MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Martin O'Malley, Governor
Anthony G. Brown, Lt. Governor
John R. Griffin, Secretary
Eric Schwaab, Deputy Secretary

A report on Hyattsville's street trees

Prepared for:
The Honorable William F. Gardiner, Mayor
James Chandler, Community Development Manager

Prepared by:

Michael F. Galvin, Supervisor, Urban & Community Forestry
Maryland Department of Natural Resources-Forest Service
580 Taylor Avenue
Annapolis, MD 21401
410-260-8531
http://www.dnr.state.md.us

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Table of Contents

NOTE: New terms are listed in the text in *italics* and are defined in the glossary.

Summary

The City of Hyattsville is a municipality in Prince George's County, MD. Situated inside the Capital Beltway, it has a land area of 6.4 km^2 (2.5 sq mi) and a population of 18,000. In 2006, the Department of Natural Resources (DNR) responded to a request for technical assistance from Hyattsville and performed an analysis of the city's street tree population using the US Forest Service iTREE software package. The data were collected and analyzed by DNR in the summer and fall of 2007.

The total number of potential street tree planting sites is estimated to be approximately 7,700. Hyattsville has approximately 2,900 street trees. There are approximately 4,800 potential plantings sites empty; there is room for approximately 2.6 times the number of street trees in Hyattsville presently.

Approximately 20% of street trees are in conflict with overhead utilities and approximately 20% are in conflict with hardscapes (curbs, sidewalks, etc.). However, most of these conflicts are minor and are not disrupting gray infrastructure.

The tree population has fairly good diversity. Willow and pin oaks are the most important species and dominate contributions to canopy cover. Two of the three most common ornamental trees (callery pear, plum) are problem species and should be phased out; this is already occurring with callery pear. Sycamore is also performing poorly.

The existing trees are well managed. Very few stumps or dead, standing trees were observed. No maintenance or routine maintenance was recommended for over 80% of trees. No critical safety concerns were observed, and only 3.8% of trees had immediate management needs. The treatment recommended for the majority of trees was no treatment followed by cleaning of dead wood.

Ecosystem services provided by city street trees include stormwater management ($104,818), energy avoidance ($44,944), carbon sequestration ($8,428) and air quality improvement ($2,706). The total annual value of benefits provided by the trees is $281,389, $96.30 in annual benefits per tree, and $18.53 in annual benefits per capita.

The cost: benefit ratio for city street trees is 0.90. This ratio does not compare favorably with the ratios found in certain other US cities and is likely due to the following: differences in energy costs in the other cities; species selection differences; high per tree maintenance expenditures in Hyattsville; and, low overall tree population in Hyattsville.

Assignment

The purposes of this report are to:

- Describe the current street tree population generally;
- Identify current stocking levels of and planting opportunities for street trees;
- Report on the costs for, and benefits provided by, Hyattsville's street trees, including quantification of the ecosystem services provided by those trees;
- Identify green and gray infrastructure conflicts;
- Make recommendations on management of the assessed trees; and,
- Provide detailed information for the parties (DNR and Hyattsville) to use in communicating with partners and constituents regarding management decisions related to the trees.

Terms and Limiting Conditions

This document is a work for hire produced by the author for the Department of Natural Resources ("the Department"). The field inspections were made throughout the summer of 2007. All references

(graphic, tabular, and text) are true and accurate representations of conditions found on the sites on those dates.

The tree condition data reported were created based on cursory observation. No detailed tree risk assessments were performed. The intent of this report is to provide a "snapshot" of the entire population rather than to provide specific information regarding any of the individual trees reported on. The Department will make all raw data available to the client in the event that they want to perform follow up assessments on any of the trees included in the survey.

The conclusions and recommendations are based on the author's experience and knowledge as a qualified professional, and are not intended as a predictor of future conditions. This work is intended as a tool to assist the tree owner in making educated tree management decisions rather than to dictate particular management actions.

Background

The City of Hyattsville is a municipality in Prince George's County, MD. Situated inside the Capital Beltway, it has a land area of 6.4 km^2 (2.5 sq mi) (Wikipedia 2007)(Figure 1) and a population of approximately 18,000 (Chandler 2007).

