Overview of MARFC Probabilistic River Forecasts

November 2006

Ned Pryor

Joe Ostrowski

Short and Long Term AHPS Ensemble Products

- 7-day probabilistic products
- 18 test basins….issued daily

- 30-day AHPS products
- 150 points…issued weekly
- Conventional AHPS graphics
- Inflows to reservoirs
- Spring Flood Outlooks

Typical Product

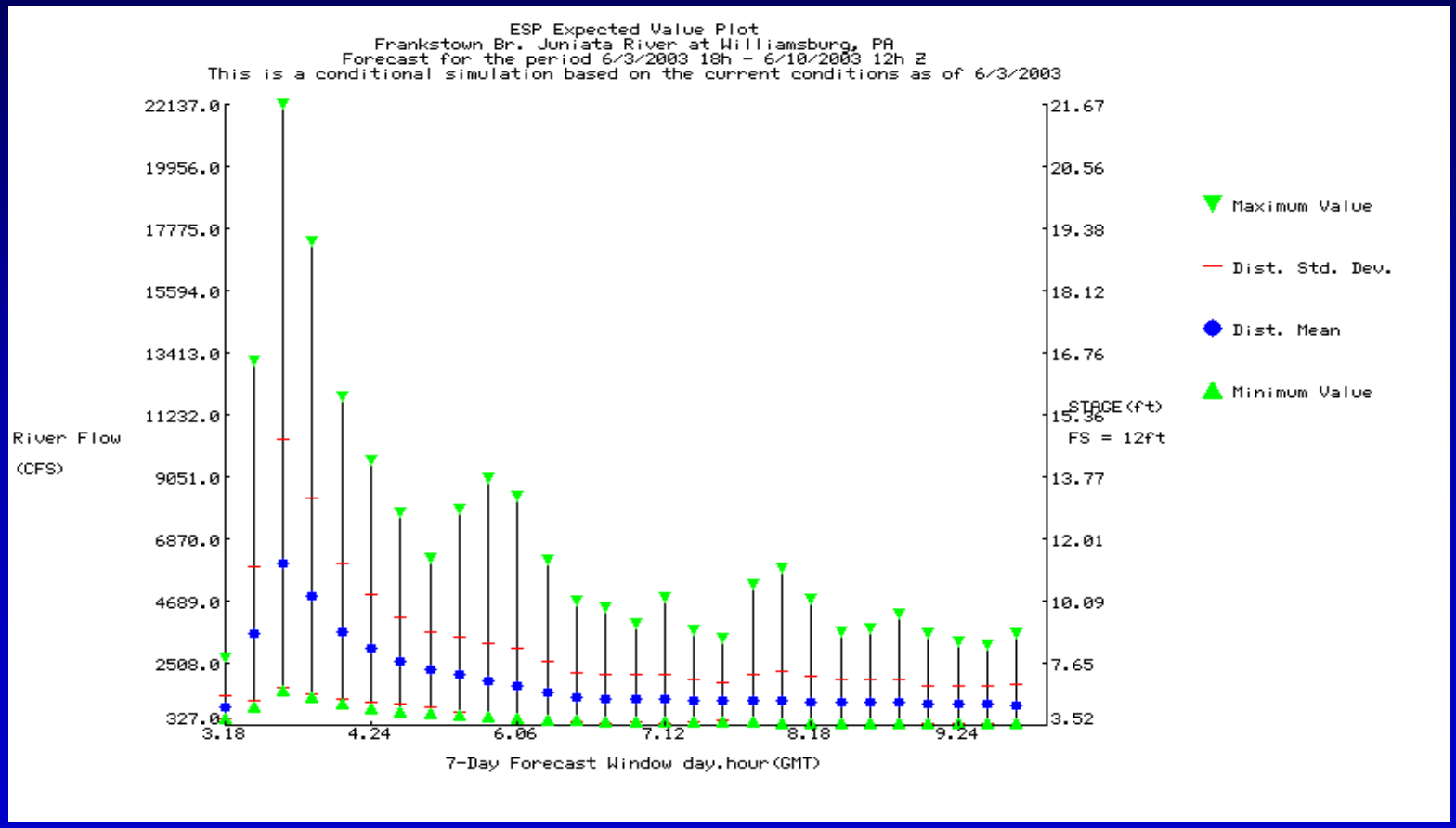
- DAILY RIVER AND LAKE SUMMARY
- NATIONAL WEATHER SERVICE STATE COLLEGE PA
- 953 AM EST THU FEB 10 2005

- : STATION FLOOD 8AM 24-HR 7AM 7AM
- : ID NAME STAGE STAGE CHANGE FORECAST /COMMENTS
- : FRI SAT
- :
- : WEST BRANCH SUSQUEHANNA RIVER

ROVP1: RENOVO 16: 3.3/: 1.1: 5.0/ 4.4/:
LHVP1 : LOCK HAVEN 21: 9.1/: 0.5: 10.2/ 10.0/:
WILP1 : WILLIAMSPORT 20: 4.7/: 1.8: 7.5/ 6.8/:

- :

7-Day Expected Value Plot



7-Day Probabilistic River Forecasts

- Current Basin Conditions
- Short term probabilistic precipitation and temperatures (PQPF/PQTF)
- 48-hour PQPF merged with 5 days of climo
- QPF scenarios based on comparison of historic forecast and observed MAPs
- 3 graphics generated daily for 18 basins in PA-Juniata (CTP) and Schuylkill (PHI) Basins

