FRIENDS OF TREES

2011 -12 Monitoring Report

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Table of Contents

Executive Summary

The mission of Friends of Trees (FoT) is to bring people in the Portland-Vancouver and Eugene-Springfield metropolitan areas together to plant and care for city trees and green spaces. To encourage the care of recently planted trees, the Friends of Trees Neighborhood Trees Program (FoT NT) trains volunteer Summer Inspectors to visit trees during the summer immediately following the planting season. These volunteers also educate homeowners on the best practices of general tree care through conversations and informative door-hangers.

The primary objective of this report is to analyze the survival of trees planted by the Friends of Trees Neighborhood Trees Program (FoT NT) the first summer after planting. It also examines the relative health and growth of a portion of trees planted by the organization beyond their initial year in the ground. This report is submitted as part of the Grey-to-Green contract with the Bureau of Environmental Services. It is intended that this report will portray the program's contribution to the growing of Portland's urban forest and as an organized dataset that may be used to support similar work done by other organizations and agencies.

The total number of trees monitored within the City of Portland during the 2011-2012 planting season was 4,782 trees. Of these, 86% (4116) were new street trees and 12% (564) were new yard trees, for a total of 4,680 new trees. In addition, 102 trees were planted to replace trees that died from the 2010-11 planting season. The 4,782 trees represent 51 genera and 134 species of trees.

Summer Inspectors inspect each tree twice during the summer. The results of Round 1 inspections fell largely into the good and okay categories—55% and 34% respectively, for a total of 89% of the tree set. Of trees monitored, 2% were assessed as bad and 2% as dead. 8% of trees were not inspected. The Round 2 inspection results also showed a significant majority of trees with a good (59%) or okay (32%) rating, and trees rated bad (2%) and dead (1%) decreased and 5% of trees were not inspected. The increase in good trees and the decline in okay and dead trees may be attributed to the Summer Inspectors who visited each tree and the informative door hangers which were left behind.

Of the 4,782 trees monitored in Portland during the 2011-12 monitoring season (MS-12), a total of 146 trees did not survive their first summer season in the ground, which presents a mortality rate of 3% for the monitored tree set, or a 97% survival rate. This survival rate is the same as the previous year, which was also 97%. Those trees that died represent 45 species.

In analyzing the data, FoT found that many tree species survived very well during their first summer in the ground. Of the 134 species planted, 89 had zero mortality. In addition, some of the species that are planted in great number had very low mortality rates, such as Japanese Snowbell, Japanese Stewartia, Crabapple sp., Tricolor Beech and Black Tupelo.

While FoT is pleased with the survival rate of the trees planted during the 2011-2012 planting season, there are plans to incorporate lessons learned from this monitoring season. These changes include encouraging even higher rates of participation on planting day, and monitoring stressed species over the next few years to ensure these species are suitable for the urban Portland area.

It is important to note that despite a significant increase in numbers of trees planted over 2011-2012 planting season, the overall survival of trees has stayed at 97%. We look forward to using this evaluation as a concrete platform from which to assess our future tree monitoring.

Introduction

Planting a tree is a relatively simple act. Ensuring that a tree survives the first growing season and throughout its lifespan is more difficult. The goal of our monitoring program is to provide proper tree planting education and after-planting care assistance to new tree owners so that a tree will survive its first growing season and ideally become an asset to the community during the many years to come. The primary objective of this report is to analyze the survival of trees planted by the Friends of Trees Neighborhood Trees Program (FoT NT) the first summer after planting. Additionally, the report also examines the relative health and growth of a portion of trees planted by the organization beyond their initial year in the ground.

To obtain the data, FoT NT trains volunteer Summer Inspectors to visit the newly planted trees during the summer following the planting season. Summer Inspectors are volunteers who may be new to the organization, but most often are volunteers who have previous experience with FoT as a Neighborhood Coordinator, Crew Leader, or "Treecipient"(someone who has purchased a tree through the NT program.) Friends of Trees employs the "train the trainer" method of volunteer training, meaning our trained volunteers go on to educate homeowners on the best practices of general tree care.

The monitoring report addresses the following:

- The condition and survival rate of all trees planted during PS-12
- The genus and species composition of trees planted during PS-12
- Performance trends based on genus, species and cultivar
- Assessment of the effects of planting conditions, including stock type, time of year planted, and location of planting
- The condition and survival rate of 10% of trees planted during PS-11
- The condition and survival rate of 10% of trees planted during PS-10

The report will discuss the methods for both our year one monitoring (Tier I) and long-term monitoring (Tier II & Tier Omega). Next, results for year one monitoring will be examined, along with lessons learned and conclusions. Finally, results and a summary for long term monitoring will be discussed.

Methods

Inspection Overview

To systemize data collection, the Tree Monitoring Protocol that outlines monitoring activities was established in 2009 and was modified in 2010 (Appendix A). Three types of inspections have been developed (these are further described in Table 1 and Graphic 1):

- **Tier I**: assessing the health condition and survival of first year trees. Tier I inspections are performed for all trees planted in any given year.
- **Tier II**: tracking the health condition and growth of a percentage of trees over two years. Tier II inspections occur annually on 10% of 2 year old trees. Trees are chosen so that locations are specific and well distributed."
- **Tier Omega**: analyzing the health condition and growth of a percentage of trees over an extended time period. Tier Omega inspections will occur annually into the future using a 10% subset of 2009-10 trees as its baseline dataset.

The monitoring protocol describes three aspects of site condition: inadequate water (a dry site), the absence of mulch, and the presence of weeds or grass, and three aspects of tree condition: trunk damage, the presence of suckers or sprouts, and if there are broken branches. A fourth measure of tree condition, the absence of leaves, was added prior to MS-11 to immediately indicate to FoT staff whether a tree had leaves or not (Appendix B). The combination of these seven components forms the overall Health Rating for each tree. Prior to MS-12 an eighth condition, "Not Inspected" was added to indicate if the tree was not able to be inspected. In addition, there is a notes column that enables SI volunteers to provide further details for each tree. Staff reviews these notes prior to any site visit.

For ease of comprehension, this report identifies the planting season by the year the planting ended and the monitoring season as the year the inspections took place, e.g. PS-12 refers to Planting Season 2011-2012 and MS-12 refers to inspections that occurred during summer 2012.

Tier	Timing	Trees Monitored	Data Collected	Inspection Frequency
I	First Growing Season	100% of trees planted during the previous planting season	1) Dry, 2) No Mulch, 3) Weeds, 4) Bark Damage, 5) Broken & Dead Branches, 6) Suckers, 7) No Leaves 8) Not Inspected	2 Visits (One in June, One in August)
II	Second Growing Season	10% of trees planted two planting seasons ago	The above eight factors plus Height, Width, & Caliper	1 Visit (In July or August)
Omega	Every Growing Season	Tier II subset from 09-10 planting season	The eight factors plus Height, Width, & Caliper	1 Visit Every Year (In July or August)

Table 1: Summer Inspector Schedule and Overview

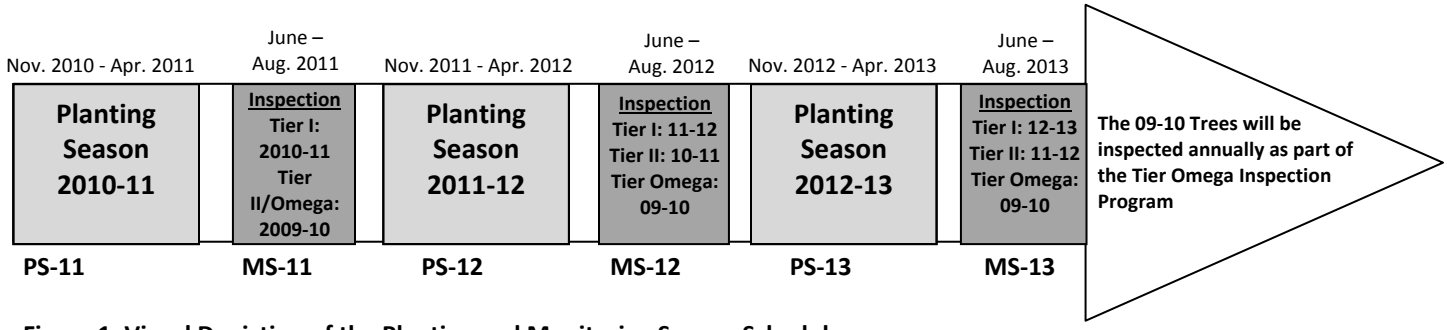

Figure 1: Visual Depiction of the Planting and Monitoring Season Schedule

Working with Volunteers

The Summer Inspector Training is designed to empower treecipients and volunteers with the knowledge to establish and maintain their new trees. During June 2012, FoT NT staff trained over 200 volunteer Summer Inspectors. Each Summer Inspector was assigned a route of approximately 30 trees based on their geographic proximity. Summer Inspectors submitted inspection results twice during the summer growing season: July 1 & August 15. Inspection results were submitted electronically via Google Documents, a shared online spreadsheet (cloud computing) or the printed inspection sheet was delivered to the Friends of Trees office which was then put into the Google Document. The first inspection period was referred to as Round 1, and the second as Round 2.

Photo 1: Summer Inspector Training

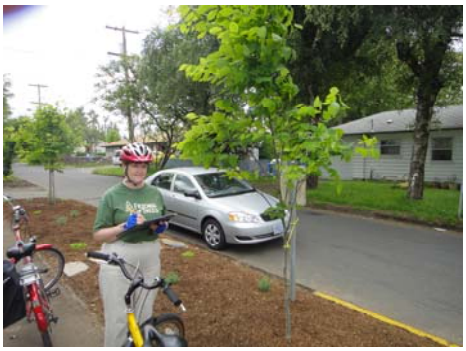

Photo 2: Summer Inspector in Action

Tree Assessment System

For Tier I, II, and Omega, Summer Inspectors collect site and tree condition information. Site conditions include lack of water, lack of mulch, and weeds and grass in the root zone, which are all important to young tree survival. Tree conditions include damaged bark, broken/dead branches, root suckers, and a lack of leaves and all of these factors are detrimental to young trees. The underlying reason for this is to provide feedback to Treecipients on why each inspection point is important to the health of their new tree(s).

For the MS-11 season, FoT NT created a "weighted point system" for tree assessment where site and tree condition measures carried different point values in order to better exemplify that some conditions have a greater impact than others on the overall health rating of a tree. The purpose of this was to remove some of the subjectivity from the inspection process and replace it with more of an objective system. It is understood and accepted that by working with hundreds of volunteers that there is still variability in our data and sample.

	Site Condition			Tree Condition			
	DRY	NO MULCH	WEEDS	BARK DAMAGE	DEAD BRANCHES	SUCKERS	NO LEAVES
Point Value	3	2	1	5	3	1	16

Table 2 – Weighted-Point Rating System

In the "weighted point rating system," the sum of points for each aspect of tree condition is calculated as follows: 0-2=Good, 3-7=OK, 8-15=Bad, 16=Dead. e.g. a tree that is dry (3), has no mulch (2), has weeds present (1), and suckers (1) adds up to a total of 7 and is therefore rated OK , but a tree that is dry (3), has no mulch (2), and dead branches (3) for a total of 8 is rated bad.

