

THETFORD MANAGEMENT PLAN

I. INTRODUCTION

Four properties encompassing about 575 acres and owned by the Town of Thetford are the subject of this report. The Hughes Forest, 261.5 acres, has frontage on Sawnee Bean Road; a small portion of the tract is located North of this road while the majority of the parcel lies to the south. The Post Mills Nature Area is located east of Route 113 in Post Mills; its area is 100 acres. The 37-acre Taylor Tract lies east of Route 113 and north of Route 244, also in the village of Post Mills. The Thetford Town Forest encompasses about 176 acres; it is located east of Five Corners Road. The locus map depicts the parcels' physical location within the town and their relationship to each other.

The Thetford Select Board, the Thetford Conservation Commission and a grant from the Department of Forest, Parks and Recreation made this project possible.

Members of the Thetford Conservation Commission (TCC) and several town residents volunteered their time to perform numerous tasks. TCC members Heather Carlos, Jennifer Davey, Ann Lavanway, Bob Pulaski and Li Shen, along with residents Rick Howard and Wayne Parks flagged the boundaries of the subject properties. Heather Carlos provided GIS-based property, soil and topographic maps. Li Shen inked and lettered the Hughes Forest, Post Mills Nature Area and the Town Forest Maps. Li Shen, Amy McElroy and Ann Lavanway of the TCC provided proof reading, editing and report review.

The natural resource inventory and field examination of these properties was conducted during the summer and the fall of 2007. A public presentation was made on 31 January 2008 attended by 32 town residents. Information on stand conditions, natural communities, rare, threatened and endangered species and special features were presented at that meeting; the public also provided input regarding objectives and land uses they wished to see on the tracts. At Town Meeting a map display and brief description of each tract was presented. A questionnaire regarding citizens' vision for the town lands was placed on all seats on the main floor and was also available at the display table. Town residents filled out 21 questionnaires. Based on inventory data, input from the public meetings and the questionnaire responses, the Conservation Commission drafted a set of management objectives for the properties.

On 28 May 2008 the goals and objectives developed by the Conservation Commission, the proposed reserve areas and the proposed prescriptions were presented to 14 town residents at a public meeting. The presenters and Conservation Commission members addressed questions and comments from the public during the forum.

All comments and questions from the public meetings and the questionnaire were recorded, responded to by the Conservation Commission and tabulated. The public comments and responses and the questionnaire are found in the Appendix.

The Upper Valley Land Trust holds a conservation easement on the Hughes Forest and the Post Mills Nature Area. Summaries of these easements are found in the Appendix.

The boundaries of all tracts require blazing and painting. Clearly marked boundaries protect property owners from adverse possession claims and timber trespass, demonstrate use and occupancy and define the limits of ownership and management. TCC members and other volunteers flagged the actual or approximate boundary lines prior to the inventory.

- Confirm and blaze boundaries in 2008-09 and paint blazes three to six months later. Maintain boundary lines by painting blazes at 5 to 7-year intervals and re-blazing and painting at 10 to 15-year intervals. After initial blazing and painting re-paint in 2013-15. Re-blaze in 2018-24 and follow with painting. This is a high priority; complete in 2008-09.

II. THE LANDSCAPE SETTING

All four tracts lie in the transition area between the Northern and Southern Vermont Piedmont biophysical regions. These regions encompass the area between the eastern foothills of the Green Mountains and the Connecticut River that forms the eastern boundary of the state. The region is primarily forested with rolling hills dissected by numerous streams and rivers that create an extensive network of narrow floodplains. Many small agricultural fields dot the landscape especially along the larger river valleys where the soils are fertile.

Topography varies throughout the region ranging from gentle slopes along the valley bottoms to very steep slopes on the sides of ridges and hills. Very steep bedrock outcrops as well as flat benches are occasionally present in the region. Overall the topographical relief is moderate for the Town Forest, Hughes Forest, and Post Mills Nature Area. Elevations typically range within 680 to 1200 feet, above mean sea level. The Taylor tract and the northern portion of the Post Mills Natural Area are within floodplain areas where slopes are nearly flat with elevations ranging from 560 to 700 feet.

The underlying bedrock of this region originated as sediments deposited during the early Devonian Period, approximately 400 million years ago, when an inland sea covered this region. Subsequent episodes of mountain building events metamorphosed these sedimentary rocks to create the Gile Mountain formation that underlies the four Thetford tracts. This formation consists of primarily of mica schists, phyllites and quartzite. Some calcareous limestone is also present within the Gile Mountain formation, although not in the higher levels of the abutting Waits River formation found to the west and northwest. The weathering of these calcium rich rocks provides this important macronutrient that is essential for plant growth. Calcium is directly associated with increased soil fertility and is responsible for the occurrence of rich woods species and high forest productivity.

After the mountain building events, the landscape underwent many years of erosion that reduced the size of these previously Himalayan-like mountains. Continental glaciers then covered the region, cycling through various periods of advance and retreat, the last one receding about 13,500 years ago. These glaciers rounded hilltops, removed soil, and littered the terrain with glacial till. The glaciers affected the topography, water features, and soil of all the Thetford tracts. The Taylor tract, for example, sits on a glacial outwash area and its soils contain an abundance of sand. Some glacial remnants create unique landscape features such as the glacial erratic lying in the central portion of the Post Mills Nature Area.

Average annual precipitation varies by elevation in the region; approximately 37 inches falls on the Thetford parcels, which is evenly distributed during the year. About 35% of this precipitation falls in the form of snow. Snowfall typically occurs during the latter part of November, through March, and sometimes into April. Average annual snowfall is 6.5 feet.

The water that flows from all four Thetford properties feeds tributaries that drain into the East Branch of the Ompompanoosuc River and eventually into the Connecticut River. Rain and snowmelt runs off the properties through numerous unnamed streams. There are many seeps, springs, and small wetlands embedded within the Thetford tracts that create an ecologically important mosaic of water resources and associated riparian corridors. These areas provide habitat for a diverse suite of plants and animals, sometimes including rare, threatened and endangered or uncommon species. Wood turtles, a species at risk due to

declining populations, and sweet coltsfoot, ranked S1 by the VT Nongame and Natural Heritage Program, are both associated with water. (See the Appendix for information about the ***Rare Plants of Vermont*** list and an explanation of rankings.) Though these water resources comprise a relatively small portion of properties' total area, these habitats greatly enhance the biodiversity of the subject properties.

Much of the region's forests were cleared in the past for agricultural uses. In the 1850's, during the peak sheep-grazing period, the region consisted of approximately 80% agricultural land. Past land uses impacted and altered the landscape of the region. Unfortunately, the long-term consequences of such land use practices are not fully understood. However, evidence suggests that soil productivity is reduced for at least decades and probably a century or more by exploitive timber harvesting and inappropriate farming practices. The severity of the impact largely depend on the type, frequency and duration, and extent of these practices as well as site conditions including soil type, localized weather events, aspect, topography, and hydrology. For example, heavy pasturing negatively affected soil and water resources, destroyed native vegetation, altered wildlife and aquatic habitats, and created conditions conducive for the colonization of invasive or alien plants. Plowing altered the soil to an even greater degree by altering soil structure and increasing erosion potential.

When fields were abandoned trees quickly re-colonized these areas. In this, and many other portions of Vermont, white pine occupied these areas, while further north, white spruce would also populate old fields. As these forests grew they were typically logged. The forests that are the subject of this report have been logged at least twice and probably three times. The initial harvest cleared the land for agricultural use during the settlement period. The second harvest was typically a cut of valuable timber species that had attained merchantable size or the re-clearing of land for agriculture. As the forests once again colonized fields and pastures subsequent harvests (within the last 20 or 30 years) have exploited the forest to a lesser degree and sometimes been more sensitive to other resources. Despite these landscape level abuses forests quickly reclaimed abandoned agricultural land and seemingly thrive today.

Despite the lack of data available to document ecological degradation, some forest parameters that are greatly influenced by past land use practices are readily assessed. These include forest composition, structure and timber quality. Past land use practices have affected these characteristics throughout the region and specifically on the Thetford properties. For example, past timber harvests that removed only high quality trees (termed high grading) typically resulted in residual stands stocked with high proportions of low quality timber (e.g. unacceptable growing stock). The forest composition and structure is also substantially altered, often containing inordinate proportions of non-commercial species, fewer large trees and a corresponding greater percentage of small trees.

Invasive plants have also influenced the forest composition, particularly the understory, in the region. Invasive plants were introduced from Europe or Asia for ornamental plantings, erosion control, and wildlife food. Invasive plants are typically prevalent in agricultural areas such as the borders of old fields or other forest areas with heavy disturbance. The fruits of these plants are consumed by various wildlife species, most notably birds, who then transport and spread seeds throughout the landscape. Invasive plants displace native species, suppress forest succession, and create localized monocultures if left unchecked. These plants and their continued spread are a threat to the composition and functioning of the forest ecosystem throughout the region and more specifically to the Thetford properties.

Such past land use practices along with the existing site conditions (e.g., soil, underlying bedrock, topography, forest pathogens, aspect and climate) all have influenced, and will continue to affect forest growth and development within the region. Summaries of

land use activities, specific existing conditions, and forest descriptions for each of the Thetford properties are described more fully in *Tract Descriptions* (Section VI).

III. EXAMINATION METHODS & FOREST TYPE CLASSIFICATION

Forest Inventory

A forest inventory of the Hughes Forest, the Post Mills Nature Area (PMNA) and the Town Forest was performed by Ehrhard Frost and Bill Stack. The subject properties have not been surveyed. A variety of maps and aerial photos were utilized to create a base map and design the inventory for each tract. Abutting surveys were utilized when available. Four surveys, the tax map and a Conservation Map by Upper Valley Land Trust were utilized to create the PMNA map. The Tax Maps and other referenced non-survey maps proved inaccurate in all cases; the PMNA composite map was the most accurate. The Grand List acreage was utilized for determining the area of the subject properties.

Forest types were stratified using orthophotographs, other aerial photography and any available forest type maps. On each tract a grid was designed with the intention to adequately sample each stand. The grids were referenced to the boundaries as depicted on available maps, all of which were inaccurate, resulting in skewed grids in relationship to the actual boundaries. Therefore, a substantial amount of time was spent GPSing numerous corners and boundary points on each parcel to create more accurate maps. The skewed grids contributed to lower sampling intensity than originally designed. Other contributing factors included: forest types were delineated based on field observations and did not always coincide with preliminary photo interpretation or existing type maps; some stands were smaller than originally mapped and some stands were irregular in shape and did not lend themselves to sampling on the grid design. All stands that are designated as working forest were sampled adequately. Some areas of forest reserve were not actually sampled or were sampled at low intensity. A forest inventory was not conducted on the Taylor Tract due to the non-commercial nature of this floodplain forest. The specific grid system utilized for inventorying each tract is described in the respective tract section of this report.

All sample points were GPSed, flagged and numbered; point centers were marked with 10" spikes, wrapped with flagging and topped with 6" florescent pink polyester whiskers for future reference. Forest trees were sampled using a twenty basal area factor (BAF) prism. At each sample point all trees over 2 inches at diameter breast height (DBH) were tallied by species, 2-inch diameter classes, crown class, timber growing stocking category (acceptable and unacceptable growing stock), product and log grade by merchantable eight-foot sections of the tree and merchantable top diameter. Dead trees were tallied by species and diameter class. Additional notes pertaining to individual trees were made on the tally cards regarding form, damage and presence of cavities. The inventory data was processed using the Multicruise program developed by Computer Forest Consultants, Inc. Additional data collected at sample points included aspect, surface features, terrain, regeneration abundance and composition, stand structure, crown cover, horizontal and vertical diversity, cultural and water features, if present. An ocular estimate of invasive plant abundance, and an ocular evaluation of cavity trees, retained organic material (ROM) [or down woody material], snags, unique trees and mast trees were also collected. Approximate age was also estimated and random core samples were taken on each property to more accurately determine tree age and stand structure.

Some botanical and other data were also collected along transects between points. Numerous forest features were observed, recorded and/or mapped during the inventory. Forest type, size class and timber stocking level, successional stage, forest composition and stand density were ascertained and/or measured. Forest health, including insect and disease,

logging damage, ice, snow or wind damage, and other signs of disturbance and past land use were observed and recorded. Wildlife sign and usage, human-made features such as roads, recreation trails, stone walls and wire fences and other cultural features or evidence of man's activity and land use were noted. The data collected at each sample point and along transects in the form of tallies or field notes were utilized to quantify and qualify these forest features; physical features were mapped.

Soils information and site indexes for tree species were obtained from the Soil Survey of Orange County, Vermont, a publication of the National Cooperative Soil Survey, which is a joint effort of the US Department of Agricultural and other federal and state agencies. This publication maps soils at the county level. Therefore, occasional disparities exist between the maps and actual field conditions, frequently due to differences of scale and survey level. The soil survey is utilized to provide a general overview and description of the soils found on the subject properties.

Forest Typing

Forest types were classified using two publications by the Society of American Foresters (SAF): Forest Cover Types of North America, copyright 1954, reprinted 1975 and Forest Cover Types of the United States and Canada, F. H. Erye, Editor, revised and published in 1980. These publications define a forest type as: "A descriptive term used to group stands of similar character as regards composition and development due to given ecological factors by which they may be differentiated from other groups of stands...." Further, "A cover type is a forest type now occupying the ground, no implication being conveyed as to whether it is temporary or permanent." The bulletins emphasize composition instead of development as the basis for identifying forest types and utilize the following principles to recognize them:

- ❖ The cover type occupies large areas in aggregate. The type does not necessarily cover a large area in a single stand, but composition is characteristic and typical throughout a considerable range.
- ❖ The cover type is distinctive and easily separated from other types that it closely resembles. Transition areas are always found and result from both abiotic and biotic influences, including those of humans.

Forest cover types are named using species that describe the composition. Species appearing in the type name generally compose fifty percent or greater of the type. The SAF publications list and number forest types based on the habitats that they normally occupy: dry, fresh to moist and wet. The forest types on the subject properties fall into the Northern Forest Region.

The forest inventory of the Hughes Forest, Post Mills Nature Area and the Town Forest used the SAF classification system because it emphasizes ecological factors and natural forest development rather than commercial timber species. The forest types are arranged in the report first by their SAF sequencing. The sequence is next determined by size class when two or more of the same type occurs, (largest diameters first). Stand stocking or density (highest first) determines the listing order when the first two characteristics are the same. Finally, acreage (largest first) is used to determine sequence if all other determinants are the same.

A three-part alphanumeric stand code is used for mapping purposes. These codes utilize the name of the forest type in abbreviated form (alpha), a numeric code for size-class and an alpha code for stocking levels. The stand code WP4B translates to a white pine forest type composed of trees predominately in the standard (sawlog) size class, which is adequately stocked for timber production. SAF numbers are only used in the text for reference. Please refer to the Key to Vegetative Coding found in the Appendix for a complete listing of forest types, size classes, and stocking levels with their respective codes.

Note that stocking guides have been developed by forest researchers to compare actual numbers of trees to optimal numbers for timber production. These guides are usually developed for even-aged stands and are, therefore, not suitable as a measure of site occupancy in uneven-aged or multi-aged stands. Uneven-aged stands tend to more fully occupy a site due to the presence of multiple crown layers. In this report stocking levels are ranked based on both the stocking guidelines and field observations of site occupancy, crowding and competition, not solely on the Forest Service stocking guides themselves.

Natural Community Delineation

Brett Engstrom examined the subject properties and delineated natural communities based on data gathered in the field and from existing maps and aerial photography. The natural community maps of the four town parcels were produced in ArcGIS 9.2 using GPS waypoints obtained in the field as spatial reference points. The method for creating the maps involved walking all four properties and taking GPS waypoints at or along boundaries of natural communities. At each waypoint the following information on natural community type was recorded in a field book: an estimate of community size/dimensions, boundaries, vegetation, soils, condition/land use history, and ecological processes. When rare and uncommon plants were encountered a waypoint was taken at these locations and additional notes were recorded. Observation points (any point where information was recorded) were marked on field maps when GPS waypoints could not be obtained. Field maps consisted of partially transparent black & white orthophotos overlaid on a U.S.G.S. topographic map base. GIS mapping was performed in the office after completing the field surveys. Parcel boundaries were created for this project from field GPS waypoints and surveys. Natural community boundaries were digitized as polygons using multiple data layers for reference and the GPS data/field notes as the primary spatial reference data. Small natural communities (i.e.: those less than one-quarter acre or 0.1 hectare) were mapped as point features. The Vermont Center for Geographic Information provided the major GIS layers that were consulted for the project; these resources are listed below.

- U.S.G.S. topographic maps
- Hydrology (streams, lakes, and ponds)
- Orthophotos (both 1998 black & white leaf-off, and 2006 NAIP color leaf-on)
- Soils (Natural Resources Conservation Service produced)
- Wetlands (National Wetlands Inventory)

The 1939 and 1962 black and white aerial photographs, and the 1992 color infrared aerial photos were accessed at the Berlin, VT NRCS Office, color-copied, scanned, and/or simply viewed to determine land use history. The Forest Cover and Land Features maps created for this inventory were scanned, georectified and utilized as a layer in the natural community GIS project file. The final natural community maps consist of both polygon and point shapefiles, and as jpeg images of formatted final maps that include both polygon and point features. The jpeg maps are printed in 8.5x11" format and included in this report. Separate shapefiles were also created for rare and uncommon plants for Hughes Forest and Thetford Town Forest. The rare plant points are also printed on the final natural community maps. The following shapefiles were produced for this project:

- PMNA_NC
- PMNA_NCpoints

- ThetfordTF_NC
- ThetfordTF_NCpoints
- RTE_plants_TTF
- Hughes_NC
- Hughes_NCpoints
- RTE_plants_Hughes
- Taylor_NC

Attribute data for each polygon and point feature accompanies the natural community map shapefiles. The natural community database files include polygon ID fields, natural community type, natural community codes, descriptive information, and area (Acres for polygons, m² for points). The rare and uncommon plant database files include fields for common name, scientific name, Vermont endangered/threatened status, Nongame and Natural Heritage Program species rarity rank, element occurrence rank, date of find, original GPS waypoint number, and coordinate data, including both latitude/longitude and UTM (NAD'83) coordinates.

Natural community type names used in the mapping largely follow those of the Vermont natural community classification found in *Wetland, Woodland, Wildland: a Guide to the Natural Communities of Vermont*, by Elizabeth Thompson and Eric Sorenson. The Northern Hardwood Forest variant "Sugar Maple-White Ash-Jack-in-the-pulpit Forest" described in *Wetland, Woodland, Wildland* was shortened to "Semi-rich Northern Hardwood Forest" for this inventory. In a few cases, new natural community type names, or variants, are used. These include Dry-mesic Sugar Maple-Hophornbeam-Red Oak Forest, Semi-alluvial Seep, Beaver Meadow, Beaver Pond, Oxbow Marsh/Pond, Alluvial Grassland/Meadow, Seepage Marsh, Sloping Seepage Forest, Mixed Sloping Seepage Forest, and Wet-mesic Floodplain Forest. None of these new natural communities fit very well into the existing classification, yet are unique and distinct ecological communities.

IV. ADAPTIVE MANAGEMENT & ECOLOGICAL FORESTRY PRINCIPLES

This section of the forest plan is an attempt to define a new paradigm for forest management and the practice of silviculture. In developing the following silvicultural guidelines we draw heavily on scientific research and many years of forestry experience, and forest observation. "Guidelines for Biodiversity Compatible Forestry" from *Wetland, Woodland, Wildland* by Elizabeth Thompson and Eric Sorenson and research and publications by renowned and innovative foresters such as Jerry Franklin, Herb Hammond, Bill Leak and Chris Maser were also utilized to help shape this forest management approach.

The practice of forestry in this country is very young, only about 100 years old. Expressed in other ways:

- forestry in North America has been practiced for less time than the maximum attainable age of bigtooth or quaking aspen, our shortest-lived tree species!
- forestry on this continent has been practiced for less than one-eighth the maximum life span of Eastern hemlock, our longest-lived species in the Northeast!

Our silvicultural systems were handed down to us from Europe. These systems applied orderly agricultural models to the forest ecosystem. Forestry emphasized simplification and uniformity of the forest for the singular purpose of commodity production. Rotation ages and diameter objectives were rigidly applied. Regeneration methods were developed for the sole purpose of regenerating and growing commercially important tree species.

As society demands an increasingly intricate array of amenities from the forest, and as we realize that maintaining ecological function is essential to the production of these amenities, it follows that silvicultural systems must evolve to address both societal demands and our increased knowledge of natural functions. The basis of traditional forestry is actually rendered obsolete by the changing demands of our society and our increased knowledge of the complexity of all natural systems, including our forests.

A change of perspectives is the first essential element necessary to implement ecological forestry. The forest must become the focus, not the forest products. Forest structure, function, complexity and processes are necessary, and in fact, are responsible for creating the desired products. Further, we must recognize and appreciate the limits of our knowledge. We must embrace humility in our approach to the forest.

New nomenclature and terminology is also required to move beyond the traditional confines of even-aged and uneven-aged forest management. New definitions broaden perspectives, allow for a wider range of options for forest management and silvicultural systems. Expanded definitions and new terminology allow us, as foresters, to move into a new and dynamic role in concert with the forest ecosystem.

Forest management and applied silviculture also requires an adaptive management approach. Foresters must practice from a humble perspective acknowledging that our prescriptions are merely working hypotheses with uncertain outcomes. Management must be designed to enhance learning, knowledge and awareness, not to promote and maintain the status quo. Foresters must monitor and evaluate prescriptions, treatments and outcomes. Forestry must be flexible and adapt to changes in both knowledge and conditions. Management must be as dynamic as the very system it hopes to manage. Nothing in the forest is static. Only through observation and monitoring can foresters continually hone their silvicultural skills and avoid management pitfalls. This requires active, ongoing involvement, site-specific knowledge and a continual search for better understanding. Complacency results in the failure to retain the forest structure, integrity and function required to maintain sustainable forest ecosystems. Foresters must also assume responsibility for informing their clients when they make unrealistic demands on the forest and its capacity to produce goods and services.

Forests are complex and as such must be managed for wholeness and complexity instead of efficiency and simplicity (Kohm and Franklin 1997). "A biologically sustainable forest is a prerequisite for a biologically sustainable yield (harvest)" (Maser 1994). Sustainable ecological forestry must be based on the interaction between species and the processes that both create interdependence and define ecosystems (Kohm and Franklin 1997). Time must be redefined and approached on an ecological scale, not a human scale. The emphasis must be on structure, function and process, not on a desired commodity outcome. Make no mistake, society can extract commodities and amenities from the forest, but only in so far as structure, function and process are supported by the management system.

Ecological forestry is then necessarily based on a new perspective that requires a new terminology, both of which work together to create new approaches to management. The

following basic ecological forestry principles and guidelines form the foundation for silvicultural prescriptions within this forest plan.

- Maintain soil structure and productivity. Minimize soil erosion, disturbance and compaction. Protect soil by harvesting **only** during appropriate weather and seasons. Frozen and/or snow covered ground affords maximum protection. Maintain nutrient cycles by retaining organic material on the forest floor and above ground as both live and dead trees. Do not interrupt the downslope movement of soil, water and nutrients.
- Maintain the naturally occurring species composition of **all** native plants and animals. Utilize silviculture to restore the composition of radically altered stands to a naturally occurring species mix for the site.
- Harvest only from the abundance, retain and protect the rarities. Generally, utilize silviculture to create diversity of species, size and age classes and forest structures. Attempt to increase minority species that would naturally occur on sites within stands and throughout ownerships.
- Emulate natural disturbance regimes. Apply silvicultural techniques and schedules that are similar to natural disturbance patterns. Maintain higher stocking levels than traditionally recommended for optimum, short-rotation timber production to achieve slow-grown, fine-grained timber. Allow trees to achieve larger diameters than traditionally advocated. Utilize long cutting cycles, generally 15 to 25 years; occasionally a 10-year cycle may be appropriate, especially in young stands on good sites, and cycles of greater than 25 years may be necessary on poor sites. Remember, though it is natural for a tree to fall, it is not natural for that tree to move off site. Do not harvest decayed trees. Allow them to return to the site. The lifetime of a tree may be far shorter than the time required for it to decompose. There is life in death and the decomposition process is a part of the essential energy flow within the forest; death provides vitality.
- Utilize silviculture to stimulate the development of species and structures that will naturally evolve over time on a site. Thin stands early to emulate the stem exclusion stage and promote development of a complex understory. Harvest to mimic natural disturbance. Use what is traditionally known as single tree and group selection. Single tree selection mimics individual tree fall. Group selection takes many forms from very small openings to mid-sized patches to large groups, all of which have counterparts in natural disturbance regimes. Allow natural disturbances, which will occur regardless of human management, to initiate stand replacement (clearcuts) on a large scale.
- Incorporate perpetual, variable retention of all stand structures and elements to ensure that the entire range of naturally occurring forest structures (i.e., retained organic material, snags and snag replacements, Legacy Trees, mycorrhizal fungi and other forest components) are present in the forest. Legacy Trees will remain for their natural life cycle; they represent the perpetual retention component of the multi-aged retention harvesting system. Strict criteria for the number of trees or basal area/acre are not necessary. However, recognition of the critical role these Legacy Trees play and the structures and functions they support, is necessary for successful implementation. Generally, retained Legacy Trees should fall in a range of 10 to 20% of the basal area of a fully stocked stand. In large diameter Northern hardwoods assume full stocking is between 100 and 125 square feet of basal area/acre. Full stocking of softwood stands ranges from 180 to 260 square feet of basal area/acre. This translates to 10 to 25 square feet of retained basal area represented by roughly 5 to 13 trees/acre that are 18 inches DBH and greater in hardwood stands. In softwood stands retain between 18 and 52 square feet of basal area/acre or about 9 to 25 trees/acre, depending on the forest

type. When an individual dies, another Legacy Tree will be designated. Retain Legacy Trees that represent the range of species and form found within stands. Legacy Trees should include a wide range of specimens including the best examples of form required for timber production to cavity trees and declining/decaying stems. These Legacy Trees provide a biological legacy for subsequent cohorts, provide essential elements of stand structure and ensure the continued function of the forest. Maintaining the dynamic natural processes of the forest is the only certain mechanism that will allow truly sustainable product extractions from that forest.

- Practice multi-aged management. This management strategy incorporates perpetual, variable structure retention harvesting principles that are adaptable to a wide range of species and forest types. This approach ensures that the entire range of naturally occurring forest structures remains within the forest. (See above.) Eliminate rotation age and maximum diameter objectives, both commodity constructs, from the management regime. Visualize regeneration as a continuous wave-like pattern rather than a definitive point in time triggered by age or diameter. When harvesting base the selection process on tree quality and vigor. Retain those most likely to survive and maintain or improve in quality. Harvest those trees that appear least likely to live and improve in quality. However, always retain some trees that are not suitable for timber; they serve essential biological functions. Multi-age management requires working at various crown levels within stands. Follow harvests with timber stand improvement (TSI) practices such as cull removal, weeding, thinning and release. Accomplish this by girdling large excess trees that do not contain sawlog volume or are not designated as Legacy Trees and drop excess smaller stems.
- Eliminate and prevent the spread of exotic invasive plants. Utilize a variety of control methods including mechanical and chemical techniques. Whenever possible, control invasive plants prior to performing silvicultural treatments, especially harvests. Limit disturbance and maintain dense stands for long time periods to discourage invasives. Attempt to retain 300' uncut buffers between infested areas and uninfected areas. Invasive plants can, and do, modify and affect natural vegetation.
- Maintain a functioning forest first and foremost; all other desired outcomes will follow. Implement treatments that preserve future options and opportunities. Evaluate and modify treatments as necessary to achieve the desired goals and to accommodate an understanding of the site as more information is obtained.
- Identify, manage, and protect sensitive, fragile, unusual or rare plants, animals or communities. These are necessary and vital parts of the ecosystem.
- Relax utilization standards. The cost to harvest pulpwood and whole tree chips usually exceeds their value. Utilize full cost accounting. Recognize that any removal of any portion of a tree is not natural. Only those portions of the stem and that portion of the forest that have true economic value are worth harvesting. The remaining biomass should remain on site. Accomplish stand improvement for commodities and amenities via TSI practices.
- Relax top lopping requirements, except where human use demands this level of aesthetic manipulation. Top lopping is costly and dangerous. Lopping tops frequently severs established regeneration. Lopped tops do not supply the range of wildlife and micro-site habitats typically found when trees fall or break.

V. GUIDING PRINCIPLES

The recommendations and prescriptions in this report are firmly guided by the understanding that all things are connected; that humans did not weave the web of life, that we are merely a strand of that web and that whatever we do to that web, we ultimately do to ourselves. Any given forest ownership is only one small strand of the larger web. Forests are living, changing, functioning, resilient, diverse and dynamic systems composed of a vast number of plants and animals, both large and microscopically small. All forest components contribute to forest function; no part is more important or less necessary than any other part. A forest is much more than trees, and certainly far more than only those trees considered by humans to possess commercial value at some arbitrary point in time. Forests live in a time frame beyond human scale.

The recommendations in this report are further based on a respect for the intrinsic worth of all things; a respect for all components of the forest, those known and unknown, those seen and unseen, those understood and those not understood. The prescriptions are made from a humble perspective, but with strong convictions, and with the understanding that we, the "professional" foresters, still have more questions than answers. We know very little relative to the incredible intricacies of the forest, yet our recommendations and actions can have far-reaching implications. Forester, conservationist and author Aldo Leopold wrote, "Only a mountain has lived long enough to listen objectively to the howl of a wolf." We believe the same notion applies to the forest.

