Management Plan
Balch Hill Natural Area
Hanover, New Hampshire

Draft 16, March 31, 2015

TOWN of HANOVER

HANOVER CONSERVANCY
Protecting land & water in our community

DARTMOUTH
VOX CLAMANTIS IN DESERTO
1769

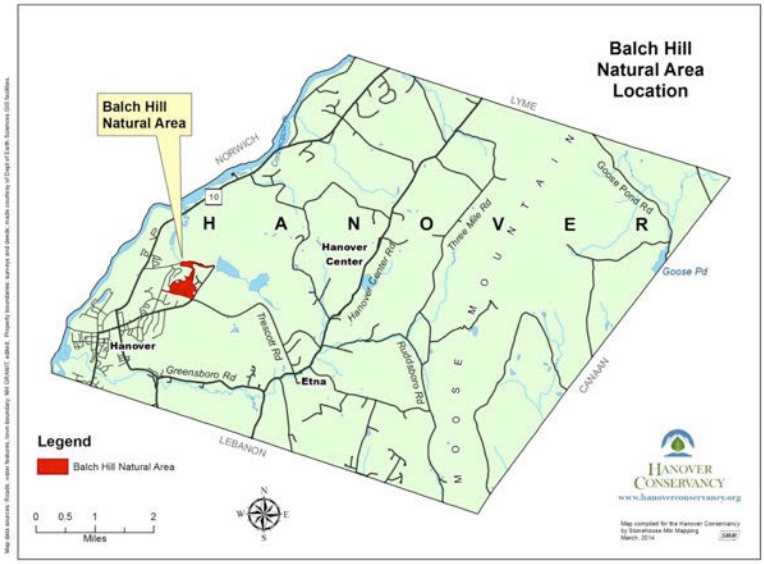
EXECUTIVE SUMMARY

Balch Hill Natural Area
Hanover, New Hampshire

The Balch Hill Natural Area is composed of five parcels of land owned by the Hanover Conservancy, the Town of Hanover, and Dartmouth College.

Size: 85 acres, including 67 acres of protected land and 18 acres of land zoned Nature Preserve.

Directions to the Property
From the Dartmouth College Green in Hanover, proceed 1.6 miles east on East Wheelock Street to the junction of Trescott and Grasse Roads. Or, follow Route 10 north. Turn right on Reservoir Road, then right on Hemlock Road. Park near end (2.5 miles from the Green).



Owner	Map/Lot	Address (town records)	Acres	Date Acquired	Protection Status
Hanover Conservancy	Map 44 Lot 59	10 Hemlock Rd	10.3	1970	Fee ownership by HC (land trust)
	Map 44 Lot 5	23.5 Rip Road	10.0	2001	Fee ownership by HC & conservation easement
Town of Hanover	Map 45 Lot 7	27 Hemlock Rd	25.9	1978	Land & Water Conservation Fund restrictions
	Map 48 Lot 3	81 Reservoir Rd	19.6	1980	Deed restriction
	Map 44 Lot 57	23.5 Rip Road	1.5	1979	Deed restriction
Dartmouth College	Map 45 Lot 20	2 Grasse Road	18.0	1940	Nature Preserve Zoning

Management Plan Preparers
This plan is an update of the Management Plan adopted in 2003. This plan was prepared by:
- Anne Evans, Gail McPeek, Laura Rosenthal and the Balch Hill Stewardship Committee
- Adair Mulligan, Executive Director, Hanover Conservancy, and Vicki Smith, Town of Hanover

Plan Adopted
28 Oct 2014 – by Balch Hill Stewardship Committee of the Hanover Conservancy
13 Jan 2015 – by Hanover Conservation Commission
Date – by Dartmouth College

Management Objectives
- maintain and restore certain views at the top of Balch Hill
- provide and maintain foot trails for public recreation
- preserve the meadow
- conserve native plant and animal diversity
- protect and enhance wildlife habitat including for monarch butterflies
- preserve an example of an historic agricultural landscape

EXECUTIVE SUMMARY

Property Use Restrictions in Brief

- open to the public for foot travel only
- no fires except as directed in this plan for vegetation management
- no disturbance of vegetation except as directed in this plan for vegetation management
- no vehicles except by special permission
- no hunting except by special permission

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I. INTRODUCTION

A. The Balch Hill Natural Area

The Balch Hill Natural Area (referred to as "Balch Hill") is located within easy walking distance of downtown Hanover, New Hampshire. The summit reaches an elevation of 947 feet above sea level. For many years, Balch Hill has been the only unforested summit close to downtown that is open to the public. The property's network of trails, leading through second-growth forests, converge on an open meadow with expansive views of Hanover and beyond into Vermont. As a partly overgrown former pasture surrounded on three sides by residential development, Balch Hill cannot be considered a truly wild area, but it is also not a cultivated, manicured park. Balch Hill is emblematic of grassroots conservation efforts and continues to inspire conservation in Hanover.

B. One Natural Area, Multiple Owners

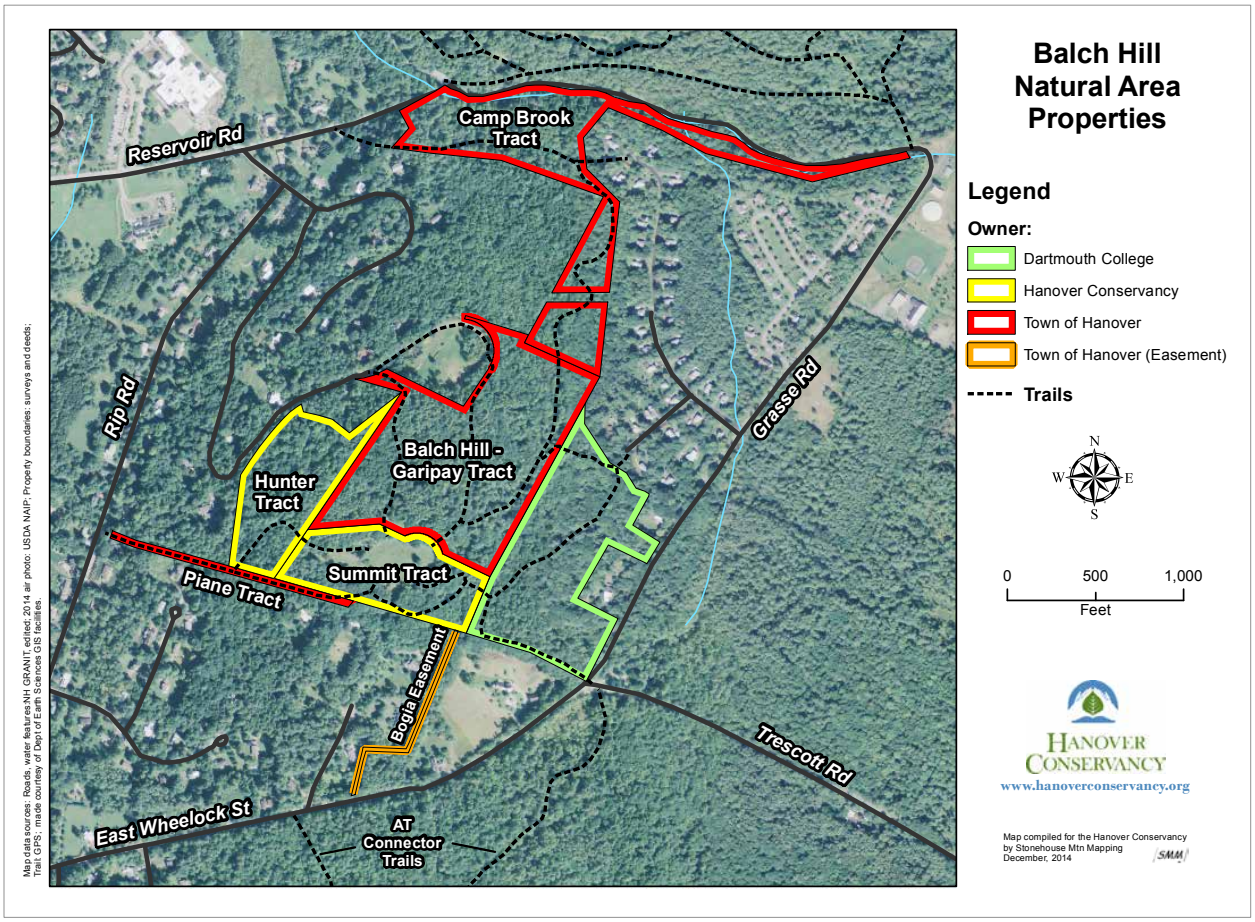


Figure 2 - Property Owners of Balch Hill Natural Area.

The 85-acre natural area is composed of five parcels owned by three entities. The Hanover Conservancy owns 24 percent, the Town of Hanover 55 percent, and Dartmouth College 21 percent. The only part of Balch Hill that can be considered permanently protected is the Hanover Conservancy's 20 acres. Those owned by the Town of Hanover carry a deed restriction that, "The open space land and pedestrian trail and bicycle path easements herein conveyed shall be used only for recreation, agriculture, conservation or parks. Notwithstanding any other provision, the restrictions on open space land and pedestrian trail and bicycle path easements shall not be changed or altered in any manner except as provided herein…"

In accepting the deed for the Balch Hill-Garipay Tract, the Town agreed that the property be held and used in a manner consistent with the purposes of NH RSA 36-A and shall be under the supervision of the Hanover Conservation Commission. The College's parcel also is not permanently protected, but is zoned Nature Preserve, as are the other lots.

Ownership of Balch Hill Natural Area

1. Hanover Conservancy

The Hanover Conservancy owns a total of 20.3 acres at Balch Hill. The Hanover Conservancy purchased the first protected parcel, which consisted of 6.26 acres on the summit, from Earl Garipay in 1970 for $18,000. At that time, the Conservancy was known as the Hanover Conservation Council, and this effort was the Council's first major fund-raising campaign since its founding in 1961. An additional gift of land from neighbors Ralph and Betty Hunter brought the protected summit area to 10.3 acres. The Hanover Conservation Commission (HCC) assisted by accessing $10,000 from the Land and Water Conservation Fund. The purpose of this acquisition was to protect the summit from development.

In 2001, the Hunters donated an additional 10 acres, also granting a conservation easement on this portion to the Upper Valley Land Trust, which monitors that parcel once a year. The Hunter West Trail runs through this land. A stone wall across the lower part of the meadow appears to follow the old boundary.

2. Town of Hanover

The Town of Hanover owns a total of 47 acres at Balch Hill. In 1978, after a series of development plans were denied for land near the summit, a 25.9 acre parcel was purchased by the Council from Earl Garipay for $130,000 and deeded to the Town. These plans first included 126 condominiums proposed by the developers of Long Island's Levittown, followed by a proposal for 49 houses, streetlights, and a water tower. The N.H. Supreme Court upheld the Hanover Planning Board's denial of that proposal in 1976. Again, the Council led an ambitious fund-raising campaign, involving 250 local donors. The Town and the Council each contributed $32,500 to match $65,000 in federal dollars from the Land and Water Conservation Fund. The Maple Trail, Hemlock Trail, and Fire Trail run through this land.

The Hanover Conservancy's deed conveying the Garipay Tract to the Town of Hanover included "a right-of-way 50 feet in width for the use of vehicles and otherwise beginning at the end of Hemlock Road and generally following the roadway leading to the home of the said Garipays and running adjacent to the fourth to the last and the third to the last courses of" [the lot's boundary description] "to the iron rod located at the beginning of the second to the last course of the description. This right-of-way is to be used

in common with L. Earl Garipay and Helene M. Garipay and their successors and assigns including purchasers of Parcels B and D as shown on said Plan. This right-of-way shall run with the land and be for the benefit of the grantee, its successors and assigns, and for the public, and is SUBJECT TO the right of L. Earl Garipay and Helene M. Garipay and their successors and assigns to convey the land subject to this right-of-way to the Town of Hanover for public highway purposes reserved in a warranty deed of L. Earl Garipay and Helene M. Garipay to the Hanover Conservation Council, Inc. dated December 19, 1978, recorded in the Grafton County Registry of Deeds at Book 1359, Page 454)."

In 1979, John Piane donated a 1.5 acre strip of land along the Piane Trail to the Town of Hanover as part of an understanding reached with the Town during land subdivision negotiations on Pine Drive and Balch Hill Lane. In 1980, Dartmouth College conveyed the 19.6 acre Camp Brook Preserve to the Town to meet the open space provision of the College's Grasse Road I subdivision. The Maple Trail and the Dot Strong Trail now run through this land. A narrow strip of land, withheld to accommodate a possible future subdivision road linking Ledge Road with MacDonald Drive, bisects this parcel.

The Town acquired a 20-foot easement in 1982 when David Bogia subdivided land on what is now Balch Hill Lane. The easement area, located on the eastern edge of the new subdivision properties, was intended to provide a "green belt" to connect the protected Balch Hill lands with the trails to Velvet Rocks on the opposite side of East Wheelock Street. Difficult topography makes use of this area challenging. The easement is recorded in the Grafton County Registry of Deeds (Book 1463, Page 968) and limits use to conservation, recreation, education, agriculture and forestry. Recreational use is limited to foot travel including by snowshoe and skis, and to horseback. No motorized vehicles are permitted. The easement area is to be kept in its natural condition, and the trail surface may not be hardened with gravel or paving. No dwelling or other structure may be erected in the easement area.

3. Dartmouth College

The Trustees of Dartmouth College purchased 185 acres in 1940 that had once been part of the Balch Farm. Most of this land later became the MacDonald Drive, Morrison Road, and Camp Brook Road residential developments off Grasse Road. The remaining 18.0 acres are forested and the Hunter East Trail, Garipay Trail and a portion of the Grasse Road Trail run through them. This lot is zoned Nature Preserve but is not permanently protected from development.

C. The Balch Hill Stewardship Committee

Balch Hill is supervised by the Balch Hill Stewardship Committee ("Balch Hill Committee") under the direction of the Hanover Conservancy and its Board of Directors. This committee is an advisory group composed of volunteers, neighbors, and representatives of the Hanover Conservancy, and the Hanover Conservation Commission. Dartmouth College is welcome to but has declined to have a representative on this committee, and is responsive when issues arise concerning its land.

1. Meetings and Minutes

The Balch Hill Committee meets at least quarterly, with agendas prepared by the chair. Minutes, recorded by a committee member, are distributed to all members and filed at the Conservancy office.

Subcommittees can be formed to accomplish a specific task; they should be chaired by a member of the Balch Hill Committee and can include interested community members and others with specific expertise.

2. Committee Responsibilities

- Prepare an annual work plan in consultation with the Conservancy Executive Director and/or Conservation Commission; consult Dartmouth's Real Estate Office for activities on College land.
- Monitor and record all management activities.
- Help supervise all contracted work.
- Evaluate conditions of trails; schedule improvements.
- Monitor viewsheds.
- Assist with public events at the hill, such as Kite Day, the Hawk Watch, and community work days.
- Evaluate use of hill, prohibited uses.
- Evaluate wildlife habitat and health of vegetation.
- Assist Conservancy staff in updating the plan at ten-year intervals.
- Maintain liaison with public, Conservation Commission, College.
- Communicate with or respond to those who have expressed interest.
- Provide an annual stewardship report on activities and problems to the Conservancy and Conservation Commission.

3. Budget and Expenditures

For ongoing maintenance expenses, funds come from the Balch Hill Stewardship Fund (see next section). The Balch Hill Committee should present a proposed annual budget to the Conservancy Executive Director for approval by its Board of Directors. Funding of major contracted work should be shared with the Town and the College as budgets allow. For major activities, grants or dedicated gifts may be sought. Whenever possible, the committee will locate volunteers for necessary tasks. The Hanover Conservancy manages fund-raising, grants, and contracts for work at Balch Hill, in cooperation with the Town and College when appropriate.

D. Balch Hill Stewardship Fund

Balch Hill was protected years before land trusts realized the need to plan for the costs of caring for such properties into the future. No funds for stewardship accompanied any of the parcels composing Balch Hill. Since the 1970s, the expenses associated with management have come from the Hanover Conservancy and from the Town.

In 2012, donations in memory of Michael McGean and from Balch Hill neighbor Dr. Gregory Baker helped the Hanover Conservancy establish the Balch Hill Stewardship Fund. A special appeal to other neighbors and friends, led by the Balch Hill Committee, resulted in nearly 40 gifts from 33 families, totaling $5,607. Gifts to the Hanover Conservancy in memory of former neighbor Mable Staples augmented the Fund by $2,810. In January, 2015, the Fund stood at $8,437.

The maintenance costs at this property, including annual mowing and occasional invasive species control, are significant. The Conservancy should continue to encourage donations to the Balch Hill Fund. As a landowner partner at Balch Hill, Dartmouth College should consider making a contribution to this fund. Town funds should be applied for work on Town land when appropriate and available.

E. Summary of Goals & Objectives

1. Encourage responsible use and enjoyment of the property by the public.
2. Continue to restore and maintain the viewshed.
3. Continue to manage wildlife (especially deer and monarch butterflies) and native vegetation.
4. Maintain foot trails.
5. Encourage educational activities.
6. Continue to control invasive species and monitor for new forest pests.
7. Continue to restore the historic agricultural landscape near the summit, including the meadow, orchard, and stone walls.
8. Update the previous wildlife and plant inventory.
9. Encourage scientific research and interpret findings for the public.
10. Explore opportunities to conserve abutting lands.
11. Maintain good communication with partner landowners and neighbors.
12. Ensure that the Balch Hill Stewardship Fund is adequate for the property's needs.
13. Conduct an annual review of this management plan to evaluate progress and create an annual action plan. Update the management plan every ten years.

F. Permitted & Prohibited Activities

1. Permitted Activities on the Balch Hill Natural Area

- Non-motorized, pedestrian, low-impact, non-commercial outdoor recreation and outdoor education, such as, but not limited to, hiking, wildlife observation, snowshoeing, cross-country skiing, cross-country running, geo-caching, orienteering, photography.
- Scientific and historical research with permission.
- Forestry, in accordance with this management plan and current best practices.
- Hunting for deer in season, by special permission of the Town of Hanover, with specifics of term, time, and method to be discussed annually by the Stewardship Committee.
- Dog walking if dogs are under the leash or voice control of their owners.
- Trail construction and maintenance by the Balch Hill Committee including water crossings built using best management practices.
- Signs necessary for property identification, boundary marking, habitat management, public education, low impact recreation, public safety, or forestry.
- Special events by permission of the landowners.

2. Prohibited Activities on the Balch Hill Natural Area

- Motorized vehicles (except for management activities and special events by permission).
- Bicycling.
- Combat games (including paintball).
- Horseback riding.
- Trapping and hunting with firearms, except as described in the permitted activities section.
- Picking wildflowers or other native plants (unless part of a permitted research study).
- Disturbing wetlands.
- Signs other than those described in the permitted activities section.
- Mining or disturbance of soil or drainage other than necessary for management purposes.

- Dumping, injection, or burial of trash, man-made or hazardous materials, yard or household waste (except for brush piles built by the Balch Hill Committee).
- Fires (except for brush fires built by the Balch Hill Committee).
- Storage or parking of vehicles, trailers, boats, or recreational vehicles.
- Structures other than informational kiosks and benches.

