MASSACHUSETTS FOREST RESERVES
LONG TERM ECOLOGICAL MONITORING PROGRAM

MOUNT GREYLOCK FOREST RESERVE

A report on the baseline characteristics of the Mount Greylock Reservation Forest Reserve and the proposed Intensive Monitoring Areas in the Mount Greylock Forest Reserve and Taconic Trail State Forest

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Cover: Western slope of Mount Greylock (photo by Matthew Kelty).

PREFACE

The Mount Greylock Reservation is the site of one of eight large Forest Reserves in the Commonwealth of Massachusetts (Fig. 1). The Forest Reserves were established by the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) to create areas where forest development is the product primarily of natural succession and natural disturbance. The Forest Reserve management goal is to increase the area of late seral forest and to protect and conserve species that depend on this habitat, while allowing the effects of natural disturbances to create variation in successional trends in some areas. Only passive management is used in the Forest Reserves, mainly focusing on restoring native habitat by removing invasive species. Sustainable forest management, including timber harvesting, will be implemented on state lands outside the Forest Reserve system (EOEEA 2009).

Mount Greylock is one of three Forest Reserves in the state with a matched non-Reserve state forest area that will continue to be actively managed. Within each Forest Reserve and matching non-Reserve area, an area of between 800 and 1,000 acres has been proposed for intensive monitoring. These Intensive Montoring Areas (IMAs) will provide data for a statistical comparison of forest condition in Reserve and non-Reserve state forests. The Taconic Trail State Forest has been selected as a non-Reserve match for the Mount Greylock Forest Reserve. Both the Mount Greylock Reservation, including the Mount Greylock Forest Reserve and the Taconic Trail State Forest (also known as the Taconic Trail State Park) are under the supervision of the Massachusetts Department of Conservation and Recreation-Division of State Parks and Recreation (DCR).

Section 1 of this report begins with a description of the Mount Greylock Forest Reserve. Topics include physical features, disturbance history, land use history, and forest communities. Following this, baseline data on tree density, size distribution, and species composition from Continuous Forest Inventory (CFI) data are summarized and discussed.

Section 2 presents a comparison of topography, bedrock, soils, and forest condition in the Mount Greylock Forest Reserve and Taconic Trail State Forest IMAs. Analyses of baseline CFI data for these two areas are also included.

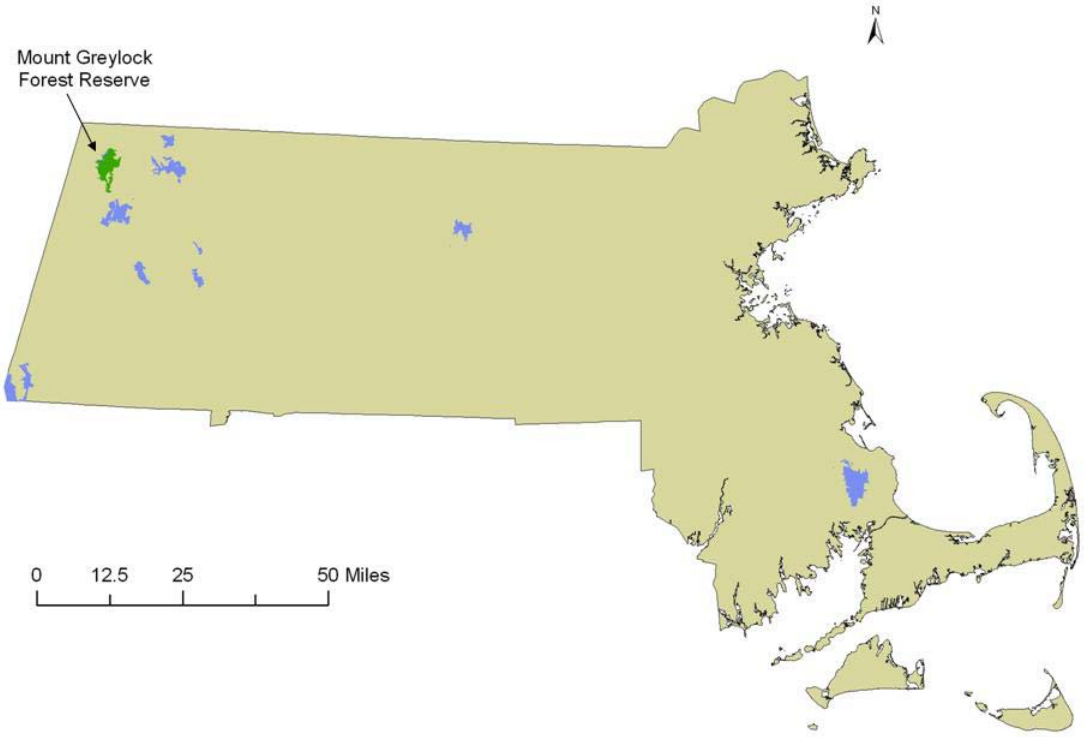

Fig. 1. Mount Greylock Forest Reserve, Massachusetts (green). The other large Forest Reserves are shown in blue (DCR 2008). All GIS analyses were completed in ArcGIS 9.3 (ESRI 2008).

SECTION 1: THE MOUNT GREYLOCK FOREST RESERVE

INTRODUCTION

The Mount Greylock Reservation is located in the northwestern corner of Massachusetts in the towns of Williamstown, North Adams, Adams, Cheshire, and New Ashford. The entire reservation covers slightly more than 13,000 acres (All areas are based on GIS analysis, unless otherwise noted). The Mount Greylock Forest Reserve occupies 8,000 acres within the Reservation boundaries (Fig. 2). The Reserve area includes all of the highest mountain peaks in the Reservation: Mount Williams (2,951 ft.), Mount Fitch (3,110 ft.), Mount Greylock, the highest point in the state (3,491 ft.), and Saddleball Mountain (3,238 ft.). These mountains form a continuous north-south ridgeline. The Appalachian Trail passes through the Reserve, traversing these mountain peaks. There are two other summits in the Reserve to the west of Mount Greylock. These are Mount Prospect (2,690 ft.) and Stony Ledge (2,580 ft.). Stony Ledge and Mount Prospect form the north, east, and south walls of the Hopper, a steep V-shaped valley, drained by Hopper Brook (Fig. 3). There are three old-growth red spruce stands located on the east wall of the Hopper. A 1,600-acre area within the Hopper, was designated a National Natural Landmark in 1987, by the National Park Service. DCR regulations have prohibited motorized vehicles and camping within this area since 1977.

The Hoosic River flows north around the base of the mountain range through Adams, North Adams, and Williamstown and into New York. Kitchen, Bassett, Pecks, and Hoxie Brooks flow down the east side of the mountains into the Hoosic River. Roaring, Hopper, and Money Brooks drain the west side of the mountains, entering the Green River, which flows north entering the Hoosic River in Williamstown (MassGIS 2000).

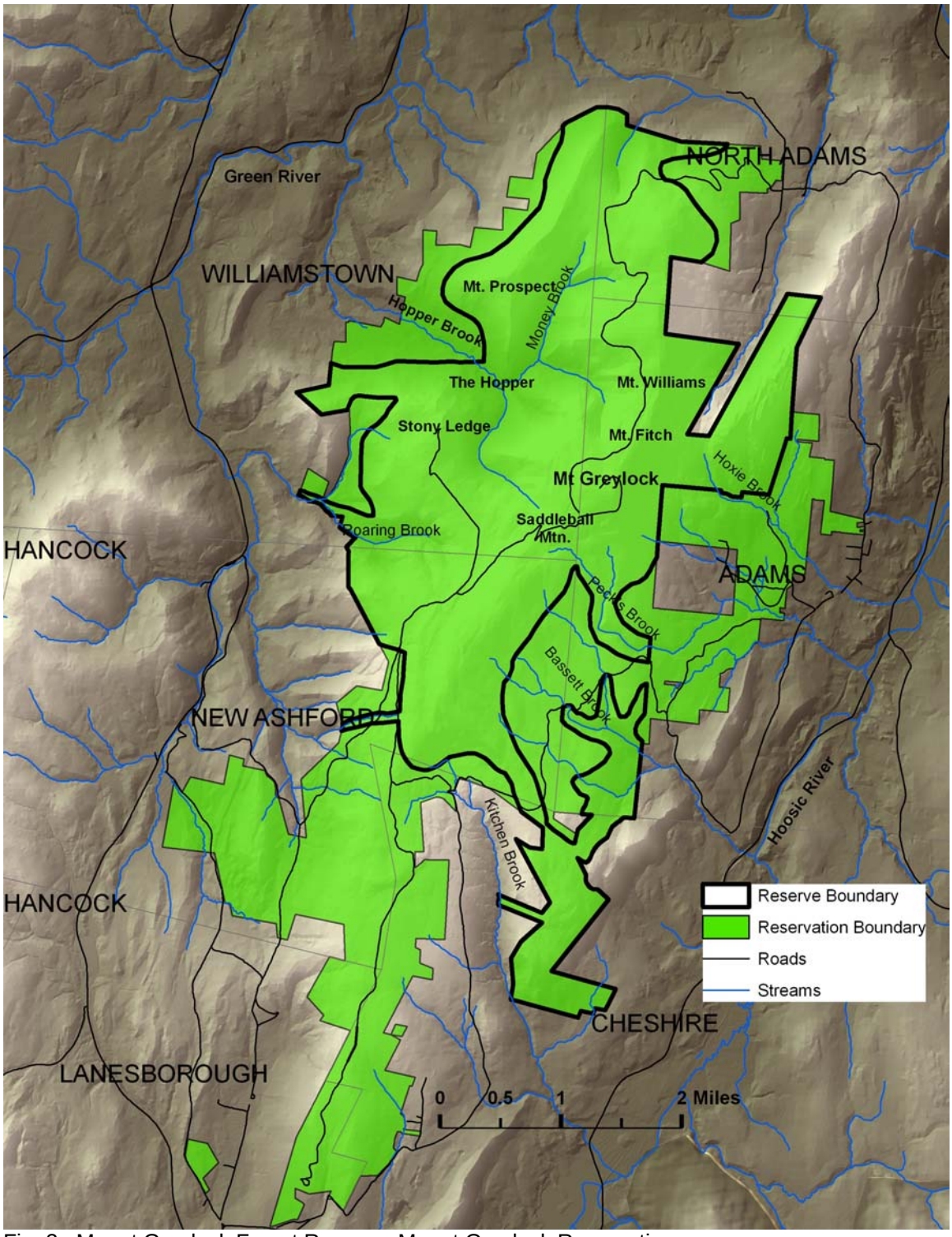

Fig. 2. Mount Greylock Forest Reserve, Mount Greylock Reservation.


Fig. 3. The Hopper (Gonewengland 2003).

The Mount Greylock Forest Reserve falls within the Taconic Mountains Subsection, an ecoregion classification of the U.S. Forest Service and the basis for Massachusetts state ecoregions. At a finer scale, within the Taconic Mountains subsection, the area is divided into three Land Type Associations (LTAs) corresponding the change in elevation and climate from the base to the peaks of the mountains. These are the Taconic Mountains Low/mid-elevation LTA, the Taconic Mountains Upper Elevation (North) LTA; and the Taconic Mountains Greylock Peak LTA (Fig. 4). These LTAs correspond to three broadly defined forest types. They are, in order from the lowest to highest elevations, Northern Hardwoods-Hemlock, Northern Hardwoods-Spruce, and High Elevation Spruce-Fir (Keyes and Carpenter 1995, de la Cretaz and Kelty 2008).

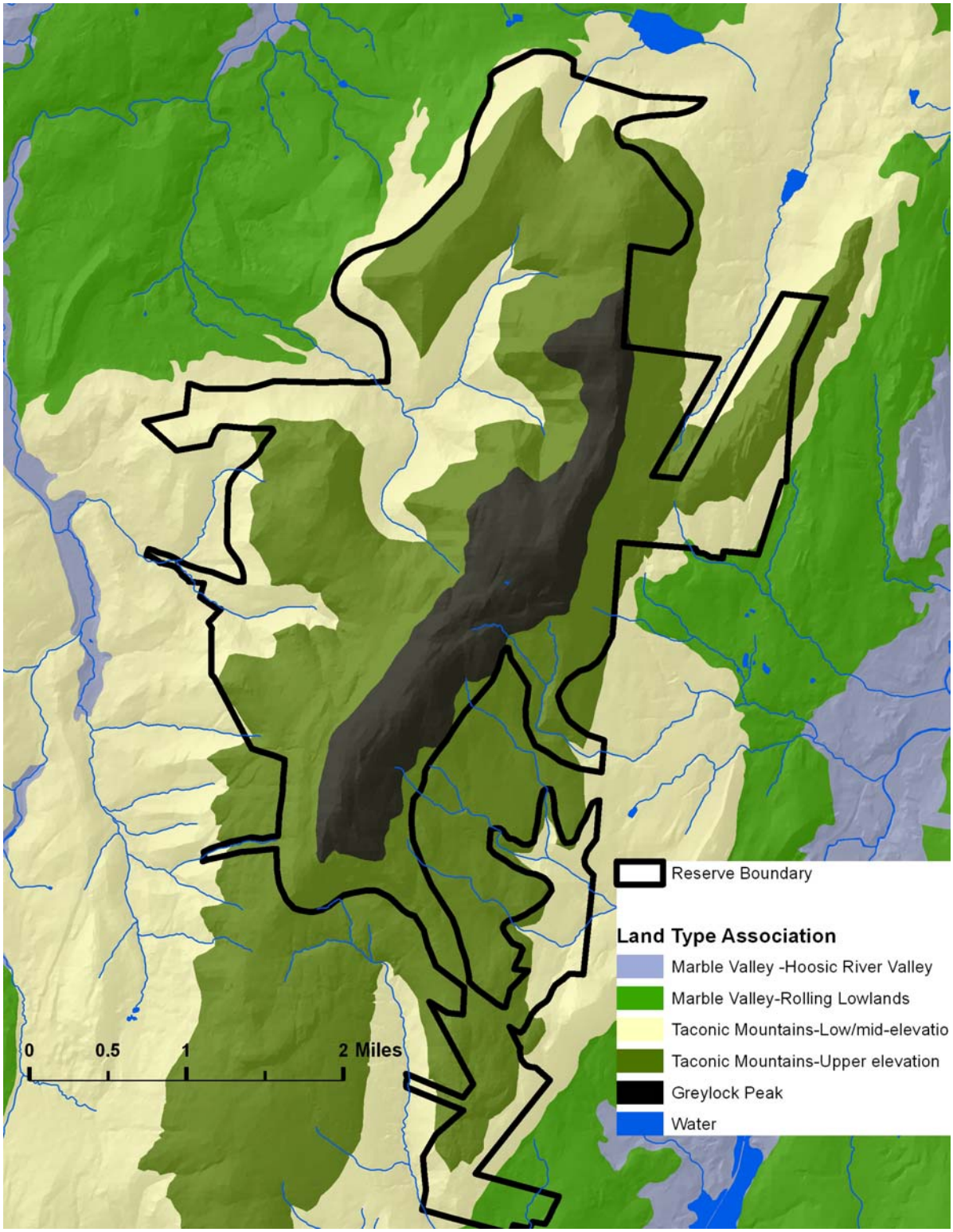

Fig. 4. Land Type Associations of the Mount Greylock Forest Reserve (de la Cretaz and Kelty 2008).

Associated Open Space

Within a two-mile buffer extending from the outer boundary of the Forest Reserve, 9,720 acres or 27% of the area is permanently protected open space (Fig. 5) (MassGIS 2009 (a)). Of this, 4,890 acres are the part of the Mount Greylock Reservation that falls outside the Forest Reserve boundary. Fee owners in the "other" category include the towns of Adams, and North Adams, Williams College, and private individuals.

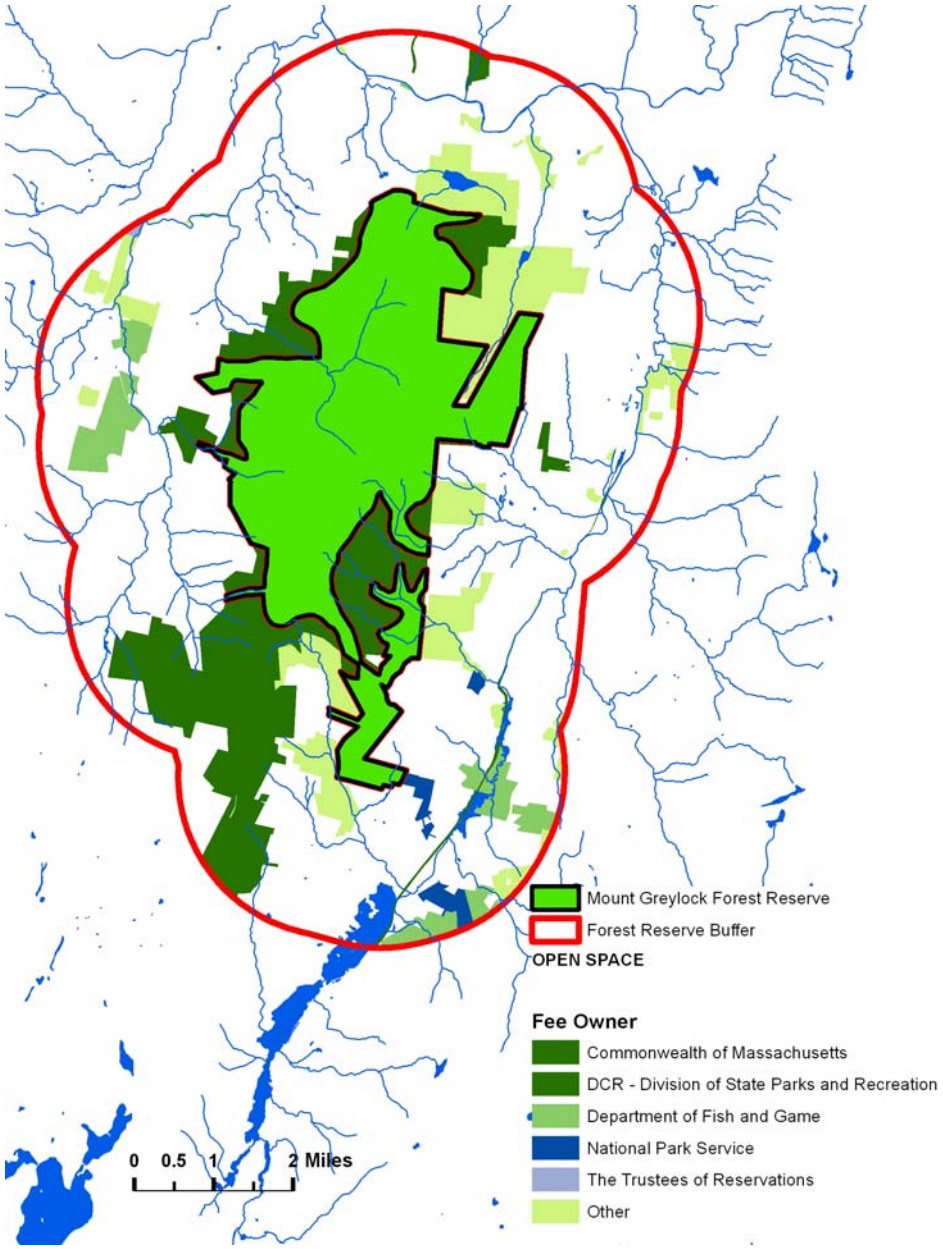

Fig. 5. Permanently protected open space within a buffer area extending 2 miles from the boundary of the Mount Greylock Forest Reserve (MassGIS 2009 (a)).

