Urban Ecology 6/1/2016

Tree Inventory Report for DePaul University

Authors: Hannah Altizer, Malcolm Engel, Sahara Bourgeois-Kuiper, Benjamin Rohr

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Summary

We inventoried 128 trees within the DePaul Lincoln Park Campus in the two block section of Webster and Fullerton / Sheffield and Kenmore. Although there is a diverse set of species on campus, the population distribution of such trees is uneven and not sustainable. The majority of trees are honeylocust trees which would put the DePaul Urban Forest at risk if honeylocust were threatened. Overall management of DePaul's Urban Forest is well cared for as most of the trees are in good condition, and the age distribution follows a sustainable model. One concern is the attention put on fair or poor conditioned trees and trees in conflict with wires. There are a few trees that could pose a threat to the public and some that may tear down cable wires if they fell. Trees in pits or or medians were not as healthy as trees in tree lawns where there is more room for lateral roots.

Introduction

Purpose of plan

The purpose of this inventory is to give the Facility Operations management on campus a tree inventory to help manage the urban forest of DePaul more efficiently and easily. This inventory is the center section of the DePaul campus, so in the future, the rest of trees on campus can be added and easily updated based on the characteristics of this inventory. This is the start of a plan to inventory the whole campus and acts as a model to do so. For example, every 5 years, a new inventory for the remaining sections can be completed to make an inventory for the whole campus. This inventory also serves the purpose of starting DePaul on the track to become a Tree Campus USA University, which on one of the five requirements to be a Tree Campus University. The Morton Arboretum is also interested in collecting as much tree inventory data as possible, as they have connected many of us to community partners, so this inventory will be beneficial to them for the area of DePaul in Lincoln Park.

Program administration and public awareness needs

DePaul Facility Operations is a well staffed, well funded department that has the ability to correctly manage the urban forest and also has some help from The Brickman Group Landscaping. There is no permanent arborist so this may be a reason that DePaul's Urban Forest may have the concerns addressed in this report although they express an understanding of sustainability and safety. DePaul Facility Operations has multiple sustainability-based programs, and have shown in the past that they are able to correctly manage programs such our LEED certified Chemistry and Environmental Science Buildings. Facility Operations expresses moving towards more native vegetation and reducing toxic substances on campus.

Regarding the City of Chicago, there is a section in the Chicago Municipal Code that outlines the various regulations and guidelines that need to be reviewed for urban forestry planning, planting, or removal. This document is the Guide to the Chicago Landscape Ordinance, and it includes everything from soil content to landscape maintenance schedules. Regarding planting size for street trees in Lincoln park, the ordinance states that street trees have to be at least 2 ½ caliper trees outside "the greater downtown" area on parkways. Any trees planted that are smaller would have a significantly lower chance of survival. Regarding planting sites, if a tree is planted in a tree pit on the sidewalk there are multiple guidelines for proper planting. Trees are also supposed to be planted at least 25 feet apart from each other in parkways, and 125 feet in parking lots. Tree pits are required to have the width of at least 3 feet 6 inches, tree grates are required when planted in sidewalk openings, and the tree pit has to have soil at least 3 feet deep to be a proper planting site. Regarding the soil, the composition of the soil is also specified in the ordinance. Soil pH has to between 6.0 and 7.0, and the soil itself should be 45-77 percent silt, 0-25 percent clay, and 25-33 part sand. In regards to maintenance, the City of Chicago is required to handle maintenance of all public property. For trees in the public right of way, the applicants are responsible for replacing the tree if it dies, but if it survives for more than 5 years, the responsibility falls to the City of Chicago. This

extensive ordinance covers all specific parts of planting and tree maintenance, but these few guidelines are more crucial to our report.

