

# Wood Pallets – An Important U.S. Industrial Product



Phil Araman  
Virginia Tech/USFS, Blacksburg, VA

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PTF BPI 2012  
St. Simons Island, Georgia, USA

# Wood Pallets



# More Pallets



# Wood Pallets – An important U.S. Industrial Product...

- **Some history of our pallet R&D in Blacksburg**
- Information on wood material use and pallet production
- Research to minimize production waste and producing better pallets
- Pallet recovery, repair, and recycling numbers
- Reclaimed pallets saves trees and is good for the environment and can be labeled

# We (US forest Service/VA Tech) have many years of working with the pallet industry

- Monitoring new pallet manufacturing
- Monitoring pallet recovery, repair, reuse and recycling
- Monitoring waste pallets to landfills
- Research supporting making better new pallets
- Research to support the pallet repair industry
- Research to support pallet recycling

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# Some Manufacturing Numbers on New Pallets

Phil Araman  
US Forest Service

Robert Bush and  
Courtney Kepley  
VA Tech

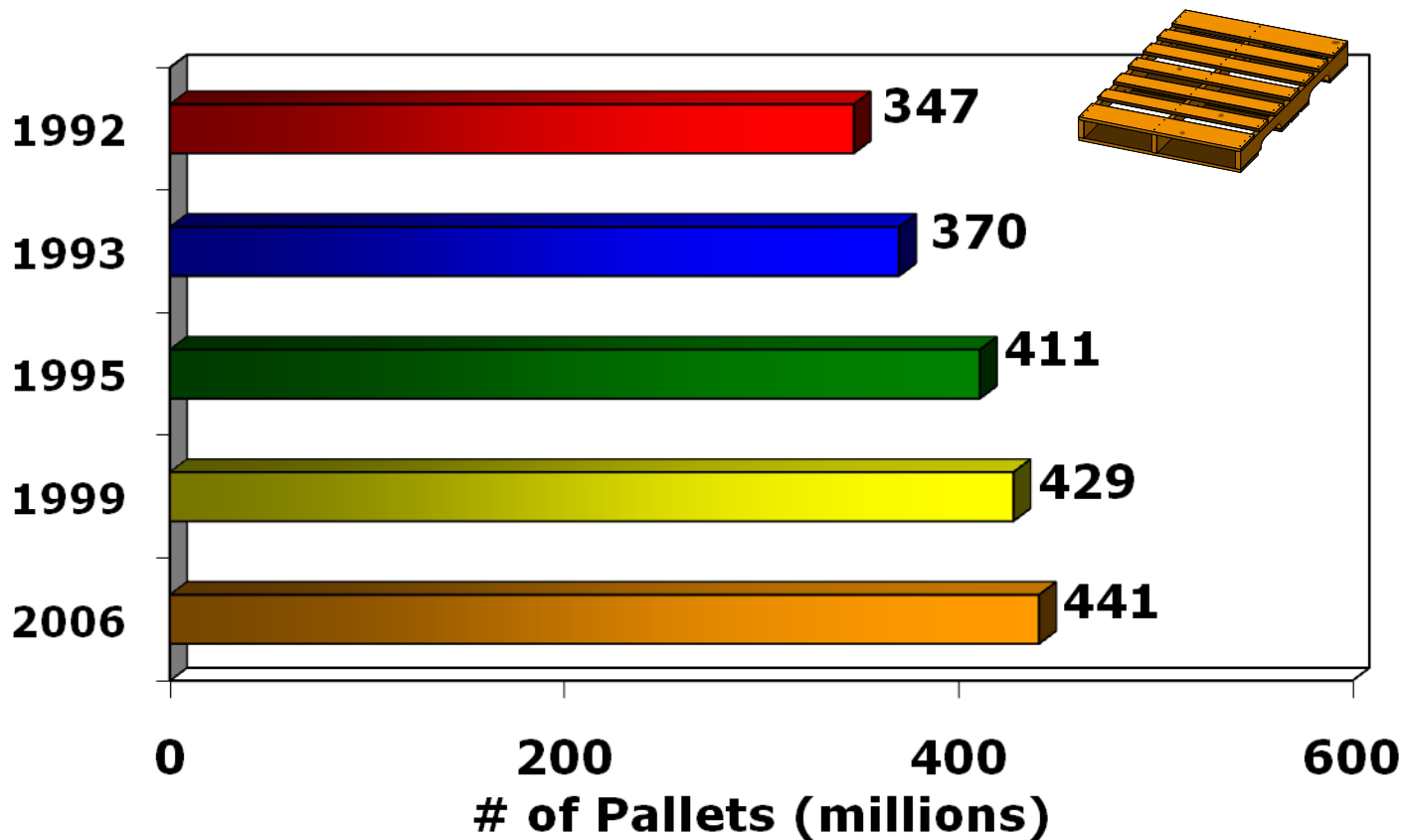


This is 2006 data – we are currently collecting analyzing 2011 data

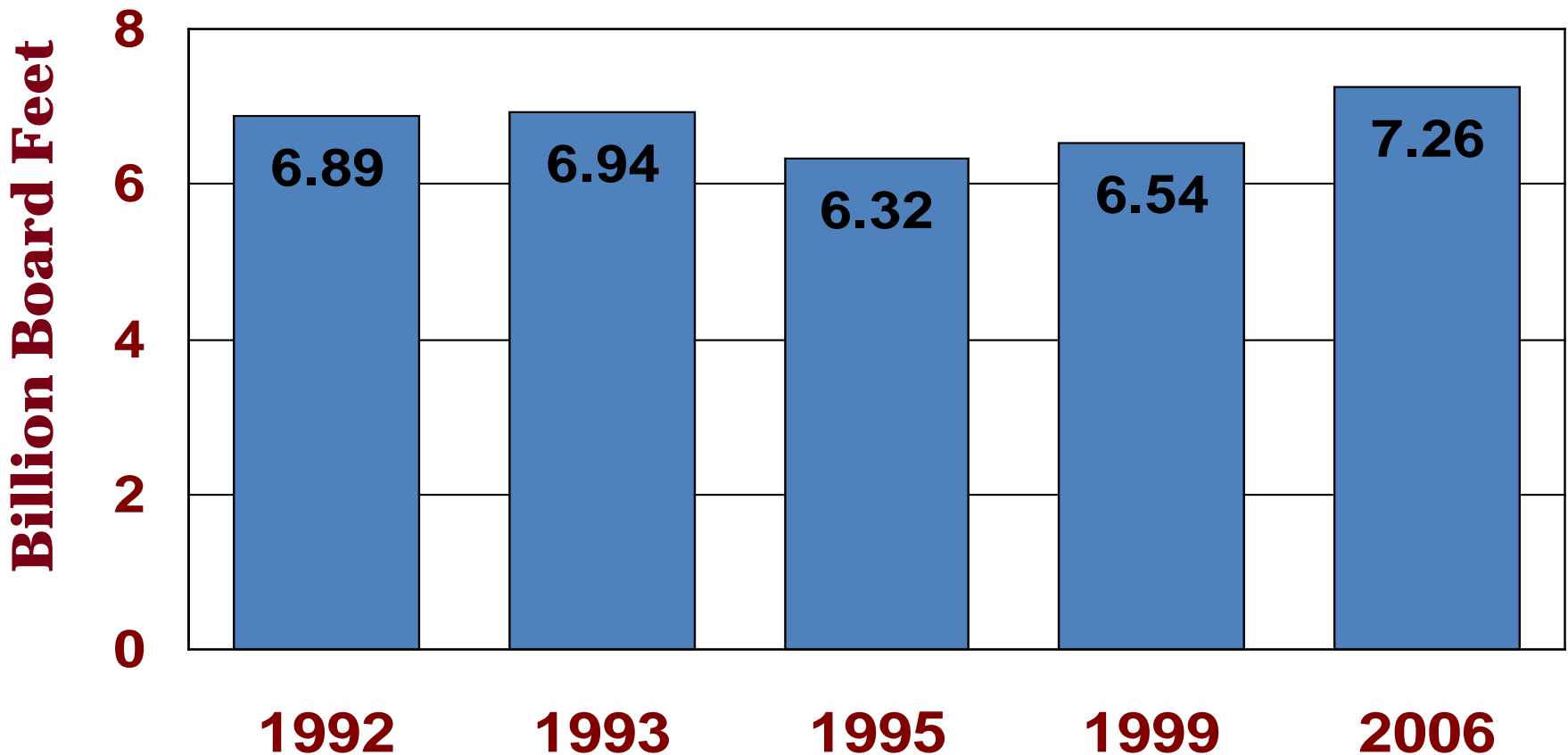




# Trends in new pallet production have been up

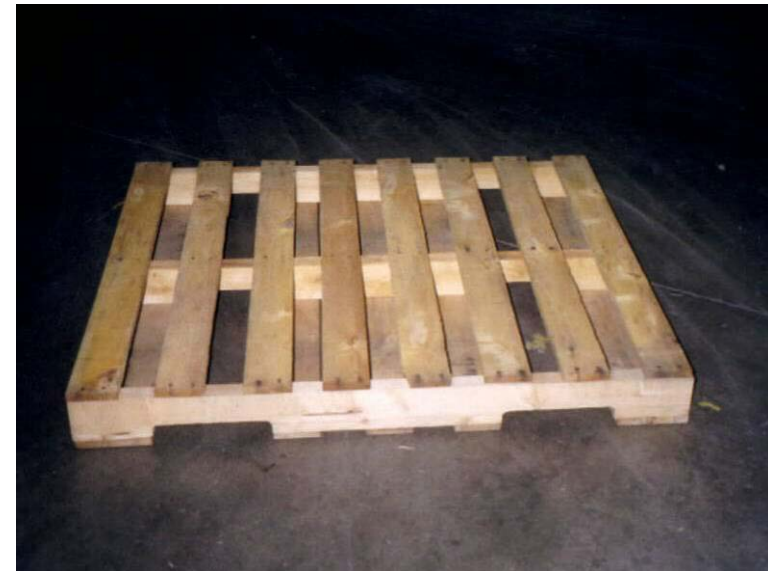
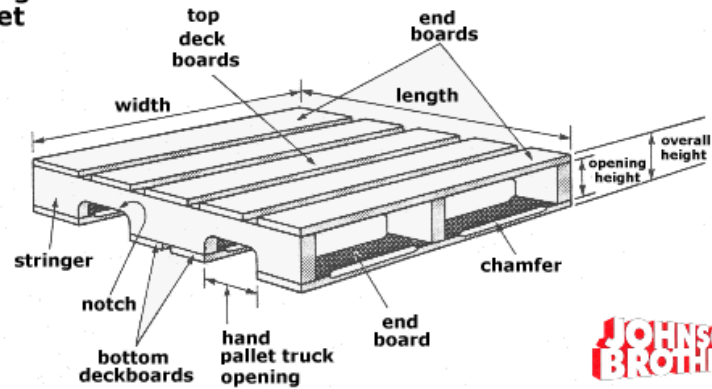


