

Coupling Hydrologic Forecast Models and the Upper Rio Grande Water Operations Model

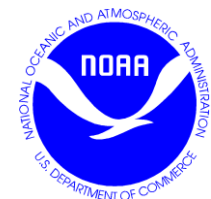
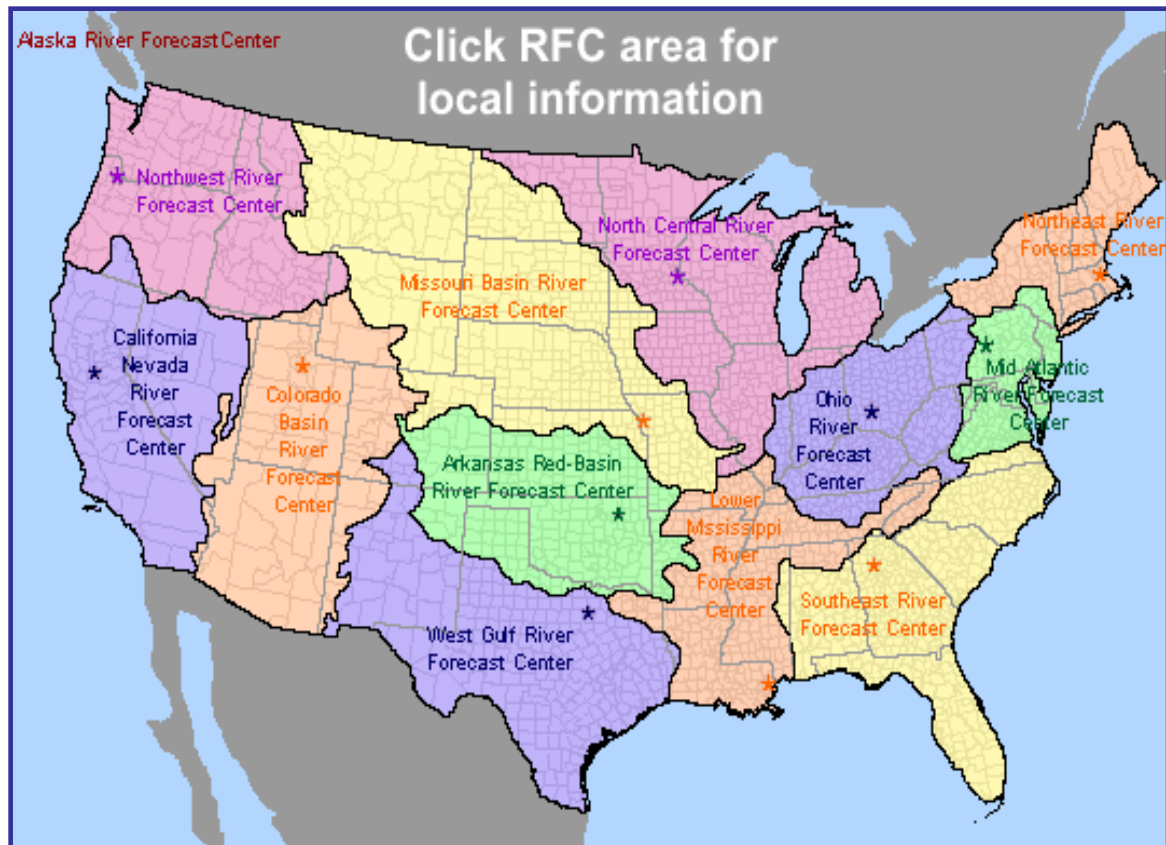
2011 AWRA Annual Conference
November 7, 2011

