Crescent Park, Sea Girt Borough
Forest Stewardship Plan

(with Platform tennis revision)

Landowner: Borough of Sea Girt
Mailing Address: 321 Baltimore Boulevard, PO Box 296, Sea Girt, NJ 08750

Contact: Borough Business Administrator James Gant (732) 449-9433

Property Location: Surrounded by "The Crescent", between 1st and 2nd Avenue
Plan Date: October 20, 2017
Revision Date: June 4, 2021
Plan Period: October 20, 2017 - October 19, 2027
Tax Block / Lots: Block 9 / Lot 22
Property Acreage: Tax record for total property = 17.66 acres

Woodland Acreage: 16.92 acres – with expanded Platform tennis court

Prepared by: Donald Donnelly, NJ Approved Forester, NRCS TSP # TSP-10-6805,
Licensed Tree Expert #376
New Jersey Audubon, Wattles Stewardship Center
1024 Anderson Road, Port Murray, NJ 07865
(908) 396-6705

Signature NJ Approved Forester

Amendment by: Bill Brash, NJ Approved Forester, Licensed Tree Expert #375
Shelterwood Forest Managers, LLC
5 Wildwood Way
Freehold, NJ 07728

Bill Brash

Signature NJ Approved Forester (2021 revision)

July 12, 2021

Date

Stewardship Pledge:
As a forest landowner, I believe the right to own land also carries the responsibility for stewardship of the natural resources in my care. I have read the attached ten-year Forest Stewardship Plan and agree to implement the plan to the best of my ability.

Signature Authorized Sea Girt Representative,
*Note - this plan is not being used for Farmland Assessment related purposes.

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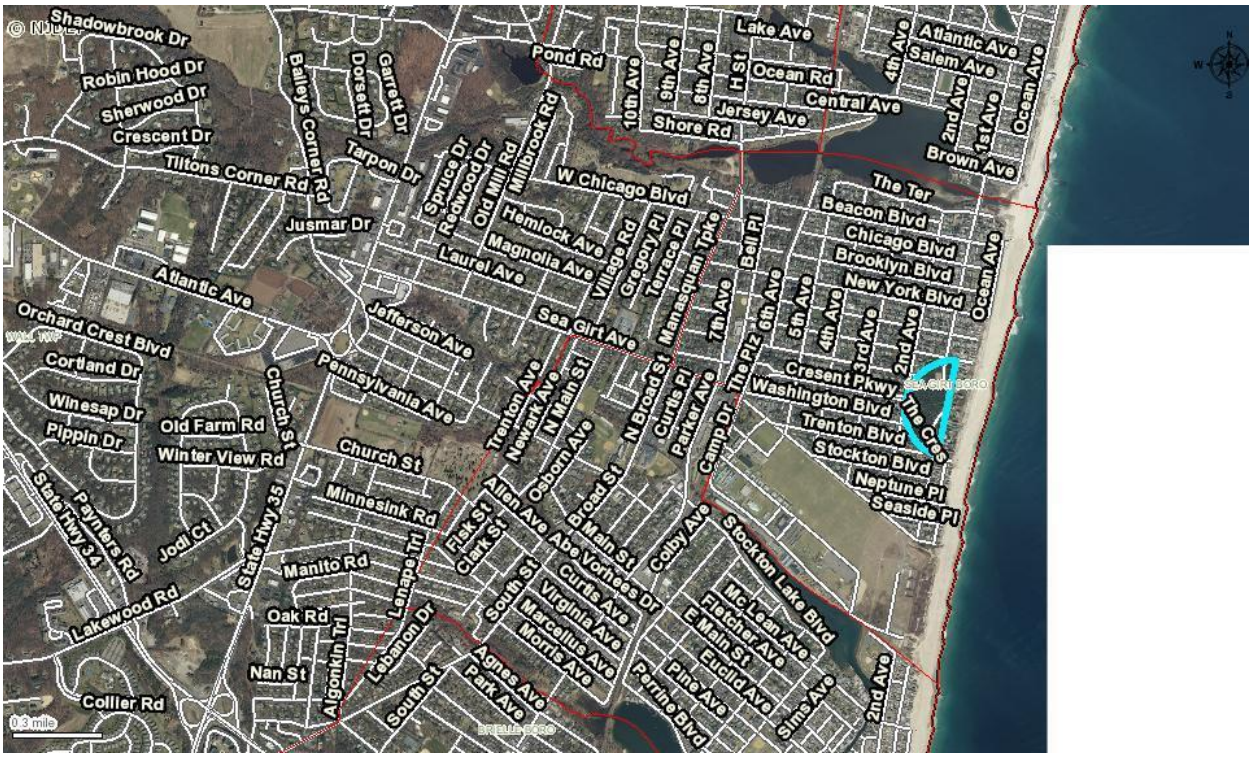
PROPERTY LOCATION & DIRECTIONS

The subject property is located one block in from the ocean, approximately midway between the northern and southern extents of Sea Girt Borough as shown in blue on the map below. The parcel is bound to the west by a road called *The Crescent*, and is bound in the east by private residences that lie between the park and the oceanfront. Crescent park is most easily accessed from 1st Avenue, which cuts through the eastern half of the park and includes a number of pull-offs for parking. The adjacent beachfront residences are also accessed via 1st Avenue, with driveways extending through the east side of the park.