Condition	Point Total	Explanation
No Leaves	16	If the 'No Leaves' column is checked, the tree is noted as 'Dead' and a FoT staff visit occurs.
Bark Damage, Dry, Broken/Dead Branches	5,3,3	Second highest point total categories. A combination of any 2 or all 3 (except Dry & Broken/Dead Branches) equals 8 points and is noted as 'Bad' and a FoT staff visit occurs.
No Mulch	2	Holds a slightly lower point value though when combined with any 2 combinations of the above 3 conditions it will equal 8 (i.e., 'Bad') and a FoT staff visit occurs.
Weeds, Suckers	1,1	Lowest point category, though when added to combinations of higher importance conditions equaling more than 8 points (i.e., 'Bad') and a FoT staff visit occurs.

Table 3 – Weighted-Point Rating System Ranking

Compiling the Data

Inspection data were uploaded into the Neighborhood Trees database (NTdb), a Microsoft Access database. There, detailed records are maintained for each tree planted through the Neighborhood Trees Program, including genus, species, cultivar, stock size, stock type and nursery of origin, date planted, street address, and other pertinent notes. At the end of each monitoring period, this database is queried to show the health ratings of the monitored trees. Trees with a bad or dead health rating were visited by NT staff to either make recommendations for improvement or determine probable cause(s) of death. Detailed notes are then entered into the NTdb. FoT Staff could then change ratings of these trees accordingly based on their findings.

At the end of the monitoring season, a report displaying monitoring information for all trees planted during the previous season was queried from the NTdb. The report is edited to remove duplicate records and other redundancies, then sorted, reorganized, and analyzed to produce the findings presented below.

Results – Year One Monitoring (Tier I)

Overall Survivability and Health Ratings

The total number of trees monitored within the City of Portland during MS-12 was 4,784 trees during Round 1 and 4,782 during Round 2. Of these, 86% (4116) were new street trees and 12% (564) were new yard trees, a total of 4,680 new trees. Additionally, 102 trees were planted as replacements for trees that died in MS-11. Replacement trees are those that die due to poor nursery stock or planting method, those trees that die due to neglect or vandalism are not replaced (Table 3 and Figure 2).

Tree Type	Qty
New Street Trees	4116
New Yard Trees	564
Replacement Trees	102
Total	**4782**

Table 4: Total Trees Monitored in MS-12

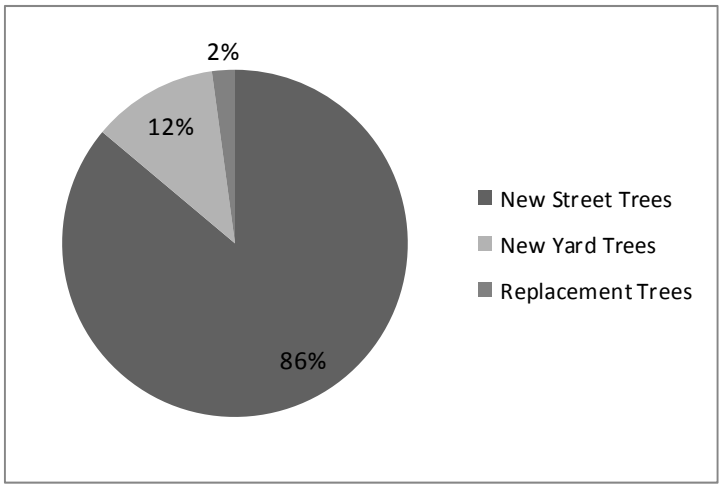

Figure 2 – Summary of trees monitored in MS-12

Health Ratings of Trees Monitored

A report of the NTDB shows the total number of trees monitored to be 4,784 during Round 1 and 4,782 during Round 2.

The results of Round 1 inspections fell largely into the good and okay categories—55.4% and 33.5%, respectively, for a total of 88.9% of the tree set. Of trees monitored 1.7% were assessed as bad, and 1.7% were recorded as dead. 7.7% of trees were not inspected

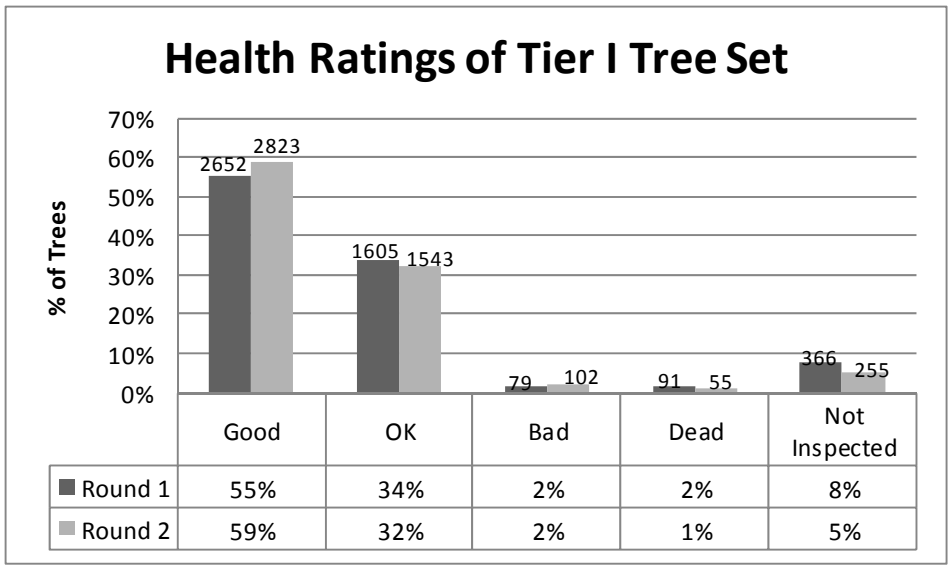

Figure 3 – Health Ratings of Tier I Tree Set – Round 1 and Round 2

Results from the Round 2 inspections also show a significant majority of trees with a good or ok rating. Interestingly, the percentage of good trees increased 3.6% from Round 1 to Round 2. During the same time period, the percentage of ok trees decreased by 1.2%. Trees rated bad increased by .4%, and dead trees decreased by .5% (Figure 3-4).

Composition of Trees Planted – (PS-12)

A diverse urban forest is a healthy urban forest, and to that end, Friends Of Trees tries to ensure that a diverse selection of tree species is planted each season. Healthy urban forests should have no more than 20% of any genus or more than 10% of any one species. While the *Acer* genus was planted approximately more than one and-a-half times more often than any other genus, it was still below the desired 20% threshold. 51 genera and 134 species or cultivars were planted during PS-12 which shows the broad variety of tree selection that FoT offers. That being said, the *Acer* and *Malus* genera accounted for a quarter of the trees planted by FoT during PS-12. Much of this has to do with the abundance of 2.5 and 3.5 width planting strips of which these genera are extremely popular, as treecipients are able to choose which species they would like. The top ten species planted during PS-12 were Rocky Mountain Glow Maple (309), Paperbark Maple (276), Black Tupelo (183), Japanese Snowbell (160), Prairifire Crabapple (158), Purple Prince Crabapple (151), Japanese Stewartia (149), Tricolor Beech (132), Golden Raindrops Crabapple (109), Forest Pansy Redbud (106).

Tree stock was obtained from 13 different nurseries; most of whom are located within the Willamette Valley. The majority of tree stock came from J.Frank Schmidt and Sons Nursery in Boring, Oregon, and Rigert Nursery in Aloha, Oregon.

Genus	Total	Percent of Total Planted	Species Breakdown	Total per Species
Acer	796	16.64%	Rocky Mtn Glow Maple	309
			Paperbark Maple	276
			Flame Maple	83
			Trident Maple	45
			Bigleaf Maple	42
			Korean Maple	19
			State Street Maple	17
			Bowhall Maple	5
Malus (crabapple)	489	10.26%	Prairifire Crabapple	158
			Purple Prince Crabapple	151
			Golden Raindrops Crabapple	109
			Royal Raindrops Crabapple	71
Styrax	279	5.86%	Japanese Snowbell	160
			Snowcone Japanese Snowbell	81
			Pink Chimes Japanese Snowbell	38
Quercus	248	5.20%	Scarlet Oak	81
			Forest Green Oak	42
			Oregon White Oak	41

Genus	Total	Percent of Total Planted	Species Breakdown	Total per Species
			Crimson Spire Oak	38
			Swamp White Oak	15
			Burr Oak	7
			Sawtooth Oak	7
			Shumard Oak	7
			Skinny Genes Oak	5
			Canyon Live Oak	1
			Emperor Oak	1
			Silverleaf Oak	1
			Interior Live Oak	1
			Island Oak	1
Nyssa	214	4.49%	Black Tupelo	183
			Wildfire Black Tupelo	28
			Chinese Tupelo	3
Crataegus	200	4.20%	Lavalle Hawthorn	80
			Black Hawthorn	74
			Washington Hawthorn	46
Magnolia	182	3.82%	Elizabeth Magnolia	47
			Galaxy Magnolia	25
			Edith Bogue Magnolia	24
			Brackens Brown Beauty Magnolia	22
			Butterflies Magnolia	19
			Yulan Magnolia	15
			Lennei Magnolia	15
			Vulcan Magnolia	15
Stewartia	168	3.53%	Japanese Stewartia	149
			Tall Stewartia	18
			Sawtooth Stewartia	1
Ulmus	156	3.28%	Emerald Sunshine Elm	92
			Accolade Elm	39
			Frontier Elm	14
			Patriot Elm	7
			Prospector Elm	3
			Allee Elm	1
Tilia	142	2.98%	Harvest Gold Linden	73
			Greenspire Linden	62
			Redmond Linden	7
Fagus	135	2.83%	Tricolor Beech	132
			Rivers Purple Beech	3

Genus	Total	Percent of Total Planted	Species Breakdown	Total per Species
Pyrus	132	2.77%	Asian Pear 'Chojuro'	20
			Asian Pear 'Shinseiki' Semi-Dwarf	19
			Asian Pear 'Seuri' Semi-Dwarf	13
			Asian Pear 'Korean Giant' Semi-Dwarf	9
			Asian Pear 'Nijiseiki'	9
			Pear 'Anjou' Semi-Dwarf	18
			Pear 'Comice' Semi-Dwarf	16
			Pear 'Bartlett' Semi-Dwarf	15
			Pear 'Moonglow' Semi-Dwarf	13
Parrotia	130	2.73%	Persian Ironwood	84
			Vanessa Persian Ironwood	46
Cornus	122	2.56%	Cornelian Cherry Dogwood	64
			Chinese Dogwood	54
			Heart Throb Dogwood	4
Cercis	106	2.22%	Forest Pansy Redbud	106
Carpinus	100	2.10%	American Hornbeam	59
			Pyramidal European Hornbeam	33
			Japanese Hornbeam	8
Amelanchier	96	2.01%	Autumn Brilliance Serviceberry	61
			Spring Flurry Serviceberry	35
Zelkova	90	1.89%	City Sprite Zelkova	49
			Green Vase Zelkova	41
Prunus	86	1.80%	Plum 'Brooks' Semi-Dwarf	29
			Plum 'Beauty' Semi-Dwarf	20
			Plum 'Seneca' Semi-Dwarf	16
			Plum 'Methley' Semi-Dwarf	15
			Plum 'Shiro' Semi-dwarf	6
Betula	84	1.76%	Dura Heat River Birch	84
Malus (apple)	77	1.62%	Apple 'Jonagold' Semi-Dwarf	37
			Apple 'Spartan' Semi-Dwarf	17
			Apple 'Akane' Semi-Dwarf	13
			Apple 'Liberty' Semi-Dwarf	10
Gingko	64	1.34%	Autumn Gold Ginkgo	54
			Halka Ginkgo	8
			Magyar Ginkgo	2
Cascara	59	1.24%	Cascara	59
Ficus	47	0.99%	Fig 'Brown Turkey'	19
			Fig 'Lattarula'	18

