



National WFO River Flood Warning Verification and Forecast Services Verification

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Second RFC Verification Workshop - November 2008

Outline

- WFO River Flood Warning Verification
 - Objective and Background
 - Link between WFO River Flood Warning Verification and RFC Forecast Verification
 - Metrics
 - Logic Tree
 - Limitations
 - Demonstration
 - FY07 Preliminary findings
 - Next steps
- Forecast Services Verification
 - Need to populate and maintain IHFS Services Tables (10-914)
 - Other Measures



WFO River Flood Warning Verification

Objective and Background

- **Objective:** To provide national metrics of river flood warning lead time and accuracy similar to flash flood metrics
- **Background:**
 - Hydrology Program committed to providing national metrics of river flood warning lead time and accuracy in both PPBES and OMB PART
 - The implementation of VTEC/HVTEC provided the data necessary to create a single source river flood warning verification system
 - OCWWS HSD and Regions coordinated on the requirements for the river flood warning verification system in Q2 FY08
 - The OCWWS Performance and Awareness Branch began archiving all FLW's (and all other products with the same WMO header) since October 1, 2007.
 - The OCWWS Performance and Awareness Branch delivered a prototype system September 2008



WFO River Flood Warning Verification

Link between River Flood Warning Verification and River Forecast Verification

- Currently these two systems are unlinked
 - The WFO River Flood Warning Verification prototype specifically addresses river flood WARNING verification.
 - The NWS River Forecast Verification Plan is focused on river FORECAST verification.



