

# Ensemble Streamflow Prediction (ESP) Forecasting Methodologies

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Northwest River Forecast Center

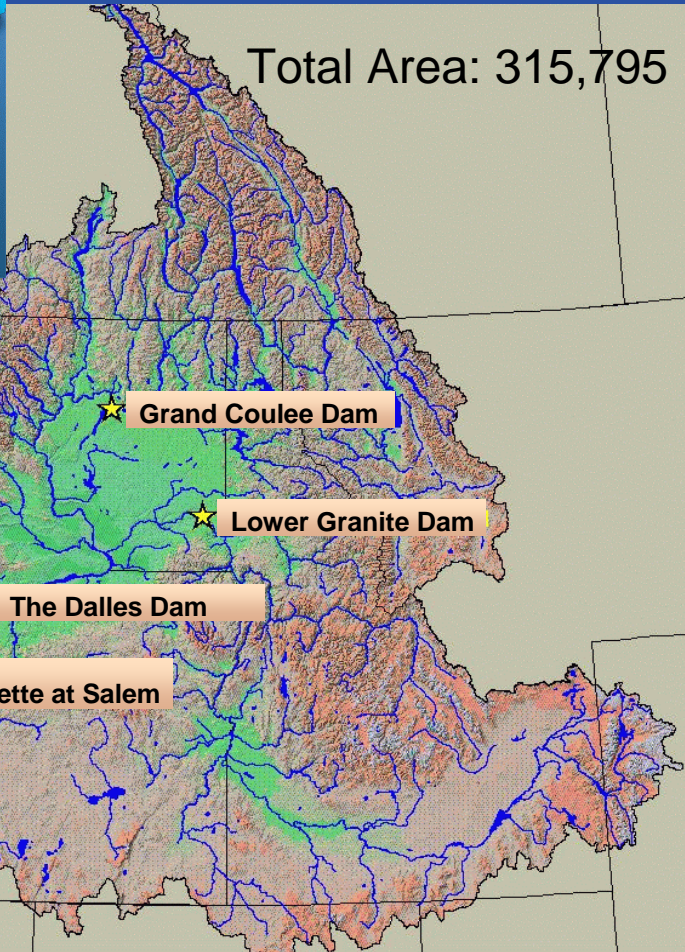


# Topics for Presentation

- Northwest River Forecast Center Overview
- NWS River Forecast System Overview
- Use of the Ensemble Streamflow Prediction to Produce Seasonal Forecasts
- Incorporation of CPC Climate Forecasts into ESP



# Northwest River Forecast Center



Columbia Basin

Coastal  
Drainages of  
Oregon and  
Washington

6 States &  
CANADA

9 NWS Field  
Offices (WFOs)

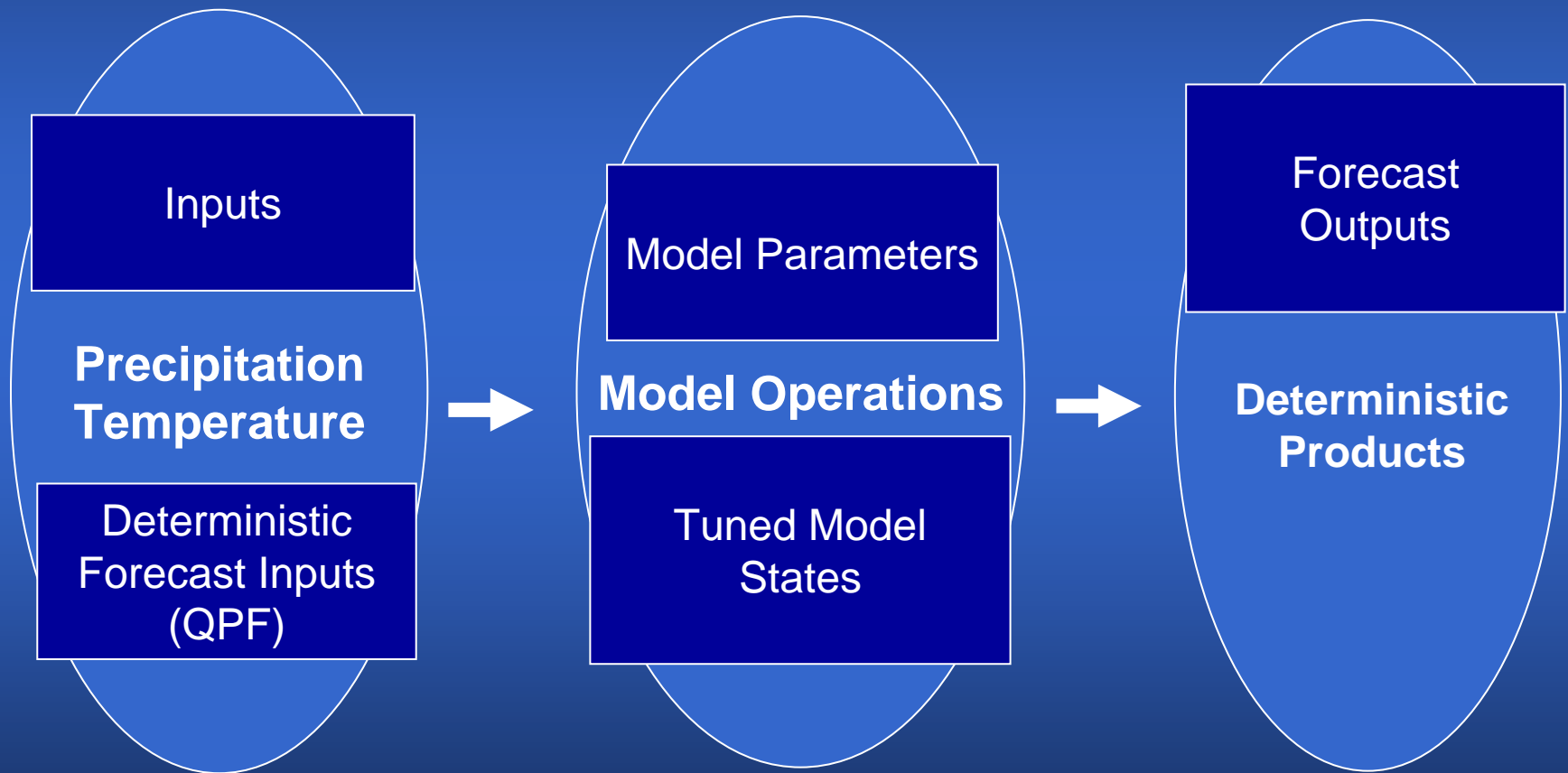


# NWRFC Forecasting Models

- NWS River Forecast System (NWSRFS)
  - Short, Medium, and Long-term forecast capabilities
    - Semi-Lumped, Conceptual, Continuous
    - Three modes of execution:
      - Calibration
      - Deterministic
      - Ensemble Streamflow Prediction (Probabilistic)

