TOO MUCH

TOO LITTLE

POOR QUALITY

Integrated Water Resources Science and Services (IWRSS)

presented to

Advisory Committee on Water Information

July 12, 2011

POOR QUALITY TOO LITTLE TOO MUCH

Outline

- Growing Water Challenges
- Water Resources Stakeholder Needs
- Recent Extreme Events
- Federal Water Resources Consortium
  - Business Model
  - Strategy and Services
  - MOU and Team Charters
- National Water Center

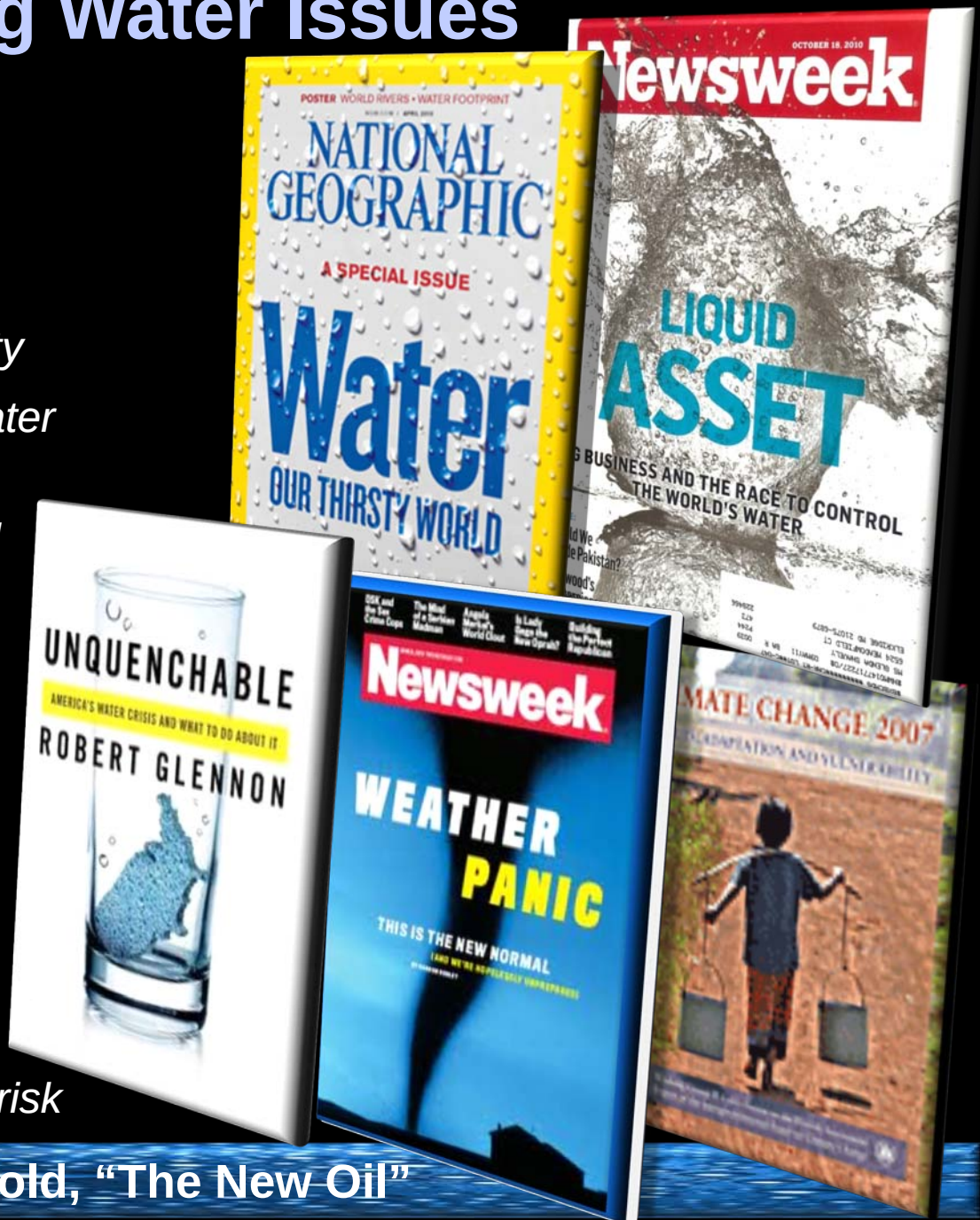
Growing Water Issues

Growing need for water resources forecasts:

- *Population growth and economic development are stressing water supplies and increasing vulnerability*
- *A changing climate is impacting water availability and quality*
- *Socio-economic risks of floods and droughts are escalating*

Decision-makers in water management sectors need:

- *Expanded/new high resolution information in space and time*
- *Quantification of uncertainty to manage risk*
- *Enhanced communication of flood risk*



Blue Gold, "The New Oil"

Energy Alternatives

Fresh Water Alternatives

None.

