



**Des Moines River, looking southeast toward downtown Des Moines, Iowa
on July 2, 2014 (Photo Credit: WHO-HD TV)**

**National Weather Service Weather Forecast Office
HYDRO APPLICATIONS GUIDE**

**for the
WES-2 Bridge Hydro Simulation Capability
Version 1.0**

**Designed by the National Weather Service
WARNING DECISION TRAINING DIVISION (WDTD)
Office of the Chief Learning Officer (OCL0)**

Release Date: September 29, 2015

Hydro Applications Guide developed by: Greg Schoor (WDTD Instructor)
Hydro Simulation Companion module developed by: Greg Schoor & Justin Gibbs (WDTD Instructors)
WES-2 Bridge Capability and Case Development: Dale Morris, Thao Pham, Eric Jacobsen, Alex Zwink
(WDTD/CIMMS), and Andre Reddington (ACE Info Solutions)



Table of Contents

(Labels are clickable links to navigate to that section. "Ctrl + left-click" on link in MS Word.)

Introduction	3
Purpose	4
Overview	6
Learning Objectives	7
SECTION 1: NWS Hydro Applications in AWIPS 2	8
1). Hydro Perspective (in CAVE)	9
2). Hydro Time Series (in CAVE)	16
3). MPE Perspective (in CAVE)	21
4). RiverMonitor & PrecipMonitor	23
5). RiverPro	24
6). Site Specific Hydrologic Predictor	25
Hydro Applications Support and Documentation	27
SECTION 2: Supplemental Flood Guidance	28
Guidance from the River Forecast Centers (RFCs)	28
1). Flash Flood Guidance (FFG)	29
2). River Forecasts for River Points and Gauges	30
River Forecast Collaboration with the RFC	33
SECTION 3: Standardized Anomalies Analysis	35
Webpage Overview	35
Pre-Event Analysis	36
SECTION 4: Pre-Simulation Procedures	37
WES2Bridge Overview	37
Additional Simulation Considerations	38
References	39



Introduction:

[\[Back to TOC\]](#)

The goal of this training is for WFO forecasters (not just Service Hydrologists or office Hydro Program Leaders) to become familiar with and be able to effectively use the AWIPS 2 Hydro Applications for improved decision-making in potential riverine flooding situations. This guide serves as a reference for the AWIPS 2 Hydrologic Applications.

The Warning Decision Training Division (WDTD) has produced this training as a first-of-its-kind simulation using the inaugural release of the **WES-2 Bridge**. WES-2 Bridge allows users to pause, fast-forward, rewind, and jump forward to different times within the same simulation, all functions that were unavailable in WES 1. This particular flooding event is optimal for the inaugural release of WES-2 Bridge because of the necessity to be able to skip ahead to different times in this multi-day event, “run” the case smaller chunks of time, and provides greater insight than just playing a case in displaced real-time (DRT).

There are hydrologic applications that are unavailable in this simulation which are detailed in a later section of this document. This simulation is deemed “Version 1.0”, as additional simulations are expected to be released with more capabilities in WES-2 Bridge and the usage of these currently unavailable hydrologic applications.

Case Introduction:

The following case review is an interval-based simulation from an event that occurred in the National Weather Service (NWS) Des Moines (DMX) County Warning Area (CWA) during the last week of June and into early July of 2014. Much of June 2014 was particularly active for this region, before this event, with several rounds of severe weather and periods of widespread heavy rain. River levels were particularly high in the northern and northeastern portions of the CWA and most area rivers were already elevated, near, or above flood stage from rainfall in the preceding weeks and more heavy rain was expected over this last week of June.

- The simulation will focus on the prospects for the additional rainfall to result in subsequent flooding.
- You will be placed in the role of a WFO forecaster in this location, monitoring the Hydro Applications and incoming RFC forecasts.
- While multiple weather hazards occurred during this multi-day period, including severe winds, large hail, and tornadoes, the riverine and hydrologic aspects of the warning process are the primary focus of the simulation.
- You will not be interrogating radar and satellite data for convective purposes other than the monitoring of heavy rainfall, nor will you be issuing any convective warnings in this simulation (including Flash Flood Warnings – so you will not need FFMP).
- You can view available radar, satellite, and observational data but will only be making decisions on river flood-related products.
- You will not actually be issuing River Flood Warnings or Watches, since RiverPro will not be available to you in this simulation version. However, the goal is for you to use the other Hydro Applications to come to those decisions, not “how” to issue a warning.

The prerequisite for the simulation is to read through this entire Hydro Applications Guide and complete the accompanying test questions provided, which you will give to your local training facilitator.



Purpose:

[\[Back to TOC\]](#)

The overarching purpose of the training and simulation is to improve forecaster performance and collaboration efforts in riverine flooding situations. This guide for NWS Hydrologic Applications and the accompanying simulation aims to refine functionality before, during, and after flood events, leading to improved hydrologic forecast operations. The simulation will operate through WES-2 Bridge and similar to the severe weather DRT simulations in WES 1 but more powerful in its capabilities. DRT is also a capability of WES-2 Bridge.

Three separate [NWS Service Assessments^{\[1\]}](#) have identified multiple needs within the agency for improved drills to train NWS forecasters on hydrological events and other hydrologic-related activities, such as interoffice coordination. The assessments revealed a lack of knowledge and experience with the available WFO hydrologic applications and proper coordination with the local River Forecast Center (RFC). Below are the relevant findings behind the motivation for this training.

Review the following findings and recommendations from these assessments as they will be addressed in the learning objectives for the guide.

From the [Nashville, TN Flooding - 2010^{\[2\]}](#) Service Assessment:

“Finding 16: As a result of an inadequate training tool to effectively drill on hydrological events, not all NWS forecasters are confident in their abilities to handle difficult, rare flooding episodes. One forecaster stated, “We do not use river programs much. They are difficult for meteorologists to integrate into operations.” This relates to an agency wide emphasis on severe weather, difficulty in using several different pieces of software for river flood monitoring and product issuance, and lack of routine exposure to and training for non-routine hydrologic events. Currently, there is no end-to-end simulator mode for hydrologic services in WFOs.

Recommendation 16: NWS should develop the capability for WFO forecasters to conduct training sessions using archived operational data from historic flood events. Such training should use operational hydrologic tools to provide a simulation capability analogous to the functionality provided by the WES used in WFOs.”

“Finding 12: Many forecasters do not have the tools or experience to routinely incorporate pattern recognition, and use of anomalies and short range ensemble data, into the forecast process.

Recommendation 12: The NWS should enhance training for operational forecasters on pattern recognition for extreme events and use of anomaly data in the forecast process in an effort to better predict rare or record events.”

“Finding 14: Not all WFOs staff prioritize adequately for high impact hydrologic events.

Recommendation 14: WFOs should employ a team approach to working hydrologic events similar to how significant severe weather events are handled. This approach should include appropriate prioritization of staffing resources and hydrologic related duties.”



From the [Front Range/Eastern CO Floods – 2013^{\[3\]}](#) Service Assessment:

“Finding 1: There was limited direct coordination regarding rainfall potential and flash flooding between WPC and the impacted WFOs and RFCs prior to this event.

Recommendation 1: WPC and the WFOs and RFCs should replicate the successful winter weather coordination model for significant hydrologic events by conducting coordination calls when the potential exists for widespread heavy rainfall and flash flooding.”

“Finding 24: WFOs cannot play back archived hydrologic data to support event simulations for high impact hydrologic events using the core WFO WFHS applications.

Recommendation 24: The NWS should develop event simulation capability for the core WFO hydrologic program applications. Once developed, NWS must integrate hydrologic training requirements into NWS Instruction 20-101, *Use of Weather Event Simulator*, which mandates at least four training simulations for each forecaster annually.”

From the [Southeast U.S. Floods – 2009^{\[4\]}](#) Service Assessment:

In the **Decision-Support** section:

“Recommendation 2: ...NWS should conduct a comprehensive communication effort and training program to help employees make the transition from a product-based organization to a high impact and decision-support agency.”

In the **Products** section:

“Fact: There was considerable confusion within the media and the public regarding the differences between areal flood, river flood, and flash flood. There was also confusion regarding the differences in content, format, and dissemination for products issued for different types of flooding.

Finding 4a: WFO warnings and statements generally contained standard WarnGen template call-to-action statements and generic impact information that failed to convey the severity of the flash flood/flood events.

Recommendation 4: Warning statements should be as specific as possible regarding area and severity of impact.”



Overview:

[\[Back to TOC\]](#)

There are two main parts of this training, to be completed in this order:

1). Hydro Applications Guide (this document): This guide is an overview of the AWIPS 2 hydrologic applications. Read through the entire document in preparation for the questions on the separate document: “**HydroAppsQuestions.docx**”. You can either print or type your answers into this form and submit the answers to your local training facilitator.

To get credit: Students must receive a score of 70% or higher on the test.

2). Simulation Companion (online module alongside WES-2 Bridge exercise): After loading the case on WES-2 Bridge, log into the NOAA Commerce Learning Center (CLC) and open the simulation companion module. This module is a narrated instructional companion, walking you through the simulation and all of the associated analysis and decision-points from the perspective of an NWS WFO forecaster concentrating on hydrology.

To get credit: Students must answer the quiz questions in the Learning Management System (LMS) and receive a score of 70% or higher.

For offices without a personal computer (with internet) co-located with the WES-2 Bridge workstation, there is also a WESSL-2 script in the WES-2 Bridge simulation with the same quiz questions at each testing period. You can answer the questions within the WESSL-2 module and print out the answers or write down your answers on paper. After you’ve completed the simulation, you can then log into the CLC LMS module and insert your answers to the questions to receive credit.



Learning Objectives:

[\[Back to TOC\]](#)

Since this training is split into two main parts, the objectives apply only to each part. The following objectives are designed for this document about the background WFO hydrologic applications, the understanding of river flood forecast guidance, and demonstrating the usage of standardized anomaly forecasting for hydrologic operations.

Objectives for the simulation are specified in the online **Simulation Companion** module.

Using the **Hydro Applications Guide** as a reference,

- **Identify the functionalities of the AWIPS 2 Hydro Applications, according to the specifications and procedures outlined in this Guide.**
- **Describe the types of RFC guidance for river gauge points and coordination practices on river forecasts according to the examples in this Guide.**
- **Identify potential meteorological elements and contributors to heavy rain events through standardized anomaly analysis using the Ensemble Situational Awareness webpage.**



SECTION 1: NWS Hydro Applications in AWIPS 2

This guide and accompanying simulation is geared toward a full operational understanding and usage of these applications, individually and collectively. **However, before diving into the event and putting yourself in a decision-making position, it is important to become familiar with the Hydro Applications available in AWIPS 2.** There are multiple applications discussed in this guide and though some of the data is redundant, but each application functions and displays the data in different ways. This gives the operational NWS Weather Forecast Office (WFO) forecaster the ability to visualize the data in multiple formats and make decisions based on the data in the appropriate confidence level.

In terms of the responsibilities held by an operational WFO forecaster, river flooding and flash flooding have some similarities but can be very different in their temporal and geographic senses. Shorter-fuse hazards, like flash floods, have tools like the **Flash Flood Monitoring and Prediction (FFMP)** program, which launches from the **Display Two Dimensions (D2D)** perspective in the AWIPS 2 **Common AWIPS Visualization Environment (CAVE)**. FFMP uses the same River Forecast Center (RFC) Flash Flood Guidance (FFG) as the other hydrologic applications but in more of a short-term sense. Flash flooding can certainly contribute to river and small stream flooding, which is essentially the hand-off in terms of the more long-term flooding considerations. River flooding and the forecasts leading up to the actual flood can happen on the scale of days, whereas as flash flooding occurrence is normally on the scale of a few hours.

The tail-end of the flash flooding is where the response from affected river and small streams normally begins to take shape, especially if their levels were already elevated. Flooding of rivers and small streams can be dependent on many factors, including the amount of rain, duration, basin size, topography, antecedent conditions, time of year, land usage, and a number of peripheral considerations. In the upcoming simulation, we will attempt to simplify these factors down to the monitoring of received rainfall and viewing the river point data to see how river levels respond – for one CWA, for a select number of gauges and river forecast points with the following hydrological applications.

- 1). Hydro Perspective (in CAVE)
- 2). Hydro Time Series (in CAVE)
- 3). MPE Perspective (in CAVE)
- 4). RiverMonitor and PrecipMonitor
- 5). RiverPro
- 6). Site Specific Hydrologic Model

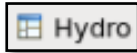
These applications will not be available in this simulation but will be in future river flood simulations

(Since you will not have RiverPro to issue the river products, the “issuance” will come in the form of quiz questions embedded the Simulation Companion module at designated times.)

*** Note:** As more capabilities become available with WES-2 Bridge, WDTD will provide instructions for creating similar river simulations for their CWAs, likely included in future simulation releases.

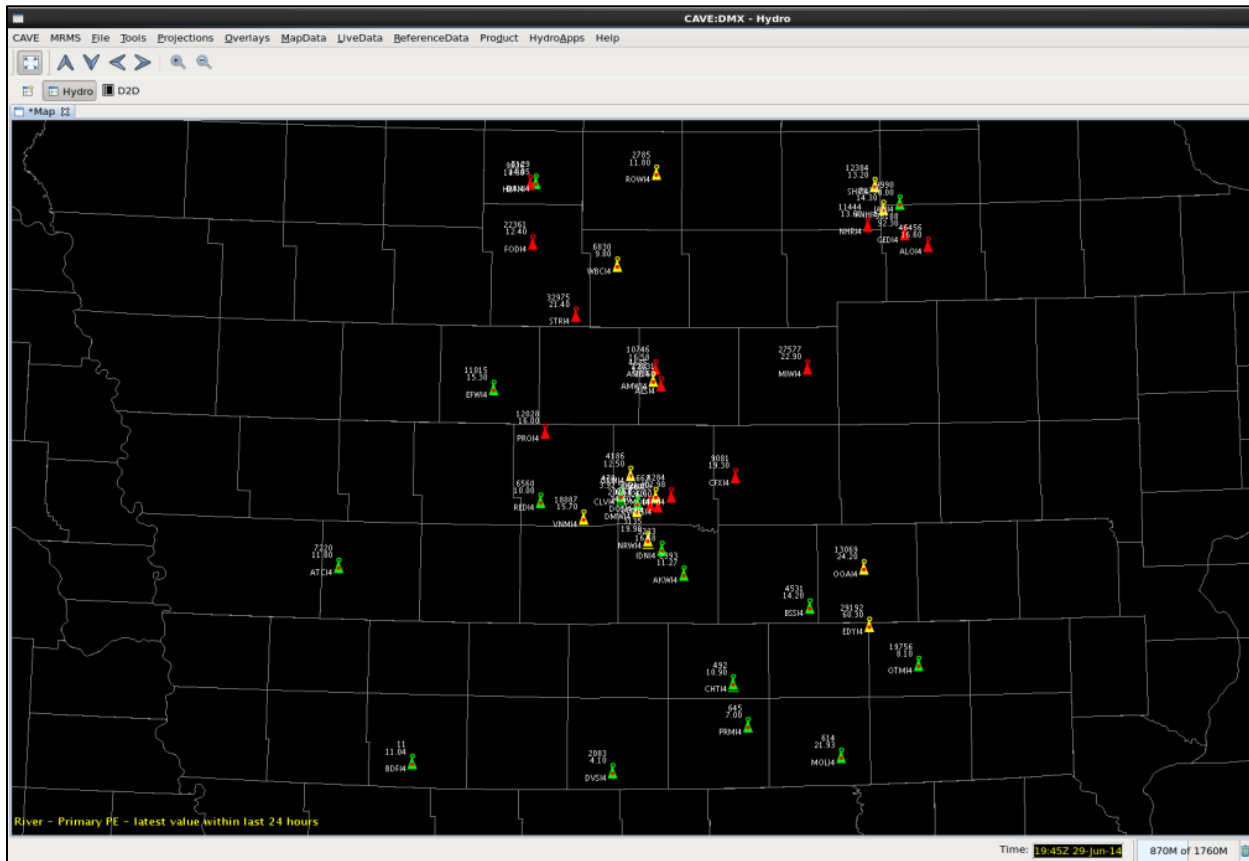


1). Hydro Perspective (in CAVE)



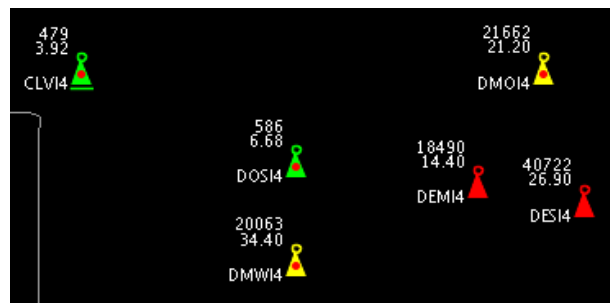
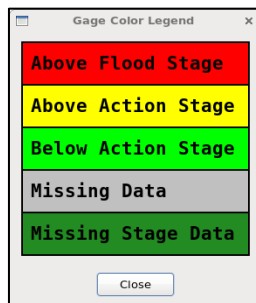
[\[Back to TOC\]](#)

In AWIPS 2, this perspective is available in [CAVE](#). The **Hydro Perspective** is essentially the “map view” of the area rivers, displaying information about river level heights, gauge amounts, and provides the quickest way to open the **Hydro Time Series** application (detailed in the next section) that generates hydrographs and tables for individual points. This application is essentially the situational awareness display of the gauges in this plan-view mode, to where additional data points and QPE layers can be overlaid, for enhanced monitoring potential. **Consider this the base application for monitoring of the area gauges, since you can view levels here at a glance and then access point forecasts through Hydro Time Series – accessed from this perspective.**



Example of Hydro Perspective in CAVE (for DMX CWA) with default gauges displayed

Notice the various icon shapes and demarcations (right image), along with the station name and associated values next to the icons. The icon shape for each point indicates the gauge type and the color indicates the current



stage (center image – Gauge Color Legend). This legend can be found by right-clicking on “Gages” on the bottom-right of the window and click “Display Gauge Color Legend”.





