How the National Weather Service Forecasts River Stages

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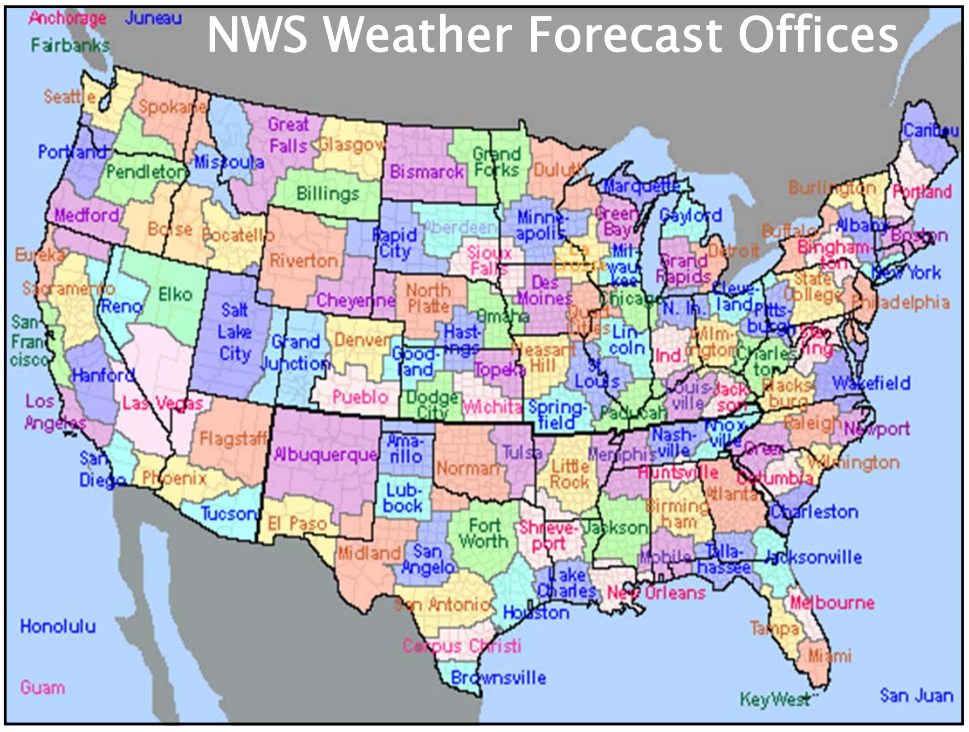
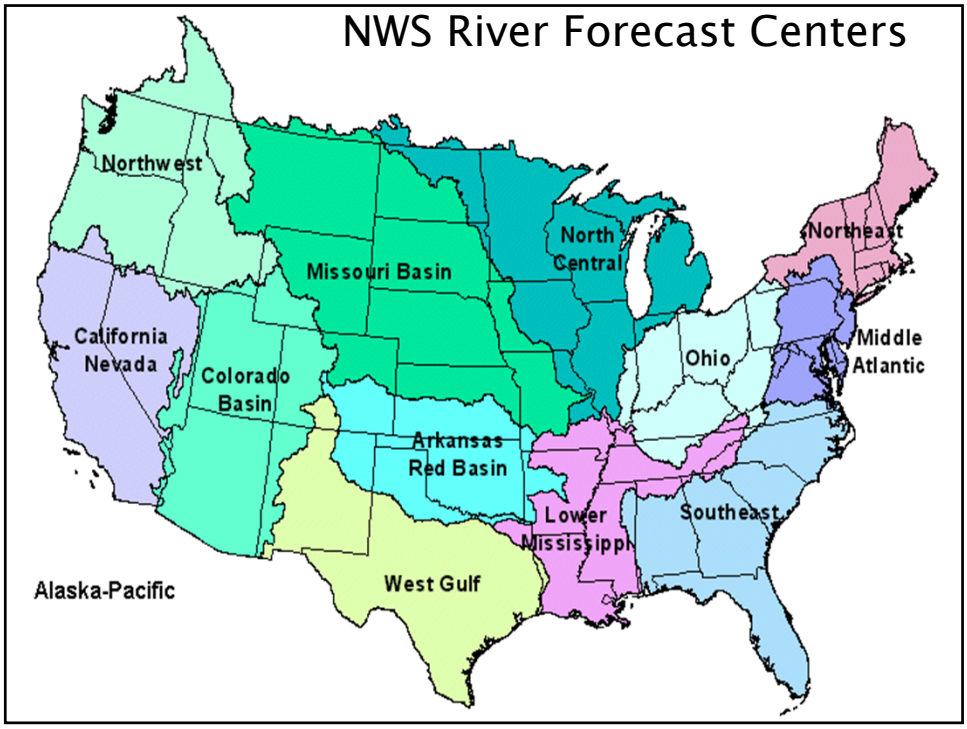
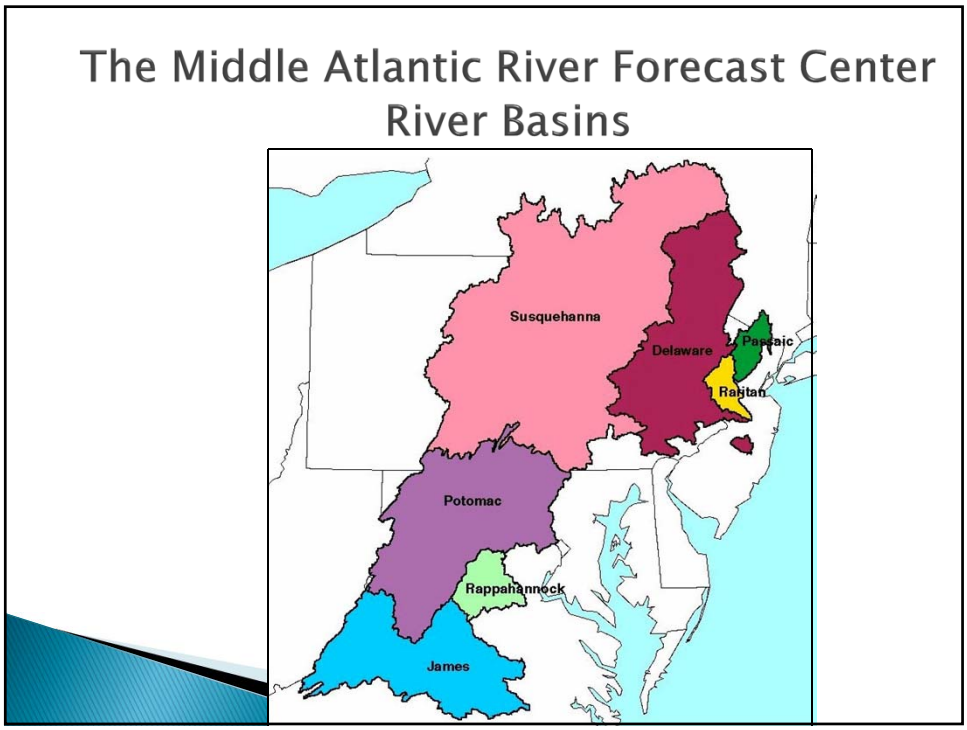
NOAA, National Weather Service,
Middle Atlantic River Forecast Center



