

NCRFC VERIFICATION CASE STUDY

**Presented at Second RFC
Verification Workshop
November 18-20, 2008
Salt Lake City, UT**

4 Locations

Cedar / Iowa Rivers

3 study questions:

1. Official Forecast Error 2007-2008
2. June 2008 record flooding
3. QPF max/min ensemble errors

Verification Statistics for Cedar River at :

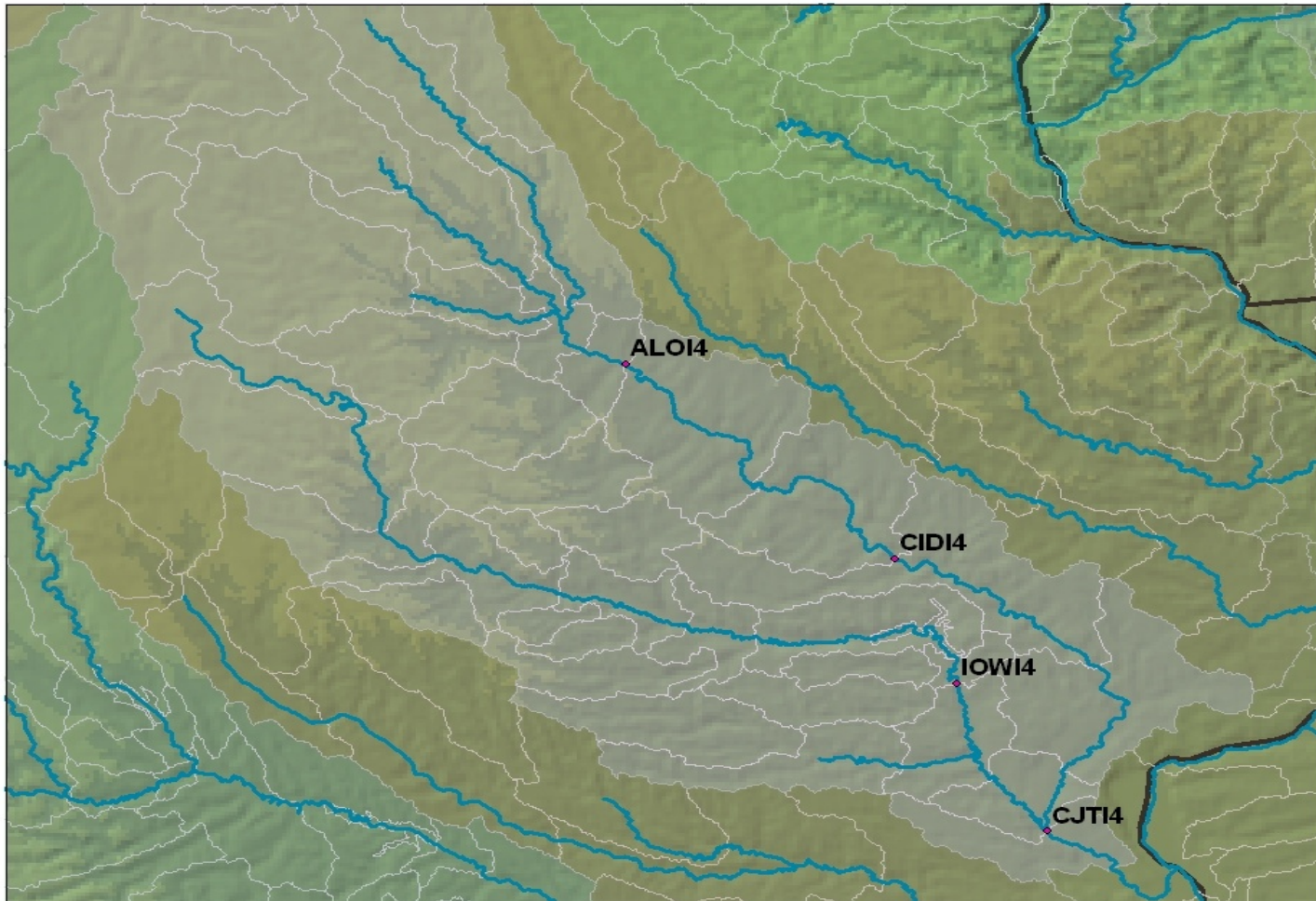
Waterloo, IA (ALO14)

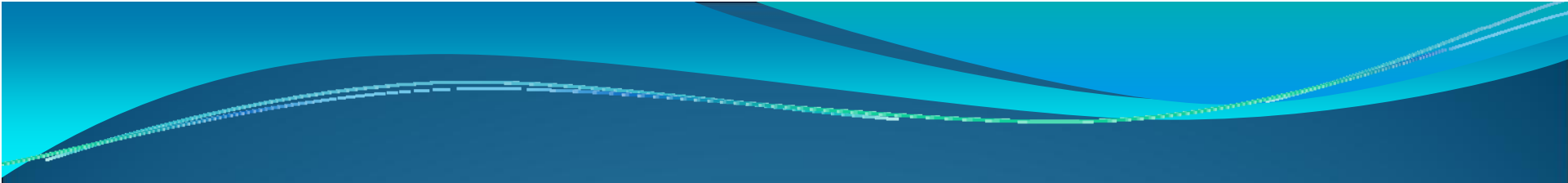
Cedar Rapids, IA (CIDI4)

Iowa River at:

Columbus Junction, IA (CJTI4)

Iowa City, IA (IOWI4)



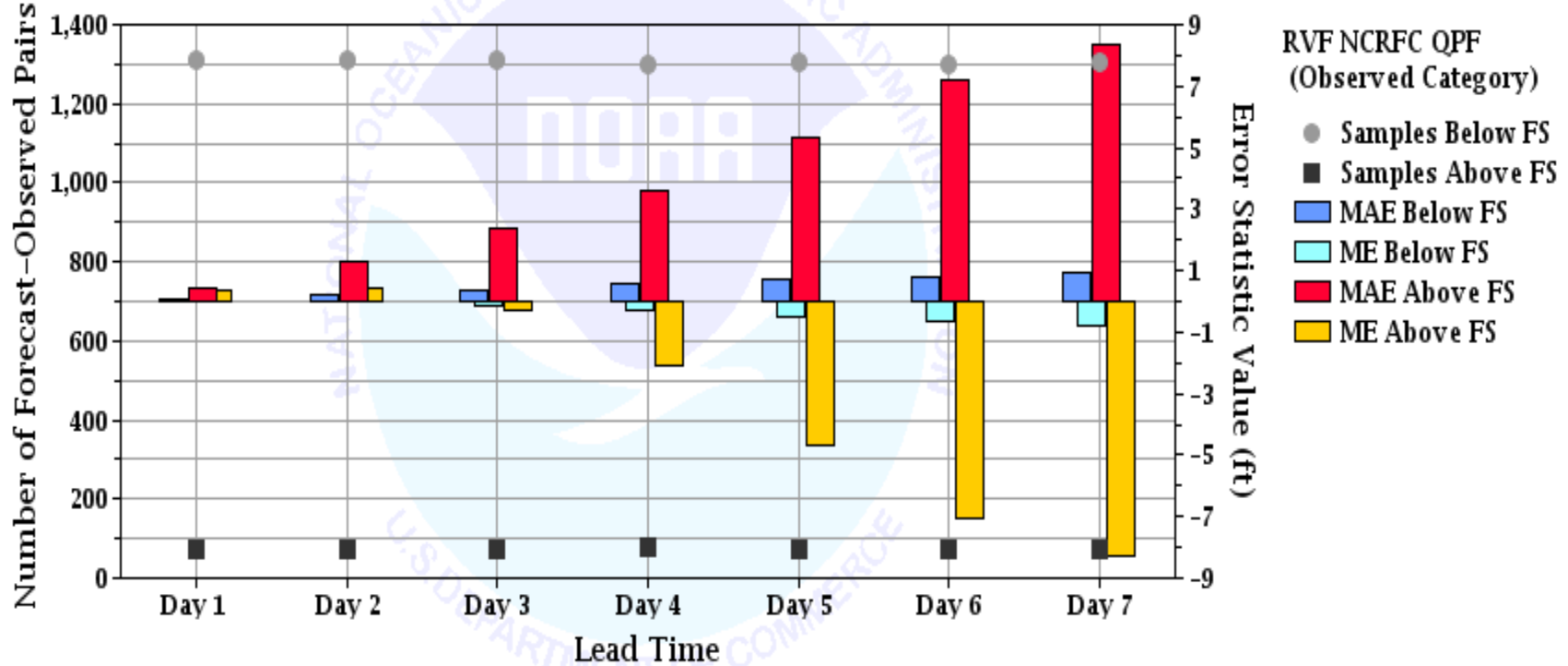


Case 1. Error Statics for NCRFC Forecasts Days 1 - 7

June 1, 2007 to September 30, 2008

Error Statistics for Above and Below FS for Period of record (June 2007-September 2008) at ALOI4

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
Compared Over Observed Category
Time Period: 2007-06-01 00:00:00 GMT - 2008-09-30 23:59:59 GMT
Lead times: 0 hours - 168 hours
Locations: ALOI4



Error Statistics for Above and Below FS for Period of record (June 2007-September 2008) at CIDI4

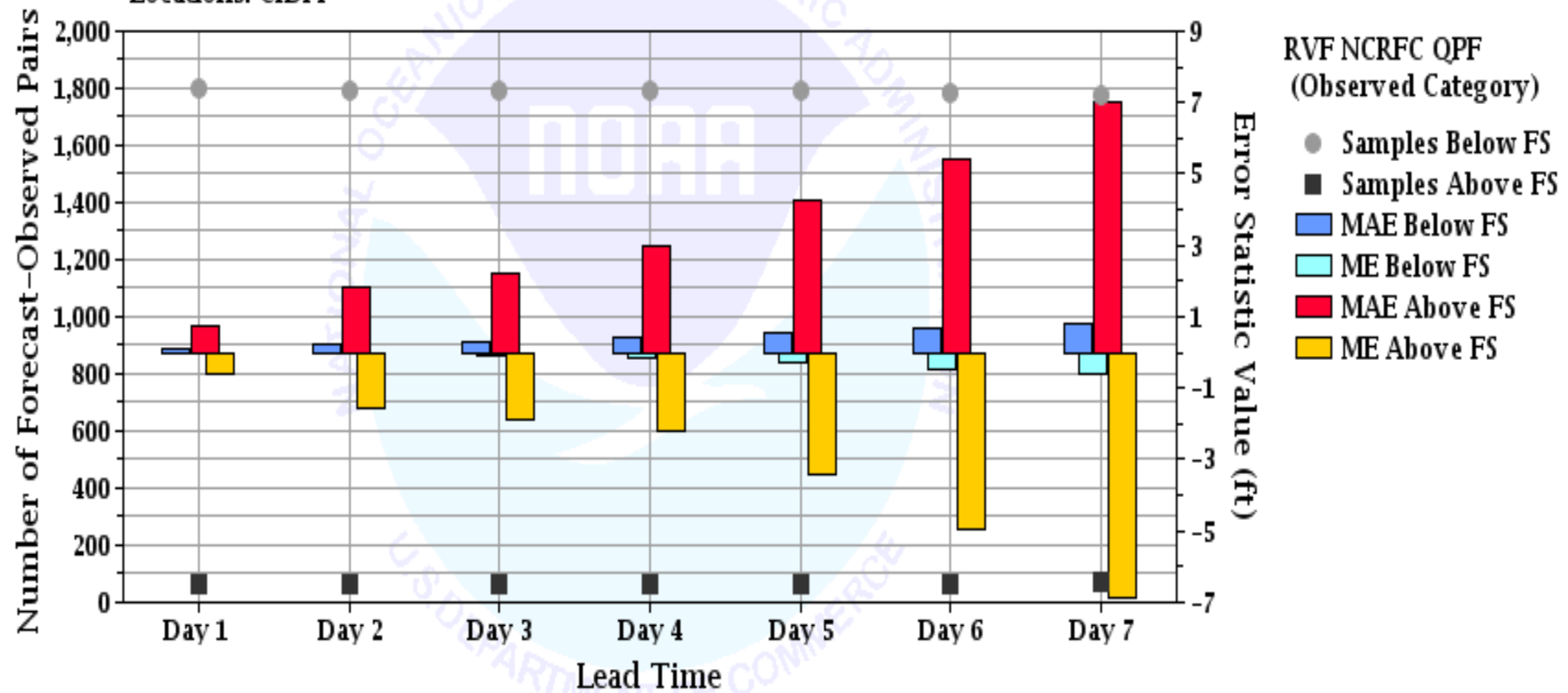
Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC

Compared Over Observed Category

Time Period: 2007-06-01 00:00:00 GMT - 2008-09-30 23:59:59 GMT

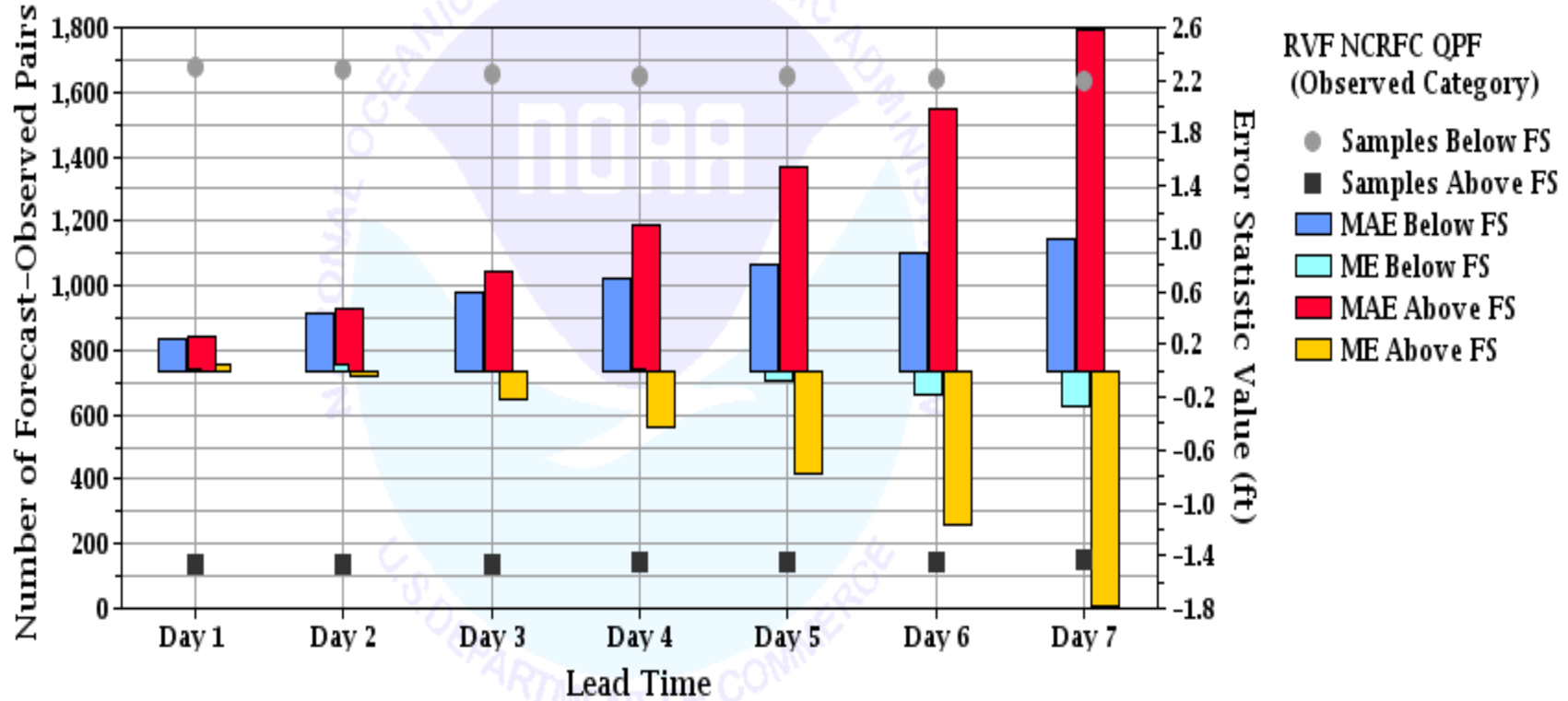
Lead times: 0 hours - 168 hours

Locations: CIDI4



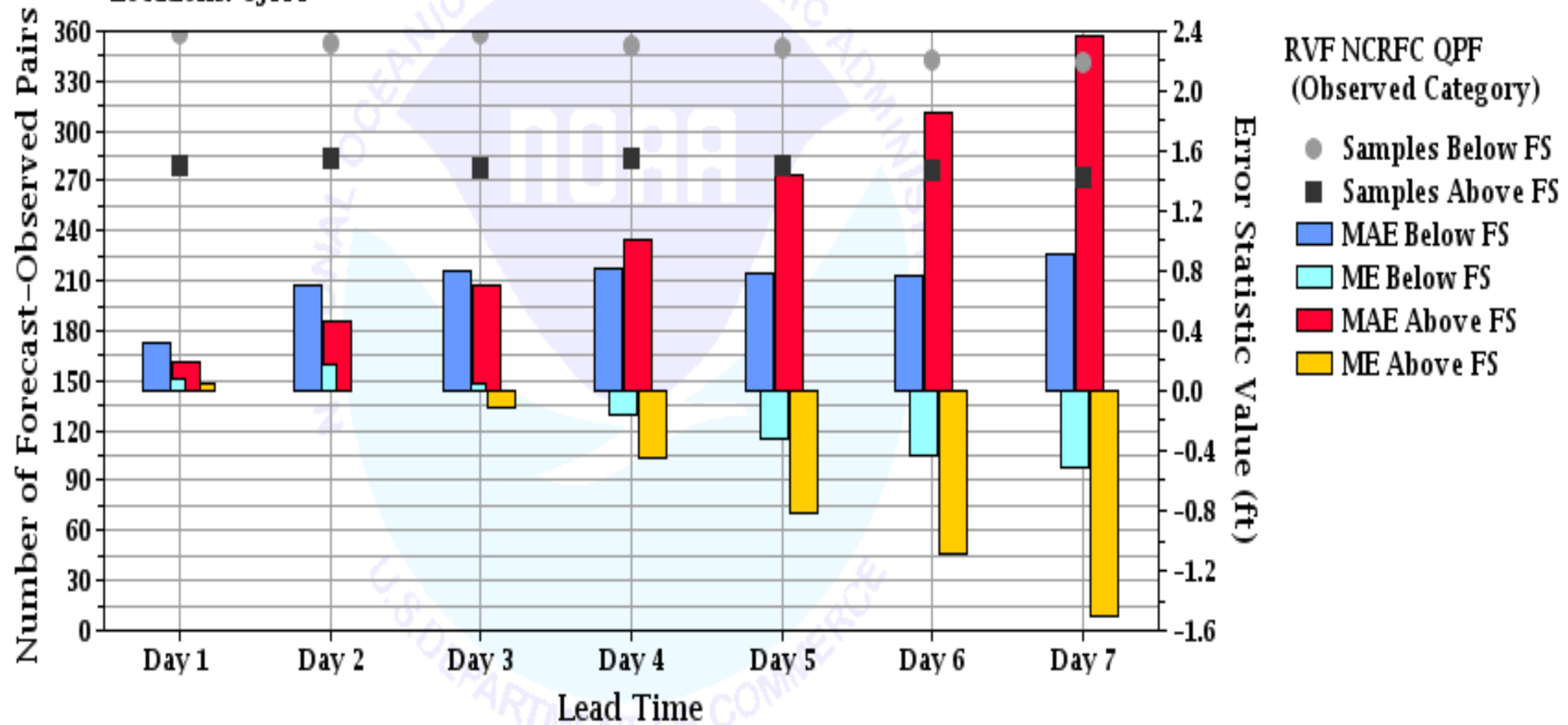
Error Statistics for Above and Below FS for Period of record (June 2007-September 2008) at IOWI4

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
Compared Over Observed Category
Time Period: 2007-06-01 00:00:00 GMT - 2008-09-30 23:59:59 GMT
Lead times: 0 hours - 168 hours
Locations: IOWI4



Error Statistics for Above and Below FS for Period of record (June 2007-September 2008) at CJTI4

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
Compared Over Observed Category
Time Period: 2007-06-01 00:00:00 GMT - 2008-09-30 23:59:59 GMT
Lead times: 0 hours - 168 hours
Locations: CJTI4



Case 2. 2008 Record Flood Error Statistics

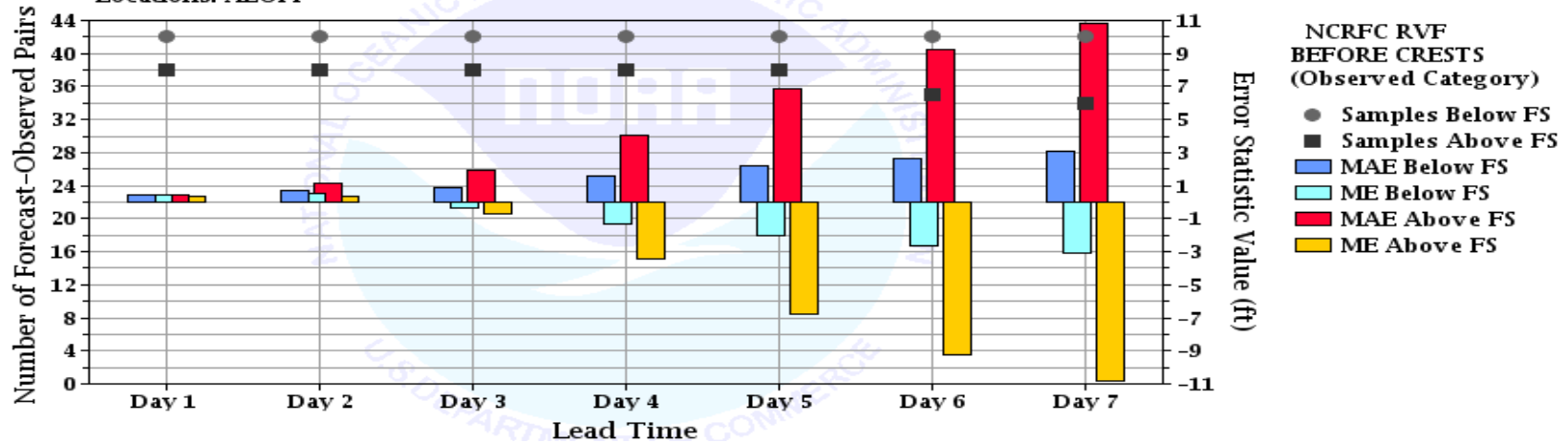
Before Crest (May 29, 2008 – June 15, 2008) and
Errors After Crest (June 15, 2008 – June 30, 2008)
for
Observations above and below Flood Stage

