Tree Hazard Identification

Visually Assessing the Canopy

W.J. Rowe II
Community Forester
Alabama Cooperative Extension System
The Canopy

Central Park in Fall
What is the canopy?

- Structural Support
  - Leaves
  - Fruit
Transportation and Distribution

- water
- sugars
- minerals and organic compounds
What is the canopy?
The Canopy

Trees in any city environment are an incentive for a more positive and energetic community.
The Canopy

2 Mature shade trees located east and west sides of a home

- Save 56% of air conditioning per year
- 25% of heating per year

Wind reduction up to 25 times the height of the windbreak
The Canopy

Each mature shade tree adds ~ 1% to the value of a home
Urban trees are often smaller than their forest kin...however, they still usually overshadow the human-built environment.
The Canopy

Happy Trees!

Government Street, Mobile, AL
The Canopy

Unhappy Trees!
Trees Fail: there are no ‘safe’ trees...

When trees attack!
Trees Fail: there are no ‘safe’ trees...

you can’t manage what you aren’t aware of...

‘Take That’ by Banksy, London, England
Visual Assessment of the Canopy

- Character
- Health
- Site Conditions
- Defects
Trees grow in a predictable manner

From: Biomechanics, Equilibrium of Tree Branch Shape by Bernard Schaffer
Trees grow in a predictable manner

From: Biomechanics, Equilibrium of Tree Branch Shape by Bernard Schaffer
Regular and Consistent Branching Patterns are preferred
Environment acts on the growth

Angel oak, SC; NOAA Coastal Services Center
Visual Assessment of the Canopy
Get started BEFORE you look at the trees

Figure out in advance:

• Level of acceptable risk

• What your methods will be

• Who will do it (consistency)

• How well informed your point of view is
Visual Assessment of the Canopy

Have an informed point of view

Reading/Reference

- The Body Language of Trees - Mattheck & Breloer
- Guide For Plant Appraisal - Council of Tree & Landscape Appraisers
- A New Tree Biology – A.P. Shigo
- Modern Arboriculture – A.P. Shigo
- Arboriculture - Harris, Clark & Matheny
- A Photographic Guide to the Evaluation of Hazard Trees In Urban Areas — Matheny & Clark
- Tree Risk Assessment – HortScience - www.hortscience.com
- Tree Risk Management – Smiley, Fraedrich & Hendrickson
- Forest & Shade Tree Pathology – www.forestpathology.org
- Pre-planning tree surveys: SULE is the Natural Progression - Jeremy Barrell
Visual Assessment of the Canopy
Be Systematic

• species
• overall appearance
• try to get a view from as many sides as possible
• look for the irregularities that may signal a problem
• assess the irregularities and the potential for failure

Failures are usually due to defects

• Size
• Type
• Location
**The Form**

**Pro**
- written record
- formalizes method
- treats all parts of the tree as a whole

**Con**
- any ‘formula’ method removes nuance and experience from the assessment
- Locks you into a single method
Characteristics are a clue to the past and potential failures of the tree

<table>
<thead>
<tr>
<th>TREE CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree #: _______ Species: _______</td>
</tr>
<tr>
<td>DBH: _______ # of trunks: _______ Height: _______ Spread: _______</td>
</tr>
<tr>
<td>Form: □ generally symmetric □ minor asymmetry □ major asymmetry □ stump sprout □ stag-headed</td>
</tr>
<tr>
<td>Crown class: □ dominant □ co-dominant □ intermediate □ suppressed</td>
</tr>
<tr>
<td>Live crown ratio: _______ % Age class: □ young □ semi-mature □ mature □ over-mature/senescent</td>
</tr>
<tr>
<td>Pruning history: □ crown cleaned □ excessively thinned □ topped □ crown raised □ pollarded □ crown reduced □ flush cuts □ cabled/braced □ none □ multiple pruning events Approx. dates: __________________________</td>
</tr>
<tr>
<td>Special Value: □ specimen □ heritage/historic □ wildlife □ unusual □ street tree □ screen □ shade □ indigenous □ protected by gov. agency</td>
</tr>
</tbody>
</table>

