Methodology

METHODOLOGY

Understanding a community forest's structure, function and value can promote management decisions that will improve human health and environmental quality. An assessment of the vegetation structure, function, and value of Dwyer Park's community forest was conducted during 2022. Complete inventory data from six forest stands/strata were analyzed using the i-Tree Eco model developed by the U.S. Forest Service, Northern Research Station. Additionally, a contemporary forestry analysis was accomplished on the complete inventory using NED. NED is a collection of software products developed by the USDA Forest Service. The NED software is intended to aid resource managers to develop goals, assess current and future conditions, and produce sustainable management plans for forest properties. Combined, these analysis aid in making forestry recommendations for Dwyer Park.

FOREST STAND DELINEATION, STRATUM

A forest stand is a contiguous community of trees sufficiently uniform in composition, structure, age and size class distribution, spatial arrangement, site quality, condition, or location to distinguish it from adjacent communities. The forest of Dwyer Park is a collection of these stands, or strata. For management purposes, Dwyer Park was broken into 6 separate stands/strata, numbered 1-6. Each stand is biologically and geographically distinct.

Stands are depicted on a map on the following page, and described in detail in the following section.

[Image] (above)

Stand 4 is a plantation of larch, pine, and spruce. It is much different than several other stands.

FOREST STANDS

Stand 1 - **Open/Mown - Northern Hardwoods Canopy**
Stand 2 - **Early Successional - Young Northern Hardwoods**
Stand 3 - **Old Forest South - Northern Hardwoods Remnant**
Stand 4 - **Plantation North - Mixed Plantation Forest**
Stand 5 - **Plantation South - Mixed Plantation Forest**
Stand 6 - **Old Forest North - Northern Hardwood Remnant**

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DWYER PARK - FOREST STAND MAP

i-Tree Analysis Findings

DATA COLLECTION

The forest data collection was accomplished via a tree inventory. The tree inventory included all trees within open/picnic/walking areas of the park (treed areas with maintained grass, etc), as well as all trees >6" DBH within a 30' ROW (right of way) of any trails, and within a 50' ROW of high use areas such as roads, pavillions, and grill/stove sites in the park.. Data was collected using GPS receivers with accuracy (stationary) of 2.5m. Trees were identified, GPS located, and then assessed for several factors. Factors noted were Tree ID/#, Stratum, Survey Date, Species, DBH, Crown Condition, Maintenance Recommended (priority), Maintenance Task, Crown Risk/Defect level, Trunk Risk/Defect level, Root and Root Collar Risk/Defect level, Residual Risk, Location (Lat/Long), and Additional Notes/Comments.

DATA ANALYSIS

Data was entered into ITREE ECO, as well as NED for contemporary forestry data analysis.

ITREE ECO analysis consisted of several factors: tree characteristics of the community forest, community forest cover and leaf area, air pollution removal by community trees, carbon storage and sequestration, oxygen production, avoided runoff, structural and functional values, and potential pest impacts.

Contemporary forest analysis (NED) consisted of several factors: tree species composition, basal area, average diameters, relative density, timber volume, and regeneration/invasive assessment.

I-TREE ECOSYSTEM ANALYSIS, URBAN FOREST EFFECTS AND VALUES

Data from the inventory of Dwyer Park were analyzed using the i-Tree Eco model. i-Tree Eco is designed to use standardized field data from forest plots and local hourly air pollution and meteorological data to quantify community forest structure and its numerous effects (Nowak and Crane 2000), including:

- Tree Characteristics and community forest structure (e.g., species composition, tree health, leaf area, etc.).
- Amount of pollution removed hourly by the community forest, and its associated percent air quality improvement throughout a year.
- Total carbon stored and net carbon annually sequestered by the community forest.
- Effects of trees on building energy use and consequent effects on carbon dioxide emissions from power sources.
- Structural value of the forest, as well as the value for air pollution removal and carbon storage and sequestration.
- Potential impact of infestations by pests, such as Asian longhorned beetle, emerald ash borer, gypsy moth, and Dutch elm disease.

All field data were collected during the leaf-on season to properly assess tree canopies.

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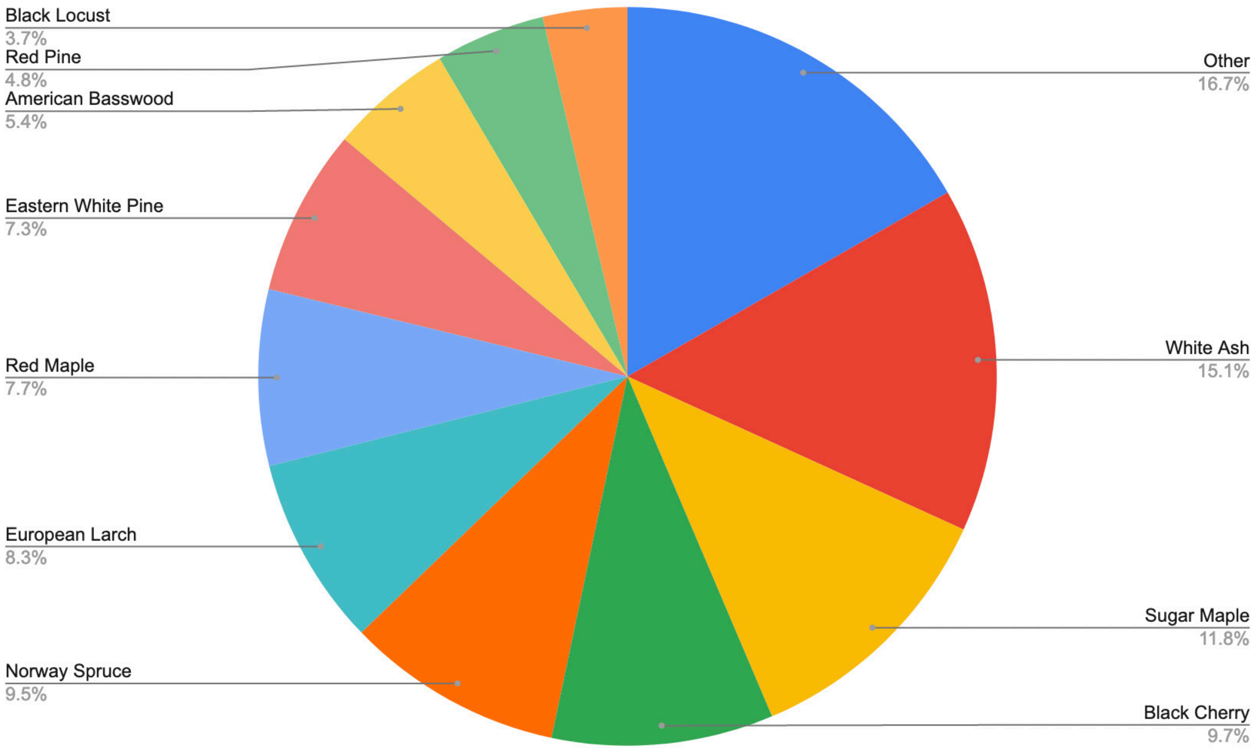
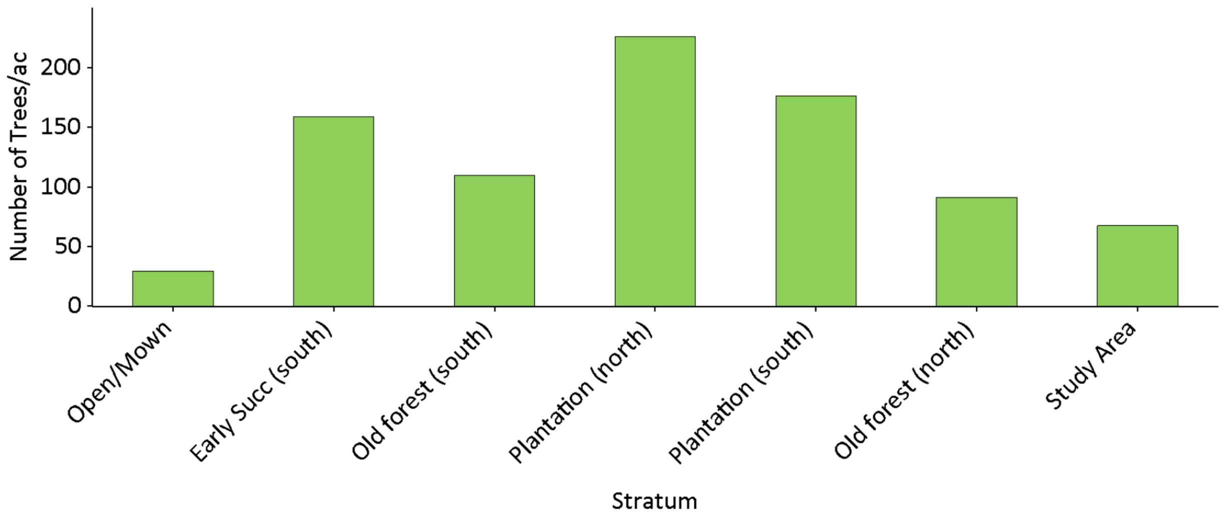
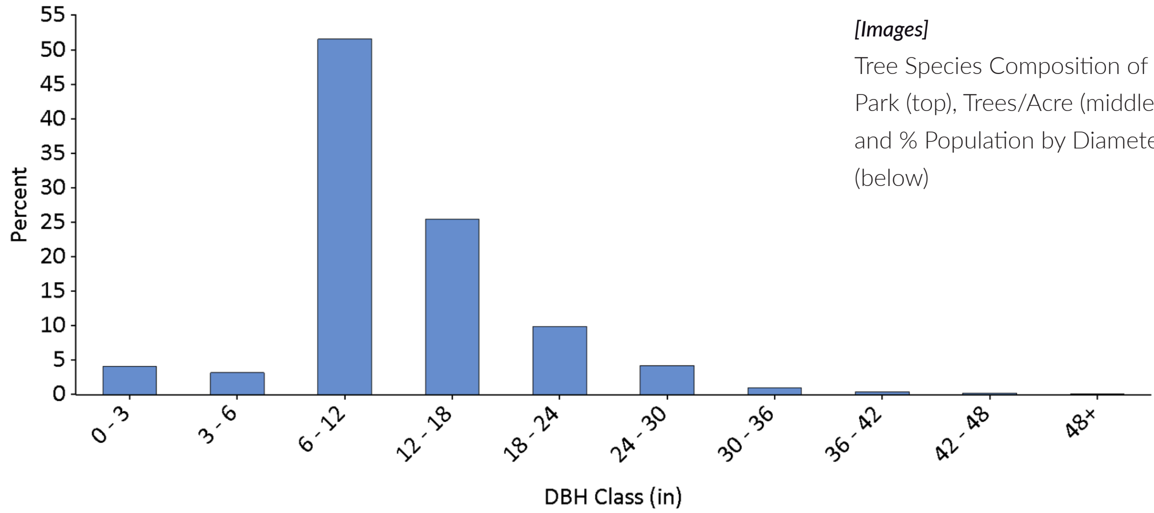