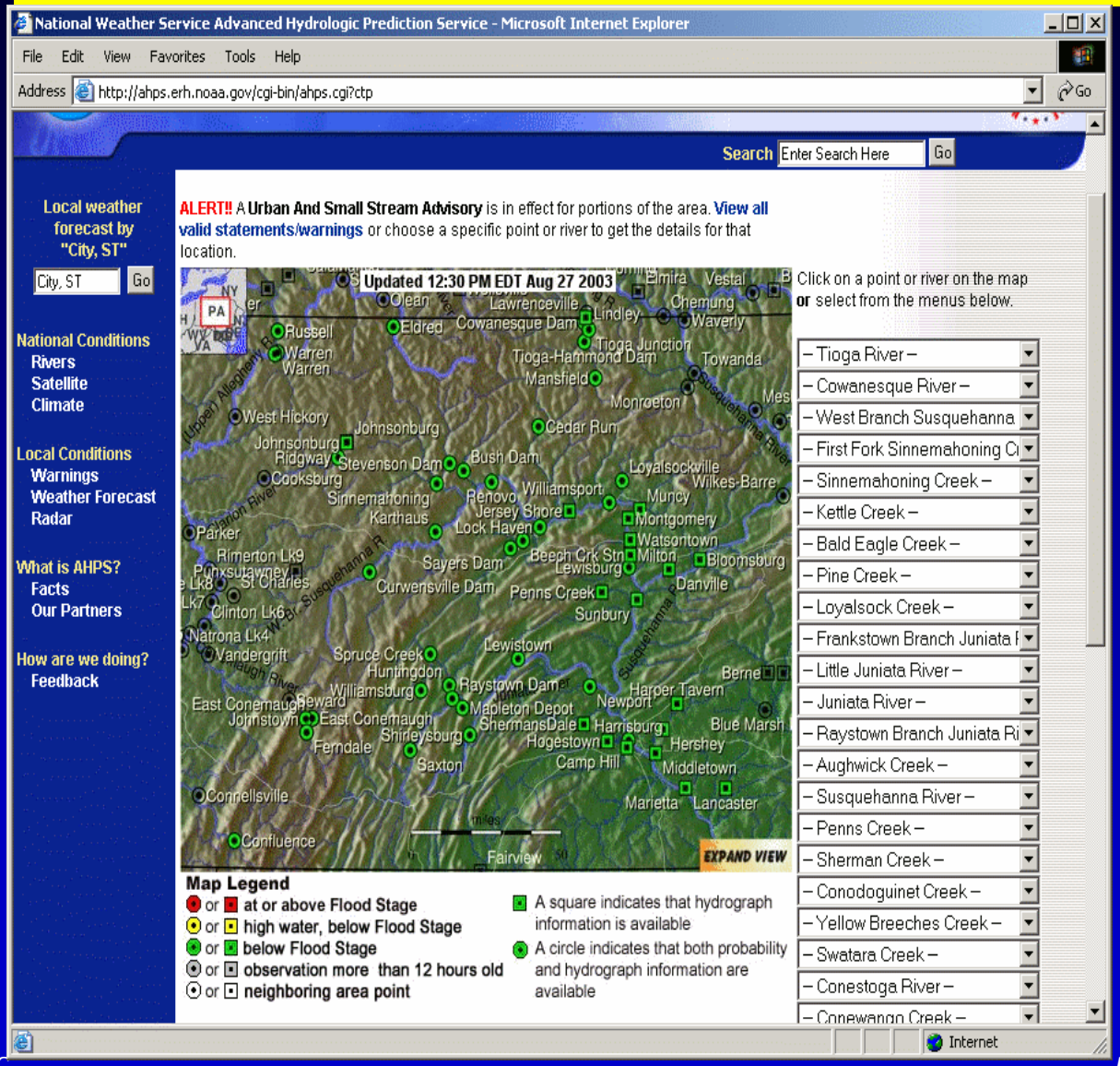
Operational Steps

- Automated process run off cron on Linux workstation
- Transfer mods from operational FGROUP to test FGROUP
- Save Carryover
- Determine and insert start/end dates in PQPF control file

