

The National Institute for Food and Agriculture's Projects in Climate Change and the USDA/ARS Long-Term Agroecosystem Research Network:

A Natural Partnership for Sustainability

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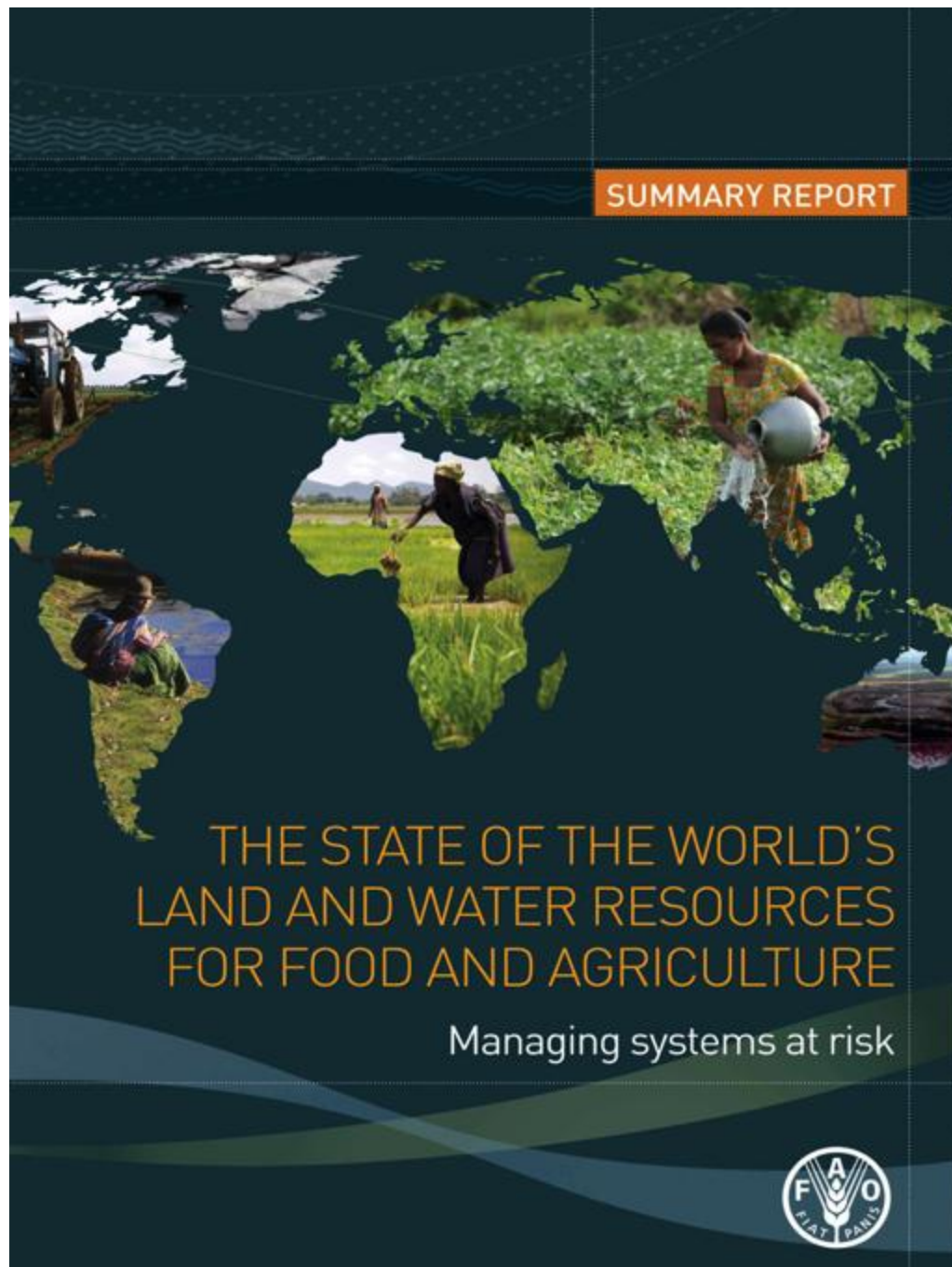
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ASA, CSSA, SSSA International Annual
Meeting Cincinnati, Ohio
2012 October 21-24

Session #185 National and International
Partnerships for Climate Science Applications In
Agriculture and Forestry: Bridging Sectoral
Requirements



Challenges Facing Agriculture in the 21st Century

- 25% of Earth's lands are already degraded.
- More than $\frac{3}{4}$ of the 70% increase in global food production needed by 2050 will have to come from the 'sustainable intensification' of existing agricultural lands.
- A global issue, requiring responses internationally and nationally

A model for a science in service of agriculture

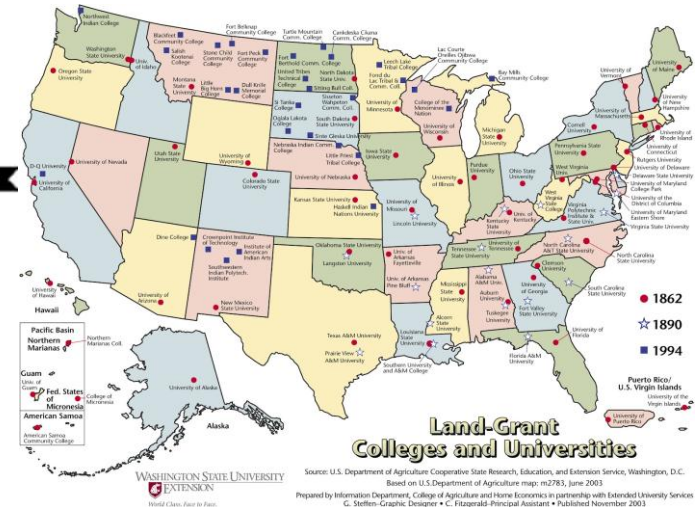
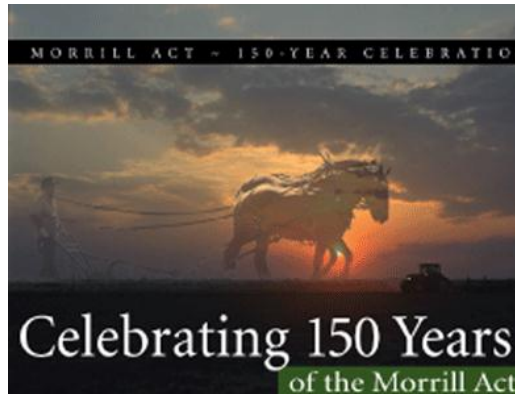
Land Grant Universities: Research, Education, Extension