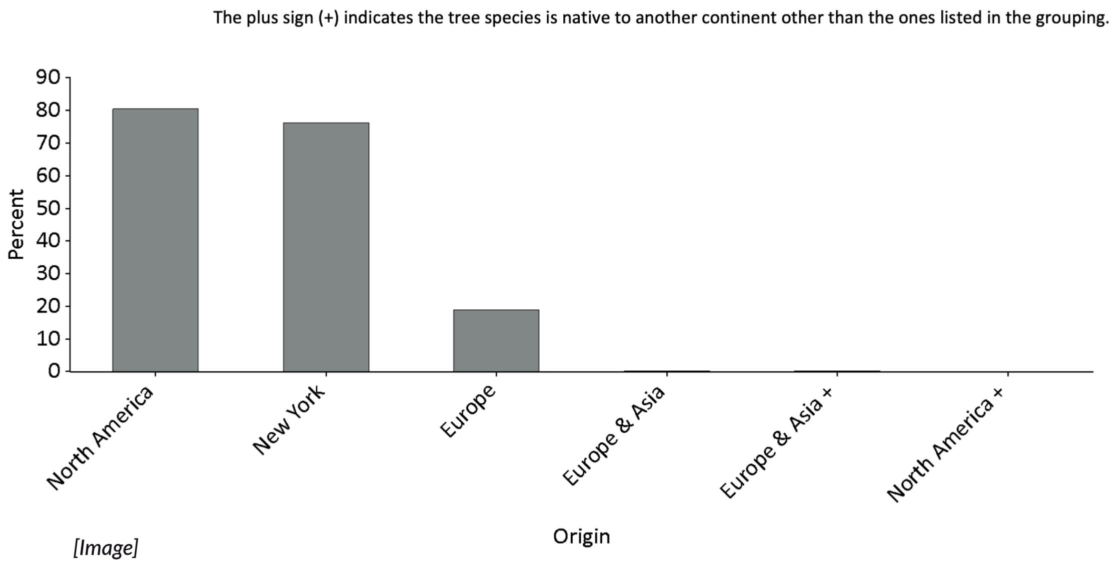
[Images]

Tree Species Composition of Dwyer Park (top), Trees/Acre (middle), and % Population by Diameter Class (below)

I-TREE CHARACTERISTICS OF DWYER PARK

The urban forest of Dwyer Park has 3,493 trees with a tree cover of 64.0 percent. The three most common species are White ash (15.1 percent), Sugar maple (11.8 percent), and Black cherry (9.7 percent).

The overall tree density in Dwyer Park is 67 trees/acre. For this stratified project, the highest tree densities in Dwyer Park occur in 'Stand 4 - Plantation North' followed by 'Stand 5 - Plantation South' and 'Stand 2 - Early Successional'.



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Percent Live Tree Population by Area of Native Origin

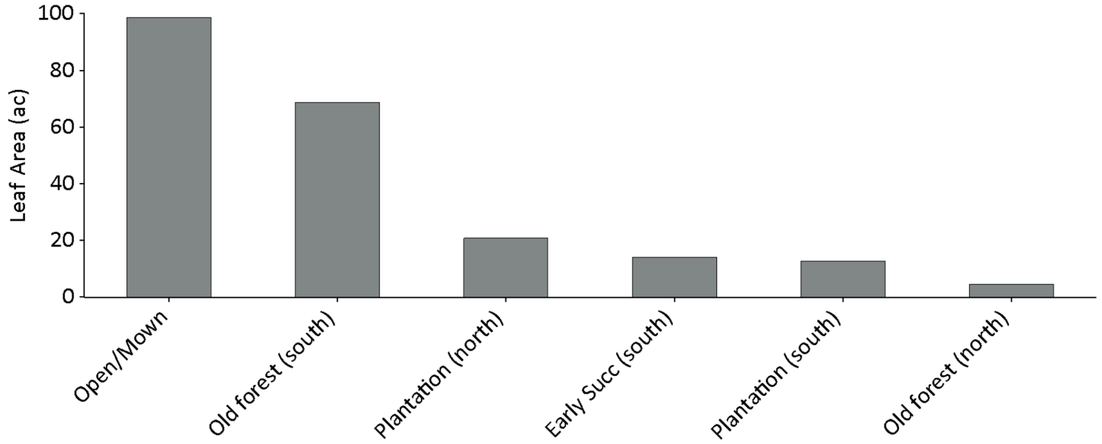
Urban forests are composed of a mix of native and exotic tree species. Thus, urban forests often have a tree diversity that is higher than surrounding native landscapes. Increased tree diversity can minimize the overall impact or destruction by a species-specific insect or disease, but it can also pose a risk to native plants if some of the exotic species are invasive plants that can potentially out-compete and displace native species. In Dwyer Park, about 80 percent of the trees are species native to North America, while 76 percent are native to New York. Species exotic to North America make up 20 percent of the population. Most exotic tree species have an origin from Europe (19 percent of the species).

Invasive plant species are often characterized by their vigor, ability to adapt, reproductive capacity, and general lack of natural enemies. These abilities enable them to displace native plants and make them a threat to natural areas. Two of the 38 tree species in Dwyer Park are identified as invasive on the state invasive species list. These invasive species comprise 3.8 percent of the tree population though they may only cause a minimal level of impact. These two invasive species are Black locust (3.7 percent of population) and Norway maple (0.1 percent).

URBAN FOREST COVER AND LEAF AREA

Many tree benefits equate directly to the amount of healthy leaf surface area of the plant. Trees cover about 64 percent of Dwyer Park and provide 219.5 acres of leaf area. Total leaf area is greatest in Open/Mown followed by Old forest (south) and Plantation (north).

In Dwyer Park, the most dominant species in terms of leaf area are Sugar maple, American basswood, and Red maple. The 10 species with the greatest importance values are listed below. Importance values (IV) are calculated as the sum of percent population and percent leaf area. High importance values do not mean that these trees should necessarily be encouraged in the future; rather these species currently dominate the urban forest structure.



[Image]

Leaf Area by Forest Stand Stratum

Species Name	*Percent Population*	*Percent Leaf Area*	*IV*
Sugar maple	11.8	22.4	34.2
White ash	15.1	8.4	23.5
Black cherry	9.7	9.5	19.2
Red maple	7.7	10.3	18.1
European larch	8.3	8.8	17.0
American basswood	5.4	11.4	16.8
Norway spruce	9.5	6.5	16.0
Eastern white pine	7.3	2.3	9.6
Red pine	4.8	1.0	5.7
Black locust	3.7	1.7	5.4

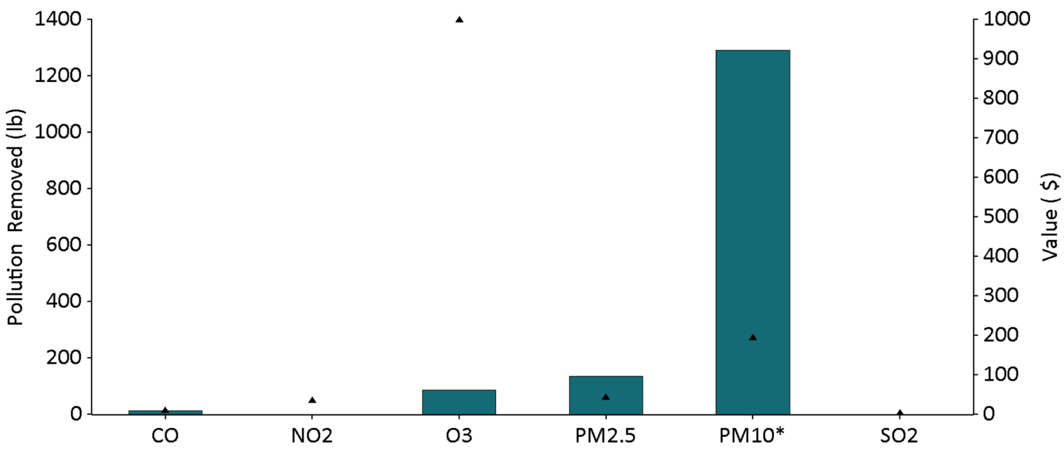
[Table]

Most important species in Dwyer Park for Leaf Area

AIR POLLUTION REMOVAL

Poor air quality is a common problem in many urban areas. It can lead to decreased human health, damage to landscape materials and ecosystem processes, and reduced visibility. The urban forest can help improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings, which consequently reduces air pollutant emissions from the power sources. Trees also emit volatile organic compounds that can contribute to ozone formation. However, integrative studies have revealed that an increase in tree cover leads to reduced ozone formation (Nowak and Dwyer 2000).

Pollution removal by trees in Dwyer Park was estimated using field data and recent available pollution and weather data. Pollution removal was greatest for ozone. It is estimated that park trees remove 1795 pounds of air pollution (ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 2.5 microns (PM2.5), particulate matter less than 10 microns and greater than 2.5 microns (PM10*), and sulfur dioxide (SO2)) per year with an associated value of $1090.



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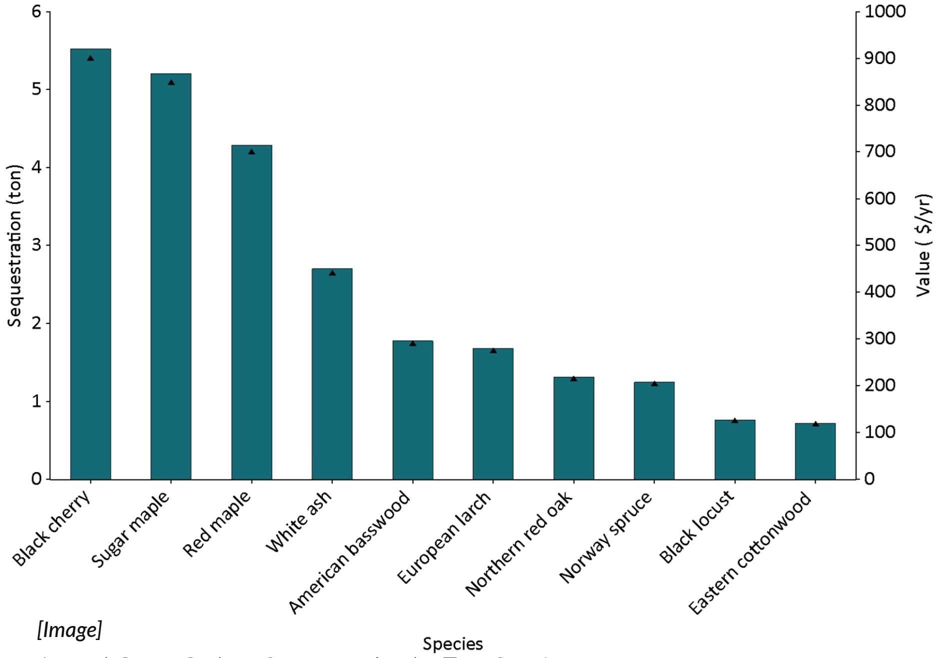
Annual Pollution Removal by Trees in Dwyer Park.

CARBON STORAGE AND SEQUESTRATION

Climate change is an issue of global concern. Urban trees can help mitigate climate change by sequestering atmospheric carbon (from carbon dioxide) in tissue and by altering energy use in buildings, and consequently altering carbon dioxide emissions from fossil-fuel based power sources (Abdollahi et al 2000).