# New Solid Wood Use by the Industry – other than housing, Pallets are the largest user of solid wood



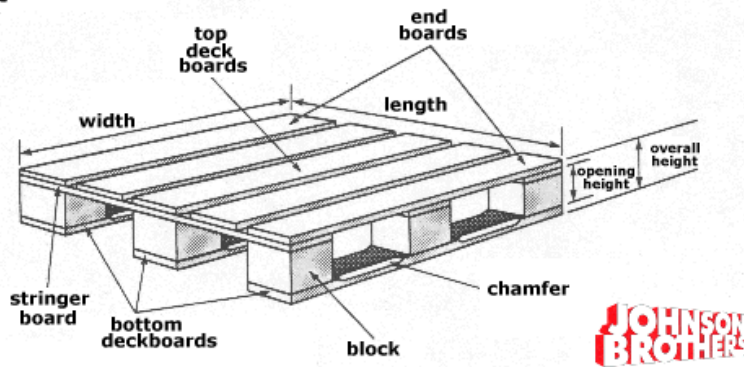
# Stringer Pallets

Stringer Pallet

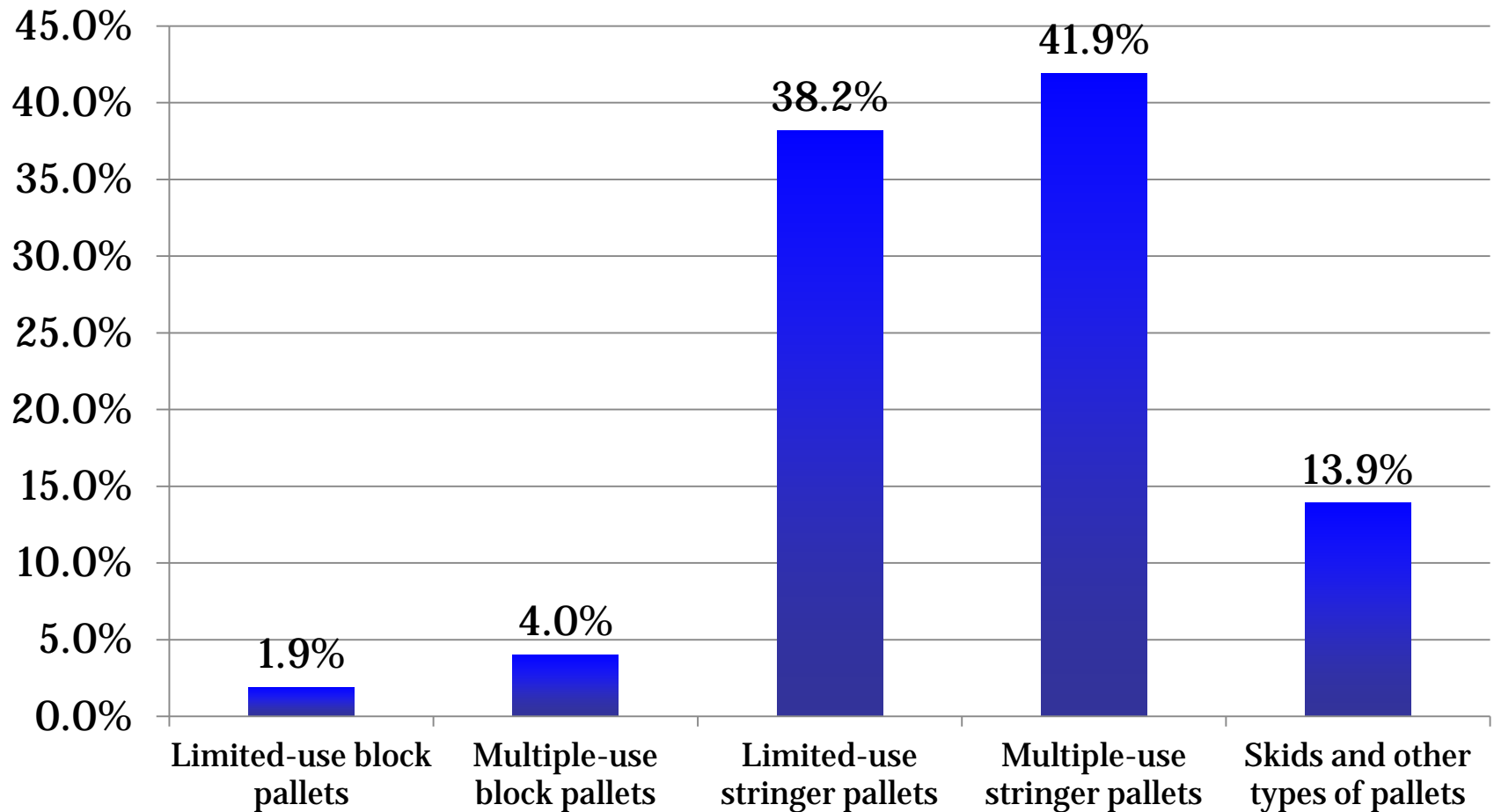


# Block Pallets

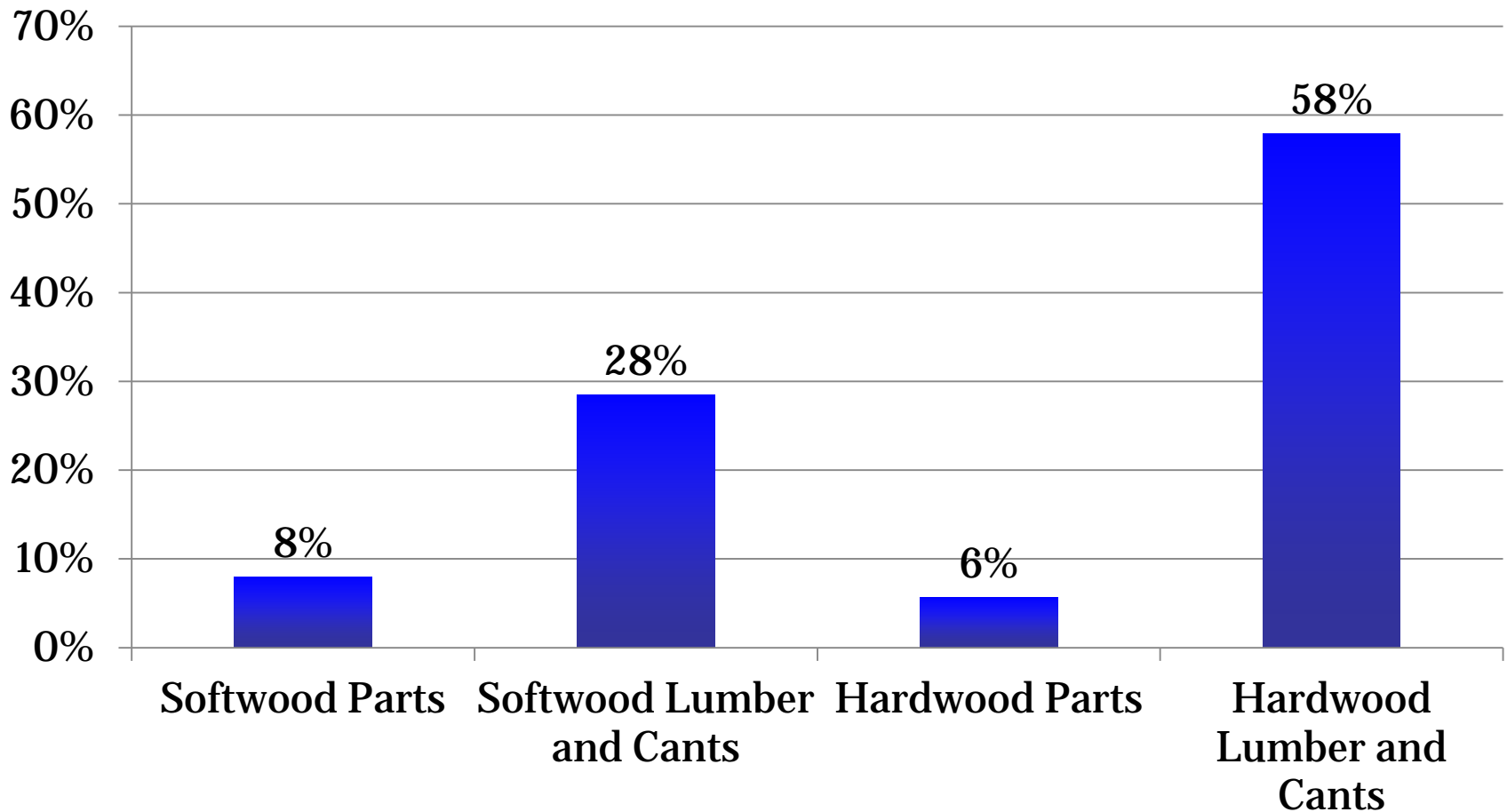
Block Pallet



# Types of New Wood Pallets Produced by the U.S. Wood Pallet and Container Manufacturing Industry – 2006 ... will 2011 data be different?



# Estimates of New Wood Volumes Used by the U.S. Wood Pallet and Container Manufacturing Industry - 2006



FYI -- We are collecting 2011 data on industry heat treating of pallets to compliment our 2006 data



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- Reclaimed pallets saves trees and is good for the environment and can be labeled



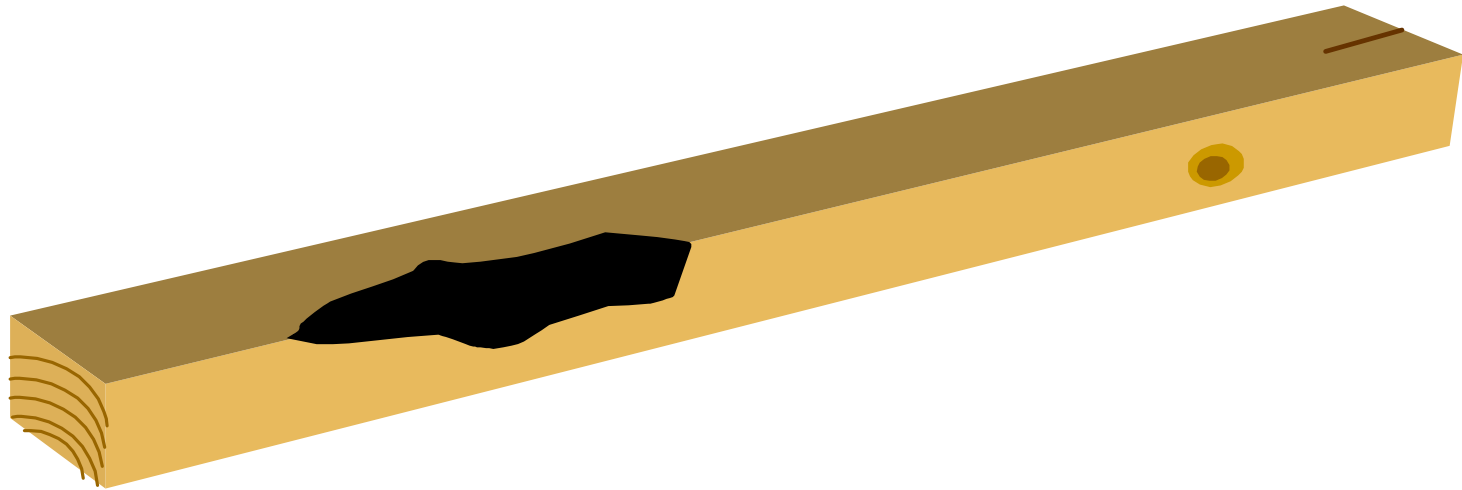
# Minimize production waste by improving pallet cant quality



# Pallet Cants

- Virginia Tech and the Forest Service proposed a minimum grade for pallet cants.
- The maximum allowable unsound defect volume for a cant grade would be 30% of the cant volume.
- Pallet cant grades would help pallet manufacturers improve part yields (reduce waste) and help sawmills market pallet cants.

# We then determined Pallet Cant Defects and Soundness at Appalachian Sawmills



Phil Araman and Matt Winn  
U.S. Forest Service  
Firoz Kabir  
Virginia Tech  
Blacksburg, VA

Xavier Torcheux and Guillaume Loizeaud  
School of Timber Engineering  
Nantes, France



# The purpose of this study was to ...

- Estimate the amount of unsound cant volume for a variety of different mills, species and sizes in order to
- Estimate the percentage of current production cants that would
- Meet proposed pallet cant grades and to
- Determine the general quality of pallet cants