Agricultural Research Service



University of Minn.

TOSU



“The requisite systems level understanding [to ensure sustainable agricultural productivity]...can be achieved best—or perhaps only—through long-term research that integrates multiple processes, both biophysical and socioeconomic, across multiple spatial and temporal scales.”

Robertson et al. 2008

Long-term Agricultural Research: A Research, Education, and Extension Imperative

G. PHILIP ROBERTSON, VIVIAN G. ALLEN, GEORGE BOODY, EMERY R. BOOSE, NANCY DRINKWATER, JAMES R. GOSZ, LORI LYNCH, JOHN L. HAVLIN, LOUISE E. JACKSON, S. LOUIS PITELKA, ALAN RANDALL, A. SCOTT REED, TIMOTHY R. SEASTEDT, ROBERT B. WALL

To meet the growing world demand for food, fiber, and other products from agriculture, we must find ways to provide economic opportunities for rural societies and communities.

To meet the growing world demand for food, fiber, and at the same time sustain the ability to provide economic opportunities for society, we need a research approach that is long-term and geographically scalable. It is time to add it. A long-term agricultural research program products and other ecosystem services to a society that calls for agriculture to be safe, con-

To meet the growing world demand for food, fuel, and fiber, and at the same time sustain the environment's ability to provide economic, social, and environmental services to society, agricultural innovations are essential. Such innovations must derive from a comprehensive understanding of the long-term functioning of agricultural systems and their resiliency. Soil, water, and energy limitations pose long-standing and persistent problems for agricultural productivity, profitability, and social acceptability; for global agricultural competitiveness; and for environmental quality and security. Long-lasting solutions to these problems require a comprehensive, systems-level understanding of the linkages among basic biophysical processes and human activity, an understanding that can serve as a solid foundation for informed management and policy decisions.

This understanding can be achieved only—through long-term research that integrates processes, both biophysical and socioeconomic, at multiple spatial and temporal scales. Practically, this requires long-term research because robust solutions to the problems facing agriculture require a context of climatic, social, ecological, and economic change on decadal (or longer) time scales. Long-term research also allows the impacts of management practices to be distinguished from impacts caused by long-term trends such as land use and regional climate change.

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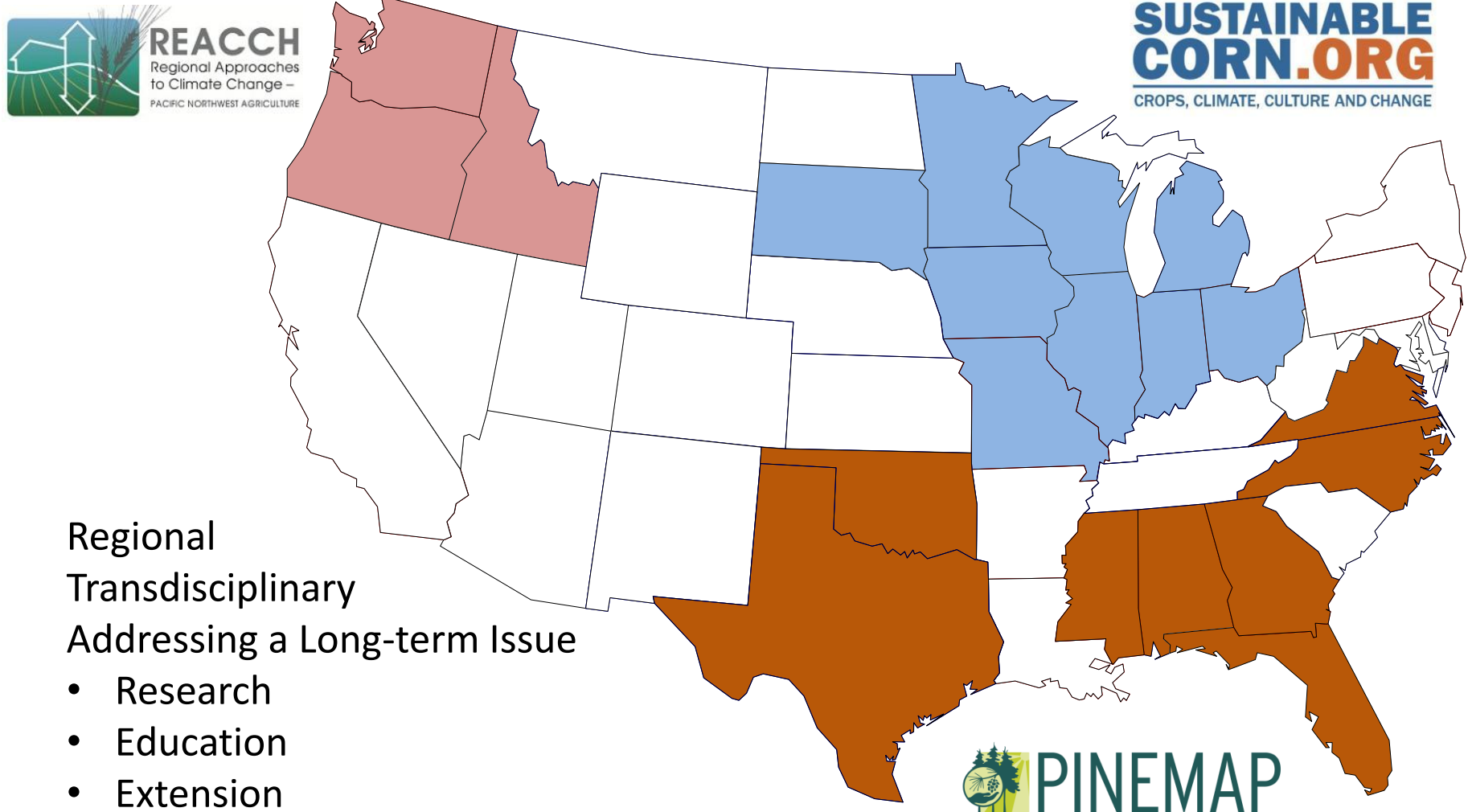
USDA's Involvement

