ESP/AHPS
Probabilistic Forecasting

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ESP/AHPS
Presentation Outline

1. Introduction:Probability & Ensembles
2. Overview: Ensemble Streamflow Prediction (ESP)
3. Common Suite of Products
4. Enhanced RFC PRODUCTS
5. Strengths and limitations

What is an ensemble Forecast ?

An ensemble forecast is a collection of two or more forecasts that verify at the same time.

Old Hydrograph Ensemble Method

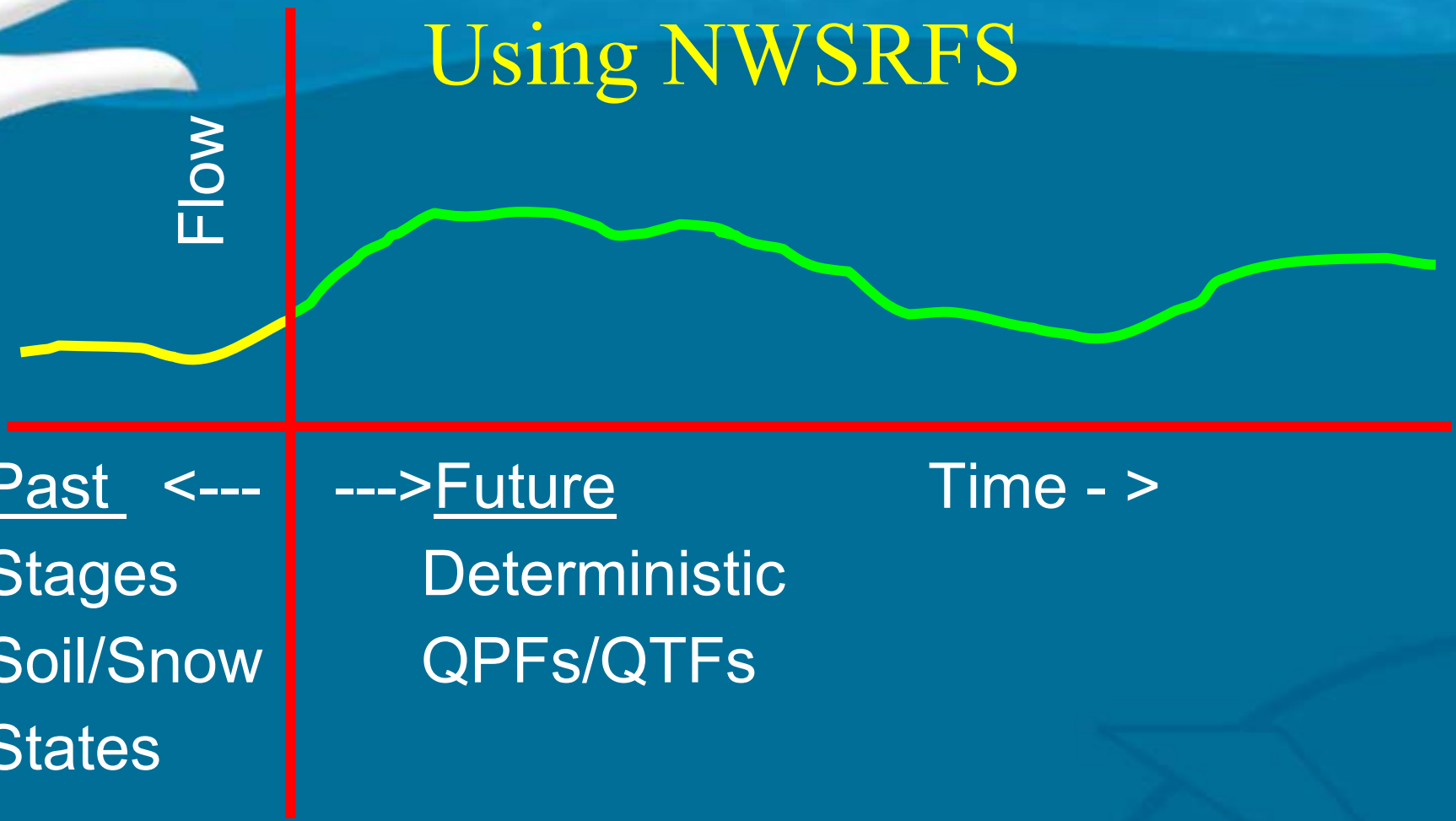
Why do you even care about ensembles ???

It is the preferred way to create Probabilistic river forecasts….

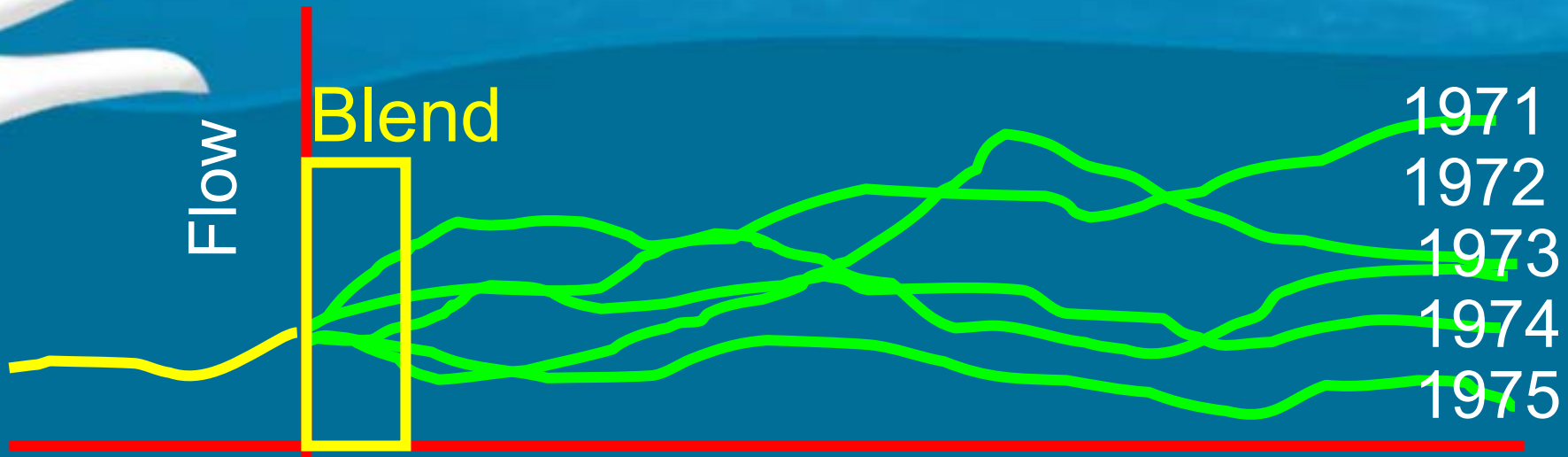
And…

A significant part of AHPS is.. Probabilistic Forecasting.

