An evaluation of the western slope forests of Wachusett Mountain

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Introduction

Recently it has been brought to the attention of the Massachusetts Department of Conservation and Recreation (DCR) that the western slopes of Wachusett Mountain may contain previously unrecognized old-growth forests. The area in question contains primarily hemlock-dominated forests located between the Up Summit Road and West Road, south of the West Side Trail (C. Pernaa, *personal communication*). Because these forests are located outside of the original Administrative Boundary of contiguous old-growth forest (cf. Foster et al. 1996, 1997; Orwig et al. 2001), detailed vegetation and tree-core sampling was conducted in an effort to document their old-growth status. Extensive reconnaissance of the western slopes of Wachusett Mountain was used to determine whether they meet DCR's accepted definition of old-growth forest. Methods previously used on Wachusett Mountain were implemented to: 1) investigate the structural and compositional attributes of forest stands in this area, 2) develop descriptions of stand age-structure, growth history, and dynamics of these forests, and 3) provide a map delineating all areas investigated in this study.

Study Area

A brief reconnaissance of the western slopes was conducted with DCR officials in Fall of 2002 to visit and discuss potential sampling areas. A large area bordered by West Road to the west and south, West Side Trail to the North, and Semuhenna Trail to the east was selected for more intensive study (Figure 1). Elevations of the study region range from 1360 ft. (415 m a.s.l.) in the west to 1660 ft. (506 m a.s.l.) along Semuhenna Trail in the east. Within this study area, soils were classified mainly as either Lyman-Tunbridge-Berkshire east of Semuhenna Trail or Tunbridge-Lyman-Berkshire soils west of Semuhenna Trail. These sandy loam soils are gently sloping to very steep, somewhat excessively drained, and formed in glacial till underlain by crystalline bedrock (NRCS 1996). Rock outcrops, stones, and boulders are common on both soil types.

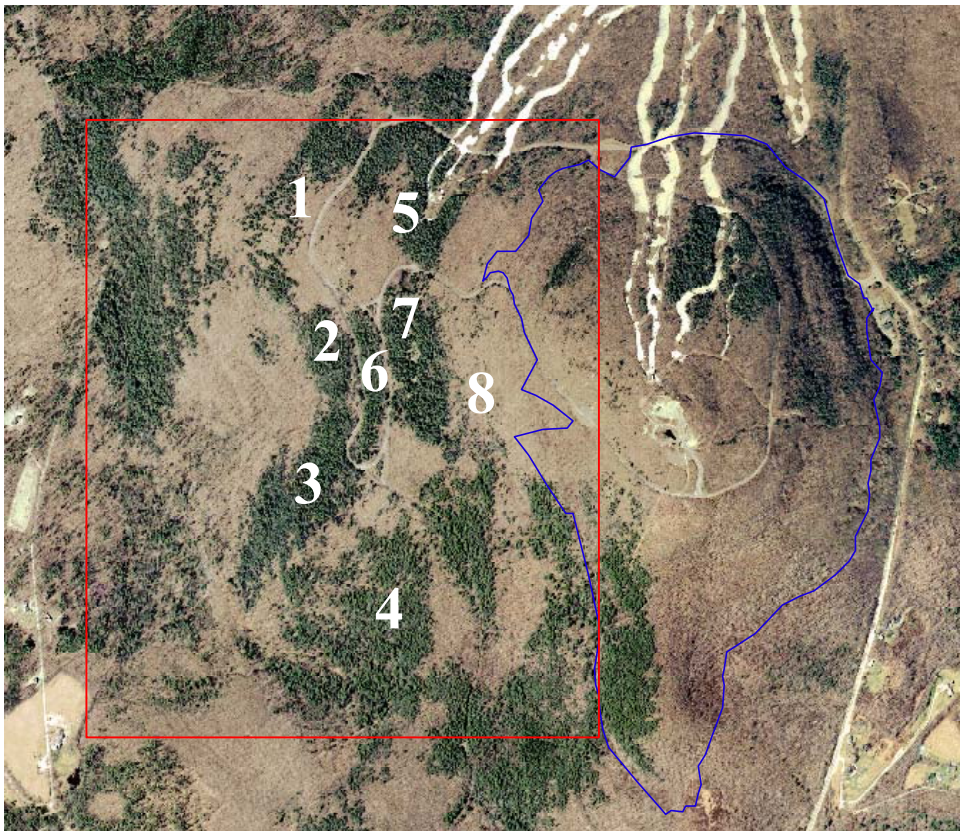

Figure 1. Location of study area (denoted by red box) that includes the western slopes of Wachusett Mountain. Numbers refer to specific forest areas intensively examined in this report and the blue boundary denotes the current Administrative Boundary of old-growth forest.

