Dec. 5, 2012

Dear Mayor, City Council Members and City Manager,

The Hallowell Tree Board, along with the Hallowell Conservation Commission, would like to present the Forest Management Plan, along with two proposals, for final approval at the Dec. 10th, 2012 Council meeting.

Thank you very much,

Ellen Gibson
Hallowell Tree Board

December 5, 2012

The two proposals drafted below will be presented at December10, 2012 City Council meeting. They were jointly agreed upon on by the Hallowell Tree Board and Hallowell Conservation Committee on December 4, 2012.

1) The Council approves the Forest Management Plan as submitted by the Tree Board, except for references to recreational trails. The Tree Board is authorized to carry out the activities listed under "Management Priorities" as prioritized for years 2012 and 2013, in consultation with the City Manager.

2. The Council authorizes the Tree Board and Conservation Commission to jointly propose a process for the management of the City Forest and Reservoir and present it to the Council for consideration and action.

Regards,

Wes Davis

Wes Davis
Chairman Hallowell tree Board.

TWO TREES

FORESTRY

FOREST MANAGEMENT PLAN

HALLOWELL CITY FOREST

Hallowell, Kennebec County, Maine
Map 19, lots 4, 4A, 5, 22, 23, and 25

City of Hallowell
1 Winthrop Street
Hallowell ME 04347
(207) 623-4021

Prepared by:
Harold Burnett, LF 993

June 5, 2012

This plan meets specifications for:
USDA-NRCS Conservation Activity Plan and Maine Tree Growth Tax Law Certification

BACKGROUND

The 168±-acre Hallowell City Forest lies west of the Town Farm Road, beginning about 700' south of Winthrop Street, and extending westward to the Manchester/Hallowell town line. The City acquired land over the years, dating to before 1853, when the Town Farm was listed as including 95 acres, buildings and land on the east side of the Town Farm Road, and a woodlot. Together with staff the farm housed, fed, and employed people who were likely poor and/or suffering from mental illness. Through the late 1800s and early 1900s from five to 15 "inmates" lived there at any one time. The farm closed in June 1936. Though the property is currently well wooded, Hallowell's 1854 Annual Report describes, "The wood on the City wood-lot having become nearly exhausted, and an adjoining lot being offered for sale at a low price, we considered it our duty, ... to secure it for the City, and made arrangements accordingly." At which point 25 more acres were added to the City Farm. In 1888, the City Farm included "168 acres with house, barn, house for the insane, and other buildings thereon." At some later date the City sold the land and buildings east of the road and expanded its holdings west of the road to its current 168 acres, with the central 40±-acres, including the developed recreational area, coming from the Hallowell Water District in 2011. The use of the land for water storage dates to the 1880s or early 1890s, when the Hallowell Water Works dammed the stream and piped water to Reservoir #1, near the top of Winthrop Street, for distribution throughout the City. In addition to farming activities, a cottage-industry of granite quarrying helped generate extra income primarily from the sale of locally-used paving stones and foundation blocks. Gravel extraction also occurred on the lot's southern end, and the lot's eastern end was a garbage dump from before 1940, and was Hallowell's primary dump during the late 1960s to mid 1980s. Maine's Historic Preservation Commission has no record of Native American activity on or near the property. The property includes a public swimming pond, ball fields, and an extensive network of hiking, biking, and snowmobile trails. The City's current leaf and brush dump is located along the southern boundary. Manchester's Town Forest abuts the property to the west.

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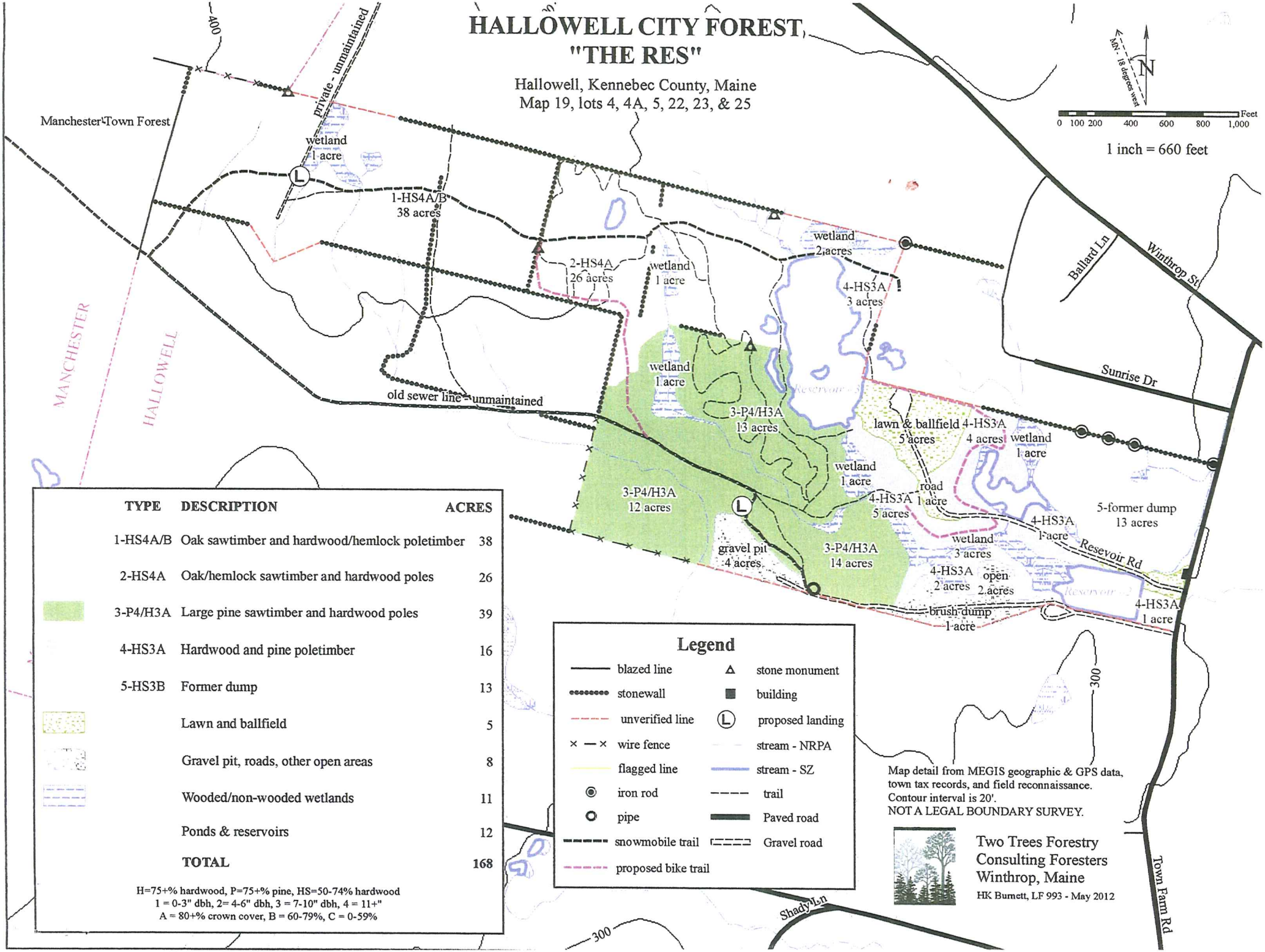
HALLOWELL CITY FOREST
"THE RES"

