

# PANEL 3: WATER RESOURCES



**Panel Lead:** Roger Pulwarty

**Supporting Panelists:** M. Timofeyeva; G. Bonnin; C. Simpson; N. Beller-Simms; S. Abdelrahim; C. Ropelewski; F. Horsfall; M. McGuirk

# Water Resource Panelists

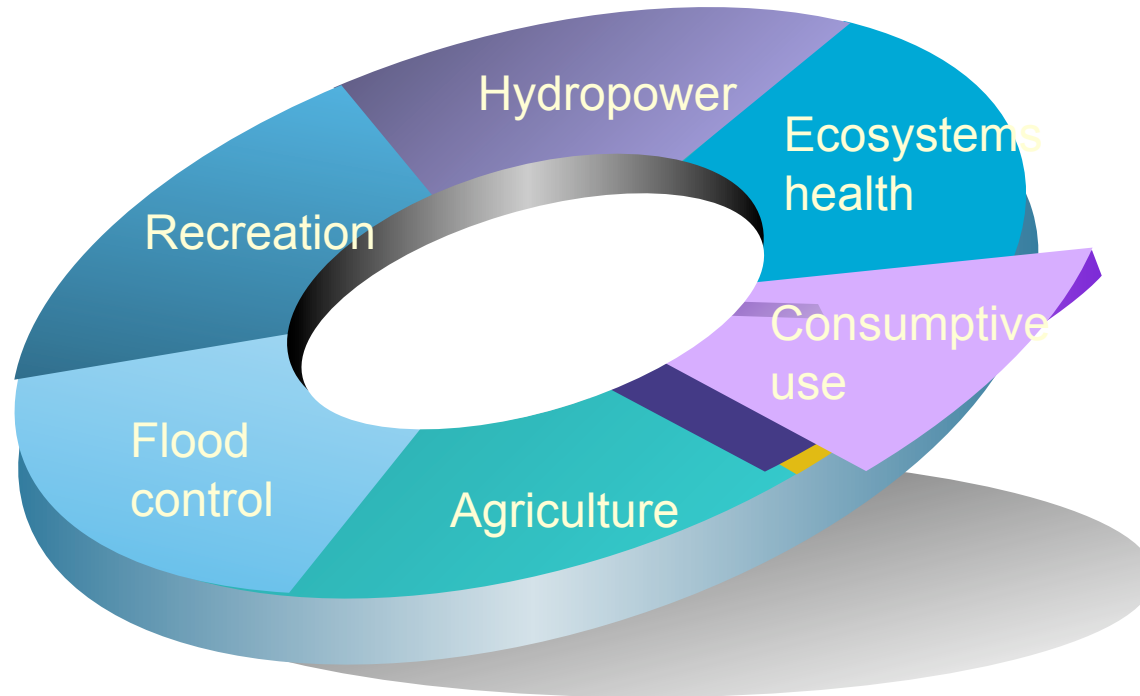
- **Caitlin Simpson: Regional Integrated Sciences and Assessments (RISA)**
- **Nancy Beller-Simms: Sectoral Applications Research Program (SARP)**
- **Fiona Horsfall: Climate Test Bed (CTB)**
- **Marina Timofeyeva: Climate Service Division (CSD)**
- **Geoff Bonnin: Office of Hydrologic Development (OHD)**
- **Sarah Abdelrahim: Transition of Research Applications to Climate Services (TRACS)**
- **Chet Ropelewski: International Research Institute for Climate and Society (IRI)**
- **Marjorie McGuirk: Regional Climate Centers (RCCs)**

