TREE PROTECTION & PRESERVATION

ISA Certification Exam Study Session
23 March 2020

Gerri Makay
North Dakota Forest Service
Construction & Trees

- Urban expansion into wooded areas
- New construction on established sites
Trees Provide:
(Ecosystem services)

- Stormwater reduction
- Water & air quality improvement
- Energy conservation
- Carbon sequestration
- Urban heat island mitigation
- Habitat for pollinators / animals
Trees Need:

- Light
- Water
- Air
- Nutrients
- Soil
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- Best results: Good planning BEFORE construction

Forestry departments, arborists

Engineers, Planners, Surveyors, Contractors

Homeowners & Commercial Property owners
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How trees are damaged:

- **Physical damage above ground**
  - Limbs improperly removed
  - Broken limbs
  - Damaged trunk
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Underground—most serious damage

- **Cutting** of roots
- Soil **compaction**
- Smothering roots **Covering** with soil

90-95% root system in upper 3’ of soil. Half of that is in top 1’ of soil – especially in urban areas where roots are extremely superficial.
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How trees are damaged:

- Cutting of roots – grade lowering
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Trenching vs Tunneling

Trenching near a tree can kill as much as 40% - 50% of its roots, almost certainly leading to poor health, windthrow or outright death of the tree.

A tunnel in the same place will do virtually no damage to the tree.

From: Trenching & Tunneling Near Trees
By: Dr. James R. Fazio
Construction & trees

Trenching vs Tunneling
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How trees are damaged:
- Smothering roots by adding soil
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- How trees are damaged:
  - Underground — most serious damage
    - Compaction
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How trees are damaged:

- Normal soil: water, air
- Compacted soil: no moisture, no air
Avoiding Tree Damage

- Tree Protection Zone (TPZ)

  DBH” x 1.0’ = minimum TPZ

  (young trees, species tolerant of construction)

<table>
<thead>
<tr>
<th>DBH</th>
<th>TPZ diam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 in.</td>
<td>5.0 feet</td>
</tr>
<tr>
<td>10</td>
<td>10 feet</td>
</tr>
<tr>
<td>15</td>
<td>15 feet</td>
</tr>
<tr>
<td>20</td>
<td>20 feet</td>
</tr>
</tbody>
</table>
Avoiding Tree Damage

- Tree Protection Zone (TPZ)
- Critical Root Zone (CRZ)

DBH” x 1.0’ diam = minimum TPZ
Avoiding Tree Damage During Construction

- **Limiting Access**
  - **One access route** for all contractors
    - Use this route later for infrastructure or hardscape
  - **Storage areas** for construction materials
  - **Other areas** for burning, cement washout pits & construction work zones

Sara Clatterbuck, U of TN
Avoiding Tree Damage

Tree Protection Zone

Effective barriers??
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Symptoms of root damage:

“I bought this wooded lot three years ago and now my trees are dying…what’s happening???”

- Small or yellow leaves
- Premature fall color
- Extensive water sprout development
- Dead twigs
- Death of major branches

“spiral of decline”
How to PREVENT Construction Damage to Trees
Avoiding Tree Damage During Construction

- **Reducing Compaction**
  - MULCH
Planning & Preservation

- Standards & specifications exist for planning & development
- Planning should include input from arborists
  - It’s in the DETAILS
  - Save the best; chip the rest
  - Use signage
  - Fines & penalties for violations
- Planning should include input from arborists
Planning & Preservation

“Save the best... chip the rest”
Tree species differ in tolerances for:
- Root cutting
- Soil compaction
- Flooding
- Changes in soil chemistry (chemical spills, pH changes)

