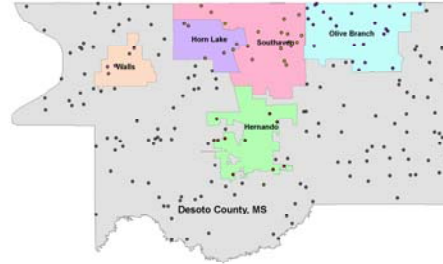
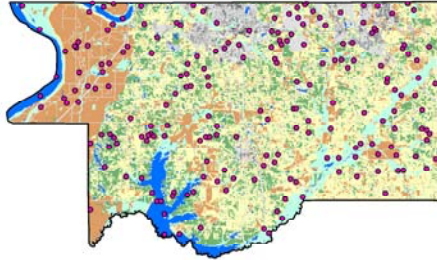


## Using i-Tree to Assess the Effects of Urbanization in Desoto County



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This presentation was given at the Mississippi Urban Forestry Council Annual Meeting in Horn Lake, MS on April 23, 2010.

This presentation will walk you through the application of several i-Tree tools as they are being used here in Desoto County this summer, and how we are using this project as a pilot project to develop cost and time-saving tools so that others can use these tools in their own communities without having to reinvent the wheel.

# Overview

- Background / History of Project
- Project set-up
  - Preliminary project stuff
  - Generating sample plots
- Information provided from i-Tree tools
  - Vue, Eco, Hydro
- Extensive training workshop



## History of the Project

- Urbanization pressures from Memphis
- August 2009 meeting with
  - MS Extension
  - Hernando planning
  - Horn Lake Urban Forester
- Desire to quantify the effects of urbanization
  - Stormwater runoff, erosion, impervious surfaces
  - Air pollution concerns (O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>)
- Desire to use i-Tree models
  - Eco for forest resources
  - Hydro for water quality/quantity



In the 1970 census, the population of Desoto County was roughly 36,000. In 2009, the estimated population of the county is 159,000. That is a population increase of about 430% in 35 years. Because land is plentiful and affordable and because taxes are lower than in TN, people are leaving Memphis to live in Desoto County. With more people comes more infrastructure. In 2009, we sat down to discuss some of the concerns that citizens had regarding this increase in infrastructure. The two highest concerns dealt with increased stormwater runoff and erosion due to impervious surface cover and air pollution. Because of her familiarity with i-Tree, the County Extension Agent wanted to use i-Tree Eco to assess the county's forest resources and i-Tree Hydro to assess water quality/quantity in the county.

## History of the Project

- Landscape scale project
  - Entire county
  - Include municipalities in project
- Funding / partnership development
  - Mississippi Forestry Commission
  - County GIS Department
  - Municipalities
  - Land trusts and other NGO's
  - EPA and NRCS
  - MSU Forestry



A plan was devised to conduct a landscape scale project to assess not only the entire county, but to also assess the five municipalities within the county. Potential funding and partnerships were also discussed. The obvious partners were MFC, the county and the municipalities. Other potential partners included NGOs, other federal agencies, and MSU Forestry.

## Project Set-up

- Project efficiency documents developed
  - Project timeline
  - Project cost sheets
  - General time allotment sheets
  - Available at [urbanforestrysouth.org](http://urbanforestrysouth.org)
    - Key word: Eco



So we had the objective and scope of the project as well as potential funders for the project. Now we needed to develop a plan to bring all of this together. We first developed a timeline to keep us on track with moving the project forward. To ensure enough funds were available to complete the project, we developed a generic cost sheet based on other Eco projects from around the Southeast. Lastly, so that everyone knew how much time was needed to commit to this project, a general time sheet was created. So that no one else has to reinvent the wheel, I have posted these helpful documents on our website using the key word “Eco”

