An Analysis of Environmental Benefits for Canfield Fairground Trees

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EXECUTIVE SUMMARY

An inventory of trees on the Canfield Fairgrounds maintained by the Mahoning County Agricultural Society was undertaken by Mahoning County Extension, its Master Gardeners, and Volunteer Naturalists. This information was then analyzed by The Ohio State University's School of Environment and Natural Resources. A total of 556 trees were inventoried. A common bid price for this service is $3.00 per tree and thus the inventory represents a savings of $1668 for Mahoning County Agricultural Society over contracting for this service. Most importantly, however, is that the Canfield Fair Board now has a tree inventory that can be used to better manage the tree resource of the fairgrounds. Benefits mentioned above do not include the value of the subsequent analysis and report.

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 and is available at no charge should this be desired. This program allows individuals interested in making informed decisions about the community tree resource or to explore many aspects including biodiversity and environmental services values.

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 fairgrounds, red maple exceeds species guidelines while maples exceed both genera, and family guidelines (Table 1). One may wish to limit planting additional maples in future plantings. Ash plantings represent 20 individuals or 3.5% of the ground's trees. Limited numbers minimize the impact of EAB but larger trees (> 24-in DBH) are costly to remove especially if encumbered by proximity to buildings. Large deciduous trees that could be used to replace the ash include the Kentucky coffeetree, honeylocust, ginkgo, deciduous conifers, sycamore, tupelo, and elms which are currently available in the nursery trade. Large trees produce markedly more environmental benefits.

Under ideal conditions tree numbers among smaller size classes should be stable and then decline as tree size increases and older trees die. This is generally true for the trees on the fairgrounds (Tables 2 and 3) although some additional new plantings might be desirable. Fortunately, fairground trees that live longer and mature at larger sizes such as preferred by a resident preference survey in Toledo, OH dominate the fairgrounds.

Trees are variable in size at present with more than 50% of the trees less than 18-inch diameter. Importance values as detailed in (Table 4) show that the 75 larger silver maples have the same importance value (a measure of canopy cover) as 127 smaller red maples. This demonstrates the fairground's 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 6). Storm water runoff is a major cost for many communities. Columbus, OH is about to embark on a multi-billion dollar sewer and storm water upgrade for the community. Trees on the fairgrounds intercept more than

1.3 million gallons) of storm water annually at a savings to the fair board of 34,821 dollars per year despite the relatively small size of the property.

Carbon sequestration, as reported here, represents the carbon removed from the air and stored in the fairground's trees (Table 6). More than 4.1 million pounds or 2,060 tons of carbon have been stored by the 566 trees over time. The ground's trees currently sequester and avoid nearly 514,312 lbs of CO_2 yearly (Table 8) and would represent carbon credits worth $3,857 per year if a carbon trading system were in place and if a system for accounting for them were available for community trees. These are net gain figures and include deductions for tree losses and maintenance. Annual CO_2 benefits vary by species and size but average $6.82 per tree per year while larger silver maples average $11.90 per tree per year or twice as much.

Annual air quality savings (reduced ozone, nitrous and sulfur oxides as well as particulate matter) for the fairground trees is $4,513 (Table 9). This includes both direct savings ($1,139) from the trees and avoided pollution which is much greater at ($3,838). 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 $464 for the volatile emissions from the trees themselves.

