Woody Biomass Utilization Challenges and Opportunities

Potential products and available technologies; what make sense?

Gareth J Mayhead
University of California Berkeley

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Overview of today

Purpose:

Look at some alternatives for utilization based on challenges and opportunities discussed

- Feedstocks
- Smallwood properties and problems
- Potential uses
  - Lumber
  - Roundwood
  - WPC
  - Densified products
- Conclusions

Restoring ecosystems, protecting communities, recreation

Feedstocks

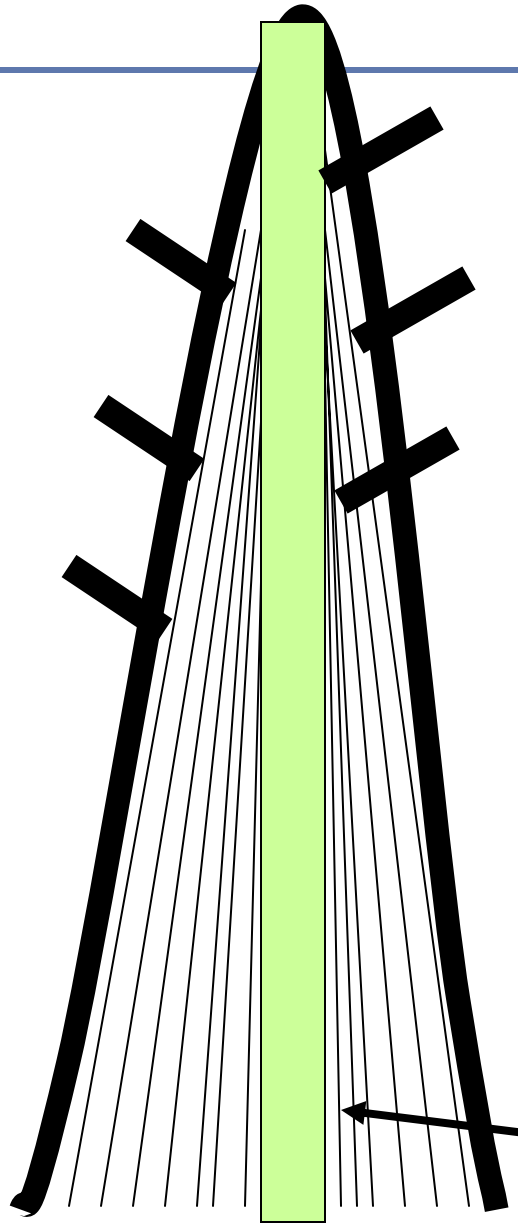
- Dead trees
  - Blue stain
  - Beetle galleries
- Small diameter…

- “waste”
- “disposal”
- “get rid of stuff”
- “stuff”
- “it”
- “cost”

What is the Problem with Smallwood?