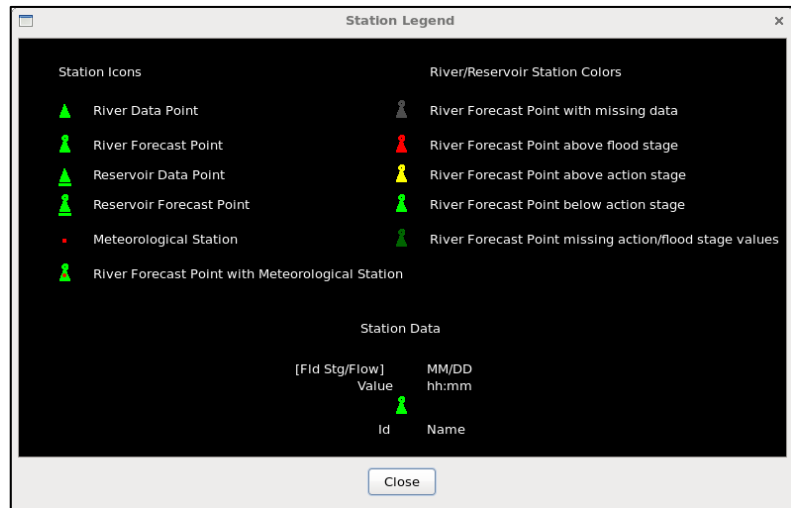
Flood Stage Terminology (Reference: [AHPS terminology](#))

Flood Stage Categories	
Action Stage	The stage which; when reached by a rising stream, lake, or reservoir represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity. The appropriate action is usually defined in a weather forecast office hydrologic services manual. Action stage can be the same as forecast issuance stage (see forecast issuance stage)
Minor Flooding	Minimal or no property damage, but possibly some public threat.
Moderate Flooding	Some inundation of structures and roads near stream. Some evacuations of people and/or transfer of property to higher elevations.
Major Flooding	Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevation.

Keep in mind, a red-colored icon indicates that the gauge/point is “in flood” or “above flood stage” but it does not indicate which of the above categories of flooding the gauge/point is experiencing. This information will come from the hydrographs you summon from **Hydro Time Series** for that point.

Station Legend (accessed from Help menu)

The right image shows the available legend for the stations and their associated information. Points that are yellow and red are clearly the higher priority given that they are either above action or flood stage. However, in an area where flooding is or could be occurring soon, even the “below action stage” point need to be monitored – their forecasts and trends – because river levels can rise quickly if enough heavy rain affects nearby and feeder streams and tributaries.



The display and the legend are a bit different, so here is a more representative diagram of the information shown.



- Additional information derived from example icon shape & color:**
- Below Action Stage (green)
 - Is a River Forecast Point (ring on top)
 - Is a Meteorological Station (red dot)



Standard Hydrometeorological Exchange Format (SHEF) Code Overview:

According to [SHEF Manual](#)^[7], the SHEF code is a documented set of rules for coding of data in a form for both visual and computer recognition of hydrometeorological data. In other words, it is a unique data format that is used by the Hydro Applications to display forecasts and observations, as opposed to the format for displaying radar, satellite, and other associated data in D2D. You will commonly see SHEF “code pairs” like “HG”, “RG”, “FF”, “FZ”, etc. in the **Hydro Times Series** application that will be important to know what data to view.

Single term values (first letter of a pair):

- **R: Reading (observed), default**
- C: Contingency
- **F: Forecast**
- **H: Historical**
- M: Model
- P: Non-forecast Processed

Single term values (second letter of a pair):

- Z: no extremum, *default*
- N: minimum of day
- H: minimum of 6 hours
- P: minimum of 12 hours
- X: maximum of day
- R: maximum of 6 hours
- Y: maximum of 12 hours

Code Pair examples:

- RZ: non-specified (observer) reading, *default*
- RG: DCP reading
- RP: phone reading (LARC, CR10, etc.)
- RR: radio reading (ALERT, IFLOWS, etc.)
- FZ: non-specified forecast, default for F type
- **FF: forecast including QPF**
- **HG: height, River Stage (the elevation of the water surface at a specified station above some arbitrary zero datum)**
- HH: height, of Reading (the elevation above MSL at which an observation is taken)

The terms highlighted in red are the ones you will be using the most, either looking at **past-to-current (R or H)** river levels for a point, the **forecast (F)** for that point, or both. The image below is an example of the bottom section of a **Hydro Time Series** window, where the selection (highlighted in blue) is for the display of the default (Z) forecast (FF) of the height/river stage (HG) of this example river gauge.

HG	RG	Z	HG=River Stage	RG=GOES
HG	RP	Z	HG=River Stage	RP=Phone DARC
HG	RZ	Z	HG=River Stage	RZ=Nonspecific Observed
HG	FF	Z	HG=River Stage	FF=Forecast uses QPF
HG	FA	Z	HG=River Stage	FA=Adjusted model 1
HG	FZ	N 90 day	HG=River Stage	FZ=Nonspecific Forecast
HG	FZ	X 90 day	HG=River Stage	FZ=Nonspecific Forecast



Point Data Control

This window is the starting-point, especially in a simulation like this, to direct the proper information to display in the **Hydro Perspective**. In real-time situations, the data should display correctly without the need to re-set or modify the desired time period. More specific information what to do with this window will appear in the simulation instructions. For this section, just view the screenshot (right image) and notice the “Value/Time” section, where these values will need to be modified for different sections of the simulation. Underneath this time section is the “Value is” which will need to be changed to “Value for Selected Time” when in a simulation mode, whereas real-time situations will be “Latest Value” as the default. Future editions of WES-2 Bridge will make this control window behave in a simulation similar to how it works in real-time.

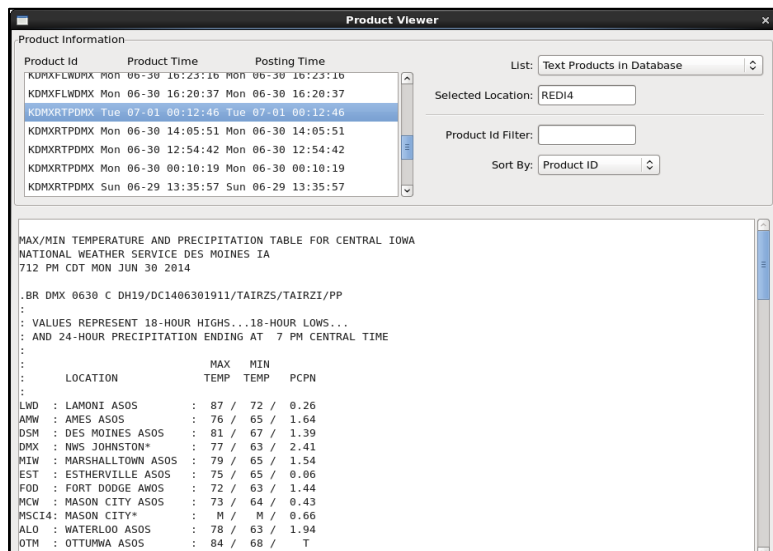
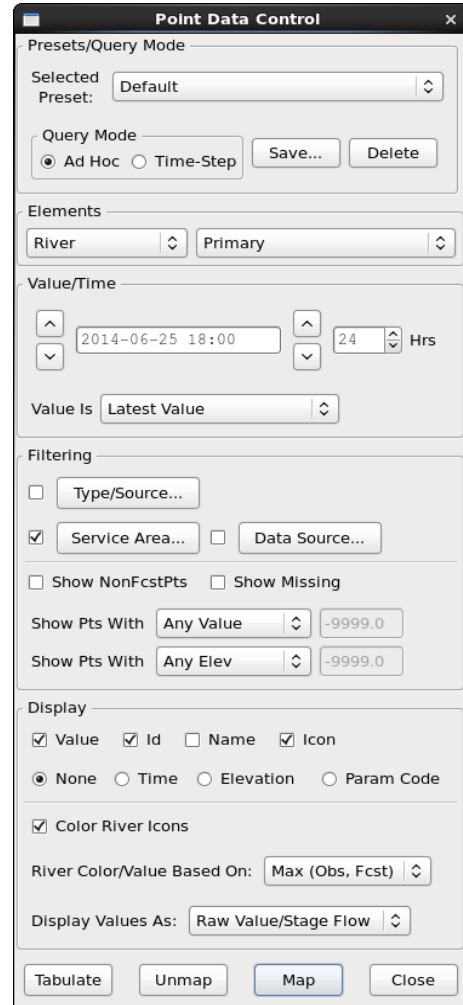
Once the desired settings are selected, click “Map” to display the river point information.

Additional Features and Capabilities

There are a number of additional displayable features, layers, and data point configurations that could be discussed for this perspective but we will stick with the most important aspects to the upcoming simulation. The goal is to become familiar with most critical capabilities of this and the other hydro-

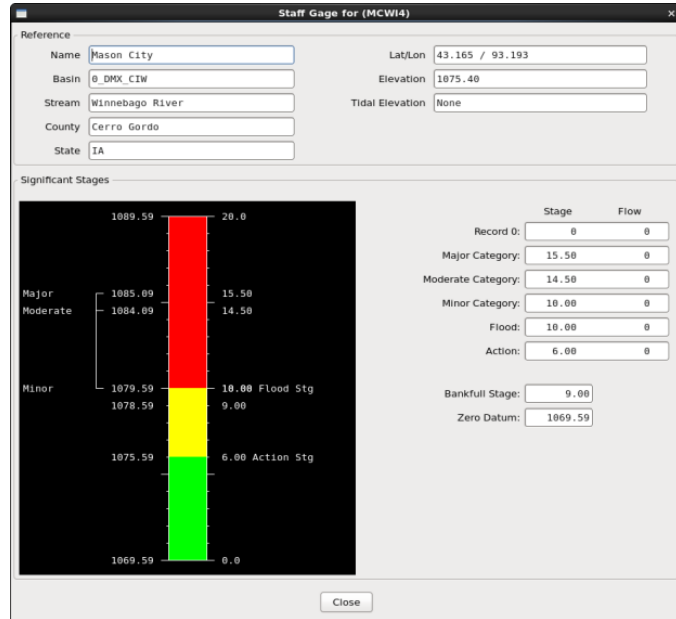
based applications, for the purpose of situational awareness and proper forecast and warning decision-making. Some of these features that will be discussed are full-view layers and others are gauge-specific data that require you to select the gauge of interest first.

First is the **Product Viewer** available from the **Product** menu in the **Hydro Perspective**. This is a text browser that displays various NWS products for a selection gauge/point for easy tabular and text data viewing, see example image below. Notice “REDI4” is the gauge ID in the “Selected Location” but you can also view all available products by selecting “Text Products in Database” under “List:”. The other two options are “Latest Product by Product Identifier” and “Products for Selected Location”.





Another feature is the **Staff Gauge** data. Left double-click on a gauge to make the red rectangle appear around the icon (top-left image), then navigate to **Staff Gauge**, the first option under the **ReferenceData** menu. A window appears (example at the top-right) with a number of gauge properties, including standard information about the gauge itself (location, elevation, etc.), flood category levels, both in text and diagrammed format.



Click on the next option from the **ReferenceData** menu – the **Impact Statement** window. Having a gauge selected, you will be able to view the actual impact statements that would go into a warning or update product, according to the anticipated or current river level. In the example images on the right, for 15.0' at the MCWI4 –Mason City gauge, water would top the protection levee that runs from the 12th St. NE Bridge to 9th St. along the east bank and also from 8th St. to 6th and Hampshire streets.

IMPACT VALUE	IMPACT PE	BEGIN	END	TENDENCY
28.5	HG	01/01	12/31	RISING
17.4	HG	01/01	12/31	RISING
15.0	HG	01/01	12/31	RISING
14.0	HG	01/01	12/31	RISING
12.0	HG	01/01	12/31	RISING
11.0	HG	01/01	12/31	RISING
10.0	HG	01/01	12/31	RISING

Characteristics:
 Impact Value: 15.0 Impact PE: HG Begin (Seasonal): January 01
 Tendency: Rising End (Seasonal): December 31
 Falling

Impact:
 This is the approximate top of levee protection. Levees run from the 12th Street Northeast bridge to 9th Street along the east bank and also from 8th Street to 6th and Hampshire Streets.

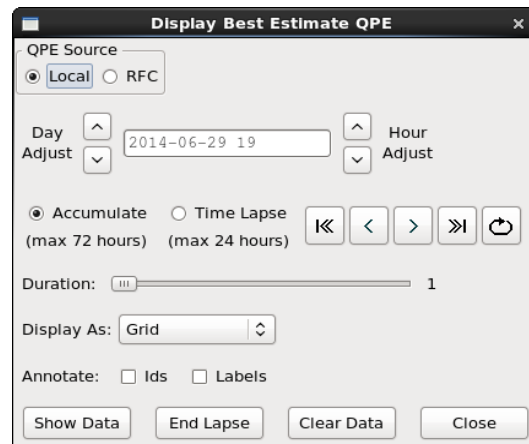
There are a few additional viewing options, including rising or falling tendency values and the option to change start/end dates – though the default are the more useful for quick reference in the upcoming simulation.

The final two features of the Hydro Perspective for this simulation are layers that can be combined with the gauges for enhanced situational awareness are **Best Estimate QPE** and **Flash Flood Guidance**.

Best Estimate QPE

Navigate to the “MapData” menu and select **Best Estimate QPE**.

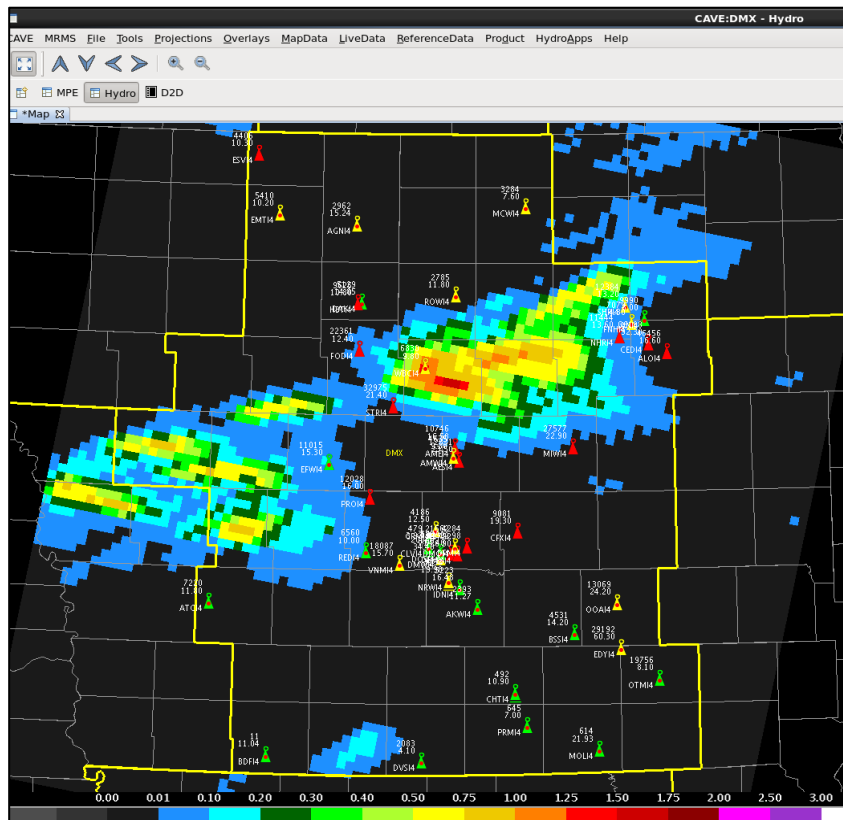
A set-up window will appear (right image), which can be set for any time during this event period (from June 25 to July 2, 2014). Adjust the date and time with the up/down arrows. “Display As:” should be “Grid”, so you can view the best-resolution gridded QPE data. These plots are hourly accumulated estimates (like the WSR-88D one-hour accumulated precipitation product), so keep that in mind.





You have the option to display and loop each hourly image as a background layer or to show a total accumulation image (for a specified amount of time).

For the hourly images, select “Time Lapse” and select the date/hour to display. To view multiple images and either loop them or step through them individually, adjust the **duration slider bar** from the default “1 hour” to the desired amount of hours to loop through – then click “Show Data”. Once the data appears, use the navigation buttons to the right of the “Time Lapse” option to go forward or backward in time, step through the images or view a set loop.

