Durability: American Style
North American Durability Classification

• Treated wood only
• Use Categories 1 (low) to 5 (marine exposure)
• Natural durability not considered
# Durability Classification (ASTM D2017)

<table>
<thead>
<tr>
<th>Mass Loss (%)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Highly Resistant</td>
</tr>
<tr>
<td>11-24</td>
<td>Resistant</td>
</tr>
<tr>
<td>25-44</td>
<td>Moderately Resistant</td>
</tr>
<tr>
<td>&gt;44</td>
<td>Slightly/Non-Resistant</td>
</tr>
</tbody>
</table>

Mass loss- in a soil block test.
Applications

• Decking
• Outdoor living
• Utility poles (western redcedar)
• Fence posts/Ag products- especially organic growers
Important Species

• Western redcedar (*Thuja plicata*)
• Coast Redwood (*Sequoia sempervirens*)
• Alaska cedar (*Chamaecyparis nootkatensis*)
• Osage orange (*Maclura pomifera*)
• Black locust (*Robinia psuedoacacia*)
Western redcedar
Coast redwood

www.chicagosuburbanlumber.com

www.gallery.sunnyfortuna.com

www.redwoodsalvagesales.com

www.arkive.com
Black locust
Osage orange

www.gardeningknowhow.com

www.dreamtime.com

www.hobbithouse.com
Imports

- Merbau (*Initsia bijuga*)
- Ipe (*Tabebuia* spp.)
- Purpleheart (*Peltogyne* spp.)
- Angelique (*Dicorynia* guianensis)
Durability Issues

• Supply
• Variability
• Second growth
• Excessive sapwood
Why are there no standards?

• Ability to verify
• Lack of supplier interest
• No consumer concern
Rapid, Non destructive Durability Assessment
Approach

• Western juniper, Alaska cedar, Western redcedar
• Collect ~20 sections/species
• Cut radial transects
• Assess decay and termite resistance, extractives content
• Assess NIR and FTIR
Near infrared (NIR)

- 700 to 2500 nm
- Surface assessment of chemistry
- Uses: wood density, moisture levels, chemistry
Fourier Transform IR Spectroscopy

• Provides surface chemistry information
• Relatively rapid
• Non-destructive
• Technology advancing rapidly
Initial Assessment

• Extractive-free Alaska cedar heartwood
• Treated with 1 to 10 % carvacrol
• FT-IR analysis using KBr pellets or ATR
• Spectra examined for evidence of changes
Comparison between FT-IR spectra of non-extracted (YC) and extracted (XYC) Alaska yellow cedar at the wave numbers of 4000 – 500 cm⁻¹.
Comparison between FT-IR spectra of non-extracted (YC) and extracted (XYC) Alaska yellow cedar at the “fingerprint region(1800 – 600 cm$^{-1}$).
FT-IR spectra of non-extracted (YC) and extracted (XYC) Alaska yellow cedar and non-extracted treated with 1 to 50 % carvacrol (CVR) in ethanol at the 1800 – 600 cm\(^{-1}\).
Intensity of unextracted, extracted, and extracted Alaska yellow cedar treated with various concentrations of carvacrol at band related to extractives.
Ratio of CH wagging vibrations to cellulose and hemicellulose peaks ($A_{808}/A_{1372}$), carvacrol related bands to cellulose and hemicellulose ($A_{1617}/A_{1372}$) and ($A_{1633}/A_{1372}$), and aliphatic to aromatic ($A_{2918}/A_{1510}$).
Analysis

• Increasing carvacrol levels detected
• Need to verify ability to detect other extractives
• ATR approach was too variable
• More work underway
Ultimate Objective

• Real time sorting of wood into durability classes
• Requires calibration for each species
• Sorting could reduce the risk of early failures
• Improve consumer confidence
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