# Integrated Water Services

Gary Carter
Director, NWS Office of Hydrologic Development
Manager, NOAA Integrated Water Forecasting Program
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**Reducing the economic and societal impacts of water hazards, habitat loss, and pollution**

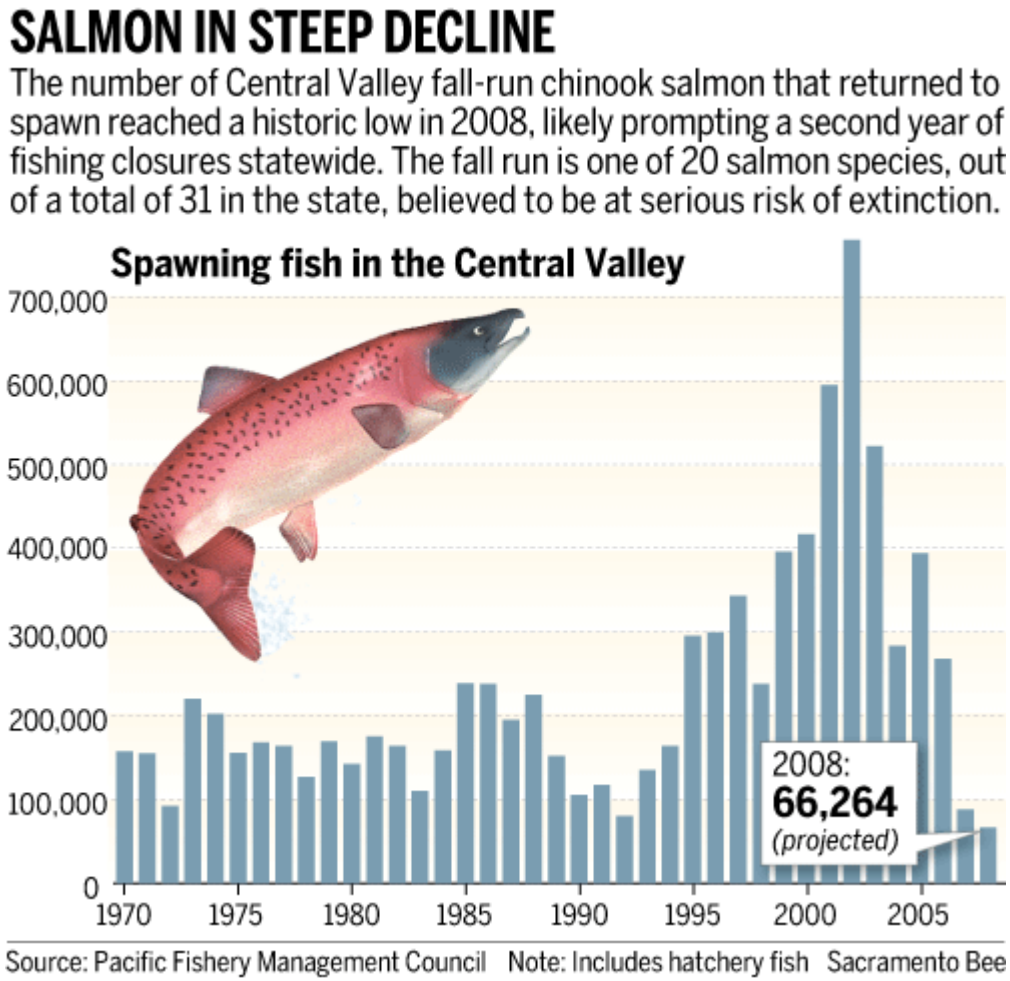
# Extremes of Precipitation: Too Little or Too Much

Water problems:

- Climate change and variability are dramatically impacting water availability and quality
- Population growth and economic development are stressing water resources and aquatic ecosystems
- Socio-economic consequences of floods and droughts are escalating

- Increased demand for new and more information
- Consistent and integrated decision support
- Broader audience, more stakeholders
- Enhanced awareness, expectations and scrutiny
- Greater consequences

# Too Little – It's about the Economy and Living Marine Resources




In 2008, the first ever ban on salmon fishing was imposed in California, deeply impacting the multi-billion dollar California salmon fishing industry.

