

Bioenergy from Forests- Moving Science to Practice Issues of Sustainability

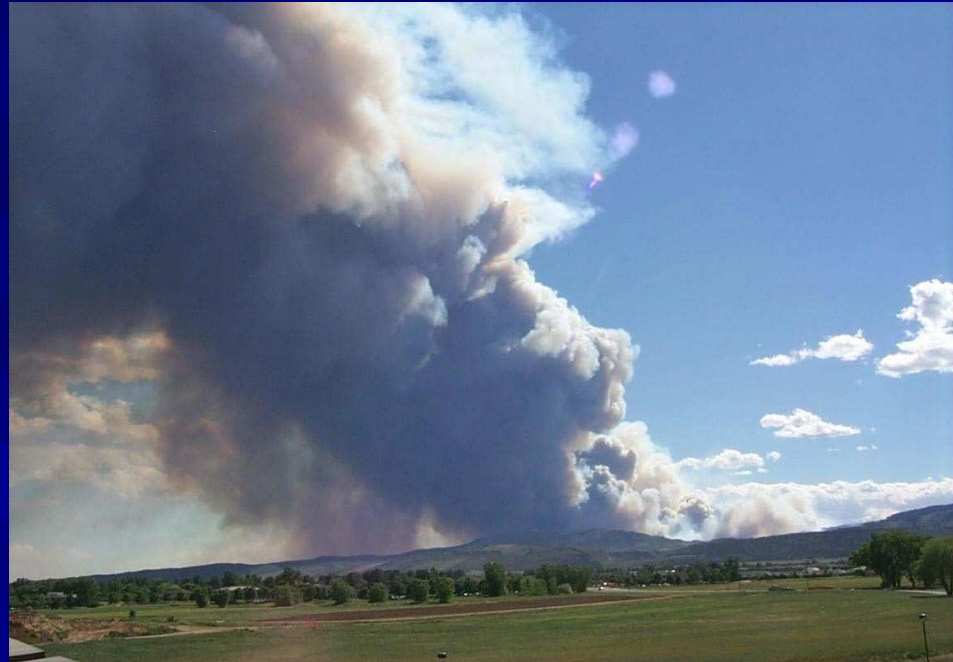
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National Academy of Sciences
Sustainability Science
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Sustainability and Bioenergy

