



Drought & Water Update for the AA Climate Goal Board July 24th meeting

Chet Koblinsky & Roger Pulwarty
OAR/Climate Program Office



Existing Activities

Cross-NOAA Examples

Monitoring and Forecasting

- **Applied research:** Evaluation of Long-Term Retrospective Forecasts with NCEP Climate Forecast System: Predictability of ENSO and Drought
- **Transition:** Improved water supply forecasts in support of the CO and SE NIDIS pilots
- **Delivery:** RCCs: Monitor and verify state climate extremes, Collect and distribute climate network information etc.

Impacts and Risk Assessment

- **Applied research:** Reconciling future streamflow projections in the Upper Colorado River Basin
- **Transition:** RCCs and State Climatologists as transition endpoints; Building partnerships with extension agencies to transition decision-support tools
- **Delivery:** Provide information regarding impacts and risks associated with water resource reliability

Informing Adaptation

- **Decision support research:** Evaluation of Paleoclimatic Data in Drought Planning for California
- **Transition:** Drought-Ready Communities
- **Delivery:** Regional climate outlook forums



Multi-Line Execution Model for Drought & Water

**AA Climate Goal Board
(Chaired by Goal
Champion)**



**Executive Working
Group**



Project Lead



Project Plan

**Execution
Agreements**

Proposed NOAA Executive Working Group members*

- Physical Sciences Division
- Coastal Services Center
- Office of Hydrology/RFCs
- NCDC
- CPC

Advisors: Executive Council-Exists for NIDIS

LO Sponsor = OAR

Project Lead = Roger Pulwarty

NIDIS Executive Council

NATIONAL

NIDIS Program Office

NIDIS Implementation Team:

NIDIS Technical Working Groups

REGIONAL

Public Awareness
And Education

Engaging
Preparedness
Communities

Integrated
Monitoring and
Forecasting

Interdisciplinary
Research and
Applications

U.S.
Drought Portal

WATERSHED/URBAN/LOCAL

Regional Drought Early Warning Systems

Information clearinghouse, prototypes, and Implementation

Drought-A continuum and a deficit

Heat Waves

Storm Track Variations

Madden-Julian Oscillation

El Niño-Southern
Oscillation

Decadal Variability

Solar Variability

Deep Ocean Circulation

Greenhouse Gases

30
DAYS

1
SEASON

3
YEARS

10
YEARS

30
YEARS

100
YEARS

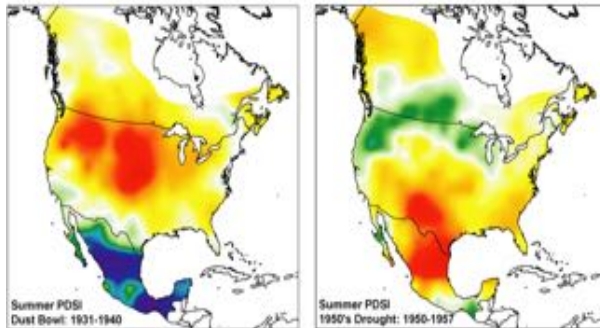
SHORT-TERM

INTERANNUAL

**DECADE-TO-
CENTURY**

Dust Bowl Drought (1931-1940)

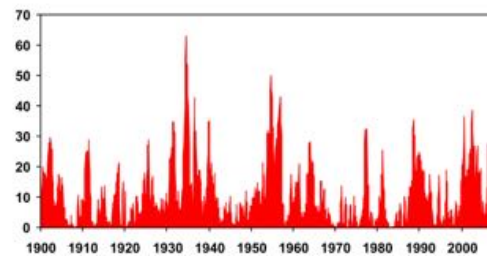
1950's Drought (1950-1957)



1930s

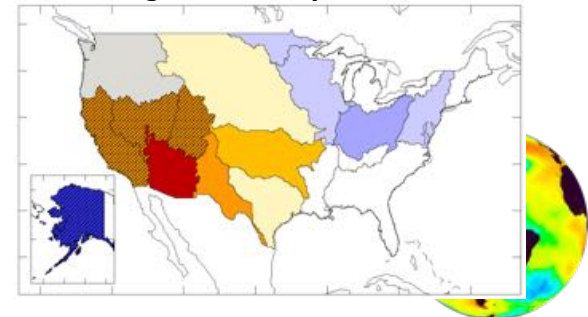
1950s

Percent Area of the United States
in Severe and Extreme Drought
January 1895–July 2008



Based on data from the National Climatic Data Center/NOAA

The future (2041-2060):
where do the projections
agree and why?

