

Sustainability and Bioenergy from Forests



Marcia Patton-Mallory, PhD
Biomass and Bioenergy Coordinator, US Forest Service
Harvesting Green Energy Conference
Portland, OR – January 29, 2008



Overview

- Sustainability: Forests, Climate Change and Biomass

- Opportunities
- Challenges



Sustainability



OUR COMMON FUTURE

THE WORLD COMMISSION

ON ENVIRONMENT

AND DEVELOPMENT



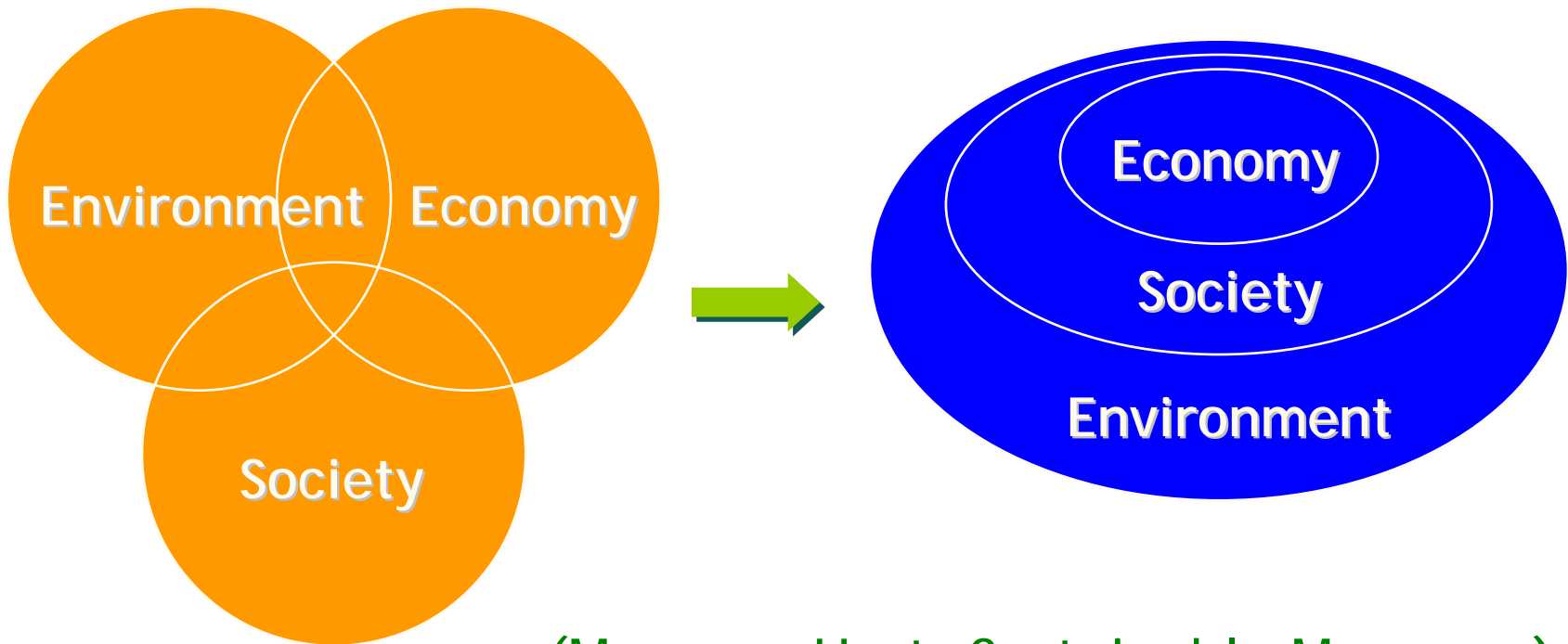
“...the capacity to meet the needs of the present without compromising the ability of future generations to meet their own needs”

(Brundtland Commission, 1987)

Sustainability's Triple Bottom-Line



Interconnected and integrated



(Maureen Hart, Sustainable Measures)

Forest Service Mission



The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

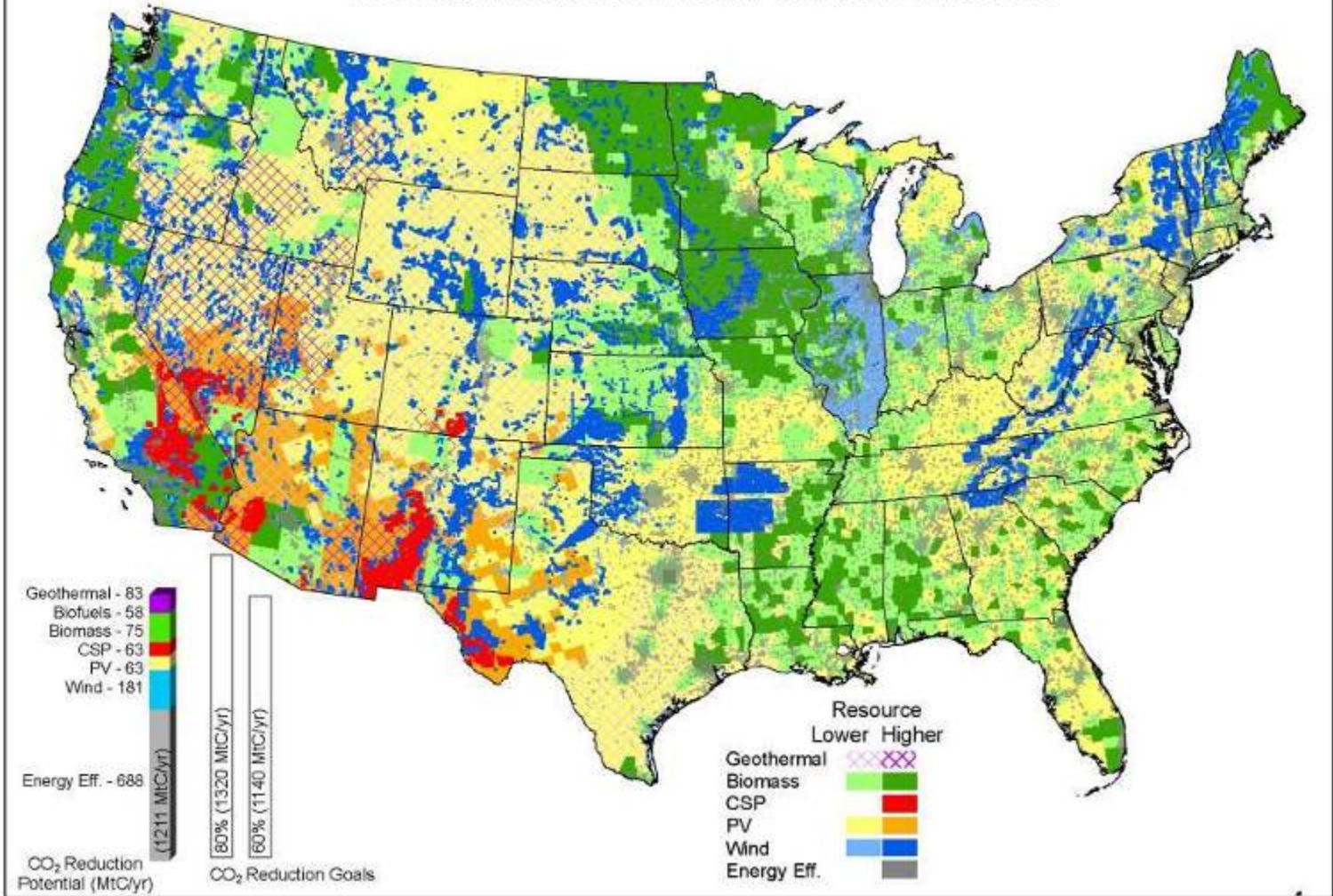
Renewable Energy



- Solar and Wind Resources on Forests and Grasslands
- Hydroelectric and Geothermal Energy
- Bioenergy- heat, power, and biofuels with associated biobased products



Potential Reduction in U.S. Carbon Emissions



Source: American Solar Energy Society. 2007. http://www.ases.org/climatechange/climate_change.pdf

