



# 2010 USDA Agricultural Outlook Forum

## Biomass for Energy & Conservation: Can We Do Both?

Sustainability of Woody Biomass:  
From Slash to Hybrid Plantations

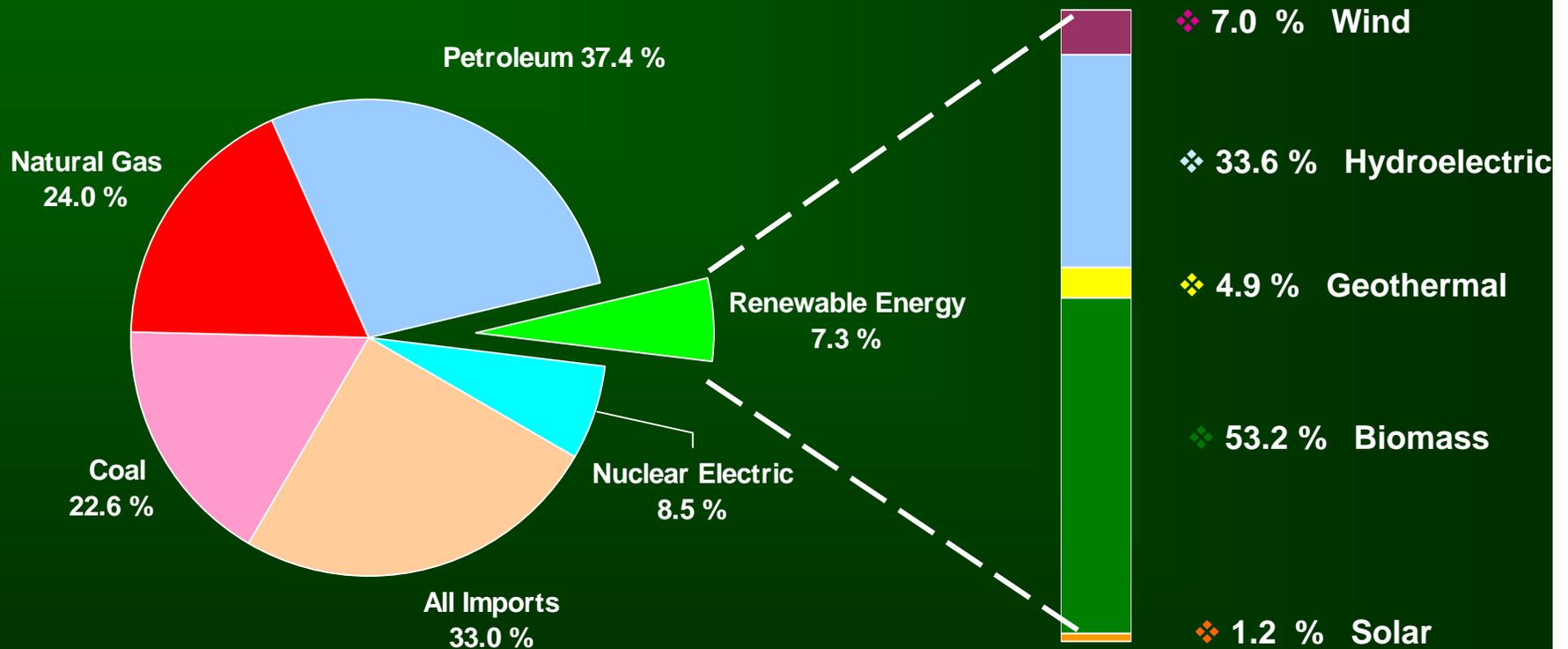
Carlos Rodríguez-Franco  
Forest Management Sciences Director  
US Forest Service R&D

