



Ensemble Streamflow Forecasts at the West Gulf River Forecast Center

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Overview

- Deterministic Streamflow Forecasts
 - ◆ 15-Day Forecasts
- Ensemble Streamflow Forecasts
 - ◆ Probabilistic Quantitative Precipitation Forecast (PQPF)
 - ◆ Ensemble Streamflow Prediction (ESP)
 - ◆ Hydrologic Ensemble Forecast System (HEFS)



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DETERMINISTIC SPECIAL 15-DAY FORECASTS



15-Day Forecast

■ Purpose:

- ◆ Brazos River Authority has a need to optimize reservoir releases under the SB3 baseflow standards established by the Texas Commission on Environmental Quality (TCEQ) Watermaster.

■ Methods:

- ◆ 15-Day daily mean flows (cfsd) issued once per week
- ◆ 14 locations on the Brazos River
- ◆ Brazos River Authority and USACE provide release projections for 14 reservoirs for 1-5 days.
- ◆ Persistence assumed for remaining releases in 5-15 day duration.

■ Results: Currently Experimental - Testing and Evaluating



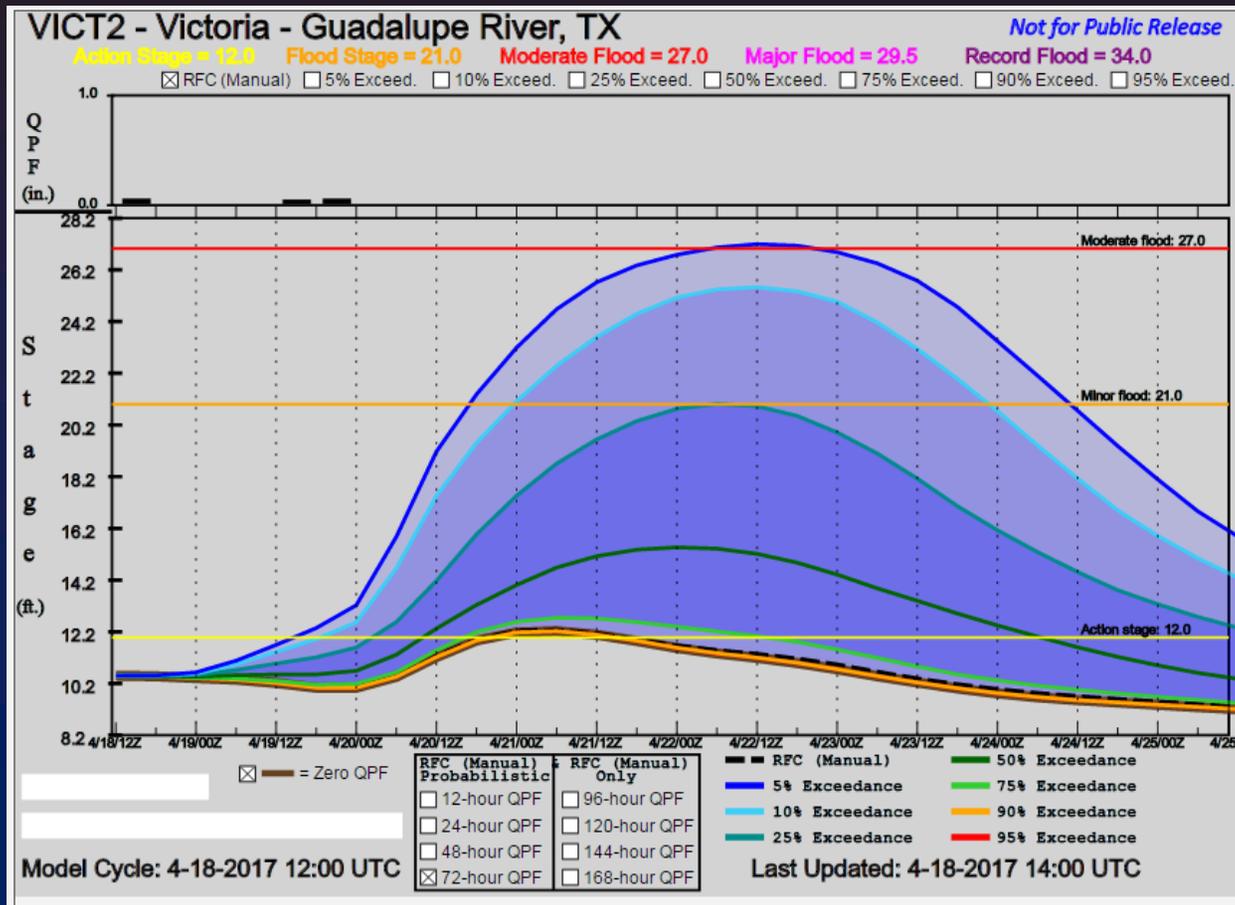
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PROBABILISTIC QUANTITATIVE PRECIPITATION FORECASTS (PQPF)