PHYSICAL FEATURES

Topography

The Mount Greylock Forest Reserve is an area of mountain peaks and steep slopes divided by steep-walled stream valleys (Fig. 2, Fig. 6). Elevations range from 1,230 ft. at the point where Hopper Brook leaves the Reserve, to 3,491 ft. at the summit of Mount Greylock. There are large areas of moderately steep (25 – 60%) and steep slopes (> 60%).

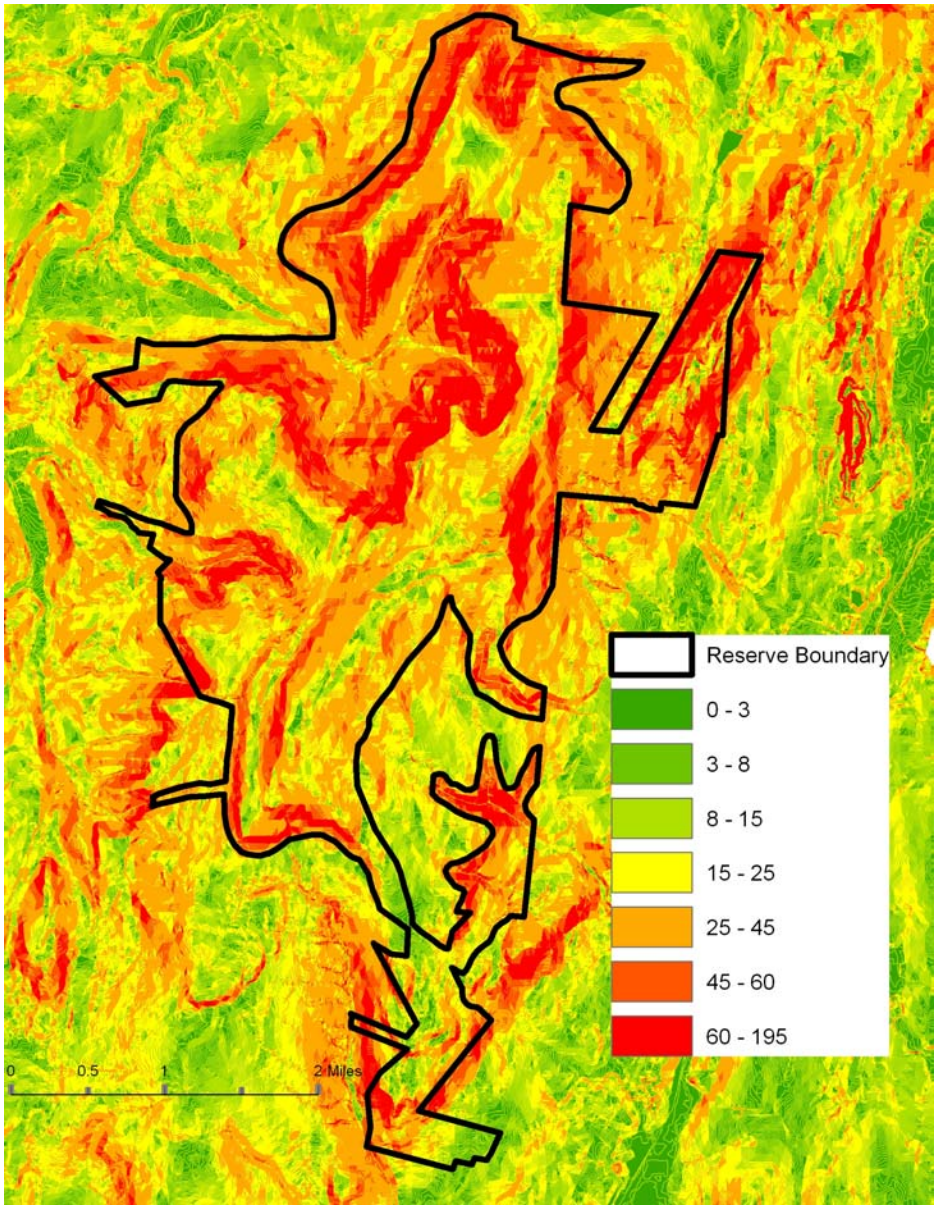

Fig. 6. Percent slopes, Mount Greylock Forest Reserve.

The mountain ridgeline running through the center of the Forest Reserve creates a dividing line. Slopes on one side of the ridge have an east-southeast aspect. Slopes on the other side of the ridge have a west-northwest aspect (Fig. 7).

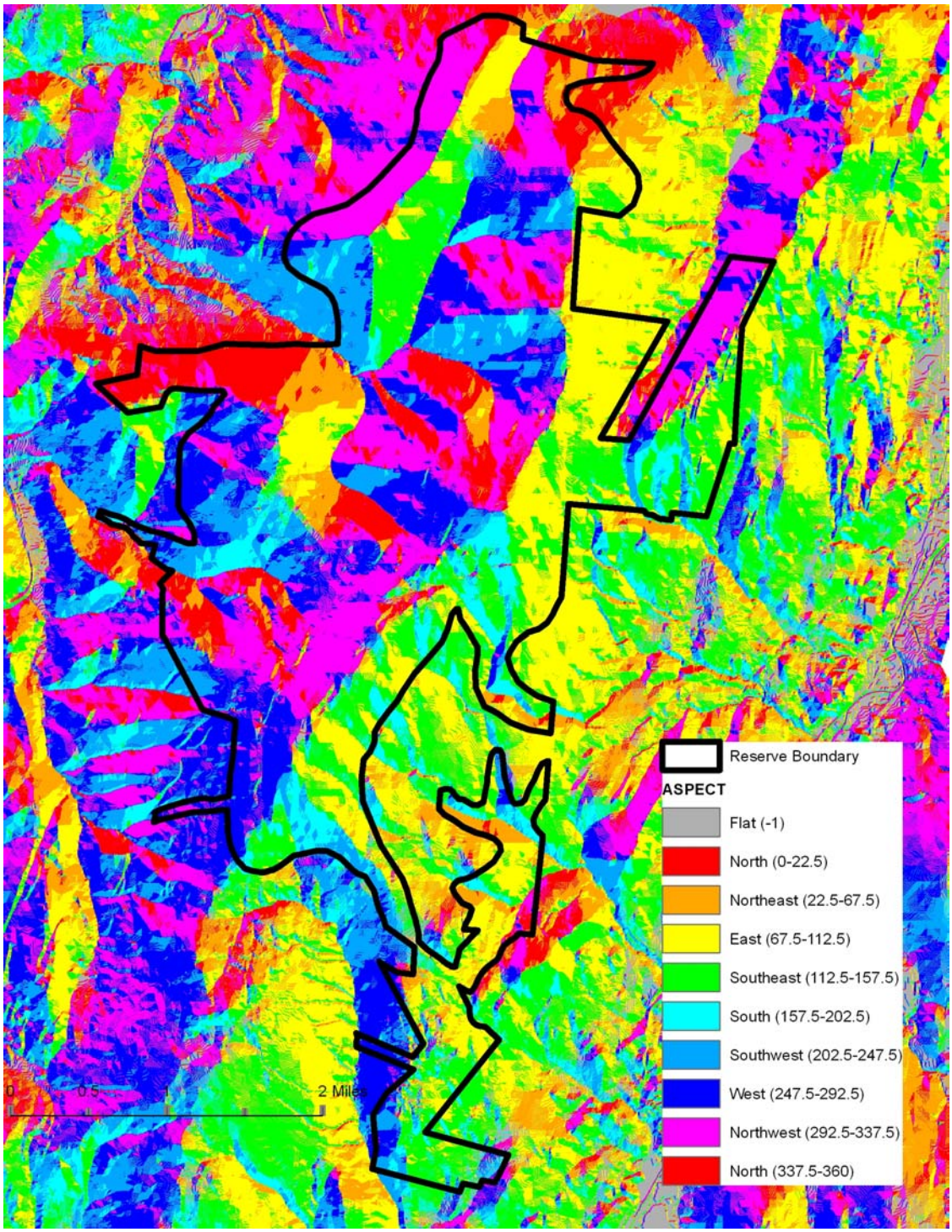

Fig. 7. Aspect analysis of the Mount Greylock Forest Reserve.

Bedrock Geology

Mount Greylock and the associated mountain peaks described above are the eroded remnants of mountains formed between 400 and 500 million years ago during the Taconic orogeny (mountain-building event). At that time ancient oceans covered the bedrock of what is now western Massachusetts, an area that includes Mount Greylock and the surrounding river valleys and the lowlands known as the Marble Valley. The movement of tectonic plates resulted in a collision between the continental landmass and a chain of offshore volcanic islands. The collision, occurring at a rate of about 1 inch per year over a 150-million-year period, pushed rocks, sandstone, and limestone from the continental slope and shelf up over the carbonate banks at the edge of the core North American continent, known as Laurentia. Continental bedrock and ocean floor material were pushed together and thrust upward forming mountains thought to be six times the height of mountain peaks found in the area today.

The bedrock of the Taconic Mountains, Mount Greylock, and the Marble Valley is the metamorphic product of sedimentary rocks and carbonate material subjected to intense heat and pressure while buried deep below the earth's surface. Bedrock formations in the Reserve include the Greylock schist, Stockbridge marble, and the Walloomsac formations, an assortment of phyllite, schist, limestone, marble, and quartz (Fig. 8, Fig. 9, Table 1). The Everett schist in the Taconic Mountains is similar to the Greylock schist. Hundreds of millions of years of erosion have reduced the height of the mountain peaks and carved out river valleys, exposing the underlying metamorphic bedrock in these geologic formations (Burns and Stevens 1988, Skehan 2001).

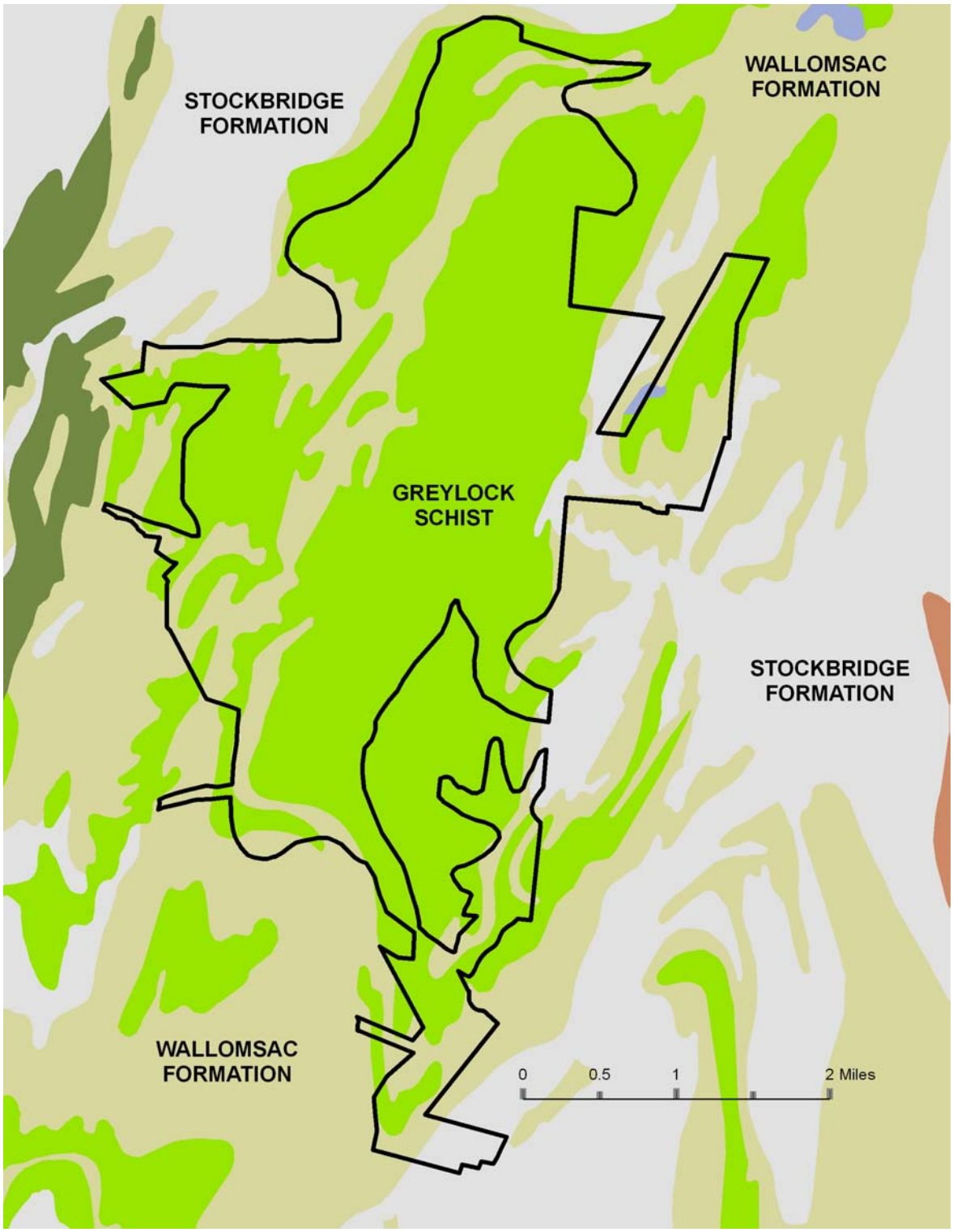

Fig. 8. Bedrock Formations in the Mount Greylock Forest Reserve Area. Forest Reserve boundaries are shown in black. In addition to the major bedrock formations (labeled), the Dalton Formation to the east is shown in dark-red and the Nassau Formation to the west is shown in dark gray-green (Zen et al. 1983).

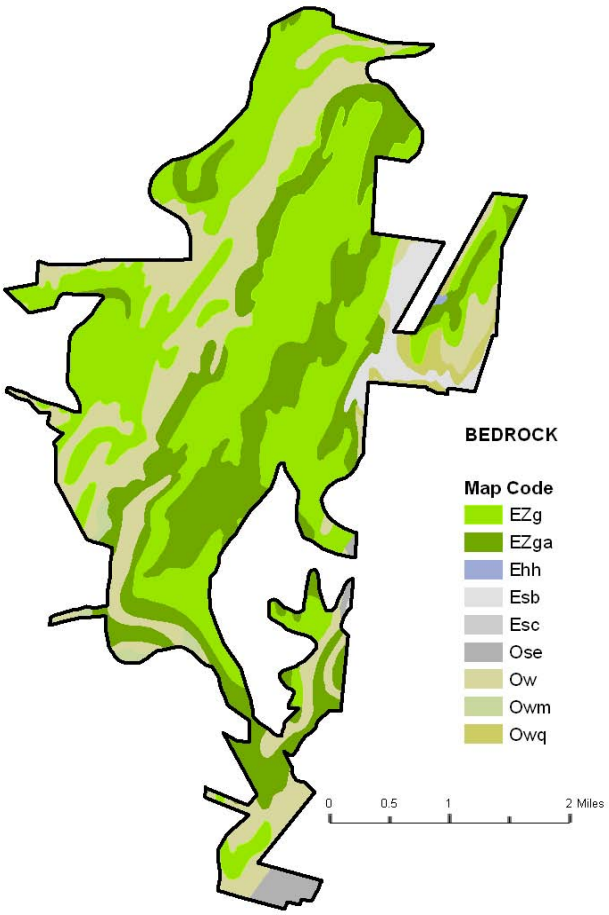

Fig. 9. Bedrock, Mount Greylock Forest Reserve (Zen et al. 1983).

Table 1. Mount Greylock Forest Reserve Bedrock Description (Zen et al. 1983).

Map Code	Description	Area (%)	Formation	Rock Type
EZg	Phyllite, quartzite	46	Greylock Schist	Metasedimentary
EZga	Phyllite, metasedimentary rock, dolostone (dolomite), conglomerate	25	Greylock Schist	Metasedimentary
Ehh	Slate, chert	<1	Hatch Hill Formation	Sedimentary
Esb	Dolomite marble, phyllite, quartzite	3	Stockbridge Formation	Metamorphic
Esc	Calcitic dolomite marble	<1	Stockbridge Formation	Metamorphic
Ose	Calcite marble	1	Stockbridge Formation	Metamorphic
Ow	Phyllite, schist, limestone	22	Walloomsac Formation	Metasedimentary
Owm	Marble, phyllite	<1	Walloomsac Formation	Metamorphic
Owq	Quartz	2	Walloomsac Formation	Sedimentary

Surficial Geology and Soils

The advance and recession of four glacial ice sheets, beginning 1.6 million years ago, further reshaped Mount Greylock and the surrounding landscape, widening valleys and rounding hilltops. The last glaciation (the Wisconsinan Ice Age) began 80,000 years ago with the ice sheet reaching its maximum extent about 25,000 years ago. At this time, western Massachusetts was covered by an ice sheet that reached heights of more than 2,000 feet in some areas. As the glaciers receded, they left deposits of dense glacial till – a mix of sand, gravel, rocks, and boulders on the slopes of Mount Greylock (Skehan 2001).

Outwash terraces, created by glacial meltwaters during the formation of Glacial Lake Bascom, widen the base of the mountain range. These are present at higher elevations, between 2,000 and 2,200 feet in the southeastern corner of the Reservation east of Kitchen Brook. For the most part, outwash areas lie at lower elevations that are outside the Reserve boundary and all soils within the Reserve boundaries were formed from glacial till (Burns and Stevens 1988).

Soils within the Mount Greylock Forest Reserve belong to the Lyman-Tunbridge-Peru association with the greatest area covered by the Lyman series (Fig. 10). Lyman soils are shallow to bedrock (<20 inches), and somewhat excessively drained. They are typically found on rocky hills, mountains, and high plateaus. The Lyman series are classified as spodosols (NCSS 2007). Spodosols are acidic, sandy, nutrient poor, leached soils that form in acidic glacial till in cold, wet environments, typically under forests. Spodosols are characterized by an E or eluviated horizon, below the Organic (O) horizon at the surface. Clay, iron, and aluminum oxides have leached out of the E horizon, leaving a soil layer that is light-colored and contains only resistant minerals such as quartz (Brady and Weil 2002). The Tunbridge, Peru, and Berkshire soil series are also spodosols. Tunbridge soils are moderately deep and well drained. Depth to bedrock is 20 to 40 inches (NCSS 2008). Peru soils are very deep and moderately well drained with a dense substratum or hardpan at 24 to 65 inches (NCSS 1998). Berkshire soils are very deep and well drained (NCSS 2006). The remaining soil series listed in Table 2 constitute only one percent of the Forest Reserve area. These soils are found at lower elevations near the Forest Reserve boundaries. Kendaia, Amenia, and Pittsfield soils formed in the calcareous till deposits that cover the rolling hills bordering the Hoosic River valley (Scanu 1988).