- USDA/CSREES: 2006 workshop and white paper that led to Robertson et al. (2008)
- NIFA: LTAP program planning grants, 2009
- ARS: begins to discuss an LTAR network, 2010
- NIFA: Large scale coordinated agricultural projects (CAPs) focused on climate change and biofuels, 2010 calls
- NIFA: Several large scale projects (\$5-\$20M) including regional CAPs initiated, 2011
- ARS: LTAR network organized 2012, 10 sites selected



Part of the response from NIFA

- 3 Regional Coordinated Agricultural Projects (CAP)
- 115 PI's across 20 states



Initial LTAR Sites and HUC2

ARS LTAR Sites 2012

Criteria

Productivity

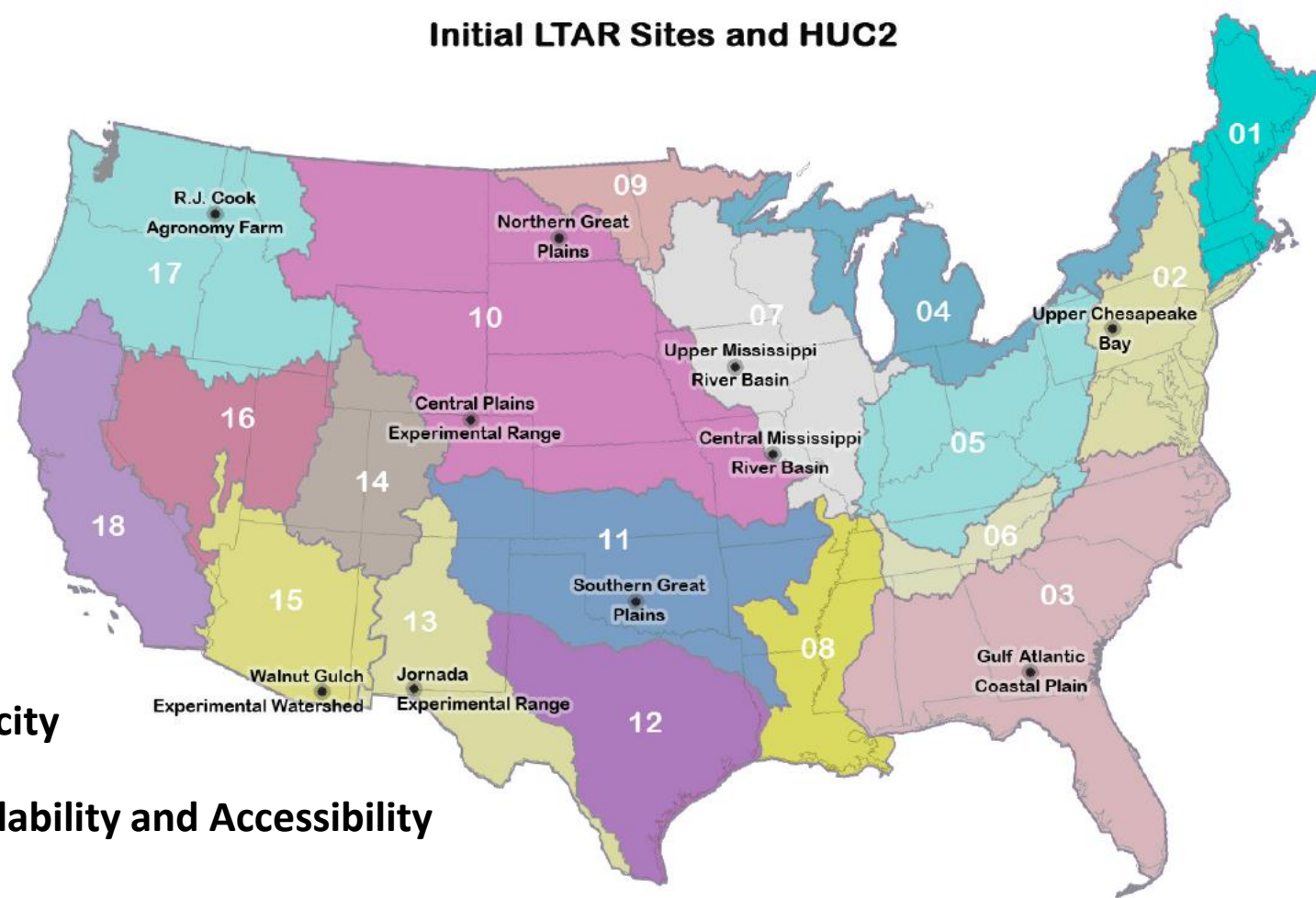
Infrastructure Capacity

Data Richness, Availability and Accessibility

Geographic Coverage at Various Scales: HUC-2
watersheds, NEON domains, etc.

