

TOO MUCH

TOO LITTLE

POOR QUALITY



Integrated Water Resources Science and Services and the National Water Center

*Addressing Our Nation's Water Resources
Service and Information Needs*

Tim Schneider

**National Weather Service / Office of Hydrologic Development
National Oceanic and Atmospheric Administration**

**HMT Annual Science Meeting
November 8, 2012**



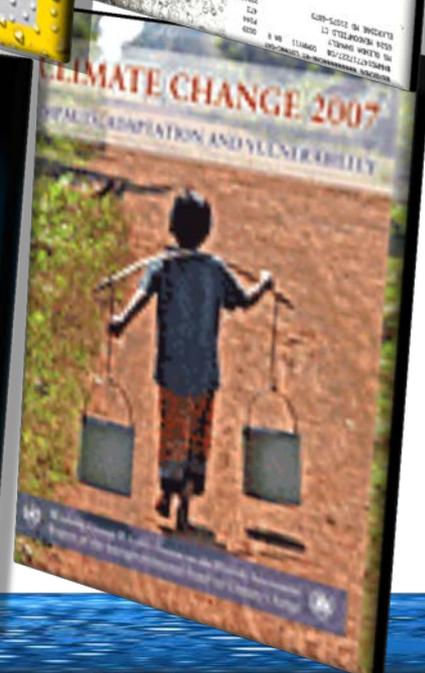
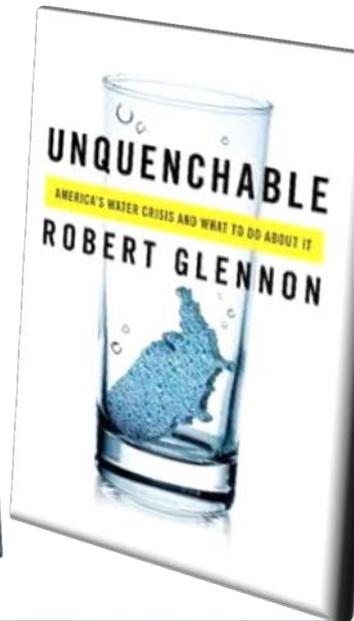
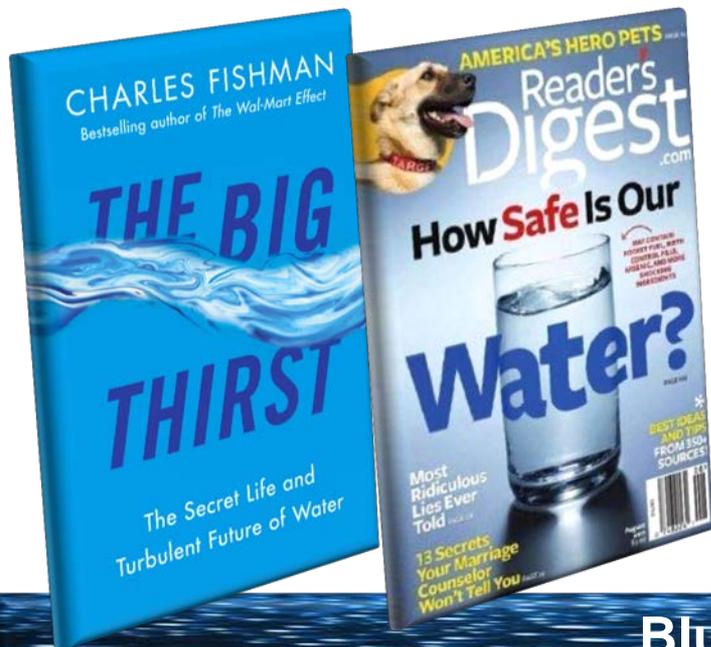


Outline

- A Nod Towards ‘Why IWRSS?’ – Growing Water Challenges & Stakeholder Needs
- Integrated Water Resources Science and Services (IWRSS) – Current Status
- National Water Center (NWC)
- Working Towards a Full Operating Capacity: First Step is the “IOC”

Growing Water Challenges

- *Population growth and economic development are stressing water supplies and increasing vulnerability*
- *A changing climate is impacting water availability and quality, increasing uncertainty*
- *An aging water infrastructure is forcing critical, expensive decisions*
- *Socio-economic risks of floods and droughts are escalating*



Blue Gold, "The New Oil"

IWRSS Roadmap and MOU

Framework to align multiple agencies with complementary water-related missions to accomplish operational goals.