Probabilistic Quantitative Precipitation Low Confidence Forecast

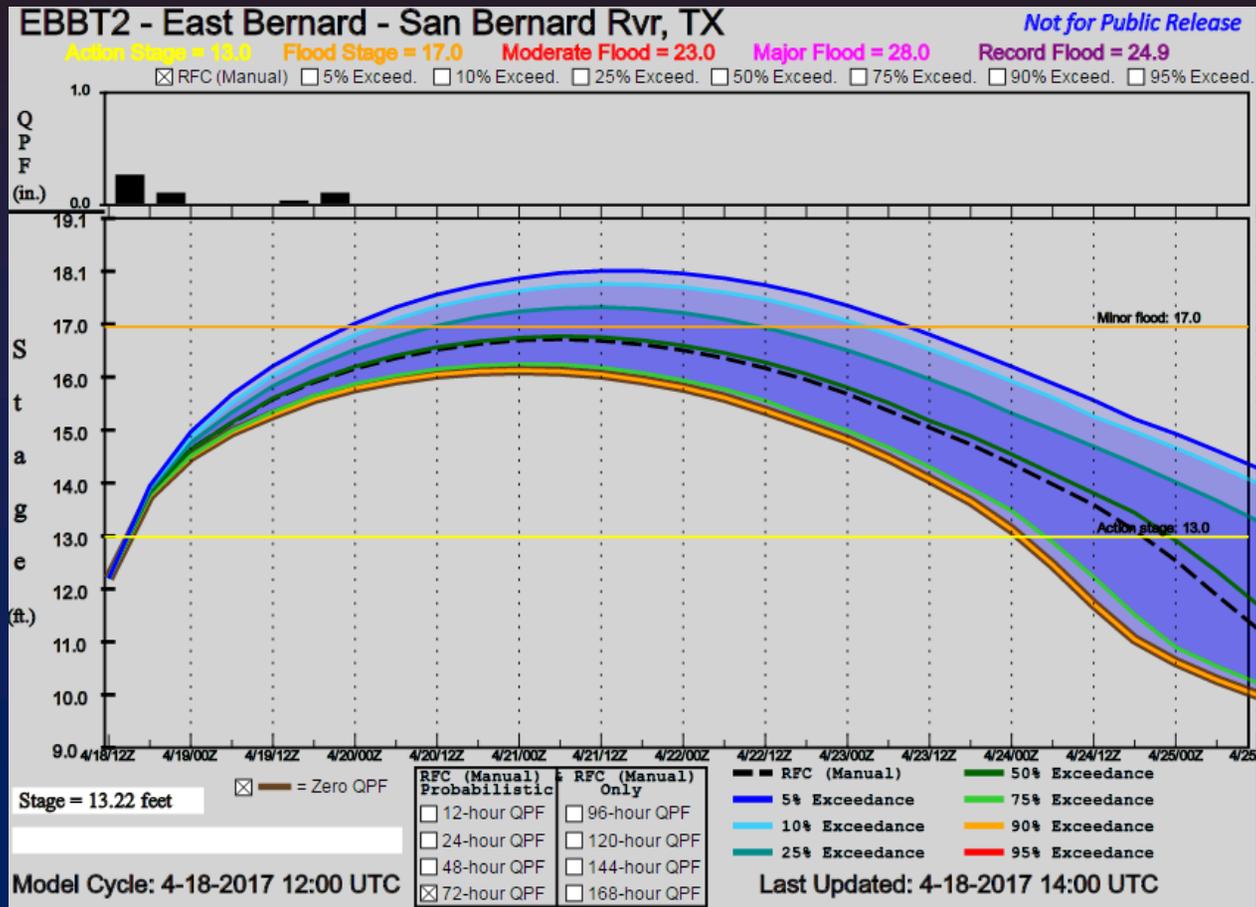
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Probabilistic Quantitative Precipitation Higher Confidence Forecast

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PQPF Forecast Applications

PQPF Forecasts Are:

- Automatically run
- Unofficial raw model guidance
- Helpful for sizing up potential basin responses
- Help RFCs and WFOs quickly size up a situation

PQPF Forecasts Are Not:

- A True Ensemble Forecast
- Quality Controlled by a Forecaster
- A substitute for the official NWS River Forecast
- Available at all locations
- Useful downstream from reservoirs