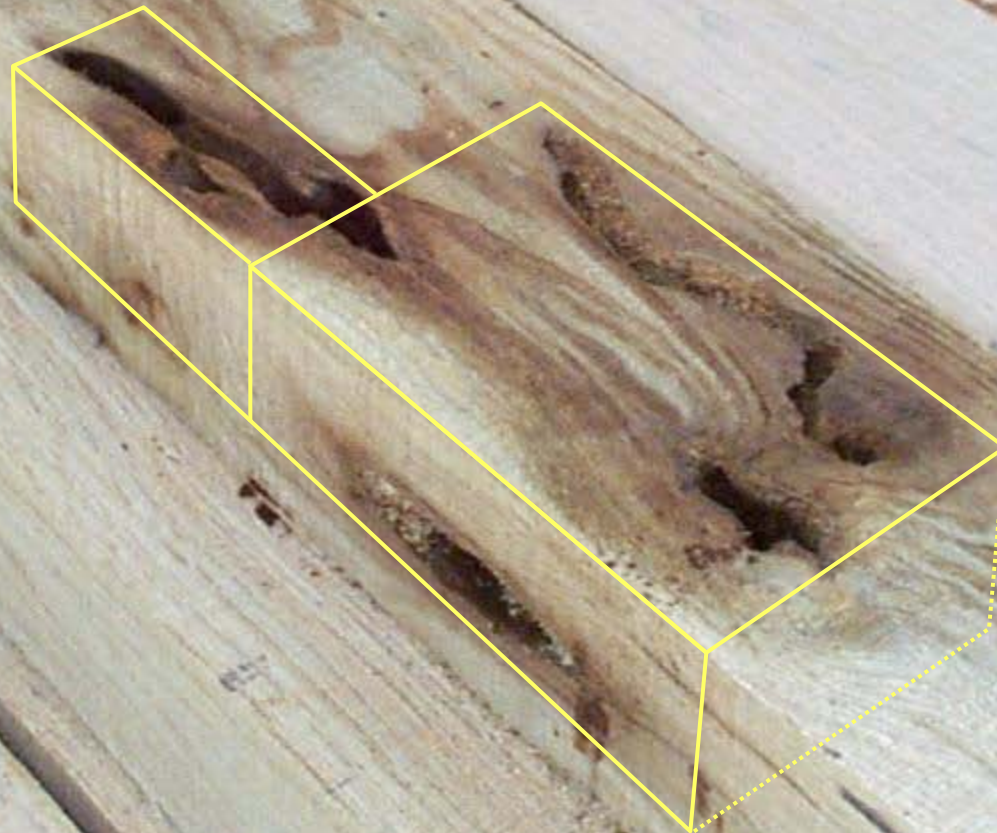
# Bark Pocket in Poplar



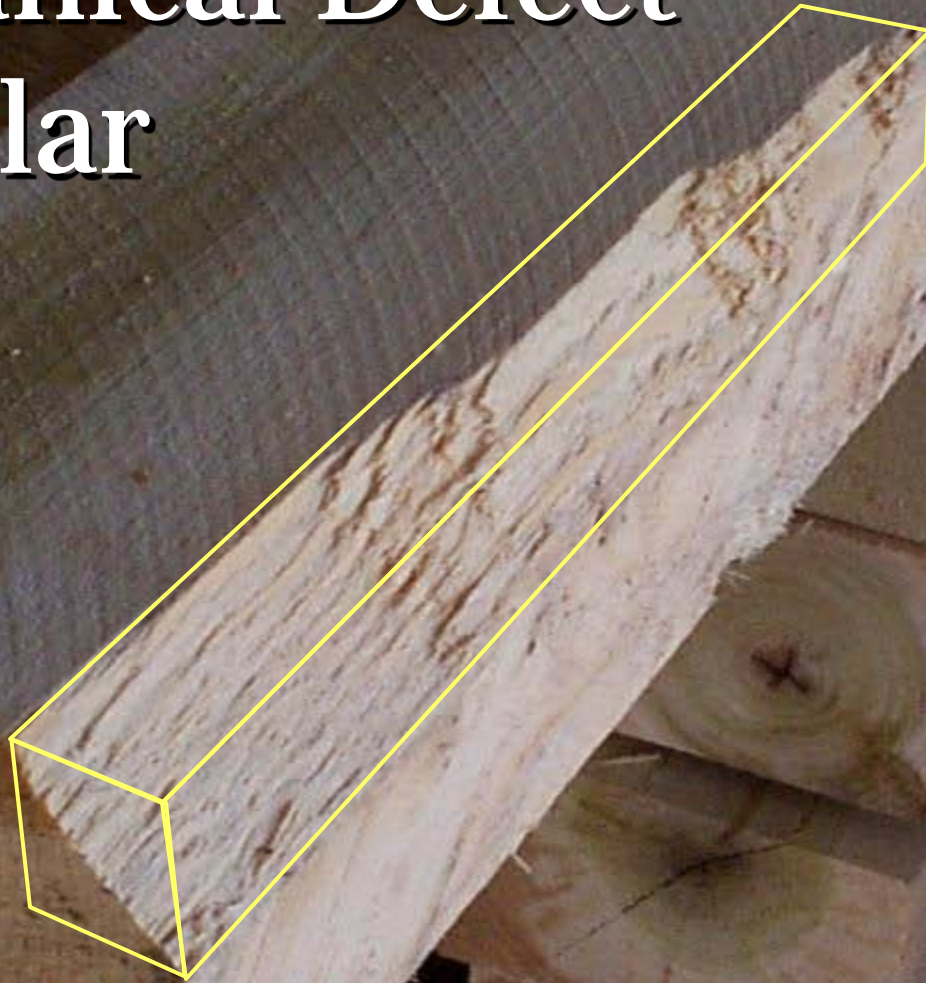
# Decay in Red Oak



# Insect Holes in White Oak

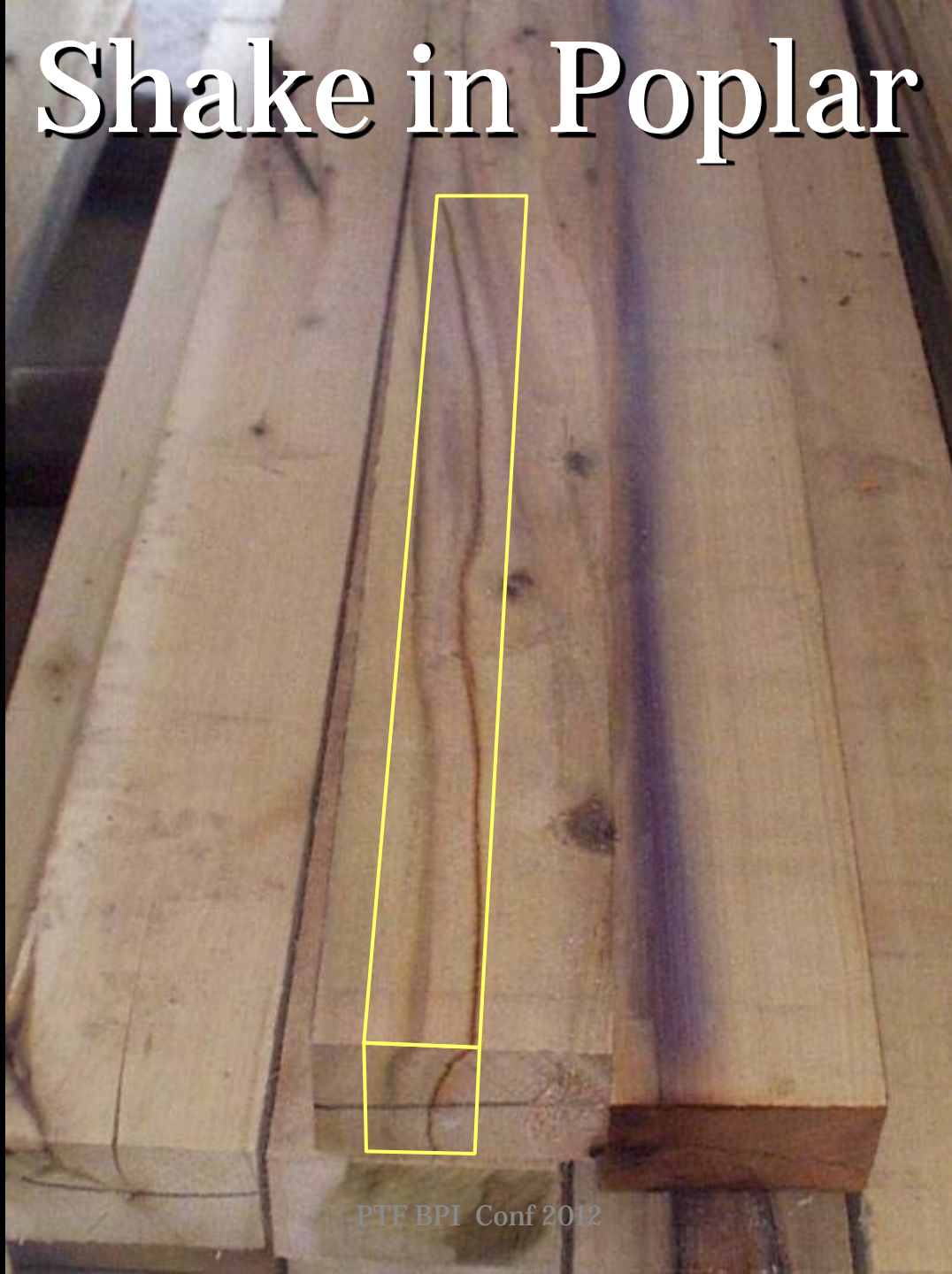


# Mechanical Defect in Poplar





# Shake in Poplar



# Split in Red Oak



# Unsound Knot in Poplar



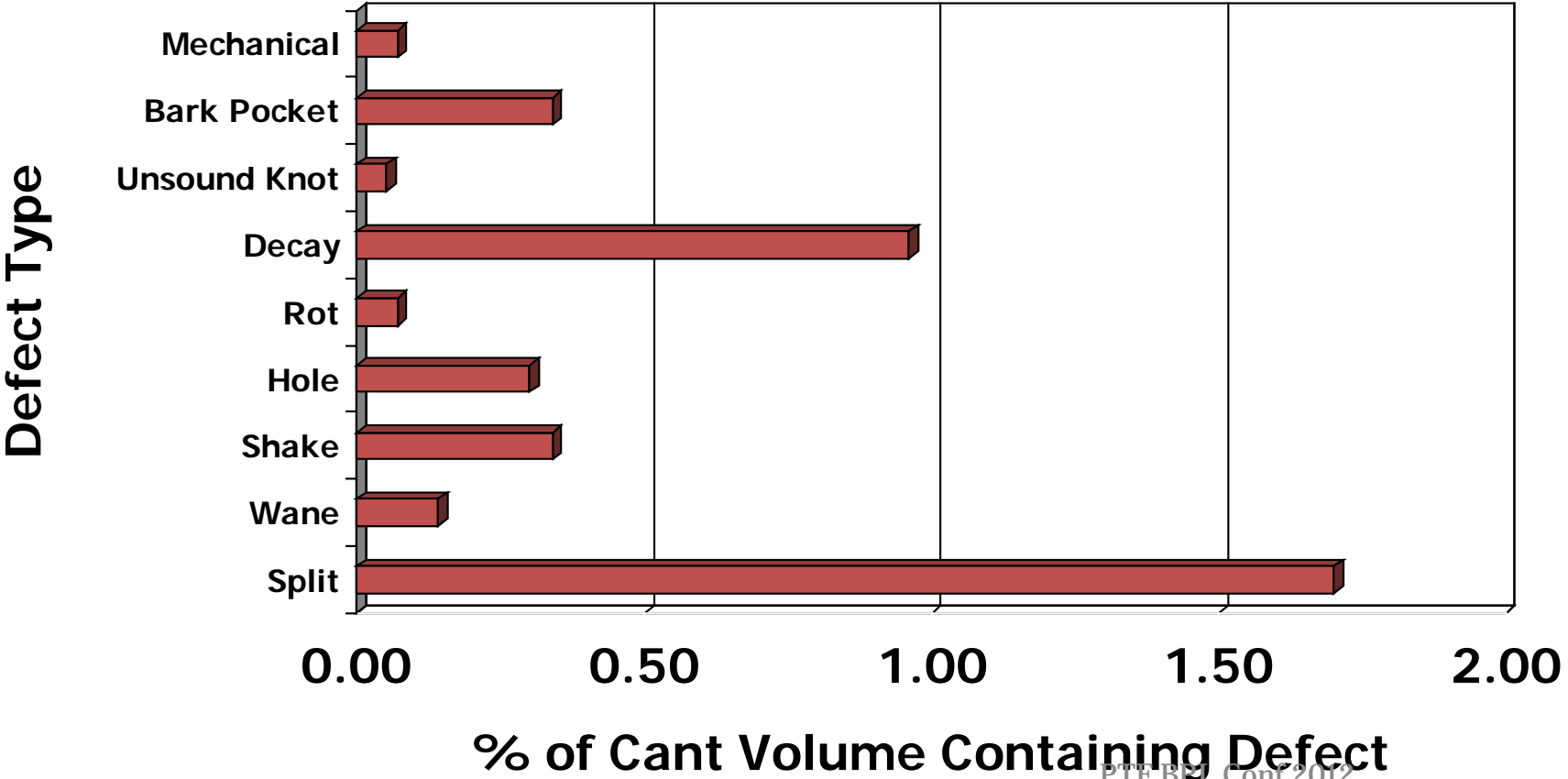
# Wane in Poplar



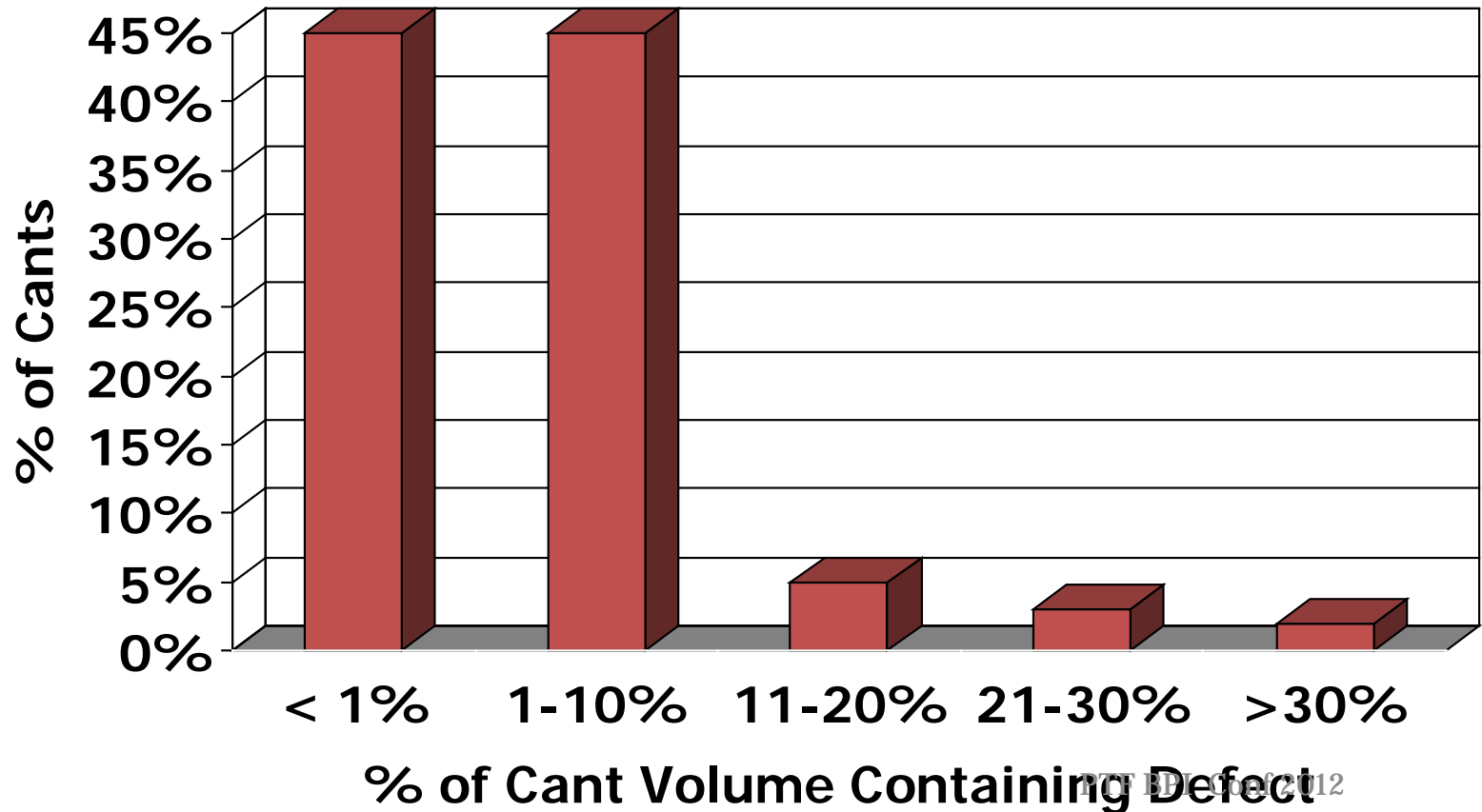
# Rot in Red Oak



# Average Defect Percentage per Cant for All Mills and Species



# Average Percentage of Cants in Each Defect Percentage Class for All Mills and Species

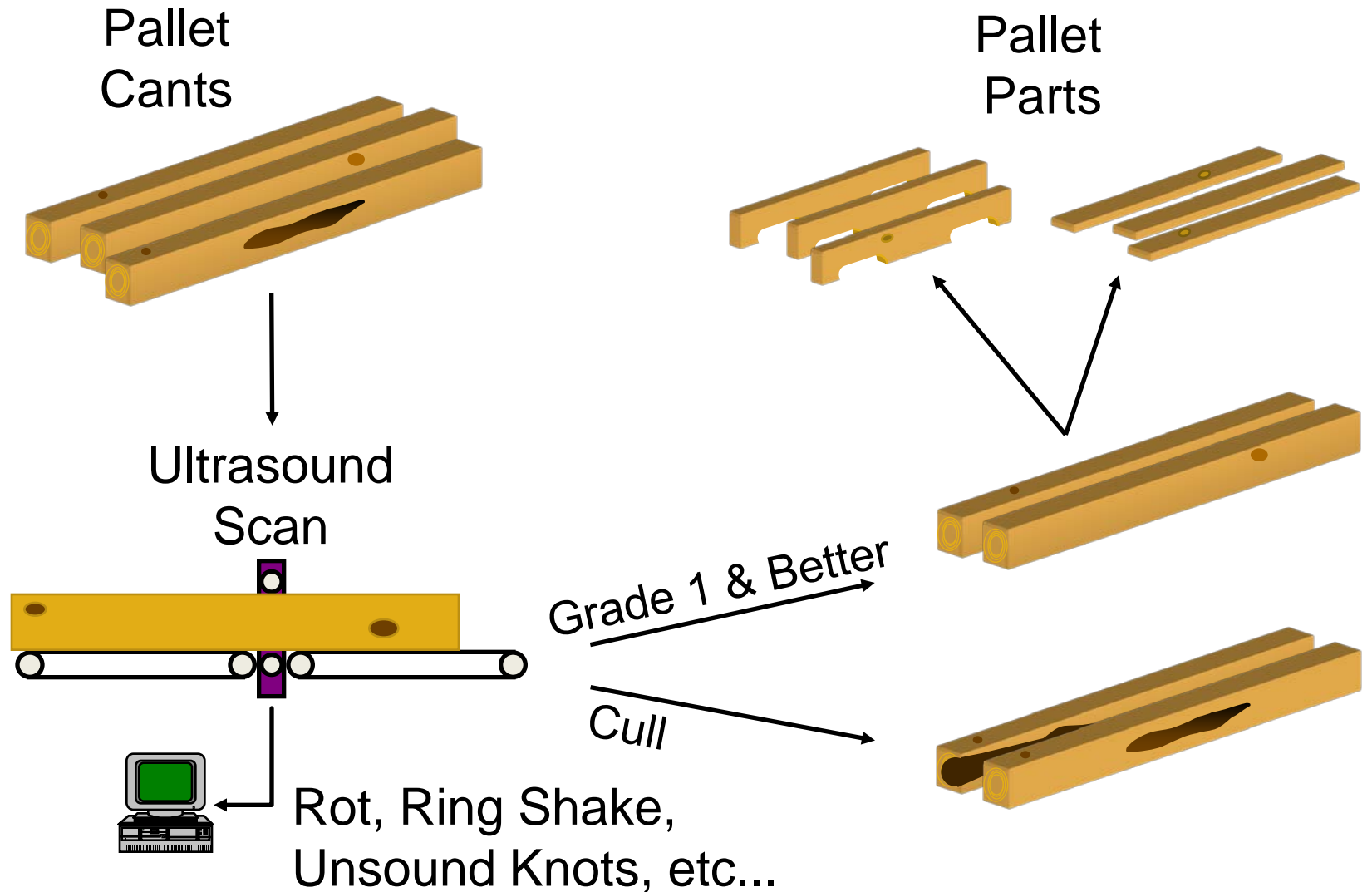


# Potential Results ....

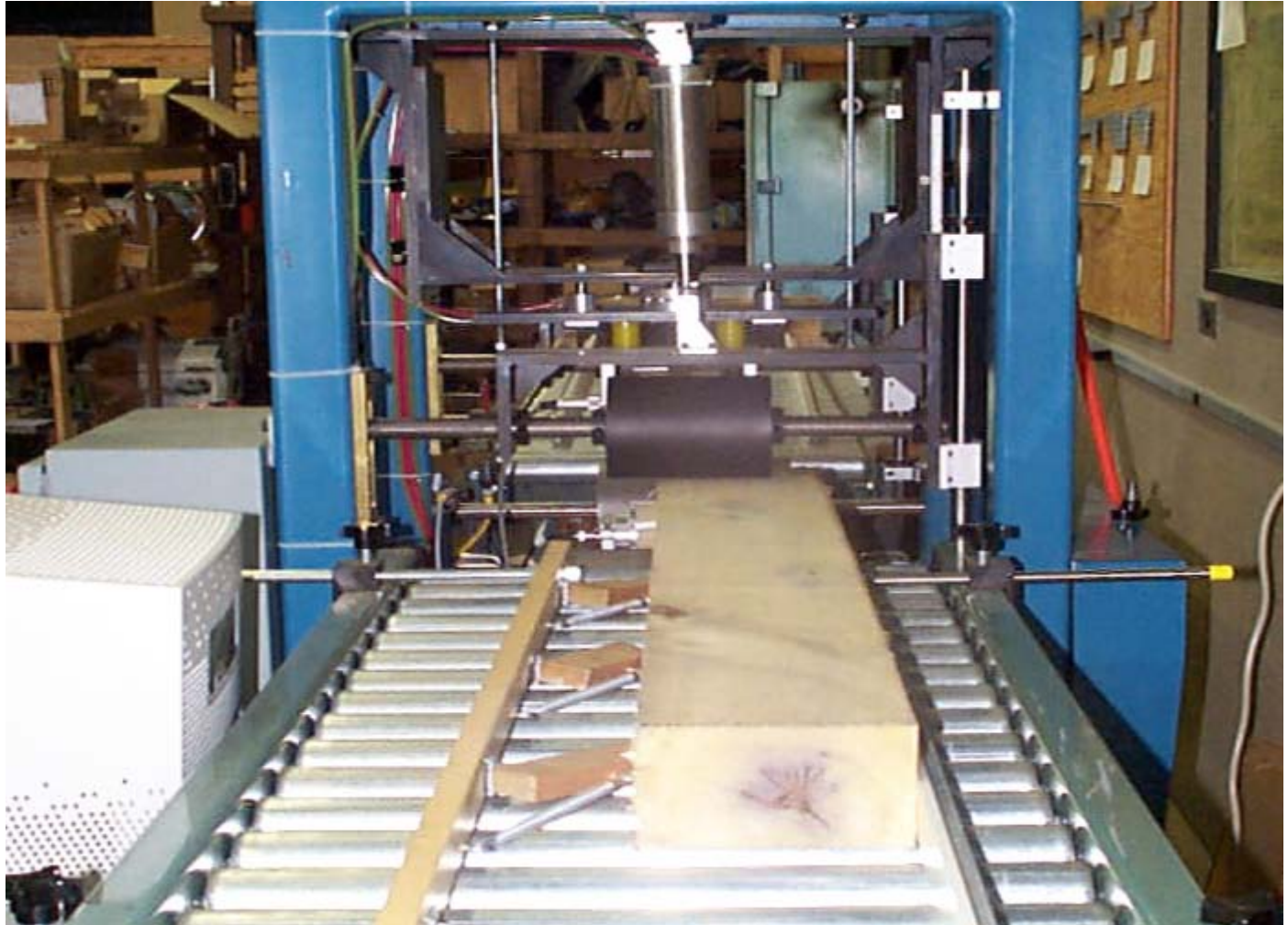
- The poorest cants eliminated– there aren't that many and would
