FOREST MANAGEMENT PLAN

for the

SALEM TOWN FOREST

located between

SHADOW LAKE ROAD and BLUFF STREET

SALEM, NEW HAMPSHIRE

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EXECUTIVE SUMMARY

The Salem Town Forest consists of approximately 343.5 acres and is located between Shadow Lake Road and Bluff Street in the northwestern part of Salem, New Hampshire. It is mostly forested with pine and oak, but contains three major wetlands and is bisected by Hittytity Brook with its associated wetland complex. The original Town Forest was expanded in 2016 and 2017 with the acquisition of 133 acres that was part of an abutting subdivision project and combined with another 3 acres that were already owned by the Town, but isolated within developer's property. The Town Forest is managed by the Salem Conservation Commission under the Multiple Use concept where consideration is given to timber production, wildlife habitat improvement, recreation, education and watershed protection. Two timber harvests have occurred in the northeast portion of the original forest since 1994 which produced a total of 145,480 board feet of sawtimber. Other areas within the forest have been set aside from the harvesting program and will be allowed to develop into Stands of Old Growth trees. An extensive recreational trail system was constructed after the property's acquisition and trail use by the public increased dramatically after the new trailhead was built along Shadow Lake Road. The importance of the Town Forest as protected Open Space with the various habitats and recreational opportunities that it offers has grown over the years as much of the surrounding forestland has been converted to house-lots.

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I. GEOGRAPHIC INFORMATION

Site Name: Salem Town Forest
Town/County/State: Town of Salem, County of Rockingham; State of New Hampshire
Total Acreage: 343.5 acres
Type of Ownership: Fee ownership with a Conservation Easement held by the Southeast Land Trust of New Hampshire

II. INTRODUCTION

A. Purpose of the Forest Management Plan

The 2016-17 acquisition of additional conservation land on the Salem Town Forest was funded by the NH Land and Community Heritage Investment Program (LCHIP) and the NH Department of Environmental Services (DES), Aquatic Resource Mitigation (ARM) Fund Program as compensation for unavoidable impacts to resources elsewhere in the Merrimack Service Area under the DES Wetlands Statute. The purpose of this Forest Management Plan is to ensure that the Town Forest is managed and maintained in perpetuity in accordance with the project agreement between the Town of Salem and the DES.

B. Long-Term Steward and Responsibilities

The Long-Term Steward of the site is the Salem Conservation Commission. The Conservation Commission shall implement this Forest Management Plan, managing and monitoring the property in perpetuity to preserve its habitat and conservation values in accordance with the DES Project Agreement.

C. Forest Management Plan Review

The Forest Management Plan will be reviewed at a minimum once every five to ten years by the Conservation Commission. The Plan may be revised or supplemented with additional information and management recommendations. Any revisions other than edits that change the management actions beyond the standard maintenance activities will be reviewed with DES.

III . PROPERTY DESCRIPTION

A. Setting and Location

The Salem Town Forest is a publicly-owned working forest that is located between Shadow Lake Road and Bluff Street, about ¾ mile east/northeast of the intersection of those roads with NH Route 28, also known a North Broadway. The Town Forest contains approximately 343.5 acres (subject to change based on a new boundary survey) and is bisected by Hittytity Brook. On paper, the Forest has frontage and access points on several roads, though the access points on Bluff Street and Matthew Drive are unusable due to wetlands. The two main access points on the west side of the lot include vehicle access at the end of West Lane off of Hitty Road and pedestrian access from the trailhead parking lot entrance off of Shadow Lake Road. There is also pedestrian access from Hummingbird Lane and Zion Hill Road on the east side of the Forest. The Town Forest is dominated by the upland oak-pine forest, but also contains some marshes along Hittytity Brook, three bog-like areas and numerous vernal pools.

The bogs and marshes have been formally designated as "Prime Wetlands" by the Town of Salem. The Forest also contains an extensive, heavily-used hiking and mountain biking trail system. There is a small privately owned tract of land in the center of the Town Forest with no known formal access.

B. Directions and Access

As mentioned previously, the two primary access routes to the portion of the Town Forest northeast of Hittytity Brook are the vehicular access from West Lane which is off of Hitty Road. Hitty Road intersects with Shadow Lake Road, just northeast of the Hittytity Brook bridge, about ¾ mile northeast of NH Route 28. West Lane is wide enough for logging trucks and tractor trailers, but the gate on the Town Forest boundary is too narrow for some mechanical harvesting equipment, such as large feller-bunchers. During the 2008 harvest, the Feller-buncher had to be unloaded on Hazelwood Drive where it followed the pedestrian access to the Town Forest. The log yard area for the past two harvests is located in the old gravel pit along the woods road off of West Lane. That woods road can be followed southerly to the southern side of the Town Forest, though parts of the road are periodically submerged during periods of high water. The road is also crossed by several intermittent streams and is currently used as a main recreational trail. Because of the heavy use of that trail, it is recommended to relocate the portions of the road that are periodically flooded to higher ground and culverts should be installed at the intermittent stream locations as part of the next timber harvest. This will help protect water quality and greatly improve winter trail conditions. It will also provide better access for emergency and rescue vehicles.

Pedestrian access to the trail system starts at the trailhead parking lot that is located on Shadow Lake Road, adjacent to the local NH Department of Transportation maintenance shed. The trail crosses Hittytity Brook over a long footbridge that is dedicated to long-time Conservation Commission member Wally Shultz, and follows the access road for a short distance where it then branches out into several trail routes. There is a less used trail access off Hazelwood Drive, but it does not have a parking area and is mainly used by residents in that subdivision. The frontage along Matthew Drive is unusable for access due to the wetlands. The timber harvests of 1994 and 2008 created a network of skidder trails in the northeast third of the Town Forest that can re-used in future harvests.

Access to some of the Town Forest west of Hittytity Brook can be obtained by following a very old and overgrown woods road off of Shadow Lake Road just southwest of the Department of Transportation maintenance yard. The old road accessed a now-depleted gravel pit. The road could be upgraded to access about 15 acres of Town Forest that abuts the Kiowa Road development. An old trail that starts near the depleted gravel pit accesses another 8 acres of the Town Forest near Samoset Drive, but it is mostly located on private property. There is an isolated area of the Town Forest with road frontage on Bluff Street, but is unusable due to wetlands.

The eastern portion of the Town Forest can be accessed off of Zion Hill Road, about 1/3 of a mile north of the Zion Hill Road/Bluff Street intersection, though the 118 feet of frontage is only suitable for pedestrian use. It can also be accessed off of the newly constructed Hummingbird Lane, which is located about 1/10 of a mile north of the Zion Hill Road/Bluff Street intersection. There are three access points with existing hiking trails along that lane, but the trail routes need to be modified to tie into that new road. Terrain also limits those access points to pedestrian use. The woods road from West Lane could be extended and improved to access the forest west of Hummingbird Lane for both forest management and emergency purposes.

C. History and Land Use of the Town Forest

1. Acquisition History

The Town Forest consists of many lots that were purchased over time starting in 1979, with the most recent occurring in 2017. There is a small privately owned, land-locked parcel in the center of the Town Forest east of Hittytity Brook. The owner of that parcel has been approached several times over the years by the Town to acquire that lot, but did not have any success.

Deed Date	Grantor	Map or Deed Acres	Deed Book/Page	Tax map/lot
9/17/1979	William & Hazel Brown	79.0	2348-1917	46-6494
9/17/1979	William & Hazel Brown	15.0	2348-1917	55-6819
4/14/1987	Robert& Elaine Glaser	.28	2722-2627	38-4662
4/14/1980	Helen M. Murray	20.0	2361-1495	46-6495
4/30/1980	Henrietta W. Lunberg	20.0	2361-1492	38-6498
4/30/1980	Francis Geary	38.0	2362-1129	38-6501
7/30/1992	Charlotte Putnam	5.4	2936-1147	46-6497
7/30/1992	Charlotte Putnam	4.0	2936-1147	46-6813
4/24/1981	William Brown	.74	2387-1318	55-6812
4/03/1995	Charlotte W. Weber	10.32	3101-2550	45-6480
1/13/1998	Andrew & Ann Santos	10.82	3262-2150	32-11568
5/23/1961	Tax Collector's deed	.05	1672-0055	37-4669
6/05/1972	Joseph & Odina Goyette	.05	2144-0311	37-4670
6/02/1975	Clarence Shapliegh	.05	2238-0175	37-4671
5/11/1998	Gordon Rosko	2.18	3291-1689	38-6516
5/26/2016	Stonebrook Land Dev.	100.994	5718-1256	47-6874
3/27/2017	Stonebrook Land Dev.	32.381	5811-2363	47-1256

2. Land Use - Colonial Settlement Return of the Forest

The history of the Town Forest can be separated into two categories, though they are inter-related. The categories are colonial settlement and abandonment; and the return of the forest with its modern land use.

Although the area was occupied by Native Americans when the Europeans first settled what is now Salem in the mid 1600's, the natives had done little to alter the forested landscape aside from occasional low intensity burning of certain habitats to encourage wildlife. Colonial settlement slowly followed the major New England rivers, such as the Merrimack River, and the Salem area was first considered the North Parish of Methuen, Massachusetts until 1741 when the boundary between New Hampshire and Massachusetts was finally established. When the Europeans settled the area, they began clearing much of the forest for agriculture, using the trees for lumber and firewood. Trees not otherwise utilized were girdled and burned once they had died and dried out. All of what is now the Town Forest was used for agriculture throughout the 1700's and most of the 1800's when New Hampshire was self-sufficient in food and industry. The better sites were used to grow crops or hay, while the less productive and rocky sites were

used for pasture. Even the marsh grass growing in the wet areas along Hittytity Brook was probably used for hay. Evidence of intensive agriculture in the area east of Hittytity Brook can be found on the base of the hill east of the old gravel pit just south of the West Lane gate. Stone piles and short sections of stone walls indicate that the land was tilled for a while. Evidence of intensive agricultural use can also be found in the northeast corner of the Town Forest towards Zion Hill Road where several stone walls, a walled corral and stone causeway across a wetland are located. Several wetland areas throughout the Forest show evidence of being ditched in an attempt to drain them to improve farming conditions as the soils in those sites were deeper and more fertile. The Town Forest area north and west of Kiowa Road, on the west side of Hittytity Brook, was also heavily used for agriculture as evidenced by the numerous stone walls and farm lanes, though the actual farmsteads were located off the Town Forest along Shadow Lake Road.

Agriculture in New Hampshire began to decline after the Civil War due to the collapse of the sheep industry and the opening up of the flat, fertile plains in the mid-west where the land was free and easily accessible by the railroads. As the marginal farmlands were abandoned, the fields slowly reverted to forests. The area east of Hittytity Brook on the original Town Forest was abandoned in the mid to late 1800's and probably grew in with white pine. Pine stands were typically clear-cut in the early to mid 1900's, but due to the lack of very old stumps in that area, it appears that any logging occurred well before the Town's acquisition. However, the mixed forest type of pine and oak, especially with the abundance of black oak and a scattering of white birch and aspen would indicate that the area probably suffered a brush fire in the early 1900's. It could have occurred shortly after the forest had been logged which was long enough ago for the stumps to have completely rotted away. The trees north and west of Kiowa Road are much younger than the rest of the Forest, so that area was probably not abandoned as farmland until the early to mid 1900's. That area grew in with pine and oak on the drier sites and red maple and white ash on the wetter sites.

Sand and gravel was mined from the area north and west of Kiowa Road in the 1950's or 1960's. The pits were not reclaimed and grew in with mixed hardwoods, mainly oak, maple and birch. The gravel deposits along Hittytity Brook were mined in the 1960's or early 1970's, after the site was cleared of trees. It was around that time that the wells were drilled in the southern part of the Forest.

The original 201 acre Town Forest was acquired in 1979 and was formally designated a Town Forest in 1983 by vote of Town Meeting. A Forest Management Plan was developed by Forester David Belford in 1988, but he left the profession before implementing his forestry recommendations, though the recreational trail system was expanded. In 1993, the Conservation Commission hired Ron Klemarczyk of FORECO: Forest Resource Consultants to set up a timber sale. A selection harvest to remove the poorer quality and mature trees was conducted in 1994 on about 50 acres in the northeastern portion of the forest. Logger Robert Lee of Allenstown, New Hampshire was high bidder and a total of 78,575 board feet of sawtimber, mostly white pine and oak; 105 cords of firewood; and 14 tons of pine pulp were harvested, which netted the Town $7,050.69.

