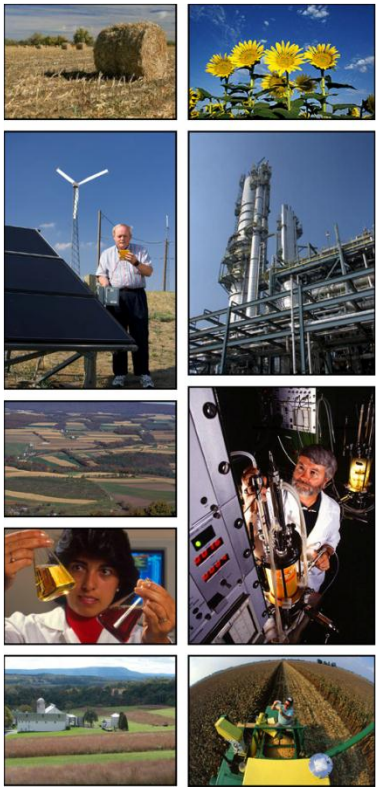


USDA Biomass Research Centers - ARS Contributions

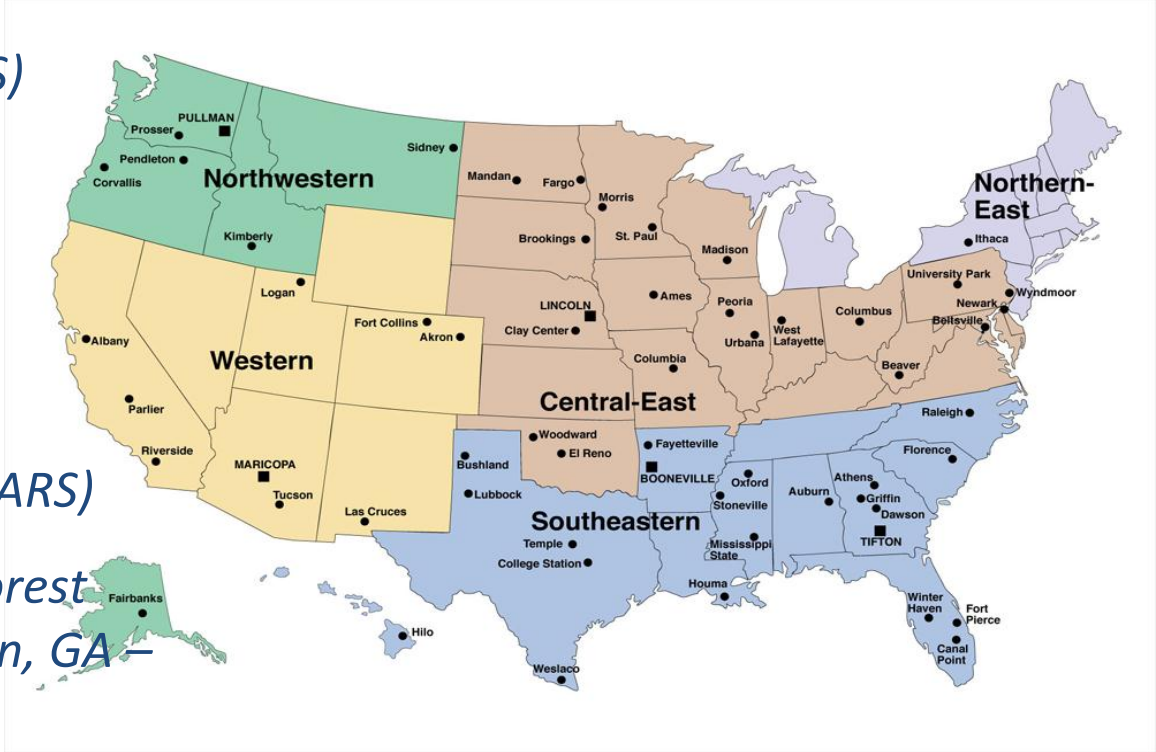
Biomass Research and Development Board
Technical Advisory Committee
Arlington, Virginia
May 19, 2011

Jeffrey J. Steiner, National Program Leader
Biomass Production Systems
USDA Agricultural Research Service

