

Cruise Report
and
Forest Management Plan
Prepared for
Town of Sanford, Maine
Town Land/Gowen Park/High School Area
Sanford Airport Land
Sanford Water District Land
Sanford Sewer District Land

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SUMMARY

There are seven wooded areas most made up of multiple lots included in this plan. They each have unique characteristics.

Note: Parcels are quite often made up of several lots on the assessor's maps. For the purposes of this plan this fact is not relevant and each parcel is treated as a single lot

Sanford Water District

The district owns four parcels included in this plan on which it has various facilities.

The River St. /Shaws Ridge Road Lots are dominated by mature white pine. There is also an old sand pit which has partially regenerated to early successional species. There are also a number of non forested wetlands and right of ways located on this property. There is some evidence of past cultural work but it appears to have been 20 or thirty years since any treatments have been applied. A light thinning is recommended that could net several thousand dollars from the sale of wood. Natural regeneration should quickly become established in the understory. There is a network of ATV trails throughout the property. This uses appears to have declined in the area between Shaws Ridge Road and River Street. There is still heavy use in the old pit north of Shaws Ridge Road and it is preventing some area from regenerating.

Old Mill Road Lot also has an area of run out sand pit, a large stand of soft maple wetland and several areas forested with white pine, hemlock and hardwood. Some invasive honeysuckle was seen in the old pit. It did not appear to be a large population and it would be fairly easy to control. Thinning and improvement cutting is recommended to treat the forest stands on this property. This treatment would raise some income and improve vigor and growth of residual trees. However, much of the forested area is on wetlands or wetlands must be crossed to access non wetland sites. These wetlands are appear to be underlain with sandy gravelly materials but an organic peat soil several feet deep has formed over these sands and gravels. This soil does not hold the weight of heavy equipment well unless it is frozen or very dry. This makes timing a timber harvest that does not do soil damage a challenge.

Country Club Road 2 lot has an interesting stand containing a large number of somewhat rare Atlantic white cedar. It is found in the southern part of the lot south east of the pumping station and is identified on the type map as type 6. There are also small areas of soft maple wet land and a large area of mature white pine on the property. This white pine has had a number of treatments in the past. Stumps indicate the stand was thinned twenty or more years ago. A number high quality stems were pruned free of branches for 17 feet to grow clear

lumber. And it appears hardwood was controlled in some areas. The result is some very nice high quality pine timber. The stand would benefit from a thinning in the near future. This is good quality timber and a pretty good income can be expected from a thinning and improvement cut. Bittersweet has taken over the northern acre of this lot making the area unusable. This species is well established over the entire area. This does not allow for any lapse in the mowing. In one or two growing seasons it would grow into a tangled mass of vines making the area difficult to use.

The Eagle Drive Lot is located at the back of an industrial park. It is a small lot. A large area of the lot is occupied by a soft maple wetland. There is a small area of young pine/oak type along the access road, some small stands of mature white pine as well as stand of hardwood along the northeast boundary. I found absolutely no evidence of any corners or boundary markers on this lot. This was a little surprising as I assume that lots in the industrial park would be well identified. The second item of significance is the soft maple stand here is growing on organic soils similar to those described above. It makes accessing most of this lot with timber harvesting equipment a challenge. If this can be overcome the stands would benefit from a harvest. Some of the pine and soft maple are overmature and showing signs of decline. There has also been some storm damage that could be salvaged. A general thinning and improvement cut would improve the growth and vigor of the residual forest. Creating conditions favorable to regeneration becoming established is also desirable for these stands.

Sanford Sewer District

This is the location of the town's sewerage treatment plant. Two hundred forty-nine (249) are productive woodland. The largest stand is composed of mature hemlock, white pine and various hardwoods. The next largest is a stand which is a mix of white pine and hardwoods of mid age on sandy soils along northeast boundary. There is some mixed age soft maple wetland along the river and east of the settling ponds and a hardwood stand at the east end of the lot in which red oak of large pole to small sawlog size is the most significant component. There is some evidence of past cutting in the north and central parts of the property. It appears that hardwood and hemlock were cut leaving the better pine to grow. The only other cutting appears to have been to expand the sand pit and to clean up blow down and otherwise maintain trees around the edges.

The forest would benefit from a cut to harvest mature and low quality stems and thin overstocked areas. The stand along the north east boundary would benefit from having much of the hardwood removed to release white pine from seedling through sawlog size. There is a significant volume of timber that should be harvested. If the recommendations are implemented it will result in significant income.

Sanford Airport

It was personally interesting to work on this parcel having hunted on some of these areas in the 1960's and 70's. This is in the area of the 1947 forest fire and in my youth was forested thick shrub growth. Much of this has grown and is now a pole to small sawlog size forest.

Most of the trees composing became established following the fire. So, most stems are about 60 years old. Most of the forest is composed of hardwood species. On the more poorly drained soils soft maple is the dominant species. Red, black and white oak become significant on the better drained sites. Popple and gray birch established themselves following the fire. They make up a significant part of the stands in some areas but are in decline. At sixty years they have reached their life span. In small areas white pine, pitch pine and spruce are significant parts of the stands. White pine is particularly well adapted to growing on all but the most poorly drained soils found here. This is evidenced by the well established seedling and saplings of this species found in the understory in many parts of the property.

The forest would benefit from a harvest and thinning. Most of the popple and gray birch should be harvested before it dies of old age. Low quality and overstocked stems of other species should be thinned. The overstory

hardwoods should be removed on sites more suitable to growing white pine and where white pine is established in the understory.

During my field work I saw what is likely a New England Cottontail Rabbit. This species is very rare. Managing the flight approaches to keep trees from interfering creates habitat to this species liking. There are some opportunities to expand the habitat for this animal.

The harvesting recommended would result in the removal of mostly small low value trees. There would not be a lot of money made per acre. However, there are a lot of acres in need of treatment so the total income will not be insignificant.

The soils vary greatly from very well drained to very poorly drained. Soil conditions need to be considered when planning any timber harvest.

Gowen Park/High School Lots

Some of this is actual park land and all of it is utilized as park land. Trails are located throughout area and get regular use by walkers and bikers. Recreation is the most important use of this land. The forested area is too large for the trees to be managed individually as in an urban park. On the other hand use is heavy and it would not be wise to use a "let nature takes its course" approach to managing the forest of a large natural park or preserve.

There is a considerable amount of wet land and shoreland found within the area. The forest here contains some of the most mature trees on any of the town's properties. It is heavily wooded throughout. White pine, red oak and hemlock are the most common species. There are large high quality red oak and white pine found in many of the stands.

