

Environmental Benefits Analysis of Trees for The Ohio State University, Columbus Campus

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A Project of the Why OSU Trees Matter Committee

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An Analysis of Tree Benefits for The Ohio State University, Columbus Campus

EXECUTIVE SUMMARY

An inventory of trees on the grounds and adjacent street trees was conducted by The Ohio State University was conducted between 1995 and 2005. A total of 11,654 trees were inventoried over this period but some data is as much as 15 years old and needs to be updated. A common bid price for this service is \$4.00 per tree and thus the inventory represents a value of nearly \$35,000. Most importantly, however, is that the Facilities, Operations and Development (FOD) now has a tree inventory in a form that can be used to better manage the tree resource of the Columbus Campus. Benefits mentioned above do not include the value of the subsequent analysis and report by The Ohio State University's School of Environment and Natural Resources which would conservatively add another \$11,600. Analysis of the inventory data was done using iTree, a software suite distributed by the USDA Forest Service. The specific program in the iTree suite used to identify benefits was iStreets. This program allows campus leaders interested in making informed decisions about the campus green infrastructure or to explore many aspects including biodiversity and values of environmental services such that environmental benefits can be enhanced to reduce the carbon footprint of Ohio State's main campus.

A long standing rule of thumb for taxonomic biodiversity is the 10–20–30 guideline which suggests that no more than 10 percent of trees should be from the same species, no more than 20 percent should be from the same genera, and no more than 30 percent should be from the same family. On the Columbus campus' grounds, no tree species or genera exceed guidelines (Table 1). Even at the family level maples represent only 15% if the total number of campus trees. Ash plantings represent 818 individuals or 7 % of the campus canopy should emerald ash borer (EAB) destroy all ashes as predicted (Table 3A). The intermediate size of ash further reduces the impact, but removal is still estimated to cost nearly \$400,000 and replacements would add another \$237,000.

Larger growing deciduous trees constituting 1% or less of the campus canopy cover that could be used to replace the ash include the Kentucky coffeetree; Shumard, and chinquapin oaks; sycamore, buckeye, basswood, and elms.

Under ideal conditions tree numbers among various size classes should be stable and then decline as trees reach mature size and older trees die. Red oaks, honeylocusts and Norway maples show a rather desirable size distribution while sugar maples, Austrian pines, and crabapples are concentrated in mature sizes (Tables 2 and 3). Consider some larger growing trees that live longer and mature at larger sizes such as preferred in a resident preference survey in Toledo, OH. Of course, this should be consistent with the design intent for campus.

Trees are variable in size at present with more than 75% of the trees less than 18-inch diameter. Importance values (Table 4) show that the 125 (1%) sycamores have an importance value of 3.5 (a measure of canopy cover). This is the same value as 286 (2%), as the closely related, London planetrees with the same importance value. This demonstrates the campus' need for planting larger statured trees whenever possible as the importance value is a measure of the overall contribution of the species to the sum of environmental benefits delivered.

A major benefit of urban trees is their ability to intercept rainfall and reduce storm water runoff (Table 5). Storm water runoff is a major cost for campus. Columbus, OH is embarking on a multi-billion dollar sewer and storm

water upgrade for the community including the OSU main campus. Trees, alone, on the Columbus campus intercept more than 10 million gallons of storm water annually at a savings to the campus and community of 272,086 dollars per year on campus' 1,700 acres but could be increased with strategic plantings.

Carbon sequestration, as reported here, represents the carbon removed from the air and stored in the trees (Table 6). More than nearly 30 million pounds or 14,886 tons of carbon have been stored by the 11,654 trees over time. The campus' trees currently sequester and avoid some 4,274,982 lbs of CO₂ yearly (Table 8) and would represent carbon credits worth \$32,000 per year if a carbon trading system were in place and if a system for accounting for them were available for campus trees. These are net gain figures and include deductions for tree losses and maintenance. Annual CO₂ benefits vary by species and size but average \$2.75 per tree per year while larger American sycamores average \$11.70 per tree per year or four times as much. Strategic plantings could increase this substantially and be a significant tool in reaching OSU's goal of reaching carbon neutrality by 2050.

Annual air quality savings (reduced ozone, nitrous and sulfur oxides as well as particulate matter) for the campus trees is more than \$39,000 (Table 9). This includes both direct savings (\$7,961) from campus trees and avoided pollution which is much greater at \$36,662. Avoided pollution is pollution not generated at power source because energy was not required (avoided) by the community. The total annual air quality benefits are discounted by \$5,298 for the volatile emissions from the trees themselves.

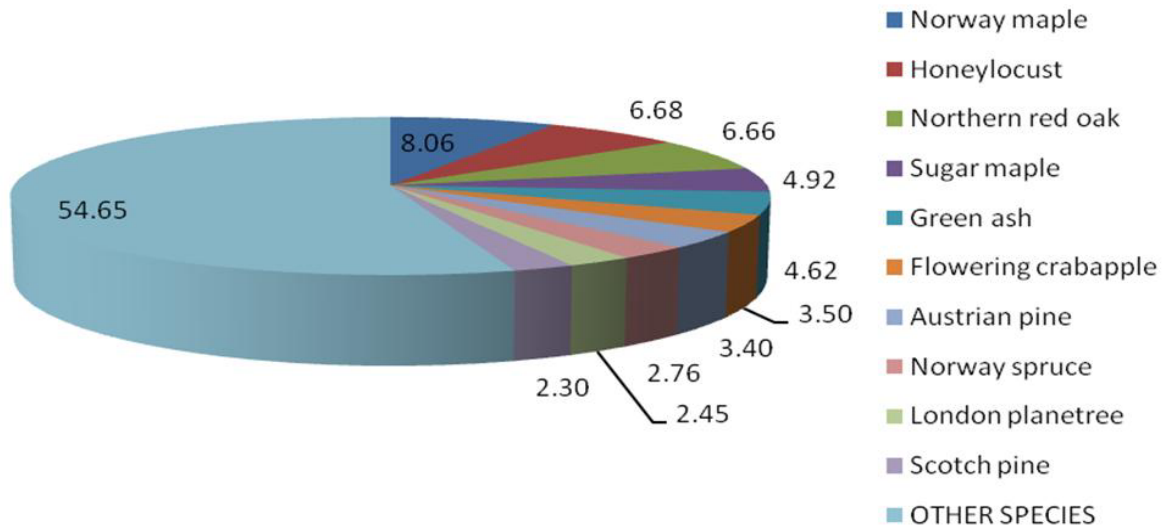
Energy savings by trees are particularly important in view of the citizenry's increasing concern over the nation's energy dependency. Energy is saved by shading structures, evaporating water (evapotranspiration) and reducing wind speed around structures (Table 7). Campus trees save Ohio State and the community \$93,242 in electricity and \$168,775 in natural gas for a total savings of \$262,017 or an average of \$22 per tree per year. Recent interest in strategic plantings of large trees to enhance energy savings has real potential for savings on campus.

Aesthetic and miscellaneous benefits from trees contribute \$296,241 annually to campus in the form of more effective recruiting and enhanced sense of place among other things (Table 10). Research in public housing has shown that areas with trees facilitate interaction among residents and lead to reduced domestic violence and more sociable environments. Customer surveys suggest that customers prefer to spend their money and time in commercial streetscapes with trees and are willing to spend up to 11% more there. Perhaps this improved atmosphere on campus might translate into enhanced endowments?