MOU Signed May 11, 2011

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

Signatories

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

Initial Focus Areas

- High-Resolution Water Resource Forecasts
- Flood Inundation Mapping
- System Interoperability and Data Synchronization

Integrated Water Resources Science and Services (IWRSS)

An Integrated and Adaptive Roadmap for Operational Implementation

Don Cline, NOAA (Compilation)

IWRSS Workshop Participants (NOAA, USACE, USGS)

Cross-cutting Theme Teams for Human Dimensions and Technical Information Services

Regional Case Study Contributors



DRAFT v1.1
February, 2009

February 2009



US Army Corps
of Engineers

IWRSS Crosscutting Themes



Human Dimensions

- Stakeholder Interactions and Communications

Establishing and maintaining a strong participatory process for IWRSS, and building the social capital necessary for success – delivering products and services that our stakeholders and customers need or want



Operational Science

- Summit-to-Sea Modeling and Prediction Framework

Developing physical and social science aspects of a well-integrated national water resources information system that is responsive to the needs of stakeholders



Technical

- Information Services

Implementing sound IT engineering practices to promote the coordination, integration and facilitation of interagency activities to pursue common goals

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 & data synchronization
 - ✓ Standardized data formats
 - ✓ Enhanced geospatial information and visualization
 - ✓ Common Operating Picture
 - ✓ Coordinated R&D portfolio investments
 - ✓ Leverage investments & multi-disciplinary skills to formulate effective solutions
 - ✓ Portal for integrated federal water data and information
- National Water Center will serve as the catalyst to achieve these objectives



National Water Center

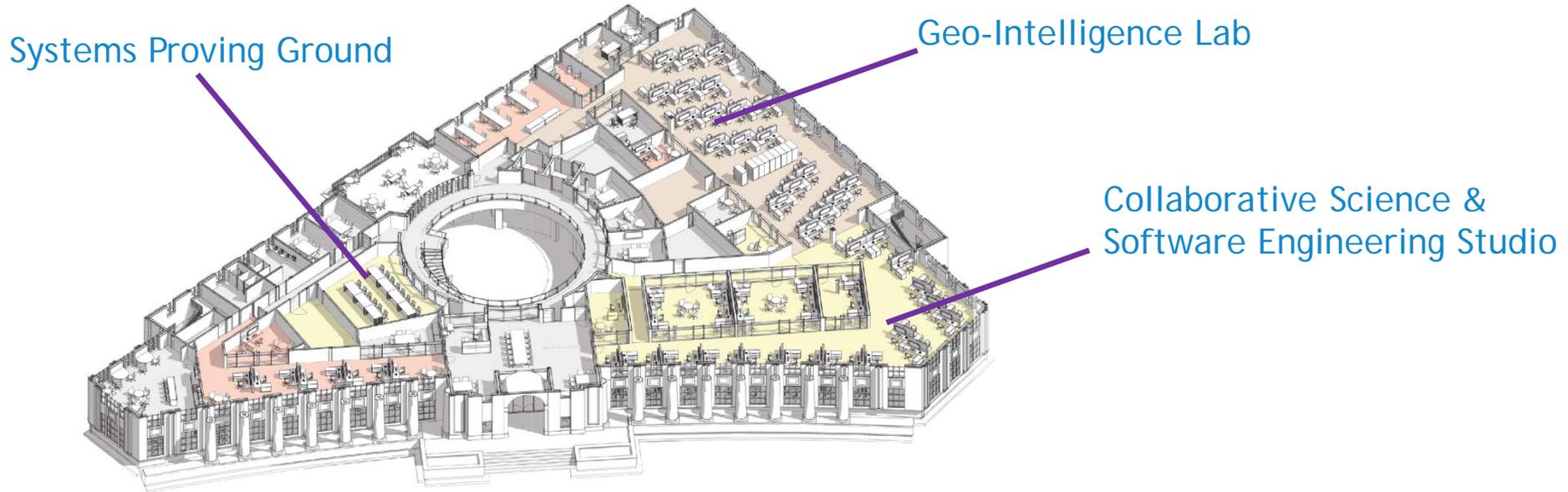


- Located on University of Alabama Campus in Tuscaloosa
- Groundbreaking Ceremony Feb 21, 2012
- Size: 65,000 sq. ft.
- Green Building: LEED Gold
- Building Completed July 2013;
Occupancy in October 2013
- Staff at Full Operating Capacity: 175



NWC Functional Elements

Level 2



- **Geo-Intelligence Laboratory**

Facility to develop, implement and maintain state-of-the science enterprise Geographic Information Systems (GIS) to support field operations

