

# Woody Biomass Resources, Utilization, and Opportunities in West Virginia

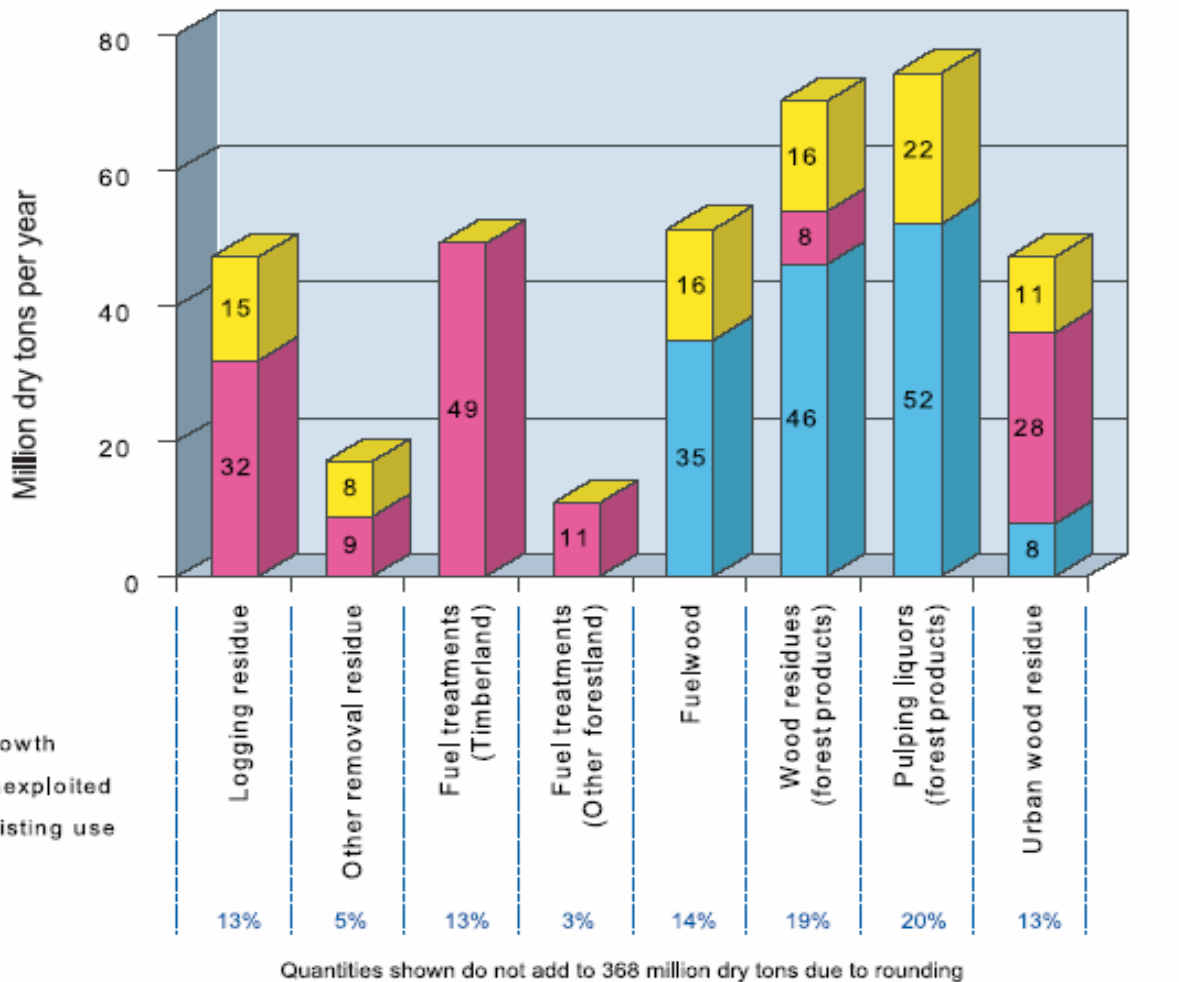
Jingxin Wang

West Virginia University  
Division of Forestry and Natural Resources  
Biomaterials and Wood Utilization Research Center  
Morgantown, WV 26506, USA  
[www.wdsc.caf.wvu.edu/BioMatCtr](http://www.wdsc.caf.wvu.edu/BioMatCtr)

# Outline

- National biomass resources and consumption
- Woody biomass resources in West Virginia
- Supply/demand, and utilization of wood residues
- Biomass projects and opportunities

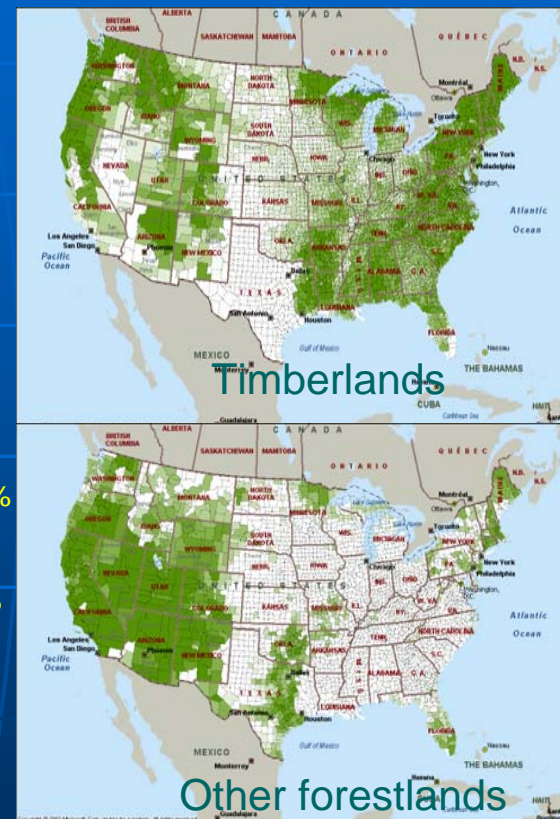
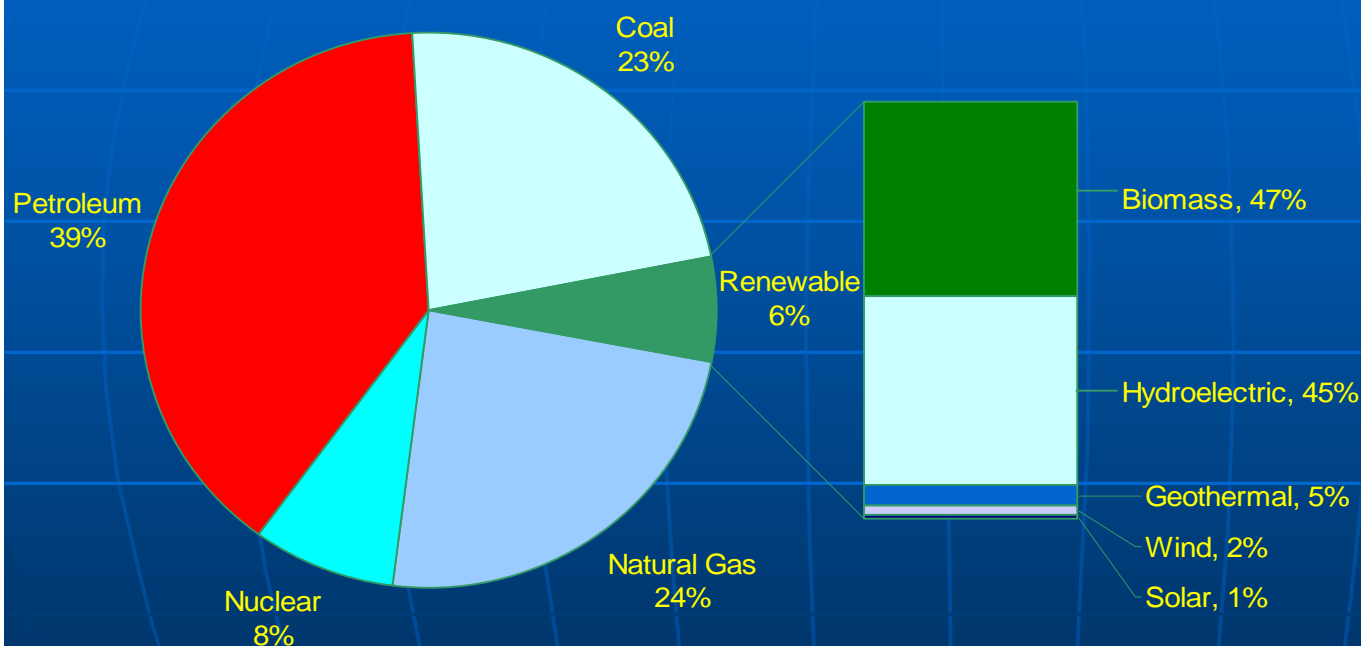
# Available Woody Biomass Summary