Summary of June 2008 Record Flood

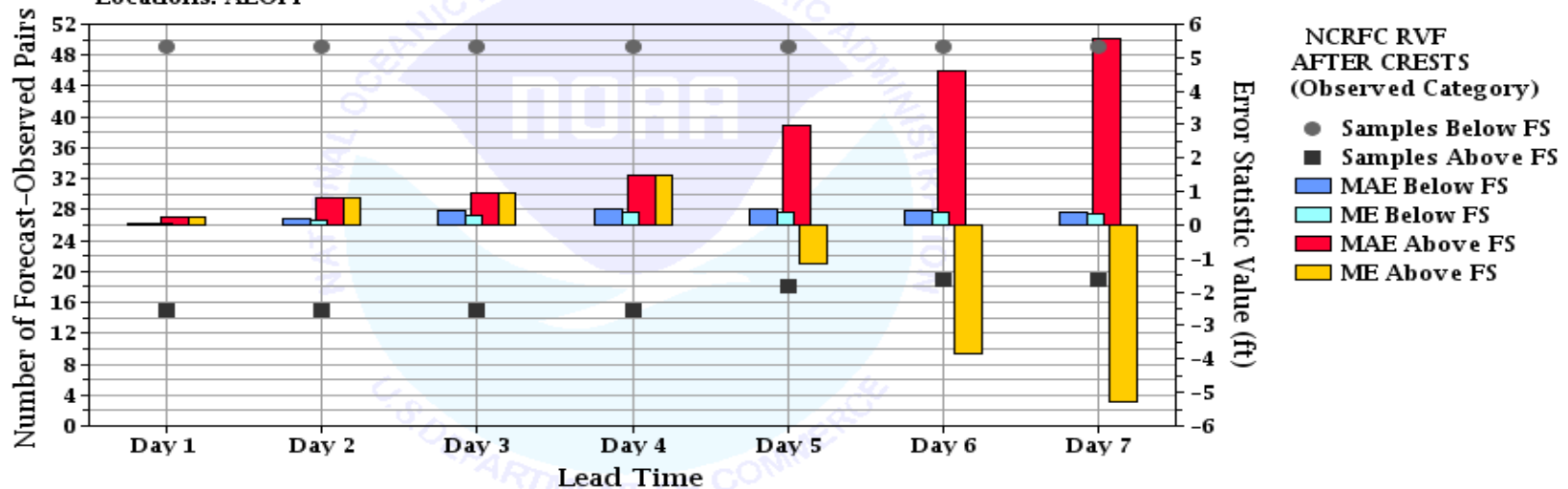
ID	Name	River	Minor	Moderate	Major	Past Record	Flood 2008 Preliminary Crest
ALOI4	Waterloo	Cedar River	12	15	19	21.86 ft on 03/26/1961	25.40 ft on 06/11/2008
CIDI4	Cedar Rapids	Cedar River	12	14	16	20.0 ft on 06/01/1929	31.12 ft on 06/13/2008
IOWI4	Iowa City	Iowa River	22	23	25	28.52 ft on 08/10/1993	31.53 ft on 06/15/2008
CJTI4	Columbus Junction	Iowa River	15	16.5	18	28.30 ft on 07/07/1993	32.42 ft on 06/15/2008

Errors before crest (June 1-15) and after crest (June 15-30) at ALOI4

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-05-29 00:00:00 GMT - 2008-06-15 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4



Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-15 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4



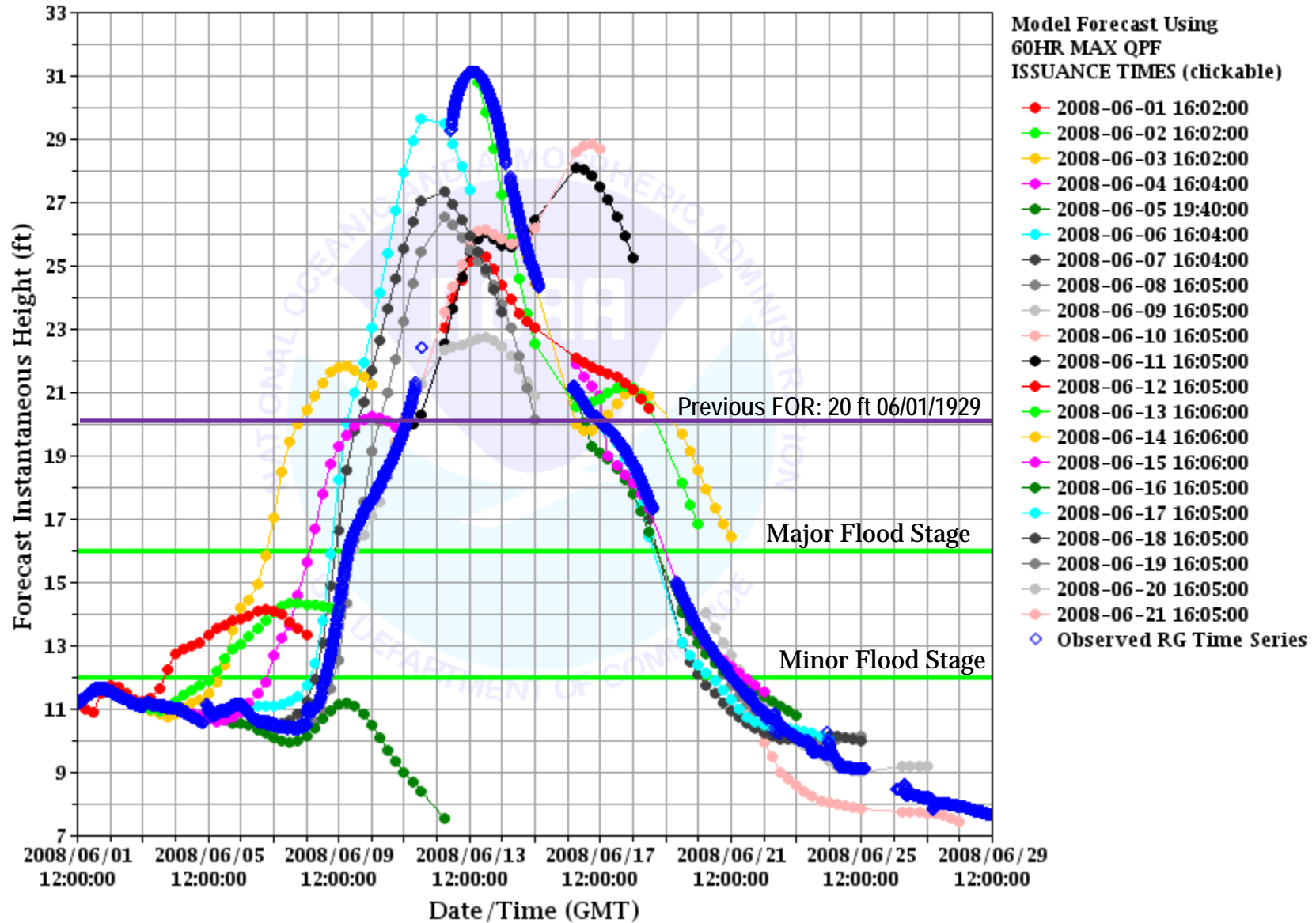
Plot of Forecast and Observed Instantaneous Height Time Series for NCRFC

Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT

Lead times: 0 hours - 168 hours

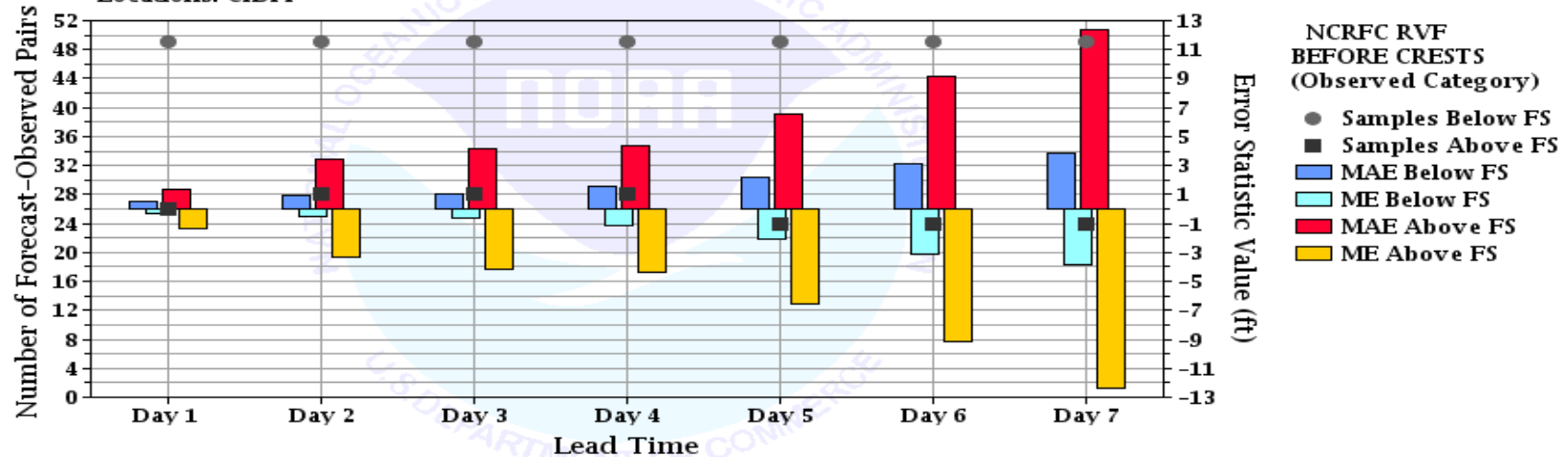
Location: Cedar Rapids [CIDI4(HGICVZZ)]

Forecast Categories: less than 12.0, 12.0 - 16.0, greater than 16.0 ft

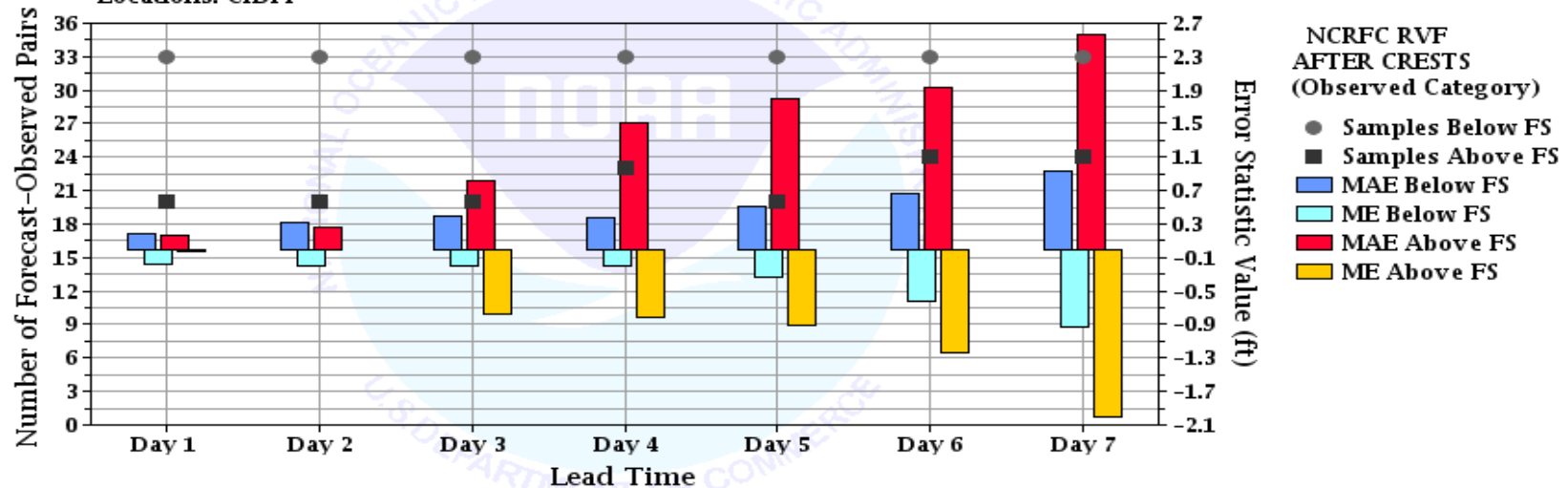


Errors before crest (June 1-15) and after crest (June 15-30) at CIDI4

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-05-29 00:00:00 GMT - 2008-06-15 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4

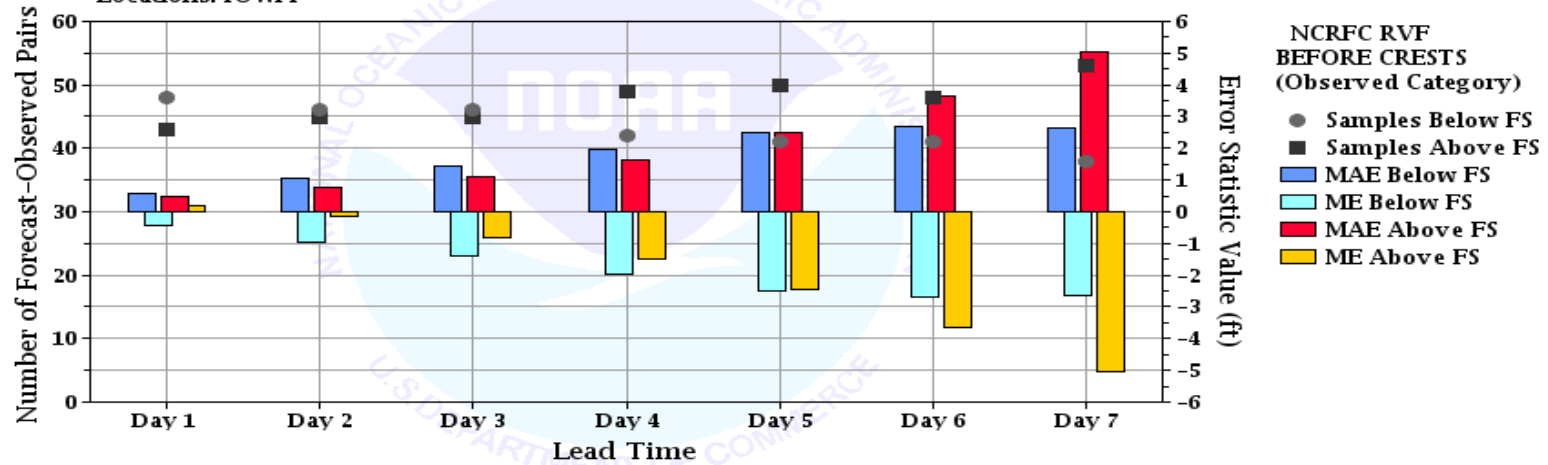


Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-15 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4

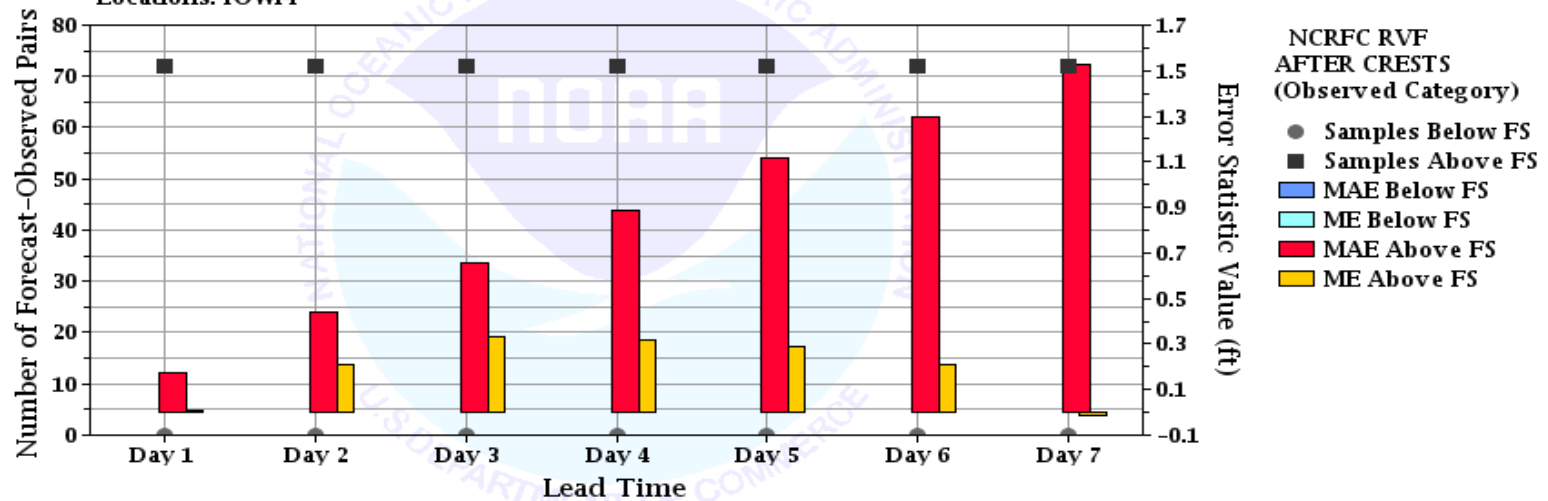


Errors before crest (June 1-15) and after crest (June 15-30) at IOWI4

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-05-29 00:00:00 GMT - 2008-06-15 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: IOWI4

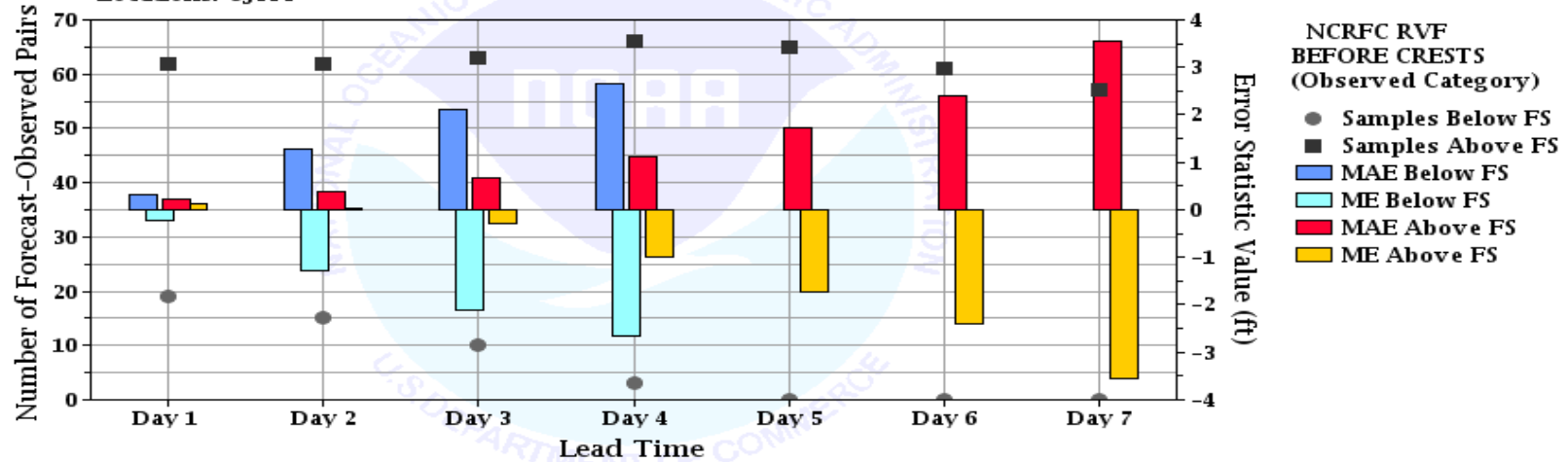


Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-15 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: IOWI4