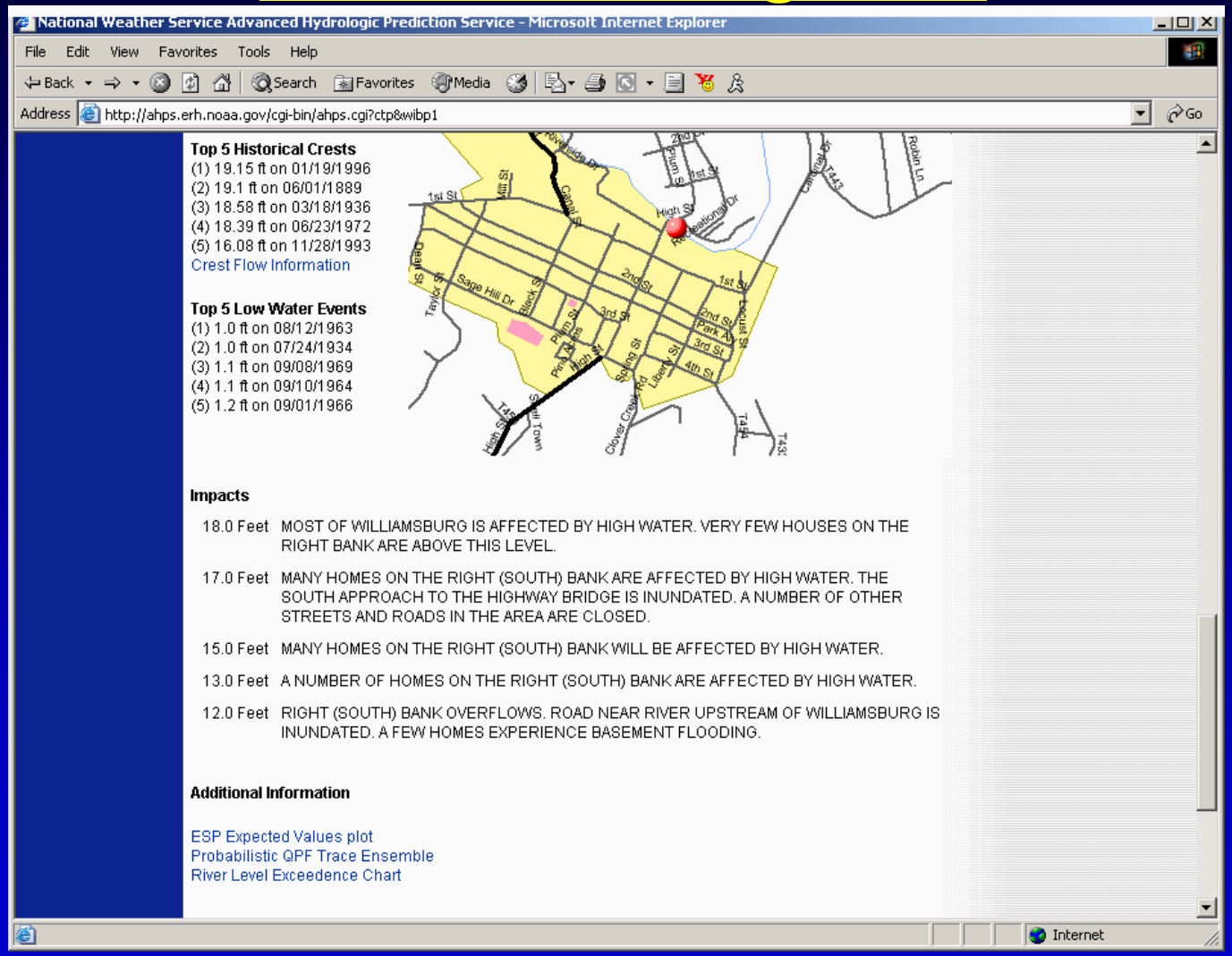
Operational Steps (cont'd)

- Run fcst_ens_compu script to generate PQPF/PQTF time-series
- Run FSCT/ESP for the FGROUP
- Generate 3 ESPADP graphics for each segment using ESPADP in batch mode
- Transfer graphics to ER AHPS server
- Archive