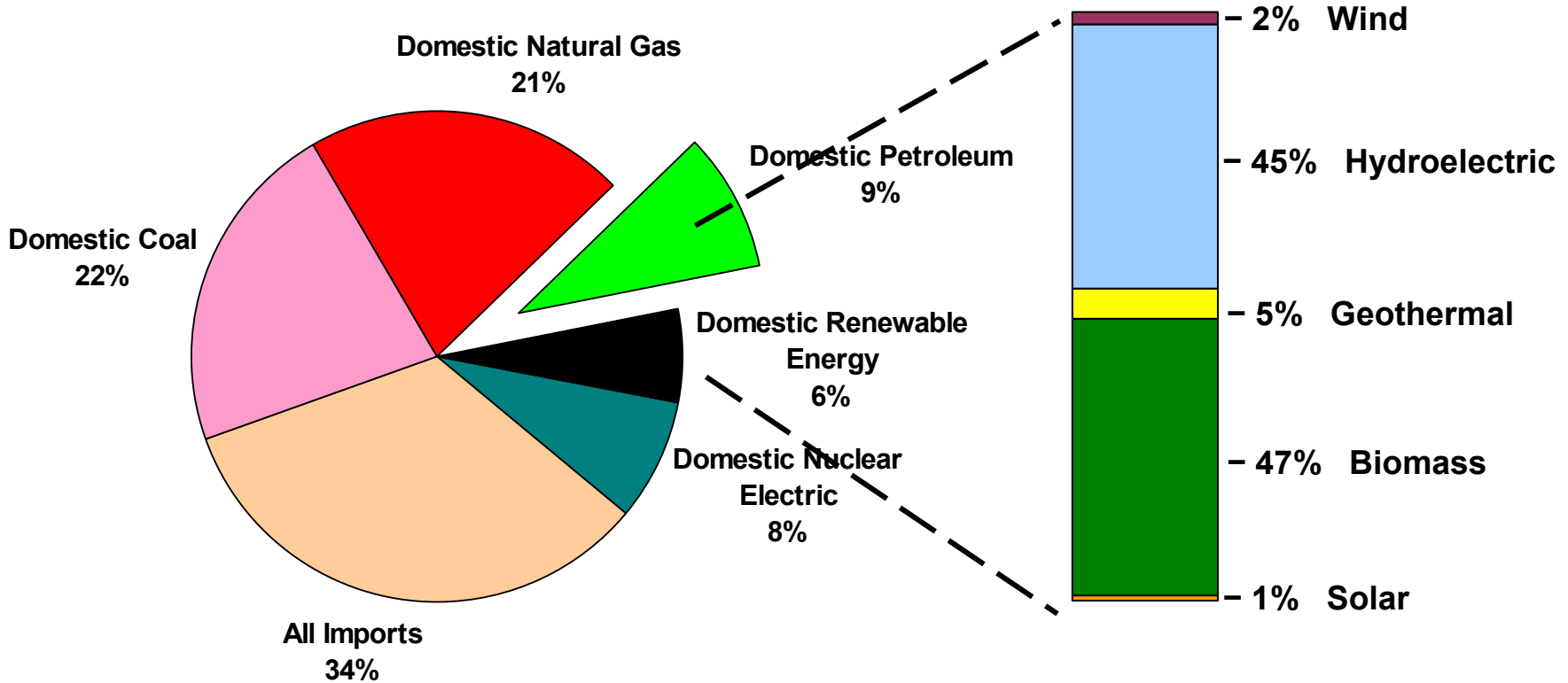


Opportunities

U.S. Energy Consumption



Total = 6.2 Quadrillion Btu

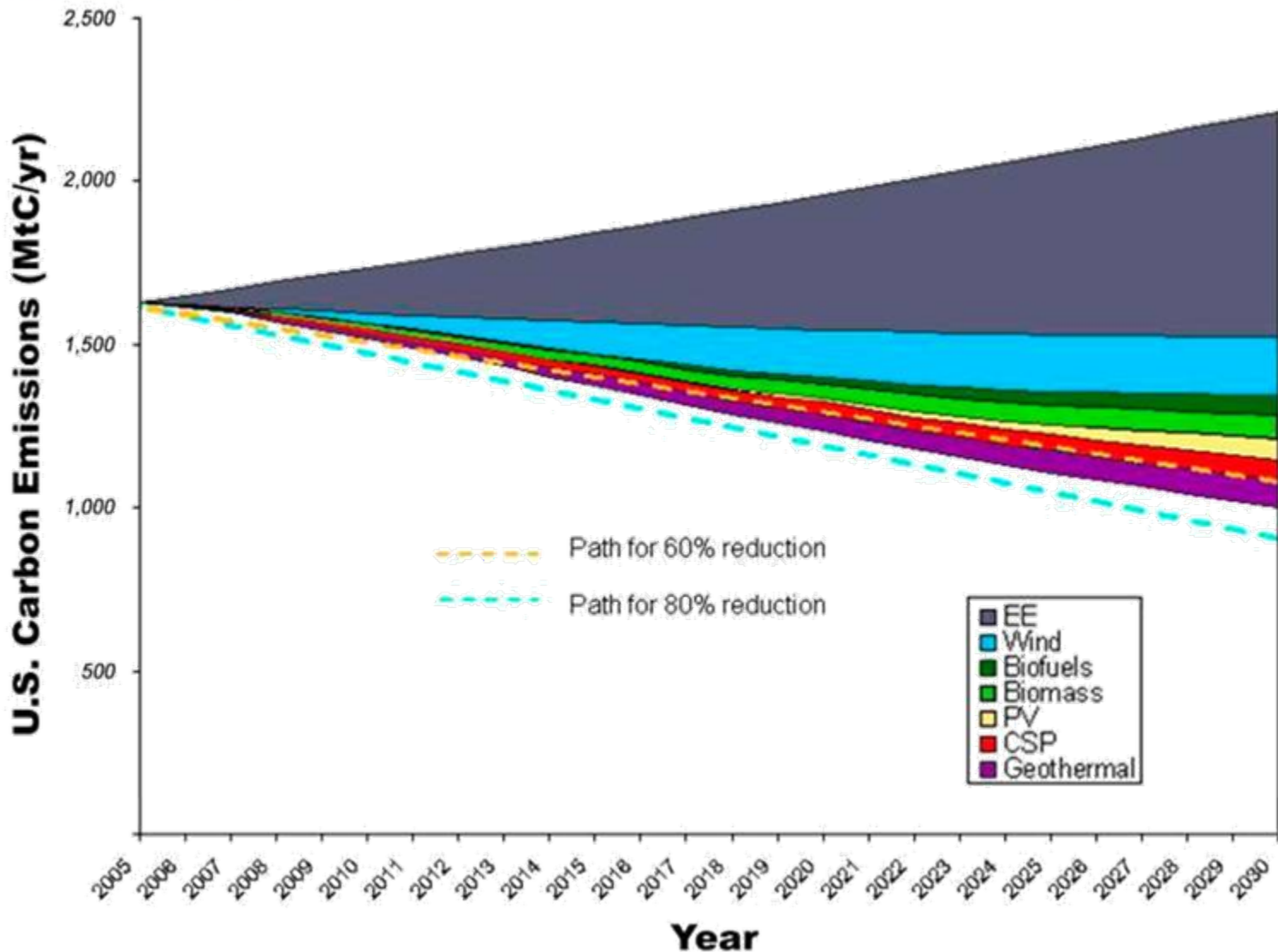


★ 72% of biomass is wood based

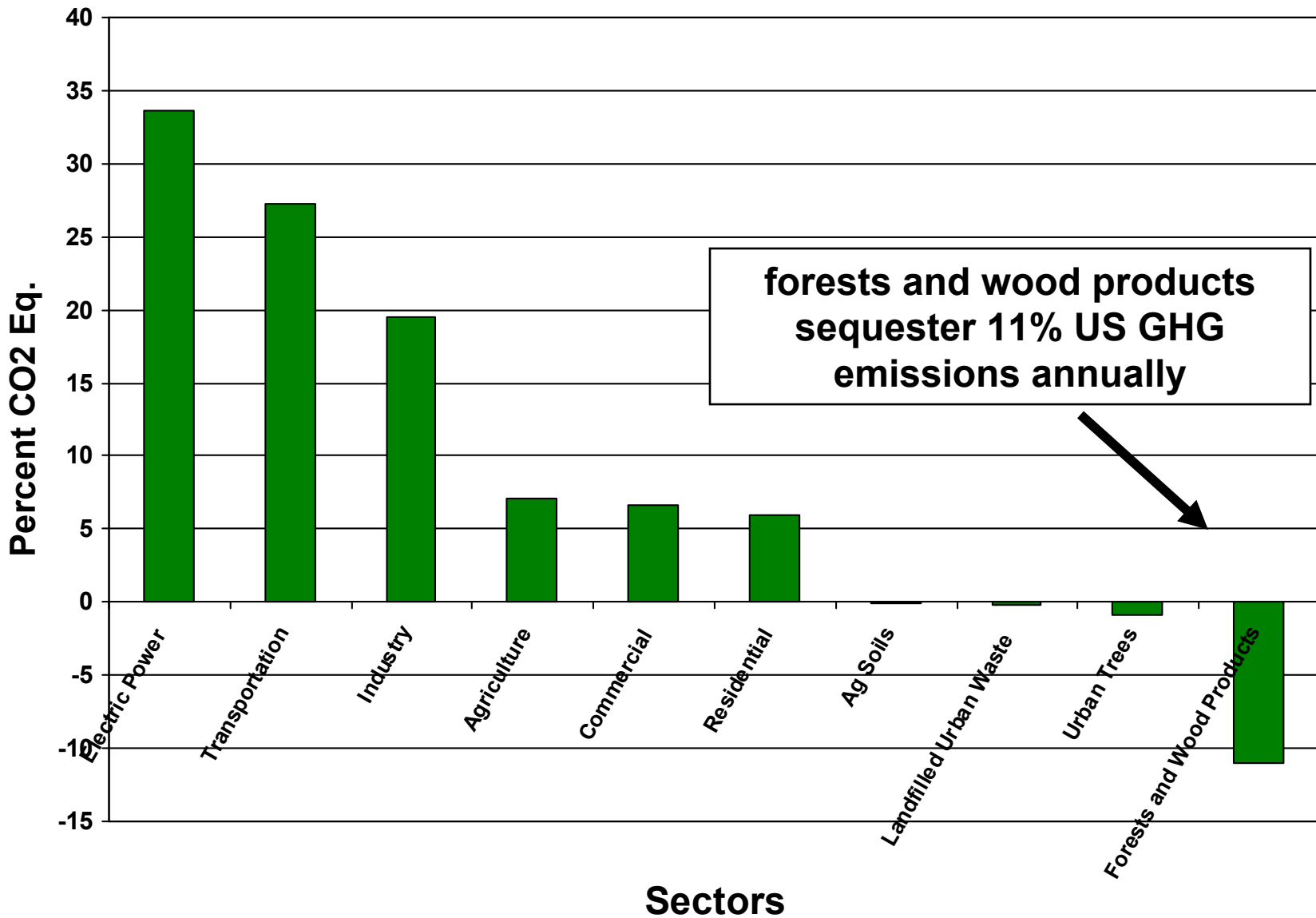
Managing our lands for energy, food and fiber



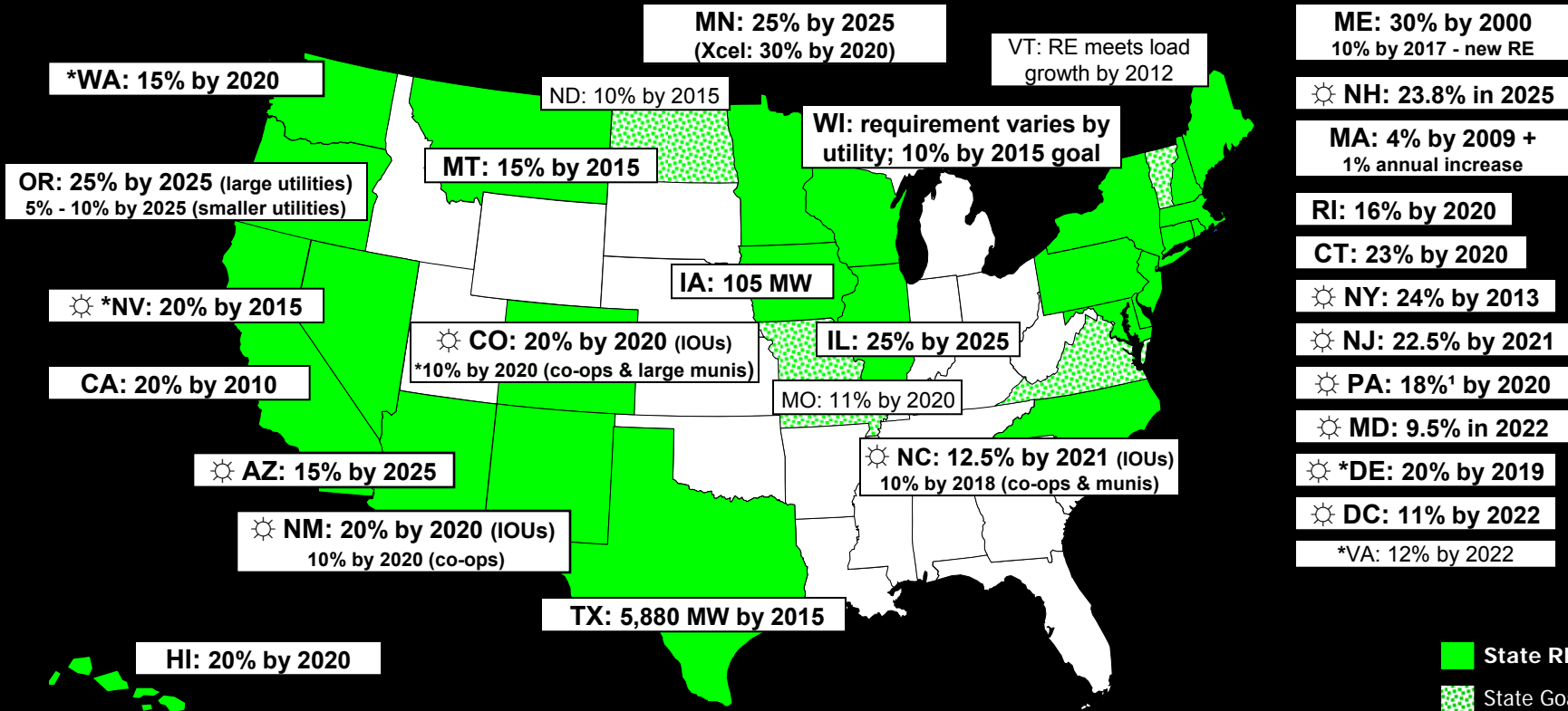
