



# NOAA CDR Program Overview

## *Sustained Production & User Engagement*

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Program Manager

Center for Weather and Climate  
NOAA's National Centers for Environmental Information

August 5, 2015

National Centers for Environmental Information | Center for Weather and Climate





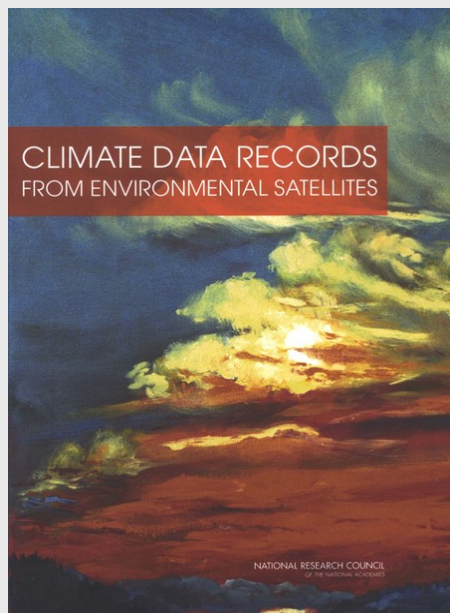
# 2015 Annual Meeting Outline

**DAY-1:** NOAA CDRP Programmatics & Processes

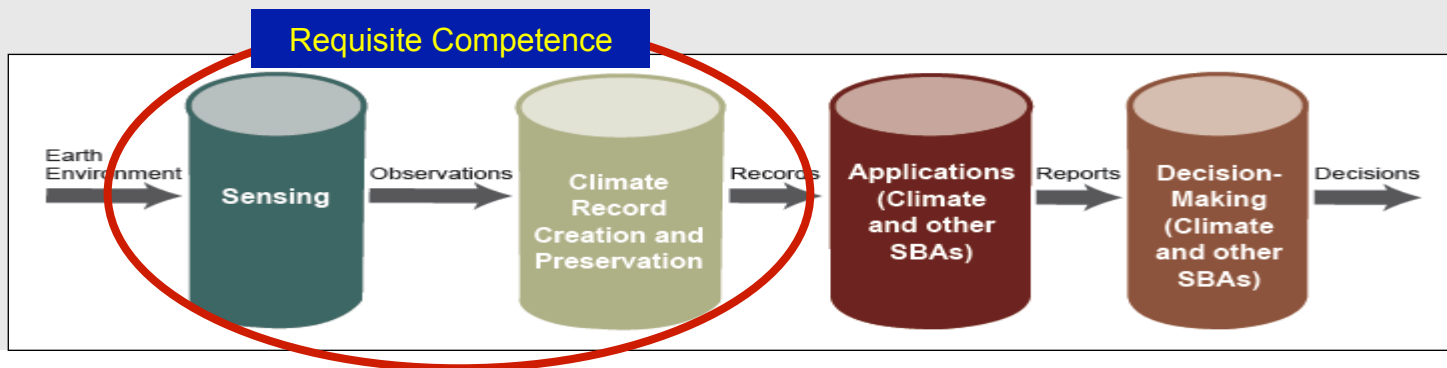
**DAY-2:** Updates from the NESDIS/AA, and International & Federal Partner Plans & Activities relevant to CDRs

**DAY-3:** CDR End-Users & Applications

# From Conception ...



- **National Research Council** (NRC) of National Academy of Sciences (NAS) (2004)
- Office of Science and Technology (**OSTP**), NOAA/NESDIS guidance
- **Scientific Data Stewardship (SDS)** Program (2007 & 2008)
- The American Recovery and Reinvestment Act of 2009 (**ARRA**)
- FY **2009** First NOAA CDR Grant Opportunity (**FFO**)
- FY **2010** “**CDR**” Established as a NOAA/NESDIS **Budget Line**
- FY **2011** Second NOAA CDR Grant Opportunity (**FFO**)



# ... to Recognized Success!

**U.S. Department of Commerce**

2014 Gold Medal Award

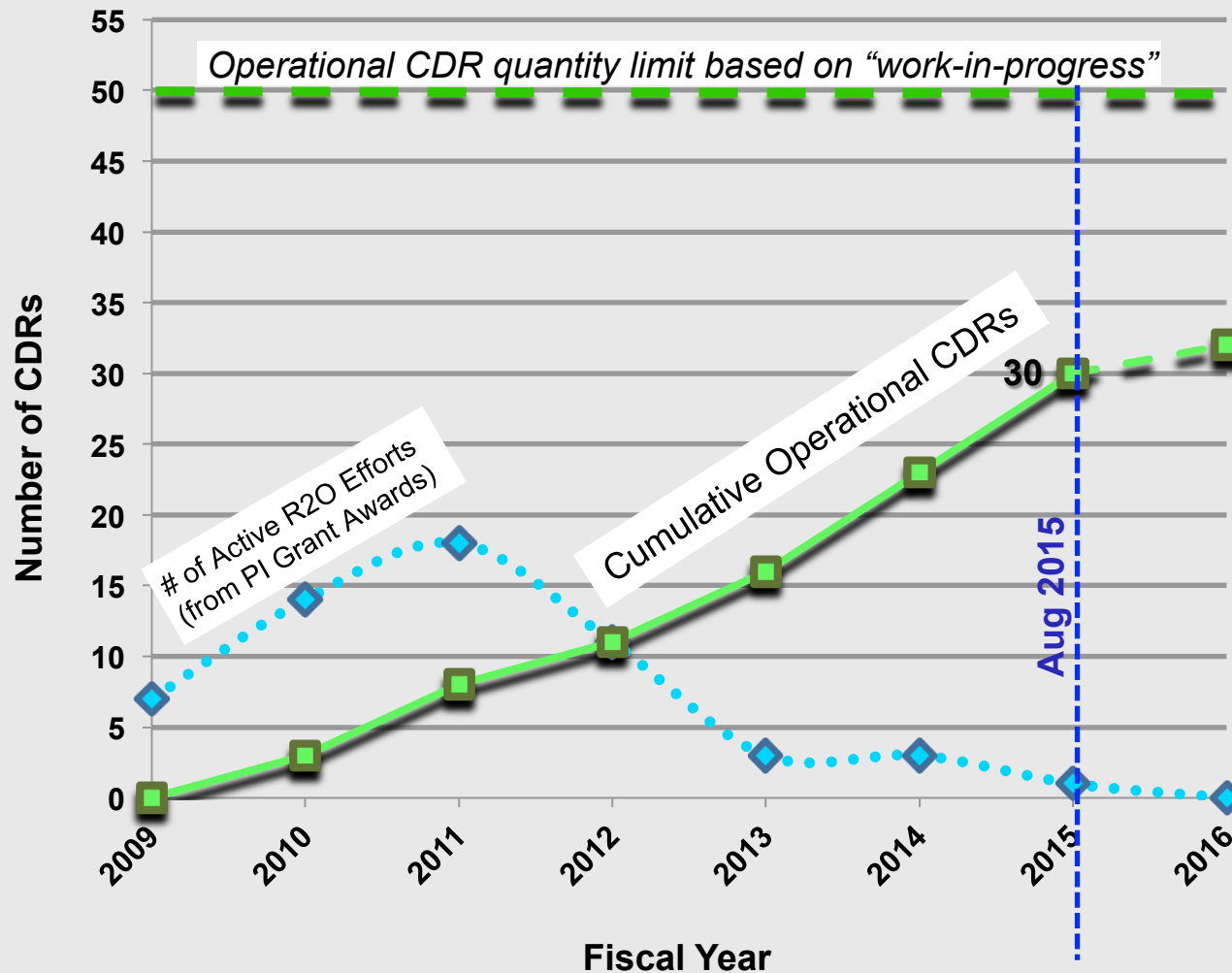
CITATION:

For creation and operational implementation of a new, extensible community standard for the production and preservation of climate data records.