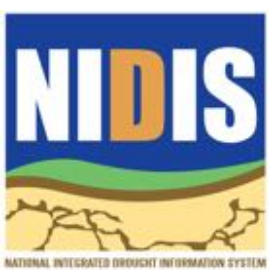




-
- THE NATIONAL INTEGRATED
DROUGHT INFORMATION SYSTEM
IMPLEMENTATION PLAN**
- A PRIORITY FOR NATIONAL ACTION**

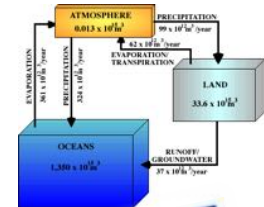
Assess &
Improve the accessibility
and utility of information to meet
user needs (*Informing Decisions-
Products, Prototyping, and
Delivery*)

Engage federal and non-federal partners to align research and practice to inform decision making
(Building Coordination & Capacity)



**Integrated
Monitoring and
Forecasting**

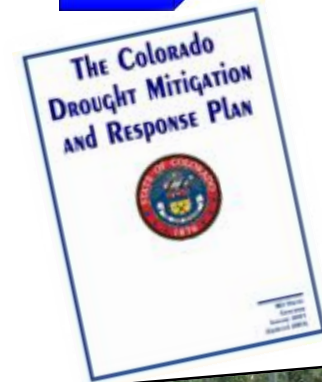
NRCS, USGS
River Forecast Center, BoR
Climate Prediction Center
USDA