Methods

Old-growth definitions

During the growing season of 2003 a large study area on the western slopes of the mountain (Figure 1) was examined for the presence of old-growth forests using the official DCR policy definition (Mass. DCR 1998). The current definition includes the following 4 criteria that were used to help evaluate each area studied:

1) **Minimum stand size**: stands > 5 to 10 acres are considered large enough to be self-sustaining in spite of natural disturbances and attrition.
2) **Lack of human disturbance** : There should be no evidence of significant, human post-European settlement disturbance in the form of timber harvesting or agricultural use.
3) **Age of older trees:** Old-growth forests should have a component of old trees that are greater than 50% of the maximum longevity for that particular species. (While accurate sources of this type of information is difficult to obtain, sources such as The International Tree-Ring Database (http://web.utk.edu/~grissino/) and Silvics of North America (Burns and Honkala 1990) were used for this report.
4) **Regeneration**: To be self-perpetuating, the belief is that old-growth stands must have a component of trees in younger ages classes that can be recruited to fill voids in the canopy as overstory trees become senescent and die or as gaps are created following disturbances.

Sample locations

Based on initial reconnaissance notes and follow-up field work, eight areas were selected for more intensive study to elucidate whether they contained old-growth forests. These areas are the focus of this report and are referred to as the following with the number corresponding to the area designated on Figure 1:

Area 1- Oak barren site, located adjacent to and south of west side trail.

Area 2 – Hemlock dominated site, west of Up Summit Road to a rocky ledge.

Area 3 – Hemlock dominated site, south of Area 2, west of Up Summit Road to rock ledge south almost to West Road.

Area 4 – Hemlock-white pine area straddling West Road, just east of Siplas Pool.

Area 5- Hemlock dominated area adjacent to top of westernmost ski lift line.

Area 6- Hemlock dominated island between the south- and north-flowing sections of Up Summit Road.

Area 7- Pitch pine-hemlock dominated area, south of the bog area and west of Semuhenna Trail. This is the area examined in Sarah Parker's Master's thesis (Parker 2004).

Area 8 – Red oak dominated area, east of Semuhenna Trail. This is the area described by Joe Choiniere in a report to Wachusett Mountain (Choiniere and Shea 2002).

Dendroecological analyses

With the exception of Area 8 (due to prior coring of trees in this area; Choinere and Shea 2002), tree cores were obtained in all areas of unknown ecological status mentioned above. Cores were obtained as close to the ground as possible (ca. 0.3 m) for reliable estimates of total age. Cores were collected in the field, stored in straws, and transported to the laboratory at Harvard Forest. They were then air dried, mounted, sanded, and aged with a dissecting microscope. For cores that missed the pith, years were added based on the early ring curvature and growth rate to estimate total coring height age (Applequist 1958). All cores and data will be permanently stored in the Harvard Forest sample archive.

RESULTS

Area 1- Oak barren site, located adjacent to and south of west side trail (~ 1 ha).

This parcel of open woodland contained several multiple-stemmed red oaks (*Quercus rubra*) with abundant blueberry (*Vaccinium* spp.) in the understory. Patches of common juniper (*Juniperus commonis*) and 2 large prostrate pitch pines (*Pinus rigida*) attest to the open nature of this site (Figure 2). In addition, evidence of at least a dozen dead pitch pine were found, some with charred wood. Many of the oak crowns had indication of winter 2003 ice/wind damage and several had basal fire scars. One of the larger diameter oaks was cored, and although rotten, yielded an age estimate of 80 to 90 years old. One additional red oak was cored several years prior in this site and was approx. 165 years old. This is an interesting site that has been open for extended periods of time and has been burned at least once, perhaps more. Due to the open nature of the site and abundance of multiple-stemmed trees, past disturbances such as mowing and/or pasturing cannot be ruled out. The small size (~ 1 ha) and lack of old trees preclude this area from being defined as old-growth according to the DCR definition.

Figure 2. Large prostrate pitch pine in open woodland of Area 1.

Area 2 –Hemlock dominated site, west of Up Summit Road and just south of Area 1 (~ 7 ha).

In the northern part of this stand, eastern hemlock (*Tsuga canadensis*) is distributed along the rocky ledges and are scattered among leaning red oaks with tattered tops and old-bark characteristics (Figures 3 and 4). Several large (> 77 cm diameter at breast height, dbh) rotten hemlocks were encountered in this forest and many hemlock crowns have densely packed branches, indicative of advanced age. Fine and coarse woody debris of red oak and hemlock are present in this forest.