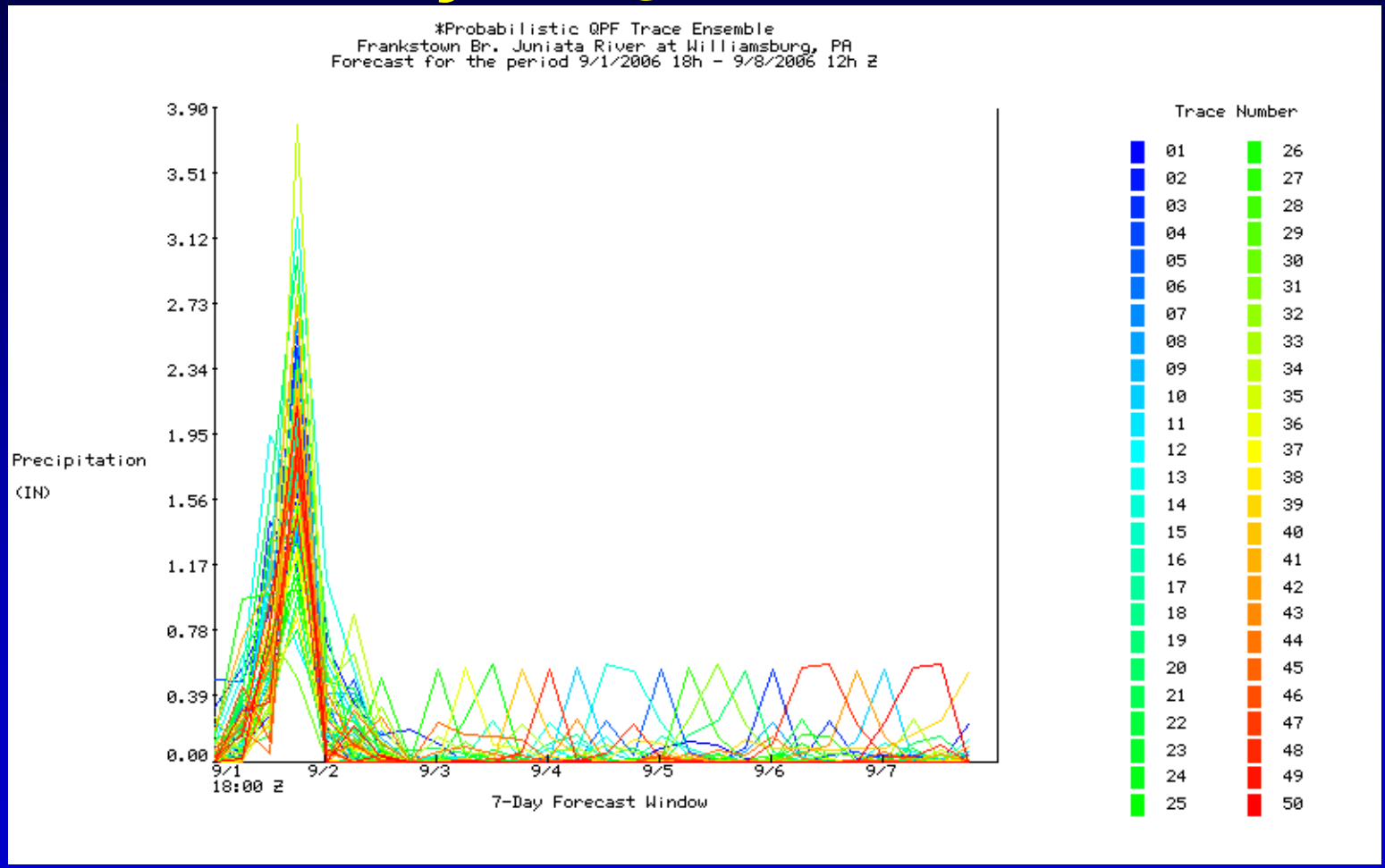
WFO CTP AHPS Page



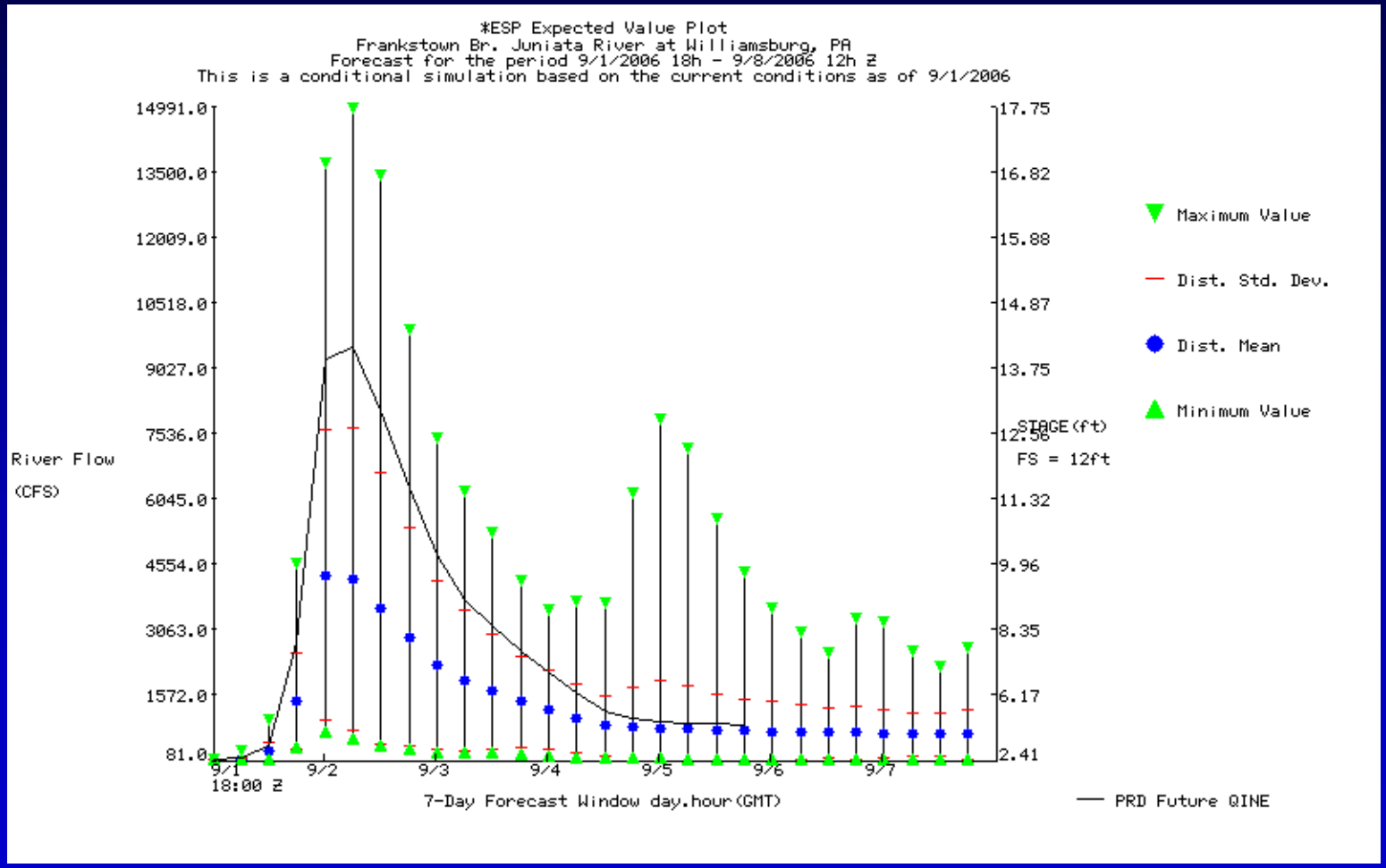
Frankstown Br. Juniata River at Williamsburg, PA