In the late 1990's, local teenagers with mountain bikes started using the Town Forest and expanded the trail system by using some of the skidder trails from the 1994 harvest. In 1998, a new trailhead was built along Shadow Lake Road and a footbridge was constructed across Hittytity Brook to access the Town Forest trail system. The highly visible trailhead and available parking greatly increased recreational use of the forest. In 2000, the UNH Cooperative Extension Service set up a wildlife habitat improvement program in the old gravel pit and cleared some land to keep the site in early successional plant species. Unfortunately, the "droppings" from the wildlife that were attracted to the site contained seeds from invasive species which sprouted and are well-established on the site.

In 2008, the area that was logged in 1994 was again harvested under the supervision of FORECO to remove the mature trees and release the regeneration that developed after the 1994 harvest. Jeff Eames of Epsom, New Hampshire, was the logger and his crew harvested 66,905 board feet of sawtimber, mostly white pine and oak; 75 tons of hardwood pulp; and 487 tons of woodchips that fueled local wood energy plants. That harvest netted the Town $6,606.80.

In 2016-17, the Town acquired another 133 acres as part of an abutting subdivision project. The land use history was somewhat similar to the original Town Forest, though was not abandoned as open pasture until the early 1900's. The barbed wire around parts of the property would indicate that it was then used for a woodland pasture in the early to mid 1900's. The forest appears to have been selectively thinned in the past, probably in the 1960's or early 1970's by the Putnam Family. It appears that the harvest focused on the removal of oaks in favor of white pine which was the common forest management strategy in that era. The forest in the recent acquisition is now dominated by large white pines and oaks. Several of the old logging trails from that harvest eventually became recreational trails and tied into the trails on the original Town Forest.

3. Cultural and Historic Features; Archeological Sites

There are numerous cultural and historic features found throughout the property. Stone walls can be found within and around the Town Forest. Stone piles can be found in the northwest part of Stand 1 and a few were noted in Stand 8. Stone piles are evidence that the site was used for growing crops. Stone piles that are not on top of boulders were probably piled on stumps when the land was first cleared. There is an old farm lane in Stand 5 that is lined with two stone walls. A stone causeway can be found crossing the wetland located northeast of Stand 1 as well as in the wetland between Stands 7 and 8. A walled in area in Stand 8 was probably used for a corral as small rocks that usually indicated intensive crop farming were not in evidence. The most impressive historical features on the lot are the old fieldstone dams found at the southern end of the Town Forest just north of where Hittytity Brook crosses under Bluff Street. The larger dam appears to have been used to create a water storage pond for the water-powered mills that were located further downstream as there is no mill foundation adjacent to the dam. Three sawmills were once located below the storage pond on the south side of Bluff Street, in the part of Town called Millville, though they operated at different points in time. A grist mill was located just off the north side of Bluff Street on what is now the Town Forest and may have predated the sawmills. Which mills the water storage pond supplied is not known. Although the grist mill and sawmills are referenced in a 1792 deed (Rockingham County Registry Book 134 Page 373), the larger dam is referred to as the "Upper Mill Dam". Whereas a lot more water is needed to run a water-powered sawmill than a grist mill, it can be assumed that the water that was stored by the Upper Mill Dam was used to power the sawmills as the Grist Mill had its own dam and an apparent sluiceway from that upper dam by-passed the Grist Mill. The mill and dam site should be set aside as a historic site. The 1792 deed describes the sale of the late Timothy Duston's flowage rights for the mills. The Duston family owned several water-powered mills in colonial Salem. All of the historic features should be protected as best as possible if they are located near timber harvesting. No cellar holes were found on the property, indicating that any of the old farmsteads were located on what are now abutting properties. There are no documented Native American archeological sites on the property, though sand and gravel deposits along brooks and marshes were often sites for hunting camps. Unfortunately, any sites would have disappeared when the sand and gravel was removed. Numerous recreational trails are found throughout the forest, many located on old logging trails. Some of the trails are also "nature trails", with points of interest delineated along the way.

4. Existing Easements and Restrictions; Boundary Line Status

The portion of the original Town Forest located east of Hittytity Brook was surveyed in the year 2000 by Thomas R. Stevens LLS#31 and it is recorded at the Rockingham County Registry of Deeds as Plan #29,207. The boundary lines east of the brook on the original Town Forest were blazed and painted red in 2008 prior to the timber harvest using that boundary survey as a guide. However, the survey uncovered a boundary overlap in the area of Matthew Drive. The surveyors for that development appear to have made an error in their survey by not tying into existing bounds along the Town Forest's eastern boundary. As a result, their subdivision map created lots that encroached onto what is now the Town Forest. One abutter painted over the new boundary blazes. Although the overlap is not extensive, the problem should be addressed (See Addendum). The entire Town Forest, including the area west of Hittytity Brook was surveyed in 2018 by Eric Mitchell and the boundaries were blazed and painted. It is important to maintain the painted blazes to prevent backyard encroachments, sometimes called "curtilage creep" that often occurs when backyards abut publicly owned forestland. Blazes typically need to be repainted every seven to ten years. Well-marked boundaries will help limit management activities to the intended parcel and help reduce the risk of accidental trespass on the part of abutters.

Other than the impending Conservation Easement to be held by the Southeast Land Trust of New Hampshire and the deed restrictions limiting the 2016-17 acquisitions to "Preservation, Conservation and/or Agricultural use" there are no utility easements, rights of way or restrictions associated with the property. However, there is a privately-owned parcel of land in the center of the forest, though no legal right-of-way has been found or claimed by the current owner.

D. Adjacent Land Uses

With the exception of the two wetlands in the northeastern part of the forest and the NH Department of Transportation maintenance shed on Shadow Lake Road found in the northern tip of the forest, the property is surrounded by residential development. Primary concerns of heavy residential use abutting the Town Forest include backyard encroachment (curtilage creep), invasive species introduction from yard waste, inadequate or poorly maintained septic systems leaching towards the forest, and over-use or misuse of recreational trails.

IV. NATURAL RESOURCES

A. Aquatic Resources

The Town Forest contains four bog-type wetlands, a large wetland complex along Hittytity Brook, five intermittent streams and numerous vernal pools.

1. Bog-type wetlands and marshes

W1- This forested wetland is located in the northern tip of the Town Forest. It is a large wetland that eventually drains into the north end of Shadow Lake, though only 7.4 acres are located within the Town Forest. Tree species include white pine and red maple, white and black ash, and some very scattered stems of black spruce and eastern larch. Shrub species include highbush blueberry, bayberry, black alder and poison sumac. Ground cover includes sphagnum moss and several species of fern. A field stone causeway can be found crossing a narrow spot in the southeastern part of the wetland.

W2- This forested wetland is located in the northeastern part of the Town Forest and drains into the W1 wetland. The 6.7 acres of the wetland on the Town Forest are similar to the W1 wetland in that the tree species include white pine and red maple, white and black ash, though no black spruce or larch were observed. Shrubs included highbush blueberry, bayberry and black alder. Ground cover includes sphagnum moss and several species of fern.

W3- This small 0.4 acre wetland is located on the property boundary between W2and W4 and drains northeasterly into W4. Tree species include mainly white pine and red maple and shrub species include high-bush blueberry, bayberry and black alder. Ground cover includes sphagnum moss and several species of fern.

W4- This forested wetland is located in the east-central part of the Town Forest and contains 13.8 acres. Like W1, a narrow spot within the wetland is crossed by a fieldstone causeway, though this causeway is used for a recreational trail. Tree species include white pine and red maple, white and black ash and elm. Shrub species include highbush blueberry, bayberry, black alder and poison sumac. Ground cover includes sphagnum moss, several species of fern and sedges. An ephemeral stream channel can be found flowing southwesterly through the wetland where it eventually drains into Hittytity Brook.

W5- This wetland complex is located along Hittytity Brook and contains 61.4 acres, including the brook. Hittytity Brook is the outflow for Shadow Lake and runs year-round. It flows in a generally southeastern direction until it reaches Millville Lake. Millville Lake is drained by Harris Brook which eventually flows into the Spicket River. Hittytity Brook runs for about 1.65 miles through the Town Forest and contains several old and new beaver dams which have created a variety of wetland types. There are a few areas of open water behind the newer beaver dams, though much of the open water is filled with pickerel weed in the summer months. Most of the wetlands along the brook are marsh-type, dominated by cattails and some and purple loosestrife. Woody shrubs along various parts of the shore include black alder, speckled alder, silky dogwood, bayberry, highbush blueberry and buttonbush. Upland shore shrub species include sheep laurel and in some cases, glossy buckthorn. Tree species along the shore include red maple and elm. Several red maples in the marsh area were observed to be dying due to flooding from beaver activity.

2. Intermittent Streams

S1 - This small intermittent stream is located in the southeastern part of Stand 1 and slowly flows easterly into the W2 wetland. It is about 500 feet long, though it does pass through an area that becomes a vernal pool in the latter part of Spring when the stream starts to dry up.

S2 - This 700 foot long intermittent stream flows southwesterly out of Stand 4, across Stand 2 and into Hittytity Brook. It contains a vernal pool once the stream stops flowing in the latter part of Spring.

S3 - This intermittent stream makes up the outflow of the W4 wetland and it flows southwesterly into the W5 Hittytity Brook wetland complex. It is about 650 feet long and is crossed by an old logging road, now used as a hiking trail, just before it enters the W5 complex. It has a narrow, but shallow floodplain along it that contains some black alder and bayberry. The trail is difficult to use in periods of high water.

S4 - This 400 foot long stream flows southwesterly out of Stand 9 and into Hittytity Brook and is crossed by a trail. It drains some vernal pools in the very early part of Spring.

S5 - This intermittent stream is located in Stand 5 on the west side of Hittytity Brook. It is 1,200 feet long with a 300 foot tributary and flows northeast into the Hittytity Brook wetlands complex. The stream passes through a vernal pool near its start which remains when the stream dries out in the late Spring.

3. Vernal Pools

Vernal pools are critical habitats for many species of amphibians, especially wood frogs and salamanders as well as some insects. Because they typically dry up in the summer, they do not contain predators such as fish and their small size make it difficult for predatory birds such as heron and kingfishers to fly in and land. There are many vernal pools found scattered throughout the Town Forest. The only area lacking vernal pools is the ridge top found in Stand 1. There is a cluster of vernal pools in Stand 4 and in Stand 10. Due to the recent development in the area adjacent to Stand 10, the pools in Stand 10 will probably be impacted by the change in surface flow dynamics as well as severe disturbance to nearby upland habitats. It will probably take a while for the wildlife that used those ponds to adjust to the altered landscape. The area should be checked at least once a year for the next five years to assess any negative impacts to water quality.

B. Baseline description of Biological Communities

1. Biological Species and Communities

The Town Forest has three basic natural communities. The first is the majority of the upland areas which are classified as Appalachian Oak-Pine-Red maple forest. Species include red, white and black oak mixed with white pine. Hickory and black birch make up secondary species. Other than white pine, oak and birch regeneration that developed after the last two timber harvests, the witch hazel shrub dominates the understory. The second natural community type includes the wetland/bogs which are classified as red maple-elm-ash forest. These wetlands are very sensitive to extreme changes of water levels. Unfortunately the Dutch Elm disease and the more recent introduction of the Emerald Ash Borer are reducing the elm and ash populations in those communities making red maple a more dominant species. The third community is the freshwater wetland/marsh along Hittytity Brook. It is dominated by cattails, pickerel weed, purple loosestrife, alders and buttonbush, with red maple and elm found in the transition to upland along the shorelines.

Mammals or signs of mammalian wildlife in the uplands noted during the 2010 and 2018 forest inventory included deer, coyote, fox, porcupine, red and gray squirrels, rabbit and mice. Some of those species also use the frozen-over bogs and wetlands in the winter to access food sources that are not available in the Spring through Fall. Mammals noted in the wetlands along Hittytity Brook include beaver, otter, mink and muskrat. Large bird species observed in the upland areas in 2010 and 2018 included goshawks, barred owl, ruffed grouse, turkeys, turkey vultures, crows and pileated and downy woodpeckers. Birds observed in the wetlands included mallards, ruddy ducks, wood ducks and great blue heron. Reptiles and amphibians observed during site visits include painted and snapping turtles, wood frogs, peepers, bullfrogs, green frogs, tree frogs, toads, garter snakes, red back salamanders and red spotted newts.