The forest management in the past appears to have been primarily the removal of trees which have fallen or have cause problems. A similar but more proactive approach is recommended. Hazard and trees that could potentially cause problems should be identified and removed periodically. This could be combined with some light thinning to favor specimen trees and keep trees growing vigorously. If a big enough project can be completed the wood from cut trees could be salvaged and sold to pay at least a portion of the cost of treatment. If the condition of the forest were the primary concern, all of these lots should be treated, but with what foresters often refer to as an improvement cut. This is a commercial cut where treatment varies depending on what is needed. The goal is to remove the least desirable stems in the stands and "improve" the residual stand. Diseased, damaged, defective, overmature and overcrowded stems are removed. Wind damage is a concern in any forests which has not experienced any thinning. The trees have come to rely on each other for support. How much to thin and still leave a wind firm residual stand is some of the "art" of forestry. In many instances it will not be possible to thin down to ideal levels for future growth. In these instances a shorter period of time between cuts is recommended to reduce stocking in a series of cuts until the residual stems grow root systems and stem form that will resist wind damage.

DESCRIPTION

The properties which were included in the Forest Canopy plan consist of seven lots with a total of 862 acres of woodland. The Water District manages four of these The woodland of each is as follows: River Street/Shaws Ridge Road, 19.9 acres; Old Mill Road Lot, 50.2 acres; Country Club Road 2 Lot, 45 acres; and Eagle Drive

Lot 17.8 acres respectively. The Sewer District manages one lot on which there is 248.8 acres of woods. The Airport manages 372.4 acres of woodland. The town has land which stretches from Gowen Park around the high school to the shores of Stump Pond. This area contains 54.4 acres of woodland. These are all found within the Town of Sanford, York County, Maine. (See location map included.) For the most part the boundary lines or at least the approximate location of the boundary lines on all the lots could be located. The exception is the Water District Lot at the end of Eagle Drive for which no physical evidence of corners or boundaries could be found. The lines are often not well marked and evidence marking the lines varies from iron pins installed by surveyors, corners marked by iron pins or stones installed many years ago, fence lines, plastic flagging or simply a line of differing land uses.

Reports from Maine Natural Areas Program and the Maine Historical Preservation Commission indicate the possible presence of New England Cottontail at the airport and possible historic sites on some of the lots. Field work found these lots are significant wildlife habitat for the wildlife that utilizes it. A possible sighting of a cottontail was made at the airport. Artifacts from past human use were seen regularly during the field work.

The terrain on all the lots is for the most part gentle. Ranging from flat to rolling with occasional steep slopes. Soils are mostly upland sites which range from poorly drained to well drained. The Mousam River passes through or borders several of the lots. There are several small brooks found on the properties and some wetland areas. The soils provide good to excellent sites for tree growth and wildlife habitat.

All of the lots are served by public roads. Trails exist in and are passing through all of the lots. Access is good for recreational use and general maintenance of the properties is good because of adjacent roads and well developed trail systems. Access for large trucks and heavy equipment exist to the properties. However, it is not developed for the purpose of removing harvested wood products. Where forest products will be removed to manage vegetation on the properties this will need to be address.

Not all of this land will be manage for timber production. However, in any case the following facts are interesting. It is stocked with 5,341,700 board feet and 20,802 cords, worth \$1,341,919.50. It is growing 1,070.6 cords per year, worth \$43,494.24 or \$50.47/acre. This is not bad but below the potential of the properties. Much of the stocking is in young trees too small for quality products and there remains a component of poor quality trees which are only suitable for pulpwood or low grade lumber. Managing the forest to reduce the low quality component will increase the amount of higher quality wood growing.

In addition to the normal tree inventory of stems 5.5" in diameter breast height (DBH) and larger smaller stems were inventoried as well. This information may be of use should carbon credits become available for sequestering carbon in forest. Shown in the table below is information as an average for all of the woodland.

Table 1. Stems per acre less than 5" in DBH

Diam at DBH	Number of Stems/Ac
1'tall to .5"	894.2
.5" to 1.5"	253.2
2	291.8
4	190.3

FOREST HISTORY

During the late 1700's and 1800's, the properties were used for agricultural, residential and industrial purposes, such as cropland, hay land and pasture. The Airport has well documented history as an airbase during World War II. Gravel and sand extraction were uses seen on several of the properties. Timber has been harvested from the lots in the past. Evidence of these past uses exists in form of stone walls, old wire fence, stone foundations, trail and road remains, and old earth works. In the late 1800's to early 1900's, agricultural use of most of the land was abandoned. A fire consumed most of the forest in south Sanford in 1947. The air base was closed and land turned over to the town. There is evidence of sporadic treatments and timber harvest in the not too distant past. Some problem trees were felled and some trees cut for road maintenance and other reasons but the forest stands have been by and large left to nature for the past 50 to 100 years. The results are forest stands which are middle age to mature and heavily stocked. Some stems are past their prime and showing evidence of decline.

MANAGEMENT OBJECTIVES

The Town has multiple goals for these properties. Obviously they are part of the infrastructure that supports that the services of the various town agencies. Beyond that the goals include providing educational and recreational opportunities, wildlife habitat, maintaining open space and a healthy vigorous forest. These goals are mutually attainable though some are more important on some areas than others. Maintaining a healthy forest is an important part of all these goals.

PROPERTY TAX STATUS

The property is in public ownership and is not taxable.

PERTINENT LAWS AND REGULATIONS

The areas with 250 feet the Mousam and Great Works Rivers and their associated wetlands are under shoreland zoning.

Forest Practices Act: Clearcuts of five acres in size or greater are regulated by the state of Maine. Considering the city's goals, this is unlikely to affect management unless there is a natural disaster where clean up and salvage become necessary and that would be exempted.

Hiring a consulting forester to administer the sale of timber as recommended within the plan will ensure compliance with all Maine State laws. A copy of Maine state laws regulating timber harvesting are found in the appendix. There are no city ordinances of which the author is aware that would affect the recommendations found in this plan.

The Natural Resources Protection Act protects any of the states waters from pollution. Any of the streams and waters found on the properties will need to be protected.

NON-TIMBER RESOURCES

Endangered species/ Exemplary Communities; See report from Maine Natural Areas Program in appendix.

Fish and Wildlife Habitats; Specific wildlife habitat management recommendations are found where appropriate in each stand description. The forest management recommendations within this plan will positively affect habitat by creating conditions encouraging healthy vigorous forest growth. A greater diversity in tree ages classes, a multi-layered canopy and more plant growth at the ground level will create better habitat conditions for more wildlife species.

Of special note and concern is the New England Cottontail. This animal likely has a population at the airport. It is suffering across its range from loss of suitable habitat. A happy circumstance is the management to keep flight approaches safe results in ideal habitat for this species. In addition an area where a wetland mitigation project was installed appears to provide additional suitable habitat. There are opportunities to expand the habitat utilized by this animal discussed in the plan.

There is evidence of use by many species of wildlife. Those species now using the property include white tail deer, moose, fox, coyote, ruffed grouse, ducks, blue heron and many other birds. This use appears to be light to moderate at the present time.

The silvicultural recommendations for this property will also benefit many species of wildlife. The recommendations will maintain a diversity of habitat and will allow herbaceous and low growing woody plants to maintain themselves in reach of ground dwelling wildlife.