7-Day PQPF Traces



7-Day Expected Value Plot



MARFC GUIDANCE

RIVER STAGE FORECAST
MIDDLE ATLANTIC RIVER FORECAST CENTER
STATE COLLEGE, PA
1052 AM EDT FRI SEP 1 2006

:Williamsburg – Frankstown Branch Juniata River
FLOOD STAGE 12.0

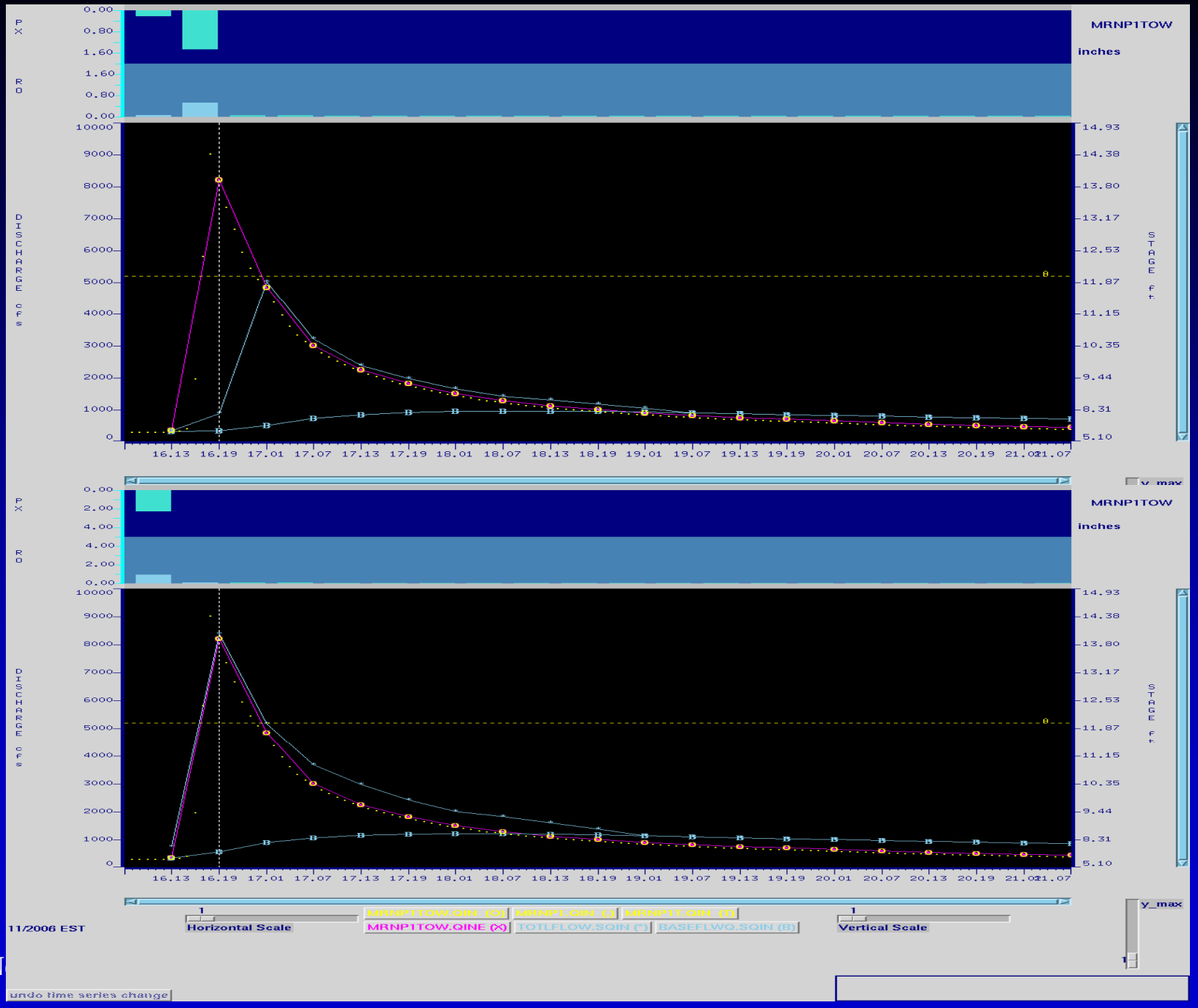
.A :CREST: WIBP1 0902 E DC0609011052/DH20/HGIFFX 14.3
.E WIBP1 0901 E DC0609011052/DH14/HGIFF/DIH6

:QPF FCST	8AM	2PM	8PM	2AM
.E1 :0901: :	:/	2.6/	2.8/	3.9
.E2 :0902:/	8.0/	14.0/	14.3/	13.1
.E3 :0903:/	11.6			

:Remarks CREST 13-15 FT SATURDAY EVENING

Other Uncertainties

- Rainfall Distribution
- Rainfall Intensity
- Snow conditions/melt
- Routings
- Rating Curves


PX
RO
MRNP1TOW
inches
DISCHARGE cfs
STAGE ft
16.13 16.19 17.01 17.07 17.13 17.19 18.01 18.07 18.13 18.19 19.01 19.07 19.13 19.19 20.01 20.07 20.13 20.19 21.01 21.07
v_max
y_max
11/2006 EST
Horizontal Scale
Vertical Scale
MRNP1TOW.QINE (X)
TOTLFLOW.SQIN (*)
BASEFLWQ.SQIN (B)
undo time series change

Next Steps

Verification

- 5 years of archived forecasts
- Hindcasting
- Potential to expand forecasts to other areas

Customer Support

- Continue to solicit feedback from users
- Assist HSAs with explanation of product content and potential utility

Next Steps

SUNY Stony Brook Proposal to OHD
investigate meso scale WRF ensembles as input to hydro models

Lessons Learned

- Short-term probabilistic software runs reliably without forecaster intervention
- 7-day PQPF forecasts are good contingency forecasts
- Help describe a range of outcomes that address “What if…” questions
- Need verification to confirm the validity of the products

Lessons Learned (con't)

- Wide range of potential river responses is not always pleasing…depicts the difficulty in forecasting precipitation
- Current technique does not address significant hydrologic modeling uncertainties
- Probabilistic forecasts seem most useful when there is time for deliberation

