

# Building the LTAR Data Portal



goodwater - NetCam SC IR - Thu Dec 24 2015 11:00:05 CST - UTC-6  
Camera Temperature: 27.0  
Exposure: 60

Susan McCarthy  
National Agricultural Library  
January 7, 2016

# Goals and Motivation for LTAR Data Portal

EXECUTIVE OFFICE OF THE PRESIDENT  
OFFICE OF SCIENCE AND TECHNOLOGY POLICY  
WASHINGTON, D.C. 20502

February 22, 2013

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: John P. Holdren *JPH*  
Director

SUBJECT: Increasing Access to the Results of Federally Funded Scientific Research

## 1. Policy Principles

The Administration is committed to ensuring that, to the greatest extent possible and consistent with law and the objectives of the federal government, the results of federally funded scientific research are made available to and used by the scientific community. Such results include peer-reviewed publications, data, and other research products.

Scientific research supported by the Federal Government catalyzes economic growth and innovation, and drives our economy. The results of that research become the grist for progress in areas such as health, energy, the environment, and national security.



THE DIRECTOR

EXECUTIVE OFFICE OF THE PRESIDENT  
OFFICE OF MANAGEMENT AND BUDGET  
WASHINGTON, D.C. 20503

May 9, 2013

M-13-13

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: Sylvia M. Burwell *SMB*  
Director

Steven VanRoekel *SV*  
Federal Chief Information Officer

## Implementation Plan to Increase Public Access to Results of USDA-funded Scientific Research

November 7, 2014

USDA

1. Federal Directives / mandates for open and machine readable access to Federally funded research results
2. For the science!

scholarly publications. It is critical that these services continue to be improved and that Federal policies not have a net negative effect on their availability.

Managing information as an asset throughout the cycle of its creation, promotion, openness and interoperability, and properly safeguard systems and information. Managing government information as an asset will increase operational efficiencies, reduce costs, improve services, support mission needs, safeguard personal information, and increase public access to valuable government information.

Making information resources accessible, discoverable, and usable by the public can help fuel entrepreneurship, innovation, and scientific discovery – all of which improve Americans' lives and contribute significantly to job creation. For example, leaders across the Federal Government made both