PROPERTY BACKGROUD, HISTORY & GENERAL FOREST HEALTH

Historical accounts indicate that the area known as Sea Girt consisted primarily of cultivated farmland throughout much of the 1800's. However, the harsh conditions and nutrient poor soils directly adjacent to the ocean are typically poorly suited to row cropping, and were undoubtedly left as maritime forest cover because of this. Forests were also maintained along the coast to provide a buffer from the direct effects of high winds and sea surges during storm events. The town's motto "Where the Cedars Meet the Sea" suggest at least anecdotal evidence of the significance of forests to the area. The borough of Sea Girt was established from Wall Township in 1917, and its origins can be traced to the *Sea Girt Improvement Corporation*, which had purchased the land to develop a speculative resort community. Aerial imagery from the 1930's confirms that although a network of roads had been established in the borough, much of the uplands along the beachfront was still undeveloped and remained largely in forest cover at the time.

The design for Crescent Park was built into the original plans for the resort community as an

undeveloped center for recreation. Today, the park remains an integral piece of open space for passive and active recreation, and it is one of the few remaining patches of maritime forest that are of significant size to provide stop-over habitat for migrating birds.

There is no evidence of any sort of vegetation management occurring within the park. The existing vegetative structure suggests that the forest has undergone a typical pattern of maritime forest succession, with very little disturbance having affected that dynamic over the years. Current forest conditions will be discussed in greater detail later in this plan.

LANDOWNER MANAGEMENT GOALS

- To maintain forest cover for the enjoyment of passive and active recreational use of local residents.
- To improve forest health and ecosystem services, and to specifically begin addressing the proliferation of non-native vegetation becoming established in the understory.
- To maintain the unique wildlife values associated with the maritime forest type, which has become an increasingly rare component of the coastal landscape throughout the region.

PROPERTY BOUNDARIES

Property boundaries are normally addressed as part of the overall management of a parcel to ensure that activities are not occurring on neighboring tracts, or so that neighboring properties can be adequately buffered from such activities. In the case of Crescent Park, the public road network provides a functional boundary for most of the park. The exception to this is the eastern boundary that is shared with residences along the beachfront. This boundary is not currently delineated, and in the absence of getting the boundary established via a licensed surveyor, 1st Avenue could be used temporarily as a default boundary. However, recognizing that natural processes and plant germination do not abide by human devised tax lot lines or roads, it would behoove the town administration to establish a working relationship with the residential property owners along 1st Avenue to collectively manage the forest under some unified principals - regardless of the actual boundary position. An example of the importance of such collective management includes the control of non-native plant populations, which can quickly become re-established from nearby populations that are left untreated.

RECREATION & AESTHETICS

On numerous occasions during the field reconnaissance for this plan, NJA staff encountered individuals who were walking through the park, and who expressed satisfaction with the ability to recreate here because of the tree cover and uniqueness of the forest. Due to our limited time at the park, we are unable to fully account for all attributes that residents find valuable, but clearly from an ecosystem services perspective, the ability to escape from adjacent residential development into the canopy of trees may be the highest value that the park serves for residents. Many visitors did convey a need to ensure that the forest remained healthy, but did not specify any related items of concern.

High winds, salt spray and poor soil nutrients, are all components of the harsh environment for plants found at the coastal interface. These factors limit tree growth and give the maritime forest

its characteristic appearance that differs from most other forests. Furthermore, Crescent Park contains a significant amount of relatively mature American holly growing in groups of co-dominant stems, which of-itself is somewhat rare. The sections of the park that are dominated by mature holly present a special appearance that needs to be considered appropriately when undertaking future management activities.

0.32% of the woodlands will be removed from the FSP for the purposes of installing an additional Platform tennis court. See map of proposed revision on page 19 (last page). No other changes are anticipated and all goals and objectives as originally set are still proposed.

CULTURAL & HISTORIC RESOURCES

To ensure that cultural resources are not impacted by management activities, a search was conducted online through the NJDEP GeoWeb portal to see if Crescent Park has any historic significance. As illustrated on the attached *Historic Resources* map, this parcel was not listed as an historic property, nor is it within a historic district. Additionally, there were no items encountered during the field inventory that would have cultural significance to the history of the site.

SOILS

A custom soil report has been completed for this plan using the Natural Resources Conservation Service (NRCS) online *Web Soil Survey*. The soil report includes soil mapping and comprehensive information on soil capability classification, vegetative productivity, and relevant soil limitations.

The soil type found here is the Downer Complex, 0%-5% slopes. Downer soils are not considered prime farmland, nor are they highly productive for forestland uses. The site index for black oak is 70. The soils support a tree productivity rate of about 52 cubic feet / acre / year for most of the hardwood species that commonly occur on them.

