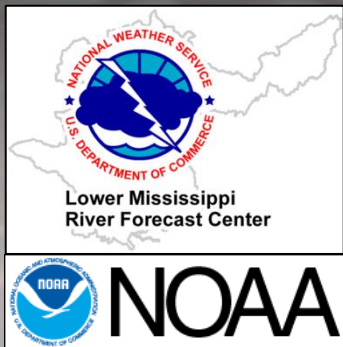# Geospatial Analyses at the Lower Mississippi River Forecast Center

W. Scott Lincoln, Sr. Hydrologist/Cartographer
David Schlotzhauer, Hydrologist
NWS Lower Mississippi River Forecast Center

Lower Mississippi
River Forecast Center

NOAA

1

Overview

What do we do at the LMRFC?

- Forecast river stages for ~220,000 mi^2 area
  - River Gauge Data
  - Rainfall Data
    - Amount/Location and Fallen/Forecasted
  - Soil Moisture Data
- Assist with Flash Flooding

Overview

- Most data used by LMRFC (or any NWS office) inherently geospatial

- Tools/Techniques for Situational Awareness
- Research

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SA – Status of Model Inputs

- Models depend on valid, consistent input (GIGO)

- Volume of data overwhelming

- So, display data graphically to enable (relatively) quick/easy QC

- (note: all of the following products are generated automatically!)

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Calibration Parameters

- Calibrated parameters for our hydrologic model are at least conceptually tied to real world, measureable quantities

- As such, they should not be random; they should be generally consistent spatially and temporally

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Calibration Parameters

- Scripts create CSV files with the calibration parameter values
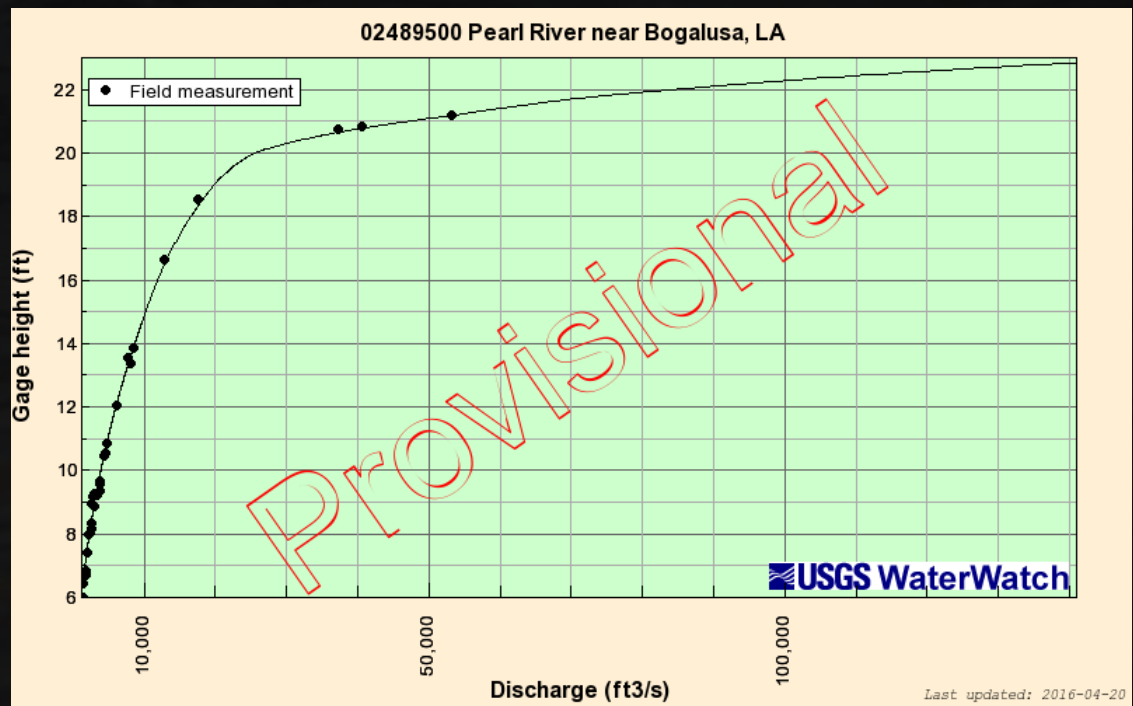- CSV file joined to shapefile of the river basins and image is output