USDA Regional Biomass Research Centers

Hubs and Agency Leadership

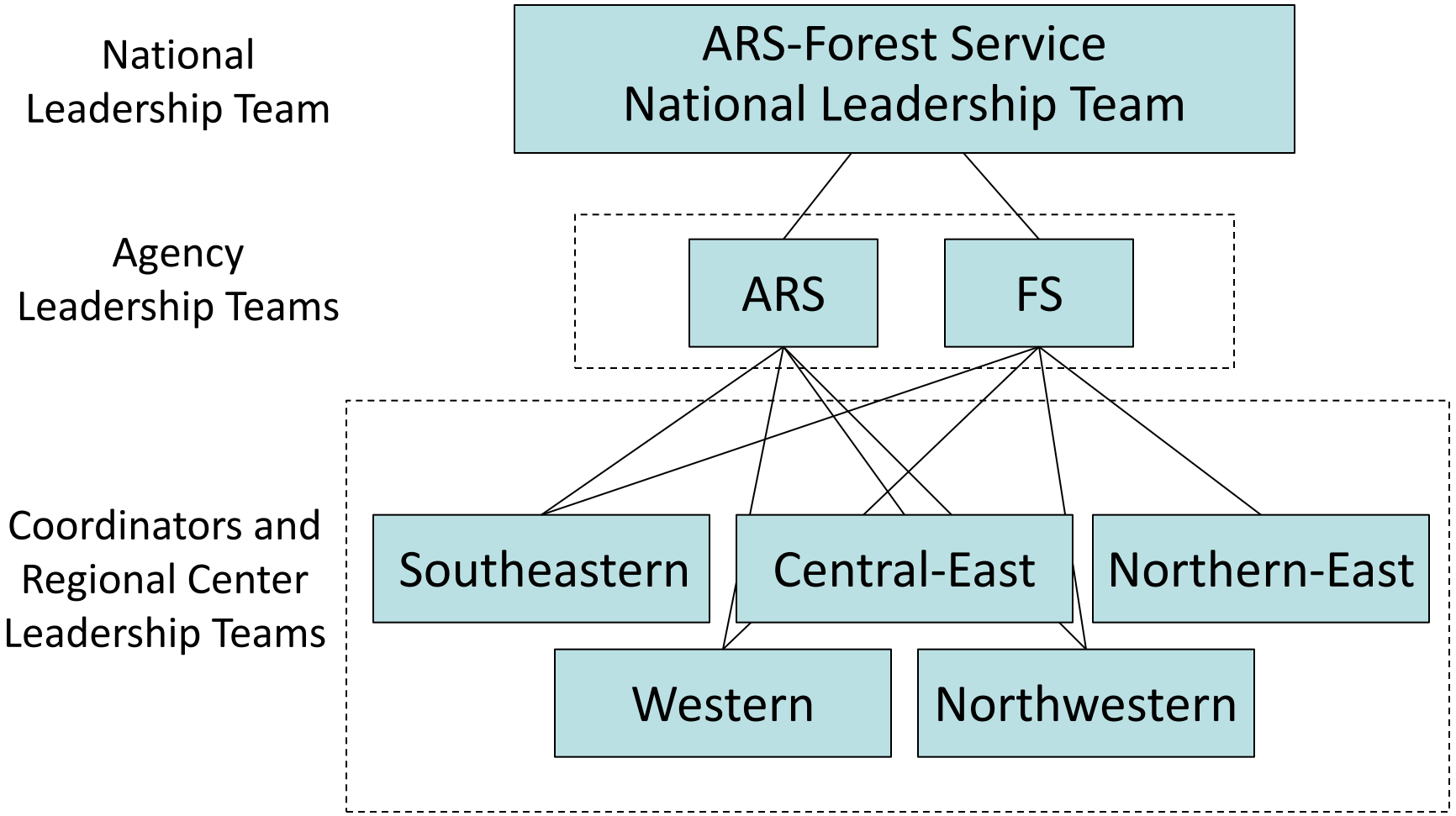
- **Central-East** *(Lincoln, NE – ARS)*
- **Northern-East** *(Madison, WI – Forest Service)*
- **Western** *(Maricopa, AZ – ARS)*
- ***Northwestern*** *(Corvallis, OR – Forest Service; Pullman, WA – ARS)*
- **Southeastern** *(Auburn, AL – Forest Service ; Booneville, AR & Tifton, GA – ARS)*



USDA Regional Biomass Research Centers

- Networks of existing ARS and FS research locations.
- Leverage current USDA nation-wide capacity to lead sustainable biomass production research.
- Coordinate ARS and FS research occurring across different locations into a comprehensive program.
- Coordination of intramural research agency and NIFA's AFRI Bioenergy Coordinated Agricultural Projects (CAP), and other extramural region-based projects.