Community History

Importance of Urban Forest to Community

Urban trees and high amounts of green space positively affect the mental and physical health of human beings. In Lindsay Abrams article “When Trees Die, People Die” (http://www.theatlantic.com/health/archive/2013/01/when-trees-die-people-die/267322/), she writes about the physical and mental health benefits that trees have on people. “[A]n analysis of numerous studies in *BMC Public Health* found evidence for natural environments having "direct and positive impacts on well-being, in the form of reduced anger and sadness”. She also cites how trees and natural scenes can bring about positive thoughts and wipe away negative ones. This study suggests that people surrounded by more trees and green space have positive effects on human beings, and humans in urban areas without green space are less likely to be as happy as the people living in abundant green space. Besides mental health, green space also makes people feel safer and more at ease in their homes. In Frances Kuo’s article “The Role of Arboriculture in a Healthy Social Ecology” (2003), she wrote that “Our findings suggest that, in fact, residents living in greener buildings feel significantly safer than do their counterparts living in more barren buildings. Further, our findings suggest that residents of greener buildings feel more comfortable or adjusted in their surroundings in general.” This study suggest that more green space makes people in urban environments feel safer and more at ease. These two studies show just a few of the many benefits urban forestry has in urban areas and the importance of green space for the health of people living in these urban areas.

Community size

The Lincoln park community has a population of around 64,000 people. It is a pretty large size community made up of a mix of families and college students. DePaul University's Lincoln Park Campus consists of 36 acres within the community of Lincoln Park. Around 23,500 students currently attend DePaul University which includes the Loop Campus, Naperville Campus, O'Hare Campus and online students. There are 14 academic buildings and 2 administrative buildings with 11 residence halls housing about 3,000 students. Our inventory was done on two blocks on the campus in between Fullerton/ Webster and Kenmore/ Sheffield.

Environment conditions

Chicago has temperate weather, cold winters and warm summers. Chicago is in the 6a hardiness zone and as the climate changes the zones will keep going up. Chicago was actually 5b but recently moved up to 6a. The soil used was mainly compost that they added when planting the trees. There were quite a few in tree lawns and front lawns that are able to have more access to soil and space. However, there were a couple that had gravel at the base instead of soil. The street trees soil might also have high concentrations of salt in it, because of the snow removal in the winter. They also might have high amount of pollution in the soil from car exhaust.

Tree Inventory Methods

1. First we got permission from the school to do the tree inventory. Then we talked with them to discuss which spots we should inventory. After that we found our location which was two blocks of the DePaul Lincoln Park Campus. The blocks were in between Fullerton to Webster and Kenmore to Sheffield. combination of public and private trees in the two block radius.

2. We decided to do a sample inventory of the campus which includes a We then worked with OpenTreeMap to figure out what custom fields we should add to our map, other than the ones already there. We had species, DBH, a picture, and height. Tree species had a full list of the street trees. The DBH (mm) was measured at breast height with DBH tape. We took pictures of each individual tree, so we could have a visual representation of the tree to look back at. Finally, we took the height of the tree by using a Nikon Forestry Pro Rangefinder. Then we added utility, planting type site, and condition. Utility was added to see if the trees had any conflict with power lines, cable wires and any others of this sort. The options that we utilized were: no utility wire, utility wire in conflict with tree, and utility wire no conflict with tree. If there were no utility wires nearby, we chose the option no utility wire above. If a tree had a utility wire nearby, we chose the option of utility wire, no conflict with tree. If the tree was touching a utility wire, we chose the option, utility wire, conflict with tree. Planting site type was added to look at the various planting sites for the trees as well, using the categories tree lawn, tree grate/pit, median, and tree lawn (Vogt et. al 2014). We utilized the planting site definitions. A median is where a tree is planted in a strip of land between traffic. A front yard is when a tree is located in the front yard of a building between the building and the street or sidewalk. A tree grate/pit is a planting area in which the tree is surrounded on all four sides in a smaller area along a street or sidewalk. A tree lawn is when a tree is planting in a strip of surface between the sidewalk and the street. Finally, we added the condition to rate the tree: good, fair, or poor (Vogt et. al 2014). We followed the overall tree condition ratings definitions. Good is a thick and full looking canopy with little to no damage or suckering. Fair is a thinning canopy, visible damage to the tree, needs pruning. Poor is very thin canopy, severe damage to the tree, needs pruning of dead wood. We wanted to make note of the health of the tree so we can tell the Facility Operations of DePaul that they need to either trim, treat, or remove the tree. Also with this data we can see how the overall population is doing.
3. We went out to inventory with our phones, orange vests and a tree identification book. We then took inventory on the trees and recorded the data in the app on our phones. The app recorded the data and also set a GPS location for each individual tree on a map.