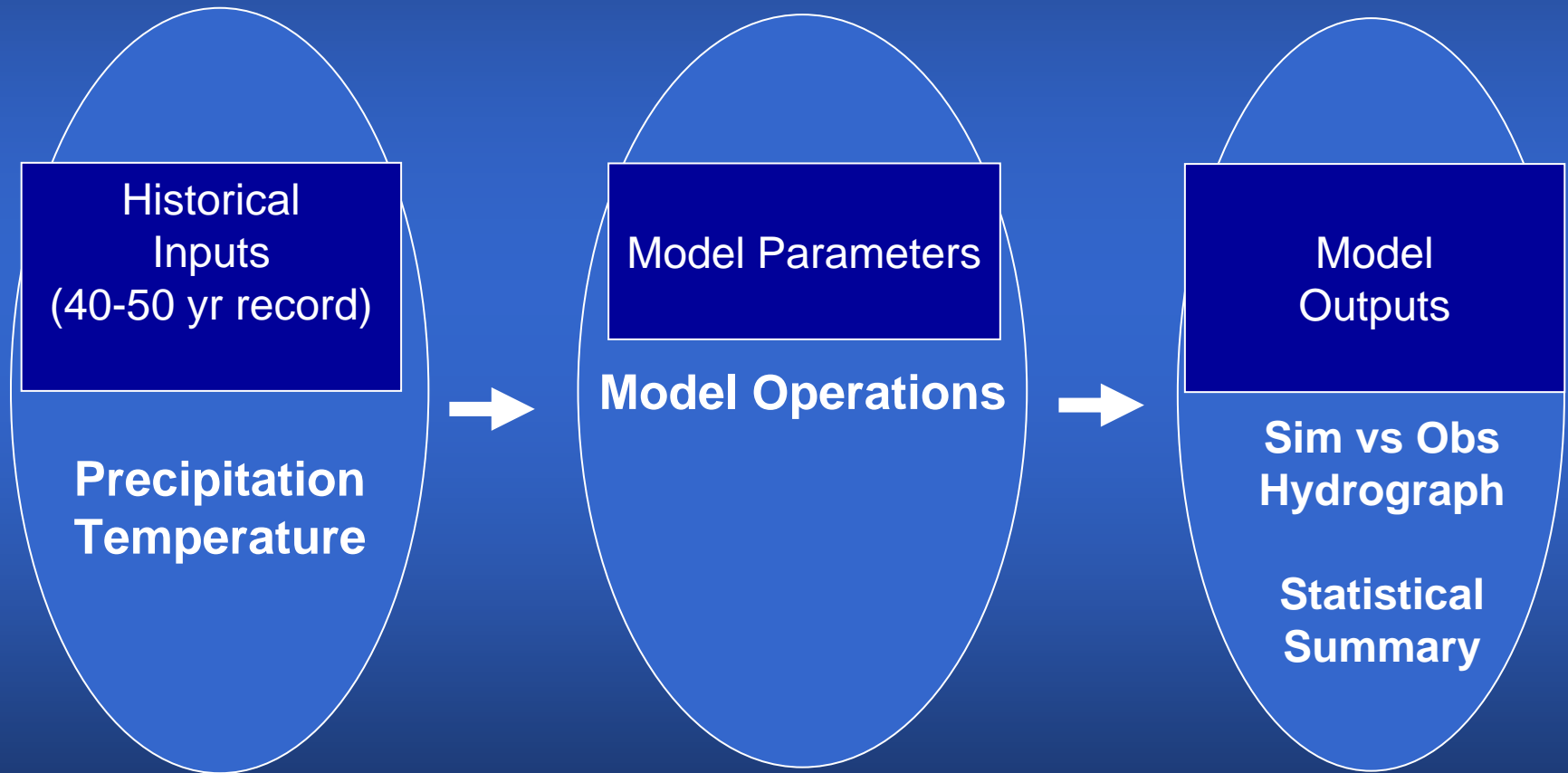


# NWS River Forecast System





# NWS River Forecast System: Calibration Mode

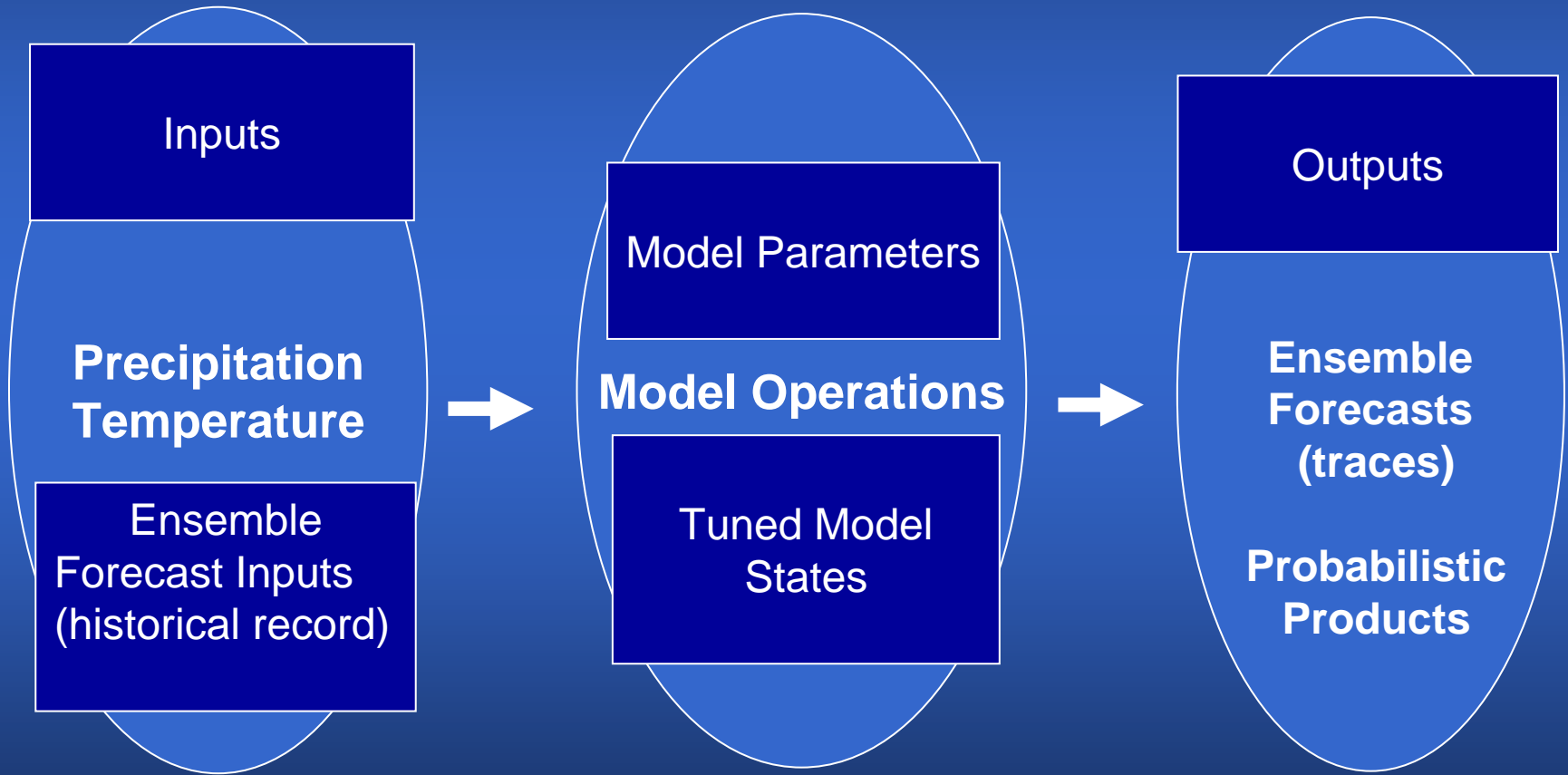






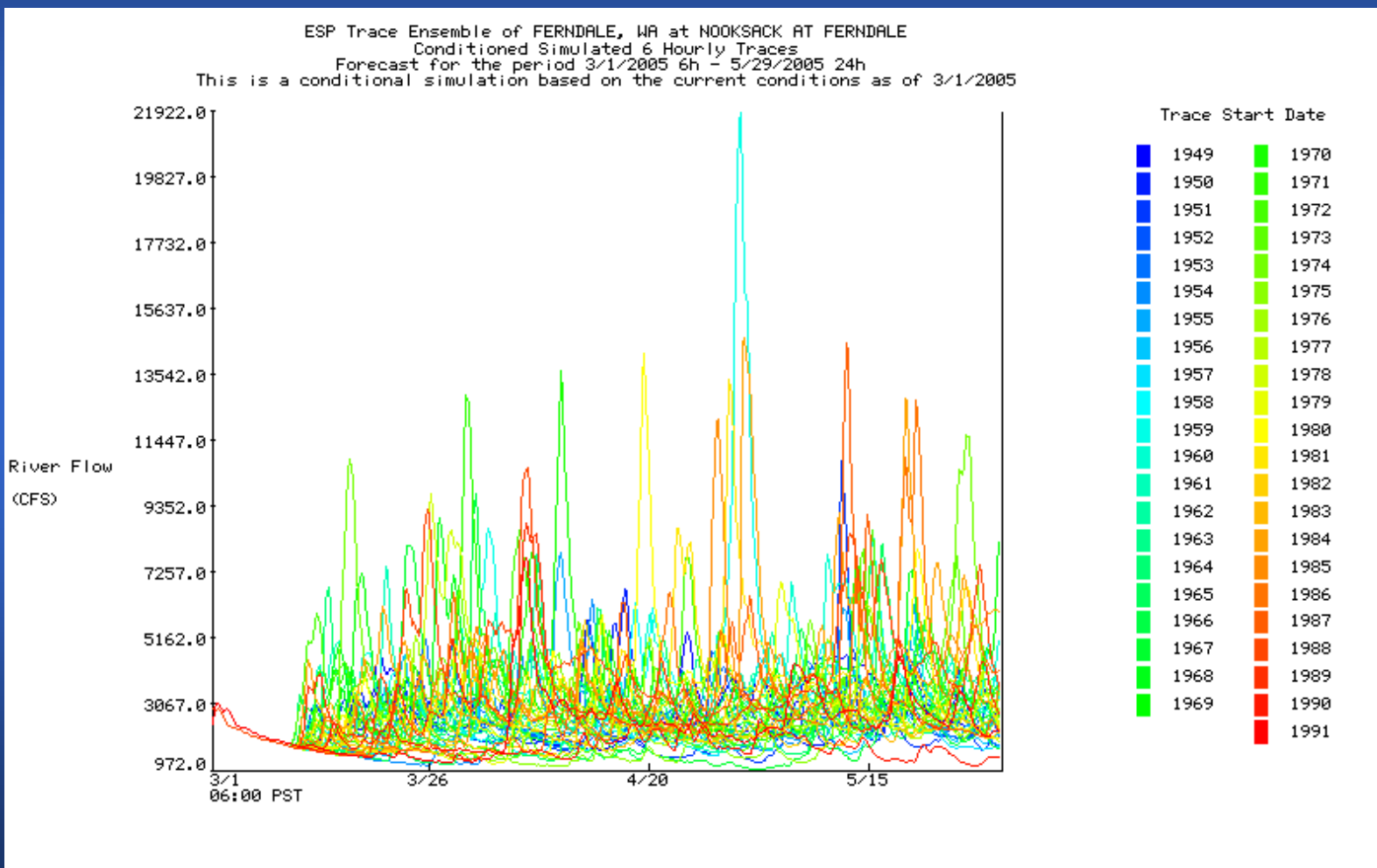
# NWSRFS:

## Ensemble Streamflow Prediction



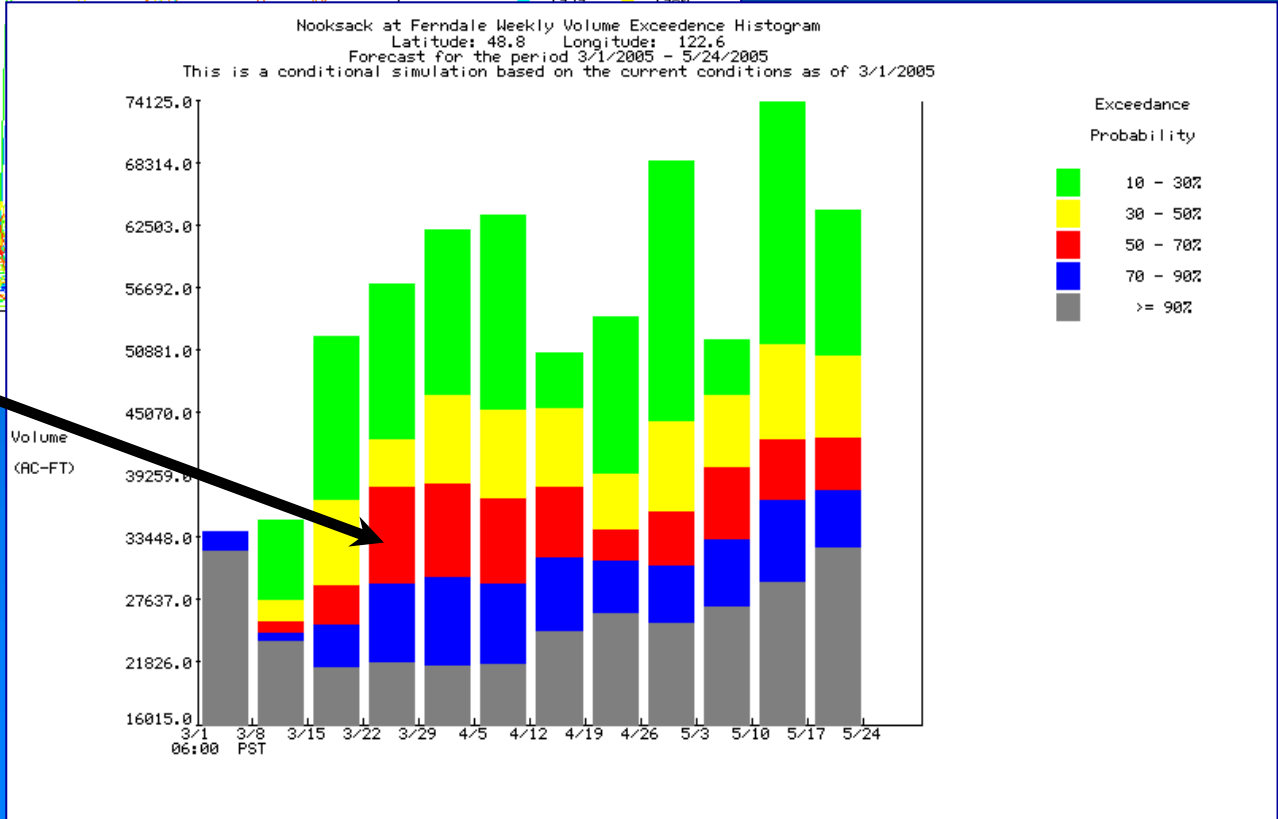
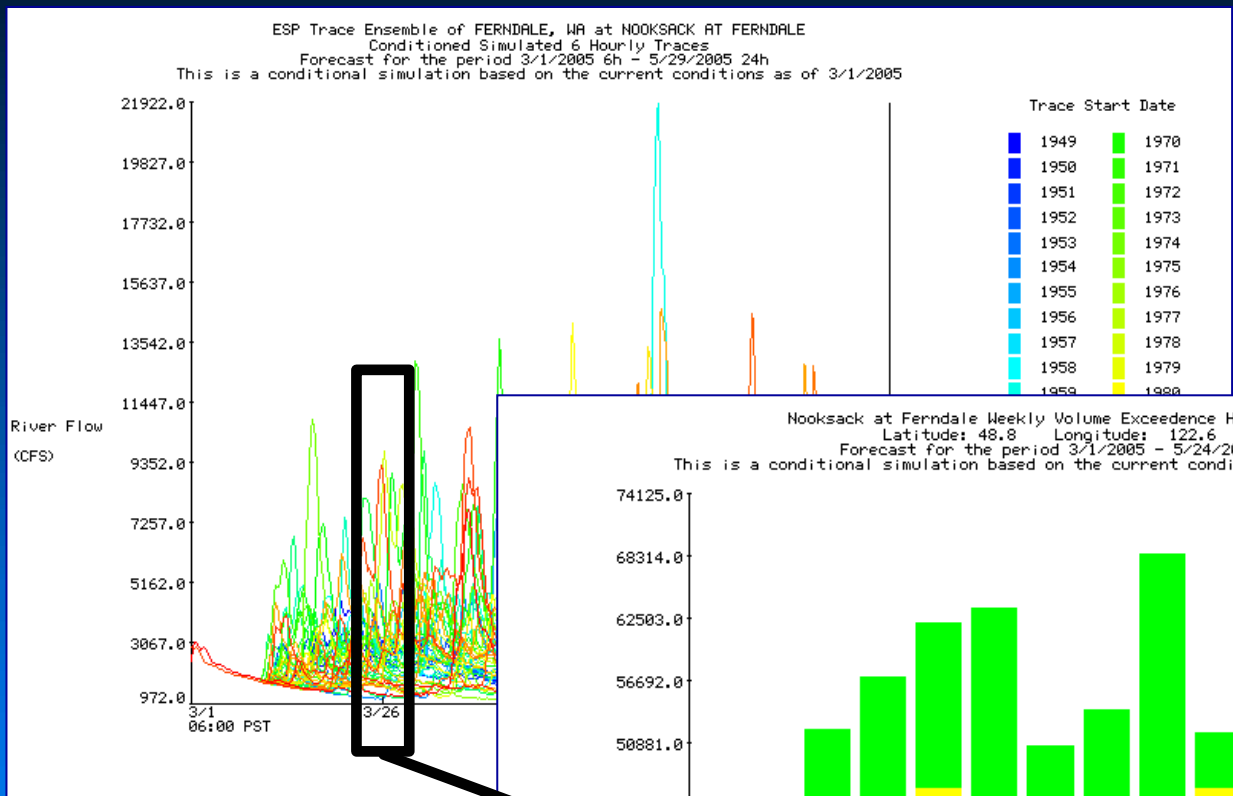