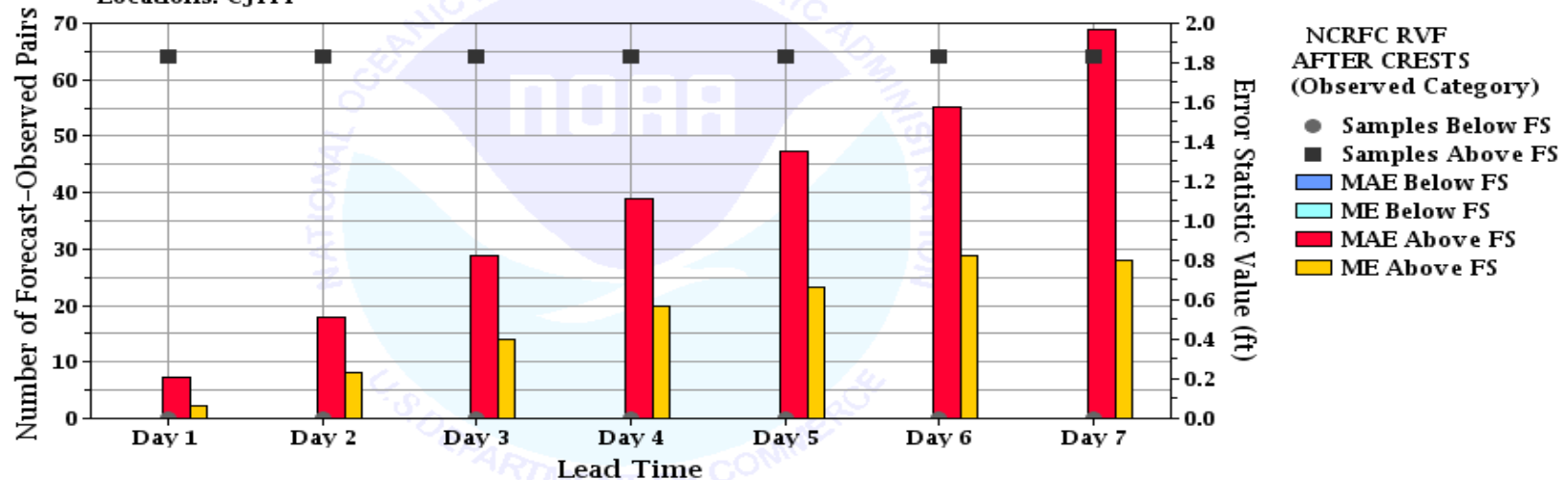


Errors before crest (June 1-15) and after crest (June 15-30) at CJTI4

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-05-29 00:00:00 GMT - 2008-06-15 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CJTI4



Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-15 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CJTI4



Case 3. Error Statistics

June 1, 2007 to September 30, 2008

HPC QPF Contingencies

95% Maximum QPF (CV,CW,CX)

ALOI4 and CIDI4

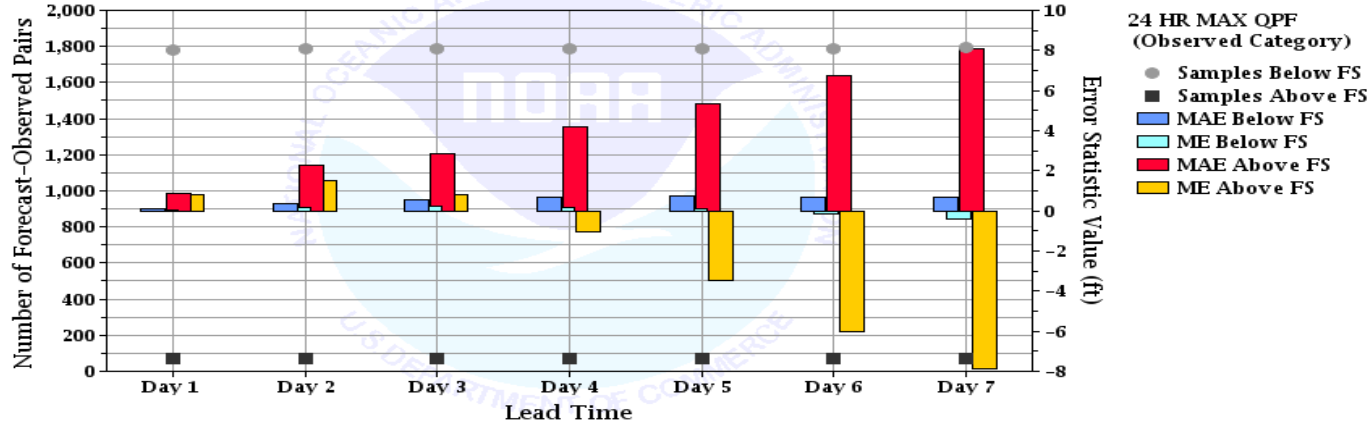
ALO14

24 hour max QPF

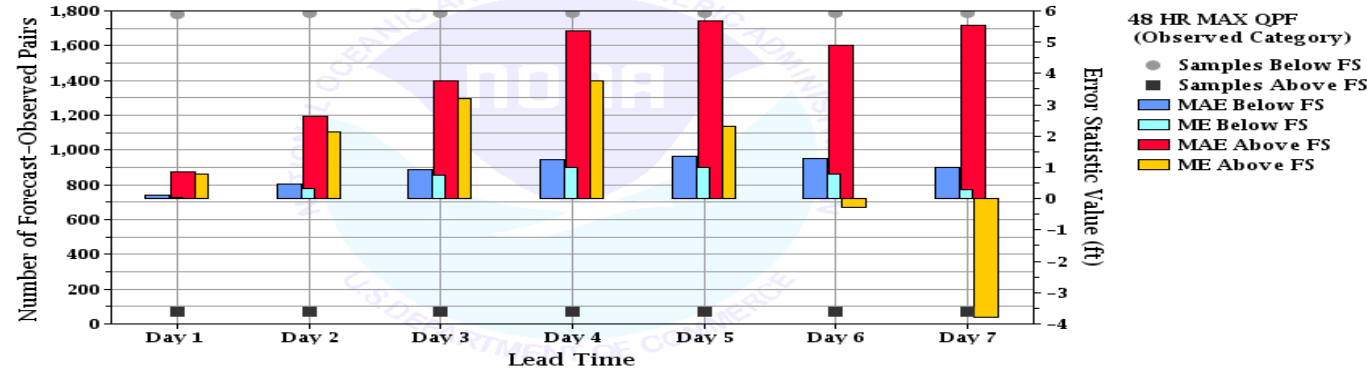
48 hour max QPF

60 hour max QPF

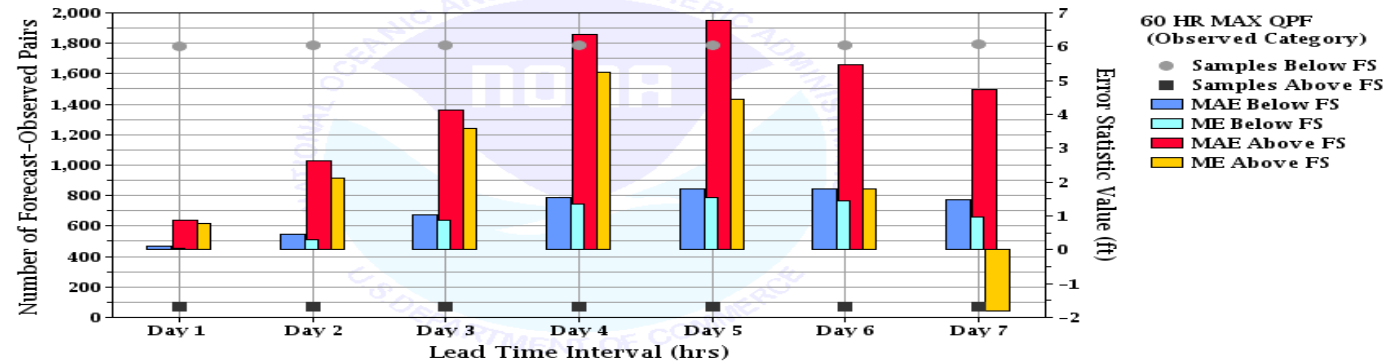
Plot of Error and Sample Size against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2007-06-01 00:00:00 GMT - 2008-09-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Location: ALO14



Plot of Error and Sample Size against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2007-06-01 00:00:00 GMT - 2008-09-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Location: ALO14



Plot of Error and Sample Size against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2007-06-01 00:00:00 GMT - 2008-09-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Location: ALO14

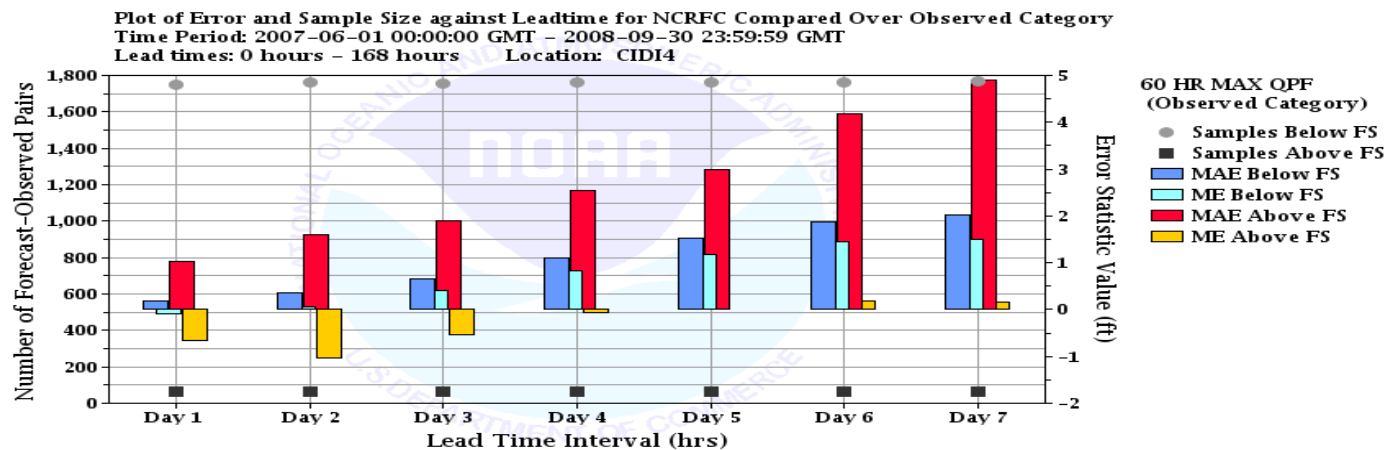
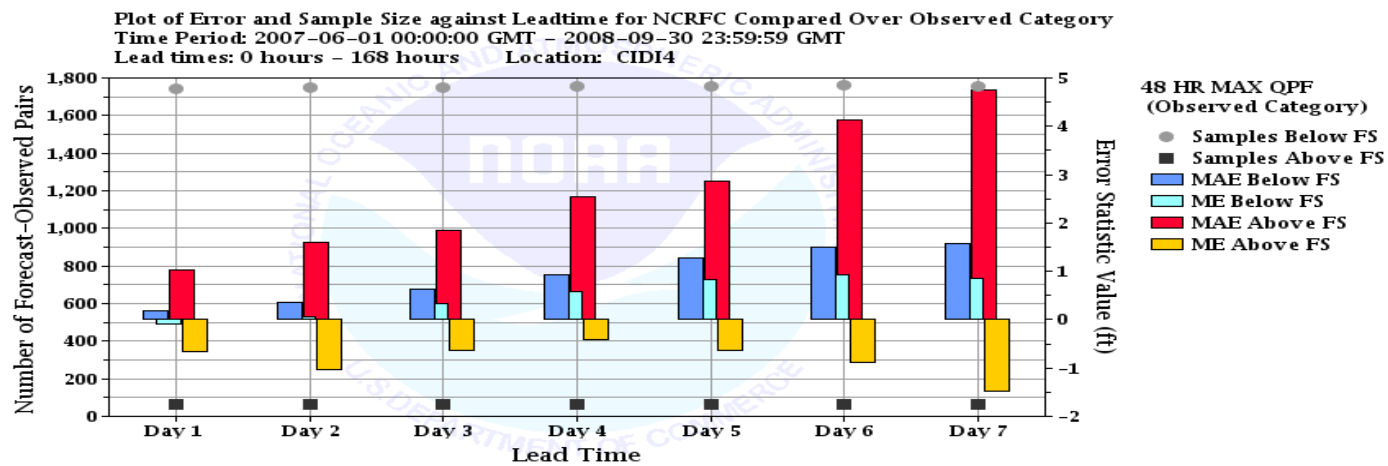
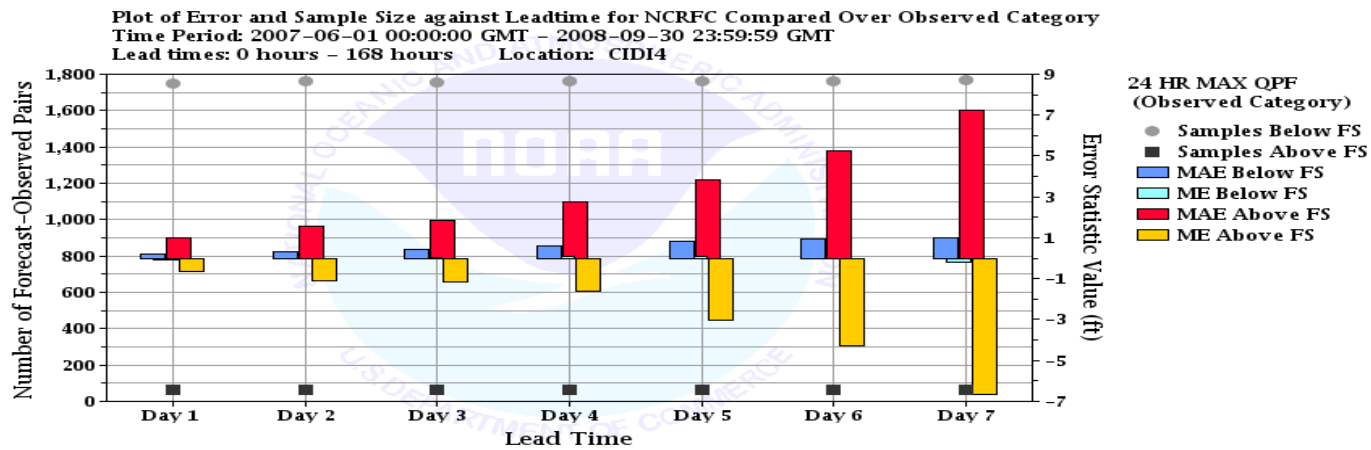


CIDI4

24 hour max QPF

48 hour max QPF

60 hour max QPF



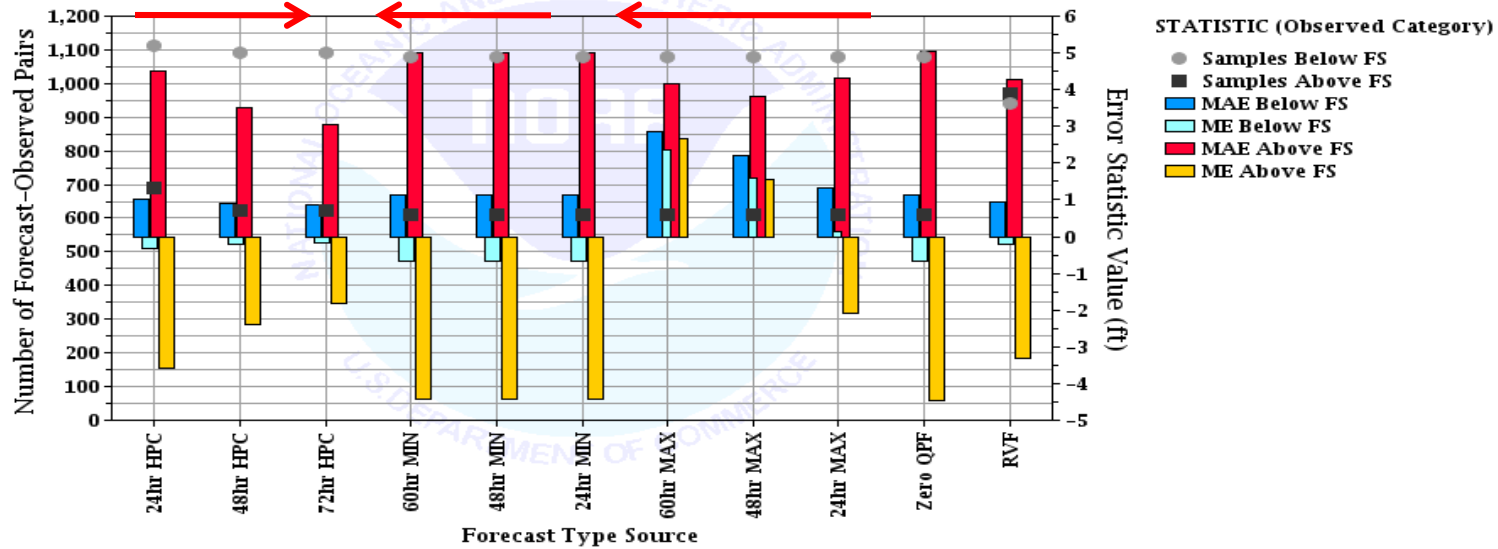
QPF Contingency Forecasts for June 2008

Categorical Error Statistics - MAE/ME

1. Observations Above and Below Flood Stage
2. Observations Above and Below Major Flood

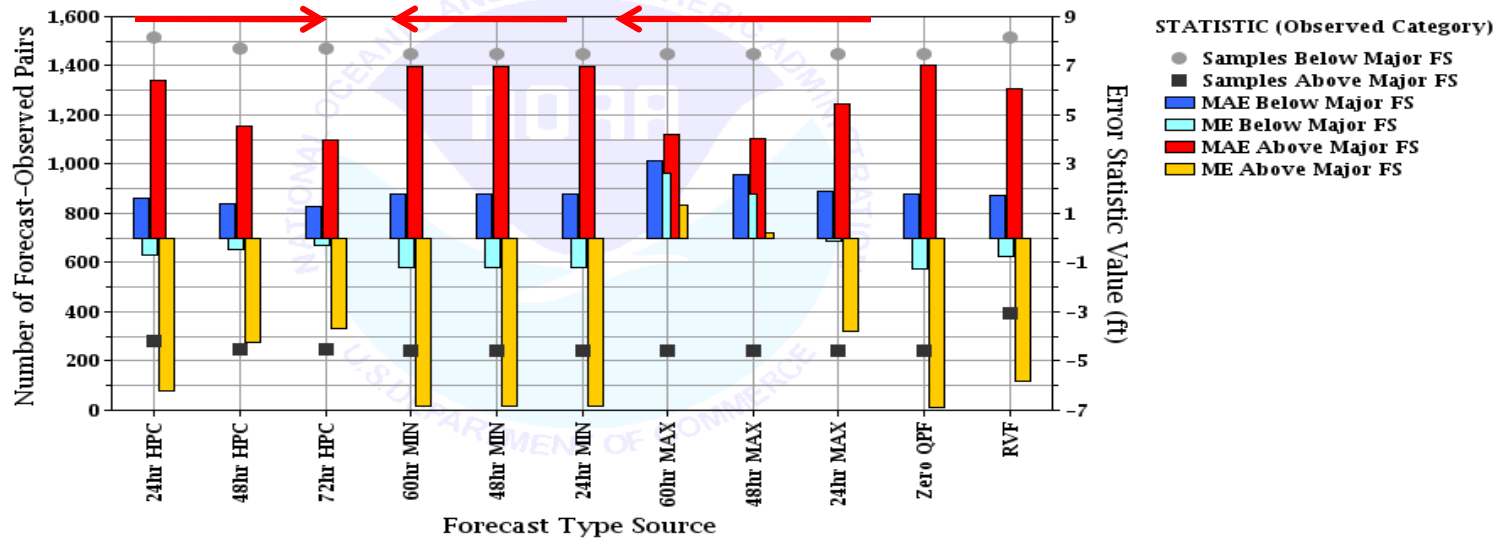
June 1 -30, 2008

Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4

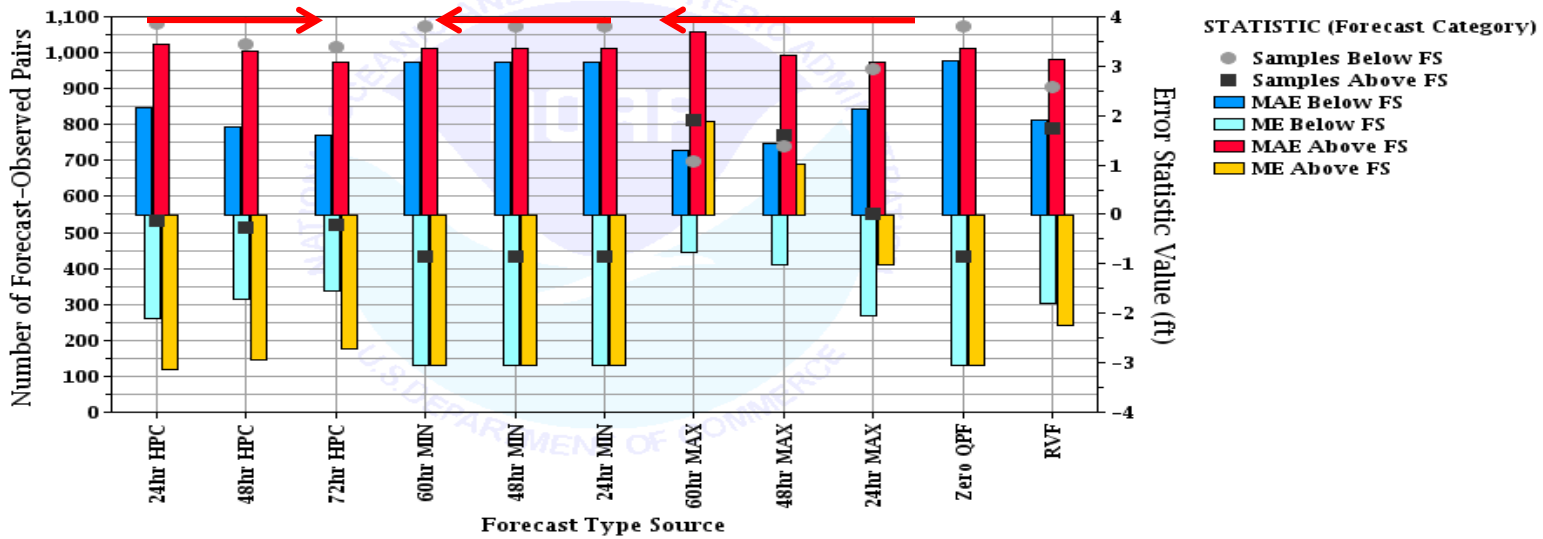


ALOI4
 June 2008

Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4

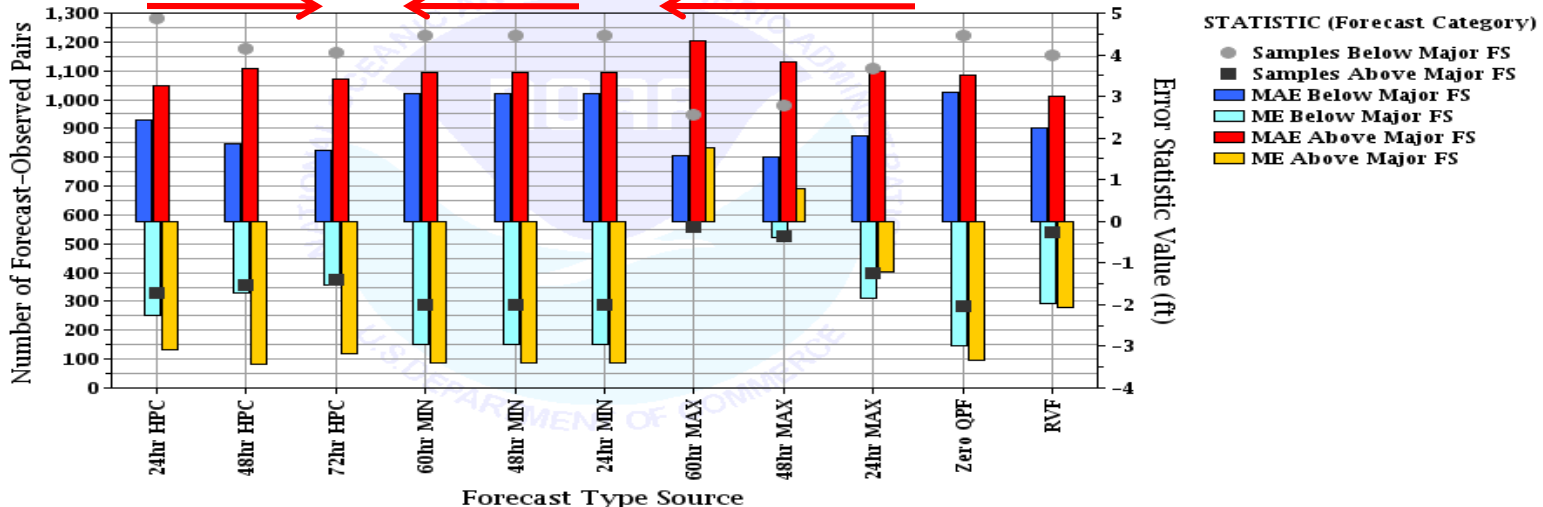


Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
Compared Over Forecast Category
Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
Lead times: 0 hours - 168 hours
Locations: CIDI4