# Project Timeline

<b>i-Tree Eco Project Step</b>	<b>Date Completed By</b>	<b>i-Tree Eco User's Manual Page</b>	<b>Who</b>
Identify the type of data to collect (plantable space, energy, shrub, hydro) and how to collect the data (paper or PDA)	09/15/09	P. 5 and P. 13	County/city
Decide on stratification type: grid, randomized grid, random, etc.	09/15/09	P. 7	County/city
Create database of proposed funding sources	09/15/09		County/city
Create county GIS layer and individual city layers (city limits plus 5-year proposed annex area)	09/15/09	N/A	GIS
Download NLCD images for the county	09/15/09	P. 8-10 and Appendix 1 and 2	GIS
Generate randomized plots for county and individual cities and create Eco-ready reports needed for project set-up	10/15/09	Appendix 1 and 2	GIS
Create database of parcel owners to be contacted for plot access	11/15/09		GIS
Using i-Tree Eco shell, create the project for the county	11/15/09	P. 11-12	MS Extension
Begin contacting landowners for plot access permission	01/15/10		County/city
Confirm funding sources for project	01/15/10		County/city
Follow-up with landowners that have not given permission for plot access	03/15/10		County/city
Create database of potential volunteer data collectors	03/15/10		MS Extension
Advertise for MSU forestry student data collectors	03/15/10		MS Extension
Solicit volunteer data collector as to when they can commit to collecting data	04/15/10		MS Extension
Confirm status of forestry student availability with MSU	04/25/10		MS Extension
Confirm plot access permission with land-owners	05/01/10		County/city
Create waypoint file to be loaded onto GPS units for plot center location	05/01/10		GIS
Print aerial photos for each plot for data collectors	05/01/10		GIS
Print map of all plots by city/county for data collectors	05/01/10		GIS
Gather all field and data collection equipment	05/10/10		MS Extension
Confirm dates that volunteers can help collect data	05/10/10		MS Extension
Data collection training workshop	05/17/10	P. 17-42	Eric

This is the generic timeline that was created for the Desoto County project identifying the step needing to be completed and the date by when it should be completed, where in the Eco User's Manual more information can be found about that step, and who is responsible for completing it.

# Cost Estimation

## **i-Tree Eco Project Cost Estimation**

Number of Plots: 200 <sup>1</sup>

Number of personnel per crew: 2 <sup>2</sup>

Cost per crew day: \$800 (\$100/hr x 8 hours/day) <sup>3</sup>

Number of plots per day: 3-4 (as few as one and as many as seven per day) <sup>4</sup>

Total number of days for project with 200 plots: 50-67 days

Total cost based on 200 plots, 3 plots/day avg., and \$800/day: \$40,000 - \$50,000

<sup>1</sup> As a general rule, 200 plots (1/10 acre) in a stratified random sample in a city will yield a standard error of about 10% for an estimate for the entire city (e.g., number of trees in the city). With the first 100 plots, the standard error drops more rapidly than with the second 100 plots, but standard error continues to drop with increased sample size. A crew of two people can typically measure 200 plots within one summer for a city with about 20% tree cover. Actual number of plots measured varies based on many factors, including size of city (increased drive



To give some idea about how much the project will cost if contracted out to a professional organization, this cost estimation sheet was developed. These approximate numbers were compiled from other Eco projects done around the Southeast.

**i-Tree Eco - Project Time Estimation**

Activity	Estimated Time (Hrs)
<b>GIS-related:</b>	
create area-of-interest layer, collect NLCD files, create plots layer and Eco-ready reports, develop property-owner database from parcel GIS layer	4
create waypoint file for plot centers and load onto GPS units for field crews, create and print plot aerial photos and area maps for field crews	16
<b>Total hours</b>	<b>20</b>
<b>Project Coordinator:</b>	
create and format project using i-Tree Eco, data bundling and unbundling for processing	1
contact parcel-owners for plot access permission (250 plots, printing/mailling 500 letters - twice [16 hrs], phone calls to non-respondent landowners @ 5min./call; 250 calls = 21 hrs)	40
train volunteer data collectors	16
organize volunteer data collectors (2 hrs/day for 63 days)	126
conduct quality assurance checks on plots and on data entry (4 hrs/week @ 12 weeks)	48
data entry @ 5 minutes/plot (if not using PDAs)	21
<b>Total hours</b>	<b>252</b>
<b>Field Crews:</b>	
8 hour days and 2 person crews = 16 hrs/day. averaging 4 plots per day would give 63 days to complete 250 plots	1008
<b>Total Project Hours</b>	<b>1280</b>



And lastly, so that Joy would know roughly how much time will need to be allocated for the project by the various components, a time estimation sheet was developed.