Washington, DC February 18, 2010

# U.S. Energy Consumption Overview 2008

Energy Consumption = 99.304 Quadrillion Btu

Renewable Energy Total = 7.30 Quadrillion Btu



★ 70% of biomass is wood based

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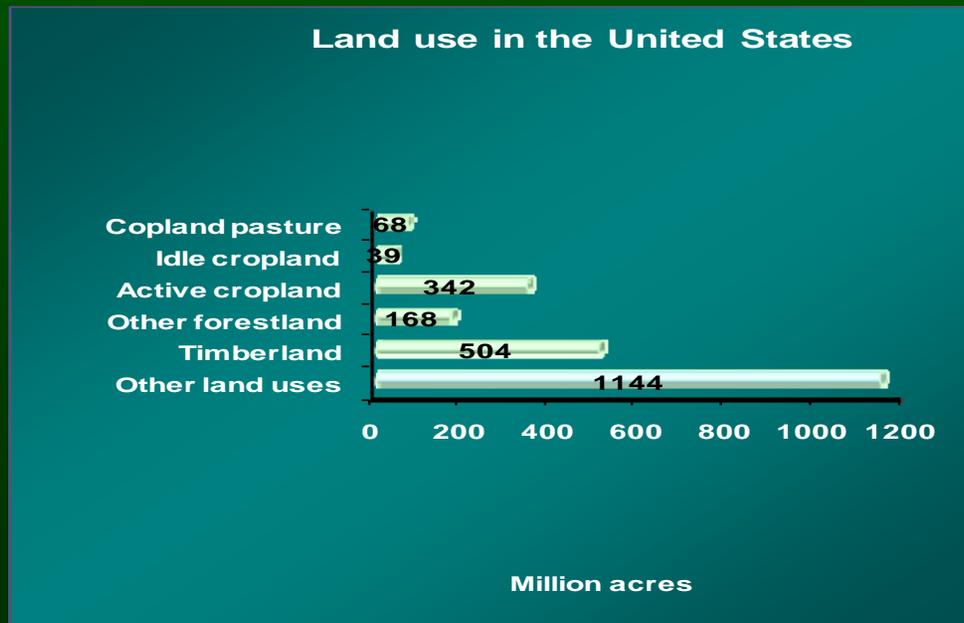


# The Biomass Feedstock Resource Base

- About one-half of the land in the contiguous U.S.
  - Forestland resources -- 504 million acres of timberland, 168 million acres of other forestland
  - Agricultural resources -- 342 million acres cropland, 39 million acres idle cropland, 68 million acres cropland pasture

