

# Bioenergy from Forests- Moving Science to Practice Issues of Sustainability

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# Sustainability and Bioenergy

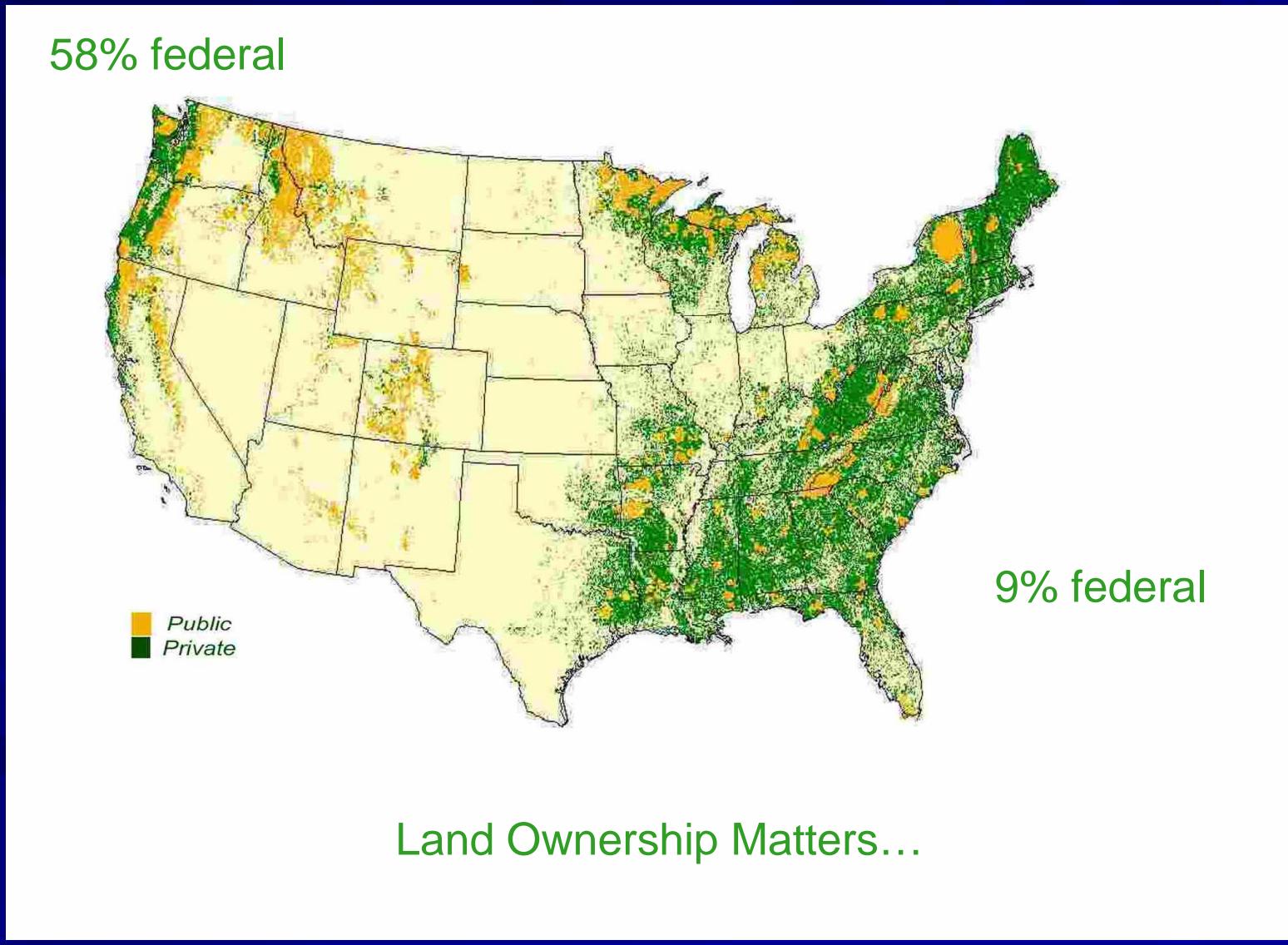
- Forest Resource Issues
- Scale: Community, State, Region
- Integrated systems
- Public dialog



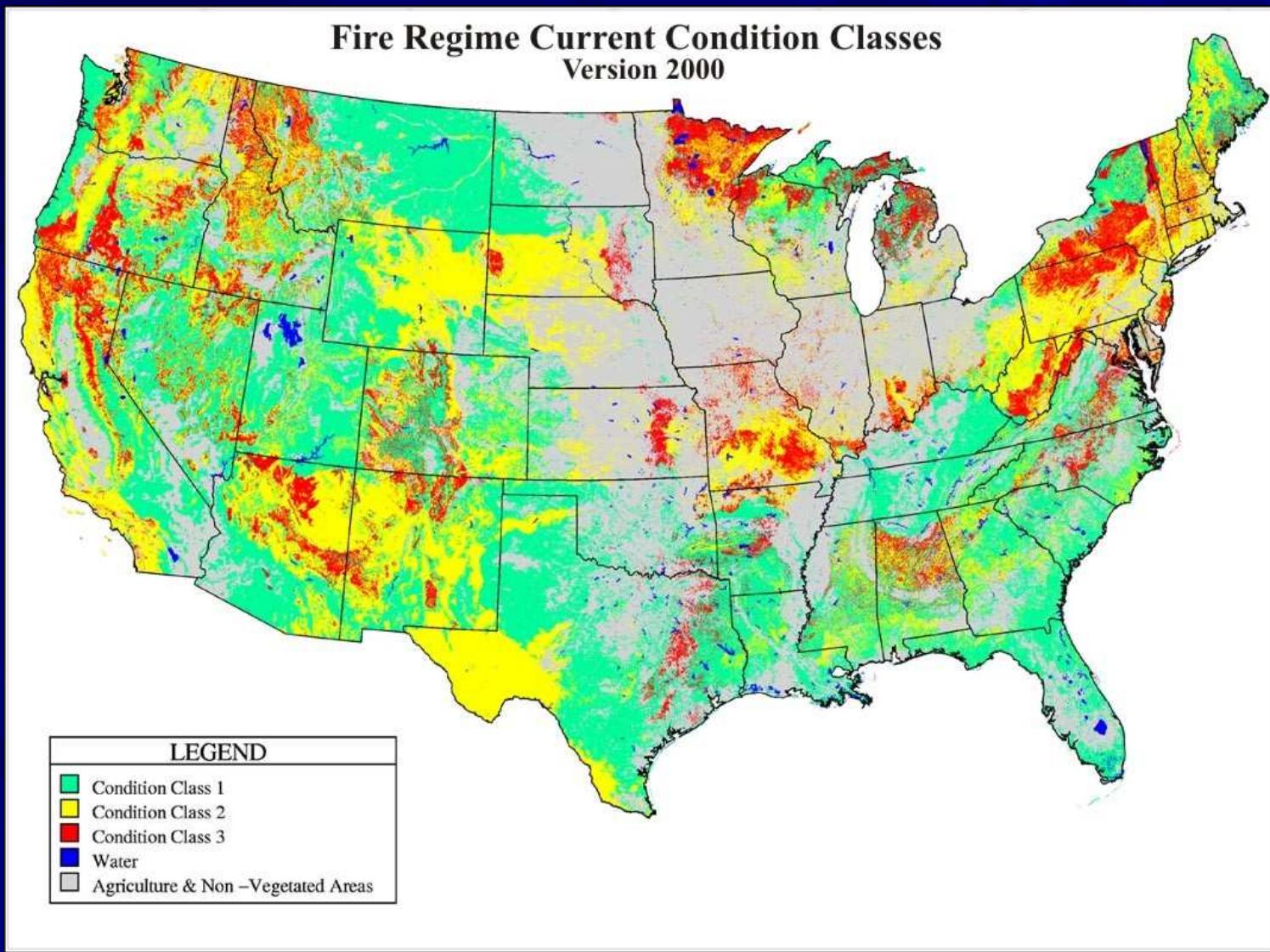
- Sustainability- Energy, Environment, Economy