Man-made disturbances to the forest began when the area was first settled in the mid 1700's. More recent disturbances can be classified as either temporary or permanent. Temporary man-made disturbances to the upland forests would include the two timber harvests. More permanent disturbances include the removal of the gravel from both shores of Hittytity Brook wetland complex and the construction of the recreational trail network. Although the actual trails tend to have a minimal impact, heavy trail use can have a negative impact on the soils and wildlife. The gravel removal greatly altered the landscape in the area along the brook, though the forest has returned to the site. Some areas are kept open for wildlife habitat purposes, though the periodic clearing allowed invasive species, such as glossy buckthorn, Asian bittersweet, Autumn

olive and honeysuckle to become established. There have been two small, low intensity human-caused brush fires in the upland area, with minimal damage impact. Natural disturbances that impacted the upland areas include the 2008 ice storm, the late October 2011 snow storm, and the 2010 and 2017 windstorms which caused some scattered blowdowns and the loss of large limbs from the crowns. Discoloration and decay in the tree trunks often result from the loss of large, live limbs. Natural disturbances to the wetlands include periodic flooding, but the occasional beaver dams created long term flooding in some area which caused die-back in some plant species.

2. Endangered, Threatened and Rare Species and Species of Special Concern

Although no rare or endangered species were observed during the 2010 and 2018 forest inventories, the NH Heritage Bureau has listed the Blandings turtle as occurring in the area of the Town Forest. The habitats along Hittytity Brook and the three bogs favors that turtle as well as the Spotted turtle. The W1 wetland/ bog found in the northeastern corner of the lot also contains trees and shrub species that are associated with northern bogs and are somewhat rare in the area. Those species include poison sumac, black spruce, eastern larch, and black ash. The spruce is part of a population that has existed since the glacier receded. It is important to protect the unique plant populations found in that site.

C. Soils, Geology and Site conditions

According the 1997 New Hampshire Geologic Map, the bedrock that underlies the Town Forest is part of the Berwick Formation which is located within the Merrimack Trough. The Merrimack Trough is a large fold in the bedrock that runs along the coasts of Maine, New Hampshire and Massachusetts. The rock is classified as a purple biotite-quartz-feldspar granofels or schist. It is a meta-sedimentary or meta-volcanic rock that was created 385 to 500 million years ago when deeply buried sediments from a now completely eroded mountain range once located in the Gulf of Maine went through metamorphosis. Plate tectonics and the continuous erosion process eventually brought the rock formation back to the surface. There are several locations within the forest where the bedrock is now visible.

The most recent geologic event was the passing of the last glacier that receded from the area around 10,000 to 12,000 years ago. As the glacier pushed south, it scoured the soil down to the existing bedrock. When the climate warmed and the glacier started to recede, the soil types currently found in the Forest started to develop. Dirt and rocks that were embedded within the glacier settled onto the landscape in the form of glacial till which is the soil found on the hills and slopes within the Forest. Numerous rivers of meltwater washed other soils out of the ice and deposited it on their river bottoms. Hittytity Brook was once a large running river of meltwater, but slowly diminished in size as the glacier disappeared. As the river shrank, the dry portions of river bottom and banks became a large deposit of “washed” sand and gravel. Over time, soil eroded from the slopes of the adjacent hills into the depressions left by the glacier, as well as the old riverbed. Shrubs and then trees followed closely behind the melting glacier. Fine silts eventually combined with the organic material from dead plants to create the muck and peat soils now found in the bogs and in the marshland along the brook.

Site, or growing site, refers to the condition of how well trees grow in a particular area. In most cases, site is based on soil type. Trees have adapted to various sites and some sites will favor certain species over others. The major site influences include soil depth and composition, drainage and exposure. There are four basic soils groups found on the Town Forest. They are the upland soils found on the hill, the glacial outwash soils found in the old gravel pits, the wetland soils found in the marshes and bogs and the transition soils found at the base of the hill adjacent to the bogs.

Most of the area east of Hittytity Brook is located on the summit and side slopes of the hill, and contains Canton gravelly fine sandy loam, as does the area along the Forest's far western boundary west of the brook. The Canton soil is considered a dry, well-drained soil, though shallow to bedrock in some areas. It is a moderately productive soil that will favor both pine and oak, though the dryness of the site will tend to favor the less valuable black oak over red oak. The southeastern base of the hill east of the brook contains the Scituate-Newfields soil complex. It is also a moderately productive soil, with some wetness issues. It also favors both pine and oak, but due to the deeper soils and higher water table, will tend to favor red maple and red oak over black oak. Although the gravel mining removed much of the soil from along the brook, the remaining outwash soils contain the Hinckley fine sandy loam, which is also a dry to excessively well-drained soil. It is a moderate to poor growing site that favors pine over hardwoods. Most of the area west of the brook as well as areas along the Forest's southeastern boundary contain the Chatfield-Hollis-Canton soil complex. Site conditions in this soil vary widely, from wet to ledge outcrops, but it is considered a moderately productive forest soil that favor hardwoods such as red oak.

In general, the Town Forest is dominated by moderately productive soils. Efforts should be taken to promote red oak on the better sites and white pine on the lesser sites, especially on the hill summit and its side slopes.

D. Hydrology and Topography

With the exception of the bogs and marshes which are flat, the rest of the property can be described as generally sloping, sometimes steeply. The steepest slopes can be found just east and west of the marshes and old gravel pits along Hittytity Brook. Most of the Town Forest east of the brook is located on a hill with elevations starting from about 170 feet at the base of the hill in the bogs along the Forest's eastern boundary to 285 feet on the summit back down to 155 feet along Hittytity Brook. The elevation then runs back up to 215 feet on the portion of Town Forest west of the brook. The Town Forest contains several small intermittent streams that are quite short in length and are not a hindrance to timber harvesting and many vernal pools, some of which are quite large. The bogs are fed by both surface and subterranean flow. The portion of the Town Forest that is found on the east side of the hill in Stand 1 drains into the two bogs that eventually drain northeasterly into Shadow Lake. Shadow Lake is a warm water pond of about 35 acres and the shores are developed with camps, many of which are being converted to year-round housing. Shadow Lake is then drained by Hittytity Brook. The rest of the Town Forest, including the bog in the southwestern part of the Forest, drains directly into that brook. Hittytity Brook is a year round stream that meanders southeasterly through a floodplain that is anywhere between 125 feet to 800 feet in width. The floodplain contains the Freetown and Natchaug mucky peat soils. Hittytity Brook then runs southeasterly into Millville Lake that is drained by the Widow Harris Brook, which eventually flows into the Spicket River. The Spicket River flows southerly and joins the Merrimack River in Lawrence, Massachusetts. With the exception of the bogs, marshes and the steep slopes found east of the old gravel pits in Stand 2 and the vernal pools and steep slopes around the Hummingbird Lane development in Stand 10, the entire forest would be considered operable.

E. Summary of Restored or Enhanced Resources

As mentioned earlier in this report, areas on both sides of Hittytity Brook within the Town Forest were mined for gravel by the previous owner. However, this occurred before local ordinances required site restoration once the mining operation was concluded. Whereas the mining operation occurred many years ago, the site re-vegetated itself and any attempts to re-grade the site will require clear-cutting the forest along the wetlands, which is not recommended.

Due to the lack of suitable locations to create a log landing other than in the old gravel pits, it is recommended that when the old pits are used for a log yard, the log yard site should be re-graded to remove the steep sides of the old pits whenever possible.

F. Threats (existing or potential)

1. Motorized Vehicle Use

Motorized vehicle use is prohibited on the Town Forest, though it had occurred frequently in the past. Signs that prohibit such use should be posted at all trail entrances, especially in areas where new housing development is occurring. Any violations should be addressed promptly, including requesting assistance from the NH Fish and Game Department.

2. Waste Disposal

Trash and junk disposal on the original Town Forest has not been a major issue since the gate was installed on West Lane. However, dumping has already occurred near the detention pond off of Hummingbird Lane and a gate should be installed on that site. Another dumping issue involves disposing brush, lawn clippings and leaf disposal by abutting residences onto Town Forest property. The numerous conversions of summer camps around Shadow Lake to year-round residences may create water quality issues in Hittytity Brook due to poorly constructed or poorly maintained septic systems. Another type of waste found on the Town Forest is the increasing use of the trail for walking dogs. Dog "waste" would not be an issue if it was spread throughout the forest, but the dog deposits are focused in the area along the woods road south of the West Lane gate. A similar situation can be expected on any trails immediately off of the new Hummingbird Lane, once that area is fully developed. If the situation becomes overwhelming, a short, separate dog trail could be laid out off of the main trails.

3. Invasive Species, Pests and Pathogens

The Town Forest is currently being impacted by two invasive insects, the *Emerald Ash Borer* and the *Hemlock Wooly Adelgid*. The *Emerald Ash Borer* has the potential to eliminate the ash population on the Town Forest, including the black ash found in the bogs. The *Hemlock Wooly Adelgid* has the same potential to eliminate the hemlock trees, though extended periods of frigid weather during the winter could reduce the infestation. Hemlock is an important winter cover for wildlife, including deer, rabbit and ruffed grouse. Numerous invasive plants were noted on the town Forest, with most occurring in the old gravel pits found in Stands 2 and 3. Invasive species observed include Glossy Buckthorn, Burning bush, Japanese knotweed, Japanese barberry, Asian bittersweet, Autumn olive, honey suckle and a thorny vine sometimes called "green briar". Purple Loosestrife was reported to be in the wetland along Hittytity Brook. Most of the species were introduced by wildlife, though some were introduced by brush dumping by abutters. The most effective way to eliminate the invasive plants is with herbicides as cutting just causes the plants to sprout and uprooting the plants is very labor intensive and disruptive to the soil. Herbiciding should only be done by a licensed applicator. Many ornamental shrubs are now considered invasive. Whereas several backyards directly abut the boundary lines, the Town Forest is often used as an area to dispose of shrub trimmings and other brush. Regularly walking the boundaries and addressing the problem when it is noticed will help reduce future invasive species infestations. The elm trees are still being impacted by the Dutch Elm disease that was introduced to this country many decades ago. Few elm trees now reach maturity. The only other pathogen of note is the *Strumella* fungus which was observed on some of the red and black oaks. Infected trees with cankers caused by the fungus were cut whenever found in the last two harvests in an attempt to reduce that fungal population.

4. Vandalism and Encroachment

Vandalism is not common on the Town Forest as there are not many features to be vandalized other than markers and signs on the Nature trail. Vandalism is most common when a use that has been occurring, predominantly by male teenagers, is no longer allowed. Therefore it is important to post signs prohibiting certain uses before such use becomes common. Encroachment does exist on the Town Forest as many back yards on abutting houselots run right up to the boundary line. As a result, lawns or intensive backyard use have encroached onto the Town Forest. Such use can be limited by well blazed boundary lines when trees that could be blazed are present. Otherwise permanent boundary markers need to be set between corner bounds.

5. Forest Fire

One of the indicators that predict the potential for forest fires is based on the history of forest fires in the area. Whereas the property has been receiving increasing recreational use and whereas there have been two brush fires on the Town Forest, easy access for emergency vehicles is quite important. Keeping the gate locked reduces misuse of the property, but the Fire Department and Police Department should have a well-labeled key at their disposable. They should also be given copies of the Forest Type Map and the trail maps. Potential water sources or problem areas, such as frequently used campfire sites, could be highlighted on the map. Using the Town Forest for training exercises would help the Town's emergency responders become familiar with the area. Improving the existing woods road and constructing a by-pass around the flooded sections of the gravel pit to tie back into the old woods roads located in the new acquisition area west of Hummingbird Lane, along with constructing at least one good turn-around near the end of the woods road will allow ambulances or fire vehicles to reach the more remote areas of the property. Keeping the woods road and hiking trails open and well-maintained, especially during periods of high fire danger, will provide quick access to the woodlot, and under certain conditions, the roads and trails could act as a firebreak.

V. FOREST MANAGEMENT VISION AND GOALS

The land making up the original Town Forest was acquired in 1979 for a well field to provide drinking water for the residences around Shadow Lake. That drinking water plan was eventually abandoned and the Town decided to use the land for a Town Forest as a way to protect open space. An existing recreational trail system was then expanded to encourage public use. The Conservation Commission eventually chose to manage the property under what is typically called the "Multiple Use" concept where the forest would be managed to provide a sustainable source of forest products and income to support the Town's conservation program, while creating opportunities for passive recreation, environmental education, ecosystem preservation, as well as the protection of water resources, wildlife habitats and historic and cultural resources. Multiple-Use management can provide the public with a variety of long-term benefits that are both sustainable and compatible.