Making a Deterministic Forecast Using NWSRFS



Making an Ensemble Forecast Using NWSRFS



Past <--- ---> Future Time - >

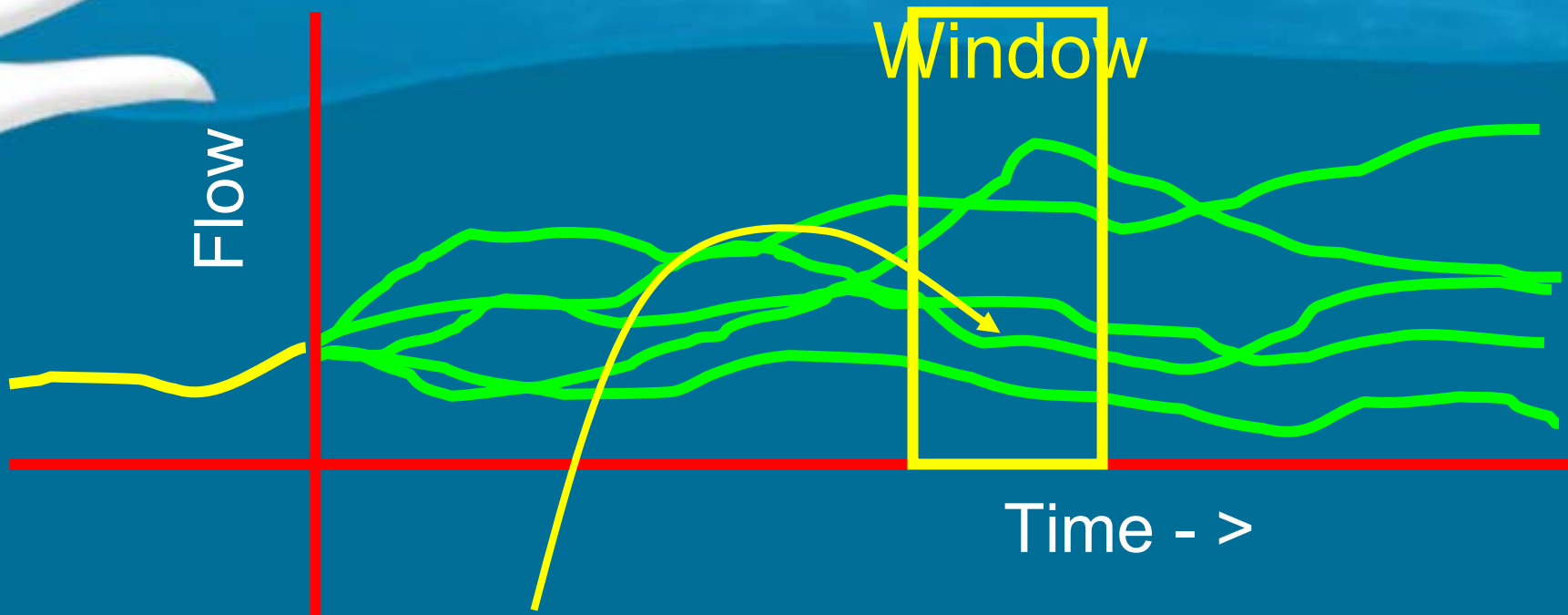
Stages

Soil/Snow States

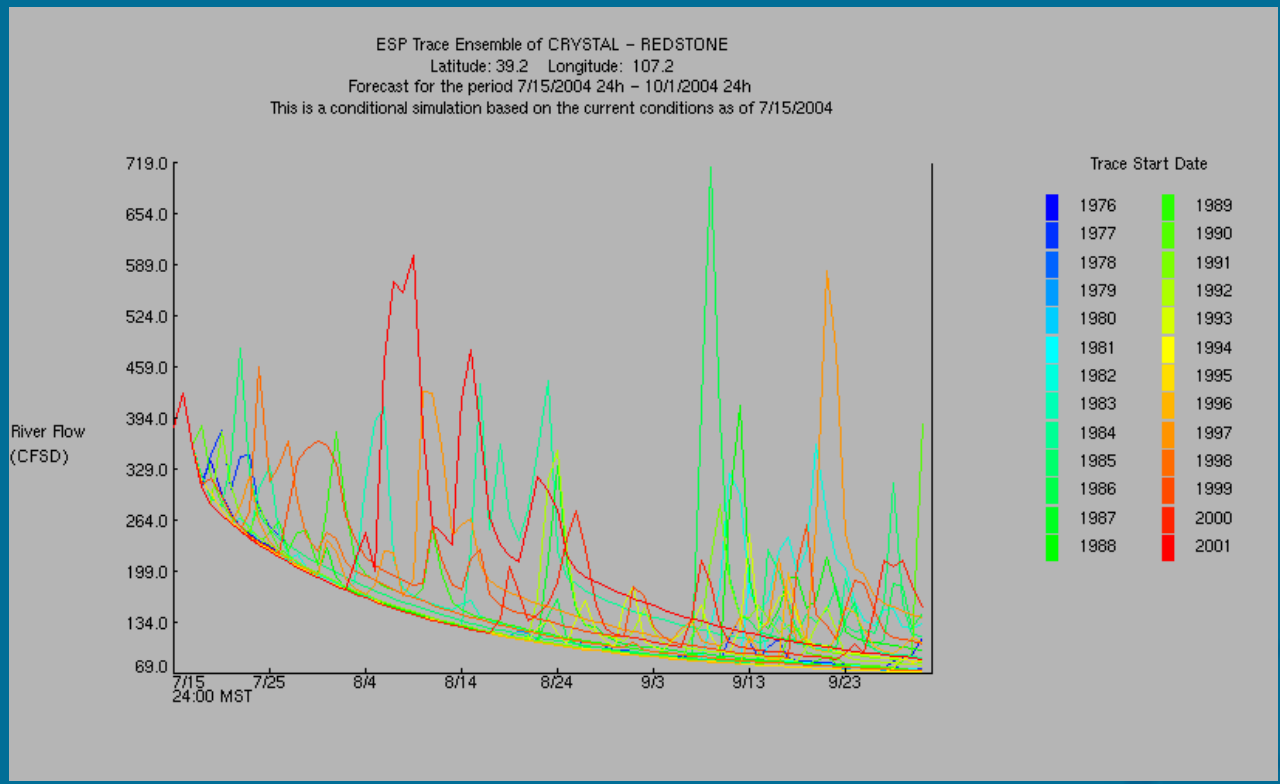
Historical Precipitation and Temperature for Every year

Water Predictions for Life Decisions

Making an Ensemble Forecast Using NWSRFS



ESP Trace Ensemble for Crystal River at Redstone Using 1976-2001 Historical Data



Water Predictions for Life Decisions

National Weather Service

ESP Trace Generation

CLIMATE FORECAST ADJUSTMENTS

HISTORICAL TIME SERIES

ALL YEARS OF RECORD

FORECAST TIME SERIES

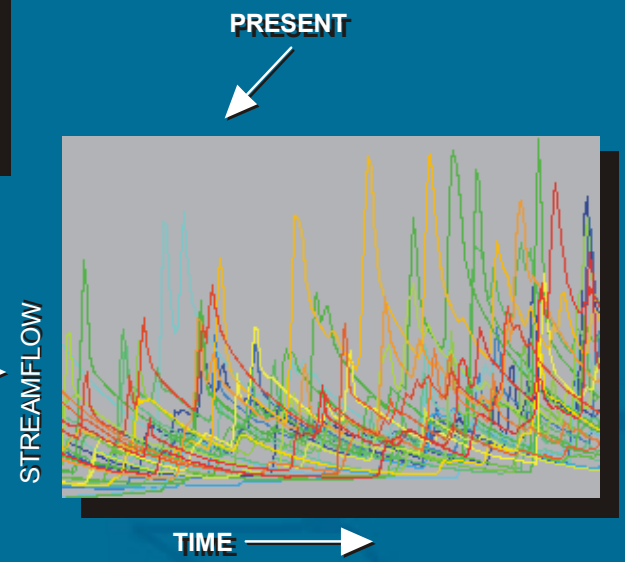
DAILY RFC FORECASTING
- DATA INGEST
- DATA QC
- MODEL UPDATING