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

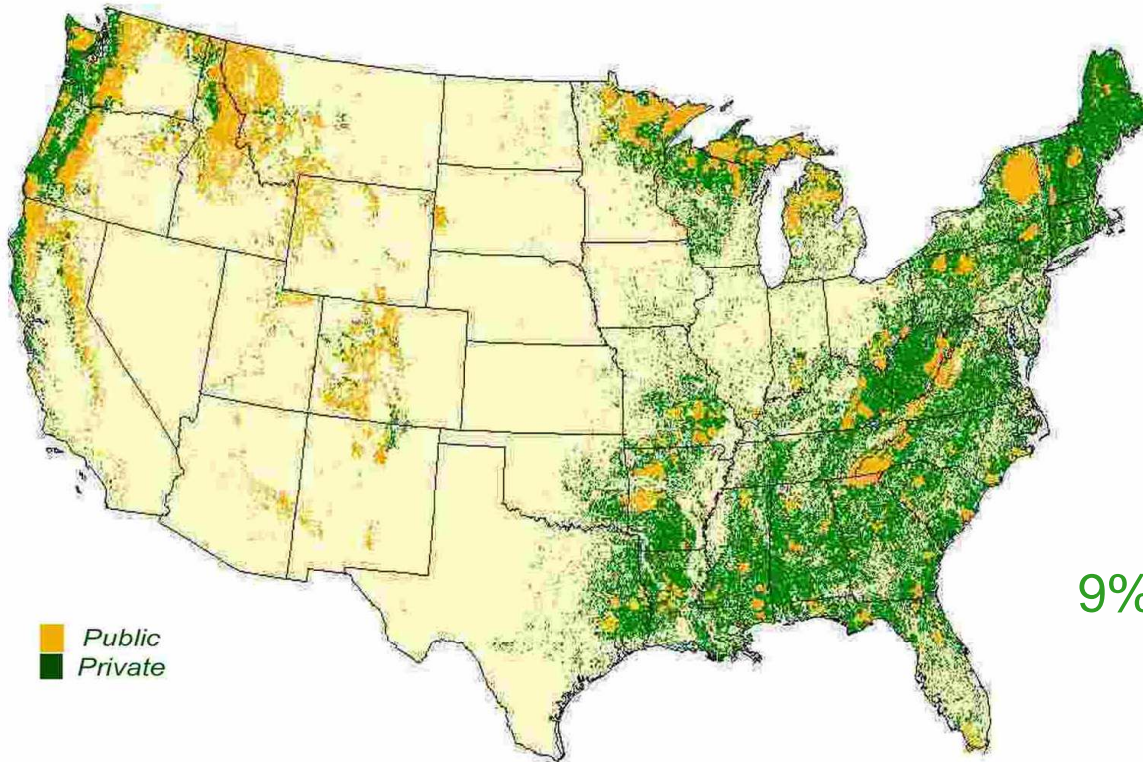


- Sustainability- Energy, Environment, Economy

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

Public and Private Forests in USA

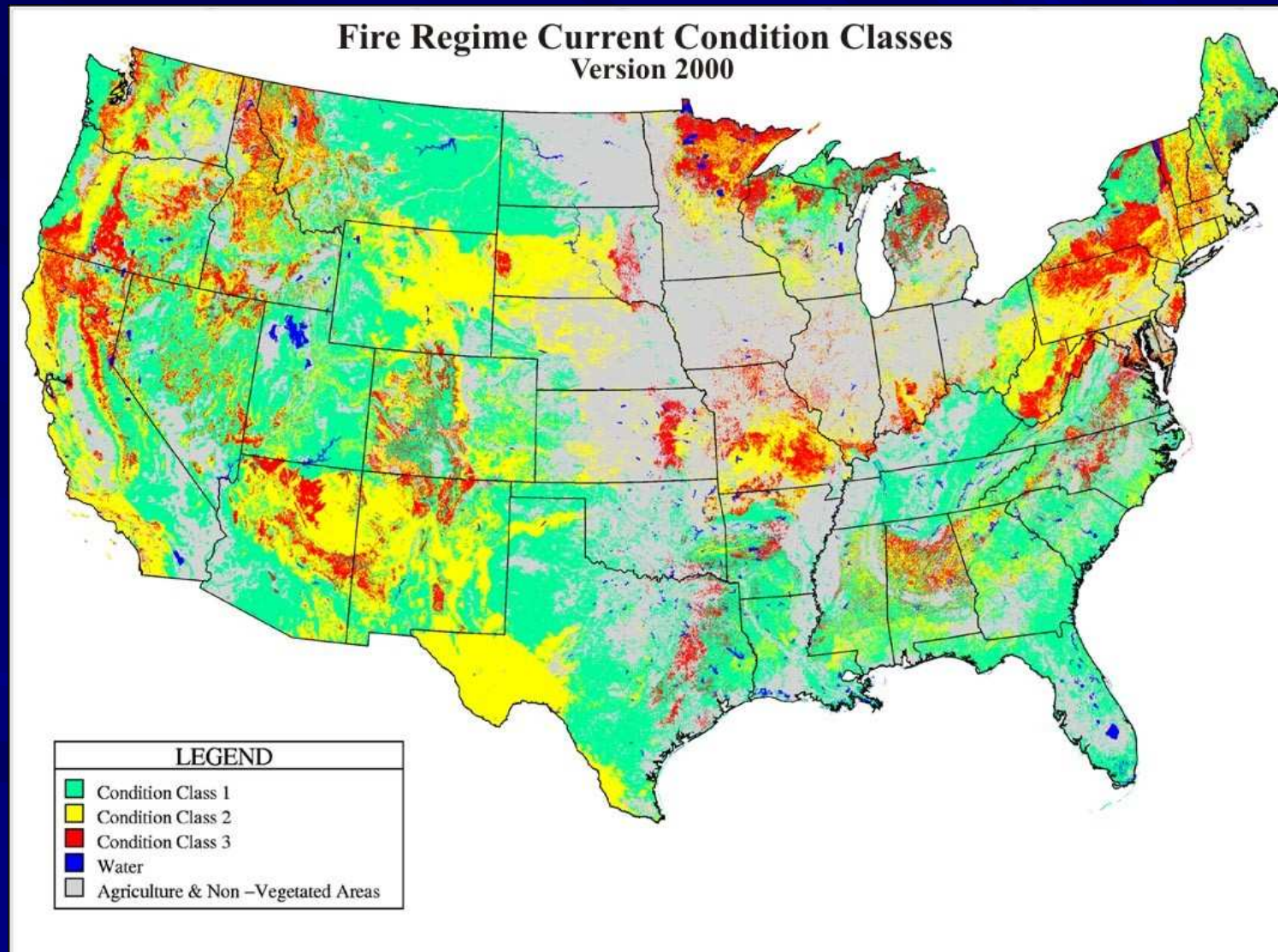
58% federal



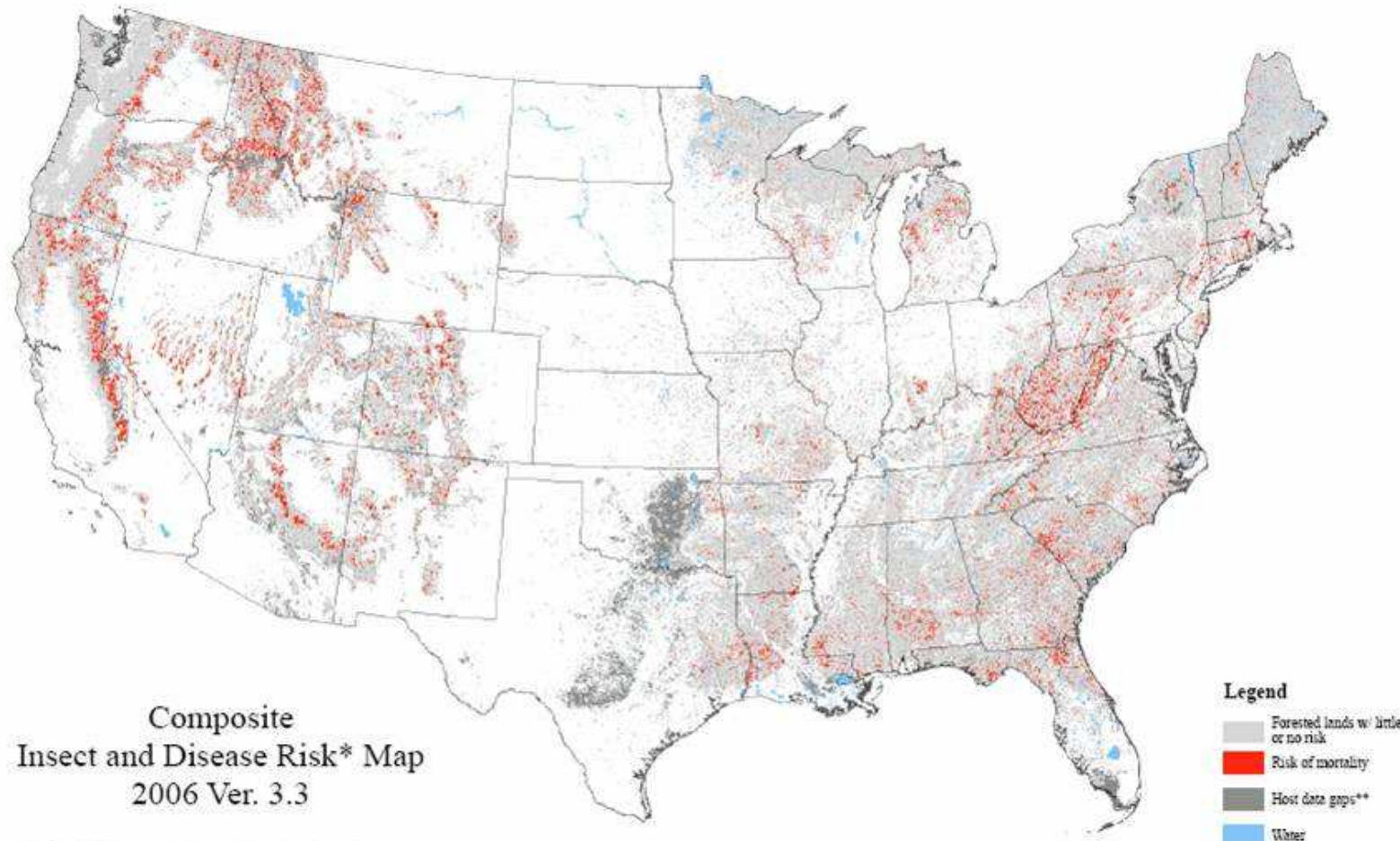
