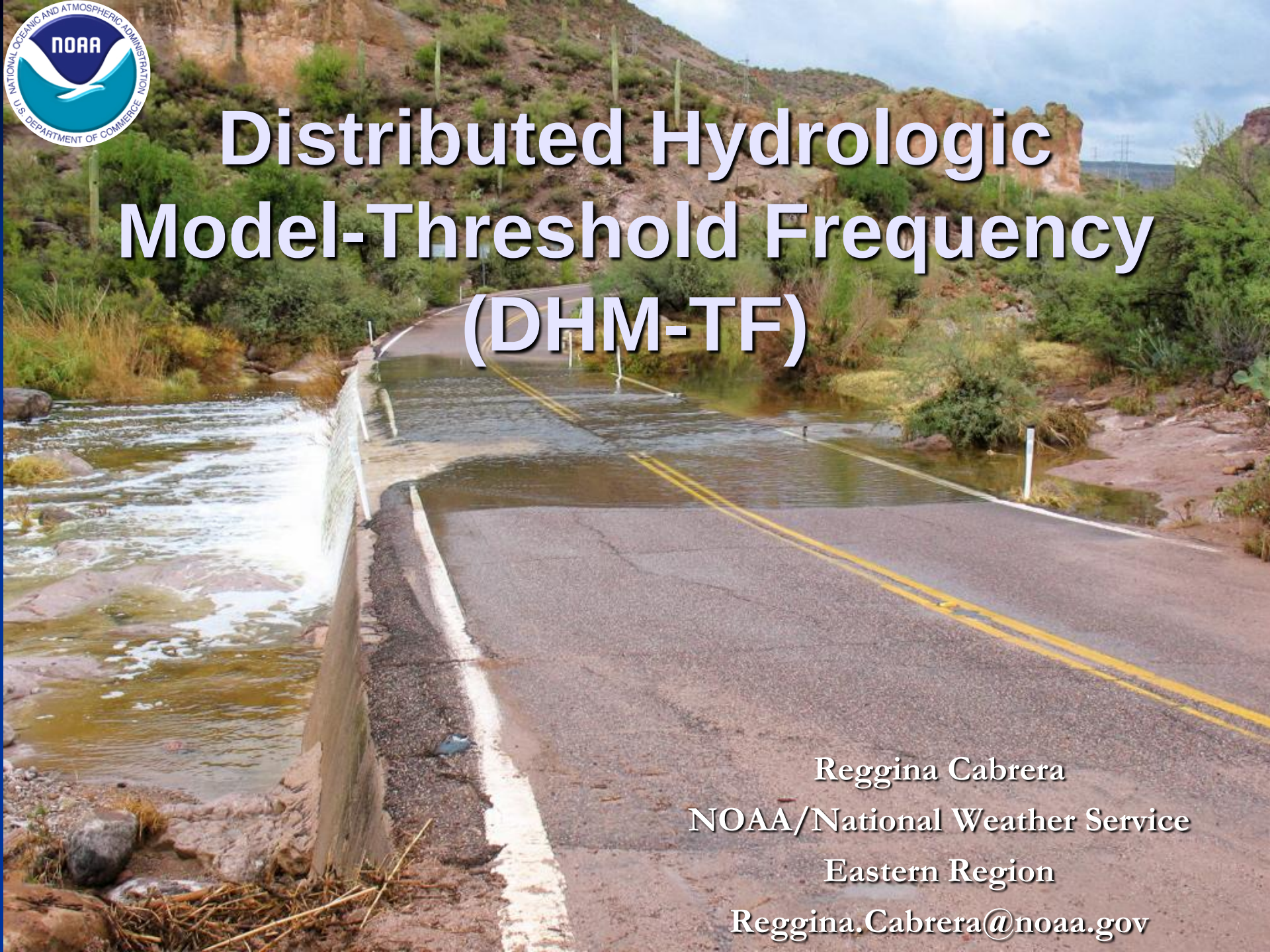
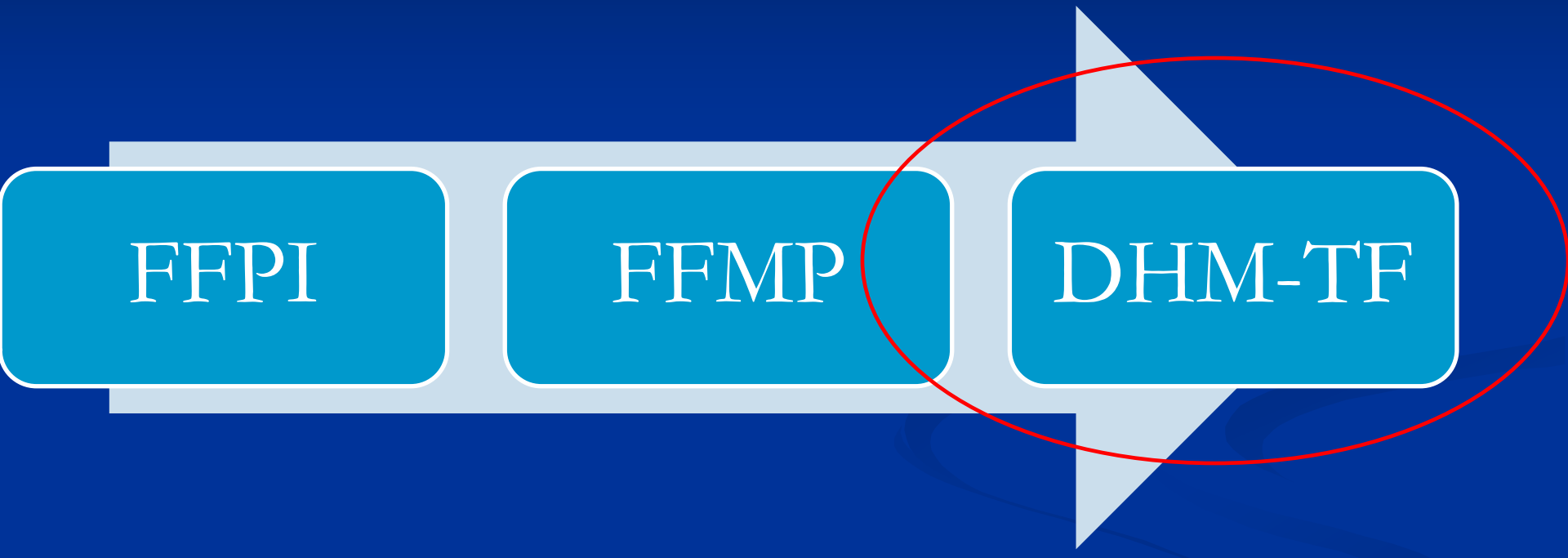


