Ensemble Forecasts at the OHRFC

Longer-term planning for flooding and drought

Forecasting Rivers Since 1946

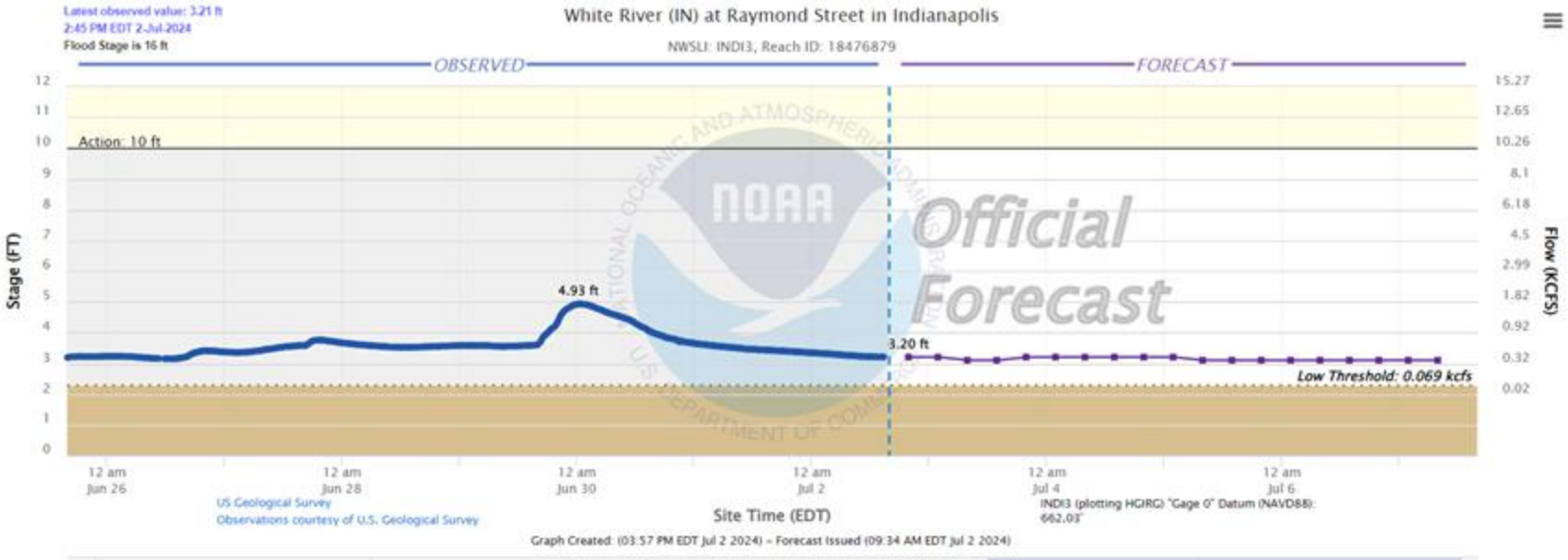
Ohio River Forecast Center (OHRFC)

- Daily river forecasts to protect lives and property and promote the economy

Forecasting Rivers Since 1946

Deterministic Forecasts

- Single value, best estimate, going out 5-10 days into the future with 2-3 days of forecast precipitation

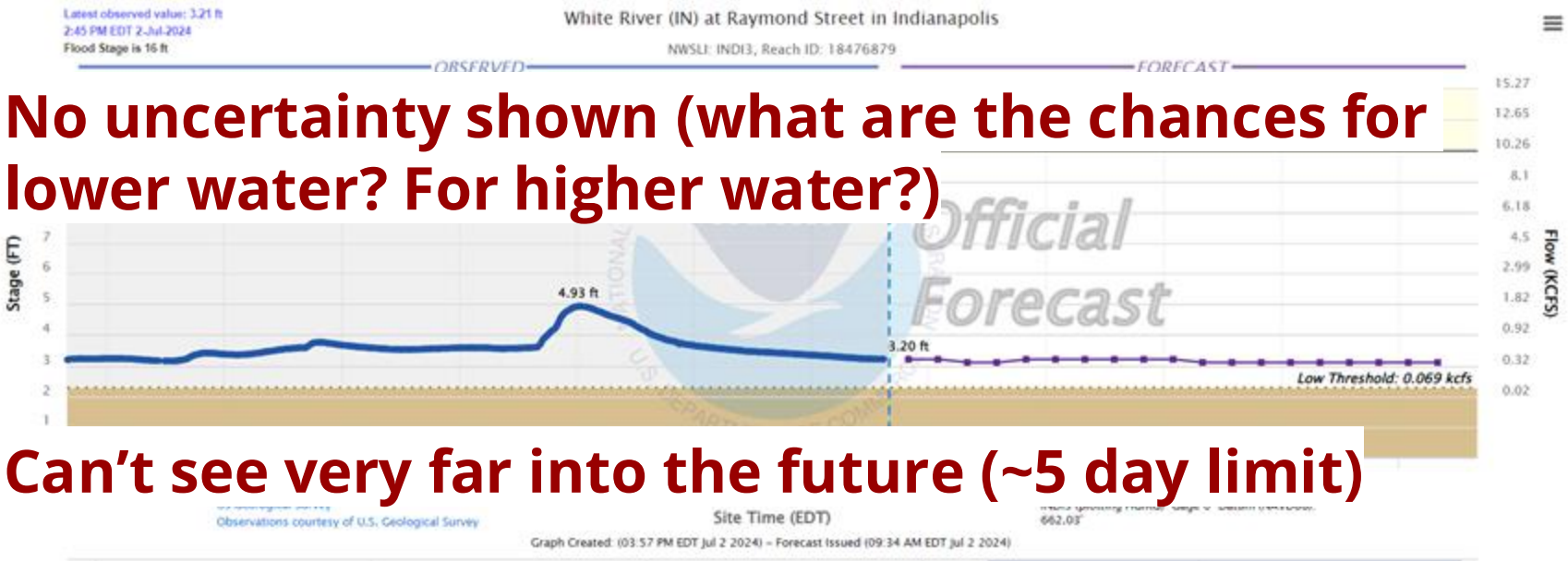


Forecasting Rivers Since 1946

Deterministic Forecasts

Tough to use for drought planning!