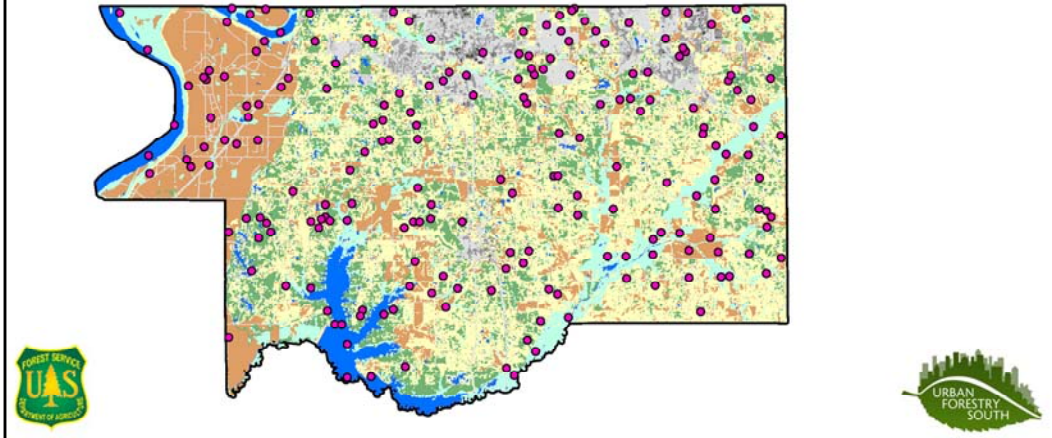
## Project Set-up

- Develop partnerships
  - For funding and/or in-kind assistance
- Secure funding
  - \$30,000 U&CF grant from MFC
- Line up additional assistance
  - Desoto County GIS providing maps/GIS assistance
  - MFC providing technical assistance
  - MSU providing Forestry students for data collection
  - Master Urban Foresters assisting in data collection
  - Etc.



## Project Set-up

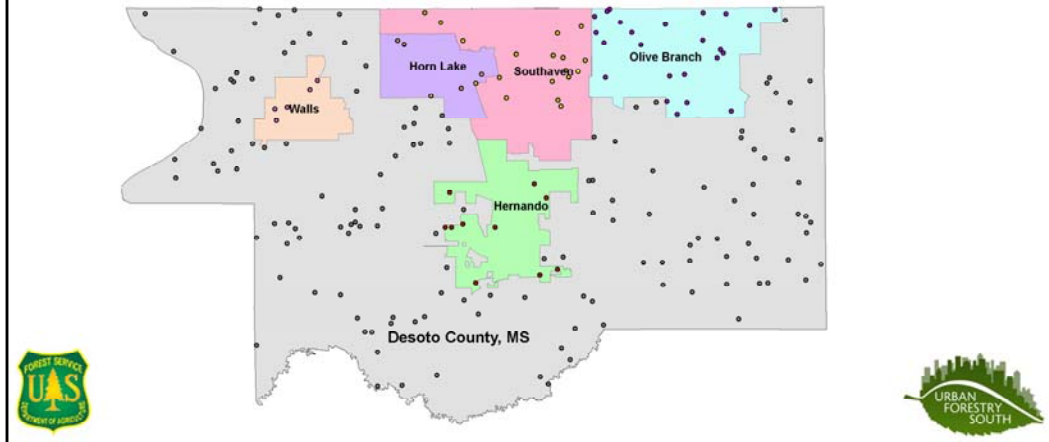
- County and municipal plots
  - randomly generated
  - Land use classifications (NLCD 2001)



So this is basically how we intend to conduct this project. The county GIS department pulled freely available 2001 NLCD land use, canopy cover, and impervious surface cover imagery from the internet and selected 200 random plot locations around the county. Land use categories include developed (from open to high density), agricultural, forests, and wetlands.