When all benefits are included the 11,654 trees contribute an average of \$77 per tree annually to campus and its community (Tables 11 & 12). Species vary in their annual benefits but mature size, longevity, and maintenance costs are but some of the factors determining annual benefits. This would be well in excess of their maintenance and planting costs for trees on campus.

The Ohio State University's budget for trees maintenance on the Columbus campus was estimated to be \$250,000. Thus while the 11,654 trees on the grounds require relatively little care per year they deliver \$901,731 in annual benefits from storm water abatement, carbon sequestration, energy savings, air quality, aesthetic benefits, and the like. This is a 360% return on investment. Returns here may seem high but Ohio communities studied routinely discover returns on their tree maintenance dollars of 2-300% and Toledo had a 436% annual return. Further, unlike most community infrastructure, annual tree benefits per tree continue to increase over a tree's lifetime.

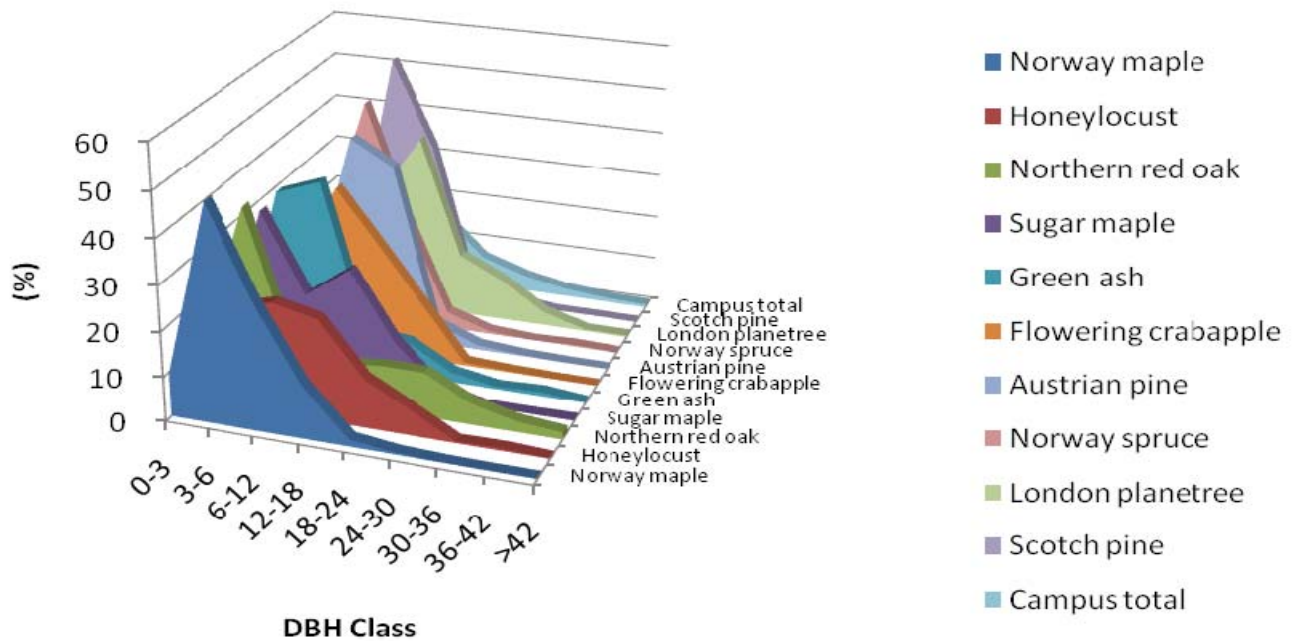
Table 1. Species Distribution of the Most Common Trees on the OSU Columbus Campus Arranged from Most to Least Frequent



Species	Percent
Norway maple	8.06
Honeylocust	6.68
Northern red oak	6.66
Sugar maple	4.92
Green ash	4.62
Flowering crabapple	3.50
Austrian pine	3.40
Norway spruce	2.76
London planetree	2.45
Scotch pine	2.30
OTHER SPECIES	54.65
Total	100.00



Table 2. Relative Age Distribution of the 10 Most Commonly Planted Trees on the Ohio State Columbus Campus as a Percentage (%) of each Species by Common Names



Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Norway maple	9.69	48.24	28.01	11.93	1.60	0.43	0.11	0.00	0.00
Honeylocust	12.84	22.21	24.78	22.59	10.91	5.78	0.39	0.51	0.00
Northern red oak	10.18	40.72	11.34	8.76	10.05	10.05	4.90	2.45	1.55
Sugar maple	3.49	36.65	19.37	26.35	11.69	2.27	0.00	0.00	0.17
Green ash	1.12	37.73	41.26	8.55	7.62	2.23	0.56	0.93	0.00
Flowering crabapple	3.92	20.34	36.76	25.00	12.99	0.74	0.25	0.00	0.00
Austrian pine	0.51	8.84	44.95	39.65	4.80	1.01	0.25	0.00	0.00
Norway spruce	1.24	19.25	50.00	24.84	3.73	0.62	0.00	0.31	0.00
London planetree	2.45	3.50	26.57	40.21	13.99	9.44	3.15	0.35	0.35
Scotch pine	0.00	5.97	54.48	35.45	2.99	1.12	0.00	0.00	0.00
Campus totals	8.13	35.73	27.00	15.33	6.73	3.63	1.80	0.95	0.70



Table 3. Population of Columbus Campus Trees by Common Name and Size Class.

Species	DBH Class (in)									Total
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Broadleaf Deciduous Large (BDL)										
Northern red oak	79	316	88	68	78	78	38	19	12	776
Sugar maple	20	210	111	151	67	13	0	0	1	573
Green ash	6	203	222	46	41	12	3	5	0	538
London planetree	7	10	76	115	40	27	9	1	1	286
Northern hackberry	11	28	61	54	13	31	7	5	2	212
Red maple	16	52	73	47	5	4	0	0	0	197
White ash	0	149	22	5	12	3	1	1	2	195
Sweetgum	27	63	44	41	17	2	0	0	0	194
Pin oak	5	98	12	9	17	10	7	7	4	169
American sycamore	0	0	3	6	38	30	15	16	17	125
Horsechestnut	0	107	0	3	1	1	1	0	0	113
Freeman maple	9	60	28	6	3	0	0	0	0	106
European beech	28	22	10	4	4	2	2	0	1	73
Silver maple	0	0	14	6	19	12	16	0	4	71
English elm	0	0	1	5	2	5	26	17	15	71
Tulip tree	29	16	6	11	1	5	1	0	1	70
Kentucky coffeetree	2	23	9	3	8	9	2	1	0	57
Shingle oak	0	7	14	12	12	3	0	3	0	51
American basswood	0	2	3	8	14	8	8	0	0	43
Shumard oak	0	19	0	4	10	3	4	1	0	41
English oak	5	10	21	0	0	2	1	0	1	40
European ash	1	13	14	7	0	1	0	1	0	37
Black walnut	1	3	8	2	4	4	6	0	0	28
Scarlet oak	2	18	0	0	4	2	1	1	0	28
Eastern cottonwood	0	0	0	0	3	1	10	5	8	27
Bur oak	0	7	9	2	4	1	0	0	1	24
Blue ash	12	9	0	0	0	0	0	0	0	21
White oak	1	10	0	2	0	3	0	1	0	17
Sawtooth oak	0	4	11	1	0	0	0	0	0	16
Chinkapin oak	7	5	0	1	0	0	0	2	0	15
Silver linden	0	11	2	1	0	1	0	0	0	15
Chestnut oak	0	11	0	0	0	2	0	0	0	13
Maple	0	0	9	2	1	0	0	0	0	12
Japenese catsuratree	0	0	2	8	1	0	0	0	0	11
Black maple	0	1	4	3	1	1	0	0	0	10
Crimean linden	0	3	4	2	0	1	0	0	0	10