CURRENT CONDITIONS
- SOIL
- SNOW
- RESERVOIR LEVELS
- STREAMFLOW

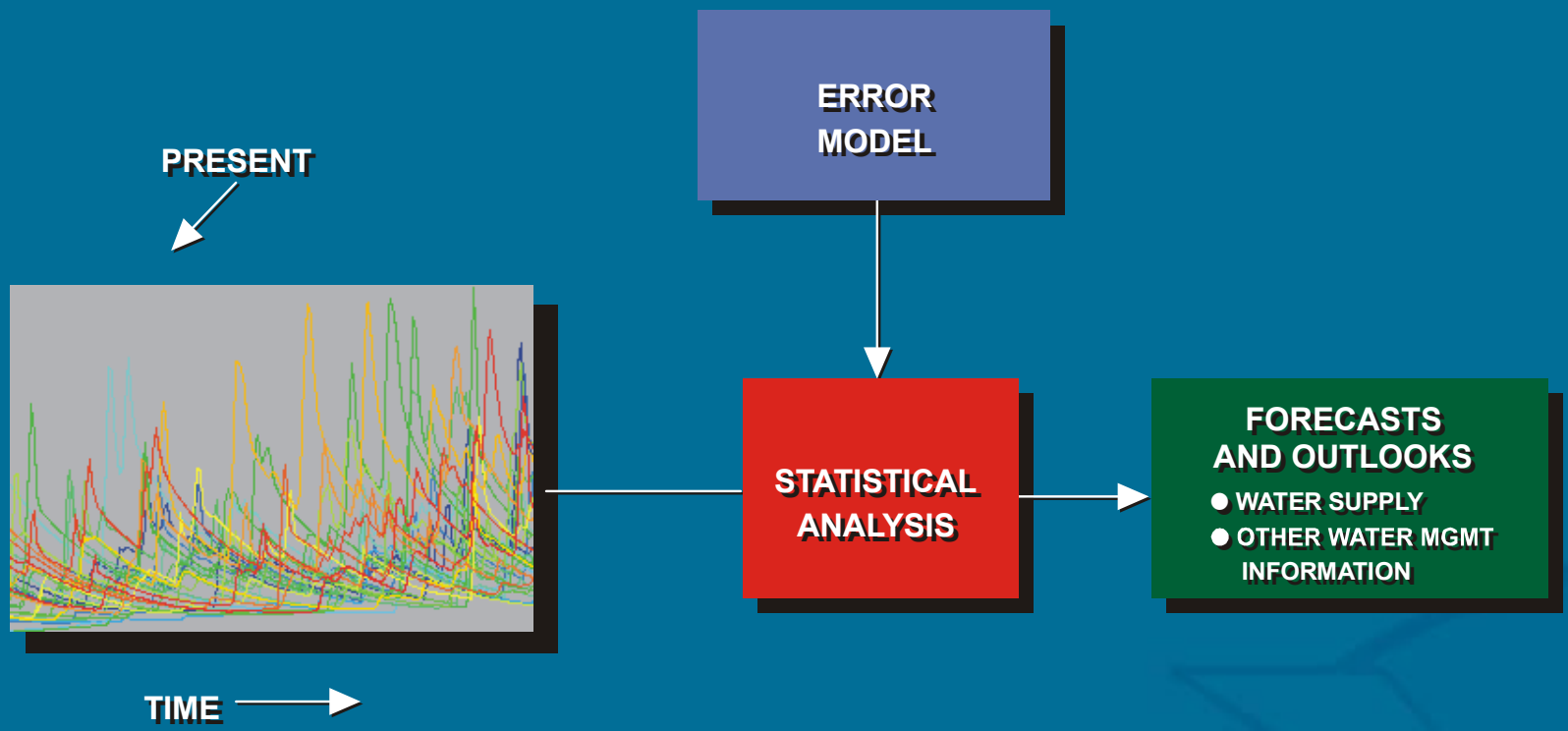
MEAN AREAL TIME SERIES

PRECIPITATION
TEMPERATURE

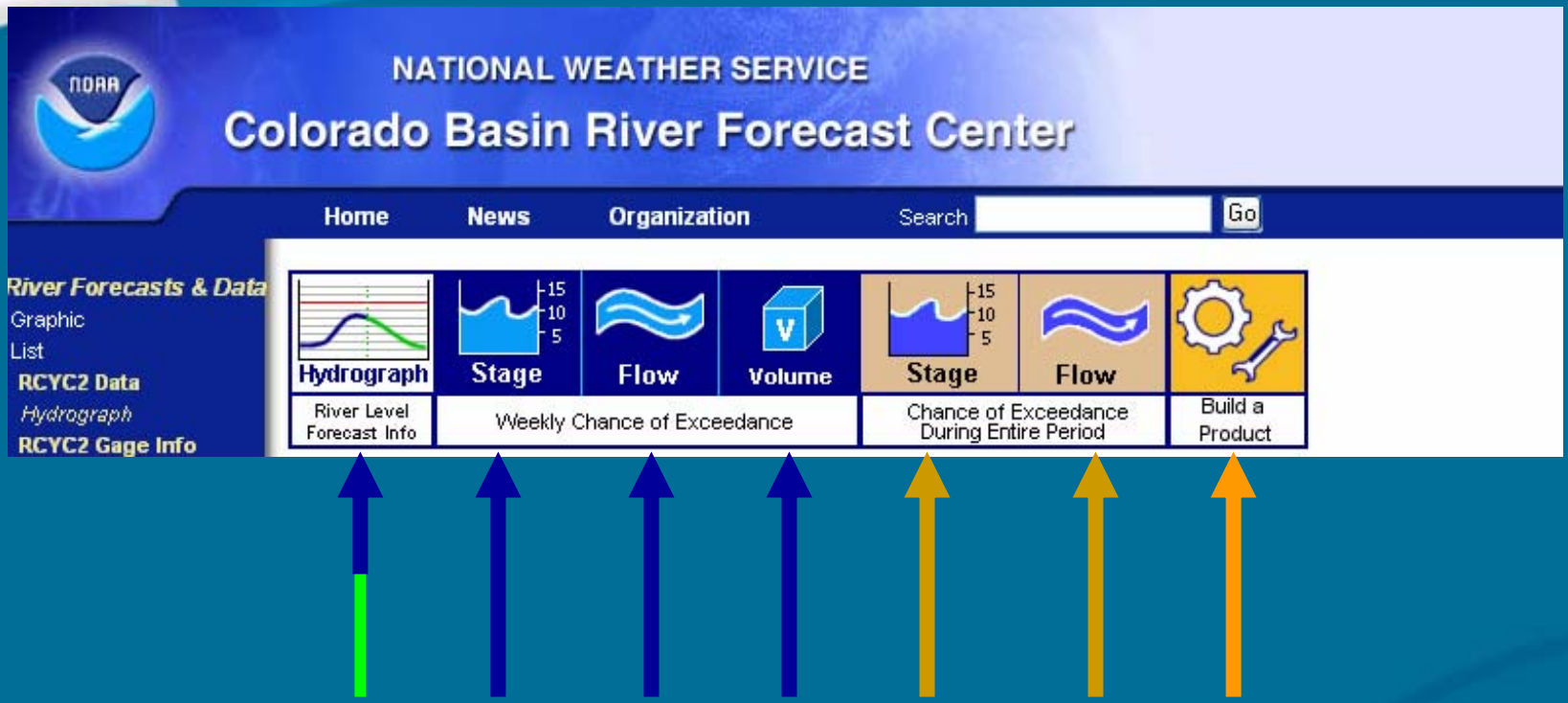
NWSRFS HYDROLOGIC MODELS



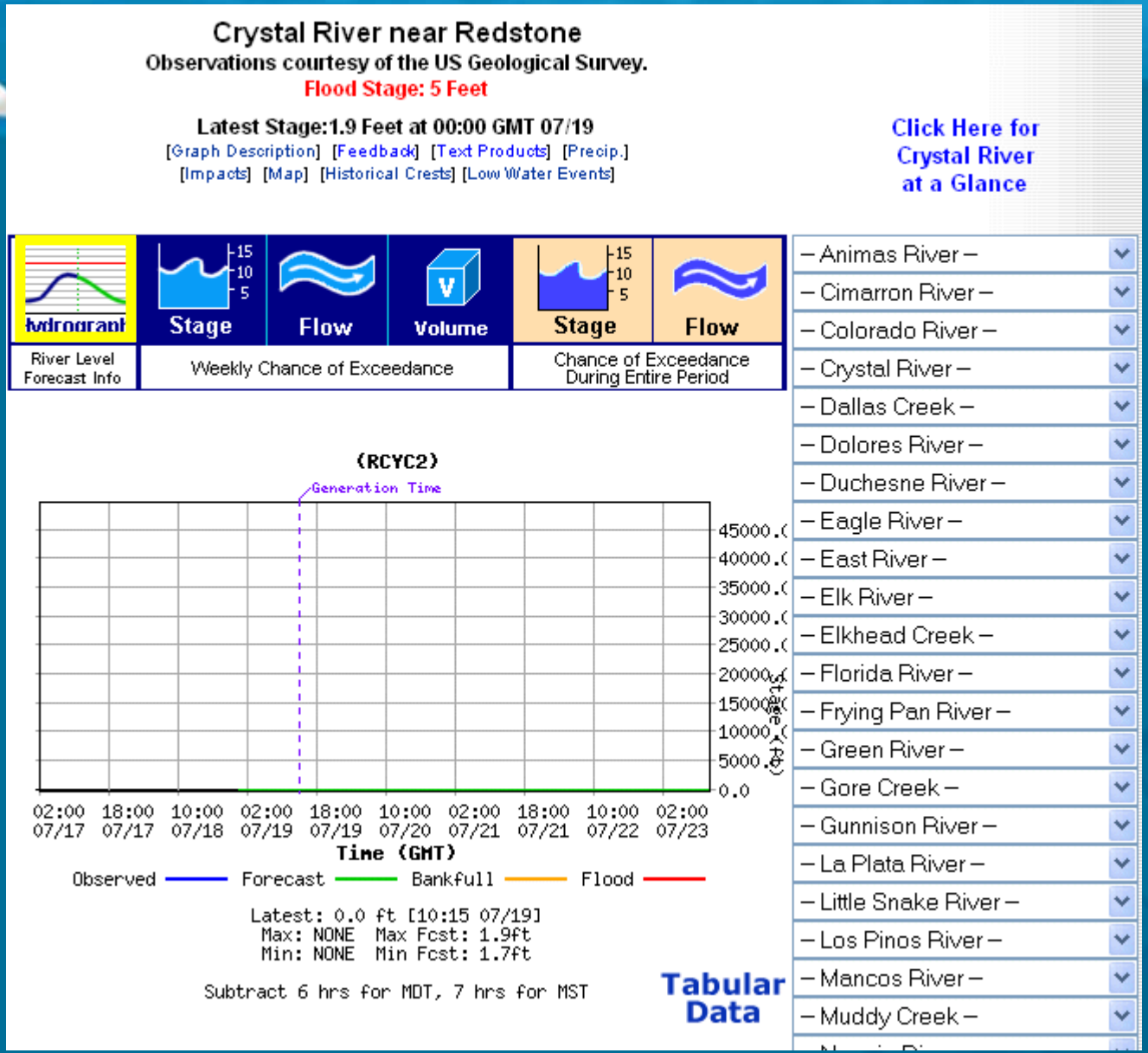
ESP Statistical Analysis



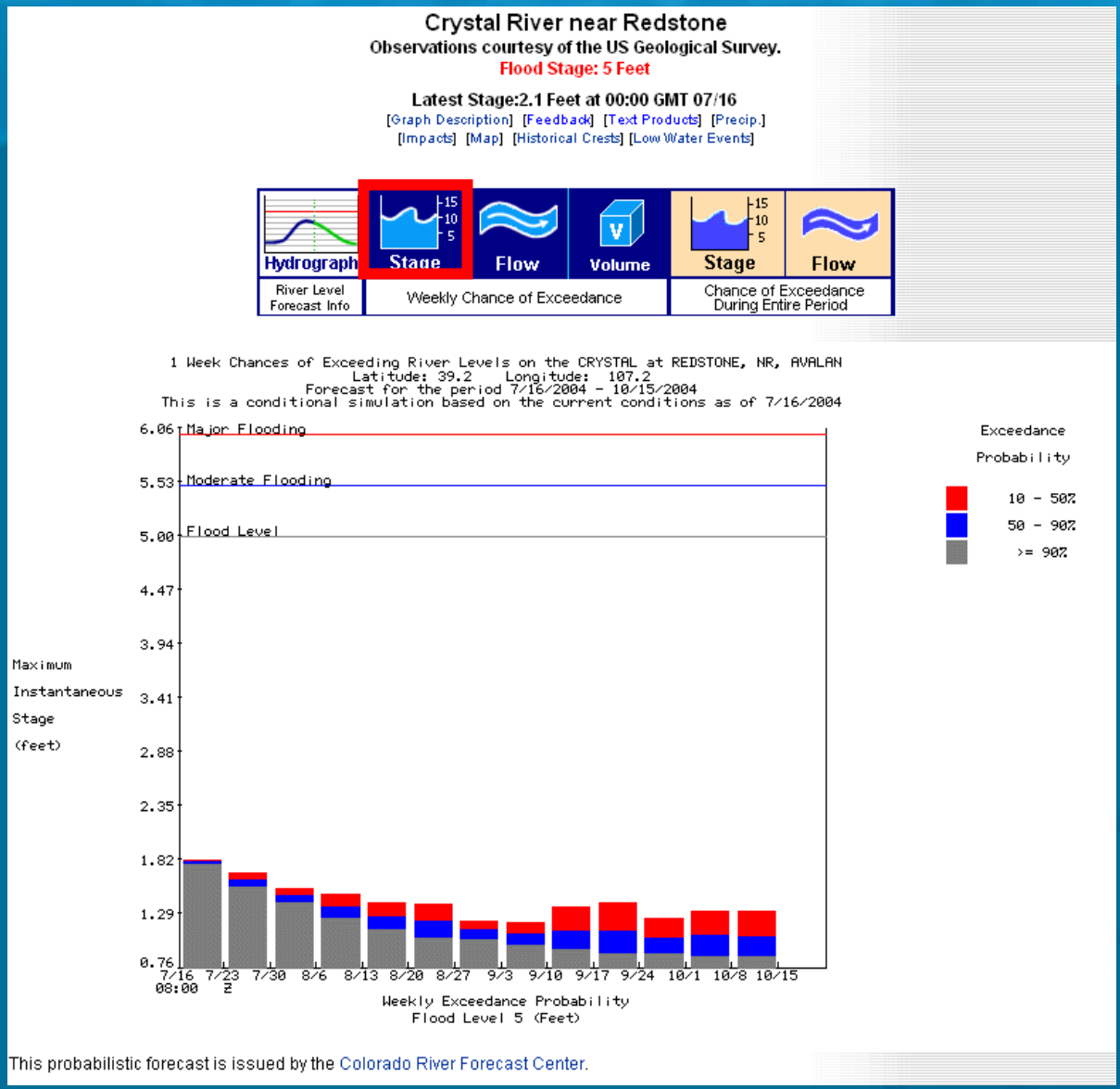
Common Suite of Probabilistic Products



Common Suite: Deterministic Hydrograph