**Regional Drought
Early
Warning Information
Systems**

**Interdisciplinary
Needs Assess.,
Research,
Applications**

Regional Integrated Sciences
and Assessments
Regional Climate Centers
NCAR



**U.S.
Drought Portal**

NCDC
NDMC-NOAA,USGS, USDA,
USBoR



**NIDIS
Implementation**
Over 50 Federal, state,
tribal and private
sector representatives
nationally

**Public Awareness
And Education**

State Climatologists, NWS-
CSD
USDA Extension

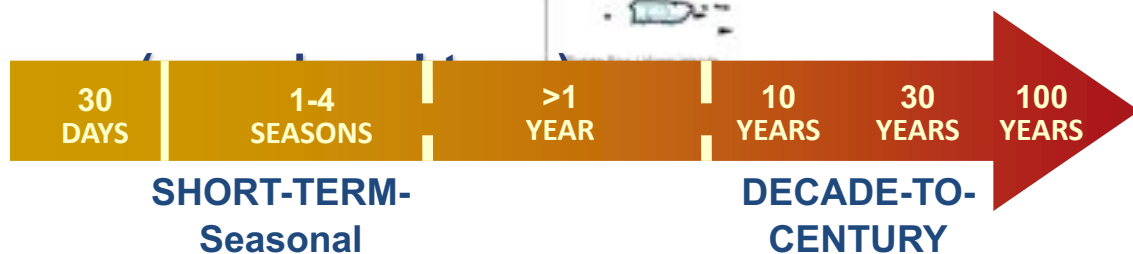
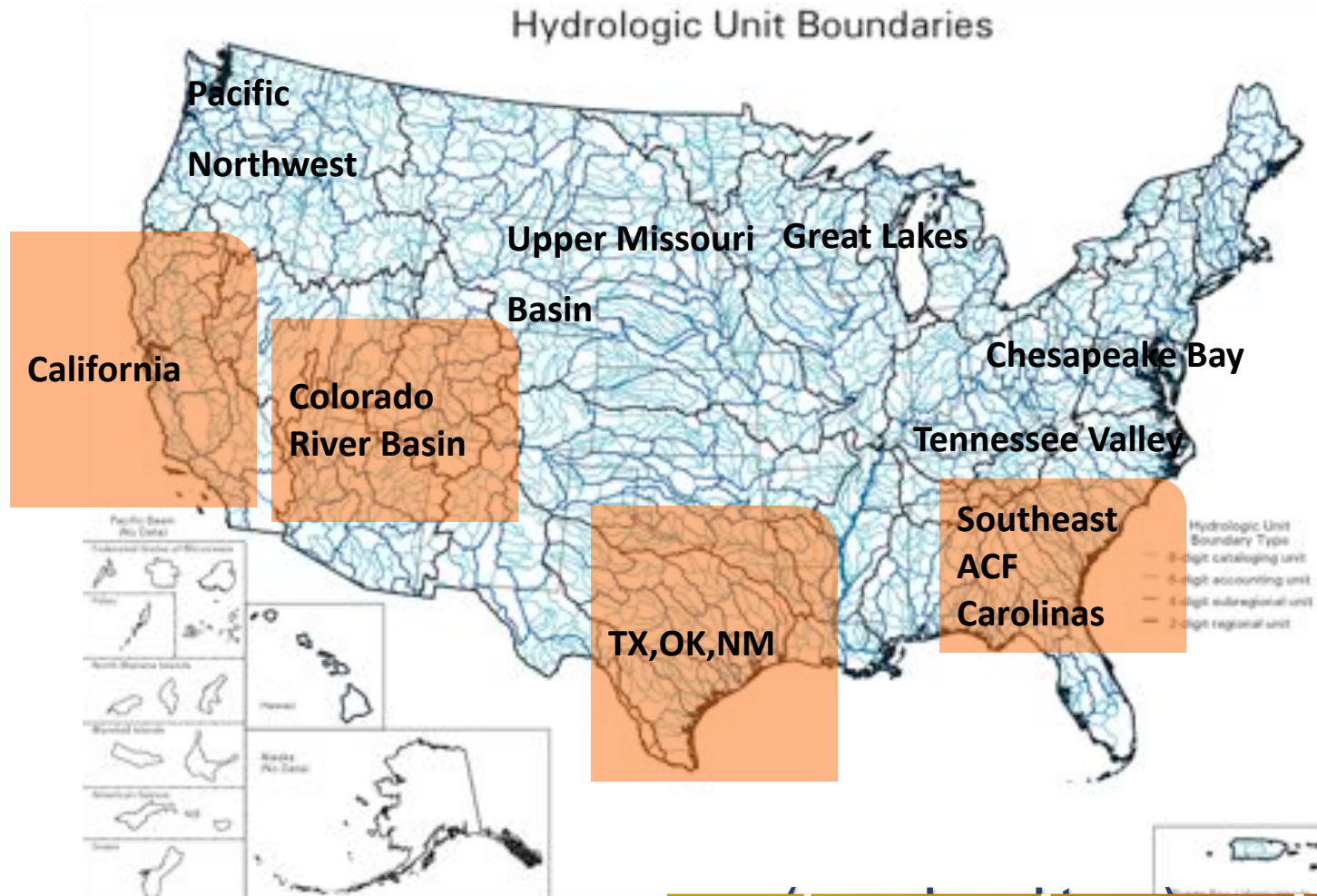
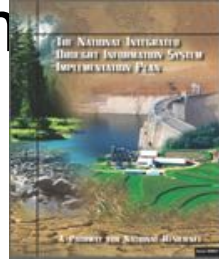


**Engaging
Preparedness
Communities**

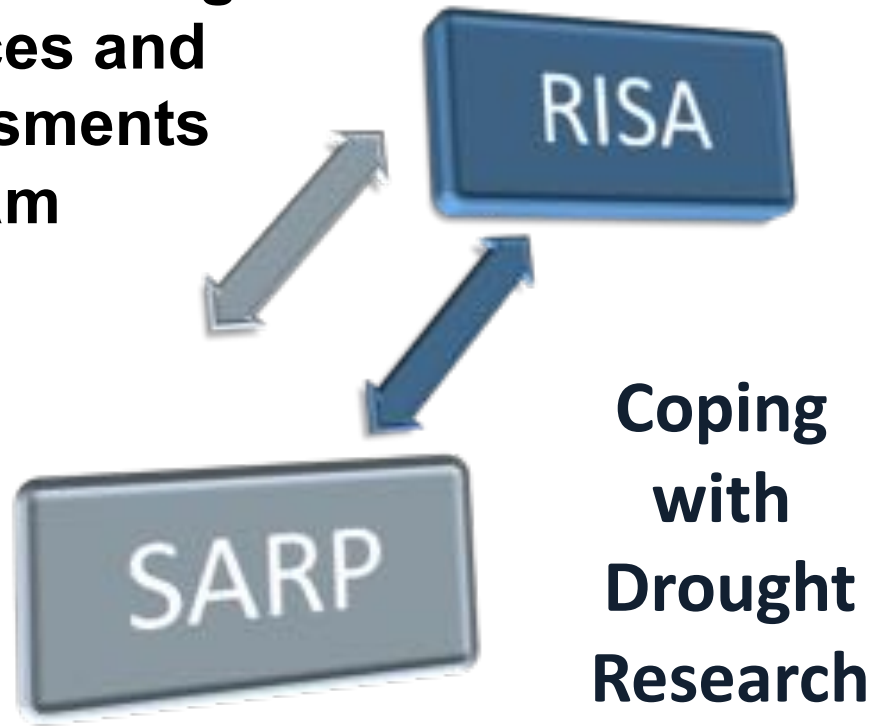
NDMC
State and Tribal Offices,
RISAs
US BoR, USACE, Counties