U.S. Carbon Emissions Displacement Potential from Energy Efficiency and Renewable Energy by 2030



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



Renewable Portfolio Standards



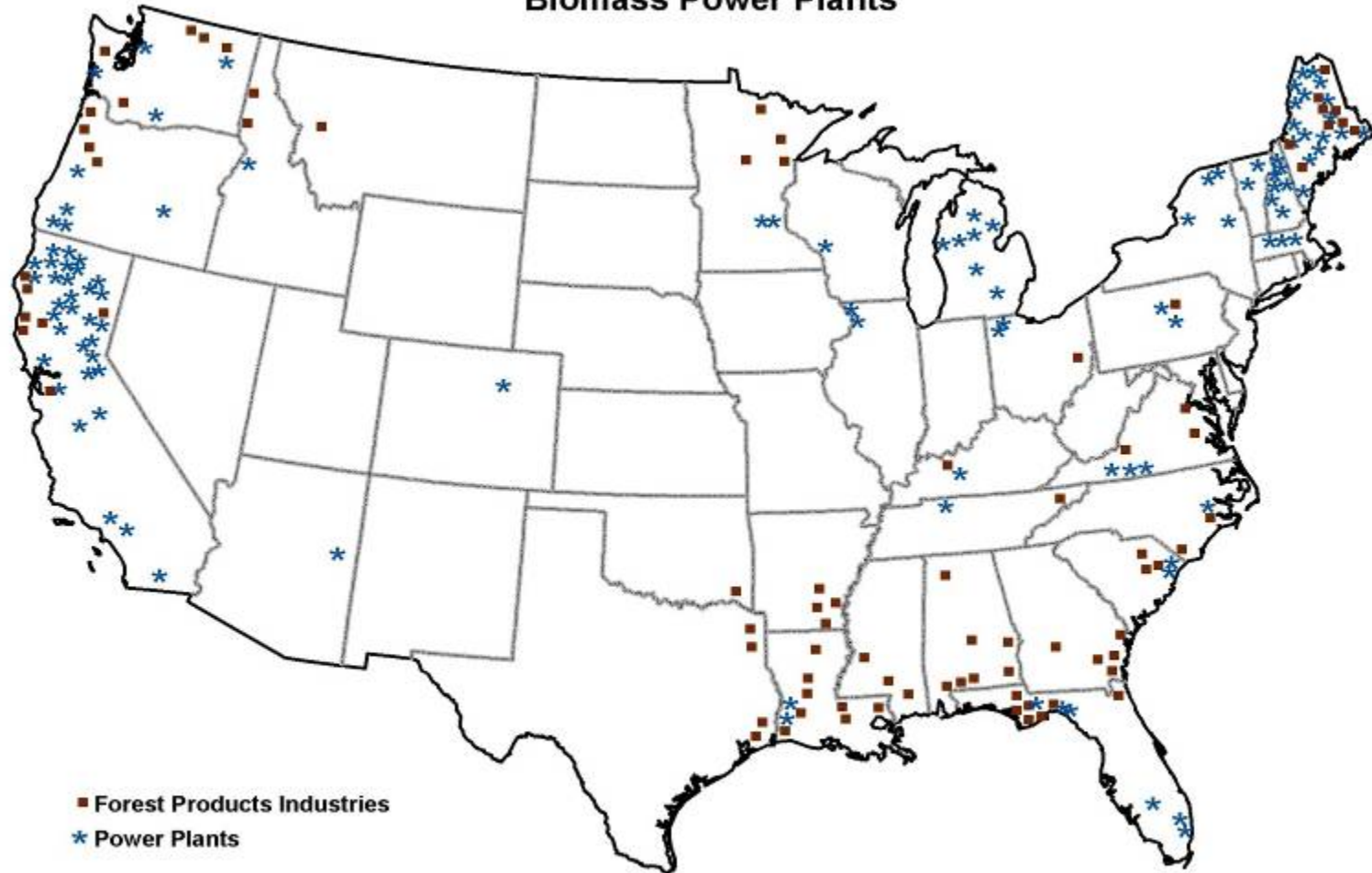
☀ Minimum solar or customer-sited RE requirement
 * Increased credit for solar or customer-sited RE
¹PA: 8% Tier I / 10% Tier II (includes non-renewables)