Amy Volckens – Riverside
Paul McKee – NWS/WGRFC
Amy Louise – USACE/SPA



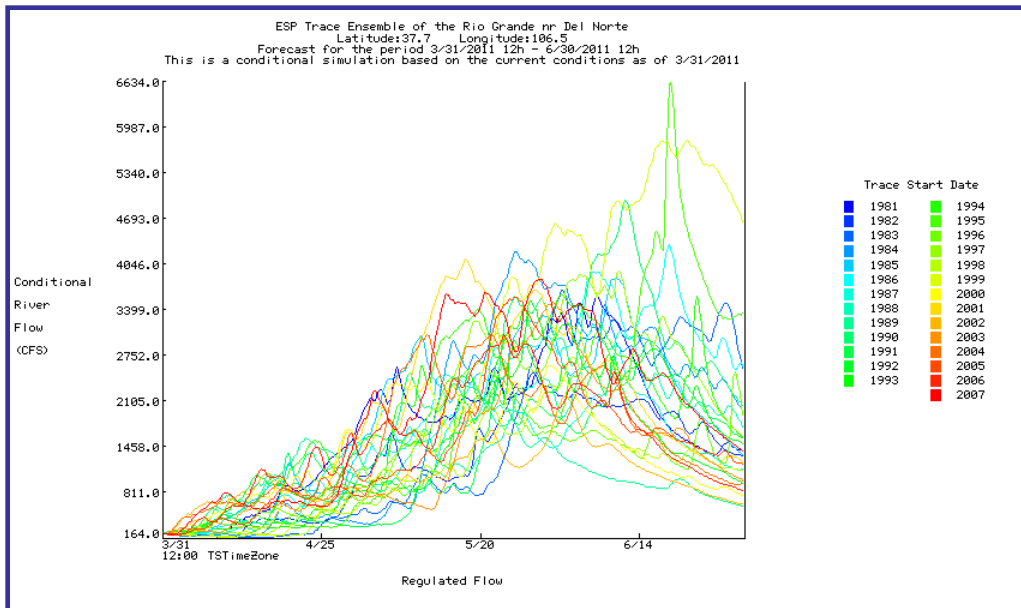
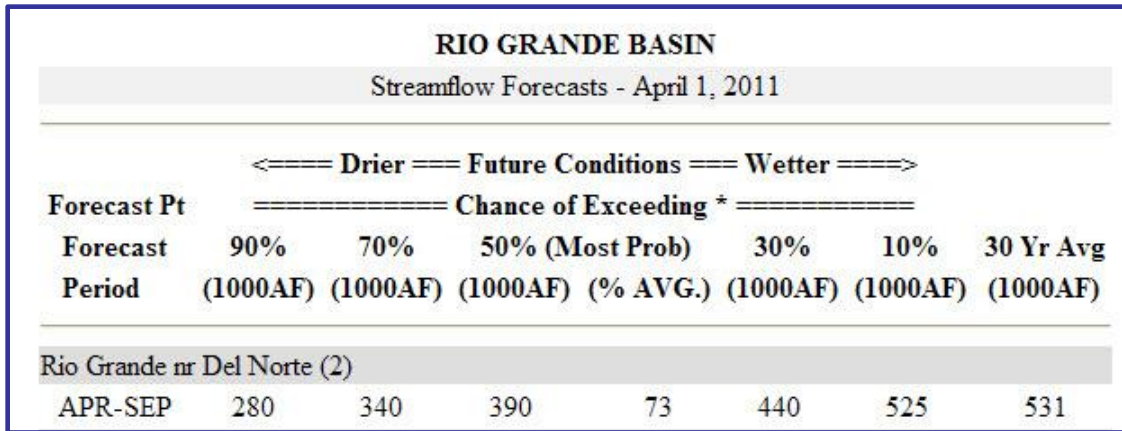
National Weather Service

Provides weather and hydrologic forecasts to protect life and property.

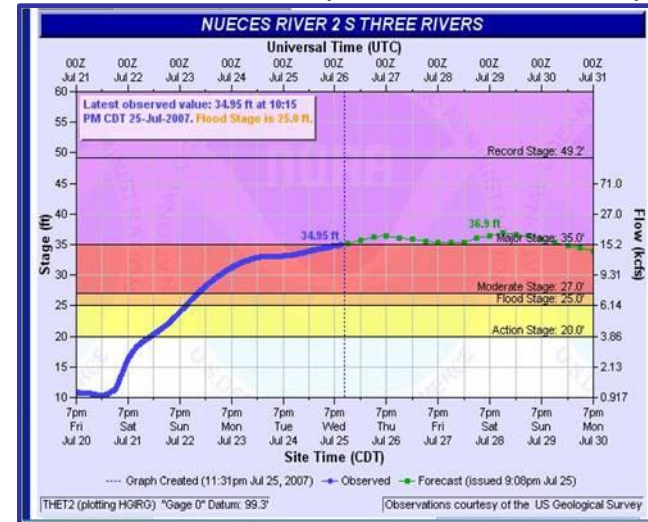


NWS Forecast Services

Seasonal water supply forecasts (probabilistic)