The general limitations for site activities in Downer soils include a risk of erosion when exposed (due to loose soil structure), and low water availability / drought susceptibility. Soil rutting and compaction are not problems for these soils.

The proposed activities that are recommended in this plan are relatively small in scale, and to not employ the use of heavy equipment that would cause significant soil disturbance. Therefore, they should not cause any measurable erosion issues.

WATER, RIPARIAN RESOURCES, WETLANDS & BMPs

In New Jersey, freshwater wetlands and their associated transition buffers are regulated under the Freshwater Wetlands Protection Act (FWPA) NJAC 13:9B, and unauthorized forestry activities are considered a regulated activity in these areas. The size of the transition buffer varies according to the resource classification of the wetland, and in many forested situations,

the wetland receives the highest classification (i.e. Exceptional Resource Value) and the largest buffer – which is 150' from the wetland edge.

Although a formal wetland delineation is beyond the scope of this plan, no obvious freshwater wetlands were noted as part of the visual inspection of the park. This assessment is seemingly confirmed by the 2012 wetlands mapping that is available on the NJDEP GeoWeb program.

The attached *Wetland & Streams* map does show a narrow band of wetlands approximately 300 feet offsite from the boundary, paralleling the ocean, but none any closer. The offsite wetlands are adequately buffered from any forest stewardship activities that might occur within Crescent Park, and no further measures are required to protect them.

All surface waters in the state of New Jersey are classified and regulated under the Surface Water Quality Standards (SWQS) NJAC 7:9B, and many open waters are also regulated under the Flood Hazard Area Control Act (FHACA) NJAC 58:16A. The regulated areas surrounding water bodies (as they pertain to forestry work) are called Riparian Zones, and the width of the zone depends on the SWQS classification for the waterbody.

Upon visual inspection of the park, there were no streams or other bodies of water found in the park. The NJDEP GeoWeb program confirms the absence of steams within, or near the park.

WILDFIRE IMPLICATIONS

Historically, natural wildfires helped shape and perpetuate many of the forest communities that we have in New Jersey, and fires remain beneficial for a variety of ecological functions. Today however, wildfires are less common for several reasons, and when they do occur, they are generally suppressed quickly over concerns for loss to human life or property. In many situations, controlled prescribed burning can be used to replicate natural fire regimes to meet certain management objectives. Prescribed burning can also be an effective tool for reducing excessive fuel loads and protect against catastrophic fires. On this property, the vegetation structure and species composition do not present a severe wildfire risk, but the use of prescribed burning on parts of this property could be helpful in perpetuating desirable plant communities. However, the opportunity to use prescribed burning here is very limited due to the proximity of homes and other surrounding development.

Although the hazard of an uncontrolled wildfire occurring on this property is relatively low, if a fire did breakout, the property is adjacent to many roads and access points to help gain control of the spread.

THREATENED & ENDANGERED SPECIES

A US Fish & Wildlife Service (USFWS) *Trust Resources* species list was generated for the property via their online portal, and is attached in the appendices for reference.

According to the report, there are no critical habitats for federally listed species on the property.

The report lists two federally Threatened species, Piping plover *Charadrius melodus* and Seabeach Amaranth *Amaranthus pumilus,* that are thought to occur in the area of Crescent Park. Both species are associated with sand dune habitat containing sparse vegetation. Crescent Park does not contain sand dunes and is heavily vegetated, and therefore does not hold suitable habitat for either species. Piping plover and Seabeach Amaranth should not be affected by forest stewardship activities. Fact sheets for both species are included as attachments to this plan.

The USFWS report also lists numerous birds that are subject to the Migratory Bird Treaty Act. These birds should be considered during management so that the appropriate conservation measures can be employed to avoid harming them. Since there is very little tree cutting proposed in this plan, the birds noted in the report are unlikely to be impacted in any way. The primary mechanism to avoid negatively impacting most bird species is to conduct tree felling operations during the dormant season, when most are no longer breeding. Activities proposed in this plan will be likely be undertaken during the winter months. Additionally, prior to commencing work, a careful review of the site should occur in order to determine if nesting birds are present, and will be harmed by the actions. Activity near nests should be deferred to a later date.

A NJDEP Natural Heritage Database report for the property was requested from the Office of Natural Lands Management. A copy of that report is included in the attachments also. The report indicates that there are no records of threatened or endangered species occurring on the site, but there are several records for listed species occurring in the general vicinity. Aside from kestrels and ospreys, the remaining species are associated with the ocean, and would not be impacted by forest stewardship work occurring in Crescent Park. Osprey nests are large and conspicuous, making them easy to find if located within the park. If found, they should be buffered from activity during nesting periods. Kestrels generally occupy open areas with sparse woody cover, and as such, are unlikely to be found within the closed canopy woodlands of Crescent Park.