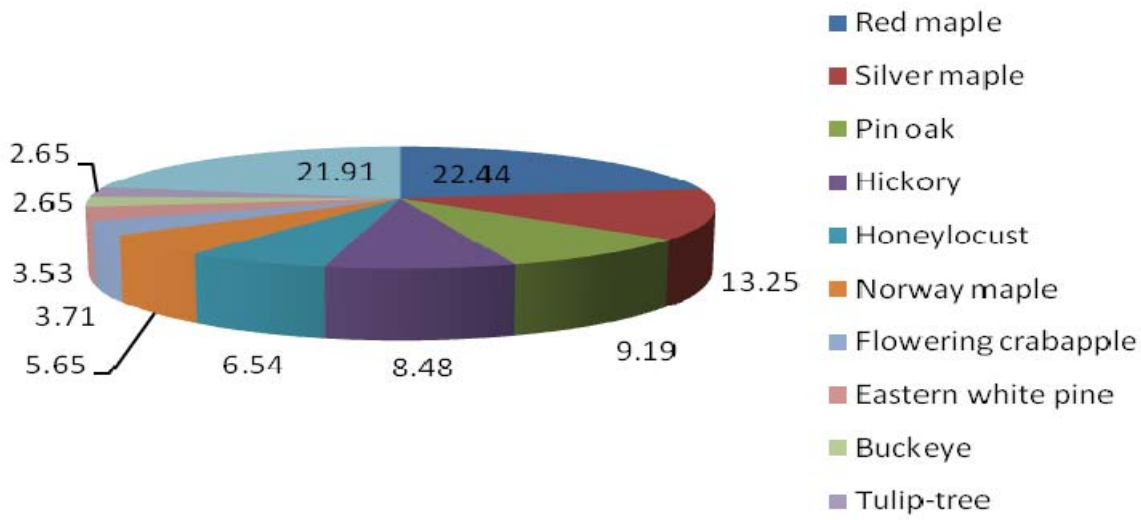
Energy savings by trees are particularly important in view of the citizenry's increasing concern over the nation's energy dependency. Planting trees in our communities may well be more cost effective than building power plants to as a conservation alternative to meeting our energy needs. Energy is saved by shading structures, evaporating water (evapotranspiration) and reducing wind speed around structures (Table 7). Canfield Fairgrounds saves $9,823 in electricity and $17,118 in natural gas for a total savings of $26,942 or an average of $47.60 per tree per year.

Aesthetic and miscellaneous benefits from trees contribute $34,233 annually to the community in the form of increased property values and enhanced community identity 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 in commercial settings with trees.

When all benefits are included the 566 fairground trees contribute an average of $60.48 per tree annually to Mahoning County Agricultural Society (Table 11). Species vary in their annual benefits but mature size, longevity, and maintenance costs are but some of the factors determining annual benefits. Thus the Canfield Fairground's 566 trees contribute $104,367 per year. This would be well in excess of their maintenance and planting costs.

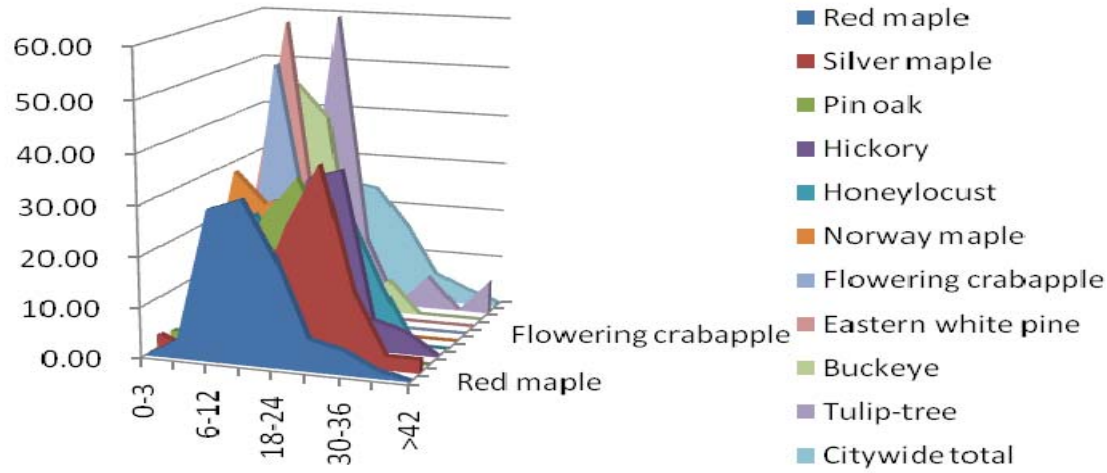
The Canfield Fairgrounds budget for maintenance of trees was estimated by fairground officials at $3,000 for 566 trees or $5 per tree per year. Thus the 566 trees on the fairgrounds require some $3000 dollars of care per year yet deliver $104,367 in annual benefits from storm water abatement, CO_2 avoidance and storage, energy savings, air quality, aesthetic benefits, and the like. This is an astounding 3,479% return on investment. This may be high but other Ohio communities studied routinely discover returns on their tree maintenance dollars of 2-300%. Further, unlike most community infrastructure, tree benefits per tree continue to increase over a tree's lifetime.

