Integrated Water Science Plan

(IWSP)

for the Next Decade

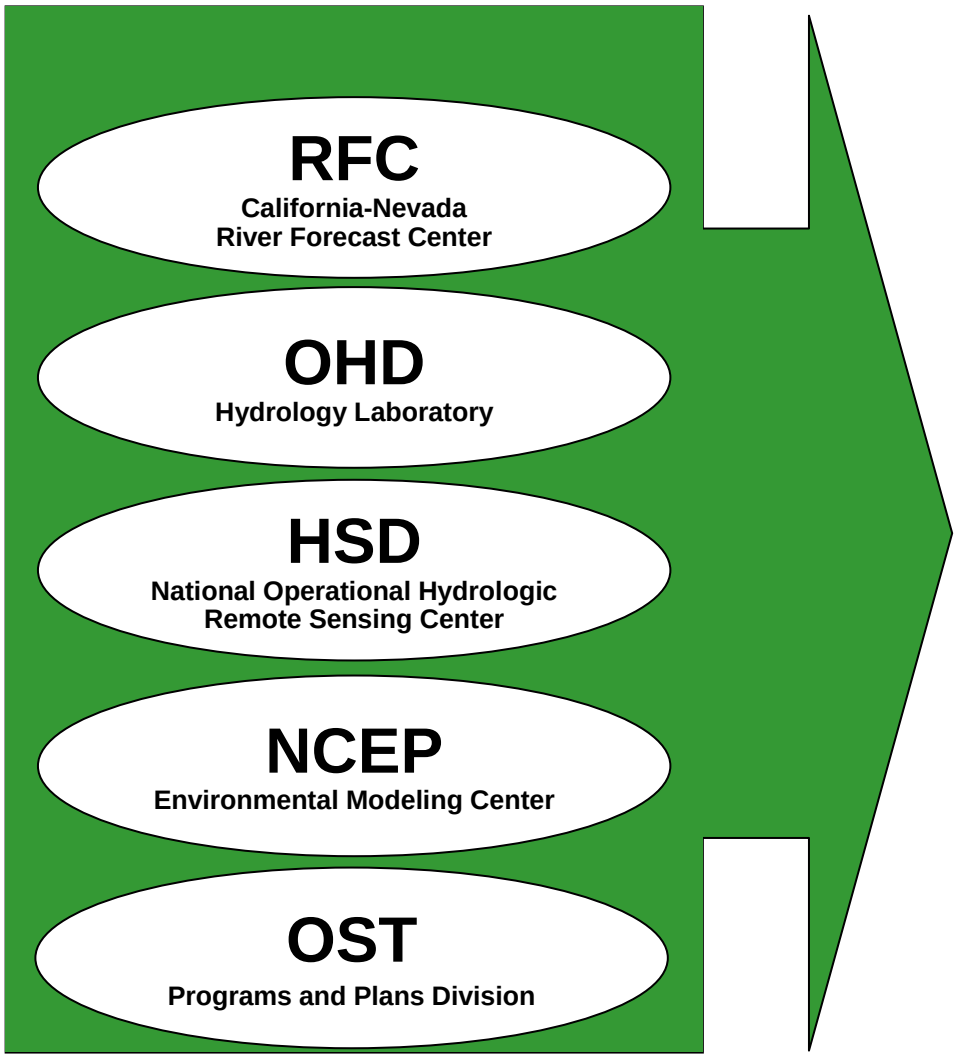
Storm near Elko, Nevada. NOAA

Spring snowmelt, Sonora Pass, California, USA
Photograph by Cagan Hakki Sekercioglu,
naturalphotos.com

October 6, 2005

NWS IWSP Team

IWSP Approach



Assess S&T development activities.

- Observing Systems
- Verification
- Uncertainty
- Modeling and Testbeds
- External Partnerships
- Other Concepts

Assess whether current NWS activities can support efficient and effective delivery of new water science for operational implementation.