Stakeholder Needs Assessment

NWS has conducted extensive outreach to objectively define, validate and prioritize stakeholder needs

- **Partnered with Claes Fornell International (CFI) Group to**
  - *survey users of NOAA's hydrologic information via the American Customer Satisfaction Index (2002, 2004, 2006, 2008, 2011)*
  - *conduct targeted user forums with emergency managers, private sector, media, and water resources managers*
- **Partnered with David Ford Consulting Engineers, Inc. to conduct a national survey of emergency managers**
- **Provided numerous presentations and conducted workshops at national conferences**
- **Interact routinely with regional and local stakeholders through field office led outreach**

Strong need for simplified access to integrated water information, flood inundation mapping, expanded and new high resolution water resources information, and quantification of forecast uncertainty to better convey and manage risk

Stakeholder Needs Assessment

Building Strong Collaborative Relationships for a Sustainable Water Resources Future

Broadly recognized need for an integrative “Federal Tool Box”

- ✓ Streamline access to Federal water resource capabilities
- ✓ Share technology, data, information, models, best practices, policy, authorities

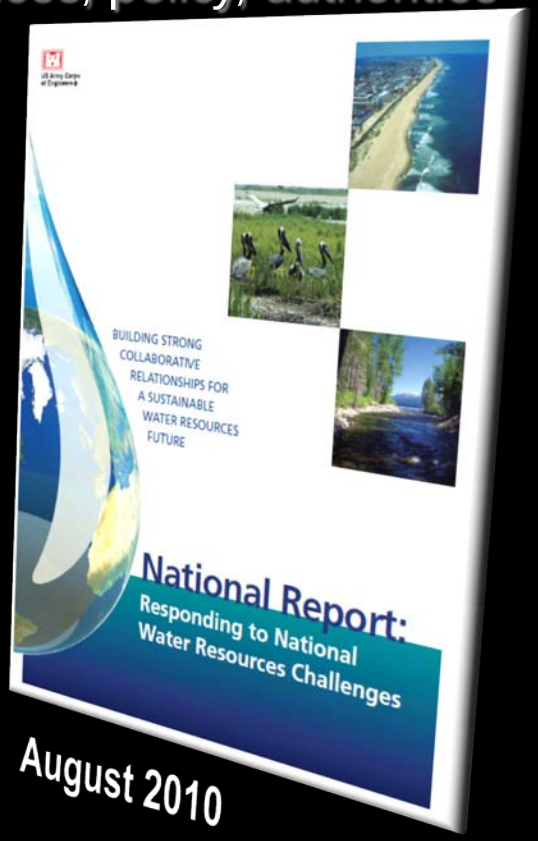
Recommended the NOAA-lead Integrated Water Resources Science and Services (IWRSS) to prototype the Federal Tool Box

US Army Corps of Engineers

50 States

+

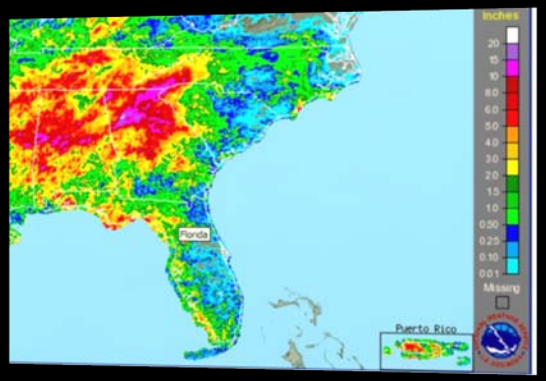
12 Federal Agencies

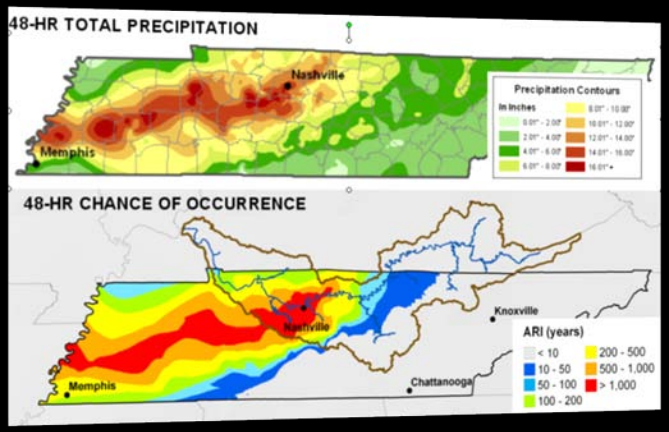


Extreme Flooding

Atlanta, GA September 19-23, 2009

- 10-20 inches of rain in 24 hours
- 11 fatalities
- $250 Million in damages
- Record river flows



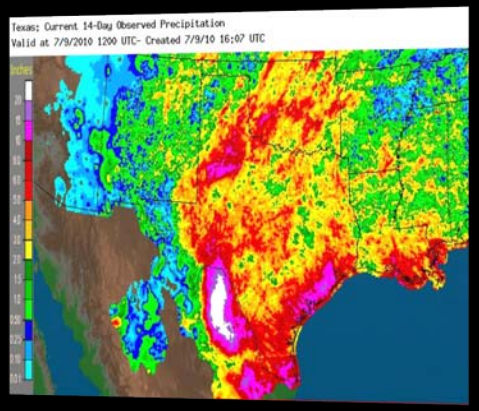


Nashville, TN May 1-3, 2010

- 10-16 inches of rain in 36 hours
- 31 fatalities
- $2.3 billion in damages

South Texas July 2010

- Tropical moisture from Hurricane Alex and TD#2 caused more than 50 inches of rain over 10 days (in Mexico, Rio Grande Basin)
- $70 million in damages