Table 1. Species Distribution of the Canfield Fairground's Common Trees Arranged from Most to Least Frequent



Species	Percent
Red maple	22.44
Silver maple	13.25
Pin oak	9.19
Hickory	8.48
Honeylocust	6.54
Norway maple	5.65
Flowering crabapple	3.71
Eastern white pine	3.53
Buckeye	2.65
Tulip-tree	2.65
Other species	21.91
Total	100.00

Table 2. Relative Age Distribution of the 10 Most Commonly Planted Tree Taxa on the Canfield Fairgrounds (%)



Species	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42
Red maple	0.0	3.9	29.9	32.3	21.3	6.3	4.7	1.6
Silver maple	2.7	0.0	1.3	10.7	26.7	38.7	14.7	2.7
Pin oak	1.9	1.9	11.5	26.9	34.6	21.2	1.9	0.0
Hickory	0.0	0.0	4.2	16.7	33.3	35.4	6.3	4.2
Honeylocust	0.0	10.8	24.3	13.5	16.2	24.3	10.8	0.0
Norway maple	3.1	31.3	25.0	28.1	9.4	3.1	0.0	0.0
Flowering crabapple	0.0	4.8	52.4	19.0	23.8	0.0	0.0	0.0
Eastern white pine	0.0	25.0	60.0	15.0	0.0	0.0	0.0	0.0
Buckeye	0.0	6.7	46.7	40.0	0.0	6.7	0.0	0.0
Tulip-tree	0.0	0.0	13.3	60.0	13.3	0.0	6.7	0.0
Fairground total	1.2	5.1	20.0	24.6	23.5	15.9	5.8	3.0

Table 3. Population of Canfield Fairground's Trees by Scientific Name and Size Class.

Species	DBH Class (in)									
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total
Broadleaf Deciduous Large (BDL)										
Acer rubrum	0	5	38	41	27	8	6	2	0	127
Acer saccharinum	2	0	1	8	20	29	11	2	2	75
Quercus palustris	1	1	6	14	18	11	1	0	0	52
Carya species	0	0	2	14	23	19	3	2	0	63
Liriodendron tulipifera	0	0	2	9	2	0	1	0	1	15
Fraxinus americana	0	0	0	1	6	2	2	1	0	12
Liquidambar styraciflua	0	0	0	3	5	2	0	0	0	10
Fagus grandifolia	0	0	0	0	2	4	2	0	0	8
Quercus rubra	1	0	0	1	3	1	1	1	0	8
Juglans regia	0	0	1	0	1	1	0	0	0	3
Quercus alba	0	0	0	0	1	0	0	1	1	3
Ulmus species	0	0	1	0	0	0	1	1	0	3
Acer saccharum	0	0	0	1	0	0	0	1	0	2
Aesculus hippocastanum	0	0	1	1	0	0	0	0	0	2
Quercus species	0	0	1	0	0	0	0	0	0	1
Quercus coccinea	0	0	0	0	0	0	0	1	0	1
Tilia species	0	0	0	0	1	0	0	0	0	1
Tilia americana	0	0	0	0	0	0	0	1	0	1
Total	**4**	**6**	**53**	**93**	**109**	**77**	**28**	**13**	**4**	**387**
Broadleaf Deciduous Medium (BDM)										
Gleditsia triacanthos	0	4	9	5	6	9	4	0	0	37
Acer platanoides	1	10	8	9	3	1	0	0	0	32
Aesculus species	0	1	7	6	0	1	0	0	0	15
Fraxinus species	0	1	1	2	0	1	1	1	1	8
Tilia cordata	0	0	0	0	2	0	0	1	0	3
Betula species	0	0	1	1	0	0	0	0	0	2
Betula nigra	0	0	0	0	0	0	0	2	0	2
Aesculus x carnea	0	0	1	0	0	0	0	0	0	1
Castenea mollissima	0	0	0	1	0	0	0	0	0	1
Nyssa sylvatica	0	0	0	0	0	1	0	0	0	1
Total	**1**	**16**	**27**	**24**	**11**	**13**	**5**	**4**	**1**	**102**