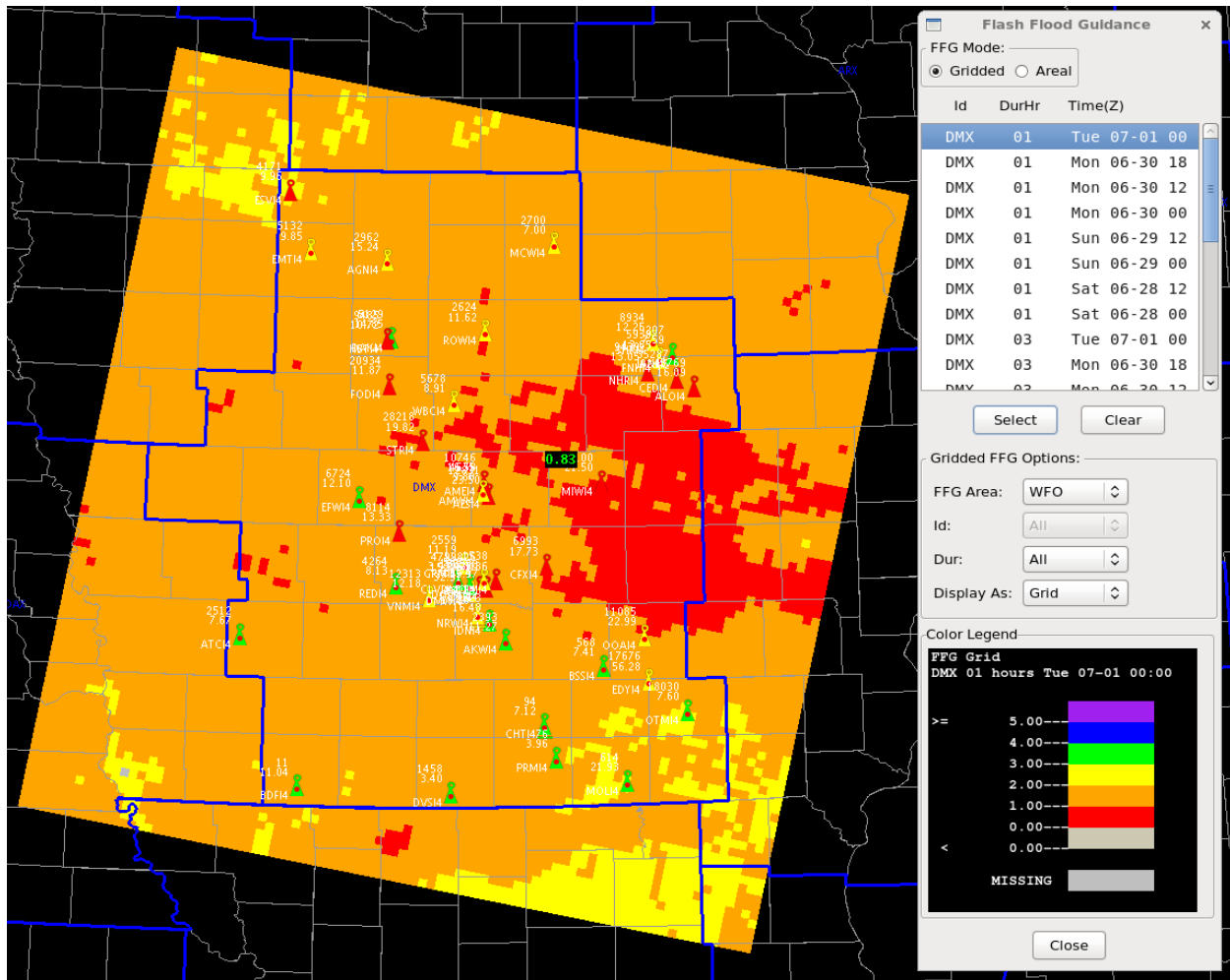


For the accumulated image, select “Accumulate” and set the total duration (in hours) with the selected date/time in the field above as the last/latest hour of the time period, or you can use the default one hour, if you just want to see the current/last hour of accumulated precipitation. When finished with this display of QPE, click on “Clear Data”.



Gridded Flash Flood Guidance

This display is the same idea as the QPE layer with a different set-up window and display options (right-side of the lower image). As with the QPE layer, keep the default mode of Flash Flood Guidance (FFG) “Gridded” data and select the desired forecast image to display. Keep this menu display open to see the color scale for reference. A display similar to the image below should appear. The Hydro Perspective allows you to add/modify customize the display with additional overlays, such as CWA boundaries, cities, roads, and rivers, using the same maps available in D2D.



As with the other layered images, this data can also be sampled by right-clicking on the map view and selecting the “Sample” option. When finished with this display of FFG, click on “Clear” button on the FFG menu.

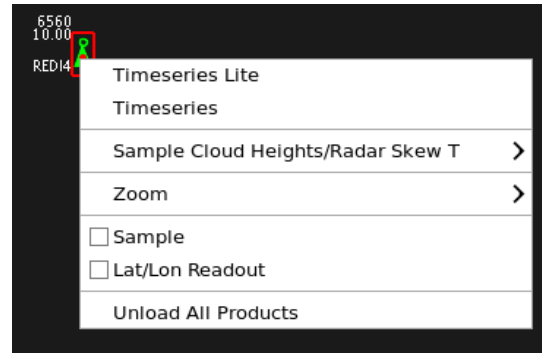


2). Hydro Time Series (in CAVE)

[\[Back to TOC\]](#)

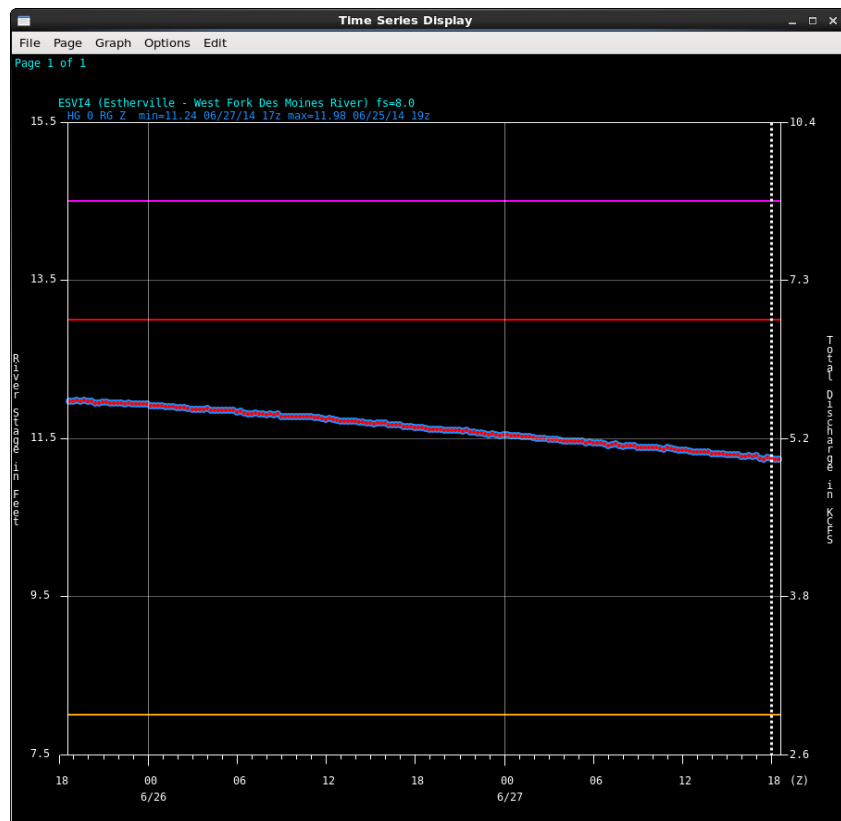
This application allows the display to view data and trends for individual gauges and forecast points. Alongside the plan-view capabilities of the **Hydro Perspective**, [Hydro Time Series](#)^[8] is equally the most important tool for effectively monitoring and building decision-making plans for the upcoming simulation. **Hydro Time Series** is most easily accessed from the **Hydro Perspective**, for the ability to select a point and display hydrographs and tabular information for gauges.

There are two main functions of **Hydro Time Series** are the graphical display and the table display of past and current river levels and the forecast levels from the RFC (for forecast points only). RFC forecasts are detailed in a later section. Monitor RFC forecasts for situational awareness and potential river flood watch/warning decisions. To display specific information about each individual gauge, double left-click on the gauge icon in the **Hydro Perspective** and right-click to get the menu in the left image.



To view the data hydrograph for this point, the actual observations, the forecast stages, or both – click on the second option “**Timeseries**”. The image on the bottom-right of this page is an example of just the output, a hydrograph of the river gauge observations, which can also display the forecast values. Notice the white-dashed line on the right-hand side of this image, which is the “current time” and ideally, the forecast would appear to the right of this line, if the end time is set far enough in advance to display.

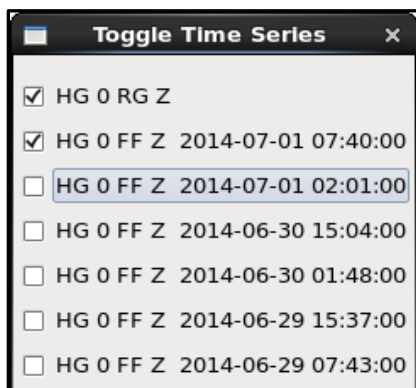
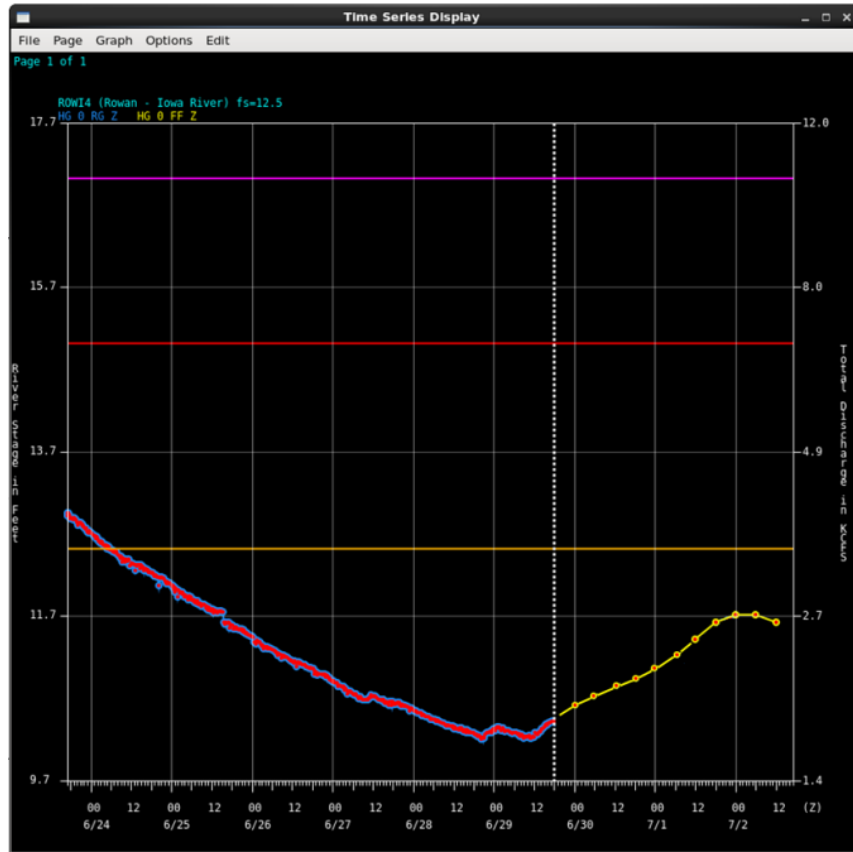
Displaying the past and present river height levels along with the forecast is the most key component of the forecast and warning decision-making process of this upcoming simulation. Working with the RFC(s) that forecast for your CWA’s river points to get the most collaborative and representative forecast is the main goal of this entire exercise.





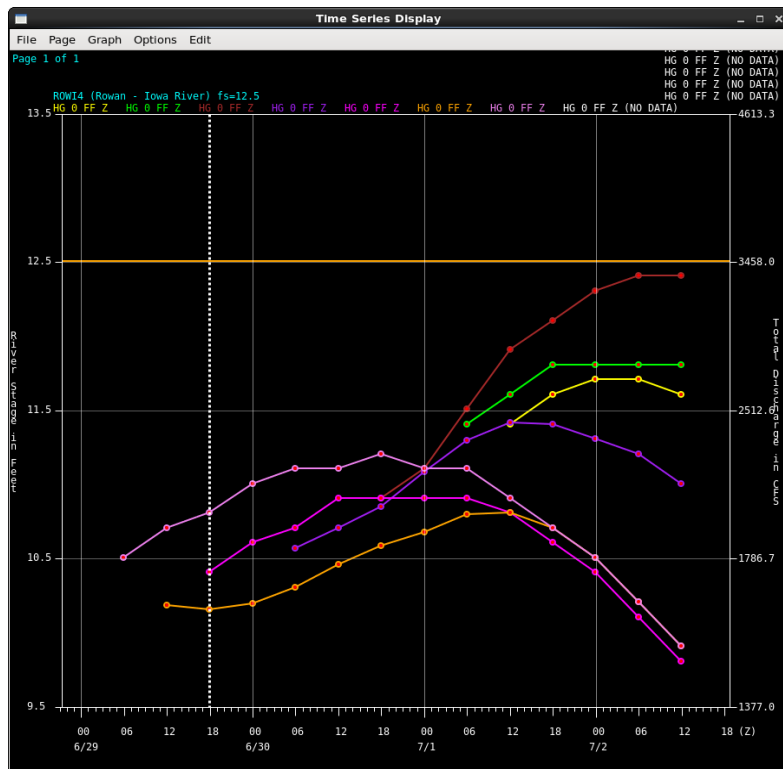
The right image is another example of the graphical output in **Hydro Time Series**, displaying both the river height observations from the past few days. The white dashed line is the current time and the yellow line with the red dots (every 6 hours) is the forecast. This is not a fixed color, especially if displaying multiple forecasts (bottom-right image).

To display multiple forecasts for a single point, you can either right-click or middle-click once in the Time Series Display window – anywhere on the black background and a separate window will appear (image below) with all of the available forecasts for this data/forecast point. You can then toggle on/off various forecasts to assess and follow the trends.



The right image is an example of multiple forecasts. To zoom in closer on the hydrograph, click on the “Graph” menu, then “Zoom”, then “select” and you can select an area to resize the area of interest.

To reset the hydrograph to the original scale, go back through the same menu and click on “Reset”.





Besides following the height (past observation) and forecast trends, the other important aspect of using these hydrographs and the Time Series Control in-general, is setting the necessary time periods to display the data. Even in real-time situations, looking at different time periods of both the past and future data can be helpful in understanding how a river could respond to a given amount of rainfall. After setting the beginning and end times for your hydrograph/table output, there are two following options, either displaying data for one single site – or multiple sites.

For one site, refer to the right image with the mode as “Station Selection”. Select the station from the list or search for it in the search field. The lowest section allows you to select the observations (the HG RG Z... selection), the forecast (the highlighted HG FF Z...selection), or both – by holding the “Shift” button on the keyboard and left-clicking once on each option separately. Click on “Graph” or “Both”, depending on which option you wish to display.

With the “Mode” set to “Station Selection” and the proper station selected for viewing, click on either “Graph”, “Table”, or “Both”. The types of products available are in the second column in the lower part of the window, where you see the “RG, RP, RZ, FF”, etc. To see the current and past observations, stay on the first option “RG”. To view the forecast guidance levels, click on the “FF” (if the station/gauge is a forecast point). An example forecast is the image on the next page, with the blue line connecting the 6-hourly dots for a time in the future.

Time Series Control

Beginning Time Z:
 2014 6 26 20

Ending Time Z:
 2014 7 2 8

Mode: Station Selection

River Precip Temp
 Snow Other

Search: ID Name
 TS Order: RG

REDI4	REDFIELD
RENM5	RENO
RHDI4	RHODES
RHDW3	RUNGE HOLLOW DAM
RHTM5	RUSHFORD 3N
RICW3	RICHLAND CENTER
RINI4	RINGSTED
RKFI4	ROCKFORD

PE TypSrc Ext Dur REDI4

HG	RG	Z	HG=River
HG	RP	Z	HG=River
HG	RZ	Z	HG=River
HG	R2	Z	HG=River
HG	FF	Z	HG=River
HG	FA	Z	HG=River
HG	FZ	N 90 day	HG=River
HG	FZ	X 90 day	HG=River



Display hydrographs for multiple sites, refer to this image on the right. Select “Predefined Group” for the mode. Select the desired stations by holding down the “Shift” button and the Left-Click on each site that you want to appear within one window. This window also shows the different categories of river gauges and points within the CWA. If you select enough sites that you have multiple “pages”, the use the “Page Up” and “Page Down” keys on your keyboard to switch between the pages, as in the example below, showing “Page 2 of 3”:

```
Page 2 of 3
DES-----Middle Raccoon R....Det_DMX
```

Your Hydro Program Manager or Service Hydrologist can or may have developed these groups.

The screenshot shows the "Time Series Control" window. At the top, it has a title bar with a close button. Below the title bar, there are two sections for time selection: "Beginning Time Z:" and "Ending Time Z:". Each section contains four input boxes for year, month, day, and hour, along with up and down arrow buttons. The "Beginning Time Z" is set to 2014, 6, 23, 17. The "Ending Time Z" is set to 2014, 7, 6, 17. Below the time selection, there is a "Mode:" dropdown menu currently set to "Predefined Group".