Specific goals for Multiple Use considerations are as follows:

1. Timber management

Improve the quality, health and vigor of the trees within designated areas of the forest by the periodic harvesting of trees that are mature or of poor quality using ecosystem-based management techniques. Improve access for emergency vehicles for public safety and to reduce the risk of wildfire.

2. Passive recreation

Improve and maintain a non-motorized recreational trail system to provide the public with a safe opportunity to enjoy the forest setting while getting exercise and to create some trails that are wheelchair accessible to maximize the opportunities that would be available to the general public.

3. Environmental Education

Continue to maintain and update the "Nature Trails" found in the forest as well as hold periodic public tours or sponsor youth activities and outdoor classes and workshops for students as well as professionals in the environmental fields.

4. Ecosystem Preservation

Identify special areas of the forest that should be left in its natural state to provide diversity within the forest ecosystem.

5. Watershed Protection

Insure that all new timber management and recreational trail activities, as well as activities on abutting lands are designed in such a way as to minimize impacts to the streams, vernal pools and wetlands to help protect the water quality throughout the forest, and to continually monitor existing recreational trails for erosion problems and correct and deficiencies when found.

6. Wildlife Habitats

Insure that all timber management and recreational trail activities, as well as activities on abutting lands are designed in such a way as to minimize impacts to wildlife and wildlife habitats while protecting certain habitats that are critical to threatened and endangered species and implement invasive species control before they start to dominate native forest habitats.

7. Historic and cultural features

Identify all cultural and historical features and develop methods to protect and preserve them during management activities.

VI. FOREST INVENTORY and TIMBER CRUISING PROCEDURE

The Salem Town Forest inventory was performed using a point sampling technique with a 20 Basal Area Factor prism. Cruise lines were laid out 500 feet apart through lot and sample points were taken at 500 foot intervals along those lines. A total of 63 points were taken on the 212 acres of harvestable forestland. At each sample point, all trees four inches in diameter at breast height (DBH) and greater were measured and tallied by species, DBH, and merchantable height by product such as grade sawlog, pallet quality sawlog, or pulp. Merchantable heights were measured to a ten inch top diameter for sawlogs and a four inch top diameter for pulp.

Tally sheets containing the sample point data were processed by **FORECO** utilizing the **MULTICRUISE** program. MULTICRUISE is an advanced variation of the forest inventory program originally developed at the University of New Hampshire Forestry Department. The processed results are later summarized in this report.

Details such as streams, woods roads, trails, stone walls, wetlands, and forest type boundaries were mapped in the field while running the cruise lines. This information was then transferred to a base map of the property and the forest type acreage was then calculated by using an instrument called a polar planimeter and adjusted to match the total acres taken from the property surveys and Town Tax Maps. Finally, all of the base map details and forest type information were combined to produce the copy of the Forest Type Map found in this report.

A Glossary and other information are provided at the end of this report.

AREAS OF FOREST TYPES
SALEM TOWN FOREST
January 2018

STAND NUMBER	FOREST TYPE	DESCRIPTION	ACRES
1	Ro,Bo,Wp 2-3B	Adequately stocked stand of pole and sawtimber-sized red oak, black oak and white pine.	79.8
2	Wp,Ro,Bo,H 2-3A	Slightly overstocked stand of pole and sawtimber-sized white pine, red oak, black oak and mixed hardwoods.	28.6
3	Gb,Rm 1-2 A	Overstocked stand of sapling and pole-sized gray birch and red maple in the old gravel pit.	7.6
4	Ro,Bo,H 2-3A	Overstocked stand of pole and sawtimber-sized red oak, black oak and mixed hardwood.	29.7
5	Wp,Rm,Ro 2-3A	Overstocked stand of pole and small sawtimber-sized white pine, white ash, red maple and red oak.	15.0
6	Wp,Ro,Bo 2-3A	Slightly overstocked stand of pole and sawtimber-sized white pine, red oak and black oak.	7.7
7	Ro,Wp,Wo,Bo 3A	Overstocked stand of sawtimber-sized red oak, white pine, white oak and black oak.	16.6
8	Wp,Ro,H 2-3B	Adequately stocked stand of pole and sawtimber-sized white pine, red oak and mixed hardwood.	17.6
9	Wp,Ro,Bo,Wo3A	Slightly overstocked stand of sawtimber-sized white pine, red oak, black oak and white oak.	34.7
10	Wp,Ro,Rm,Hm 2-3A	Slightly overstocked stand of pole and sawtimber-sized white pine, red oak, black oak, red maple and hemlock around the Hummingbird Lane development.	25.0
		TOTAL FOREST LAND	**262.3 Acres**
		Wetlands	**81.2 Acres**
		TOTAL TOWN FOREST	**343.5 Acres**

FOREST TYPE DESCRIPTIONS and PRESCRIPTIONS

The following descriptions and prescriptions are listed on a stand by stand basis. However, timber markets and logging technology may change with time, sometimes abruptly. To improve efficiency, some of the management recommendations could be combined as one operation. Other factors such as weather including windstorms and ice storms, fire, biological factors such as severe fungal infections or insect infestations may have serious impacts on the forest management program. This plan is only a guide and may have to be modified to address unforeseen circumstances, especially if they are to the advantage both the Town Forest and the Town of Salem.

STAND 1 Ro,Bo,Wp 2-3 B

Description: This 79.8 acre Stand is located in the northeast portion of the Town Forest on the east side of Hittytity Brook. It is the largest Stand on the Town Forest and contains the summit and the northern and eastern slopes of the hill found in that area of the Forest. It contains numerous recreational trails along with several vernal pools. Most of the Stand was harvested in 1994 and again in 2008 using the selection and group selection harvest techniques which left an intensive skidder trail system. The Stand now contains a fairly even mix of pole and sawtimber-sized red oak, black oak and white pine, with a scattering of red maple, white oak and a few hemlocks. Whereas the focus of the thinning was to remove the poorer quality stems, most of the trees would be considered fair to good in quality, though some poor quality stems can be found in the buffer zones along the trails, vernal pools and the bog/wetland areas. Parts of the Stand are located on shallow, dry soils which are not as productive as the deeper soils found lower on the slopes where most of the white pines tend to be concentrated. Regeneration is somewhat scattered, or in patches, most of which developed after the 1994 and 2008 harvest. It is dominated by white pine, with some red maple near the wetlands. Because the 1994 harvest occurred during the winter, the snow cover limited the soil scarification which reduced the amount of regeneration after that harvest. Areas that received little or no scarification in 1994 tend to contain a high amount of the witch hazel shrub. The 2008 harvest occurred on bare ground that created conditions favorable for white pine regeneration to develop, though the heaviest regeneration can be found in the skid trails where the scarification was most intensive. Some of the trees on the hill summit suffered moderate damage to their crowns from the December 2008 ice storm, the October 2011 snow storm and the October 2017 wind storm.

Prescription: With a Basal Area of 116 square feet and 196 trees per acre, the Stand is considered adequately stocked. Whereas the Stand was harvested in 2008, another thinning will not be needed until 2025 to 2030, though it will depend on how well the existing regeneration responds to being released as well as how much new regeneration develops. Whereas white pine seems to grow a bit better than the oaks on most of the site, care should be taken to not let the pine regeneration stagnate and die off. The existing pine regeneration should have enough room to develop into sawtimber in most places, though the areas with denser pine regeneration that developed immediately after the 2008 harvest will need to be released sometime between 2020 to 2025, again using the selection and group selection technique. That harvest should focus on harvesting the mature and poor quality oaks(low-forked, diseased, crooked, suppressed or injured), especially the black oaks as they are typically poor in quality to begin with. The entire overstory should be removed in areas with dense pine regeneration. Buffers should be kept along the trails, vernal pools and the bog/wetlands that are dedicated “Prime Wetlands” which require a 100 foot buffer to be left along them. Subsequent harvests will depend on how well the

regeneration responds to the next harvest. At some point the regeneration will develop enough to require its own thinning, though overstory removals tend to inadvertently thin the regeneration as well. A few areas with the existing ground cover dominated by low-bush blueberries and huckleberries could be clear-cut to encourage further development of the berries for wildlife and human consumption. The area within the Stand that suffered a small brush fire showed an increase in blueberry production. Periodic controlled burns on similar sites by the Salem Fire Department as part of their training program would further promote the development of the blueberries.

STAND 2 Wp,Ro,Bo,H 2-3 A

Description: This 29.7 acre Stand is located along the base of the hill on the east side of Hittytity Brook. It encompasses all of Stand 3 and includes several old gravel pits and the woods road used as a main recreational trail. It also contains some steep slopes and some small wetlands adjacent to the marshes. It is a very mixed stand as it includes areas that were once cleared for the gravel pits as well as the steep slopes that were not harvested in either 1994 or 2008. The upland areas resemble Stand 1 and old gravel pit areas resemble Stand 3. It is dominated by red oak with 40% of the basal area, followed by white pine at 29%, black oak at 18%, with a scattering of white oak, red maple and hemlock. Alders can be found in some of the wetter sites. Regeneration includes white pine and some scattered red maple and oak. Some of the Stand contains an understory of witch hazel. Because the Stand was not thinned, quality runs from good to poor. There are some very large white pine trees in the southern-most part of the Stand. Sections of the old gravel pits within the Stand were occasionally used by motorized "dirt" bikes and ATV's. Unfortunately, those same gravel pits are used by turtles for nesting sites. Much of the Stand lies within the 100 foot wide Prime Wetlands boundary.

Prescription: With a Basal Area of 128 square feet and 144 trees per acre, the Stand is considered slightly overstocked. However, the policy of leaving buffer zones along trails and wetlands would eliminate harvesting in almost all of the Stand so it should be designated as a modified Natural Preserve. Allowing the trees along the woods road to reach large diameters will in time, provide a very scenic river walk. Although there are no silvicultural prescriptions for the Stand, there are still some management recommendations. The first would be to relocate the old woods road from the areas that periodically flood and move it easterly onto the upland. If the road could be relocated at least 100 feet away from the marsh, no special permits will be needed as it would be out of the Prime Wetlands buffer and away from the turtle nesting sites. Moving the road will help protect the watershed and will provide a safer trail, especially in the winter. It will also provide emergency access to the newly acquired parcel west of Hummingbird Lane. Some culverts were installed in the small intermittent stream crossings in the old pits, though others are still needed further south on the trail. This will eliminate the ice "crevasses" that often develop after winter rain storms and ruts that develop from mountain bikes. As with any area that is used for recreational use, both the road and trails need to be periodically inspected and maintained to insure that culverts are working properly, erosion is kept to a minimum and misuse is prevented.

STAND 3 Gb,Rm 1-2 A

Description: This 7.6 acre Stand is located in the northern most old gravel pit complex, just south of West Lane. The Stand consists of early successional species that grew into the old pits including gray birch, and some aspen, along with red maple and alders in the wetter sites. Portions of the Stand were used as a log yard for the two timber harvests. Small trees and shrubs were cleared from other areas within the Stand using a piece of mechanized equipment called a "Brontosaurus" as part of a habitat improvement project under the supervision of Matt Tarr who is the wildlife Biologist from the UNH Cooperative Extension Service. The Stand also contains several recreational trails, though some occasionally flood during periods of high water. Because several trails start or end within the Stand, public use of the area is quite high. As a result, wildlife use is often disrupted. The dense shrub habitat has attracted birds, but unfortunately, some of the bird droppings contained seeds from invasive plant species such as glossy buckthorn, Asian bittersweet and a thorny vine sometimes called "bull briar" or "Green Briar" that have now become established within the Stand.

Because of the shrub-like nature of the vegetation within the Stand, no sample points were taken, though the intensive habitat program created the need to designate the site as its own forest type.