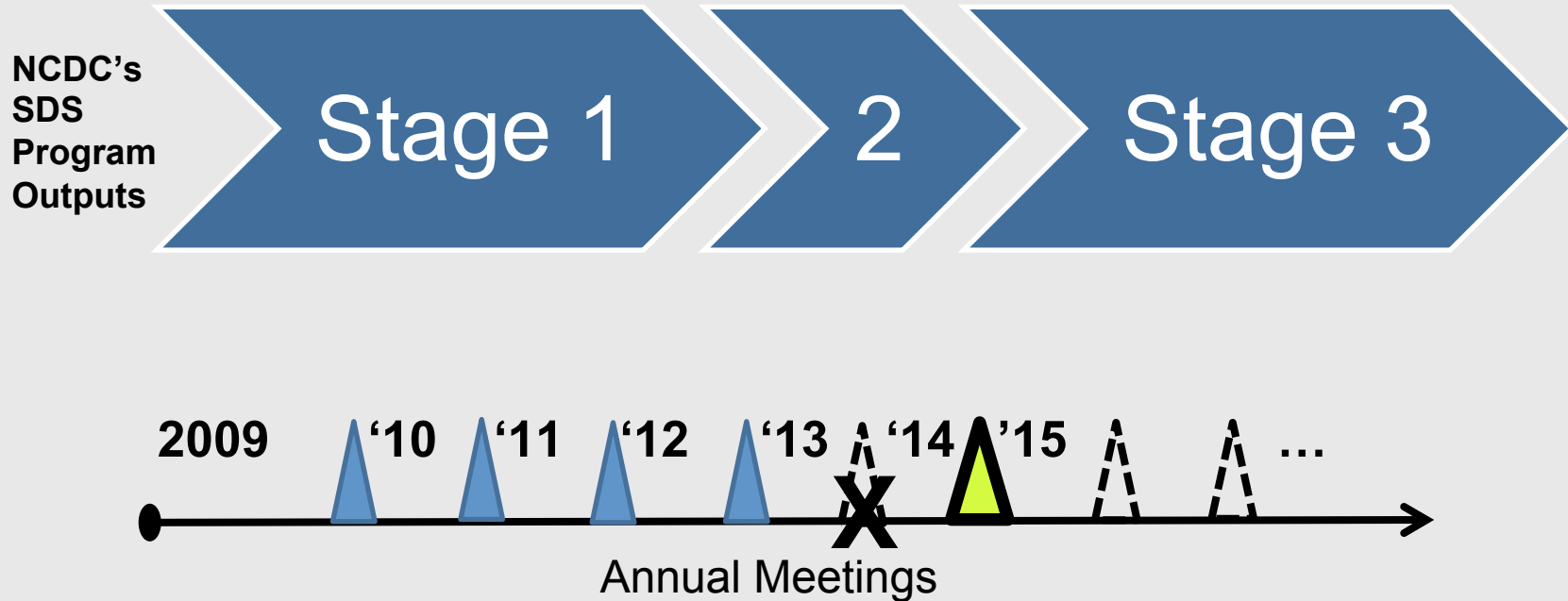
# CDR R20 Transition Status



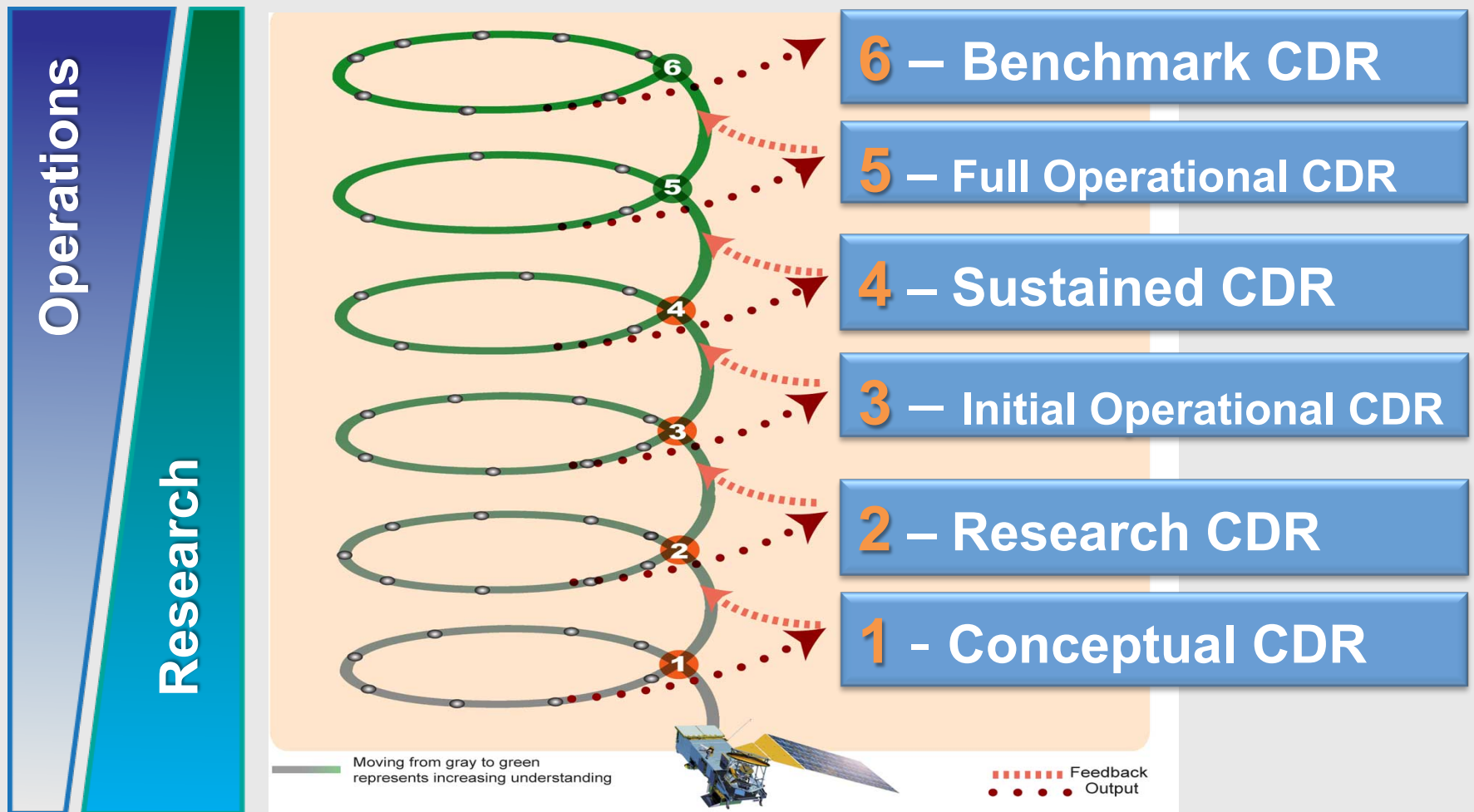
- PI R20 "work-in progress", from Grant Competition
- 20+ more individual CDRs in the work "Pipeline"
- Sustainment cost also limits operational CDR carrying capacity

# CDR Program is Maturing

- Program Evolution



# NOAA CDR Operational Spiral Development

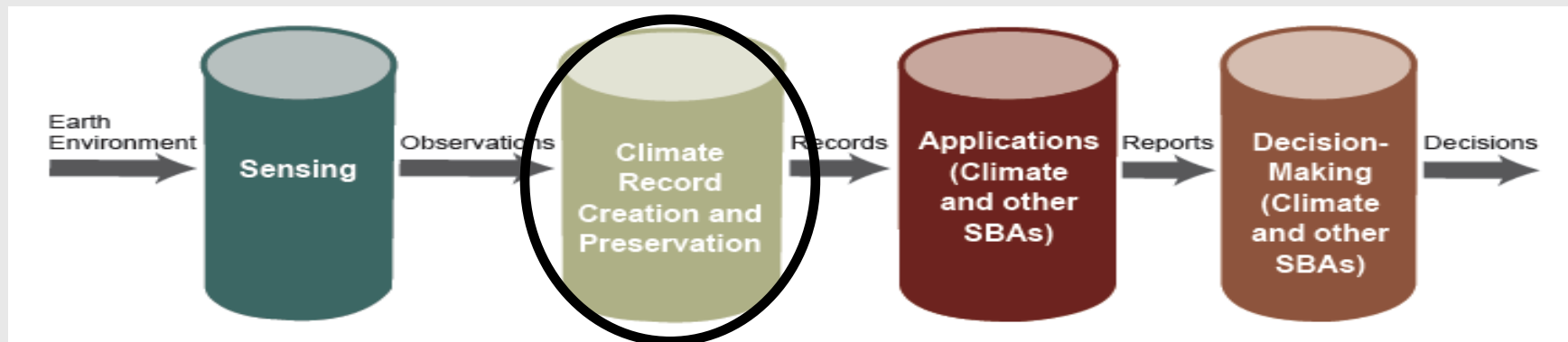


# NOAA CDR Program (CDRP) – Stage 1

## Annual Meetings #1-3

CDRP began in **2009** as an outgrowth of the National Climatic Data Center (NCDC) Science Data Stewardship (SDS) Program.