Species	DBH Class (in)									
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total
Broadleaf Deciduous Small (BDS)										
Malus hybrid	0	1	11	4	5	0	0	0	0	21
Cercis canadensis	1	0	2	0	0	0	0	0	0	3
Amelanchier x grandiflora	1	0	1	0	0	0	0	0	0	2
Pyrus species	0	1	0	1	0	0	0	0	0	2
Crataegus species	0	0	1	0	0	0	0	0	0	1
Total	**2**	**2**	**15**	**5**	**5**	**0**	**0**	**0**	**0**	**29**
Conifer Evergreen Large (CEL)										
Pinus strobus	0	5	12	3	0	0	0	0	0	20
Pinus nigra	0	0	4	5	6	0	0	0	0	15
Pinus sylvestris	0	0	0	4	1	0	0	0	0	5
Picea species	0	0	1	3	0	0	0	0	0	4
Picea abies	0	0	0	1	0	0	0	0	0	1
Tsuga canadensis	0	0	1	0	0	0	0	0	0	1
Total	**0**	**5**	**18**	**16**	**7**	**0**	**0**	**0**	**0**	**46**
Conifer Evergreen Medium (CEM)										
Conifer Evergreen Medium	0	0	0	1	1	0	0	0	0	2
Total	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**2**
Fairgrounds Total	**7**	**29**	**113**	**139**	**133**	**90**	**33**	**17**	**5**	**566**

Table 4. Importance Values Listed by Common Name from Greatest to Least Canopy Cover or Importance Value.

Species	Number of Trees	% of Total Trees	Leaf Area (ft2)	% of Total Leaf Area	Canopy Cover (ft2)	% Total Canopy Cover	Importance Value
Red maple	127	22.4	323,209	15.7	119,604	19.3	19.15
Silver maple	75	13.3	443,951	21.6	127,595	20.6	18.48
Hickory	48	8.5	255,483	12.4	68,216	11.0	10.64
Pin oak	52	9.2	174,825	8.5	61,440	9.9	9.20
Honeylocust	37	6.5	194,100	9.4	48,644	7.9	7.94
White ash	12	2.1	86,396	4.2	27,040	4.4	3.56
Norway maple	32	5.7	39,584	1.9	17,227	2.8	3.45
Tulip tree	15	2.7	54,837	2.7	15,548	2.5	2.61
Shagbark hickory	12	2.1	44,255	2.2	13,738	2.2	2.16
Flowering crabapple	21	3.7	14,196	0.7	11,148	1.8	2.07
Austrian pine	15	2.7	48,316	2.3	6,840	1.1	2.03
Sweetgum	10	1.8	40,072	1.9	12,127	2.0	1.89
American beech	8	1.4	46,958	2.3	11,651	1.9	1.86
Buckeye	15	2.7	21,425	1.0	9,479	1.5	1.74
Eastern white pine	20	3.5	16,233	0.8	4,617	0.7	1.69
Ash	8	1.4	28,952	1.4	8,607	1.4	1.40
Northern red oak	8	1.4	26,621	1.3	7,448	1.2	1.30
Other trees	51	9.0	198,189	9.6	48,314	7.8	8.81
Total	**566**	**100.0**	**2,057,603**	**100.0**	**619,282**	**100.0**	**100.00**