- Please pallet producers
- Please sawmillers and
- Ultrasound scanning can make this possible – our next R&D effort



# Potential Scanning System To Grade Pallet Cants at Sawmills (% Unsound Limit)



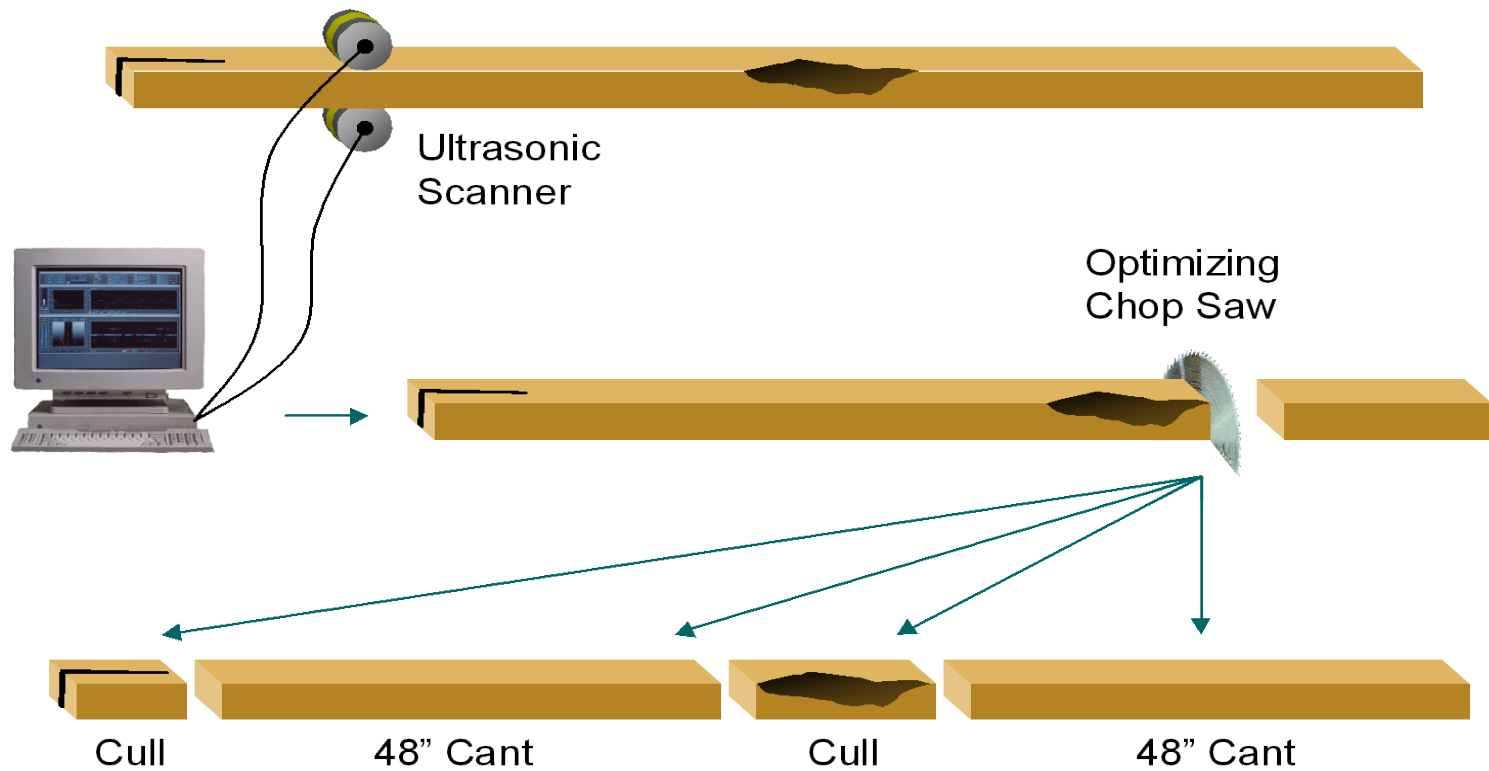
# Scanning System In-feed



# Close-up View of Rolling Transducers



# Potential Ultrasonic Scanning of Pallet Cants for Processing and to Optimize Value

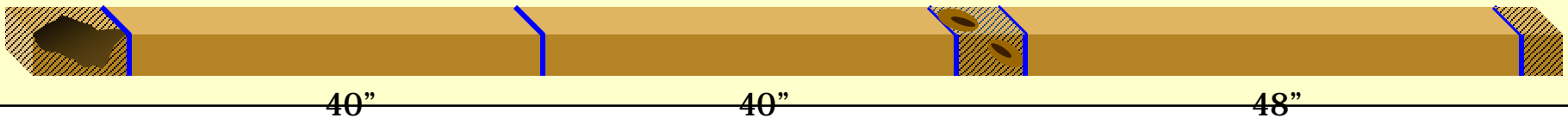


# Optimized Sawing can Increase the Value of Material Obtained from Each Cant – Can be done manually!

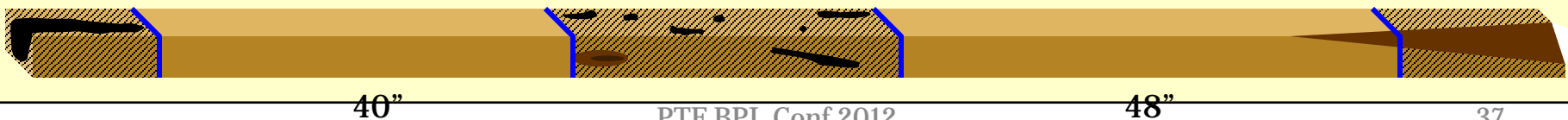
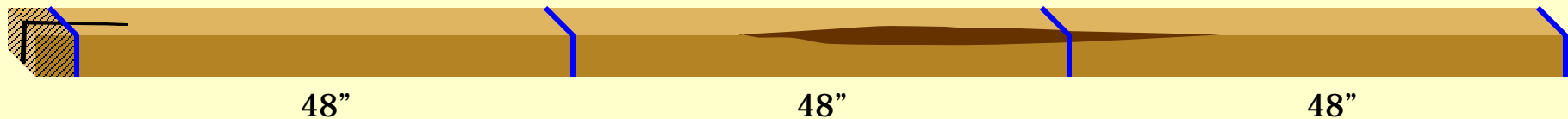
General sawing practice is to cut adjacent parts, starting at one end of the cant:



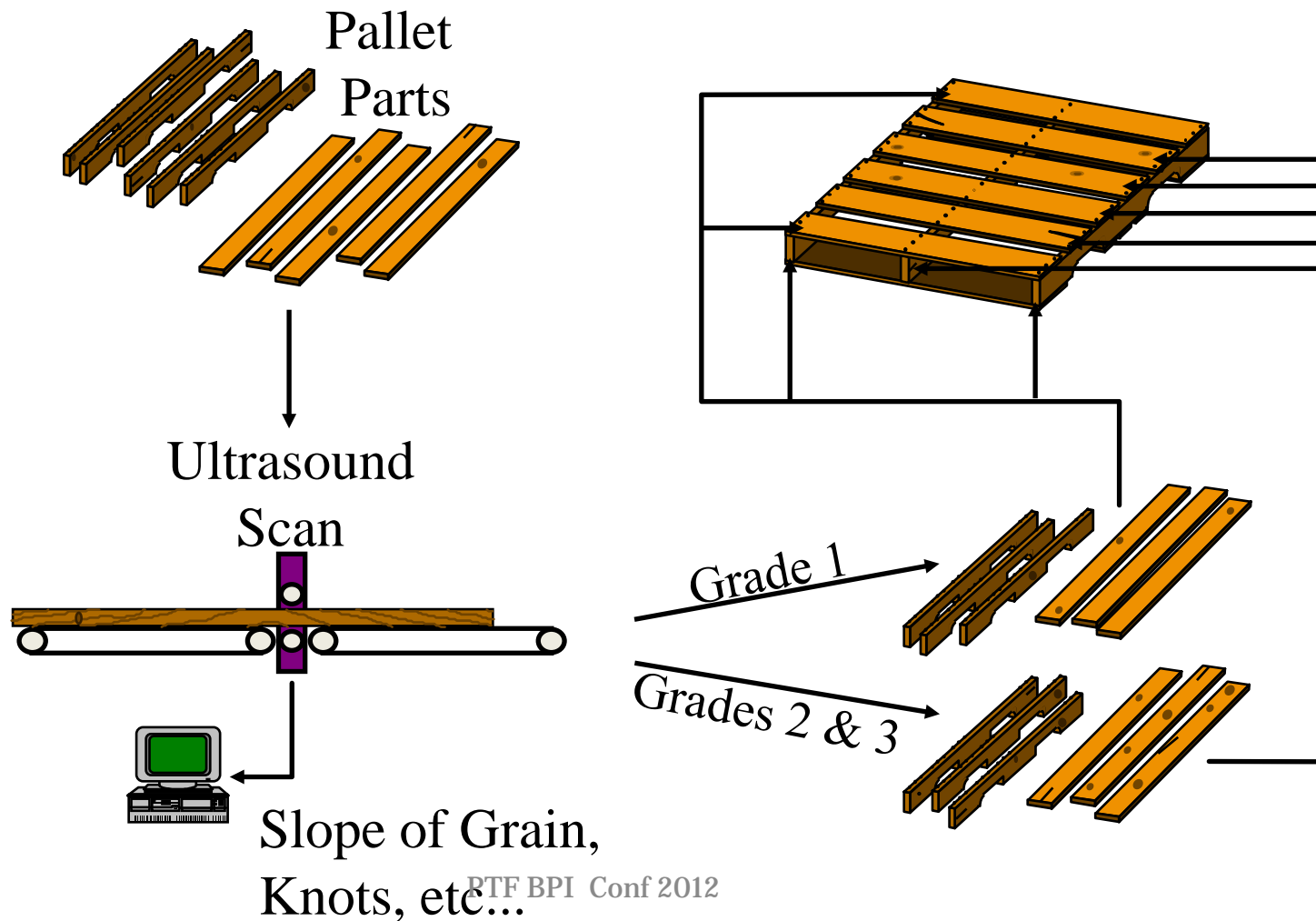
Value-optimized sawing:



Other optimizing examples:



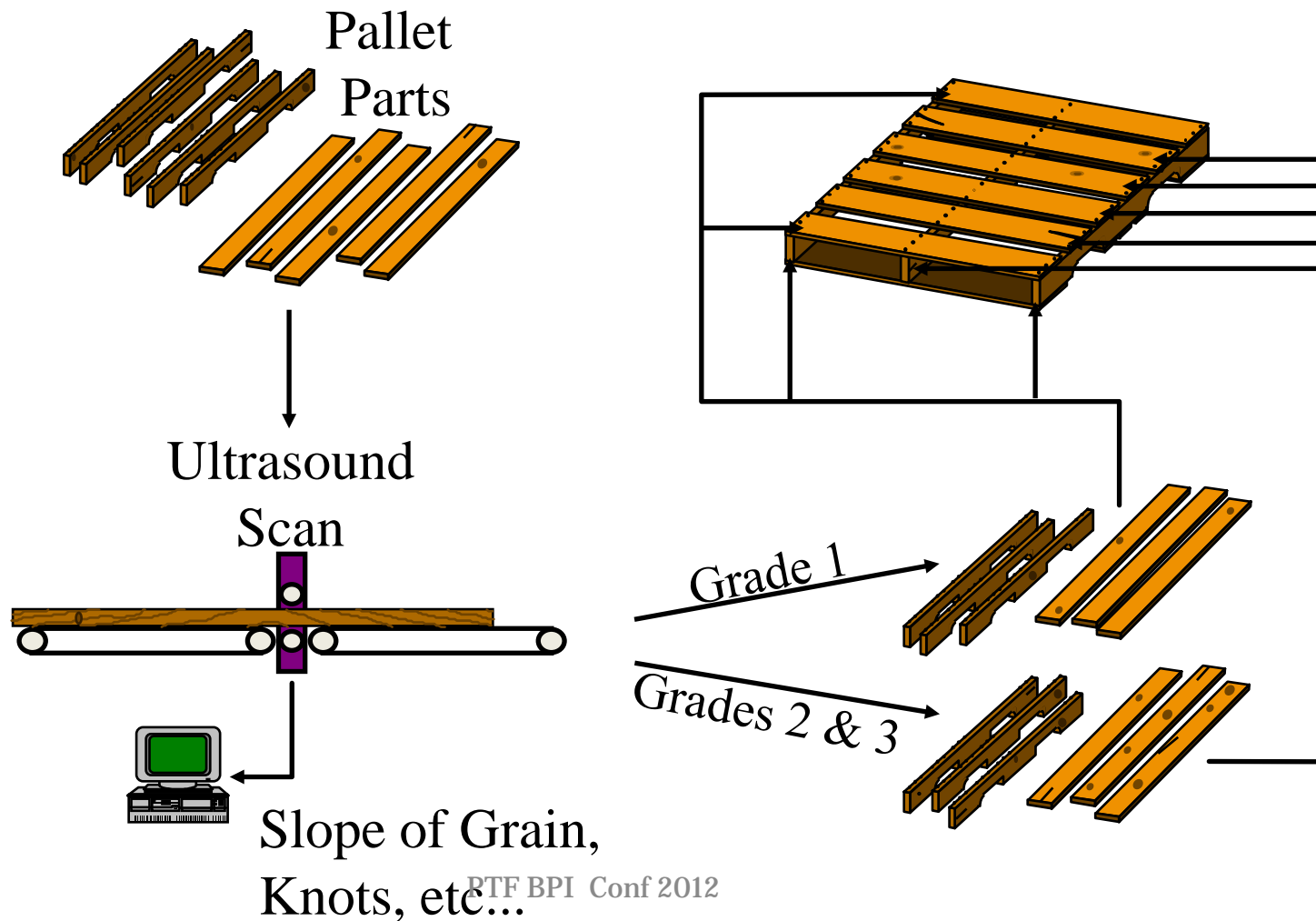
# Potential Ultrasound System to Grade and Sort Pallet Parts = More Valuable Pallets (slope of grain is also important)



# Pallet parts and grades – new and used parts



# Potential Ultrasound System to Grade and Sort Pallet Parts = More Valuable Pallets (slope of grain is also important)





# The Pallet Design System<sup>®</sup> Version 5.0

## 3-D Design and Engineering Tool for Wood Pallets and Unit Loads

The industry's premier design tool for wood pallets has evolved into a design tool for unit loads.

The next version of PDS is the result of years of planning and development. It will enable clear communication about the customer's unit load handling requirements and the pallet's ability to meet those requirements.

Wood pallet manufacturers produce the key component to successful unit load material handling – the pallet – the interface between the equipment, forces and impacts of the material handling environment and the Customer's valuable, sometimes fragile, unitized load.

And PDS is the key tool in designing this key component.

**Racked Across Length**

2 Beam Support  
Distance Between Supports: 44.000  
 User Specified Deflection Limit  
Maximum Tolerable Deflection: 0.750

3 Beam Support  
Distance Between Supports: 21.000

**Racked Across Width**

2 Beam Support  
Distance Between Supports: 36.000  
 User Specified Deflection Limit  
Maximum Tolerable Deflection: 0.750

3 Beam Support  
Distance Between Supports: 17.000

Shelf Support

4 Corner Support

**Side View**      **End View**

Forklift Support

Common Fork Dimensions: 42 x 4 x 1.75

Enter and Lift from Pallet End  
 Enter and Lift from Pallet Side

Forkline: Length: 42.000, Width: 4.000, Thickness: 1.750, Spacing (Outside): 29.000

**End Entry**      **Side Entry**

Warehouse Storage | Shipping

Warehouse: Maximum Number of Unit Loads in a Stack: 4  
 User Specified Deflection Limit  
Maximum Tolerable Deflection: 0.250

**Container Type: Corrugated Box**

Box Style: Regular Slotted Container (RSC) 40201  
Combined Board Type: Singlewall  
Flute Profile: C-Flute  
Caliper: 0.200  
ECT: 35.000

Weight (lbs.) per Box: 20

Number of Boxes per Layer: 10  
Number of Layers per Unit Load: 4      Interlock Stacked  
Number of Boxes per Unit Load: 40  
Total Weight of Load: 800  
Total Height of Load: 40.000

**Load Stabilizers**

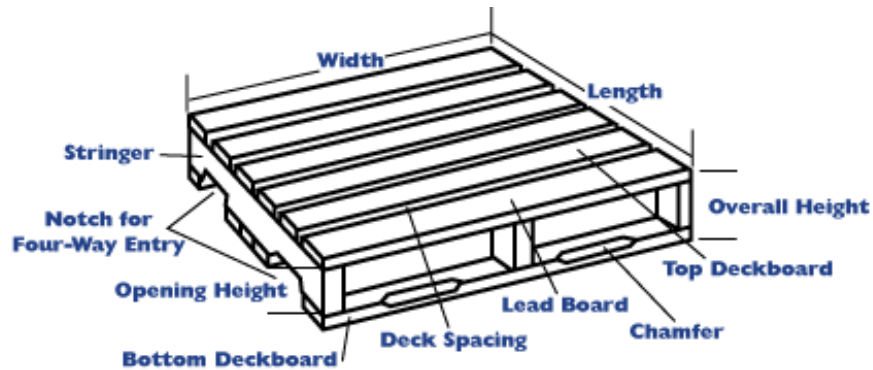
Horizontal Straps: Type: Steel  
Parallel Straps: Type: Steel  
Perpendicular Straps: Type: Steel  
Corner Protectors: Type: Plastic  
Top Edge Protectors: Type: Plastic  
Pallet Barrier Sheet: Type: Paper

Outside Dimensions:  
Length: 10.000  
Width: 12.000  
Depth: 10.000 \*

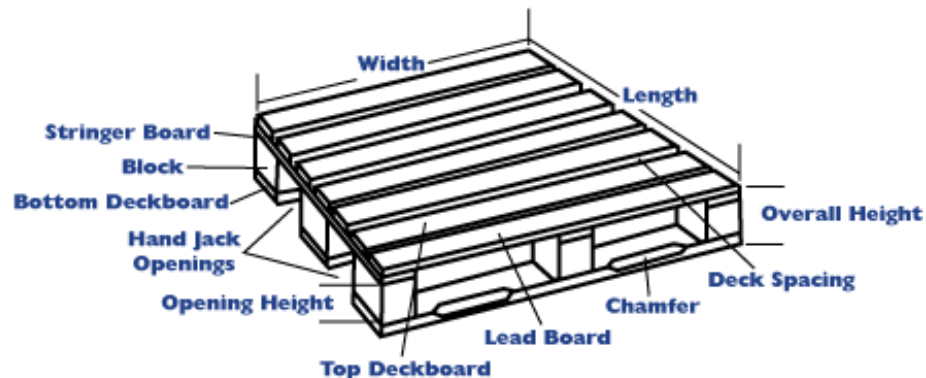
**Side View**      **End View**



Part grades and placement on pallets is possible to make a better pallet

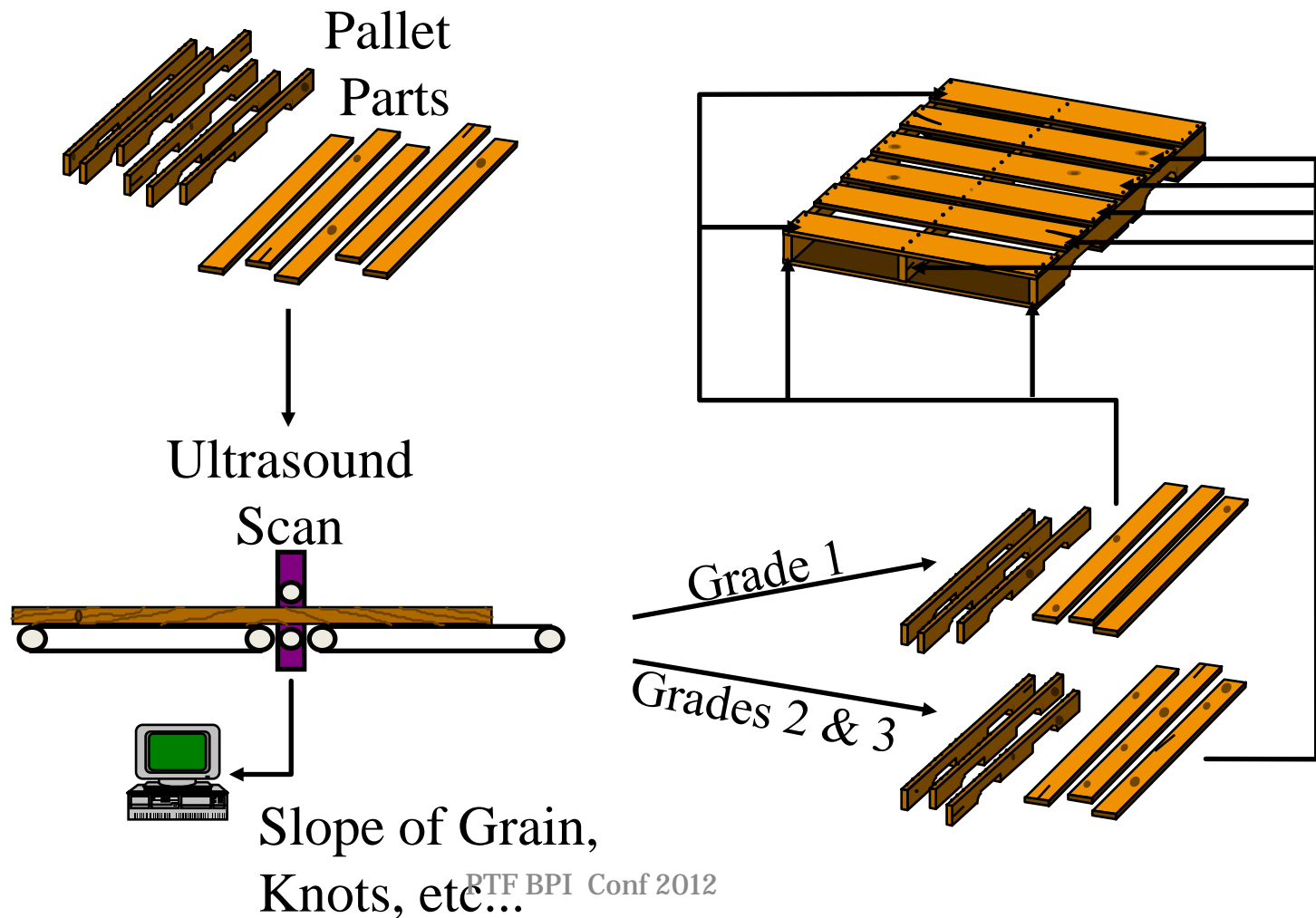


## STRINGER



## BLOCK

# Potential Ultrasound System to Grade and Sort Pallet Parts = More Valuable Pallets (Grading can also be done by people)