WFO River Flood Warning Verification

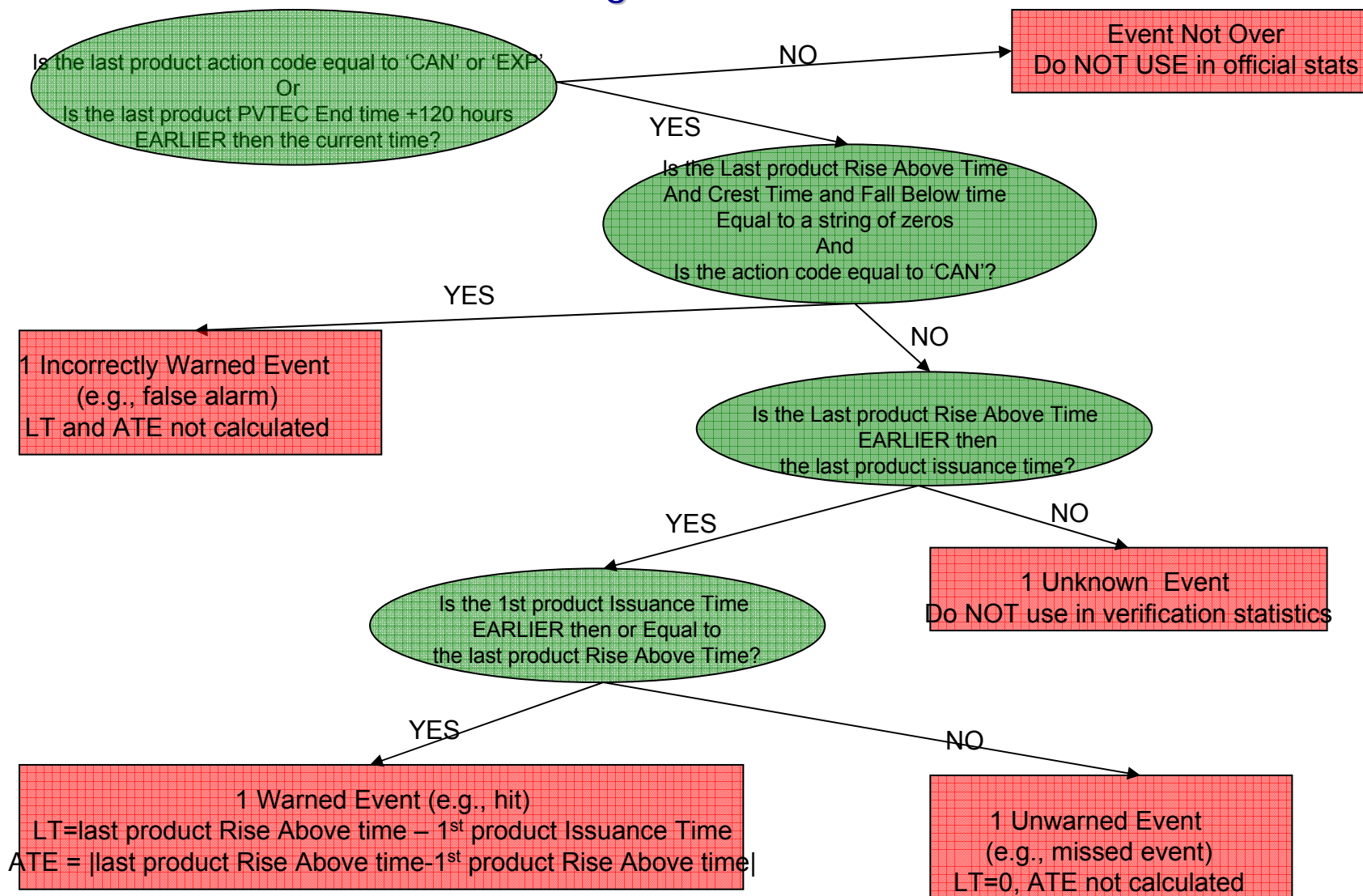
Metrics and System Requirements

- Metrics
 - Probability of Detection
 - False Alarm Ratio
 - Critical Success Index
 - Lead Time
 - Absolute Timing Error
- Metric Stratification
 - by Time (day, multiple days, month, multiple months, year)
 - by location (point, groupings of points, WFO, RFC, Region, National)
 - by Typical River Response (slow, medium, fast)



WFO River Flood Warning Verification

Logic Tree



WFO River Flood Warning Verification

Limitations

- Observations Issues
 - Quality Control of Observations - same level of WHFS QC applied prior to product issuance. Some QC automated with data ingest.