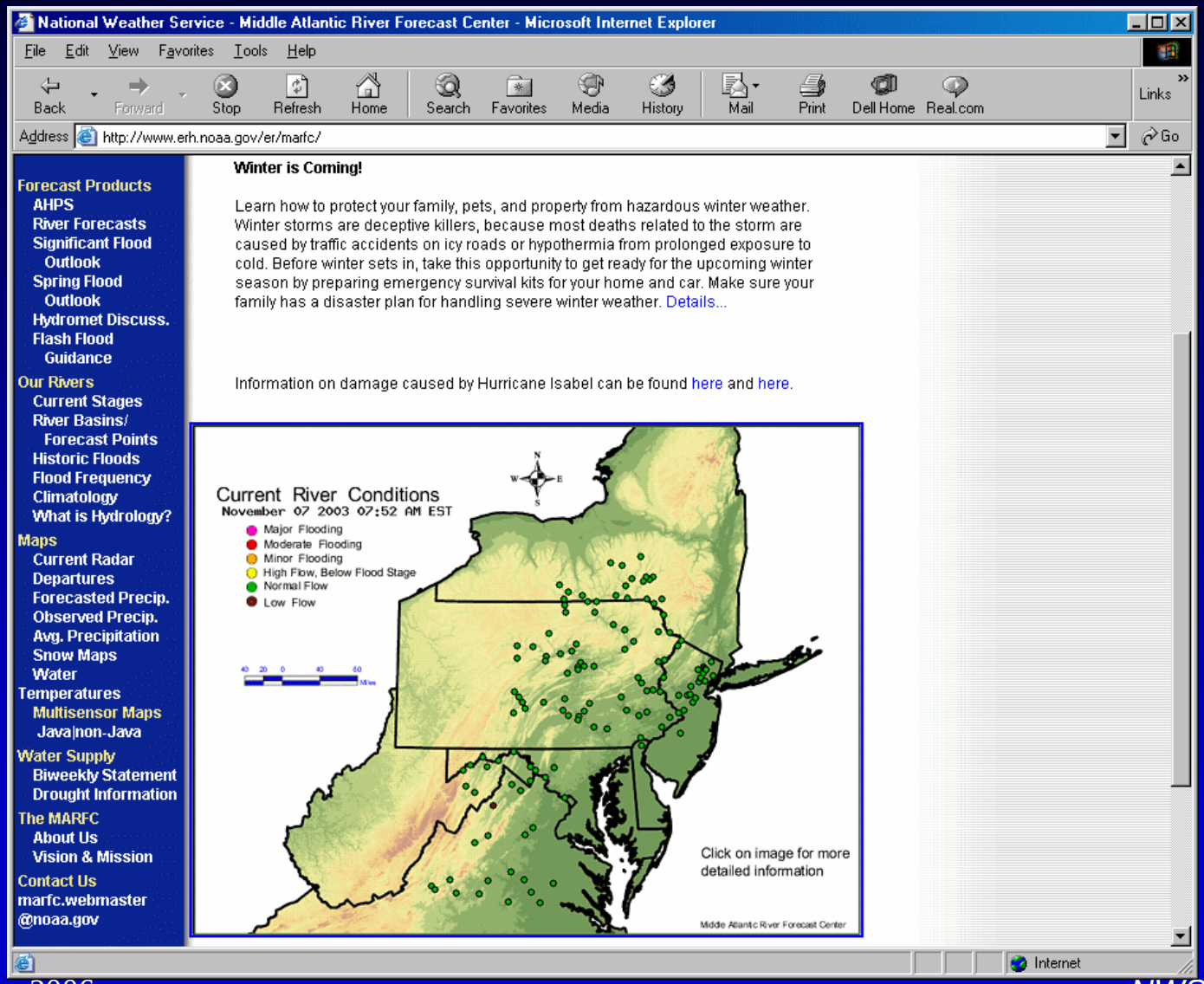
Lessons Learned (con't)

- Limited user feedback in part due to difficulty in finding products on web page
- Specifics of methodology are difficult to convey

Longer Term Probabilistic Forecasts

- Traditional 30-day ESP forecasts
- 150 basins
- 18 reservoir inflow forecasts
- Generated weekly
- "Basic" AHPS requirement
- Spring Flood Outlooks

