

WOOD SCIENCE & TECHNOLOGY

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Module Outline

- Wood—why we care in the 21st Century
- Tree-ology and Wood Science
- Wood Properties and You
- The Products and the Technology
- Careers and Challenges for Gen X,Y and Z

Goals

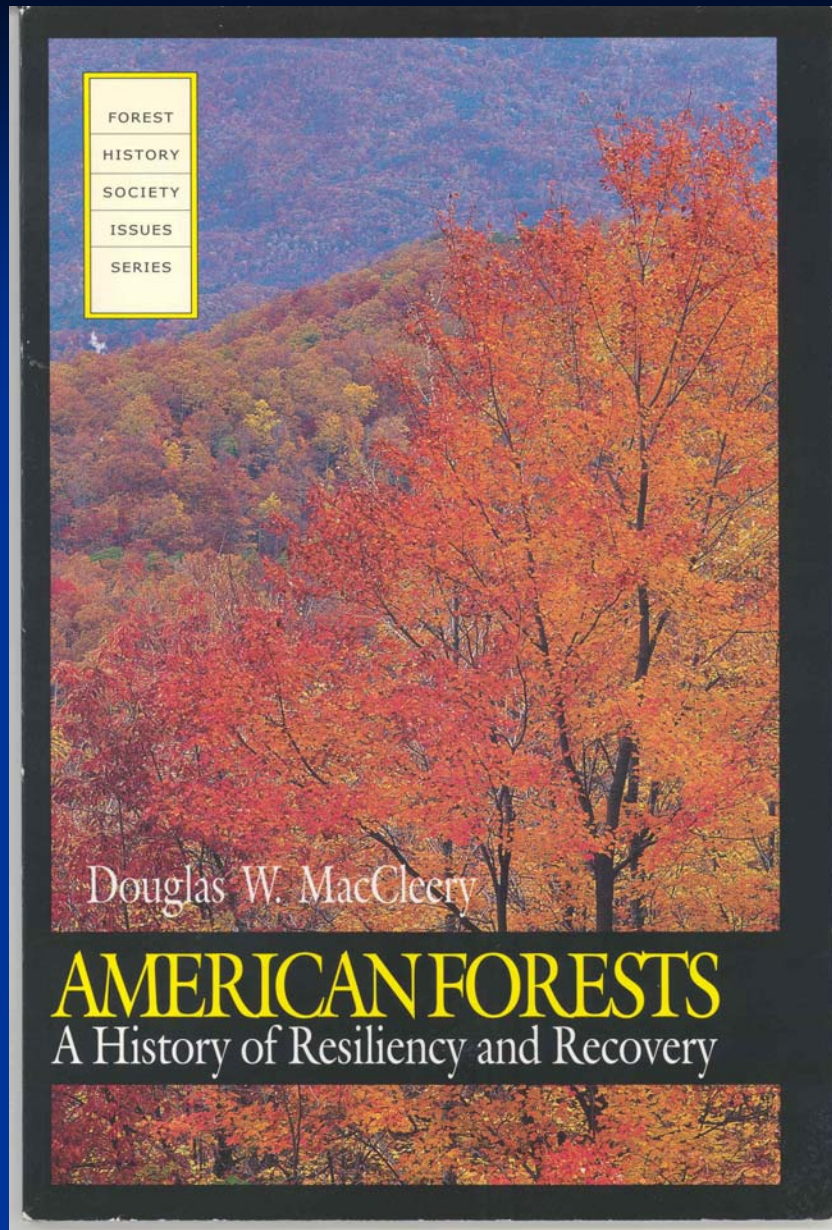
- Gain appreciation for the role of wood in 21st Century
- Understand some basic physiology and wood science, and how that relates to wood products
- Learn some important wood properties that influence how it is used and misused
- Become aware of how technology is revolutionizing our relationship with wood

Goals -2

- Become familiar with some of the diverse career paths that start with wood science and technology
- Introduce you to some of the challenges you will face as a 21st Century consumer.

Reading Assignments

- Chapter 20 of Young and Giese
- On Blackboard:
 - Bowyer, “Sustainability and the Resource Manager of Tomorrow”
 - Moore, “Trees are the Answer”
 - Sutton, “Wood in the Third Millenium”
 - Sutton, “Does the world need planted forests?”



- Available in SLC or bookstore
- Great overview of US forest history
- Quick read with lots of pictures

Wood—why do we care in the 21st
Century?

Short Answers

- Money, jobs
 - Keeps private land in forests
 - Employs millions of people
 - Supports many public services
- Essential to human existence as we know it

Forests, Wood and Society: A Repeating Process

- Easy Forest Access = Society Develops
- Local Forests Decline = Colonization, Diplomacy, Trade, Military Ventures
- Forest Decline Continues = Decline in Society

