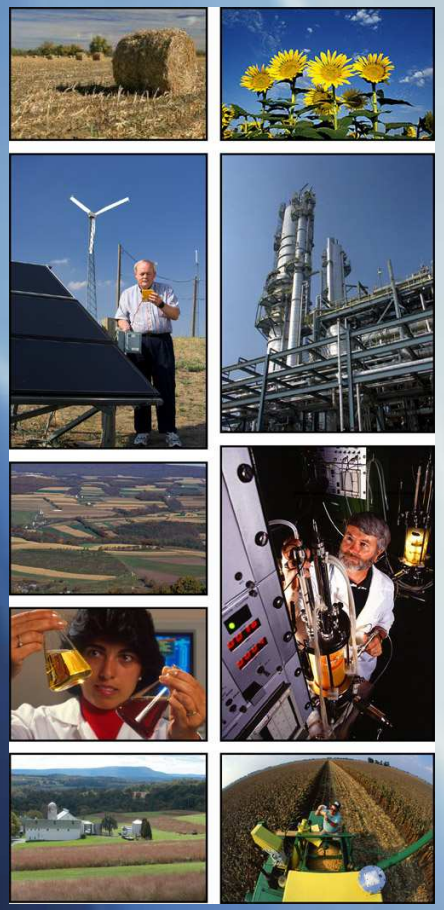


Research for Decision Makers: Federal Research Relevant to Sustainability

Jeffrey Steiner
Office of National Programs
Agricultural Research Service, USDA
Beltsville, Maryland

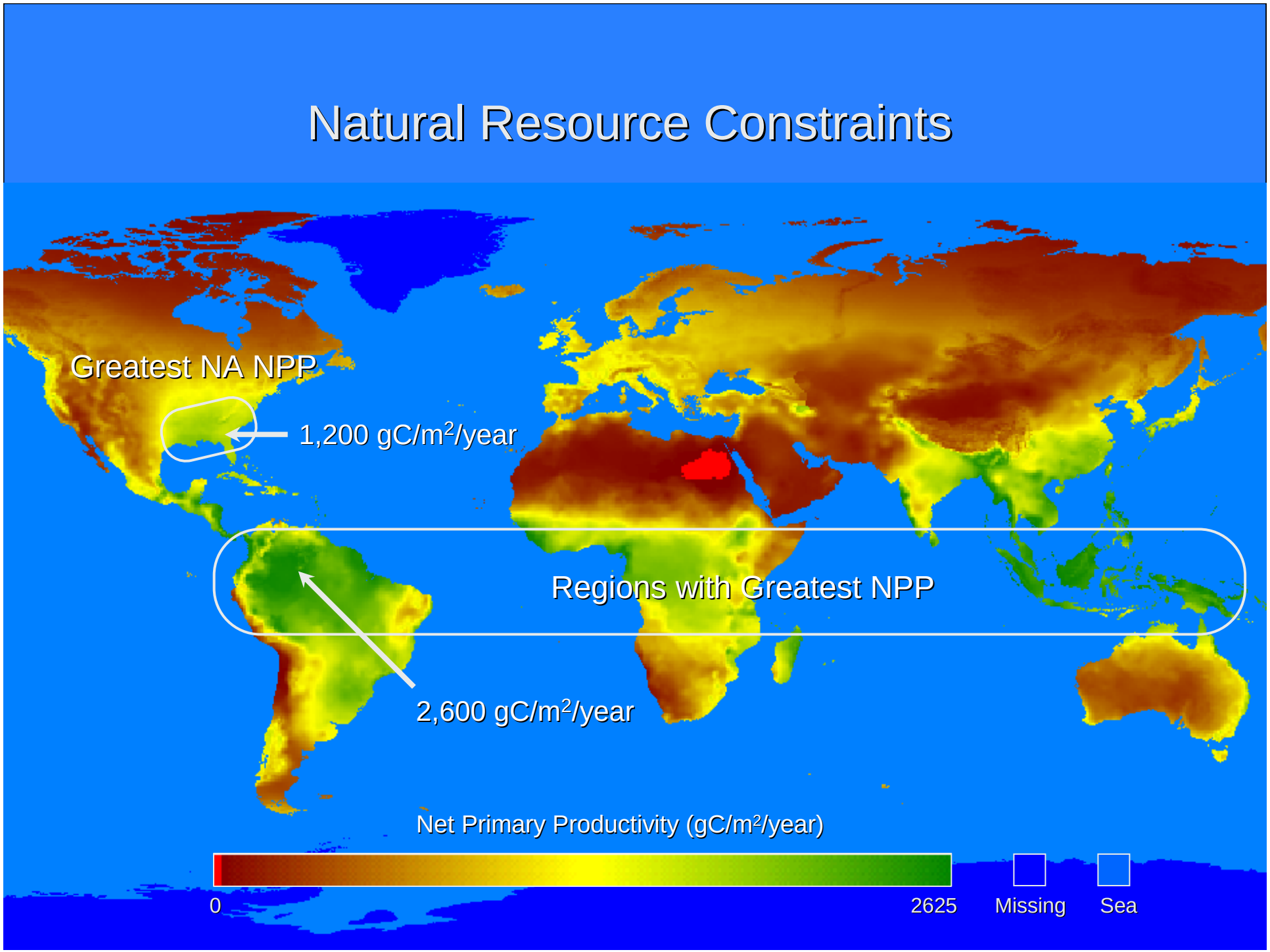
The National Academies of Science
Upper Midwest Sustainability Lessons
Madison, Wisconsin
June 24, 2009