Calibration Parameters
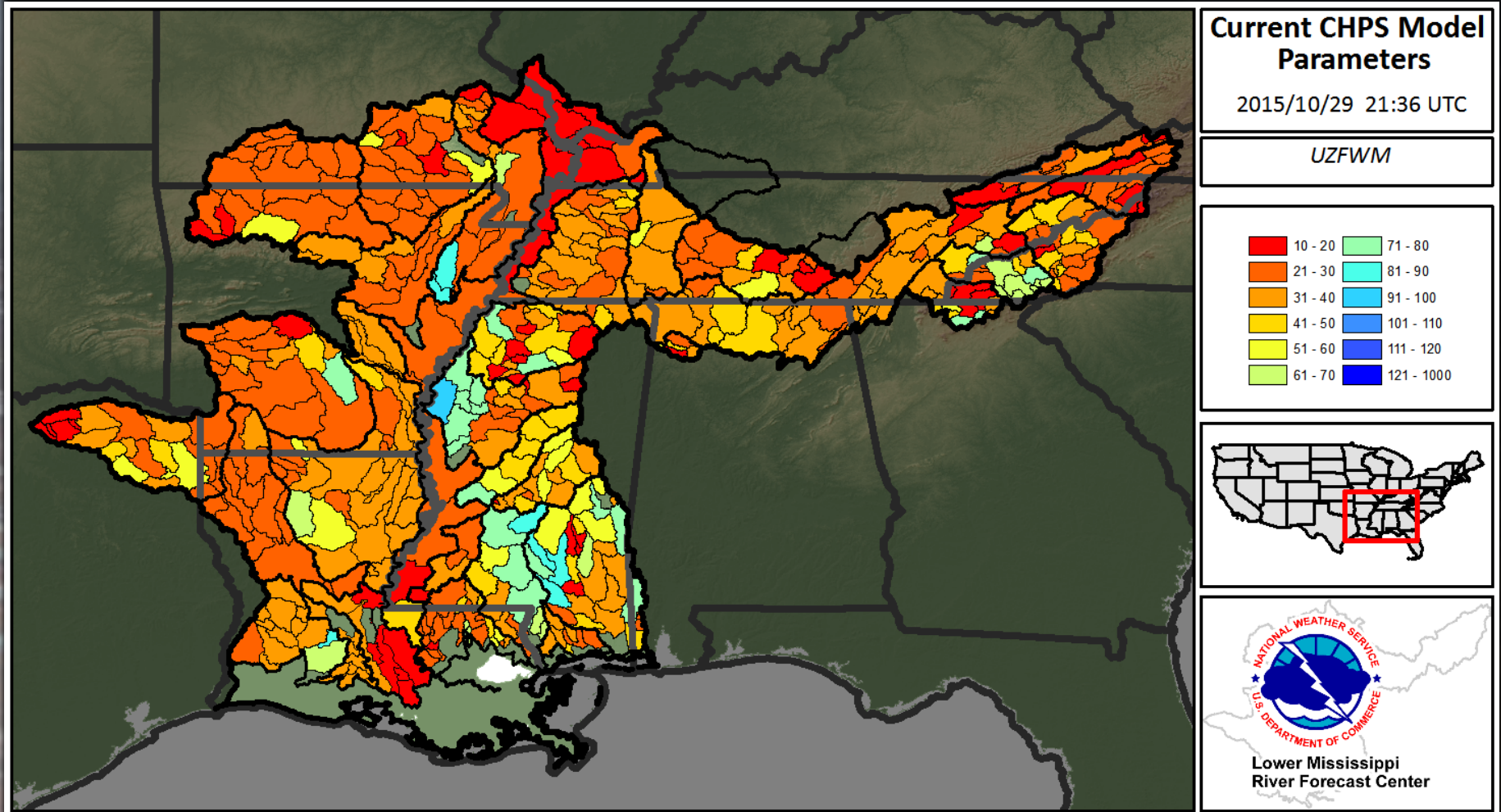
Rating Curves

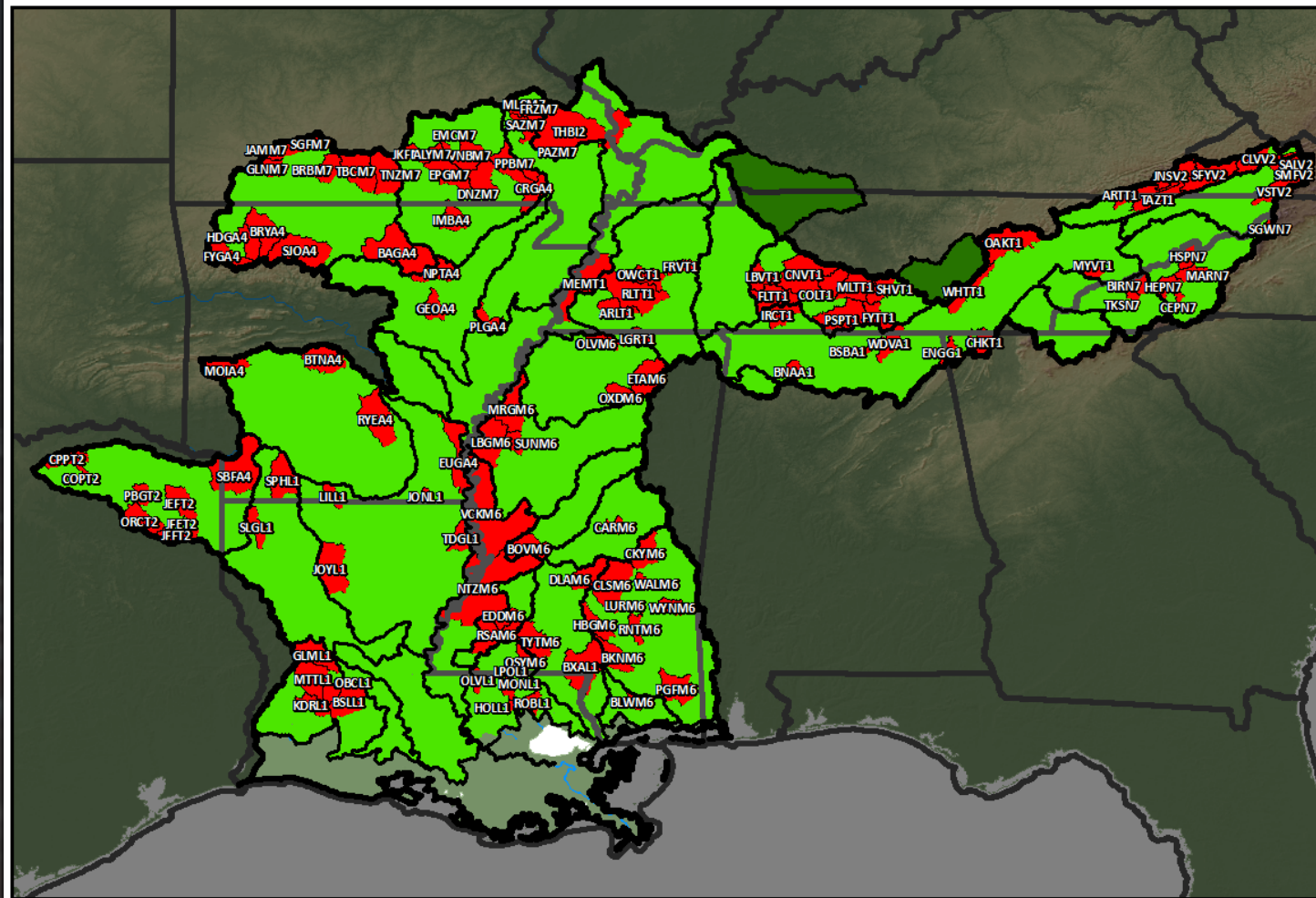- ## Rating curves provide a means to relate an observed stage to a flow rate

Frequently updated rating curves required for hydrologic forecasting because river impacts are related to the stage but models work with discharge (flow rate)

02489500 Pearl River near Bogalusa, LA

- Field measurement

Gage height (ft)

Discharge (ft3/s)

10,000   50,000   100,000

USGS WaterWatch

Provisional

Last updated: 2016-04-20