G. Current Management Concerns

- Over-population of white-tailed deer resulting in over-browsing of native vegetation, reducing forest health and regeneration.
- Invasive, non-native plants on the property and on abutting lands.
- Soil compaction and erosion from heavy foot traffic and trail design.
- Increasing tick population.
- Severe windthrow events.
- Managing hunting in a safe way.
- Encroachment from activities on abutting properties.
- Vegetation encroaching on the viewshed.

H. Previous Management Plans For Balch Hill

The first formal plan for Balch Hill was prepared in 2002-03 and published in February 2004. This comprehensive, well-researched plan was written by Barbara McIlroy, Ed Chamberlain, Bob Norman, Tom Linell, Karen Watson and Linda Wilson. It remains an important resource for the Balch Hill Stewardship Committee, especially sections on land ownership and land-use history, geology, and an extensive viewshed analysis and plan for viewshed restoration created by Jim Kennedy in 1985. Several plant, mammal and insect surveys were conducted in preparation of the 2003 plan. Copies of the plan are available for public review at the Hanover Conservancy office (16 Buck Road, Hanover, NH 03755), Town office, and Howe Library.

A fall gathering on Balch Hill, October, 1958.

In 2011, funds from the USDA Natural Resources Conservation Service and contributions from the Town and Dartmouth College enabled the Conservancy to hire a professional forester to examine the Natural Area. Ben Hudson of Hudson Forestry completed a new forest management activity plan in that year to guide habitat improvements. A cost-share grant from USDA-NRCS permitted implementation of some of Hudson's recommendations in 2013-15.

The present plan draws from the perspective of the 2003 plan, informed by the professional forester's 2011 analysis and more recent developments, such as the growth of the local deer population and increased interest in preserving historic and cultural landscapes. Through it all, the community remains as devoted to Balch Hill as ever.

II. RESOURCES & MANAGEMENT

A. Natural Resource Inventories

While no baseline documentation exists from the 1970s when most of the Balch Hill was obtained, subsequent surveys, research, and personal observations provide fairly extensive lists of plants and wildlife for Balch Hill. Volunteers gathered plant data in the spring and summer of 2001 and 2002, and a Dartmouth biology class inventoried meadow vegetation and insects in 2001. Some tracking for mammals was conducted in February and March 2002.

Since publication of the first plan in 2003, additional data have been gathered for invasive plant species, spring wildflowers, mammals, and birds. The 2011 Forest Activity Plan provided an update for tree species and overall forest types. These surveys and observations are explained in more detail in following sections, and complete lists appear in appendices C, D and E.

B. Geology & Soils

The south and west sides of Balch Hill are composed of border gneiss, a thin zone of darker metamorphic rock surrounding Lebanon granite. The northwest side of Balch Hill reveals metamorphic schists of volcanic deposits. Ten thousand years ago, when glacial meltwaters flooded the Connecticut River Valley, Balch Hill rose directly above the east shore of glacial Lake Hitchcock.

The Cardigan-Kearsarge rock outcrop complex on 8-60% slopes accounts for 88% of the Balch Hill soils. Pittstown loam on the Maple Trail is the richest soil present on Balch Hill. The Cardigan and Kearsarge soils and rock outcrop occur in intricate patterns that are difficult to map separately. The Cardigan soils are silty, moderately deep, and well drained. The Kearsarge soils are silty, shallow, and somewhat excessively drained. These soils are found on undulating or gently sloping hilltops and hillsides. Forest management considerations include seedling mortality and windthrow hazard. Erosion hazard is moderate on the east side of the summit and severe on steeper areas west of the summit. For more, see the 2003 Management plan and Hudson Forestry's 2011 Forest Activity Plan.

C. Water Resources

The north side of the hill drains toward Camp Brook and the south and west sides toward Girl Brook. There are no perennial streams on the upland of Balch Hill, although there are seeps and small drainages that are sometimes wet, such as at the bottom of the Maple Trail, on the Hemlock Trail, the middle of the Grasse Road Trail, and between the Garipay and Hunter East Trails. A large depression near the intersection of the Maple and Fire Trails was excavated in the 1940s as a source of water for firefighting. This man-made pond remains and may now serve as a vernal pool. Wet areas are addressed in the trail maintenance section on page 30.

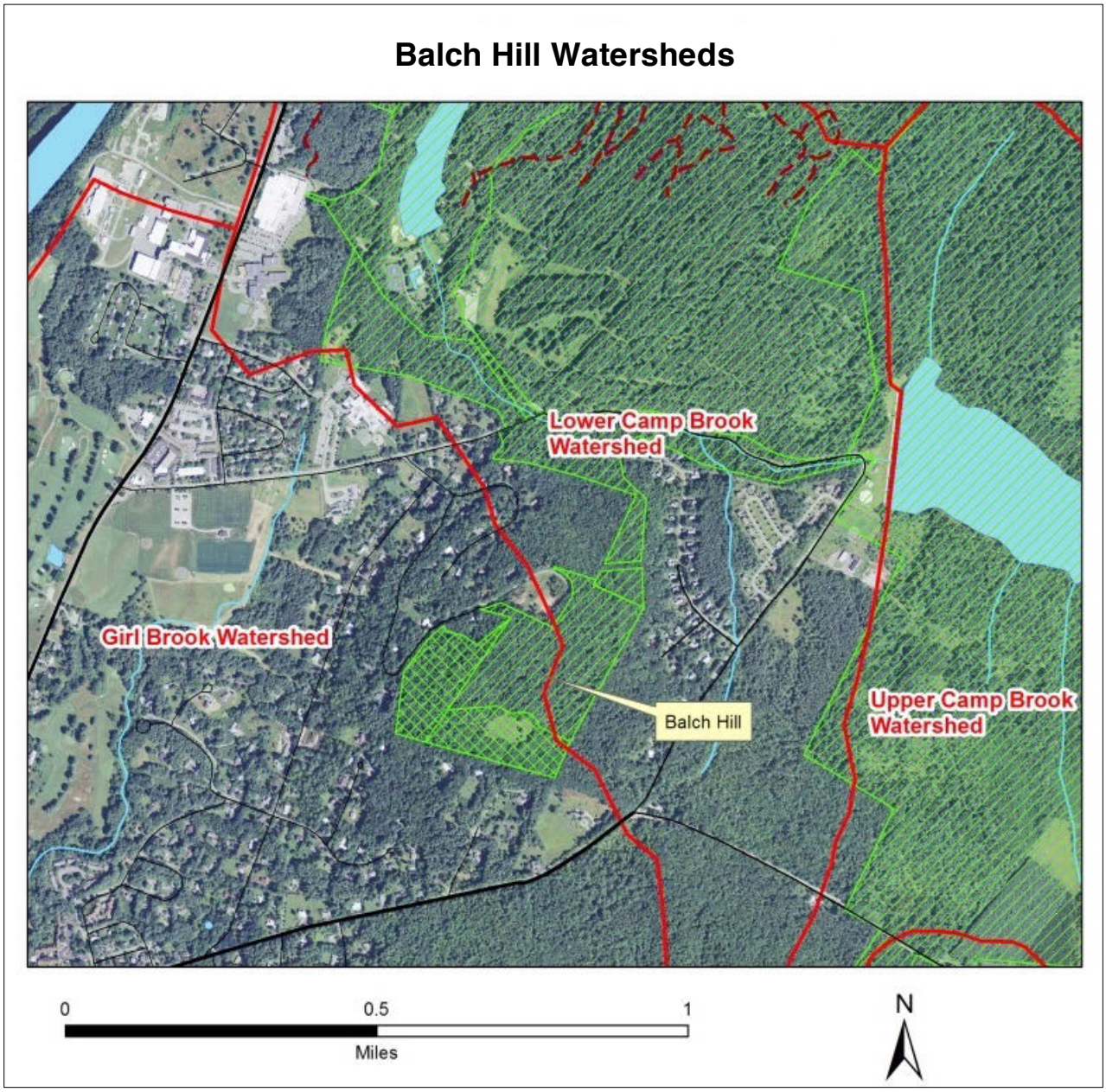


Figure 3 – Watersheds of Balch Hill Natural Area.

D. Vegetation

Forest Overview

Encircling the summit is a mature, predominantly even-aged forest that is a direct result of the land's prior use as pasture for sheep and later a dairy operation that ceased in the 1940s. Dense eastern white pine, a pioneer tree that invades open abandoned pastures, occupies the highest elevations that are well-drained. Hemlock and northern hardwoods grow on richer sites at lower elevations. These steep, rocky areas were less inviting for livestock and therefore currently display large dominant trees in the canopy.

Several very large individual trees survive on Balch Hill that may date from the time of Hanover's settlement. Along the Maple Trail, possibly marking the route of historic Half Mile Road, is a line of ancient sugar maples. On the Hemlock Trail, just below the summit, are an immense red oak and two large white ash trees. Several large, old trees stand along the Grasse Road Trail on Dartmouth College land, at the old boundary. See Legacy Trees on page 19.

Scattered to the north, west, and south are a number of red oaks approaching 120 feet in height that are valuable for producing mast (nuts and other protein-rich food for wildlife). Also of note is the handsomely shaped solitary sugar maple at the summit of the hill.

Forest Stand Descriptions

The following descriptions for Forest Stands and Management Recommendations are taken from the 2011 plan by Hudson Forestry. See the stand map on the next page.

1. Forest Stand 1

The majority of the Balch Hill forest, growing on pastures abandoned in the 1940s, is dominated by white pine (45%), hemlock (14%), red maple (12%) and red oak (9%). Scattered northern hardwoods make up the balance. No major forest health problems were recorded in 2011. The overall quality of the trees varies from excellent to poor depending on location. The white pine and other pioneer species that invaded the highest part of the hill pasture are of poor quality.

2. Forest Stand 2 (Apple Orchard and "Shelves")

This stand, 1.5 acres surrounding the summit, is composed (2011) of small, low quality trees that have invaded the edges of old abandoned pasture and the orchard. This site is better suited for wild apple production adjacent to the meadow.

3. Forest Stand 3

This stand, on the northern slopes of Balch Hill, is dominated by red maple (22%), aspen (17%), sugar maple (17%) and hemlock (11%). Site quality is excellent for production of high quality northern hardwoods. This mature forest stand provides habitat primarily for species that use the forest canopy. No major forest health issues were observed during the 2011 timber cruise.

A major windstorm in April, 2007 toppled a number of white pines in Stands 1 and 3. The resulting openings in the canopy have stimulated early successional habitat that will improve forest stand and habitat diversity. However, the downed trees were not salvaged after the windstorm and foresters from USDA-NRCS caution that the debris poses a fire hazard to the forest and nearby homes. Examination in 2011 indicated that the pine boles are now blemished with blue stain and can no longer be cost-effectively removed from the forest to eliminate this threat and permit the native northern hardwood forest to readily reclaim the area. The windstorm also created openings that were quickly colonized by invasive buckthorn.

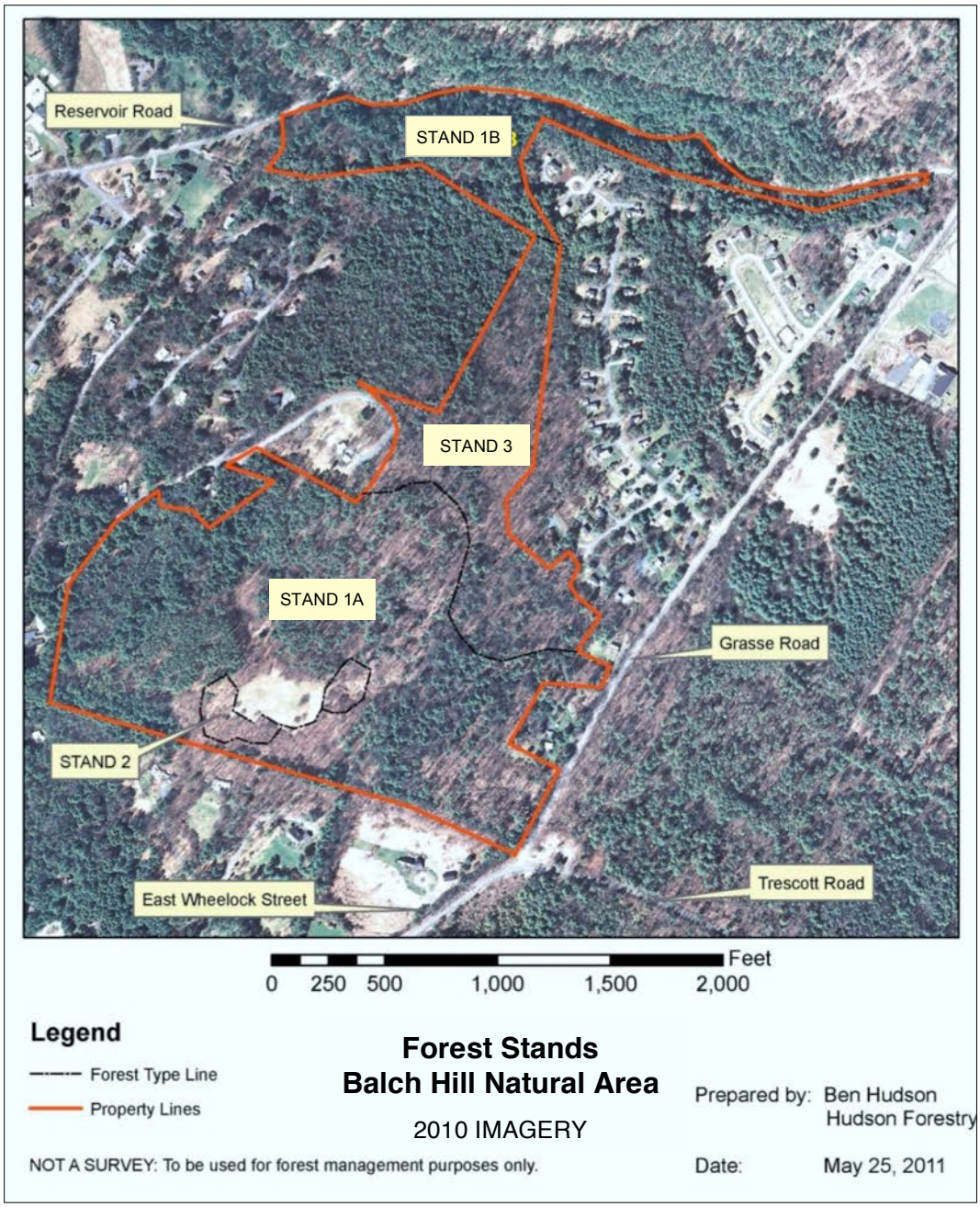


Figure 4 - Forest Stands of Balch Hill Natural Area.

Understory Plants

Most information regarding understory vegetation comes from surveys done for the 2003 Management Plan and updated in 2014. Among the native species present are: maple leaf viburnum, alternate-leaf dogwood, hop hornbeam, striped maple, hawthorn, chokecherry, shadbush, elderberry, blackberry and lowbush blueberry, as well as saplings of the various tree species. A number of invasive plant species dominate sections of the understory and these are documented in a separate section. Over-browsing by deer in recent years has become a concern and is under study.

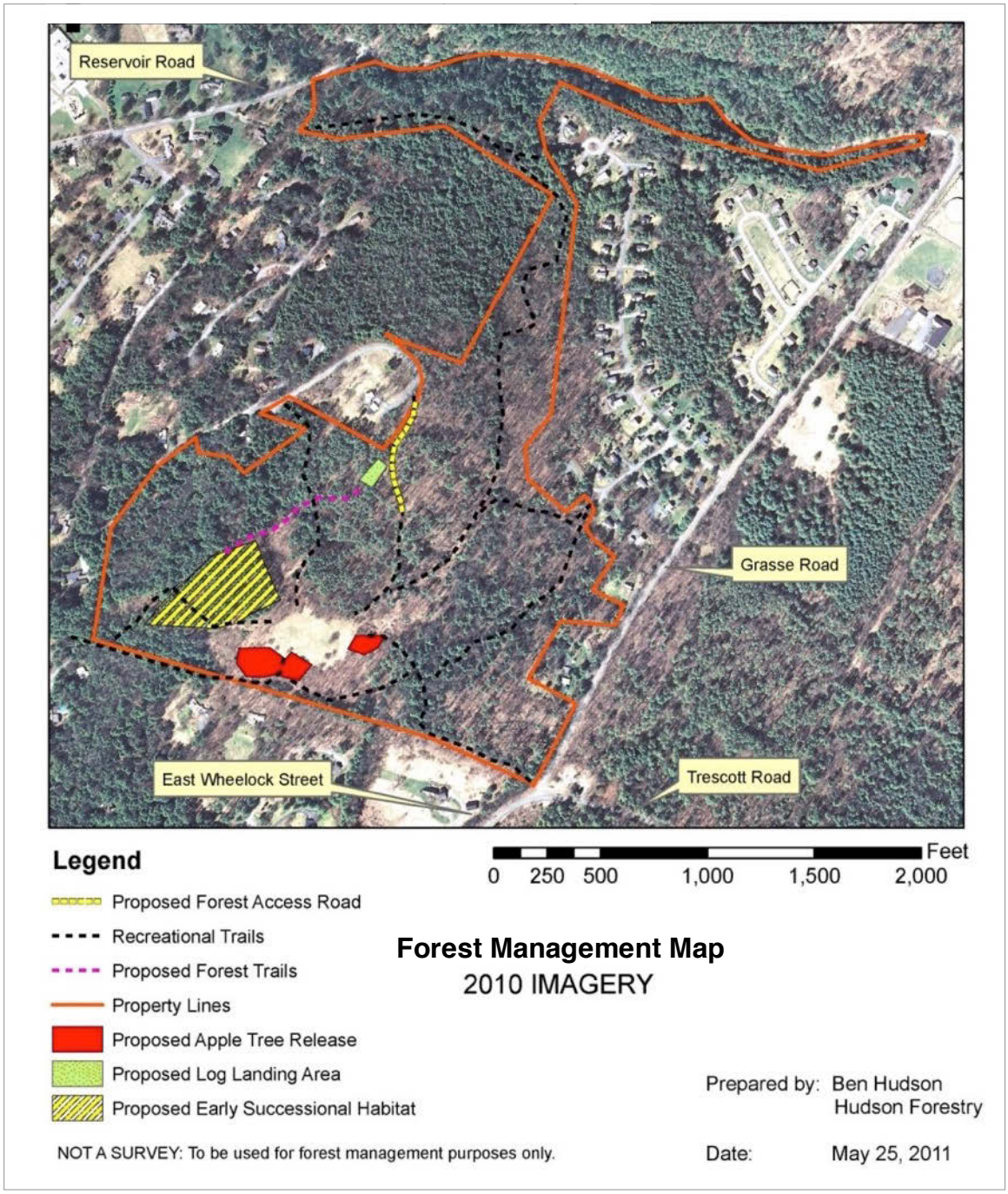


Figure 5 - Forest Management of Balch Hill Natural Area.

