MANAGEMENT PLAN
for
FALL MOUNTAIN STATE FOREST
Charlestown and Langdon, New Hampshire

STATE OF NEW HAMPSHIRE
DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
Division of Forests and Lands
2014

ACKNOWLEDGEMENTS

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- Editor and contributing author, William Guinn, Regional Forester, May 2014.

Cover: North Pond in winter. Photo by Janine Marr

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CHAPTER 1: INTRODUCTION

Fall Mountain State Forest is a New Hampshire state reservation managed by the Department of Resource and Economic Development. The state accepted the 948.5 acre property located in the towns of Charlestown and Langdon as a gift from The Nature Conservancy in 2005. The Nature Conservancy acquired the property to protect the habitat of the federally-endangered Northeastern bulrush and currently holds an easement on the property. Some acquisition funds were provided by the Land and Community Heritage Investment Program and the Cooperative Endangered Species Conservation Fund; LCHIP holds an Executory Interest, and USFWS holds a Grant Agreement on the property.

The purpose and management of state reservations are described under RSA 227-H.

> *RSA 227-H:1 Declaration of Purpose. – It is hereby recognized and declared that state-owned reservations contribute to the conservation of natural resources and distinctive quality of life in the state. The public welfare of this state is served by the prudent acquisition and management of reservations to provide forest benefits and for the purposes of demonstrating sound forestry principles, protecting habitat for plants, animals, and other organisms, conserving forested watersheds, preserving areas of rare and exemplary natural beauty and ecological value, and providing for perpetual public access and use.*

The above mentioned forest benefits are defined in RSA 227-G:2 and include, but are not limited to, forest products, a viable forest-based economy, recreation opportunities, scenic values, healthful surroundings, climate mitigation, clean water, and biologically diverse populations of plants and animals.

Within the Department of Resources and Economic Development, the Division of Forests and Lands is responsible for the management of the natural resources on State Reservations. The Division's mission is to *...protect and promote the values provided by trees and forests*. Various bureaus within the Division of Forests and Lands oversee different aspects of forest management on state reservations.

The Land Management Bureau is responsible for activities that generally involve non-biological uses such as maintaining the property boundaries, issuing special use permits and leases.

The Forest Management Bureau manages the natural resources on state reservations. Typical activities include conducting natural resource inventories, timber harvests, wildlife habitat improvement projects and maintaining roads as necessary to provide access for these activities.

The Natural Heritage Bureau conducts and maintains inventories of rare and endangered plants and exemplary natural communities.

CHAPTER 2: LANDSCAPE ANALYSIS

FUNCTIONAL LANDSCAPE

Fall Mountain State Forest is part of a 3,800 acre block of unfragmented forest land located on a broad ridge above the Connecticut River in southwest Sullivan County, in the towns of Charlestown and Langdon, New Hampshire (Figure 1). This functional landscape is bounded by Route 12A to the north, by Cheshire Turnpike Road on the East, by Cold River Road to the south and Route 12 on the west. Eighty nine percent of the area is forested, 4% is agricultural, 2% is wetland and the remainder is developed. Fall Mountain State Forest contains 25% of the eastern hemlock and 36% of the mixed forest cover within the functional landscape. This disproportionately high percentage of softwood cover may be attributed to the topography and soils, as well as past land management practices. An abundance of stone walls indicates widespread pasturing or agricultural use in the past, consistent with much of this area of the state. Presently, the majority of the area appears to contain a mostly even aged forest structure with young forest habitat conspicuously absent upon the landscape. Selective timber harvesting of some form has occurred on approximately 230 acres of the adjacent forest land in Charlestown and Langdon within the past 10 years. The functional landscape drains into the Connecticut River via three subwatersheds; the south Charlestown Tributaries, the Walpole Tributaries and the Lower Tributaries. These subwatersheds all converge at the southern edge of the Fall Mountain State Forest. Mountain Brook is the only named waterway that passes through the area and drains the majority of the property. This brook has been subject to historic and current beaver activity which has played an active role in the formation of North Pond, Middle Pond, and a network of associated unnamed wetland complexes. This stream-pond-wetland ecosystem provides habitat for a number of state species of concern and plays an important ecological role within this unfragmented block.

REGIONAL LANDSCAPE

Examining Fall Mountain State Forest on a broader regional scale, the important ecological role the property plays in the extended landscape becomes readily apparent. Located within the Vermont-New Hampshire Upland Section, Fall Mountain State Forest is part of the Connecticut Valley Ecological Region. This narrow region of land paralleling the Connecticut River has unique morphological and geologic features associated with the river valley which help define its vegetation. The valley provides for a northward extension of the Appalachian oak-pine forest type common to more southern regions of the state while the rocky topography, rising to a high point of 1,115 feet, is vegetated by a hemlock-beech-oak-pine forest more typical of the bordering Sunapee Uplands Ecological Region with its hilly terrain and shallow rocky soils.

The association of Fall Mountain State Forest with both ecological regions is made more meaningful for conservation because of the role it provides in generating an unfragmented east-west wildlife travel corridor. Starting near the Connecticut River to the west, the property provides an uninterrupted forest habitat which extends eastward to the border with Great Brook. A tributary of the Connecticut River, Great Brook crosses the Cheshire Turnpike at a narrow vegetated gap, forming a connection to additional forest habitat to the east. Close to 70% of the

landscape at this regional level is still forested, 13% is in agriculture and only 14% has been converted for transportation or buildings. Interestingly Fall Mountain State Forest is the only piece of conserved land within this landscape context.

The water resources of Fall Mountain State Forest are just as important regionally as they are within the functional landscape. The core complex of wetlands along Mountain Brook within the property provide critical habitat for the federally endangered Northeastern bulrush (*Scirpus ancistrochaetus)* and also account for 68% of the wetlands within the region. This wetland complex was the primary consideration in the acquisition of the property by The Nature Conservancy and its protection is a predominant part of the restrictions found within the easement. The importance of this wetland complex for wildlife habitat and water resources makes it the most noteworthy ecological aspect of the property at a variety of landscape scales.

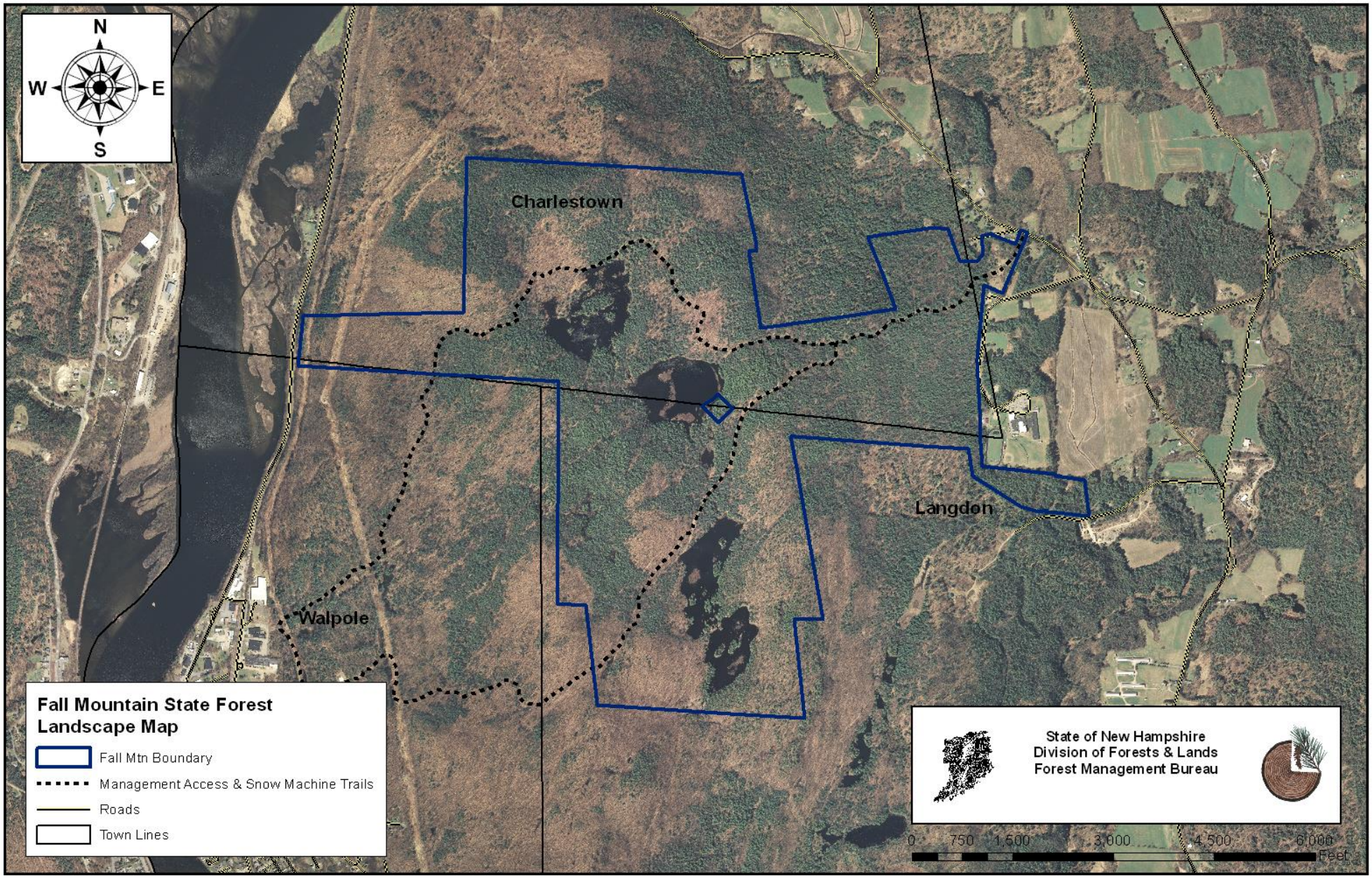


Figure 1. Landscape Context of Fall Mountain State Forest.

CHAPTER 3: LEGAL ISSUES

Any type of management at Fall Mountain State Forest must follow all applicable federal and state wetland and timber harvesting laws. In addition any management is subject to the terms and restrictions found within the conservation easement held by The Nature Conservancy. The terms of the conservation easement are incorporated into the four sections of the Management Guidelines Chapter of this plan.

FOREST AND WETLANDS LAWS

Timber harvesting laws applicable to Fall Mountain State Forest are primarily those stated under RSA 227-J, which are in place for the care and protection of forest cover adjacent to certain waters and public highways, along with the proper disposal of slash resulting from forest operations to help conserve water quality, reduce the risk of forest fires, and to promote healthful surroundings, recreational opportunities, and scenic values.

Specific laws pertaining to management activities occurring at Fall Mountain State Forest include RSA 227-J:6 Operations in Wetlands, 227-J:9 Cutting of Timber Near Certain Waters and Public Highways, and 227-J:10 Care of Slash and Mill Residue.