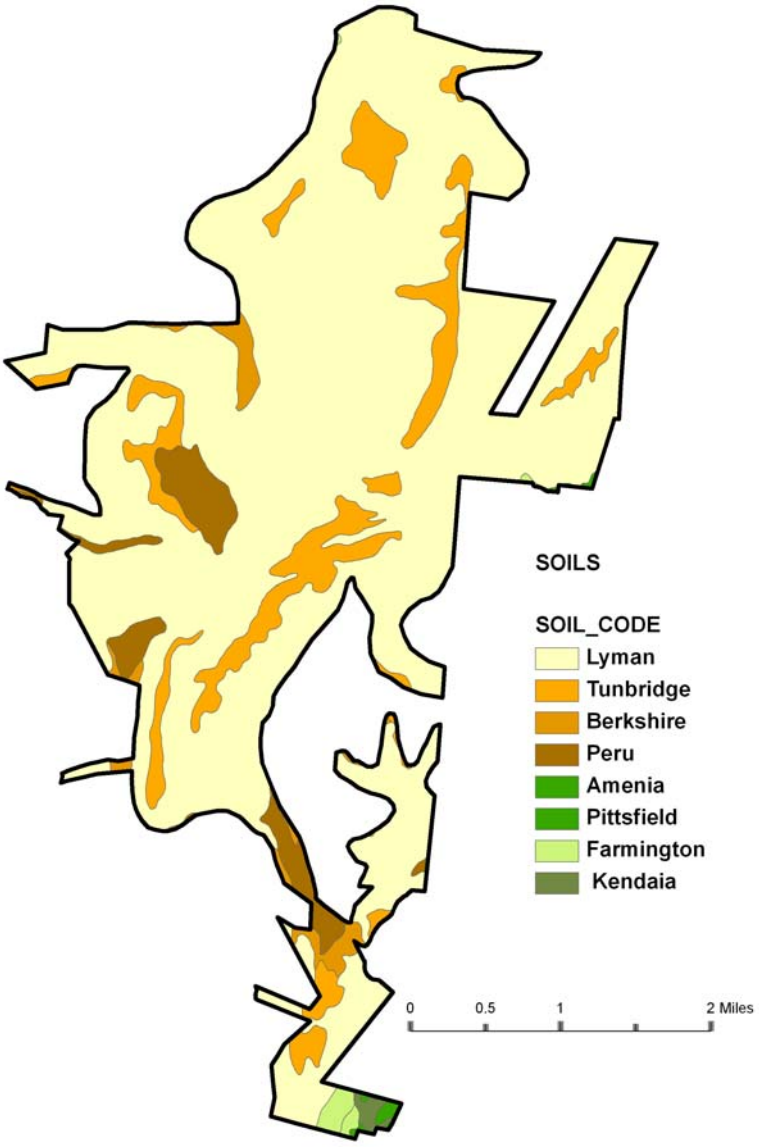

Fig. 10. Soils, Mount Greylock Forest Reserve (Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture 1999).

Table 2. Soil Series, Mount Greylock Forest Reserve (NCSS 1998, 2006, 2007, 2008).

Parent Material	Series	Soil Description	Area (%)
Acidic glacial till	Lyman	Shallow, somewhat excessively drained	82
	Tunbridge	Moderately deep, well drained	11
	Berkshire	Very deep, well drained	2
	Peru	Very deep, moderately well drained	4
Calcareous Glacial Till			
Amenia, Pittsfield, Farmington, Kendaia			1

Climate

In Berkshire County winters are cold and summers are moderately warm with occasional hot spells. Mean annual precipitation for the town of Adams is 44 inches. At the summit of Mount Greylock, mean annual precipitation rises to between 56 and 58 inches (Fig. 11). Precipitation is fairly evenly distributed throughout the year with slightly greater values, over 4 inches/month, for April, May, June, July, and September (Scanu 1988, World Climate 1996, Daly and Taylor 1998). Mean yearly snowfall in the uplands is 70 inches. Snow cover is often present from November till April.

Weather records were not kept at the Mount Greylock summit during the twentieth century although the site has served as a weather observatory in the past. Williams College students first built an observatory there in 1830. The original structure was destroyed by fire in 1841 and replaced by students working with Professor Albert Hopkins. The tower was used for meteorological and astronomical observations and contained "anemometers, barometers, self-registering thermometers, and other instruments that could keep track of weather for two months without adjustment." The operation was plagued by vandalism however, and the second tower was destroyed in 1855 (Burns and Stevens 1988).

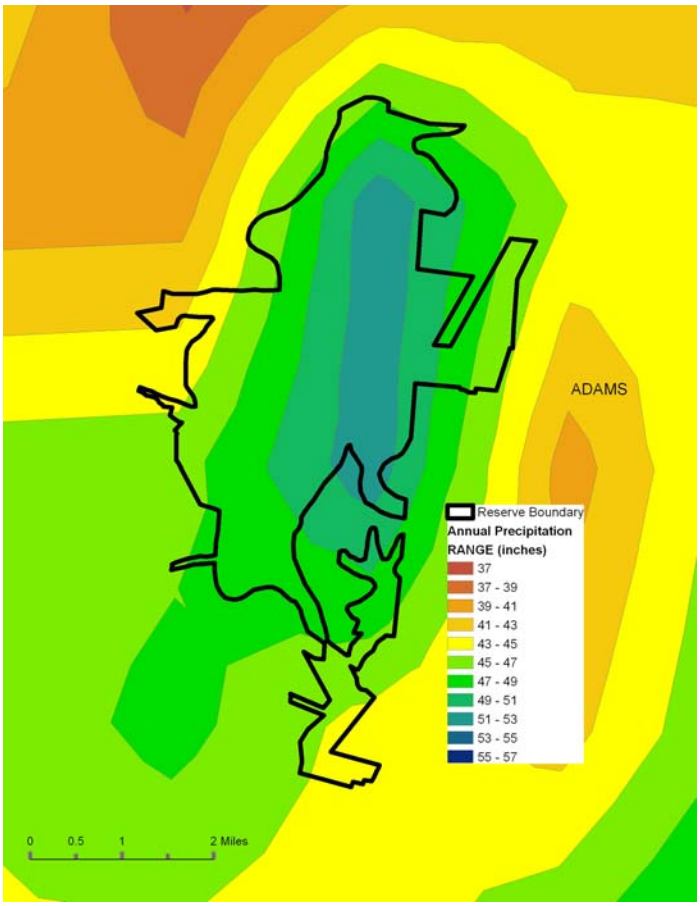

Fig. 11. Estimated precipitation in the Mount Greylock area (Daly and Taylor 1998).

Disturbance History

Natural disturbances that have affected Mount Greylock in the past include wind storms (hurricanes and tornadoes), winter snow and ice storms, severe thunderstorms, landslides, insect infestations, and fungal diseases.

Wind Storms and Hurricanes: Investigations of old-growth stands have found evidence of damage from 33 hurricanes between 1716 and 1985 (D'Amato 2007). The extent of the damage was variable and in part dependent on landscape position. Old-growth stands on the steep-walled, west facing slopes of Mount Fitch above the Hopper were protected from the full force of hurricane winds and frequently escaped damage. Continuous Forest Inventory (CFI) sampling recorded wind damage to Greylock CFI plots in 1950, 1978, and 1995 (DCR 2000). The 1950 hurricane lifted the roof off a 70-foot barn, and deposited it in the tree tops across Notch Road, on the lower slopes of Mount Williams (Burns and Stevens 1988). Severe thunderstorms caused considerable damage in 1901 (MGCR 1919).

Ice Storms: Canopy damage from severe ice storms was recorded in 1921 and 1942 (Reid 1978). CFI data notes snow and ice damage affecting trees on sample plots in 1958, 1975, 1977, 1995 and 1997 (DCR 2000).

Landslides: Steep mountain slopes within the Greylock Forest Reserve are vulnerable to landslides, especially following heavy rains. A summary of landslides from the late 18th century to the 1970s is given in Reid (1978). Historical records of landslides begin with a severe landslide that occurred in the Hopper region in 1784 following a cloudburst. The slide cut a channel from the summit to the base of the mountain that cleared nearly ten acres of land (Dwight 1822; Perry 1896). Another landslide in the Hopper was reported in 1823. In this instance the mass of landslide material came to the dense woods towards the bottom of the Hopper, destroying the largest trees in its course and creating an opening that, from a distance, had the appearance of a road cut through the forest (Burns and Stevens 1988, reported by Dewey in Field, D.D. 1829). Hitchcock (1833) observed several slides in the Hopper, visible from Stony Ledge, where "trees and loose soil had been swept away...these areas being of considerable width." Major landslides on the steep eastern slopes of Mount Greylock occurred following a cloudburst on August 20, 1901. This event was preceded by 2 months of unusually heavy rain, 12.92 inches in July and August alone, 5.8 inches above normal. The area had been left bare of trees following logging in the 19th century. The landslides left scars that were visible for the next 50 years (Burns and Stevens 1988). Aerial photographs, taken by the United States Forest Service in 1938, show 2 large landslides on the slopes of Mount Williams and Mount Fitch. In the 1970s, these areas were covered with early-successional red maple and white birch in contrast to the surrounding northern hardwood forest. In the late 1970s, a slide occurred on the very steep upper slope of Mt. Fitch, facing south towards Greylock. It was approximately 450 feet long and ran through a stand of spruce (Reid 1978). In 1990, a landslide, estimated to be at least 300 feet wide and 1,000 feet long destroyed forests on the western slope of Mount Greylock following two days of heavy rain (Associated Press 8/10/1990). Flaccus (1959) characterized most landslides in the

Berkshires as "debris-avalanche" type, caused by the slipping of waterlogged soils following severe summer storms.

Fire: Fires were common during the 19th century when widespread clear cutting of trees for charcoal and other uses left slash and debris on denuded slopes (DCR no date given). At the current time, most forests in Massachusetts do not experience fires of high frequency or high intensity. On the Mount Greylock Forest Reserve, northern hardwood forests present a particularly low fire risk. The leaves, twigs, and branches of the main species (beech, yellow birch, and sugar maple) decompose readily, so there is a relatively low accumulation of fuel on the forest floor. The live canopy of northern hardwood stands ordinarily do not carry a fire, because of the high moisture content of the leaves, and the high air humidity caused by transpiration of the trees. Oak dominated stands are more fire-prone, however the risk is still low largely due to climate – snowy winters and evenly distributed rainfall. Fire risk is greatest during the spring after snowmelt and before leaf out and in the fall after the leaves have fallen (Kelty 2008).

Insect, Fungi, and Disease: Within the past 50 years, forests in the Mount Greylock Reservation have suffered from a variety of insects and fungal diseases including beech bark disease, saddled prominent caterpillars, gypsy moth caterpillars, and pear thrips (MassGIS 1997). Beech bark disease can cause the death of mature beech trees. Saddled prominent caterpillars, gypsy moth caterpillars, and pear thrips undergo periodic population explosions during which trees are weakened and damaged; however, most trees are able to recover, once the pest population has crashed (Houston and O'Brien 1983, Rush and Allen 1987, Liebhold 2003). CFI data indicates that plots within the Mount Greylock Forest Reserve were affected by insects and disease in 1967, 1979, and 1999 (DCR 2000).

Pest and Pathogen Information:

Beech Bark Disease results when bark, attacked and altered by the beech scale insect (*Cryptococcus fagisuga*), is invaded and killed by fungi, primarily *Nectria coccinea* and sometimes *Nectria galligena* (Houston and O'Brien 1983). Beech bark disease became evident in forests within the Mount Greylock Reservation in the 1960s. Mortality in older stands following that infestation was almost 100 percent (Reid 1978).

Saddled Prominent (*Heterocampa guttivitta*) caterpillars (also referred to as Saddle Prominent) have caused defoliation of hardwoods in the Northeastern United States and Southeastern Canada. A major outbreak occurring from 1968 to 1971, affected nearly 1.5 million acres in Maine, Massachusetts, New Hampshire, New York, and Vermont (Rush and Allen 1987). Additional outbreaks affecting small patches (<300 acres) were reported in 1981 and 1995 (Mass GIS 1997). Saddled prominent larvae primarily feed on broad-leaved trees and shrubs, favoring American beech, sugar maple, yellow birch, and paper birch, species that are found in abundance in Greylock Reservation forests. Saddled prominent populations collapse due to the combined actions of parasites, predators, and disease and from starvation as large populations defoliate many trees and outstrip the food supply (Canadian Forest Service 2007).

Gypsy Moth (*Lymantria dispar*) caterpillars have cause widespread forest defoliation. The last major infestation affecting the Mount Greylock area occurred in 1980-1982. Limited damage from gypsy moths was noted in 1991 (MassGIS 1997). In Massachusetts, gypsy moth caterpillars prefer hardwoods, especially oaks, basswood, gray and white birch, and poplar. Older larvae feed on several species of hardwoods plus hemlock, pines and spruces. They tend to avoid ash, butternut, balsam fir and mountain laurel, but will feed on almost anything during a population outbreak. Outbreak populations return to low levels that do not visibly affect the forest canopy after 2 to 3 years. Wasps, flies, ground beetles, and ants; many species of spiders, birds, and many small woodland mammals (mice, shrews, chipmunks, squirrels, and raccoons) all prey on gypsy moth larvae when population density is low, but this predation does not prevent outbreaks (McManus et al. 1989, Elkinton et al. 2004). Population outbreaks are eventually controlled by density-dependent mortality. A virus (*Nucleopolyhedrovirus*) usually causes outbreak population collapse. Recently an entomopathogenic fungus species (*Entomophaga maimaiga*) has prevented population outbreaks. The fungus has spread rapidly since it was first observed in 1989, partially the result of intentional introduction into gypsy moth infested areas as a biological control (Hajek et al. 1996, Liebhold 2003).

Pear Thrips (*Taeniothrips inconsequens*) were first identified as agricultural pests that attacked fruit trees. They have been considered a serious forest pest since 1979. A major infestation affecting most of the Mount Greylock Reservation forest occurred in 1987 – 1988 (MassGIS 1997). Adult pear thrips emerge from the soil in the spring. They feed on the buds and emerging leaves of sugar maples, birch, ash, black cherry, and beech, and then lay their eggs in the veins and petioles of the leaf epidermis leaving brown scars (O'Brien and Snowden 1989).

Hemlock Woolly Adelgid (*Adelges tsugae*), an aphid-like insect from Japan that feeds on Hemlock needles, has caused considerable mortality to eastern hemlock trees from North Carolina to Connecticut. The woolly adelgid is now present in southern Berkshire County, and has been reported in Greenfield, MA to the east of Mount Greylock and in Copake, NY to the west. As of 2005, it had not yet been observed in Williamstown, MA. Woolly adelgid remains a potential threat to hemlocks in the Forest Reserve (Orwig et al. 2002, Smith 2005).

LAND USE HISTORY

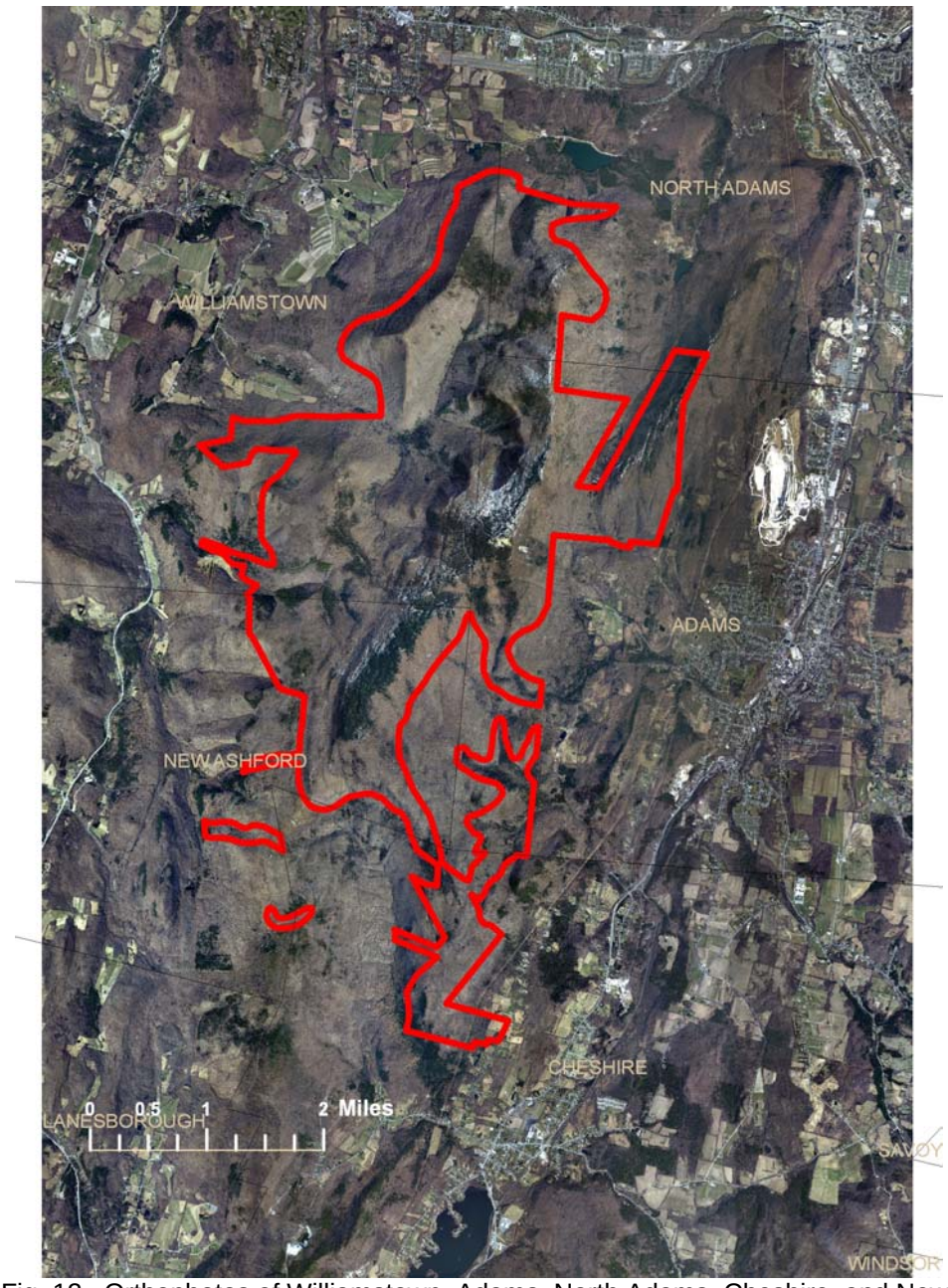

Fig. 12. Orthophotos of Williamstown, Adams, North Adams, Cheshire, and New Ashford (MassGIS 2005) with Forest Reserve boundaries shown in red.