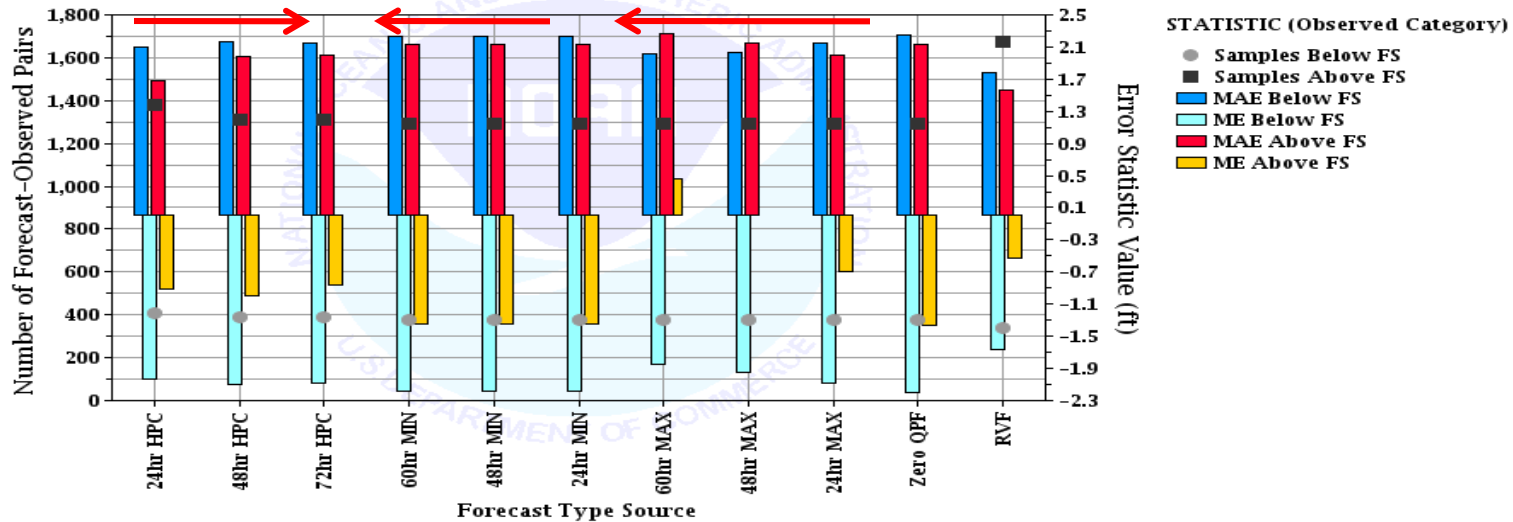
Flood Stage

Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
Compared Over Forecast Category
Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
Lead times: 0 hours - 168 hours
Locations: CIDI4



Major Flood

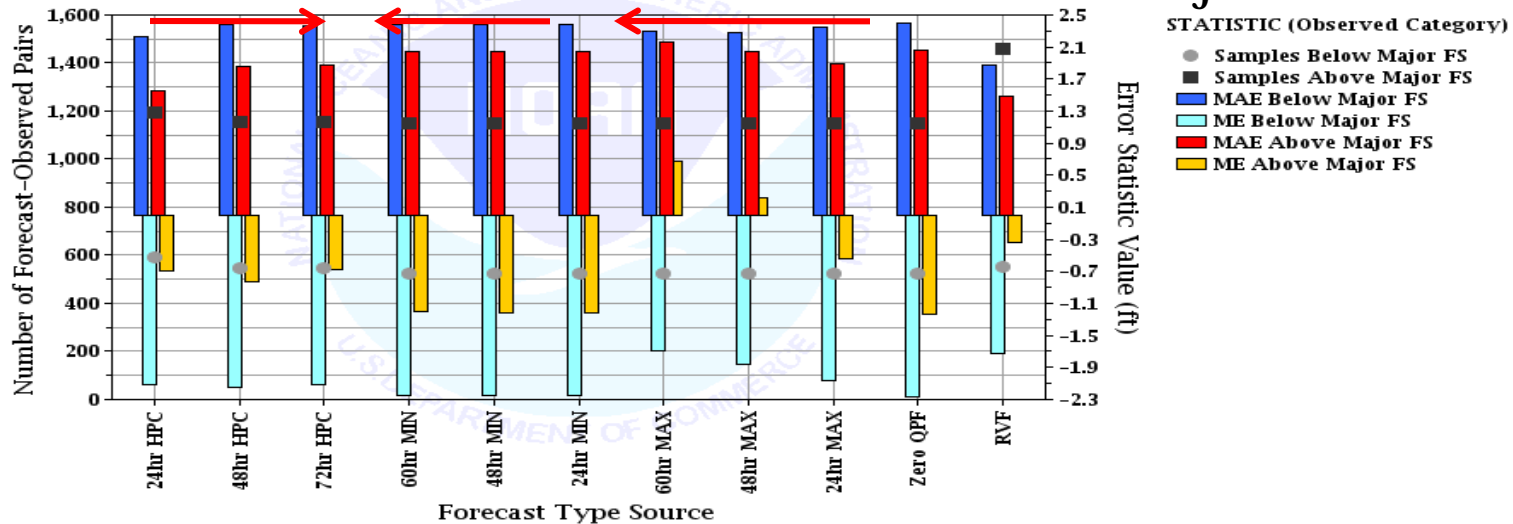
Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: IOWI4



Flood Stage

IOWI4
 June 2008

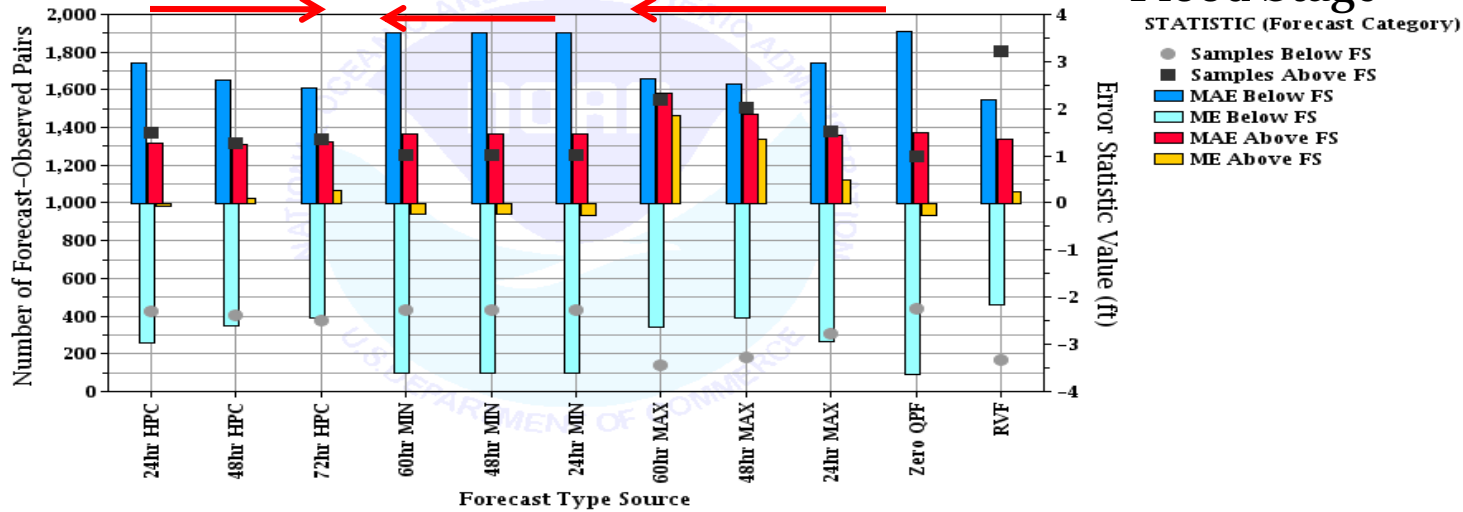
Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: IOWI4



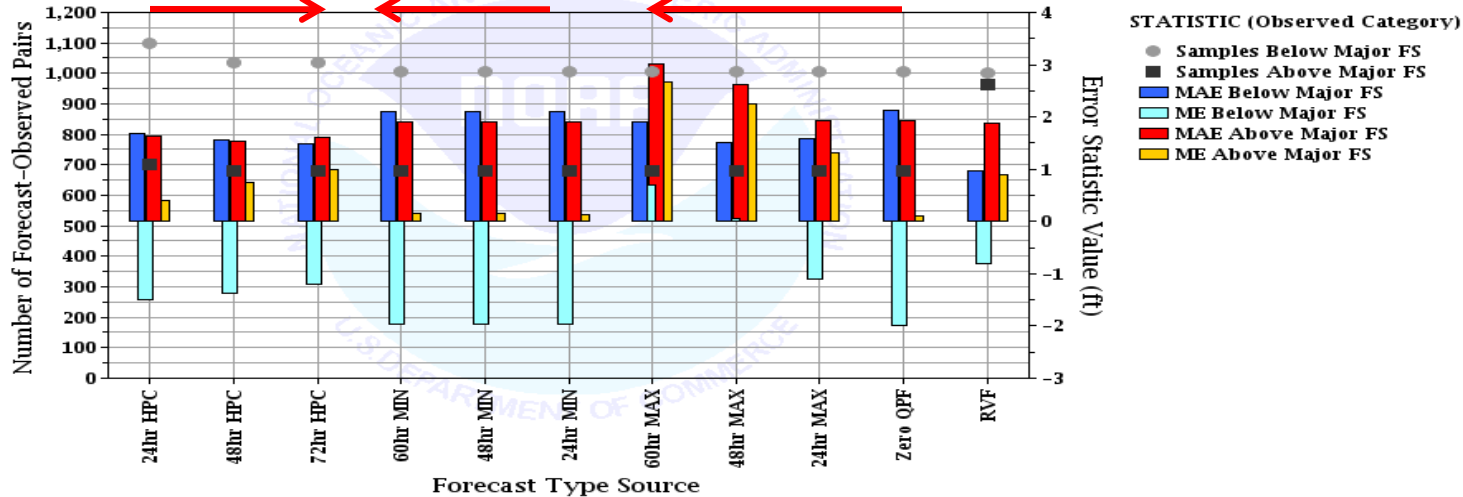
Major Flood

CJT14
June 2008

Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
Compared Over Forecast Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CJT14

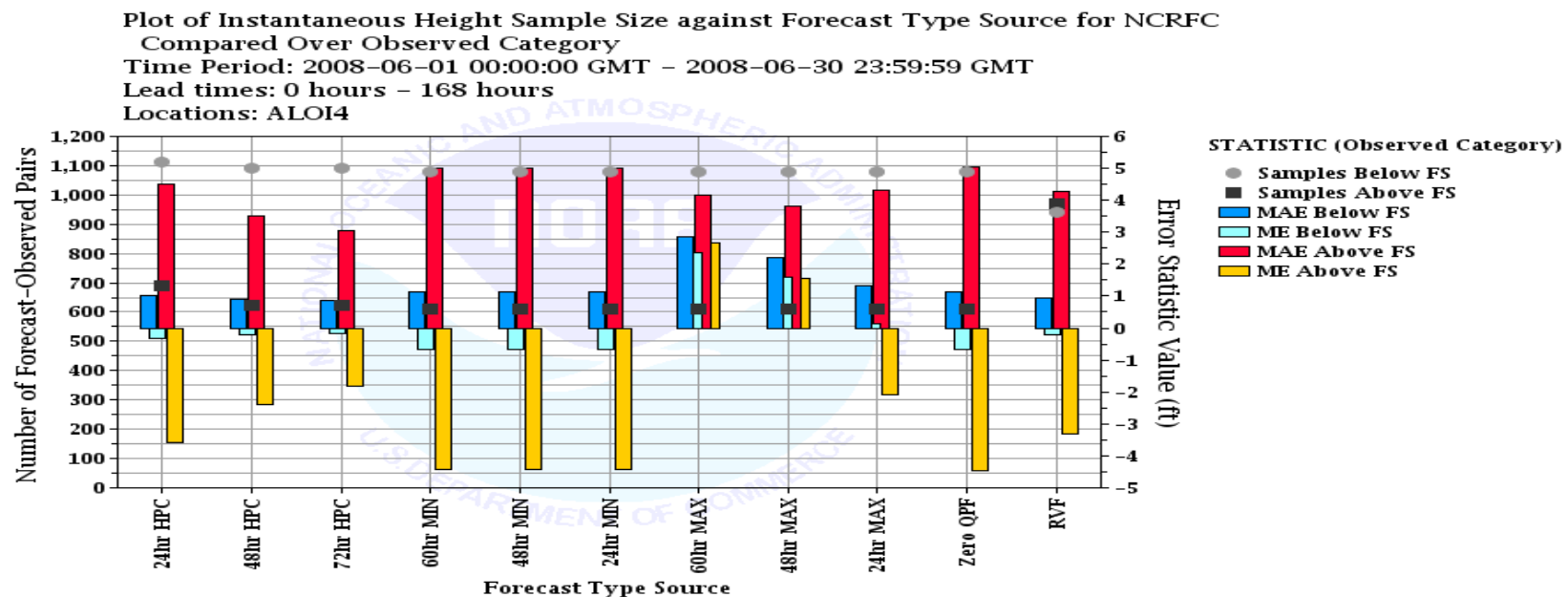


Plot of Instantaneous Height Sample Size against Forecast Type Source for NCRFC
Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CJT14

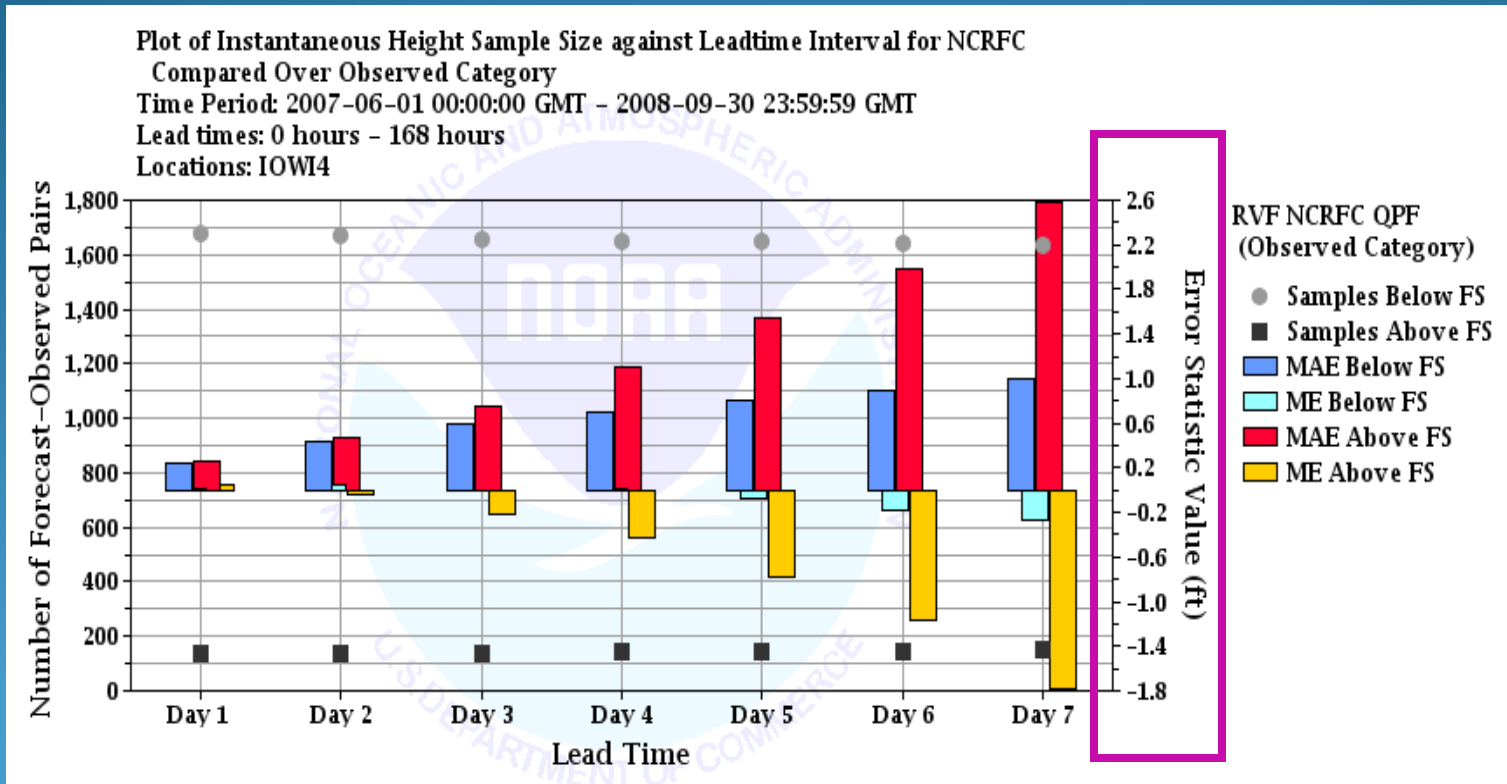


Questions/Issues

- We would like the ability to control the order of variables that we are comparing. For example...when comparing the QPFC files instead of alphabetical it should be in order of increasing QPF, or whatever user selected order.



Is there a way to control the grid lines—which axis they are tied to? For example the number of samples has to be the ‘primary statistic’ because I want the symbols to appear on top of the bars which are the ‘secondary statistic’, but I’m more interested in the grids lines matching the value on the ‘secondary axis. Can that be done?



Ivpbatch questions:

- The 'input' directory is getting pretty cluttered. Is there a way to easily create subdirectories under '/input' that ivpbatch will run?
- Replacement strings** – need some examples and documentation.

•In IVP using the batch creation wizard it seems to add a bunch of extra parameters...is there a reason?

•If I'm trying to create one batch file to create several different plots by changing one parameter (like FCST_TS) I have to find/change all of them or delete all the extras.

