December 2008

Community GroundWorks
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Report on 2008 Troy Gardens Tree Inventory

Introduction

This project assessed the tree species composition of wooded areas at Troy Gardens. Three management zones of the Troy Natural Areas were inventoried: The Maple Lane (ML), a half acre elongated area along the southern portion of the western property boundary, the Old Railroad Corridor (ORC), an elongated area of 2.61 acres, which runs roughly east-west through the center of the property, and the Troy Community Forest (TCF), a mostly triangular 1.75 acre area on Mendota Mental Health Institute property directly bordering the Maple Lane to the west. These three areas contain the greatest concentrations of trees, though not all trees at Troy Gardens.

The Maple Lane was developed in 2004, with the designs of Ziegler Design Associates, as an area to exhibit a picture of the southern mesic woodland of Wisconsin. This type of woodland is dominated by sugar maple and is home to beloved spring ephemeral plant species. Probably the main reason that this type of landscape was chosen to be emulated here is that at the time of development, there was a heavy concentration of maple saplings in the area. These young trees, which had grown up under several old specimens of sugar maple along the lane, provided an opportunity to create a shade-dominant natural space. The Lane was historically used as a walk or drive to a train platform that was in the area; maple trees were planted at regular intervals along this. The large old trees continue to influence the character of the site with their stateliness.

Although a relatively narrow strip of land, the Maple Lane has a forest-like quality of enclosure and shade, making it a welcome retreat from the sunshine of the adjacent community gardens. Allowing this sense of enclosure to be achieved is the dense barrier of native shrubs that border the trees. These attractive, mostly nut and berry-bearing plants act as a visual screen to enclose the woods, increase the shade and shelter inside the stand—helping forest species survive there—and provide fun forage of fruit and nuts to people and animals. A sheltered picnic area is situated at the heart of this wooded land, with views over the community gardens.

Troy Community Forest, across the access-road path from the ML, also adds to the forest experience at Troy Gardens. This land is owned by Mendota Mental Health Institute, which has partnered with Community GroundWorks (CGW) to allow this piece of land to be managed with the rest of the Troy Gardens land in a community-oriented style. The primary use of this particular piece of land is as a teaching space. Troy Gardens volunteer stewards, neighbors, and school programs, working with CGW staff have created a path system and sitting/meeting area in these woods. A coalition of community partners, including youth, will continue to develop and maintain this land.

The TCF has perhaps the most unusual arrangement of species of Troy natural areas. The area had been landscaped with exotic trees—European larch and Norway spruce—and green ash, all in regular patterns. The land had subsequently grown over in young forest, made up in part by maple saplings—presumably propagates from the ML trees.

The Old Railroad Corridor is a bit different from the first two areas. Its main feature is the path down its middle, built on top of a defunct rail line. This path is broad, level and mostly straight, even as the land around it slopes variably. This gives a sense of disconnect between the path and the tree-and-shrub-covered land surrounding it, differing from the path through the ML. There are no paths within the wooded areas of the ORC and this area is too overgrown for people to enter anyway.

This area has a feeling, like other overgrown railways, of wildness—of frontier. In fact, this feeling matches the predominant management strategy on this area, namely no management. There has been little imposition on or control of the vegetation in the ORC, aside from keeping it out of the way of the path. The area has been left to nature's devices, in part as an example of how a piece of land looks when there is little intervention.

Other areas of the land, such as the northern area of mulberry 'savanna' and the stand of Siberian elm at the front (south), were not formally inventoried. Such areas are mostly homogeneous in species composition and in any case have few specimens that would likely fall within the parameters of the study. These areas will likely not be managed as woodland in the future.

It was decided to not inventory the Edible Landscape Forest, containing mostly small fruit trees, either, due to similar concerns about the caliper of the trees, as well as the fact that this area is already well catalogued.

The three sections that were inventoried in this study are each in a unique state of current or planned (future) woodland restoration management. See below for how data from this inventory will be used for each section.

Goals

The inventory goal for all three areas is to assess species composition. We wanted to know what species are present and something of the stands' age characteristics (trunk size being a proxy for age). The results will be used differently for each area: ML data will be used to understand the progress of the restoration, as well as to plan for management (e.g. removal of dead trees); ORC data will be used, among other things, for potential development of a management plan for this overgrown area; use for TCF data is simpler—getting a picture of the composition of this new management area for use as a baseline and jumping-off point for community-based management/development.

Methods

I determined that the best way to get an overall picture of the makeup of these small wooded areas was to go through each zone and count the number of stems of each species in each of a set of size classes. I chose these categories of DBH: 4-9" (Class A); 9-13" (Class B); 13" and greater (Class C). I chose size classes to represent young trees, mature trees and the ones in between. Stems at least 4" DBH I considered 'trees' even if they belong to species sometimes considered shrubs (e.g. buckthorn). I considered trees smaller than 4" 'saplings' and did not count them. Dead trees in each size class were counted because CGW would like to have an idea of how much wood may need to be taken out for maintenance.

I counted each stem as a separate tree, even if it seemed that it was connected to other stem(s). I took side notes of any trees that were made up of more than one stem, joined below breast height, but stems were still counted singly. The justification for this practice is that

management, treatment or removal cost increases by stem rather than by individual. (For clarity, when I reference 'individual' henceforth in this report, I am referring to the individual stem, not the individual organism or tree.) All tree stems in all three areas were counted.

