Urban Forest Inventory: i-Tree Eco Pilot Project at Auburn University

SAVANNAH, GEORGIA
FEBRUARY 22, 2011

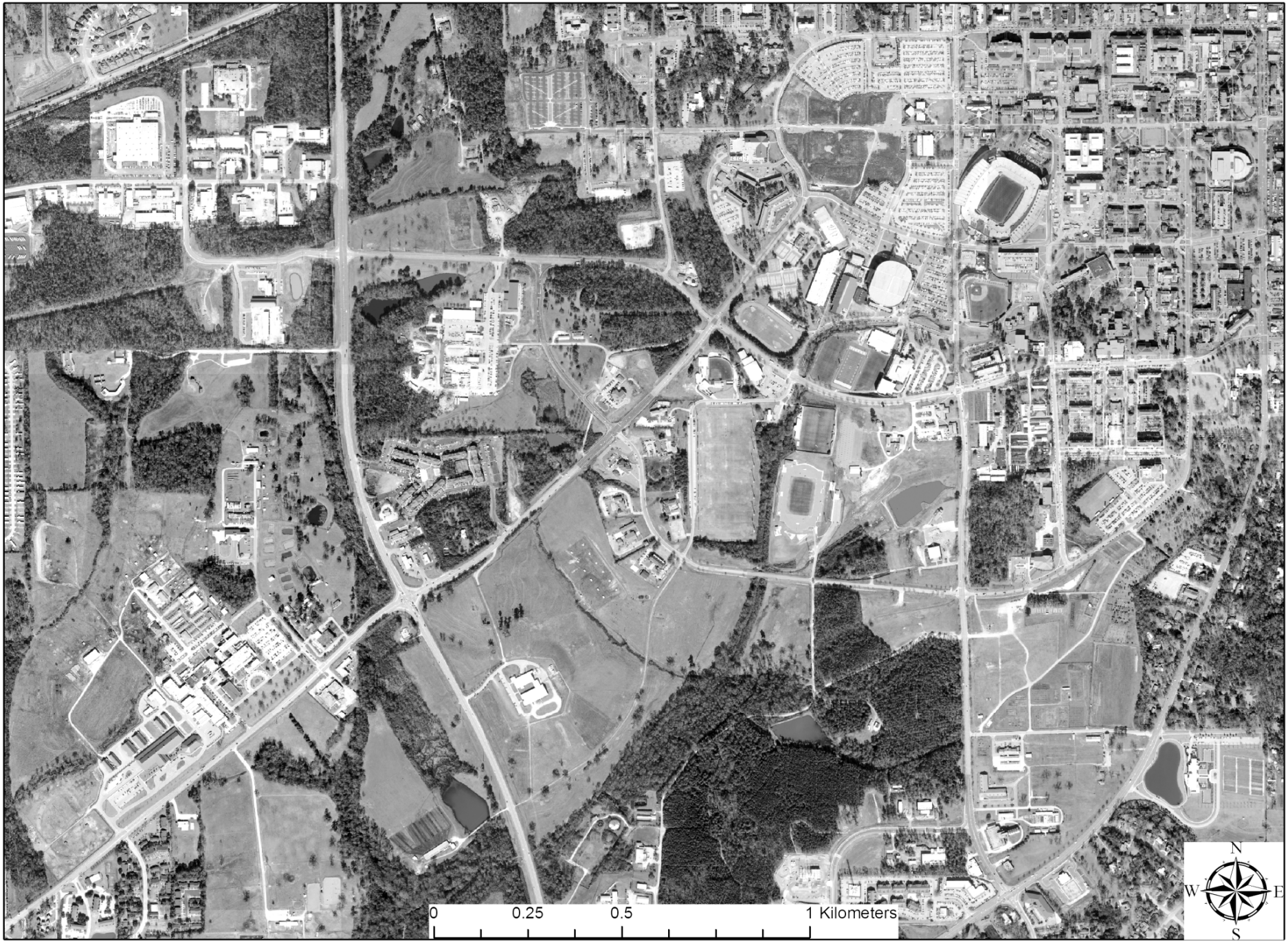
I-TREE ECO PILOT PROJECT

- Project Overview:
  - Project was initiated in May 2009
  - Inventory managed areas of the AU campus
- Project Objectives:
  - Conduct a 100% inventory an i-Tree Eco compatible form and complete GIS database layer from the data (i.e. tree locations will be captured).
  - Analyze model components relative to southern species & models, and make i-Tree Eco plot sampling comparisons with the 100% inventory.
  - Develop class & field training material and conduct a regionally advertised training class for i-Tree Eco including QA/QC components.