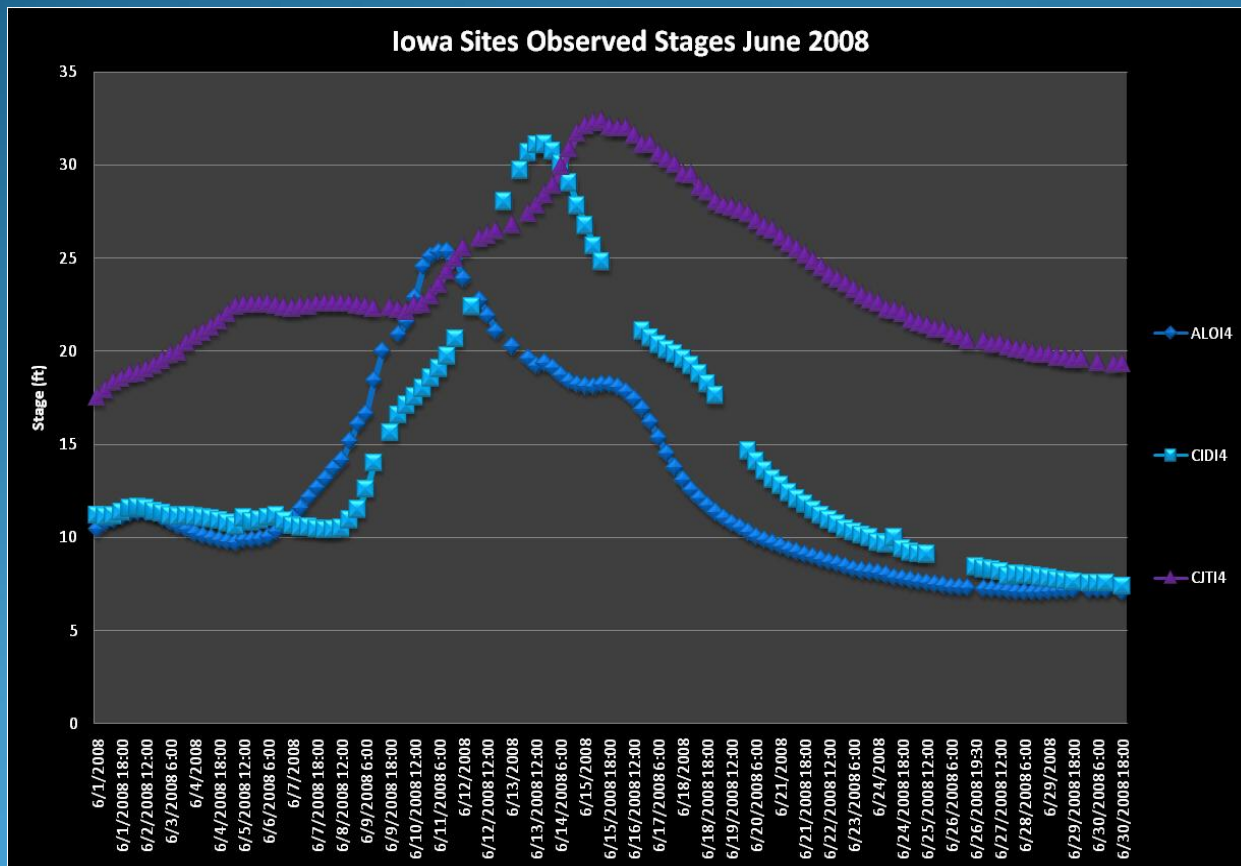
```
#===== LOCATION DEFINITIONS
PE = HG
DUR = I
FCST_TS = CX
EXTREMUM = Z
OBS_TYPE = RAW
OBS_CAT = MIN,1.0*FS,MAX
FCST_CAT = MIN,1.0*FS,MAX
DEF_LOC = ANSI4

DUR = <default>
EXTREMUM = <default>
PE = <default>
FCST_TS = <default>
#===== END OF LOCATION DEFINITIONS

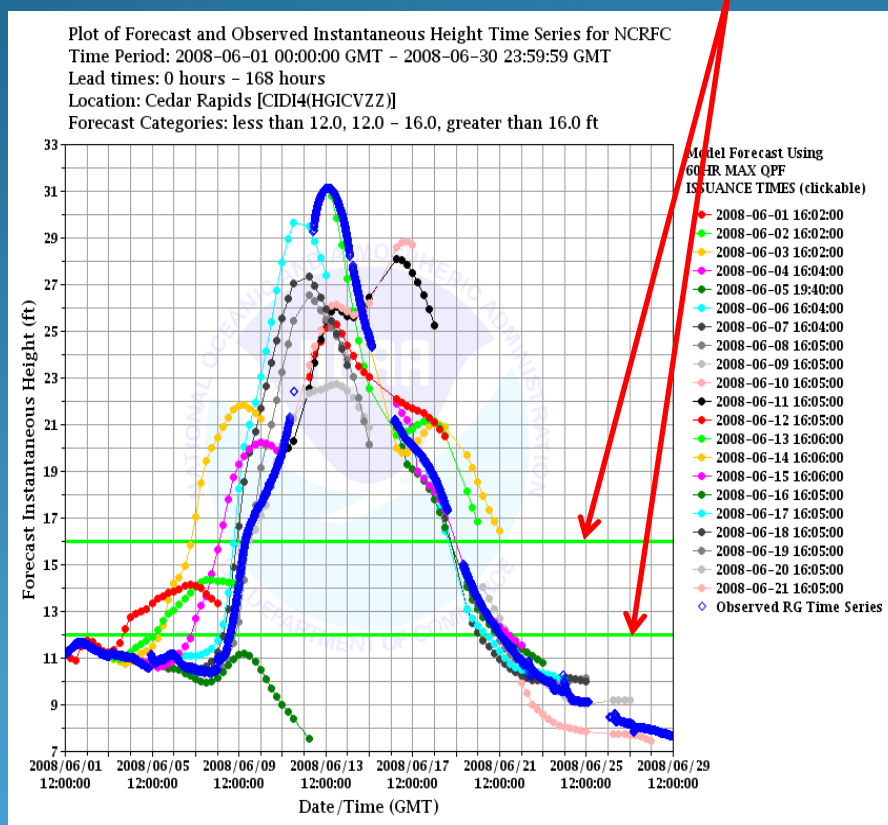
#===== GROUP PARAMETER DEFINITIONS
START_TIME = 2007-06-01
END_TIME = 2008-09-30
ANALYSIS_INTERVAL = 1day
LEADTIME_START = 0days
LEADTIME_END = 7days
LEADTIME_STEP = 1day
ISSUANCE_START = 16hours
ISSUANCE_END = 21hours
ISSUANCE_STEP = 6hours
FCST_TS = CX
ACTIVE_STATUS = ACTIVE
RIVERRESPONSE = ALL
BREAKDOWN_BY_LID = OFF
#===== END OF GROUP PARAMETER DEFINITIONS

#===== GROUP DEFINITION(S)
PE = <default>
DUR = <default>
EXTREMUM = <default>
FCST_TS = CX
RIVERRESPONSE = ALL
ACTIVE_STATUS = ACTIVE
DEF_GRP = ANSI4
#===== END OF GROUP DEFINITION(S)
```

IVP – when creating displays...Is there a way to display several forecast time series (like CV,CW,CX) from one site (or many) in one plot to allow graphical comparison? Is there a way to display several observed time series in on plot?



Is there a way to assign different colors to the FS and MajFS lines that are shown in IVP plots?



Planned Verification Activities at NCRFC

We have two dedicated focal points assigned to verification: one for IVP and one for EVS.

Develop local batch menu similar to ESPADP

- Interactive too complex for routine verification
- better suited to individual point analysis

Develop forecast expectation statistics for Meramec R. for user community. (FY09 AOP item)

Long term goal provide on demand statistics for all forecast NCRFC points. Provide as forecaster reference and customer service.

Implement EVS project (to be determined). Original beta test demonstrated lack of sufficient sample size and need to pool samples.



End....

MAE/ME Averaged for 3-month Seasons

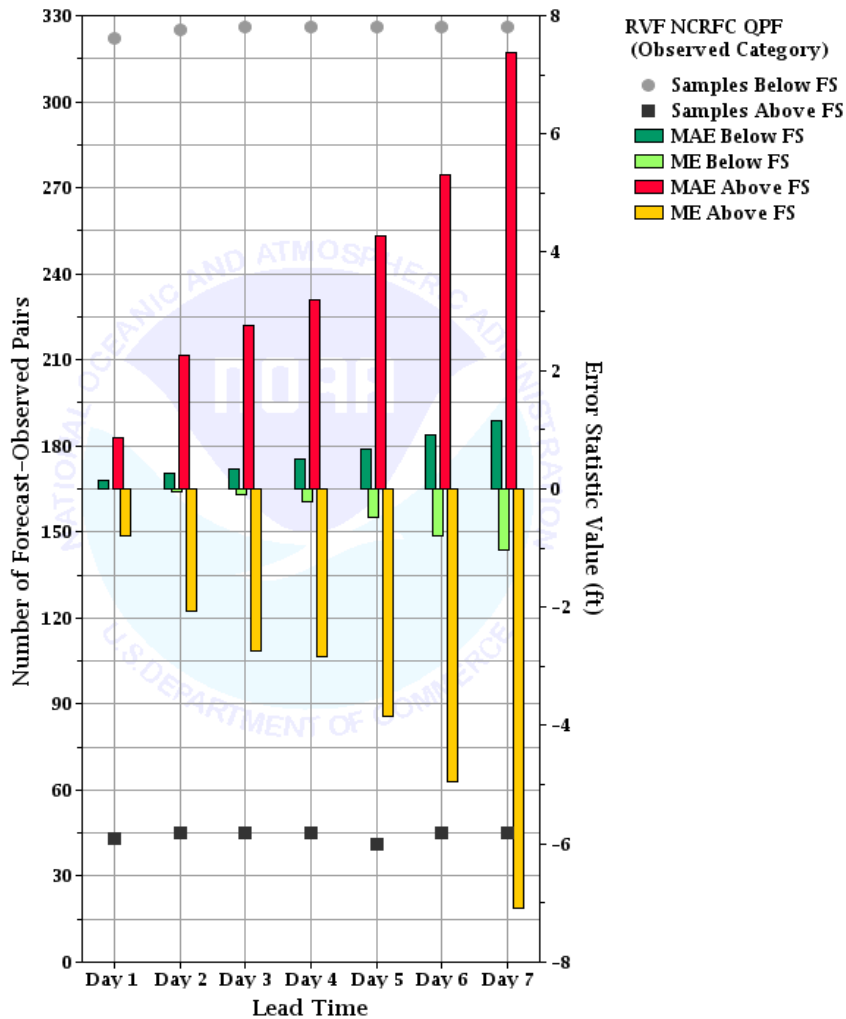
FF :RVF with 24hr QPF...issued 12-18z

CN: 24hr MIN HPC QPF...issued 16z

CX: 24hr MAX HPC QPF...issued 16z

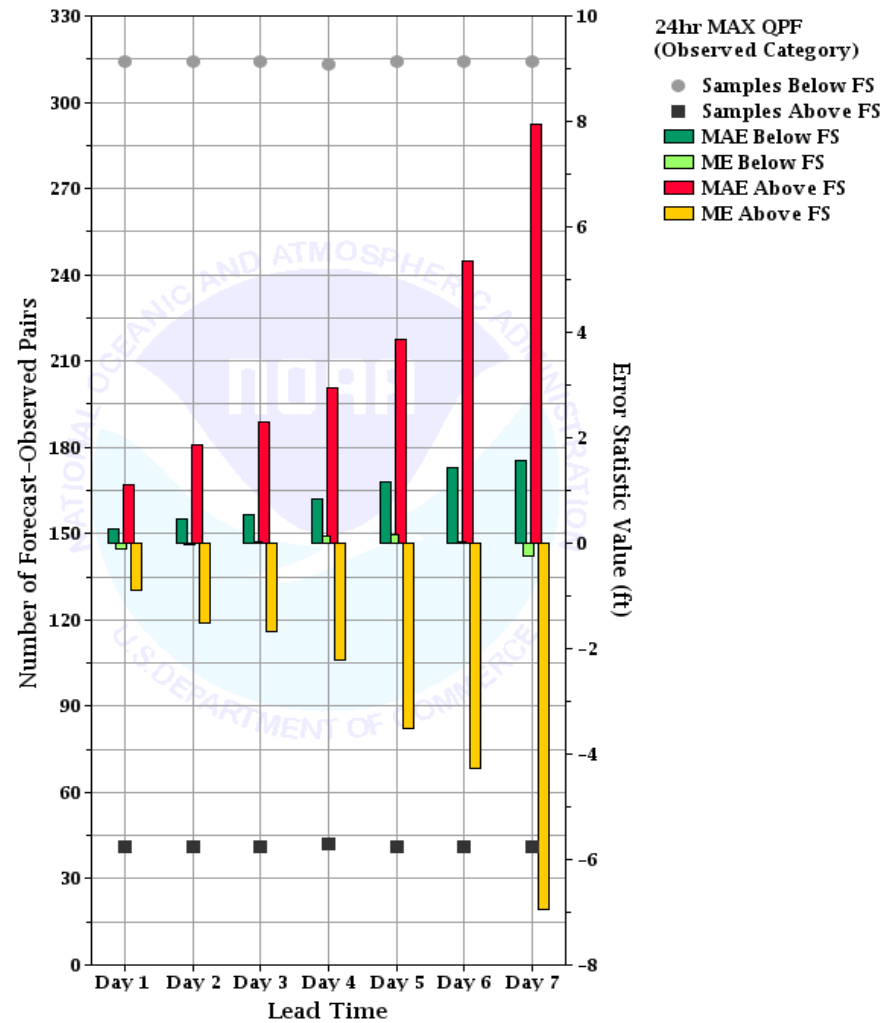
Errors for Summer 2008 CIDI4 RVF with 24hr QPF

Plot of Errors and Sample Size against Leadtime Interval for NCRFC
 Season Average: 2008-06-01 00:00:00 GMT - 2008-08-31 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4



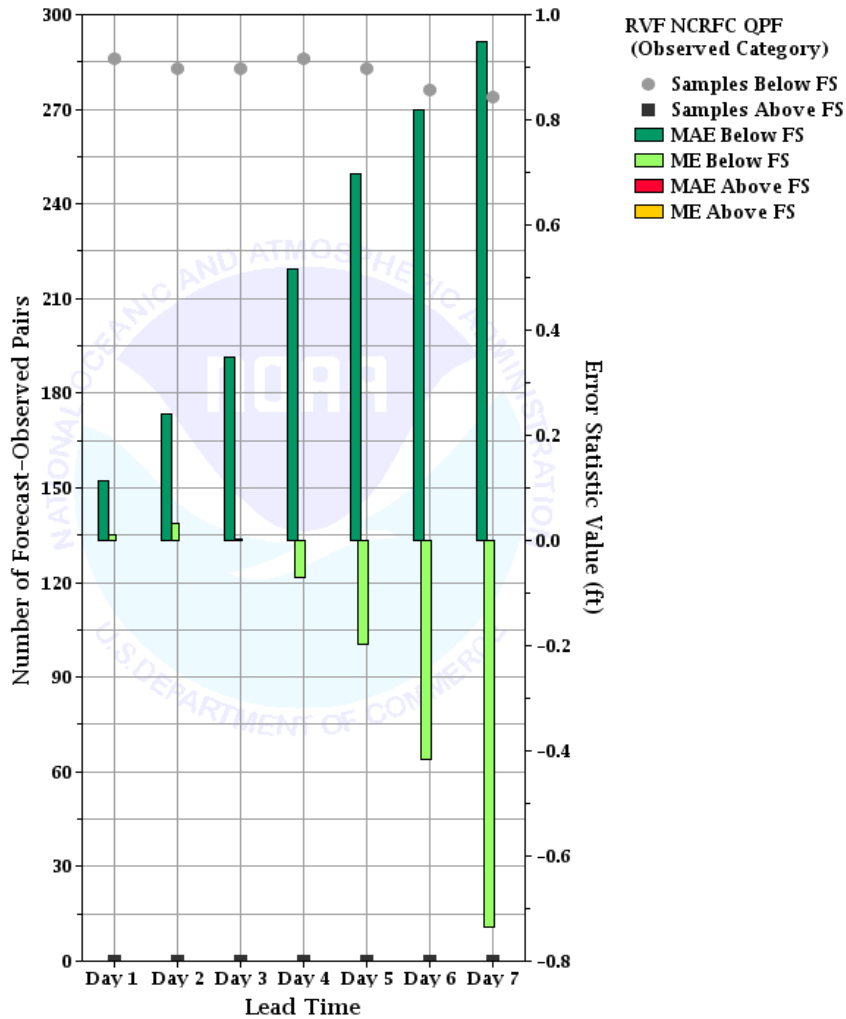
Errors for Summer 2008 CIDI4 with 24hr MAXQPF

Plot of Errors and Sample Size against Leadtime Interval for NCRFC
 Season Average: 2008-06-01 00:00:00 GMT - 2008-08-31 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4



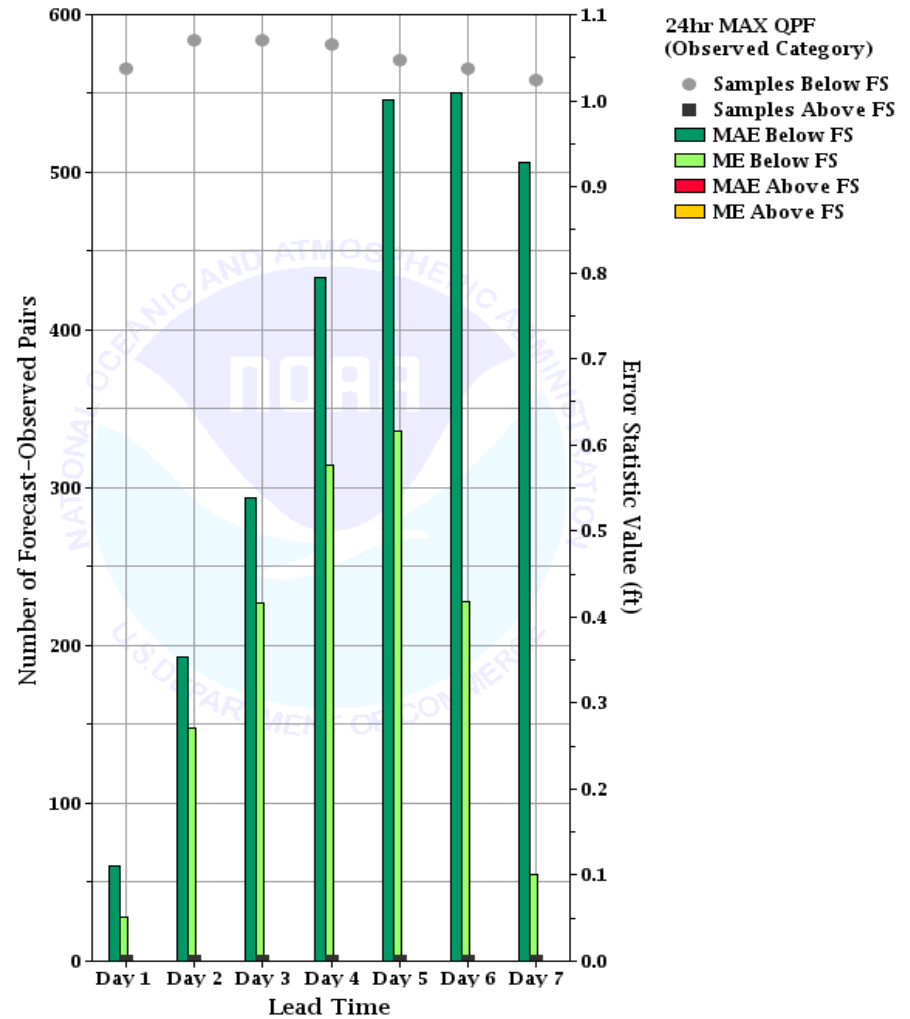
Errors for Summer 2007 CIDI4 RVF with 24hr QPF

Plot of Errors and Sample Size against Leadtime Interval for NCRFC
 Season Average: 2007-06-01 00:00:00 GMT - 2007-08-31 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4



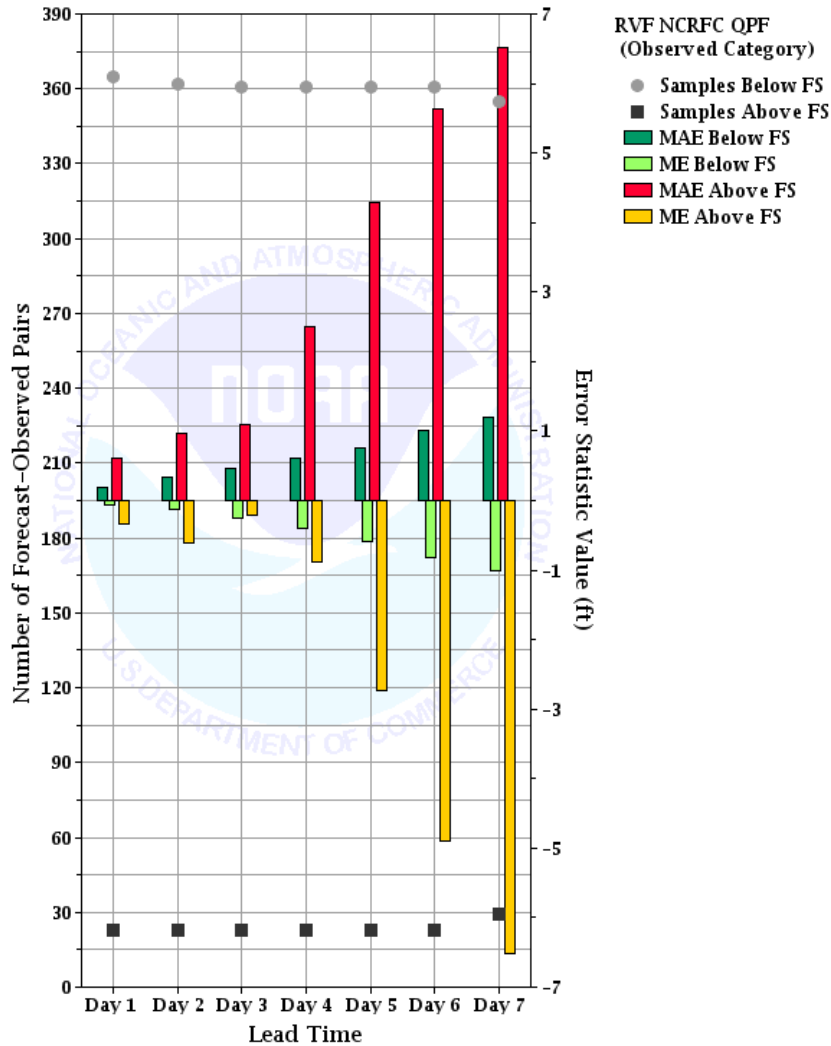
Errors for Summer 2007 CIDI4 with 24hr MAX QPF