Common Suite: Weekly Exceedance-Stage



Common Suite: Weekly Exceedance-Flow

Crystal River near Redstone

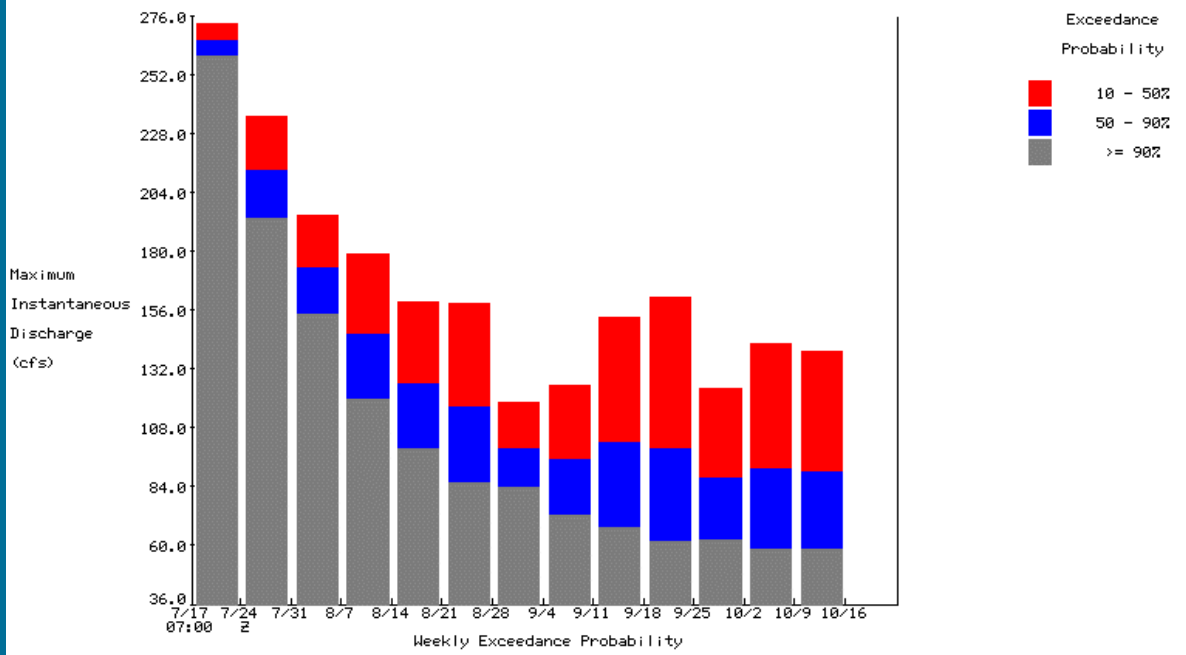
Observations courtesy of the US Geological Survey.

Flood Stage: 5 Feet

Latest Stage:2.1 Feet at 00:00 GMT 07/16

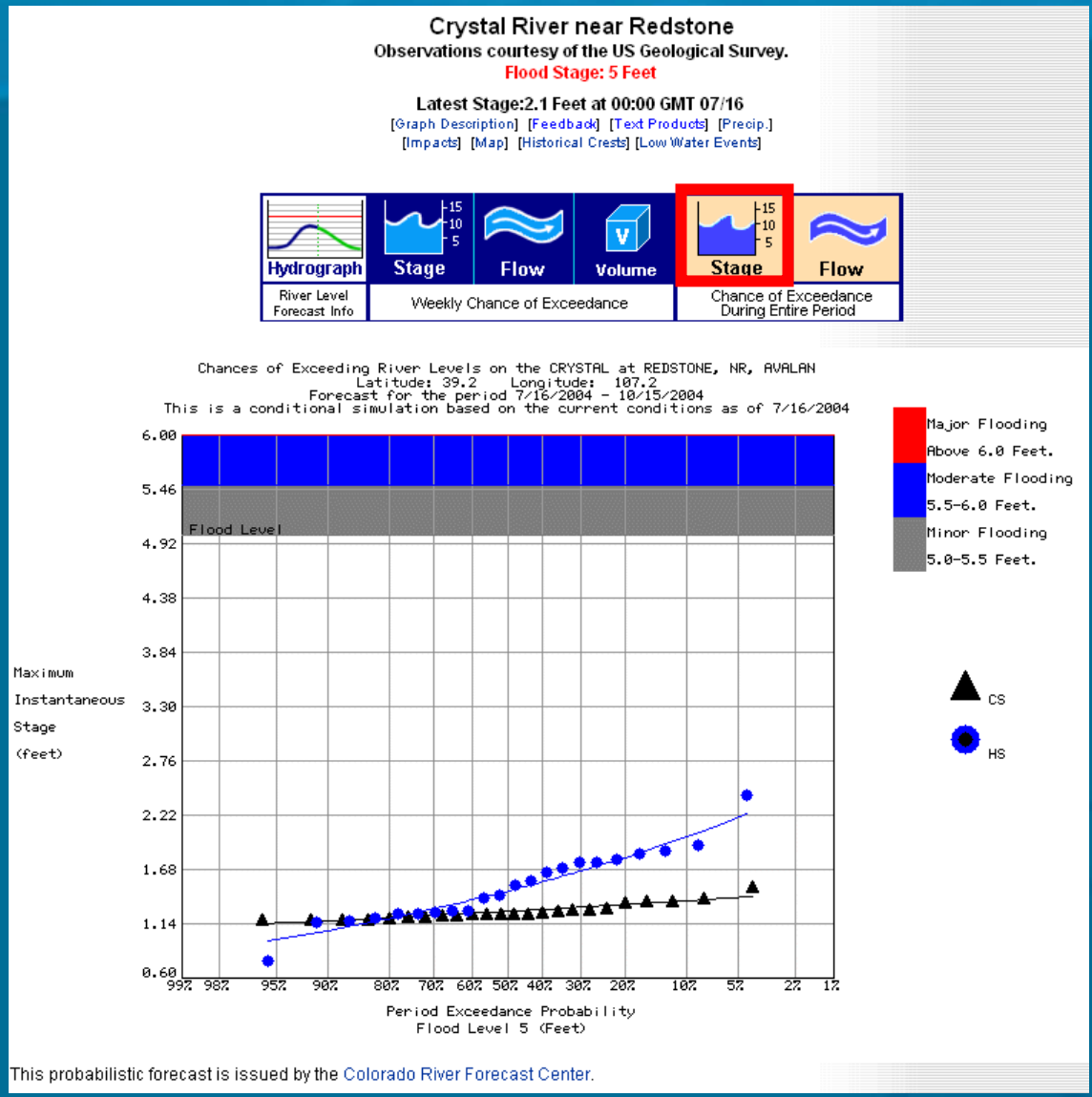
[Graph Description] [Feedback] [Text Products] [Precip.]
[Impacts] [Map] [Historical Crests] [Low Water Events]