Climate Information Products and Applications Program Review



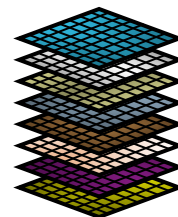
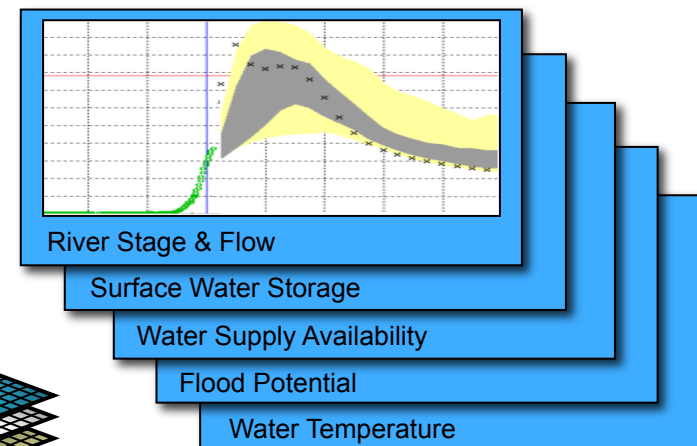
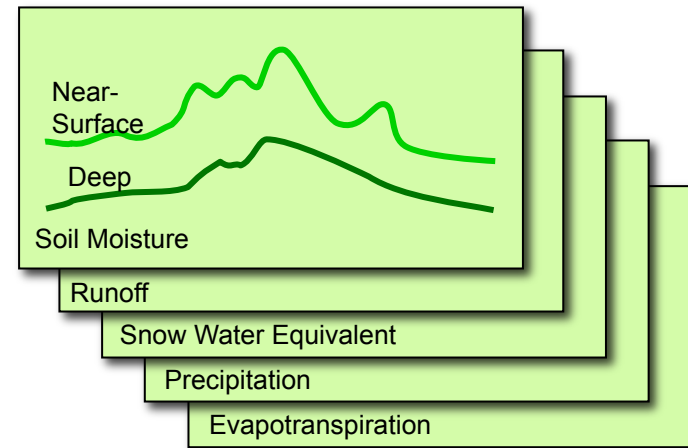
# Multiple competing values

## Multiple, competing objectives



# Increased Demand for Water Information

- Water Forecasts for Every Community
- Forecasts for the Entire Watershed:
  - Streamflow and Snowpack
  - Soil Moisture and Temperature
  - Water Temperature
- Seamless Suite of Water Information for the Coasts / Estuaries
- Groundwater / Aquifer Forecasts
- Location-Specific Trends in Precipitation, Snow Melt, and Streamflow Patterns
- Drought Outlooks and Projections
- Improved Forecast Accuracy & Quantification of Uncertainty
  - Short Time Frame - Flash Floods
  - Medium Time Frame - Mainstem Rivers
  - Long Time Frame - Water Supply



# Research and Applications in Service to Society

## Strategic

- Basic research focused, seeks understand natural and human processes/systems identified as important to the solution of a specified problem

## Applied

- Uses existing knowledge to identify approaches and develop prototype technologies and processes to solve problems of widespread e.g. sectoral (ag, energy), importance

## Adaptive

- Articulate problems at local and regional scales
- Identify appropriate approaches and options to solution
- Fit these to the particular circumstances of specific groups through appropriate decision making entry points



# Framework

- Monitoring and Forecasting
- Impacts and Risk Assessment
- Informing Adaptation

Research  
Transition  
Delivery

- Example of an Integrating Activity
- Gaps



# Monitoring and Forecasting

**Applied Research:** Integrated Water Forecast Program: inter-annual to climate time scales

- Evaluation of Long-Term Retrospective Forecasts with NCEP Climate Forecast System: Predictability of ENSO and Drought

**Transition:** Transition monitoring and forecasting for understanding vulnerability, risks, and to support adaptation to climate variability and change

- Improved water supply forecasts in support of the CO and SE NIDIS pilots (CTB/TRACS)

**Delivery:** Variety of services for monitoring and forecasting water supply reliability

- Rainfall Intensity Frequency Duration Climatologies
- River Forecast Centers: streamflow and river level forecast models covering much of the nation
- RCCs: Monitor and verify state climate extremes, Collect and distribute climate network information etc.