Effective biomass policy is essential to achieving sustainable forests in the United States

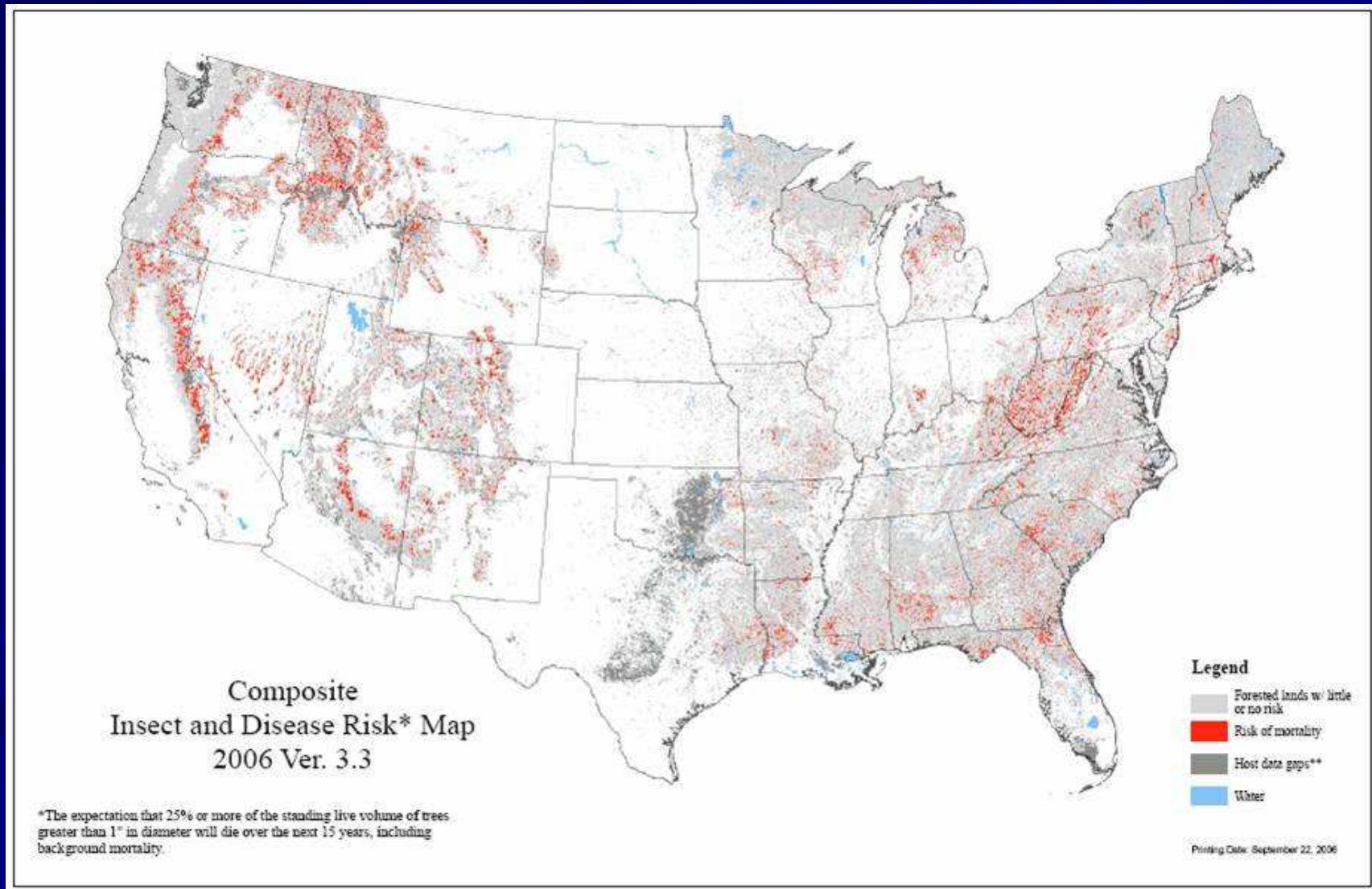
# Public and Private Forests in USA



# Restoring Fire Adapted Forest Ecosystems



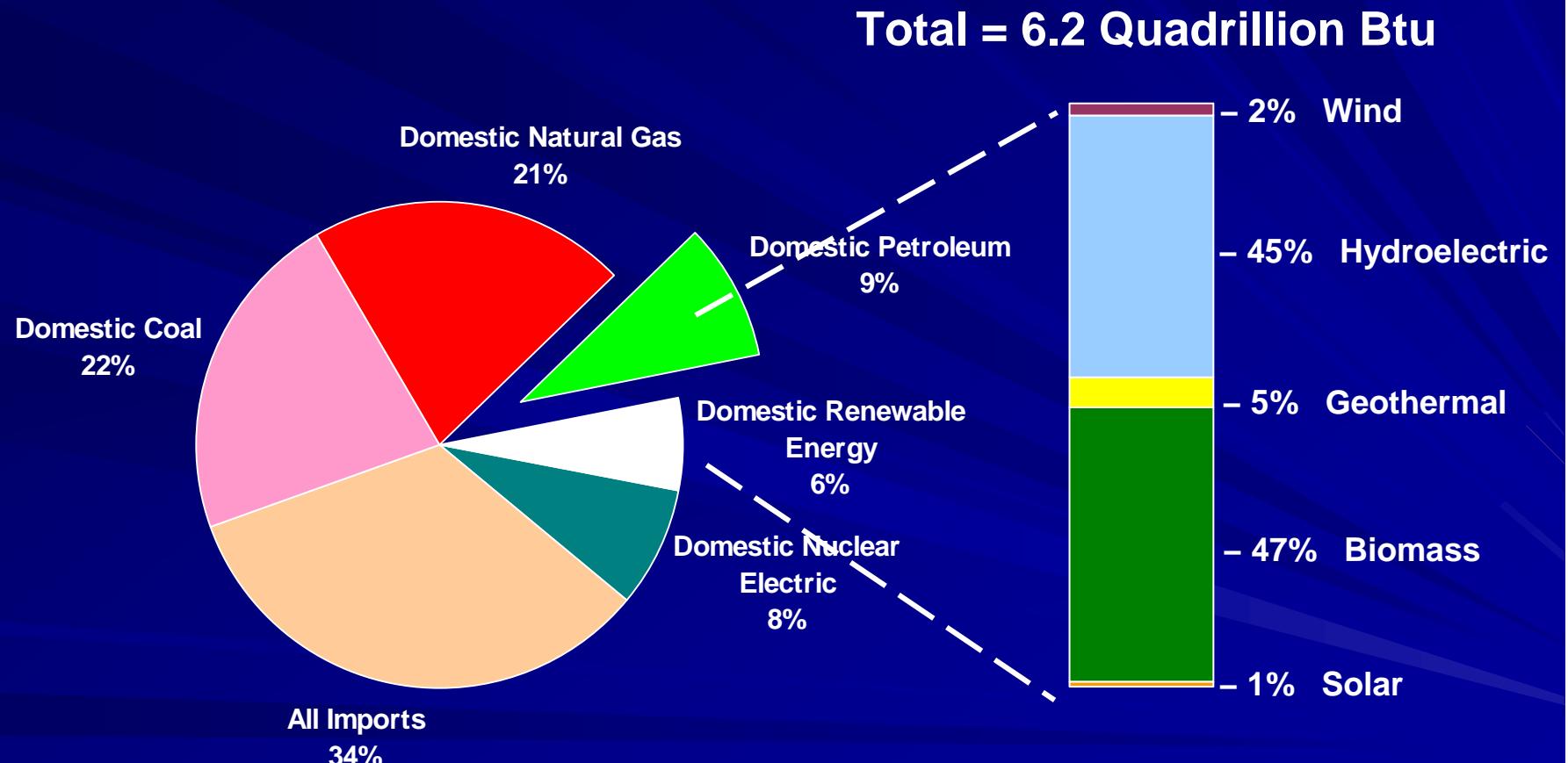
# Forest Insect and Disease Risk



# Sustainability and Woody Biomass Used for Energy

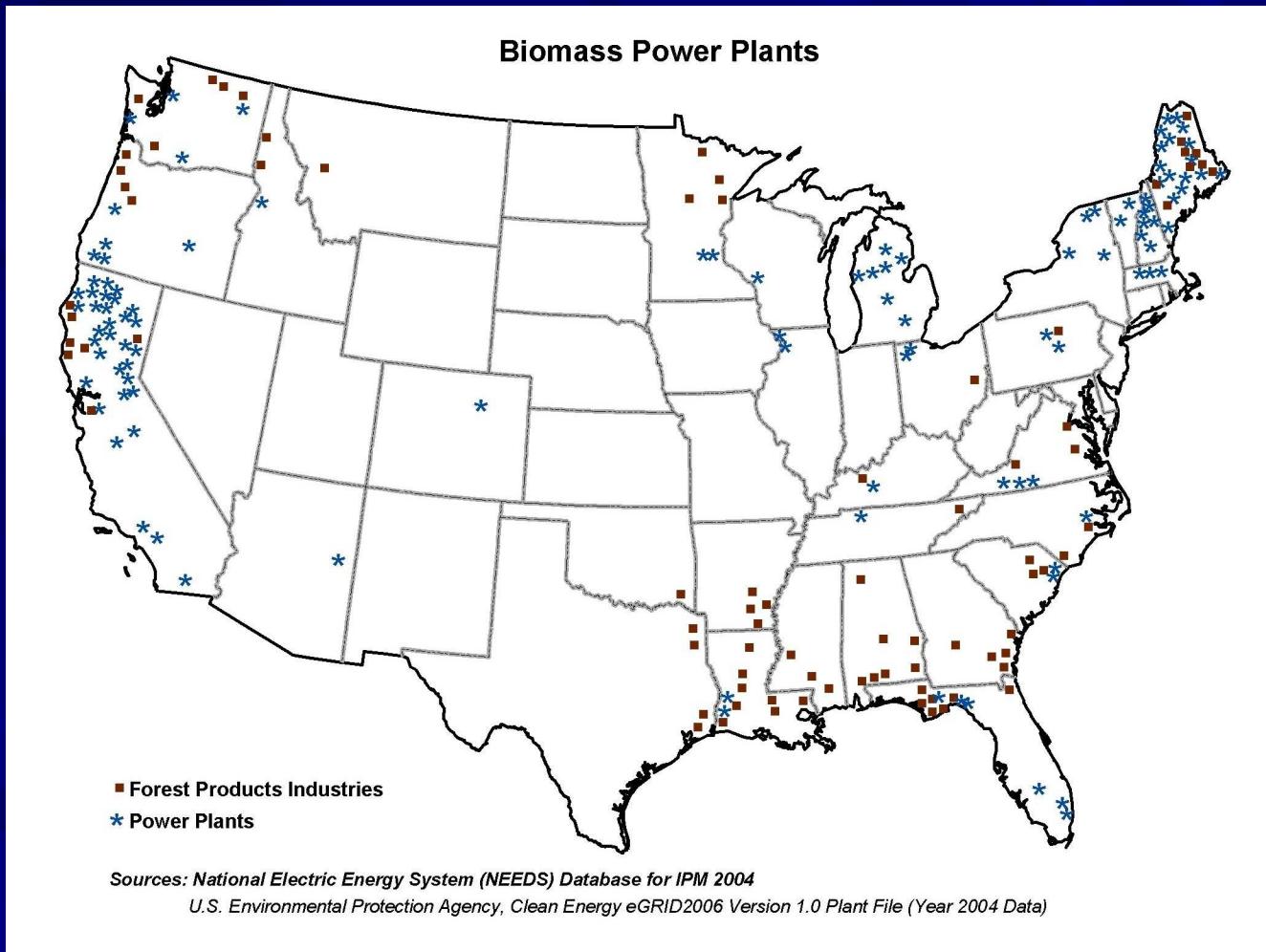
- Maintaining healthy forested landscapes for the ecological services they provide
- Changing the way we handle materials that we previously treated as waste
- National energy security and sustainability of energy supplies
- Concerns about global climate change
- Concerns about healthy rural economies