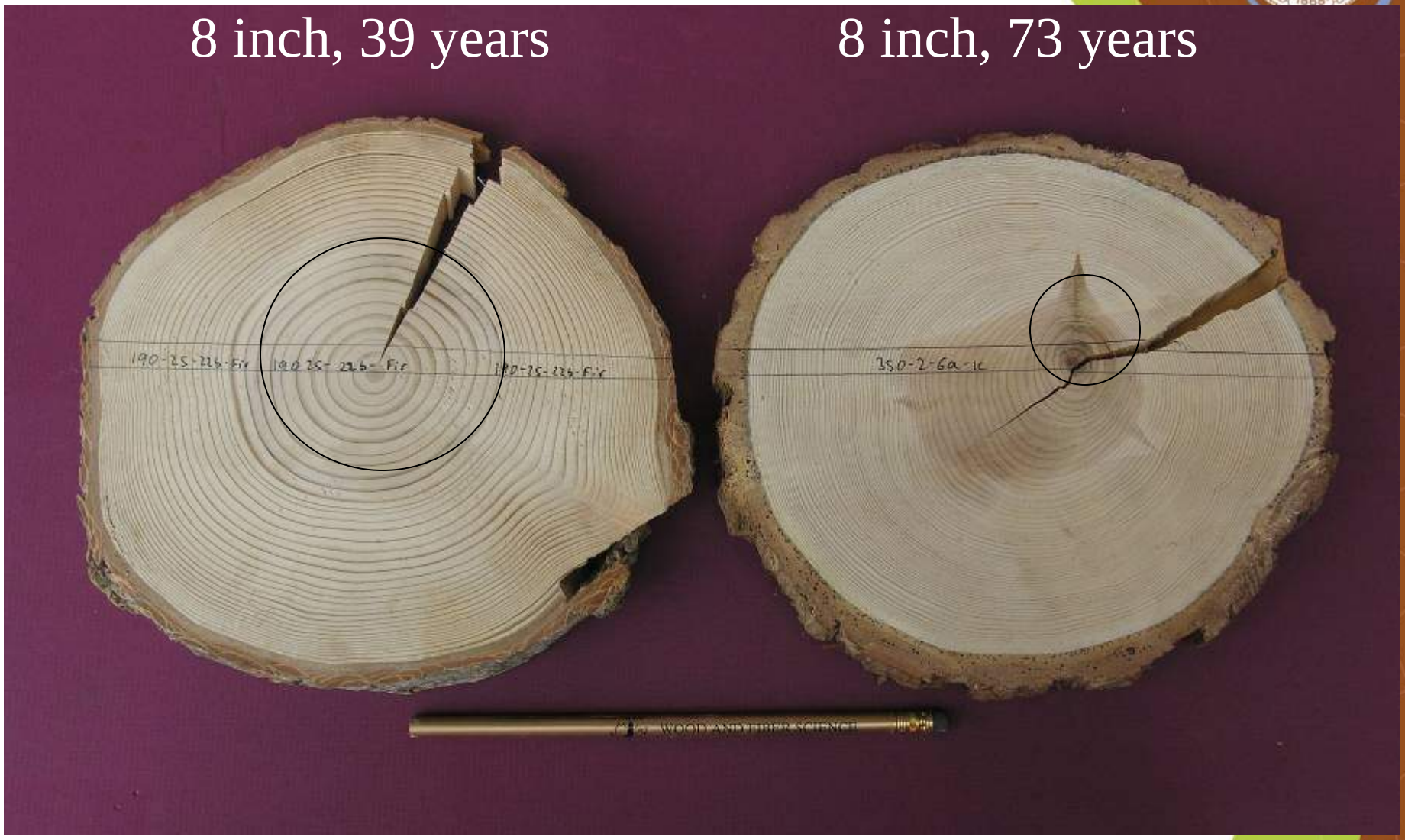
- Resource Availability
- Processing Cost
- Product Quality
  - juvenile wood
  - differential shrinkage
  - knots