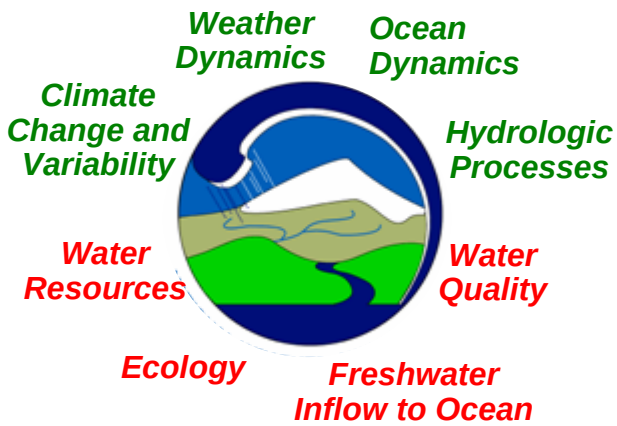
Recommend approaches to maximize the strengths of each NWS water science component and to streamline water science to operations paths in meeting the objectives.

Water Science Objectives

Water Science Vision

Emerging Interdisciplinary Water Science Paradigm

Understand and Harness Predictability of Physical Processes



Interdisciplinary Environmental Prediction

NOAA, Partners, Collaborators

Integrated NWS Water Science Capabilities

Observing Systems and Data Assimilation

Land Surface Hydrology & Water Resources Modeling

Development & Operations

Science & Technology Infusion

Integrated Products and Services

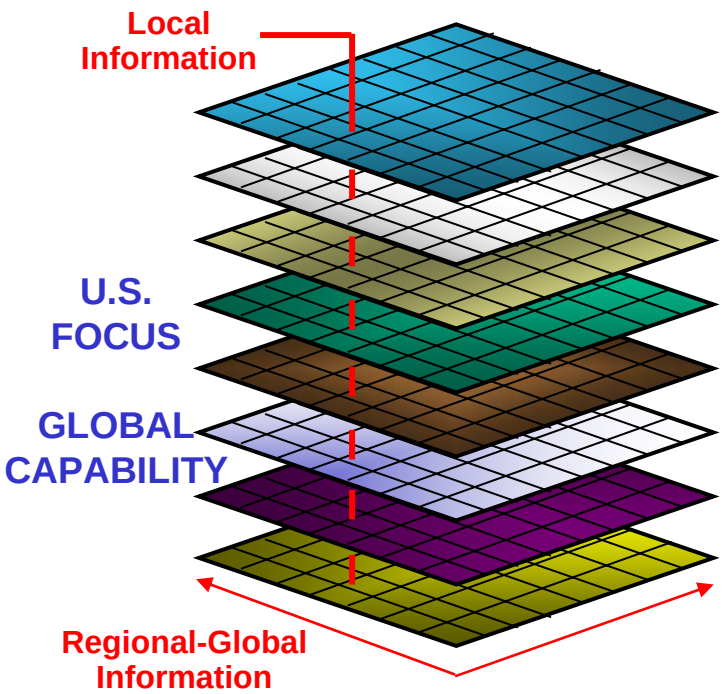
Comprehensive High-Resolution Water Resources Product Suite

Multiple Applications and Customers

National Focus, Global Capability

Water Science Vision: Integrated Products and Services

NWS-NDFD High-Resolution Gridded Water Resources Product Suite (WRPS)



- Precipitation
- Snowpack
- Soil Moisture, Runoff
- Evaporation
- Groundwater
- River flow
- Surface Storage
- Water Quality
- Others