I made a measuring stick with the limits of the size classes marked on it for use in gauging into which class each individual fell. All tree class recordings were based on my use of this device, and are not, therefore, to be taken as absolute measurements. (See Potential Errors section.) I walked through the wooded areas and recorded trees, as I moved in a set direction. I remembered which stems I had already counted in an area, to the best of my ability. In this way, every tree could be counted in a fairly short period of time.

The three main zones of forested areas I broke up into several units, labeled A through J. These non-uniform units were for the purpose of landmarking while in the field and spatial organization in data collection. Pausing recording at the boundaries of units allowed me to assess my direction and make sure I had not missed areas. Also these were convenient stopping points so that the process could be broken up over a course of several sessions.

I recorded the species and class of each stem in a list, by letter unit. At the end, I compiled the results from letter units into tables of each management zone (see below). Breakdown of the records into the letter units, records of trees with multiple trunks and/or anomalies (e.g. a tree covered in vines), and the geographic direction of my record-taking are preserved in the raw data.

Results

I recorded seventeen species of trees across the three areas that I studied:

Species of Trees Recorded

Scientific Name	Common Name
Acer negundo	box elder
Acer platanoides^^	Norway maple
Acer saccarinum	silver maple
Acer saccharum	sugar maple
Celtis occidentais	hackberry
Fraxinus pennsylvanica	green ash
Jugulans nigra	walnut
Larix decidua^	European larch
Morus alba^^	white mulberry
Picea abies^	Norway spruce
Prunus serotina	black cherry
*Rhamnus cathartica**^^	buckthorn
*Rhus typhina**	staghorn sumac
Ulnus americana	American elm
Ulnus pumila^^	Siberian elm
Ulnus rubra	slippery elm

*Generally considered to be shrub species
^Non-native
^^Invasive Non-native

The breakdown of the three areas studied is as follows:

Maple Lane Species

Scientific Name	Common Name
(dead)	(dead)
Acer negundo	box elder
Acer saccharum	sugar maple
Celtis occidentais	hackberry
Fraxinus pennsylvanica	green ash
Jugulans nigra	walnut
Morus alba^^	white mulberry
Prunus serotina	black cherry
Ulnus americana	American elm
Ulnus pumila^^	Siberian elm
Ulnus rubra	slippery elm

TCF Species

Scientific Name	Common Name
(dead)	(dead)
Acer negundo	box elder
Acer saccarinum	silver maple
Acer saccharum	sugar maple
Celtis occidentais	hackberry
Fraxinus pennsylvanica	green ash
Juglans nigra	black walnut
Larix decidua^	European larch
Morus alba^^	white mulberry
Picea abies^	Norway spruce
Prunus serotina	black cherry
*Rhamnus cathartica**^^	buckthorn
Ulnus americana	American elm
Ulnus pumila^^	Siberian elm
Ulnus rubra	slippery elm

Old Railroad Corridor Species

Scientific Name	Common Name
(dead)	(dead)
Acer negundo	boxelder
Acer platanoides^^	Norway maple
Acer saccarinum	silver maple
Celtis occidentalis	hackberry
Fraxinus pennsylvanica	green ash
Juglans nigra	black walnut
Morus alba^^	white mulberry
Prunus serotina	black cherry
*Rhamnus cathartica**^^	buckthorn
*Rhus typhina**	staghorn sumac
Ulnus americana	American elm
Ulnus pumila^^	Siberian elm

Maple Lane:

In term of numbers, the Maple Lane is made up predominantly of two species of tree: *Fraxinus pennsylvanica* (42%) and *Celtis occidentalis* (24%). For other species, including *Acer saccharum*, percentages drop off to below 10% of total for the ML. The third most numerous species there is *Ulnus pumila* at 9%. There are ten species in that area.

As expected, maple saplings make up a major portion of the midstory, as seen on a walk-through assessment (no saplings were quantitatively assessed). This suggests that the predominant species will change from ash to maple at some time in the future, as these saplings mature. Another reason to believe this is a likely scenario is that the Emerald Ash Borer's threat may drive favoritism of maple over ash in management.

Old Railroad Corridor:

The Old Railroad Corridor is noticeably different than the other areas in more than one way. Dead trees are most numerous. Also, the makeup of this are is more even, as can be seen in the species distribution charts for the three areas (Appendix A). After dead trees (30%) and *Morus alba* (18%), the two most numerous species are *Acer negundo* (19%) and *Prunus serotina* (black cherry; 13%). There are 12 species in this area.

Morus being the most numerous living species in the ORC might have come about because of the death of many elms in that area, causing a lack of shading. The fast growing mulberries would have been able to quickly take advantage of these openings, surpassing other species. Now that these mulberries and the other tree species, such as *Acer n.*, have grown up to create a canopy, there is little expansion—few new mulberries are being established.

Troy Community Forest:

The Troy Community Forest has the most skewed makeup: After *Fraxinus p.* (56%), all percentages are below ten. Second and third most numerous species are *Acer negundo* at just under 7% and *Morus a.* at just over 6%. There are 14 total species in TCF.

I would surmise that the predominance of green ash is due to the free-seeding nature of that plant (by comparison to sugar maple, for example) and the ready seed source: the row of large ash trees that runs through this zone. The ash row, spruces and larches were probably established around the same time, since these are the only large trees in this area and they are arranged in regular patterns (obviously planted, not natural). Thus, the area would have been fairly open and prone to invasion by fecund species such as ash. We see ash and sugar maple trees of similar caliper in this area, suggesting that there was also an invasion from the east, propagating from the ML.