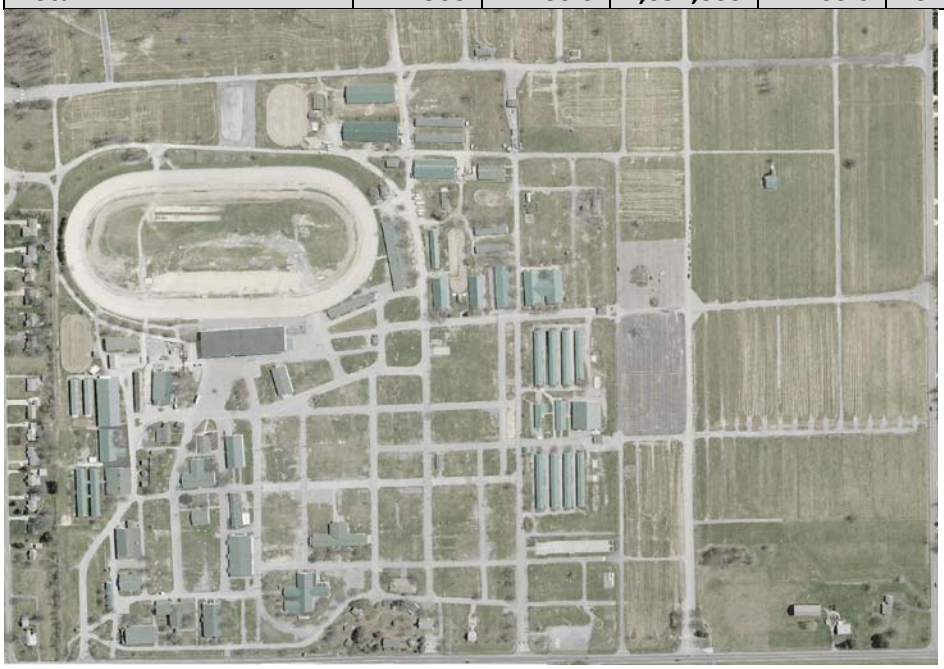


Table 5. Annual Storm Water Benefits of Canfield Fairground by Species Ordered by Decreasing Benefits/Tree

Species	Total Rainfall Interception (Gal)	Total ($)	% of Total Tree Numbers	% of Total $	Avg. $/tree
White ash	55256.3	$1,497.55	2.1	4.3	$124.80
Silver maple	299069.1	$8,105.33	13.3	23.3	$108.07
American beech	26620.4	$721.46	1.4	2.1	$90.18
Hickory	152360.2	$4,129.25	8.5	11.9	$86.03
Sweetgum	25234.2	$683.90	1.8	2.0	$68.39
Honeylocust	92479.2	$2,506.36	6.5	7.2	$67.74
Shegbark hickory	28165.1	$763.33	2.1	2.2	$63.61
Ash	18623.0	$504.72	1.4	1.5	$63.09
Tulip tree	32314.2	$875.78	2.7	2.5	$58.39
Pin oak	110513.5	$2,995.12	9.2	8.6	$57.60
Northern red oak	16418.8	$444.98	1.4	1.3	$55.62
Austrian pine	27888.4	$755.83	2.7	2.2	$50.39
Red maple	213471.6	$5,785.48	22.4	16.6	$45.55
Buckeye	16482.2	$446.70	2.7	1.3	$29.78
Norway maple	30208.9	$818.72	5.7	2.4	$25.58
Eastern white pine	12825.1	$347.58	3.5	1.0	$17.38
Flowering crabapple	11513.5	$312.04	3.7	0.9	$14.86
Other street trees	115389.0	$3,127.26	9.0	9.0	$61.32
Fairground total	**1284832.7**	**$34,821.39**	**100.0**	**100.0**	**$61.52**

Table 6. Stored CO_2 Benefits of the Canfield Fairground's Trees by Species

Species	Total stored CO_2 (lbs)	Total ($)	% of Total Tree Numbers	% of Total $	Avg. $/tree
American beech	127295.2	$954.71	1.4	3.1	$119.34
White ash	163792.9	$1,228.45	2.1	4.0	$102.37
Silver maple	1002509.3	$7,518.82	13.3	24.3	$100.25
Hickory	591250.1	$4,434.38	8.5	14.4	$92.38
Northern red oak	73978.3	$554.84	1.4	1.8	$69.35
Sweetgum	84849.4	$636.37	1.8	2.1	$63.64
Tulip tree	125873.1	$944.05	2.7	3.1	$62.94
Ash	65688.0	$492.66	1.4	1.6	$61.58
Shegbark hickory	92193.1	$691.45	2.1	2.2	$57.62
Pin oak	397180.8	$2,978.86	9.2	9.6	$57.29
Honeylocust	223707.3	$1,677.81	6.5	5.4	$45.35
Red maple	533155.6	$3,998.67	22.4	12.9	$31.49
Buckeye	43948.3	$329.61	2.7	1.1	$21.97
Flowering crabapple	56027.0	$420.20	3.7	1.4	$20.01
Norway maple	81740.3	$613.05	5.7	2.0	$19.16
Austrian pine	26934.4	$202.01	2.7	0.7	$13.47
Eastern white pine	6781.9	$50.86	3.5	0.2	$2.54
Other street trees	192014.9	$3,174.90	9.0	10.3	$62.25
Fairground total	4120224.9	$30,901.69	100.0	100.0	$54.60