The main area of the window is a scrollable list of predefined groups. The list is divided into sections by lines of equals signs. The first section is titled "ALL AHPS PTS" and contains the following entries:

- All_AHPS_Pts1_TIA1-CIW1_D
- All_AHPS_Pts2_CIW2_D_DMX
- All_AHPS_Pts3_TIA2_D_DMX
- All_AHPS_Pts4_DES1_D_DMX
- All_AHPS_Pts5_DES2_D_DMX
- All_AHPS_Pts6_DES3-MTA-GRA
- ALERT_SentinelSites_D_DMX

 The second section is titled "DETERMINISTICS" and contains the following entries:

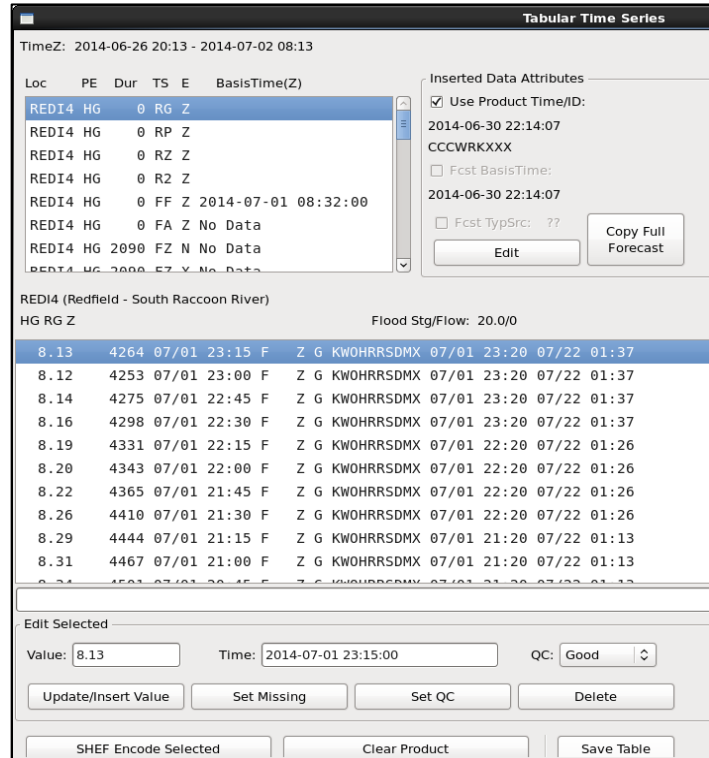
- TIA
- Wapsipinicon R....Det_DM
- CIW
- F---Iowa R....Det_DMX
- W Main Drainage Ditch.
- S Fk Iowa R....Det_DM
- Tipton Cr....Det_DM
- Beaver Cr_Eldora...
- S Beaver Cr_Eldora

 At the bottom of the window, there are four buttons: "Graph", "Table", "Both", and "Close".

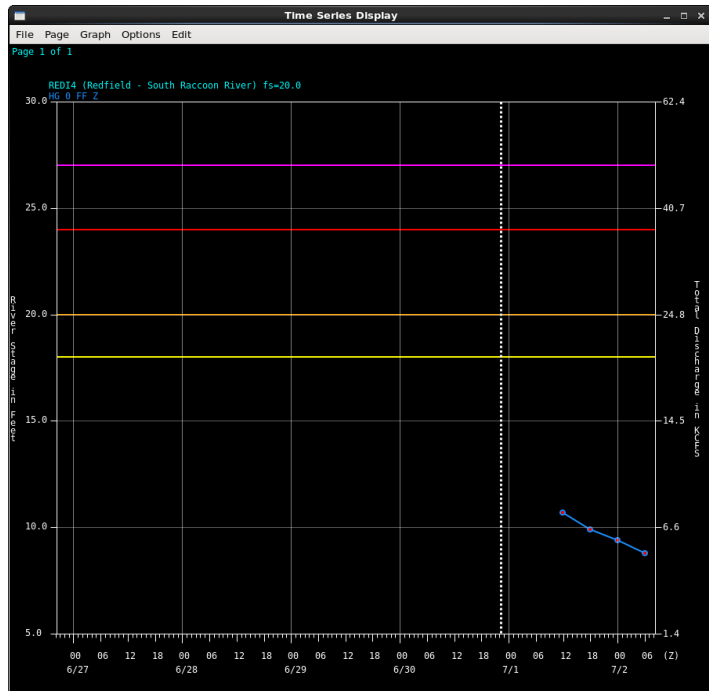


Don't forget the tables! Graphs are nice, especially when attempting to follow trends, but they do not provide exact values. Whenever viewing graphical data, make sure the tabular data isn't far behind, especially if/when a point is heading toward a different flood category (minor, moderate, major), a couple tenths of an inch in height can make a big difference in a forecast and a potential warning decision.

The top-right image is an example of the tabular output for a gauge, where you can view more data than just the line trend. The exact level, the flow values (cfs), observation or forecast valid time/date is all displayed in this chart. Both the hydrograph and table formats are used extensively, individually and together in the upcoming simulation.



In the simulation, make sure to monitor both the recent/current stages and trends in river levels but also the forecast values in these hydrographs. They will be the key to your in-event decision-making based on the amount of rainfall received. Rapid increases or decreases can occur, which will take the levels off the course of the most recent forecast. If a river stage forecast is deemed to be non-representative of the recent trends in observational data, then the NWS forecaster should collaborate with their local RFC to recalibrate the forecast. **These forecasts and predicted flood stages are used by RiverPro for potential river flood watch and warning decision-making and product issuance.**



Note: Not all points have an Action Stage assigned (yellow line).

Also keep in mind the colored flood stage markers:

- Pink = Major Flood**
- Red = Moderate Flood**
- Orange = Flood**
- Yellow = Action**



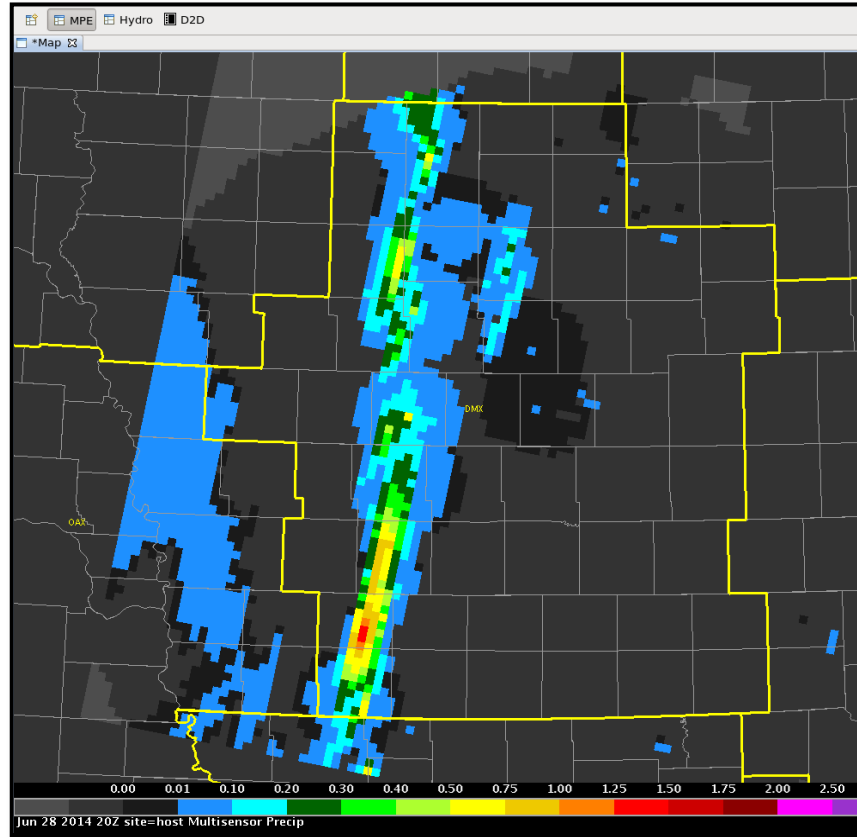
3). MPE Perspective (in CAVE)



[\[Back to TOC\]](#)

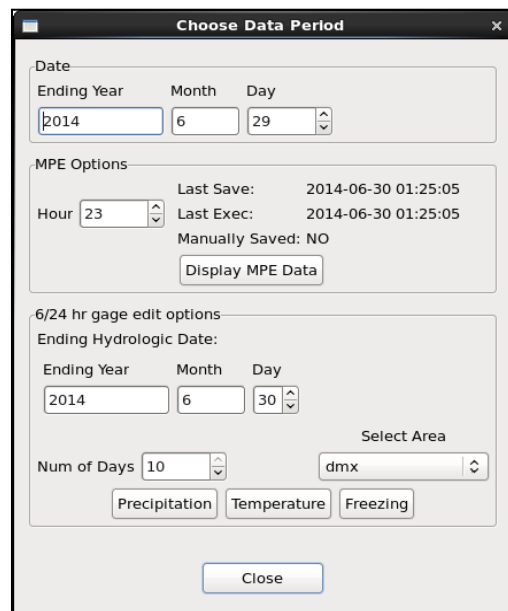
The other CAVE perspective that needs to be monitored during the simulation and actual river events is the **MPE Perspective**. This feature displays MPE (Multi-sensor QPE [Quantitative Precipitation Estimate]), which is the AWIPS 2 version of the old AWIPS I **MPE Editor**, although this new application displays more than just the MPE.

MPE is a gridded display of estimated rainfall amounts based on both remotely sensed data (radar, satellite) and “ground truth” observations (rain gauges). This data is displayed on a 4-km Hydrologic Rainfall Analysis Project (HRAP) grid. The primary inputs to MPE are the gridded Digital Precipitation Array (DPA) products, which provide radar estimates on a 4-km grid, and precipitation gauge data. MPE also uses satellite estimates of precipitation. For more background and reference information, refer to the [MPE Perspective Users Guide^{\[9\]}](#).



The MPE Perspective offers the ability to edit these gridded data fields and the point gauge observations. MPE is capable of generating several different types of precipitation fields and mosaics, with one of these designated as the “best estimate” QPE grid. At WFOs, this grid is used as input to the SiteSpecific Headwater Model.

Similar to the other applications, make sure the desired time is set in the “Choose Data Period” window (right image). When opening the MPE Perspective, this window will appear (right image). Select the ending date/time in the top couple of option fields, then click “Display MPE data”.

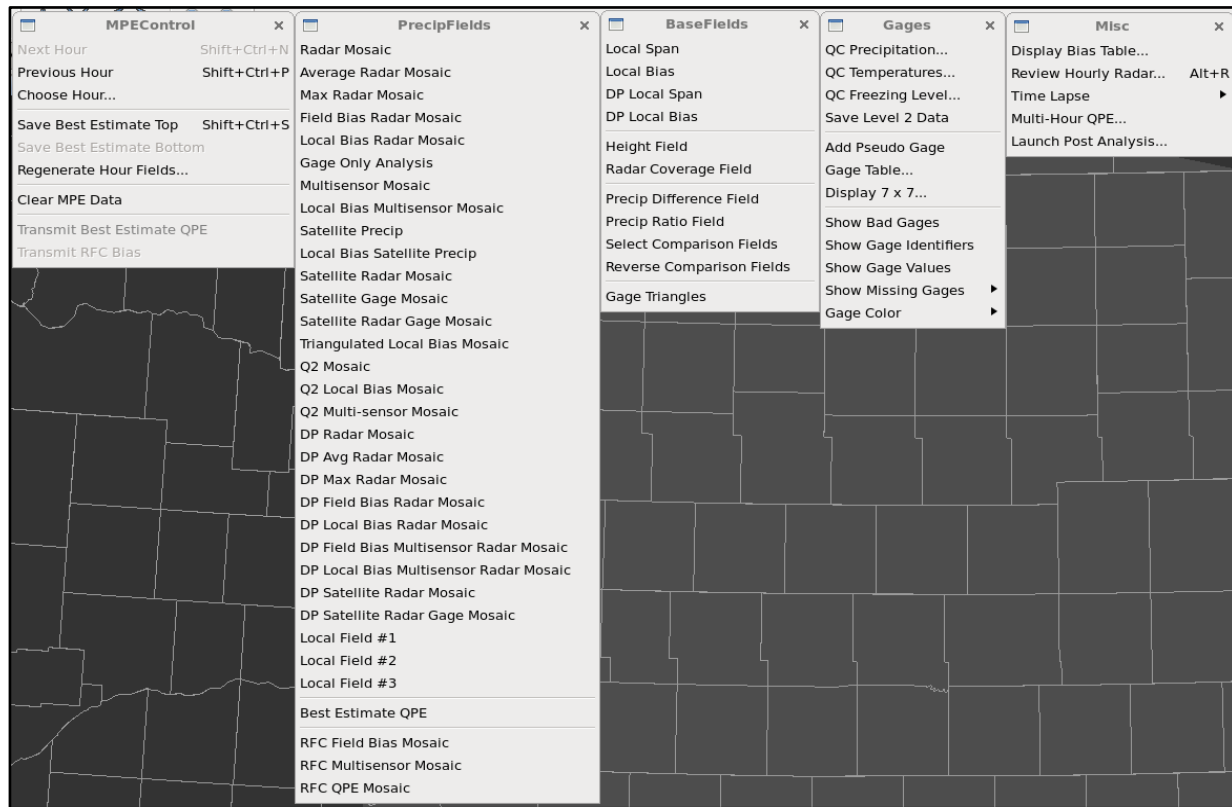


Learn more about MPE through this [~30 minute module^{\[10\]}](#), developed by Greg Shelton, Senior HAS Forecaster at the West Gulf RFC.



Additional Menu Options

The image on the right shows a bulk of the useful menus and layer/data options in the **MPE Perspective**. Since this is an archived case, not all of the data will be available for viewing, but in real-time, assuming the selected time settings are correct, these options should be available. It is beneficial to use this (and the other applications) in even routine operational settings to become familiar with their functions before any potential flooding/flash flooding event(s).



Much more on the specific applications and features of the MPE Perspective can be found linked in the reference section.



4. RiverMonitor & PrecipMonitor ([RiverMonitor Reference\[11\]](#))
(Not yet available in this simulation – coming in a future edition)

[\[Back to TOC\]](#)

“River Monitor” and “Precip Monitor” look essentially the same and have similar functionality but their usage essentially follows their names – one monitors area river levels and the other monitors area precipitation gauge amounts. Each application is straight-forward in terms of usage and is mainly used for real-time monitoring of various characteristics relating to your area river and precipitation gauges.

In this main window (right image) are the important components areas:

- Location Filter/Selection Tree (left side of the window)
- Main Table (main body of the window)
- Menu Bar (top row of the window)
- Data Refresh Panel (row of information immediately under the menu bar)

Location Id	Threat	HSA	Group Id	Group Name	Group Ordinal	Location Ordinal	River Basin	ObsFctMax	Stream	Latest StgVal	Latest StgTin
WEAT2	A	FWD	TRIN	Trinity E...	4	12		6.43	Clear Fork T...	6.43	04/29 - 161
DLRT2	FO	FWD	RIOG	Rio Gran...	15	340		4.05	Rio Grande	4.05	04/29 - 161
DWYT2	FO	FWD	SABR	Sabine E...	1	270	Sabine River	23.6	Sabine River	23.6	04/29 - 164
CRDT2	FO	ENX	GGAD	Guadalu...	10	280		87.0		87.0	04/29 - 130
LOLT2	F	FWD	TRIN	Trinity E...	4	66		30.30	Trinity River	29.78	04/29 - 163
BEZT2	FO	FWD	LBRA	Lower Br...	1	400		17.48	Brazos River	17.48	04/29 - 131
CBET2	FO	EPZ	RIOG	Rio Gran...	15	380	RIOG	12.50	Rio Grande	12.48	04/29 - 161
FLWT2	FO	FWD	TRIN	Trinity E...	4	10		594.12	West Fork T...	594.08	04/29 - 131
LDOT2	FO	EPZ	RIOG	Rio Gran...	15	390	Rio Grande	7.11	Rio Grande	7.11	04/29 - 161
TDDT2	FO	FWD	TRIN	Trinity E...	4	56		22.40	Trinity River	26.36	04/29 - 170
AAIT2	ENX	RUFF	Ruffale...		5	1		0.20		0.20	04/29 - 081
AAIT2	ENX	DEF	ENX	DEF...	0	1		2.77	Williamson C...	2.77	04/29 - 163
AALNGT2	FWD	DEF	FWD	FWD DE...	0	1					
AATC2	GJT	URIO	Upper Ri...		14	175		3.55		3.55	04/29 - 164
AAVT2	FWD	TRIN	Trinity E...		4	1		4.56		4.56	04/29 - 161
ABAT2	LUB	UBRA	Upper Br...		4	230		5.32	Hubbard Cree...	5.32	04/29 - 170
ABDT2	SJT	COLO	Colorad...		11	2		6219.25		6219.25	04/29 - 141
ABRS	GJT	URIO	Upper Ri...		14	202		2011.90	Elm Creek	2011.90	04/29 - 143
ABIT2	LUB	UBRA	Upper Br...		4	145					
ABLT2	SJT	DEF	SJT	DEF...	0	1					
ABNT2	LUB	UBRA	Upper Br...		4	270			North Fork R...		
ABQNS	GJT	URIO	Upper Ri...		14	220		5.47	Rio Grande	5.47	04/29 - 163
ABST2	SJT	COLO	Colorad...		11	101	COLORADO	22.28	Barton Cree...	22.28	04/29 - 160
ABTT2	SJT	COLO	Colorad...		11	60		3.00	Barton Cree...	3.00	04/29 - 130
ABUT2	SJT	COLO	Colorad...		11	95		2.81	Bull Cree...	2.81	04/29 - 130
ACCT2	LUB	UBRA	Upper Br...		4	150		0.95	Cat Claw Cr...	0.95	04/29 - 154
ACDT2	EPZ	RIOG	Rio Gran...		15	22		7.49		7.49	04/29 - 161
ACET2	ENX	NIEC	Naches ...		12	1023	San Diego Crk				
ACL12	SJT	COLO	Colorad...		11	126		10.05		10.05	04/29 - 130
ACMNS	ABQ	PECO	Pecos Ea...		13	150		4.40	Pecos River	4.40	04/29 - 161
ACONS	ABQ	DEF	ABQ	DEF...	0	1					
ACRT2	SJT	COLO	Colorad...		11	103		2.49	Colorado River	2.49	04/29 - 141
ACTT2	FWD	LBRA	Lower Br...		1	90		462.96	Esosque Riv...	462.96	04/29 - 120
ACWT2	LUB	UBRA	Upper Br...		4	160		2.34	Cedar Cree...	2.34	04/29 - 154
ADBT2	HGX	SANJ	San Jac...		6	325	San Jacinto	58.42		58.42	04/29 - 163
ADDT2	HGX	SANJ	San Jac...		6	320		72.30	South Mayde ...	72.30	04/29 - 163
ADPNS	ABQ	PECO	Pecos Ea...		13	330					
ADPNS	ABQ	DEF	ABQ	DEF...	0	2					
AHOT2	SJT	COLO	Colorad...		11	102	COLORADO RIVER	1.67		1.67	04/29 - 162
AICNS	GJT	URIO	Upper Ri...		14	203		4.55	Rio Chama	4.55	04/29 - 141
AICT2	ENX	NIEC	Naches ...		12	400	San Fernando Creek	0.95	San Fernando...	0.95	04/29 - 154
ALAC2	GJT	URIO	Upper Ri...		14	110		4.05	Rio Grande	4.05	04/29 - 161
ALAT2	FWD	LBRA	Lower Br...		1	20		541.66	Aquilla Cree...	541.66	04/29 - 163
ALKT2	SJT	COLO	Colorad...		11	96		492.30	Lake Austin	492.30	04/29 - 130
ALNT2	HGX	DEF	HGX	DEF...	0	1		10.07	Chocolate E...	10.07	04/29 - 161
ALOT2	FWD	NECH	Neches ...		2	120		4.74	Angelina River	4.74	04/29 - 160
AMIT2	EPZ	RIOG	Rio Gran...		15	330		1102.43	Rio Grande	1102.43	04/29 - 161
AMTT2	LUB	UBRA	Upper Br...		4	70		0.90	Douille Mon...	0.90	04/29 - 164
APMT2	LUB	UBRA	Upper Br...		4	80			Stinking Cree...		
AQAT2	FWD	LBRA	Lower Br...		1	30		12.72		12.72	04/29 - 170
AQIT2	FWD	LBRA	Lower Br...		1	35		12.00	Aquilla Cree...	12.00	04/29 - 160
AQLT2	FWD	LBRA	Lower Br...		1	10					