Daily streamflow forecasts (deterministic)

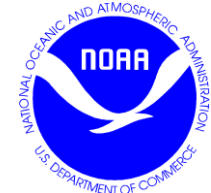


Flash flood warnings

THE NATIONAL WEATHER SERVICE IN MIAMI HAS ISSUED A

* FLASH FLOOD WARNING FOR...
EAST CENTRAL BROWARD COUNTY IN SOUTHEAST FLORIDA...

* UNTIL 600 PM EDT



U.S. Army Corps of Engineers

Provides engineering services to reduce risks from disasters.

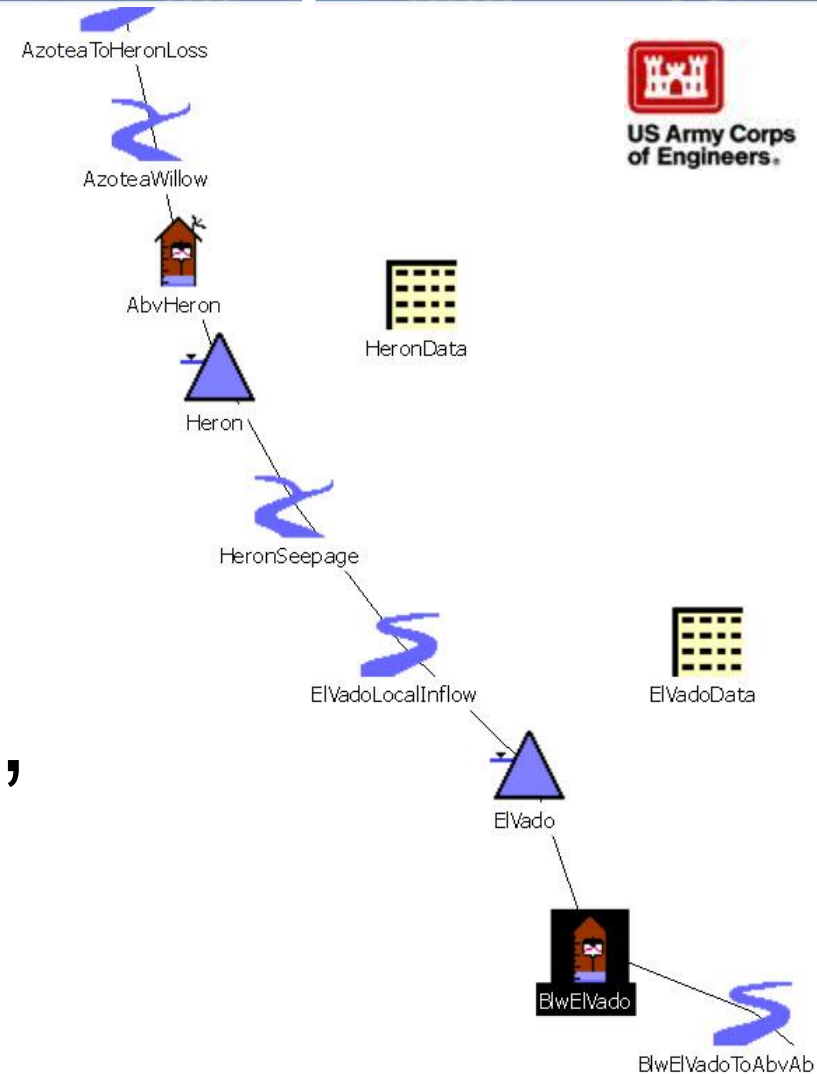


- Flood control
- Water supply
- Hydropower
- Recreation

Jemez Canyon Dam
Courtesy of U.S. Army Corps of Engineers

Upper Rio Grande Water Operations Model (URGWOM)