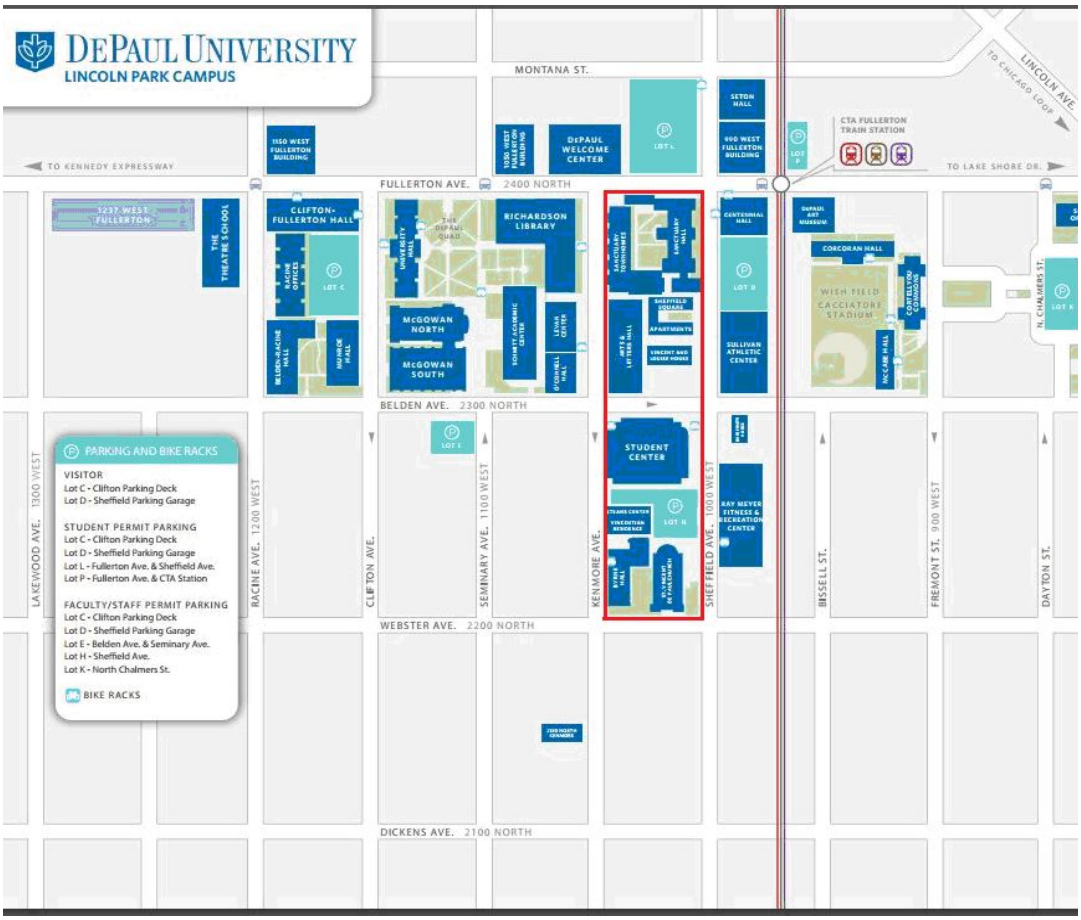

Figure 1: Map of DePaul's Lincoln Park Campus, Chicago, IL, red outline indicating the area that was inventoried. [Source: DePaul Website]

Figure 2: Map of trees inventoried in DePaul's Lincoln Park Campus, Chicago, IL. [Source: Open Tree Map]

Inventory Results

Species Distribution

The following list represents the species of trees that we inventoried as well as the number of each species within our inventoried area.