Interestingly, the vast majority of saplings observed in this area are maple, not ash. This is likely due to the fact that sugar maple so readily germinates and grows up under an established canopy, unlike ash. This disparity between what is overhead (young ash) and what is at eye level (maple saplings) could be easily exploited to develop a maple-dominant woods here, mirroring the ML.

All Three Areas:

Totals show that by far the most numerous species in ML and TCF is *Fraxinus pennsylvanica* (green ash), at 42% and 56%, respectively; it makes up 32.5% of the total for all three areas. Green ash is 7% of ORC. The finding that green ash is the most numerous species was surprising and has important implications for management, as emerald ash borer (EAB) looms. This result was surprising because ashes are not the most obvious trees on the land. Maple makes the biggest impression on a visitor because of several large specimens of sugar and silver maple along the three areas studied, as well as the many saplings of sugar maple in the Maple Lane and TCF areas. I do not expect that this means a future of ash predominance for two reasons: There will likely be thinning of the ashes because of EAB, and most of the saplings in all three areas are other species (largely maples).

Second most numerous overall, especially evident in ORC, are standing dead trees—just under 16% of the total trees (153 individuals out of 978). Dead trees are nearly 30% of trees in ORC, the largest percentage of any category for that area. While it is desirable to have some standing ‘snags’ for wildlife to use and inhabit, having so many dead trees poses hazards and is unsightly. Snags that may fall across a path or on a structure need to be removed. Because of the arrangement of the area in relation to such targets, many dead trees in the ORC should be on high priority for removal.

Size class totals show a woodland skewed toward younger trees, with Class A (4" to 9") having 84% of all of the stems. When totals are broken down by species and class, it is seen that class A dominates percentages. (See Appendix B) The top three species/classes are all class A. Of the fifteen species/classes with more than one percent of the total, only five are not class A.

It is clear from the data that the huge mature maples, dominant in the visual impression of the site, hide a very different younger tree generation—the numerous slim ashes, hackberries and cherries, as well as box elders of varying sizes. Because of these generational differences in composition, for a fuller picture of the future makeup of these areas, this inventory must be viewed along with the shrub/sapling inventory. The view of this mid layer shows a different picture yet—one where maple dominates the ML midstory and part of TCF's, while the ORC is choked by a thicket of shrubs with few saplings at all. Of the 16 tree species observed, only 4 did not have any saplings present anywhere on the site. Three of the four are exotic species—European larch, Norway Spruce and Norway maple.

Seven of the sixteen total species are non-native; four of these—white mulberry, Siberian elm, *Acer platanoides* (Norway maple) and *Rhamnus cathartica* (buckthorn)—are recognized as invasive by the WDNR and other sources, although only buckthorn is of great concern to ecosystems statewide. Of these exotics, only white mulberry was found in high numbers (104 individuals out of 978—11%) at tree size in these areas.

When looked at through the filter of the 4" DBH + size class, it would seem that buckthorn is not much of a threat. However, there are many shrub-sized specimens of this species at Troy Gardens. Invasion is thickest in the TCF, which has not yet been cleared of its brush. Buckthorn is also somewhat of a nuisance along the Lane.

The other invasive species that was recorded in this study that has a strong population on the land is mulberry. Like buckthorn, there are many individuals of this species that were not counted here because of their small caliper. Invasion by this plant is widespread on the site, with the north edges of TCF and the south side of ORC having the worst cases. There are also well-established mulberries in the north of the land, spaced out as in a savanna. I have observed deer impact on these mulberries (loss of lower branches and bark; no seedlings in the area), suggesting that further spread of this species has been kept in check by this foraging.

2008 Troy Gardens Tree Inventory Data

Species Stem Totals

Scientific Name	ML Stems	ORC Stems	TCF Stems	Total all 3 Areas	Sp. % of Total
Fraxinus pennsylvanica	60	30	228	318	32.5
(dead)	2	127	24	153	15.6
Morus alba^^	2	76	26	104	10.6
Acer negundo	6	64	27	97	9.9
Prunus serotina	4	56	6	66	6.7
Ulnus americana	6	40	16	62	6.3
Celtis occidentalis	34	3	14	51	5.2
Acer saccharum	8	0	23	31	3.2
Acer saccarinum	0	17	3	20	2
Jugulans nigra	5	8	7	20	2
Ulnus pumila^^	13	1	6	20	2
Larix decidua^	0	0	15	15	1.5
Picea abies^	0	0	9	9	0.9
Acer platanoides^^	0	4	0	4	0.4
Ulnus rubra	3	0	1	4	0.4
*Rhamnus cathartica**^^	0	1	1	2	0.2
*Rhus typhina**	0	2	0	2	0.2
Sum:	143	429	406	978	100

*Generally considered to be shrub species
^Non-native
^^Invasive Non-native

Class Stem Totals

Class	ML Stems	ORC Stems	TCF Stems	Total all 3 Areas	Class % of Total
4 to 9" DBH	114	388	324	826	84.4
9 to 13" DBH	22	35	39	96	9.8
> 13"DBH	7	6	44	57	5.8
Sum:	143	429	407	979	100.0