In 2006, city officials committed to adopt an Urban Tree Canopy (UTC) goal under the Chesapeake Bay Program's Directive 03-01. The Department committed to support the city's efforts in two ways:

- Provision of technical assistance in acquiring remote sensing data, interpreting the imagery for existing and potential UTC, and assisting the city in adopting an appropriate UTC goal; and,
- Provision of technical assistance in taking a census of the city's street trees in order to report on population, type, and condition of existing trees, as well as opportunities for planting additional trees.

This report focuses on the latter effort.

Methods

We made all visual observations from the ground with the naked eye; no hand lenses, binoculars, or similar devices were used. We did not climb the trees with arborist equipment or assess the crowns from an aerial lift or similar device.

The Department communicated with city staff on recent annexations and created a mutually agreed upon shapefile for the city boundary.

iTREE software (www.itreetools.org) was used to collect and analyze the data. The iTREE manual recommends sampling 6% of total street miles when performing an assessment in a community of less than 50,000. We scheduled sampling of 17% of street miles and 19% of street segments using a GIS random segment generator and a TIGER line file of streets within the city boundary polygon. 100 street segments were selected for data collection.

A GIS Desktop project of the study area was created in Arc Map and exported to a Windows Mobile handheld device. The mobile GIS was used in concert with a Garmin 76C GPS unit to locate study segments in the field. Data on trees were recorded using the iTREE software and data on segments were recorded using Arc Pad mobile GIS.

All field data were uploaded to the desktop for storage and analysis.

Street tree stocking was estimated based on biophysical possibility with allowance for a tree every 30', with the following exceptions: areas of marked curb and areas adjacent to traffic control devices,

utility poles and driveways were excluded. A point to note is that local policy or ordinance may provide for more or less trees than we estimated.

Utility conflict was defined as any tree part touching any overhead line. In many cases, the conflict would not require an intervention by electric, telephone, or CATV utilities. The estimate of conflict is therefore conservative and likely overestimates practical conflict.

Discussion

The study area is shown in Figure 2. The city area prior to the recent annexation is shown in purple. The area of the recent annexation is shown in blue. Street segments on which data were collected are shown in green. Five segments, shown in red, had to be disregarded for various reasons (inside of housing complex rather than public street; street no longer in use; start and end points could not be identified; etc.). Ninety-five segments were completed.

Trees and planting opportunities

The typical street tree planting site is a planting strip (75.5%) in a single or multi-family residential (88.5%) neighborhood.

The total number of potential street tree planting sites is estimated to be approximately 7,700. Hyattsville has approximately 2,900 street trees. There are approximately 4,800 potential plantings sites empty. *Stocking level* is 38%. To put it another way, there is room for approximately 2.6 times the number of street trees in Hyattsville presently.

Over 83% of planting sites have a tree lawn wide enough to accommodate a large tree. However, over 55% of these sites have overhead utility lines. In most such cases, smaller scale trees are more appropriate in order to avoid maintenance conflicts. Large trees should be planted in the remaining 45% of available large sites.

A breakdown of tree stocking and planting opportunities by ward can be found in Figure 3 and Table 1. Wards 1, 2, and 3 all have stocking levels of approximately 40%. Ward 5 has by far the fewest plantable spaces and the lowest stocking level. This may be due to the post-stratification of the plots and the very small number of plots in ward 5. The low stocking levels in wards 4 and 5 may be in part due to the relatively smaller amount of single family residential properties and the larger number of commercial, institutional, and multi-family residential properties (shopping centers, schools, housing complexes, etc.), resulting in fewer roads.

Tree management

The stump removal program is very effective. Only 0.3% of all sites had a stump present.

The tree management program is also very effective. No maintenance or routine maintenance was recommended for over 80% of trees. No critical safety concerns were observed, and only 3.8% of trees had immediate management needs. The trees most commonly in need of immediate maintenance were sycamore (26.7%) and callery pear (26.7%).

The treatment recommended for the majority of trees was no treatment (37.95%). Cleaning to remove deadwood was the most frequently recommended treatment (30%), followed by reduction (18.21%) which was recommended primarily to alleviate conflicts with overhead utilities. Raising (2.05%) for vehicular and pedestrian clearance was not a significant issue and again points to the effectiveness of the tree management program.

Infrastructure conflicts

No sidewalk heaving was associated with 80% of street trees. Low (13.9%), medium (4.4%), and high (1.5%) heaving occurred related to the remaining trees. The species associated with the most severe heaving were pin oak, southern red oak, and silver maple; this is likely due to their size at maturity (they are among the largest stature trees).

