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Structural Applications & Research of Hardwood CLT

August 13, 2026

Western Hardwood Association

NHLA Current Research Initiative

NHLA Structural Grade Hardwood Lumber (SGHL) Initiative

Key Priorities

- Structural design values and engineering data
- Hardwood grading rules and standards development
- Structural performance testing and validation
- CLT and mass timber product applications
- Manufacturing best practices and quality assurance
- Market adoption and industry education

Industry Benefits

- New high-value markets for hardwood lumber
- Expanded hardwood use in construction
- Increased demand for underutilized species
- Enhanced industry competitiveness
- Greater recognition of hardwoods as structural materials

NHLA Objectives for Structural Grading

Developing Hardwood Markets for Structural Use

- **Pallets and Containers**
- **Matting and Board Road**
- **Timbers**
- **Mass Timber**
- **Outdoor Use (Decking)**
- **DOT and other State Uses**

CLT Mill Survey

Technology

Adequate technology to use hardwood lumber
Need some adjustments

Lumber

Various dimension
Higher moisture content
Hard to work with multiple species at once
Not enough volume

Cost

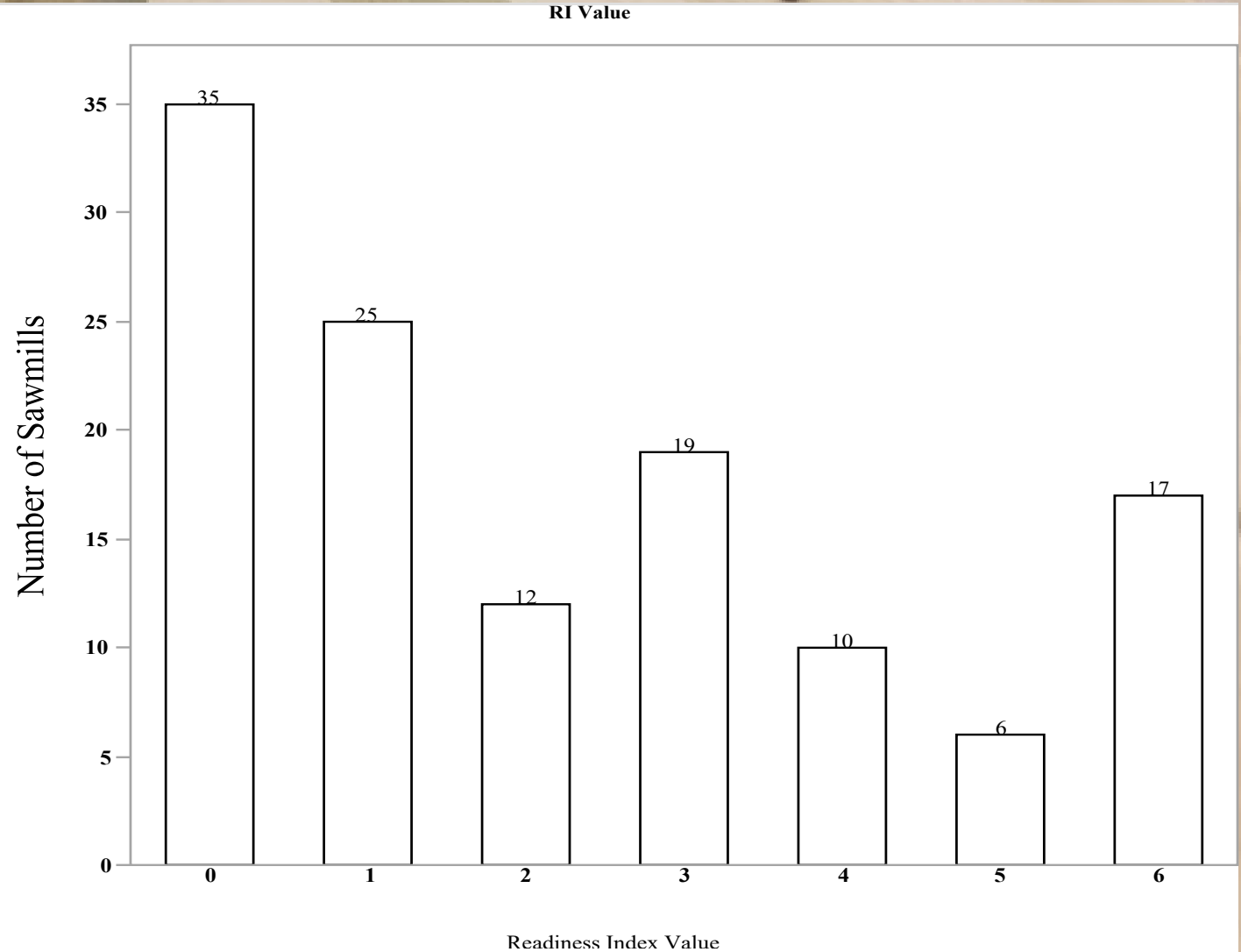
Increase press time and glue volume
Increase transportation due to higher density

Hardwood Sawmill Survey

Do you have SGHL:

- Sawing capacity
 - Drying capacity
 - Surfacing capacity
 - Grading capacity
 - Sorting capacity
 - Inventory space
-
- RI =6 have all resources
 - RI = 0 have no resources

Distribution of Sawmills Needs Express as Readiness Index



What are the Requirements of SGHL for CLT Use?