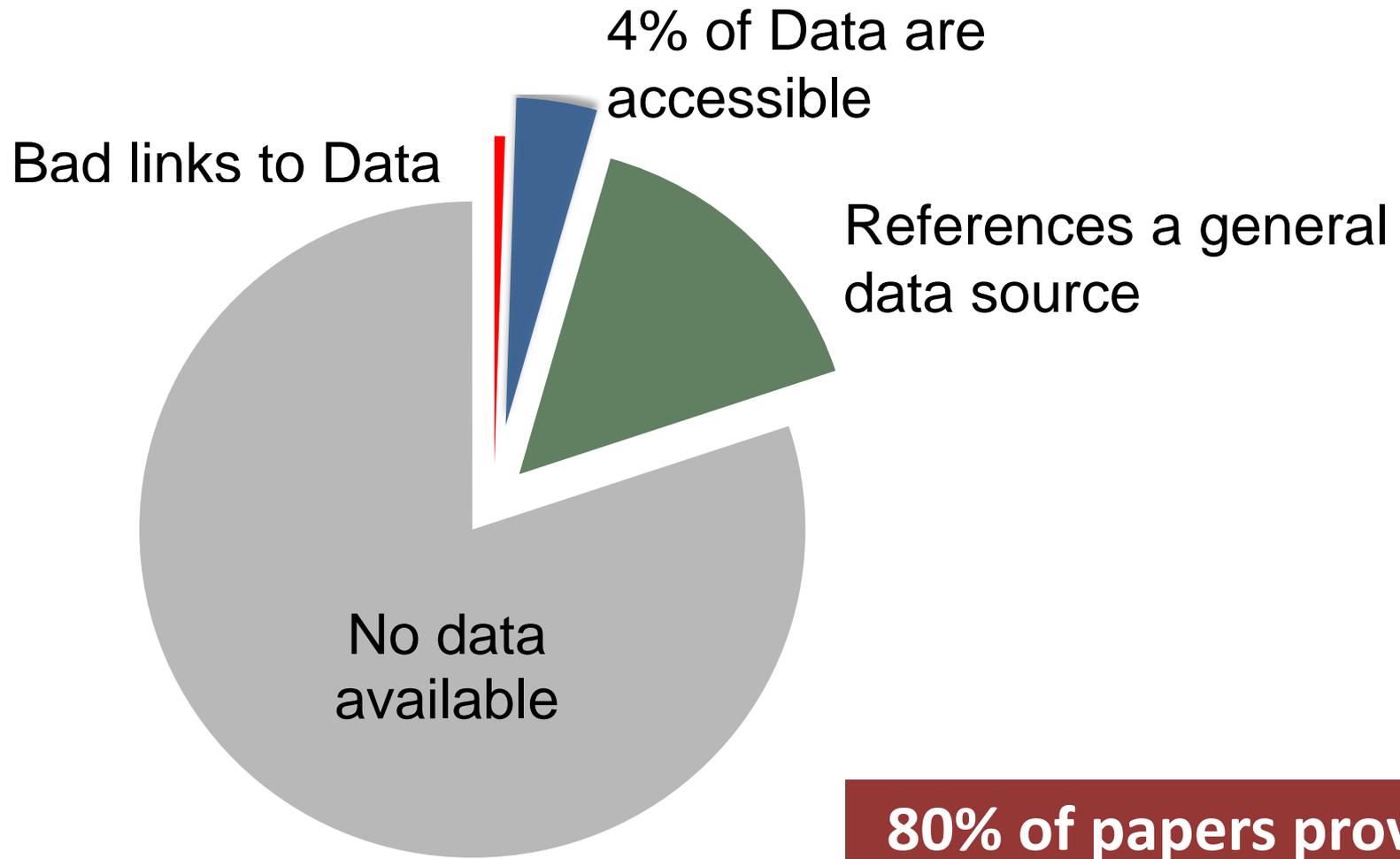
ates Department of Agriculture





# LTAR Publication-Related Data Loss

N=194 of ~500 citations in 2011 LTAR site proposals



**80% of papers provide no way to obtain data**



# Putting the “Long-Term” in LTAR Data

In order to have data of known quality for re-use in a new application...

*50 years from now, someone would need to:*

- Discover that the data exists;
- Find the data;
- Obtain and read the data;