Wood Through Time

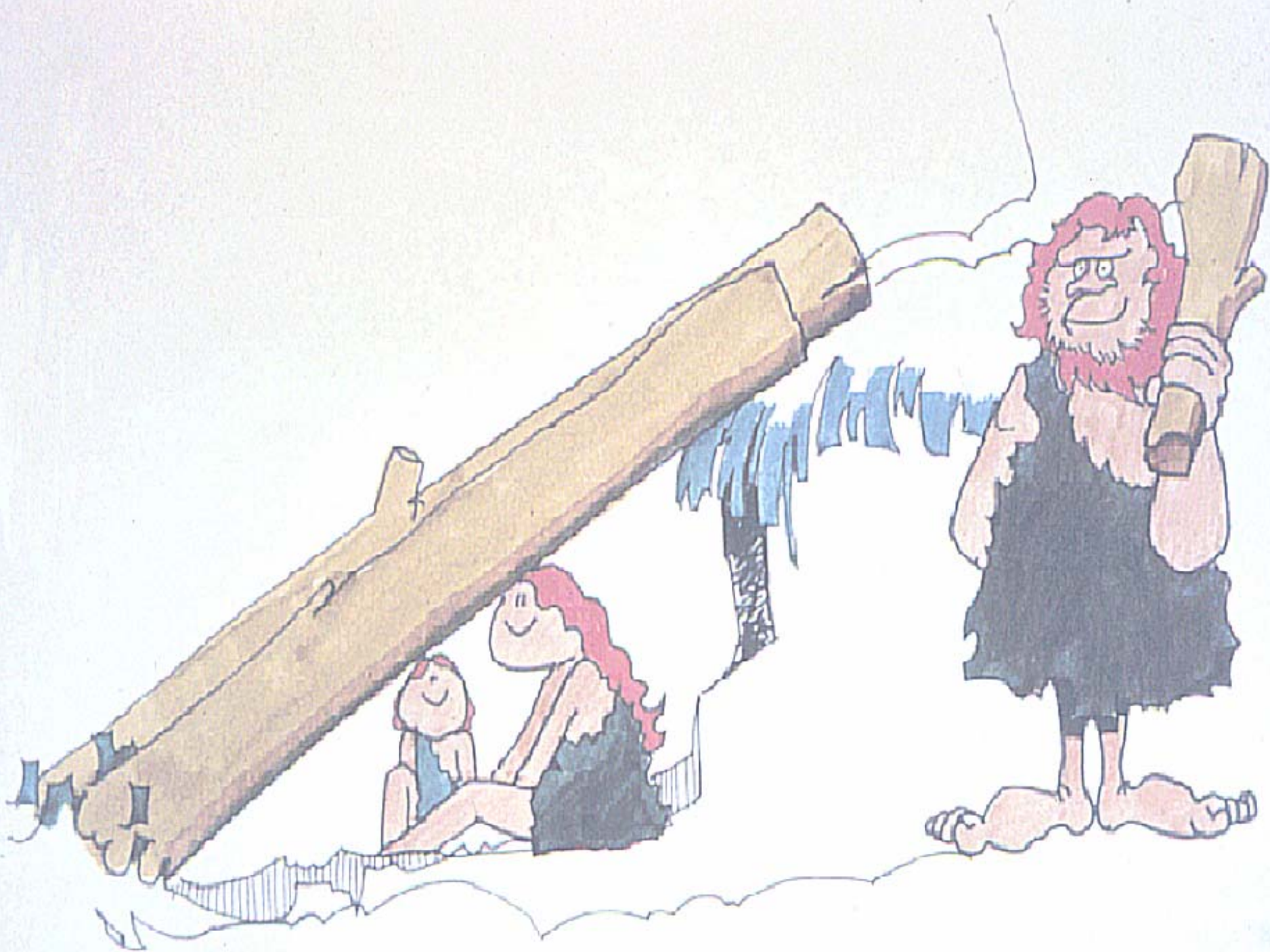
- The foundation on which early civilization was built
- Society's principal fuel
 - Fuel is still largest single use for wood
- Society's principal building material
- Wood use is directly related to living standards and literacy

Fuel Wood Created:

- Heat from wood fires made cold climates habitable
- Inedible grains changed to major food sources
- Clay converted to pottery
- Metal could be extracted from ore
- Glass could be made from sand
- Steam for steamboats, locomotives and industry

Wood Built:

- Ships to explore new worlds
- Waterwheels to generate mechanical power
- Tools for everyday life
- Shelter from the elements and enemies
- Wagons, carts, chariots, and bridges
- Spear shafts and arrows
- Economical ways to communicate and do business—books, newspapers, letters, etc.

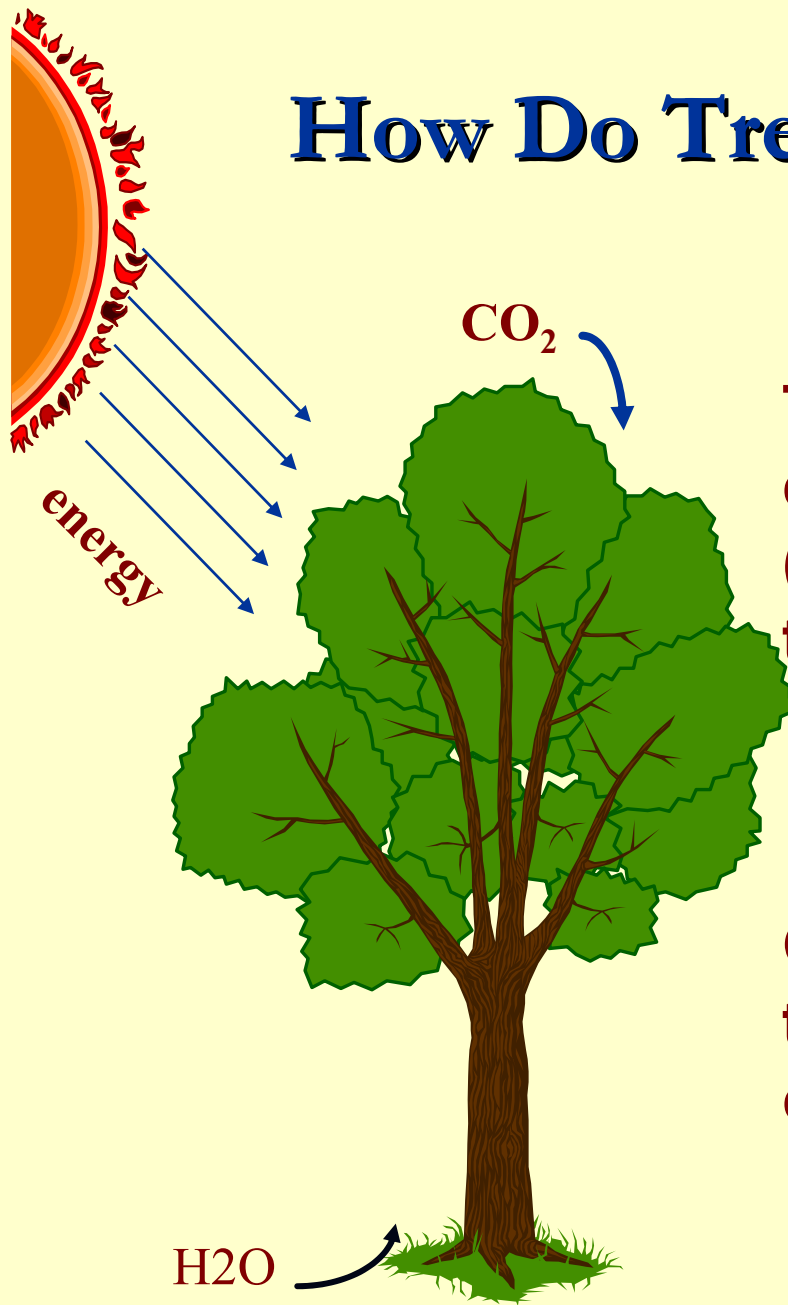








How Do Trees Produce Wood?

