RUTGERS
New Jersey Agricultural Experiment Station

Cooperative Extension of Morris County
PO Box 900
Morristown, NJ 07963-0900

njaes.rutgers.edu/extension
Phone: 973-285-8300
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11/04/23

Dear Lois Kraus and Philip Round,

It was a pleasure walking through Brightwood Park with you both on October 3rd, 2023, and seeing all the work you have accomplished to reduce invasive plant populations and promote native species. Your work has been and will remain challenging as deer are not excluded from the Park. This results in continued infiltration and spread of invasive plants while native plants continue to be diminished. The success of intense invasive plant treatments is evident and control measures must persist. In addition, there are steps that can be taken to further advance restoration goals, and where possible, can result in a patchwork of successes that grow over time. The following pages include resources and recommendations that can serve as an addendum to Michele Bakacs's report from May 2023.

If you have any questions please feel free to contact me, Jean Epiphan, at jean.epiphan@rutgers.edu or your Count Agent, Michele Bakacs bakacs@njaes.rutgers.edu.

Sincerely,

Jean Epiphan
County Agent | Assistant Professor
Licensed Tree Expert #692
ISA Certified Arborist NJ-1247A

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CURRENT STATUS OF VEGETATION – BRIEF SUMMARY

Many areas of the park are inundated with invasive species, while others are not. The invaded areas show active management and successes while the native areas are degraded as they lack natural regeneration in the understory. This could be due to several factors, but one main cause of degradation is the overabundant deer population in Brightwood Park.

CURRENT STATUS OF NATIVE FOREST

- In general, the understory is sparse and lacking growth, diversity, and populations of many species that would naturally persist if deer were not overabundant.
- The few persisting seedlings or shrubs are all severely browsed to below 30cm in height.
- There is very low recruitment of native seedlings regeneration, which may be partly from deer, but also could be due to high predation of seeds by native forest critters including deer. (Deer eat acorns too!)
- There are remnant, yet diminished, inklings of understory natural plant communities on site that require immediate protection in order allow them to persist and grow.

BACKGROUND INFORMATION & RESOURCES

Brightwood Park has distinct vegetation areas or plant communities that have differing ecological qualities (i.e. amount of invasive and non-native species). Much of the current day vegetation is the result of prior land-use. The areas with the heaviest prior land-use and soil disturbances are dominated by invasive plants today. Other areas that are dominated by native plants have been less disturbed historically even though the site has likely been clear-cut more than once and much land-moving and habitation has likely occurred throughout the Park.

When walking through Brightwood Park, the differences among vegetation and site characteristics are evident, but some background information such as mapped soil types, landforms, ecological communities, and wetlands explain the differences. The background information in this section can be utilized to help manage the differing vegetation and ecological communities accordingly.

The following data are sourced from organizations that map the attributes remotely using satellite imagery. Exact boundaries of mapped areas may differ slightly from ground-verified data.

SOILS & LANDFORMS

Research findings and the soils map came from the Web Soil Survey
https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Within the Brightwood Park boundaries there are multiple types of mapped soil formations (Figure 1). The Booton and Haledon series have coarse-loamy basal till parent material derived from basalt and their landforms are convex ground moraines. The Booton and Haledon soils occupy mainly the upland areas that dominate the site. The Booton soil types are well drained, while the Haledon soils are somewhat poorly drained. These soil formations are not listed as containing urban land (fill), with the exception of the Haledon – Urban Land – Hasbrouck Complex (HatB) which contains approximately 25% fill. The soil formations that include urban land/fill are more disturbed and degraded than their counterparts.