The installation of an additional Platform tennis court is expected to disturb 2500 square feet or 0.32% of the property in an area that is between the parking lot and the existing Platform tennis court. The minor disturbance is expected to have no impact to any Threatened and Endangered species.

WILDLIFE & LANDSCAPE LEVEL CONSIDERATIONS

Being that Crescent Park is an isolated patch of forest lacking connectivity to other blocks of forest, it has minimal value for wildlife species other than birds. Because of the relatively small size of the park (within a forest context), there is little opportunity to create breeding habitat for many birds, however, because the park is one of the few remaining significant blocks of maritime forest along the coast in this area, it could be viewed as critical habitat for *migrating* birds. The mixture of trees and shrubs in maritime forests produce highly nutritious mast and seeds that sustain migrants as they travel between summer and winter ranges. Additionally, the forest patch provides resting cover where birds can stop during their journey and recuperate without the exposure that is found in residential landscapes.

Rather than focusing on any particular species for enhancement, one strategy is to try and broadly increase plant vigor and diversity within the forest, thereby increasing seed production and cover to the benefit of a wide range of birds. This type of general approach is probably the most appropriate for property of this size, which is relatively small and therefore has limitations

regarding targeted wildlife management. Recommendations on how to increase those vegetation values is discussed within the Forest Resources section below.

Any discussion of wildlife in New Jersey would be incomplete without considering deer and their impacts on native vegetation. Sea Girt is not thought to have a significant deer population, and there was not much evidence found at Crescent Park suggesting significant deer use.

Discussions with some residents revealed deer occurrences tend to be rare and of a transient nature, rather than any persistent population. The naturalization of non-native plants here is seemingly a function of site conditions that favor the plants, instead of preferential or excessive browsing by deer.

FOREST RESOURCES

In the absence of natural disturbances (e.g. storms, fire, insects, etc.) or anthropogenic disturbances (clearing and harvesting), forest plant communities evolve through a continuum of predictable successional stages. In most instances, site parameters change (primarily the amount of available sunlight or shade for germination) as succession progresses, often creating unsuitable conditions for the predominant species to perpetuate themselves. This allows a different suite of species to take advantage of the altered conditions, until ultimately a climax stage is achieved. Within a climax forest, plant communities are stabilized as site conditions remain favorable for a select number of species to perpetuate themselves indefinitely, or at least until a disturbance creates different conditions that allow the process to start over again. Accordingly, climax forests are achieved at the expense of diversity, because fewer species can persist this way. Crescent Park is reaching a climax condition - characterized by the position of American holly in the overstory. American holly is quite shade tolerant, meaning that it can germinate and persist under the canopy of other trees. It then maintains a slow and steady growth pattern, eventually replacing other trees as they die. At Crescent Park, remnants of an earlier community of oak, cherry, sassafras and red cedar remain in pockets, but are mostly decreasing because of their inability to reproduce under the dense shade. Many of the largest stems in this forest are oaks that have recently died, or are in severe decline. Many cherries and sassafras can also be found in decline or already dead. Over time, holly continues to gradually occupy more and more of the stand's growing space, converting the forest from an assemblage of mixed upland species to what is essentially a monoculture of holly.

As part of the reconnaissance for this report, tree cores were extracted from a number of co-dominant stems to ascertain the stand age. The oldest trees were found to be between 90 - 120 years old. The average tree height for this stand was approximately 60' - 65', which is below the stand's projected site index of 70'. Considering the site conditions, stand age and the species involved, it is not unexpected that we are witnessing a transition between successional stages at this time.

The primary tree species found occurring at Crescent Park include; **American holly** *Ilex opaca*, **sassafras** *Sassafras albidum*, **black oak** *Quercus velutina*, **white oak** *Quercus alba*, **red maple** *Acer rubrum,* **black cherry** *Prunus serotina,* **scrub oak** *Quercus marilandica* and **black gum** *Nyssa sylvatica*. Additional species that were noted, but were not common enough to be captured as part of the sampling, include; **black locust** *Robinia pseudoacacia*, **bigtooth aspen** *Populus grandidentata,* **Japanese maple** *Acer palmatum*, Little-leaf linden *Tilia cordata* and **crab-apple** *Malus spp.*

The following table provides a breakdown of the predominant species basal area and stem count per acre.

Composition

	All species	American holly	sassafras	black oak	white oak	red maple	black cherry	scrub oak	blackgum
Basal Area (square feet)	181.4	114.3	25.7	18.6	7.1	7.1	5.7	1.4	1.4
Percentage of stand basal area	100.0	63.0	14.2	10.2	3.9	3.9	3.1	0.8	0.8
Stems Per Unit Area (stems per acre)	321.2	243.7	44.0	9.7	9.5	4.9	6.8	1.3	1.2

(Dead observations were omitted when calculating values in this report)

The table below provides a breakdown of the amount of basal area for each species within different diameter classes (DBH). This report includes dead trees.