 - No Observation – event not included in metric
 - Reporting Frequency - system captures verification statistics for all locations where observations are available. However, we will only report statistics for those sites where the observational frequency is sufficient to assure the integrity of the verification data.
- Underestimates missed events.
- Prototype is still being tested – errors are likely
- Database incomplete – Currently only includes points that have river response classification and are in the HADS database



WFO River Flood Warning Verification

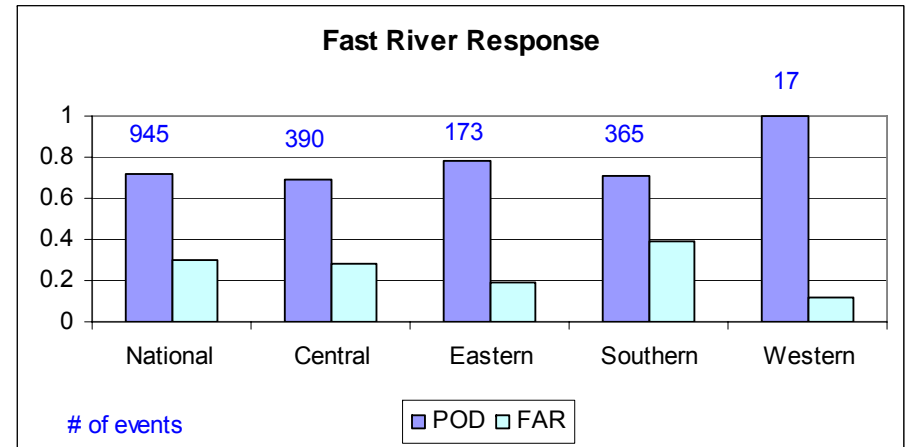
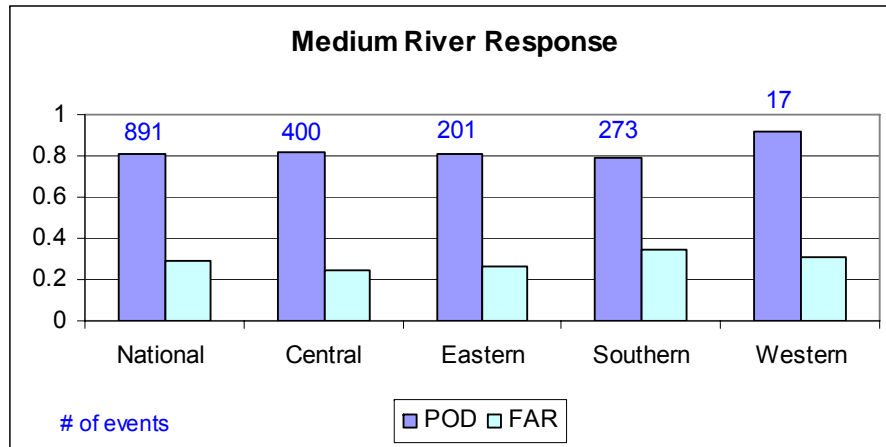
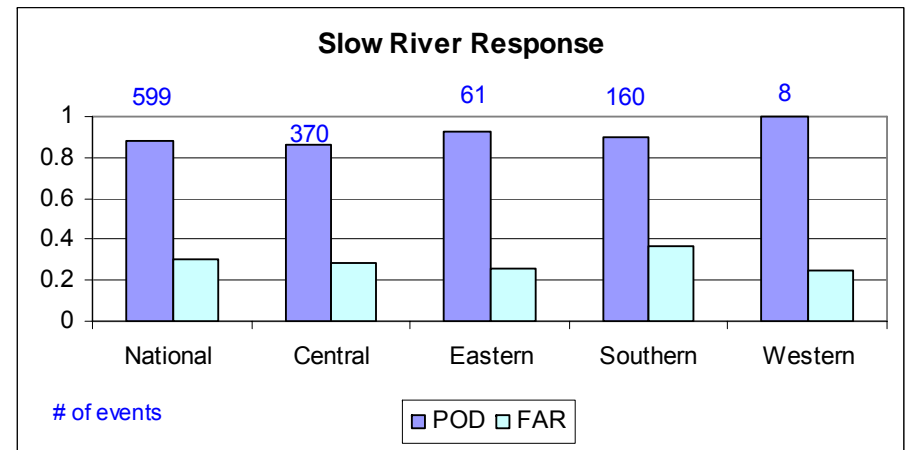
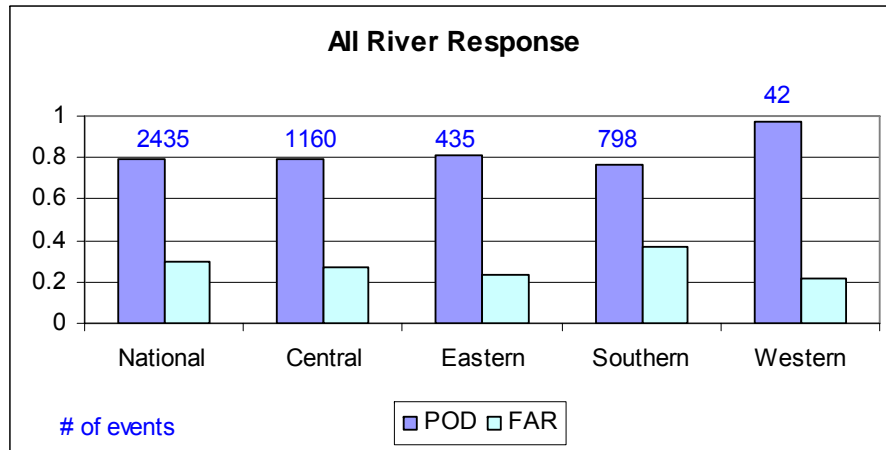
Demonstration