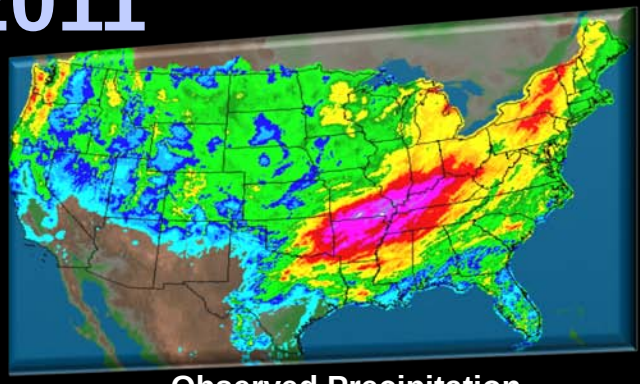


Extreme Flooding 2011

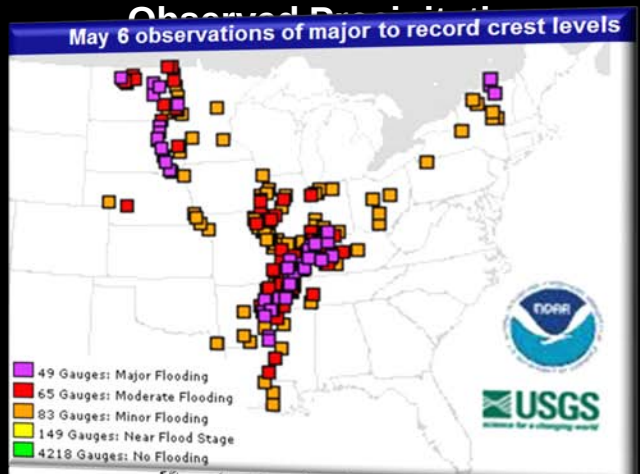
Record Spring and Summer Flooding – Red, Ohio, Mississippi, Milk and Souris Rivers

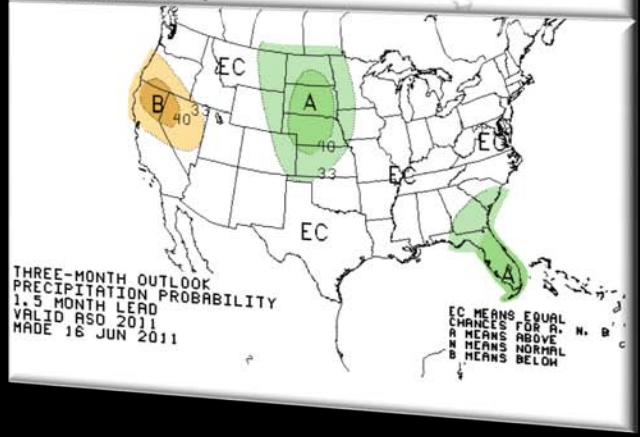
- Wettest snow pack in 60 years across much of the North Central United States
- Extensive snowmelt flooding in Red River of the North, Upper Mississippi, James, Big Sioux and Minnesota Rivers
- During late April-early May, Central US received 10-20+ inches of precipitation (600% of normal)
- Major to Record Flooding occurred at several locations along the Ohio and from Cairo, Il southward
- USACE employed several Mississippi floodways and flood control reservoirs to protect population centers
- Evacuations in many states
- U.S. Coast Guard, increased restrictions on river commerce
- Missouri, Souris and James Rivers in flood; USACE operating flood control reservoirs to mitigate impacts
- CPC long-range precipitation outlook for upper mid-west and western U.S. above normal for June-August

Conditions similar to Great Flood of 1993



Observed Precipitation
April 21, 2011 – May 5, 2011





Extreme Flooding

Nashville, TN
May 2010

Issue: NWS, USACE, and USGS were not able to share information and communicate in an effective manner during the peak of the event
Action: ***Facilitate improved access to data and ensure common operating picture***

Issue: City officials and the public were not aware of devastating impacts until they occurred - severity and extent of inundation not communicated effectively
Action: ***Implement comprehensive flood forecast inundation mapping system***

Not Just Floods

Too Much Too Little Poor Quality

Grand Challenge

Deliver enhanced water information to:

- ✓ Support the growing water economy
- ✓ Understand water availability, threats, and uncertainties
- ✓ Help decision makers understand and reduce risk
- ✓ Improve social and economic security

How?

Integrated Water Resources Science and Services (IWRSS)

Aligns multiple agencies with complimentary water-related missions to:

- **Integrate services and service delivery**
- **Improve river and flood forecasts**
- **Provide new summit-to-sea water resources analyses and forecasts**
- **Enable more effective use of resources**

Roadmap Document (February 2009)

- Purpose, Scope, Vision and Goals
- Cross-Cutting Themes
- National and Regional
- Operations and Business Concepts