Genus	Total	Percent of Total Planted	Species Breakdown	Total per Species
			Fig 'King'	10
Liriodendron	46	0.97%	Tuliptree	46
Chionanthus	44	0.92%	Chinese Fringetree	44
Cotinus	40	0.84%	Grace Smoketree	39
			American Smoketree	1
Catalpa	40	0.84%	Northern Catalpa	34
			Purple Catalpa	6
Diospyros	39	0.82%	Japanese Persimmon 'Fuyu'	28
			Japanese Persimmon 'Hachiya'	11
Thuja	37	0.78%	Western Redcedar	29
			Hogan-Cedar	8
Heptacodium	35	0.73%	Seven Son Flower	35
Clerodendron	34	0.71%	Glorybower	34
Calocedrus	29	0.61%	Incense-Cedar	29
Cladrastis	29	0.61%	Perkins Pink American Yellowwood	15
			American Yellowwood	14
Maackia	27	0.57%	Amur Maackia	27
Koelreuteria	22	0.46%	Goldenrain Tree	20
			Columnar Goldenrain Tree	2
Gymnocladus	21	0.44%	Espresso Kentucky CoffeeTree	21
Fraxinus	21	0.44%	Autumn Purple Ash	21
Pseudotsuga	16	0.34%	Douglas-fir	16
Metesequoia	14	0.29%	Dawn Redwood	14
Pawpaw	10	0.21%	Common Pawpaw	10
Ostrya	9	0.19%	American Hophornbeam	9
Corylus	9	0.19%	Turkish Hazel	9
Pistacia	8	0.17%	Chinese Pistache	8
Juglans	7	0.15%	Walnut 'English Carpathian'	7
Alnus	6	0.13%	White Alder	6
Sequoiadendron	5	0.10%	Giant Seqouia	5
Taxodium	3	0.06%	Bald Cypress	3
Pinus	2	0.04%	Ponderosa Pine	2
Abies	2	0.04%	Abies pinsapo 'Glauca'	2
Maclura	2	0.04%	Osage-orange	2
Poliothyrsis	2	0.04%	Pearlbloom	2
Emmenopterys	1	0.02%	Emmenopterys	1
Tsuga	1	0.02%	Western Hemlock	1
Celtis	1	0.02%	Hackberry	1
Katsura	1	0.02%	Katsura Tree	1

Table 5 – Composition of Trees Planted in PS-1

Composition of Dead Trees

A total of 146 trees planted and monitored during PS-12 did not survive their first summer season in the ground, amounting to a mortality rate of 3% for the monitored tree set; this corresponds to a 97% survival rate. Of the 146 trees that failed, 27 genera were represented. Of the 146 trees that failed, 131 (90%) were street trees and 15 (10%) were yard trees; and out of those 146 street and yard trees, 9 (6%) of the trees were replacement trees that had previously failed.

Genus	Qty Dead (Genus)	Qty Planted (Genus)	Percent Dead (Genus)	Species Breakdown, by Cultivar	Qty Dead (Species)	Qty Planted (Species)	Percent Dead (Species)
Acer	36	796	4.52%	Rocky Mtn Glow Maple	15	309	4.85%
				Paperbark Maple	13	276	4.71%
				Bigleaf Maple	4	42	9.52%
				Flame Maple	3	83	3.61%
Quercus	19	248	7.66%	Scarlet Oak	9	81	11.11%
				Forest Green Oak	5	42	11.90%
				Crimson Spire Oak	2	38	5.26%
				Oregon White Oak	1	41	2.43%
				Swamp White Oak	1	15	6.67%
Magnolia	17	182	9.34%	Elizabeth Magnolia	12	47	25.53%
				Bracken's Brown Beauty	8	22	36.36%
				Lennei Magnolia	2	15	13.33%
				Butterflies Magnolia	1	19	5.26%
				Edith Bogue Magnolia	1	24	4.17%
				Yulan Magnolia	1	15	6.67%
Cercis	11	106	10.38%	Forest Pansy Redbud	11	106	10.38%
Nyssa	10	214	4.67%	Black Tupelo	8	183	4.37%
				Wildfire Black Tupelo	2	28	7.14%
Styrax	7	279	2.51%	Japanese Snowbell	3	160	1.88%
				Snowcone Japanese Snowbell	3	81	3.70%
				Pink Chimes Japanese Snowbell	1	38	2.63%
Cornus	6	122	4.92%	Cornelian Cherry Dogwood	5	64	7.81%
				Chinese Dogwood	1	54	1.85%
Fagus	6	135	4.44%	Tricolor Beech	6	132	4.55%
Malus (crabapple)	3	489	0.61%	Royal Raindrops Crabapple	2	71	2.82%

Genus	Qty Dead (Genus)	Qty Planted (Genus)	Percent Dead (Genus)	Species Breakdown, by Cultivar	Qty Dead (Species)	Qty Planted (Species)	Percent Dead (Species)
				Prairifire Crabapple	1	158	0.63%
Cotinus	3	40	7.50%	Grace Smoketree	2	39	5.12%
Thuja	3	37	8.11%	Western Redcedar	3	29	10.34%
Koelreuteria	3	22	13.64%	Goldenrain Tree	3	20	15.00%
Malus (apple)	2	77	2.60%	Apple 'Akane' Semi-Dwarf	1	13	7.69%
				Apple 'Jonagold' Semi-Dwarf	1	37	2.70%
Zelkova	2	90	2.22%	City Sprite Zelkova	2	49	4.08%
Sequoiadendron	2	5	40.00%	Giant Sequoia	1	5	20.00%
Crataegus	1	200	0.50%	Washington Hawthorn	1	46	2.17%
Ulmus	1	156	0.64%	Emerald Sunshine Elm	1	92	1.09%
Tilia	1	142	0.70%	Redmond Linden	1	7	14.29%
Pyrus	1	132	0.76%	Pear 'Moonglow' Semi-Dwarf	1	13	7.69%
Carpinus	1	100	1.00%	American Hornbeam	1	59	1.69%
Amelanchier	1	96	1.04%	Spring Flurry Serviceberry	1	35	2.86%
Prunus	1	86	1.16%	Plum 'Methley' Semi-Dwarf	1	15	6.67%
Ficus	1	47	2.13%	Fig 'King'	1	47	2.13%
Catalpa	1	40	2.50%	Northern Catalpa	1	34	2.94%
Clerodendron	1	34	2.94%	Glorybower	1	34	2.94%
Maackia	1	27	3.70%	Amur Maackia	1	27	3.70%
Alnus	1	6	16.67%	White Alder	1	6	16.67%

Table 6 – Composition of Dead Trees in Portland Planted During the 2011-12 Planting Season

Mortality by Root Stock

Balled & burlapped and bare root trees had the highest mortality rate at 3.1%, followed by containerized at 2.6%, and root control bags at 2.4%. Approximately one-and-a-half times as many balled & burlapped trees were planted than all other types combined.

Root Stock	Total Planted	% of Total Planted	Total Dead	% of Root Stock Dead
Balled & Burlapped	2886	60.3%	92	3.1%
Bare Root	650	13.5%	21	3.2%
Containerized	818	17.1%	22	2.6%
Root Control Bag	330	6.9%	8	2.4%
Unknown	98	2%	3	3.0%

Table 7 – Root Stock of Trees - Comparison of Root Stock of Dead Trees for PS-12

Mortality by Date Planted

Of particular interest to Friends Of Trees is whether or not the time of year matters significantly in regards to tree mortality. A vast majority of trees planted in PS-12 were planted in the months of December, January, February, and March, where there was a relatively consistent mortality rate across those months (2.3%-5.0%).

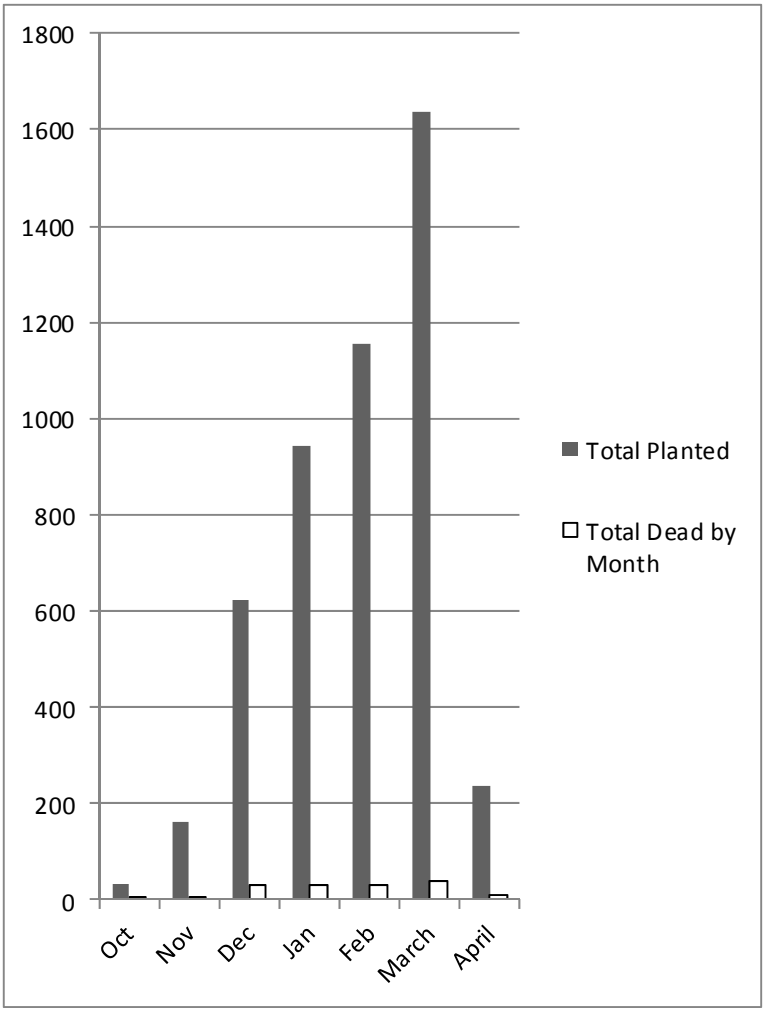

Figure 4 – Comparison of Portland Trees Planted and Dead Trees by Month, PS-12

Month Planted	Total Planted	% of Total Trees Planted	Total Dead by Month	Mortality Rate by Month	Mortality % of all Trees Planted by Month
Oct	32	0.7%	2	***6.3%***	0.04%
Nov	162	3.4%	4	***2.5%***	0.08%
Dec	623	13.0%	31	***5.0%***	0.65%
Jan	941	19.7%	32	***3.4%***	0.67%
Feb	1155	25.9%	30	***2.3%***	0.63%
March	1636	34.2%	39	***2.4%***	0.82%
April	235	4.9%	8	***3.4%***	0.17%

Table 8 - Comparison of Trees Planted and Dead Tree Quantities and Percentage by Month, PS-12

Mortality by Planting Location

Lastly, we visually examined the spatial distribution of health ratings for trees from PS-12 to see if any notable geographical patterns might emerge (Appendix E). In general, the distribution of trees within each rating is widely dispersed and does not appear to have a clear spatial distribution. There does appear to be a larger number of bad and dead trees in outer SE and North Portland, although, in general, there were a greater number of trees planted in both these locations as well. So, there does not appear to be health or mortality link between SE and North Portland. Given the lack of any clear pattern, we do not feel we can attribute any correlation between planting location and incidence of mortality.