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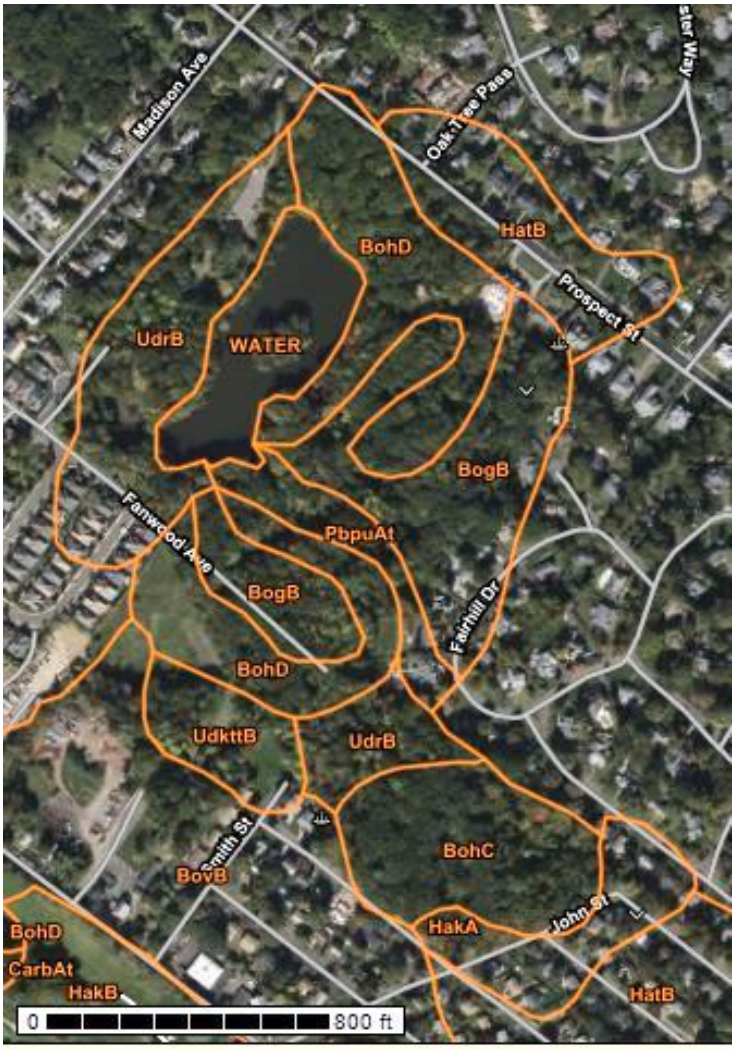
The area with the most soil disturbance is mapped as UdrB, Udorthents refuse substratum, which is described as loamy human-transported material over refuse. This mapped formation is likely the most ecologically degraded in the Park with the highest number of invasive plants. This area may also serve as a vector of invasion to other parts of the Park.

The Parsippany-urban land complex is a mixture of fill soil and with frequently flooded Parsippany series soils. The parent material is derived from basalt, shale, and granitic fine glaciolacustrine deposits. This soil is poorly drained. This area may also exhibit degraded ecological communities and facilitate invasion.

The soil data reveals the areas that were landfills or have fill/urban soils as well as which areas maintain a more natural soil and landform setting. The soil formations that include no urban land/fill correlate to areas of higher ecological quality and native flora. The poorly drained soils correlate the mapped wetlands (pg. 5) and wetland ecological communities (pgs. 6 & 7).



BogB - Booton loam 3-8% slope

BohC - Booton gravelly loam 8-15% slope

BohD - Booton gravelly loam 15-25% slope

HakA - Haledon loam 0-3% slope

HatB - Haledon – Urban land – Hasbrouck Complex 0-8% slope

PbpuAt - Parsippany – Urban land Complex 0-3% slope

UdrB – Udorthents refuse substratum 0-8% slope

Figure 1. Soil Type Map of Brightwood Park Area
https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

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NATIONAL WETLAND INVENTORY

The wetland data was sourced from the national wetland inventory https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/

Brightwood Park Lake is listed as PUBHh which translates to: a "palustrine system" waterbody that is no deeper than 8.2ft at low water levels; "unconsolidated bottom" dominated by small particles; "permanently flooded"; and "impounded" meaning the waterbody was either created or modified by man with a barrier such as a dam. The green wetlands in Figure 2 are freshwater forested/shrub wetlands. These are common and usually represent the landform depressions that store water, forested streams, seeps, and their surrounding wetlands. Connecting the forested wetlands and the lake are narrow streams.

The location and type of wetlands help to determine ecological community distinctions. The wetlands areas mapped by the national wetland inventory correlate to specific ecological communities (pgs. 6 & 7). Importantly, activities within delineated wetlands or buffers may require special NJDEP permitting.