- Single value, best estimate, going out 5-10 days into the future with 2-3 days of forecast precipitation

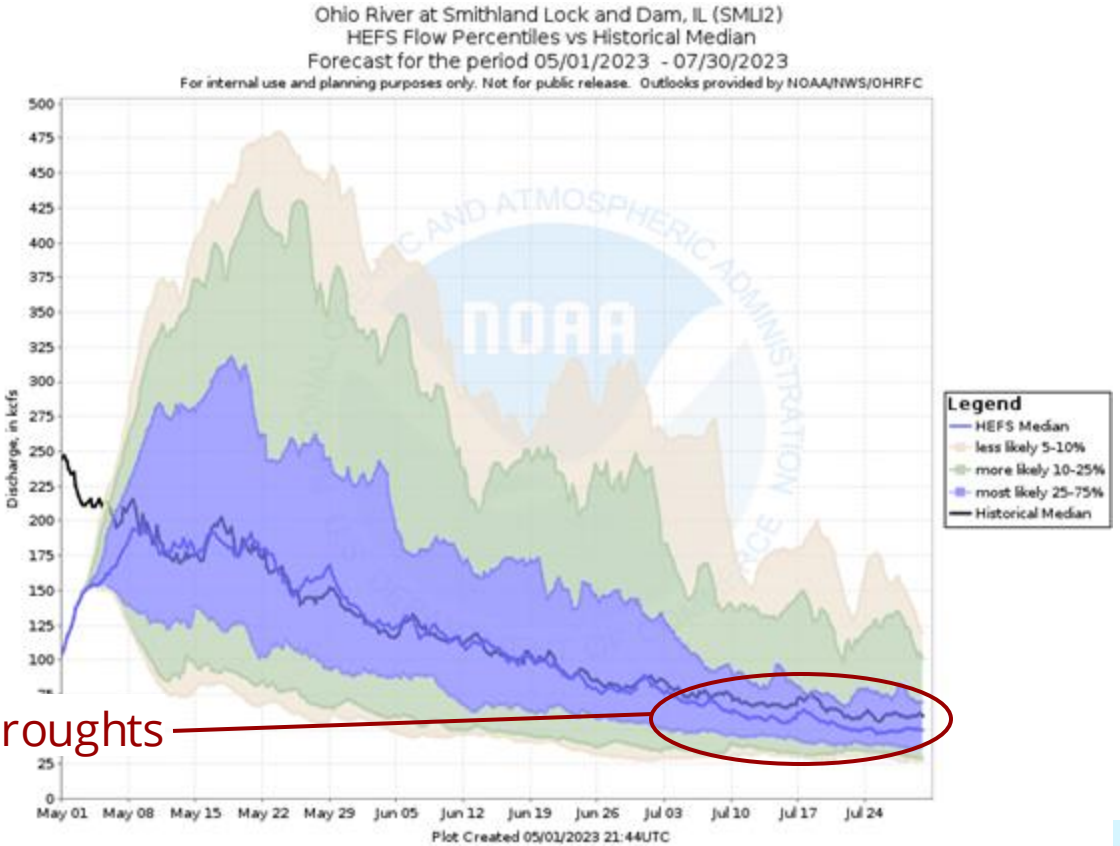


No uncertainty shown (what are the chances for lower water? For higher water?)

Can't see very far into the future (~5 day limit)

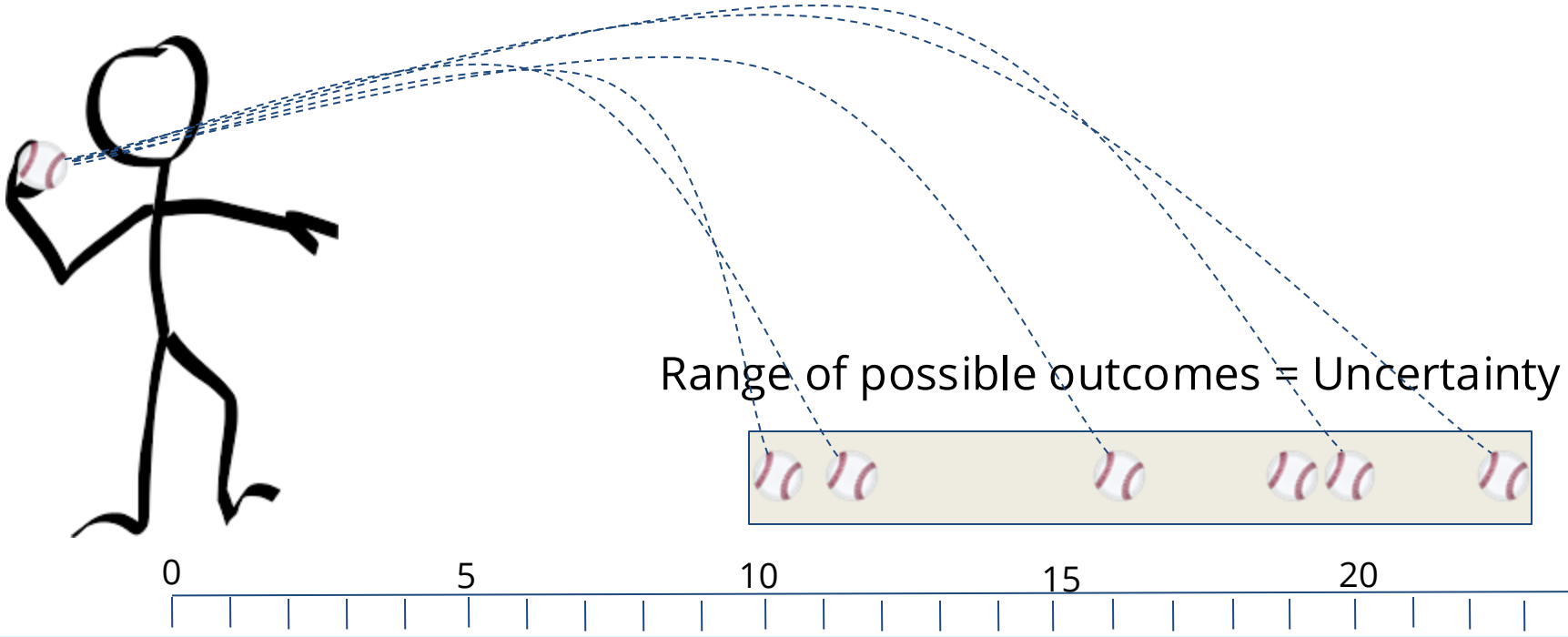
Hydrologic Ensemble Forecast Service

- Visualize uncertainty and probability
- Look out much further into the future



Early indicator for potential droughts

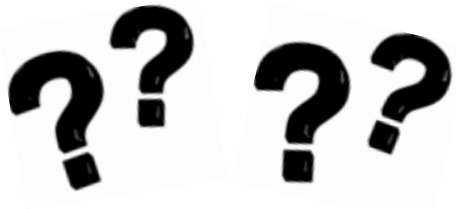
Uncertainty and Probability



Uncertainty and Probability

What we know:

- Stick figure is going to throw the ball (who knows how hard)
- We have never seen this stick figure throw a ball