- Auburn University is a Certified Tree Campus USA
  - Standards:
    1) Campus Tree Advisory Committee
    2) Campus Tree Care Plan
    3) Dedicated annual expenditures for the Campus Tree Care Program
    4) Arbor Day Observance
    5) Service Learning Project

- i-Tree Eco Summer Training Workshop
  - June 15-17th, 2010 at Auburn, AL
    - i-Tree Eco
    - GPS equipment
    - Field data collection
    - i-Tree Eco Shell set-up
    - i-Tree Eco Shell output reports
- Regional Training Center

- Specific Objectives:
  1) Conduct a 100% tree inventory of all managed areas of the AU campus
  2) Compare ecosystem services between an urban protected and urban managed forest
  3) Develop predictive open-grown crown width equations for 3 southern urban tree species
  4) Evaluate i-Tree Eco plot sampling protocol


0
0.25
0.5
1 Kilometers
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100% INVENTORY

- Conduct 100% inventory in i-Tree Eco compatible form and complete GIS database layer from the data
  - 1, 2, or 3 person crew
  - GPS collection unit, ‘Loggers tape’, laser hypsometer
  - 16 attributes
  - Inventory completed in Spring 2010
  - Inventory covered approximately 600 ac:
    - AU main campus = 587 ac
    - Davis Arboretum = 13.5 ac

100% INVENTORY RESULTS AS OF JUNE 2010

- Total of 8,236 trees
- 3,980,914 lbs of stored Carbon
- Sequesters 173,424 lbs of Carbon/year
- Auburn main campus:
  - Top species:
    - Crapemyrtle (*Lagerstroemia* spp.) 20.2%
    - Willow oak (*Quercus phellos*) 7.3%
    - Loblolly pine (*Pinus taeda*) 7.1%

	AU Campus	Davis Arboretum
Total Area (ac)	587	13.5
Number of Trees	7,345	891
Number of Tree Species	139	160
Average dbh (in)	6.5	9.6
Average height (feet)	28	42
Estimated Canopy Cover	16	62
Carbon Storage (lbs)	3,472,400	508,514
Gross Carbon Sequestration (lbs/year)	152,123	21,301
Air Pollution Removal Value ($)	15,880	3,013

Tree Condition Rating evaluation

% Dieback vs. Overall Tree Condition Rating

				Overall Condition				
		E	**G**	**F**	**P**	**VP**	**D/D**	**Total**
	E	9	4113	1387	292	71	1	**5873**
	G	0	319	480	147	43	1	**990**
DIEBACK	**F**	0	13	130	115	68	2	**328**
	P	0	0	17	19	22	11	**69**
	C	0	0	2	13	4	10	**29**
	D/D	0	0	0	47	5	4	**56**
	Total	**9**	**4445**	**2016**	**633**	**213**	**29**	**7345**

- Crew Size Evaluation
  - Trees ≤ 10 in
  - Appropriate crew size will vary

Crew Size	Trees Inventoried	Average Time (minutes/tree)	Average Inventory (trees/hour)
3 person	581	2.18	27.5
2 person	716	1.77	33.9
1 person	365	2.12	28.3