Prescription: The wildlife biologist recommended brushing about half the Stand every five years, with a two to three year interval between mowing the remaining acreage. This will keep the area in the early successional stage, but with some diversity. Such habitat is suitable for rabbit, ruffed grouse and woodcock. The public should be notified well ahead of time of any planned brushing operation. The logging of Stand 1 could also be timed to coincide with a brushing operation as the log yard has to be cleared by the logger to set up his harvesting and tree processing equipment. Whereas this brushing is a cost operation, grants and cost share programs should be pursued to help cover the expenses. Wildlife biologist should also do periodic evaluations of the program to insure it is accomplishing the desired goals. Efforts should also be taken to eradicate the invasive species. Cutting is only a temporary solution as the invasive species are also vigorous sprouters. Herbicides are the most effective way to eliminate invasive plants but will require a licensed vegetation control company.

STAND 4 Ro,Bo,H 2-3 A

Description: This 24 acre Stand is located in the southeastern portion of the Forest and contains two of the drilled wells. A recreational trail loops through the Stand and several vernal pools are located near its center. It was very similar to Stand 1 prior to that Stand being harvested, though with fewer white pine. The Stand was not harvested in 1994 to lessen the impact of the first harvest to the Town Forest. Because the Stand contains a high proportion of large trees, it was decided to not include it with the 2008 harvest in order to create an area of potential "old growth" forest as there are very few such forests in the Salem area. Unfortunately, the 2008 ice storm, the October 2011 snow storm and the October 2017 wind storm blew down several trees and damaged the crowns on many others, including the older stems. Although some of the large black oaks died off, most of the damaged trees may recover, though they will be stressed and will eventually develop internal decay below the broken limbs. Red oak dominates the basal area with 65%, followed by black oak at 16%, with a scattering of white oak, hickory

and white pine. Regeneration is limited to some scattered red maple, though there is a heavy understory of witch hazel in most areas. Because the Stand was not harvested, quality runs from good to poor, with some trees considered mature to over-mature. Most of the older hardwood trees are relatively large as compared to the hardwood trees in the other Stands within the Town Forest.

Prescription: With a Basal Area of 124 square feet and 127 trees per acre, the Stand is considered slightly over-stocked. Although this Stand was designated to be left as "Old Growth" in the 2010 Management Plan, the deterioration of the forest within the Stand caused by the recent weather events suggests the Stand should be thinned to improve the growing conditions for the larger, healthy stems. About 50% of the basal area was considered poor quality and could be harvested, though leaving buffer zones along the vernal pools and recreational trails will reduce the harvestable acreage. Whereas many of the damaged trees will continue to deteriorate, the Stand should be harvested between 2018 and 2025 to remove the poor quality stems, especially those damaged by weather events, using the group selection technique on bare ground to encourage pine and oak regeneration. The harvest should also include moving the old woods road out of the Hittytity Brook floodplain to the uplands located to the east and tie it back in with the old woods road in Stand 9. This would involve installing a culvert where the stream from the W4 wetland crosses the existing woods road.

Future harvests will depend on how well the Stand regenerates. If a good catch of pine and oak regeneration develops, the next harvest should occur in conjunction with the next harvest in Stand 1 to in part release that regeneration as well as to encourage new areas to regenerate. After the next harvest, the Stand could be combined with Stand 1 to create a single forest type.

STAND 5 Wp,Wa,Rm,Ro 2-3 A

Description: This 15 acre Stand is located in the western-most part of the Town Forest, west of Hittytity Brook, and is almost surrounded by houselots. It is a very mixed forest due to site conditions and past gravel mining activity. It also contains two small intermittent streams and a few wetlands that developed in the old gravel pits. Access to the Stand is through a 50 foot wide strip of land that runs from Shadow Lake Road out to the old pits in the northern part of the Stand. That strip of land contains the old road that accessed the pits, but has since overgrown with small trees and shrubs and would require a culvert at its entrance onto the highway. Several trees blew down during the 2017 windstorm. The Stand also contains a few old footpaths from abutting residences and an old farm lane that is lined with stone walls. The forest type consists of a fairly even mix of white pine, white ash, red maple and red oak, with a scattering of black oak and hickory, all in the pole to small saw-timber size class. Quality runs from good to poor, with almost 50% of the basal area considered to be poor quality. Regeneration is minimal, consisting of scattered white pine, with a light understory of witch hazel.

Prescription: With a Basal Area of 140 square feet and 186 trees per acre, the Stand is considered overstocked. It should be thinned between 2018 and 2025 by removing the poorer quality stems, both small and large, especially where they are found to be competing with good quality trees. Whereas 50% of the stems were tallied as poor quality, it would be a fairly heavy cut, though buffer zones should be left along the wetlands, streams and property lines. Unfortunately, after deducting the volumes within the buffer zones, and addressing concerns about what a heavy cut in the remaining areas would have on the nearby houselots, combined with the expense of constructing an access route from Shadow Lake Road, the marketability of

any harvesting within the Stand is greatly reduced. A harvest could be made more attractive by combining it with a thinning Stand 6, though that will require getting permission to cross private property. Because of the small volumes involved, the thinning could also be combined with the next harvest in Stands 1 or 4. The other option is to leave the area alone until markets greatly improve making the Stand more economically feasible. Subsequent thinnings would be based on conditions similar to current factors and would need to be tied in with harvest in the other Stands. Another option after the first thinning is to let the stand develop into "Old Growth".

STAND 6 Wp,Ro,Bo 2-3 A

Description: This 7.7 acre Stand is located along the west side of Hittytity Brook and has no public access. The Stand was once accessed by an old woods road from Shadow Lake Road that crossed through Stand 5. That route now crosses through the private backyard of a house on Kiowa Road. Much of the Stand is on a steep slope that runs down to the brook, with most of the remaining acreage being clearly visible from other houses on Kiowa Road and Samoset Drive. The Stand is slightly dominated by red oak with 42% of the basal area, followed by white pine at 37% and black oak at 21%, with a scattering of black birch, with regeneration consisting mainly of scattered red maple and some witch hazel. Quality runs from fair to good.

Prescription: With a Basal Area of 127 square feet and 149 trees per acre, the Stand is considered slightly overstocked. It could be thinned between 2020 and 2025 by removing the poorer quality (low-forked, diseased, crooked, suppressed or injured) hardwoods for firewood in conjunction with Stand 5. However, this would require obtaining permission to cross private property. The Town could approach the landowner about accessing the Stand for a firewood cut, though most abutters tend to be reluctant to give a permanent right-of-way or allow a large skidder trail to cross their backyard. Leaving buffer zones along the boundary lines and on the steep slope along the brook as part of the Prime Wetlands buffer will greatly reduce the amount of harvestable acreage to the point where it will probably be uneconomical to log. It is therefore recommended to set aside the Stand as a Natural Area. Occasionally, abutters ask permission to cut nuisance or hazard trees along the property boundary. That may present an opportunity to thin some of the forest, as long as it complies with any Easements, though the economics may not work, especially if the abutter is working with a tree service. The Conservation Commission should develop a policy about cutting nuisance trees on the part of abutters (See Addendum).

STAND 7 Ro,Wp,Wo,Rm,Bo 3 A

Description: This 16 acre Stand is located just east of the out-lot in the east-central part of the Forest. It was accessed in the past from Zion Hill Road by crossing the adjacent wetland over a fieldstone causeway, though the route is now closed off due to residential development along that road. A recreational trail now follows the old access route and crosses through the Stand and into the original Town Forest. Based on the old stumps and skidder trails, it appears that the Stand was selectively thinned in the late 1960's or the early 1970's. The Stand is contains a fairly even mix of white pine at 33% of the basal area and red oak at 26%, followed by red maple at 21% and a scattering of white oak, black oak and hickory. The red maple is mostly located along the edges of the abutting wetlands. Because the Stand was selectively thinned, tree quality is generally good, though the trees are large and would be considered mature to over-mature, some of which could be called "Old Growth". Regeneration is quite limited and consists mainly of scattered white pine, with a heavy amount of witch hazel.

Prescription: With a Basal Area of 172 square feet and 200 trees per acre, the Stand is considered overstocked. This would imply that the Stand should be thinned. However, leaving buffer zones along the property boundary, wetlands and the recreational trail will greatly reduce the harvestable acreage. Whereas the trees are large but relatively healthy, the Stand could be set aside for an Old Growth Natural Area. It will help diversify the habitat of the Town Forest and provide the aesthetics of large trees in a natural setting which is a forest type that is slowly disappearing from the Salem area due to increased development. It will also allow comparable research between this Stand and Stand 1 as to the various effects of timber harvesting. The Stand should still be monitored for stem mortality. If large groups of trees start to die-off from over-maturity, or other causes such as another severe ice storm, a salvage harvest should be set up to reduce fire danger and potential insect infestations.

STAND 8 Wp,Ro,H 2-3 B

Description: This 14 acre Stand is located along the eastern boundary, just north of the Hummingbird Lane development. Like Stand 7, it was accessed in the past from Zion Hill Road though the route is now closed off due to residential development along that road and also like Stand 7, it appears that the Stand was selectively thinned in the late 1960's or the early 1970's. A recreational trail now follows the old access route and crosses through the Stand. The Stand includes several short but steep slopes with a few ledge outcrops. It is bisected by a stone wall that also has some sort of a corral or enclosure attached to it. The Stand contains a fairly even mix of white pine at 33% of the basal area and red oak at 26%, followed by black oak at 16%, white oak at 12%, and a scattering of red maple and hickory. Tree quality runs from good to poor, with most of the poor quality trees found in the smaller, suppressed stems. Regeneration consists mainly of scattered white pine and red maple with some witch hazel.

Prescription: With a Basal Area of 126 square feet and 181 trees per acre, the Stand is considered at the high end of adequately stocked. Whereas 30% of the basal area is considered poor quality, the Stand could use a light thinning to remove the poor quality stems. However, access is quite limited without crossing trails, wetlands, steep slopes or private property. As a result, the Stand could be set aside for an Old Growth Natural Area. It will help diversify the habitat of the Town Forest and provide the aesthetics of large trees in a natural setting. It will also allow comparable research between this Stand and Stand 1 as to the various effects of timber harvesting. The Stand should still be monitored for stem mortality. If large groups of trees start to die-off from over-maturity, or other causes such as another severe ice storm, a salvage harvest should be set up to reduce fire danger and potential insect infestations.

STAND 9 Wp,Ro,Bo,Wo 3 A

Description: This 30 acre Stand is located on the southern tip of the Town Forest. It appears that it was once accessed from Zion Hill Road and from a now unusable causeway from Bluff Street. The Hummingbird Lane development has cut off the access route from that road and beaver activity on Hittytity Brook has flooded the causeway as well as the potential woods road access from West Lane. It appears that the Stand was selectively thinned at the same time as Stands 7 and 8. Recreational trails now follow the old access routes through the Stand, but

now end up in backyards on Hummingbird lane. A human-caused brush fire burned a small area in the center of the Stand, but caused little damage. The Stand is slightly dominated by white pine with 37% of the basal area, followed by a fairly even mix of red oak at 23%, white oak at 17%, black oak at 15%, with a scattering of red maple and hickory. Because the Stand was selectively thinned, tree quality is generally good, though the trees are large and would be considered mature to over-mature, some of which could be called "Old Growth". Regeneration consists mainly of scattered red maple white pine with witch hazel.

Prescription: With a Basal Area of 130 square feet and 122 trees per acre, the Stand is considered slightly overstocked. This would imply that the Stand should be thinned. However, leaving buffer zones along the vernal pools, wetlands and the recreational trails will greatly reduce the harvestable acreage. Whereas the trees are large but relatively healthy, the Stand could be set aside for an Old Growth Natural Area. It will help diversify the habitat of the Town Forest and provide the aesthetics of large trees in a natural setting. It will also allow comparable research between this Stand and Stand 1 as to the various effects of timber harvesting. The Stand should still be monitored for stem mortality. If large groups of trees start to die-off from over-maturity, or other causes such as another severe ice storm, a salvage harvest should be set up to reduce fire danger and potential insect infestations.

STAND 10 Wp,Ro,Rm,Hm 2-3 B

Description: This 25 acre odd-shaped Stand almost encircles the Hummingbird Lane development. It contains numerous short but steep slopes, along with several wetland areas and vernal pools, basically, any areas near the Lane that could not be developed. Several hiking trails were cut off by the new lane and will have to be relocated. Due to the terrain, poor access and proximity to the backyards along Hummingbird Lane, typical forest management activities as might be found in the other Stands would not be feasible, so no timber inventory points were taken in the area. The Forest contains a fairly even mix of sawtimber-sized white pine, red and black oak with a scattering of pole-sized ash, red maple and hemlock. Hemlock and red maple tend to be more dominant in the wet areas. Tree quality runs from poor to good due to the varied site conditions.