Discussion/Analysis – First Year Monitoring

It would be difficult, if not impossible, to identify with absolute certainty, the causes of death that claimed 3% of the trees planted during PS-12. However, we have attempted to identify some of the factors underlying tree mortality during MS-12, as discussed in the 'Results' section of this report. In this section, mortality by species, mortality by planting date, cause of death and homeowner involvement are further analyzed to better understand the Friends of Trees tree mortality in Portland.

Due to incomplete "nursery of origin" records in the NTdb and the occasional substitution of trees on planting day, we decided to spend minimal time analyzing the stock size and nursery of origin for the entire set of dead trees, as the results would not be well founded.

Mortality by Species

To further assess whether particular plant species showed a greater or lesser incidence of mortality, we analyzed the success of each plant species planted during PS-12 that had one or more specimen that died (Tables 6 – 8). Of the 134 different species and cultivars planted during PS-12, 45 species had at least one incidence of mortality. These species are further analyzed in the following paragraphs.

Monitoring staff noticed a higher than expected mortality with two species planted in moderate quantity: Bracken's Brown Beauty and Elizabeth Magnolia. The Bracken's Brown Beauty experienced central leader breakage during the winter 2012 ice storms, likely due to poor branching structure and the heavy evergreen leaves. Many Elizabeth Magnolias did not leaf out, or produced very small leaves that never matured. Additionally, while Paperbark Maples didn't die at a high rate, they struggled during MS-12 with sparse leafing. Staff plans to monitor these three species over the next few years.

Special Breakdown (Common Name)	Qty Dead	Qty Planted	Percent of Species Dead
Bracken's Brown Beauty	8	22	36%
Elizabeth Magnolia	12	47	26%
Giant Seqouia	1	5	20%
White Alder	1	6	17%
Goldenrain Tree	3	20	15%
Redmond Linden	1	7	14%
Lennei Magnolia	2	15	13%
Forest Green Oak	5	42	12%
Scarlet Oak	9	81	11%
Forest Pansy Redbud	11	106	10%
Western Redcedar	3	29	10%
Fig 'King'	1	10	10%
Bigleaf Maple	4	42	10%
Cornelian Cherry Dogwood	5	64	8%
Apple 'Akane' Semi-DwarYf	1	13	8%
Pear 'Moonglow' Semi-Dwarf	1	13	8%
Wildfire Black Tupelo	2	28	7%
Plum 'Methley' Semi-Dwarf	1	15	7%
Swamp White Oak	1	15	7%
Yulan Magnolia	1	15	7%
Grace Smoketree	2	39	5%
Butterflies Magnolia	1	19	5%
Crimson Spire Oak	2	38	5%
Rocky Mtn Glow Maple	15	309	5%
Paperbark Maple	13	276	5%
Tricolor Beech	6	132	5%
Black Tupelo	8	183	4%
Edith Bogue Magnolia	1	24	4%
City Sprite Zelkova	2	49	4%
Amur Maackia	1	27	4%
Snowcone Japanese Snowbell	3	81	4%
Flame Maple	3	83	4%
Glorybower	1	34	3%
Northern Catalpa	1	34	3%
Spring Flurry Serviceberry	1	35	3%
Royal Raindrops Crabapple	2	71	3%
Apple 'Jonagold' Semi-Dwarf	1	37	3%
Pink Chimes Japanese Snowbell	1	38	3%
Washington Hawthorn	1	46	2%
Oregon White Oak	1	41	2%
Japanese Snowbell	3	160	2%
Chinese Dogwood	1	54	2%
American Hornbeam	1	59	2%
Emerald Sunshine Elm	1	92	1%
Prairifire Crabapple	1	158	1%

Table 9 – Quantity and Percent of Species Dead in PS-12

To gain a better understanding of how proportionate the number of dead trees within a species compared to the number of trees planted within that species, a calculation for effective mortality (Total Percent Species Planted *Percent Species Dead = Effective Mortality) was performed (Table 10).

A higher 'Effective Mortality' percentage indicates greater proportionate mortality. Species with a higher 'Effective Mortality' constitute a larger portion of the dead set relative to their portion of the overall population of trees planted. Conversely, species with a lower 'Effective Mortality' constitute a proportionately smaller subset of the dead. For example, the likelihood of Japanese Snowbell, American Hornbeam, Chinese Dogwood and Emerald Sunshine Elm are far less likely than all other species represented in the dead set to die.

Special Breakdown (Common Name)	Percent of Species Planted	Percent of Species Dead	Species Percent of Total Dead	Effective Mortality
Rocky Mtn Glow Maple	6.48%	4.85%	10.2%	0.34%
Paperbark Maple	5.79%	4.7%	9.2%	0.27%
Elizabeth Magnolia	0.99%	25.5%	8.5%	0.25%
Forest Pansy Redbud	2.22%	10.4%	7.7%	0.23%
Scarlet Oak	1.70%	11.1%	6.3%	0.19%
Black Tupelo	3.84%	4.4%	5.6%	0.17%
Tricolor Beech	2.77%	4.5%	4.2%	0.12%
Cornelian Cherry Dogwood	1.34%	7.8%	3.5%	0.10%
Forest Green Oak	0.88%	11.9%	3.5%	0.10%
Bigleaf Maple	0.88%	9.5%	2.8%	0.08%
Flame Maple	1.74%	3.6%	2.1%	0.06%
Goldenrain Tree	0.42%	15.0%	2.1%	0.06%
Japanese Snowbell	3.36%	1.9%	2.1%	0.06%
Snowcone Japanese Snowbell	1.70%	3.7%	2.1%	0.06%
Western Redcedar	0.61%	10.3%	2.1%	0.06%
City Sprite Zelkova	1.03%	4.1%	1.4%	0.04%
Crimson Spire Oak	0.80%	5.3%	1.4%	0.04%
Grace Smoketree	0.82%	5.12%	1.3%	0.04%
Lennei Magnolia	0.31%	13.3%	1.4%	0.04%
Royal Raindrops Crabapple	1.49%	2.8%	1.4%	0.04%
Wildfire Black Tupelo	0.59%	7.1%	1.4%	0.04%
American Hornbeam	1.24%	1.7%	0.7%	0.02%
Amur Maackia	0.57%	3.7%	0.7%	0.02%
Apple 'Akane' Semi-Dwarf	0.27%	7.7%	0.7%	0.02%
Apple 'Jonagold' Semi-Dwarf	0.78%	2.7%	0.7%	0.02%
Butterflies Magnolia	0.40%	5.3%	0.7%	0.02%
Chinese Dogwood	1.13%	1.9%	0.7%	0.02%
Edith Bogue Magnolia	0.50%	4.2%	0.7%	0.02%
Emerald Sunshine Elm	1.93%	1.1%	0.7%	0.02%

Special Breakdown (Common Name)	Percent of Species Planted	Percent of Species Dead	Species Percent of Total Dead	Effective Mortality
Fig 'King'	0.21%	10.0%	0.7%	0.02%
Giant Seqouia	0.10%	20.0%	0.6%	0.02%
Glorybower	0.71%	2.9%	0.7%	0.02%
Northern Catalpa	0.71%	2.9%	0.7%	0.02%
Oregon White Oak	0.86%	2.4%	0.6%	0.02%
Pear 'Moonglow' Semi-Dwarf	0.27%	7.7%	0.7%	0.02%
Pink Chimes Japanese Snowbell	0.80%	2.6%	0.7%	0.02%
Plum 'Methley' Semi-Dwarf	0.31%	6.7%	0.7%	0.02%
Prairifire Crabapple	3.32%	0.63%	0.7%	0.02%
Redmond Linden	0.15%	14.3%	0.7%	0.02%
Spring Flurry Serviceberry	0.73%	2.9%	0.7%	0.02%
Swamp White Oak	0.31%	6.7%	0.7%	0.02%
Washington Hawthorn	0.97%	2.2%	0.7%	0.02%
White Alder	0.13%	16.7%	0.7%	0.02%
Yulan Magnolia	0.31%	6.7%	0.7%	0.02%

Table 10 – Species Percent of All Dead Trees in Proportion to the Number of that Species Trees Planted

In conclusion, we found that many tree species survived very well during their first summer in the ground. Of the 134 species planted, 89 did not have any mortality within the species; these include several crabapple cultivars and Japanese Stewartia, which were both planted in somewhat high quantities during PS-12. In addition, some of the species that are planted in great number had very low mortality rates, such as Japanese Snowbell, Tricolor Beech and Black Tupelo.

Mortality by Root Stock Type

Balled and burlapped and bare root trees died at a higher rate than those planted in container or root control bags during the first growing season following PS-12. Balled and burlapped trees require some consideration in handling and planting (i.e., care in maintaining the integrity of the root ball), so it is possible this also increased the mortality rate in this root stock. Bare root trees also tend to be more sensitive than the other root stock types analyzed here, so conditions during holding and transport (i.e., whether the roots were kept covered and moist or not) are likely to have been additional factors in the higher rate of failure of these trees. In conclusion, root stock type generally may not contribute to survival after one year as much as other factors, such as specific tree species survivability, or preparation and care of root stock types. However, over the long term, it is expected that root stock type could play a more important role in tree mortality.

Root Stock	Total Planted	% of Total Planted	Total Dead	% of Root Stock Dead	% of Total Dead
Balled & Burlapped	2886	60.3%	92	**3.2%**	63.0%
Bare Root	650	13.5%	21	**3.2%**	14.0%
Containerized	818	17.1%	22	**2.6%**	15.0%
Root Control Bag	330	6.9%	8	**2.4%**	5.3%
Unknown	98	2%	3	**3.0%**	2.0%

Table 11 – Root Stock Type Mortality Analyzed in Proportion to Quantity of Trees Planted

Mortality by Date Planted

As noted earlier, there was a relative consistent mortality rate across those months of the planting season. It is believed that the mortality rates were not affected by the month trees were planted in 2011-12.