## Forest resources

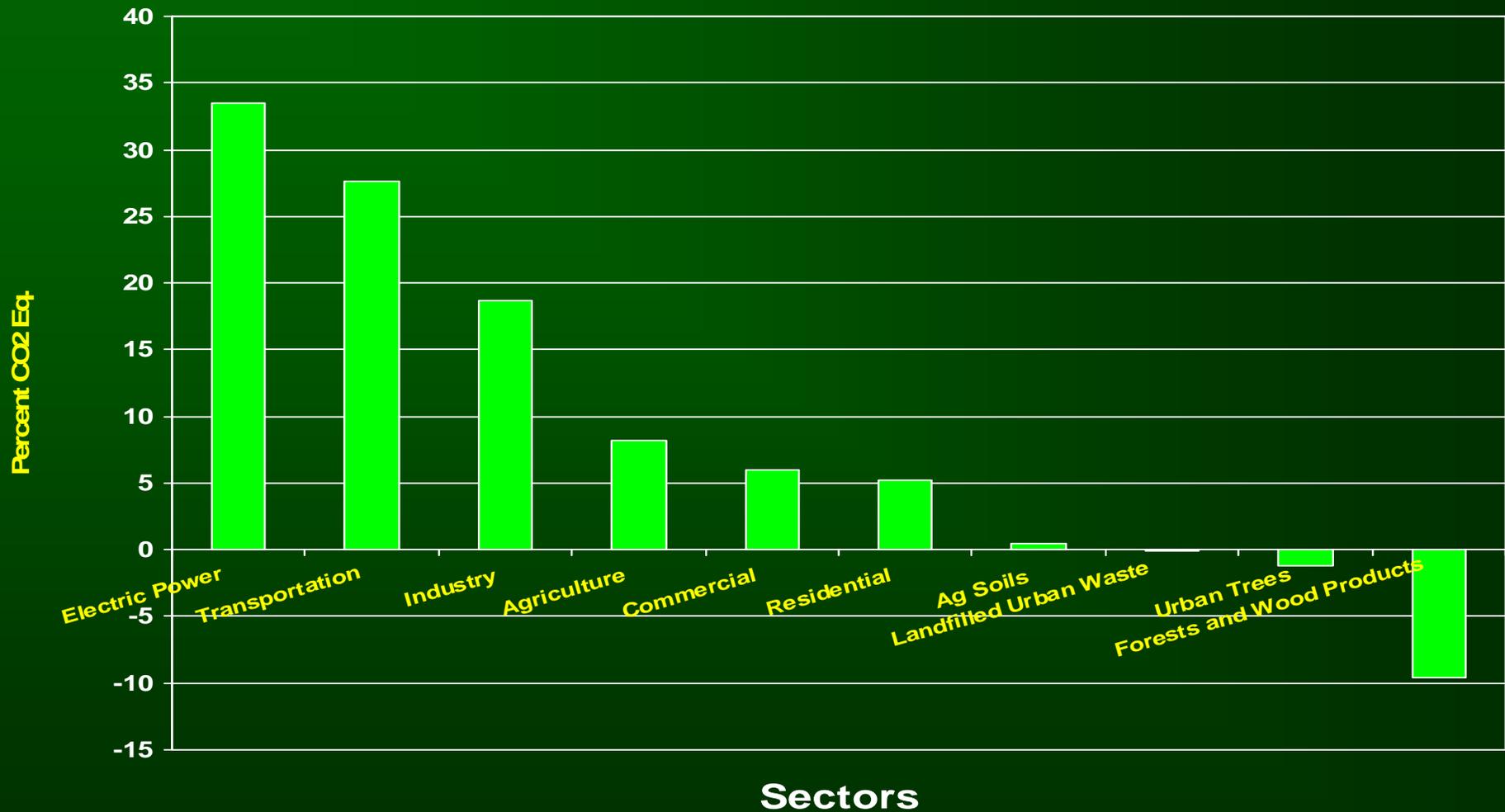
- Logging residues and other removals
  - Traditional logging activities
  - Cultural operations on timberlands
- Forest thinnings (fuel treatments)
  - Timberland
  - Other forestland
- Industry processing residues
  - Primary wood processing mill wastes
  - Secondary wood processing mill wastes
- Urban wood wastes
- Fuelwood
- Pulping liquors (black liquor)
- Conventional Forestry
- Short Rotation Woody Crops



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# Percent Total US GHG Annual Emissions by Sector (2005)



Note: Negative numbers denote sequestration; forests, trees and wood products sequester 11% US GHG emissions annually  
Source: <http://www.epa.gov/climatechange/emissions/downloads06/07ES.pdf>

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# Forests

## A Strategic Asset

- **Energy security**
- **Environmental quality**
- **Economic opportunity**

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# Natural Resource Management