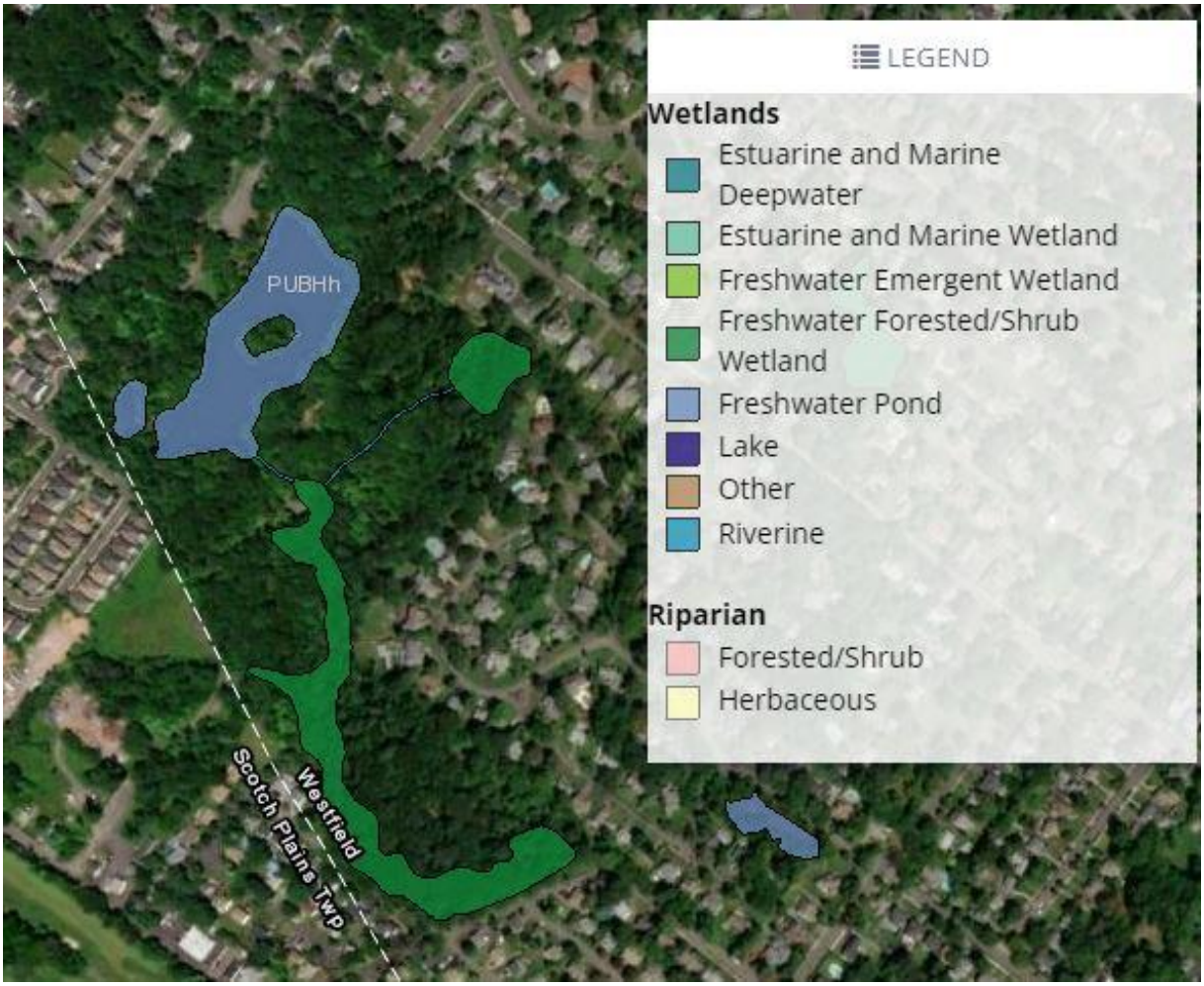

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Figure 2. National wetland inventory map of Brightwood Park
https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/

ECOLOGICAL COMMUNITIES
Ecological community map data was sourced from https://www.maps.tnc.org/nehabitatmap/

Even though Union County is considered part of central NJ, the ecological communities at Brightwood park and the surrounding area are those that are common throughout the northern half of NJ (as opposed to coastal plain ecological communities of the southern half of NJ). The geomorphological history is shaped by glaciers at this site; the soil formations are a product of glacial history and parent material that strongly influence vegetation species assemblage and natural ecological community type.