Distributed Hydrologic Model-Threshold Frequency (DHM-TF)

Reggina Cabrera
NOAA/National Weather Service
Eastern Region
Reggina.Cabrera@noaa.gov

Tools



FFPI FFMPA DHM-TF

FFPI

- Shows you areas that you should be concerned, where flash flooding could occur. It is static

FFMPA

- Monitors areas where current/future rainfall might prompt a warning. It is dynamic

DHM-TF

- Shows you **severity** of impacts which you might communicate to the public. It is dynamic

Concepts

NWS defines a flash flood as a flood that occurs within 6-hours of the causative event (rainfall)

FFG is the depth of runoff over a given duration required to cause flooding in small streams. FFG procedures use regionally derived threshold at at ungaged locations. These are flows that exceed bankful just enough to cause damage.

DHM-TF Modeling Approach

Objective

Improve flash flood forecast at ungaged locations by using a distributed hydrologic model with a frequency post-processor.

Advantages:

- The proposed approach models flow and characterizes **flood severity** at ungaged locations
- It aids in the forecaster's warning decisions

DHM-TF Modeling Approach

- Spatial and temporal scales that are more commensurate with flash flooding

Distributed models provide a framework for forecasting flashy events that occur at higher spatial and temporal resolutions than the lumped models used at the River Forecast Centers

Rainfall input data

- MPE- Multisensor Precipitation Estimator (observations at 4 km resolution, hourly)
- HPE- High Resolution Precipitation Estimator (observations at 1 km resolution, hourly)
- HPN- High Resolution Precipitation Nowcaster (forecasts at 4 km resolution, hourly)

The Process

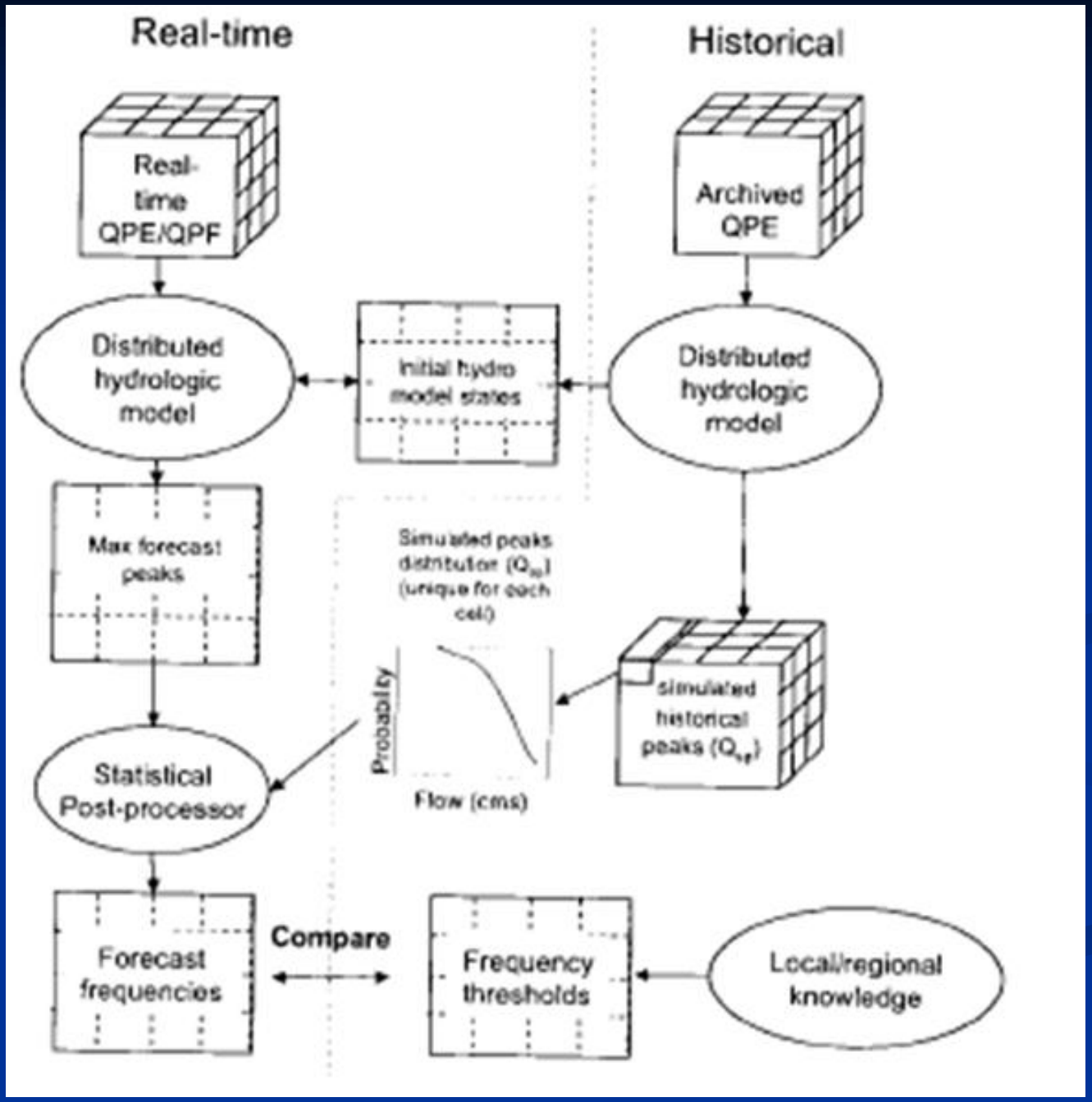
- DHM produces gridded flow forecasts
- Gridded frequency (return period) forecasts are derived based on historical simulations