Rating Curves

- Our system checks an online repository of USGS rating curves, downloads updates when available

- CSV file created indicating which river basins have a USGS rating curve newer than what is currently in system

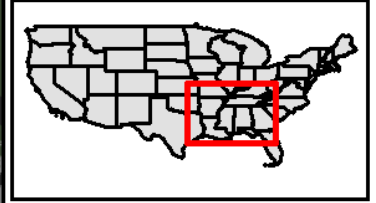- CSV file joined to shapefile of the river basins and image is output

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Rating Curves

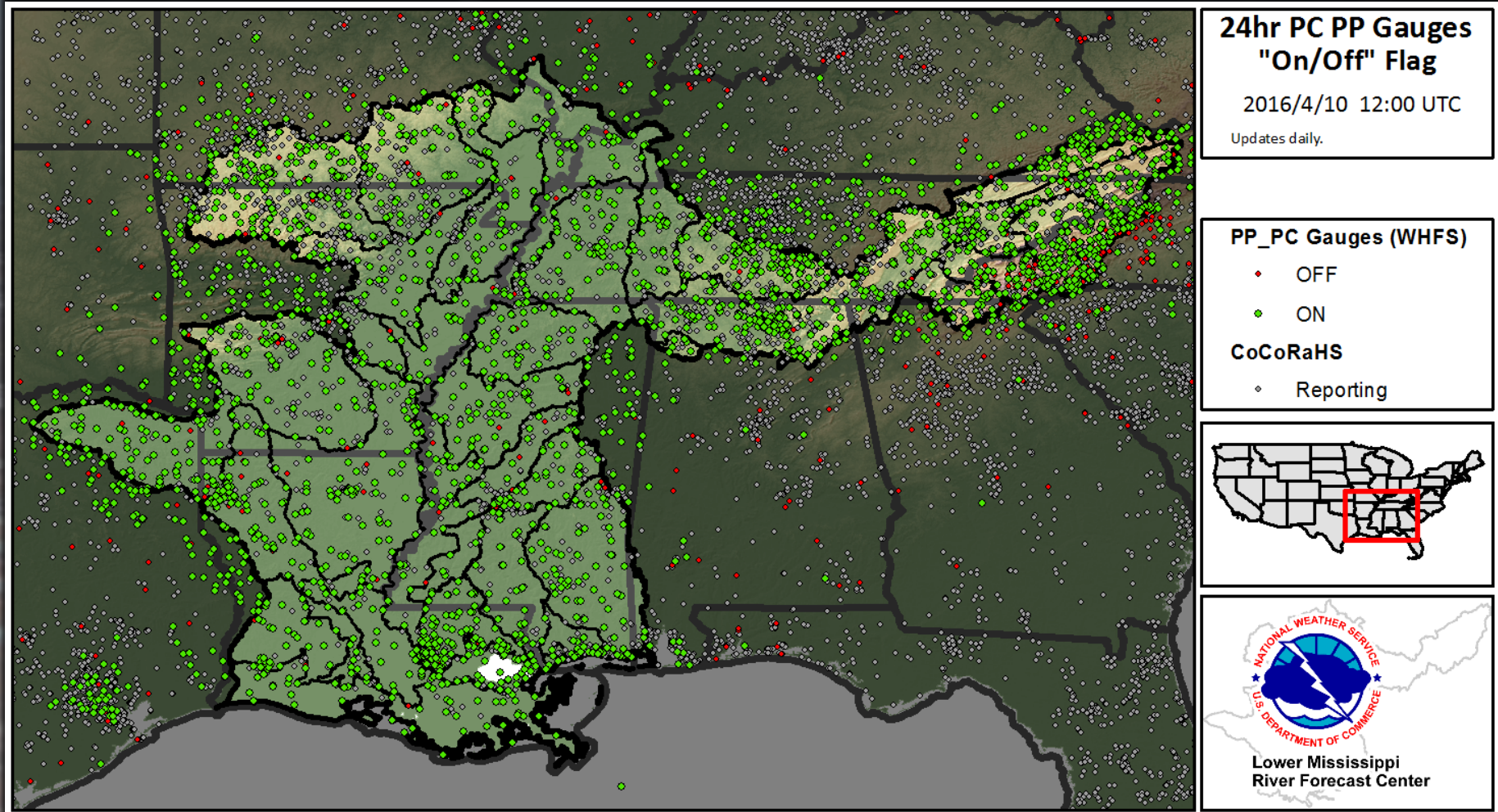Geospatial Analyses at the LMRFC
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Rain Gauge Status