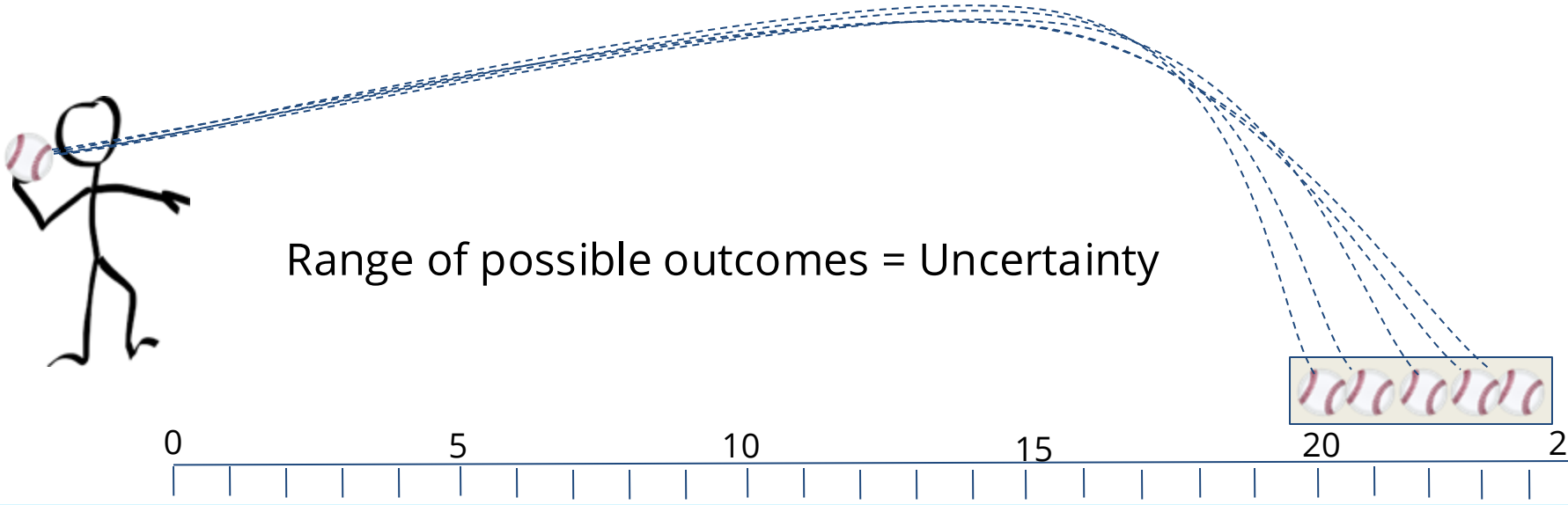
The larger the spread, the greater the uncertainty!

Range of possible outcomes = Uncertainty

Uncertainty and Probability

What we know:

- Stick figure plans on throwing the ball as hard as possible
- Stick figure's past hard throws have landed in these locations

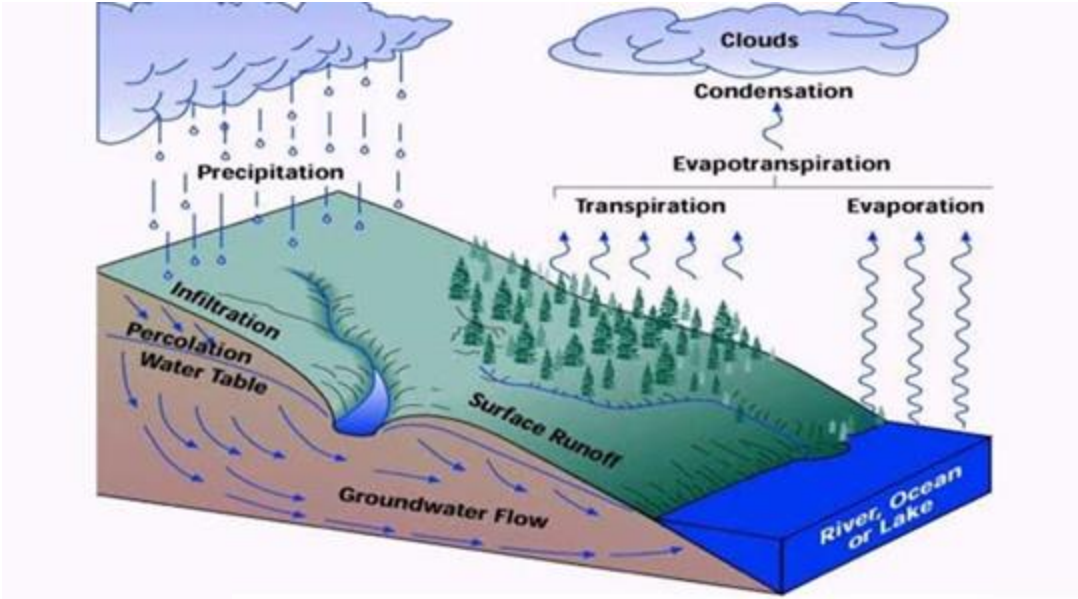


Uncertainty in River Forecasts

Predicting the future **always** involves uncertainty

River forecasting uncertainty

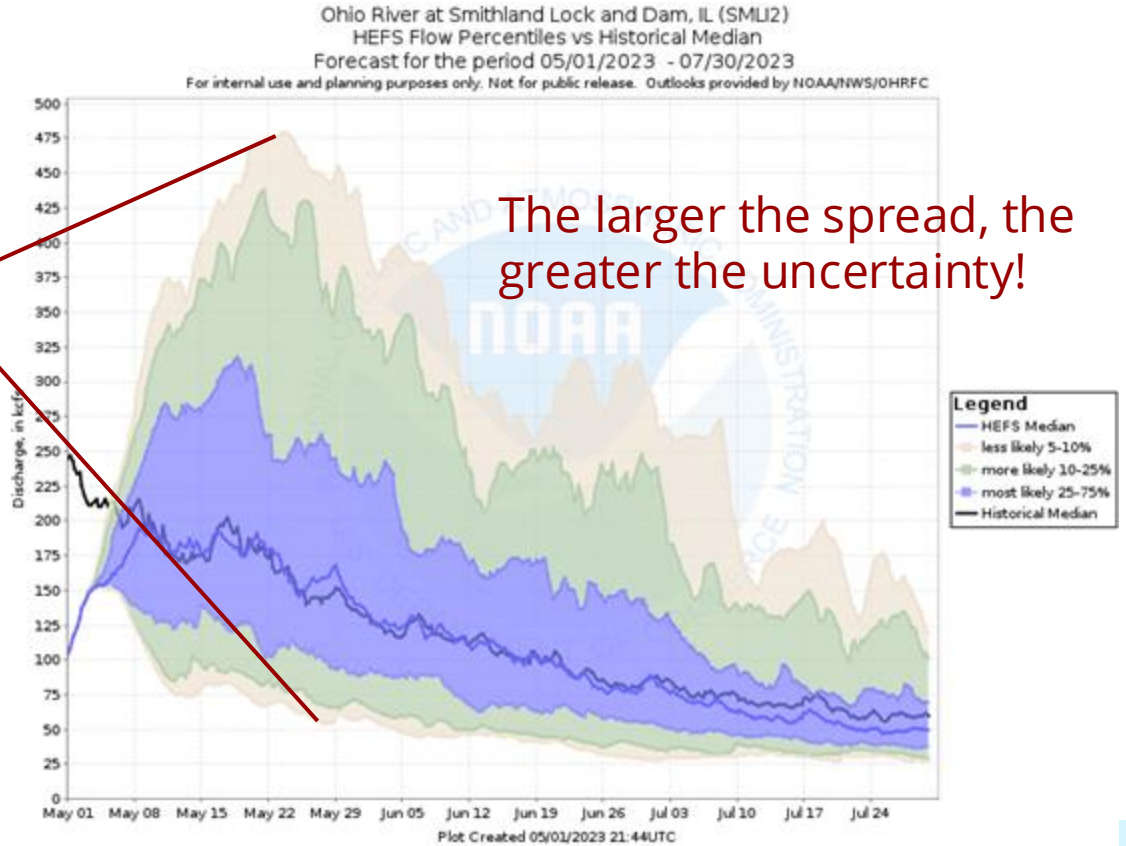
- Weather (rain, snow, snowmelt)!
- How will precipitation or snowmelt act once it is on the surface (infiltration vs runoff)?
- What happens to the river?