**Environment**

- Climate Change
- Stand Function
- Sustainability

**Energy**

- Renewable
- Secure
- Sustainable

**Biomass Management and Use**

**Economy**

- Costs
- Rural Development
- Global Competition

Water

Land

Air

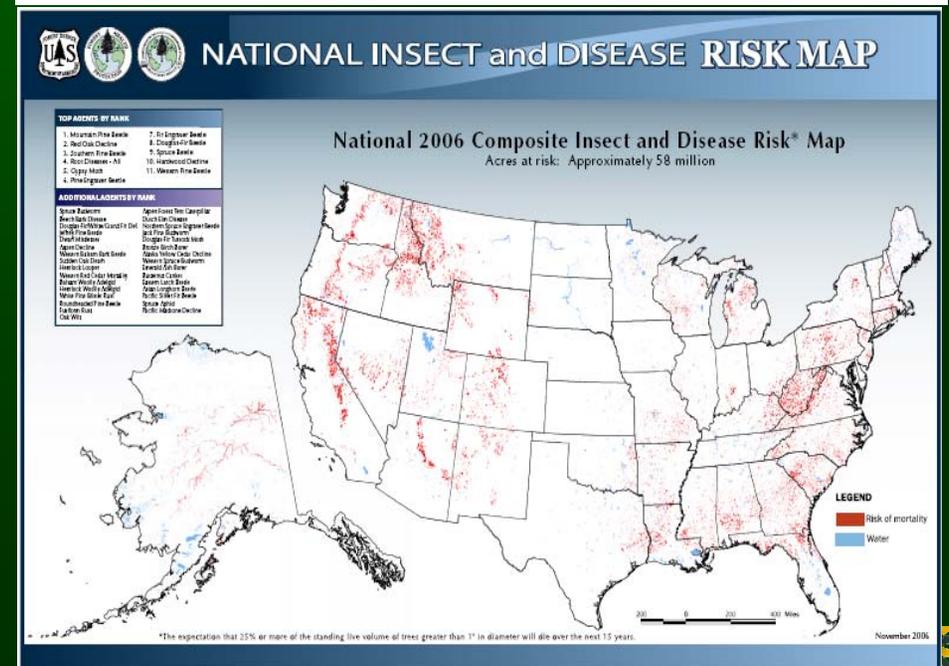
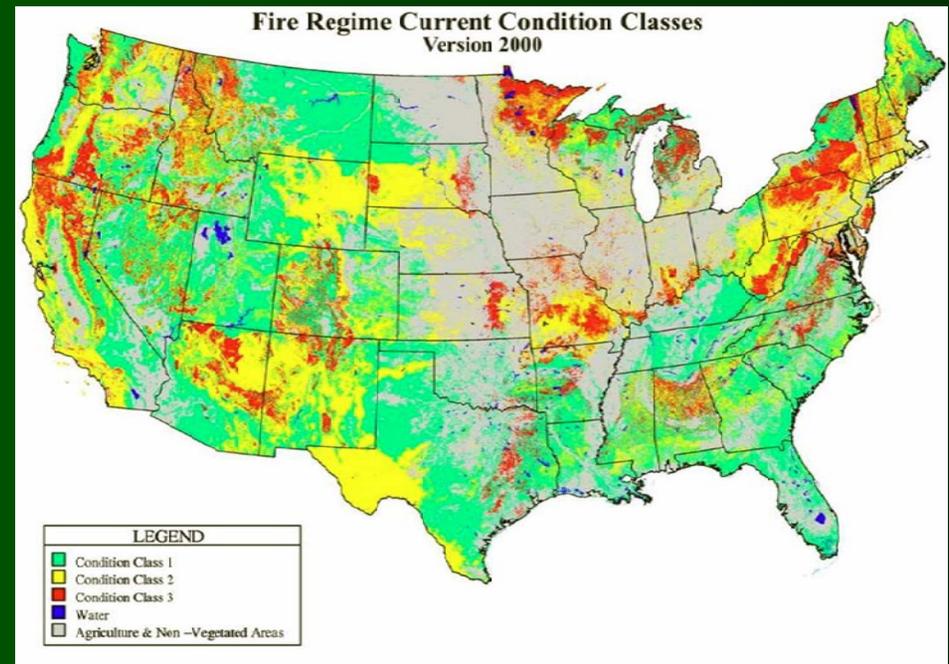
Infrastructure

Working Lands

Conservation & Utilization

## Points to Ponder

- Large volumes of biomass
  - ❖ Fire risks
  - ❖ Declining health
  - ❖ Reduction of services
  - ❖ Many forms and shapes
  - ❖ Can produce even more
- Declining infrastructure
  - ❖ Industry decline
  - ❖ Offshore investments and imports
  - ❖ Worker (capacity) shortage
  - ❖ Reduced investments
- Markets and barriers
  - ❖ Cyclic booms and busts
  - ❖ No markets
  - ❖ Higher costs
  - ❖ Very distributive



# From Slash to hybrid plantations Opportunity and Potential



Photo: Jake Eaton, Podatch Corporation



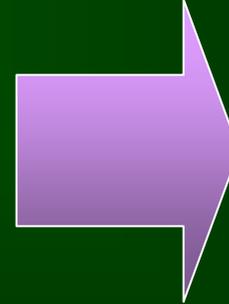
## Feedstock

- Forest Residues
- Hazardous Fuel Treatments
- Short Rotation Woody Crops
- Wood Waste
- Conventional Forestry
- Mill Wastes & Residues



## Conversion

- Manufacturing
- Co-firing
- Combustion
- Gasification
- Hydrolysis
- Digestion
- Pyrolysis
- Extraction
- Separation



## Uses

### Fuels:

- Ethanol
- Other Liquid Fuels
- Hydrogen

### Electricity and Heat

### Biobased Products

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

# Desired Resource Outcome

- **Forest systems**
  - ❖ **Healthy**
  - ❖ **Productive**
  - ❖ **Supply goods, services, and values**