Trees reduce the amount of carbon in the atmosphere by sequestering carbon in new growth every year. The amount of carbon annually sequestered is increased with the size and health of the trees. The gross sequestration of Dwyer Park trees is about 28.16 tons of carbon per year with an associated value of $4.8 thousand.



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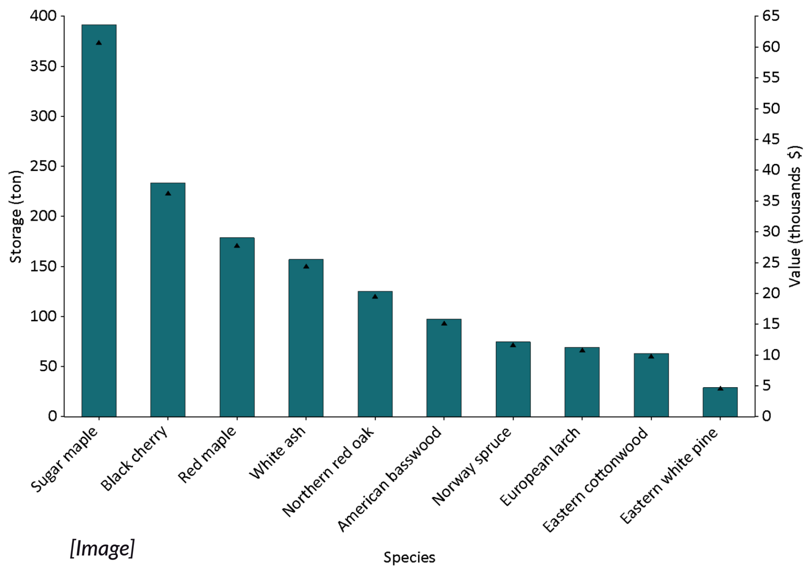
Annual Gross Carbon Sequestration by Tree Species

Carbon storage is another way trees can influence global climate change. As a tree grows, it stores more carbon by holding it in its accumulated tissue. As a tree dies and decays, it releases much of the stored carbon back into the atmosphere. Thus, carbon storage is an indication of the amount of carbon that can be released if trees are allowed to die and decompose. Maintaining healthy trees will keep the carbon stored in trees, but tree maintenance can contribute to carbon emissions (Nowak et al 2002c). When a tree dies, using the wood in long-term wood products, to heat buildings, or to produce energy will help reduce carbon emissions from wood decomposition or from fossil- fuel or wood-based power plants.

Trees in Dwyer Park are estimated to store 1510 tons of carbon ($257 thousand). Of the species sampled, Sugar maple stores the most carbon (approximately 24.8% of the total carbon stored) and Black cherry sequesters the most (approximately 19.2% of all sequestered carbon.)



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Annual Carbon Storage by Tree Species

OXYGEN PRODUCTION

Oxygen production is one of the most commonly cited benefits of urban trees. The net annual oxygen production of a tree is directly related to the amount of carbon sequestered by the tree, which is tied to the accumulation of tree biomass.

Trees in Dwyer Park are estimated to produce 75.09 tons of oxygen per year. However, this tree benefit is relatively insignificant because of the large and relatively stable amount of oxygen in the atmosphere and extensive production by aquatic systems. Our atmosphere has an enormous reserve of oxygen. If all fossil fuel reserves, all trees, and all organic matter in soils were burned, atmospheric oxygen would only drop a few percent (Broecker 1970).

Species	*Oxygen (ton)*	*Gross Carbon Sequestration (ton/yr)*	*Number of Trees*	*Leaf Area (acre)*
Black cherry	14.38	5.39	339	20.78
Sugar maple	13.56	5.09	412	49.23
Red maple	11.17	4.19	270	22.68
White ash	7.04	2.64	528	18.41
American basswood	4.63	1.74	190	25.03
European larch	4.38	1.64	289	19.24
Northern red oak	3.42	1.28	57	7.79
Norway spruce	3.25	1.22	331	14.35
Black locust	1.99	0.74	129	3.79
Eastern cottonwood	1.88	0.70	28	4.34
Eastern white pine	1.65	0.62	254	5.06
Red pine	1.22	0.46	166	2.16
Green ash	0.90	0.34	124	2.75
Eastern hemlock	0.72	0.27	43	5.14
American elm	0.68	0.26	46	1.52
Black walnut	0.61	0.23	22	2.22
Yellow birch	0.58	0.22	29	2.50
American beech	0.57	0.22	19	3.99
Bitternut hickory	0.46	0.17	19	3.07
Bigtooth aspen	0.45	0.17	15	1.19

[Image]

Top 20 Oxygen Producing Tree Species

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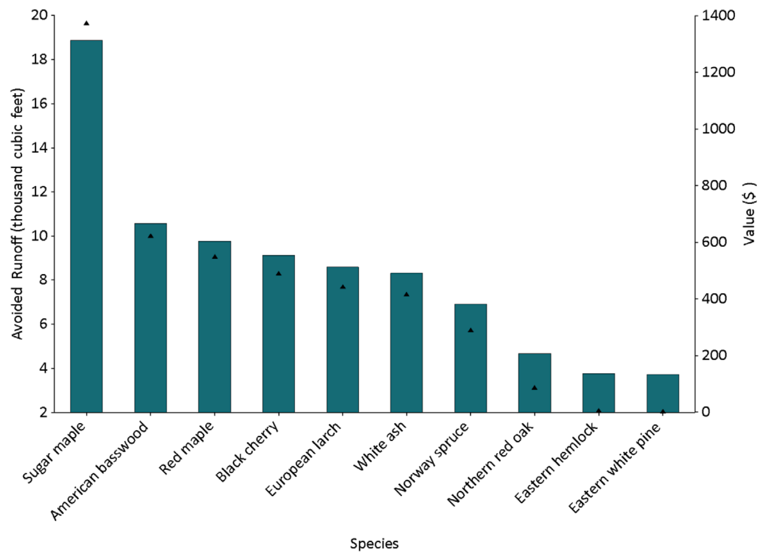
AVOIDED RUNOFF

Surface runoff can be a cause for concern in many urban areas as it can contribute pollution to streams, wetlands, rivers, lakes, and oceans. During precipitation events, some portion of the precipitation is intercepted by vegetation (trees and shrubs) while the other portion reaches the ground. The portion of the precipitation that reaches the ground and does not infiltrate into the soil becomes surface runoff (Hirabayashi 2012). In urban areas, the large extent of impervious surfaces increases the amount of surface runoff.

Urban trees and shrubs, however, are beneficial in reducing surface runoff. Trees and shrubs intercept precipitation, while their root systems promote infiltration and storage in the soil. The trees and shrubs of Dwyer Park help to reduce runoff by an estimated 87.5 thousand cubic feet a year with an associated value of $5.9 thousand. Avoided runoff is estimated based on local weather from the user-designated weather station. In Cortland, the total annual precipitation in 2019 was 32.2 inches.



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Annual Avoided Runoff for Tree Species

REPLACEMENT AND FUNCTIONAL VALUES

Urban forests have a replacement value based on the trees themselves (e.g., the cost of having to replace a tree with a similar tree); they also have functional values (either positive or negative) based on the functions the trees perform.

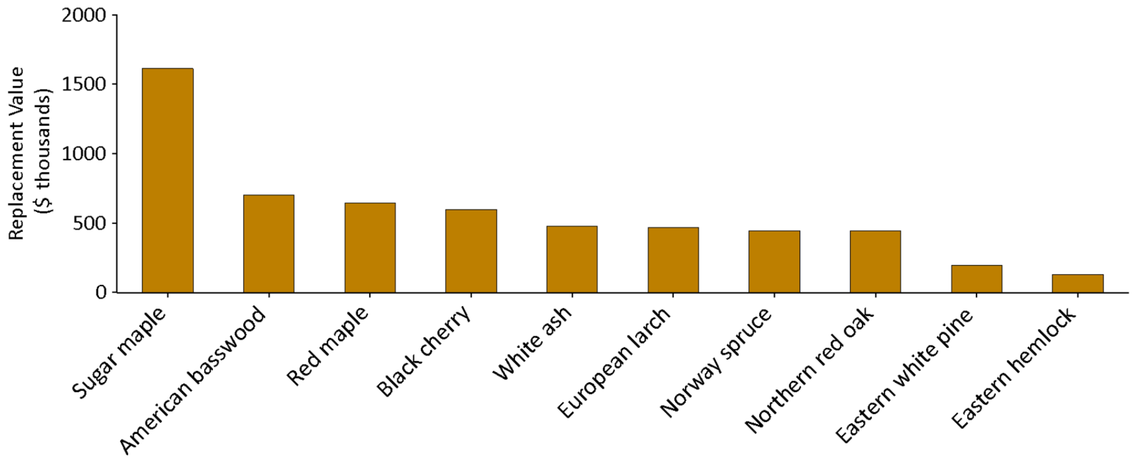
The replacement value of an urban forest tends to increase with a rise in the number and size of healthy trees (Nowak et al 2002a). Annual functional values also tend to increase with increased number and size of healthy trees. Through proper management, urban forest values can be increased; however, the values and benefits also can decrease as the amount of healthy tree cover declines.

Urban trees in Dwyer Park have the following structural values:

- Replacement value: $6.44 million
- Carbon storage: $257 thousand

Urban trees in Dywer Park have the following annual functional values:

- Carbon sequestration: $4.8 thousand
- Avoided runoff: $5.85 thousand
- Pollution removal: $1.09 thousand



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Tree Species with Greatest Structural Value

POTENTIAL PEST IMPACTS

Various insects and diseases can infest urban forests, potentially killing trees and reducing the health, replacement value and sustainability of the urban forest. As pests tend to have differing tree hosts, the potential damage or risk of each pest will differ among cities. Thirty-six pests were analyzed for their potential impact and compared with pest range maps (Forest Health Technology Enterprise Team 2014) for the conterminous United States to determine their proximity to Cortland County. Eleven of the thirty-six pests analyzed are located within the county.

Beech bark disease (BBD) (Houston and O'Brien 1983) is an insect-disease complex that primarily impacts American beech. This disease threatens 0.5 percent of the population, which represents a potential loss of $58.8 thousand in replacement value.

Butternut canker (BC) (Ostry et al 1996) is caused by a fungus that infects butternut trees. The disease has since caused significant declines in butternut populations in the United States. Potential loss of trees from BC is 0.6 percent ($58 thousand in replacement value).

Dogwood anthracnose (DA) (Mielke and Daughtrey) is a disease that affects dogwood species, specifically flowering and Pacific dogwood. This disease threatens 0.0 percent of the population, which represents a potential loss of $0 in replacement value.

American elm, one of the most important street trees in the twentieth century, has been devastated by the Dutch elm disease (DED) (Northeastern Area State and Private Forestry 1998). Since first reported in the 1930s, it has killed over 50 percent of the native elm population in the United States. Although some elm species have shown varying degrees of resistance, Dwyer Park could possibly lose 1.3 percent of its trees to this pest ($37.3 thousand in replacement value).