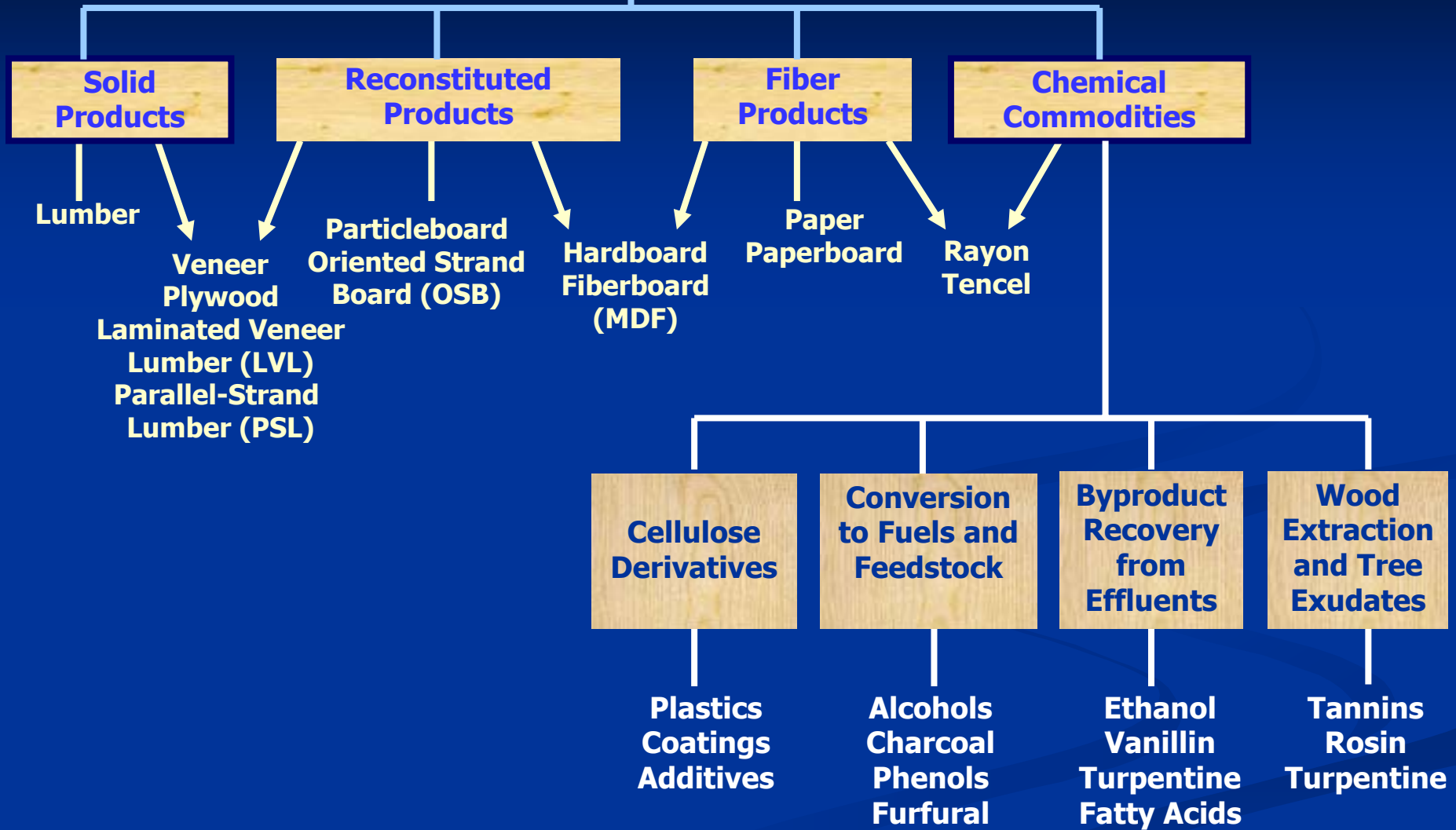


The sun provides energy to combine carbon dioxide gas (from the air) with water (from the soil).



Glucose units link in long chains to form cellulose-- the primary component of wood fibers.

WOOD



Conversion Methods

■ Mechanical

- Sawing
- Peeling
- Slicing
- Chipping
- Crushing
- Fiberization



■ Chemical

- Pulping
- Pyrolysis
- Extraction

Primary Products

Made from a log

- Lumber
- Poles and Posts
- Veneer
- Chips and Pulp
- Flakes



Secondary Products

Made From a Primary Product

- Furniture
 - Cabinets
 - Paper and Paperboard
 - ...1000's of others
-
- Primary/Secondary classifications are fuzzy
 - Secondary Products are also called Value-Added Products

End Uses



- Literally 1000's of end uses
- Principal materials
 - Sawn lumber, veneer
 - Fuel wood
 - Composite products (plywood, particleboard, etc)
 - Paper & paperboard

End Uses

■ Secondary products

- Furniture
- Molding, millwork, etc

■ Many others

- Food additives (gum arabic, cellulose x,
- Clothing (rayon, tencel, lyocel)
- Film, cigarette filters
- Solvents

See <http://wood.orst.edu> for more about products

What wood products have you been intimate with during the past three hours?