9% federal

Land Ownership Matters...

Restoring Fire Adapted Forest Ecosystems



Forest Insect and Disease Risk



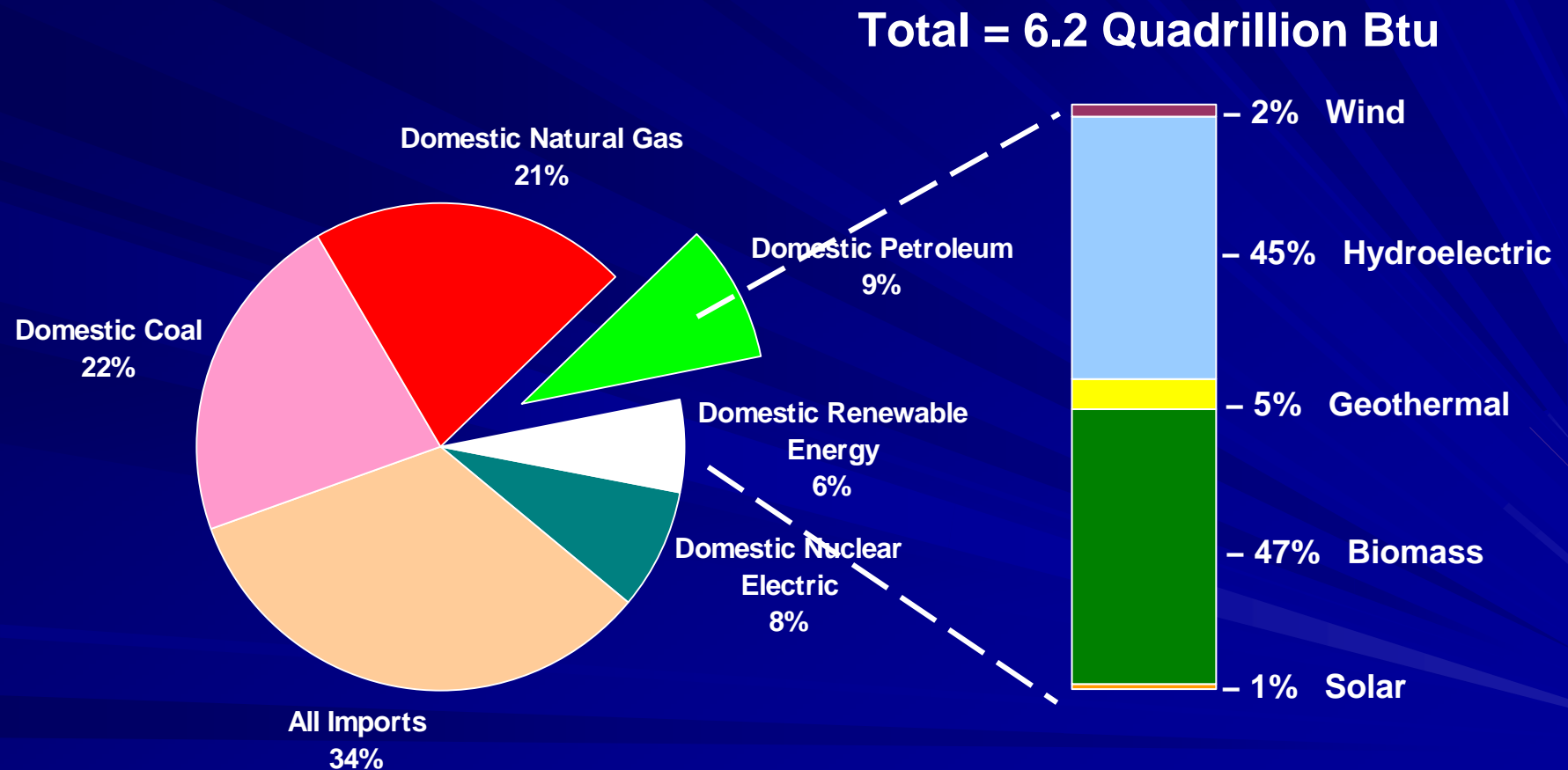
*The expectation that 25% or more of the standing live volume of trees greater than 1" in diameter will die over the next 15 years, including background mortality.