2008 Troy Gardens Tree Inventory Data

Species By Class Stem Totals

		Number of Stems				
Species Common Name	Size Class Code	ML	ORC	TCF	All 3 Areas	% of Total
green ash	A	50	25	203	278	28.4
(dead)	A	1	112	16	129	13.2
white mulberry	A	2	74	25	101	10.3
box elder	A	5	59	21	85	8.7
black cherry	A	3	53	4	60	6.1
American elm	A	4	38	12	54	5.5
hackberry	A	34	3	11	48	4.9
green ash	B	10	4	15	29	3.0
sugar maple	A	6	0	21	27	2.8
(dead)	B	0	14	2	16	1.6
European larch	C	0	0	15	15	1.5
walnut	A	0	8	4	12	1.2
box elder	B	1	5	5	11	1.1
green ash	C	0	1	10	11	1.1
Siberian elm	A	8	1	2	11	1.1
(dead)	C	1	1	6	8	0.8
silver maple	A	0	8	0	8	0.8
Siberian elm	B	4	0	3	7	0.7
black cherry	B	1	3	2	6	0.6
silver maple	B	0	6	0	6	0.6
silver maple	C	0	3	3	6	0.6
American elm	C	2	1	2	5	0.5
walnut	B	4	0	1	5	0.5
Norway maple	A	0	4	0	4	0.4
Norway spruce	A	0	0	4	4	0.4
sugar maple	C	2	0	2	4	0.4
American elm	B	0	1	2	3	0.3
hackberry	B	0	0	3	3	0.3
Norway spruce	B	0	0	3	3	0.3
slippery elm	B	2	0	1	3	0.3
walnut	C	1	0	2	3	0.3
white mulberry	B	0	2	1	3	0.3
buckthorn	A	0	1	1	2	0.2
Norway spruce	C	0	0	2	2	0.2
Siberian elm	C	1	0	1	2	0.2
staghorn sumac	A	0	2	0	2	0.2
box elder	C	0	0	1	1	0.1
slippery elm	A	1	0	0	1	0.1
	Sum:	143	429	406	978	100.0

2008 Troy Gardens Tree Inventory Data

Maple Lane Species Stem Totals

Scientific Name	Class A*	Class B*	Class C*	All 3 Classes	Rel Freq (%)**
Fraxinus pennsylvanica	50	10	0	60	42.0
Celtis occidentalis	34	0	0	34	23.8
Ulnus pumila^^	8	4	1	13	9.1
Acer saccharum	6	0	2	8	5.6
Acer negundo	5	1	0	6	4.2
Ulnus americana	4	0	2	6	4.2
Jugulans nigra	0	4	1	5	3.5
Prunus serotina	3	1	0	4	2.8
Ulnus rubra	1	2	0	3	2.1
Morus alba^^	2	0	0	2	1.4
(dead)	1	0	1	2	1.4
				143	100.0

^Non-native

^^Invasive Non-native

*Class A: 4" to 9" DBH Class B: 9" to 13" DBH Class C: larger than 13" DBH

**Total of all trees = 143; Relative Frequency = Sp total / 143

Old Railroad Corridor Species Stem Totals

Scientific Name	Class A*	Class B*	Class C*	All 3 Classes	Rel Freq (%)**
(dead)	112	14	1	127	29.6
Morus alba^^	74	2	0	76	17.7
Acer negundo	59	5	0	64	14.9
Prunus serotina	53	3	0	56	13.1
Ulnus americana	38	1	1	40	9.3
Fraxinus pennsylvanica	25	4	1	30	7.0
Acer saccarinum	8	6	3	17	4.0
Jugulans nigra	8	0	0	8	1.9
Acer platanoides^^	4	0	0	4	0.9
Celtis occidentalis	3	0	0	3	0.7
Rhus typhina~	2	0	0	2	0.5
*Rhamnus cathartica**^^	1	0	0	1	0.2
Ulnus pumila^^	1	0	0	1	0.2
				429	100.0

~Generally considered to be shrub species

^Non-native

^^Invasive Non-native

*Class A: 4" to 9" DBH Class B: 9" to 13" DBH Class C: larger than 13" DBH

**Total of all trees = 429; Relative Frequency = Sp total / 429

2008 Troy Gardens Tree Inventory Data

Troy Community Forest Species Stem Totals

Scientific Name	Class A*	Class B*	Class C*	All 3 Classes	Rel Freq (%)**
Fraxinus pennsylvanica	203	15	10	228	56.2
Acer negundo	21	5	1	27	6.7
Morus alba^^	25	1	0	26	6.4
(dead)	16	2	6	24	5.9
Acer saccharum	21	0	2	23	5.7
Ulnus americana	12	2	2	16	3.9
Larix decidua^	0	0	15	15	3.7
Celtis occidentais	11	3	0	14	3.4
Picea abies^	4	3	2	9	2.2
Jugulans nigra	4	1	2	7	1.7
Prunus serotina	4	2	0	6	1.5
Ulnus pumila^^	2	3	1	6	1.5
Acer saccarinum	0	0	3	3	0.7
*Rhamnus cathartica**^^	1	0	0	1	0.2
Ulnus rubra	0	1	0	1	0.2
				406	100.0