No overhead utility lines were found on 54% of sites. On 21.5% of sites, lines were present but were not in conflict with the tree. On 24.1% of sites, conflicts were observed. The three species most commonly in conflict were callery pear, willow oak, and red maple. This is likely at least partially attributable to the fact that they among the most prevalent species found on Hyattsville's roadsides.

Tree census results (population, condition, etc.)

Diameter distribution overall is good. Trees were divided into diameter classes as follows: 0" – 3"; 3" – 6"; 6" – 12"; 12" – 18"; 18" – 24"; 24" – 30"; 30" – 36"; 36" – 42"; and > 42". Ten percent or more of the total population can be found in each diameter class from 1" – 30". Less than 10% of the population is made up of trees larger than 30", but the even distribution of younger trees should expand these numbers provided the trees grow to maturity.

The most common street tree in Hyattsville is callery pear ('Bradford', 'Aristocrat', etc.). Red maple, pin oak, and flowering cherry are, respectively, the next most common trees. No other species account for 10% or more of the overall population. The top 10 most common species are found in Table 2. In the following paragraphs, we describe these species as found on Hyattsville's streets.

Callery pear

Callery pear is the most common (15.1%) as well as one of the most important species in the city (*IV*=13.2). It represents 16% of canopy cover provided by street trees. Performance of this species is average (RPI=1). There are few callery pears (1.7%) smaller then 6". Over 80% of the callery pear are 12" – 30". This indicates that this tree is being phased out. We concur as this is a problem species. As these trees are prone to damage and failure, managing these trees will represent a significant resource investment for the city for some time into the future.

Red maple

Red maple is the second most common (13.3%) and one of the most important (IV=13.2) street trees. It represents 12.1% of canopy cover provided by street trees. Performance of this species is below average (RPI=0.92). Diameter distribution is good for red maple, indicating a stable population.

Pin oak

Pin oak is the third most common (11.0%) and second most important (IV=14.1) species in Hyattsville. It accounts for 15.4% of street tree canopy cover. The city's pin oaks are above average in performance (RPI=1.05). Diameter distribution is good for pin oak, indicating a stable population.

Yoshino flowering cherry

The flowering cherry is the fourth most common (10.3%) street tree. Like callery pear, it is also a member of the Rose family. Its importance value is much lower than the larger shade trees (IV=5.2) due to its small stature. It accounts for 4.2% of street tree canopy cover. Performance of this species is slightly below average (RPI=0.97). The service life for flowering cherries in Hyattsville appears to peak at around 18". Only 5% of all cherries were larger than this, and none were found larger than 24".

Willow oak

The fifth most common street tree is the willow oak (7.9%). However, it is the most important street tree (IV=17.7) and provides more canopy cover (17.1%) than any other species. These trees are performing very well (RPI=1.12). Over 16% of willow oaks are 6" or less in diameter; over 74% are larger than 24". This species could be planted in greater numbers as older trees are removed.

Sycamore

Sycamore is the sixth most common street tree (6.9%). It is among the least important of the most common species (IV=4.2) and provides 4.1% of street tree canopy cover. It is among the most poorly performing of the most common trees (RPI=0.81) and has poor diameter distribution with 100% of trees in the 6" – 12" class.

Silver maple

Silver maple is the seventh most common street tree (5.4%). It has an Importance Value of 5.9 and accounts for 6.2% of street tree canopy cover. Silver maples are performing very well (RPI=1.15), but this may be due in part to the fact that the majority of them are 24" or less.

Plum

Plum is the eighth most common street tree (4.6%). It is unimportant (IV=2.2) and accounts for the least canopy cover (1.6%) of the top ten most common trees. It was the worst performer of the 39 types observed (RPI=0.72).

Southern red oak

Southern red oak is tied with little leaf linden as the ninth most common street tree (2.6%), but is disproportionate in importance (IV=6.8) and canopy cover (7.7%). It performs slightly better than average (RPI=1.04). Diameter distribution is poor; the majority of individuals are greater than 42", and none are smaller than 12". This species will greatly decline in significance over the next 10-20 years unless replacements occur.