In addition to comments made in the individual stand sections the following general recommendations will improve wildlife habitat and will have a minimal effect on the production of timber.

1. Leave large den trees and dead snags.
2. Leave some large crowned oak and beech for the mast they produce, and some stems of other species important to wildlife including hophornbeam, cherry, apple and striped maple.
3. Maintain landings and roads open and seed these areas with "conservation mix." This will benefit those species that use openings and edges between forest and openings.

Water Quality and Wetlands; The Mousam and Great Works River flow through or border some of the lots. Numerous small to medium wetlands are found on the properties as are small streams. Best Management Practices to prevent soil erosion and damage to these areas should be utilized in any harvesting operation.

Cultural and Historical Sites; Maine Historic Preservation Commission list possibility several historical or archeological sites identified on this property (see MHPC review located in appendix). Extreme care should be taken when working near these areas.

Recreation; Recreation is a very important use of the properties. Educational and recreational programs are part of the long term goals. Numerous trails are found throughout the properties. Several teachers use parts of the properties as outdoor class rooms. The trails and property are open to the public and the town would like to expand the educational use of the woodlands.

Aesthetics; Managing the trees on the property will maintain a vigorous healthy forest stand of multiple age classes which will help maintain aesthetic quality of the stands. Actively managing the forest for the production of forest products will provide educational opportunities in forest heavily used for recreation. It will demonstrate responsible forest management is compatible with recreational and abutting residential use. It will also provide opportunities to enhance recreational uses.

Large woody debris should be mentioned in this section. It is dead wood in the form of trunks, large branches and stumps. It is an important component of habitat for many wildlife species. It is also seen as waste or messy by many people. This is an excellent educational opportunity to inform people that this is actually a component of wildlife habitat and while not aesthetically pleasing is an important part of that habitat.

TIMBER RESOURCE AND VEGETATION MANAGEMENT

All of the lots are stocked with high volumes of forest products. Little evidence was seen of any wood harvesting. In places hazardous trees have been cut and the wood left to decay. Some wind damaged trees were salvaged from Pine Grove Park. These are obviously not rural woodlots dedicated to growing timber. However, there are numerous opportunities to harvest trees, utilize the wood they contain and realize income or defray expenses by selling this wood.

Portland is surrounded by an area where there is an active forest products industry and market and a good logging infrastructure. Loggers are available from small chainsaw/tractor equipped contractors to those with large mechanize tree harvesting equipment. There are positives and negatives to the various equipment spreads. With good definition of goals it is possible to choose contractors with the right equipment to achieve the stated goals.

INVASIVE SPECIES

The good news is fewer areas with invasive plants were found than expected. The bad news is some were found. In the old pit at the Old Mill Road Lot honeysuckle was found. Around Gowen Park and near the YMCA honeysuckle, bittersweet and Japanese knotweed were found. I would recommend controlling these and other invasives at every opportunity.

TIMBER INVENTORY PROCEDURE

The maps drawn for this plan were developed using information from several sources. Aerial photos were downloaded from the state's GIS web site. Property lines were located with GPS data and/or digitized from the city tax maps. Aerial photos were used to identify prominent stand types. Stand type lines were further refined on field maps produced during field work for the forest inventory.

Variable plot or point sampling was the method used for the timber inventory. Point sampling measures the relative density of trees rather than the actual number of trees on a fixed area (fixed area sampling). Point sampling assumes that there is an equal stocking expressed as basal area (square feet of stump area) for each tree measured regardless of size. Since large trees have more basal area large trees are more intensively sampled than small trees. Point sampling is desirable because larger more valuable trees are more intensively sampled and it is relatively quick and efficient to use. A 20 basal area factor (BAF) prism was used for this inventory

Inventory samples were systematically spaced. In general it was attempted to place plots on a 300x300 foot grid. All stands were inventoried down to the two inch class for tree species. Regeneration and shrub species were noted a 1/100 acre plot around plot center.

Merchantable height was recorded in five foot increments of cordwood to a four inch top or the number of eight foot logs sections of saw or veneer logs based on the utilization standards for each species. Sample data was then calculated using Two Dogs brand software. All volumes are expressed in standard cords and thousand board feet (MBF), international ¼ inch scale. Desirable, young stems likely to produce high value sawlogs or veneer in the future are identified as growing stock, although because of small diameter their current value is that of pulpwood or firewood. This distinguishes the volume from other stems of poorer quality that are likely to remain as pulpwood or other low value products.

Log utilization standards for standing trees

Species	Diameter Breast Height in inches	Small end
Spruce and fir	8	6
White birch	8	7

Red oak	10	9
All other hardwoods	12	10
All other softwoods	10	8

Statistics

Several runs were made of the data to determine statistical error. Unstratified, the data showed an error for estimated basal area of 8.2% for the entire inventory. Stratified by the lots the error is 7.8%. Stratified by type the error is 6.2%. These estimate errors are all for a 95% confidence interval. Said in another way 19 times out of twenty the estimate will be within plus or minus the error.

Looking over the inventory print outs shows the estimates for volumes for individual species/products to have considerable variation. This is normal. The smaller the population the less likely it is to be sampled and the more likely something is missed or misrepresented. The number I look at that gives me confidence in the reported numbers are value. There may be more of one thing and less of another but if the value estimate is good my experience is the inventory has a big enough sample so the numbers can be trusted. In this case the estimate error for value is 12.6%. Considering the great variation in conditions found over these lots that is a good number.

SILVICULTURAL TREATMENTS

For both the short and long term management, a combination of the shelterwood and selection methods of silviculture is recommended with a cutting cycle of 10 years. That is, on the average each area should be treated every ten years. A fairly short cutting cycle allows more of the potential mortality to be salvaged and also allows for more conservative thinning. Also the visibility of regularly applied treatments will educate the public that the forest benefits from regular treatments and to expect that they will occur.

Cultural treatments are recommended that will maintain the health and vigor of the forest and assure that natural forests continue to exist for future generations. The production of forest products and income derived from the sale of those products are by-products of treating the forest for continued health. That said the cutting of trees is a necessary cultural practice. Trees need to be removed to give growing room to more desirable stems, release existing regeneration or to create conditions suitable for the establishment of regeneration, to remove hazardous trees and for many other reasons encountered in managing a forest.

Some may argue that these parcels be treated as wilderness. While large compare to residential lot they are small from a forest's perspective and cannot fill the ecological role of a wilderness. They are affected by land use of abutting property, invasive plants and constant human and domestic animal traffic. Managing the vegetation, forest trees, in this situation would be proactive. A forest appropriate to its intended use can be developed. The alternative is reactive management dealing with trees which have become dangerous or have fallen do to natural events.

Large trees have an attraction of their own and it is recommended that some be grown to maximum size for the species and site. These may occur as single stems or groups of stems depending on what nature provides. Where these large stems occur or grow in the future the area around them should be treated with periodic sanitation cuts to remove younger stems that are crowding these old slow growing relics. Depending on their location these large stems should be examined regularly to determine if they have become hazardous and treated appropriately.

