i-Tree – STRATUM
Sample Street Tree Inventory
Social Circle, GA

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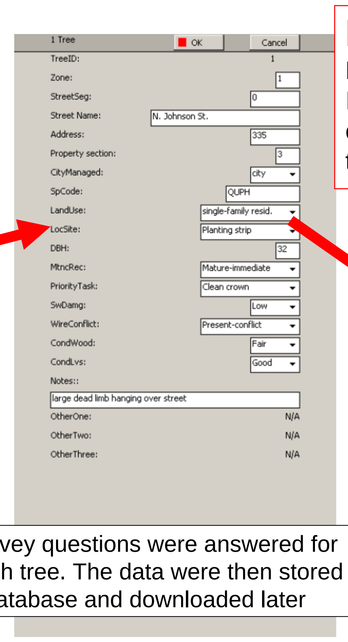
Introduction

The i-Tree Software Suite currently supports only the PocketPC platform on PDA's and is not compatible with GIS technology. PDA's are expensive and not everyone has access to them. GIS technology is very useful for locating trees in a community. Using available GPS equipment, we set out to demonstrate that data could be easily collected using non-supported equipment and imported into the STRATUM software to gain valuable information about urban forest structure as well as the economic and ecological benefits of street trees.

How Data Were Collected

Using Juniper Systems' Allegro CX Field PC equipped with a GPS expansion pod using Trimble technology, we were able to collect data in the field.



Survey questions were answered for each tree. The data were then stored in a database and downloaded later