## Project Set-up

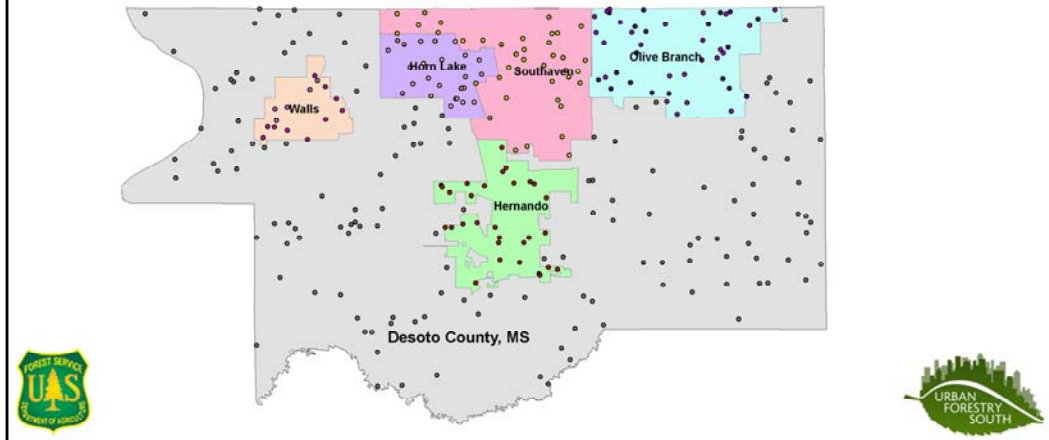
- 200 County plots
  - some fell within municipal boundaries



Of these 200 plots, we had quite a few that fell within incorporated municipal boundaries. That's good because we are very interested in assessing each municipality separately from the county, and these plots can be used in those assessments as well.

## Project Set-up

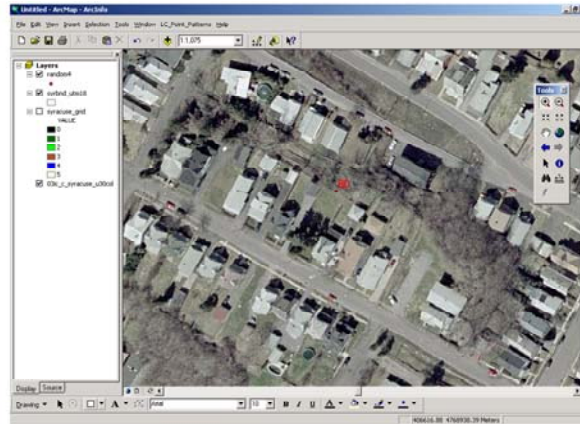
- 20 additional municipal plots each
  - Except for Walls (10 additional plots)
- 290 total plots for the project



Additional plots were placed in each municipality for a total of 290 plots. Not plots will be assessed due to parcel owner's declining to grant access or because parcel owners could not be identified. However, we think we have enough plots in each landuse category to provide good statistical representation.

## Project Set-up

- GIS data provided landowner information
- Request permission to access property



