Red Grandis:

The Hardwood of the Future

AIA Continuing Education

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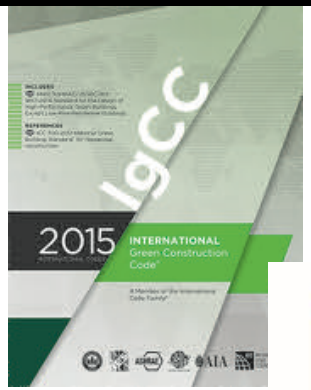
Learning Objectives

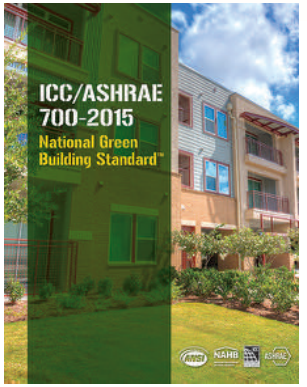
Upon completion of this course, you should be able to:

- Explain the benefits of specifying sustainably managed hardwood products in the design of sustainable, environmentally positive buildings.
- Describe how wood contributes to credits under various green building rating systems.
- Discuss the sustainable aspects of wood products.
- Examine the natural cycle of carbon absorption and storage, and the role of forests and wood products in mitigating carbon emissions.

Introduction

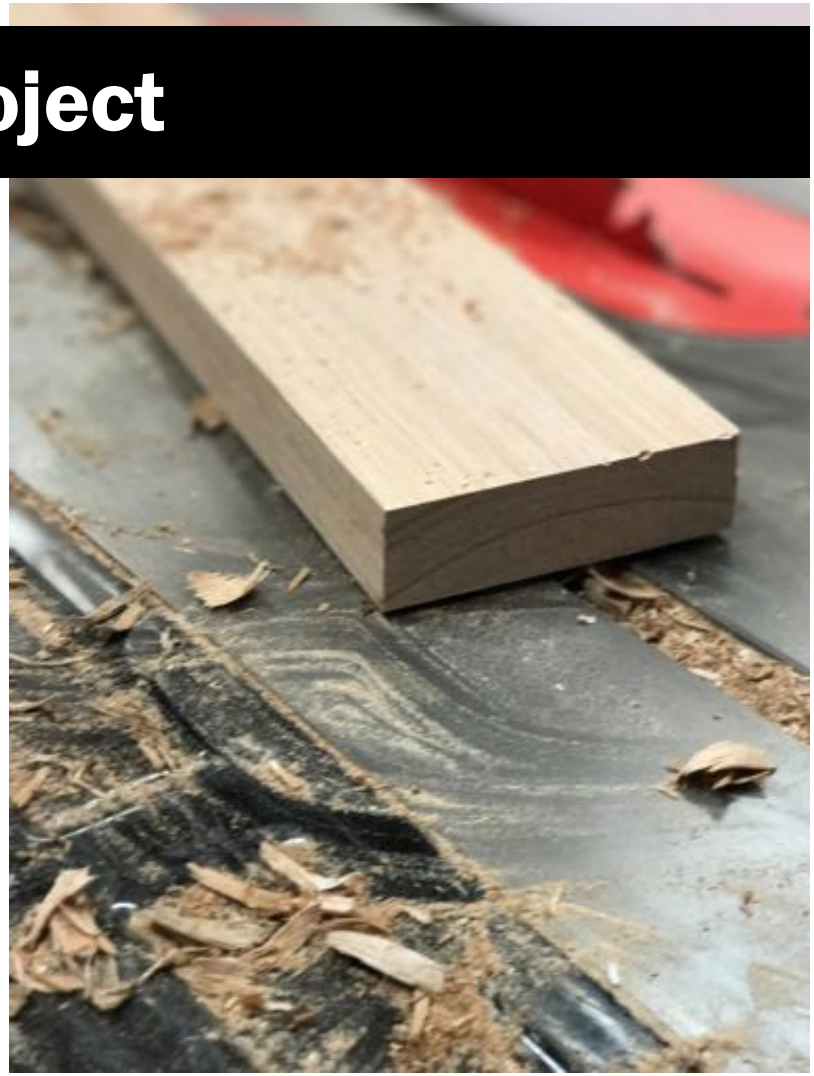
- Design-build community challenges
  - Green building codes
    - ICC's IGCC
  - Green building rating systems,
    - USGBC's LEED
    - NAHB's Green Building Standards (GBS)
- Sustainable building codes and green standards will drive the use of natural resources to:
  - Protect the environment
  - Support the communities bringing sustainable products to market.





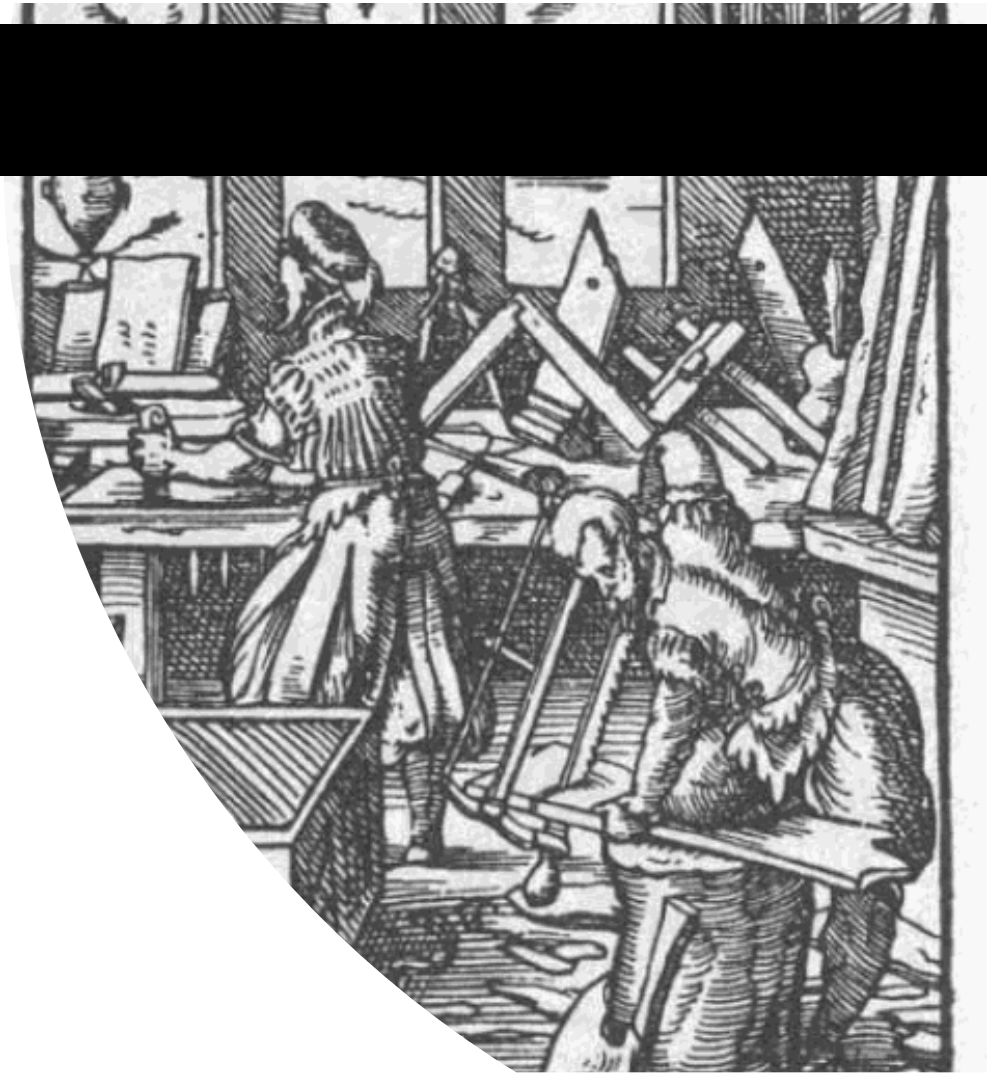
Choosing Wood For Your Project

- Environmental sustainability
- Economic sustainability
- Social sustainability
- Abundant sourcing
- Energy
- Health
- Acoustics



Hardwood History

- Hardwoods have been used for in buildings for centuries.
- Interior hardwoods are regularly specified for:
  - flooring, paneling, moldings, mantles, cabinets, furniture, and built-ins.
- Exterior hardwoods have no match when used for :
  - Doors, windows, decking, siding, moldings, and outdoor furniture.