Sampled hemlock trees ranged in size from 44 – 76 cm dbh and in age from 106 to 270 years old (Table 1). Red oaks varied in size from 38 to 51 cm dbh and 170 to 230 years old. One 40 cm dbh black birch (*Betula lenta*) was aged at 203 years. The average age of the 21 trees cored in this area was 190 years old. There was no sign of recent or historical cutting, no evidence of stone walls or wire in trees, and therefore the advanced ages here represent a nice example of old-growth forest according to the DCR definition.

Areas 2 and 3 are essentially separated by a narrow section of hardwood forest with a much younger appearance. It is comprised of many multiple-stemmed black cherry (*Prunus serotina*), red maple (*Acer rubrum*) and red oak, along with smaller beech (*Fagus grandifolia*) and scattered hemlock. It is uncertain what the past history of this area is, although one potential possibility is historical clearing for a firebreak. These clearings were distributed throughout the Reservation to help reduce the threat of fires during the early 1900s. This area is in close proximity to the "fire guard E" that is shown on the 1904 map produced by the Wachusett Mountain State Reservation Commission (WMSRC 1904).

Figure 3. Leaning and twisted red oak trees among hemlock in Area 2.

Figure 4. Old red oak bark characteristics in Area 2 seen in the right foreground of picture.

Area 3 – Hemlock dominated site, south of Area 2, west of Up Summit Road to rock ledge south almost to West Road (~ 12 ha).

Area is similar in topography to area 2 with gentle western slopes, although some portions have a much higher density of hemlock. The crowns are tightly packed with dense branches. In the northern portions of Area 3 there are patches where hemlock is the sole species in the understory and overstory (see cover and Figure 5). A few scattered white pine (*Pinus strobus*) were present in the western part of Area 3. Sampled hemlock trees ranged in diameter from 41 to 61 cm dbh and in age from 158 to 242 years old (Table 1). Red oaks and white pine were aged to 199 and 184 years, respectively.

Several snags (dead, standing trees) and coarse woody debris in various stages of decay were present, oriented in multiple directions. Soils had a spongy feel underfoot due to large accumulations of organic matter. There was no visual sign of cutting in this stand and there were no stonewalls present. Several trees in the western portion of Area 3 contained branch scars low to the ground and rapid early radial growth rates during this time, indicating that some trees began growing under more open canopy conditions than exists in present-day forests. It is interesting to note that several trees exceeding 200 years old are within 20 to 30 m from the Up Summit Road. They probably escaped recognition due to the lack of any established hiking trails.

Due to the rugged, secluded nature of these western slopes, this area represents one of the "wildest" locations in the Reservation. The structure, composition, lack of visual signs of direct human disturbance, and advanced tree ages of this area certainly represent old-growth conditions according to Massachusetts DCR definitions. There was one location in the extreme southwest corner of Area 3, in the transition area of hemlock and hardwood forest that experienced some selective cutting of oak (22 stumps were found). This would represent the southern limit, north of which is the contiguous old-growth area.

Area 4 – Hemlock-white pine area straddling West Road, just east of Siplas Pool (~ 10 ha).

Hemlock and red oak trees along Siplas Brook (that forms Siplas Pool) were quite large (50-75 cm dbh) and appeared to grow well, as ages ranged from 165 to 184 and 164 to 199 years, respectively. South of West Road is a portion of forest in which hemlock, white pine, and large red oak was cut in the last 20 years or so. Currently a dense sapling thicket of red maple and beech occurs in the cut area. Based on stump counts of 90 to 150 years, it appears that mature, but not old-growth forest was cut. Additional stumps were observed south of the Brook, as well as a few double-stemmed red oak trees. One large hemlock (70.1 cm dbh) cored south of West Road, along Harrington Trail was aged at 165 years old.

Figure 5. Dense hemlock stand in the northern portion of Area 3 with downed hemlock bole in background.

North of West Road there was a mixture of young hemlock and beech, large red oaks, and a few scattered white pine. There was evidence of some pit and mound topography, indicative of past wind disturbance, a few double-stemmed red oaks, and the presence of some scattered old stumps of unknown age. One beech was aged to be 190 years old in this area. In the northern portion of Area 4 many downed trees were oriented in directions ranging from 270 to 320 degrees, probably resulting from the 1938 hurricane. In addition, there were many leaning red oak and red maple trees and multiple pits and mounds, some with young black birch growing on them.

The level of direct, recent human disturbance both north and south of West Road precludes this area from being considered old-growth forest according to the Massachusetts DCR definitions. This is certainly an area with nice, tall red oak and white pine trees. Several of the white pines had an "open grown" appearance, with large crowns and large, low branch scars.

Area 5- Hemlock dominated area adjacent to top of westernmost ski lift line (~ 6 ha).