- Determine the data’s suitability for re-use

# Long-Term Data Requirements

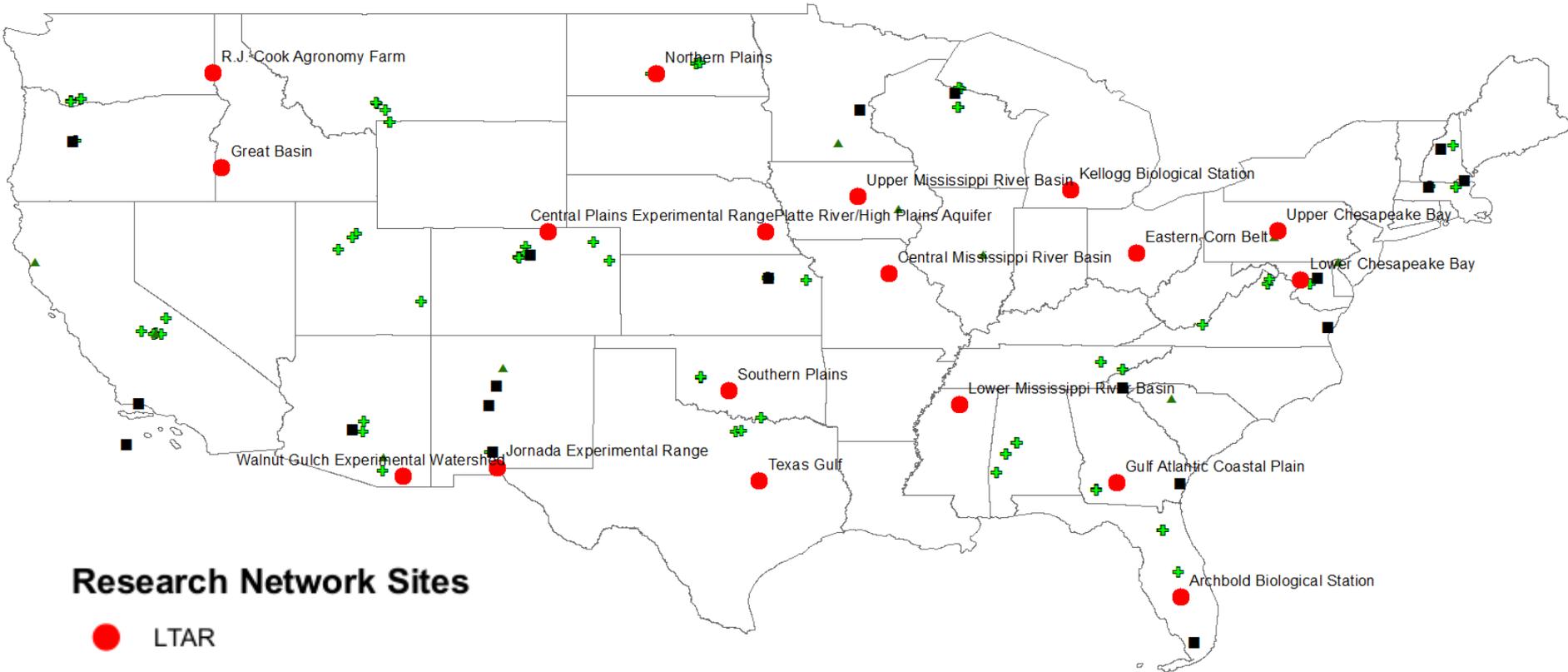
- **Preserved** – data needs to be secured for the long-term
- **Discovered** – consistent application of standards-based metadata description
- **Accessed** -- available through standards-compliant Web services
- **Re-used** – multiple data output formats; adequate metadata including descriptions of intended use, limitations of use, and data quality