- Gauges used in our rainfall analysis sometimes provide inaccurate data so often, they are turned off in our system

- Once a gauge is turned off, it requires manual change to turn it back on

- Also difficult to keep track of gauges that are off

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Rain Gauge Status

- Script in our system checks for which gauges are set to "on" or "off" and creates a CSV file

- CSV file joined to shapefile of the rainfall gauges and image is output

Rain Gauge Status

24hr PC PP Gauges "On/Off" Flag
2016/4/10 12:00 UTC
Updates daily.

PP_PC Gauges (WHFS)
- ◆ OFF
- ● ON

CoCoRaHS
- ◦ Reporting

Lower Mississippi
River Forecast Center

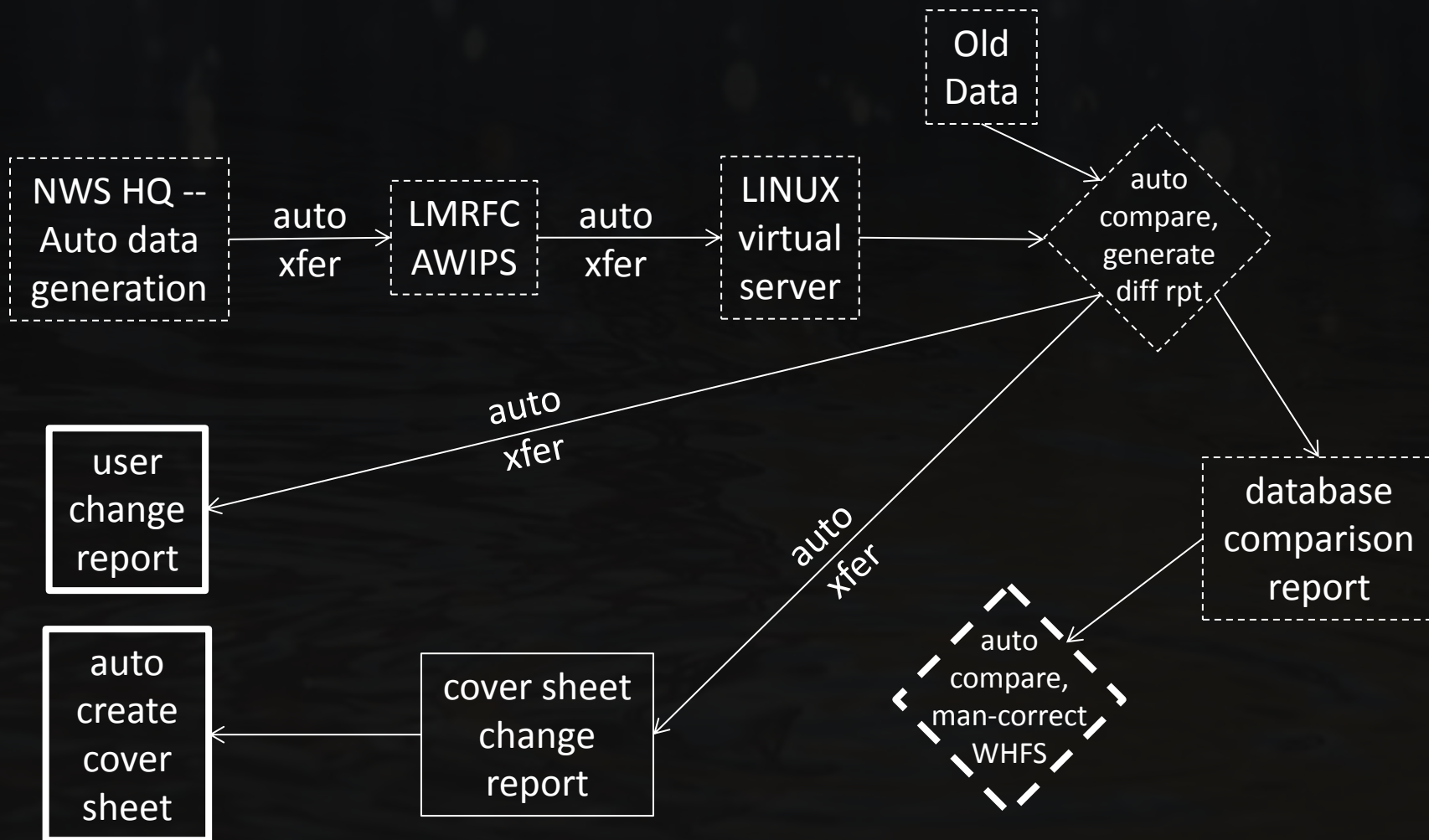Geospatial Analyses at the LMRFC
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SA – Data Consistency