- **Collaborative Science and Software Engineering Studio**

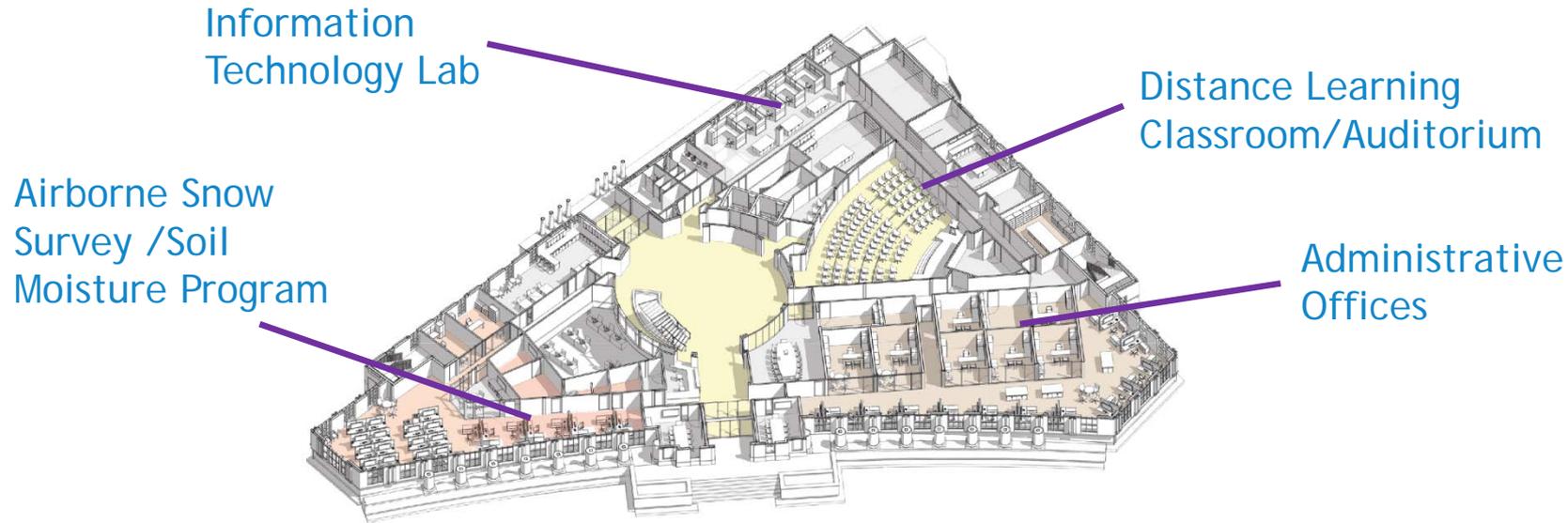
Development environment to better share and leverage investments and advances in science, technology and modeling among federal agencies

- **Systems Proving Ground**

Laboratory to test new capabilities prior to field implementation, minimize operational risk, and accelerate deployment from research to operations

NWC Functional Elements

Level 1



- **Distance Learning Classroom and Auditorium**

Facility to provide cost-effective, state-of-the-art residence and distance learning to enhance technical competencies and enable field forecasters to easily leverage NWC knowledge base

- **Airborne Snow Survey/Soil Moisture Program**

Space for pilots to manage and plan airborne surveys to collect mission critical information for river forecast modeling operations

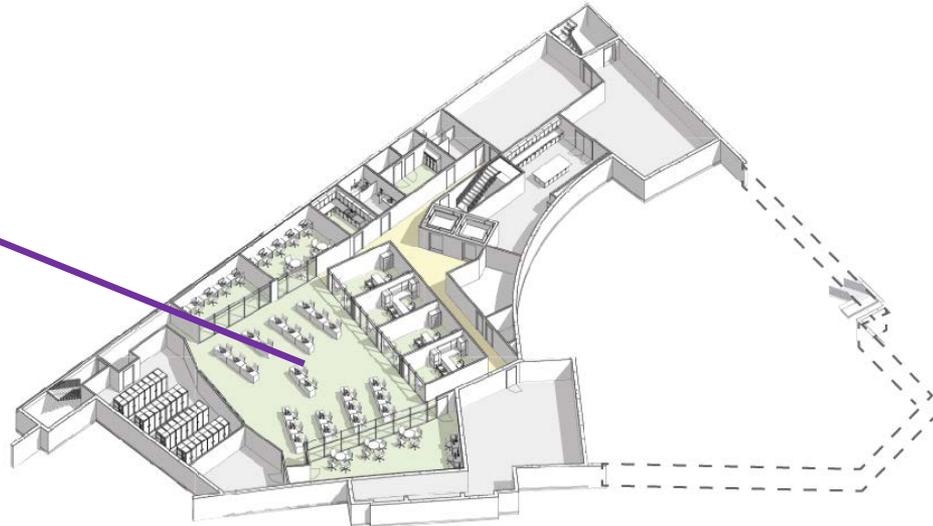
- **Information Technology Lab**

Area for IT specialists to manage, support and assure security of facility hardware/software assets