It should be pointed out that the recommendations are based on current conditions to attain the owner's current goals. Should conditions, such as markets, natural conditions or the landowner's needs change, the recommendations should be modified to reflect those changes. For example, it makes no sense to sell high valued timber when markets for that timber are weak. Waiting will have little effect on forest growth, but could greatly increase the income realized. Alternatively, should the owner's needs change, there is timber available for cutting. Cutting sooner than planned may not maximize the timber value, but may be the owner's best financial choice and can be done without damaging the long term productivity of the forest.

Forestry is defined as an art and a science. To assure that treatments are applied properly it takes a skillful selection of trees to be removed and layout of trails to allow equipment access. Considering this I strongly encourage a skill and experienced forester be used when any silvicultural treatments or timber sales are applied.

SILVICULTURAL SYSTEMS

Shelterwood

The shelterwood system is an even-age system of silviculture. That is, all of the trees in the forest stands are near the same age. In this system, the stands are thinned periodically until they are mature. Once mature, they are thinned in a manner that will encourage the establishment of seedlings of desirable species. These seedlings then develop under the "sheltering" overstory. As the seedlings develop, that sheltering overstory is removed in one or more harvest cuts.

By extending the removal period to two, three or more cutting cycles a forest managed by a shelterwood may take on the appearance of a forest managed under the selection system. The difference is somewhat academic, but does affect which trees are selected for cutting and when they are cut. Also in that it results in forest stands that are composed of trees that are near the same age.

Selection

In the selection system, individual stems and groups of stems are selected for cutting. Thinning and harvest are combined in this system. Reproduction becomes established in openings created when groups are cut, and uneven or all-age forest stands result. If only small openings are made in the canopy, reproduction will be only of species that are tolerant of shade. Larger openings, at least as wide as the surrounding trees are tall, will allow some stems of intermediate and shade intolerant species to become established. A cutting cycle of ten years is recommended. In the most intensive applications of this system, pre-commercial thinning and weeding is conducted within groups of young stems. This is generally done following a commercial harvest and is restricted to those areas that do not have a competing overstory. The regeneration component in this forest is relatively young. Pre-commercial thinning is not likely to be needed as a cultural treatment within the time that this plan covers.

DESCRIPTION AND RECOMMENDATIONS BY LOT *See map for location of lots.

Water District Lots

River Street/Shaws Ridge Road Lots

Introduction

On this property are found the office and maintenance facilities for the district. Throughout the forest are wells, water line corridors and power line right of ways. Care will need to be taken not to damage these facilities should any timber harvesting take place. There are two forest types on the property a mature pine stand and an early succession forest on an old sand pit.

Boundary Lines

Most of the lines can be located. There are some questionable areas around the house lots on the south end of the lot.

Public Use

This small lot has a dense network of trails criss crossing the lot. Most of these trails were created and used by ATV's. It looks like this use has declined in recent times in the area between River St. and Shaws Ridge Road. However, it is continuing north of Shaws Ridge Road. The trails are obviously well used by walkers and bikers. It is pleasant to be in a mature forest.

Terrain and Soils: The terrain is rolling. Soils in the forested areas are classified as Coltons and Adams loamy sands and gravels. Their provide fair to good sites for pine growth. This soil type is well drained.

Access: Access for this stand is provided by trails. This is a light duty access suitable for foot traffic and 4-wheel drive vehicles. The people of the neighborhood use this area fairly heavily and there is a network of trails throughout the lot. However, most of the trails appear to have become established by repeated use and not by any sort of pre-planning. If timber is harvested at least two access points will need to be established for wood removal.

Composition and Quality: This stand developed from natural seeding on open land in the first part of the 1900. It is composed primarily of eastern white pine. Scattered stems of oak and red maple are also found. The timber is of medium to large sawlog size and poor to good quality. The stand is heavily stocked. The trees are tall.

Understory: Regeneration is scattered composed mostly of white pine, red maple, red oak, and lesser numbers of white oak and black cherry.

Recommendations: This stand is mature and treatments need to be applied that consider its replacement. Thinning will not only improve vigor and growth of the residual stand it will create conditions suitable for the establishment of tree seedlings.

It is recommended that about a third of the standing volume be removed in an improvement cut/thinning. This would result in 200 to 250 cords of wood being removed from the stand. Hazardous trees, trees which have sustained damaged in the past, those showing obvious signs of decay or decline and those with structure that is likely to fail should be selected for removal. Additional thinning should be done removing stems in the suppressed or weak intermediate crown classes reducing basal area to the 150 to 160 square foot range and would be a preparatory cut of a shelterwood that will eventually replace the stand.

A similar treatment should follow five to seven years after the first. Should the stand develop as expected a third similar treatment is recommended to follow seven to ten years after the second.

Old Mill Road Lot

Introduction

There is a pumping station on this lot and a well maintain road service the station. There are three forest types on the property a mature pine hemlock hardwood stand, a large area of soft maple wetland and an early succession forest on an old sand pit.

Boundary lines

Several surveyors' pins were located on the north east side of the lot and they likely mark corners of this lot. However a little time will be needed to determine exactly what is what. The west boundary is clearly marked. The south and south west boundaries are in question. No corner markers could be located. The line would appear to be the tree line but plastic ribbons were found beyond the tree line parallel it. These may or may not mark the line. Some of this line may be a brook and an old wire fence was found which lead to the river. These are in about the right place but I am not prepared to say they mark the boundaries. The east line is the river.

Public Use: There is little public use of this property.

Terrain and Soils: The terrain is flat. Soils in the area of the pit are classified as Coltons loamy sands and gravels. Their provide fair to good sites for pine growth. This soil type is well drained. Most of the rest of the lot has soils which are classified as Sebago or Chocura peats and Saco Silt loams. These soils do not normally support much of a forest, but there are good stands of trees here. They may borderline between soil and actually are suitable for tree growth. In any case they are wet soils and a few inches change in elevation makes quite a difference in productivity.

Access: The road into the lot provides good access and there are several good places along that timber processing equipment can be located.

Composition and Quality: This forest likely developed from natural seeding on open land in the early to mid 1900's. There is a large area composed primarily of soft maple. Another is composed primarily of eastern white pine with hemlock and hardwood mixed. And a third area, the old pit is composed of gray birch, popple and white pine. The pine is of fair to good quality. The soft maple varies with site. Where it grows well it is of good quality where rooting depth is restricted by water it is of fair to poor quality.

Understory: There is little regeneration established.

Recommendations: It is recommended that about a third of the standing volume be removed in an improvement cut/thinning. This would result in 200 to 300 cords of wood being removed from the stand. Hazardous trees, trees which have sustained damaged in the past, those showing obvious signs of decay or decline and those with structure that is likely to fail should be selected for removal. Additional thinning should be done removing stems in the suppressed or weak intermediate crown classes reducing basal area to the 150 to 160 square foot range and would be a preparatory cut of a shelterwood that will eventually replace the stand.