species	< 2.00	>=2.00 and <=6.00	>6.00 and <=10.00	>10.00 and <=14.00	>14.00 and <=18.00	>18.00 and <=22.00	>22.00 and <=26.00	>26.00 and <=30.00	> 30.00
American holly	0.0	14.3	28.6	48.6	20.0	2.9	0.0	0.0	0.0
sassafras	0.0	2.9	7.1	10.0	8.6	10.0	0.0	0.0	0.0
black oak	0.0	0.0	0.0	1.4	11.4	5.7	2.9	1.4	1.4
black cherry	0.0	0.0	2.9	4.3	1.4	0.0	0.0	0.0	0.0
white oak	0.0	0.0	2.9	1.4	2.9	0.0	0.0	0.0	0.0
red maple	0.0	0.0	0.0	1.4	1.4	2.9	0.0	1.4	0.0
scrub oak	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0
blackgum	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0

n order to best reflect the average tree diameter in a stand (based on the predominant size classes) forestry applications often employ the quadratic mean diameter (QDM), which is the "average tree diameter of the average basal area". Since QDM gives a better approximation of the central tendency rather than a straight mean, it minimizes skewed representation by individual stems occurring at either end of the range. The table below provides the average tree diameters by species.

Diameters

	All species	American holly	sassafras	black oak	white oak	red maple	black cherry	scrub oak	blackgum
Quadratic Mean DBH (inches)	10.2	9.3	10.3	18.7	11.7	16.3	12.4	14.0	15.0
Average DBH (inches)	9.3	8.6	9.1	18.4	11.2	15.6	12.2	14.0	15.0

Stem densities are integral factor in understanding forest stand dynamics, and various densities dictate how a forest develops. There are several stocking index's to evaluate the relationship between the number of stems of any given size and overall basal area. *Relative* density incorporates the difference in growth among *species* into the relationship, and is therefore a good index in mixed species stands. As the following table indicates, the stand-wide relative density at Crescent park is 120% of the optimum (maximum optimum being 100%). At 120% of the optimum, there is an elevated amount of competition between trees for limited growing space. This reduces individual tree vigor, and usually leads to increased mortality among smaller stems. Overall, a stand's resilience to stress is significantly compromised when relative density is high, making it more susceptible to drought, extreme weather, diseases and insect outbreaks.

Relative density

	All species	American holly	sassafras	black oak	white oak	red maple	black cherry	scrub oak	blackgum
Relative Density (percent)	120.42	76.28	15.83	14.22	5.94	3.80	2.40	1.15	0.80
percentage of stand	100.00	63.34	13.14	11.81	4.93	3.15	1.99	0.96	.67
Stems Per Unit Area (stems per acre)	321.2	243.7	44.0	9.7	9.5	4.9	6.8	1.3	1.2

Although growing and harvesting forest products is not currently a management objective for the Borough of Sea Girt, it is often helpful as a descriptive tool, to quantify the volume of vegetation on a site in terms of cordwood and board feet. The following table provides those volumes based on a per acre basis.

Volumes

	All species	American holly	sassafras	black oak	white oak	red maple	black cherry	scrub oak	blackgum
Sawtimber net total (board feet/acre)	7,590	3,221	1,455	1,618	290	503	306	103	94
Pulpwood net total (cords/acre)	27	19	3	2	1	1	1	0	0
Gross total (cords/acre)	52	31	7	6	2	2	2	0	0

Because trees are long lived, their mere existence is not always a very good indicator of forest health, function, or ecological value. In many instances, the understory vegetation can be a better metric for this, and a diverse understory containing native plants is usually the desired condition to best exemplify good forest health.

At Crescent Park, fourteen evenly spaced inventory locations were established to collect ground cover data within fixed radius plots. This sampling revealed only ten understory plants other than tree seedlings, and of these, four are non-native plants (English ivy, multiflora rose Japanese honeysuckle and double-file viburnum). Although many non-native plants have become endemic and widespread in New Jersey, they are considered invasive to native ecosystems because they displace native vegetation and disrupt ecological processes. Furthermore, they tend to be less palatable and nutritious to local wildlife.

Understory (*i.e. large shrub & sapling*) data was also collected on fixed radius plots, and the resulting data shows the park to be very limited in terms of diversity and density. Only four different tree or tall shrub species were sampled as part of the fixed radius plot inventory, and one of those is the non-native invasive known as Norway maple.

Several other ground cover and understory plants are found in the park (particularly within the forest edge along First Avenue), but were not common enough to be picked up as part of the sampling. They are; pokeweed, winterberry, European privet, mugwort, Japanese knotweed, winged euonymus, clematis and Asiatic bittersweet. Of these, only pokeweed and winterberry are native plants to New Jersey. The others have been known to completely take over native systems and become quite problematic after becoming established.

The core flora are those species common to every ground cover plot. For Crescent Park, the core flora is represented by one species, English ivy *Hedera helix*, which accounts for 77% of the stand's ground cover.