"The Practice of Forestry" assumes new meaning: we are eternally practicing, continuously observing and endlessly learning. After many years of "practicing" forestry, we have discovered that our intuition provides a reliable guide that is just as valid as our professional, scientific and technical knowledge. We must, as Leopold implied, think like a forest. We must feel like a forest, not a forester. This intuition, together with our knowledge and experience, weaves a tapestry of respect for the forest that hopefully manifests itself in a humble approach to responsible forest use and care.

Responsible forest use maintains options and choices. After a choice is made we can make another choice, and still another. The more options we create with our choices, the more choices we have. A "light" touch in the forest is preferable: choices remain numerous; harvests reap the abundance yet protect and maintain the rare and unique. Forest integrity, diversity and function are respected and maintained. The cardinal rule of "tinkering" with our environment is to keep all the parts. Waste does not exist in natural systems; all naturally occurring components have a place and a purpose. Diversity, stability and resiliency are ecologically inherent and necessary characteristics of all natural systems. Again, Aldo Leopold recognized these principles over one-half century ago. Many forestry professionals and forest landowners are just beginning to recognize and incorporate these concepts so eloquently stated by Leopold into current forestry practices. It is time for all of us to recognize that the forest is far more than only trees.

It is from this perspective that we offer the following suggestions to the Thetford Conservation Commission, the Thetford Board of Selectmen and the Thetford towns people for the stewardship and management of these town parcels.

VI. MANAGEMENT OBJECTIVES

The Thetford Conservation Commission, with the assistance of public input, developed the following general management objectives for the Hughes Forest, The Post Mills Nature Area, The Taylor Tract and The Thetford Town Forest.

Maintain and encourage a functioning, vital, indigenous forest.

- Protect and maintain all forest components, structures and functions.
 - Soil, water and nutrient and energy cycles
 - Fragile habitats and conditions including wetlands, water courses, seeps and springs and shallow soils
 - Rare, threatened and endangered plants and exemplary natural communities
 - Snags and cavity trees
 - Retained organic material (or down woody material)
 - Legacy Trees
- Encourage forest diversity.
 - Native plants
 - Native animals
 - Tree size and age class
 - Large diameter and uniquely formed trees
 - Unusual species
 - Stand density
 - Horizontal and vertical diversity

Create forest reserves (areas not managed for timber production).

- Designate the entire Post Mills Nature Area forest.
- Designate the Taylor Tract as a natural area.
- Designate a portion of The Hughes Forest as a reserve (see map).
- Designate a portion of The Town Forest as a reserve (see map).

Identify natural communities and vegetative types that would benefit from active management.

- Grasslands
- Alder stands
- Other shrub lands
- Productive and accessible forestland

Retain the services of a professional forester to implement silvicultural techniques designed to achieve management objectives.

- Non-commercial weeding, thinning and release in young stands
- Appropriate commercial thinning, improvement cuts and regeneration harvests
- Snag creation and snag and retained organic material (ROM) recruitment
- Reforestation to restore degraded conditions
- Trail design
- Invasive plant control

Utilize adaptive management to continually evaluate and refine management activities.

- Monitor and evaluate the properties and treatments periodically.
- Continue to build on the initial inventory by conducting more focused natural resource assessments.
 - rare, threatened and endangered plants
 - wetland communities

- Talus slopes and cliffs
 - Soil
 - Birds
 - ◆ Grassland dependent species
 - ◆ Early successional dependent species
 - ◆ Interior forest dependent species
 - Animals - especially those with specific habitat requirements
- Evaluate treatments periodically and review management plans every five years.
 - Update management plans every 15 years.

Utilize a landscape context when implementing management on Town properties.

- Work with surrounding property owners to identify and protect wildlife corridors.
- Work with surrounding property owners to protect vernal pools and surrounding areas (including those near, but not on town land).
- Work with surrounding property owners to protect other fragile and significant habitats.
- Evaluate management practices on abutting properties and factor them into management decisions on Town owned land.

Improve and maintain the forest for low impact public recreation and education.

- Maintain public access to town properties and provide modest parking.
- Provide low impact dispersed recreational opportunities for the public.
 - Walking
 - Skiing
 - Snow shoeing
 - Bird watching
 - Nature observation
 - Hunting and fishing
- Consider other recreational uses consistent with land constraints, easement conditions (where applicable) and the Conservation Commission's new trail policy.
 - Snowmobile trails
 - Single track hiking trails
- Encourage the educational use of the properties by schools, the community, professional organizations and educational groups for natural resource study.
- Continue the relationship with the Upper Valley Fish and Game Club that maintains the shooting range at the Town Forest.
 - Explore possibilities to expand public accessibility to the forest while maintaining use of the shooting range.

Control and prevent the proliferation of exotic invasive plants.

- Develop a plan to control invasive species on all of the parcels.

Explore conservation easements for the Taylor Tract and the Town Forest.

Establish a policy that dedicates the exclusive use of any funds generated from timber harvesting to managing or protecting the Town's natural resources and Town owned lands.

Consider the forest's role in sequestering carbon and offsetting carbon and other greenhouse gas emissions.

- Explore the potential for selling carbon credits.

Retain cultural and historical resources.

- Stone walls
- Cellar holes
- Wells
- Cemeteries
- Native American cultural sites

VII. TRACT DESCRIPTIONS

This section of the management plan is divided into four sections, one for each of the subject properties, that provides site specific data and information for each tract.

The Hughes Forest

Tract Description

The Hughes Forest encompasses 261.5 acres. The tract has been divided into three management units based on access and terrain. The North Compartment, 8.5 acres, is located northerly of Swanee Bean Road and fronts along this road for 960'. The tract fronts for about 1,770' on the south side of Sawnee Bean Road and 335' on the south side of Colby Road. Poor Farm Road and Whippoorwill Road, both class IV roads, bisect the property from north to south and form the dividing lines between the West and East Compartments. The West Compartment lies west of Poor Farm Road; it fronts the latter for about 4,045' and encompasses 112 acres. The East Compartment of 141 acres is located east of Poor Farm and Whippoorwill Roads. This compartment fronts Poor Farm Road for approximately 2,70' and Whippoorwill Road for about 2,125'. Boundary lines are flagged and flagged lines appear consistent with field evidence.

Upland forests compose 251.5 acres, or 96% of the property. One acre of semi-open land is found in the North Compartment and two acres of the East Compartment are open. Three acres of wetlands were mapped, all located in the East Compartment. A black ash forested wetland occupies two acres and a shrub wetland is located along Whippoorwill Road in the Southwest corner of the compartment. Other small wetlands are associated with streams, seeps and springs on the property. Five vernal pools were found in the East Compartment and one was observed in the West Compartment. A beaver pond, formerly 3 acres before heavy rains breached the damn in 2006 and caused downstream erosion, is located in the northwest corner of the East Compartment between Poor Farm and Sawnee Bean Roads. Shrubs surround the pond and emergent growth is filling in the majority of the formerly flooded area.

Access to the property for timber harvesting is fair to poor, despite the extensive road frontage. Only one landing is found on the property; it is located in the East Compartment along Whippoorwill Road about half way between the junction with Poor Farm Road and the southwest corner of the compartment. This landing serves a portion of stand #2 and the working forest portion of stand #4.

Previous harvesting operations utilized the adjacent fields for landings that were formerly owned by Mr. Hughes. Excepting 2 acres in the East Compartment, the town does not currently own these fields. An additional landing must be constructed in the East Compartment and at least one landing is needed in the West Compartment; two are preferable if the topography allows. Additional field reconnaissance is needed to evaluate and determine potential landing locations. A portion of the 2-acre field or the central portion of stand #1, in both cases, adjacent to Poor Farm Road and in the East Compartment, are workable sites. In the West Compartment stand #2 affords the best opportunity for a landing. An additional landing in the northern portion of the West Compartment is optimal, but may not be possible due to topographic constraints. It may be possible to consolidate the West and East Compartment landings into stand #1 of the East Compartment, providing it is acceptable to cross Poor Farm Road with harvesting equipment (preferably a forwarder). All harvesting operations should be conducted on snow covered ground during the winter to mitigate the potential negative impact of this option. Landings could serve the dual purpose of providing public parking. Limit motorized and/or wheeled vehicle access to landings and trails during spring mud-season and other times that the soil is saturated and subject to rutting, compaction and erosion.

ACREAGE CHART

Stand #	Stand Code	Vegetation Type	Area	
			Total	Reserve
			(in acres)	
<i>North Compartment, 8.5 acres</i>				
1	WP3-4B	white pine	3	3
2	HM/NH3-4B	hemlock/Northern hdwd.	4.5	4.5
		open	1	1
		Total	8.5	8.5
<i>East Compartment, 141 acres</i>				
1	WP4B	white pine	33	0
2	WP4B	white pine	27	0
3	WP4B	white pine	14	14
4	HM/NH4B	hemlock/Northern hdwd.	46	35
5	HM/NH4B-A	hemlock/Northern hdwd.	11	11
6	BA/AE/RM3B	b. ash/A. elm/r. maple	2	2
		old beaver pond	3	3
		shrub	2	2
		open	2	0
		wetland	1	1
		Total	141	68

West Compartment, 112 acres

1	WP4B-A	white pine	14	3
2	WP4B-A	white pine	4	0
3	HM4B	hemlock	42	19
4	SM/BE/YB4-3A	s. maple/beech/y. birch	20	5
5	NH/HM3-4B-A	Northern hdwd./ hemlock	19	5
6	NH/HM3-4B-C	Northern hdwd./ hemlock	13	0
		Total	112	32
	TOTAL AREA		261.5	108.5

The Landscape***Topography***

The Hughes Forest lies between two hills, both named Childs Hill; both summits are located on abutting properties. The West Compartment sits on eastern flank of Childs Hill (west). The terrain varies widely; most of the tract occupies moderately steep to extremely steep slopes. Limited areas of nearly flat to gentle terrain are found in the eastern and central sections of the compartment. Two extensive rock outcrop bands, both running north to south are found within the compartment. One band runs along the west boundary in the northwest quadrant of the compartment; talus slopes are associated with this in places. Another band is more centrally located and runs from near Sawnee Bean Road southerly for about 2/3rds the length of the compartment. A steep rocky area is also located in the southwest corner of the compartment. Slopes are very steep in these areas, exceeding 50% grades in places. Occasional benches intersperse the steeper terrain; old harvesting trails make frequent use of these topographic breaks. Topographic relief is relatively high. Elevations range from 800' at the junction of Poor Farm and Sawnee Bean roads to just over 1200' at the southwest property and compartment corner.

The North Compartment lies along Barker Brook on the north side of Swanee Bean Road. The field and white pine stand occupies relatively gentle terrain along the southern portion of this compartment. The northern portion of the compartment slopes steeply north to Barker Brook; grades range from 25% to 50%. Elevations range from about 740' to 810'.

The terrain in the East Compartment is variable with moderate topographical relief. The majority of the western portion of the compartment as well as most of the area between Sawnee Bean Road and the brook flowing out of the old beaver pond occupies gentle to moderate slopes; grades range from nearly flat to up to 15%. The outflow brook from the beaver pond is deeply incised with very steep side slopes that typically exceed 50%.

The southeast portion of this compartment lies on the western flanks of Childs Hill (East); slopes steepen here ranging from 10 to 50%. These slopes include rock outcrops that run north to south with an occasional bench or troughs that lie between rocky spines. A small portion of the ridge top of Childs Hill is located in the compartment; it is the height of land at about 1020'. The low point is located in the northeast section of compartment where the beaver pond stream leaves the property, at approximately 670'.

The topographic map of the tract depicts these features.

Hydrology

The Hughes Forest is in the East Branch of the Ompompanoosuc River watershed. Rain and snowmelt runs off the property carried by unnamed intermittent and perennial streams both easterly and southerly into the East Branch.

The West Compartment drains into two unnamed intermittent channels. One brook flows north and appears to cross Sawnee Bean Road before flowing into Barker Brook. The other drainage flows northeasterly into the pond that lies in the northwest corner of the East Compartment. Two vernal pools are found within the West Compartment and another is located just west of the property on abutting land. Three semi-alluvial seeps were identified and mapped during the inventory. A Hemlock-hardwood swamp is found along the jog in the west boundary line; the majority of this wetland extends southerly from the subject property onto the abutting tract.

Water from the North Compartment runs off through a series of seeps and subsurface flow directly into Barker Brook. Barker Brook empties into the East Branch about 2,000' easterly of the property boundary. A small seepage marsh is found within the old field white pine stand. A narrow outlet drains this marsh; there is no evidence of a dam.

The East Compartment is rich in water resources. The north and central portions of the East Compartment are drained by a series of seasonal and perennial streams. The pond outlet stream flows perennially, draining directly into the East Branch of the Ompompanoosuc River about 1,000' easterly of the east boundary line. Like many small ponds in the region, beavers previously dammed this pond outlet. The dam failed during torrential rains in 2006, sending a surge of water downstream contributing to further channel downcutting. Two northeasterly flowing seasonal brooks that merge and become perennial also feed the outlet stream. Another perennial stream located in the east central portion of the property drains the larger black ash swamp, flowing parallel to the east boundary before crossing the property line. The water in the southern portion of the compartment runs off via a south flowing seasonal stream. This drainage becomes perennial after leaving the property. It runs parallel to Whippoorwill Road, crossing from the west to the east side and back again to the west side of the road before crossing Tucker Hill Road. This stream empties into the East Branch approximately 1.8 miles downstream of the southwest corner of East Compartment.

The central portion of the East Compartment contains numerous seeps, sloping seepage marshes, two mixed sloping seepage forests and small intermittent channels. Two black ash/red maple swamps occupying about 2 acres combined, are also located in the central portion of this compartment. Buckland and Cabot soils underlie much of the central area of the compartment; both soils are underlain with hardpan that limits water infiltration. This dense compacted soil layer creates a perched, or raised, water table during rain storms or spring snowmelt creating wetland conditions.

The southern section of the compartment supports a number of interesting wetlands. Another small hemlock-hardwood seepage swamp is found about 330' east of the corner of the jog in the property line. This is hydrologically associated with the three seepage marshes to the south and is linked by the seasonal stream connecting them. The southern most seepage marsh in the southwest corner of the compartment was probably partially created when Whippoorwill Road was constructed. The road fill created a dam that ponded water during runoff and caused sedimentation and the subsequent upstream wetland that is now evident. Four vernal pools were found; they all are located between rocky spines in the southeast section of this compartment just below Childs Hill.

Although the aggregate of the wetlands found on the Hughes Forest comprise a small area they nonetheless play a critical ecological role on the landscape. The streams and associated wetlands provide biological diversity, (unique plants, animal habitats and plant communities) creating a variety of conditions that are not found on the uplands sites of the property. They also perform hydrological functions such as filtering water and buffering storm runoff. Wetland areas often are the first areas to 'green up' in the spring and provide a much needed wildlife food source early in the growing season. These water-influenced communities are not confined to the property, but are found across the landscape, regardless of property

ownership. The impact of forest management activities on these habitats also travels beyond the property boundaries.

While these water resources provide important watershed functions and processes within the property and downstream, they also create management and logistical challenges for timber harvesting. Past harvesting on the tract has negatively impacted the water resources, fortunately on a minor scale; the hydrology of the site may also have been modified. Careful design, planning and implementation of forest management activities will protect soil and water resources, site productivity, associated fragile plant communities, and forest nutrient and energy cycles. Employ the following strategies to protect water resources and soil:

- Identify and flag all streams, seeps and springs and wetlands prior to harvest.
- Design a harvest trail system that parallels streams and minimizes and avoids stream and wetland crossings to the greatest degree that the topography allows.
- Prohibit equipment from entering and crossing seeps and springs.
- When operating on hardpan soils and in proximity of wetlands and water, harvest timber only during the winter months with snow-covered ground conditions and cold temperatures to protect soil, water, and plant resources.
- Design and maintain buffers adjacent to streams, wetlands, springs and seeps. Designate these buffers as special management zones. Limit forest management in these areas to light thinning, selection harvesting or, on fragile sites, **“No Harvest”** zones. Follow the guidelines published in Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont (1987).

Soils

The *Soil Survey of Orange County, Vermont* (1978), indicates that there are five soil series underlying the Hughes Forest: Buckland, Cabot, Colrain, Tunbridge-Woodstock complex, Tunbridge-Woodstock Rock outcrop complex and Stowe. The Tunbridge-Woodstock complexes are the dominant soil types on the property, covering over 50% of the tract. The Appendix includes a soil map that depicts specific soil locations and a table that summarizes potential management challenges by slope class, including heavy equipment limitations, erosion and wind throw hazards. General soil characteristics for the primary soil series are briefly described below. Additional detail may be obtained from the Soil Survey of Orange County, Vermont,

Buckland soils are usually found on the middle and lower slopes of bedrock-controlled hills and ridges. This soil consists of a stony or very stony loam that is well drained to moderately well drained and deep (>60"). The soils formed in glacial till derived from schist, shale and sandy limestone. A hardpan occurs 16" to 33" below the surface. This pan layer impedes drainage and is responsible for a seasonally high water table. On the Hughes Forest this soil occupies slopes of 8 to 15% and 8 to 25%.

Cabot soils consist of a very stony silt loam. They are typically found at the lower positions of hills and ridges, in depressions and along streams. Cabot soils occupy 3 to 15% slopes on the Hughes Forest. The parent material of this soil is glacial till derived from siliceous limestone and schist. These soils are deep, somewhat poorly drained and underlain with a fragipan at 12" to 24". This pan layer impedes drainage and the water table is at or near the surface in the spring and during other periods of high rainfall.

Colrain soils are usually found in convex areas on the sides and tops of hills and ridges. This soil consists of a very stony fine sandy loam that is well drained and deep (>60"). Colrain soils were formed in glacial till derived from siliceous limestone and schistose rocks. This soil is found on the 25% to 50% slope class on the Hughes Forest. Soil productivity for trees is ranked moderately high.

The Tunbridge-Woodstock complex is composed of about 45% of each soil type and 10% of included soils. Small areas of Glover, Vershire, Colrain and Pomfret soils and rock outcrops are mapped within this complex. It is found on slopes ranging from 25 to 50%. The Tunbridge soil consists of very rocky fine sandy loam that is deep and well drained. They are found where the topography is bedrock controlled: side hills, hilltops and ridges.

Woodstock soils are only mapped in complexes with the above Tunbridge soils and are therefore found in the same position on the landscape. This soil consists of very rocky fine sandy loam that is shallow and somewhat excessively drained. It is considered less productive than the Tunbridge soils.

The Tunbridge-Woodstock Rock outcrop complex is composed of about 45% Tunbridge soils, 35% Woodstock soils, and 10% rock outcrops. These soils are typically found on 8 to 25% grades on the subject property. This soil series has the same soil characteristics as the Tunbridge-Woodstock complex listed above except it contains a greater proportion of rock outcrop and is found on slopes that are not as steep.

Stowe soils cover less than 5% of the Hughes Forest; it is the predominant soil underlying Stand #2 in the West Compartment. These soils formed in loamy, compact glacial till on uplands. Stowe soils are very deep to bedrock and shallow to moderately deep to a fragipan; they are considered well and moderately well drained. These soils have a perched water table at depths of 18" to 30" below the surface from late Fall through late Spring.

Existing Uses

The Hughes Forest is primarily a forested property with two small open areas and streams and associated wetlands. Until the beaver dam was breached in 2006, beavers were active in and around the pond.

The Snowcoaster Snowmobile Club has historically used the unmaintained portion of Whippoorwill Road and Poor Farm. The club approached the Conservation Commission with a request to move the trail off of Whippoorwill Road onto the Hughes Forest. Philip O'Donnell representing the Snowcoasters, Li Shen, representing the Conservation Commission and Ehrhard Frost designed a segment of trail that commenced north of the wetland in the southwest corner of the East Compartment and terminated back on the road southerly of the landing. Wetlands and ledges prevented the trail from extending further north to the landing as originally hoped for by the club. Approximately 1,330' of trail was constructed in the winter of 2007-08 and was used by snowmobilers that winter. The club hopes to move additional portions of the trail off these roads and through the Hughes Forest in the future. The Conservation Commission is developing a trail and use application process to handle such requests.

Though there are currently no other known or documented use of the property, it is assumed that the Hughes Forest is utilized for low impact recreation such as, walking/hiking, bird watching and hunting.

The former owner, Charles Hughes, enrolled the property in the Vermont Use Value Appraisal Program. Numerous and extensive harvests were conducted between 1991 and 1998. Mr. Hughes died in January 1999. There is no record or evidence of harvesting since Mr. Hughes' death.

Forest Inventory

The Hughes Forest was examined and inventoried on 2, 3, 4, 9 and 13 October 2007. The North Compartment was designated as Reserve Area and was not included in the forest inventory. The Forest Management Plan and type map for the Charles W. Hughes Estate, dated March 2002 by Redstart Forestry was reviewed prior to designing the inventory. A systematic grid was designed for the West and East Compartment. Transects on the West Compartment were run at a bearing of N 15° E (S 15° W) with sample points located at 417' intervals. Perpendicular offsets were made at 625' intervals at a bearing of N 75° W (S 75° E). The grid in the East Compartment utilized the same bearings, though the spacing between transects was modified. In the northern portion of the compartment sample points and transects were on a 417' by 417' grid; in the central portion of the compartment transect lines were 625' apart with sample points remaining at 417' intervals. The grid reverted to the original 417' by 417' pattern in the southern portion of the compartment. All bearings were referenced to magnetic North. The grids were occasionally modified in the field. See the inventory map for additional detail.

Forest inventory data was collected at 24 sample points in the East Compartment and 24 sample points in the West Compartment. Five increment borings were taken in the West Compartment and 9 in the East Compartment.

Specific Management Objectives

- ***Designate a portion of The Hughes Forest (see map) as a reserve.***
 - Vernal pools and buffers
 - Seeps and other wetlands
 - Talus woodland
 - Talus slopes, cliffs and ledges
 - Rare, threatened and endangered species
 - Black ash/red maple swamp
 - All the forested portion of the Northern section
 - Riparian corridors and buffers (including Barker Brook)
 - The old beaver pond
- ***Further evaluate existing natural habitat relating to:***
 - Porcupine
 - Bobcat
 - Forest interior birds
 - Early successional dependent birds
 - Wetland and water dependent birds
- ***Incorporate appropriate recreational uses.***
 - low impact dispersed recreation
 - possible expansion of snowmobile trail
 - hunting
- ***Explore timber harvesting potential.***
 - Utilize harvesting as a tool to accomplish long range management objectives.
- ***Develop a plan to control invasive plants.***

Forest Types: Descriptions & Prescriptions

North Compartment

Stand # 1 Stand Code: WP3-4B (SAF# 21) Total Area: 3 acres
(Working Forest: 0 acres Forest Reserve: 3 acres)

Forest Type: White Pine **Size Class:** poles to standards
Stocking level: adequately stocked **Stand Condition:** even-aged

Soil type: Cabot (3-15%) **Site index:** SM 56 & YB 56

Site Class: II **Number of Samples:** 0

Stand Data: NO DATA

Natural Community: Northern hardwood forest with a small seepage marsh

Invasive Plants (ocular): none noted; requires additional investigation

Special Features: seepage marsh with narrow outlet, no evidence of a dam, associated with a small stream

Stand Description and History: This white pine stand occupies a bench above Barker Brook. Aspen is also prominent in the overstory in portions of the stand. Slopes are gentle to moderate; the aspect is northerly. The stand originated from an old field and is even-aged.

This area was identified as a forest reserve prior to conducting the forest inventory, therefore the stand was not sampled. Brett Engstrom examined the area to classify the natural communities. The stand is typical of old field pine and also includes aspen, paper birch, red maple and other hardwoods. Timber quality is poor according to the Redstart plan.

Disturbance: No past harvesting noted. White pine weevil and blister are evident. Natural mortality and single tree fall common.

Stand management objectives:

- ❖ Maintain as a natural stand allowing the forest to develop without significant human intervention.

Prescription: No treatment. Monitor natural stand development.

-

Stand # 2 Stand Code: HM/NH3-4B (SAF# 23 & 25) Area: 4.5 acres
(Working Forest: 0 acres Forest Reserve: 4.5 acres)

Forest Type: Hemlock/Northern Hardwoods
Stocking level: adequately stocked

Size Class: poles to standards
Stand Condition: unknown

Soil type: Colrain (25-50%)

Site index: WP 75, RO 66 & SM 65

Site Class: I

Number of Samples: 0

Stand Data: NO DATA

Natural Communities: hemlock/Northern hardwood forest

Invasive Plants (ocular): none noted; requires additional investigation

Special Features: steep ravine of Barker Brook and associated riparian area

Stand Description and History: This stand occupies very steep banks along Barker Brook. Very little time was spent examining this stand by the inventory team.

Disturbance: No past harvesting noted. Ravine banks are steep. Additional investigation is required.

Stand management objectives:

- ❖ Maintain as a natural stand allowing the forest to develop without significant human intervention.
- ❖ Maintain as a vegetative buffer to protect water and soil.

Prescription: No treatment.

East Compartment

Stand # 1 Stand Code: WP4B (SAF# 21) Area: 33 acres
(Working Forest: 33 acres Forest Reserve: 0 acres)

Forest Type: White Pine **Size Class:** standards
Stocking level: adequately stocked **Stand Condition:** even-aged

Soil type: Buckland (8-25%) **Site index:** WP 71, YB 60 & SM 57
 Cabot (3-15%) SM 56 & YB 56
 Colrain (25-50%) WP 75, RO 66 & SM 65
 Tunbridge- WP 75 & RO 70
 Woodstock-Rock outcrop complex (8-25%) RP 60 & BF 58

Site Class: I/II **Number of Samples:** 6

Stand Data:

Species Composition (% BA): white pine 73%, red maple 11%, black cherry 5%, hemlock 2%, sugar maple 2%, white ash 2%, quaking aspen 2%, and paper birch 2%

Regeneration Species (ocular): moderate/- overall; beech, sugar maple, white ash, hophornbeam, red oak, red maple, striped maple & white pine.

TOTAL STOCKING AND VOLUME

Basal Area/acre: 177 sq. ft./ac **Trees/acre:** 292
MSD: 11 inches **Merchantable MSD:** 13 inches

Grade logs: 8,500 BF/acre **Pallet logs:** 1,500 BF/acre **Total BF:** 10,000 BF/acre
Percent of BF volume **Percent Total Volume**
 85% 15% 49%

Pulp: 21 cords/acre (10,500 BF equivalent) **Total volume:** 20,500 BF (41 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 94 sq. ft./acre
Intermediate: 43 sq. ft./acre
Suppressed: 40 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 73 sq. ft./ac **AGS Trees/acre:** 53
AGS MSD: 16 inches **AGS Merchantable MSD:** 16 inches

UGS Basal Area/acre: 104 sq. ft./ac **UGS Trees/acre:** 239
UGS MSD: 9 inches **UGS Merchantable MSD:** 12 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	4 sq. ft.	0 sq. ft.	4 sq. ft.
6"-10" DBH:	50 sq. ft.	0 sq. ft.	50 sq. ft.
12"-16" DBH:	53 sq. ft.	36 sq. ft.	17 sq. ft.
18"-24" DBH:	67 sq. ft.	37 sq. ft.	30 sq. ft.
26" + DBH:	3 sq. ft.	0 sq. ft.	3 sq. ft.
Total:	177 sq. ft.	73 sq. ft.	104 sq. ft.

Ecosystem Structural Components

Cavity trees: Low **Vertical Diversity:** Low **Horizontal Diversity:** Low/
+

Retained Organic Material: Low **Mast trees:** Low

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	10 sq. ft.	40
12"-16" DBH:	7 sq. ft.	7
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	17 sq. ft.	47

Potential Legacy Trees: Basal Area/Acre: 3 sq. ft./ac. **Trees/acre:** 2

Natural Communities: semi-rich Northern hardwood forest, about 6 acres of hemlock/Northern hardwood forest (could be Northern hardwood forest) between the eastern section of stand # 4 and # 5

Invasive Plants (ocular): moderate/+ overall, common buckthorn, honeysuckle, barberry & Asiatic bittersweet

Special Features: 2 seeps, 2 sloping seepage swamps, 2 intermittent brooks, Loose sedge (S2/S3), small ledgy area with talus slope & porcupine den

Stand Description and History: Stand origin is from old fields. The stand fronts along Poor Farm Road and a short section of Whippoorwill Road, extending easterly to the property boundary. Slopes are gentle in the majority of the stand; they become steeper east of the stonewall. The stand quality is good east of the field and the "out" lot as well as east of the wall. This section of the stand also supports higher stocking levels and has never been thinned. A dense canopy, low herbaceous populations and limited regeneration characterize these sections of the stand. The majority of the stand supports trees that are average to low quality for timber production. Stocking levels are lower and regeneration and the shrub layer (invasives) are well developed. The stand age is estimated at 55 to 65 years old. One increment core was taken from a 20" DBH white pine. This tree was 57 years old, growing 10 rings/radial inch (2" of diameter in 10 years) and exhibited red rot in the core sample.

Disturbance: Little evidence of logging was noted though the Redstart plan indicates portions of the stand were harvested in the early 1990s. White pine weevil damage is prevalent throughout most of the stand and many trees therefore exhibit multiple tops. Blister rust is also evident. Natural mortality and single tree fall is common. Heavy herbivore browse was noted on hardwood regeneration.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect rare plants, fragile conditions and sensitive areas.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Retain and protect cultural resources.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription:

Invasive control is the highest priority in this stand. Accomplishing this protects rare plants and native plant communities and encourages forest diversity. Control invasives prior to harvesting activity. Secure cost-sharing from any available source to fund this activity. Utilize volunteers to hand pick small plants. Treat mature plants with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. This method is relatively quick and very effective; high mortality with very minimal sprouting is achieved. Schedule the first treatment in 2013-14 or earlier if funding is available. Follow up with a second treatment (hand pulling and chemical) two years after initial treatment. Continue to monitor and treat as necessary to allow a vigorous population of native plants to develop and to permit successful regeneration.