(Source: Database of State Incentives for Renewable Energy. 2007. "Renewables Portfolio Standards." NC State University. NC Solar Center. Available online at: http://www.dsireusa.org/documents/summarymaps/RPS_Map.ppt)

Biomass Power Plants



Biomass Power Plants



Sources: National Electric Energy System (NEEDS) Database for IPM 2004

U.S. Environmental Protection Agency, Clean Energy eGRID2006 Version 1.0 Plant File (Year 2004 Data)

WGA Biopower Assessment

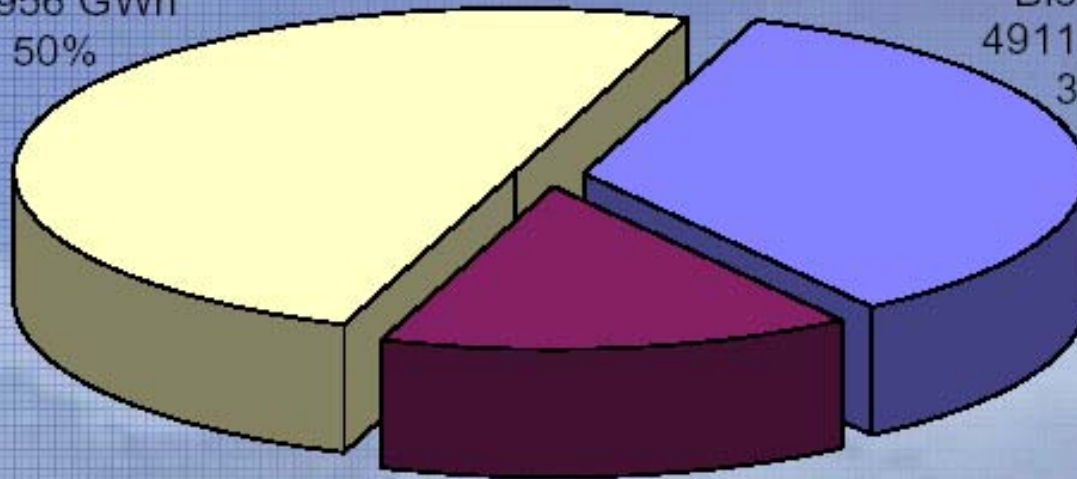


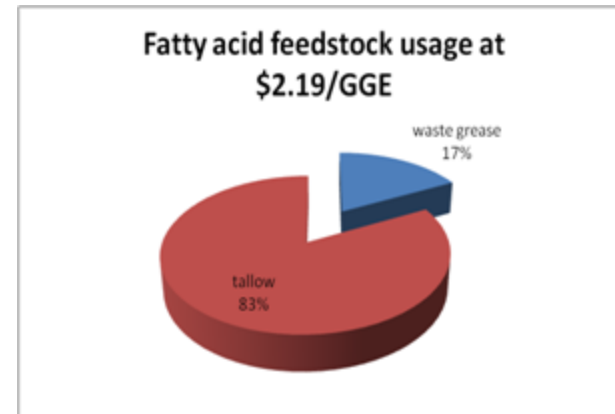
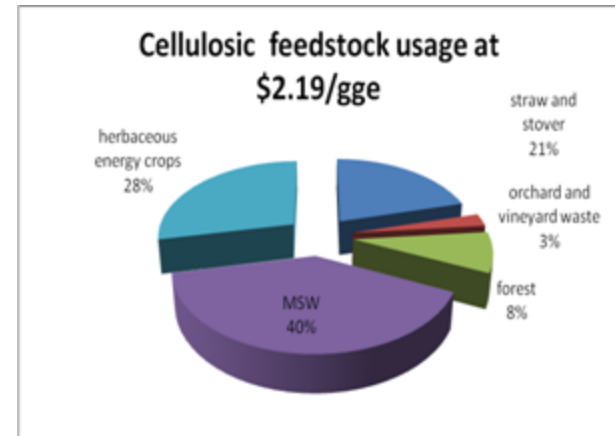
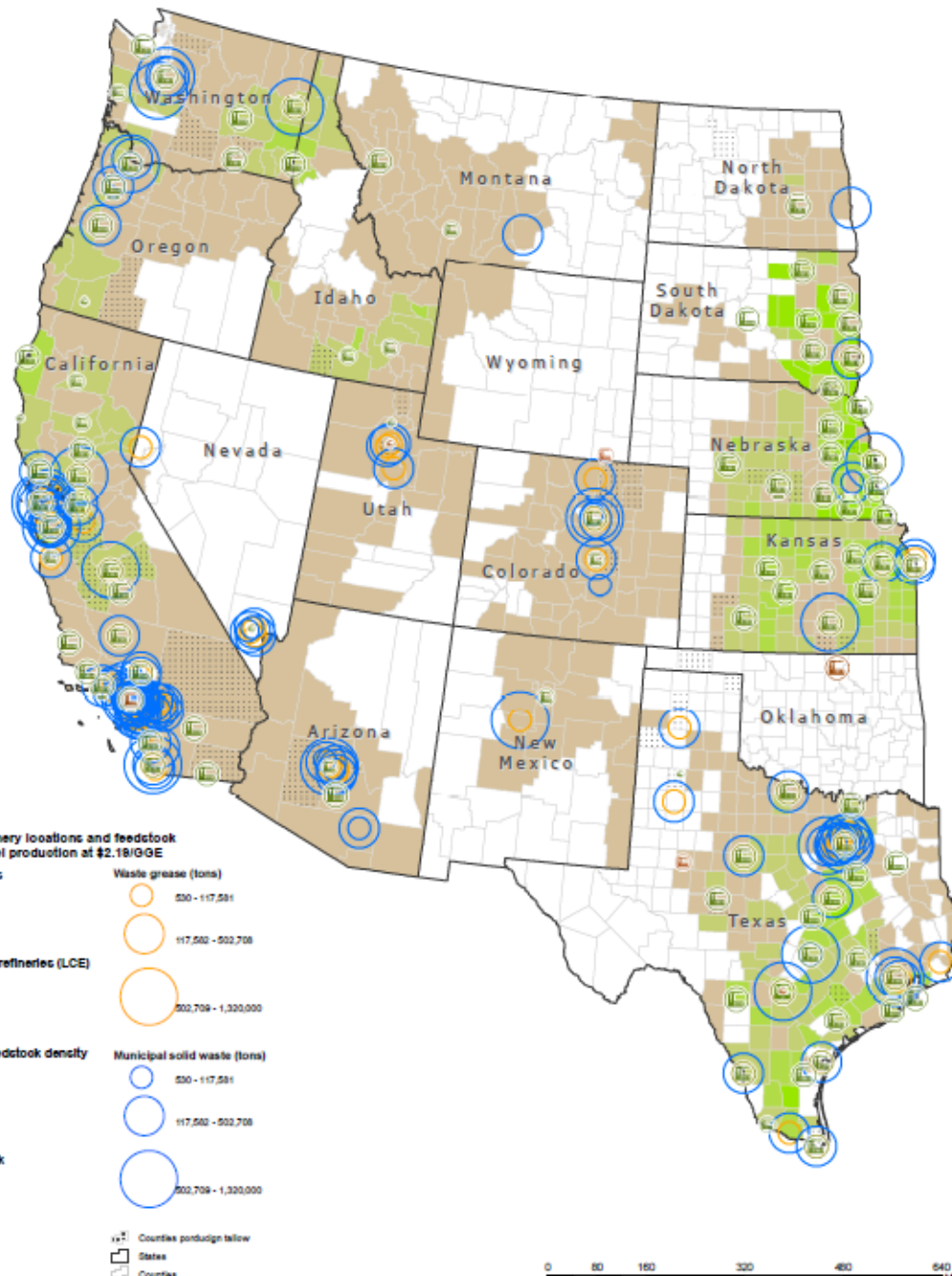
Biomass Resources by 2015