This relatively small area representing approximately 6 ha, located near and east of the Semmuhenna Trail, north of West Side Trail and west of Ralph's Run Ski trail, contains an excellent pocket of ancient trees. This forest patch is dominated by hemlock with scattered red oak containing gnarled crowns and blocky bark. Some trees along the small stream west of the ski area contain great age. In one area in particular, a 267 year-old hemlock was adjacent to a 290 year-old red oak (Figure 6). There were several large (> 70 cm dbh) hemlock present, but many were rotten in the center. One partial core from such a tree yielded 250 years. The area immediately south of the ski lift area contained a few white pines up to 189 years old. Trees east of the ski lift area were much younger in general and included a 46 cm dbh red spruce (*Picea rubens*) that was only 90 years old. However, one old hemlock was aged to 200 years in this area.

Figure 6. Tree crown of a 290 year old red oak in Forest in Area 5.

A small northern extension of this area, located between Semmuhenna Trail and the Up Summit Road, just south of the parking area also contained several twisted hemlocks between 200 and 250 years old. Despite the small size of this parcel, the lack of any significant direct human disturbance in the forest beyond the ski trail, the ancient tree growth forms (bark and crown conditions), and the tremendous ages present here make this a very important stand warranting immediate, strict protection (see also Recommendations and Future Concerns section).

Area 6- Hemlock dominated island between the south- and north-flowing sections of Up Summit Road (~ 3 ha).

This thin parcel of land located between the southbound and northbound sections of Up Summit Road, north of Administrative Road, contains abundant rock ledges and many young, open-grown hemlocks, some with lower branches extending 5 to 6 m. In the northern portion of the island, very dense young hemlock trees are interspersed with scattered red oak and small beech trees. There is one portion just north of an ephemeral stream that contained somewhat larger trees, and a 54.2 cm hemlock was aged at 110 years old. With the exception of this tree, there was no evidence that any of these small trees were > 100 years, and therefore this parcel does not meet the Massachusetts DCR definition of old-growth forest.

Area 7- Pitch pine-hemlock dominated area, south of the bog area and west of Semuhenna Trail (~ 6 ha).

This 5 to 6 ha parcel just south of the Up Summit Road and The Bog parking area, was the area examined in Sarah Parker's Master's thesis (Parker 2004). Extensive coring within 3 major pitch pine (*Pinus rigida*)- hemlock areas located on shallow soils with exposed bedrock yielded an all-aged pitch pine community ranging from 20 to 220 years old. The later age represents one of the oldest known pitch pine in the state of Massachusetts (D. Orwig, *personal observation*). However, the vast majority were less than 100 years old and the average pitch pine age was 78 years old. There was no sign of significant human disturbance in this area, although the relatively young age of the forest precludes this area from being considered old-growth according to the Massachusetts DCR definition. This being said, the broad age patterns, unusual morphological characteristics (Figure 7), lack of past fire evidence, and geographical setting of this site make this a rare and unusual community that should certainly be protected in the future.

Figure 7. Seventy-eight year-old pitch pine that has been twisted and is currently almost prostrate in form in Area 7. Note abundance of exposed bedrock.

Area 8 –Red oak dominated area, east of Semuhenna Trail (~ 15 ha).

This is the area described by Joe Choiniere in a report to Wachusett Mountain (Choiniere and Shea 2002). Ages reported therein included sugar maple (*Acer saccharum*) and beech (*Fagus grandifolia*) 158 to 215 years old, a red oak near 210 years old, white ash (*Fraxinus americana*) 200 to 245 years, and yellow birch (*Betula alleghaniensis*) 213 to 332 years old. Due to prior aging, I purposely did not pursue additional coring of this area but did investigate the forest composition and structure along Harrington Trail from the Administrative Road beyond 3 streams up to the steeper upper slope. A 30 to 40 m wide band of forest north of the trail contained severely tapered, gnarled, old red oak and hemlock trees, although most were rotten. Two recently snapped hemlock at the base of a ledge were field counted to between 170 and 180 years old. South of Harrington Trail there was the continued presence of scattered large (>70 cm dbh) red oak trees among younger hemlock trees. Large, downed woody material was also scattered in this area. Field observations of this area from this study along with prior notes and ages (Choiniere and Shea 2002) appear to make a solid supporting argument for the inclusion of this area as supporting old-growth forest, as per the

definitions of the Massachusetts DCR. Certainly more work is needed here to better document these areas (See Proposed Future Research section below).