# U.S. Energy Consumption Overview

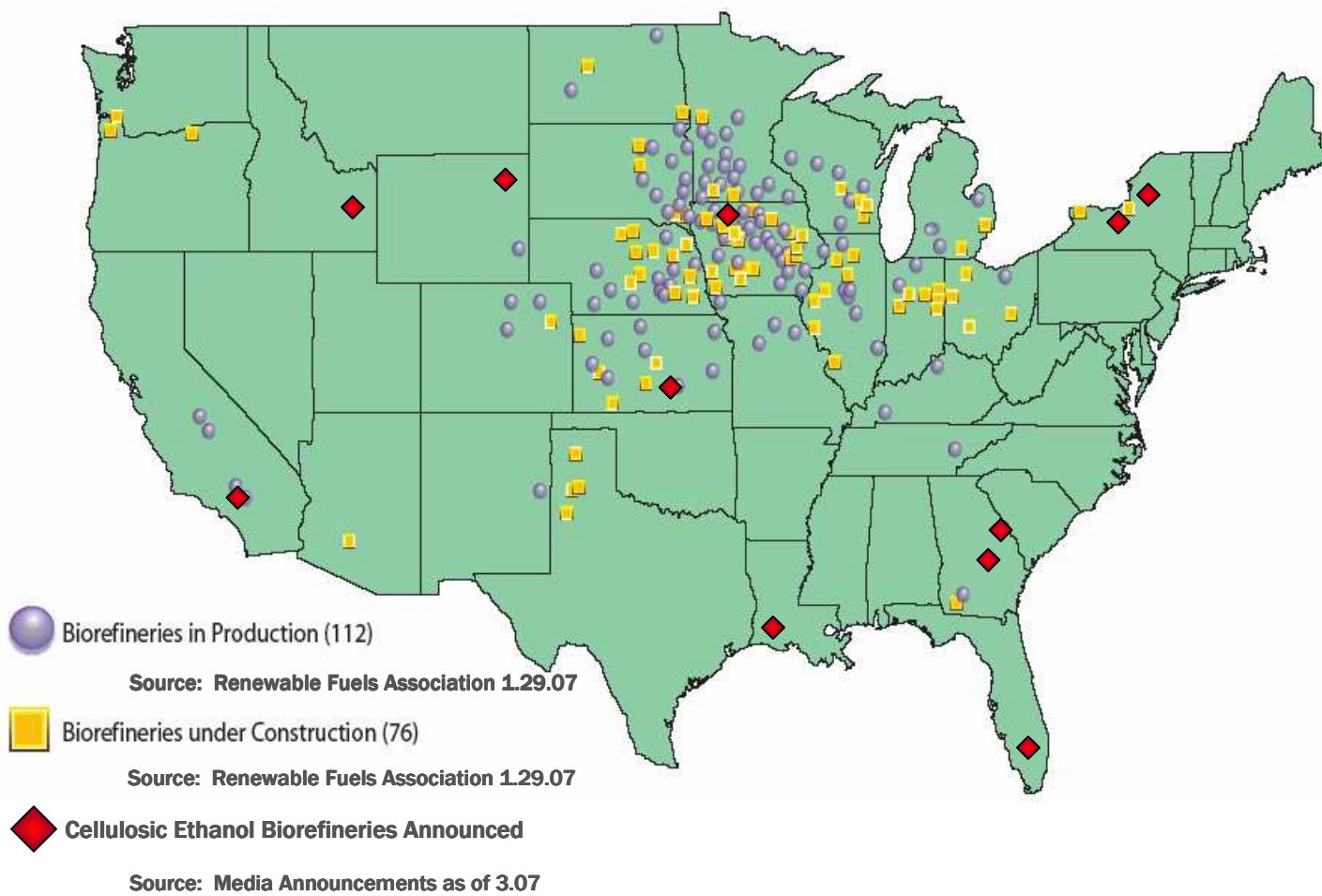


★ 72% of biomass is wood based

# Biomass Power Plants

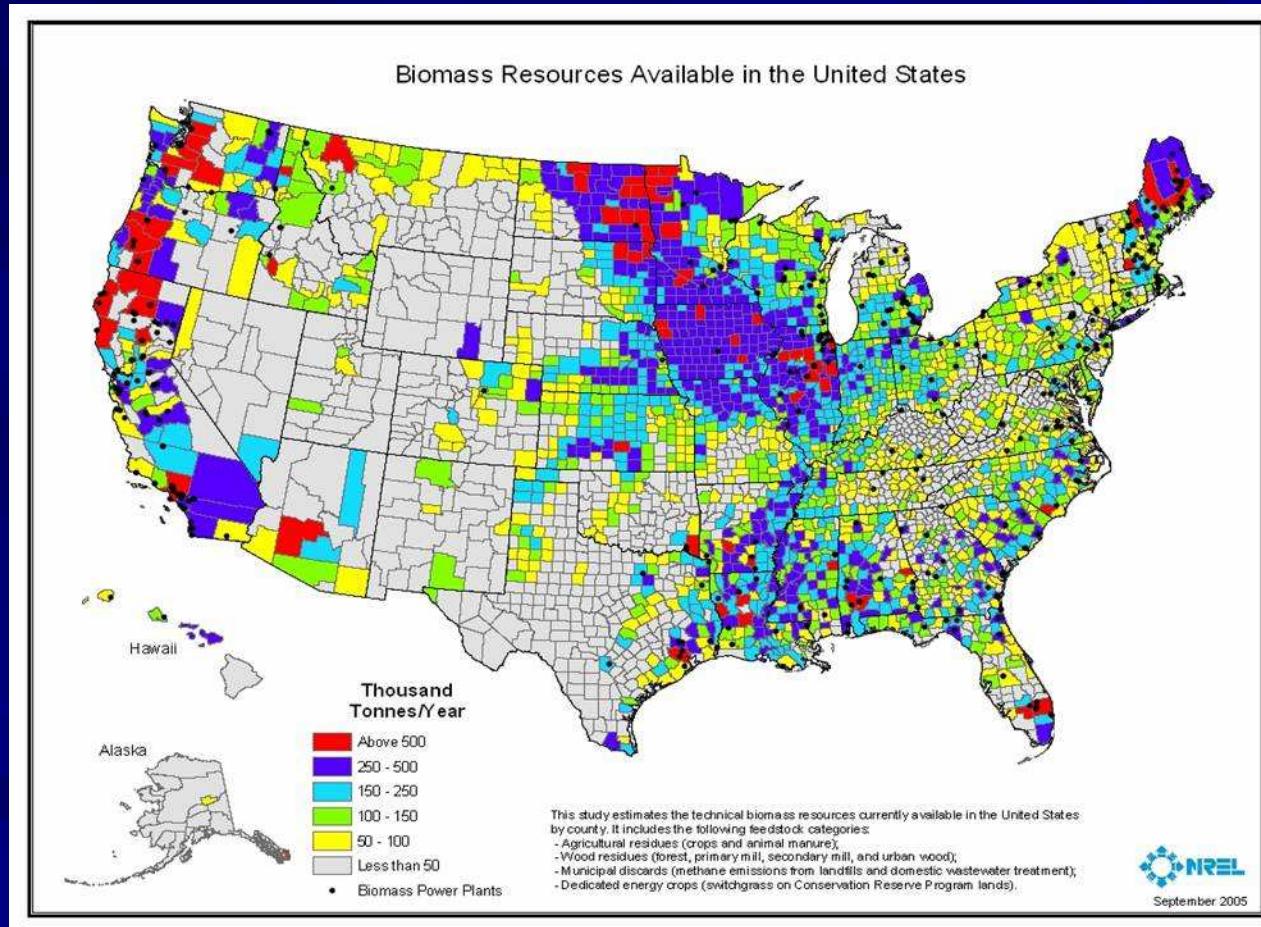


# U.S. Biorefinery Locations Corn and Cellulosic Feedstocks

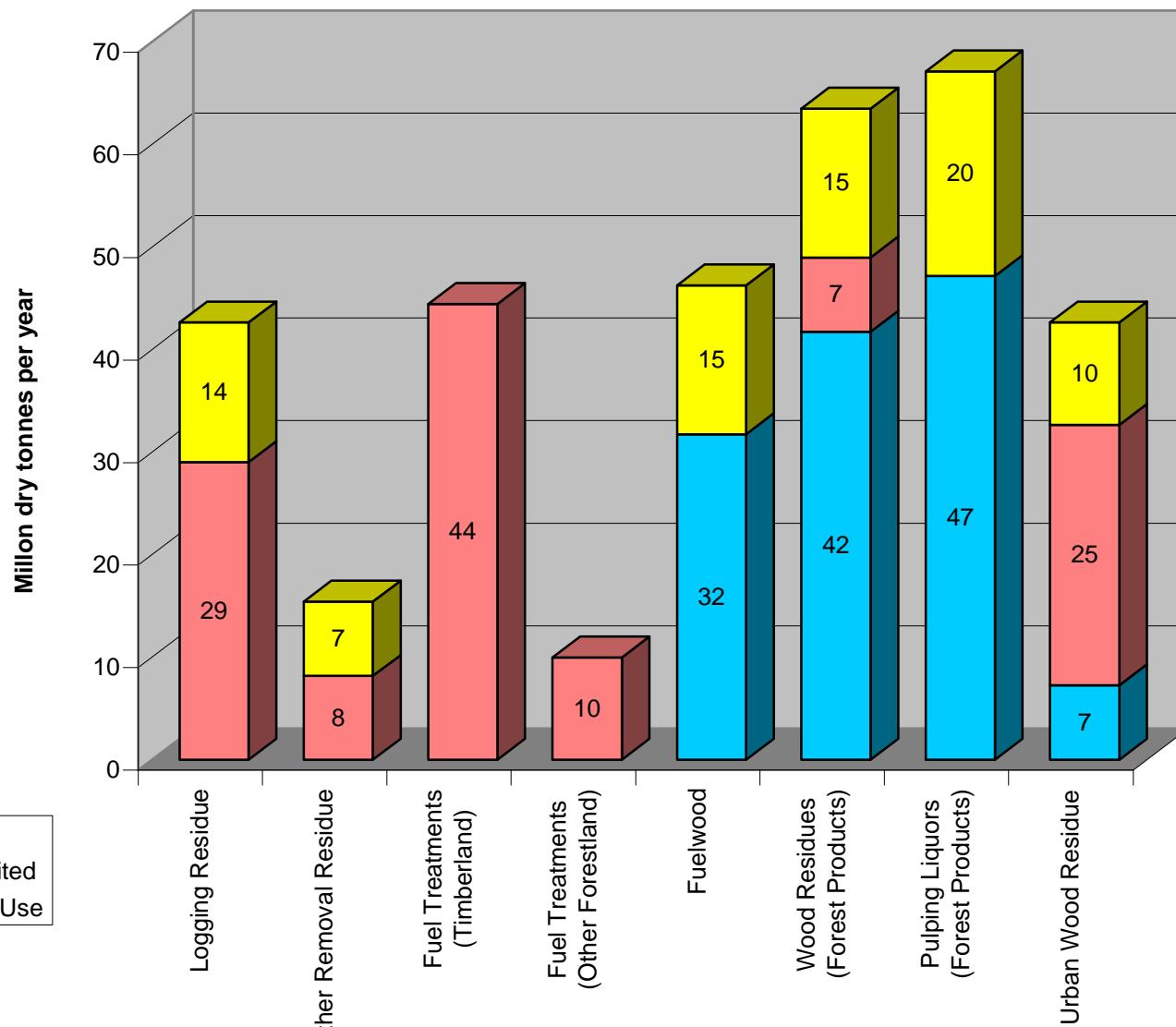