Applications

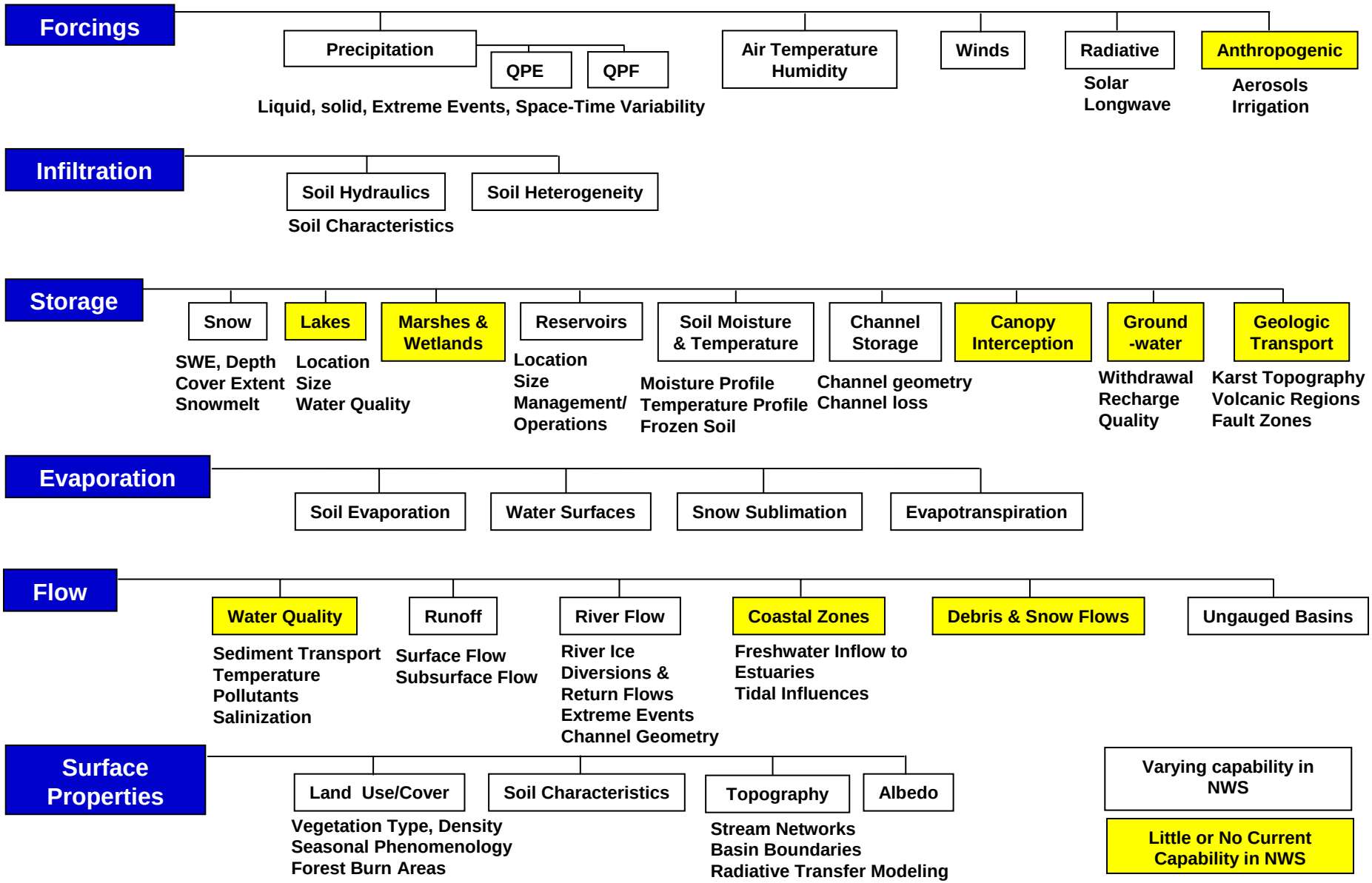
Drought
Flood Management
Flash Flood Prediction
Water Supply
Transportation
Emergency Management
Agriculture
Debris Flows
Ecosystems Management
Research