NWC Functional Elements

Level 0

Operations Center with
Situation Rooms



• Operations Center with Situation Rooms

- ✓ Nerve Center for National Hydrologic Forecast Operations and Support.
- ✓ Enhance intra- and inter-agency coordination and stakeholder engagement
- ✓ Provide comprehensive situational awareness and a national Common Operating Picture for water resources
- ✓ Provide new sector-specific information and services to enable routine, high-value decision-making
- ✓ Staff includes focal points to address sector-specific information needs (Flood Hazards, Drought, Agriculture, Water Supply, Transportation, Energy, Ecosystems, Water Quality/Human Health)

National Water Center

Planned Water Resources Services at Full Operating Capacity

24x7 Operations and Support Coverage

Sector-Specific, Service-Based Focal Points

Improved River Forecasts, and High-Resolution (i.e., .5 km, hourly), National Summit-to-Sea Water Resources Analyses and Forecasts

Dynamic Flood Inundation Mapping

National Snow and Soil Moisture Data Acquisition and Satellite Data Processing

Common Operating Picture, Multi-Agency System Interoperability, and Enterprise Geo-Intelligence for Enhanced Decision Support

National Integrated Web-based Information Portal

National Data Archive

Service Backup for River Forecast Centers

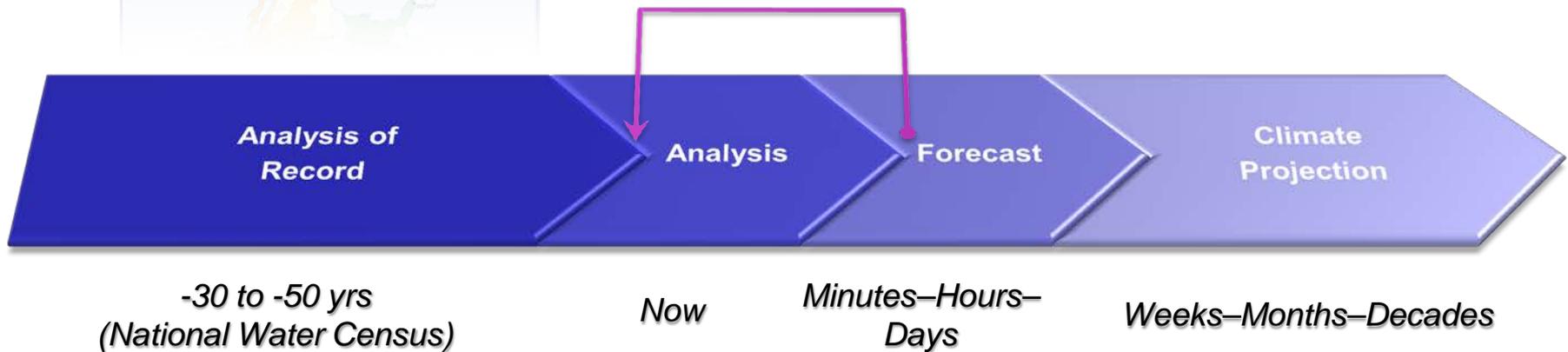
Development Proving Ground to Leverage Federal Agency Investments and Accelerate Research to Operations

Technical Implementation of IWRSS: Scope & Approach

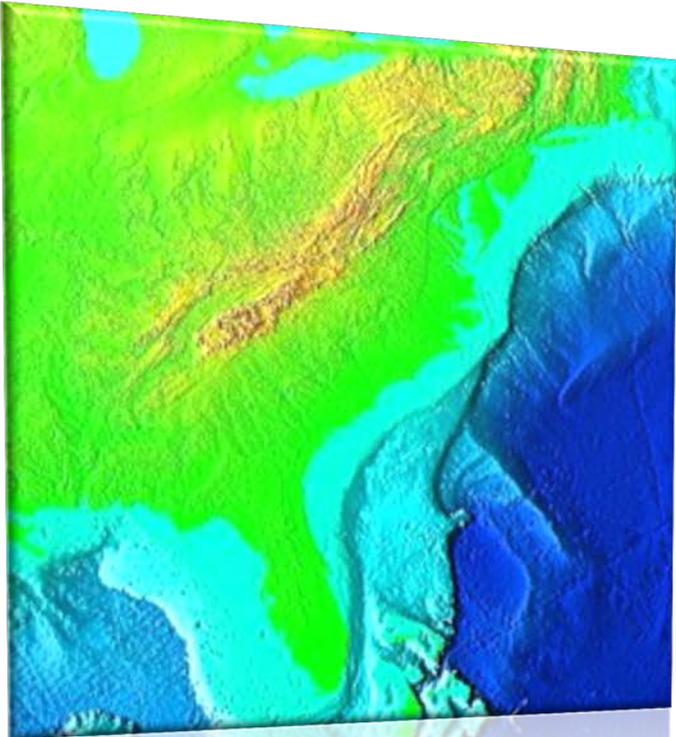


IWRSS Scope:

Provide summit to sea, boundary layer to bedrock, high-resolution (goal: half hour; half km) gridded water resource information for the United States & *North America* and globally (at lower resolution); derived from observations and model output



IWRSS Comprehensive Coverage



Summit to Sea...