The wetland soils found under most of this lot make it difficult to implement a timber harvest without causing soil damage. Soils will need to be very dry or well frozen to accomplish this.

Country Club Road 2 Lot

Introduction

There is also a pumping station on this lot and a well maintain road service the station. There are three forest types on the property a mature pine stand, two small areas of soft maple wetland and a mixed softwood type with a significant component of Atlantic white cedar.

Boundary lines

Several corner pins were located on the North West side of the lot mark corners of this lot. The west boundary is pretty well defined. The southern boundaries are in a wet land and were not located. Nor was the corner where it comes out to the highway. Several surveyors' pins were located marking the boundary of the house lots on Country Club Road. There is not a marked line but these corners can likely be connected.

Public Use: There is a snowmobile/ATV trail in the power line right of way which crosses the road near the pump house and then proceeds northerly through the lot.

Terrain and Soils: The terrain is flat. Soils in the area of the pit are classified as Adams and Croghan loamy sands in the northern two thirds of the lot. The sandy soils provide fair to good sites for pine growth. This soil type is well drained. Most of the rest of the lot has soils which are classified as Sebago or Chocura peats. These soils do not normally support much of a forest but there are good stands of trees here. They may borderline between soil types and actually are soils suitable for tree growth. In any case they are wet soils and a few inches change in elevation makes quite a difference in productivity.

Access: The road into the lot provides good access and there are several good places along that timber processing equipment can be located.

Composition and Quality: This forest likely developed from natural seeding on open land in the early to mid 1900's. There is a large area primarily of eastern white pine. This area has been thinned, crop trees pruned and some areas weeded to remove hardwood. The pine is of fair to good quality. The soft maple varies with site. Where it grows well it is of good quality where rooting depth is restricted by water it is of fair to poor quality. In the transition between upland and wet land is found a mixed softwood stand with a significant component of Atlantic White Cedar.

Understory: Some white pine has become established where natural openings have been created. There is little desirable regeneration other than this.

Recommendations: It is recommended that about a third of the standing volume be removed in an improvement cut/thinning. This would result in about 350 cords of wood being removed. Hazardous trees, trees which have sustained damaged in the past, those showing obvious signs of decay or decline and those with structure that is likely to fail should be selected for removal. Additional thinning should be done removing stems in the suppressed or weak intermediate crown classes reducing basal area to about the 120 square foot range. Another thinning will be needed in ten years or so which will be a preparatory cut for a shelterwood.

Most of the pine stand is on soils which are very well drained and can hold the weight of heavy equipment under most soil moisture conditions.

Atlantic white cedar is a new experience for me. The literature says it is not particularly shade tolerant. It is not an old stand and a conservative approach should be used. I would recommend some light thinning in the surrounding stand and along the periphery of the cedar. If cedar regenerates in the conditions created it can be released in future treatments.

Eagle Drive Lot

Introduction

There is a pumping station on this lot and a short well maintain road service the station. The problem is there is a soft maple wet land which lies between this access and most of the lot. This will certainly make it a challenge to remove harvested wood by this access. There are three forest types on the property a mature pine stand with a soft maple component, a large area of soft maple wetland and hardwood forest with a good component of red oak.

Boundary lines

I spent a fair amount of time trying to locate any physical evidence marking the corners and boundaries of this lot. I failed. I don't believe any permanent markers have been installed to define the corners and bounds of these lots.

Public Use: There is little public use of this property.

Terrain and Soils: The terrain is flat rising somewhat to the north. Soils to the west of the access road classified as Coltons loamy sands and gravels. Their provide fair to good sites for pine growth. This soil type is well drained. The middle of the lot has soils which are classified as Sebago or Chocura peats and Naumburg sands. These soils do not normally support much of a forest, but there are good stands of trees here. As said above they may borderline between soils and actually are suitable for tree growth. In any case they are wet soils and a few inches change in elevation makes quite a difference in productivity. Near the pumping station they are very wet, however.

Access: The road into the lot provides good access and there are several good places along that timber processing equipment can be located.

Composition and Quality: The area around the wetland may have burned in the 1947 fire. Location, age and composition of the trees suggest that is the case. These pole size trees are of fair to good quality. The areas of wetter soils either did not burn or the fire was not hot enough to kill the trees. On the transition between the upland and wetland there are found stands of mature white pine. There is a large area composed primarily of soft maple.

Understory: Little regeneration is established.

Recommendations: Before any treatments can be applied the boundary lines must be located and marked.

There has been some wind damage to the pine and appears that it has reached its potential. If it can be accessed I recommend most of the large pine be harvested. Considering the soils it is growing on it would be at high risk of wind damage following any disturbance. In the soft maple stand I would recommend patch cuts of a quarter acre to half acre in size. In the upland stands surrounding the wetland a thinning is recommended that favors the pine and oak in the stand. This would result in about 200 to 300 cords of wood being removed from the stand.

The wetland soils found under most of this lot make it difficult to implement a timber harvest without causing soil damage. Soils will need to be very dry or well frozen to accomplish this.

Sewer District Treatment Lot

Introduction

This is where the Sanford Sewerage Treatment plant and settling ponds are located. The northern half to two thirds of the property are forested. Most of the forest appears to have become established following a heavy disturbance 70 or 80 years ago. Pits and mounds of uprooted stumps are evidence that hurricane of 1938 could have been the source of that disturbance. The stand in the north and northeast is appears to be a little younger about 60 years of age and appears to have become established following a timber harvest. The soft maple stand evidently became established on open land at about the same time.

Boundary lines

Several stones and pins were located on the North West side of the lot out to the power line. Old blazes and painted trees were also found marking the line. A stone marking the northeast corner on the powerline was found, but the line from there to the river was not located. The river is the boundary from this point around to the westerly corner.

Public Use: Several snowmobile/ATV trails come into the property from the west and past through the lot out to the power line. Several deer stands were seen during the field work.

Terrain and Soils: The terrain is flat. Soils in the area are sands, loamy sands and gravels of the Adams, Colton, Croghan and Naumberg Series. There are also some peat soils of the Chocorua and Sebago Series. The better drained soils and the Naumberg series provide good sites for pine growth and fair sites for hardwood growth. Again there organic soils are supporting commercial tree growth.

Access: The road into the lot provides good access. The pit area has several good places where timber processing equipment can be located.

Composition and Quality: Most of this forest developed following a disturbance. Two major age classes of trees are present in one area the trees appear to be about 80 years old and are composed of white pine, hemlock, red oak and soft maple. The younger stand is mostly on better drained soils and is about 60 years of age and is composed mostly of oak, white pine and soft maple. There are two areas composed primarily of soft maple. Another is composed primarily of hardwood mixed primarily oak. Quality is variable but there are good to excellent quality stems throughout the most of the areas.