Partners

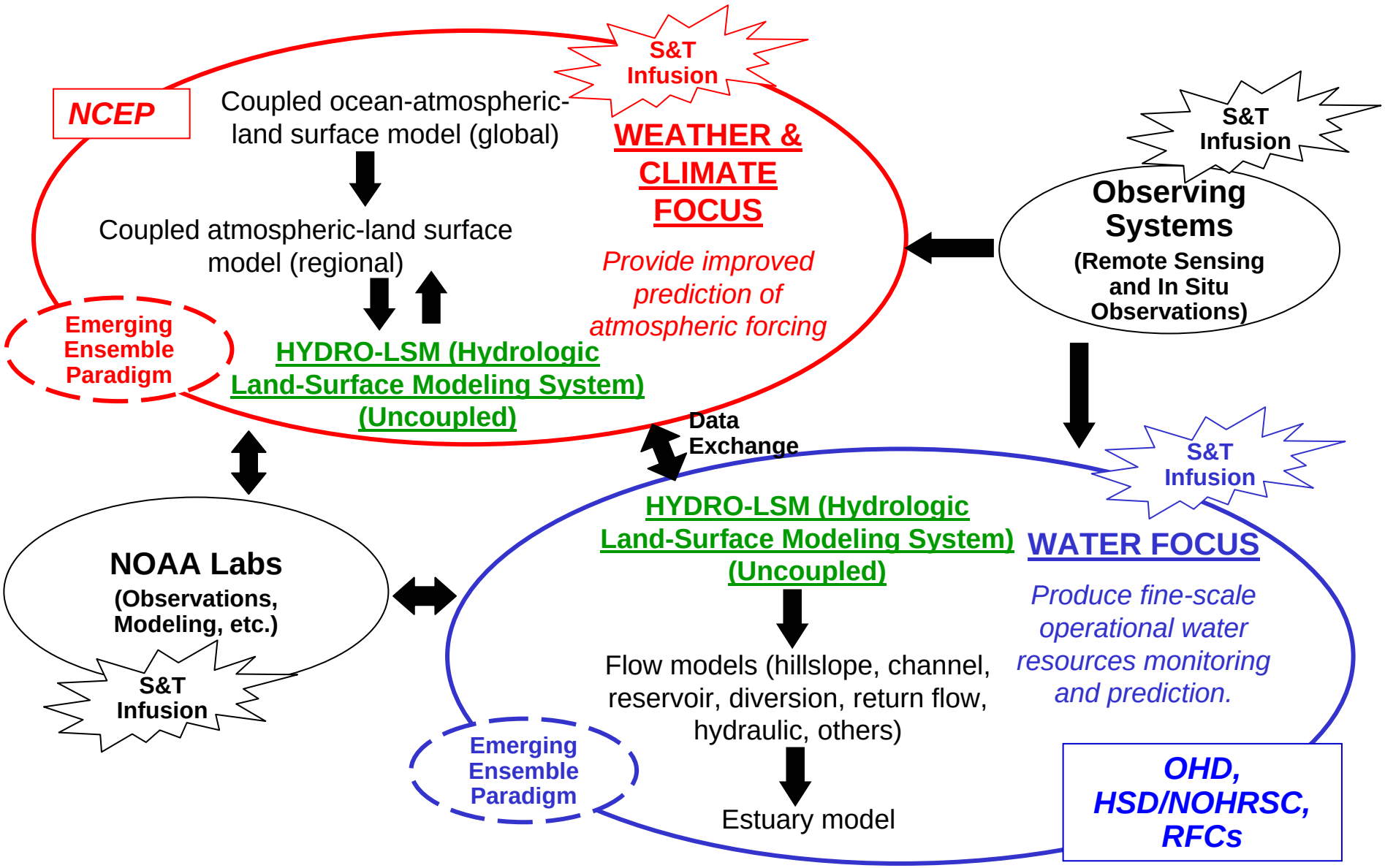
NWS
NOAA
Federal Agencies
Tribal Agencies
State Agencies
Local Agencies
Private Sector
Academia

The WRPS includes a comprehensive suite of high-resolution (1-10 km) gridded hydrologic state variable and flux datasets and derived products to support a wide range of future applications and services. Temporal characteristics of WRPS range from current-hour analyses to forecasts of several months. Datasets include rainfall, snowfall, snow water equivalent, snowpack temperature, snowmelt, soil moisture, soil temperature, evaporation, sublimation, streamflow, and surface storage. Other hydrologic variables such as groundwater, fuel moisture, soil stability (e.g. debris flows potential), water quality, etc. are also possible in this framework.