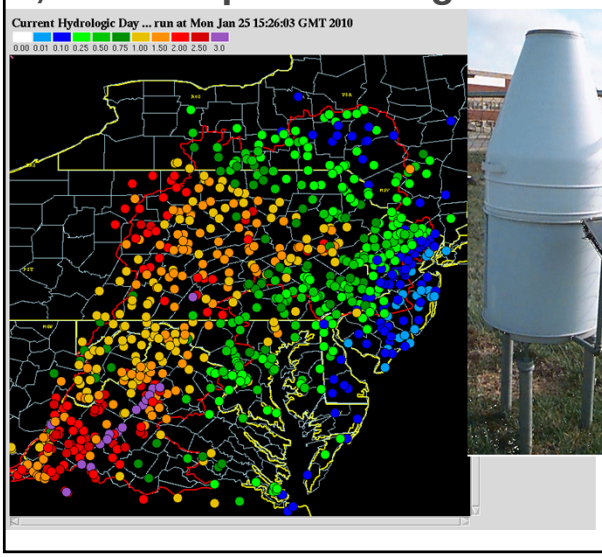

NWS River Forecast Centers
Northwest
Missouri Basin
North Central
Northeast
California
Nevada
Colorado Basin
Ohio
Middle Atlantic
Arkansas Red Basin
Lower Mississippi
Southeast
Alaska-Pacific
West Gulf


The Middle Atlantic River Forecast Center River Basins
Susquehanna
Delaware
Passaic
Raritan
Potomac
Rappahannock
James