http://www.nohrsc.noaa.gov/~cline/IWRSS/IWRSS_ROADMAP_v1.0.pdf

Innovative Federal Consortium

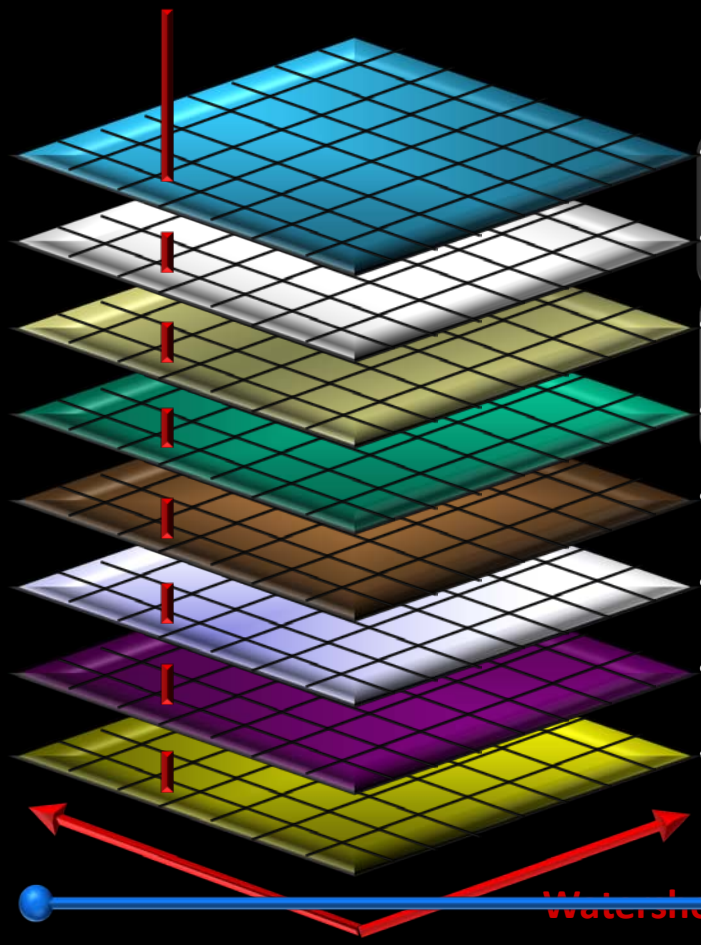
- **New business model for interagency collaboration**
- **Share technology, information, models, best practices**
- **Started with three agencies, designed to expand**
- **Members agree to work towards:**
  - ✓ *Interoperability of key systems and data synchronization*
  - ✓ *Standardized data formats*
  - ✓ *Enhanced geospatial information and visualization*
  - ✓ *Common Operating Picture*
  - ✓ *Coordinated R&D portfolio investments*
  - ✓ *Leverage multi-disciplinary skills to formulate effective solutions*
  - ✓ *Federal Tool Box – one stop shopping for federal water data and information*
- **Joint governance structure – shared leadership model**
- **Joint stakeholder outreach, educational efforts**

It is amazing what you can accomplish if you do not care who gets the credit. ***Harry S. Truman***

NOAA · US Army Corps of Engineers · USGS science for a changing world · U.S. Department of the Interior Bureau of Reclamation · United States Environmental Protection Agency · FEMA · Forest Service U.S. Department of Agriculture · National Park Service · U.S. Fish & Wildlife Service · NRCS

Limitations of Current Practice and What's New

Local Information (<1 km^2)
Quantify Uncertainty



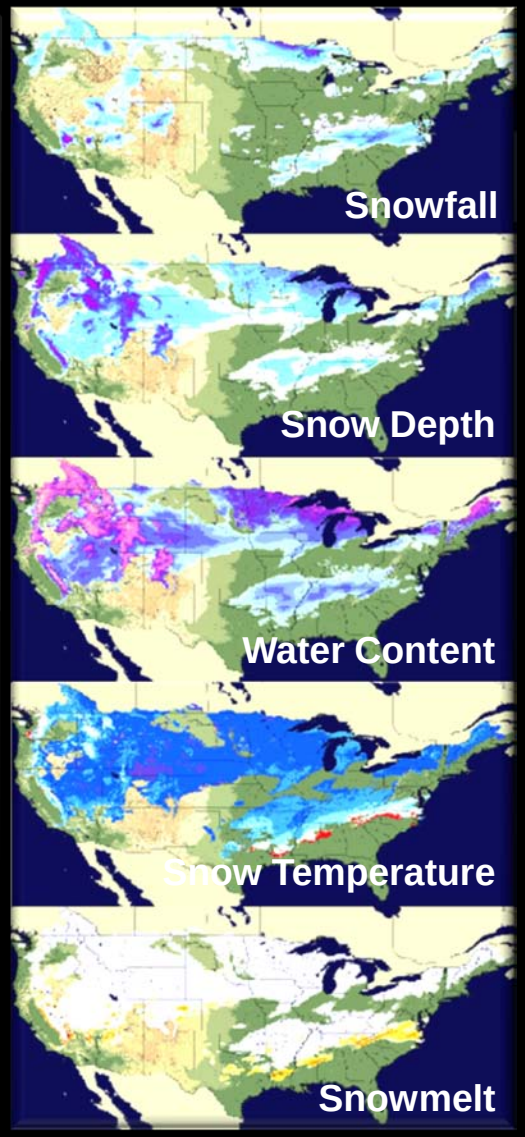
Summit-to-Sea

- Precipitation
- Snowpack
- Soil Moisture
- Evapotranspiration
- Groundwater
- River flow
- Surface Storage
- Water Quality

Watershed to National Information

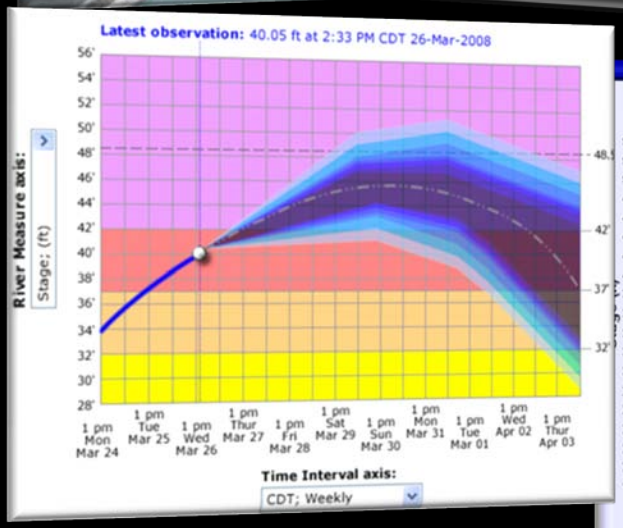
Past — USGS - WaterSmart — Present — NWS - IWRSS — Future