# Impacts and Risk Assessment

**Applied Research:** Through focused efforts like NIDIS, coordinate research activities to investigate impacts and risks associated with water resource reliability

- Reconciling future streamflow projections in the Upper Colorado River Basin (RISA); NDMC study on low flow impacts (NWS)

**Transition:** RCCs and State Climatologists as transition endpoints; Building partnerships with extension agencies to transition decision-support tools

- WRCC/RISA, NDMC, State Climatologists: West Wide Drought Tracker
- NRCC/SRCC: Carolinas Dynamic Drought Index
- AgroClimate: Transition to Florida Extension Service's website

**Delivery:** Provide information regarding impacts and risks associated with water resource reliability

- U.S. Drought Portal, RCCs

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# Informing Adaptation

**Decision Support Research:** Inform adaptation through regional and sectoral focused research

- Evaluation of Paleoclimatic Data in Drought Planning for California (SARP)
- Managing Competing Water Uses in the Philippines: Angat Reservoir (IRI)
- Reconciling future streamflow projections in the UCRB (RISA)

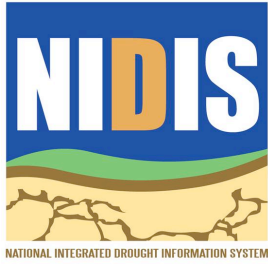
**Transition:** Build capacity and understanding to facilitate transfer of information

- Western RISAs: build capacity within federal agencies to use climate change data, projections, models, and connect the information to water management activities
- NIDIS/CSD training workshop with California Department of Water

**Delivery:** Outline and provide services to inform adaptation strategies to changes in water resource reliability as a result of climate variability and change

- RCCs: conduct workshops on climate adaptation and mitigation with State Climate Offices in their respective Regions
- NIDIS Pilots building a framework that will require broader Service support





# Integrating Activities: Across Line Offices, Across Spatial and Temporal Scales

## NIDIS Early Warning Information System Pilot: Upper Colorado River Basin (UCRB)

### Research

- Reconciling projections of future Colorado River stream flow in a changing climate (RISA)
- Integrate objective climate forecasts into the River Forecast Center ESP for UCRB (CTB/TRACS)
- With BoR, develop operations management model that can make use of CBRFC ESP continuous, probabilistic forecasts (BoR)

### Regional Needs and Delivery of Services

- Inventory/assess drought indicators and triggers
- With SCs, design an approach for UCRB Drought Monitor
- Establish network to communicate impacts and projections across climate timescales (UCRB Drought Monitor)
- Develop decision support tools for demand projections and review of triggering criteria



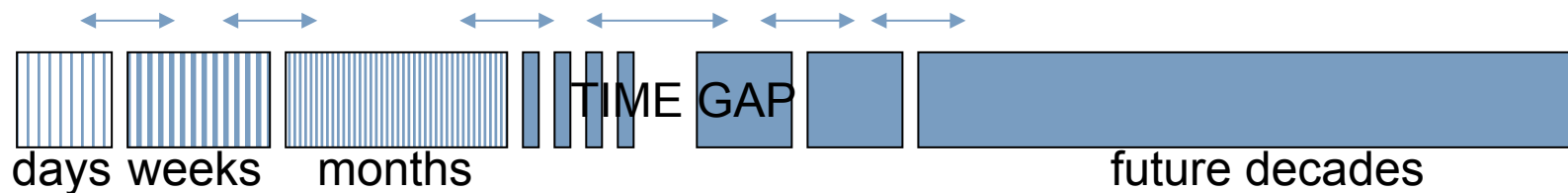
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# Gaps in NOAA Climate Services Applications for Water Resources

## Monitoring and Forecasting:

- Temporal/Spatial Scale
  - Temporal Resolution
  - Spatial Resolution: Climate data and monitoring products; Downscaling capabilities



- Water Quality: Approach is not coordinated, more focus on water quality forecasts
- More soil moisture observations
- Sparse network of surface observing gages (e.g. rain and snow)
- Precipitation frequency estimates: out of date, poor understanding of potential climate change impact
- Training to understand monitoring forecasting applications for user groups and regions