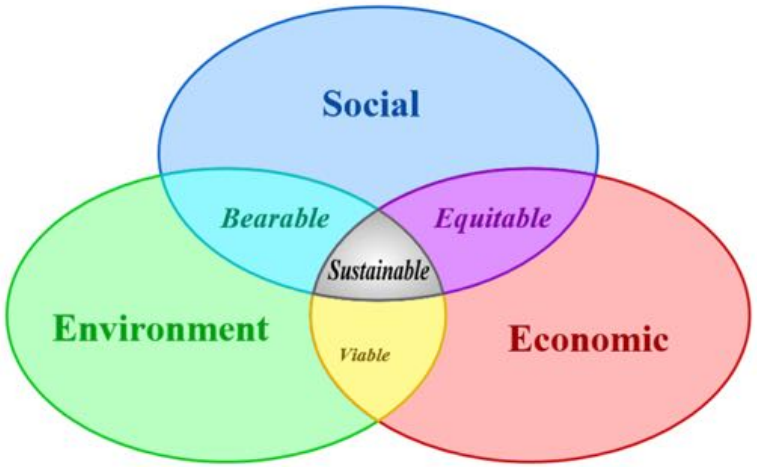


Red Is the New Green: Planet-Friendly Hardwood

- Red grandis (*Eucalyptus grandis*)
  - Sustainable
  - Environmentally conscious hardwood choice
  - Overcomes sourcing problems and challenges
  - Forest Stewardship Council (FSC) certified
    - Forest management (FM)
    - Chain of custody (COC)
  - Not listed in the CITES appendices
  - Not on International Union for Conservation of Nature (IUCN) red list of threatened species

Sustainable Forestry Management

- First described in 1713
- United Nations Food and Agriculture Organization (UNFAO) definition:
  - “The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biological diversity, productivity, regeneration capacity, vitality, and potential to fulfill, now and in the future, relevant ecological economic and social functions at local, national, and global levels and that does not cause damage on other ecosystems.”



Forest Practices

Tim White, Director of the School of Forest Resources and Conservation, University of Florida

Wood Products – Low Carbon Footprint Material

- Wood Products
  - Are unrivaled when it comes to environmental sustainability
  - UNAFO wood products are:
    - Manufactured from renewable raw material
    - Reusable and biodegradable
    - Continue to store carbon throughout their lifetime
  - Alternative to larger carbon footprint of concrete, steel, aluminum, and plastic
  - Athena Sustainable Materials Institute LCA Study:
    - Wood has “softer environmental footprint”

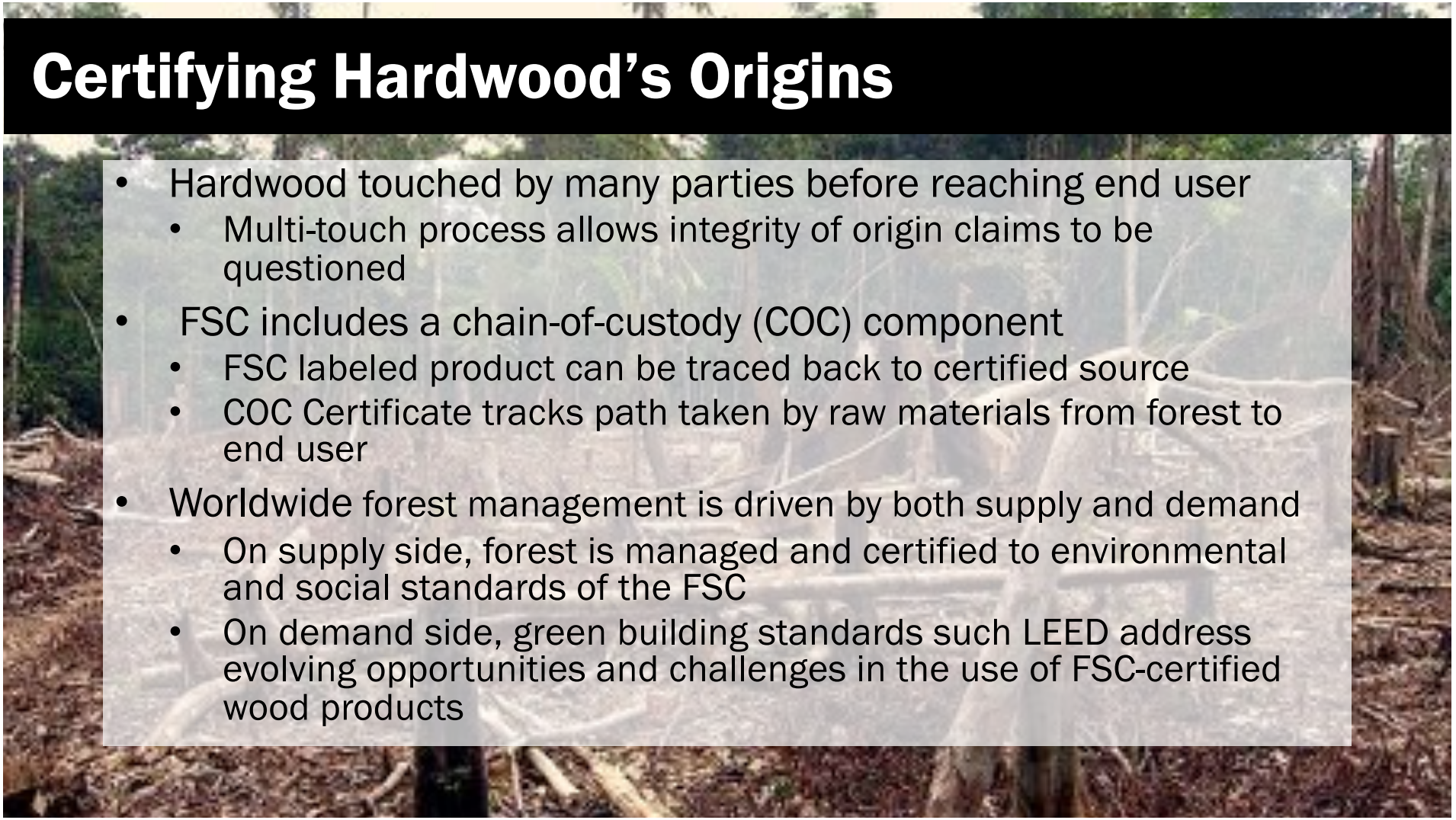
Forests

- Forests support nearly 80 percent of the world's terrestrial species.
- Forests support the livelihoods of 1.6 billion people.
- Forests comprise 31 percent of our land area.
- During the past 50 years, almost half the world's original forest cover has been lost.

Forest Stewardship Council (FSC)

- Independent, nongovernmental, not-for-profit
- Established to:
  - Promote responsible management of world's forests
  - Certify forest products
- A focus on:
  - Ways real forests are managed
  - Benefits they provide to society and the environment
- Based on 10 principles
- Independently verified

Certifying Hardwood's Origins



- Hardwood touched by many parties before reaching end user
  - Multi-touch process allows integrity of origin claims to be questioned
- FSC includes a chain-of-custody (COC) component
  - FSC labeled product can be traced back to certified source
  - COC Certificate tracks path taken by raw materials from forest to end user
- Worldwide forest management is driven by both supply and demand
  - On supply side, forest is managed and certified to environmental and social standards of the FSC
  - On demand side, green building standards such LEED address evolving opportunities and challenges in the use of FSC-certified wood products

Interview: Sourcing and Chain of Custody

David Salisbury, David Salisbury Conservatories

Environmental Stewardship

- Environmental stewardship refers to the responsible use and protection of the natural environment through conservation and sustainable practices.
- Aldo Leopold, pioneer American conservationist, championed environmental stewardship based on a land ethic:
  - “Dealing with man's relation to land and to the animals and plants which grow upon it.”
- EPA defines it more broadly as “the responsibility for environmental quality shared by all those whose actions affect the environment.”

Environmental Impact – Deforestation

- Permanent conversion of forest land to non-forest land uses
  - Major issue and contributor to global warming
- Forest stewardship
  - Partially motivated by commercial interest in maintaining a wood supply
  - Can help protect vulnerable forests from illegal logging, encroachment, and conversion to farmland
  - WWF report states that expanding responsible forest management is the only way to reduce deforestation and still meet the needs of a growing population.
- There is much potential for using alternatives to tropical rainforest timber, including wood sourced from plantations established on degraded, non-forest land.