# ESP Trace Ensemble Plot

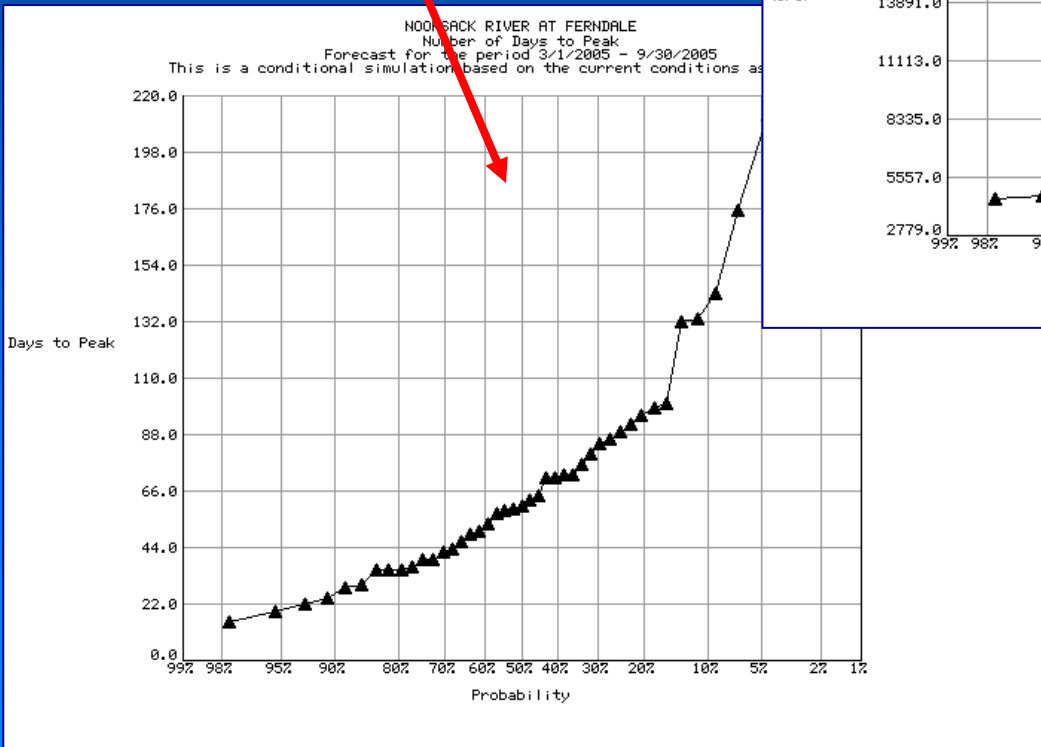
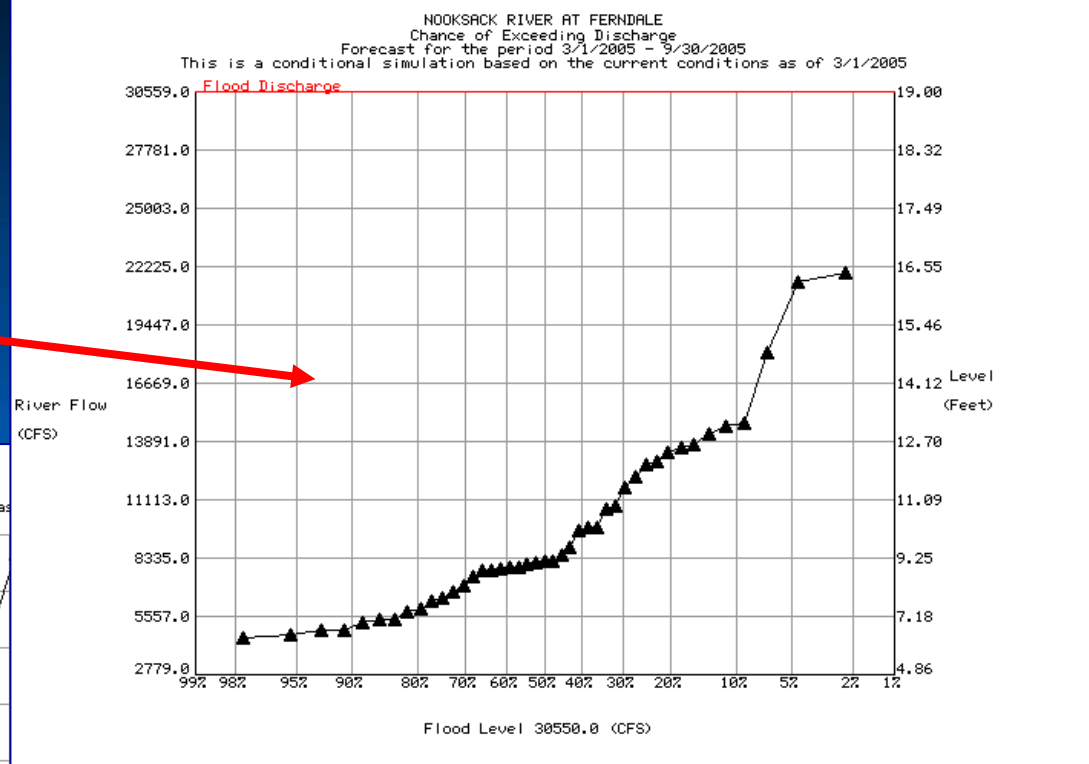
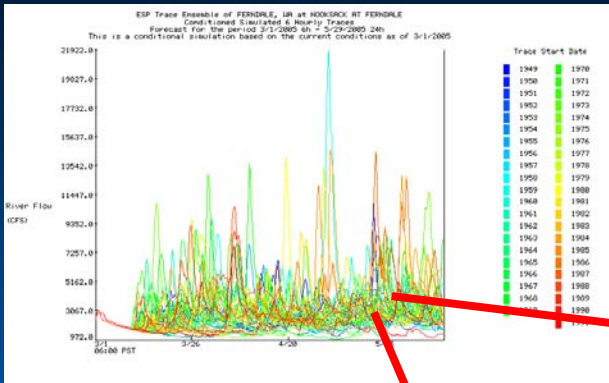




# ESP Probabilistic Products

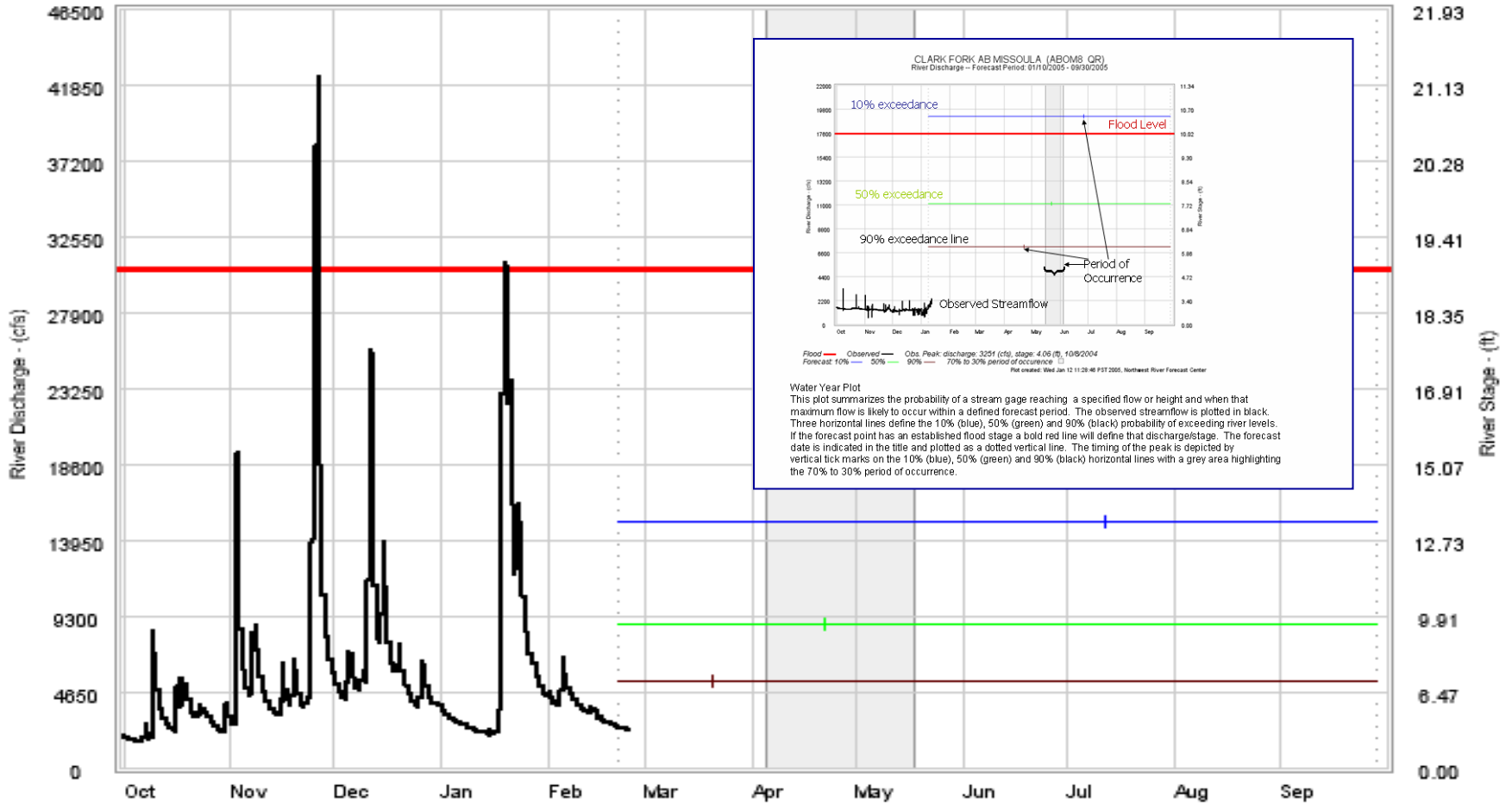


# ESP Peak Flow Products



# ESP Peak Flow Summary Graphic

NOOKSACK RIV AT FERNDALE (NKSW1 QR)  
River Discharge -- Forecast Period: 02/22/2005 - 09/30/2005