Partnerships: with producers, other stakeholders,
universities

Institutional Commitment – for 30-50 years of support



Partnerships to Achieve the LTAR Vision: **Benefits**

- Foster transdisciplinary science to address complex issues
- Engage diverse stakeholders
- Promote integration of research, education, Extension/outreach efforts
- Address spatiotemporal scaling from field to region to nation
- Meet data management and cyberinfrastructure needs

Partnerships to Achieve the LTAR Vision: **Challenges**

- Remaining responsive in the short term while incorporating the longer view
- Coordinating with relevant partners: NEON, NOAA RISAs, LTERs, Land-grants, other research and education institutions
- Avoiding creating new ‘entities’
- Data management

A Case Study for Collaboration

A NIFA-funded Coordinated Agricultural Project
(REACCH)

A newly designated ARS LTAR site
(Cook Agronomy Farm)

**\$20 million, five-year project funded by the
National Institute for Food and Agriculture**

Regional Approaches to Climate Change for PNW Agriculture

**3 institutions, ARS, 12 academic/research units, >60 scientists, 20
students and postdocs**

Research – Extension – Education

Transdisciplinary (biological, socio-economic)

Geographically Extensive

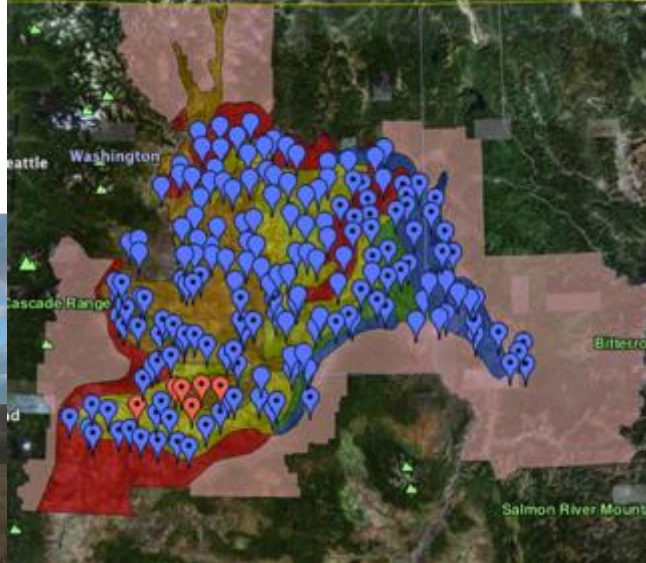
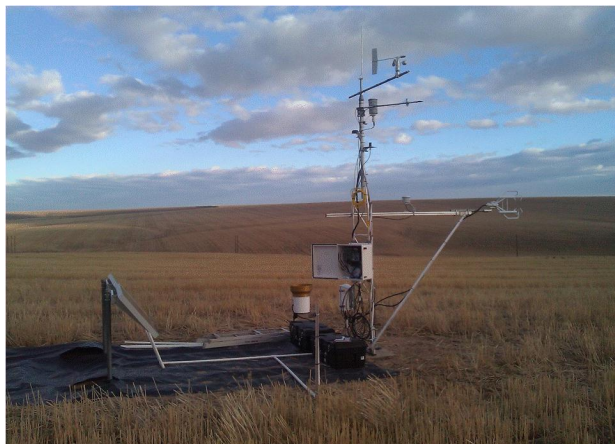
REACCH