# Data Curation for the Long-Term

## *Archiving is not a back-up!*

- Initiating a data curation program at NAL:
  - In collaboration with the University of Maryland iSchool faculty and postdoc (R. Punzalan, A. Kreisberg)
  - Currently conducting a self-assessment
  - Developing requirements and recommendations

# Long Term Agro-ecosystem Research (LTAR)



# LTAR Research

## Common Observatory Data (CORe)

### Immediate and Near Term

- Meteorology
- Phenocam (camera)
- Hydrology
- Eddy flux: CO<sub>2</sub> and Non-CO<sub>2</sub> gasses
- Soil

### Long Term

- Biological

## Research Approach

### ***Common Experiment***

- Management Studies: Business as usual compared with Aspirational
- Crop and livestock

### ***Common Experiment Data***

- Management practices
- Results

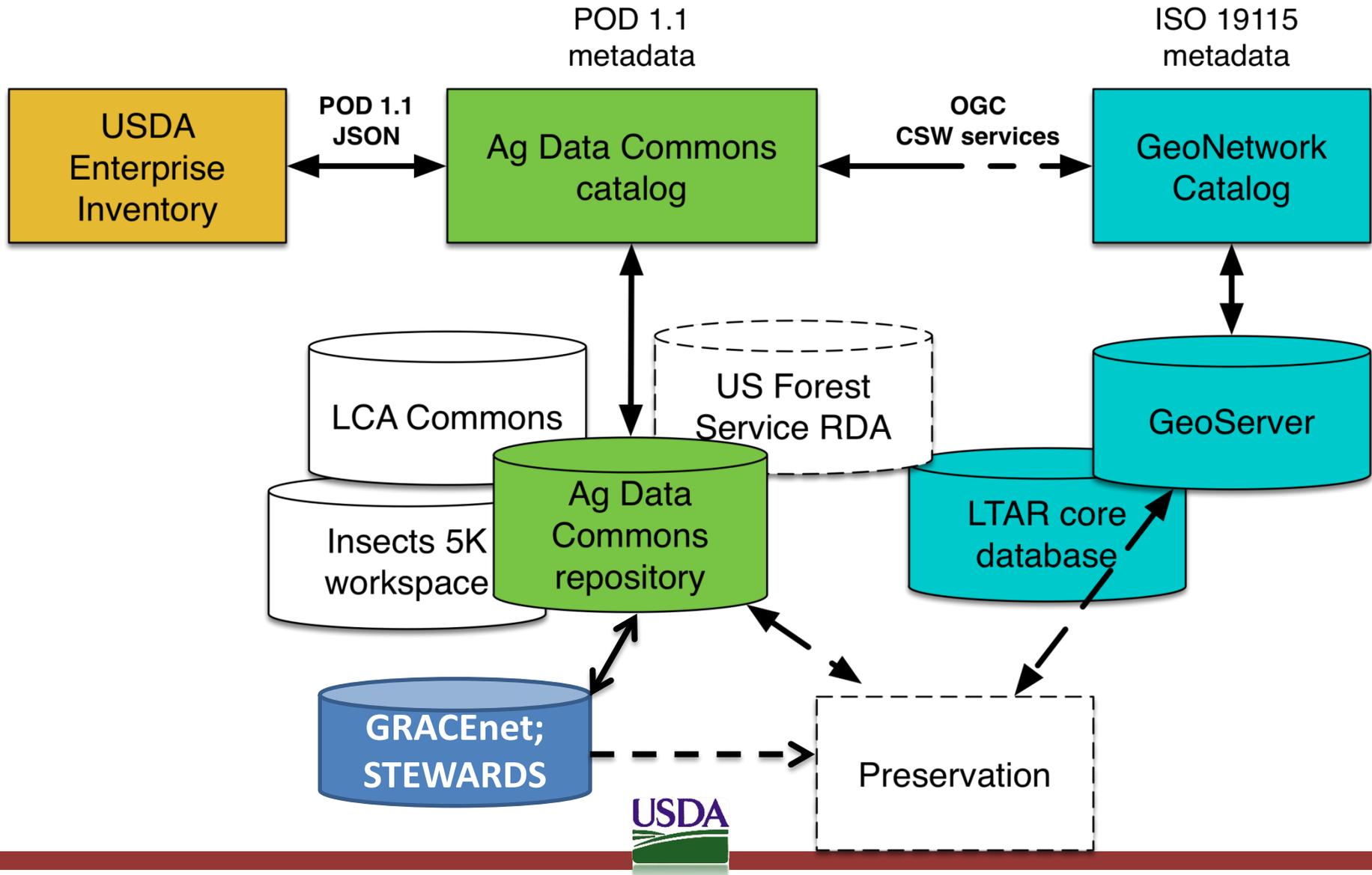
# Approach for LTAR Data Management

- Provide a central data catalog (registry) linking to wherever the data resides
- Describe the data for long-term re-use and discovery
- Leave existing data in specialized systems (STEWARDS, GRACENet, PhenoCam, etc.)
- Common Observatory data stored at NAL
- Preserve (curate) the data for the long-term

## LTAR Data Under Management

- 1) Near real-time CORE
- 2) Publication-related datasets
- 3) Aerial Imagery

# LTAR Data IT Infrastructure @ NAL



# Two Interconnected Systems

## Ag Data Commons

### *System for Agricultural data*

- Central registry for USDA data
  - Link to data residing outside of the Ag Data Commons
- Provide a repository for data without logical “home”
- Provide citable DOI’s
- Feed USDA Enterprise Inventory >>> Data.gov

## Geospatial Data System

### *System LTAR CORe and GIS-based data*

- Central registry – GIS data
- Robust descriptive information
  - Enhanced discovery and display for GIS data
  - Automatic feed to Ag Data Commons >> ... >>> Data.gov
  - Cross-site linkage
  - Citable DOI’s



## Long-Term Agroecosystem Research Data Overview

The USDA Agricultural Research Service (ARS) Long-Term Agroecosystem Research network consists of 18 Federal and university agricultural research sites with an average of over 50 years of history. The goal of this research network is to ensure sustained crop and livestock production and ecosystem services from agroecosystems, and to forecast and verify the effects of environmental trends, public policies, and emerging technologies.