- Need for a consistent "one-stop-shop" of metadata (flood stage, owner, record crest) for each of our forecast locations

- Data should come from the local NWS Weather Forecast Offices, which are the maintainers of said metadata

SA – Data Consistency

- As a positive side effect, automated retrieval of gauge metadata from WFOs can also improve other issues:
  - Multiple databases/sources can cause inconsistency
  - "System" doesn't allow for single database
  - Alerts/notifications not given when WFOs change their metadata

Forecast Point Cover Sheet

Geospatial Analyses at the LMRFC
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Forecast Point Cover Sheet

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer
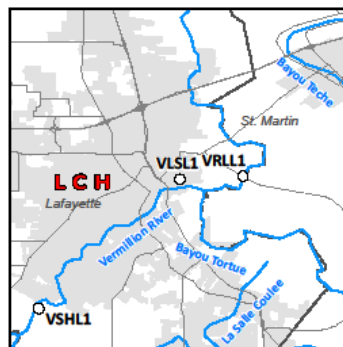
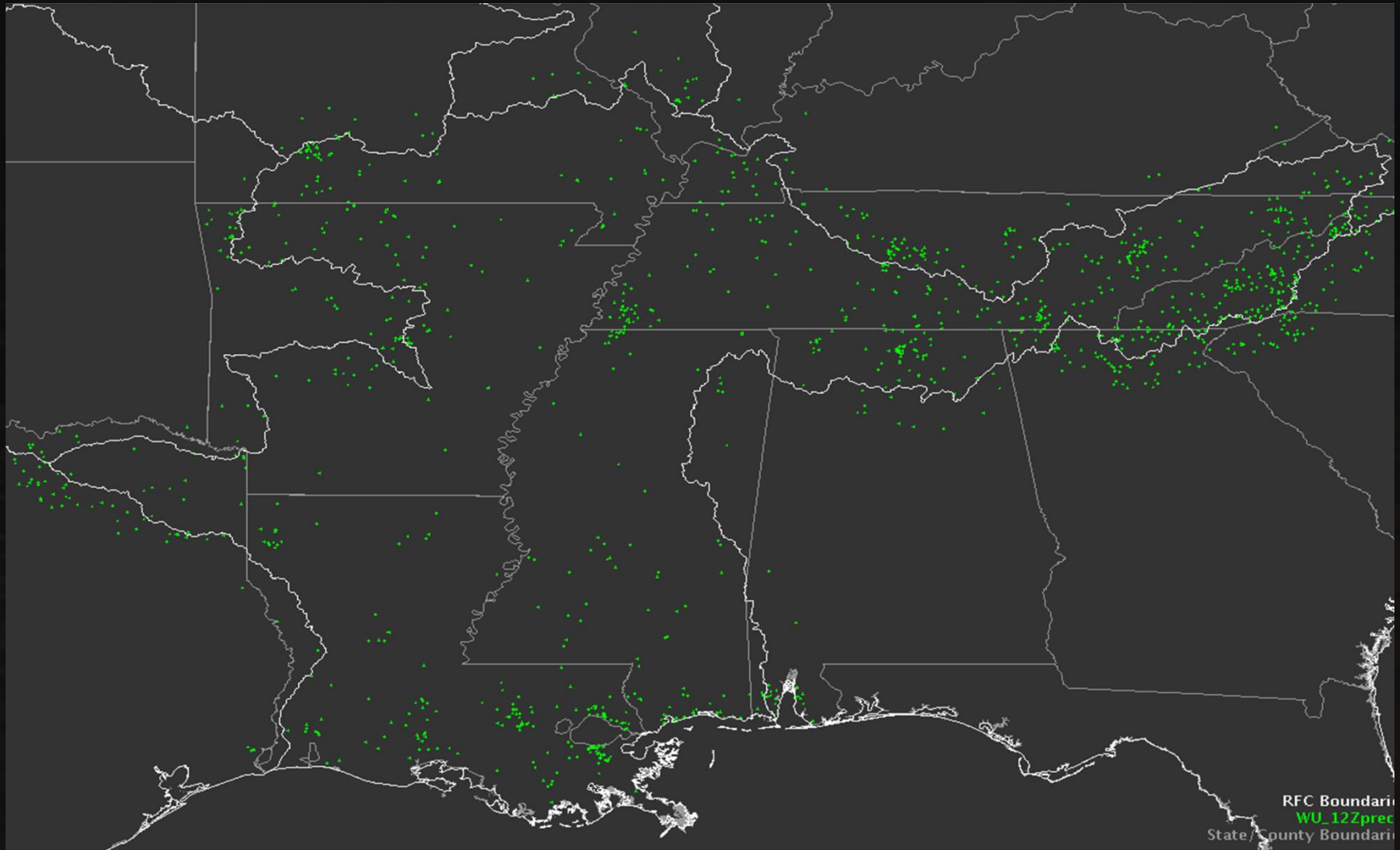# SA – Available Data