Stewardship

- Credible, independent third-party certification of management practices ensure stewardship
- Best hope for preserving the largest amount of forests depends on aligning:
  - Local rights and aspirations
  - Science, environmental laws
  - Land-use planning, policy, and the market for forest products and services

Plantations

- Composed of a few tree species with useful attributes
  - Low management requirements
  - High product yield
- Plantations help meet demand for forest products
  - Industrial roundwood
  - Fuelwood
  - Pulpwood
- Concurrently providing some functions of natural forests, such as:
  - Soil stabilization
  - Prevention of erosion
  - Carbon emissions mitigation
  - Maintaining the water cycle

Plantations: Overcoming Concerns

- Limits forest plantations to highly degraded forest and non-forest lands
- Offers substantial benefits to local communities
  - Local livelihoods
  - Buffers around protected areas

LEED Up Close

- USGBC'S green building rating system
  - Leadership in Energy and Environmental Design (LEED)
  - World's most widely used rating system
  - When choosing hardwoods
    - A complete understanding of the LEED rating system
    - How points are accumulated

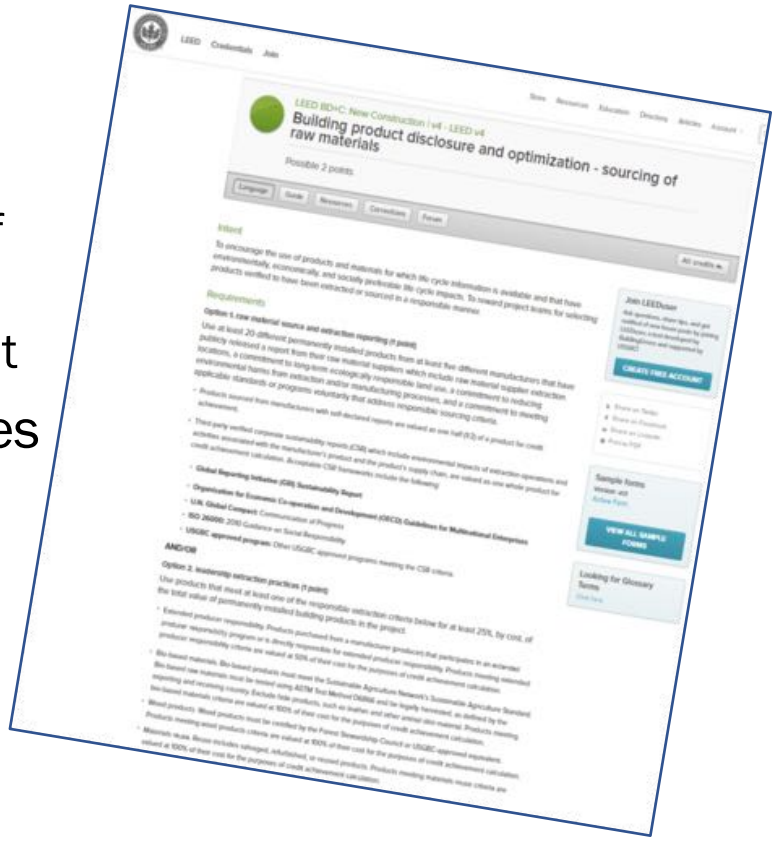
LEED
LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN

LEED: Aims to Assure Sustainable Design & Construction

- LEED criteria
  - Sustainable Sites
  - Water Efficiency
  - Energy & Atmosphere
  - Materials & Resources
  - Indoor Environmental Quality
  - Innovation in Design
- Building earns rating depending on total points
  - Silver
  - Gold
  - Platinum

LEED: Raw Materials Credit

- New LEED v4 Standard
  - Key credit addressing certified wood
  - Raw Materials Credit: Building Product Disclosure And Optimization: Sourcing Of Raw Materials
  - Focus on responsible forest management
- Products certified according to the policies and standards set by FSC are recognized
  - Including products meeting other environmental criteria
    - Materials reuse
    - Recycled content



LEED and Hardwoods

- In LEED v4 commercial rating system, FSC is recognized in the credit
  - Building Product Disclosure & Optimization: Sourcing Of Raw Materials
- Credit may be earned by using products that meet “leadership extraction practices” for at least 25 percent, by cost, of the total value of permanently installed building products in project.
- FSC-certified wood is one of a few products that can count toward the 25 percent threshold.

Removing Irresponsibly Sourced Hardwood

- Still possible to meet LEED requirements and have illegal wood in a LEED-certified project
- New LEED pilot: Alternative Compliance Path (ACP) credit intended to help rid buildings of illegal wood products
  - Encouraging use of material verified to be legal
  - ACP seeks to focus attention on need for more comprehensive and effective verification of building products
  - Address a critical piece of supply chain
  - Reward projects that verify wood they are using is legal

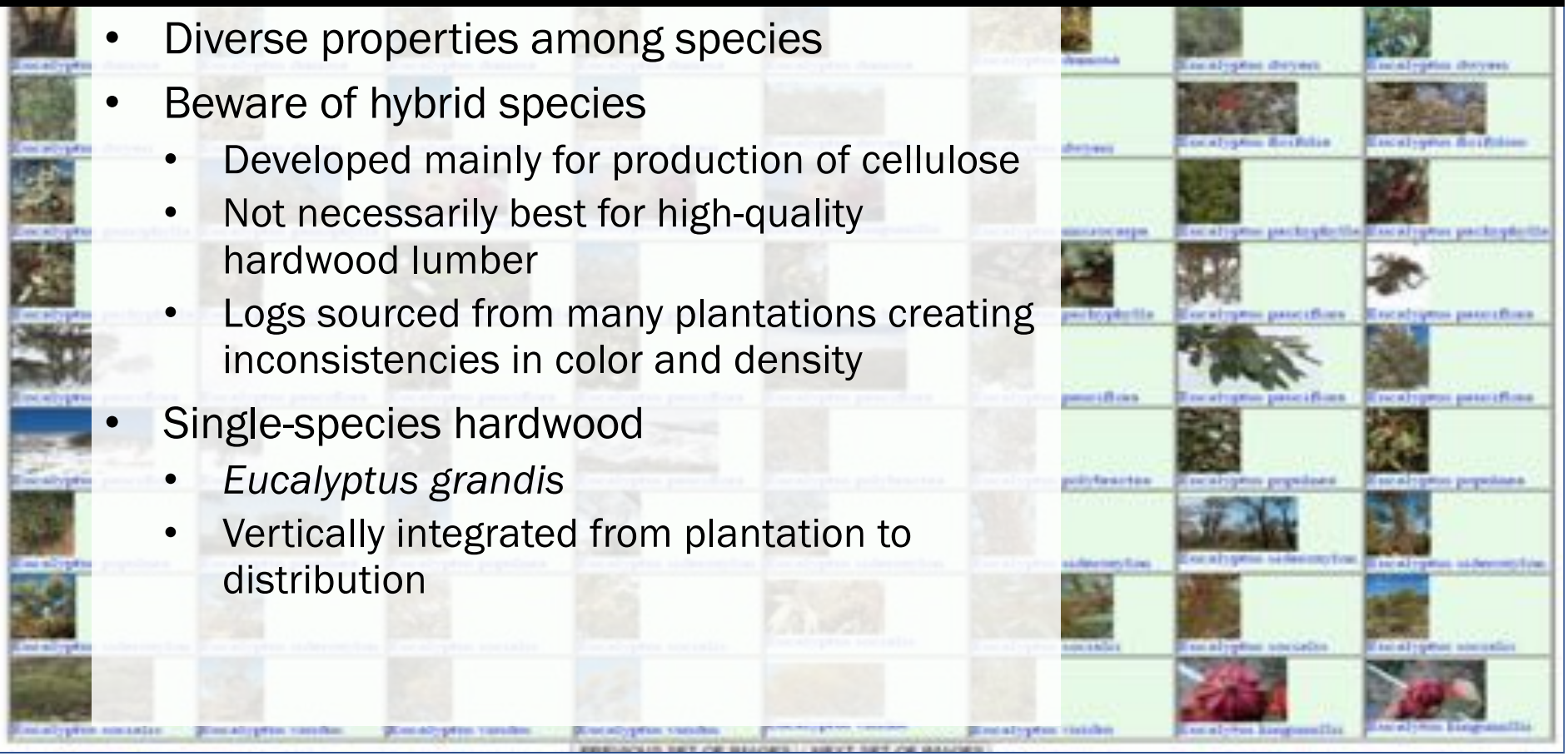
Weeding Out the Supply Chain

"The U.S. Green Building Council has a vision that buildings and communities will regenerate and sustain the health and vitality of all life within a generation. Its mission is to transform the way buildings and communities are designed, built, and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves quality of life."