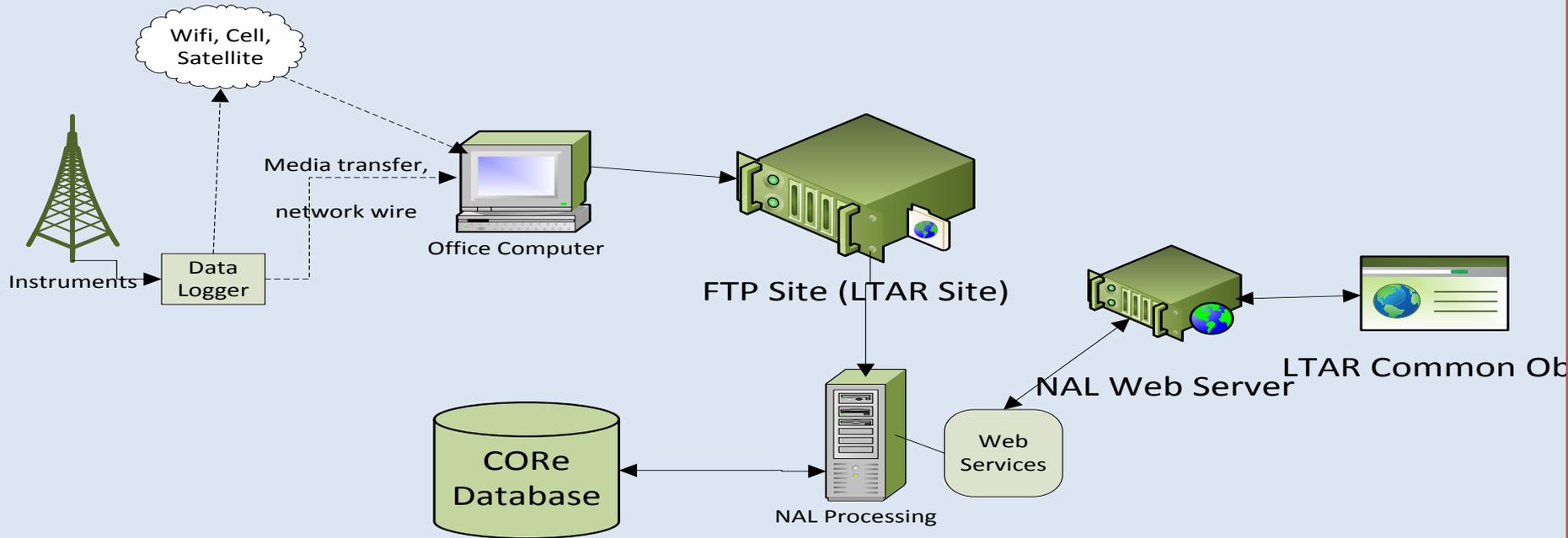
### Display Options

- LTAR
  - LTAR sites
  - Soil Climate Data
  - Atmospheric Gas D
  - Camera Images
- Other Research Networ
- Boundaries
- Ecological Context
- Watersheds
- Seasonal Drought C
- Ecosystems
- Bioclimates
- Land Surface Form:
- Surface Lithology
- Topographic Positic
- Base Maps



Click on the LTAR sites on the map to see more information about each site. Other national ecosystem research networks are available on the map to show how LTAR contributes to nation-wide coverage. The map also links for LTAR data available through the Ameriflux, Soil Climate Analysis Network, and PhenoCam research data networks.

# CORe Meteorological Data Flow



# LTAR CORe Data Status

## Current Status

- Meteorological Data:
- Near Real-Time Data for 11 stations at 7 LTAR locations
- Test batch data from 4 stations at 2 LTAR locations
- Phenocam images for 18 cameras at 7 LTAR sites
  - Phenocam network performs image analysis to measure seasonal changes (spectrum)

## Future Value-Enhancements

- Respond to environmental events (e.g. flooding)
  - Tie-in LTAR data (graphic display of cumulative precipitation)
  - Create a news feed
- Build out API Web services
  - ability to automatically serve downloads
- ***And....***

# Near Real-Time Meteorological Data



Long-Term Agroecosystem Research  
Common Meteorology Data (Alpha Pilot)

[CORe Home](#)

[Meteorology Home](#)

[Real-Time Cameras](#)

Central Mississippi River Basin-000

09/03/2015



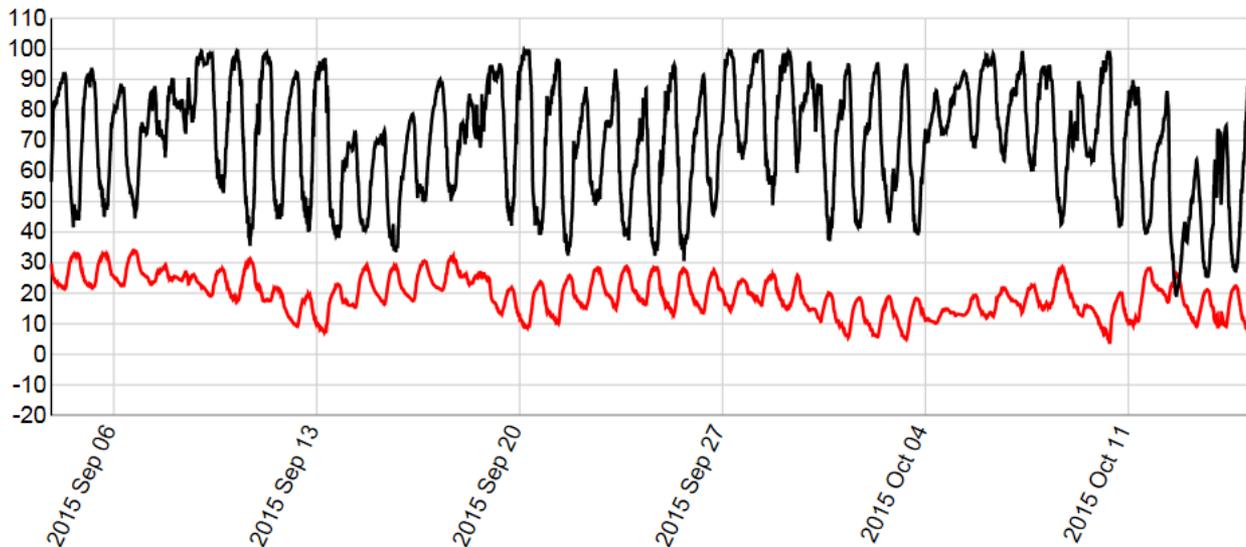
01/06/2016



[Update Dates](#)