Brightwood Park contains three ecological community types (Figure 3). They include:

- Northeastern Interior Dry-Mesic Oak Forest - For more information and species lists of this community type please see the links below.
  https://conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/HabitatGuides/68.pdf
  https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.723014/Northeastern_Interior_Dry-Mesic_Oak_Forest

- North-Central Appalachian Acidic Swamp - For more information and species lists of this community type please see the links below.
  http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/HabitatGuides/59.pdf
  https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.723005/North-Central_Appalachian_Acidic_Swamp

- Laurentian-Acadian Freshwater Marsh - For more information and species lists of this community type please see the links below.
  https://conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/HabitatGuides/41.pdf
  https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.731557/Laurentian-Acadian_Freshwater_Marsh

For more information on the nearby ecological communities, a simple internet search using the ecological community's name bring up both the NatureServe Explorer descriptions as well as the Conservation Gateway 2pg. summary as a PDF.
To explore this map resource further, visit: https://www.maps.tnc.org/nehabitatmap/
To download the full files available visit:
http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx

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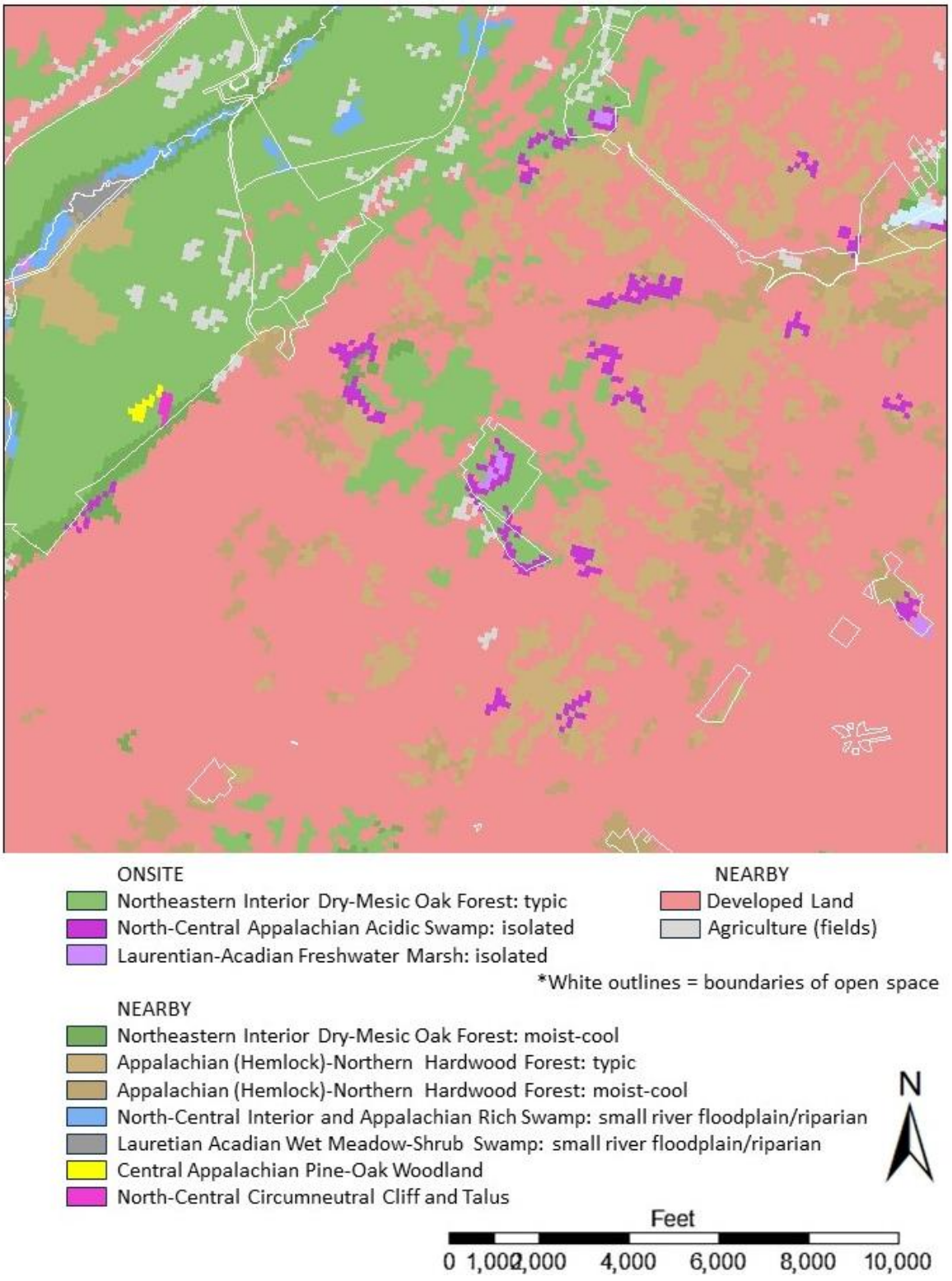