• Species
• Height
• Spread (radius or diameter)
• Form
• Crown Class
• Live Crown Ratio
• Pruning History
Tree Characteristics
Species

Life strategy is important:
• grow fast, ignore defense
• usually early succession species
Tree Characteristics
Species

Life strategy is important:
• grow slow, build defense
• often climax canopy trees
Tree Characteristics
Species
cultivar differences
Tree Characteristics

Height

‘Hyperion’, 379 foot tall redwood, Oregon
Tree Characteristics
Height

‘Hyperion’, 379 foot tall redwood, Oregon

Acceleration of falling object = 32.2’/second²

Or

.006 miles per hour x distance fallen
Tree Characteristics

Spread
Tree Characteristics
Symmetry

Excurrent

Decurrent
Tree Characteristics
Symmetry

Excurrent

Strong central leader maintained through the canopy. Ideally straight, tapered, and branches are substantially smaller diameter.
Tree Characteristics
Symmetry

Decurrent

Canopy made up of codominant scaffold branches.

Ideally these branches have wide angles of attachment and are 1/3 the diameter of the trunk or less.
Tree Characteristics
Symmetry

symmetric

Behold! The PROPER Live Oak
Tree Characteristics
Symmetry

Symmetric?

minor asymmetry
Tree Characteristics
Symmetry

Major asymmetry
Tree Characteristics
Symmetry

Dead branch tips
Tree Characteristics

Symmetry

Stag Headed
Tree Characteristics
Crown Class

Description of placement and character of the canopy

From: Urban Trees, Parts, Processes & Procedures. Clemson, University
Tree Characteristics
Crown Class

Description of placement and character of the canopy

Dominant and co-dominant trees
Tree Characteristics
Crown Class

Intermediate trees

Suppressed trees
Tree Characteristics
Crown Class

Suppressed live oak
Tree Characteristics
Live Crown Ratio

Ratio of crown height from lowest contiguous portion to total tree height

Nevada Forestry Field Guide, Crown Metrics, Chapter 3
Tree Characteristics
Live Crown Ratio

Forest to development
Tree Characteristics
Live Crown Ratio

Intermediate tree now exposed to full sun

Excessive canopy raising
Tree Characteristics

Age Class

- Young
- Semi Mature
- Mature
- Over Mature

Age is important
Older fails more than younger
Pruning:

The goal of guiding tree growth to an ideal of strength, longevity, and aesthetic appeal.

There is a tendency for something, else, to happen.
Tree Characteristics
Pruning History

Poor pruning cuts leave stubs or flat open wounds

Flush cuts are seldom closed quickly and open the tree to opportunistic decay.
Tree Characteristics
Pruning History

Poor pruning cuts

Overlarge cut

Tear away

Stub cuts
Tree Characteristics
Pruning History

Excessive Pruning
Tree Characteristics
Pruning History

Crown cleaning

Excessive cleaning
Tree Characteristics
Pruning History

Lions tailing
Topped trees should be regarded a strong risk for future failure and topping is not usually correctible.
Tree Characteristics
Pruning History
Tree Characteristics
Pruning History

Excessive raising
Tree Characteristics
Pruning History

Actual Crown reduction

Still just topping
Pollarded ginkgo trees
Cave Hill Cemetery,
Louisville, KY
Tree Characteristics
Pruning History
Evidence of the tree’s health in the canopy