^Non-native

^^Invasive Non-native

*Class A: 4” to 9” DBH Class B: 9” to 13” DBH Class C: larger than 13” DBH

**Total of all trees = 407; Relative Frequency = Sp total / 407

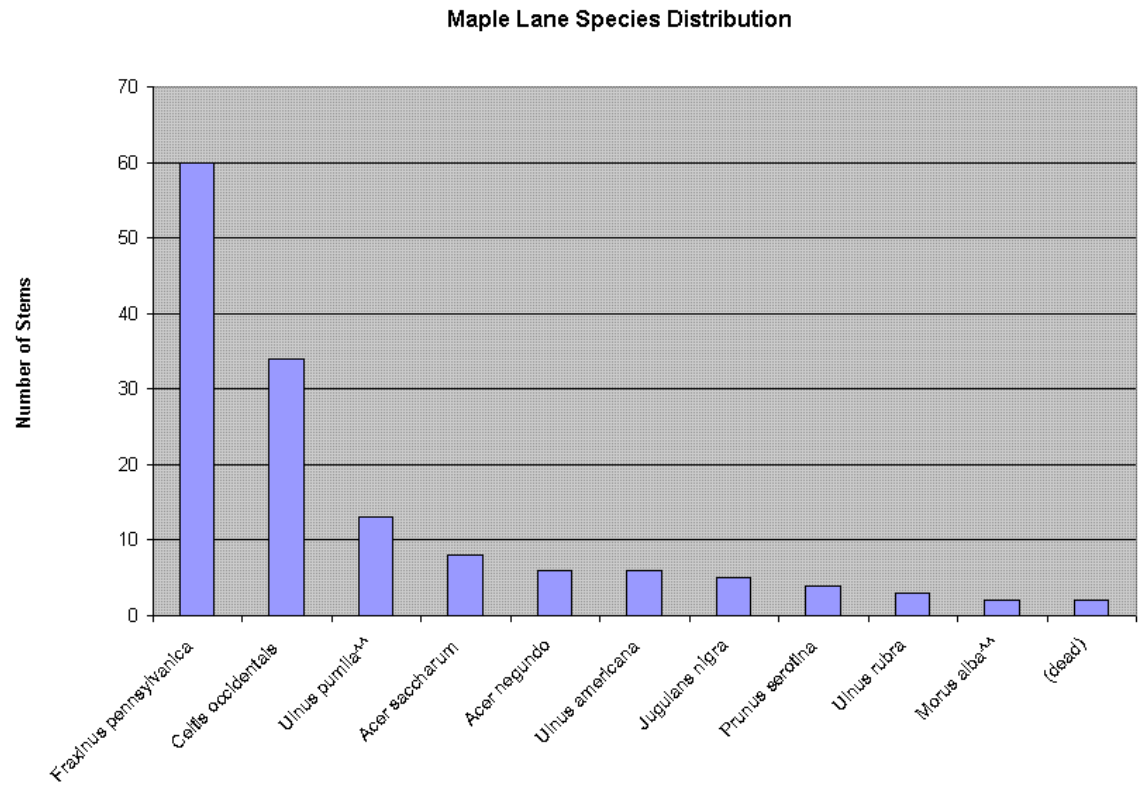
Additional Notes

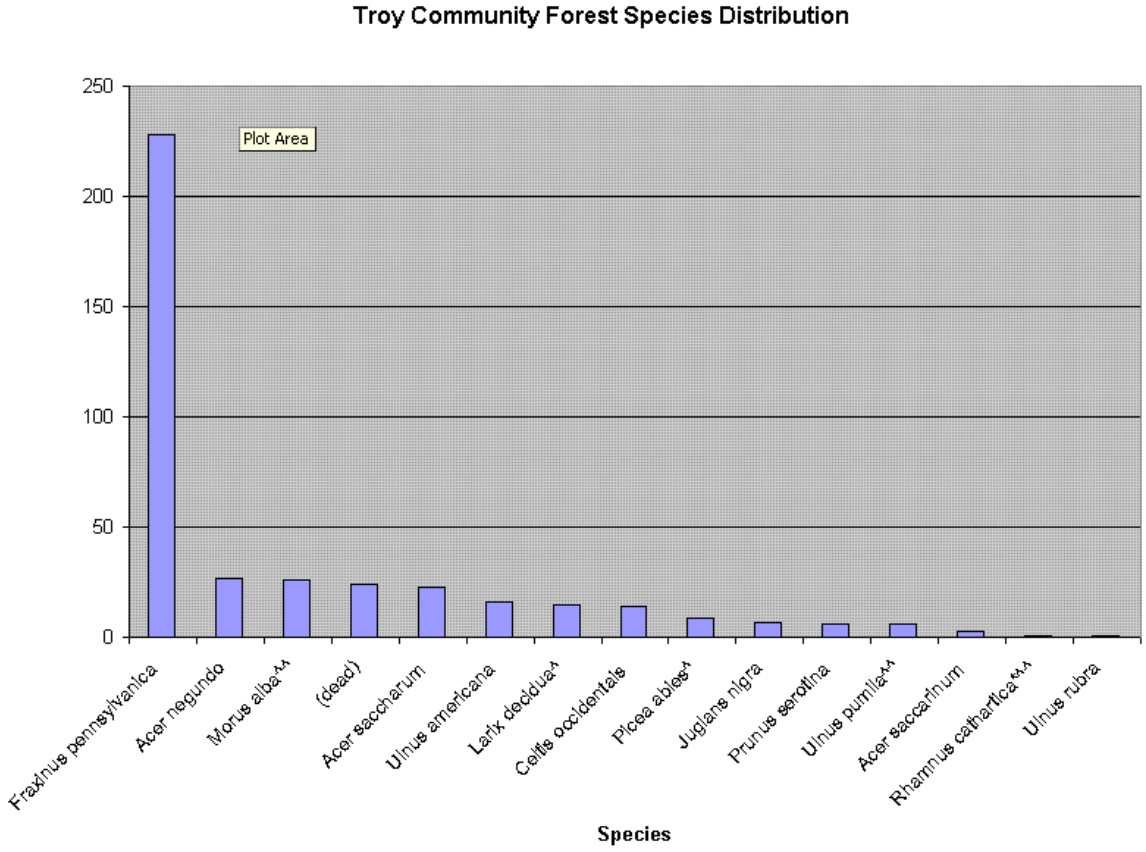
Although I believe the procedure of this study to be adequate for its purposes, I feel necessity to mention, in the interest of full disclosure, some potential sources of error in my methods. For one, precision of categorization of the stems was limited to the accuracy of my perception. I would estimate that I could have been off by as much as an inch DBH, leading to the miscategorization of some stems. It is also possible that I counted stems more than once or missed stems due to the fact that I simply memorized which ones had been already counted, rather than marking them off in some way. I feel confident that these errors are minor. It would be just as likely for me to count a stem twice as to miss counting one, so it may be that those errors will cancel out in any case.