Hydrologic Model Input

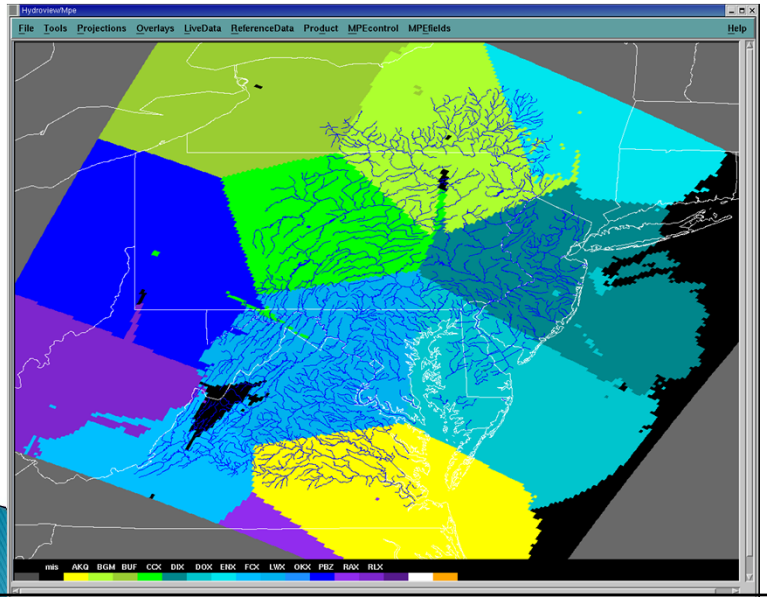
Precipitation over the past 24 Hours

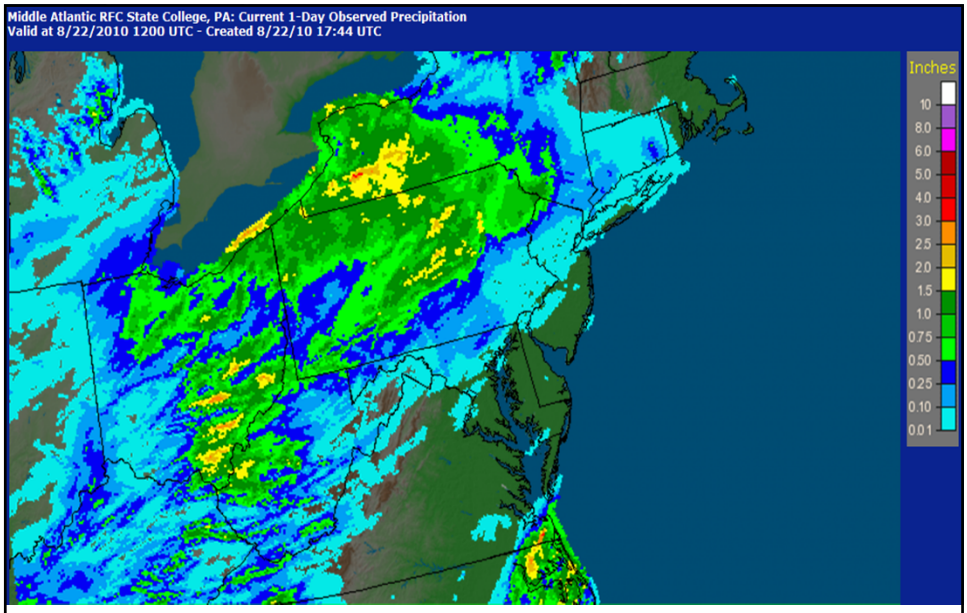
1,467 Precipitation Gages



CoCoRaHS

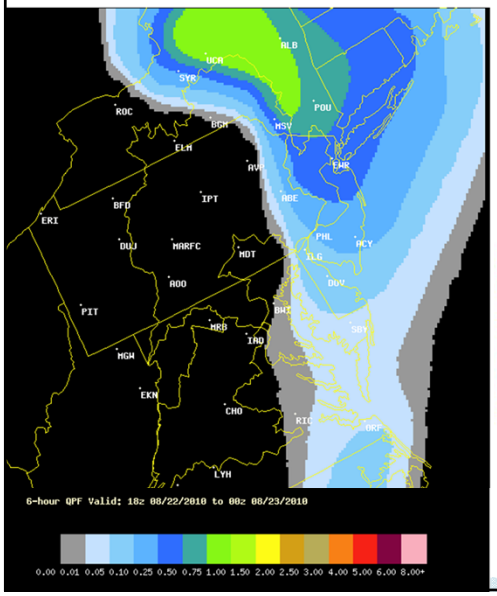
12 NWS Weather RADARS

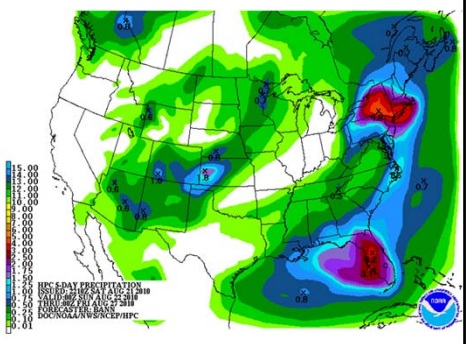




MPE = Multisensor Precipitation Estimator
Radar and Gages info combined

Forecast Precipitation through next 48 hours





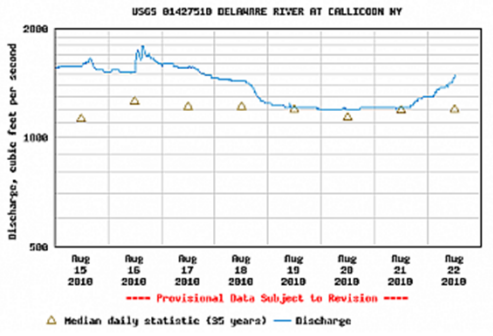
Basin average, 6 hourly resolution

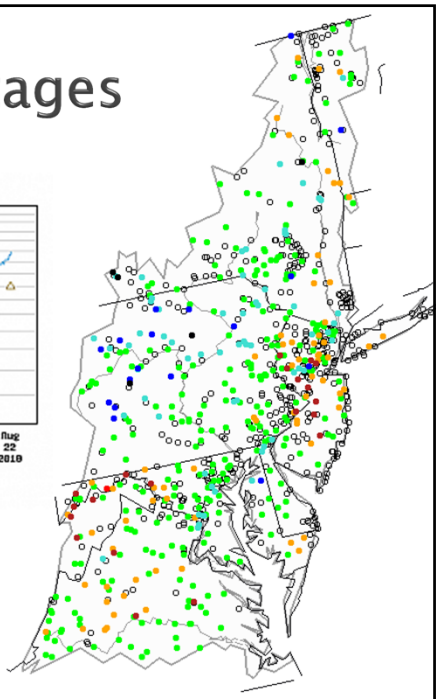
Observed River Stages

USGS
science for a changing world

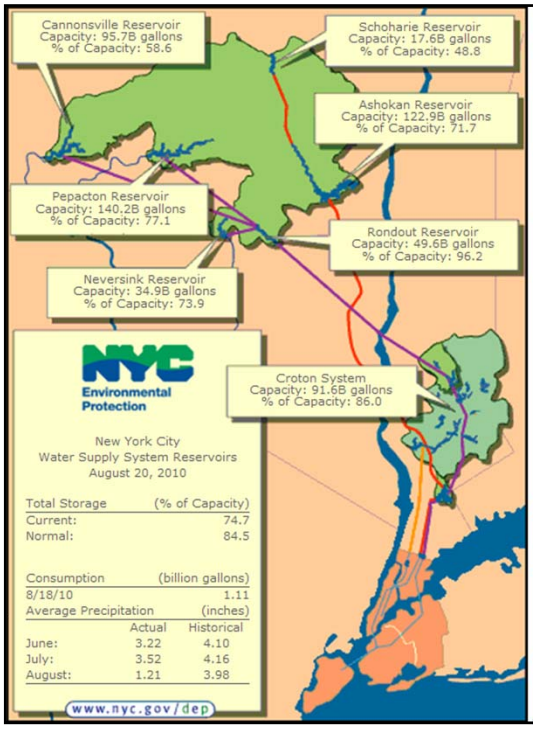
South Branch Raritan River at Stanton, NJ