Major Science Elements Included in Water Science Objectives

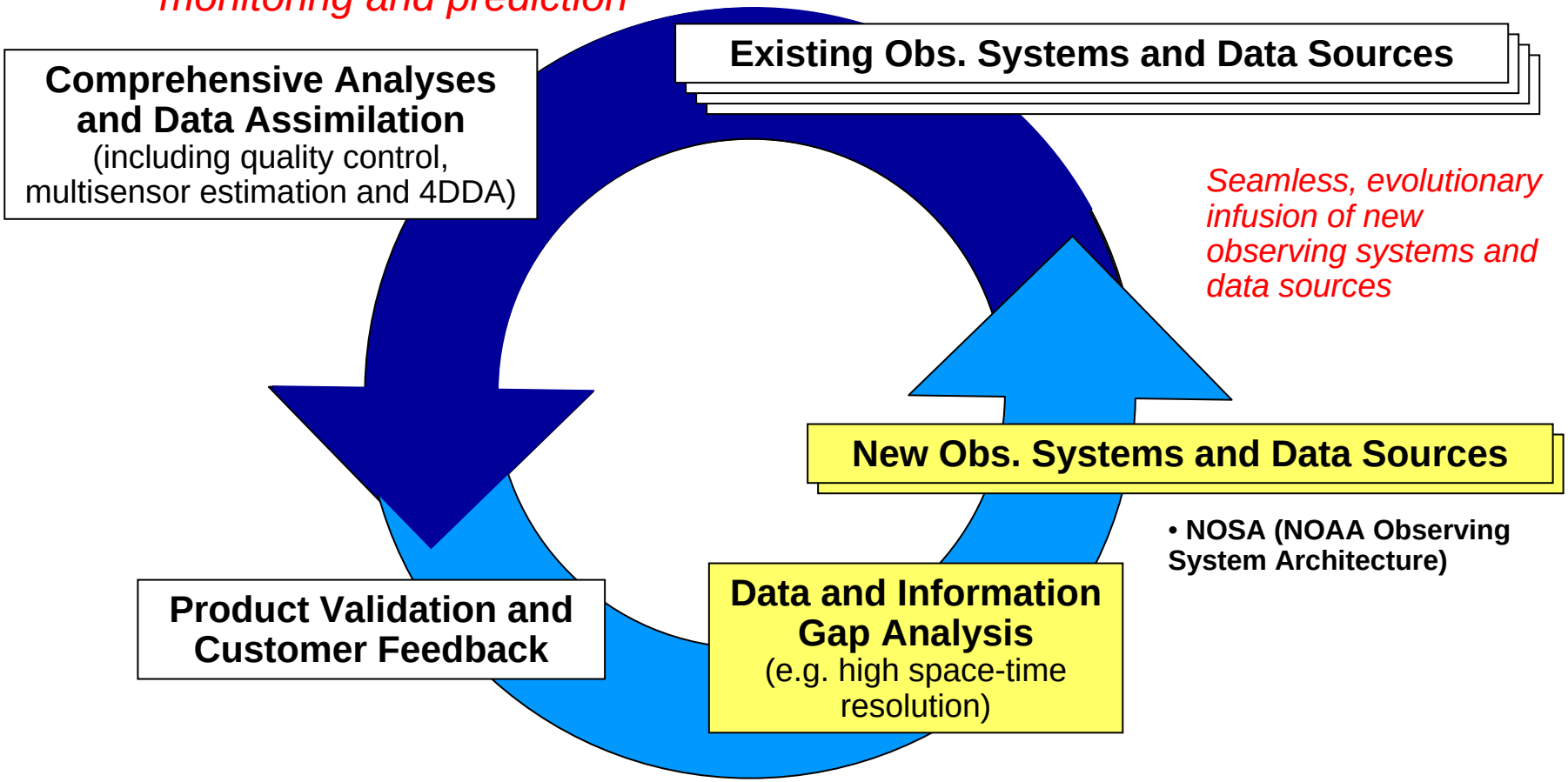


Current Water Science Framework



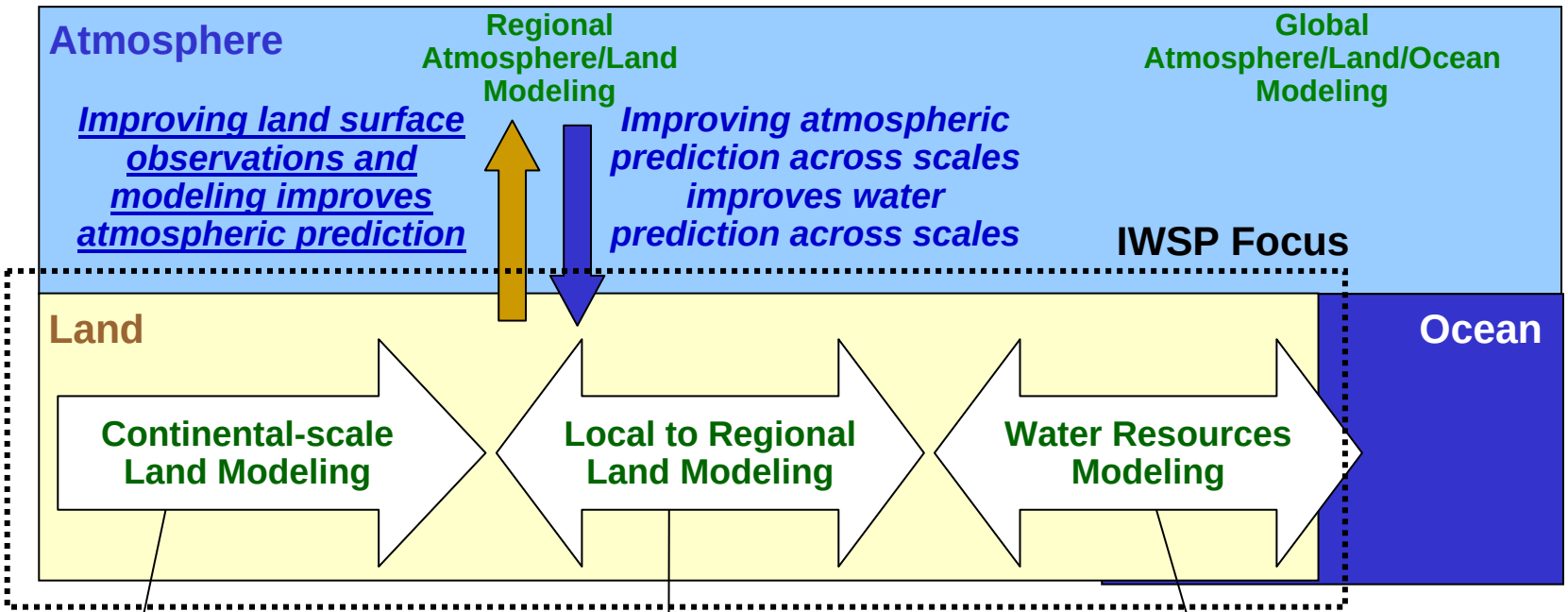
Water Science Vision: Integrated Observing Systems and Data Assimilation

Integrated hydrologic and hydrometeorological observing systems feed comprehensive data assimilation to improve multi-scale monitoring and prediction



Water Science Vision: Integrated Hydrologic Land Surface Modeling

Integrated, end-to-end hydrologic land-surface modeling framework is centerpiece of new water science vision. This is necessary to improve monitoring and prediction of water cycle at local, regional, continental and global scales.