This method is different from the standard method of inventorying trees. It is usual to devise a system of sample points within a stand, to record a representative portion of the total trees and extrapolate up to the whole stand. I feel that my method is more accurate and just as open to subjectivity as the sample approach—the accuracy comes from counting all of the stems/trees rather than interpolating. I chose not to sample here because the area is so small. It would have taken up almost as much time to set up and later interpret a sample program as to count every tree. It may be difficult to compare data that were collected by differing methods of inventory. Therefore, the data from this study cannot be assumed to be directly comparable to the data collected in a 2004 forest inventory that was done at Troy Gardens.

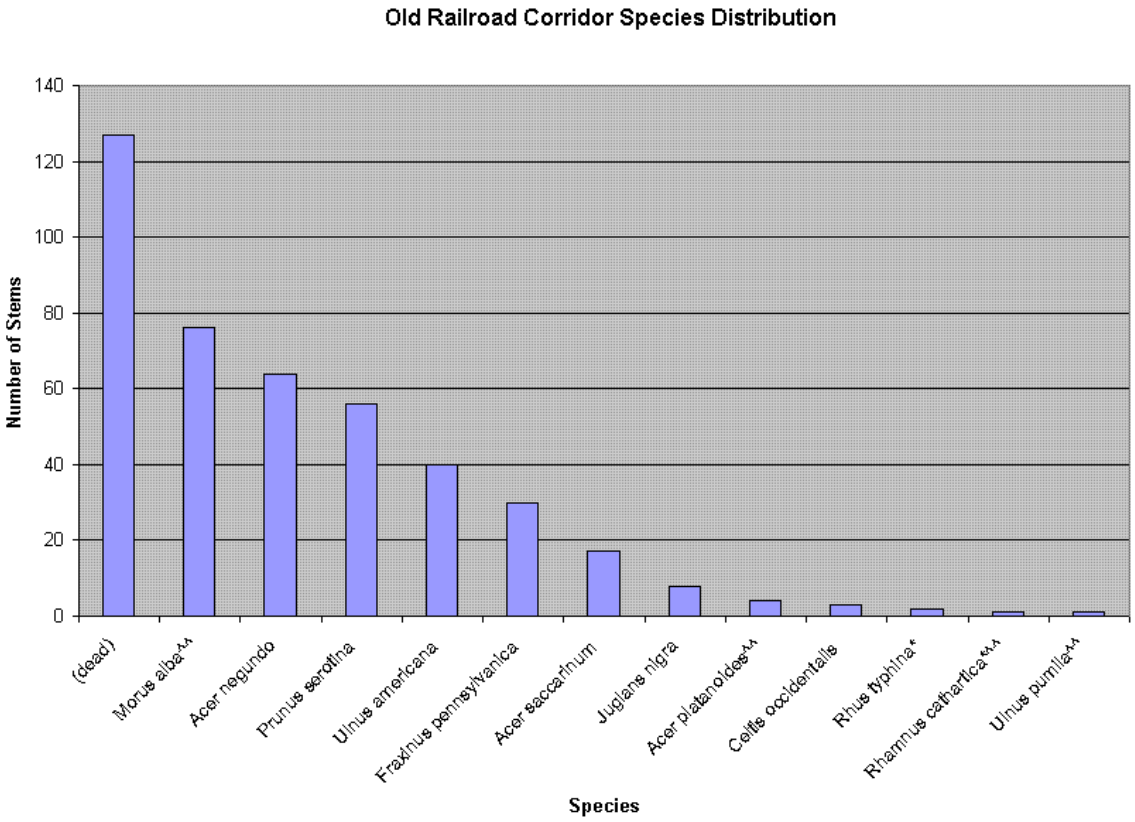
This study did not look quantitavely at dominance, a figure used in the scientific study of forest ecosystems. A pseudo-dominance number could be obtained from the data in this study, if that were desired. However, I feel that this is not something that is needed for understanding the wooded areas at Troy Gardens.