Kiln dried to $12 \pm 3\%$ moisture content

Surfaced on all four sides

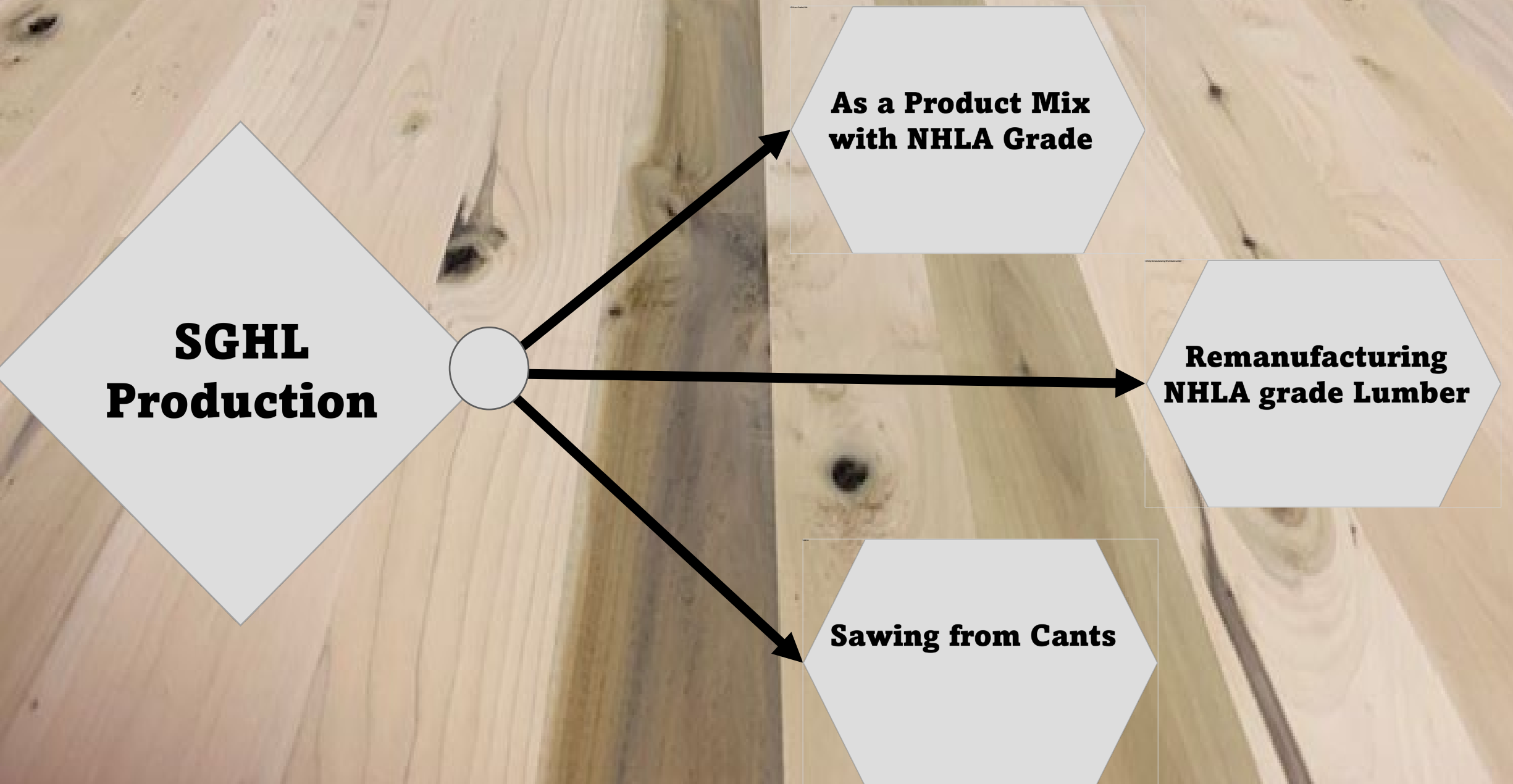
Graded with structural rules

Must be No 2 and better grade for major direction

No 3 and better grade for minor direction

Who Provides Grading Service For SGHL ?

- **NHLA has had SGHL grading rules since the 1920s**
- **NELMA also provides grading services**
 - **Testing Done by ASTM D245 Small Clears**
 - **Done under ALSC PS20 for Softwoods**