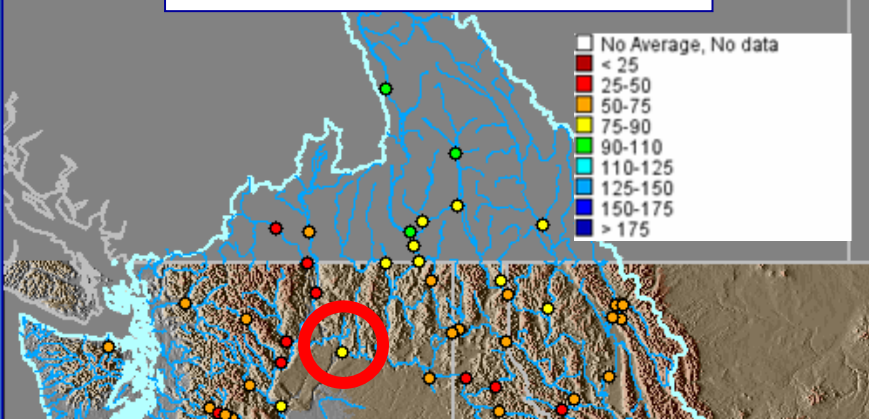
Flood — Observed — Obs. Peak: discharge: 42280 (cfs), stage: 21.21 (ft), 11/26/2004  
Forecast: 10% — 50% — 90% — 70% to 30% period of occurrence □

Plot created: Thu Feb 24 09:52:51 PST 2005, Northwest River Forecast Center

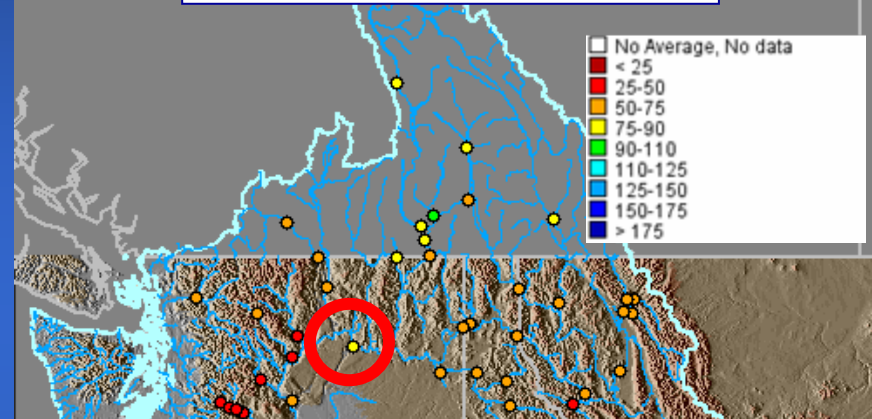


# ESP Volume Forecasts

## Statistical Water Supply



## ESP Volume Forecasts



The Official Statistical Water Supply forecast is issued between the middle of December and July 1st. Ensemble Predicted forecasts are issued weekly. A comparison continues to be made between the two forecasts through the end of September.

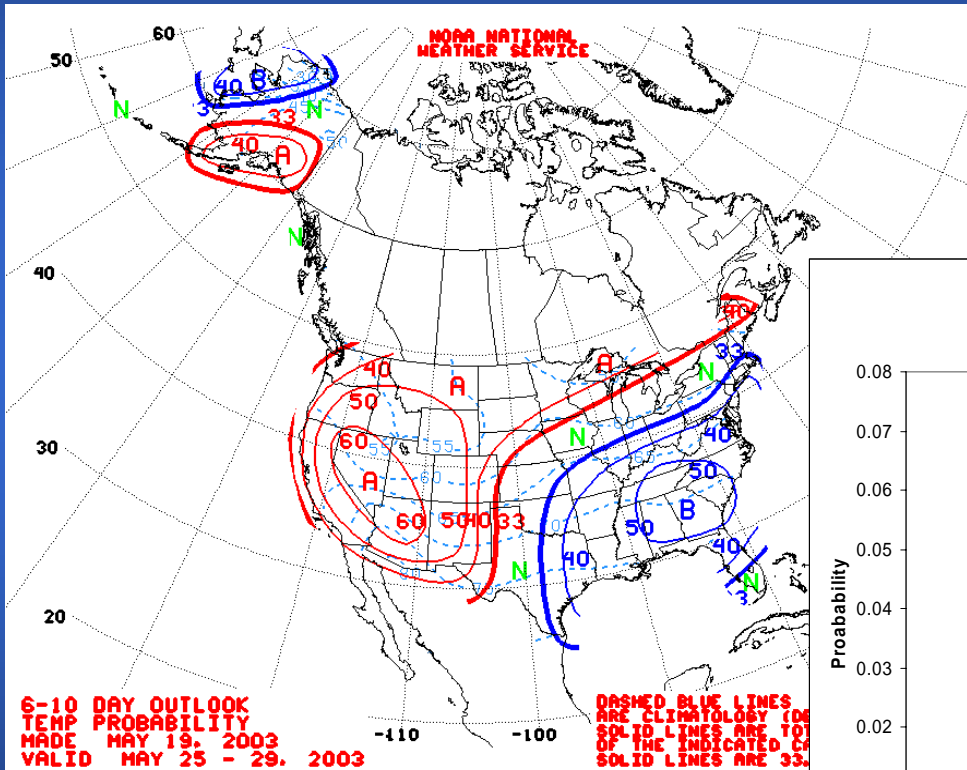
COLUMBIA - GRAND COULEE DAM (GCDW1)  
Forecasts for WY 2005