NIDIS-Developing Regional Early Warning System



Regional Integrated Sciences and Assessments Program



Support cross-regional efforts to assess user needs, test drought-focused decision support tools

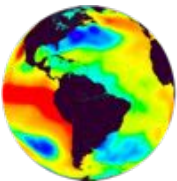


Sectoral Applications Research Program

Identify *socio-economic effects of drought and *data and info needs of resource managers and policy/decision makers

Evaluate and transition drought information products to operations

Regional Climate Centers
State Climatologists
RCSDs





Ensemble evaporation estimates

6 Western River Forecast
Centers (RFC)

Water Supply
Forecasts

Ensemble Streamflow
Forecasts

Historical Streamflow

Metadata

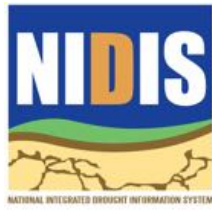


Central Database

RFC Website

NIDIS Web
Services

NIDIS
(RFC/CPC,
BoR)



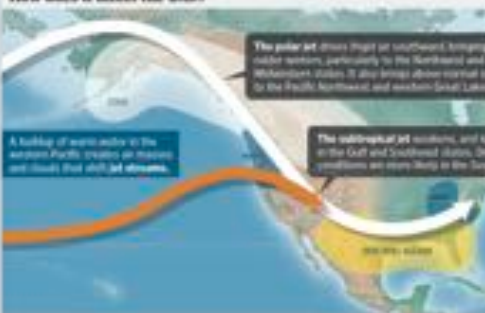


Regional Outlooks

Snow, Rain, Heat and Gloom of Night

This year's La Niña weather pattern is expected to last a week or more, peaking in the winter months. It exacerbates conditions in vulnerable areas devastated by the floods, tornadoes, wildfires and drought. Last year broke the record for the number of climate-related disasters that caused billion-dollar loss in the U.S., according to the National Oceanic and Atmospheric Administration.

How does it affect the U.S.?



Prospects for the first three decades of the year



What will it mean for 2012?

Government and businesses are watching for drought—of beefsteaks—weather. Some preparations:

- Retail/Energy**
 - Increased energy consumption from air conditioning in the West is likely to take delivery, even when conditions in regions worsen.
 - Electricity short, interior winter expected to be the worst. Great Lakes region and Northwest likely to see a lack of snow and early spring.
 - Less ice on the Colorado in Pacific Northwest likely to experience in spring and summer if precipitation is lower than last year.
 - Less snow on mountain peaks to do start, but good season for winter sports and ski resorts if snow weather gets disrupted by a warm winter.
- Agriculture**
 - Cattle ranchers in the West likely to see a dry spring, with a lack of snow and a lack of rain. Further issues in the West and the West.
 - Spring crops likely to be dry, with a lack of rain and a lack of snow. Further issues in the West and the West.
 - Wheat and corn growers are likely to see a dry spring, with a lack of snow and a lack of rain. Further issues in the West and the West.
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- Government**
 - Spring drought in the West is likely to be a problem, with a lack of snow and a lack of rain. Further issues in the West and the West.
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Quarterly Climate Impacts and Outlook

Western Region Spring 2012

National - Significant Events for March - May 2012

Significant Events for May and Spring 2012



Highlights for the West

Mountain snowpack in the Northwest continued to increase due to below-average temperatures and above-average precipitation.