1 Week Chances of Exceeding River Levels on the CRYSTAL - REDSTONE
Latitude: 39.2 Longitude: 107.2
Forecast for the period 7/17/2004 - 10/16/2004
This is a conditional simulation based on the current conditions as of 7/17/2004

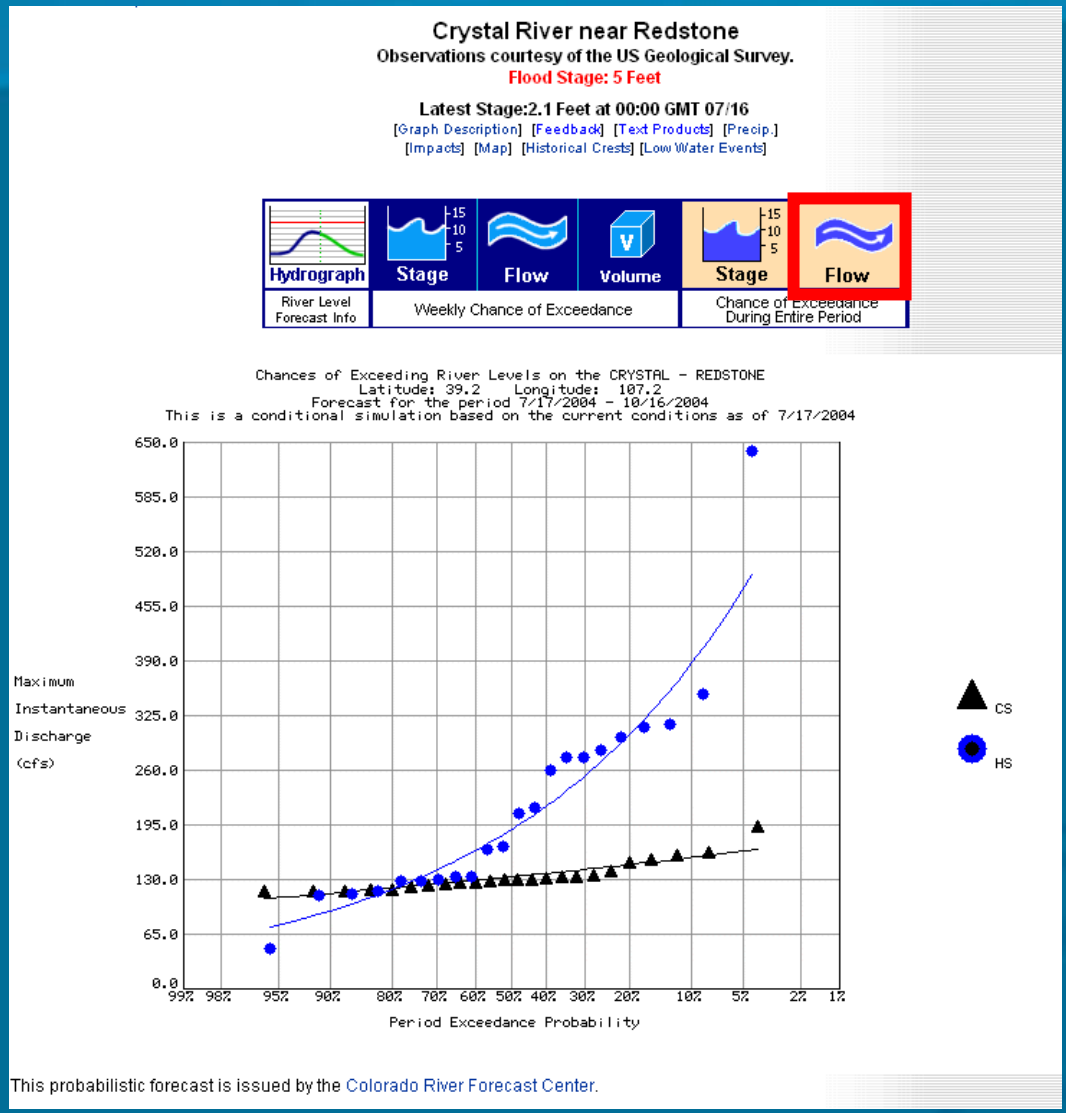


This probabilistic forecast is issued by the Colorado River Forecast Center.

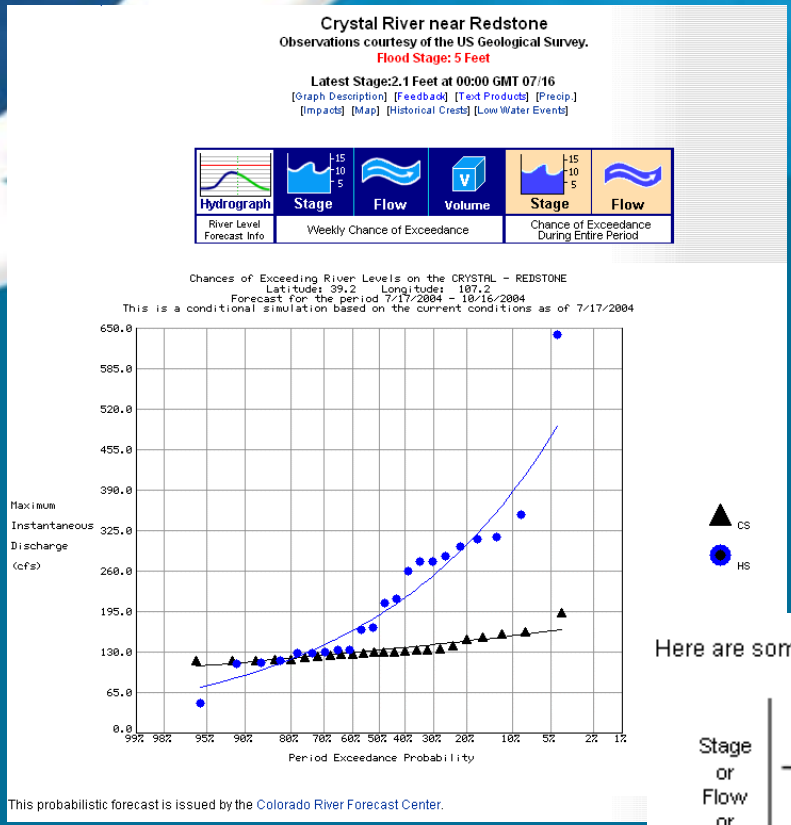
Common Suite: 90-Day Exceedance-Stage



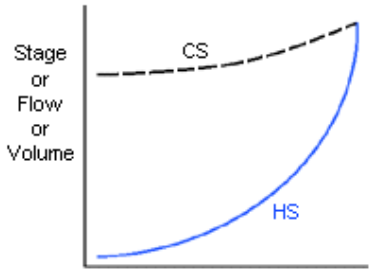
Common Suite: 90-Day Exceedance-Flow



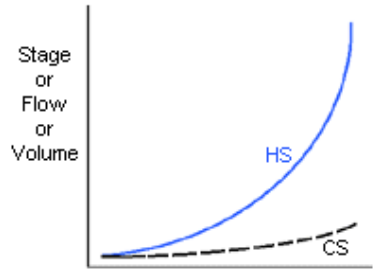
Explanation :
90 Day Exceedance



Here are some possible scenarios to help you understand this graphic:



More wet than "normal" conditions over the forecast period.
The chances are greater for wet conditions, as indicated by the **Conditional Simulation**, over the entire range of possible outcomes.



More dry than "normal" conditions over the forecast period.
The chances are greater for dry conditions, as indicated by the **Conditional Simulation**, over the entire range of possible outcomes.

When the two simulations are very close across the entire range, the chances of the river going over a certain level is similar to the total range of past levels.