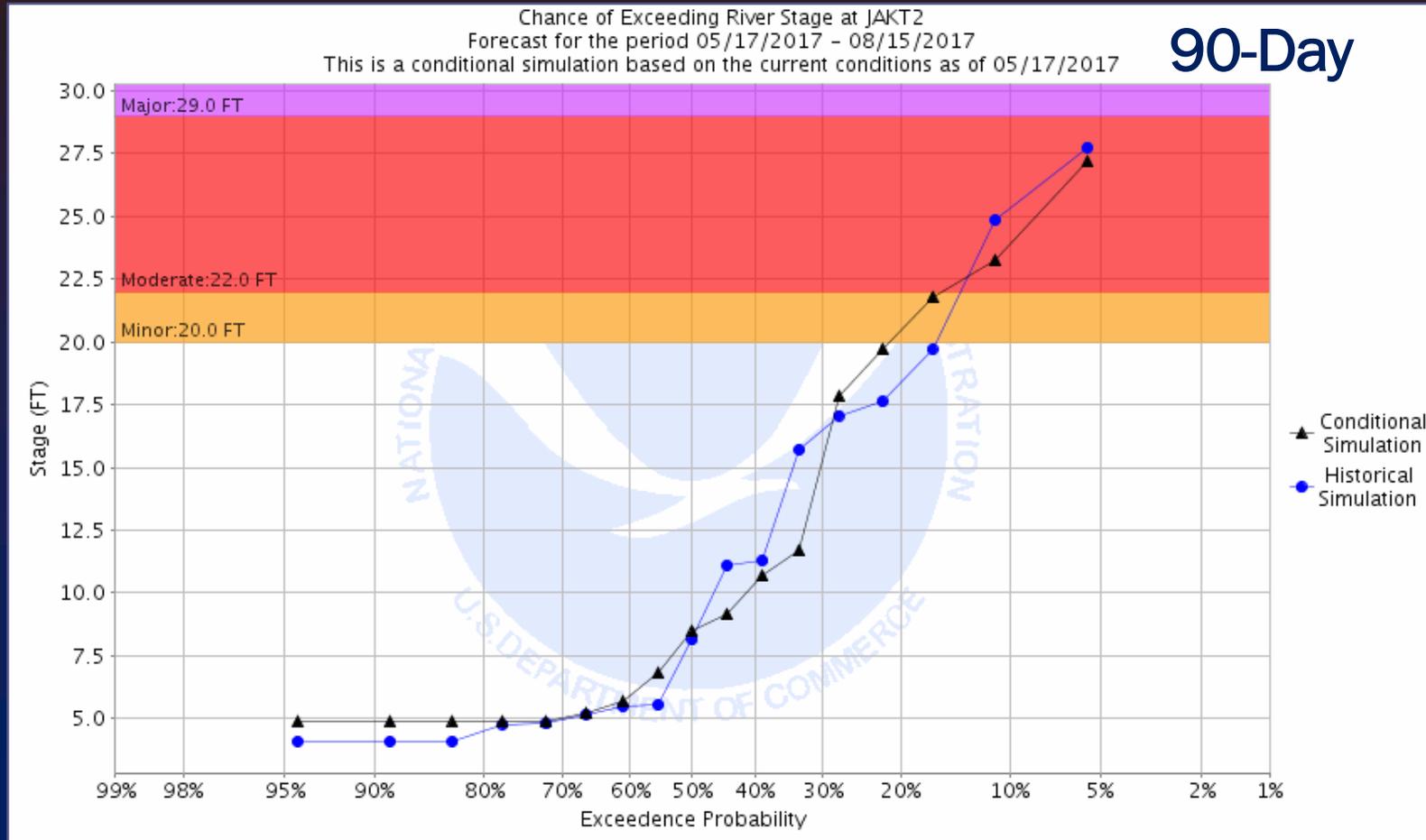


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ENSEMBLE STREAMFLOW PREDICTION (ESP)

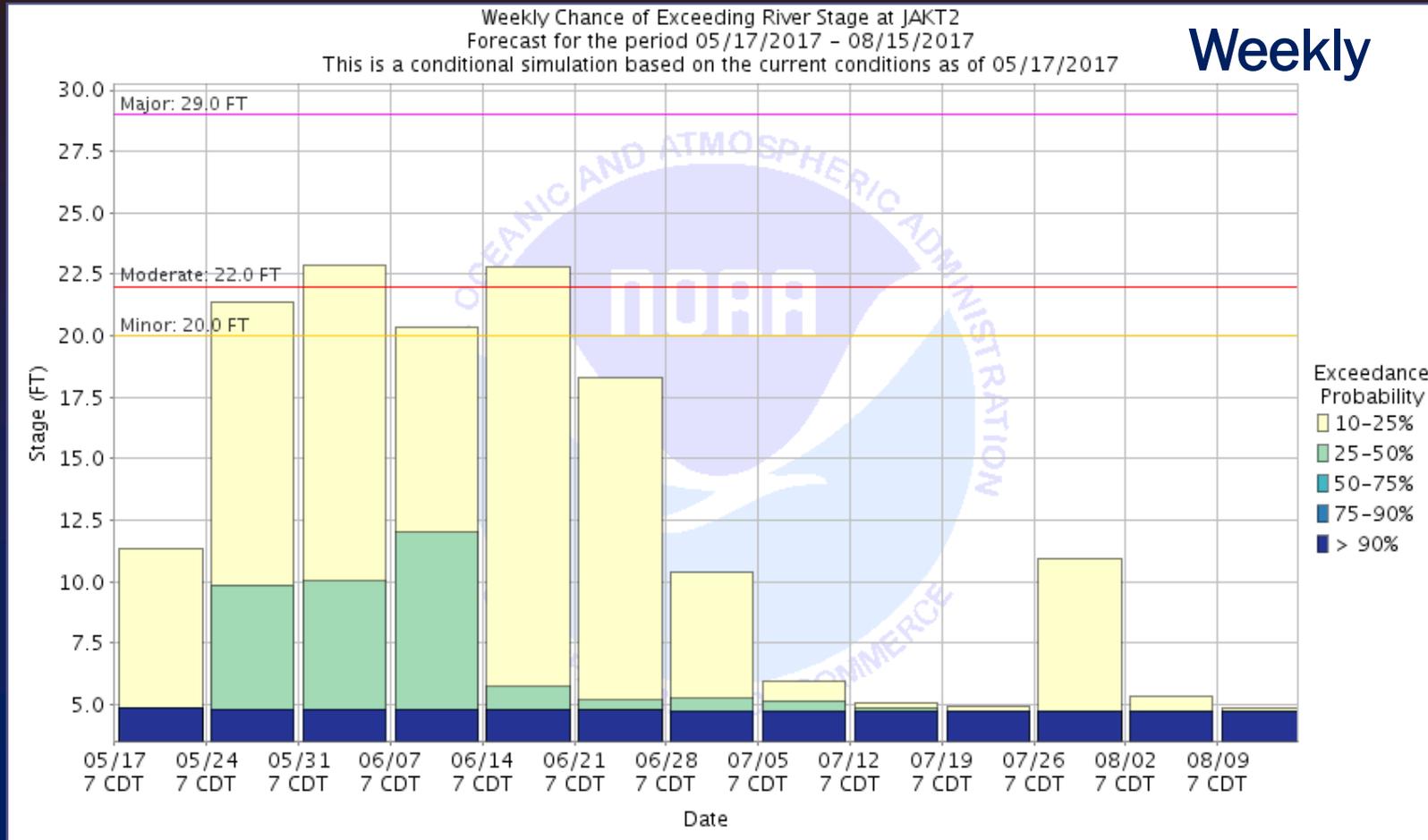


Ensemble Streamflow Prediction (ESP)