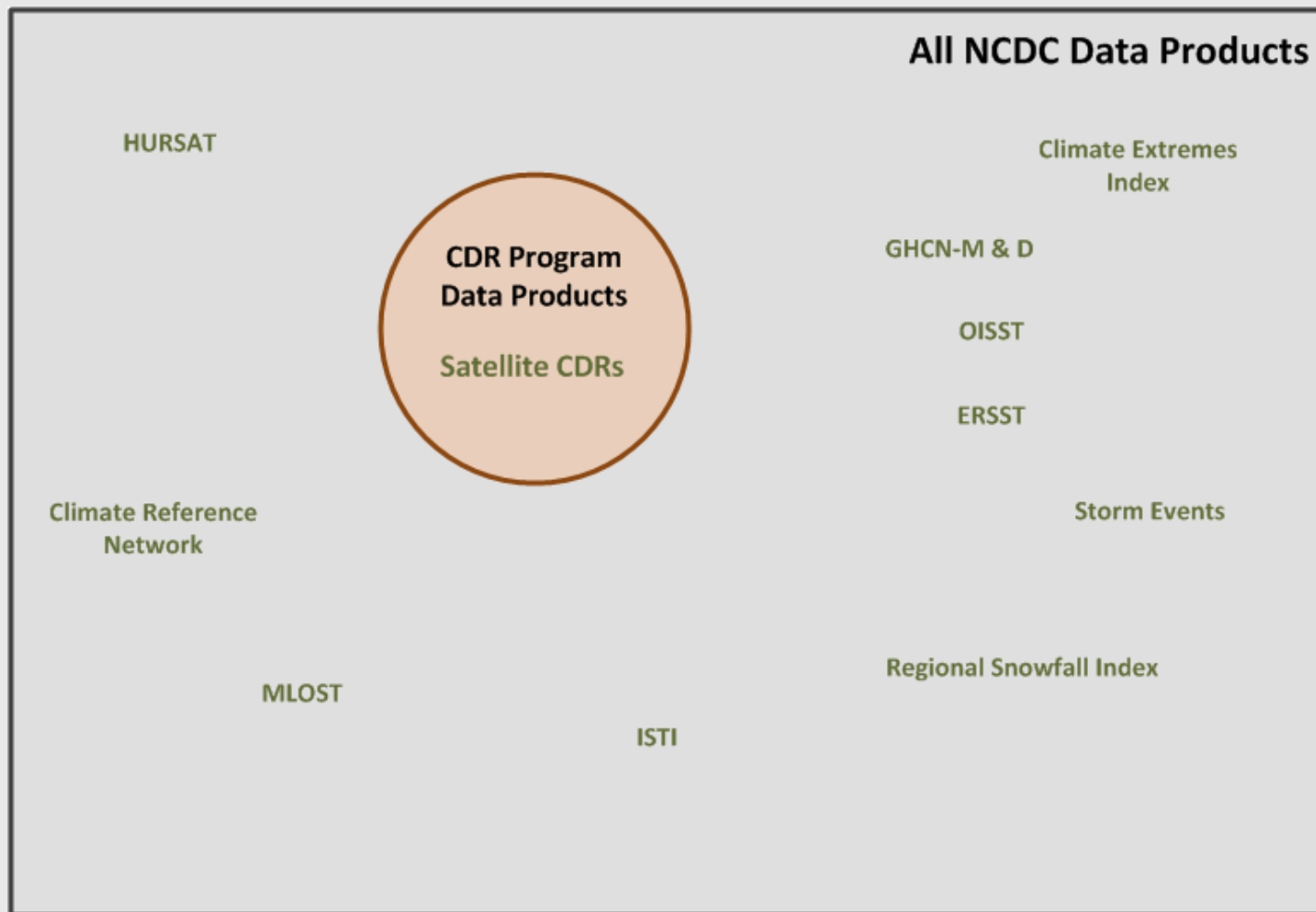
- Focus: **Essential Climate Variables** (ECVs); “**critical**” CDRs identified by international experts were top priority.
- **R2O** awards based on **best science** and **most mature** algorithms.
- **Grant competition** captured leading knowledge from the research community. (U.S. agencies, universities, private companies)
- CDRP **coordinated** with NASA, USGS, and international partners.