## Pallet Grading Training System

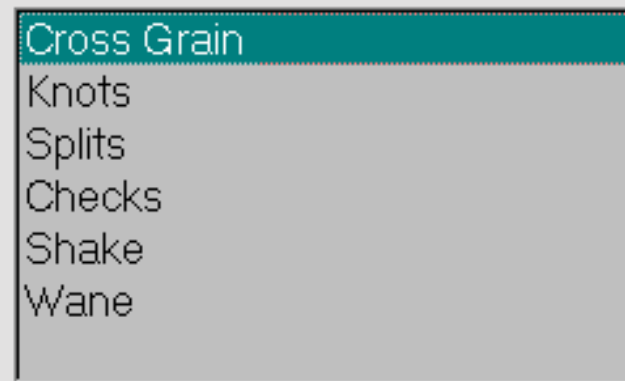
Use the mouse to choose one of the following two options:

- Pallet Grading Tutorial
- Pallet Grading Exercises

Exit System

The following major defects can occur in lumber used in pallet manufacturing.

Select the defect (using the mouse, place the cursor over the defect to be selected and click the left button) that you would like to see more information about and click on Enter (with the left mouse button):



ENTER

Return to Program Start

Exit System

## Cross Grain

Cross grain exists when the grain of wood is not parallel to the long axis of the piece of lumber. Strength and stiffness drops off rapidly as the degree of cross grain increases.

Show Photo

## Measuring Cross Grain

Cross grain is measured in terms of slope of grain stated in terms of 1 inch deviation from a straight line X inches long.

Return to Tutorial Start

Next Page

Return to Program Start



Close Photo Window

## Grading Criteria for Deckboards

Grade 2BTR:

Slope of general cross grain - 1 in. in 10 in.

Max. dimension of local cross grain - 1/4 board width

Grade 3:

Slope of general cross grain - 1 in. in 8 in.

Max. dimension of local cross grain - 1/3 board width

Grade 4:

Slope of general cross grain - 1 in. in 6 in.

Max. dimension of local cross grain - 1/2 board width

Return to Tutorial Start

Next Page

Return to Program Start

Previous Page



## Grading Criteria for Stringers

Grade 2BTR:

Slope of general cross grain - 1 in. in 10 in.

Max. dimension of local cross grain - 1/4 cross section

Grade 3:

Slope of general cross grain - 1 in. in 8 in.

Max. dimension of local cross grain - 1/3 cross section

Grade4:

Slope of general cross grain - 1 in. in 6 in.

Max. dimension of local cross grain - 1/2 cross section

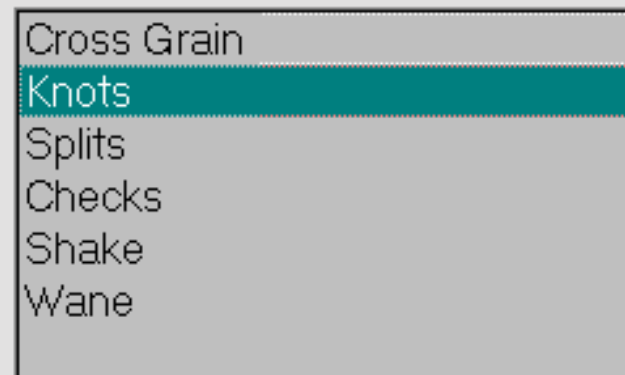
Return to Tutorial Start

Previous Page

Return to Program Start

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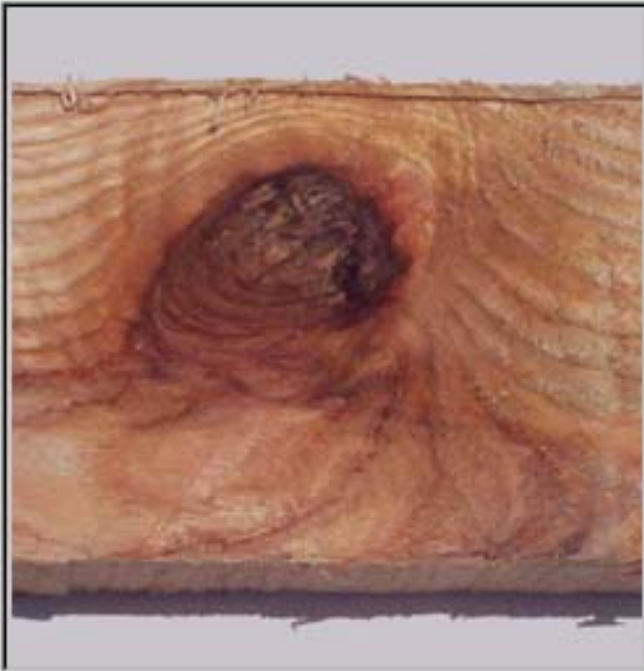
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ENTER

Return to Program Start

Exit System



Close Photo Window

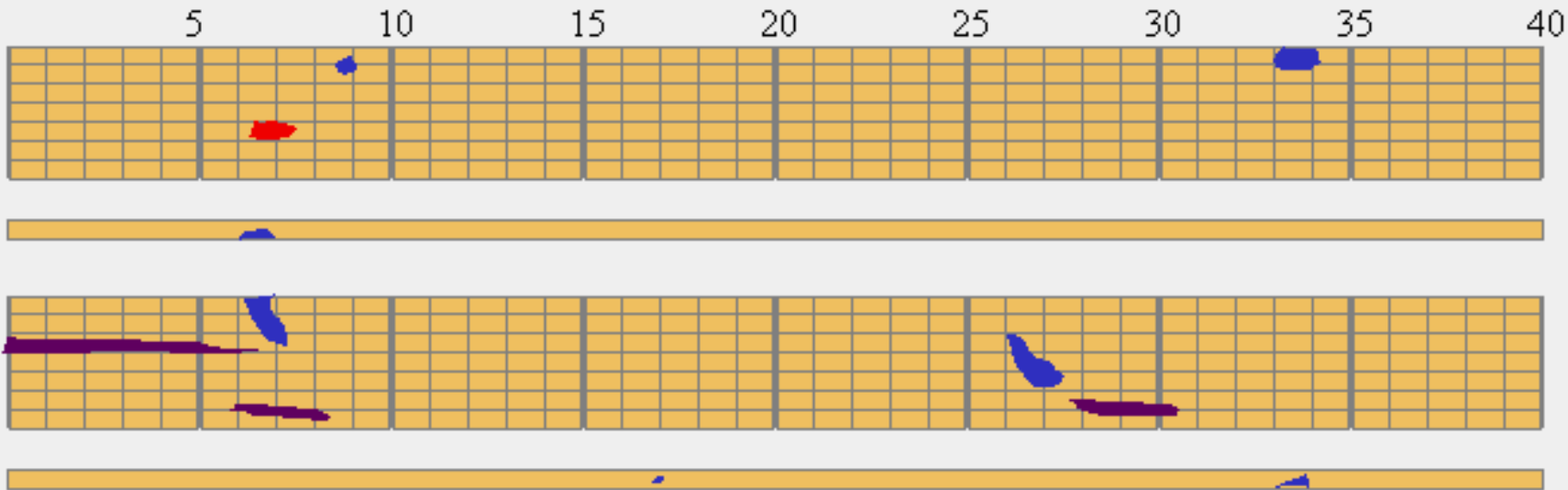
## Pallet Grading Exercises

Board 1	Board 6	Board 11	Board 16
Board 2	Board 7	Board 12	Board 17
Board 3	Board 8	Board 13	Board 18
Board 4	Board 9	Board 14	Board 19
Board 5	Board 10	Board 15	Board 20

Select a board to grade and click here.

Return to Program Start

Exit System



Select grade for the board shown above:

- 2\_BTR
- 3
- 4

Select defect to view grading criteria:

- Sound Knots
- Knot Location
- Unsound Knots
- Splits, Checks, Shake
- Cross Grain
- Wane

Grade Another Board

Return to Program Start

Exit System

Legend

- Unsound Knot / Hole
- Sound Knot
- Pith
- Check / Split / Shake
- Decay
- Cross Grain
- Wane

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- **Pallet recovery, repair, and recycling numbers**
- Reclaimed pallets saves trees and is good for the environment and can be labeled

# Pallet recovery, repair, and recycling numbers

Phil Araman  
US Forest Service

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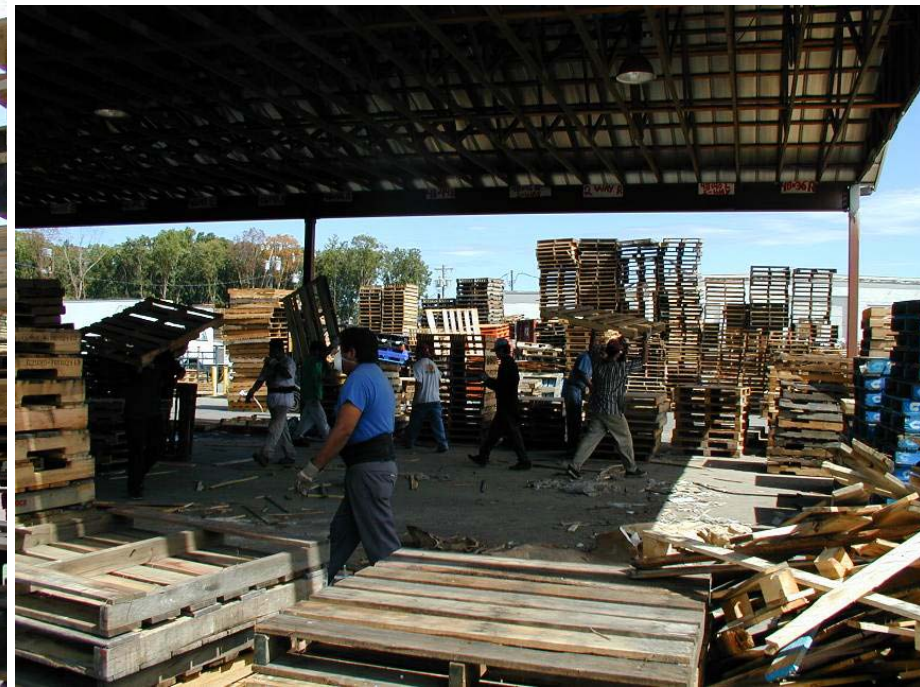


# Pallets going to repair and incoming trailers from pallet users – We collect this data





# Pallet recovery -- Separation area at large recycler



# Modern repair facility



# Repair operations



# Three repair stations



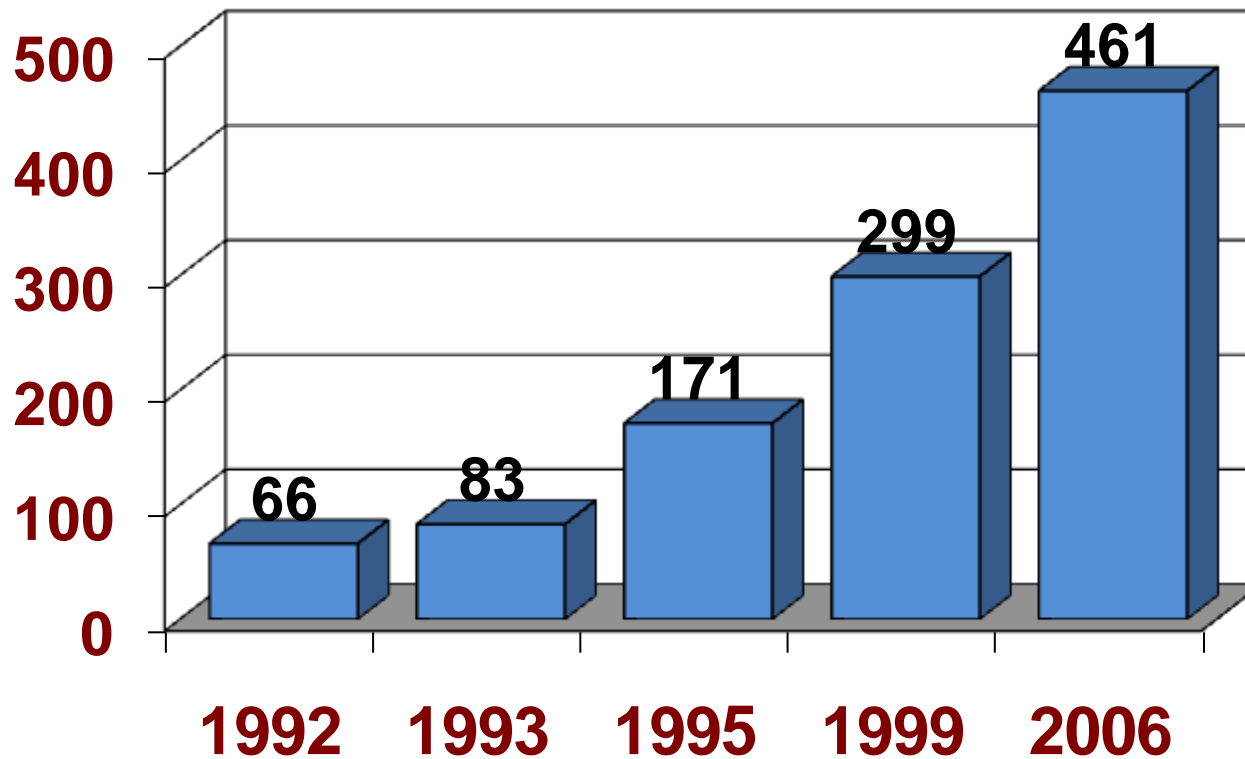
# Salvaging pallet parts



# Recovered Parts for Repairs



# Numbers of Wood Pallets Recovered has Increased



63

# Wood Pallet Recovery, Reuse, and Recycling



(SAVES TREES ..... SAVES LANDFILL SPACE ..... AND PROVIDES NEEDED WOOD PRODUCTS)