ECOSYSTEM SERVICES COMPARISON

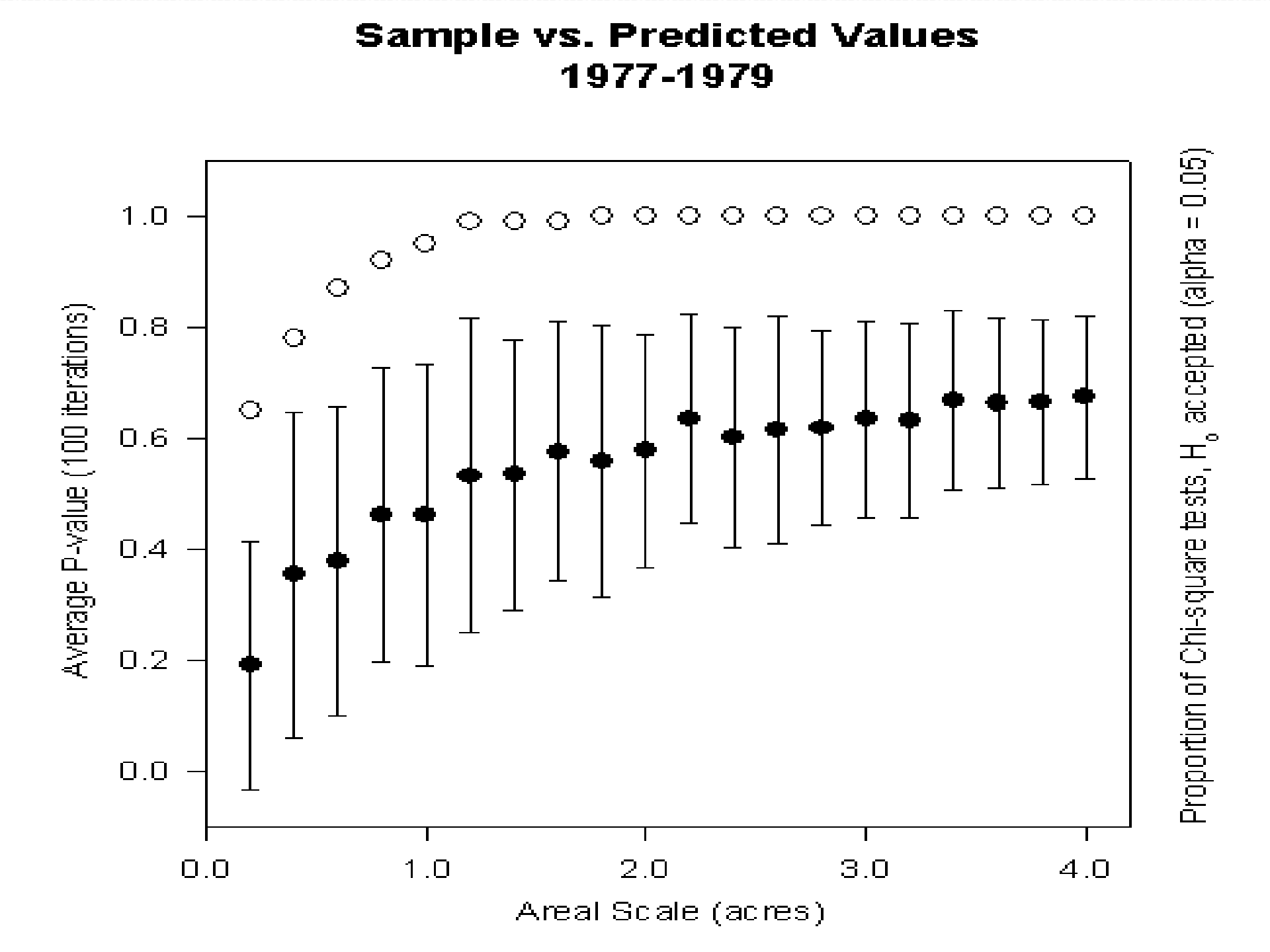
- Evaluation of Ecosystem Services
  - Compared AU main campus (urban) vs. the Davis Arboretum (protected)
    - Specifically: Carbon sequestration
  - Determined that Davis Arboretum sequesters 6x the amount of the AU main campus on a per acre basis
    - AU campus = 259 lbs/ac/year
    - Davis Arboretum = 1,578 lbs/ac/year
  - Protected Areas

PREDICTIVE O-G CROWN WIDTH EQUATIONS

- 3 common southern urban tree species:
  - *Quercus lyrata* (overcup oak)
  - *Quercus Nuttallii* (Nuttall oak)
  - *Quercus phellos* (willow oak)
- Model: crown width = $\beta_0 + \beta_1 dbh + \beta_2 dbh^2$
  - crown width = dependent variable
  - dbh = independent variable
  - dbh^2 = independent varibale
- Reduced field work

PLOT SAMPLING EVALUATION

- Evaluation of plot sampling protocol for i-Tree Eco
  - Standard protocol: 200, 1/10 acre circular plots
- Determine the number of plots needed
  - Ecosystem Services
  - Proportionality (% total area)
  - Ran different sample sizes vs. the 100% inventory
    - Air pollution removal value ($)
    - Values were broken up into 5 categories
    - Ran 100 simulations per sample size
    - Chi-square comparison
    - 80% agreement


Sample vs. Predicted Values
1977-1979
Average P-value (100 iterations)
1.0
0.8
0.6
0.4
0.2
0.0
0.0
1.0
2.0
3.0
4.0
Areal Scale (acres)
Proportion of Chi-square tests, H$_o$ accepted (alpha = 0.05)

- Preliminary Conclusions:
  - Samples sizes ran:
    - 2-10, 13, 14% samples
- Future Analyses:
  - Run smaller sample sizes
  - Run with out the arboretum
  - Stratified Sampling
    - Save time & money

POST I-TREE ECO PROCESSING

- Tying i-Tree Eco Ecosystem Services data to the inventoried tree data and locations in a GIS program
  - Perform more analyses

ACKNOWLEDGEMENTS

- Auburn University
  - School of Forestry & Wildlife Sciences
  - Committee:
    - Dr. Arthur H. Chappelka, SFWS
    - Dr. Gary J. Keever, Department of Horticulture
    - Dr. Edward F. Loewenstein, SFWS
- USDA Forest Service
  - Urban Forestry South
    - Dudley Hartel
    - Eric Kuehler

QUESTIONS/COMMENTS?