Table 3. Population of Columbus Campus Trees continued

Species	DBH Class (in)									Total
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Tree of heaven	0	3	0	0	0	3	1	0	0	7
Balkan ash	0	0	1	1	3	2	0	0	0	7
Bitternut hickory	0	0	0	5	1	0	0	0	0	6
Northern catalpa	0	0	1	0	2	1	1	0	1	6
Overcup oak	0	4	0	0	1	0	1	0	0	6
Willow oak	0	2	0	0	2	1	1	0	0	6
Paper birch	0	0	5	0	0	0	0	0	0	5
Oriental oak	0	1	0	0	3	0	0	0	0	4
Yellow buckeye	0	1	0	0	0	1	1	0	0	3
Pignut hickory	0	1	1	0	0	0	0	0	0	2
American beech	0	0	0	2	0	0	0	0	0	2
Beech	0	0	1	0	0	0	1	0	0	2
Black oak	0	0	1	0	0	1	0	0	0	2
American elm	0	0	0	0	2	0	0	0	0	2
Dutch elm	0	0	0	0	2	0	0	0	0	2
Slippery elm	0	0	0	0	0	1	0	1	0	2
White birch	0	1	0	0	0	0	0	0	0	1
Shellbark hickory	0	0	0	1	0	0	0	0	0	1
Shagbark hickory	0	0	1	0	0	0	0	0	0	1
Biltmore ash	0	0	0	1	0	0	0	0	0	1
Japanese walnut	0	0	0	0	1	0	0	0	0	1
Sourwood	0	0	1	0	0	0	0	0	0	1
Hungarian oak	0	1	0	0	0	0	0	0	0	1
Scotch elm	0	0	1	0	0	0	0	0	0	1
Total	268	1,504	894	645	437	287	164	87	71	4,357
Broadleaf Deciduous Medium (BDM)										
Norway maple	91	453	263	112	15	4	1	0	0	939
Honeylocust	100	173	193	176	85	45	3	4	0	779
Littleleaf linden	4	38	103	51	33	6	0	3	0	238
Ginkgo	1	66	35	22	9	9	4	0	1	147
Hybrid elm	4	96	36	6	0	0	0	0	0	142
Callery pear	1	48	53	9	1	0	0	0	0	112
Swamp white oak	11	42	8	9	7	9	3	3	1	93
Yellowwood	33	44	2	1	1	0	0	0	0	81
Zelkova	0	37	12	12	6	3	4	3	1	78
Lacebark elm	19	33	17	3	0	3	2	0	0	77
European hornbeam	15	10	21	0	0	0	2	0	0	48

Table 3. Population of Columbus Campus Trees continued

Species	DBH Class (in)									Total
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Turkish filbert	7	23	10	1	3	1	1	0	0	46
River birch	3	27	7	4	1	0	0	0	0	42
Ohio buckeye	6	17	9	4	1	2	0	0	0	39
Black locust	0	11	9	6	10	1	0	1	0	38
Goldenraintree	1	6	4	17	5	2	0	0	0	35
Siberian elm	0	4	5	8	2	5	7	1	2	34
Japanese pagodatree	0	0	4	5	12	3	2	3	0	29
Elm	1	18	2	0	3	0	1	2	2	29
Unknown deciduous tree	7	4	6	2	0	1	4	0	1	25
Amur corktree	0	1	4	7	7	3	0	0	1	23
Hedge maple	6	8	1	4	0	0	2	0	0	21
Netted hackberry	0	0	9	10	0	0	0	0	0	19
Red mulberry	0	4	5	5	1	1	2	1	0	19
White mulberry	1	1	0	4	3	5	0	0	0	14
Bluebeech	0	4	6	1	0	0	0	0	1	12
Boxelder	0	3	2	3	1	1	0	0	0	10
Hardy rubber tree	2	3	3	0	1	0	1	0	0	10
Black cherry	0	4	3	1	1	0	0	0	1	10
Black tupelo	1	5	3	0	0	0	0	0	0	9
Paperbark maple	3	3	1	1	0	0	0	0	0	8
Trident maple	0	2	2	2	0	0	0	0	0	6
Nikko maple	0	1	3	1	0	0	0	0	0	5
Red Horsechestnut	1	4	0	0	0	0	0	0	0	5
Persimmon	0	1	1	1	1	0	0	0	0	4
Honeylocust unknown	0	4	0	0	0	0	0	0	0	4
European aspen	0	1	0	0	1	0	1	0	0	3
Striped maple	0	1	1	0	0	0	0	0	0	2
Shantung maple	0	0	0	0	0	2	0	0	0	2
Bigleaf magnolia	0	1	1	0	0	0	0	0	0	2
Umbrella magnolia	0	1	0	1	0	0	0	0	0	2
Ivy-leaved maple	0	0	0	1	0	0	0	0	0	1
Planetree maple	0	0	0	1	0	0	0	0	0	1
Tatarian maple	0	0	0	1	0	0	0	0	0	1
Ash	0	0	1	0	0	0	0	0	0	1
Cucumbertree magnolia	0	0	1	0	0	0	0	0	0	1
Flowering crabapple	16	83	150	102	53	3	1	0	0	408
Eastern redbud	12	156	48	14	0	0	0	0	0	230
Allegheny serviceberry	21	146	28	0	2	0	0	0	0	197

Table 3. Population of Columbus Campus Trees continued

Species	DBH Class (in)									Total
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Washington hawthorn	0	36	65	38	2	3	0	0	0	144
Corneliancherry dogwood	0	106	16	2	1	0	0	0	0	125
Nannyberry viburnum	9	44	0	2	0	0	0	0	0	55
Apple serviceberry	8	36	4	0	0	0	0	0	0	48
Green Hawthorn	0	33	13	1	0	0	0	0	0	47
Kousa dogwood	0	35	3	3	1	0	0	0	0	42
Star magnolia	7	21	12	2	0	0	0	0	0	42
Serviceberry	3	17	14	5	0	0	0	0	0	39
Staghorn sumac	0	37	0	0	0	0	0	0	0	37
Amur maple	0	6	19	9	1	1	0	0	0	36
Running serviceberry	27	9	0	0	0	0	0	0	0	36
Saucer Magnolia	1	15	13	4	2	0	0	1	0	36
Japanese tree lilac	2	29	1	1	1	0	0	0	0	34
Cherry or plum hybrid	24	4	0	0	0	0	0	0	0	28
Shadblow serviceberry	0	16	7	4	0	0	0	0	0	27
Oak-leaved hydrangea	22	3	0	0	0	0	0	0	0	25
Cockspur hawthorn	0	6	6	2	3	2	0	0	0	19
Lavalle hawthorn	0	3	6	3	4	0	0	0	0	16
Downy hawthorn	0	0	7	7	2	0	0	0	0	16
Blackhaw viburnum	0	7	8	0	1	0	0	0	0	16
Sargeants crabapple	13	1	1	0	0	0	0	0	0	15
Eastern hophornbeam	0	0	6	9	0	0	0	0	0	15
Witchhazel	9	2	3	0	0	0	0	0	0	14
Japanese tea crabapple	0	0	7	7	0	0	0	0	0	14
Japanese maple	1	7	4	1	0	0	0	0	0	13
Flowering dogwood	5	6	1	0	0	0	0	0	0	12
Carmine crabapple	0	2	5	2	1	1	0	0	0	11
Red buckeye	2	2	4	1	0	0	0	0	0	9
Glossy hawthorn	0	8	1	0	0	0	0	0	0	9
Carolina silverbell	1	4	4	0	0	0	0	0	0	9
Amur honeysuckle	1	6	1	1	0	0	0	0	0	9
European spindletree	8	0	0	0	0	0	0	0	0	8
Persian parrotia	0	0	6	2	0	0	0	0	0	8
European alder	1	1	4	1	0	0	0	0	0	7
Magnolia Hybrid	1	2	4	0	0	0	0	0	0	7
Burningbush	5	1	0	0	0	0	0	0	0	6
Higan cherry	1	3	2	0	0	0	0	0	0	6
Willowood viburnum	0	3	0	0	2	1	0	0	0	6