Hallowell, Kennebec County, Maine
Map 19, lots 4, 4A, 5, 22, 23, & 25



TYPE	DESCRIPTION	ACRES
1-HS4A/B	Oak sawtimber and hardwood/hemlock poletimber	38
2-HS4A	Oak/hemlock sawtimber and hardwood poles	26
3-P4/H3A	Large pine sawtimber and hardwood poles	39
4-HS3A	Hardwood and pine poletimber	16
5-HS3B	Former dump	13
	Lawn and ballfield	5
	Gravel pit, roads, other open areas	8
	Wooded/non-wooded wetlands	11
	Ponds & reservoirs	12
	TOTAL	**168**

H=75+% hardwood, P=75+% pine, HS=50-74% hardwood
1 = 0-3" dbh, 2= 4-6" dbh, 3 = 7-10" dbh, 4 = 11+"
A = 80+% crown cover, B = 60-79%, C = 0-59%

Legend

- blazed line
- stonewall
- unverified line
- wire fence
- flagged line
- iron rod
- pipe
- snowmobile trail
- proposed bike trail
- stone monument
- building
- proposed landing
- stream - NRPA
- stream - SZ
- trail
- Paved road
- Gravel road

Map detail from MEGIS geographic & GPS data, town tax records, and field reconnaissance.
Contour interval is 20'.
NOT A LEGAL BOUNDARY SURVEY.

Two Trees Forestry
Consulting Foresters
Winthrop, Maine
HK Burnett, LF 993 - May 2012

The terrain slopes gently eastward but includes a relatively flat western section, a rocky sloping central section, and a flat eastern third. A small quarry pond, two reservoirs, and a small open wetland are present along with a small gravel pit. Most of the land drains eastward, enters Bombahook Stream and then Vaughan Brook before flowing into the Kennebec River. The forest is well wooded, and growing pine, oak, and hemlock sawtimber and poletimber, along with beech and red maple poletimber. Timber harvesting last occurred on the land during the 1980s. Current volumes total 850,000 to 1,050,000 board feet of sawtimber and 2,800 to 3,200 cords of pulpwood, worth $190,000 to $219,000.

To my knowledge no one has surveyed the entire property recently, though Thayer Engineering surveyed portions of the northern line, in common with the Bombahook Estates and neighboring gravel pit, and also created a composite plan of the portion of the property that came recently from the Hallowell Water District. We noted no other surveying evidence. However, the land's perimeter is generally marked, albeit sometimes quite crudely, by stonewalls, blazed trees, and scraps of old wire fences. In addition, a Hallowell/Manchester corner is identified by a stone monument near the lot's western end, and corners of the former Hallowell Water District are also marked with stone monuments. As municially-owned land none of the land is assessed for tax purposes.

Access to the property is fair, but quite good from the eastern end via the Reservoir and Fish and Game Roads. However, the main swimming pond (Reservoir #3) and its outlet stream block ready access to much of the remainder of the woodlot. Though two woods roads and trails provide access to all areas of the property, it is unclear to what extent any of them provide legal access. For example, the main hiking and snowmobile trail around the northern end of Reservoir #3, crosses a corner of the abutter's land, just north of the parking area. The extension of the Fish and Game Road, along the retired Augusta Sanitary District sewer line, is sufficient to allow vehicles to drive to the lot's western end, but also crosses two private properties. Dale Glidden, the retired former superintendent of the Augusta Sanitary District, said[1] that in the late 1960s and early 1970s the ASD acquired an easement to build the sewer line, including the parallel maintenance road, but after the line was retired in the late 1980s or early 1990s the easement reverted back to the abutters. Lastly, the unmaintained Beacon Road, from Winthrop Street, formerly accessed a Federal airplane navigational beacon on the lot's western end, though that legal right-of-way may or may not still exist. Two snowmobile trails are currently maintained, including along the old sewer line and another that crosses the property from its far southwestern corner to the northeastern corner, north of Reservoir #3.

However it appears that the southern abutters, have historically used the Fish and Game Road extension, then linked to the old sewer line, and crossed City property to harvest and remove timber from those lots; it would require some research/permission for the City to use that road to bring logging equipment and trucks to the lot's western end.

[1] Personal communication, 6/1/12

MANAGEMENT OBJECTIVES

During 2009 the Hallowell Tree Board conducted a city-wide survey and held a public meeting relating to the use of The Res. The survey results suggest that most residents who use the woods hike, bike, snowmobile, snowshoe, and/or cross-country ski on the land, and favor continued recreational use of the trails, but generally opposed motorized vehicle use, except for snowmobiles on certain trails. In addition, survey results suggested that most respondents valued the area's wildlife and related habitats and sought to protect ecologically significant areas, and saw selective forest management as an appropriate means to that end. Since 2009 the Tree Board and the Conservation Commission further reviewed matters and identified recreation as the area's top use, with trail design and maintenance as the leading priority, along with wildlife enhancement. They also concluded that illegal ATV use, enhancing esthetic values, and establishing timber harvesting guidelines were important priorites, as well. In 1999, the City Council had suggested that all timber harvesting proceeds should be dedicated to furthering the multiple-use aspects of the property, including, but not limited to trail and facility maintenance and perhaps repairs to the two reservoir dams.

The City Boards further agreed that the goals of any timber harvesting program would be to maintain/improve/sustain the health and productivity of the forest, while maximizing the recreational use of the property.

LAWS IMPACTING LAND MANAGEMENT ON PROPERTIES

- **Shoreland Zoning (SLZ)** -As of May 2012, Hallowell shoreland zoning laws do not apply anywhere on the property. No other town ordinances regulate forest management or harvesting either.
- **Natural Resources Protection Act (NRPA)** – NRPA regulates disturbing soil adjacent to water bodies, including all seasonal brooks including all well defined channels with exposed mineral soil, including streams with only seasonal water flows. The law requires that concerted efforts must be made to ensure that soils don't wash into the brooks. Working within guidelines described in the Maine Forest Service's Best Management Practices for Forestry should ensure compliance. Permitted activities may require permit-by-rule or full permitting.
- **Protection and Improvement of Water Law** – The law regulates activities, which discharge or may potentially discharge materials (pollutants) into water bodies. In forestry context the law addresses pollutants originating from non-point sources and addresses the impact, not the location, of an activity.
- **Erosion and Sedimentation Control Law** – The Law requires that measures be taken to prevent unreasonable erosion of soil or sediment beyond the site or into a protected natural resource, such as a river, stream, brook, lake, pond, or wetland. Erosion control measures must be installed before the activity begins, be maintained, kept in place and functional until the site is permanently stabilized.
- **Forest Practices Act** – FPA mandates adequate regeneration must be present within five years of any harvest, establishes rules relating the planning requirements, size, and spacing of clearcuts, and outlaws liquidation harvesting. All landowners must notify the Maine Forest Service prior to harvesting and then report volume and price information for any year in which harvesting occurred.