Hydrologic Ensemble Forecast Service

- Visualize uncertainty and probability

HEFS can take both **meteorological** and **hydrologic** uncertainty into account

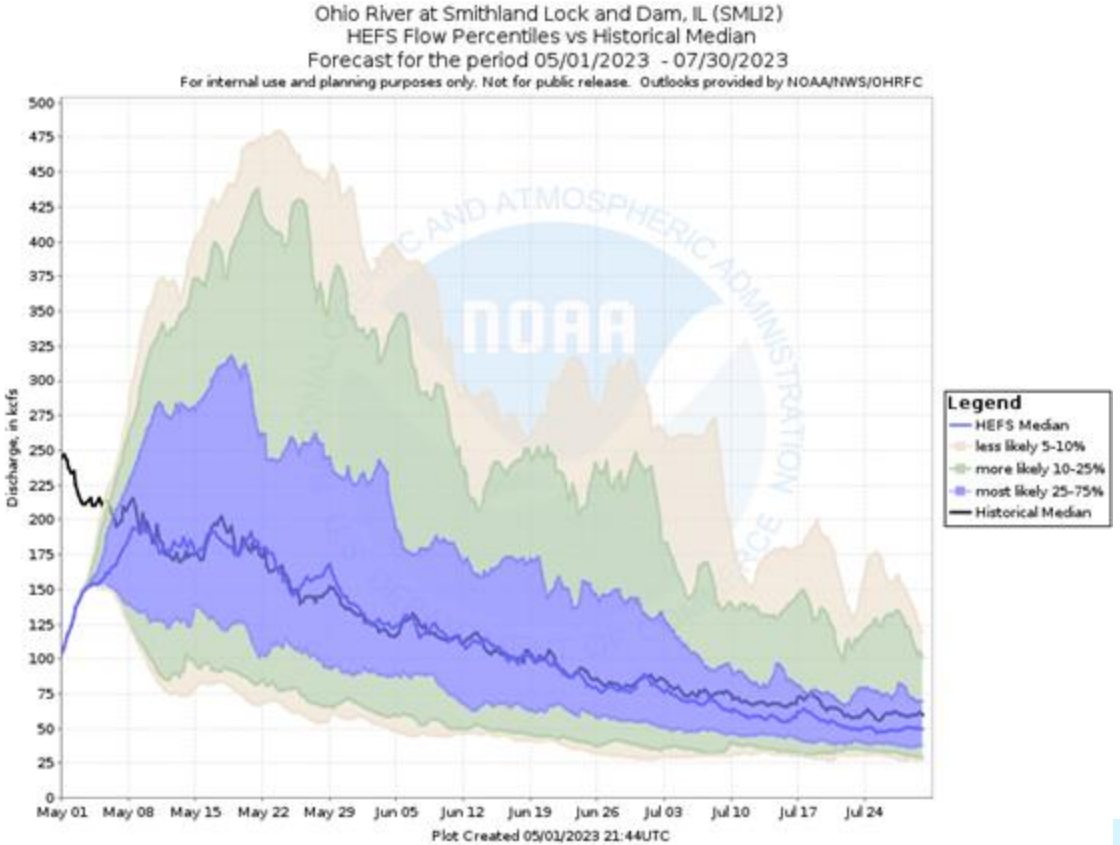


The larger the spread, the greater the uncertainty!

Hydrologic Ensemble Forecast Service

- Look out much further into the future

  This example shows 90 days, but can go out much further



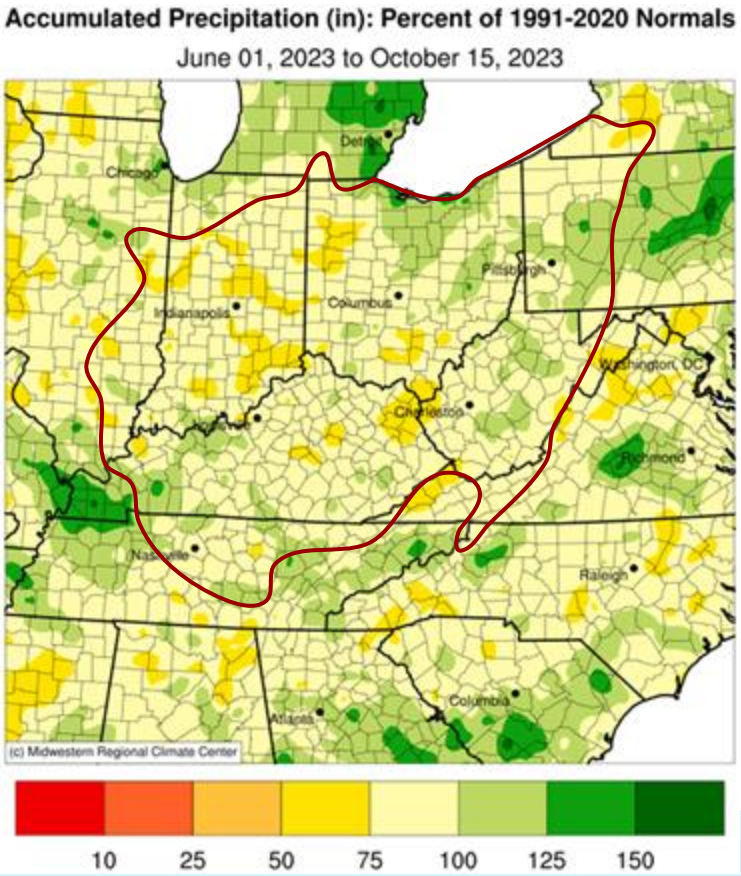
2023 Drought - HEFS Example

For the 2nd year in a row - Drought in the Midwest

August 25th, 2023 - Midwest Drought Status Update:

- The Ohio River at Cairo, IL dropped almost ten feet since August 16.
- The forecasts and outlooks through early- to mid-September show the persistence of hot and dry weather will likely continue.
- The Ohio River is forecast to have below-normal flows in September, and low stages are expected to persist throughout the length of the Mississippi River. These low flows and stages will likely impact industry and navigation.