Demonstration



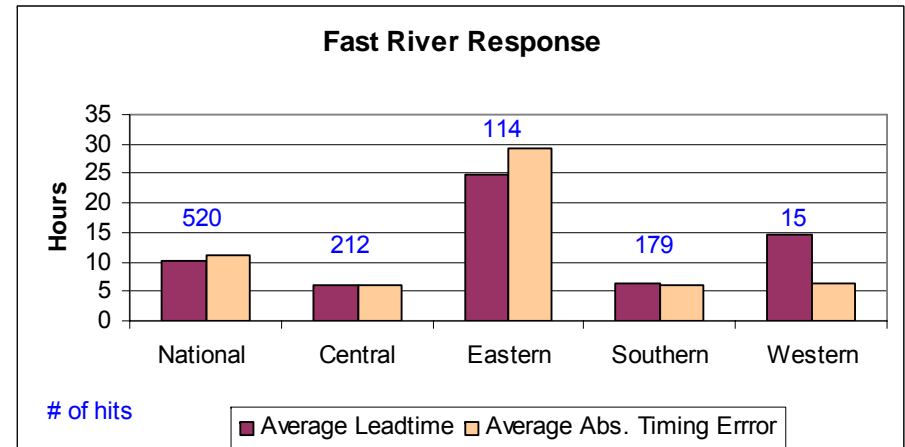
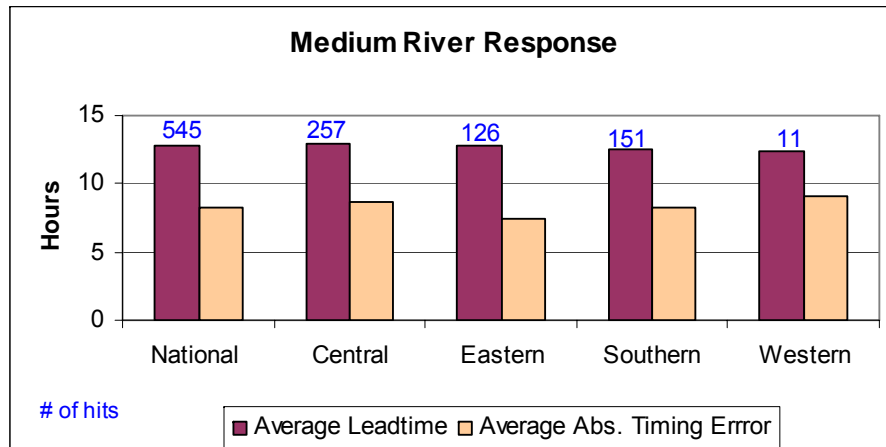
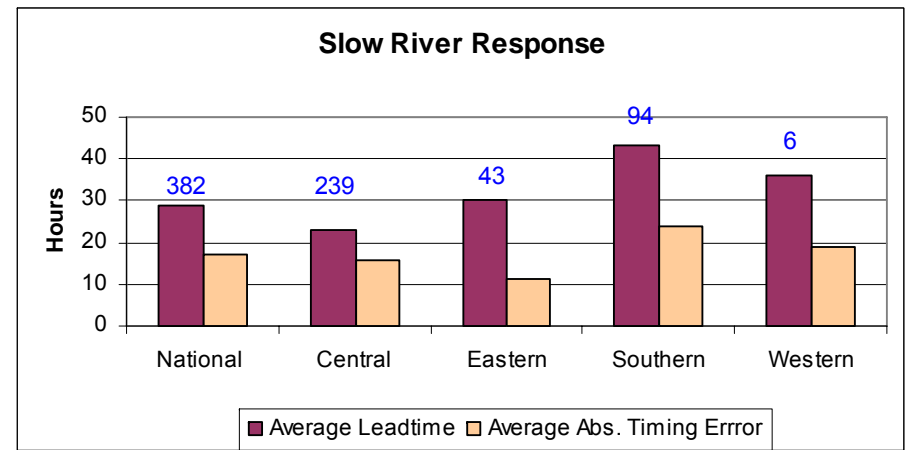
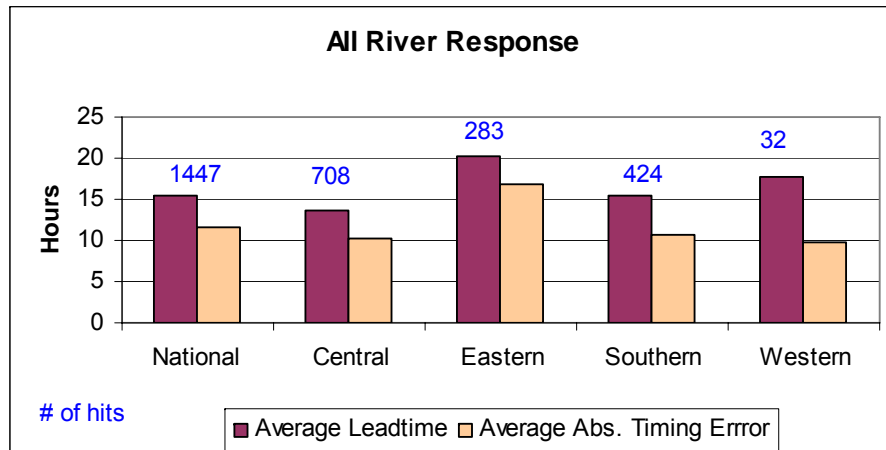
WFO River Flood Warning Verification