227-J:6 - It is required to file a Forestry Notification with the Department of Environmental Services in order to cross or operate in a jurisdictional wetland. In combination with filing a notification, operations are required to follow the guidelines presented in *Best Management Practices for Forestry: Protecting New Hampshire's Water Quality*. On state lands Forestry Notifications are completed by a staff forester and filed by the contractor who purchases and cuts the timber. The permit by notification is required for the crossing of any stream, seasonal or perennial, or operating within any delineated wetland.

227-J:9 - There are no public roadways within or adjacent to Fall Mountain State Forest, therefore cutting timber near public highways is not a concern. However, it may be necessary to harvest timber within regulated areas in or around jurisdictional wetlands for the benefit of wildlife habitats and natural communities, such as creating early-successional habitat for beavers or providing increased sunlight to rare plant species such as the Northeastern bulrush. These unique projects will require collaboration with the Natural Heritage Bureau and the U.S. Fish and Wildlife Service as required by the conservation easment as well as a variance request to RSA 227-J:9 subject to the approval of the Director of the Division of Forests & Lands.

227-J:10 - Slash laws pertaining to streams, wetlands, and boundary lines shall be adhered to by all contractors while harvesting timber in the regulated areas, and will be administered by the Division of Forests & Lands.

CHAPTER 4: ECOLOGICAL ASSESSMENT

RARE AND ENDANGERED PLANTS AND EXEMPLARY NATURAL COMMUNITIES

In 2006, the New Hampshire Natural Heritage Bureau conducted an ecological inventory and assessment of Fall Mountain State Forest (Bowman, 2006). The purpose of this survey was to gather data on the floristic and ecological diversity of the property as well as document the known populations of the federally endangered Northeastern bulrush to help inform the development of a management plan.

Two regional forest types were identified, the *hemlock-beech-oak-pine forest*, common throughout most of the local area, and the *Appalachian oak-pine forest system*, more common in the southeast portion of the state. A third forest type, *rich Appalachian oak rocky woods*, was found in a northwest corner of the property, and is considered a unique and exemplary natural community this far north.

In addition to four of NH's nine known populations of the federally-endangered Northeastern bulrush another endangered wetland plant, twining screwstem, was noted to occur in the Mountain Brook stream-pond-wetland ecosystem. Two threatened upland plants, fern-leaved false foxglove and American cancerroot were found in the rich Appalachian oak rocky woods exemplary natural community. One other uncommon plant on the state Watch List, the broad beech fern, was documented on an enriched slope in the northeast corner of the property.

INVASIVE SPECIES, EXOTIC INSECTS AND NATURAL DISTURBANCE

Several invasive species were noted in the old field area currently used as a parking lot as well as along both forks of the main trail to the heights of land on either side of North Pond. These include Japanese barberry, bittersweet, autumn olive, honeysuckle, alder-buckthorn and multiflora rose.

There are several exotic forest pests with the potential to reach Fall Mountain State Forest in the coming years. The three that pose the greatest risk are hemlock wooly adelgid, the emerald ash borer and the Asian long-horned beetle. Currently the Asian long-horned beetle has not been detected in New Hampshire. While Emerald Ash borer has been found in the state its current location is limited to Merrimack County. Hemlock wooly adelgid, however, has been documented in several surrounding towns and it is most likely just a matter of time before it is found on the property.

The increased frequency and severity of severe weather events such as wind storms and ice storms over the past decade and a half also have the potential to negatively impact forest health at Fall Mountain State Forest. Shallow rooted softwoods are generally more prone to wind damage while hardwoods tend to be more susceptible to ice damage due to their upturned and forking branch patterns.

CHAPTER 5: HISTORY AND CULTURAL RESOURCES

EARLY HISTORY

In his 1880 history of Walpole, George Aldrich wrote, "A little more than one hundred and twenty-five years ago the territory which is now included in the present town of Walpole was one unbroken, gloomy forest, which shaded the deep, rich soil that the summer sun had not warmed for centuries…Fall Mountain also was covered with a heavy growth of white pines, which had, perhaps, withstood the blasts of centuries" (Aldrich, 1880).

The first inhabitants of the area were the Abenaki people who settled on a meadow along the Cold River just south of Fall Mountain. They fished for salmon and shad each spring at the Great Falls until the end of the French and Indian War when they were no longer seen in Walpole. Sylvanus Johnson, an early settler of North Walpole, lived among the Anebaki for many years, and as an old man in the 1820s, was reported "in summer, to erect a wigwam on the top of Fall Mountain, where he used to spend several weeks of enjoyment in the forest solitude, always declaring the Indian's mode of life preferable to civilization" (Aldrich, 1880).

It appears that very little European settlement actually occurred in the area that makes up Fall Mountain State Forest. The 1805 Charlestown map does not indicate the presence of any homesteads and this is consistent with the scarcity of cultural resources located on the property. Early use of the area appears to have been primarily for pastureland as evidenced by the numerous stonewalls along the northern and eastern edges of the property. Much of Fall Mountain's old growth timber was harvested by the early 1800s for sheep farming which peaked between 1830 and 1840 when over 16,000 sheep were raised in Walpole alone (Aldrich, 1880). After abandonment, the land on the north side of the forest was converted to cattle, as evidenced by remnants of two-strand barbed wire attached to some of the boundary pines. However no farms, homesteads, or cellar holes were depicted on the 1860 town maps of Charlestown and Langdon in the present area of Fall Mountain State Forest.

Agricultural reports in 1873 indicated that in Charlestown, "Probably about one-third of the area of the town is covered with forest; a greater part is of second growth (about three-fourths). The amount of wood and timber is diminishing…The valuable varieties in town are ash, oak, chestnut and pine" (Adams, 1873). Langdon reported, "About four-fifths old growth…Pine, hemlock, chestnut, oak, birch, beech and maple" were valuable timber (Adams, 1873). In Walpole, "about one-quarter is covered with forests, and one half of it second growth…Chestnut and pine…" were the valuable tree species (Adams, 1873).

THE LAST 100 YEARS

Between 1910 and 1915, Joshua H. Blakely and the Blakely Lumber Company purchased several hundred acres of the mountain from various owners, including the woodland surrounding North Pond and the land along the Walpole town line. After harvesting much of the" second growth" mentioned above, he then sold the nearly 250 acres surrounding North Pond in 1929.

Between 1967 and 1978 New England Power purchased the acreage that makes up the present day footprint of Fall Mountain State Forest from private landowners, businesses, and the town of Langdon. While under ownership by New England Power, the property was managed for timber and wildlife habitat. Shelterwood, thinning and improvement cuts were employed between 1985 and 1998 to start the regeneration process, to thin overstocked areas and to improve the quality of the residual stands. Stands throughout the property ranged from 60 to 80 years in age in 1985 with the exception of 25 acres just north of North pond, aged at 45 years, and the Langdon portion of the property with stands between 35 and 50 years of age.

In 2004 The Nature Conservancy purchased the property from New England Power to protect the federally endangered Northeastern bulrush and its habitats. In 2005 The Nature Conservancy donated the property to the New Hampshire Department of Resources and Economic Development's Division of Forests and Lands subject to the terms of a conservation easement held by The Nature Conservancy.

CHAPTER 6: ROADS, TRAILS AND RECREATION

ROADS AND TRAILS

The primary public access for Fall Mountain State Forest is an old gravel road located on the west side of Route 12A just north of the entrance to the Fall Mountain Regional High School. The road is marked by a large property sign and leads up through a short section of woods to an old field area with parking for several vehicles (Figure 2). Winter access is limited during heavy snowfall as the area is not plowed. The road continues past the parking area through the old field to a large gate that marks the entrance to the main trail across the property. This trail is an old woods road that serves double duty as access for forest management activities and as a trail for snowmobilers and other recreational users of the property. The trail climbs steadily in a westerly direction across the property and forks around North Pond. The upper fork continues climbing west, wrapping around the wetland complex above North Pond and eventually heads south as it exits the west side of the property. The bottom fork of the trail climbs southwest below North Pond, passes above Middle Pond and exits the west side of the property where the two forks eventually rejoin. Both forks have recently been gated where they exit the property to minimize unwanted OHRV and other motor vehicle use. The gates are opened in the winter months to accommodate snowmobile traffic. The majority of the maintenance on this trail has been conducted in conjunction with timber harvest activities to allow passage of log trucks and equipment. Some intermittent brushing and drainage work is performed sporadically by snowmobile club members and school groups.

In addition to the main woods road there are several spur trails that lead to various areas of the property. One such spur leaves the south branch just after the main split and heads south splitting again, one fork leaving the property to the south, the other fork heading east down to the high school. Another short spur leads from the north branch to North Pond and provides fine access for fishing and wildlife viewing. There is also a “single track” cross country running trail used and maintained by the school which connects the north and south branches of the main trail and runs south- easterly below the wetland complexes and North Pond along the western boundary.

RECREATION

The network of woods roads and trails at Fall mountain State Forest provides many great opportunities for an array of traditional low-impact recreational activities including hiking, snowshoeing, cross-country skiing, and wildlife observation and snowmobiling. The property's diverse terrain and habitat conditions also offer excellent hunting and fishing opportunities. A list of permitted and prohibited activities in accordance with the terms of the conservation easement and regulations for state properties is provided in the Management Guidelines Chapter of this plan.