Plot of Errors and Sample Size against Leadtime Interval for NCRFC
 Season Average: 2007-06-01 00:00:00 GMT - 2007-08-31 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4



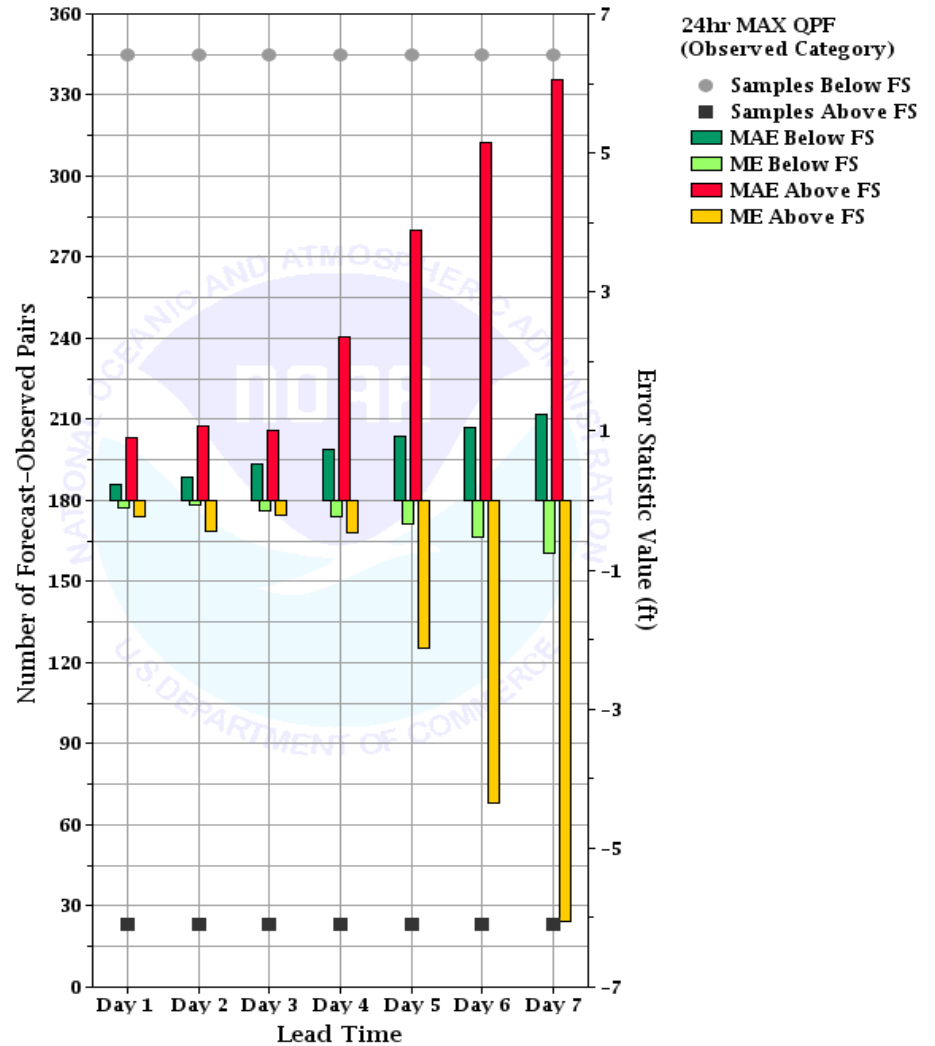
Errors for Spring 2008 CIDI4 RVF with 24hr QPF

Plot of Errors and Sample Size against Leadtime Interval for NCRFC
 Season Average: 2008-03-01 00:00:00 GMT - 2008-05-31 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4



Errors for Spring 2008 CIDI4 with 24hr MAX QPF

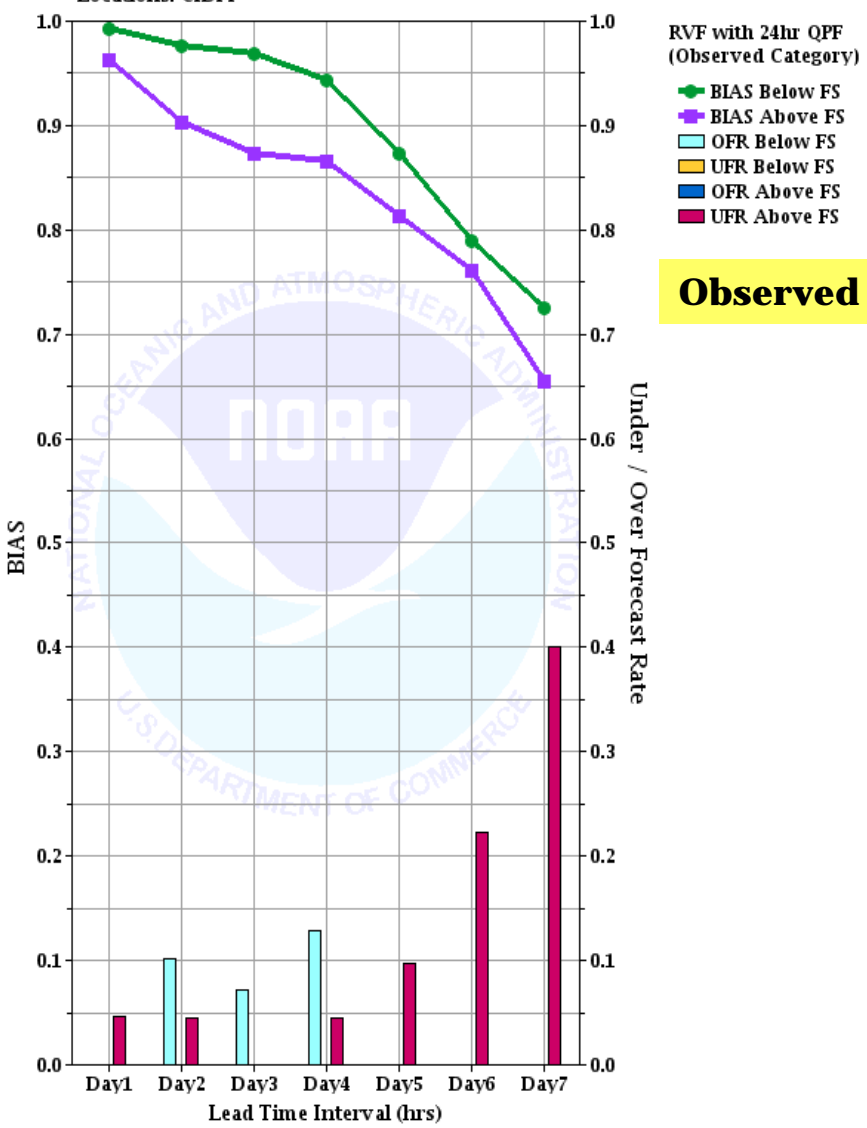
Plot of Errors and Sample Size against Leadtime Interval for NCRFC
 Season Average: 2008-03-01 00:00:00 GMT - 2008-05-31 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4



