

# Bioenergy and Biobased Products Research & Development

*US Forest Service Activities*

**Marilyn Buford**  
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# Forest Service R&D Mission

- **Improve the health and use of the Nation's forests and rangelands**
  - ~750 million acres forest;
  - ~587 million acres range/grassland



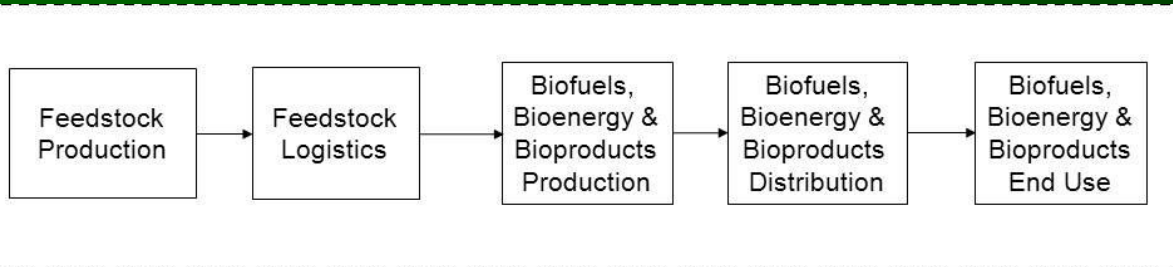
# Forests: A Strategic Asset

- **Energy Security**
- **Environmental quality**
- **Economic opportunity**

# Challenge

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

# Sustainability Across the Supply Chain



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



Harvest  
Collection  
Transportation



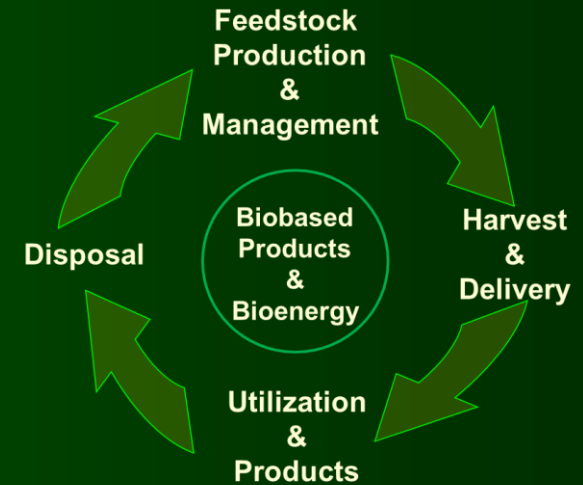
Manufacturing  
Co-firing  
Heat & Power  
Combustion  
Gasification  
Hydrolysis  
Digestion  
Pyrolysis  
Extraction  
Separation



Liquid Transportation  
Fuels  
Hydrogen  
Electricity and Heat  
Composites  
Specialty Products  
New Products  
Chemicals  
Traditional Products