- Toothbrush and tooth paste
- Toilet paper
- Rayon clothing
- Breakfast Cereal
- Your house
- Hair combs
- Shampoo
- Makeup and lipstick
- Perfume, shaving lotion
- Chewing gum

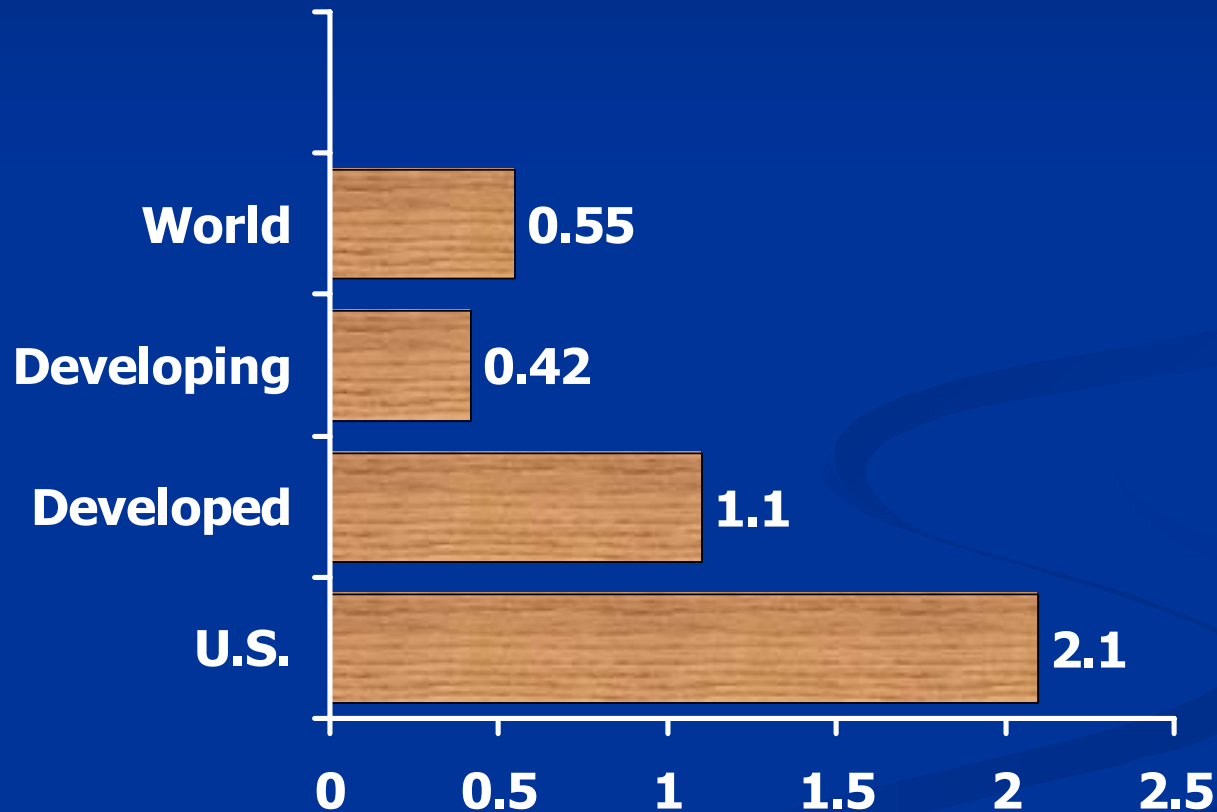


Why Use Wood?

- Renewable
- Available
- Economical
- Burns
- Biodegradable
- Aesthetic
- Cultural heritage
- Makes useful products
- Favorable properties
 - Physical
 - Mechanical
 - Chemical
- Easy to work with simple tools
- Low energy consumption
- Source of fiber and chemicals
- To store carbon for long periods

ANNUAL WOOD CONSUMPTION

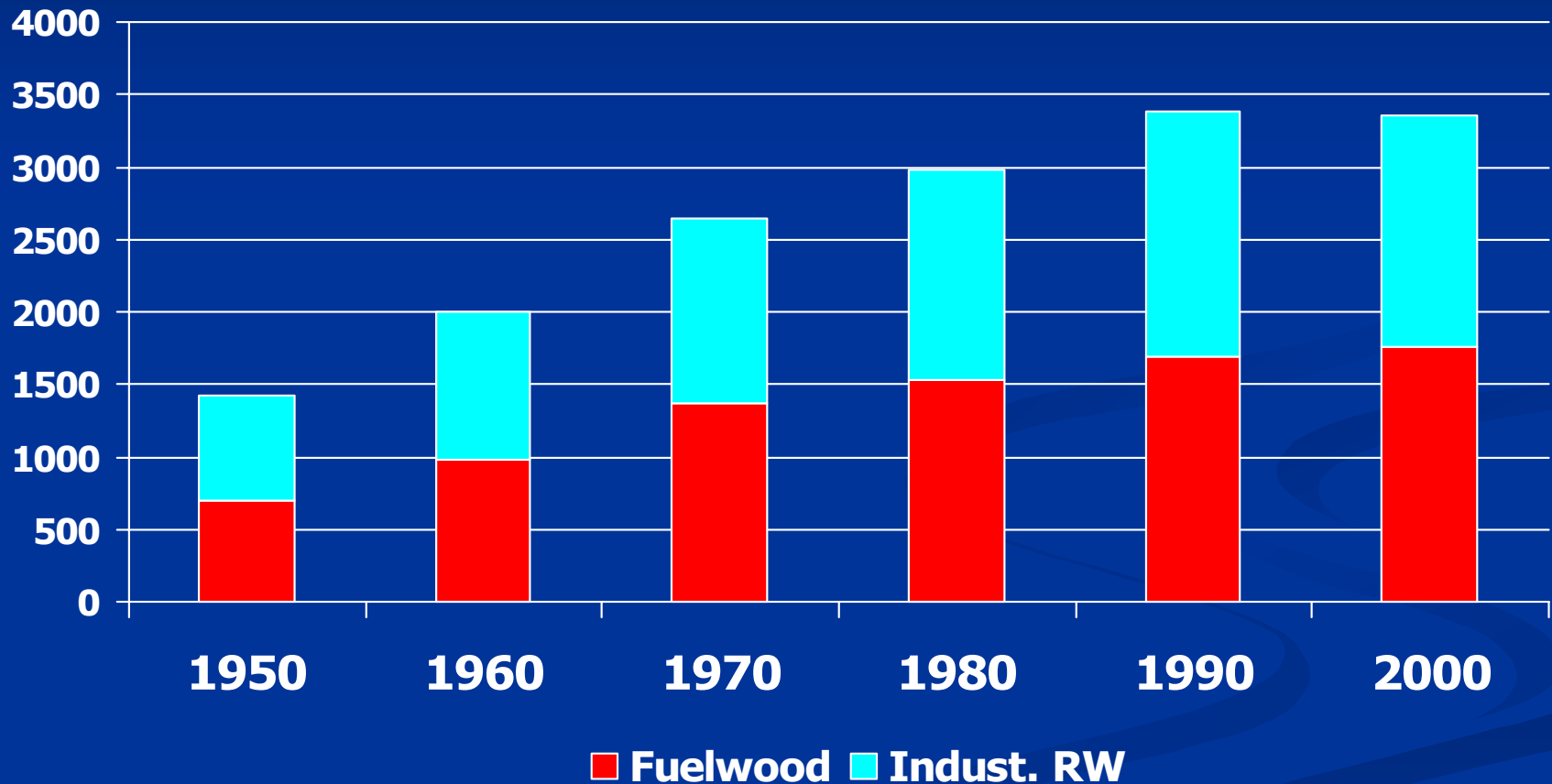
Per Capita (Cubic Meters)