<table>
<thead>
<tr>
<th>TREE HEALTH</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foliage color:</strong></td>
<td>□ normal □ chlorotic □</td>
</tr>
<tr>
<td><strong>Foliage density:</strong></td>
<td>□ normal □ sparse □</td>
</tr>
<tr>
<td><strong>Leaf size:</strong></td>
<td>□ normal □ small</td>
</tr>
<tr>
<td><strong>Epicormics?</strong></td>
<td>Y □</td>
</tr>
<tr>
<td><strong>Annual shoot growth:</strong></td>
<td>□ excellent □ average □</td>
</tr>
<tr>
<td><strong>Twig Dieback?</strong></td>
<td>Y □</td>
</tr>
<tr>
<td><strong>Woundwood development:</strong></td>
<td>□ excellent □ average □</td>
</tr>
<tr>
<td><strong>Vigor class:</strong></td>
<td>□ excellent □ average □</td>
</tr>
<tr>
<td><strong>Major pests/diseases:</strong></td>
<td>□ fair □ poor</td>
</tr>
<tr>
<td><strong>Growth obstructions:</strong></td>
<td>□ stakes □ wire/ties □</td>
</tr>
<tr>
<td></td>
<td>□ signs □ cables</td>
</tr>
<tr>
<td></td>
<td>□ curb/pavement □ guards</td>
</tr>
<tr>
<td></td>
<td>□ other __________________</td>
</tr>
</tbody>
</table>

Foliage color and density
Epicormic growths
Shoot growth
Vigor
Tree Health

Foliage

Evenly distributed and dense
Color even and appropriate

Baltimore, Maryland, Urban Forest Project
Tree Health
Discolored Foliage

Chlorosis
Tree Health
Discolored Foliage

• Site conditions
  • Soil compaction
  • Soil nutrient depletion
  • Lack of soil moisture

• Root loss/sapwood cambium loss

• Poisoning

• Disease/pest

• Age
Tree Health
Discolored Foliage

Conifers show some additional colors related to either poisoning or other deficiency

- often related to site conditions

Photo Courtesy S. Porter, University of IL
Tree Health
Foliage Density
Tree Health
Foliage Density
Tree Health
Epicormic Growth
Tree Health
Shoot Growth

Check on health by seeing how much terminal growth differs from year to year.

- Average amount differs between species
- Check growth on several branches

- Shorter year of year growth a possible sign of decline

- Equal or longer growths show Vitality*

*Vitality is the plant’s inherent ability to deal effectively with stress
Tree Health

Vigor

A plant’s inherent/genetic ability to deal with stress

This makes Vigor somewhat species dependent.
## Site Conditions affecting the canopy

### SITE CONDITIONS

**Site Character:**
- □ residence
- □ commercial
- □ industrial
- □ park
- □ open space
- □ natural
- □ woodland/forest

**Landscape type:**
- □ parkway
- □ raised bed
- □ container
- □ mound
- □ lawn
- □ shrub border
- □ wind break

**Irrigation:**
- □ none
- □ adequate
- □ inadequate
- □ excessive
- □ trunk wetted

**Recent site disturbance?**
- □ Y
- □ N

**% dripline paved:**
- □ 0%
- □ 10-25%
- □ 25-50%
- □ 50-75%
- □ 75-100%

**Pavement lifted?**
- □ Y
- □ N

**% dripline w/ fill soil:**
- □ 0%
- □ 10-25%
- □ 25-50%
- □ 50-75%
- □ 75-100%

**% dripline grade lowered:**
- □ 0%
- □ 10-25%
- □ 25-50%
- □ 50-75%
- □ 75-100%

**Soil problems:**
- □ drainage
- □ shallow
- □ compacted
- □ droughty
- □ saline
- □ alkaline
- □ acidic
- □ small volume
- □ disease center
- □ history of fail
- □ clay
- □ expansive
- □ slope _____° aspect: ________

**Obstructions:**
- □ lights
- □ signage
- □ line-of-sight
- □ view
- □ overhead lines
- □ underground utilities
- □ traffic
- □ adjacent veg.
- □ ________

**Exposure to wind:**
- □ single tree
- □ below canopy
- □ above canopy
- □ recently exposed
- □ windward, canopy edge
- □ area prone to windthrow

**Prevailing wind direction:**
- ____________

- □ Occurrence of snow/ice storms
- □ never
- □ seldom
- □ regularly

**Obstructions**

**Wind Exposure**
Site Conditions

Obstructions

For the canopy only tall or large objects are usually a problem

• utility lines
Site Conditions
Obstructions

For the canopy objects that fall into branch space are usually a problem

- utility lines
- signage
- street lighting
Site Conditions
Obstructions

For the canopy only tall or large objects are usually a problem

- utility lines
- buildings
Site Conditions

Obstructions

For the canopy only tall or large objects are usually a problem

• buildings
• signage
• vehicle passage
Site Conditions

Wind Exposure

Wind direction is important. Reversal of direction leads to increased tree damage.
Specific Crown Defects