- NWS is not the only gauge game in town
- Private Weather Station data can be valuable, e.g. wunderground.com

Geospatial Analyses at the LMRFC
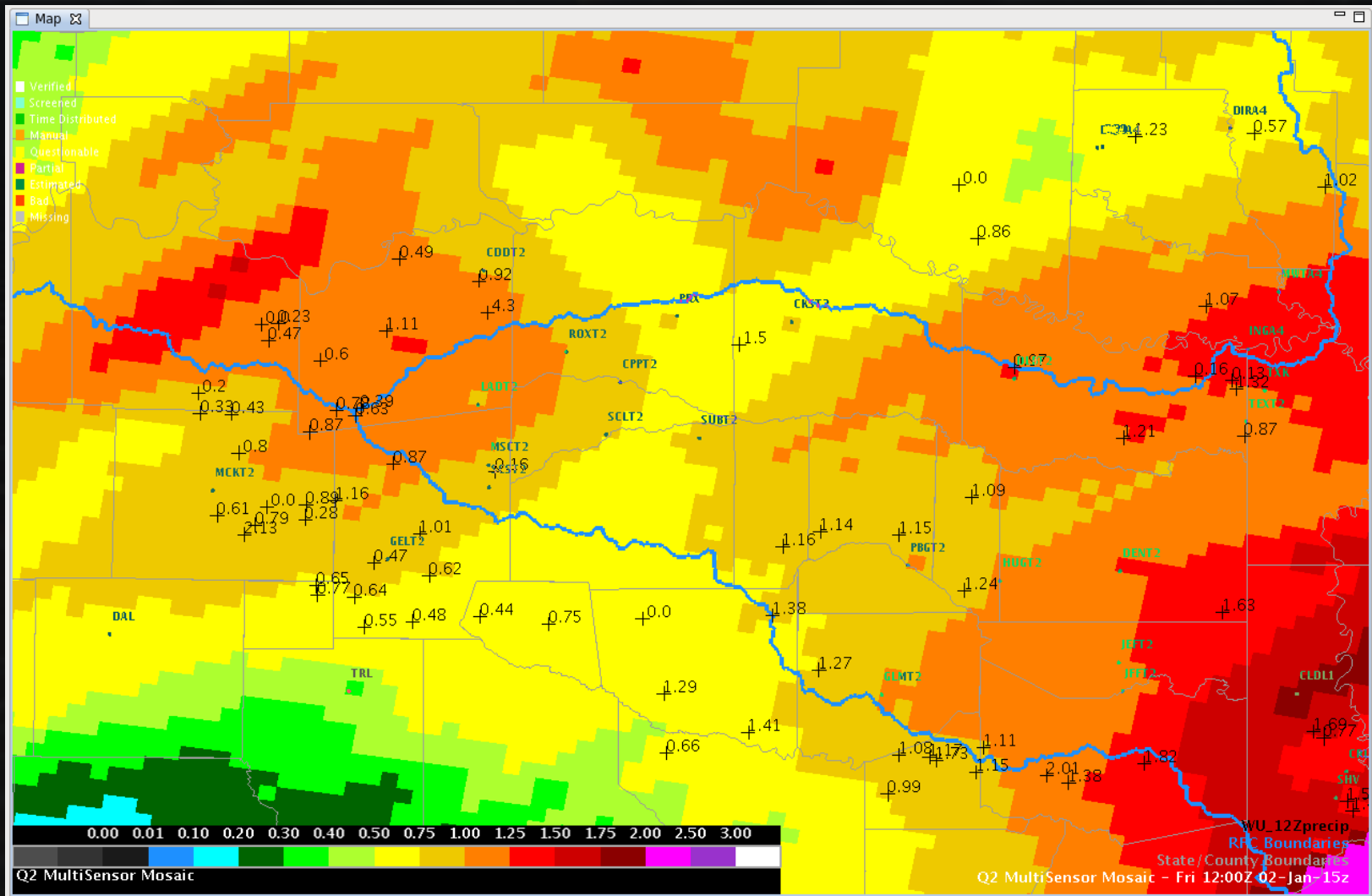Lincoln & Schlotzhauer

