Coming Soon … A Web-Based Tree Crown Condition Training and Evaluation Tool for Urban and Community Forestry

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Abstract

Training personnel for natural resource related field work can be a costly and time-consuming process. For that reason, web-based training is considered by many to be a more attractive alternative to on-site training. The U.S. Forest Service Southern Research Station in Blacksburg, Virginia is in the process of constructing a website that will provide web-based training to FIA crews, urban foresters, and citizen scientists in the area of urban tree monitoring. Initially, the website will focus primarily on tree crown characteristics but will eventually contain information on site and bole characteristics as well.

Why the Need?

- Train urban monitoring FIA federal and state crews
- Train urban foresters
- Train citizen scientists
- Expose the above people to a variety of tree species
- Expose the above people to different conditions
- Evaluate the ability of people to determine crown properties
- Train people in the use of digital camera approaches to evaluate crowns
- To have a system where people can enter digital pictures to be automatically evaluated

Target Audience

- Urban monitoring FIA federal and state crews
- Urban foresters and technicians
- Citizen scientists
- University students
- Scientists
- Concerned citizens

Crown Characteristics

- This is where we are focused right now since this is where our expertise lies.
- Tree crowns provide an indicator of overall tree health.
- Crown characteristics often provide a direct link to tree growth and vigor.

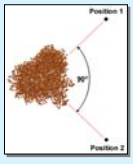
Crown Analysis Sub-Sections

- Training Module
- Testing Module
- Do-It-Yourself Crown Analysis Software

www.srs4702.forprod.vt.edu/urbantree/

Training Module

- Tutorial that provides step by step instructions for evaluating individual tree crown conditions in urban areas
- Discusses terminology used in crown assessment and measurement techniques
- Most information taken from FIA Phase 3 Field Guide



Crown Measurements

Crown Diameter – average width of the tree's drip line

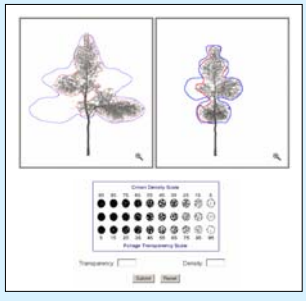
Live Crown Ratio – live crown height divided by the total live tree height

Crown Density – amount of crown branches, foliage and reproductive structures that blocks light visibility through the crown

Crown Dieback – percentage of the live crown area with recent mortality of branches with fine twigs

Foliage Transparency – amount of skylight visible through the live, normally foliated portion of the crown

- Once training is complete, an individual can test their crown measurement skills.
- 10-20 trees of varying species, density, and transparency



Testing Module

Objectives

- To examine the repeatability of observer estimates of crown transparency and density with controlled models
- Compare observer values to our image processing solutions
- Determine how much error is due to human variability

Summary

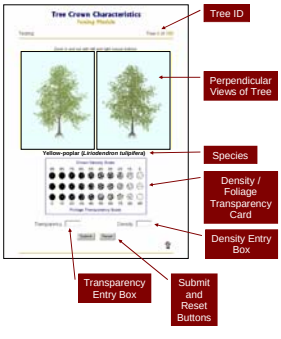
- Current plan is to use 100 trees with 2 perpendicular views of each tree.
- Tree images appear in random order.
- Observer enters estimates of crown transparency and density for each tree.
- Values are sent to a database along with user ID and timestamp.
- Observer does not see correct value

XFrog Tree Modeling Software

- Used to create 3D trees of different species and sizes
- Can control density and transparency values
- Can change the structure of the tree

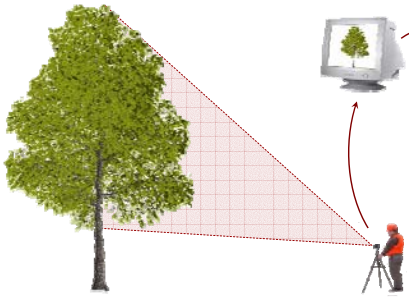
Red Oak (View 1)

Red Oak (View 2)



Do-It-Yourself Crown Analysis

- On-line tool where people can upload digital images of their own trees for customized analysis
- Users could include arborists, urban foresters, FIA personnel, citizen scientists, and others.

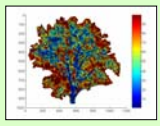


Procedure

- Person takes digital photograph of tree crown using guidelines specified (resolution, etc…)
- Information such as the species, distance to tree, and slope is collected (depending on the type of output information the user wants)
- Image is uploaded to the website and other relevant information collected
- Image is processed on the server using crown analysis software
- User is provided with a report on the crown analysis

The Software

- Calculates density and transparency estimates from digital photographs
- Future version will calculate tree height, crown diameter, crown ratio, and leaf surface area estimates.



Uses

- Monitor individual tree health over time
- Based on leaf area estimates, can estimate such things as rainfall interception and pollution removal
- Data can be used in the UFORE model