Historical Simulations

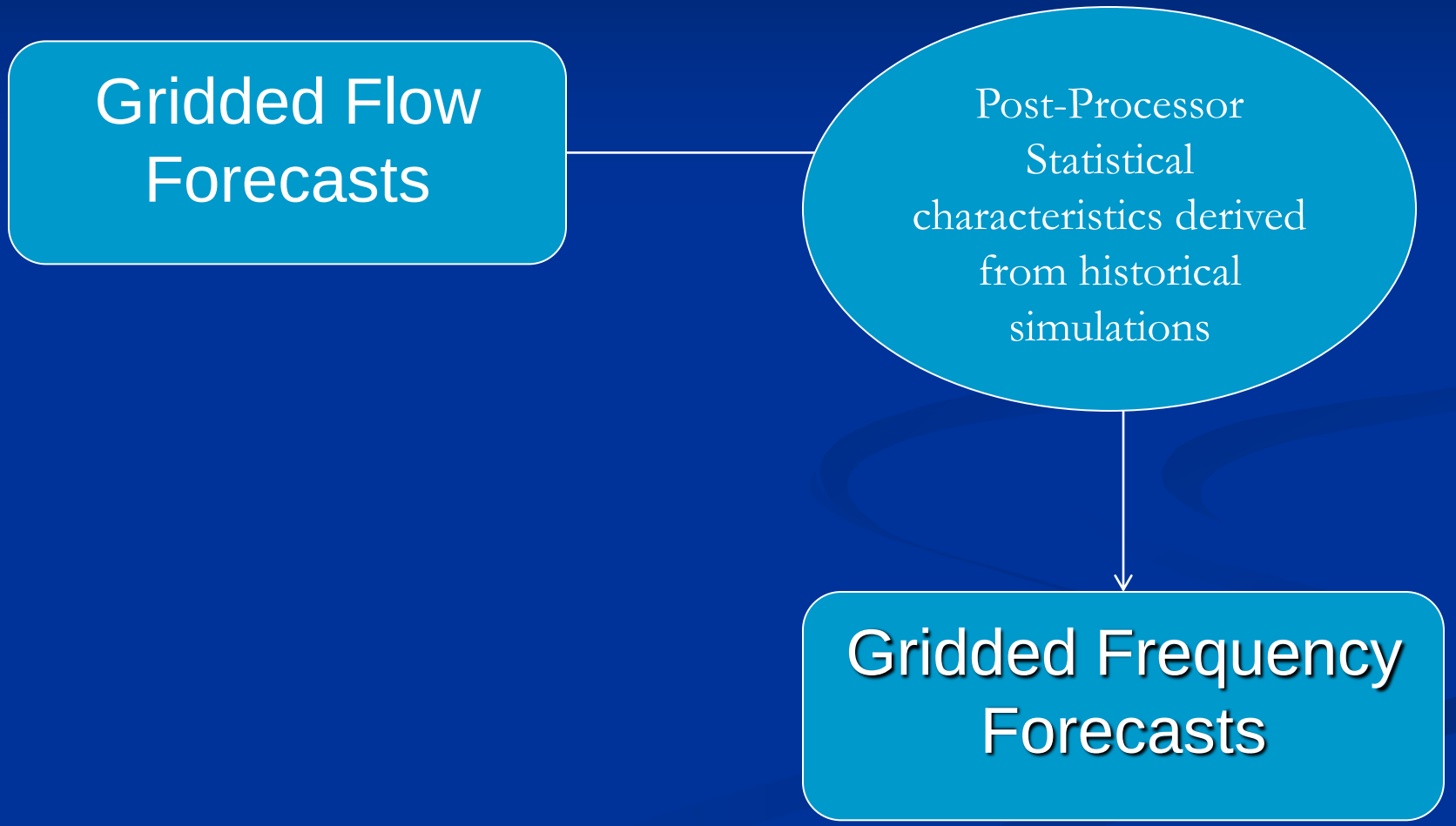
- Conducted with DHM
- Same type of forcing data used as in forecast simulations to derive statistical parameters