Vision and Approach

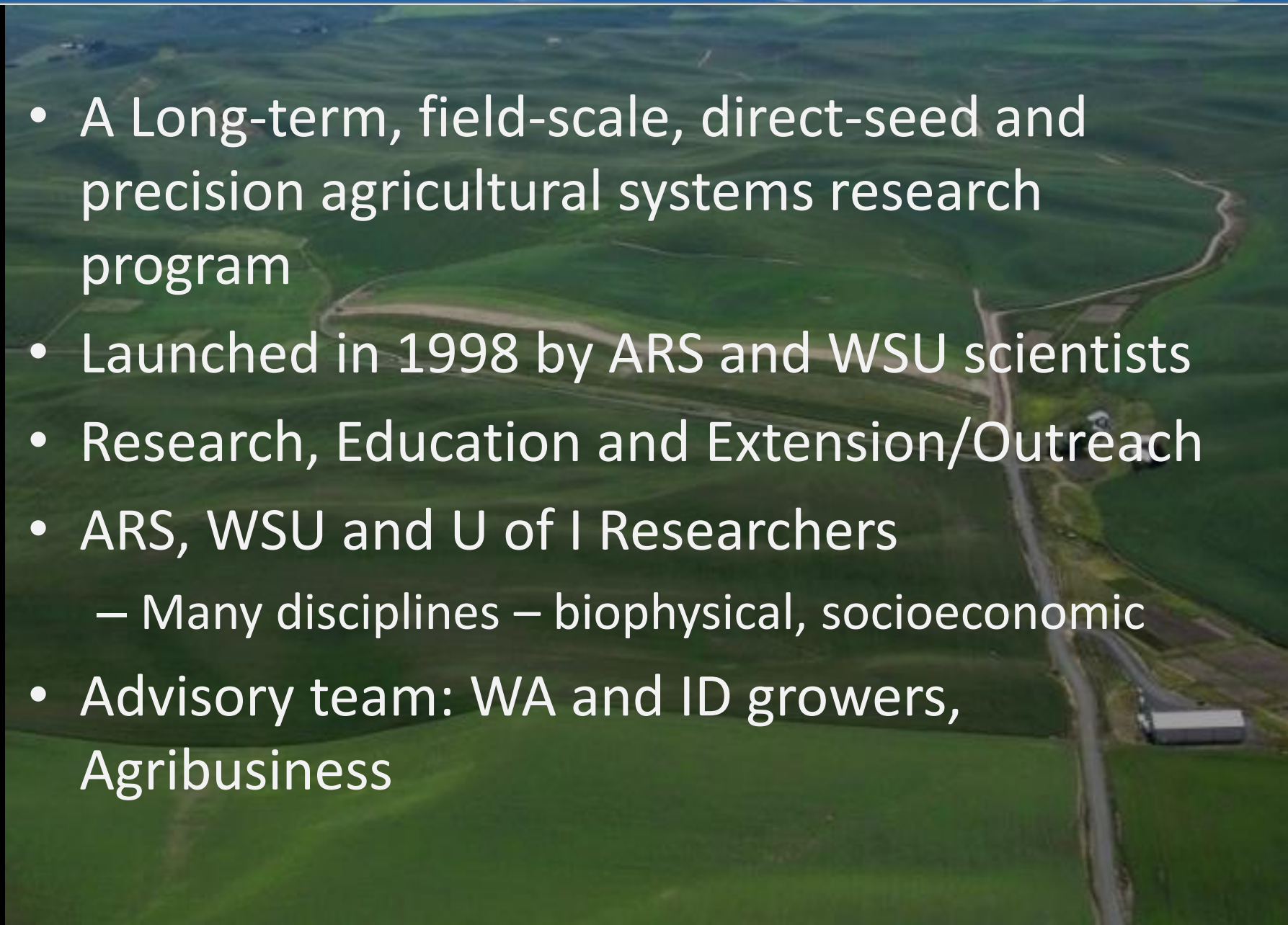
REACCH aims to:

- ensure the long-term viability of cereal-based farming in the inland Pacific Northwest amid a changing climate (*adaptation*)
- identify farming practices that can help reduce greenhouse gas emissions (*mitigation*)



Cook Agronomy Farm

- A Long-term, field-scale, direct-seed and precision agricultural systems research program
- Launched in 1998 by ARS and WSU scientists
- Research, Education and Extension/Outreach
- ARS, WSU and U of I Researchers
 - Many disciplines – biophysical, socioeconomic
- Advisory team: WA and ID growers, Agribusiness



Cook Agronomy Farm

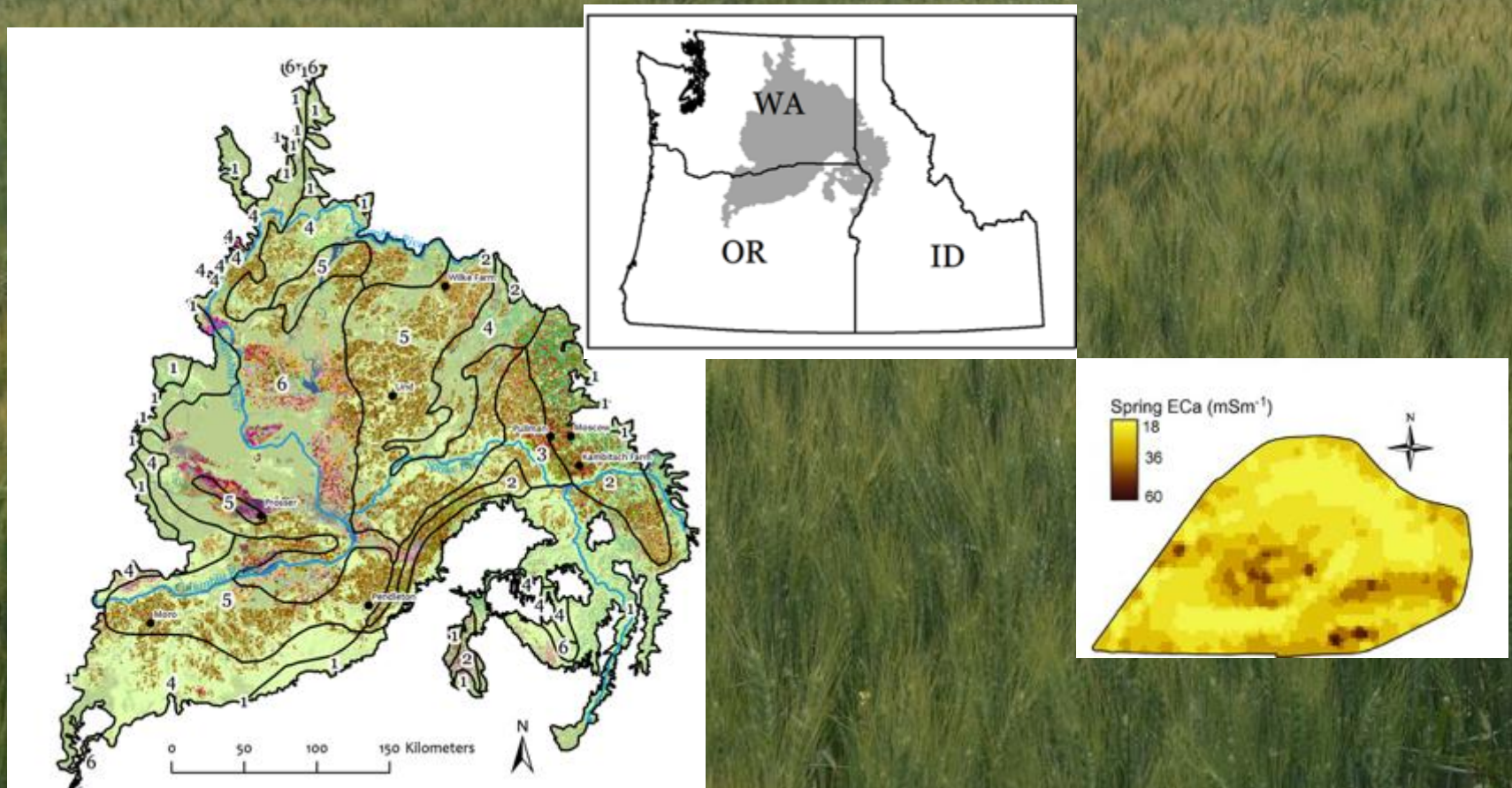
- Aims to reduce risks, conserve soil and other resources, increase profits and agroecosystem function
- Includes study of within-field processes for sustainable precision agroecology
- Serves producers on 3.6 acres in ID and WA