# We will expect forests to produce

- ✓ **Wood**
- ✓ **Water**
- ✓ **Non-wood products**
- ✓ **Recreational opportunities**
- ✓ **Habitats**
- ✓ **Wildlife and Fish**
- ✓ **Climate change mitigation**
- ✓ **Energy**

# So we must

- **Manage through changing conditions**
  - ❖ **Environmental**
  - ❖ **Economic**
  - ❖ **Supply and demand**
  - ❖ **Global economy**
- **Continue to supply goods, services, and values**
- **Including energy**

# Our challenge

- NOT merely
  - ❖ Sustaining existing systems
  - ❖ Restoring selected systems
- IS ALSO
  - ❖ Enhance capacity of systems to meet future resource needs
  - ❖ Managing systems to provide for increasing levels of a variety of benefits

# Woody Biomass

- **Derived from any and all parts of trees**
  - ❖ **Bole, limbs, tops, roots, foliage**
- **Insect-, disease-, or fire- damaged or killed**
- **Purpose-grown wood for energy**
- **Conventional forestry**
- **Pre- and post consumer paper and wood products**
- **Pulping liquors**

# Considerations

- **Resource availability, sources, production and management, feedstock supply components**
- **Harvesting and operations technologies, in-forest pre-processing technologies, transportation**
- **Conversion technologies, feedstock characteristic needs, conversion efficiencies, costs**
- **Integrated management systems**
- **Information, data, decision tools**
- **Development/deployment of biomass energy facilities**

# Challenges

- **Provide quantities of wood needed for energy**
  - ❖ **Increase the supply of renewable and alternative fuels to 35 billion gallons by 2017<sup>1</sup>**
  - ❖ **Renewable Fuels Standard 36 Bgal biofuels/year by 2022 with 20 Bgal non-corn<sup>2</sup>**
  - ❖ **President Obama<sup>3</sup> called for doubling renewable energy production (2009). The President also created the Biofuels Interagency Working Group (Biofuels 2009), which is charged with:**
    - **Developing the Nation's first comprehensive biofuel market development program;**
    - **Coordinating infrastructure policies affecting the supply, secure transport, and distribution of biofuels; and**
    - **Identifying new policy options to promote the environmental sustainability of biofuels feedstock production**
- **Maintain & enhance forest health and productivity**
  - ❖ **Ensure conservation & sustainable delivery of wood products and other benefits**
  - ❖ **Avoid/mitigate potential negative impacts**
  - ❖ **Capitalize on benefits working forests provide in the landscape**
- **Reduce Costs & increase efficiency**
  - ❖ **Feedstock production & management**
  - ❖ **Harvest, collection & delivery**
  - ❖ **Conversion processes**
- **Reduce Investor Risk**

<sup>1</sup> 2007 State of the Union Address

<sup>2</sup> EISA 2007 (Energy Independence and Security Act of 2007)

<sup>3</sup> Obama, B. 2009. [Speech]. February 24. Address to Joint Session of Congress. Washington, DC. President of the United States.

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# Some Critical Information In Hand