Protect soil, water, rare plants, fragile conditions and sensitive areas by identifying, mapping and clearly flagging all such features prior to any harvest. Design harvests to avoid disturbing wetland communities, rocky talus slopes and ledges. When necessary, cross streams using portable bridges. Harvests only on snow covered ground during the winter to protect soil and water. Contact the Vermont Non-Game and Natural Heritage Program to determine whether Loose sedge is sensitive to or benefits from disturbance. Act appropriately to protect and enhance this population.

Design harvest trails to avoid damaging stone walls, springhouse and other cultural resources. Utilize existing barways in walls and expand them if necessary. Create new barways only if other alternatives are not available.

Implement multi-aged management, incorporating perpetual, variable retention harvesting principles, to maintain and enhance the existing stand. Multi-age management requires working at various crown levels within the stand. A shift to a multi-aged stand structure will require 40 to 50 years.

- Commercially thin northern and eastern portions of the stand to improve stand vigor and emulate natural thinning. The increased light levels should stimulate herbaceous growth and add to plant diversity. Openings will generally be too small to initiate tree regeneration. Schedule for 2020-22, or earlier.
- In the remaining portion of the stand implement group selection to establish regeneration and release existing advanced regeneration. Create canopy openings that are no wider than the height of the dominant trees. The objective is to regenerate hardwoods. Schedule for 2020-22, or earlier.

- Evaluate the need for Forest Stand Improvement (FSI) both prior to and following commercial harvesting. The removal of suppressed trees, all of which are unacceptable growing stock, just prior to or following harvest could provide future advantages by improving stand quality and creating additional space for the remaining trees. Girdle a portion of the large, coarse dominant white pine component that does not contain any sawlog value. This will improve ecosystem structure by creating large diameter snags and will produce future large diameter ROM.
- Begin designating Legacy Trees prior to harvest with “DO NOT CUT” flagging. Ultimately, as the stand matures, retain about 10-20% of a fully stocked stand, or about 18 to 52 square feet of basal area/acre or about 9 to 25 trees/acre. The inventory identified 2 Legacy Trees/acre representing 3 square feet of basal area/acre. This practice will maintain large diameter trees in the stand, perpetually providing this important structural element. Additionally, it provides for future snag and ROM recruitment and provides increased vertical diversity.
- Maintain higher stocking levels than traditionally recommended for optimum, short rotation timber production wherever stem quality is above average. Strive for consistent and relatively slow growth to achieve high quality, fine-grained timber. A growth rate of 8 to 12 rings per radial inch during the first 100 years, slowing to 12 to 16 rings per radial inch after that period is the goal. As the stand shifts to hardwoods in the future this goal may shift.
- Utilize a cutting cycle of about 10 to 15 years in well-stocked areas that are thinned until age 100 to 120. Lengthen the cutting cycle to 15 to 20 years thereafter. Also utilize the later cutting cycle for group selection harvests.
- Do not lop tops. Unlopped tops provide better wildlife habitat while also helping to minimize deer browse.
- Maintain tree cover along the brook via a variable width buffer and prohibit equipment from entering seeps and springs.
- Harvest timber only during winter months, with snow cover and cold temperatures, to protect both water and soil.

Stand # 2 **Stand Code: WP4B (SAF# 21)** **Area: 27 acres**
(Working Forest: 27 acres Forest Reserve: 0 acres)

Forest Type: White Pine
Stocking level: adequately stocked

Size Class: standards
Stand Condition: even-aged

Soil type: Buckland (8-25%)
Colrain (8-50%)
Tunbridge-
Woodstock-Rock outcrop complex (8-25%)

Site index: WP 71, YB 60, SM 57
WP 75, RO 66 & SM 65
WP 75 & RO 70
RP 60 & BF 58

Site Class: II

Number of Samples: 6

Stand Data:

Species Composition (% BA): white pine 54%, hemlock 18%, red maple 11%, sugar maple 9%, quaking aspen 4%, and red oak 4%

Regeneration Species (ocular): moderate/- overall; beech, red oak, black cherry, red maple, white ash, white pine, balsam fir, sugar maple, hophornbeam, red spruce & striped maple.

TOTAL STOCKING AND VOLUME

Basal Area/acre: 153 sq. ft./ac
MSD: 13 inches

Trees/acre: 168
Merchantable MSD: 13 inches

Grade logs: 10,000 BF/acre
97%

Pallet logs: 300 BF/acre
Percent of BF volume
3%

Total BF: 10,300 BF/acre
Percent Total Volume
53%

Pulp: 18 cords/acre (9,000 BF equivalent)

Total volume: 19,300 BF (39 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 80 sq. ft./acre
Intermediate: 40 sq. ft./acre
Suppressed: 33 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 73 sq. ft./ac
AGS MSD: 14 inches
inches

AGS Trees/acre: 71
AGS Merchantable MSD: 14

UGS Basal Area/acre: 80 sq. ft./ac
UGS MSD: 12 inches
inches

UGS Trees/acre: 97
UGS Merchantable MSD: 12

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
6"-10" DBH:	33 sq. ft.	6 sq. ft.	27 sq. ft.
12"-16" DBH:	67 sq. ft.	44 sq. ft.	23 sq. ft.
18"-24" DBH:	36 sq. ft.	23 sq. ft.	13 sq. ft.
26" + DBH:	17 sq. ft.	0 sq. ft.	17 sq. ft.
Total:	153 sq. ft.	73 sq. ft.	80 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/+ **Vertical Diversity:** Low/+ **Horizontal Diversity:** Moderate/-

Retained Organic Material: Moderate/+ **Mast trees:** Low

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	13 sq. ft.	35
12"-16" DBH:	20 sq. ft.	14
18"-24" DBH:	7 sq. ft.	3
26" + DBH:	0 sq. ft.	0
Total:	40 sq. ft.	52

Legacy Trees (Basal Area/Acre): 23 sq. ft./ac **Trees/acre:** 15

Natural Communities: semi-rich Northern hardwood Forest with a series of 3 seepage marshes associated with the seasonal drainage and the wetland in the southwest corner of the compartment; also, a small red maple/black ash swamp embedded within the larger community

Invasive Plants (ocular): Low/+ overall: honeysuckle & barberry.

Special Features: seasonal stream and associated seepage marshes, 2 mixed sloping seepage forests, a vernal pool and a small black ash/red maple swamp.

Stand Description and History: Former agricultural land that reverted to white pine and is shifting to white pine/red oak/red maple. The stand fronts along Whippoorwill Road, beginning just south of the intersection with Poor Farm Road and extending southerly to the southwest corner of the compartment. Slopes are gentle in the majority of the stand becoming steeper east of the seasonal drainage. Cabot soils underlie the drainage. The timber quality of this stand is slightly better than the adjacent stand #1; stocking levels are also lower. The stocking level varies greatly in the stand ranging from a low of 40 square feet of basal area/acre to a high of 240. The stand age is estimated at 60 to 80 years old. Four increment cores were taken: two white pine, one hemlock and one red oak; these data are found below.

Species	Age	Rings/radial inch
White pine	60	6
White pine	42	8
Hemlock	65	18
Red oak	43	8

The core sample ages indicate two age classes. Ocular age estimates include an 80 to 100 year age class for a portion of the pine component. (Redstart's plan estimates that the larger pines are "at least 80 years old" while "many of the trees are around 60 years old.") Portions of the stand also support well-developed white pine and hardwood regeneration that is estimated at 10 to 20 years old. Though not found on every acre of the stand, it appears that four age classes may be present.

Disturbance: This stand was harvested in 1997-98, as well as about tens years prior. White pine weevil damage and blister rust are minor in occurrence and impact. Heavy herbivore browse on hardwoods and balsam fir was noted. Wind damage was noted, especially in

heavily logged areas. Logging damage to residual stems was observed. Invasives, though currently found at low levels, are a continuing management concern.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Consider timber harvesting to accomplish ecological objectives.
- ❖

Prescription: Invasive control is a medium priority in this stand due to the lower populations levels than found in stand #1. Control invasives prior to harvesting activity. Secure cost-sharing from any available source to fund this activity. Utilize volunteers to hand pick small plants. Treat mature plants with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. This method is relatively quick and very effective, achieving high mortality with negligible sprouting. Schedule the first treatment in 2017-18 or earlier if funding is available. Follow up with a second treatment (hand pulling and chemical) two years after initial treatment. Continue to monitor and treat as necessary to allow a vigorous population of native plants to develop and to permit successful regeneration.

Protect soil, water, rare plants, fragile conditions and sensitive areas by identifying, mapping and clearly flagging all such features prior to any harvest. (Note, rare plants were not observed during the inventory and natural community assessment, but may be present.) Design harvests to avoid disturbing wetland communities; cross the seasonal drainage using portable bridges. Harvest only on snow covered ground during the winter to protect soil and water.

Implement multi-aged management, incorporating perpetual, variable retention harvesting principles, to maintain and enhance the existing stand. Multi-age management requires working at various crown levels within the stand. This stand may currently contain four age classes. A portion of the advanced regeneration may not survive browsing and the shading of the overstory in places. A ten to fifteen year cutting cycle, as historically practiced and recommended appears to be too short, at least at the previous cutting intensities. Harvesting is not recommended until 2025-29. Monitor stand condition, particularly the 10 to 20 year old advanced regeneration. If site-suited regeneration is in jeopardy by delaying harvesting for 17 to 21 years (a 27 to 31 year entry cycle) modify the schedule and treat sooner.

- Implement group selection to release existing advanced regeneration and to create hardwood regeneration in densely stocked portions of the stand. Thinning in dense portions of the stand that support adequate acceptable growing stock may also be appropriate. Create canopy openings that are no wider than the height of the dominant trees. Schedule for 2025-29, or earlier.
- Evaluate the need for Forest Stand Improvement (FSI) both prior to and following commercial harvesting. The removal of suppressed trees, all of which are unacceptable growing stock, as well as girdling selected individuals to provide snags and future ROM will provide future advantages by improving stand quality and creating additional light for the advanced regeneration that is in danger of dying.
- The inventory identified 10 Legacy Trees/acre, representing 23 square feet of basal area/acre currently present within the stand; this is approximately at the 10% level of

full stand stocking recommended for Legacy Trees. Designate and mark Legacy Trees with "DO NOT CUT" flagging or other methods at any time professionals or TCC members are on site. The Legacy Trees currently identified will increase in basal area. This practice will maintain large diameter trees in the stand, perpetually providing this important structural element. Additionally, it provides for future snag and ROM recruitment and provides increased vertical diversity.

- Maintain higher stocking levels than traditionally recommended for optimum, short rotation timber production wherever stem quality is above average. Strive for consistent and relatively slow growth to achieve high quality, fine-grained timber. A growth rate of 8 to 12 rings per radial inch during the first 100 years, slowing to 12 to 16 rings per radial inch after that period is the goal. As the stand shifts to hardwoods in the future this goal may shift. Consistent growth is more important for product quality and structural integrity than fast growth.
- Utilize a cutting cycle of about 10 to 15 years in well-stocked areas that are thinned until age 100 to 120. Lengthen the cutting cycle to 15 to 20 years thereafter. Also utilize the longer cutting cycle for group selection harvests.
- Do not lop tops. Unlopped tops provide better wildlife habitat while also helping to minimize deer browse.
- Maintain tree cover along the seasonal brook, around the shrub wetland in the southwest corner of the compartment and the interface with black ash/red maple forested wetlands. Utilize a variable width buffer that is defined on the ground by topography, hydrology and soil type.
- Harvest timber only during winter months, with snow cover and cold temperatures, to protect both water and soil.

Stand # 3 Stand Code: WP4B
(Working Forest: 0 acres)

(SAF# 21) Area: 14 acres
Forest Reserve: 14 acres)

Forest Type: White Pine
Stocking level: adequately stocked

Size Class: standards
Stand Condition: even-aged

Soil type: Colrain (8-25%)

Site index: WP 75, RO 66 & SM 65

Site Class: I

Number of Samples: 3

Stand Data:

Species Composition (% BA): white pine 95% and yellow birch 5%

Regeneration Species (ocular): low/+ overall; beech, red oak, white pine, balsam fir, basswood, hemlock, red maple, sugar maple & striped maple.

TOTAL STOCKING AND VOLUME

Basal Area/acre: 140 sq. ft./ac
MSD: 11 inches

Trees/acre: 205
Merchantable MSD: 16 inches

Grade logs: 4,500 BF/acre **Pallet logs:** 4,000 BF/acre **Total BF:** 8,500 BF/acre
Percent of BF volume **Percent Total Volume**
53% 47% 49%

Pulp: 18 cords/acre (9,000 BF equivalent) **Total volume:** 17,500 BF (35 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 100 sq. ft./acre
Intermediate: 40 sq. ft./acre
Suppressed: 0 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 60 sq. ft./ac
AGS MSD: 9 inches
inches

AGS Trees/acre: 147
AGS Merchantable MSD: 15

UGS Basal Area/acre: 80 sq. ft./ac
UGS MSD: 16 inches
inches

UGS Trees/acre: 58
UGS Merchantable MSD: 16

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	7 sq. ft.	7 sq. ft.	0 sq. ft.
6"-10" DBH:	20 sq. ft.	13 sq. ft.	7 sq. ft.
12"-16" DBH:	27 sq. ft.	7 sq. ft.	20 sq. ft.
18"-24" DBH:	86 sq. ft.	33 sq. ft.	53 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	140 sq. ft.	60 sq. ft.	80 sq. ft.

Ecosystem Structural Components

Cavity trees: Low **Vertical Diversity:** Low **Horizontal Diversity:** Low/+

Retained Organic Material: Low **Mast trees:** Low/-

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	0 sq. ft.	0
12"-16" DBH:	7 sq. ft.	9
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	7 sq. ft.	9

Legacy Trees (Basal Area/Acre): 7 sq. ft./ac **Trees/acre:** 5

Natural Communities: White pine/Northern hardwood forest

Invasive Plants (ocular): moderate overall; honeysuckle, common buckthorn, bittersweet & phragmites

Special Features: adjacent to beaver meadow and beaver pond, Sawnee Bean Road frontage

Stand Description and History: This stand originated from abandoned agricultural fields. The stand is even-aged. Timber quality is fair. The stand occupies a bench; the terrain is gentle. The stand is about 50 to 60 years old. The stocking level varies from 60 to 200 square feet of basal area/acre.

Disturbance: Evidence of harvesting was not observed. White pine weevil damage is moderate to severe; many stems are multi-topped. Minor blister rust was noted. Invasives are abundant in the vicinity of the beaver pond and meadow. Hardwood regeneration is heavily browsed by herbivores.

Stand management objectives:

- ❖ Maintain as a natural stand.
- ❖ Control invasive plants.

Prescription: Control invasives as funding is available, no later than 2021-22. Treat sooner if funding permits. Secure cost-sharing from any available source to fund this activity. Utilize volunteers to hand pick small plants. Most plants are mature; treat with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. This method is relatively quick and very effective, achieving high mortality with negligible sprouting. Follow up with a second treatment (hand pulling and chemical) two years after initial treatment. Continue to monitor and treat as necessary to allow a vigorous population of native plants to develop and to permit successful regeneration.

This stand was designated as a reserve to both maintain the scenic character along Sawnee Bean Road and to provide an educational/research opportunity to follow stand

development of an old field to late succession with limited human intervention. Invasive control is the only anticipated human interference with the stand. Continue to monitor and inventory at appropriate intervals.

Stand # 4 Stand Code: HM/NH4B (SAF# 23/25) Area: 46 acres
(Working Forest: 11 acres Forest Reserve: 35 acres)

Forest Type: Hemlock/Northern Hardwoods
Stocking level: adequately stocked

Size Class: standards
Stand Condition: two to multi-aged

Soil type: Tunbridge-
 Woodstock-Rock outcrop complex (8-25%)

Site index: WP 75 & RO 70
 RP 60 & BF 58

Site Class: II

Number of Samples: 9

Stand Data:

Species Composition (% BA): hemlock 66%, red maple 15%, sugar maple 7%, white ash 4%, hophornbeam 3%, black cherry 1%, paper birch 1%, yellow birch 1%, basswood 1%, and red oak 1%

Regeneration Species (ocular): low overall; beech, hophornbeam, red oak, white pine, hemlock & red spruce.

TOTAL STOCKING AND VOLUME

Basal Area/acre: 189 sq. ft./ac
MSD: 9 inches

Trees/acre: 462

Merchantable MSD: 13 inches

Grade logs: 3,000 BF/acre
Percent of BF volume
 97%

Pallet logs: 100 BF/acre
Percent of BF volume
 3%

Total BF: 3,100 BF/acre
Percent Total Volume
 16%

Pulp: 32 cords/acre (16,000 BF equivalent)
 cords)

Total volume: 19,100 BF (38

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 82 sq. ft./acre

Intermediate: 40 sq. ft./acre

Suppressed: 67 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 31 sq. ft./ac
AGS MSD: 11 inches

AGS Trees/acre: 47

AGS Merchantable MSD: 14 inches

UGS Basal Area/acre: 158 sq. ft./ac
UGS MSD: 8 inches

UGS Trees/acre: 415

UGS Merchantable MSD: 12 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	11 sq. ft.	0 sq. ft.	11 sq. ft.
6"-10" DBH:	53 sq. ft.	6 sq. ft.	47 sq. ft.
12"-16" DBH:	85 sq. ft.	20 sq. ft.	65 sq. ft.
18"-24" DBH:	36 sq. ft.	5 sq. ft.	31 sq. ft.
26" + DBH:	4 sq. ft.	0 sq. ft.	4 sq. ft.
Total:	189 sq. ft.	31 sq. ft.	158 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/+ **Vertical Diversity:** Low **Horizontal Diversity:** Low/+

Retained Organic Material: Moderate **Mast trees:** Low

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	18 sq. ft.	54
12"-16" DBH:	4 sq. ft.	4
18"-24" DBH:	4 sq. ft.	2
26" + DBH:	0 sq. ft.	0
Total:	26 sq. ft.	60

Legacy Trees (Basal Area/Acre): 27 sq. ft./ac **Trees/acre:** 13

Natural Communities: Hemlock Forest, Hemlock/Northern hardwood Forest, Dry mesic sugar maple/hophornbeam/red oak Forest in the southeast corner of the compartment

Invasive Plants (ocular): low overall; common buckthorn, honeysuckle & burning bush

Special Features: 5 seeps, 7 vernal pools, Northern hardwood talus woodland (w/cliffs), hemlock/hardwood swamp & mixed sloping seepage swamp

Stand Description and History: Portions of this stand were formerly agricultural land while others may be primary forest. This stand begins just north of the brook draining the eastern black ash swamp and occupies an undulating band of variable width along the east boundary and extending to the southern boundary. The terrain is varied and ranges from gentle slopes to very steep slopes, some of which are shallow to bedrock and some of which are cliffs and talus slopes. The depressions between ledges are generally poorly drained. The timber quality is poor; 84% of the total stocking is considered unacceptable growing stock. Four increment cores were taken and rings were counted on one stump; these data are found below.

Species	Age	Rings/radial inch
Hemlock	115+	15
Hemlock*	80+	40
Hemlock	98	-
Hemlock	110+	-
Hemlock (stump)	115(1997)	-

This is a complex stand, made more so by the harvesting conducted in 1997 and in the mid to late 1960s (pre Redstart). The core sample ages indicate at least two age classes. Ocular age estimates include 80 to 150 years for hemlock and 70 to 100 years for hardwoods. In one area 30 to 40 year old hardwoods were present. The second entry above, marked with an asterisk, is from a 12" tree with 3" of solid wood before encountering rot. This 3' outer rim of wood was 80 years old and only growing 2 inches in 40 years. Interestingly, the northern portion of the stand east of the brook in contains the highest levels of large ROM found on any of the subject properties; 7 pieces of down wood over 16" in diameter were noted. The hydrology adds to the diversity and complexity of the stand. Additional examination and data are needed to gain a better understanding of this stand.

Disturbance: This stand was harvested in 1997 and in the 1960s according to Redstart's plan. The majority of the harvest in the northern portion of the stand was west of the brook. In the southern section harvesting was scattered; this area was whole tree chipped and cut with a fellerbuncher. In all cases, the easily accessible areas were treated, the difficult areas to access were not cut. Minor wind damage was noted, especially in heavily logged areas. Logging damage to residual stems was observed. Invasive plants are found at low levels near the boundaries of stands that developed from old fields. Browsing of hardwood regeneration was noted.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Reserve approximately 35 acres of this stand from timber management. In the northern section of the stand this consists of the area east of the brook as well as an area west of the brook that buffers the brook and the black ash swamps. This designation also protects other water resources, the natural hydrology and a talus area. The eastern 2/3rds of the southern portion of the stand is also designated as reserve, protecting the numerous vernal pools found in this vicinity along with the ledge outcrops and shallow soils. The dry mesic Forest and talus slopes and cliffs are also protected. The forest reserve protects soil, water and nutrient cycles, fragile habitats and sensitive areas. Ecological structure and diversity will develop as the reserve area moves toward the late successional stage; natural disturbances and mortality will create varied patterns of light and vegetation. Refine the reserve boundaries on the ground, clearly mark them and map them prior to harvesting in and adjacent to these areas.

Invasive control is a low priority in this stand due to the low population levels and the large reserve area that will not experience harvesting related disturbances. Control invasives prior to harvesting activity in the working forest area, which is where current populations are found. Secure cost-sharing from any available source to fund this activity. Utilize volunteers to hand pick small plants. Treat mature plants with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. This method is relatively quick and very effective, achieving high mortality with negligible sprouting. Schedule the first treatment in 2021-22, or earlier if funding is available. Follow up with a second treatment (hand pulling and chemical) two years after initial treatment. Continue to monitor and treat as necessary to allow a vigorous population of native plants to develop and to permit successful natural regeneration.

Implement multi-aged management, incorporating perpetual, variable retention harvesting principles to maintain and enhance the existing portion of the stand that is working forest. Multi-age management requires working at various crown levels within the stand. This stand currently contains two or more age classes. Harvesting is not recommended until at least 2020-22 when stand #1 is scheduled for treatment. Treat the southern portion of the stand in conjunction with the scheduled treatment in stand #2. Evaluate stand condition at the next inventory cycle, or prior to treatment, to determine an appropriate prescription.

- Evaluate the need for Forest Stand Improvement (FSI) both prior to and following commercial harvesting. The removal of suppressed trees, all of which are unacceptable growing stock, as well as girdling selected individuals to provide snags and future ROM will provide future advantages by improving stand quality and creating light for natural regeneration.
- The inventory identified 13 Legacy Trees/acre, representing 27 square feet of basal area/acre currently present within the stand; this is approximately at the 10% level of full stand stocking recommended for Legacy Trees. Designate and mark Legacy Trees with "DO NOT CUT" flagging or other methods at any time professionals or TCC members are on site. The Legacy Trees currently identified will increase in basal area. This practice will maintain large diameter trees in the stand, perpetually providing this important structural element. Additionally, it provides for future snag and ROM recruitment and provides increased vertical diversity.
- Harvest timber only during winter months, with snow cover and cold temperatures, to protect both water and soil.

Stand # 5 Stand Code: HM/NH4B-A (SAF# 23 & 25) Area: 11 acres
(Working Forest: 0 acres Forest Reserve: 11 acres)

Forest Type: Hemlock/ Northern Hardwoods
Stocking level: adequately to overstocked

Size Class: standards
Stand Condition: even-aged

Soil type: Colrain (25-50%)
 Cabot (3-15%)
 Buckland (8-25%)

Site index: WP 75, RO 66 & SM 65
 SM 56 & YB 56
 WP 71, YB 60 & SM 57

Site Class: I

umber of Samples: 0

Stand Data: NO DATA

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	20 sq. ft.	80
12"-16" DBH:	0 sq. ft.	0
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	20 sq. ft.	80

Natural Communities: Hemlock Forest

Invasive Plants (ocular): none noted, but are likely along stand boundaries with stands #1 & #3

Special Features: deeply entrenched perennial stream, intermittent stream, small rock outcrop/talus slope

Stand Description and History: Stand origin is unknown, though portions of the stand were undoubtedly cleared in the past. This stand is located along the beaver pond drainage and its tributaries to the south. A small area along Sawnee Bean Road is included in the stand; this area differs in composition from both adjacent stands. Whereas the main portion of the stand is dominated by an overstory of hemlock and Northern hardwoods, this area is composed of a mixture of pioneer hardwoods (paper birch and aspen) and red maple, with hemlock below the main canopy for the most part. The section along the road is also younger than the main stand. Colrain soil underlies the majority of the stand. Cabot soil is found in the depression in the southern lobe of the stand along the seasonal brook. A small area of Buckland soil is located around the ephemeral stream feeding in from the west. The main stream is deeply entrenched and portions of the banks are unstable and subject to slippage. Above the top of the ravine banks the terrain moderates and consists primarily of gentle slopes. Inventory data was not collected in this stand, though one sample point was located in the section along Sawnee Bean Road; this data was not processed. Increment cores were not collected in this stand. The age of the hemlock component is estimated at 80 to 100 years old.

Disturbance: Evidence of past harvesting was not noted. Wind damage was observed along Sawnee Bean Road where soils are poorly drained. The stream was further downcut and scoured when the beaver dam broke. Trees along the lower banks were uprooted and additional bank slippage occurred during that event.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.

Prescription: The entire stand is designated as forest reserve to protect the site's natural hydrology, soil, water and nutrient cycles as well as to protect fragile habitats and the aesthetic qualities along Sawnee Bean Road. Define the reserve boundaries on the ground, clearly mark them and map them prior to harvesting in adjacent stand #1.

Further evaluate the stand for invasive plant populations. These will most likely occur along and/or near the stand boundaries with stands #1 and #3. Implement control measures as needed. Continue to monitor the stand and treat as necessary.

Stand # 6 Stand Code: BA/AE/RM3B (SAF# 39) Area: 2 acres
(Working Forest: 0 acres Forest Reserve: 2 acres)

Forest Type: Black Ash/American Elm/Red Maple
Stocking level: adequately stocked

Size Class: poles
Stand Condition: even-aged

Soil type: Muck

Site index: N/A

Site Class: IV

Number of Samples: 0

Stand Data: NO DATA

Natural Communities: Red maple/Black ash swamp

Invasive Plants (ocular): none noted

Special Features: headwater area with associated vernal pools, seeps and other wetlands

Stand Description and History: This forested wetland is composed of two small stands located in wet depressions. The soil is composed of a layer of sapric, woody muck about 36" to 44" deep underlain with blue-gray silt and fine sand. This is a hydric soil and is considered unsuitable for agricultural or timber production. The soil survey maps this area as a Buckland soil. Other species found along with black ash and red maple include balsam fir, hemlock, white pine and American elm.

Disturbance: Evidence of past harvesting was not noted, though trees were cut along the boundaries of adjacent stands. Wind damage was observed and is typical on these wet sites.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.

Prescription: The entire stand is designated as forest reserve to protect the site's natural hydrology, soil, water and nutrient cycles as well as to protect fragile habitats. The reserve forest in stand #4 provides additional buffering. Consider expanding the forest reserve area to the south and southwest into stand # 2 to afford further wetland and hydrological buffering. Define the reserve boundaries on the ground, clearly mark them and map them prior to harvesting in adjacent stands #2 and #4.

West Compartment

Stand # 1 Stand Code: WP4B-A (SAF# 21) Area: 14 acres
(Working Forest: 11 acres Forest Reserve: 3 acres)

Forest Type: White Pine **Size Class:** standards
Stocking level: adequately to fully stocked **Stand Condition:** even-aged

Soil type: Buckland (8-25%) **Site index:** WP 71, YB 60 & SM 57
 Colrain (8-25%) WP 75, RO 66 & SM 65

Site Class: I **Number of Samples:** 4

Stand Data:

Species Composition (% BA): white pine 71%, hemlock 19%, sugar maple 5% and red maple 5%

Regeneration Species (ocular): low overall; beech, white ash, sugar maple, red maple, red oak, white pine & black cherry

TOTAL STOCKING AND VOLUME

Basal Area/acre: 210 sq. ft./ac **Trees/acre:** 134
MSD: 17 inches **Merchantable MSD:** 17 inches

Grade logs: 9,500 BF/acre **Pallet logs:** 5,000 BF/acre **Total BF:** 14,500 BF/acre
Percent of BF volume **Percent Total Volume**
 66% 34% 43%

Pulp: 39 cords/acre (19,500 BF equivalent) **Total volume:** 34,000 BF (68 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 130 sq. ft./acre
Intermediate: 50 sq. ft./acre
Suppressed: 30 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 80 sq. ft./ac **AGS Trees/acre:** 30
AGS MSD: 22 inches **AGS Merchantable MSD:** 22 inches

UGS Basal Area/acre: 130 sq. ft./ac **UGS Trees/acre:** 104
UGS MSD: 15 inches **UGS Merchantable MSD:** 15 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
6"-10" DBH:	20 sq. ft.	0 sq. ft.	20 sq. ft.
12"-16" DBH:	60 sq. ft.	0 sq. ft.	60 sq. ft.
18"-24" DBH:	90 sq. ft.	70 sq. ft.	20 sq. ft.
26" + DBH:	40 sq. ft.	10 sq. ft.	30 sq. ft.
Total:	210 sq. ft.	80 sq. ft.	130 sq. ft.