Cook and REACCH Partnership

- Data management
- Integrating across scales from field to region
- Sharing physical infrastructure
- Education and Extension
- Transdisciplinary integration
- Engaging with other projects and entities in the region
- Forging a common vision for regionally integrated efforts for agricultural sustainability

Cook and REACCH Partnership

Research: Scaling up, from field to region



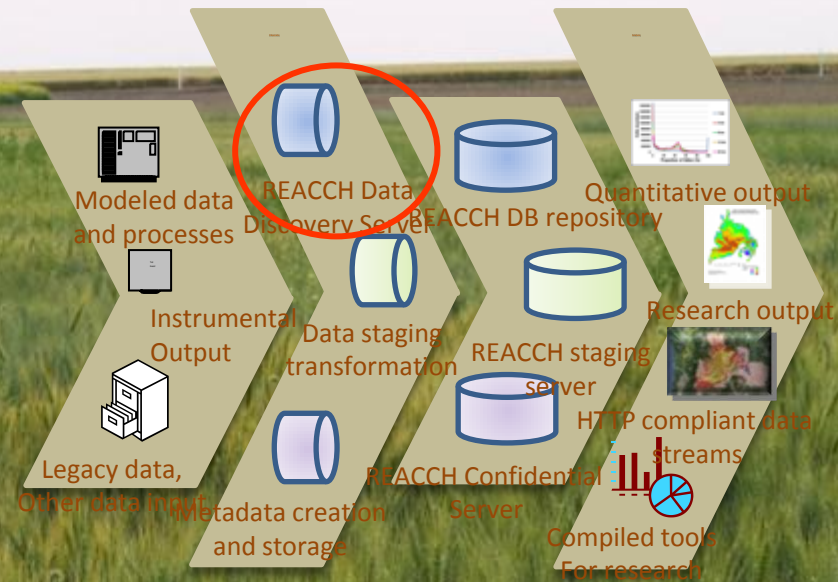
Cook and REACCH Partnership

Education and Extension



CAF and REACCH Partnership

Data management



- REACCH data policy, portal for storage, discovery, synthesis across the project
- As an LTAR, CAF to comply with LTAR data management policies and cyberinfrastructure
- Both require interoperability, metadata standards, accessibility, legacy data migration

Beyond Cook and REACCH

A Regional Long-term Effort

Strengthening and Augmenting Partners

- The land-grant universities: OSU, UI, WSU
- Federal entities (USDAFS, NIFA, NASA, NSF, NOAA, DOI others) and funded projects
- ARS units: Pendleton, Wapato, Corvallis, NW Watershed Res. Center, Aberdeen, Kimberly, Dubois
- NEON Domain (16, Wind River Experimental Forest)
- Pacific Northwest Climate Science Center
- Great Northern Landscape Conservation Cooperative (DOI)
- National Laboratories (INL, PNNL)
- Identifying shared interests, commitments, resources

UW
Climate Impacts
Group (CIG)