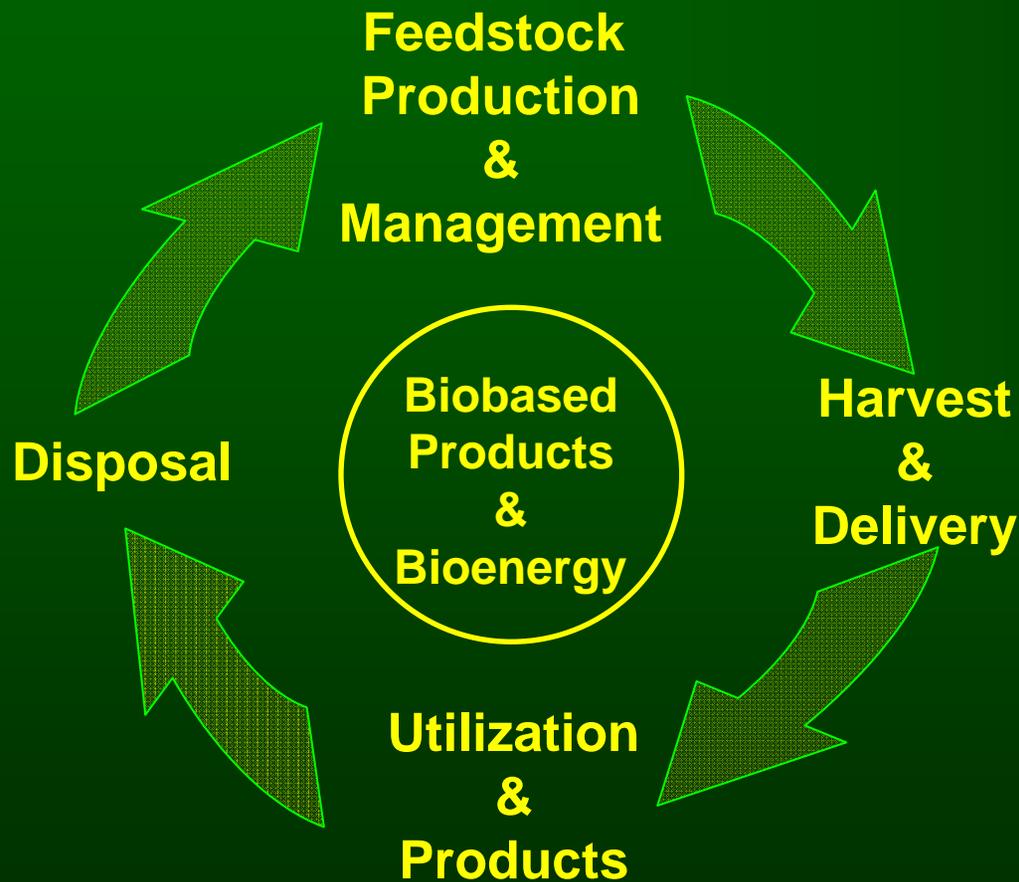
- **Resource Assessments**
  - ❖ **Billion Ton Report**
  - ❖ **Resources Planning Act Assessments**
  - ❖ **Regional Assessments**
  - ❖ **FIA**
- **Life Cycle Analyses**
  - ❖ **CORRIM**
- **Soil Productivity**
  - ❖ **National Long Term Soil Productivity Study**
  - ❖ **Soil carbon syntheses**
  - ❖ **Whole-tree logging and harvest impact studies**
- **Water quality**
  - ❖ **Best Management Practices (42 states)**
- **Habitat and biodiversity studies**
- **Forest Certification Programs**

\* Items listed as examples – not exhaustive

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# Integrated Biobased Products And Bioenergy Approach



- Research & Development
  - Synthesis
  - Development of
    - options
    - strategies
    - systems
    - practices
- For sustainable goods,  
services, & values

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# Critical Research

- **Management and utilization systems for forest biomass and residues, forest health and fuels reduction treatments, and production forests**
- **Science and technology for woody cropping systems at multiple operational scales**
- **Management and land use systems for specific functions (designed forest systems)**

# Critical Research (cont)

- **More efficient, light-on-the-land harvest, collection, and transportation systems**
- **Highly productive feedstocks with improved water- and nutrient-use efficiencies**
- **Efficient technologies for wood conversion to biofuels and bioproducts**
- **Life cycle analysis of integrated systems**

• • • **Sustainability**

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# IEA BIOENERGY

- **TASK 31: Biomass Production for Energy from Sustainable Forestry**
  - 8 Countries: USA, Canada, United Kingdom, Finland, Sweden, Denmark, Norway, Germany, Netherlands
  - Two State-of-the Science books from Tasks A6 and 31

## TASK 31

Richardson et al. **2002**. Bioenergy from Sustainable Forestry: Guiding Principles and Practices.

## TASK A6

Dyck et al. **1994**. Impacts of Forest Harvesting on Long-Term Site Productivity.



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<http://www.ieabioenergytask31.org/>

# IEA BIOENERGY

- **TASK 30: Short Rotation Crops for Bioenergy Systems**
  - 5 Countries: Brazil, Canada, Australia, New Zealand, Sweden, United Kingdom, USA



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*Science You Can Use*

**Questions?**

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