STRATUM Technology Showcase

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USDA Forest Service
Center for Urban Forest Research
Davis, CA

CaUFC Annual Conference
Pasadena CA, Sept. 9, 2006
Today

- Overview
- Install STRATUM
- Data Collection – Volunteers & PDAs
- An Example Project
- Reports
- Making Use of Results
- Question & Answer
Common Goal

“To improve the condition and extent of the urban and community forest”
i-Tree: Demonstrating That Trees Pay Us Back!

Trees are assets, management adds value by increasing return on investment
Public/Private Partnership

- USDA Forest Service
  - Research and Development
  - State and Private Forestry

- Davey Tree Expert Co.

- National Arbor Day Foundation

- Society of Municipal Arborists
Pulling it Together

i-Tree Cooperative was formed to deliver all Forest Service applications in a single software suite:

- Credible, USDA FS peer-reviewed tools you can trust
- Public domain software
- Accessible
- Technical support
- Training workshops
What’s Included?

Two urban forest assessment tools:
- Assessing street tree populations
- Assessing urban ecosystems

Multiple utilities:
- Data collection & transfer
- Inventory management
- Storm damage assessment
How is i-Tree Different?

- Peer-reviewed science
- Public domain software
- Information on structure, function, value & management needs
- Scalable analyses: Tree → Neighborhood → Community
- Results provided at species & tree level
- Local field inventory data required!
- Statistically based, standardized sampling protocol
Assessing Street Tree Populations: STRATUM

STRATUM assesses:

- Structure
- Function
  - Energy
  - Air pollution
  - Stormwater
  - Carbon
- Property Value
- Value
- Management needs

<table>
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<tbody>
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</table>
Assessing Urban Ecosystems: UFORE

UFORE assesses:

- Structure
- Function
  - Energy
  - Air pollution
  - Carbon
- Value
- Management
  - Health
  - Pest impacts
i-Tree Management Utilities

🌳 MCTI—Mobile Community Tree Inventory

🌳 SDAP—Storm Damage Assessment Protocol
Mobile Community Tree Inventory System

- Simple, easy-to-use tree inventory system satisfying a variety of community needs
- Data collection and management, i-Tree PDA & STRATUM compatible
How does MCTI work?

- **Variable level of applicability**
  - Paper to PDA implementation
  - Day-to-day management of street & park tree records

- **Variable inventory protocols**
  - Condition
  - Maintenance
  - Risk tree

- **Three components**
  - Paper tally sheet template
  - Desktop application
  - PDA data collection program
MCTI Desktop Application
**Reporting Screen – Species Distribution**

*Tab One – Species Rating

Gives a bar graph of 10 most frequently found species

10 most frequently occurring street tree species in survey – displayed in bar chart format

- Copy Currently Displayed Graph to Windows Clipboard
- Updates Graph to display any changes in database

Top 10 Species Distribution - Based on 36 trees

Created 05/25/2004
PDA to Desktop Data Transfer
STRATUM/MCTI
Storm Damage Assessment Protocol Utility

- Standardized method to assess widespread storm damage in a simple, credible, and efficient manner immediately after a severe storm.
- Provides information on the time and funds needed to mitigate storm damage.
How does SDAP work?

“Protocol” indicates

- Rigor
- Uniformity
- Adherence

Three replicable components

- Sampling method
  - Pre-storm set-up
  - Post storm sampling
- Estimating engine
- Reporting means
Pre-Storm Sampling

- Set-up permanent plots
- Tree density count
- Train post-storm survey team
Post-Storm Assessment

- Re-visit sample segments
- Estimate
  - Crown loss
  - Hazard pruning & removals
Reporting

Analyze costs based on local variables

<table>
<thead>
<tr>
<th>Community:</th>
<th>Report Date: 5/Jan/2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note: numbers on this page were generated by a “Storm Damage Estimate Template” as revised in 2004 by the USDA Forest Service and Davey Resource Group using post-storm field observations of random plots</td>
<td></td>
</tr>
</tbody>
</table>

**Estimated Cost of Tree Damage**: $0

**Community Values**

<table>
<thead>
<tr>
<th>Street Miles</th>
<th>Removal Cost/ hr</th>
<th>Pruning Cost/ hr</th>
<th>Brush Cost/ sq. ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>55</td>
<td>55</td>
<td>6</td>
</tr>
</tbody>
</table>