SGHL as a Product Mix

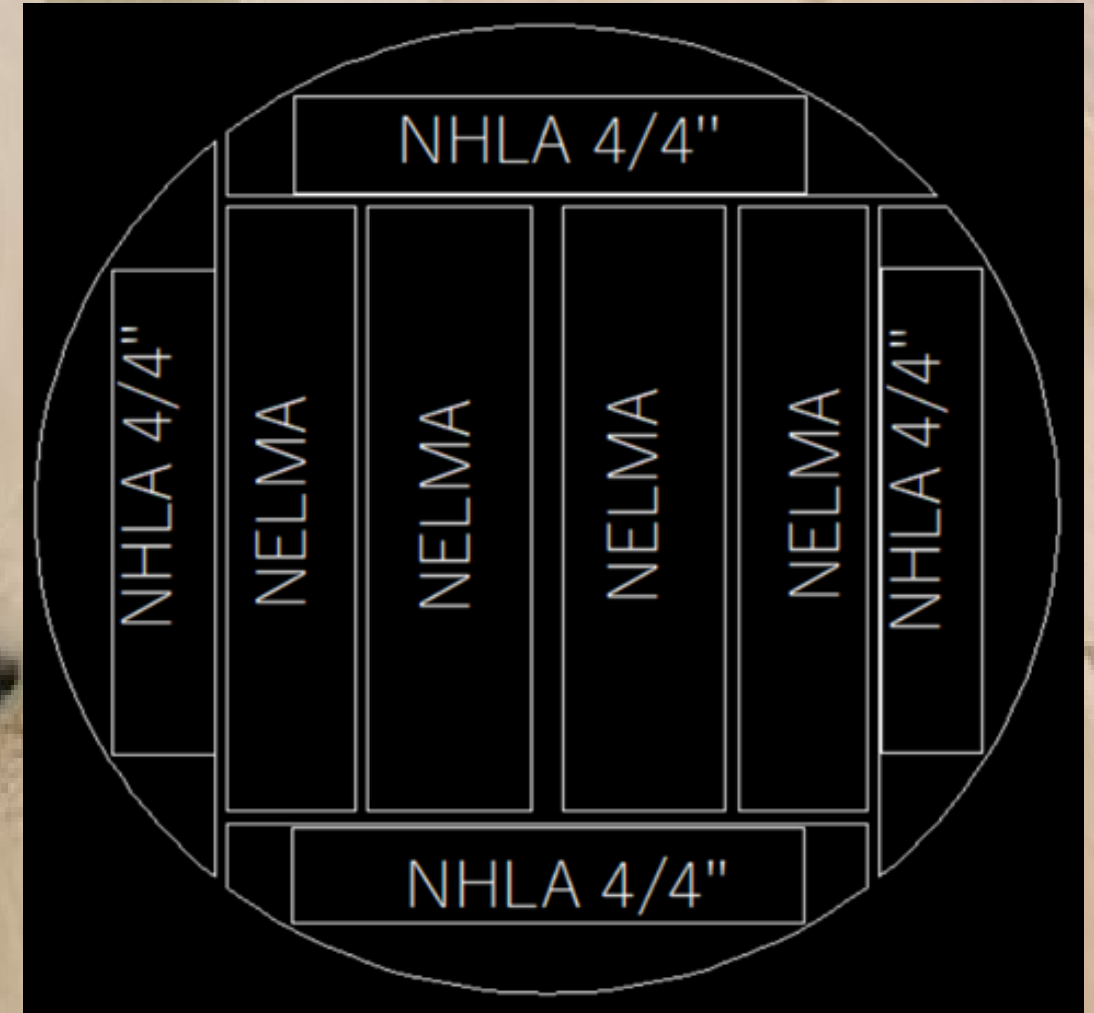