Vegetation Management

Balch Hill should be managed to maintain or increase habitat diversity, protect native vegetation, control non-native invasive vegetation, preserve views, and showcase an historic agricultural landscape. To this end, some areas may be kept in permanent openings, others may be maintained in early successional stages, and forest succession allowed to progress in still others.

Active management of the Balch Hill forest for wildlife habitat can be a useful tool, especially to introduce elements of age and species diversity. Any habitat alterations proposed for particular species will be carefully evaluated against established wildlife management criteria to insure that habitat integrity and connectivity can be maintained and that current animal usage and diversity is not adversely affected. Volunteer monitors should be trained to recognize new forest insect pests such as the hemlock woolly adelgid and emerald ash borer.

Balch Hill should not be managed as a park. In general, fallen trees and limbs should be allowed to remain to return nutrients to the forest soil and provide substrate for new plants. Isolated larger dead and dying trees should remain to provide nesting cavities for birds and other wildlife unless they pose a hazard to trail users. However, should further windthrow occur on a significant scale, efforts should be made to remove the fallen timber to allow forest succession to proceed in its wake and to protect the surrounding residential neighborhoods from the threat of forest fire. After such events, the Balch Hill Committee may decide to have debris removed by volunteers or by a forester, or sell firewood to raise money for the Balch Hill Fund.

1. Forest Stand 1

The largely even-aged pine forest on much of Balch Hill reflects several centuries of disturbance and the hill's agricultural past rather than the diverse native hemlock/northern hardwood forest that originally cloaked the hill. Since pine forest followed in the old fields 75-80 years ago, there is less early successional habitat at Balch Hill except on the two "shelf" areas (Figure 6) and in the Ascutney viewshed where management was carried out for viewshed restoration and invasive species control.

Figure 6 - Balch Hill Shelves.

To provide some early successional habitat, Hudson Forestry recommended creating a 3-4 acre opening in the low-quality pine stand on Town land on the northwest side of the hill, perhaps using horses in the logging activity as a demonstration. This stand of pine is affected by white pine weevil and subject to windthrow. Creating an opening here would provide more diverse wildlife habitat, including for migrating birds, rabbits, woodcock, grouse, and especially warblers. A clearing here would also help restore views, while the skid trail could become a new trail linking the Fire Trail with the Hemlock and Hunter West Trails.

The Hanover Conservation Commission gave its permission on November 9, 2011 for this project with the understanding that the work would be undertaken at no cost to the Town and that the trail and landing would be stabilized and vegetated at the completion of the logging operation. The logs could also be drawn out over the summit and down the Fire Trail. An alternative log landing site could be created on the east side of the Fire Trail. Such an opening would provide a good view north to Smarts Mountain. As of 2015, this project has not yet been undertaken. Before any further disturbance is contemplated, the Balch Hill Committee should carefully consider whether such action would invite the growth of invasive plants and create a management problem.

2. Forest Stand 2 (Apple Orchard and "Shelves")

The old farm orchard and wild apple trees are part of the historic and scenic landscape of Balch Hill. They also provide valuable wildlife habitat for many species of birds and mammals as well as pollinating bees and other insects. Forester Paul Harwood performed some apple tree release work in 2000, along with clearing to improve Moose Mt. and Gile Mt. views. This is the same year that volunteers began an ambitious campaign to remove and limit invasive plants on the east shelf of the summit. Since that time, work parties of volunteers (Appendix B) have worked to manage vegetation around the perimeter of the summit meadow on nearly an annual basis. This work has served two functions: to control invasive plants (more details on page 20), and to help with viewshed management (page 25).

A major effort to release over two dozen apple trees from competing invasives and other growth took place in June, 2013 with funding from USDA-NRCS and private donations, and carried out by Hudson Forestry. Large patches of buckthorn were removed along with many small and medium sized maples, birch, oaks, and other saplings that had encroached on the orchard. A tractor was used to mechanically pull down and move much of the growth. A chainsaw was used for larger trees. The resulting brush was deposited in large piles, mostly out of view along the edge of the clearing, for wildlife habitat. Larger trees were pulled out along the Fire Trail and donated as firewood for those in need. Hudson Forestry was careful during this process to leave a few "islands" of trees in the lower field for habitat diversity. Following the clearing process, Hudson Forestry evened out the surface of the cleared area and seeded it with a winter rye mix. Conservation seed mix was avoided because these mixes contain non-native plant seeds.

Pruning to rejuvenate the remaining apple trees should continue. Mowing of the meadow should be extended to the newly cleared area under them to keep competition in check. A cluster of apple trees near the Fire Trail should be released by clearing brush around them and managing for grass beneath them. Retain the hop hornbeam here, which provides critical food for birds. On the east shelf, islands of small trees and shrubs should be maintained in openings for habitat.

3. Forest Stand 3

On the northern slopes of Balch Hill, this forest should remain in its natural state to mature over time. Steep slopes and lack of an adequate log landing area would make forest operations extremely difficult here. On the east side, especially near the Maple Trail, many large blowdowns from 2007 remain as a fire hazard and cannot be economically removed after the passage of so much time. The best alternative appears to be to cut the debris enough to allow it to lie flat on the ground, to enhance moisture uptake and natural decomposition.

4. Brush Management

Edges and the brush piles that result from view clearing and apple tree release provide useful cover for small mammals. While it is important to retain some brush piles, they should be built out of public view and away from trails where possible. By 2012, clearing for view restoration and invasive plant removal had created so many brush piles that they became an aesthetic problem. In Spring 2013, a professional chipper was hired for a full day to reduce the brush to chips that were dispersed into the woods and spread on compacted trail surfaces. Brush reduction by burning is a time-consuming but inexpensive alternative to chipping. See the Brush Burning Policy in Appendix I.

5. Legacy Trees

The Grafton County Champion Northern Red Oak stands along the property line by the Link Trail. Its height in 2014 was 110 feet when measured by the Grafton County Big Tree Steward. Its average crown spread was 80 feet and circumference was 196 inches. The beautiful, symmetrical summit maple and the County Champion Red Oak should be protected from injury. The large oak on the Hemlock Trail would have been considered the county champion before its larger lower limbs fell. The maples marking Half Mile Road and other legacy trees should be protected, and those along trails should be regularly inspected for weaknesses that might pose a risk to hikers. As when the large limb fell from the massive oak on the Hemlock Trail, trails should be rerouted in response to hazards posed by the disintegration of these survivors, so that the trees can senesce naturally. The Town has decided not to cable the trees, although the Town Forester fertilizes them on a regular but infrequent basis.

6. Understory Plants

Botanist Alice Schori undertook a new inventory of wildflowers and other understory plants in 2014. A comparison of this inventory should be done with the 2003 list to determine changes, given the increase in deer browsing pressure on these plants.

Meadow Management

Maintaining the summit meadow is an important management goal. This open habitat is a key feature which attracts people to Balch Hill to enjoy the panoramic views, have a picnic, watch birds, fly a kite, and more. This grassland habitat also adds diversity to Balch Hill. In July 2001, a Dartmouth College biology class sampled meadow vegetation in nine plots and found the composition to be typical of old fields, with dominant species such as Kentucky bluegrass, red clover and timothy. Of particular interest is the lack of milkweed on the summit in surveys from 2001-02, because milkweed is now one of the dominant meadow species.

1. Grassland Wildlife at Balch Hill

Maintaining the meadow habitat is accomplished by annual mowing. History of mowing from the 1970s to 2000 is not well documented, but was primarily done by various neighbors or other volunteers over the years. Records indicate the “hill” was brush-hogged in 2000 for a total of $1,608. From 2001 until 2012, the meadow was mowed annually in late summer by Peter Keene for a minimal fee. In some years, additional mowing of walking paths was done by volunteers such as neighbor Greg Baker. By 2006, the Balch Hill Committee considered different mowing strategies because milkweed had become abundant. Gail McPeek conducted a breeding bird survey in 2007, and found no bird species nesting in the meadow. Typical grassland species such as bobolinks and savannah sparrows require fields larger than the summit acreage provides. Results showed that several species (e.g., American robin, chipping sparrow, American goldfinch) were feeding on plants and insects in the meadow, but it was agreed that a different mowing schedule would not affect foraging and may even enhance food availability by increasing plant diversity.

2. Milkweed and Monarch Butterflies

The abundance of milkweed in the meadow has come to provide important habitat for monarchs. Teachers from the nearby Ray School collect monarch caterpillars on Balch Hill for their classrooms. By 2010, milkweed had become so prevalent that it was reducing the diversity of the meadow and effort was made

by volunteers to collect seed pods and pull milkweed north and east of the summit maple. This proved too time-consuming and had little impact. Peter Keene, an experienced farmer, recommended mowing the entire summit in late June. This would result in younger, more succulent milkweed plants for monarch caterpillars to feed on and would allow other plants to grow, improving diversity. This technique was tried in 2012, and observations by volunteers showed a healthy population of monarchs later that summer. This method was repeated in late June 2013 by Hudson Forestry. Again, volunteers observed a more diverse plant community, and even though monarch populations were scarce across the region that summer, both monarch caterpillars and adults were observed on Balch Hill. International concern for monarchs and the steep decline reported across its range in 2013 prompted the Hanover Conservancy to enroll Balch Hill in a Monarch Waystation program and the summit area is now a certified butterfly demonstration area.

3. Mowing

The management of the meadow and mowing schedule will be part of the annual work plan so that modifications can be made if necessary. The entire summit above the stone wall should be mowed annually, preferably in late June. Ideally, grassland birds would be nesting in this field, requiring delay of mowing until September or October but because the field is too small to support grassland nesting, the timing of mowing is not a concern. In years of drought, mowing can occur earlier in the season to prevent fires.

The 2013 restoration work expanded the area that can now be maintained by mowing, on the west shelf below the stone wall and around the apple and crabapple trees southwest of the summit. To prevent invasive plants from re-establishing and keep the orchard free from competition, these areas should be mowed with a high blade, preferably on a three-year rotation to allow lowbush blueberries, forbs, and small brush to provide cover. USDA-NRCS funding will cover this activity in 2015. As other invasive plants are cleared around the summit perimeter, mowing and seeding with native grasses could follow to further expand the meadow habitat. Converting to warm season grasses is not advised by NRCS as it would require much lime which could negatively affect the acid-loving blueberries downslope. Trails across the summit should be mowed twice during the summer to keep them open and to discourage the ticks which have become a scourge on Balch Hill.

Occasional depressions in the soil surface appear in the meadow, possibly a result of excavations by woodchucks or foxes. Where such depressions pose a safety hazard and are not actively used by wildlife, they should be filled with soil and seeded. More diverse native vegetation should be encouraged at the meadow edge to encourage a diversity of pollinators.

Non-Native Invasive Species

Invasive plants became a topic of concern at Balch Hill in the mid-1990s. Since Balch Hill is surrounded by residential neighborhoods and the Trescott Company lands that have been colonized by non-native vegetation, it is not surprising that non-native home landscape plants such as burning bush and honeysuckle have escaped to Balch Hill. Because the area consists of post-agricultural, disturbed land, it is especially susceptible to invasive plants.

Inventory work from 2000-02 identified the following species: glossy buckthorn *(Rhamnus frangula),* common buckthorn *(Rhamnus cathartica),* shrub honeysuckles *(Lonicera morrowii, L. tatarica, L. bella),* oriental bittersweet *(Celastrus orbiculatus),* Japanese barberry *(Berberis thunbergii),* burning bush *(Euonymus alatus),* and amur maple *(Acer ginnala).* Based on age and distribution of plants, they were probably introduced in the late 1970s as part of a "conservation mix" which was commonly used at that time (2003 Management Plan, B. McIlroy). Other seed sources for these plants are the nearby landscaped neighborhoods. The large deer population on Balch Hill further exacerbates the situation, as deer consume competing native vegetation and avoid browsing invasive growth.

Linda Wilson, a student at Vermont's Johnson College, used Balch Hill as a study site in 2000-01 to compare four control methods for glossy buckthorn. The most effective treatment was "cut stump" application of herbicide (triclopyr ethylamine), with torch girdling second in effectiveness. Results also indicated that cutting, such as caused by infrequent brush-hogging, seemed to cause re-sprouting and massive root system growth. (See 2003 Management Plan).

Sarah McPeek uses a weed wrench to pull an invasive plant up by the roots.

The Balch Hill Committee began control efforts in 2000, when a work party of 25 volunteers spent three hours clearing invasives (mostly glossy buckthorn, honeysuckle, and bittersweet) on the east shelf and south edge of the summit. Similar efforts on the east and west shelves and around the summit perimeter have been conducted on a near annual basis. Methods consisted of cutting and or removing large plants by weed-wrench, digging, and even chains pulled by jeeps. In some years, removal efforts were followed by plantings of native shrubs, grasses and wildflowers. Strategies followed those outlined in the 2003 Management Plan. Appendix B documents the work completed from 2004-14.

From 2009-12, foliar herbicide application by a state-licensed professional was conducted once each year to supplement volunteer removal efforts. Herbicide applications targeted areas where previously cut buckthorn had re-sprouted, plus areas where the invasive species overwhelmingly dominated the understory vegetation. These efforts are also summarized in Appendix B.

Invasive plant species on Balch Hill are much less prevalent because of this concerted, annual management effort. A significant number of buckthorn, honeysuckle and bittersweet plants were also cleared as part of the NRCS work in 2013, when a large area north and west and also southwest of the summit was mechanically cleared. This area is being returned to open grassland where mowing will control invasive growth mechanically, to reduce the use of chemicals.

Management of Invasive Species and Other Pests

Controlling invasive species is an ongoing management objective, to be addressed by the committee in the annual action plan. This will involve identifying areas where invasive species still occur, planning for removal and/or herbicide treatment, conducting volunteer work days, follow-up management with annual mowing or rotational mowing, and possibly planting of native species (Appendix C).

Management involves regular monitoring for invasives, especially along trails. Stands of invasives remain on the Dartmouth land, uphill from Grasse Road homes, and in the area of the Hunter East Trail near the Morrison Road cul-de-sac—especially some large buckthorn. The highest priority treatment areas include those immediately surrounding the summit and along trails. Treatment areas may benefit from re-vegetation with habitat-appropriate, locally native plants.

The Hanover Conservancy's Education Committee, in consultation with the Town's Biodiversity Committee and the Balch Hill Committee, will work to provide information to neighbors on managing invasive species on their own properties. Garlic mustard *(Alliaria petiolata)* appeared in neighboring areas around 2009 and nearby populations have been monitored and removed annually since 2010. Continuing this effort is essential to keep this herbaceous biennial from invading the understory on Balch Hill.

Methods

Preferred invasive control methods are those that have minimal impact on native plants, animals, soils, and water. They will be chosen after consulting with experts and considering the chances of success and resources available for the task. Mechanical control, including cutting and/or pulling, is preferred, especially in sensitive areas with rare plants. Focused, carefully limited use of rapidly-degrading herbicides is an option for species that are difficult to control manually, such as buckthorn and bittersweet. Only state-certified persons may use herbicides on Conservancy or Town land. Abutters should be notified prior to use, and temporary signs posted at trailheads to alert trail users.

E. Wildlife

The wildlife diversity of Balch Hill reflects its varied habitat, from open meadow at the summit to shrubby edges and deep forest. The property is nearly contiguous with extensive other undeveloped habitat, including the 1265-acre Trescott Company lands of the public water supply, Appalachian Trail lands, Oak Hill, and the Rinker-Steele Natural Area, forming a well-connected corridor for the movement of wildlife.

1. Mammals

Balch Hill provides habitat for white-tailed deer, porcupine, raccoon, fisher, short-tailed weasel, skunk, red fox, snowshoe hare, red and gray squirrels. Older openings invite fruiting brambles that attract many diners, including black bears. Small mammals include voles, mice, shrews, and chipmunks. These creatures appreciate the hiding places offered by brush piles when owls and other predators are near. Coyotes are likely more frequent visitors than in previous years.

White-tailed deer *(Odocoileus virginianus)* have become exceedingly abundant at Balch Hill in the last decade. While in 2003 observers noted little damage from deer browse, by 2013 the population had become so large that it is now rare to visit the hill without seeing one. Neighbors report deer lounging in their yards and browsing their gardens and other ornamental plants. A series of mild winters, lack of predators, availability of high quality browse in the form of garden plants, and long-time closure of the extensive nearby Trescott Company public water supply lands to hunting have all likely contributed to the dramatic increase in the deer population in the last decade.

A deer exclosure study was established by Dartmouth ecology students under Professor Craig Layne in 2012 in three locations (Figure 7). Within a single year, results indicated the effects of deer browse, especially in pine-dominated areas and to a lesser extent in maple-dominated forest.

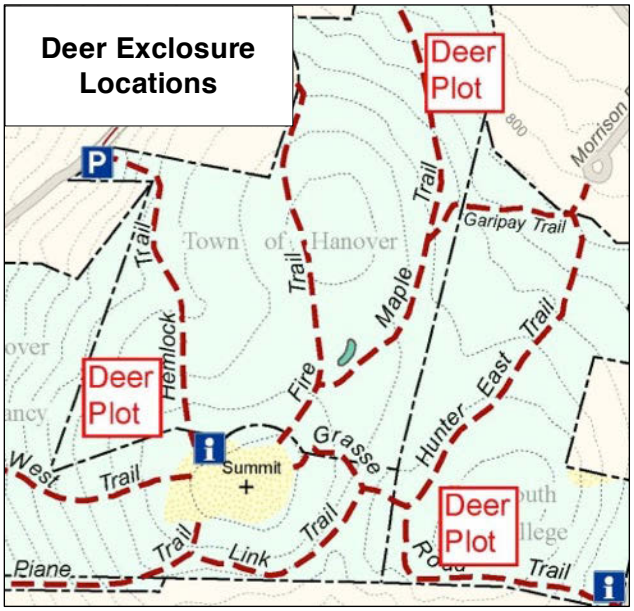


Figure 7 - Deer Exclosure Locations.

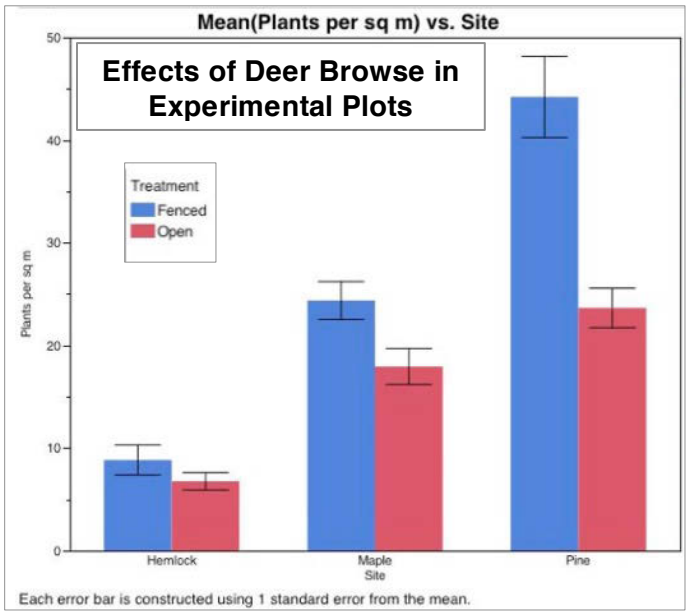


Figure 8 - Effects of deer browse after two years in plots established by Dartmouth College. More plants are growing in the areas fenced off from deer (blue) than in similarly sized plots without fencing (red).