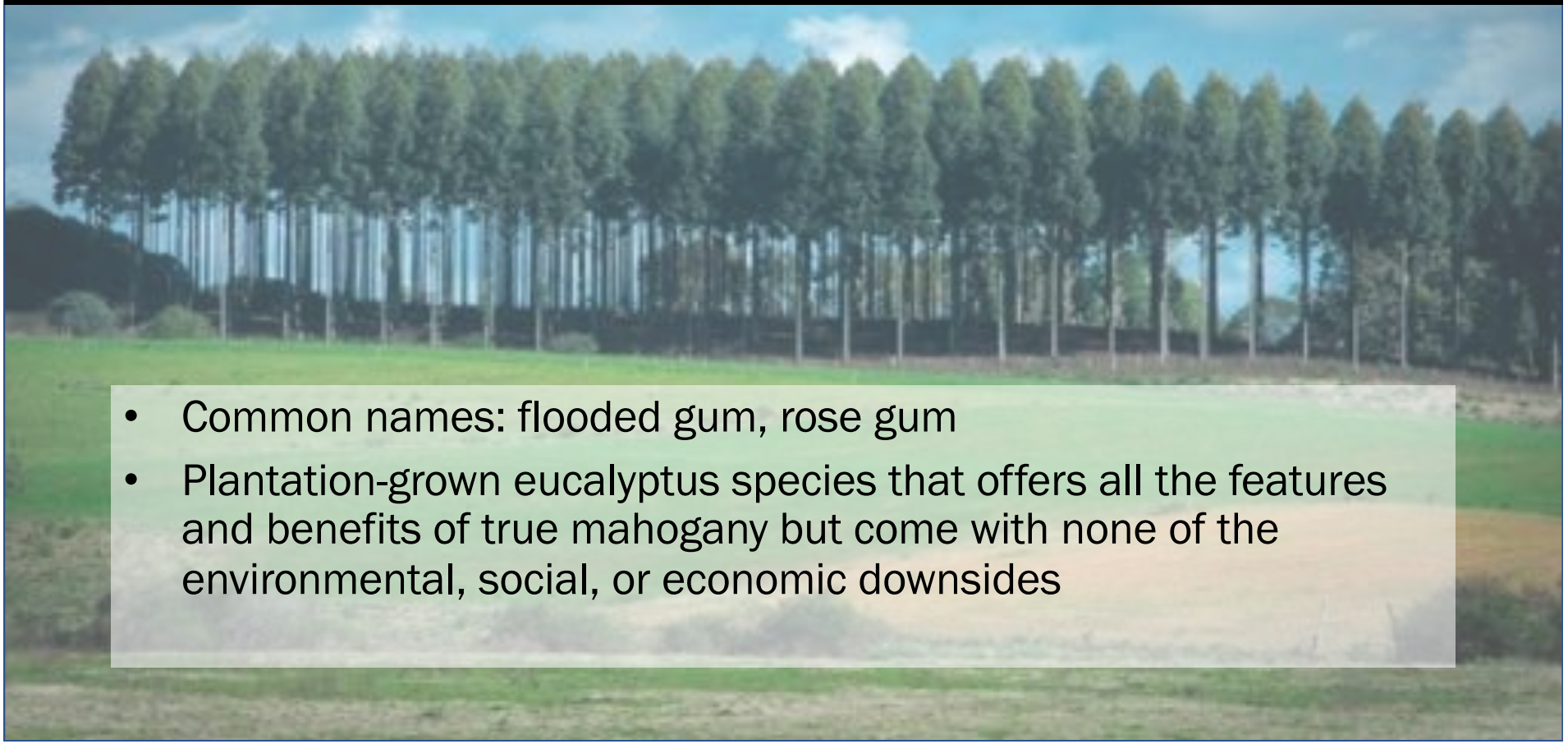
—Taryn Holowka, Senior Vice President,
Marketing, Communications, & Advocacy, USGBC

Eucalyptus Family: More Than 700 Species

- Diverse properties among species
- Beware of hybrid species
  - Developed mainly for production of cellulose
  - Not necessarily best for high-quality hardwood lumber
  - Logs sourced from many plantations creating inconsistencies in color and density
- Single-species hardwood
  - *Eucalyptus grandis*
  - Vertically integrated from plantation to distribution



Temperate Plantation Hardwood



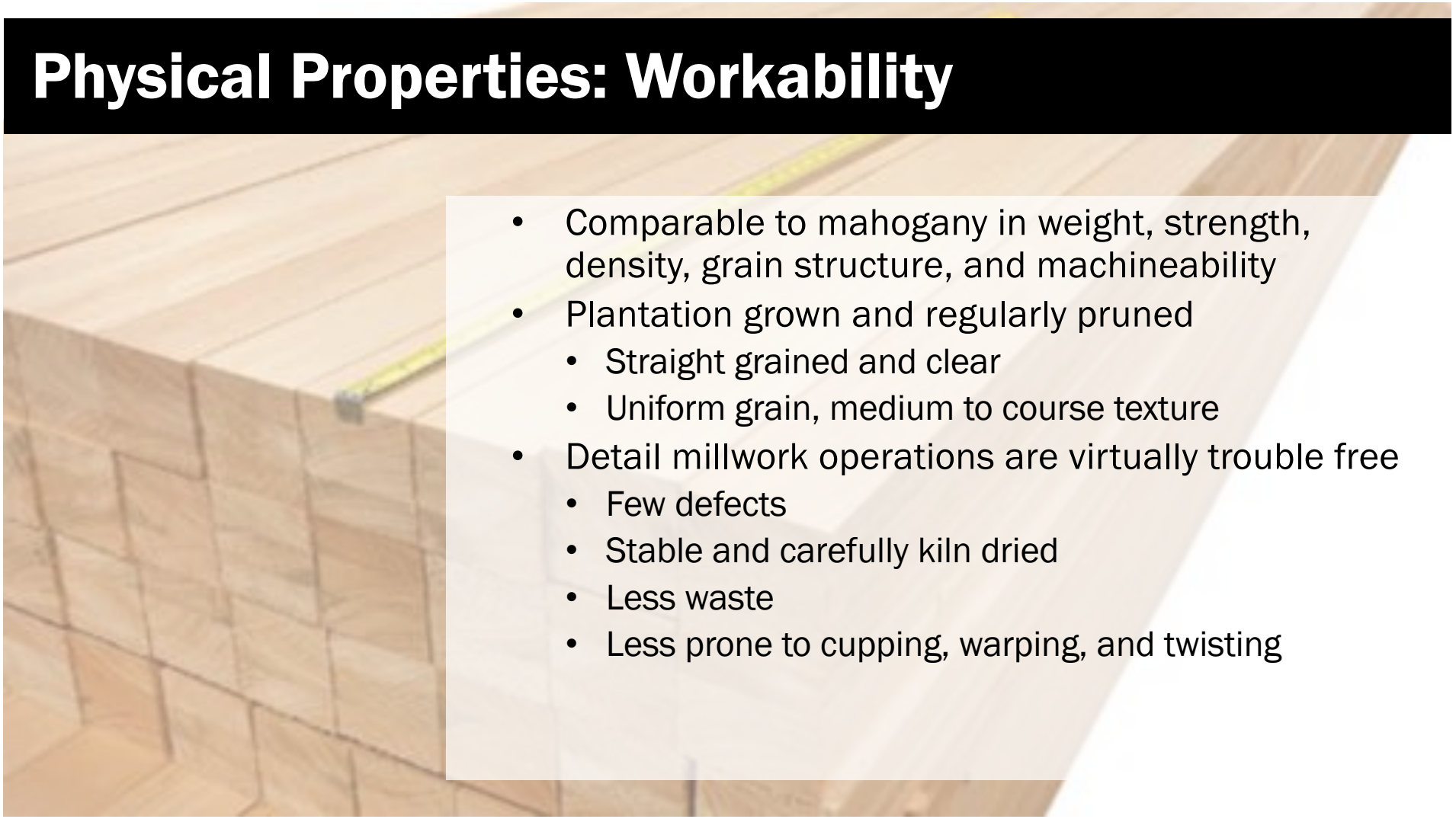
- Common names: flooded gum, rose gum
- Plantation-grown eucalyptus species that offers all the features and benefits of true mahogany but come with none of the environmental, social, or economic downsides

Physical Properties: Coloration

The color is lighter than genuine mahogany and closer to pale pink.

As it oxidizes and is finished, the color deepens to a rich red much closer to centuries-old mahogany.