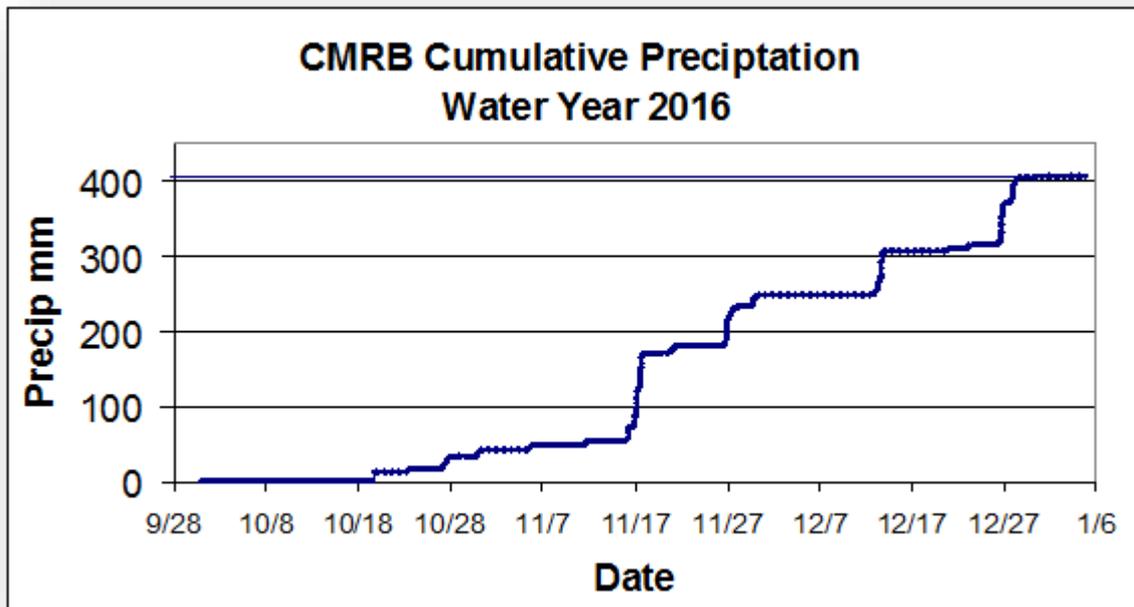
[Download Dataset](#)

Air Temperature  Air Pressure  Precipitation  Wind Speed  Relative Humidity



# Future Enhancements

- Greatly enhanced information visualization and user interaction with data
- Possible timely news features



Cumulative precipitation at Central Mississippi River Basin LTAR site (Columbia, MO) ties into the current flooding in Missouri (and downstream)



# Highlighted Program: Long Term Agroecosystem Research

A network of 18 research sites around the U.S. are collecting long-term data on agriculture, climate change, ecosystems and natural resource conservation. These data are vital to developing safe and sustainable agricultural production systems.

## Topics

-  Agricultural Products
-  Agroecosystems & Environment
-  Animals & Livestock
-  Bioenergy
-  Food & Nutrition
-  Genomics & Genetics
-  Maps & Multimedia
-  Plants & Crops

## Highlighted Datasets



Scientists are using the Blue Berry Genomics Database (BBGD) to investigate which genes are involved in acclimation to cold in blueberries.



The Baylor College of Medicine recently sequenced and annotated the *Oncopeltus fasciatus* genome as part of the 15k pilot project.



What is the role of pathogens in Honey Bee Colony Collapse Disorder? Deep RNA sequencing was used to study microbial diversity and seek answers.