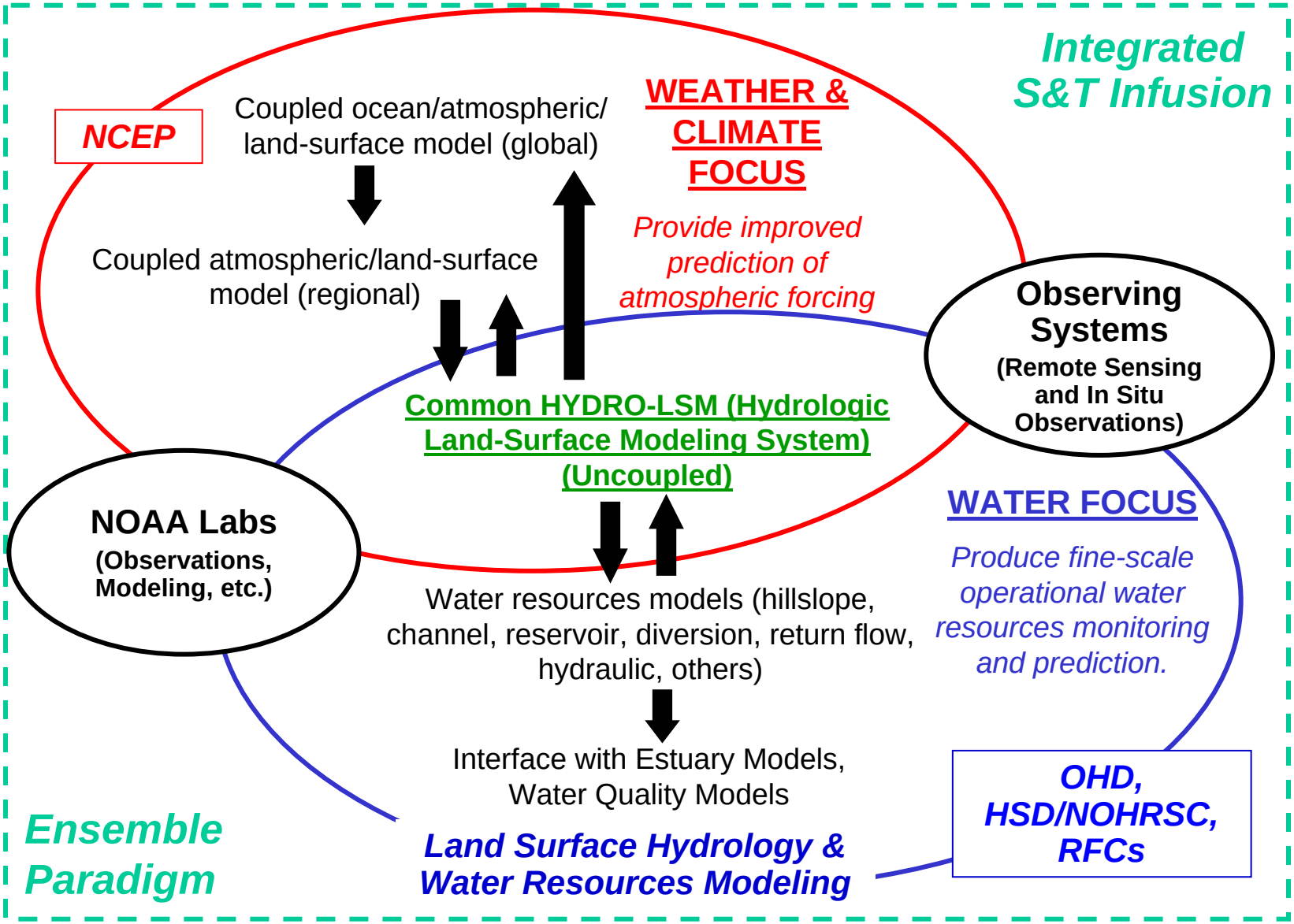


Generates U.S.-focused, high-resolution, short- to long-range Water Resources Product Suite (WRPS)

Supports local to regional applications, including prognostic analysis of land surface/use changes

Supports comprehensive monitoring and prediction of flow, storages and quality of water, including coupling with estuaries and tidal influences