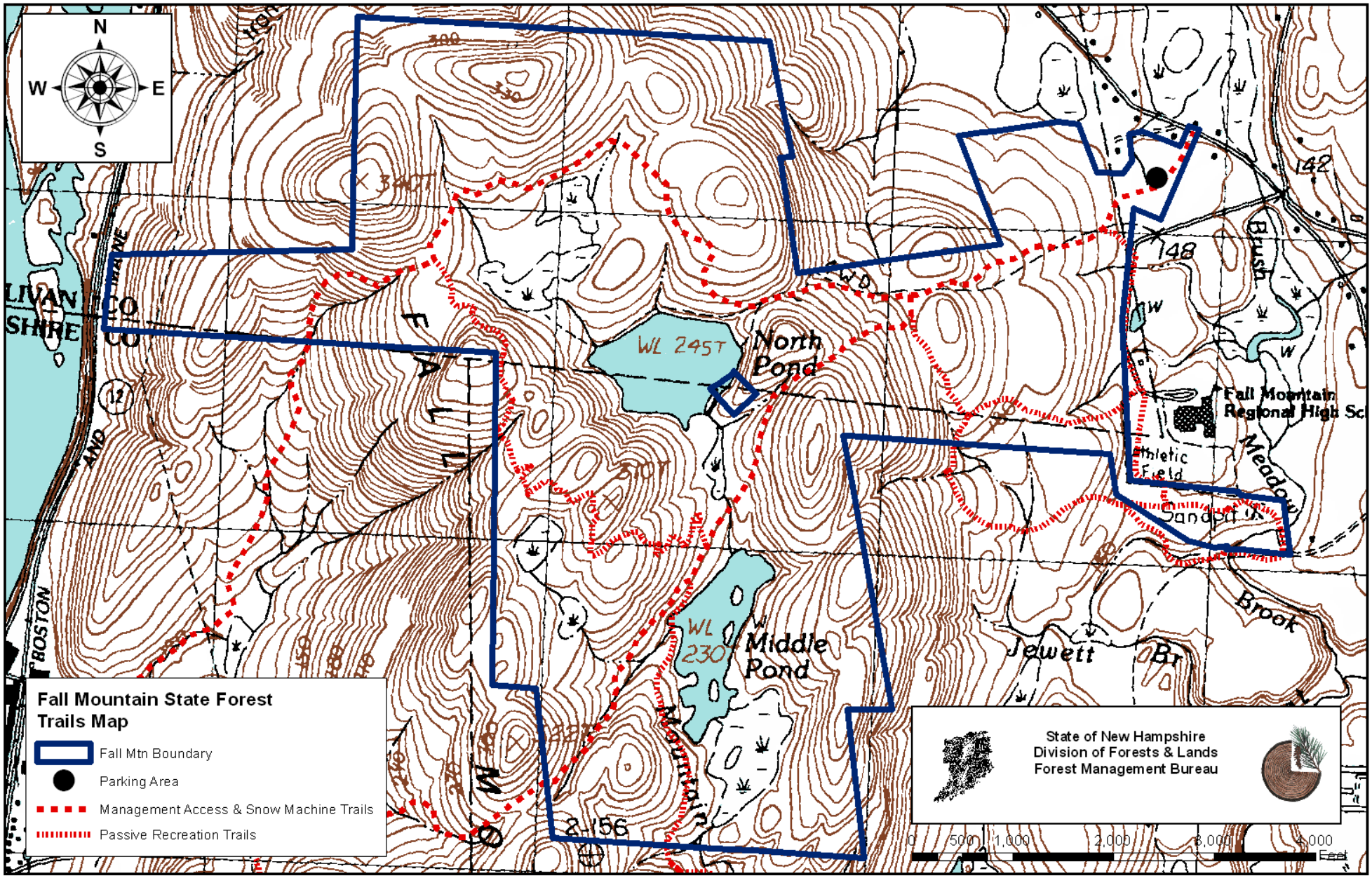


Figure 2. Roads and Trails for Management and Recreation at Fall Mountain State Forest.

CHAPTER 7: SOILS

Soils play an important role in the health of forests and wildlife habitats. Soils provide nutrients, water, and stability to trees and plants. Soil characteristics also have a significant influence on where plant species grow. NRCS generates and updates soils maps for each state. A combination of GIS data and the NRCS Web Soil Survey has been used to identify the soils and their characteristics present at Fall Mountain State Forest.

Eleven different soil series have been identified within the property, with sub-series based on soil combinations and variability of terrain (Figure 3; Table 1). The property is comprised of three primary soil types that have the greatest impact on forest growth, composition, and management decisions. The remaining soil types are a combination of wetlands or poorly drained soils, are located in small pockets or isolated areas, or are found in such small portions that they will likely have minimal impact on forest characteristics or management objectives.

SOIL SERIES DESCRIPTIONS

LsE: Lyman-Monadnock Rock Outcrop Complex, 25-50% Slopes

The most prevalent soil type within the property is Lyman-Monadnock rock outcrop complex. Found on approximately 473 acres, this soil type comprises more than half of the property. This soil is derived from ablation till and is considered well drained or somewhat excessively drained. Lyman-Monadnock is part of Important Forest Soils Group IIA, suitable for forestland and wildlife habitat use. Important Forest Soils Group IIA soils are similar to group IB soils in terms of having favorable moisture and fertility for tree growth, but have been identified separately due to physical limitations such as steep slopes, boulders, and rock outcrops. The physical limitations likely have minimal impact on the growth and production of timber. However, forest management is made more difficult. Successional trends are typically towards shade tolerant hardwoods such as red maple, American beech, and yellow birch in combinations with white pine and hemlock.

MvB, MvC, MvD: Monadnock-Lyman Series, 3-25% Slopes

The second most prevalent soil within the property is Monadnock-Lyman stony fine sandy loam with slopes ranging from 3-25%. Areas of this soil total approximately 180 acres. This soil series is derived of glacial till and is excessively or well drained. This soil is part of Important Forest Soil Group IB and is adequate for forestland and wildlife habitat. Important Forest Soils Group IB soils are generally sandy or loamy over sandy textures. These soils are less fertile and favorable for tree growth than IA soils, but are still adequate for good tree growth. Successional trends are typically towards forest stands of shade tolerant hardwoods such as American beech,

although actively managed stands are commonly comprised of a variety of hardwoods such as sugar maple, yellow birch, red oak, red maple, and paper birch in combinations with white pine and hemlock.

MwD: Monadnock-Lyman Rock Outcrop Complex, 15-25% Slopes

The third and final dominant soil type within Fall Mountain State Forest is Monadnock-Lyman Rock Outcrop Complex. This soil complex occurs between North, Middle and Mountain Ponds, and along the east and west boundaries of the property comprising approximately 85 acres. This soil is derived from till or ablation till and is well drained or excessively well drained. The soil series is part of Important Forest Soils Group IIA, and is suitable for forestland and wildlife habitat. Important Forest Soils Group IIA soils are similar to group IB soils in terms of having favorable moisture and fertility for tree growth, but have been identified separately due to physical limitations such as steep slopes, boulders, and rock outcrops. The physical limitations likely have minimal impact on the growth and production of timber however, the ability for forest management is made more difficult. Successional trends are typically towards shade tolerant hardwoods such as red maple, American beech, and yellow birch in combinations with white pine and hemlock.

ADDITIONAL SOILS

There are several additional soils at Fall Mountain State Forest including Warwick-Quonset gravelly fine sandy loam (WaB), Monadnock stony fine sandy loam (MfD), Borohemists Ponded (Bp), Lyme-Moosilauke stony loam (LyA, LyB), Pillsbury stony loam (PlA, PlB), Quonset-Warwick gravelly fine sandy loam (QsC), Marlow stony loam (MbD), and Rumney loam (Ru). These soils are a combination of wetlands or poorly drained soils, are located in small pockets or isolated areas, and typically comprise less than 5% of the total property acreage.

Both Warwick-Quonset combinations (WaB and QsC) are excessively drained soils with a sandy parent material. This soil type is part of Important Forest Soil Group IC found on outwash sands and gravels. Soil moisture is favorable for softwood growth and favors white pine. Successional stands with a history of forest management are commonly comprised of a combination of white pine, hemlock, balsam fir, red maple, and paper birch.

The Monadnock Stony Fine Sandy Loam series (MfD) is located on the north side of North Pond and along the town line on the eastern portion of the property. It is part of Important Forest Soil Group IB, and is a well-drained, glacial till soil. IFSG IB soils are generally sandy or loamy over sandy textures. These soils are less fertile and favorable for tree growth than IA soils, but are still adequate for good tree growth. Successional trends are typically towards forest stands of shade tolerant hardwoods such as American beech, although actively managed stands are commonly comprised of a variety of hardwoods such as sugar maple, yellow birch, red maple, and paper birch in combinations with white pine and hemlock.

The Lyme-Moosilauke (LyA, LyB) and Pillsbury (PlA. PlB) soil series are both poorly drained, hydric soils with the water table 0-18" beneath the surface. These soils are each part of Important Forest Soils Group IIB. IFSG IIB soils are poorly drained and are typically less productive for tree growth than any other soil group. Successional trends are towards shade tolerant softwoods including hemlock and spruce. Balsam fir and red maple commonly occur on these soils and harvesting opportunities are usually restricted to periods of frozen ground and are limited due to severe windthrow potential.

Marlow Stony Loam (MbD) is a well-drained soil with a parent material of basal lodgment till. Marlow stony loam is part of Important Forest Soil Group IA which consists of deep, loamy textured, fertile soils with the most favorable conditions for tree growth. Successional trends are toward stands of shade tolerant hardwoods including American beech and sugar maple. Forest stands typically contain a variety of species including red maple, yellow birch, white ash, and northern red oak in combinations with white pine and hemlock.

Borohemists Ponded (Bp) and Rumney (Ru) soils are both wet soils, poorly drained, and often found in bogs and floodplains with the depth to the water table being 0-12". They are recommended for use as forestland, wildlife habitat, watershed, and recreational or aesthetic purposes only. Tree species typically include those that tolerate frequent inundation by water, high organic matter, and low oxygen levels.

Table 1. Fall Mountain State Forest Soils Summary.

Soil Name	***Symbol***	***Parent Material***	***Drainage Class***	***IFSG***	***Successional Trend***
Lyman-Monadnock rock outcrop complex	LsE	Till	Well drained	IIA	Hardwoods
Monadnock-Lyman stony fine sandy loam	MvB MvC MvD	Till	Excessively well drained	IB	Hardwoods
Monadnock – Lyman rock outcrop complex	MwD	Till	Excessively well drained	IIA	Hardwoods
Monadnock stony fine sandy loam	MfD	Till	Well drained	IB	Hardwoods
Warwick-Quonset gravelly fine sandy loam	WaB	Outwash	Excessively well drained	IC	Softwoods
Quonset-Warwick gravelly fine sandy loam	QsC	Outwash	Excessively well drained	IC	Softwoods
Lyme-Moosilauke stony loam	LyA LyB	Till	Poorly drained	IIB	Softwoods
Pillsbury stony loam	PlA PlB	Till	Poorly drained	IIB	Softwoods
Marlow stony loam	MbD	Till	Well drained	IA	Hardwoods
Rumney loam	Ru	Alluvium	Poorly drained	IIB	Softwoods
Borohemists ponded	Bp	N/A	Very poorly drained	NC	N/A