Ecosystem Structural Components

Cavity trees: Low **Vertical Diversity:** Low **Horizontal Diversity:** Low/+

Retained Organic Material: Moderate

Mast trees: Low/-

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	20 sq. ft.	58
12"-16" DBH:	0 sq. ft.	0
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	20 sq. ft.	58

Legacy Trees (Basal Area/Acre): 10 sq. ft./ac

Trees/acre: 2

Natural Communities: Northern hardwood/hemlock Forest and hemlock Forest

Invasive Plants (ocular): Low/+ overall: honeysuckle and common buckthorn

Special Features: seep, intermittent streams, steep ledgy slopes

Stand Description and History: This stand originated from old fields. The stand is separated from Sawnee Bean Road by a narrow band of stand #3 and fronts the northern portion of Poor Farm Road for about 250'. Slopes are gentle to moderate in the majority of the stand; they become steeper to the east near Poor Farm Road. Access to the stand is fair to poor for timber harvesting despite the stand's proximity to two roads. The frontage is too steep along both roads to afford harvesting access or to accommodate a landing. Buckland very stony loam soils underlie most of the stand. This soil series is underlain with a hardpan layer typically found 16" to 33" below the surface. This is a productive soil; it is considered a hardwood site. The pan layer prevents subsurface drainage in the spring and during periods of heavy rain. The eastern portion of the stand is delineated as a Colrain very stony fine sandy loam by the soil survey. The eastern portion of the stand is definitely bedrock controlled and is more likely the Tunbridge-Woodstock-Rock outcrop complex soil type that is mapped the south and west. The timber quality of this stand is fair; coarse, multi-topped stems are commonly found throughout the stand. The stand age is estimated at 60 to 70 years old. One increment core was taken.

Species	Age	Rings/radial inch
White pine	58	9

Individual trees may be older, though the stand appears very uniform. (Redstart's plan estimates that the stand is "at least 80 years old.") Portions of the stand also support well-developed hardwood regeneration that is estimated at 10 to 20 years old.

Disturbance: Past harvesting was noted in small portions of the stand; the cut was light. Old white pine weevil damage is common and expressed in the numerous rough and multi-topped stems present. Minor blister was noted. Invasives are currently found at low levels; they are a continuing management concern. Hardwood regeneration is heavily browsed by herbivores.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Invasive control is a high priority in this stand. Commercial thinning and group selection harvests are suggested in 2013-15. It is essential to control invasives prior to any harvest. Schedule the first control treatment in 2009-10, with a follow-up treatment in 2011-13. Secure cost-sharing from any available source to fund this activity. Utilize volunteers to hand pick small plants. Treat mature plants with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. Continue to monitor and treat as necessary to allow a vigorous population of native plants to develop and to permit successful regeneration.

Protect soil, water, rare plants, fragile conditions and sensitive areas by identifying, mapping, clearly flagging and designating these areas as forest reserves. The steep bedrock controlled slopes in the eastern portion of the stand comprise this reserve area. Accomplish this delineation prior to harvesting. Design harvests to avoid disturbing stream banks; cross the seasonal drainage using portable bridges. Maintain tree cover along these streams. Harvest only on snow covered ground during the winter to protect soil and water.

Implement multi-aged management, incorporating perpetual, variable retention harvesting principles, to maintain and enhance the existing stand. Multi-age management requires working at various crown levels within the stand. Commercial thinning and group selection harvests are scheduled in 2013-15.

- Implement group selection to release existing advanced regeneration and to create hardwood regeneration in densely stocked portions of the stand. Thin dense portions of the stand that support adequate acceptable growing stock. Create canopy openings that are no wider than the height of the dominant trees.
- Evaluate access and design an appropriate trail system to serve this area.
- Evaluate the need for Forest Stand Improvement (FSI) following commercial harvesting. Girdle some large stems that do not contain valuable products to create snags and future ROM.
- The inventory identified 2 28" DBH Legacy Trees/acre, representing 9 square feet of basal area/acre. This is less than the recommended minimum level of 10% of full stand stocking. Designate and mark additional Legacy Trees with "DO NOT CUT" flagging during the harvest design. This practice maintains large diameter trees in the stand, perpetually providing this important structural element. Additionally, it provides for future snag and ROM recruitment and provides increased vertical diversity.
- Maintain higher stocking levels than traditionally recommended for optimum, short rotation timber production wherever stem quality is above average. Strive for consistent and relatively slow growth to achieve high quality, fine-grained timber. A growth rate of 8 to 12 rings per radial inch during the first 100 years, slowing to 12 to

16 rings per radial inch after that period is the goal. As the stand shifts to hardwoods in the future this goal may shift. Consistent growth is more important for product quality and structural integrity than fast growth.

- Utilize a cutting cycle of about 10 to 15 years in well-stocked areas that are thinned until age 100 to 120. Lengthen the cutting cycle to 15 to 20 years thereafter. Utilize the longer cutting cycle for group selection harvests.
- Do not lop tops. Unlopped tops provide better wildlife habitat while also helping to minimize deer browse.
- Harvest timber only during winter months, with snow cover and cold temperatures, to protect both water and soil.

Stand # 2 Stand Code: WP4B-A (SAF# 21) Area: 4 acres
(Working Forest: 4 acres Forest Reserve: 0 acres)

Forest Type: White Pine **Size Class:** standards
Stocking level: adequately to overstocked **Stand Condition:** even-aged
Soil type: Stowe (8-15%) **Site index:** SM 75 & WP66
Site Class: I **Number of Samples:** 1

Stand Data:

Species Composition (% BA): white pine 90% and red maple 10%

Regeneration Species (ocular): moderate overall; sugar maple, red maple, beech, hophornbeam, red oak, striped maple & black cherry

TOTAL STOCKING AND VOLUME

Basal Area/acre: 200 sq. ft./ac **Trees/acre:** 255
MSD: 12 inches **Merchantable MSD:** 15 inches

Grade logs: 3,800 BF/acre **Pallet logs:** 3,500 BF/acre **Total BF:** 7,300 BF/acre
Percent of BF volume **Percent Total Volume**
52% 48% 36%

Pulp: 26 cords/acre (13,000 BF equivalent) **Total volume:** 20,300 BF (41 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 160 sq. ft./acre
Intermediate: 40 sq. ft./acre
Suppressed: 0 sq. ft./acre

TIMBER QUALITY STOCKING**AGS Basal Area/acre:** 40 sq. ft./ac**AGS MSD:** 15 inches
inches**AGS Trees/acre:** 33**AGS Merchantable MSD:** 15**UGS Basal Area/acre:** 160 sq. ft./ac**UGS MSD:** 12 inches
inches**UGS Trees/acre:** 222**UGS Merchantable MSD:** 15**DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY**

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
6"-10" DBH:	40 sq. ft.	0 sq. ft.	40 sq. ft.
12"-16" DBH:	80 sq. ft.	40 sq. ft.	40 sq. ft.
18"-24" DBH:	60 sq. ft.	0 sq. ft.	60 sq. ft.
26" + DBH:	20 sq. ft.	0 sq. ft.	20 sq. ft.
Total:	200 sq. ft.	40 sq. ft.	160 sq. ft.

Ecosystem Structural Components**Cavity trees:** Low **Vertical Diversity:** Low/- **Horizontal Diversity:** Low/+**Retained Organic Material:** Low/-**Mast trees:** Low/-**Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories**

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	20 sq. ft.	229
6"-10" DBH:	40 sq. ft.	159
12"-16" DBH:	40 sq. ft.	38
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	100 sq. ft.	426

Legacy Trees (Basal Area/Acre): 0 sq. ft./ac**Trees/acre:** 0**Natural Communities:** Northern hardwood/hemlock Forest**Invasive Plants (ocular):** moderate/- overall; honeysuckle & common buckthorn**Special Features:** old cellar hole near north stand/property boundary and field edge

Stand Description and History: The majority of this small stand is found south of the field on the abutting property; a finger also extends northerly along the west property boundary and field. The stand also fronts on Poor Farm Road. This is another example of an old field white pine stand. The estimated age is 50 to 60 years old. Increment core data was not collected. The slopes are gentle to moderate throughout the stand. Access to the stand is fair to poor for timber harvesting despite the stand's frontage on Poor Farm Road. (Refer to the access and landing discussion in the Tract Description portion of the Hughes Forest section of the report on page 15.) The Stowe soil series is underlain with a hardpan layer typically at 16" to 33" below the surface. The pan layer prevents subsurface drainage in the spring and during periods of heavy rain. This is a productive soil; it is considered a hardwood site. The timber quality of this stand is poor; 80% of the basal area/acre is considered

unacceptable growing stock. The stand is very homogeneous; species diversity is low and the herbaceous layer is poorly developed. Rare plants, sensitive areas and water courses were not observed in the stand.

Disturbance: Evidence of past harvesting was lacking in this stand. Old white pine weevil damage is common and resulted in the numerous rough and multi-topped stems present. Minor blister was noted. Invasives are currently found at moderate levels. Herbivore browse is evident.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Invasive control is a high priority in this stand. Commercial thinning and group selection harvests in conjunction with stand #1 are suggested in 2013-15. It is essential to control invasives prior to any harvest. Schedule the first control treatment in 2009-10, with a follow-up treatment in 2011-13. Secure cost-sharing from any available source to help fund this activity. Utilize volunteers to hand pick small plants. Treat mature plants with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. Continue to monitor and treat as necessary to allow a vigorous population of native plants to develop and to permit successful regeneration.

Protect soil, water by harvesting only during the winter season with snow cover. Buffering the seasonal stream in adjacent stand #4 may include maintaining canopy cover within this stand.

Implement multi-aged management, incorporating perpetual, variable retention harvesting principles, to maintain and enhance the existing stand. Schedule a commercial thinning and group selection harvest in conjunction with work in stand # 1 in 2013-15.

- Implement group selection to release existing advanced regeneration and to create hardwood regeneration in densely stocked portions of the stand. Thin dense portions of the stand that support adequate acceptable growing stock. Create canopy openings that are no wider than the height of the dominant trees.
- Evaluate access and design a landing trail system that serves this stand and the compartment.
- Evaluate the need for Forest Stand Improvement (FSI) following commercial harvesting. Girdle some large stems that do not contain valuable products to create snags and future ROM.
- The inventory did not identify any Legacy Trees in this stand. Begin designating and marking Legacy Trees with “DO NOT CUT” flagging during the harvest design. This practice maintains large diameter trees in the stand, perpetually providing this important structural element. Additionally, it provides for future snag and ROM recruitment and provides increased vertical diversity.

- Maintain higher stocking levels than traditionally recommended for optimum, short rotation timber production wherever stem quality is above average. Strive for consistent and relatively slow growth to achieve high quality, fine-grained timber. A growth rate of 8 to 12 rings per radial inch during the first 100 years, slowing to 12 to 16 rings per radial inch after that period is the goal. As the stand shifts to hardwoods in the future this goal may shift. Consistent growth is more important for product quality and structural integrity than fast growth.
- Utilize a cutting cycle of about 10 to 15 years in well-stocked areas that are thinned until age 100 to 120. Lengthen the cutting cycle to 15 to 20 years thereafter. Utilize the longer cutting cycle for group selection harvests.
- Do not lop tops. Unlopped tops provide better wildlife habitat while also helping to minimize deer browse.
- Harvest timber only during winter months, with snow cover and cold temperatures, to protect both water and soil.

Stand # 3 Stand Code: HM4B (SAF# 23) Area: 42 acres
(Working Forest: 23 acres Forest Reserve: 19 acres)

Forest Type: Hemlock **Size Class:** standards
Stocking level: adequately stocked **Stand Condition:** even to two-aged

Soil type: Tunbridge- **Site index:** WP 75 & RO 70
Woodstock-Rock out crop complex (8-25) RP 60 & BF 58
Buckland (8-25%) WP 71, YB 60 & SM 57

Site Class: I/II **Number of Samples:** 7

Stand Data:

Species Composition (% BA): hemlock 91%, hophornbeam 7%, and sugar maple 2%

Regeneration Species (ocular): low/+ overall; red oak, hophornbeam, white ash, striped maple, beech, sugar maple, hemlock, red maple, white pine & mountain maple

TOTAL STOCKING AND VOLUME

Basal Area/acre: 166 sq. ft./ac **Trees/acre:** 260
MSD: 11 inches **Merchantable MSD:** 13 inches

Grade logs: 6,500 BF/acre **Pallet logs:** 0 BF/acre **Total BF:** 6,500 BF/acre
Percent of BF volume **Percent Total Volume**
100% 0% 29%

Pulp: 32 cords/acre (16,000 BF equivalent) **Total volume:** 22,500 BF (45 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 60 sq. ft./acre
Intermediate: 57 sq. ft./acre
Suppressed: 49 sq. ft./acre

TIMBER QUALITY STOCKING**AGS Basal Area/acre:** 51 sq. ft./ac**AGS Trees/acre:** 43**AGS MSD:** 15 inches**AGS Merchantable MSD:** 15 inches**UGS Basal Area/acre:** 115 sq. ft./ac**UGS Trees/acre:** 217**UGS MSD:** 10 inches**UGS Merchantable MSD:** 12 inches**DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY**

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	6 sq. ft.	0 sq. ft.	6 sq. ft.
6"-10" DBH:	37 sq. ft.	0 sq. ft.	37 sq. ft.
12"-16" DBH:	86 sq. ft.	43 sq. ft.	43 sq. ft.
18"-24" DBH:	34 sq. ft.	8 sq. ft.	26 sq. ft.
26" + DBH:	3 sq. ft.	0 sq. ft.	3 sq. ft.
Total:	166 sq. ft.	51 sq. ft.	115 sq. ft.

Ecosystem Structural Components**Cavity trees:** Moderate/- **Vertical Diversity:** Low **Horizontal Diversity:** Moderate/-**Retained Organic Material:** Low/+**Mast trees:** Low/-**Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories**

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	0 sq. ft.	0
12"-16" DBH:	6 sq. ft.	6
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	6 sq. ft.	6

Legacy Trees (Basal Area/Acre): 6 sq. ft./ac**Trees/acre:** 2**Natural Communities:** primarily Hemlock Forest, Hemlock/Northern hardwood Forest on the talus slope section of the west boundary and a Dry-mesic Sugar maple/hophornbeam/red oak Forest imbedded in the latter**Invasive Plants (ocular):** Low/+ overall; honeysuckle & common buckthorn**Special Features:** Hemlock/hardwood swamp, 2 semi-alluvial seeps, vernal pool, Northern hardwood talus Woodland, 3 rare plants, rock outcrops, talus slope & intermittent stream**Stand Description and History:** This hemlock stand is the largest stand on the property; it dominates the landscape in the northwest portion of the property and the compartment. The moderate slopes within the stand were cleared at one time for pasture; steeper slopes and talus sections are primary forest. The terrain ranges from moderately steep to very steep. Occasional benches and other areas of gentle terrain, primarily associated with the seasonal drainage, break up these steep slopes. The Tunbridge-Woodstock-Rock outcrop complex is the major soil series underlying the stand. The soil survey indicates areas of the Tunbridge-Woodstock complex on 25% to 50% slopes in the eastern portion of the stand. The slope designation is accurate. However, these sites contain as much or greater areas of rock

outcrops than those areas delineated as such. The western portion of the stand also contains areas that exceed 25% slopes. Buckland soils follow the seasonal stream and Cabot soils may also be associated with this drainage as it extends southerly to the property boundary. The timber quality is poor; 69% of the total stocking is considered unacceptable growing stock. One increment core was taken from a 20" DBH hemlock.

Species	Age	Rings/radial inch
Hemlock	114	14

Ocular age was estimated at 80 to 100+ years for the hemlock component; the majority of the hemlock probably exceeds 100 years of age. The minor hardwood component appears younger than the hemlock. Small areas of 10 to 20 year old regeneration are also found within the stand. The hydrology and steep talus slopes both add to the diversity and complexity of this stand.

Disturbance: The majority of the central section of the stand was harvested in 1993. The harvest area lays between the toe slope on the west and the extremely steep slopes found in the eastern portion of the stand. The treatment consisted of thinnings and group selection harvests. At least one patch cut is found east of ridge and just north of the jog in the west boundary. This cut was intended to provide early successional habitat. Currently hay-scented fern dominates the area; tree regeneration is absent. The harvesting trail bisects this opening. Heavy winds in 1998 and Hurricane Floyd, which hit in 1999, both created pockets of blowdown, thereby expanding openings that were created by harvesting. Harvests did not appear to produce any significant regeneration. Thinned areas still contain high proportions of low quality stems for timber. Hay-scented fern has aggressively occupied portions of the stand. Honeysuckle and common buckthorn occur commonly throughout the managed portion of the stand; invasives were not noted in the undisturbed areas of talus and very steep slopes dominated by outcrop. Minor logging damage to residual stems was observed. Hardwood regeneration is subject to heavy browse pressure.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Approximately 19 acres of the stand is designated as forest reserve to protect steep slopes, shallow soils, talus areas, wetland habitats and rare plants. Ecological structure and diversity will develop as the reserve area moves toward the late successional stage. Wind events and other natural disturbances will continue to create varied patterns of light and vegetation throughout this stand. Refine the reserve boundaries on the ground and clearly mark them and map them prior to harvesting in and adjacent to these areas. The TCC may wish to explore the expansion of the reserve area.

Invasive control is a low priority in this stand due to the low population levels, the large reserve area that will not experience harvesting related disturbances and the long interval between any anticipated future harvesting. Control invasives prior to harvesting activity in the working forest area or earlier; treatment is tentatively scheduled for 2023-24. Follow up with a second treatment two years after the initial treatment. Monitor and treat as

necessary to allow a vigorous population of native plants to develop and to permit successful natural regeneration.

Evaluate the working forest portion of the stand during the next planning/inventory cycle in 10 to 15 years (2018-23). Schedule any silvicultural treatments after that process is completed. Currently commercial harvesting or thinning is not recommended until 2028 or later.

Stand # 4 Stand Code: SM/BE/YB4-3A (SAF# 25) Area: 20 acres
(Working Forest: 15 acres Forest Reserve: 5 acres)

Forest Type: Sugar Maple/Beech/Yellow Birch
Stocking level: fully stocked

Size Class: standards to poles
Stand Condition: even-aged

Soil type: Tunbridge-
 Woodstock-Rock out crop complex (8-25)
 Cabot (3-15%)

Site index: WP 75 & RO 70
 RP 60 & BF 58
 SM 56 & YB 56

Site Class: I/II

Number of Samples: 4

Stand Data:

Species Composition (% BA): sugar maple 85%, basswood 8%, and red oak 7%

Regeneration Species (ocular): moderate/- overall; red oak, hophornbeam, white ash & beech

TOTAL STOCKING AND VOLUME

Basal Area/acre: 130 sq. ft./ac
MSD: 10 inches

Trees/acre: 256
Merchantable MSD: 13 inches

Grade logs: 4,500 BF/acre **Pallet logs:** 7,000 BF/acre **Total BF:** 11,500 BF/acre
Percent of BF volume **Percent Total Volume**
 39% 61% 70%

Pulp: 10 cords/acre (5,000 BF equivalent) **Total volume:** 16,500 BF (33 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 60 sq. ft./acre
Intermediate: 60 sq. ft./acre
Suppressed: 10 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 80 sq. ft./ac
AGS MSD: 13 inches

AGS Trees/acre: 90
AGS Merchantable MSD: 13 inches

UGS Basal Area/acre: 50 sq. ft./ac
UGS MSD: 7 inches

UGS Trees/acre: 166
UGS Merchantable MSD: 12 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	10 sq. ft.	0 sq. ft.	10 sq. ft.
6"-10" DBH:	30 sq. ft.	10 sq. ft.	20 sq. ft.
12"-16" DBH:	80 sq. ft.	70 sq. ft.	10 sq. ft.
18"-24" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
26" + DBH:	10 sq. ft.	0 sq. ft.	10 sq. ft.
Total:	130 sq. ft.	80 sq. ft.	50 sq. ft.

Ecosystem Structural Components

Cavity trees: Moderate/+ **Vertical Diversity:** Low/- **Horizontal Diversity:** Low/+

Retained Organic Material: High/-

Mast trees: Moderate

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	10 sq. ft.	18
12"-16" DBH:	0 sq. ft.	0
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	10 sq. ft.	18

Legacy Trees (Basal Area/Acre): 10 sq. ft./ac.

Trees/acre: 2

Natural Communities: Semi-rich Northern hardwood Forest in the northern half, Northern hardwood Forest in the southern section with Mesic Red oak/Northern hardwood Forest in the southwest corner of the compartment.

Invasive Plants (ocular): None noted.

Special Features: talus slope in southwest, vernal pool, intermittent stream at the toe slope in the northern portion of the stand, rich site indicator plants

Stand Description and History: This Northern hardwood stand forms a long narrow band running north to south in the central section of the property. The stand flares out in the southern-most portion and encompasses the talus and ledgy slopes in the southwest corner of the compartment. The northern portion of the stand located westerly of the abutting property's field and stand #2 occupies toe slopes; a seasonal, low gradient drainage is also found in this portion of the stand. Slopes are gentle to moderate in the majority of the stand; they are steep and rocky in the southwest portion of the stand. Old harvesting trails provide fair access for timber harvesting and good access for recreational activities. The Tunbridge-Woodstock-Rock outcrop complex underlies the majority of the stand. A small area of Tunbridge-Woodstock complex on 25% to 50% slopes is found in the southwest corner of the stand and compartment. Cabot soil underlies the toe slope, extending about half the length of the stand. A hardpan layer is found between 16" to 33" below the surface of this soil type. The pan layer prevents subsurface drainage in the spring and during periods of heavy rain. The timber quality of this stand is variable; some areas support high quality trees while in other areas the quality is poor. The stand age is estimated at 60 to 90 years old. Increment cores were not collected. Individual trees may be older, especially on the steeper rocky slopes. Most of the stand features low regeneration levels; beech is common in the south

central section. The abundance of cavity trees and ROM is higher than typically found on the landscape.

Disturbance: The central portion of the stand has been previously logged. Minor wind damage was observed. Invasives were not noted. Hardwood regeneration is heavily browsed by herbivores.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Approximately 5 acres of the stand is designated as forest reserve to protect steep slopes, shallow soils, talus areas, a vernal pool, other water resources and nutrient cycles. Ecological structure is well-developed and will develop increased richness as the stand moves toward the late successional stage. Wind events and the other natural disturbances will continue to create varied patterns of light and vegetation throughout this stand. Refine the reserve boundaries on the ground and clearly mark them and map them prior to harvesting within and adjacent to this stand. The TCC may wish to explore the expansion of the reserve area; the northern finger deserves additional examination and consideration.

Monitor invasive plants and implement control measures if this area becomes populated with any of these species.

Implement multi-aged management, incorporating perpetual, variable retention harvesting principles in the working forest portion of the stand. Schedule a commercial thinning and group selection harvest in 2013-15 in conjunction with harvesting in stands #1 and #2.

- Implement group selection to release existing advanced regeneration and to create hardwood regeneration. Thin dense portions of the stand that support adequate acceptable growing stock. Create canopy openings that are no wider than the height of the dominant trees. Horizontal and vertical diversity typically increases after these prescribed treatments.
- Evaluate access and design an appropriate trail system to serve this area.
- Evaluate the need for Forest Stand Improvement (FSI) prior to or following commercial harvesting. Girdle some large stems that do not contain valuable products to create snags and future ROM.
- The inventory identified 2 Legacy Trees/acre, representing 10 square feet of basal area/acre which is about 10% of full stand stocking. Designate and mark additional Legacy Trees with "DO NOT CUT" flagging during the harvest design. This practice maintains large diameter trees in the stand, perpetually providing this important structural element. Additionally, it provides for future snag and ROM recruitment and provides increased vertical diversity.
- Maintain higher stocking levels than traditionally recommended for optimum, short rotation timber production wherever stem quality is above average. Strive for consistent and relatively slow growth to achieve high quality, fine-grained timber. A

growth rate of 8 to 12 rings per radial inch during the first 100 years, slowing to 12 to 16 rings per radial inch after that period is the goal. Consistent growth is more important for product quality and structural integrity than fast growth.

- Utilize a cutting cycle of about 15 years in well-stocked areas that are thinned until age 100 to 120. Lengthen the cutting cycle to 15 to 20 years thereafter. Utilize the longer cutting cycle for group selection harvests.
- Do not lop tops. Unlopped tops provide better wildlife habitat while also helping to minimize deer browse.
- Harvest timber only during winter months, with snow cover and cold temperatures, to protect both water and soil.

Stand # 5 Stand Code: NH/HM3-4B-A (SAF #23/25) Area: 19 acres
(Working Forest: 14 acres Forest Reserve: 5 acres)

Forest Type: Northern Hardwoods/Hemlock
Stocking level: adequately to fully stocked

Size Class: poles to standards
Stand Condition: even-aged

Soil type: Tunbridge-
 Woodstock-Rock out crop complex (8-25)

Site index: WP 75 & RO 70
 RP 60 & BF 58

Site Class: I/II

Number of Samples: 4

Stand Data:

Species Composition (% BA): hemlock 55%, red maple 17%, red oak 14%, sugar maple 10%, and beech 4%

Regeneration Species (ocular): moderate/- overall; red oak, hophornbeam, white pine, beech, striped maple, hemlock & red maple

TOTAL STOCKING AND VOLUME

Basal Area/acre: 145 sq. ft./ac.
MSD: 11 inches

Trees/acre: 240
Merchantable MSD: 12 inches

Grade logs: 6,000 BF/acre **Pallet logs:** 1,500 BF/acre **Total BF:** 7,500 BF/acre
Percent of BF volume **Percent Total Volume**
 80% 20% 35%

Pulp: 28 cords/acre (14,000 BF equivalent)

Total volume: 21,500 BF (43 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 75 sq. ft./acre
Intermediate: 15 sq. ft./acre
Suppressed: 55 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 70 sq. ft./ac
AGS MSD: 11 inches
 inches

AGS Trees/acre: 100
AGS Merchantable MSD: 13

UGS Basal Area/acre: 75 sq. ft./ac
UGS MSD: 10 inches

UGS Trees/acre: 140
UGS Merchantable MSD: 11 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
6"-10" DBH:	70 sq. ft.	25 sq. ft.	45 sq. ft.
12"-16" DBH:	60 sq. ft.	35 sq. ft.	25 sq. ft.
18"-24" DBH:	15 sq. ft.	10 sq. ft.	5 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	145 sq. ft.	70 sq. ft.	75 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/+ **Vertical Diversity:** Low/+ **Horizontal Diversity:** Moderate/-

Retained Organic Material: Moderate

Mast trees: Moderate

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	10 sq. ft.	35
12"-16" DBH:	5 sq. ft.	4
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	15 sq. ft.	39

Legacy Trees (Basal Area/Acre): 0 sq. ft./ac

Trees/acre: 0

Natural Communities: Hemlock/Northern hardwood Forest with small inclusions of Semi-rich Northern hardwood Forest & Mesic Red oak/Northern hardwood Forest

Invasive Plants (ocular): None noted.

Special Features: shallow soils, steep slopes, rock outcrops, ledges & one rare plant

Stand Description and History: This Northern hardwood/hemlock stand forms a band along the west boundary that is about half of the width of the compartment. Slopes are moderately steep to steep throughout the majority of the stand. A steep ridge of rock outcrop in the eastern section of the stand runs south to north, extending into stand #3. The Tunbridge-Woodstock-Rock outcrop complex underlies the majority of the stand. A small area of Tunbridge-Woodstock complex on 25% to 50% slopes is found in the eastern portion of the stand in association with the ridge. Though not typed as such by the soil survey, this is also a Rock outcrop complex. Old harvesting trails provide fair access for timber harvesting and good access for recreational activities. The timber quality of this stand is variable; the red oak component was all rated as acceptable growing stock. Stocking is also variable. Basal area/acre ranges from 100-sq. ft. to 220-sq. ft. The absence of large trees was noted; a 20" DBH red oak was the largest tree tallied in this stand during the inventory. Hemlock composes the entire suppressed crown class; it represents 28% of the intermediate and dominant crown classes. The age of the hardwood component is estimated at 70 to 90 years old while the hemlock is estimated at 80 to 100 years old; individual trees may be older. Two increment cores were collected.

Species	Age	Rings/radial inch
Hemlock (13")	85	22 (shake)
Red oak (14")	75	10

Disturbance: Evidence of past harvesting was noted throughout the stand (in 1993 per Redstart). Minor wind damage was observed probably from summer 1998 or Hurricane Floyd in 1999. Single tree fall is the most common disturbance. Drought stress among hemlock was observed. Invasives were not noted. Hardwood regeneration is heavily browsed heavily.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Approximately 5 acres of the stand is designated as forest reserve to protect steep slopes, shallow soils, talus areas and nutrient cycles. Ecological structure is becoming well-developed and will develop increased richness as the stand moves toward the late successional stage. Wind events and the other natural disturbances will continue to create varied patterns of light and vegetation throughout this stand. Refine the reserve boundaries on the ground and clearly mark them and map them prior to harvesting within and adjacent to this stand. The TCC may wish to explore the expansion of the reserve area.

Monitor invasive plants and implement control measures if this area becomes populated with any of these species.

Implement multi-aged management, incorporating perpetual, variable retention harvesting principles in the working forest portion of the stand. Schedule a commercial thinning and group selection harvest in 2013-15 in conjunction with harvesting in stands #1, #2 and #4.

- Implement group selection to release existing advanced regeneration and to create additional hardwood regeneration. Remove a high proportion of the suppressed hemlock. Create canopy openings that are no wider than the height of the dominant trees. Horizontal and vertical diversity typically increases after these prescribed treatments.
- Evaluate access and design an appropriate trail system to serve this area.
- Evaluate the need for Forest Stand Improvement (FSI) prior to or following commercial harvesting.
- The inventory did not identify any Legacy Trees. Designate and mark Legacy Trees with "DO NOT CUT" flagging during the harvest design. This practice maintains large diameter trees, recruits large diameter trees and perpetually provides this important structural element. Additionally, it provides for future snag and ROM recruitment and provides increased vertical diversity.
- Maintain higher stocking levels than traditionally recommended for optimum, short rotation timber production wherever stem quality is above average. Strive for consistent and relatively slow growth to achieve high quality, fine-grained timber. A

growth rate of 8 to 12 rings per radial inch during the first 100 years, slowing to 12 to 16 rings per radial inch after that period is the goal. Consistent growth is more important for product quality and structural integrity than fast growth.

