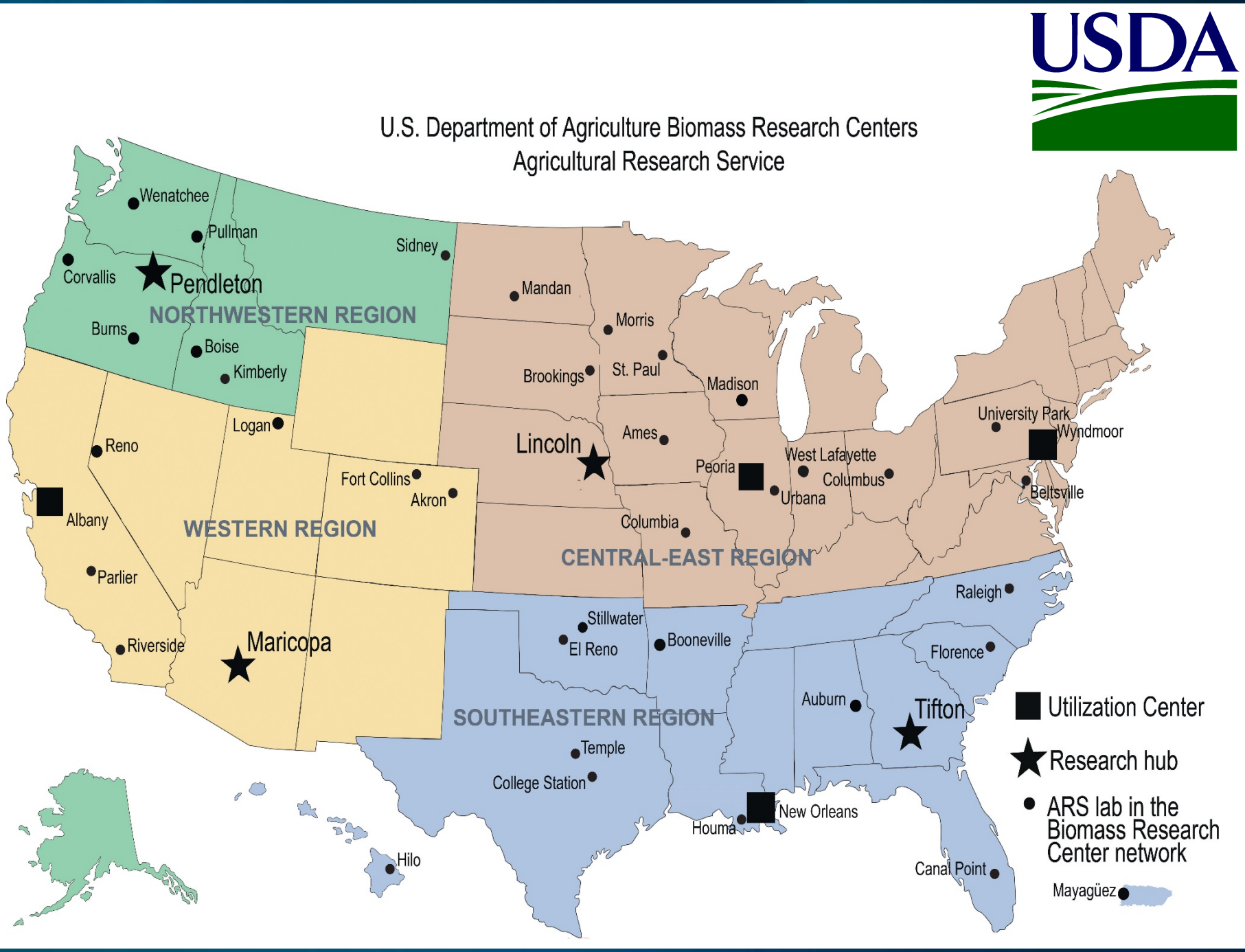
Feedstock Production, Development, and Utilization (Fuels and Products).

Gene Lester, Ph.D.
National Program Leader- Biorefining
USDA-Agricultural Research Service


USDA
U.S. Department of Agriculture Biomass Research Centers
Agricultural Research Service
Wenatchee
Pullman
Sidney
Corvallis
Pendleton
NORTHWESTERN REGION
Burns
Boise
Kimberly
Mandan
Morris
Brookings
St. Paul
Madison
Logan
Reno
Lincoln
Ames
University Park
Wyndmoor
Fort Collins
Akron
Peoria
West Lafayette
Columbus
Urbana
Beltsville
Albany
WESTERN REGION
Columbia
CENTRAL-EAST REGION
Parlier
Raleigh
Stillwater
El Reno
Booneville
Riverside
Maricopa
Florence
Auburn
Tifton
SOUTHEASTERN REGION
Temple
College Station
New Orleans
Houma
Hilo
Canal Point
Utilization Center
Research hub
ARS lab in the Biomass Research Center network
Mayagüez