Discussion

Eight specific areas were examined on the lower western slopes of Wachusett Mountain (Figure 1). Four forests (Areas 2, 3, 5, and 8) were considered to be old-growth based on the current DCR definition. These areas comprised approximately 40 ha and all contained trees exceeding 240 years old. A total of 63 trees were cored, with 40% exceeding 200 years of age (Figure 8). This is a significant finding as only a fraction of the trees present in these stands were cored. In addition, ages of red oak and hemlock trees on the lower slopes examined in this report either approached or exceeded the maximum ages found in more intensively sampled forests elsewhere on the mountain (Orwig et al. 2001). Similar to past findings on this mountain (Orwig et al. 2001), sampled trees were relatively small statured and contained old bark characteristics and broken and gnarled crowns. Despite the broad range of ages found in this report the trees were consistently between 40 and 60 cm dbh (Figure 8).

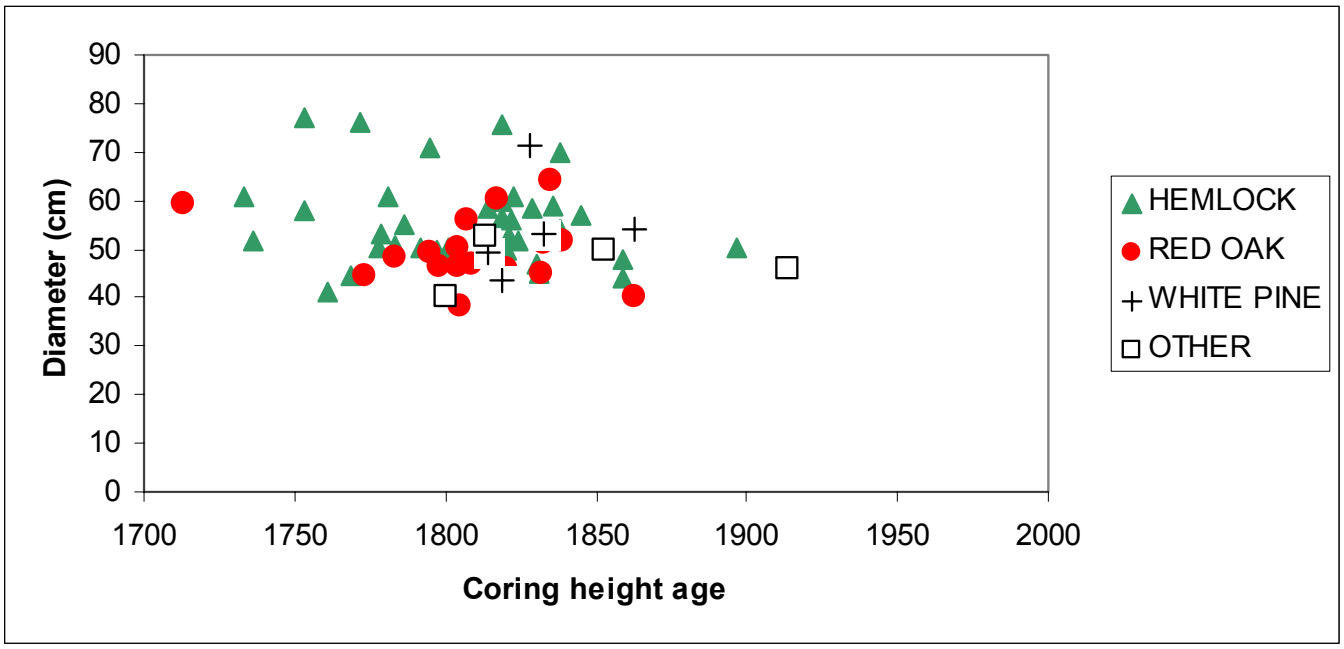

Figure 8. Coring height ages versus diameter relationship of trees sampled within the lower western slope of Wachusett Mountain (n = 63).

Recommendations and Future Concerns

According to the current Wachusett Mountain Management Plan (Epsilon Associates, Inc. 1999), the forest areas examined in this report are already zoned as being within a Conservation Zone or an Environmental Protection Zone with both interior forest habitat significance overlays and biodiversity significance overlays (Figure 9).