- Utilize a cutting cycle of about 15 to 20 years.
- Do not lop tops. Unlopped tops provide better wildlife habitat while also helping to minimize deer browse.
- Harvest timber only during winter months, with snow cover and cold temperatures, to protect both water and soil.

Stand # 6 Stand Code: NH/HM3-4B-C (SAF #23/25) Area: 13 acres
(Working Forest: 13 acres Forest Reserve: 0 acres)

Forest Type: Northern Hardwoods/hemlock **Size Class:** poles to standards
Stocking level: adequate to understocked **Stand Condition:** two-aged

Soil type: Tunbridge- **Site index:** WP 75 & RO 70
 Woodstock-Rock out crop complex (8-25) RP 60 & BF 58

Site Class: I/II **Number of Samples:** 4

Stand Data:

Species Composition (% BA): hemlock 40%, sugar maple 20%, red maple 10%, beech 10%, white ash 5%, paper birch 5%, yellow birch 5%, and red oak 5%

Regeneration Species (ocular): moderate/- overall; red oak, beech, hophornbeam, sugar maple & white ash

TOTAL STOCKING AND VOLUME

Basal Area/acre: 100 sq. ft./ac **Trees/acre:** 435
MSD: 7 inches **Merchantable MSD:** 12 inches

Grade logs: 3,000 BF/acre **Pallet logs:** 500 BF/acre **Total BF:** 3,500 BF/acre
Percent of BF volume **Percent Total Volume**
 86% 14% 32%

Pulp: 15 cords/acre (7,500 BF equivalent) **Total volume:** 11,000 BF (22 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 50 sq. ft./acre
Intermediate: 20 sq. ft./acre
Suppressed: 30 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 30 sq. ft./ac **AGS Trees/acre:** 18
AGS MSD: 18 inches **AGS Merchantable MSD:** 18 inches

UGS Basal Area/acre: 70 sq. ft./ac **UGS Trees/acre:** 417
UGS MSD: 6 inches **UGS Merchantable MSD:** 11 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	10 sq. ft.	0 sq. ft.	10 sq. ft.
6"-10" DBH:	35 sq. ft.	0 sq. ft.	35 sq. ft.
12"-16" DBH:	35 sq. ft.	15 sq. ft.	20 sq. ft.
18"-24" DBH:	15 sq. ft.	15 sq. ft.	0 sq. ft.
26" + DBH:	5 sq. ft.	0 sq. ft.	5 sq. ft.
Total:	100 sq. ft.	30 sq. ft.	70 sq. ft.

Ecosystem Structural Components

Cavity trees: Moderate/- **Vertical Diversity:** Low/+ **Horizontal Diversity:** Low/+

Retained Organic Material: Moderate/-

Mast trees: Low

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	5 sq. ft.	57
6"-10" DBH:	15 sq. ft.	43
12"-16" DBH:	0 sq. ft.	0
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	20 sq. ft.	100

Legacy Trees (Basal Area/Acre): 5 sq. ft./ac

Trees/acre: 1

Natural Communities: Northern hardwood/hemlock Forest

Invasive Plants (ocular): None noted.

Special Features: some ledge/shallow soil, one rare plant

Stand Description and History: This Northern hardwood/hemlock stand is located west of Poor Farm Road and runs from stand #2 on its northern stand boundary to the south property line. Slopes are gentle to moderately steep; exposed ledge is common and soils are shallow. The Tunbridge-Woodstock-Rock outcrop complex underlies the stand. Some old harvesting trails were observed. These provide fair access for timber harvesting and good access for recreational activities. The timber quality of this stand is poor; 70% of the basal area/acre and 96% of the trees/acre are considered unacceptable growing stock. Stocking is variable with basal area/acre ranging from 60-sq. ft. to 140-sq. ft. Portions of the stand contain large trees, some of which support cavities as well as large diameter ROM. Hemlock composes 67% of the suppressed crown class and 29% of the intermediate and dominant crown classes. Scattered white pine are present in some sections of the stand. In portions of the stand a 40 to 50 year old age class of hardwood is present. In other areas the hardwood appears to be 60 to 70 years old. The age of hemlock is estimated at 100 to 125 years old. One increment cores was collected.

Species	Age	Rings/radial inch
Hemlock (17")	125	19 (shake)

Disturbance: Evidence of past harvesting was noted throughout most of the stand (in 1993 per Redstart). The exception was the frontage along Poor Farm Road, much of which is

ledgy. Minor wind damage was observed probably from summer 1998 or Hurricane Floyd in 1999. Single tree fall is the most common disturbance. Beech bark disease is common on beech and occasional maple stem borer damage was observed. Invasives were not noted. Hardwood regeneration is heavily browsed by herbivores.

Stand management objectives:

- ❖ Protect soil and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Forest reserve areas have not been designated within this stand. Portions of the Poor Farm Road frontage are steep and ledgy; harvesting may destabilize the soil and tree cover in these areas of shallow soil. Evaluate this area further and consider establishing a reserve area or uncut buffer to protect these fragile sites.

Monitor the stand for invasive plants and implement control measures if this area becomes populated.

Evaluate this stand further in 10 to 15 years. No commercial treatment is recommended until 2018 to 2023 to allow stocking levels to increase. Consider felling unmerchantable suppressed trees that are considered unacceptable growing stock in portions of the stand. This will increase horizontal diversity immediately and provide greater vertical diversity as regeneration fills in gaps.

Identify and mark Legacy Trees with “DO NOT CUT” flagging whenever working in this stand. Retain all large diameter trees (greater than 24”) regardless of timber quality. Retain all trees with cavities or with the potential to develop cavities. Retain all snags that do not present a safety issue for recreationalists and timber harvesters.

Maintain higher stocking levels than traditionally recommended for optimum, short rotation timber production wherever stem quality is above average. Strive for consistent and relatively slow growth to achieve high quality, fine-grained timber. Utilize a cutting cycle of about 15 to 20 years. Harvest timber only during winter months, with snow cover and cold temperatures, to protect sensitive sites.

Open Land

The open land found on the Hughes Forest is limited to an old 1-acre field in the North Compartment and a 2-acre field in the East Compartment. Additional open land that is not owned by the town is found in the East and West Compartments.

The field in the North Compartment is really semi-open and being reclaimed by trees and shrubs. Maintain this in a mix of open and early successional woody species. Do not allow trees heights to exceed about 20’. Cut white pines and create brush piles. This area provides suitable habitat for chestnut-sided warbler, white-throated sparrow and other species dependent on early successional, shrubby habitat.

The 2-acre field in the East Compartment appears to be mowed and maintained in an open condition. Consider allowing trees and shrubs to fill in along field edges to “soften” these currently “hard” field/forest interfaces. This field could be display ground for woodcock. Additional bird species will utilize this area with a brushy edge. The field is probably not large enough for species dependent on grassland habitat.

Treatment Schedule

Stand # Year Stand code, forest type and treatment

North Compartment, 8.5 acres

1	--	WP3-4B, 3 acres, white pine; no treatment. Forest reserve.
2	--	HM3-4B, 4.5 acres, hemlock; no treatment. Forest reserve and riparian buffer.

East Compartment, 141 acres

1	2013-14 2015-16 2020-22	WP4B, 33 acres, white pine; invasive control, high priority. Second invasive control treatment. Commercial thinning to promote stand vigor and group selection to establish hardwood regeneration. Identify and flag brooks, seeps and other water resources and associated buffers prior to any harvesting. Harvest only during winter months. Identify and flag cultural resources prior to harvesting. Monitor invasive populations and treat as necessary.
2	2017-18 2019.20 2025.29	WP4B, 27 acres, white pine; invasive control, medium priority. Second invasive control treatment. Group selection harvest to regenerate hardwoods. Identify and flag brooks, marsh and other water resources and associated buffers prior to any harvesting. Harvest only during winter months. Identify and flag cultural resources prior to harvesting. Monitor invasive populations and treat as necessary.
3	-- 2021-22 2023-24	WP4B, 14 acres, white pine; no timber management. Forest reserve. Invasive control. Second invasive control treatment. Monitor invasive populations and treat as necessary.
4	--	HM/NH4B, 46 acres, hemlock/Northern hardwood: approximately 35 acres reserve and 11 acres working forest. Refine reserve boundaries, evaluate remainder for treatment or inclusion in reserve.
5	--	HM/NH4B-A, 11 acres, hemlock/Northern hardwood. Reserve area to protect water quality & riparian areas and roadside aesthetics.
6	--	BA/AE/RM3B, 2 acres, black ash/American elm/red maple. Forested wetland. Reserve area.

Stand # Year Stand code, forest type and treatment

West Compartment, 112 acres

1	2009-10 2011-12 2013-15	WP4B-A, 14 acres, white pine: approximately 3 acres reserve and 11 acres working forest. Invasive control, high priority. Second invasive control treatment. Commercial thinning to promote stand vigor and group selection to establish and release hardwood regeneration in working forest area. Refine reserve boundary prior to treatment. Identify and flag brooks, seeps and other water resources, other fragile habitats and associated buffers prior to any harvesting. Monitor invasive populations and continue to treat as necessary.
2	2009-10 2011-12 2013-15	WP4B-A, 4 acres, white pine; invasive control, medium priority. Second invasive control treatment. Construct landing. Commercial thinning to promote stand vigor in conjunction w/stand # 1. Identify cultural resources (cellar hole in Northeast corner of stand) and associated buffers prior to any harvesting. Monitor invasive populations and treat as necessary.
3	-- 2023-24 2025-26 2028-30	HM4B, 42 acres, hemlock: approximately 19 acres reserve and 23 acres working forest. Invasive control. Second invasive control treatment. Evaluate working forest area for treatment.
4	2013-15	SM/BE/YB4-3A, 20 acres, sugar maple/beech/yellow birch: approximately 5 acres reserve and 15 acres working forest. Refine reserve boundaries. Single tree and small group selection to release and/or establish hardwood regeneration.
5	2013-15	NH/HM3-4B-A, 19 acres, Northern hardwood/ hemlock: approximately 5 acres reserve and 14 acres working forest. Refine reserve boundaries. Identify and flag vernal pool, seasonal stream and associated buffers. Thinning to promote stand vigor and group selection to release and/or regenerate hardwoods.
6	--	NH/HM3-4B-C, 13 acres, Northern hardwood/ hemlock. No treatment for 10 to 15 years (2018-23).

Entire Property

2008-09	Blaze and paint property boundary; high priority.
Ongoing	Monitor invasive plants.
2021-23	Re-inventory and update management plan.

Post Mills Nature Area

Tract Description

The Post Mills Nature Area (PMNA) is composed of 58 acres of forest, 31 acres of open land and 11 acres of shrub land; the total area is 100 acres. The tract is located easterly of Route 113 just south of the village of Post Mills. This parcel does not have any road frontage. An access road off of Route 113 that runs across the Braley property and the former Barker-Sargent Landfill provides ingress and egress to the property. The road is gated and locked to prevent unauthorized vehicular traffic; foot travel is possible without unlocking the gate. This road provides very good access for any anticipated activities on the property.

TCC members flagged the property boundaries prior to the inventory. The west line abutting the Braley property must be run with a compass prior to blazing; some old blazes painted red were noted. Several round, plastic covered hay bales were also noted over this boundary. These bales are assumed to have been the Braley's; their age is unknown and they may pre-date the town's ownership of the tract. A stonewall forms a portion of the east line; additional examination of the field evidence is needed to ascertain the accuracy of the flagged line. A stonewall forms the entire south boundary.

The Upper Valley Land Trust holds a conservation easement on this property.

The Thetford Conservation Commission designated the forestland of the PMNA as forest reserve.

ACREAGE CHART

Stand #	Stand Code	Vegetation Type	Area	
			Total	Reserve
			(in acres)	
1	WP4A	white pine	4	4
2	WP4B	white pine	21	21
3	HM4B-C	hemlock	24	24
4	HM3-4A	hemlock	1	1
5	SM/BE/YB4B-A	s. maple/beech/y. birch	8	8
Total Forestland			58	58
open			31	31
shrub			7	7
alder			4	4
TOTAL AREA			100	100

The Landscape

Topography

The northern portion of the Post Mills Nature Area is relatively flat and largely occupied by open fields, narrow stream corridors and old fields that have reverted to forest. Elevations range from 570' to 600' above mean sea level on this terrace. Glacial outwash, glaciolacustrine and alluvium deposits underlie the fields. These deposits were all formed in association with water of various forms: melting ice, streams and glacial lakes.

The southern portion of the tract is forestland that occupies steeper slopes and glacial till derived soils. The base of the forested slope is found at an elevation of about 600', rising to the south, occupying the northerly slopes of an unnamed hill. The height of land is found on the south boundary, about 2/3rds the distance from the southwest corner to the southeast corner at an elevation of approximately 830'. Grades are generally gentle to moderate ranging from 8-25%. Small outcrops are found near the southwest and southeast portions of the property; slopes increase to 25-50% in these areas. See the topographic map of the tract for additional terrain features.

Hydrology

The property lies within the East Branch of the Ompompanoosuc River watershed. Rain and snowmelt runs off the property through a combination of surface and subsurface processes that eventually drain into the Lake Fairlee Outlet. The outlet forms the northern property boundary, meandering west and north before joining the East Branch near the northwest corner of the tract. The Lake Fairlee Outlet stream is very sinuous and slightly entrenched with an active channel width of approximately 15' to 30'. The channel flows through an active floodplain. Typical geomorphic features include eroding cut banks, pools, riffles, sandbars, and high flow cutoff channels.

A small, seasonal stream originates near the southeast corner of the property; numerous seeps are associated with its headwaters in Stand #5. Two mixed sloping seepage forests within stand #3 are also associated with this stream. The stream flows northerly, flattening out in the seepage swamp in the northern section of stand #3, before joining the seepage areas of the western portion of the alder stand. This stream continues its northerly flow joining the Lake Fairlee Outlet near the northeast property corner. The alder swamp at the toe slope, between forest and field, contributes seepage flow to this stream.

A small intermittent stream originates from a series of seeps in the north central portion of Stand #1. This seasonal stream flows northeasterly, becoming a seep before the flow becomes subsurface. This area is still wet, especially seasonally, despite the subsurface flow. This flow pattern is typical of small streams with low volumes that flow into deep well-drained soils.

Seeps are common natural features of the PMNA. One very small vernal pool was found in the central portion of the forest. This pool is probably not very productive.

The water resources of the Post Mills Nature Area, like those of the other Thetford tracts, provide unique aquatic and wetland habitat that adds richness and diversity to the landscape. Again, these habitats represent a relative small portion of the property yet they create conditions that support a wide variety of plant and animal life. The Lake Fairlee Outlet is a valuable resource that provides aquatic and riparian habitat for fish and numerous other species. Riparian vegetation maintains critical water quality and quantity functions while supporting hydrological processes, both within the property and to downstream areas. Benefits provided by vegetation include stabilizing banks, providing shade, dissipating energy from flood flows, and filtering sediments.

Soils

The *Soil Survey of Orange County, Vermont* (1978) indicates that a complex mosaic of soils underlies the tract. The diverse soils reflect the varied geologic processes that over time created the current soil pattern. Past mountain building events and continental glaciers that scoured soils and littered the landscape with rocky till influenced the upland forest soils. The soils underlying the open fields were affected by these geologic events, but were then overlaid with glacial outwash, alluvial deposits and lake deposits. More recent channel processes including erosion and deposition reworked these areas and subsequently shaped the soils. The soils underlying the fields are typically fine sandy loam or loamy fine sand of the Agawam, Windsor and Winooski series; the Belgrade series is a silt loam soil.

Six soil series underlie the majority of the forestland on the Post Mills Nature Area: Buckland, Colrain, Tunbridge-Woodstock complex, Tunbridge-Woodstock-Rock outcrop complex, Walpole, and Windsor. The Agawam and Raynham soil series are minor components typically found at the interface of the forest and other habitats. A soil map depicting specific soil locations and a table that summarizes potential management challenges is included in The Appendix. The general characteristics for the soil series underlying the PMNA are briefly described below.

Buckland soils are usually found on the middle and lower slopes of bedrock-controlled hills and ridges. This very stony loam soil is well drained to moderately well drained and deep (>60 inches). The soils formed in glacial till derived from schist, shale and sandy limestone. A hardpan occurs 16 to 33 inches below the surface. This pan layer impedes drainage and is responsible for a seasonally high water table. The soil survey indicates that the Buckland soils found on the PMNA occupy 8% to 25% slopes.

Colrain soils usually occupy convex areas on the sides and tops of hills and ridges. This soil is a very stony fine sandy loam that is well drained and deep (>60 inches). Colrain soils were formed in glacial till derived from siliceous limestone and schistose rocks. On the tract this soil is found on variable slopes ranging from 15 to 50%. Soil productivity for trees is ranked moderately high.

Tunbridge and Woodstock soils occur in such intricate patterns that they are only mapped together, forming a soil complex. Both soils are derived from glacial till composed of siliceous limestone and schistose rock. These soils are found where the topography is bedrock controlled: side hills, hilltops and ridges. The Rock outcrop version of this complex shares the same characteristics as the Tunbridge-Woodstock complex, though the proportion of ledge is higher.

The Tunbridge-Woodstock complex is composed of about 45% of each soil type and 10% of included soils. Small areas of Glover, Vershire, Colrain and Pomfret soils are mapped within this complex. This soil series is found on slopes ranging from 25% to 50% on the PMNA. The Tunbridge-Woodstock-Rock outcrop complex is comprised of about 45% Tunbridge soils, 35% Woodstock soils, 10% rock outcrop and 10% inclusions. Glover, Vershire, Colrain and Pomfret soils are included on ridges and Buckland and Cabot soils are included in depressions and along drainages. On the PMNA this series occupies slopes of 8% to 25%.

The Tunbridge soil is a very rocky fine sandy loam that is moderately deep and well drained. Bedrock is found 20" to 40" below the surface. Woodstock soils consist of very rocky fine sandy loam that is shallow and somewhat excessively drained. The depth to bedrock ranges from 10" to 20". It is considered less productive than the Tunbridge soils.

Agawam, Walpole and Windsor soils are relatively minor forest soil components on the PMNA. They are found on sandy terraces, outwash plains and escarpments; they formed in sandy glacial outwash. Agawam fine sandy loam soil underlies the eastern most field and the southern and easterly fringes of stand #2. This is considered a deep, well-drained soil. The

Windsor soils in stand #1 occupy 0% to 8% slopes; in stand #4 this soil is found on 8% to 25% slopes. Windsor loamy fine sands are very deep and excessively drained. Walpole fine sandy loam soils are found on level to gently sloping terrain. This soil series is very deep and poorly drained. These soils have a water table that is 0 to 1.0 feet below the surface from late Fall through late Spring. The northern portion of stand #3 occupies these soils at the toe slope landscape position.

Raynham Variant is a deep poorly drained soil found on level to gently sloping stream terraces. These soils are formed in silt loam and very fine sandy loam glaciolacustrine material. A seasonal high water table is found at or near the surface. This soil underlies the main alder stand that is located north of stand #3 and extends in a finger along the stream that separates the east field from the main field.

Existing Uses

The Post Mills Nature Area is currently used for low impact recreation and foot travel. Its proximity to Post Mills is conducive for walking, snowshoeing and cross country skiing by village residents. The mix of shrubland, open land and forest, together with the various wetlands and the outlet riparian area, provides a variety of habitats for birds and birdwatchers. Deer hunting is also a common activity during the fall hunting season.

Currently, there are no recreational trails serving the PMNA. Several old logging trails are found in the woods. The band of poorly drained soils along the eastern half of the forest/field edge impedes trail access.

The fields have been mowed to maintain their open condition since the town acquired the property. Currently, about one third of fields are mowed each year in the fall; each area is therefore mowed every three years.

Forest Inventory

The Post Mills Nature Area forest was examined and inventoried on 21 August 2007. A systematic grid was designed to sample the forest. Transects were run at a bearing of N 35° E (S 35° W) with sample points located at 330' intervals. Perpendicular offsets were made at 417' intervals at a bearing of N 55° W (S 55° E). Forest inventory data was collected at 17 sample points in four stands and on 57 acres. Eight increment cores were collected. Stand #4, 1 acre was not sampled. See the inventory map for additional detail.

Specific Management Objectives

- ***Maintain the Post Mills Nature Area forest as a reserve.***
- ***Manage alder stands for woodcock habitat.***
- ***Manage existing fields for birds and other animals dependent on grassland habitat.***
- ***Protect the public water supply owned by the Post Mills Water Association.***
- ***Evaluate habitat suitability for forest interior birds and other animal species.***
- ***Address the importance of Lake Fairlee Outlet as riparian habitat.***
 - Incorporate the findings of the Phase I Geomorphic assessment in future management decisions.
- ***Incorporate appropriate recreational uses.***
 - dispersed low impact recreation
 - hunting
 - Mow a path through the fields to accommodate foot travel.
- ***Develop a plan to control invasive plants.***

Forest Types: Descriptions & Prescriptions

Stand # 1 Stand Code: WP4A (SAF #21) Area: 4 acres

Forest Type: White Pine
Stocking level: fully stocked

Size Class: standards
Stand Condition: even-aged

Soil type (% slope): Buckland (8-25%)
(w/small area of Agawam fine sandy loam)

Site index: WP 71, YB 60, SM 57

Site Class: I

Number of Samples: 2

Stand Data:

Species Composition (% BA): white pine 64%, hemlock 25%, red oak 4%, beech 4%, and paper birch 3%.

Regeneration Species (ocular): low overall; red maple, sugar maple, white ash & beech

TOTAL STOCKING AND VOLUME

Basal Area/acre: 280 sq. ft./ac
MSD: 8 inches

Trees/acre: 819
Merchantable MSD: 14 inches

Grade logs: 23,000 BF/acre	Pallet logs: 0 BF/acre	Total BF: 23,000 BF/acre
Percent of BF volume		Percent Total Volume
100%	0%	56%

Pulp: 36 cords/acre (18,000 BF equivalent)

Total volume: 41,000 BF (82 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 140 sq. ft./acre
Intermediate: 50 sq. ft./acre
Suppressed: 90 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 170 sq. ft./ac
AGS MSD: 7 inches

AGS Trees/acre: 600
AGS Merchantable MSD: 14 inches

UGS Basal Area/acre: 110 sq. ft./ac
UGS MSD: 10 inches

UGS Trees/acre: 219
UGS Merchantable MSD: 13 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	20 sq. ft.	10 sq. ft.	10 sq. ft.
6"-10" DBH:	40 sq. ft.	10 sq. ft.	30 sq. ft.
12"-16" DBH:	120 sq. ft.	100 sq. ft.	20 sq. ft.
18"-24" DBH:	80 sq. ft.	50 sq. ft.	30 sq. ft.
26" + DBH:	20 sq. ft.	0 sq. ft.	20 sq. ft.
Total:	280 sq. ft.	170 sq. ft.	110 sq. ft.

Stand # 2 Stand Code: WP4B (SAF #21) Area: 21 acres

Forest Type: White Pine

Size Class: standards

Stocking level: adequately stocked

Stand Condition: even-aged

Soil type: Tunbridge-

Site index: WP 75 & RO 70

Woodstock-Rock out crop complex (8-25)

RP 60 & BF 58

(w/small area of Tunbridge-Woodstock complex along western edge, Windsor along northern edge of stand and Colrain in southeast corner of stand representing in aggregate 20% to 25% of stand area.)

Site Class: II

Number of Samples: 6

Stand Data:

Species Composition (% BA): white pine 60%, hemlock 34%, balsam fir 2%, red spruce 2%, sugar maple 1%, and quaking aspen 1%.

Regeneration Species (tress/acre based on 1/1,000 acre plots): red maple 4,500, white pine 667, hemlock 667, red spruce 167 & beech 167. (sugar maple & white ash also present)

TOTAL STOCKING AND VOLUME

Basal Area/acre: 207 sq. ft./ac

Trees/acre: 438

MSD: 9 inches

Merchantable MSD: 13 inches

Grade logs: 10,000 BF/acre

Pallet logs: 3,000 BF/acre

Total BF: 13,000 BF/acre

Percent of BF volume

Percent Total Volume

77%

23%

51%

Pulp: 25 cords/acre (12,500 BF equivalent)

Total volume:

25,500 BF (51 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 97 sq. ft./acre

Intermediate: 30 sq. ft./acre

Suppressed: 80 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 80 sq. ft./ac

AGS Trees/acre: 91

AGS MSD: 13 inches

AGS Merchantable MSD: 13 inches

UGS Basal Area/acre: 127 sq. ft./ac

UGS Trees/acre: 347

UGS MSD: 8 inches

UGS Merchantable MSD: 13 inches

inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	13 sq. ft.	0 sq. ft.	13 sq. ft.
6"-10" DBH:	64 sq. ft.	20 sq. ft.	44 sq. ft.
12"-16" DBH:	61 sq. ft.	40 sq. ft.	21 sq. ft.
18"-24" DBH:	46 sq. ft.	20 sq. ft.	26 sq. ft.
26" + DBH:	23 sq. ft.	0 sq. ft.	23 sq. ft.
Total:	207 sq. ft.	80 sq. ft.	127 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/- **Vertical Diversity:** Low **Horizontal Diversity:** Low/+

Retained Organic Material: Moderate/- **Mast trees:** Low/-

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	4 sq. ft.	38
6"-10" DBH:	10 sq. ft.	36
12"-16" DBH:	3 sq. ft.	3
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	17 sq. ft.	77

Natural Communities: Hemlock/Northern hardwood Forest

Invasive Plants (ocular): moderate/- overall; honeysuckle, common buckthorn & Japanese barberry

Special Features: numerous seeps & intermittent stream in west section, other seeps, glacial erratic in northeast quadrant and some rock outcrop in southern section

Stand Description and History: This white pine stand occupies the western portion of the forestland on the PMNA. The stand was previously cleared for pasture. The timber quality is fair to poor; many trees are multi-topped. The terrain varies; nearly flat to gentle slopes are found in the northern portion of the stand near the field edges. The land rises to the south and west, at times quite steeply. In at least one area of the stand, scattered open grown hardwoods were encountered. Stocking levels are variable. Total stocking ranges from 120 to 280 square feet of basal area/acre. Main crown canopy stocking ranges from 80 to 180 square feet of basal area/acre. The presence and abundance of regeneration is heavily correlated to stand density. Regeneration is absent in areas of the stand that support high stocking levels. Where basal areas are lower and more light is available regeneration is more abundant. In all cases, where regeneration was present it was not considered free to grow due to canopy shading. The major soil series underlying the stand is Tunbridge-Woodstock-Rock outcrop complex. However, as detailed above, three other soil types, comprising 20% to 25% of the stand area, also underlie this stand. These soil variations will influence stand development over time. Four increment cores were collected; the age data are below.

Species	Age
White pine (24")	65
White pine (14")	54
Hemlock (10")	25
Hemlock (14")	55

The 14" DBH pine and hemlock are essentially the same age. The growth rings of the hemlock indicate that it was open-grown at establishment. It did not originate under a dense canopy, therefore, this cohort was established as a result of either natural or human disturbance about 55-60 years ago. A younger cohort (about 25 years old) is also present. The age and development structure of this stand is probably more complicated than the visual features indicate.

Ecosystem structural components are all ranked low, with the exception of ROM, or down material. This is typical for a relatively young stand.

Disturbance: The majority of the stand was previously logged; stumps and logging damage on residual stems was noted. Old white pine weevil damage is prevalent, resulting in many multi-topped trees. Minor white pine blister rust was noted. Pine canker was observed. *Fomes pini*, a heart rot was also noted. Wind damage was found in the southwest corner of the stand. Single tree fall, primarily due to natural mortality was commonly observed. Invasive plants are present and present concerns. Herbivores are heavily browsing hardwood regeneration when present.

Prescription: Designated as forest reserve. No active management is needed, except invasive control.

Invasive control is a low priority in this stand, and on the PMNA. The forest reserve designation eliminates human disturbance (timber harvesting) and therefore, invasive plants are subject to greater competition and shading which reduces fruit production. Additionally, soil disturbance is decreased by prohibiting logging and the resulting intact duff layer is less conducive to seed germination.

Controlling invasive plants in this stand, and within the property, is still critical to maintaining and supporting ecosystem functions and natural stand development. Secure cost-sharing from any available source to fund this activity. Utilize volunteers to hand pick small plants. Treat mature plants with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. This method is relatively quick and very effective, achieving high mortality with negligible sprouting. Follow up with a second treatment (hand pulling and chemical) two to three years after initial treatment. Continue to monitor and treat as necessary to allow a vigorous population of native plants to develop and to permit successful natural regeneration.

Stand # 3 Stand Code: HM4B-C (SAF #23) Area: 24 acres

Forest Type: Hemlock

Size Class: standards

Stocking level: adequate to under stocked

Stand Condition: even to two-aged

Soil type (% slope): Buckland (8-25%)
Colrain (25-50%)
Walpole (0-8%)

Site index: WP 71, HM 56, & YB 60
WP 75, RO 66 & SM 65
RM 75, WP 68 & RS 43

Site Class: I

Number of Samples: 6

Stand Data:

Species Composition (% BA): hemlock 84%, balsam fir 5%, sugar maple 5%, white pine 2%, yellow birch 2%, and beech 2%.