Source: FAO Statistical Database (www.fao.org), Population Reference Bureau (www.prb.org)...Yr 2001

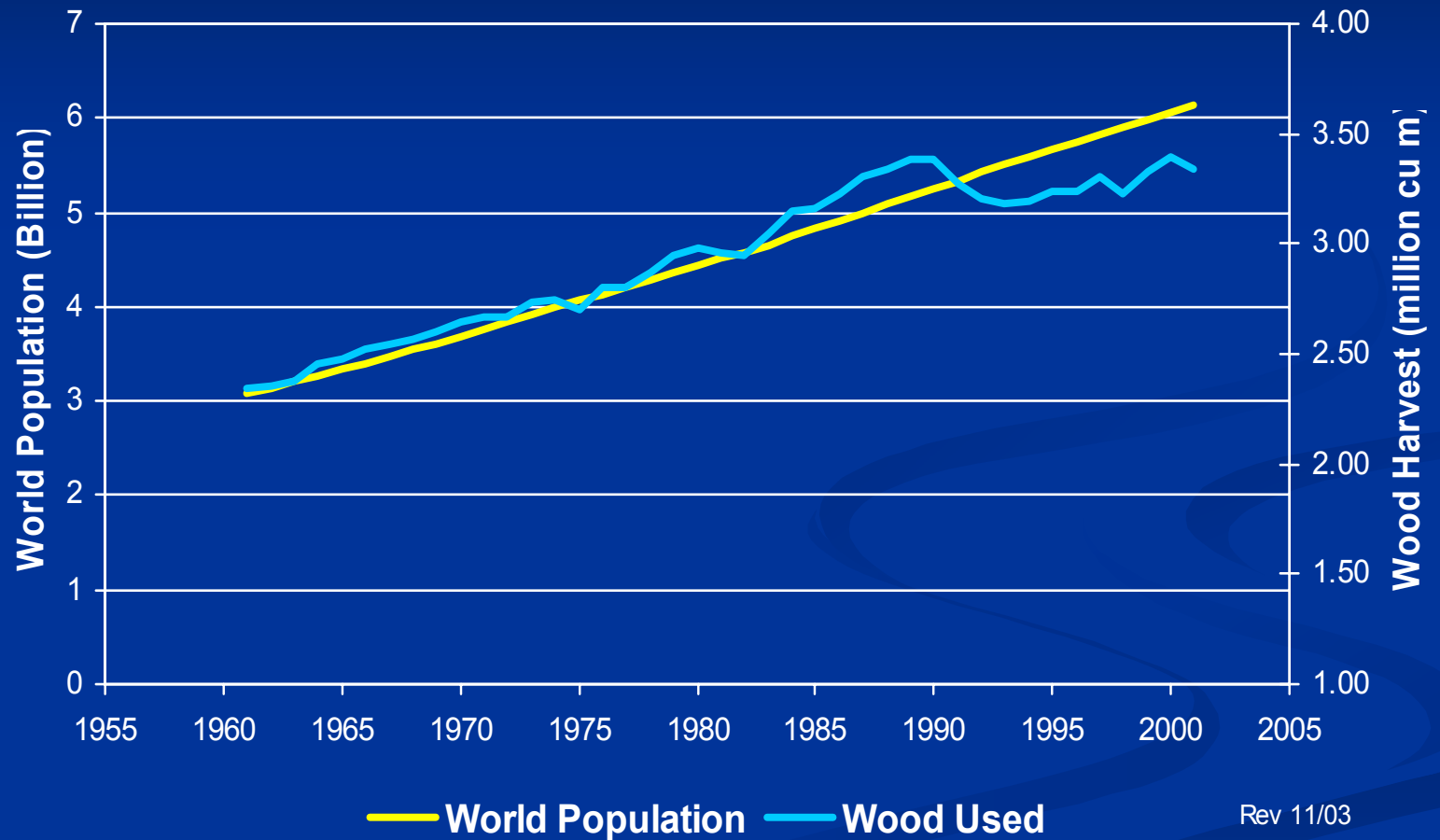
Global Wood Harvest 1950 to 2000

Million m³

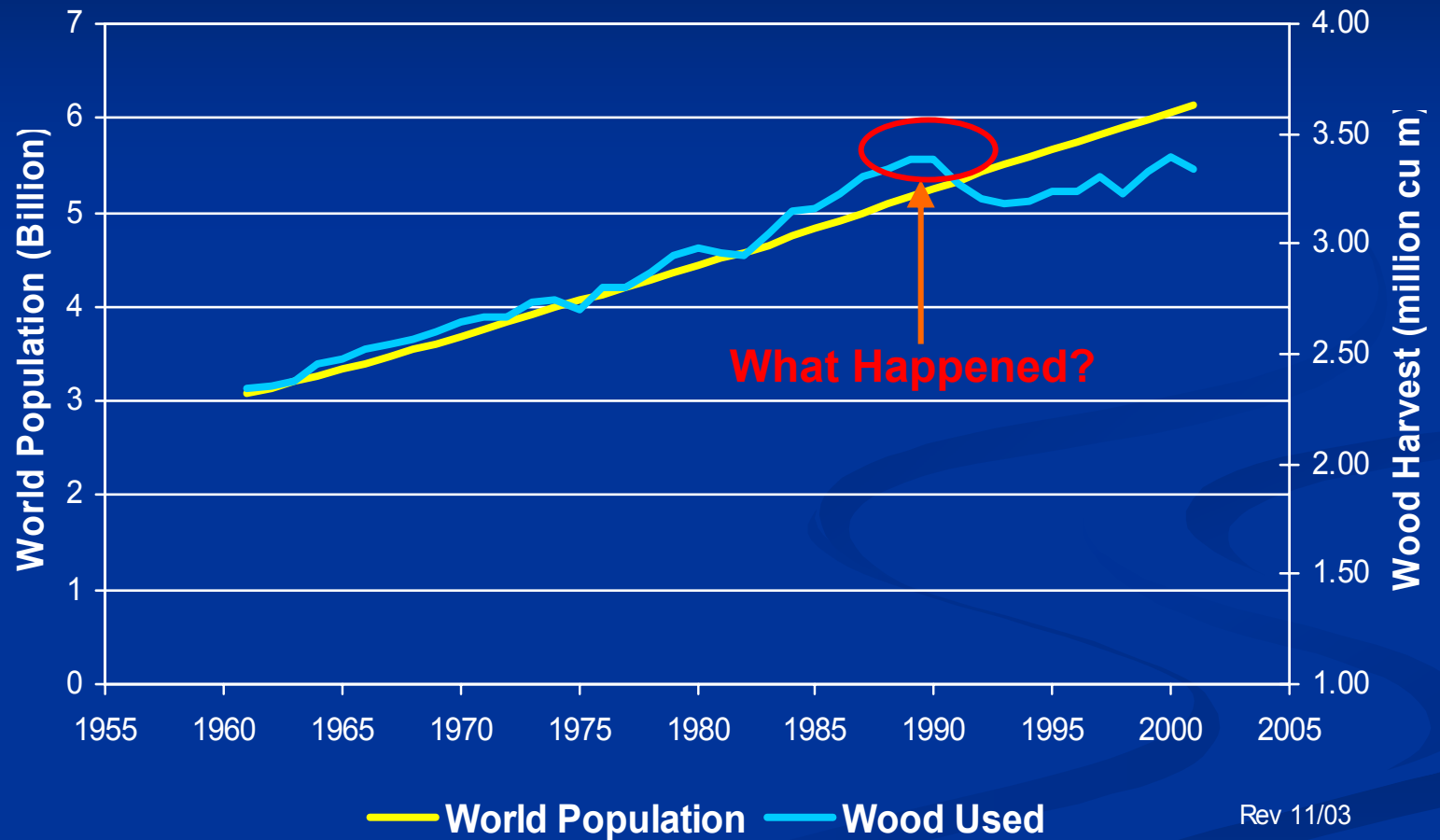