Understory: There is a fair amount of pine regeneration found in the stand of Type 8. Over most of the rest of the lot what seedlings exist are mostly of shade tolerant hemlock and beech and not desirable regeneration.

Recommendations: It is recommended that about a third of the standing volume be removed in an improvement cut/thinning. This would result in 1500 to 2000 cords of wood being removed from the stand. Hazardous trees, trees which have sustained damaged in the past, those showing obvious signs of decay or decline and those with structure that is likely to fail should be selected for removal. Additional thinning should be done removing stems in the suppressed or weak intermediate crown classes reducing basal area about the 140 square foot range.

Airport

Introduction

As expected this lot is quite flat. The lot was a WW II airbase and there are artifacts of this past use seen regularly in the forest. It is mostly a young forest either growing up on disturbed soils after the air base was abandoned or following a large fire which occurred in 1947. There is a significant component of short lived pioneer species in most of the stands. These stems are nearing the end of their natural lifespan. Most of the rest of the forest is composed of hardwood trees. However the sandy soils found here are excellent for growing white pine and "want to grow pine." This is evidenced by the presence of white pine seedlings and saplings in the understory in many areas. This is occurring even though there are no large pine nearby to act as seed trees. What pine seed does manage to travel a long distance is successfully germinating and growing.

Boundary lines

This property was evidently surrounded by a tall barbed wire fence. It appears the military was careful to have this fence placed on the boundary line. What evidence of recent surveying that was found has place monuments very close to this old fence. Some of this fence is still standing. In other areas the posts and wire can be found. In the wet areas this evidence can be difficult to locate. Some time with a metal detector could probably locate all of this old fence line.

Public Use: There are several snowmobile/ATV trails on the property. There is an area south west of the runway intersection where ATV's are damaging a wetland. Several deer stands were noted during the field work. Use other than this appears to be light.

Terrain and Soils: The terrain is flat. Soils are mostly sands, loamy sands, sandy gravelly loams and peat soils classified as Adams, Colton, Croghan and Naumberg. Their provide fair to good sites for pine growth and fair sites for hardwoods. These soil types are well drained except the Naumberg soils. Some areas classified as Sebago or Chocura peats are wet.

Access: There is good access for logging trucks and equipment. A key will be to coordinate with airport operations to not cause dangerous situations for aircraft landing or taking off.

Composition and Quality: The forest is a young forest. Most stems became established following the 1947 fire. Typical of early successional forest hardwood species dominate. Some of the wet land soils capable of supporting tree growth went through a shrub stage for years following the fire. Short lived popple and gray birch are at the end of their life spans. Soft maple dominates in many of the less well drained sites and will continue to be the primary species on the wettest sites. However, white pine has established itself in the understory and will be a significant component of future stands if given half a chance. Oak and pine are found on better drained sites. Some of these soils are capable of growing good oak and some are not. Again pine is invading the understory of these areas. Most of these trees are young and there are adequate numbers of stems to develop into good quality trees.

Understory:

These are young stands and regeneration would not normally be a concern. However, much of the land would be more productive growing white pine and this species is invading the understory on the drier sites.

Recommendations: Almost all of the forest stands would benefit from a thinning and harvest. As many stems as practical of short lived species such as popple and gray birch should be harvested. Low quality stems should also be harvest and potential crop trees should be released. Where white pine is present it should be release. Most of what is recommended for harvesting will produce only low value products. However, there are many acres and the value will add up. Soils vary in their ability to bear heavy equipment. Some of the better soils at

the south end of the airport can be operated any time. More care in timing is needed on the soils with high water tables and on those areas with organic soils. Heavy equipment should only be operated on these areas when soils are very dry or frozen.

Gowen Park/High School Lots

Introduction

This parcel has some of the nicest stands seen during this project. There are numerous large high quality trees that are vigorous and growing well. There are numerous vernal pools back waters of Number 1 pond and frontage on Stump pond. It is well suited to use as a park and education facility. There are numerous walking/biking trails which provide access into all parts of the property.

Boundary lines

For the most part the town owns to the roads. Where residential property abuts some corner markers were found but the boundary lines are questionable. Also some corner markers were found delineating the abutting YMCA property but the lines are not marked.

Terrain and Soils: The terrain is flat to rolling. Soils are mostly gravelly sandy soils of the Adams and Colton Series by the good sites for pine growth and fair sites for hardwood. In this case there are many very good oak found. This soil type is well drained. Around the back water vernal pools is Vassalboro peat. This soil does not support tree growth.

Access: Numerous roads and trails pass through the property and provide access to all areas of the lot.

Composition and Quality: This forest most likely developed from natural regeneration in the early to mid 1900's. The pine stands around Gowen Park and mixed pine/hemlock along the shores likely developed from open land. Species mix indicates that most of the rest of the forest developed following the removal of another older forest. There are few stumps remaining and none that were judge to be as old as the existing trees. There are not large numbers of multiple stem trees indicating sprout origin. It is likely a softwood forest was removed and was replaced by the current mix of species. Oak and pine dominate the forest here. Hemlock, soft maple and beech are also found. Quality is good.

Understory:

There is little desirable regeneration in these stands.

Recommendations: This area is used as a park if it is not all officially a park. The trees should be managed with that use in mind. It appears in the past management has be reactive removing trees which had fallen or otherwise become problems. The trees in the area around Gowen Park should be managed individually. Each tree should be examined and its future determined. Some will be hazardous and need to be removed. Some may need to be removed because they are competing with better stems. Some may need arboricultural treatments to remove dangerous limbs or improve crown structure. Deeper in the woods treatments would be of benefit. Along the trails stems should be examined and any hazard trees removed. Away from the trails there are opportunities to do some thinning an improvement cutting which will leave residual trees with more room to grow. Any harvesting will need to be done with a very light touch. The goal is not to grow timber but to grow trees to large size and keep them healthy and sound as long as possible. The occasional removal of large trees will create openings where new trees can become established. The existing forest would not be considered old but it is mature and most of the trees are near the same age. With luck of no major storms many will live another 50 or 100 years. If the trees on the forest can live for two hundred years a half a percent should be replaced every year. That

amounts to about a quarter acre per year on a forest this size. Not very much the removal of one or two large trees will accomplish that. Some future forester or park manager will be happy if such a practice is implemented.

Forest Types

Descriptions

Soft Maple Wetlands, Type I (Sm2-3B)

The type is well named. This type is dominated by soft maple mostly growing on what would be considered wet soils. Soft maple regenerates aggressively and competes well against other species. This is particularly true on wet sites. All of the areas dominated by soft maple are at least seasonally wet and some are very wet sites. This can vary in fairly short distances. A few inches change in elevation makes great difference in productivity. Where soils are more productive quality of the stems is good and there is good potential for producing high quality sawlogs. The wettest sites will likely produce only low grade cordwood and biomass products. This can be seen in the standing timber. Where site is better quality of the stems is good. Where site is not good, neither is quality.

