Idaho Horticulture Expo 2007

Urban Forest Research in the Temperate Interior West

Kelaine Vargas, Urban Ecologist
Center for Urban Forest Research, US Forest Service

Center for Urban Forest Research

USDA Forest Service

PSW Research Station

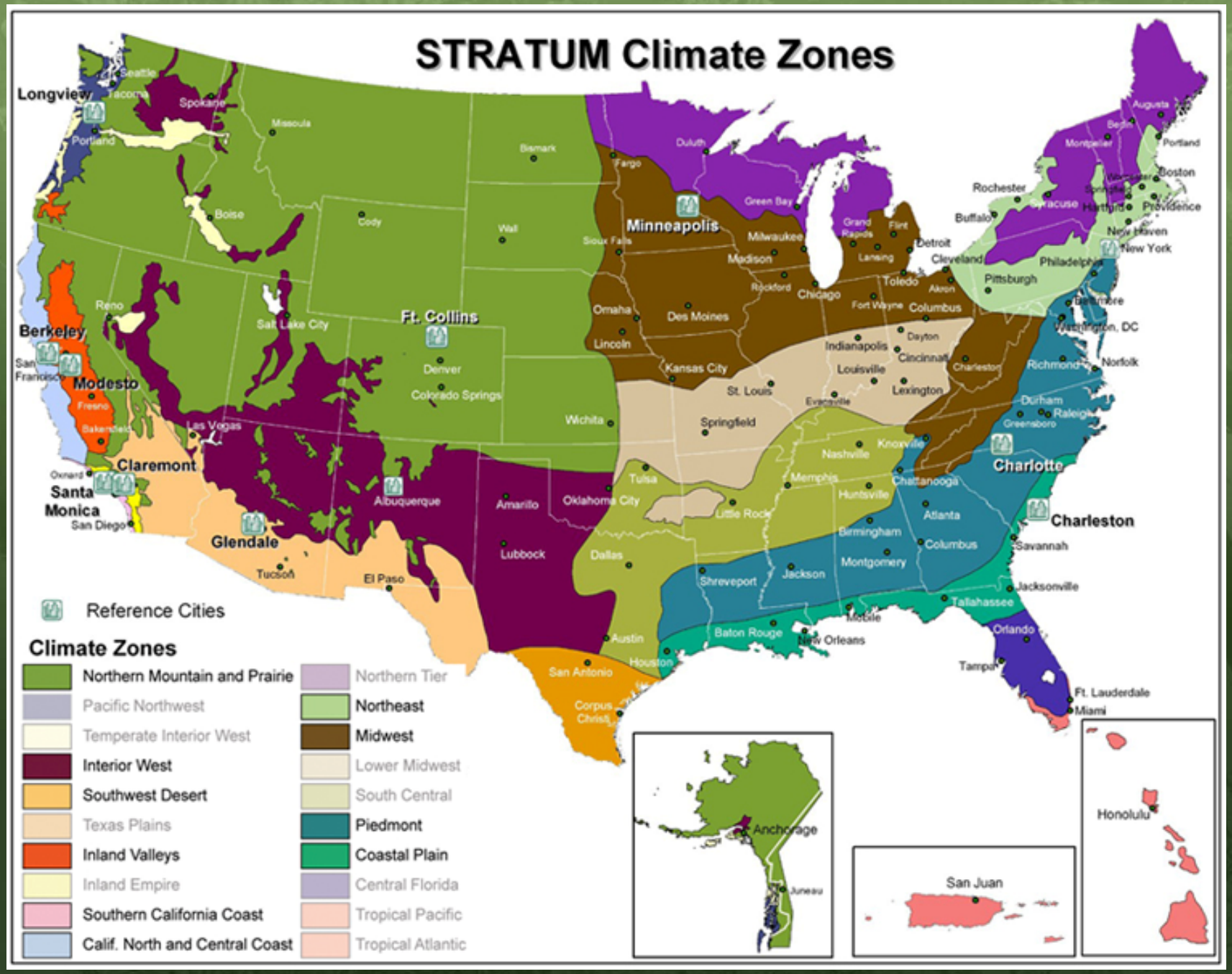
Davis, CA

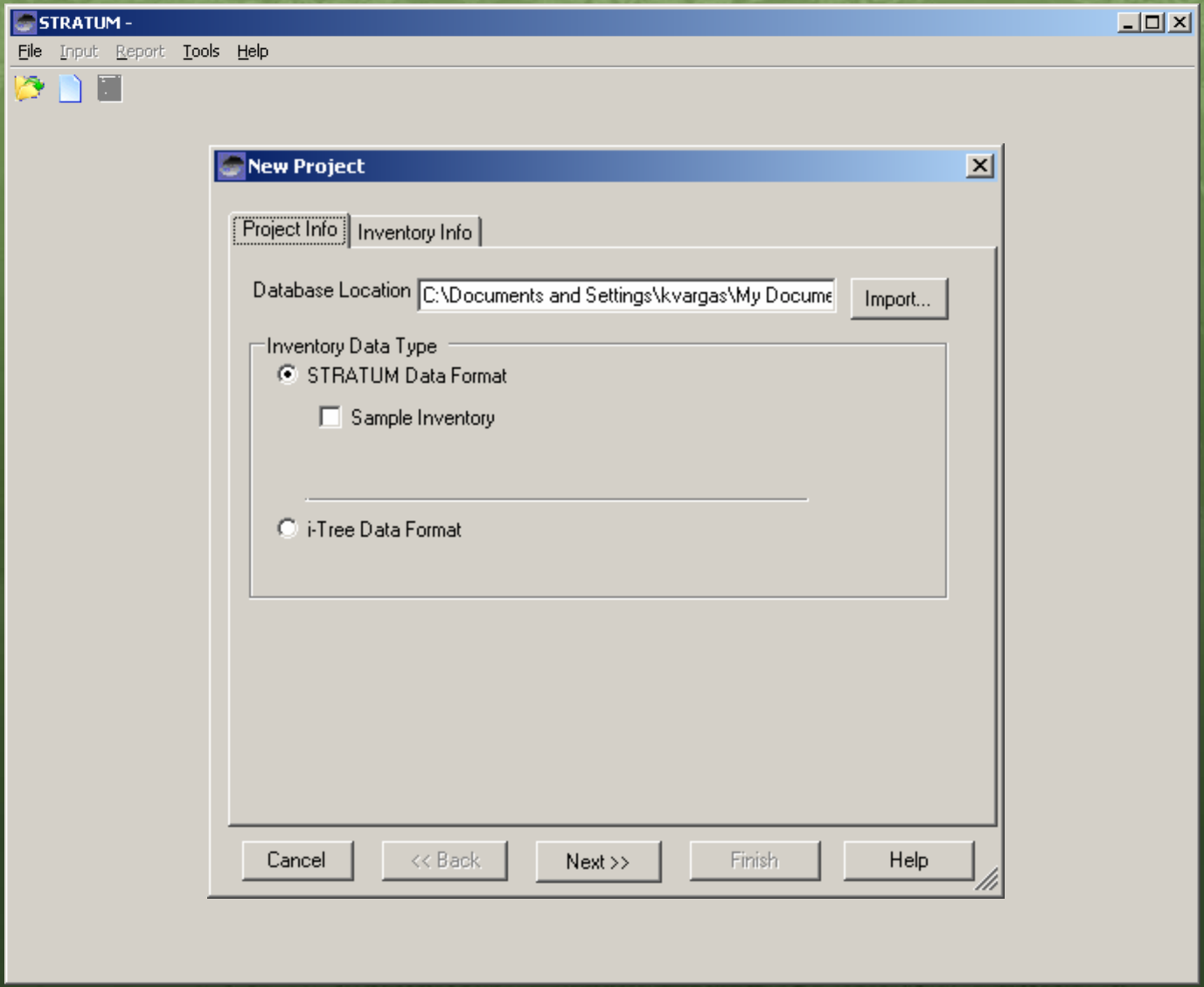
STRATUM v 3.1

Street Tree Resource Analysis Tool for Urban Forest Managers

Center for Urban Forest Research
Pacific Southwest Research Station, USDA Forest Service

Benefit-Based Approach


STRATUM Climate Zones
Longview
Seattle
Tacoma
Spokane
Portland
Missoula
Bismark
Boise
Cody
Wall
Fargo
Duluth
Minneapolis
Sioux Falls
Green Bay
Milwaukee
Madison
Grand Rapids
Flint
Detroit
Lansing
Cleveland
Toledo
Akron
Rockford
Chicago
Fort Wayne
Columbus
Pittsburgh
Rochester
Buffalo
Syracuse
Augusta
Portland
Boston
Providence
New Haven
New York
Philadelphia
Baltimore
Washington, DC
Norfolk
Richmond
Charleston
Durham
Raleigh
Greensboro
Charlotte
Knoxville
Nashville
Chattanooga
Atlanta
Columbus
Savannah
Jacksonville
Tallahassee
Orlando
Tampa
Ft. Lauderdale
Miami
Reno
Salt Lake City
Ft. Collins
Denver
Colorado Springs
Berkeley
San Francisco
Modesto
Fresno
Bakersfield
Las Vegas
Claremont
Oxnard
Santa Monica
San Diego
Glendale
Tucson
El Paso
Albuquerque
Amarillo
Lubbock
Wichita
Omaha
Lincoln
Des Moines
Kansas City
St. Louis
Springfield
Indianapolis
Dayton
Cincinnati
Louisville
Lexington
Evansville
Tulsa
Oklahoma City
Little Rock
Memphis
Huntsville
Birmingham
Montgomery
Dallas
Shreveport
Jackson
Mobile
Baton Rouge
New Orleans
Austin
Houston
San Antonio
Corpus Christi
Reference Cities
Climate Zones
Northern Mountain and Prairie
Pacific Northwest
Temperate Interior West
Interior West
Southwest Desert
Texas Plains
Inland Valleys
Inland Empire
Southern California Coast
Calif. North and Central Coast
Northern Tier
Northeast
Midwest
Lower Midwest
South Central
Piedmont
Coastal Plain
Central Florida
Tropical Pacific
Tropical Atlantic
Anchorage
Juneau
San Juan
Honolulu