Source: FAO (2002) www.fao.org

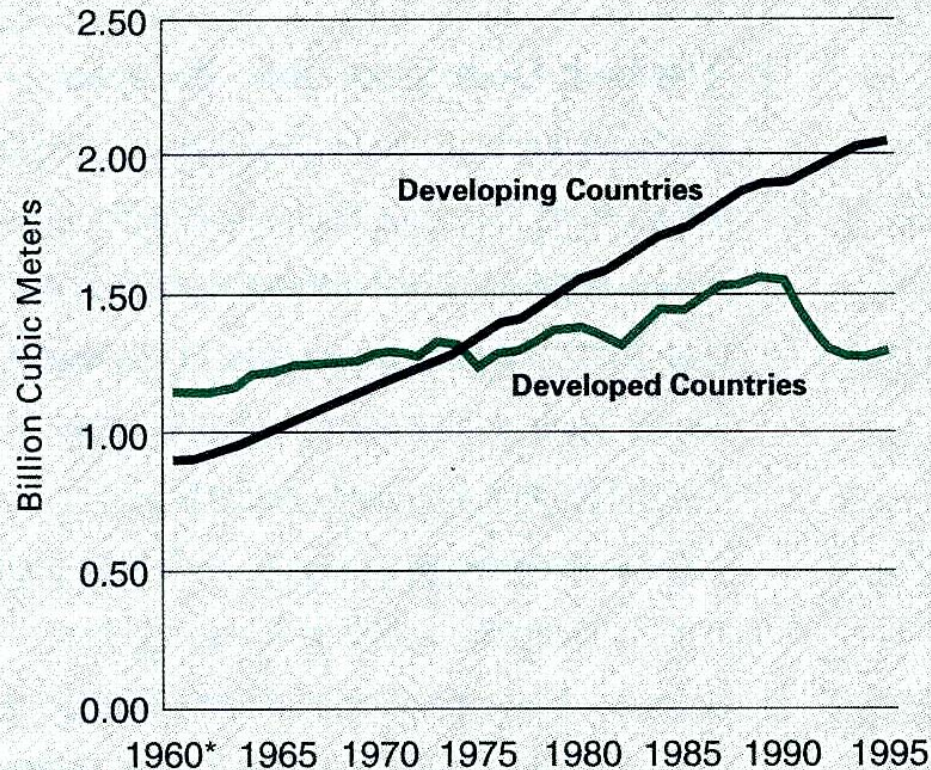
WORLD WOOD USE AND POPULATION



WORLD WOOD USE AND POPULATION



Total Wood Consumption: 1960-1995

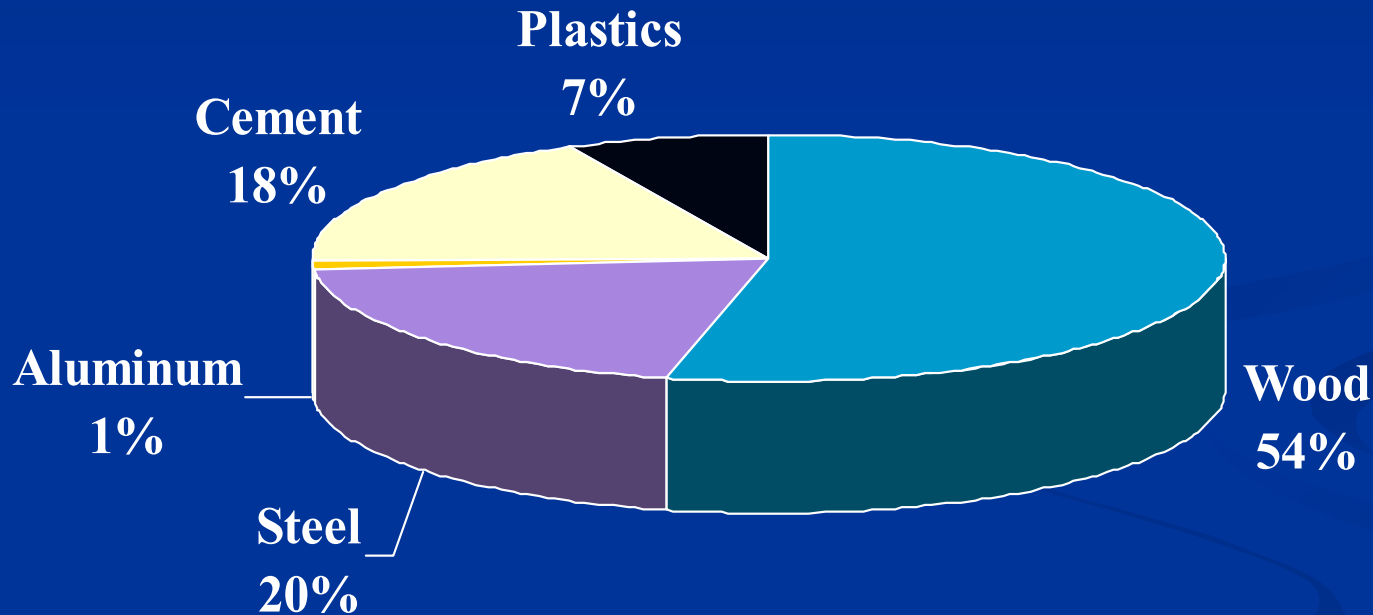