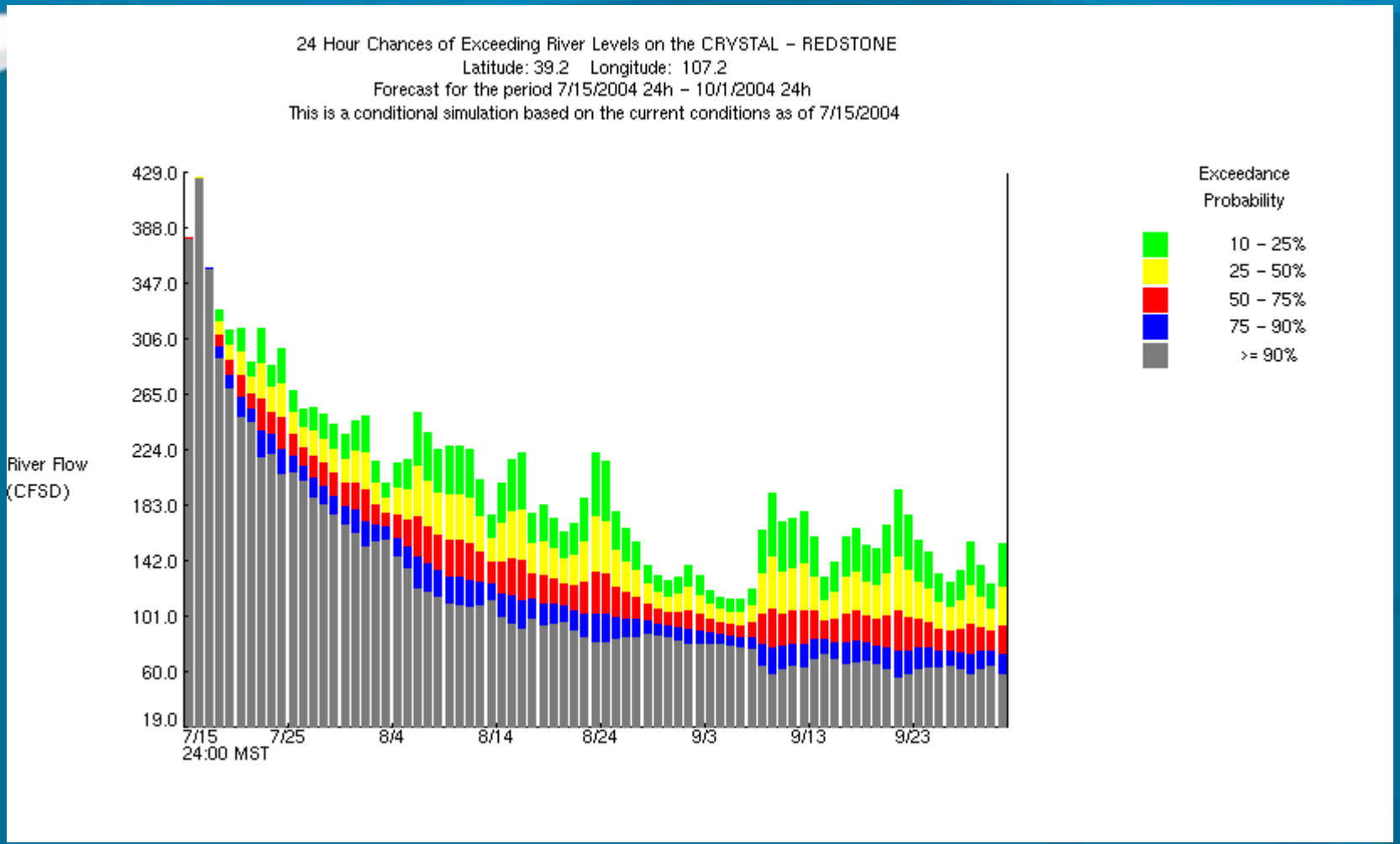
Enhanced Products From the CBRFC

Products from ESP-ADP

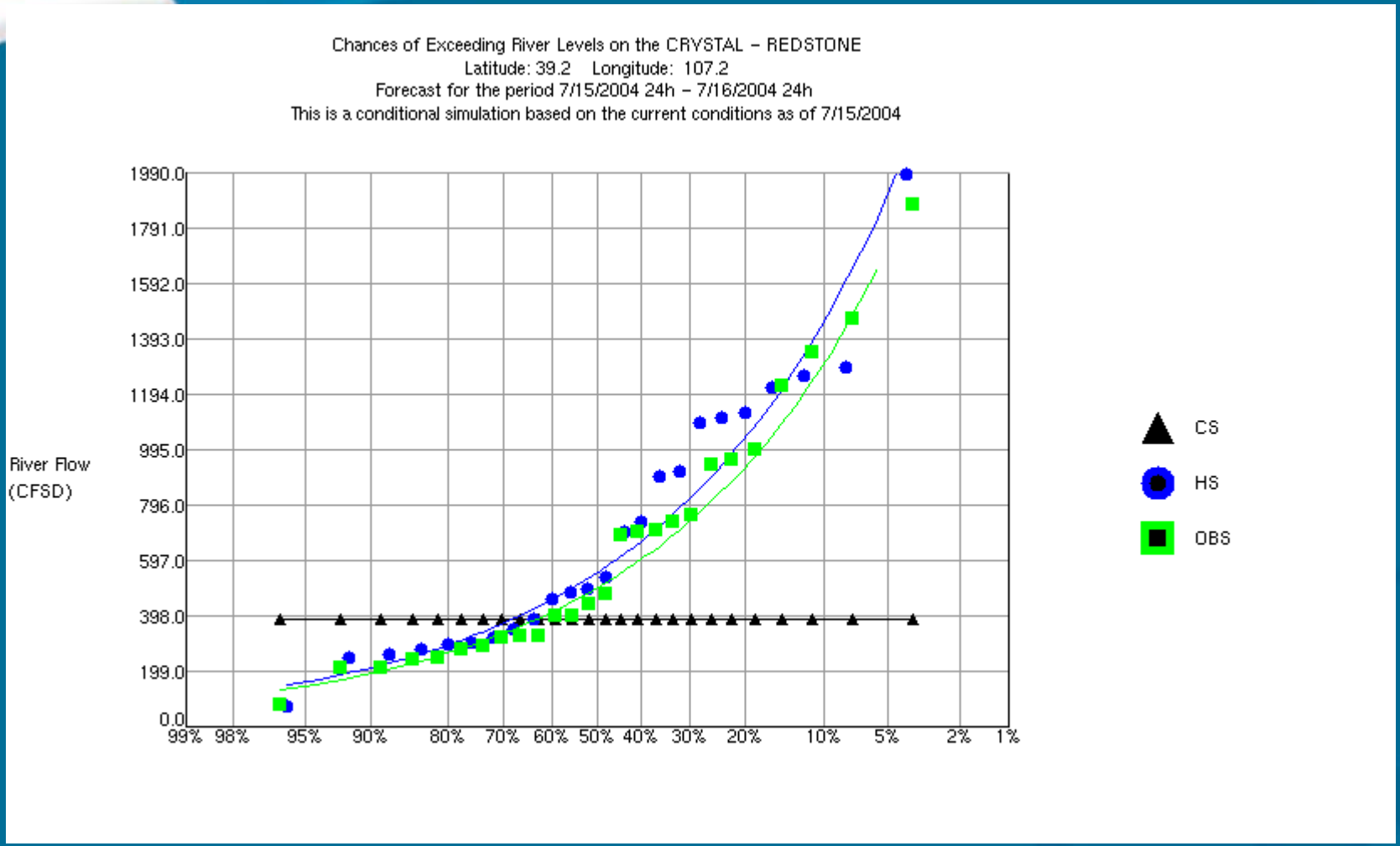
Products on the Web

Build your Own

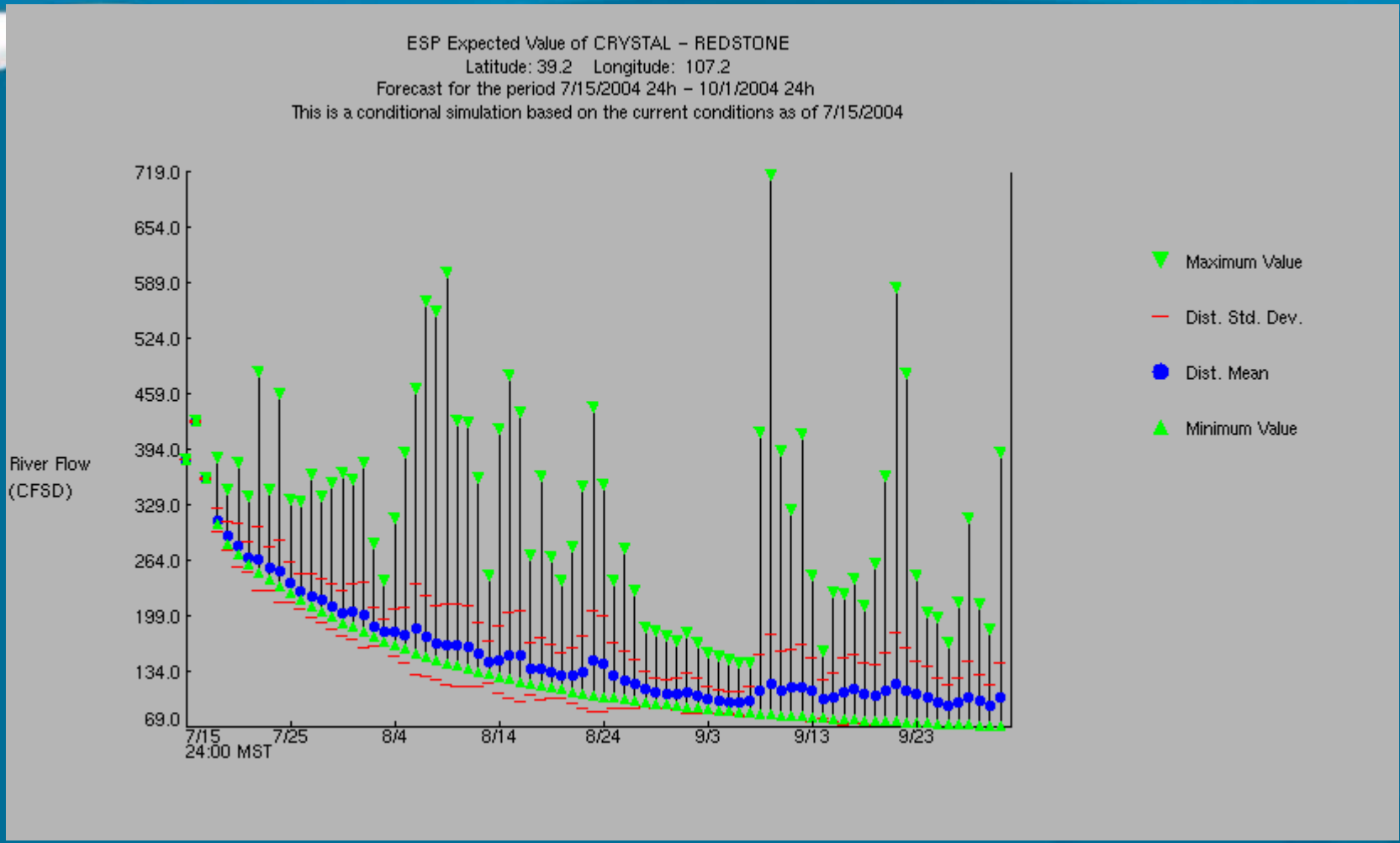
Enhanced: Daily Exceedance - Flow



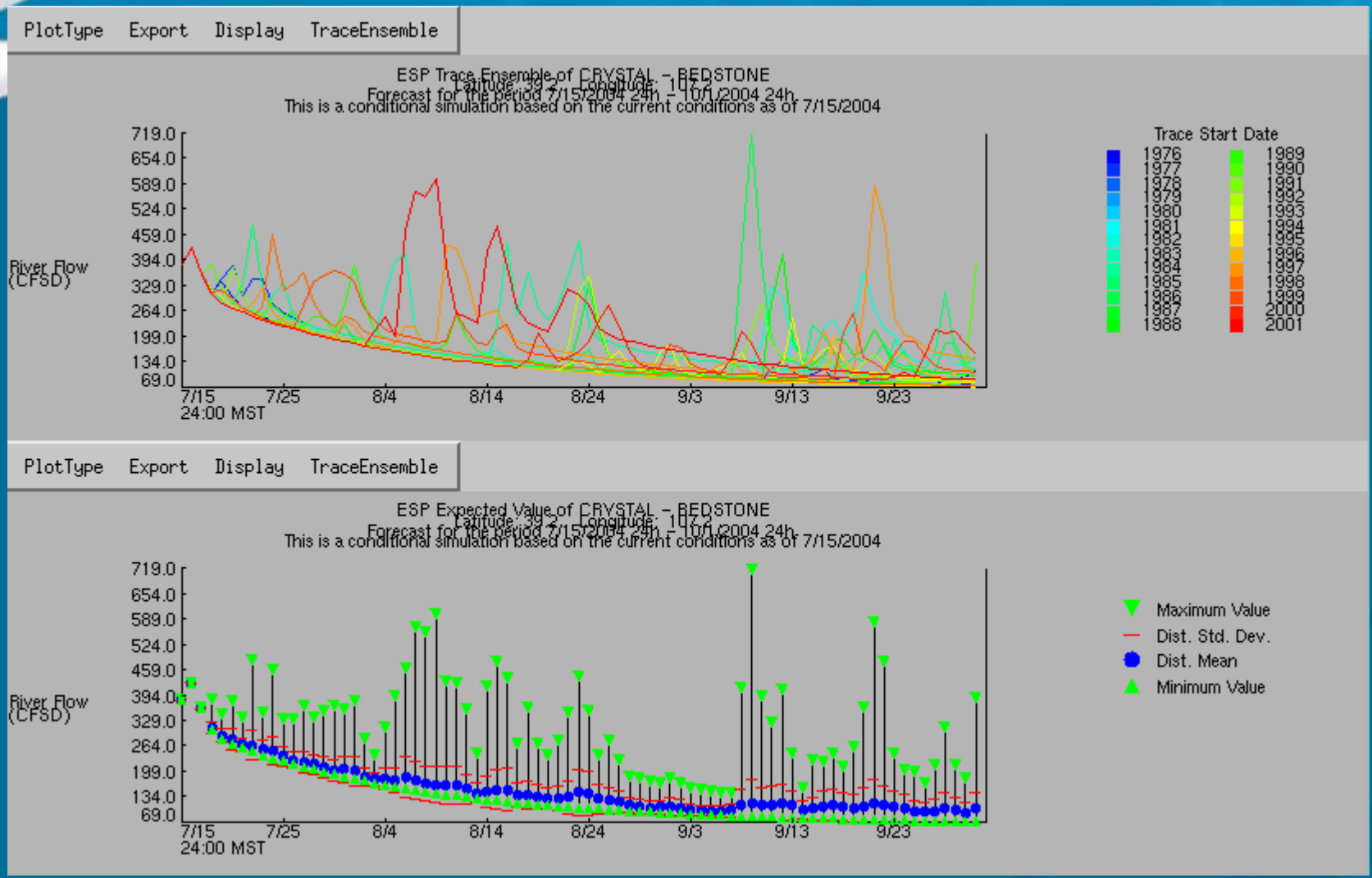
Enhanced: Daily Exceedance – Flow With Historical, Conditional, Observed



Enhanced: Expected Value Plot



Enhanced: Dual Plot For Comparisons



Enhanced: Web Product

www.nws.noaa.gov

NATIONAL WEATHER SERVICE

Colorado Basin River Forecast Center

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River Forecasts & Data
- Graphic
- List

APNC2 Data/Forecasts
- Hydrograph