Modeling Flash Floods

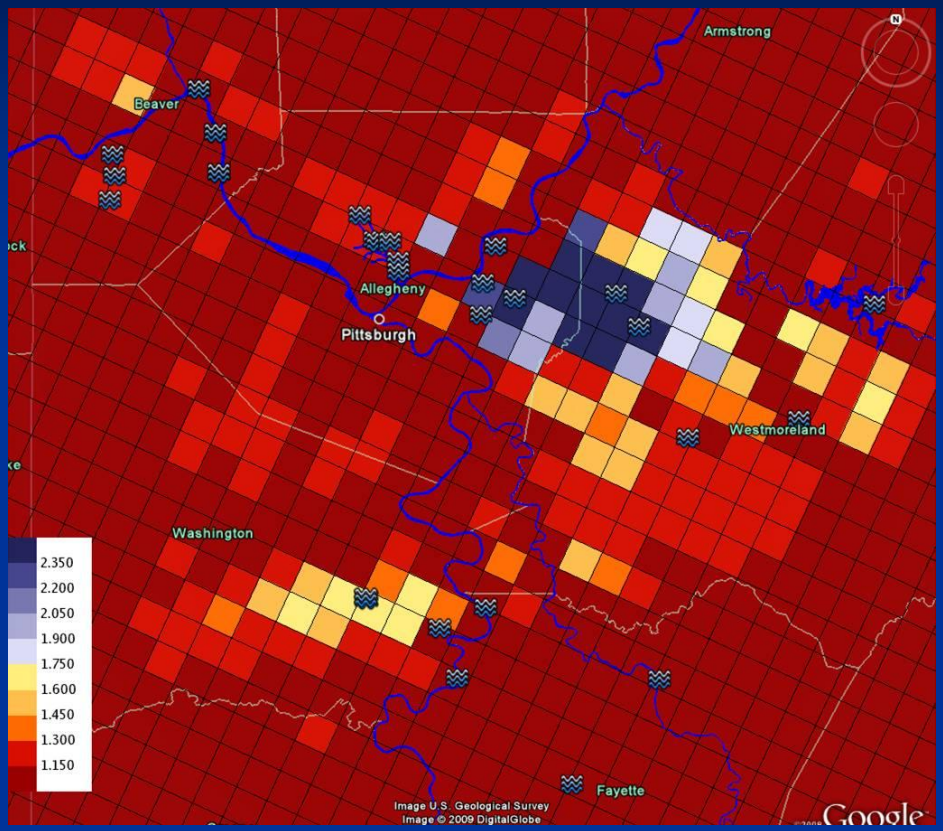
- Model Output
  - Map of modeled flood frequencies
- NWS/OHD Implementation
  - Sacramento model with kinematic routing
  - Any model can be used that reasonably represents flow distribution


Real-time
Historical
Real-time QPE/QPF
Archived QPE
Distributed hydrologic model
Initial hydro model states
Distributed hydrologic model
Max forecast peaks
Simulated peaks distribution (Q_{sp}) (unique for each cell)
Probability
Flow (cms)
simulated historical peaks (Q_{sp})
Statistical Post-processor
Forecast frequencies
Compare
Frequency thresholds
Local/regional knowledge