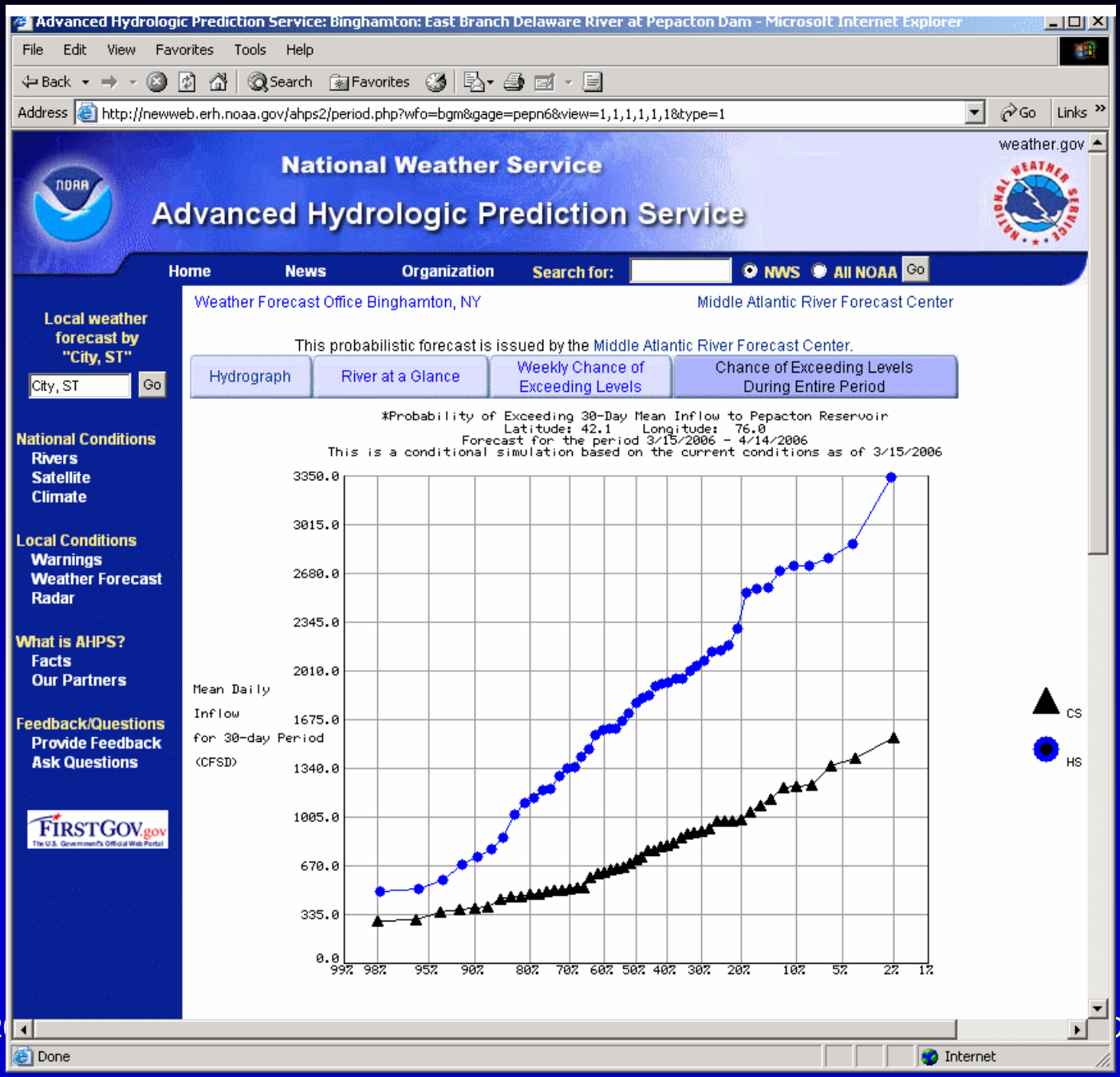
MARFC Home Page



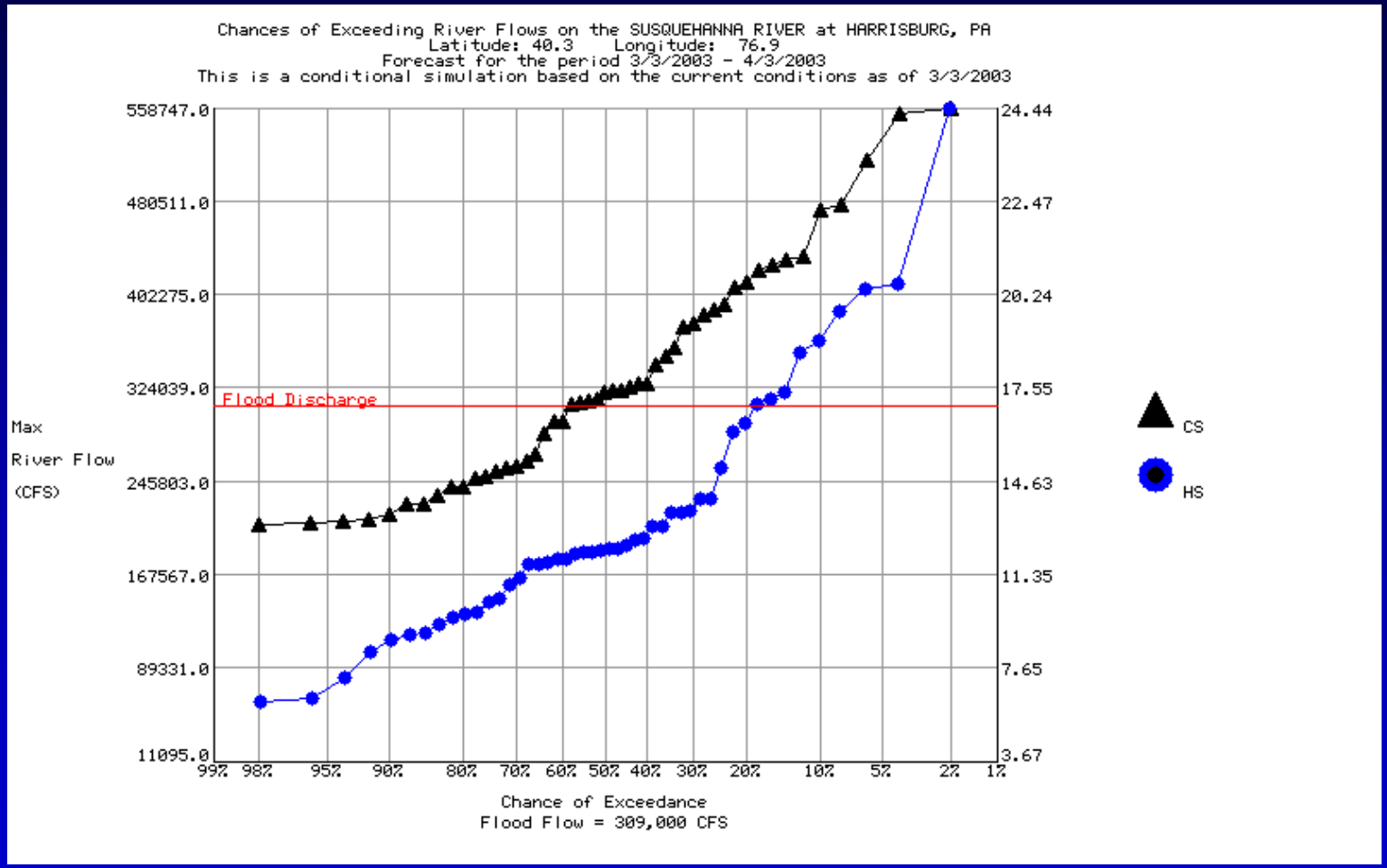
Inflows to Water Supply Reservoirs

- Most widely used product
- Inflows to COE multi-purpose reservoirs
- Inflows to 3 New York City water supply reservoirs
- NYC DEP uses product operationally