Regeneration Species: low overall; (tress/acre based on 1/1,000 acre plots): balsam fir 833, hemlock 167, black cherry 167 & red maple 167. (beech & red spruce also present)

TOTAL STOCKING AND VOLUME

Basal Area/acre: 147 sq. ft./ac

Trees/acre: 276

MSD: 10 inches

Merchantable MSD: 13 inches

Grade logs: 7,000 BF/acre

Pallet logs: 150 BF/acre

Total BF: 7,150 BF/acre

Percent of BF volume

Percent Total Volume

98%

2%

34%

Pulp: 28 cords/acre (14,000 BF equivalent)

Total volume: 21,150 BF (42 cords)

CROWN CANOPY STOCKING BY BASAL AREA**Dominant & co-dominant:** 87 sq. ft./acre**Intermediate:** 20 sq. ft./acre**Suppressed:** 40 sq. ft./acre**TIMBER QUALITY STOCKING****AGS Basal Area/acre:** 54 sq. ft./ac**AGS MSD:** 15 inches**AGS Trees/acre:** 43**AGS Merchantable MSD:** 15 inches**UGS Basal Area/acre:** 93 sq. ft./ac**UGS MSD:** 9 inches**UGS Trees/acre:** 233**UGS Merchantable MSD:** 12 inches**DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY**

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	7 sq. ft.	0 sq. ft.	7 sq. ft.
6"-10" DBH:	33 sq. ft.	0 sq. ft.	33 sq. ft.
12"-16" DBH:	67 sq. ft.	37 sq. ft.	30 sq. ft.
18"-24" DBH:	40 sq. ft.	17 sq. ft.	23 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	147 sq. ft.	54 sq. ft.	93 sq. ft.

Ecosystem Structural Components**Cavity trees:** Low **Vertical Diversity:** Low **Horizontal Diversity:** moderate/-**Retained Organic Material:** Moderate/-**Mast trees:** Low/-**Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories**

No dead trees occurred within the samples taken in this stand. Snags were observed during the inventory; their presence is ranked low to low/+.

Natural Communities: Hemlock/Northern hardwood Forest, Hemlock/hardwood Swamp**Invasive Plants (ocular):** None noted.**Special Features:** two Mixed Sloping Seepage Forests embedded within the larger matrix, additional seeps, vernal pool and perennial stream

Stand Description and History: This stand occupies the majority of the eastern portion of the tract; it is the largest stand on the PMNA. Stonewalls and wire fences along the boundaries and within the stand indicate past agrarian use. This stand has the "feel" of old pasture; it was either cleared or utilized as wooded pasture. Timber quality is fair to poor. The terrain is nearly flat to gentle and soils are poorly drained in the northern portion of the stand along the edge of the alder stand and stand #1. The hemlock-hardwood swamp, seeps and wet areas are found in this portion of the stand. The land rises to the south, stepping up in a series of steep slopes that are sometimes ledgy, and sometimes punctuated by narrow shelves or benches. Near the south boundary the slope drops off east of an interior stonewall to a flat in the southeast property corner. Patches of hardwood saplings and small poles occur within the stand in old openings created by past harvesting. Stocking levels vary, ranging from 60 to 260 square feet of basal area/acre. Buckland soils underlie the lower slope position of the stand while upper slopes are underlain with Colrain soils. Stand development

and disturbance influences will vary on these very different soils. Two increment cores were collected; the age data are below.

Species	Age	Rings/radial inch
Hemlock (16")	97	10
Hemlock (19")	130	11

Growth ring analysis indicates that the hemlock component originated under the canopy of another stand. The growth pattern changed about 40 years ago, probably as a result of logging. The occurrence of ROM and tip-ups from wind is much higher in the northern portion of the stand on poorly drained soils (Buckland) than on the upper slopes (Colrain soils).

Disturbance: Evidence of at least one and probably two harvests was noted. Wind damage is a major disturbance agent on the lower slopes with poorly drained soils. Herbivore browsing heavily impacts hardwood regeneration.

Prescription: Designated as forest reserve. No active management is needed.

Stand # 4 Stand Code: HM3-4A (SAF #23) Area: 1 acre

Forest Type: Hemlock
Stocking level: overstocked

Size Class: poles to standards
Stand Condition: even-aged

Soil type (% slope): Windsor (8%-25%)

Site index: WP 57, SM 55 & RO 52

Site Class: III

Number of Samples: 0

Stand Data: NO DATA COLLECTED

Natural Communities: Hemlock Forest

Invasive Plants (ocular): None noted.

Special Features: knob overlooking Lake Fairlee outlet

Stand Description and History: This is a small isolated hemlock stand perched on top of steep knob. The stand was not inventoried, but was examined. This is a young stand composed of trees mainly of 6" to 14". Red maple, paper birch and red oak are also present. Regeneration is ranked low/- and is composed of hemlock.

Disturbance: Old red oak and paper birch cut stumps were observed.

Prescription: Designated as forest reserve. No treatment is needed.

Stand # 5 Stand Code: SM/BE/YB4B-A (SAF #25) Area: 8 acres

Forest Type: Sugar Maple-Beech-Yellow Birch **Size Class:** standards
Stocking level: adequately to overstocked **Stand Condition:** two to multi-aged

Soil type (% slope): Buckland (8-25%) **Site index:** YB 60, SM 57 & HM 56
 Colrain (25-50%) WP 75, RO 66 & SM 65

Site Class: I

Number of Samples: 3

Stand Data:

Species Composition (% BA): hemlock 45%, beech 18%, sugar maple 18%, yellow birch 9%, red maple 5%, and paper birch 5%

Regeneration Species: (tress/acre based on 1/1,000 acre plots): red maple 15,667 & beech 3,667

TOTAL STOCKING AND VOLUME

Basal Area/acre: 147 sq. ft./ac **Trees/acre:** 233
MSD: 11 inches **Merchantable MSD:** 13 inches

Grade logs: 6,500 BF/acre **Pallet logs:** 2,000 BF/acre **Total BF:** 8,500 BF/acre
Percent of BF volume **Percent Total Volume**
 76% 24% 44%

Pulp: 21 cords/acre (10,500 BF equivalent) **Total volume:** 19,000 BF (38 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 67 sq. ft./acre
Intermediate: 33 sq. ft./acre
Suppressed: 47 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 73 sq. ft./ac **AGS Trees/acre:** 96
AGS MSD: 12 inches **AGS Merchantable MSD:** 14 inches

UGS Basal Area/acre: 74 sq. ft./ac **UGS Trees/acre:** 137
UGS MSD: 10 inches **UGS Merchantable MSD:** 13 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
6"-10" DBH:	47 sq. ft.	13 sq. ft.	34 sq. ft.
12"-16" DBH:	67 sq. ft.	47 sq. ft.	20 sq. ft.
18"-24" DBH:	33 sq. ft.	13 sq. ft.	20 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	147 sq. ft.	73 sq. ft.	74 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/+ **Vertical Diversity:** Moderate/- **Horizontal Diversity:** Low/+

Retained Organic Material: Moderate/- **Mast trees:** Low/-

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	0 sq. ft.	0
12"-16" DBH:	13 sq. ft.	13
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	13 sq. ft.	13

Natural Communities: Northern hardwood Forest

Invasive Plants (ocular): None noted.

Special Features: seeps, seasonal stream, rock outcrop and some rich site indicator plants

Stand Description and History: This Northern hardwood stand is comprised of a main canopy that is largely hardwood and a lower layer of hemlock. The hardwoods represent 67% of the overstory. Fifty percent of the hemlock component is considered suppressed. This was very likely pasture at one time. Timber quality of the hardwoods is good while the hemlock quality is fair to poor. The terrain consists of gentle to moderately steep slopes. Patches of hardwood saplings and small poles occur in old openings created by past harvesting. Total basal area/acre range from 60 to 220 square feet; main crown stocking ranges from 60 to 140 square feet/acre. Some pit and mound micro-topography was observed. An old coyote den was found. One increment cores was collected:

Species	Age	Rings/radial inch
Hemlock (16")	91	9

The general assumption is that the hardwood is older than the hemlock component. The one hemlock sampled grew very slowly after establishment, indicating that it originated under a canopy. This is probably the oldest stand on the PMNA. Ecosystem structural components are better developed than other stands; these older stands typically develop higher ecological diversity and structure than their younger counterparts.

Disturbance: Evidence of past logging was noted. Minor wind was observed in limited areas. Pit and mound micro-topography indicates previous wind damage. Herbivore browse on hardwood regeneration is evident.

Prescription: Designated as forest reserve. No active management is needed.

Open Land

The fields at the PMNA comprise 31% of the property. Trees and shrubs are encroaching along field edges, especially along southern edges. Allowing some woody growth in these areas will softens these edges, which are currently very abrupt or "hard". Allowing fingers of shrubs and trees provides additional edge and variety. However, this complicates

the mowing process and eventually results in substantially shrinking fields over time. Allowing woody encroachment also necessitates an additional treatment consisting of periodically brushsawing young growth. The TCC should explore this possibility further.

Cut the majority of the white pines that are encroaching along the southern field edge as well as any woody growth in the middle of fields. About 1/3rd of the open area is mowed annually in the fall resulting in a three year mowing rotation. The Thetford Conservation Commission wishes to maintain these areas in their current condition to provide vegetative diversity and habitat for grassland birds and wood turtles.

Mowing paths/trails through the fields to invite recreational use has been discussed by the TCC. Further evaluate the implication of mowing both paths and the fields on other uses and priorities such as bird and wood turtle habitat. See information on guidelines for recreational trails and management guidelines for mowing and turtles found in the Appendix

Mow fields in the late fall, preferably after 15 September. Remove the mown hay during every other cutting. Stake and flag portions of the open land that are poorly drained or seasonally wet and prohibit mowing equipment from entering or crossing these areas. Allowing these areas to develop naturally will encourage additional early successional woody species to occupy these areas. Burning is another method for maintaining open land; the thatch is also removed during this process. Wet portions of the field are more readily maintained by burning than by mowing; this would also prevent woody growth from colonizing these areas. Contact the Thetford Fire Department to investigate the logistics and feasibility of conducting a prescribed burn. This may provide a training opportunity for the department.

The small field east of the alder band and stream is accessed via the existing old farm road. An undersized culvert is currently installed in the stream crossing. This culvert is undermined and washed-out every spring. Gravel was placed on top of this culvert in 2006 to allow tractor access for mowing. This gravel has since washed away. Install an adequately sized culvert, or preferably, a geo-textile lined stone ford to provide access to this field and prevent further sedimentation of the stream.

Shrub Land

Shrubs occupy the steep banks of the Lake Fairlee Outlet, an area of about 7 acres on the PMNA. Invasive plants, notably honeysuckle and common buckthorn are common to abundant in this area. Control treatment is scheduled in fall 2008. Additional measures are planned and necessary to control invasives. This initial invasive control treatment is cost-shared by the Wildlife Habitat Improvement Program (WHIP) administered by the Natural Resource Conservation Service (NRCS) of the US Department of Agricultural (USDA).

Two alder dominated areas are also found on the property. The main stand is found between the fields and stand #3. This stand then narrows, swings to the north and forms a band along the stream that separates the main field from the east field. Another small wedge-shaped alder stand is found between stand #1 and the north property line. These areas could revert to forested wetlands if not managed. The alder is biologically mature throughout most of the stand and in places is declining significantly.

Efforts to manage this habitat and rejuvenate the declining alders began in 2007. Enhancing woodcock habitat is the primary goal in these areas. The main body of the larger alder stand was divided in half lengthwise and then into roughly equal sections across the width of the stand. In February 2007 volunteers cut all alders and other shrubs in alternating quadrants of the stand creating a checkerboard pattern. Softwood trees were also cut. Approximately half of the main stand was cut. Alders and other deciduous vegetation have vigorously sprouted in these areas over the 2007 and 2008 growing seasons. Cut half the remaining blocks during the winter of 2008-09 and complete the remaining blocks in 2009-10.

If desired the remaining uncut blocks could be cut during one operation. This initial treatment is cost-shared under WHIP.

In the future regenerate alder stands on an eight to 15 year rotation to maintain vigor. Expand treatment to the sections of alder found along the stream and along the north boundary. Apply a similar treatment to the shrub habitat along the Lake Fairlee Outlet, after invasive plants have been adequately controlled, if desired. Optimum sprouting is obtained when cutting is performed in the dormant season. Wet areas are most easily accessed in the winter.

Treatment Schedule

<u>Area</u>	<u>Year</u>	<u>Treatment</u>
Shrub & Field	2008	Invasive control, 8 acres (WHIP cost-sharing)
	2010	Invasive control, second treatment
Fields	2008	Delayed mowing (after 15 Sept.) 7.3 acres (WHIP cost-sharing)
	2008-10 Ongoing	Construct adequate stream crossing Delayed mowing: mow 1/3 rd of the fields (10 acres) every year, after 15 Sept. Stake and flag drainages and reserve from mowing. Controlled burning is an alternate method of maintaining open fields.
Alder	2008-09	Cut half of the remaining uncut blocks during the winter of 2008-09.
	2009-10	Cut remaining alder block.
	Ongoing	Cut 25% of the alder every 8 to 15 years.
Entire Property	2008	Blaze and paint property boundary; high priority.
Entire Property	Ongoing	Monitor invasive plants and treat as necessary.
Entire Property	2021-23	Re-inventory and update management plan.

Thetford Town Forest

Tract Description

The Thetford Town Forest encompasses approximately 176 acres. Forestland occupies 172 acres of the tract. The balance of the acreage is composed of 3.5 acres of open land and a 0.5 acre pond. The tract is located on the east side of Five Corners road about 1 mile northeasterly of Route 113. The Town Forest fronts on Five Corners Road for about 2,540'. Two roads provide access to the property, both of which are cabled and locked. The first road accesses the Upper Valley Fish and Game Club's shooting range. The second road enters the property just south of the pond and accesses the town stump dump and highway department storage area. Parking is limited unless the cables are unlocked and open.

TCC member Heather Carlos and town residents Wayne Parks and Rick Howard flagged the property boundaries prior to the inventory. A majority of the boundary is formed by stone walls and wire fence. The town tax map does not agree with the field evidence. There is some question about how far to the east the jog in the property extends. Additional research and field reconnaissance is needed to determine if there is a boundary disparity.

In August 1951 James E. Wilkinson, Jr. the Orange County Forester prepared a brief "*Report of Survey for the Proposed Town Forest*" for this tract. The work record maintained by the Department of Forests and Parks (or the Vermont Forest Service) indicates a history of tree planting, marking timber sales and limited harvesting as a result. This record indicates that about 272 MBF was marked between 1955 and 1974; some of this was re-marked timber that was successfully sold or harvested. Approximately 54 MBF was harvested between 1953 to 1956. Another 82 MBF was harvested in 1975. The work record notes that 16,000 trees were planted on this tract between 1909 and 1958.

The Upper Fish and Game Club initiated about five patch cuts between 1980 and 1985 to encourage early successional habitat in what is now stand #2. In the mid to late 1990s the snowmobile trail was rerouted and the logger that the Club contracted with to cut and excavate the new trail also harvested additional areas on the Town Forest.

The Landscape

Topography

The Town Forest is situated on the westerly side of an unnamed knob directly below and east of a north-south running ridge that includes Houghton Hill. The forestland generally slopes west to northwest and encompasses most of this knob. Elevations on the property range from about 700' at the southwest corner on Five Corners Road to 1,130' at the top of the knob. Refer to the topographic map for additional details.

Forested slopes are typically moderate with the majority of the grades ranging from 15 to 25%. Areas of gentle slopes (0-5%) are found on the property, notably along the ridge of the knob and in the south central portion of the property encompassing stand #7, the black ash swamp, and extending northerly into the wetland by the snowmobile trail in stand #5. Topographic benches, interspersed throughout the property, also form nearly level to gentle breaks in the steeper terrain. The tract contains numerous steeper slopes (30-50%), some on shallow to bedrock soil or talus slopes; it is difficult to access some of these areas. These areas are located in the southwest section of the tract in most of stand #3 and its interface with stand #1, throughout most of stand #4 and #6 and in along most of the east boundary in stand #5, extending into the southeast corner of the Town Forest.

Hydrology

The property lies within the East Branch of the Ompompanoosuc River watershed. Rain and snowmelt runs off the property through two perennial, unnamed streams. One flows northwest from the northeast quadrant of the tract into the Five Corners Road Swamp, which is located northwest off the property across Five Corners Road. The headwaters of this stream are three artificial ponds on abutting property. Formerly wetlands, these areas were dredged and earth dams were constructed to retain water. Subsurface seepage from the northern-most pond and a seepage marsh on the Town Forest feed the stream. Approximately 1000' of the stream flows through this tract.

The second perennial stream is smaller and originates at the toe of talus slopes in the southeast quadrant of the tract. It courses southerly, flowing off the property before swinging north and east and emptying into the black ash swamp (stand #7). The stream emerges from the west lobe of the swamp flowing westerly onto an abutting parcel. This stream then courses southwest into the stream draining the Five Corners Road swamp, subsequently emptying into the East Branch.

The black ash swamp is a significant, though small wetland; one state listed rare plant is found here.

Four seeps were noted and mapped during the inventory. Intermittent streams are also found on the tract, some with short segments of defined channels that then become subsurface. Additional unmapped seeps and seasonal brooks are found in the northwest portion of the property, typically associated with the Buckland soils that underlie this area. A hardpan layer is characteristic of this soil, limiting water infiltration and thereby raising the water table during periods of heavy rain or during snowmelt. This soil and water dynamic contribute to the abundance of seeps and/or ephemeral drainages. A ½-acre artificial pond is located in the northwest corner of the tract along Five Corners Road.

Three small vernal pools were located and mapped during the inventory; two are found within stand #1 and one is located in stand #6. These pools are typically cradled in depressions between rock outcrops. Unfortunately, ruts indicate that skid trails from past harvests crossed through or along at least two of the pools.

The Town Forest water resources provide unique aquatic and wetland habitats that add richness and diversity to the landscape. Although these habitats represent a relative small portion of the property, they create diverse conditions that support a wide variety of plant and animal life. The 3-acre hardwood swamp provides suitable habitat for unique plant communities (black ash) as well as a State listed rare plant (sweet coltsfoot). These features also provide critical water quality and quantity functions such as dissipating runoff, storing water, and filtering sediments that are important to the overall forest ecology of the Town Forest as well as to downstream areas within the larger watershed.

ACREAGE CHART

Stand #	Stand Code	Vegetation Type	Area	
			Total	Reserve
			(in acres)	
1	WP/RO/RM4-3B	w. pine/r. oak/r. maple	65	28
2	WP4-3B-C	white pine	42	0
3	HM/NH4A	hemlock/Northern hdwd.	9	9
4	HM/NH4B-A	hemlock/Northern hdwd.	17	17
5	HM/NH4-3B-C	hemlock/Northern hdwd.	30	15
6	SM/BE/YB4B-A	s. maple/beech/y. birch	6	6
7	BA/AE/RM3B	b. ash/A. elm/r. maple	3	3
Total Forest			172	78
open			3.5	0
pond			0.5	0
TOTAL AREA			176	78

Soils

The *Soil Survey of Orange County, Vermont* (1978) indicates that three primary soil series underlie the Town Forest: Buckland, Colrain, and Tunbridge-Woodstock-Rock outcrop complex. The Colrain series and Tunbridge-Woodstock Rock complex are found under about 70% to 75% of the tract. The Buckland soils underlie the northwest quadrant of the tract (most of stand #2). Two other minor soil series are present: Cabot in the vicinity of the ½-acre pond and Peacham underlying the black ash swamp. The Appendix includes a soil map of the tract and a table that summarizes potential management challenges including heavy equipment limitations, and erosion and wind throw hazards. General characteristics for the soils under this tract are briefly described below.

Buckland soils are usually found on the middle and lower slopes of bedrock-controlled hills and ridges. This very stony loam soil is well drained to moderately well drained and deep (>60 inches). The soils formed in glacial till derived from schist, shale and sandy limestone. A hardpan occurs 18" to 30" below the surface. This pan layer impedes drainage seasonally and during periods of high rainfall. In the Town Forest this soil is found on slopes of 8% to 25%. Soil productivity is considered moderately high for trees.

Cabot soils consist of deep, somewhat poorly drained very stony silt loam underlain with a fragipan at 12" to 24". This pan layer impedes drainage and the water table is at or near the surface in the spring and during other periods of high rainfall. Cabot soils are typically found at the lower slope positions of hills and ridges in depressions and along streams. This soil series occupies 3% to 15% slopes on the Town Forest. The parent material of this soil is glacial till derived from siliceous limestone and schist.

Colrain soils typically underlie convex areas on the sides and tops of hills and ridges. This is a very stony fine sandy loam soil that is well drained and deep (>60 inches). Colrain soils were formed in glacial till derived from siliceous limestone and schistose rocks. This soil is found on two slope classes on the tract: 8% to 25% and 25% to 50%. Soil productivity for trees is ranked moderately high.

The Tunbridge-Woodstock Rock outcrop complex is composed of about 45% Tunbridge soils, 35% Woodstock soils, and 10% rock outcrops. Small inclusions, comprising about 10% of the unit, include Glover, Vershire, Colrain and Pomfret soils. This mapping unit is found on side hills, hilltops and ridges where the topography is bedrock controlled. This soil complex is found on 8% to 25% grades on the property according to the soil survey; actual grades are steeper in places. The Tunbridge and Woodstock soils are both classified as very rocky, fine sandy loams; the Tunbridge soils are deep and well drained, while the Woodstock soil is shallow and somewhat excessively drained. Woodstock soils are only mapped in complexes with Tunbridge soils and are therefore found in the same landscape position. The Woodstock component is considered less productive than the Tunbridge soils.

The Peacham soils underlie about 2% of the Town Forest. This soil underlies stand #7, a Black Ash/American Elm/Red Maple forest type. (**Note:** The soil survey does not accurately depict this mapping unit on the Town Forest.) Peacham soils formed in organic deposits less than 16 inches thick overlying loamy, compact glacial till in depressions and in water courses on uplands. They are very deep to bedrock, shallow to moderately deep to dense basal till, and very poorly drained. These soils have a water table that is ponded on the surface to 0.5 feet below the surface from Fall through early Summer.

Existing Uses

The Thetford Town Forest is currently leased to the Upper Valley Fish and Game Club, Inc. The term of the lease is 20 years; the current lease expires in about 2015. The club maintains a shooting range on the property that is utilized by members. They also sponsor a youth fishing derby at the pond. Local and State police and the National Guard also utilize the shooting range. The facility is used for Hunter Safety training. Club members and the general public hunt on the property.

A major snowmobile trail, part of the VAST network, is located on the property. This trail was re-routed within the last 10 years to provide a safe location that is not within the shooting range line of fire.

The Thetford Highway Department maintains a stump dump and storage area for culverts, guardrails and other materials.

Though the club leases the land from the Town of Thetford, the town maintains control of the forest and any management activities.

Forest Inventory

The Town Forest was examined and inventoried on 18, 20, 25 and 26 September and 1 October 2007. A potential boundary discrepancy and the lack of an accurate map to utilize as a base plagued the inventory process. A systematic grid utilizing magnetic cardinal directions was designed to sample the forest. Transects were run due east and west with sample points located at 417' intervals. Perpendicular offsets were made due south and north at 417' intervals. Forest inventory data was collected at 46 sample points in seven stands and on 172 acres. Seventeen increment cores were collected. See the inventory map for additional detail.

Specific Management Objectives

- ***Explore a conservation easement.***
- ***Designate a portion of The Town Forest as a reserve (see map).***
 - Vernal pools
 - Seeps
 - Talus woodland
 - Talus slopes, cliffs and ledges
 - Rare, threatened and endangered species
 - Black ash/red maple swamp
 - Representations of forest types & natural communities
 - Riparian corridors and buffers
 - Steep slopes and shallow soils
- ***Further evaluate existing natural habitat.***
 - Forest interior birds
 - Vernal pools
 - Black ash swamp
- ***Evaluate additional and appropriate recreational opportunities.***
 - low impact dispersed recreation
 - snowmobile trail
 - hunting
 - target practice
- ***Explore timber harvesting potential.***
- ***Develop a plan to control invasive plants.***

Forest Types: Descriptions & Prescriptions

Stand #1 Stand Code: WP/RO/RM4-3B (SAF #20) Area: 65 acres
(Working Forest: 37 acres Forest Reserve: 28 acres)

Forest Type: White Pine/Red Oak/Red Maple
Stocking level: adequately stocked
Size Class: standards to poles
Stand Condition: two to multi-aged

Soil type (%slope): Colrain (8-25%)
Tunbridge-
Woodstock-Rock outcrop complex (8-25%)
Site index: WP 75, RO 66 & SM 65
WP 75 & RO 70
RP 60 & BF 58

Site Class: I/II

Number of Samples: 20

Stand Data:

Species Composition (% BA): red maple 41%, white pine 24%, hemlock 7%, quaking aspen 6%, red oak 4%, hophornbeam 4%, paper birch 3%, beech 2%, balsam fir 2%, sugar maple 2%, white ash 2%, yellow birch 2%, and white spruce 1%

Regeneration Species (ocular): beech, red oak, white pine, hophornbeam, white ash, red spruce, hemlock, balsam fir, sugar maple, black cherry, red maple & striped maple.

TOTAL STOCKING AND VOLUME

Basal Area/acre: 158 sq. ft./ac
MSD: 7 inches
Trees/acre: 681
Merchantable MSD: 11 inches

Grade logs: 4,300 BF/acre
Pallet logs: 1,000 BF/acre
Total BF: 5,300 BF/acre
Percent of BF volume
81% 19% 33%
Percent Total Volume

Pulp: 22 cords/acre (11,000 BF equivalent) **Total volume:** 16,300 BF (33 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 82 sq. ft./acre
Intermediate: 30 sq. ft./acre
Suppressed: 46 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 62 sq. ft./ac
AGS MSD: 7 inches
AGS Trees/acre: 260
AGS Merchantable MSD: 12 inches

UGS Basal Area/acre: 96 sq. ft./ac
UGS MSD: 7 inches
UGS Trees/acre: 421
UGS Merchantable MSD: 11 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	20 sq. ft.	6 sq. ft.	14 sq. ft.
6"-10" DBH:	72 sq. ft.	23 sq. ft.	49 sq. ft.
12"-16" DBH:	42 sq. ft.	22 sq. ft.	20 sq. ft.
18"-24" DBH:	20 sq. ft.	11 sq. ft.	9 sq. ft.
26" + DBH:	4 sq. ft.	0 sq. ft.	4 sq. ft.
Total:	158 sq. ft.	62 sq. ft.	96 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/+ **Vertical Diversity:** Low/+ **Horizontal Diversity:** Low/+

Retained Organic Material: Low/+

Mast trees: Low/+

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	1 sq. ft.	11
6"-10" DBH:	10 sq. ft.	35
12"-16" DBH:	4 sq. ft.	4
18"-24" DBH:	1 sq. ft.	1
26" + DBH:	0 sq. ft.	0
Total:	16 sq. ft.	51

Legacy Trees (Basal Area/Acre): 5 sq. ft./ac

Trees/acre: 1

Natural Communities: predominately Northern hardwood Forest with Dry/mesic/Hophornbeam/Sugar maple Forest on hilltop and steep south and west slopes. Smaller areas of Hemlock/Northern hardwood Forest and Red oak/Northern hardwood Forest.

Invasive Plants (ocular): low/- overall; common buckthorn & honeysuckle

Special Features: dry ridge top and steep slopes with shallow soil and ledge, seep, two vernal pools, small hemlock/hardwood swamp, Northern hardwood talus Woodland and two state listed rare plants

Stand Description and History: This white pine/red oak/red maple stand is the largest on the property, representing about 37% of the total area. The terrain ranges from gentle to extremely steep slopes. The 1939 aerial photographs depict most of this stand as open land. The 1951 Wilkinson plan describes this area as "much hardwood, hemlock and white pine reproduction, interspersed with many large rocky and brushy areas." The stand has changed dramatically over the last 57 years, dramatically demonstrating the influence and role time plays in stand development. Shallow soils and ledge outcrop heavily influence stand development and composition. Timber quality, stocking and composition vary greatly. Total basal area/acre range from 80 to 280 square feet; main crown stocking ranges from 40 to 200 square feet/acre. Though white pine composes only 24% of the basal area/acre it represents 67% of the board foot volume of the stand. The ratio for red oak is even more striking; 4% of the basal area and 19% of the board foot volume. Eleven increment cores were collected:

Species	Age	Rings/radial inch
Hemlock (14")	70	25
Hemlock (12")	66	13
Quaking aspen (19")	55	12
Quaking aspen (16")	55	13
Quaking aspen (12")	54	11
White pine (20")	70	10
White pine (16")	60	8
White pine (12")	33	5
Balsam fir (10")	35	11
Red maple (10")	60	13
Red oak (16")	53	8

The core samples indicate that two age classes are present. The hemlock, red maple and most of the white pine were probably present as regeneration when the November 1950 hurricane impacted the area. The aspen and red oak component were established as a result of that event. The younger (35 year) age class probably initiated from the 1974-75 harvesting. An additional cohort is present in portions of the stand (seedlings and saplings) though is usually not free to grow due to the shade cast by the canopy.

Disturbance: Evidence of past logging was noted, the most recent of which is in the vicinity of the rerouted snowmobile trail. Minor wind was observed in limited areas. Vermont Forest Service records indicate that a portion of the section of this stand that is located between stands #3 and #5 was harvested in 1975. Single tree fall was noted. Low levels of invasive plants are found in the stand. Hardwood regeneration is heavily browsed by herbivores.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: The easterly portion of the stand, about 28 acres or 43% of the stand, is designated as forest reserve to protect soil, water, nutrient cycling, other sensitive habitats and rare plants. This area includes the ridge top and most other areas occupying shallow to bedrock sites. The Dry/mesic hophornbeam/sugar maple Forest, two rare plants and one vernal pool are included in the reserve. Consider other areas adjacent to stand #3 as possible reserves. Refine reserve boundaries in the field.