The reasons for the California salmon crisis are varied and include:

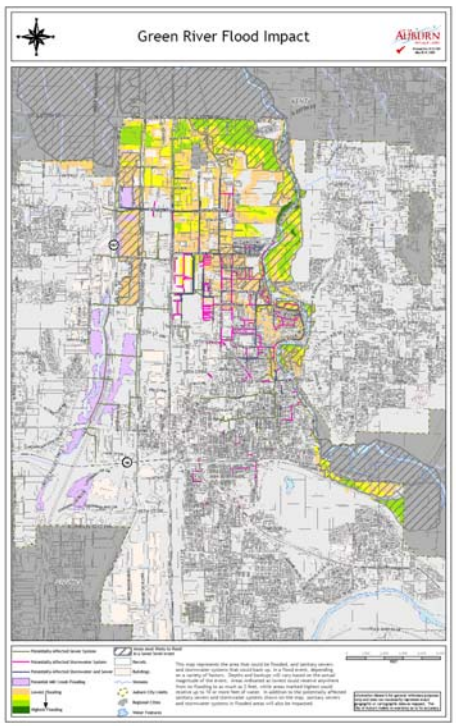
- river and ocean pollution
- destruction of salmon habitat
- lack of cold water needed for spawning
- fierce competition for precious water resources

# Too Little – It's about the Economy and Agricultural Production


Current federal environmental rulings have reduced water shipments to farmers in the Central Valley of California to as little as 10 percent of what they normally receive.

In all, farmers in the valley stand to lose between $1.2 billion and $1.6 billion in revenue this year, with 60,000 to 80,000 people thrown out of work.