## The Urban Resources



Shouldn't Do



 Questions - Contact Phil Araman  
USDA Forest Service  
Southern Research Station  
Blacksburg, VA  
(540) 231-5341 paraman@vt.edu 



Repair



Pallet Disassembly



Mulch



Animal Bedding



Flooring/  
Paneling



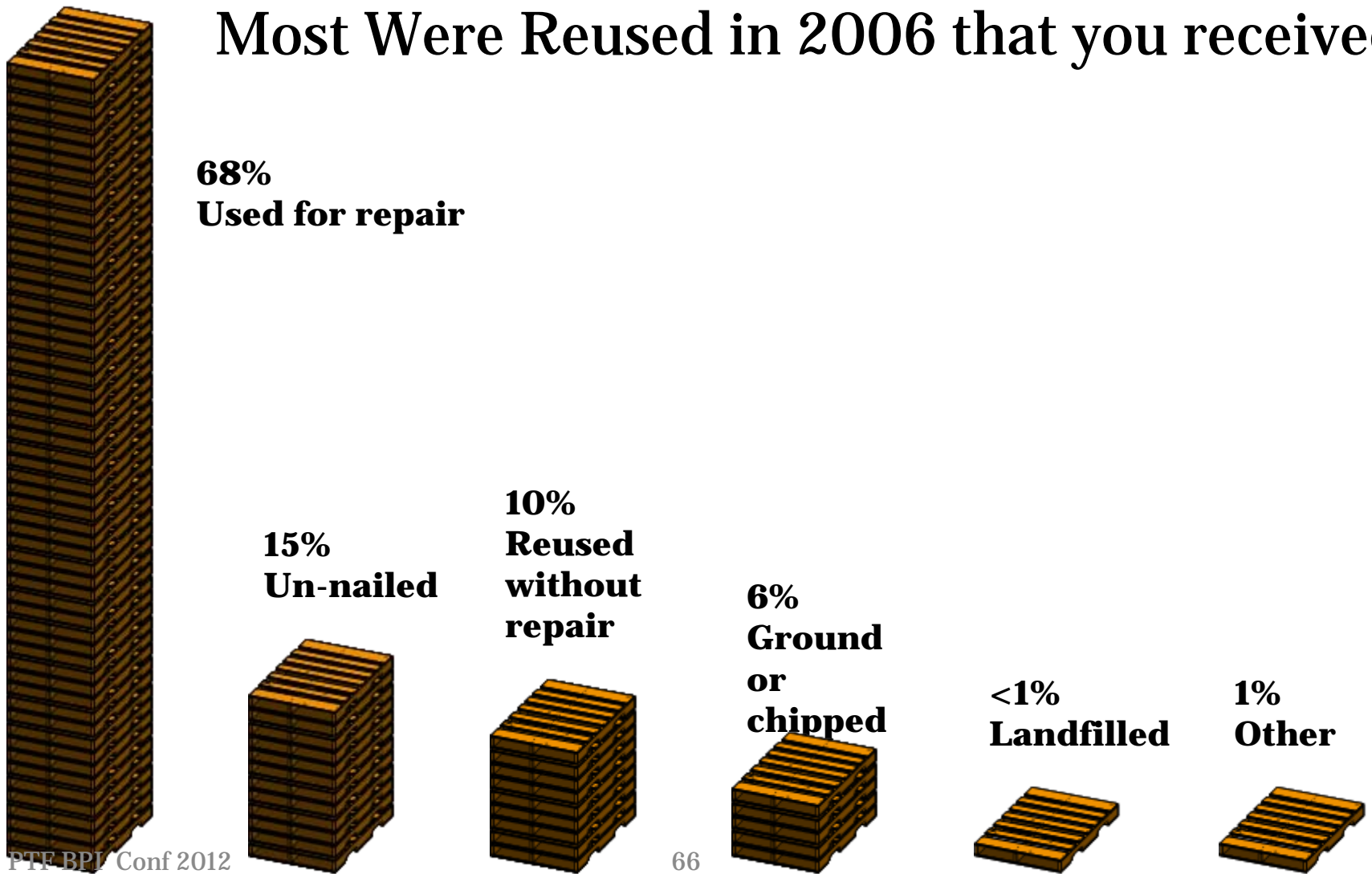
Fuel



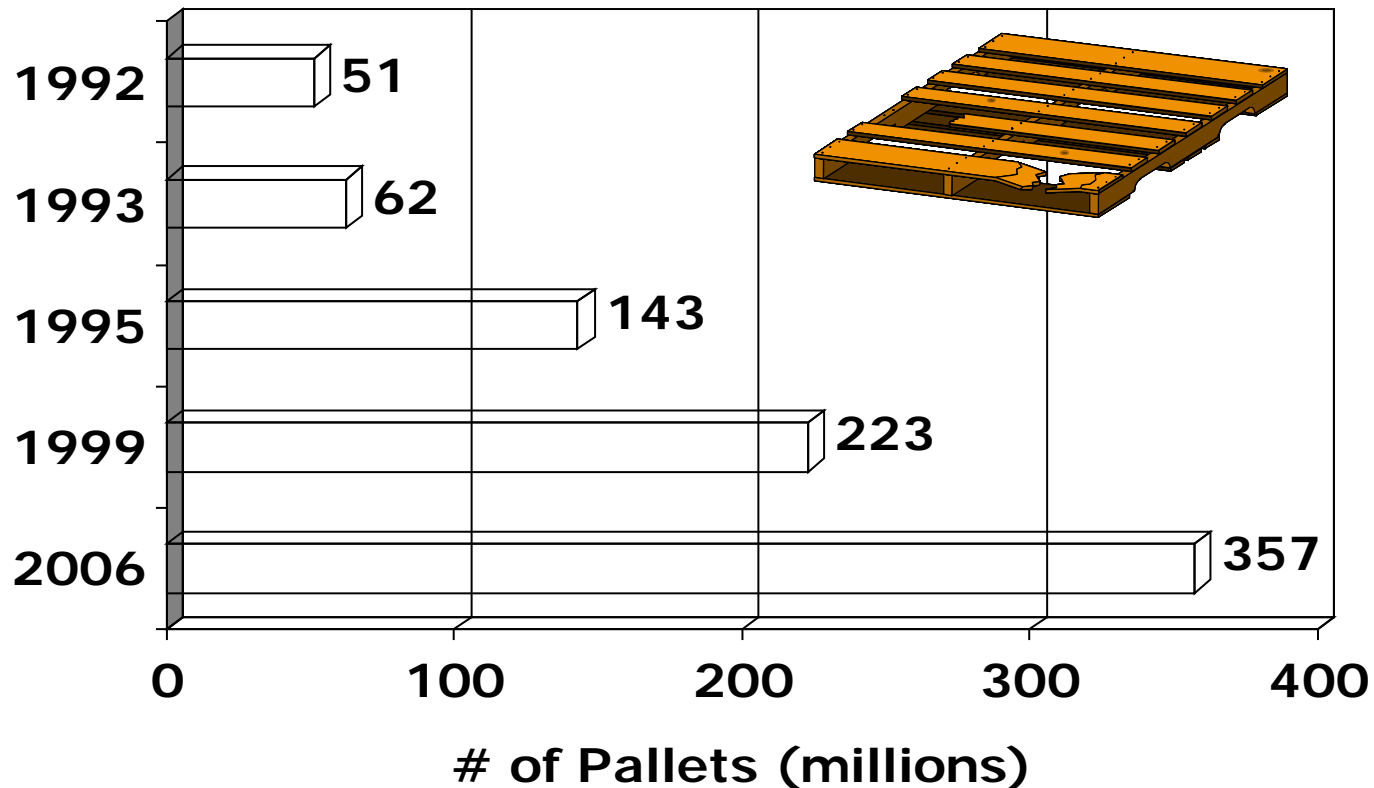
# Survey shows most pallet are repaired



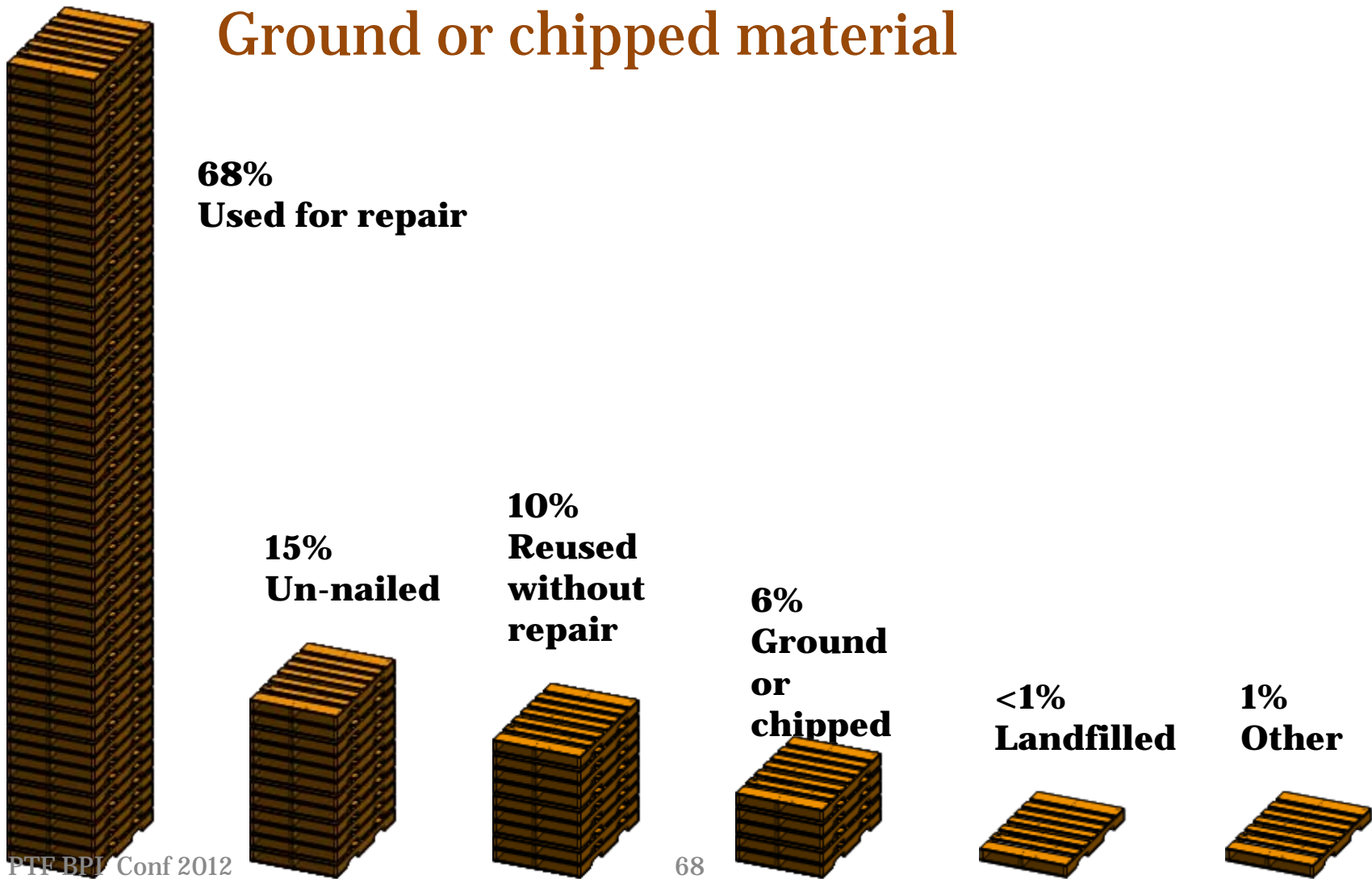
# What happens to the Recovered Pallets? – Most Were Reused in 2006 that you received



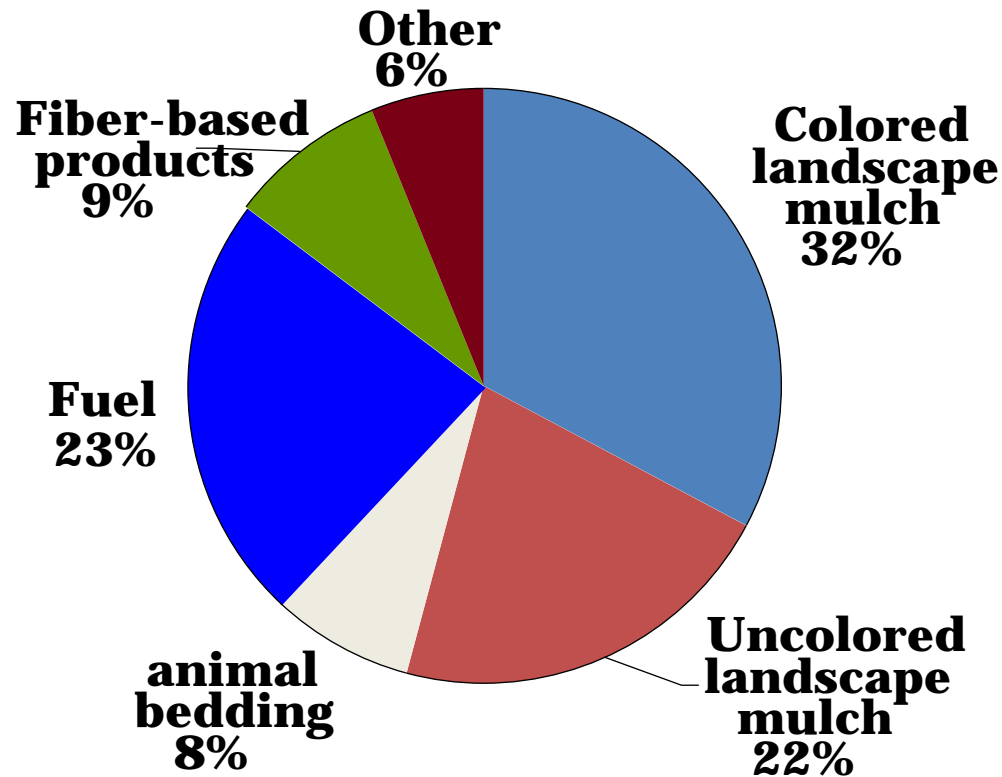
# Pallets recovered, repaired, rebuilt and sold to pallet users