Table 3. Population of Columbus Campus Trees continued

Species	DBH Class (in)									Total
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Russian olive	0	1	0	3	1	0	0	0	0	5
Beautybush	4	1	0	0	0	0	0	0	0	5
Dahurian buckthorn	1	2	2	0	0	0	0	0	0	5
European smoketree	4	0	0	0	0	0	0	0	0	4
Japanese Flowering crabapple	0	3	0	0	0	1	0	0	0	4
Sweet cherry	0	0	4	0	0	0	0	0	0	4
Flowering plum	0	2	1	1	0	0	0	0	0	4
Cherry plum	1	2	1	0	0	0	0	0	0	4
Lilac	4	0	0	0	0	0	0	0	0	4
Glossy buckthorn	0	1	2	0	0	0	0	0	0	3
Roseybloom crabapple	0	0	3	0	0	0	0	0	0	3
Willowleaf pear	0	3	0	0	0	0	0	0	0	3
American filbert	0	1	0	0	1	0	0	0	0	2
Dotted hawthorn	0	1	0	1	0	0	0	0	0	2
Viburnum	1	1	0	0	0	0	0	0	0	2
Chinese fringetree	0	1	0	0	0	0	0	0	0	1
White fringetree	0	1	0	0	0	0	0	0	0	1
Alternatleaf dogwood	0	0	1	0	0	0	0	0	0	1
Giant filbert	1	0	0	0	0	0	0	0	0	1
Japanese cornel dogwood	0	0	1	0	0	0	0	0	0	1
Dogwood	0	1	0	0	0	0	0	0	0	1
Spicebush	0	0	1	0	0	0	0	0	0	1
Arnolds crabapple	0	0	0	0	1	0	0	0	0	1
Loebner Magnolia	0	0	1	0	0	0	0	0	0	1
Common chokecherry	0	0	1	0	0	0	0	0	0	1
Siebold viburnum	0	0	1	0	0	0	0	0	0	1
Total	216	917	492	228	79	12	1	1	0	1,946
Broadleaf Evergreen Medium (BEM)										
Southern magnolia	0	1	0	0	1	0	0	0	0	2
Total	0	1	0	0	1	0	0	0	0	2
Broadleaf Evergreen Small (BES)										
Sweetbay	4	14	3	1	1	0	0	0	0	23
American holly	1	5	5	0	0	0	0	0	0	11
Total	5	19	8	1	1	0	0	0	0	34

Table 3. Population of Columbus Campus Trees continued

Species	DBH Class (in)									Total
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Conifer Evergreen Large (CEL)										
Austrian pine	2	35	178	157	19	4	1	0	0	396
Norway spruce	4	62	161	80	12	2	0	1	0	322
Scotch pine	0	16	146	95	8	3	0	0	0	268
Eastern white pine	10	11	121	42	13	0	0	0	0	197
Northern white cedar	39	59	2	0	0	0	0	0	0	100
White fir	3	7	14	4	0	1	0	0	0	29
Baldcypress	3	5	17	2	0	0	0	1	0	28
Eastern hemlock	0	13	10	2	0	0	0	0	0	25
Fraser fir	0	8	14	1	0	0	0	0	0	23
Douglas-fir	0	4	17	2	0	0	0	0	0	23
Red pine	1	5	12	0	0	0	0	0	0	18
Serbian spruce	1	4	8	1	0	0	0	0	0	14
Unknown conifer	1	6	0	0	0	0	0	0	0	7
Dawn-redwood	0	1	2	1	1	0	1	0	0	6
Balsam fir	0	1	0	0	0	0	0	0	0	1
Tigertail spruce	0	1	0	0	0	0	0	0	0	1
Himalayan pine	0	0	1	0	0	0	0	0	0	1
Japanese hemlock	0	0	0	0	0	1	0	0	0	1
Total	64	238	703	387	53	11	2	2	0	1,460
Conifer Evergreen Medium (CEM)										
Blue spruce	21	103	98	20	1	0	0	0	0	243
White spruce	0	21	9	2	0	0	0	0	0	32
Lace-bark pine	0	2	14	1	0	0	0	0	0	17
Japanese larch	0	0	1	0	1	6	2	0	0	10
Japanese black pine	0	2	2	0	0	0	0	0	0	4
Total	21	128	124	23	2	6	2	0	0	306
Conifer Evergreen Small (CES)										
Eastern red cedar	0	105	2	2	0	0	0	0	0	109
Chinese juniper	8	18	55	0	0	0	0	0	0	81
Intermediate yew	45	15	12	7	0	1	0	0	0	80
Limber pine	2	6	4	0	0	0	0	0	0	12
Japanese red pine	0	2	4	0	0	0	0	0	0	6
Mountain Pine	0	6	0	0	0	0	0	0	0	6
Swiss stone pine	0	1	1	0	0	0	0	0	0	2
Yew	0	0	0	2	0	0	0	0	0	2

Table 3. Population of Columbus Campus Trees continued

Species	DBH Class (in)									Total
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
European larch	0	0	1	0	0	0	0	0	0	1
Larch	0	1	0	0	0	0	0	0	0	1
Total	55	154	79	11	0	1	0	0	0	300
Columbus Campus Total	947	4,164	3,146	1,787	784	423	210	111	82	11,654



Table 3A Estimated Expenses for Ash Removal and/or Replacement for OSU Columbus Campus Trees

SIZE	NUMBER	REMOVAL COSTS PER TREE	CLASS TOTALS	REPLACEMENT COST	REMOVAL W/ REPLACEMENT
3	28	\$375	\$10,500	\$290	\$18,620
3-6	365	\$375	\$136,875	\$290	\$242,725
6-12	259	\$375	\$97,125	\$290	\$172,235
12-18	60	\$675	\$40,500	\$290	\$57,900
18-24	57	\$675	\$38,475	\$290	\$55,005
24-30	33	\$1,290	\$42,570	\$290	\$52,140
30-36	10	\$1,625	\$16,250	\$290	\$19,150
36-42	3	\$2,150	\$6,450	\$290	\$7,320
>42	3	\$2,150	\$6,450	\$290	\$7,320
REMOVAL ONLY TOTALS			\$395,195	REMOVE + REPLACE TOTAL	\$632,415



Table 4. OSU Columbus Campus Trees Listed by Common Name from Greatest to Least Importance Value and/or Canopy Cover.