Much is Expected from Rural Landscapes

- Ecosystem services: water, air, wildlife habitat, C-sequestration.
- Income supporting farms and rural communities.
- High quality, nutritious, and safe food and other products.
- New bio-based consumer products, including bioenergy.

Common Components for Sustainability throughout the Supply Chain

Natural Resource Constraints

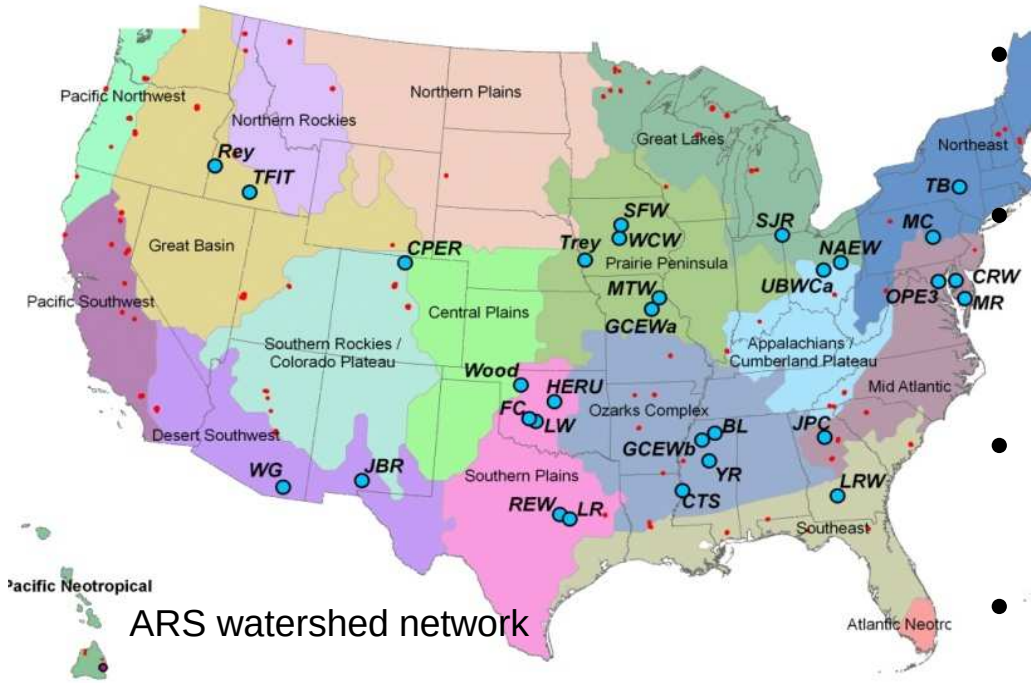


Biomass Research and Development Board

- DOE and USDA co-chairs, with senior management membership from 10 agencies: USDA, DOE, DOT, EPA, NSF, DOI, DOC, Treasury, OFEE, and OSTP.
- Carried forward by new Administration.
- Provides science and technical input to the government.
- Interagency working groups in:
  - Feedstock production
  - Conversion science & technologies
  - Sustainability
  - Logistics
  - Environmental health & safety
  - Distribution infrastructure
  - Blending

USDA Agency Bioenergy Activities

National Agricultural Surveys and Long-term Research Networks



ARS watershed network

- NASS Census of Agriculture.
- NRCS Natural Resources Inventory.
- USDA Conservation Effects Assessment Project (CEAP) watersheds.
- ARS GRACEnet and Carbon Flux networks.
- USDA long-term agricultural and forest research locations, including REAP.

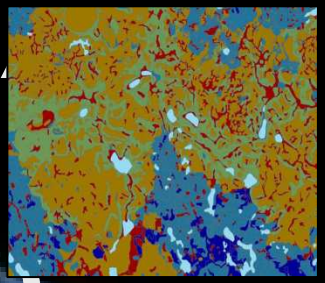
Pre-existing Conditions: Tracking National System Stressors

Government Payment to Gross Cash Farm Income Ratio, 2005

- 32% of rural counties have lost population.
- Greatest deficit use of water is where the greatest population pressures occur.
- As much as 55% of farm income comes from government programs.