Appendix A


Maple Lane Species Distribution
Number of Stems
70
60
50
40
30
20
10
0
Fraxinus pennsylvanica
Celtis occidentals
Ulnus pumila^^
Acer saccharum
Acer negundo
Ulnus americana
Juglans nigra
Prunus serotina
Ulnus rubra
Morus alba^^
(dead)

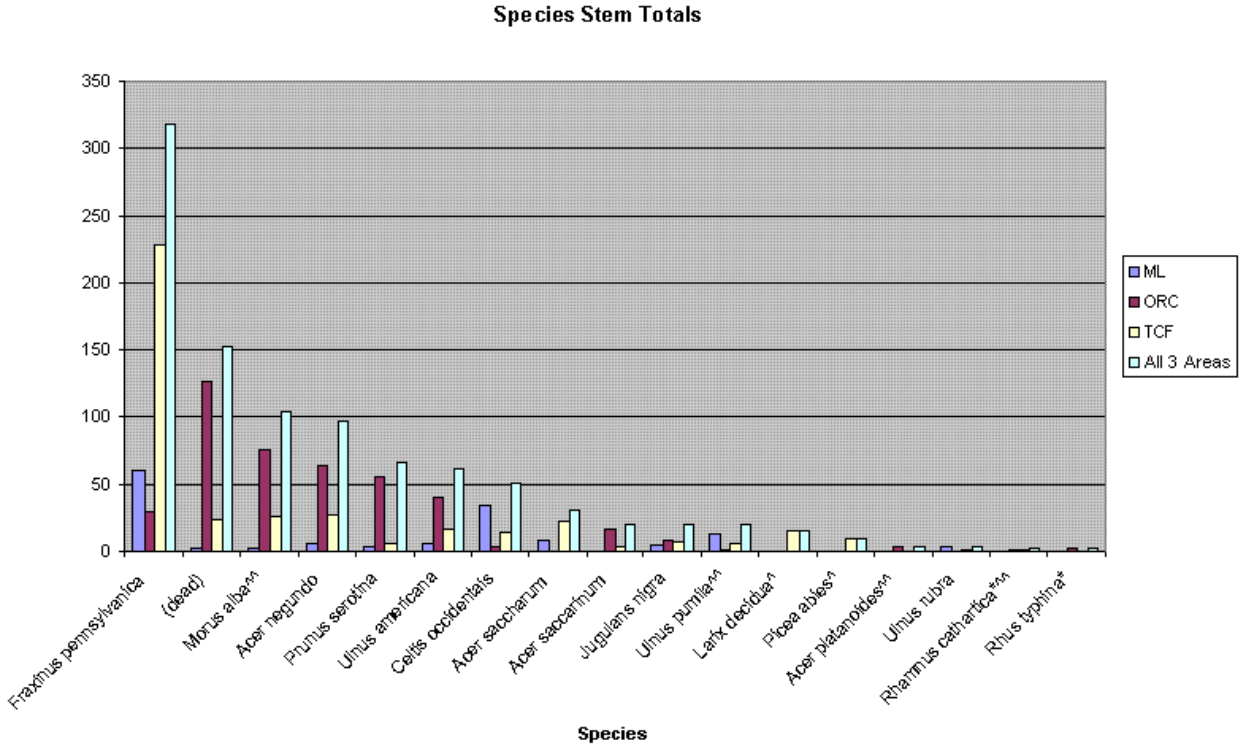

Troy Community Forest Species Distribution
Plot Area
250
200
150
100
50
0
Fraxinus pennsylvanica
Acer negundo
Morus alba^^
(dead)
Acer saccharum
Ulnus americana
Larix decidua^
Celtis occidentals
Picea abies^
Juglans nigra
Prunus serotina
Ulnus pumila^^
Acer saccarinum
Rhamnus cathartica^^
Ulnus rubra
Species

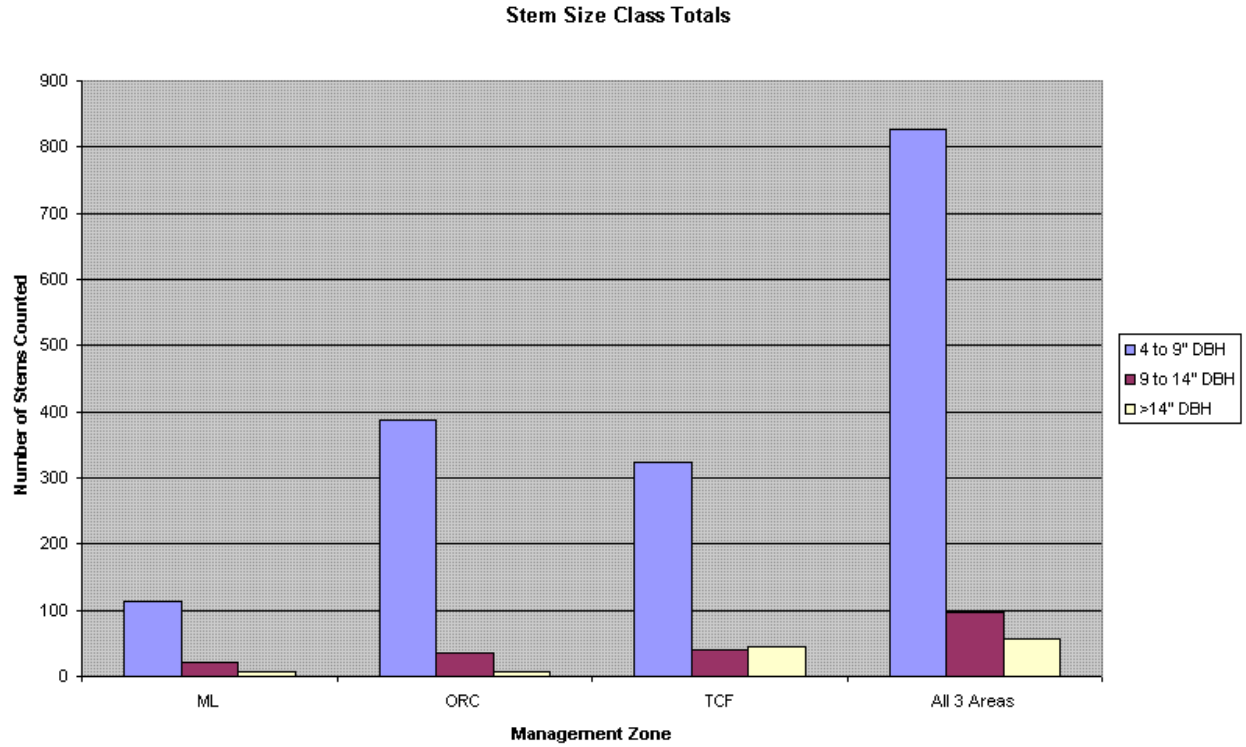
Class A: 4” to 9” DBH Class B: 9” to 13” DBH Class C: larger than 13” DBH