- Probabalistic
- Water Supply

APNC2 Model Data
- Precipitation
- Temperature
- Freezing Level
- Snow Information
- Soil Moisture
- Combination Plot

APNC2 Gage Info
- Conditions Map Location
- Basin/Location Maps
- Aerial Photos/Topo Maps
- Photos
- Gage Information
- Records
- Rating Table

APNC2 Verification
- Short Range
- Long Range (ESP)
- Water Supply
- Model Simulation

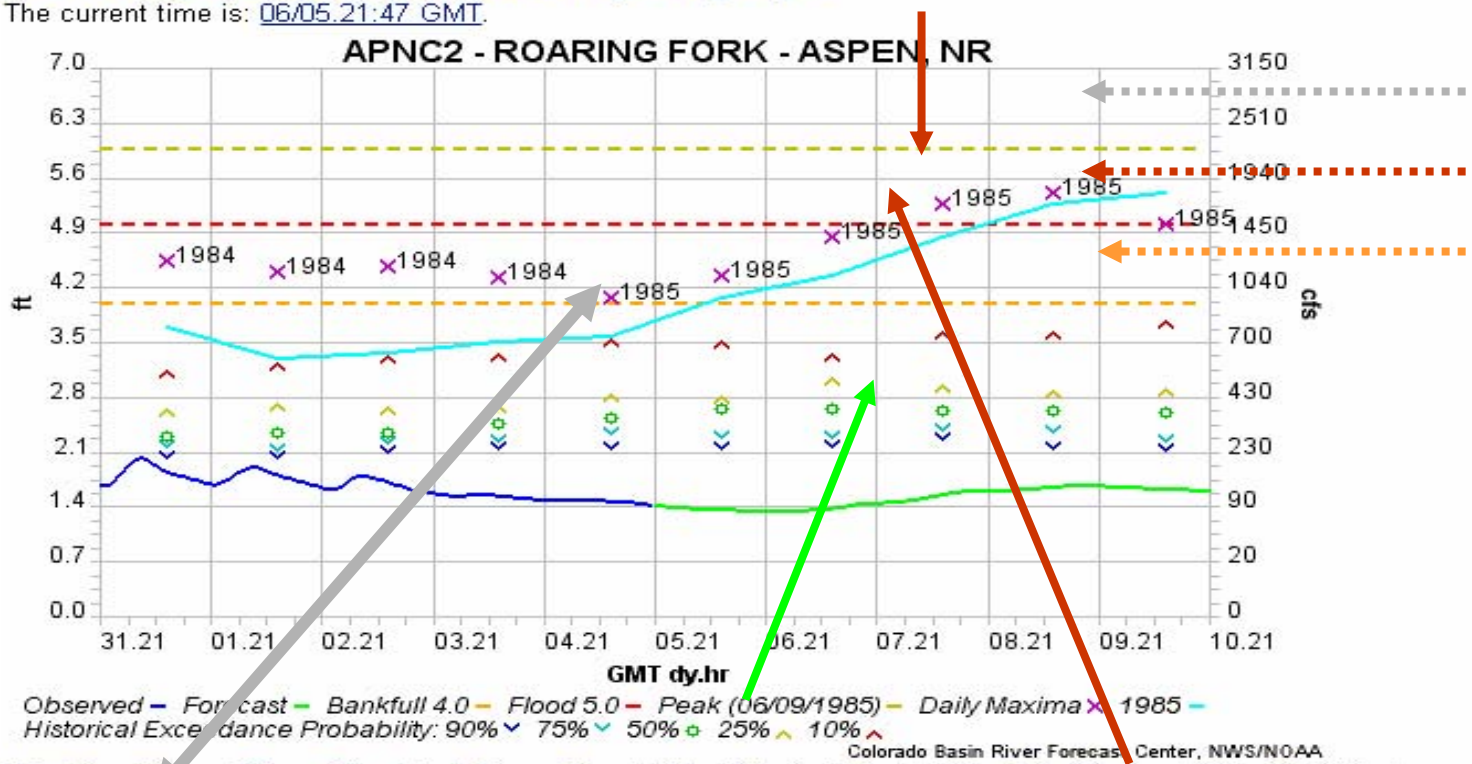
Back to Main Menu

Hydrograph | Stage | Flow | Volume | Stage | Flow | Build a Product

River Level Forecast Info | Weekly Chance of Exceedance | Chance of Exceedance During Entire Period

APNC2 Observed/Simulated Hydrograph

The current time is: 06/05.21:47 GMT.