Ground Cover Species	Frequency	Rel Frequency	Percent cover	Rel Percent cover	Importance Value
English ivy	100.00	32.56	68.57	77.17	41.34
sassafras	71.43	23.26	5.43	6.11	31.90
greenbrier	35.71	11.63	5.14	5.79	7.51
multiflora rose	21.43	6.98	2.57	2.89	4.31
Japanese honeysuckle	21.43	6.98	0.86	0.96	3.67
Virginia creeper	21.43	6.98	0.21	0.24	3.43
eastern poison ivy	14.29	4.65	2.86	3.22	3.30
fox grape	7.14	2.33	1.43	1.61	1.65
Viburnum (combined double-file and arrow-wood)	7.14	2.33	1.07	1.21	1.52
Allegheny blackberry	7.14	2.33	0.71	0.80	1.38

Description of Ground Cover Table Items

- **Frequency** = The percentage of plots where this species was observed, based on the number of plots where species occurred divided by total number of plots.
- **Rel Frequency** = Relative frequency of occurrence, based on individual species frequency divided by the total of all species frequencies.

- **Percent cover** = Mean percent coverage. The mean proportion of area that is covered by a vertical projection of the foliage onto the ground surface for all stems or individuals of a given species.
- **Rel Percent cover** = Mean relative percent coverage, based on the individual species percent coverage or basal area divided by the total percent coverage or basal area for all species.
- **Importance Value** = Importance Value, a value computed by arbitrarily adding together the values for relative abundance, relative frequency, and relative dominance and dividing by three.

Understory Species	Stems per acre
sassafras	207
American holly	21
black cherry	14
Norway maple	7

Compiled list of species recorded within the forest sampling

Species	Latin	Overstory	Understory	Ground
black cherry	***Prunus serotina***	X	X	
American holly	***Ilex opaca***	X	X	
sassafras	***Sassafras albidum***	X	X	X
red maple	***Acer rubrum***	X		
English ivy	***Hedera helix***			X
Virginia creeper	***Parthenocissus quinquefolia***			X
black oak	***Quercus velutina***	X		
white oak	***Quercus alba***	X		
Norway maple	***Acer platanoides***		X	
scrub oak	***Quercus marilandica***	X		
blackgum	***Nyssa sylvatica***	X		
greenbrier	***Smilax***			X
multiflora rose	***Rosa multiflora***			X
fox grape	***Vitis labrusca***			X
Japanese honeysuckle	***Lonicera japonica***			X
Allegheny blackberry	***Rubus allegheniensis***			X
double-file viburnum	***Viburnum plicatum***			X
arrowwood viburnum	***Viburnum dentatum***			X
eastern poison ivy	***Toxicodendron radicans***			X

CRESCENT PARK CARBON STORAGE

The quantification of long term carbon storage in forests is dependent on a number of factors that vary according to the site, and the ultimate fate of the trees. One of the best ways to maximize carbon sequestration is to process harvested trees into durable goods that will be maintained for long durations, and then have those trees quickly replaced by new vigorously growing trees. However, this will not be strong option for this property because of the constraints surrounding the management objectives and the public use of the property.

We can assume that given the current tree stocking, age, and site fertility, carbon storage is at, or near maximum for this stand. One strategy to maintain stable carbon levels is to avoid catastrophic dieback (in this case, particularly to holly) and the subsequent spike of released carbon that would be emitted while waiting for new trees to become established. Gradually reducing holly dominance to favor improved tree diversity will provide greater buffering capacity against wide-spread tree loss due to species specific pathogens or insects.

The following tables show the current estimated carbon storage at Crescent Park

Total Live Carbon (total tons)

	Stand Area (ac)	Foliage	Stem Wood	Stem Bark	Aboveground	Coarse Root	Total
Crescent Park	18	20	619	126	998	189	1,186
TOTALS	18	20	619	126	998	189	1,186

Total Dead Carbon (total tons)

	Stand Area (ac)	Foliage	Stem Wood	Stem Bark	Aboveground	Coarse Root	Total
Crescent Park	18	3	83	17	131	25	156
TOTALS	18	3	83	17	131	25	156

Total Live and Dead Carbon (total tons)

	Stand Area (ac)	Foliage	Stem Wood	Stem Bark	Aboveground	Coarse Root	Total
Crescent Park	18	23	703	143	1,129	213	1,342
TOTALS	18	23	703	143	1,129	213	1,342

MANAGEMENT RECOMENDATIONS

The key stand dynamics associated with this forest are:

- The relative decline in those tree species that are common to earlier successional stages of maritime forest types, many of which are important forage producers for migratory birds.

- The continual progression towards a climax overstory of American holly as the dominating overstory species, and the reduced complexity that comes with a "single species" forest. Single species stands are also less resilient to environmental stressors.
- Dwindling diversity at the shrub and ground cover layers, which provides the basis for many important ecosystem services including water conservation, carbon storage and wildlife habitat.
- Relatively high tree stocking, which compromises individual tree vigor due to the stress of competition for resources such as water, sunlight and nutrients.
- The high proportion of non-native invasive species in the park, which further compromises all of the above issues.