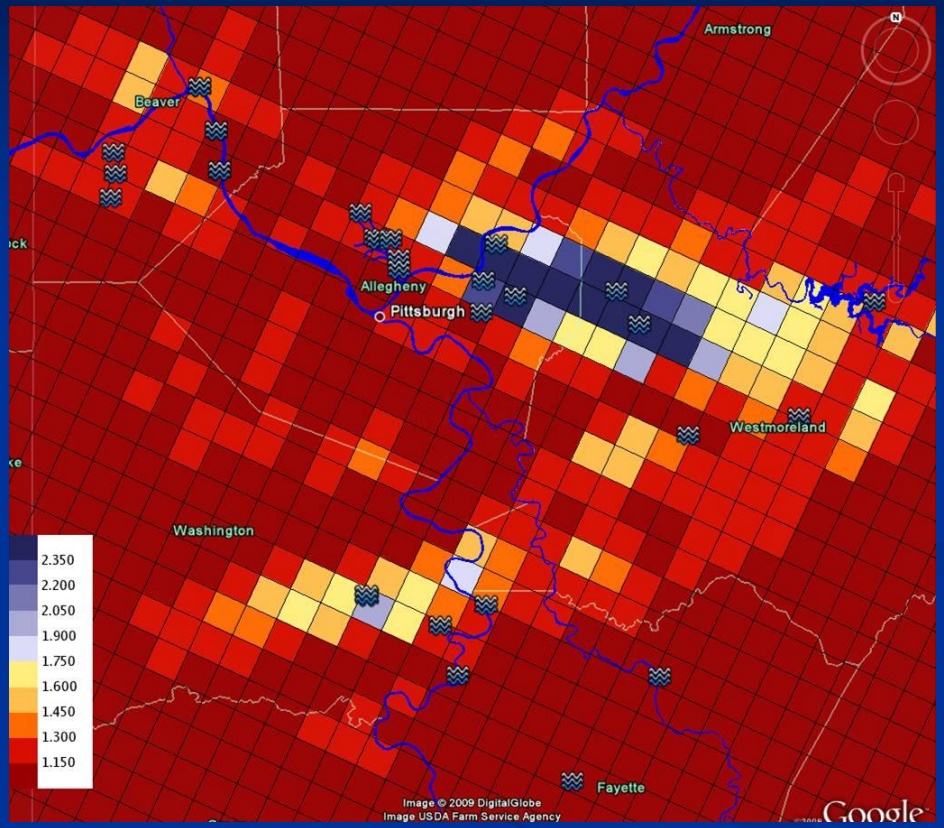
Statistical Component



Maximum DHM-TF Return Period Values (Years) for August 9th Flash Flood Event (10Z 8/9/07 through 06Z 8/10/07)



Standard Cell-to-Cell Routing



Local Routing

*Blue wave symbols indicate spotter-reported flash flood events

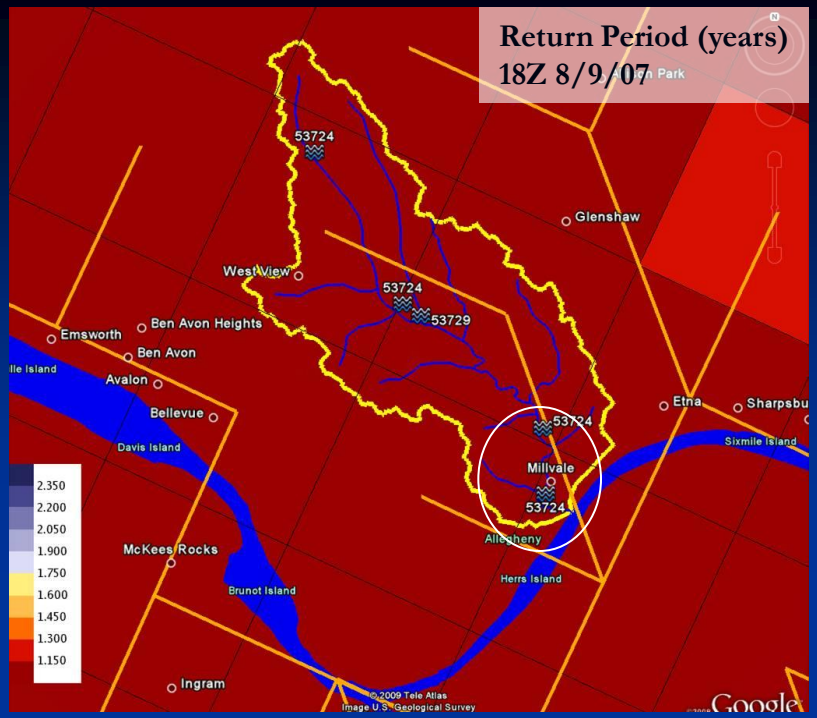
- Overall, good match between areas of high DHM-TF return periods and spotter-reported events (wave symbols)

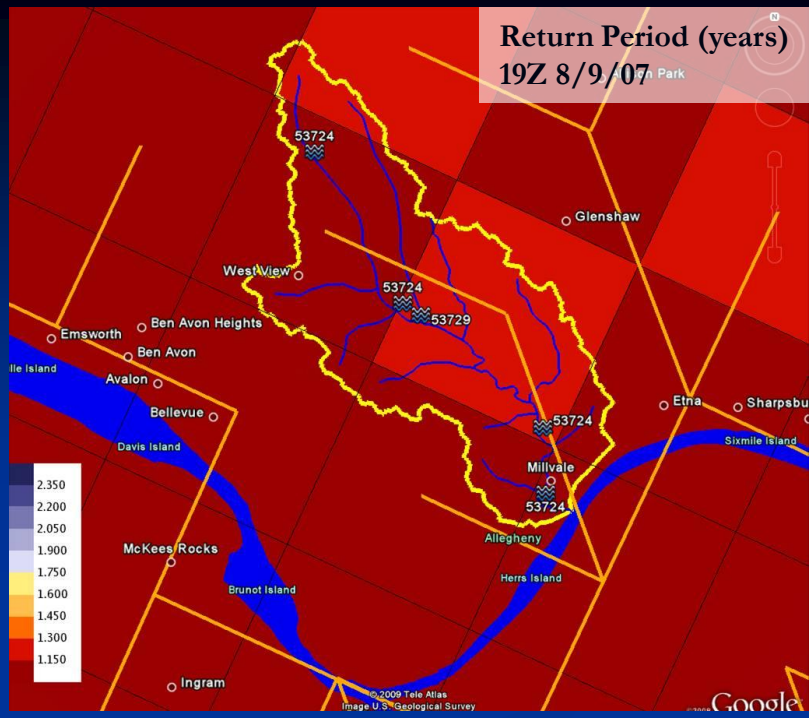
Girty's Run DHM-TF return periods (years) 18Z-21Z August 9th 2007