# Too Much – It's about the Potential for Catastrophic Flooding in Washington

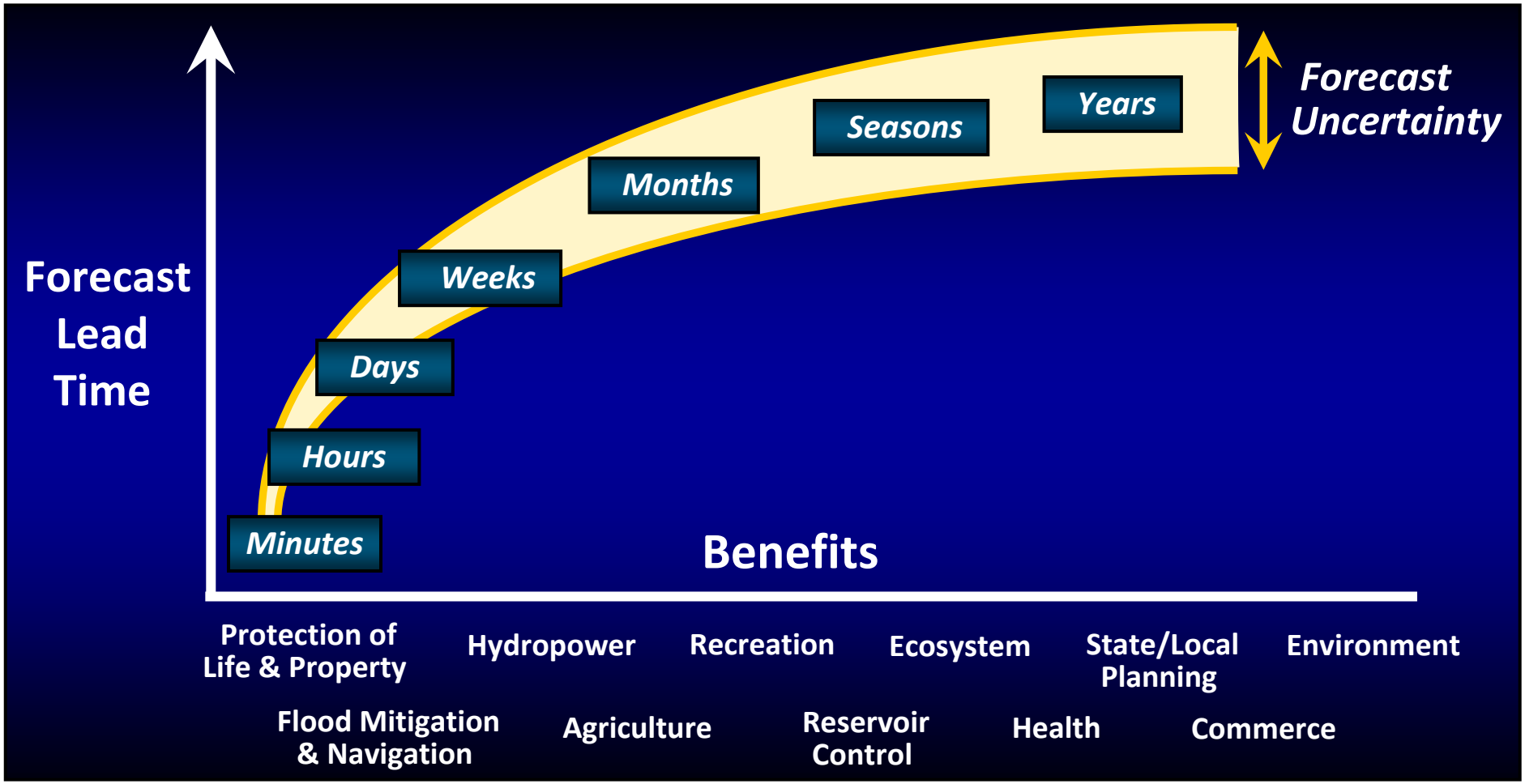

The abutment -- a hillside that anchors one side of the Howard Hanson Dam -- has leaked almost since the dam began operating in 1961.

The latest leak, detected after a huge rainstorm last January filled the reservoir higher than ever, prompted the USACE to reclassify Hanson as "unsafe" with an "urgent and compelling" need for immediate action.

Up to $2-3 B of damage could occur downstream in a catastrophic flood.

$10 million to $35 million are needed to protect and possibly evacuate jail inmates, courts, animal shelter, and county offices in the face of floods in the Green River Valley that could be caused by water releases.

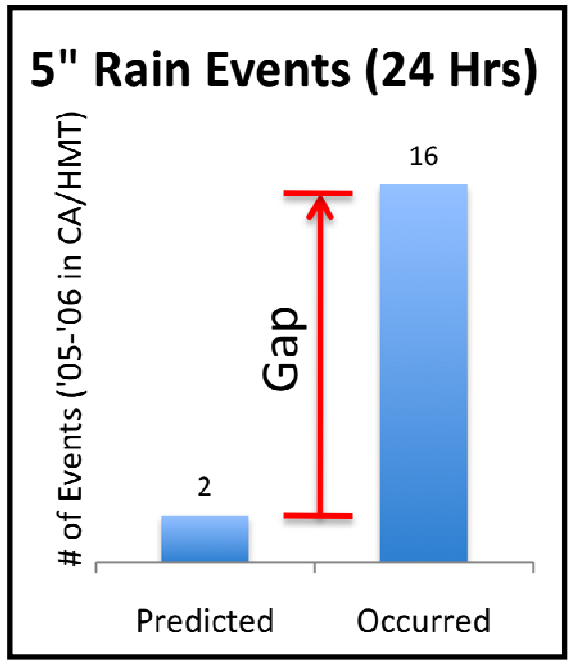
# It's about NOAA addressing Multi-Scale Water Forecasting Challenges




A seamless suite of probabilistic hydrometeorological forecasts are required for all lead times and all users