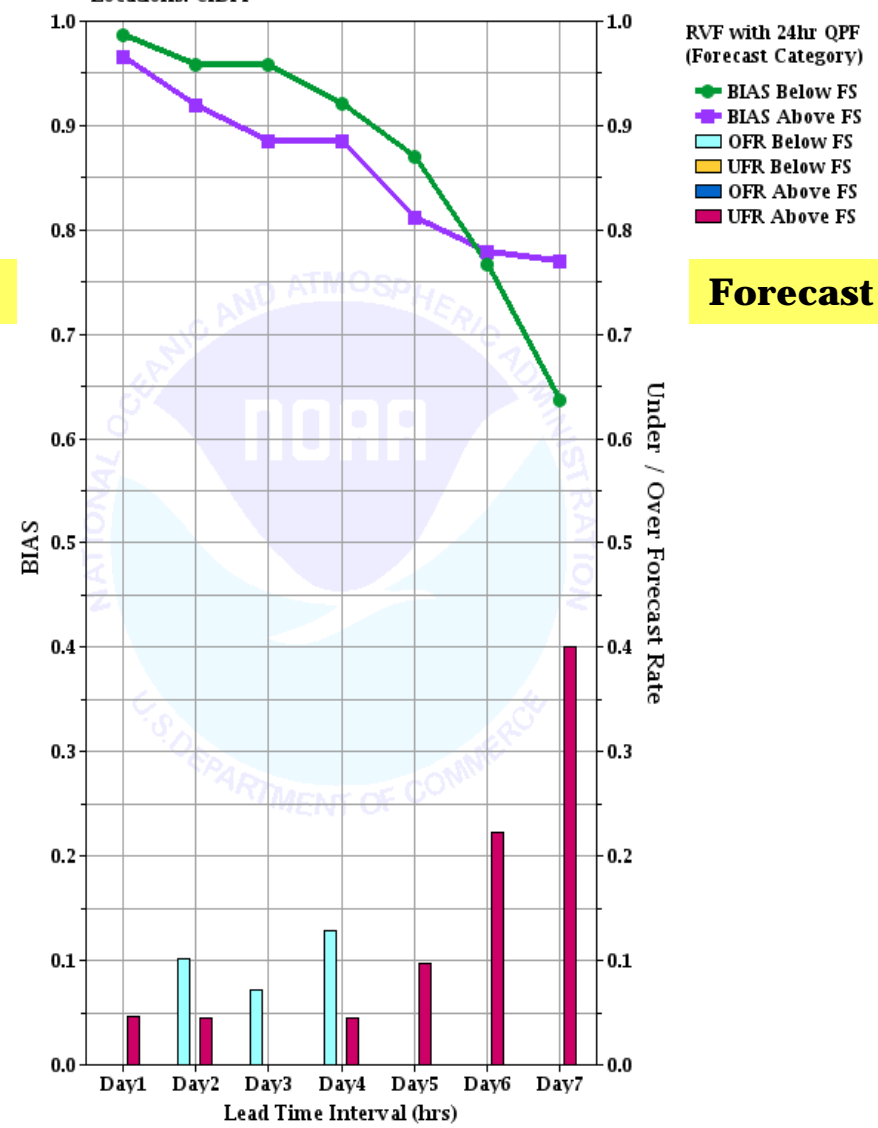
BIAS / UFR / OFR

Bias and UFR/OFR for CIDI4 RVF with 24hr QPF June 2008

Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4

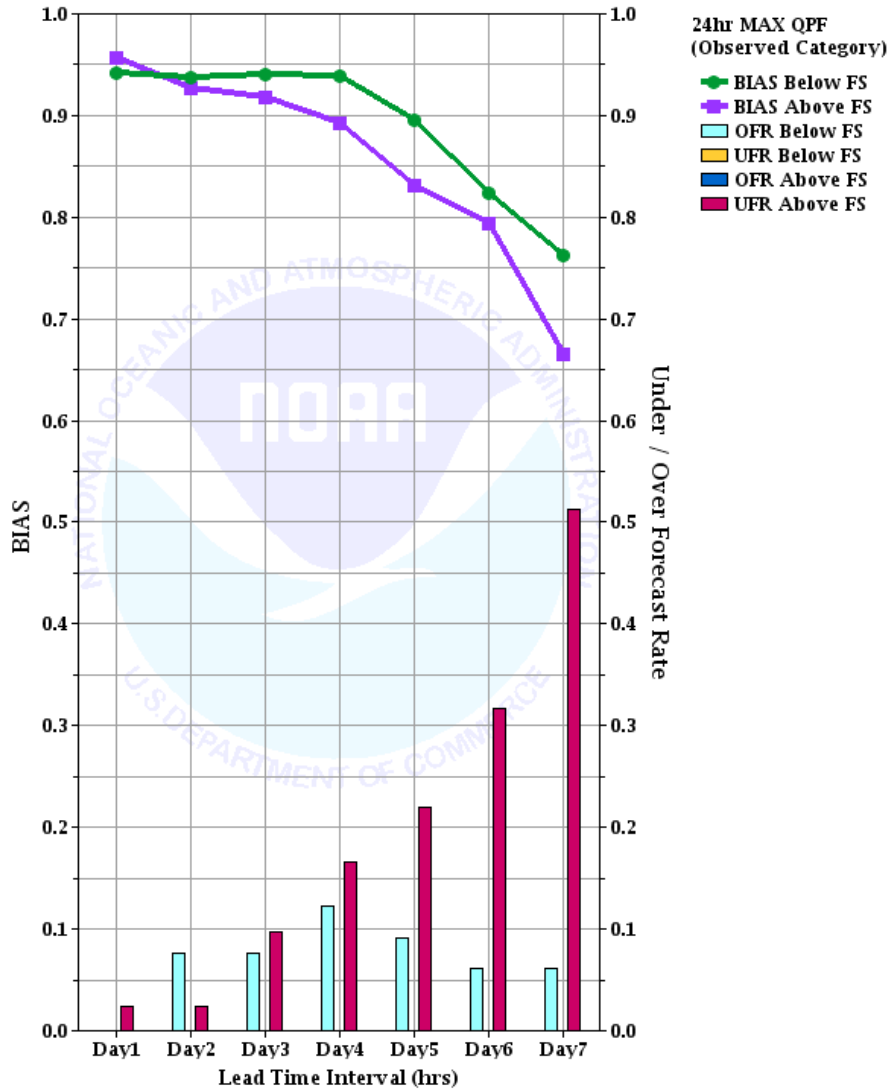


Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4

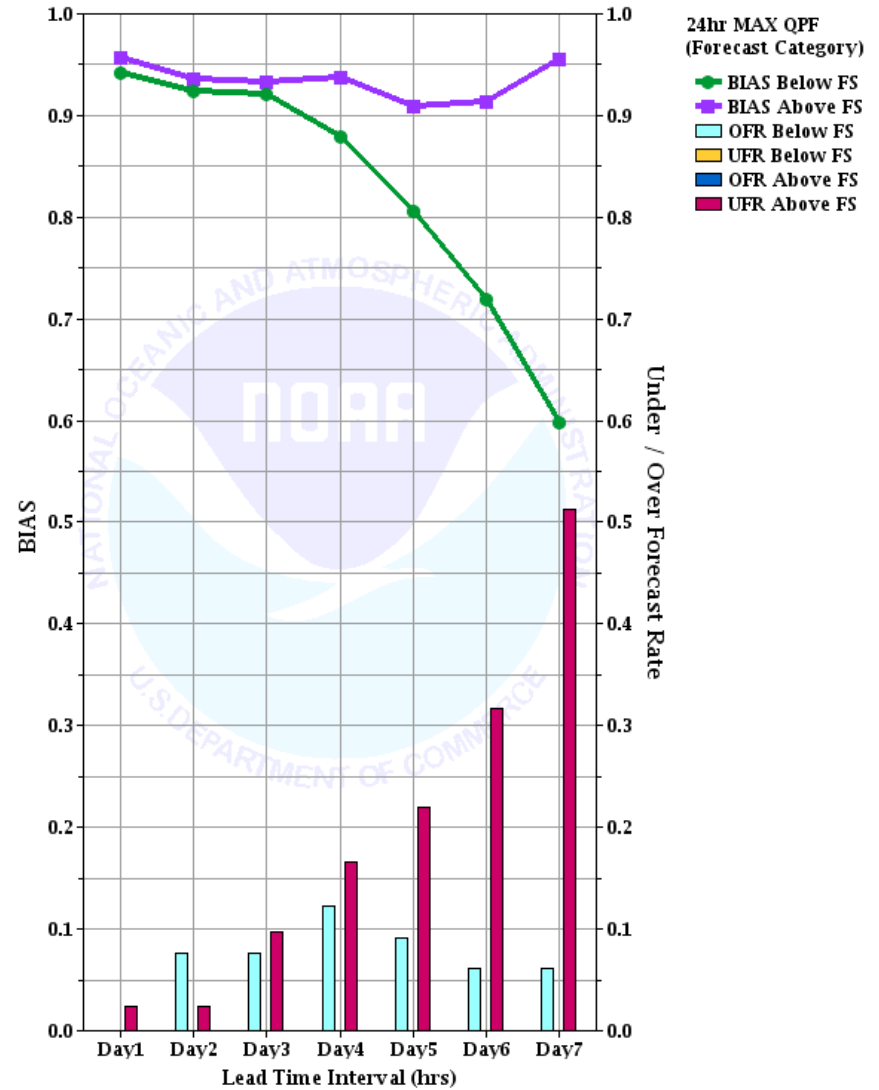


Bias and UFR/OFR for CIDI4 with 24hr MAX QPF June 2008

Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4

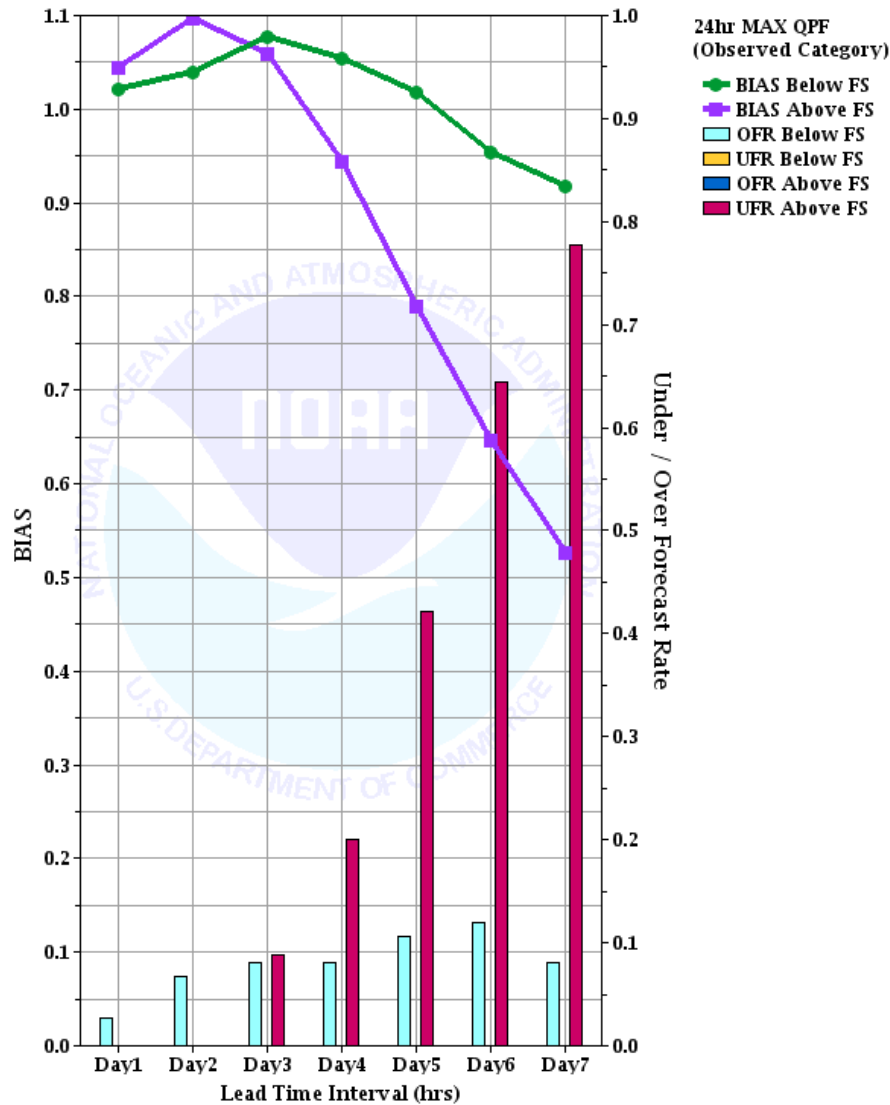


Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4

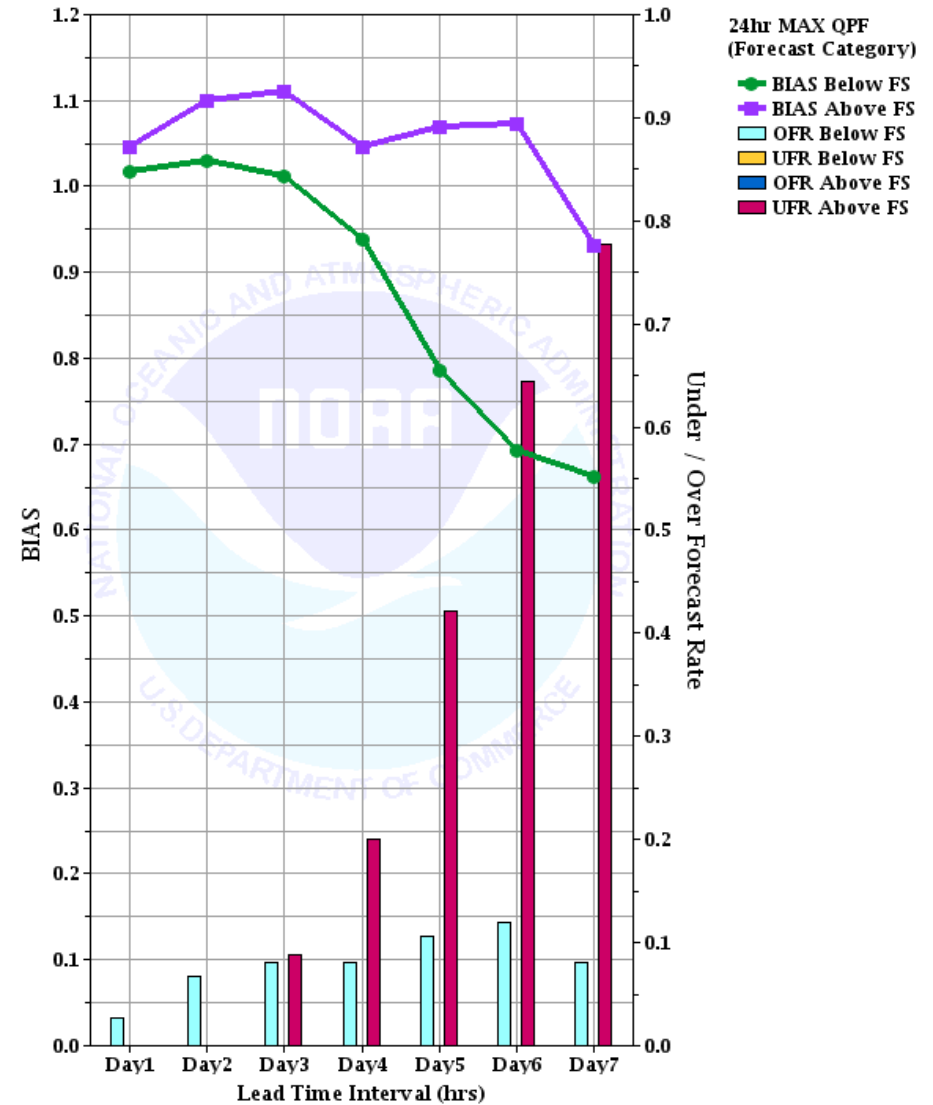


Bias and UFR/OFR for ALOI4 with 24 hr MAX QPF June 2008

Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4

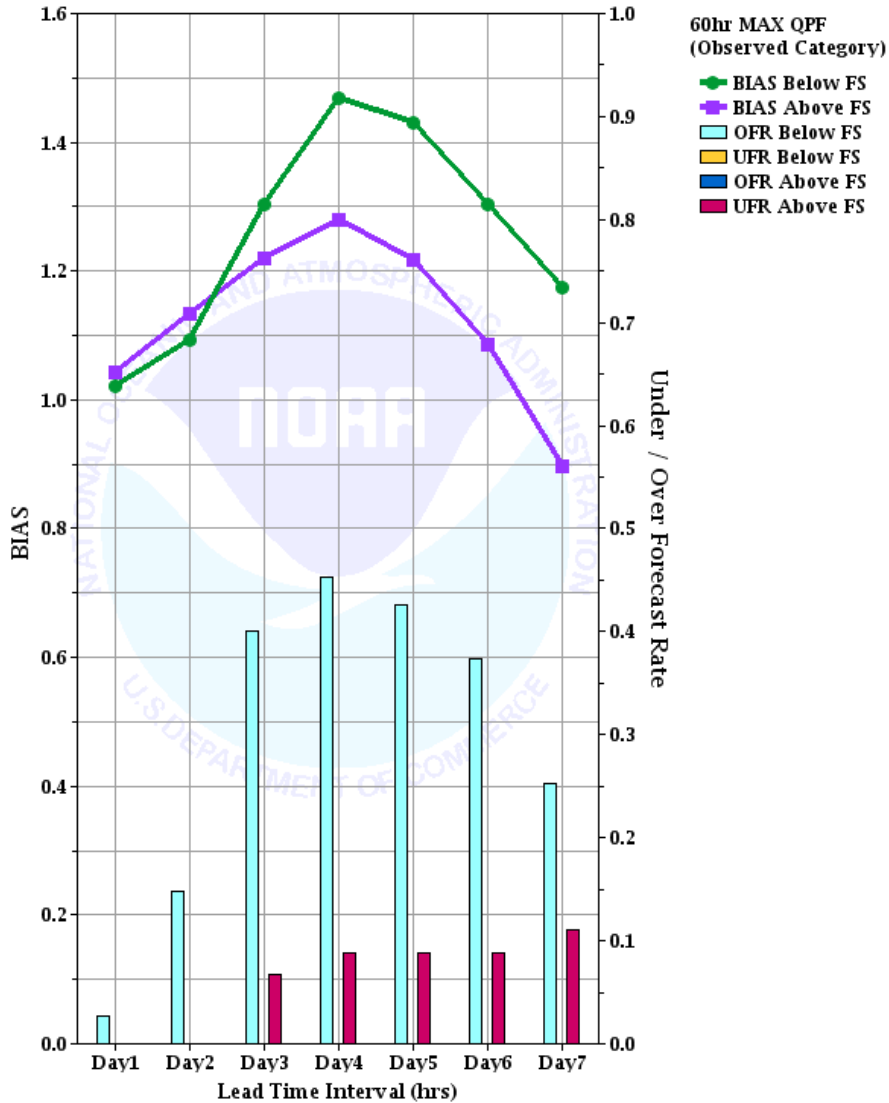


Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4

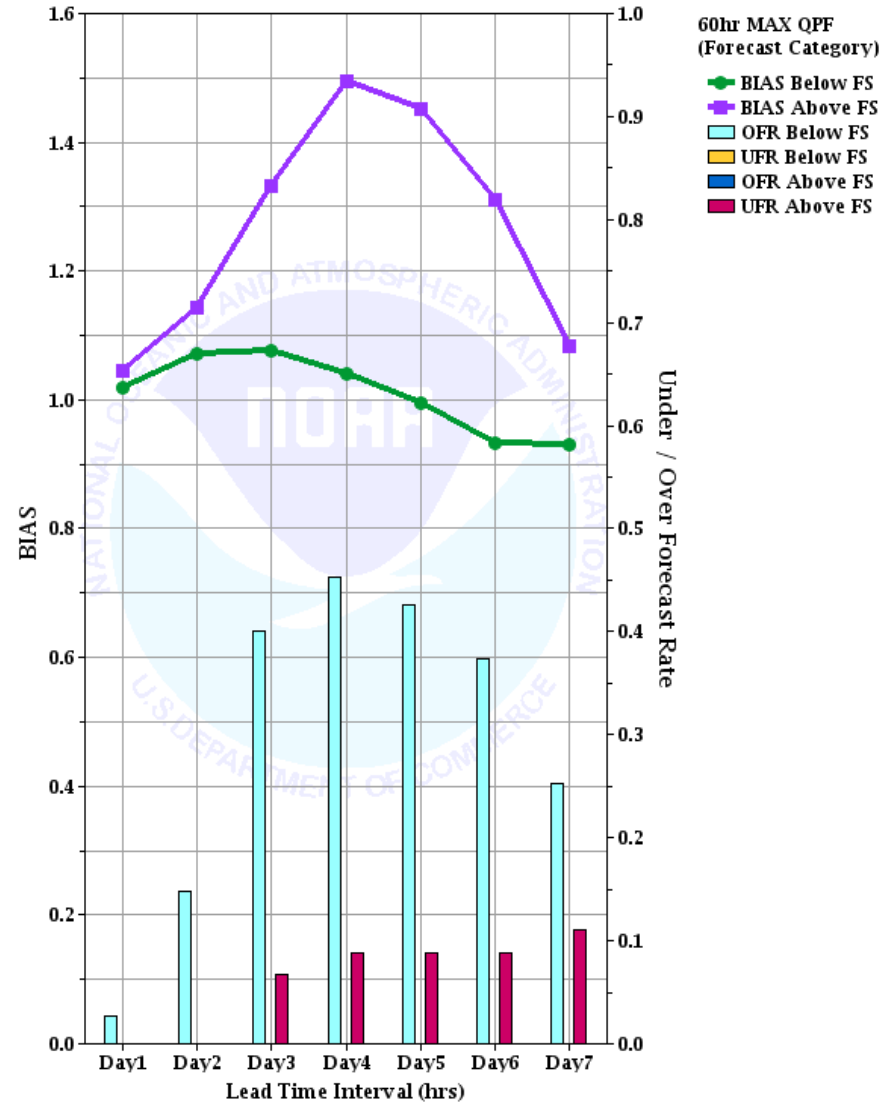


Bias and UFR/OFR for ALOI4 with 60 hr MAX QPF June 2008

Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4



Plot of Bias & Under/Over Forecast Rate against Leadtime Interval for NCRFC
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: ALOI4



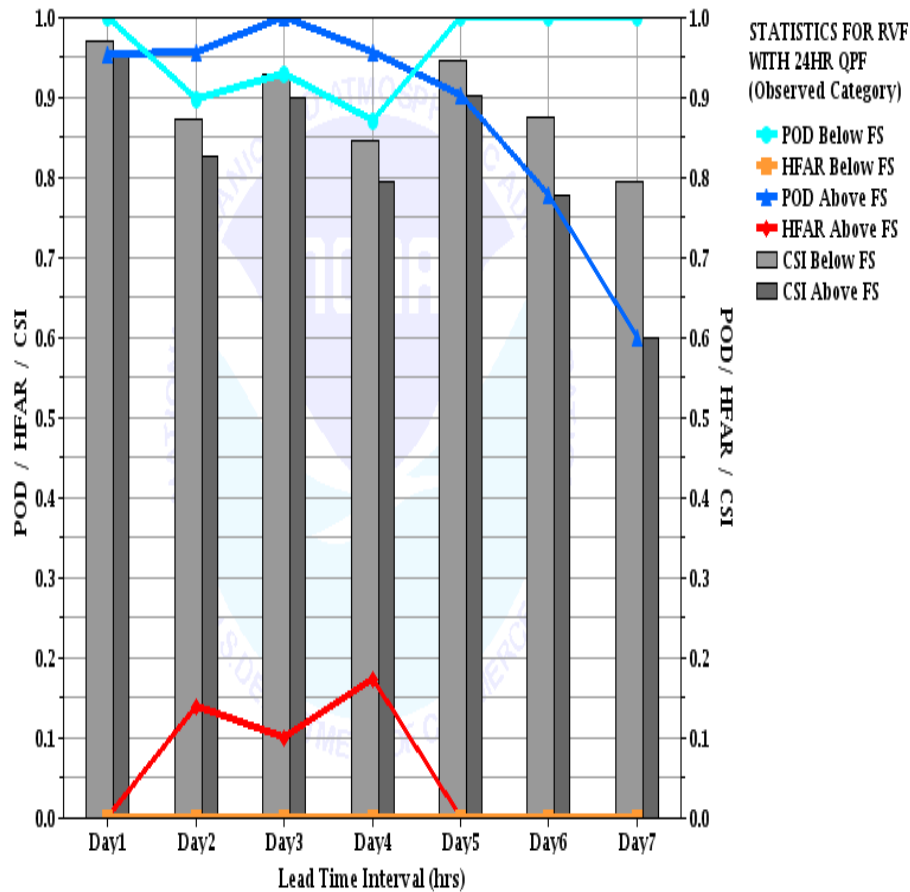
POD / HFAR / CSI

CIDI4

POD/FAR/CSI at CIDI4 for RVFs with 24 hr QPF

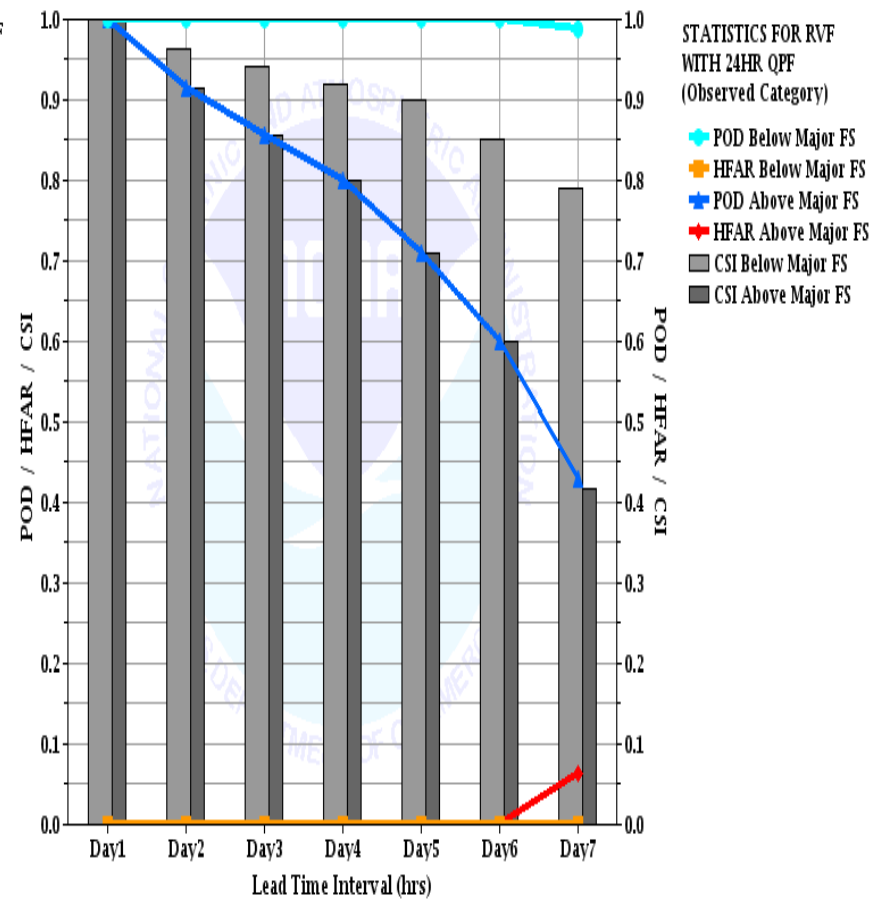
Flood Stage

POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Location: CIDI4



Major Flood Stage

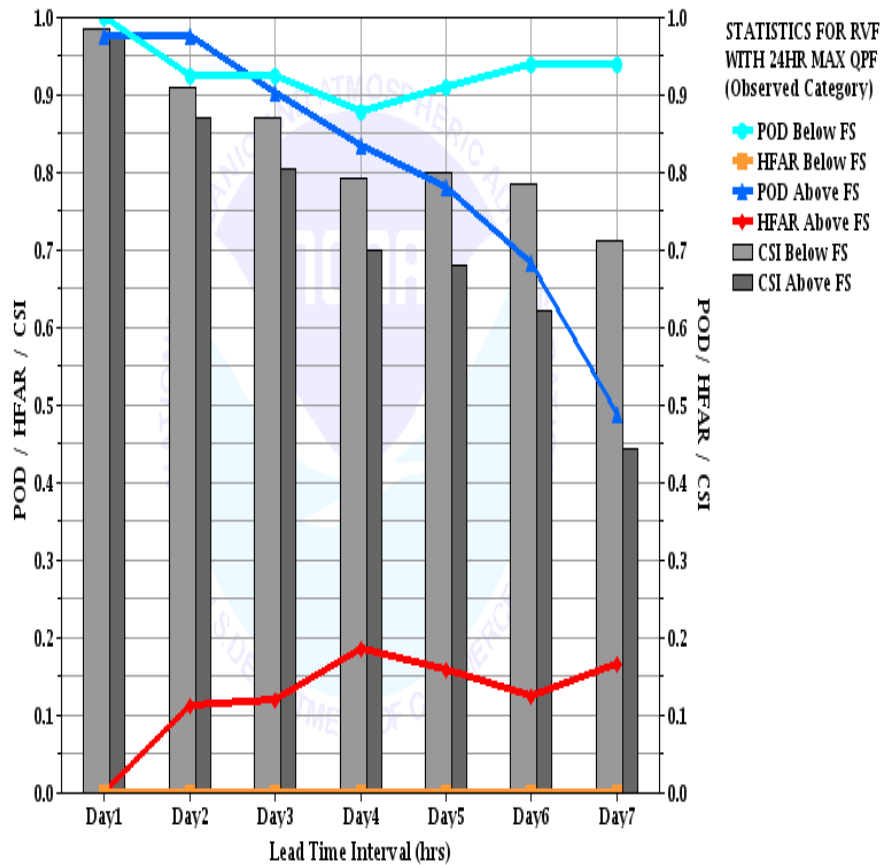
POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Locations: CIDI4