Physical Properties: Workability



- Comparable to mahogany in weight, strength, density, grain structure, and machineability
- Plantation grown and regularly pruned
  - Straight grained and clear
  - Uniform grain, medium to course texture
- Detail millwork operations are virtually trouble free
  - Few defects
  - Stable and carefully kiln dried
  - Less waste
  - Less prone to cupping, warping, and twisting

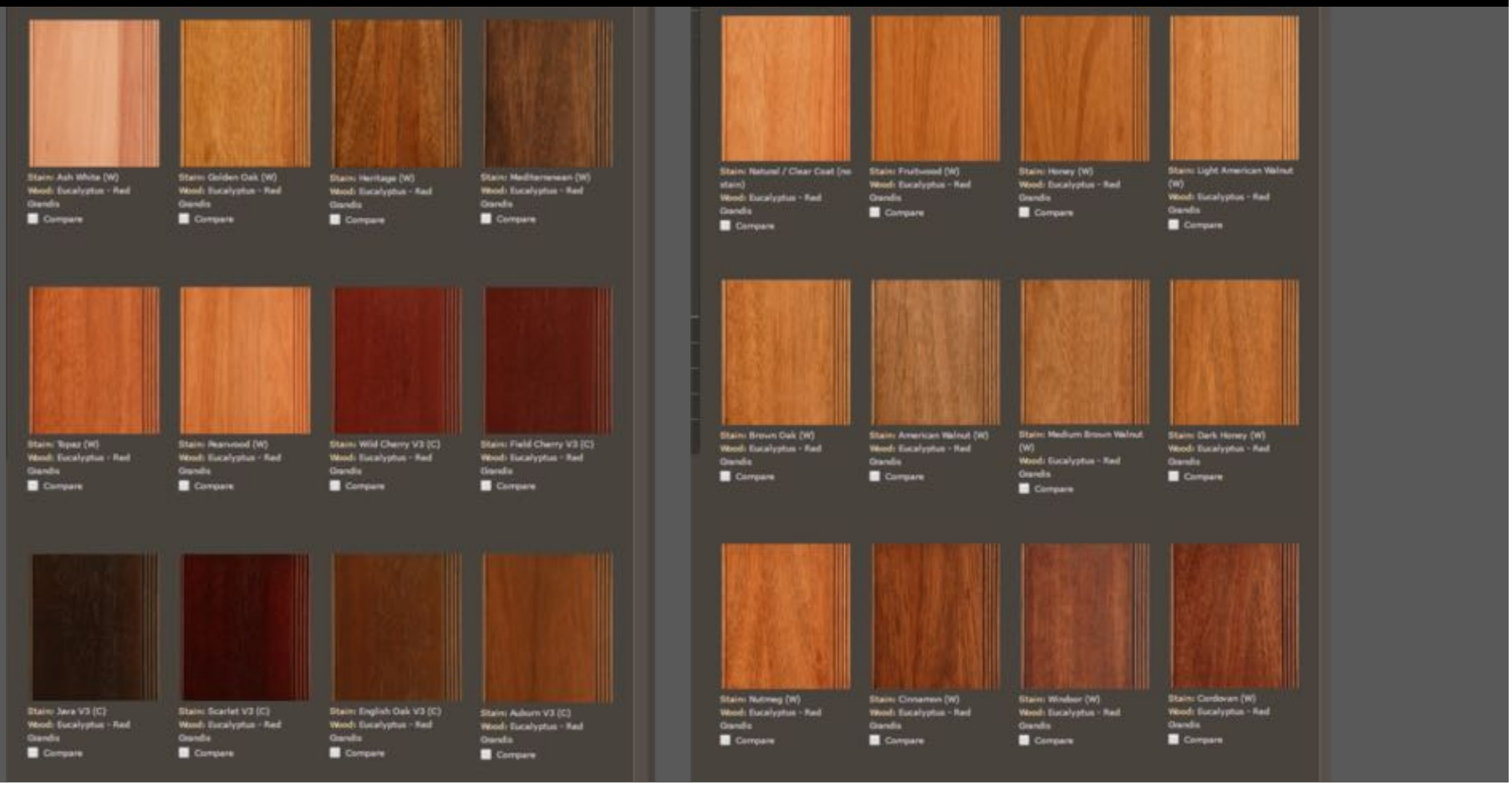
Video: Workability

Brian Daws, Production Manager, DW Modlings Ltd.

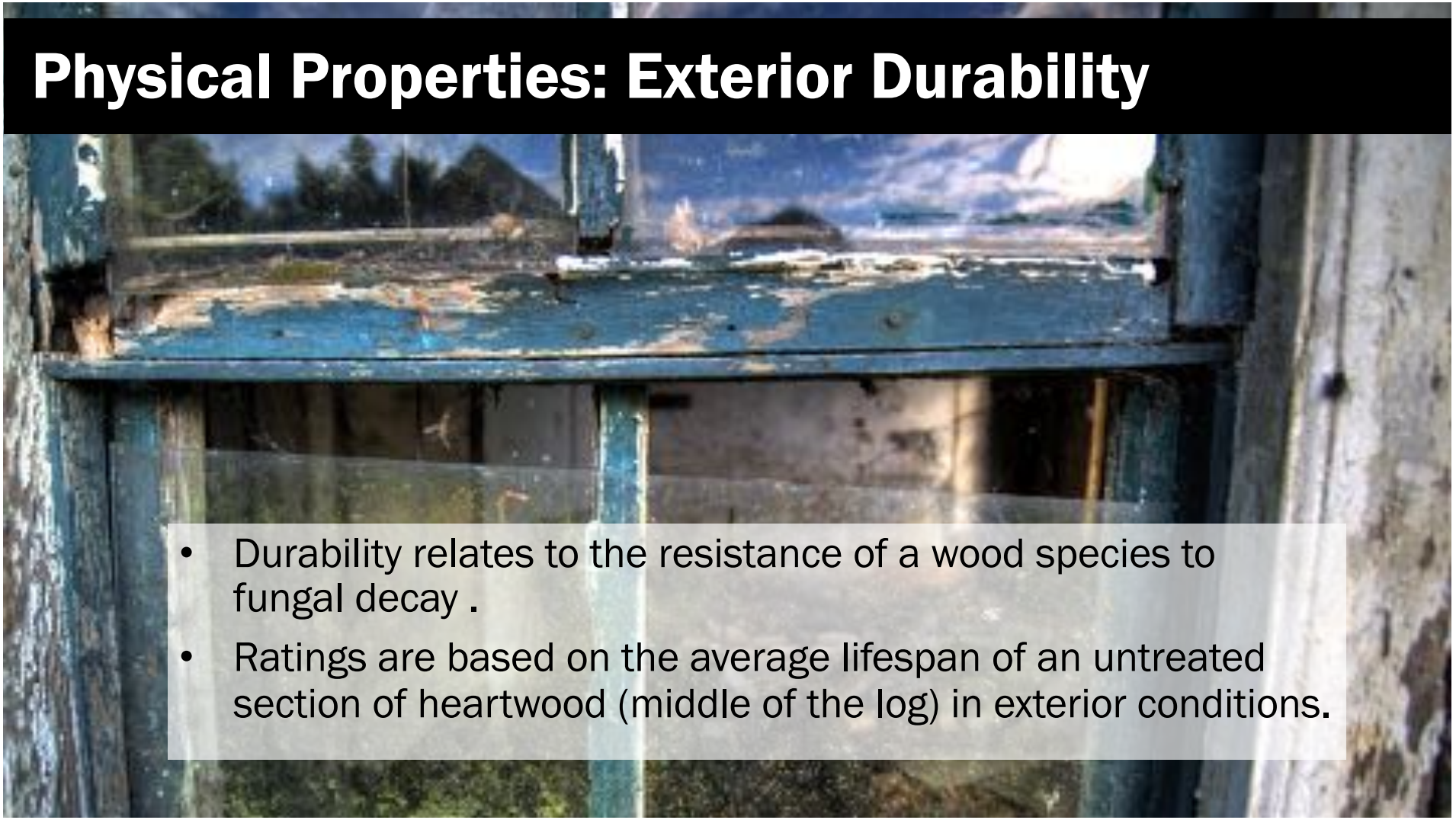
Physical Properties: Interior Applications

- Easily absorbs:
  - Stains
  - Washes
  - Paints and other coatings
- Excellent hardwood choice for custom finishes
- For lighter coloration, bleach to get shades similar to ash, birch, and white oak.