Mortality by Cause of Death

In order to better understand tree mortality of PS-12 trees, cause of death was analyzed and can be reviewed in Table 12 and Figure 5. The majority of the trees died due to bad tree stock (46%), which is typically referencing those trees that despite good care, either never leafed out, or performed poorly from the spring throughout the summer. Neglect, the second highest mortality rate (18%), refers to those trees that died due to lack of care (watering, bark damage, etc.). This is followed by those that died due an unknown reason (17%), bad planting (11%) and third party (8%). Cause of death by a third party includes those trees that die due to vandalism or severe weather conditions (i.e., ice storm breaking central leader of tree).

Cause of Death	Quantity	Percent of Dead	Percent of Total Trees
Bad Stock	67	46%	**1.4%**
Neglect	27	18%	**0.5%**
Unknown	25	17%	**0.5%**
Bad Planting	15	11%	**0.3%**
Third Party	12	8%	**0.2%**
Total	146		

Table 12 – Cause of Death to PS-12 Trees

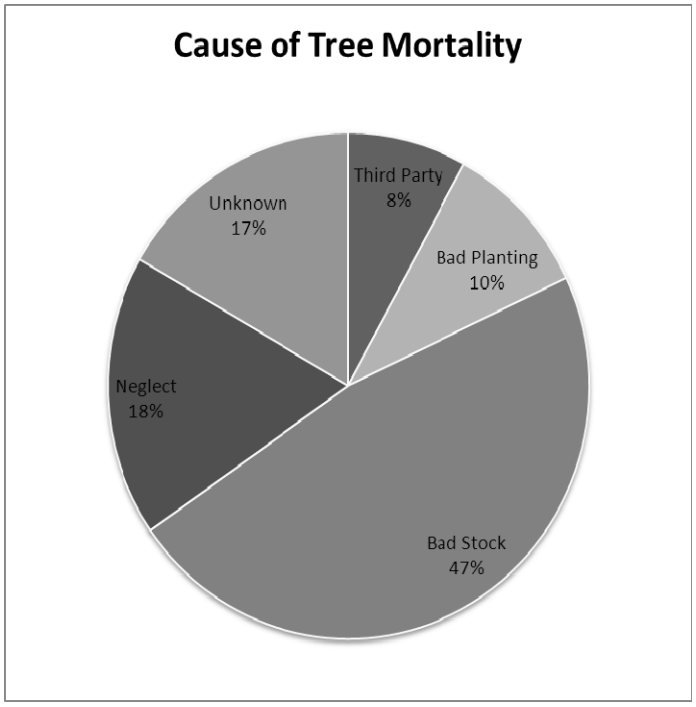

Figure 5 – PS-12 Tree Mortality by Cause of Death

While we work with reputable nurseries and receive very high quality tree stock, when monitoring the tree health of 4,782 trees, it is expected that some trees may fail due to poor tree stock. Trees are living plants, and it's expected that some may experience transplant shock, and/or fail for another reason. This encompasses only 1.4% of all trees planted this season.

Additionally, it's interesting to note that of all the trees planted, only 0.5% failed due to neglect. Friends of Trees aims to involve the treecipient in the tree selection and planting day as much as possible, encouraging them to feel connected to their tree. Additionally, tree care reminder door hangers are left at each property visited by Summer Inspectors congratulating treecipients on the positive tree care actions, and reminding them of improvements they can make. While a direct correlation cannot be made, since we do not have a control group in which to compare, it appears that the treecipient participation and tree care reminders may be helping to ensure these trees survive their first summer after planting.

Tree Mortality and Treecipient Involvement

Over the last few years, Friends of Trees has diversified the options available to a person interested in planting with our organization. The descriptions of each option listed in Table XX are described below:

- ***Paid for Trees, Signed up to Volunteer:*** Neighbors sign up to plant trees with us, select their tree species, pay for their tree, and signed up to volunteer in some capacity.
- ***Paid for Trees, Did Not Plant:*** Paid for, and selected their tree species, but because their neighborhood tree planting was at capacity, their tree was planted for them without their assistance.
- ***Free Trees, Signed up to Volunteer:*** Their neighborhood was offered free street trees, they selected their species, and signed up to volunteer in some capacity.
- ***Free Trees, Did Not Plant:*** Their neighborhood was offered free street trees, and selected their tree species, but because their neighborhood tree planting was at capacity, their tree was planted for them without their assistance.
- ***Free Trees, No Participation, No Tree Choice:*** Their neighborhood/street was offered free street trees, and the tree species was selected for them, and planted with volunteer groups on planting day.

While the overall highest mortality was within the group that paid for their tree, and signed up to volunteer in some capacity, it is rather expected because that group also had the largest overall quantity. So, the data was further analyzed to find out if any of the categories had higher proportional tree mortality. In general, during PS-12 free trees died at a slightly higher proportion than those trees that were paid for by the treecipient. Furthermore, there is a slight increase in mortality for those trees in which the homeowner did not interact with the tree on planting day. While this is interesting information, it is difficult to conclude that paying for a tree and/or interacting with the tree on planting day have a huge impact on tree mortality because it is a rather small difference in proportional mortality and the small sample size of dead trees.

	Trees Rated "Dead"			
Participation	**Qnty**	**% of Dead**	**Qnty of Total Planted**	**% of Total Planted**
Paid for Trees, Signed up to Volunteer	86	58.9%	3053	**2.8%**
Paid for Trees, Did Not Plant	12	8.2%	473	**2.5%**
Free Trees, Signed up to Volunteer	21	14.4%	626	**3.4%**
Free Trees, Did Not Plant	19	13.0%	447	**4.3%**
Free Trees, No Participation, No Tree Choice	8	5.5%	183	**4.4%**
Total	146		4782	

Table 13 – Tree Mortality and Treecipient Involvement

Poorly Rated Trees and Treecipient Involvement

To further analyze the relationship between treecipient involvement and tree health, we analyzed the same participation options described in the "Tree Mortality and Treecipient Involvement" section in those trees rated "bad." Typically, a tree is rated 'bad' due to neglect, such as lack of water/mulch, and/or bark damage.

In general, there does not appear to be a connection between a 'bad' rating and a treecipient paying for their tree. Although, there does seem to be a trend between treecipient involvement and tree care/health, especially within the second round of inspection data. Within round two, the percentages for the non-participation categories are at least a percentage point higher than those categories that did participate.

Again, while this is interesting information, it is difficult to conclude that paying for a tree and/or interacting with the tree on planting day have a huge impact on tree health because it is a rather small difference and the small sample size of bad trees.

	Round 1: Trees Rated "Bad"			
Participation	**Qnty**	**% of All Bad**	**Qnty of Total Planted**	**% of Total Planted**
Paid for Trees, Signed up to Volunteer	59	74.7%	3054	**1.9%**
Paid for Trees, Did Not Plant	3	3.8%	475	**0.6%**
Free Trees, Signed up to Volunteer	6	7.6%	628	**1.0%**
Free Trees, Did Not Plant	7	8.9%	445	**1.6%**
Free Trees, No Participation, No Tree Choice	4	5.1%	182	**2.2%**
Total	79		4784	

Table 14 – Round 1 Trees Rated "Bad" and Treecipient Involvement

	Round 2: Trees Rated "Bad"			
Participation	**Qnty**	**% of All Bad**	**Qnty of Total Planted**	**% of Total Planted**
Paid for Trees, Signed up to Volunteer	58	56.9%	3053	**1.9%**
Paid for Trees, Did Not Plant	16	15.7%	473	**3.4%**
Free Trees, Signed up to Volunteer	9	8.8%	626	**1.4%**
Free Trees, Did Not Plant	13	12.7%	447	**2.9%**
Free Trees, No Participation, No Tree Choice	6	5.9%	183	**3.3%**
Total	102		4782	

Table 15 – Round 2 Trees Rated "Bad" and Treecipient Involvement

Lessons Learned

In order to increase tree survival in future planting seasons, we have a short list of "lessons learned" from PS-12 and recommendations for future seasons, which are briefly described below.

Record of Historical Knowledge about Tree Inventory

In response to an issue of high mortality with the *Koelreuteria* genus in PS-11, a notes section for each tree species has been added to our database and has proved a beneficial communication tool between tree monitoring staff and tree ordering staff. This year, monitoring staff was able to add comments about the weak branching structure of the Bracken's Brown Beauty Magnolias after the high failure rate during the February ice storm. And, notes have been included that the Elizabeth Magnolias and Prairifire Crabapples seemed to struggle this year, which could be in response to climatic conditions

(very wet spring, followed by a dry, hot summer), or may be a trend; this is something we can monitor as we move into the future.

We would also like to strengthen our ability to comment on the nursery stock type by maintaining more accurate records of stock details and the planting location of the nursery stock. Staff will discuss opportunities to refine our database and data collection system for this information.

Monitor Tree Performance of Certain Species

As mentioned above, tree health notes have been entered for Elizabeth Magnolias, Prairifire Crabapples and Paperbark Maples into the database. These three species will be monitored over the next year or two in order to understand if the stress experienced this year was an isolated experience, or a trend.

Tree Selection and Treecipient Involvement

While we hesitate to make any direct conclusions regarding lack of homeowner involvement and tree health/mortality, there appears to be a slight trend that the more involved one is in planting day, the more likely the treecipient is to care for their tree, or not have it rated 'bad.' In an effort to encourage more treecipients to participate in planting day, updates have been made to the online ordering system to enhance the ease of selecting a volunteer role; there are now multiple locations to select the role (during tree selection and during payment), and volunteer times, descriptions and photographs have been added. Neighborhood Coordinator volunteers are also encouraged to contact those neighbors that originally shared that they were unavailable to ask for their help again as planting day nears.

Additionally, if we continue to offer the option for treecipients to receive free trees selected by staff and planted by non-treecipient volunteers, we may want to select from the list of species that are planted in high quantities and appear to perform well (e.g., crabapple varieties). It may also be interesting to further analyze those trees rated 'good' to identify those trees that appear to perform well despite lack of care. Lastly, in order to better understand the link between participation and tree health / mortality, the volunteer details will be added to future monitoring data reports from the database.

Treecipients with Poorly Rated Trees

An additional 181 trees (3% of trees planted) are rated 'bad.' While these trees did not die this year, it is likely that they may die in the next year or two, especially if they continue to be neglected. All treecipients receive a postcard reminding them to water and care for their tree during the first two years, yet further follow-up may be helpful in encouraging proper tree care for these treecipients. Friends of Trees will discuss options to further reach out, such as sending a targeted mailing or email to these households noting that their tree appeared to be struggling in MS-12 and may need additional TLC in MS-13 to survive and thrive into the future.

Conclusions

In conclusion, inspection data collected during MS-12 for trees planted during PS-12 indicates a 97% survival rate. This is very similar to the 97-98% survival rate of past years. This represents a very high rate of survival for volunteer-planted trees left in the care of thousands of individual homeowners.

Overall, tree condition results improved from Round 1 inspections to Round 2 inspections. It appears the initial visit by a summer inspector along with a door hanger with detailed tree care instructions appeared to go a long way towards improving overall health. These and past data support the idea that these types of face-to-face reminders are instrumental in maintaining a 3% mortality rate.