- 368 million dry tons per year
- 2.5 times the current consumption
- 142 million dry tons
- 190 million dry tons

(Source: Perlack et al. 2005)

# Biomass Resource Consumption



[http://www1.eere.energy.gov/biomass/pdfs/final\\_billionton\\_vision\\_report2.pdf](http://www1.eere.energy.gov/biomass/pdfs/final_billionton_vision_report2.pdf)

(Source: Perlack et al. 2005, Stokes 2006)

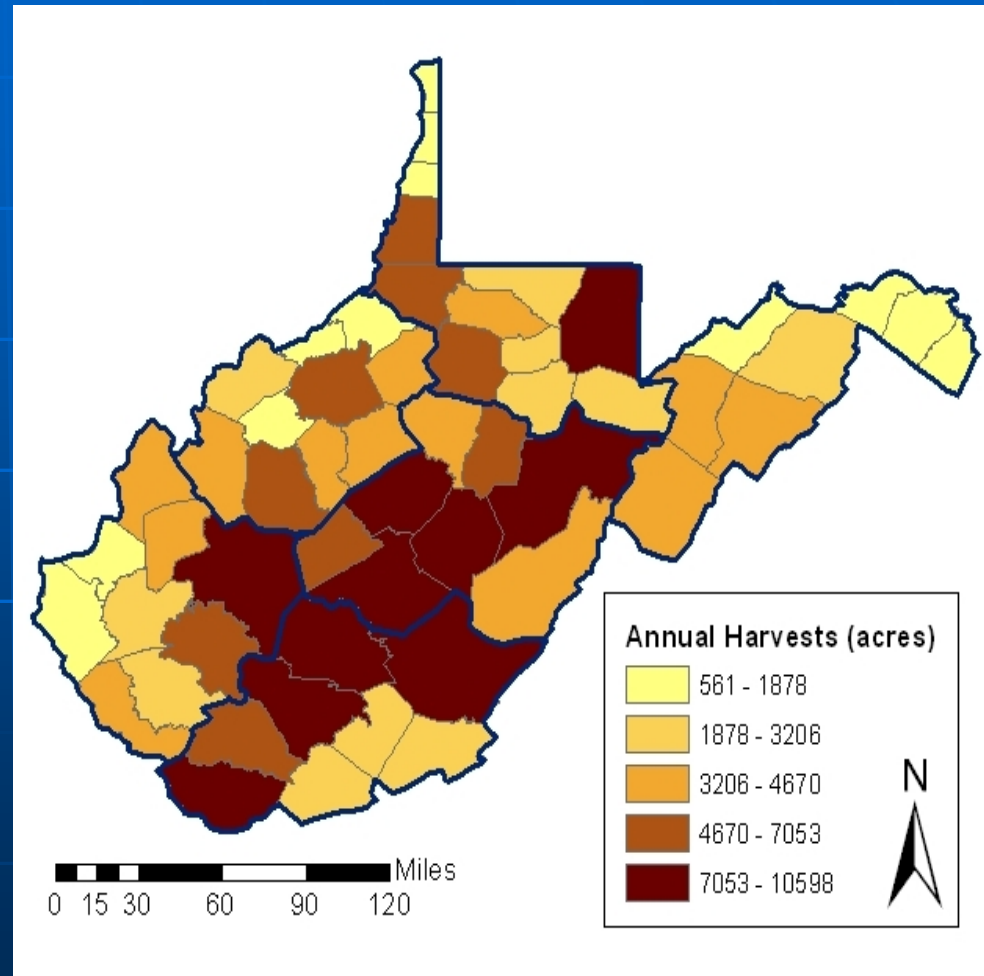
# West Virginia's Forests

- Sustainable forestry (USDA Forest Service)
  - 7 million more acres of forestland than it did in 1910
  - 18 billion BF of sawtimber in 1949 to 76 billion BF in 1995
- 12 million acres of forestland or 78% of the State
- Ranks third in the nation (by %), behind Maine and New Hampshire
- Are at least 94% hardwood species including maple, oak, yellow-poplar, ...