Printing Date: September 22, 2006

Sustainability and Woody Biomass Used for Energy

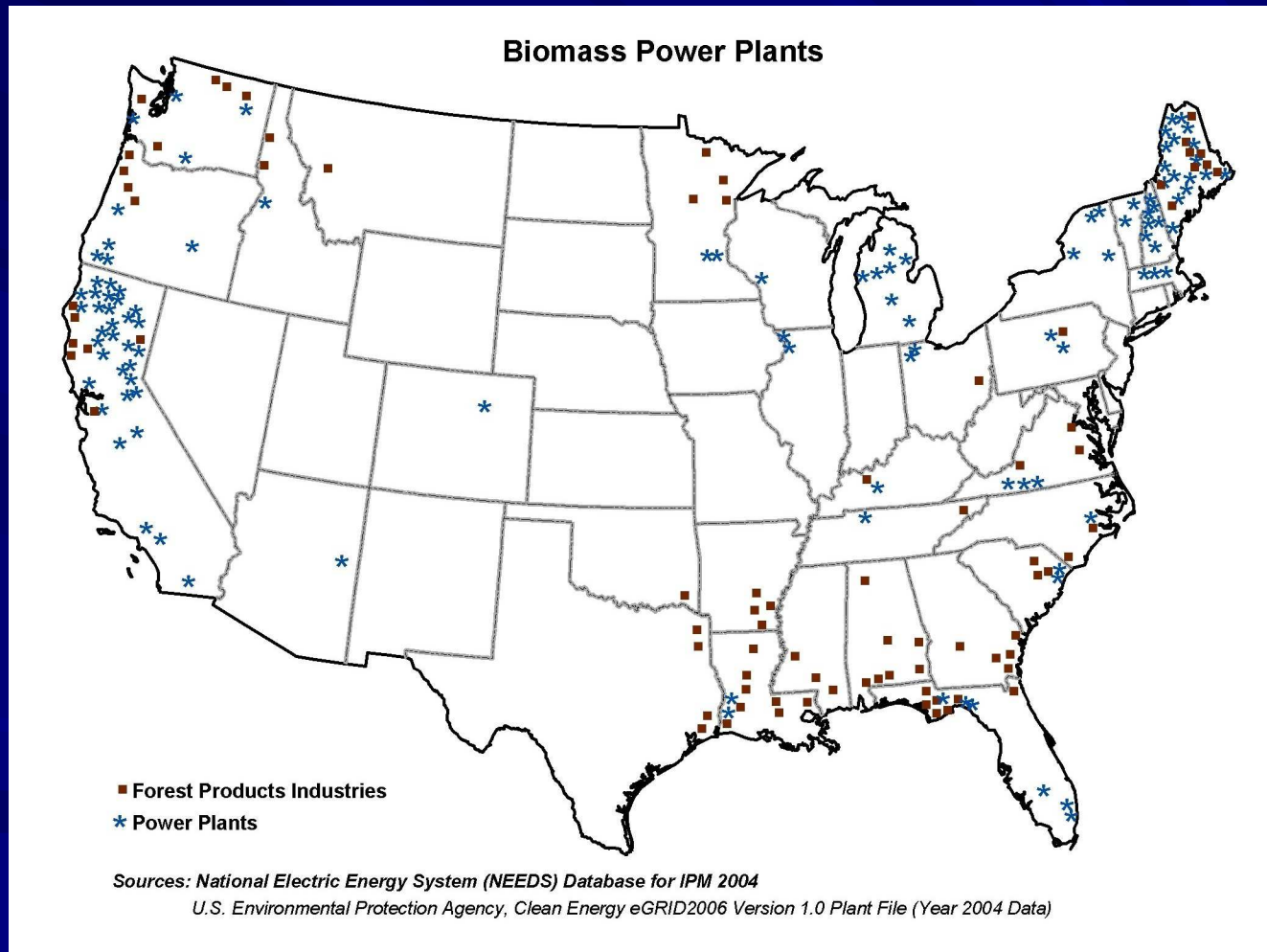
- Maintaining healthy forested landscapes for the ecological services they provide
- Changing the way we handle materials that we previously treated as waste
- National energy security and sustainability of energy supplies
- Concerns about global climate change
- Concerns about healthy rural economies