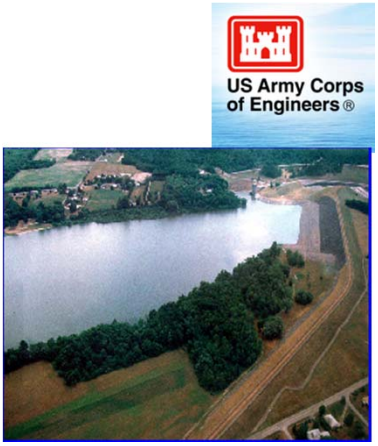
Observed River Stages





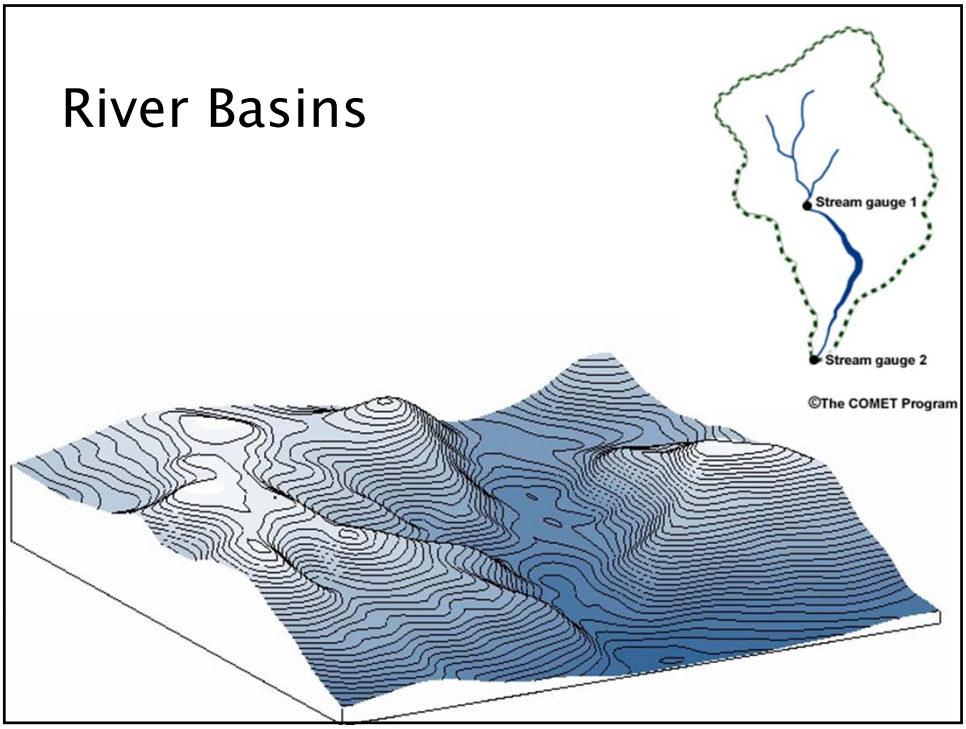
USGS

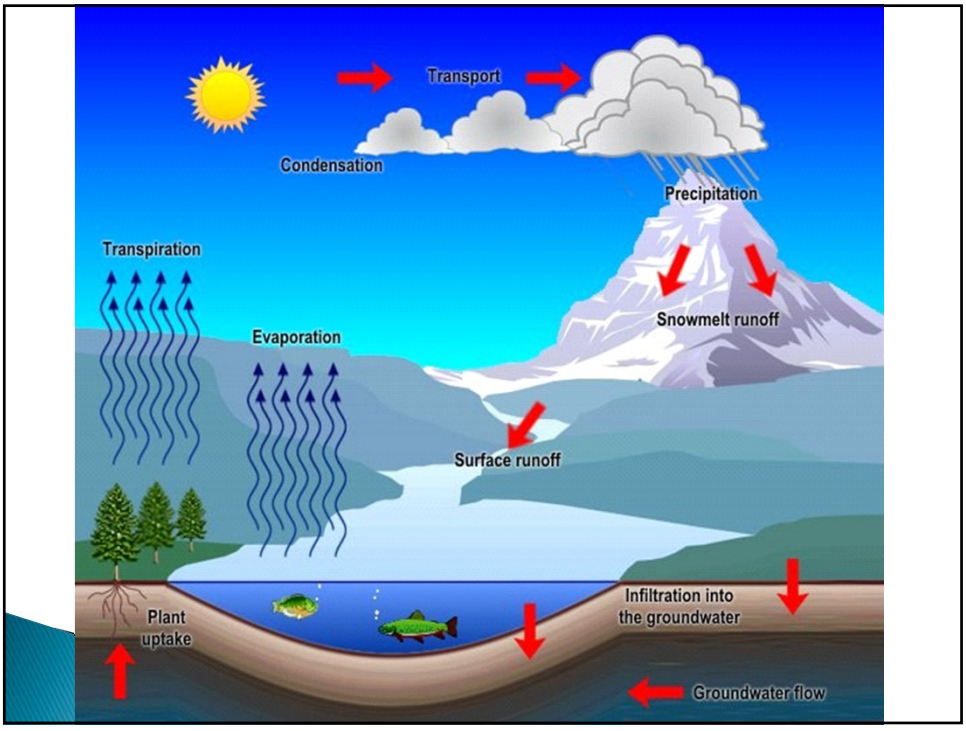


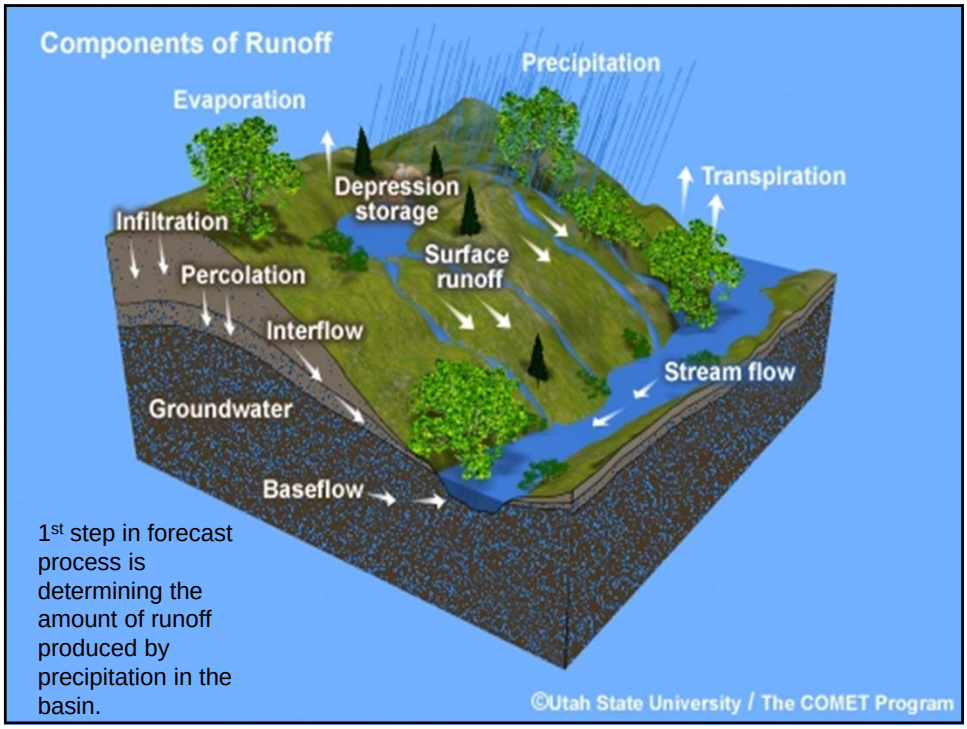


The Forecast Process

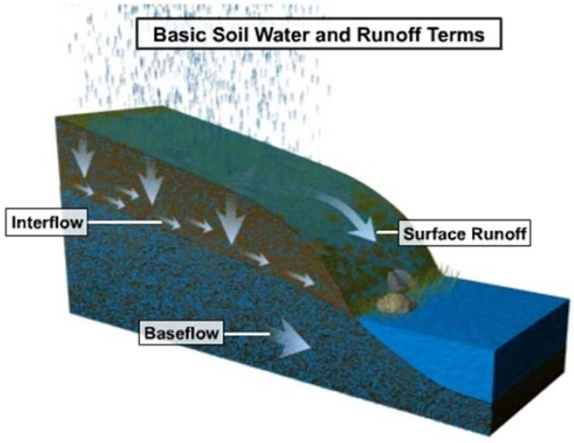
River Basins







Rainfall – Runoff Model



- API – Continuous Model
  - Experience
  - Calibrated
  - Easy-to-understand & use
  - Works well for our rivers

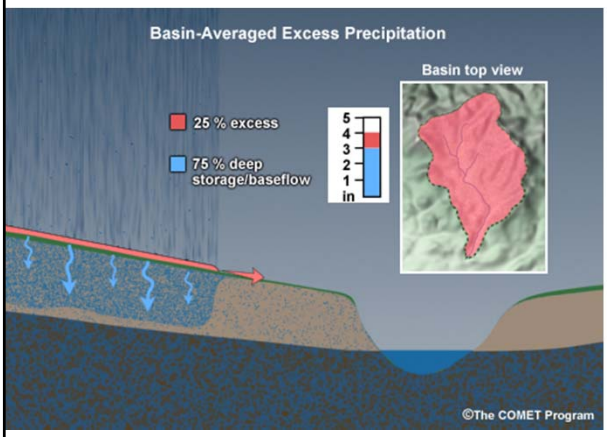
API-Continuous Model

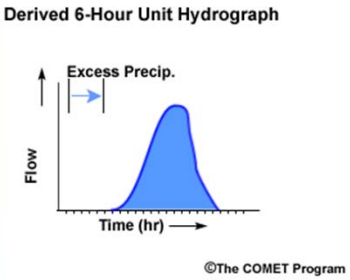
- Accounts for seasonal relationship of soil moisture conditions and surface moisture conditions
- Computes incremental surface runoff based on surface and overall soil-moisture conditions