FY2007 Preliminary Results



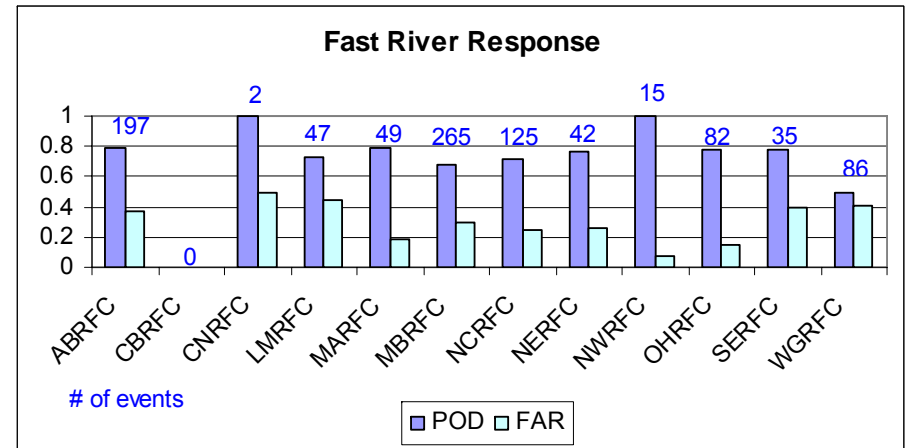
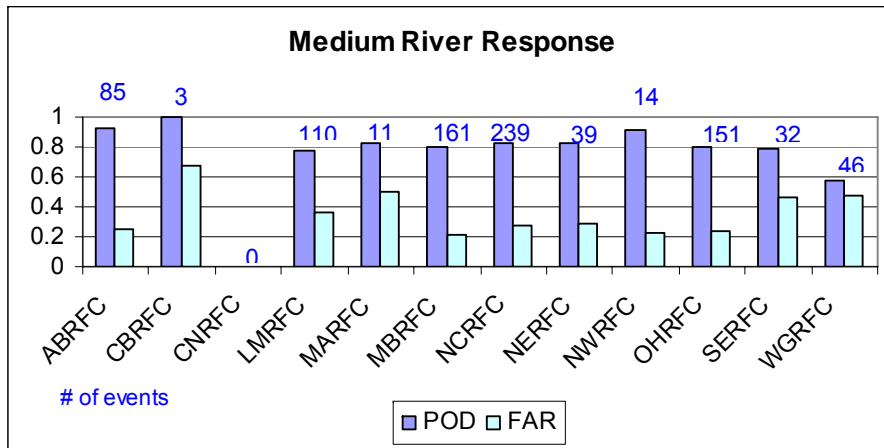
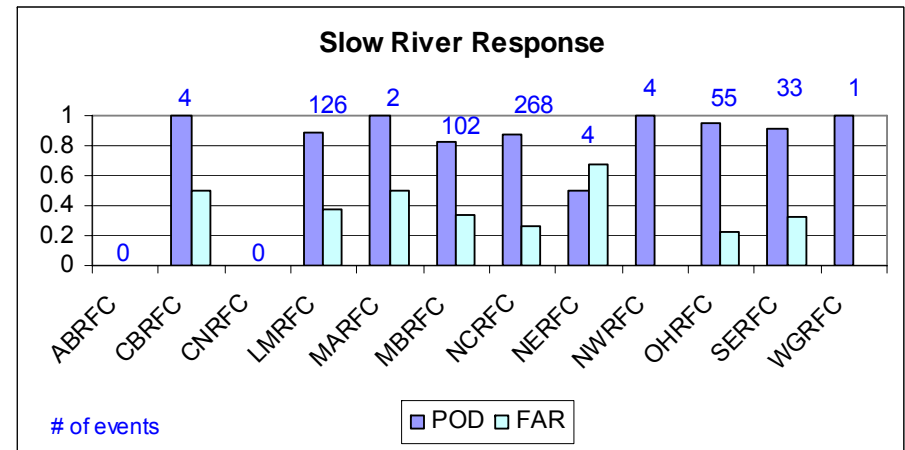
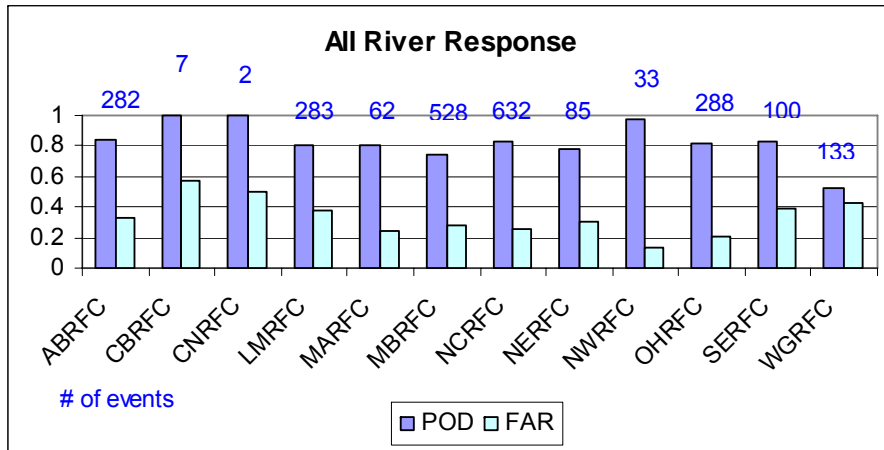
WFO River Flood Warning Verification