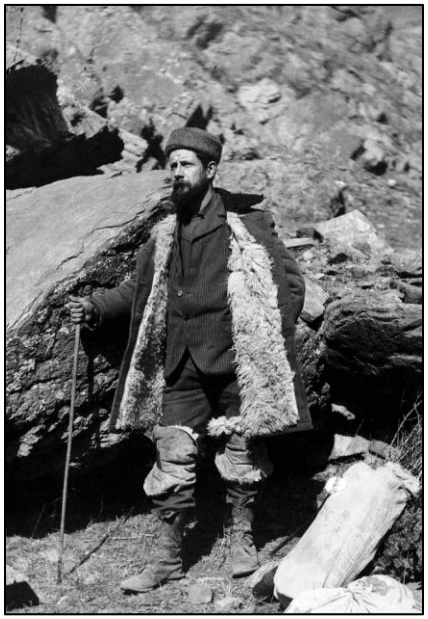
Leadership of the Biomass Research Centers



Sustainable Biomass Production Research Objectives

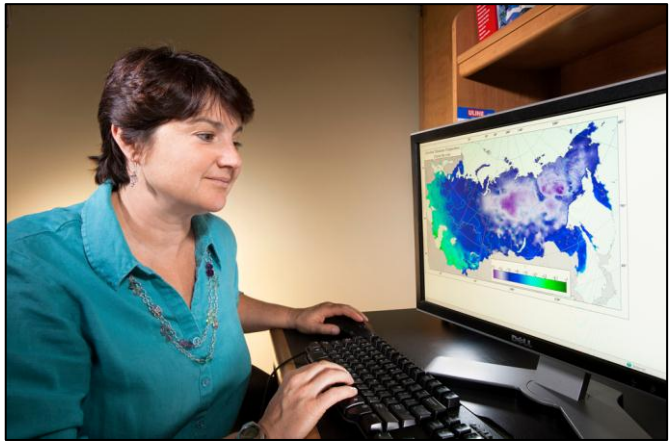
- Increase biomass production efficiency to increase grower profits and reduce biorefinery transaction costs
- Optimally incorporate biomass and other dedicated feedstocks into existing agriculture and forestry-based systems
- Address the uncertainties of expanded production up-front to avoid negative impacts on existing markets and ecosystem services
- Develop and utilize new value-added coproducts to help enable commercially preferred biorefining technologies