**Detailed Post-Storm Calculation 1: Removals and Hazard Pruning**

<table>
<thead>
<tr>
<th>DBH Class (inches)</th>
<th>Total of Removal Trees</th>
<th>Removal Time per Tree</th>
<th>Total Hours for Removal</th>
<th>Total Hazard Prune Trees</th>
<th>Time Per Hazard</th>
<th>Total Hours for Hazard Prune</th>
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</thead>
<tbody>
<tr>
<td>6-12</td>
<td>0</td>
<td>3.2</td>
<td>0</td>
<td>0</td>
<td>0.75</td>
<td>0</td>
</tr>
<tr>
<td>13-18</td>
<td>0</td>
<td>5.1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>19-24</td>
<td>0</td>
<td>7.7</td>
<td>0</td>
<td>0</td>
<td>1.5</td>
<td>0</td>
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<tr>
<td>25-30</td>
<td>0</td>
<td>10.2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>31-36</td>
<td>0</td>
<td>12.5</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>37-42</td>
<td>0</td>
<td>20.4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>43+</td>
<td>0</td>
<td>29</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>All Rural</td>
<td>0</td>
<td>6.2</td>
<td>0</td>
<td>0</td>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<table>
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<tr>
<th>Plot Info</th>
<th>Method</th>
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<td>Pet Street Miles in Sample</td>
<td>0.00%</td>
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**Estimate Components**

- % Street Miles Sampled: 0
- Removals: 0
- Total Removal Hours: 0.0
- Total Removal Cost: $0
- Hazard Prune: 0
- Total Pruning Hours: 0.0
- Total Pruning Cost: $0
- Total Canopy Loss: 0
- Total Brush cut yards: 0.0
- Total Brush Cost: $0
- Total Cost: $0
Who will use i-Tree?
i-Tree Supports Local U&CF Programs

- Highlight value of trees
- Justify investment in tree programs
- Leverage funds from other sources
- Develop management plans
- Manage data
- Baseline for tracking progress
How do I get i-Tree?

trees Initial public release of i-Tree has begun!
trees Telephone & on-line support available

Workshop Schedule

♦ 2006: Clemson, SC; Golden, CO; Minneapolis (Nov)
♦ 2007: National training-of-the-trainer workshop scheduled for early spring

User Feedback = i-Tree Refinement
How do I get i-Tree?

Visit:

- [http://www.itreetools.org](http://www.itreetools.org)
- Sign up for e-mail newsletter
  - Updates will be posted on-line
Assessing Street Tree Populations

STRATUM assesses:

- Structure
- Function
  - Energy
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- Property Value
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How does STRATUM work?

- **Input:**
  - Sample inventory (3-5%)
  - Or existing inventory
  - Price adjustments, management costs

- **Output:**
  - Graphs, charts, tables

- **Benefit:**
  - Baseline data to more effectively manage the street tree resource
What makes STRATUM different?

- Street trees, not entire urban forest
- Costs, not only benefits
- Management tool, not only for advocacy
- Tree inventory-based, not GIS
- Answers the question: Do the accrued benefits of street trees outweigh the cost of their management?
Data Collection

- Working with volunteers
- Data collection methods
  - Paper
  - i-Tree PDA utility
Volunteer Data Collection: Minneapolis Pilot Project

- Summer of 2004, i-Tree software tested using volunteers
- Professionals collected information along with volunteers
Purpose of Pilot Project

- Accuracy of volunteer data collection
- Usability of maps & PDAs
- Recruitment, training, organization of volunteers
Volunteer Project Logistics

- >3000 trees in sample
- Divided city into 20 different groups, needed at least 3 per team or 120 as a goal (89 volunteered)
- Each group inventoried 18-24 street segments
- Allowed each team 30 days to complete their data collection.
Volunteer Recruitment

- Informational open house
- Newspaper article in Minneapolis paper
- Neighborhood groups
- Emails to local corporate volunteer coordinators
- Email network
- Tree care advisors / Master Gardeners
Volunteer Training

- Volunteer manual
- Hands-on one day training
Training Components

- Classroom tree ID
- Outdoor tree ID
- Tree characteristics
- Measurement
- Software/PDA operation
Volunteer Organization

- Organizing teams
- Scheduling data collection
- Distribution of groups
Tools

- PDA & charger
- PDA backup chip
- DBH tape
- Map
- Reference materials
- Phone
Volunteer Recognition

🌿 Recognize volunteers for their efforts
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
Results & Recommendations

- 80% accurate for species, size, leaf condition.
- Less accurate for conflicts (66%) & maintenance needs (49%) due to training.