STRATUM -
File Input Report Tools Help
New Project
Project Info
Inventory Info
Database Location
C:\Documents and Settings\kvargas\My Docume
Import...
Inventory Data Type
STRATUM Data Format
Sample Inventory
i-Tree Data Format
Cancel
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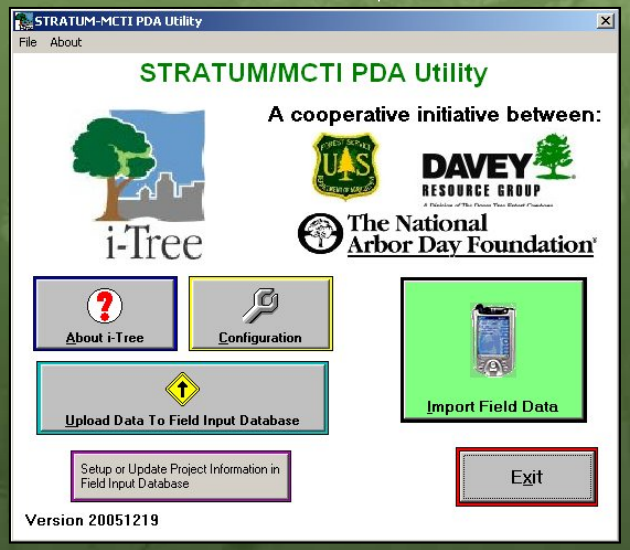
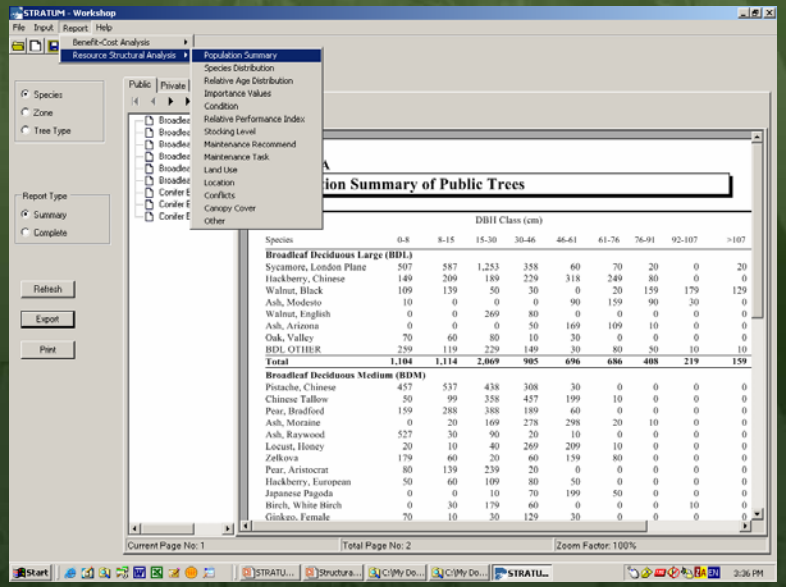
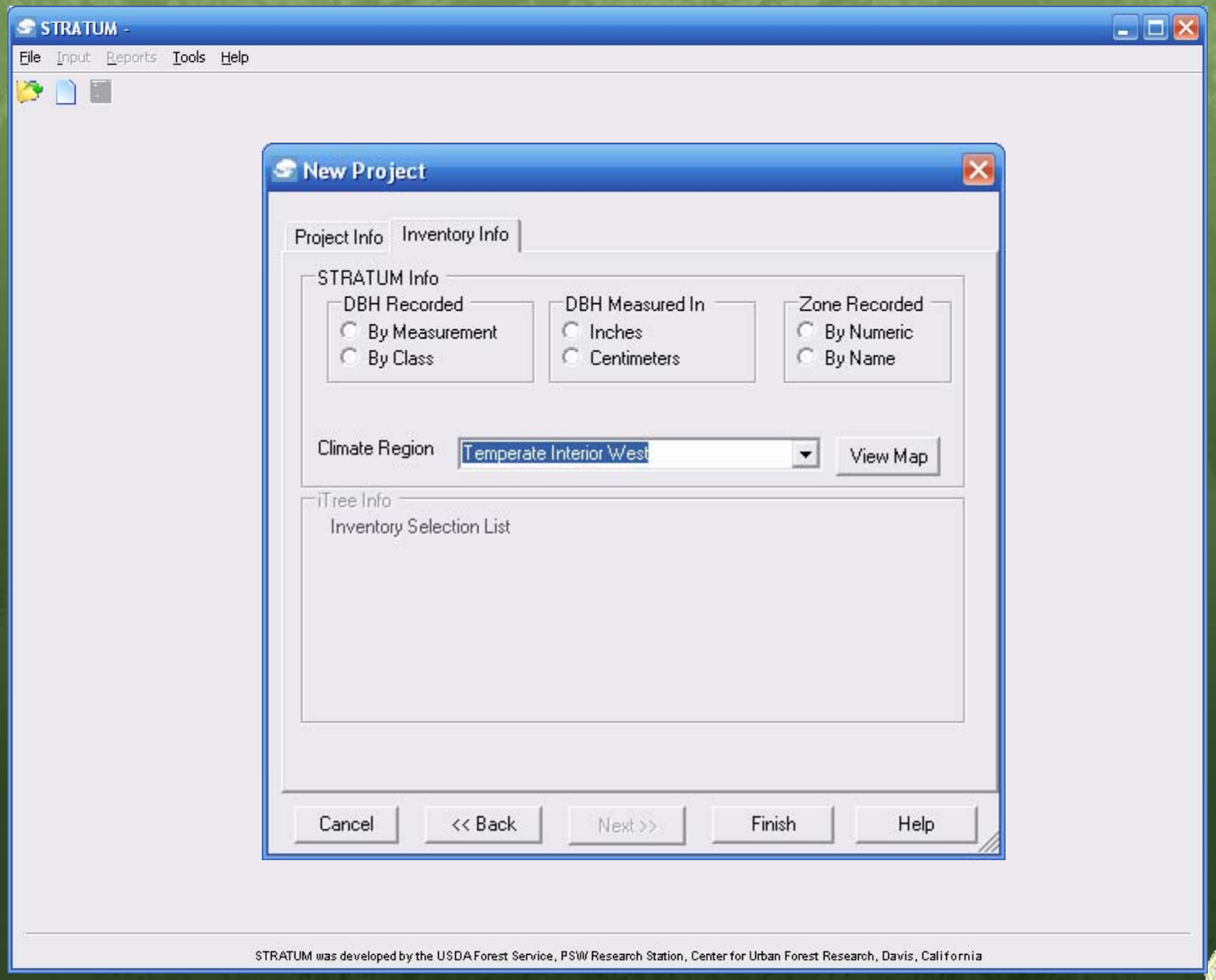
PDA to Desktop Data Transfer

STRATUM






STRATUM -
File Input Reports Tools Help
New Project
Project Info
Inventory Info
STRATUM Info
DBH Recorded
By Measurement
By Class
DBH Measured In
Inches
Centimeters
Zone Recorded
By Numeric
By Name
Climate Region
Temperate Interior West
View Map
iTree Info
Inventory Selection List
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STRATUM - BOI STRATUM

File | Input | Reports | Tools | Help

- Define City & Costs
  - Define City
  - Define Cost
  - Define Benefit Prices
- Define Species
- Define Inventory

Define City

City Name: Boise

verage Sidewalk idth (ft): 5

otal Linear Miles Street (mile): 800

ancel | Help

Define Cost

Public | Private | All

Annual Planting ($)	40,920	Annual Price of Repair/mitigation of Infrastructure Damage ($)	87,780
Annual Pruning ($)	132,000	Annual Price of Litter/Storm Clean-Up ($)	33,000
Annual Tree And Stump Removal And Disposal ($)	149,820	Average annual Litigation And Settlements due to Tree-Related Claims ($)	825
		Annual Expenditure for	144,540

Benefit Prices

Electricity ($/Kwh)	0.060936	SO2 ($/lb)	0.06
Natural Gas ($/Therm)	1.14245	VOC ($/lb)	0.14
CO2 ($/lb)	0.00334	Stormwater Interception ($/gallon)	0.005
PM10 ($/lb)	0.92	Average Home Resales Value ($)	151,000
NO2 ($/lb)	0.51		

Ok | Cancel | Help

Benefit Prices

Electricity ($/Kwh)	0.1323	SO2 ($/lb)	3.67
Natural Gas ($/Thermal)	1.3048	VOC ($/lb)	7.22
CO2 ($/lb)	0.0075	Stormwater Interception ($/gallon)	0.004
PM10 ($/lb)	11.7901	Average Home Resales Value ($)	525,000
NO2 ($/lb)	10.3101		