2. Birds

Balch Hill has a diverse community of birds and is a stop on the Connecticut River Birding Trail. Year-round residents include barred owls, ruffed grouse, turkeys, and many species of songbirds. Spring brings waves of warblers and other migrating birds. Balch Hill's open summit has also become a popular spot to observe the fall migration of hawks. Red-tailed, broad-winged and sharp-shinned hawks, kestrels, osprey, and even bald eagles ride the thermals on their way south.

Pileated woodpecker at Balch Hill. Photo by Francesco Ticozzi.

3. Reptiles, Amphibians, and Others

Balch Hill's herpetological denizens include red-backed salamanders and red efts, toads, garter snakes, tree frogs, and spring peepers. More studies are needed.

4. Insects

The summit meadow and its milkweed attract monarch butterflies, and local schoolteachers frequent the area to collect monarch caterpillars for classroom display. As these butterflies' numbers have recently become threatened, a closer look is warranted (see meadow management). In 2014, the Conservancy registered the Balch Hill meadow as Monarch Waystation # 7639 with MonarchWatch.

The 2003 Management Plan did not mention ticks, but by 2013, ticks had become a marked nuisance on Balch Hill. Whether this is associated with the parallel increase in the deer population is not known. Tick advisory information is posted on the kiosks.

5. Rare, Threatened, or Endangered Species

A data check with the NH Natural Heritage Bureau on May 25, 2011 indicated that while there are recorded endangered species in the vicinity of Balch Hill, none are known to exist on the property.

Wildlife Management

1. Deer

The Balch Hill Committee decided to close Balch Hill to deer hunting in 2006. Five years later, in May, 2011, concerned about the over-population of deer, the Hanover Conservancy and Balch Hill Committee conducted a survey of neighbors. Results indicated that 92% of respondents had seen deer browsing in their home landscape, 76% viewed deer as a nuisance, and 67% called for some form of limited, controlled deer culling (50% by any legal method, 17% using only bow and arrow). One third of respondents preferred a continued ban on all hunting. Full results are presented in Appendix F.

The Balch Hill Committee, the Hanover Conservancy, Dartmouth College, and the Town of Hanover are concerned that the current deer population is causing a variety of problems in the Balch Hill neighborhood.

- Over-browsing to the detriment of native plants and benefit of invasive plants (Figure 8).
- Damage to natural habitat for birds and other wildlife.
- Increase in tick population with attendant Lyme Disease and similar concerns.
- Increase in potential for deer/vehicle collisions.
- Damage to private property.

Many owners of other nature preserves and protected lands have had to adopt a program to manage deer by hunting in order to retain ecological balance and protect habitat quality.

In Fall 2013 the Town of Hanover, at the recommendation of the New Hampshire Fish and Game Department and after consulting the Conservancy and the Balch Hill Committee, opened Balch Hill to a limited season of archery-only deer hunting with a special permit program managed by the Hanover Public Works Department. This decision reflected concern that Balch Hill would attract deer avoiding hunters on other nearby lands that were also opened to hunting in a coordinated effort between the College and the Town. The Town held a forum for neighbors at the Ray School in advance. The Conservancy supplied abutting homeowners with large yellow Wildlife Safety Zone signs. Before making this decision, the Conservancy, Town, and Balch Hill Committee consulted the extensive literature on deer population control. Other methods, such as using a paid sharp-shooter, were dismissed as too expensive, and attempts at birth control have proved unsuccessful in areas such as this where the deer population cannot be confined.

In the 2013 season, 13 permits were issued and two deer were taken at Balch Hill. Experts advise that it will take more than a few seasons to have an appreciable effect on the population.

In 2014, the Balch Hill Committee considered evidence submitted by experts at a town-wide presentation and consulted with neighbors before deciding to continue allowing hunting by bow and arrow for a one-month period from tree stands located 50 feet away from trails and the summit, by written permission only.

In the future, Balch Hill could remain open to limited, controlled deer hunting as a modest form of population control, subject to annual evaluation and discussion. The Town should continue to administer a strict archery permit program that includes clear instructions for hunters about boundaries and respect for neighboring private land. There shall be no hunting or trapping of other animals on the Natural Area except for diseased or dangerous animals. Firearms will not be permitted at Balch Hill due to the proximity of settled neighborhoods.

The Town, College, and Conservancy should make a concerted effort to keep neighbors informed about deer management at Balch Hill. Temporary signage at trailheads and on the kiosk should indicate the hunting season and advise safety measures such as blaze orange vests for trail users and their pets.

2. Other wildlife

Efforts should be made to expand the lists of known vertebrate and insect species on the property, and to update the 2003 list of wildlife at Balch Hill.

F. Views

In the 19th and 20th centuries, the summit of Balch Hill was a pasture for grazing of sheep and cattle, cleared of most trees. Today, Balch Hill is a popular area for hikers rewarded by the spectacular views accessible so close to town. In recent years, as other open hillsides and pastures in Hanover have been retired from agricultural use and either developed or allowed to grow back to forest, Balch Hill's historic hilltop agricultural landscape has become a rare sight. Retaining its open meadow, with its stone wall and the orchard on its southwest fringe, provides an increasingly valuable bit of habitat and a glimpse of how most of Hanover appeared 150 years ago.

When the Hanover Conservancy (Council) acquired the summit in 1970, it was understood that a portion of the land would remain cleared and that the Council had responsibility to manage the viewsheds. Active management is essential to preserve this special quality for future generations, but also a challenge, demanding unceasing and sometimes expensive efforts to suspend natural succession.

Efforts to maintain views on Balch Hill should consider other objectives of the Management Plan, such as wildlife habitat, but should not necessarily be subservient to the other objectives. Maintenance of the views is also complicated by the mixed ownership of the land on Balch Hill. While the Conservancy owns the top of the hill, some obscuring growth occurs on land owned by Dartmouth College, the Town, and private citizens. Years ago, Balch Hill offered broad views to Gile Mountain, downtown Hanover, Mt. Ascutney, Velvet Rocks, and Moose Mountain as well as Pinneo Hill, Lord's Hill, and Smarts Mountain to the north and northeast. These latter views are now obscured by forests on Town and College land.

Viewshed Management

In 1985, the Hanover Conservation Commission approved a limited viewshed plan developed by Jim Kennedy. The 2003 Balch Hill Management Plan significantly expanded the viewsheds to be managed, as shown in Figure 9. Highlighted areas indicate the view angle limits to be managed (not areas on the ground to be cleared). The angles shown are magnetic degrees from North in a clockwise direction. Lines show the limits of each viewshed, but are not intended to limit cutting to within these boundaries. In some areas, a complete view will be available only in winter. The goal is to maintain certain views.

Viewshed Monitoring

Balch Hill Committee will monitor the views, taking panoramic pictures of the views at five-year intervals during summer and winter to determine changes and identify vegetation that needs to be removed. By focusing on one viewshed each year, all four summit views can be monitored and managed in a four-year cycle. The Balch Hill Committee or a subcommittee will meet on the hill annually to make decisions about cutting and scheduling of viewshed actions. These will be outlined in the annual Action Plan.

Methods

Some views can be maintained by cutting, girdling, or limbing trees on Conservancy, Town, and College land, but care should be taken not to create dead trees that could become hazards to trail users. Where trees on adjacent property need to be treated, agreements must be reached with willing abutting property owners. The Conservancy will manage any contracts for this work with the committee's help in marking trees and evaluating results. If funds permit, professionals may be hired to accomplish work that is beyond the capacity of volunteers.

Ben Hudson of Hudson Forestry clearing for views in 2013.

Priority Views

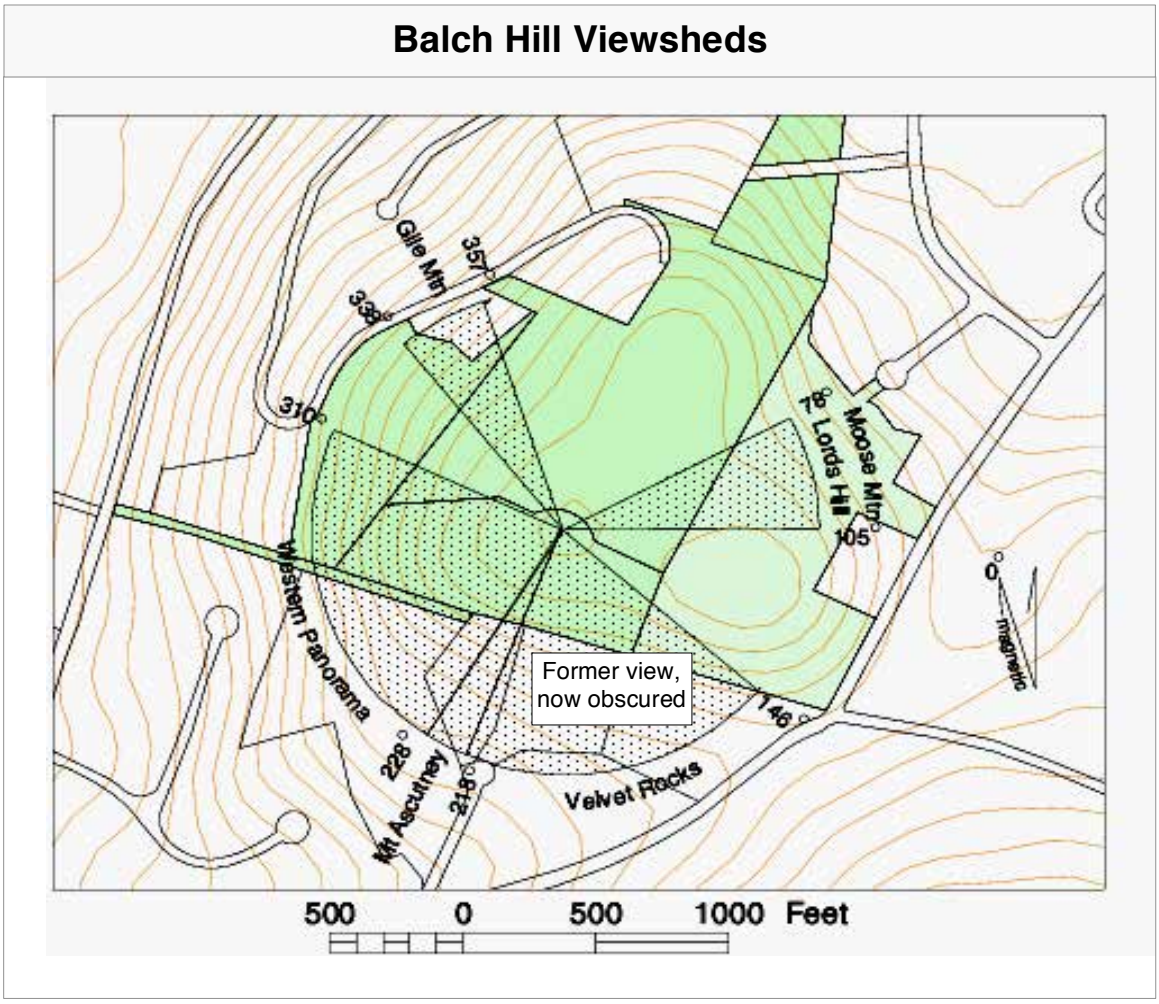


Figure 9 - Viewsheds of Balch Hill Natural Area.

1. **Gile Mountain Viewshed**
   - **Magnetic Bearings** - between 336° and 357°
   - **Views** - Gile Mountain in Norwich, Vermont, northwest of the summit of Balch Hill.
   - **Current Land Ownership** - Conservancy [45/5], Town [45/7]
   - **2003 Plan** - In 2003, the plan anticipated that trees would soon begin to obscure this view. Active cutting (or girdling) would be needed with permission required for work on Town land.
   - **2011-13**: Some work was done in this viewshed on Conservancy land by Hudson Forestry with funding from USDA-NRCS and by volunteers on Town land. On the slope by the Hemlock Trail, some of the best oaks should be left for mast, with views opened up among them.
   - **Future Plans** - This view should be a priority for restoration.

2. **Moose Mountain/Lord's Hill Viewshed**

- **Magnetic Bearings** - between 78° and 105°
- **Views** - East to Moose Mountain and west peak of Lord's Hill
  Part of the Moose Mountain ridge can be seen in winter east from the summit of Balch Hill. Lord's Hill is no longer visible. The Balch Hill Committee has no plans to reclaim either the Moose Mountain nor the Lord's Hill views from the summit. This would require a major amount of tree removal. The current seasonal view of Moose Mountain from the summit will be maintained.
- **Current Land Ownership** - Conservancy [45/5], Town [45/7], Dartmouth [45/20]
- **2003 Plans -** The plan identified an immediate need to cut (or girdle) several tall pine trees on Dartmouth College and Town land within the range of 78° to about 87° to open up the view of Lord's Hill and Moose Mountain. However, no action has been taken in this viewshed except removal of invasives in 2008 on the east shelf just below the summit.
- **Future plans** - investigate the possibility of building a short spur trail off the Hunter East Trail, or Grasse Road Trail to provide a new view of Moose Mountain. This will require permission of Dartmouth College.

3. **Velvet Rocks Viewshed**

- **Magnetic Bearings** - between 146° and 218°
- **Views** - Winter view of Velvet Rocks ridge and peaks
  The Velvet Rocks viewshed is east of the Mt. Ascutney view, with a winter view of the three peaks of Velvet Rocks south from the summit of Balch Hill. The view of easternmost peak was formerly visible year-round between 146° and 165° but extensive growth now obscures the view.
- **Land Ownership** - Conservancy [lot 45/5, 44/59], Dartmouth [45/20], Whittington[45/6], Riemann-Ciardelli [42/59], Horvath [45/21]
- **2003 Plan** - Maintaining this view would require selective cutting on Conservancy property and some on abutters' land, where permission would be required.
- **2011-13** - While some apple tree release work was done near the summit on Conservancy land by Hudson Forestry in 2013, no other work has been done in this viewshed.
- **Future Plans** - No further work will be done to reclaim a summer view in this viewshed, since it would require heavy clearing around trails that are now pleasantly forested.

4. **Mt. Ascutney Viewshed**

- **Magnetic Bearings** - between 218° and 228°
- **Views** - Mt. Ascutney
  The view of Mt. Ascutney falls in a narrow swath adjacent to the Western Panorama. The mountain is visible from the summit.
- **Current Land Ownership** - Conservancy [lot 45/5, 44/59], Whittington[45/6]
- **2003 plan** - One large old oak on the boundary was partially obscuring the view in 2003, and the plan called for limbing rather than removal. Removal of several other trees on Conservancy and abutters' land was deemed necessary and of high priority. (See Appendix B for list of work done.)
- **2011-13** – Extensive work was done by volunteers and by Hudson Forestry with funding from USDA-NRCS. Significant growth of oaks and other mast trees on the western edge resulted in a

decision to allow that area to continue to grow. Several large limbs on a hardwood growing on the property line were cut by Chippers with permission of the abutter. This viewshed is now narrower than previously but still dramatic.

- **Future Plans** – continue mowing every few years in cleared areas and remove trees if necessary to maintain view.

View reclamation work 2013 – Ascutney viewshed.

5. Western Panorama

- **Magnetic Bearings** - between 228° and 310°
- **Views** - Dartmouth College campus, Baker Library, Killington Peak.

  This is the most sweeping view from the summit, with northern parts of the campus, including Baker Tower and the medical school. The distant view of the Green Mountains and hills of Vermont includes Killington Peak where ski slopes are visible in the winter.
- **Current Land Ownership** - Conservancy [lot 45/5, 44/59], Town [44/57], Greger [lot 42/55]
- **2003 plan** - Several trees were identified for removal to maintain the winter view, and it was anticipated that future cuttings would be required to maintain the summer view. Most were on Conservancy land; some were on the Town's Piane tract and private land.
- **2011-2013** - Extensive work was done by volunteers and by Hudson Forestry with funding from USDA-NRCS. Presence of oaks and other mast trees in the space from 228° to 250° resulted in a decision to allow that area to continue to grow. Between 300° and 310°, pines on the Piane Tract and other Town land were not addressed; cutting proceeded on Conservancy land up to the property line, largely because NRCS funding would not cover work on Town land.
- **Future Plans** - continue mowing every few years in cleared areas to retain grassland, keep woody growth down, and discourage invasives.

G. Recreation

Balch Hill has been a magnet for recreational use for many years, even before the summit was protected. Blueberry picking and picnicking were favorite pursuits. Balch Hill will be managed for public enjoyment of its scenic, historic, and ecological assets. Portions of the natural area may be temporarily closed to the public for safety risk or to protect flora or fauna that would be threatened by public access.

Trails

Balch Hill's trails indicate heavy use by an appreciative public. Some of these routes developed years before thought was given to erosion or sustainable use, and are quite steep. Others travel through wet areas and have recently been improved with rustic log crossings.

Trails should be regularly monitored for erosion and over-use, and where a good alternative route exists to an erosion-prone path, it should be considered. Trail design should be managed by experienced builders. If a member of the Stewardship Committee, Board, or staff is not able to fill this role, outside expertise, such as the Upper Valley Trails Alliance, should be considered. Trails should be designed for quiet reflection, aesthetic enjoyment, and nature study, accommodating any constraints of the land. Trail layout should occur in winter and after at least a year's observation of wildlife and drainage, including at least one significant rainstorm. A width of 4 feet should be sufficient; narrow and curving trails are preferred. Trails should follow ridges and avoid steep areas to minimize erosion. Whenever possible, trailside trees should be left in place, especially on an inside curve. Trails should be placed to avoid seasonally wet areas or wetlands. If such areas cannot be avoided, water bars, raised platforms, rustic bog bridges, or stepping stones should be used.

1. Trail Monitoring

Balch Hill Committee members should notify the committee chair of minor problems, such as trash (remove small amounts, report a major mess), evidence of recent fire (no longer burning), downed or threatening large branches or trees on or near trails, illegal cutting, unsafe conditions (loose step in trail), or evidence of unauthorized disturbance or removal of vegetation. For major problems (fire, party, noise, vehicle trespass, unauthorized hunters), contact the police immediately at (603) 643-2222 and then contact the Conservancy office.

2. Trail Maintenance

Hazard trees and limbs that pose a clear danger to trail users should be cut when necessary. For threats associated with large "grandfather" trees, consider rerouting the trail around the threat. Trail maintenance activities should also minimize the impact on special places such as wetlands and areas of important vegetation or wildlife habitat. Fallen branches that block trails and seedlings and saplings that establish there should be cleared. Trees that have fallen across a trail may be addressed by cutting out a section of the trunk to clear the path.

Figure 10 - Trails of Balch Hill Natural Area.

3. New or Re-routed Trails

The number of trails is limited to ensure that some parts of the Balch Hill remain undisturbed and available to wildlife. Proposed new trails should be evaluated by the Balch Hill Committee. Linkages with nearby public trails should be encouraged. New trail entrances from abutting properties require landowner approval, be it from the Hanover Conservancy, Hanover Conservation Commission's Trails Committee on Town land, or Dartmouth College. Due to erosion near the top of the trail, the Grasse Road Trail was re-routed along a previous trail path in 2012-13. In 2014, Dartmouth College granted permission to re-route a wet and challenging section of the lower Maple Trail onto College land.