Small Diameter Wood is Different from wood derived from larger trees

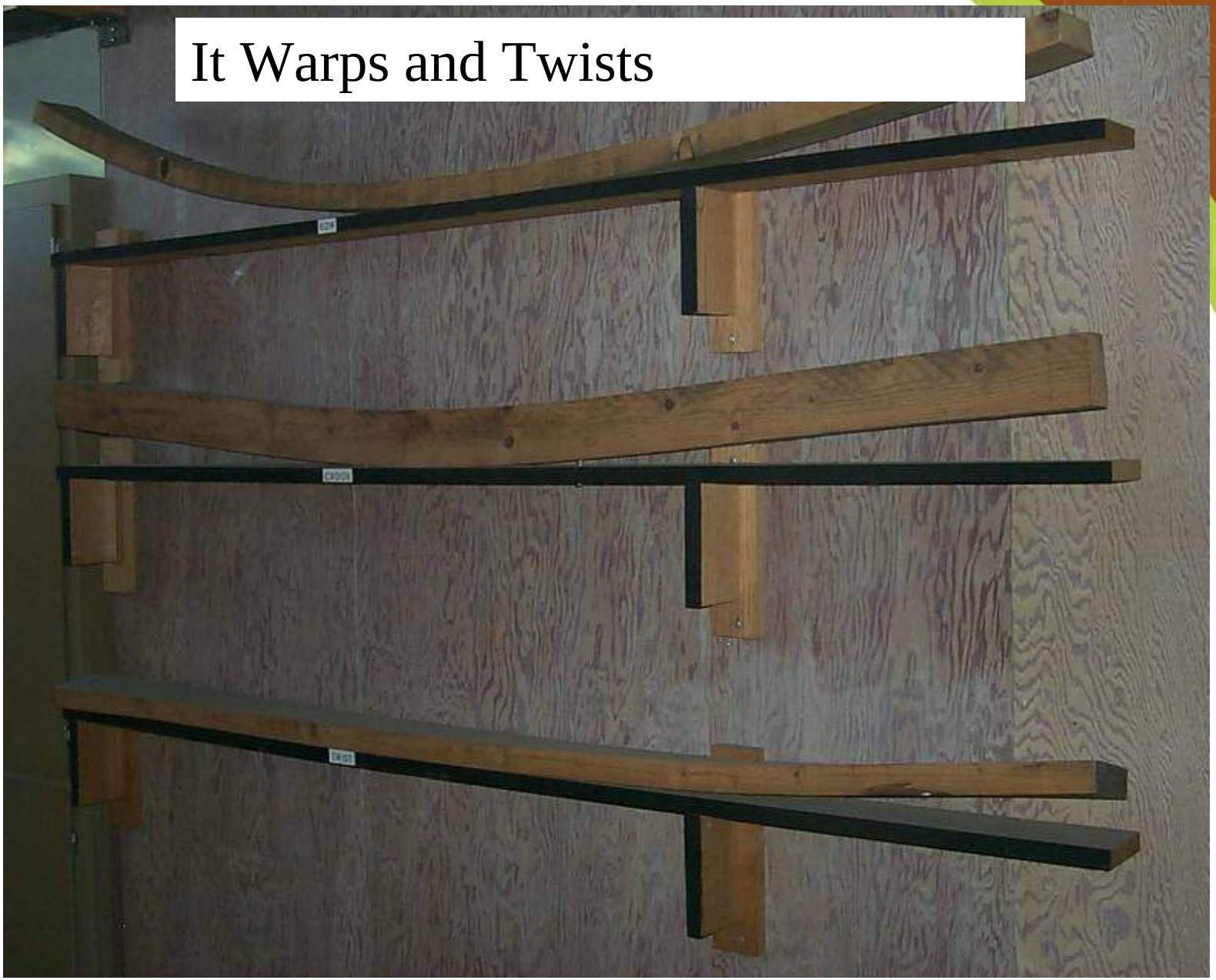


Juvenile Wood Core – first 5 to 20 growth rings

It Cracks



It Warps and Twists



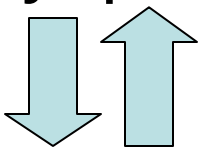
It Cups

Dimensional change in the tangential direction is twice as great as it is in the radial direction

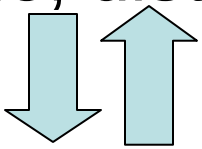
It behaves badly!

Value chain considerations

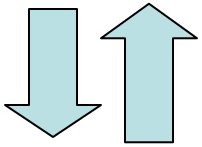
Resource : quality, price, availability