Ensemble Streamflow Prediction (ESP)





Ensemble Streamflow Prediction (ESP)

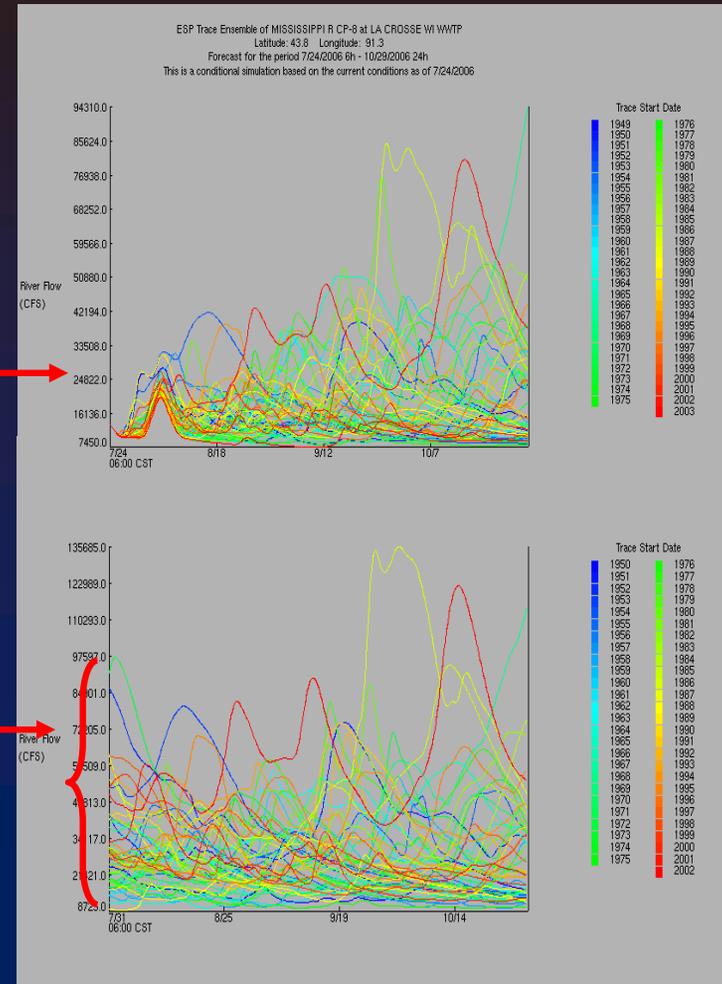
Two Ensembles

Conditional Simulations (CS)

- 55 simulations each starting with the current model states only
- Blend of forecast and historic data drive the model

Historical Simulation (HS)

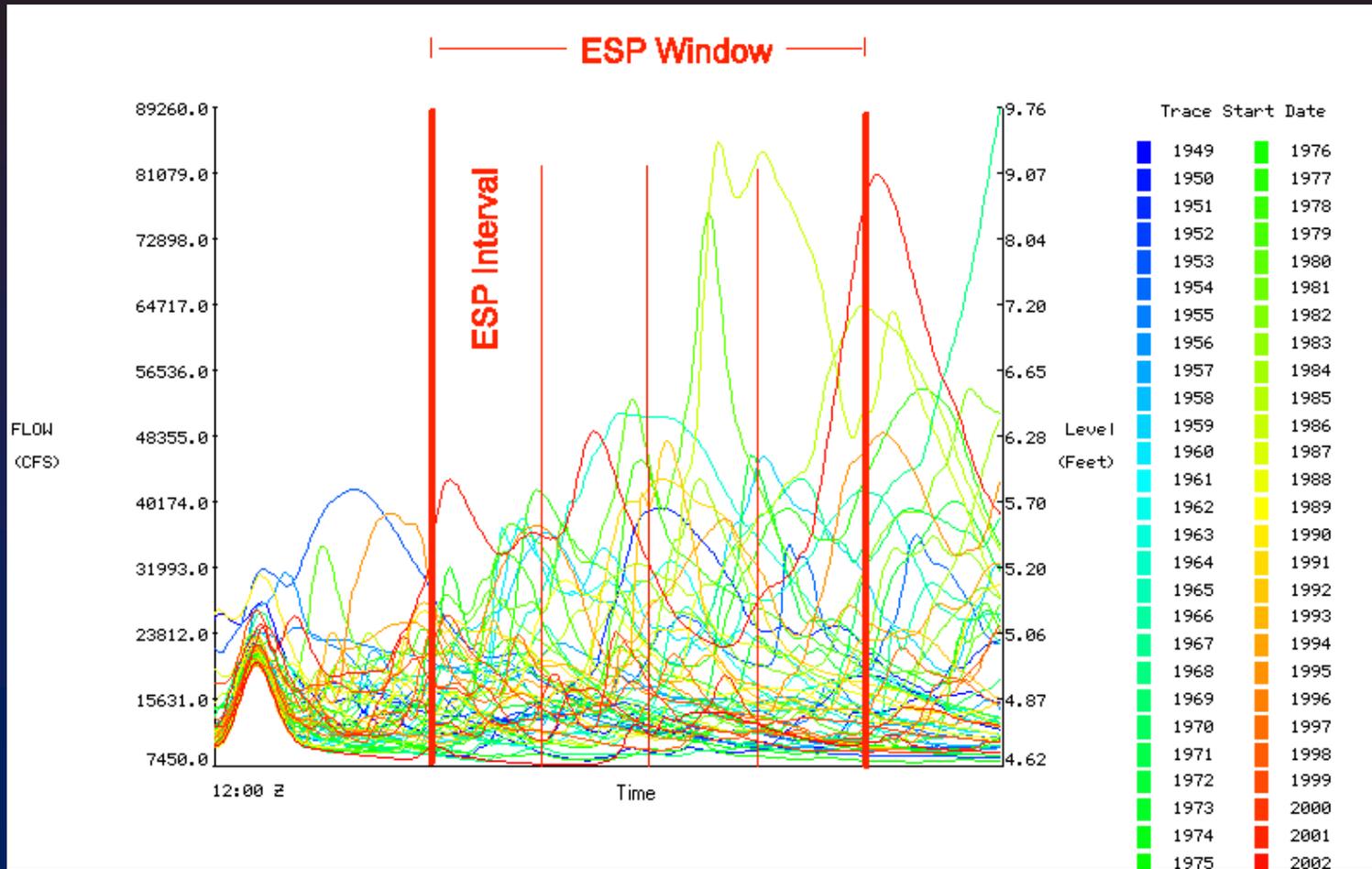
- one simulation for entire period of record
- 55 Hydrographs starting over a range of initial conditions
- Represents the hydrologic model climatology