# Gaps in NOAA Climate Services Applications for Water Resources

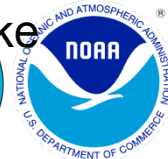
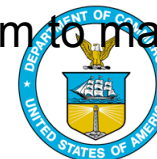
## Risk Assessment:

- What societal factors impact water supply and demand and what are the economic impacts
- What are there tools to understand risk and vulnerability
- What kinds of risk analyses are needed for planning

## Informing Adaptation:

- Need a better understanding of motivators for use of climate info (e.g., economic analyses)
- How do we integrate lessons learned on adaptation and make them useful and accessible to decision makers
- How do we convey to scientists what kinds of information decision makers need and the format and timing necessary for action on their parts
- How do we assess, then portray impacts - so that planners understand what adaptation encompasses and steps they can take to begin to adapt their planning efforts
- How do we expand the current focus on mitigation to include adaptation
- What kinds of information are needed in the short term vs. longer term to make decisions

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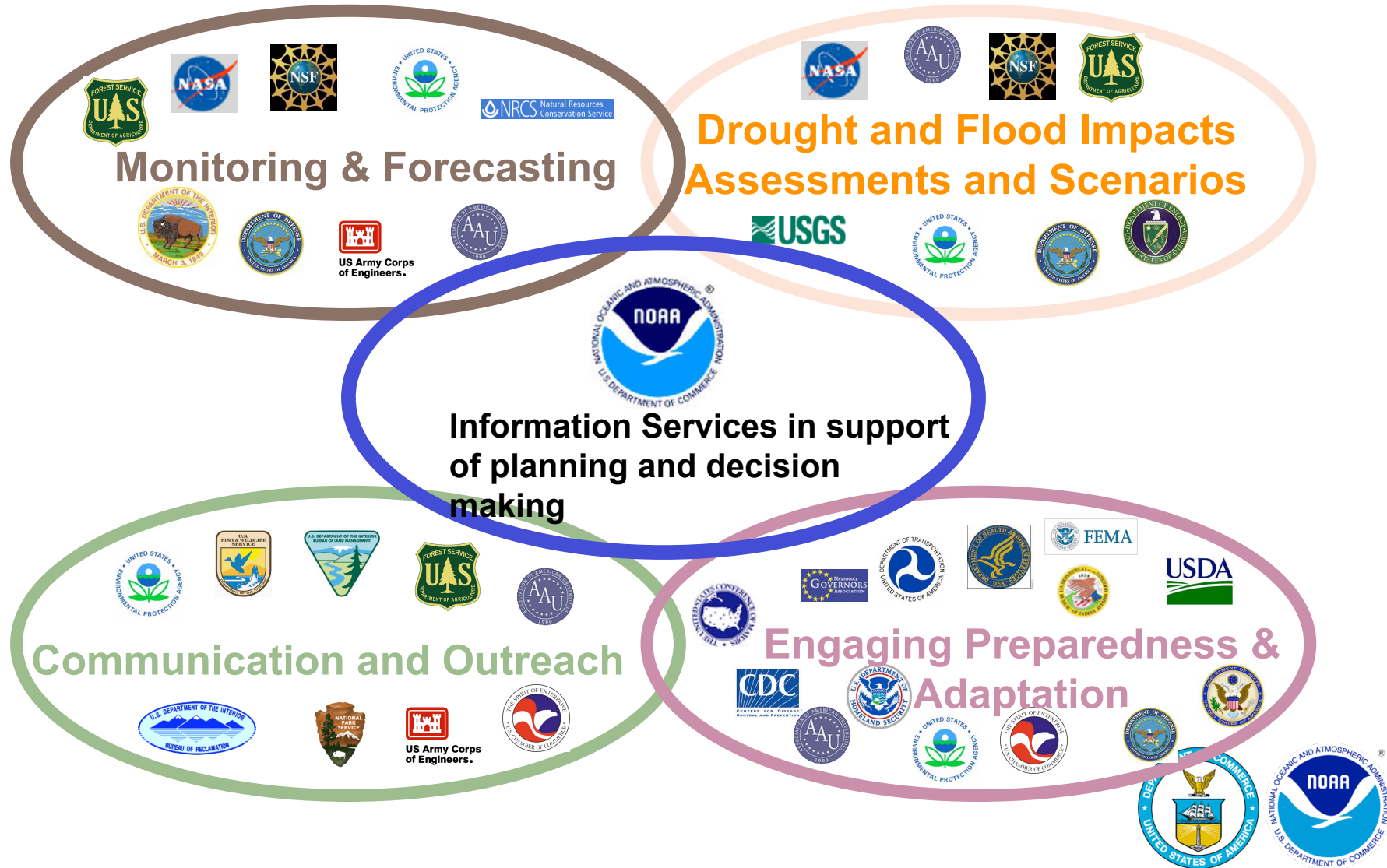
# Gaps in NOAA Climate Services Applications for Water Resources