Official Forecast (Regression) <i>Issued: 2005-02-25</i> (Description)								ESP Forecasts <i>Issued: 2005-03-02</i>						
Period	Forecas (KAF)	% of Average	10% Forecast	90% Forecast	30yr (1971-2000) Average	Max of Record	Min of Record	Forecast Period	ESP Forecasts for Forecast Period (KAF)					Obs Flow From Start of Period To 3/1/2005
									90 % Exceedance Probability	70 % Exceedance Probability	50 % Exceedance Probability	30 % Exceedance Probability	10 % Exceedance Probability	
JAN-SEP	58700.0	80	71167.0	46233.0	73040.0	103500.0	44000.0	JAN-SEP	52194.6	55127.2	57597.6	60242.3	63354.5	6844.0
MAR-SEP	52400.0	77	64867.0	39933.0	67820.0			MAR-SEP	45350.6	48283.2	50753.6	53398.3	56510.5	0.0
APR-JUL	41200.0	77	53667.0	28733.0	53850.0	76239.0	31885.0	APR-JUL	34717.9	37734.3	39301.4	41338.5	42795.0	0.0
APR-SEP	49400.0	77	61867.0	36933.0	63990.0	88512.0	39829.0	APR-SEP	42428.7	44975.8	48097.6	50309.3	52996.7	0.0
JAN-JUL	50600.0	80	63067.0	38133.0	62900.0	91140.0	34760.0	JAN-JUL	44319.0	47253.1	49327.3	51107.5	52958.4	6844.0
APR-AUG	46400.0	77	58867.0	33933.0	60290.0	84080.0	37442.0	APR-AUG	39525.8	42183.3	44623.1	46746.6	48620.4	0.0
JAN-AUG	55700.0	80	68167.0	43233.0	69340.0									
MAR-AUG	49400.0	77	61867.0	36933.0	64120.0									

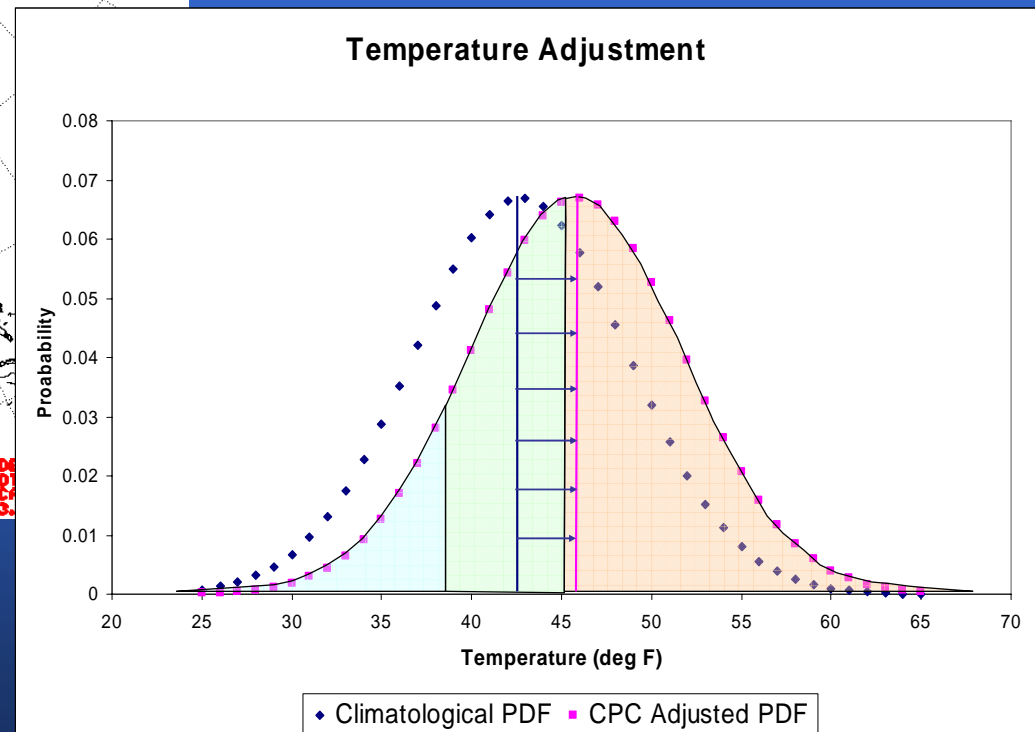
Select for Verification Plots



# Taking Advantage of CPC Climate Forecasts: ESP Pre-Adjustment Technique

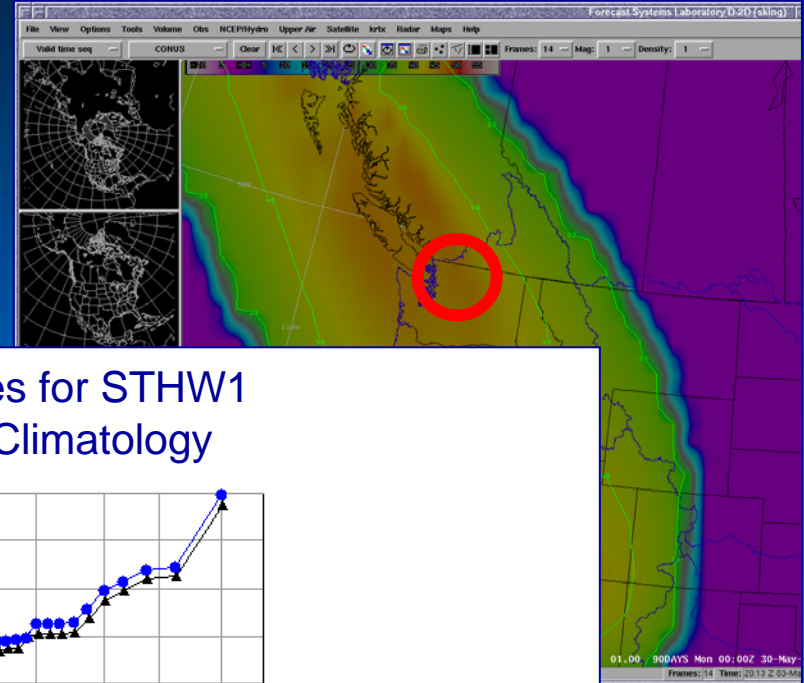
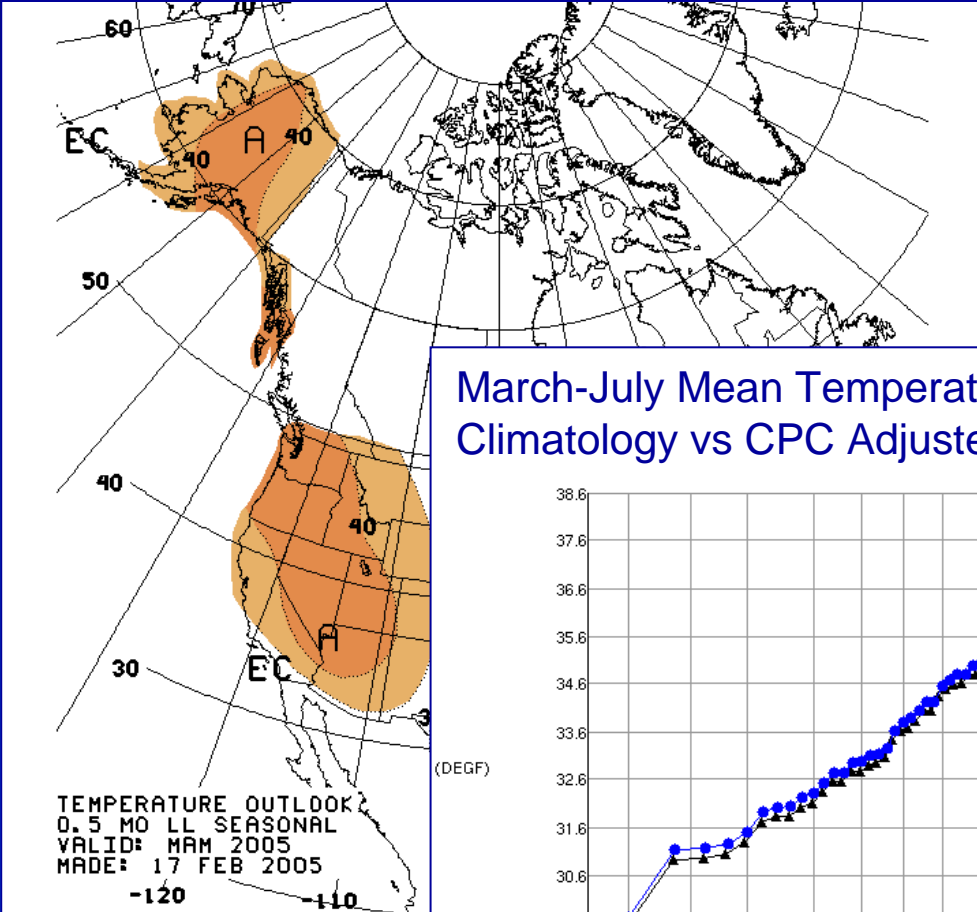