Plant Exploration & Germplasm Resources



Plant exploration – China 1908

Germplasm collection management



Germplasm distribution from Regional Plant Introduction Station

Feedstock Development

Feedstock Production

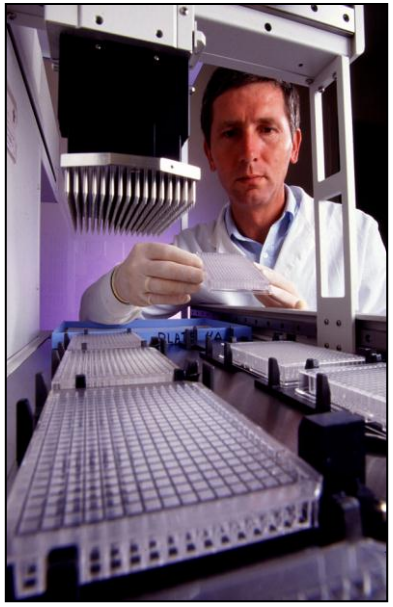
Feedstock Logistics

Biofuels Conversion

Fuel Testing & Approval

Large Scale Deployment

Genetic Mapping and Genetic Improvement



Recently developed genomic map

Breeding cultivars with improved biomass conversion yields

Feedstock Development

Feedstock Production

Feedstock Logistics

Biofuels Conversion

Fuel Testing & Approval

Large Scale Deployment

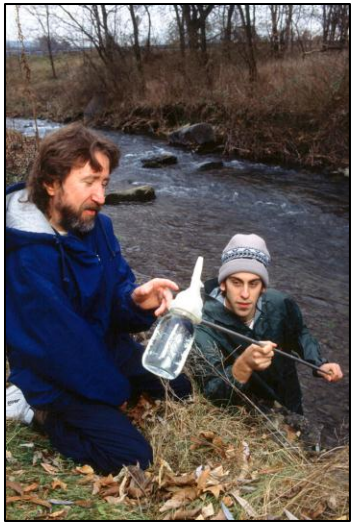
Incorporating Biomass into Existing Systems

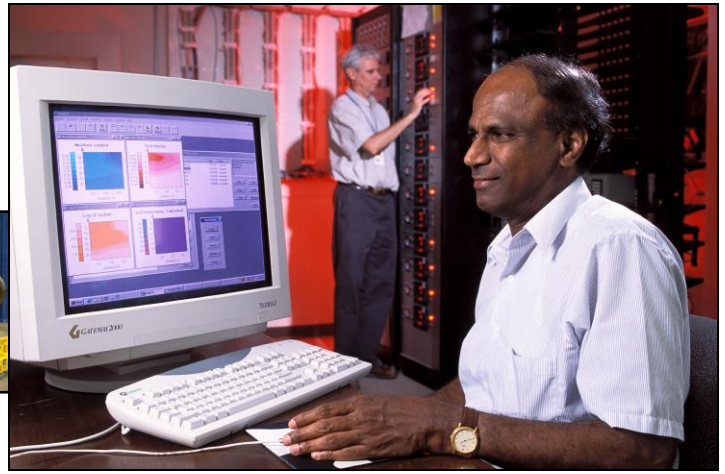
Feedstock Development | Feedstock Production | Feedstock Logistics | Biofuels Conversion | Fuel Testing & Approval | Large Scale Deployment