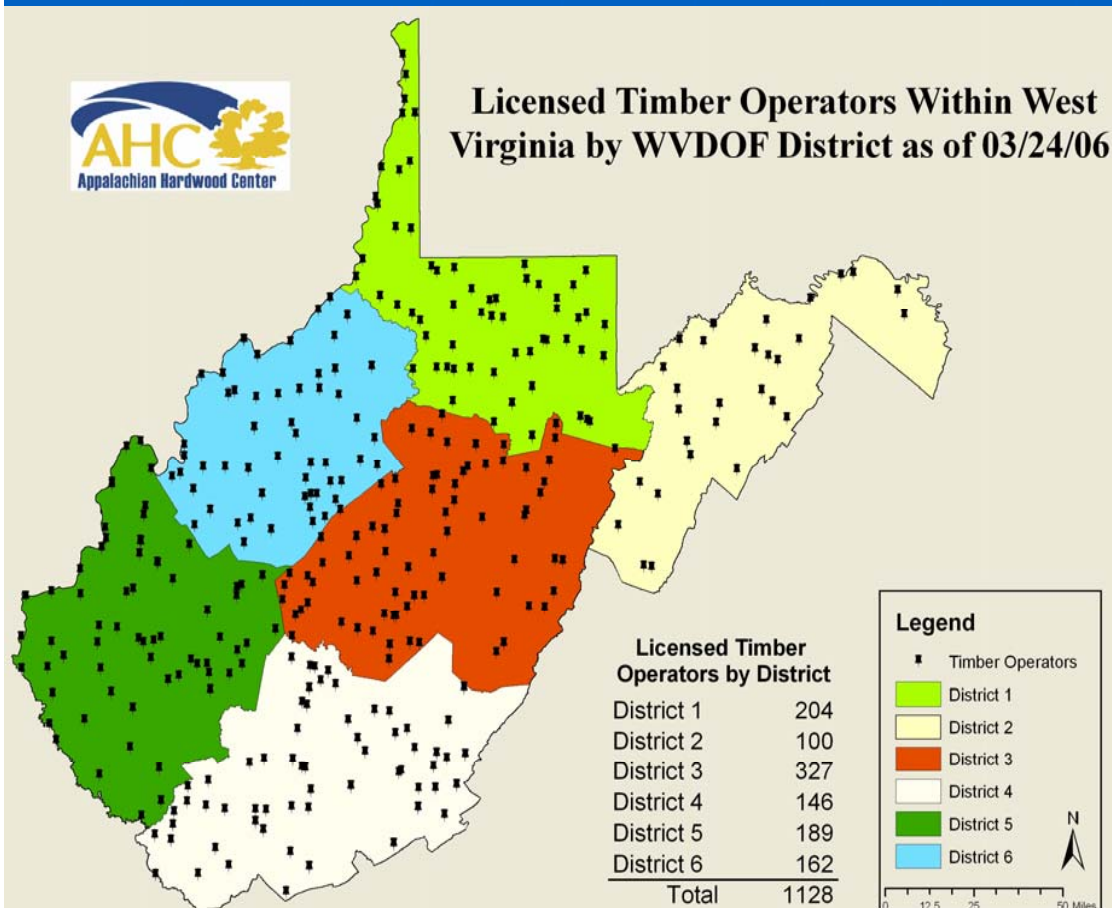
(Source: USDA 2000, Griffith and Widmann 2003)

# Forest Industry

- About 400 active logging firms
- Average crew size is 4 persons
- A crew operates on an average of 2.2 harvest sites per year
- Each site averaging 89.34 acres
- 6000 bf per harvested acre
- Oak and yellow-poplar 68.9% of sawtimber