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Figure 3. Ecological communities of Brightwood Park and the greater surrounding area
https://www.maps.tnc.org/nehabitatmap/

TRANSLATING BACKGROUND DATA TO CONSERVATION GUIDANCE

The soils, wetlands, and ecological communities' data all help determine how to best conserve and restore Brightwood Park and prioritize actions. Some portions of the mapped ecological communities on site are degraded versions as they experienced historic land change and soil disturbance, which is shown in the soils map. For example, in the northwest corner of the Park, where there is invasive plant dominance. Much successful work has already been performed by your team to remediate invasive plants here. When planning restoration plantings or seeding, it is best practice to use a species palette drawn from the original mapped ecological community (see species recommendations pg. 12). Therefore, the northwest corner (invasive plant battle zone) should have an eventual goal of being restored to a Northeastern Interior Dry-Mesic Oak Forest.

For areas that are dominated by native plants, it is important to identify which areas demonstrate specific ecological community species assemblage. The highest quality ecological community areas on site, should receive priority focus for conservation measures including protection from deer damage, invasive plant monitoring and removal (early detection-rapid response), and protections from land-use such as fragmentation by trail creation.

DETERMINING DIFFERING ECOLOGICAL QUALITIES, PLANT COMMUNITIES, & MANAGEMENT

Differing vegetation areas as well as differing ecological qualities have been observed (i.e. amount of invasive and exotic species). Utilize the background information maps and sourced websites to help delineate the differing vegetation communities you have currently on site.

You may use the following steps to help you create a basic conservation management map of Brightwood Park.

1. Print out a google map of Brightwood Park to have on a clipboard. Bring with you the background maps in this report.
2. Delineate on paper your highly invaded zones dominated by invasive plants. You know these well, of course, as they are where your active treatment zones are. They will likely correlate to the urban fill soils in the soils map.
3. Then, in other areas of the park that are dominated by native forest trees, pinpoint areas of invasion and unwanted ornamentals as well as canopy gaps and put them in your map. These locations will serve as your invasive plant monitoring/management areas. You also may find that the boundary of the Park may have continued invasive plant infiltration (edge effects).
4. The forested areas that contain native understory species are the higher quality sites in the park. The more native species of differing habits (tree, shrub, forb, fern, etc.) that are growing in one area are likely the zones of higher ecological quality. Draw these areas on the map. Determine the species assemblage by plant identification apps, books, or contacting your county office. These higher quality locations are the highest priority for conservation protection including deer exclusion and early detection-rapid response (ED-RR).
5. Determine if some of your native communities have differing plant assemblages. This may be due to landform and wetland status. It is likely that your site has a swamp ecological community

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in addition to the upland oak forests as shown on the ecological map (Figure 3). Mark the boundaries of differing plant assemblages on your map and estimate their boundaries. Importantly, activities within delineated wetlands or buffers may require special NJDEP permitting. An official wetland delineation may be required.

6. Over time, the conservation management map can be updated, as needed, as more is learned and explored in Brightwood Park.

REMNANT NATURAL PLANT COMMUNITY – *FIRST PRIORITY FOR CONSERVATION MEASURES*

During the site visit, we came upon a small patch of hillside blueberry (*Vaccinium pallidum*) and heavily browsed azalea seedlings that were difficult to identify to species; it could be swamp azalea (*Rhododendron viscosum*), or roseshell azalea (*R. prinophyllum*), or pinxter azalea (*R. periclymenoides*); the latter is most likely considering the microsite condition. These were underneath a cluster of mature chestnut oak (*Quercus montana*) near the trail and park boundary along Prospect Street.

This is an example of a higher quality forest patch of the Northeast Interior Dry-Mesic Oak Forest ecological community that is paramount to conserve and protect from further deer damage and detriment. The specimens and their genetics are irreplaceable. It is necessary and essential to protect these plants from deer browse so they may eventually flower and then produce seed. The local progeny seeds can then be used to plant new understory shrubs in this park for other restoration zones. This is a remnant, yet critical ecological resource and will not persist for much longer without immediate protection. The best protection measure for this zone is a 6ft black PVC coated wire mesh supported by heavy duty metal stakes. Protection from deer will allow these plants to eventually flower and fruit as well as be appreciated for their beauty and natural heritage (Figure 4).