Emerald ash borer (EAB) (Michigan State University 2010) has killed thousands of ash trees in parts of the United States. EAB has the potential to affect 18.7 percent of the population ($558 thousand in replacement value).

The spongy moth (SM) (formerly gypsy moth - GM on chart) (Northeastern Area State and Private Forestry 2005) is a defoliator that feeds on many species causing widespread defoliation and tree death if outbreak conditions last several years. This pest threatens 19.2 percent of the population, which represents a potential loss of $1.74 million in replacement value.

As one of the most damaging pests to eastern hemlock and Carolina hemlock, hemlock woolly adelgid (HWA) (U.S. Forest Service 2005) has played a large role in hemlock mortality in the United States. HWA has the potential to affect 1.2 percent of the population ($130 thousand in replacement value).

Quaking aspen is a principal host for the defoliator, large aspen tortrix (LAT) (Ciesla and Kruse 2009). LAT poses a threat to 2.3 percent of the Dwyer Park urban forest, which represents a potential loss of $78.4 thousand in replacement value.

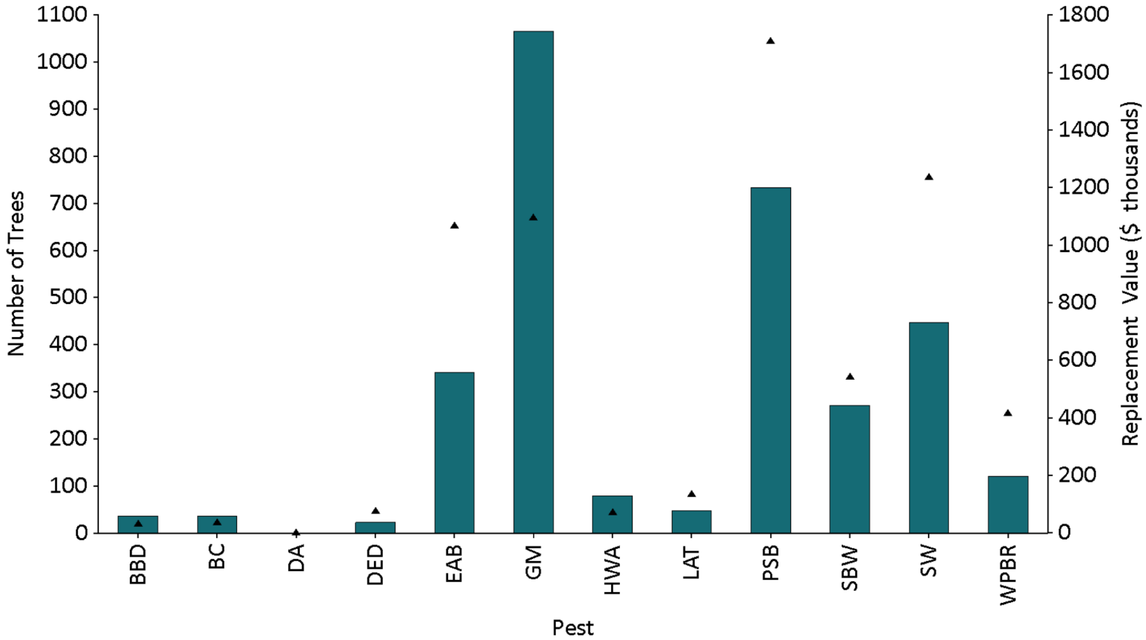
The pine shoot beetle (PSB) (Ciesla 2001) is a wood borer that attacks various pine species, though Scotch pine is the preferred host in North America. PSB has the potential to affect 29.9 percent of the population ($1.2 million in replacement value).

Spruce budworm (SBW) (Kucera and Orr 1981) is an insect that causes severe damage to balsam fir. SBW poses a threat to 9.5 percent of the Cortland urban forest, which represents a potential loss of $444 thousand in replacement value.

The sirex woodwasp (SW) (Haugen & Hoebeke 2005) is a wood borer that primarily attacks pine species. SW poses a threat to 21.6% of the Dwyer Park urban forest, which represents a potential loss of $732 thousand in replacement value.

Since its introduction to the United States in 1900, white pine blister rust (Eastern U.S.) (WPBR) (Nicholls and Anderson 1977) has had a detrimental effect on white pines, particularly in the Lake States. WPBR has the potential to affect 7.3 percent of the population ($197 thousand in replacement value).

Spotted lanternfly (SLF) is an invasive pest from Asia that primarily feeds on tree of heaven (Ailanthus altissima) but can also feed on a wide variety of plants such as grapevine, hops, maple, walnut, fruit trees and others. This insect could impact New York's forests as well as the agricultural and tourism industries.



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# of Trees at Risk for Most Threatening Pests located in the County

Contemporary Forestry Analytics

Data from the inventory was analyzed using NED to determine the following characteristics of the various forest stands:

Composition -

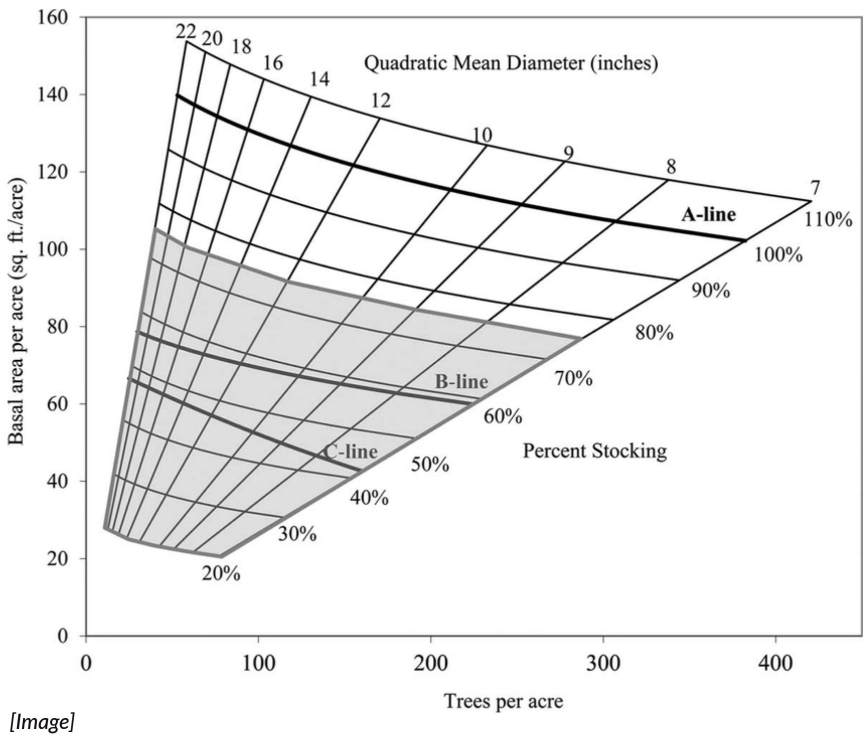
Basal area/dominance - A measurement used to help estimate forest stocking. Basal area is the cross-sectional surface area (in square feet) of a standing tree's bole measured at breast height (4.5 feet above ground). The basal area of a tree 14 inches in diameter at breast height (DBH) is approximately 1 square foot, while an 8-inch DBH tree is .35 square feet, and a 19-inch DBH tree is 2 square feet. A sum of the basal area when used with the number of trees within a given forest can aid in determining forest stocking recommendations.

Relative dominance - Dominance is calculated as the total basal area of a species. Relative dominance is calculated by dividing the dominance by the sum of the dominance of all species, multiplied by 100 (to obtain a percentage).

Average diameters - Mean, medial, merchantable, quadratic, and merchantable quadratic measurements are calculated. In forestry, quadratic mean diameter or QMD is a measure of central tendency which is considered more appropriate than arithmetic mean for characterizing the group of trees which have been measured.

Structure -

relative density - Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. On most stocking charts, 100% relative density is represented as the A-line. If relative density is at least 60% and below 100%, trees can fully occupy the growing site. Maximum stand growth occurs near 60% (the B-line), and enough trees occupy the site to discourage detrimental effects on growth form. The lower limit of stocking necessary to reach 60% (B-line) stocking in ten years on average sites is centrally represented as the C-line and corresponds roughly to 40% relative density.



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Example stocking chart

Q-factor - The shape of an uneven sized forest can be described with a measure called a q-factor. The q-factor defines the change of tree numbers across diameter classes. Q-factor typically range from 1.1 to 1.9, with the lower numbers typically applying to stands with shade tolerant species. The q-factor for this stand is 1.08. The table above lists the q-factor for each tree species. The q-factor could not be calculated for species displaying a value of zero. One inch size classes were used to compute the q-factor values.

Regeneration/Invasive Assessment -

Natural regeneration is essential to sustaining NY's native hardwood forests and the many values they provide. The health of Dwyer Park's forested stands depends on the recruitment of seedlings from the trees already growing on the site, to create the canopy seen across the landscape. This is not a planted forest. Rather, it is a forest that depends on trees naturally regenerating. To have this happen, it is essential that the forests accumulates advance regeneration in the understory to ensure that the next forest is there and ready to grow. The future of Dwyer Park's forest depends on ensuring that our management and use practices foster adequate advance regeneration.

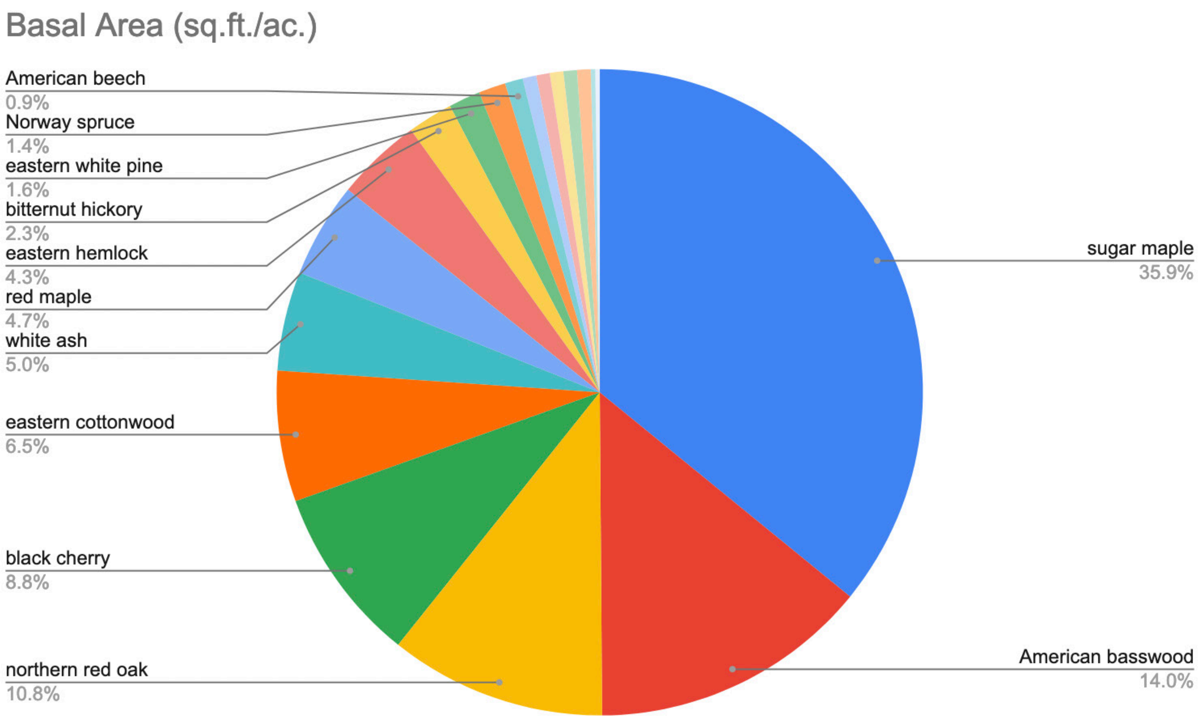
All field data were collected during the leaf-on season.