Ok | Cancel | Help

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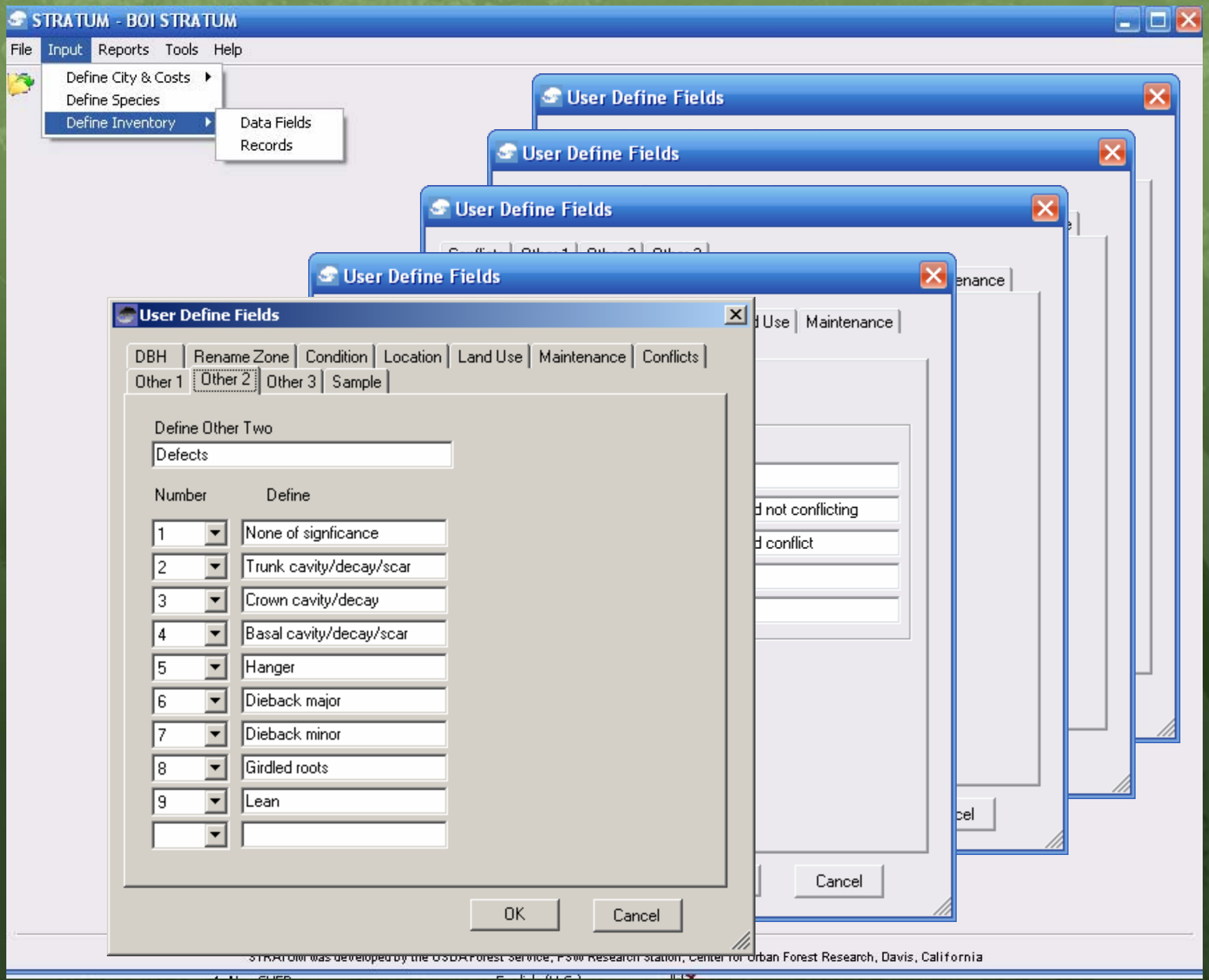
STRATUM - BOI STRATUM
File
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Define City & Costs
Define Species
Define Inventory
Data Fields
Records
User Define Fields
DBH
Rename Zone
Condition
Location
Land Use
Maintenance
Conflicts
Other 1
Other 2
Other 3
Sample
Define Other Two
Defects
Number
Define
1
None of signficance
2
Trunk cavity/decay/scar
3
Crown cavity/decay
4
Basal cavity/decay/scar
5
Hanger
6
Dieback major
7
Dieback minor
8
Girdled roots
9
Lean
OK
Cancel
Cancel
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Structure

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MainReport

Boise

Importance Values for Most Abundant Public Trees

1/16/2007

Species	Number of Trees	% of Total Trees	Leaf Area (ft^2)	% of Total Leaf Area	Canopy Cover (ft^2)	% of Total Canopy Cover	Importance Value
Norway maple	2,430	10.4	3,427,328	6.1	1,110,360	7.3	8.0
Silver maple	1,926	8.3	13,300,478	23.8	3,602,907	23.8	18.6
Honeylocust	1,607	6.9	2,382,679	4.3	903,552	6.0	5.7
Green ash	1,046	4.5	1,438,364	2.6	437,499	2.9	3.3
Crabapple	944	4.1	335,031	0.6	147,613	1.0	1.9
White ash	875	3.8	468,885	0.8	150,796	1.0	1.9
Maple	770	3.3	1,201,394	2.1	369,241	2.4	2.6
Callery pear	745	3.2	290,363	0.5	82,894	0.5	1.4
American sycamore	713	3.1	5,668,569	10.1	1,438,316	9.5	7.6
American basswood	672	2.9	991,999	1.8	286,878	1.9	2.2
Ash	621	2.7	1,781,251	3.2	539,219	3.6	3.1
Sweetgum	616	2.6	544,285	1.0	137,392	0.9	1.5
Black locust	601	2.6	1,224,755	2.2	356,163	2.4	2.4
Elm	500	2.1	3,221,936	5.8	579,637	3.8	3.9
Scotch pine	467	2.0	165,596	0.3	44,537	0.3	0.9
Northern red oak	465	2.0	1,410,519	2.5	395,024	2.6	2.4
Blue spruce	451	1.9	509,810	0.9	106,098	0.7	1.2
Black walnut	412	1.8	1,430,379	2.6	463,421	3.1	2.5
Hawthorn	390	1.7	256,311	0.5	114,678	0.8	1.0
Austrian pine	361	1.6	328,771	0.6	82,594	0.5	0.9
Sugar maple	352	1.5	350,606	0.6	80,020	0.5	0.9
Northern catalpa	345	1.5	880,510	1.6	229,941	1.5	1.5
London planetree	343	1.5	713,931	1.3	205,402	1.4	1.4
Siberian elm	307	1.3	1,634,050	2.9	295,987	2.0	2.1
English elm	303	1.3	2,947,684	5.3	530,133	3.5	3.4
Littleleaf linden	295	1.3	78,716	0.1	23,817	0.2	0.5
Plum	290	1.2	148,401	0.3	65,711	0.4	0.6
Cottonwood	272	1.2	1,122,196	2.0	308,663	2.0	1.7
Other trees	4,143	17.8	7,642,695	13.7	2,053,084	13.6	15.0
Total	23,262	100.0	55,897,468	100.0	15,141,576	100.0	100.0

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MainReport

Boise

Species Distribution for the Five Most Abundant Species of Public Trees

1/16/2007

Zone	1st (%)	2nd (%)	3rd (%)	4th (%)	5th (%)
0	Honeylocust (10.2)	Norway maple (9.7)	Green ash (6.6)	Crabapple (5.6)	Silver maple (4.9)
1	Norway maple (10.7)	Silver maple (9.3)	Honeylocust (6.8)	Maple (6.3)	Green ash (5.2)
2	Silver maple (11)	Norway maple (10.9)	Honeylocust (4.3)	Maple (3.9)	Elm (3.8)
3	Green ash (7.1)	Silver maple (6.7)	Norway maple (6.4)	Ash (5.9)	White ash (4.3)
4	Norway maple (18.8)	Honeylocust (10.9)	White ash (6.3)	Green ash (6.3)	Silver maple (5.2)
5	Norway maple (9.3)	Honeylocust (8.4)	Silver maple (7.4)	Maple (5)	White ash (4.8)
6	Silver maple (13.6)	Black locust (9.7)	Siberian elm (6)	Green ash (5.2)	Crabapple (4.9)
7	Scotch pine (13.7)	Crabapple (7.4)	Honeylocust (6.8)	Silver maple (6.6)	Austrian pine (6.3)
Citywide total	Norway maple (10.4)	Silver maple (8.3)	Honeylocust (6.9)	Green ash (4.5)	Crabapple (4.1)

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Species

Zone

Zone

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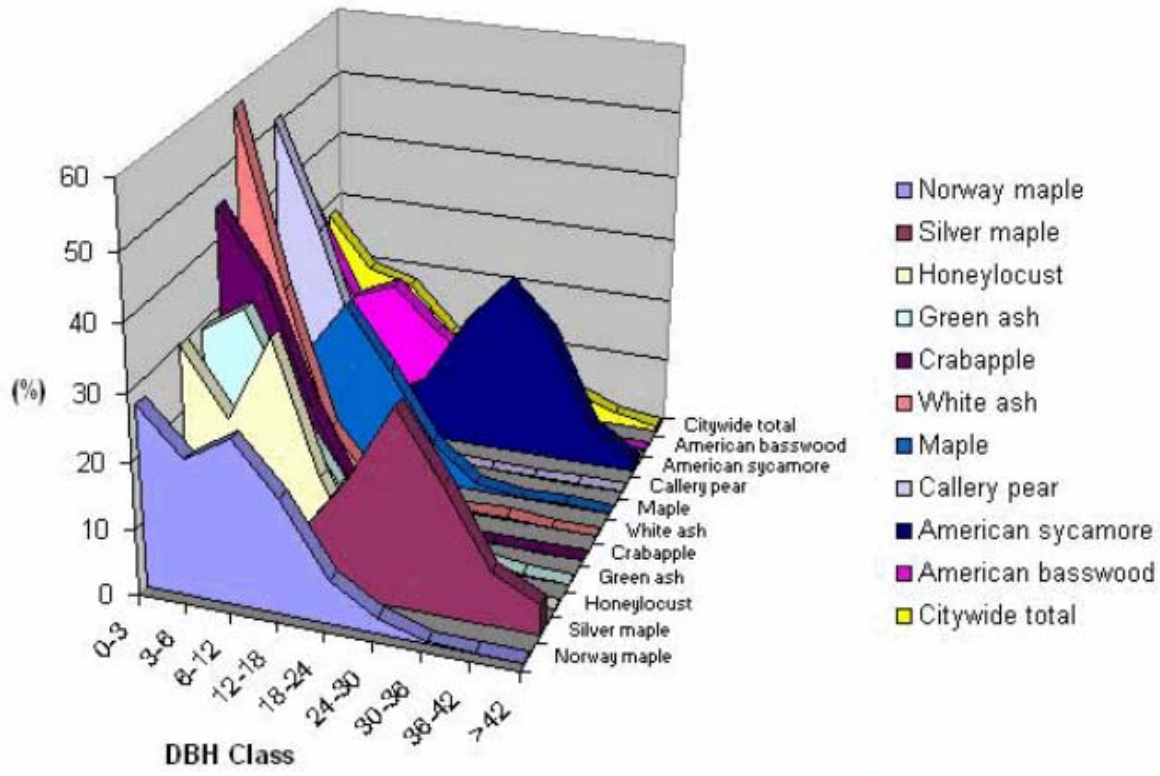
MainReport