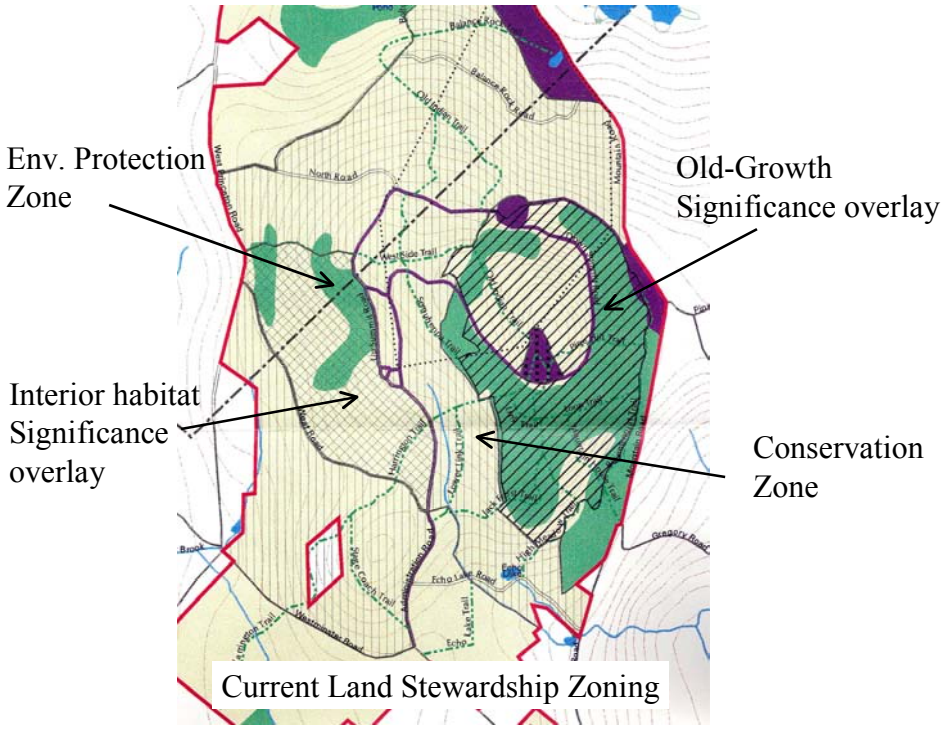

Figure 9. Current Land Stewardship Zones of the Wachusett Mountain State Reservation. Adopted from Epsilon Associates, Inc. (1999).

One reasonable strategy for protecting the recently discovered old-growth forests reported here would be to extend the old-growth administrative boundary from its current limit westward, using prominent natural or man-made features such as trails and roads to define the boundaries of the new area (cf. Foster et al. 1996; Epsilon Associates, Inc. 1999). The proposed new boundary would now extend from the Up Summit Road west down North Road to West Road, south along West Road to Harrington Trail, and east along Harrington Trail to the original old-growth boundary near Link Trail (Figure 10). This approach would effectively link all known old-growth forests in one large area while also including other significant areas like the unusual pitch pine Area 7 and the maturing Area 4 containing large trees. Therefore, not every tree within the boundary will be old, but there will be a variety of age and structural classes present. Since commercial

silvicultural activity is largely prohibited from most of this area, incorporating all the old-growth forests with other areas of significance into one old-growth significance zone would provide more stringent protection of these valuable forests while preserving and enhancing the integrity of the existing old-growth stands. The larger old-growth zone would also effectively provide the site-specific buffers required by the statewide old-growth policy (Mass. DCR 1998).

Due to the close proximity of old trees to Ralph's Run ski trail and the frequent "off trail" excursions of skiers into this area, a simple, but important safeguard to help protect this old forest without diminishing the current ski activity or experience would be the placement of snow fence along the western edge of Ralph's Run down to the summit road. This is consistent with efforts to protect other sensitive areas along ski trails elsewhere on the mountain and would be easy to implement and maintain.