# Available Biomass

## Agricultural and Wood Residues

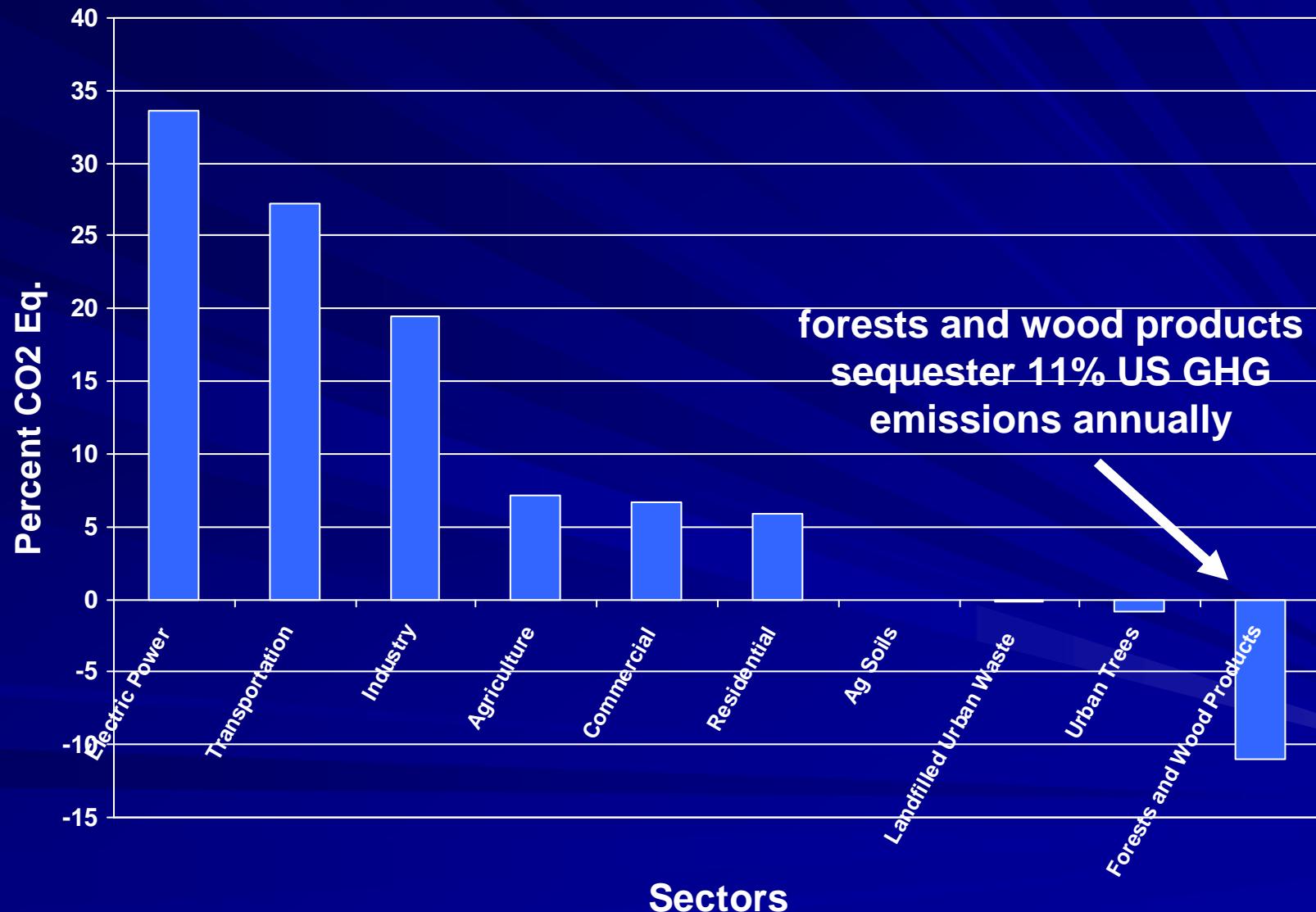


# Potentially Available Forestry Resource



DOE and USDA "Billion Ton Report" May 2005  
<http://www1.eere.energy.gov/biomass/publications.html>

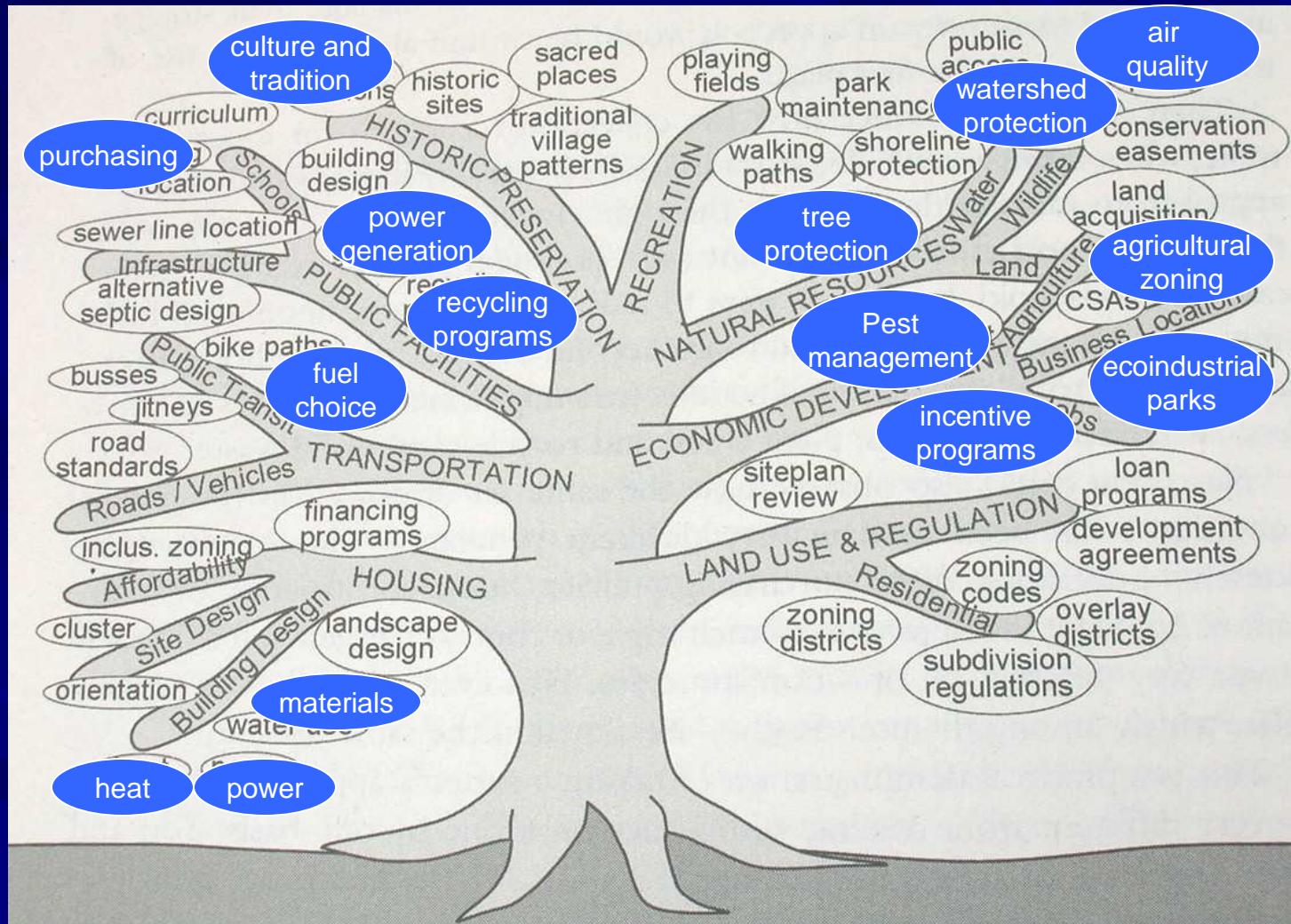
# Percent Total US Green House Gas Annual Emissions by Sector (EPA, 2003)