ESP 90-Day and Weekly Probabilities

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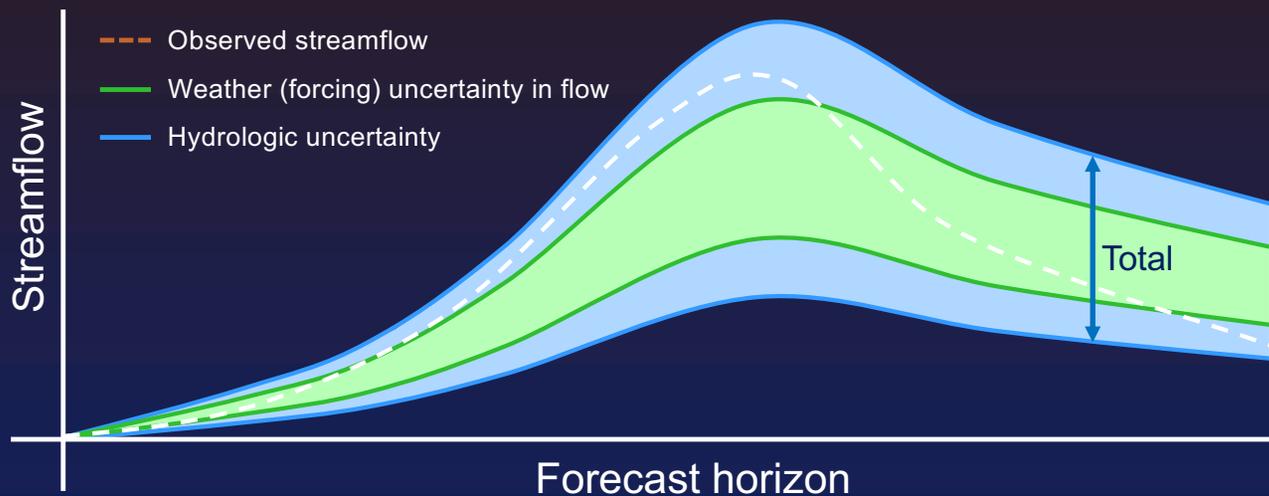


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HYDROLOGIC ENSEMBLE FORECAST SERVICE (HEFS)

Hydrologic Ensemble Forecast Service (HEFS)