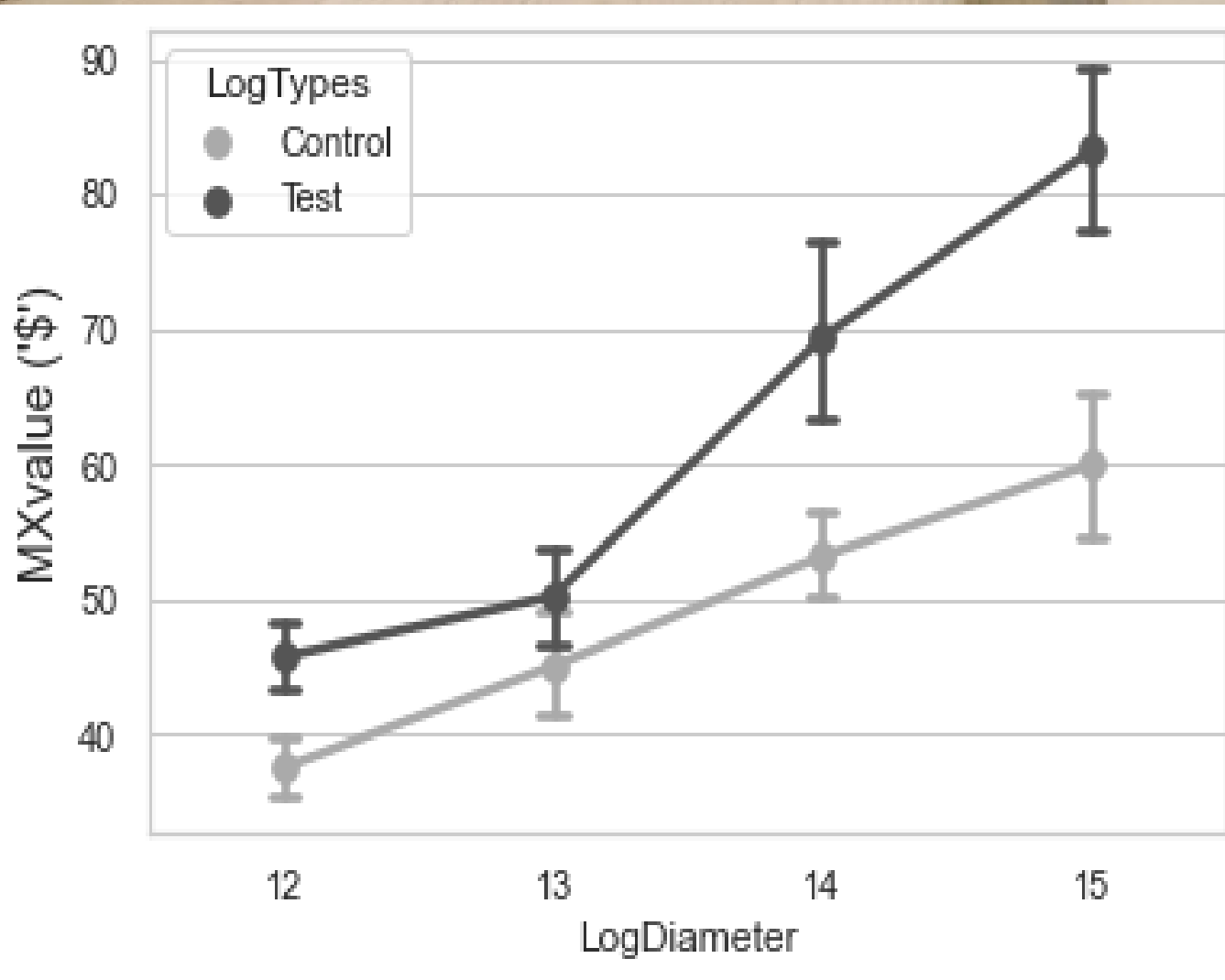
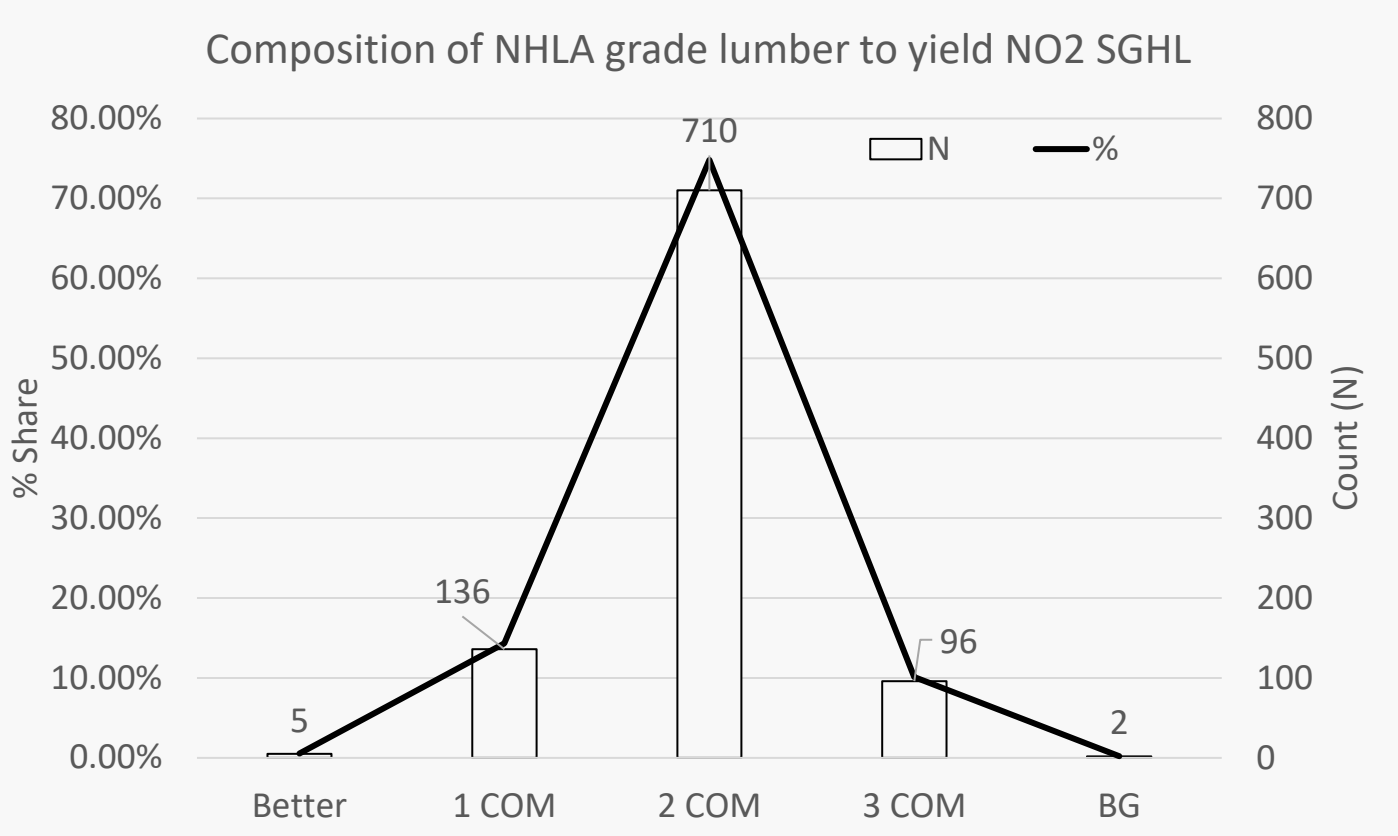