In the long term the wettest soils will remain in a soft maple type. On the moderately poorly drained sites the nearly pure soft maple stands are an artifact of history. Other species, white pine being one will eventually invade and grow in a mixture with soft maple.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
331	104.9	4.1	788.7	56.3	0.89

Location: Examples of this type are found on all the lots except the River St. /Shaws Ridge Road lots.

Recommendations: In the near term improvement cuts to remove stems of short lived species, high risk stems and thin stands. For the long term it is recommended soft maple stands be managed by individual tree and group selection. Where pine or oak develops in the understory a shelterwood treatment can be used to bring these species along.

Volume Estimate:

Species	Board Feet	Cords
White pine	219,690	402
White Pine Pallet	33,460	
Hemlock	28,690	167
Red Oak	12,260	05
White Ash	6,360	37
Yellow birch	11,510	518
Soft maple	232,380	5,821
Popple		273
Misc. hardwood	10,660	185
Totals	555010	7,996
Per acre	1,677	24
Total cords per acre		28

Mixed Hardwood and Softwood, Stand 2 (HwSw2)

This type is an artifact of the 1947 fire and will likely evolve into a white pine type. Now it is a pole to small sawlog size stand composed of soft maple, popple, gray birch, Norway pine, white pine, pitch pine and spruce. The popple and gray birch are at the end of their life span. The pitch pine is of fair quality but is a low value species and unlikely to regenerate unless the stand is clear cut. White pine, soft maple possibly with some spruce will come to dominate this stand. While the trees are still young and small they have good potential to develop into high quality stems.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
35.3	100	2.9	1,526	39.8	0.73

Location: There are two stands of this type found at the airport.

Recommendations: A harvest removing the popple and gray birch in the near future. In this harvest to low quality stems of all species should be harvested. Where white pine exists in the understory it should be released. Long term if these areas are successfully converted to white pine the shelterwood system will be successful in maintain pine on these soils.

Volume Estimate:

Species	Board Feet	Cords
White pine		161
Norway pine	21,790	
Pitch pine	25,050	
Spruce		270
White birch		40
Soft maple		81
Popple		54
Misc. Hardwoods		161
Totals	48,840	803
Per acre	1,327	23
Total cords per acre		25

Hardwood Large Pole to Small Sawtimber Type 3 (Hw2B)

These are mixed hardwood stands compose primarily of red oak, soft maple and white oak. They are young to middle age stands of good quality stems. They regenerated on better sites following disturbances about 60 years ago. They have a high potential to produce high quality sawtimber.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
75.5	91.1	4.8	517.8	56.18	.68

Location: There are two stands of this type found at the airport and one on the Sewer District lot.

Recommendations: At this time the stands would benefit from a thinning to favor the high quality oak stems. In the long term these stands are likely to evolve into mixed pine/oak stands. Both oak and pine will regenerate well under shelterwood systems and I recommend they be managed to that end.

Volume Estimate:

Species	Board Feet	Cords
White pine	63,850	30
Red oak	44,010	243
White oak	25,050	196
Soft maple		758
Misc. hardwood		77
Totals	126,230	1,304
Per acre	1,672	17
Total cords per acre		21

Disturbed Sites Type 4 (Hw0-1A)

This type is a combination of two old gravel pits and an abandoned runway. They are typical of young early successional forest. Composed primarily of early successional species gray birch, white birch, popple and white pine. They are a transitional type and longer lived species, red oak, white pine and soft maple have already invaded the understory. In time these area if left alone would develop into a pine/hardwood type.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
34.4	56.0	3.5	779.2	0	.19

Location: The old pits on the Shaws Ridge Road and Old Mill Road lots and an abandoned runway at the airport.

Recommendations: For timber production these areas simple need time to continue growing. Alternatively they could be kept in early successional cover by periodically clear cutting. This habitat type has become rare. The few acres involved would not greatly impact timber production. Clear cutting gets very bad press but is a valid treatment. Many wild life species require early stage forest as habitat. I would encourage this practice on these site and particularly at the airport. The New England Cottontail is a rare species and I encourage expanding its habitat whenever possible.

Volume Estimate:

Species	Board Feet	Cords
White birch		32
Popple		158
Misc. hardwood		283

Totals	0	234
Per acre	0	14
Total cords per acre		14

Scrub oak, oak pitch pine, white pine Type 5

This is a classic bear oak (shrub/small tree species of oak) jungle with scattered taller trees. This is a droughty site. After the 1947 fire bear oak likely dominate the site. Tree species have now managed to poke through this dense stand of shrub oak. In time white pine and black oak would come to dominate the site with bear oak in the understory. The site has potential to grow good quality white pine.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
17.2	56	2.8	1,004	0	0.31

Location: At the airport south of the long runway.

Recommendations: I would recommend the periodic clear cutting of this stand to maintain it in an early succession brush type. It is on the flight approach to the runway and periodic clear cutting will keep tree heights below what they need to be kept. Secondly this will maintain and expand habitat suitable for use by the cottontail.

Volume Estimate:

Species	Board Feet	Cords
White pine	0	16
Pitch pine	0	26
Red oak	0	60
White oak	0	11
Misc. hardwood	0	142
Totals	0	255
Per acre	0	15
Total cords per acre		15

Atlantic White Cedar Mixed Softwood Type 6 (Sw2B)

This is a softwood stand with about half of the stems and a third of the volume being Atlantic White Cedar. The species is at the northern limit of its range and rare in Maine and declining throughout its range. The stand is large pole to small sawtimber in size. The other major species are white pine and soft maple. It is in an area that transitions from sandy well drained upland site and wetland sites below. Other than the presence of the cedar this small stand would have been combined with another type for forest inventory purposes.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
6.1	168.0	4.3	981.2	263.16	0.98

Location: This stand type is found at the south end of the Club House Road 2 Lot.

Recommendations: A conservative approach is recommended. It would be nice to preserve this area as an example of a rare plant. Atlantic White Cedar is reportedly intermediate in shade tolerance. That suggests that it would respond to treatments similarly to white pine. I recommend some small patch cutting around the edge of the stand to encourage regeneration and light thinning to release the cedar in part of the stand. The result of this can be evaluated and if successful the whole stand can be treated during the next cutting cycle.

Volume Estimate:

Species	Board Feet	Cords
White pine	22,730	12
W. pine pallet	12,560	
Spruce	3,010	5
White ash	0	11
Soft maple	2,670	104
Totals	40,970	132
Per acre	6,716	22
Total cords per acre		35

Mature white pine, Type 7 (Wp3B)

These are stands dominated by sawtimber size white pine. These stands are in general composed of good quality trees growing mostly on moderately poor to well drained soils. White pine has been and continues to be one of the most valuable and desirable trees in southern Maine. Most of these stands have received some management treatments in the past. The stands are somewhat too highly stocked for the best growth of individual stems and there are stems which are defective or in decline.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
59.9	153.3	6.2	396.4	455	.065

Location: There are examples of this type on almost all the lots.