Table 7. Annual Energy Benefits of Canfield Fairground Trees by Species ($/tree)

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($)	% of Total Tree Numbers	% of Total $	Avg. $/tree
White ash	4.5	$345.04	581.8	$570.16	$915.21	2.1	3.4	$76.27
American beech	2.4	$181.90	354.6	$347.48	$529.38	1.4	2.0	$66.17
Silver maple	23.3	$1,766.50	3082.0	$3,020.38	$4,786.88	13.3	17.8	$63.83
Hickory	13.9	$1,055.66	1928.7	$1,890.17	$2,945.83	8.5	10.9	$61.37
Sweetgum	2.7	$203.17	365.2	$357.94	$561.11	1.8	2.1	$56.11
Shagbark hickory	3.1	$238.73	419.2	$410.84	$649.57	2.1	2.4	$54.13
Honeylocust	9.4	$713.16	1249.7	$1,224.75	$1,937.91	6.5	7.2	$52.38
Pin oak	13.1	$994.42	1748.0	$1,713.00	$2,707.43	9.2	10.1	$52.07
Ash	1.9	$144.11	271.7	$266.26	$410.37	1.4	1.5	$51.30
Tulip-tree	3.7	$278.78	461.4	$452.16	$730.94	2.7	2.7	$48.73
Red maple	27.1	$2,060.09	3601.4	$3,529.38	$5,589.47	22.4	20.8	$44.01
Northern red oak	1.6	$122.89	225.5	$221.01	$343.90	1.4	1.3	$42.99
Buckeye	2.5	$190.24	348.5	$341.56	$531.79	2.7	2.0	$35.45
Norway maple	4.5	$338.15	629.1	$616.47	$954.62	5.7	3.5	$29.83
Flowering crabapple	2.6	$195.06	401.7	$393.69	$588.75	3.7	2.2	$28.04
Austrian pine	1.8	$132.96	229.4	$224.86	$357.82	2.7	1.3	$23.85
Eastern white pine	1.2	$89.21	177.7	$174.17	$263.38	3.5	1.0	$13.17
Other fairground trees	10.2	$773.85	1391.6	$1,363.82	$2,137.67	9.0	7.9	$41.92
Fairgrounds total	**129.4**	**$9,823.93**	**17467.4**	**$17,118.10**	**$26,942.02**	**100.0**	**100.0**	**$47.60**