- American basswood: 1
- American elm: 3
- American sycamore: 1
- Ash: 2
- Basswood: 3
- Birch: 1
- Black spruce: 1
- Blue spruce: 4
- Callery pear: 15
- Catalpa: 1
- Elm: 2
- Gingko: 4
- Honeylocust: 42
- Japanese maple: 4
- Kentucky coffee tree: 2
- Northern white cedar: 9
- Oak: 2
- Peach: 1
- Plum: 2
- Red maple: 2
- Silver maple: 5
- Sugar maple: 13
- White ash: 2
- White oak: 1
- Blank/ No Species Identified: 5

Looking at the species distribution is essential to assessing the sustainability of the urban forest. It also provides information that can be utilized in planning future tree plantings and understanding where any vulnerabilities would be for the urban forest. The general rule of thumb for distribution in the urban forest is the 30/20/10 rule, meaning no more than 30% of a family, 20% of a genus, and 10% of a species. The only family that went over this rule is the Fabaceae family, which represents the vast amounts of honeylocust as well as the few kentucky coffee trees, with 34.2%. The only genus that went over this rule is the Gleditsia genus, representing the honeylocusts, with 32.8%, way over the recommended 20%. Honeylocust ended up being the most dominant species within this area and represented 32.8% of all trees. This is way over 10% recommendation, and pose a problem for DePaul if any sort of disease or pest targets the honeylocust. The honeylocust represented the vast majority of the street trees, posing even more of an issue. If there is any pest or disease the street tree population would be decimated. Callery pear trees were also slightly over, at 11.7%, so planting new callery pear trees should be avoided.

Table 1: Tree families (Latin name) distribution for the top 5 tree families represented in the inventoried area, DePaul Lincoln Park Campus

Family	Number of Trees	Percentage of Forest
Fabaceae	44	34.3%
Sapindaceae	31	24.2%
Rosaceae	18	14%
Cupressaceae	9	7%
Ulmaceae	5	3.9%

Table 2: Tree geniuses (Latin name) distribution for the top 5 tree families represented in the inventoried area, DePaul Lincoln Park Campus

Genus	Number of Trees	Percentage of Forest
Gleditsia	42	32.8%
Acer	24	18.7%
Pyrus	15	11.7%
Thuja	9	7%
Ulmus	5	3.9%

Table 3: Tree species (common name) for the top 5 tree families represented in the inventoried area, DePaul Lincoln Park Campus

Species	Number of Trees	Percentage of Forest
Honeylocust	42	32.8%
Callery Pear	15	11.7%
Sugar Maple	12	9.4%
Northern White Cedar	9	7%
Silver Maple	5	3.9%

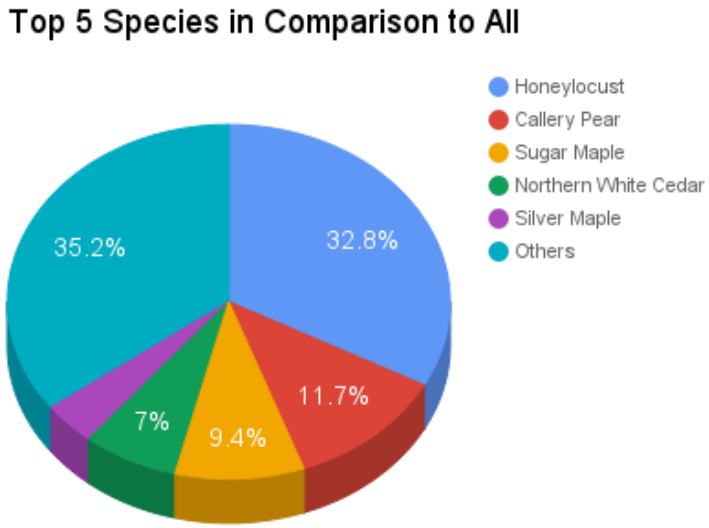

Figure 3: Species distribution compared to the top 5 tree species of all trees in the inventoried area, DePaul Lincoln Park Campus

Diameter Class

The majority of our tree's were smaller trees, with the diameter class distribution following a downward slope, with the smallest amount of trees being very large trees. This does follow the sustainable size distribution model, with a need for a large number of smaller trees to both replace the older trees and account for death. However, we cannot say with certainty that all of the trees within the sapling/pole class are actually younger trees. Species variation could account for the large number of trees being classified as saplings, some trees are naturally smaller, such as the Japanese Maple, which could have influenced the diameter distributions. The very large tree was a sycamore on Kenmore.