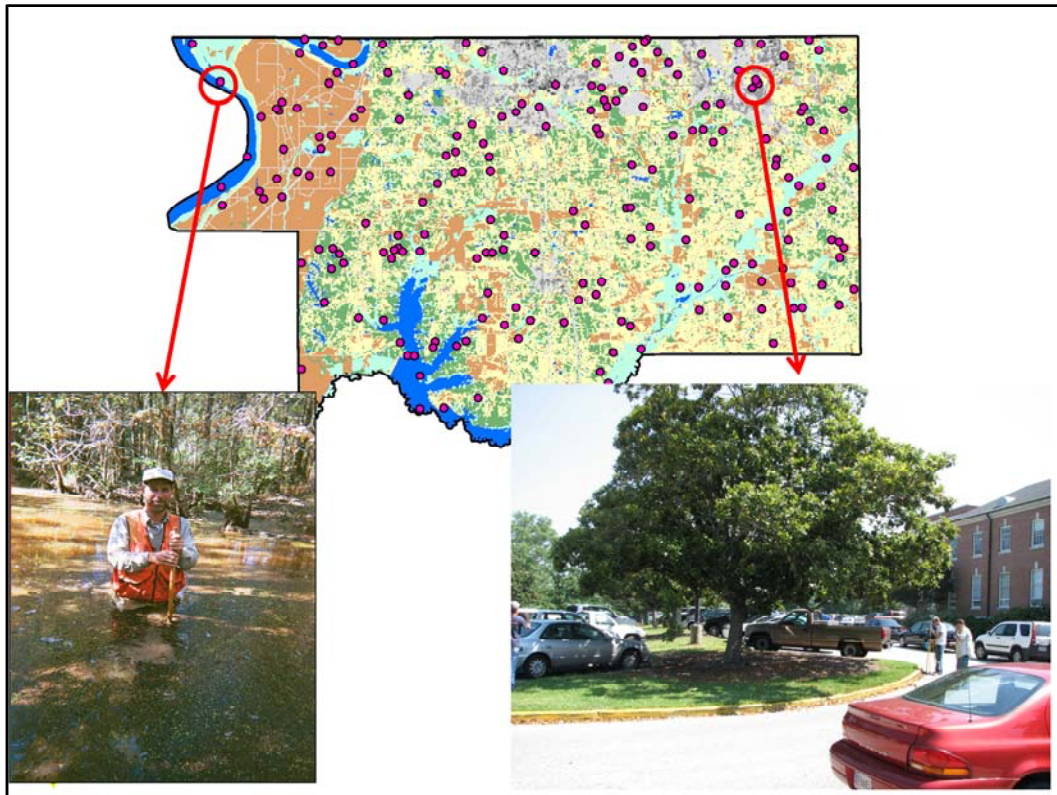
For each plot, the GIS dept. was able to provide parcel ownership information so that permission could be asked for the data collectors to enter the property boundaries to inventory it.

## Project Set-up

- Advertise for and secure data collectors
  - MSU Forestry students
  - Natural resources students from area colleges
  - Volunteers (**caution**)
- Organize plots by degree of difficulty
  - Volunteers will take the more urban plots
  - Paid personnel assess forested/natural plots



With funding secured, Joy then advertised for project data collectors. Advertisement at MSU for forestry students and at other local colleges and universities for natural resources students was done as well as informing local volunteers. A word of caution about using volunteers, some plots can be quite overwhelming and intimidating especially in natural areas. From past experience, I have seen where energy spent organizing volunteers adds a great amount of time to the project coordinator's day. So a potential plan for this project is for the volunteers to assess the more urban plots and the paid personnel will assess the more natural plots.



By viewing the aerial imagery for each plot, we can decide which plots to give to the volunteers and which to give to the students.

## i-Tree Results

- What is all of this going to provide?
- Eco
  - Forest structure, function, and value
    - Forest structure by land use and size
      - Species composition/density, size class, condition
    - Pollution removal by month
    - Carbon sequestration and storage by land use
    - Energy conservation effects due to trees
- Hydro
  - Water quality and quantity
    - By watershed



Once we have collected all of these data, what will these i-Tree tools provide us?



