an old-growth refugium than to strip it of resources and expose all the dependent species to loss of habitat and the ability to thrive.

If state officials believe they still lack adequate information to make a decision about the future of the Cattle Barn Lot, a recommendation includes the following: hire an independent wetlands scientist to do a complete delineation during the growing season; contract for a LiDAR scan for an accurate picture of the aboveground hydrology features; study the aquatic life in the perennial and intermittent streams; bring in amphibian and avian experts to estimate populations during the breeding seasons, and; hire a hydrogeologist to create a three-dimensional map of the underlying hydrology and geology, showing the interconnectedness of the site. All of these scientists could be hired and funded by Green Berkshires, Inc. or other nonprofits such as TNC, or DCR could handle these arrangements separately.

As another recommendation, if it has not done so already, DCR could enroll the Intemann land (and, for that matter, the entire Mount Washington Forest Reserve) in research programs such as the Forest Global Earth Observatory, an international network of long-term forest research sites. Apparently, DCR has ongoing internal studies on its land in Mount Washington.

TNC may have research interests on the land it owns contiguous to the Intemann land and elsewhere on the Plateau. Green Berkshires, Inc. is prepared to continue funding studies to gather more scientific knowledge about the upper Karner Brook Watershed and other areas in Mount Washington. The upcoming Woodwell Climate Research Center carbon mapping project, to include the Cattle Barn Lot, the Intemann land, and all of the South Taconic Plateau, is one such study.

There will always be pressures to ignore, set aside, or devalue the accumulation of state-sponsored and other studies and reports on the big challenges facing our state in favor of other priorities. For this demonstrably rare location, though, timber sales and hunting habitat should be very, very low on the hierarchy of priorities. All the Mount Washington homeowners who are committed to protecting the environment of this South Taconic Plateau and who signed the petition asking the same for the Cattle Barn Lot and Intemann land hope that the Healey Administration will add the Cattle Barn Lot and the Intemann land to the Mount Washington Forest Reserve.

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