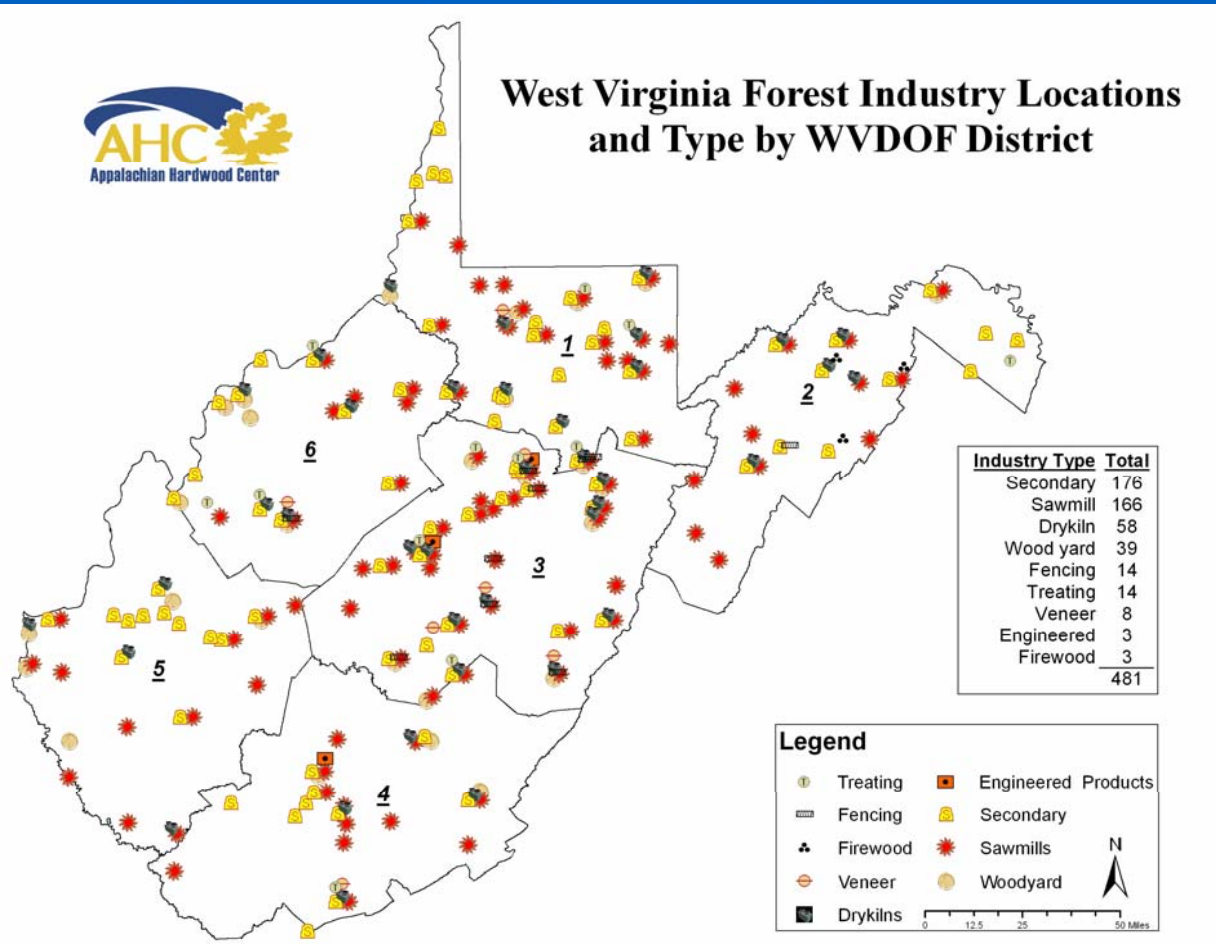


# Forest Industry (Cont'd)



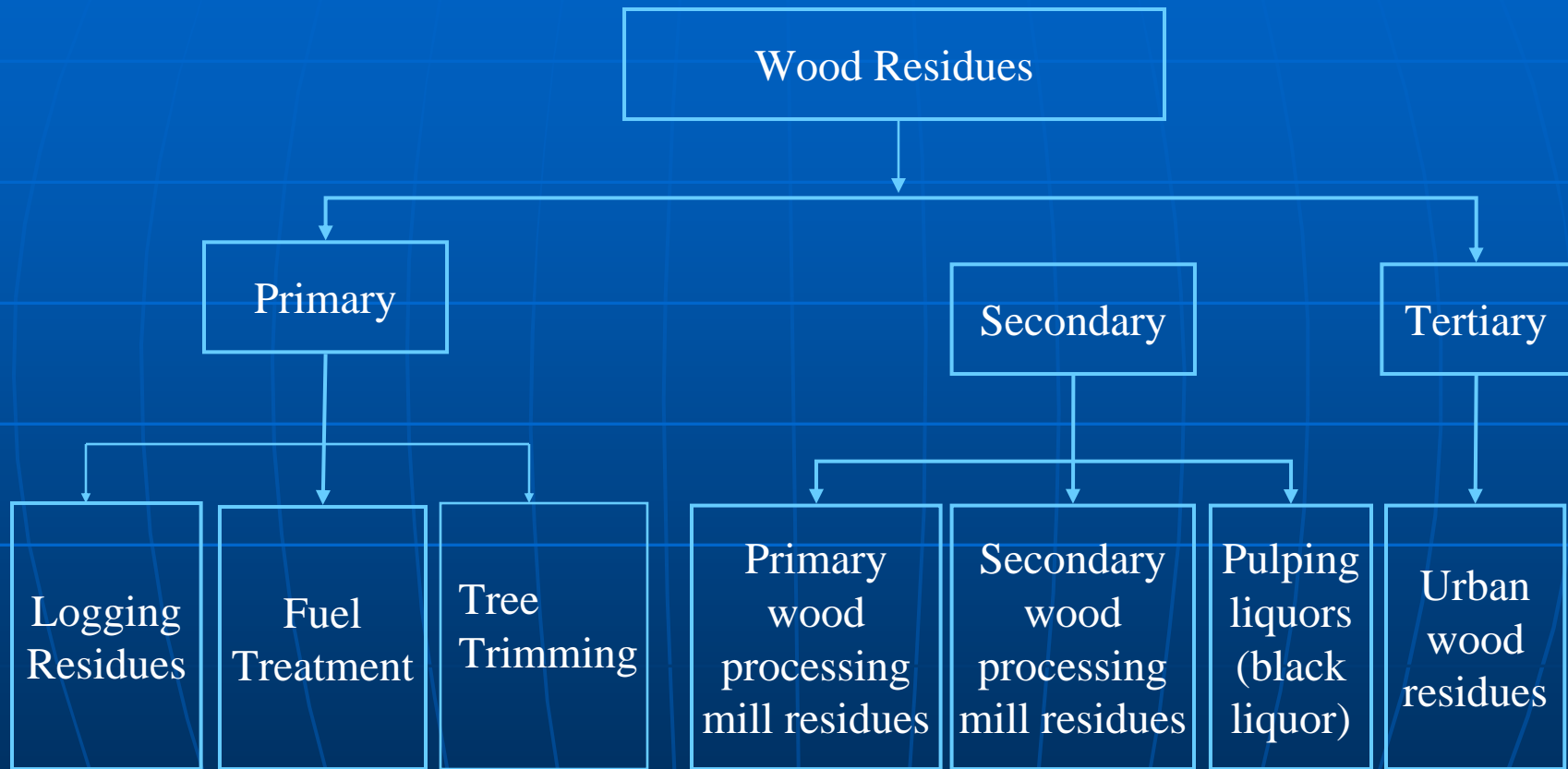
- 1000+ licensed loggers
- Diameter limit 46%
- Selective cut 44%
- Clearcut 7%
- Not specified 3%

# Forest Industry (Cont'd)



- LSCA
- 30,000+ people employed
- All 55 WV counties
- \$4 billion annually to the WV economy
- Sawmills produce 700 to 800 million BF/yr

# Wood Residues



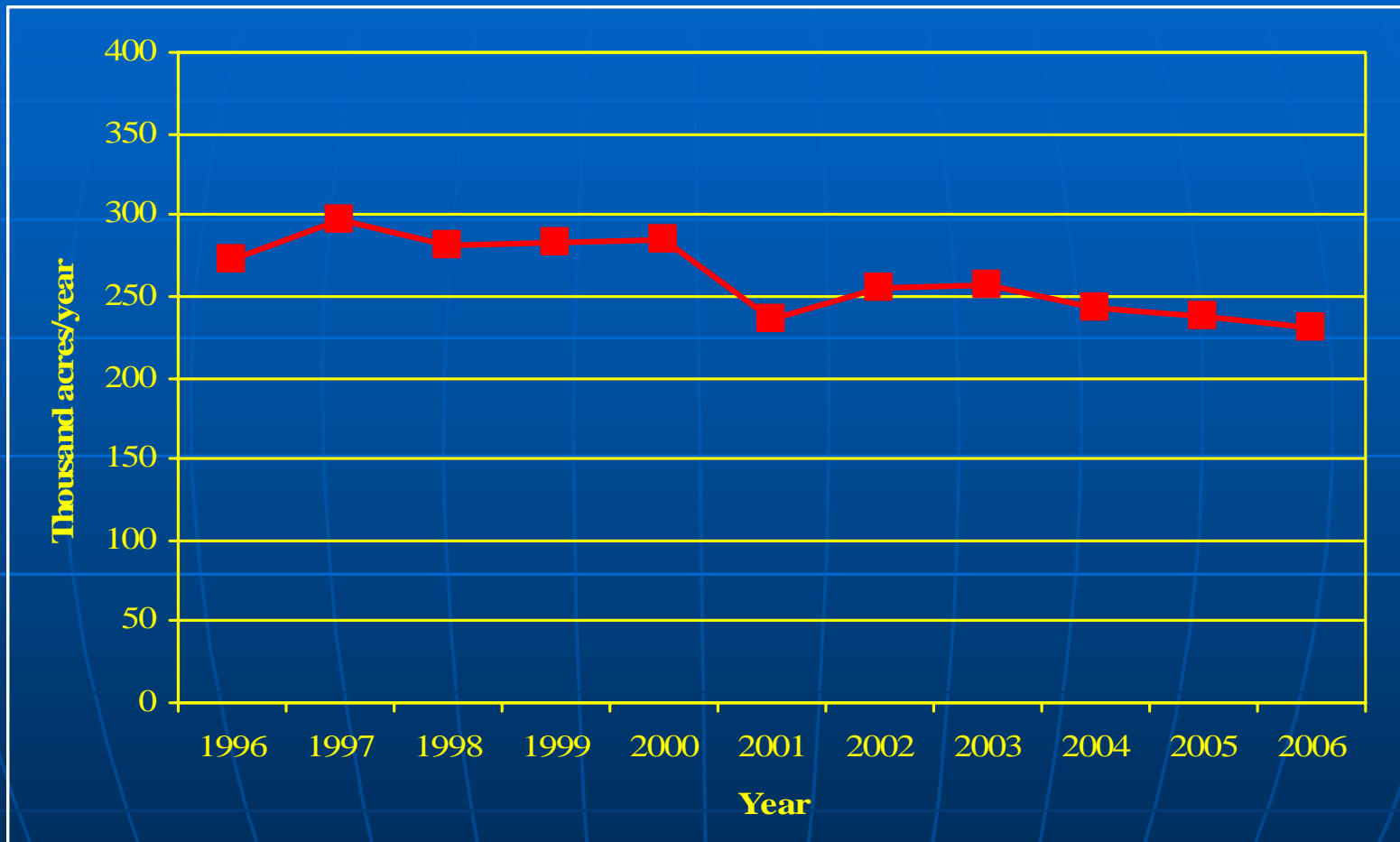
(Source: Perlack et al. 2005)