WeatherUnderground PWS - AWIPS

- Compile list of stations and associated lat/lon

- Scripts retrieve wunderground.com data and sum rainfall for each station

- Scripts use arcpy to build shapefile set

- Shapefile set transferred to operational system

- (future?...increase efficiency using LINUX only [pyshp]; create auto QC algorithm)

WeatherUnderground PWS - AWIPS

Geospatial Analyses at the LMRFC
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WeatherUnderground PWS - AWIPS

Geospatial Analyses at the LMRFC
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WeatherUnderground PWS – GR2Analyst

- Same data collection process as previous, but with different parameters and timing
- Matter of formatting data properly so display program can ingest/understand

GR2Analyst is a widely-used radar interrogation program utilized by meteorologists.

WeatherUnderground PWS – GR2Analyst


```
lix-lw-www1/grlevel2/shapefiles/LIX_WU_1hrRain_Placefile.txt
```

```
;!!! DISCLAIMER ----

;THIS FILE SHOWS DATA RETRIEVED FROM PRIVATE WEATHER STATIONS ON THE
;WEATHERUNDERGROUND INTERNET SITE AT wunderground.com. THE DATA OBTAINED AND
;DISPLAYED IS NOT QUALITY CONTROLLED BY THE NATIONAL WEATHER SERVICE.  THE DATA
;IS PROVIDED 'AS IS' AND THE FORECASTER MUST BE RESPONSIBLE FOR DETERMINING THE
;DATA'S FINAL QUALITY AND USEFULNESS.

;THE DATA IS COLLECTED AND FORMATTED TO MEET SPECIFIC NATIONAL WEATHER SERVICE
;SPATIAL AND TEMPORAL NEEDS AND IS NOT INTENDED FOR USE OUTSIDE OF NATIONAL
;WEATHER SERVICE APPLICATIONS.

;---- END DISCLAIMER !!!


Title: LIX WU Station 1 hour Rainfall Total ending 2016-04-12 15:52Z
Color: 200 200 255
IconFile: 1, 20, 49, 1, 48, "http://www.meteor.iastate.edu/~ckarsten/chase/placefiles/black_barbs.png"
Font: 1, 16, 1, "Courier New"
RefreshSeconds: 60

;WU STATIONS (scanned 455 WU PWS in the LIX CWA; 317 reported valid data below)
;              (bounding box for scan defined by latitudes: 28.9 to 34.2 and longitudes: -92.2 to -88.2)

Object: 32.103508, -88.204414
 Threshold: 999
 Icon: 0, 0, 0, 1, 24, KALBUTLE3     ;text string displayed on mouse hover
 Color: 255 255 255
 Text: 0, 0, 1, 0.0      ;last number is hourly rain in inches
End:
```
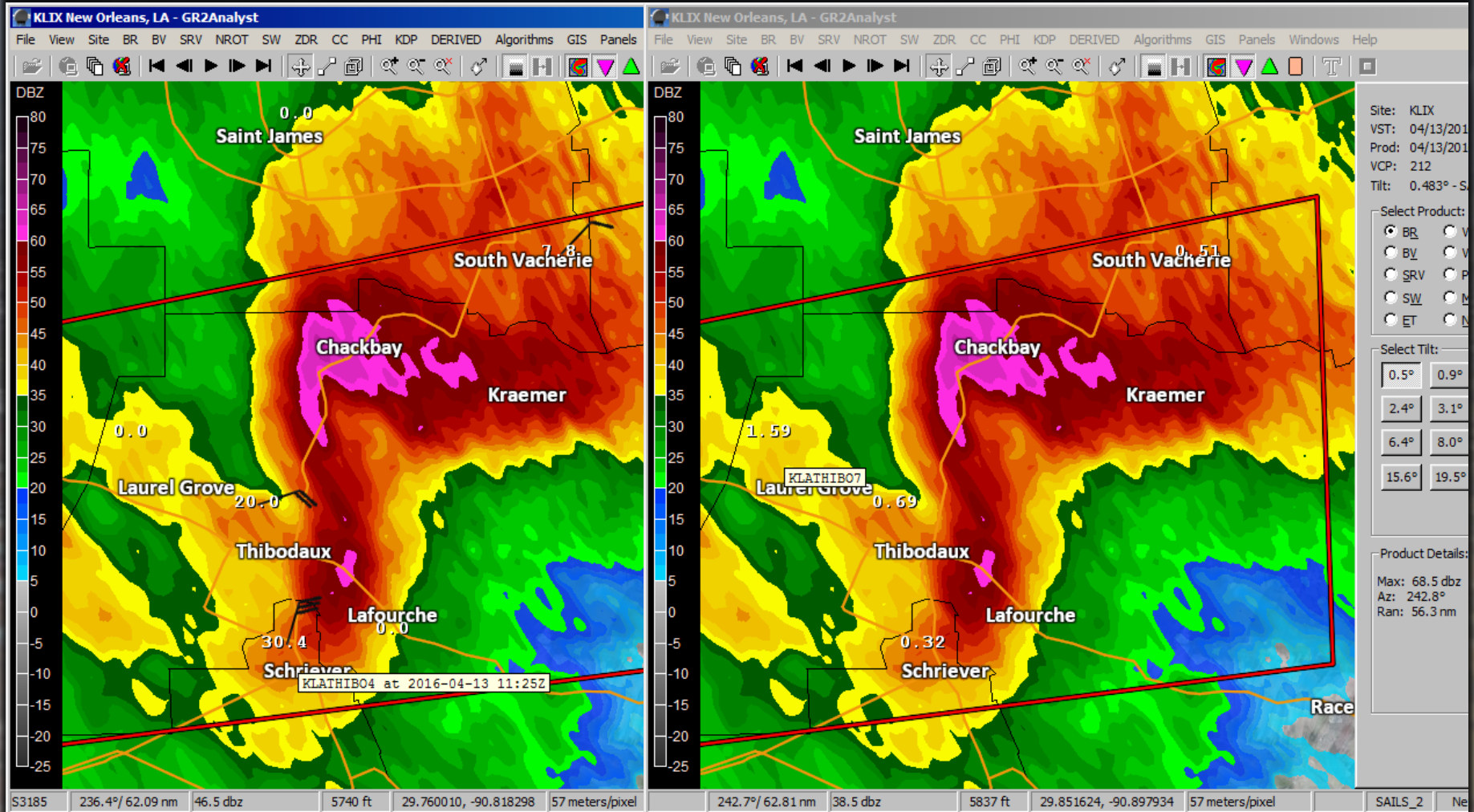
Geospatial Analyses at the LMRFC
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WeatherUnderground PWS – GR2Analyst