2023 Drought - HEFS Example



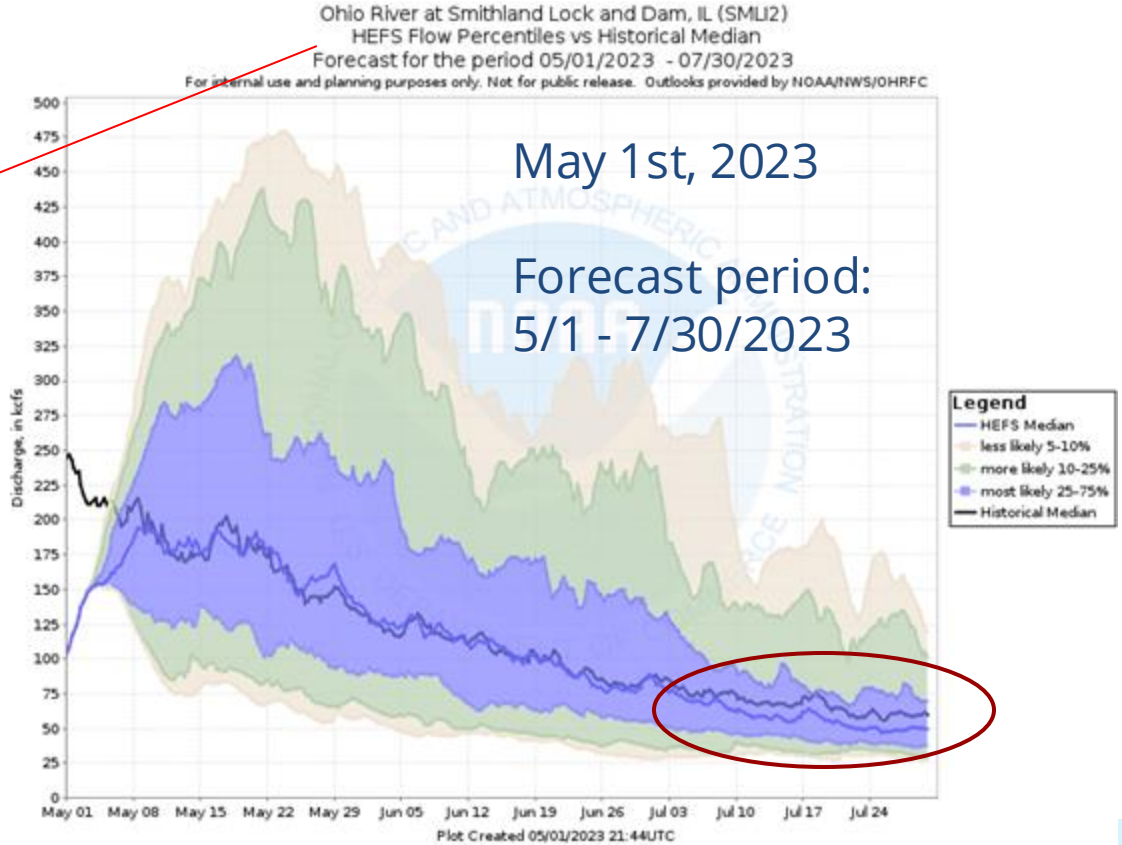
From 6/1 - 10/15/2023, percent of normal precip was quite low