Figure 4. Pinxter azalea (*Rhododendron periclymenoides*) in flower (left); hillside blueberry (*Vaccinium pallidum*) in fruit (right)

In further explorations of Brightwood Park, one may come across more remnant patches of this plant community or others. Treat them all as a high priority for protection.

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DEER DETERRENTS

Even though many plants boast some deer resistance when searching online, most species are barely deer resistant in parks like Brightwood Park because the population of deer is so high. There are only very few species of indigenous plants that are not palatable to deer, but all are subject to buck rub if they have woody stems that grow above 2 ft. A multifaceted deer deterrent approach is required throughout Brightwood Park.

Until the township agrees to allow deer fencing where needed, there are other deterrent options outlined below as well as notes on temporary fencing for single trees and small plant groupings that can be easier on the eyes than typical fencing, if installed neatly.

DEER REPELLENT

- Options include: Bobbex, Deer Out, Repels All, Liquid Fence.
- Rotate products for best results
- Target: shrubs and tree seedling foliage between 1ft and 6ft; stems of saplings and shrubs that are likely to be rubbed between 1ft and 6ft
- Frequency of application differs by season and rainfall. In regular droughty summer years (unlike an El Nino year) utilize the following regime:
    - In fall and winter spraying once per month can be sufficient.
    - Spring's rapid growth and leaf emergence, along with increased rain, require weekly spraying. This is also the time fawns learn where to eat from their parents; spray weekly to stop the generational feed cycle.
    - Summer can be limited to every 2-3 or even 4 weeks depending on rainfall frequency and intensity.
    - Any time of year you start using deer repellent, it is important to start with a frequent weekly cycle to teach the deer not to browse and so they also teach their young to avoid your spraying areas too.

DEER NETTING

- Wrap some stems as needed with deer netting aka bird netting to prevent buck rub. An example of the product can be found here: https://www.amazon.com/KLEWEE-Netting-Protect-Vegetables-Squirrels/dp/B09XBKKFVN
- Advantages: it is cheap to buy; it is not very noticeable especially for trees and shrubs that have lower branches, or whorled branches like American holly and pines.
- Disadvantages: is it annoying to work with; it lasts between 3-5 years and begins to degrade; depending on the tree form and installation method, it may require upkeep; curious animals can get caught in it, but this rarely happens when used in the method I explain below.

Installation for buck rub protection

- Cut a 1ft panel from the 7x100ft roll – result = 1ft x 7ft piece
- Loosely spiral the netting around the trunk from 6ft to the base
- Utilize branches to easily affix the deer netting in place – it easily gets stuck.

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- For plants that do not have many branches you can spiral or make a neat sleeve and use natural twine to tie loosely to a branch around 6ft and very loosely at the base.
    - Never tie or install twine or netting tightly as it will eventually girdle the stem or branches. Always install loosely to leave ample room for growth. Plan to revisit regularly to adjust and amend as needed.

DEER BARRIER OPTIONS FOR VOLUNTEER INSTALLATION (once given the green light or use as pilot fence areas)

- PVC Coated wire mesh like: https://www.lowes.com/pd/GARDEN-CRAFT-50-ft-x-6-ft-Black-PVC-Coated-Steel-Welded-Wire-Rolled-Fencing-with-Mesh-Size-2-in-x-3-in/1000552609
    - Black or brown coated is preferred as silver or green catches the eye more and are more likely to result in negative feedback. Black or brown escapes the scrutinous eye better and are better choices for ornamental settings.
    - 6ft high is needed for single tree cages (about 2-3 ft diameter) or small exclosures like 10ft x 10ft size.
    - Use a combination of one or two metal fence stakes and landscape staples (aka anchoring pins) to make them sturdy. Fence stake often come with hooks which help anchor the wire tree cage. To prevent cage shifting or movement, landscape staples from 6-10 inches long can be inserted into the ground.
    - At times, utilization of some existing larger trees for stability can be effective but make sure not to damage or girdle the supporting trees.
    - If 6ft wire mesh is unavailable, acquire 4ft and 2ft and attach them with zip ties, metal wire, or twist ties.