SOIL AND FOREST RESOURCES

The property may be divided into three topographic areas:

- gentle terrain on the lot's western end – deep, well-drained Paxton very stony fine sandy loams, which formed in glacial tills. These areas roll gently and well suited to oak, pine, hemlock, and beech. The area is probably too dry for quality northern hardwoods to flourish. The ground has few operational limitations, except for periodic wetruns.
- east sloping terrain west of Reservoir #2 – deep, moderately well-drained, and rocky Hollis and Hinckley fine sandy loams, which formed in glacial tills. Historically, these are areas where most of the granite quarrying occurred and appear well suited to oak, pine, hemlock, and beech, though northern hardwoods could grow reasonably well on the lower slopes, where soil depth and fertility are greater. The ground has few operational limitations for forestry.
- heavily disturbed terrain east of Reservoir #2 – gravel mining and garbage dumping operations have and continue to heavily impact potential tree growth. Piles of garbage and seeps limit tree growth. It is likely that much of this area will best support red maple, though undisturbed sections appear to be able to support a range of much higher quality tree growth. Equipment should probably only work these areas on frozen ground.

For management planning purposes, the wooded areas were divided into five stands: All stocking and volume figures list a range of values, accurate to a 67% confidence interval.

Stand 1 Oak sawtimber with hardwood and hemlock poletimber (HS4A/B – 38 acres) The western end of the woodlot rolls gently, but includes numerous small depressions and wetruns. The area is dominated by 12" to 18" diameter and 70' to 80' tall oak sawtimber and oak, red maple, and beech poletimber. Hemlock are interspersed throughout the stand, but are frequently mid canopy trees; isolated large pine sawtimber trees tower above the main canopy. Loggers last entered the area during the 1980s to selectively harvest. The quality of the oak is good, but not great, as few stems support more than 1.5 logs; the sawtimber-sized hemlocks tend to be limby, though most of the hemlock aren't quite large enough for sawtimber. No insect or disease concerns were noted, except the beech bark disease complex that is common throughout southern Maine. Current stocking rates average 98 - 119 sq.ft. of basal area per acre; 61% is considered quality growing stock. Annual growth rates likely average 0.5 to 0.7 cords per acre, though the tree-to-tree competition has reduced individual tree growth rates. Current volumes likely average 2,900 – 4,900 board feet of sawtimber and 16 - 21 cords of pulpwood per acre.

Distribution of trees by species and diameter (basal area/acre)

Diameter	White pine	Hemlock	Red oak	Beech	other hardwood	**Species**	Snags
5 - 8"		13	3	11	6	**33**	7
9 - 12"		1	14	10	7	**33**	3
13 - 16"		6	10	1		**17**	1
17 - 20"		6	11			**17**	
>20"	9					**9**	
total BA	**9**	**26**	**39**	**23**	**13**	**109**	**11**
% of total	**8%**	**24%**	**36%**	**21%**	**12%**	**100%**	

Regeneration is dominated by beech saplings and hemlock and beech sprouts. Logging could occur during most seasons except the very wettest.

Stand 2 Oak and hemlock sawtimber and hardwood poletimber (HS4A – 26 acres) Sections of the woodlot west of the main reservoir are dominated by 12" to 18" and 70' to 90' tall red oak sawtimber and oak, red maple, and beech poletimber, along with scattered white pine and hemlock sawtimber. Virtually all the quarrying operations occurred within this area. The stand likely originated during the early part of the 20th century, but has not been entered by loggers since at least 1960, though the 1998 ice storm caused widespread mortality of most of the stand's then white birch. The quality of the oak is quite good, with many tall, well formed stems, though the best quality trees tend to be in the 10" to 14" range; the larger oaks tend to have more forks and lower limbs. Growth, likely averaging 0.5 to 0.7 cords/acre/year, tends to be quite vigorous for a hardwood stand, though overcrowding has limited individual tree growth. Stocking rates total 121 - 142 sq.ft. of basal area per acre of which only 47% is considered quality growing stock. Current volumes average 5,300 – 8,600 board feet of sawtimber and 23 - 27 cords of pulpwood per acre.

Distribution of trees by species and diameter (basal area/acre)

Diameter	White pine	Hemlock	Red oak	Beech	other hardwood	**Species**	Snags
5 - 8"		2	2	27	7	**37**	13
9 - 12"	2		8	12	12	**33**	7
13 - 16"	2	8	17	2	5	**33**	2
17 - 20"		7	8			**15**	
>20"	7	5	2			**13**	
total BA	**10**	**22**	**37**	**40**	**23**	**132**	**22**
% of total	**8%**	**16%**	**28%**	**30%**	**18%**	**100%**	

The understory is dominated by beech and hemlock sprouts and saplings, with few high value species present. Operability within the stand is quite good; logging could occur during most seasons.

Stand 3 Large pine sawtimber and hardwood poletimber (P4/H3A – 39 acres) South and west of the main reservoir 20" to 30" and 90' to 110' tall white and red pine sawtimber tower above a dense stand of mostly 5" to 10" red maple and beech poletimber. The stand likely originated during the early part of the 20th century on abandoned agricultural land. Loggers have entered periodically, having most recently selectively harvested during the 1980s or early 1990s. Then, the best-formed pines were retained. The quality of the pine tends to be quite good with only the upper stems being limby and of pallet grade, however, several of the largest pines exhibited red heart rot indicators and some of the white pine closest to the reservoir appear to be suffering from a needle cast. White pine blister rust is not present to any noticeable degree. Unfortunately the hardwood midcanopy is comprised almost entirely of low-value red maple and beech, with only a few scattered oaks present. Stocking rates total 137 - 164 sq.ft. of basal area, of which 67% represents the pine sawtimber. Current growth likely averages 1.0 to 1.2 cords/acre/year. Current volumes average 13,100 – 17,100 board feet of sawtimber and 18 - 25 cords of pulpwood per acre.

Distribution of trees by species and diameter (basal area/acre)

Diameter	White pine	Red pine	Hemlock	Red oak	other hardwood	**Species**	Snags
5 - 8"	1		2	1	13	**18**	4
9 - 12"	2		7	4	14	**27**	1
13 - 16"	11	7	6	4	6	**33**	1
17 - 20"	19	9	5	1	1	**35**	
>20"	34		4			**38**	2
total BA	**67**	**16**	**24**	**9**	**34**	**151**	**8**
% of total	**45%**	**11%**	**16%**	**6%**	**23%**	**100%**	

Below the hardwood only scattered beech and striped maple sprouts are growing. Logging could occur during most seasons, but scattered wet spots suggest dry or frozen conditions would be best.