Littleleaf linden

Littleleaf linden's importance (IV=2.1) is proportionate to its population (2.6%) and canopy cover (2.3%). It performs well (RPI=1.06). Ninety percent of littleleaf lindens are 6" – 18". None are larger than 24". This species will increase in significance as these individuals grow, but replacements will be required to maintain stocking.

Ecosystem services; costs and benefits

The majority (42.82% $120,493) of the monetary value of benefits provided by Hyattsville's street trees relate to aesthetics. Ecosystem services provided by city street trees include stormwater management (37.25%; $104,818), energy avoidance (15.97%; $44,944), carbon sequestration (3%; $8,428) and air quality improvement (0.96%; $2,706). The total annual value of these benefits is $ 281,389. This equals approximately $96.30 in annual benefits per tree and approximately $18.53 in annual benefits per capita.

According to information reported by the city, annual maintenance costs for pruning, removal, planting, etc. equal $311,000.

The annual net benefits (benefits minus costs) provided by these trees is - $29,611, - $10.13 per tree, and - $1.95 per capita.

The cost: benefit ratio is 0.90. This ratio does not compare favorably with the ratios found in other US cities such as New York City (5.06), Fort Collins, CO (2.18), Glendale, AZ (2.41), and Charlotte, NC (3.25) (Peper et al. 2007). The disparity is likely due to the following: differences in energy costs in the other cities; species selection differences; high per tree maintenance expenditures in Hyattsville; and, low overall tree population in Hyattsville.

Conclusions

Hyattsville's street trees provide significant benefits to the city's residents. However, the street trees are underperforming in the delivery of benefits related to the cost of management for a number of reasons, including species selection and unrealized planting opportunity.

There is opportunity for significant growth in the street tree population. Well over half of potential planting sites are unoccupied. An increase in tree population would bring about an increase in tree-related benefits.

The trees are well-managed but some issues exist. Two of the three most common ornamental trees (callery pear, plum) are problems species and should be phased out. This is already occurring with callery pear. Sycamore is also underperforming. City arborists should observe this and intervene if the trend continues.

The existing trees are well managed. Very few stumps or dead, standing trees were observed. No maintenance or routine maintenance was recommended for the majority of trees. No critical safety concerns were observed, and few trees had immediate management needs.

Recommendations

- Expand the tree planting program, beginning with identification and prioritization of candidate sites. An increase in tree population would bring about an increase in tree-related benefits.
    - Maintain or increase diversity at the species, genus, and family levels.
    - Plant the largest tree possible at a given site in order to maximize benefits; however, do not plant large scale trees in sites that will result in conflicts with gray infrastructure (overhead lines, sidewalks) as this will result in increased maintenance costs and decreased cost: benefit ratio. If savings were realized from the $50,000 allotted for infrastructure repairs, those funds could possibly be redirected to the planting program.
    - Cease planting callery pear cultivars and plum. Consult technical resources such as Landscape Tree Factsheets (Gerhold et al. 2001) to identify suitable alternate species.
- Continue to manage for safety.
    - Maintain current custom of minimizing critical concerns via rapid response.
    - Maintain current custom of grinding stumps shortly after removal.

Glossary

IV or *Importance Value* - the mean of three relative values (percent of total trees, percent of total leaf area, and percent of canopy cover). It is presented in table form. An IV of 100 suggests total reliance on one species, and an IV of 0 suggests no reliance. IVs are particularly meaningful to managers because they suggest a community's reliance on the functional benefits of particular species.

RPI or *Relative Performance Index* – Index values relating each species overall condition to all other species in the city; the information is presented in table form. Species with an average condition compared to all other species have an RPI value of 1. Any value higher than 1 indicates species that have proportionately better condition ratings. Likewise, index values lower than 1 are species with below-average condition ratings when compared with other inventoried street trees. The RPI of each species provides an indication of its suitability to local growing conditions, as well as its performance. Species with more trees in good or better condition are likely to provide greater benefits at less cost than species with more trees in fair or poor condition.

Stocking level - The ratio of the number of sites with trees to the total number of possible sites.