Bedrock to Boundary Layer...

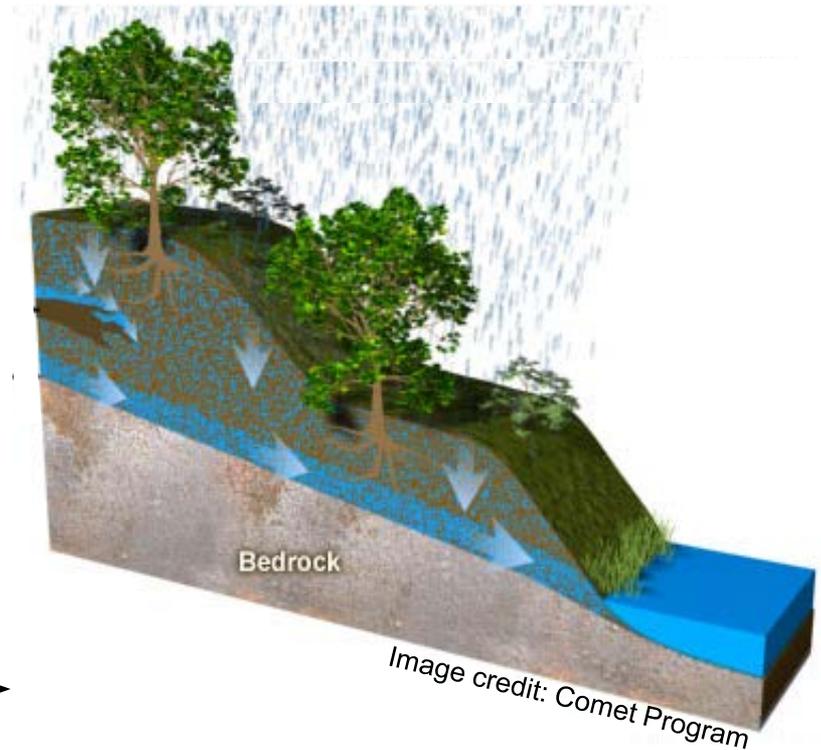
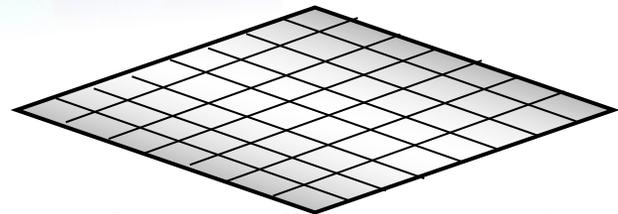


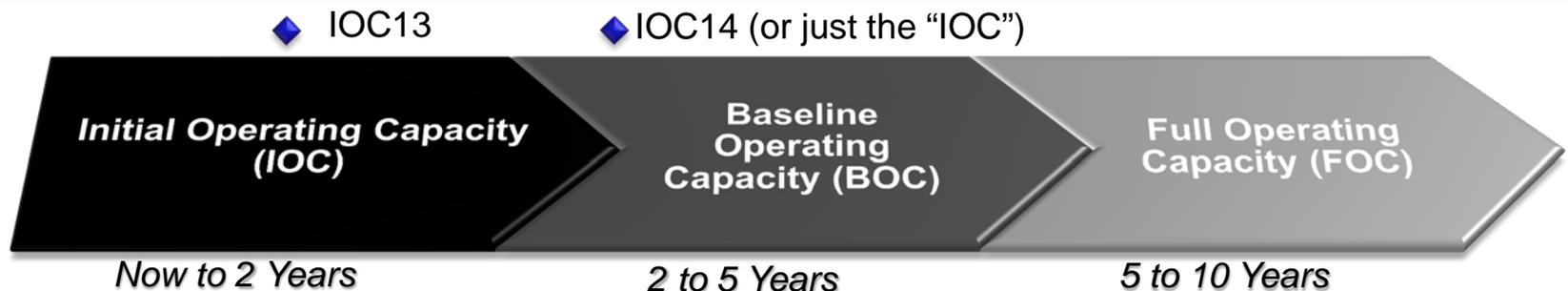
Image credit: Comet Program



**High-resolution Gridded Information,
Everywhere, Anytime**

A Bit on Process: Project Phases

- **Scoping Phase**
 - To begin as soon as possible
 - ~ 6-9 month process
 - Identify requirements and define solution space
 - Wide open - unconstrained
- **Design Phase**
 - Follows scoping exercise
 - ~ 6-9 month process
 - Result is a workable design – therefore the process is subject to resource constraints
- **Development & Implementation Phase**
 - 5 years to BOC
 - 10 years to FOC