Few trends were noticeable between mortality and the planting stock and/or location. While the Bracken's Brown Beauty succumbed to ice storm damage, and the Elizabeth Magnolias appeard to struggle more than expected, no other correlations were found between plant species and their fitness for survival within the geographical area planted. Root stock type also did not appear to have a significant impact on mortality. Similarly, there do not appear to be any connections between planting location and survivability across the city.

While it is interesting to analyze treecipient involvement and first season tree health/mortality, it is difficult to conclude that paying for a tree and/or interacting with the tree on planting day have a huge impact on tree health and mortality because there is a rather small difference in proportional mortality and the small sample size of dead and bad trees.

Overall, Friends of Trees is very pleased with the rate of success we have managed to maintain regarding first year survival despite a significant increase in numbers of trees planted during PS-12. We look forward to using this evaluation as a concrete platform from which to assess our future accomplishments.

Longer Term Monitoring Efforts

Tier II & Tier Omega Introduction

Friends of Trees additionally facilitates inspections on a 10-15% subset of trees in their second growing season (Tier II inspections), as well as, conducts yearly inspections on a 10% subset of trees planted during PS-10 (Tier Omega inspections). Data collected in both cases includes the seven factors assessed in Tier I inspections, plus measurements of caliper diameter, approximate tree height, and canopy width. Tier II (T2) and Tier Omega (TO) inspections were developed to lend additional depth to the Friends of Trees monitoring program. Tier II data is used to measure the success of trees beyond their first year in the ground; a year during which treecipients receive numerous points of contact urging them to provide proper establishment care for their trees. Tier Omega information is building a legacy dataset from which long-term survival and growth rates in the local Portland environment may be studied. While currently still very young, this dataset will become more robust and informative over time. These monitoring efforts go beyond the requirements of our reporting obligations, with the goal of providing a better idea of how well our trees are performing over time, and to help inform local urban tree planting and management efforts in the future.

Methods

Similar to Tier I inspections, trained volunteers perform Tier II (T2) and Tier Omega (TO) inspections. Each volunteer inspector is provided with a clipboard, datasheet, and caliper tool. Tier II routes are derived from the previous year's Tier I routes such that 10-15% of trees are resampled in a geographically well-dispersed manner. The Tier Omega route was also created in this way at the start of MS-10.

The T2/TO protocol asks inspectors to record tree and site conditions, to measure trunk caliper, and to estimate tree height and width. It also differs from the Tier I protocol in that informative doorhangers are not left for treecipients. Materials are not left behind to keep the conditions regarding the sampling as objective as possible (particularly for the Omega set).

Photo 3: Volunteer using caliper tool (FOT)

Volunteers typically enter their data directly into a shared Google Spreadsheet, although they may opt to drop off or send us their data sheet. From here, Friends of Trees staff export the Google files in Excel format to be uploaded into an Access database for permanent storage, and from which a composite monitoring report may be pulled for analysis. It is important to note that unlike following Tier I inspections, staff have do not visit reports of Bad or Dead trees that are beyond their first year in the ground.

Results

TIER II Inspections

The 2012 Tier II cohort contained 614 trees divided amongst 21 routes and amounted to 15.2% of the total number of trees planted during the 2010-11 planting season. Nineteen volunteers and one FoT staff member collected condition and dimensional data on these trees. The due date for inspection data to reach Friends of Trees was August 15th. Inspectors were urged to complete their routes as close to this deadline as possible, so as to inspect trees after they had endured some of the summer's heat and droughty conditions.

This year's monitoring efforts revealed that 77% of trees were rated as good or okay (275 and 198 respectively), based on the weighted-point, tree inspection system described in the first year inspection section above. Trees that were in poor health or did not survive totaled 59 (16.6% of Tier II trees). Only 39 trees were not inspected. (Table 16 and Figure 6).

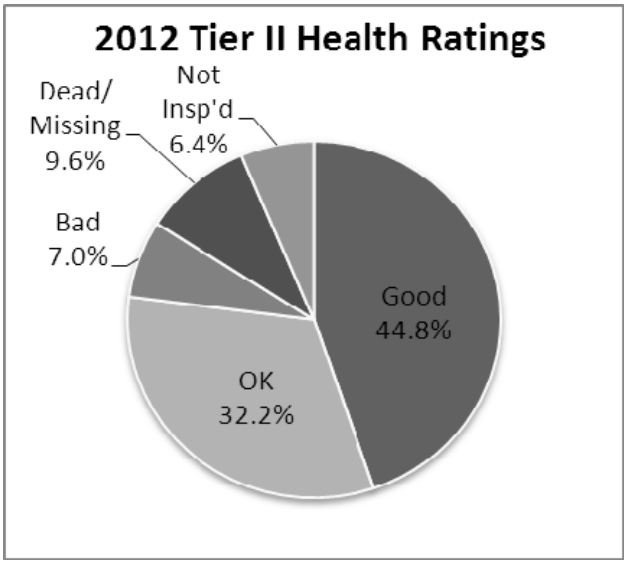

Figure 6 – 2011 Tier II Health Ratings

Health Rating	Quantity	Percent of Total
Good	275	44.8%
Okay	198	32.2%
Bad	43	7.0%
Dead/ Missing	59	9.6%
Not Inspected	39	6.4%
Total	**614**	

Table 16 – 2012 Tier II Inspection Summary

Of the 59 trees reported as Dead or Missing, 29 different species/cultivars were noted. Nearly 65% of this group (38 trees) fell within five genera, and each genus experienced the death of at least two different species or cultivars—*Acer*, *Magnolia*, *Malus*, *Parrotia*, and *Ulmus*. Compared with first-year mortality rates for this plating year, there was a significant decrease in survivability for trees within the *Acer* and *Malus* genera, 23.3% and 16.3% respectively. The overall mortality rate for trees after their second season in the ground was 9.6%, up 6.6% from the previous year (Table 17).

Species/Cultivar	#	# in T2 Subset	% of of T2 Dead	% Dead of # Planted in T2 Subset	% Dead After Year 1	% Increase in Mortality after Year 2
Bigleaf Maple	0	5				
Flame Maple	1	15				
Paperbark Maple	4	31				
Rock Mountain Glow Maple	9	75				
Trident Maple	1	11				
Acer	**15**	**137**	25.4%	10.9%	2.1%	**8.8%**
Bracken's Brown Beauty Magnolia	1	3				
Elizabeth Magnolia	3	9				
Magnolia	**4**	**12**	6.8%	33.3%	3.3%	**30.0%**
Apple 'Jonagold'	1	2				
Apple 'Liberty'	1	2				
Prairiefire Crabapple	1	6				
Purple Prince Crabapple	5	20				
Royal Raindrops Crabapple	2	16				
Malus	**10**	**46**	16.9%	21.7%	0.6%	**21.1%**
Persian Ironwood	3	22				
Vanessa Persian Ironwood	4	7				
Parrotia	**7**	**29**	11.9%	24.1%	2.3%	**21.8%**
Accolade Elm	1	6				
Emerald Sunshine	1	9				
Ulmus	**2**	**15**	3.4%	13.3%	1.6%	**11.7%**
5 Top Genera	**38**	**239**	15.9%	-	10.0%	**5.9%**
All Other Trees	**21**	**375**	5.6%	-	n/a	n/a
Total Dead	**59**	**614**	**9.6%**	-	**3.0%**	**6.6%**

Table 17 – Analysis of 2012 Tier II Dead Trees

Using only measurements from inspected and living trees, this year's Tier II trees averaged 10.65' tall and 5.55' wide, with a caliper measurement of 1.99". Mean measurements for all three categories were nearly identical to the average of entries for each at 10', 5.5', and 2", respectively (Table 18). Dimensional data was not collected on one route, reducing the total number of trees included in this analysis to 486.

	Caliper (inches)	Height (feet)	Width (feet)
Low	0.5	2.5	2
High	5.5	25	12
Mean	2	10	5.5
Average	**1.99**	**10.65**	**5.55**

Table 18 – Tier II Dimensional Measurements

Results

TIER OMEGA Inspections

The 2012 Tier Omega set totaled 473 trees spread across 16 routes, and amounted to 14.6% of trees planted during the 2009-10 planting season. Fourteen volunteer inspectors and one FoT staff member recorded data on these trees as per the Tier II inspection protocol described above. Again, the deadline for submitting data sheets was August 15th and inspectors were encouraged to monitor as late as possible to capture the effects of summer stress on trees.

Good and okay rated trees totaled 69.8% of the Omega class this year (174 and 156, respectively), with Bad trees numbering 44 (9.3%) and Dead or Missing trees at 48 (10.1%). Fifty-one trees were not evaluated (Table 19 and Figure 7).

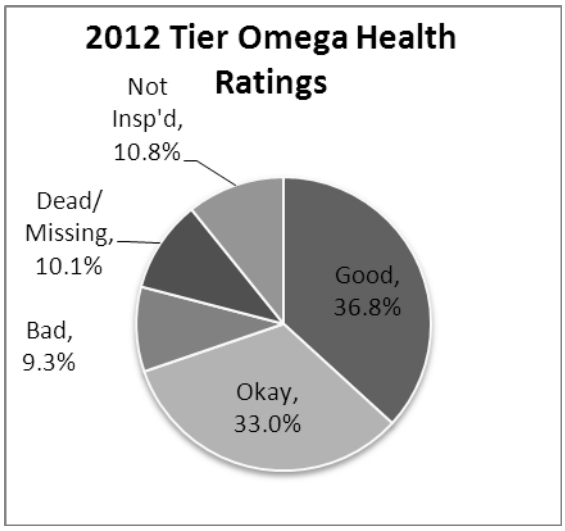

Figure 7 – 2012 Tier Omega Health Ratings

Health Rating	Quantity	Percent of Total
Good	174	36.8%
Okay	156	33.0%
Bad	44	9.3%
Dead/Missing	48	10.1%
Not Inspected	51	10.8%
Total	**473**	

Table 19 – 2012 Tier Omega Inspection Summary

Forty-eight trees from 16 genera constituted the 2012 Tier Omega class of dead trees (Table 20). Of these, just four genera comprised 52% of trees that did not survive their third summer – *Acer*, *Crataegus*, *Fagus*, and *Malus*. Further, six genera lost 50% or more of their kind that had been planted in PS-10 – *Celtis*, *Clerodendrum*, *Fagus*, *Juglans*, *Magnolia*, and *Quercus*. Given their usual robustness and abundance, it is notable that *Crataegus* and *Malus* also endured fairly high mortality rates at 44.4% and 20.7%, respectively. Because a similar species-based analysis was not completed during 2011,