# Stage 1

## Product Scope: 2009 - 2011

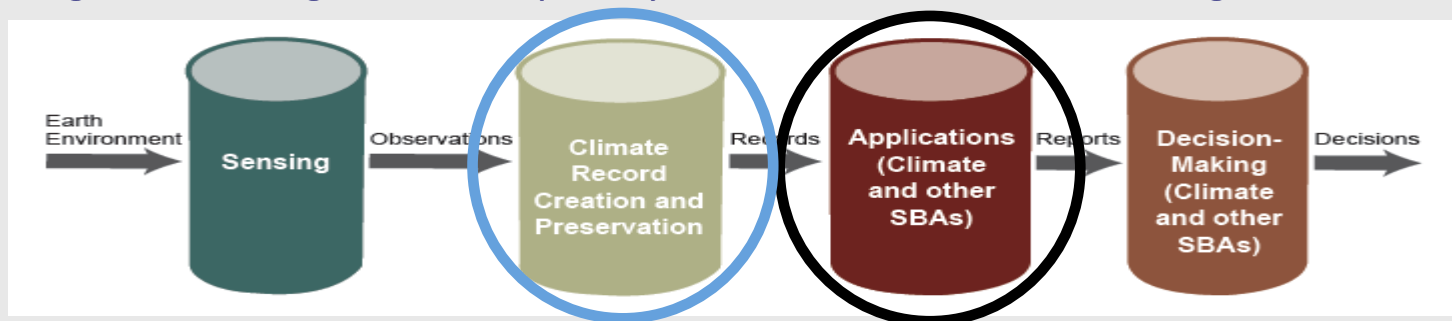


# NOAA CDR Program – Stage 2

## Annual Meeting #4

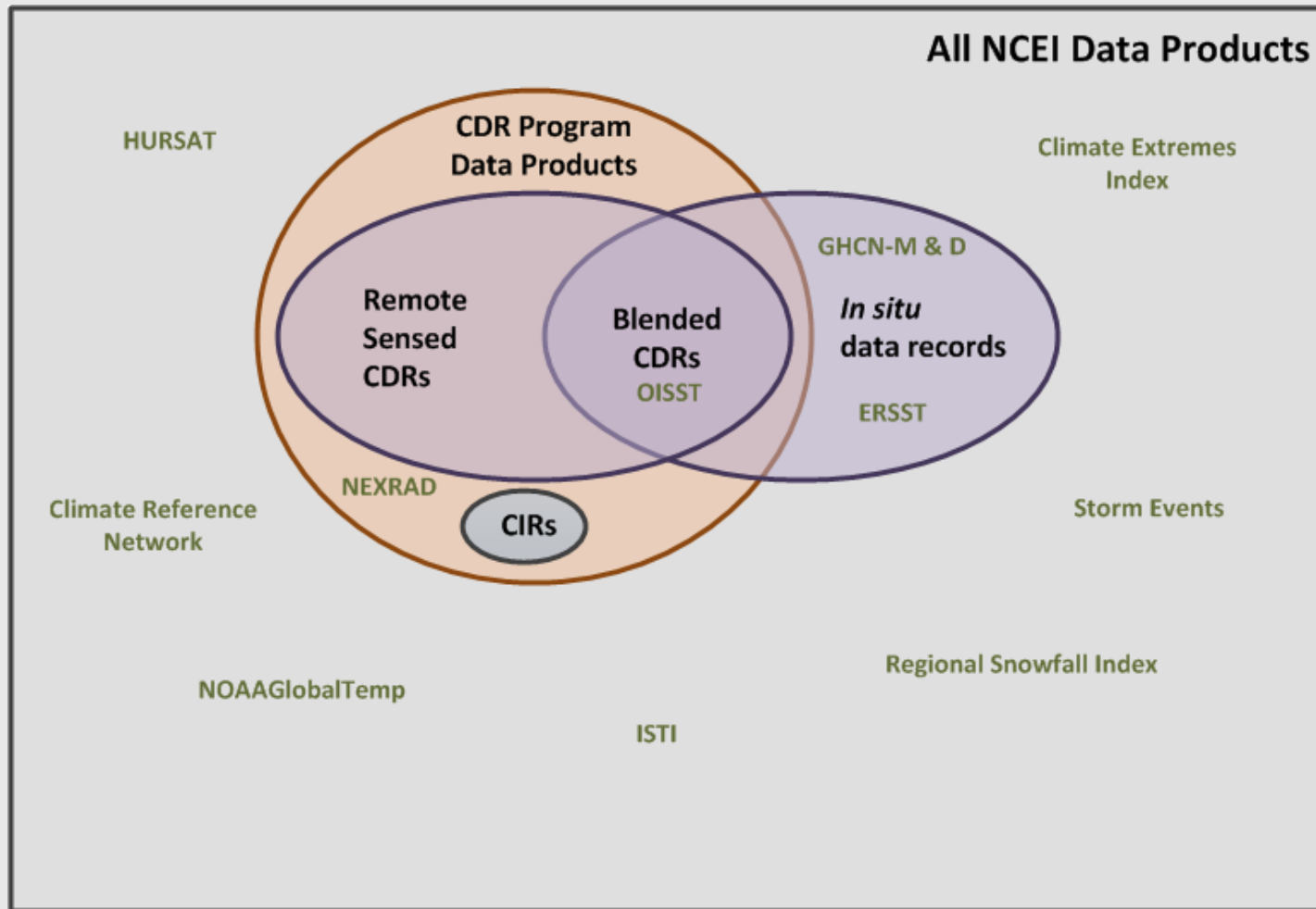
CDRP in **2013** Expanded its Target Users to Include non-climate research Applications & Users.

- Priority moved to “**best use**” regardless of Societal Benefit Area (SBA).
- Began **interactions with industry and public** to identify needs and prioritize CDRs capable of meeting them.
- Formalized **R2O processes**, cost-estimating, policies, and procedures for transition activities and information preservation.
- Began **CDR O&M** using **NOAA Contracts & IAAs** with other agencies, universities, and private industry with provisions for deliverables, configuration mgmt., and quality assurance, and user/usage statistics.



# Stage 2

## Product Scope: 2012 –2015

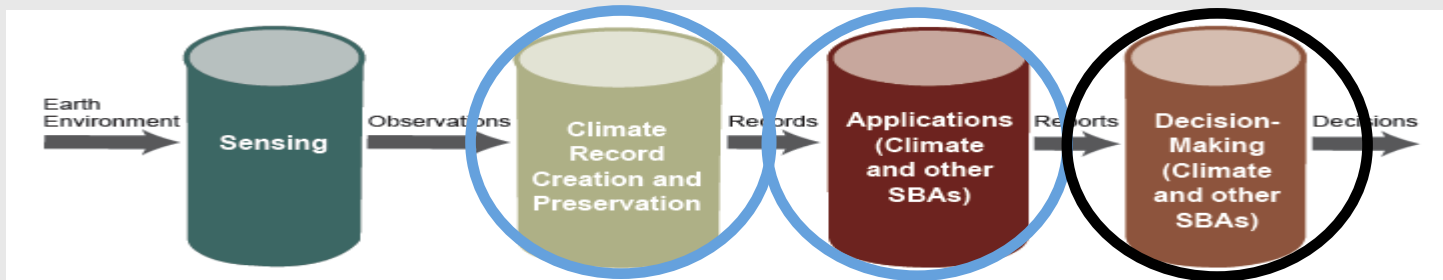


# NOAA CDR Program – Beginning Stage 3

2015 Annual Meeting (\*Now)

CDRP in **2015** is focused on: Sustaining NOAA's Operational CDRs and Users Requiring trusted environmental information products. (e.g. informed decision making, management, and climate applications including science)

- Incorporating ***in-situ* and blended products** into the CDR portfolio to preserve those products for the future in addition to the satellite data products.
- **Developing Climate Information Products** that target User needs and requirements.
- Supporting decision-makers with lower-latency “Preliminary” or **ICDRs** that employ the most mature algorithms, but are not yet CDRs.
- Accelerating **high-demand, less scientifically maturity products**, e.g. NEXRAD weather radar reprocessing for hi-res precipitation CDRs/CIRs requested by Users.