U.S. Energy Consumption Overview



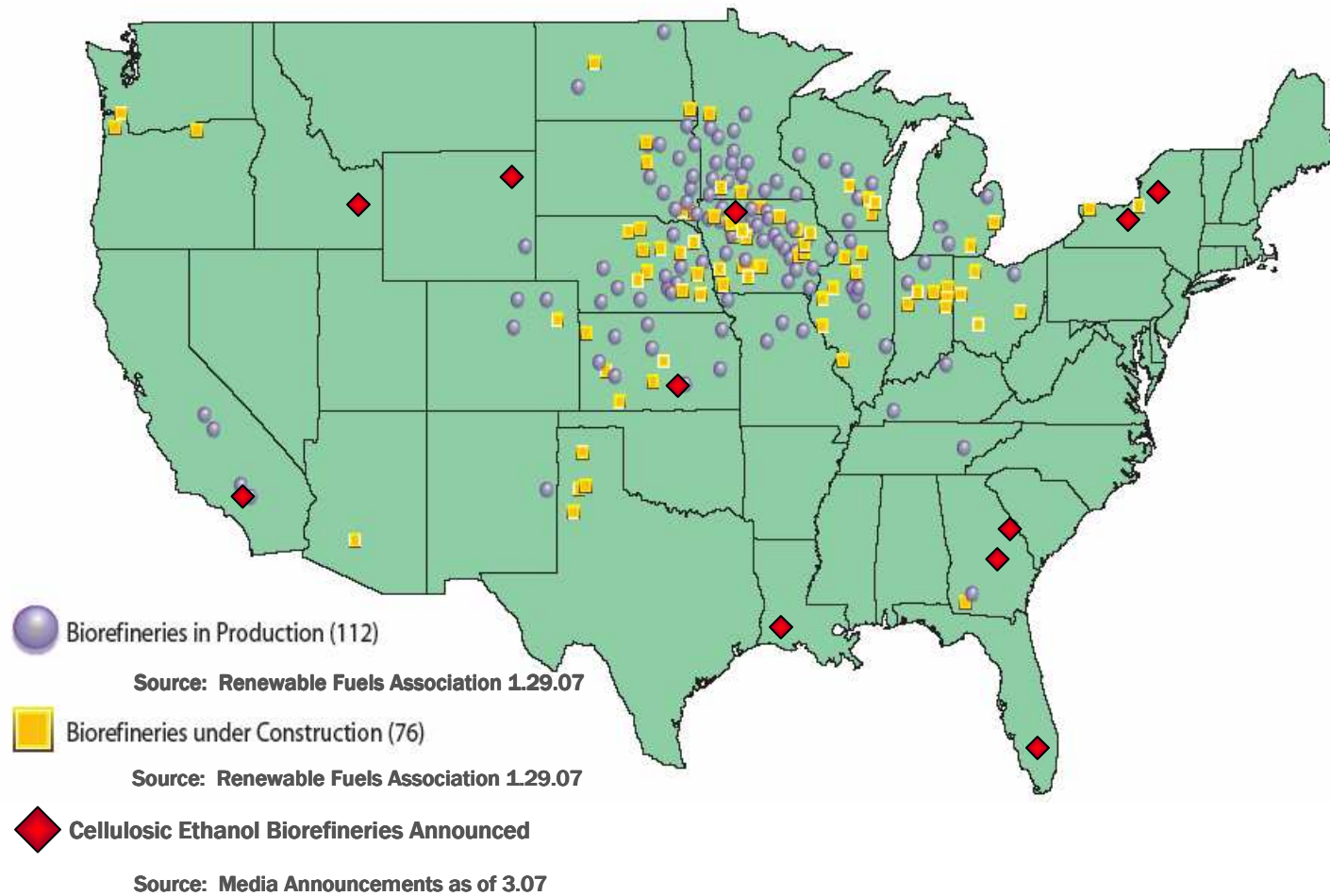
★ 72% of biomass is wood based

Biomass Power Plants



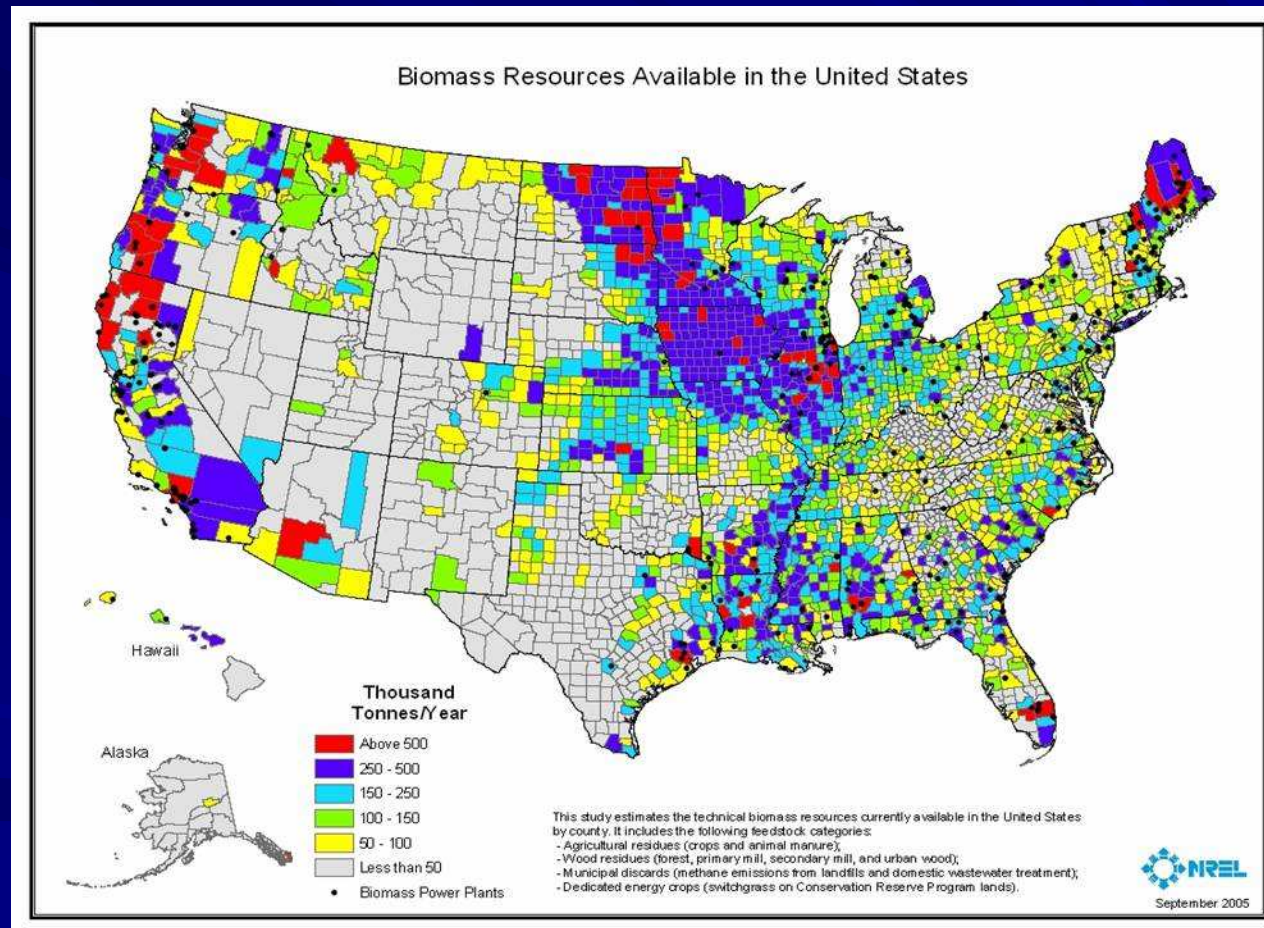
U.S. Biorefinery Locations

Corn and Cellulosic Feedstocks

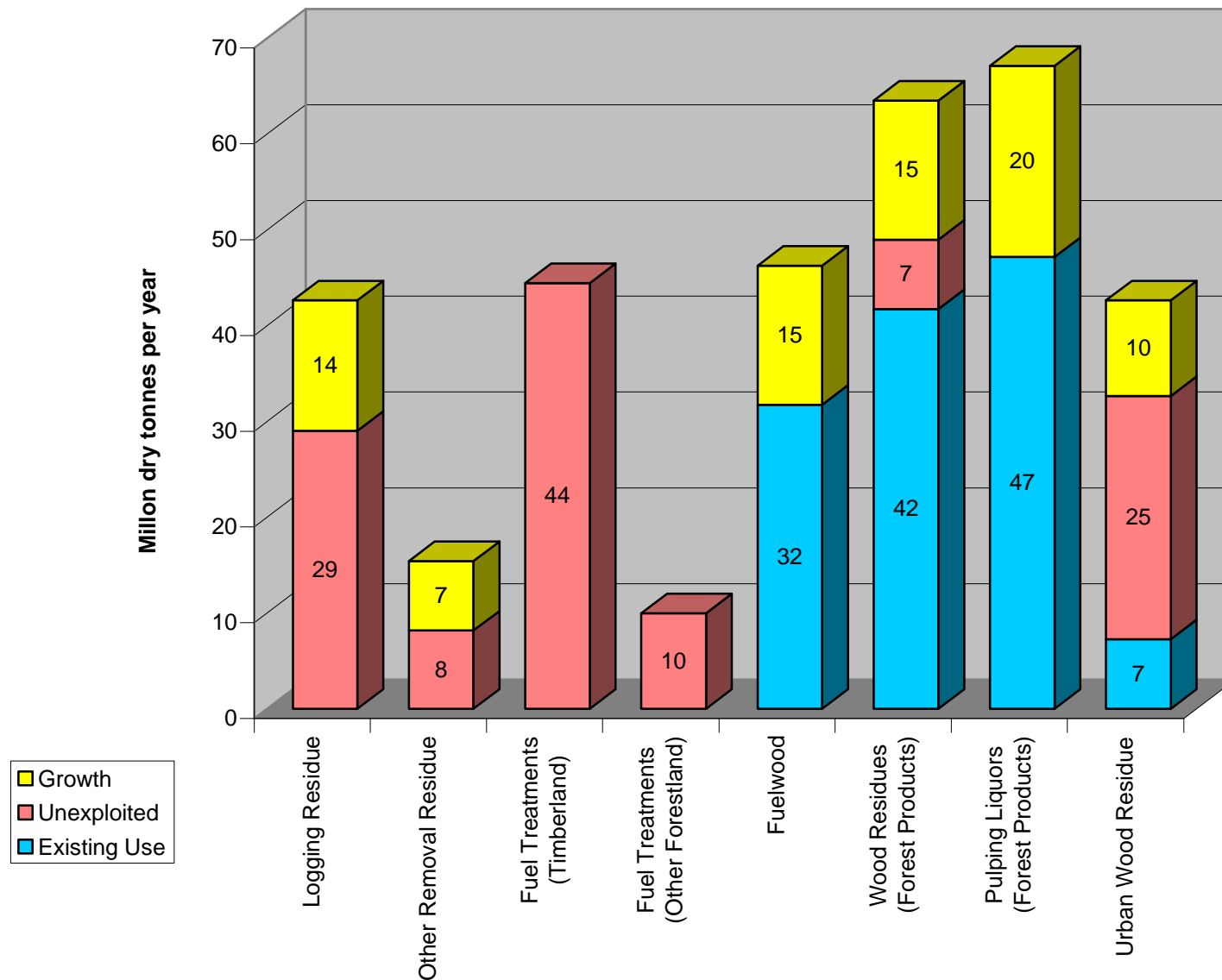


Available Biomass

Agricultural and Wood Residues



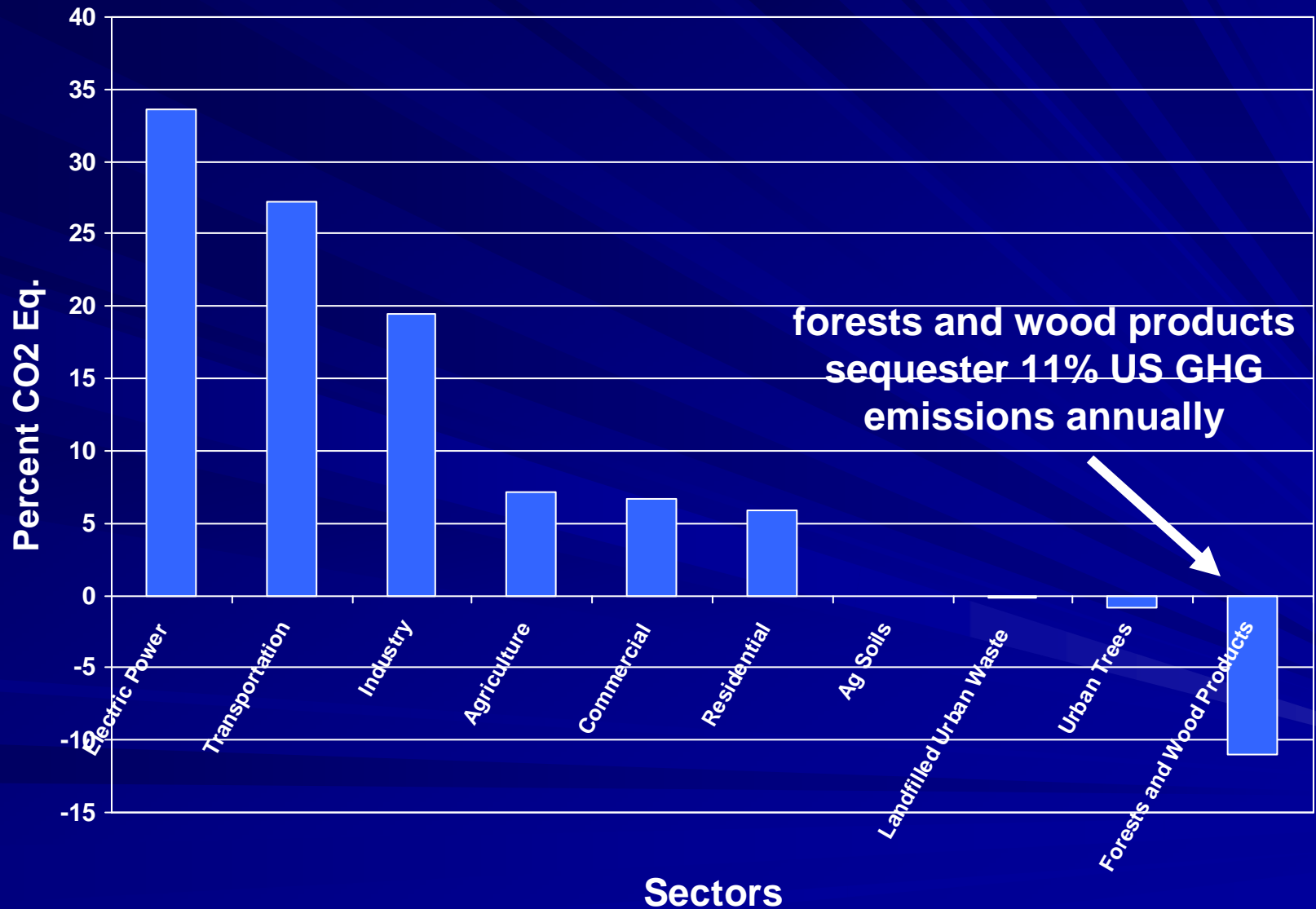
Potentially Available Forestry Resource



DOE and USDA "Billion Ton Report" May 2005

<http://www1.eere.energy.gov/biomass/publications.html>

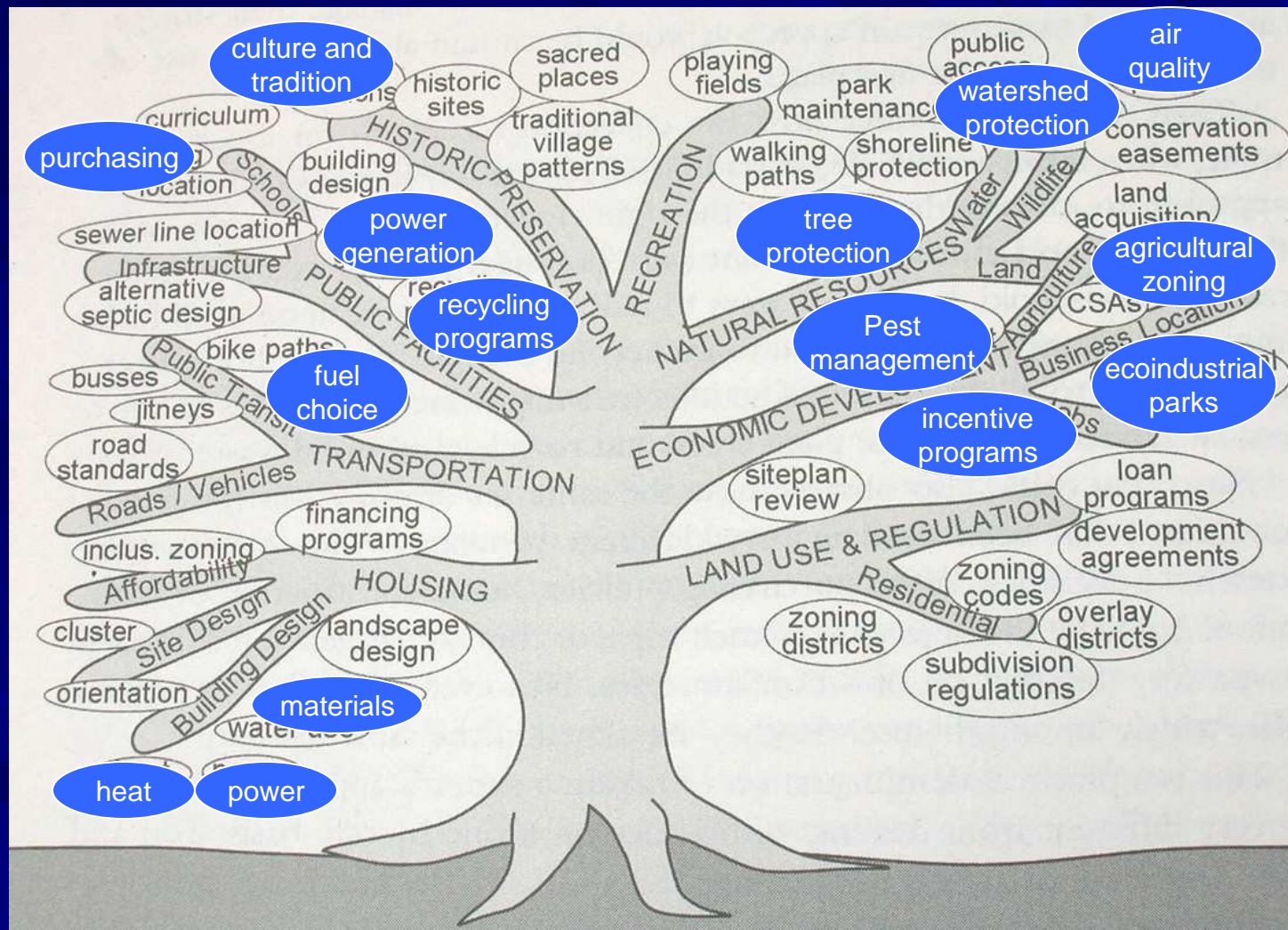