Needed Water Science Framework



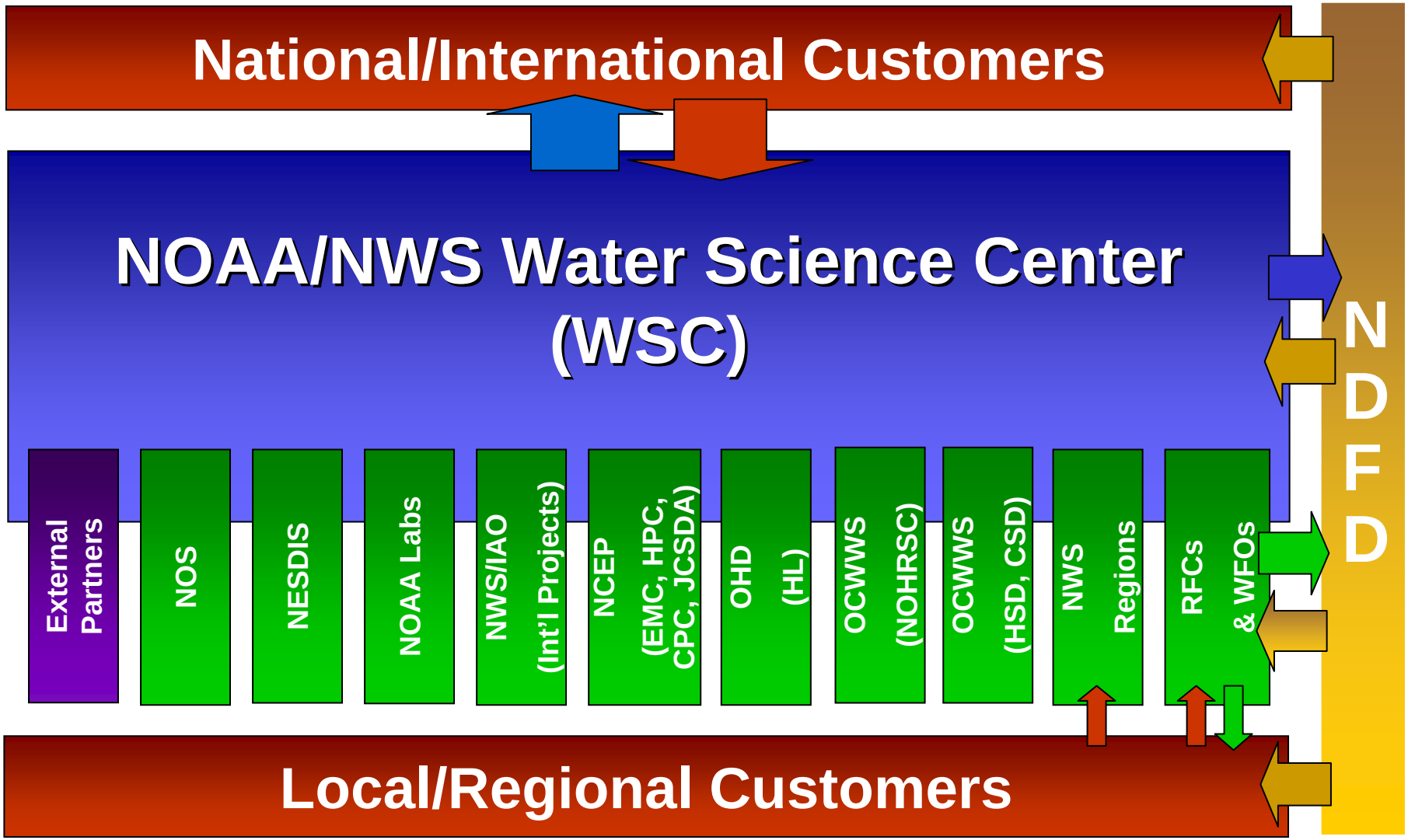
Principal Recommendation

- Establish a NOAA Water Science Center (WSC) as the world leader in water science and prediction by aligning existing science, development, technology and operations resources into a dynamic, integrated, collaborative center of expertise

Water Science Center

- **Operational Functions**
  - Coordinate and advocate observing systems
    - Hydrologic and hydrometeorological remote sensing (satellite, airborne, ground)
  - Manage data streams
    - Manage and organize data from in-situ observation networks (e.g. HADS)
  - Operate national high-resolution Hydro-LSM, water resources models, and comprehensive hydrologic and hydrometeorological data assimilation system
    - Produce WRPS
    - Populate NDFD
  - Provide guidance to RFCs and WFOs
  - Support science Infusion to RFCs and WFOs
    - RFC version of Hydro-LSM and water resources models
    - Hydrologic, hydrometeorological, and water resources applications for WFOs
- **Development Functions**
  - Integrated development for all operational functions
  - Hydro-Testbed Facility
  - Interdisciplinary partnership with other agencies and external science partners

Recommended Structure



Why this structure?

- Creates critical mass for integrated, end-to-end, interdisciplinary water science enterprise
  - From observations to product delivery
  - From atmosphere to estuary
  - Comprehensive monitoring and prediction of a broad range of water-related hazards, water resources and water quality

- Improves efficiency, productivity, accountability and transparency in development and implementation of new science, technology, products and services

- Creates a true “center” for NOAA/NWS’s water resources enterprise

Expected Benefits of WSC

Current Structure	Recommended Structure
Little coordination and planning among the players	Single-point coordinated water science and operations within NWS and NOAA
Driven primarily by short-term operational needs of the specific customers that each player serves	Guided by long-term vision of integrated development, operations, products, and services for NOAA/NWS
Multiple doors for external partners and stakeholders	One door for external partners and stakeholders
Development and operations are physically, functionally separated • *RFCs are out of primary development loop*	Development and operations are synergistically linked • *RFCs are included in primary development loop through Hydro-Testbed Facility*
Difficult to exploit collective NWS water science resources	Full utilization and leveraging of water science resources and capabilities in NWS, NOAA and external partners • *Comprehensive suite of NWS hydrology and water resources products and services*

Water Science Center

Flagship of NOAA's Water Resources Enterprise

- Weather and Climate Predictions
- Science and Technology Infusion
- Collaboration and Partnerships
- Improved Organizational Structure

Integrated Water Science, Operations, and Services

Water Resources Monitoring and Prediction

- Improved and Expanded Products and Services
- Improved Customer Interaction
- State-of-the-Art Water Science
- Unified Modeling and Prediction System
- National Testbed For Water Science Development