Table 4: Tree size distribution and size definition for all inventoried trees, DePaul Lincoln Park Campus

Tree Size	Size Definition	Number of Trees	Percentage of Forest
Sapling/pole	<24cm	66	51.5%
Small	25-37cm	26	20.3%
Medium	38-49cm	24	18.8%
Large	50-75cm	11	8.6%
Giant	>75cm	1	.8%

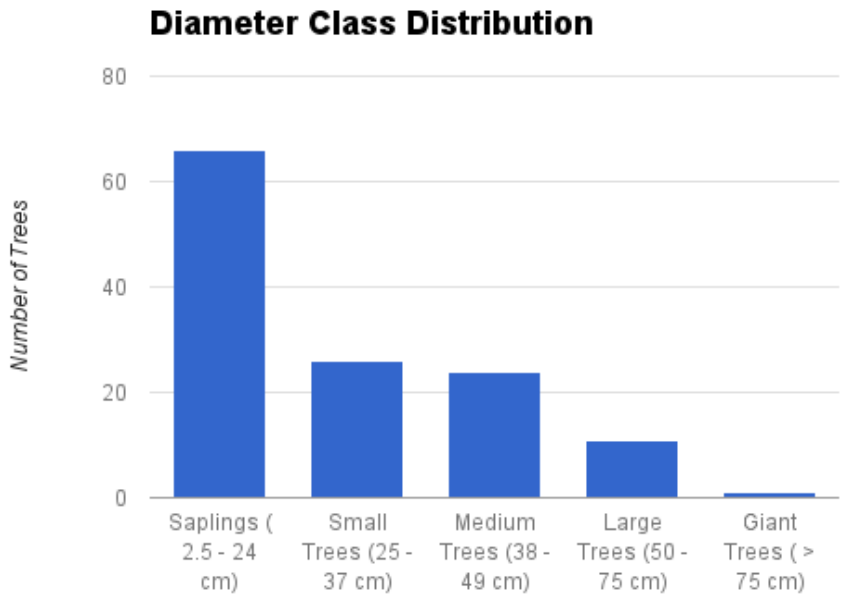

Figure 4: Diameter class distribution (at breast height), in cm, of all trees in the inventoried area, DePaul Lincoln Park Campus

Tree Heights

We looked at tree heights to get an idea of the canopy cover of the urban forest. The taller the trees are, theoretically the greater amount of area the trees canopy covers, although this can vary based on the trees species. Shorter trees would provide shade for humans, while larger trees could provide shade for buildings, reducing heating and cooling costs. The majority of the tree's that we inventoried were between 5-10m, with the next largest percentage being 15-20m. We had very few trees with heights over 20 meters. These heights could theoretically grow over time, but since some species naturally stay smaller or trees could be at their maximum height this change could be minimal.

Table 5: Tree height distribution for all inventoried trees, DePaul Lincoln Park Campus

Tree Height	Number of Trees	Percentage of Forest
0-5 m	29	22.8%
5-10m	56	44.1%
15-20m	38	29.2%
20-25m	5	3.9%