Regional Biomass Research Centers

Three research focus areas:

- Feedstock Development
- Feedstock Production
- Feedstock Conversion

Central-East Region

‘Liberty’ switchgrass

28 August, 2013
19.7 tons/ha (8 tons/ac)
standing crop

First year after seeding

19 November, 2013
12.6 tons/ha (5.1 tons/ac)
transported off field

Southeastern Region

Bio-energy Feedstocks for the Southeast

Southeastern Region

Napiergrass hybrid evaluation

Western Region

Perennial Grasses

Western Region

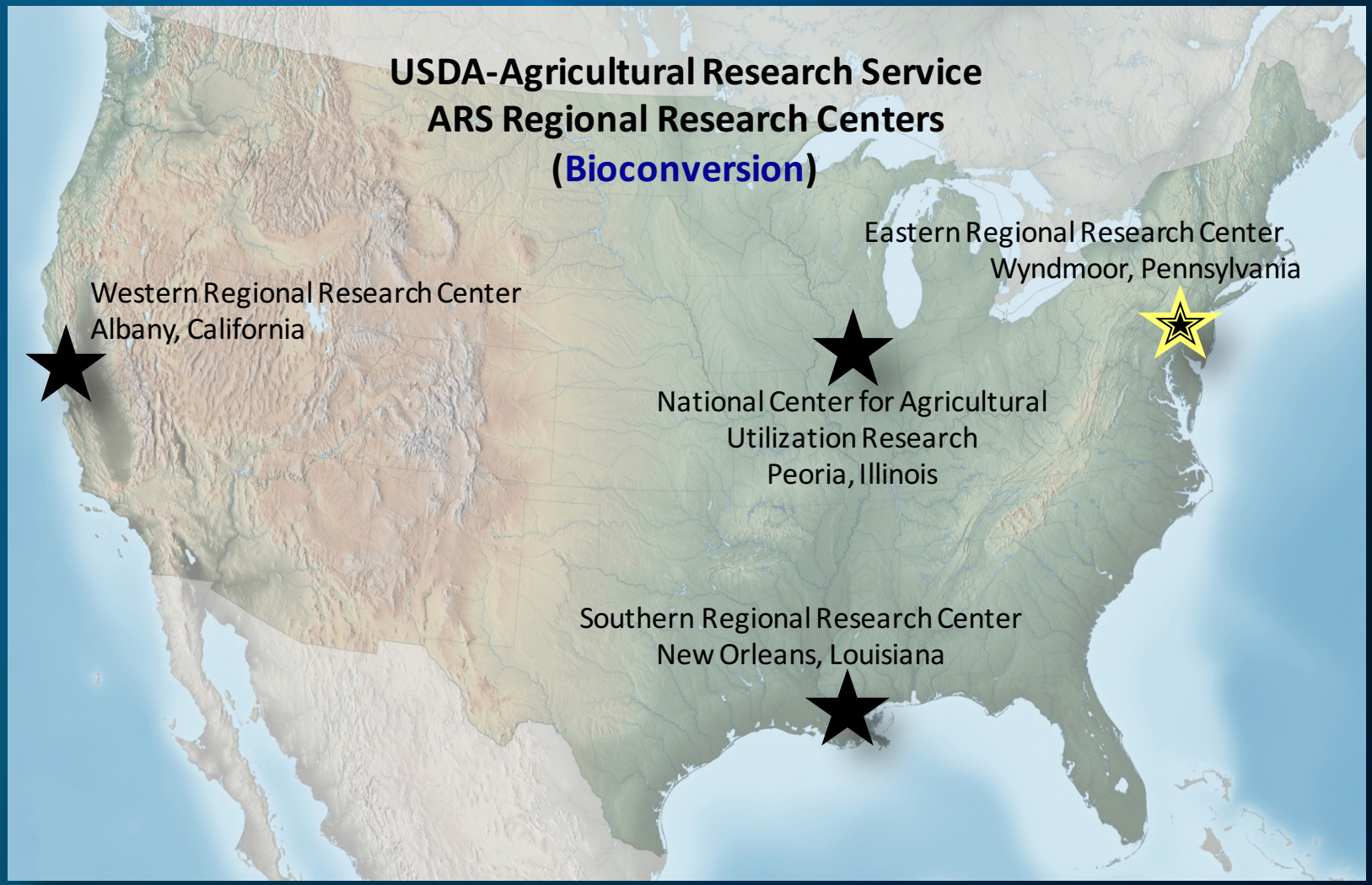
No-till corn
Miscanthus
Prairiegrass
Canola
Poplar-tree
sugarcane

Northwestern Region

Biomass Crops

Industrial Oilseeds

Biomass Utilization Centers



Utilization Research Centers

Three research focus areas:

- Feedstocks
- Conversion technologies
- Biofuels/bioproducts

Biomass Utilization Centers

Feedstocks:

- Grasses: switchgrass, miscanthus, napiergrass, big bluestem, corn stover, sorghum, sugarcane, wheat & rice straw, rice hulls, corn bran.
- Woody biomass: eucalyptus, forest trimmings.
- Waste: processing waste, household waste , manure, distiller grains.