These two applications display databases of river points and precipitation gauges in a formatted table, which you can sort to order the rows by the information you want to monitor. The advantages lie in the ability to sort each column by the threat type (in flood, action stage, etc.), current levels, forecast max stage, or just in alphabetical order. If the latest river stage forecast from the RFC contains points in flood 24-48 hours from now (but not currently), you can sort the column those points expected to go above flood at the top of the list to easily and continually monitor them.

You can also determine which gauges you want to appear in the table; by CWA, HSA (Hydrologic Service Area), river basin, surrounding CWAs and/or HSAs, and even add/subtract off individual stations. This can be performed on the left-hand side, with the black background, with the “check boxes”.

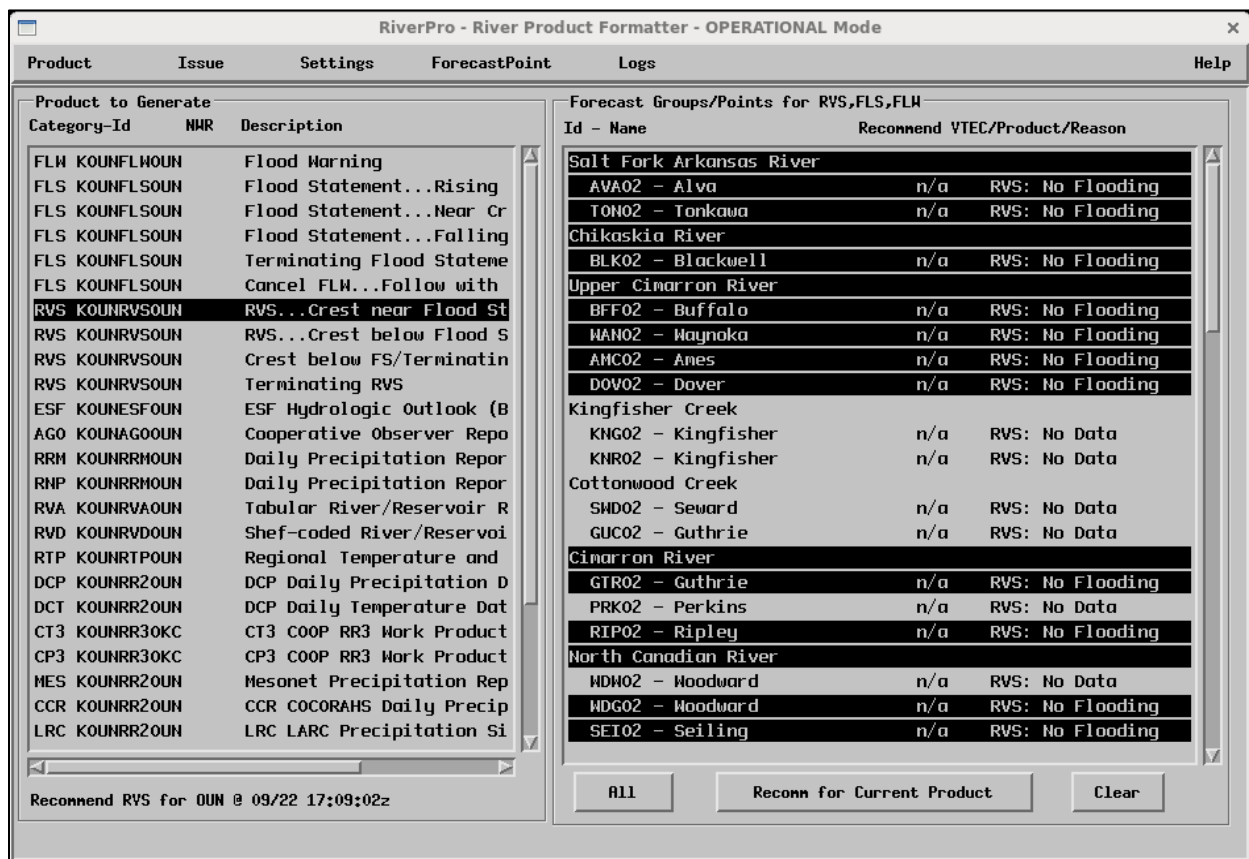


5). RiverPro ([Reference Guide^{\[12\]}](#))
 (Not yet available in this simulation – coming in a future edition)

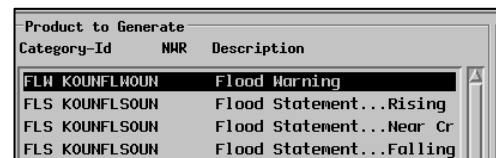
[\[Back to TOC\]](#)

RiverPro is the current standard application for the issuance of longer fuse hydrometeorological hazard products, such as River Flood Watches, Warnings, and [follow-up] Statements. However, RiverPro is not be utilized in this simulation as the capability was not designed for usage in the WES-2 Bridge environment. Therefore, no actual river flood products will be generated or issued for this simulation. Instead, the goal is to monitor and analyze the other available hydro applications to aide in the NWS forecaster’s decision to issue such products.

In the example image below, notice the left side is the product selector and the right side holds the river points that can be included or are recommended to be included in that particular product. The black-highlighted fields are the selections for the product and points included in that product.



For reference, here is a simplified example on how to issue a product through RiverPro (*which you will not be doing in the simulation*). To issue a Flood Warning, select “Flood Warning” on the left side.



Next, on the right side, at least one of the river points should also be highlighted. This is an automatic recommender based on the forecast for that point to go into flood stage. Once these selections are made, from the “Product” menu and select “Create”. A new “Kwrite” window will open up with the editable portions of the product apparent and the rest hard-coded, ready to release after quality-controlling and adjusting if there are potential edits.



6). Site Specific Hydrologic Predictor (SSHP)

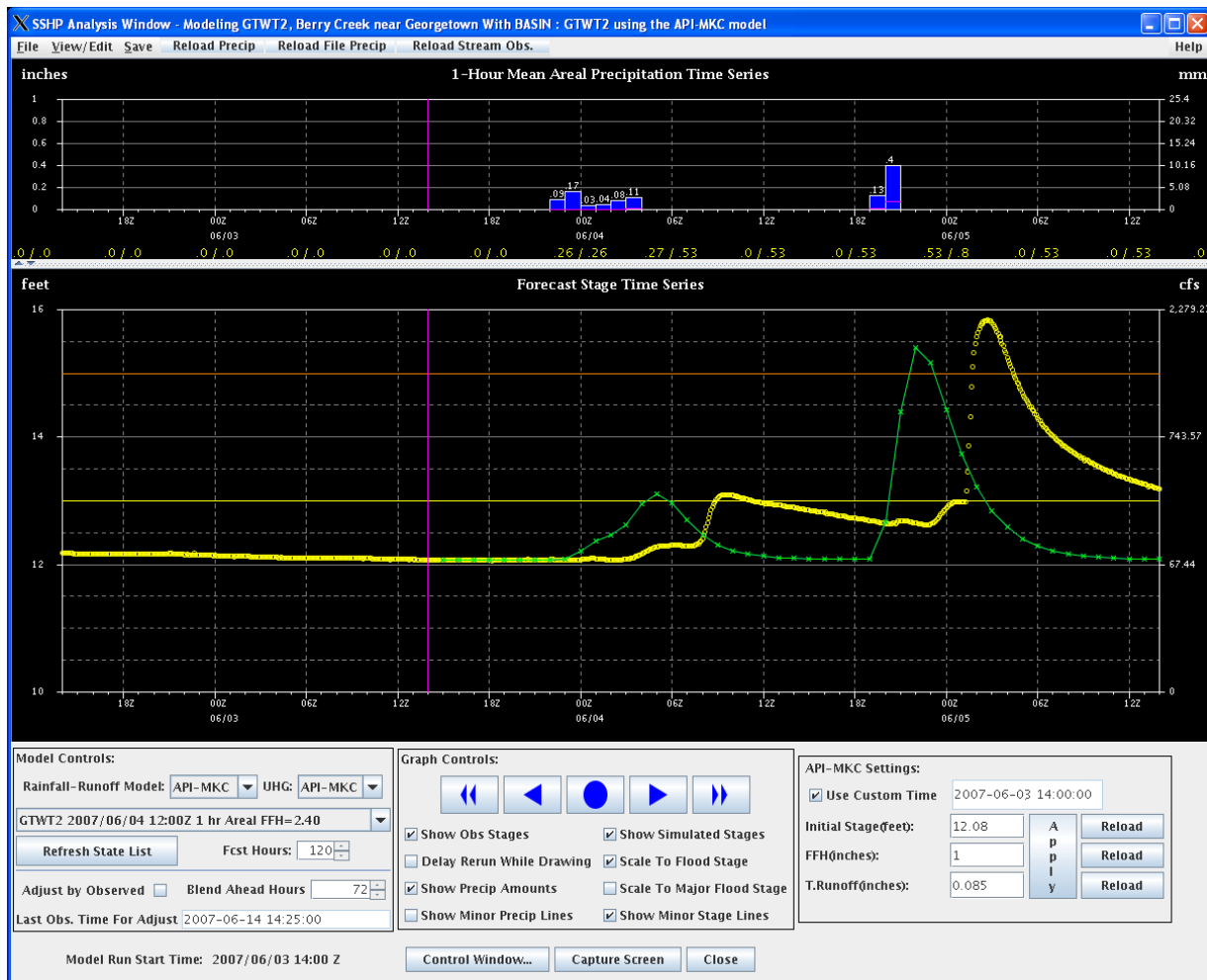
[\[Back to TOC\]](#)

(Not yet available in this simulation – coming in a future edition)

AWIPS I OB 9.0: [Operations Guide^{\[13\]}](#) and [Quick Reference Guide^{\[14\]}](#).

This application provides WFOs the ability to produce their own streamflow forecast for their headwater points with the main catalyst being the input of precipitation. In one-hour time steps, a user can input a desired amount of precipitation and watch the river “respond” based on the background model used by the application. RFC models follow a 6-hour time step, so the SSHP allows forecasters to see the potential for quicker rises and responses to input precipitation, effective for fast-responding streams.

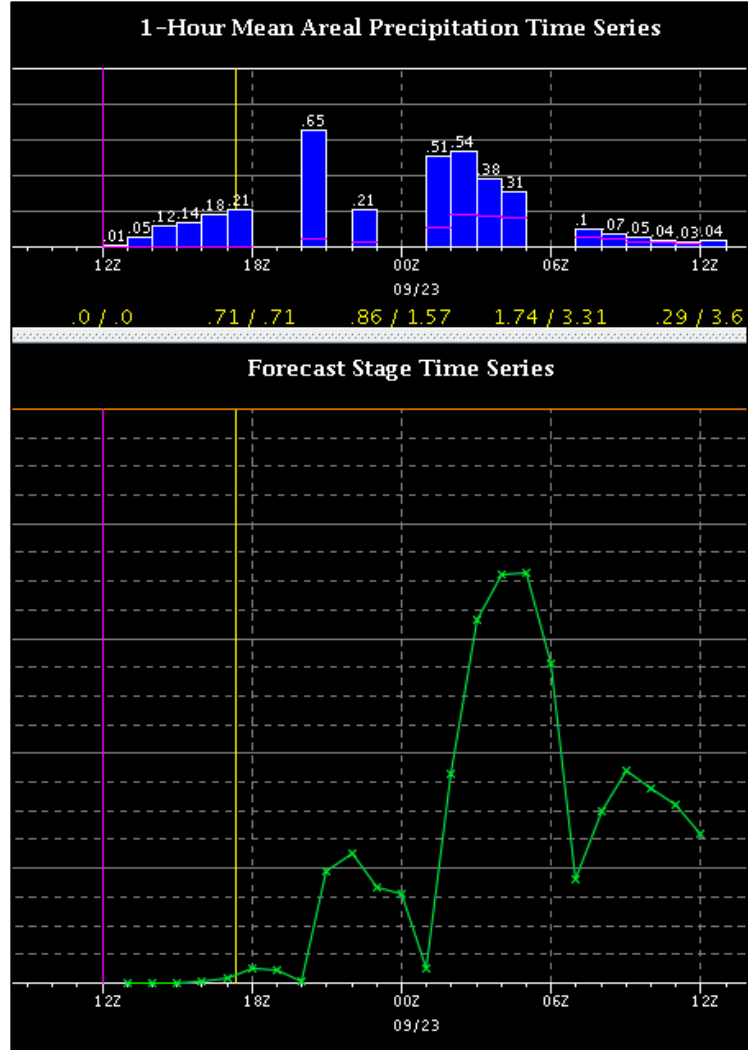
In the example below, the top section with the small blue columns is the area where hourly precipitation can be added and modified, based on forecast changes or recent received reports. The section below with the yellow and green lines is where the river level response to the added precipitation appears. Additional settings can be applied in the bottom section but the main objective of this section is to show that WFO forecasters do have a tool to assess river levels for their own points and are encouraged to discuss results and collaborate with their RFC to get the best possible forecast, especially for points that have widely different precipitation amounts that fall in between routine forecasts.





Notice in the example on the right how hourly rainfall amounts that were manually added by the user in the top section (the blue columns) influenced the river height trend (green line) in the bottom section. The yellow vertical line is the “current” time and the purple vertical line is 6 hours ago. The application will allow the user to input rainfall amounts up to 6 hours in the past, in the event actual or close estimates are received and can be inserted to better represent recent trends.

Forecast rainfall amounts can also be added in the future to determine a number of potential outcomes. This is one way you can see how much rainfall is needed and in what duration, to cause the point to reach or exceed flood stage or even cross into higher flood categories, like moderate and major flood stage. This is useful for situations with forecast crest and QPF uncertainty, making your own “highest” and “lowest” potential impact scenario to minimize the possibility of unanticipated outcomes.





Hydro Applications Review:

- Start the situational awareness picture with the Hydro Perspective, displaying the area river gauges and noting their current stages and states.
- Overlay and toggle through the best-estimate QPE and gridded FFG to get a visual perspective on the most flood/flash flood prone areas given the recent antecedent conditions.
- Use the Hydro Time Series applications to dig deeper into the data by interrogating individual river gauges and forecast points for potential or ongoing flooding issues by assessing the recent observations and forecast trends.
- Assess the hourly data in the MPE Perspective and compare the values with the QPE fields in the Hydro Perspective to get a more complete picture of the actual rainfall amounts.
- Monitor the received rainfall and river levels with the two aptly-named applications, PrecipMonitor and RiverMonitor. The tabular format and the ability to filter any column (least to greatest, vice versa) provides a best possible quick reference for proper situational awareness.

Hydro Applications Support and Documentation:

[\[Back to TOC\]](#)

The official documentation, installation, and support information for these and other AWIPS hydro-related applications can be located on the [WHFS Field Support Group webpage^{\[15\]}](#).

