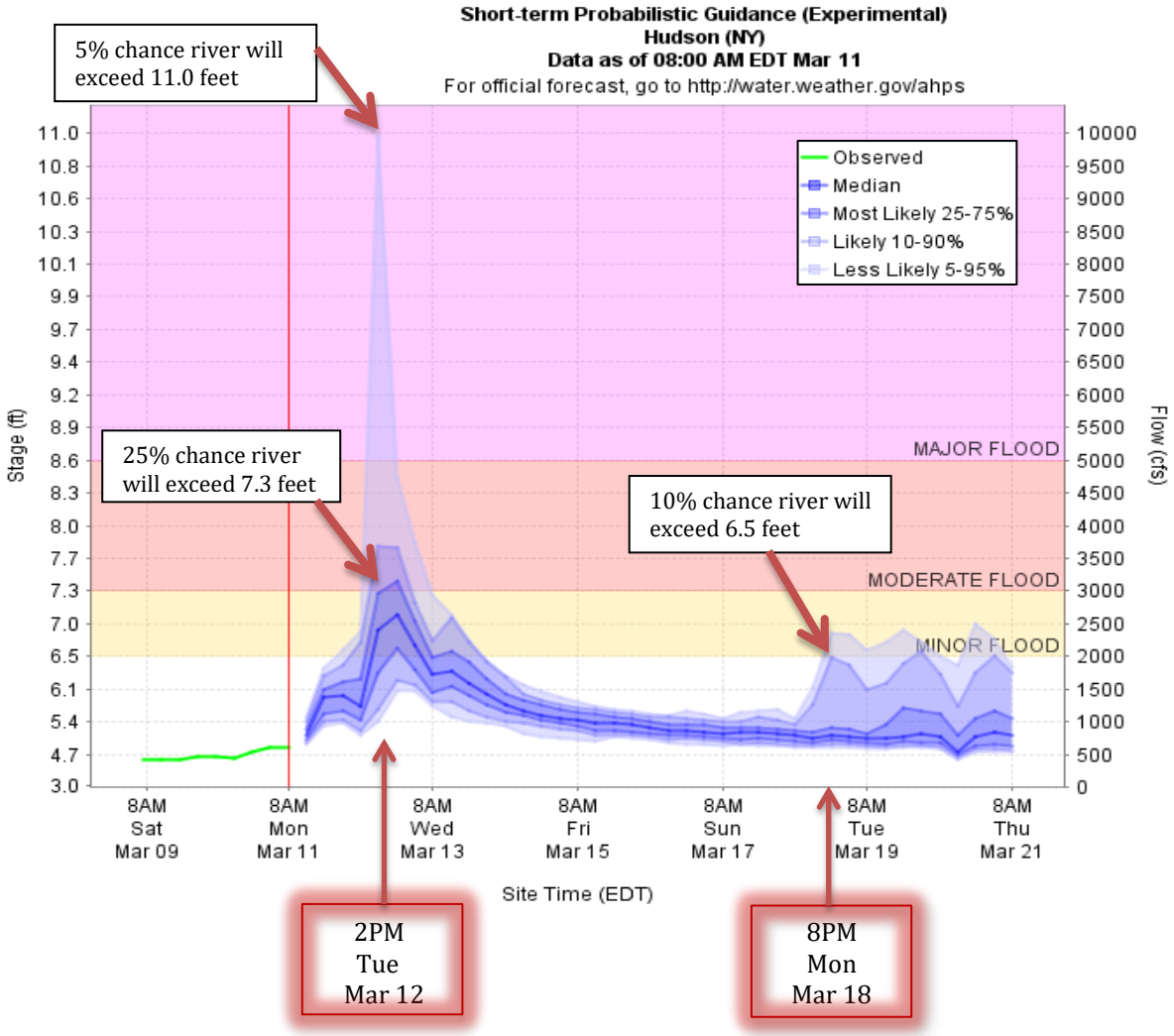
Short-term Probabilistic Guidance Product (Experimental)

What:
The Short-Term Probabilistic Guidance Product contains a graphical depiction of the short-range (0-10 days) river forecast uncertainty predicted by the HEFS. At each forecast time-step (typically every 6 hours), the graphic conveys a range of possible river stages, and corresponding flows, at a particular forecast location. These possibilities are shaded using different categories of forecast probability, ranging from most likely to less likely. These probability ranges (uncertainty bounds) are derived from the ensemble forecasts produced by HEFS at each forecast time-step.

In the example below, the forecast for 2pm EDT on March 12 indicates a roughly 25% chance that the river level will exceed 7.3 feet (Moderate Flooding). It also indicates a roughly 5% chance that the river will exceed 11.0 feet (above the Major Flooding level).