Percent Total US Green House Gas Annual Emissions by Sector (EPA, 2003)



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

Sustainability and Communities

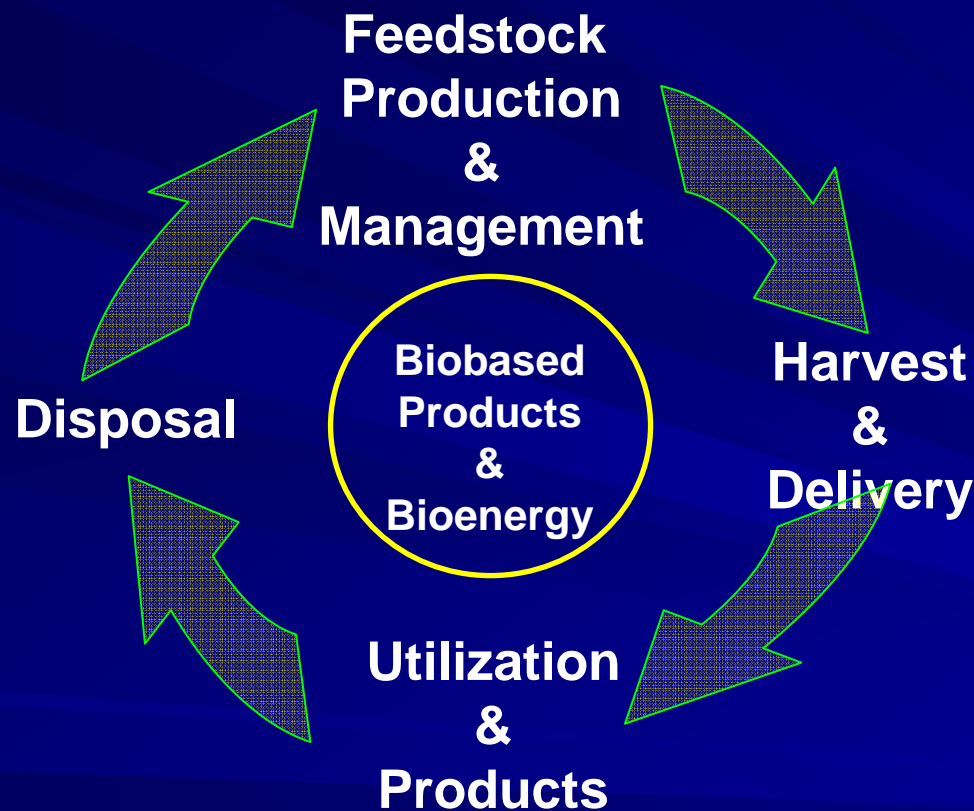
Biobased Products and Bioenergy



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



Climate Change

effects
adaptation
mitigation
carbon markets

- Research & Development
- Technical Assistance
- Financial Assistance
- Land Management
- Public & Private Partnerships
- Collaborative Project Planning & Development