Stand 4 Hardwood poletimber – old field sites (HS3A – 16 acres) Areas east of the swimming area and the reservoir's outlet stream, but excluding the former dump site, was formerly open land as recently as the 1960s. This heavily disturbed site has been excavated for gravel, crossed by the sewer line, and developed as a recreational site. Wetlands are scattered throughout the area. The area is heavily infested with non-native and invasive honeysuckle, Japanese knotweed (bamboo), Japanese barberry, and some bittersweet vines; as well, several patches of poison-ivy are growing just west of the road. The overtopping trees are dominated by six to 12" diameter and 40' to 60' tall red maple, red oak, and white birch poletimber, along with larger white pines, though white pine weevils have caused many of the pine stems to fork and crook. Current stocking rates are quite high, though growth is fair, averaging 0.4 to 0.6 cords/acre/year. Stocking rates total 101 - 143 sq.ft. of basal area per acre of which 51% is considered quality growing stock. Current volumes average 600 - 1,600 board feet of sawtimber and 24 - 32 cords of pulpwood per acre.

Distribution of trees by species and diameter (basal area/acre)

Diameter	White pine	Red oak	White birch white ash	Red maple	other hardwood	**Species**	Snags
5 - 8"	9	11	9	13		**42**	
9 - 12"	13	4	2	16	4	**40**	4
13 - 16"	13	2	2	4	4	**27**	
17 - 20"	2				4	**7**	
>20"	2			2	2	**7**	
total BA	**40**	**18**	**13**	**36**	**16**	**122**	**4**
% of total	**33%**	**15%**	**11%**	**29%**	**13%**	**100%**	

Most of the well-shaded forest floor is free of regeneration, except for the previously mentioned shrubs. Logging could occur during all but the wettest seasons.

Stand 5 Hardwood and hemlock poletimber – old dump Portions of the lot's northeastern corner was open land as recently as the 1960s, though a block of woods along the Bombahook Estates boundary had then been wooded. Most of this heavily disturbed site was used as a town dump. The area is heavily infested with non-native and invasive honeysuckle, Japanese knotweed (bamboo), Japanese barberry, burning bush, and some bittersweet vines. In many places walking through the tangle of shrubs is difficult. The overtopping trees vary considerably, with old hemlock and hardwood common along the northern boundary, but more open-grown eight to 12" and 50' to 70' tall red maple, popple, white birch, white ash, and black willow more typical elsewhere. While this site is wooded, onn the old dump site garbage is quite evident on the surface, and the drainage is poor, thus it is unlikely that much of the area will be a productive forest for many decades, at least. Current stocking rates are moderate, though growth is fair, averaging 0.4 to 0.6 cords/acre/year. Stocking rates total 85 - 143 sq.ft. of basal area per acre of which only 43% is considered quality growing stock. Current volumes average 700 - 1,700 board feet of sawtimber and 17 - 29 cords of pulpwood per acre.

Distribution of trees by species and diameter (basal area/acre)

Diameter	Balsam fir hemlock	Red oak	Red maple	Popple	other hardwood	**Species**	Snags
5 - 8"	11	9	3	6	9	**37**	3
9 - 12"	3		11		14	**29**	
13 - 16"	9	3	9	3	9	**31**	3
17 - 20"		3		3	6	**11**	3
>20"					6	**6**	
total BA	**23**	**14**	**23**	**11**	**43**	**114**	**9**
% of total	**20%**	**13%**	**20%**	**10%**	**38%**	**100%**	

BIODIVERSITY AND AREA LANDSCAPE FEATURES

Maine's Dept. of Inland Fisheries and Wildlife has not identified and areas on or near the property as significant wildlife habitat. However, the woodlot is certainly well used by a variety of wildlife, as deer, beaver, foxes, raccoons, porcupines, hares, grouse, and a multitude of songbirds were seen or evident. However, from a wildlife management standpoint, the woodlot is relatively small. While many animals utilize the property, few depend on it for all their needs. That being said, wildlife require places to nest, feed, hide, mate, and traverse, any of which might occur even on small lots, if the required habitat elements are present. For example, the Hallowell City Forest supports many valuable habitats elements, including a considerable amount of fresh water and wetlands, field and woods edge, where wildlife can feed close to protective cover. In addition scattered apple trees, nut-bearing oak and beech trees, and dense softwood areas are present. While the largest brooks no doubt support fish, the two dams limit their in-stream movement. Woodlot activities can do virtually nothing to improve stream conditions for fish, other than maintain the status quo.

There are few large diameter snags (standing dead trees) or cavity trees on the property, though some scattered large blister rust-killed pines are present. The most significant number of snags are five to 10" diameter and are either diseased beech mortality or white birch and popple trees that died as a result of the 1998 ice storm. Many of the wetlands have been home to beavers, over the years, though the stream connecting the two reservoirs was cleared of beavers during the late 2010s; beavers are currently present in the far western wetland. The land's numerous wetlands and stream corridors likely support the most unique plant and animal communities on the woodlot, though I noted no sign of late-sucessional ephiphytes, unusual lichens and mosses, that grow on trees.

The habitat conditions most lacking are pockets of young herbaceous growth. The generally well-shaded forest floor has enabled only a modest amount of grasses, forbs, shrubs, and small trees to become established. Invasive shrubs are quite dense on the eastern quarter of the property. No threatened or endangered species were seen on this woodlot, and it is unlikely that any are present.

The property, in general, is part of broad rolling coastal plain, that remains relatively well wooded, despite the increasing residential developments, as the area transitions from an agriculturally based economy to a more bedroom community for Augusta commuters. Augusta and Hallowell's, commercial districts, are within a mile or two of the land.

LONG TERM MANAGEMENT DIRECTION

The forest should be managed in a way that improves and maintains the property's recreational values and infrastructure, while improving wildlife habitats and the forest's health. Forest managers should sustain a perpetual flow of forest products from the land, so as to retain the diversity and vigor of the forest, while generating income to fund recreational facilities, and other management activities.

Natural succession should, over time, change the appearance of the woodlot from its current one and two-age, post-agricultural stands to one characterized by trees of all ages and species more suitable to shady conditions. The 1980s logging accelerated this transition on the lot's southern end; sunlight reached the forest floor and helped a young cohort of trees to become established there. Generally long lived and site friendly red oak, beech, and hemlock will continue developing as the forest matures, but at the expense of white pine, red pine, and white birch. These latter species were much more abundant during the later half of the 1900s, given the lot's former agricultural heritage and pattern of disturbance and efforts should be made to encourage white pine whenever possible, as it will likely continue declining in abundance unless efforts are made to encourage it. Individual tree mortality, from windthrow, disease/insects, and should continue as the primary disturbance agent, but likely at a pace that is hardly noticeable.

Protecing these lands from unauthorized cutting by neighbors and/or others is the top priority, along with educating users as to allowed uses. Boundaries are not well marked and the lines around the old beacon site are not evident. Blazing and painting trees along all boundary line is the best way to highlight these, while trail signs at entrances to the property can inform trail users about allowed property uses.