Addressing Uncertainties of Expanded Production

GHG assessment: carbon dioxide, nitrous oxide, and methane

Strategies to stop pollution for least cost





Feedstock Development

Feedstock Production

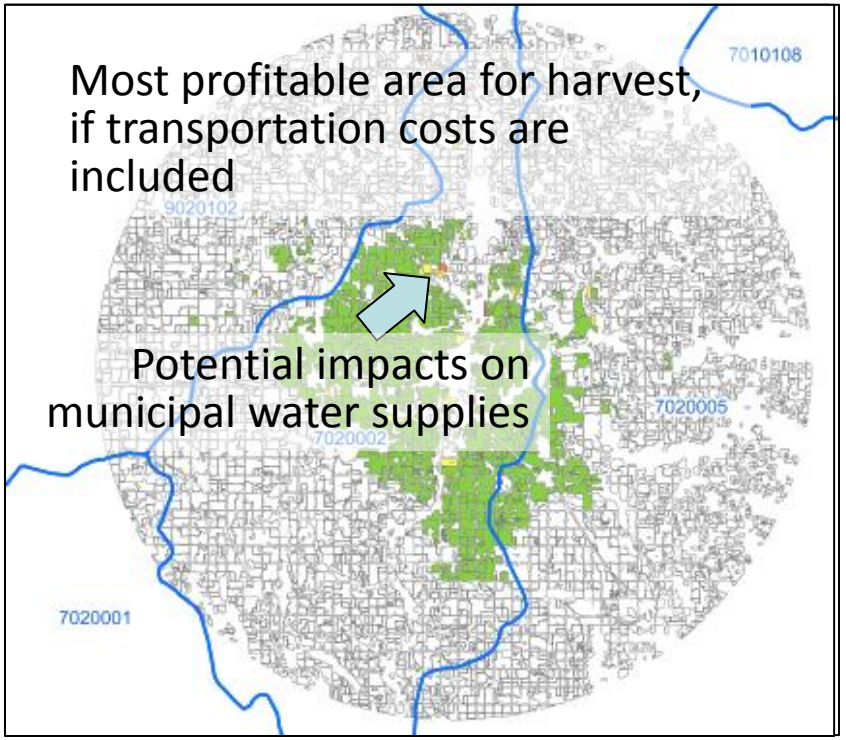
Feedstock Logistics

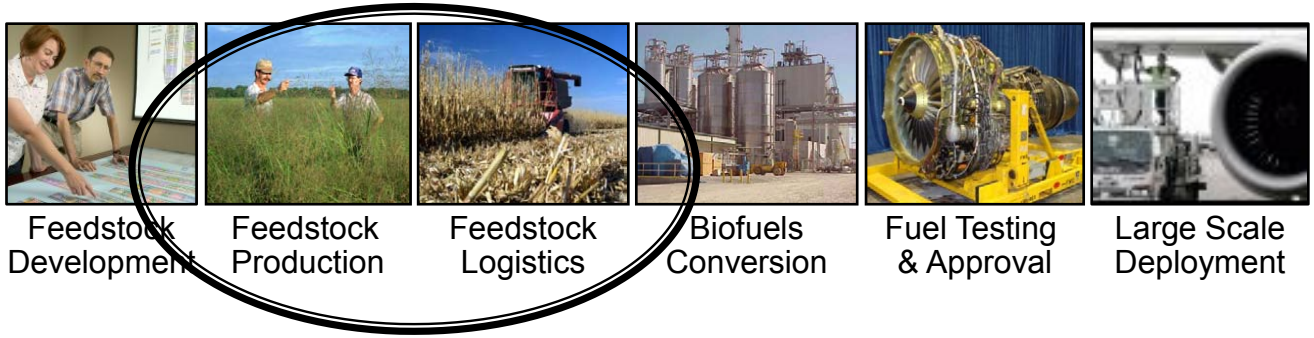
Biofuels Conversion

Fuel Testing & Approval

Addressing Uncertainties of Expanded Production

Sustainable Landscapes: Integrating production costs and impacts with logistics considerations – SWAPAE+H





Helping Enable Commercial Biorefining Technologies

New barley to ethanol process

Developing new fuel winterizing technologies

Optimizing biomass conversion processes

Feedstock Development

Feedstock Production

Feedstock Logistics

Biofuels Conversion

Fuel Testing & Approval

Large Scale Deployment

USDA Regional Biomass Research Centers
Emphasis on Partnerships

USDA service agency programs

Other Federal agencies

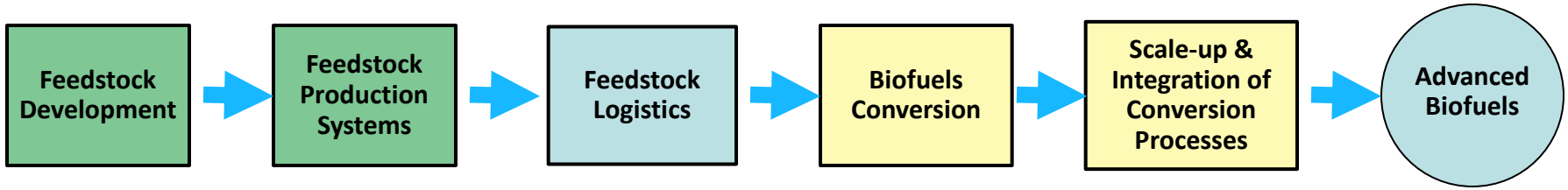
Land Grant and other universities

Partnerships that target 1890's, Tribal Nations, and Hispanic Serving Institutions

Commercial partnerships

Technology innovation partnerships

USDA and DOE Biofuels Research Domains



Current DOE OBP R&D

Algae Oil

Herbaceous Crops
Energy cane
Perennial grasses
Biomass sorghum

Woody Biomass
Purpose grown species
Harvest residues

Oil Seeds
Brassica species
High-oil soy & peanut

Feedstock Logistics:
Systems for harvesting, transporting, and pre-processing lignocellulosic feedstocks for entry into conversion facility

Conversion R&D:
Conversion of feedstocks into suitable fuel intermediates, through pyrolysis, gasification, or saccharification

Conversion R&D:
Catalysts or fermentation organisms for conversion of intermediates into hydrocarbon fuels