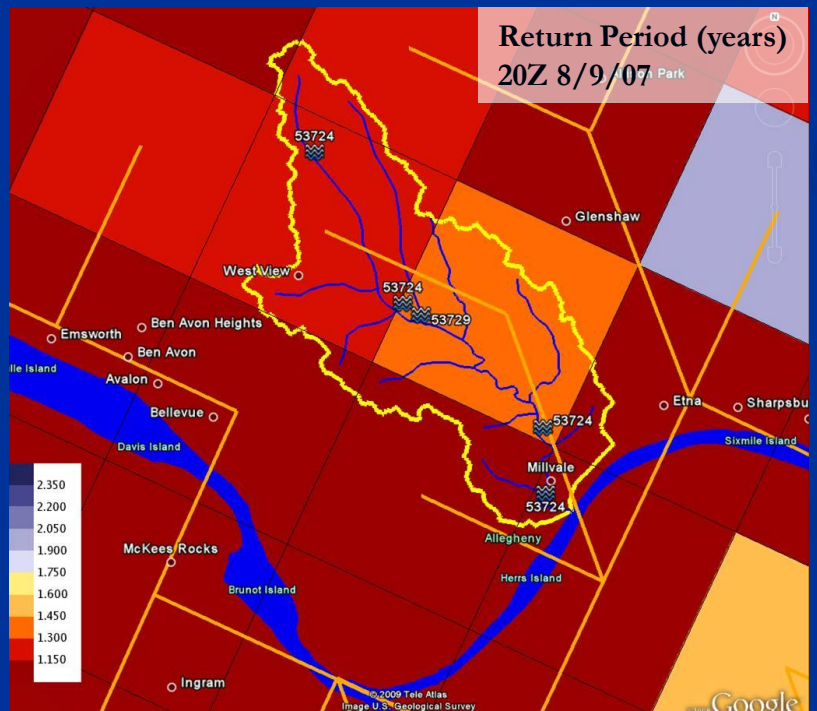
Standard cell-to-cell routing method used

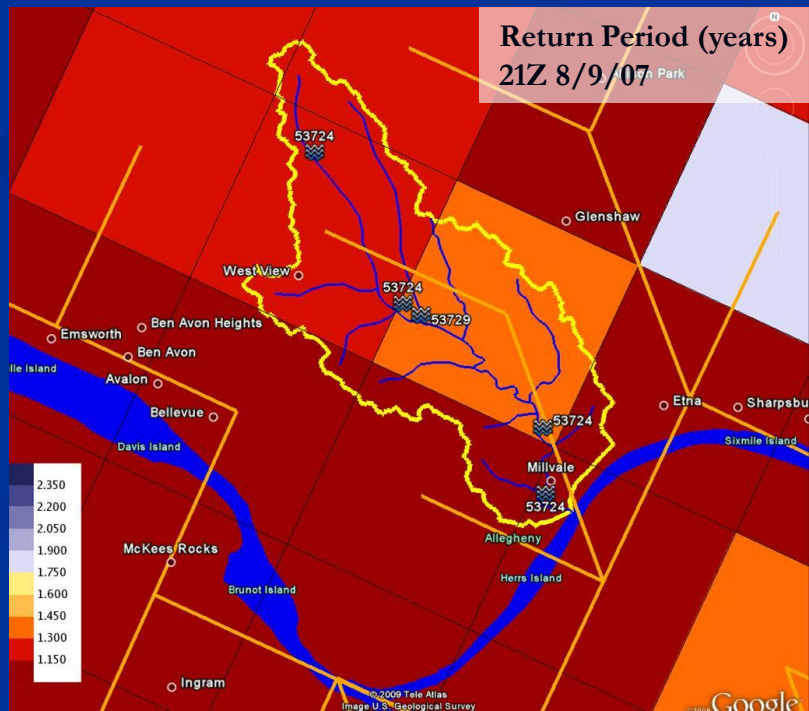
•Return period values appear low given severity of flash flood event over Millvale