# It's about Improving Precipitation and Flood Forecasts

The threat…



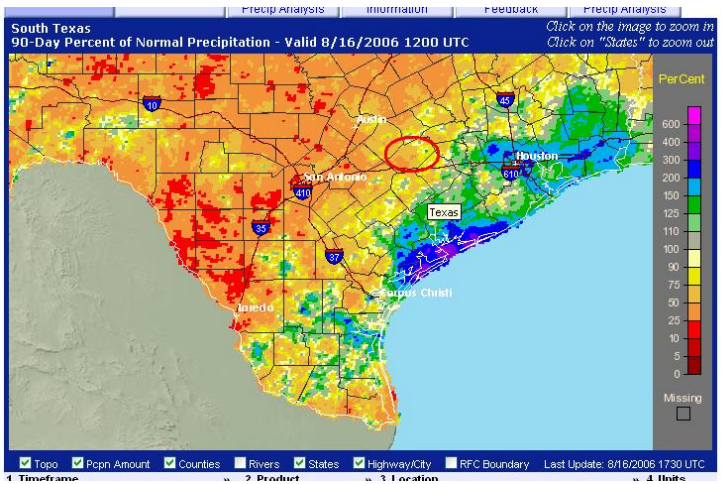

The challenge…

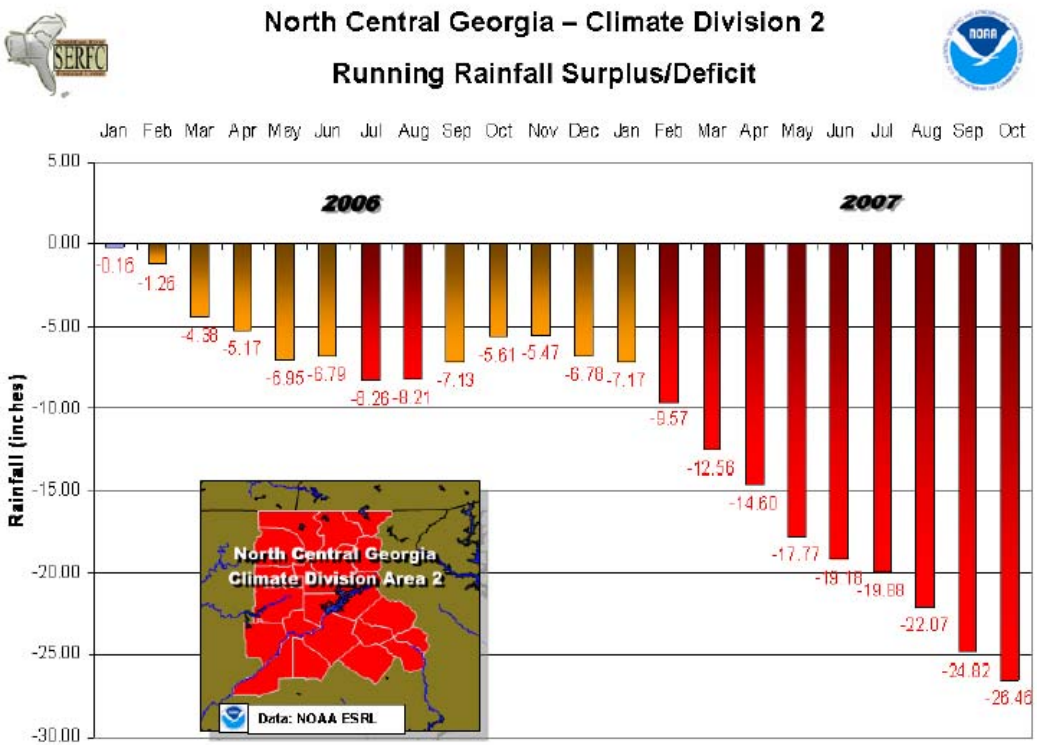
**QPE – QPF – Decision Support Tools – Verification Studies**

# It's about Delivering Community Focused Water Information and Services

Many areas rely on groundwater where recharge is intermittent or declining.

Water mangers require high quality forecasts of streamflow, soil moisture, and water temperature.




Coastal communities need up-to-date information about their watersheds, rivers, estuaries and coasts to mitigate natural hazards and manage water resources and ecosystems.

# It's about delivering New Services such as 7-day Water Temperature Forecasts

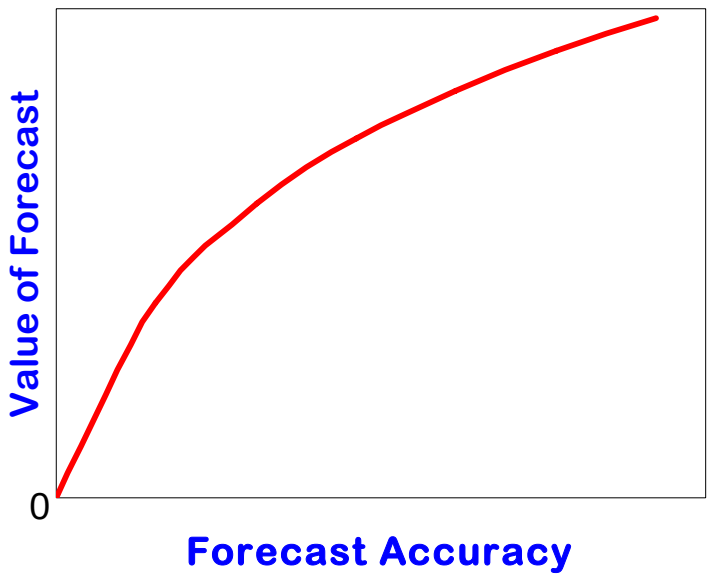
## Research Study (Richard Adams et al., 2009, Agricultural and Resource Economics, Oregon State University)

- Conflicting water usage (fish, agricultural irrigation and hydropower plants)
- Two case studies (Trinity River, North Fork of the John Day River) where more in-channel water would reduce stream temperature and protect salmonids (Chinook salmon, steelhead trout)
- Water Managers create value by keeping "just enough" water in the stream