## Overarching Issue:

- Large number of assets related to monitoring, forecasting, and assessing water resource related risks
- **Are these activities and programs integrated in such a way to effectively inform adaptation [requires ongoing Resources]**



# Drought and Water Resources Federal Partnerships



# QUESTIONS?

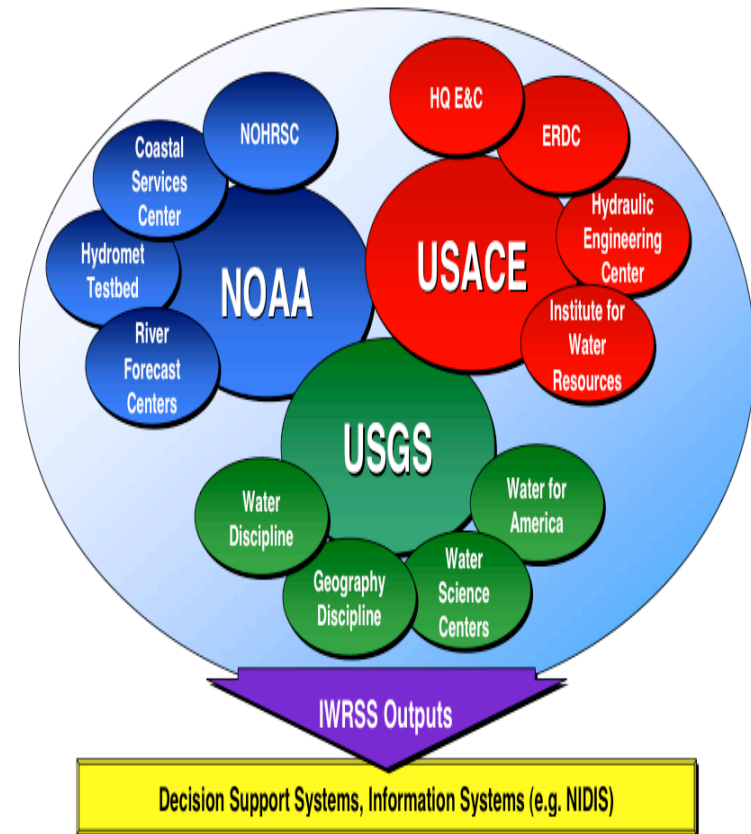


# BACKUP SLIDES



# Integrated Water Resources Science and Services (IWRSS)

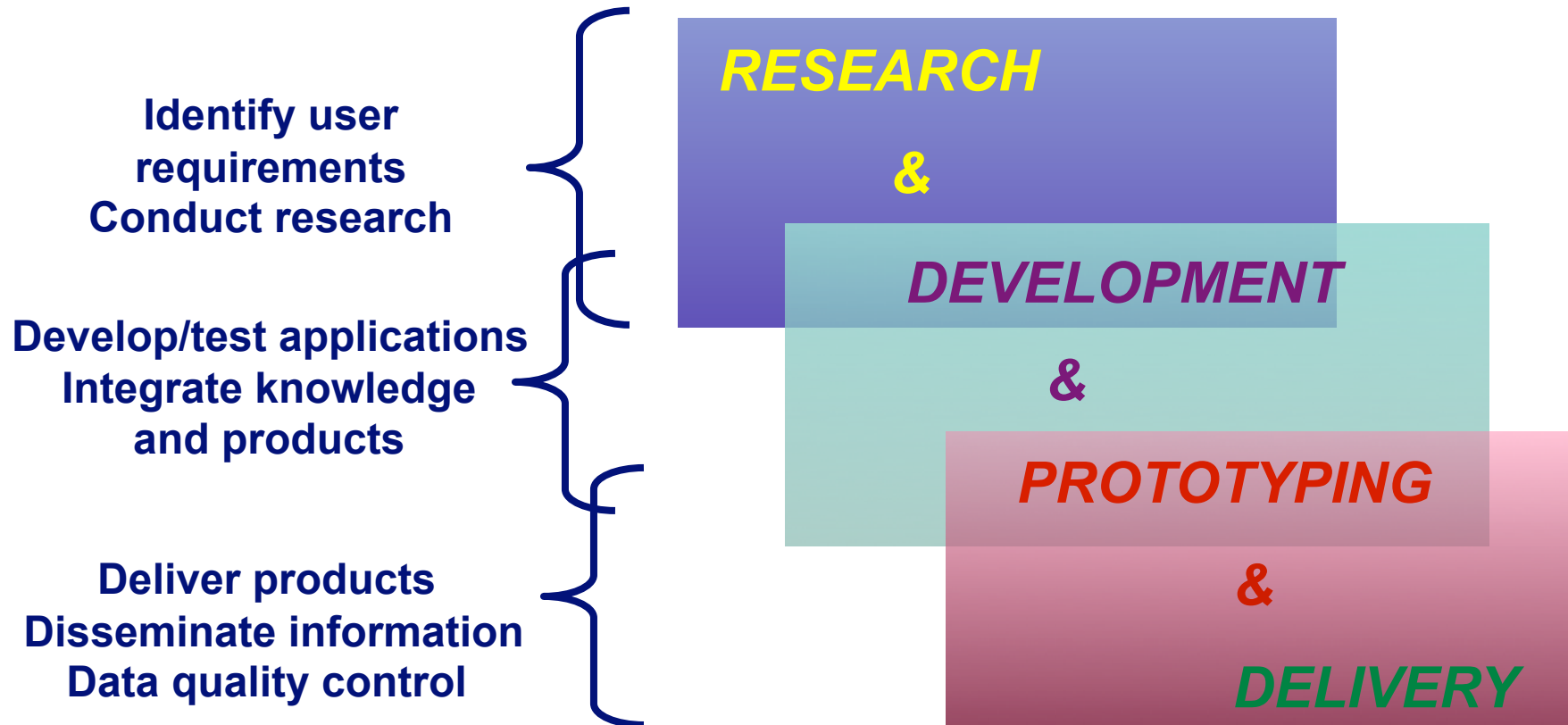
- Aligning NOAA-wide capabilities to address user needs in a unified and consistent fashion
- Multi-agency collaboration is essential
- Reconfigure NOAA's water enterprise by establishing the Integrated Water Forecasting (IWF) Program
- Provide strategic cooperation across line offices and goals
- Accelerate delivery of products and services demanded by NOAA's water customers
- Align NOAA-wide capabilities to address user needs in a unified and consistent fashion
- Implement a National Integrated Water Resources Gridded Forecast System by 2013



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# The Challenge



# Training Class at California Department of Water Resources

- “Climate, Drought, and Remote Sensing”
- Organized by M. Timofeyeva, NWS/CSD, and J. Verdin, USGS/NIDIS
- Over 40 attendees, mainly CA DWR employees
- Instructors from NWS, USGS, WRCC, Climate Central, NASA, SEBAL North America
- Climate: variability, drought mechanisms, forecasting, GCMs and downscaling, hydrology
- Remote sensing: snow, ET, soil moisture, vegetation
- Attendee evaluations were very positive; video to be available on the web