IWRSS BOC (and Beyond) Projects



**Flood Inundation
Mapping**



**System
Interoperability &
Data Synchronization**



Modeling & Forcings



eGIS



Others, TBD...

IWRSS BOC: Governance, Teams & Process

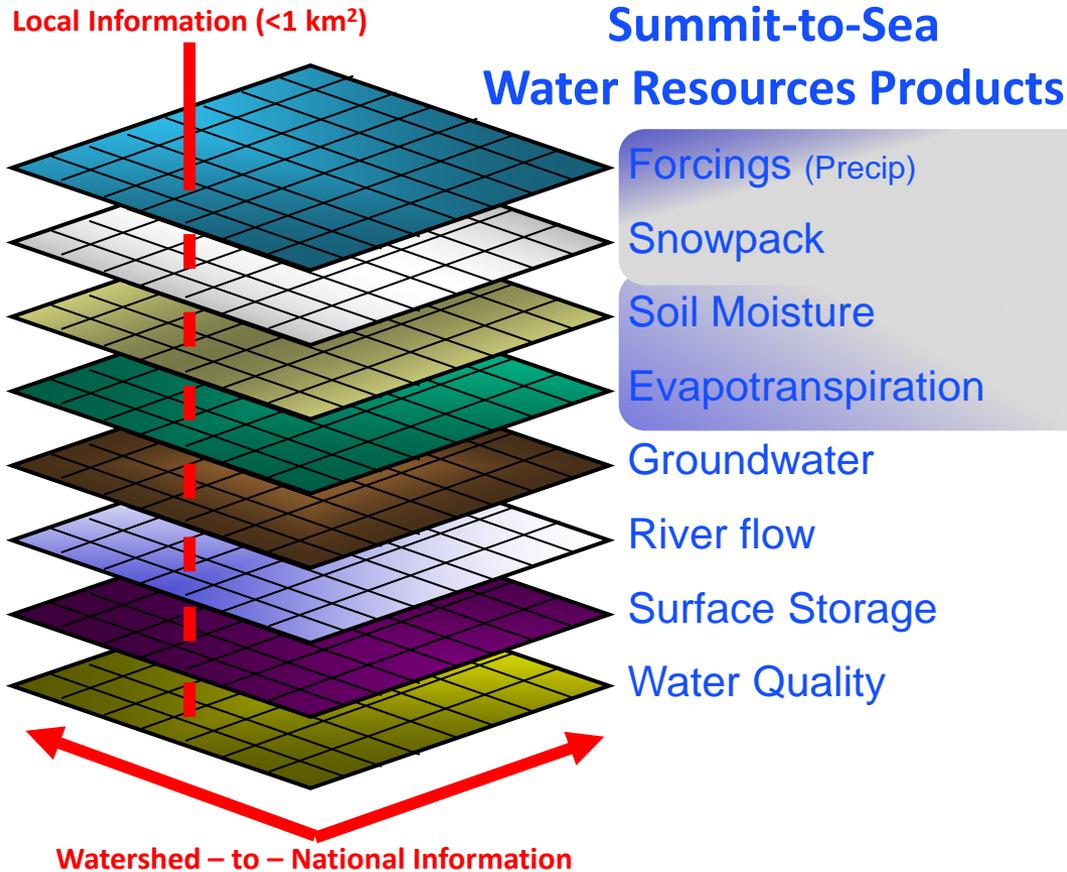
- The three agency signatories are the Adaptive Water Resources Management **Governance Board**
 - Don Cline (NOAA)
 - James Dalton (USACE)
 - Jerad Bales (USGS)
- Each major IWRSS Project will be supported by an **Interagency Team**
 - Chartered teams to date:
 - Interoperability and Data Synchronization (IDS)
 - Flood Inundation Mapping (FIM)
 - Anticipated teams:
 - National Water Modeling System (NWMS)
 - Enterprise Geographical Information Systems (eGIS)
 - Additional IWRSS Teams (building blocks) will be created as needed...
- **Reach-back** function (internal to each agency):
 - NOAA: Advisory Groups; Subject Matter Experts; Focus Groups
 - USGS: A couple possible, existing mechanisms are being explored
 - USACE: “Communities of Practice”