Sub-par mountain snowpack in the Southwest rapidly disappeared in response to exceptional warmth and lack of moisture.

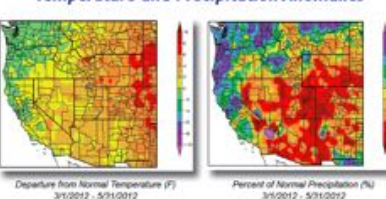
Critical fire conditions (low relative humidity, high wind, drought conditions) persisted across much of the Southwest, allowing wildfires to develop and spread rapidly.

Southwest winds in excess of 50 mph drove a dust storm into the Four Corners region which combined with wildfire smoke to reduce regional visibility and air quality.

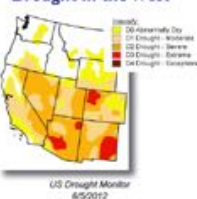
Equatorial Pacific sea surface conditions have transitioned from La Niña to ENSO-neutral conditions. These conditions are expected to continue through the summer.

Regional - Climate Overview for March - May 2012

Temperature and Precipitation Anomalies



Drought in the West



The temperature anomalies shown in the left panel indicate that most of the interior West had above-normal temperatures (warm colors), with slightly cooler-than-normal temperatures in the Northwest and the northern and central California coastal region.

The Pacific Northwest and much of California had well above-normal precipitation, while most of the interior West received much less precipitation than normal. Oregon had the wettest spring in the last 118 years and Washington had the third wettest. (Provisional temperature and precipitation data courtesy of the High Plains Regional Climate Center, www.hprcc.unl.edu.)

The US Drought Monitor shows anomalously dry to extreme drought conditions in many parts of the West. (The Drought Monitor is a collaborative product from the USDA, NOAA and National Drought Mitigation Center, www.droughtmonitor.unl.edu/monitor.html.)

Contact: Robert Webb (Robert.S.Webb@noaa.gov)

Western Region Quarterly Climate Impacts and Outlook | June 2012

NOAA-WGA Regional Outlook

The 2012 Drought in Colorado, Utah and Wyoming

A July 2012 update from the Western Water Assessment and the National Integrated Drought Information System

At the end of La Niña, drought conditions emerged markedly through the 2012 winter past, with low snowpacks leading to a very dry and warm spring. Spring and early summer rainfall over most of the region was well below average. Earlier to 2002 and other benchmark drought years. Continued dry and hot conditions in June dried out vegetation and soil and intense wildfires in all three states, along with widespread rangeland, pasture, and dryland crop losses.

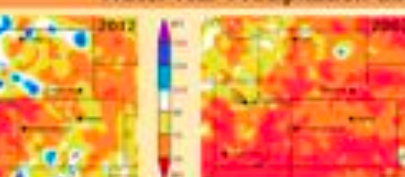
Drought Conditions as of early July



Similar for July 10, 2012 (left) and July 10, 2002 (right) drought conditions in the Western Region.

According to the July 10 US Drought Monitor, across an entire drought conditions cover nearly all of Colorado, most of Utah, and about half of Wyoming. In early July 2012, conditions were generally worse than 2002 across the three-state region, except for northern Colorado and for northwestern Utah. The severity of the drought classification (D1-D4) is based on hydro-meteorological variables such as precipitation, soil moisture, streamflow and temperature. Note that the Drought Monitor is now based on more detailed spatial input compared to 2002.

Water Year Precipitation through June



Through June 2012, a mixed first five months followed by an extremely dry March-June added up to dry conditions across all of the region, except for pockets in northern and southern Wyoming and southern Colorado. The driest areas, with less than 70% of average precipitation, included many of the key mountain headwaters in western and northern Colorado, and in Utah. But as dry as water year 2012 has been, 2002 was drier than the same period in nearly all parts of the region.

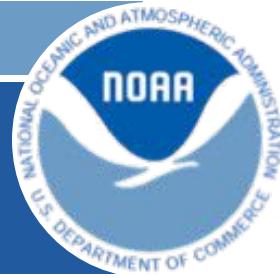
Spring and Early Summer Temperatures



March-May temperatures in 2012 (left) were 2° to 7° F above normal across the 3-state region, much warmer than the same period in 2002 (right). (Source: NOAA NCDC PDS Climate Analysis Branch, plotted from NOAA NCDC observational data: <http://www.ncdc.noaa.gov/data/access/observing/>.)