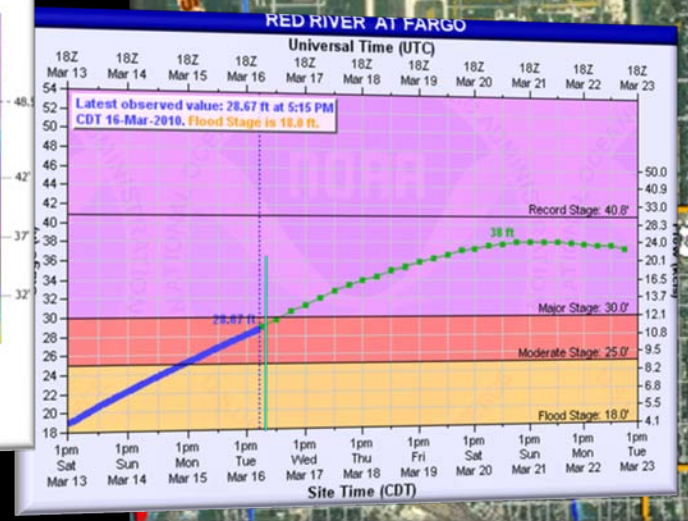
Pilot Products - Snowpack

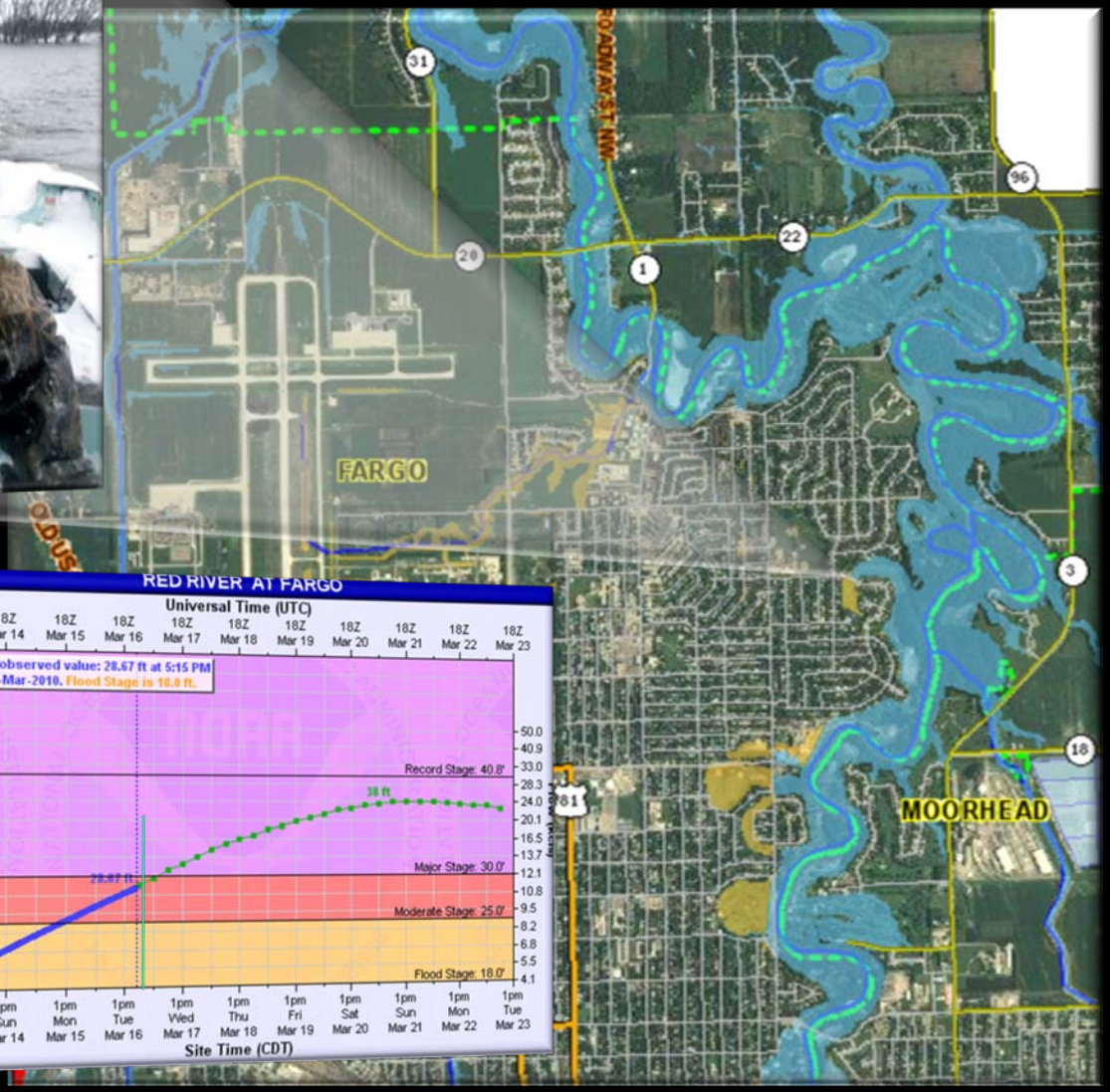


www.nohrsc.noaa.gov

Limitations of Current Practice and What's New

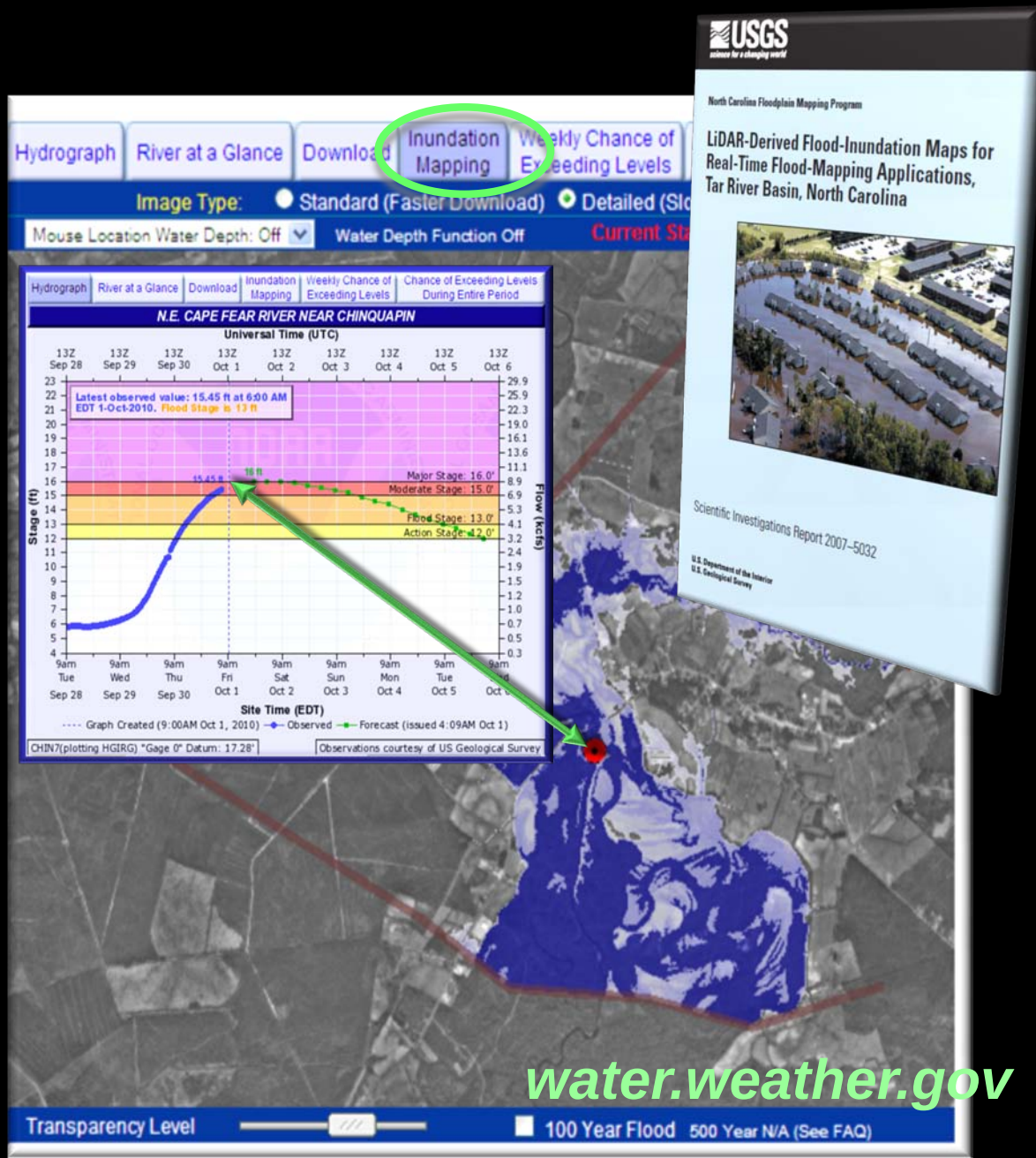






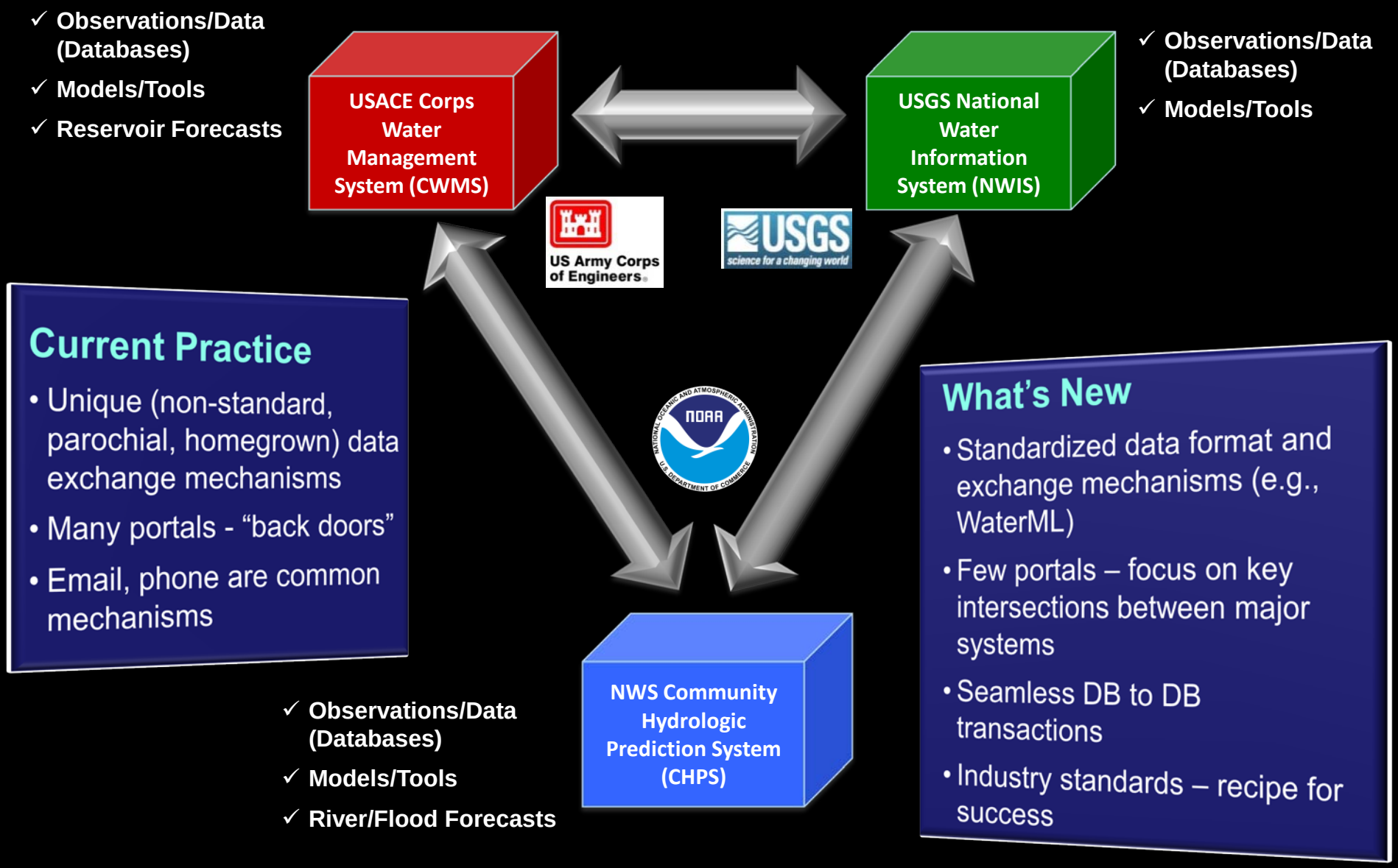
Limitations of Current Practice and What's New

- Display spatial extent and depth of flood water linked to NWS river forecast
- Maps for levels ranging from minor through record flood
- Better mitigate impacts of flooding, reduce repetitive flood losses, and build more resilient communities
- Libraries include NWS flood severity categories and regulatory FEMA frequency-based flood maps (1% and .2% annual chance floods)
- Enhanced map viewer being developed jointly with link to HAZUS data



Limitations of Current Practice and What's New

Data and Modeling System Interoperability Example



Status and Current Activities

U.S. Army		U. S. Geological Survey U. S. Department of the Interior		National Oceanic and Atmospheric Administration U.S. Department of Commerce	
Signature	for	Signature	Marcia McNutt	Signature	
Name	Jo-Ellen Darcy	Name	Marcia McNutt	Name	Jane Lubchenco
Title	Assistant Secretary of the Army (Civil Works)	Title	Director, U.S. Geological Survey	Title	Under Secretary for Oceans and Atmosphere