FY2007 Preliminary Results



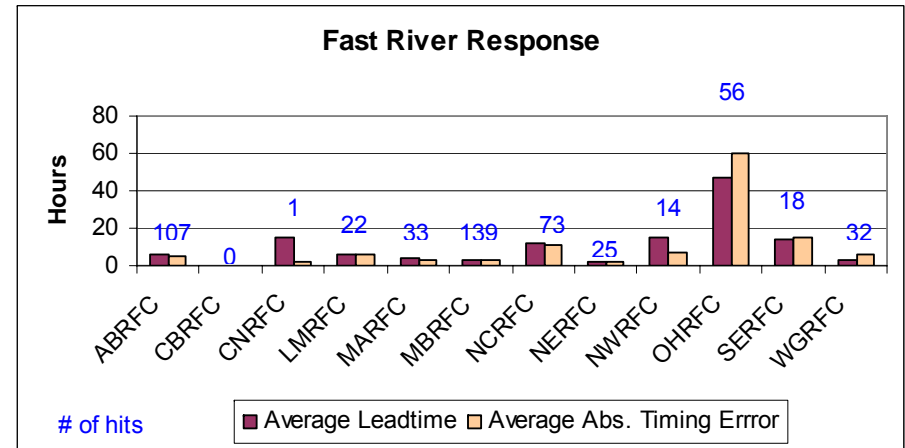
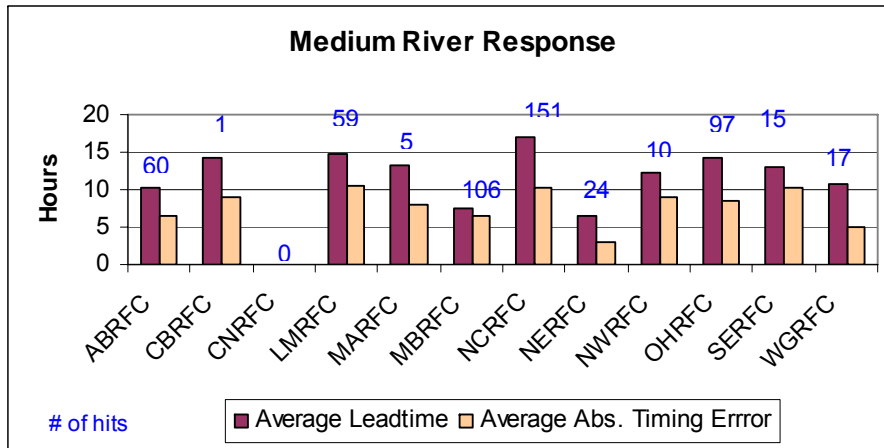
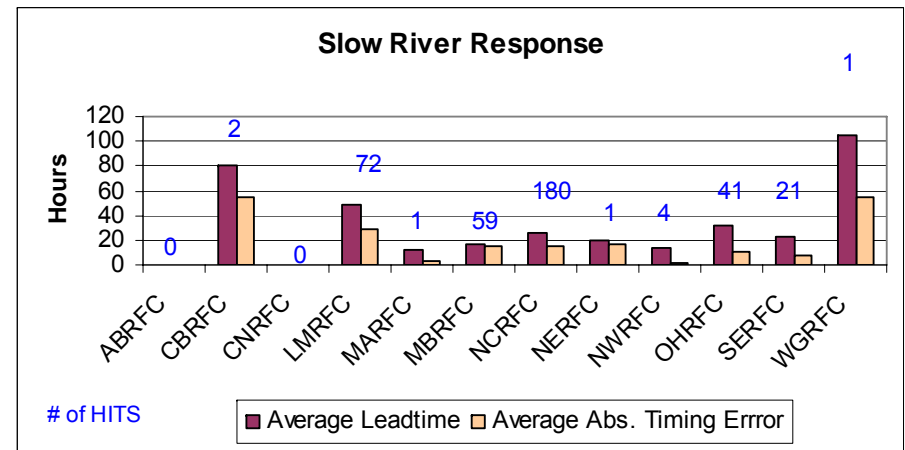
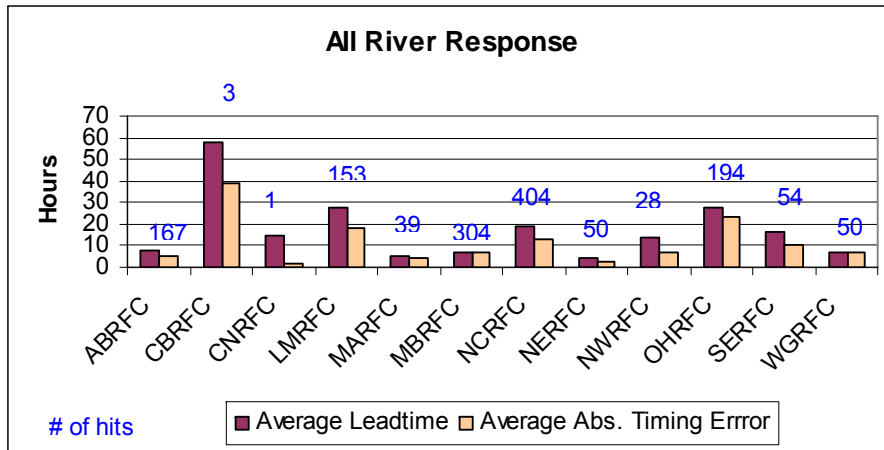
WFO River Flood Warning Verification

FY2007 Preliminary Results



WFO River Flood Warning Verification

FY2007 Preliminary Results



WFO River Flood Warning Verification

Next Steps

- Expand Interface to get detailed reports of events
- Expand database - Each flood warning location must have a classified river response and an observation reporting frequency
- Rigorous Testing
- Develop River Flood Warning Lead Time and Accuracy performance goals



Forecast Services Verification

- Forecast Services measure what hydrologic services the NWS provides; where these services are provided; and how often.
- The types of forecast services include:
 - **Data Point Service:** all locations on a river/stream for which observed data is input to RFC or WFO hydrologic forecast procedures, or included in public hydrologic products.
 - **Deterministic Forecast Service:** all forecast points for which a single-value forecast is produced
 - **Ensemble Forecast Service:** all forecast points for which ensemble forecasting is used to generate forecasts and associated uncertainty information.
 - **Water Supply Forecast Service:** all forecast points for which water supply forecasts are provided



Forecast Services Verification

- These four Forecast Services tables (Data Point Service, Deterministic Forecast Service, Ensemble Forecast Service, Water Supply Forecast Service) are included in OB8.1 IHFS-DB
- RFC personnel will be responsible for populating and maintaining all forecast services information for each lid in the RFC area of responsibility