Relative Age Distribution of Top 10 Public Tree Species (%)

1/16/2007



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Species
Zone

Condition Type
Structural (woody)

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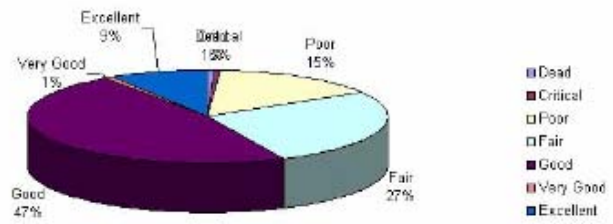
MainReport

Boise

Structural (Woody) Condition of Public Trees by Species (%)

1/16/2007

Citywide total



Species	Dead	Critical	Poor	Fair	Good	Very Good	Excellent
Norway maple	0.6	0.7	9.4	25.0	56.9	0.5	7.0
Silver maple	0.8	0.9	42.6	42.6	12.5	0.1	0.5
Honeylocust	0.3	0.2	4.5	20.5	60.8	1.3	12.4
Green ash	0.6	0.5	4.4	21.8	54.7	1.0	17.0
Crabapple	0.2	0.3	5.4	23.5	50.8	1.0	18.8
White ash	0.3	0.5	2.7	17.1	52.5	2.2	24.7
Maple	1.4	0.4	7.6	21.5	48.6	0.0	20.6
Callery pear	0.5	0.3	3.2	13.5	62.4	1.6	18.4
American sycamore	0.3	0.4	21.2	45.4	23.3	0.4	8.9
American basswood	0.4	0.1	7.0	22.3	45.1	0.0	25.0
Ash	0.3	0.0	19.3	35.7	41.2	0.0	3.4
Sweetgum	0.7	0.3	3.4	18.6	66.1	0.2	10.7
Black locust	2.3	1.7	71.4	19.6	3.5	0.0	1.5
Elm	1.4	0.4	37.6	37.0	23.0	0.0	0.6
Scotch pine	0.0	0.0	0.2	17.4	82.4	0.0	0.0
Northern red oak	0.6	0.0	3.2	9.5	71.0	1.1	14.6
Blue spruce	0.4	0.0	1.8	21.1	73.8	0.0	2.9
Black walnut	2.0	1.5	28.1	46.9	21.0	0.0	0.5
Hawthorn	0.5	0.8	5.4	39.7	40.3	0.0	13.3
Austrian pine	0.0	0.0	1.9	12.7	83.9	0.0	1.4
Sugar maple	0.3	0.9	5.1	9.1	71.9	6.3	6.5

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Species

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MainReport

Boise

Relative Performance Index for Public Trees

1/16/2007

Species	Dead	Critical	Poor	Fair	Good	Very Good	Excellent	RPI	# of Trees	% of Total Population
Norway maple	0.6	0.7	9.4	25.0	56.9	0.5	7.0	1.02	2,428	10.46
Silver maple	0.8	0.9	42.6	42.6	12.5	0.1	0.5	0.75	1,919	8.26
Honeylocust	0.3	0.2	4.5	20.5	60.8	1.3	12.4	1.10	1,607	6.92
Green ash	0.6	0.5	4.4	21.8	54.7	1.0	17.0	1.12	1,045	4.50
Crabapple	0.2	0.3	5.4	23.5	50.8	1.0	18.8	1.13	942	4.06
White ash	0.3	0.5	2.7	17.1	52.5	2.2	24.7	1.19	875	3.77
Maple	1.4	0.4	7.6	21.5	48.6	0.0	20.6	1.11	768	3.31
Callery pear	0.5	0.3	3.2	13.5	62.4	1.6	18.4	1.16	743	3.20
American sycamore	0.3	0.4	21.2	45.4	23.3	0.4	8.9	0.92	711	3.06
American basswood	0.4	0.1	7.0	22.3	45.1	0.0	25.0	1.15	672	2.89
Ash	0.3	0.0	19.3	35.7	41.2	0.0	3.4	0.93	621	2.67
Sweetgum	0.7	0.3	3.4	18.6	66.1	0.2	10.7	1.10	614	2.64
Black locust	2.3	1.7	71.4	19.6	3.5	0.0	1.5	0.63	601	2.59
Elm	1.4	0.4	37.6	37.0	23.0	0.0	0.6	0.79	500	2.15
Scotch pine	0.0	0.0	0.2	17.4	82.4	0.0	0.0	1.07	466	2.01
Northern red oak	0.6	0.0	3.2	9.5	71.0	1.1	14.6	1.15	465	2.00
Blue spruce	0.4	0.0	1.8	21.1	73.8	0.0	2.9	1.06	451	1.94
Black walnut	2.0	1.5	28.1	46.9	21.0	0.0	0.5	0.80	409	1.76
Hawthorn	0.5	0.8	5.4	39.7	40.3	0.0	13.3	1.04	390	1.68
Austrian pine	0.0	0.0	1.9	12.7	83.9	0.0	1.4	1.08	361	1.55
Sugar maple	0.3	0.9	5.1	9.1	71.9	6.3	6.5	1.11	352	1.52
Northern catalpa	0.0	0.3	15.1	47.8	34.8	0.6	1.4	0.91	345	1.49
London planetree	0.0	0.0	2.6	13.1	65.3	0.9	18.1	1.17	343	1.48
Siberian elm	0.0	0.0	55.4	34.5	6.5	0.0	3.6	0.73	307	1.32
English elm	0.0	1.0	49.5	38.9	10.6	0.0	0.0	0.72	303	1.30
Littleleaf linden	0.0	0.3	3.1	25.4	62.7	5.1	3.4	1.06	295	1.27
Plum	1.4	0.7	14.8	26.2	34.8	0.0	22.1	1.07	290	1.25
Cottonwood	4.1	0.0	35.1	32.1	28.4	0.0	0.4	0.79	271	1.17
White oak	0.0	0.0	1.1	18.4	62.1	1.1	17.2	1.16	174	0.75
American elm	0.0	0.6	27.5	60.5	9.6	0.0	1.8	0.80	167	0.72
Japanese pagoda tree	0.0	0.7	9.9	19.2	55.0	0.0	15.2	1.09	151	0.65
Ginkgo	0.0	0.7	3.4	12.8	77.9	0.0	5.4	1.09	149	0.64
Basswood	0.7	1.4	9.5	19.0	63.3	2.0	4.1	1.02	147	0.63

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Species

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MainReport

Boise

Replacement Value for Public Trees by Species

1/16/2007

Species	DBH Class (in) 0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total	Standard Error	% of Total
Norway maple	89,044	249,069	1,010,245	1,950,829	1,418,823	834,526	146,852	59,605	0	5,758,993	(±0)	6.52
Silver maple	8,387	20,118	137,676	611,029	2,392,822	6,662,492	6,348,965	3,463,423	2,357,652	22,002,562	(±0)	24.90
Honeylocust	60,037	169,016	946,600	1,047,467	226,481	294,462	70,826	69,689	0	2,884,578	(±0)	3.26
Green ash	43,210	168,018	317,559	397,233	406,472	441,062	268,862	75,423	24,084	2,141,924	(±0)	2.42
Crabapple	53,576	167,725	277,953	173,914	18,067	0	0	0	0	691,235	(±0)	0.78
White ash	66,980	131,616	141,862	75,580	0	27,937	95,616	0	0	539,591	(±0)	0.61
Maple	34,208	60,635	304,255	540,269	433,814	124,116	22,289	44,050	0	1,563,636	(±0)	1.77
Callery pear	48,765	126,221	179,743	22,730	7,461	0	0	0	0	384,919	(±0)	0.44
American sycamore	9,556	10,407	46,893	226,683	990,527	2,354,429	2,592,123	1,090,125	280,837	7,601,581	(±0)	8.60
American basswood	25,731	60,479	245,752	485,897	662,020	428,405	199,650	34,845	32,075	2,174,853	(±0)	2.46
Ash	8,437	61,537	198,456	554,975	840,089	730,531	295,597	20,940	23,402	2,733,966	(±0)	3.09
Sweetgum	35,298	61,037	224,473	346,168	107,110	51,026	0	0	0	825,113	(±0)	0.93
Black locust	5,787	30,281	133,021	334,423	666,072	1,051,526	406,209	231,586	42,580	2,901,484	(±0)	3.28
Elm	9,112	25,156	82,497	55,920	213,017	765,365	1,636,198	1,457,405	402,179	4,646,850	(±0)	5.26
Scotch pine	23,650	104,123	111,696	39,664	18,788	61,861	0	0	0	359,781	(±0)	0.41
Northern red oak	21,261	34,132	94,037	242,873	598,861	596,881	301,450	26,120	0	1,915,614	(±0)	2.17
Blue spruce	7,861	82,188	144,474	456,913	251,521	145,673	20,823	0	30,086	1,139,490	(±0)	1.29
Black walnut	1,962	14,382	152,455	523,405	608,443	416,337	93,797	97,084	61,477	1,969,343	(±0)	2.23
Hawthorn	16,460	36,296	221,326	297,376	58,840	0	0	0	0	630,298	(±0)	0.71
Austrian pine	3,637	66,581	239,090	221,335	64,217	73,622	0	0	0	668,482	(±0)	0.76
Sugar maple	35,532	17,281	39,112	95,440	76,622	87,374	18,904	0	0	370,264	(±0)	0.42
Northern catalpa	1,780	20,175	78,967	315,748	612,742	1,094,941	756,575	199,965	30,086	3,110,980	(±0)	3.52
London planetree	16,333	28,246	156,598	131,454	129,354	264,027	104,359	67,476	68,126	965,972	(±0)	1.09
Siberian elm	3,743	7,820	57,590	132,469	294,997	559,408	311,233	212,475	37,608	1,617,342	(±0)	1.83
English elm	0	506	4,970	3,978	180,390	670,634	1,689,091	1,425,427	480,592	4,455,587	(±0)	5.04
Littleleaf linden	26,353	32,618	32,226	22,569	36,134	0	0	0	0	149,898	(±0)	0.17
Plum	7,302	65,506	139,531	19,487	20,947	0	0	0	0	252,773	(±0)	0.29
Cottonwood	6,882	32,253	40,285	53,705	52,477	205,188	244,860	285,801	515,505	1,436,956	(±0)	1.63
White oak	2,555	6,435	44,747	109,480	315,767	512,863	215,904	55,670	0	1,263,421	(±0)	1.43
American elm	0	0	0	31,543	114,325	689,649	902,183	650,683	230,872	2,619,255	(±0)	2.96
Japanese pagoda tree	5,109	20,155	66,419	62,729	160,020	27,639	0	0	0	342,072	(±0)	0.39
Ginkgo	7,551	6,798	74,219	138,835	28,745	0	0	0	0	256,148	(±0)	0.29
Basswood	6,122	22,889	49,249	67,375	89,044	27,639	0	0	0	262,317	(±0)	0.30
Silver linden	12,146	11,377	1,554	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tree of heaven	1,407	6,065	45,077	78,079	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bur oak	11,284	2,370	8,502	10,619	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pine	2,373	20,558	64,953	54,586	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Total Replacement Value: $88.3 million