Table 8. Annual Carbon Dioxide Benefits of Canfield Fairground Trees by Species

Species	Sequester (lb)	Sequester ($)	Decomp Release (lb)	Maint Release (lb)	Total Release ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	% Total Tree Numbers	% Total $	Avg. $/tree
Silver maple	85031.1	$637.73	-4812.2	-241.8	-$37.90	39039.3	$292.79	119016.4	$892.62	13.3	23.14	$11.90
White ash	12038.7	$90.29	-786.2	-39.0	-$6.19	7625.3	$57.19	18838.8	$141.29	2.1	3.66	$11.77
American beech	7622.0	$57.16	-611.0	-28.1	-$4.79	4020.0	$30.15	11002.9	$82.52	1.4	2.14	$10.32
Pin oak	42109.4	$315.82	-1906.5	-127.1	-$15.25	21976.5	$164.82	62052.3	$465.39	9.2	12.07	$8.95
Hickory	33805.2	$253.54	-2838.0	-144.3	-$22.37	23329.7	$174.97	54152.7	$406.14	8.5	10.53	$8.46
Sweetgum	6348.2	$47.61	-407.3	-26.5	-$3.25	4490.0	$33.68	10404.5	$78.03	1.8	2.02	$7.80
Honeylocust	23353.3	$175.15	-1076.1	-74.5	-$8.63	15760.6	$118.20	37963.4	$284.73	6.5	7.38	$7.70
Shagbark hickory	7238.9	$54.29	-442.5	-30.4	-$3.55	5275.8	$39.57	12041.7	$90.31	2.1	2.34	$7.53
Tulip-tree	7392.9	$55.45	-604.2	-35.1	-$4.79	6161.1	$46.21	12914.6	$96.86	2.7	2.51	$6.46
Red maple	51215.3	$384.11	-2559.1	-244.7	-$21.03	45527.5	$341.46	93939.0	$704.54	22.4	18.26	$5.55
Buckeye	4349.0	$32.62	-211.7	-24.0	-$1.77	4204.2	$31.53	8317.5	$62.38	2.7	1.62	$4.16
Ash	1461.5	$10.96	-316.0	-22.0	-$2.54	3184.7	$23.89	4308.2	$32.31	1.4	0.84	$4.04
Northern red oak	1801.9	$13.51	-355.1	-20.9	-$2.82	2715.9	$20.37	4141.8	$31.06	1.4	0.81	$3.88
Norway maple	8006.5	$60.05	-399.4	-44.7	-$3.33	7473.0	$56.05	15035.4	$112.77	5.7	2.92	$3.52
Flowering crabapple	4753.4	$35.65	-268.9	-34.9	-$2.28	4310.7	$32.33	8760.3	$65.70	3.7	1.70	$3.13
Austrian pine	1912.5	$14.34	-129.3	-30.8	-$1.20	2938.4	$22.04	4690.8	$35.18	2.7	0.91	$2.35
Eastern white pine	1068.1	$8.01	-32.6	-22.8	-$0.42	1971.4	$14.79	2984.2	$22.38	3.5	0.58	$1.12
Other fairground trees	18801.4	$141.01	-2032.0	-123.8	-$16.17	17102.0	$128.26	33747.5	$253.11	9.0	6.56	$4.96
Fairgrounds total	**318309.2**	**$2,387.32**	**-19788.1**	**-1315.5**	**-$158.28**	**217106.2**	**$1,628.30**	**514311.8**	**$3,857.34**	**100.0**	**100.00**	**$6.82**

Table 9. Annual Air Quality Benefits of Canfield Fairground Trees by Species Ordered by Decreasing Benefits per Tree

Species	Deposit O3 (lb)	Deposit NO2 (lb)	Deposit PM10 (lb)	Deposit SO2 (lb)	Total Deposit ($)	Avoided NO2 (lb)	Avoided PM10 (lb)	Avoided VOC (lb)	Avoided SO2 (lb)	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($)	% Total Tree Number	Avg. $/tree
White ash	9.9	1.6	4.5	0.4	$52.29	21.3	3.1	3.0	20.6	$133.66	0.0	$0.00	64.5	$185.95	2.1	$15.50
Silver maple	47.1	8.0	23.6	2.1	$255.34	109.9	16.1	15.3	105.3	$687.23	-24.9	-$93.25	302.6	$849.32	13.3	$11.32
Hickory	18.3	2.9	8.8	0.8	$97.57	66.6	9.7	9.2	63.0	$414.53	0.0	$0.00	179.4	$512.10	8.5	$10.67
American beech	3.5	0.6	1.7	0.2	$19.05	11.7	1.7	1.6	10.9	$72.27	-3.0	-$11.35	28.9	$79.98	1.4	$10.00
Sweetgum	2.6	0.4	1.4	0.1	$14.33	12.8	1.9	1.8	12.1	$79.59	0.0	$0.00	33.1	$93.92	1.8	$9.39
Ash	4.0	0.7	1.9	0.2	$21.33	9.2	1.3	1.3	8.6	$56.95	-0.9	-$3.44	26.2	$74.84	1.4	$9.36
Shagbark hickory	2.9	0.5	1.5	0.1	$15.57	14.9	2.2	2.1	14.3	$93.19	0.0	$0.00	38.4	$108.76	2.1	$9.06
Honeylocust	17.4	2.9	8.1	0.8	$92.41	44.4	6.5	6.2	42.5	$277.77	-13.3	-$49.87	115.6	$320.32	6.5	$8.66
Tulip-tree	3.7	0.6	1.9	0.2	$20.14	17.2	2.5	2.4	16.7	$107.88	0.0	$0.00	45.1	$128.02	2.7	$8.53
Red maple	48.4	8.3	22.9	2.1	$258.74	128.4	18.8	17.9	123.0	$802.76	-16.7	-$62.47	353.1	$999.04	22.4	$7.87
Pin oak	16.1	2.8	8.8	0.7	$89.59	62.1	9.1	8.7	59.4	$387.85	-31.5	-$118.16	136.1	$359.28	9.2	$6.91
Northern red oak	3.5	0.6	1.7	0.2	$18.75	7.8	1.1	1.1	7.3	$48.24	-4.9	-$18.55	18.3	$48.44	1.4	$6.06
Buckeye	2.6	0.4	1.4	0.1	$14.25	12.0	1.7	1.7	11.4	$74.87	-0.7	-$2.54	30.7	$86.58	2.7	$5.77
Norway maple	4.8	0.8	2.6	0.2	$26.61	21.5	3.1	3.0	20.2	$133.40	-1.3	-$4.70	55.0	$155.31	5.7	$4.85
Flowering crabapple	3.5	0.6	1.7	0.2	$18.67	12.7	1.8	1.7	11.6	$78.07	0.0	-$0.07	33.8	$96.67	3.7	$4.60
Austrian pine	3.1	0.6	2.6	0.4	$20.73	8.2	1.2	1.2	7.9	$51.66	-11.7	-$43.71	13.6	$28.68	2.7	$1.91
Eastern white pine	1.2	0.2	1.2	0.1	$8.19	5.8	0.8	0.8	5.3	$35.47	-3.9	-$14.69	11.5	$28.98	3.5	$1.45
Other fairground trees	17.2	3.0	9.2	0.9	$95.51	48.6	7.1	6.8	46.2	$303.09	-11.0	-$41.07	128.1	$357.53	9.0	$7.01
Fairgrounds total	**209.9**	**35.5**	**105.4**	**9.9**	**$1,139.08**	**615.2**	**89.8**	**85.6**	**586.4**	**$3,838.48**	**-123.7**	**-$463.86**	**1613.8**	**$4,513.70**	**100.0**	**$7.97**