# What happens to the Recovered Pallets? – Ground or chipped material



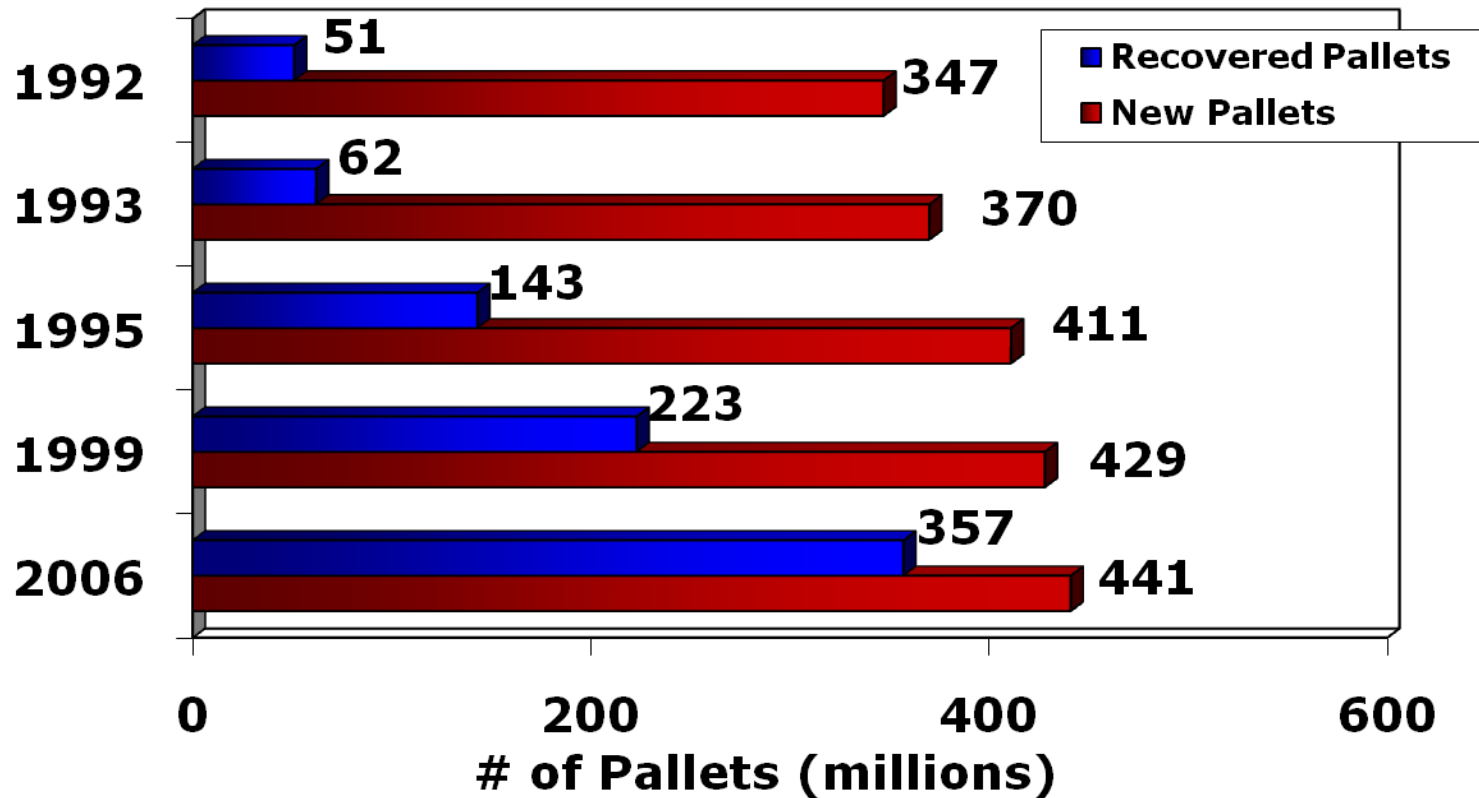
# Use of Ground/Chipped Recycled Pallet Materials



# Tub Grinder and Colored Mulch



# New pallets compared to pallets recovered, repaired, rebuilt and sold to pallet users

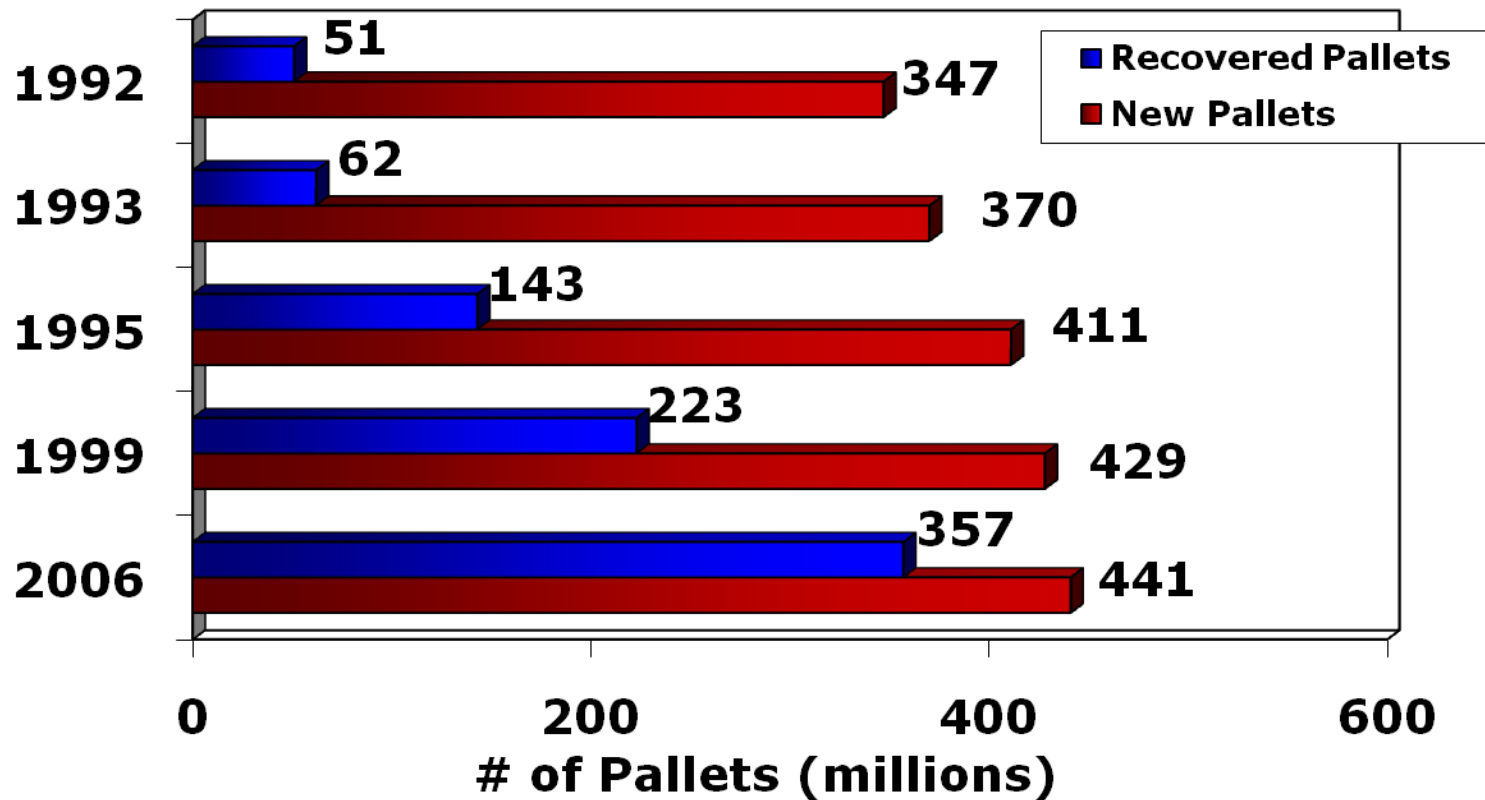


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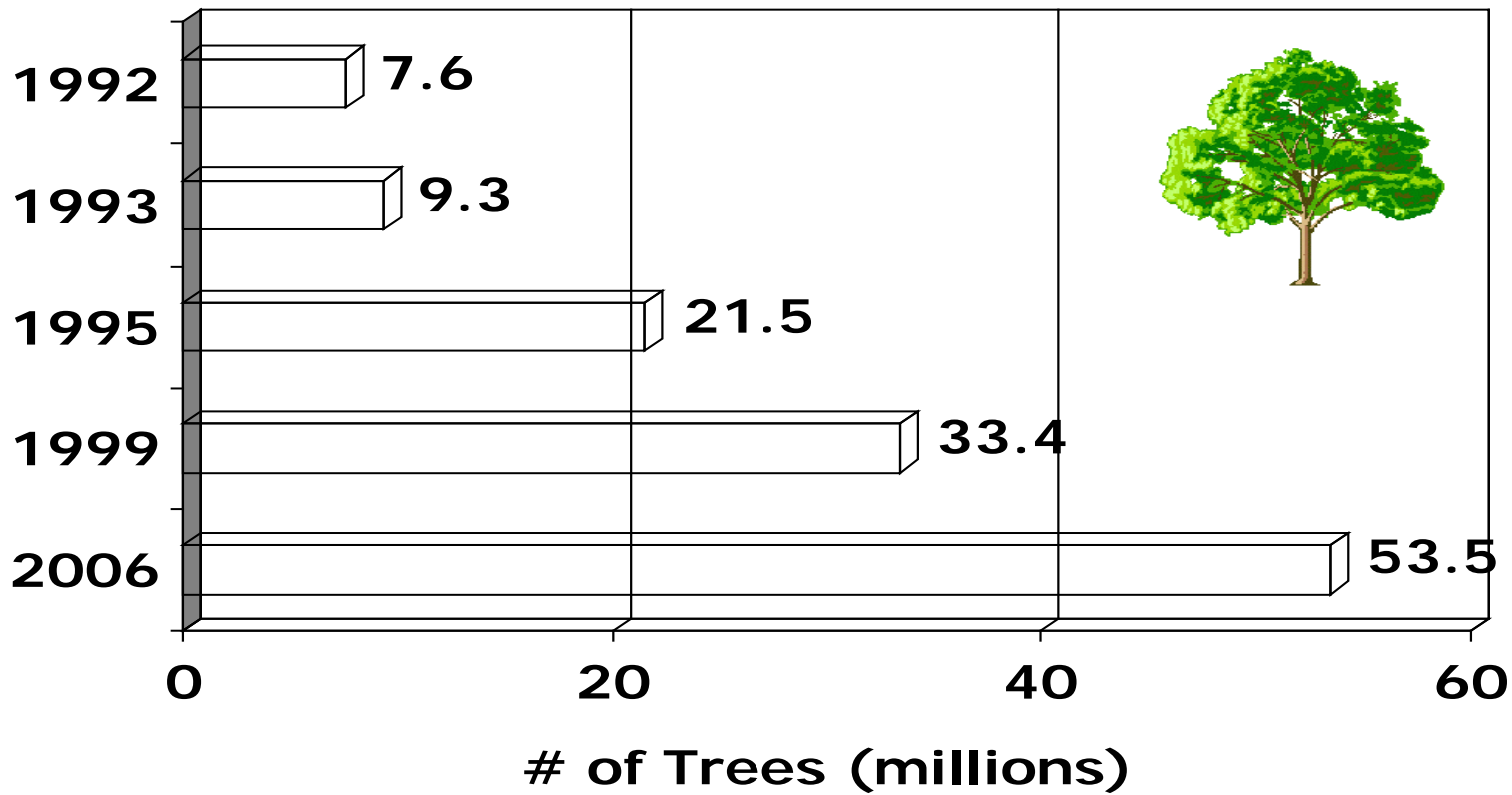
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This is a powerful slide -- New pallets compared to pallets recovered, repaired, rebuilt and sold to pallet users



# Is pallet recovery/repair/reuse important? Yes –millions of trees are saved every year for future use = **Green Commercial**



\* Based on trees 12" in diameter (DBH) with 2.5 16 foot long logs.  
(Estimated to contain 100 board feet of lumber)

# Pallet Recyclers – Can join the very visible environmental movement of FSC – Forest Stewardship Council



# Green Products from Recycled Wood = Good PR



They could qualify as a chain-of – custody companies and use on-product labels such as .....

Many pallet users are pushing FSC for products they sell

### What are the 3 'On-product Labels?'



**100%**

Products only contain material from FSC Certified forest that meet the environmental and social standards of FSC.



**Mixed sources**

Products with material from FSC certified forests, recycled material or other controlled sources.



**Recycled**

Products only contain post consumer material and may include some pre-consumer material content.



**These could be their words ...**

## **It's official - We Are FSC Certified!**

**Are we green yet? Turns out we always were. But now it's official. Our repaired pallet line was recently awarded the Forest Stewardship Council designation, and we didn't have to strain to meet the conditions for it. As it turns out, we were doing things the right way from the beginning. That means low ecological impact just as we, and the FSC intended.**

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