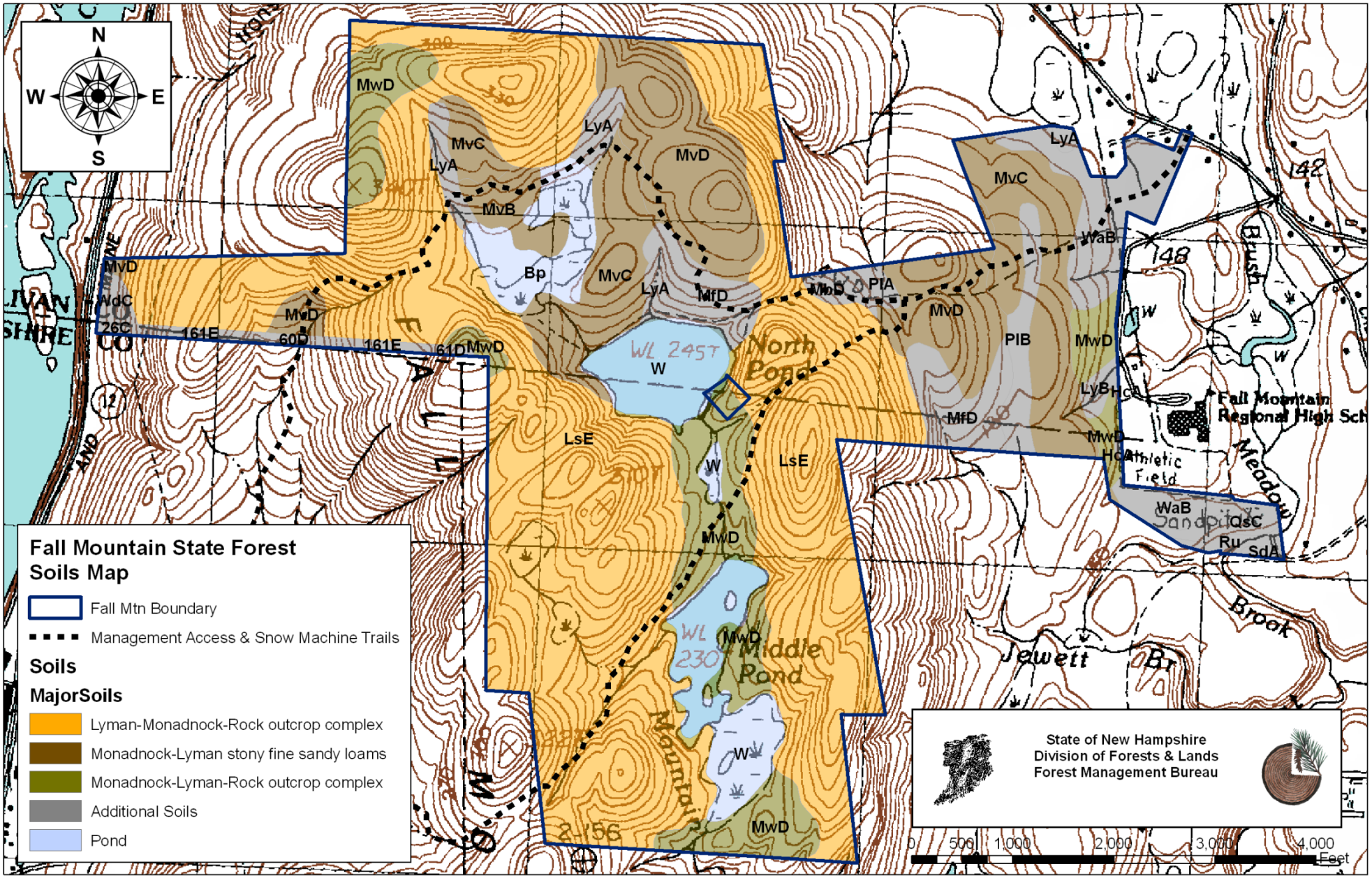


Figure 3. Soil Types at Fall Mountain State Forest.

CHAPTER 8: FOREST RESOURCE SUMMARY

The following stand evaluations are based on a forest inventory of Fall Mountain State Forest conducted by Division of Forest and Lands forest technicians in 2006. Based upon the requirements of the conservation easement the stands have been divided into two management areas; the *restricted management area* comprising those portions of the property encompassed by the riparian buffer zones, steep slopes and highly erodible soils as described in the easement and the *unrestricted management area* containing the remainder of the property. The following abbreviations are used in the tables below:

Types:	*Size:*	*Other:*
Wp - white pine	1 - seedling/sapling	QMD - quadratic mean stand diameter
POM - pine, oak, maple	3 - poles	BA - basal Area
Ro - red oak	4 - small sawtimber	Rel. Den. - relative density
Wo - white oak	5 - large sawtimber	AGS - acceptable growing stock
Bo - black oak		
He - hemlock		
Sm - sugar maple		
Yb - yellow birch		
Be - beech		

UNRESTRICTED MANAGEMENT AREA STAND EVALUATIONS

Hemlock-Beech-Oak-Pine Forest Type

Table 2. Unrestricted Management Area: Hemlock-Beech-Oak-Pine Forest Type Stands.

Stand	Acres	Type/Size	Age	QMD	BA/acre	Rel. Den.	Trees/Acre	% AGS
2	10.1	Wp/4	65	13.1	150.9	62	162.3	95
3	8.7	POM/5	80	16.7	132.0	70	87.1	89
4	153.8	Ro He/4	70-105	11.5	117.9	84	163.5	85
5	25.6	POM /5	80	11.4	133.3	85	187.8	88
8	23.5	Wp/5	80	14.3	133.3	63	119.8	88
9	23.0	POM/4	80	10.7	117.1	82	185.9	90
10	3.7	Wp He/5	80	8.3	153.3	67	407.4	83
12	15.5	Ro/4	75	11.6	91.6	69	124.4	86
13	5.4	He Ro/5	105	16.4	133.3	66	91.0	82

Soils: Five different soil types are found within these stands. The most prevalent soils are Lyman-Monadnock-Rock outcrop complex and Monadnock-Lyman stony fine sandy loams. Other soils found in smaller, more isolated pockets are Monadnock stony fine sandy loam, Warwick-Quonset gravelly fine sandy loam, and one poorly drained soil, Pillsbury stony loam. Soil characteristics are described in Chapter 7 of this management plan.

Overstory Conditions: These stands are primarily comprised of a combination of mature white pine, red oak, and hemlock. Mixed throughout the canopy are secondary species such as red maple, American beech, black birch, and some northern hardwood species. Crown stocking is typically dense, exceeding 60% relative density, with stem densities and basal areas indicating a fully stocked stand. Many of these stands are comprised of the full suite of tree species listed, however some stands are comprised of more than 80% of just one dominant species such as white pine. Although currently dominated by an individual tree species, all of these stands share the characteristics to eventually evolve into a more diverse, mixed-wood stand.

Understory Conditions: Understory species are primarily comprised of hemlock and American beech in areas with little to no sunlight or past disturbances. In stands with a more active land use history species such as red maple, black birch, red oak, and white pine are present. Overall, understory and mid-canopy species are present, but typically sparse in the majority of stands.

Regeneration Conditions: A suite of young vegetation is present throughout these stands. White pine, red maple, black birch, and red oak are the most prevalent in areas where timber harvesting occurred in the past. American beech and hemlock is widespread in heavily shaded areas and areas that have not been managed with timber harvesting. Regeneration ranges from just a couple feet in height up to 20 feet, based on the species, growing conditions, and year it was established.

Appalachian Oak-Pine Forest Type

Table 3. Unrestricted Management Area: Appalachian Oak-Pine Forest Type Stands.

Stand	Acres	Type/Size	Age	QMD	BA/acre	Rel. Den.	Trees/Acre	% AGS
15	6.8	Ro/4	100	12.1	112.5	76	139.9	82
16	22.3	Ro, Wo, Bo/3	95	8.7	91.3	80	220.7	66
17	8.2	Ro, He/4	95	10.1	110.0	76	197.0	84
18	49.1	Ro, Wo, Bo/3	85-95	9.2	85.0	75	185.4	69
19	72.0	POM/3	60-105	8.8	93.3	74	223.2	78

Soils: The stands within this forest type are entirely comprised of Lyman-Monadnock-Rock outcrop complex. Soil characteristics are described in Chapter 7 of this management plan.

Overstory Conditions: The dominant red and white oak species throughout these stands are the common denominator of these Appalachian-oak-pine types. Red oak is the more dominant species comprising 50% or more of most stands. White oak is also consistently present, accounting for 10-30% of the stocking. Other common species within all these stands include a strong component of white pine, red maple, and hemlock, with scattered black oak, hickory, red maple, and black birch. The majority of these stands are comprised of pole sized to small sawlog sized timber. The stands are highly stocked with relative densities exceeding 60%, although basal areas are not excessive due to the smaller diameter stems.

Understory Conditions: Understory species are primarily comprised of red maple, black birch, hemlock, red oak, and American beech. Many of these stands are densely stocked with overstory species, therefore limiting the establishment and growth of a mid-canopy.

Regeneration Conditions: A suite of young vegetation is present throughout these stands. Red oak, white oak, white pine, red maple, and black birch are the most prevalent in areas with suitable sunlight and disturbance. American beech is more widespread in heavily shaded areas and areas that have not been managed with timber harvesting.

Northern Hardwoods Forest Type

Table 4. Unrestricted Management Area: Northern Hardwoods Forest Type Stands.

Stand	Acres	Type/Size	Age	QMD	BA/acre	Rel. Den.	Trees/Acre	% AGS
14	20.0	Sm, Be, Yb/4	105	13.1	107.4	74	114.5	71

Soils: The stand within this forest type is primarily comprised of Lyman-Monadnock-Rock outcrop complex, with a small portion containing Monadnock-Lyman stony fine sandy loam. Soil characteristics are described in Chapter 7 of this management plan.

Overstory Conditions: There are a diverse mix of hardwood species in this stand including sugar maple, American beech, red oak, and red maple. Additional species scattered throughout include black birch, white ash, paper birch, and hemlock. This is primarily a pole sized to small sawtimber sized stand. Stocking is moderate to dense with relative densities exceeding 60%, but basal area and trees per acre are at modest stocking levels.

Understory Conditions: Understory species are primarily comprised of American beech and red maple. Hemlock, sugar maple, and black birch are more sparsely present. Overall presence of an understory is limited based on current stocking conditions and past land use.

Regeneration Conditions: Young forest growth is limited within this stand. A presence of American beech, sugar maple, and black birch is scattered throughout. Development and densities of regeneration vary depending on intensity of past land uses.

RESTRICTED MANAGEMENT AREA STAND EVALUATIONS

Hemlock-Beech-Oak-Pine Forest Type

Table 5. Restricted Management Area: Hemlock-Beech-Oak-Pine Type Stands.

Stand	Acres	Type/Size	Restriction
1	6.6	POM/4	Annual stream runs through stand.
6	12.2	Ro, He/5	Slopes exceeding 35%.
7	24.4	He/5	Shallow to bedrock soils.
20	260.9	POH/4	Slopes exceeding 35%, shallow to bedrock soils, adjacent to wetlands.
23	8.5	Wp/4	Adjacent to wetlands.
25	7.8	Wp, He/4	Adjacent to wetlands.
26	10.5	Ro, He/4	Adjacent to wetlands.

Soils: Six different soil types are found within these stands. The most prevalent soil is Lyman-Monadnock-Rock outcrop complex. Other soils found in smaller, more isolated pockets are Monadnock-Lyman stony fine sandy loams, Monadnock stony fine sandy loam, Warwick-Quonset gravelly fine sandy loam, and two poorly drained soils, Rumney loam and Lyme-Moosilauke stony loams. Soil characteristics are described in Chapter 7 of this management plan.

Overstory Conditions: These stands are primarily comprised of a combination of mature white pine, red oak, and hemlock. Mixed throughout the canopy are secondary species such as red maple, American beech, black birch, and some northern hardwood species. Many of these stands are comprised of the full suite of tree species listed, however some stands are comprised of more than 80% of just one dominant species such as hemlock.

Understory Conditions: Understory species are primarily comprised of hemlock and American beech in areas with little to no sunlight or past disturbances. In stands with a more active land use history species such as red maple, black birch, red oak, and white pine are present.

Regeneration Conditions: A suite of young vegetation is present throughout these stands. White pine, red maple, black birch, and red oak can be found in areas where timber harvesting occurred in the past. American beech and hemlock is widespread in heavily shaded areas and areas that have not been managed with timber harvesting.