From a recreational vantage point, maintaining the existing trail system will be important. Though no signage exists, most trails are easy to find given their high level of use, though fortunately few exhibit any destructive erosion. With the exception of a small section of the old sewer line and south of a small wetland on the lot's western end, virtually no trail sections have any water problems. During heavy rains water bubbles up from the retired sewer pipe, near where it crosses a stream, which has cut several gullies along and beside the trail. The primary concerns with the trail network are two-fold: bikers can't loop around the property and some of the side trails are likely difficult for novice users to find especially during snow cover, given the lack of signs or other markers. The narrow secondary trails are also quite narrow and repetitiously looping. It would be helpful to bike riders if the sewer line and the main snowmobile trail were connected, so that riders could enter along the old sewer line and travel westward, before heading northwesterly, on an as-of-yet unmade trail to connect with the main snowmobile trail, where they could then loop back to the east, traverse the northern end of the swimming pond and ballfield, circle through the woods, cross the road, and return to the road and sewer line. Hikers could also be aided by signs or small blazes along the side trails. In addition, trails could be cleared of overhead limbs to ensure snow-laden branches don't block trails during winter. All trails should be routinely cleared of ever-lengthening branch tips and saplings.

However given that the property is to be used by more than just recreationists, I recommend that the woodlot be managed in a somewhat segregated fashion. Specifically, given the likely conflicts between recreational and educational use and periodic timber harvesting, I propose that forest management be limited to the western 38 acres and the 30-acre area south of the main brook. The remainder of the property should be managed primarily for recreation, wildlife habitat improvements, and forest health, including the eradication of invasive species.

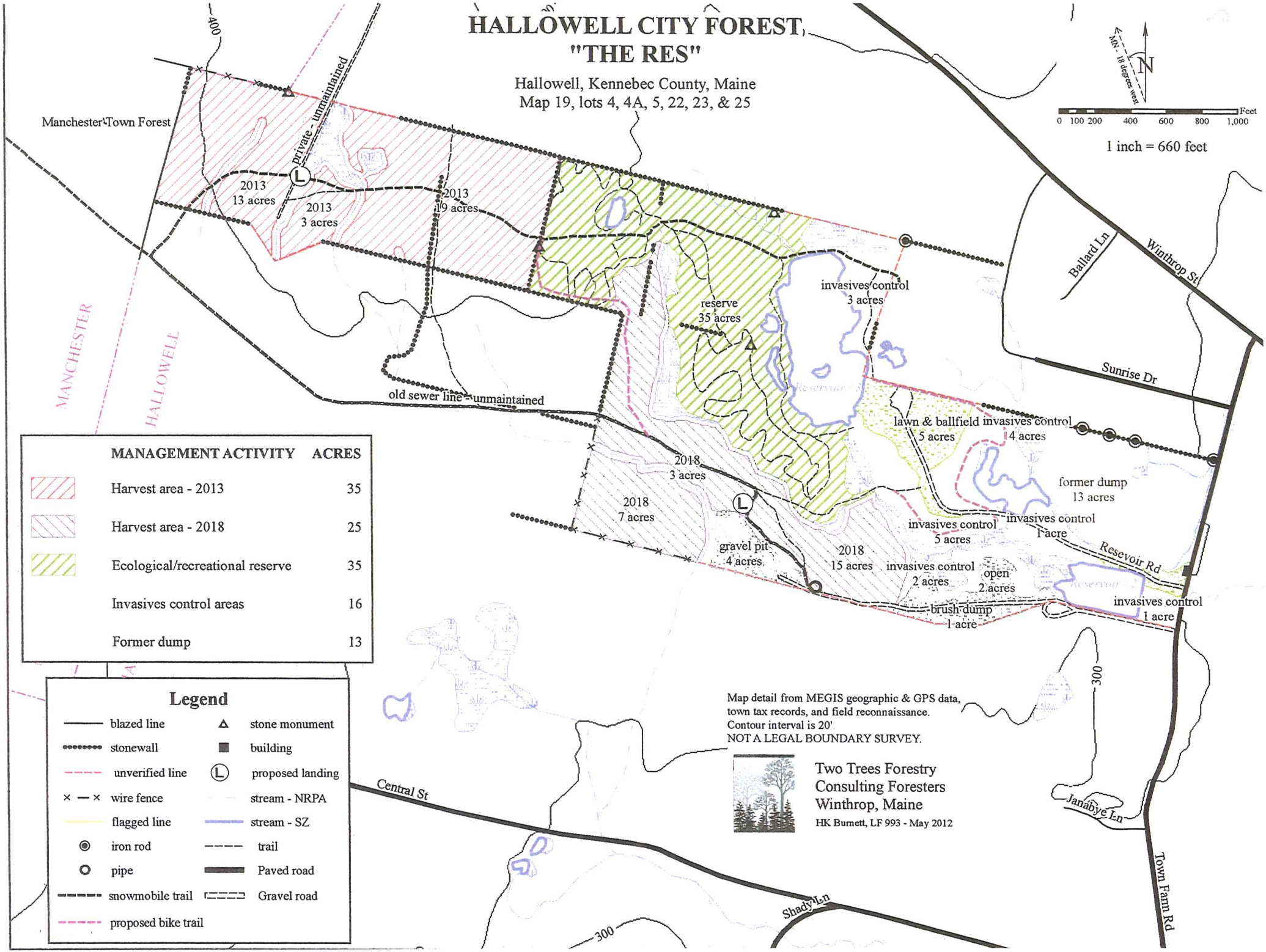
Thus a reserve area, dedicated to natural forest successional, recreation, and education, be roughly defined as that area lying between Reservoir #3 and the lot's longest brook (see map). In addition, all areas of the above harvest areas within at least 25' of streams and wetlands should be similarly protected. The areas surrounding the reservoir's outlet stream and the developed portion of the property will be difficult to manage for timber, given the high recreational usage, numerous brook and wetlands, and the small scattered acreage. The primary management concern there at this time is the abundance of invasive honeysuckle, Japanese barberry, and Japanese knotweed (bamboo). The area around the old dump is another matter, where invasives have overrun the formerly disturbed site and site conditions hinder tree growth. This latter area is the lowest priority on the property and I thus suggest that all other priorities be attended to first.

The most benefitical means of controlling non-native and invasive species generally begins by limiting the spread of the shrubs, and thus includes a strategy of working from the perimeter of the problem back to the problem's epicenter around the road, ballfields, and old dump. On the Hallowell City Forest I recommend that managers initially monitor and eliminate all invasives west of a rough line extending along the main reservoir, its outlet stream, to the City's brush dump. The second priority should be all other areas except the old dump site. Again the former dump should be tackled last. Outside funding, including the Maine Forest Service's Project Canopy, may be available to help subsidize such expenses; volunteers could be quite helpful as well.

In the areas designated for forest management, retaining a woodlot dominated by valuable species will require managers to improve growing conditions for existing trees and create favorable conditions for regenerating them as well. While for now, most of the moderately-aged woodlot will benefit from additional overstory growth, long-term attention should be paid to regenerating oak, pine, hemlock, and perhaps quality northern hardwoods. Commercial thinnings can improve species composition and tree spacing, by removing low value species and poor quality individuals of all species, in order that future growth occur on the preferred species. Later, as the best trees attain large sawtimber size, managers should begin planning for regenerating portions of the stands. Creating patches, two to four tree lengths in diameter (0.4 to 1.3 acres), will direct sunlight to the forest floor and spur regeneration of both sun-dependant and shade tolerant species. Future harvests should then remove nearby and overtopping trees to enlarge the regenerated gaps on the forest floor, while improving the conditions of the large residual trees surrounding the gaps. Care will also need to be taken to limit the advantages that are given to beech, a shade-loving, often diseased tree, that sprouts vigorously and dominates partial-shady and shady sites. Cutting during summer months will most agressively deter vigorous sprouters such as beech and red maple, which along with the exposed mineral soil will help seed-originated seedlings of more valuable species to become established and develop.