4. Future Considerations

- **Piane Trail** – This steep, direct trail leading to the summit from Rip Road was once a ski slope and is now suffering from erosion. It becomes a sluiceway for runoff from the hill in rainstorms. The narrowness of the Town's parcel here does not accommodate a more sinuous layout, although a switchback could be added near the steep top. This trail should be evaluated with the help of the Upper Valley Trails Alliance as a possible site for water bars and/or stone steps.
- **Spur Trail to Moose Mountain View –** Consult the Upper Valley Trails Alliance for advice in laying out a new spur from the Hunter East Trail or Grasse Road Trail.
- **Grasse Road Trail** – Improve the lower portion from the kiosk toward the stone wall where it has become slippery and wide.
- **Bogia Easement** – This area should be explored with the goal of re-establishing a trail connection to the AT Connector across Trescott Road.

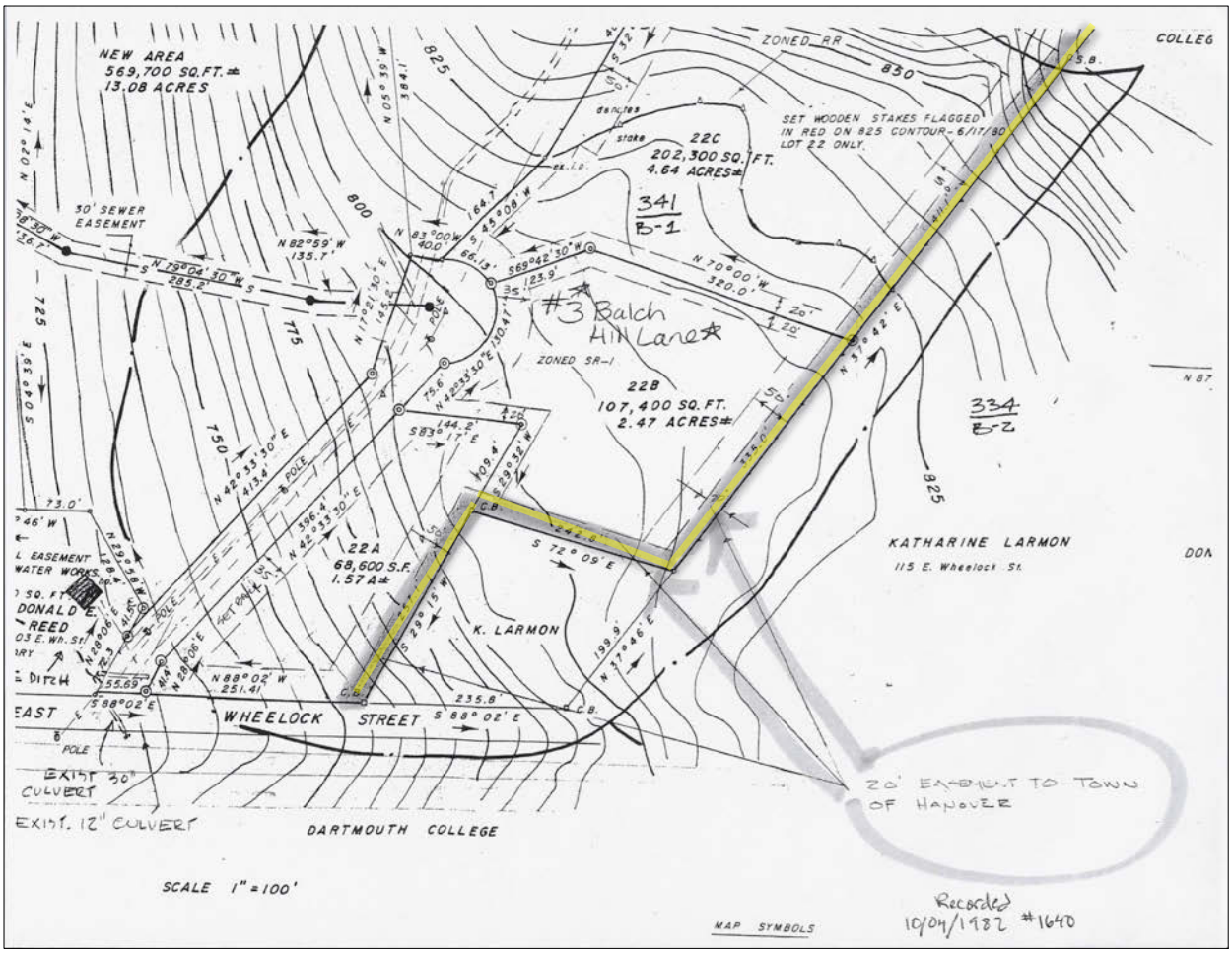


Figure 11 - Bogia Easement, October 4, 1982 (yellow highlight).

Signage & Blazing

Trails at Balch Hill are so well traveled that they are generally easy to follow. Signage on Balch Hill should be compatible with the natural setting - minimal, but adequate to convey needed information and keep trail users from becoming lost. Wooden routed signs with a natural finish, including signs with routed arrows, have been used to mark trails.

An effort to reduce and consolidate excessive signage began in 2012 and continues. This is a challenge on a property with multiple owners. The Town of Hanover should remove duplicative signage posted on College land at the entrance to the Grasse Road Trail that describes Town policies that do not apply to the portion of the Natural Area accessed at that point. The Town should also consolidate signage at the Hemlock Road parking area.

Blazing should not detract from the natural setting. Trail routes are indicated with arrows routed into small wooden signs and at times with painted blazes. Avoid painting blazes on rocks and on mature trees. Place blazes approximately 6-7 feet above the ground so they can be seen with heavy snow cover. Blazes should be painted 2 inches wide by 6 inches long and spaced so only one blaze can be seen at a time in either direction. Blue is the preferred color.

Parking

The only formal parking for this property is located at the end of Hemlock Road. From here, trail users have two options: hike up the steep Hemlock Trail, or walk up the private driveway to the Fire Trail. Visitors also park in a roughly cleared area on property owned by Dartmouth College opposite the entrance to the Grasse Trail. Dartmouth currently has no plans to improve this parking area because the property may be designated for development in the future, which could result in reconfiguration of the intersection. A more formalized public parking area across from the Grasse Road trailhead is desirable and should be explored with the College. There is no designated parking at other trailheads. The Town created space for two cars on the west side of Grasse Road.

Vehicle Access

The Fire Trail, which leaves from a private driveway at the end of Hemlock Road, is intended for emergency vehicles and can, with some difficulty, accommodate others with high clearance. The driveway is closed to traffic with a chain and padlock but may be opened by the Balch Hill Committee or Town officials. Across the driveway is a formal 50 foot wide right of way, conveyed to the Town for the use of vehicles. It is to be used in common with the owner of the driveway and may be conveyed for public highway purposes.

There is also a right of way deed to the Conservancy for foot travel over Town land and the Fire Trail to Conservancy property. In 2010, the entrance to this trail from the top of the drive was closed by the landowner with the permission of the Town Planning Director and re-routed to a more challenging path. This area may require some grading.

Kiosks

Two rustic, wood-framed information kiosks at Balch Hill display trail maps, safety notices, permitted and prohibited uses, and interpretation of the Natural Area's history and significance. Kiosks are also useful for posting trail updates and other notices to the public. The summit kiosk was installed in 2009 as a memorial to Alice Jackson, a devoted Balch Hill volunteer. The Grasse Trailhead kiosk was installed in 2012 on Dartmouth land with the permission of the College and support from the Hanover Lions Club.

Benches

Three granite benches are located on Conservancy property near the summit. See "Memorials," below.

Hours

The summit and other Hanover Conservancy lands are open to the public continuously. However, Town Ordinance #20 (Regulation of Public Land) stipulates that "Access to the Balch Hill Nature Preserve, including the public access point located at 27 Hemlock Road, is only allowed from thirty (30) minutes before sunrise to thirty (30) minutes after sunset." This means that trails on the Town's portion of Balch Hill may not be used after dark. Yet, many people would enjoy stargazing and observing the moon from the open summit. The conflict between the Conservancy's policy and the Town Ordinance should be resolved.

Visitor Etiquette and Pets

Visitors should leave no trace of their visit, avoid disturbing plants and wildlife, and keep pets under control. Pet owners must pick up after their pets and restrain them from disturbing others and from harassing wildlife. Under New Hampshire law, dogs chasing deer may be shot by officials and the owner fined. Visitors are expected to carry out what they carry in, and remove their own trash, toys, and other possessions. No structures, temporary or otherwise, are permitted on the Natural Area without the permission of the Balch Hill Committee and property owners.

Fires

The Hanover Conservancy does not permit fires on Balch Hill, due to the proximity of neighborhoods, except those conducted by the Balch Hill Committee with a fire permit issued by the Hanover Fire Department. However, Town Ordinance #20 allows fires as long as a permit has been secured from the Town. This policy conflict should be resolved. To deter unauthorized fire-building, a large stone engraved with "no fires" was placed in the summit meadow.

H. Education & Interpretation

Balch Hill offers a valuable outdoor laboratory of forest and wildlife ecology and a display of historical land use features. The Hanover Conservancy uses the property for educational field trips, including programs that focus on spring bird migration, fall hawk migration, and wildflowers, and for public events such as the annual Kite Day. The Conservancy website provides trail and safety guidance for the public, a map, and information about the property and its history, user etiquette, and permitted uses. The website also offers an opportunity to share information about other Balch Hill issues, such as invasive plants and deer impacts.

1. Public Information

The two information kiosks should be periodically reviewed for obsolete messages and checked for signs of vandalism. The historic photo on the Grasse Road trailhead kiosk should be examined for accuracy in labeling. In season, post signs to invite volunteer participation at specific work days, indicate hunting season dates and advice to dress safely, and alert trail users to times when herbicides will be used to control invasive plants.

2. Educational Programs

Outdoor trip programs should continue to provide education for the public with an emphasis on natural history, interpretation of forest and landscape features, and principles and priorities for conservation. Other organizations proposing trips to the Balch Hill Natural Area should notify the Hanover Conservancy or the Town as a courtesy. The Conservancy will reach out to Hanover's schools to make teachers aware of Balch Hill and encourage use of the property for field studies led by educators. Engagement of neighbors to help stem the spread of invasive species will be a goal.

3. Maps

The Conservancy has posted maps on the kiosks and on its website; the Town website should also offer access to these maps with a link to this page. The Conservancy's published map and guide to the Balch Hill Natural Area (first published in 2008, updated in 2010) was revised and reprinted in 2014 with funds from the Mable Staples memorial gift.

I. Land Use History & Historic Features

For such a small hill, Balch Hill has a large and fascinating history. The property has been a sheep pasture, training ground for the Dartmouth ski team, farm orchard, woodlot, and dairy grazing area. See pages 2-7 of the 2003 Management Plan for more details.

Today, Balch Hill's high meadow and orchard are a surviving example of the land use that was once prevalent in Hanover and elsewhere in northern New England in the last two centuries. The stone wall along the Grasse Road Trail and fragments of wide wire fencing are relics of the Sheep Craze days of the early-mid 1800s, when 11,000 sheep pastured in Hanover, including here.

Veteran trees along the boundary have grown around fragments of barbed wire that mark the transition to dairy farming after the Civil War. While most of Balch Hill was cleared for grazing in the 19th and early 20th centuries, many large, old trees remain, including a line of ancient sugar maples on the long-ago route of Half Mile Road. White pines reclaimed much of the abandoned farmland.

Marking an old boundary line just below the summit meadow is a low stone wall. Other stone walls are visible along the Grasse Road Trail, the Piane Trail, and along the Garipay Trail near the Morrison Road cul-de-sac. A possible early boundary marker is a pile of stones next to the Grasse Trail that may have indicated a corner. Also mentioned in the 2003 plan are traces of an old cabin.

J. Management of Historic Features

All stone walls should be protected from disturbance. The stone wall at the west side of the meadow should be re-stacked to repair disturbance during 2013 land clearing activities. This wall appears to have been a "tossed" wall, rather than a "laid" wall. Remnants of barbed wire should be inventoried and evaluated for hazard to trail users. Generally, they should remain in place as a reminder of past agricultural use, but where they are very close to a trail and are deemed to pose a safety hazard, wire points can be blunted.

The fire pond near the Maple Trail should remain to provide vernal aquatic habitat and a water source for wildlife. Other relicts of historic land use, such as the summit orchard, should be maintained. The location of the cabin remains, referenced in the 2003 plan, should be identified. To the extent possible, changes in land use at Balch Hill should be further documented through interviews with former owners to improve understanding of the historic values of the property.

K. Memorials

Balch Hill hosts a number of memorial structures. The summit kiosk was installed and dedicated to Alice Jackson, an active volunteer in the Conservancy's education program, in 2009. A nearby granite bench is inscribed and dedicated to Ralph Hunter, donor of part of the Conservancy's land. A plaque and two smaller benches on the southern side of the grassy summit near the Piane Trail honor Betty French Latham. One of these benches became overgrown by an apple tree and was moved close to the summit maple in 2013.

The Piane, Garipay, and Hunter East and West Trails also commemorate Balch Hill friends. Adding further structures will detract from the feeling of the place. Yet, Balch Hill is a place that begets memories. Should the desire arise to create a new memorial, it should not involve a structure. The Committee should explore how to recognize gifts made to benefit the Natural Area, such as planting of a native, site-appropriate species of tree, plaques on the back side of the summit kiosk, or other method.

L. Organized Events

Groups of 10 or more wanting to use the summit for an organized activity should notify the Conservancy staff of their intentions in advance and acknowledge their understanding of the Natural Area's permitted and prohibited uses. Groups wishing to arrange for special events, such as a wedding, should contact the Conservancy well in advance. Written permission will be required from the Conservancy and a donation to the Balch Hill Stewardship Fund will be welcome.

Prohibited activities for events include: disturbance of soil, plants, or wildlife; no vehicles without special permission; no firearms; no fires or fireworks; no distribution of materials that could be considered litter (such as balloon release, release of non-native species, confetti). The site must be cleaned up promptly following the event. The property will not be closed to the general public during the event. Town

Ordinance #20 governs the use of the Town portion of the property. An Outdoor Event Permit is required from the Town for events using Town land or for vehicle passage over the Fire Trail.

M. Scientific Research

Balch Hill offers an easily accessible research site for many areas of inquiry. Research that does not substantially disturb the property or obstruct walking trails is encouraged, and requires advance written permission of the landowner and the Balch Hill Committee. Researchers are required to share their findings and may be asked to provide a demonstration for the public. Balch Hill is currently hosting research on deer browsing by Dartmouth College, and early findings are proving useful in guiding deer management at the hill (Figure 8).

N. Boundary Lines

The Hanover Conservancy's boundaries were marked in 2013 with 4-inch square boundary signs. The boundaries of Town land are marked with old blazes that should be refreshed. The College boundaries are not marked. Boundary marking should be more frequent where other boundary definitions, such as stone walls, are not evident. Boundary markings should be checked regularly, at least every five years.

O. Easement Monitoring

The Upper Valley Land Trust holds a conservation easement on the Hanover Conservancy's ten-acre Hunter parcel and monitors it annually. A member of the Conservancy's Stewardship Committee or staff should accompany the easement monitor to answer questions. The Balch Hill Committee should review UVLT's monitoring report and respond to any reported issues.

P. Adjacent Lands

Managing wildlife habitat in the larger Balch Hill neighborhood as a unit is a challenging goal, but one that should be pursued. Neighbors should be encouraged to manage their abutting properties in a way that is consistent with Balch Hill, especially with respect to removing invasive plants and promoting the growth of native plants. Through communication with neighbors and attention to proposed development, the Committee will strive to secure integrated, functioning habitat when adjacent properties are developed.

Future Protection. Balch Hill is surrounded by privately owned land, including several parcels owned by Dartmouth College. The Conservancy should seek opportunities to expand the permanent protection of the Balch Hill by exploring conservation options on adjacent lands. These include Dartmouth College property at 6 Ledge Road, and on the east side of Balch Hill, and the Town's property.

Q. Management Plan Review and Updates

This Management Plan should be updated at least every ten years by the Balch Hill Committee under the direction of the Hanover Conservancy and in consultation with the Hanover Conservation Commission, Dartmouth College, and the Upper Valley Land Trust. Copies of the plan will be available for public review on the Hanover Conservancy website, at the Conservancy's offices, and at the Town Offices.
The Conservancy should arrange for updates to the Natural Resource Inventory every ten years, focusing on wildlife habitat quality and abundance of invasive species. Updates will be conducted by either paid or volunteer naturalists with adequate training and experience in habitat assessment. The NRI and subsequent updates inform management decisions by the Conservancy and Balch Hill Committee and are a resource for public education at the Natural Area.

The Balch Hill Committee should devise an annual Action Plan in the winter of each year to direct work for that year.

III. Action Plan

An Action Plan is drafted annually by the Balch Hill Stewardship Committee at its winter meeting. The plan is consistent with the goals outlined in this Management Plan (and reproduced below) and is available upon request by contacting the Hanover Conservancy.

This Management Plan recognizes the challenges posed by having multiple landowners and the limited capacity of volunteers and budget. Full implementation of plans to meet the objectives would require funding from Dartmouth College and the Town of Hanover.

Summary of Goals & Objectives for Balch Hill

1. Encourage responsible use and enjoyment of the property by the public.
2. Continue to restore and maintain the viewshed.
3. Continue to manage wildlife (especially deer and monarch butterflies) and native vegetation.
4. Maintain foot trails.
5. Encourage educational activities.
6. Continue to control invasive species and monitor for new forest pests.
7. Continue to restore the historic agricultural landscape near the summit, including the meadow, orchard, and stone walls.
8. Update the previous wildlife and plant inventory.
9. Encourage scientific research and interpret findings for the public.
10. Explore opportunities to conserve abutting lands.
11. Maintain good communication with partner landowners and neighbors.
12. Ensure that the Balch Hill Stewardship Fund is adequate for the property's needs.
13. Conduct an annual review of this Management Plan to evaluate progress and create an annual action plan. Update the Management Plan every ten years.

IV. Appendices

Appendix **Page**

Appendix A
Balch Hill Stewardship Committee Through the Years

All of these volunteers have contributed greatly to the health and beauty of Balch Hill over the years, from the late 1990s through 2015, contributing their time and effort to managing the property for the benefit of all.

Jan Assmus
Clyde Barbour
Wayne Barstad
Supreet Bauer
Len Cadwallader
Mary Ann Cadwallader
Ed Chamberlain, Hanover Conservation Commission
Rob Chapman
Anne Evans (current chair)
Rob Harris
Ryan Johnson
Tom Linell
Barbara McIlroy
Gail McPeek, Representative, Hanover Conservancy
Adair Mulligan, Executive Director, Hanover Conservancy
Bob Norman
David Pollock
Judy Reeve, Hanover Conservation Commission
Lois Roland
Ellis Rolett
Laura Rosenthal (current secretary)
Vicki Smith, Senior Planner, Town of Hanover
Sara Tally
Karen Watson
Linda Wilson

Apologies for errors or omissions. Please let us know if you note any.