Species/Cultivar	#	Number Planted in TO Subset	% of Total Dead in TO Subset	% Dead of # Planted in TO Subset
Bigleaf Maple	1	7		
Flame Maple	1	9		
Paperbark Maple	1	28		
Rocky Mountain Maple	1	2		
Rocky Mtn Glow Maple	1	31		
Acer	**5**	**77**	**10.4%**	**6.5%**
Japanese Hornbeam	1	5		
Carpinus	1	5	**2.1%**	**20.0%**
Hackberry	1	1		
Celtis	**1**	**1**	**2.1%**	**100.0%**
Glorybower	1	2		
Clerodendrum	**1**	**2**	**2.1%**	**50.0%**
Black Hawthorn	6	12		
Washington Hawthorn	2	6		
Crataegus	**8**	**18**	**16.7%**	**44.4%**
Tricolor Beech	6	10		
Fagus	**6**	**10**	**12.5%**	**60.0%**
Autumn Purple Ash	1	6		
Fraxinus	**1**	**6**	**2.1%**	**16.7%**
Seven Son Flower	2	5		
Heptocodium	**2**	**5**	**4.2%**	**40.0%**
Walnut 'English Carpathian'	4	7		
Juglans	**4**	**7**	**8.3%**	**57.1%**
Elizabeth Magnolia	1	1		
Victoria Magnolia	1	3		
Magnolia	**2**	**4**	**4.2%**	**50.0%**
Golden Raindrops Crabapple	1	9		
Prairifire Crabapple	2	3		
Royal Raindrops Crabapple	3	17		
Malus	**6**	**29**	**12.5%**	**20.7%**
Black Tupelo	1	7		
Nyssa	**1**	**7**	**2.1%**	**14.3%**
Swamp White Oak	3	6		
Quercus	**3**	**6**	**6.3%**	**50.0%**
Japanese Stewartia	2	7		
Stewartia	**2**	**7**	**4.2%**	**28.6%**
Japanese Snowbell	2	22		
Styrax	**2**	**22**	**4.2%**	**9.1%**
Harvest Gold Linden	3	8		
Tilia	**3**	**8**	**6.3%**	**37.5%**
Total Tier Omega Dead	**48**	**428**	**100.0%**	**11.2%**

Table 20 – Analysis of Tier Omega Dead Trees

Again, using only measurements from inspected and living trees, this year's Tier Omega trees averaged 11.82' tall and 6.81' wide, with a caliper measurement of 2.31". Mean measurements were slightly less for all three categories at 11.50', 6.00', and 2.25", respectively (Table 21). The only dimensional data not collected was the height on one tree; total number of trees included in this analysis to 374.

	Caliper (inches)	Height (feet)	Width (feet)
Low	0.75	5	2
High	5	23	18
Mean	2.25	11.5	6
Average	2.31	11.82	6.81

Table 21 – Tier Omega Dimensional Measurements

Discussion/Analysis

Before beginning any further analysis, it is important to recognize that last year's 2011 Tier II dataset is simultaneously the Year 2 Tier Omega dataset. Upon close examination of the previously reported data of this cohort, it was noted that this set was considerably smaller than it should have been as a fixed dataset (less 54 trees, down 11.3%) (Table 22). This precipitated the need to cross reference all trees and addresses from the 2011 Tier II set and the 2012 Tier Omega set.

Health Rating	Quantity	Percent of Total
Good	228	53.6%
Okay	128	30.1%
Bad	43	10.1%
Dead	8	1.9%
No Access	10	2.4%
Missing	8	1.9%
Total	**425**	

Table 22 – 2011 Tier II Inspection Summary (Submitted 2011)

Two scenarios were discovered that describe most of the discrepancies between the datasets. Many trees had not been evaluated which resulted in either false Good ratings or the absence of any record at all. In other cases, inspectors had made notes indicating that both trees at a particular address were "identical," however, information in the Notes field does not produce a duplicate record in the database, and thereby, no record of the visit was produced. Additional changes made during this update were to combine Missing and Dead data into one class since they equate to the same reality of no tree present, and to rename the rating of No Access to Not Inspected since trees may not be inspected for any number of reasons, not necessarily a lack of access (Table 23).

Health Rating	Quantity	Percent of Total
Good	214	44.7%
Okay	128	26.7%
Bad	43	9.0%
Dead/Missing	13	2.7%
Not Inspected	81	16.9%
Total	**479**	

Table 23 – 2011 Tier II Inspection Summary (REVISED 2012)

TIER II Inspections

Because Tier II datasets are comprised of 10-15% of trees planted during the previous season, the number of trees included in each year's cohort will differ. For this reason, the following analysis of relative health will consider percentages only (Table 24).

	2011		2012	
Health Rating	**Quantity**	**Percent of Total**	**Quantity**	**Percent of Total**
Good	214	**44.7%**	275	**44.8%**
Okay	128	**26.7%**	198	**32.2%**
Bad	43	**9.0%**	43	**7.0%**
Dead/Missing	13	**2.7%**	59	**9.6%**
Not Inspected	81	**16.9%**	39	**6.4%**
Total	**479**		**614**	

Table 24 – Summary of Tier II Health Ratings for 2011 and 2012

Overall, findings indicate that good and okay ratings for second year trees increased by 5.6%, but that ratings of Dead also increased by nearly 7% (Table 25). It would be nearly impossible to definitively name the reasons for these shifts, however, differences in local weather over the past three years, variability in tree stock quality, and/or changes to volunteer inspector trainings may been in part responsible. The two health classes that decreased were Bad and Not Inspected. Again, it would be difficult to say with certainty why the number of Bad rated trees decreased in 2012, but the decrease in trees Not Inspected was likely the result of either improved data collection or data entry by volunteers. If volunteer performance was the reason for this change, let it be noted that this was not explicitly asked by FoT as the low data return on 2011 had not yet been discovered.

	2011	**2012**	**Difference**
Good	44.7%	44.8%	**0.1%**
OK	26.7%	32.2%	**5.5%**
Bad	9.0%	7.0%	**-2.0%**
Dead/Missing	2.7%	9.6%	**6.9%**
Not Inspected	16.9%	6.4%	**-10.6%**

Table 25 – Difference in Tier II Health Ratings between 2011 & 2012

TIER OMEGA Inspections

The purpose of the Tier Omega dataset is to examine a defined set of geographically dispersed trees over time to learn more about tree survivability and growth in Portland's urban environment. Monitoring Season 2012 marks the first year that we have had enough data to begin looking at the performance of this group of trees. While end of season health ratings for Year 1 (2009-10) of the Tier Omega set has not yet been sussed out, Table 26 presents Year 2 and Year 3 monitoring data.

YEAR	Planting Year	Total # Trees	# GOOD	# OK	# BAD	# DEAD/ MISSING	# Not Inspected	Average Caliper (inches)	Average Height (feet)	Average Width (feet)
1	**2009-10**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2	**2010-11**	479	214	128	43	13	81	1.80	10.35	5.74
3	**2011-12**	473	174	156	44	48	51	2.31	11.82	6.81

Table 26 – Comparative Analysis of Tier Omega Inspection Data for Year 2 & Year 3

The different number of total trees between Year 2 and Year 3 reflects the number of Dead trees reported in 2011, less two (the reason for this small discrepancy is unknown). Additionally, several Missing trees were left in the dataset to be reinspected during 2012, however, all Dead and Missing trees will be removed from subsequent inspection routes in the future.

A comparison of reported health ratings show a decrease in number of trees rated as Good, and increases of trees rated OK and Dead, with Bad rated trees remaining about the same (Figure 8 and Table 27). Reasons explaining these shifts cannot be definitively known, but are likely caused by reduced care by treecipients or poor planting stock in slow decline. Lack of mulch and water stress were common comments made by inspectors.

Health Rating	Year 2	Year 3	Difference
Good	44.7%	36.8%	**-7.9%**
Okay	26.7%	33.0%	**6.3%**
Bad	9.0%	9.3%	**0.3%**
Dead/Missing	2.7%	10.1%	**7.4%**
Not Inspected	16.9%	10.8%	**-6.1%**

Table 27 – Difference in Tier Omega Health Ratings between Year 2 & Year 3

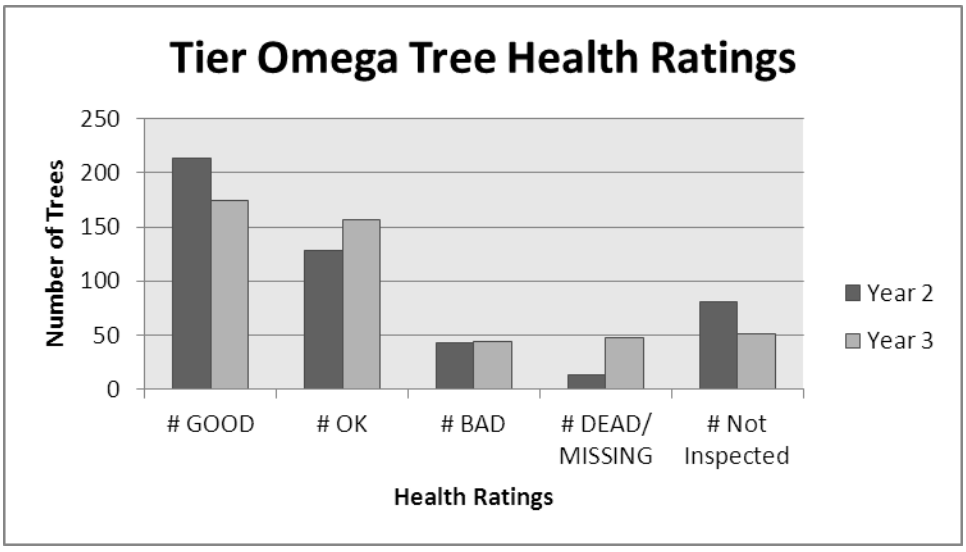

Figure 8 – Comparison of Tier Omega Health Ratings for Year 2 & Year 3

Reviewing the mortality rates of the Tier Omega cohort reveals a significant decrease in survival after Year 2, with only a slight increase in tree death in the following year (Table 28). That said, mortality rates continued to go up, however, the drop in rate of mortality increase is promising. As our data collection grows, we hope to better understand the reasons for this trend.

	% Dead After Year 1	% Dead After Year 2	% Increase in Mortality after Year 2	% Dead After Year 3	% Increase in Mortality after Year 3
Tier Omega Cohort	3.0%	9.6%	**+6.6%**	11.2%	**+1.6%**

Table 28 – Summary of Tier Omega Mortality since PS-10

Due to the fact that stock size for trees planted during planting season 2009-10 was not accurately recorded, dimensional measurement records for the Tier Omega cohort did not exist before monitoring season 2011. Accordingly, growth between Year 2 and Year 3 of these trees represents our first knowledge of growth performance of the Tier Omega set. Analysis shows that on average trees increased in caliper size by about .5", grew in height by nearly 1.5' and increased their spread by about 1' (Table 29).

YEAR	Average Caliper (inches)	Average Height (feet)	Average Width (feet)
1	n/a	n/a	n/a
2	1.80	10.35	5.74
3	2.31	11.82	6.81
	0.51	1.47	1.07
	.51 inches	**1.47 feet**	**1.07 feet**

Table 29 – Average Growth of Tier Omega from Year 2 to Year 3

While these numbers provide a rough estimate of tree growth in urban Portland, the wide range of species included and the variability of available planting spaces suggest they should be referred to with some caution. It is hoped that these factors can be examined in greater detail in future renditions of this report. Ideally, both species and planting strip widths would be classified into size categories, with yard trees in their own category.