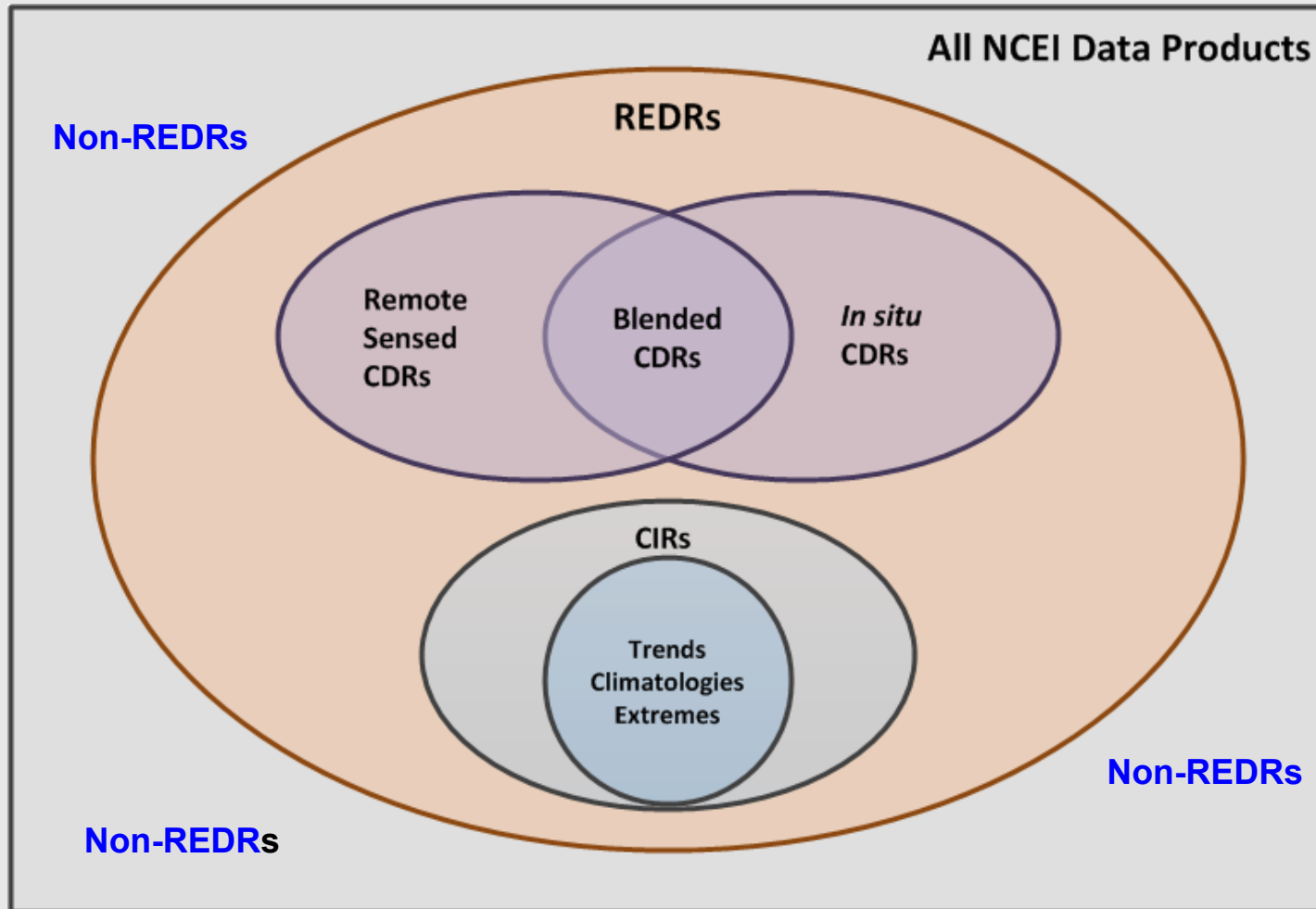




# Stage 3

## Product Scope: 2016 +

### Reference Environmental Data Records (REDRs)



# User Needs Met are Society's Benefit

## Priority areas



Agriculture and food security



Disaster risk reduction



Energy



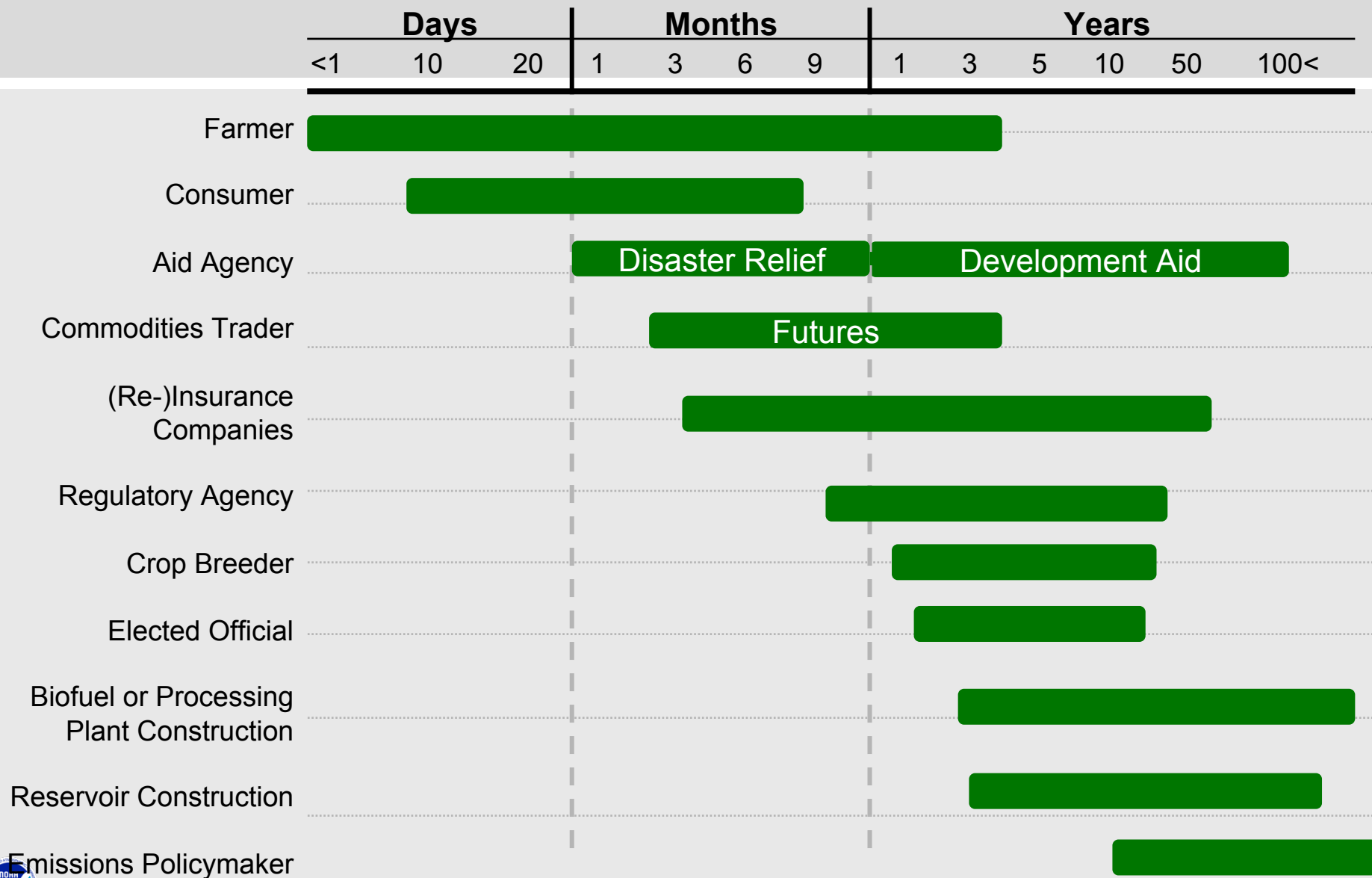
Health



Water

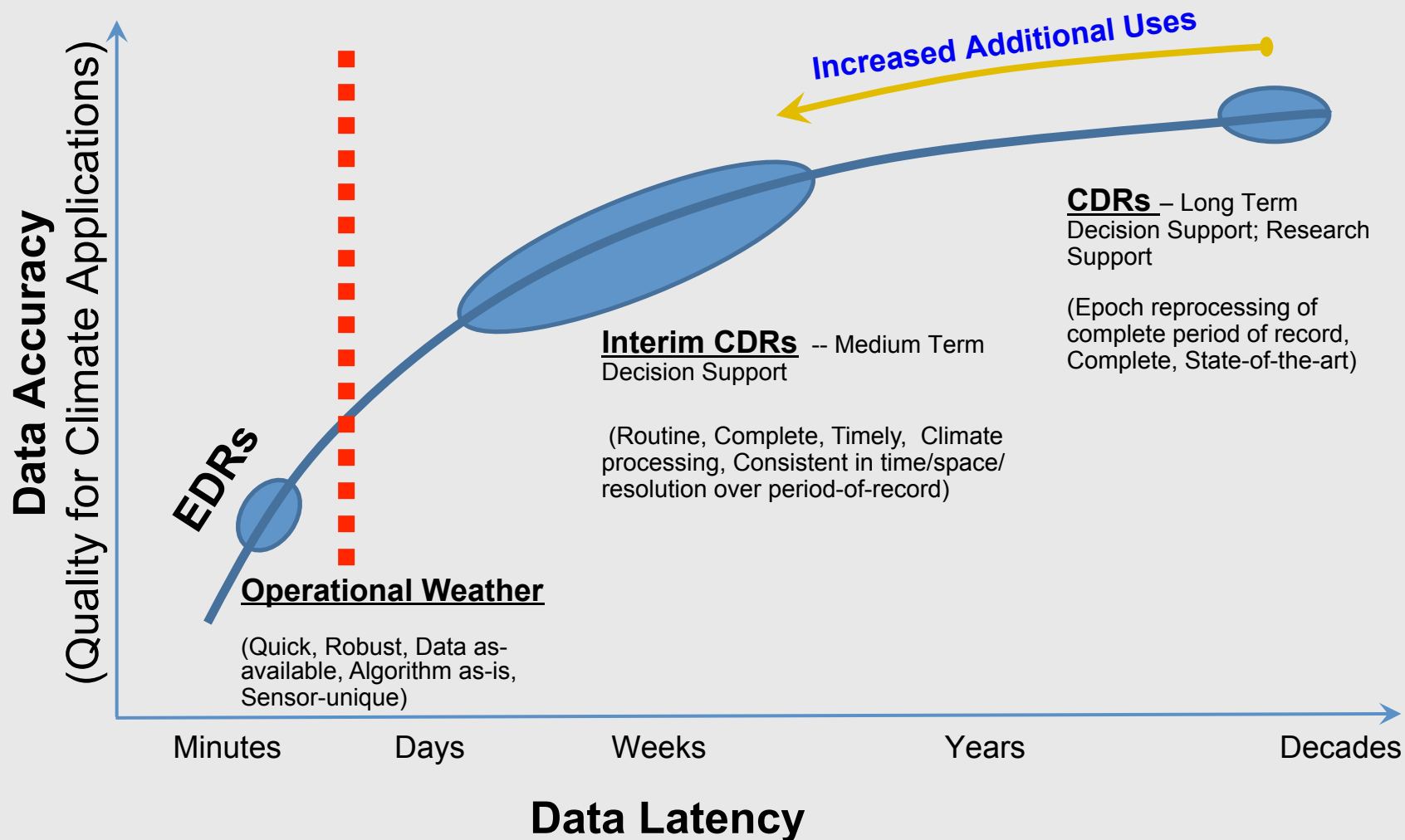
**One must first Understand the End-User's Needs!**