Date	May 11, 2011	Date	5/11/2011	Date	May 11, 2011

Memorandum of Understanding signed May 11, 2011

- ***"Collaborative Science, Services and Tools to Support Integrated and Adaptive Water Resources Management"***

Signatories

- Dr. Jane Lubchenco, Director of NOAA
- Rock Salt for the Honorable Jo-Ellen Darcy, Assistant Secretary of the Army for Civil Works
- Dr. Marcia McNutt, Director of the U.S. Geological Survey

Team Charters being developed for System Interoperability, Flood Inundation Mapping and Governance

NOAA USGS science for a changing world US Army Corps of Engineers

Memorandum of Understanding

Article II. Purpose

- **Better align agency programs within current authorities, enhance communications and the exchange and availability of information.**

- **Leverage resources for sharing information and planning, developing, and implementing science and services in support of integrative and adaptive water resources management.**

- **Intended to serve as the foundation and a mechanism for other Federal agencies and partners to join this collaborative partnership in the future to further address our Nation's water resources information and knowledge capacity needs.**

Memorandum of Understanding

Article IV. Responsibilities

- **Develop and implement highly collaborative and integrative capabilities** to protect lives and property, and support integrated and adaptive water resources management. The capabilities include:
  - **Interoperable systems, seamless data exchange and synchronization**, and enhanced geospatial information and visualization to establish extensive situational awareness within a **common operating picture**.
  - **Enhanced water resource information and capabilities** including:
    - Historical and real-time data
    - High resolution water resource forecasts and flood inundation maps
    - Data and modeling applications and other software tools
    - Contextual and background information about authorities, policies, and programs grounding science and engineering efforts of respective agencies, especially regarding water and related resources
  - **National water support center** for transitioning science and technology advancements into operations and to generate a new seamless suite of water resources information and support.
- Participate in **joint stakeholder outreach**, educational efforts and evaluation activities.
- Identify areas of information gaps, redundancies, conflicts, and opportunities for subsequent **joint project planning, program alignment, and problem solving**.