*All netting or fencing needs to be installed very neatly to curb complaints; stakes must be installed straight and kept that way. Routine checks on their status is required to maintain a neat look as well as total plant protection.

PLANTING or SEEDING

Once a deer deterrent regime is in place, planting of some high priority species can begin. Since a total deer fence around the property is not likely in the future, planting should be strategic and localized so fencing can be installed in clusters of planting areas or at least, deer repellent can be continually applied. All plantings should occur in fall to best protect plants from transplant shock stress overlapping with drought and heat stress. All seeding or nut planting should occur very soon after seed/nut drop in fall.

FIRST PRIORITY

- White Oak Group
    - Swamp white oak (*Quercus bicolor*) lowland or wet to moist soil
    - Chestnut oak (*Quercus montana*) upland, non-wetland
    - White oak (*Quercus alba*) moist to upland soil
- Hickories
    - Shagbark (*Carya ovata*) moist to upland acidic soil, prefers toe slopes but not wetlands.
    - Pignut (*Carya glabra*) & mockernut (*Carya tomentosa*) upland acidic soil, not wetlands
    - Bitternut hickory (*Carya cordiformis*) can tolerate degraded soils; can grow well in neutral soil as well as acidic, and upland or lowland sites but not standing water.

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SECOND PRIORITY

- Black Gum (*Nyssa sylvatica*) tolerates wetlands, prefers moist acidic soil, not very dry soil; can develop clonal groves like beech – which helps replace ecologically-valuable vegetative structure of beech (beech are likely to decline from Beech Leaf Disease).
- American Holly (*Ilex opaca*) can be deep shade to full sun tolerant. It is the most deer resistant native tree available – it is rarely browsed but can be buck rubbed on occasion. To prevent buck rub on holly or other stems, you can spiral a long 1ft wide cut piece of deer netting loosely around the trunk.
    - American holly is hard to find in most nurseries – Pinelands Nursery has them and so do garden centers that purchase from Pinelands. Ask your local retailer or wholesaler to acquire them.
- White Pine (*Pinus strobus*) – requires sunny areas (i.e. sunny space near the back fence at the south-facing Scotch Plains side) or canopy gaps. Pines will help over time to restore and maintain soil pH. (Planting the sun-loving white pine as well as eastern red cedar, and grey birch, replicates the restart of forest succession. A disturbance clearing or gap (before invasives and deer were a problem) would be likely places where early succession trees would naturally germinate, thrive, and restore the disturbed soil preparing it for the next succession of forest trees and plants i.e. oaks, hickory etc.)

THIRD PRIORITY – the two species below are important for forest vertical structure diversity as they both are understory tree species.

- Hop-hornbeam (*Ostrya-virginiana*) (also called ironwood) prefers more upland sites, not wetlands.
- Musclewood (*Carpinus caroliniana*) (also called ironwood, hornbeam, blue beech) moist or riparian sites on edges of waterbodies.
    - both above require protection from buck rub, but the leaves are often avoided by deer as they are not palatable.

*For more species options see the attached flyer of tree species for Morris County and Northern NJ – these include sustainable species that occur in the Northeast Interior Dry-Mesic Oak Forest and the North-Central Appalachian Acidic Swamp.

GROWING TREES FROM LOCAL SEED/NUT RESOURCES

LOWER INPUT METHOD – PLANT SEEDS/NUTS ON SITE

- Collect viable seeds/nuts of priority tree species and plant them near their mother trees.
    - Do not bury too far in the ground, but plant just below the soil surface to lower the chances of loss (predation)
    - Flag areas discreetly, mark in a map app, or draw on a map where they are planted.

HIGHER INPUT METHOD – PLANT SEEDS/NUTS IN CONTAINERS AND GROW OFF SITE

- Collect viable seeds/nuts of priority tree species and label them according to species and parent tree location.
- Acquire growing areas with ample pot size and ¼" wire mesh to protect from predation.
    - Hickory nuts require deep pots that are >12" to grow for 6-12 months.

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- Acquire soil media; options include:
    - Store bought seed starting media.
    - A mix of peat moss, clean (beige) natural sand, and organic garden soil.
    - For better tree health, use some native soil from the near mother trees to inoculate with beneficial soil microbes.
- Seeds must be protected and monitored to make sure barriers are not infiltrated by critters.
- Keep outdoors where there is sun in the winter to receive precipitation and sunlight.