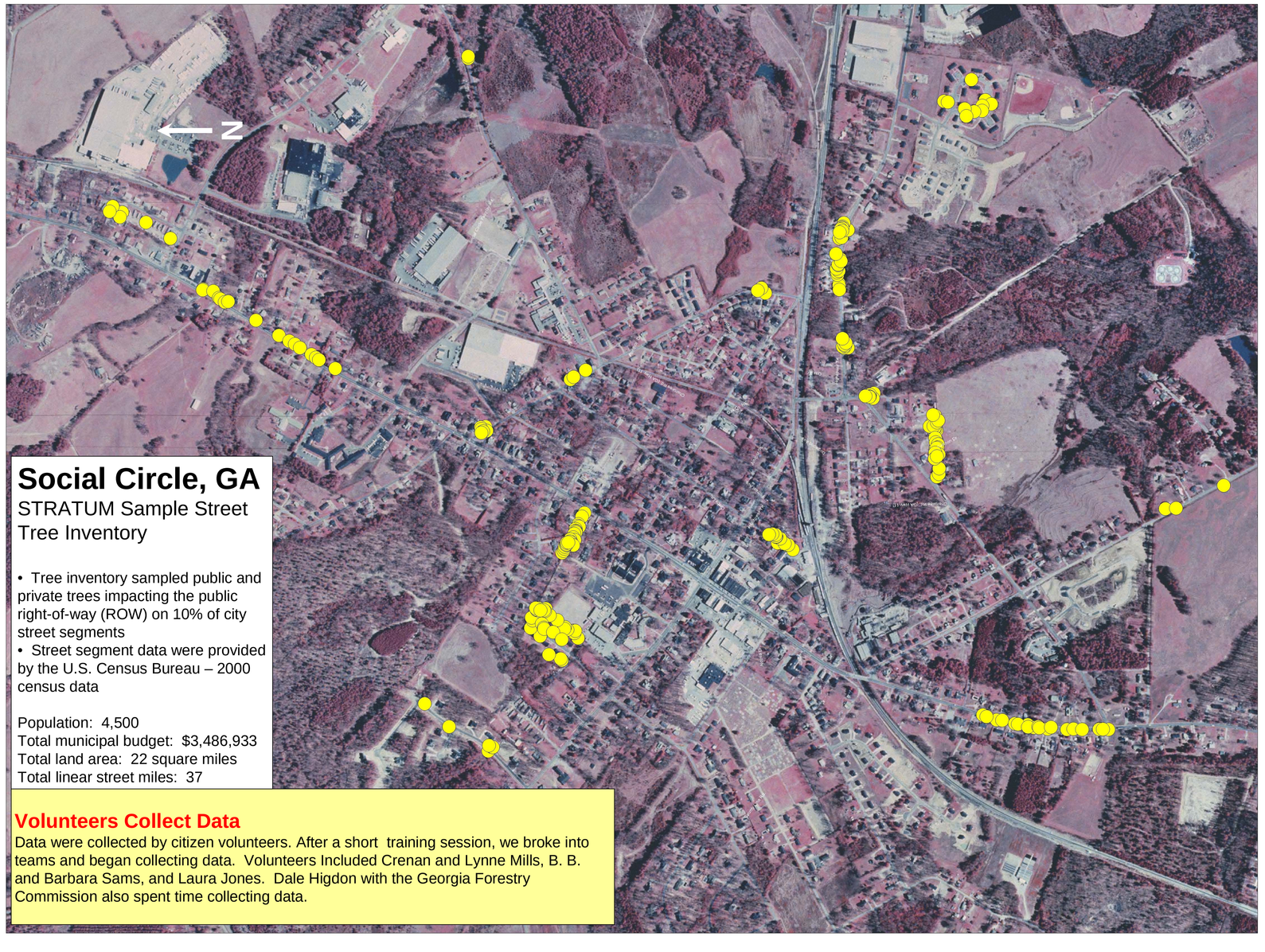
No Budget? Start Here

Equipment is not necessary to collect data in the field. If your community or volunteer group has no equipment or budget for equipment, you can collect data using paper tally sheets then enter it into an Excel spreadsheet.

Social Circle, GA — i-Tree STRATUM Inventory

TreeId	Zone	StreetSeg	CityManaged	SpCode	LandUse	LocSite	DBH	MtncRec	PriorityTask	SwDamg
1	1	9	1	CASP	1	1	21	4	3	0
2	1	9	1	CAIL	1	1	33	4	4	0
3	1	9	1	CAIL	5	2	32	4	3	0
4	1	6	1	LISP	1	7	13	1	0	0
5	1	6	1	LISP	1	7	8	1	0	0
6	1	6	1	LISP	1	7	4	1	0	0
7	1	6	1	LISP	1	7	3	1	0	0
8	1	6	1	LISP	1	7	3	1	0	0
9	1	6	1	TRSE6	1	7	5	1	0	0
10	1	16	1	PRSE1	1	7	12	1	0	0
11	1	16	1	LIST	4	6	20	1	0	0
12	1	15	1	CAIL	1	1	16	1	0	0
13	1	15	1	CAIL	1	1	16	1	0	0
14	1	22	1	LISP	2	1	20	4	4	0
15	1	22	1	QUPH	2	1	13	4	4	0
16	1	22	1	CAIL	2	1	13	4	3	0
17	1	22	1	QUPH	2	1	29	4	4	0

After data are collected, they can be downloaded into a MicroSoft Excel spreadsheet then imported into a MicroSoft Access database for STRATUM to use.



Social Circle, GA

STRATUM Sample Street Tree Inventory

- Tree inventory sampled public and private trees impacting the public right-of-way (ROW) on 10% of city street segments
- Street segment data were provided by the U.S. Census Bureau – 2000 census data

Population: 4,500
Total municipal budget: $3,486,933
Total land area: 22 square miles
Total linear street miles: 37

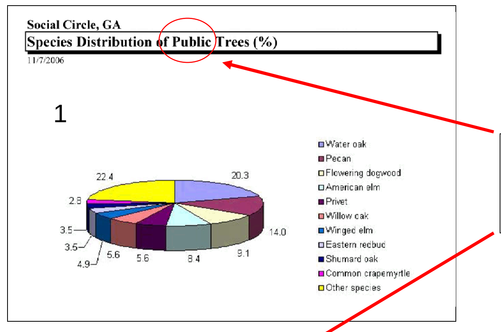
Volunteers Collect Data

Data were collected by citizen volunteers. After a short training session, we broke into teams and began collecting data. Volunteers Included Crenan and Lynne Mills, B. B. and Barbara Sams, and Laura Jones. Dale Higdon with the Georgia Forestry Commission also spent time collecting data.

STRATUM Reports Generated

STRATUM can segregate public and private tree data to generate reports on one or the other type or all trees if desired.