# Logging Residue

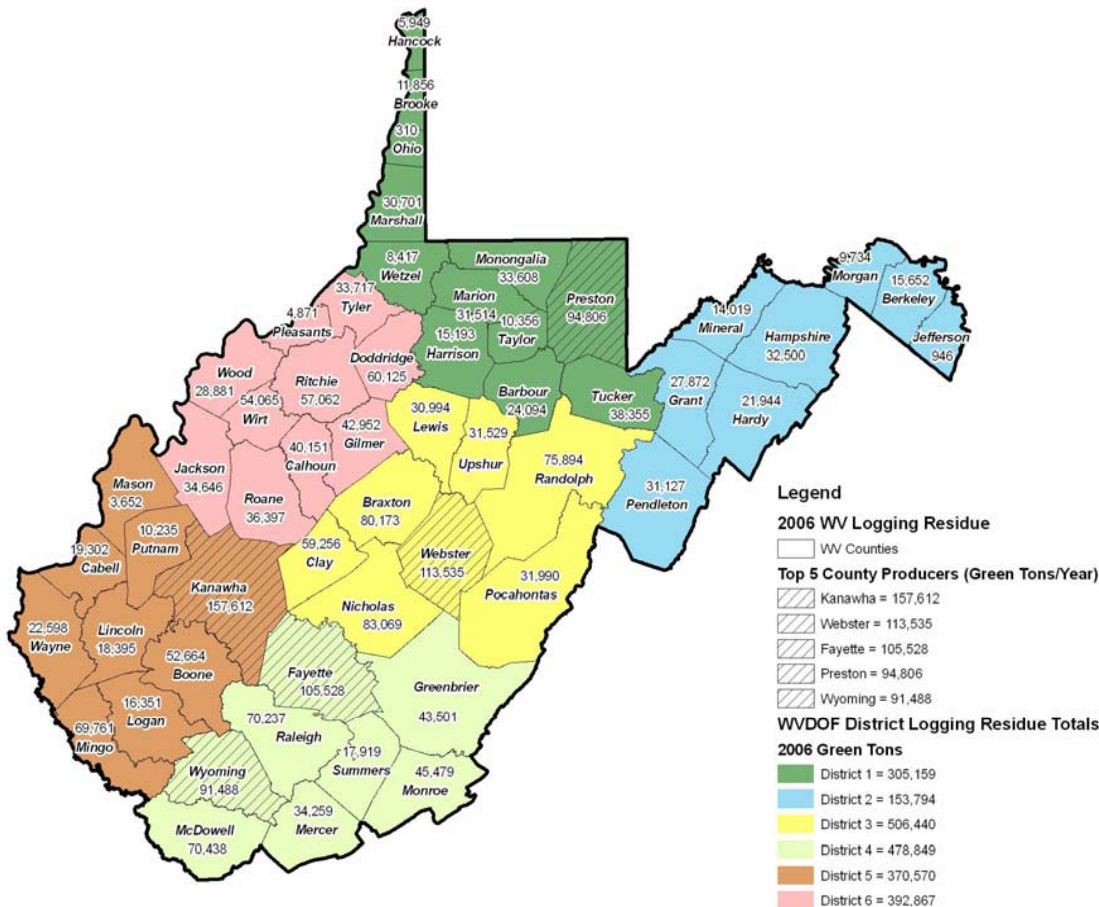
- 1995, statewide survey
  - 101 harvested sites sampled
  - 504 ft<sup>3</sup>/acre or 8.4 tons/acre
  - Average piece size 12.9 ft<sup>3</sup>
  - Mean diam. 7 inches
  - Pulp wood size residues – 86%
  - Sawlog size residues – 14%
  - Red oak, mixed hardwood, yellow-poplar, and soft-hardwood
- 2002, southern WV
  - 70 sites sampled
  - Average diam. 7.3 in. and length 20.4 ft.
  - 623.7 ft<sup>3</sup>/acre or 10.4 tons/acre
  - 24% higher than in 1995
  - Oak followed by miscellaneous hardwoods, yellow-poplar, and maple species



# Harvesting Acreage



# 2006 Logging Residue



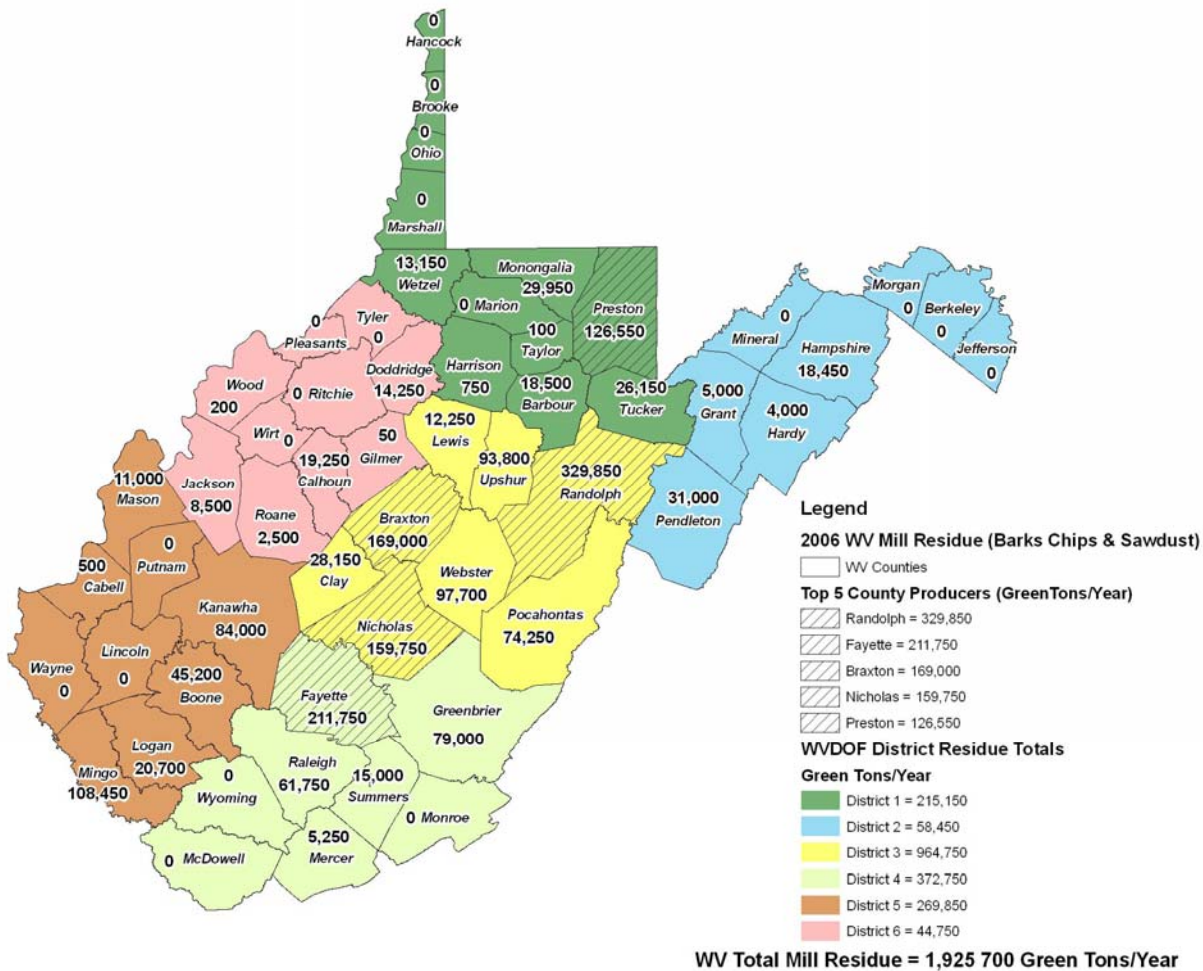
WV 2006 Logging Residue = 2,207,679 Green Tons