Stain Samples



Physical Properties: Exterior Durability

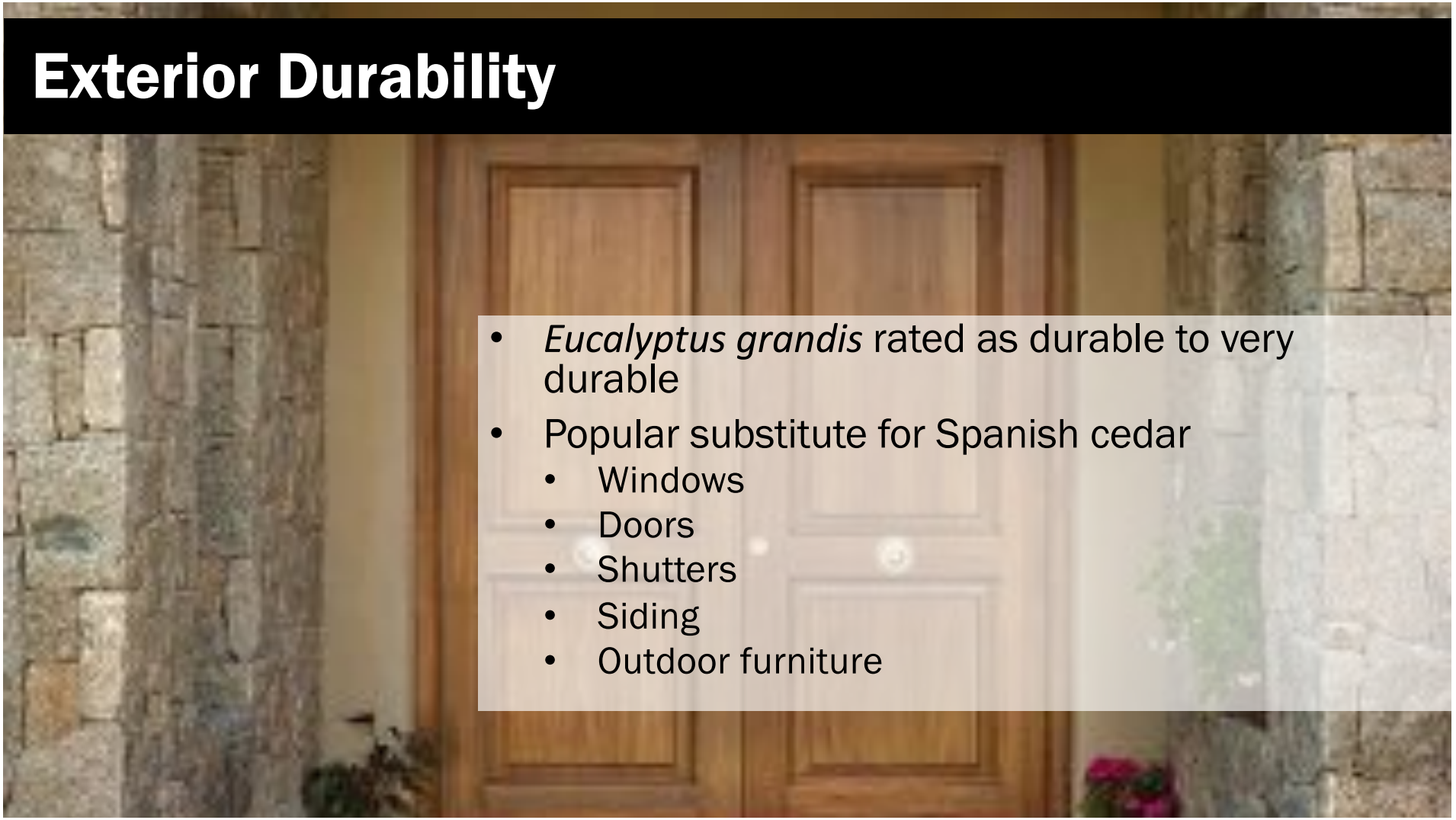


- Durability relates to the resistance of a wood species to fungal decay .
- Ratings are based on the average lifespan of an untreated section of heartwood (middle of the log) in exterior conditions.

Exterior Durability

- WDMA rot-resistance tests
- FCBA
  - Rated as Class 3 against wood-destroying fungi (*Basidiomycetes*)
- TRADA tests state:
  - Durability Class 3
  - Windows and doors up to 30 years without treatment

Exterior Durability



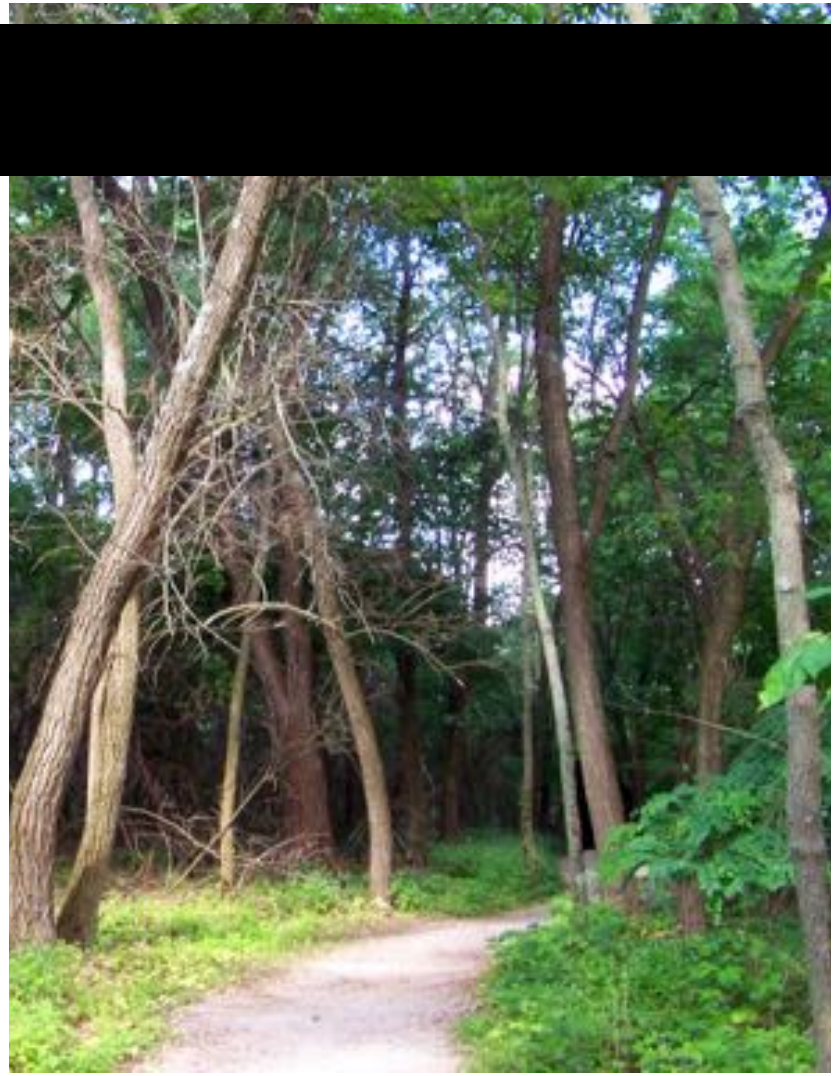
- *Eucalyptus grandis* rated as durable to very durable
- Popular substitute for Spanish cedar
  - Windows
  - Doors
  - Shutters
  - Siding
  - Outdoor furniture

Physical Properties

SPECIALTY LUMBER:	SPANISH CEDAR	SAPELE	MERANTI Dark Red Nemesu	RED GRANDIS
COLOR:	Light pinkish to reddish brown	Dark reddish brown	Dark reddish brown	Light pinkish to reddish brown
STAINING:	Stains well	Stains well	Stains well	Stains well
GROWTH AREA:	Central & South America and the Caribbean	Tropical Africa	Southeast Asia	Latin America
SUITABLE FOR EXTERIOR USE:	Excellent	Excellent	Excellent	Excellent
ALSO KNOWN AS:	Cedro	Sapelli, Sapeli	Dark Red Lauan, Dark Red Philippine Mahogany	Eucaluptus Grandis, rose gum
COMMON USES:	Cabinetry, fine furniture, musical instruments, boat building, cigar boxes	Furniture, cabinetry, decorative veneers, plywood, flooring, paneling	Furniture, flooring, decking, paneling, door and window frames, boat building, vehicle floor boards	Furniture, cabinetry, flooring, decking, windows, doors, exterior siding and trim, outdoor furniture
DURABILITY:	Resistant to termites	Resistance to termites is moderate	Generally termite resistant	Resistance to termites is moderate
GRAIN:	Straight or shallow interlocked	Interlocked and sometimes wavy	Straight or interlocked	Straight or slightly interlocked
SMELL:	Distinctive cedar-like aroma	Cedar-like aroma	No characteristic aroma	No characteristic aroma
BENDING STRENGTH (Dry):	11,300 psi	17,895 psi	17,761 psi	11,250 psi
AVERAGE WEIGHT (Dry):	29 lbs./ft³	42 lbs./ft³	42 lbs./ft³	42 lbs./ft³
JANKA HARDNESS:	600 lbf	1410 lbf	800 lbf	720 lbf
RADIAL SHRINKAGE:	4%	5%	4%	3%
GRAIN APPEARANCE:				

Economic Sustainability

- Land owners have options to convert forests to other uses to improve their economic returns
- Value of harvested wood can help to keep land in forest
- Ethically sourced:
  - Procured from full FSC-certified plantations
  - Guaranteed by a full chain of custody
  - Environmentally friendly
  - Available in abundance