STAND 1 - OPEN/MOWN - NORTHERN HARDWOODS - 34.40 ACRES

Stand 1 is the largest stand in Dwyer Park. It is located centrally in the park, and consists of areas that are mown with large trees throughout. This stand is dominated by sugar maples, with basswood, black cherry, red maple, bitternut hickory, red oak, white ash, beech, sweet cherry, hophornbeam, and hemlock present. In certain areas and edges this stand has understory and herbaceous plants growing as well, with native plants such as blackhaw viburnum, silky dogwood, Joe-pye weed, boneset, meadowsweet, elderberry, currants, jewelweed, sedges, and rushes present.

SPECIES COMPOSITION

The total basal area of the overstory and understory combined is 44.5 square feet per acre. For the overstory only, acceptable growing stock for timber (AGS) is 39.8 square feet per acre and the basal area of unacceptable growing stock for timber (UGS) is 4.7 square feet per acre.



Species	Basal Area (sq.ft./ac.)	Relative Dominance (%)
sugar maple	15.9	35.83
American basswood	6.2	14.00
northern red oak	4.8	10.77
black cherry	3.9	8.83
eastern cottonwood	2.9	6.59
white ash	2.2	4.98
red maple	2.1	4.64
eastern hemlock	1.9	4.29
bitternut hickory	1.0	2.32
eastern white pine	0.7	1.59
Norway spruce	0.6	1.31
American beech	0.4	0.80
European larch	0.3	0.78
bigtooth aspen	0.3	0.74
black walnut	0.3	0.70
hophornbeam	0.3	0.70
American elm	0.3	0.59
red pine	0.1	0.33
green ash	0.1	0.17
boxelder	0.0	0.03
sweet cherry	0.0	0.02
Norway maple	0.0	0.00
American hornbeam	0.0	0.00

This is a large sawtimber stand, with the following diameters:

Species	Mean	Medial	Merchantable	Quadratic	Merchantable Quadratic
northern red oak	27.5	34.9	34.9	29.8	29.8
eastern cottonwood	22.5	37.4	37.4	26.2	26.2
bitternut hickory	19.6	21.6	21.6	20.2	20.2
eastern hemlock	19.3	23.0	23.1	20.4	21.1
black cherry	18.7	24.8	24.8	20.3	20.3
American basswood	17.3	21.2	21.2	18.4	18.4
American beech	16.8	21.0	21.0	17.9	17.9
sugar maple	16.2	20.8	20.8	17.4	17.4
eastern white pine	15.8	17.6	17.6	16.2	16.2
Norway spruce	14.0	16.8	16.8	14.7	14.7
black walnut	13.3	18.7	18.7	14.7	14.7
bigtooth aspen	13.1	18.0	18.0	14.4	14.4
red maple	12.7	19.5	19.6	14.6	16.0
European larch	11.9	12.6	12.6	12.1	12.1
white ash	11.7	20.5	20.7	13.6	14.4
hophornbeam	9.9	11.2	11.2	10.2	10.2
red pine	9.4	10.1	10.2	9.6	9.9
green ash	9.3	14.0	14.2	10.8	12.3
American elm	8.5	10.2	10.2	8.9	8.9
sweet cherry	6.8	6.8	6.8	6.8	6.8
boxelder	6.7	6.7	6.7	6.7	6.7
American hornbeam	3.4	3.4	0.0	3.4	0.0
Norway maple	2.7	2.7	0.0	2.7	0.0
All species	16.0	23.5	23.5	17.8	18.0

STRUCTURE

Stand 1 has density of 29.6 trees/acre. The stand relative density is 29% of the average maximum stocking expected in undisturbed stands of similar size and species. This density is below the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.

Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. On most stocking charts, 100% relative density is represented as the A-line. If relative density is at least 60% and below 100%, trees can fully occupy the growing site. Maximum stand growth occurs near 60% (the B-line), and enough trees occupy the site to discourage detrimental effects on growth form. The lower limit of stocking necessary to reach 60% (B-line) stocking in ten years on average sites is centrally represented as the C-line and corresponds roughly to 40% relative density. .

Species	Relative density	Q-factor	AGS relative density
sugar maple	12	1.10	3
northern red oak	4	1.00	3
American basswood	3	1.03	3
eastern cottonwood	2	1.01	3
black cherry	1	1.03	3
red maple	1	1.04	3
eastern hemlock	1	1.01	3
white ash	1	1.06	3
bitternut hickory	1	0.98	3
black walnut	0	1.03	3
American beech	0	1.00	3
American elm	0	1.22	3
eastern white pine	0	1.02	3
European larch	0	1.16	3
hophornbeam	0	1.08	3
bigtooth aspen	0	0.99	3
Norway spruce	0	1.01	3
red pine	0	0.99	3
green ash	0	1.00	3
boxelder	0	1.00	3
sweet cherry	0	0.00	3
American hornbeam	0	0.00	3
Norway maple	0	0.00	3

The shape of an uneven sized forest can be described with a measure called a q-factor. The q-factor defines the change of tree numbers across diameter classes. Q-factor typically range from 1.1 to 1.9, with the lower numbers typically applying to stands with shade tolerant species. The q-factor for this stand is 1.08. The table above lists the q-factor for each tree species. The q-factor could not be calculated for species displaying a value of zero. One inch size classes were used to compute the q-factor values.

Trees of acceptable quality for future growing stock are inadequate to provide a fully stocked stand in themselves (26 % of AGS relative density).

REGENERATION/INVASIVE ASSESSMENT

An assessment of the understory reveals that there is limited regeneration of native species where the stand is not mown, with a significant portion of regeneration being plants that are unpalatable to deer. Establishment of new tree, shrub and herbaceous plants in the stand is somewhat limited by deer. Invasive buckthorn and honeysuckle were also surveyed in this stand. An area of Japanese knotweed was also noticed near the bathrooms on the slope toward Route 81.

[Image] (above)

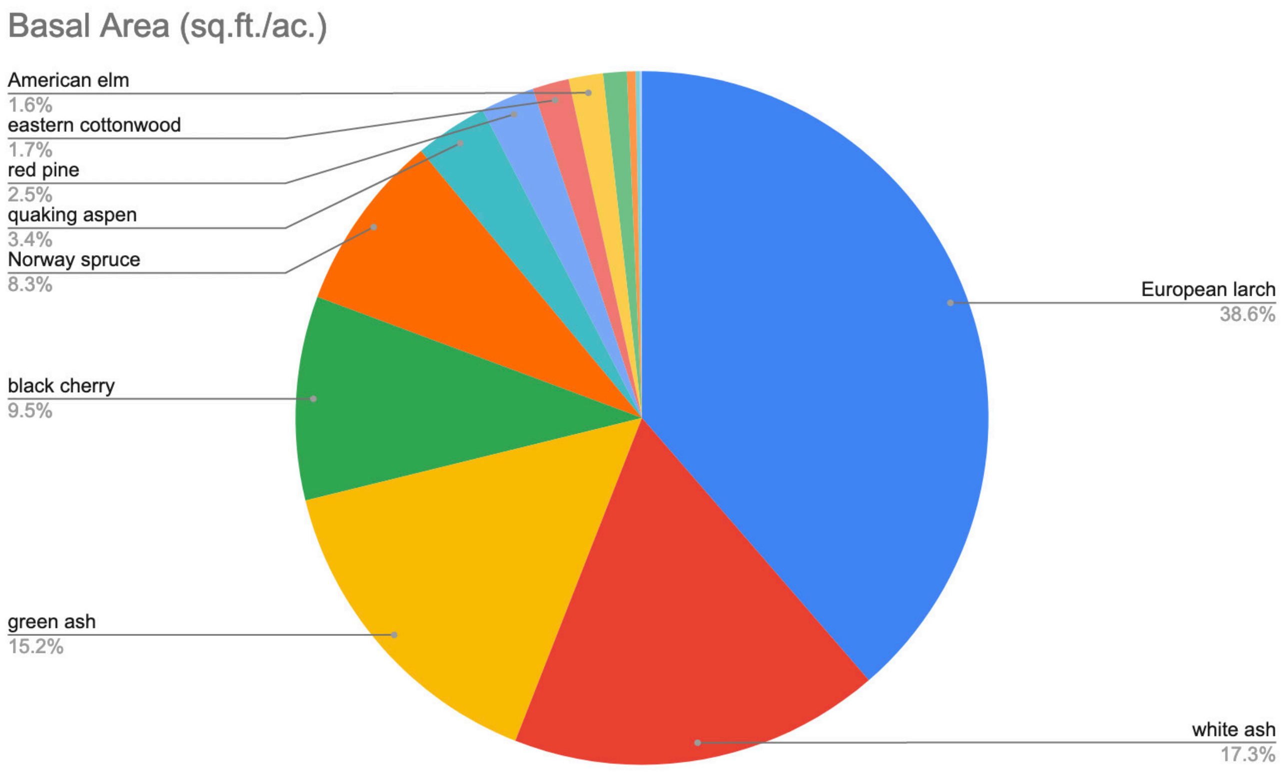
The forest of Stand 1 is mown and has no chance to regenerate naturally. It will need to be planted to replace lost canopy.

STAND 2 - EARLY SUCCESSIONAL - ASH DOMINANT W/ NORTHERN HARDWOODS - 2.60 ACRES

Stand 2 is located within a road loop in the southern area of the park. This stand is dominated by white ash but other northern hardwood trees such as black cherry and red maple are abundant as well. There is also a ring of planted Norway spruce and larch around the perimeter of the stand. Chokecherry also makes up a smaller component of the stand understory.

SPECIES COMPOSITION

The total basal area of the overstory and understory combined is 99.8 square feet per acre. For the overstory only, acceptable growing stock for timber (AGS) is 63.5 square feet per acre and the basal area of unacceptable growing stock for timber (UGS) is 36.4 square feet per acre.