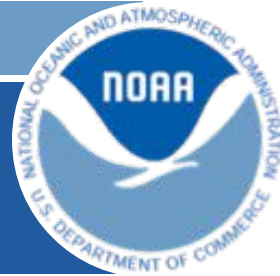
March-May 2012 was the 2nd warmest spring in Colorado in the past 118 years, the 3rd warmest in Wyoming and the 8th warmest in Utah. This extended warmth hastened the early meltout of the already low snowpack, and caused excessive evapotranspiration from soils and vegetation. June continued the string of warm months, with temperatures 2°-8° F above average across the region. In eastern Colorado, there were many record daily highs in late June and a tie for all-time highest statewide temperature for Colorado (116° F in Las Animas on June 23rd).

For an expanded version of this overview, including additional graphics and text, see the Special Issue of the Western Water Assessment (Western Water Assessment Special Issue: Colorado and Utah Drought 2012, July 2012).



Next Steps

- Understand the role of precipitation events in reducing the severity or ending drought conditions and the influence of temperature in exacerbating (or reducing) drought severity and duration
- Develop new regions for early warning systems: Pacific Northwest, Chesapeake Bay, Great Plains (transferring approaches from earlier pilots)
- Initiate a network of Regional Drought Information Coordinators for existing EWS



Next Steps-Help needed Drought-Water EWG

- Developing partnerships with extramural groups- state, tribal, private, and local agencies, organizations, and other stakeholders on developing and implementing early warning information that include impacts assessments
- Improving the understanding of climate variability and forecast reliability across a variety of timescales (influence of decadal scale forcings and land surface feedbacks on seasonal forecast reliability);
- Assessing current understanding of climate processes, model and observational capabilities for accurately representing watershed scales and budgets
- Characterizing and communicate relevant uncertainties
- Developing and delivering skillful drought and flood outlooks that integrate antecedent, existing and predicted conditions
- Work across the Climate Goal Societal Challenges team on cross-scale water-related issues e.g. coastal/nearshore impacts