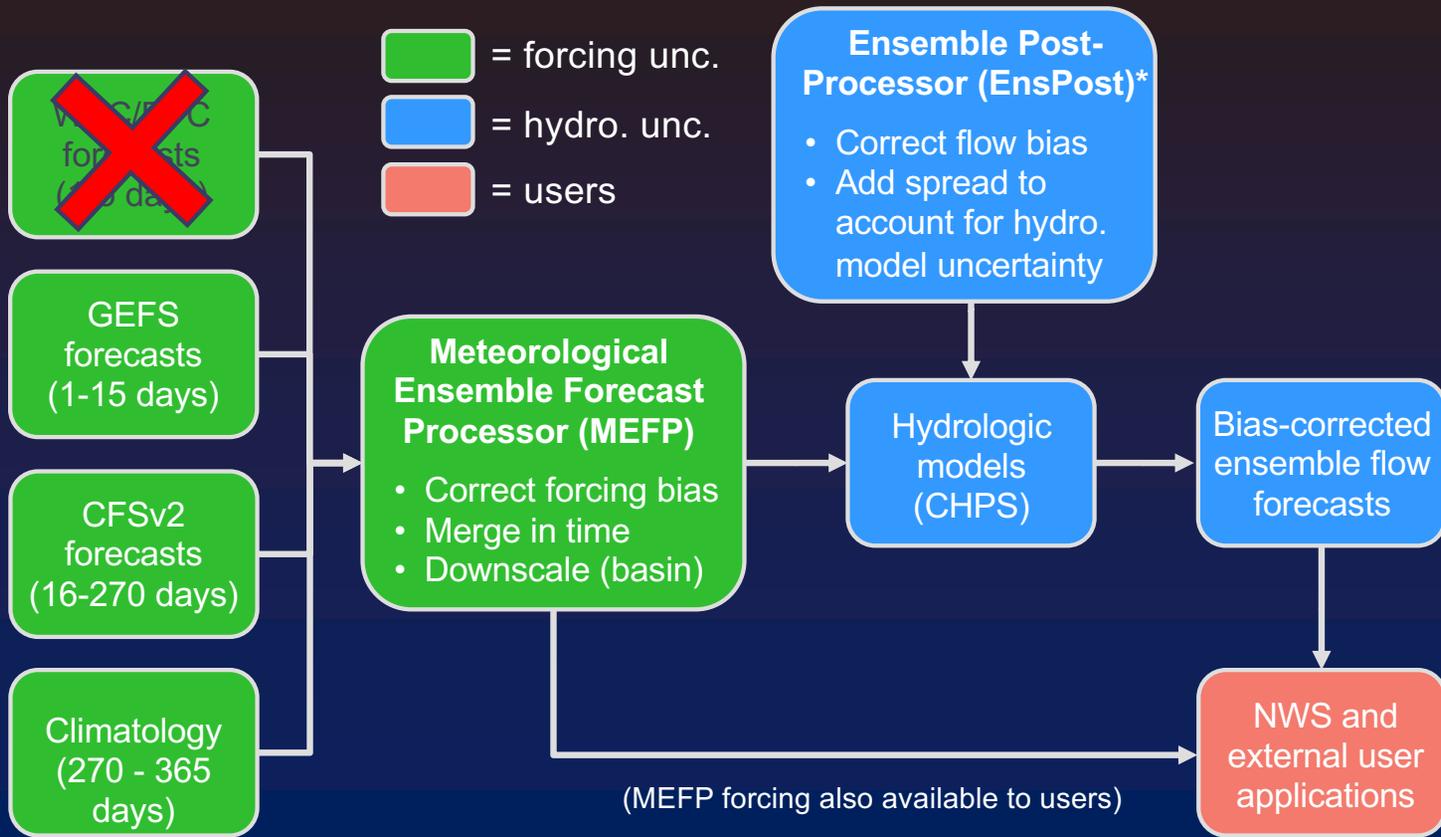
Goal: quantify total uncertainty in flow



- HEFS aims to “capture” observed flow consistently
- So, must account for total uncertainty & remove bias
- Total = forcing uncertainty + hydrologic uncertainty