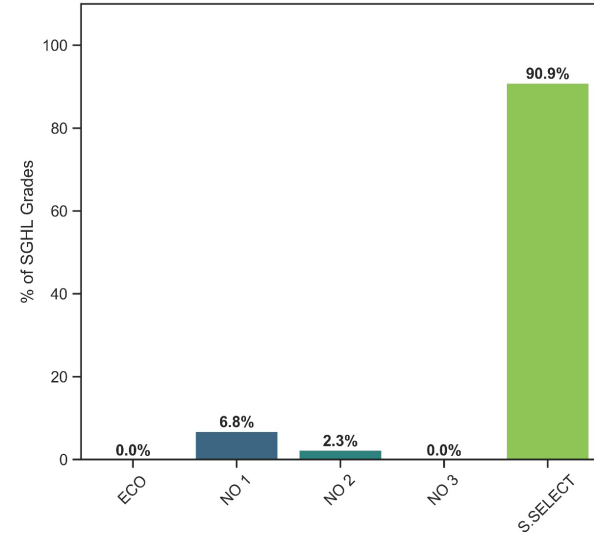
Figure: Generalized log sawing procedure for test samples

SGHL by Remanufacturing NHLA Grade Lumber

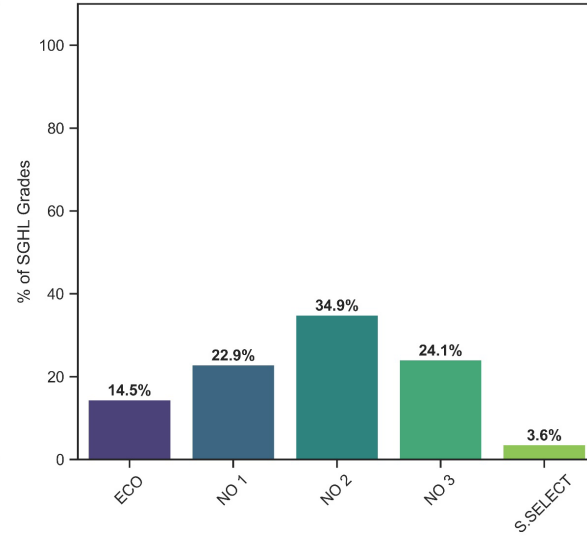


SGHL from Cants

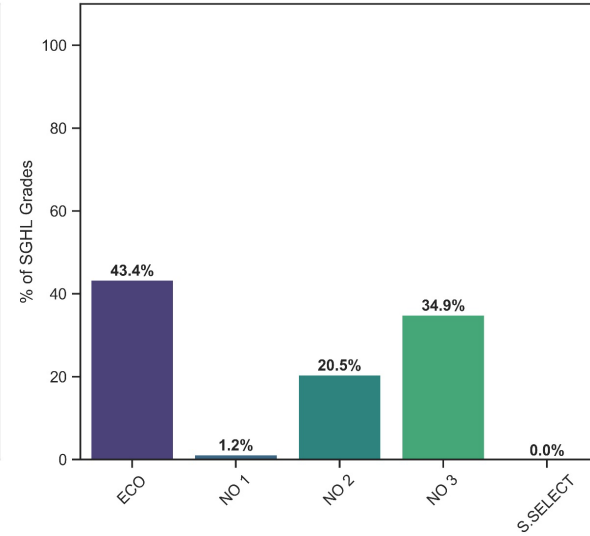
NHLA Grade: FAS
Total = 44



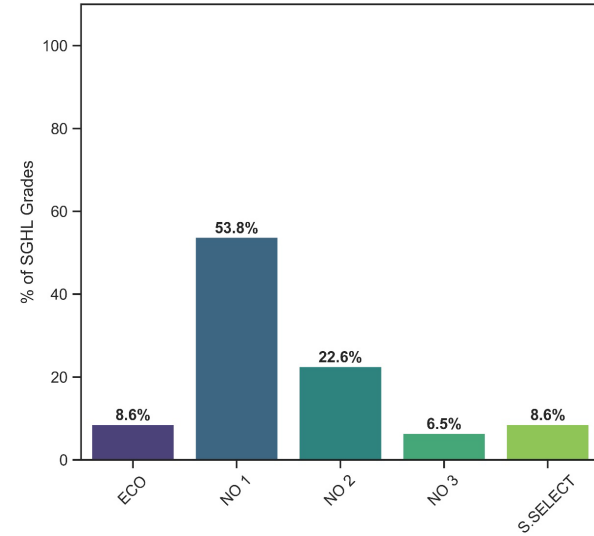
NHLA Grade: 2 COM
Total = 83



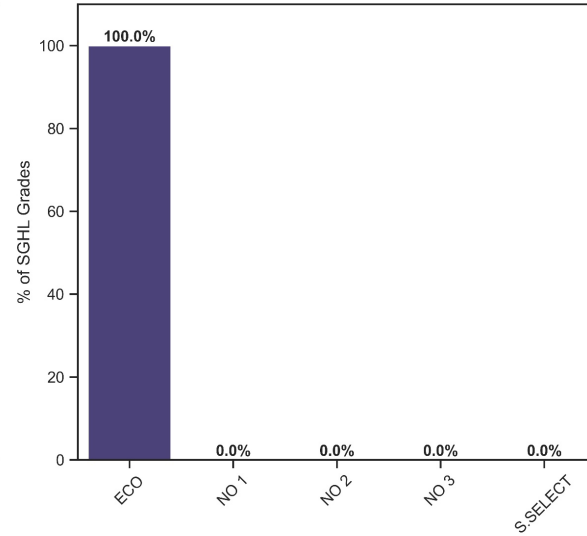
NHLA Grade: 3 COM
Total = 83



NHLA Grade: 1 COM
Total = 93



NHLA Grade: BG
Total = 14



What Should be Avoided to Produce SGHL