- Total harvest  
231,209 acres
- Total 2.2 million  
green tons
- Top 5 counties
- Districts 3 and  
4/Region 2

# Mill Residue Survey

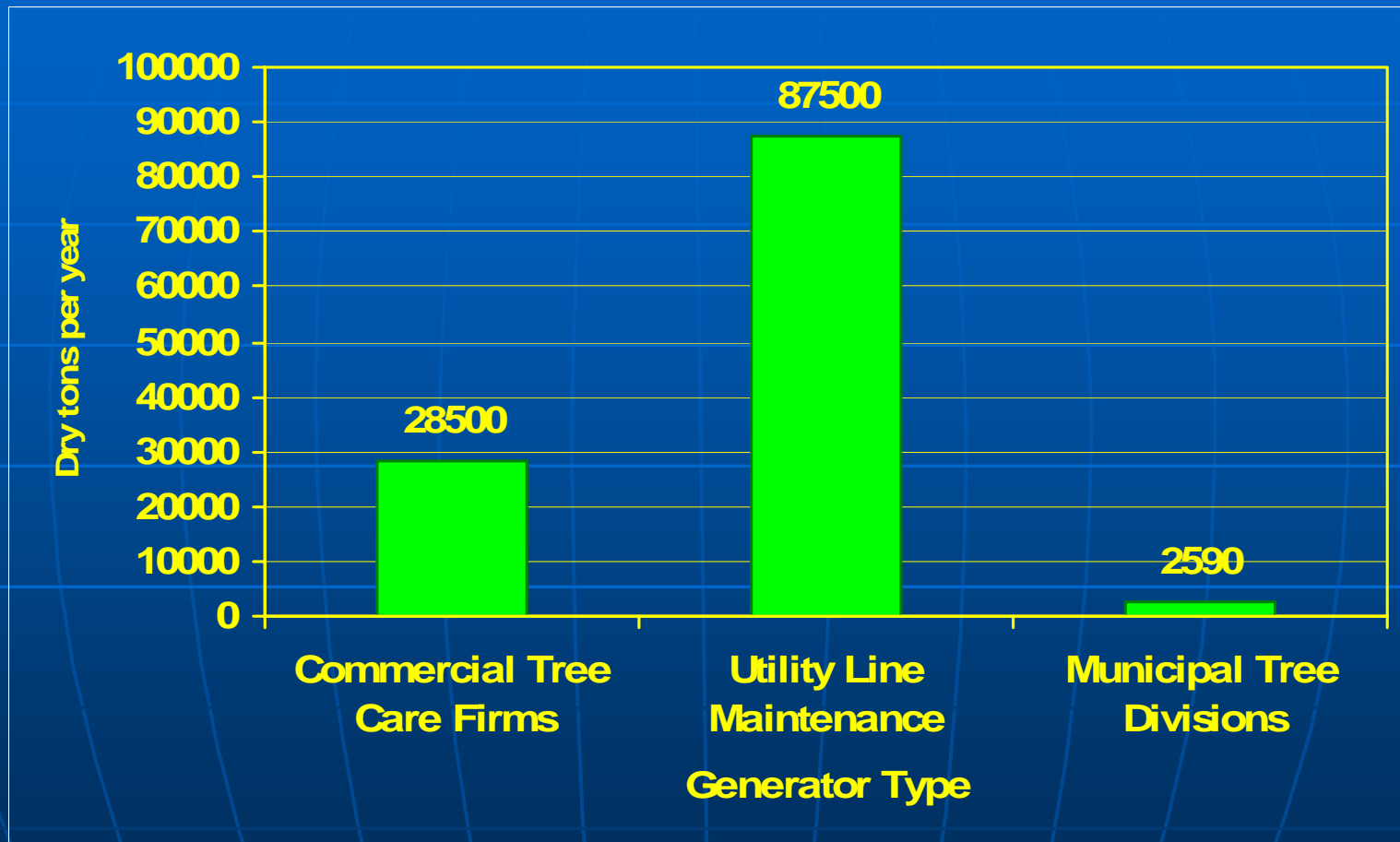
	Surveyed		Reponses	
	Manufactures	Potential users	Manufactures	Potential users
1999	365	238	91	28
2000	402	177	121	38
2002	394	98	121	38
2003	294	120	89	38
2004	352	111	73	23
2005	365	109	87	20
2006	342	193	103	28

# 2006 WV Mill Residues



- 43,388 tons per week
- Total 2 million green tons per year
- Sawdust – 600,350 tons
- Chips – 693,700 tons
- Bark – 630,650 tons