HEFS Forcings and Post Processing



*EnsPost turned on for Headwater locations in Trinity

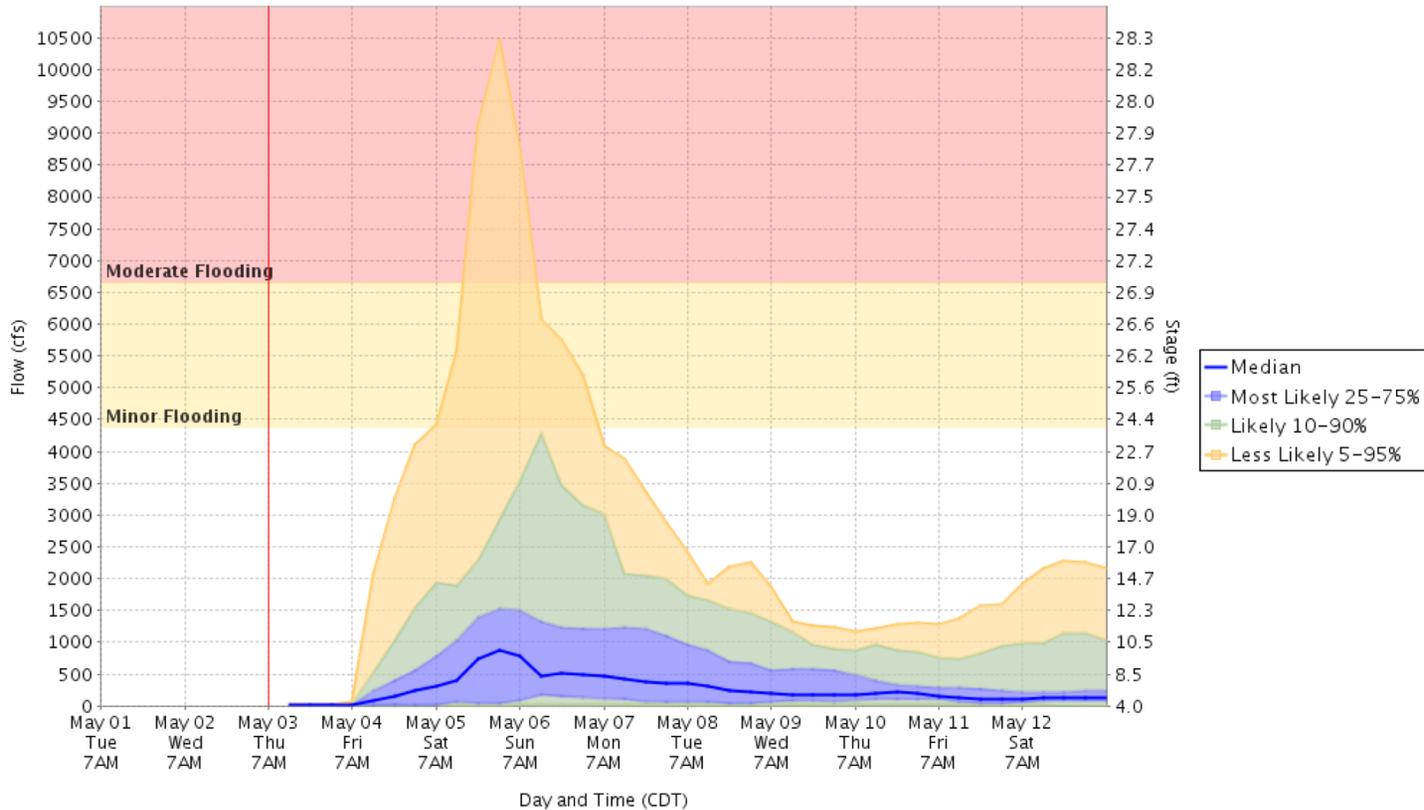


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10 Day River Level Probabilities Rice - Chambers Creek Data as of 07:00 AM CDT May 03

Used to Estimate the Range of Possible River Levels
For the latest official forecast, go to <http://water.weather.gov/ahps>

Rice - Chambers Creek (RCET2)



Model runtime: 07:00 AM CDT May 03 2018
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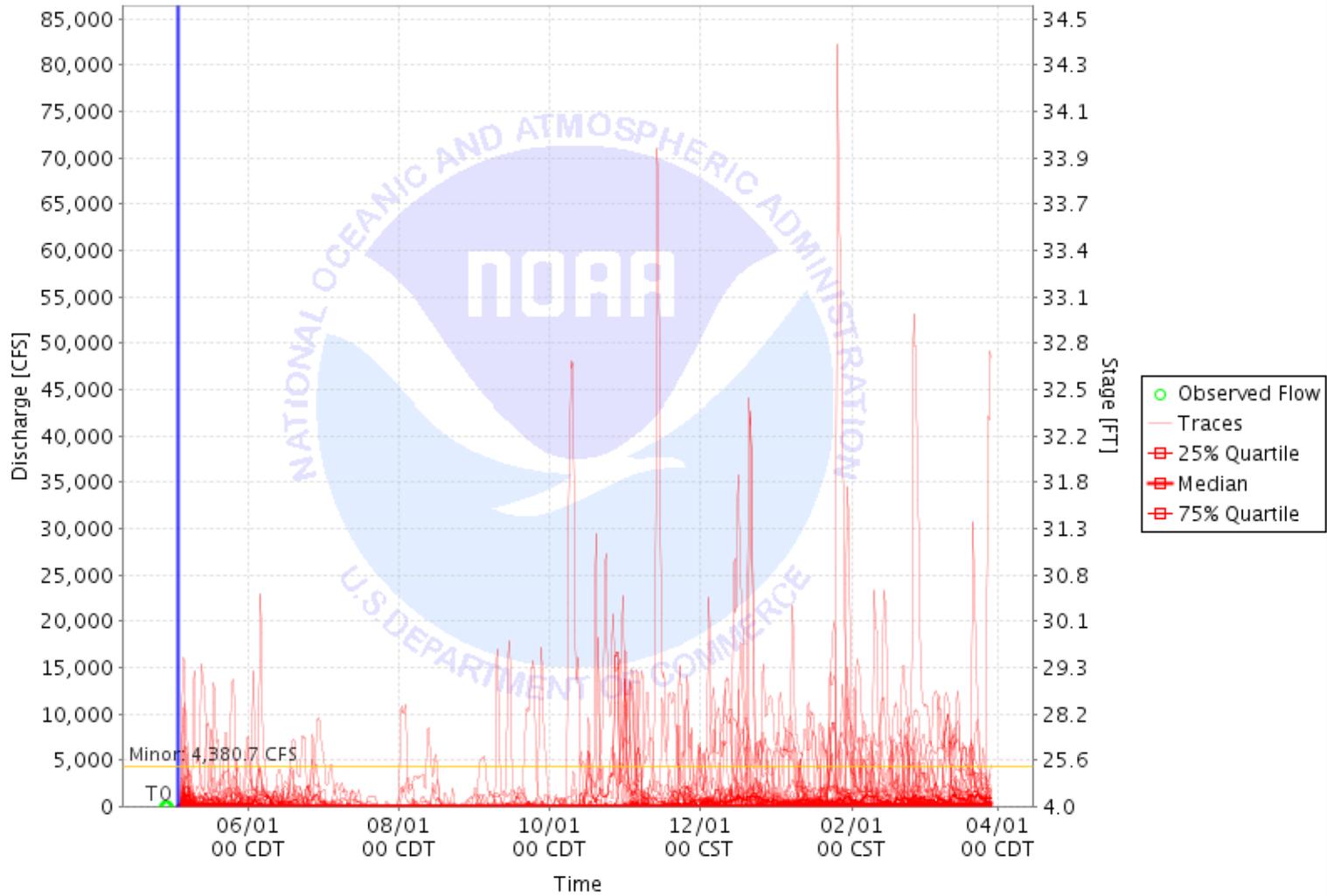
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HEFS Post-Processed Stream Flows for Rice - Chambers Creek

Latitude: 32.2 Longitude: -96.51972

Forecast for the period 05/03/2018 - 05/03/2019

This is a conditional simulation based on the current conditions as of 05/03/2018