Species	Basal Area (sq.ft./ac.)	Relative Dominance (%)
European larch	38.6	38.71
white ash	17.3	17.34
green ash	15.2	15.25
black cherry	9.5	9.48
Norway spruce	8.3	8.31
quaking aspen	3.4	3.41
red pine	2.5	2.48
eastern cottonwood	1.7	1.72
American elm	1.6	1.56
bigtooth aspen	1.1	1.15
northern red oak	0.4	0.35
staghorn sumac	0.2	0.18
red maple	0.1	0.06

This is a small sawtimber stand, with the following diameters:

Species	Mean	Medial	Merchantable	Quadratic	Merchantable Quadratic
eastern cottonwood	27.6	27.6	27.6	27.6	27.6
American elm	18.6	18.6	18.6	18.6	18.6
European larch	12.8	14.0	14.0	13.1	13.1
northern red oak	12.5	12.5	12.5	12.5	12.5
quaking aspen	12.0	13.3	13.3	12.3	12.3
bigtooth aspen	11.2	11.6	11.6	11.3	11.3
black cherry	10.6	13.4	13.4	11.3	11.3
white ash	9.2	11.0	11.1	9.6	9.8
green ash	9.0	10.1	10.2	9.2	9.3
Norway spruce	8.2	9.4	9.4	8.5	8.5
red pine	7.7	8.2	8.2	7.8	7.8
staghorn sumac	6.3	6.3	6.3	6.3	6.3
red maple	5.3	5.3	0.0	5.3	0.0
All species	10.2	12.5	12.6	10.7	10.8

STRUCTURE

Stand 2 has density of 159.1 trees/acre. The stand relative density is 60% of the average maximum stocking expected in undisturbed stands of similar size and species. This density is within the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.

Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. On most stocking charts, 100% relative density is represented as the A-line. If relative density is at least 60% and below 100%, trees can fully occupy the growing site. Maximum stand growth occurs near 60% (the B-line), and enough trees occupy the site to discourage detrimental effects on growth form. The lower limit of stocking necessary to reach 60% (B-line) stocking in ten years on average sites is centrally represented as the C-line and corresponds roughly to 40% relative density.

Species	Relative density	Q-factor	AGS relative density
European larch	22	1.00	3
green ash	14	1.23	3
white ash	9	1.12	3
black cherry	4	1.10	3
Norway spruce	4	1.17	3
quaking aspen	2	1.00	3
red pine	1	1.42	3
eastern cottonwood	1	0.00	3
American elm	1	1.00	3
bigtooth aspen	1	1.28	3
northern red oak	0	0.00	3
staghorn sumac	0	1.00	3
red maple	0	0.00	3

The shape of an uneven sized forest can be described with a measure called a q-factor. The q-factor defines the change of tree numbers across diameter classes. Q-factor typically range from 1.1 to 1.9, with the lower numbers typically applying to stands with shade tolerant species. The q-factor for this stand is 1.18. The table above lists the q-factor for each tree species. The q-factor could not be calculated for species displaying a value of zero. One inch size classes were used to compute the q-factor values.

Trees of acceptable quality for future growing stock provide enough stocking by themselves to warrant stand management (35 % of AGS relative density).

REGENERATION/INVASIVE ASSESSMENT

An assessment of the understory reveals that there is some regeneration of native species, but mainly this regeneration is white ash, which will be killed by Emerald Ash Borer (EAB). Invasive honeysuckle, buckthorn, and swallow-wort were also inventoried.

[Image] (above)

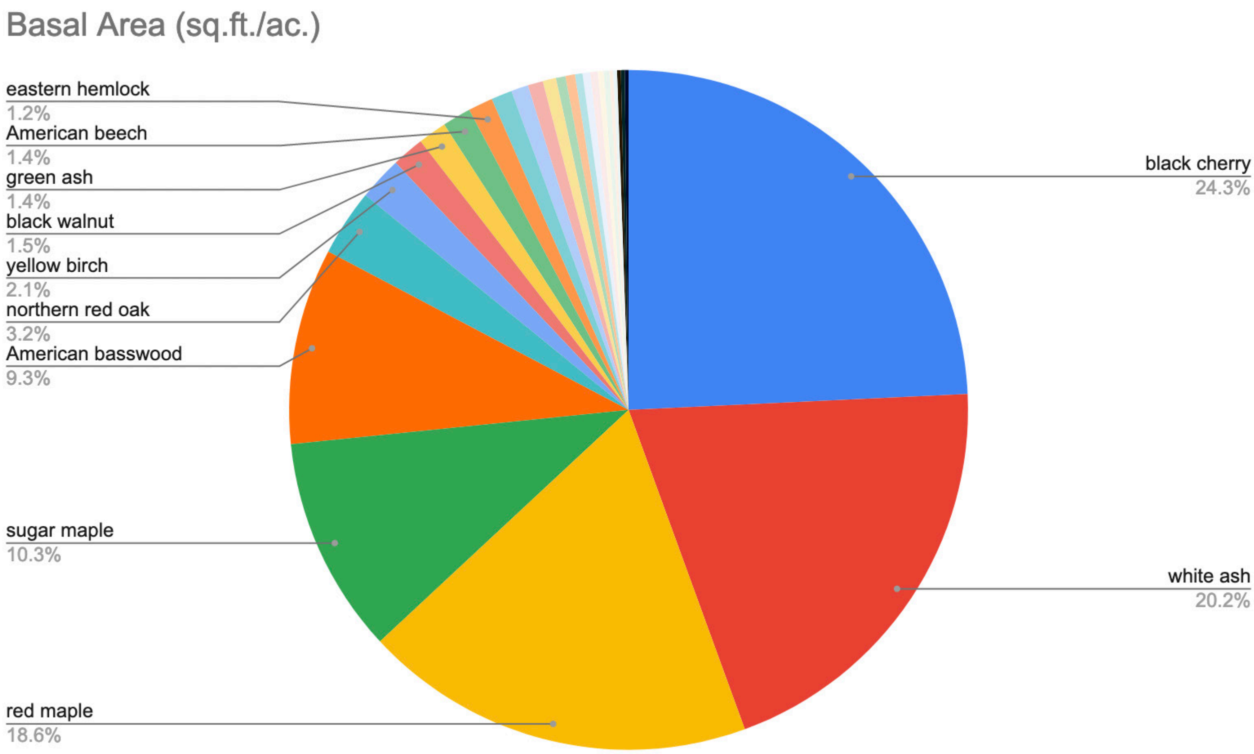
There are both issues and opportunities found in Stand 2. In the foreground there is a significant patch of native bloodroot, in the background invasive shrubs. A mix of native hardwoods and plantation trees make up the species composition.

STAND 3 - OLD FOREST SOUTH - MAPLE DOMINANT W/ NORTHERN HARDWOODS- 9.90 ACRES

Stand 3 is a native forest remnant stand. This stand has sugar maple and other species associated with Northern Hardwood stands such as black cherry, basswood, hawthorn, red maple, ironwood, red oak, butternut hickory, hemlock, beech, and chokecherry. This stand also has a very large component of white and green ash, which are in decline due to EAB. In the understory this stand has a rich composition of plants which is not found in all the other stands. Virginia creeper, grape vines, false Solomon's seal, flowering raspberry, blackberry, jack in the pulpit, doll's eyes, black cohosh, bloodroot, and Canada mayflower were all surveyed. Also worth noting is a patch of native yew, which is becoming more rare in the area due to deer pressure. The Old Forest South stand is unique in that it includes wetland areas, lakeshore, and some areas of deep mesic soils.

SPECIES COMPOSITION

The total basal area of the overstory and understory combined is 110.3 square feet per acre. For the overstory only, acceptable growing stock for timber (AGS) is 69.9 square feet per acre and the basal area of unacceptable growing stock for timber (UGS) is 40.4 square feet per acre.



Species	Basal Area (sq.ft./ac.)	Relative Dominance (%)
black cherry	26.8	24.27
white ash	22.3	20.20
red maple	20.6	18.65
sugar maple	11.4	10.31
American basswood	10.3	9.33
northern red oak	3.5	3.21
yellow birch	2.3	2.10
black walnut	1.7	1.56
green ash	1.5	1.35
American beech	1.5	1.33
eastern hemlock	1.3	1.16
American elm	1.1	0.97
red pine	0.9	0.79
Norway spruce	0.8	0.76
European larch	0.7	0.60
American hornbeam	0.5	0.49
eastern white pine	0.5	0.43
quaking aspen	0.4	0.35
sweet cherry	0.4	0.35
black locust	0.4	0.35
hawthorn	0.3	0.27
shagbark hickory	0.3	0.23
boxelder	0.2	0.21
hophornbeam	0.2	0.20
black willow	0.2	0.18
Norway maple	0.2	0.16
bitternut hickory	0.2	0.16
Canadian serviceberry	0.0	0.02

This is a large sawtimber stand, with the following diameters:

Species	Mean	Medial	Merchantable	Quadratic	Merchantable Quadratic
sweet cherry	26.4	26.4	26.4	26.4	26.4
shagbark hickory	21.4	21.4	21.4	21.4	21.4
northern red oak	21.3	31.8	31.8	24.2	24.2
black willow	18.9	18.9	18.9	18.9	18.9
sugar maple	17.5	23.4	23.4	19.0	19.0
American beech	16.8	18.1	18.1	17.2	17.2
black walnut	14.3	19.0	19.0	15.5	15.5
red maple	13.8	19.6	19.6	15.2	15.2
American basswood	13.8	23.0	23.1	15.9	16.0
eastern hemlock	13.5	17.4	17.4	14.6	14.6
black cherry	13.3	17.2	17.2	14.2	14.2
European larch	12.9	13.9	13.9	13.1	13.1
yellow birch	12.2	13.3	13.3	12.5	12.5
black locust	11.6	12.6	12.6	11.8	11.8
quaking aspen	11.5	12.6	12.6	11.8	11.8
boxelder	11.3	13.0	13.0	11.7	11.7
Norway spruce	10.9	12.3	12.3	11.3	11.3
eastern white pine	10.8	12.2	12.2	11.1	11.1
white ash	10.1	14.1	14.2	11.0	11.2
bitternut hickory	10.0	11.0	11.0	10.2	10.2
Norway maple	9.9	11.8	11.8	10.4	10.4
red pine	9.7	10.7	10.7	10.0	10.0
green ash	9.3	11.4	11.5	9.8	10.0
American elm	9.2	11.0	11.0	9.6	9.6
hophornbeam	8.8	9.7	9.7	9.0	9.0
American hornbeam	7.3	7.6	7.6	7.4	7.4
hawthorn	7.3	7.5	7.5	7.3	7.3
Canadian serviceberry	6.0	6.0	6.0	6.0	6.0
All species	12.3	18.3	18.3	13.6	13.7

STRUCTURE

Stand 3 has density of 109.8 trees/acre. The stand relative density is 59% of the average maximum stocking expected in undisturbed stands of similar size and species. This density is within the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.

Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. On most stocking charts, 100% relative density is represented as the A-line. If relative density is at least 60% and below 100%, trees can fully occupy the growing site. Maximum stand growth occurs near 60% (the B-line), and enough trees occupy the site to discourage detrimental effects on growth form. The lower limit of stocking necessary to reach 60% (B-line) stocking in ten years on average sites is centrally represented as the C-line and corresponds roughly to 40%

Species	Relative density	Q-factor	AGS relative density
red maple	11	1.10	3
black cherry	10	1.14	3
white ash	10	1.17	3
sugar maple	9	1.02	3
American basswood	5	1.04	3
northern red oak	3	0.98	3
yellow birch	2	0.90	3
black walnut	2	1.01	3
green ash	1	1.04	3
American beech	1	0.98	3
American elm	1	1.12	3
eastern hemlock	1	1.06	3
red pine	0	1.05	3
American hornbeam	0	1.15	3
European larch	0	1.18	3
Norway spruce	0	1.04	3
quaking aspen	0	0.99	3
black locust	0	0.98	3
hawthorn	0	1.30	3
shagbark hickory	0	0.00	3
eastern white pine	0	1.14	3
hophornbeam	0	1.11	3
sweet cherry	0	0.00	3
bitternut hickory	0	1.00	3
boxelder	0	1.00	3
Norway maple	0	1.12	3
black willow	0	0.00	3
Canadian serviceberry	0	0.00	3

relative density.