As this stand continues to develop the aspen component will deteriorate and produce snags, ROM, cavity trees and create openings that increase horizontal diversity in the short term and produce greater vertical diversity over time.

No other treatment is recommended during this planning cycle. Evaluate during next inventory in 2018 to 2023.

Evaluate invasive population during the next planning cycle and treat prior to any harvesting activity.

Stand # 2 Stand Code: WP4-3B-C (SAF#21) Area: 42 acres
(Working Forest: 42 acres Forest Reserve: 0 acres)

Forest Type: White Pine **Size Class:** standards to poles
Stocking level: adequately to understocked **Stand Condition:** two to even-aged

Soil type (% slope): Buckland (8-25%) **Site index:** WP 71, SM 57 & YB 60
 Colrain (8-25%) WP 75, RO 66 & SM 65

Site Class: I **Number of Samples:** 10

Stand Data:

Species Composition (% BA): white pine 53%, quaking aspen 15%, white ash 12%, red maple 6%, black cherry 6%, paper birch 4%, sugar maple 2%, red oak 1%, and balsam fir 1%

Regeneration Species (ocular): low/+ overall; white ash, beech, red maple, red oak, hemlock, red spruce, quaking aspen, black cherry & sugar maple

TOTAL STOCKING AND VOLUME

Basal Area/acre: 136 sq. ft./ac **Trees/acre:** 357
MSD: 8 inches **Merchantable MSD:** 14 inches

Grade logs: 5,000 BF/acre **Pallet logs:** 500 BF/acre **Total BF:** 5,500 BF/acre
Percent of BF volume **Percent Total Volume**
 91% 9% 34%

Pulp: 21 cords/acre (10,500 BF equivalent) **Total volume:** 16,000 BF (32 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 80 sq. ft./acre
Intermediate: 28 sq. ft./acre
Suppressed: 28 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 62 sq. ft./ac **AGS Trees/acre:** 223
AGS MSD: 7 inches **AGS Merchantable MSD:** 14 inches

UGS Basal Area/acre: 74 sq. ft./ac **UGS Trees/acre:** 134
UGS MSD: 10 inches **UGS Merchantable MSD:** 14 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	8 sq. ft.	6 sq. ft.	2 sq. ft.
6"-10" DBH:	32 sq. ft.	14 sq. ft.	18 sq. ft.
12"-16" DBH:	62 sq. ft.	30 sq. ft.	32 sq. ft.
18"-24" DBH:	30 sq. ft.	10 sq. ft.	20 sq. ft.
26" + DBH:	4 sq. ft.	2 sq. ft.	2 sq. ft.
Total:	136 sq. ft.	62 sq. ft.	74 sq. ft.

Ecosystem Structural Components

Cavity trees: Low **Vertical Diversity:** Low **Horizontal Diversity:** Low/+

Retained Organic Material: Low/+ **Mast trees:** Low

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	2 sq. ft.	92
6"-10" DBH:	8 sq. ft.	30
12"-16" DBH:	6 sq. ft.	6
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	16 sq. ft.	128

Legacy Trees (Basal Area/Acre): 2 sq. ft./ac

Trees/acre: 1

Natural Communities: Semi-rich Northern hardwood Forest

Invasive Plants (ocular): high/- overall; honeysuckle & common buckthorn

Special Features: seep, hardpan soil, seasonal brook, numerous stone walls

Stand Description and History: This white pine stand originated from old fields; the 1939 aerial photographs depict most of this stand as open land with limited areas growing in with shrubs and trees. In 1951 most of the western portion of the stand was open field. This stand covers 24% of the tract. The terrain is gentle. Buckland soils underlie almost the entire stand; Colrain soils may occupy the northeast corner. Stocking and composition vary greatly. Total basal area/acre range from 80 to 220 square feet; main crown stocking ranges from 60 to 160 square feet/acre. The western portions of this stand contain limited areas of planted red pine. Timber quality is generally poor, especially of the white pine overstory. One increment core was collected:

Species	Age	Rings/radial inch
White pine (18")	45	11

The stand age is between 45 and 65 years old. Portions of the stand contain patches of aspen and other hardwoods resulting from the cuts performed sometime between 1980 and 1985 to improve early successional habitat. This component is 25 to 30 years old. This is a hardwood site and Northern hardwoods will eventually occupy this site. Significant portions of the understory are dominated by honeysuckle, some reaching 6' to 8' tall.

Disturbance: Old white pine weevil damage is evident throughout the stand. Minor blister rust was noted and pine canker is suspected. Evidence of past logging was observed, primarily in the form of patch cuts for wildlife habitat. Minor wind damage was observed in limited areas. Much of the stand is infested with high levels of honeysuckle with lesser populations of common buckthorn. Herbivores are heavily browsing hardwood regeneration.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Control invasive plants.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Invasive control is the highest priority treatment for this stand. Begin control measures in 2009-10 if possible. Obtain funding through available cost-sharing programs. Hand pick small plants utilizing volunteers if available. Treat mature plants with a basal bark application of Garlon 4® (Triclopyr in the butoxyethylester form) mixed with mineral oil. Controlling invasive plants in this stand will increase plant diversity. Monitor population levels and treat as necessary.

After the first control treatment, apply low level cull removal throughout the stand. Girdle multi-topped white pine that does not, and will not in the future, contain a sawlog product. This will create snags, ROM, provide release for higher quality stems and begin shifting the stand towards Northern hardwoods by creating canopy gaps and opportunities for regeneration. Begin identifying Legacy Trees during this treatment.

Evaluate this stand for treatment during this planning cycle (2018 to 2023). Emphasize regenerating hardwoods such as sugar maple, yellow birch, white ash, red oak and red maple utilizing group selection methods. Also, retain and continue to grow quality trees as well as Legacy Trees. Devote about 20 square feet/acre of basal area to Legacy Trees while white pine is the dominant species.

During future harvests operate during the winter under snow-covered ground conditions to protect soil, water and fragile areas. Identify and clearly flag all water resources prior to harvest and protect appropriately.

Stand # 3 Stand Code: HM/NH4A (SAF# 23 & 25) Area: 9 acres
(Working Forest: 0 acres Forest Reserve: 9 acres)

Forest Type: Hemlock/Northern Hardwoods **Size Class:** standards
Stocking level: overstocked **Stand Condition:** two to multi-aged

Soil type: Colrain (25-50%) **Site index:** WP 75, RO 66 & SM 65
Site Class: I **Number of Samples:** 2

Stand Data:

Species Composition (% BA): hemlock 30%, white ash 20%, quaking aspen 20%, big tooth aspen 10%, white pine 10%, and red maple 10% (red oak also present)

Regeneration Species (ocular): low overall; hemlock & hardwoods

TOTAL STOCKING AND VOLUME

Basal Area/acre: 200 sq. ft./ac **Trees/acre:** 234
MSD: 13 inches **Merchantable MSD:** 13 inches

Grade logs: 4,000 BF/acre **Pallet logs:** 0 BF/acre **Total BF:** 4,000 BF/acre
Percent of BF volume **Percent Total Volume**
100% 0% 14%

Pulp: 49 cords/acre (24,500 BF equivalent) **Total volume:** 28,500 BF (57 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 120 sq. ft./acre
Intermediate: 20 sq. ft./acre
Suppressed: 60 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 60 sq. ft./ac **AGS Trees/acre:** 85
AGS MSD: 11 inches **AGS Merchantable MSD:** 11 inches

UGS Basal Area/acre: 140 sq. ft./ac **UGS Trees/acre:** 149
UGS MSD: 13 inches **UGS Merchantable MSD:** 13 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
6"-10" DBH:	40 sq. ft.	20 sq. ft.	20 sq. ft.
12"-16" DBH:	120 sq. ft.	20 sq. ft.	100 sq. ft.
18"-24" DBH:	40 sq. ft.	20 sq. ft.	20 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	200 sq. ft.	60 sq. ft.	140 sq. ft.

Ecosystem Structural Components

Cavity trees: Low **Vertical Diversity:** Low/+ **Horizontal Diversity:** Low

Retained Organic Material: Low **Mast trees:** Low/+

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	20 sq. ft.	102
12"-16" DBH:	0 sq. ft.	0
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	20 sq. ft.	102

Legacy Trees (Basal Area/Acre): 0 sq. ft./ac

Trees/acre: 0

Natural Communities: Hemlock/Northern hardwood Forest with small area of Semi-rich Northern hardwood Forest in the northern-most section of the stand

Invasive Plants (ocular): None noted.

Special Features: seep, Northern hardwood Talus Woodland, steep slopes with cliffs and ledges

Stand Description and History: This stand forms a narrow band along Five Corners Road. This stand is heavily forested in the 1939 aerial photographs. Hemlock dominates most of the stand, but is not always in the main canopy. Hardwoods form most of the main canopy and their composition is variable. Most of the terrain is extremely steep and slopes are punctuated with ledges or talus areas; portions of this stand are inoperable or nearly so. Increment core samples were not collected in this stand. The overstory age is estimated at over 100 years. A younger cohort, primarily of hemlock, is present. Another age class may also occupy the site.

Disturbance: Evidence of past logging was not observed. Disturbance is mainly single tree fall and natural mortality.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.

Prescription: This stand is designated as forest reserve to protect soil, water, nutrient cycling and fragile conditions and sites. Ecological structural components will naturally develop as this stand ages. No active management is recommended.

Stand # 4 Stand Code: HM/NH4B-A (SAF# 23 & 25) Area: 17 acres
(Working Forest: 0 acres Forest Reserve: 17 acres)

Forest Type: Hemlock/Northern Hardwoods **Size Class:** standards
Stocking level: adequately to overstocked **Stand Condition:** even-aged

Soil type: Tunbridge- **Site index:** WP 75 & RO 70
Woodstock-Rock out crop complex (8-25%) RP 60 & BF 58

Site Class: II **Number of Samples:** 3

Stand Data:

Species Composition (% BA): hemlock 70%, beech 18%, sugar maple 4%, red oak 4%, and red spruce 4% (red maple, paper birch & yellow birch also present)

Regeneration Species (ocular): low overall; beech & red maple

TOTAL STOCKING AND VOLUME

Basal Area/acre: 180 sq. ft./ac **Trees/acre:** 541
MSD: 8 inches **Merchantable MSD:** 12 inches

Grade logs: 11,000 BF/acre **Pallet logs:** 1,000 BF/acre **Total BF:** 12,000 BF/acre
Percent of BF volume **Percent Total Volume**
92% 8% 51%

Pulp: 23 cords/acre (11,500 BF equivalent) **Total volume:** 23,500 BF (46 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 87 sq. ft./acre
Intermediate: 53 sq. ft./acre
Suppressed: 40 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 100 sq. ft./ac **AGS Trees/acre:** 389
AGS MSD: 7 inches **AGS Merchantable MSD:** 14 inches

UGS Basal Area/acre: 80 sq. ft./ac **UGS Trees/acre:** 152
UGS MSD: 10 inches **UGS Merchantable MSD:** 11 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	7 sq. ft.	7 sq. ft.	0 sq. ft.
6"-10" DBH:	47 sq. ft.	7 sq. ft.	40 sq. ft.
12"-16" DBH:	100 sq. ft.	60 sq. ft.	40 sq. ft.
18"-24" DBH:	26 sq. ft.	26 sq. ft.	0 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	180 sq. ft.	100 sq. ft.	80 sq. ft.

Ecosystem Structural Components

Cavity trees: Moderate **Vertical Diversity:** Low **Horizontal Diversity:** Low

Retained Organic Material: Low/- **Mast trees:** Moderate/-

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

No dead trees occurred within the samples taken in this stand. Snags were observed during the inventory; their presence is ranked low to low/+.

Legacy Trees (Basal Area): 0 sq. ft./ac **Trees/acre:** 0

Natural Communities: Hemlock/Northern hardwood Forest

Invasive Plants (ocular): None noted.

Special Features: perennial stream, seep, steep slopes, sometimes stony & ledgy

Stand Description and History: This Hemlock/Northern hardwood stand is located in the eastern most portion of the tract. The stand boundary begins west of the stream for the most part and coincides with a soil type change. Slopes are steep to extremely steep, moderating somewhat along portions of the brook. This stand appears as a heavily forested area on the 1939 aerial photographs. Hemlock dominates the canopy; hardwoods are also usually found in main canopy position. Hemlock and beech each compose 50% of the suppressed crown class. Stocking levels vary from 120 to 280 square feet of basal area/acre; the hemlock/hardwood mix is stocked at the lower levels while the nearly pure hemlock (with a minor red spruce component) is found at much higher densities. Timber quality is fair to good. Access for harvesting purposes is poor. Two increment core samples were collected:

Species	Age	Rings/radial inch
Hemlock (12")	78	20
Hemlock (14")	145+	28

The age of the hardwood is unknown; it is estimated to be 70 to 100 years old. Most of the hemlock is the same age class, though bark and tree form characteristics indicate a scattering of older trees, such as the 145 year old hemlock above.

Disturbance: Evidence of past logging was observed; old skid trails and rotted cut stumps were present. Vermont Forest Service records indicate a harvest was conducted in this area in 1965. Beech bark disease was noted and the vigor of this species is declining in the stand. Some minor wind damage was noted in the form of stem breakage. Disturbance is mainly single tree fall and natural mortality.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.

Prescription: This stand is designated as forest reserve to protect soil, water, nutrient cycling and fragile conditions and sites. Ecological structural components will naturally develop as this stand ages. The beech component is losing vigor and will provide future snags and ROM. No active management is recommended.

Stand # 5 Stand Code: HM/NH4-3B-C (SAF# 23 & 25) Area: 30 acres
(Working Forest: 15 acres Forest Reserve: 15 acres)

Forest Type: Hemlock/Northern Hardwoods **Size Class:** standards to poles
Stocking level: adequately to under-stocked **Stand Condition:** even-aged

Soil type: Tunbridge- **Site index:** WP 75 & RO 70
 Woodstock-Rock out crop complex (8-25%) RP 60 & BF 58

Site Class: II **Number of Samples:** 6

Stand Data:

Species Composition (% BA): hemlock 56%, red maple 19%, beech 14%, sugar maple 5%, red oak 3%, and paper birch 3% (yellow birch also present)

Regeneration Species (ocular): low overall; white pine, beech, hophornbeam, red oak, white ash & red maple

TOTAL STOCKING AND VOLUME

Basal Area/acre: 120 sq. ft./ac **Trees/acre:** 279
MSD: 9 inches **Merchantable MSD:** 11 inches

Grade logs: 3,000 BF/acre **Pallet logs:** 500 BF/acre **Total BF:** 3,500 BF/acre
Percent of BF volume **Percent Total Volume**
 86% 14% 27%

Pulp: 19 cords/acre (9,500 BF equivalent) **Total volume:** 13,000 BF (26 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 63 sq. ft./acre
Intermediate: 27 sq. ft./acre
Suppressed: 30 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 50 sq. ft./ac **AGS Trees/acre:** 84
AGS MSD: 10 inches **AGS Merchantable MSD:** 11 inches

UGS Basal Area/acre: 70 sq. ft./ac **UGS Trees/acre:** 195
UGS MSD: 8 inches **UGS Merchantable MSD:** 11 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	7 sq. ft.	0 sq. ft.	7 sq. ft.
6"-10" DBH:	50 sq. ft.	23 sq. ft.	27 sq. ft.
12"-16" DBH:	53 sq. ft.	24 sq. ft.	29 sq. ft.
18"-24" DBH:	10 sq. ft.	3 sq. ft.	7 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	120 sq. ft.	50 sq. ft.	70 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/+ **Vertical Diversity:** Low **Horizontal Diversity:** Low/+

Retained Organic Material: Moderate/- **Mast trees:** Low

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	7 sq. ft.	20
12"-16" DBH:	0 sq. ft.	0
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	7 sq. ft.	20

Legacy Trees (Basal Area/Acre): 3 sq. ft./ac **Trees/acre:** 2

Natural Communities: Hemlock/Northern hardwood Forest with 1-acre Hemlock Forest

Invasive Plants (ocular): None noted.

Special Features: intermittent & perennial streams, Hemlock/Hardwood Swamp, rock outcrops and talus slopes

Stand Description and History: This hemlock/Northern hardwood stand occupies a substantial area of the south central and southeast section of the tract. The majority of the terrain consists of gentle slopes. Extremely steep slopes are found along much of the east property boundary where ledges and talus slopes occur. The 1939 aerial photographs depict this stand as heavily forested. Timber quality is poor due to the uncontrolled harvest in the 1990s that resulted in severe high grading and low stocking in portions of the stand. Stocking varies widely, again due to the past cutting pattern. Total basal area/acre ranges from 20 to 200 square feet; main crown stocking ranges from 20 to 140 square feet/acre. Hay-scented fern dominates the forest floor in poorly stocked areas and is excluding regeneration in these areas. Composition is also variable. Areas of pure hemlock as well as areas of pure hardwood are found within this stand. Other sections of the stand support a mix of hemlock and hardwood. Increment cores were not collected in this stand, however ring counts were made on two stumps cut in the 1990s. This data is found below and the ages are corrected to account for the intervening years since the cut.

Species	Age	Rings/radial inch
Hemlock (16")	115	-
Hemlock (12")	90	-

The stand is classified as even-aged, though a portion of the hardwood component may be a different age class. In places white pine regeneration is established, is 6 to 10 years old and is free to grow.

Disturbance: Evidence of two past harvests were noted; one in 1975, according to the Vermont Forest Service record, and one in the mid to late 1990s that was performed in conjunction with the snowmobile trail rerouting. This trail was also routed through a hemlock/hardwood swamp. Minor wind damage was noted. Pit and mound micro-topography was observed in portions of the stand indicating some history of wind disturbance (November

1950?). Invasive plants were not found in the stand. Hardwood regeneration, though uncommon, is subject to heavy herbivore browse.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.
- ❖ Develop structural components of the stand.
- ❖ Encourage forest diversity.
- ❖ Consider timber harvesting to accomplish ecological objectives.

Prescription: Half of this stand is designated as forest reserve. The reserve areas include steep slopes, shallow soils, talus areas, sections of the stand abutting and adjacent to the black ash swamp and the streams and other sensitive habitats. Refine reserve boundaries in the field.

Consider rerouting the section of the snowmobile trail that currently impacts the hemlock/hardwood swamp. Field reconnaissance is needed to ascertain feasibility and to determine an alternative route with less impact.

No other treatment is recommended during this planning cycle. Allow the stand to recover from the harvest of the 1990s. Evaluate during next inventory in 2018 to 2023.

Stand # 6 Stand Code: SM/BE/YB4-3B-A (SAF# 25) Area: 6 acres
(Working Forest: 0 acres Forest Reserve: 6 acres)

Forest Type: Sugar Maple/Beech/Yellow Birch **Size Class:** standards to poles
Stocking level: adequately to overstocked **Stand Condition:** even-aged

Soil type: Tunbridge- **Site index:** WP 75 & RO 70
 Woodstock-Rock out crop complex (8-25%) RP 60 & BF 58

Site Class: II **Number of Samples:** 2

Stand Data:

Species Composition (% BA): sugar maple 54%, red maple 23%, hemlock 8%, yellow birch 8%, and beech 7%

Regeneration Species (ocular): low overall; red oak, sugar maple, white ash, beech & hophornbeam

TOTAL STOCKING AND VOLUME

Basal Area/acre: 130 sq. ft./ac **Trees/acre:** 334
MSD: 8 inches **Merchantable MSD:** 13 inches

Grade logs: 6,500 BF/acre **Pallet logs:** 2,500 BF/acre **Total BF:** 9,000 BF/acre
Percent of BF volume **Percent Total Volume**
 72% 28% 67%

Pulp: 9 cords/acre (4,500 BF equivalent) **Total volume:** 13,500 BF (27 cords)

CROWN CANOPY STOCKING BY BASAL AREA**Dominant & co-dominant:** 60 sq. ft./acre**Intermediate:** 40 sq. ft./acre**Suppressed:** 30 sq. ft./acre**TIMBER QUALITY STOCKING****AGS Basal Area/acre:** 60 sq. ft./ac**AGS MSD:** 14 inches**AGS Trees/acre:** 58**AGS Merchantable MSD:** 14 inches**UGS Basal Area/acre:** 70 sq. ft./ac**UGS MSD:** 7 inches**UGS Trees/acre:** 276**UGS Merchantable MSD:** 11 inches**DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY**

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	10 sq. ft.	0 sq. ft.	10 sq. ft.
6"-10" DBH:	40 sq. ft.	10 sq. ft.	30 sq. ft.
12"-16" DBH:	50 sq. ft.	30 sq. ft.	20 sq. ft.
18"-24" DBH:	30 sq. ft.	20 sq. ft.	10 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	130 sq. ft.	60 sq. ft.	70 sq. ft.

Ecosystem Structural Components**Cavity trees:** Moderate**Vertical Diversity:** Low/+ **Horizontal Diversity:** Low**Retained Organic Material:** Low**Mast trees:** Low**Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories**

No dead trees occurred within the samples taken in this stand. Snags were observed during the inventory; their presence is ranked low.

Legacy Trees (Basal Area/Acre): 0 sq. ft./ac**Trees/acre:** 0

Natural Communities: Northern hardwood Forest with Semi-rich Northern hardwood forest in the valley

Invasive Plants (ocular): None noted.**Special Features:** rock outcrops, ledgy spines, vernal pool and one rare plant

Stand Description and History: This sugar maple/beech/yellow birch stand (also called Northern hardwood) is located in the eastern most portion of the tract. Slopes are steep to moderately steep. The narrow valley that the vernal pool is located in is nearly flat. This stand appears as a heavily forested area on the 1939 aerial photographs. The hemlock component is largely suppressed. Stocking and composition are fairly homogenous. Timber quality is good. Harvesting access is poor. Increment core samples were not collected. The age of the main featured stand is estimated at 80 to 100+ years old. Another canopy layer of sugar maple and hophornbeam is about 30 to 50 years old.

Disturbance: Evidence of past logging was observed; Vermont Forest Service records indicate this areas was harvested in 1965. An old skid trail was noted and appears to skirt the eastern edge of the vernal pool. Disturbance is mainly single tree fall and natural mortality.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.

Prescription: This stand is designated as forest reserve to protect soil, water, nutrient cycling and fragile conditions and sites. No active management is required.

Stand # 7 Stand Code: BA/AE/RM3B (SAF#39) Area: 3 acres
(Working Forest: 0 acres Forest Reserve: 3 acres)

Forest Type: Black Ash/American Elm/Red Maple **Size Class:** poles
Stocking level: adequately stocked **Stand Condition:** even-aged

Soil type: Peacham (0-5%) **Site index:** N/A
Site Class: IV **Number of Samples:** 2

Stand Data:

Species Composition (% BA): black ash 30%, balsam fir 20%, paper birch 20%, red maple 10%, hemlock 10%, and yellow birch 10%

Regeneration Species (ocular): moderate/- overall; red spruce, balsam fir, hemlock & white pine

TOTAL STOCKING AND VOLUME

Basal Area/acre: 100 sq. ft./ac **Trees/acre:** 317
MSD: 8 inches **Merchantable MSD:** 9 inches

Grade logs: 1,500 BF/acre **Pallet logs:** 0 BF/acre **Total BF:** 1,500 BF/acre
Percent of BF volume **Percent Total Volume**
100% 0% 43%

Pulp: 4 cords/acre (2,000 BF equivalent) **Total volume:** 3,500 BF (7 cords)

CROWN CANOPY STOCKING BY BASAL AREA

Dominant & co-dominant: 60 sq. ft./acre
Intermediate: 0 sq. ft./acre
Suppressed: 40 sq. ft./acre

TIMBER QUALITY STOCKING

AGS Basal Area/acre: 40 sq. ft./ac **AGS Trees/acre:** 111
AGS MSD: 8 inches **AGS Merchantable MSD:** 10 inches

UGS Basal Area/acre: 60 sq. ft./ac **UGS Trees/acre:** 206
UGS MSD: 7 inches **UGS Merchantable MSD:** 8 inches

DIAMETER DISTRIBUTION BY TOTAL BASAL AREA & TIMBER QUALITY

	Total Basal Area	AGS Basal Area	UGS Basal Area
2" & 4" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
6"-10" DBH:	90 sq. ft.	30 sq. ft.	60 sq. ft.
12"-16" DBH:	10 sq. ft.	10 sq. ft.	0 sq. ft.
18"-24" DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
26" + DBH:	0 sq. ft.	0 sq. ft.	0 sq. ft.
Total:	100 sq. ft.	40 sq. ft.	60 sq. ft.

Ecosystem Structural Components

Cavity trees: Low/+ **Vertical Diversity:** Low/- **Horizontal Diversity:** Low/+

Retained Organic Material: Moderate/+ **Mast trees:** Low/-

Dead Trees: Basal Area/Acre and Trees/Acre by Diameter Categories

Diameter	Basal Area	Trees/acre
2" & 4" DBH:	0 sq. ft.	0
6"-10" DBH:	20 sq. ft.	47
12"-16" DBH:	10 sq. ft.	7
18"-24" DBH:	0 sq. ft.	0
26" + DBH:	0 sq. ft.	0
Total:	30 sq. ft.	54

Legacy Trees (Basal Area/Acre): 0 sq. ft./ac

Trees/acre: 0

Natural Communities: Red maple/black ash Swamp

Invasive Plants (ocular): None noted.

Special Features: unique wetland community with one rare plant

Stand Description and History: This stand occupies hydric soils and is located in the south central portion of the tract. The soil is considered unproductive for timber production. The terrain is nearly level. This stand was forested in the 1939 aerial photographs. Stocking is fairly uniform. Composition varies somewhat with hardwoods, primarily black ash, more prevalent in the central through eastern sections of the stand and the softwood component becoming more common to the west. Timber quality is poor, as is typical on poor sites. This area supports a high degree of plant diversity. One increment core sample was collected.

Species	Age	Rings/radial inch
Black ash (8")	130+	30

The stand is thought to be even-aged, though the presence of another cohort is possible. Stand origin is unknown.

Disturbance: No evidence of past logging was observed, though the adjacent stand #5 was logged to the edge of this forested wetland. The adjacent harvesting occurred most recently in the mid to late 1990s and another cut was made in 1975. Wind damage is common, as expected on a wet site. Tip ups and single tree fall occur commonly.

Stand management objectives:

- ❖ Protect soil, water and nutrient cycles.
- ❖ Protect fragile conditions, sensitive areas and any rare plants that occur.

Prescription: This stand is designated as forest reserve to protect soil, water, nutrient cycling and fragile conditions and sites. No active management is necessary.

Treatment Schedule

Stand #	Year	Stand code, forest type and treatment
1	--	WP/RO/RM4-3B, 65 acres, white pine/red oak/red maple: approximately 28 acres reserve and 37 acres working forest. Refine reserve boundaries.
	2023-28	Evaluate in 15 to 20 years at next planning cycle.
	2022-35	Invasive control, 2 treatments w/re- treatments 2 years following initial treatment.
	Ongoing	Monitor invasive populations and treat as necessary.
2	2009-10	WP4-3B-C, 42 acres, white pine; invasive control (15 acres).
	2011-12	Invasive control (15 acres).
	2025-26	Invasive control (12 acres).
	2023-28	Evaluate in 15 to 20 years at next planning cycle.
	Ongoing	Monitor invasive populations and treat as necessary.
3	--	HM/NH4A, 9 acres, hemlock/Northern hardwood: no timber management. Forest reserve.
4	--	HM/NH4B-A, 17 acres, hemlock/Northern hardwood: no timber management. Forest reserve.
5	2013-14	HM/NH4B-C, 30 acres, hemlock/Northern hardwood: approximately 15 acres reserve and 15 acres working forest. Refine reserve boundaries.
	2023-29	Evaluate in 15 to 20 years at next planning cycle. Monitor invasive populations and treat as necessary.
6	--	SM/BE/YB4-3B-A, 6 acres, sugar maple/beech/yellow birch: no timber management. Forest reserve.
7	--	BA/AE/RM3B, 3 acres, black ash/American elm/red maple. Forested wetland. Reserve area.
Entire Property	2008-09	Blaze and paint property boundary; high priority.
All stands	Ongoing	Monitor invasive plants.
Entire Property	2018-23	Re-inventory and update management plan.

The Taylor Tract

The following summarizes the findings of the brief ecological inventory performed on the Taylor Tract. The information is based on one day of field reconnaissance and a review of background information. A brief description of the site, a natural community map, a plant species list, rare and uncommon species information, and a discussion of the site's ecological significance are all covered below. Methods for field survey and natural community mapping are described in the Methods section on pages 6 and 7.

Landscape Overview

The area of the Taylor Tract is 36 acres. The majority of this parcel is found on the east side of the Ompompanoosuc River between Route 244 and West Fairlee Road just north of the village of Post Mills. The U.S.G.S. topographic map indicates that the tract is situated at an elevation of 680-700 feet above sea level. Alluvial, or river deposited soils, designated as frequently flooded Limerick and Winooski very fine sandy loam by the soil survey, dominate the flats along the river easterly to a large sandpit found along the east side of the tract. This sandpit was dug into sandy post-glacial river deposits that form the large terrace at the 700-foot elevation. The Post Mills Airport also sits on this terrace. Agawam fine sandy loam is the soil type immediately adjacent the sandpit; only small slivers of this soil type remain along the east property boundary north and south of the sandpit. Bedrock outcrops were not observed.