In pre-settlement times, indigenous people of the Mahican and Hoosac tribes occupied the lowland valleys at the base of Mount Greylock. They lived in temporary settlements, growing maize, beans, and squash, and hunting in the forests that covered the mountain slopes. European settlement began in earnest following the end of the French and Indian Wars in 1763. Settlers were farming the slopes of Mount Greylock in the late 1700s. Property maps from the town of Adams show the first parcels of land owned by John and Jeremiah Wilbur. The Wilbur's property, which eventually totaled 1,600 acres,

covered land from the summit down the north slopes of the mountain including the area known today as Wilbur's clearing. Jeremiah Wilbur (1753 -1813) was the first to build a road to the summit (Burns and Stevens 1988).

Local industries included sawmills and gristmills that depended on seasonal waterpower provided by water running down the mountain slopes (DCR, no date given). Crumbling stonewalls and an apple orchard can be found at an elevation of 2,200 feet on the slopes of Mount Greylock. The Hopper, with rich soils, level ground, and many streams was an attractive area for agricultural development. Several early settlers cleared land and built farmhouses in this area, in the valley and on the slopes of Mount Prospect and Stony Ledge (Burns and Stevens 1988).

In the early 19th century land was cleared well up the mountain slopes for pastures for dairy cows and sheep. This period was followed by widespread farm abandonment due to economic pressures. Agriculture declined following the opening of the Erie Canal in 1825, which allowed for the transport of abundant supplies of lower cost food products from the Midwest. The decline in the value of agricultural products and the rise of the industrial revolution, led to farm abandonment throughout New England (Hall et al. 2002), but the demand for forest products did not diminish. Harvested timber supplied the needs of local populations for fuel and construction material and supported industrial and commercial activity. An iron mine and a copper mine were established at the base of Prospect Mountain and an iron forge or smelter was built and operated on Roaring Brook Road on the western side of the mountain (Pierson 1953). There was a large deposit of iron ore on Mount Williams and limestone deposits were located above Adams, Cheshire, and Lanesborough. Quarries produced limestone that was converted to quicklime in lime kilns that operated at various sites throughout the region including the town of Cheshire. Iron ore, lime, and charcoal, produced by the slow burning of harvested timber, were the basic ingredients required to turn iron ore into pig iron in blast furnaces in North Adams and Lanesboro. Trees also provided fuel for the year-round operation of textile factories and paper mills. By 1841, the summit trees had been cleared (Burns and Stevens 1988, Kirby 1995).

More trees were cleared when new technology, developed in the 1860s, made it possible to manufacture paper from wood pulp rather than rags. Industry declined in the late 19th and early 20th centuries, as resources were depleted and improved transportation made shipping manufactured goods from other areas of the country, more economical (Gordon 1998). Second and third growth forest reclaimed the mountain slopes as industrial demands declined in the late 19th and early 20th century. As in the past, the towns of Williamstown (pop. 8,424), North Adams (pop. 14,681), Adams (pop. 8809), New Ashford (pop. 247) and Cheshire (pop. 3,401) currently ring the base of Mount Greylock with residential, urban, and industrial development (Fig.12). The populations in North Adams and Adams declined between 1980 and 2000, down 16% and 13% respectively, while the populations of Williamstown and Cheshire increased slightly. The population of New Ashford, while still very small, increased 72% during this same period (MassGIS 2009(b), Census 2000).

Local business people formed the Greylock Park Association in 1885, after heavy logging on the eastern side of the mountain range led to forest fires, severe erosion, and landslides. The Association purchased 400 acres around the summit of Mount Greylock for recreation. In 1898, the State Legislature provided $25,000 for the purchase of an additional 3,324 acres and established Mount Greylock as the first State Reservation Wilderness Park (Burns and Stevens 1988). The reservation was operated and managed by the Greylock Reservation Commission, a three-person board appointed by the Governor. Professor John Bascom, Francis W. Rockwell and Alfred B. Mole were the first commissioners. Between 1933 and 1941, the Civilian Conservation Corps (CCC) 107th Company helped to transform the reservation into a popular recreational site by improving the road system, building hiking and downhill ski trails, lean-to shelters, and completing the construction of Bascom Lodge and other stone structures at the summit. The Greylock Reservation Commission was abolished in 1966 and management and operation of the Reservation was transferred to the state's Division of Forests and Parks (now DCR, Division of State Parks and Recreation) (DCR no date given). Between 1967 and 2000, 4,452 acres were added to the Mount Greylock Reservation through purchases and donations from individuals, businesses and educational institutions (DCR Deed Database 2008). There have been no timber harvests within the boundaries of the Mount Greylock Forest Reserve since 1984.

FOREST TYPES

In 2003, DCR completed the "Land Cover Classification Project", including forest type mapping of all Massachusetts State Forests. GIS digital forest-type data were derived from 1:12,000 scale, leaves-on, color infrared aerial photographs. The digital data and aerial photography were provided by the James W. Sewall Company of Old Town, Maine (DCR 2003). Forest cover for Mount Greylock is shown in Fig. 13 and summarized in Table 3.

Tree species on the lower slopes of Mount Greylock belong to the Northern Hardwood – Hemlock forest type. Overstory species include beech, sugar maple, and yellow birch, with lesser amounts of black cherry, basswood, and white ash. Hemlocks are common and are found in greater numbers in streamside ravines. Red oak is a dominant overstory species on dry south-facing and west-facing slopes near the western border of the Forest Reserve. Outcrops of marble and limestone bedrock support pockets of Rich Mesic Forest. Sugar maple is the dominant species in Rich Mesic Forests with white ash and basswood as common associates. The calcium-enriched environment supports a distinctive and diverse community of shrubs and herbaceous plants. Early successional species such as white (paper) birch, grey birch, and red maple are found in more recently disturbed areas.

Red spruce is more abundant on the upper mountain slopes above 2,000 feet. The largest high elevation spruce-fir forest in the state occurs along the Mount Greylock ridgeline at elevations above 2600 - 2800 feet. This is a community of red spruce and balsam fir trees with mountain ash as a common understory species. Spruce-fir boreal swamps are found in poorly drained areas. A list of rare plant and animal species is

found in Appendix D. The Natural Heritage and Endangered Species Program (NHESP) of Massachusetts Division of Fisheries and Wildlife has identified several populations of rare plants, located at upper elevations on Mount Greylock. These include "two of the state's best populations of large-leaved Goldenrod", two large and healthy populations of bristly black currant, and several populations of Bartram's shadbush. Other rare plant species found in this forest are the northern prickly rose, northern mountain ash, and black-fruited woodrush (NHESP 2004).

A species list for all forest tree species can be found in Appendix A.

Table 3. Forest Types, Mount Greylock Forest Reserve (DCR 2003).

Forest Type	Area (%)
Northern Hardwoods	64
Sugar maple	8
Oak-Hardwoods	4
Hemlock-Hardwoods	4
Red spruce	6
Spruce-fir	7
White pine - Hardwoods	<1
Birch-Red maple	6
Agriculture	<1
Norway spruce plantation	<1
Forested wetlands	<1
Open water	<1
Cliffs	<1
Non-forest	<1

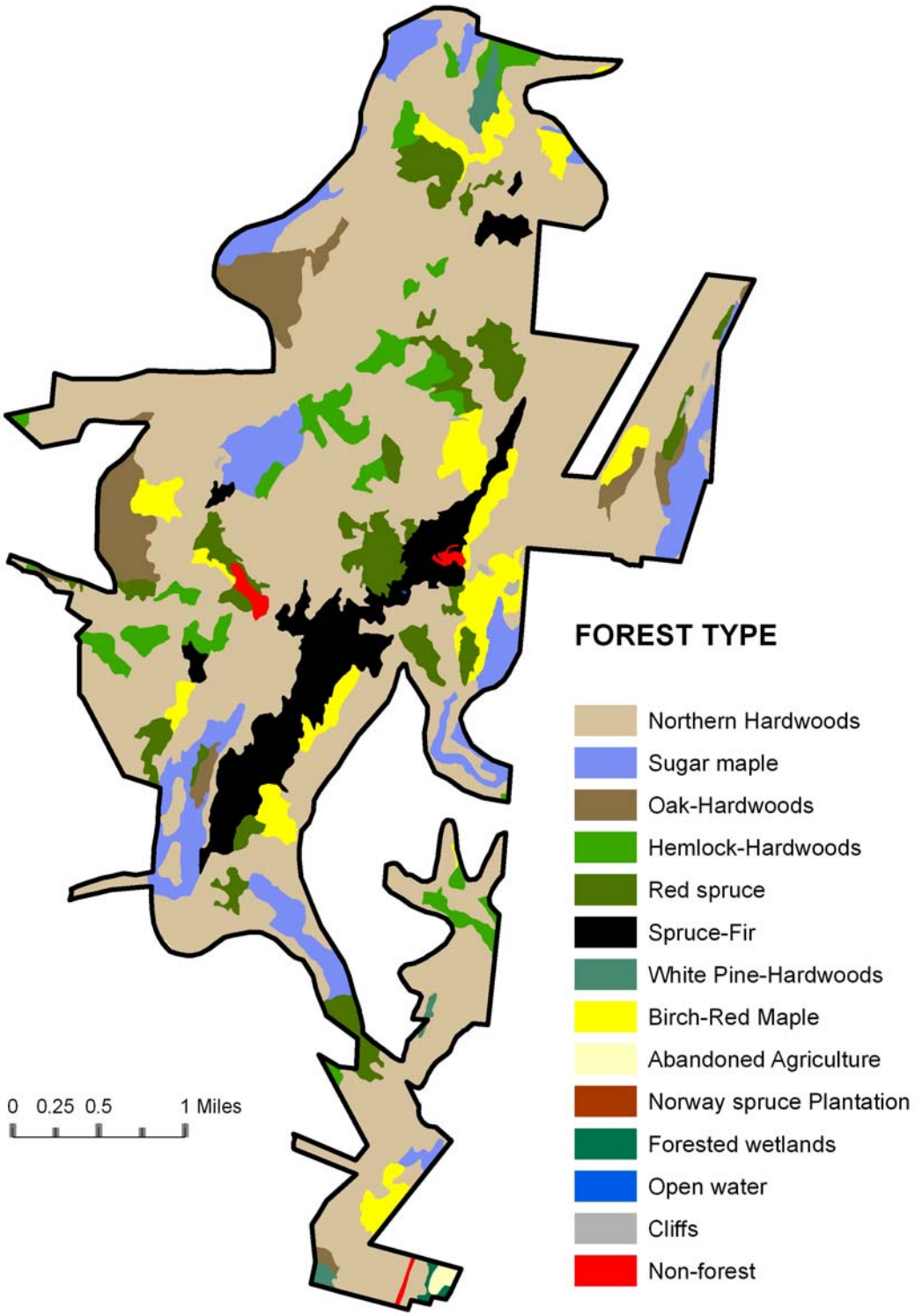

Fig. 13. Forest Type Map, indicating predominant overstory species, Mount Greylock Forest Reserve (DCR 2003).

Old-Growth in the Mount Greylock Forest Reserve

A recent study (D'Amato et al. 2006, D'Amato 2007,) identified four old-growth stands within the Mount Greylock Forest Reserve (Fig. 14). The largest of these (115 acres) is located in the Hopper. The remaining old-growth stands cover 10, 25, and 25 acres. Old-growth was defined as "forests lacking any evidence of past land use and containing five canopy trees >225 years old per hectare (2.47 acres), which indicates establishment prior to European settlement." These forests are usually found on steep slopes that were relatively inaccessible to nineteenth century logging. Analysis of these stands showed that old-growth in this area exhibited a much higher degree of structural complexity than was found in second-growth forests nearby. In particular, old-growth stands had larger overstory trees, a wider range of diameter distributions and greater volumes of snags and downed coarse woody debris (D'Amato et al. 2008). An additional analysis (D'Amato and Orwig 2008) documented the disturbance history of these stands. The natural disturbance regime in these old-growth stands was "dominated by frequent, relatively low-intensity disturbances operating somewhat randomly on the landscape." There was no evidence of stand-replacing disturbances. Data from these studies provide a basis for comparing the condition of the Forest Reserves to true old-growth forest, at the present time and in the future, as the Reserves forests develop through forest succession subject to the effects of natural disturbances.

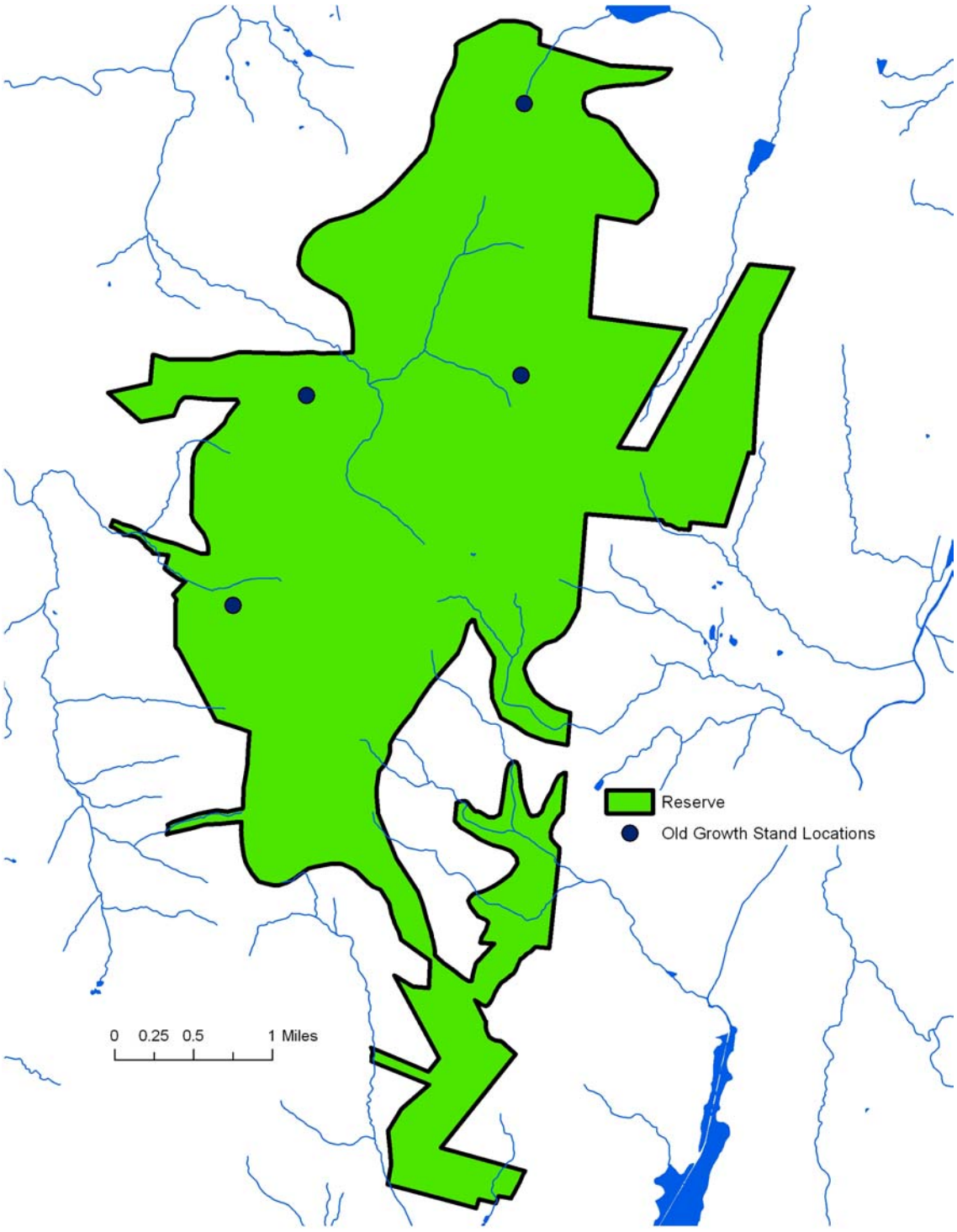

Fig. 14. Old-Growth stand locations in the Mount Greylock Forest Reserve (D'Amato et al. 2006).

CONTINUOUS FOREST INVENTORY (CFI) DATA

The Continuous Forest Inventory (CFI) plots were established by Massachusetts state forestry agencies in the late 1950s. These are permanent 0.20-acre plots, laid out on a 0.5-mile square grid on all state forests and most state watershed protection land (Fig. 15). Plot measurements were completed in 1960, 1965, 1980, and 2000. Data include plot descriptors and measurements of all trees > 5.0 inches dbh. Deadwood and understory sampling were added in 2000 (Rivers 1998). Future sampling is planned at 10-year intervals. All analyses, except where otherwise noted, are based on the 2000 CFI dataset (DCR 2000). The CFI data was analyzed using SAS 9.1.3 statistical software (2004).

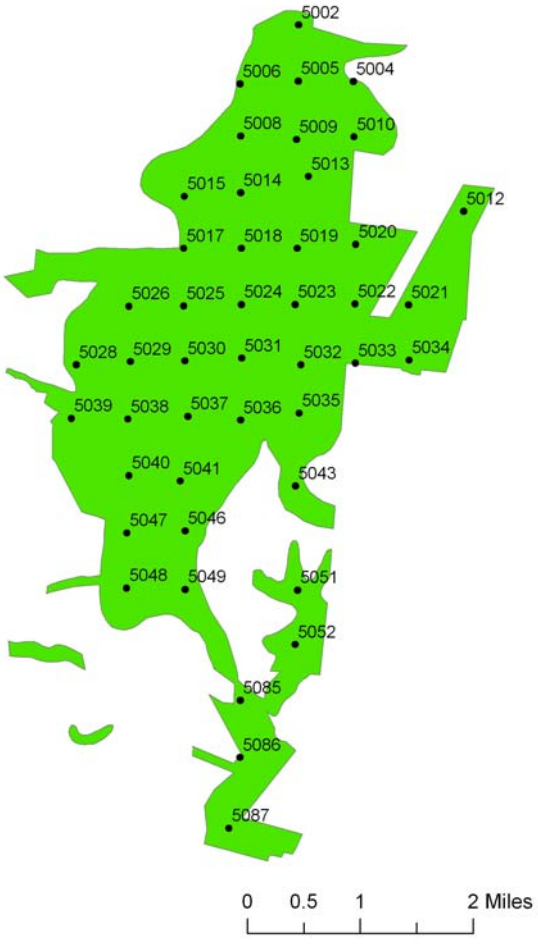

Fig. 15. Continuous Forest Inventory (CFI) Plots, Mount Greylock Forest Reserve. There are 44 CFI plots that fall within the boundaries of the Mount Greylock Forest Reserve. Of these, 40 had been established and measured in 1960.