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Function and Value

Conserving Energy

STRATUM - Charlotte

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Benefits
Energy

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MainReport

Charlotte

Annual Energy Benefits of Public Trees by Species

4/2/2006

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (MBtu)	Natural Gas ($)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Willow oak	2,390.9	181,472	7,374.6	77,138	258,610	(N/A)	16.7	37.9	18.15
Common crapemyrtle	153.8	11,670	827.4	8,654	20,325	(N/A)	14.1	3.0	1.69
Pear	353.1	26,801	1,435.5	15,015	41,816	(N/A)	7.6	6.1	6.50
Red maple	356.4	27,051	1,426.4	14,920	41,971	(N/A)	6.7	6.2	7.34
Flowering dogwood	109.6	8,318	582.9	6,097	14,415	(N/A)	5.4	2.1	3.16
Sugar maple	224.0	17,001	908.3	9,501	26,502	(N/A)	3.5	3.9	8.91
Plum	80.9	6,140	379.7	3,972	10,112	(N/A)	2.9	1.5	4.09
Eastern red cedar	75.4	5,724	196.0	2,050	7,774	(N/A)	2.4	1.1	3.76
Silver maple	248.2	18,839	896.2	9,374	28,214	(N/A)	2.4	4.1	13.82
Sweetgum	154.5	11,725	558.6	5,843	17,568	(N/A)	2.2	2.6	9.53
Shortleaf pine	97.6	7,406	340.8	3,565	10,970	(N/A)	1.3	1.6	9.66
Apple	32.2	2,444	175.1	1,832	4,276	(N/A)	1.2	0.6	4.20
American holly	12.9	981	57.0	596	1,577	(N/A)	1.1	0.2	1.62
Unknown tree	62.8	4,768	247.2	2,586	7,354	(N/A)	1.1	1.1	7.60
Dogwood	20.5	1,559	109.2	1,142	2,702	(N/A)	1.1	0.4	2.84
Privet	10.1	766	48.1	503	1,269	(N/A)	1.1	0.2	1.37
Loblolly pine	73.4	5,569	192.2	2,010	7,580	(N/A)	1.1	1.1	8.25
Callery pear	52.3	3,970	206.3	2,158	6,129	(N/A)	1.1	0.9	6.84
Yoshino flowering	44.3	3,359	205.4	2,148	5,507	(N/A)	1.1	0.8	6.16
Water oak	131.0	9,946	406.9	4,256	14,202	(N/A)	1.0	2.1	16.07
Other street trees	1,343.0	101,934	4,970.7	51,993	153,928	(N/A)	24.9	22.5	7.26
Citywide total	6,026.9	457,444	21,544.5	225,355	682,799	(N/A)	100.0	100.0	8.02

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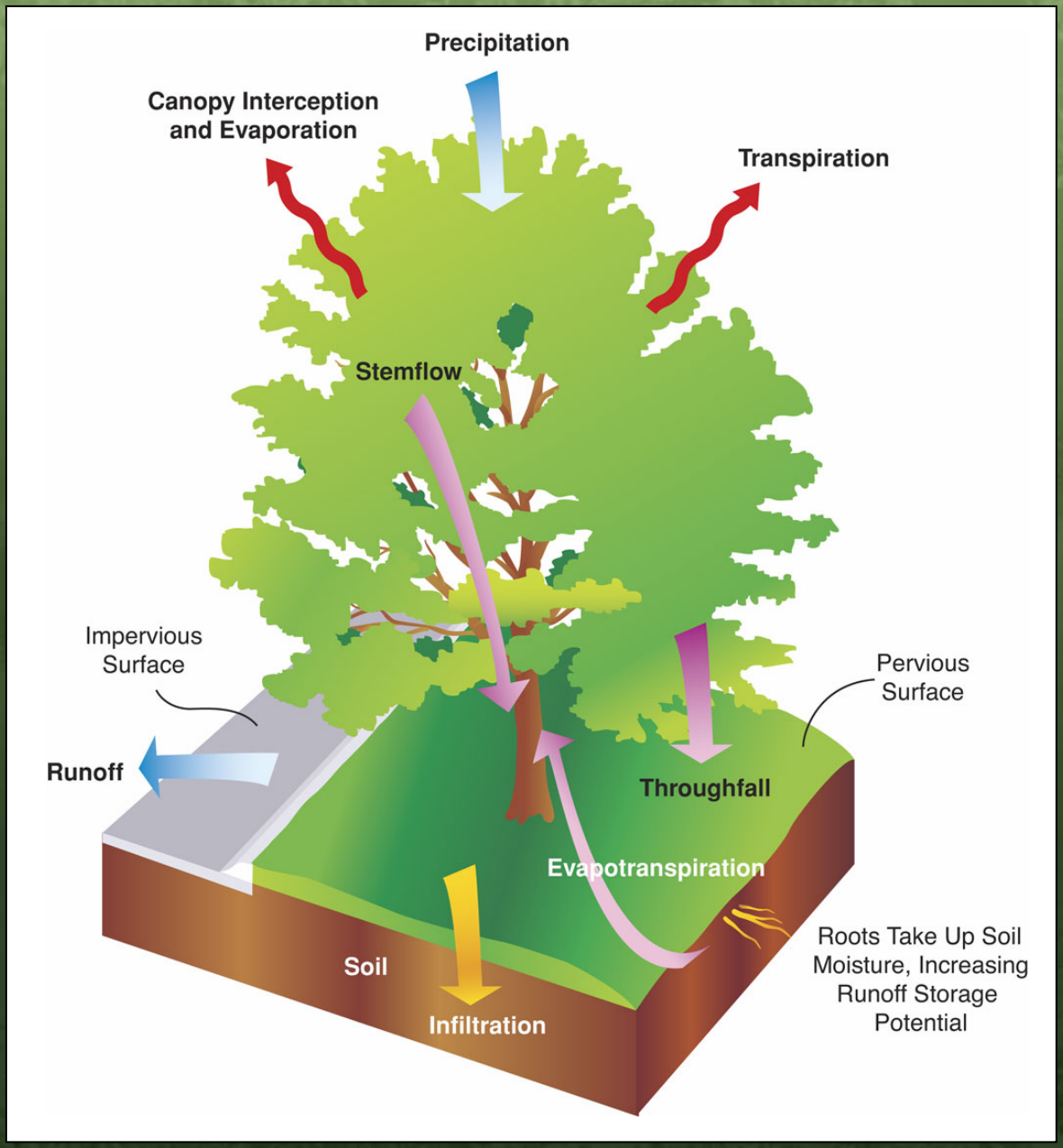
Reducing Stormwater Runoff



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Benefits
Stormwater

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MainReport

Charlotte

Annual Stormwater Benefits of Public Trees by Species

4/2/2006

Species	Total Rainfall Interception (CCF)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Willow oak	142,568	1,055,817	(N/A)	16.7	50.8	74.10
Common crapemyrtle	3,270	24,219	(N/A)	14.1	1.2	2.02
Pear	10,003	74,080	(N/A)	7.6	3.6	11.52
Red maple	14,805	109,638	(N/A)	6.7	5.3	19.16
Flowering dogwood	2,601	19,263	(N/A)	5.4	0.9	4.23
Sugar maple	7,284	53,940	(N/A)	3.5	2.6	18.12
Plum	2,023	14,985	(N/A)	2.9	0.7	6.06
Eastern red cedar	2,237	16,566	(N/A)	2.4	0.8	8.01
Silver maple	9,253	68,525	(N/A)	2.4	3.3	33.57
Sweetgum	7,122	52,743	(N/A)	2.2	2.5	28.60
Shortleaf pine	3,700	27,400	(N/A)	1.3	1.3	24.12
Apple	603	4,465	(N/A)	1.2	0.2	4.39
American holly	305	2,262	(N/A)	1.1	0.1	2.32
Unknown tree	2,159	15,986	(N/A)	1.1	0.8	16.53
Dogwood	483	3,576	(N/A)	1.1	0.2	3.76
Privet	232	1,719	(N/A)	1.1	0.1	1.85
Loblolly pine	3,355	24,849	(N/A)	1.1	1.2	27.04
Callery pear	1,498	11,092	(N/A)	1.1	0.5	12.38
Yoshino flowering cherry	1,135	8,408	(N/A)	1.1	0.4	9.41
Water oak	7,119	52,721	(N/A)	1.0	2.5	59.64
Other street trees	58,757	435,140	(N/A)	24.9	21.0	20.51
Citywide total	280,512	2,077,394	(N/A)	100.0	100.0	24.40