Prescription: Whereas this Stand is in the backyard of the houses along Hummingbird Lane, and whereas the stand contains a variety of vernal pools, wetlands and the recreational trails, it is recommended to set the area aside as a Natural Area. It will help diversify the habitat of the Town Forest and provide a buffer between the houses and any activities on the Town Forest. The Stand should still be monitored for stem mortality. If large groups of trees start to die-off from over-maturity, or other causes such as another severe ice storm, a salvage harvest should be set up to reduce fire danger and potential insect infestations. Portions of the trails within the Stand should be relocated to create better entrances onto Hummingbird Lane as well as to provide a better loop system for the residents within the development.

TOTAL OPERABLE VOLUMES
and
ESTIMATED HARVEST VOLUMES AND VALUES

From the sample data obtained during the forest inventory and information calculated from that data, a summary of the timber and pulp volumes was prepared. It is broken down by species and product for each Stand and then totaled for the entire Town Forest and represents the total volumes found growing on the Forest, including trees found within buffer zones. Next, an estimate was made of the timber that could be harvested using the recommendations found within the plan.

TIMBER, PULP AND CORDWOOD VOLUMES
SALEM TOWN FOREST
January 2018

SPECIES/PRODUCT	Stand 1 Ro,Bo,Wp2-3B 77 ac	Stand 2 Wp, Ro,Bo,H2-3A 29 ac	Stand 3 Gb,Rm1-2A 9 ac	Stand 4 Ro,Bo,H2-3A 24 ac	Stand 5 Wp,Rm,Ro2-3A 14 ac	Stand 6 Wp,Ro,Bo2-3A 8 ac	Stand 7 Ro,Wp,Wo,Bo3A 16 ac	Stand 8 Wp,Ro,H2-3B 14 ac	Stand 9 Wp,Ro,Bo,Wo3A 30 ac	**TOTAL**
White pine	175,000	185,000	-	10,000	25,000	60,000	120,000	60,000	180,000	815,000
White pine #4	55,000	10,000	-	1,000	15,000	-	10,000	15,000	15,000	121,000
Red maple	-	-	-	-	3,000	-	-	1,000	-	4,000
Black oak	55,000	25,000	-	35,000	-	9,000	3,000	8,000	25,000	160,000
Red oak	280,000	65,000	-	165,000	55,000	15,000	45,000	25,000	70,000	720,000
White oak	-	-	-	-	-	-	10,000	8,000	35,000	53,000
Hickory	-	-	-	-	-	-	5,000	-	-	5,000
Hardwood pallet	65,000	35,000	-	35,000	10,000	5,000	5,000	8,000	40,000	203,000
TOTAL	630,000	320,000	-	246,000	108,000	89,000	198,000	125,000	365,000	**2,081,000 Bd. Ft**.
Pine/hemlock pulp	135	70	-	20	60	5	50	30	100	470 cords
Hardwood Pulp	560	195	-	135	160	65	215	135	185	1,650 cords

POTENTIAL TIMBER HARVEST VOLUMES AND VALUES

SALEM TOWN FOREST

February 2018

STAND 4

SPECIES/PRODUCT	ESTIMATED VOLUME	ESTIMATED VALUE	TOTAL VALUE
Red oak	35,000 Bd.Ft.	$ 300.00/1,000 Bd.Ft.	$ 10,500.00
Black oak	10,000 ”	150.00/ “	1,500.00
Hardwood pallet	10,000 ”	30.00/ “	300.00
TOTAL SAWLOG	55,000 Bd.Ft.		
Hardwood firewood -cords	30 cords	$ 10.00/cord	300.00
TOTAL ESTIMATED VALUE			**$ 12,600.00**
	Forester fees	($2,400.00)	
	Road construction	(3,600.00)	
		($6,000.00)	
TOTAL ESTIMATED NET VALUE			**$ 6,600.00**

Note: This harvest could be combined with the harvest in Stand 5.

POTENTIAL TIMBER HARVEST VOLUMES AND VALUES

SALEM TOWN FOREST

February, 2018

STAND 5

SPECIES/PRODUCT	ESTIMATED VOLUME	ESTIMATED VALUE	TOTAL VALUE
White pine	14,000 Bd.Ft.	$ 140.00/1,000 Bd.Ft.	$ 1,960.00
White pine-grade 4	10,000 ”	25.00 ”	250.00
Red oak	14,000 ”	300.00 ”	4,500.00
Hardwood pallet	2,000 ”	25.00 ”	50.00
TOTAL SAWLOG	40,000 Bd.Ft.		
Softwood pulp-cords	15 cords	$ 1.00/cord	15.00
Hardwood firewood -cords	30 cords	$ 10.00/cord	300.00
TOTAL ESTIMATED VALUE			**$ 7,075.00**

Forester fees	($1,500.00)
Road improvements	($2,500.00)
	($4,000.00)

TOTAL ESTIMATED NET VALUE **$ 3,075.00**

Note: This harvest could be combined with the harvest in Stand 4.

VII. FOREST MANAGEMENT ACTION PLAN

STAND	YEAR	ACTIVITY
4	2018	Timber harvest using selection and group selection technique.
2	2018	Relocate woods road out of wet areas and install culverts as needed in conjunction with the harvest in Stand 4.
3	2018	Assess wildlife habitat mowing program by doing wildlife inventory and investigate invasive species eradication program.
2 & 3	2018	Investigate layout and cost of wheelchair accessible trail.
1 & 4	2018	Block trail that crosses outlot or seek permission from the landowner to allow the trail.
10	2018	Install gate at detention pond off of Hummingbird Lane.
5	2018-2020	Selection thinning, and/or tie in with harvest in Stand 4
6	2018-2020	Investigate potential access routes.
10	2018-2020	Relocate recreational trails to tie into Hummingbird Lane. Install bridges or plank-walks where needed.

GENERAL MAINTENANCE ACTIVITIES

Repaint boundary lines every 10 years.

Perform yearly maintenance on woods roads and recreational trails. Clean out culverts.

Perform yearly inspection and maintenance on station markers and signs on nature trails.

VIII. FUNDING AND TASK PRIORITIZATION

1. Funding

The Conservation Commission will oversee implementation of the management plan, monitoring activities and long-term stewardship of the property. Commission members or their designees will maintain and monitor the property in perpetuity.

Table 1 summarizes recommended management activities for the Town Forest. Table 2 summarizes the anticipated annual costs for long-term management of the forest which total approximately $800.00 per year. Monies will come from the Town's Conservation Fund. Sources of those funds are derived from the Current Use property tax program. The Conservation Commission gets 100% of the Change of Use tax penalty

2. Task Prioritization and Cost/Revenue Estimates

Table 1: Schedule of Activities

Goal	Action	Priority	Target Date	Completed By	Cost/Revenue	Notes
Forestry	Timber harvest	1	Fall 2018	Logger	+ $12,600.00	Stand 4
Forestry	Timber Harvest	1	"	Forester	- $ 2,400.00	Forester fees
Infrastructure	Road relocation	1	"	Logger	- $ 3,600.00	Stand 2
Habitat	Assessment	1	Summer 2018	Forester/Ext*	- $ 400.00	Stand 3
Infrastructure	Gate	1	Fall 2018	Town of Salem	- $ 5,200.00	Hummingbird Lane
Recreation	Relocate trails	2	Fall 2018	Forester/SCC**	- $ 1,500.00	Stand 10
Recreation	Wheelchair trail	2	"	Forester/SCC	- $ 800.00	Investigate layout & construction costs.
Recreation	Block trail	2	Spring 2019	SCC	0	Trail across outlot
Forestry	Timber harvest	2	Fall 2018	Logger	+ $ 7,500.00	Stand 5
Forestry	Timber Harvest	2	"	Forester	- $ 1,500.00	Forester fees
Infrastructure	Road improvement	2	"	Logger	- $ 2,500.00	Stand 5
Infrastructure	Access assessment	3	Summer 2019	SCC	0	Stand 6

* UNH Cooperative Extension
** Salem Conservation Commission

Table 2: Estimated Annual Costs

Action	Cost per year	Notes
Trail maintenance	$200.00	Bridge and trailhead maintenance
Sign maintenance	$200.00	Replace and install new signs
Trash removal	$150.00	Town of Salem
Brochures	$120.00	Update and supply
Boundary marking	$ 60.00	$600.00 every 10 years
Management Plan update	$ 70.00	$700.00 every 10 years
Total annual cost	**$800.00**	

VIX. GENERAL RECOMMENDATIONS

1. WILDLIFE

Interacting with wildlife can be the most memorable part of any forest experience. A variety of wildlife signs were noted while cruising on the property, including signs of deer, coyote, porcupine, beaver, otter, fox, squirrels, rabbits and mice. Large birds that were observed included crows, turkeys, herons, pileated woodpeckers, goshawks, herons and ruffed grouse. There were no rare or endangered wildlife species noted on the lot during the 2010 and 2018 forest inventories, though the NH Heritage Bureau Data Base lists the Blandings turtle as being present in the area. The presence of wildlife usually indicates the presence of adequate habitat both on the property as well as on abutting lands for a breeding population. The size of a species' population is usually dependent on the amount of suitable habitat. Animal populations can often be manipulated by varying the amount of habitat. However, unless a species is rare and endangered, one species should not be favored over another. Providing a variety of habitats will increase the diversity of wildlife. Most wildlife are opportunists and will take advantage of almost any type of habitat according to their needs. As area habitats are slowly lost to development, it may become more important to replace some of the lost habitats to avoid losing wildlife populations.

There are several habitat improvement and protection practices that can be incorporated into the timber harvesting activities. First, all harvesting should follow the State's "Best Management Practices" (BMP's) guidelines for logging. Wetlands should be avoided and stream crossings should be kept to a minimum. Any crossings should be designed to prevent mudding of the stream. This includes installing temporary bridges, culverts and/or pole fords. Logging should be avoided during "mud" season or prolonged rain spells. Access road construction or improvements should be designed to minimize erosion. These practices are designed to protect water quality, which in turn protects the aquatic habitats of fish, amphibians and certain birds and mammals. Numerous vernal pools were located during the inventory. They should also be protected during harvest activities by creating large enough buffer zones around the edges to keep the pool shaded and to prevent the logging slash from falling into the water. Such pools are important breeding grounds for many amphibians. Den trees, also known as cavity trees, as well as potential den trees should be left and protected during harvest activities. Several active den trees were noticed during the cruise. Leaving five to seven of those types of trees per acre is recommended to provide sufficient habitat. Hollow trees are nesting sites for squirrels, mice, bats, raccoons, owls and other birds along with many insects that are the start of numerous food chains. Tall hardwood trees with a three-pronged fork are preferred nesting sites for hawks. Some of the larger, more vigorous red oak trees should be protected to act as "mast" (nut and acorn producing) trees as their acorns are an important wildlife food source, especially for deer and turkeys.

Grouse use aspen buds as a winter food source. Only a few aspen trees were observed on the upland portions lot, so they should be protected, though some will have to be cut in their prime to encourage them to regenerate through root suckers. These sucker sprouts need full sunlight in order to survive. Planting trees or shrubs for wildlife purposes is generally discouraged unless local, native species are used. Crab apples are about the only non-native trees now recommended for planting as they do not readily spread and are therefore not considered invasive.

The vegetation control program in Stand 3 should be re-evaluated as the wildlife use that the clearing has encouraged has introduced invasive plant species. Also, increased recreational use by the public may discourage wildlife from using that habitat. Should the program continue, it should be periodically assessed for its effectiveness by doing an intensive wildlife survey.

2. RECREATION

The woods roads and trail system offer a great opportunity for passive recreation including hiking, mountain-biking, snowshoeing, cross-country skiing, wildlife observation and hunting. These uses are considered relatively environmentally friendly, though some of them can be temporarily disrupted by logging as forest management prescriptions and site conditions will sometimes dictate the time of year when logging will occur. Posting signs in advance of any activities that could be construed as disruptions helps minimize problems, especially since the trails are quite popular. As nearby open space is developed, recreational use, both passive and motorized, will be concentrated into the protected lands and conflicts may start to develop.