Appendix B
Journal of Balch Hill Stewardship & Educational Activities 2003-2014

2014

The main focus for 2014 was updating the Balch Hill Management Plan. Initial rewriting done by Adair Mulligan, Gail McPeek, and Anne Evans and the BH (Balch Hill) Stewardship Committee made recommendations and modifications. Laura Rosenthal managed the formatting and draft updates. The plan is to be presented to the Hanover Conservation Commission and Dartmouth College for their approval in early 2015.

January: Work day in which brush piles from 2013 clearing of viewshed were burned under the direction of Len Cadwallader. Burning was done because there were more than enough wildlife piles.

February: Application submitted by Adair Mulligan to the International Monarch Waystation Registry for Balch Hill to become an official Monarch Waystation. Application approved. Balch Hill is now a designated Monarch Waystation and the meadow is to be managed to support monarchs. Results of 2013 deer hunt presented by Gail McPeek and Vicki Smith: 13 permits issued, 2 deer taken. Neighbors' concerns about the hunters discussed.

March: Apple tree pruning workshop led by Len Cadwallader and Anne Evans. Poor weather and poor attendance. Will consider trying again next year.

May: Kite Day, led by Gail McPeek and Rob Harris was a resounding success with 60 participants and good wind. Revision of Balch Hill Brochure completed. UNH's Big Tree steward confirmed that a northern red oak along the Link Trail was the Grafton County champion, and that another on the Hemlock Trail had once been even larger.

June: Two small weddings were held at the summit, positive experiences for the wedding parties and for the BH Committee, with donations made by each couple to the Balch Hill Fund . Held two work days to begin clearing of northwest (Gile Mountain) viewshed and continue work on removing invasives, particularly buckthorn. Meadow was mowed by Ben Hudson.

August: Wide paths were mowed from summit to each trail to decrease hikers' tick exposure.

September: Special meeting held Sept. 10 to discuss bow hunting this year on BH. Gail McPeek coordinated a working group to come up with recommendations. Regular meeting on the 29th reviewed Gail's working group recommendations and decided on dates and rules for hunting at BH. Annual Hawk watch led by Gail in which 19 people participated. Successful first Hanover Trail challenge (97 registrants) included a destination on BH.

October/ November/ December: Reviewed trails needing attention (especially, Grasse, Maple and Garipay). Courtney Dragiff, Laura Rosenthal, and Anne Evans met with John Taylor for suggestions about addressing concerns about erosion and increasing width of Grasse Rd. trail. Courtney, Anne and Laura also scouted a new route for lower portion of Maple Trail to avoid wet, slippery portion. This will need to be approved by Dartmouth (as it crosses their land) and the Town's Trail Committee. Courtney and Anne added a few blazes on the Maple, Hemlock, Link and Hunter East trails.

Hunting took place from Nov. 15 to Dec. 15. No complaints from neighbors or hikers were received. Results of hunting are not yet known. Work day on Nov. 6 involved pruning apples, clearing brush,

cutting buckthorn on Hunter East trail and benching of a portion of Grasse Rd. trail. December meeting cancelled due to a snowstorm.

2013

January: Balch Hill Fund now has 30 contributors and a total of $6,643. Brush piles from the summer clearing of invasives were burned thanks to Len Cadwallader's fire starting expertise and a group of intrepid fire feeders.

February: Work day to continue clearing Ascutney viewshed.

March: NRCS grant approved for apple tree release, creation of early successional habitat and for a one-time mowing of the meadow. Adair Mulligan, Tom Jack, Gail McPeek, Anne Evans, and forester Ben Hudson met with BethAnn Finley and Mitch Hess from NRCS to review the work proposed.

April: Work day to clear brush along the stone wall at the western edge of the summit. Two generous additional donations to the Balch Hill fund were received.

May: Chippers chipped brush piles created during Ascutney viewshed work; also removed a couple of large limbs in the viewshed. Expense was covered by generous donation from neighbor Steve Swett.

Several native shrubs from the Town's holding bed were planted near the old Grasse Rd. trail route near the summit, with assistance of a local church group. Another good turnout for Kite Day.

June: NRCS funded work was done by Ben Hudson during the last week of June. He also mowed the field, did some additional work to clear more of the western viewshed and the Ascutney viewshed and added a few water bars along the Fire Trail.

August: Rob Harris mowed the very top of the summit and wide paths to the trailheads. G. McPeek reported a few monarch butterflies; numbers were very low for the entire Eastern region this year.

September: A group of freshman Dartmouth students spent several hours helping to pile the brush generated by Ben Hudson's viewshed work on the western slope of the summit. The plexiglas cover on the Grasse Rd. kiosk was smashed, and was later replaced. Hawk Day attracted 25 participants (and eight hawks!). The Balch Hill celebration (9/29) was a success. Ben Hudson led a tour of the work he did. Kathryn Staples came from Texas to participate.

Oct/Nov: A special meeting of the Balch Hill Stewardship Committee was held October 16th to discuss the Town's decision to open Balch Hill to bow hunting this season. The Town subsequently issued 13 permits (2 deer were taken). Some residents were upset by this decision and someone posted "No Hunting" signs at the summit, which the committee removed. The committee posted signs on kiosks and trailheads advising hikers to wear blaze orange.

December: Work day was held Dec. 8th to consolidate brush piles near the stone wall in preparation for burning later in the winter.

2012

January: Reviewed condition of trails; erosion at top of Grasse Rd. trail and wet areas on Garipay Trail to be addressed in spring. NRCS application was resubmitted under a different program due to cuts to the initial program.

February: Discussed the possibility of a change in policy to once again allow hunting on Balch Hill as a way to address the deer population. A dedicated Balch Hill Fund was established.

March: Work day to prune apple trees and maintain trails. Gail McPeek proposed setting up deer exclusion zones to document the impact of deer on vegetation.23

April: Dartmouth ecologist, Craig Layne and the summer ecology class agreed to take on the deer exclusion project this summer. Areas will be identified and mapped, half will be fenced and half left open. The class will then monitor the areas yearly.

May: Top of Grasse Rd. Trail was rerouted due to erosion. Invasive removal continued. Kite Day was well attended.

June: Letter was sent to Balch Hill neighbors with updates and announcement of the new Balch Hill Stewardship Fund, with request for contributions. The summit was mowed by Peter Keene at an earlier time of year than previously to reduce milkweed and provide younger plants which are better for monarch caterpillars. He indicated this would be his last year to mow. Work day for invasives removal and trail maintenance. Work continued during the summer by the committee. Prescott Towle sprayed invasives around the summit, particularly buckthorn.

August: Good numbers of monarchs (caterpillars, adults) reported by G. McPeek and some volunteers

September: We learned that we did not receive the NRCS grant. Deer exclusion study begun by the Dartmouth students.

October: There was minimal damage from Hurricane Sandy. Adair spoke at a Rotary Club meeting, at Len Cadwallader's invitation, with a focus on the viewshed plan. They will be sending some volunteers to help with the effort.

Nov/Dec: Adair reported that we may still have a chance for NRCS funding, so the proposal will be resubmitted. The Balch Hill Stewardship fund has received a number of donations (current total is $1,415).

2011

January: Completed small log crossing on Grasse Rd. Trail, made with hemlock that had fallen in storm. John Taylor (UVTA) helped supervise work by 4-5 volunteers. Barbara McIlroy and others have observed that deer overpopulation is impacting the regeneration of forest habitat on Balch Hill. The Committee began drafting a survey to send to Balch Hill neighbors with some general questions and specific questions related to deer problems and potential hunting (see Appendix F.)

April 29: Wildflower survey with Alice Schori to update inventory.

May 8: Mother's Day wildflower walk with Alice Schori (also helped to update inventory)

May 14: Kite Day had about 25 people; weather was overcast.

June: Forester Ben Hudson led a tour of proposed work areas from his forest activity plan; need to work out options for town owned land not covered by NRCS.

Summer: Plans for new kiosk at start of Grasse Rd. trail with funds from Lions Club.

July 7: Prescott Towle did herbicide foliar treatment of invasive plants around summit edge.

September: Peter Keene mowed summit, and suggested different timing of mowing to reduce dominance of milkweed. Committee will discuss this.

September 25: 50th Anniversary celebration of Hanover Conservation Council, newly renamed the Hanover Conservancy, on Balch Hill, attended by approximately 100 people.

October 15: Work day with Youth-in-Action students to remove burning bush and other invasives along west side of summit edge.

October 29: Education talk with forester Ben Hudson for the public (12 attended).

2010

Late Winter: Discussed possible ways to mark trails (blazes, signs, other).

April: David Pollock, Jan Assmus, Gail McPeek, and Lois Roland added a few blazes to trails.

May 15: Kite Day, overcast day, about 30 people attended. (Lisa Densmore and Jim Block took photos)

May 22: "Art in the Outdoors" event with Betsy Derrick; only two attended; consider trying again.

May work: Ed Chamberlain, Tom Linell, and Rob Chapman removed some blow-downs; Chippers also helped. May workday to clip bittersweet (4 volunteers) on Maple Trail and top of Hemlock Trail and down one side of Fire Trail.

June 25: Prescott Towle used foliar spray for bittersweet and honeysuckle, also on re-sprouting buckthorn on East shelf; we closed the summit for that half day. Signs were posted the day before, alerting the public. (Treatment was very successful when checked later in summer and following year).

August: Gail McPeek and Jan Assmus trimmed back brambles on Maple Trail.

Summer: Volunteer groups pulled milkweed on the north part of summit and collected pods to begin efforts to control milkweed spread. The milkweed has really taken over the summit.

August 27: Small wedding was held on the hill; Gail McPeek opened the gate for one car to drive up.

September 25: Valley Quest event held with Vital Communities.

September: Forester Ben Hudson spoke to committee about NRCS grant and forest management plan.

October 2: Hawk Watch & GPS workshop for families with help from John Taylor and UV Trails Alliance.

October 17: Friend-raiser event for Balch Hill neighbors at Betsy McGean's home; great turnout.

Late Fall: 6 volunteers pulled burning bush at summit edge (north and western sides).

2009

Late Winter: Sarah Pena, Stewardship Coordinator, arranged a meeting with Matt Tarr and David Falkenham of UNH Cooperative Extension, Grafton Co. to discuss major viewshed work using a Brontosaurus. Also got estimates from Eric Johnson and John Brown and Sons. The stewardship

committee felt that priorities need to be clarified before doing any work with this heavy equipment. New panoramic viewshed photos taken by Rob Chapman, Ellis Rolett, and Jan Assmus.

May 16: Kite Day (about 40 people)

July and September: Paths mowed in early July; full mowing of summit in early September.

September 12: Hawk Watch (13 people)

October 20: Fall work day—cleaned out invasives and brambles along edges of summit, 10 volunteers.

October 25: Dedication of kiosk and plaque honoring Alice Jackson.

2008

Spring & Summer: Filled some of the larger holes in the summit field. Field mowing of paths in June (Greg or Chris Baker); full mowing around Labor Day by Peter Keene.

May 10: Kite Day

June 12: Tree removal for viewshed provided small window view of Ascutney; this was on Whittington and Ciardelli properties. Tom Linell has taken down the top of some saplings trees on the NE side in ongoing viewshed management.

June 28: Trail work and pulling of some invasives by 12 volunteers; bittersweet was removed along north and south of summit by hand and weed wrench; honeysuckle was removed along north of summit with jeep and chain; this should be followed up with fall spraying of re-sprouting bittersweet and buckthorn and removal of large buckthorn at northern edge of summit.

September 13: Hawk Watch.

September 17: Work on buckthorn and bittersweet by 5 volunteers; cut-stump treatment on the north side of summit; Prescott Towle sprayed bittersweet on southerly side (work by Prescott was very limited).

2007

Spring & Summer: At least 20 trees needed to be cleared from trails after April 15 storm; work done by Rob Chapman, Doug McIlroy, Tom Linell, David Peart, Hugh Mellert, Ellis Rolett, David Pollock, Richard McNulty, Brad Naples, Clyde Barbour, Michael Mayor, and William Desch. No Kite Day due to all the blow downs.

Summer: Mid-summer partial mow of meadow by Greg Baker.Field completely mowed by Peter Keene just after Labor Day. Gail McPeek conducted breeding bird survey in and around the summit of Balch Hill to determine what species of birds are nesting in the area, specifically in the grasslands. Results: acreage is too small to support common nesting grassland birds such as bobolink or savannah sparrow.

September 8: Hawk Watch.

September: Letter sent to all Balch Hill neighbors.

October 30: Work day to continue removing invasive plants; concern expressed about the spreading and density of milkweed. Barbara McIlroy made contact with a state-licensed herbicide applicator, Prescott Towle. Began discussion of kiosk and Alice Jackson Funds.

2006

Summer: Transplanted low-bush blueberry plants to rock outcrops near Latham benches; some apple tree pruning done in summer; summit field mowed; installation of trailhead signs (made by Dick Geyer and Hanover HS woodshop students); publication of Balch Hill Natural Area Map and Guide.

September 22: Barbara McIlroy and Clyde Barbour surveyed summit area to plan for invasive plant work

November 9 & 16: Meeting with Tom Linell, William Desch, and Rob Chapman to get an update on woodlot management and viewshed work. Reported the removal of selected trees east and southeast of summit (near Link, Piane and Grasse Rd. trails) and blow-downs across Maple Trail and top of Piane Trail.

November 18: Fall work day on East Shelf for invasive plant removal, there was an attempt to brush hog some of the raspberry brambles that have come to dominate this area, but several bird nests were found (Clyde Barbour noted snowshoe hare tracks in this area in winter, and large amount of bird activity in the summer). Work also included removal of burning bush on west side of summit.

2005

Winter: Burned some brush.

March: Roletts (Balch Hill Lane) hosted two Sunday gatherings for neighbors and friends of Balch Hill.

May: Kite Day (about 40 people). Trails all surveyed for any needed work; began working on trail guide.

Summer: Some tree work and apple tree pruning.

Fall: Hawk Watch; worked on finalizing trail guide.

Hunting: After a close incident with a hiker and hunter, the committee reviewed hunting policy and town ordinances and adopted a policy prohibiting hunting within the Natural Area by the Hanover Conservation Council, Hanover Conservation Commission, and Dartmouth College. Posted Wildlife Safety Zone signs around the boundary of the Natural Area.

December: Cut-stump treatment was limited to the west side of the summit field; Barbara McIlroy noted that the application by Lucas Tree Company was not done exactly correctly and there was some collateral damage to surrounding vegetation.

2004

February 2004: First Balch Hill Management Plan published.

May 1 & 2: Spring planting work on the East Shelf restoration area. 15 large silky dogwood (*Cornus amomum*), 25 wild raisin (*Viburnum cassinoides*), and 10 gray dogwood (*Cornus racemosa*). Also removed shrub honeysuckles near stone wall and planted two small elderberries (Barbara McIlroy noted that silky dogwood and red-osier dogwood had best success; the viburnums seemed weak). Trail work

(stones) on wet area of Grasse Rd. Trail; installed carved stone that reads “no fires;” discussed moving Latham bench to a better location. Tom Linell and Ed Chamberlain girdled some large white pines in the Gile and Moose Mountain viewsheds.

May 22: Annual Kite Day. Barbara McIlroy and Ginny Rolett led wildflower walk for trail monitors (2 attended).

June workday: Volunteers removed buckthorn near top of Piane Trail by the blueberry patch. Began investigating cut-stump herbicide treatment for buckthorn with Bartlett Tree Service.

September 18: Fall Hawk Watch.

December 9: Workday for invasive removal in area west of stone wall (West shelf).

2003

October: UVLT monitored Hunter easement (continued annually in subsequent years).

November 24: Cut-stump treatment of buckthorn on the East shelf area. Linda Wilson reported on her study of girdling vs. herbicide for control of buckthorn. Brian Beaty of Bartlett Tree Service assessed condition of legacy oaks: the soil is low in magnesium and calcium; he made some recommendations for fertilizing, pruning and cabling. Committee decided not to cable; William Desch will continue to fertilize.

Prior to 2003

Please refer to the previous Balch Hill Management Plan.

Appendix C
Balch Hill Plants

Color Key:

Invasive plants

State Watch List plant

cf = probable

Balch Hill Locations key:

1 = From kiosk up Grasse Rd. trail
2 = Hunter East Trail
3 = Garipay Trail
4 = Ridge NE near junction of Maple & Garipay trails.
5 = Maple Trail
6 = Fire Trail to Hemlock to summit
7 = summary

The summit meadow and Hunter West Trail were excluded from this study and will be undertaken in the future.