1



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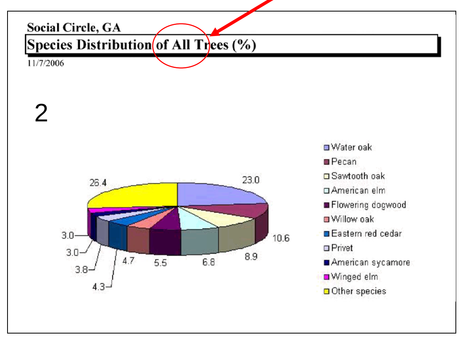
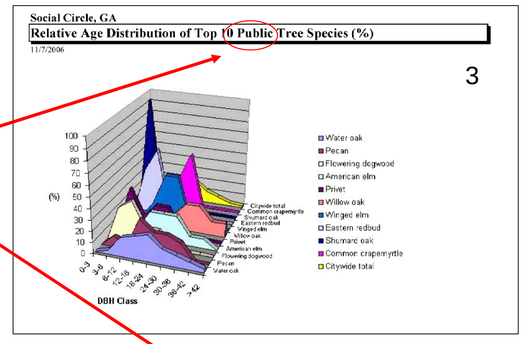


STRATUM calculated approximately 2,300 public trees and 3,800 total trees impacting the ROW. Of those public trees, 1 in 5 (20%) is water oak.

3



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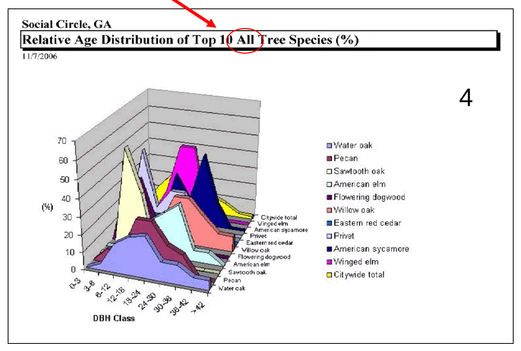
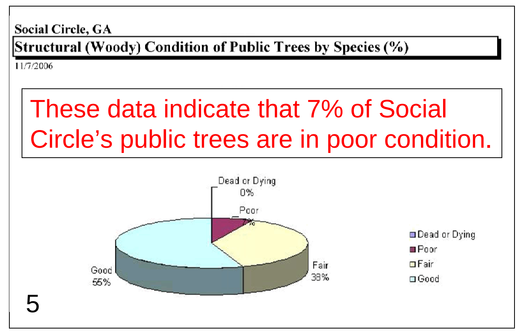


These charts demonstrate a good example of uneven-aged management. These data show a need to plant larger type trees to replace the eventual loss of tree canopy.

5



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Social Circle, GA
Total Annual Benefits, Net Benefits, and Costs for Public Trees
11/7/2006

Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	33,543	(±8,658)	14.48	(±3.74)	7.45	(±1.92)
CO2	8,906	(±2,299)	3.84	(±.99)	1.98	(±.51)
Air Quality	-2,150	(±-555)	-0.93	(±-.24)	-0.48	(±-.12)
Stormwater	105,994	(±27,359)	45.75	(±11.81)	23.55	(±6.08)
Aesthetic/Other	63,216	(±16,317)	27.28	(±7.04)	14.05	(±3.63)
Total Benefits	209,509	(±54,078)	90.42	(±23.34)	46.56	(±12.02)
Costs						
Planting	3,000		1.29		0.67	
Contract Pruning	5,000		2.16		1.11	
Pest Management	0		0.00		0.00	
Irrigation	0					
Removal	0					
Administration	0					
Inspection/Servic	0					
Infrastructure	0					
Litter Clean-up	28,000		12.08		6.22	
Liability/Claims	0		0.00		0.00	
Other Costs	0		0.00		0.00	
Total Costs	36,000		15.54		8.00	
Net Benefits	173,509	(±54,078)	74.89	(±23.34)	38.56	(±12.02)
Benefit-cost ratio	5.82	(±1.5)				

This is what Social Circle spent on trees in the last fiscal year.

STRATUM estimated the net benefits of public trees for Social Circle to be about $175,000 annually. For every $1 that the city spends on public trees, it receives approximately $5.82 in return.