- RiverWare
- Multi-agency
- Uses water supply forecasts
- Simulates operations, deliveries, and downstream flows

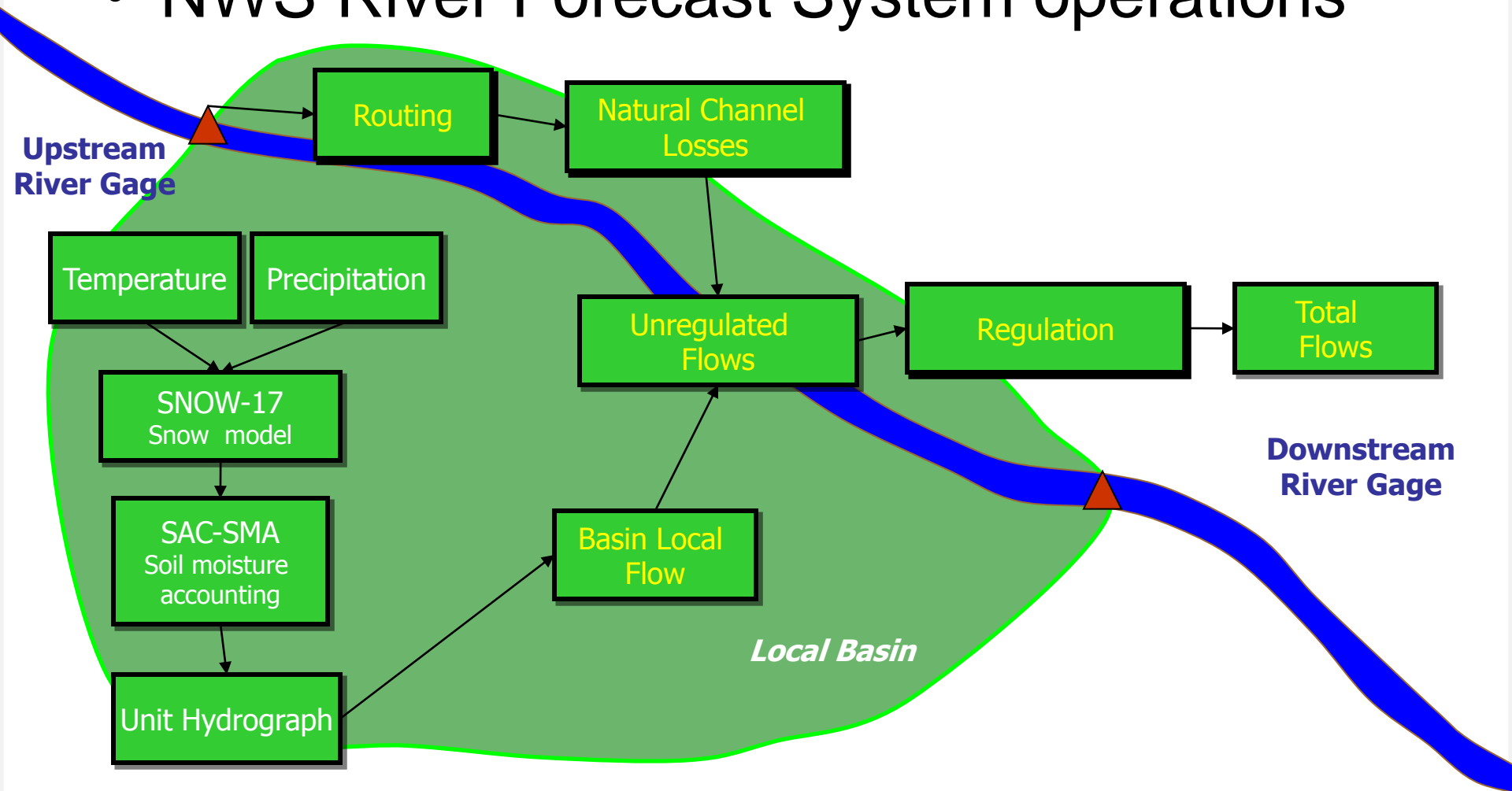


Project Overview

- USACE/SPA provided funding
- Riverside redeveloped NWS hydrologic models to support:
 - URGWOM inflow locations
 - Snow modeling for water supply
 - Ensemble streamflow prediction
- WGRFC will run models operationally
- USACE/SPA and USBR will receive forecasts