Climate Forecast Probabilities can be Used to shift the distribution of ESP Inputs (historical temp/precip record)

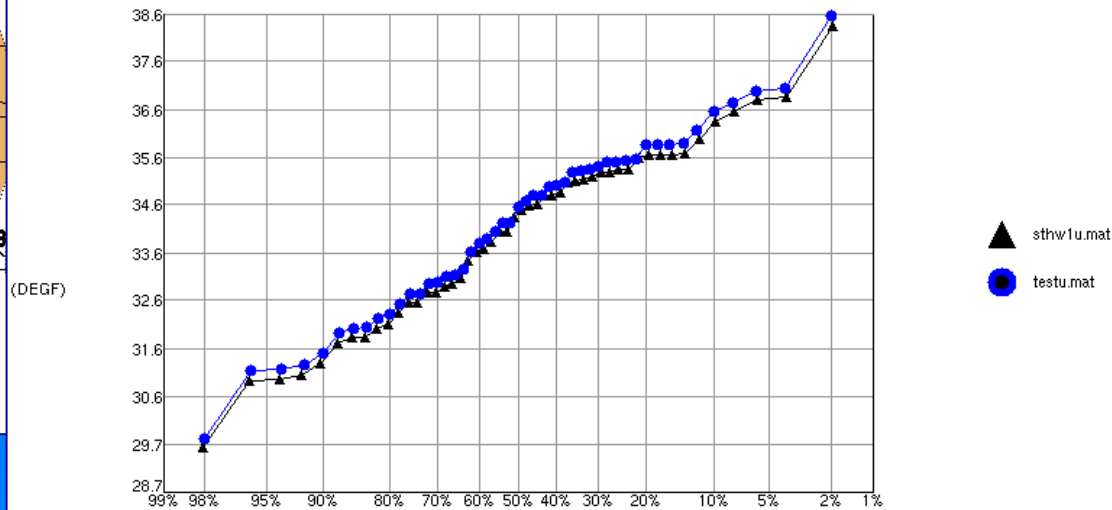




# ESP Pre-Adjustment Technique - Temperature



### March-July Mean Temperatures for STHW1 Climatology vs CPC Adjusted Climatology





# Northwest River Forecast Center www.nwrfc.noaa.gov

## Water

- Forecasts:
  - 0 - 14 Days
  - 14 - 120 Days
  - Water Supply
  - Peak Flow
  - AHPS

- Watch & Warnings
  - Flood Outlook
  - Discussion

- Past Floods
  - River Photos
  - Dambreak
  - Hydrologic Cycle

## Weather

- Snow
- Observations
- Forecasts
- Exp Forecasts
- Temp & Precip
- Forecasts

## Climate

- Climate Forecasts
- Drought
  - Assessment
  - Hazard
  - Assessment
- Indexes
- Monthly Means
- Return Periods

## NWRFC Office

- Information
- Internal Web
- SDM
- Schedule
- Staff
- Employment
- Projects
- Papers
- Presentations
- Contact Us

## Links

- River Centers
- Weather Offices
- NWS Offices

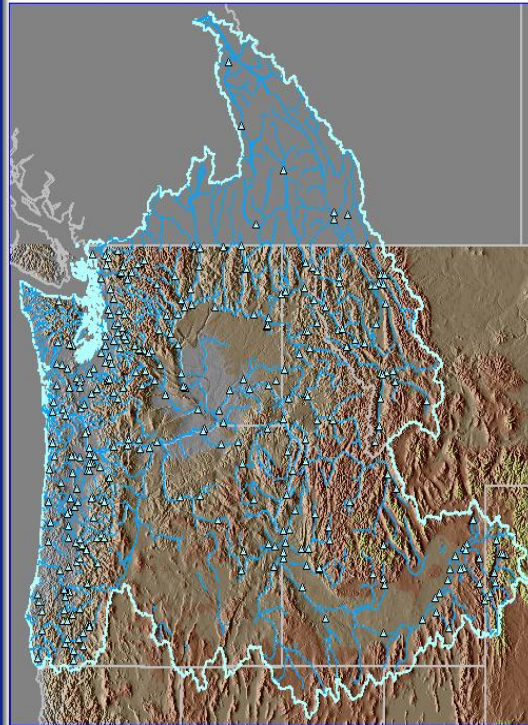
## River Forecasts and Data

Map data updated 09/14,00:08 GMT, 09/13,17:08 PDT.

The following data is preliminary, may contain errors, and is subject to change

Click map on to zoom.  
Click on Select Option for Station Info and Plots.

Click to: Select | Zoom    Zoom to: 1x 4x 8x



### Legend

- Hydrologic Indicator**
- 1 = Normal, 0 = No Data
  - 2 = 80% of Bankfull
  - 3 = 90% of Bankfull
  - 4 = Above Bankfull
  - 5 = Above Flood Stage
  - Observed (Solid)
  - Simulated (Striped)

### Quick Plot

NWS ID:

Plot

### Layers

- Topography
- States
- RFC
- Rivers
- Basins
- Active Basins
- Data Points
- Forecast Points
- Active Points
- Point Labels

Update

--Rivers--    List Stations

National Weather Service  
Northwest River Forecast Center (NWRFC)  
6241 NE 122nd Avenue

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