Multiple Scale Assessments of Biomass Production and Harvest Impacts

Biophysical-economic modeling



SWAT
PGA-BIOECON

EPIC
WholeFarm

WEPP
AGNPS
CQSTR

GLYSIM
MAIZIM
ALMANAC
RZWQM2

Spatially referenced databases:

- Land availability
- Soil suitability
- Climate variability
- Crop growth and production capacity
- Natural resources quality
- Production practices
- Consumption, production, supply chain accounts

Interpretations:

- Policy constraints
- Embodied energy
- Many-objective optimization
- Sustainability indexing
- System resilience/supply risks

Practices and Technologies to Improve Production and Natural Resources Quality

Feedstock Development

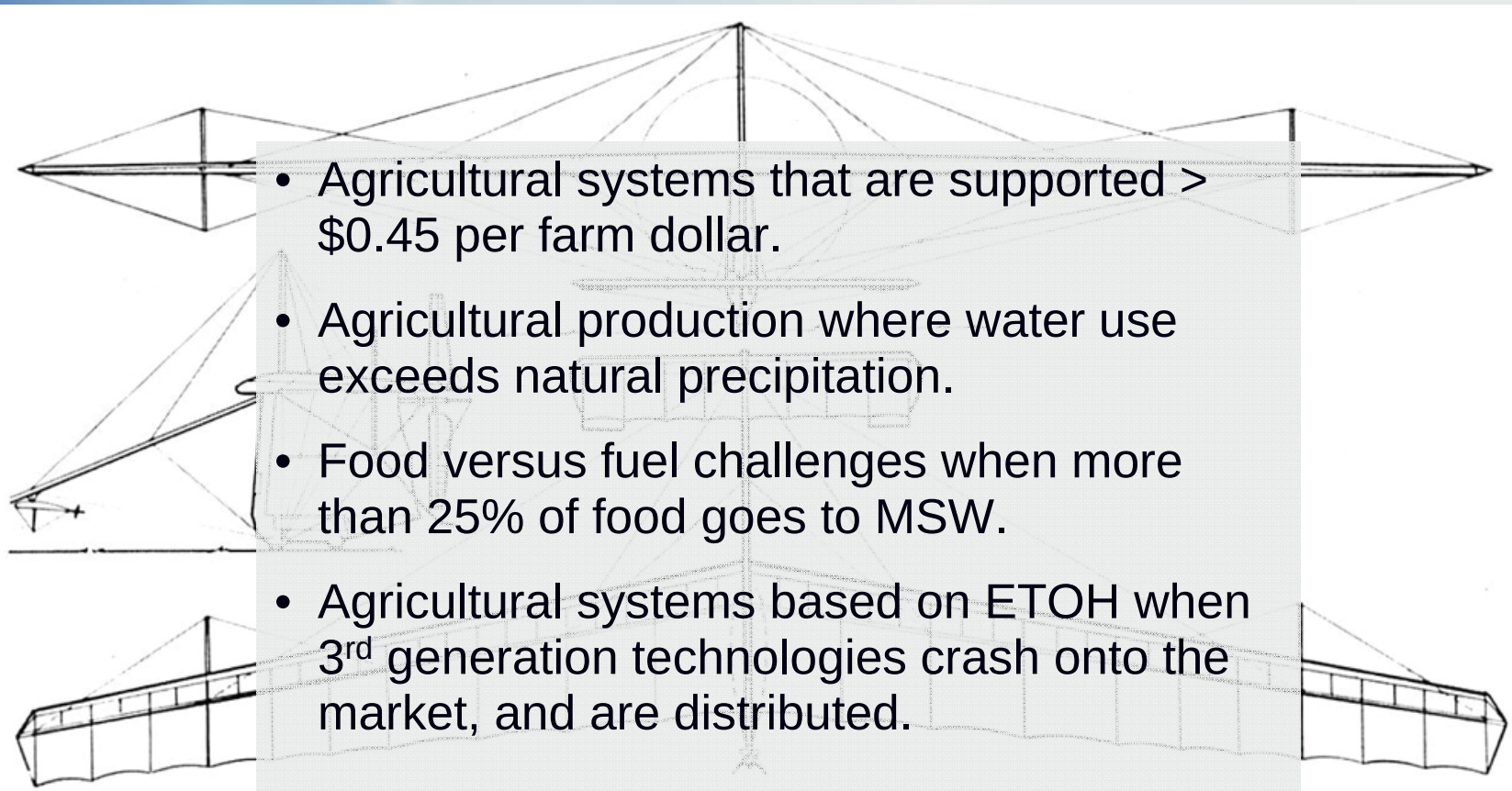
- Evaluation of germplasm and breeding new varieties.
- Understanding biological and molecular basis of plant traits.
- Adapted ecoregion-specific varieties combined with sustainable practices to optimize harvest.

Practices and Technologies to Improve Production and Natural Resources Quality

Feedstock Production

- Soil carbon enhancing practices.
- Technology and practices to remediate existing problems.
- Strategies incorporating bioenergy into existing systems.
- On-farm utilization of biorefinery co-products.

Is the System Resilient or Prone to Shock



- Agricultural systems that are supported > $0.45 per farm dollar.
- Agricultural production where water use exceeds natural precipitation.
- Food versus fuel challenges when more than 25% of food goes to MSW.
- Agricultural systems based on ETOH when 3rd generation technologies crash onto the market, and are distributed.