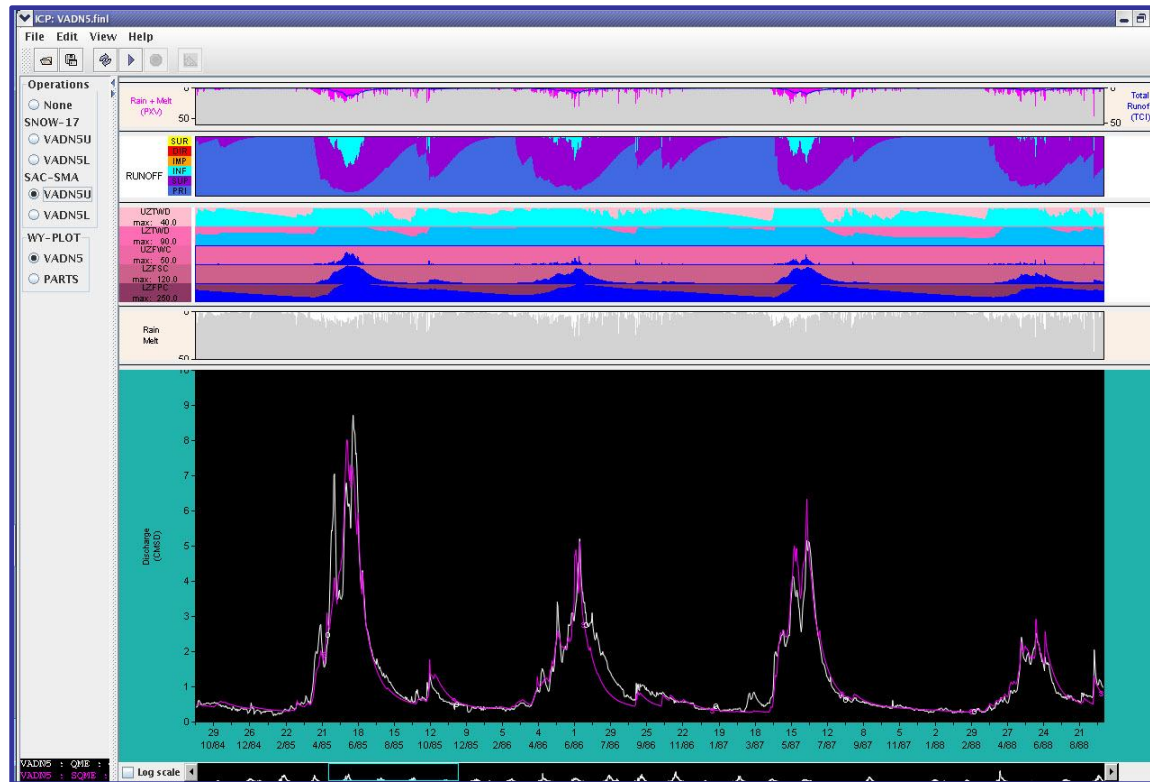
Hydrologic Model Development

- NWS River Forecast System operations*



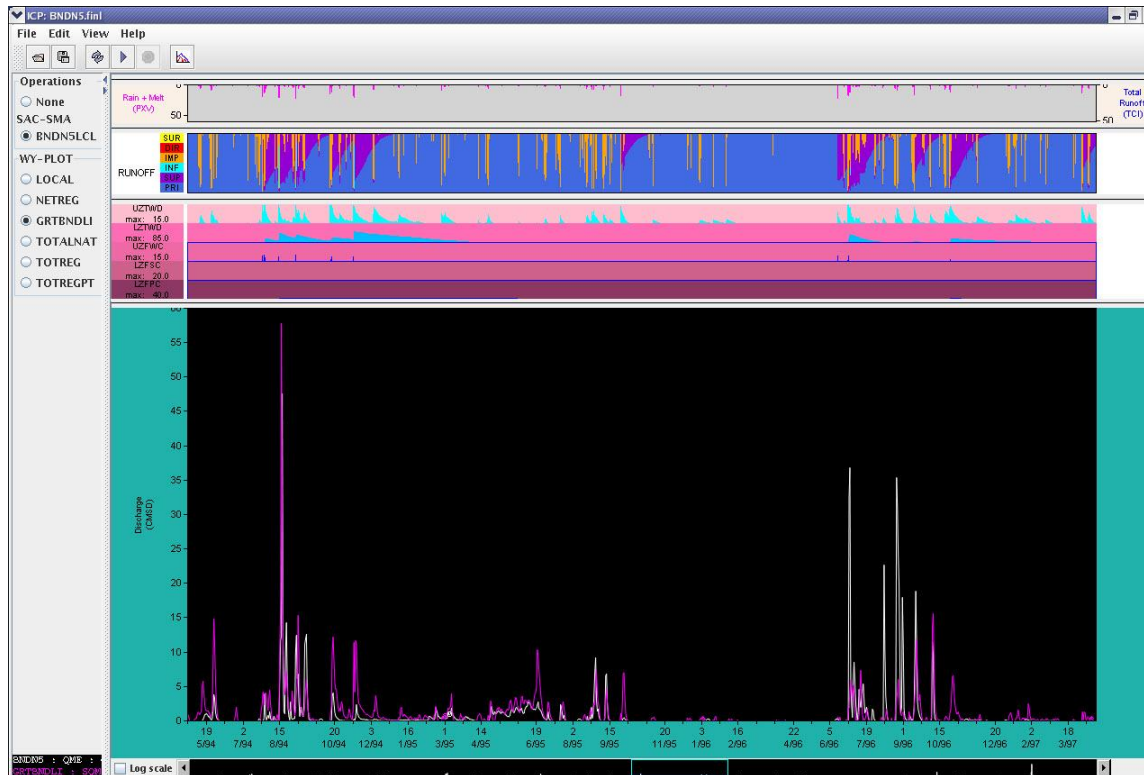
Results: Snowmelt Runoff

- Low annual and seasonal biases
- High daily correlation coefficients



Results: Rainfall Runoff

- Less emphasis on volume biases
- Variable precipitation estimation



Model Challenges

- Precipitation estimation
 - Sparse station network
 - Highly variable rainfall events
 - Benefit from radar-estimated precipitation?
- Isolating natural local runoff contribution
- Applying a lumped model in an arid environment

Notable Model Differences

Item	Weather Service Forecast Model	URGWOM
Simulation time step [hr]	6	24
Routing models	Variable lag Variable attenuation	Variable lag No attenuation
Natural losses	Fractions of routed flow (all locations)	Fractions of routed flow OR detailed models
Regulation modeling approach	Simplified (lumped by basin)	Detailed
Sources of regulation	Explicit accounting of small reservoirs	Implicit accounting of small reservoirs

Next steps

WGRFC

- Implement hydrologic models into operational system.

USACE •
USBR • NMISC

- Configure URGWOM model to accept ESP forecasts.

WGRFC •
USACE •
USBR

- Finalize forecast product format, frequency, and delivery mechanism.