The shape of an uneven sized forest can be described with a measure called a q-factor. The q-factor defines the change of tree numbers across diameter classes. Q-factor typically range from 1.1 to 1.9, with the lower numbers typically applying to stands with shade tolerant species. The q-factor for this stand is 1.13. The table above lists the q-factor for each tree species. The q-factor could not be calculated for species displaying a value of zero. One inch size classes were used to compute the q-factor values.

Trees of acceptable quality for future growing stock provide enough stocking by themselves to warrant stand management (39 % of AGS relative density).

REGENERATION/INVASIVE ASSESSMENT

An assessment of the understory reveals that there is native plant regeneration, but deer browse is steering regeneration towards unpalatable species to deer. Invasive barberry, honeysuckle, and buckthorn were also inventoried.

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[Image] (above)

The larger wetland located in Stand 3 is accessible via a bridge/boardwalk.

STAND 4 - PLANTATION NORTH - MIXED PLANTATION - 3.28 ACRES

This stand is the first of two stands that are plantations. This plantation is mainly planted to Norway spruce, larch, and white pine. The understory has regeneration of some hardwood trees and shrubs including chokecherry, basswood, white ash, and black locust (considered invasive).

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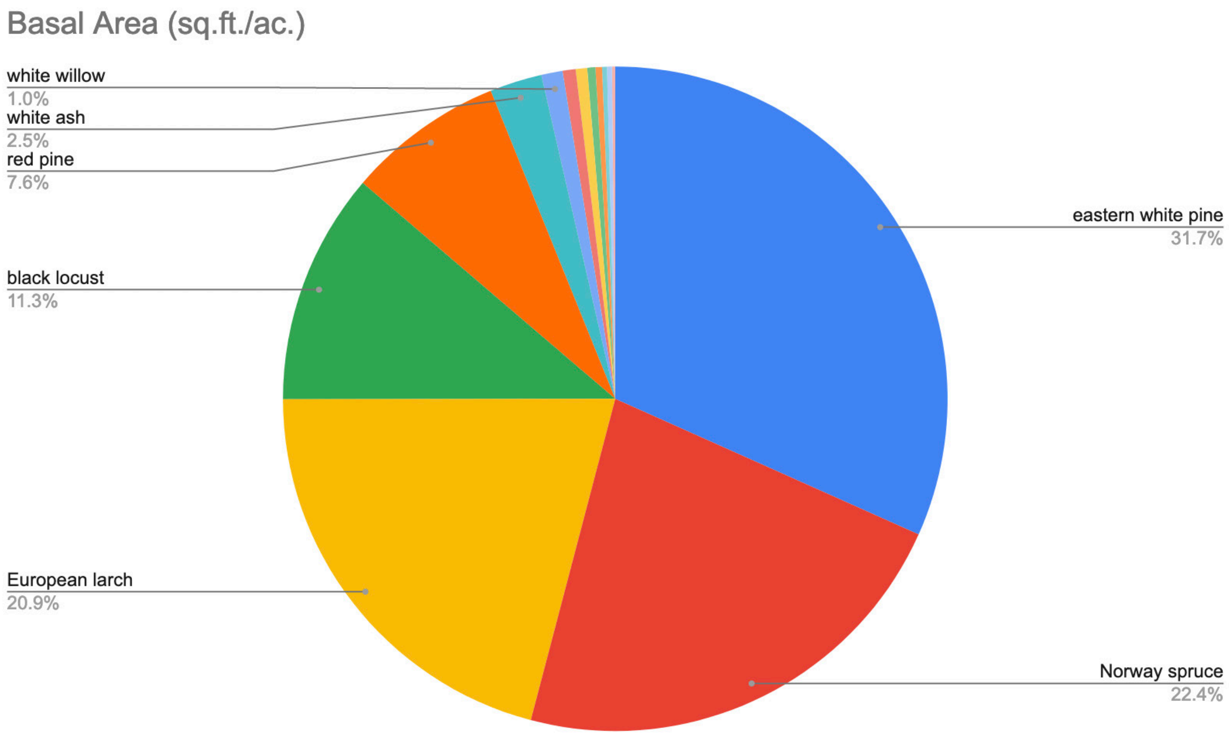
SPECIES COMPOSITION

The total basal area of the overstory and understory combined is 125.9 square feet per acre. For the overstory only, acceptable growing stock for timber (AGS) is 113.7 square feet per acre and the basal area of unacceptable growing stock for timber (UGS) is 12.2 square feet per acre.



Species	Basal Area (sq.ft./ac.)	Relative Dominance (%)
eastern white pine	39.9	31.65
Norway spruce	28.2	22.37
European larch	26.3	20.87
black locust	14.2	11.28
red pine	9.6	7.65
white ash	3.2	2.52
white willow	1.3	0.99
boxelder	0.8	0.67
bigtooth aspen	0.7	0.52
black cherry	0.5	0.41
Scotch pine	0.4	0.35
green ash	0.3	0.27
American elm	0.3	0.26
red maple	0.2	0.18

This is a small sawtimber stand, with the following diameters:

Species	Mean	Medial	Merchantable	Quadratic	Merchantable Quadratic
bigtooth aspen	19.9	19.9	19.9	19.9	19.9
white willow	19.4	19.6	19.6	19.5	19.5
American elm	14.1	14.1	14.1	14.1	14.1
European larch	12.5	13.2	13.2	12.7	12.8
red maple	11.7	11.7	11.7	11.7	11.7
Scotch pine	11.6	11.6	11.6	11.6	11.6
Norway spruce	10.0	11.4	11.4	10.3	10.3
eastern white pine	9.9	11.3	11.3	10.2	10.2
white ash	9.2	10.8	10.9	9.6	9.7
black cherry	9.0	13.4	13.9	10.2	12.1
boxelder	8.3	9.3	9.3	8.5	8.5
green ash	8.1	8.7	8.7	8.2	8.2
black locust	8.1	9.3	9.3	8.3	8.3
red pine	7.9	8.9	8.9	8.1	8.1
All species	9.7	11.4	11.4	10.1	10.2

STRUCTURE

Stand 4 has density of 226.2 trees/acre. The stand relative density is 63% of the average maximum stocking expected in undisturbed stands of similar size and species. This density is within the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.

Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. On most stocking charts, 100% relative density is represented as the A-line. If relative density is at least 60% and below 100%, trees can fully occupy the growing site. Maximum stand growth occurs near 60% (the B-line), and enough trees occupy the site to discourage detrimental effects on growth form. The lower limit of stocking necessary to reach 60% (B-line) stocking in ten years on average sites is centrally represented as the C-line and corresponds roughly to 40% relative density.

Species	Relative density	Q-factor	AGS relative density
eastern white pine	16	1.29	3
European larch	16	0.75	3
Norway spruce	11	1.22	3
black locust	10	1.35	3
red pine	5	1.22	3
white ash	2	1.06	3
boxelder	1	1.08	3
white willow	1	1.00	3
bigtooth aspen	0	0.00	3
green ash	0	1.26	3
Scotch pine	0	0.00	3
American elm	0	0.00	3
black cherry	0	1.00	3
red maple	0	0.00	3

The shape of an uneven sized forest can be described with a measure called a q-factor. The q-factor defines the change of tree numbers across diameter classes. Q-factor typically range from 1.1 to 1.9, with the lower numbers typically applying to stands with shade tolerant species. The q-factor for this stand is 1.16. The table above lists the q-factor for each tree species. The q-factor could not be calculated for species displaying a value of zero. One inch size classes were used to compute the q-factor values.

Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves (56 % of AGS relative density).

REGENERATION/INVASIVE ASSESSMENT

An assessment of the understory reveals that there is some native hardwood regeneration, but this is being limited by competing and invasive vegetation. Invasive black locust and honeysuckle are the largest threat, but herbaceous plants such as dame's rocket, garlic mustard, and japanese knotweed (near field edge) were also inventoried. Swallowwort has not become a large issue in this stand but should be managed to keep the plant from proliferating as it exists in surrounding areas (mainly the southern plantation).

[Image] (above)

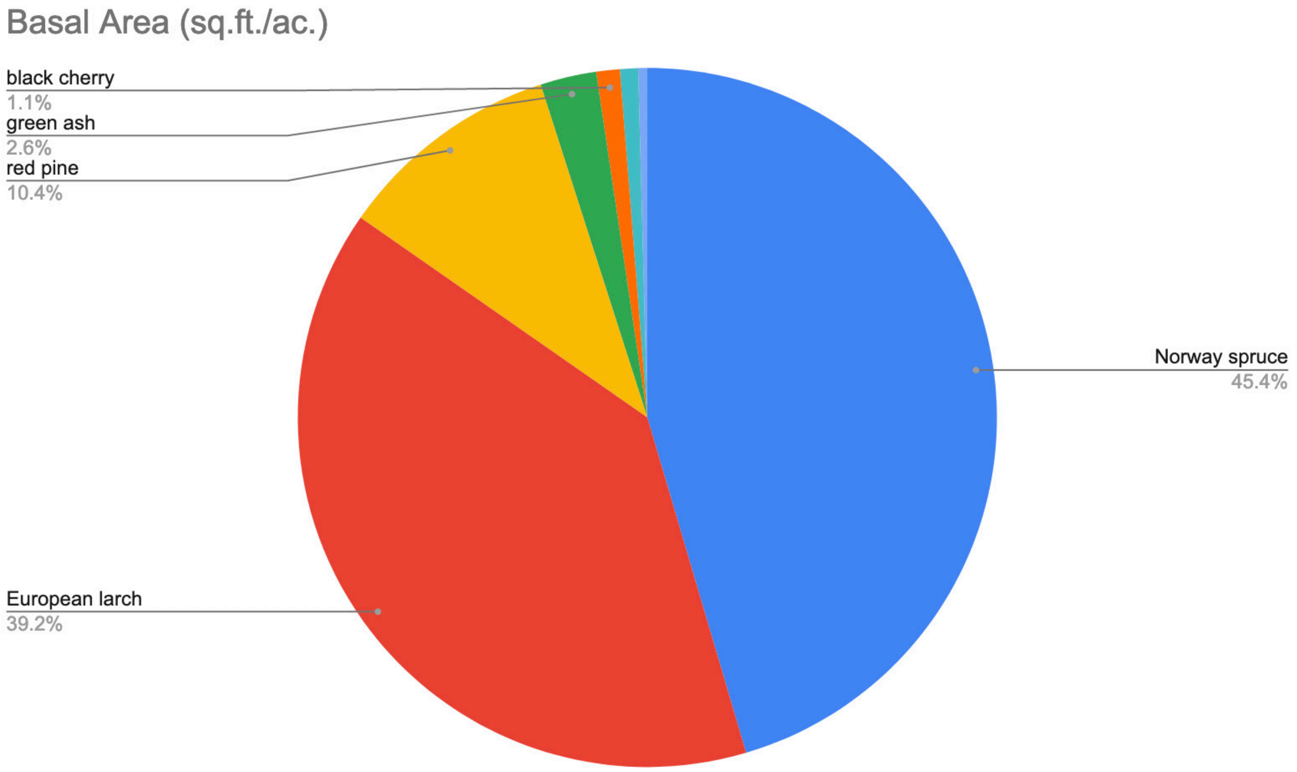
Stand 4 is a plantation which has some native hardwood regeneration, but, several areas have high invasive pressure with little to no regeneration. As trees die from competition, light penetrates onto the forest floor and helps invasive plants to proliferate.