# Agricultural Stakeholder Temporal Outlook



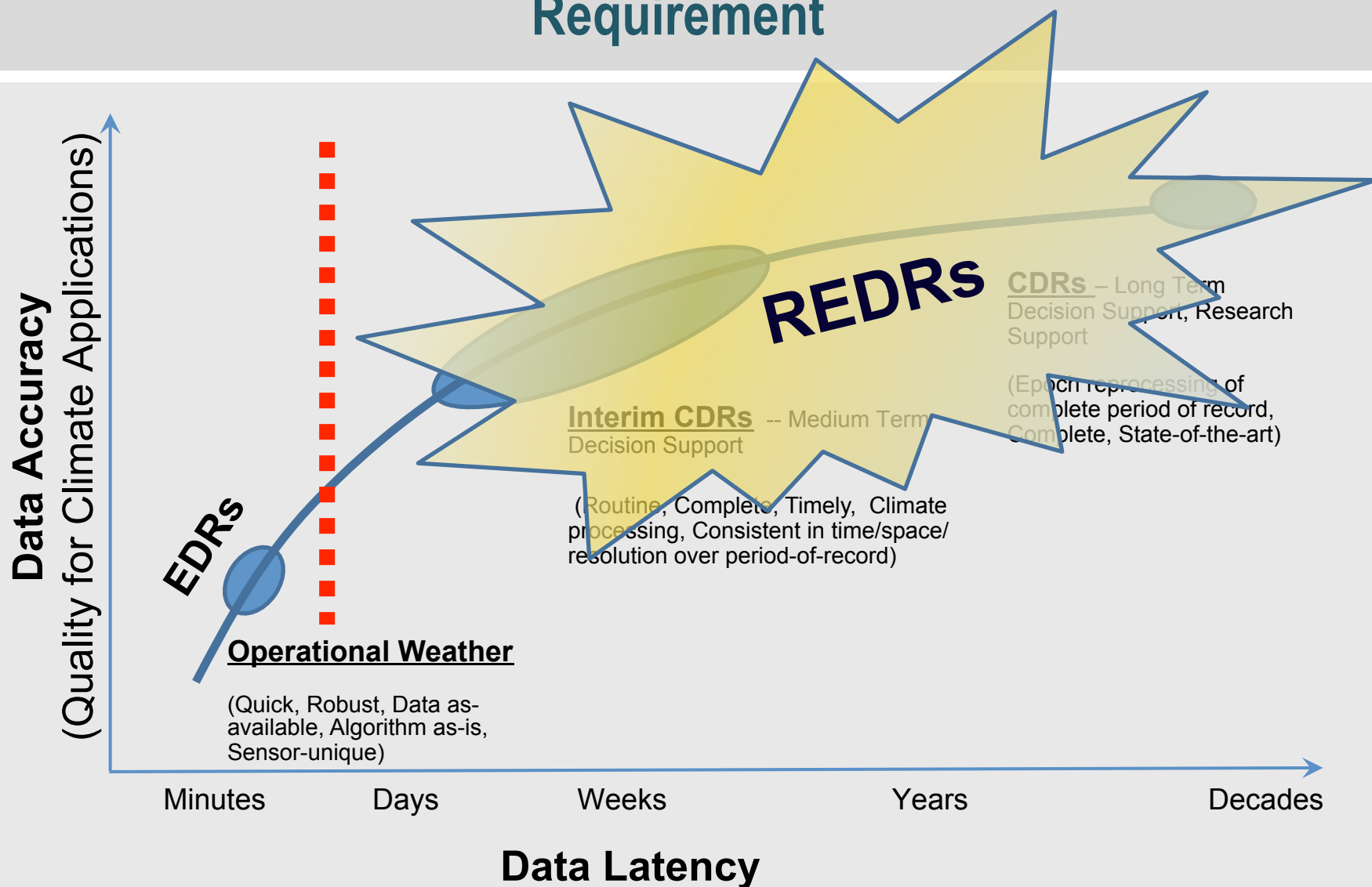
# Accuracy vs. Latency

CDRs Have Higher Latency, but are Better for Long-Range Decisions than Low Latency Operational Weather Data Products



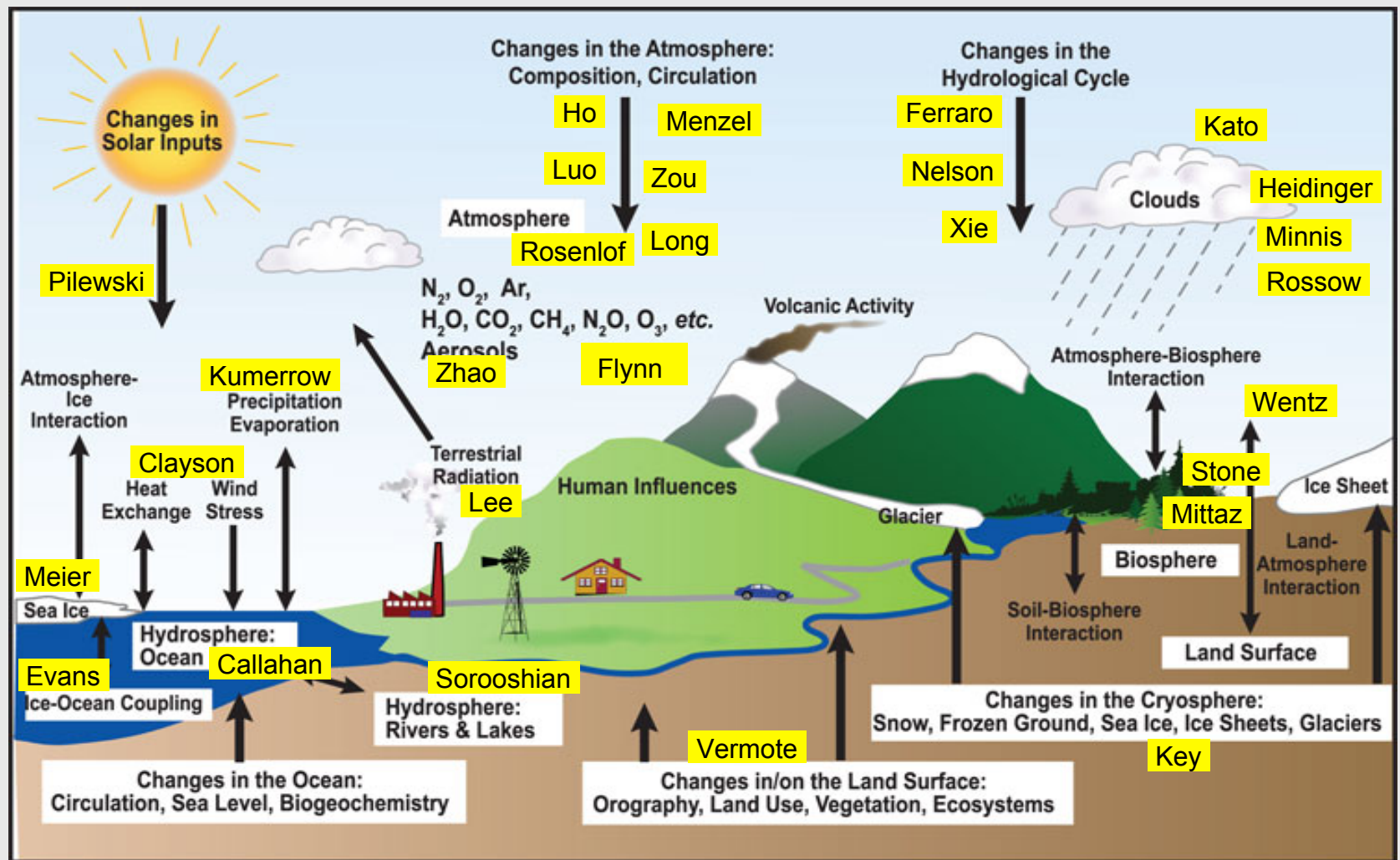


# REDRs: Able to Meet Any Higher-Latency Application / Requirement



# NOAA CDR Environmental Variable Coverage

(with Principle Investigator's Names Highlighted near their Area of Contribution)

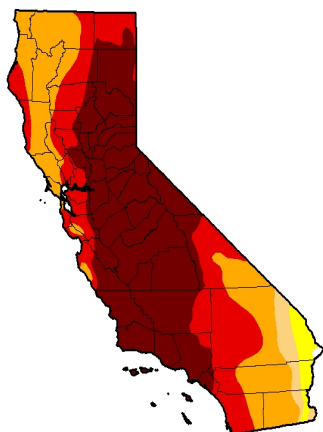


# NOAA Operational CDRs Support User Needs

(Details to be Presented in the Poster Session!)