Non-uniform dimension and uneven ends



What Should be Avoided to Produce SGHL

End grain knots, end knots



What Should be Avoided to Produce SGHL

Missing wood, mechanical damage, end splits



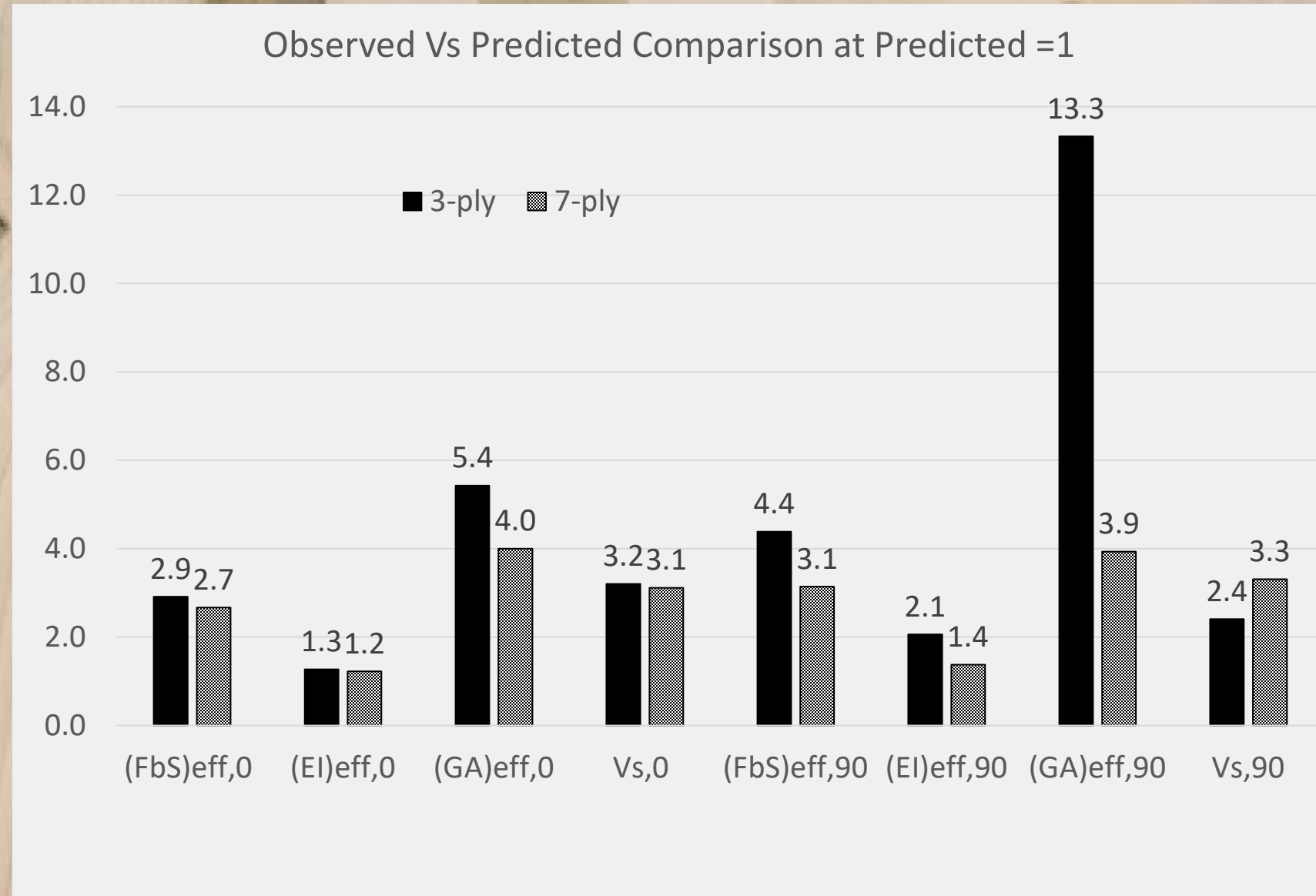
What Should be Avoided to Produce SGHL

Large Bark Pockets



Production and Mechanical Properties of YP CLTs

- Manufactured at **SmartLam, Dothan, Alabama 9/21**
- Nominal 2x6 No. 2 Yellow Poplar lumber
- All panels exceed the minimum design value required by PRG 320 predicted using Shear Analogy Method