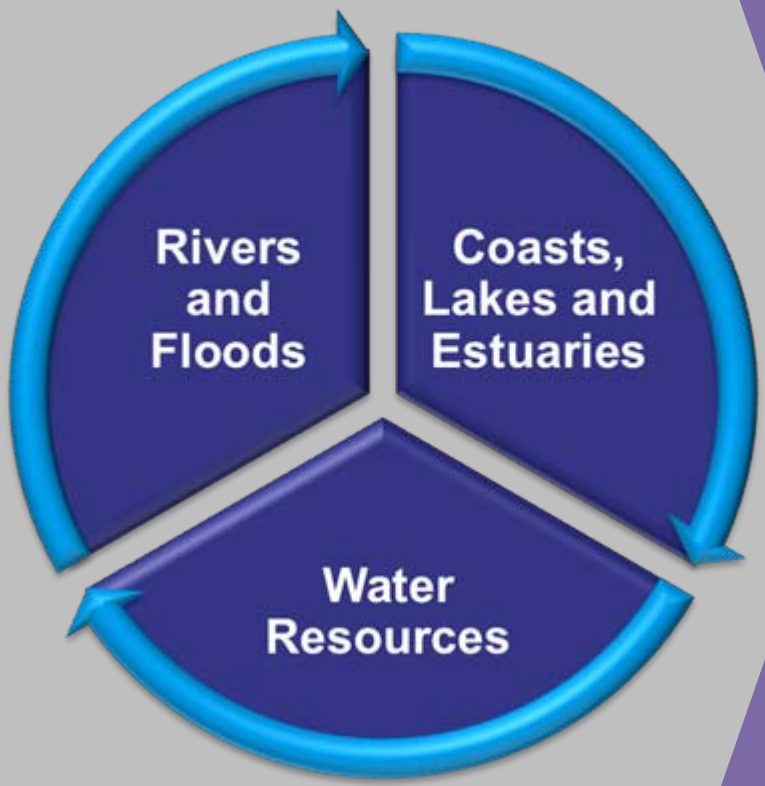
## Initial Findings

- Use of 7-day water temperature forecasts would increase fish population in both settings
- More accurate forecasts would optimize decisions (water releases, water purchases, etc.)

IWF Program to prototype Water Temperature forecasts in FY11



# It's about accomplishing NOAA's Integrated Water Forecasting Long-term Goals




**IWFP Business Areas**

The three business areas of NOAA's **Integrated Water Forecasting Program** are aimed at producing a seamless suite of water forecast information, covering:

**Floods** ⟷ **Droughts**

**Summit** ⟷ **Sea**

**Short-term Warnings** ⟷ **Seasonal Outlooks**

with increased emphasis on climate-related impacts for arid and coastal watersheds.

# Back-up Slides

- IWF Program Goals and Objectives

# It's about accomplishing NOAA's Integrated Water Forecasting Long-term Goals

**NOAA's Role: Provide accurate and reliable water forecasts (*where, when, and how much)***

| Rivers and Floods | Coasts, Lakes and Estuaries | Water Resources |
|---|---|---|
| **Advance Hydrologic Prediction Service** | **Coast, Estuary, River Information Services** | **Integrated Water Resources Science and Services** |