“The Office of Central Processing provides technical support to the WFOs and RFCs for the Advanced Weather Information Processing System (AWIPS) operations and the Advanced Hydrologic Prediction System (AHPS) web operations. The Field Support and Infrastructure team is assisted by the National Water Center (NWC) organization and others. Together, we respond to issues and questions regarding operations of the NWS Hydrology Program. **For Critical AWIPS Support after working hours and on weekends/holidays, please contact the Network Control Facility (NCF).**”

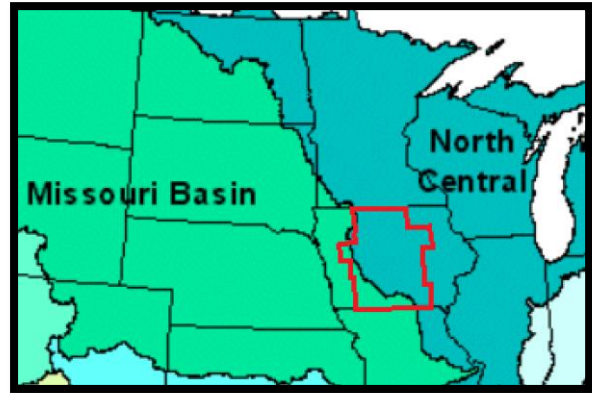


SECTION 2: Supplemental Flood Guidance

Guidance from the River Forecast Centers (RFCs)

[\[Back to TOC\]](#)

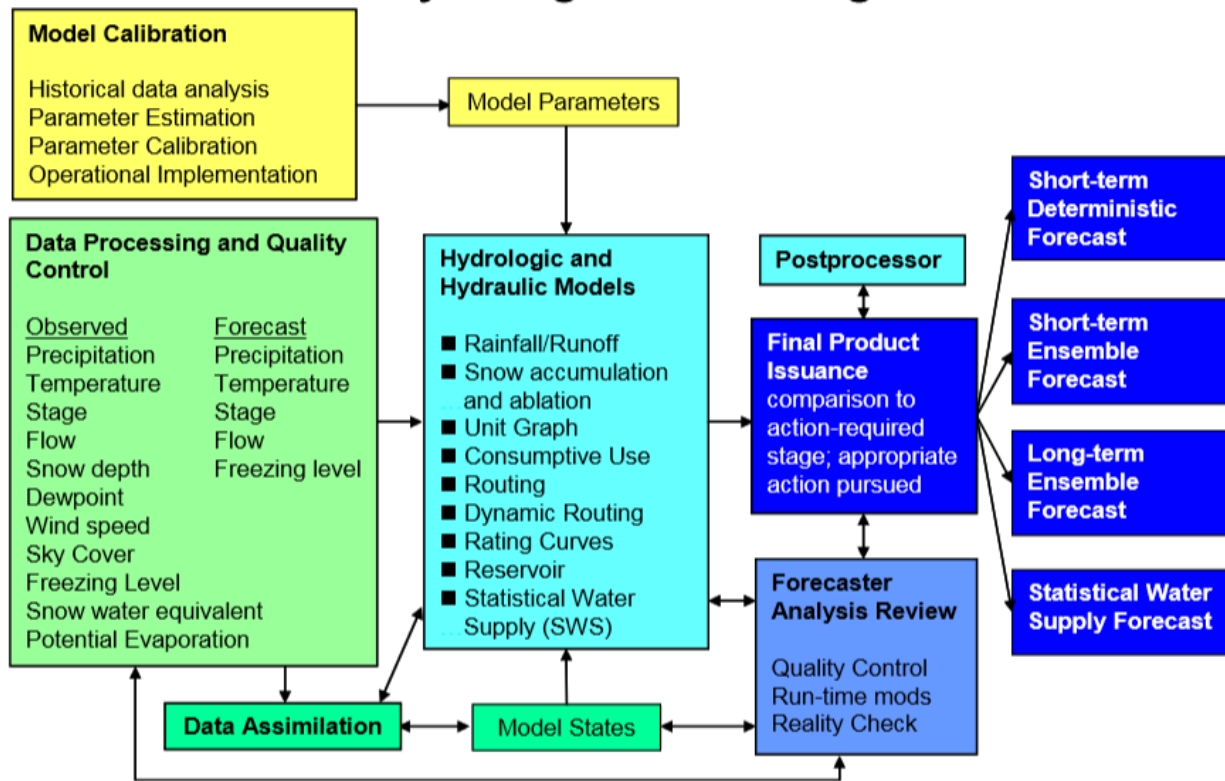
The DMX CWA (within the red line) receives river forecast and guidance support from two separate RFCs, with much of the area within the bounds of the **North Central RFC** in Chanhassen, MN (<http://www.weather.gov/ncrfc/>) and a smaller portion within the **Missouri Basin RFC** in Pleasant Hill, MO (<http://www.weather.gov/mbrfc/>).



The two important types of guidance that each provides for their Hydrologic Service Area (HAS) are Flash Flood Guidance (FFG) and River Forecasts – or River Stage Forecasts. Though RFCs do not issue actual flood or flash flood-related watches/warnings/advisories, they do continuously run hydro models with forecast and recent rainfall amounts to determine if/when/where river, small stream, and even flash flooding may occur.

For further reference, the following diagram shows the hydrologic forecasting process for RFC's.

RFC Hydrologic Forecasting Process



From (http://www.nws.noaa.gov/oh/rfcdev/docs/Final_Verification_Report.pdf)

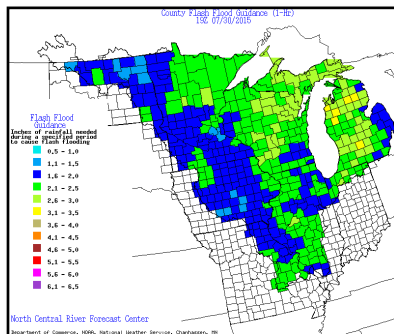


For the simulation, you will use guidance from these RFCs as the basis for potential flood watch and warning-related decisions. Even Flash Flood Warnings you issue will need to have some level of confidence that relates back to the FFG values from the RFC(s). Below is some further explanation about the types of RFC-issued guidance you will use.

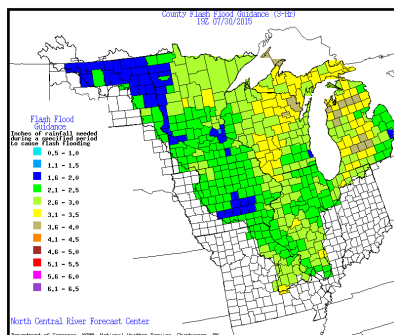
1). Flash Flood Guidance (FFG) [\[Back to TOC\]](#)

These products focus on displaying values for “how much rain” an area would need to initiate flooding on small streams (<http://www.nws.noaa.gov/oh/hrl/ffg/modflash.htm>). These products are useful not only for potential flash flooding, but also potential river and small stream/basin flooding potential. They are issued routinely each day and are available in 1hr, 3hr, & 6hr plots, i.e. how much rain a basin needs in 1 hour, 3 hours, or 6 hours to flood. There are three forms of FFG: 1). **County-based** 2). **Gridded** and 3). **Headwater** guidance. Keep in mind that Flash Flood Guidance is guidance, with potential model errors, biases, and unrepresentativeness.

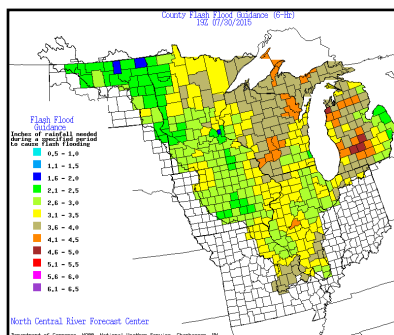
Below are examples of the web graphics from the North Central RFC (NCRFC) for **County-based (or county-averaged) FFG**.



1hr FFG



3hr FFG



6hr FFG

```

FOUS63 KMSR 250146
FFGDMX

COUNTY FLASH FLOOD GUIDANCE
NWS NORTH CENTRAL RIVER FORECAST CENTER TWIN CITIES/CHANHASSEN MN
846 PM CDT TUE JUN 24 2014

DES MOINES HYDROLOGIC SERVICE AREA

AVERAGE INCHES OF RAINFALL FOR GIVEN DURATIONS REQUIRED TO INITIATE
FLASH FLOODING ON SMALL STREAMS. GENERAL FLASH FLOOD GUIDANCE FOR
STEEP TERRAIN AND URBAN AREAS ARE ONE TO TWO INCHES OR MORE IN ONE
TO TWO HOURS OR LESS RESPECTIVELY.

.B MSR 140625 Z DH12/DC1406250146 /DUE/PPHCF/PPTCF/PPQCF
:
: IDENT 1HR 3HR 6HR COUNTY NAME
: =====
:
: *** IOWA COUNTIES ***
:
IAC013 1.8/ 2.2/ 2.7 :BLACK HAWK
IAC015 1.7/ 2.2/ 2.7 :BOONE
IAC017 1.9/ 2.3/ 2.8 :BREMER
IAC023 1.8/ 2.1/ 2.6 :BUTLER
IAC025 1.9/ 2.3/ 2.8 :CALHOUN
IAC027 1.7/ 2.1/ 2.6 :CARROLL
IAC033 1.8/ 2.2/ 2.7 :CERRO GORDO
IAC039 2.1/ 2.7/ 3.4 :CLARKE
IAC049 1.8/ 2.3/ 2.9 :DALLAS
IAC051 2.0/ 2.5/ 3.3 :DAVIS
IAC063 1.8/ 2.2/ 2.7 :EMMET
IAC069 1.7/ 2.1/ 2.6 :FRANKLIN
IAC073 1.8/ 2.3/ 2.8 :GREEN
IAC075 1.5/ 1.9/ 2.3 :GRUNDY
IAC077 1.7/ 2.1/ 2.7 :GUTHRIE
IAC079 1.8/ 2.2/ 2.7 :HAMILTON
IAC081 1.7/ 2.1/ 2.6 :HANCOCK
IAC083 1.7/ 2.1/ 2.7 :HARDIN

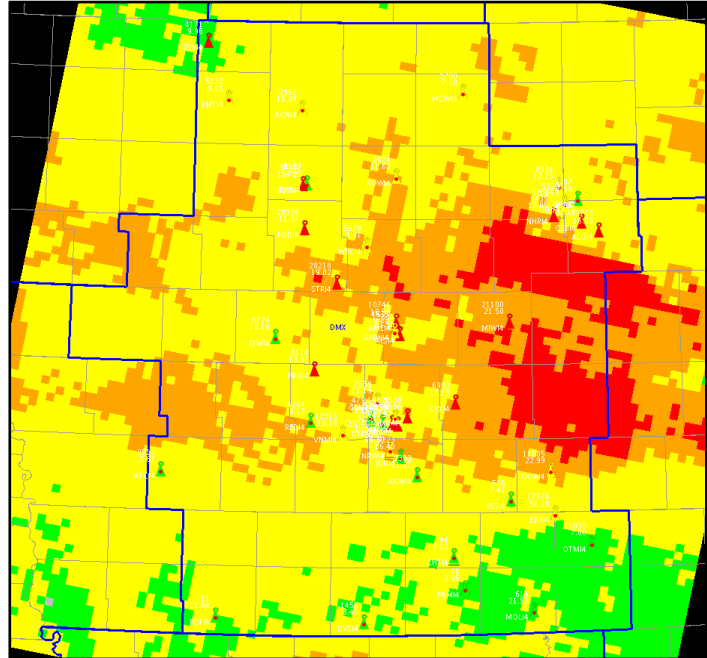
```

Example text FFG product issued by the North Central RFC (from [IEM](#))



County-averaged FFG may be useful to show larger-scales or show generalized regions that may be sensitive to short-term flooding. Looking back at the three graphics on the previous page, it appears that it would take a lot more rain (at least a couple of inches) to initiate flooding on small streams in much of central and western Michigan than it would surrounding Red River of the North basin bordering eastern North Dakota and western Minnesota.

However, more precise data is needed to depict flooding potential on smaller-scales that represent river and river basins. With county-averaged values, there could be a 3hr FFG for a specific county of 4.2", but a higher-resolution view might show a spectrum of values across the entire county – as seen in **Gridded FFG**. With the Gridded FFG layer displayed in the Hydro Perspective (instructions on pg. 12), situational awareness is enhanced for much smaller, more defined areas that are near or coincident with actual rain and river gauges, and forecast points. Notice the example image on the right, with the various gauges overlaid on top a Gridded FFG layer.



The third type of FFG is **Headwater Guidance**, as explained in the first lesson in the FY15 WFO Flash Flood Hydrology and Warning Operations Training "[Flash Flood Processes¹⁶](#)" (*Met-Ed login required*). This less-used but available guidance follows the same logic of "how much rain" would be required to produce flooding at the outlet of a river basin.

2). River Forecasts for River Points and Gauges

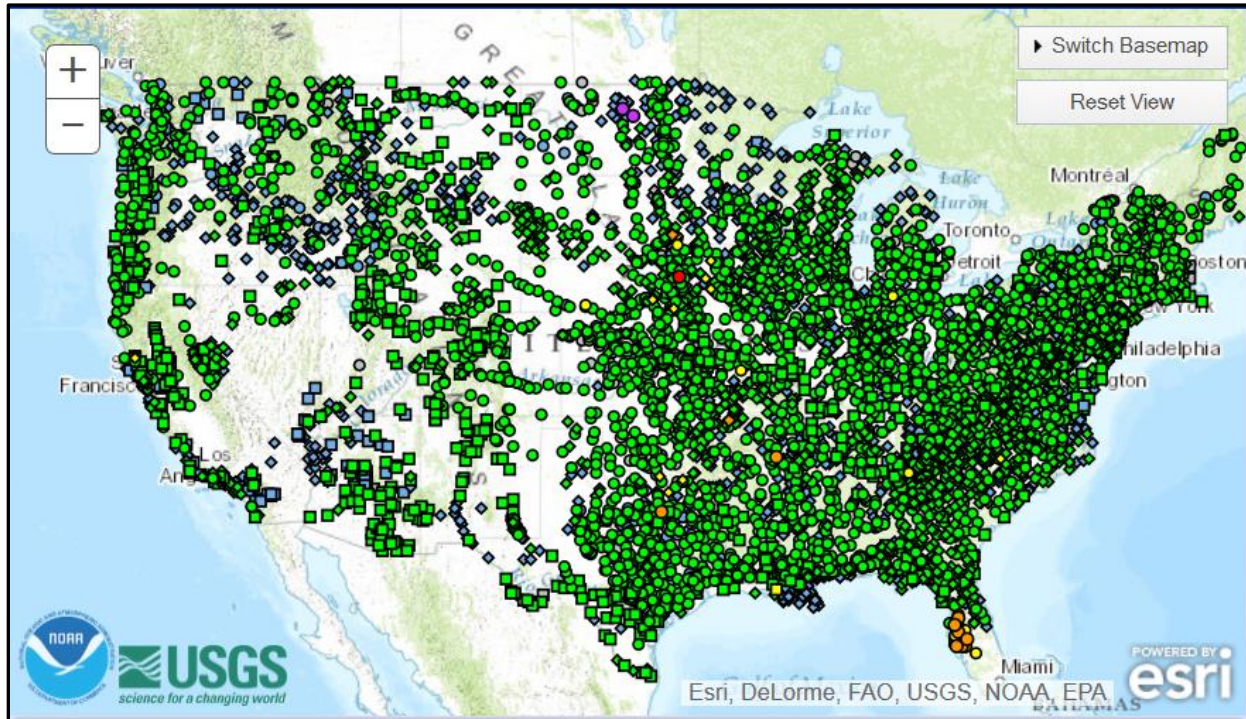
[\[Back to TOC\]](#)

All of the information up to now has detailed the various situational awareness (SA) tools for operational understanding of the hydrologic responsibilities. Now, we add the decision-making aspect to SA tools and techniques. To reiterate operational responsibilities, RFCs provide guidance for both river and flash flooding potential, from which WFO forecasters should issue associated flooding or flash flooding products for locations in their area. **Hence forth based on the understanding that RFCs produce the guidance that WFOs use in cases of potential or ongoing river flooding, interoffice collaboration between WFOs and RFCs is essential for to provide the most representative, timely, and accurate flooding-related products.**

Since river flood product decision-making is based largely from resultant RFC river forecasts, the simulation will prompt you, the student decision-maker to, at times, be in contact with the local RFC (not literally, but in a displaced real-time sense). The repetition of reference to RFC forecasts in the simulation is designed to place a greater emphasis on proactive coordination and collaboration of forecast river levels and stages, crests, and timing – not just when points are in flood or are on an obvious track toward some flooding stage. The success of your forecasts will be directly related to how you anticipate and respond to the variables presented.