Forest Age and Disturbance History

CFI plot ages are determined by coring 1-3 overstory trees located just outside the boundaries of each plot (Table 4). Plot 5032 was listed with age 0. As there are trees > 5 inches present in 2000, we assume that this was an error and have omitted this plot from the data for plot age. We have also omitted plot 5034 because the 2000 tree data for this plot is missing.

Table 4. Plot age, Mount Greylock Forest Reserve (DCR 2000).

CFI Plot Age		
Age (years)		**#Plots**
60-70		5
71-80		5
81-90		9
91-100		2
101-110		7
111-120		14
	Total Plots	42
	Age Range	65-120

The CFI methods allow only one disturbance to be entered for each plot at each measurement date (Table 5). The disturbance recorded may be the most recent disturbance or the most important disturbance to have affected the plot (e.g., if a plot was damaged by a windstorm in 1970 and then harvested in 1990, the recorded disturbance would have been changed from "wind" to "harvest cut" in the 2000 sampling). Therefore, the data do not represent a complete disturbance history of the plot. Disturbances from as early as 1920 are recorded. A disturbance record by plot is given in Appendix B.

Table 5. Summary of disturbances, Mount Greylock Forest Reserve (DCR 2000).

CFI Plot Disturbance		
Disturbance Type		**# Plots**
Code	**Description**	
0	None	2
1	Fire	2
2	Wind	6
3	Snow & Ice	23
4	Other use, cleared	0
5	Other use, pastured	1
6	Insects	2
7	Disease	7
8	Timber stand improvement	0
9	Harvest cut	1
	Total Plots	44

Live Trees

Size distribution in the Mount Greylock Forest Reserve follows a typical inverse-J curve with larger numbers of trees in the smaller size classes (Fig. 16). The number of trees/acre declines progressively as dbh increases. Mean stand density based on data from 43 plots in the Mount Greylock Forest Reserve for trees greater than 5 inches dbh is 179.4 ± 3.4 stems/acre (95% Confidence Interval). Mean stand density for large trees (greater than 20 in. dbh) is 7.3 ± 2.1 stems/acre (DCR 2000).

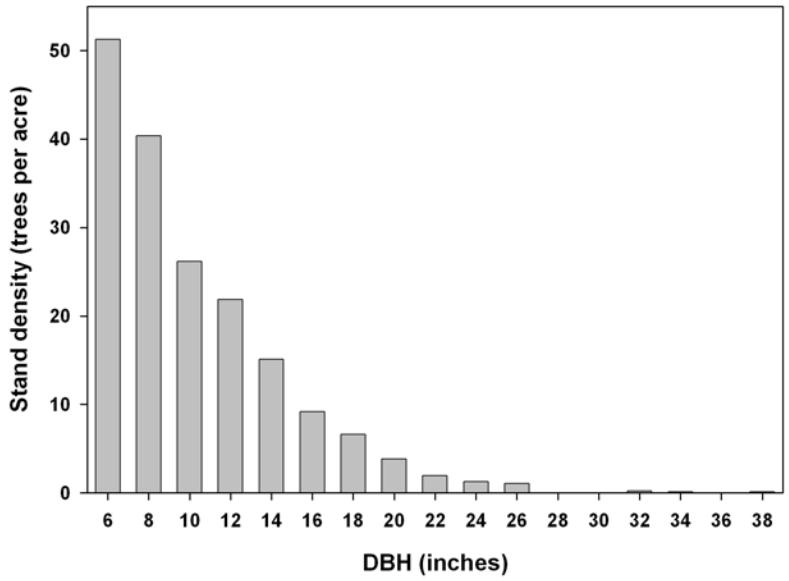

Fig. 16. Mean stand density (trees/acre) by 2-inch dbh class (DCR 2000), Mount Greylock Forest Reserve. There were nine trees in the 26-inch dbh class, two trees in the 32-inch dbh class, and one tree in each of the 34-inch, and 38-inch dbh classes (N=43).

Northern Hardwoods (beech, yellow birch, and sugar maple) are the predominant species in the Mount Greylock Forest Reserve (Fig. 17). Northern hardwoods and northern hardwood associates (white ash and black cherry) account for 57% of the total basal area. Ten percent of the basal area is red oak and another 9 % is red spruce. There was an increase in mean basal area for all species combined from 108 to 119 ft^2/acre between 1960 and 2000, with many shade tolerant species increasing, and white birch decreasing.

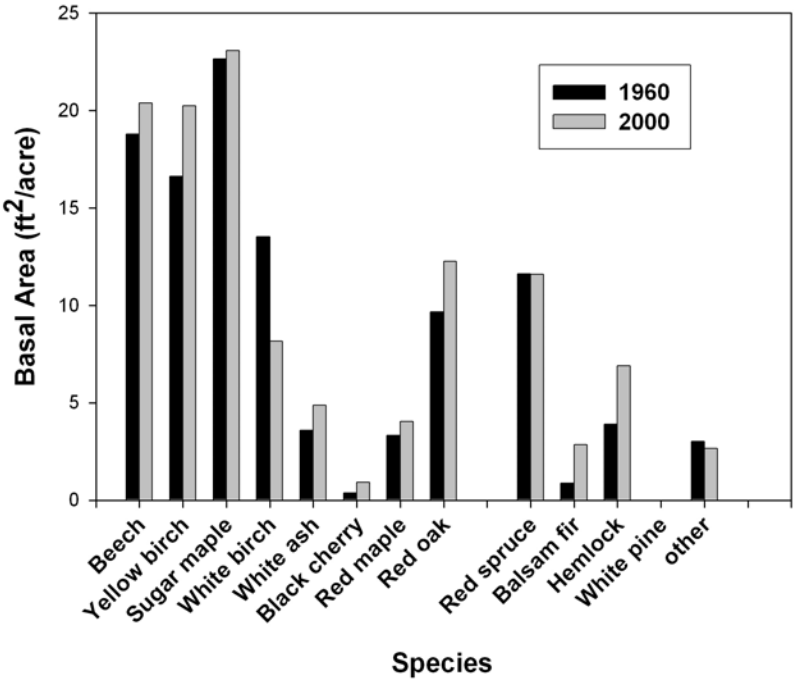

Fig. 17. Mean basal area (ft^2/acre) by species from 1960 and 2000 CFI data, Mount Greylock Forest Reserve. ("Other" includes black birch, other pine, poplar, and unidentified species.)

Live-tree biomass in 2000 was 85.7 ± 7.6 tons per acre, based on data from 43 plots. A comparison of data from the 40 plots established and measured in both 1960 and 2000 shows that live-tree biomass increased from 74.7 ± 8.8 tons/acre in 1960 to 85.0 ± 9.8 tons/acre. Live-tree biomass was estimated by applying Jenkins and others (2003) national-scale biomass estimator equations.

Deadwood

Fig. 18. Mount Greylock Forest Reserve, standing and down deadwood 2008 (Photo by Lena Fletcher).

Biomass of standing deadwood (snags) and down deadwood was estimated from volume calculations using specific gravity estimates by species, reduced for stages of decay (Tyrrell and Crow 1994, Chojnacky and Heath 2002,Woodall and Williams 2007). The biomass estimate of standing deadwood was 3.0 ± 0.8 tons/acre. The down deadwood biomass estimate was 4.2 ± 0.9 tons/acre.

Sugar maple and white birch were the most common species among down deadwood found on CFI plots in 2000. Beech, yellow birch, sugar maple and red spruce were the most common species of standing deadwood (Fig. 19).

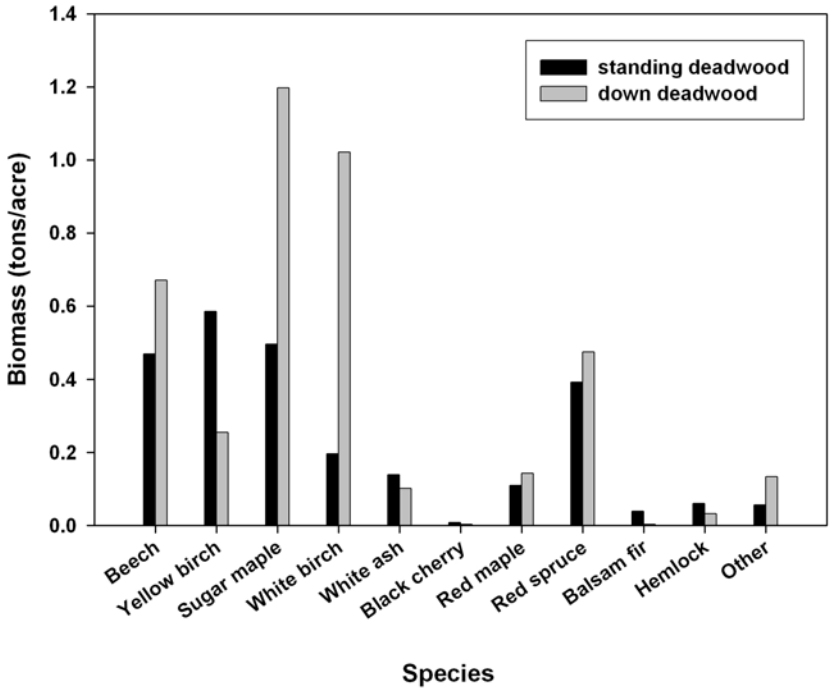

Fig. 19. Species composition of standing and down deadwood (DCR 2000), Mount Greylock Forest Reserve.

Understory Regeneration

Four 0.0026 acre (6 ft. radius) subplots were established within each 0.20-acre CFI plot to sample understory regeneration. Percent cover for several classes of groundcover vegetation also was estimated. Only a portion of the total data set for 2000 is available. Fig. 20 and Table 6 below provide a sample of this type of information.

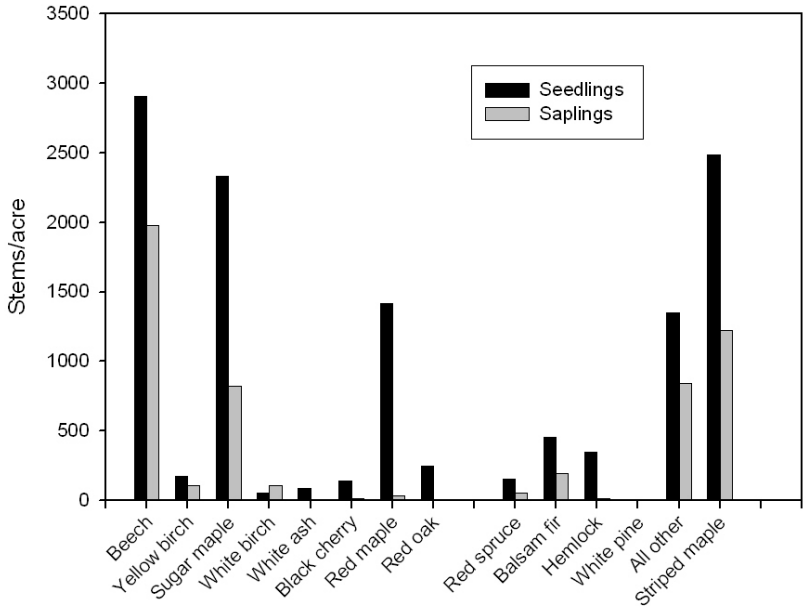

Fig. 20. Understory regeneration, Mount Greylock Forest Reserve (DCR 2000). Seedlings are trees < 4.5 ft. tall. Saplings range in size from 4.5 ft. tall to 5.0 in. dbh. Data are derived from 22 CFI plots (88 subplots).

Table 6. Mount Greylock Forest Reserve, groundcover, percent cover by number of subplots.

Species	**0**	**1-25%**	**26-50%**	**51-75%**	**76-100%**
Ferns	28	45	10	4	1
Grass	75	13	0	0	0
Hobble viburnum	62	19	3	4	0
Mapleleaf viburnum	83	5	0	0	0
Striped maple	87	1	0	0	0

SECTION 2: MOUNT GREYLOCK FOREST RESERVE AND TACONIC TRAIL STATE FOREST PROPOSED INTENSIVE MONITORING AREAS

INTRODUCTION

The Taconic Trail State Forest has been proposed as a non-reserve forest match for the Mount Greylock Forest Reserve (Fig. 21). The Taconic Trail State Forest is located entirely in Williamstown, MA and extends eastward from the ridge of the Taconic Mountains at the Massachusetts/New York border. Within the Intensive Monitoring Areas (IMAs) at each location, the CFI plot density will be increased from a 0.5 mile to a 0.25 mile grid. Each IMA will have a total of 20 plots. The IMAs were selected based on similarities in bedrock, soils, and forest types.

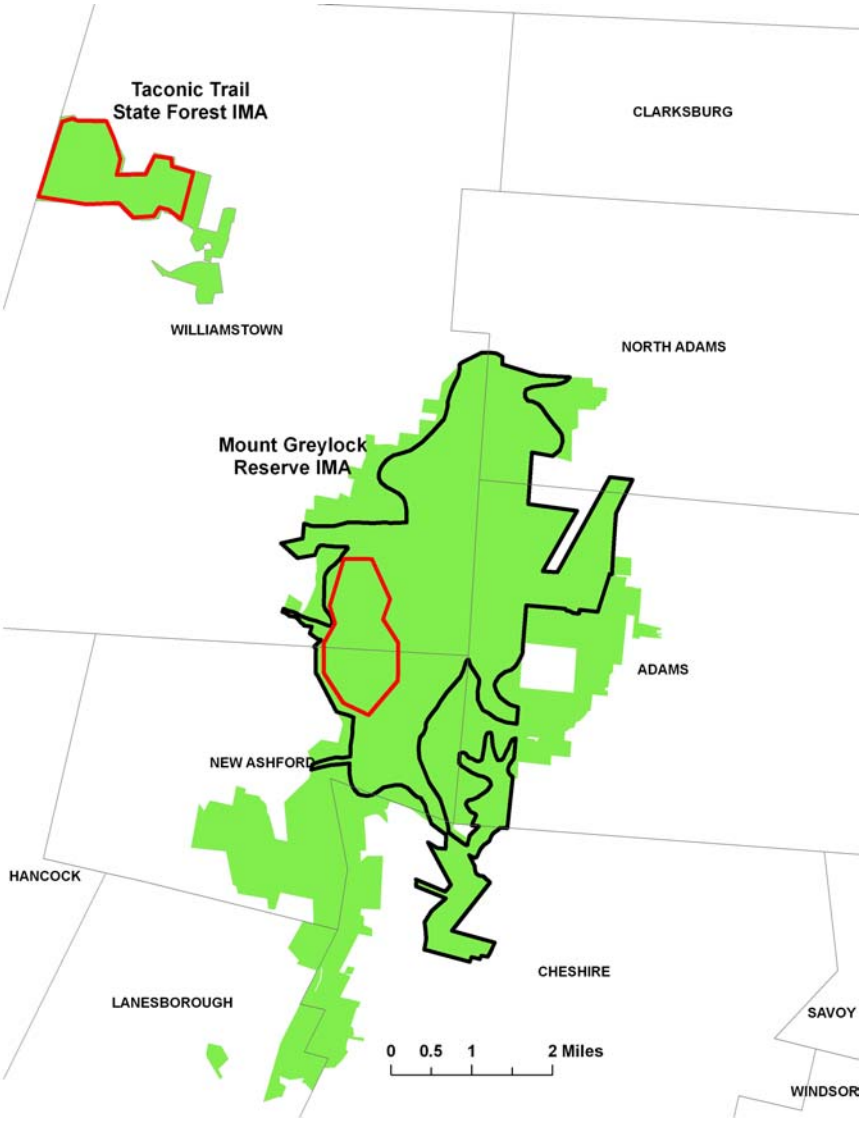

Fig. 21. Proposed Intensive Monitoring Areas (IMAs) (red) in the Mount Greylock Forest Reserve and Taconic Trail State Forest.

PHYSICAL FEATURES

Topography

Elevations range from 1,180 ft. to 2,215 ft. in the Taconic Trail State Forest IMA. Elevations in the Mount Greylock Forest Reserve IMA are higher, 1,395 ft. to 2,920 ft. (Fig. 22). The relative area of gentle slopes (0-25%) and steep slopes (25-60%) is similar in the two IMAs (Fig. 23). There are limited areas of extreme slopes in both IMAs. There is an area of extreme slopes within the Mount Greylock Forest Reserve IMA on either side of Roaring Brook. The highest slopes in the Taconic Trail State Forest are in the western portion of the State Forest near the New York border. Slopes on the Mount Greylock IMA face primarily to the northwest and west. Slopes on the Taconic Trail IMA face northeast and east (Fig. 24).