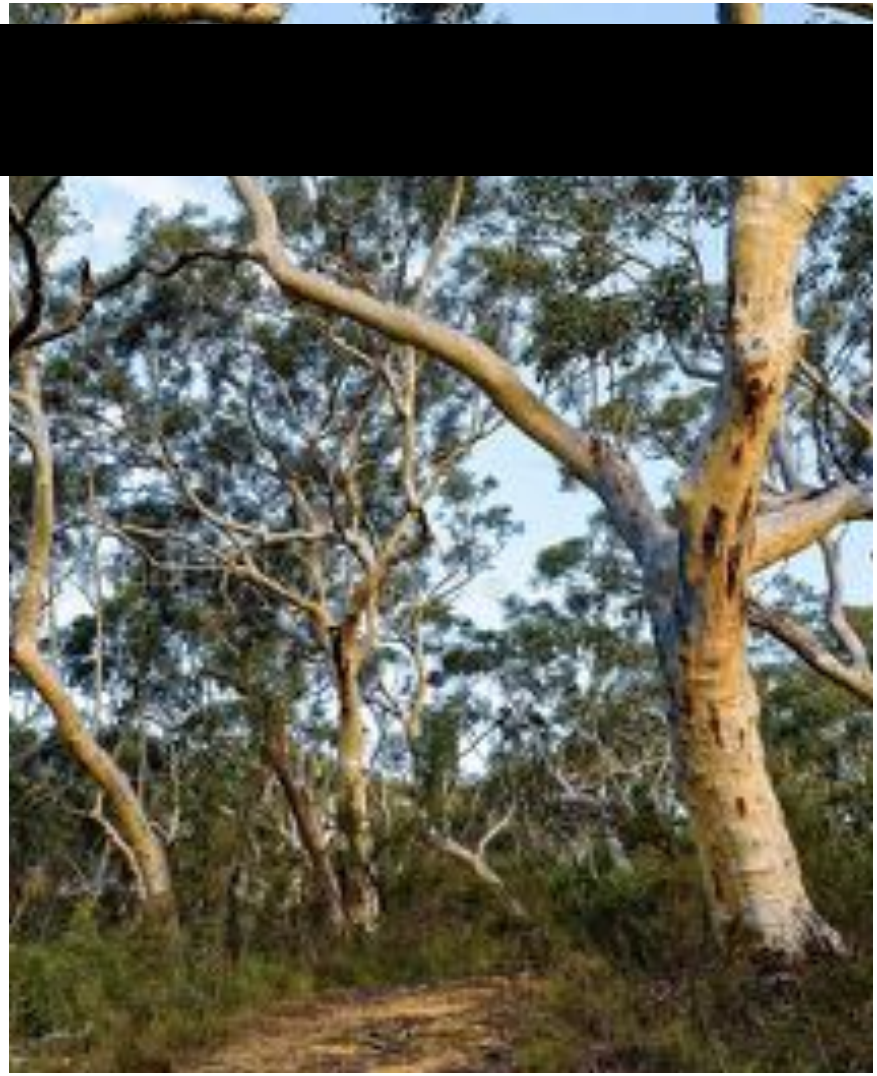
Social sustainability

- Encompasses:
  - Social equity
  - Livability
  - Health equity
  - Community development
  - Social capital
  - Human rights
  - Labor rights
  - Placemaking,
  - Social responsibility
  - Social justice
  - Cultural competence
  - Community resilience
  - Human adaptation
- FSC Pure timber also means:
  - Plantation workers receive a decent livelihood
  - Workers' social, health, and safety needs are met
  - Contributes to their economy and reduces illegal logging

Video

Fiber Farms

- Fiber farm's controversial environmental and social impact
  - Short rotation crops
  - Replacement of existing, natural forests with tree plantations
  - Social problems in regard to rights of local people



Local Stewardship, International Reach

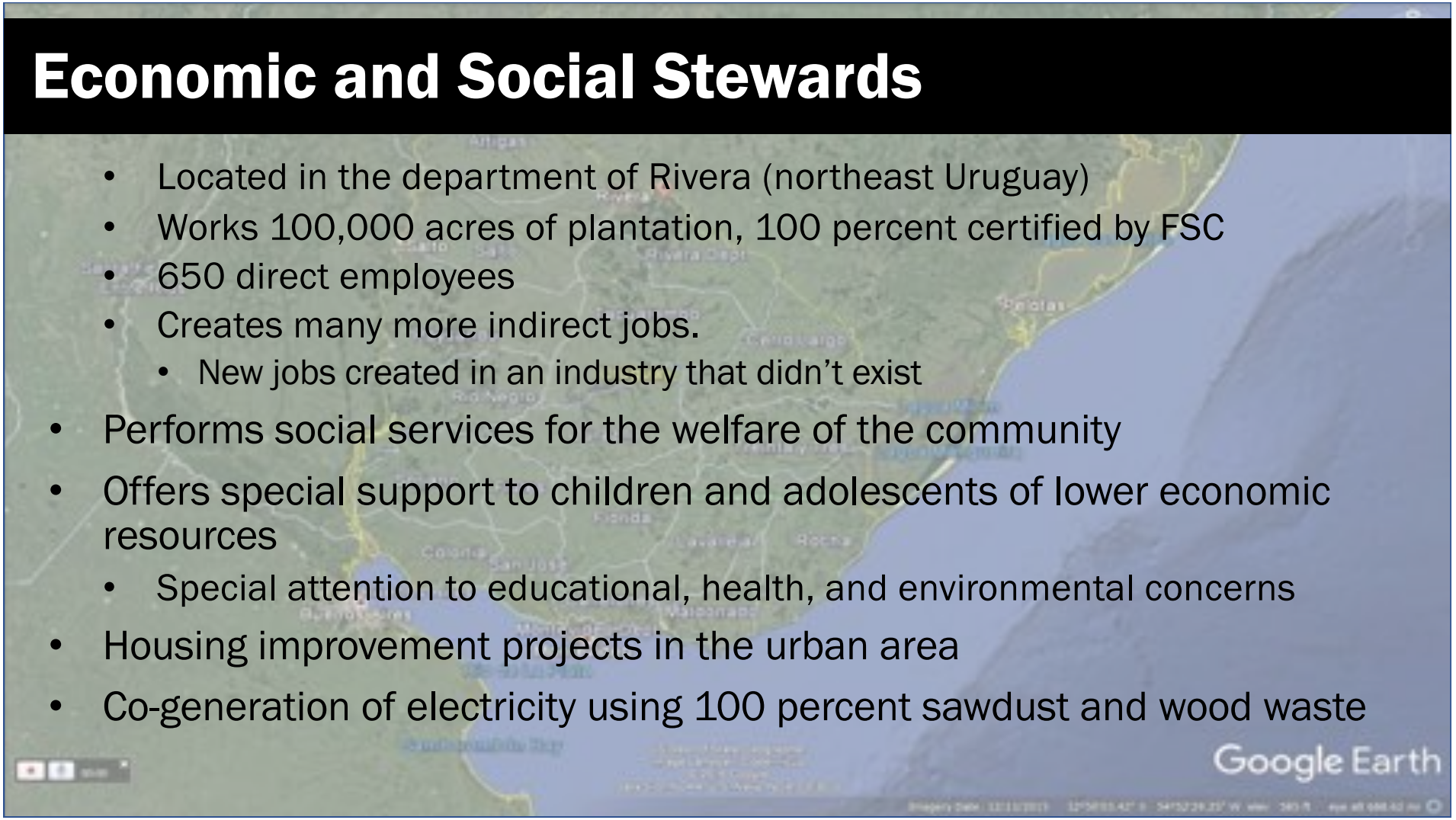
- A contrary model
  - Pioneer in forestation of Uruguay, a country without indigenous forests
  - New forests NOT from appropriated land serving other purposes
  - Land only used for raising cattle, when converted to plantations, still used for cattle, unaffected by new forest industry
  - High-quality solid lumber
  - Maintaining a serious environmental, economic, and social stewardship role in Uruguay

Environmental Stewards

- Managed forests increase jobs and job security
- Forests also provide habitat for both rare and common species
- Forests
  - Create recreational opportunities
  - Provide aesthetic values
  - Improve quality of life for community
- Supports development of alternative rural production activities
  - Beekeeping
  - Horticulture
- Diversifies Uruguay exports

Economic and Social Stewards

- Located in the department of Rivera (northeast Uruguay)
- Works 100,000 acres of plantation, 100 percent certified by FSC
- 650 direct employees
- Creates many more indirect jobs.
  - New jobs created in an industry that didn't exist
- Performs social services for the welfare of the community
- Offers special support to children and adolescents of lower economic resources
  - Special attention to educational, health, and environmental concerns
- Housing improvement projects in the urban area
- Co-generation of electricity using 100 percent sawdust and wood waste



How It’s Grown

Nursery Science

- Urufor tree improvement program
  - 100 percent *Eucalyptus grandis* (one specie)
- State-of-the-art nurseries
  - Modern vegetative reproductive technology
  - Ensures healthy saplings every generation
- Defect-free trees in 22- to 23-year growing cycle