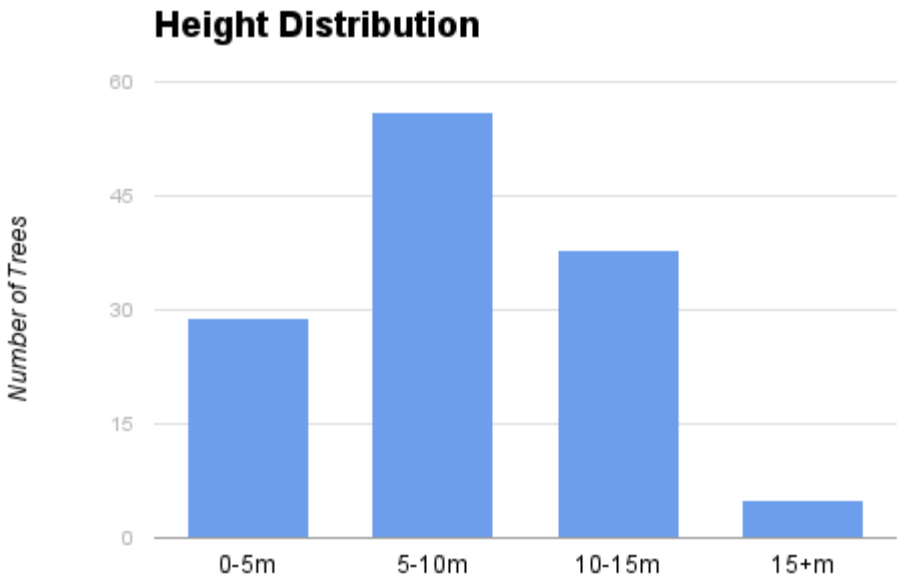

Figure 5: Tree height distribution, in m, of all trees in the inventoried area, DePaul Lincoln Park Campus

Utility Conflicts

The majority of the trees did not have any conflicts with utility wires, which was a positive. A small amount had a utility wire nearby, but there was no current conflict. However, this could pose problematic as the trees continue to grow. 18% of all the trees had some current conflict with a utility wire, which does cause some concern. If there is any storm or tree damage, branches could fall and bring down these utility lines.

Table 6: Utility conflict distribution for all inventoried trees, DePaul Lincoln Park Campus

Utility Conflict	*Number of Trees*	*Percentage of Forest*
No Utility Wire	100	78.1%
Utility Wire, No Conflict	5	3.9%
Utility Wire, Conflict with Tree	23	18%

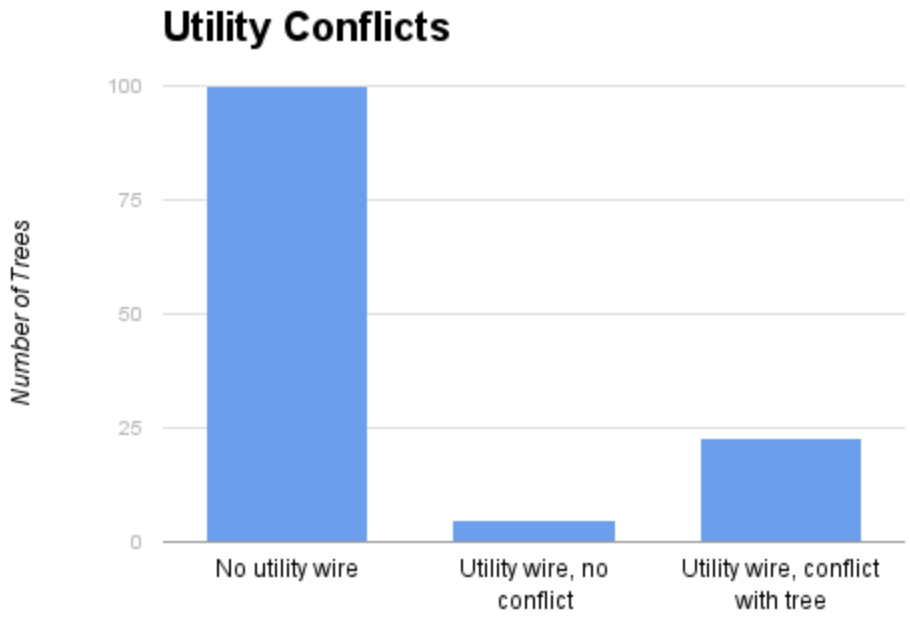

Figure 6: Utility conflict distribution of all trees in the inventoried area, DePaul Lincoln Park Campus

Planting Site

The most popular planting site ended up being tree lawns, accounting for the majority of the tree planting areas. These can be beneficial because there is less growth restriction for the trees, but there can be restrictions on the width of these tree lawns. Tree grates/pits accounted for the next largest amount, also accounting for the least amount of growing space for the trees. There was a section of honeylocust on Sheffield planted in very small tree pits that seemed to be suffering. The trees planted in front yards consisted of trees within the church's yard and within the yard of some apartments on Sheffield.