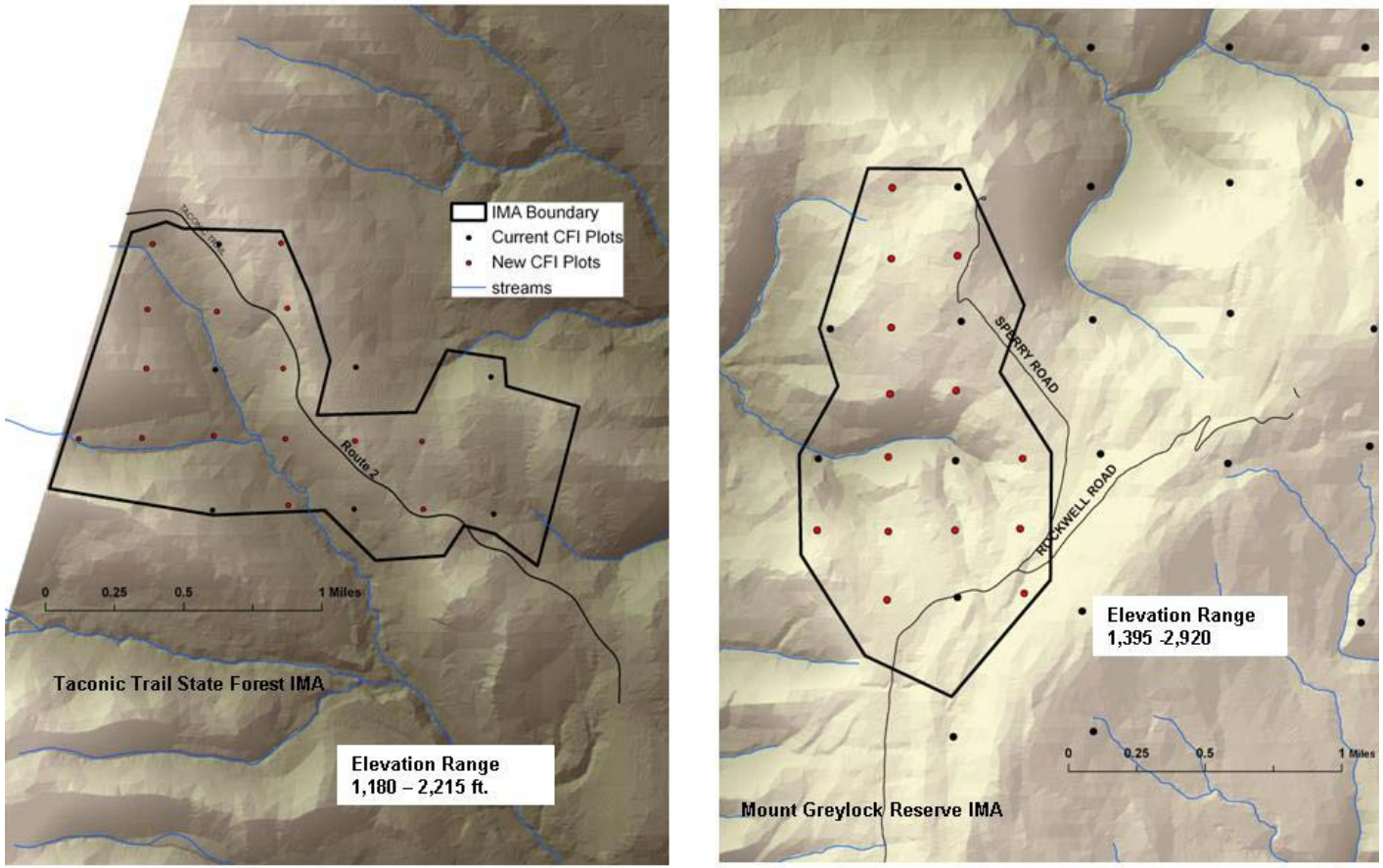

Fig. 22. Elevation, Taconic Trail State Forest and Mount Greylock Forest Reserve IMAs. Existing CFI plots are shown in black. Locations of proposed new CFI plots are shown in red.

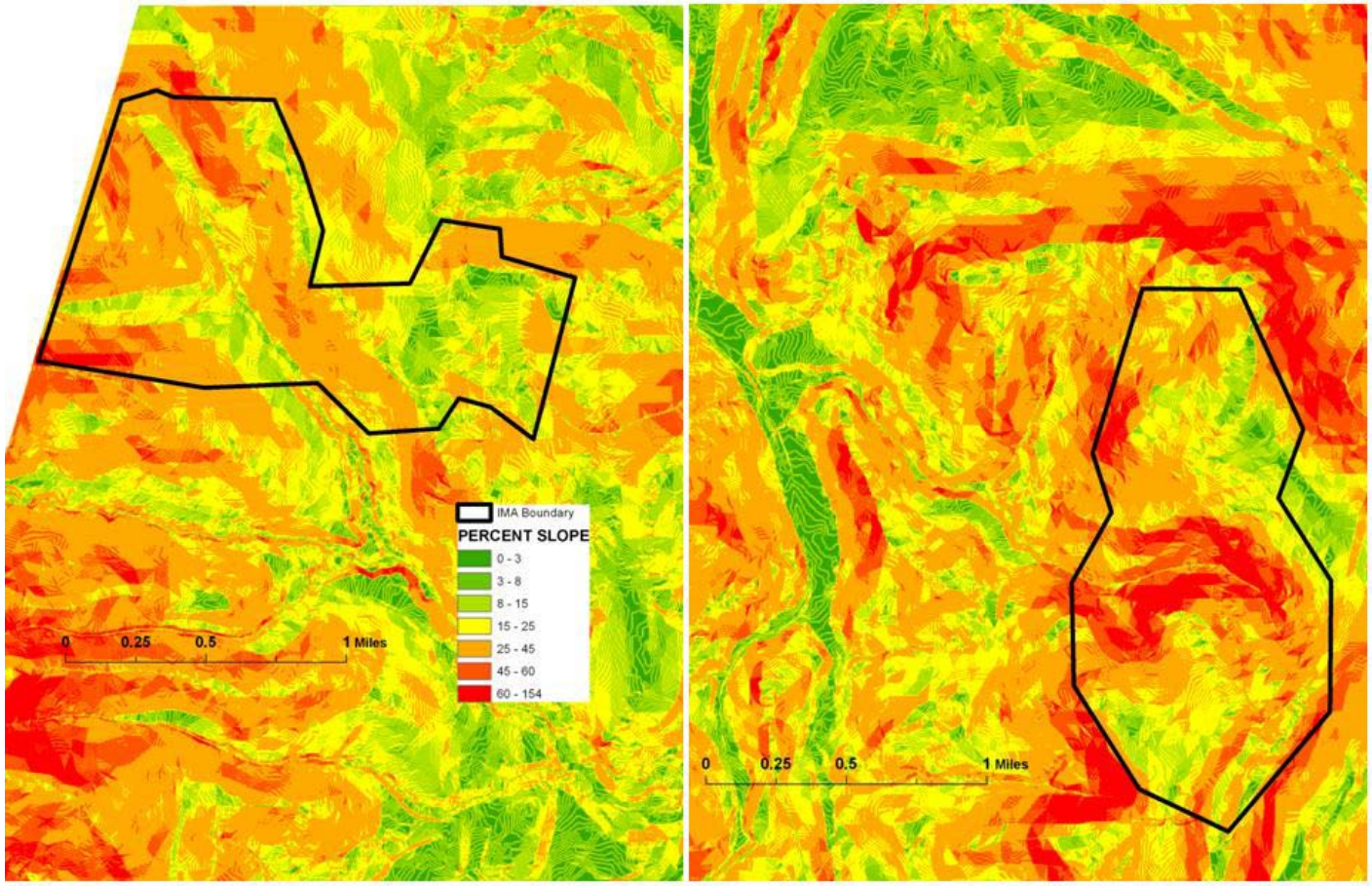

Fig. 23. Slope Comparison, Taconic Trail State Forest and Mount Greylock Forest Reserve IMAs.

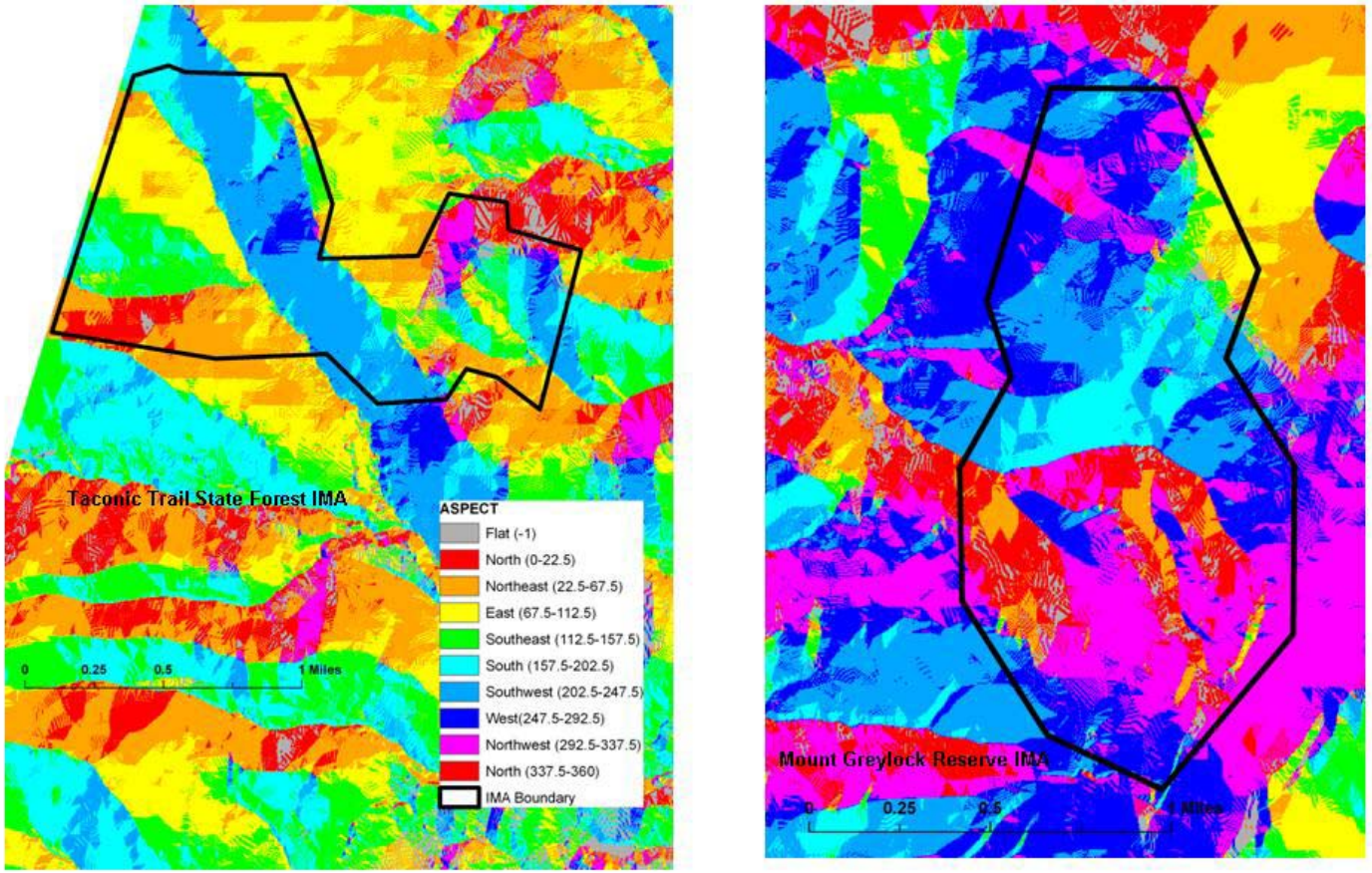

Fig. 24. Aspect, Taconic Trail State Forest and Mount Greylock Forest Reserve IMAs.

Bedrock Geology

Bedrock in the Greylock Reserve IMA is part of the Greylock schist formation composed of phyllite and quartz and the Walloomsac formation composed of schist, phyllite, limestone and marble. Bedrock in the Taconic Trail State Forest belongs to the Nassau Formation consisting of phyllite and quartzite and the Walloomsac Formation (Table 7, Fig. 25).

Limestone and marble bedrock provide mineral nutrients, calcium in particular, that can reduce acidity and increase nutrient concentrations in forest soils, increasing forest productivity, and making it more likely that Rich Mesic Forest communities will develop. The bedrock influence depends on the concentration of limestone and marble, the characteristics of surficial deposits and the depth to bedrock at a particular site. Bedrock containing limestone and marble is found in both the Taconic Trail State Forest IMA and the Mount Greylock Forest Reserve IMA, occupying about a third of each IMA. Bedrock in other areas is uniformly acidic.

Table 7. Bedrock Comparison, Taconic Trail State Forest and Mount Greylock Forest Reserve IMAs (Zen et al. 1983).

Taconic Trail State Forest IMA			
Map Code	**Rocktype**	**Area (%)**	**Formation**
EZn	Phyllite, Quartzite, meta-argillite, greywacke	<1	Nassau Formation
EZnp	Phyllite	64	Nassau Formation
Ow	Phyllite, Schist, Limestone	36	Walloomsac Formation
Mount Greylock Reserve IMA			
Map Code	**Rocktype**	**Area (%)**	**Formation**
EZg	Phyllite, Quartz	49	Greylock Schist
EZga	Phyllite, Metasedimentary Rock, dolostone (dolomite), conglomerate	15	Greylock Schist
Ow	Phyllite, Schist, Limestone	34	Walloomsac Formation
Owm	Marble, Phyllite	2	Walloomsac Formations

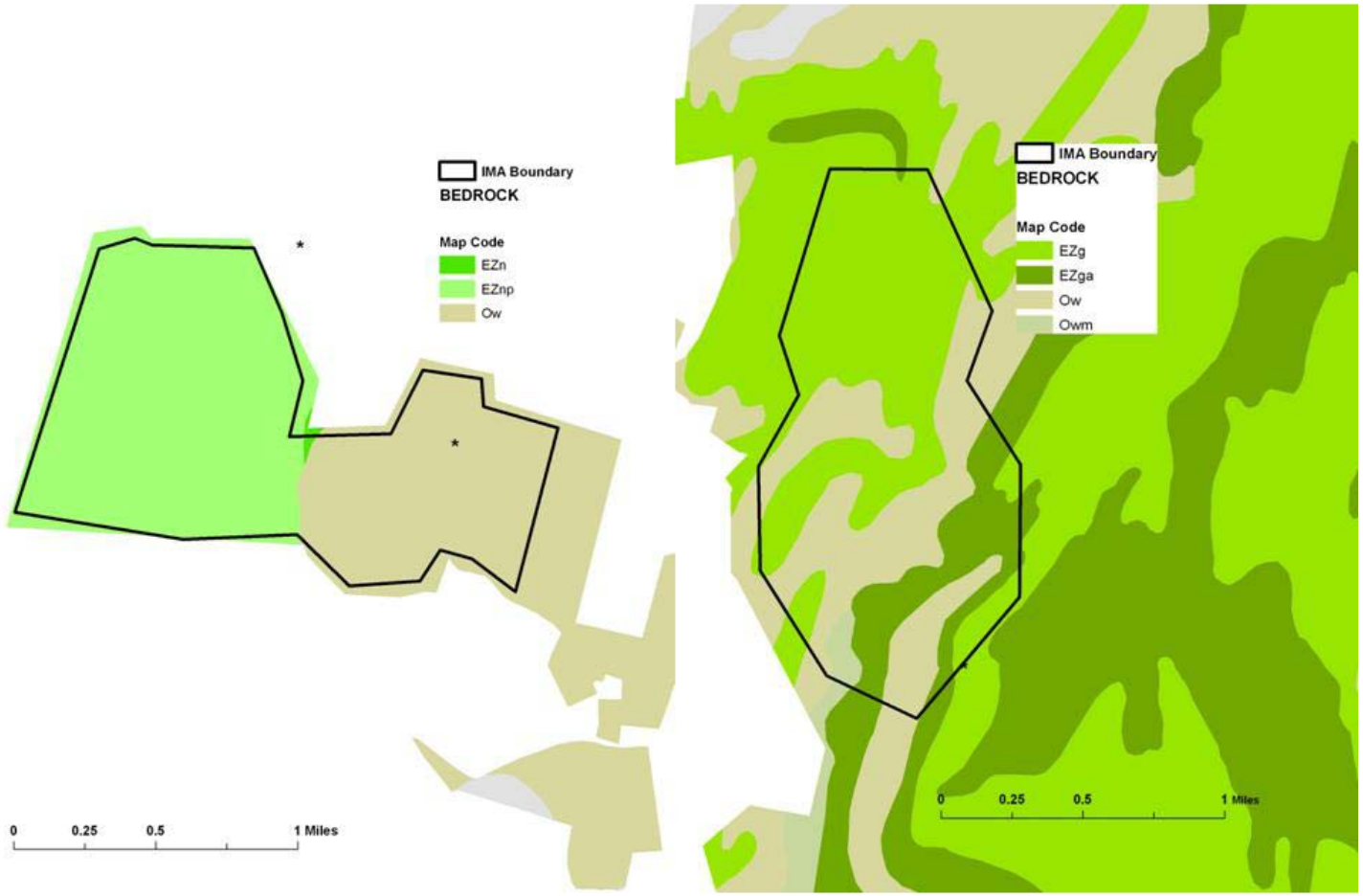

Fig. 25. Bedrock Comparison, Taconic Trail State Forest and Mount Greylock Forest Reserve IMAs (Zen et al. 1983).

Surficial Geology and Soils

The Taconic Mountains, like Mount Greylock, are covered with surficial deposits of glacial till. Soils in the Greylock Reserve IMA are Lyman, Tunbridge, and Peru soils, formed in acidic glacial till and are described in Section 1. Soils in the Taconic Trail State Forest IMA belong to the Taconic, Fullam and Lanesboro series and were also formed in acidic glacial till (Fig. 26). The Taconic soil series are inceptisols (young soils, showing little soil development) and not as heavily leached as the spodosol soil series on the Greylock Reserve.

The Taconic series consists of shallow, somewhat excessively drained soils located on hills, ridges and mountain sides. Bedrock is at a depth of 10 to 20 inches (NCSS 2005). The Lanesboro series consists of well drained soils on glaciated uplands. Lanesboro soils are moderately deep to dense till and very deep to bedrock (NCSS 2005). They formed in till derived mainly from dark gray phyllite, shale, slate, or schist. The Fullam series consists of moderately well drained soils on glaciated uplands. They are moderately deep to dense till and very deep to bedrock and formed in dense, loamy till (NCSS 2009).

The soil drainage class distribution in both IMAs is similar. Slightly more than 70% of the area in each IMA is covered with somewhat excessively drained soils. In the Taconic Trail State Forest IMA, 7% of the area is covered by well drained soils, 22% of the area is covered by moderately well drained soils. On the Mount Greylock Forest Reserve IMA 11% of the area is covered by well drained soils and 17% of the area is covered by moderately well drained soils (Table 8).

Table 8. Soil series and drainage classes, Taconic Trail State Forest and Mount Greylock Forest Reserve IMA (NCSS 2005, 2005, 2009, 2007,2008, 2006, 1998).