By Alice Schori, 2014		**Balch Hill Location**						
Common Name	**Scientific Name**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
TREES								
striped maple	Acer pensylvanicum					x		x
red maple	Acer rubrum						x	x
sugar maple	Acer saccharum	x	x			x		x
shadbush	Amelanchier canadensis	Hunter West Trail (to be surveyed)						x
yellow birch	Betula alleghaniensis		x					x
white or paper birch	Betula papyrifera	x						x
bitternut hickory	Carya cordiformis			x		x		x
hawthorn	Crataegus sp						x	x
American beech	Fagus grandifolia	x						x
glossy buckthorn	Frangula alnus	x					x	x
white ash	Fraxinus americana	x						x
hop hornbeam	Ostrya virginiana	x					x	x
white pine	Pinus strobus	x					x	x
big-tooth aspen	Populus grandidentata	x					x	x
black cherry	Prunus serotina	x				x		x
red oak	Quercus rubra	x						x
common buckthorn	Rhamnus cathartica	x						x
basswood	Tilia americana		x					x
hemlock	Tsuga canadensis	x	x					x
American elm	Ulmus americana cf	x						x
SHRUBS & VINES								
Japanese barberry	Berberis thunbergii	x				x		x
Oriental bittersweet	Celastrus orbiculata			cf			x	x
burning bush	Euonymus alatus		x				x	x
Morrow's honeysuckle (non-native)	Lonicera morrowii	cf						x
virginia creeper	Parthenocissus quinquefolia			x				x
choke cherry	Prunus virginiana	x						x
eastern prickly gooseberry	Ribes cynosbati	x	x					x
skunk currant	Ribes glandulosum	cf						x
common blackberry	Rubus allegheniensis cf	x				x		x
red raspberry	Rubus idaeus	x				x		x

black raspberry	Rubus occidentalis					x			x
purple-flowering raspberry	Rubus odoratus					x			x
red-berried elder	Sambucus racemosa cf					x	x		x
early low blueberry	Vaccinium angustifolium							x	x
maple-leaf viburnum	Viburnum acerifolium		x						x
FERNS									
maidenhair fern	Adiantum pedatum				x		x		x
lady fern	Athyrium angustum (filix-femina)		x	x	x				x
Mackay's fragile fern	Cystopteris tenuis cf		x			x	x		x
hayscented fern	Dennstaedtia punctilobula		x	x			x		x
silvery gladefern	Deparia acrostichoides								
evergreen woodfern	Dryopteris intermedia			x			x		x
marginal woodfern	Dryopteris marginalis		x	x	x				x
oak fern	Gymnocarpium dryopteris						x		x
ostrich fern	Matteuccia struthiopteris				x				x
sensitive fern	Onoclea sensibilis			x					x
cinnamon fern	Osmundastrum cinnamomeum			x					x
interrupted fern	Osmunda claytoniana		x	x					x
long beech fern	Phegopteris connectilis			x					x
polypody fern	Polypodium sp.		x	x					x
Christmas fern	Polystichum acrostichoides		x	x	x		x		x
New York fern	Thelypteris noveboracensis			x					x
HERBACEOUS PLANTS									
yarrow	Achillea millefolium							x	x
red baneberry	Actaea rubra				x				x
baneberry (not ID'd to species)	Actaea sp.		x						x
sharp-lobed hepatica	Anemone (Hepatica) acutiloba						x		x
wood anemone	Anemone quinquefolia								
pussytoes	Antennaria sp.							x	x
sweet vernal grass	Anthoxanthum odoratum							x	x
wild columbine	Aquilegia canadensis		x	x	x				x
wild sarsaparilla	Aralia nudicaulis			x					x
Jack-in-the-pulpit	Arisaema triphyllum		x	x	x	x			x
common toothwort	Cardamine diphylla						x		x
Pennsylvania sedge	Cardamine pensylvanica					cf			x
Appalachian sedge	Carex appalachica				cf				x
fibrous-rooted sedge	Carex communis cf		x						x
Dewey's sedge	Carex deweyana cf		x	x					x
graceful sedge	Carex gracillima		x						x
greater bladder sedge	Carex intumescens					x			x
long-stalked sedge	Carex pedunculata		x	x	x		x		x
plantain-leaved sedge	Carex plantaginea						x		x
rosy sedge	Carex rosea		cf						x
sedge (not ID'd to species)	Carex sp.			x					x
blue cohosh	Caulophyllum thalictroides cf					x	x		x
celandine	Chelidonium majus		x						x
dwarf enchanter's nightshade	Circaea alpina					x	x		x
enchanter's nightshade (not ID'd to sp)	Circaea sp.		x			x			x
goldthread	Coptis trifolia						x		x
squirrel corn	Dicentra canadensis		x				x		x

trout lily	Erythronium americanum		x				x		x
white wood aster	Eurybia divaricata		x						x
wild strawberry	Fragaria virginiana			x			x	x	x
marsh bedstraw	Galium palustre						cf		x
sweet-scented bedstraw	Galium triflorum cf		x						x
herb Robert	Geranium robertianum						x		x
avens (not ID'd to species)	Geum sp.			x	x				x
grass not ID'd to species	grass sp.							x	x
bluets	Houstonia caerulea			x			x	x	x
Virginia waterleaf	Hydrophyllum virginiana		x		x	x	x		x
live-forever	Hylotelephium (Sedum) telephioides			x					x
jewelweed	Impatiens capensis					cf	x		x
oxeye daisy	Leucanthemum vulgare		x						x
common wood rush	Luzula multiflora							x	x
Canada mayflower	Maianthemum canadense		x						x
false Solomon's seal	Maianthemum racemosum		x						x
partridgeberry	Mitchella repens			x					x
miterwort	Mitella diphylla				x		x		x
wall lettuce	Mycelis muralis		x			x	x		x
forget-me-not	Myosotis sp.						x		x
tall white lettuce or rattlesnake root	Nabalus sp.			x					x
sweet cicely	Osmorhiza claytonii						x		x
creeping yellow wood sorrel	Oxalis corniculata							x	x
mountain wood sorrel	Oxalis montana						x		x
yellow wood sorrel	Oxalis stricta		x						x
flat-stemmed bluegrass	Poa compressa		x						x
Solomon's seal	Polygonatum pubescens		x	x		x			x
common cinquefoil	Potentilla simplex							x	x
shinleaf	Pyrola elliptica			x					x
small-flowered crowfoot	Ranunculus abortivus		x	x					x
common buttercup	Ranunculus acris			x					x
hooked crowfoot	Ranunculus recurvatus				x				x
blue-eyed grass	Sisyrinchium montanum							x	x
blue-stemmed goldenrod	Solidago caesia		x	x				x	x
bristly clubmoss	Spinulum annotinum							x	x
dandelion	Taraxacum officinalis			x					x
foam flower	Tiarella cordifolia			x					x
western poison ivy	Toxicodendron rydbergii		x						x
starflower	Trientalis borealis		x	x				x	x
red trillium	Trillium erectum		x			x			x
common mullein	Verbascum thapsus							x	x
common speedwell	Veronica officinalis				x			x	x
sweet white violet	Viola blanda cf			x			x		x
Canada violet	Viola canadensis						x		x
American dog violet	Viola labradorica							x	x
yellow forest violet	Viola pubescens var pubescens						x	x	x
long-spurred violet	Viola rostrata						x		x
round-leaved violet	Viola rotundifolia			x					x
Selkirk's violet	Viola selkirkii cf						x		x
common blue violet	Viola sororia		x	x			x		x

Appendix D
Birds of Balch Hill

Birds of the Balch Hill Natural Area, 2001-2014

By Gail McPeek, 2014

This list includes bird species reported in the 2003 Management Plan with updates and additions compiled from the following sources: 2007 breeding bird survey conducted by Gail McPeek; annual spring bird trips; regular summer visits by G. McPeek, neighbors and other birders; annual fall migration days led by David Merker; occasional winter observations. Species order follows the *Checklist of the North American Birds* (7th ed. & 54th supplement, 2013) published by the American Ornithologists' Union.

Key to Terms

Season of Occurrence:
R = year-round resident
S = summer
M = migrant
W = winter

Breeding Status: possible, probable, or confirmed breeders.

Likelihood: common (good chance of observing), uncommon or rare

N = nest found
FL = fledglings observed

Habitat: various ornithological sources including *Birds of North American Online* (Cornell Laboratory of Ornithology) and *The Sibley Guide to Birds* (2000, Alfred Knopf, NY)

Species	Occur-rence	Breeding Status	Likelihood	Habitat & Notes
Ruffed Grouse	R	probable	common	young forest with openings
Wild Turkey	R	probable	common	mixed forest, mast trees
Turkey Vulture	S, M	possible	common	forest, wet
Osprey	S, M		uncommon	rivers, lakes; breeds nearby (CT River)
Bald Eagle	R, M		uncommon	breeds nearby (CT River)
Northern Harrier	M		uncommon	large open fields, marshes
Sharp-shinned Hawk	S, M, W	possible	uncommon	coniferous/mixed forest with openings
Cooper's Hawk	S, M,	probable	uncommon	various forests w/ openings, woodlots
Broad-winged Hawk	S, M	probable	common	deciduous & mixed forests
Red-tailed Hawk	R, M	possible	uncommon	Fields w/ patches of large trees for nesting
Golden Eagle	M		rare	2 seen Oct. 2011 (D. Merker)
Killdeer	S, M		uncommon	open fields, breeds nearby
Mourning Dove	R	probable	common	mixed forest, suburbs
Eastern Screech-Owl	R	possible	uncommon	forest, nests in tree cavities
Barred Owl	R	confirmed (FL)	common	mature forest with large cavity trees

Chimney Swift	S		uncommon	needs chimneys, breeds nearby
Ruby-throated Hummingbird	S	confirmed (N)	common	deciduous, mixed forests, orchards
Yellow-bellied Sapsucker	S, M	confirmed (FL)	common	mixed forest
Downy Woodpecker	R	confirmed (FL)	common	deciduous and mixed forests, orchards
Hairy Woodpecker	R	confirmed (FL)	common	mature decid./mixed forests
Northern Flicker	S, M	probable	common	woodlands with openings
Pileated Woodpecker	R	probable	common	mature decid./mixed forests
American Ketrel	M, S		uncommon	fields with some trees, cavity nester
Merlin	M, S		uncommon	conif. forests, breeds nearby on golf course
Peregrine Falcon	M, S		rare	breeds nearby (CT River)
Eastern Wood-Pewee	S	probable	common	decid./mixed forests
Least Flycatcher	S	possible	common	forest and edges
Eastern Phoebe	S	probable	common	open woods, water, ledges for nesting
Great Crested Flycatcher	S	confirmed (FL)	common	deciduous forest with cavity trees
Eastern Kingbird	S	possible	uncommon	open country and edge habitats
Blue-headed Vireo	S	confirmed (FL)	common	mixed/hemlock forests
Warbling Vireo	S	probable	common	deciduous, second-growth woods, edges
Red-eyed Vireo	S	confirmed (FL)	common	decid./mixed forests
Blue Jay	R	confirmed (FL)	common	forests, suburbs, second-growth
American Crow	R	confirmed (N)	common	forests for breeding, suburbs, fields
Common Raven	R	probable	uncommon	mature mixed forest
Tree Swallow	M, S ('02)	possible	common	open land; no recent summer observations
Black-capped Chickadee	R	confirmed	common	forest and edges, cavity nester
Tufted Titmouse	R	confirmed	common	mixed forests, edges, cavities
Red-breasted Nuthatch	R	probable	common	mixed/coniferous forests, cavity nester
White-breasted Nuthatch	R	confirmed (FL)	common	decid./mixed forests, cavity nester
Brown Creeper	R	probable	common	mixed forests
House Wren	S	probable	common	edges, thickets, cavity nester
Winter Wren	S	confirmed (FL)	common	mixed/coniferous forests
Golden-crowned Kinglet	M, W		uncommon	coniferous/mixed forests
Ruby-crowned Kinglet	M		common	coniferous/mixed forests
Eastern Bluebird	S	possible	uncommon	open lands, meadows, cavity nester
Veery	S	probable	common	mixed, moist forest
Swainson's Thrush	M		uncommon	coniferous/mixed forests
Hermit Thrush	S, M	probable	common	mixed forests
Wood Thrush	S	probable	uncommon	decid/mixed forests
American Robin	S, M, W	confirmed (N)	common	various woodland types with open areas
Gray Catbird	S	probable	common	thickets, edge habitat
Brown Thrasher	S	possible	uncommon	thickets, edge habitat
European Starling	R	possible	common	open areas and edges, cavity nester
Cedar Waxwing	S	probable	common	orchard-like areas, edges, berries
Ovenbird	S	confirmed (FL)	common	mixed forests, nests on ground
Worm-eating Warbler	M ('02)		rare	woods with dense understory
Northern Waterthrush	M ('02)		uncommon	woods with small still waters

Black-and-white Warbler	S	probable	common	mixed forests, mature and young
Tennessee Warbler	M		uncommon	young forest, scrubby
Nashville Warbler	S	probable	common	young forests, edges
Mourning Warbler	M		uncommon	second growth, shrubs, thickets
Common Yellowthroat	S	probable	common	edges, thickets, often wet
American Redstart	S	probable	common	open deciduous woods, moist
Cape May Warbler	M		uncommon	tall conifers
Northern Parula	S	possible	common	coniferous/mixed forests
Magnolia Warbler	S	possible	uncommon?	woods, young conifers
Bay-breasted Warbler	M ('02)		uncommon	conifer/spruce forests
Blackburnian Warbler	S	probable	common	Mixed/coniferous forests
Yellow Warbler	S	probable	common	second growth, edges, moist
Chestnut-sided Warbler	S	probable	common	second growth, edges
Blackpoll Warbler	M ('01)		uncommon	conifer/spruce forests
Black-throated Blue Warbler	S	probable	common	decid./mixed forests with dense understory
Palm Warbler	M			bogs, grassy openings in migration
Pine Warbler	S, M	probable	common	conifer/mixed forests, tall pines
Yellow-rumped Warbler	S	probable	common	mixed forests of many types
Prairie Warbler	M		rare	shrubby edges, 2011 spring obs.
Black-throated Green Warbler	S	confirmed (FL)	common	decid./mixed forests
Canada Warbler	M		uncommon	moist mixed forests, dense understory
Wilson's Warbler	M ('02)		uncommon	second growth, edges, moist areas
Chipping Sparrow	S	confirmed (N)	common	mixed open woods, edges, orchards
Fox Sparrow	M		uncommon	edges, open fields
Song Sparrow	S	probable	common	edges, thickets, second growth
White-throated Sparrow	S, M	possible	common	mixed/coniferous forests, brushy
White-crowned Sparrow	M		uncommon	shrubby, weedy areas
Dark-eyed Junco	S, M, W	probable	common	mixed forest, edges, small openings
Scarlet Tanager	S	probable	common	mature forest, dry
Northern Cardinal	R	confirmed (FL)	common	second growth, thickets, suburban
Rose-breasted Grosbeak	S	probable	common	decid./mixed forest, edges
Indigo Bunting	S	probable	common	second growth, edges near old fields
Red-winged Blackbird	S	possible	common	marshes, old fields, shrubs
Common Grackle	S, M	possible	common	open areas
Brown-headed Cowbird	S, M	probable	common	open woodlands, nest parasite
Baltimore Oriole	S	probable	common	tall trees with openings
Purple Finch	S, M, W	possible	uncommon	coniferous forests and shrubby areas
American Goldfinch	R	confirmed (FL)	common	edge habitats with old fields, weed seeds
Evening Grosbeak	M, W		uncommon	conif./mixed woodlands

Appendix E
Wildlife - Mammals of Balch Hill

Observations are based on two tracking trips in winter of 2002 and on notes from regular observers of activity on the hill. This list should be updated with more recent observations.

Name	Year* & Likelihood	Habitat *	Food *	Notes *
Smoky shrew *Sorex fumeus*	2002 common	Damp forest uplands	insects	Uses runways made by other animals
Short-tailed Shrew *Blarina brevicauda*	common	Open areas, most woods; leaf litter	insects worms plants	Makes tunnels; has poisonous bite; active day and night
Hairy-tailed Mole *Parascalops breweri*	common	Mixed hardwoods	insects	Forages at night; makes 2 tunnels-one shallow & one deep
Eastern pipestrelle *Pipistrellus subflavus obscurus*	common	Feeds over water; roosts in trees	insects, esp leafhoppers	Solitary feeder at twilight;
Snowshoe Hare *Lepus americanus*	2002 common	Mixed forest	grasses, herbs,twigs	Feeds at twilight and night; fur white in winter
Eastern Chipmunk *Tamius striatus*	2002 common	Deciduous forest, logs, rocks	varied; caches food for winter	Elaborate deep tunnels; feeds in day; awakens to use food cache in winter
Woodchuck *Marmota monax*	2002 common	Woods, meadows	herbs, grasses	Feeds in daylight; hibernates with body temp of 4°C
Red Squirrel *Tamiasciurus hudsonicus*	2002 common	Coniferous forest, mixed hardwood	conifer seeds, sap, fungi, eggs	Doesn't hibernate. Important prey for hawks & weasels
Gray Squirrel *Sciurus carolinensis*	2002 common	Hardwood, cavity trees	nuts, buds, fungi,eggs	Arboreal.
Northern Flying Squirrel *Glaucomys sbrinus*	2002 likely	Mixed forest, cavity trees	nuts, fruit, insects, eggs, lichen	Nocturnal feeder; stores cache in cavities.
Deer Mouse *Pero-myscus maniculatus*	2002 common	Logs, rocks cavities	omnivorous	Active most of year
White-footed Mouse *Peromyscus leucopus*	2002 common	open habitat	omnivorous	Active most of year; Logs, rocks cavities for seed cache
Meadow Vole *Microtus pennsylvanicus*	2002 common	Field, orchard, bogs	vegetarian, roots, seeds	Makes tunnels an grasses; nests in tunnels, rocks, logs
Porcupine *Erethizon dorsatum*	2002 present	Hardwood/ hemlock	buds,seeds, leaves,fruit cambium	Hemlock critical in winter; prey of fisher
Coyote *Canis latrans*	likely, transient	Various, forest edge	carrion, hare, fruit, small prey	Active in morning
Red Fox *Vulpes vulpes*	2002 common	Various, broken forest	insects, birds, fruits	May cache food in leaf litter; burrow for dens; rabies
Gray Fox *Urocyon cineroargenteus*	likely, transient	Mixed field, hardwoods	omnivorous	Climbs trees; rabies; nocturnal; less common than red fox

Black Bear *Ursus americanus*	2000 transient	Forest, openings	vegetarian, insects	Hibernates in dug dens; marks territory
Raccoon *Procyon lotor*	2002 common	Woods,fields	omnivorous	Nocturnal; dens in hollow trees (10' above ground);rabies; dormant in winter
Fisher *Martes pennanti*	2002 common	Pine/ hemlock mix	hare, small mammal	Dens in hollow trees; active all winter
Short-tailed Weasel [ermine] *Mustela erminae*	2002 common	Successional woods, brush	small mammals,	Nocturnal; needs dense brush cover; fur white in winter
Bobcat** *Lynx rufus*	2001 transient	Ledge; dense hardwoods	hare, small mammals	Deep snow is problem.
White-tailed deer *Odocoileus virginianus*	2002 common	Mixed field and forest	vegetarian	Deer yard established in hemlock woods. Deep snow a problem
Moose *Alces Alces*	transient	Mixed field	vegetarian	

*Year found = lists specific year of sign or sighting; otherwise an indication of likelihood of the mammal on Balch Hill. While some species may be common in the area, they may not be likely on the hill and are so noted. "Transient" means the mammal might cross Balch Hill in covering its larger territory.

**A bobcat visited houses on the hill in the winter of 2000, because of very deep snow. Alcott Smith suspects the animal was starving and looking for food. In this case, cat food would have been appropriate for the animal.

Appendix F
Neighbor Survey Regarding Deer

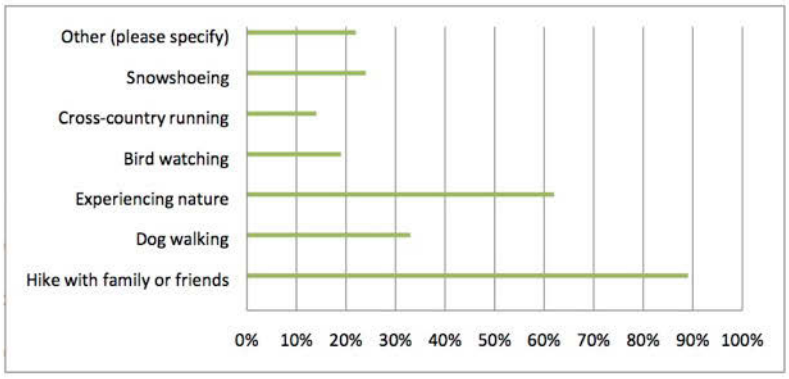
See page 24 for background information on this survey to neighbors regarding deer populations. Here are the results.

Balch Hill Survey - May, 2011 (total responses 39 as of 6/13/11)

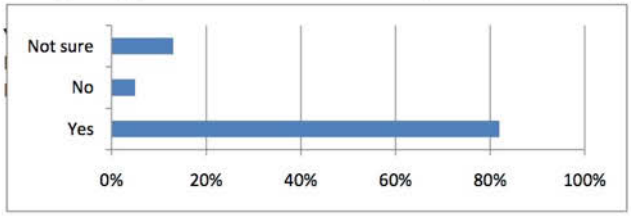
1. Do you visit the Balch Hill Natural Area?