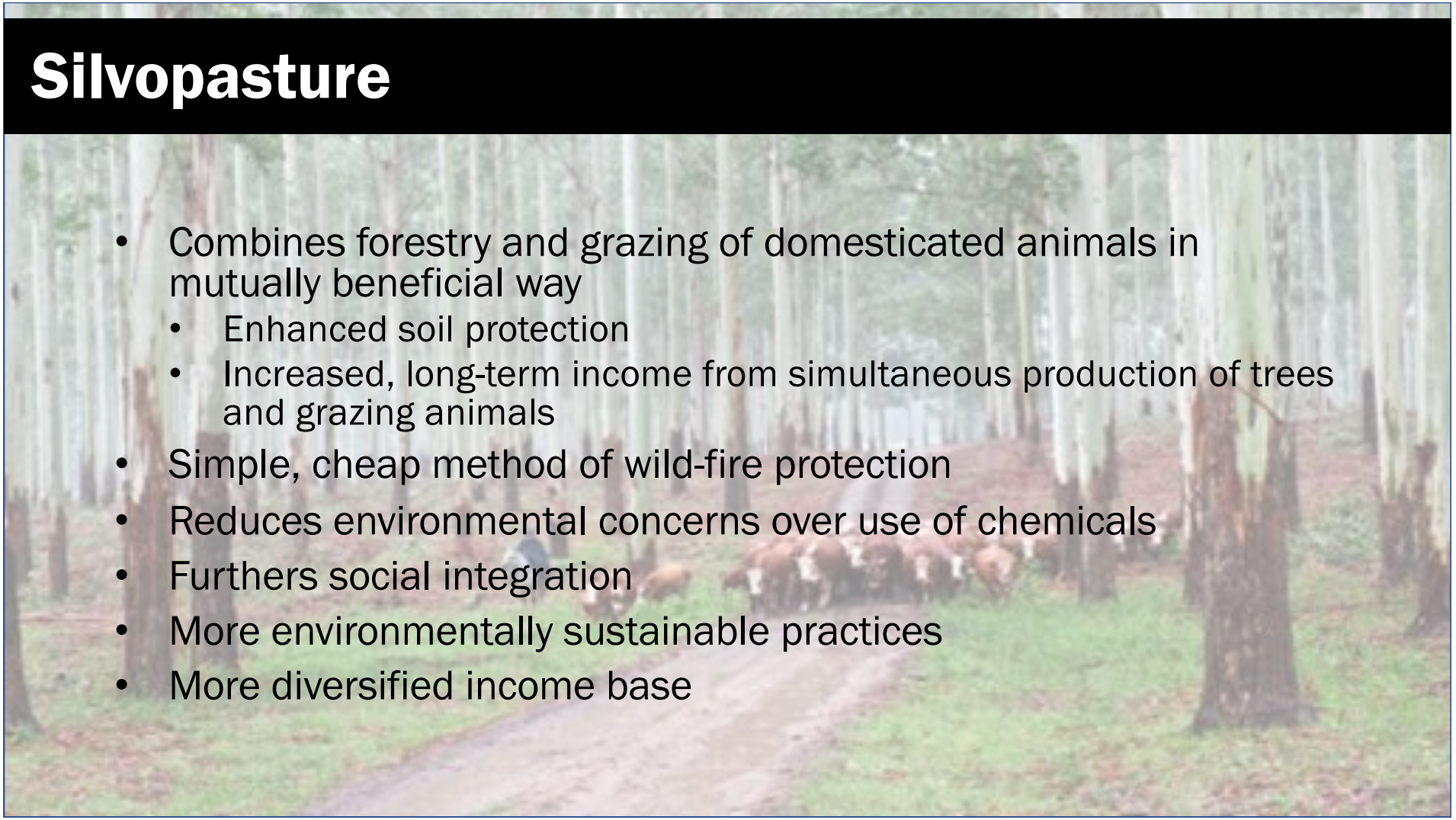
Video

Sylvicultural Management

- Modern sylvicultural practices:
  - Thinning
  - Pruning
    - Single, straight stem
    - Knot-free trunks
    - Increased growth rate
- Increase soil and biomass, biological diversity, and water capture and storage
- Low environmental impact, many rotations into the future

Video

Silvopasture



- Combines forestry and grazing of domesticated animals in mutually beneficial way
  - Enhanced soil protection
  - Increased, long-term income from simultaneous production of trees and grazing animals
- Simple, cheap method of wild-fire protection
- Reduces environmental concerns over use of chemicals
- Furthers social integration
- More environmentally sustainable practices
- More diversified income base

FSC-Certified Harvesting

- Factory/sawmill
  - Log input capacity of 320,000 cubic meters per year
- Continuity of supply
  - Extensive stocks of sawn boards, moldings, and other engineered products

Lumber Mill

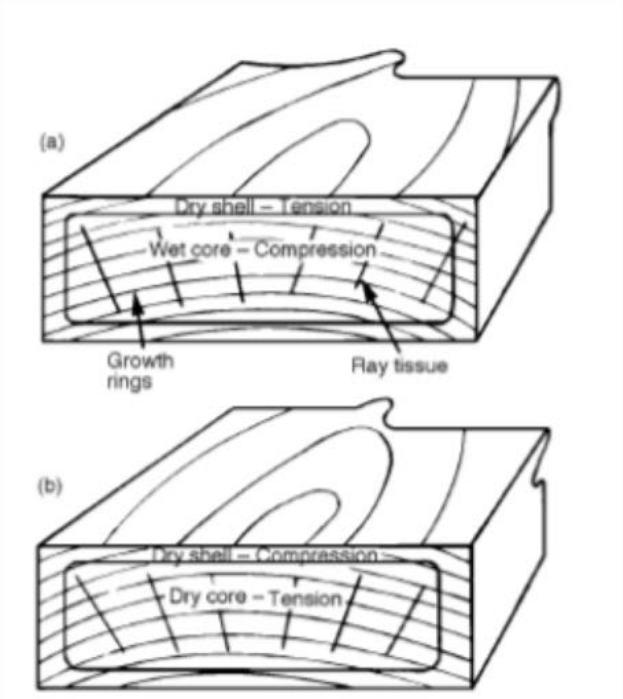
- State-of-the-art German saw mill technology
- Quality control
  - Accurate dimensions
- Consistent grading under NHLA Rules

Careful Kiln Drying

- Kiln Drying
  - 58 state-of-the-art kilns
  - 5.5 million BFT drying capacity
  - Cogeneration of 9 MW/hour of energy
  - 6–8 percent or 10–12 percent moisture content

Lumber Distribution

- Thickness: 4/4, 5/4, 6/4, 8/4
- Width: 6–12 inches, average 8–9 inches
- Length: 8–16 feet
- Kiln dried to 6–8 percent or 10–12 percent moisture content



What Is *Eucalyptus grandis* Used For?

- Uses: Interior
  - Moldings
  - Mantels
  - Decorative Features
  - Pergolas
  - Louvers
  - Wall Panels
  - Paneling
    - Walls
    - Ceilings
  - Detail millwork
    - Staircases, balustrades
    - Truss and beams
    - Columns
  - Furniture
  - Cabinets and built-ins
  - Others
    - Guitars

Uses: Exterior

- Doors
- Shutters
- Windows and skylights
- Siding
- Moldings
- Decorative beams, trellis
- Outdoor furniture

Hardwood Acoustics

"In addition to the usual sustainable advantages of wood—renewability, nontoxic, carbon storing—there is an additional aspect, that being acoustics. Sustainability is more than being responsible about the impact of a project on the earth's resources and climate but also on the quality of environment for users."

—Marcy Wong, Marcy Wong Donn Logan Architects

Wood and Health

- Use of visual wood can lower physiological stress responses in humans
- Wood is hypoallergenic
- Wood can moderate humidity
- Performs well in areas that are essential to occupant comfort and performance, resulting in spaces where people feel good and do well over long periods of time

"This is one of the most overlooked aspects of sustainability. It's not about the points. It's about designing places where people want to be."

—Marc L'Italien of EHDD, discussing the LEED Platinum-certified David and Lucile Packard Foundation Headquarters

Case Study: Lewis Lumber Products

- Mahogany alternative
- Excellent exterior properties

"A versatile, strong, and beautiful lumber considered one of the first substitutes for tropical lumber. It is an excellent lumber for furniture, house interiors, flooring, framing, and decorative products."

—Lewis Lumber Website

Case Study: Advantage Architectural Woodwork

- Used for custom wood windows and doors
- Appealing because
  - Sustainably grown
  - Dimensional stability
- Tested each board for moisture content
  - Within 1 percent!
- Machined and glued well
- No rejects
- Consistent in color and density

Conclusion


Thank you!
This concludes The American Institute of Architects Continuing Education Systems Course.
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