# LTAR Data @ Ag Data Commons

[Home](#) / Long Term Agroecosystem Research Landing

## Long Term Agroecosystem Research Overview

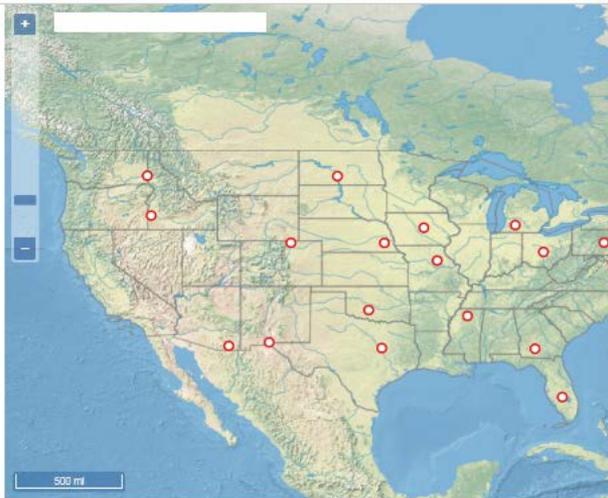
Agriculture faces tremendous challenges in meeting multiple, diverse societal goals, including a safe and plentiful food supply, supplying sources of bioenergy, improving water/air/soil quality, and maintaining biodiversity. The LTAR network enables long-resource regions to address these challenges. The goal of this research network is to ensure sustained crop and livestock prod agroecosystems, and to forecast and verify the effects of environmental trends, public policies, and emerging technologies. Ult array of clients, partners, and stakeholders with four basic outcomes:

1. Agroecosystem productivity is sustainably enhanced by the development and application of new technologies
2. Mitigation and adaptation of agroecosystems to climate change is improved by more accurate predictions of resource re
3. Stronger linkages to other long-term research networks improves conservation and environmental quality in agricultura
4. The socio-economic viability of, and opportunities for, rural communities are enhanced through educational outreach by

For the fully interactive version of this LTAR data explorer visit <https://ltar.nal.usda.gov>.

### Display Options

- Natural Earth
- Native Lands
- States
- Counties
- Ecosystems
- Bioclimates
- Land Surface Forms
- Surface Lithology
- Topographic Position
- Ag Stat District
- Farm



Click on the LTAR sites on the map to see more information about each site. Other national ecosystem research networks are contributes to nation-wide coverage. The map also links for LTAR data available through the Ameriflux, Soil Climate Analysis N networks.

<https://data.nal.usda.gov/long-term-agroecosystem-research>

## LTAR Research Sites

Data from the following LTAR sites are presented. They are related to topics such as agricultural sustainability, climate change, ecosystem services, and natural resource conservation at the watershed or landscape scale.

- Archbold Biological Station (ABS), Venus, FL
- Cook Agronomy Farm (CAF), Pullman, WA
- Central Mississippi River Basin (CMRB), Columbia, MO
- Central Plains Experimental Range (CPER), Cheyenne, WY; Fort Collins, CO; Nunn, CO
- Eastern Corn Belt (ECB), Columbus, OH; West Lafayette, IN
- Gulf Atlantic Coastal Range (GACP), Tifton, GA
- Great Basin (GB), Boise, ID; Burns, OR
- Jornada Experimental Range (JER), Las Cruces, NM
- Kellogg Biological Station (KBS), southwestern MI
- Lower Mississippi River Basin (LMRB), Oxford, MS; AR; LA; MO
- Northern Plains (NP), Mandan, ND
- Platte River-High Plains Aquifer (PRHP), Lincoln, NE
- Southern Plains (SP), El Reno, OK
- Texas Gulf (TG), Riesel, TX
- Upper Chesapeake Bay (UCB), University Park, PA
- Upper Mississippi River Basin (UMRB), Ames, IA; MN; WI
- Walnut Gulch Experimental Watershed (WGEW), Tucson, AZ; Tombstone, AZ
- Lower Chesapeake Bay (LCB), Beltsville, MD

## Datasets

107 datasets

Search...

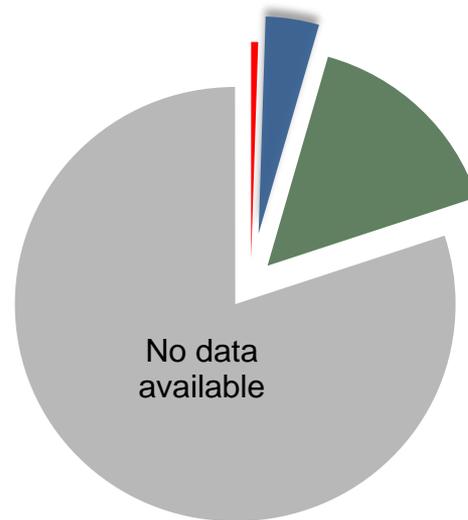
Upper Washita River Experimental Watershed: Nutrient Water Quality Data



# Publication-related LTAR Data

## Publications Related

- LTAR site proposal references were reviewed for related data
  - 194 of more than 500 citations were reviewed
  - These citations are cross referenced to full-text papers in PubAg



4% of  
Data are  
accessible

**107 LTAR-Data  
Records in Ag Data  
Commons (including  
records for other  
network data, e.g.  
SCAN)**

# Aerial Imagery

- More than 600 images from Mandan, ND and Cheyenne, WY; NAL:
  - Digitized the images
  - Created metadata records
- Under development: image comparison tools
- Expected public release this fiscal year

# Aerial Imagery: Sneak Peek

USDA Long-Term Agroecosystem Research

## Long-Term Agroecosystem Research

The USDA Agricultural Research Service (ARS) Long-Term Agroecosystem Research (LTAR) network has been in place over 50 years of history. The goal of this research network is to monitor and verify the effects of environmental trends, public policies, and agricultural practices on the land.