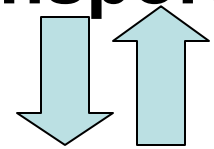
Transport: mode, distance, terrain



Process – Product



Transport



Market

Existing niche markets

- Supplies of sawlogs are declining
- Trend set to continue
  - Management objectives
  - Thinning prescriptions
  - Public perception
- A move to greater use of tree surgery arisings
- Is this type of infrastructure compatible with Forest Service objectives?

Existing bulk markets

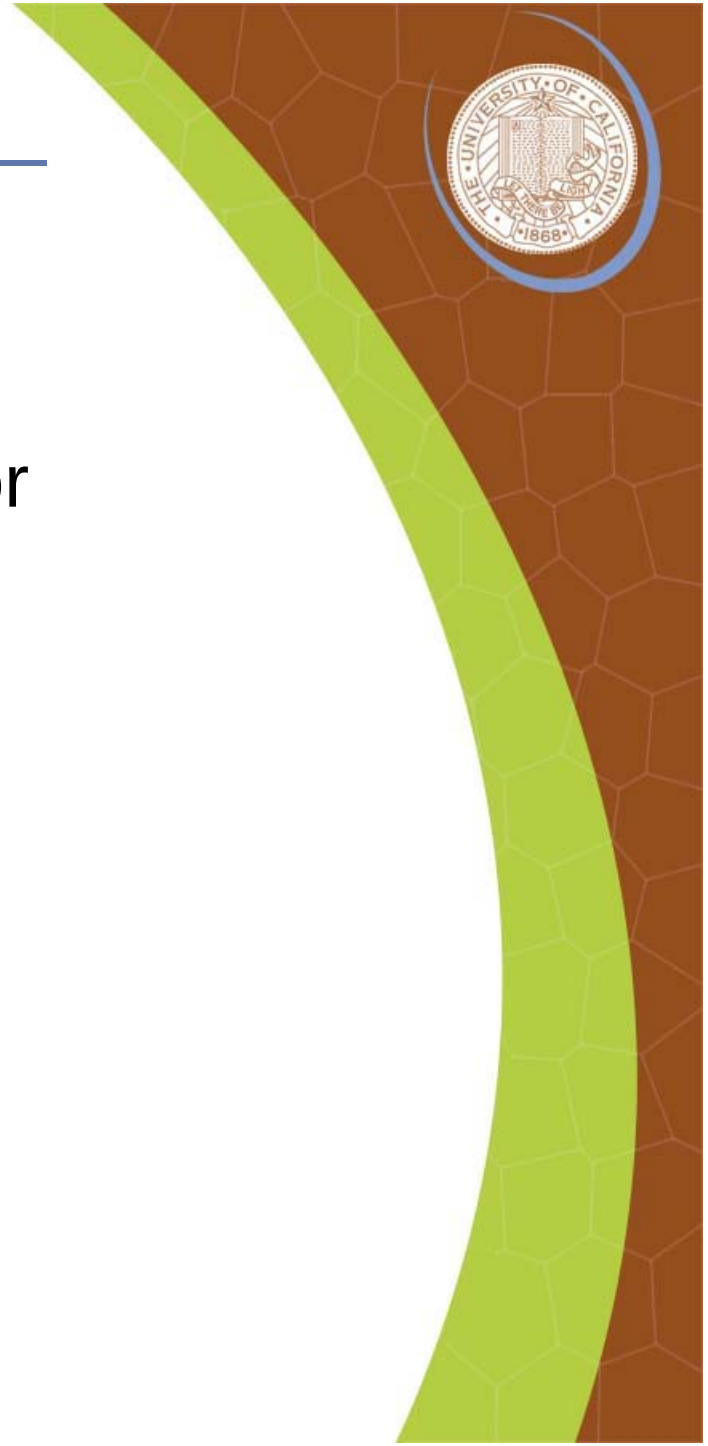
- Energy – Colmac
- Landscaping materials