IGERT
Projects
WSU- NSPIRE
UI - Ecological Resilience

Pacific
NW Regional Climate
Science Center

Great Northern LCC

**Oregon Climate Change
Research institute
(OCCRI)**

**Climate Impacts
Research Consortium**



ARS GRACEnet

**ARS LTAR Site
(Cook Farm)**

- **PINEMAP**
- **SustainableCorn.org**
- **MAS Wheat (Davis)**

Site Specific
Climate Friendly
Farming
WSU

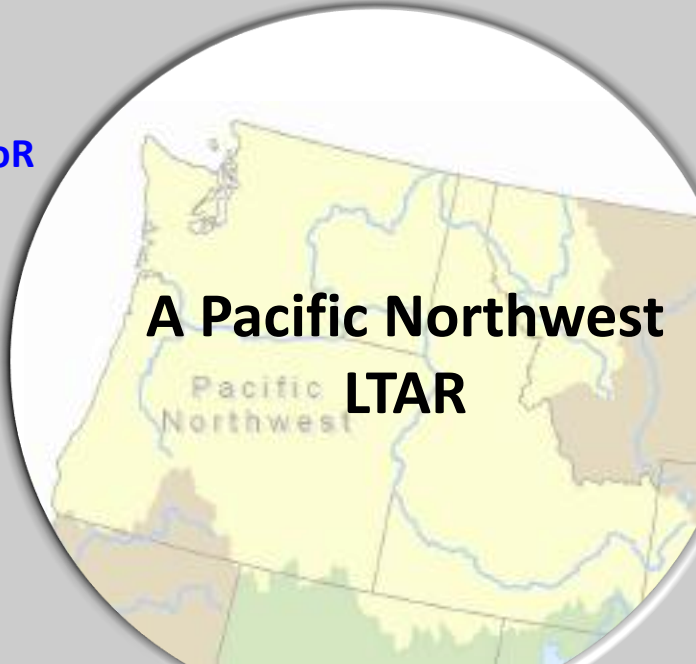
UI –
Northwest
Knowledge
Network

**Kellogg Biological
Station**



BioEarth

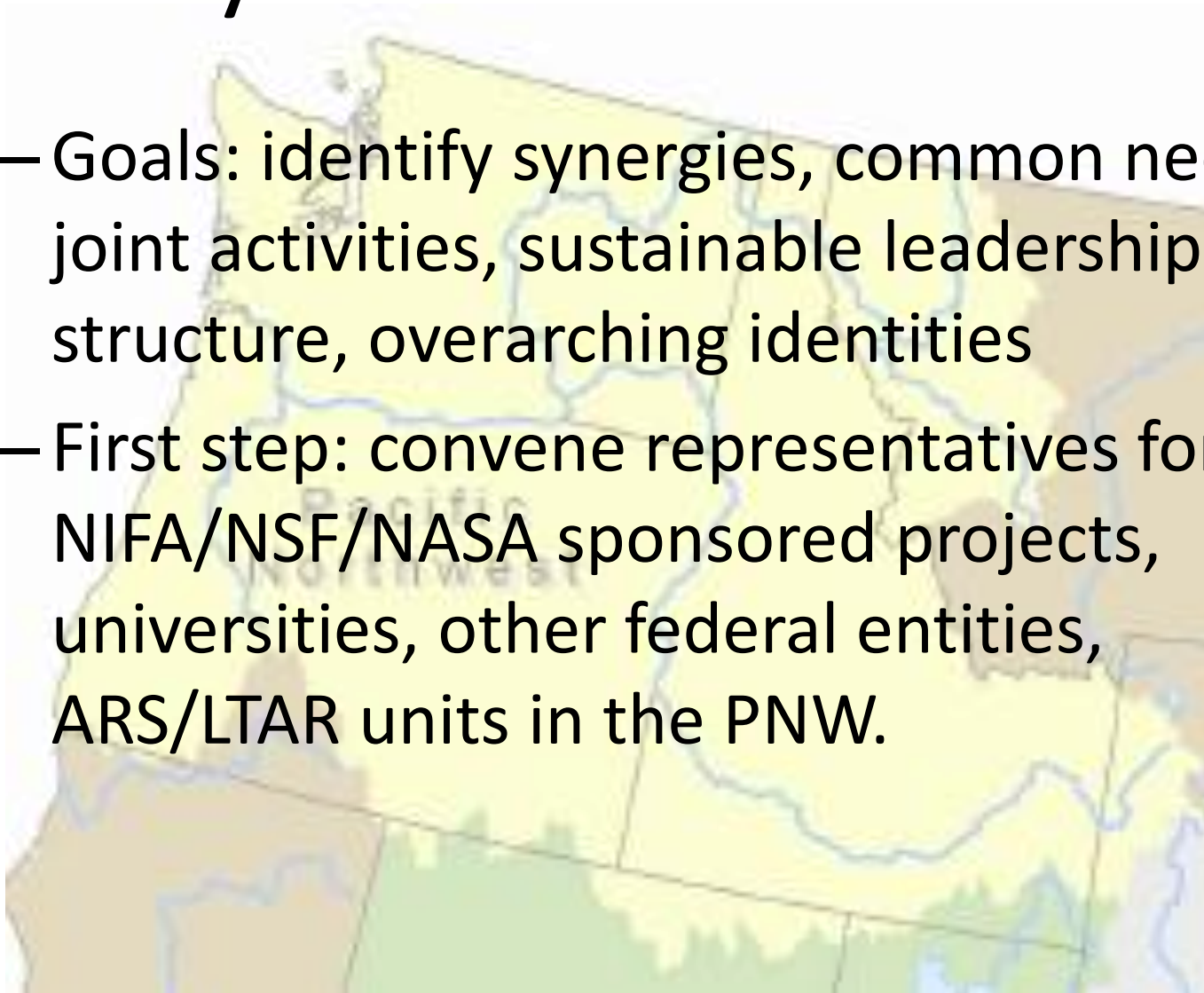
Idaho EPSCoR



**A Pacific Northwest
LTAR**

Ways Forward in the PNW

- Goals: identify synergies, common needs, joint activities, sustainable leadership structure, overarching identities
- First step: convene representatives for NIFA/NSF/NASA sponsored projects, universities, other federal entities, ARS/LTAR units in the PNW.



Ways Forward, National

- Initiate a similar process in the regions served by ARS LTARs, Large-scale NIFA projects, Land-grants, other partners
- Establish a community of practice for these regional partnerships
- Establish a network for coordinating such efforts



A scenic landscape photograph featuring rolling green hills and a golden wheat field in the foreground. The hills are covered in lush green grass, and the wheat field is a vibrant yellow-gold. In the background, there are more rolling hills and a range of mountains under a hazy, light-colored sky. The overall mood is peaceful and serene.

Thank you for your attention!

Photo: David Barton

Partnerships to Achieve the LTAR Vision: **Benefits, cont.**

- Address processes that occur over longer term (decades)
- Address the broader societal benefits of modern agriculture (e.g., bio-energy production, carbon sequestration, water quality and improved water quality & water-use efficiency, wildlife habitat).