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Social Circle, GA
Annual Energy Benefits of Public Trees by Species
11/7/2006

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($) Error	Standard	% of Total Trees	% of Total $	Avg. $/tree
Water oak	81.5	6,109	2,514.1	2,630	8,739	(±3,436)	20.3	26.1	18.60
Pecan	60.0	4,498	1,961.5	2,052	6,550	(±2,255)	14.0	19.5	20.22
Flowering dogwood	9.5	715	443.0	463	1,178	(±623)	9.1	3.5	5.60
American elm	41.3	3,098	1,303.4	1,363	4,461	(±2,682)	8.4	13.3	22.95
Privet									6
Willow oa									5
Winged e									8
Eastern re									9
Shumard									5
Common									0
American									3
Hickory									0
Black walnut	4.3	324	179.9	188	512	(±396)	2.1	1.5	10.54
Black cherry	5.5	411	214.4	224	635	(±428)	2.1	1.9	13.07
Mimosa	2.3	171	101.0	106	276	(±261)	1.4	0.8	8.53
Chinaberry	2.1	155	88.4	92	247	(±233)	1.4	0.7	7.63
Loblolly pine	1.9	144	49.7	52	196	(±185)	1.4	0.6	6.06
Carolina laurelcherry	0.3	21	16.6	17	39	(±24)	1.4	0.1	1.19
Elm	4.2	318	157.4	165	483	(±305)	1.4	1.4	14.90
Other street trees	10.2	765	380.1	398	1,163	(±212)	6.3	3.5	7.97
Citywide total	306.8	23,007	10,072.2	10,536	33,543	(±8,658)	100.0	100.0	14.48

STRATUM estimated that $33,000 is saved in energy costs from public trees alone. Public trees make up less than 5% of the urban forest, and larger trees provide most of those benefits.

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Social Circle, GA
Annual Energy Benefits of All Trees by Species
11/7/2006

Species	Total Electricity (MWh)	Electricity ($)	Total Natural Gas (Therms)	Natural Gas ($)	Total ($) Error	Standard	% of Total Trees	% of Total $	Avg. $/tree
Water oak	153.8	11,538	4,681.1	4,896	16,434	(±5,771)	23.0	29.6	18.79
Pecan	72.8	5,460	2,419.9	2,531	7,991	(±2,224)	10.6	14.4	19.73
Sawtooth oak	28.1	2,108	1,107.9	1,159	3,267	(±3,084)	8.9	5.9	9.60
American elm	54.0	4,050	1,716.5	1,795	5,846	(±3,347)	6.8	10.5	22.55
Flowering dogwood	9.5	715	443.0	463	1,178	(±623)	5.5	2.1	5.60
Willow oak	40.9	3,069	1,242.8	1,300	4,369	(±1,408)	4.7	7.9	24.52
Eastern red cedar	4.9	365	123.7	129	494	(±298)	4.3	0.9	3.05
Privet									
American sycamore									
Winged elm									
Hickory									
Eastern redbud									
Loblolly pine									
Shumard oak									
Black walnut									
Common crapemyrtle									
Black cherry									
Silver maple	7.5	563	263.9	278	841	(±746)	1.3	1.5	17.53
River birch	5.8	438	210.3	220	658	(±444)	1.3	1.2	13.54
Other street trees	36.5	2,741	1,295.6	1,355	4,096	(±946)	9.4	7.4	11.49
Citywide total	508.5	38,134	16,699.1	17,467	55,601	(±11,163)	100.0	100.0	14.60

Street trees provide shade to keep asphalt and concrete cool, so air conditioners do not need to run as much. Thus, less energy is used. STRATUM estimated that all trees along the ROW saved Social Circle about $55,000 annually in energy costs.

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Social Circle, GA
Annual Stormwater Benefits of All Trees by Species
11/7/2006

Species	Total rainfall interception (Gal)	Total ($)	Standard Error	% of Total Trees	% of Total $	Avg. $/tree
Water oak	6,340,721	62,778	(±22,043)	23.0	35.6	71.76
Pecan	2,337,536	23,143	(±6,440)	10.6	13.1	57.14
Sawtooth oak	652,483	6,460	(±6,099)	8.9	3.7	18.99
American elm	1,819,744	18,017	(±10,315)	6.8	10.2	69.51
Flow						
Will						
East						
Priv						
Ame						
Win						
Hick						
East						
Lob						
Shu						
Blac						
Common crapemyrtle	99,803	988	(±715)	1.7	0.6	15.25
Black cherry	227,576	2,253	(±1,190)	1.7	1.3	34.77
Silver maple	211,065	2,090	(±1,973)	1.3	1.2	43.60
River birch	185,745	1,839	(±1,240)	1.3	1.0	37.84
Other street trees	1,393,625	12,907	(±2,980)	9.4	7.3	36.22
Citywide total	17,813,022	176,361	(±35,407)	100.0	100.0	46.33

Large trees intercept large amounts of rainfall thus reducing water runoff. STRATUM calculated that Social Circle's public trees intercept about 18 million gallons of water annually. The costs estimated are the avoided costs of having to build retention areas or retro-fit the city for stormwater control.