- Lower risk
- Low quality okay
- Mixed species okay
- Capacity to take more material

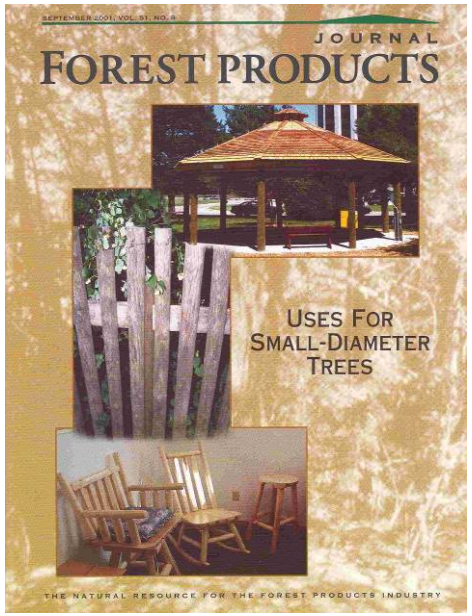
- Long term (10 years) supply commitments required in order for investment to happen

New bulk markets

- Another monster to feed?
- Long term (10 years) supply commitments required in order for investment to happen



Innovation?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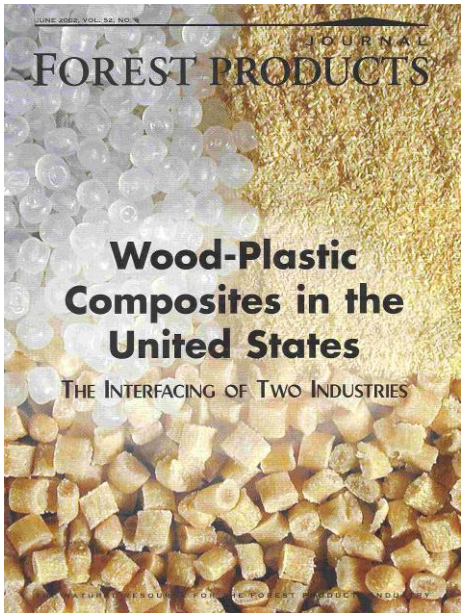
THE NATURAL RESOURCE FOR THE FOREST PRODUCTS INDUSTRY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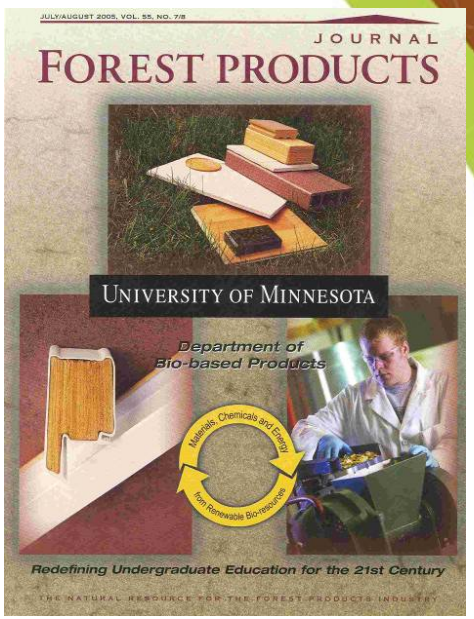
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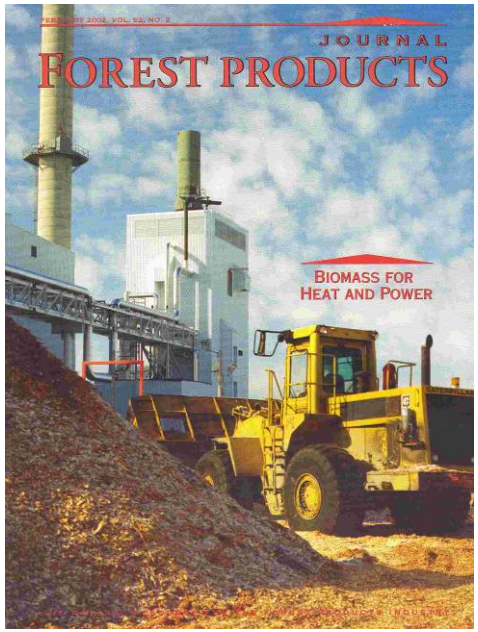
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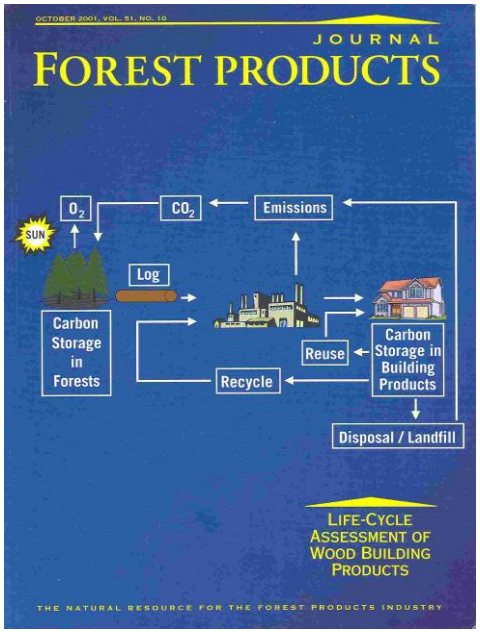
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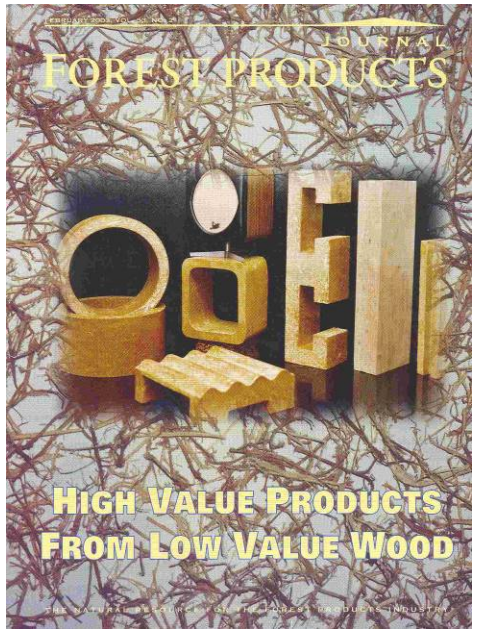
O_2
CO_2
Emissions
SUN
Log
Carbon Storage in Forests
Reuse
Carbon Storage in Building Products
Recycle
Disposal / Landfill
LIFE-CYCLE ASSESSMENT OF WOOD BUILDING PRODUCTS
THE NATURAL RESOURCE FOR THE FOREST PRODUCTS INDUSTRY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HIGH VALUE PRODUCTS FROM LOW VALUE WOOD

How can we innovate?

1. Improve conventional processes to overcome the inherent property limitations
2. Develop new processes
3. Develop new products

Innovation in Lumber Processing

"You should go to a pear tree for pears, not to an elm"

Publilius Syrus (~100 BC)

Round Wood-Is Stronger and More Stable

Connections are Difficult-Costly

Slide provided by USDA Forest Service, Forest Products Lab

End Products Can Be Beautiful!