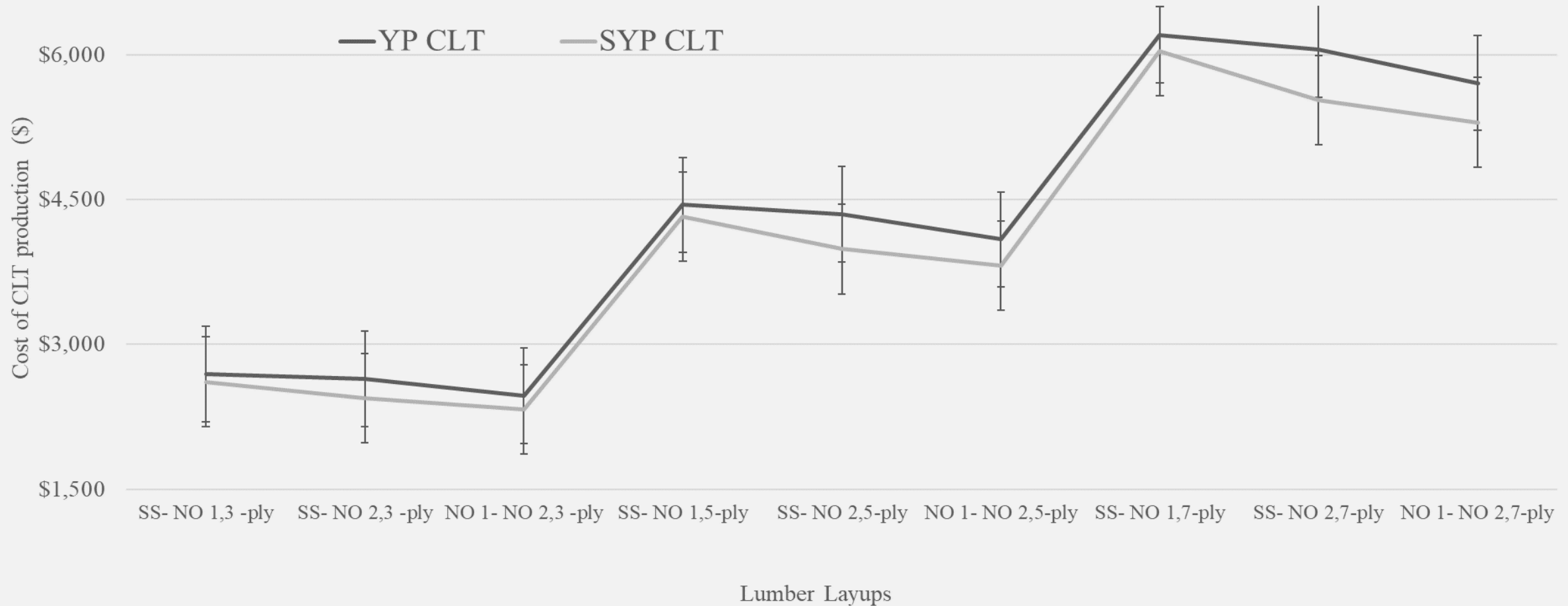
SYP-YP Hybrid CLTs

- Lumber were remanufactured to meet PRG 320 standard and shipped to CLT mill
- CLTs were pressed under PRG 320 Standard at **Texas CLT facility**
- Samples were tested at VT Laboratory
- All panels exceed the minimum design value required by PRG 320 predicted using Shear Analogy Method



Economics of Hardwood CLTs

Competitiveness of Hardwood CLTs with SYP CLTs



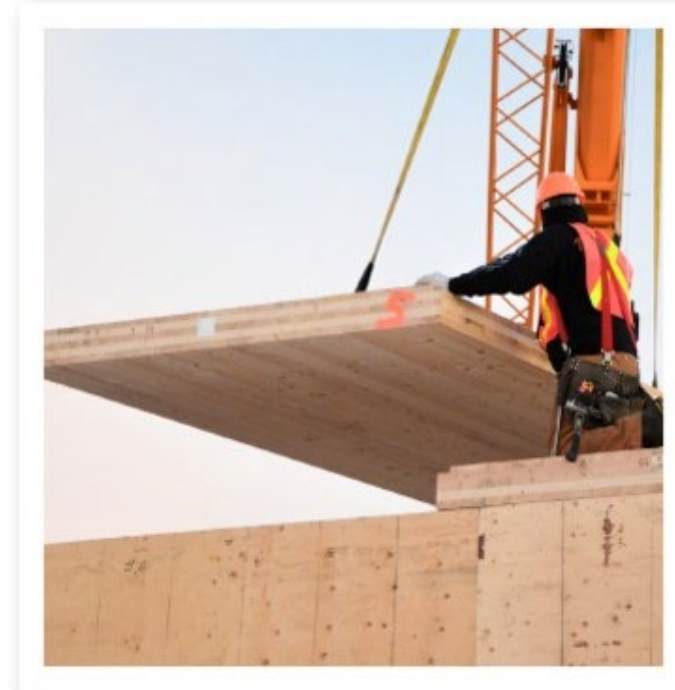
At 40% cost-share of lumber at referenced price, Hardwood CLTs Production cost was up to 7% higher compared to SYP CLTs using same grade of lumber to lay ups