WGRFC Operations

Estimate precipitation, temperature



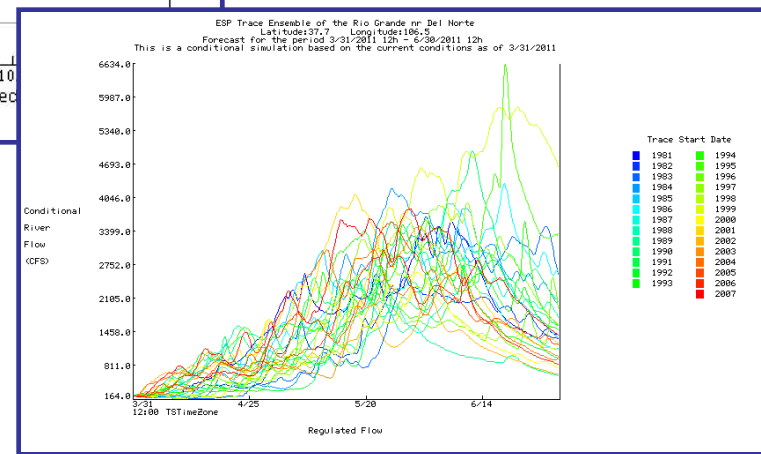
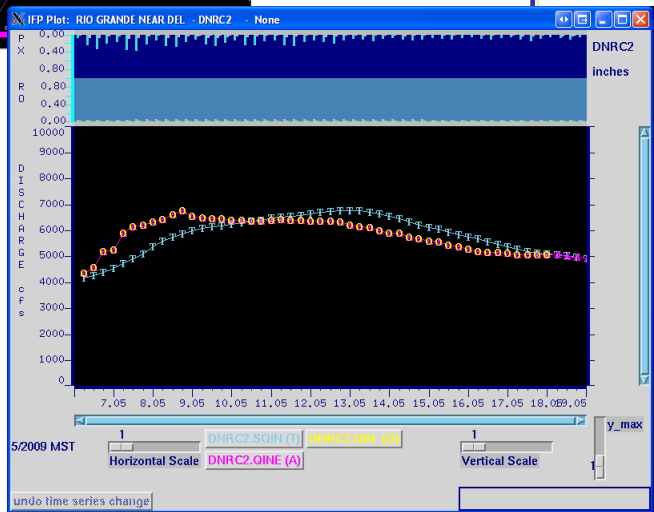
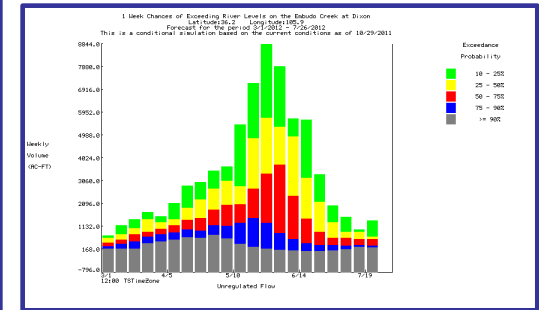
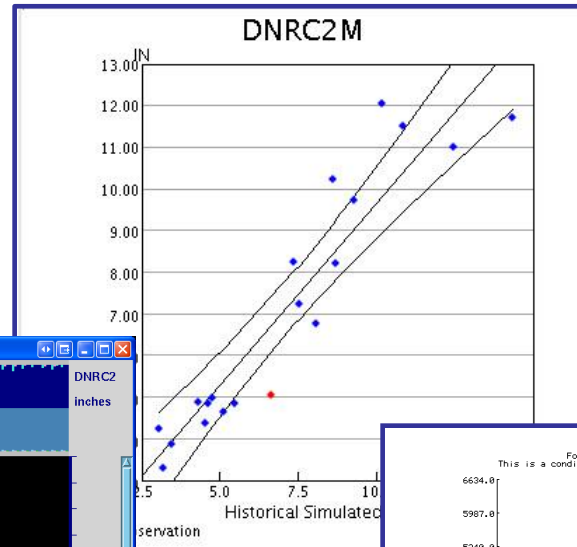
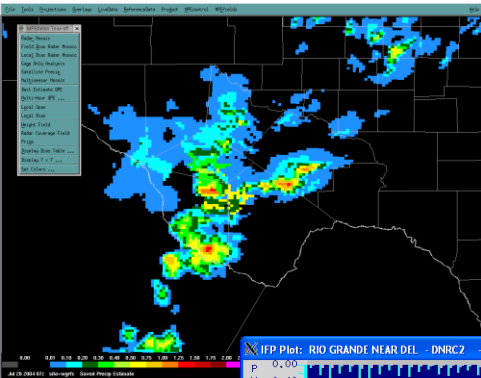
Run model to obtain snow, soil moisture states