- Computes what portion of the precip that does not become surface runoff enters groundwater storage.

- Now that we know the runoff – we apply the unit hydrograph to compute the flow at the basin outlet.

Unit Hydrograph

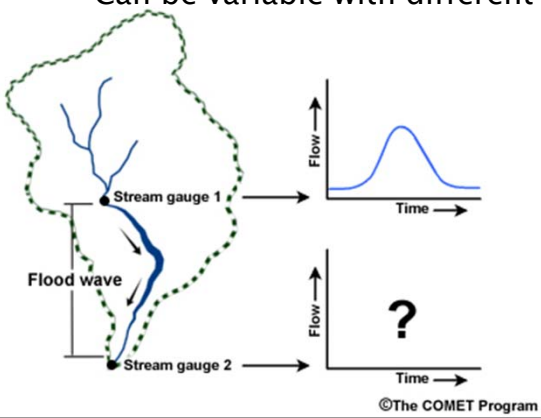
Hydrograph resulting from 1 inch of runoff occurring uniformly over space and time. Shape is affected by the slope of the basin.

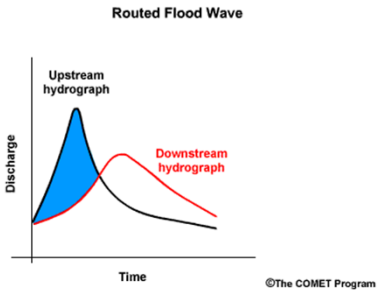




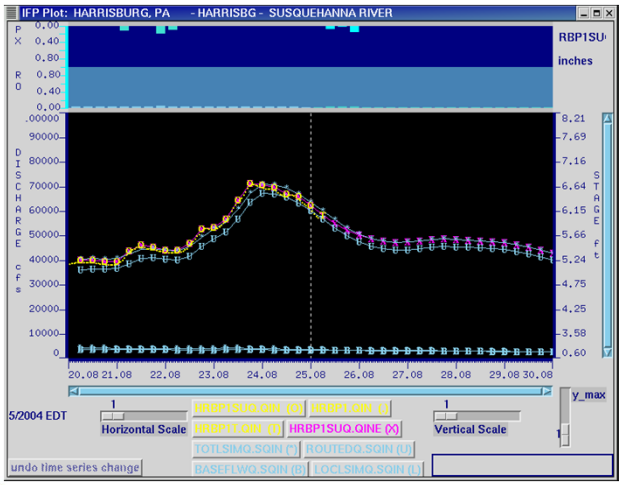
& Route the flow down the river

- K and Lag
  - Attenuation and timing
  - Determined through calibration
  - Can be variable with different flows