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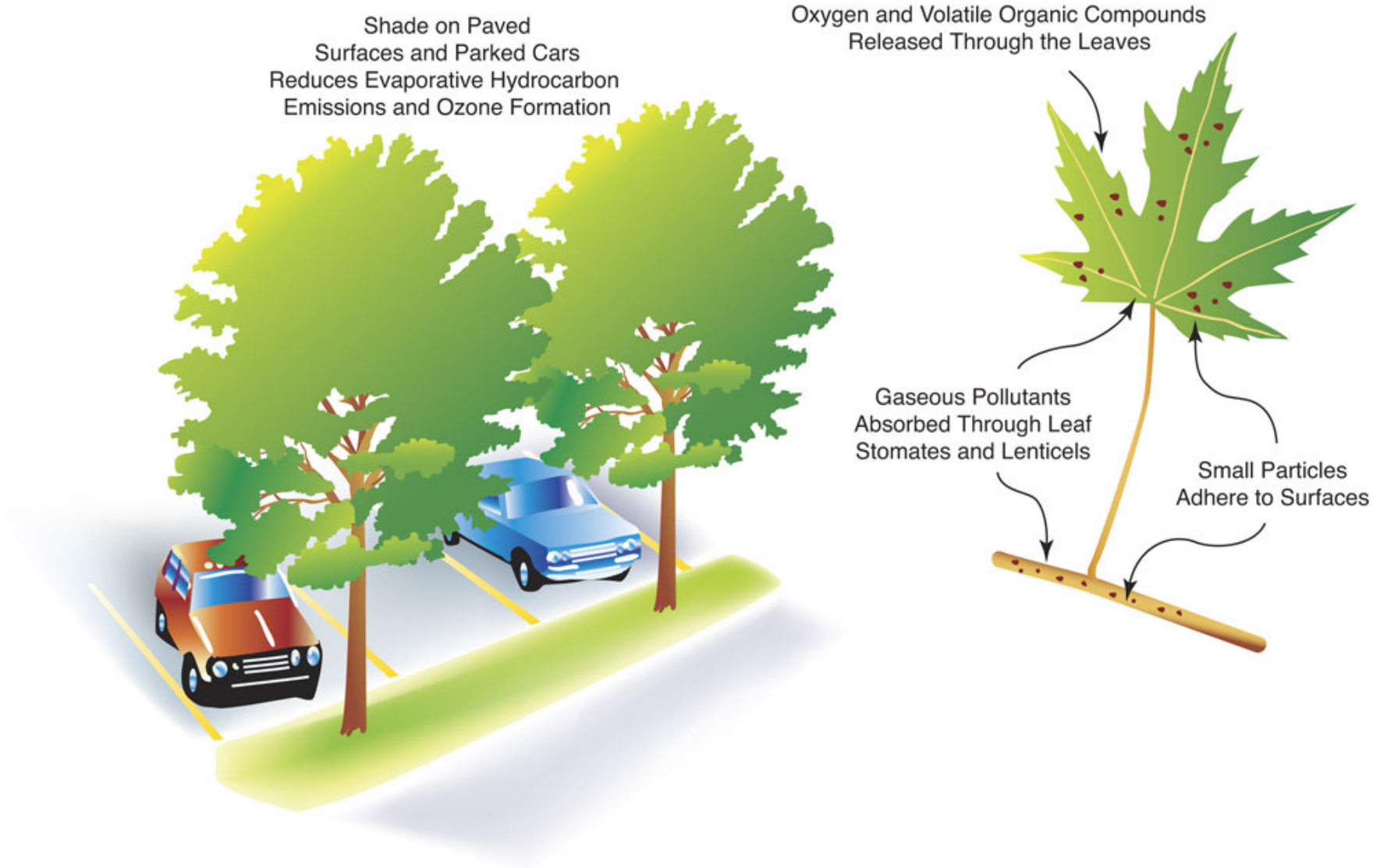
Improving Air Quality



STRATUM - BOI STRATUM

Berkeley

Annual Air Quality Benefits of Public Trees by Species

1/24/2006

Species	Deposition (lb) O_3	NO_2	PM_{10}	SO_2	Total Depos. ($)	Avoided (lb) NO_2	PM_{10}	VOC	SO_2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total Emissions (lb)	Total ($)	Standard Error	% of Total Trees	Avg. $/tree
London planetree	1,149.2	465.1	668.4	92.3	24,863	229.8	58.6	30.1	123.5	3,731	-2,563.3	-18,507	253.7	10,086	(N/A)	7.4	3.72
Sweetgum	280.9	112.4	176.9	22.5	6,223	209.2	50.8	26.3	105.1	3,332	-6,239.4	-45,048	-5,255.3	-35,494	(N/A)	6.5	-15.07
Coastal live oak	171.6	75.5	116.6	14.7	3,977	102.8	25.7	13.2	53.8	1,656	-3,034.5	-21,909	-2,460.5	-16,276	(N/A)	6.4	-6.95
Cherry plum	70.6	25.4	34.8	4.8	1,417	30.8	7.9	4.0	16.6	500	-1.5	-11	193.2	1,906	(N/A)	4.1	1.27
Plum	45.4	16.3	22.6	3.1	913	20.8	5.3	2.7	11.2	338	-1.0	-7	126.3	1,243	(N/A)	3.3	1.03
Camphor tree	363.8	160.2	224.7	31.2	8,167	76.2	19.6	10.0	41.4	1,241	0.0	0	927.2	9,408	(N/A)	3.2	8.03
Ash	136.9	48.1	70.4	9.1	2,772	74.9	18.3	9.5	38.0	1,196	0.0	0	405.3	3,968	(N/A)	3.1	3.47
Evergreen pear	104.7	46.1	64.9	9.0	2,353	32.7	8.3	4.2	17.4	529	0.0	0	287.3	2,883	(N/A)	2.8	2.84
Coast redwood	168.1	74.0	99.2	14.4	3,719	97.2	23.3	12.1	48.0	1,541	-4,886.7	-35,282	-4,350.3	-30,022	(N/A)	2.0	-41.01
Purpleleaf plum	32.1	11.5	15.8	2.2	643	14.0	3.6	1.8	7.5	227	-0.7	-5	87.7	865	(N/A)	1.7	1.40
Southern magnolia	40.6	17.9	28.4	3.5	950	21.1	5.4	2.8	11.5	343	-288.2	-2,081	-157.2	-788	(N/A)	1.7	-1.30
American elm	465.1	177.4	243.8	36.6	9,632	95.1	24.2	12.4	50.9	1,541	0.0	0	1,105.3	11,174	(N/A)	1.7	18.53
Victorian box	80.4	35.4	46.7	6.9	1,770	15.1	3.9	2.0	8.3	247	0.0	0	198.8	2,017	(N/A)	1.6	3.48
Other	18.1	6.4	9.7	1.2	371	14.9	3.6	1.9	7.5	237	0.0	0	63.3	608	(N/A)	1.5	1.08
Chinese pistache	29.8	11.0	14.4	2.1	599	8.4	2.1	1.1	4.4	135	-76.9	-556	-3.6	178	(N/A)	1.5	0.34
Velvet ash	95.2	33.4	47.2	6.3	1,906	41.0	10.1	5.2	20.9	656	0.0	0	259.4	2,562	(N/A)	1.4	4.91
Japanese maple	27.4	9.9	13.1	1.9	546	10.6	2.6	1.4	5.5	170	-22.3	-161	50.0	555	(N/A)	1.4	1.07
Chinese elm	136.2	54.5	82.8	10.9	2,982	30.9	7.9	4.1	16.7	502	-36.3	-262	307.6	3,222	(N/A)	1.4	6.52
Callery pear	48.8	18.1	23.7	3.5	981	17.0	4.2	2.2	8.7	272	0.0	0	126.0	1,253	(N/A)	1.3	2.64
Cotoneaster	6.2	2.7	4.8	0.5	151	7.6	1.9	1.0	3.9	122	0.0	0	28.7	274	(N/A)	1.3	0.59
Ginkgo	32.5	12.1	15.6	2.3	652	12.9	3.2	1.6	6.5	206	-43.8	-316	43.0	542	(N/A)	1.2	1.21
Black locust	43.5	15.3	20.8	2.9	862	17.4	4.2	2.2	8.7	276	-87.1	-629	27.9	509	(N/A)	1.2	1.14
California sycamore	130.1	52.7	78.5	10.5	2,848	35.5	9.0	4.6	18.8	574	-363.7	-2,626	-24.0	797	(N/A)	1.2	1.81
Tulip tree	68.7	24.7	31.7	4.6	1,353	27.8	6.8	3.5	14.0	443	-126.1	-910	55.7	886	(N/A)	1.1	2.15
Black acacia	44.1	19.4	28.0	3.8	998	16.4	4.2	2.1	8.8	266	-178.1	-1,286	-51.4	-22	(N/A)	1.1	-0.06
Monterey cypress	61.1	26.9	36.7	5.2	1,359	40.1	9.6	5.0	19.8	636	-1,936.1	-13,979	-1,731.7	-11,984	(N/A)	1.0	-31.79
Blierana plum	14.4	5.2	7.2	1.0	291	7.0	1.8	0.9	3.8	114	-0.3	-2	41.0	402	(N/A)	1.0	1.07
Other street trees	1,255.3	527.4	757.1	102.8	27,683	501.5	125.1	64.4	261.4	8,069	-10,816.7	-78,097	-7,221.9	-42,345	(N/A)	36.8	-3.15
Citywide total	5,120.5	2,084.8	2,984.6	409.9	110,980	1,808.5	451.1	232.3	942.8	29,101	-30,702.8	-221,674	-16,668.4	-81,593	(N/A)	100.0	-2.24