Appalachian Oak Pine Forest Type

Table 6. Restricted Management Area: Appalachian Oak-Pine Forest Type Stands.

Stand	Acres	Type/Size	Restriction
21	19.6	Ro, Wo, Bo/4	Slopes exceeding 35%, Exemplary natural community.
24	9.1	Wp, Ro/4	Adjacent to wetlands.

Soils: The stands within this forest type are entirely comprised of Lyman-Monadnock-Rock outcrop complex. Soil characteristics are described in the Soils section of this Management Plan.

Overstory Conditions: The dominant red and white oak species throughout these stands are the common denominator of these Appalachian-oak-pine types. Other common species within these stands include a strong component of white pine, red maple, and hemlock, with scattered black oak, hickory, red maple, and black birch.

Understory Conditions: Understory species are primarily comprised of American beech and hemlock in areas with little to no sunlight or past disturbances. In stands with a more active land use history species such as red maple, black birch, red oak, white oak, and white pine are present.

Regeneration Conditions: A suite of young vegetation is present throughout these stands. Red oak, white oak, white pine, red maple, and black birch k are the most prevalent in areas with suitable sunlight and disturbance. American beech is more widespread in heavily shaded areas and areas that have not been managed with timber harvesting.

Northern Hardwood Forest Type

Table 7. Restricted Management Area: Northern Hardwood Forest Type Stands.

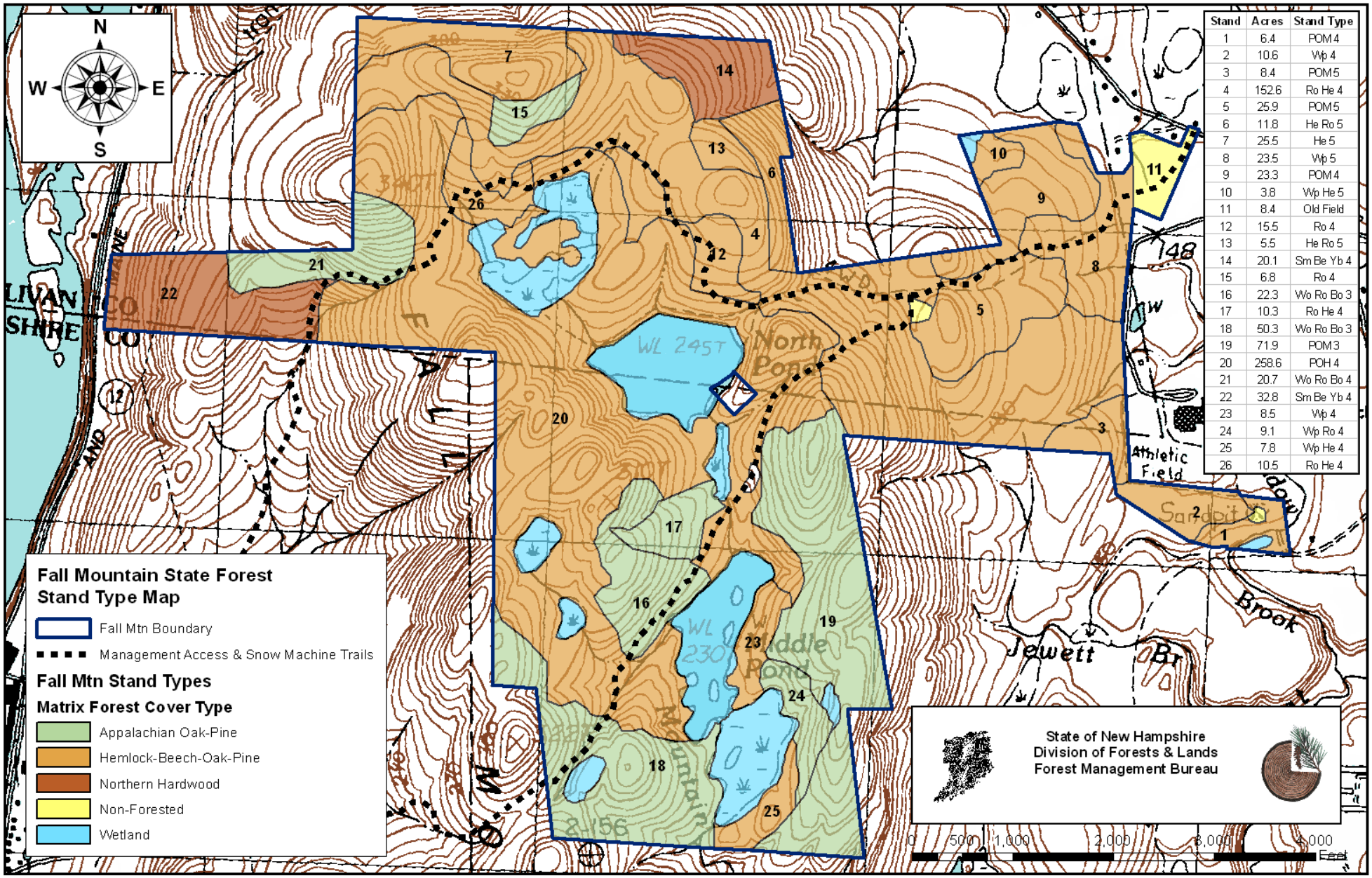
Stand	Acres	Type/Size	Restriction
22	30.9	Sm, Be, Yb/4	Slopes exceeding 35%.

Soils: The stand within this forest type is primarily comprised of Lyman-Monadnock-Rock outcrop complex, with small pockets of Monadnock-Lyman stony fine sandy loams and Windsor loamy sand. Soil characteristics are described in Chapter 7 of this management plan.

Overstory Conditions: A diverse mix of hardwood species comprises this stand including sugar maple, American beech, and yellow birch. Additional species scattered throughout include red maple, black birch, white ash, paper birch, and hemlock.

Understory Conditions: Understory species are primarily comprised of American beech and hemlock in areas with little to no sunlight or past disturbances. In areas with a more active land use history species such as sugar maple, red maple, and black birch are present.

Regeneration Conditions: Sugar maple, red maple, and black birch are common in areas with suitable sunlight and disturbance. American beech is more widespread in heavily shaded areas and areas that have not been managed with timber harvesting.



Stand	Acres	Stand Type
1	6.4	POM 4
2	10.6	Wp 4
3	8.4	POM 5
4	152.6	Ro He 4
5	25.9	POM 5
6	11.8	He Ro 5
7	25.5	He 5
8	23.5	Wp 5
9	23.3	POM 4
10	3.8	Wp He 5
11	8.4	Old Field
12	15.5	Ro 4
13	5.5	He Ro 5
14	20.1	Sm Be Yb 4
15	6.8	Ro 4
16	22.3	Wo Ro Bo 3
17	10.3	Ro He 4
18	50.3	Wo Ro Bo 3
19	71.9	POM 3
20	258.6	POH 4
21	20.7	Wo Ro Bo 4
22	32.8	Sm Be Yb 4
23	8.5	Wp 4
24	9.1	Wp Ro 4
25	7.8	Wp He 4
26	10.5	Ro He 4

Figure 4. Forest Stand Types at Fall State Forest.

CHAPTER 9: WILDLIFE ANALYSIS

WILDLIFE HABITAT

Fall Mountain State Forest contains critical wildlife habitat, as identified in the NH Wildlife Action Plan 2010 (NH Fish & Game Department, 2010). More than 75% of the forest is listed as Tier 1, Highest Ranked in NH (Figure 5). This is due to the fact that it resides in a large, unfragmented forest block with low road, human population, and housing densities, and a relatively high number of rare species occurrences. It also ranks highly as a wildlife travel corridor to the mosaic of Appalachian oak-pine and hemlock-hardwood-pine forests to the south, the Connecticut River to the west, and a mix of the hemlock-beech-oak-pine forest and grasslands to the north and east. Long strips in the northern and eastern portions of the property are categorized as Tier 2 and Tier 3 ranked habitat (Figure 5). These are located in both the Appalachian oak-pine and hemlock-beech-oak-pine mixes. The closest conserved land to Fall Mountain State Forest, a 286-acre easement held by The Society for the Protection of NH's Forests, is nearly 2 miles away in the northeastern part of Langdon.

Fall Mountain State Forest contains a variety of habitats that likely benefit a diversity of wildlife. Over 50 acres of ponds and wetlands support migratory waterfowl including mallards, wood ducks, common mergansers, Canada geese, wood frogs and turtles. Charlestown's natural resource inventory report identified the area surrounding North Pond as important marsh wetland. The extensive hemlock-beech-oak-pine forest and Appalachian oak-pine forest (Figure 4) provides suitable habitat for deer, bear, bobcat, veery, wood thrush, eastern wood pewee, as well as several raptor and bat species. Areas dense with hemlock provide important wintering habitat for deer, turkeys, bobcat, and songbirds. Acorns produced by red, white, and black oaks provide an important food source for bear, deer, turkey, small mammals, and many songbirds. Scattered vernal pools are important for salamanders, wood frogs, peppers, and turtles. The many rock outcrops may provide denning habitat for bobcats, foxes, and coyotes.

A lack of structural diversity including regenerating forest cover has been identified at Fall Mountain State Forest and the surrounding landscape. This habitat type, made up of seedling to sapling sized trees, is critical to many of the species known to occur or likely to occur at Fall Mountain State Forest listed in Table 8. The dense cover and increased insect activity that results from regenerating forests provides nesting and foraging opportunities for many bird species including veery, wood thrush, Canada warbler, ruffed grouse, and turkey. Abundant woody shoots provide ample browse for moose and deer while increased soft mast such as berries provide forage for bear and a variety of songbirds, especially prior to fall migration. The young, lush vegetative growth in regenerating forests is also an important source of food and cover for snowshoe hare. Bobcat which have a strong correlation with snowshoe hare populations also benefit from the increased prey opportunities provided by regenerating forest cover.

BIG GAME SPECIES

Fall Mountain State Forest lies within the Department of Fish & Game's Wildlife Management Unit H1 as identified in the NH Big Game Management Plan (NH Fish & Game Department, 2006). Current big game management goals for the area include increasing the deer, black bear and moose populations. Currently the turkey population is above goal (NH Fish & Game Department, 2013) and signs of both turkey and deer are prevalent at Fall Mountain State Forest. The property also provides suitable habitat for moose and bear and likely supports populations of both species.

ADDITONAL FISH AND WILDLIFE SPECIES

The 2006 Natural Heritage Bureau inventory of Fall Mountain State Forest noted the presence of Great blue heron nests at Middle Pond and active nesting was noted in the spring of 2014. Fall Mountain State Forest also contains suitable habitat for three additional rare species documented in a 2008 Natural Heritage Bureau inventory of Charlestown; American Bittern, Wood Turtle and Northern Leopard Frog (Charlestown Conservation Commission, 2009). Dwarf wedge mussel was also documented during the Charlestown inventory in the nearby Connecticut River.