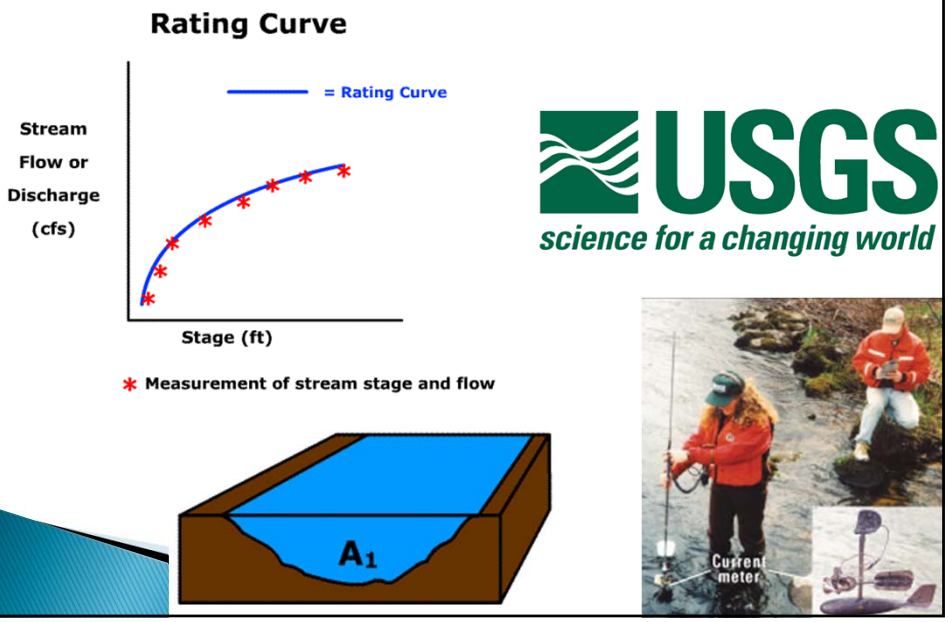


River Model



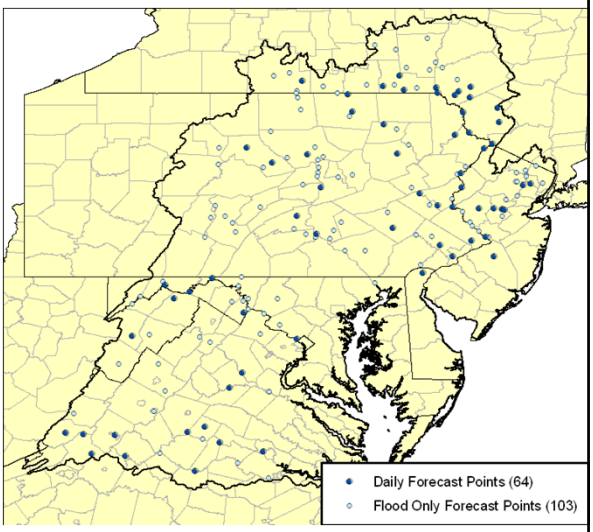
- Computer Models
  - Subdivide basins into smaller areas
  - 6 hour time steps
  - Manual adjustments by hydrologists

Flow gets converted to a stage



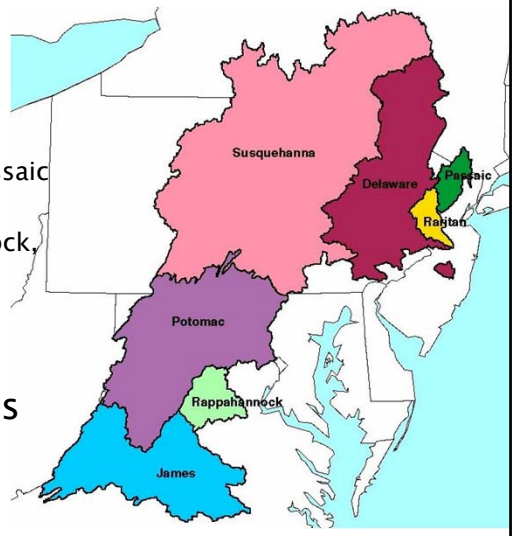
Our River Forecast Responsibility

- 7 days a week including holidays
- 6am to 11pm, 24 hours during flooding
- 64 Daily Forecast Points
- 103 Flood-only Forecast Points
- 42 Points are 72 hour forecasts
- Remainder are 48 hour forecasts



Staffing, shift work

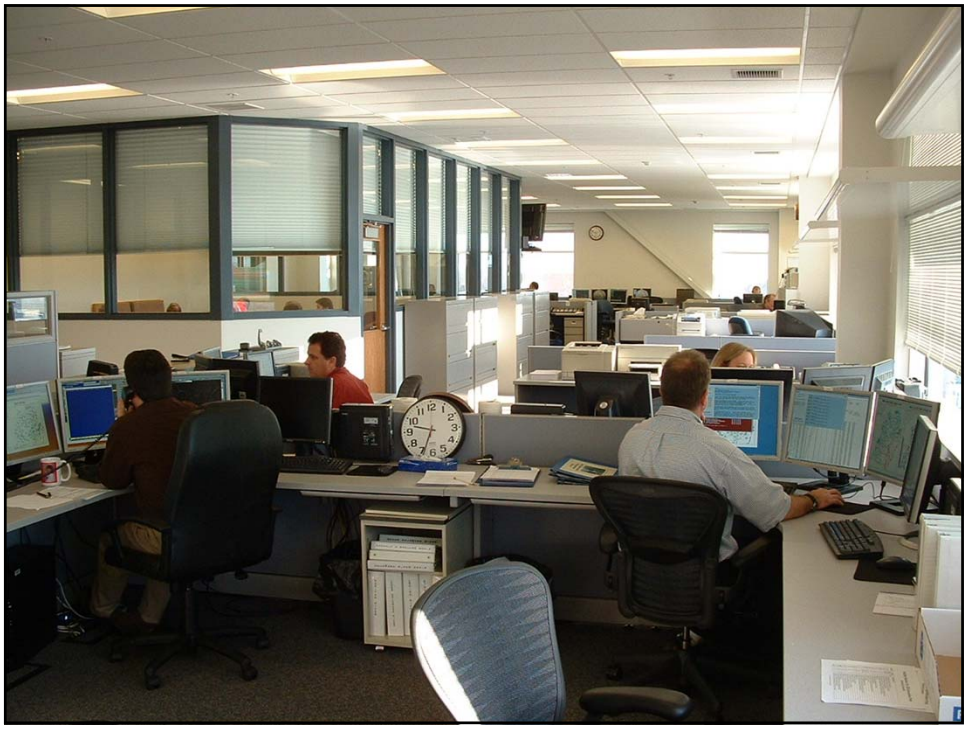
- 4 daytime shifts
  - 1 Hydrometeorologist
  - 3 Hydrologists
    - Delaware, Raritan, Passaic
    - Susquehanna
    - Potomac, Rappahannock, James
- 1 evening shift
- Flexibility in floods