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Social Circle, GA
Annual Air Quality Benefits of All Trees by Species
11/7/2006

Species	Deposition (lb) O3	NO2	PM10	SO2	Total Depos. ($)	Avoided (lb) NO2	PM10	VOC	SO2	Total Avoided ($)	BVOC Emissions (lb)	BVOC Emissions ($)	Total (lb)	Total ($) Error	Standard	% of Total Trees	% of Total $	Avg. $/tree
Water oak	246.1	115.8	283.0	56.8	3,187	310.0	62.1	61.2	698.3	3,914	-2,512.1	-15,831	-698.8	-8,729	(±3,062)	23.0	-9.97	
Pecan	96.0	41.2	99.3	19.6	1,184	148.9	29.6	29.1	331.6	1,885	-162.5	-1,019	632.5	2,050	(±570)	10.6	5.06	
Sawtooth oak	47.0	16.7	43.6	7.5	540	59.0	11.6	11.4	128.6	740	-2.3	-15	323.1	1,266	(±1,195)	8.9	3.72	
American elm	71.3	30.6	73.7	14.6	880	109.7	21.9	21.6	245.6	1,392	-110.2	-815	458.8	1,457	(±814)	6.8	5.62	
Flowering dogwood	21.0	6.8	17.8	3.3	233	20.6	4.0	3.9	43.5	255	0.0	0	120.9	488	(±258)	5.5	2.32	
Willow oak	65.8	31.0	75.6	15.2	852	82.5	16.5	16.3	185.8	1,049	-975.9	-6,109	-487.3	-4,208	(±-1,356)	4.7	-23.62	
Eastern red cedar	21.0	7.1	15.3	4.2	230	9.5	2.0	1.9	22.2	123	-6.0	-38	77.2	316	(±198)	4.3	1.95	
Privet	28.8	9.7	21.0	5.7	316	13.2	2.7	2.7	30.8	171	0.0	0	114.6	487	(±262)	3.8	3.34	
American sycamore	33.6	14.4	34.7	6.9	414	51.6	10.3	10.1	115.6	655	-61.9	-387	215.4	682	(±437)	3.0	6.01	
Winged elm	19.3	6.9	17.9	3.1	222	24.8	5.0	4.9	56.2	316	0.0	0	138.1	539	(±249)	3.0	4.75	
Hickory																2.6	4.21	
Eastern redbud																2.6	1.73	
Loblolly pine																2.1	-18.91	
Shumard oak																2.1	0.86	
Black walnut																1.7	3.44	
Common crapemyrtle																1.7	3.82	
Black cherry																1.7	4.27	
Silver maple	12.6	4.5	11.7	2.0	145	15.5	3.1	3.0	34.4	196	-11.7	-73	75.1	268	(±253)	1.3	5.52	
River birch	9.9	3.5	9.2	1.6	114	12.1	2.4	2.3	26.7	152	-0.8	-5	66.9	261	(±176)	1.3	5.37	
Other street trees	63.8	25.0	61.7	12.1	759	75.4	14.9	14.7	166.5	951	-232.9	-1,458	201.1	251	(±58)	9.4	0.70	
Citywide total	842.1	352.7	856.3	173.2	10,300	1,036.8	206.5	203.3	2,314.6	13,138	-4,543.0	-28,439	1,442.6	-5,002	(±-1,004)	100.0	-1.31	

Certain trees emit biogenic volatile organic compounds (BVOC). Although these pollutants cost cities indirectly, the benefits from these trees that produce them far outweigh their costs.

Recommendations for Social Circle, GA

1. Plant diverse, long living, larger type trees to ensure future tree canopy
2. Maintain existing large trees to continue cost benefits
3. Encourage residents to plant diverse, long living trees on their properties to improve the entire urban forest
4. Remove hazard trees annually to reduce liability
5. Conduct a complete street tree inventory and manage them using i-Tree's MCTI application