Figures

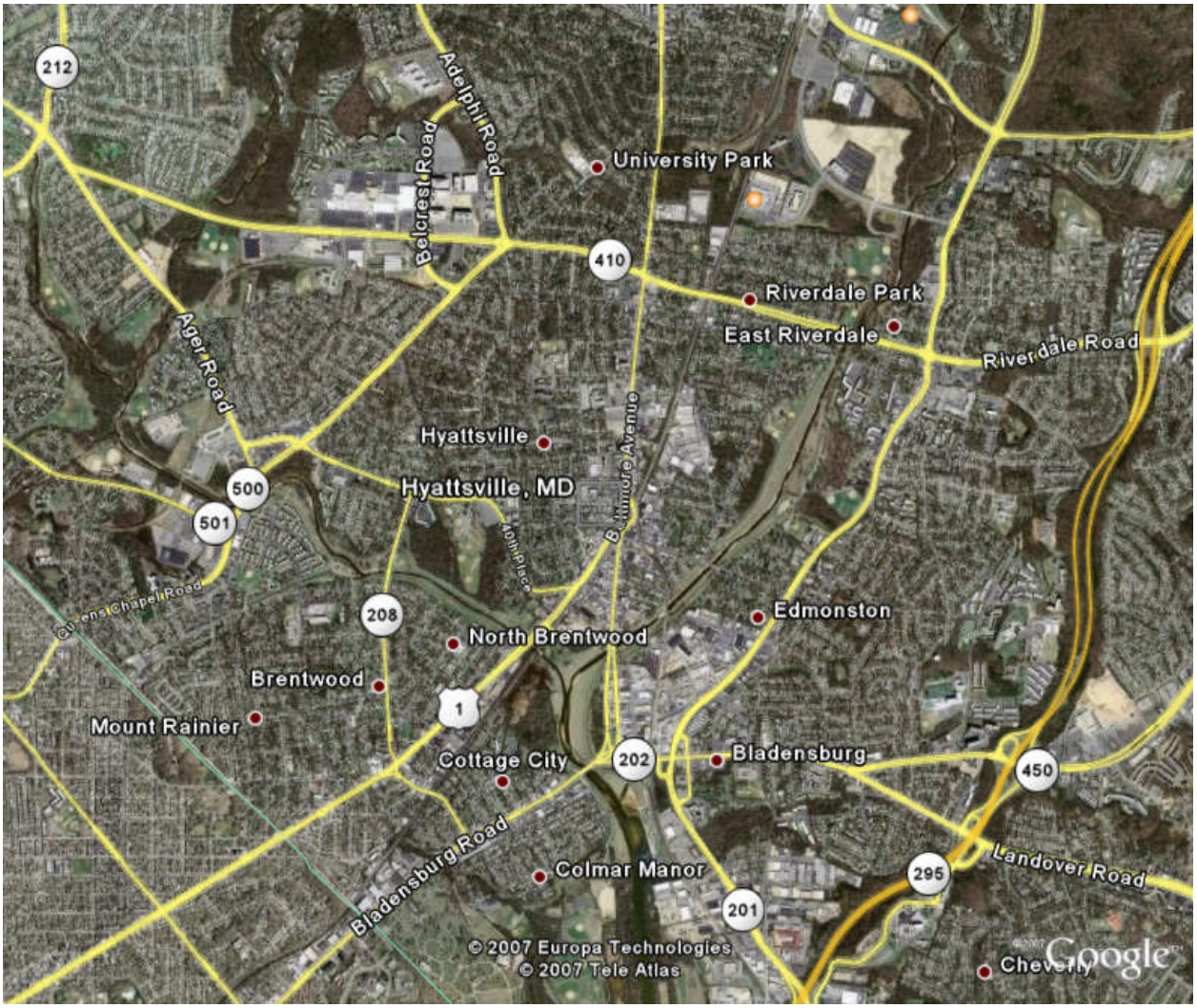

Figure 1 – Hyattsville area

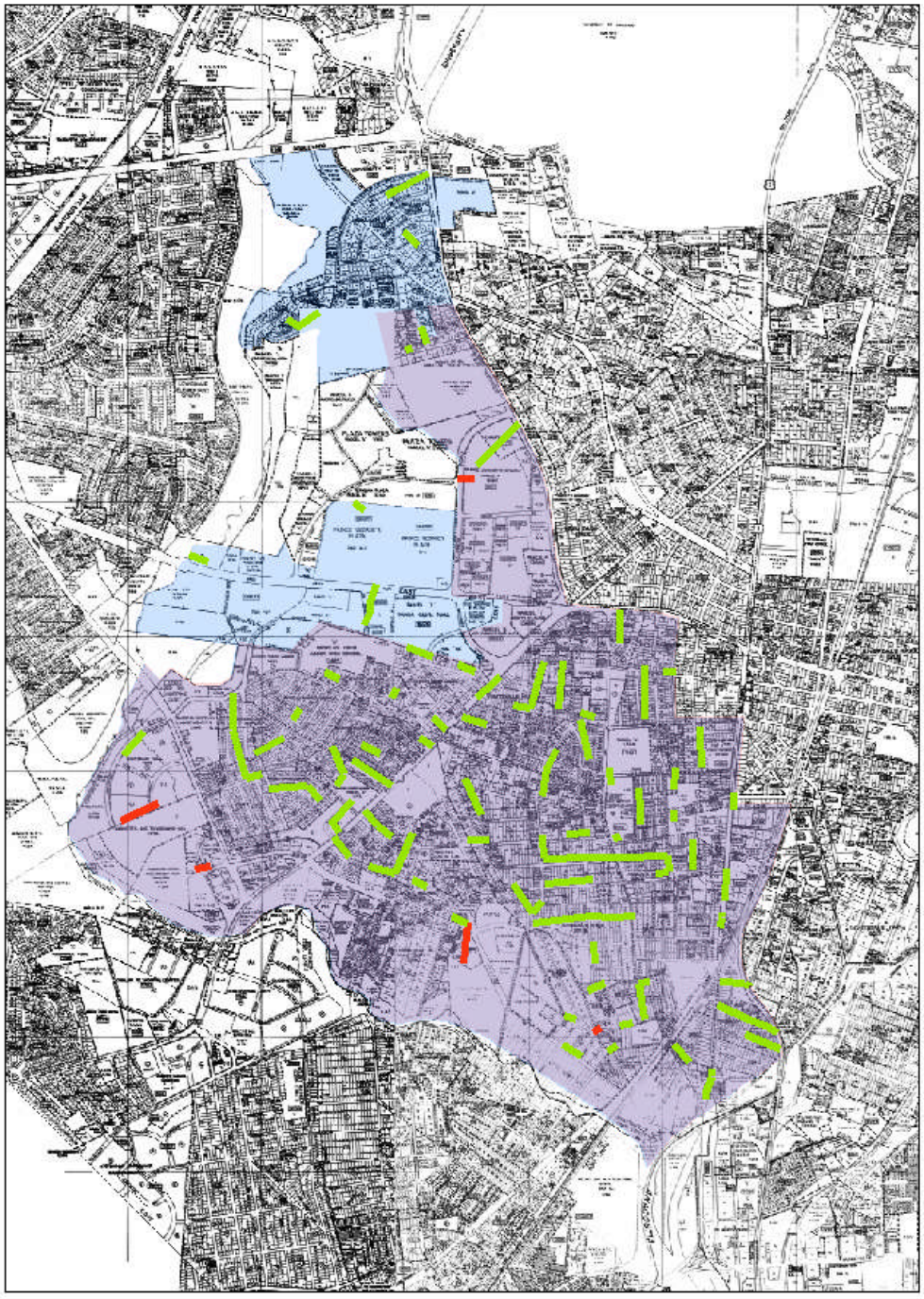

Figure 2 – GIS map of the study area and plot locations

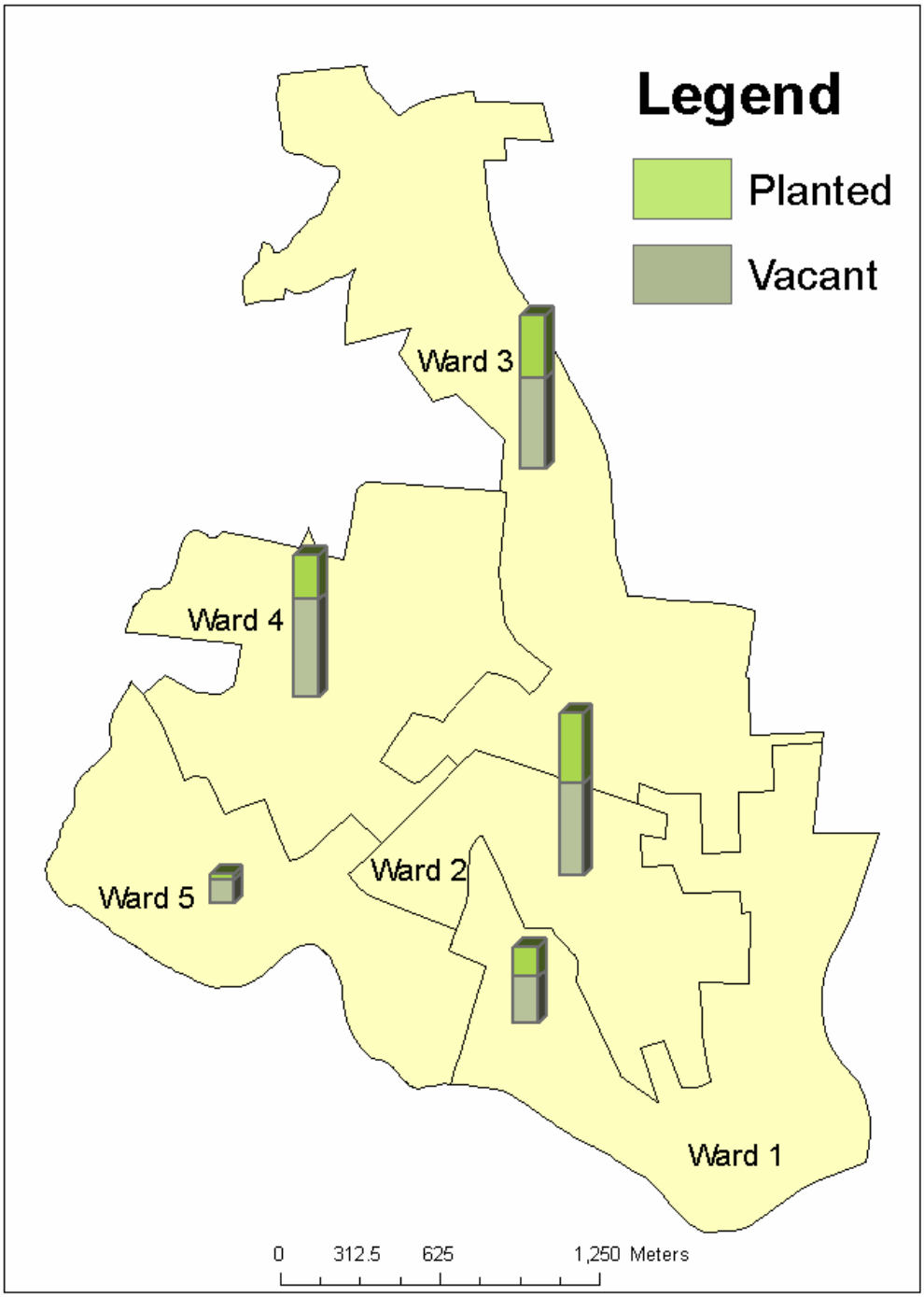

Figure 3 - Trees and planting spaces by ward

Tables

Zone	No. of Unplanted Sites	No. of Planted Sites	Total No. of Sites	Stocking (%)	No. of Unplanted Sites		
					Small	Medium	Large
1	629	405	1,034	39	360	15	255
2	1,266	974	2,240	43	37	112	1,116
3	1,244	869	2,113	41	247	0	997
4	1,341	607	1,948	31	0	0	1,341
5	337	67	405	17	0	0	337
Citywide total	4,818	2,922	7,740	38	644	127	4,046

Table 1 – Summary of available planting sites for public trees by ward

Species	Prevelance	IV	RPI	Canopy cover
Callery pear	15.1%	13.2	1.00	16.0%
Red maple	13.1%	13.2	0.92	12.1%
Pin oak	11.0%	14.1	1.05	15.4%
Yoshino flowering cherry	10.3%	5.2	0.97	4.2%
Willow oak	7.9%	17.7	1.12	17.1%
American sycamore	6.9%	4.2	0.81	4.1%
Silver maple	5.4%	5.9	1.15	6.2%
Plum	4.6%	2.2	0.72	1.6%
Southern red oak	2.6%	6.8	1.04	7.7%
Littleleaf linden	2.6%	2.1	1.06	2.3%
Other species	20.3%			

Table 2 - Summary of population characteristics of 10 most prevalent species

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