Process Optimization:
Eight Integrated Biorefinery projects that will demonstrate technologies to produce diesel and/or aviation biofuels

Current USDA R&D

Feedstock Logistics:
Harvesting, transportation and storage systems, pre-processing lignocellulosic feedstocks, optimal facility site placement and environmental impact assessment, modeling of feedstock supply availability & dependability

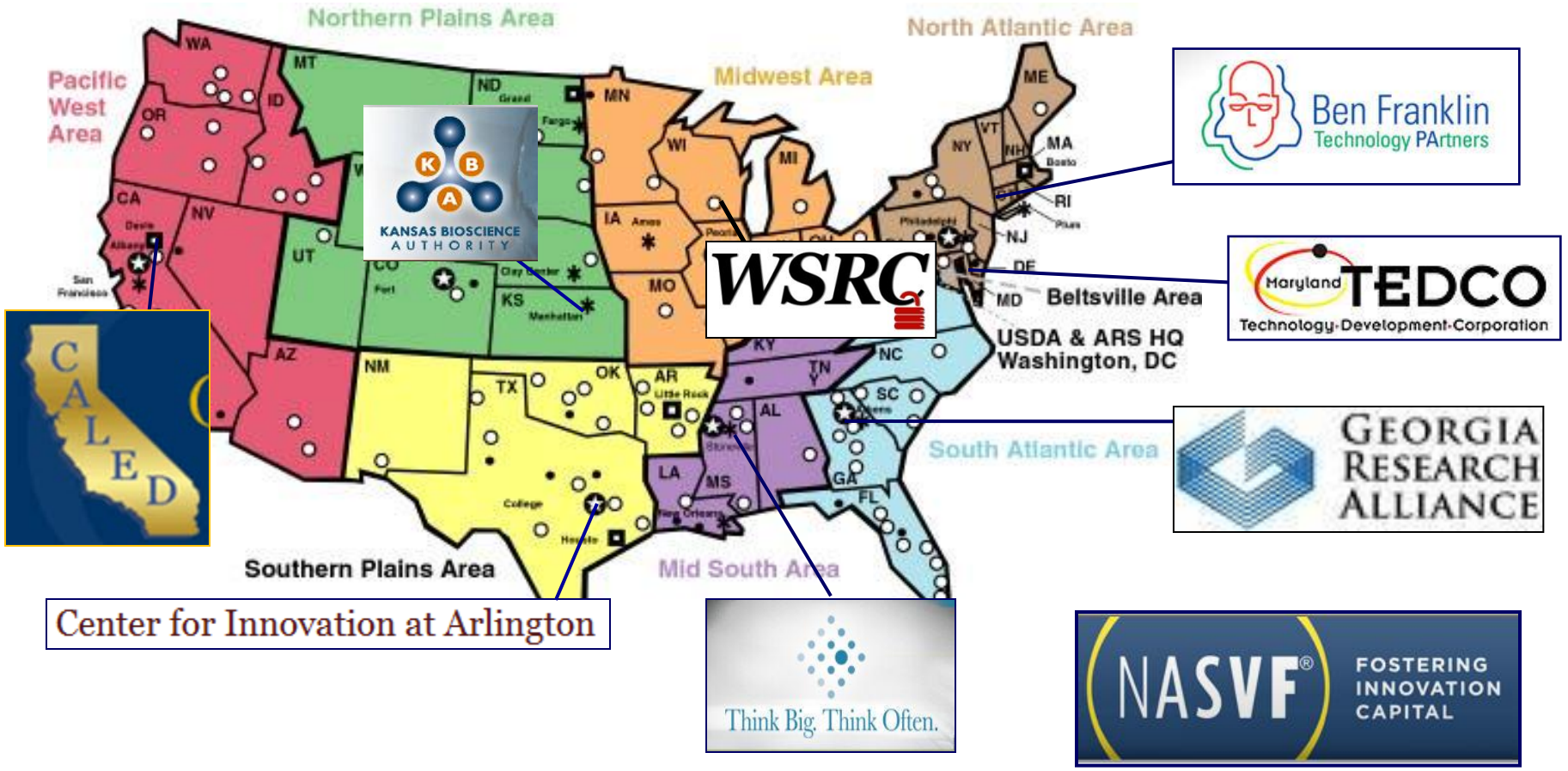
Conversion R&D:
Value-added co-product development and utilization