Typical Day

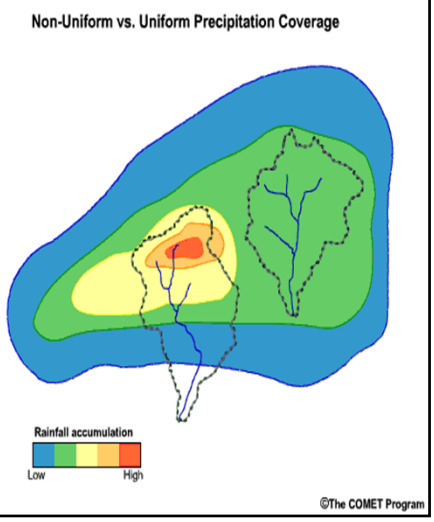
- 6am to 8am – Hydrometeorologist Function
  - Past and future precipitation data gathering
  - Quality Control of precip, RADAR and Multisensor Precipitation Data
  - Quality Control of temperature data in winter
  - Formatting of precipitation & temperature input for river model

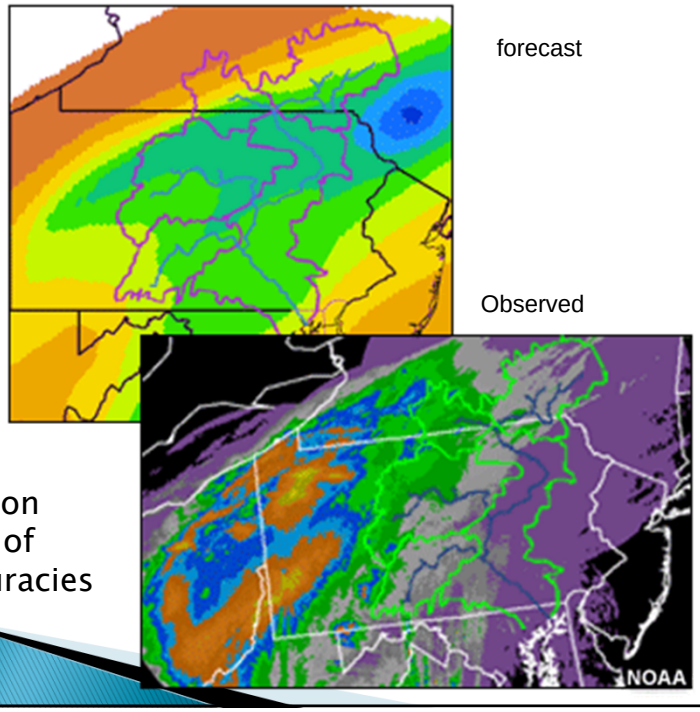
- 8am –Three Hydrologists Begin River Forecasting
  - Briefing
  - Quality control of streamgage data
  - Run river model
  - Make manual adjustments to model
  - Coordination with Weather Offices
  - Issue forecasts (around 10am)
  - Monitor and update forecasts as needed



The Hydrologist's Role: Accounting for areas where the model assumptions are not met.

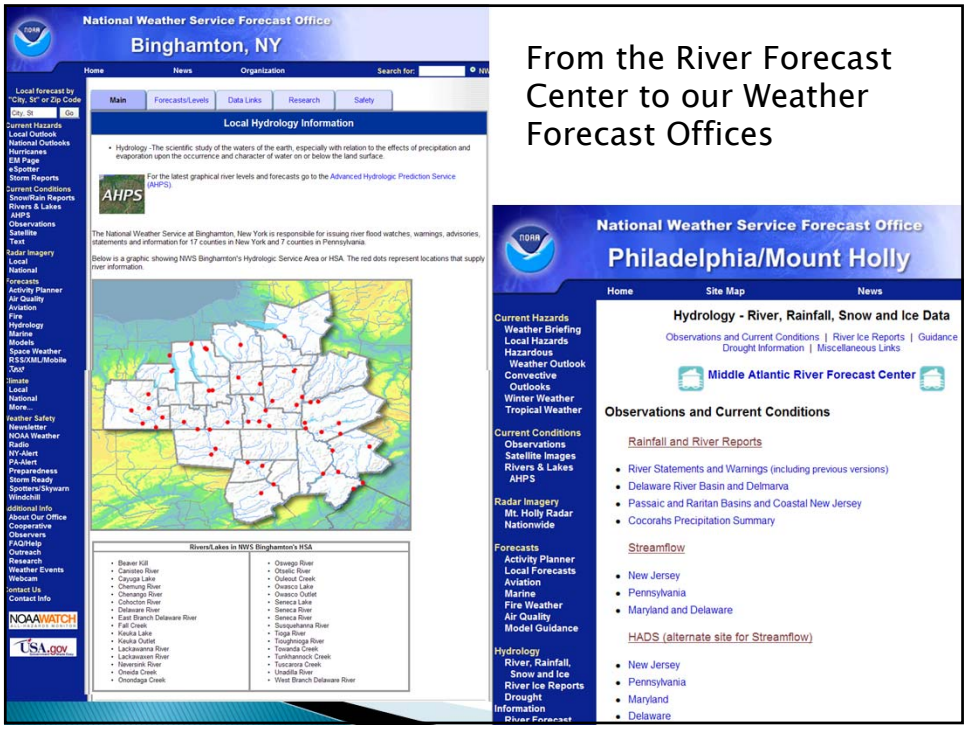
- Precipitation does not occur uniformly over space and/or time
- Forecasting Precipitation