Most areas in the 75-100% category

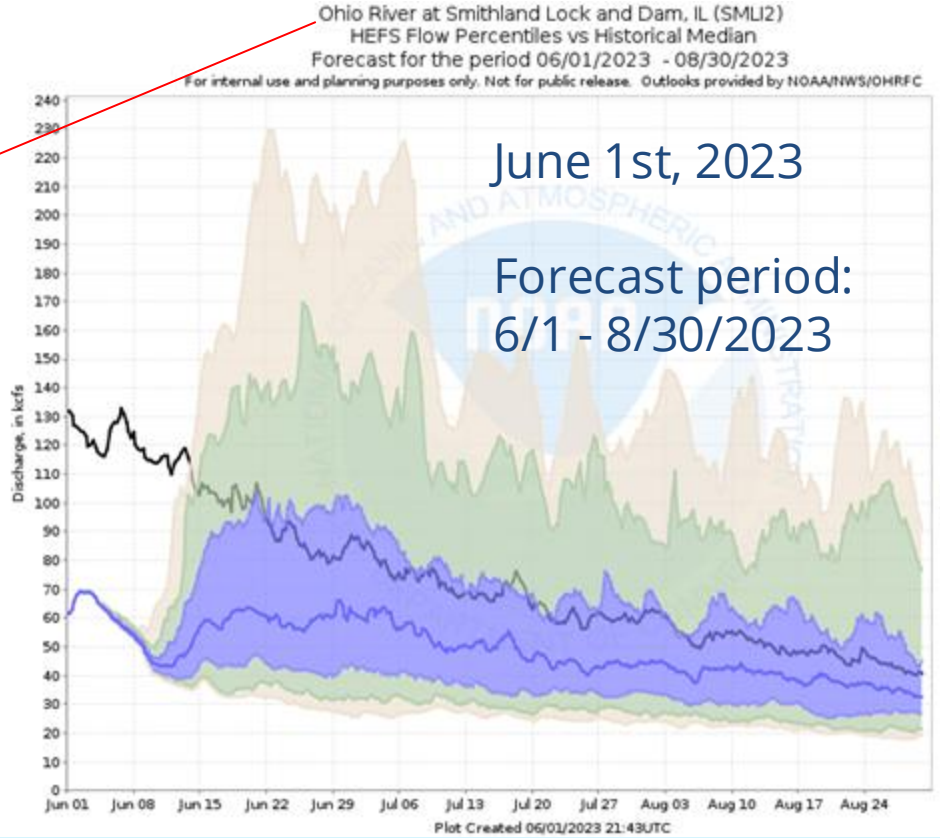
Large sections in the 50-75% category

2023 Drought - HEFS Example

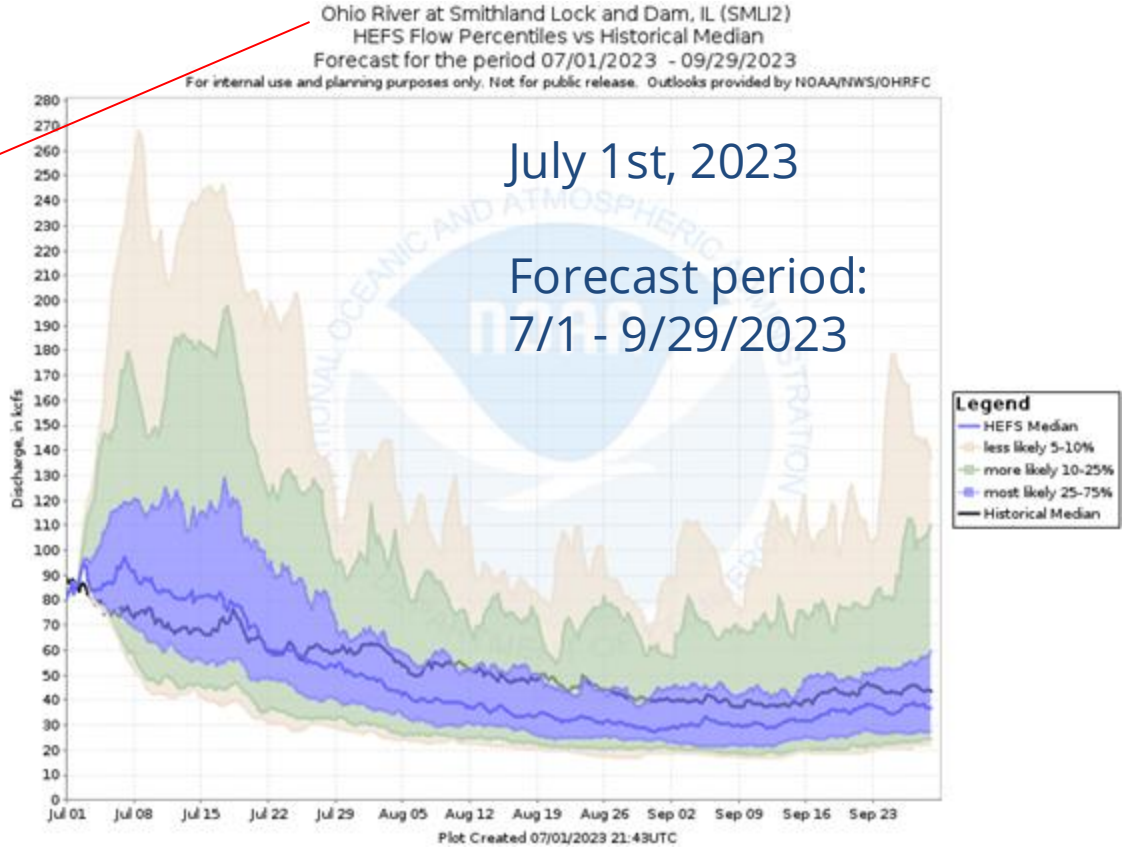
Ohio River at Smithland - receives most OHRFC water



2023 Drought - HEFS Example



2023 Drought - HEFS Example



2023 Drought - HEFS Example

Takeaways:

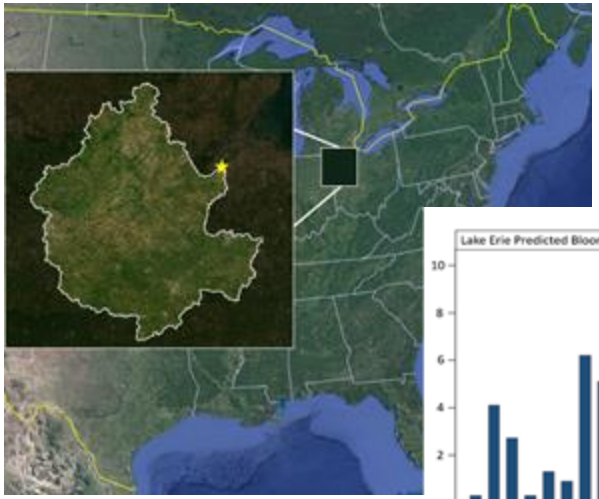
- Drainage basin outlets show the effects of drought over a large area
- HEFS median for the Ohio River at Smithland was consistently lower than climatological median from late June/early July through the end of the summer
  - Daily predictions were showing this at least as early as April 2023
- This tool gave a pretty good heads-up for OHRFC-wide drought which would go on to occur summer 2023

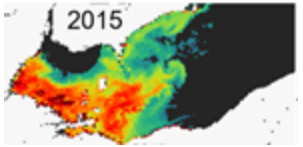
Who is Using HEFS?