The Cold River Watershed Management Plan documented historical records of the Timber Rattlesnake found in the Cold River corridor near Fall Mountain in Walpole dating back to 1950 (Cold River Local Advisory Committee, 2009). This species has not been documented in southwest New Hampshire for many decades. Peregrine falcons have been recorded nesting on Fall Mountain in Walpole, and bald eagles are known to roost near Bellows Falls on the Connecticut River in Walpole. The likelihood of these species using Fall Mountain State Forest to any extent is fairly low. Cooper's hawk and Osprey were also cited in the report but no locations were given. Cooper's hawk likely uses habitat on the Fall Mountain State Forest from time to time. Given the pond and marsh complexes, and standing snags within them, there is suitable osprey nesting and foraging habitat on the state forest.

Based on analysis of these known wildlife occurrences, the habitats within Fall Mountain State Forest, and wildlife species distributions, the following NH Wildlife Action Plan species have the potential to exist at Fall Mountain State Forest.

Table 8. Wildlife Species Likely to Occur at Fall Mountain State Forest.

SPECIES	**LEVEL OF CONSERVATION CONCERN**	**PREFERRED HABITAT**
AMPHIBIAN		
Blue-Spotted Salamander	regional concern	A-O-P, H-H-P, wetlands, vernal pools
Jefferson Salamander	NH special & regional	A-O-P, H-H-P, wetlands, vernal pools

Smooth Green Snake	NH special concern	A-O-P, H-H-P, grass, shrubs, wetlands
Wood Turtle	NH special & regional	A-O-P, H-H-P, grass, shrubs, wetlands
BIRD		
American Bittern	regional concern	grass, shrubs, wetlands
American Black Duck		wetlands
Canada Warbler	regional concern	A-O-P, H-H-P forests
Eastern Towhee		A-O-P, H-H-P forests, shrubs
Great Blue Heron		wetlands
Northern Goshawk		A-O-P, H-H-P forests
Osprey	NH threatened	wetlands
Pied-Billed Grebe	NH threatened	wetlands
Red-Shouldered Hawk	NH special concern	H-H-P forests, wetlands
Ruffed Grouse		A-O-P, H-H-P forests, shrubs
Veery		A-O-P, H-H-P forests
Whip-poor-will	NH special concern	A-O-P, H-H-P forest, grass, shrubs
Wild Turkey		A-O-P, H-H-P forests, grass, shrubs
Wood Thrush		A-O-P, H-H-P forests
MAMMAL		
Bobcat	NH special concern	A-O-P, H-H-P forests
Moose		A-O-P, H-H-P forests
White Tailed Deer		A-O-P, H-H-P forests
Black Bear		A-O-P, H-H-P forests
Eastern Pipistrelle	NH special concern	A-O-P, H-H-P forests
Northern Myotis		A-O-P, H-H-P forests
Silver-Haired Bat	NH special & regional	A-O-P, H-H-P forests

Wildlife species currently documented at Fall Mountain State Forest include deer, porcupine, wild turkey, red and gray foxes, coyote, ruffed grouse, snowshoe hare, pileated woodpecker, yellow-bellied sapsucker, and raccoon. As mentioned above middle pond is an active nesting site for Great blue heron. North Pond is stocked with brook trout each spring and also supports pickerel, beaver with three active lodges, a variety of waterfowl, including mallards, wood ducks, common mergansers, Canada geese, as well as wood frogs and turtles. A variety of songbirds, ravens, turkey vultures, and red-tailed hawks have also been noted in the area.

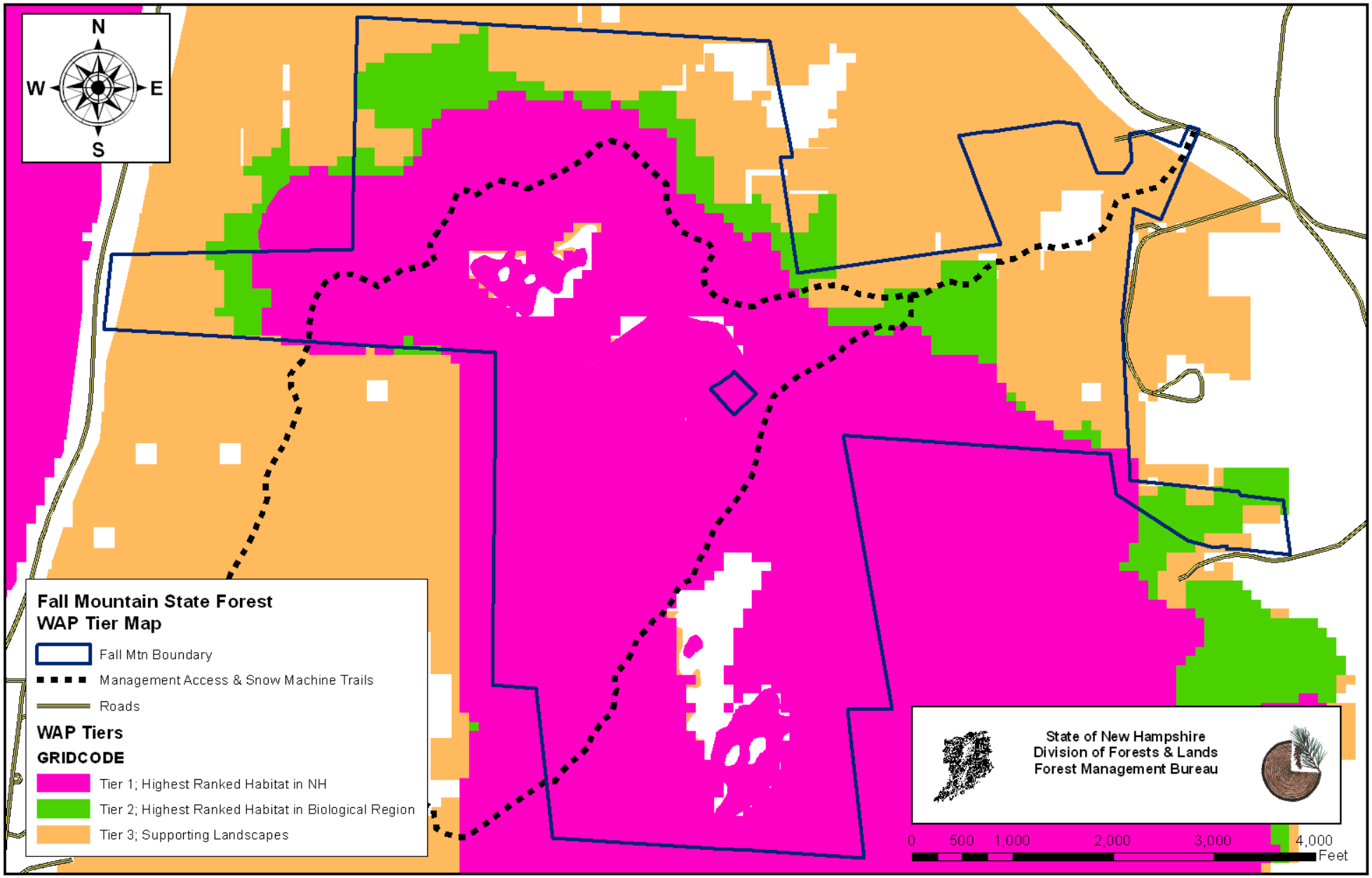


Figure 5. Wildlife Action Plan Habitat Ranking at Fall Mountain State Forest.

CHAPTER 10: MANAGEMENT OBJECTIVES

The following objectives for the Property have been identified in the conservation easement for Fall Mountain State Forest held by The Nature Conservancy and were developed in 2003 by a technical committee consisting of representatives from The Nature Conservancy, the United Sates Fish and Wildlife Service, the New Hampshire Fish and Game Department, the New Hampshire Division of Forest and Lands Forest Management Bureau and Natural Heritage Bureau, and the New Hampshire Division of Parks and recreation Bureau of Trails.

- Identify, protect, and conserve the exemplary natural communities, unique or fragile natural areas, and rare plant and animal species on the property and protect the Northeastern bulrush populations, and their current and potentially suitable habitats.
- Maintain or enhance the native biological diversity and natural habitat values found on the property.
- Ensure that the composition and structure of the Mountain Brook stream-pond-wetland ecosystem is shaped primarily by natural ecological processes and disturbance regimes and the ecological impacts and influences of past or future human activities are minimized.
- Protect the water quality, aquatic habitat, and ecological integrity of wetlands and riparian zones.
- Protect the fragile or highly erodible soils and maintain soil integrity and productivity.
- Maintain or enhance the quality of timber resources over time.
- Provide for high quality, traditional, low-impact public outdoor recreational and educational opportunities that are consistent with the management objectives outlined above, and which do not degrade the biodiversity conservation values and interests of the property.

In order to monitor and evaluate progress towards achieving these Management Objectives the Division of Forests and Lands and The Nature Conservancy will discuss any new or ongoing management activities or issues that have arisen annually as part of the existing yearly monitoring that The Nature Conservancy does of the Property.

CHAPTER 11: MANAGEMENT GUIDELINES

The management guidelines for Fall Mountain State Forest contained in the following four sections of this chapter were developed to achieve the management objectives identified in the previous chapter. They are based upon the terms of the conservation easement, as well as state policies and guidelines for the management of public lands, and the collaboration and input of natural resource professionals from numerous state agencies.

PUBLIC ACCESS AND RECREATION

Given Fall Mountain State Forest's remote character, sensitive ecological resources, proximity to population centers, and traditional use patterns, the property is best suited to undeveloped, dispersed recreation and winter snowmobile use on designated trails. This is reflected by the terms of the conservation easement and fits in well with existing regulations for state properties.

The following recreational uses are *permitted* at Fall Mountain State Forest:

- Hiking, running, biking, skiing, snowshoeing.
- Bird watching and wildlife viewing.
- Any other dispersed use of a non-destructive nature allowed under Department rules.
- Hunting, fishing, trapping (except beaver).
- Non-motorized, carry in/carry out canoeing or boating.
- Snowmobiling on designated trails (Figure 2).

The following recreational uses are *prohibited* at Fall Mountain State Forest either due to State regulations, Department rules or restrictions contained in the conservation easement:

- Operating motor vehicles or OHRVs (see below).
- Horseback riding (see below).
- Camping or campfires.
- Storage of canoes or boats.
- Artifact or relic hunting.
- Collecting any plants or animals without a permit.
- Hunting or trapping of beaver.
- Dumping of any refuse or waste.

Any commercial or organized use of the property requires a *special use permit* issued by the Land Management Bureau of the Division of Forests and Lands. Requests for special use permits must be in line with the purposes of the property and be on the permitted activity list.

Disabled hunters may request a special use permit to operate and hunt from an OHRV, pursuant to RSA 207:7-a.

Horseback riding may be permitted at the sole discretion of the easement holder and will require written approval by The Nature Conservancy after consultation with the Natural Heritage Bureau to determine that the activity does not harm or threaten any exemplary natural communities, unique or fragile natural resources, or rare plant and animal species on the Property. In addition any approval shall require an update to the management plan to include the location of the trails and roads proposed for horseback riding and any associated improvements and conservation measures.