Recommendations: While many of the stands of this type have received treatments in the past, it has been many years. All of the stands could use treatment. In general a thinning and improvement cut should be applied to the stands. Suppressed and intermediate stems should be thinned from below the main canopy, defective and low quality stems should be harvested leaving an "improve" stand of trees to grow. In most areas this cut will also anticipate the replacement of these stands and should create conditions suitable for the establishment of pine seedlings.

The exception to this recommendation is the lot at the end of Eagle Drive. Here the pine stands are quite small and growing on wet soils. It is recommended all of the large pine be harvested. They are at high risk of wind throw now and any disturbance will increase that risk.

For the long term the Shelterwood system is recommended.

Volume Estimate:

Species	Board Feet	Cords
White pine	810,600	622
White pine pallet	55,660	
Norway pine	9,050	
Pitch pine	4,980	54
Hemlock		11
Spruce & fir		23
Red oak	6,170	
White oak	3,670	
Soft maple	14,460	
Beech		31
Popple		41
Totals	904,590	1,181
Per acre	15,102	20
Total cords per acre		50

Mature Hardwood Type 8 (Hw3B)

These are mature hardwood stands composed primarily of red oak, white oak, soft maple and scattered white pine. Quality of the dominant stems tends to be good to excellent. They are evidently a second growth and 80 to 100 year in age.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
22.4	172.0	4.9	722.4	392	1.01

Location: All of the stands of this type on the Gowen Park/High School Lot.

Recommendations: These stems are growing in an area used as a park. Stocking is fairly high and should be reduced by removing hazard and high risk trees. It is recommended that trees be grown to very large size for as long as they are safe. A rotation age of approximately 200 years is recommended.

Volume Estimate:

Species	Board Feet	Cords
White pine	39,020	61
Red oak	165,900	249
White oak	6,540	75
White birch	3,190	22
Soft maple	6,460	100
Beech	3,400	87
Popple		26
Misc hardwoods		31
Totals	224,510	651
Per acre	10,023	29
Total cords per acre		49

Hardwood White pine Pole to Small Sawlogs, Type 9 (HwWp2B)

These are medium age stands composed of hardwoods and white pine. White pine seedlings and saplings are common in the understory. Soils under the stands are well drained coarse textured sands and gravels. In time white pine would come to dominate these sites.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
18.0	184.4	9.6	272.3	437.8	1.66

Location: There are stands of this type on the Gowen Park/High School parcel and on the Sewer District lot.

Recommendations: The stands would benefit from a harvest to remove hardwood to release pine in both the overstory and understory. Low quality pine stems should also be harvested. There are occasional oak stems which are of good quality and should be retained. There are two reasons for this. One these stems have potential to produce good high quality logs. Economically it makes sense to hold them until they achieve this growth. Second, holding some of the hardwood in this type will maintain the wind firmness of the pine as they expand their root system and thicken their stems.

Volume Estimate:

Species	Board Feet	Cords
White pine	280,950	487
White pine pallet	5,850	
Hemlock	25,230	329
Spruce & fir	10,260	16
Red oak	161,030	364
White oak	49,980	151
Soft maple	13,740	451
Beech		31
Misc. hardwood		60
Totals	547,040	1,951
Per acre	6,855	24
Total cords per acre		38

Hemlock, Hardwood, White pine Sawtimber, Type 10 (HeHwWp3B)

This is a typical mixed growth type found on moist sandy soils. The white pine and hardwood grow just fast enough to out compete the hemlock. The hemlock's dense shade kills the lower branches while they are small and trees tend to be of very good quality. That is the case. The Pine have achieved a dominant position in the canopy. The hardwoods co dominate while much of the hemlock is below the crowns of these other species. Many of the stems are of good quality. Some of the soft maple and hemlock show signs of internal decay or shake. There is some evidence that thinning has been done in parts of these stands. From the condition of the stumps I would estimate these treatments were applied 20 to 30 years ago.

Acres	Basal Area	Avg. DBH	Avg. Number Trees/ac	Growth Per acre	
				Board feet	Cords
23.0	124.7	6.7	308.1	149.1	0.88

Location: There is a large stand of this type on the Sewer District Lot and a smaller one on the Old Mill Road Lot.

Recommendations: The stand would benefit from a harvest, thinning and improvement cut. Some stems and small groups are showing signs of being overmature these should be harvested before they start to decline. Defective stems should also be harvested as should suppressed stems. This treatment will reduce the amount of hemlock and soft maple in the stand leaving a well space stand composed of more oak and pine. Some openings will be created where groups of stems are harvested. Regeneration will likely become established and will be of the same species now occupying the site.

For the long term a combination of individual tree and group selection and shelterwood systems of silviculture are recommended. Where pine and oak are successfully regenerated they should be brought along with a shelterwood removal of the overstory.

Appendix A

Table 1. Total Volumes by Species and Product

White pine	2,958,360	2,622
Norway pine	45,200	101
Pitch pine	38,450	100
Hemlock	440,640	1,618
Spruce & Fir	38,410	446
Red oak	1,053,790	2,188
White oak	100,120	558
White ash	6,360	90
White birch	7,520	178
Yellow birch	16,020	644
Soft maple	486,210	10,420
White pine pallet	127,590	0
Beech	12,370	192
Popple	0	644
Hardwood	10,660	1,001
Totals	5,341,700	20,802
per acre	6,198	24
Total per acre		37

APPENDIX B: Recent stumpage range and most likely stumpage value.

Species & Product	Recent Range	Most Likely Price
White pine sawlogs	\$185.00 to \$290.00 per MBF	\$200.00
pallet logs	\$25.00 to \$100.00 per MBF	\$50.00
pulpwood	\$5.00 to \$12.00 per cord	\$7.00
Norway pine	\$25.00 to \$80.00 per MBF	\$50.00
Pitch pine	\$30.00 to \$50.00 per MBF	\$40.00
Hemlock sawlogs	\$30.00 to \$90.00 per MBF	\$50.00
Hemlock pulpwood	\$5.00 to \$25.00 per cord	\$10.00
Spruce & fir pulpwood	\$5.00 to \$30.00 per cord	\$7.00
Red oak sawlogs	\$100.00 to \$500.00 per MBF	\$290.00
White oak sawlogs	\$50.00 to \$300.00 per MBF	\$125.00
White ash sawlogs	\$50.00 to \$300.00 per MBF	\$1100.00
White birch sawlogs	\$50.00 to \$200.00 per MBF	\$80.00
Yellow birch sawlogs	\$50.00 to \$400.00 per MBF	\$80.00
Soft maple sawlogs	\$50.00 to \$200.00 per MBF	\$75.00
Beech sawlogs	\$40.00 to \$100.00 per MBF	\$50.00
Popple pulpwood	\$10.00 to \$35.00 per cord	\$20.00
Hardwood pulpwood/firewood	\$5.00 to \$20.00 per cord	\$20.00

TOTAL VALUE OF ALL STANDING TIMBER:

\$1,341,919.59