Display Options

- LTAR
  - LTAR sites
  - Soil Climate
  - Atmospheric
  - Camera Images
  - Aerial Imagery
- Other Research
- Boundaries
- Ecological Context
- Watersheds

### Aerial Image Comparison

The image comparison tool displays two side-by-side aerial photographs of the same geographic area. The left image is labeled 'Aerial\_AZY\_2001' and the right image is labeled 'Aerial\_AZY\_1963'. The 1963 image is circled in red, highlighting a specific area of land. The 2001 image shows a more developed landscape with a river and agricultural fields, while the 1963 image shows a more rural landscape with a river and agricultural fields.

**Land occupation 1963**

# Aerial Imagery: Sneak Peek

USDA Long-Term Agroecosystem Research

## Long-Term Agroecosystem Research

The USDA Agricultural Research Service (ARS) Long-Term Agroecosystem Research (LTAR) network has been in place over 50 years of history. The goal of this research network is to monitor and verify the effects of environmental trends, public policies, and agricultural practices on agroecosystems.

Display Options

- LTAR
- LTAR sites
- Soil Climate
- Atmospheric
- Camera Images
- Aerial Imagery
- Other Research
- Boundaries
- Ecological Context

46.7772° N, 100° W

### Aerial Image Comparison

The image shows a side-by-side comparison of two aerial photographs. The left image is labeled 'Aerial\_AZY\_1963' and the right image is labeled 'Aerial\_AZY\_2001'. A red circle highlights the 'Aerial\_AZY\_1963' label. The interface includes a 'Display Options' sidebar on the left with a tree view of layers, a map navigation bar with a zoom slider and coordinates (46.7772° N, 100° W), and a header for 'Long-Term Agroecosystem Research'.

Land occupation 2001

# Aerial Imagery: Before & After

Spyglass shows 2001 image over the 1963 base

USDA Long-Term Agroecosystem Research

## Long-Term Agroecosystem Research

The USDA Agricultural Research Service (ARS) Long-Term Agroecosystem Research (LTAR) network has been in place over 50 years of history. The goal of this research network is to monitor and document the effects of environmental trends, public policies, and agricultural practices on the land.

### Aerial Image Comparison

Aerial\_AZY\_1963      Aerial\_AZY\_2001

Display Options

- LTAR
  - LTAR sites
  - Soil Climate
  - Atmospheri
  - Camera Imag
  - Aerial Imag
- Other Research
- Boundaries
- Ecological Cont
- Watersheds

# Immediate Next Steps for LTAR Data

- Continue to add new LTAR sites with near real-time meteorological data
- Coordinate QA/QC processes for LTAR-wide comparability (ARS statisticians)
- Establish a means to collect “station event” metadata (sensor calibration; wildlife interference; major weather events, etc.)
- Publish the Mandan and Cheyenne aerial images

# LTAR Project Acknowledgements

Jeffrey Campbell  
Susan McCarthy  
Mark Walbridge  
Charlie Walthall  
Sally Schneider

Cynthia Parr  
Bruce Vandenberg  
Jorge Delgado  
Simon Liu  
Jim Ascough

Ursula Pieper  
NuCivic Team  
Qing Qu  
Gary Moore  
Jiabin Heng

**Jeffrey Campbell**

[Jeffrey.campbell@ars.usda.gov](mailto:Jeffrey.campbell@ars.usda.gov)

**301-504-5767**



# Ag Data Commons Acknowledgements

Susan McCarthy, NAL – KSD

Ursula Pieper, NAL – ISD

Qing Qu, NAL – KSD contractor

Jeff Campbell – NAL – KSD

Jaylen Nathwani, NAL – student intern

NüCivic, Angry Cactus Team

Jocelyn McNamara -- NAL – KSD contractor

Kerry Huller – UMD graduate fellow

Erin Antognoli – UMD graduate fellow

[Cynthia.Parr@ars.usda.gov](mailto:Cynthia.Parr@ars.usda.gov)