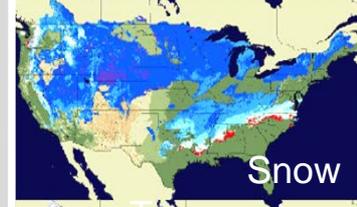
First Steps... the IOC

New Digital Information Products

Near-Term Planned (“IOC”): Soil Moisture and Evapotranspiration Added to Suite



Pilot Products - Snowpack



www.nohrsc.noaa.gov

Initial Operating Capacity

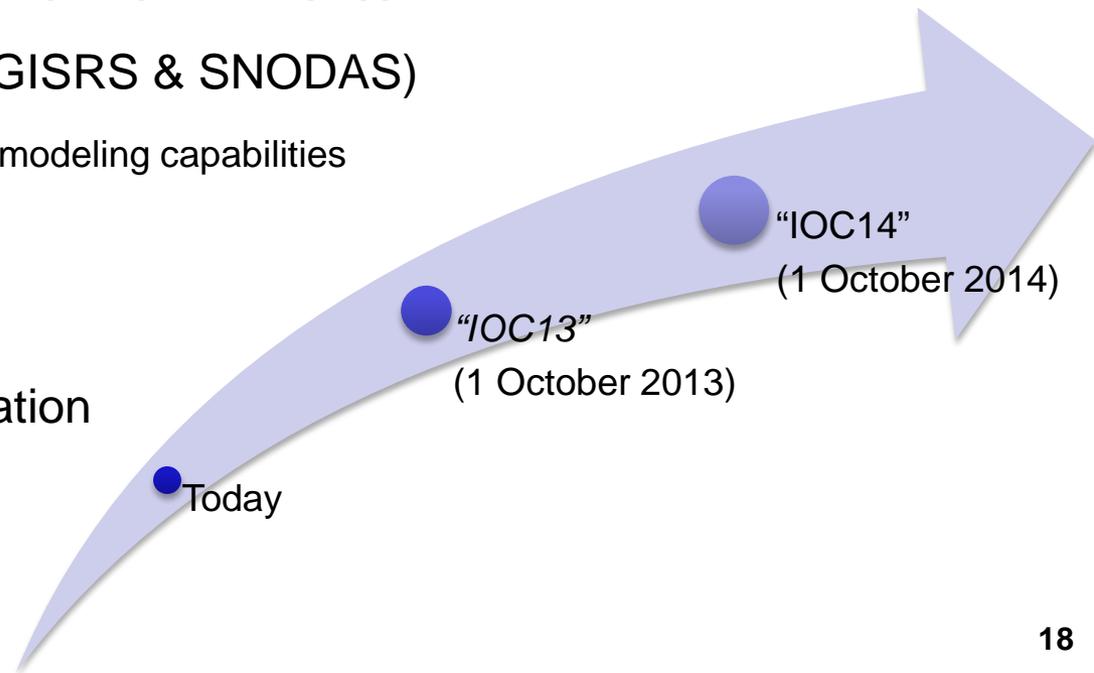
- Draft Scoping and Design Document (in progress)
- Based on high-TRL efforts, already underway → big “O” operational

IOC13:

- Analysis and forecasts out to 72 hours
- Full suite of hydrometeorological forcings for North America
- Basic land surface modeling system for North America
- Enhanced snow modeling system (GISRS & SNODAS)
 - Enhancements of GISRS to handle new modeling capabilities

Some IOC14 Targets:

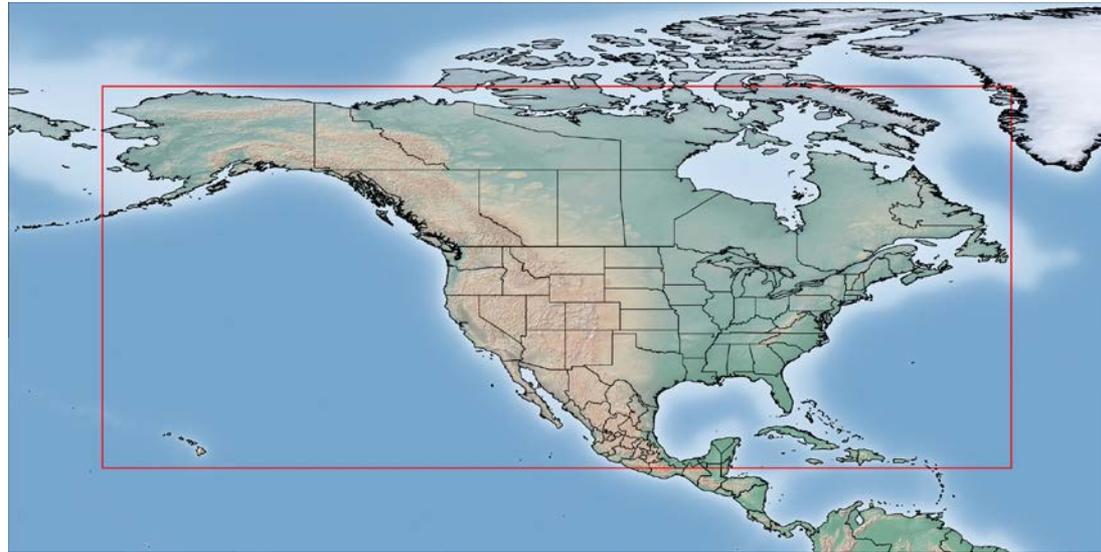
- Hydrologic runoff and routing
- Improved Downscaling and Assimilation
- AOR – 30-year record
- SAC-HTET