Note: Negative numbers denote sequestration; forests and wood products sequester 11% US GHG emissions annually

# Sustainability and Communities

## Biobased Products and Bioenergy

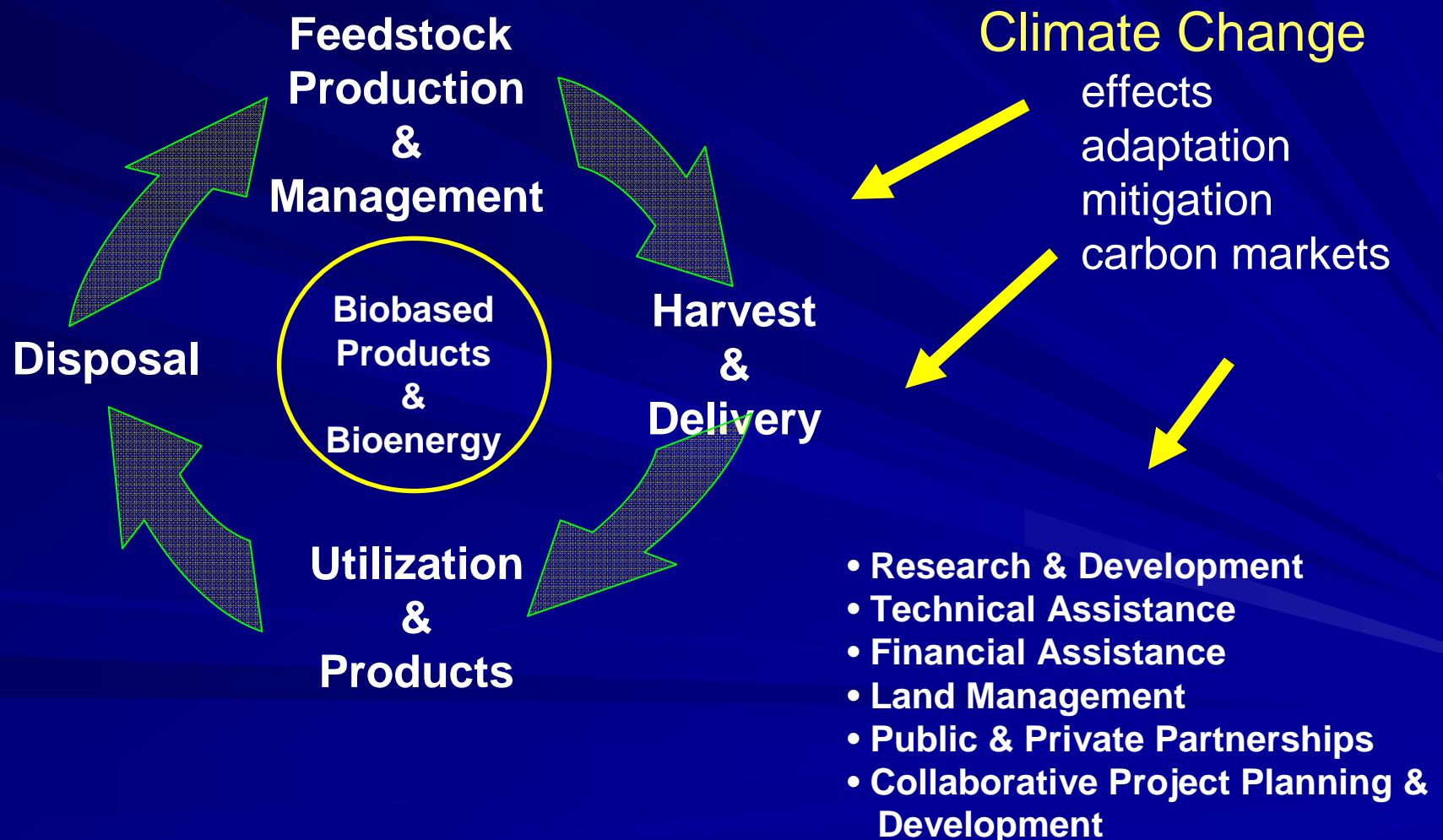


James and Lahti, 2004, The Natural Step for Communities

# Forest Service Woody Biomass Utilization Strategy

1. Identify and build partnerships through collaboration
2. Develop and deploy the needed science and technology
3. Help develop new and expand markets for bioenergy and biobased products
4. Facilitate a reliable and predictable supply of biomass

# Integrated Biobased Products and Bioenergy Approach



# The Opportunity & Potential



## Forest Biomass Feedstock

- Forest Residues
- Hazardous Fuel Treatments
- Short Rotation Woody Crops
- Wood Waste

## Conversion Processes

- Manufacturing
- Co-firing
- Combustion
- Gasification
- Enzymatic Fermentation
- Gas/liquid Fermentation
- Acid Hydrolysis/Fermentation

## USES

### Fuels:

- Renewable Diesel
- Ethanol

### Electricity and Heat

### Biobased Products

- Composites
- Specialty Products
- New Products
- Chemicals
- Traditional Products