**U.S. Drought Monitor  
California**



**July 21,  
(Released Thursday  
Valid 8 a.m.**

	Drought Conditions			
	None	D0-D4	D1-D4	D2-D4
Current	0.14	99.86	97.35	
Last Week 7/14/2015	0.14	99.86	98.71	94
3 Months Ago 4/21/2015	0.14	99.86	98.71	92.44
Start of Calendar Year 1/1/2015	0.00	100.00	98.12	94.34
Start of Water Year 9/30/2014	0.00	100.00	100.00	95.04
One Year Ago 7/21/2014	0.00	100.00	100.00	97.81

**Intensity:**  
 D0 Abnormally Dry  
 D1 Moderate Drought  
 D2 Severe Drought  
 D3 Extreme Drought  
 D4 Exceptional Drought  
 The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

**Author:**  
David Simeral  
Western Regional Climate Center



<http://droughtmonitor.unl.edu/>

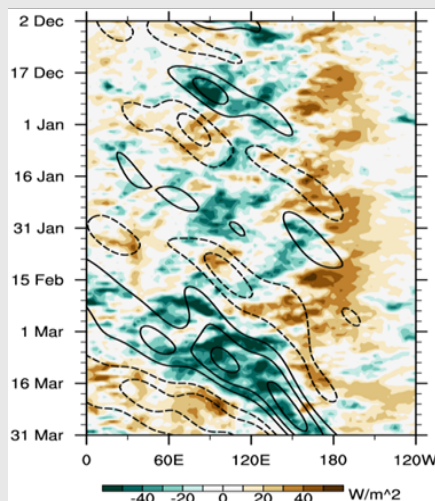
Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0-50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101-150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151-200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201-300	Health alert: everyone may experience more serious health effects.
Hazardous	> 300	Health warnings of emergency conditions. The entire population is more likely to be affected.



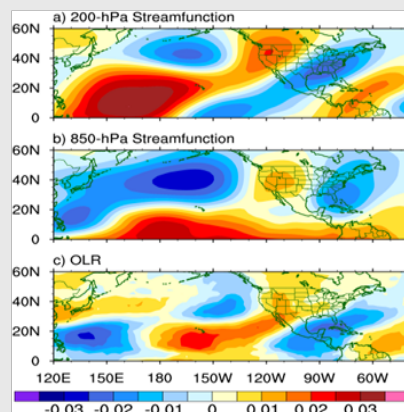


# NOAA CDRs are Being Used to Improve Monthly to Seasonal Forecasts

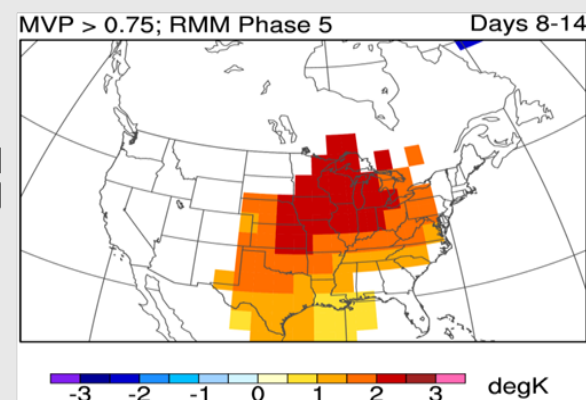
Satellite CDRs



Reanalysis



Improved 2-week Forecast



- NOAA's Outgoing Longwave Radiation (OLR) CDR is used to measure the Madden-Julian Oscillation (MJO) evolution
- Reanalysis leads to estimates of the future MultiVariate Pacific-North American (MVP) index
- MJO plus MVP provides a useful forecasting tool for future extratropical responses over US

*Courtesy of Dr. Carl Schreck,  
CICS-NC*



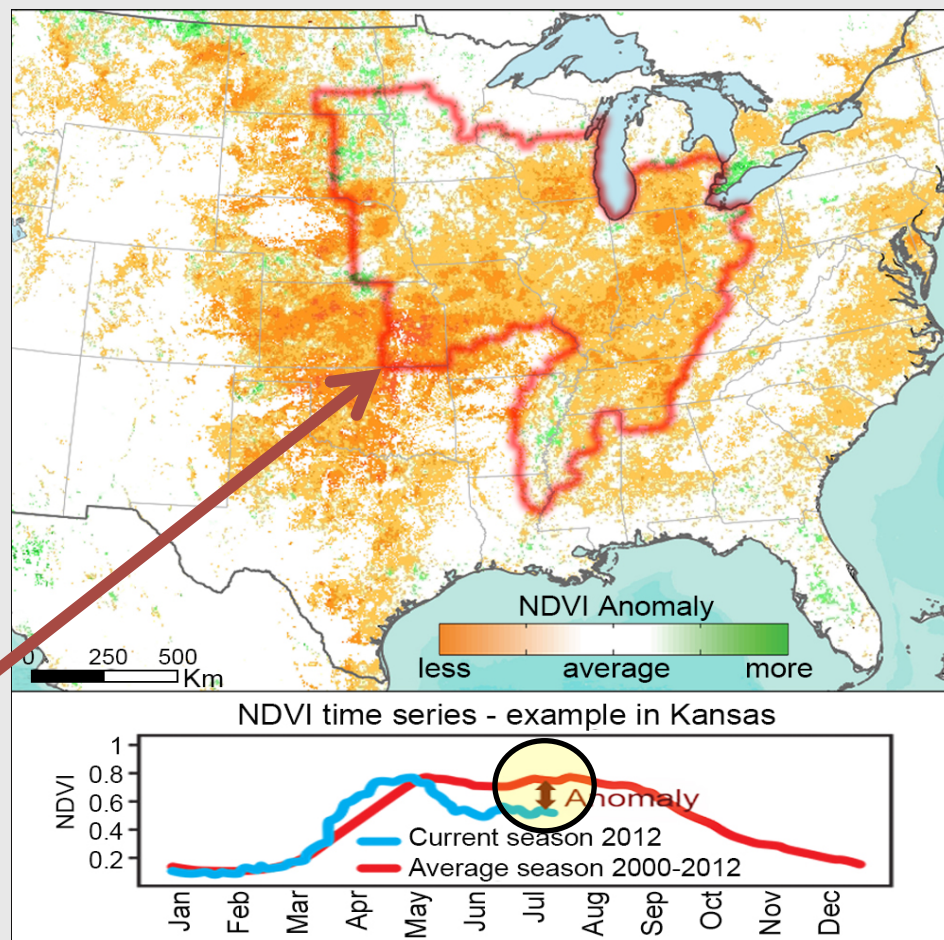
# NOAA CDRs Supporting Farming / Agribusiness

Enables understanding of anomalies and discovery of analogs.