Forest
Resources
70,956 GWh
50%

Urban
Biomass
49,117 GWh
35%

Agriculture
21,681 GWh
15%

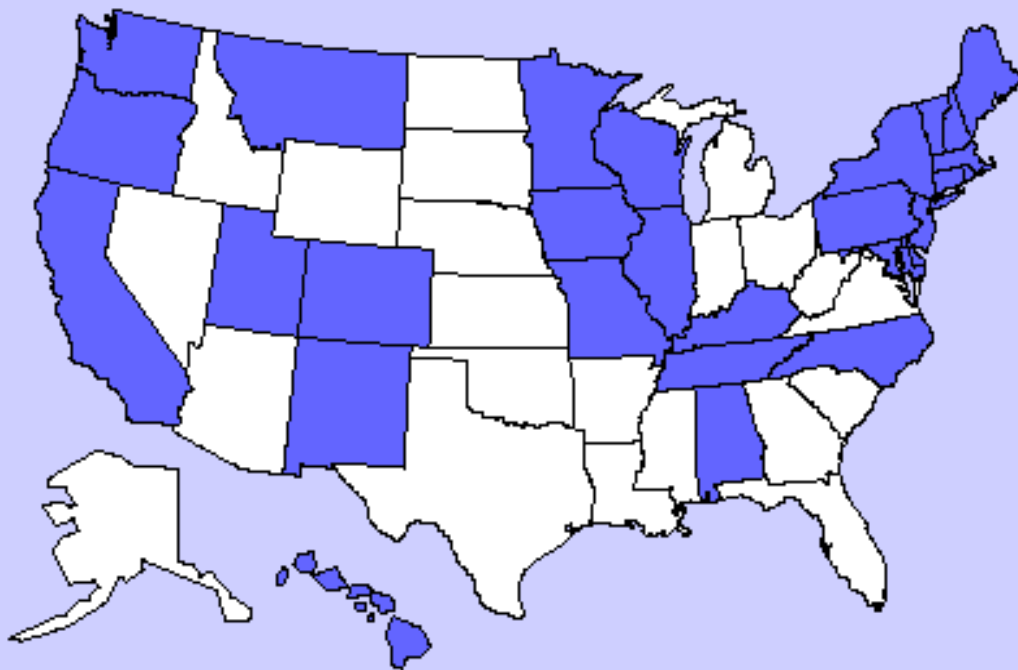




Climate Change Mitigation



Climate Action Plans



 Completed Climate Action Plans



Climate Change Framework

- Adaptation
- Mitigation (includes reducing our carbon footprint)
- Bioproducts
- Policy
- Tools

“I propose two forest related goals:

The first goal would be to sustain and strengthen the role of America’s forests as a net carbon sink.

The second goal would be to increase the amount of America’s energy that comes from forests. ”

Chief Gail Kimball- Climate Change, Kids and Forests, Sept 7, 2007

Net Energy and Net GHG Emissions



Units of biofuel produced from 1 unit of fossil fuel	Reduction in GHG emissions to make ethanol compared to gasoline made from fossil fuel
1.3 Corn to ethanol	22%
8 Sugar Cane to ethanol	56%
2.5 Soybean to biodiesel	69%
Up to 36 Wood/Grass to ethanol	91%

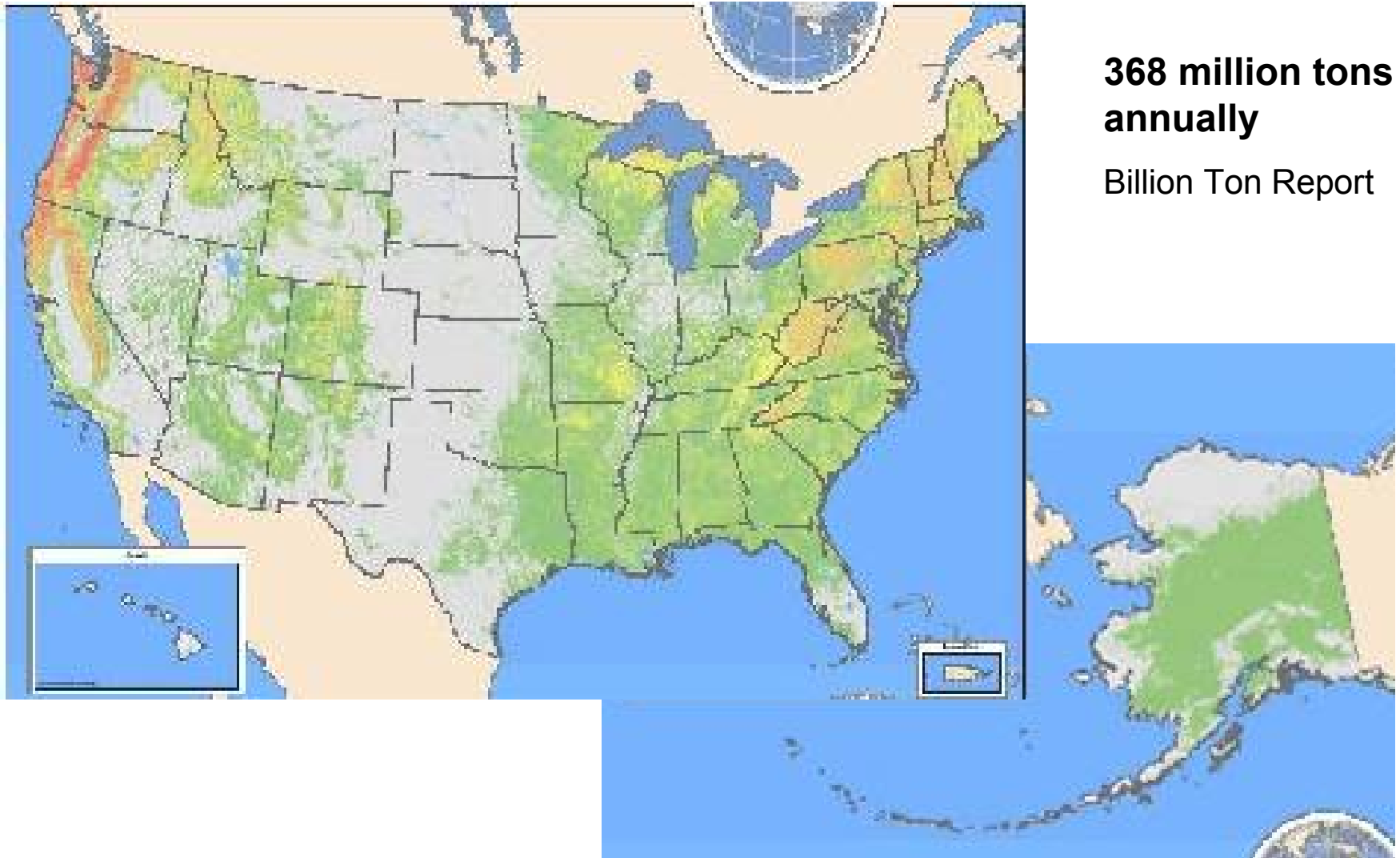
Data Sources (adapted from C.Mater, Mater Engineering)