Taconic Trail State Forest		
Soil Series	**Drainage Class**	**Area (%)**
Taconic	Somewhat excessively drained	71
Lanesboro	Well drained	7
Fullam	Moderately well drained	22
Mount Greylock Forest Reserve IMA		
Lyman	Somewhat excessively drained	72
Tunbridge	Well drained	11
Berkshire	Well drained	<1
Peru	Moderately well drained	17

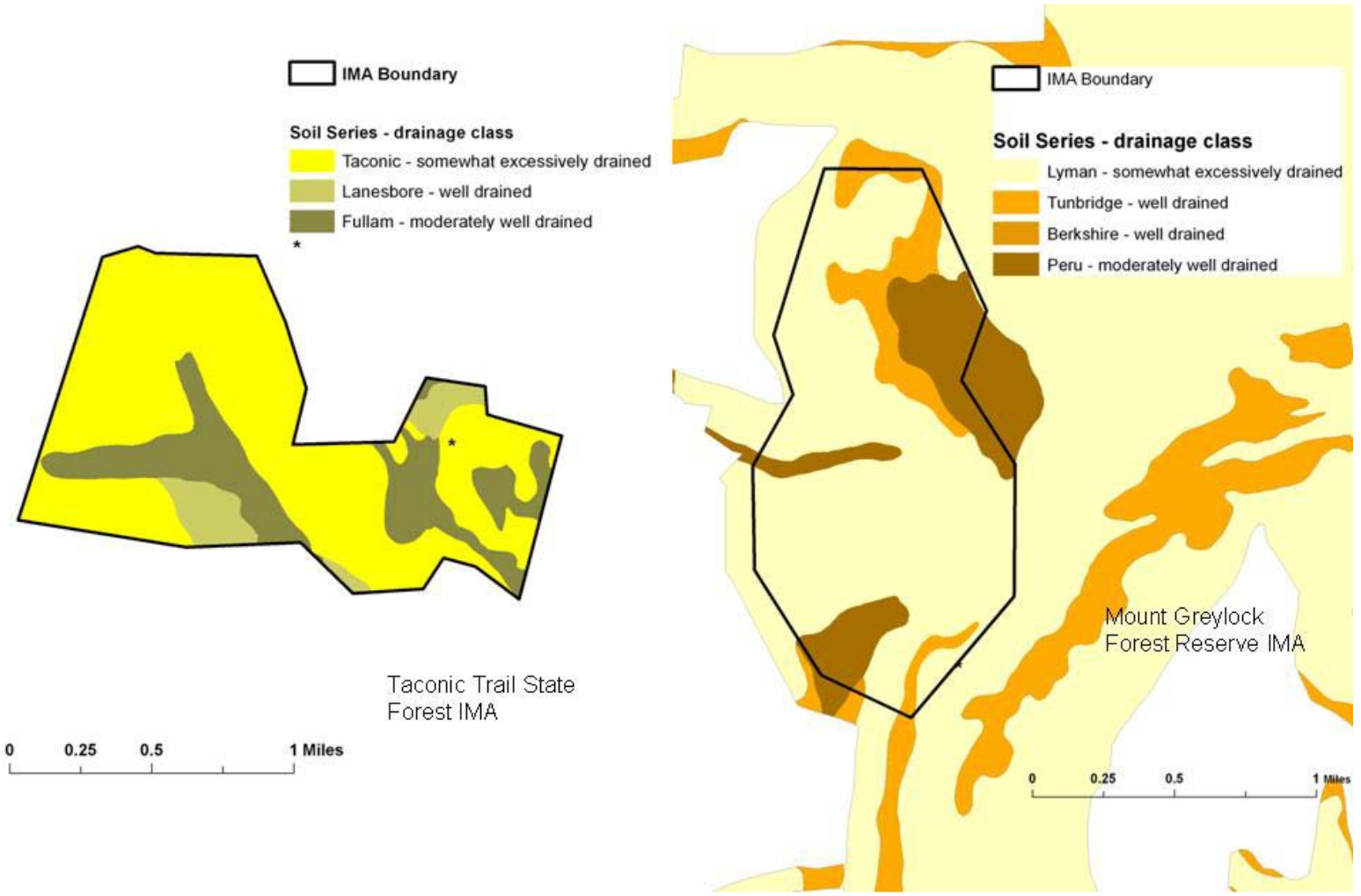

Fig. 26. Soil series, Taconic Trail State Forest and Mount Greylock Forest Reserve IMAs (Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture 1999)..

Disturbance History

The Taconic Trail State Forest is subject to the same disturbances described for the Mount Greylock Reserve. The primary exception is landslides. Landslides are more common in the Mount Greylock Reserve, but most of the landslides recorded since the 1700s have occurred north and east of the area selected for the Mount Greylock Reserve IMA, on the steep slopes of the Hopper, Mount Greylock, Mount Williams, and Mount Fitch.

Mass GIS (1997) data from aerial photographs shows dead timber and defoliation resulting from unknown causes in higher elevation areas of the Taconic IMA, near the Massachusetts/New York border in 1969 – 1971. An infestation of either fall cankerworms (*Alsophila pometaria*) or spring cankerworm (*Paleacrita vernata*) was noted in 1980 in much of the area that was harvested in 1984 (Fig. 27). An infestation of saddle prominent (*Heterocampa guttivitta*) caterpillars occurred in 1981. Most of the Taconic IMA was defoliated again in 1982. The infestation is identified as an unspecified insect, however this was a time of widespread gypsy moth outbreak and it is very likely that these were the insects in question. There was an outbreak of pear thrips in 1987 and and defoliation from unknown causes at higher elevations along the Massachusetts/New York border in 1990. CFI plot data indicate tree damage from snow and ice in 1977, 1986, 1996, 1997, and 1998.

LAND USE HISTORY

The area of Williamstown currently occupied by the Taconic State Forest IMA, experienced a history of forest clearing similar to that on Mount Greylock. It is likely that this location, with more moderate slopes and slightly lower elevations, was cleared earlier and farmed more intensively than the Mount Greylock Reserve, still, the forest was cleared and cut repeatedly in all but a few small, inaccessible areas at both sites. In 1765, 93% of the Williamstown was forested. By 1800, 20,000 acres had been cleared of trees leaving only 33% as forest. The period between 1800 and 1830, was the peak of agricultural activity in Williamstown and the time when the most land was cleared. On some farms, land was plowed from the base to the peak of the Taconic Ridge. Despite widespread farm abandonment in the mid- 19th century, trees continued to be cut for sawtimber and fuel, especially for charcoal for the local iron furnaces. By 1900 almost all of the original forest was gone (Satterson 1977). Vegetation in the area now consists of second- and third-growth forests. The properties that make up the Taconic Trail State Forest were acquired between 1955 and 2004 (DCR Deed Database 2008)

DCR conducted two management projects in between 1984 and 2003 in the Taconic Trail State Forest IMA. One was a timber harvest in 1984 (Fig. 27) (McDonald et al. 2006). The other was an abandoned field reclamation efforts by DCR and MassWildlife. The goal of the project was to establish extensive areas of open habitat in one portion of the landscape in order to minimize the effects of fragmentation. In February of 2000, 18.5 acres of overgrown fields and an adjacent, abandoned larch

plantation were cleared of most of the invading woody trees and shrubs. Vegetation left on site included species such as wild apple, cherry, serviceberry, blueberry, hawthorne, viburnum, and some aspen, that provide habitat and food for wildlife (MassWildlife 2002).

FOREST TYPES

Northern Hardwoods comprise about 60 % of the forest area in both the Taconic Trail Active State Forest IMA and the Mount Greylock Forest Reserve IMA according to forest type maps interpreted from aerial photographs (Table 9, Fig. 27) (DCR 2003). Red oak-and mixed oak-hardwood stands cover more area in the Taconic Trail State Forest IMA (27%) than in the Greylock Forest Reserve IMA (8%). Hemlock and hemlock-hardwoods and some early-successional forest stands consisting of white birch, grey birch and red maple are found in both IMAs. There is one small red spruce stand in the Taconic Trail State Forest IMA. The Mount Greylock Forest Reserve IMA has several areas dominated by red spruce and one high-elevation spruce-fir stand. Although both IMAs are underlain by bedrock containing some limestone, sugar-maple-dominated forest stands have only been identified within the Greylock Forest Reserve IMA. Pocket of Rich Mesic Forest may be present in both areas at a finer scale than that represented here. There are two areas of abandoned agricultural land within the Taconic IMA (5% of the total IMA area) and one larch plantation, adjacent to the agricultural land (DCR 2003).

Table 9. Forest Types, Taconic Trail State Forest and Mount Greylock Reserve IMAs (DCR 2003).

Taconic Trail State Forest	
Forest Type	**Area (%)**
Northern Hardwoods	61
Oak-hardwoods	27
Hemlock-hardwoods	4
Red spruce	<1
Birch-red maple	3
Agriculture	5
Larch	<1
Mount Greylock Forest Reserve IMA	
Forest Type	**Area (%)**
Northern Hardwoods	62
Sugar maple	4
Oak-hardwoods	8
Hemlock-hardwoods	9
Red spruce	8
Spruce-fir	2
Birch	7

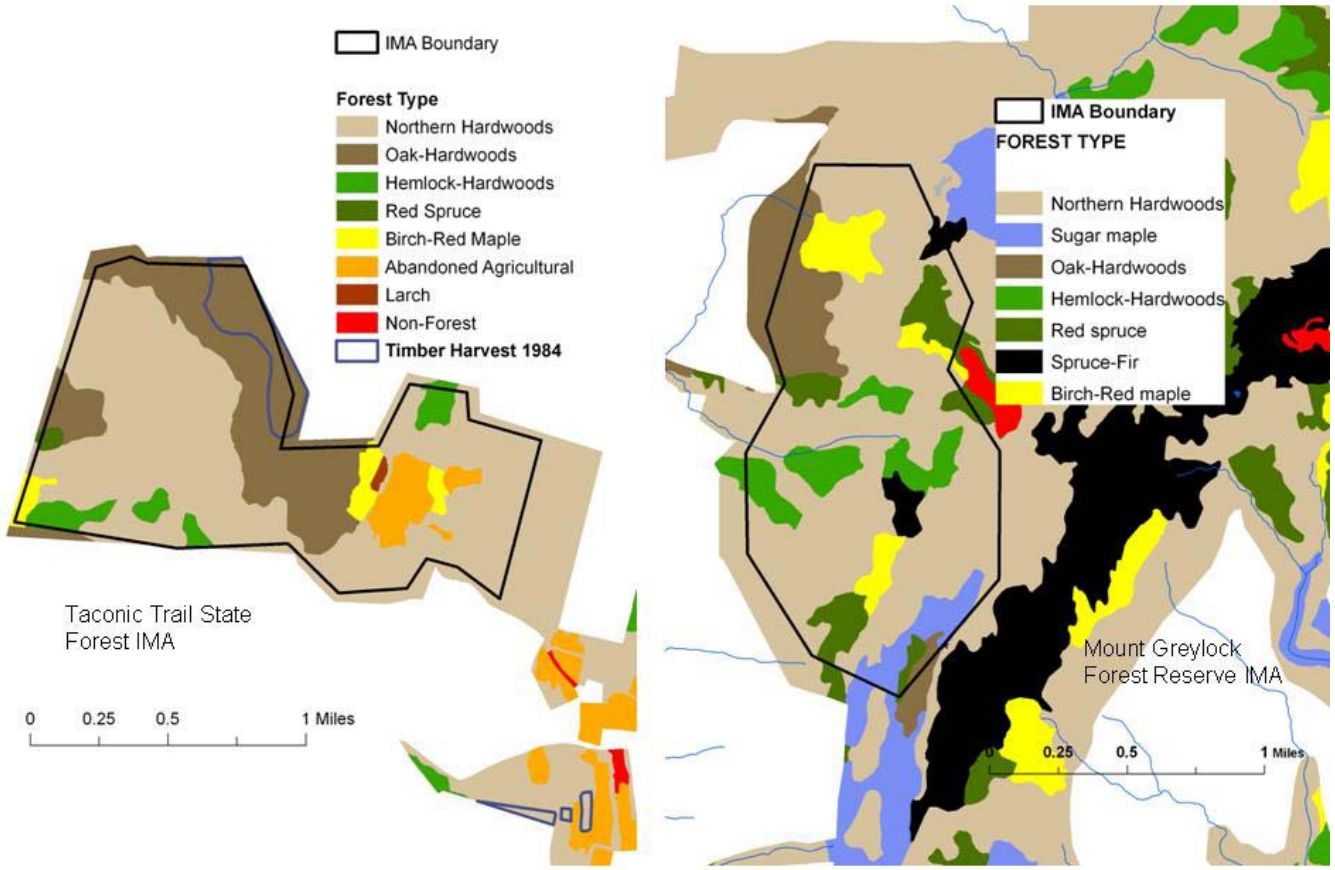

Fig. 27. Forest types, Taconic Trail State State Forest and Mount Greylock Forest Reserve IMAs and timber harvests 1984-2003 (DCR 2003; McDonald et al. 2006).

CFI DATA

There are currently six CFI plots (5026, 5028, 5029, 5038, 5040, 5047) in the Mount Greylock Forest Reserve IMA and seven CFI plots (0001, 0002, 0003, 0005, 0007, 0009, 0013) in the Taconic Trail State Forest. The plots provide an initial estimate of forest condition on the two IMAs.

Forest Age and Disturbance History

Plots in the Taconic Trail State Forest IMA have a lower mean age than those in the Mount Greylock Forest Reserve IMA, 79 years versus 94 years respectively (Table 10). Disturbance records for the two areas are similar (Table 11).

Table 10. Plot age, IMAs.

Taconic Trail State Forest IMA		**Mount Greylock Forest Reserve IMA**	
Plot #	**Age**	**Plot #**	**Age**
0001	87	5026	102
0002	80	5028	81
0003	65	5029	68
0005	107	5038	120
0007	72	5040	74
0009	68	5047	118
0013	76		
Mean Age	79		94

Table 11. Disturbance records, IMAs.

Taconic Trail State Forest IMA			**Mount Greylock Forest Reserve IMA**		
Plot #	**Disturbance**	**Year**	**Plot #**	**Disturbance**	**Year**
0001	Snow and ice	1977	5026	Snow and ice	1979
0002	None	0	5028	none	
0003	None	0	5029	Snow and ice	1977
0005	Insects	1980	5038	Disease	1979
0007	Snow and ice	1996	5040	Disease	1999
0009	Harvest cut[1]	No date	5047	Insects	No date
0013	Harvest cut[1]	No date			

[1] dates of cuts listed as 0, while stand ages are given as 68 and 76 respectively, implying that the plots were harvested in 1932 and 1940.

Live Trees

The data indicate that there are more small trees (5-20 in. dbh) in the Taconic Trail State Forest IMA and a greater number of large trees (> 20 in. dbh) in the Mount Greylock Reserve IMA (Fig. 28). Using 95% confidence intervals, the mean density for the Mount Greylock Reserve IMA for all trees > 5 in. dbh is 130.0 ± 25.0 stems/acre, and 192.1 ± 37.6 stems/acre for the Taconic Trail State Forest IMA. Mean density for large trees (>20 in. dbh) is 15.0 ± 6.9 stems/acre for the Mount Greylock IMA and 3.6 ± 3.5 stems/acre for the Taconic IMA. Additional data from the 14 new plots in the Mount Greylock IMA and the 13 new plots in the Taconic Trail State Forest IMA will increase the information available for these areas.

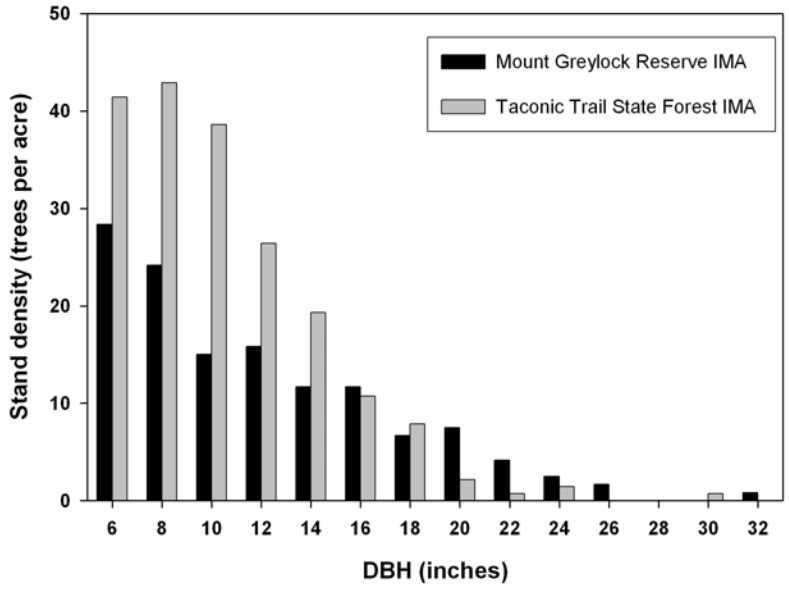

Fig. 28. Mean stand density (trees/acre) by 2-inch dbh class (DCR 2000), Mount Greylock Forest Reserve IMA and Taconic Trail State Forest IMA.

Basal area of Northern Hardwood species is greater on the Greylock Reserve IMA than in the Taconic Trail IMA (Fig. 29). Basal area of white birch and red maple, two early successional species, is greater in the Taconic Trail IMA. Consistent with data derived from aerial photos, there is a larger amount of red spruce at the Greylock IMA. The basal area of red oak is similar in both areas.

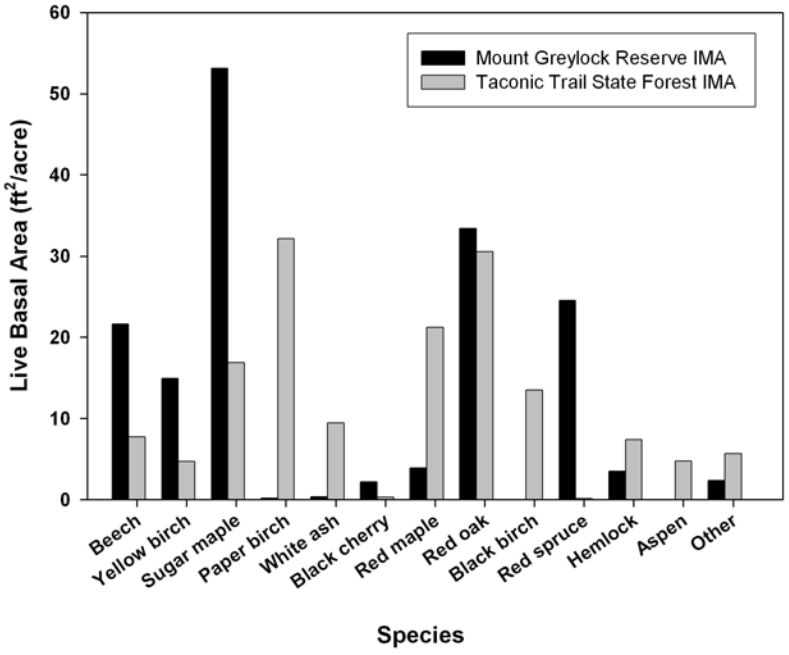

Fig. 29. Mean basal area (ft^2/acre) Mount Greylock Forest Reserve and Taconic Trail State Forest IMAs (DCR 2000). (In the Mount Greylock IMA other equals unidentified species only; in the Taconic IMA other includes gray birch, black oak, cottonwood, and unidentified species.)

Live-tree biomass in 2000 within the Mount Greylock Forest Reserve IMA was 95.1 ± 28.0 tons/acre (N=6). Within the Taconic Trail State Fores IMA, live-tree biomass was 90.6 ± 18 tons/acre (N=7).

Deadwood

Biomass of standing deadwood was 3.2 ± 2.3 tons per acre in the Mount Greylock Forest Reserve IMA (N=6) and 2.1 ± 1.6 tons per acre in the Taconic Trail State Forest IMA (N=7). Biomass of down deadwood was 5.0 ± 4.0 tons/acre in the Mount Greylock Forest Reserve IMA and 4.0 ± 2.7 tons/acre in the Taconic Trail State Forest IMA (N=7).