STAND 5 - PLANTATION SOUTH - MIXED PLANTATION - 1.18 ACRES

Stand 5 is the second stand that is a plantation. It is a predominantly Norway spruce and larch plantation, with some pines. There is some minor maple and ash regeneration. The stand exists at the most southeastern section of Dwyer Park, and borders a waterway that connects Goodale Lake to Little York Lake. Along this edge, the stand has an intrusion of invasive plants including swallowwort.

SPECIES COMPOSITION

The total basal area of the overstory and understory combined is 119.6 square feet per acre. For the overstory only, acceptable growing stock for timber (AGS) is 112.2 square feet per acre and the basal area of unacceptable growing stock for timber (UGS) is 7.3 square feet per acre.



Species	Basal Area (sq.ft./ac.)	Relative Dominance (%)
Norway spruce	54.3	45.42
European larch	46.9	39.23
red pine	12.4	10.38
green ash	3.1	2.59
black cherry	1.3	1.07
Scotch pine	1.0	0.86
Norway maple	0.5	0.45

This is a small sawtimber stand, with the following diameters:

Species	Mean	Medial	Merchantable	Quadratic	Merchantable Quadratic
European larch	11.9	13.0	13.0	12.2	12.2
Norway spruce	11.0	12.7	12.7	11.5	11.5
Norway maple	10.9	10.9	10.9	10.9	10.9
Scotch pine	10.6	10.8	10.8	10.6	10.6
black cherry	9.4	10.5	10.5	9.7	9.7
red pine	9.0	9.3	9.3	9.1	9.1
green ash	8.5	9.2	9.2	8.7	8.7
All species	10.9	12.3	12.3	11.2	11.2

STRUCTURE

Stand 5 has density of 176.3 trees/acre. The stand relative density is 59% of the average maximum stocking expected in undisturbed stands of similar size and species. This density is within the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.

Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. On most stocking charts, 100% relative density is represented as the A-line. If relative density is at least 60% and below 100%, trees can fully occupy the growing site. Maximum stand growth occurs near 60% (the B-line), and enough trees occupy the site to discourage detrimental effects on growth form. The lower limit of stocking necessary to reach 60% (B-line) stocking in ten years on average sites is centrally represented as the C-line and corresponds roughly to 40% relative density.

Species	Relative density	Q-factor	AGS relative density
European larch	28	0.97	3
Norway spruce	20	1.12	3
red pine	7	1.18	3
green ash	3	1.16	3
Scotch pine	1	1.00	3
black cherry	1	1.00	3
Norway maple	0	0.00	3

The shape of an uneven sized forest can be described with a measure called a q-factor. The q-factor defines the change of tree numbers across diameter classes. Q-factor typically range from 1.1 to 1.9, with the lower numbers typically applying to stands with shade tolerant species. The q-factor for this stand is 1.16. The table above lists the q-factor for each tree species. The q-factor could not be calculated for species displaying a value of zero. One inch size classes were used to compute the q-factor values.

Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves (54 % of AGS relative density).

REGENERATION/INVASIVE ASSESSMENT

An assessment of the understory reveals that there is little to no regeneration of native species, other than a limited amount of maple and ash. Establishment of new tree, shrub and herbaceous plants in the stand is limited by competing vegetation and deer. Invasive swallowwort is the largest threat, with barberry and honeysuckle present. This stand also has a large Norway maple that has successfully seeded out into the stand around it.

[Image] (above)

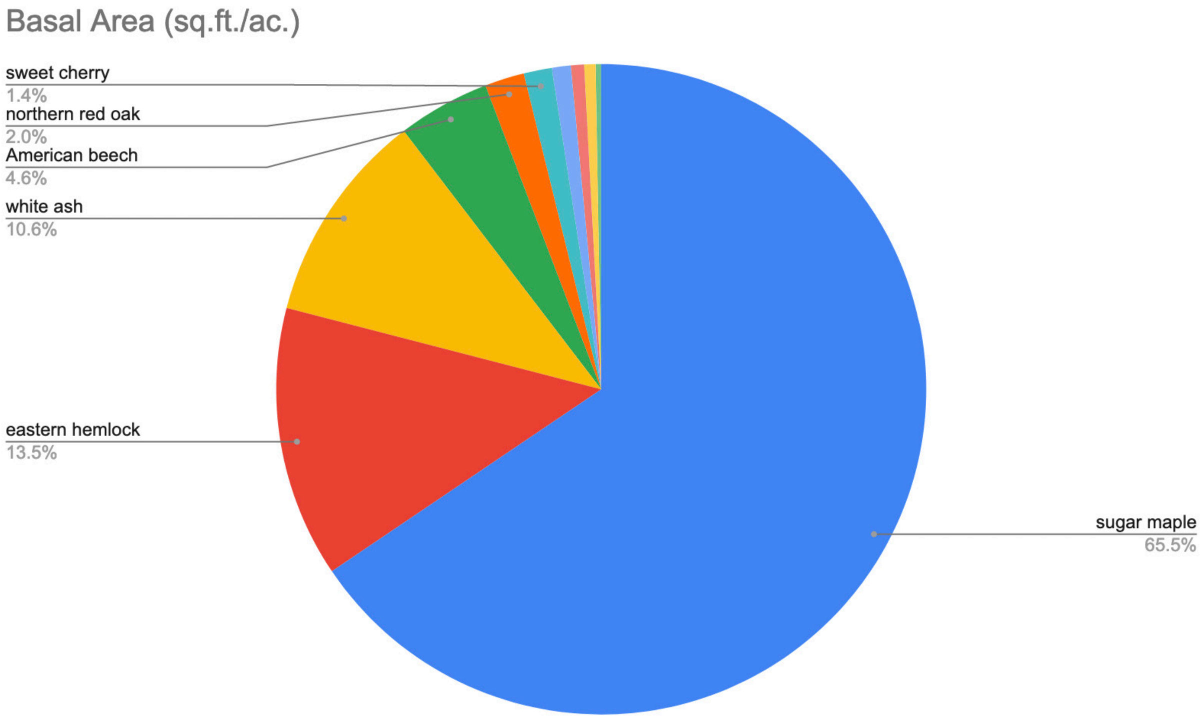
These understory in Stand 5, a plantation, has been overtaken by swallowwort and needs to be maintained to allow for native plants to regenerate.

STAND 6 - OLD FOREST NORTH - NORTHERN HARDWOODS - 0.57 ACRES

Stand 6 is a native forest stand located on the transition from the uplands of the open/mown stand to the bottomland/wetlands to the east of Green Lake. It is a Northern Hardwoods stand dominated primarily by sugar maple and beech. Also the stand has hemlock, ash, basswood, black cherry, and red oak in it's makeup. This stand has limited invasive tree/shrub pressure, mostly honeysuckle and barberry at low numbers. Cohosh and white snakeroot were also surveyed (herbaceous plants that are not palatable to deer).

SPECIES COMPOSITION

The total basal area of the overstory and understory combined is 106.9 square feet per acre. For the overstory only, acceptable growing stock for timber (AGS) is 79.6 square feet per acre and the basal area of unacceptable growing stock for timber (UGS) is 27.3 square feet per acre.



Species	Basal Area (sq.ft./ac.)	Relative Dominance (%)
sugar maple	70.0	65.46
eastern hemlock	14.4	13.48
white ash	11.3	10.56
American beech	4.9	4.59
northern red oak	2.1	1.94
sweet cherry	1.5	1.39
yellow birch	1.0	0.97
hophornbeam	0.7	0.70
American elm	0.6	0.59
green ash	0.3	0.32

This is a large sawtimber stand, with the following diameters:

Species	Mean	Medial	Merchantable	Quadratic	Merchantable Quadratic
eastern hemlock	21.4	26.6	26.6	23.0	23.0
sugar maple	17.6	21.3	21.3	18.7	18.7
American beech	11.5	19.0	19.0	13.4	13.4
sweet cherry	9.0	9.1	9.1	9.1	9.1
white ash	8.8	14.1	14.1	9.8	9.8
northern red oak	8.5	9.4	9.4	8.7	8.7
American elm	8.3	8.3	8.3	8.3	8.3
yellow birch	7.5	7.8	7.8	7.6	7.6
hophornbeam	6.4	6.4	6.4	6.4	6.4
green ash	6.1	6.1	6.1	6.1	6.1
All species	13.2	20.4	20.4	15.0	15.0

STRUCTURE

Stand 6 has density of 91.2 trees/acre. The stand relative density is 75% of the average maximum stocking expected in undisturbed stands of similar size and species. This density is within the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.

Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. On most stocking charts, 100% relative density is represented as the A-line. If relative density is at least 60% and below 100%, trees can fully occupy the growing site. Maximum stand growth occurs near 60% (the B-line), and enough trees occupy the site to discourage detrimental effects on growth form. The lower limit of stocking necessary to reach 60% (B-line) stocking in ten years on average sites is centrally represented as the C-line and corresponds roughly to 40% relative density.

Species	Relative density	Q-factor	AGS relative density
sugar maple	54	1.00	3
eastern hemlock	7	1.00	3
white ash	5	1.08	3
American beech	4	1.00	3
northern red oak	2	1.19	3
sweet cherry	1	0.00	3
yellow birch	1	1.00	3
hophornbeam	1	1.00	3
American elm	1	0.00	3
green ash	0	0.00	3

The shape of an uneven sized forest can be described with a measure called a q-factor. The q-factor defines the change of tree numbers across diameter classes. Q-factor typically range from 1.1 to 1.9, with the lower numbers typically applying to stands with shade tolerant species. The q-factor for this stand is 1.04. The table above lists the q-factor for each tree species. The q-factor could not be calculated for species displaying a value of zero. One inch size classes were used to compute the q-factor values.

Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves (58 % of AGS relative density).

REGENERATION/INVASIVE ASSESSMENT

An assessment of the understory reveals that there is some regeneration of native species, but plants such as white snakeroot which is unpalatable to deer are becoming more abundant. Establishment of new tree, shrub and herbaceous plants in the stand may be limited by deer. Invasive honeysuckle and barberry were also inventoried in low numbers.

[Image] (above)

Stand 6 along the northern edge of Dwyer Park has a nice collection of northern hardwood trees on it's upland section, and wetland trees and shrubs deeper into the Stand to the north. This very northern section is inaccessable to park visitors.