The Ompompanoosuc River is the dominant hydrological and ecological feature of the tract. Its channel, sprinkled with gravel bars, meanders through the west side of the property. The flat portion of the tract is river floodplain; this feature is ecologically significant. Over time, the river channel shifts through the floodplain via a dynamic process of erosion and deposition of sediments, especially during floods. The 2001 topographic survey of the property by Vermont Survey and Engineering, Inc. (dated 08-29-01), the 1999 Flood Insurance Rate Map, and the NRCS soil survey maps all indicate that these flats are within the 100-year floodplain, or the floodway mapped by FEMA. The 2001 topographic survey also indicates that a significant portion of the sandpit west of the roadway running through the sandpit lies within the same elevation as the floodplain. While the tract includes no mapped wetland (class 2), the 2001 topographic survey mapped a large wetland area in the floodplain adjacent to the sandpit. Field observations in 2007 corroborate the presence of this wetland.

An un-named intermittent stream enters the north end of the property. This feature is depicted on the U.S.G.S. topographic map and was observed in the field. Though the topographic map shows this stream flowing into the river at the north end of the tract, it is unclear on the ground where this stream joins the river. It may flow through the tract via flood channel and join the river south of the property.

Natural Communities

Twenty-eight acres, or 77% of the tract, is mapped as floodplain natural communities (see the Taylor Natural Community map). Four natural communities occur in the floodplain: Sugar Maple-Ostrich Fern Floodplain Forest, Wet-mesic Floodplain Forest, Oxbow Marsh/Pond, and the river. While very young, the floodplain forest natural communities dominate the floodplain. The Wet-mesic Floodplain Forest is not described in the Vermont natural community classification. It was differentiated from the Sugar Maple-Ostrich Fern Floodplain Forest because it occupies a wetter soil within the floodplain and was mapped as wetland on the Vermont Survey and Engineering 2001 topographic map. The Wet-mesic Floodplain Forest is most closely related ecologically to Silver Maple-Sensitive Fern Floodplain Forest type in the Vermont classification.

The Sugar Maple-Ostrich Fern Floodplain Forest occupies the levee zone, i.e. the higher, well-drained, soil immediately adjacent the river. Currently, part of this higher floodplain is open meadow thick with old field species, such as goldenrod and field grasses, plus a heavy infestation of wild parsnip. (See the Appendix for a list of vascular plants, including both common and scientific names, observed at the Taylor Tract during the 2007 inventory.) This invasive is particularly noxious because contact with all parts of the plant can cause severe skin rashes on some people, especially during sunlight exposure. The wooded portion of this natural community type has an unusual abundance of both American and slippery elms. Additional species typical of the natural community include basswood, butternut, white ash, black cherry, and sugar maple. In other areas, less typical species, such as white pine, paper birch, and balsam poplar are principal canopy species. Conspicuously missing is silver maple, which does not naturally occur along the Ompompanoosuc River this far upstream from the Connecticut River. The groundcover in the well-drained floodplain is very weedy, with the invasive known as Bishop's weed, or goutweed, dominant in places. Many native species typical of this floodplain forest natural community type, including wild-ryes, tall brome, ostrich fern, jack-in-the-pulpit, bloodroot, and the sedge *Carex hirtifolia*, are also found.

The river and Oxbow Marsh/Pond are the other natural communities found in the floodplain. The river channel contains the river itself, which is an aquatic natural community, and very small and unmapped gravel bars, which would technically be classified as River Sand/Gravel Shore natural community type. In the 1998 publication "A Classification of the Aquatic Natural Communities of Vermont" prepared by The Aquatic Classification Workgroup, the reach of the Ompompanoosuc found at the Taylor Tract would best fit into the "Lower reaches of small rivers" running water classification type. Two small (half-acre or less) Oxbow Marsh/Pond natural communities are mapped for the property. The half-acre community is dominated by a very diverse shallow-emergent marsh with standing water in the center. The water is choked with native water starwort, water purslane, and water plantain, while a variety of sedges and swamp candles dominate the wetland margins. At the time of the survey, the smaller oxbow natural community was a full pond with minimal marsh vegetation.

Less than one quarter of the tract is upland, i.e. above the floodplain. Almost all of this high ground consists of the old sand pit. The gravelly, loamy sand soil in the pit is vegetated with a mosaic of successional forest, shrubland, and open herbaceous types that are artificial rather than natural communities. Common trees and shrubs in the pit include gray birch, quaking aspen, balsam poplar, white pine, black cherry, staghorn sumac, Morrow's honeysuckle (exotic), meadowsweet, and red-osier dogwood. Some of the sand is well-drained, but a considerable amount is somewhat poorly drained. One seep or spring issues from the east side of the pit and spreads out into a seepage zone towards the center of the pit. Herbs such as common scouring-rush, gray goldenrod, redtop, and the sedge *Carex tonsa* dominate some of the dry openings. In contrast, the forest found on the terrace flat and scarp north of the pit is mature old field forest of white pine, black cherry, American elm, and hemlock with a ground layer indicative of somewhat fertile conditions. Given this vegetation and the deep, well-drained, fine sandy loam soil, these un-mined uplands are mapped as White Pine-Northern Hardwood Forest.

Rare and Uncommon Species

In May, 2007, Steve Parren, director of Vermont Fish and Wildlife Department's Nongame and Natural Heritage Program, and Thetford Conservation Commission members, documented wood turtle (*Glyptemys insculpta*) at the Taylor Tract. Wood turtle is an uncommon animal in Vermont according to the Nongame and Natural Heritage Program. While not legally protected in Vermont, it has a status of "Special Concern", meaning that it is rare and requires monitoring for a possible decline to a threatened status. According to a brief report by Parren, the Taylor Tract is high quality habitat for wood turtle because it includes areas for nesting, foraging, and hibernation, and is uninterrupted by roads.

Two uncommon plants in Vermont - Wiegand's wild-rye (*Elymus wiegandii*) and loose-stemmed sedge (*Carex laxiculmis*) - were found on the property during the 2007 inventory. The Wiegand's wild-rye grows with other species of wild-rye in the lush, open floodplain habitat at the north end of the property. A small population of loose-stemmed sedge was found in the remnant White Pine-Northern Hardwood Forest at the north end of the property. This species of sedge typically is found in moist, fertile soils of upland hardwood forests.

The large population of slippery, or red, elm (*Ulmus rubra*) at the Taylor Tract is notable. In some places in the floodplain, elms are prevalent, and split equally between slippery and American. Though not listed as an uncommon or rare species by the Nongame and Natural Heritage Program, slippery elm is an uncommonly encountered tree in Vermont. Like the American elm, slippery elm is susceptible to Dutch elm disease.

Specific Management Objectives

- ***Explore a conservation easement.***
- ***Protect riparian ecosystems, soil, water and nutrient cycles.***
- ***Protect fragile conditions, sensitive areas and rare plants and animals.***
- ***Encourage the re-population of the floodplain forest.***
- ***Consider maintaining a portion of the property (e.g. the gravel pit) in early successional habitat.***
- ***Develop a plan to control invasive plants.***

Prescription: Restoring native natural plant communities is a high priority on this tract. Invasive plant control is an integral component of restoration. Explore funding options via federal cost-sharing programs such as the Wildlife Habitat Improvement Program (WHIP) and the Environmental Quality Improvement Program (EQIP). Recruit and train individuals to hand pick small plants. Utilize herbicides to control invasives in the manner proven most appropriate and consistent with the labeled use of the applicable chemical. Consult knowledgeable and experienced applicators to determine optimum control methods for the various invasives found on the tract. Begin invasive control in 2009-10 if possible. Perform invasive control in 5 to 10 acre blocks annually. Re-treat areas two years after initial treatment. Monitor population levels and perform subsequent treatments as necessary.

Planting native shrubs and trees suited to the site is another critical restoration need. Some invasive species require sunlight and creating shade could contribute to their decline.

Maintain a portion of the tract in early successional species and in bare ground habitat. Evaluate the site further to determine the appropriate areas and the extent to which early successional and bare ground habitats should be maintained and/or expanded.

VIII. SUMMARIES

Hughes Forest Summary

The Hughes Forest is the largest parcel owned by the Town of Thetford. The land use history, current forest condition and composition and the natural communities found on the property typify those in the region.

The tract supports numerous small natural communities, most associated with water or hydrology, nested within the larger matrix communities. Nine vernal pools were found on the Hughes Forest and two are located nearby on abutting property. Seeps were commonly encountered; there are at least 11 on the property. Hemlock/hardwood swamps and seepage marshes were also identified. Five talus areas were also encountered during the inventory and natural community delineation. Two other uncommon natural communities are found on the property: Dry mesic sugar maple/hophornbeam/red oak Forest and Mesic red oak/Northern hardwood Forest. The inventory team identified four state-listed rare plants.

Though the small natural communities found on the property represent small areas, they support high levels of biodiversity and add greatly to the tract's overall diversity. Forest Reserve areas were delineated to protect these habitats; additional reserve areas may be designated and other protections methods will be utilized to protect fragile and special habitats found within the working forest.

The property has a history of forest management under Mr. Hughes' ownership. Many areas previously harvested require additional time to increase stocking prior to harvesting again. Other areas that were not harvested or were very lightly harvested afford opportunities to accomplish many ecological objectives while harvesting forest products and generating income.

Invasive plant populations are high in many of the stands on the Hughes Forest. Former agricultural land supports the highest levels of invasives. Honeysuckle is the most common invasive species found on the property. Common buckthorn, along with lower populations of barberry and Asiatic bittersweet in the uplands and phragmites in the beaver meadow/pond area were also encountered. Additional invasive species could be present in areas that were not observed during the inventory and population levels could also vary from those indicated.

Invasive plants displace native species, suppress forest succession, and create localized monocultures that rapidly spread if left unchecked. Invasive plants and animals (including insects) are responsible to a large degree for the rapid rate of species extinction currently experienced on a global level. These alien plants and their continued spread are a threat to the composition and functioning of the forest ecosystem throughout the region. Any disturbance, natural or human induced (included timber harvesting) improves conditions for invasives and promotes their spread.

Many control methods have been utilized and evaluated by foresters, ecologists and other parties. Small plants with low to moderate populations can be successfully hand-pulled. Several treatments are necessary over at least three to eight years to control, not eliminate invasive species. Once the populations are controlled monitoring and periodic re-treatment of newly established plants is necessary. Several chemical control methods are also available. Foliar spraying with Roundup® or other Glyphosate products appears to have mixed results. Treating cut stumps with this chemical has excellent results on the buckthorns, honeysuckles and barberry; it is not effective on bittersweet. This method is very time consuming because it entails several steps. The most promising chemical control is a basal bark treatment with Garlon 4® (Triclopyr in the butoxyethylester form) and mineral oil. This method is relatively

quick and very effective; high mortality with very minimal sprouting is achieved. A combination of hand pulling small plants and treating larger plants with a basal bark treatment utilizes less chemicals and is very effective.

Invasive plants pose a serious problem on large areas of the Hughes Forest and will require both resolve and resources to successfully control. Utilize the WHIP or EQIP cost-sharing programs (or equivalents) that are available through the USDA Natural Resource Conservation Service (NRCS) to help defray the control costs. Implement control practices prior to harvesting activity for optimum results.

The Thetford Conservation Commission has identified numerous management objectives for the Hughes Forest; some of these may present the opportunity for conflict. Ultimately, the bedrock, soil and hydrology of the tract should dictate appropriate uses on the property. The conservation easement held by Upper Valley Land Trust also governs use and management of this tract.

Post Mills Nature Area Summary

The Post Mills Nature Area is unique among the town parcels due to its substantial area of open land as well as its significant shrub component. However, the land use history, current forest condition and composition and the natural communities found on the property remain typical of the region.

The areas of open land and shrub land afford the town opportunities to maintain and manage these habitats that are becoming increasingly uncommon on the landscape. The TCC successfully obtained WHIP cost-sharing funds to begin rotational field mowing, alder regeneration and invasive plant control. Seek additional funding for habitat improvement work through any applicable programs. Also, consider requesting increased appropriations for the Conservation Commission budget to provide funding.

The tract supports numerous small natural communities, most of which are associated with water or hydrology and are nested within the larger matrix communities. Numerous seeps occur on the property; one vernal pool was found. The large glacial erratic is notable and unique. The mixed sloping seepage forests, hemlock-hardwood Swamp, alder swamps and the alluvial shrub swamp and meadow communities all add richness and diversity to the tract. The Lake Fairlee Outlet is also a unique physical feature that deserves more attention.

The entire forested area of the PMNA is currently designated as a forest reserve. The conservation easement held by the Upper Valley Land Trust governs use and management of the tract.

Portions of the property previously supported a sugarbush. The valuable trees in this area were harvested during the tenure of previous owners. The previous owners harvested the majority of the property at various intensities.

Invasive plant populations are high in the shrub lands along the Lake Fairlee Outlet. Concentrations of invasives are also found in portions of the field. Populations have spread into the adjoining woodland and are prevalent near field edges; they appear to be absent from the forest interior. Honeysuckle is the most common invasive species found on the property. Common buckthorn and barberry were also encountered. Additional invasive species could be present in areas that were not observed during the inventory and population levels could also vary from those indicated. Implement planned control measures and continually monitor populations and treat as necessary.

The Thetford Conservation Commission has identified numerous management objectives for the Post Mills Nature Area. Additional evaluation, study and data are needed to provide direction, inform decision-making and accomplish these goals. Additional assessments or inventories are needed to further evaluate grass land, early successional and interior forest bird habitat as well as wood turtle populations. Several options for maintaining open land are available; mowing and fire. These should be examined and discussed further. The public water supply remains adequately protected by current management strategies. Potential conflicts include maintaining open land and mowing recreation trails in these fields in a manner that is not detrimental to species targeted for management. Gathering more information on the physical property and researching the various management options thoroughly will inform the decision-making process and reduce the potential for implementing conflicting management practices and incompatible land uses.

Thetford Town Forest Summary

The Town of Thetford has owned the Town Forest for the longest period of time of any of the subject properties. The land use history, current forest conditions and composition and the natural communities found on the property typify those of the region. Past agricultural use and logging have greatly influenced the forest.

The tract's most notable physical features are those associated with steep slopes and bedrock: talus slopes and ledges and cliffs. The black ash stand is unique and supports a variety of plant life. Three state listed rare plants are found on the tract, one in three locations. Several small water associated communities and features are found on the Town Forest. Three vernal pools were discovered and mapped during the inventory. Three seeps were also identified. Two perennial streams and at least four seasonal streams were noted. Two small hemlock/hardwood swamps were also identified; one of these has been impacted by the snowmobile trail.

The variations created by wetland and other water related habitats, the bedrock influenced sections of the property and the talus areas add an incredible richness to the otherwise ubiquitous quality of much of the woodland. Forest Reserve areas were delineated to protect these habitats; additional reserve areas may be designated in the future. Other protection methods will be implemented to protect fragile and special habitats found within the working forest.

The property has a history of forest management by the Vermont Forest Service from the early 1950s through the mid 1970s. Enough trees were planted in abandoned farmland to re-forest between 12 and 20 acres, depending upon spacing. Though the Vermont Forest Service marked significant volumes of timber for harvest, the actual volume harvested was small. The most recent harvesting in the 1990s resulted in a high-grade harvest that extracted the best timber and, instead, retained poor quality trees that now comprise the current stand. This operation was not marked or supervised by a qualified forester.

Invasive plant populations are high in many of the stands on the Town Forest. Former agricultural land supports the highest levels of invasives. Honeysuckle is the most common invasive species found on the property; common buckthorn is also present. The forest interior portions of the property that were either not cleared for agricultural or were abandoned much longer ago do not appear to support invasive plants. Additional invasive species could be present in areas that were not observed during the inventory and population levels could also vary from those indicated. These invasive plants pose a serious problem on significant areas of the tract and will require both resolve and resources to successfully control.

The Thetford Conservation Commission has identified numerous management objectives for the Town Forest, among them the possibility of placing a conservation easement on the property. The TCC has also identified a number of areas requiring additional study and research. Most of these concern rare plant and plant communities, wildlife habitat and fragile and/or sensitive sites on the property.

The current lease held by the Upper Valley Fish and Game Club, Inc. precludes a number of recreational activities on the tract both due to the lease itself and due to safety issues. Winter somewhat mitigates the safety issues related to the shooting range. However, though the shooting range may not be used as much during the winter months, it still supports some activity, hence the relocated snowmobile trail. It seems critical to explore options for broadening the safe use of this tract while continuing to accommodate the club and its members.

Taylor Tract Summary

The Taylor Tract is an ecologically significant site for conservation on both the town and Ompompanoosuc River watershed levels. The floodplain, which dominates the tract, includes both forested and open wetland natural communities that are particular to river floodplain environments. The tract supports a young Sugar Maple-Ostrich Fern Floodplain Forest which, despite its agricultural history, clearly retains important characteristics of a floodplain forest, including typical flora, soils, and, most importantly, the natural process of flooding. Over time, and without human disturbance, this will develop into a better example of the natural community type as the successional trees drop out and as the more shade tolerant sugar maple and other northern hardwoods dominate the canopy. Invasive plants such as wild parsnip and Bishop's weed are a significant problem at the tract. An increasing hardwood canopy and an invasive control program will greatly diminish the population these alien species. The Sugar Maple-Ostrich Fern Floodplain Forest is a rare natural community, both on a state level (ranked by the Vermont Nongame & Natural Heritage Program as an S2, or rare type) and locally. The rarity of this river floodplain community in Vermont is due to conversion to agriculture use.

The Taylor Tract is of conservation significance because of the rarity of its Sugar Maple-Ostrich Fern Floodplain Forest and due to the important functional values it performs as a floodplain wetland. These functions include streambank stabilization, water quality enhancement, and flood waters retention. Furthermore, it is an important reservoir of biodiversity. It supports critical wildlife habitat for uncommon wood turtle, and a great diversity of native plants, including the uncommon Wiegand's wild-rye (*Elymus wiegandii*) and loose-stemmed sedge (*Carex laxiculmis*).

Invasive plant populations are high, well developed and diverse throughout much of the Taylor Tract. Habitat restoration is a high priority. Invasive plant control and planting native tree, shrub and possibly herbaceous species are all critical to restoring this rare floodplain habitat. Invasive plants pose a serious problem on significant areas of the tract and will require both resolve and resources to successfully control; they also negatively impact surrounding properties and downstream locations.

General Summary

The Thetford Conservation Commission, after reviewing the information generated from the inventories, listening to public input and consulting with the inventory team developed broad management objectives for the subject parcels. This document has addressed a number of these and made recommendations designed to accomplish the following goals:

- Maintain and encourage a function, vital indigenous forest.
- Create forest reserves.
- Identify communities and vegetation that would benefit from active management.
- Control invasive plants.

Political will and resources are required to accomplish these and the other identified objectives. Forest reserves require few resources and support natural forests and their function. Active management, by contrast, will require a substantial commitment by the town to steward these properties. Controlling invasive plants constitutes the greatest financial commitment and will require decades of attention. Approximately 175 acres of these four parcels is infested with invasive plants. Two treatments are required to begin to get these species under control and to allow native plants to colonize. Additional treatments to maintain control will be necessary.

This plan has attempted to acknowledge the wide range of current and potential recreational uses that the properties afford. Some recreational uses conflict with each other while others conflict with other uses or with the physical constraints of the properties themselves. Much work is needed to sort out the various recreational issues. This will require a concerted effort on behalf of the TCC to work with other town bodies and interested parties. Manpower and time, rather than money is necessary, to accommodate the various recreational interests and potential uses while still protecting the natural resources on these four parcels. The new trail and recreational use application procedure that the commission is currently drafting is a positive step toward balancing various recreational uses with maintaining ecological integrity.

The plan has not adequately addressed the following stated objectives:

- Retaining professionals to implement on the ground management.
- Utilizing adaptive management to guide management activities.
- Utilizing a landscape context to implement management on the subject properties.
- Exploring conservation easements on the Taylor Tract and the Town Forest.
- Establishing a policy that dedicates any revenue generated from these properties exclusively to their management.
- The forest's role in sequestering carbon and the potential to generate income from the sale of carbon credits.
- Retaining cultural and historic resources.

The last goal is probably most easily addressed. Simply identifying cultural resources and instituting a policy of minimal disturbance and maximum protection when performing any activity on the properties accomplishes this goal. The effort and resources required are few. One example of translating this to on the ground practice is to utilize existing barways whenever possible when crossing stone walls. Or, do not disturb cellar holes and other historic resources. Retaining and protecting Native American cultural sites is more complicated. Further evaluation of any such sites by qualified parties is necessary to accomplish this element.

Exploring the possibility of placing conservation easements on the Taylor Tract and the Town Forest is relatively straightforward. This task requires some minimal research as well as some clear understanding of the intended consequences of such action. Retain a professional with experience in crafting conservation easements to aid in the process and review documents when this stage is reached. The inventory team supports placing easements on these tracts to ensure the perpetual protection of these natural resources. It is incumbent upon the conservation commission to initiate a dialog with the selectboard and the town residents to accomplish this goal.

Similarly, the commission is responsible for engaging the selectboard and encouraging that body to exclusively dedicate any revenue generated from town properties to the management of those properties. Though it is not realistic to expect that these four town properties can be self-sustaining at this time, a long-term approach to forest management will increasingly contribute to management expenses in the future. The inventory team supports this concept.

Adaptive management requires a monitoring program to evaluate the outcome of proposed and implemented activities and then requires modifications to the prescription to better meet the objectives. This is a common sense approach that fosters constant evaluation and improvement while helping to avoid perpetuating ineffective prescriptions and treatments. This requires a financial commitment.

This report does not examine the forest's role in sequestering carbon and mitigating the impacts of greenhouse gases. Forests currently sequester substantial amounts of carbon and can sequester additional volume. The designated forest reserves can play a substantial role in increasing carbon levels as can certain management approaches. The recommended management activities contained in this document are consistent with increasing stored carbon. The inventory data is more than adequate to provide the required baseline information for a carbon project or contract. Additional information or calculations may be necessary. This is an emerging market with many uncertainties. Additional opportunities and developments in this area will be forthcoming within the year.

Managing the Town's properties in a landscape context requires a substantial outreach program to all the abutting and nearby landowners; ideally it would reach all landowners within Thetford and also those in abutting towns. It will be essential to establish communications and a rapport with numerous individuals and to ascertain and evaluate their management practices and their impact on those of the town parcels. Forest management impacts numerous elements across the landscape including water, wildlife, plant communities and invasive populations. Integrating a landscape approach when managing these town parcels will require a huge commitment of time by the conservation commission or some other party and, most probably the services of professionals.

Retaining the services of professionals is a decision for the conservation commission and ultimately the selectboard. Sadly, the lack of professional advise and supervision is evident in the condition of portions of the Thetford Town Forest. Areas that were indiscriminately logged are severely degraded and have not recovered after 10 or more years. Revenue was lost at the time of harvest and the potential for future returns was

compromised; the cutting did not accomplish any town-derived objectives. The relocation of the snowmobile trail in the related operation negatively impacted a wetland due to the lack of professional assistance. The inventory team consists of three individuals with a wide variety of resource experience ranging from ecology and botany, to hydrology and water resources, to trail design, to invasive control strategies and to applied silviculture. Ultimately, it is the town's responsibility to steward these public resources and to engage the professional guidance necessary to successfully accomplish the stated objectives while maintaining this public legacy.

The Thetford Conservation Commission does not feel compelled to manage these forestlands for a financial return. The current commission intends to manage the properties to support native forest function and processes, utilizing a holistic approach that implements silvicultural prescriptions intended to accomplish objectives first and generate revenue second. Prior to harvesting and timber, the commission wishes to gather additional information to inform their decision making over the next five years. An assessment of bird habitat on the subject properties was just completed by Vermont Audubon and conveyed to the commission. This report is included in the Appendix. Utilize the report as the basis for further evaluating the resource and the issues of bird habitat on the properties. A Phase I Geomorphic assessment of the Ompompanoosuc River watershed is currently being conducted. Incorporate the findings of this survey in the management of the town parcels, particularly the Post Mills Nature Area. Additional examination is necessary to evaluate spring ephemeral plants and portions of the subject properties that possess unusual attributes.

Action and effort by the Thetford Conservation Commission is required in the short term (within 5 years or less) on the following:

- Blaze and paint boundaries. Confirm boundary lines that were flagged by volunteers. Investigate the boundary disparity on the Town Forest. Blaze and paint boundaries using standard protocols to clearly define town properties. Maintain these lines.
- Secure funding for invasive control and implement control measures as soon as possible. Utilize volunteer labor, if available, for hand pulling and licensed applicators for herbicide treatments.
- Gather information on existing habitats and the implications for wildlife, including birds.
- Investigate further unique natural communities and fragile habitats. Survey for additional rare, threatened and endangered plants.
- Begin exploring conservation easements for the Taylor Tract and the Town Forest.
- Incorporate the findings of the geomorphic assessment into managing the riparian habitat of the Lake Fairlee Outlet.
- Incorporate the Vermont Audubon Report on bird life and habitat into this planning document and into management decisions.
- Refine and clearly mark on the ground forest reserve boundaries.
- Complete alder management and invasive control projects that are scheduled under the existing WHIP contract on the Post Mills Nature Area.

Forests are diverse and continually changing ecosystems, influenced by soils, drainage, aspect, slope, slope position, climate, weather, natural disturbance and human use. The forests owned by the Town of Thetford are typical of the region; they are relatively young and comprised of second or third growth forest. The current forest conditions are directly attributable to past farming and logging practices. Human influence, along with natural succession and disturbance, will continue to shape the character of this forest. The unknown impacts of climate change will exert additional influences on our forests, the results of which can only be speculated on despite the best computer models.

The town owned forests support a diverse mix of plant species, tree size classes, stand densities and conditions. Several rare plants were discovered on the properties and these tracts support a variety of natural communities, some of which are uncommon. Many small, fragile communities are embedded within the larger matrix; these are often associated with water and add richness and diversity to the properties and to the landscape. The rocky talus slopes and warm steep hillsides, especially those on shallow soils, also support unique arrays of plants and conditions that vary from the surrounding vegetation.

The hardwood components will undoubtedly increase with time and will eventually become the major component over much of the town's forests, while white pine will eventually decline in its predominance, despite the longevity of this species. Hemlock may also become more prevalent if management does not deliberately discriminate against this species. The ability of hemlock to persist over time and space is well documented, as is its homogenizing impact on the forest. The hemlock woolly adelgid, an exotic pest that is responsible for killing large areas of hemlock from Southern New England to the Southern Appalachians, is another wildcard in the future of our native hemlock; this insect has recently been confirmed in Southeast Vermont. Future hemlock declines due to this insect are likely.

Global warming, and its impact not only on climate, but also on weather patterns, precipitation levels and natural disturbance regimes, is yet another wildcard with which to contend. We know there will be an impact; we just don't know with certainty what, and how severe that impact will be on our forests. Regardless, stands will continue to diversify and change as they develop naturally, as exotic insect and plant pests assault them and as they are manipulated to achieve human objectives.

The habitat found on the town's forestland and surrounding properties supports white-tailed deer, black bear, moose, porcupine, fisher and other upland mammals. Red squirrels and chipmunks commonly inhabit and utilize softwood stands. The forest is also home to numerous songbirds and raptors. See the report by Steve Hagenbuch of Vermont Audubon in the Appendix for specific bird sightings.

Retain all snags and dying trees, except where safety is an issue, to enhance ecological structure and improve wildlife habitat. Snags provide important habitat: perches for raptors and songbirds, potential nesting cavities, valuable food sources and a future source of ROM for the forest floor. Retain large trees and trees with cavities. Designate at least 10% to 20% of the trees in the managed portion of the forest to remain as Legacy/Elder Trees or Legacy/Elder-designate Trees for their entire natural life cycle. Harvest only from the abundance; preserve the rare.

Implementing forest management on town-owned forests must necessarily recognize the established indigenous residents, the intrinsic values possessed by the property and reflect the landowner's objectives, in this case the collective town. Much of forest, like the surrounding woodland in our region, is still healing from the overcutting and agrarian uses of the past. It is essential to maintain forest function to assure forest processes. Protecting, maintaining and, where possible, enhancing, energy flows, nutrient cycles, forest structure, forest soil and diversity of species, ages and genetics ensures a fully functioning forest that is capable of providing sustainable goods and services.

Consider this plan a dynamic document that is designed to aid decision-making and to prioritize and guide the work necessary to achieve both the stated management objectives and to restore and maintain a functioning forest. Terrain, soils and conditions can vary widely within stands. Consider these variations, market conditions, management objectives and weather when implementing specific recommendations. Evaluate treatments after implementation to determine if objectives were met. Modify prescriptions as well as expectations.

A land ethic recognizes that treatments designed and implemented to mimic natural forest development is the cornerstone of responsible stewardship; it is also the basis for ecological forestry. Ultimately, silvicultural treatments implemented from this perspective produce the greatest human benefit while simultaneously maintaining a fully functioning forest, which is the true provider of its own sustainable production and wealth.

Use this plan thoughtfully and carefully. This is a flexible guide; expect it to evolve to reflect additional information, a greater knowledge base, increased familiarity with the subject properties, changing conditions and perhaps changing objectives. Always act for the future, not simply for the present. Our decisions and actions will outlive us and the natural world will outlive our actions and decisions.

The Town of Thetford is responsible for the legacy these properties represent. The selectboard, the elected representatives and leaders of the town, are ultimately responsible for stewarding these lands. The conservation commission, an appointed body, is directly responsible to the selectboard and is charged with assisting in planning for the conservation of the town's natural resources for the benefit of the townspeople. This document represents the first step of a long, continuous journey for the conservation commission, the selectboard and the town as a whole. The journey may be difficult and arduous at times, but should also be perpetually fulfilling and rewarding.