Table 7: Tree planting site distribution for all inventoried trees, DePaul Lincoln Park Campus

Planting Site	*Number of Planting Sites*	*Percentage of Planting Sites*
Median	1	.8%
Front Yard	15	11.7%
Tree Grate/ Pit	28	21.9%
Tree Lawn	84	65.6%

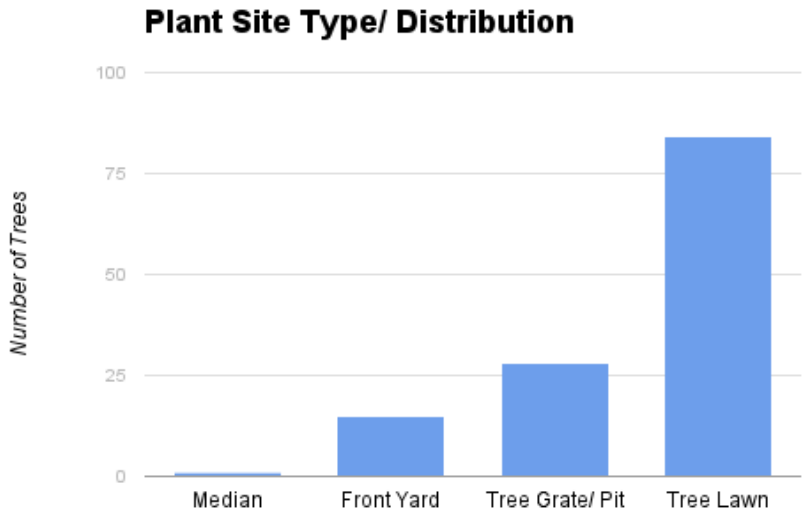

Figure 7: Planting site distribution of all trees in the inventoried area, DePaul Lincoln Park Campus

Condition Class

The majority of the trees inventoried were in the good classification. Of the fair trees, they consisted of elm trees that appeared to be suffering from Dutch Elm Disease, and a stretch of honeylocust along Sheffield Ave, all planted in small tree pits, who had dying branches that were hanging over the street.

Table 1: Condition class distribution for all inventoried trees, DePaul Lincoln Park Campus

Condition Class	*Number of Trees*	*Percentage of Forest*
Good	121	94.5%
Fair	7	5.5%
Poor	0	0%

Urban Forest Value

We calculated the monetary value of the urban forest utilizing the National Tree Benefits Calculator. The value of the 128 trees that we inventoried came to $11,516 in benefits per year. This is based on the value of the trees ability to reduce storm water runoff, increasing the property value, conserving energy for heating and cooling (natural gas & electric), improving air quality, and absorbing and sequestering carbon. This showcases the vast economic value of the trees on DePaul campus, and the economic incentive to care for and improve the urban forest.

Recommendations

Maintenance Requirements

A lot of the requirements for maintenance were safety and tree care issues, but there are other requirements as well. There are two Elm trees that could possibly be threatened by Dutch Elm Disease, and these should be looked at and possibly removed if they are in fact being affected. There are also two Ash trees that could be threatened by Emerald Ash Borer, and should be either checked or removed if actually affected.

On Sheffield there are many honeylocusts that management should give attention. There is a very large honeylocust that is leaning towards the street reaching a little more than halfway to the other side. The portion of branches over the street seems to be dead while section on sidewalk looks healthier. This could be very dangerous during high winds, thunder, precipitation, etc. Facility Operations should trim this to avoid an emergency. There are many other honeylocust that lean into the street that are of fair condition that should be looked and trimmed

by Facility Operations. These trees are all planted in very small tree pits, which could be a reason to their declining health. On the corner of Belden and Kenmore there is another honeylocust with branches just barely leaning on a cable wire. This tree should also be trimmed to avoid any harm of the tree falling and coming in contact with the wire, or tearing it down.