HALLOWELL CITY FOREST
"THE RES"

Hallowell, Kennebec County, Maine
Map 19, lots 4, 4A, 5, 22, 23, & 25



MANAGEMENT ACTIVITY	ACRES
Harvest area - 2013	35
Harvest area - 2018	25
Ecological/recreational reserve	35
Invasives control areas	16
Former dump	13

This general notion of expanding the size of openings, while retaining surrounding blocks of uniformly large trees, will ultimately create a forest comprised of multiple age classes, tree sizes, and heights. Such forests provide the diversity that best resists insect and disease problems, benefits a multitude of wildlife, and provides a solid foundation for a regular income stream. Thus the woods should be managed to produce large diameter (14 - 22" dbh), high value trees, under gradually developing uneven-aged conditions, with some 20+" trees retained indefinitely. Harvest levels should be set to ensure that harvest volumes within the 60-acre management area do not exceed volumes grown, currently 70 to 90 cords per year[2].

Within the management areas I recommend that two harvest blocks be considered: the lot's western third and the area south and west of the lot's longest brook. Such will minimize the potential conflicts with trail users, keep log trucks off of the Reservoir Road, and minimize the number of required stream crossings. However, to access the western section will require use of the unmaintained Beacon Road, over neighboring land to the north, or use of the Fish and Game Road, old sewer line, and a small connecting trail from the sewer line to the proposed yard. Both roads are in pretty good condition, are not very rutted or puddled, and could be made serviceable with minor grading and some surfacing material. Each of the two management areas could be harvested on a 20-year cycle, with cutting rotated between the two areas. However, given the silvicultural need that has arisen over the 30+ years since the last harvest entry, I recommend that loggers enter the westernmost block in 2013, and then move to the southern block in 2018. Such will attend to the highest forestry needs, while generating income for other management activities as well.

Finally, from the stand point of maintaining wildlife habitat, the managed forest should include undisturbed areas along the stream and wetland corridors in addition to the reserve area, and be complemented by "recruiting" and protecting snags and cavity trees and a diversity of tree canopy layers. Generally conscientious timber management should stear and improve these wildlife habitat efforts.

SHORT TERM MANAGEMENT RECOMMENDATIONS

Blazing and painting boundary trees will be important to protect the land from timber trespass from loggers on neighboring land. Such work could be contracted or performed by volunteers. Though stonewalls are common boundary markers they, by themselves, can't be relied upon given the large number of interior non-boundary stonewalls. Old barbed wire evidence, along the southern lines are often difficult to locate, as is the section around the old beacon site on the lot's western end. Volunteers could be helpful with such tasks, though contractors could highlight boundaries for $800 to $1,000 per mile, around the 2.0 miles of wooded boundaries.

[1] based on state-wide growth averages, of the species and products present on the City Farm.

Maintaining the trail network will require a modest annual committment, to remove windthrow and can likely be done in collaboration with the local snowmobile club on the primary trails. In addition, I recommend that two new 0.25-mile bike trails be created to link the old sewer line to the main snowmobile trail and also around the ballfield, as illustrated on the map. The southern half of the trail's western section would also be a primary skidding route, used every 20 years or so, to access a corner of the harvest block. Such a connector could probably be developed without needing to fell many large trees, but should be relatively straight and avoid rocks. However, on the smaller side trails volunteers should sweep the trails to ensure that twigs, branches, and trees don't block the routes. However consideration should also be given to marking those trails in a way that enables novices to traverse without fear of getting lost, especially in winter. Small signs or tree blazes may be helpful to guide users. Some consideration may be given to removing a few loops; trails don't need to be straight, but removing some of the loops may make the trails easier to follow.

INVASIVES

As mentioned previously I also urge the Tree Board and Conservation Commission to begin confronting the invasive species. As invasive populations generally originate in one or several spots and spread outward from there, the primary goal is therefore to limit its spread. The disturbed portions of the property, along the roads and old dump, are the most heavily infested, thus a first step is in developing a control plan should be to monitor areas west of Reservoir #3 to determine exactly where the problem lies. Monitoring areas east of there is not necessary, given the obvious high levels there. Overlaying a 200' by 200' grid on the woods west of the reservoir and counting the species and numbers that are present in each 1/10th-acre (37.2' radius) plot will quickly define the problem's location and edge. The areas most in need of monitoring are those just west of the reservoir and that around the former beacon site. However, once the location(s) have been accurately determined, control should begin on the problem's perimeter and progress back toward the areas of greatest concentration. I recommend that the shrubs be removed or killed. Control can be either by mechanical (pulling) or chemical (herbicide) means.

Chemical control, by a licensed pesticide applicator, or mechanical control, can cost $150 to $300 per acre, and generally needs to be repeated over a few years, however volunteer or contracted laborers can pull the shrubs as well at likely less expense. It is most efficient to combat the shrubs in early spring or late fall, as the shrubs tend to have a much more extensive growing season than native plants and are thus easily seen with their early/late green foliage, when other trees and plants are leafless.

HARVESTING

From a forest management standpoint, I recommend that a commercial harvest occur in the westernmost oak sawtimber stand (1-HS4A) as soon as reasonable. Stocking levels are quite high and the growth of the best trees is limited by competition. An improvement harvest would enable managers to remove low value and poor quality red maple, white birch, and hemlock poletimber, in order to allow the best oak and hemlock trees to grow more vigorously. Though beech is common throughout the stand, I don't recommend cutting much of it except to release quality oak or hemlocks nearby. As this proposed harvest is designed to improve the overstory growth, the harvest intensity will be too light to favor desirable regeneration; cutting much beech at this time will likely only encourage more beech sprouts to dominate the understory. Harvesters should also strive to retain single-stem oaks over multi-stemmed ones and the well formed 12" to 14" diameter trees over the larger ones, which tend to be of lesser quality. Efforts should be made to retain a few of the largest and best formed of the white pine sawtimber trees as well.

The residual stand will be quite uniformly stocked, with a likely density of 80 to 100 sq. ft. of basal area per acre, and dominated by oak sawtimber and developing hemlock poletimber and small sawtimber trees. The understory will be quite open, lending a "park-like" appearance to the area. Such a harvest, on 35± acres, will likely yield 40,000 to 60,000 board feet of sawtimber and 250 to 300 cords of pulpwood worth $12,000 to $18,000. Cutting during winter could be feasible, and most protective of roads over neighboring land.