WGRFC HEFS Implementation and GEFSv12 Transition Plan

- Phase I: Now to January 2020
 - ◆ 70 locations validated & on AHPS

- Transition to GEFSv12: January 2020 to 2021
 - ◆ Phase 1 basins must Recalibrated for GEFSv12
 - ◆ GEFSv12 Operational at NCEP (September 2020)
 - ◆ Transition completed (January 2021)

- Phase II: January 2021+
 - ◆ Complete **All** remaining WGRFC locations



HEFS Implementation in Phase 1

■ HEFS Model Configurations

- ◆ Configured: 70 locations in Sabine, Neches, San Jacinto and Trinity

■ HEFS Baseline Validation Status

- ◆ Completed: 26 Locations in Sabine and Neches basin
- ◆ In Progress: 44 Locations in San Jacinto and Trinity basins

■ HEFS Locations Posted on AHPS by January 2020

- ◆ Current: 18 Locations in Trinity and Neches
- ◆ Future: 70 Locations Sabine, Neches, San Jacinto and lower Trinity



Comparing ESP vs. HEFS

Current Product Availability:

- Locations: 322 ESP vs. 18 HEFS
- Production Cycle: ESP 1 x Monthly vs. HEFS 1 x Daily

Skill of Recent Baseline Validation Results (for all RFCs):

- Overall Skill: Overall HEFS has 10% to 60% improvement in forecast skill over ESP.
- Short-Term Skill: HEFS Skill is greatest during the first few days, as GEFS forcing washes through the model. Break even point at 12 days + days
- Long-Term Skill: For long-range, HEFS results are no worse than ESP and be better where hydrologic persistence is high.



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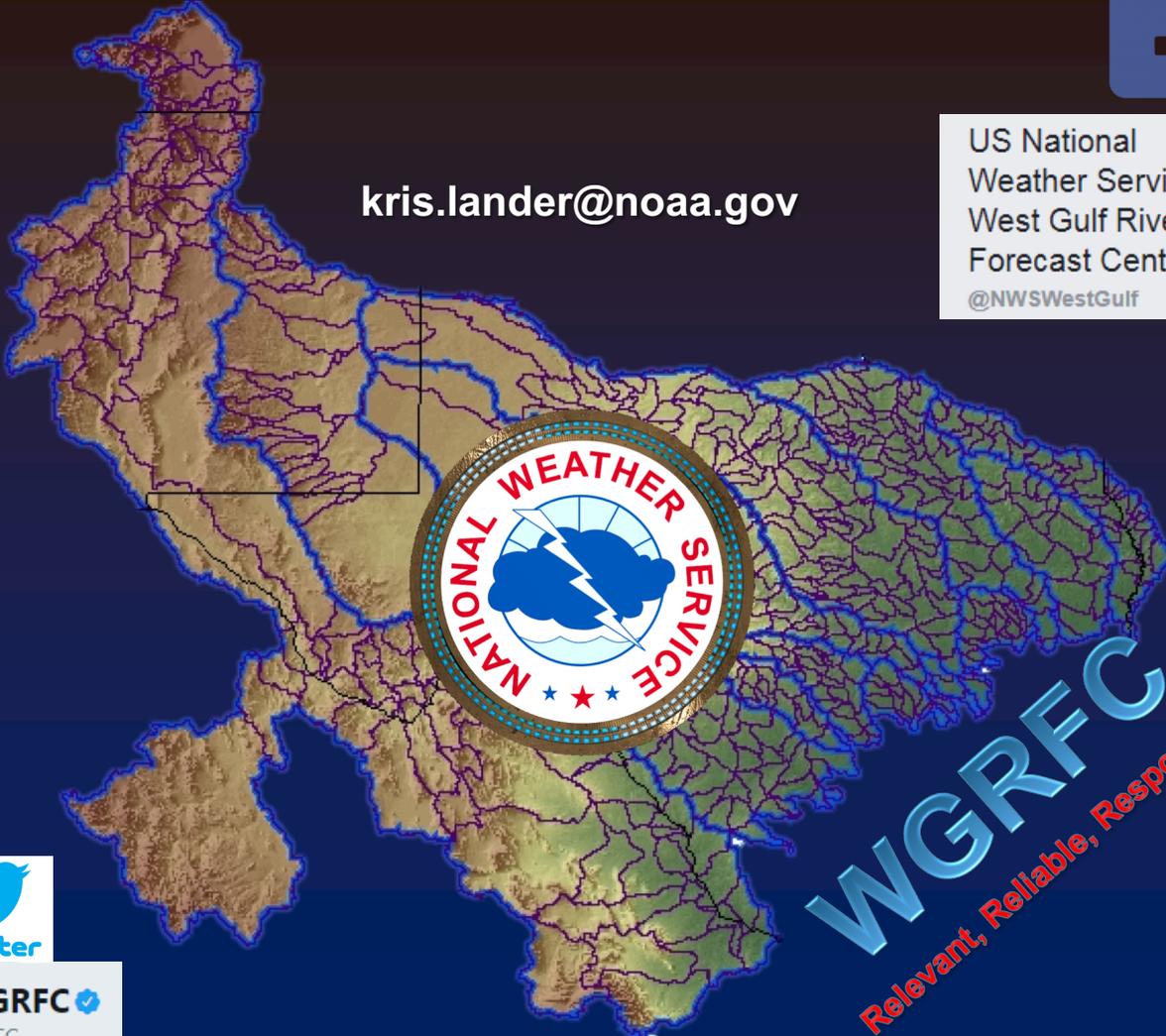


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