Cook and REACCH Partnership

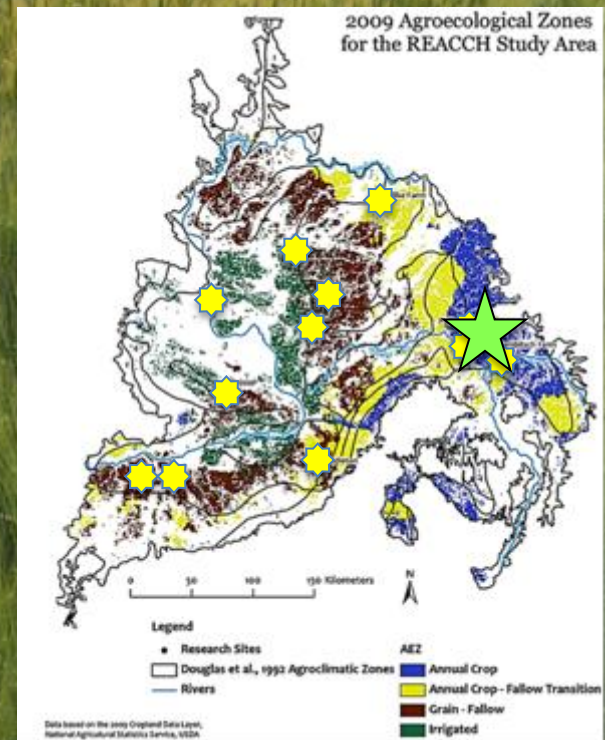
Sharing physical infrastructure



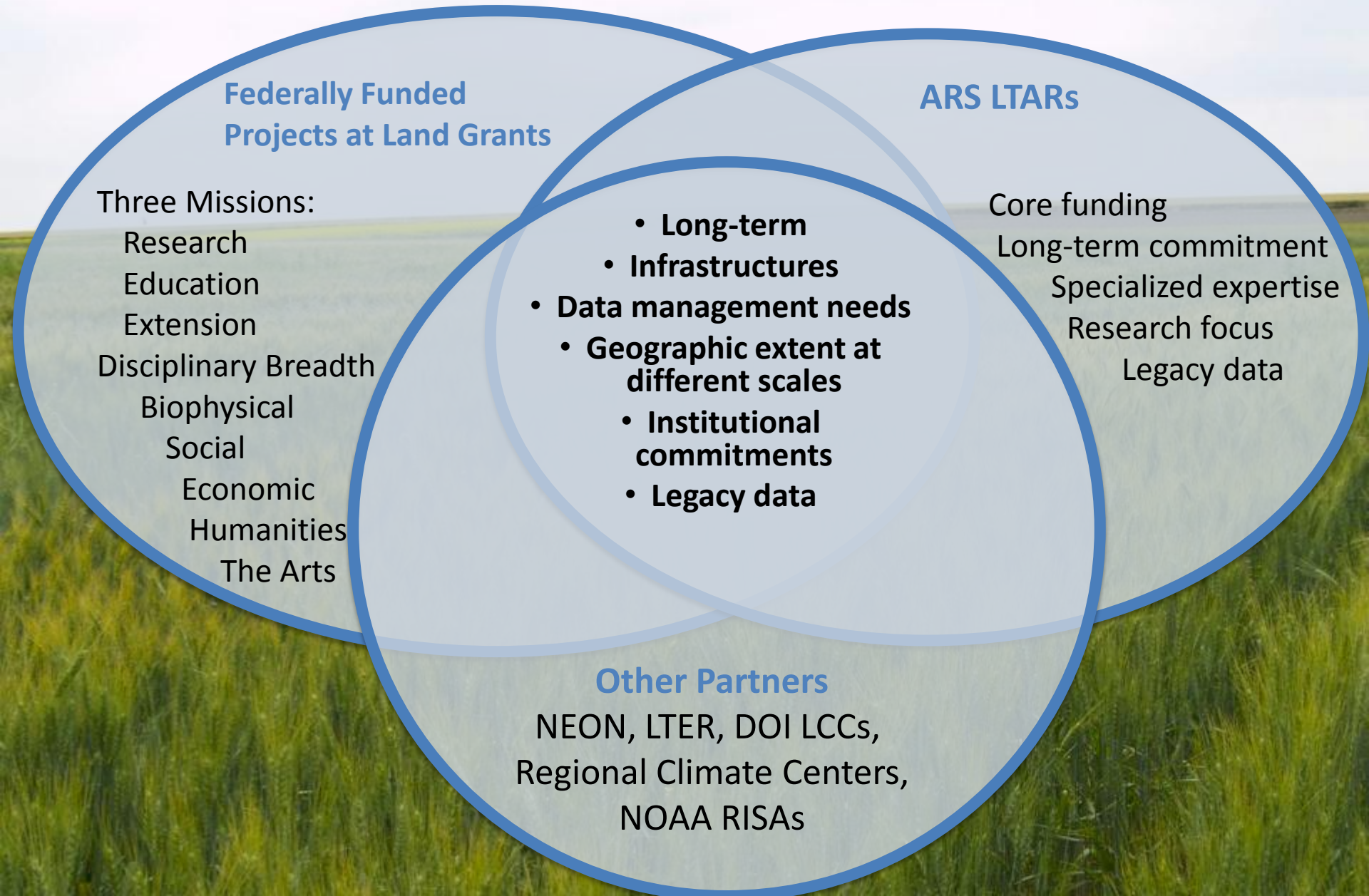
Palouse Research, Extension and
Education Center



Lind Dryland Research Station



Partnerships to Achieve the LTAR Vision



ARS LTAR Evaluation Criteria

- **Productivity**
- **Infrastructure Capacity**
- **Data Richness, Availability and Accessibility**
- **Geographic Coverage at Various Scales:** HUC-2 watersheds, NEON domains, etc.
- **Partnerships:** with producers, other stakeholders, universities
- **Institutional Commitment** – for 30-50 years of support

More Detail on preceding