Transportation  
Fuels  
Chemicals  
Electricity  
Heat  
Other Products

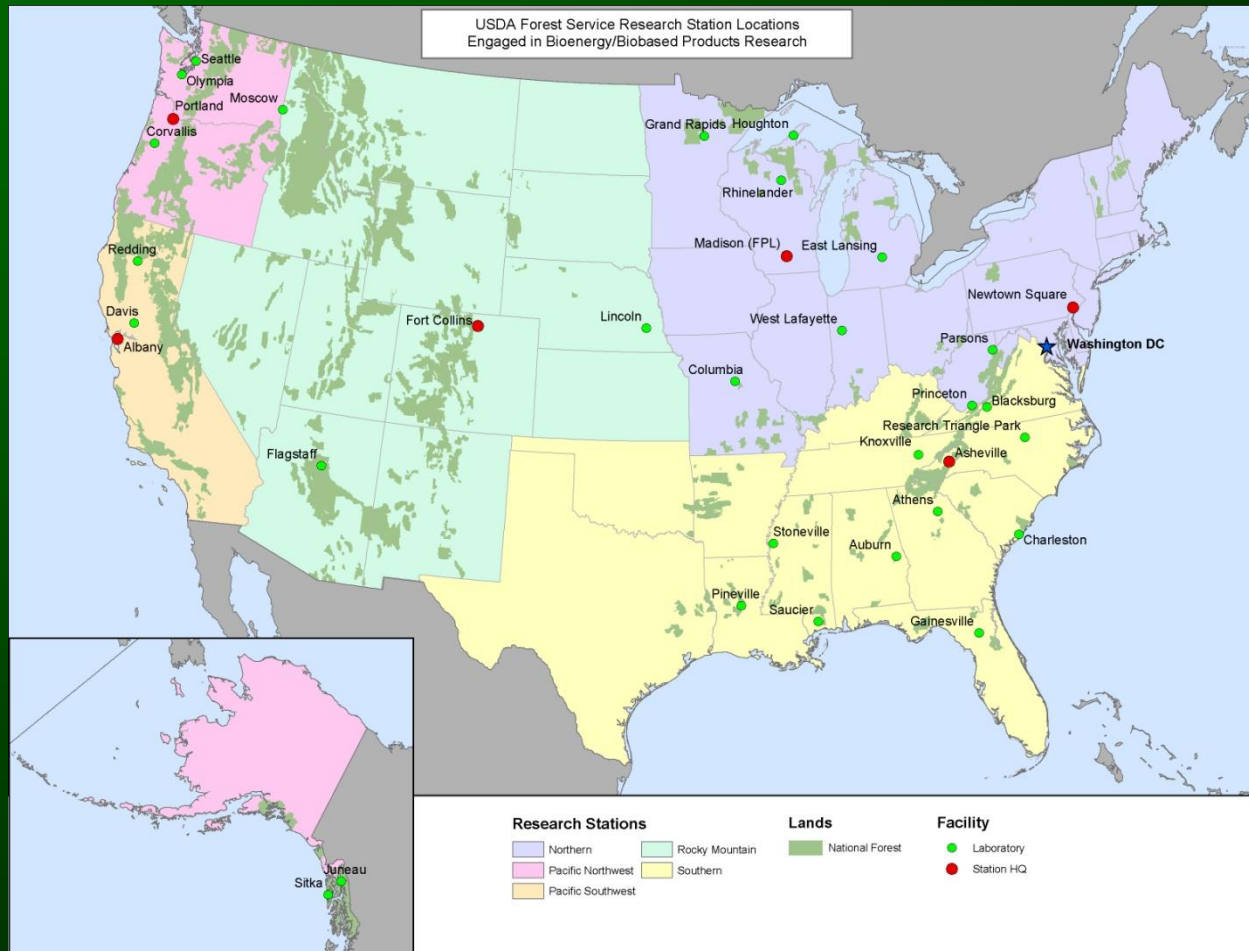


## Develop & Deploy

- options
- strategies
- systems
- practices
- products

To Deliver:  
sustainable goods,  
services, & values

# FS Energy R&D Locations (USDA Centers)



## FS R&D Emphasis: Sustainable Production & Management

- Southeastern – logistics, operations, transport, srwc, sustainable productivity
- Northern – conversion/products, srwc
- Northwestern – fuel reduction, sustainable productivity, srwc



# Sustainable Production and Management Research

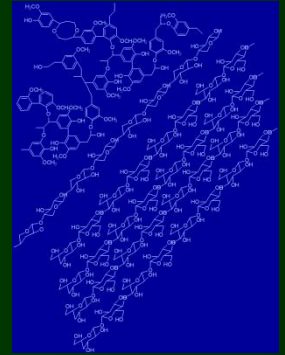
- Sustainable Soil Productivity
- Integrating Feedstock Production into Forest Management Systems
- Short Rotation Woody Crops
- Forest Operations Research
- Best Management Practices





# Conversion and Bioproducts Research

- Lignocellulosic constituent chemistry
- Wood to biofuels conversion
  - Thermochemical
  - Biochemical
- Biorefinery Technologies/VPP
- Cell wall and intermediates