- Corn to ethanol data: US DOE; EPS; Renewable Fuel's Association; Energy Future Coalition; Worldwatch Institute
- Cane to ethanol data: USDOE; Worldwatch Institute; Iowa State University
- Soy to biodiesel data: USDOE; EPA; Worldwatch Institute;
- Woody/grass biomass to ethanol: USDOE; EPA; WorldWatch Institute



Challenges

Woody Biomass Potential



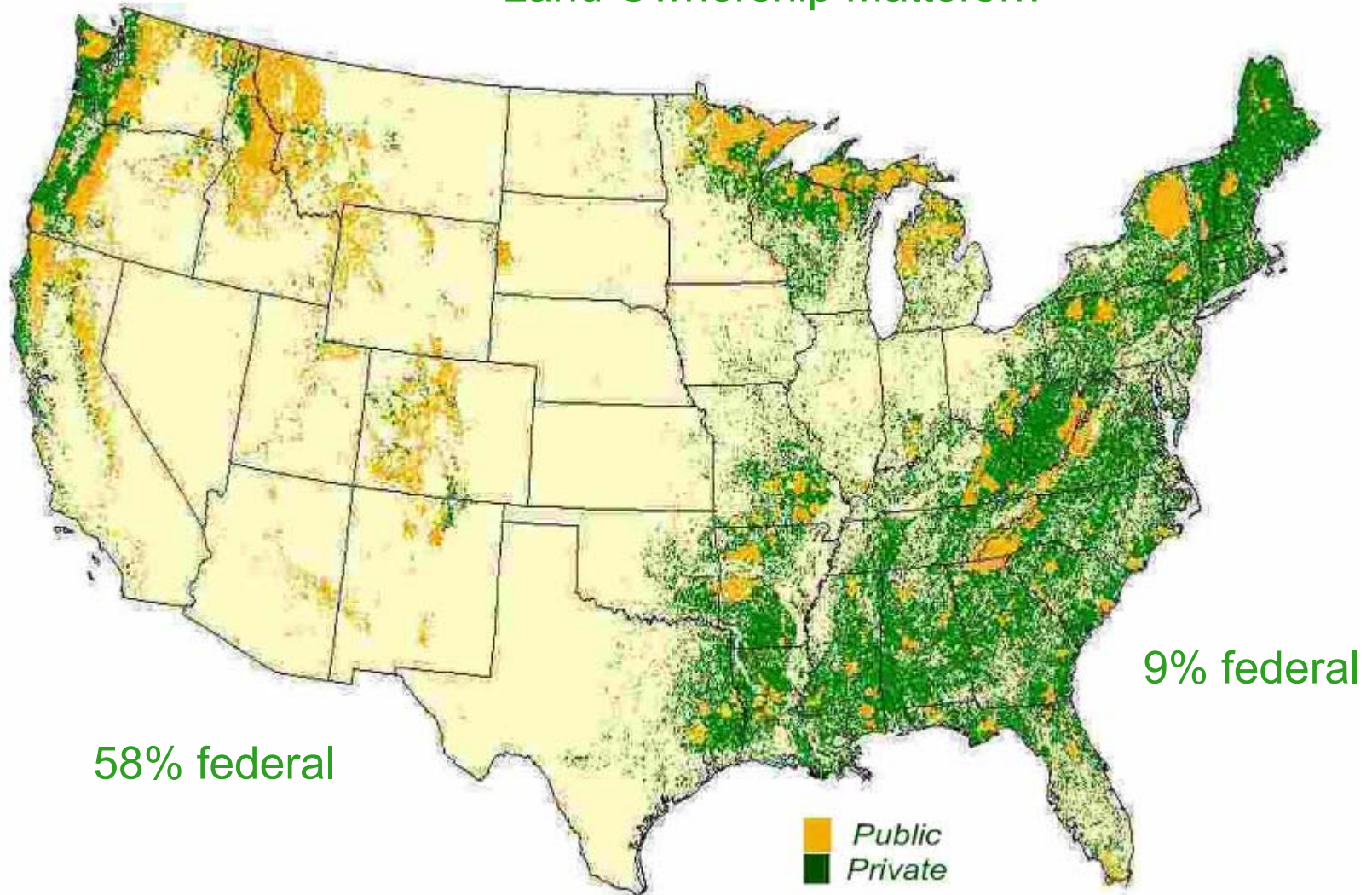
**368 million tons
annually**

Billion Ton Report

Public vs Private Forests



Land Ownership Matters...



Biomass Utilization Pathways

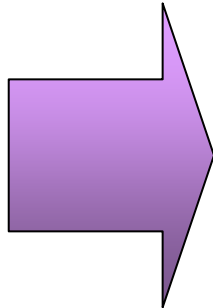


Photo: Jake Eaton, Podlatch Corporation



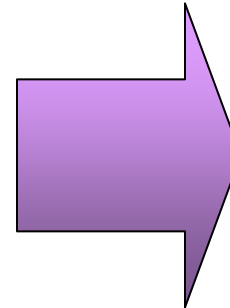
Forest Biomass Feedstock

- 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:

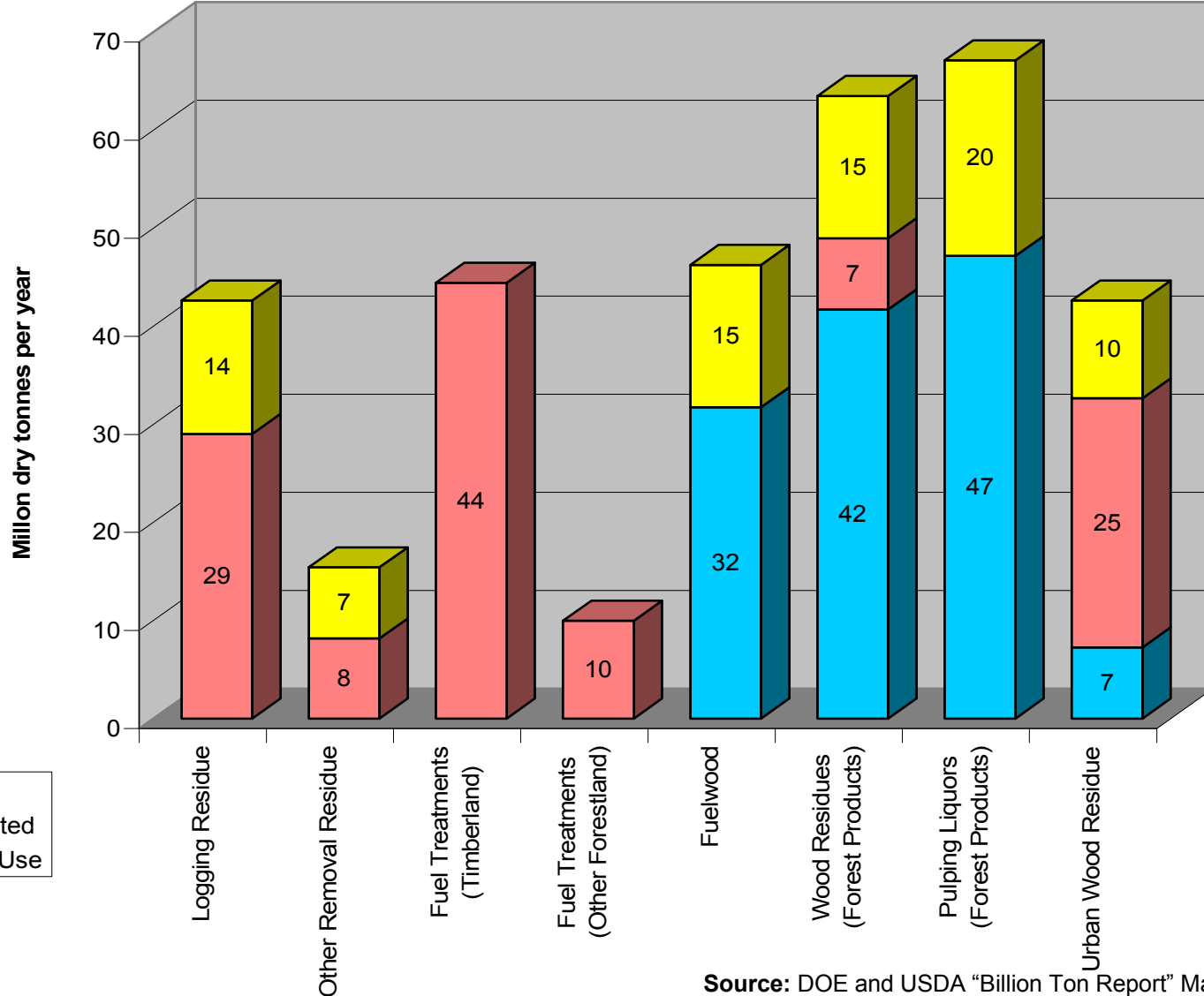
- Renewable Diesel
- Ethanol

Electricity and Heat

Biobased Products

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

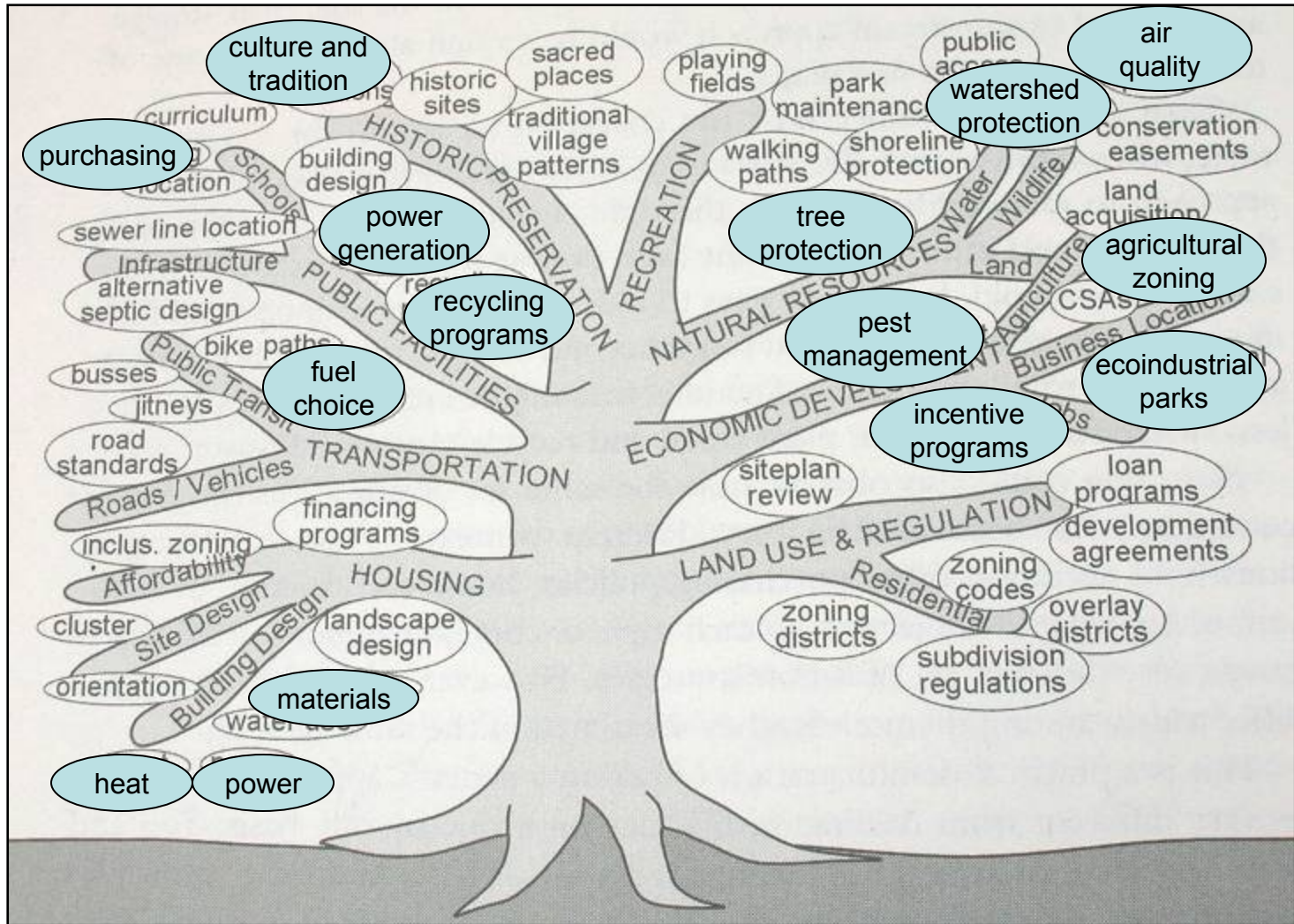
Potentially Available Forest Resource



■ Growth
■ Unexploited
■ Existing Use

Sustainability and Communities

Biobased Products and Bioenergy

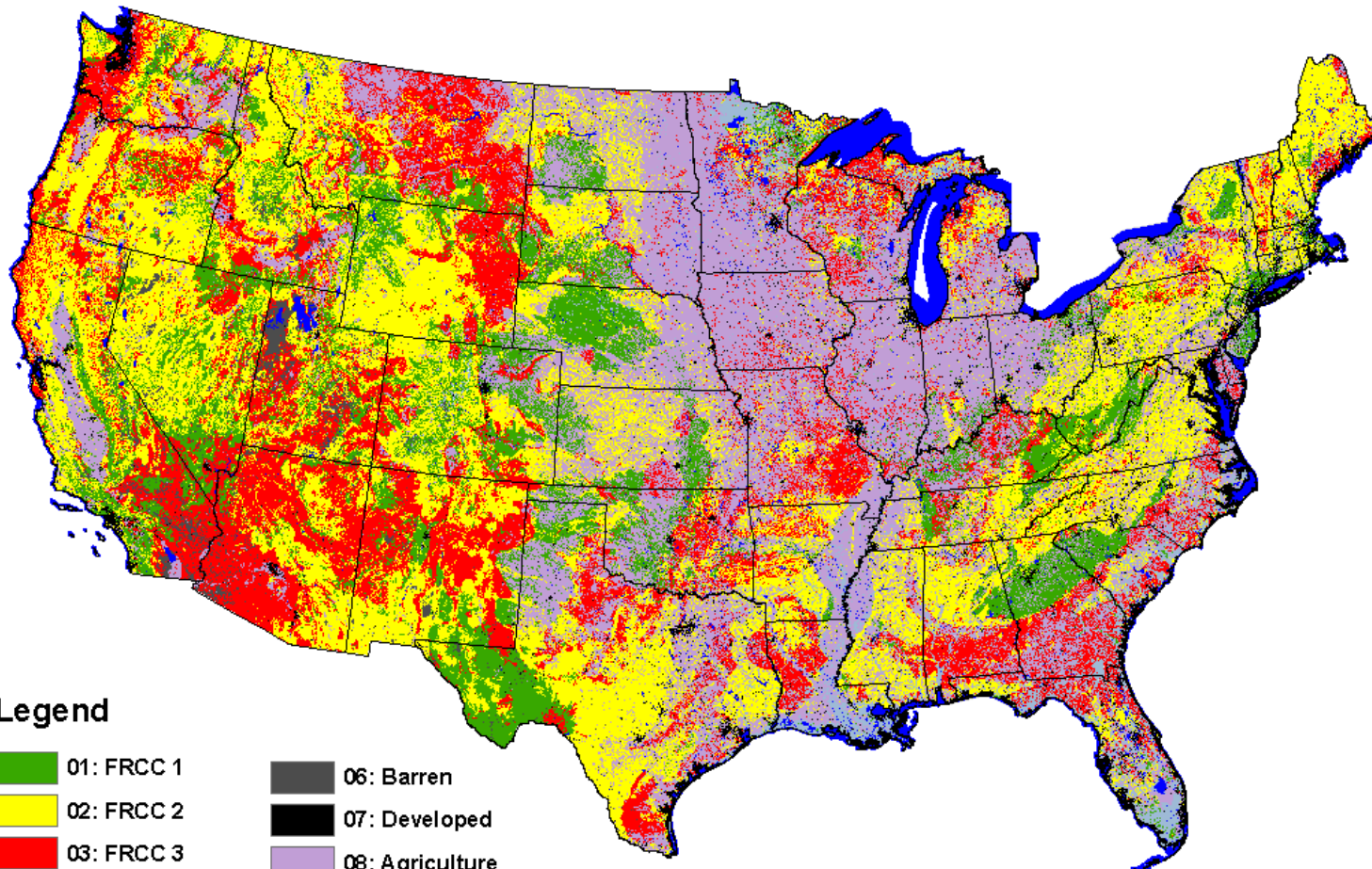


Source: James and Lahti, 2004, The Natural Step for Communities

Restoring Fire Adapted Forest Ecosystems



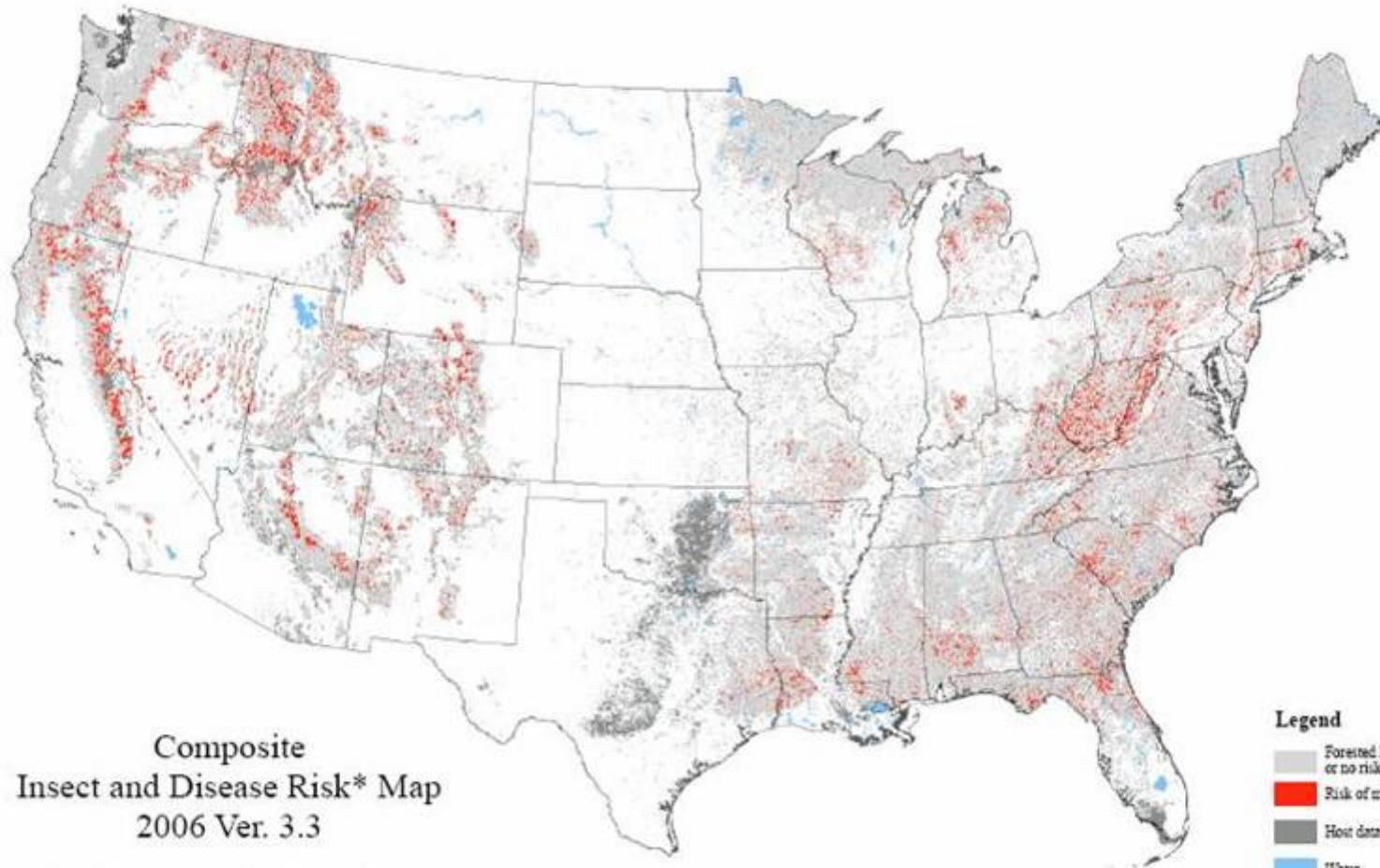
LANDFIRE Rapid Assessment Fire Regime Condition Class



Legend

 01: FRCC 1	 06: Barren
 02: FRCC 2	 07: Developed
 03: FRCC 3	 08: Agriculture
 04: Water	 09: Non-Classified V
 05: Snow/Ice	 10: Unclassified