Aside from these hazardous trees, on Sheffield there were two tree stumps that could be removed to make way for new trees. This is important to utilize the space available on campus for trees, to have a maximum healthy and sustainable forest, and to receive maximum benefits on campus. There are two vacant planting sites on Sheffield also, which is not a lot, but should still have attention to utilize the space available so the DePaul Urban Forest can be at maximum health and give maximum benefits. There is also some room within the tree lawns, but this may create more problems than not. Overall the DePaul campus has efficiently used the amount of space available to plant trees within the area we inventoried.

Management of the Urban Forest Resource

From the inventory results we would recommend increasing the cycles of pruning. If not the whole campus than just focusing more on the trees that have a conflict with utility wire. The trees that were evaluated as "fair" should be followed up on more frequently. The tree stumps should be removed and then replaced with a new tree. There should be no ash or elm planted due to lack of resilience, maple and honeylocust are not recommended as well due to the large amount already planted. Some of the trees we recommend are autumn gold ginkgo, bald cypress, bloodgood planetree, dawn redwood, fastigiate english oak, hardy pecan, japanese pagoda tree, and village green japanese zelkova. These trees were found to be great street trees and sustainable for the upcoming threat of climate change.

Urban Forest Program Recommendations

Another recommendation would be for DePaul to work towards being a Tree Campus USA. The Arbor Day Foundation has a Tree Campus USA program, a designation given to schools that meet five core standards that promote a healthy campus urban forest. DePaul's urban forest is a valuable asset, and through working to become a tree campus DePaul can ensure its continued survival and success. Both The University of Illinois at Chicago and Roosevelt University are tree campuses; DePaul could look towards them on how to be a tree campus

within Chicago. The vast economic benefits discussed earlier in the report speak to this value, but becoming a Tree Campus would be beneficial in many other ways. It would be yet another way for DePaul to showcase its commitment to the environment and sustainability, create opportunities for student involvement, and would help create a community with care and interest in its urban forest. There are five core standards that every college has to meet in order to be designated a Tree Campus. These standards provide a framework for sustainable urban forestry for the school as well as guidelines for the school. The five core standards are as follows:

1. *Campus Tree Advisory Committee*: This committee must include representative from students, faculty, facility management, and the community. The committee acts with a vested interest in a successful urban forest, and can provide guidance on planning, education, or a tree care plan. A tree committee is a valuable way for DePaul to facilitate communication between all parties with a vested interest in DePaul's urban forest, gain greater resources, and involve the community more. Students can reach out to faculty/facility management, or DePaul can send out an invitation to students/the community
2. *Campus Tree Care Plan*: DePaul must develop a Campus Tree Care Plan with specific purposes, policies, goals and targets, and specifies rules of the Campus Tree Advisory Committee
3. *Campus Tree Program with Dedicated Annual Expenditures*: Currently DePaul has money/staff for the urban forest, but it is a part of the facility management, not its own separate funding. Finances need to be set aside and an annual work plan must be established in order to qualify for dedicated annual expenditures. The suggested amount is $3 per full-time student. With 22,500 students over four campuses this amount could be reasonable.
4. *Arbor Day Observance*: Some sort of Arbor Day observance must be held, what actually happens is up to the school, and evidence must be submitted. There is a large amount of opportunity for students to get involved in this, within or out of the Environmental Science department.
5. *Service Learning Project*: This is an opportunity to students to get involved, and would need some sort of project related to the trees on campus. Future inventories

would could for these, as well as volunteer tree planting or pruning, and community education.

Final Summary

In conclusion, the DePaul Urban Forest is well cared for. Though it is sustainable, the main issues with this Urban Forest stem from lack of species diversity and lack of sufficient pruning cycles and risk management. The monetary benefits of the urban forest are over $11,000 a year, which showcase that DePaul has economic incentive to invest in their urban forest. There are also other benefits, such as increased happiness and overall safety of an urban green space. Other ways to maximize the benefits of this urban forest would be to increase pruning cycles, increase species diversity, utilize vacant lots, and plant more resilient species. A way to increase the success of this process while also including the community would be to work towards making DePaul a Tree Campus USA. This would increase awareness of urban forestry issues and bolster student involvement in activities such as planting and pruning. Overall, our inventory yielded valuable results, which could be the basis of future tree inventories of DePaul and the Lincoln Park area.

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