The Mount Greylock Forest Reserve IMA has a greater biomass of dead sugar maple in both the standing and down deadwood categories and more down dead beech (Fig. 30, Fig. 31). The Taconic Trail State Forest IMA has a greater biomass of both standing and down dead white birch. This reflects the relative abundance of the various forest species in the two IMAs with sugar maple having the greatest live basal area in the Mount Greylock IMA and white birch having the greatest live basal area in the Taconic Trail State Forest IMA.

No CFI understory data were available for the Taconic Trail State Forest.

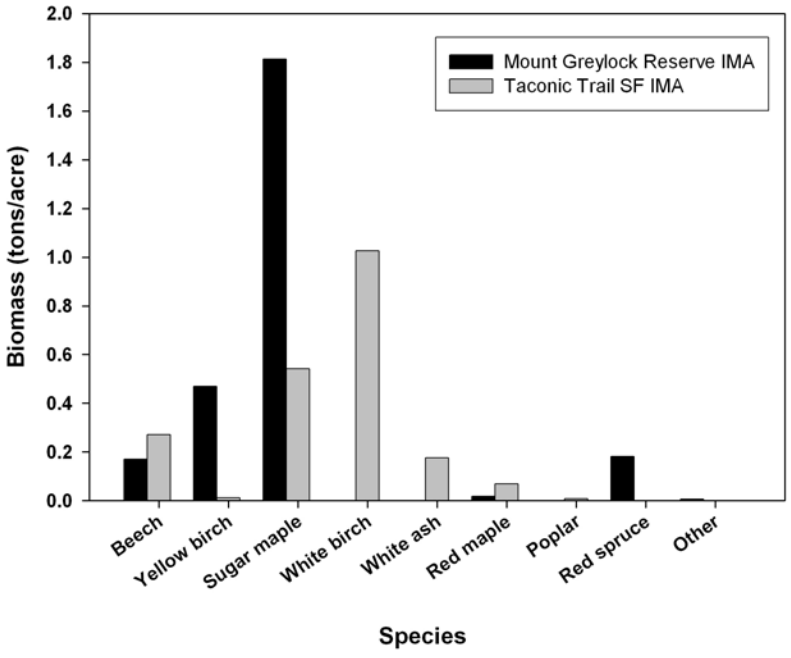

Fig.30. Comparison of standing deadwood biomass by species (DCR 2000), Mount Greylock Forest Reserve IMA and Taconic Trail State Forest IMA.

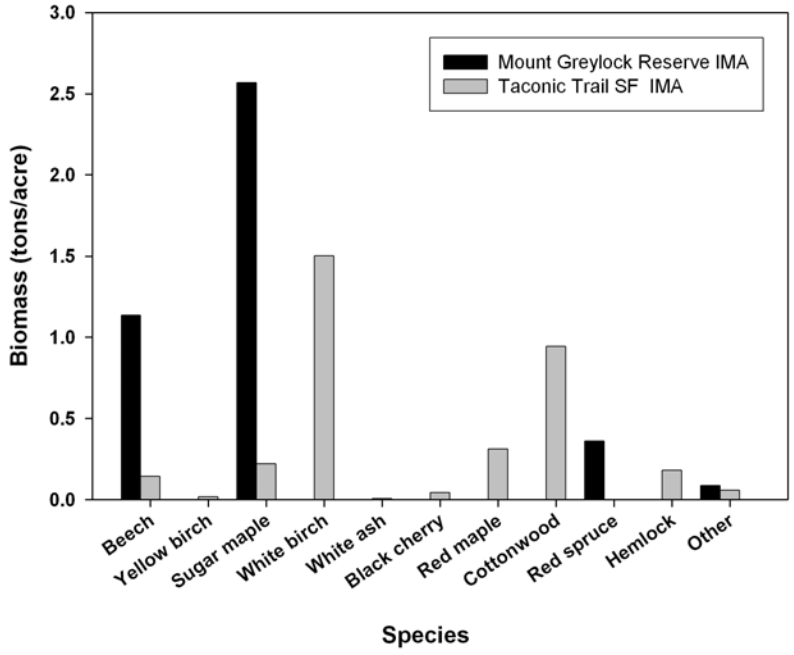

Fig. 31. Comparison of down deadwood species composition (DCR 2000), Mount Greylock Forest Reserve IMA and Taconic Trail State Forest IMA.

SUMMARY: A Comparison of the Taconic Trail State Forest (TTSF) and Mount Greylock Forest Reserve (MGFR) IMAs

- There are some differences in the topography between the two IMAs. There is a wide overlap in elevations, but the higher points of MGFR rise 700 ft higher than TTSF, and the lowest points of TTSF are lower by about 200 ft. There is a larger area of very steep slopes (> 60%) in MGFR and a higher maximum slope (150% for the MGFR versus 90% for the TTSF), but the majority of the area in both IMAs has slopes of less than 60% and the proportion of 0 to 30% slopes and 30% to 60% slopes is similar in both IMAs. Aspects differ in that MGFR is largely west-facing and TTSF is largely east-facing

- The bedrock is similar in both IMAs, with about 66% of the area in acidic rock types (phyllite and quartzite) and 34% of the area with rock types that contain limestone.

- The soils are similar in both IMAs, with about 70% of the area in shallow-to-bedrock, somewhat excessively drained soils, with the remaining 30% of the areas in deeper, moister soils.

- Forest types are similar in IMAs, having 61% (TTSF) and 66% (MGFR) of the areas in the northern hardwood and sugar maple types. The remaining areas of both IMAs have oak-hardwood stands, although the area of oak-hardwoods is greater in TTSF (27%) than in MGFR (8%). Hemlock-hardwoods stands are more common in MGFR. There is very little red spruce in TTSF. Red spruce and spruce-fir cover 10% of the area of MGFR. There are small patches of early successional species in both IMAs. TTSF also has 5% of the area in fields.

- Forests in TTSF are clearly younger than those in MGFR. TTSF has more trees that are 14 inches dbh and smaller, and fewer trees in larger sizes than MGFR.

- Biomass estimates for live trees, standing deadwood, and down deadwood are similar in both IMAs.

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Appendix A: Species List (common and scientific names of species referred to in this report)

Balsam fir	*Abies balsamea*
Basswood	*Tilia americana*
Beech (American beech)	*Fagus grandifolia*
Black birch	*Betula lenta*
Black cherry	*Prunus serotina*
Gray birch	*Betula populifolia*
Hemlock	*Tsuga canadensis*
Larch	*Larix sp.*
Norway spruce	*Picea abies*
Poplar	*Populus spp.*
Red maple	*Acer rubrum*
Red oak (Northern red oak)	*Quercus rubra*
Red spruce	*Picea rubens*
Striped maple	*Acer pennsylvanicum*
Sugar maple	*Acer saccharum*
White ash	*Fraxinus americana*
White birch	*Betula papyrifera*
White Pine	*Pinus strobus*
White spruce	*Picea glauca*
Yellow birch	*Betula alleghaniensis*

Appendix B: CFI Plot Disturbance History, Mount Greylock Reserver

Plot #	Disturbance	Year	Plot #	Disturbance	Year
5002	Disease	1979	5029	Snow and Ice	1977
5004	Wind	1995	5030	Snow and Ice	1979
5005	Disease	1967	5031	Wind	1950
5006	Wind	1995	5032	Snow and Ice	1979
5008	Disease	1967	5033	Disease	1979
5009	Snow and Ice	1979	5034	Pastured	1935
5010	Snow and Ice	1958	5035	Snow and Ice	0
5012	Disease	1979	5036	Snow and Ice	1978
5013	Snow and Ice	1995	5037	Wind	1950
5014	Snow and Ice	1977	5038	Disease	1979
5015	Snow and Ice	1977	5040	Disease	1999
5017	Snow and Ice	1977	5041	Snow and Ice	1997
5018	Snow and Ice	1979	5043	Insects	1967
5019	Snow and Ice	1979	5046	Fire	1942
5020	Snow and Ice	1979	5047	Insects	0
5021	Snow and Ice	1977	5048	Snow and Ice	1977
5022	Snow and Ice	0	5049	Snow and Ice	1977
5023	Snow and Ice	1979	5051	Wind	0
5024	Wind	1978	5052	Snow and Ice	1977
5025	Snow and Ice	1977	5085	Harvest cut	0
5026	Snow and Ice	1979	5086	None	0
5028	Fire	0	5087	None	0

Appendix C: Core Habitats and Rare Species

Massachusetts Natural Heritage and Endangered Species Program (2004)

HABITATS

Massachusetts NHESP has identified the following core habitat, which encompasses the Mount GreylockForest Reserve. "Core habitats represent habitat for the state's most viable rare plant and animal population that include exemplary natural communities and aquatic habitats" (NHESP 2004).

Core Habitat BM130

This large Core Habitat contains many high-quality natural communities associated with the slopes and summits of Mount Greylock and surrounds. Together these habitats support tremendous biodiversity with many rare species that are adapted to the cooler, montane environment. The Core Habitat contains dozens of rare plant populations, as well as habitats for rare butterflies and damselflies. It is one of the most important areas in the state for Spring Salamanders and one of the few areas to find two rare songbirds. It contains one of the state's few known populations of Long-tailed Shrews and an important underground overwintering area for bats. Along the Mount Greylock ridgeline, this Core Habitat includes the largest High Elevation Spruce-Fir Forest community in the state. While part of this Core Habitat is protected as conservation land, important areas of habitat remain unprotected.

Natural Communities

This large Core Habitat contains many of the exemplary natural communities that occur on slopes and summits in the Mount Greylock area. Incredibly forceful and interesting geologic events created Mount Greylock as it appears today. Pockets of nutrient-rich rocks, occasionally associated with marble cliffs and outcrops, have resulted in patches of Rich, Mesic Forest on the mountain's lower slopes that support many rare plant species. The largest High Elevation Spruce-Fir Forest in the state occurs along the Mount Greylock ridgeline. Here, atop Massachusetts' highest mountain, Balsam Fir and Red Spruce trees are stunted from extreme exposure to the wind. Poorly drained basins associated with this ridgeline contain good examples of Spruce-Fir Boreal Swamps. These two natural community types are rarely found in Massachusetts, but are more commonly found in the taller mountains to the north.

Plants

This Core Habitat contains dozens of rare plant populations. Many of these rare plant species are adapted to cool temperatures and montane habitats. Two of the state's best populations of the Large-Leaved

Goldenrod, which grows in mountainous areas, are found here. It is also home to two large and healthy populations of Bristly Black Currant and several populations of Bartram's Shadbush. The Hairy Wood-Mint is found in this area, as are the very uncommon Northern Prickly Rose, Northern Mountain Ash, and Black-Fruited Woodrush. Lower-elevation areas within this Core Habitat support other rare plant species such as Bailey's Sedge, which is known of its unusual mace-shaped fruiting clusters.

Invertebrates

This Core Habitat includes important habitat for a variety of rare insect species, including the Early Hairstreak butterfly, which inhabits Northern Hardwoods Forest with a complement of Beech; the Dion Skipper butterfly, a species of calcareous fens; the Elderberry Longhorned Beetle, which inhabits wetlands and meadows with thickets of Elderberry; and the Tule Bluet damselfly, a species of lakes such as the Mount Williams Reservoir. This Core Habitat is located less than 5 km from Core Habitat in Florida and Savoy, which probably allows for occasional dispersal of Early Hairstreak butterflies and other rare insect species between these two areas.

Vertebrates

Numerous cold, high-gradient brooks and headwater seeps make this one of the most important Core Habitats in the state for protecting extensive connected populations of Spring Salamanders. Significant habitat for Jefferson Salamanders occurs at lower elevations near clusters of vernal pools within deciduous forests. This is one of the few areas of the state that supports breeding Blackpoll Warblers and Mourning Warblers, two species of songbirds found more commonly in forests of northern New England. Rocky forests at upper elevations provide habitat for one of the few documented populations of Long-tailed Shrews in the state. This Core Habitat also contains forested habitat around the entrance to an important bat hibernaculum (underground overwintering area). Although this Core Habitat is anchored by the large block of conservation land protected within Mount Greylock State Reservation, other large and important areas to the east, west, and south remain unprotected.

Core Habitat BM130: Slopes and summits in the Mount Greylock Area

Natural Communities:	Status
Acidic Rocky Summit/Rock Outcrop Community	Secure
Calcareous Rock Cliff Community	Vulnerable
Calcareous Rocky Summit/Rock Outcrop Community	Imperiled
Calcareous Talus Forest/Woodland	Vulnerable
High Elevation Spruce - Fir Forest/Woodland	Imperiled
Rich, Mesic Forest Community	Vulnerable
Spruce - Fir - Northern Hardwoods Forest	Secure
Spruce-Fir Boreal Swamp	Vulnerable

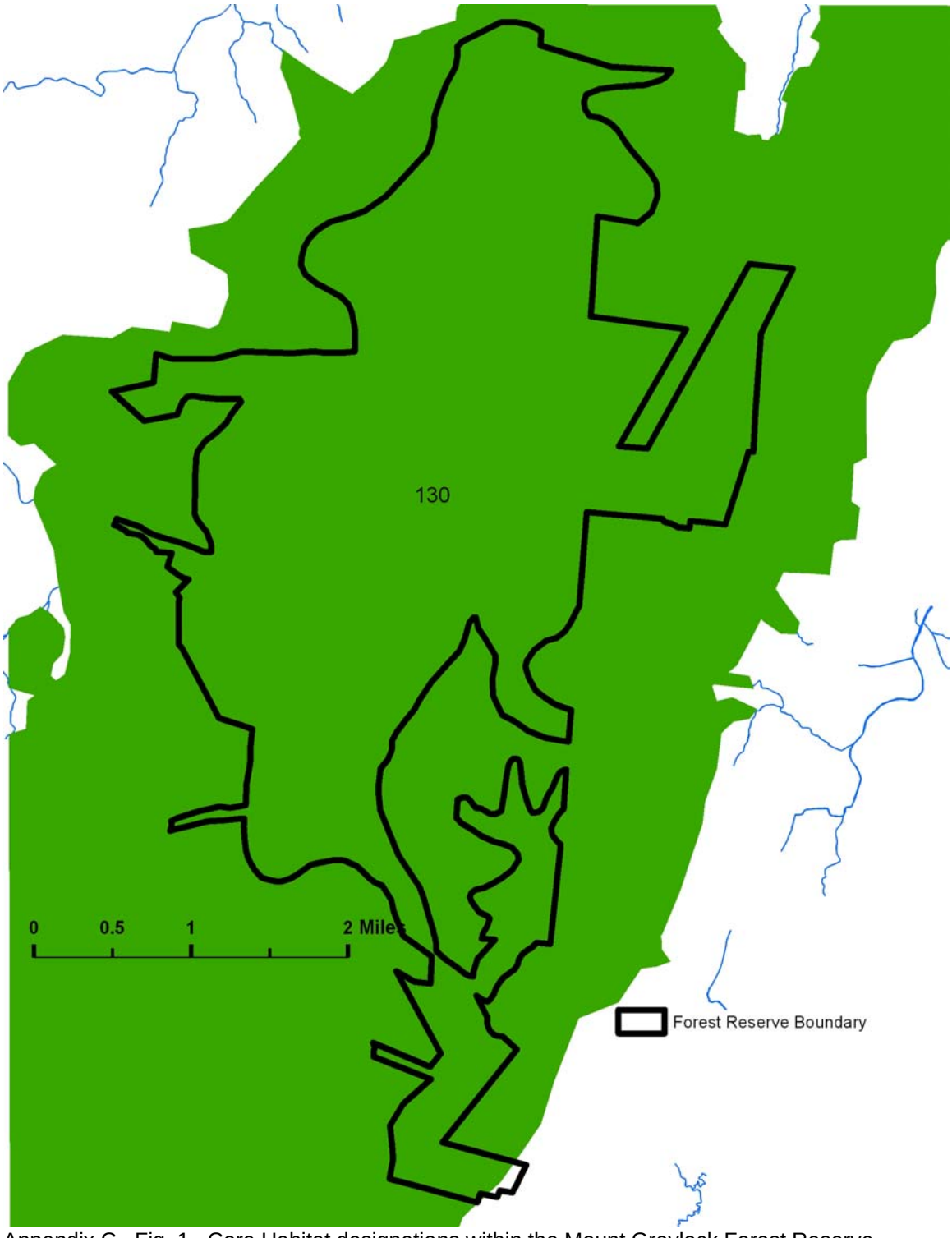
Rare Species

Plants

Common Name	Scientific Name	Status	Most Recent Observation
Bailey's Sedge	*Carex baileyi*	Endangered	1995
Bartram's Shadbush	*Amelanchier bartramiana*	Threatened	2004
Black-Fruited Woodrush	*Luzula parviflora* ssp. *melanocarpa*	Endangered	2002
Bristly Black Currant	*Ribes lacustre*	Special Concern	2003
Broad Waterleaf	*Hydrophyllum canadense*	Endangered	2003
Fen Sedge	*Carex tetanica*	Special Concern	1995
Gattinger's Panic-Grass	*Panicum gattingeri*	Special Concern	1997
Hairy Wood-Mint	*Blephilia hirsuta*	Endangered	2005
Hemlock Parsley	*Conioselinum chinense*	Special Concern	1985
Large-Leaved Goldenrod	*Solidago macrophylla*	Threatened	2004
Mountain Cranberry	*Vaccinium vitis-idaea* ssp. *minus*	Endangered	2003
Northern Bedstraw	*Galium boreale*	Endangered	1995
Northern Bog Violet	*Viola nephrophylla*	Endangered	1912
Northern Mountain-Ash	*Sorbus decora*	Endangered	2002
Northern Prickly Rose	*Rosa acicularis*	Endangered	2004
Smooth Rock-Cress	*Arabis laevigata*	Threatened	1986
Stiff Gentian	*Gentianella quinquefolia*	Watch Listed	
Woodland Millet	*Milium effusum*	Threatened	2002

Invertebrates			
Common Name	**Scientific Name**	**Status**	**Most Recent Observation**
Dion Skipper	*Euphyes dion*	Threatened	1996
Early Hairstreak	*Erora laeta*	Threatened	2005
Elderberry Long-Horned Beetle	*Desmocerus palliatus*	Special Concern	
Tule Bluet	*Enallagma carunculatum*	Special Concern	1998

Vertebrates			
Common Name	**Scientific Name**	**Status**	**Most Recent Observation**
Bat Hibernaculum			
Blackpoll Warbler	*Dendroica striata*	Special Concern	2006
Jefferson Salamander	*Ambystoma jeffersonianum*	Special Concern	2006
Long-Tailed Shrew	*Sorex dispar*	Special Concern	2000
Mourning Warbler	*Oporornis philadelphia*	Special Concern	2000
Spring Salamander	*Gyrinophilus porphyriticus*	Special Concern	



Appendix C. Fig. 1, Core Habitat designations within the Mount Greylock Forest Reserve (NHESP 2004).