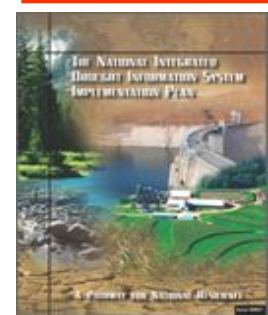


Backup Slides

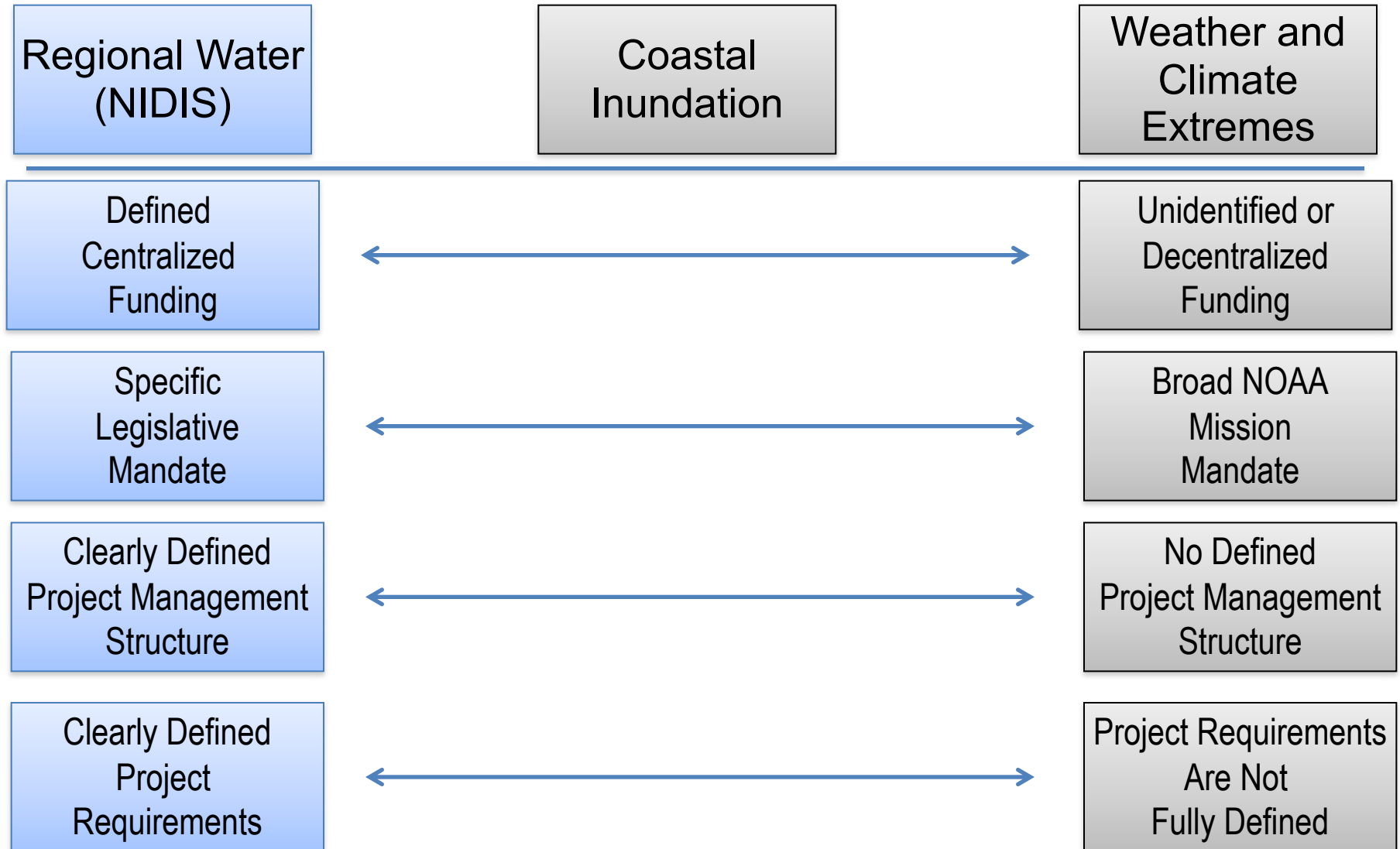


NIDIS Requirements

- **Public Law (109-430, 2006)** *better informed and more timely drought-related decisions leading to reduced impacts and costs*
- Specific Tasks
 - Provide an effective drought early warning system:
 - collect and integrate key indicators of drought severity and impacts; and (b) produce timely information that reflect local, regional, and State differences;
 - Coordinate and integrate as practicable Federal research in support of a drought early warning system
 - Build upon existing forecasting and assessment programs and partnerships



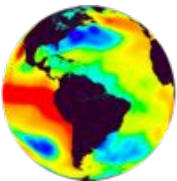
Current Status



What does the NIDIS prototype allow—

- **Developing an Information Pedigree-Relevant, authoritative, accessible, compatible/usable**
 - Downscaling is valuable but not a substitute for monitoring and understanding local climates
- **Overcoming impediments to information flow**
 - Existing barriers to cross-agency collaboration to be addressed or least be made explicit
 - Innovations and new information to be introduced and tested, and
 - The benefits of participation in design, implementation and maintenance to be clarified

Mature prototypes become the regional early warning system and are
More likely to be viewed as transferable



Coping with Drought: Examples

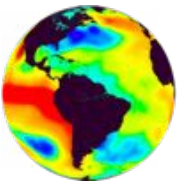
Drought decision support portal for the Republican River Basin (NE,KS)

Reconciling projections of CO Basin streamflow (multiple)

Develop climate training workshops targeting Extension Agents/Farm Bureaus (OK,TX)