* Data on wood consumption for 1961, the earliest available from FAO, are used for 1960.

Source: Data are from *FAOSTAT Statistics Database on CD-ROM*, 1998.

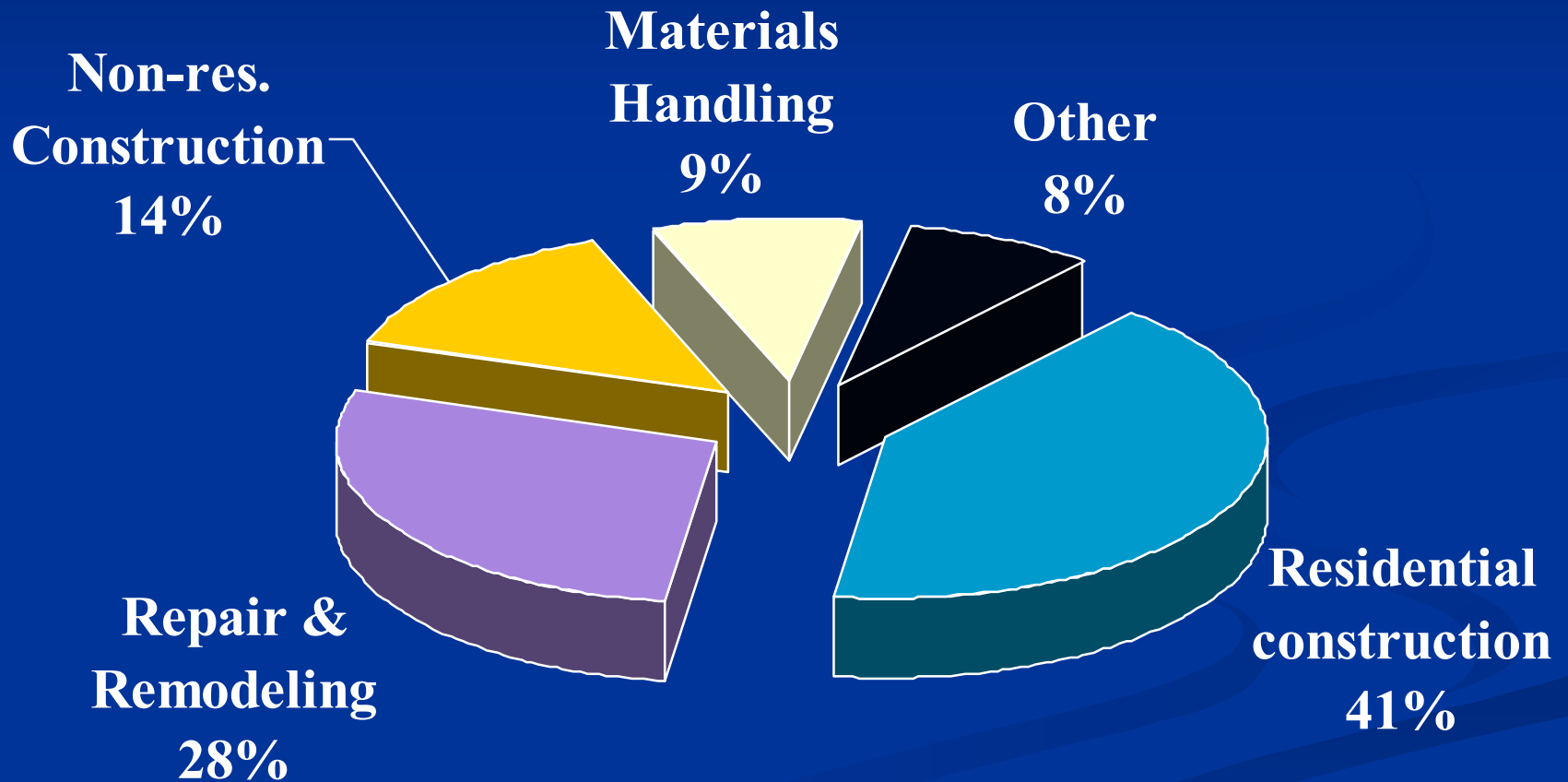
Per Capita Consumption of Key Raw Materials in the U.S. - 1998