Conversion R&D:
Scaled technology for on-farm & in rural community fuel and power replacement

Supply Chain Optimization:
- Joint-funded USDA- NIFA/DOE-EERE Biomass Board 9008 Research Program
- AFRI Sustainable Biomass CAP
- SBIR Grant Program

USDA Regional Biomass Research Centers

Emphasis on Partnerships



Agricultural Technology Innovation Partnership Network

Coordinated Public and Private Efforts to Assist Commercial Development

Feedstock Development & Production

Advanced Fuels

It starts with the end in mind

Supply Chain Systems Approach

Feedstock Development

Feedstock Production

Feedstock Logistics

Biofuels Conversion

Fuel Testing & Approval

Large Scale Deployment

USDA Biomass Research Centers - ARS Contributions

Jeffrey J. Steiner, USDA-ARS

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301-504-4644

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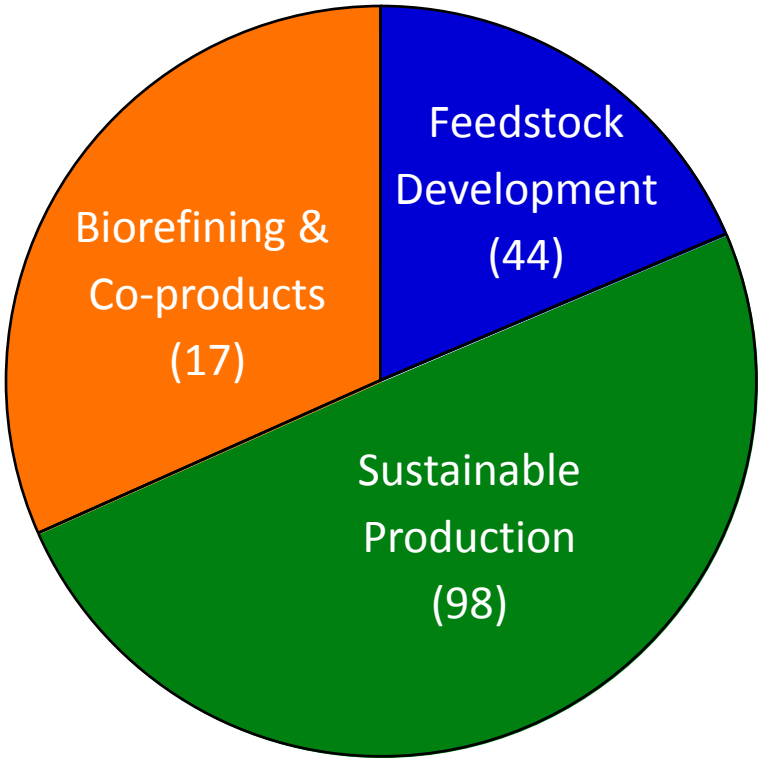
ARS Financial Support for Biomass Research Centers



Research component	Current	Current & contributing
	$-million	
Feedstock development	6.1	11.3
Sustainable production	9.8	30.2
Biorefining & co-products	17.9	19.2