Also, the forecast for 8pm EDT on March 18 indicates a roughly 10% chance that the river will exceed 6.5 feet (Minor Flooding) at that time in the forecast horizon.



How:
Ensemble forecasting is a practical and effective approach to quantifying uncertainty. In contrast to single-valued forecasts, ensemble forecasts provide a collection of possibilities. Each ensemble member represents one possible and equally likely outcome and, collectively, all of the ensemble members aim to capture the range of possible outcomes and their associated probabilities.

If the total uncertainty is not adequately quantified, the forecast probabilities will not be sufficiently accurate; in other words the ensemble spread will not consistently "capture" the observed streamflow. The uncertainty in our river forecasts originates from two main sources: 1) weather forecasting or "forcing" uncertainty (i.e., uncertainty about the future values of temperature, precipitation and any other forcing variables used by the hydrologic models); and 2) hydrologic uncertainty (i.e., all of the uncertainties associated with hydrologic modeling, including the initial conditions, model parameters, model structure, etc.).

The NWS has developed and implemented the Hydrologic Ensemble Forecast Service (HEFS), in order to produce accurate ensemble forecasts that better quantify the uncertainties in our river forecasts. The HEFS utilizes weather and climate forecasts from a variety of sources, including the River Forecast Center (RFC) precipitation and temperature forecasts, as well as ensemble mean forecasts from NWS numerical weather prediction models. Biases in the weather forecasts are calculated and corrections are applied. A post-processing option in the HEFS also provides the capability to capture the hydrologic uncertainty in the streamflow predictions and correct for biases in the forecast probabilities.

Why:
The typical river forecasts produced by the NWS are single-valued forecasts (example), which are known to be imperfect. They are based on models with imperfect descriptions of physical processes. They utilize parameters that are estimated with limited data, and that limited data includes measurement and other errors.

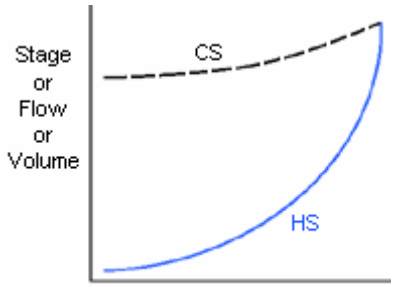
These imperfections are reflected in the differences between the river forecasts and the corresponding river observations (at gage locations). The differences generally increase with forecast lead time and can be much larger for extreme events (e.g., floods). A single-valued forecast does not provide information about the forecast uncertainty (i.e., the range of possible outcomes and their associated probabilities).

Quantifying and providing explicit estimates of the uncertainty in our river forecasts is one of the most pressing needs of operational hydrologic forecasting. Ultimately, the goal is to support informed, risk-based, management of water resources and hazards.

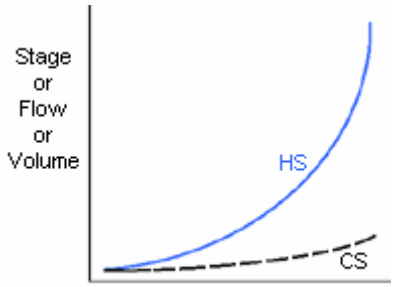
This graph shows chances of the river stage, flow, or volume going above various levels during the forecast period labeled above the graph. Similar plots are usually available for one or more of these variables at this forecast location. The **conditional simulation (CS)** line indicates chances of the river going above given levels based on current conditions. The **historical simulation (HS)** line indicates the chances of the river going above given levels based on the total range of past levels.

These long-range forecasts or outlooks allow you to see what computer simulations can tell us about extended periods. *Remember that this information is **indicative**, that is, it only gives you probabilities or chances of possible scenarios*. It should be expected that conditions can and will change over such extended periods. These forecasts are updated periodically and should be consulted on a regular basis.

Here are some possible scenarios to help you understand this graphic:



More wet than "normal" conditions over the forecast period.
The chances are greater for wet conditions, as indicated by the **Conditional Simulation**, over the entire range of possible outcomes.



More dry than "normal" conditions over the forecast period.
The chances are greater for dry conditions, as indicated by the **Conditional Simulation**, over the entire range of possible outcomes.

When the two simulations are very close across the entire range, the chances of the river going over a certain level is similar to the total range of past levels.

Links to past and forecast precipitation, river level impact and historical flood information are also included on this page.

The following terminology is used when describing floods:

Minor flooding - minimal or no property damage, but possibly some public threat or inconvenience.

Moderate Flooding - some inundation of structures and roads near stream. Some evacuations of people and/or transfer of property to higher elevations is necessary.

Major Flooding - extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.