POD/FAR/CSI at CIDI4 with 24 hr MAX QPF

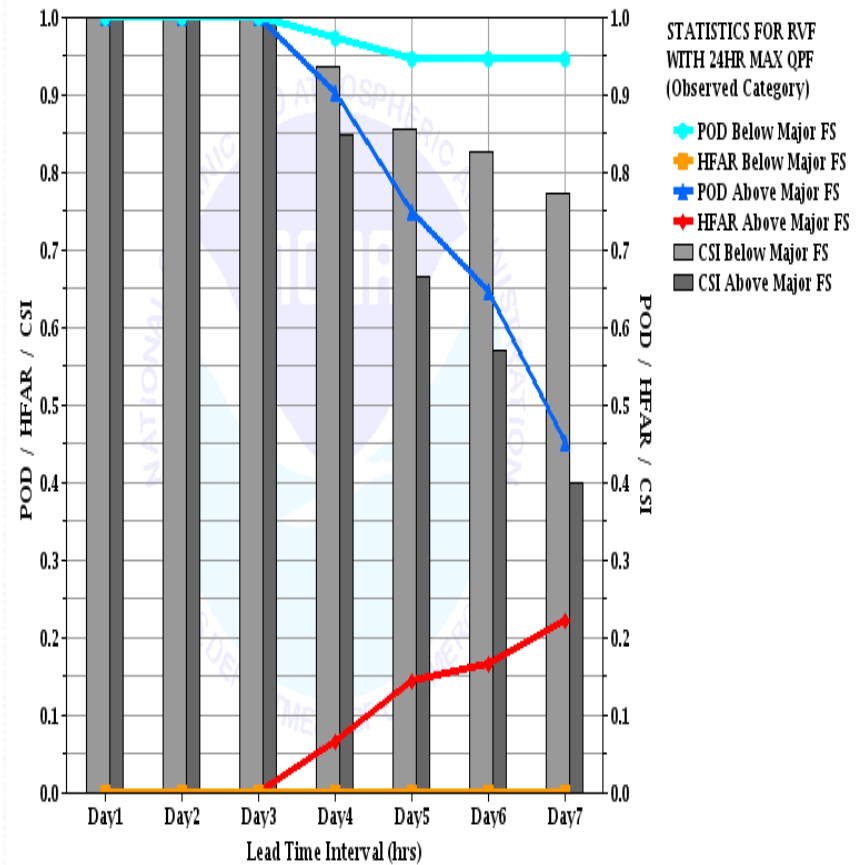
Flood Stage

POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Location: CIDI4



Major Flood Stage

POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Locations: CIDI4

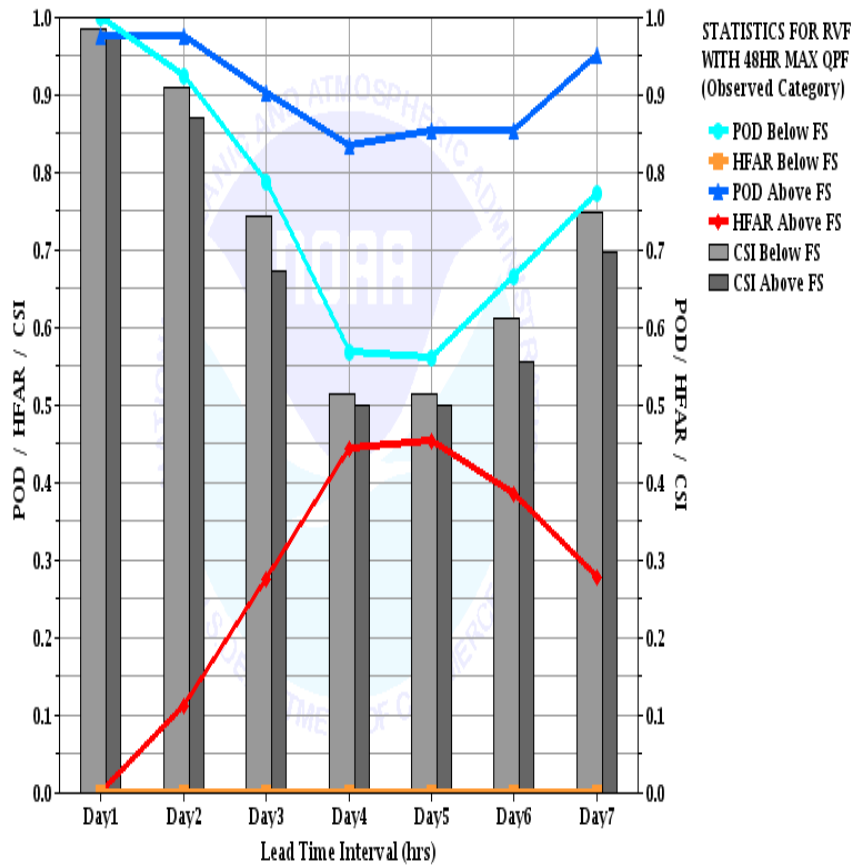


POD/FAR/CSI at CIDI4 with 48 hr MAX QPF

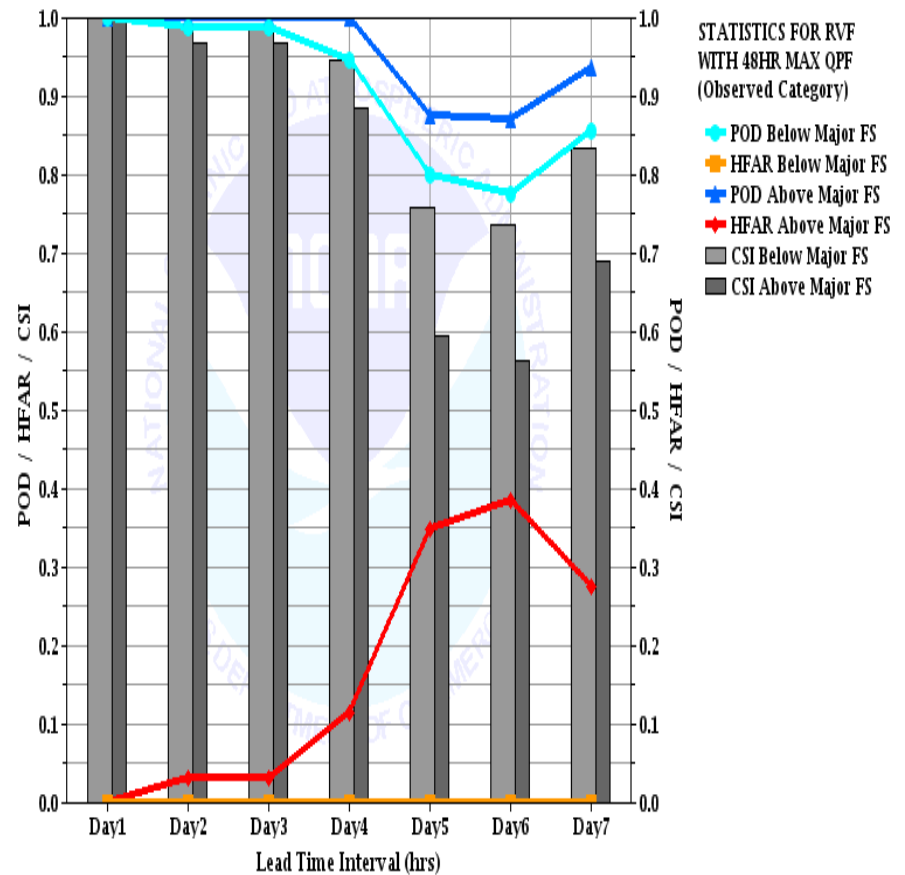
Flood Stage

Major Flood Stage

POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Location: CIDI4



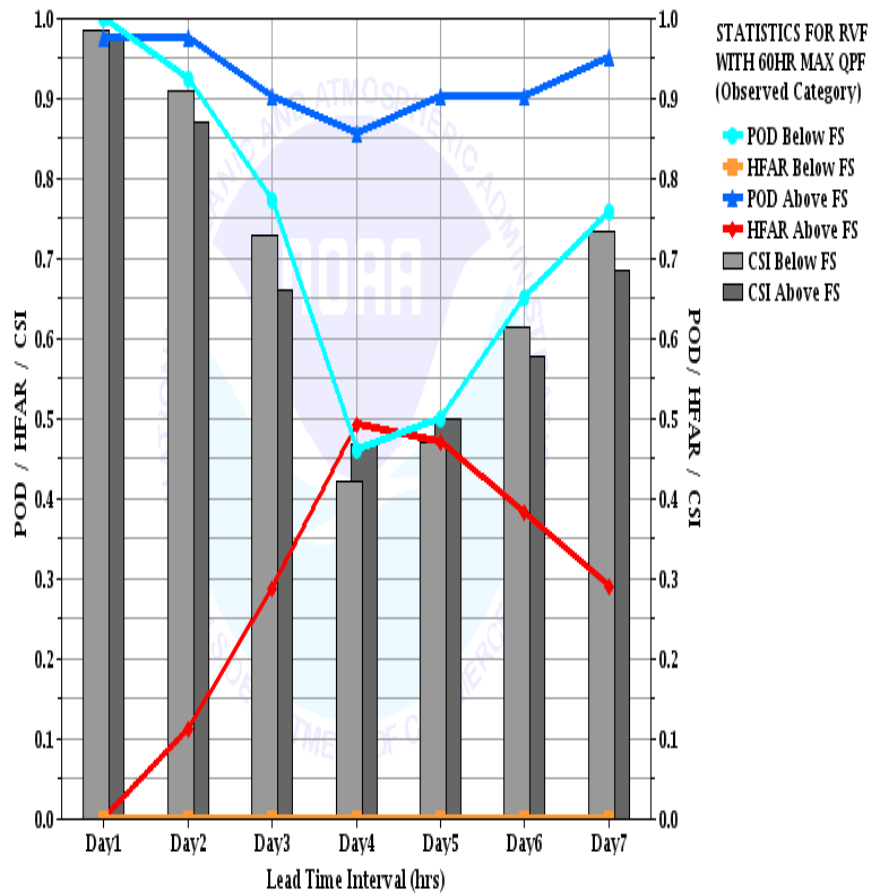
POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Locations: CIDI4



POD/FAR/CSI at CIDI4 for RVFs with 60 hr MAX QPF

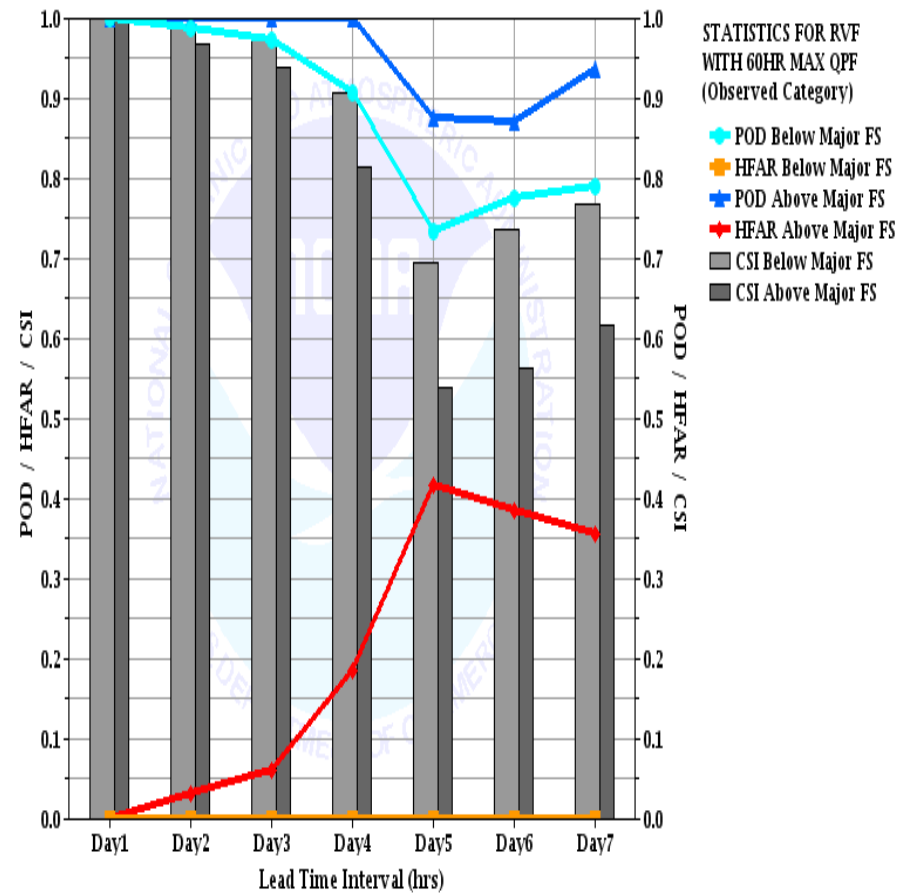
Flood Stage

POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Location: CIDI4



Major Flood Stage

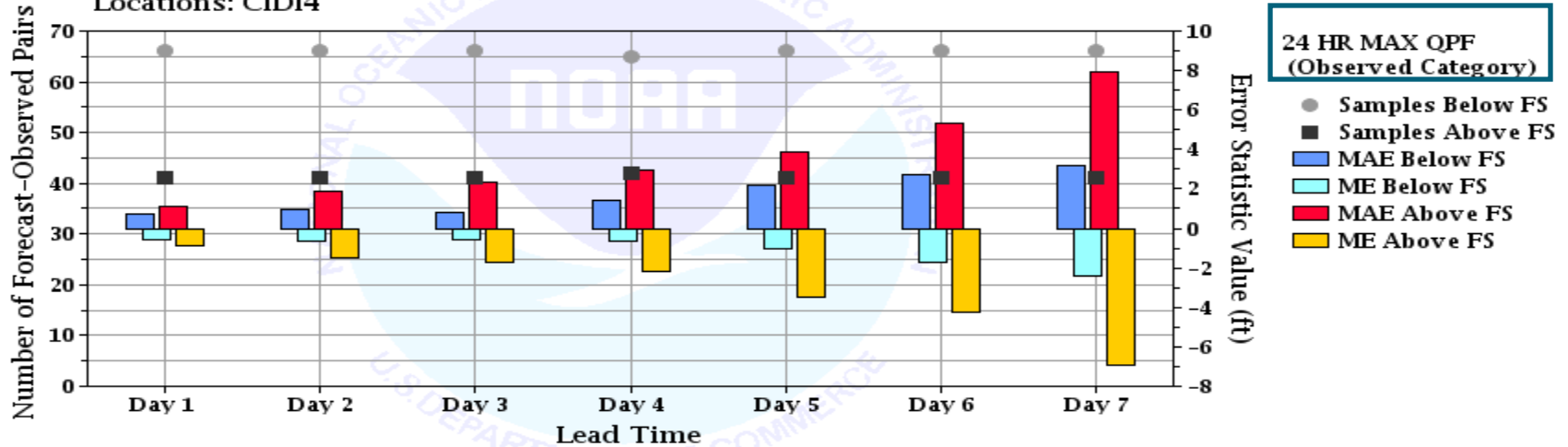
POD FAR CSI plotted against Leadtime for NCRFC Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours Locations: CIDI4



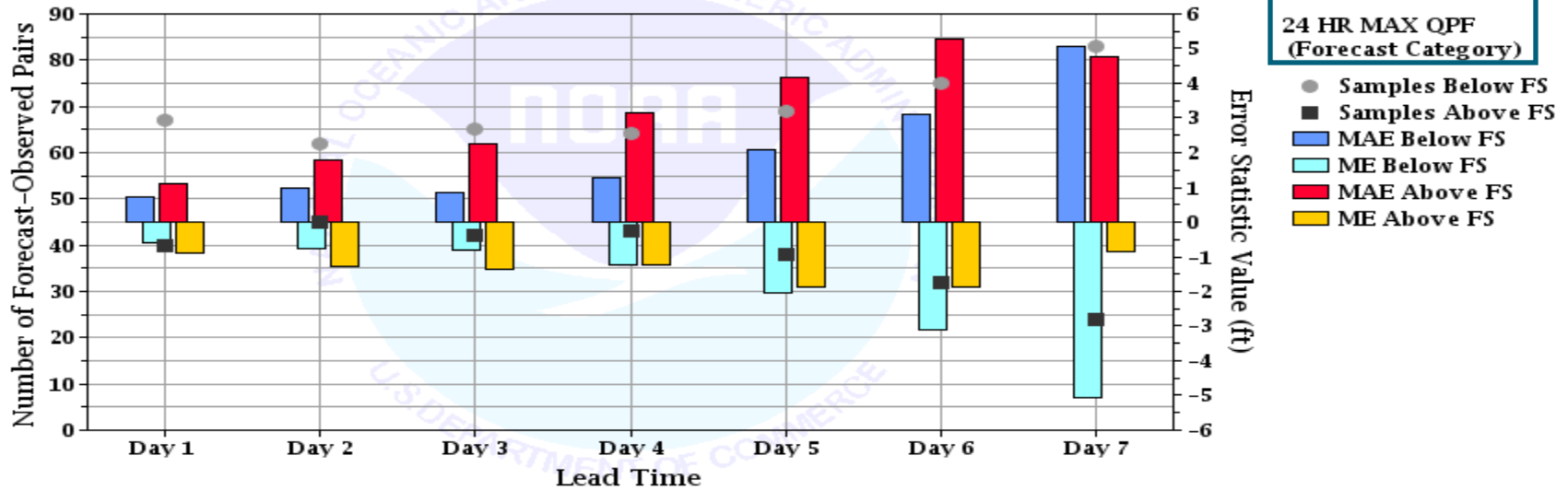
Next slide compares MAE/ME for
Above and Below FS for CX (24HR Max QPF)
FOR Time Period June 1 – 30, 2008
at CIDI4 using Comparisons for Observed Category then
Forecast Category

Plot of Instantaneous Height Sample Size against Leadtime Interval for NCRFC
 Compared Over Observed Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Locations: CIDI4

June 2008 at CIDI4

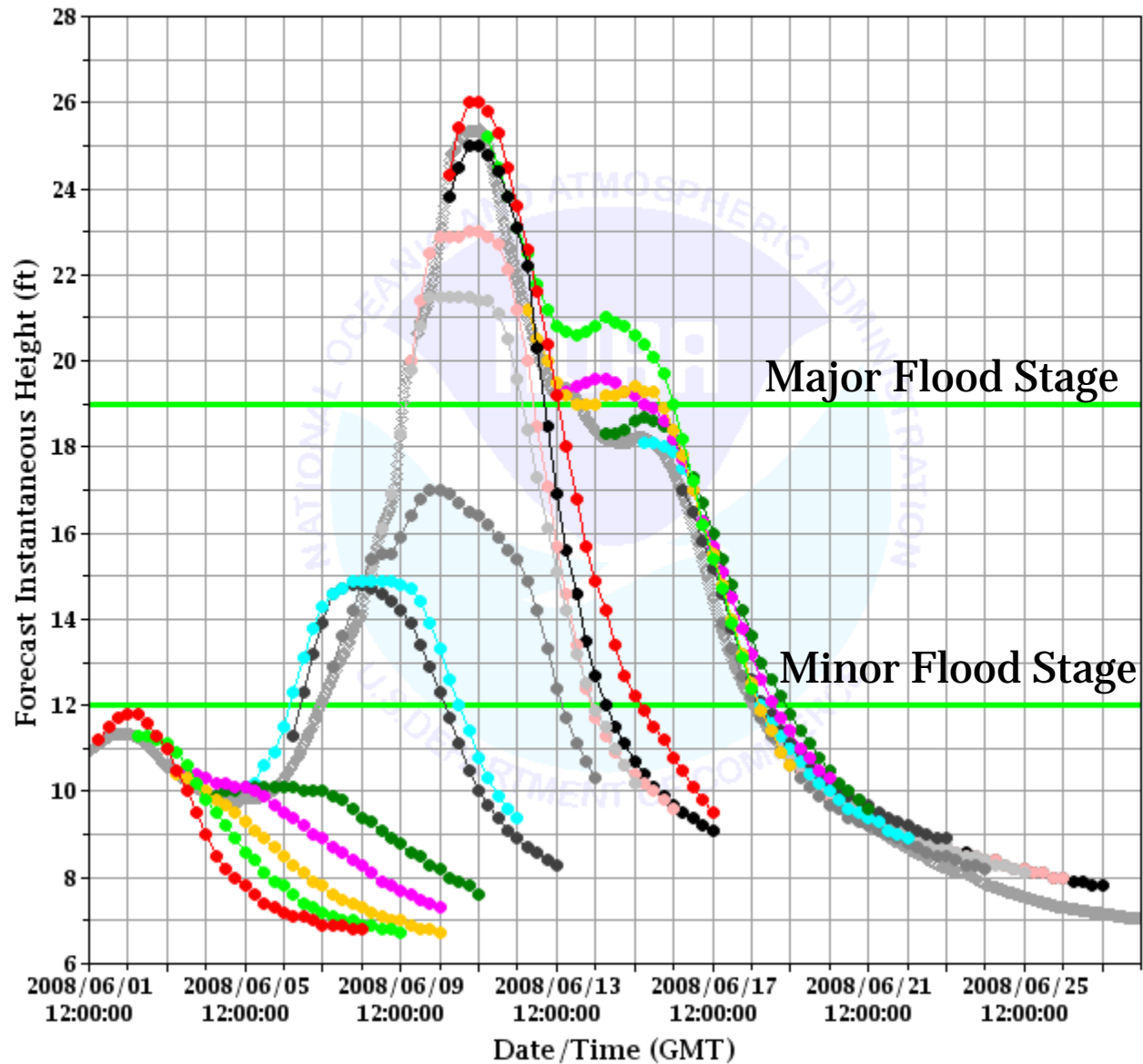


Plot of Error and Sample Size against Leadtime for NCRFC Compared Over Forecast Category
 Time Period: 2008-06-01 00:00:00 GMT - 2008-06-30 23:59:59 GMT
 Lead times: 0 hours - 168 hours
 Location: CIDI4



Plot of Forecast and Observed Instantaneous Height Time Series for NCRFC
 Time Period: 2008-06-01 14:58:35 GMT - 2008-06-30 14:58:59 GMT
 Lead times: 0 hours - 168 hours
 Location: Waterloo [ALOI4(HGIFFZZ)]
 Forecast Categories: less than 12.0, 12.0 - 19.0, greater than 19.0 ft

RVF with 24hr QPF

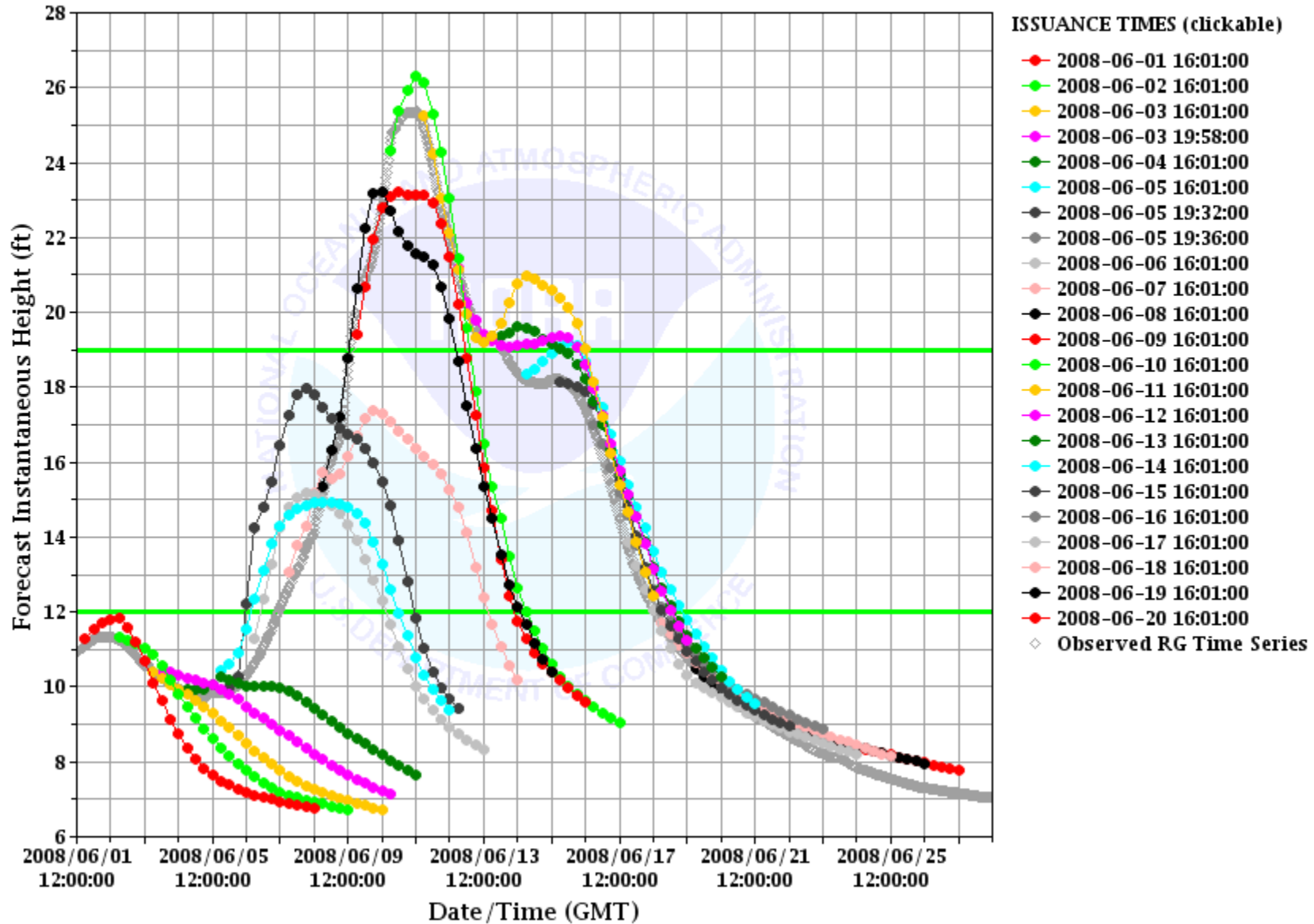


ISSUANCE TIMES (clickable)

- 2008-06-01 14:02:00
- 2008-06-02 13:44:00
- 2008-06-03 13:54:00
- 2008-06-03 18:03:00
- 2008-06-04 14:04:00
- 2008-06-05 14:14:00
- 2008-06-06 14:14:00
- 2008-06-07 13:20:00
- 2008-06-08 15:15:00
- 2008-06-09 14:59:00
- 2008-06-10 12:48:00
- 2008-06-10 15:09:00
- 2008-06-11 15:14:00
- 2008-06-12 13:58:00
- 2008-06-13 16:16:00
- 2008-06-14 14:32:00
- 2008-06-15 15:42:00
- 2008-06-16 16:04:00
- 2008-06-17 14:31:00
- 2008-06-18 14:16:00
- 2008-06-19 14:52:00
- 2008-06-20 13:30:00
- ◇ Observed RG Time Series

Plot of Forecast and Observed Instantaneous Height Time Series for NCRFC
 Time Period: 2008-06-01 14:58:35 GMT - 2008-06-30 14:58:59 GMT
 Lead times: 0 hours - 168 hours
 Location: Waterloo [ALOJ4(HGICBZZ)]
 Forecast Categories: less than 12.0, 12.0 - 19.0, greater than 19.0 ft

Model with 24hr QPF



Plot of Forecast and Observed Instantaneous Height Time Series for NCRFC

Time Period: 2008-06-01 14:58:35 GMT - 2008-06-30 14:58:59 GMT

Lead times: 0 hours - 168 hours

Location: Waterloo [ALOJ4(HGICXZZ)]

Forecast Categories: less than 12.0, 12.0 - 19.0, greater than 19.0 ft

Model with MAX 24hr QPF