Conclusions/Lessons Learned

The 2012 monitoring season resulted in the first batch of Tier II and Tier Omega records that could be compared to a previous year's T2 and TO data. From this, the ability to identify trends in the performance of our trees after their first season in the ground has been made possible. This year's T2 and TO inspection results now exist as a foundation for analyzing future second year and later monitoring data.

The preparation of this year's Tier II and Tier Omega report (the first of its kind) has shown the need to thoughtfully develop a systematic approach for analyzing these specific classes of data to create a legitimate body of research into the future. Specific items to address include: retrieving first year monitoring data to be included in the Tier Omega comparison chart, removing Dead/Missing trees from subsequent data collection sheets, and further breaking out species and planting condition factors when assessing tree growth. Creating a legacy document informing consistent processes for conducting Tier II and Tier Omega inspections and analyzing resultant data should also be undertaken.

Appendices

A: 2011-12 Friends of Trees Monitoring Protocol
B: 2011-12 Data Collection Forms for Tier I Inspectors
C: 2011-12 Data Collection Forms for Tier II/Tier Omega Inspectors
D: 2011-12 Tree Inspection Door Hanger
E: MS-12 Map of MS-12 Tree Health

Appendix A: 2011-12 Friends of Trees Monitoring Protocol

Objective:

Friends of Trees (FOT) Neighborhood Trees Program (NT) will annually manage a Summer Inspector (SI) program with the goals of:

1. Helping to ensure maximum survivability by giving feedback to customers during their trees' first growing season,
2. Tracking the survivability of FOT trees for reporting purposes, and
3. Measuring the growth and survivability rates of FOT trees over time.

Methods:

FOT will monitor three tree sets each year:

- Tier I – 100% of trees planted during the previous planting season [Goals 1 &2];
- Tier II – 10% of trees planted two seasons ago (geographically well-distributed) [Goals 1 &2];
- Tier Omega – 10% of trees planted in the 2009-2010 planting season (fixed) [Goal 3].

For each tree set, trained volunteers or staff members will record site and tree conditions for each tree. Conditions examined will include: presence of leaves, adequacy of watering, proper mulching, absence of weeds/grass, bark free of injury, intact canopy, absence of suckers. Tier II and Tier Omega Inspections will additionally note truck diameter, as well as tree height and crown width. All inspection routes will be created based on geographic proximity in groups of approximately 30 trees.

Tier I Inspections will occur twice during the summer months (July 1st and August 15th). Tree owners will receive feedback on their tree care to date after each visit. FOT staff will make follow-up visits to all trees which receive a poor rating or are indicated as being dead. Tier II and Tier Omega Inspections will occur only once (early August).

Volunteer Summer Inspectors:

Tier I: Homeowners who have purchased and planted a tree from FoT in the most recent planting season and at-large volunteers. T1 inspectors will gather data on trees planted during the most recent planting season.

As a subset of Tier I Inspections, FoT staff conduct a follow-up site visit to those trees rated 'Bad' or 'Dead' by the volunteer Tier I Summer Inspectors. The FoT staff members inspect the 'Bad' and 'Dead' rated trees to determine cause of struggle and/or death. Dead trees may be replaced at the discretion of FoT, if the tree died due to poor nursery stock or planting method. Replacement trees will be planted during the following planting season.

Tier II: Returning summer inspectors and other experienced volunteers. T2 inspectors will inspect approximately 10% of the trees going into their second season in the ground. Tier II SI's will gather data on trees planted in previous seasons.

Tier Omega: Returning summer inspectors and other experienced volunteers. Tier Omega inspectors will inspect the 2009-10 Tier II trees annually for ten years (until 2020) to understand how this subset of trees performs over the course of 10 years.

Data Assessment Protocol

Each street and yard tree planted within the City Limits of Portland will be monitored by volunteers twice during the summer months using provided data sheets.[1] SI's will not prune, add mulch, provide water or otherwise manage the trees. Their performance goal is to inspect the site, assess the tree, rate the tree and report back to FoT.

Data gathered will include: tree condition, site condition, and an overall tree health rating. We propose to use the weighted point rating system that determines the health rating for each tree: Good, Okay, Bad or Dead. FoT will determine the health rating based on the data collected from SIs. Annual training for SIs will include both classroom and field components. As a part of SI training, new SI's will inspect newly planted trees alongside more experienced Tier II and FoT staff inspectors.

SI training will occur at a site(s) in the immediate area of newly planted trees. This will facilitate field observations with Tier II and Tier III inspectors.

Tier I data collection will include:

- Date of visit
- Inspector's name
- Route Number[2]
- Property Address[3]
- Tree Location (front, side, yard)[3]
- Tree Species, including cultivar[3]
- Site Conditions
- Tree Conditions
- Overall Health Rating
- Miscellaneous Notes

Tier II and Tier Omega data collection will include the above information and:

- Caliper size
- Tree canopy width
- Tree canopy height

FoT Staff Visits will include:

- Recommendation of replacement tree
- Cause of decline/death

Tier I SI's will inspect each tree twice during the summer months. Specific reporting dates will be determined on an annual basis; generally they will occur once in mid-June and again in late July. Tier II and Tier Omega Sis will inspect each tree once during the summer months.

[1] See attached data collection form.

[2] Information to be pre-loaded on data collection sheet

Analyses
Mortality rate:

- Number of trees confirmed as dead by Tier III inspectors compared to overall tree count.

Identified trends seen in data:

- Reason for mortality (neglect, watering, tree damage, etc.)

Patterns of mortality based on:

- Nursery or origin
- Type of nursery stock
- Size of nursery stock
- Tree species
- Location within city.

Products
Annual Tree Monitoring Report.
A report generated by FoT, provided to the City of Portland, describing the previous season's tree planting survivability.

The report shall include the following information:

- Total number of trees planted within the City of Portland
- Total number of trees assessed[3]
- Total number of trees in each rating class
- Genera, species and cultivar death rate
- Patterns of mortality
- Common trends

Tree Health Rating Map
FoT will provide to the City of Portland a GIS map with locations of all trees planted within the City of Portland. An electronic version of this map, and an attribute table that shall include street address, species type and planting strip width, can be shared with the City, if requested.

Deadline
FoT will provide a Tree Monitoring Report and GIS data layer to the City of Portland every year of the contract by October 31st.

This Tree Monitoring Protocol Report will be useful for the duration of the contract, unless it is deemed by both parties that the protocol needs to be modified, in which case, updated protocol will be due by March 31st of the following year.

[3] Not all yard trees will be inspected due to access constraints

Appendix B: 2011-12 Data Collection Forms for Tier I Inspectors

TIER I - ROUTE # 1 **Name:** _____

Due Date: July 1st **Date:** _____

Site Condition Issues: (1) Inadequate Water • (2) No Mulch • (3) Grass & Weeds Present
Tree Condition Issues: (4) Bark Damage • (5) Broken Branches • (6) Suckers / Sprouts Present • (7) Leaf Issues (i.e., no leaves present)
(8) Tree Not Inspected (i.e., tree inaccesible, missing) - note reason in "Notes"

			Indicate Problems with 'X'								
Property Address	Tree Species	Location	Site Condition			Tree Condition				NOT INSPECTED	NOTES
			DRY	NO MULCH	WEEDS	BARK	BRANCHES	SUCKERS	LEAVES		
		(St/Yard)	1	2	3	4	5	6	7	8	

Appendix C: 2011-12 Data Collection Forms for Tier II/Omega Inspectors

TIER II - ROUTE # 1 **Name:** _____

Due Date: August 15 **Date:** _____

Site Condition Issues: (1) Inadequate Water • (2) No Mulch • (3) Grass & Weeds Present
Tree Condition Issues: (4) Bark Damage • (5) Broken Branches • (6) Suckers / Sprouts Present • (7) Leaf Issues (i.e., no leaves present)
(8) Tree Not Inspected (i.e., tree inaccesible, missing) - note reason in "Notes"

			Indicate Problems with 'X'											
			Site Condition			Tree Condition								
Property Address	Tree Species	Location	DRY	NO MULCH	WEEDS	BARK	BRANCHES	SUCKERS	LEAVES	NOT INSPECTED	Caliper	Height	Width	NOTES
		(St/Yard)	1	2	3	4	5	6	7	8				

TIER Omega - ROUTE # 1 **Name:** _____

Due Date: August 15 **Date:** _____

Site Condition Issues: (1) Inadequate Water • (2) No Mulch • (3) Grass & Weeds Present
Tree Condition Issues: (4) Bark Damage • (5) Broken Branches • (6) Suckers / Sprouts Present • (7) Leaf Issues (i.e., no leaves present)
(8) Tree Not Inspected (i.e., tree inaccesible, missing) - note reason in "Notes"

			Indicate Problems with 'X'											
			Site Condition			Tree Condition								
Property Address	Tree Species	Location	DRY	NO MULCH	WEEDS	BARK	BRANCHES	SUCKERS	LEAVES	NOT INSPECTED	Caliper	Height	Width	NOTES
		(St/Yard)	1	2	3	4	5	6	7	8				

Appendix D: 2011-12 Tree Inspection Door-hanger (scanned copy)

FRIENDS of TREES

Hi. I'm _____, a volunteer with Friends of Trees. I came by to see how your tree(s) is doing. Please see the information below regarding future care. Thanks for planting!

Site Conditions:

1. Soil is moist and tree appears to be getting ample water:

Remember, young trees need water during the dry summer months to survive. Give each tree 10-15 gallons of water each week for the first three years. Frequent surface watering encourages shallow, vulnerable root growth. Providing one deep watering over the entire root system per week is recommended.

2. Tree is properly mulched:

Mulch shades the soil, retains water, and makes weeds easier to remove. Common mulches include grass clippings, compost, and bark dust. Spread mulch several feet in diameter around the trunk, 2" deep. Keep mulch 3 - 6" away from the base of the trunk.

3. Root zone is free of weeds and grass:

Grass and weeds compete with your tree for water. Mulch adequately and hand pull weeds when necessary.

Tree Conditions:

4. Bark is free of injury or damage:

Bark protects a tree's water & nutrient transportation system. Be careful not to damage the tree trunk with lawn mowers, weed eaters, or car doors.

5. Tree canopy is fully intact and free of broken branches:

To reduce hazards or unsightliness, remove dead branches and broken branches through proper pruning techniques.

6. Tree is free of sucker growth:

Suckers divert energy away from crown development. Any suckers or water sprouts at the base or along stem of the tree should be removed.

This is our 1st 2nd visit. If you did not recieve all thumbs up, we have provided ways you can improve the situation to keep your tree healthy and happy!

Comments: _____

_____

_____

_____

_____

Thank You! Your efforts are helping to grow our urban forest.

FREE tree care and pruning brochures available through the Urban Forestry Division:
Portland: (503) 823-4489
Vancouver: (360) 619-1128

Growing Healthy Communities for over 20 Years!

Tree care information and Friends of Trees opportunities:
www.FriendsofTrees.org

Overall Tree Health Rating for the Planting Season 2011-2012 Portland