With more focused training, volunteers can collect reliable data:

- Cover PDAs, maps, tree assessment in 6-hr day
- Separate 3-4 hour tree-ID session w/ “dress rehearsal”
- Slide library showing different management needs
- Demonstrate how to troubleshoot PDAs
- Cover street side safety tips
- Show key ways to distinguish most important species
Results & Recommendations

- Organization: use questionnaire to determine who wants to survey trees in own neighborhood and group together in training.
- Develop formal troubleshooting process before deploying volunteers so assistance is available.
- Have “refresher session” soon after deployment to review solutions to common problems.
Summary

Using volunteers can be successful, evaluate if it is the right choice for your community.
Data Collection Methods

Two options:

- Paper forms
- Pocket PC
Paper

Advantages
- Low up-front cost
- No technical training
- No batteries
- Paper doesn’t break when you drop it

Disadvantages
- Error-prone
  - Deciphering
  - QA harder
- Can be slower in field
- Much slower in office
PDAs

Advantages
- Fast data collection
- Low error rate
- No data entry required
- Data transfer automated

Disadvantages
- Up-front equipment expense
- Training required
- Require maintenance / care
  - Charging batteries
- Units not protected from elements
  - Water, dust, etc.
Choosing a PDA

- Compatible only with Pocket PCs
  - Alternative OS (Palm, BlackBerry, Psion, PocketLinux, etc.) are not compatible.
  - Windows Mobile 2002 or 2003 operating systems (OS).
  - Mobile 5.0 operating systems

- Other considerations
  - Weatherized models
  - Back-up media slot
  - Protective slip covers or carrying cases
  - High capacity batteries
  - Cost ($200-400 or more)
PDA-based Inventory with i-Tree Utility

Two Interfaces

- Desktop
- Pocket PC

STRATUM/MCTI PDA Utility

A cooperative initiative between:

i-Tree

UAS

DAVEY

RESOURCE GROUP

The National Arbor Day Foundation

Version 20051231
Desktop Interface

STRATUM/MCTI PDA Utility

A cooperative initiative between:

i-Tree

The National Arbor Day Foundation

Version 20051231
PDA Interface
STRATUM v 3.0
Street Tree Resource Analysis Tool for Urban Forest Managers

Center for Urban Forest Research
Pacific Southwest Research Station, USDA Forest Service
Making Use of Your Results
Minneapolis Experience

- Minneapolis Evaluation Study
- Minneapolis Municipal Forest Assessment
- Midwest Community Tree Guide
- [http://www.itreetools.org/resource_learning_center/reports.html](http://www.itreetools.org/resource_learning_center/reports.html)
- Other Regional Tree Guides and Municipal Forest Reports
  - [http://www.fs.fed.us/psw/programs/cufr](http://www.fs.fed.us/psw/programs/cufr)
Minneapolis Tree Advisory Commission

selected portions of

Annual Report

to the

Minneapolis Park & Recreation Board

Minneapolis City Council & Mayor

January 2006
Minneapolis Tree Advisory Commission

Created in October 2005 by the Minneapolis Park & Recreation Board

GOAL: To enhance the Minneapolis urban forest & improve its long term health.

Introduction: How We Got Here
i-Tree Pilot in Minneapolis

Urban Forestry Analysis & Benefits Assessment Software

The first city in the nation to test the data collection and analysis applications of the i-Tree software suite.

Introduction: How We Got Here

Co-sponsored by MPRB & Tree Trust
The State of the Urban Forest

- Benefits
- Impacts
- Threats

Recommendations

- Resources
- Policies
- Outreach
The Benefits of the Urban Forest

The trees of Minneapolis are THE growing capital asset that benefits everyone in the City.