Species	Number of Trees	% of Total Trees	Leaf Area (ft2)	% of Total Leaf Area	Canopy Cover (ft2)	% of Total Canopy Cover	Importance Value
Honeylocust	779	6.7	1561589	10.2	589633	11.1	9.3
Northern red oak	776	6.7	1198005	7.8	396151	7.5	7.3
Norway maple	939	8.1	505651	3.3	289268	5.5	5.6
Sugar maple	573	4.9	780860	5.1	311376	5.9	5.3
Green ash	538	4.6	653403	4.3	236953	4.5	4.5
London planetree	286	2.5	622797	4.1	209983	4.0	3.5
American sycamore	125	1.1	882279	5.8	193421	3.7	3.5
Austrian pine	396	3.4	654046	4.3	129481	2.4	3.4
Northern hackberry	212	1.8	522852	3.4	207042	3.9	3.0
Flowering crabapple	408	3.5	212760	1.4	179841	3.4	2.8
Norway spruce	322	2.8	410922	2.7	88600	1.7	2.4
Scotch pine	268	2.3	400622	2.6	84787	1.6	2.2
Littleleaf linden	238	2.0	334941	2.2	111321	2.1	2.1
Pin oak	169	1.5	374132	2.4	113586	2.1	2.0
Red maple	197	1.7	203743	1.3	99782	1.9	1.6
Eastern white pine	197	1.7	256006	1.7	56225	1.1	1.5
White ash	195	1.7	185773	1.2	74675	1.4	1.4
Blue spruce	243	2.1	168808	1.1	48801	0.9	1.4
Sweetgum	194	1.7	164400	1.1	71259	1.3	1.4
Eastern redbud	230	2.0	26723	0.2	39468	0.7	1.0
Ginkgo	147	1.3	83671	0.5	50588	1.0	0.9
Washington hawthorn	144	1.2	53128	0.3	54448	1.0	0.9
Allegheny serviceberry	197	1.7	14836	0.1	24818	0.5	0.8
Hybrid elm	142	1.2	68076	0.4	29721	0.6	0.7
Corneliancherry dogwood	125	1.1	10541	0.1	17380	0.3	0.5
OTHER TREES	3,614	31.0	4967582	32.4	1582532	29.9	31.1
Campus Total	11,654	100.0	15318149	100.0	5291140	100.0	100.0



Table 5. Annual Storm Water Benefits of Ohio State Columbus Campus Trees by Species Ordered by Decreasing Benefits/Tree

Species	Total Rainfall Interception (Gal)	Total (\$)	% of Total Tree Numbers	% of Total \$	Avg. \$/tree
American sycamore	473,009	\$12,819	1.1	4.7	\$102.56
Northern hackberry	344,100	\$9,326	1.8	3.4	\$43.99
London planetree	402,419	\$10,906	2.5	4.0	\$38.13
Pin oak	217,005	\$5,881	1.5	2.2	\$34.80
Honeylocust	918,764	\$24,900	6.7	9.2	\$31.96
Austrian pine	434,518	\$11,776	3.4	4.3	\$29.74
Scotch pine	274,068	\$7,428	2.3	2.7	\$27.72
Northern red oak	786,534	\$21,317	6.7	7.8	\$27.47
Littleleaf linden	227,038	\$6,153	2.0	2.3	\$25.85
Sugar maple	518,421	\$14,050	4.9	5.2	\$24.52
Eastern white pine	178,095	\$4,827	1.7	1.8	\$24.50
Norway spruce	281,780	\$7,637	2.8	2.8	\$23.72
Green ash	443,478	\$12,019	4.6	4.4	\$22.34
Red maple	154,145	\$4,178	1.7	1.5	\$21.21
White ash	132,272	\$3,585	1.7	1.3	\$18.38
Sweetgum	120,034	\$3,253	1.7	1.2	\$16.77
Blue spruce	134,440	\$3,644	2.1	1.3	\$14.99
Norway maple	442,722	\$11,999	8.1	4.4	\$12.78
Ginkgo	68,896	\$1,867	1.3	0.7	\$12.70
Flowering crabapple	180,385	\$4,889	3.5	1.8	\$11.98
Washington hawthorn	50,858	\$1,378	1.2	0.5	\$9.57
Hybrid elm	50,051	\$1,356	1.2	0.5	\$9.55
Eastern redbud	32,825	\$890	2.0	0.3	\$3.87
Corneliancherry dogwood	14,016	\$380	1.1	0.1	\$3.04
Allegheny serviceberry	19,933	\$540	1.7	0.2	\$2.74
OTHER STREET TREES	3,139,552	\$85,088	31.0	31.3	\$23.54
CAMPUS TOTAL	10,039,359	\$272,086	100.0	100.0	\$23.35



Table 6. Stored CO₂ Benefits in the Trees on the Ohio State University Columbus Campus by Species Ordered by Decreasing Benefits

Species	Total stored CO ₂ (lbs)	Total (\$)	% of Total Tree Numbers	% Total \$	Avg. \$/tree
American sycamore	2,548,918	\$19,117	1.1	8.6	\$152.94
Pin oak	943,531	\$7,076	1.5	3.2	\$41.87
London planetree	1,541,409	\$11,561	2.5	5.2	\$40.42
Northern red oak	3,275,709	\$24,568	6.7	11.0	\$31.66
Northern hackberry	668,793	\$5,016	1.8	2.3	\$23.66
Littleleaf linden	704,368	\$5,283	2.0	2.4	\$22.20
Sugar maple	1,474,183	\$11,056	4.9	5.0	\$19.30
Honeylocust	1,951,764	\$14,638	6.7	6.6	\$18.79
Green ash	1,246,451	\$9,348	4.6	4.2	\$17.38
Flowering crabapple	845,288	\$6,340	3.5	2.8	\$15.54
Sweetgum	374,757	\$2,811	1.7	1.3	\$14.49
Red maple	333,822	\$2,504	1.7	1.1	\$12.71
White ash	321,335	\$2,410	1.7	1.1	\$12.36
Washington hawthorn	214,540	\$1,609	1.2	0.7	\$11.17
Ginkgo	208,043	\$1,560	1.3	0.7	\$10.61
Norway maple	986,459	\$7,398	8.1	3.3	\$7.88
Austrian pine	331,722	\$2,488	3.4	1.1	\$6.28
Scotch pine	198,473	\$1,489	2.3	0.7	\$5.55
Eastern white pine	124,110	\$931	1.7	0.4	\$4.72
Norway spruce	199,907	\$1,499	2.8	0.7	\$4.66
Eastern redbud	114,001	\$855	2.0	0.4	\$3.72
Hybrid elm	68,031	\$510	1.2	0.2	\$3.59
Corneliancherry dogwood	46,189	\$346	1.1	0.2	\$2.77
Allegheny serviceberry	65,154	\$489	1.7	0.2	\$2.48
Blue spruce	57,339	\$430	2.1	0.2	\$1.77
OTHER STREET TREES	4,956,530	\$81,954	31.0	36.7	\$22.68
CAMPUS TOTAL	29,771,559	\$223,287	100.0	100.0	\$19.16