*Blue wave symbols indicate spotter-reported flash flood events







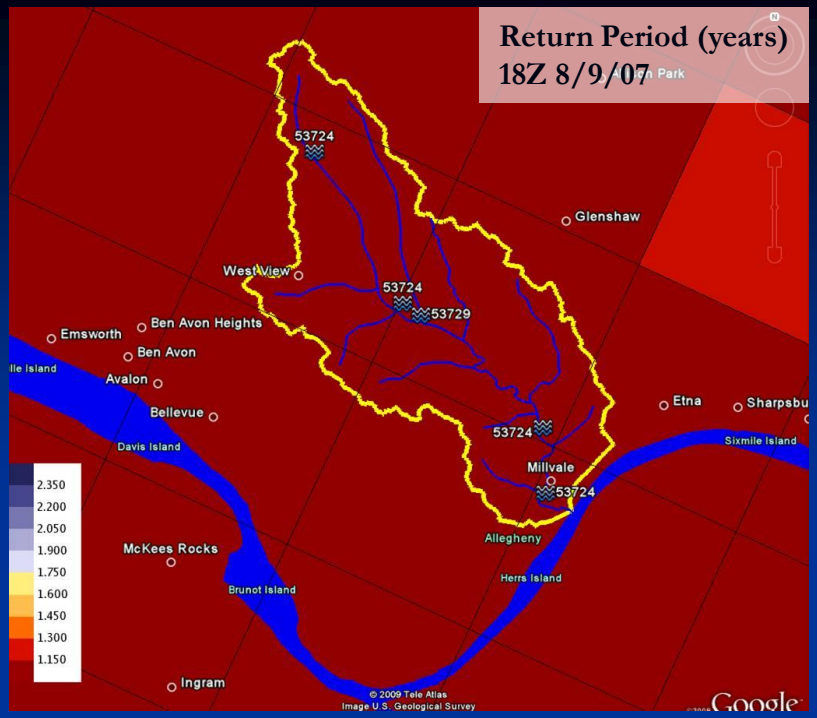


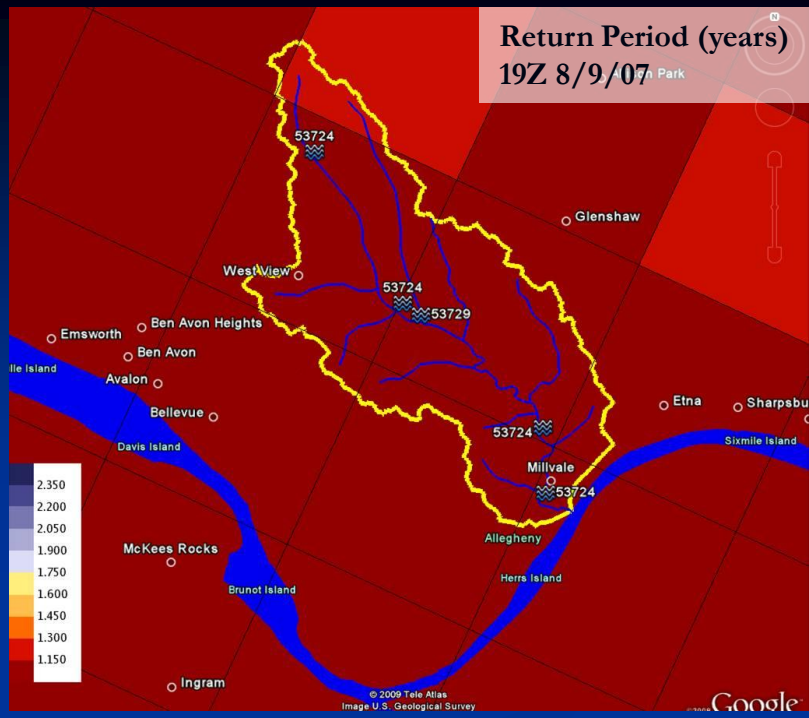
Girty's Run DHM-TF return periods (years) 18Z-21Z August 9th 2007