**Community Hydrologic Prediction System (CHPS)**

Objective 1

**Reduce 1-7 day river forecast errors by 50% and quantify uncertainty**

Objective 3

**Couple modeling systems for rivers, lakes and estuaries**

Objective 4

**Provide seamless suite of summit-to-sea high resolution water quantity and quality forecasts**

Objective 2

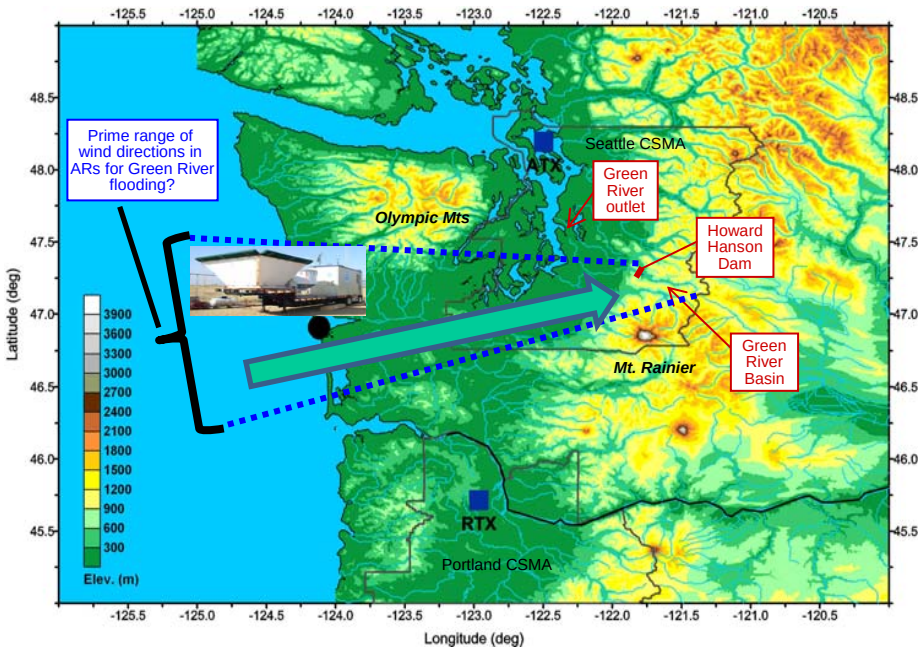
**Provide flood inundation forecast maps for 100% of high-impact river and coastal communities**

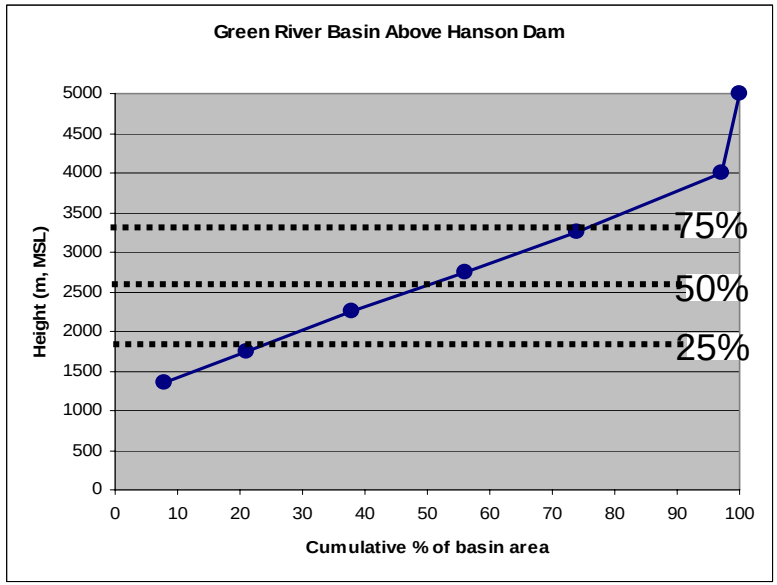
Objective 5

**Advance and integrate observing systems for water resources**

# Too Much – It's about the Protection of Life and Property

Potential impact of the restrictions on the flood storage capacity is increased flood risk to the Green River valley below the dam.




**Wind direction in the controlling layer**

-Wind direction near 1 km MSL is 250-275 deg

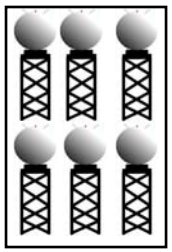
Outside this, rain shadowing reduces precipitation over the Green River watershed.

**Snow level**

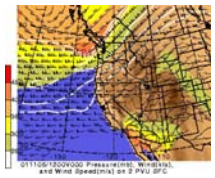
-½ the watershed area above the dam is above 2500 ft MSL and below 4000 ft

e.g., if snow-level is forecast below 2500 ft, but actually is above 4000 ft, then runoff will be roughly twice what is expected.