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

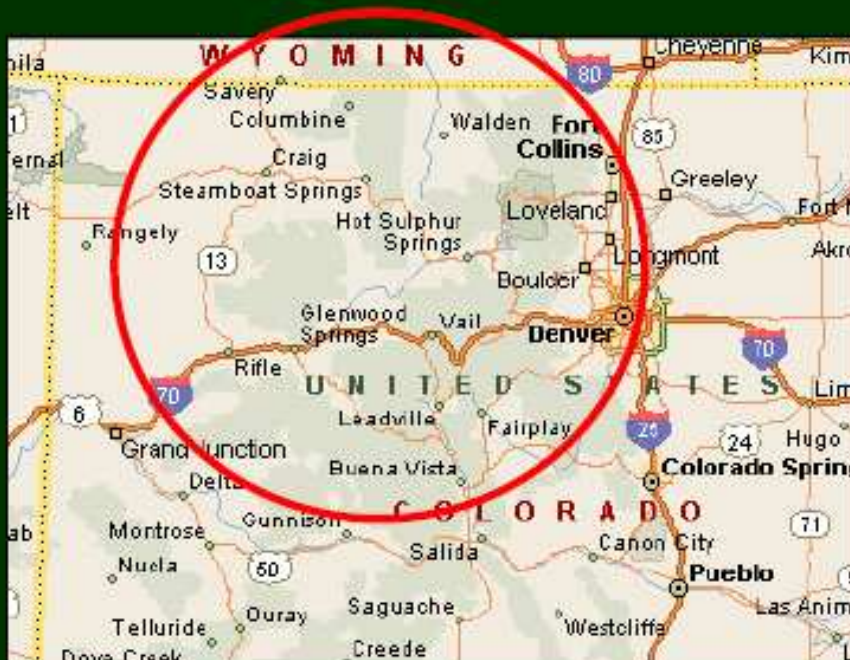
Electricity and Heat

Biobased Products

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

Colorado CROP

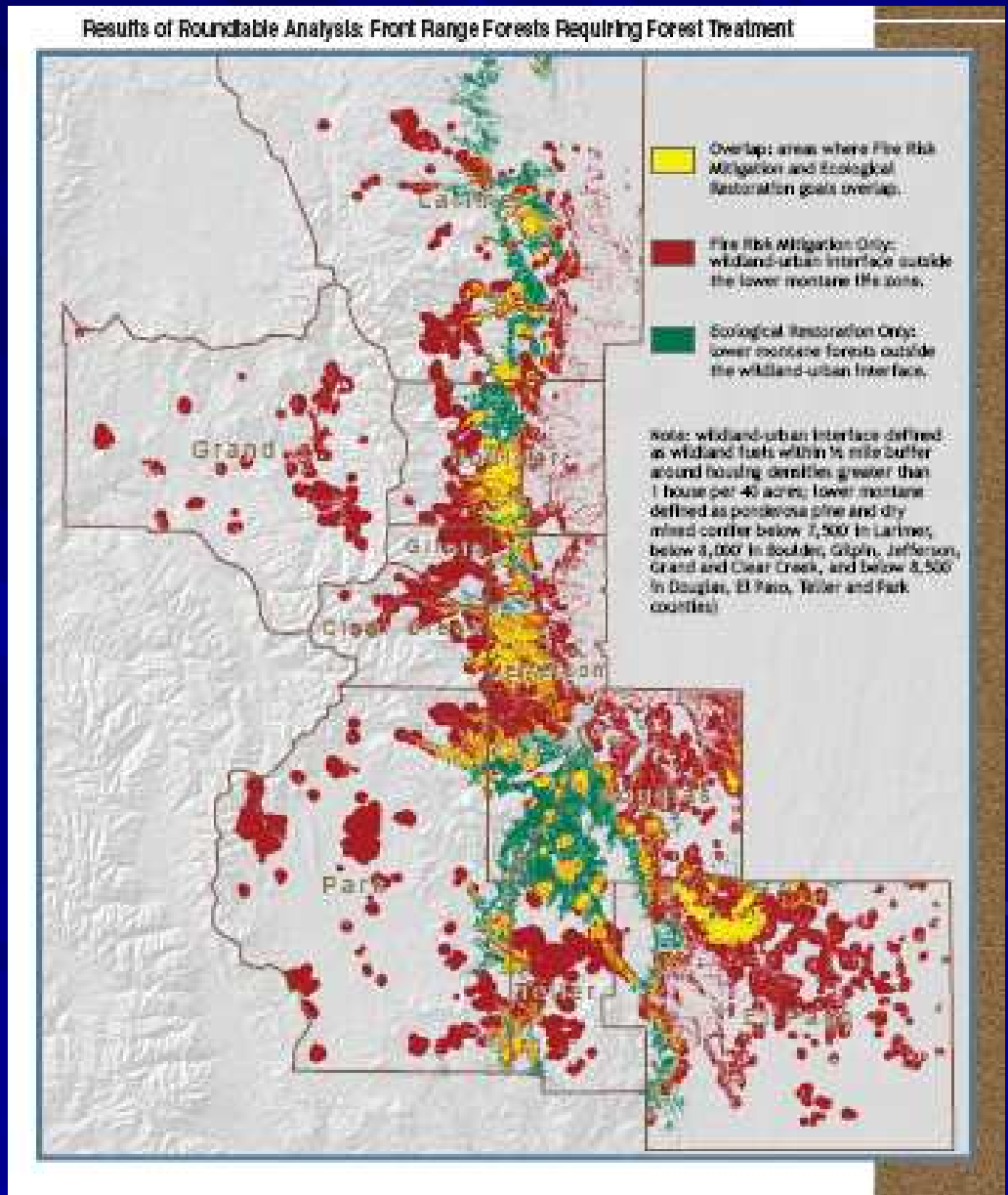
Colorado CROP: Kremmling, CO (centerpoint)



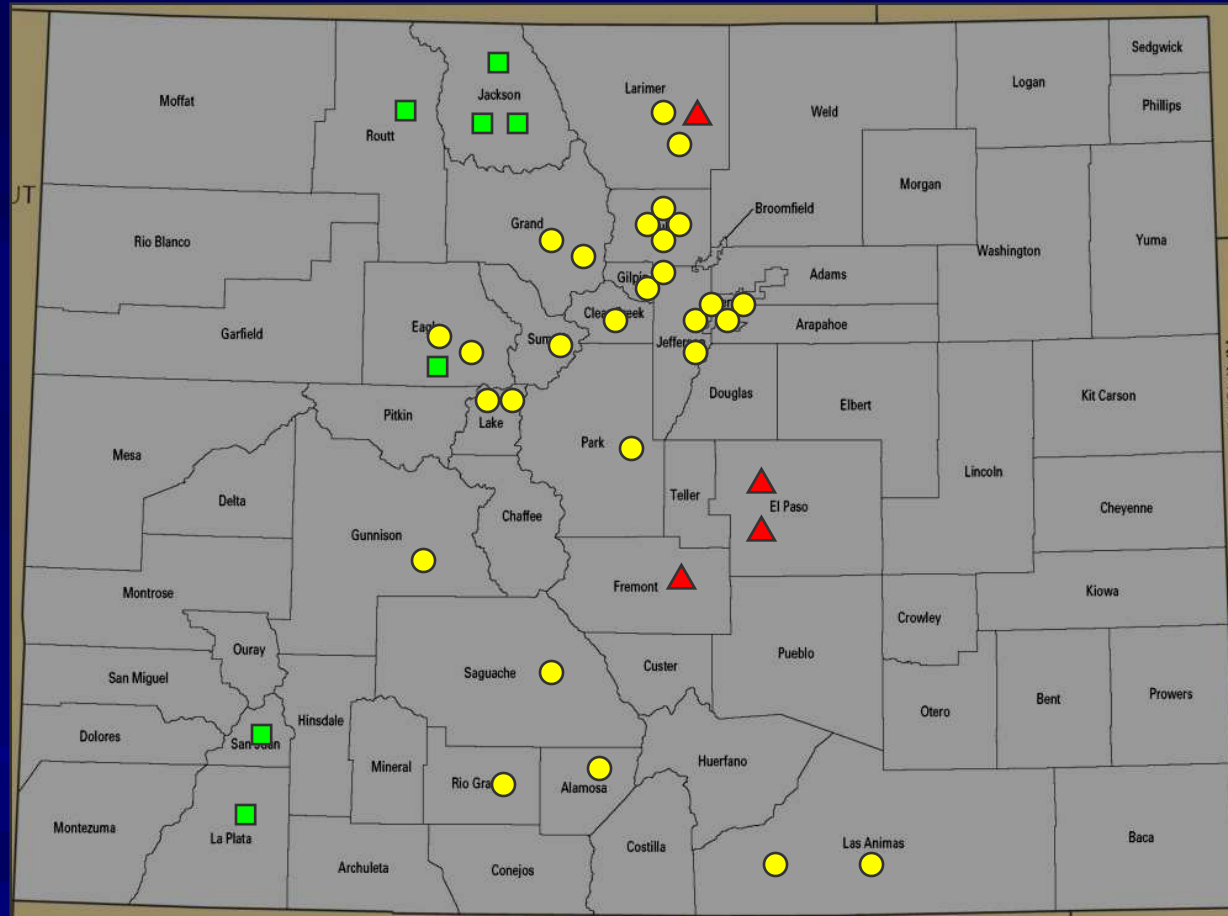
- *3 States*
- *6 National Forests*
- *22 Ranger Districts*
- *9 BLM Districts*
- *29 Counties*
- *State Lands*