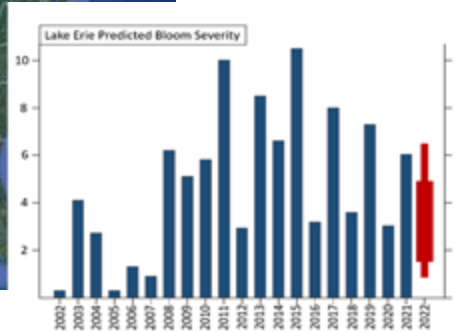
US Army Corps of Engineers

NIDIS

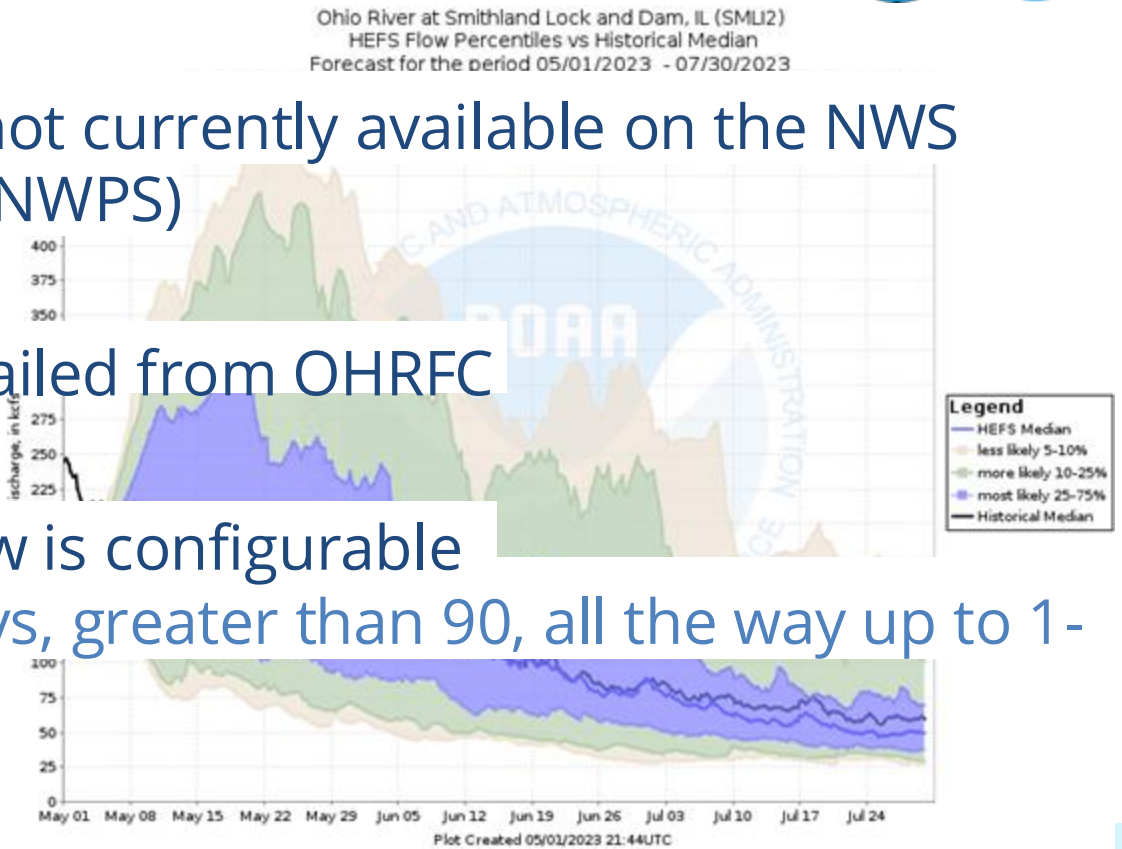
NOAA NCCOS





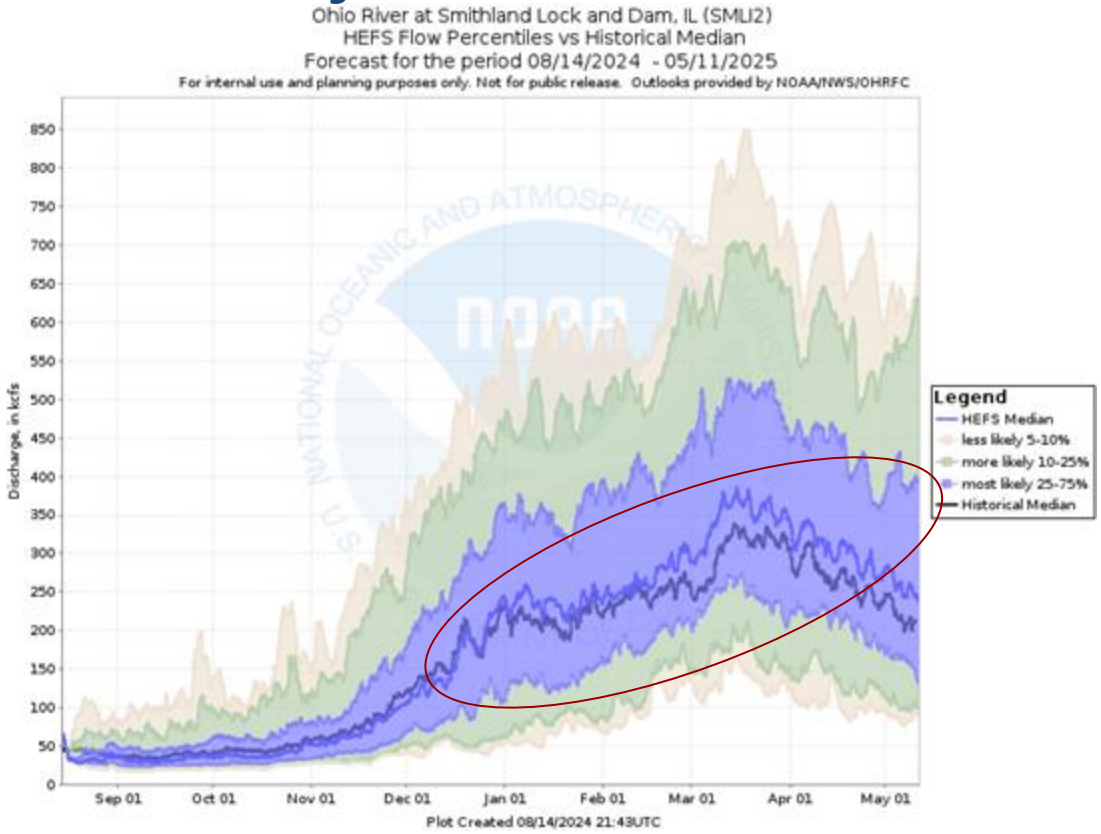


Interested in Using HEFS?



- Long-term HEFS is not currently available on the NWS hydrology website (NWPS)
- Currently being emailed from OHRFC
- The forecast window is configurable
  - Less than 90-days, greater than 90, all the way up to 1-year

270-Day Smithland Flow



Hinting at a pattern shift from drier to wetter

HEFS median separates from Historical Median beginning late fall

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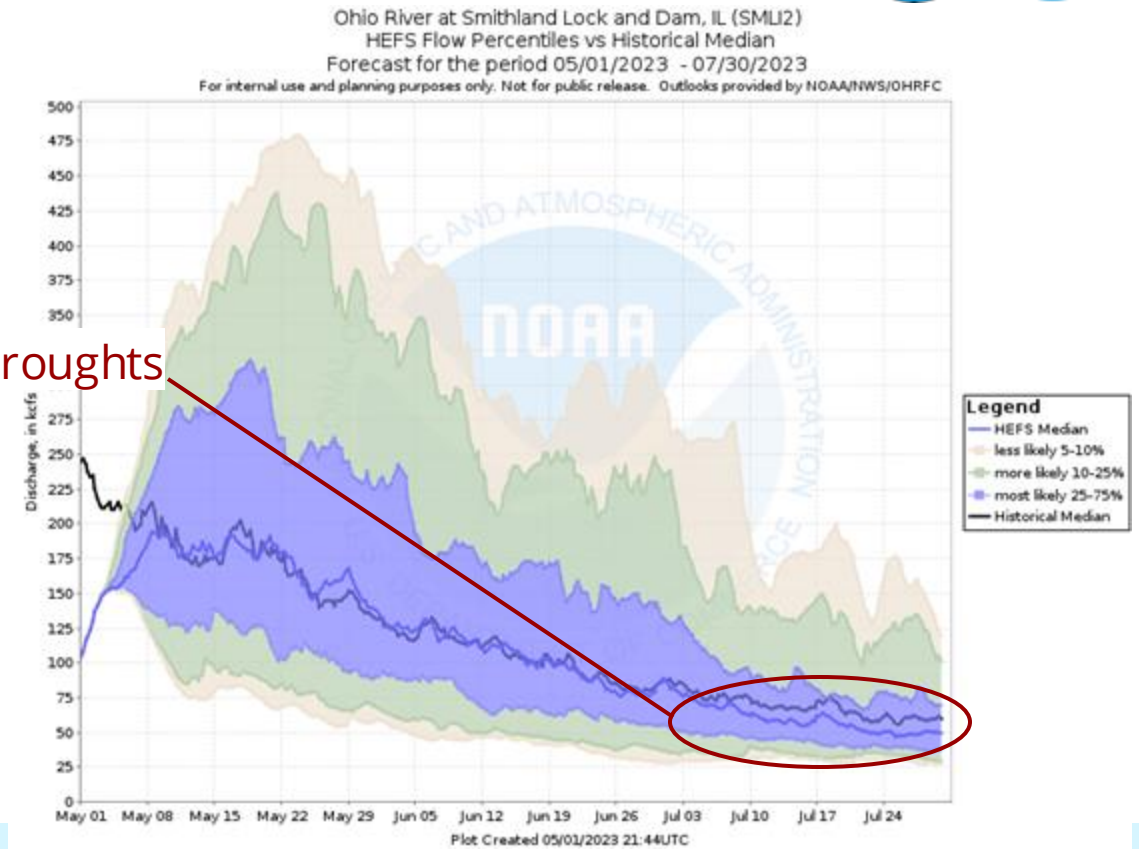
Early indicator for potential droughts



Thanks!