Forecast Services Verification

- Forecast Services Policy
 - Proposed Policy 10-924 requiring RFC to populate and maintain services field in the IHFS-DB for all data and forecast points
- National River Location DataBase (NRLDB)
 - Forecast Services tables pulled from RFCs and combined with WFO E-19 and E-19a information



Other Logistical Verification Measures

- Characterizing point forecasts by service type, frequency and location (Forecast Services)
- Characterizing areal forecasts by service type, frequency and location
- Identifying daily the number of issued forecasts by type and location
- Quantifying the person effort required to set up a basin for forecasting, including data gathering, calibration, model setup and implementation efforts
- Quantifying the person effort required to issue each type of forecast, including manual quality control of input data, forecaster run-time modifications and forecaster review and analysis
- Quantifying the timeliness of issued forecasts

Goal is to standardize and automate the collection of these measures



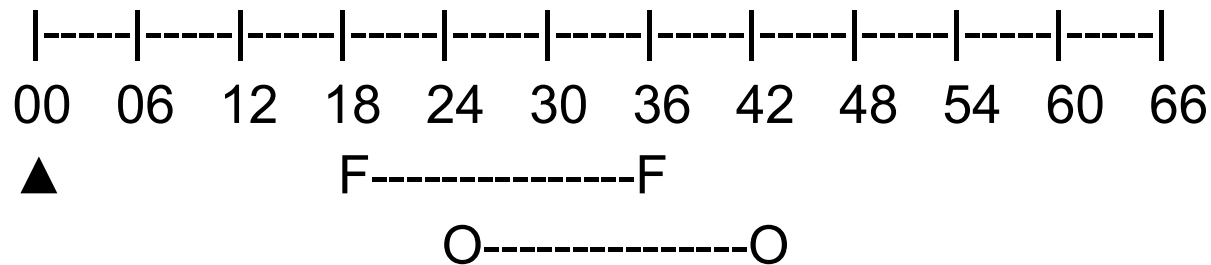


Any Questions?



Scenarios

- **Scenario 1:** River point flood warning where flood stage is exceeded during the valid time.



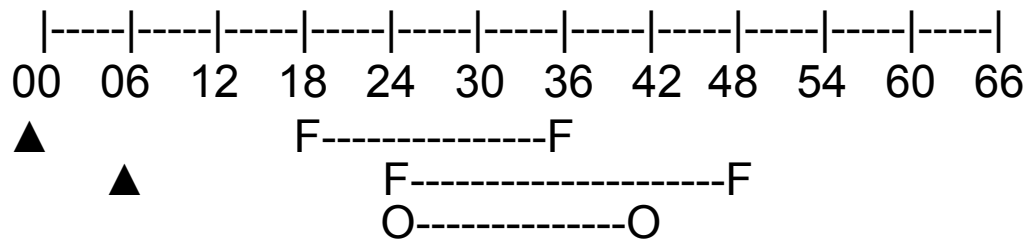
FLW (issued at 00, forecast rise above at 18, fall below at 36)
Flood Observed (observed rise above at 24, fall below at 42)

- **Verification Results:**
 - 1 warned event (hit)
 - Lead Time = 24 hours
 - Absolute Timing Error = 6 hours = $|24-18|$



Scenarios

- **Scenario 2.** River point flood warning and extension where flood stage is exceeded during the valid time.



FLW (issued at 00, forecast rise above at 18, fall below at 36)

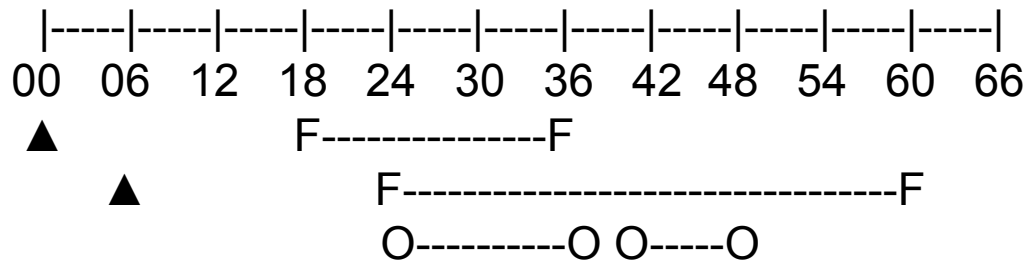
EXT (issued at 06, forecast rise above at 24, fall below at 48)

Flood Observed (observed rise above at 24, fall below at 42)

- **Verification Results:**
 - 1 warned event (hit)
 - Lead Time = 24 hours
 - Absolute Timing Error = 6 hours = $|24-18|$

Scenarios

- **Scenario 3.** River point flood warning and extension where flood stage is exceeded during the valid time.