- Subset of 5-km resolution, “wall-to-wall” global NDVI CDR.
- Historical record from **1981-to Present**.
- Env. Variables Also Available:
  - Surface Reflectance
  - Leaf Area Index (LAI)
  - FPAR (photosynthetically active radiation)

**Primary U.S. Corn and Soybean Production Region**

## 2012 U.S. Drought as depicted using Vegetation Index CDR for July 17th



# NOAA CDRs Supporting Resource Management

## Example: Forest Change Detection Using NOAA CDRs

### Percent Tree Cover Change in the Amazon Basin

1990 (AVHRR NOAA CDRs)

2000 (MODIS Data)

2010 (MODIS Data)



#### AVHRR-based NOAA CDR Variables:

- Normalized Difference Vegetation Index (NDVI)
- Leaf Area Index (LAI)

<http://www.ncdc.noaa.gov/cdr/operationalcdrs.html>

Percent Tree Cover

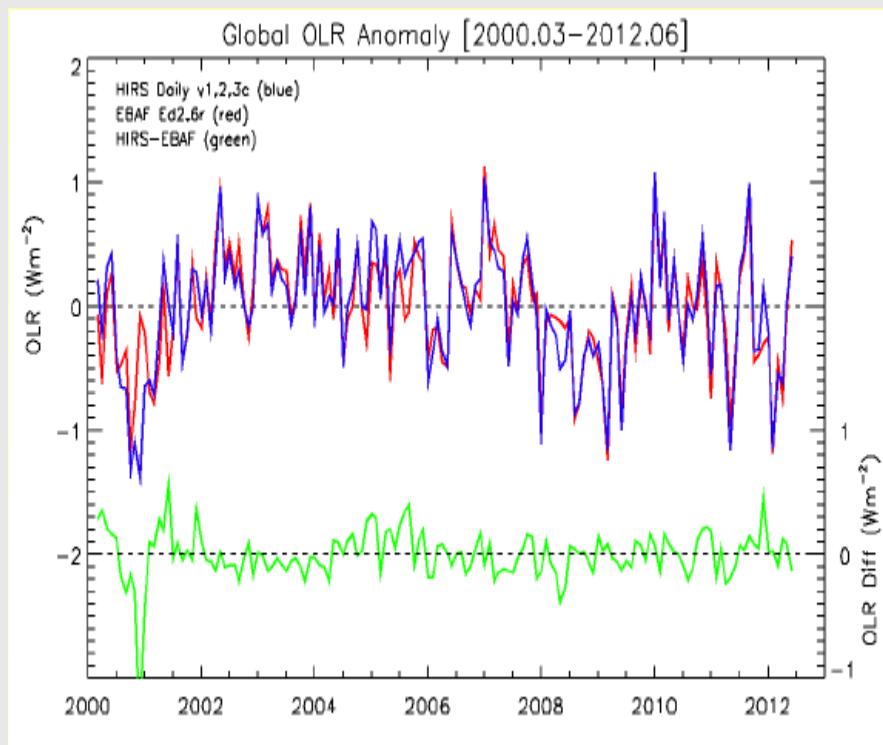
0 25 50 100

(Courtesy of Dr. Eric Vermote)



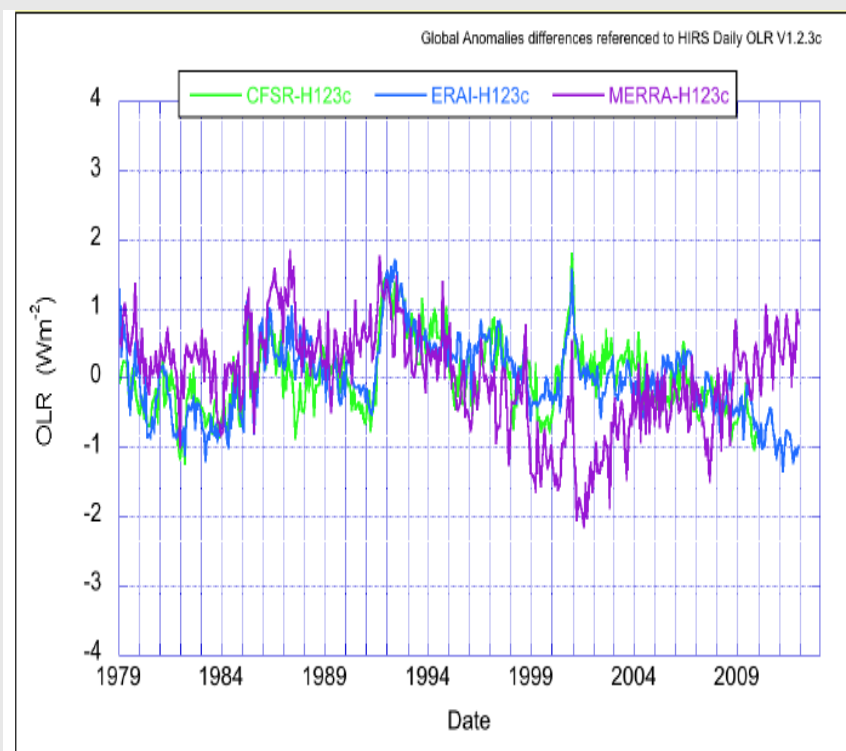
# NOAA CDRs Support Climate Analysis and Climate Model Improvement

## Difference of Global OLR Anomalies (Long-term HIRS CDR vs. Short-term CERES CDR)



*Slope of OLR anomalies diff =  $0.03 \pm 0.09 \text{ Wm}^{-2}/\text{decade}$  with 2-sigma*

## Difference of Global OLR Anomalies (Reanalysis minus HIRS CDR )





# Near-Term Major Activities

- **O&M (Sustainment)** for CDRs that Evidence Continued User Demand
- **End-User Application Projects** that Verify CDRs alone, or in combination with other Products, Can Meet Specified User Needs (may precede R2O)
- Complete the **R2O Transitions** Backlog
- Transition **Period of Record Extensions** to CDRs Using New Sensor Data (from SNPP/JPSS, NASA-GPM, METOP, etc.)
- With NOAA/NESDIS/OSGS and other Partner assistance, determine best path for attaining a **CDR re-processing capability**



# CDR Program's Vision - 2016 & Beyond

## Meet End-User Needs for Environmental Information by:

- **Making vital contributions to an emerging market for a new class of environmental information products.**
- **REDRs** leveraging CDRP and Partner best practices, experiences and lessons learned.
- Acknowledging some Users require lower-latency products and are **willing to sacrifice accuracy to obtain decreased latency** (i.e. ICDRs and products derived from or blended with them).
- Addressing User needs across **multiple Societal Benefit Areas** (SBAs), including global climate change research.



# Questions?





# Backup Slides

# CDRs Supporting Resource Management

## Example CDR Application: USDA Forest Change Detection

### Background

- USDA and NASA are collaborating to develop a capability to assess forest health using a satellite-derived Vegetation Index.

### NOAA CDR Contribution

- Verify the feasibility of using NOAA's operational NDVI CDR. If successful, NASA's research can be "operationalized" by USDA, since the NOAA CDR is an operationally sustained product.

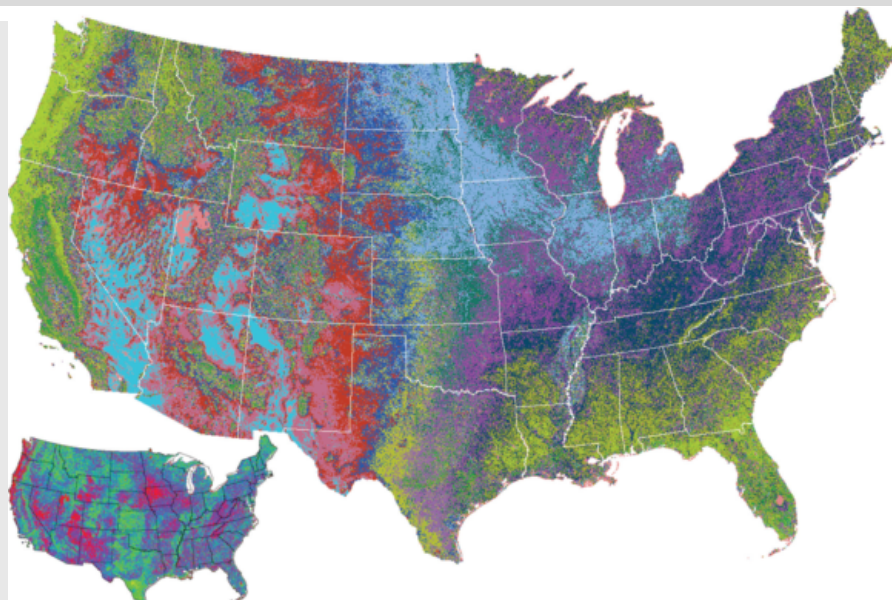
Expanding ranges of forest scavengers,  
linked to climate trends.



**Gypsy Moth Larvae**



**Pine Beetles**



### Expected Output and Impact

- NOAA CDR Program sustains a 30-year times series Vegetation Index suitable for identifying forest health trends, enabling improved U.S. forest resource management.

### Partners

- USDA Southern Research Station, NASA, and NOAA.