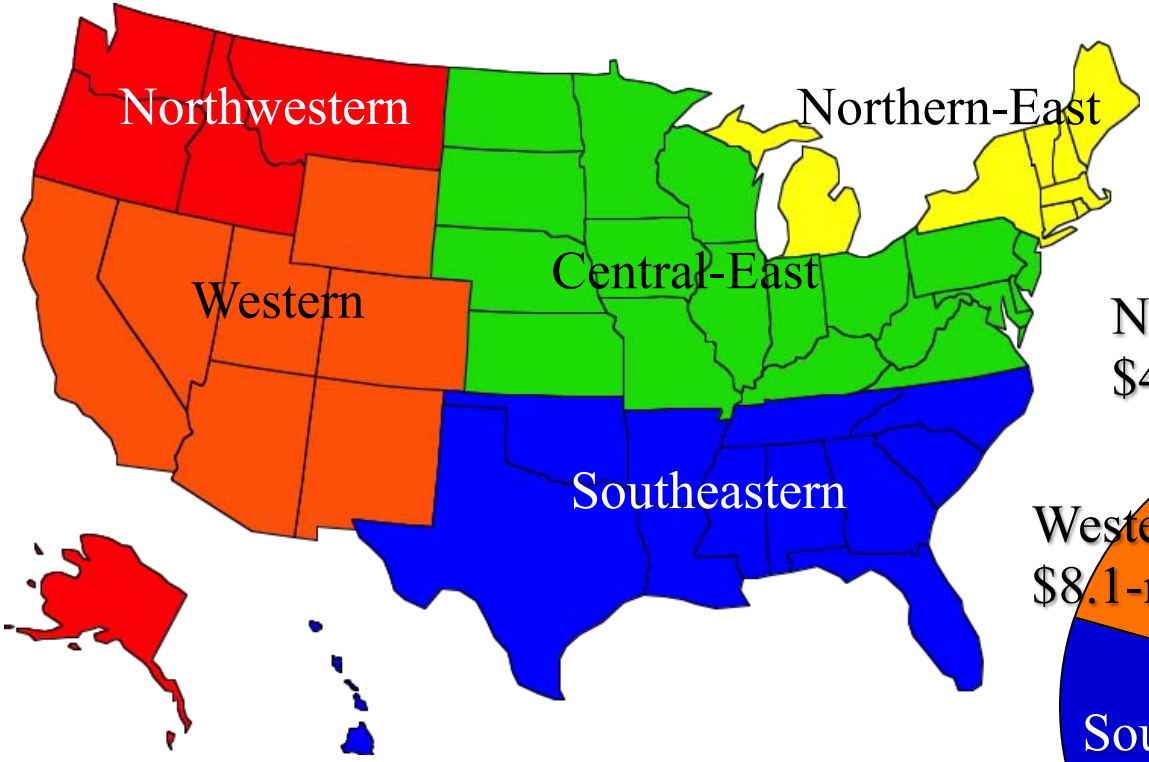
Identified 2010 current: $34-million; and current & contributing funding: $61-million, 147 projects (no funds or personnel moved)

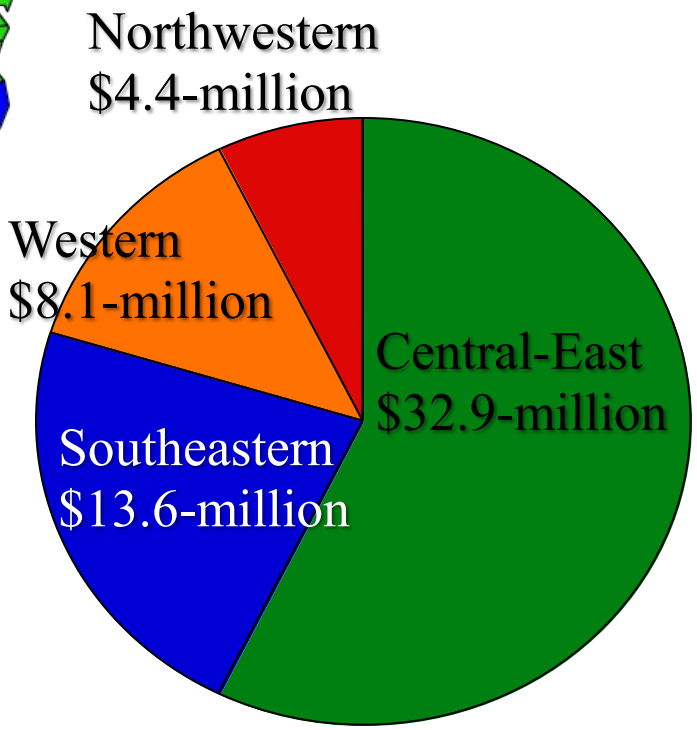
ARS Contributions to the USDA Biomass Research Centers

Projects current & contributing funding: $61-million, 147 projects (no funds or personnel moved)

Projects	Number	$-million	Percentage
Officially contributing	54	37.2	61.3
Ad hoc contributions	63	16.5	27.2
Identified for contributing	30	7.0	11.5

ARS Financial Support for Biomass Research Centers





2010 current and contributing funding