FLW (issued at 00, forecast rise above at 18, fall below at 36)

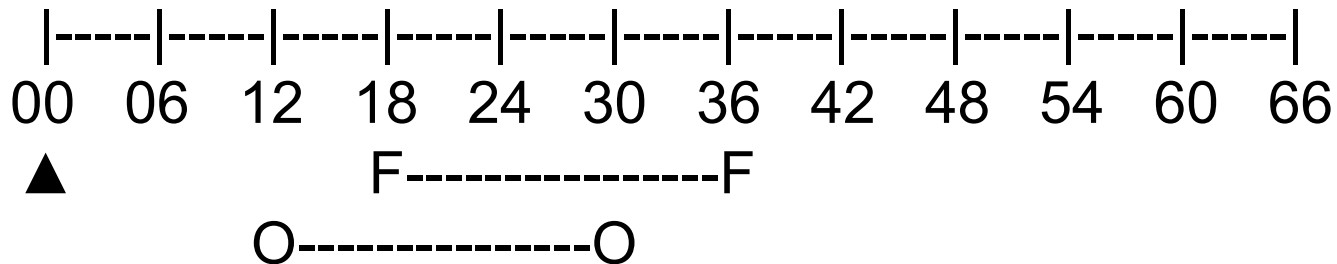
EXT (issued at 06, forecast rise above at 24, fall below at 60)

Flood Observed (observed rise above at 24, fall below at 36 second rise above at 40, fall below at 48)

- Verification Results:
 - 1 warned event (hit)
 - Lead Time = 24 hours
 - Absolute Timing Error = 6 hours = $|24-18|$
- **Bottom line:** 1ETN → 1 VTEC event → 1 Flood event in new river flood warning verification system

Scenarios

- **Scenario 4.** River point flood warning where flood stage is exceeded during the valid time but before the forecast rise above flood stage.

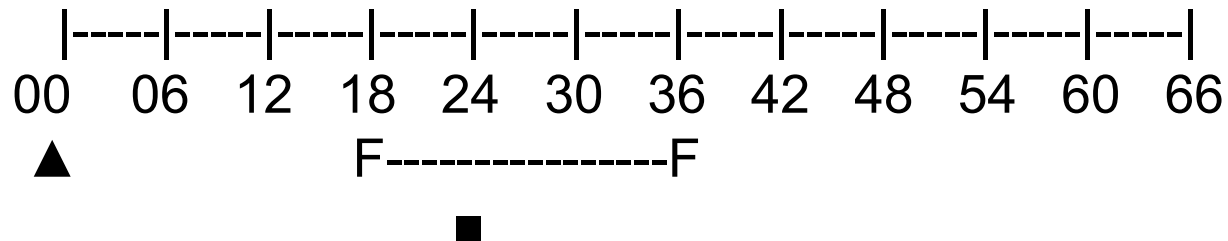


FLW (issued at 00, forecast rise above at 18, fall below at 36)
Flood Observed (observed rise above at 12, fall below at 30)

- **Verification Results:**
 - 1 warned event (hit)
 - Lead Time = 12 hours
 - Absolute Timing Error = 6 hours = $|12-18|$

Scenarios

- **Scenario 5.** River point flood warning with observation never going above flood stage.



FLW (issued at 00, forecast rise above at 18, fall below at 36)

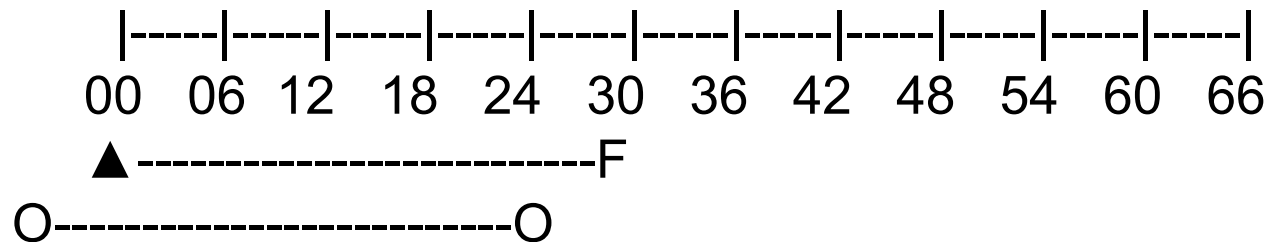
No Flood Observed

CAN issued at 24 with new forecast below flood stage

- **Verification Results:**
 - 1 flood warning not verified (false alarm)
 - Absolute Timing Error not calculated
- **Bottom Line:** CAN or EXP is required to determine false alarms

Scenarios

- **Scenario 6.** River point flood warning issued after observation exceeds flood stage.



FLW issued at 00

Flood Observed (observed rise above at -6, fall below at 24)

- **Verification Results:**
 - 1 missed event
 - Lead Time = 0
 - Absolute Timing Error not calculated
- **Bottom Line:** If observed rise above is less than or equal to product issuance time, will count as missed event.