# It's about Developing QPE Products with Higher Spatial and Temporal Resolution



Radar



Model

Rain Gauge

Quality Control

3-D Radar Mosaic

QPE

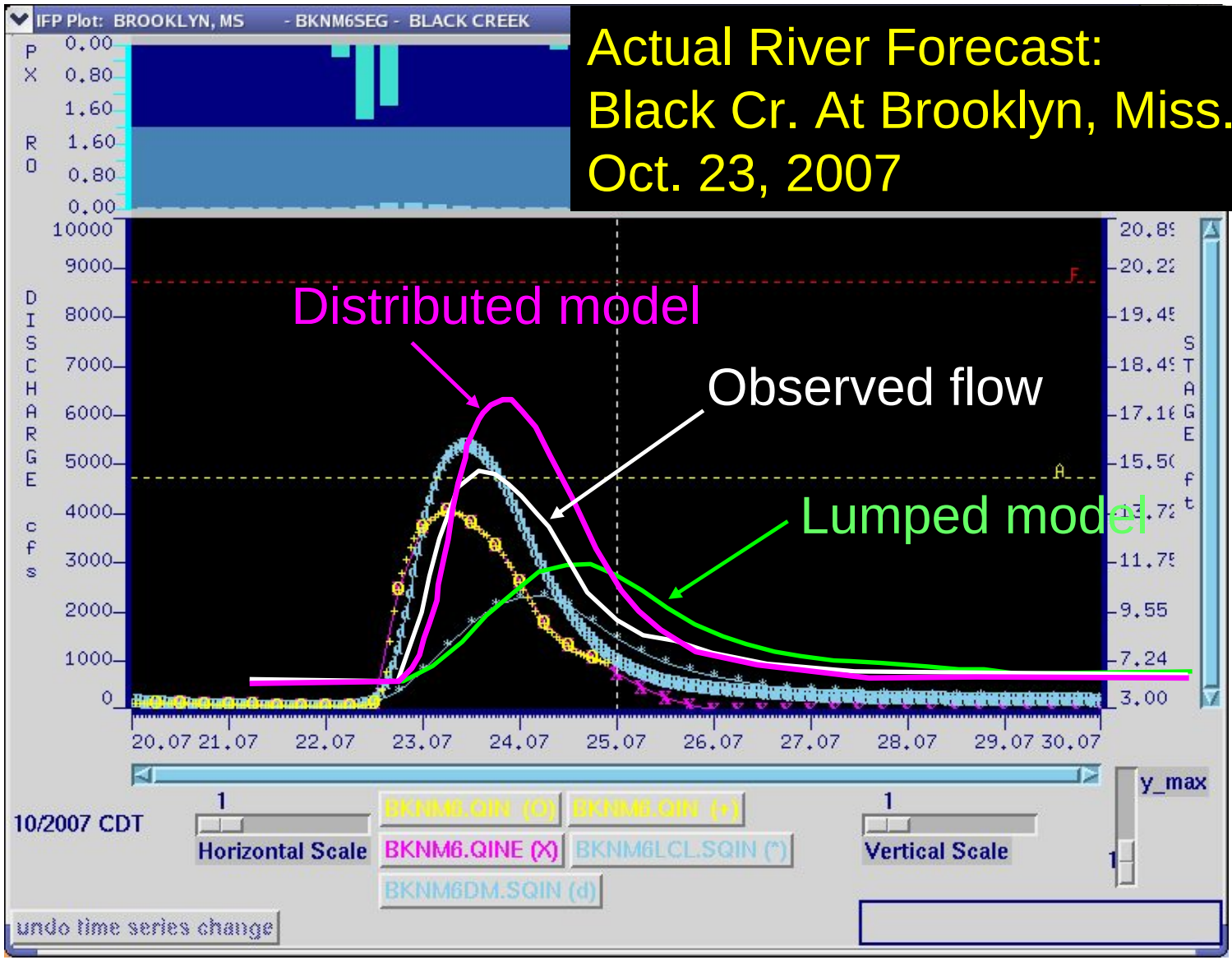
Mosaic Products

Precip Products

Users & Collaborators

Evaluation

# It's about implementing High-Resolution Hydrologic Models



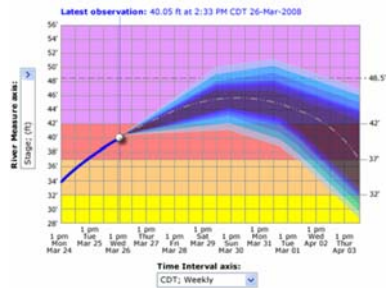
# It's about Community Models and Ensemble Forecasts

## Community Hydrologic Prediction System (CHPS)

- **What:**
  - A software architecture to enhance collaboration across agencies and facilitate the use of data, models and software tools
- **Key Accomplishments**
  - Implemented AWIPS-II compatible prototype hardware and software capabilities at 4 RFCs
- **Implementation**
  - Parallel operations at 4 RFCs beginning Oct 2009, remaining RFCs Oct 2010
  - Retire legacy system and integrate CHPS within AWIPS II