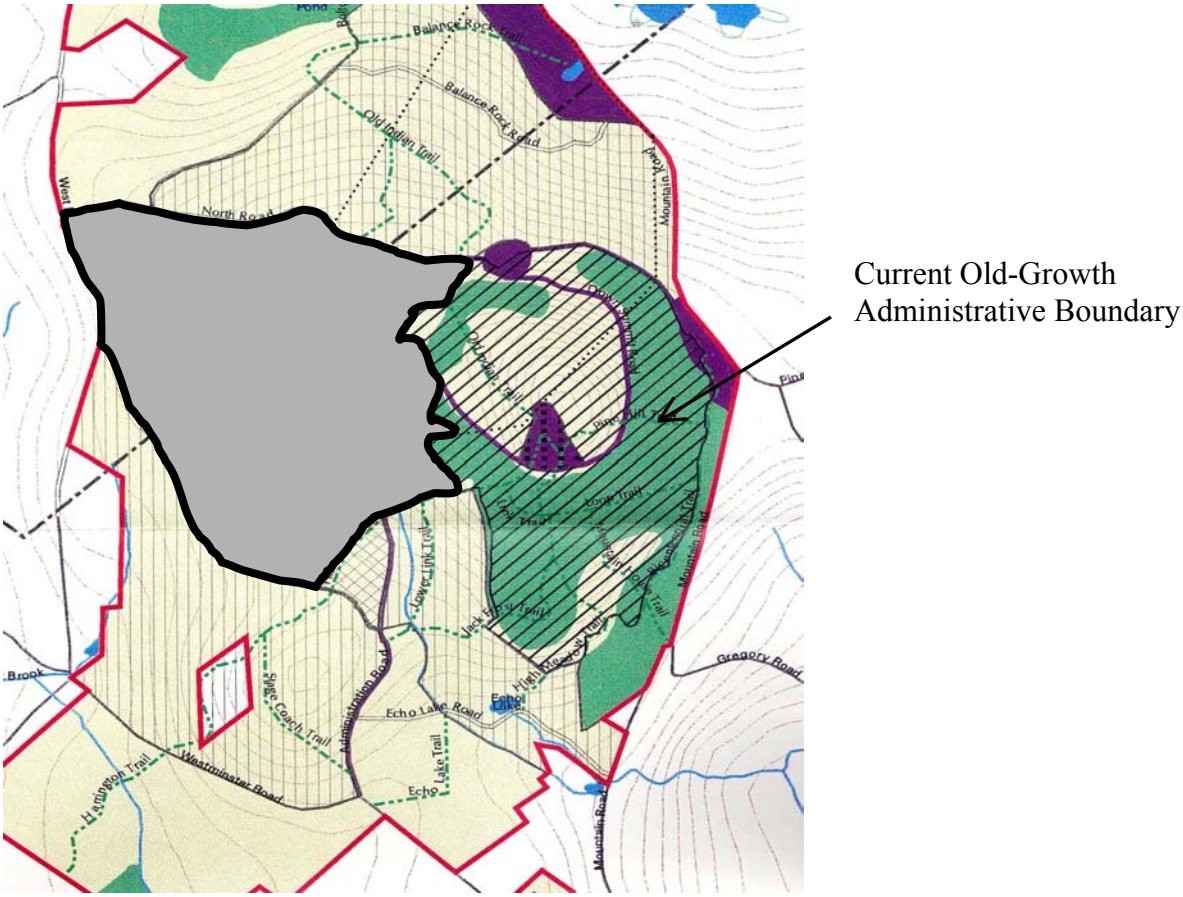

Figure 10. Proposed westward extension of the Old-growth Administrative Boundary within the Wachusett Mountain State Reservation, represented by the transparent gray polygon with bold black boundary. Background adopted from Epsilon Associates, Inc. (1999).

Although the current Wachusett Mountain Management Plan does allow for "salvage operations" elsewhere in the Reservation, even in the environmental protection zone, the current DCR WMSR old-growth policy prohibits salvage operations, even following a severe insect or disease infestation. The ongoing beech bark disease (a combination of the fungi *Nectria coccinea* var. *faginata* and the introduced scale insect *Cryptococcus fagisuga*; Twery and Patterson 1984) and the impending migration of the introduced hemlock woolly adelgid (HWA; *Adelges tsugae*) provides examples of these scenarios that will likely impact the Reservation (Orwig and Foster 1998; Orwig et al. 2002).

It is likely that the Wachusett Mountain hemlock stands will be infested with HWA within the next 2 – 5 years, if not sooner and therefore the reservation will face many management issues related to HWA and other pests, but it also has several unusual opportunities to consider. First, it should be discussed and considered whether any stands should be pro-actively protected from HWA for future generations to experience and enjoy via chemical and/or biological controls. The statewide old-growth policy (Mass. DCR 1998) does allow intervention for protection from outbreaks of introduced pests and pathogens if guidelines are developed locally for site-specific management plans. Currently pest control efforts are allowed under the general use guidelines for land stewardship zoning under forest protection in parts of the Reservation but not within the old-growth significance overlay (Epsilon Associates, Inc. 1999). A few traits characteristic of certain areas like Area 3, which would actually favor protection efforts include close proximity to road access, relatively flat to gently rolling terrain, and relatively short-statured trees, allowing a better chance of success for canopy sprays. Second, in areas where HWA control is not feasible or desirable, it should be pointed out that if HWA kills the hemlock in these old-growth stands, they will remain special and ecologically important sites *only* if they are *not* manipulated by salvage logging. Removal of the dead and downed timber would remove biological legacies and habitat for a number of wildlife, disrupt the soils and soil environment, and could lead to more dramatic vegetation and ecosystem function changes than allowing them to remain on the site (Lindenmayer et al. 2004).

Strict adherence to the policy of securing special-use permits to conduct research in these areas can only aid in the future protection of these special areas in the future.