Any trails located on steep slopes should be laid out diagonally to the contours with the use of switchbacks if space is limited. Trails should be cleared to the height of eight feet to allow for at least a two foot snowpack. Trail widths should not be less than four feet. Narrow trails have some aesthetic appeal, but will require frequent brushing and may be difficult to use in the winter when the snow weighs down the branches. Properly sized culverts should be installed in the stream crossings on the woods road in the old gravel pit area. The footbridge over Hittytity Brook should be inspected periodically, especially after heavy flooding or ice events. Trails that are regularly used will require **YEARLY MAINTENANCE.** Kiosks, trail markers and signs, along with nature trail stations can be very informative but are subject to vandalism and can be expensive to maintain. Signs are important when new trail systems are created, but the need for them decreases as the public becomes familiar with area. Avoid nailing trail markers and signs into trees as they can injure the trees and should the trail be relocated, those trees could be harvested and the metal can create potentially dangerous problems with the saws, planers and chippers.

3. WATER RESOURCE PROTECTION

Life cannot be sustained without water, so it is a resource that needs to be respected as well as protected. Siltation from erosion is the most common pollution problem associated with forest management. Soil disturbance can seldom be avoided during harvesting, but it can be minimized. Winter harvesting reduces soil scarification, though scarification is sometimes desired for regeneration purposes. Winter harvesting also reduces mud problems and allows operating in areas while they are frozen that would not normally be logged except during extreme drought conditions. One problem with winter harvesting is that pole crossings will sometimes freeze in and they cannot be removed upon completion of the harvest. Then the entire area may be too wet to go in and remove the crossing when the site thaws. If skid trails need to cross running streams in the winter, temporary bridges should be used to maintain the stream flow come springtime in case the bridge has to be left. Skidder trails should not be run on steep slopes, and even minor slopes should be water-barred when the use of that trail is completed. Skidders should not be driven through marshes, bogs and open water. Logging should be stopped during mud season and periods of prolonged rain spells. Newly installed culverts should be over-sized to accommodate flood conditions. All culverts and water bars should be checked yearly to insure that they are functioning. Following the State's **Best Management Practices** for erosion control during harvesting will prevent most of the sedimentation problems associated with logging.

Blown hydraulic hoses and minor fuel spills are often unavoidable during a timber harvest. Fuel contamination of the water resources can be minimized by making sure that truck and skidder fueling areas along with the log yards are not located adjacent to streams and drainage ways. Leaking equipment and hoses should be repaired before starting the harvest, and heavy maintenance and repair activities should be conducted off-site. Exposed soils in log yards and on skidder trails could be seeded and mulched to reduce the erosion potential and to increase site recovery time.

4. EDUCATION

The Town Forest provides many opportunities for outdoor education. A self-guided nature trail was updated in 2001 with signs and brochures. Such nature trails are a great way to learn about the environment, but also creates additional responsibilities on the part of the Conservation Commission to insure that the trail, trail markers and informational signs are all well-maintained and the trail is kept passable year-round. The brochures should be kept updated and easily available at such places as the Town Office building, library and local schools. Maintaining an adequate supply of the brochures at the trailhead can be quite tedious due to heavy use or vandalism, so the brochures could also be put "on line" to be printed out by the public as needed. Stations could also be GPSe'd to create a Smart Phone app for the nature trail. Area schools should be made aware of the Town Forest and the resources such as soils, water, wildlife that could be studied there. State-wide groups and organizations such as the New Hampshire Timberland Owners Association, the Society for the Protection of New Hampshire Forests, and the UNH Cooperative Extension Service often hold workshops on town forests and they could also be made aware of the activities on the Town Forest.

Signs should be posted at the trailhead explaining ongoing management activities such as timber harvests or habitat improvement projects to give the public a better understanding of the project and lessen complaints to the Town Office.

ADDENDUMS

SALEM TOWN FOREST
UNIQUE FEATURES
2018

MANMADE FEATURES	LOCATION	DESCRIPTION
Colonial farm lane	Stand 5	Fieldstone walls along old woods road.
Colonial corral	Stand 7	Fieldstone wall enclosure
Stone walls	Throughout the Forestand along boundaries.	Fieldstone walls
Stone piles	Northwest corner of Stand 1 and in Stand 8.	Piles of fieldstones from clearing land for agriculture
Stone causeways	W1 and W4	Fieldstone causeways across wetlands
Grist Mill Site	Southeastern end of W5 on Hittytity Brook near Bluff Street.	Fieldstone and earthen dam, and tumbled fieldstone remains of the mill foundation
Stone dam	Southeastern end of W5 on Hittytity Brook	Fieldstone dam for water storage for 18th and 19th century water powered mills.
Trail system	Throughout property	Trails that can be used for recreation
Footbridge	Over Hittytity Brook	Boardwalk-like bridge over the brook and adjacent wetlands dedicated to longtime Conservation Commission member WallyShultz.

NATURAL FEATURES	LOCATION	DESCRIPTION
Vernal pools	Scattered throughout forest.	Critical habitat for amphibians.
Floodplain marsh	Along Hittytity Brook	Typical marsh vegetation and beaver swamps.
Large boulders	Base of the west side of the hill in the center of the lot	Glacial erratics

BOUNDARY LINE DISPUTES

As mentioned in the "Boundary Lines" status report, there is a boundary overlap in along the eastern boundary of the Town Forest which is shown on 2000 Stevens survey. When the land of what became the Matthew Drive development was subdivided, it appears that the surveyors did not tie into any of the existing bounds along the eastern boundary of what is now the Town Forests. It is not known what they based their survey on, but if it was only a deed description, they failed to consider the field evidence that could have been easily located. As a result, the deed descriptions of the houselots are based on a faulty survey. Whereas the deeds are legal documents, and that people can get very possessive of what they believe they own, resolving such disputes can get quite complicated. However, the situation should get rectified as the overlap will not solve itself with time and the original parties involved in creating the problem may either move on or pass away.

The first thing to do is to find out how the problem began. A meeting with the appropriate Town officials should be set up with the Town's Counselor to discuss the possible course of action. A copy of the Matthew Drive subdivision map should be obtained and Thomas Stevens should be contacted for his input as to the extent of the problem as he would have done some research on abutting lots as part of his survey. If it appears that the surveyors for Mathew Drive were in error, and the surveyors are still around, they should be contacted to have them explain their boundary determination procedure. They may also have professional liability insurance that could help cover the expenses in solving the problem.

Once the cause of the error is established, it needs to be rectified. Setting aside the liability issues of who was responsible and suing them to fix the problem, the easiest way to rectify the problem is to meet with the five affected abutters and draw up a boundary line agreement as to where the boundary should be located. If any or all of the abutters refuse, some of the options include conceding and giving a Quit Claim deed of the affected area to the abutters; offering to "buy" the affected land from the reluctant abutters instead of paying potentially expensive legal fees; or Petitioning the Court to quiet title on the affected land assuming that the Town has a historic claim to the property.

NUISANCE TREES

Nuisance trees can be defined as a tree that is creating a problem for an abutter. It could run from trees that are blocking the winter sun or a satellite signal to dropping leaves and needles into a backyard or swimming pool to a dead or leaning tree that is truly hazardous. State law gives towns certain authority in dealing with privately owned trees in a public right-of-way, but there are no State statutes to deal with hazardous or nuisance trees along property lines. Whereas the boundary of the Town Forest runs along many houselots, the Conservation Commission might be asked by certain abutters to deal with a nuisance tree. It would be to the Commission's benefit to develop a policy that would protect the liability of the Town and the safety of the abutters, as long as it complies with the Conservation Easement. A distinction should also be made between perceived nuisance trees and actual hazard trees, with hazard trees taking a higher priority.

The Commission should first contact the Easement holder to see what their policy is regarding such trees. Secondly, the Town's Public Works or Recreation Department should be contacted to see if they have a policy in dealing with Town-owned nuisance or hazard trees that could be modified. If not, a policy needs to be developed with first and foremost, who is responsible for any costs involved in removing the tree? Typically, whoever wants a tree cut should pay for the cutting and removal. Because of potential liabilities involved, all communication should be in writing. If a person would like a nuisance or hazard tree removed, they should make a request in writing as to where the tree is and why they would like it removed. The Commission should then assign someone to view the tree along with someone who normally deals with the Town's tree removal projects and report back to the Commission. It is important to find out who will do the cutting and how they plan to dispose of the tree once it is cut to make sure that the trees and limbs are not dumped back into the Town Forest. Most homeowners do not know how to safely fall a tree, especially if it is near buildings, power lines or other improvements. The Commission should probably require that such trees be taken down by professional tree companies that have proper insurance. If the Commission agrees that the tree could be cut, they should be issue a permit that absolves the Town of any liability for any actions of the homeowner or their contractor and states how and where the tree shall be disposed of, along with any fines if the permit is not adhered to. Before any permits are issued, the permit and the permitting process should first be reviewed by the appropriate Town Officials and Town Counsel, especially if the permitting process requires developing a new Town Ordinance.

Salem Town Forest
Rules and Guidelines for the General Public

Access hours: Open daily from 30 minutes before sunrise to 30 minutes after sunset

The General Public may use any open trail to:
- Walk, run skip, ski, snowshoe, sled, push a baby carriage;
- Exercise dogs; *(Please remove animal waste from trail, and bagged waste from forest.)*
- Ride a non-motorized bicycle;
- Use a wheelchair (with or without motor);
- Ride a horse. *(Please remove animal waste from trail.)*

The Town Forest is open for Hunting and Fishing according to regulations issued by the NH Fish and Game Department and the US Fish and Wildlife Service.

Some Activities Require Authorization from the Salem Conservation Commission. Information and Authorization Forms are available on the Town's web site or at the Town Hall for these activities:
- Camping and use of cooking stoves by organized groups;
- Campfires;
- Maple sugar sap collection;
- Trail creation;
- Activities not listed, at the discretion of the Conservation Commission.

Motorized Vehicles uses are to maintain trails, harvest timber, and provide access for habitat management, emergencies, and wheelchairs. No other motorized vehicles are allowed.

Prohibited Activities are:
- Unauthorized motor vehicles;
- Off-trail use by any vehicle;
- Reckless or endangering behavior;
- Use of any trail designated as CLOSED;
- Consuming alcoholic beverages;
- Dumping or littering,
- Unauthorized camping, fires and the use of cooking stoves (see above);
- Trapping;
- Unauthorized discharge of explosives;
- Cutting, destroying or removing any structure,
- tree, plant or natural feature;
- Unattended pets;
- Building any structure and/or creating new trails without Conservation Commission approval;

Please report reckless and dangerous behavior, unauthorized fires and unlawful use of firearms immediately to the Salem Police Department (603)-893-1911.

Report IRREGULARITIES to the Salem Conservation Commission or to the appropriate public official at the Salem Town Hall **(603)-890-2000.**

Trail cleanup is encouraged!

Offers to assist with trail maintenance or trail creation are welcome. Please contact the Salem Conservation Commission (see webpage).

Adopted by the Salem Conservation Commission on June 7, 2017.

GLOSSARY

ACCEPTABLE GROWING STOCK (AGS): Trees with desirable qualities that would potentially be grown to their economic or biological maturity.

ACCESS: The place or ability to enter a woodlot from an existing public road.

AGE CLASS: The age of groups of trees used to describe the characteristics of that group, i.e. 10 or 20 year age class.

BASAL AREA (BA): The cross-sectional area of a tree at 4½ feet above the ground, usually measured in square feet. A measure of the density or stocking of a stand is often expressed as square feet of basal area per acre.

BEST MANAGEMENT PRACTICES (BMPs): The practice or practices used to control soil erosion or sedimentation on truck roads, skid trails and log landings.

BLAZE: An axe mark on a tree denoting a boundary line.

BIODIVERSITY: The variety and variability of living organisms.

BIOMASS: Commonly refers to the entire mass of living tree material above stump height.

BOARD FEET (BF): A measure of wood by volume. One board foot is the volume of wood equal to a piece 12 inches long by 12 inches wide by one inch thick. Many "log rules" are available for converting raw material to board foot units. Log rules are closely linked with the local forest industries and vary with geographical areas. The "International ¼ inch Log Rule" is commonly used in most areas of the Northeast. Board feet per acre (BF/A) is a measure of tree density in a forest stand.

BOLTWOOD: Wood which is used for turning stock and for the eventual manufacture of countless small items, such as buttons, golf tees, dowels and wooden toys. Boltwood mills buy the raw material in four-foot lengths (bolts) and/or log length form.

BROWSE: Leaves, buds and woody stems used by mammals such as deer and moose for food.