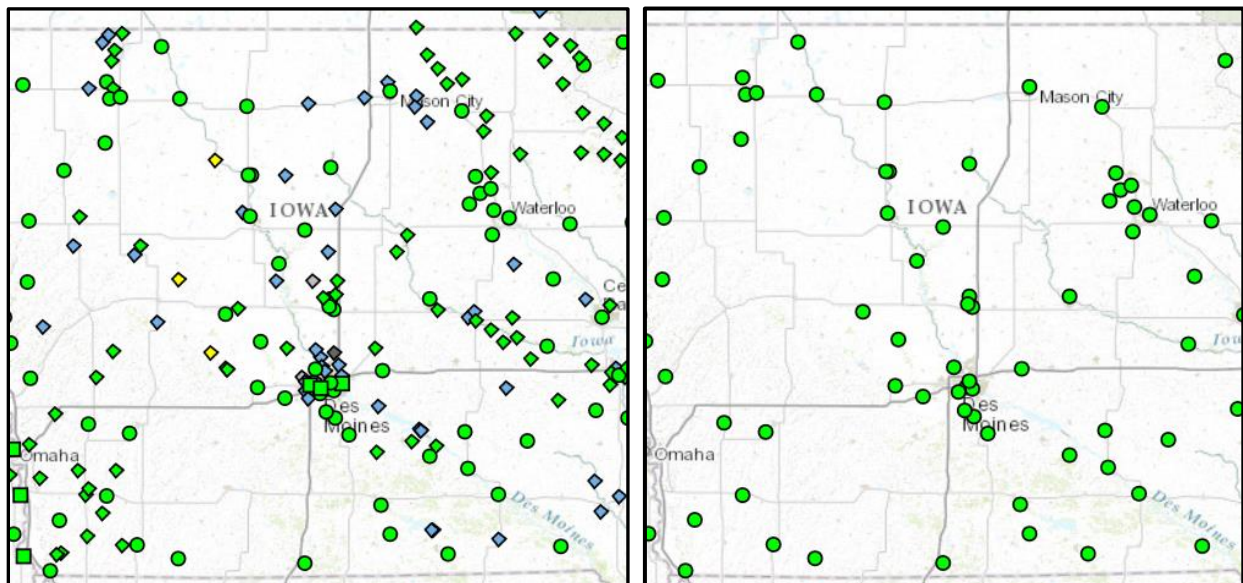


In a typical WFO CWA, there are a number of river forecast points, especially along some of the larger or main stem rivers and a few scattered about their various tributaries. Not all river gauges are forecast points. The ratio of gauges with just observations to gauges with observations and forecasts is normally around 2:1 or 3:1, with the obvious exception of CWAs with very few rivers or gauges (see national map below). As a WFO forecaster, you can request the RFC to issue a non-routine forecast gauge with elevated concern.



From: <http://water.weather.gov/ahps/>

In Central Iowa, the following two images represent all of the gauges (including routine points) on the left and just routine points on the right.





River forecasts are issued routinely by RFCs through the RVF (River Forecast) product, normally with all forecast points included in one statement. However, non-routine forecasts can be generated for any or all of the points, if necessary.

To the right are examples of both a tabular/text forecast product and a web version of the graphical output (bottom-right). Starting with the text product, notice the second line, below the gauge site information, where the flood stage appears. Keep this value in mind as you look through the forecast values below. The next line starts off the forecast by designating the first forecast point time and height. For Beaver Creek at New Hartford (the first point in the example), the first section – the lines .E and .E1 are observations leading up to the beginning of the forecast and as it shows in the second line, “Fcst Issuance Stage:9.0 FT”, the forecast was issued as the gauge was reading 9.0’. The second section contains the forecast stages, in 6-hourly increments. The next two points are already in flood at the time of the forecast, but levels are on the steady decrease, so there is no crest information.

The bottom-right image is for a different gauge than in the text forecast but with the similar general trend, starting out with the point already in flood – in this case for a solid day and a half – and several more hours to go before dropping below flood stage, according to this forecast.

You will make similar assessments you will be making throughout the simulations, looking at past observations, forecast trends, received and forecasted rainfall, and making decisions based on this information. You will also need to consider and sometimes initiate collaboration efforts with the RFC.

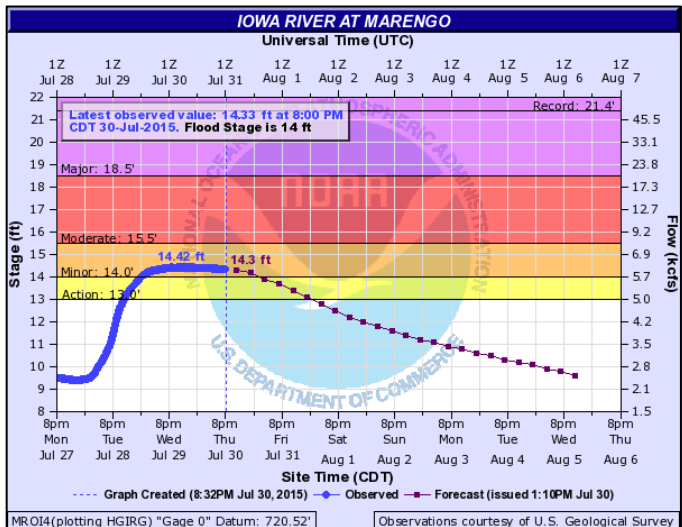
```

FGUS53 KMSR 250114
RVFCIW

RIVER FORECAST
NWS NORTH CENTRAL RIVER FORECAST CENTER TWIN CITIES/CHANHASSEN MN
812 PM CDT TUE JUN 24 2014

: THIS PRODUCT HAS PRELIMINARY DATA THAT MAY BE SUBJECT TO REVISION.
: REFER TO YOUR LOCAL WFO FOR THE LATEST OFFICIAL RIVER FORECAST.
:
: Beaver Creek New Hartford - NHRI4
: HSA:DMX Flood Stage:12.0 FT Fcst Issuance Stage:9.0 FT
.E NHRI4 0624 Z DH06/DC06250112/HGIP/DIH06 :6-Hr Obs Stage (ft)
.E1 9.3/ 9.3/ 9.2/ 9.0
.E NHRI4 0625 Z DH06/DC06250112/HGIFF/DIH06 :6-Hr Fcst Stage (ft)
.E1 8.8/ 8.3/ 8.0/ 7.9/ 7.7/ 7.6/ 7.5/ 7.4
.E1 7.3/ 7.2/ 7.0/ 6.9/ 6.9/ 6.8/ 6.7/ 6.6
.E1 6.6/ 6.5/ 6.5/ 6.5/ 6.4/ 6.4/ 6.3/ 6.3
.E1 6.3/ 6.2/ 6.2/ 6.1/
:
: Cedar River Cedar Falls - CEDI4
: HSA:DMX Flood Stage:88.0 FT Fcst Issuance Stage:85.0 FT
.E CEDI4 0624 Z DH06/DC06250112/HGIP/DIH06 :6-Hr Obs Stage (ft)
.E1 92.5/ 92.2/ 91.9/ 91.6
.E CEDI4 0625 Z DH06/DC06250112/HGIFF/DIH06 :6-Hr Fcst Stage (ft)
.E1 91.3/ 91.0/ 90.6/ 90.3/ 90.0/ 89.6/ 89.3/ 89.0
.E1 88.6/ 88.3/ 88.0/ 87.7/ 87.4/ 87.1/ 86.9/ 86.6
.E1 86.4/ 86.2/ 85.9/ 85.7/ 85.4/ 85.2/ 84.9/ 84.7
.E1 84.6/ 84.4/ 84.2/ 84.1/
:
: Cedar River Waterloo - ALOI4
: HSA:DMX Flood Stage:13.0 FT Fcst Issuance Stage:8.5 FT
.E ALOI4 0624 Z DH06/DC06250112/HGIP/DIH06 :6-Hr Obs Stage (ft)
.E1 15.5/ 14.9/ 14.3/ 13.9
.E ALOI4 0625 Z DH06/DC06250112/HGIFF/DIH06 :6-Hr Fcst Stage (ft)
.E1 13.6/ 13.2/ 12.8/ 12.5/ 12.1/ 11.8/ 11.5/ 11.3
.E1 11.0/ 10.8/ 10.5/ 10.3/ 10.1/ 10.0/ 9.8/ 9.7
.E1 9.5/ 9.4/ 9.2/ 9.1/ 9.0/ 8.9/ 8.8/ 8.8
.E1 8.7/ 8.6/ 8.5/ 8.4/

```





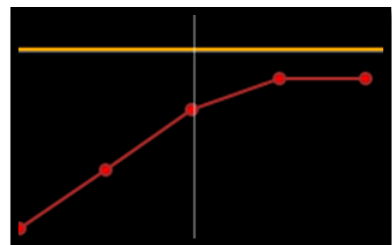
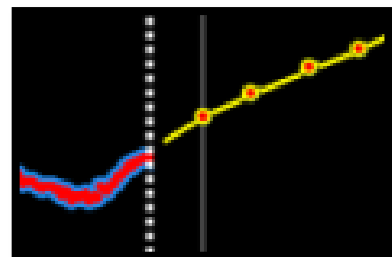
River Forecast Collaboration with the RFC(s)

[\[Back to TOC\]](#)

It is highly unlikely that all forecast points in your CWA would need an updated forecast outside of the routine forecast cycles. RFCs run river model forecasts that input both received rainfall (QPE) and forecast rainfall (QPF) for 24 hours into the future. If one or multiple points receive additional rainfall that is not accounted for in the routine forecast or a previous update, then be proactive in determining whether any of the river forecast points in your area need an updated forecast. Most RFC HSAs provide forecasts for dozens of points for multiple CWAs. It is in your best interest from a service standpoint to monitor your own precipitation and river gauges, monitoring the forecasts upstream, and making plans to coordinate your thoughts with the RFC.

Under inexact circumstances, where RFC forecasters are able to include recent heavy rainfall to rerun their height forecast/flow models for certain points, then they will normally send updates to those points. Not only is there the variable of how much rain will affect a river and surrounding basins, but an occasional “monkey wrench” of area dams releasing water can also send a river well above flood stage. Although there are specific protocols for dam personnel to notify the NWS (and vice versa is a dam is at risk) if they plan to release water, there are well-documented cases where this did not occur.

Although monitoring precipitation amounts, river heights, trends, and updated forecasts go a long way toward improved decision-making, you also need to be ready for any additional unknowns that may crop up. As a general rule, don’t ever “buy” completely into a deterministic line or trend for a river level or forecast – just as there are errors associated with a 7-day weather forecast from the numerous unknowns involved. For example, if you are looking at a forecast like the one on the top-right, where the observation trends have begun a steady climb, ask yourself if it is reasonable that the river will continue to steadily climb at this rate that far into the future. That would mean the feeder rivers, streams, and tributaries will continue to usher-in water from downstream at a steady and nearly unchanging rate during this time. If there is no additional rainfall expected or occurring, this may be a fairly sound assumption, but one to continually monitor.



As for the lower-right image, can you also trust a trend line like this, when flood stage (the straight orange line) is at risk of being overcome? You certainly don’t have enough information with just that question and just this tiny image – and that’s the point. While you will have forecasts and you will be armed with questions like the ones just mentioned (i.e. “does this make sense?”), you also have all of the aforementioned hydrologic applications, and possibly the most important tool of all...**a phone.**

This powerful tool can answer many questions in just a few short minutes. For example, a call to a county EOC or 911 Center:

“Hi, this is _____ from the National Weather Service. Do you have any reports of flooding around the county? Are there any road closures or rivers over their banks?”





Here is an example call to your local RFC to ask about and collaborate on a forecast:

“Hi, this is _____ from the [Weather Forecast Office], can I speak to someone about the river forecasts for our area? I just noticed we had a rain gauge in the western part of _____ county that feeds into [downstream forecast point] just received 3.78 inches in the couple of hours from that group of training cells. Did you have any plans to update the [downstream forecast point] forecast?”

While phone calls like these may not answer every question you have, the RFC may have already seen the high rainfall amount and started the process of updating the forecast for that point and calling an EOC/911 Center is probably more useful *during* an actual flooding event, there is nothing wrong with being used to picking up the phone when necessary. Making calls, when necessary, is part of the mission. This effort to make calls like these and other fact-finding calls is not going “above and beyond”, it is part of our service, to bring confidence and answers to the unknown, as much as it can be done.

Non-routine RFC updates:

There are number of reasons RFCs will send updates for forecast points, the main reason is a simple change in the trend values. When these updates occur, look not only for the updated values but any special message or information that is included when the RFC forecaster deems it necessary. Here are some actual examples from RVF updates:

“THE CORPS OF ENGINEERS REDUCED FLOWS COMING OUT OF [river] THIS AFTERNOON TO AID IN KEEPING [city-gauge name] BELOW FLOOD STAGE.”

“FIRST OBSERVED CREST WAS DUE TO LOCAL URBAN RUNOFF. NEXT FORECAST CREST IS DUE TO ROUTED UPSTREAM WATER FROM [city-gauge name].”

“UPDATED BASED ON UPDATED OUTFLOW PROJECTIONS FROM [river].”

“*** FORECASTS FOR AREA BELOW THE RESERVOIRS WILL BE ISSUED LATER THIS MORNING WHEN RESERVOIR OUTFLOW PROJECTIONS ARE RECEIVED. ***”

When a forecast does take a river into flood, they also provide predicted crest information, helpful in case you need to brief an emergency manager on the situation. Notice in the example on the right, on the “.A” row, the expected crest of 10.8’.

```

: HSA:DMX   Flood Stage:10.0 FT   Fcst Issuance Stage:7 FT
: CREST FORECAST
.A HBTI4   0701 Z DH06/DC07010119/HGIFFX  10.8
:
.E HBTI4 0630 Z DH06/DC07010119/HGIP/DIH06 :6-Hr Obs Stage (ft)
.E1  10.2/ 10.1/ 10.4/ 10.7
.E HBTI4 0701 Z DH06/DC07010119/HGIFF/DIH06 :6-Hr Fcst Stage (ft)
.E1  10.8/ 10.8/ 10.8/ 10.8/ 10.7/ 10.6/ 10.5/ 10.4
.E1  10.3/ 10.2/ 10.1/ 10.0/ 9.9/ 9.8/ 9.7/ 9.6

```

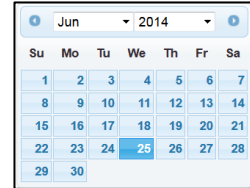
Be mindful of these updated forecasts and look for any embedded notes or messages such as these to help supplement your situational awareness and understanding of the forecast trend.



SECTION 3: Standardized Anomalies Analysis

We're not quite ready for the simulations yet! One last and also important aspect of forecasting river flooding left. Recall the FY15 WFO Flash Flood Hydrology and Warning Operations Training, [AWOC Flash Flood Track IC 2: Recognizing High-Impact Hydro Events \(Parts I & 2\)](#)^[17]. These modules focus on how situational awareness starts with understanding the bigger picture. In order to properly anticipate and respond to an event like the upcoming simulation(s), it is important to start out with a broader view of the weather patterns that will be affecting the area.

- Navigate to this page: <http://ssd.wrh.noaa.gov/satable/archive/>
- Click on the "Historic Cases" radio button
- Use the calendar that appears when you click in the "Date:" field and navigate to **06/25/2014** and set the time to **12Z**
- For this first iteration, select the default "NAEFS Standardized Anomaly"
- Selection "Northcentral U.S." for the region
- Click "View Table"

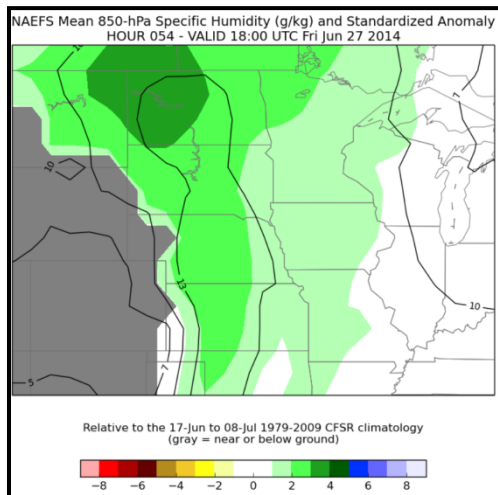


Type: Recent Cases Historic Cases Date: 06/25/2014 12Z Region: Northcentral U.S. [View Table](#)

Webpage Overview:

Recall the aforementioned [AWOC Flash Flood IC2](#) course where Richard Grumm, SOO of NWS State College, PA discussed the value of and procedures for analyzing these tables and images (right image). The parameters, like Q (Specific Humidity g/kg) are the columns, with 6-hour standardized (and colored) anomaly values. Clicking on any of these values **3.5** will cause the image to appear (example image below) to the right of the table, with the color shade of the cell equating to the highest or lowest anomaly value in the geographic domain, in this case their area for the "Northcentral U.S.", whichever is the larger value in that domain.