Biomass Utilization Centers

Conversion Technologies

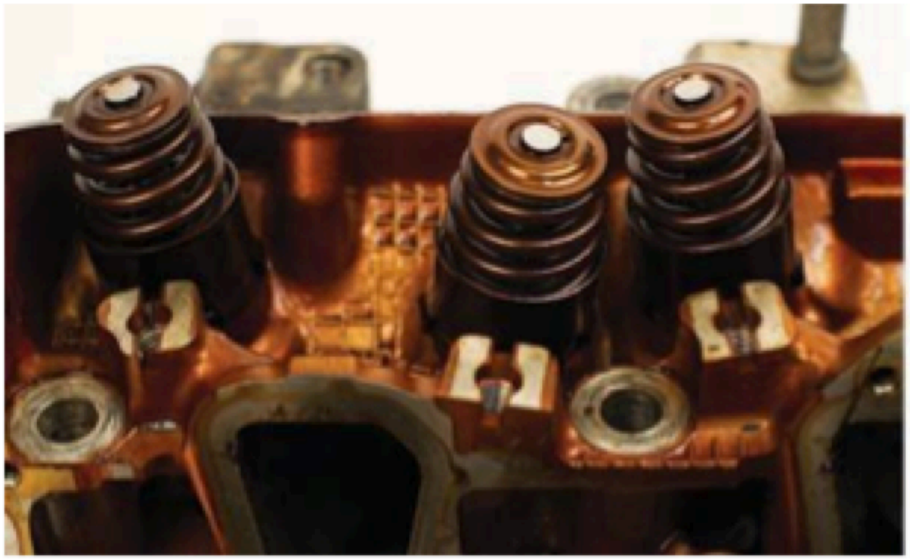
- Hydrolysis
- Enzymatic (catalytic and non catalytic)
- Metal catalysis
- Pyrolysis and torrefication
- Microbial (bacterial, fungi and yeast)
- Anaerobic digestion

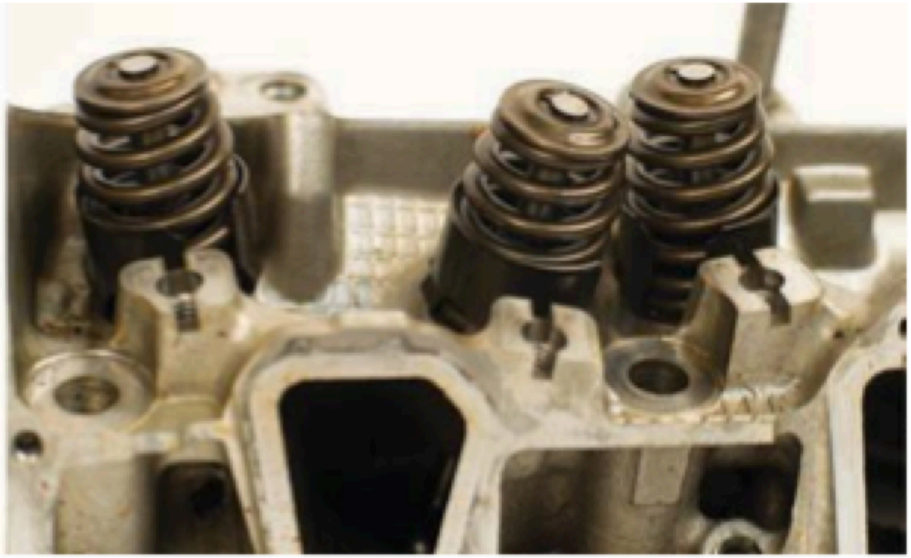
Biomass Utilization Centers

- **Biofuels/bioiproducts**
  - Fuels: ethanol, biodiesel, jet, butanol, biogass
  - Bioproducts: sugars, biochars, carotenoids, lipids, acids (butaric, itaconic, triacedic, succinic), hydrogels, films/plymers, plastics, nylon, nanomaterials, xylitol, antimicrobial agents.

Biomass Utilization Centers

- **Bioproducts:**
  Biobased estolides.





Solid waste into bioenergy

SALINAS VALLEY
SOLID WASTE AUTHORITY
Promoting the Environmental Health of the Salinas Valley