The State of the Minneapolis Urban Forest
The Benefits of the Urban Forest

Each year Minneapolis street trees provide:

- $6.8 million in energy savings
- $9.1 million in reduced storm water runoff
- $7.1 million increased property value
- Plus improvements to air quality

$24.9 million TOTAL value each year!
Minneapolis Urban Forest Summary

**Number of Trees**
- 979,000

Tree Cover
- 26.4%

Top 3 Species
- Green Ash, Amer. Elm, Boxelder

% of Population <6” Dia.
- 47.3%

Pollution Removal
- 423 tons/year ($1.9 million/year)

Carbon Storage
- 250,000 tons ($4.6 million)

Carbon Sequestration
- 8,900 tons/year ($164,000/year)

Building Energy Savings
- $216,000/year

Avoidance Carbon Emissions
- $16,000

**Structural (Appraised) Values**
- $756 million

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**UFORE**

Urban Forest Effects Model

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Forest Service

The National Arbor Day Foundation

Davey Resource Group
To provide Benefits ...

Each PUBLIC UTILITY requires ongoing public investments

60% of Minneapolis street trees currently need some maintenance
The Impacts of Dutch Elm Disease

Only 10% of Minneapolis street trees are elms. But they generate 30% of tree benefits.
The Impacts—why elms matter

Elms are our largest trees.
The Impacts—why elms matter

LARGE TREES

= MOST BANG FOR BUCK

The State of the Minneapolis Urban Forest
The **Impacts** of Dutch Elm Disease

Minneapolis has irretrievably lost:

- In 2004: 10,153 elms
- In 2005: 6,179 elms

$5.75 million in annual benefits GONE FOREVER
Major **Threats** to the Urban Forest

Disasters are looming
Threats to Minneapolis Tree Population

- Asian Longhorn Beetle
- Gypsy Moths
- Emerald Ash Borer

Graph showing the number of trees at risk and their compensatory value for different threats.
Major **Threats** to the Urban Forest

Most Minneapolis trees are green ash!

Percentage by Tree Species

If Emerald Ash Borer came...

22% of our trees would be clear-cut
RECOMMENDATIONS

• Resources
• Policies
• Outreach
Resources

1. Fund Park Board Forestry to achieve:
   ✓ Timely removals & pruning
   ✓ Stump removal
   ✓ Tree planting
   ✓ Storm response
Resources

1. Fund Park Board Forestry
2. Invest in stewardship campaign
3. Support state funding
4. Advocate planned giving
Policies

1. Adopt urban forestry standards:
   - Incentives for developers
   - Streetscape standards & spec’s
   - Private arborist qualifications
Policies

1. Adopt urban forestry standards
2. Integrate forestry in Comp Plan
3. Institute storm response plan
4. Initiate 50-year vision
Outreach

1. Launch Stewardship Campaign
   - Inform constituents
   - Promote participation
   - Including Citizens Tree Academy
Outreach

1. Launch Ssewardship campaign
   - Encourage tree planting through "1000 Trees Program"
   - Utilize city cable
Outreach

1. Launch stewardship campaign.
2. Enhance 311 for trees.
CONCLUSIONS

The State of the Urban Forest

• Benefits
• Impacts
• Threats

Recommendations

• Resources
• Policies
• Outreach

Minneapolis Tree Advisory Commission
On a broader scale, the USFS study is serving as a framework for cost-benefit analyses of forestry efforts in Minneapolis and Le Center. Le Center has calculated its 900 or so public trees to save some $28,000 in energy expenditures and provide some $8,000 worth of storm-water management services each year. USFS researchers found that nearly taken their place as a necessity, an important part of the urban infrastructure," he says. "Engineers can always tell you how many miles of road and the cost. Well, up until urban forestry started to gather these figures, it was hard to do. Now we have a little better understanding of that value and how it fits into the picture."
How i-Tree makes a difference:

Through i-Tree ... elected officials see proof of the economics of trees, e.g.:

- Annual $ benefits of street trees
- Total $ value of urban forest
- Quantity & cost of maintenance
- Economic losses from DED now
- High % & value of trees threatened
- Costs of deferred vigilance

Resulting in funding, leadership & action.
Questions?

 visita http://www.itreetools.org
Screen Shots of STRATUM and PDA Utility