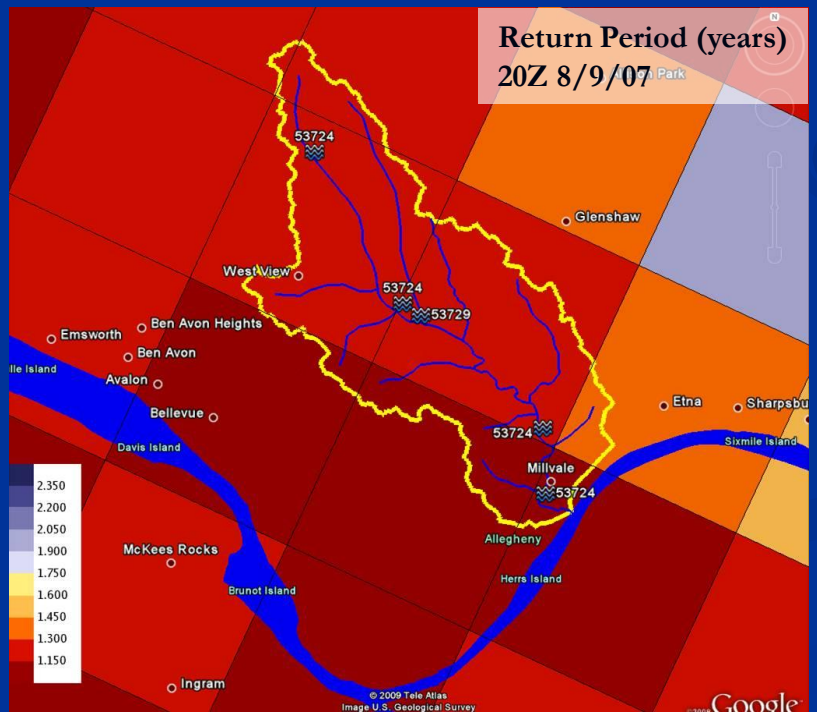
Local routing (unconnected) method used

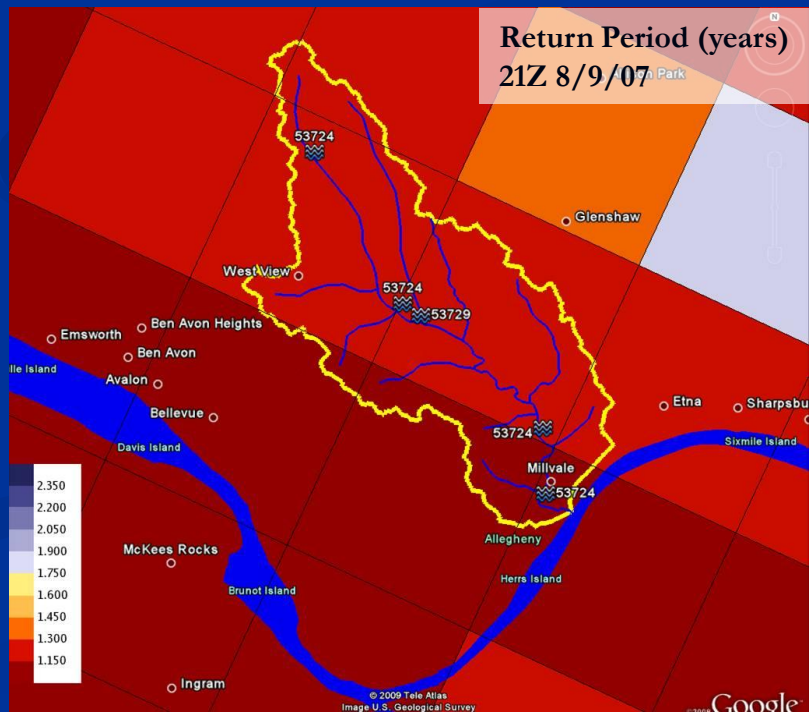
•Return period values appear low given severity of flash flood event over Millvale

*Blue wave symbols indicate spotter-reported flash flood events

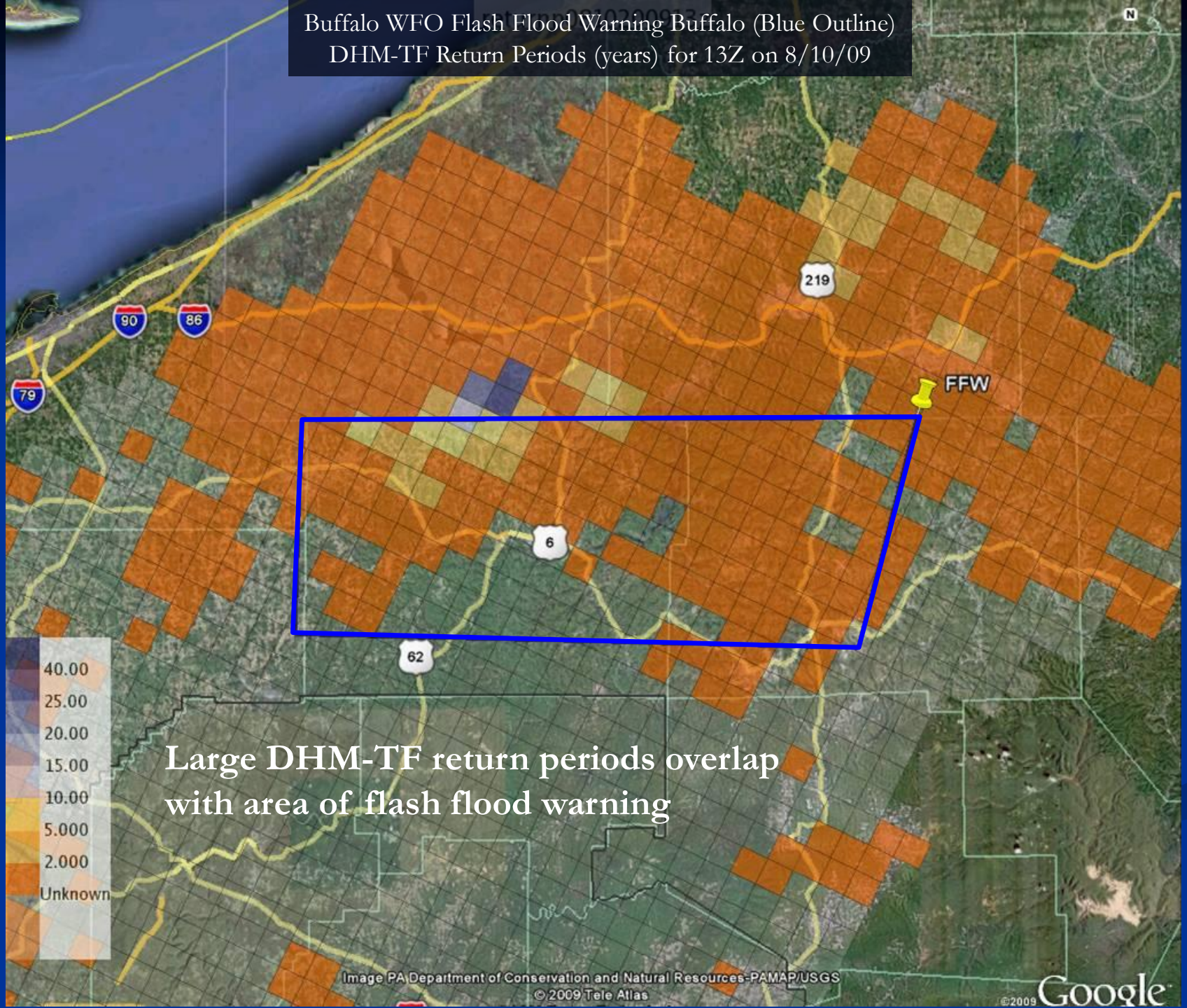








Real-time Verification Effort
DHM-TF Computed Return Period (Years)
Cell-to-Cell Routing Option



Evaluation

- **Real-time Verification:** Limited qualitative analysis has demonstrated that increased DHM-TF return periods generally match areas of heavy rain and flash flooding, while low DHM-TF return periods generally match non-flooded areas.