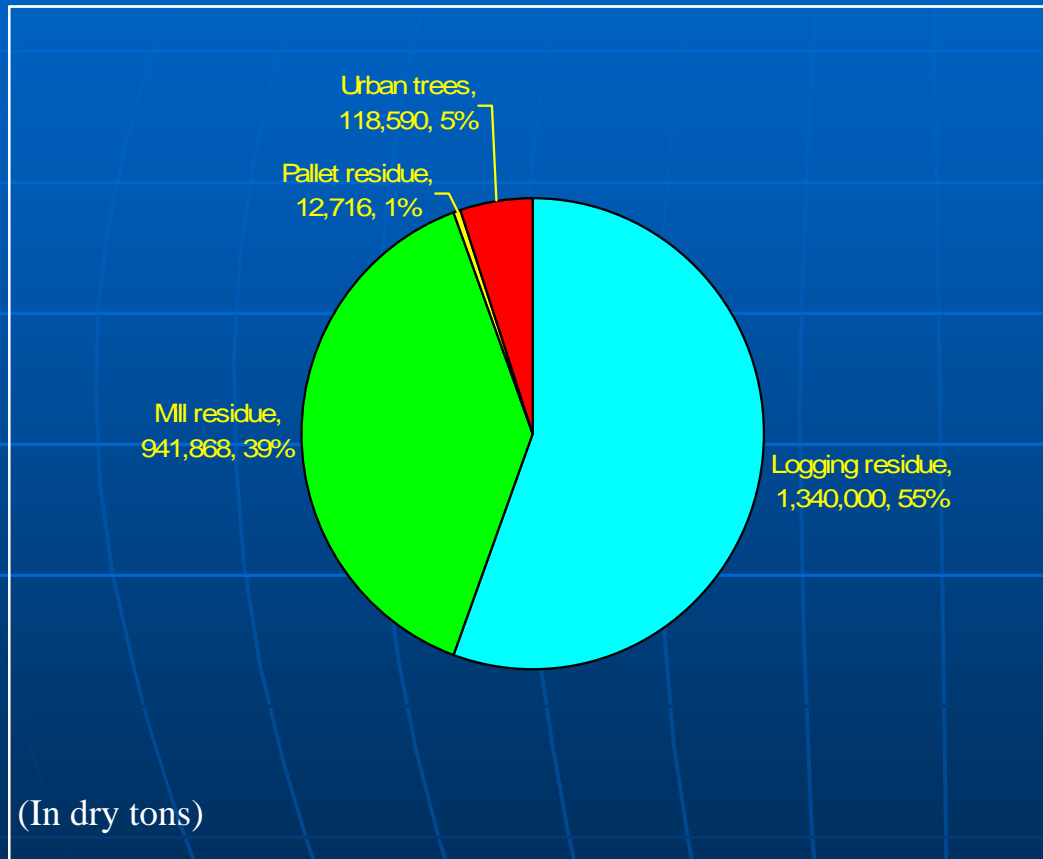
# Residue from Tree Trimming



# Pallet Residue

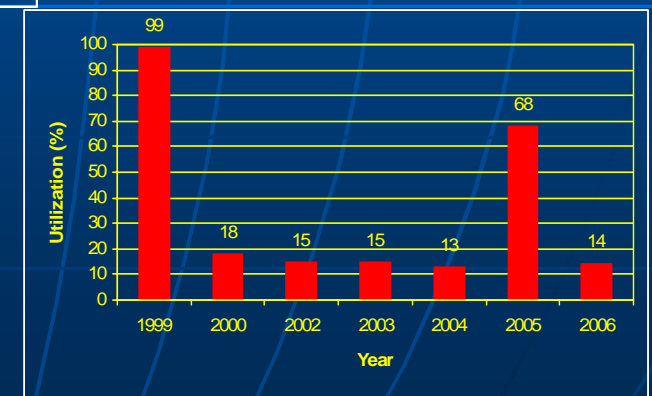
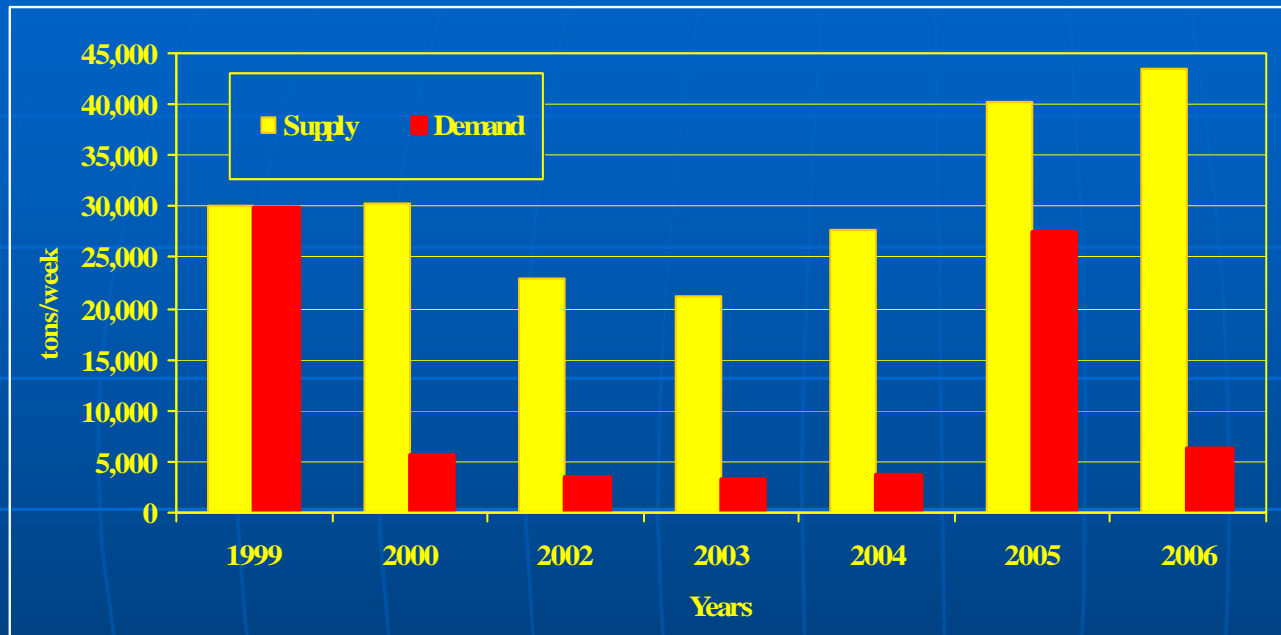
- Ten manufacturers of new pallets produce over 2,700,000 pallets per year.
- Less than 274,000 of those are used in West Virginia.
- Remaining 90% are delivered to surrounding states.
- A survey showed that 83% of pallets are retrieved and reused in some form.
- It results in about 12,716 dry tons of residue, which is sold for mulch.