Table 10. Annual Aesthetic or Other Benefits of Canfield Fairground Trees by Species

Species	Total ($)	% of Total Tree Numbers	% of Total $	Avg. $/tree
Honeylocust	$5,495.11	6.5	16.1	$148.52
White ash	$1,293.77	2.1	3.8	$107.81
Silver maple	$7,047.32	13.3	20.6	$93.96
Pin oak	$3,746.28	9.2	10.9	$72.04
American beech	$562.23	1.4	1.6	$70.28
Hickory	$2,778.49	8.5	8.1	$57.89
Sweetgum	$557.19	1.8	1.6	$55.72
Shagbark hickory	$648.90	2.1	1.9	$54.07
Red maple	$6,816.72	22.4	19.9	$53.67
Tulip-tree	$694.75	2.7	2.0	$46.32
Austrian pine	$505.76	2.7	1.5	$33.72
Buckeye	$462.85	2.7	1.4	$30.86
Norway maple	$854.42	5.7	2.5	$26.70
Ash	$148.89	1.4	0.4	$18.61
Northern red oak	$131.87	1.4	0.4	$16.48
Eastern white pine	$316.18	3.5	0.9	$15.81
Flowering crabapple	$278.41	3.7	0.8	$13.26
Other fairground trees	$1,893.75	9.0	5.5	$37.13
Fairgrounds total	**$34,232.88**	**100.0**	**100.0**	**$60.48**

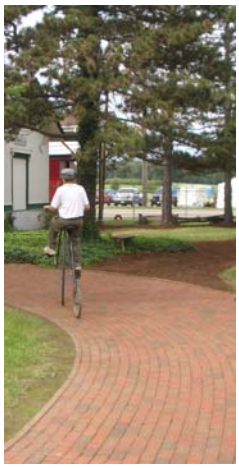


Table 11 Percentage Environmental Benefits from Five Benefit Categories for Canfield Fairground Trees

Benefits	Total ($)	$/tree
Stormwater	$34,821	$61.52
Aesthetic/Other	$34,233	$60.48
Energy	$26,942	$47.60
Air Quality	$4,514	$7.98
CO_2	$3,857	$6.81
Total Benefits	**$104,367**	**$184.39**