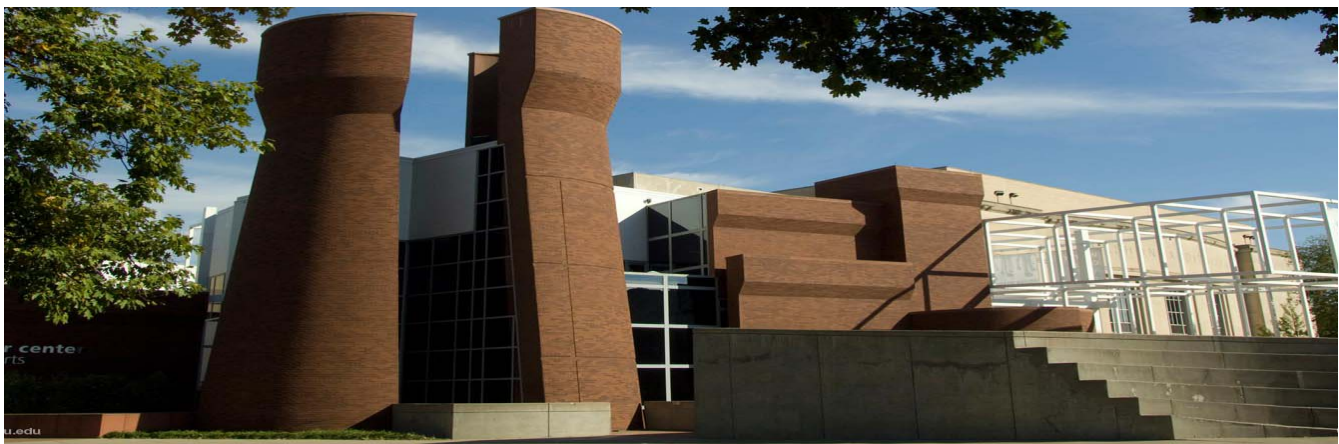


Table 7. Annual Energy Benefits of OSU Columbus Campus Trees by Common Name and Decreasing Dollars/Tree

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	% of Total Tree Number	% of Total \$	Avg. \$/tree
American sycamore	38.7	\$2,936	5606	\$5,494	\$8,430	1.1	3.2	\$67.44
Northern hackberry	44.8	\$3,403	6316	\$6,190	\$9,593	1.8	3.7	\$45.25
London planetree	53.5	\$4,063	7340	\$7,193	\$11,256	2.5	4.3	\$39.36
Honeylocust	129.1	\$9,799	17282	\$16,936	\$26,735	6.7	10.2	\$34.32
Pin oak	22.5	\$1,711	3047	\$2,986	\$4,697	1.5	1.8	\$27.79
Sugar maple	75.8	\$5,751	9783	\$9,587	\$15,338	4.9	5.9	\$26.77
Littleleaf linden	29.5	\$2,237	4148	\$4,065	\$6,303	2.0	2.4	\$26.48
Red maple	24.6	\$1,870	3260	\$3,195	\$5,066	1.7	1.9	\$25.71
Northern red oak	89.0	\$6,759	12377	\$12,129	\$18,888	6.7	7.2	\$24.34
Flowering crabapple	43.1	\$3,274	6568	\$6,437	\$9,711	3.5	3.7	\$23.80
Green ash	55.8	\$4,234	7622	\$7,470	\$11,703	4.6	4.5	\$21.75
Washington hawthorn	13.6	\$1,032	2066	\$2,025	\$3,057	1.2	1.2	\$21.23
Sweetgum	19.3	\$1,465	2685	\$2,631	\$4,097	1.7	1.6	\$21.12
Norway maple	77.3	\$5,867	11442	\$11,213	\$17,080	8.1	6.5	\$18.19
Austrian pine	34.8	\$2,641	4626	\$4,533	\$7,174	3.4	2.7	\$18.12
Scotch pine	22.6	\$1,713	3072	\$3,010	\$4,723	2.3	1.8	\$17.62
Ginkgo	12.5	\$946	1645	\$1,612	\$2,558	1.3	1.0	\$17.40
White ash	15.4	\$1,166	1994	\$1,954	\$3,120	1.7	1.2	\$16.00
Eastern white pine	14.4	\$1,095	2070	\$2,029	\$3,124	1.7	1.2	\$15.86
Norway spruce	23.1	\$1,755	3259	\$3,194	\$4,948	2.8	1.9	\$15.37
Blue spruce	12.0	\$909	1847	\$1,811	\$2,720	2.1	1.0	\$11.19
Hybrid elm	7.5	\$568	994	\$974	\$1,542	1.2	0.6	\$10.86
Eastern redbud	9.6	\$731	1561	\$1,530	\$2,260	2.0	0.9	\$9.83
Corneliancherry dogwood	4.1	\$311	689	\$675	\$986	1.1	0.4	\$7.89
Allegheny serviceberry	5.8	\$439	990	\$970	\$1,409	1.7	0.5	\$7.15
OTHER STREET TREES	350.0	\$26,565	49931	\$48,932	\$75,497	31.0	28.8	\$20.89
CAMPUS TOTAL	1228.5	\$93,242	172219	\$168,775	\$262,017	100.0	100.0	\$22.48



Table 8. Annual Carbon Dioxide Benefits of OSU Columbus Campus Trees by Common Name and Ordered by Decreasing Benefits per Tree

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release(lb)	Maintenance Release (lb)	Total Release (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total (\$)	% of Total Tree Numbers	% of Total \$	Avg. \$/tree
American sycamore	142748	\$1,071	-12235	-463	-\$95	64891	\$487	194941	\$1,462	1.1	4.6	\$11.70
Pin oak	82643	\$620	-4529	-257	-\$36	37806	\$284	115663	\$867	1.5	2.7	\$5.13
London planetree	111167	\$834	-7399	-574	-\$60	89794	\$673	192988	\$1,447	2.5	4.5	\$5.06
Honeylocust	277605	\$2,082	-9471	-1064	-\$79	216565	\$1,624	483636	\$3,627	6.7	11.3	\$4.66
Northern hackberry	45694	\$343	-3217	-406	-\$27	75212	\$564	117284	\$880	1.8	2.7	\$4.15
Littleleaf linden	84318	\$632	-3404	-367	-\$28	49446	\$371	129993	\$975	2.0	3.0	\$4.10
Sugar maple	123276	\$925	-7224	-785	-\$60	127102	\$953	242369	\$1,818	4.9	5.7	\$3.17
Red maple	41451	\$311	-1603	-235	-\$14	41337	\$310	80949	\$607	1.7	1.9	\$3.08
Green ash	126682	\$950	-5983	-662	-\$50	93561	\$702	213597	\$1,602	4.6	5.0	\$2.98
Flowering crabapple	73026	\$548	-4058	-585	-\$35	72348	\$543	140731	\$1,055	3.5	3.3	\$2.59
Sweetgum	32455	\$243	-1800	-227	-\$15	32384	\$243	62812	\$471	1.7	1.5	\$2.43
Northern red oak	108547	\$814	-15727	-1165	-\$127	149365	\$1,120	241020	\$1,808	6.7	5.6	\$2.33
Norway maple	154460	\$1,158	-5057	-868	-\$44	129667	\$973	278202	\$2,087	8.1	6.5	\$2.22
White ash	32220	\$242	-1631	-185	-\$14	25774	\$193	56178	\$421	1.7	1.3	\$2.16
Washington hawthorn	19895	\$149	-1030	-187	-\$9	22805	\$171	41483	\$311	1.2	1.0	\$2.16
Austrian pine	32729	\$245	-1592	-605	-\$16	58366	\$438	88897	\$667	3.4	2.1	\$1.68
Scotch pine	21215	\$159	-953	-398	-\$10	37860	\$284	57724	\$433	2.3	1.4	\$1.62
Ginkgo	10943	\$82	-999	-196	-\$9	20917	\$157	30665	\$230	1.3	0.7	\$1.56
Eastern white pine	13890	\$104	-596	-267	-\$6	24196	\$181	37223	\$279	1.7	0.9	\$1.42
Norway spruce	21607	\$162	-960	-426	-\$10	38777	\$291	58998	\$442	2.8	1.4	\$1.37
Hybrid elm	13286	\$100	-381	-111	-\$4	12554	\$94	25348	\$190	1.2	0.6	\$1.34
Eastern redbud	15236	\$114	-548	-177	-\$5	16147	\$121	30658	\$230	2.0	0.7	\$1.00
Blue spruce	7023	\$53	-275	-221	-\$4	20098	\$151	26625	\$200	2.1	0.6	\$0.82
Corneliancherry dogwood	6857	\$51	-222	-87	-\$2	6880	\$52	13429	\$101	1.1	0.3	\$0.81
Allegheny serviceberry	9867	\$74	-314	-128	-\$3	9694	\$73	19119	\$143	1.7	0.5	\$0.73
OTHER STREET TREES	764679	\$5,735	-52842	-4476	-\$430	587088	\$4,403	1294450	\$9,708	31.0	30.3	\$2.69
CAMPUS TOTAL	2373519	\$17,801	-144047	-15122	-\$1,194	2060632	\$15,455	4274982	\$32,062	100.0	100.0	\$2.75