New York City Water Supply System

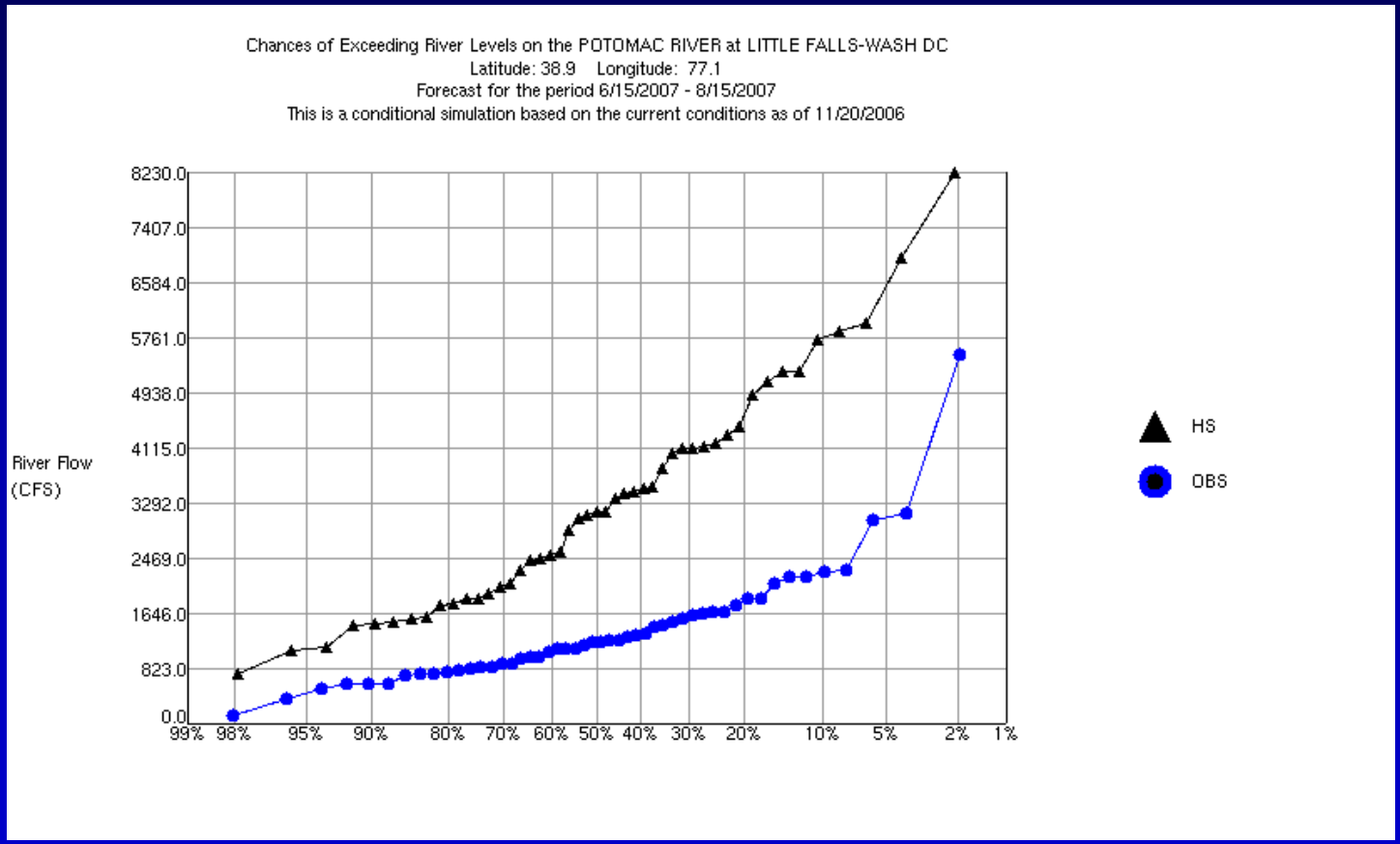

Advanced Hydrologic Prediction Service: Binghamton: East Branch Delaware River at Pepacton Dam - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://newweb.erh.noaa.gov/ahps2/period.php?wfo=bgm&gage=pepn6&view=1,1,1,1,1,1&type=1
Go Links
weather.gov
National Weather Service
Advanced Hydrologic Prediction Service
Home News Organization Search for: NWS All NOAA Go
Local weather forecast by "City, ST"
City, ST Go
National Conditions
Rivers
Satellite
Climate
Local Conditions
Warnings
Weather Forecast
Radar
What is AHPS?
Facts
Our Partners
Feedback/Questions
Provide Feedback
Ask Questions
FIRSTGOV.gov
Weather Forecast Office Binghamton, NY
Middle Atlantic River Forecast Center
This probabilistic forecast is issued by the Middle Atlantic River Forecast Center.
Hydrograph
River at a Glance
Weekly Chance of Exceeding Levels
Chance of Exceeding Levels During Entire Period
*Probability of Exceeding 30-Day Mean Inflow to Pepacton Reservoir
Latitude: 42.1 Longitude: 76.0
Forecast for the period 3/15/2006 - 4/14/2006
This is a conditional simulation based on the current conditions as of 3/15/2006
Mean Daily Inflow for 30-day Period (CFSD)
3350.0
3015.0
2680.0
2345.0
2010.0
1675.0
1340.0
1005.0
670.0
335.0
0.0
99% 98% 95% 90% 80% 70% 60% 50% 40% 30% 20% 10% 5% 2% 1%
CS
HS
Done
Internet

Spring Flood Potential Outlook



Low Flow Forecasting

Low Flow Simulations



Lessons Learned

- 30-day reservoir inflow product most widely used probabilistic product
- Low-flow products are frequently requested
- Error model post processing may be the tool for improved low flow forecasts