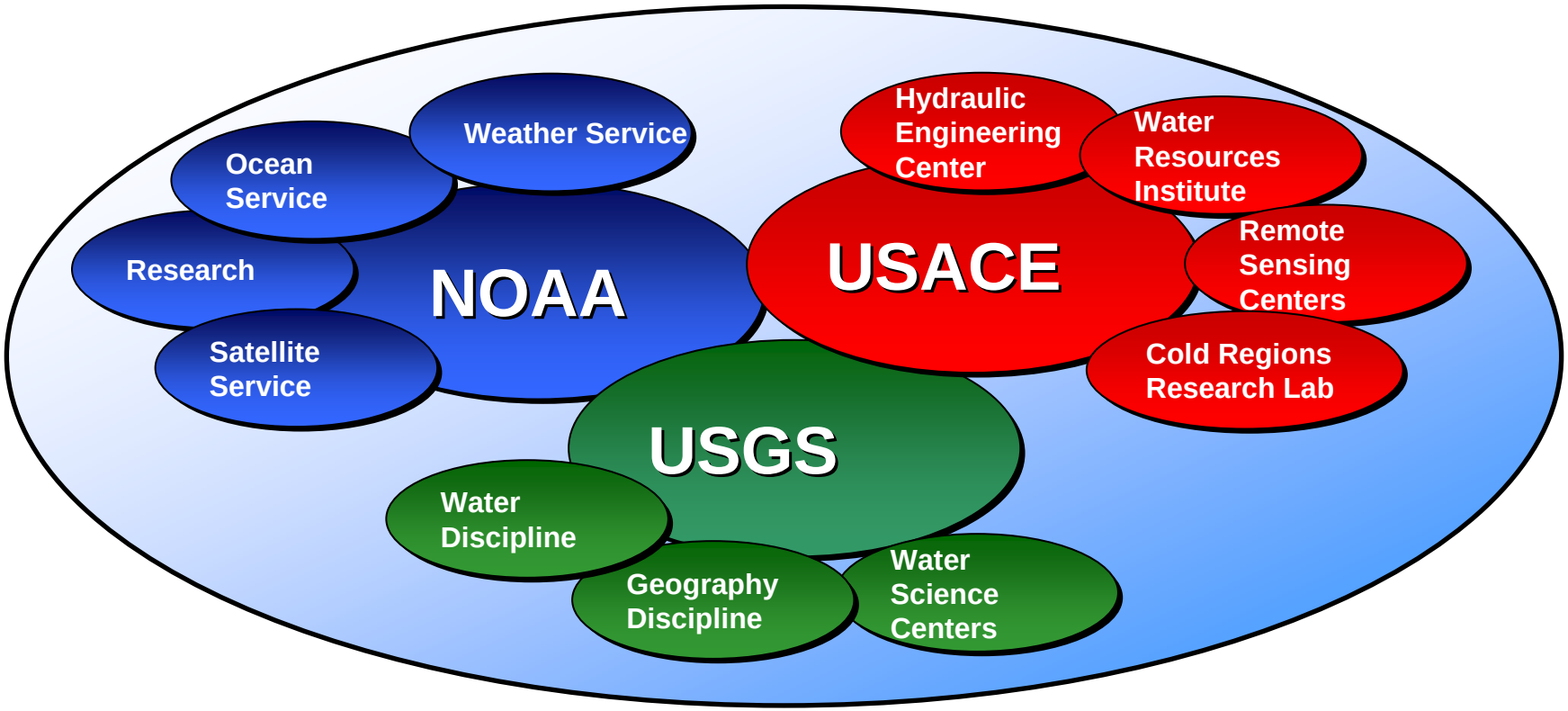
## Hydrologic Ensemble Forecast Service (HEFS)

- **What:**
  - End-to-end (seamless short-term to long-term) ensemble forecast service within CHPS
- **Key Accomplishments**
  - Demonstrating components of short-term capability at select basins in 6 RFC domains



- **Implementation**
  - Additional short-range prototype deployments during the next 2 years
  - Implement HEFS (integrated short- to long-term capability) via CHPS in 2012

# It's about NOAA doing its part to meet America's water challenges




***NOAA plays a KEY ROLE in the MULTI-AGENCY effort to address the FULL ARRAY of climate change-induced water problems:***

- ***Share data and develop interoperable tools to create a common operating picture***
- ***Provide the Nation with a seamless suite of consistent water resources monitoring and forecast information – summit to sea***