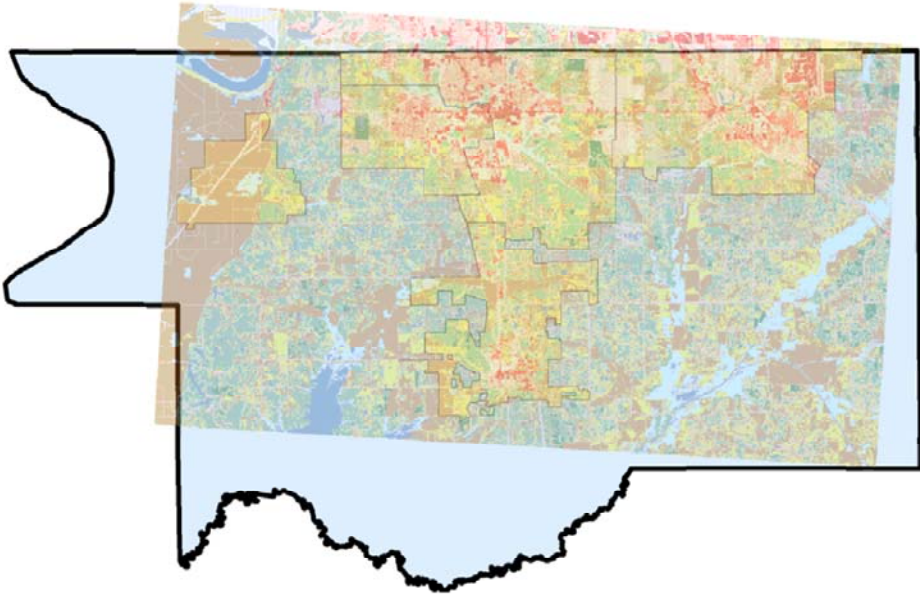
## i-Tree Results

- Vue
  - Canopy assessment/benefits tool
    - Preliminary canopy/impervious cover information
      - Uses 2001 NLCD imagery
      - 30 m<sup>2</sup> resolution
    - Annual pollution removal due to trees
    - Carbon sequestration and storage by land use
    - Stocking levels by land use area
    - Canopy change scenarios
  - Quick and easy without GIS software



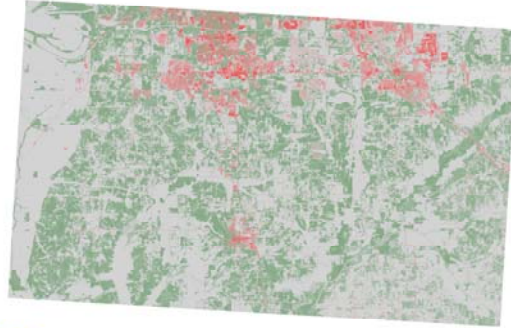
Preliminary results have already been obtained using another i-Tree tool called i-Tree Vue. Using that same NLCD imagery obtained to set-up the Eco project, I was able to estimate annual pollution and carbon removal due to trees by land use category for the county.

# i-Tree Vue Project



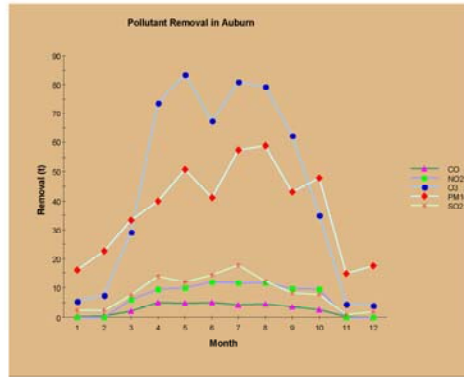
## i-Tree Vue Results

- Desoto County urbanizing portion
  - Area = 311,000 acres
  - Tree canopy = 30.3%
  - Impervious = 3.8%
  - Developed area = 15.4%
    - 48,000 acres
    - Tree canopy = 17.8%
    - Impervious = 23.8%
- i-Tree Eco will provide more accurate numbers



## i-Tree Report Uses

- Planning
  - Development patterns
  - Natural resource management
  - Strengthen policy and ordinances
    - For development
    - For natural resources
- Track changes over time
  - Permanent plots
  - Re-inventory every 5 years



What can the county and municipalities use these results and reports for?

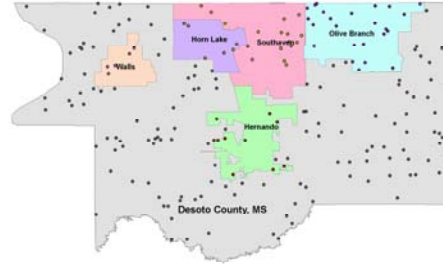
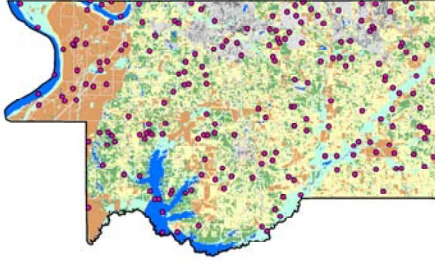
## Extensive i-Tree Eco training workshop

- May 17 – 18 in Hernando
- In-depth project set-up (step-by-step)
- Hands-on data collection strategies
  - Plot set up details
  - What and how to collect data
  - How to use the field equipment
  - Data entry
- Explanation of the reports that will be generated
- Limited to 25 people



To train the data collectors for this project and to teach others about how to conduct an Eco project in their community, we will have an extensive, regional training workshop here in Desoto County in May. We plan to go over, in detail, every aspect of an Eco project from start to finish. To register for the training, talk with Joy Anderson.

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