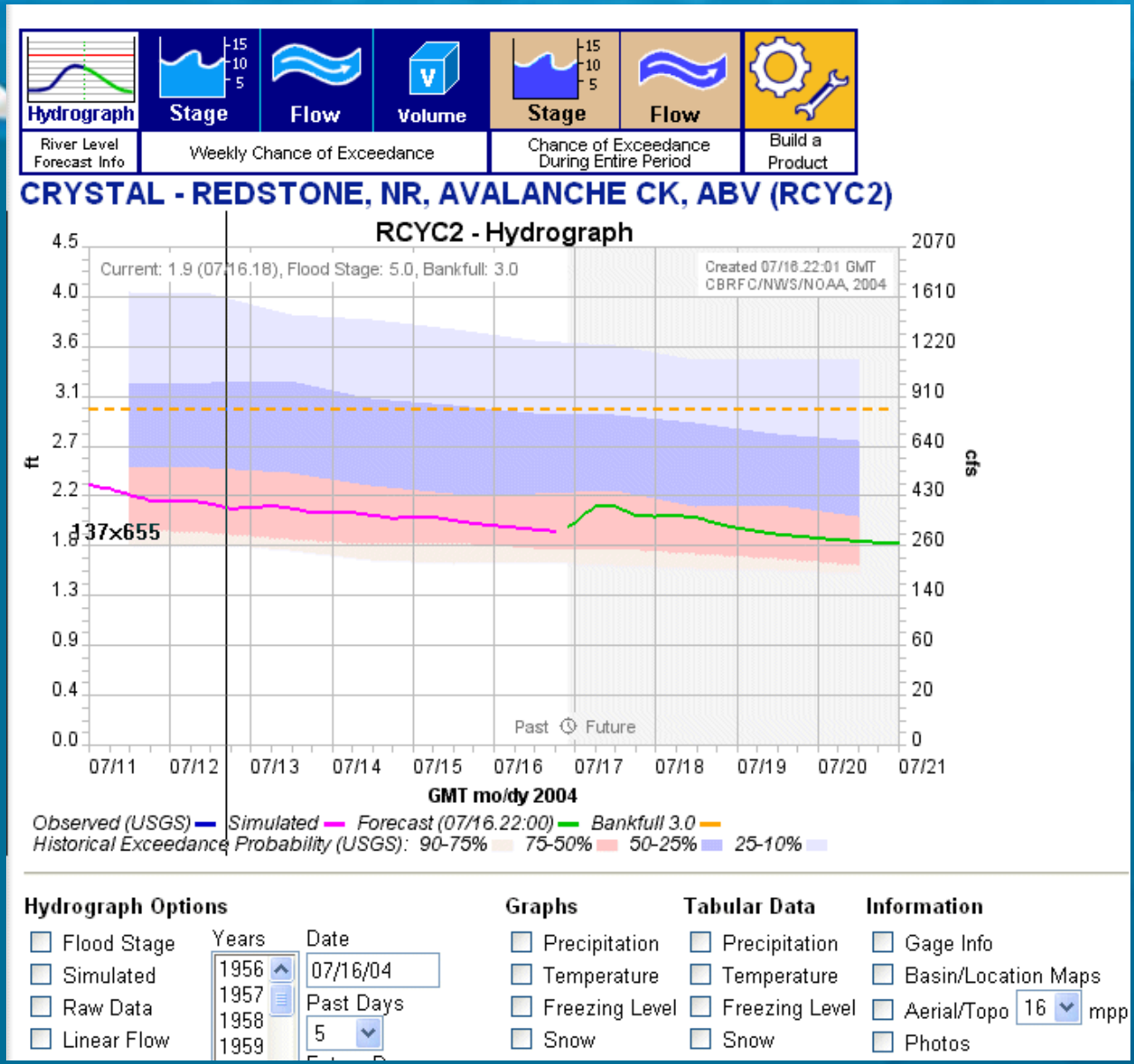


Hide Flood Stage | Show Simulated | Linear Flow | Hide Historical Peak | Hide Daily Maxima | Hide Statistics | Show ESP | Remove Adjustment | Requery from elk | Requery from awips | Plot Cache

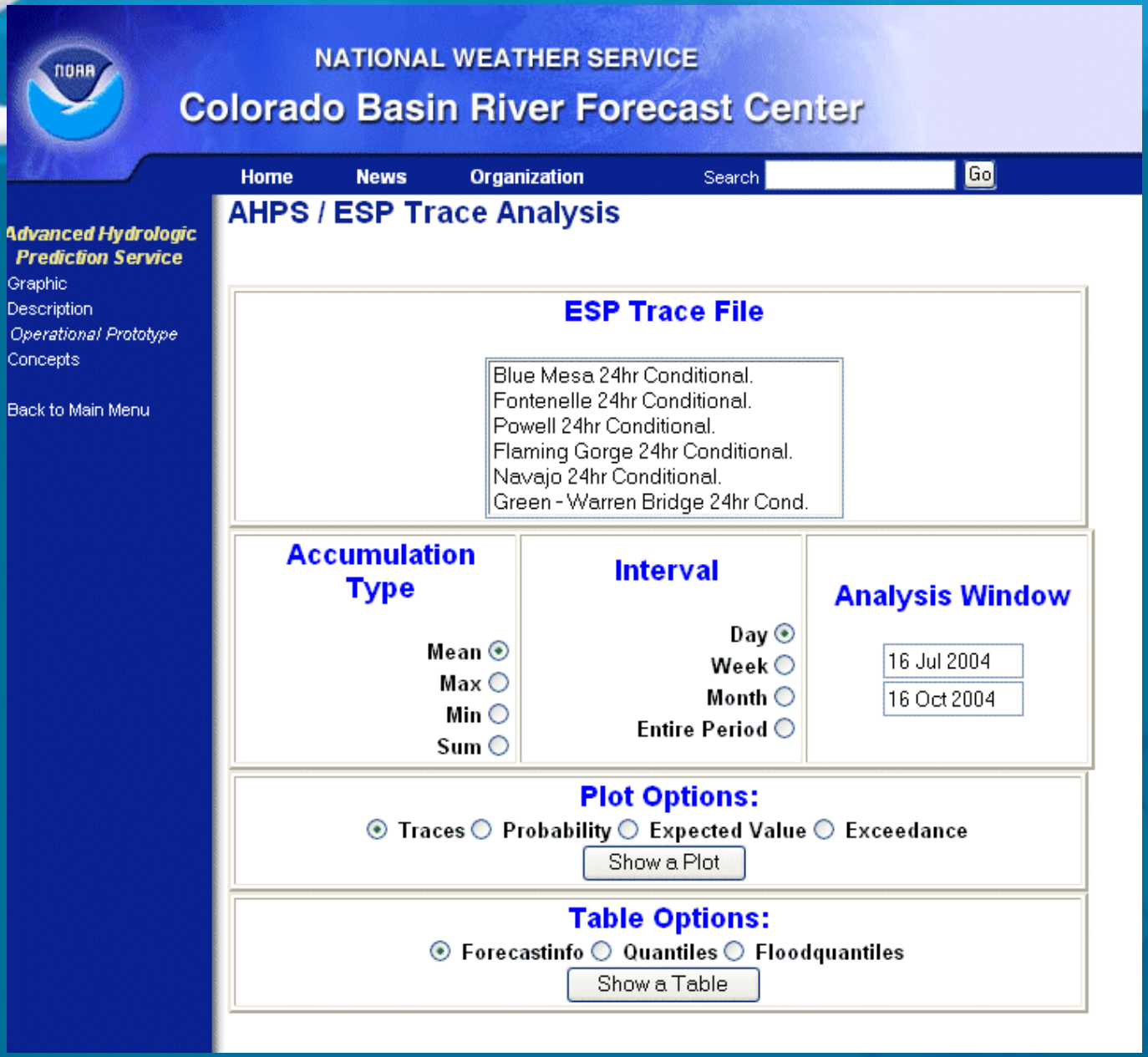
Add Year: 84 02 01 00 99 98 97 96 95 94 93 92 91 90 89 88 87 86 84 83 82 81 80 79 78 77 76 75 74 73 72 71 70

Delete Year: 85

Enhanced: Web Product



Enhanced: Build Your Own



Strengths For ESP Forecasting

Uses the current conditions of model to project possible scenarios.

1. Soil moisture conditions

   Accounts for Drought/Wet Conditions
2. Snow conditions
3. River flow
4. Reservoir elevations

Strengths For ESP Forecasting

Provides Probabilistic Information For Various Applications

1. Spring Flood Outlooks
2. Water Supply Forecasts
3. Drought Analysis
4. Hydropower Planning
5. Fisheries Management
6. Recreation
7. Navigation
8. Reservoir Inflow Forecasts

Current Limitations For ESP Forecasting

- River Regulation.

  Model Reservoir/Irrigation/Diversion operating criteria – very difficult task.
- Relies on historical MAP/MAT and simulated flows…requires good calibrations.
- How do we provide this information in a useful manner.