	Often	Sometimes	Rarely	Never
Weekdays	37% (14)	45% (17)	16% (6)	3%(1)
Weekends	41% (14)	**56% (19)**	6%(2)	3%(1)

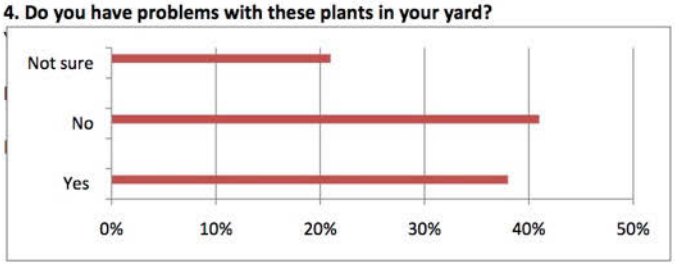
2. How do you use Balch Hill?



3. Do you support efforts to control invasive plants on Balch Hill, especially near the summit?



4. Do you have problems with these plants in your yard?



5. Would you be willing to help on work days to remove invasive plants at Balch Hill?

Yes	44%
No	56%

when the children are older
maybe
I am never in town for your work days
not available during summer months
Have to be convinced it's a priority.

6. Do you see deer in your yard? 100% yes

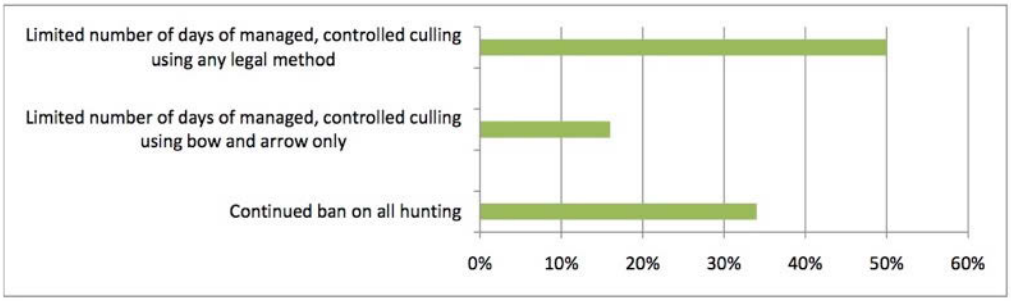
7. Do deer browse your plants?

yes	92%
no	5%
not sure	3%

8. Do you consider deer a nuisance?

yes	76%
no	24%

9. To manage deer at Balch Hill, would you prefer



Appendix G
Balch Hill Deer Browse Observations

By Barbara McIlroy, August 29, 2014

Not having had a fall visit to Balch Hill for at least three years, this trip was a bit of a shock. Armed with the newly trained eyes (thanks to the Vermont Foresters 2012 report to legislature[1] and draft paper[2] from Tom Rawinski) I took a closer look in wandering around the summit, on trails and through the open woodland. Certainly the fresh clearing and accumulated removal of invasives have removed much of the honeysuckle that had once obscured the edges. These are informal notes from brief survey.

Overall, there were very few sugar maple, white pine or hemlock seedlings in evidence. Those that had survived to a few feet were heavily browsed. Some of the Dartmouth deer exclosures had a few maple seedlings. In the woods, there were beautiful large thick patches of fern, another clue that deer are too numerous. **Plants that should be common were hard to find.**

The browse line tells a story. *A browse line at the trailhead of the Piane Trail illustrates the deer problem clearly.*

There were a few Canada mayflowers, but not in the quantity found in a healthy forest. They were thicker on ground inside the exclosures. No evidence of Trillium, which is recorded on Balch Hill biodiversity reports[3], but quite a few seedling jack-in-the-pulpits were seen. The latter is a plant with low preference by deer.

Please see photos demonstrating deer browse continued on the next pages.

Notes

1. VT report to Legislature (2012) www.vtfishandwildlife.com/library/Reports_and_Documents/Fish_and_Wildlife/Deer_Damage_Working_Group_Legislative_Report.pdf, and list on vegetation prone to over-browse by deer.
2. http://www.town.east-hampton.ny.us/DocumentsPDF/DeerManagement/UnderstandingDeerImpacts.pdf
3. Botanical Survey Field Work 2001, Natural Communities and Rare Plants of Hanover NH, page BH1, Balch Hill Management Plan, 2003.

Balch Hill Deer Browse Observations

At the edge of the field, a young white pine tree, about 12' tall, had been browsed of foliage to height of about 4 feet off the ground.

Leaves were browsed to height of 4' on a sapling shadbush(?) (*Amelanchier spp*). No short sapling side-shoots had leaves.

A dogwood shrub (donated by Ellis Rollett) was planted in 2011at the Hemlock trailhead, now has only one branch that has escaped severe browse. A browse line is obvious in the background.

Here is an example from the Hunter East Trail. There are no saplings coming up among the ferns, in part because root mass is very thick.

Balch Hill Deer Browse Observations continued.

Along the Link Trail, there was a small cut oak stump with sprouts that had recently been browsed and then re-sprouted with fresh new bright green leaves. A leaf that missed earlier browse is darker than the new leaves. This heavy browse of re-sprouts is another sign of too many deer.

Forest herbs such as wild oats (*Uvularia sessilifolia*) in the lily family were protected by a deer exclosure fence. No other examples of this common plant were observed.

On the Hunter East Traiol white wood asters have their flowering stems cut off, evidence of heavy browse.

On the Hunter East Trail, only one white wood aster had blossoms.

Appendix H
History of Balch Hill

By Adair Mulligan, Executive Director, Hanover Conservancy. This history was assembled from various sources, including the previous Balch Hill Management Plan.

The Early Years

View from East Wheelock, date unknown.

Originally known as Corey Hill, Balch Hill takes its present name from Adna P. Balch, a prominent citizen who served in the New Hampshire Legislature in 1876-1877. While the Balch Hill name does not appear on the 1892 map of Hanover, it does appear on a map drawn by J.W. Goldthwait in 1915. In the early to mid-twentieth century, the summit was commonly known as Dewey Hill Pasture, after owners at that time. During the 19th and early 20th centuries, the summit was used as a pasture for grazing of sheep and cattle. Records indicate that it was cleared of most trees for more than a century.

Half Mile Road

One of the earliest roads laid out in Hanover, Half Mile Road passed just east of the summit of Balch Hill on land now owned by the Town of Hanover and Dartmouth College. It is numbered One on the Goldthwait map of 1926, and is described in an appendix to *A History of the Town of Hanover, NH,* by John King Lord (1928, Dartmouth Press). Laid out in 1764, eight rods in width (132 ft) and beginning at the Lyme-Hanover border, Half Mile Road initially ran in a southwesterly direction on a line parallel to and one-half mile east of the Connecticut River. Its route coincided with the first 1.5 miles of the current Lyme Road and then veered eastward near Slade Brook over the west flank of Pinneo Hill and the east side of Oak Hill to Grasse Road near the reservoir. Half Mile Road crossed Balch Hill, possibly in the area still marked by ancient sugar maples, and then ran south along the western flank of Velvet Rocks to the Sand Hill area of Lebanon Street. Finally it followed the course of Mink Brook, eventually reaching

the area where Route 10 now crosses the Hanover-Lebanon line. Much of this road seems to have been infrequently used in early times, and most physical evidence of the route has long been erased (Childs, p. 62, Lord p. 307-308).

William Corey

An early property map of Hanover (before 1800) shows that William Corey owned land that included the summit. Corey was one of the original grantees listed by Governor Wentworth's Charter of 1761, and the parcel ended up in his hands when the grantee's parcel numbers were drawn from a hat (Childs, p. 7). Thus, he provided the hill's earliest printed name.

Sally Duguet

Sally Duguet (sometimes spelled Duget) was a hermit who lived on Balch Hill in the early 19th century. The daughter of employees of Eleazar Wheelock, she was "a tall pleasing young lady" (Childs, p. 146), who worked as seamstress and household helper for homes on the Plain (the flat area of Hanover between the hills and river). She became mentally unstable after a disappointing love experience, became increasingly deranged, and was occasionally assisted by the town's overseers of the poor. About 1824, she assumed the life of a hermit on Corey Hill, as it was then called. Her first crude shelter, described as "slabs over a hollow near a stone wall on south side of the road to the adjacent stone wall," burned. A former employer helped build her another hut that also burned. This was replaced by a 12' square house of brick with only one window, built by a group of citizens. Sally lived on the hill for 30 years, occasionally bartering seeds and berries in town or in exchange for food. On her way home one snowy night, she got lost in the storm, having refused a neighbor's offer of shelter, and was found dead the next day by her nearest neighbors (How, p. 110; Hanover Bicentennial Book, pp. 146-147).

Sally is buried in the Dartmouth Cemetery in a plot (#156) purchased by townspeople who also donated a plain marble slab inscribed: "Here lies the mortal wreck of / Sally Duget / In the midst of society / she lived alone / beneath the mockery of cheerfulness / she hid deep woes / in the ruins of her intellect / the kindness of her hart survived / She perished in the snow / on the night of Feb 26, 1854 / age 69."

Adna Perkins Balch

A.P. Balch (born 1817 in Lyme, died 1889 in Hanover) bought 125 acres of land on the south and west sides of the hill in 1883 and occupied the stone house (built by Professor A. Crosby in 1845) that still stands at the corner of Rip Road and East Wheelock Street. Balch owned six large farms in Hanover on Reservoir Road, Lyme Road, and East Trescott Road, shown on the 1855 map by E.M. Woodford. His cattle were of imported blooded stock and great value to other farmers in the area. Balch also was a director of the Hanover Gas Company. The Balch property on Balch Hill passed to Adna and Susie Balch's daughter, Julia St. George, and her husband. The land left the family in 1890.

Adna Balch earned a considerable fortune in the transportation business, first by carting goods to Boston by wagon, and then in contracting to build railroads. Balch was responsible for extending the Connecticut and Passumpsic Rivers Railroad (later owned by Boston and Maine RR) from St. Johnsbury to Darby Station in Quebec. The 1855 contract for this service specifies payment of $500,000 in cash and $675,000 in RR stocks.

Balch had an impact upon the architecture and development of downtown Hanover. On West Wheelock Street, the first house on the left was the mansion of President Wheelock, built in 1773. Balch owned it in 1846 and changed the gambrel roof to a sharply sloped roof. In 1900, owner Mrs. Emily Howe Hitchcock gave it as the village library. Adna Balch built Hanover's grandest house in 1875 at the northwest corner of Main and Wheelock Streets, replacing a house built in 1772 that was moved away. Balch's 1875 house was sold to F.W. Davidson in 1887 and converted to a store with a fraternity on the second floor; it partially burned in 1900. The College purchased the property and built College Hall on the site the next year. Balch Street is also named for Adna Balch, and was developed by 1915.

Dartmouth Alpine Ski Team

Under the leadership of Prof. Charles A. Proctor, head of the physics department and director of the newly constructed Intercollegiate Winter Sports Union, ski competition at Dartmouth made history. In 1926, Proctor arranged for the first modern ski competition with a mile run judged only on time (previous races had a "style" component as well as time), as well as the first slalom race to be judged in the same manner. The course for these races was created on Balch Hill.

Ski teams practiced and raced on the hill from 1926 until WW II, and ran challenging snow shoe and cross country ski races on the surrounding terrain. Remains of a small box that stored the emergency toboggan still can be found just south of the house formerly owned by Betty and Ralph Hunter. After the ski lift on Oak Hill, north of Balch Hill, opened in 1935, most alpine skiing events moved elsewhere. However, inter-fraternity meets were held on Balch Hill and students at Hanover High School participated in downhill ski meets there well into the 1940s (Andy Stewart). D.J. Bradley recalls day-long ski touring events, starting in Hanover Center, along Class VI roads through the Trescott Company land, past the second reservoir, over Balch Hill, and down into town. These continued until the Trescott Company lands were fenced in 1973 (Hooke, pp. 271-231; Ski Magazine).

The 20th Century Owners and Protection of Balch Hill

Garipay/Hunter Ownership

In 1946, Earle Garipay purchased 100 acres of land on the north side of the hill, including the summit, from Melvin and Maybelle Dewey, whose farm house stood where Girl Brook crosses Route 10 near the current site of the Dartmouth Medical School. The Dewey land had been in that family since the 1840's. This land on the northwest side of Balch Hill extended the Garipay family's Reservoir Road dairy farm, known as Golfside Farm, from Lyme Road to Grasse Road. The farm had a herd of 185 cows, and young stock were pastured on the hill. (Charles Garipay).

In 1948 there was a transfer of land with the right of first refusal on the summit to Ralph Hunter, who then developed seven building lots on Hemlock Road. About this time, although both Garipay and Hunter had wanted to see it continue, grazing ceased on the hill although farming continued closer to Reservoir Road well into the 1960s. The Garipay barn (once owned by A.P. Balch and then the Warden family) on Reservoir Road was a famous birding site in the severe winter of 1968-69, when a snowy owl took up

residence. During the 1950s and 1960s, Balch Hill was a popular destination for walkers, blueberry pickers, and skiers in Hanover, and its bald top was visible from many parts of the town.

In October of 1957, town consultants Adams, Howard, and Greeley released a report entitled "Hanover Plans Ahead," the first modern master plan for the town. In this report, the notion first surfaced for a "green belt" around the town's developed areas (p. 22). The plan's Proposed Land Use Map (p. 16) shows a greenway starting near the present Rinker Tract, past Storrs Pond, over the summit of Balch Hill, and connecting to Velvet Rocks and lands near Mink Brook. Much of this land has been protected in the years since this report appeared.

Blueberry pickers, c 1960.

Based on this report, the Town adopted its first town-wide zoning ordinance in 1961, but omitted the proposed greenbelt. That very day, a few concerned citizens (Bob Norman, Carolyn Tenney, George Wrightson, Ted Hunter, and Jean Hennessey) met to form a group to see what could be done to protect those areas. The result of their research led to approval by Town Meeting in 1962 of a new type of zone labeled NP (Nature Preserve), placed on the ballot by petition of this group. Several of the previously mentioned areas were placed in NP zones. This active group eventually became the Hanover Conservation Council; by 1963 the Council was formally incorporated and ready to raise funds to help preserve lands in town.

State enabling legislation for conservation commissions was enacted in 1963, and Hanover established its commission in 1966. Since that time, both the Commission and the Council have actively worked together to identify and to protect critical parcels of land.

Purchase of First Parcel at Balch Hill

Before 1970, stories had circulated about possible development of the summit. The Hanover Conservation Council mobilized to protect the summit, bolstered by a communication from George Woodruff, a Dartmouth alumnus and friend of Ralph Hunter, who recalled the hill from his undergraduate years. Woodruff's contribution of $10,000 helped to launch an ambitious fundraising campaign, the first such major Council effort, led by Charles Hirschleb, a well-respected 89-year old resident of Hanover. The Balch Hill goal was $20,000. Another $21,000 was needed to purchase the South Esker land (which was later transferred to the Town). A fund of $10,000 for future land acquisition brought the total to be raised to $51,000. About 100 residents participated in this campaign, raising about $58,000, of which $10,000 came from the federal Land and Water Conservation Fund. The Hanover Conservation Commission helped access these funds through an application to the state's Department of Resources and Economic Development. The details of the purchase were surprisingly complicated and involved several exchanges

of deeds, but with considerable help from Ralph Hunter, the Hanover Conservation Council finally acquired 6.26 acres on the summit from Earle Garipay in June, 1970. An additional gift from Ralph Hunter increased the preserved area to 10.3 acres. In 2001, Ralph and Elizabeth Hunter donated an additional 10 acres of land just below the summit to the Council.

Garipay v. Town of Hanover

In 1973, fresh from developing Levittown on Long Island and after briefly considering the construction of 126 condos on the summit of Balch Hill (a proposal that was quickly rejected by the Planning Board), Levitt & Sons proposed a complex of 49 houses near the summit. Streetlights and a water tower would be installed to serve the residents. Neighbors were awakened to the proposal by the appearance of logging trucks on Hemlock Road. Soon after, concerned citizens and neighbors formed the Balch Hill Association. This group raised funds and hired Hanover attorney Mike Slive, who helped prepare for an eventual court case. The group produced newsletters, collected dues, held public meetings, and arranged for professional maps of the area and studies of soils and traffic. They also conducted an informal survey of Hanover residents' opinions about the development proposal.

Following the Planning Board's denial of the second proposal, Earl Garipay appealed the decision, claiming that the Planning Board had improperly considered off-site factors such as the road and traffic. This case was decided in 1976 by the NH Supreme Court, which, recognizing the constraints of Hemlock Road (narrow, steep and winding) declared, "…The [Planning] Board must ascertain what amount of development…will present the hazard described in the statutes and regulations. At the point where such a hazard is created, further development becomes premature. Thus, in this instant case…when an additional forty-nine homes will endanger the well being of residents both within and contiguous to the development, the statute and regulations authorize the Planning Board to find the subdivision premature."

The Court further cited case law: "A new subdivision is not an island, but an integral part of the whole community which must efficiently with the municipal pattern of streets, sewers, waterlines and other installations which provide essential services and vehicular access…. Off site circumstances may be considered by the reviewing board, and may provide the basis for denying approval of a plan."

Purchase of Town Parcel

After the Garipay v. Town of Hanover decision in 1976, the Planning Board rezoned the land above the 825' elevation to Rural Residential (three-acre lots). Earle Garipay then proposed an eight-lot subdivision on the hilltop adjacent to Council land. After intense negotiations over more than two years, with Brian Quinn serving as facilitator, the Council was able to purchase an additional 25.9 acres from the Garipays in 1978, which were later deeded to the Town. This purchase totaled $130,000; the Town appropriated $32,500 and the Council contributed a quarter of the cost of ($32,500). The project obtained matching federal funds of $65,000 from the Land and Water Conservation Fund for the remainder of the purchase and an additional $7,078 for administrative costs to the State. Again the Council led a most ambitious fund-raising campaign involving 250 local donors.

Appendix I
Brush Burning Policy and Instructions

The person in charge of the burn should be aware of NH statutes on burning: Forest Laws of NH, RSA 227-L: 13, 15, 17 and 227-J: 10. [http://www.gencourt.state.nh.us/rsa/html/indexes/227-L.html].

Due to the summit's exposure to drying wind, flammability of dry meadow grasses, the fuel remaining from the 2007 blowdown on Dartmouth land, and the proximity of settled neighborhoods, brush burning should be conducted only in winter or, if necessary at other seasons, when it is raining. The Hanover Fire Department should be notified by the burn manager in advance of any burn, whether or not a permit is necessary.

Brush burning piles should be located at least 25 feet from property lines, preferably in a relatively flat area. The actual burning can be accomplished by different methods. One method is documented in the 2003 management plan. An alternate method, used in 2013-14, was to burn during times of good snow cover. Prior to burning, branches were piled in an organized fashion with stout ends together for easy handling. A small fire was started near the edge of the pile with a match and birch bark or with one charcoal briquette, and volunteers then fed brush onto the fire. The fire was allowed to burn itself out over 24 hours. Volunteers checked the area at least once a day for the next few days to be sure embers were fully extinguished. The burn sites were not covered with more brush.