By Weight



Sources: Dr. James Bowyer, University of Minnesota; Steel, Aluminum, Cement: US Geological Survey; Plastics: Society for the Plastics Industry and the American Plastics Council; Wood: US Forest Products Laboratory and FAO

US Softwood Lumber Consumption

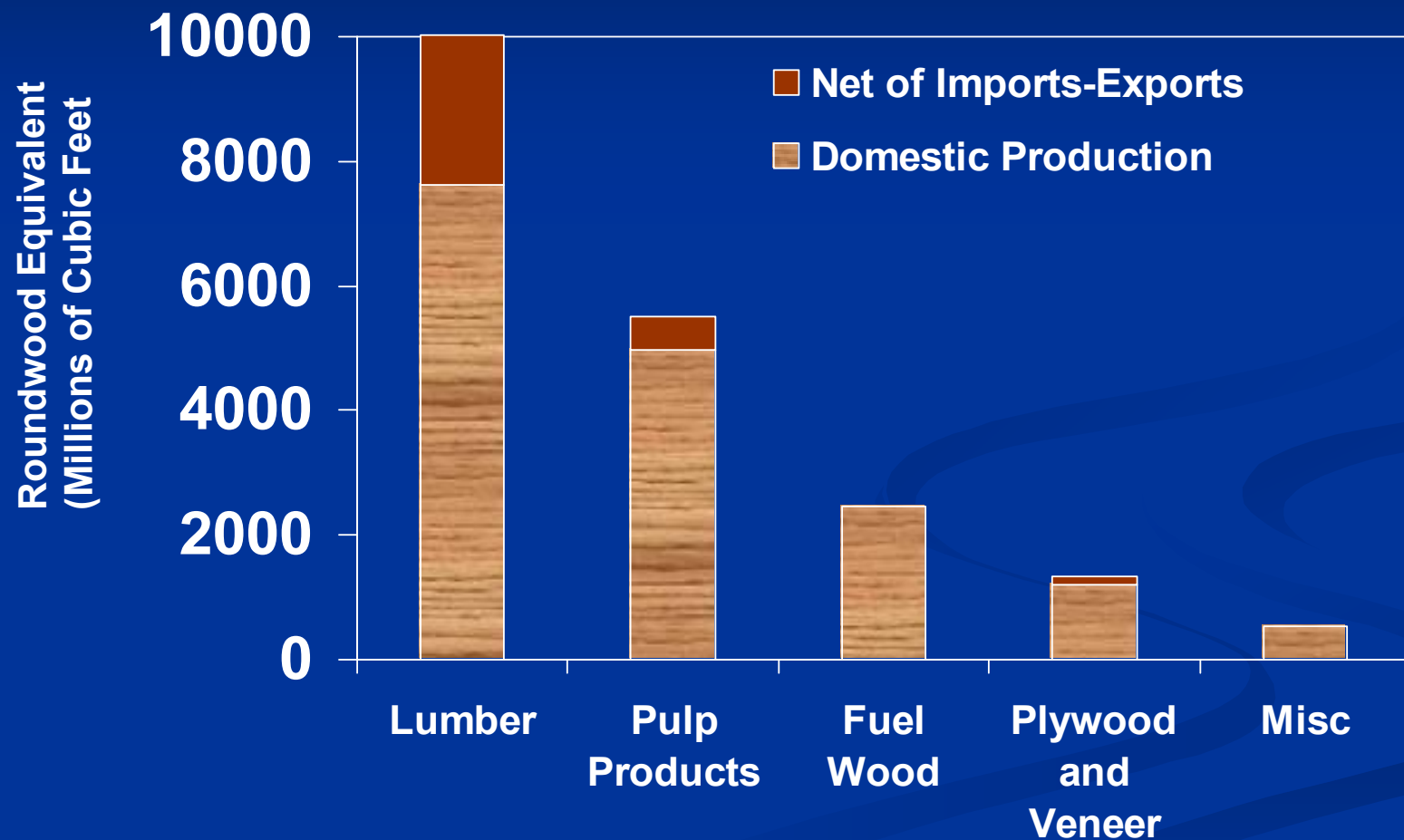


Source: WWPA, 1999 Statistical Yearbook

Here are the paper products that a family of four typically uses in just one year ~1985. This includes packaging left at grocery stores or shopping centers where items are unpacked. Each American “consumes” over 600 lb of paper annually.



U.S. TIMBER PRODUCTS PRODUCTION, TRADE, CONSUMPTION (1999)



Source: Howard, J.L. 2001 U.S. Timber Production, Trade, Consumption and Price Statistics 1965-1999. U.S. Forest Service FPL-RP-595

Demand for Wood

Increases with Population

- Especially fuel wood
- Population is increasing, mostly in developing countries
- Per capita consumption in the world has declined slightly since 1960



Demand for Wood

Increases and shifts with economic growth

- Fuel wood demand declines with income growth
- Industrial round wood demand increases with :
 - Increase with gross domestic product;
 - Increase in personal disposable income
- Switch to using more complex products, and more of them
- Economic growth slows population growth

Wood Science and Technology

Wood Science....that body of knowledge applicable to wood as a material, including its origin, properties, composition and characteristics.

Wood Technology....the application of knowledge in the conversion, processing and the many uses of wood, including the design, manufacture and marketing of wood products.

Wood Science and Technology

Goals

- Economic well-being of human communities
- Improved human quality of life
- Conservation of forest resources through:
 - Efficient manufacture and use
 - Intelligent consumption



“The long and short of the matter is that forest conservation depends in part on intelligent consumption, as well as intelligent production of lumber”

Aldo Leopold, 1928