Table 9. Annual Air Quality Benefits of OSU Columbus Campus Trees by Species' Common Names and Ordered by Decreasing Total Benefits per Tree

Species	Deposition O3 (lb)	Deposition NO2 (lb)	Deposition PM10 (lb)	Deposition SO2 (lb)	Total Deposition (\$)	Avoided NO2 (lb)	Avoided PM10 (lb)	Avoided VOC (lb)	Avoided SO2 (lb)	Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total (\$)	% of Total Tree Number	Avg. \$/tree
American sycamore	67.9	11.6	32.8	3.0	\$365	187.8	27.1	25.8	175.5	\$1,163	-56.8	-\$213	475	\$1,314	1.1	\$10.51
Northern hackberry	45.7	7.9	24.9	2.1	\$254	216.0	31.3	29.8	203.4	\$1,341	0.0	\$0	561	\$1,595	1.8	\$7.52
London planetree	42.0	7.1	23.3	1.9	\$234	256.2	37.3	35.5	243.0	\$1,596	-40.1	-\$150	606	\$1,679	2.5	\$5.87
Honeylocust	155.3	25.6	75.8	7.1	\$834	612.0	89.4	85.3	584.8	\$3,823	-107.0	-\$401	1,528	\$4,255	6.7	\$5.46
Red maple	28.0	4.8	14.2	1.2	\$152	116.5	17.0	16.3	111.6	\$728	-10.5	-\$39	299	\$841	1.7	\$4.27
Littleleaf linden	31.3	5.4	16.7	1.4	\$173	142.0	20.6	19.6	133.8	\$882	-16.4	-\$62	354	\$993	2.0	\$4.17
Sugar maple	50.3	8.6	30.0	2.2	\$286	355.9	52.2	49.9	343.3	\$2,231	-43.5	-\$163	849	\$2,355	4.9	\$4.11
Flowering crabapple	53.0	8.7	25.4	2.4	\$283	211.8	30.4	28.9	195.5	\$1,305	-0.3	-\$1	556	\$1,587	3.5	\$3.89
Pin oak	35.2	6.2	18.7	1.6	\$194	107.1	15.6	14.9	102.1	\$668	-67.4	-\$253	234	\$610	1.5	\$3.61
Green ash	35.9	5.7	20.7	1.6	\$201	265.8	38.7	36.9	252.7	\$1,657	0.0	\$0	658	\$1,858	4.6	\$3.45
Northern red oak	155.2	26.8	77.6	6.9	\$842	425.9	61.9	59.0	403.3	\$2,651	-222.6	-\$835	994	\$2,658	6.7	\$3.43
Washington hawthorn	13.2	2.2	6.5	0.6	\$71	66.7	9.6	9.1	61.6	\$411	-0.1	\$0	169	\$482	1.2	\$3.35
Sweetgum	9.9	1.7	6.2	0.4	\$57	92.8	13.5	12.8	87.7	\$577	-10.6	-\$40	214	\$594	1.7	\$3.06
Ginkgo	14.4	2.5	7.4	0.6	\$79	58.8	8.6	8.2	56.5	\$368	-4.9	-\$18	152	\$429	1.3	\$2.92
White ash	16.2	2.6	8.4	0.7	\$88	72.1	10.6	10.1	69.6	\$452	0.0	\$0	190	\$540	1.7	\$2.77
Norway maple	53.9	9.3	32.3	2.4	\$308	377.6	54.4	51.7	351.0	\$2,333	-16.0	-\$60	917	\$2,580	8.1	\$2.75
Austrian pine	45.3	9.0	40.6	5.6	\$308	164.5	24.1	23.0	157.6	\$1,029	-157.8	-\$592	312	\$745	3.4	\$1.88
Scotch pine	28.1	5.6	25.6	3.5	\$192	107.4	15.7	14.9	102.2	\$670	-96.6	-\$362	206	\$499	2.3	\$1.86
Eastern white pine	17.8	3.5	16.5	2.2	\$123	69.6	10.1	9.6	65.3	\$432	-61.8	-\$232	133	\$323	1.7	\$1.64
Hybrid elm	1.7	0.3	1.7	0.1	\$12	35.3	5.2	4.9	33.9	\$221	0.0	\$0	83	\$232	1.2	\$1.64
Norway spruce	28.0	5.6	25.9	3.4	\$193	111.0	16.1	15.3	104.7	\$690	-99.1	-\$372	211	\$511	2.8	\$1.59
Eastern redbud	5.7	0.9	3.3	0.3	\$32	48.1	6.8	6.5	43.6	\$294	0.0	\$0	115	\$326	2.0	\$1.42
Blue spruce	12.4	2.5	12.3	1.5	\$88	58.9	8.4	8.0	54.2	\$362	-42.0	-\$157	116	\$293	2.1	\$1.20
Corneliancherry dogwood	2.0	0.3	1.3	0.1	\$12	20.7	2.9	2.8	18.6	\$126	0.0	\$0	49	\$137	1.1	\$1.10
Allegheny serviceberry	2.7	0.5	1.8	0.1	\$16	29.3	4.1	3.9	26.2	\$178	0.0	\$0	69	\$194	1.7	\$0.98
OTHER STREET TREES	461.7	79.1	250.0	23.6	\$2,565	1688.5	244.6	232.9	1586.2	\$10,475	-359.2	-\$1,347	4,207	\$11,693	31.0	\$3.24
CAMPUS TOTALS	1412.9	243.7	799.6	76.5	\$7,961	5898.1	856.4	815.9	5567.9	\$36,662	-1412.8	-\$5,298	14,258	\$39,325	100.0	\$3.37



Table 10. Annual Aesthetic or Other Benefits of Trees by Species on the Columbus Campus of Ohio State