As well I recommend that loggers strive to improve the long-term potential of the pine sawtimber site, where the maturing large pines overtop a red maple and beech stand, which has few long-term prospects. As noted previously, in 2018 I recommend clearing 0.5 to 0.75-acre patches of hardwood during summer months to create the best opportunities for quality northern hardwoods, pine, and perhaps oak to become established. Some concurrent thinning of the red and white pine sawtimber would be helpful, with care taken so that the most vigorous and well-formed pines be retained to continue towering over the site. Consideration might be given to also retaining those pines with obvious red heart rot, as future cavity and legacy trees. Between the patches care should be taken to release any oak, well-formed red maple, and yellow birch poletimber. Cutting there, on about 25 acres, would yield 120,000 to 150,000 board feet of sawtimber and 200 to 300 cords of pulpwood, likely worth $20,000 to $25,000. Such work should be schedule for summer, with wood yarded to an area just north of the gravel pit. One skidder bridge will be required to enter the section of the property in the southwestern corner of the harvest block, near the western boundary. Most recently loggers crossed the brook closer to the boundary than is advisable and rutted a lengthy stretch of trail; the prefered and older route is much higher and drier.

There should be no reason to update this plan or inventory prior to 2022, unless a natural disturbance intervenes or landowner objectives change significantly.

MANAGEMENT PRIORITIES
2012 - 2022

year	area	activity	net income/(cost)
2012	perimeter	Blaze and paint boundaries (2.0 mi.)	($1,500 - $2,000)[3]
	2-H4A & 3-P4A	Clear 0.25-mile bike trail	?[3]
2013	1-HS4A/B	Commercially harvest	$12,000 - $18,000
2013/15	4-HS3/4A	Monitor and eradicate invasive shrubs	?[3]
2018	3-P4A	Commercially harvest	$20,000 - $25,000
2022	all	Update plan	?

[3] Such work would be completed by volunteers at considerably less expense.

WOODLOT SUMMARY BY WOOD PRODUCT
Hallowell City Forest
Hallowell, Maine – May 2012

Product	Volume	Stumpage Rate	Value
Sawtimber (10" minimum top diameter):	(MBF)	($/MBF)	
White pine - grade	335	$ 200	$ 67,000
White pine - pallet	140	$ 70	$ 9,800
Hemlock	130	$ 60	$ 7,800
Red pine	105	$ 60	$ 6,300
Red oak	145	$ 380	$ 55,100
White birch	20	$ 120	$ 2,400
Red maple	65	$ 60	$ 3,900
White ash	5	$ 120	$ 600
Beech	5	$ 60	$ 300
total MBF	950		

Cordwood (4" top diameter)	Cords	$/Cord	
Pine	410	$ 9	$ 3,690
Hemlock	330	$ 12	$ 3,960
Red pine	20	$ 9	$ 180
Spruce	10	$ 15	$ 150
Balsam fir	30	$ 15	$ 450
Red oak	670	$ 18	$ 12,060
White birch	120	$ 18	$ 2,160
Yellow birch	70	$ 18	$ 1,260
Sugar maple	30	$ 18	$ 540
Red maple	480	$ 18	$ 8,640
White ash	120	$ 18	$ 2,160
Beech	610	$ 18	$ 10,980
Popple	110	$ 35	$ 3,850
Black cherry	10	$ 18	$ 180
Other hardwood	50	$ 18	$ 900
total cordwood	3070		

Total Estimated Volume in Cords 4872 ±9.4% @19:1
statistically significant range 3860 - 5890 cords

Gross Estimated Value $ 204,500 ±14.2% @19:1
statistically significant range $150720 - $258280

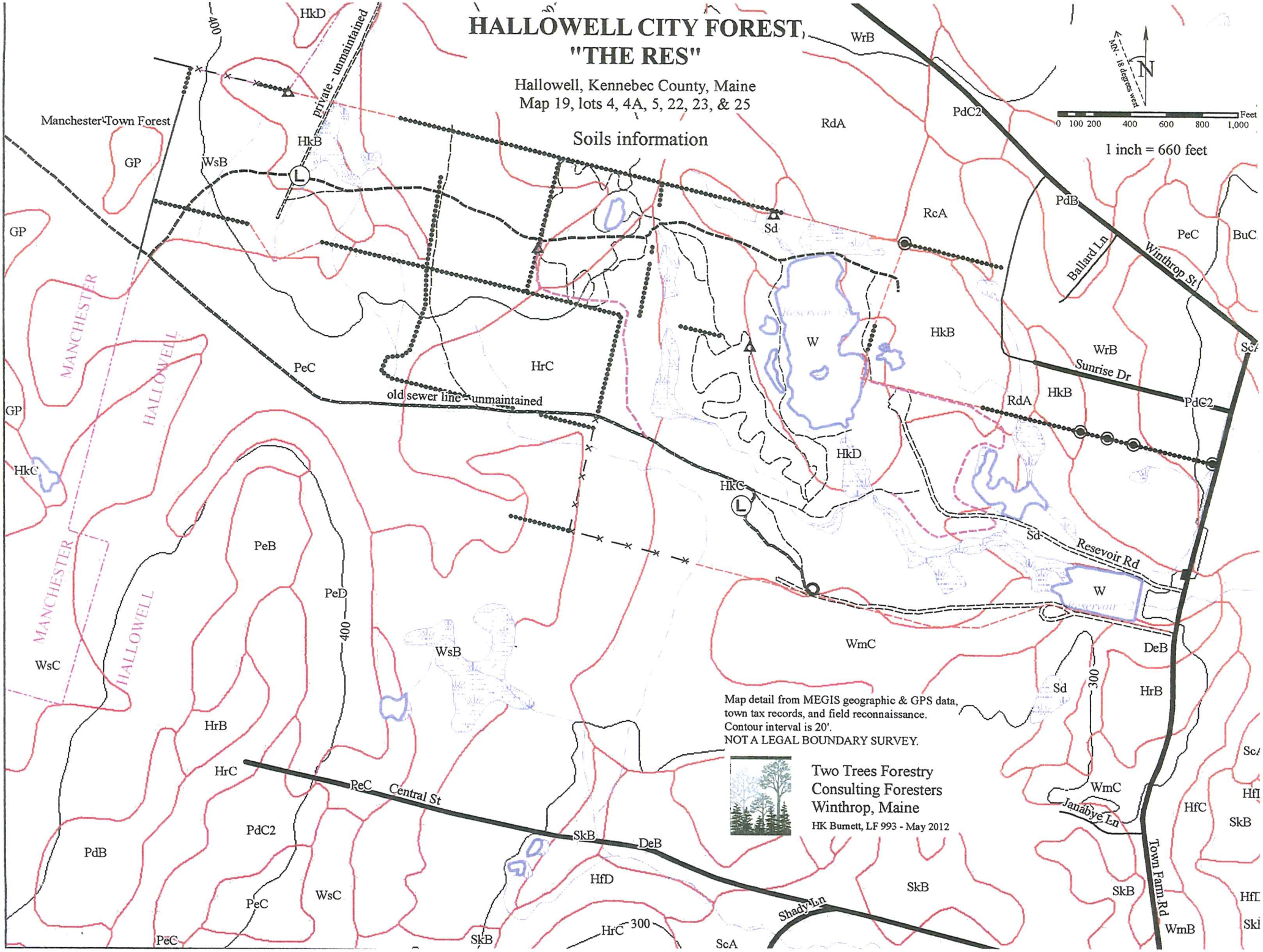
ABOUT STATISTICS: There is an element of error in any sampling scheme. The sampling errors of the estimates of total volume and gross value are within a 95 percent confidence interval, which means that if the woodlot was recruised, new estimates would be within the above stated statistically significant range 19 times in 20 (assuming same product utilization and stumpage rates).