CANOPY: The more or less continuous cover of branches and foliage formed by the crowns of adjacent trees.

CAPITAL GAINS: Increase in value over time of an asset. For tax purposes, it is the sale price of an eligible asset less its cost.

CORD: The standard cord of wood is an imaginary rack, or stack of wood, measuring 4 feet by 4 feet by 8 feet and containing 128 cubic feet of wood, bark and voids. Tables are available for estimating the number of cords represented by standing trees. Cords per acre (CDS/A) is a measure of density in a forest stand.

CROP TREE: Crop trees are trees that are left unharvested due to desirable qualities or have the potential to produce a particular benefit, i.e. a red oak tree left to produce acorns for wildlife food or timber production.

CROWN: The part of the tree or woody plant bearing live branches.

CROWN CLOSURE: The percent of the canopy overlying the forest floor.

DBH (Diameter at Breast Height): The average diameter of a standing tree, measured outside the bark, at a point 4½ feet above the ground.

DIAMETER CLASS: Intervals of tree size used to describe stand characteristics; i.e. 8" or 10" diameter class.

DEFECT: Internal rot, knots, or other defects in a live tree. The extent of unseen defect can be estimated from the history of a stand and from evidence of external damage from ice, wind, fire, insects, logging operations, etc.

DEPLETION ALLOWANCE: A tax benefit derived from "depleting" timber harvested as defined by the Internal Revenue Service.

FIREWOOD: Similar to pulpwood in that it is wood, not fit for higher uses such as sawlogs and veneer but it is used for heat production rather paper production.

FLAGGING: The practice of hanging plastic ribbon as temporary markers in the woods for such things as boundary location and skid trail layout.

FOREST TYPE LINE: A boundary between two different stands of trees.

GROWTH: The amount of fiber added to a tree over a period of time. Usually expressed in cords per acre per year or board feet per acre per year.

HARDWOOD: Hardwood trees are generally of the broad leaved species, also known as "deciduous" trees. Economically important hardwood species include maples, birches, ashes, and oaks.

INACCESSIBLE: Describes land which cannot be logged at the present time because there is no economical way to harvest the timber.

INVASIVE: Non-native or exotic plants, animals and insects that are introduced into and can thrive in areas beyond their natural habitat. They are often adaptable, aggressive and capable of high reproduction, to the detriment of native species.

INTOLERENCE: A species inability to thrive in shade.

LOGGING COSTS: Include cost of cutting and yarding, trucking, internal road construction, and agent's fees.

MANAGEMENT PLAN: A document which analyzes the forest on a woodlot and makes suggestions for future activities thereon.

MATURE: Describes a tree which is at its peak as far as biological or economic conditions are concerned.

MBF: Thousand board feet (see "board feet").

MEAN STAND DIAMETER (MSD): The average diameter of a group of trees measured at diameter breast height (DBH).

MERCHANTABLE HEIGHT: The height of a tree where the merchantable portion of it ends. Usually at about 4"- 6" in diameter.

MIXED WOOD: Describes a stand condition where both softwood and hardwood are present in significant amounts.

MULTIPLE USE: Concurrent use of the forest resources for more than one goal such as timber production, wildlife habitat, watershed management, etc.

NON-COMMERCIAL: A stand which is not able to be operated economically either due to terrain or size and value of the timber present.

OPEN AREA: Unforested land, typically hayfield, built up areas, or overgrown fields.

OPERABLE: Before a stand of timber can be logged (operated) on a commercial basis, it must have some minimum volume of timber. Just as markets vary from one geographical area to another, so does the minimum volume required to operate a stand profitably.

OVERMATURE: A condition in which a tree or stand is past its peak of either economic value or biological growth.

OVERSTORY: The upper crown canopy of a forest, usually referring to the largest trees.

POINT SAMPLING: Statistical approach determining volumes in a forest. Commonly done with a prism at point randomly selected on a grid network spread out all over the property.

PRISM: In forestry, a prism is a calibrated wedge of glass which deflects light rays at a specific offset angle. In conducting a timber cruise, trees seen through the prism from fixed points are measured and are easily converted to "per acre" figures.

PULPWOOD: Wood or trees used to make pulp, from which paper products are manufactured. Trees of poor form and/or quality (rough and rotten), and of small size, are commonly tallied as pulpwood during at timber cruise.

RELEASE: Freeing the tops of young trees from competing vegetation.

RESIDUAL TREES: Trees left to grow in the stand following a silvicultural treatment.

SAWLOG: The portion of wood cut from a tree which will yield timbers, lumber, railroad ties and other products which can be sawn with conventional sawmill equipment.

SCARIFICATION: Exposing soil for regeneration by direct seeding or natural seed-fall.

SELECTIVE HARVESTING: The process of choosing some trees to cut over others based on such criteria as species, age, quality, location, health, etc., with the owner's long term goals for management in mind.

SILVICULTURE: The practice of growing trees.

SITE INDEX: A measure of the ability of an area to grow timber.

SIZE CLASS: Stands fit into size classes based on the size of trees which occupy them.

> **Sawlog** - A live tree which measures over 10 inches in diameter 4½ feet from the ground.
> **Pole** - A live tree which measures between 4 and 10 inches in diameter 4½ feet from the ground.
> **Sapling** - A live tree taller than 4½ feet but less than 4 inches in diameter 4½ feet from the ground.
> **Seedling** - A live tree less than 4½ feet tall.

SOFTWOOD: A class of tree species retaining their needles year round, also known as Conifers such as pine, hemlock, and spruce.

SOIL SUITABILITY: The general quality of the soil to provide a good medium for the growth of timber products.

SOIL TYPE: A general description of depth and water content of soil.

STAND: A group or area of trees or forest having similar characteristics and requiring similar management practices.

STEMS: A term used to describe individual trees such as in the phrase "stems per acre."

STOCKING: The density of a forest stand, often quantified as trees, basal area or volume per acre.

> **Overstocked** - A stand condition where there are too many trees present to maximize growth and yield.
> **Adequately Stocked** - A favorable stand condition where growth and yield are at or near optimum levels.
> **Understocked** - A stand condition where growth and yield is lessened because all growing space is not adequately utilized.

STUMPAGE VALUE: The value of the standing tree. It consists of the mill price (M) paid for the logs, less the total logging costs (L) for cutting the timber and trucking the wood to the mill. Stumpage value is crucial to the forest owner; it represents his profit on timber sales to the mill, and may be determined by using the formula: S = M - L.

TIE AND PALLET: Logs that are too rough, short, small or crooked to be marketed as high quality sawlogs, but which can be sawn into railroad ties or pallet stock.

TIMBER CRUISE: A "cruise," or timber appraisal, is an inspection of a forest tract, conducted in order to determine the species composition, volume and value of timber of the tract. Other considerations during a cruise include site characteristics, reproduction and growth capacities of the species on the tract, operability, and the availability of markets.

TIMBER LIQUIDATION VALUE: The timber liquidation value (TLV) of a forest is the value of all the standing trees in operable stands. The value depends upon many variables, including logging costs and delivered mill prices, and may change from month to month.

TIMBER STAND IMPROVEMENT (TSI): Treatments that improve the composition, condition and growth of a timber stand, often performed non-commercially (at an expense).

TOLERANCE: A species ability to thrive in shade.

TREES PER ACRE (TPA): The number of trees or stems per acre, a measure of stand density.

TRUCKING: Moving logs or other wood products from the landing area to the mill. One of the costs of logging.

UNDERSTORY: All vegetation growing under an overstory.

UNACCEPTABLE GROWING STOCK (UGS): Trees of poor quality or mature/overmature trees that would potentially be removed from a forest stand to provide more growing room for better quality and younger trees to grow.

VENEER: Veneer logs are turned on a lathe to produce thin sheets of wood to be used in the production of veneer, plywood and paneling. Veneer logs are usually the highest quality logs produced in a logging operation.

VERNAL POOL: A temporary body of water that forms in shallow depressions in the spring and does not have a permanent outlet. They are important for the propagation of amphibians such as frogs and salamanders.

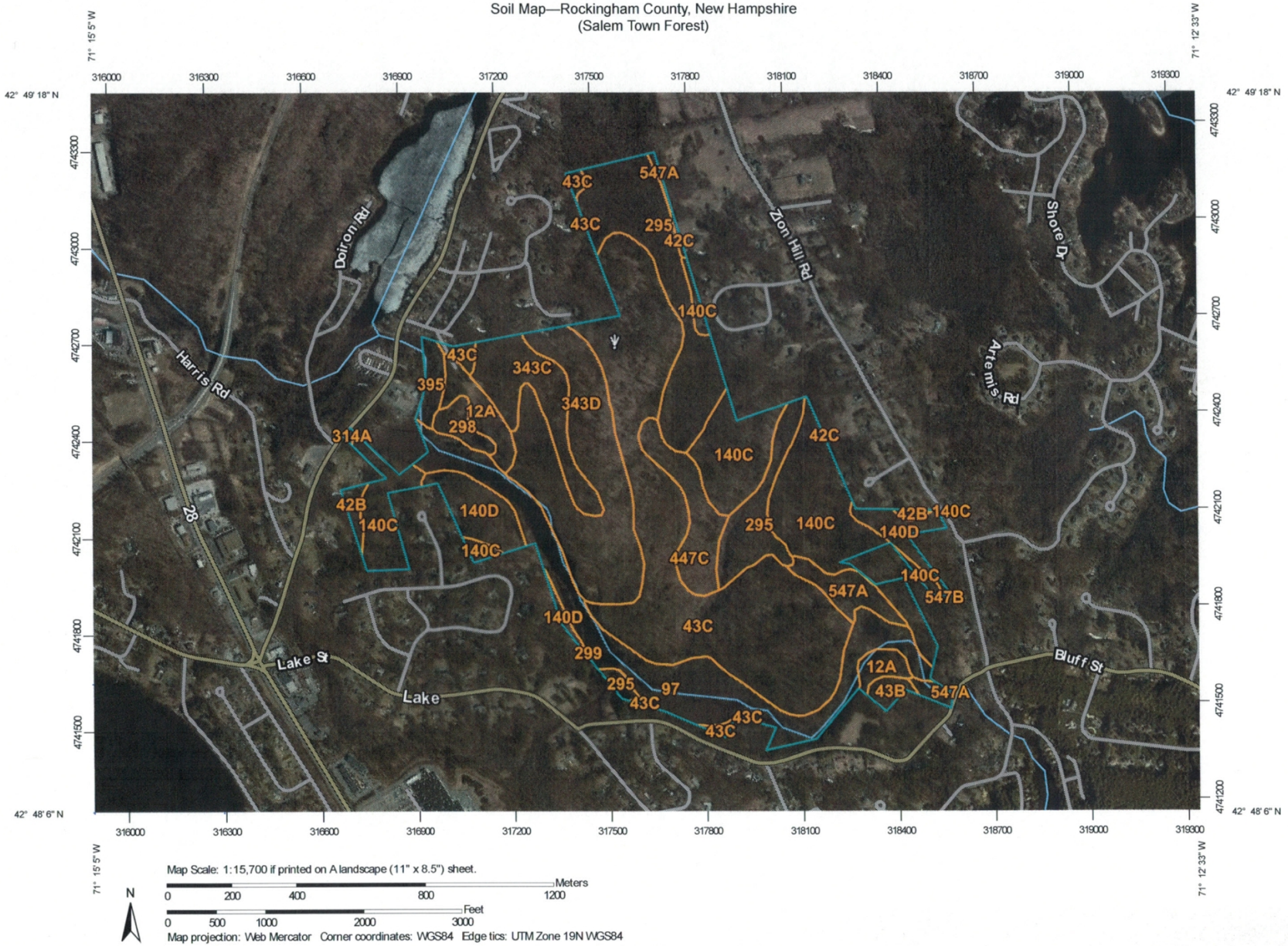
VOLUME: A quantitative measure of the amount of wood in a tree, stand, or woodlot usually expressed in board feet, cords, tons, or cubic feet.

WETLAND: Area of property which has surface water or high water table and is not able to economically grow trees.

WHOLE TREE CHIPS: Wood fiber produced when the remains of a tree are ground up after logs and pulp have been removed, often referred to as biomass.

YARDING: The transport of logs or whole trees from the stump to yard, where wood is sorted. Yarding is usually done with rubber-tired "skidders," with

Soil Map—Rockingham County, New Hampshire
(Salem Town Forest)



Map Scale: 1:15,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84