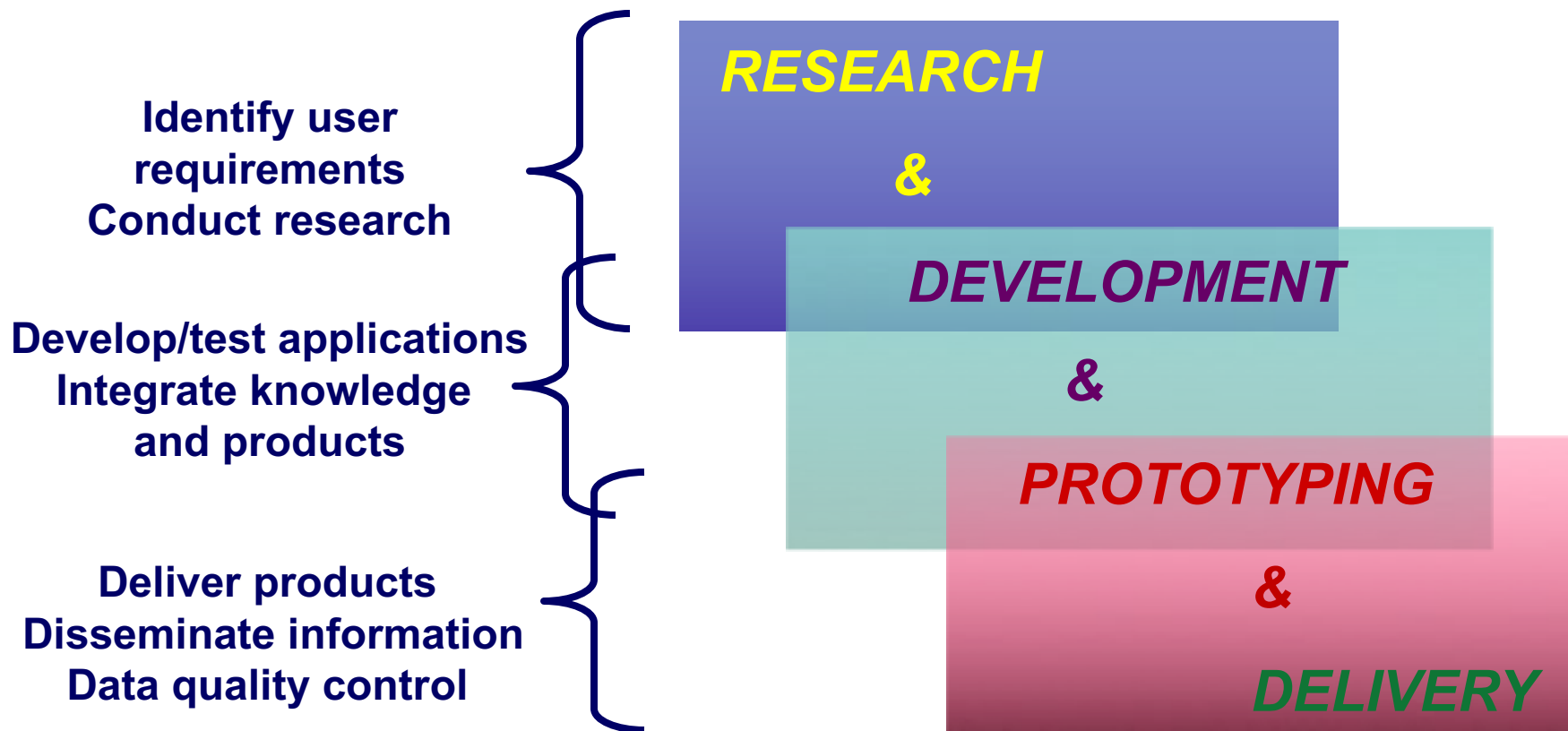
Paleoclimatic Information for Drought Planning and Decision Making (AZ,CA)

Link NOAA climate forecasts to dynamic vegetation models to produce seasonal predictions for fire management (NV)





Framework for Drought & Water





Measures

- The number of states and institutions with improved capacity to inform risk management and reduce exposure to drought and flood risks
- The number of staff in or working with those institutions trained to develop and communicate local drought information and help reduce impacts
- The number of research projects that conduct and update drought impacts and user needs assessments in drought-sensitive parts of the US and
- The percentage of the U.S. population covered by adequate drought risk and early warning information systems



National Weather Center

- **NOAA is constructing the IWRSS National Water Center (NWC) at the University of Alabama, Tuscaloosa.**
 - 60,000 SF facility (full occupancy = 200)
 - groundbreaking was February 21, 2012
 - completion in Summer 2013
- **Key Components & Capabilities**
 - operations center for water analysis, forecasting and decision support
 - applied water resources research and development center
 - geo-intelligence laboratory
 - distance-learning center
 - Joint agency coordination and collaboration; common operating picture
 - multi-agency interoperability



National Water Center
Grand Opening
~June, 2013



Initial Operating
Capability (IOC)
October, 2013



Baseline Operating
Capability
~5 Years



Full Operating
Capability
~10 Years