Currently there are no plans to expand the existing road or trail network. Any future requests for development of new trails will be considered on an individual basis as well as for their cumulative effects on the property. In the event that a new road or trail is warranted, the location and construction shall be consistent with the purpose of the property and the terms of the conservation easement. Particular attention will be given to protecting wetlands and sensitive areas as well as to preventing increased motor vehicle or OHRV use on the property. Requests from outside parties must be submitted to the Division of Forests and Lands for evaluation through the state review process prior to the start of any trail construction. This review process includes members of Department of Fish and Game, the Natural Heritage Bureau, the Division of Historic Resources, the Bureau of Trails and the Department of Environmental Services.

Routine maintenance of the existing roads and trails on the property will follow The New Hampshire Trails Bureau *Best Management Practices for Erosion Control During Trail Maintenance and Construction* and will include controlling motor vehicle and OHRV use through the installation of gates, preventing erosion through the use of water bars and maintaining ditches and culverts and keeping brush cut back along roads.

The Division of Forests and Lands may limit public access and use of the property during the implementation of management goals for the property. This may include restrictions on the type, timing, or location of uses to:

- Protect fish and wildlife habitats, rare plants and unique natural communities and water quality.
- Reduce conflict between various recreational uses.
- Facilitate the removal of forest products.
- Ensure public safety.

Department of Fish and Game conservation officers enforce hunting and fishing laws as well as OHRV laws. Division of Forests and Lands forest rangers enforce timber harvesting and forest fire protection laws and may enforce any other state laws or regulations on the property.

WILDLIFE AND ECOLOGICAL MANAGEMENT

The following management guidelines for Fall Mountain State Forest were developed based on landscape analysis, review of NH's Wildlife Action Plan, review of the NH Fish and Game Big Game Plan, the forest resource inventory and collaboration with NH Fish and Game habitat biologists to enhance wildlife habitats within the property and the surrounding landscape.

- Establish groups of regenerating forest, each 1/2-2 acres in size, to provide food and cover for a suite of wildlife species.
- Promote hemlock cover for deer wintering areas.
- Enhance hard and soft mast producing species.
- Restore and maintain the old field area (Figure 6) as a permanent grass/shrub opening through periodic mowing.
- Control invasive plant species in the old field area and along the adjacent woods road through the use of herbicide applications with a written agreement with The Nature Conservancy.
- Retain forested buffers along wetlands and streams as travel corridors, as well as around vernal pools, and other sensitive areas.
- Promote early successional habitat for beaver to maintain the Mountain Brook stream-pond-wetland ecosystem and associated Northeastern bulrush habitat with guidance from the Natural Heritage Bureau and the U.S. Fish & Wildlife Service.
- Work with Fish and Game to ensure that North Pond is stocked with native fish species.

Many of the vegetative guidelines will be addressed through the implementation of forest management on the property. Long term forest structure goals for the property have been calculated based on an assessment of operable and accessible terrain, wetland and road buffers, current forest structure, as well as desired structure and composition. Based on the above guidelines the following desired habitat composition has been selected.

Table 9. Desired Future Habitat Composition at Fall Mountain State Forest.

COMPOSITION	**CURRENT CONDITION**	**DESIRED FUTURE CONDITION**
SIZE CLASS DISTRIBUTION		
Seedling/Sapling	**0.0%**	**7.0%**
Pole Timber	**15.5%**	**14.0%**
Saw Timber	**73.0%**	**24.5%**
Late Successional	**0.0%**	**43.0%**
Grass/Shrub	**1.0%**	**1.0%**
Wetlands	**3.5%**	**3.5%**
Ponds	**7.0%**	**7.0%**

Reclamation of the old field area and control of the associated invasive species will be accomplished with the use of a bronto-mower. Some larger trees may need to be felled by chain saw. Additional hand clipping and pulling of invasive species will be necessary along the access road. Apple trees and any other mast producing shrubs or trees will be retained for wildlife. After at least one growing season, invasive plants including autumn olive, honeysuckle, glossy and common buckthorn, and multiflora rose will be treated with a foliar spray following all

applicable state and federal laws. Additional follow up treatments may be necessary. The restored field will be maintained as old field habitat with a regular mowing schedule using a brush-hog every two to three years.

To help prevent the inadvertent introduction of invasive species elsewhere on the property, either directly through management efforts or indirectly as a result of wildlife utilizing newly created habitat, care will be taken to ensure that machinery is not transporting invasive seeds and managed areas will be monitored for newly established invasive species. In the event that any new invasive species are detected they will be treated promptly.

Stream and wetland buffers will be implemented in accordance with the conservation easement and are summarized in the next section. Vernal Pools will be buffered in accordance with *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. In addition Fish and Game wildlife biologists may review vernal pools in management areas prior to scheduled harvests and further refinement of vernal pool buffers may be recommended as well as restrictions on the timing of the operation with respect to species life cycles.

Fish Stocking of North Pond is done annually by Fish & Game. Prior to 2010, stocking consisted of 100 brown and 300 rainbow trout annually. In 2010 managers agreed to only stock native species, and since that time brook trout is the only species being stocked in the North Pond.

FOREST MANAGEMENT

All forest management activities at Fall Mountain State Forest will be conducted in accordance with *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire* and in accordance with *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire*. Every timber harvest or wildlife habitat improvement project will be prepared and administered by Division of Forests and Lands foresters. The planning process for any project on land managed by the Division of Forests and Lands includes review and input from the State Lands Management Team, a group which includes representatives from multiple state agencies including the Department of Fish and Game, the Natural Heritage Bureau, the Division of Historic Resources, the Bureau of Trails and the Department of Environmental Services. In addition the conservation easement requires the Division of Forests and Lands to notify The Nature Conservancy at least 30-days prior to any timber harvest activity so they may review the proposed operation for compliance with the terms of the easement.

Based upon the requirements of the conservation easement and the results of the 2006 resource inventory, Fall Mountain State Forest has been divided into two management areas; the *restricted management area* comprising those portions of the property encompassed by the riparian buffer zones, steep slopes, and highly erodible soils as described in the easement and the *unrestricted management area* containing the remainder of the property.

The conservation easement requires the following riparian buffer zones, measured from the normal high water mark:

- 200 feet from each side of USGS mapped intermittent, 1st and 2nd order streams and along shores of ponds and non-forested wetlands less than 10 acres in size.
- 300 feet along shores of ponds and non-forested wetlands greater than 10 acres in size.
- Expanded buffer zones to encompass all vegetative communities subject to flooding, slopes greater than 35%, or soils classified as highly erodible that are adjacent to the water body or wetland.

The riparian buffer zones have the following constraints:

- Timber harvesting is prohibited within the first 100 feet from the normal high water mark or wetland edge.
- Within the remainder of the buffer zone crown closure may be reduced to a relative density of 60% and must otherwise be in accordance with *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*.
- Log yards and new road construction are not permitted within the buffer zones unless it can be demonstrated that they are necessary for access; any new construction shall require written approval from The Nature Conservancy.
- Skid trails shall be kept to a minimum within the buffer zones and shall follow best management practices for erosion control and minimize damage to aquatic habitats.
- The use of pesticides or herbicides is prohibited within the buffer zones.
- Exceptions to these limitations may be granted at the discretion of The Nature Conservancy and with the written endorsement of the Natural Heritage Bureau and the U.S. Fish & Wildlife Service for the purposes of maintaining or restoring Northeastern bulrush habitat.

Due to the rugged topography and the size of the Mountain Brook stream-pond-wetland ecosystem, applying the riparian buffer zones and expanded buffer zones results in a restricted management area of 515.5 acres. This area includes the entire wetland complex and dominates the central portion of the property with several smaller fragmented blocks throughout and covers a little more than half of the property acreage (Figure 6). The remainder of the property outside the required buffers is the unrestricted management area. This area is slightly smaller at 433 acres and is spread across the property in several large blocks. Both management areas contain stands of hemlock-beech-oak-pine forest types and Appalachian oak-pine forest types. The dominant soils of both management areas are comprised of various combinations of the Lyman and Monadnock series. These are excessively to well drained, sandy loam soils of varying depth derived from glacial till.

The mid successional species in these forest types such as white oak, hickory, red oak and white pine regenerate well in medium openings ½ to 2 acres in size. The late successional species such as beech and hemlock regenerate well in smaller openings. This makes Fall Mountain State Forest well suited to *uneven-aged management*, a silvicultural system that removes individual stems or groups of stems to create multiple openings of varying size in the forest canopy. Unlike *even-aged management* which ultimately has one final stand replacing harvest at the end of the rotation, uneven-aged management retains a perpetual forest cover with a slowly shifting mosaic

of small openings across the stand over time. This form of management results in a multi-aged stand that contains a range of size classes. Typically to be considered uneven-aged, a stand needs at least three distinct age classes, approximately 20 years apart. Timber harvests in both management units will follow the principles of uneven-aged management using single tree selection and group selection.

Due to the terrain and the constraints of the conservation easement much of the restricted management area will be unavailable for timber harvesting. These *inoperable areas* will be left to progress naturally through the processes of forest succession. Eventually over time some of the area may even attain characteristics of old growth forest. Harvesting in the restricted management area will be primarily limited to the manageable portions of the buffer zones that are adjacent to the unrestricted management area. Single tree selection will be used here to remove poorly formed stems, less desirable species and mature trees to enhance the growth and improve the quality of the stands. Harvesting will reduce relative density to 60% and will be performed in conjunction with management occurring in the adjacent unrestricted stands. Over time this type of selective silviculture may begin to favor more shade tolerant species, such as hemlock and northern hardwoods such as beech, which can regenerate and thrive in the small openings created by the removal of individual stems.

In the unrestricted management area group selection will be used to create midsized openings ranging from 1/2 to 2 acres in size. Openings in this size range will allow more sunlight to reach the forest floor and will encourage mid successional species in the Appalachian oak-pine forest stands and the hemlock-beech-oak-pine forest stands. In addition some selective silviculture may be applied between groups as needed over time to help improve the growth and quality of the developing stands.

The amount of acreage that can be harvested sustainably in the unrestricted management area can be calculated using *area control*. Area control utilizes the *harvestable acreage*, a desired *rotation age* and a *cutting cycle* to establish an *allowable harvest*. The allowable harvest is the amount of acreage that can be sustainably treated with group selection over time. By subtracting the old field area at the entrance to the property and the sugar bush area the resulting harvestable acreage is 393 acres. Due to the modest soil fertility on the property a slightly longer rotation age of 120 years has been chosen to allow trees to attain sawtimber size. As mentioned earlier uneven aged management requires several age classes, approximately 20 years apart so the cutting cycle will be every 20 years. Utilizing these numbers an allowable harvest of 66 acres is calculated as follows:

$$(393 \text{ acres}/120 \text{ years}) \times 20 \text{ years} = 66 \text{ acres}$$

This allows for up to 66 acres of groups ½ to 2 acres in size to be harvested across the entire 393 acres every 20 years. However, applying group selection to the entire unrestricted area at once would be impractical, so for logistical reasons it has been split into three smaller *cutting units* of roughly equal size (Figure 6). The *south cutting unit* is 124 acres and contains stands 16, 17, 18, and 19. The *north cutting unit* is 134 acres and contains a portion of stand 4 as well as stands12, 13, 14 and 15. The *east cutting unit* is 135 acres and contains the remainder of stand 4 as well as stands 2, 3, 5, 8, 9, and 10.