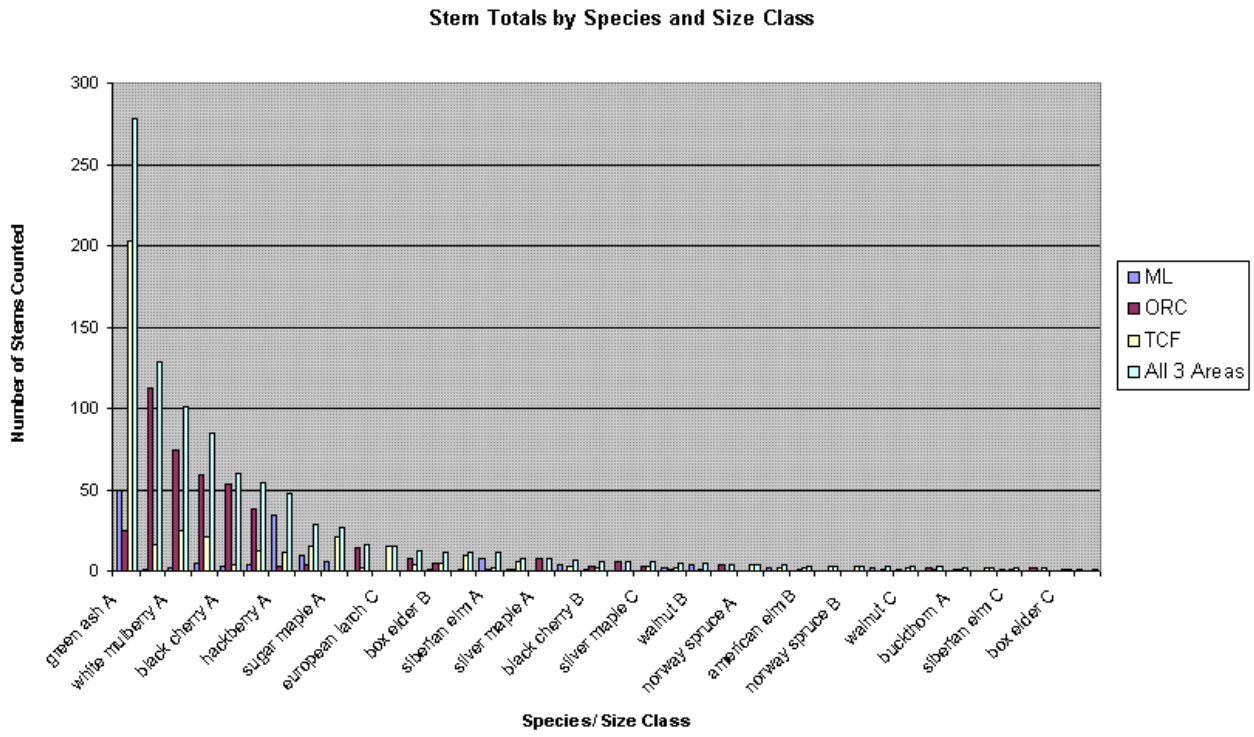


Class A: 4” to 9” DBH Class B: 9” to 13” DBH Class C: larger than 13” DBH

Appendix B


Species Stem Totals
350
300
250
200
150
100
50
0
ML
ORC
TCF
All 3 Areas
Fraxinus pennsylvanica
(dead)
Morus alba^^
Acer negundo
Prunus serotina
Ulmus americana
Celtis occidentalis
Acer saccharum
Acer saccarinum
Juglans nigra
Ulmus pumila^^
Larix decidua^
Picea abies^
Acer platanoides^^
Ulmus rubra
Rhamnus cathartica*^^
Rhus typhina*
Species


Stem Size Class Totals
900
800
700
600
500
400
300
200
100
0
Number of Stems Counted
4 to 9" DBH
9 to 14" DBH
>14" DBH
ML
ORC
TCF
All 3 Areas
Management Zone



Class A: 4” to 9” DBH Class B: 9” to 13” DBH Class C: larger than 13” DBH

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