# Colorado CROP

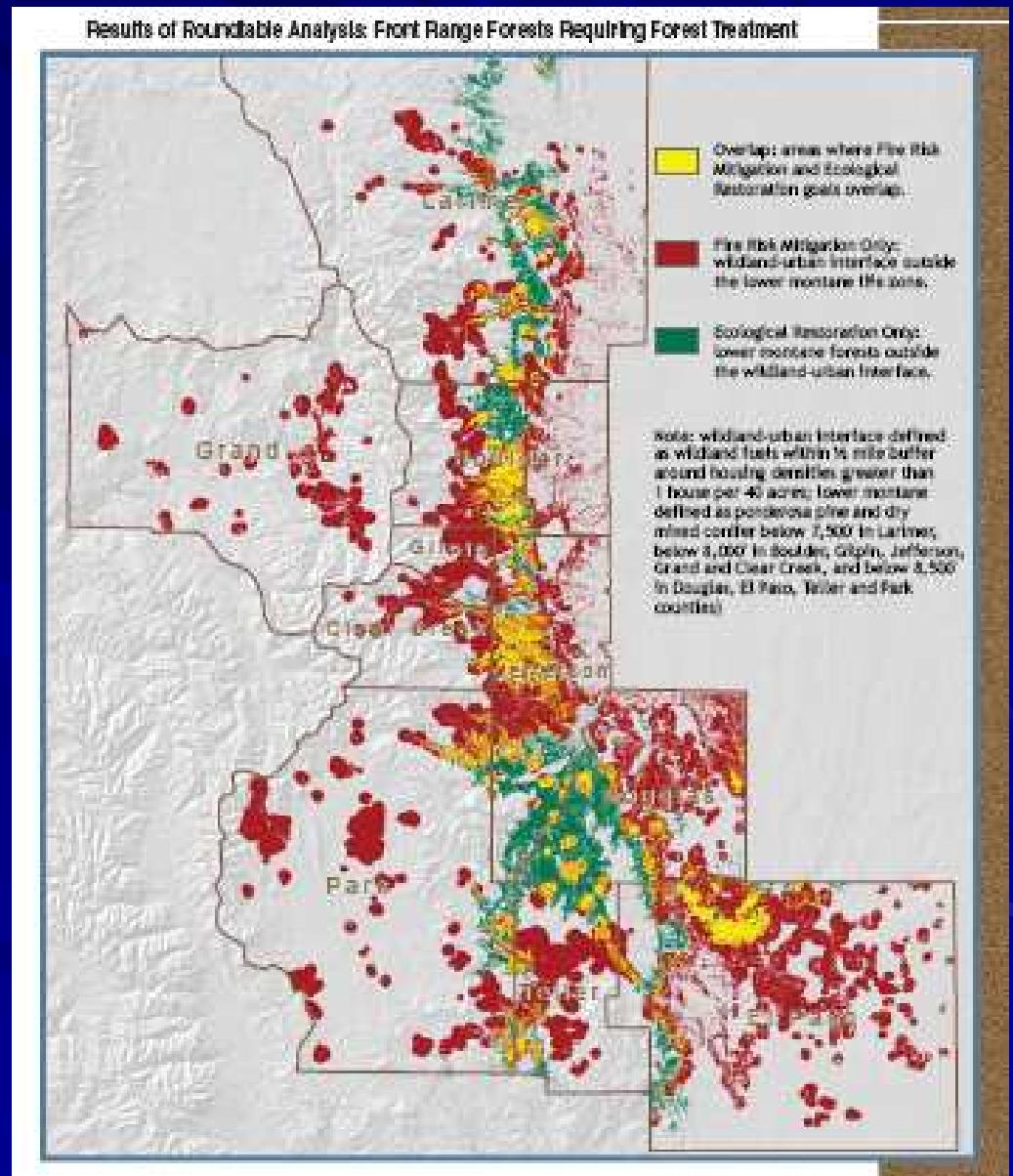
## Colorado CROP: Kremmling, CO (centerpoint)



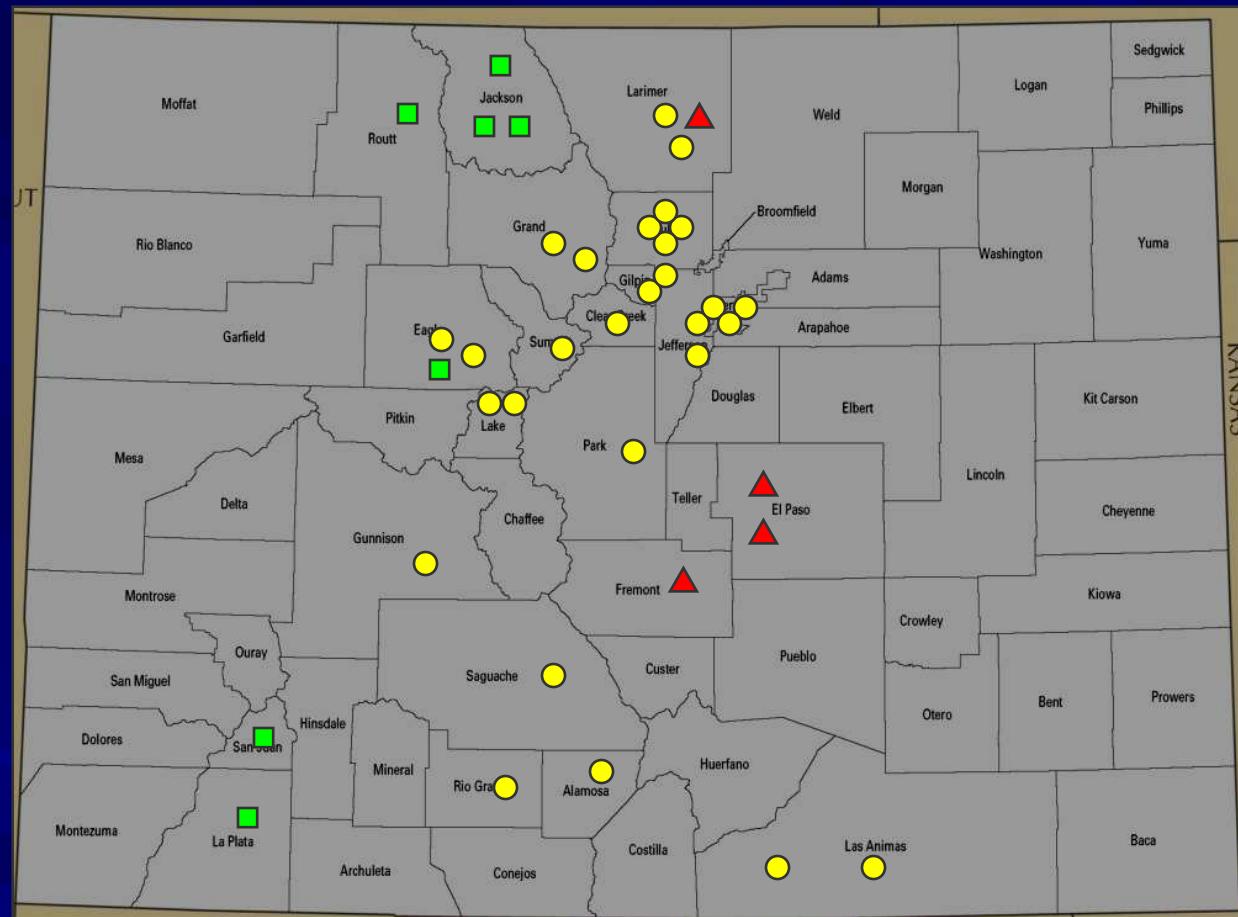
- *3 States*
- *6 National Forests*
- *22 Ranger Districts*
- *9 BLM Districts*
- *29 Counties*
- *State Lands*

# Front Range Fuels Treatment Partnership Roundtable Findings

“ The Roundtable concluded that woodchip fired boilers in institutional buildings (also known as bioheating) appear to offer the best opportunity to connect woody biomass supply with near-term market demand, conveniently providing a source of funds to offset forest treatment costs.”