AVOID PLANTING

- Red Oak group for now (red, pin, scarlet, black; *Quercus rubra, Q. palustris, Q. coccinea, Q. velutina*) due to highest bacterial leaf scorch susceptibility.
- Reduce planting of mesic species and focus on priority species listed in this report.
- Leguminous trees species elevated soil nitrogen and can facilitate invasive plant growth and success.
    - Black locust (*Robinia pseudoacacia*), honey locust (*Gleditsia triacanthos*), and catalpas (*Catalpa speciosa, C. bignoniodes*) are considered ecologically invasive species in NJ they should not be planted.
    - Red bud (*Cercis canadensis*), Kentucky coffeetree (*Gymnocladus dioicus*), and yellowwood (C*ladrastus kentukea*) are not ecologically helpful species to plant as they are not native to the ecological communities onsite or nearby. In particular, red bud is overplanted in developed landscapes and escapes from plantings into forests.
- Avoid species that do not belong in the site's ecological communities (or a nearby ecological community).

INVASIVES – TREE UPDATE

The easiest tree targets are seedlings that can be pulled out by hand; saplings can be girdled and treated. Larger trees are best managed with the hack and squirt method, but only where a dying tree will not cause a safety hazard as they decline. Larger trees may be difficult to remove in areas where people gather or walk; for these scenarios, at the least, remove the invasive tree progeny asap. Perform early detection rapid response (ED-RR) to all seedlings. Learn tree seedling ID and other common invasive plant seedlings. The "Picture This" app (free) is fairly accurate and easy to use.

ADDITIONAL INVASIVE PLANT TARGETS

- White mulberry (*Morus alba*) is also an ecologically invasive species even though not on the NJISST list. It is most commonly found in the northeast quadrant of NJ.
- Norway maple (*Acer platanoides*)
- Black locust (*Robinia pseudoacacia*), honey locust (*Gleditsia triacanthos*), and catalpas (*Catalpa speciosa, C. bignoniodes*) are considered ecologically invasive species in NJ.
- Tree-of-heaven (*Ailanthus altissima*)
- Angelica tree (*Aralia elata*)

MANAGING SERIOUS INVASIVE TREE DISEASES

BEECH LEAF DISEASE (BLD)– this disease spreads quickly! Either accept premature decline or treat the trees annually.

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- Treating can be expensive – find a Licensed Tree Expert that you trust and get quotes for Thiabendazole root flare injections (estimates should be free).
    - one injection every two years per tree is recommended, this is a new disease and new treatment option, frequency recommendations could change.
- If treatment is not an option, then under-plant each mature beech with priority species densely in 3-8ft spacing – fencing is required.

*If treatment nor mitigation planting occurs, beech areas will become canopy gaps and invasive plants will take over before native trees and other plants can naturally occupy the area.

BACTERIAL LEAF SCORCH (BLS)– This disease is on the doorstep if not already in the Park. Impact severity cannot be predicted. But BLS can be deadly.

- In the last week of September inspect oak trees, especially red oak group trees (black, red, scarlet, pin) for symptoms of BLS.
    - BLS is exhibited in browning of leaves from the tips inward and branch dieback.
    - Get a partially symptomatic sample and send it to the Rutgers Plant Diagnostic Lab.
    - A licensed tree expert can do this inspection, but cannot confirm 100% that it is BLS, confirmation must be performed by a plant diagnostic lab.
- The only time to witness this symptom is the last week of Sept through the first week of October.
- This is also the treatment timing, therefore symptom checking needs to occur promptly at the end of Sept. to plan any treatment within 2 weeks.
    - Treatment is an antibiotic injection once per year to keep it alive.
- BLS is deadly. Once infected, the tree will slowly decline and could die after a few years without treatment. The amount of time a tree can live with BLS is unknown, but site factors and level of soil degradation play a large role.
- If treatment is not an option utilize the same mitigation planting strategy as for BLD, dense mass planting of priority tree species but **minus all oaks.**
    - The white oak group is susceptible to BLS, but not as susceptible as red oak group.

*Trees at risk should be inspected annually.

OUTREACH

- Make sure to take many pictures! Before and after pics are very powerful. A picture speaks a thousand words.
- Where possible use quality, graphically designed, subtle, and simple signage to teach the public about your constant work and all the progress.