Dividing the unrestricted management area into three cutting units allows several smaller harvests to be implemented over the 20 year cutting cycle. Staggered six to seven years apart, each cutting unit will be harvested once every 20 years removing approximately 22 acres, a third of the allowable harvest, at each entry. There are multiple advantages to managing in this fashion. The smaller cutting units are more manageable for planning and implementing, they reduce the footprint and impact of any one harvest on the property at a particular time, and more frequent creation of groups ensures a continuous supply of regenerating forest cover for wildlife.

The establishment of pure plantations and the introduction of non-native species or genetically modified species are prohibited by the terms of the conservation easement except for the purposes of ecological restoration. To this end the Division of Forests and Lands is currently working with the American Chestnut Foundation to develop a blight resistant American chestnut hybrid using backcrossed Chinese chestnut/American chestnut pollen to fertilize local remnant seed sources. The final product will be a chestnut tree that is over 93% American chestnut, retaining the genetic resistance to the blight from the Chinese chestnut. When disease resistant chestnut seedlings become available, consideration will be given to planting some of the group selection areas at Fall Mountain State Forest as part of an attempt to restore the once abundant chestnuts to their native range.

SCIENTIFIC RESEARCH AND EDUCATION

The Division of Forests & Lands supports the use of state lands for educational opportunities and scientific research. The conservation easement also allows that Fall Mountain State Forest may be used by students and professionals from academic institutions for these purposes. Any research or educational program must be approved by the state through the special use permit process before it can begin.

An educational partnership currently exists at Fall Mountain State Forest under a Special Use Permit with the Land Use Program at Fall Mountain High School. The program is aimed at increasing student involvement and understanding of the forestry and the maple sugaring professions. As part of the program the high school students tap maple trees within a 32 acre area on the eastern edge of Fall Mountain State Forest that abuts the school grounds (Figure 6). This “sugarbush” area encompasses portions of stands 3, 4 and 8. These stands primarily consist of pole and sawtimber sized white pine, red oak, red maple and hemlock. The majority of the tapped trees are red maples with a few scattered sugar maples. Tapping in the sugarbush follows the requirements set forth in the Division’s *Policy and guidelines regarding the use of Department of Resources and Economic Development lands for maple sap production*. Students in the program will apply selective silviculture under the guidance of Division of Forests and Lands foresters to increase crown size and sap production of maple trees by removing competing stems of other species. Students will also have to adhere to the riparian buffers discussed in the forest management guidelines section while working around the two streams that flow through the sugarbush area.

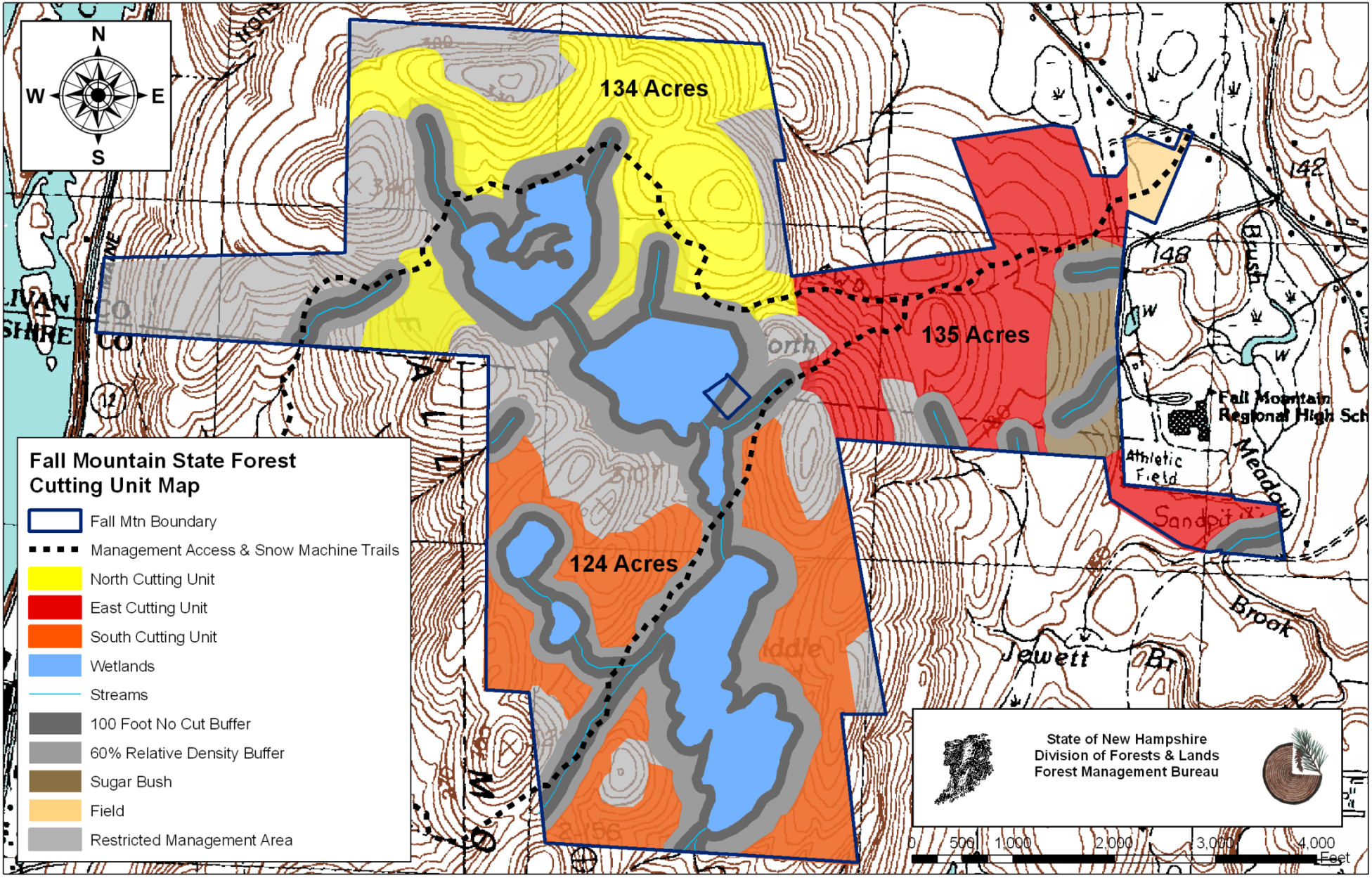


Figure 6. Cutting Units and Restricted Management Areas.

CHAPTER 12: SUMMARY

This plan provides a mechanism to manage Fall Mountain State Forest in a manner consistent with the requirements of the conservation easement that will:

- Assure that the property will be retained in a predominantly natural, forested, and open space condition.
- Protect and conserve the native biological diversity and habitats on the property; occurrences of Northeastern bulrush; any other rare plants and animals, exemplary natural communities and significant wildlife habitats occurring on the property; and the ecological processes that sustain these natural heritage features.
- Conserve and compatibly manage the property for the protection of water quality and aquatic habitat including North Pond, Middle Pond, Mountain Brook, and all other surface waters on the property.
- Conserve the productive forest soils and forestland on the Property for responsible forest management that preserves the public benefits of the natural resources of the Property and maintains the property's long-term capacity to produce forest products.
- Manage the property in accordance with the state forest management program.
- Allow for public pedestrian outdoor recreational uses of the property, such as hiking, bird watching, cross-country skiing, hunting, trapping, and fishing; and to allow for public use through snowmobiling on designated trails.
- Sustain the property's remote, undeveloped open spaces for the enjoyment, education, and benefit of the general public.

REFERENCES:

Adams, J. (1873). NH Agriculture Third Annual Report of the Board of Agriculture to His Excellency the Governor May 1, 1873. Orren C Moore, State Publisher. Nashua, NH.

Aldrich, G. (1880). Walpole As It Was and As It Is. The Claremont Manufacturing Co. Claremont, NH.

Bennett, K. (2010). Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire. UNH Cooperative Extension. Durham, NH.

Bowman, P. (2006). Ecological Inventory of Fall Mountain State Forest. State of New Hampshire, Department of Resources and Economic Development, Division of Forests and Lands, Natural Heritage Bureau. Concord, NH.

Charlestown Conservation Commission. (2009). Natural Resources Inventory of the Town of Charlestown, New Hampshire. Charlestown, NH.

Cold River Local Advisory Committee. (2009). Cold River Watershed Management Plan. S. Acworth, NH.

Cullen, J.B. (2001). Best Management Practices for Erosion Control on Timber Harvesting Operations in NH. Online source: http://des.nh.gov/organization/divisions/water/wetlands/documents/timber_harvesting.pdf.

The Department of Natural Resources and Economic Development. (2003) Policy and guidelines regarding the use of Department of Resources and Economic Development lands for maple sap production. Concord, NH.

Hagenbuch, S., Manaras, K., Shallow, J., Sharpless, K., & Snyder, M. (2011). Forest Bird Habitat Assessment: A Guide to Integrating Bird Habitat Data into a Vermont Forest Inventory. Huntington, VT: Audubon Vermont. Retrieved from http://vt.audubon.org/sites/default/files/documents/assessment-guide.pdf

The Nature Conservancy. (2005). Deed of Conservation Easement, Fall Mountain State Forest. Concord, NH.

NH Fish & Game Dept. (2006). New Hampshire Big Game Plan: Species Management Goals & Objectives 2006-2015. Concord, NH.

NH Fish & Game Dept. (2010). NH Wildlife Action Plan. Concord, NH.

Southwest Region Planning Commission. (2003). Southwest Region Natural Resources Inventory First Edition October 2003. Keene, NH.

Talking About Young Forests: A Communication Handbook. (2013). Northeast Association of Fish & Wildlife Agencies. Retrieved from http://youngforest.org/sites/default/files/research_documents/Young%20Forest%20Habitat%20Communication%20Handbook-FINAL-020413.pdf

Town of Charlestown, NH. (1805). 1805 Map of Charlestown NH. Charlestown NH. Online source: http://www.sullivancountynh.gov/index.php?n=maps.

Walling, HF. (1860). Map of Charlestown NH. From Topographical Map of the County of Sullivan New Hampshire from Surveys under the Direction of HF Walling. Smith & Morley Publishers. NY, NY. Online source: http://www.oldmaps.com/nh/nh_towns/sull60/Charlestown.jpg.

Walling, HF. (1860). Map of Langdon NH. From Topographical Map of the County of Sullivan New Hampshire from Surveys under the Direction of HF Walling. Smith & Morley Publishers. NY, NY. Online source: http://www.old-maps.com/nh/nh_towns/sull60/Langdon.jpg.