ABOUT THE CRUISE: The woodlot summary values were derived from a field cruise of 59 variable radius plots, on systematically located transect lines, using a 20 BAF prism. Volume tables were derived from tables created by the U.S. Forest Service and the Univ. of Maine. Sawtimber volumes use the International 1/4" Log Rule, which converts to cordwood at a ratio of one MBF to two cords. Cordwood volumes include topwood of sawtimber trees.

HALLOWELL CITY FOREST, "THE RES"

Hallowell, Kennebec County, Maine
Map 19, lots 4, 4A, 5, 22, 23, & 25

Soils information



Map detail from MEGIS geographic & GPS data, town tax records, and field reconnaissance.
Contour interval is 20'.
NOT A LEGAL BOUNDARY SURVEY.

Two Trees Forestry
Consulting Foresters
Winthrop, Maine
HK Burnett, LF 993 - May 2012

Soil Legend

Symbol	other slopes	Name	Ordination number	Site index WP	RO	SM	RM
BhB		Berkshire fine sandy loam	3o	75		63	
BkB	C, D	Berkshire very stony fine sandy loam	3o	75		63	
Bo		Biddeford mucky peat	5w				50
BuB2	C	Buxton silt loam, eroded	4o	55		48	
DeB		Deerfield loamy fine sand	4o	65		55	
Ha		Hadley silt loam	3o	75		62	
HfC	D	Hartland very fine sandy loam	3r	75		62	
HkB	C, D	Hinckley gravelly sandy loam	5s	55		48	
HrB	C, D	Hollis fine sandy loam	5d	55		48	
HtB	C, D	Hollis-rock outcrop complex	5x	55		48	
Lk		Limerick silt loam	4w	65		56	
LyB	C, D	Lyman loam	4d	65		56	
LzC		Lyman-rock outcrop complex	4x	65		56	
MoA		Monarda silt loam	4w	65		55	
MrA		Monarda very stony silt loam	4w	65		55	
PbB	C	Paxton fine sandy loam	3o	75		62	
PcB	C, D	Paxton very stony fine sandy loam	3o	75		62	
PdB		Paxton-Charlton fine sandy loam	3o	75		63	
PdC2	D	Paxton-Charlton fine sandy loam, eroded	3o	75		63	
PeB	C, D	Paxton-Charlton very stony fine sandy loam	3o	75		63	
PfB		Peru fine sandy loam	3o	75		56	
PkB	C	Peru very stony fine sandy loam	3o	75		56	
RcA		Ridgebury fine sandy loam	4w	65		56	
RdA		Ridgebury very stony fine sandy loam	4w	65		56	
RF		Rifle mucky peat					
SA		Saco soils					
ScA		Scantic silt loam	5w	55		48	
Sd		Scarboro mucky peat	5w	55		48	
SkB		Scio very fine sandy loam	3o	75		55	
SkC2		Scio very fine sandy loam, eroded	3r	75		55	
SuC2	D, E	Suffield silt loam, eroded	5c	55		48	
TO		Togus fibrous peat					
VA		Vassalboro fibrous peat					
WmB	C, D	Windsor loamy sand	5s	55		48	
Wn		Winooski silt loam	30	75		55	
WrB	C	Woodbridge fine sandy loam	3o	75		62	
WsB	C	Woodbridge very stony fine sandy loam	3o	75		62	

Symbols and slopes - The first and second letters abreviate the soil name. The third letter shows the slope (A = <3%, B = 3-8%, C = 8-15%, D = 15-25%, E = 25-45%). Soils without slope letters are nearly level. A final 2 shows that the soil is eroded.
Ordination number – Potential productivity on a national scale; 3=good, 4=fair, 5=poor; x=stoniness. Also, w=wet, d=restricted rooting depth, o=insignificant limitations, s=sandy, r=steep
Site index – Average height growth, of listed species, in 50 years. WP=white pine, RO=red oak, SM=sugar maple, RM=red maple

GLOSSARY

Clearcutting - cutting of all trees within a defined area (generally greater than 1 acre)
Commercial harvest - a timber stand improvement or harvest operation that results in a net landowner income
Cord - wood measurement statistic; 128 cubic feet, or a pile of wood four feet high, four feet wide, and eight feet long
DBH - tree measurement; diameter at breast height (4.5 feet above ground)
Decadent - overmature trees that are deteriorating in wood quality
Mature - condition of optimal tree value, after tree vigor and growth have slowed, yet before the onset of decay
MBF - log measurement statistic; one thousand board feet. One board foot equals a board one inch thick by 12 inches square
Operability - ease with which logging machinery could work a site; often limited by rockiness, steep slopes, wetness, etc.
Pre-commercial - a timber stand improvement practice that is a cost, where trees to be cut are frequently too small to be saleable
Poletimber - tree between five inches and 9.9 inches DBH
Regenerate - to establish a new stand of tree seedlings
Regeneration - seedlings of commercial tree species
Sawtimber - logs favored for lumber; generally eight to 16 feet long, straight, with small end diameter greater than eight to 10 inches
Seedling - tree greater than six inches tall but less than one inch DBH
Snag - standing dead and/or dying tree. Important habitat element for numerous wildlife species
Stand - a homogeneous unit of forestland, delineated because it supports trees of common species, age, potential, etc.
Stocking - stand measurement relative to the optimal number of trees that a unit of forestland could grow

FURTHER SOURCES OF ASSISTANCE

1. Two Trees Forestry: We can mark trees to harvest, select competent loggers, ensure a favorable timber sale contract and best market prices, and oversee harvests to meet landowners' objectives. We also maintain boundary lines and administer Federal cost-share programs. Please contact us for further assistance. P.O. Box 356 Winthrop, ME 04364. (207) 377-7196 or www.twotreesforestry.com

2. Maine Forest Service: A good source of educational material. Taxation and utilization specialists are also on staff.
State House Station 22, Augusta, ME 04330. (207) 287-2791 or www.state.me.us/doc/mfs/

3. USDA-NRCS and Farm Service Agency: Information and applications for Federal forestry cost-sharing programs, such as erosion control, road and trail repairs, tree planting, timber stand improvement, and management planning.
21 Enterprise Drive, Suite 1, Augusta, ME 04330. 207-622-7847 or www.me.nrcs.usda.gov

4. Small Woodland Owners Association of Maine (SWOAM): Publish a monthly newsletter on local forestry concerns and organize educational field days regularly throughout the state.
P.O. Box 926 Augusta, ME 04330. (207) 626-0005 or www.swoam.org5e years.