Update model states using observations



Run ensemble streamflow prediction



USACE Operations

Ingest
forecast time
series



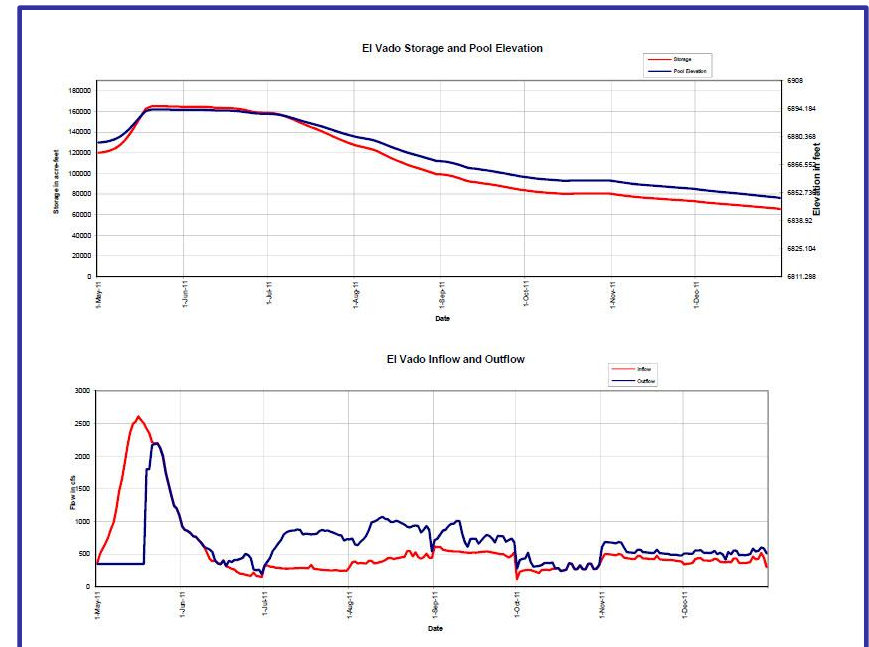
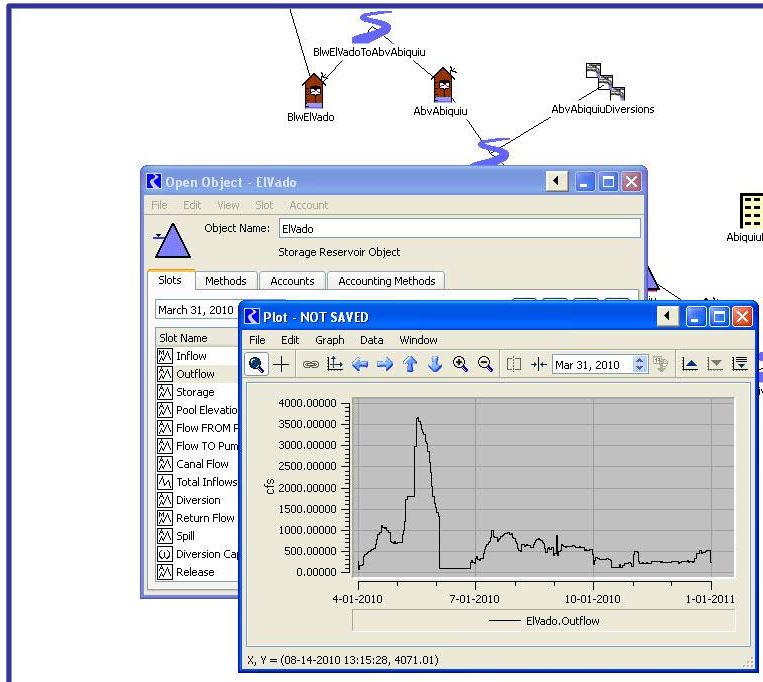
Run
URGWOM
forecast
model



Adjust
operations to
achieve
objectives



Develop
annual
operating
plans



Thank you!

Want more information?

NWS/WGRFC

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Riverside

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