Northcentral U.S. Table Jun 25, 2014 12Z Run											
		Z	T	U	V	WSP	SLP	Q	PW	IVT	
6	Wed 25th	18Z	1.2	-1.8	1.1	1.8	0.9	1.5	-2.4	-1.9	1.4
12	Thu 26th	00Z	1.2	-1.8	1.1	2.0	1.1	-1.5	2.4	2.0	1.8
18		06Z	1.3	-1.7	1.3	1.7	1.6	-2.0	2.2	2.0	1.9
24		12Z	-1.4	-1.5	1.5	1.5	1.8	-2.3	2.2	1.9	1.6
30		18Z	-1.8	-1.3	1.9	2.0	1.9	-2.4	3.0	2.2	2.0
36	Fri 27th	00Z	-2.0	-1.5	2.1	2.5	2.6	-2.7	3.5	2.4	2.9
42		06Z	-2.4	-1.7	2.4	1.7	2.4	-2.9	3.2	2.7	2.7
48		12Z	-2.6	-2.0	2.2	-3.4	2.2	-3.1	3.0	2.7	2.5
54		18Z	-2.8	-2.0	2.2	-3.1	2.6	-3.1	3.5	2.8	2.4
60	Sat 28th	00Z	-2.7	-2.0	2.3	-2.9	2.6	-2.7	3.8	3.1	2.8
66		06Z	-2.4	2.0	1.9	-2.5	2.2	-2.8	3.6	2.9	2.9
72		12Z	-2.4	2.3	1.9	-2.3	2.1	-2.8	3.4	2.6	2.7
78		18Z	-2.0	2.0	2.0	2.4	3.1	-2.1	3.4	2.5	3.1
84	Sun 29th	00Z	-2.1	2.0	2.0	2.3	2.9	-2.1	3.3	2.4	3.3
90		06Z	-2.1	2.0	1.9	2.4	2.4	-2.1	3.3	2.4	2.7
96		12Z	-2.1	2.1	2.5	2.3	2.6	-2.1	3.2	2.2	2.1
102		18Z	-2.3	2.0	3.0	2.2	2.7	-2.2	3.1	2.2	2.3
108	Mon 30th	00Z	-2.4	1.8	3.0	2.1	2.7	-2.2	2.9	1.8	2.1
114		06Z	-2.4	1.9	2.4	2.0	2.0	-2.2	2.6	1.5	1.8
120		12Z	-2.3	1.8	2.3	1.9	2.3	-2.1	2.3	1.6	1.8
126		18Z	-2.4	1.8	2.3	1.8	2.2	-2.1	2.6	1.3	1.7
132	Tue 1st	00Z	-2.2	1.8	2.2	1.7	2.2	-2.2	2.5	1.5	2.2
138		06Z	-2.1	1.8	1.8	1.7	1.7	-2.1	2.2	1.5	2.0
144		12Z	-2.0	1.9	1.7	1.6	1.6	-2.1	1.8	1.3	1.6
150		18Z	-1.8	1.7	1.5	1.3	1.2	-2.1	2.1	1.0	1.0

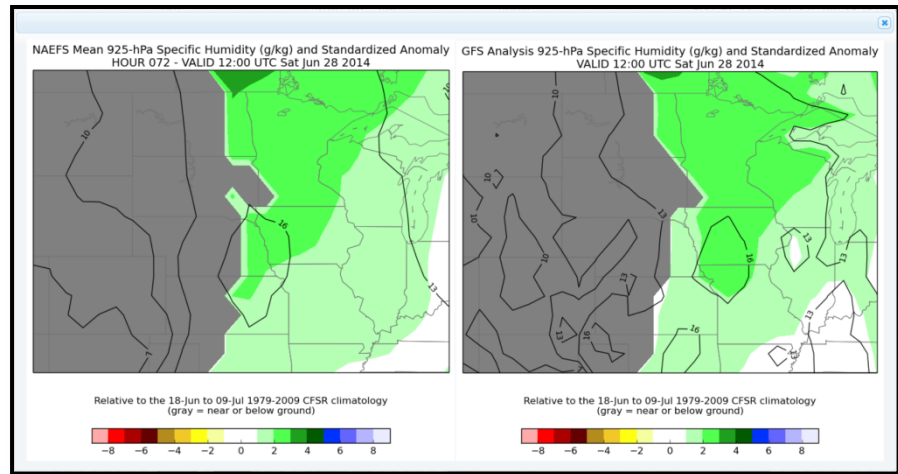


Clicking on the parameter symbol (i.e. Z, V, SLP, Q, etc.) will change the table to various critical levels important for each parameter (i.e. 200, 500, 850mb, etc.) except for PW and IVT. This is for the deeper analysis of the available parameters, as opposed to the mean value for that date & time.

		Q	500	700	850	925
6	Wed 25th	18Z	1.4	-1.6	-2.4	-1.6
12	Thu 26th	00Z	1.8	1.9	2.4	1.8
18		06Z	2.1	1.7	2.2	1.7
24		12Z	2.0	1.7	2.2	1.7
30		18Z	2.3	1.8	3.0	2.4



Additionally, clicking on the image itself will pop open an embedded window that has both the NAEFS and GFS output for that valid time and domain (example image on the right). This makes for quicker comparative analysis and gives an idea of what a forecaster could use in real-time pre-event analysis.



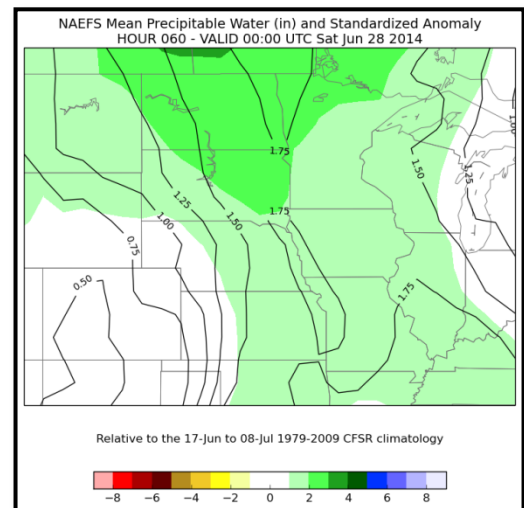
Pre-Event Analysis:

Northcentral U.S. Table Jun 25, 2014 12Z Run											
		Z	T	U	V	WSP	SLP	Q	PW/VI		
6	Wed 25th	18Z	1.2	-1.8	1.1	1.8	0.9	1.5	-2.4	-1.9	1.4
12	Thu 26th	00Z	1.2	-1.8	1.1	2.0	1.1	-1.5	2.4	2.0	1.8
18		06Z	1.3	-1.7	1.3	1.7	1.6	-2.0	2.2	2.0	1.9
24		12Z	-1.4	-1.5	1.5	1.5	1.8	-2.3	2.2	1.9	1.6
30		18Z	-1.8	-1.3	1.9	2.0	1.9	-2.4	3.0	2.2	2.0
36	Fri 27th	00Z	-2.0	-1.5	2.1	2.5	2.6	-2.7	3.5	2.4	2.9
42		06Z	-2.4	-1.7	2.4	1.7	2.4	-2.9	3.2	2.7	2.7
48		12Z	-2.6	-2.0	2.2	3.4	2.2	-3.1	3.0	2.7	2.5
54		18Z	-2.8	-2.0	2.2	3.1	2.6	-3.1	3.5	2.8	2.4
60	Sat 28th	00Z	-2.7	-2.0	2.3	2.9	2.6	-2.7	3.8	3.1	2.8
66		06Z	-2.4	2.0	1.9	2.5	2.2	-2.8	3.6	2.9	2.9
72		12Z	-2.4	2.3	1.9	2.3	2.1	-2.8	3.4	2.6	2.7
78		18Z	-2.0	2.0	2.0	2.4	3.1	-2.1	3.4	2.5	3.1
84	Sun 29th	00Z	-2.1	2.0	2.0	2.3	2.9	-2.1	3.3	2.4	3.3
90		06Z	-2.1	2.0	1.9	2.4	2.4	-2.1	3.3	2.4	2.7
96		12Z	-2.1	2.1	2.5	2.3	2.6	-2.1	3.2	2.2	2.1
102		18Z	-2.3	2.0	3.0	2.2	2.7	-2.2	3.1	2.2	2.3
108	Mon 30th	00Z	-2.4	1.8	3.0	2.1	2.7	-2.2	2.9	1.8	2.1
114		06Z	-2.4	1.9	2.4	2.0	2.0	-2.2	2.6	1.5	1.8
120		12Z	-2.3	1.8	2.3	1.9	2.3	-2.1	2.3	1.6	1.8
126		18Z	-2.4	1.8	2.3	1.8	2.2	-2.1	2.6	1.3	1.7
132	Tue 1st	00Z	-2.2	1.8	2.2	1.7	2.2	-2.2	2.5	1.5	2.2
138		06Z	-2.1	1.8	1.8	1.7	1.7	-2.1	2.2	1.5	2.0
144		12Z	-2.0	1.9	1.7	1.6	1.6	-2.1	1.8	1.3	1.6
150		18Z	-1.8	1.7	1.5	1.3	1.2	-2.1	2.1	1.0	1.0

You are the day shift forecaster for DMX on Wed. June 25, 2014 and for the sake of this case, you are looking at the entire forecast period from now through the next 7 days. In order to get a sense of whether any potential flooding could occur, nuisance or historic, you view the initial output table again (left image).

Notice the increase in Q (specific humidity) anomalies that increase as we head into Thu. June 26th, and into the weekend. The values don't really drop off until early next week and also notice how the PW (precipitable water) anomalies also follow fairly closely with the Q values, peaking at 00Z Sat. June 28th. Recall that these values are ones that appear anywhere within the domain and will not necessarily be coincident with your area of concern. If you are forced to use a relatively large domain, like this one, as opposed to a CWA-scale domain, then it is good to click through some of these images to see where the largest (positive or negative) values are plotted.

Click on the **PW** for **00Z Sat. June 28th** and notice that the 3.1 SD value in this domain is actually hanging around at the top of the image (right) on the border of Saskatchewan and Manitoba, Canada – which is relatively far away from the DMX CWA. Notice however, the contours of PW centered over middle of the domain from south-to-north, with a relative maxima contour of 1.75” over the Missouri River Valley of eastern Nebraska and western Iowa. This is also important information for pattern recognition and potential heavy rainfall forecasting.





SECTION 4: Pre-Simulation Procedures

[\[Back to TOC\]](#)

1). You are at the end of the hydrologic applications overview. Your action now is to open the “**HydroAppsQuestions.docx**”, answer the questions and submit it to your local training facilitator, either by printing it out or completing it electronically.

2). After the questions are completed and submitted to your training facilitator, follow the procedures to open the simulation case through **WES-2 Bridge**. A **WESSL-2** script will direct you through the entire simulation, along with the online Simulation Companion module (narrated by WDTD Instructor, Justin Gibbs).

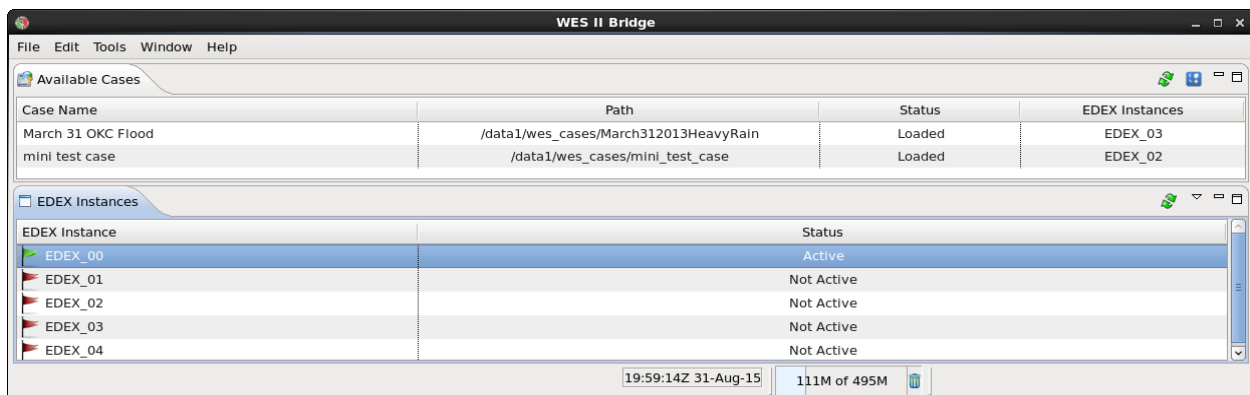
3). **Complete the Simulation.** Unlike severe convective-related simulations, where radar interrogation and short-fuse warning issuance is a race against the clock in displaced real-time, what is critical for learning and understanding in this simulation is your ability to utilize the available Hydro Applications to follow and react to potential river flooding. Instead of large chunks of time with a running clock that can dictate your actions and responses, you will be dropped into a certain time of day, each day of the simulation to analyze the latest data (river forecasts, models, observations, etc.), what has changed since “yesterday” at that time, and what the forecast calls for from that time onward.



You will not be left “alone” to analyze data and merely follow graphs and tables. After the initial loading of the simulation from WES-2 Bridge, including your various CAVE displays, you will then follow-along with a narrated “Simulation Companion” online module. The evaluation questions for the simulation are embedded into the module, so you will need to log into the [Commerce Learning Center](#) and go through the entire module to reach the quiz section.

WES2Bridge Overview:

The “Bridge” in WES-2 Bridge is just that – this application is a “bridge” between the legacy WES (Weather Event Simulator), or “WES 1” in AWIPS I and the eventual WES 2 capability in the AWIPS 2 baseline. WES-2 Bridge is an application that allows playback of data in either “Review” or “Simulation” mode (example below).





Once the simulation settings are correct and loaded from one of the active EDEX instances (bottom section of the WES-2 Bridge application window), the simulation automatically starts a CAVE window. Additional CAVE windows can be started from the instance manager. The simulation progress can then be controlled from the “Simulation Controls” window (image below), with the capabilities of pausing, stopping, skipping around in a case. The “SYNC” feature forces CAVE and WES-2 Bridge to be at the same time in case they get separated.

The new “SKIP” feature in WES-2 Bridge will be your main feature of use in the upcoming simulation.



Additional Simulation Considerations:

[\[Back to TOC\]](#)

NWS Product Responsibilities (during simulation):

During the simulation, you will mainly be assessing and analyzing data to get comfortable with the available hydrologic applications and their functions. However, besides answering a number of questions interlaced throughout the simulation procedures, your product issuance responsibility will be to issue:

- **River Flood Watches (optional)**
- **River Flood Warnings**
- **Associated Statements for each of the previous warning types (as the time allows during the simulation)**

You will not be responsible for any routine forecast products or anything GFE-related, just the hydro-related products above. There will also be some points of explanation, to describe various aspects of your decision-making.

Instead of having to follow and make decisions on all of the river gauge locations in the DMX CWA, you will only be following a handful of sites, in an effort to familiarize yourself with the process as opposed to full-fledged all-encompassing scenario.

The next section will briefly discuss River Flood Watch issuance, for those who are not familiar with the process.

River Flood Watches or Flood Watch for Forecast Points (FFA)

Either term will work, but essentially the product is a watch for a forecast point along a river.

From [NWS Directive 10-992](#), “this optional product is issued by some NWS offices to inform the public of the possibility of flooding - typically within a 6 to 48 hour time frame before the event - at specific forecast points on rivers and streams. The flood watch for forecast points is not a mandatory product. It may be issued for a location regardless of whether or not the area surrounding the location is already covered by an areal flood watch.”



References:

[\[Back to TOC\]](#)

- 1). National Weather Service. Office of Climate, Water, and Weather Services. Service Assessment Webpage. <http://www.nws.noaa.gov/om/assessments/index.shtml>
- 2). National Weather Service. Service Assessment. "The Record Front Range and Eastern Colorado Floods of September 1-17, 2013." (2014). http://www.nws.noaa.gov/os/assessments/pdfs/Tenn_Flooding.pdf
- 3). National Weather Service. Service Assessment. "Record Floods of Greater Nashville: Including Flooding in Middle Tennessee and Western Kentucky, May 1 - 4, 2010." (2011). http://www.nws.noaa.gov/os/assessments/pdfs/Tenn_Flooding.pdf
- 4). National Weather Service. Service Assessment. "Southeast United States Floods, September 18-23, 2009." (2010). http://www.nws.noaa.gov/os/assessments/pdfs/Tenn_Flooding.pdf
- 5). Raytheon Corporation. "CAVE User's Manual." (2013). https://www.unidata.ucar.edu/software/awips2/doc/CAVE_D2D_Manual.pdf
- 6). National Weather Service, Advanced Hydrologic Prediction Service (AHPS) terminology page. http://water.weather.gov/ahps2/pdf/hydrograph_terminology.pdf
- 7). National Weather Service, Office of Climate, Water, and Weather Services. "Standard Hydrometeorological Exchange Format (SHEF) Code Manual." (2012) http://www.nws.noaa.gov/om/water/resources/SHEF_CodeManual_5July2012.pdf
- 8). National Weather Service, Office of Hydrologic Development. "Time Series Hydrometeorologic Data Viewer Operations Guide." (2008). http://www.nws.noaa.gov/om/water/WFO_support/TimeSeries/timeseries_guide_OB8.3.doc
- 9). National Weather Service. Office of Hydrologic Development. "AWIPS2 MPE Perspective Users Guide Build 14.3.1." (2015)
- 10). National Weather Service. Warning Decision Training Division. FFMP Training. Greg Shelton, Senior HAS Forecaster, West Gulf RFC. "Multisensor Precipitation Estimator." <http://www.wdtb.noaa.gov/buildTraining/FFMP-A/MPE/player.html>
- 11). National Weather Service. Office of Hydrologic Development. "RiverMonitor Operations Guide". (2008). http://www.nws.noaa.gov/os/water/WFO_support/RiverMonitor/RiverMonitor_OperationsGuideOB83.doc
- 12). National Weather Service. "RiverPro Reference Manual." (2010). http://www.nws.noaa.gov/om/water/WFO_support/RiverPro/RiverProMainBody.doc
- 13). National Weather Service. Office of Hydrologic Development, Hydrology Laboratory. "Site Specific Hydrologic Predictor Operations Guide." (2008). http://www.nws.noaa.gov/os/water/WFO_support/SiteSpecific/SSHP_OB9.0_Ref_Guide.doc



- 14). National Weather Service. Office of Hydrologic Development, Hydrology Laboratory. "Site Specific Hydrologic Predictor Quick Reference Guide." (2008). http://www.nws.noaa.gov/os/water/WFO_support/SiteSpecific/SSHP_OB9_Quick_Ref_Guide.doc
- 15). WHFS Field Support Group webpage. http://www.nws.noaa.gov/os/water/WFO_support/index.shtml
- 16). Met-Ed. "Flash Flood Processes." <http://www.meted.ucar.edu/hydro/basic/FlashFlood/index.htm>
- 17). NWS Warning Decision Training Division. "AWOC Flash Flood Track IC 2: Recognizing High-Impact Hydro Events." <http://www.wdtb.noaa.gov/courses/ffawoc/index.php>