<table>
<thead>
<tr>
<th>DEFECT</th>
<th>ROOT CROWN</th>
<th>TRUNK</th>
<th>SCAFFOLDS</th>
<th>BRANCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor taper</td>
<td></td>
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<tr>
<td>Bow, sweep</td>
<td></td>
<td></td>
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<tr>
<td>Codominants/forks</td>
<td></td>
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<tr>
<td>Multiple attachments</td>
<td></td>
<td></td>
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<tr>
<td>Included bark</td>
<td></td>
<td></td>
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<tr>
<td>Excessive end weight</td>
<td></td>
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<tr>
<td>Cracks/splits</td>
<td></td>
<td></td>
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<tr>
<td>Hangers</td>
<td></td>
<td></td>
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<tr>
<td>Girdling</td>
<td></td>
<td></td>
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<tr>
<td>Wounds/seam</td>
<td></td>
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<tr>
<td>Decay</td>
<td></td>
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<tr>
<td>Cavity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conks/mushrooms/bracket</td>
<td></td>
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<tr>
<td>Bleeding/sap flow</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Loose/cracked bark</td>
<td></td>
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<tr>
<td>Nesting hole/bee hive</td>
<td></td>
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<tr>
<td>Deadwood/stubs</td>
<td></td>
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<tr>
<td>Borers/termites/ants</td>
<td></td>
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<tr>
<td>Cankers/galls/burls</td>
<td></td>
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</tr>
<tr>
<td>Previous failure</td>
<td></td>
<td></td>
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</tbody>
</table>

Presence of a defect doesn’t necessarily equal failure  
Effect and Quality of defect must be considered with the tree situation and character
Canopy Defects

Remember that we want to see smooth, repeating form within the canopy from the trunk outwards.

Regular and Consistent Branching Patterns are preferred.
Bow / Sweep

Note taper

End Weight
Bow / Sweep
Cracks & Splits
Poor Taper
Excessive End Weights
Codominants & Forks

Branch diameter should always be at least 1/3 smaller than the trunk or scaffold branch they are attached to.

Tight branch angles with large diameter branches often lead to Included Bark
Codominants & Forks

Included bark
Weak structure

Branches overlarge at point of attachment
Decay at point of attachment
Hanging Or Suspended Branches
Girdling
Insect/Disease/Parasite Deformity
Canopy Defects

- size
- type
- location
- mitigate?

Failure potential: 1 - low; 2 - medium; 3 - high; 4 - severe
Size of part: 1 - <6” (15 cm); 2 - 6-18” (15-45 cm);
  3 - 18-30” (45-75 cm); 4 - >30” (75 cm)
Target rating: 1 - occasional use; 2 intermittent use;
  3 - frequent use; 4 - constant use
**HAZARD ABATEMENT**

<table>
<thead>
<tr>
<th>Prune:</th>
<th>□ remove defective part</th>
<th>□ reduce end weight</th>
<th>□ crown clean</th>
<th>□ thin</th>
<th>□ raise canopy</th>
<th>□ crown reduce</th>
<th>□ restructure</th>
<th>□ shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable/Brace:</td>
<td>_________________________</td>
<td></td>
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<td></td>
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<tr>
<td>Inspect further:</td>
<td>□ root crown</td>
<td>□ decay</td>
<td>□ aerial</td>
<td>□ monitor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove tree:</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace?:</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Move target:</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Other:</td>
<td>_________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect on adjacent trees:</td>
<td>□ none</td>
<td>□ evaluate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notification:</td>
<td>□ owner</td>
<td>□ manager</td>
<td>□ governing agency</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Date:</td>
<td>_________________________</td>
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</tr>
</tbody>
</table>

**COMMENTS**
The End?

Mitigation?

Regular Re-Assessment?

More technical assessment?