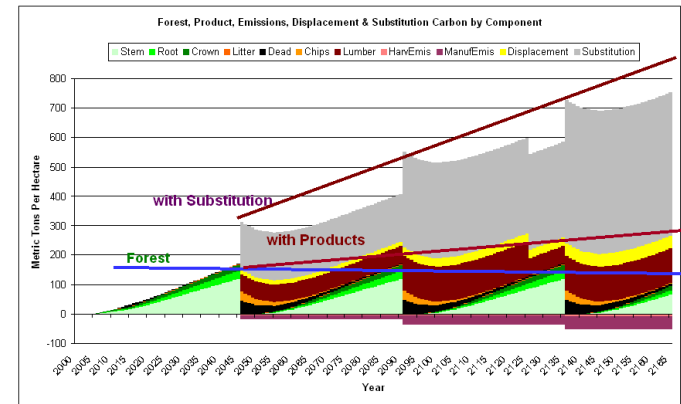




# Decision Support and Policy Analysis Research

- Lifecycle analysis
- Siting models
- Sustainability criteria
- Operations cost reduction models
- Integrated land use and markets models

Carbon as the Sustainability Metric: from Forest, Product and Substitution Pools (concrete frame vs wood)



The screenshot shows the 'Fuel Reduction Cost Simulator-South' software interface. The configuration panel includes the following fields:

- System Type: Ground-Based Manual WT
- Cut Type: Partial Cut
- Location (State): Arkansas
- Yard/Skid/Forward Slope Dist (ft): 1000
- Percent Slope: 3
- Elevation: 0
- Change Machine Costs (\$/PMH): Bundler
- Residue Handling:  Include the costs of collecting and chipping residues.
- Loading Costs:  Include loading costs
- Move-In Costs:  Include move-in costs
- Area treated: 1 acres
- One-way move-in distance: 0 miles
- Tree Characteristics:
 

	Chipped	Small Log	Large Log
Green wood density (basal)	0	0	0
Residue Fraction	0	0	0
Hardwood Fraction	0	0	0

The 'Results List' table is as follows:

Cut Tree Table			Results List		
Chip Trees		Small Log Trees	Large Log Trees		
Trees/acre	Vol/tree (#3)	Trees/acre	Trees/acre	Vol/tree (#3)	
					\$/CCF
					\$/Ton
					\$/Acre
					Calculati
					Clear Data
					Report Page



# Research Activities

- **Production/Management**
  - Productivity and long-term sustainability
  - **BMP development**
  - **Genomics and plant development**
  - **Sun Grant Initiative – Short Rotation Woody Crops**
  - **Water Quality R&D – Southwide Catchlight (Weyerhaeuser) Study**
  - **SRWC Research Coop at DOE Savannah River Site**
  - Multi-cropping and integrated crop management
- **Logistics**
  - **New Equipment to Reduce Handling Costs of Woody Biomass**
  - **Cost data and systems analysis**
- **Conversion**
  - Tech Transfer Agreement signed with Catchlight Energy LLC for pretreatment technology
  - Bioenergy alternative (fast pyrolysis and biochar) to on-site slash pile burning
  - Northwest Advanced Renewables Alliance research partner
- **Analysis, Economics, and Modeling**
  - **Billion Ton Report Update partner**
  - **CORRIM Partner**
  - **BIOSAT, POLYSYS Module, BIOSUM, FRCS**
  - Transportation
- **IEA Task 43 – US Rep is FS R&D**
- **Internal Competitive Grants Program**
- **Contributed conceptually and materially to GBEP process**
- **BRD Board IWGs (Feedstock Production, Logistics, Conversion)**

# Critical Research Outcomes

- **Since 2010, in excess of 100 publications advancing science and technology in biomass production and management systems, biofuels and bioproducts, and decision support/policy analysis research.**
- **Reduce investor risk and significantly contribute to U.S. energy security, environmental quality, and economic opportunity**

**Thank you**