The first course of action recommended to begin mitigating these issues is to reduce, or eliminate, the non-native plants to allow for the eventual establishment of preferential native vegetation. Of particular focus should be the English ivy. Despite that some people may find the ivy to be aesthetically pleasing, it is currently the largest disruption to native plant regeneration at the park. It has become so dense that it even seems to be preventing the otherwise shade tolerant American holly from regenerating in the understory. If left unchecked, it may become the only plant persisting in the understory, and as the hollies eventually die (as all trees do), the site would be converted from a forest, to a barren of English ivy.

English ivy can be controlled via mechanical and chemical methods, or potentially a combination of both. Each control method has pros and cons, and the preferred method rests with the landowner's resources and commitment to completing the task a certain way. Generally speaking for invasive plants, long term successful control warrants at least some chemical applications to be effective (and cost effective). Author Jonathan Soll of The Nature Conservancy, prepared a comprehensive summary for controlling English Ivy in the Pacific Northwest, and those experiences should apply equally to Crescent Park. The 12 page document is attached to this plan for reference, and while it reviews the methods they found successful, there are undoubtedly other treatments - including different herbicides - that could provide comparable results. It is beyond the scope of this plan to fully comprehend the resources of the Borough to control the ivy, but consultation with a licensed pesticide applicator who has experience with English ivy would be warranted prior to undertaking the work. It could be feasible to assemble a workforce to first conduct a hand pulling operation to reduce the amount on the forest floor and to sever vines climbing into the trees. Then, conduct herbicide applications to treat the residual materials and new sprouts that occur. This would require less chemicals, but will be much more labor intensive. Undoubtedly, complete control will be a multi-year task, requiring follow-up treatments.

Since English ivy is an evergreen species, it has the unusual characteristic of being susceptible to foliar chemical treatments during the dormant season, when other plants aren't. This allows for a very selective treatment, eliminating the possibility of affecting non-target species. It also allows for applications to occur from very late fall through early spring, when human visitor use is presumably lowest, and wildlife exposure is lowest.

Given the size of the park and available resources, eradication efforts may need to occur as phases over successive years, covering a certain amount of land each year. Some cost per unit estimated are outlined in the attached English ivy control document. Additionally, the adjoining

landowners along First Avenue who also have English ivy should be encouraged to co-operate, otherwise a re-infestation is almost certain.

The populations of mugwort, Japanese knotweed, privet and clematis cannot easily be controlled via mechanical treatments, and should therefore be treated using herbicides. Each plant has a preferred chemical control and treatment process, depending on its location and growing conditions. At Crescent Park, these plants tend to occur in smaller pockets, and can be effectively treated during the growing season while providing very little disruption to visitors and wildlife usage. A licensed pesticide applicator can determine the best treatment methods for each population.

Once sufficient control has been exerted in a given area, the management focus can shift to altering the light regime to allow for more diverse plant growth to occur. This can be accomplished via a Forest Stand Improvement (FSI) treatment with the assistance of a professional forester. Sections of the forest can be selected where a variety of overstory species remain, and where the target trees exhibit sufficient vigor to expect adequate seed development.

Once the ideal candidate trees are selected, the adjacent stems can be culled in order to open the canopy to allow better light penetration to the forest floor. In general, the gaps created would be on the order of 50'- 100' wide, and ideally they would be scattered widely throughout the park to stagger the regeneration. If there are no hiking trails within 75' of the gaps, the trees (which are a maximum of 65' tall) should be girdled and retained as snags for wildlife. Where trails are in close proximity, trees can be felled and left on the ground to serve as coarse woody debris for wildlife use, and to recycle nutrients.

To balance the varied interests for this forest and the unique aesthetic values that it provides to visitors, it is suggested that at least one third of the stand where holly dominates is retained as a climax holly forest, and perhaps the other two thirds are managed for a continuum of various ages and species. However, even where holly is the dominant species, tree stocking is well above the optimum for tree growth, and those sections would be well served by a thinning operation to reduce inter-tree stress and improve residual tree vigor. It is suggested that 30 - 40 sq. feet of basal area per acre can be culled in these sections, which will concentrate growth on the residual stems. This effort should target intermediate and co-dominant stems for removal that already exhibit symptoms of decline. Common signs of decline might include structural defects, decay or compacted bark plates. A secondary benefit of thinning is that the small canopy openings will allow some filtered light to reach lower canopy strata, fostering better understory plant development.

It is suggested that FSI progress slowly through the stand, rather than in a few intense treatments. Completing patches that are smaller than an acre per year (perhaps spread across several spots), will help to minimize the visual impacts and preserve visitor use for most of the park at any given time.

MANAGEMENT SCHEDULE

The proposed management schedule provides a framework that establishes a generally acceptable rate of progress towards management of the property. It is not intended to be definitive, and in conjunction with advice from a resource manager, it should be adjusted as

site conditions change. This could include accommodating unforeseen circumstances such as disease and insect outbreaks, or storm damage. If adaptive management monitoring reveals that significant changes beyond the recommendations contained in the plan are required, the schedule should be modified as a plan amendment. The management schedule can also be accelerated if resources are available to do so.