Species	Total (\$)	% of Total Tree Numbers	% of Total \$	Avg. \$/tree
American sycamore	\$9,759	1.1	3.3	\$78.08
Honeylocust	\$59,551	6.7	20.1	\$76.45
Pin oak	\$7,000	1.5	2.4	\$41.42
Littleleaf linden	\$9,759	2.0	3.3	\$41.00
Northern hackberry	\$7,674	1.8	2.6	\$36.20
London planetree	\$9,238	2.5	3.1	\$32.30
Red maple	\$6,200	1.7	2.1	\$31.47
Green ash	\$15,115	4.6	5.1	\$28.09
Sugar maple	\$14,925	4.9	5.0	\$26.05
White ash	\$4,735	1.7	1.6	\$24.28
Austrian pine	\$9,069	3.4	3.1	\$22.90
Scotch pine	\$5,886	2.3	2.0	\$21.96
Eastern white pine	\$3,968	1.7	1.3	\$20.14
Norway maple	\$18,140	8.1	6.1	\$19.32
Norway spruce	\$6,132	2.8	2.1	\$19.04
Hybrid elm	\$2,399	1.2	0.8	\$16.89
Blue spruce	\$3,965	2.1	1.3	\$16.32
Sweetgum	\$3,019	1.7	1.0	\$15.56
Northern red oak	\$9,469	6.7	3.2	\$12.20
Flowering crabapple	\$4,237	3.5	1.4	\$10.39
Washington hawthorn	\$1,136	1.2	0.4	\$7.89
Ginkgo	\$1,049	1.3	0.4	\$7.13
Eastern redbud	\$846	2.0	0.3	\$3.68
Corneliancherry dogwood	\$380	1.1	0.1	\$3.04
Allegheny serviceberry	\$538	1.7	0.2	\$2.73
OTHER STREET TREES	\$82,051	31.0	27.7	\$22.70
CAMPUSWIDE TOTAL	\$296,241	100.0	100.0	\$25.42

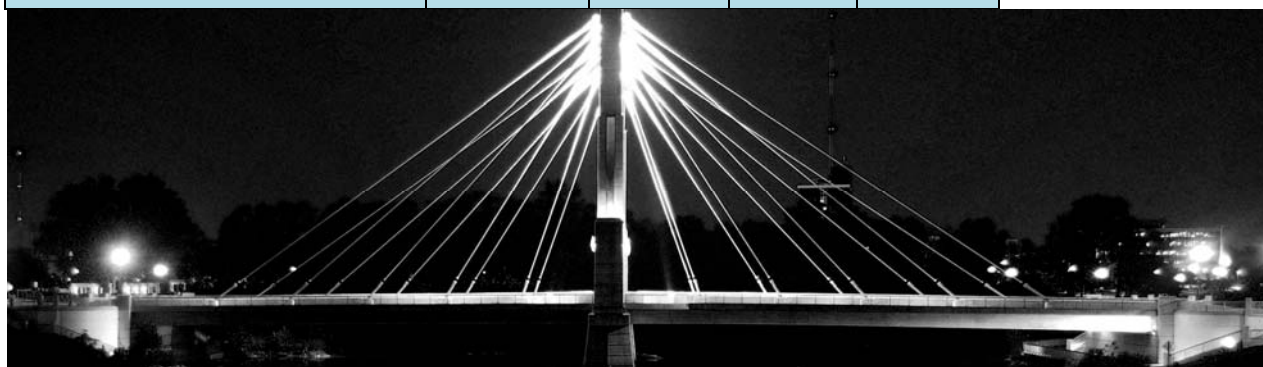
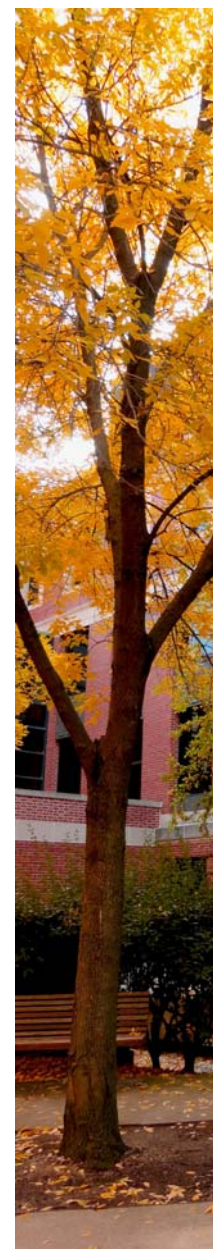


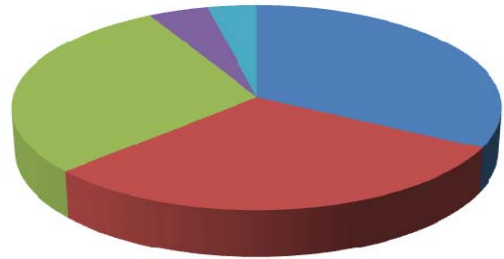
Table 11. Annual Benefits and Total Annual Benefits per Tree by Common Name on OSU Columbus Campus

Species	Energy	CO2	Air Quality	Stormwater	Aesthetic/Other	Total
American sycamore	\$67.44	\$11.70	\$10.51	\$102.56	\$78.08	\$270.29
Honeylocust	\$34.32	\$4.66	\$5.46	\$31.96	\$76.45	\$152.85
Northern hackberry	\$45.25	\$4.15	\$7.52	\$43.99	\$36.20	\$137.11
London planetree	\$39.36	\$5.06	\$5.87	\$38.13	\$32.30	\$120.72
Pin oak	\$27.79	\$5.13	\$3.61	\$34.80	\$41.42	\$112.75
Littleleaf linden	\$26.48	\$4.10	\$4.17	\$25.85	\$41.00	\$101.61
Red maple	\$25.71	\$3.08	\$4.27	\$21.21	\$31.47	\$85.74
Sugar maple	\$26.77	\$3.17	\$4.11	\$24.52	\$26.05	\$84.62
Green ash	\$21.75	\$2.98	\$3.45	\$22.34	\$28.09	\$78.62
Austrian pine	\$18.12	\$1.68	\$1.88	\$29.74	\$22.90	\$74.32
Scotch pine	\$17.62	\$1.62	\$1.86	\$27.72	\$21.96	\$70.78
Northern red oak	\$24.34	\$2.33	\$3.43	\$27.47	\$12.20	\$69.77
White ash	\$16.00	\$2.16	\$2.77	\$18.38	\$24.28	\$63.60
Eastern white pine	\$15.86	\$1.42	\$1.64	\$24.50	\$20.14	\$63.56
Norway spruce	\$15.37	\$1.37	\$1.59	\$23.72	\$19.04	\$61.09
Sweetgum	\$21.12	\$2.43	\$3.06	\$16.77	\$15.56	\$58.94
Norway maple	\$18.19	\$2.22	\$2.75	\$12.78	\$19.32	\$55.26
Flowering crabapple	\$23.80	\$2.59	\$3.89	\$11.98	\$10.39	\$52.64
Blue spruce	\$11.19	\$0.82	\$1.20	\$14.99	\$16.32	\$44.53
Washington hawthorn	\$21.23	\$2.16	\$3.35	\$9.57	\$7.89	\$44.20
Ginkgo	\$17.40	\$1.56	\$2.92	\$12.70	\$7.13	\$41.72
Hybrid elm	\$10.86	\$1.34	\$1.64	\$9.55	\$16.89	\$40.28
Eastern redbud	\$9.83	\$1.00	\$1.42	\$3.87	\$3.68	\$19.79
Corneliancherry dogwood	\$7.89	\$0.81	\$1.10	\$3.04	\$3.04	\$15.88
Allegheny serviceberry	\$7.15	\$0.73	\$0.98	\$2.74	\$2.73	\$14.34
OTHER STREET TREES	\$20.89	\$2.69	\$3.24	\$23.54	\$22.70	\$73.06



Table 12 Environmental Benefits from Five Benefit Categories for the Ohio State Columbus Campus Trees

Benefits	Total (\$)	\$/tree
Aesthetic/Other	\$296,241	\$25.42
Stormwater	\$272,086	\$23.35
Energy	\$262,017	\$22.48
Air Quality	\$39,325	\$3.37
CO2	\$32,062	\$2.75
Total Benefits	\$901,731	\$77.38



■ Aesthetic/Other
 ■ Stormwater
 ■ Air Quality