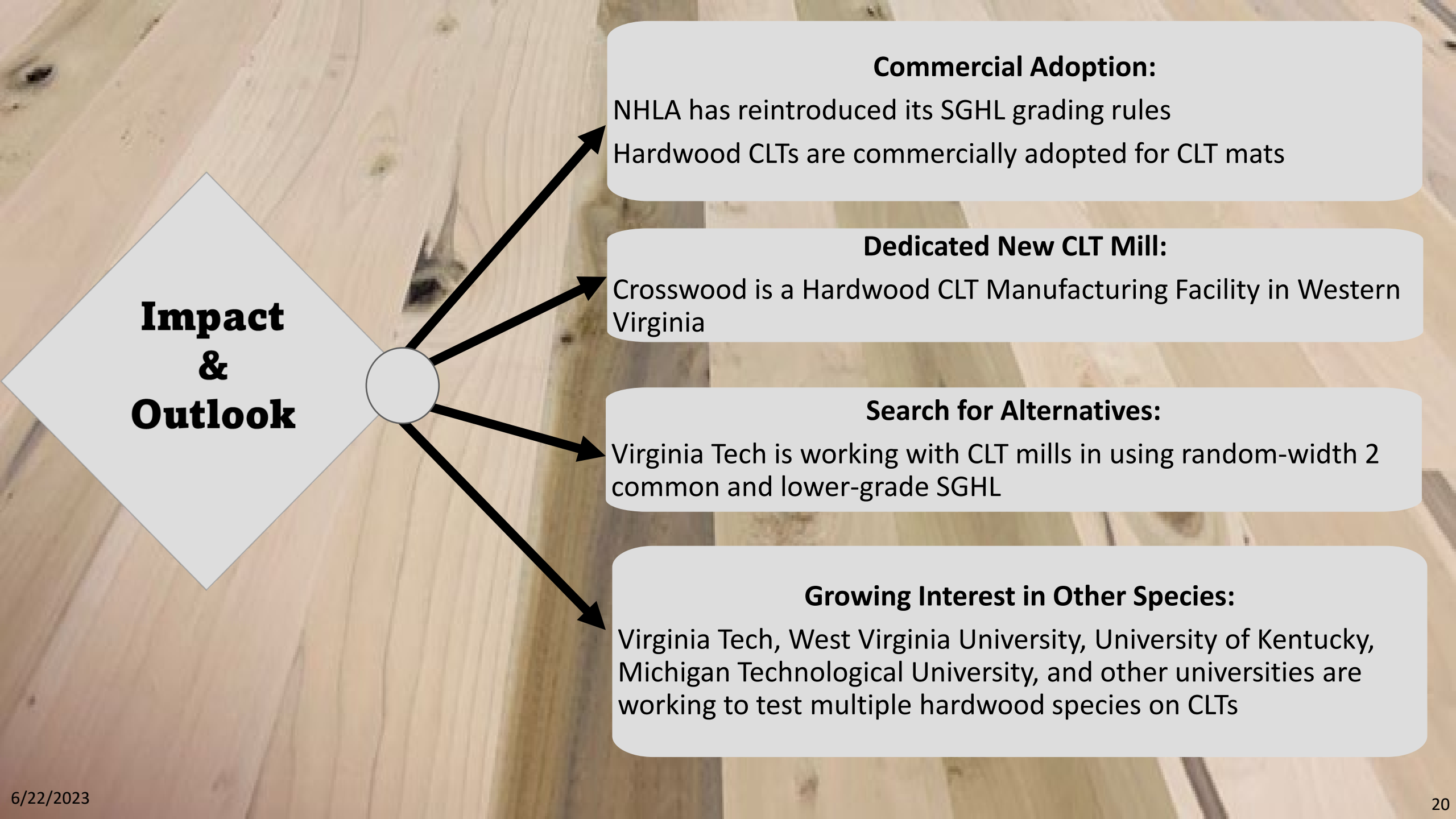
PRG-320 Major Revisions

What is there for hardwood industry ?

- Added VH1 grade (No. 2 Yellow-Poplar) to the list of standard CLT grades
- Moisture content “shall not exceed 16%”, and follow adhesive manufacturer’s guidelines
- Quality control testing changed to align with glulam standards (ANSI A190.1 and CSA 0177)

Standard for Performance-Rated Cross-Laminated Timber





Impact & Outlook

Commercial Adoption:

NHLA has reintroduced its SGHL grading rules
Hardwood CLTs are commercially adopted for CLT mats

Dedicated New CLT Mill:

Crosswood is a Hardwood CLT Manufacturing Facility in Western Virginia

Search for Alternatives:

Virginia Tech is working with CLT mills in using random-width 2 common and lower-grade SGHL

Growing Interest in Other Species:

Virginia Tech, West Virginia University, University of Kentucky, Michigan Technological University, and other universities are working to test multiple hardwood species on CLTs

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graph LR; A[Impact & Outlook] --> B[Grouping Species for Strength: NHLA is working with researchers to group lumber by strength values to facilitate the adoption]; A --> C[Producing SGHL similar to softwood : NHLA is working with Sawmills to produce the SGHL, similar to SYP to evaluate the competitiveness]; A --> D[Market study and Collaboration : NHLA is actively working with IHLA, AHMI, RAHC, HMA, Hardwood Federation, and other organizations to develop market and awareness]; A --> E[Collaboration for Hardwood University : NHLA is working with multiple universities to develop a research and information-sharing collaboration on hardwood CLTs and other hardwood products];
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Impact & Outlook

Grouping Species for Strength:

NHLA is working with researchers to group lumber by strength values to facilitate the adoption

Producing SGHL similar to softwood :

NHLA is working with Sawmills to produce the SGHL, similar to SYP to evaluate the competitiveness

Market study and Collaboration :

NHLA is actively working with IHLA, AHMI, RAHC, HMA, Hardwood Federation, and other organizations to develop market and awareness

Collaboration for Hardwood University :

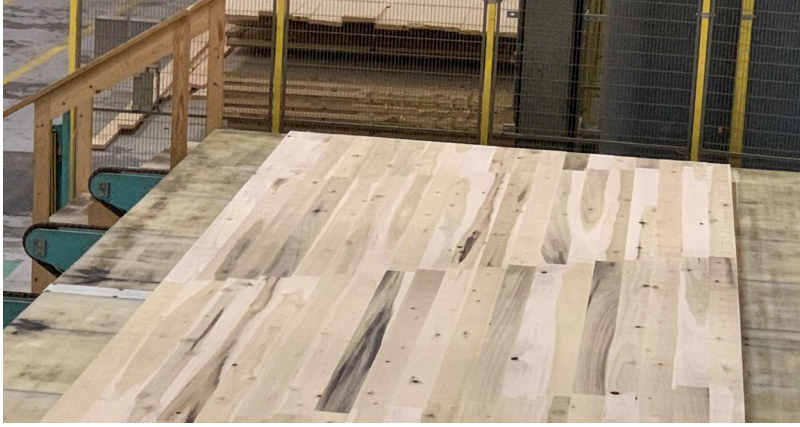
NHLA is working with multiple universities to develop a research and information-sharing collaboration on hardwood CLTs and other hardwood products



Acknowledgements



All the projects were funded by Wood Innovation Grants in 2016, 2019, 2020, 2022, and 2023



Questions or Comments Please!!!



Thank You !!!