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Activity	**Stand(s)**	**Year(s)**
English ivy control suggested to commence immediately on approximately five acres per year to complete a rotation through the entire park in three years.	1	2017 - 2019
Conduct follow-up herbicide treatments in English ivy control areas - attempt to complete at least two to five acres per year as needed. Treat other non-native plants using growing season herbicide applications as described in plan	1	2018-2026
As English ivy control is deemed successful and stable, initiate FSI treatments in those areas. Treat an average of 2 acres annually.	1	2020-2027
Re-evaluate stand conditions and update the Forest Stewardship Plan.		2027

ATTACHMENTS

- Maps - Stand, Infrared, Wetlands & Streams, Topo, Historic Resources, 1930's Photo
- English Ivy Control Methods for the Pacific Northwest
- USFWS – Trust Resources List
  (Federal Threatened & Endangered Species List)
- Federal Species Fact Sheets
- NJ DEP Natural heritage Database Report
  (State Threatened & Endangered Species List)
- NRCS Custom Soil Report

GLOSSARY OF TERMS

Acre – An area of land measuring 43,560 square feet. A 1-acre plot measures about 209' x 209'. A circular acre has a radius of 117.75'.

AGS – Acceptable Growing Stock. Trees that are of good form and vigor that are likely to live for at least 15 years. They should be capable of yielding at least one 8' sawlog, or if they are sapling or pole size trees they can be expected to yield a sawlog in the future.

Age – Mean age of the dominant and co-dominant trees in a forest.

All-aged or Uneven Aged Stand – A forest compromised of trees of different ages and sizes.

Aspect – Compass direction to which a slope faces.

Basal Area – The cross sectional area of all trees in a stand, usually expressed as a square feet per acre value. It is normally measured at DBH.

BAF – Basal Area Factor. Number of units of basal area per acre represented by each tree.

Board Foot – A unit of wood measuring 144 cubic inches. A board foot measures 1 inch thick by 12 inches wide by 12 inches long. Board foot volume is determined by:
length (feet) x width(inches) x thickness (inches) / divided by 12.

Bole – The main trunk of a tree.

Butt Rot – Decay or rot confined to the base or lower bole of a tree.

Crown – Upper portion of the tree where most of the leaves are found.

DBH – Diameter at Breast Height. Defined as a tree diameter measurement taken 4.5 feet above the forest floor on the uphill side of a tree.

Dominant Trees – Trees with crowns receiving full light from above and at least partly from the sides; usually larger than the average trees in the stand. The crown extends above the others in the vicinity.

Even Aged – Stand of trees where there are only small differences in age among the individual trees.

FSI – Forest Stand Improvement. Improving the forest quality by removing or deadening undesirable trees to achieve desired stocking and species composition.

Forest Type – Groups of tree species commonly growing in the same stand because their environmental requirements are similar.

Girdling – A physical cutting or disruption of the cambial sap flow around the entire circumference of a tree.

Group Selection – The removal of small groups of trees to regenerate shade intolerant trees in relatively small openings (usually at least ¼ acre).

High Grading – A harvesting technique that removes only the biggest and most valuable trees from a stand and provides high returns at the expense of future growth potential. Poor quality shade tolerant trees tend to dominate in continually high-graded sites.

Improvement Cut – An intermediate cut made to improve the form, quality or health of the remaining stand.

Intermediate Trees – Trees receiving little direct light from above and none from the sides. Usually with small crowns that extend into the canopy of co-dominant trees.

Intolerant Species – Tree relatively incapable of developing and growing normally in the shade of other trees.

Mast – Fruits or nuts used as a food sources by wildlife. Soft mast includes fruits with fleshy coverings, such as dogwood or cherries. Hard mast refers to nuts such as acorn, beech and hickory nuts.

Sawlog or Sawtimber – A log or tree that is at least 12 inches diameter and 8 foot long that can be sawn into lumber.

Silviculture – The art, science, and practice of establishing, tending, and reproducing forest stands of desired characteristics. It is based on knowledge of species characteristics and environmental requirements.

Site Index – A relative measure of forest quality based on the height of co-dominant trees at base age of 50 years old. Helps estimate future productivity.

Slash – Tree tops, branches, bark or other woody residue left on the ground after logging operations.

Stocking – A description of the number of trees, basal area, or volume compared with a desired level for balanced health and growth.

Suppressed Trees – Trees with crowns receiving no direct light from above or the sides. Usually with small crowns that are entirely below the canopy of co-dominant trees.

Thinning – A tree removal practice that reduces tree density and competition between trees in a stand. Thinning concentrates growth on fewer, high quality trees.

Tolerant Species – A tree species that has the ability to grow normally in the shade of other trees.

Proposed Platform tennis Installation
Amendment

Proposed Additional Platform tennis Court

2500 square foot impact or 0.32 % of the property