# Bioenergy Interests in Colorado Communities



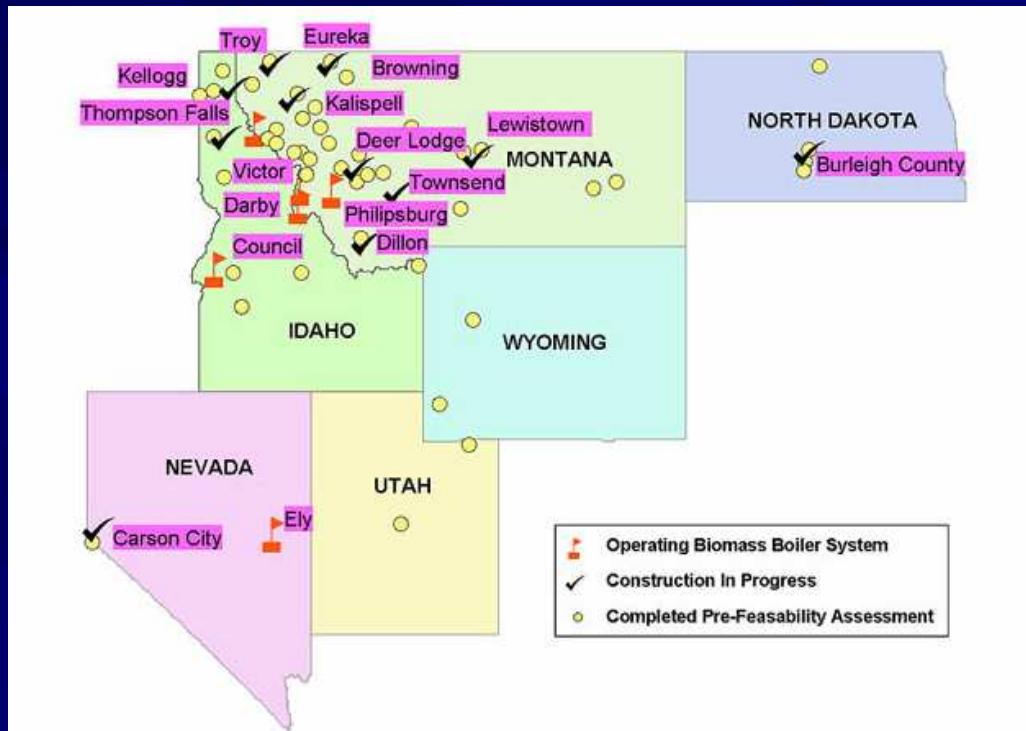
## Legend

- Bio-Heating Projects
- ▲ Co-Firing Projects
- Other Projects

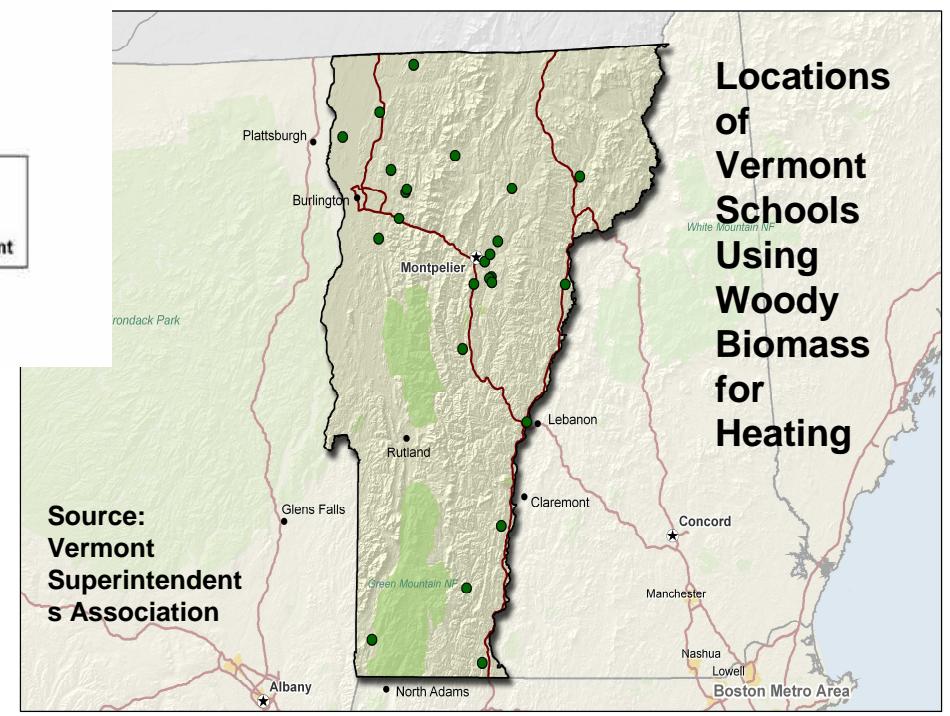
**Note:** A number of state-wide and regional efforts are on-going but are not shown on the map.

**Source:** Jones, C. 2007. Personal communication. Forest Biomass Specialist, Colorado State Forest Service.

# Fuels For Schools and Communities

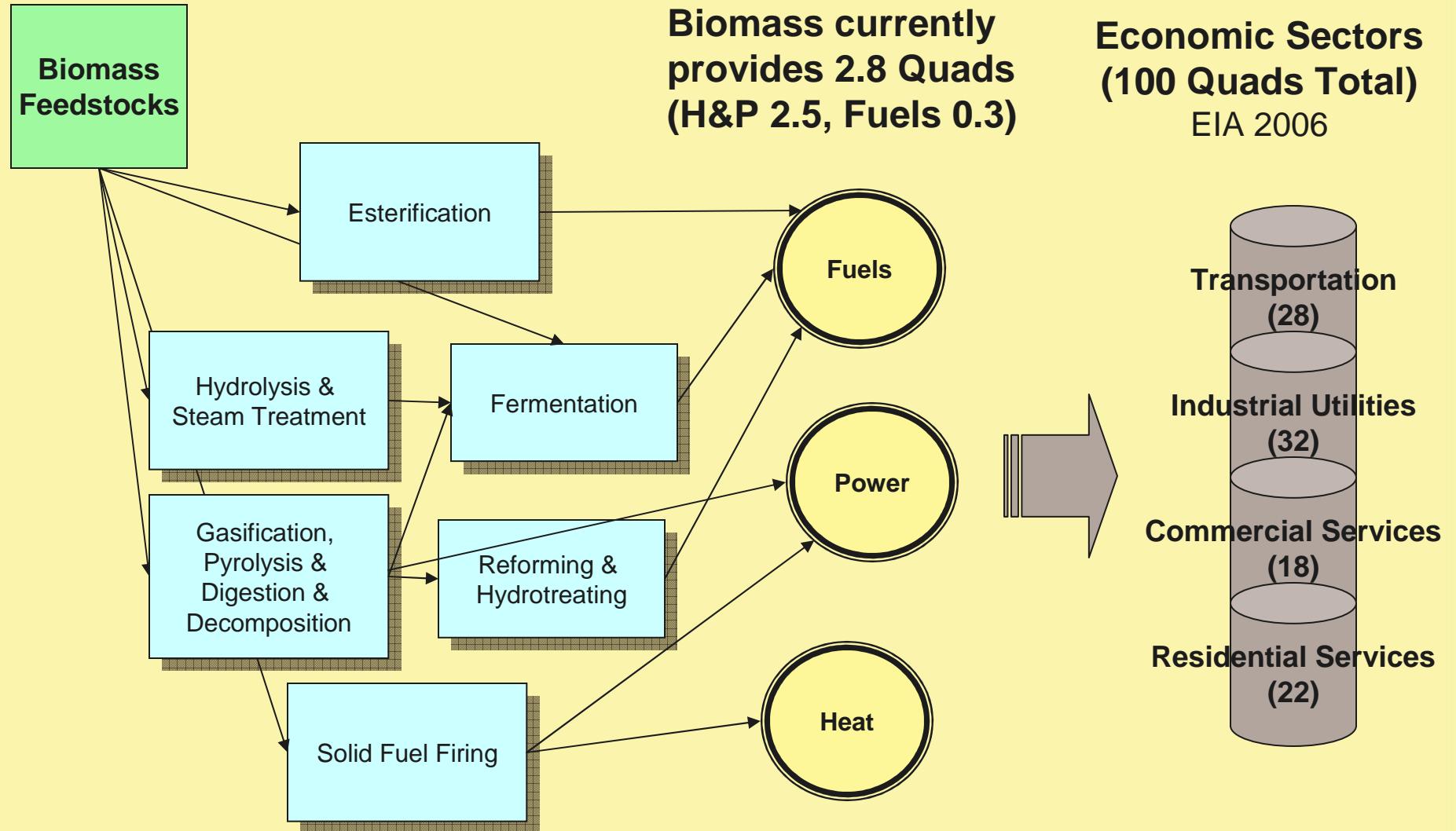


VT- by law funds 30% of school biomass heat projects, the balance is through bonds





# Biomass Conversion and Product Options





# Biomass to Markets

**Creating an Environment Conducive to Bioenergy Development- Western Governor's Association**



# Public Dialog

- Demands of a growing biofuels infrastructure balanced with ecosystem nutrient and habitat requirements
- Conversion of native forests to energy plantations or non-forest uses and effects on biodiversity
- Size and location that match community needs and interests
- Integrating sustainable forestry, carbon management, and restoring resilience and ecosystem services



# Thank You



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