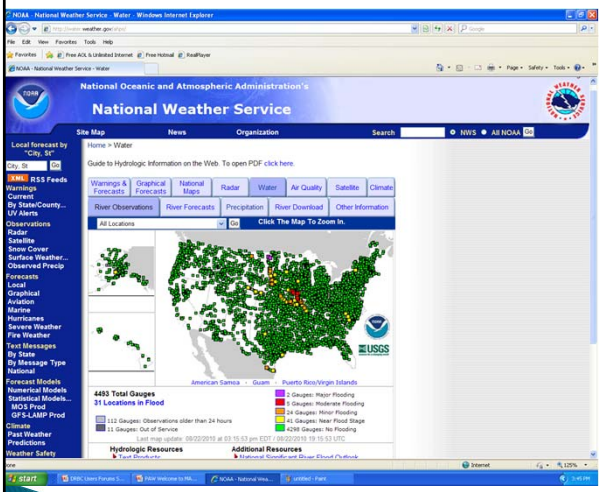


Most common cause of inaccuracies

From the River Forecast Center to our Weather Forecast Offices



To AHPS



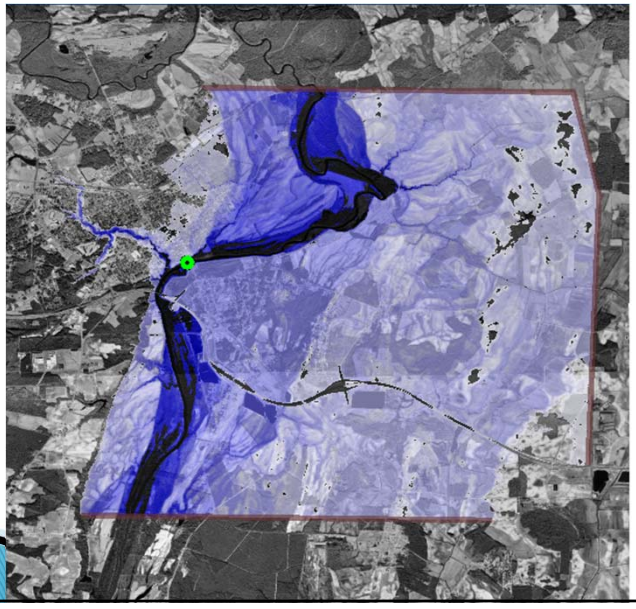
Want to learn more?

- Fact Sheets
- Free online learning modules http://www.meted.ucar

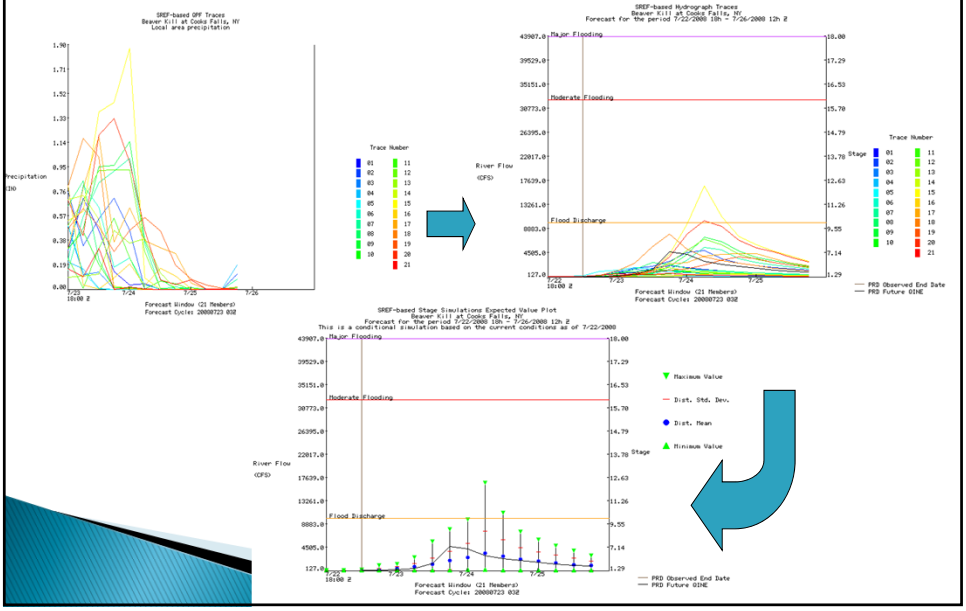
The Future in River Forecasting

Providing more than 1 stage at 1 point at 1 time

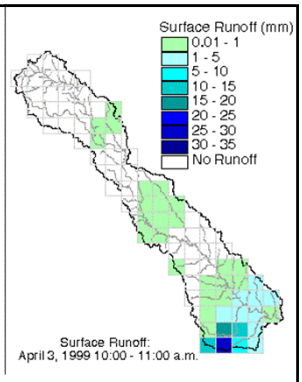
Inundation Mapping

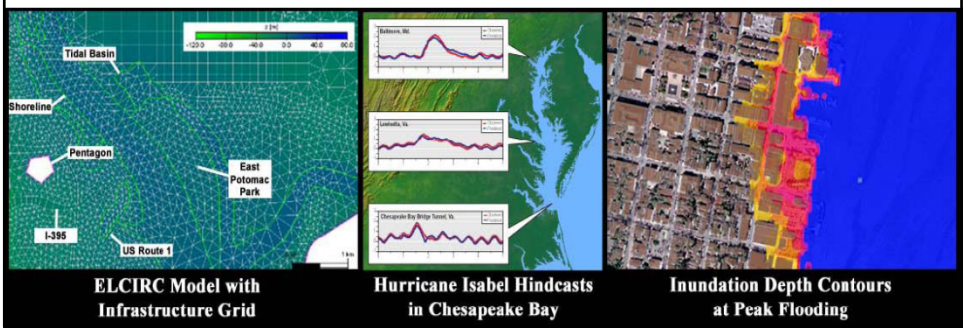


Probabilistic Forecasts



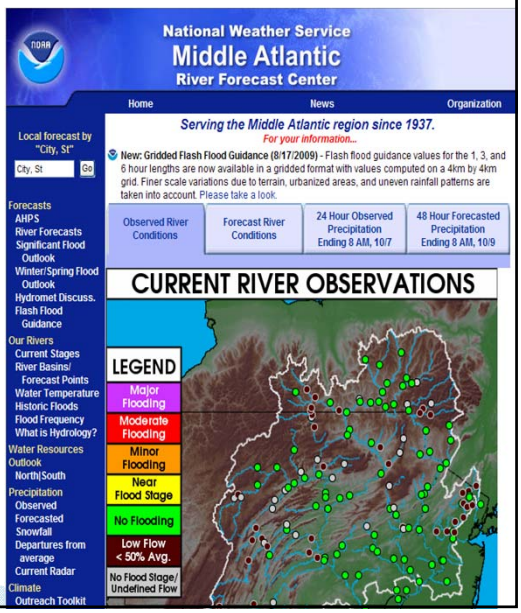
* Distributed Models
* Community Hydrologic Prediction System
* Soil Moisture Estimates & Forecasts
* Estuary Water Level Forecasts





http://weather.gov/marfc

- Flood Outlooks
- Flood Climatology
- Water Supply
- Precipitation
- Flash Flood Guidance
- Expansion into Water Resources
- Customer Advisory Board



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COMET®
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for many of the graphics.

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