# Tree Species and Tolerance

<table>
<thead>
<tr>
<th>Species</th>
<th>Root Severance</th>
<th>Soil Compaction &amp; Flooding</th>
<th>Soil pH Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotch pine</td>
<td>Tolerant</td>
<td>Sensitive</td>
<td>4.0 – 6.5</td>
</tr>
<tr>
<td>Colorado spruce</td>
<td>Intermediate</td>
<td>Tolerant</td>
<td>4.6 – 6.5</td>
</tr>
<tr>
<td>Green ash</td>
<td><strong>Tolerant</strong></td>
<td><strong>Tolerant</strong></td>
<td>6.0 – 7.5</td>
</tr>
<tr>
<td>Quaking aspen</td>
<td>Tolerant</td>
<td>Sensitive</td>
<td>4.8 – 6.5</td>
</tr>
<tr>
<td>Paper birch</td>
<td>Intermediate</td>
<td>Sensitive</td>
<td>5.0 – 8.0</td>
</tr>
<tr>
<td>River birch</td>
<td><strong>Tolerant</strong></td>
<td><strong>Tolerant</strong></td>
<td>4.0 – 6.5</td>
</tr>
<tr>
<td>Boxelder</td>
<td><strong>Tolerant</strong></td>
<td><strong>Tolerant</strong></td>
<td>6.5 – 7.5</td>
</tr>
<tr>
<td>Ohio buckeye</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>6.1 – 6.5</td>
</tr>
<tr>
<td>American elm</td>
<td>Tolerant</td>
<td>Intermediate</td>
<td>5.5 – 8.0</td>
</tr>
<tr>
<td>Hackberry</td>
<td>Tolerant</td>
<td>Intermediate</td>
<td>6.6 – 8.0</td>
</tr>
<tr>
<td>Honeylocust</td>
<td>Tolerant</td>
<td>Intermediate</td>
<td>6.0 – 8.0</td>
</tr>
<tr>
<td>Basswood</td>
<td>Intermediate</td>
<td>Sensitive</td>
<td>5.5 – 7.3</td>
</tr>
<tr>
<td>Silver maple</td>
<td><strong>Tolerant</strong></td>
<td><strong>Tolerant</strong></td>
<td>5.5 – 6.5</td>
</tr>
<tr>
<td>Bur oak</td>
<td>Tolerant</td>
<td>Intermediate</td>
<td><strong>4.0 – 8.0</strong></td>
</tr>
<tr>
<td>Black walnut</td>
<td>Sensitive</td>
<td>Intermediate</td>
<td>6.6 – 8.0</td>
</tr>
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</table>
Avoiding Tree Damage During Construction

- **Changes in Grade**
  - **Removing soil:** use terracing, create tree islands

Consideration: Is the expense of the effort justified? Will the tree sustain this activity?
Avoiding Tree Damage During Construction

- **Changes in Grade**
  - *Adding soil*: build tree wells (must be large) and/or install aeration systems - expensive

Source: IPM Access - An Integrated Pest Management Online Service
Treatment of Trees Damaged by Construction

- **Post-Construction Tree Maintenance**
  - Stressed trees – predisposed to problems
  - Resilient trees need time
Treatment of Trees Damaged by Construction

- Treating Trunk & Crown Injuries
  - Repairing Damaged Bark & Trunk Wounds
    - Bark tracing
Treatment of Trees Damaged by Construction

- Irrigation & Drainage
  - Long, slow watering over root zone
  - Drainage problems
Treatment of Trees Damaged by Construction

- Mulching
  - Organic material
  - 2” – 4” deep
  - Away from trunk
  - As wide as possible
Treatment of Trees Damaged by Construction

- **Aeration of the Root Zone**
  - **Vertical mulching:** holes 12” deep, 2”-4” diam, 1’-3’ on center. Fill with organic material
Treatment of Trees Damaged by Construction

- **Aeration of the Root Zone**
  - **Radial trenching:**
    - 12” deep, 4 to 8 ft from trunk, in radial pattern (spokes of a wheel), at least to drip-line
Treatment of Trees Damaged by Construction

- **Fertilization** – yes or no??
  - Based on soil sample & nutritional needs of trees
  - Slow-release soluble mineral sources to minimize root injury
ROLE of the ARBORIST during Construction:

1. Enforce the TPZ / CRZ
2. Assist with changes in the field
3. Monitor injury to trees - & provide corrective action
4. Communicate with the project superintendent
5. Facilitate completion of the project.
Treatment of Trees Damaged by Construction

- Monitoring for Decline & Hazards
  - On-going process; risk management
ISA Arborists’ Certification Study Guide

Cabling & Bracing – Support Systems
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Static Cable Systems – steel cable:

- 7-strand, common-grade
- Extra-high-strength (EHS)
Cabling – Dynamic system

Cobra system
Lightning Protection Systems
Additional Resources

- [http://www.deeproot.com/blog/blog-entries/category/design/construction](http://www.deeproot.com/blog/blog-entries/category/design/construction)
  - Jim Urban

- U of MN
  - Gary Johnson – research on tree roots, construction damage

- [www.hort.cornell.edu/uhi](http://www.hort.cornell.edu/uhi)
  - Nina Bassuk, Program Leader - Urban Hort. Inst.
  - Tree Fund Webinar: “Reducing Tree (and Soil!) Damage During Construction” – December 2018 (start at 4:45 in the recording)

- “How to Communicate with Engineers”, Arborist News, December 2007 (Carol Kwan)

- ANSI A-300: Standards & BMPs

- TREE Fund Webinars
QUESTIONS?

Good Luck!

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