Verification of design values is necessary to obtain building code approval

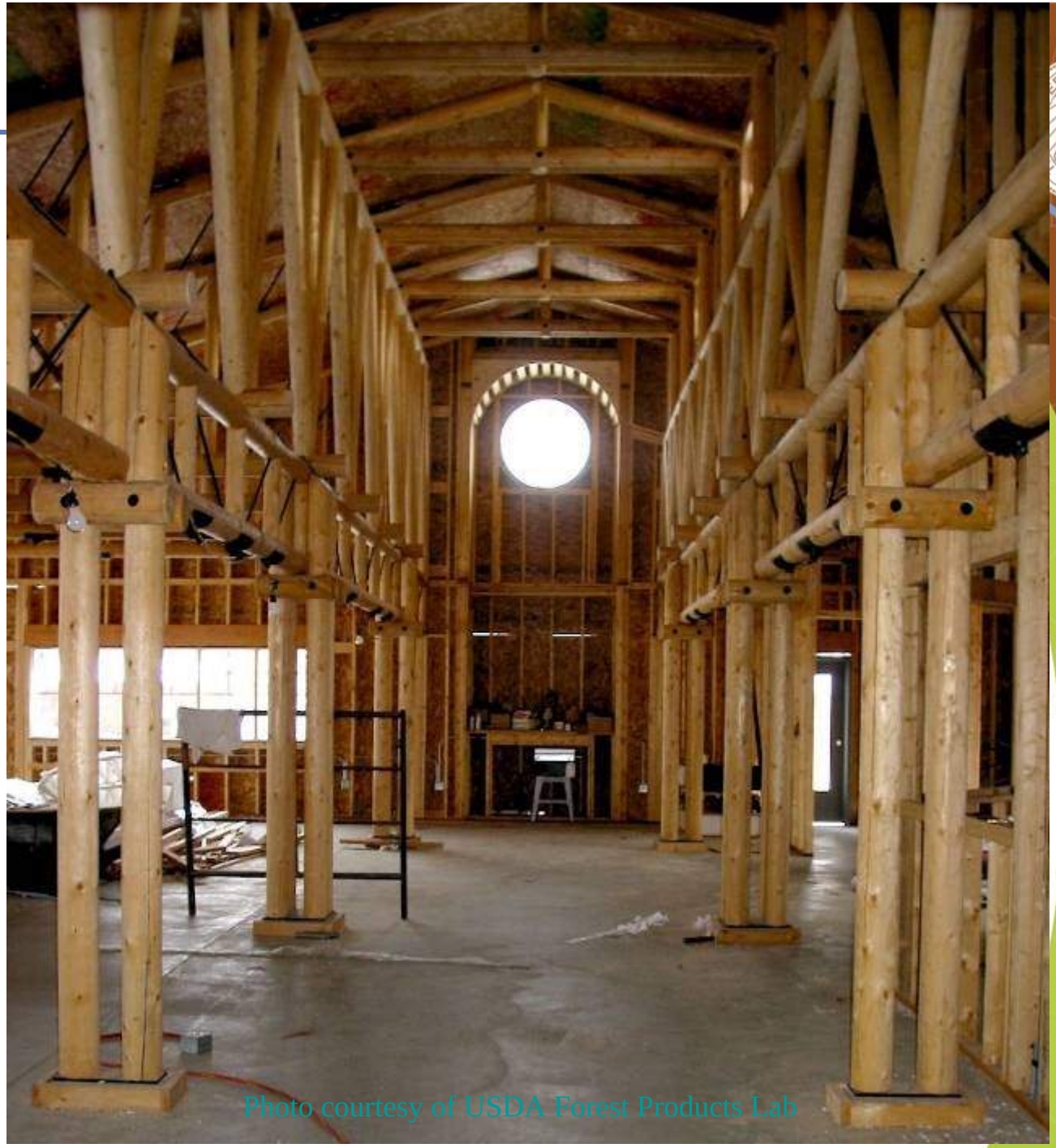
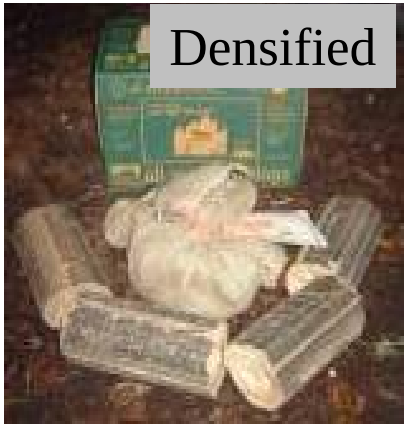


Photo courtesy of USDA Forest Products Lab

Breaking wood down into particles minimizes the impact of defects (knots, juvenile wood, insect galleries etc.)