Status and Plans

for the

IWRSS National Water Center

IWRSS National Water Center (NWC)

Combine hydrologic forecasting operations, research and development, systems engineering, and national support facilities to fill several critical gaps:

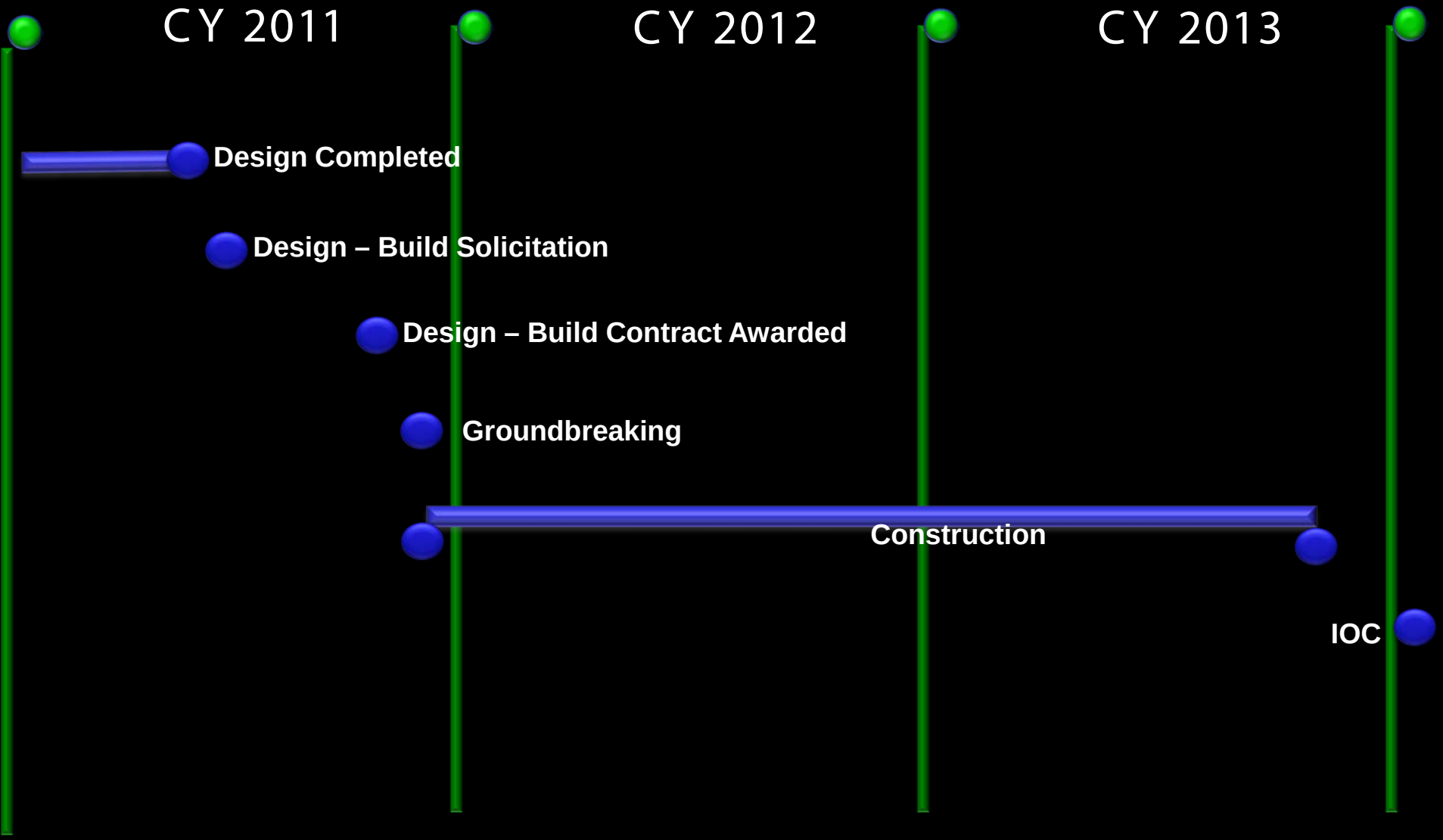
- ✓ Provide new high-resolution forecasts of water resource variables to help decision makers better manage water
- ✓ Extend river and flood forecasting to provide maps showing forecasted spatial extent and depth of flooding
- ✓ Integrate water resources information to provide one-stop shopping for stakeholders (Federal Toolbox)
- ✓ Establish multi-agency proving ground to leverage capabilities and accelerate R2O
- ✓ Establish Common Operating Picture

NWC Design Elements

- **Operations Center**
  - *10 Socioeconomic Service Sector Desks*
  - *5 Regional Desks including International*
  - *Modeling, Data Assimilation & Forecasting Desks*
- **Geo-Intelligence Laboratory**
- **Airborne Remote Sensing Facility**
- **Collaborative Science & Software Engineering**
  - *Systems Proving Ground*
  - *Research to Operations Focus*
- **Information Technology Laboratory**
- **Distance Learning Classroom/Auditorium**
- **Administrative Offices**

Service Sectors
Hazards 1: Floods, Debris Flows, Storm Surge
Hazards 2: Drought
Agriculture
Climate
Weather
Water Supply
Transportation
Energy
Ecosystems
Water Quality/Human Health

NWC New Capabilities

- 24 x 7 Operations and National Support Coverage
- Joint Agency Coordination and Collaboration
- Regional Liaisons
- Service Backup for Field Units
- High Resolution Hydrologic Analyses, Forecasts and Field Guidance
- Dynamic Flood Inundation Mapping
- Common Operating Picture
- Multi-agency Interoperability
- National Portal for Water Resources Information
- Research to Operations Systems Proving Ground
- National Archive for Hydrologic Data and Information

NWC Design and Construction Schedule