Proposed future research

In areas that meet the criterion of old-growth status, I would recommend establishing permanent plots to sample vegetation as in previous studies (cf. Orwig et al. 2001): Vegetation would be sampled in three to five, 20 x 20 m permanently marked plots established along transects oriented through the central portion of the stand(s). Slope, aspect, topographic position, and the species and diameter at breast height (dbh) for every tree (stems ≥ 1.37 m tall and ≥ 8 cm dbh) would be recorded in each plot. In each area, a relative importance value will be calculated for each species by averaging relative density and relative basal area data from the permanent plots. In addition, tree

heights of four dominant or codominant trees would be obtained in each plot with a clinometer. All saplings (stems > 1.37 m tall and < 8 cm dbh) and seedlings will be counted by species within each plot. A complete inventory of all understory vegetation including herbs and shrubs should be taken at each plot. Nomenclature will follow Gleason and Cronquist (1991). In addition, historical reconstructions of land-use history, ownership, and patterns of disturbance (cf. Cogbill 1995) would be very useful in interpreting the history, development and boundaries of forests on the western slope of the mountain. Additional tree cores would be obtained to help to discern the past and current forest dynamics of these areas.

With the ongoing infestation of beech bark disease and the threat of the introduced hemlock woolly adelgid, old-growth hemlock forests at Wachusett Mountain represent an invaluable scientific resource to compare with ongoing investigations of HWA impacts across southern New England, primarily in second-growth forests (Orwig and Foster 1998; Orwig et al. 2002; Tingley et al. 2002). Investigations of vegetation and ecosystem function dynamics (e.g., nitrogen availability and cycling) as well as a variety of wildlife and aquatic studies should be initiated and/or maintained to examine the short and long-term effects of the invasive pest on old-growth forest structure, composition, and function.

Table 1. Diameter and age data for sampled trees within various sampling areas on the lower western slopes of Wachusett Mountain.

Area	Species	Year of origin	Dbh (cm)	Age
2	Black birch	1800	40.4	203
2	Eastern hemlock	1820	49.8	183
2	Eastern hemlock	1831	44.8	172
2	Eastern hemlock	1897	50.5	106
2	Eastern hemlock	1772	76	231
2	Eastern hemlock	1830	46.8	173
2	Eastern hemlock	1822	56.2	181
2	Eastern hemlock	1786	55	217
2	Eastern hemlock	1836	58.7	167
2	Eastern hemlock	1859	48	144
2	Eastern hemlock	1733	60.8	270
2	Eastern hemlock	1779	53.3	224
2	Eastern hemlock	1859	44	144
2	Eastern hemlock	1814	58.3	189
2	Red Oak	1805	38.2	198
2	Red Oak	1820	46	183
2	Red Oak	1783	48.4	220
2	Red Oak	1773	44.6	230
2	Red Oak	1798	46.3	205
2	Red Oak	1833	51.1	170
2	Red Oak	1832	45.2	171
3	Eastern hemlock	1792	50.2	211
3	Eastern hemlock	1783	50.7	220
3	Eastern hemlock	1838	54	165
3	Eastern hemlock	1823	60.6	180
3	Eastern hemlock	1781	60.7	222
3	Eastern hemlock	1819	59.9	184
3	Eastern hemlock	1824	51.5	179
3	Eastern hemlock	1761	41	242
3	Eastern hemlock	1797	49.8	206
3	Eastern hemlock	1845	57.1	158
3	Eastern hemlock	1778	50.1	225
3	Eastern hemlock	1829	58.3	174
3	Eastern hemlock	1769	44.4	234
3	Eastern hemlock	1800	49	203
3	Eastern hemlock	1819	56.4	184
3	Red Oak	1809	47.1	194
3	Red Oak	1804	46.2	199
3	Red Oak	1807	56	196
3	White Pine	1833	53.2	170
3	White Pine	1819	43.7	184
4	Beech	1813	52.5	190
4	Eastern hemlock	1838	70.1	165
4	Eastern hemlock	1819	75.4	184
4	Red maple	1853	50	150
4	Red Oak	1835	64.2	168
4	Red Oak	1839	51.9	164
4	Red Oak	1817	60.5	186
4	Red Oak	1804	50.5	199
4	White Pine	1828	71.1	175
5	Eastern hemlock	1795	70.7	208
5	Eastern hemlock	1821	52.8	182
5	Eastern hemlock	1801	50.3	202
5	Eastern hemlock	1753	77.3	250
5	Eastern hemlock	1736	51.7	267
5	Eastern hemlock	1753	58.1	250
5	Eastern hemlock	1803	50.8	200
5	Red Oak	1795	49.4	208
5	Red Oak	1713	59.2	290
5	White Pine	1814	49.4	189
MISC	Red Oak	1863	40.2	140
MISC	Red Spruce	1914	46	89
MISC	White Pine	1863	54	140

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