Creating uniformity

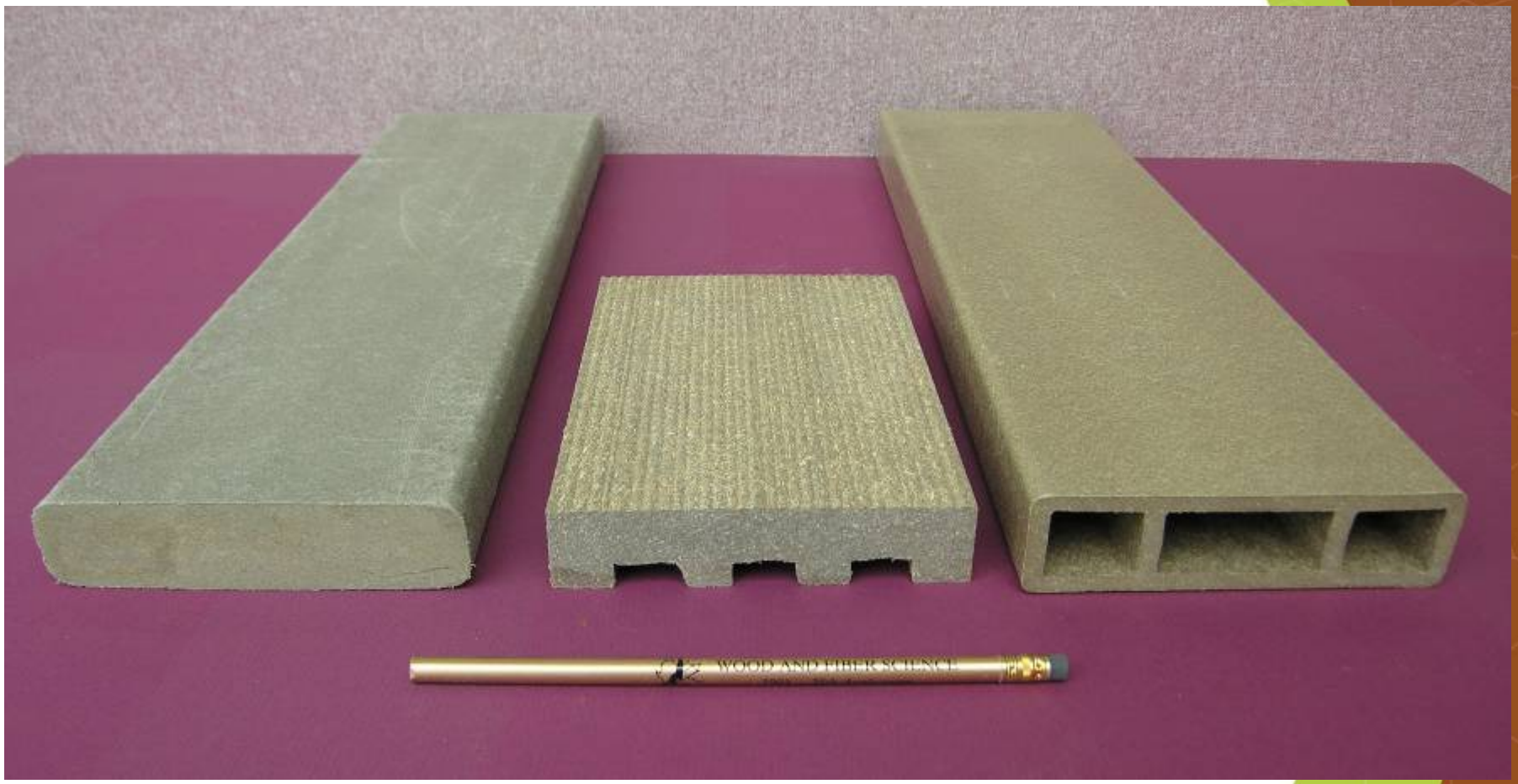


Innovation

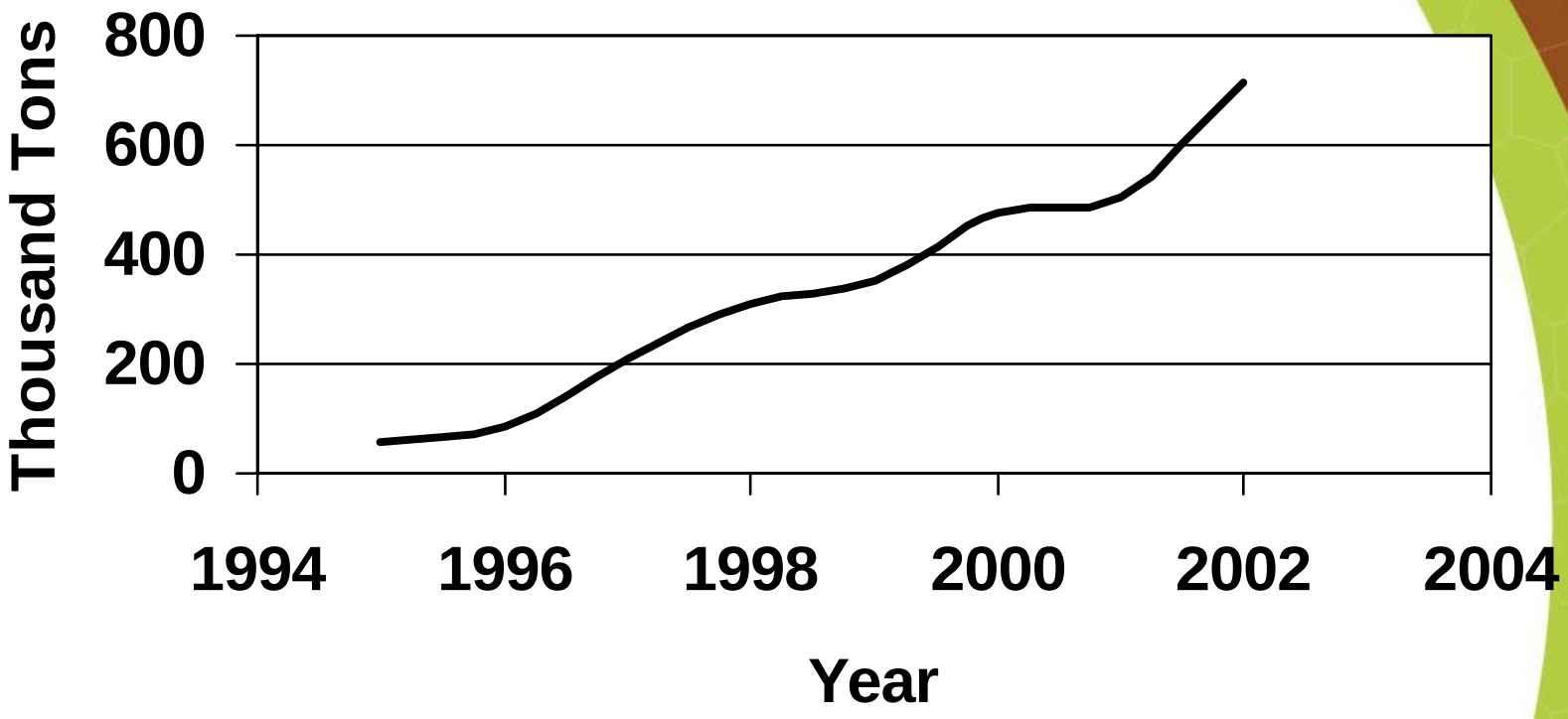
- Wood-Plastic Composites

Innovation

- Wood-Plastic Composites



Demand for Natural and Wood Fiber-Plastic Composites



Adapted from Morton, Quarmley, and Rossi. 2004. Seventh International Conference on Wood Fiber – Plastic Composites. Forest Products Society, Madison, WI

Densified Solid Wood Products

Densified Products

- Breakdown
- Screens
- Drying
- Compression and heat
- Cutting
- Cooling

Wood pellets

- Uses
  - Fuel (seasonal)
  - Animal bedding/litter
  - Barbeque pellets
- Markets:
  - N America: 1.5 million tons/year
  - Europe: 10-12 million tons/year

Wood pellets for heat

- Domestic grades – big demand?
- Commercial grades

- High energy content
- Convenience
- Consistent product
- Stoves meet air quality
- Global commodity
- Equipment intensive
- Energy input
- Expensive end-product

- 10,000-40,000 tons/yr typical plant production (Some are 100,000 tons+)
- 60,000 tons optimal
- Simple process requires much optimization – many variables

Pellet feedstock

- For domestic market (<1% ash)
  - Less than 10% MC
  - **Clean** chips, shavings or sawdust
  - Pay up to $50BDT
  - 100 mile sourcing radius
  - Delivery: 0-1000+miles
- Possible to use any biomass (high ash)
  - Limited market
  - Tool wear
  - Consistency

Example: 40,000 ton/yr facility

- 100 BDT/day
- $5.5m build cost
- 24/7 operation
- 3-5 acre site
- 30-35 jobs

Challenges for a Pellet facility

- Guaranteeing long-term supply of raw material
- Distance to market and market size
- Cash flow
- Air quality
- Quality control
- Future overcapacity?
  - New mills throughout USA and Canada
  - New Oregon tax credit
- Commodity product = downward price pressure

Challenges for Manufacturing Biomass Based Products

- Guaranteeing long-term supply of raw material to encourage investment
- Overcome material property limitations (biomass is a low quality raw material)
- Reduce the high handling and production costs
- Improve processing knowledge
- Develop new markets or market share

Conclusions

- Woody biomass has unique properties
- It is possible to make many different products
- Economics and politics determine viability
- Fully assess value chain when developing a product offer [forest to market]
- Raw material supply is crucial for new investments and to maintain existing infrastructure
- Can Forest Service objectives be compatible with industry?
- Product opportunities:
  - Energy
  - Landscaping
  - Roundwood
  - Wood plastic composites
  - Densified wood products


Thank you