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Reducing Atmospheric Carbon Dioxide

STRATUM - Charlotte

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Tree Type

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Carbon Dioxide

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Charlotte

Annual CO_2 Benefits of Public Trees by Species

4/2/2006

Species	Sequestered (lb)	Sequestered ($)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released ($)	Avoided (lb)	Avoided ($)	Net Total (lb)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Willow oak	8,388,412	62,913	-677,917	-1,580	-5,096	2,020,742	15,156	9,729,657	72,972	(N/A)	16.7	37.9	5.12
Common crapemyrtle	264,266	1,982	-5,178	-1,330	-49	129,952	975	387,711	2,908	(N/A)	14.1	1.5	0.24
Pear	1,320,137	9,901	-37,789	-713	-289	298,432	2,238	1,580,066	11,851	(N/A)	7.6	6.2	1.84
Red maple	1,347,752	10,108	-43,745	-634	-333	301,224	2,259	1,604,596	12,034	(N/A)	6.7	6.3	2.10
Flowering dogwood	438,056	3,285	-14,517	-505	-113	92,618	695	515,652	3,867	(N/A)	5.4	2.0	0.85
Sugar maple	683,485	5,126	-21,161	-330	-161	189,307	1,420	851,302	6,385	(N/A)	3.5	3.3	2.15
Plum	162,799	1,221	-3,048	-274	-25	68,366	513	227,842	1,709	(N/A)	2.9	0.9	0.69
Eastern red cedar	208,849	1,566	-7,489	-229	-58	63,739	478	264,870	1,987	(N/A)	2.4	1.0	0.96
Silver maple	980,733	7,355	-37,790	-226	-285	209,779	1,573	1,152,495	8,644	(N/A)	2.4	4.5	4.24
Sweetgum	447,084	3,353	-16,601	-204	-126	130,560	979	560,839	4,206	(N/A)	2.2	2.2	2.28
Shortleaf pine	333,052	2,498	-11,218	-126	-85	82,465	618	404,172	3,031	(N/A)	1.3	1.6	2.67
Apple	142,935	1,072	-2,769	-113	-22	27,217	204	167,271	1,255	(N/A)	1.2	0.7	1.23
American holly	38,580	289	-1,450	-108	-12	10,926	82	47,948	360	(N/A)	1.1	0.2	0.37
Unknown tree	352,542	2,644	-7,098	-107	-54	53,094	398	398,431	2,988	(N/A)	1.1	1.6	3.09
Dogwood	78,185	586	-2,743	-106	-21	17,361	130	92,697	695	(N/A)	1.1	0.4	0.73
Privet	29,728	223	-1,052	-103	-9	8,526	64	37,099	278	(N/A)	1.1	0.1	0.30
Loblolly pine	238,729	1,790	-8,544	-102	-65	62,018	465	292,101	2,191	(N/A)	1.1	1.1	2.38
Callery pear	191,052	1,433	-5,799	-99	-44	44,211	332	229,364	1,720	(N/A)	1.1	0.9	1.92
Yoshino flowering	93,961	705	-2,125	-99	-17	37,402	281	129,139	969	(N/A)	1.1	0.5	1.08
Water oak	512,182	3,841	-30,857	-98	-232	110,755	831	591,982	4,440	(N/A)	1.0	2.3	5.02
Other street trees	5,467,856	41,009	-221,824	-2,352	-1,681	1,135,066	8,513	6,378,746	47,841	(N/A)	24.9	24.9	2.26
Citywide total	21,720,376	162,903	-1,160,714	-9,439	-8,776	5,093,760	38,203	25,643,984	192,330	(N/A)	100.0	100.0	2.26

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Aesthetic and other benefits

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Berkeley

Annual Aesthetic/Other Benefits of Public Trees by Species

1/24/2006

Species	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
London planetree	234,460	(N/A)	7.4	8.3	86.42
Sweetgum	308,429	(N/A)	6.5	11.0	130.97
Coastal live oak	216,804	(N/A)	6.4	7.7	92.57
Cherry plum	50,826	(N/A)	4.1	1.8	33.86
Plum	38,780	(N/A)	3.3	1.4	32.24
Camphor tree	74,890	(N/A)	3.2	2.7	63.95
Ash	99,064	(N/A)	3.1	3.5	86.52
Evergreen pear	61,781	(N/A)	2.8	2.2	60.93
Coast redwood	139,437	(N/A)	2.0	5.0	190.49
Purpleleaf plum	21,677	(N/A)	1.7	0.8	35.02
Southern magnolia	30,993	(N/A)	1.7	1.1	50.97
American elm	150,275	(N/A)	1.7	5.3	249.21
Victorian box	20,532	(N/A)	1.6	0.7	35.46
Other	40,482	(N/A)	1.6	1.4	71.78
Chinese pistache	23,458	(N/A)	1.5	0.8	44.26
Velvet ash	49,194	(N/A)	1.4	1.8	94.24
Japanese maple	18,025	(N/A)	1.4	0.6	34.86
Chinese elm	24,870	(N/A)	1.4	0.9	50.34
Callery pear	32,071	(N/A)	1.3	1.1	67.52
Cotoneaster	26,644	(N/A)	1.3	1.0	57.05
Ginkgo	20,266	(N/A)	1.2	0.7	45.14
Black locust	38,622	(N/A)	1.2	1.4	86.79
California sycamore	39,340	(N/A)	1.2	1.4	89.61
Tulip tree	19,843	(N/A)	1.1	0.7	48.05
Black acacia	25,309	(N/A)	1.1	0.9	64.89
Monterey cypress	65,090	(N/A)	1.0	2.3	172.65
Blierana plum	12,695	(N/A)	1.0	0.5	33.85
Other street trees	931,391	(N/A)	36.9	33.1	69.28
Citywide total	2,815,250	(N/A)	100.0	100.0	77.16

STRATUM was developed by the USDA Forest Service, PSW Research Station, Center for Urban Forest Research, Davis, California

STRATUM - BOI STRATUM

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Species
Zone

Benefits
Summary

Report Type
$ per Tree
Total $

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MainReport

Boise

Annual Benefits of Public Trees by Species ($/tree)

1/16/2007

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error
Norway maple	11.57	0.41	0.19	2.66	21.12	35.94	(N/A)
Silver maple	36.65	-0.23	0.74	10.25	42.92	90.34	(N/A)
Honeylocust	11.38	0.23	0.21	3.44	30.14	45.40	(N/A)
Green ash	10.32	0.17	0.30	2.29	21.00	34.08	(N/A)
Crabapple	4.69	0.15	0.07	0.26	11.53	16.70	(N/A)
White ash	4.70	0.10	0.13	0.94	25.15	31.02	(N/A)
Maple	12.79	0.17	0.20	2.63	32.58	48.38	(N/A)
Callery pear	3.09	0.14	0.05	0.78	14.95	19.01	(N/A)
American sycamore	36.16	0.65	0.33	14.18	35.65	86.97	(N/A)
American basswood	10.52	0.19	0.29	3.05	20.49	34.54	(N/A)
Ash	20.18	0.33	0.63	4.76	24.82	50.71	(N/A)
Sweetgum	6.10	0.10	-0.01	1.14	17.79	25.13	(N/A)
Black locust	16.70	0.76	0.38	0.98	16.04	34.86	(N/A)
Elm	23.73	0.91	0.50	10.25	36.12	71.51	(N/A)
Scotch pine	0.00	0.06	0.01	1.90	13.17	15.15	(N/A)
Northern red oak	17.28	0.36	0.22	4.15	30.52	52.53	(N/A)
Blue spruce	5.85	0.11	0.07	5.42	15.92	27.36	(N/A)
Black walnut	25.67	0.58	0.47	5.96	28.60	61.28	(N/A)
Hawthorn	8.24	0.21	0.13	1.66	9.14	19.37	(N/A)
Austrian pine	5.61	0.13	0.03	4.67	20.17	30.61	(N/A)
Sugar maple	5.65	0.15	0.09	0.75	15.03	21.68	(N/A)
Northern catalpa	16.94	0.27	0.28	3.98	16.88	38.35	(N/A)
London planetree	12.98	0.20	0.14	4.21	42.18	59.71	(N/A)
Siberian elm	21.21	0.83	0.42	8.52	40.62	71.60	(N/A)
English elm	34.75	1.35	0.75	15.47	32.26	84.59	(N/A)
Littleleaf linden	2.24	0.09	0.06	0.58	23.09	26.05	(N/A)
Plum	6.76	0.22	0.11	0.38	14.77	22.22	(N/A)
Cottonwood	22.50	0.17	0.80	6.22	19.26	48.95	(N/A)
Other street trees	9.36	0.26	0.21	3.50	19.52	32.85	(N/A)