# Annual Wood Residue Production

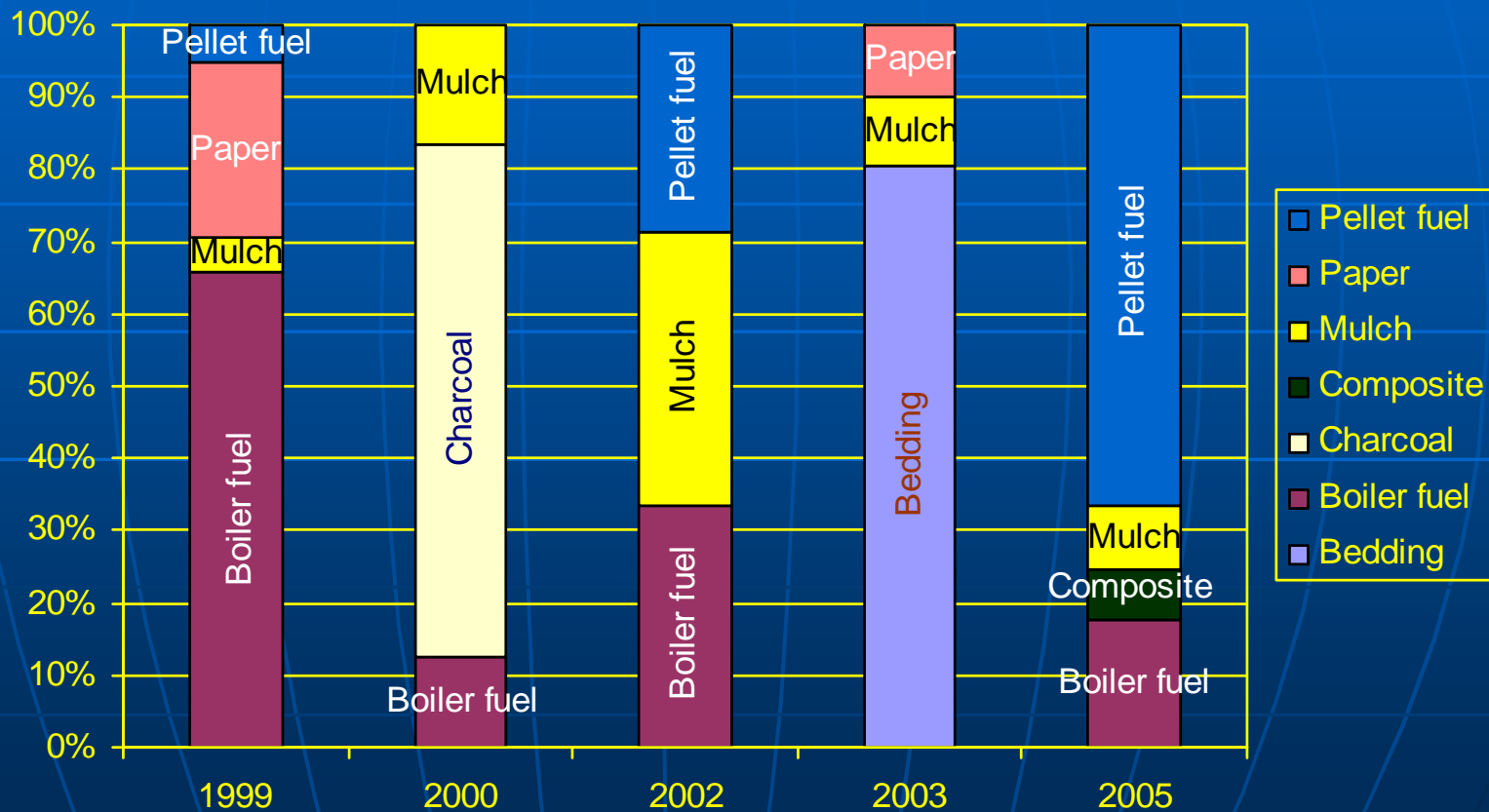


- 1.34 million dry tons of logging residue, 55%.
- 941,888 dry tons of mill residue (39%).
  - 40,000+ green tons weekly
  - 80% from sawmills and 20% from secondary manufacturers
  - 50% of chips, 30% of sawdust, and 20% of bark
- Urban tree and pallet residues, 6%
- Total 2.41 million dry tons (~5 million green tons) of residue biomass per year.

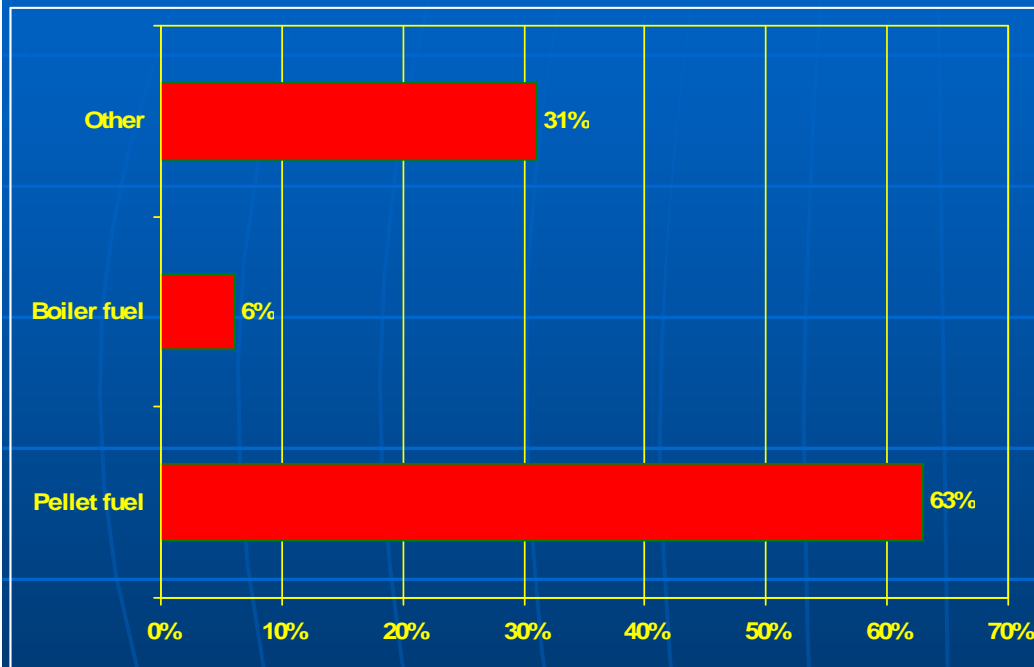
# Mill Residue Supply/Demand



# Major Utilization for the Wood Residues in WV



# 2006 Major Mill Residue Utilization



- 49% actively marketing their available byproducts
- 90% think the lack of markets for their available byproducts did not restrict their production
- 94% indicated that their companies' production had not been restricted due to cost of byproduct disposal
- Easiest byproduct to sell: chips (47%), bark (19%), sawdust (14%)
- 82% users expressed that they have a reliable supply of wood byproducts

# Challenges and Opportunities

- Abundant Woody Biomass
- Better opportunities to utilize residues
- Linkages to industry and national efforts
  - President Bush proposed to reduce gasoline use by 20% in the next 10 years.
  - Other policies, Biomass R&D Act of 2000, Farm Bill, National Energy Policy Act of 2005, Advanced Energy Initiative.
  - Incentives would be required to surpass barriers for producing biofuels.
- Sustainability and environmental impacts
  - Nutrient availability left after residue utilization
- Competitions (international, others)
- Biofuels
  - Feedstock development
  - Conversion - recalcitrance
  - Commercialization

# What Are We Doing Now?

- The University Strategic Initiative - *Advance technologies for bio-fuels and bio-products from renewable resources and reducing environmental liabilities*
- Biobased Materials Research Center
  - West Virginia Development office and other agencies
  - Multidisciplinary research team and collaborations
- Projects
  - Biomass availability and feedstock development
  - Economic and technical feasibilities
  - Biomass conversions to bio-fuels
  - Agencies, WVDO, WVEPSCOR, USDA, USDOE, NE SARE, NE Sun Grants
  - Regional Collaboration, SURA