Forest Insect and Disease Risk



Composite
Insect and Disease Risk* Map
2006 Ver. 3.3

*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.

Legend

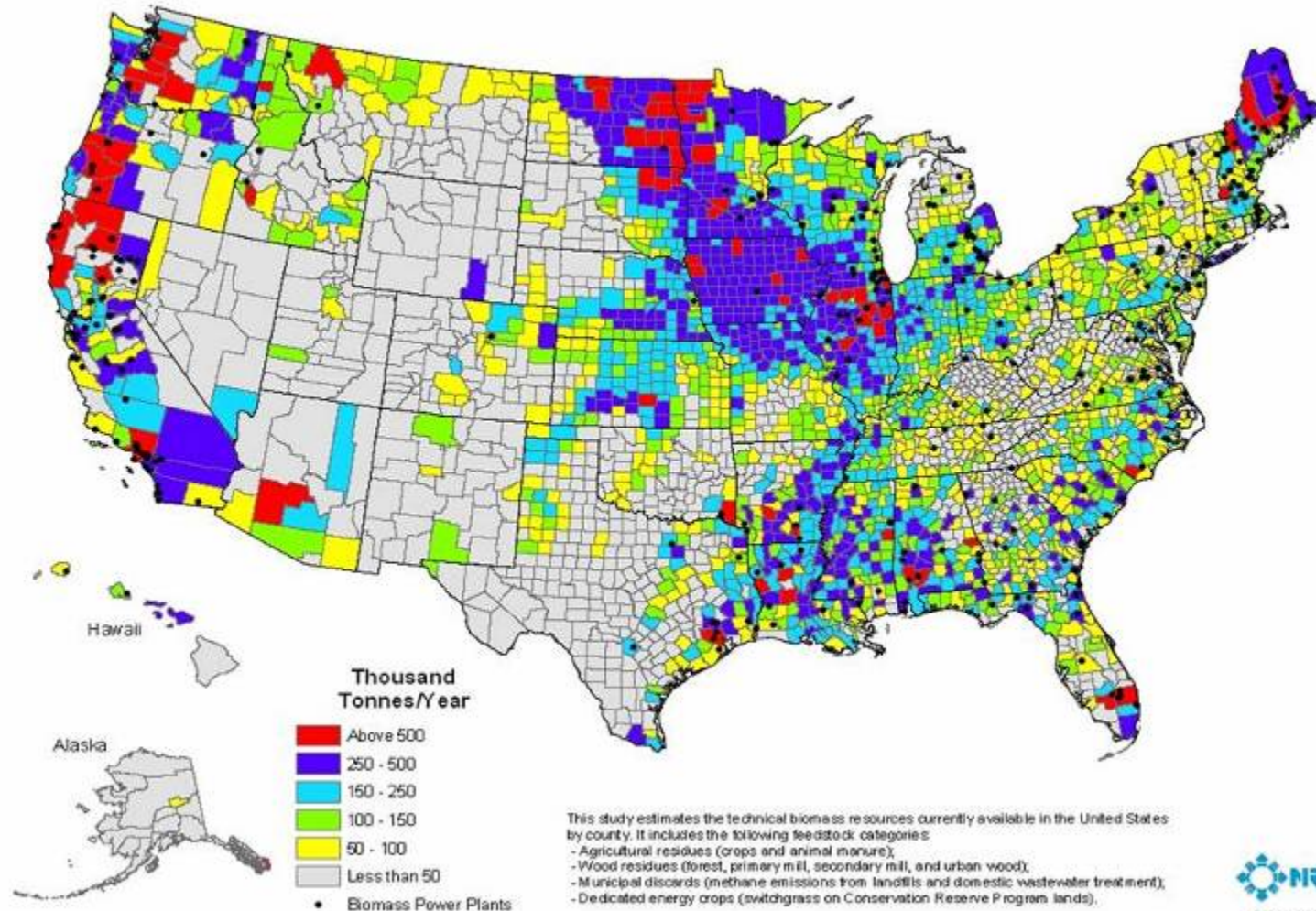
- Forested lands w/ little or no risk
- Risk of mortality
- Hot data gaps**
- Water

Printing Date: September 22, 2006

Agricultural and Wood Residues



Biomass Resources Available in the United States



Sustainability and Bioenergy



- Forest Resource Issues
- National Policy
- State Policy
- Public Interest



- Sustainability- Energy, Environment, Economy

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

Thank you!



Contact Information:

(970) 295-5947

mpattonmallory@fs.fed.us



For more information, please visit:
<http://www.fs.fed.us/woodybiomass>