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STRATUM - Charlotte

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Berkeley

Total Annual Benefits, Net Benefits, and Costs for Public Trees

1/24/2006

Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	517,842	(N/A)	14.19	(N/A)	4.98	(N/A)
CO2	49,047	(N/A)	1.34	(N/A)	0.47	(N/A)
Air Quality	-81,593	(N/A)	-2.24	(N/A)	-0.78	(N/A)
Stormwater	142,502	(N/A)	3.91	(N/A)	1.37	(N/A)
Aesthetic/Other	2,815,250	(N/A)	77.16	(N/A)	27.07	(N/A)
Total Benefits	3,443,048	(±0)	94.37	(±0)	33.11	(±0)
Costs						
Contract Pruning	770,000		21.10		7.40	
Tree & Stump	70,000		1.92		0.67	
Pest Management	0		0.00		0.00	
Irrigation	0		0.00		0.00	
Inspection/Servic	80,000		2.19		0.77	
Planting	95,000		2.60		0.91	
Administration	100,000		2.74		0.96	
Litter Clean-up	195,000		5.34		1.88	
Infrastructure	1,030,000		28.23		9.90	
Liability/Claims	32,000		0.88		0.31	
Other Costs	0		0.00		0.00	
Total Costs	2,372,000		65.01		22.81	
Net Benefits	1,071,048	(±0)	29.36	(±0)	10.30	(±0)
Benefit-cost ratio	1.45	(±0)				

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City of Charlotte, North Carolina Municipal Forest Resource Analysis

By
E. Gregory McPherson
James R. Simpson
Paula J. Peper
Shelley L. Gardner
Kelaine E. Vargas
James Ho
Scott Maco
Qingfu Xiao

Center for Urban Forest Research
USDA Forest Service, Pacific Southwest Research Station

Technical Report to:
Don McSween, City Arborist
Engineering and Property Managment, Landscape Management
Charlotte, North Carolina

—November 2005—

Center for
Urban Forest Research

Trained Volunteer Data Collection

City of 60,000
20,000 Trees

3-5% Sample = 600–1,000 trees
4 min / tree = ~50 hrs

4 teams of 3 →
2 6-hr days + 1 day training

Summer Interns

Pair of interns ♦ Sample inventory

Conduct inventory, analyze data, write reports
= ~1–2 months

Piedmont Community Tree Guide

Benefits, Costs, and Strategic Planting

By
E. Gregory McPherson
James R. Simpson
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Center for Urban Forest Research
Pacific Southwest Research Station
USDA Forest Service

Estimating benefits per tree

Large Tree	Year 5		Year 10		Year 15		Year 20		Year 25		Year 30		Year 35		Year 40		40 year average	
Benefits/tree	RU	$	RU	$	RU	$	RU	$	RU	$	RU	$	RU	$	RU	$	RU	$
Cooling (kWh)																		
Yard: West	48	3.90	176	14.42	306	25.10	395	32.42	459	37.63	495	40.55	515	42.20	522	42.83	364	29.88
Yard: South	22	1.81	91	7.43	167	13.69	247	20.25	305	25.03	355	29.08	388	31.80	409	33.54	248	20.33
Yard: East	28	2.32	113	9.23	203	16.62	281	23.01	337	27.63	377	30.87	402	32.93	416	34.11	269	22.09
Public	21	1.71	81	6.65	145	11.85	209	17.13	256	20.96	296	24.27	323	26.49	342	28.06	209	17.14
Heating (kBtu)																		
Yard: West	143	1.67	481	5.61	766	8.93	917	10.69	1,021	11.91	1,031	12.03	1,023	11.93	982	11.45	795	9.28
Yard: South	71	0.83	198	2.32	267	3.12	328	3.83	371	4.33	382	4.46	385	4.49	372	4.35	297	3.47
Yard: East	106	1.24	366	4.27	587	6.84	738	8.61	845	9.86	876	10.21	885	10.33	864	10.08	658	7.68
Public	182	2.12	625	7.30	1,024	11.94	1,267	14.78	1,438	16.77	1,477	17.23	1,485	17.32	1,442	16.83	1,117	13.04
Net Energy (kBtu)																		
Yard: West	619	5.58	2,239	20.03	3,827	34.04	4,871	43.12	5,610	49.54	5,976	52.58	6,170	54.14	6,205	54.29	4,440	39.16
Yard: South	292	2.65	1,104	9.74	1,937	16.81	2,798	24.08	3,423	29.36	3,928	33.54	4,263	36.29	4,462	37.88	2,776	23.79
Yard: East	390	3.56	1,491	13.49	2,613	23.46	3,544	31.62	4,215	37.49	4,641	41.09	4,902	43.26	5,023	44.18	3,352	29.77
Public	390	3.83	1,436	13.94	2,469	23.80	3,355	31.91	3,994	37.73	4,437	41.51	4,715	43.81	4,864	44.88	3,208	30.18
Net CO2 (lb)																		
Yard: West	58	0.19	208	0.70	359	1.20	466	1.55	545	1.82	592	1.98	623	2.08	638	2.13	436	1.46
Yard: South	30	0.10	112	0.37	196	0.66	286	0.95	354	1.18	411	1.37	453	1.51	482	1.61	290	0.97
Yard: East	39	0.13	148	0.49	260	0.87	359	1.20	433	1.45	485	1.62	522	1.74	545	1.82	349	1.17
Public	42	0.14	155	0.52	269	0.90	368	1.23	442	1.48	496	1.66	534	1.78	558	1.86	358	1.20
Air Pollution (lb) [1]																		
O3 uptake	0.052	0.03	0.219	0.11	0.410	0.21	0.622	0.32	0.805	0.41	0.991	0.51	1.155	0.59	1.317	0.67	0.70	0.36
NO2 uptake+avoided	0.077	0.04	0.294	0.15	0.519	0.26	0.712	0.36	0.854	0.44	0.958	0.49	1.029	0.52	1.074	0.55	0.69	0.35
SO2 uptake+avoided	0.152	0.01	0.588	0.04	1.049	0.06	1.447	0.09	1.735	0.10	1.946	0.12	2.080	0.12	2.160	0.13	1.39	0.08
PM10 uptake+avoided	0.020	0.02	0.112	0.10	0.270	0.25	0.479	0.44	0.681	0.63	0.874	0.80	1.055	0.97	1.227	1.13	0.59	0.54
VOCs avoided	0.014	0.00	0.052	0.01	0.092	0.01	0.127	0.02	0.152	0.02	0.170	0.02	0.181	0.03	0.188	0.03	0.12	0.02
BVOCs released	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.00	0.00
Avoided + net uptake	0.315	0.10	1.266	0.41	2.340	0.80	3.387	1.23	4.227	1.60	4.938	1.94	5.500	2.23	5.966	2.50	3.49	1.35
Hydrology (gal) [1]																		
Rainfall Interception	82	0.41	349	1.75	654	3.27	993	4.96	1,285	6.43	1,582	7.91	1,843	9.22	2,102	10.51	1,111	5.56
Aesthetics and other																		
Yard		11.45		32.79		40.55		39.37		33.51		25.47		16.68		10.19		26.25
Public		12.79		36.62		45.29		43.98		37.43		28.44		18.63		11.38		29.32
Total Benefits																		
Yard: West		**17.72**		**55.67**		**79.85**		**90.24**		**92.90**		**89.87**		**84.35**		**79.62**		**73.78**
Yard: South		**14.70**		**45.05**		**62.08**		**70.60**		**72.08**		**70.22**		**65.93**		**62.70**		**57.92**
Yard: East		**15.65**		**48.93**		**68.95**		**78.39**		**80.47**		**78.02**		**73.14**		**69.21**		**64.09**
Public		**17.26**		**53.24**		**74.05**		**83.30**		**84.67**		**81.45**		**75.68**		**71.14**		**67.60**

Estimating costs per tree

Large Tree	Year 5		Year 10		Year 15		Year 20		Year 25		Year 30		Year 35		Year 40		40 year average	
Costs ($/yr/tree)	Yard	Public	Yard	Public	Yard	Public	Yard	Public	Yard	Public	Yard	Public	Yard	Public	Yard	Public	Yard	Public
Tree & Planting	35.00	28.00															4.38	3.50
Pruning	0.23	5.44	2.45	6.20	2.37	5.88	2.30	5.56	6.34	8.73	6.13	8.20	5.91	7.66	5.70	7.12	3.92	6.97
Remove Dispose	0.08	0.26	1.14	1.36	1.78	2.12	2.37	2.83	2.92	3.48	3.43	4.09	3.91	4.66	4.37	5.20	2.31	2.77
Pest & Disease	0.04	0.04	0.10	0.09	0.15	0.13	0.19	0.16	0.22	0.18	0.25	0.20	0.28	0.22	0.30	0.22	0.18	0.14
Infrastructure Repair	0.01	0.07	0.02	0.15	0.03	0.23	0.04	0.29	0.05	0.33	0.06	0.37	0.06	0.39	0.07	0.40	0.04	0.26
Irrigation	1.48	1.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.18
Clean-Up	0.02	0.12	0.04	0.28	0.06	0.41	0.08	0.52	0.09	0.60	0.10	0.66	0.11	0.70	0.12	0.73	0.07	0.47
Liability & Legal	0.00	0.01	0.00	0.03	0.01	0.04	0.01	0.06	0.01	0.06	0.01	0.07	0.01	0.08	0.01	0.08	0.01	0.05
Admin/Inspect/Other	0.00	0.81	0.00	1.87	0.00	2.76	0.00	3.48	0.00	4.03	0.00	4.45	0.00	4.74	0.00	4.92	0.00	3.14
Total Costs	36.86	36.08	3.75	9.98	4.40	11.57	4.98	12.88	9.64	17.43	9.99	18.04	10.29	18.45	10.57	18.68	11.09	17.47

Estimating net benefits per tree

Total net benefits	**Year 5**	**Year 10**	**Year 15**	**Year 20**	**Year 25**	**Year 30**	**Year 35**	**Year 40**	**40-year average**
Yard: west	-19	52	75	85	83	80	74	69	63
Yard: south	-22	41	58	66	62	60	56	52	47
Yard: east	-21	45	65	73	71	68	63	59	53
Public	-19	43	62	70	67	63	57	52	50

Urban Advantage

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Our research demonstrates new ways that trees add value to communities, converting results into financial terms to stimulate more investment in trees.

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kevargas@ucdavis.edu

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