IOC13

Basic Features (to complement SNODAS/GISRS)

- Forcings downscaled to 1 km & 1 hr.
 - Precipitation; temperature; pressure; humidity; vector winds; SW radiative fluxes
 - Initially based on Rapid Refresh and NAM
 - Analysis and forecasts out to 72 hours
- Enhanced SNODAS & GISRS
 - To improve performance and extensibility
- LSM based on LIS
 - CLM & Noah
 - Products include: soil moisture & temperature; Reference ET, PET, etc.
- Basic IV&V Framework
 - Simple data archive
 - Focus on precip and soil moisture/temp
- Basic Interoperability Infrastructure
 - Based on NetCDF4 w/CF Metadata Convention

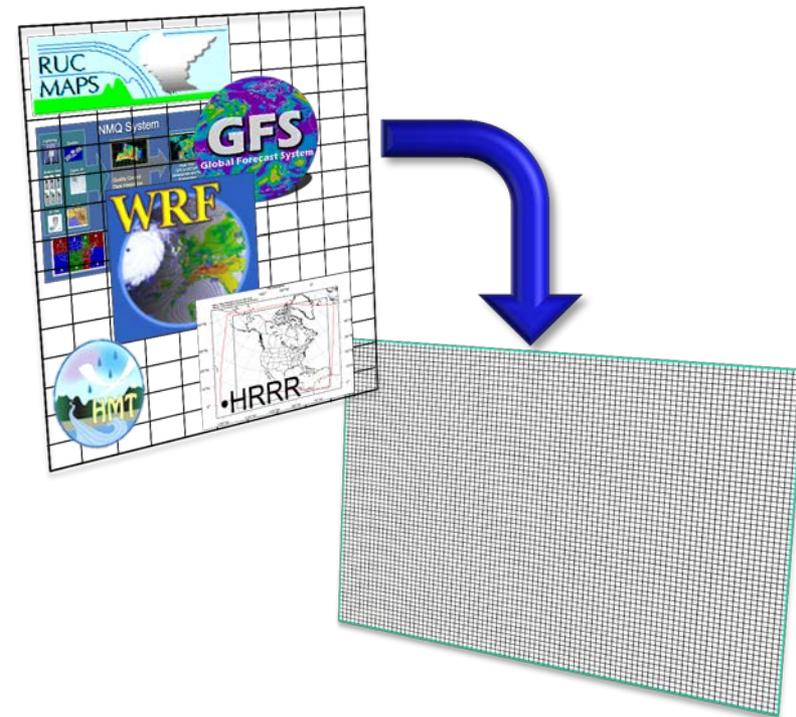


Modeling Domain for IOC operations. The red rectangle delineates a region in latitude/longitude space extending from -52° W to -168° W and from 17° N to 72° N. The entirety of the image covers -40° W to -180° W and 5° N to 84° N. If possible and necessary, the modeling domain may be expanded to cover some portions of this larger area.

High-Impact Areas of Opportunity for R&D

- New Observations
 - Basic met, esp. Precipitation; Fluxes (energy, mass); States (soil moisture & temperature; ET; etc.)
 - Metadata; integrating data collectives; transmission
- Improved QPI:
 - MRMS
 - RAP/HRRR
- Downscaling & Assimilation:
 - Both hydromet forcings & hydrologic states
- Independent Verification & Validation (IV&V)
 - Both hydromet forcings & hydrologic states
- Hillslope-scale & Urban Hydrology
 - Process studies; scaling issues; IV&V
 - Ensembles
- Earth system modeling approaches

- Short-term & Ongoing
- Longer-term



THANK YOU!

Questions?

Contact: timothy.schneider@noaa.gov