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abram.dasilva@noaa.gov

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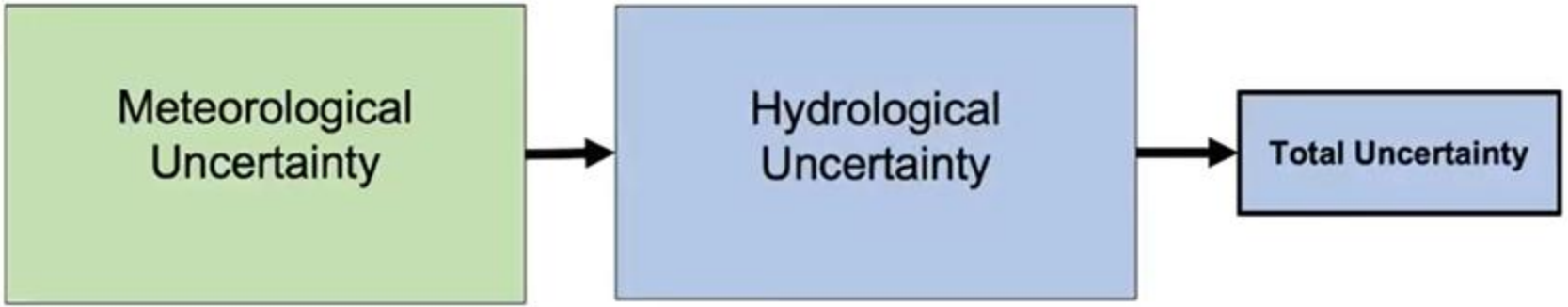

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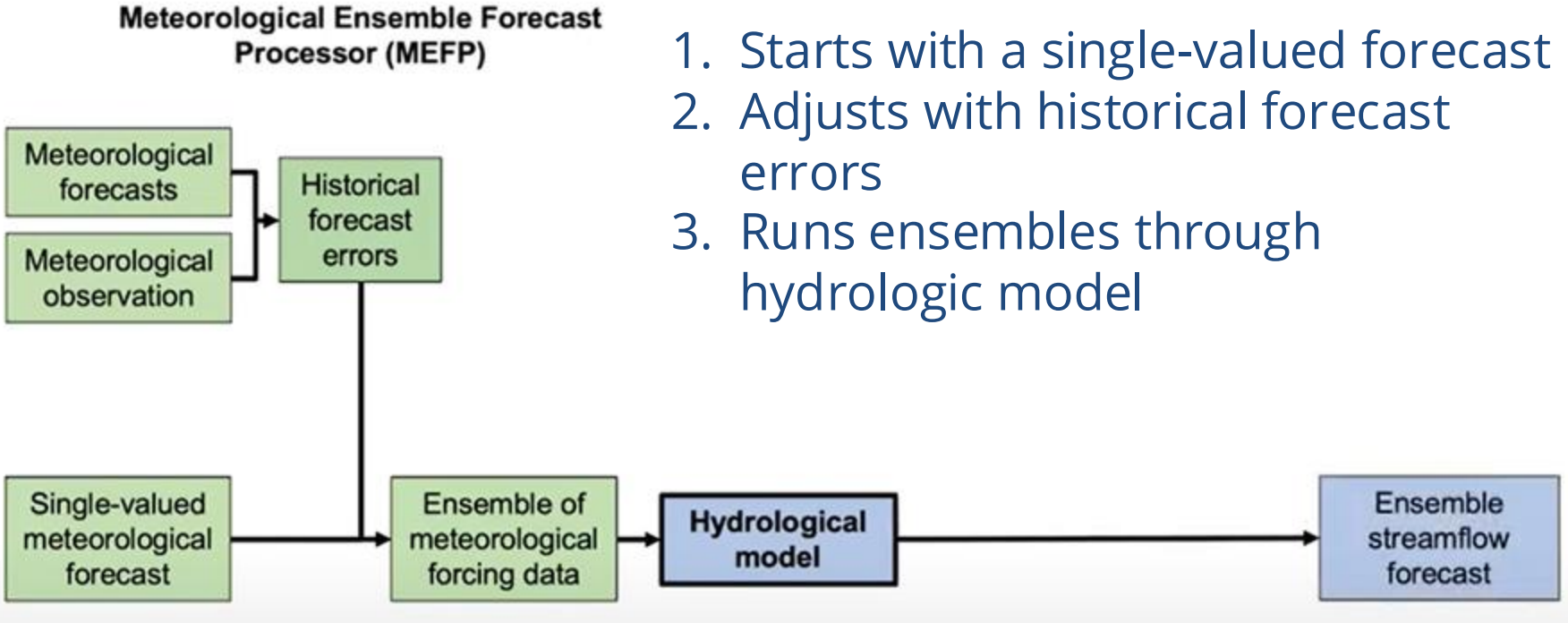
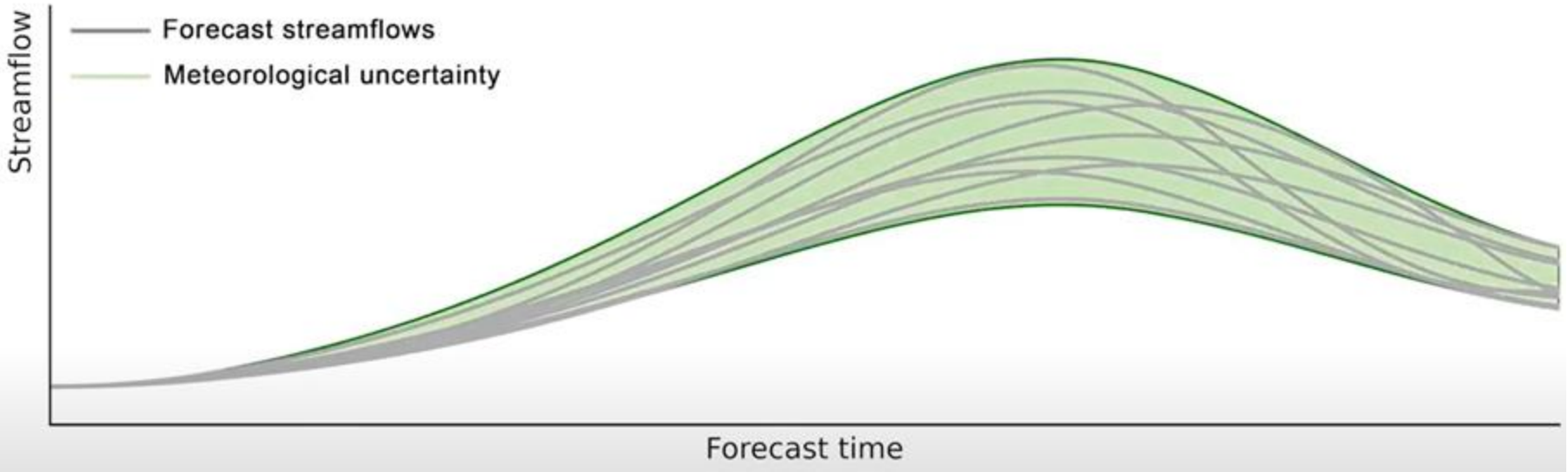


1. Starts with a single-valued forecast
2. Adjusts with historical forecast errors
3. Runs ensembles through hydrologic model

Hydrologic Ensemble Forecast Service



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