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



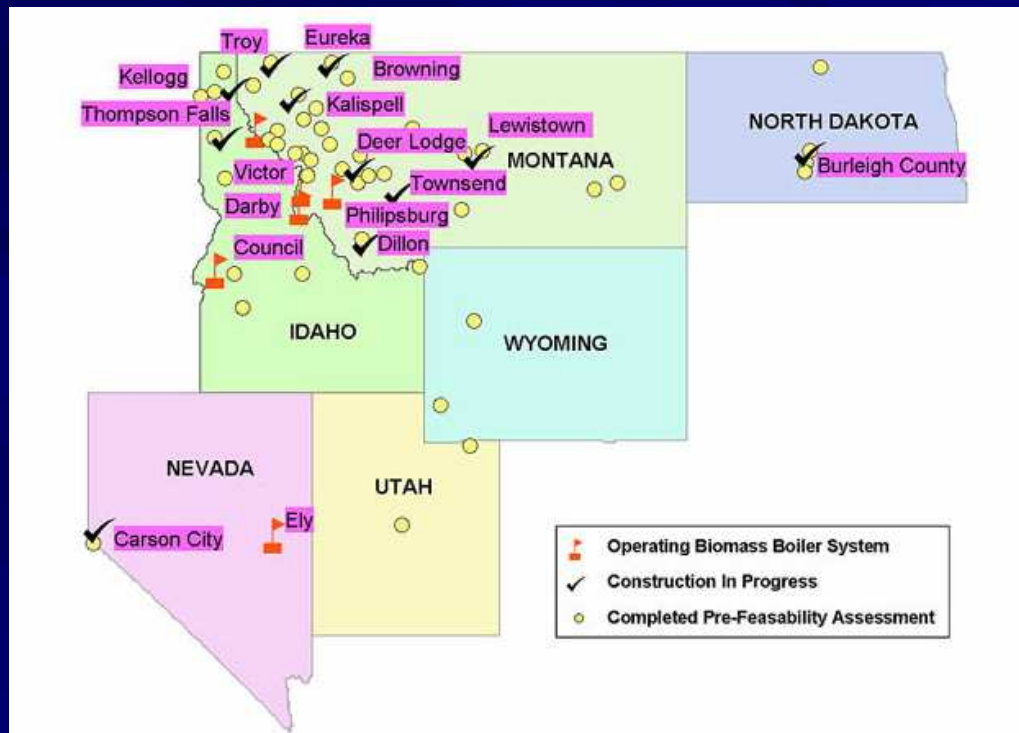
Legend

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

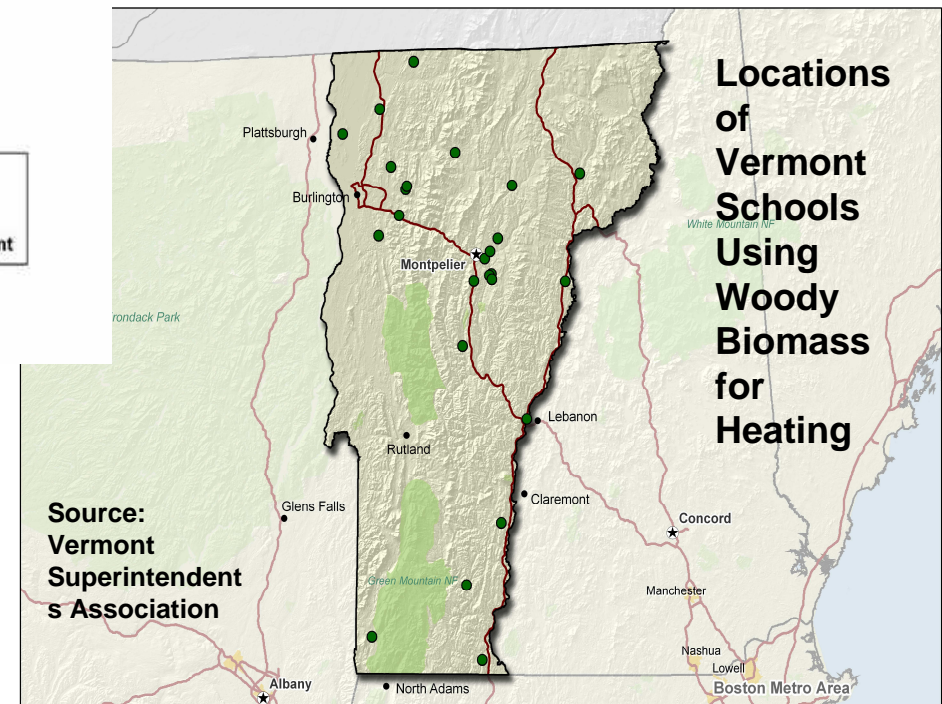
Note: A number of state-wide and regional efforts are on-going but are not shown on the map.

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

Fuels For Schools and Communities

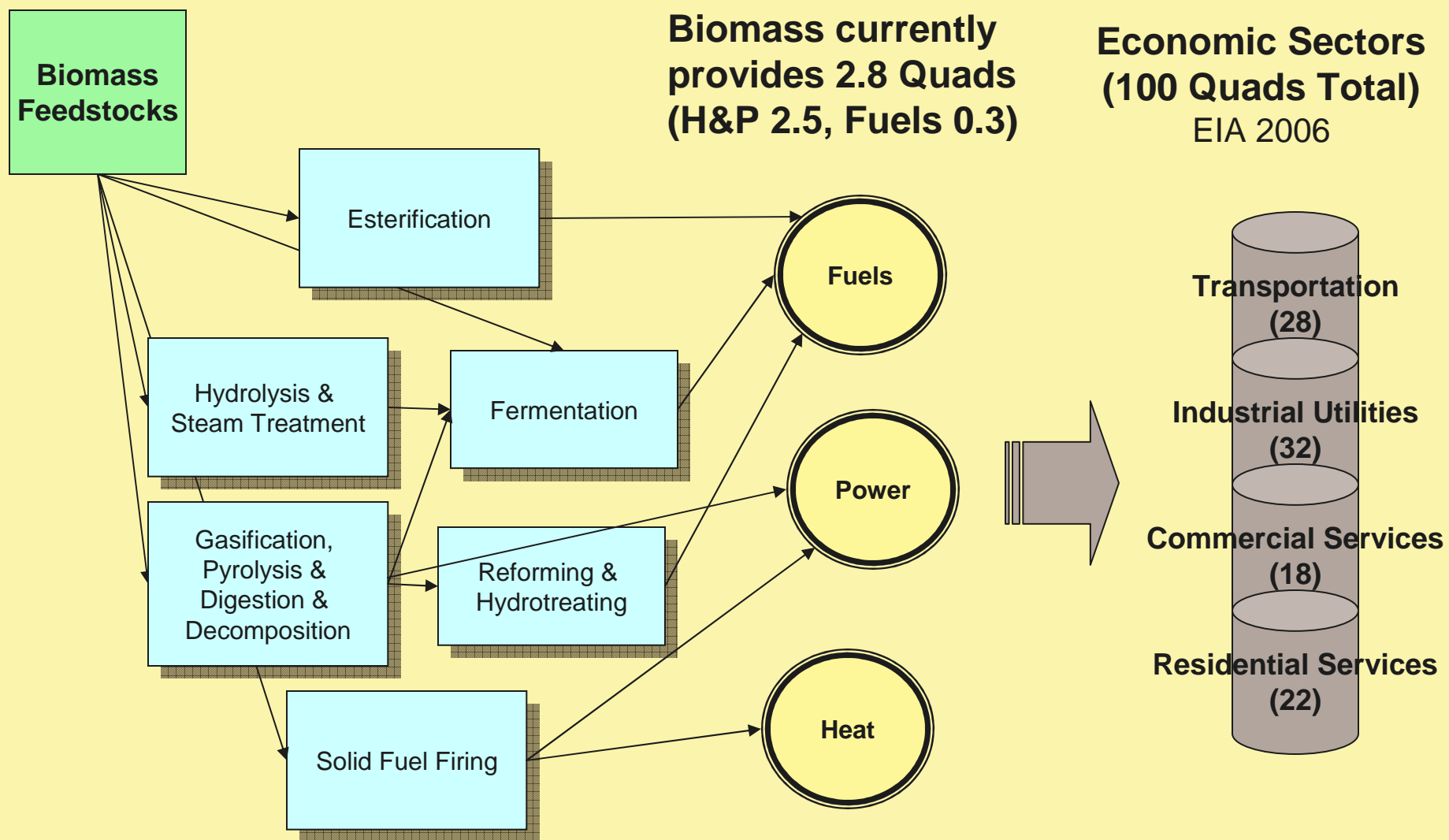


VT- by law funds 30% of school biomass heat projects, the balance is through bonds





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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