SA – Data Presentation

- Sometimes map isn't the best answer ☹
    - Relatively high bandwidth requirement to display
    - Hard to navigate/manipulate on smartphone
    - Users with visual impairments
- So, show data in tabular format
- Rely on users' inherent geospatial knowledge

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Current Gauge HTML

- Script collects current/forecast stage data from various sources

- Script writes data with appropriately formatted HTML tags embedded in ascii file

- NWS Content Management System ingests HTML and displays to web

- http://w2.weather.gov/lmrfc

Current Gauge HTML

```
outf.write('      <tr>' + crlf)
outf.write('        <td>' + ID + '</td>' + crlf)
outf.write('        <td>' + CurrStage + '</td>' + crlf)
outf.write('        <td>' + Crest + '</td>' + crlf)
outf.write('        <td>' + " " + '</td>' + crlf)
outf.write('        <td><a href="' + tablelink + '">Table</a></td>' + crlf)
outf.write('      </tr>' + crlf)
outf.write('      <tr>' + crlf)
outf.write('        <td>' + Descript + '</td>' + crlf)
outf.write('        <td>' + ObTime + '</td>' + crlf)
outf.write('        <td>' + CrestTime + '</td>' + crlf)
outf.write('        <td> </td>' + crlf)
outf.write('        <td><a href="' + graphlink + '">Hydrograph</a></td>' + crlf)
outf.write('      </tr>' + crlf)
outf.write('      <tr>' + crlf)
outf.write('        <td> </td>' + crlf)
outf.write('        <td> </td>' + crlf)
outf.write('        <td> </td>' + crlf)
outf.write('        <td> </td>' + crlf)
outf.write('        <td> </td>' + crlf)
outf.write('      </tr>' + crlf)
```

Current Gauge HTML

Observations and Forecasts by River System

Forecast Group	Major Rivers
FGMISSISSIPPI	Mississippi, Ohio, Arkansas
FGATCHAFLA	Atchafalaya
FGUYAZMS	Colwater, Tallahatchie
FGLYAZMS	Skuna, Yazoo
FGBIGBMS	Big Black
FGUPERMS	Pearl, Yackanookany
FGLPERMS	Pearl, Bogue Chitto
FGPASMS	Pascagoula, Leaf, Chickashaway, Escatawpa
FGGULFMS	Wolf, Tchoutacabouffa, Biloxi
FGFRBRNC	French Broad, Pigeon
FGLITLTN	Oconaluftee, Tuckasegee
FGCPOWTN	Clinch, Powell
FGHOLSTN	Holston
FGHWSETN	Hiwassee
FGTENNTN	Flint, Paint Rock
FGDKEKTN	Duck, Elk
FGWESTTN	Forked Deer, Wolf, Hatchie
FGSTFRAR	St. Francis
FGBLAKAR	Black
FGUWHIAR	White, James
FGLWHIAR	White, Cache
FGUOUAAR	Ouachita, Saline
FGLOUALA	Ouachita, Tensas
FGUREDLA	Red, Sulphur, Big Cypress, Black Cypress
FGLREDLA	Red
FGCALCLA	Calcasieu
FGVERMLA	Vermilion
FGAMCOLA	Amite, Comite, Tickfaw, Tangipahoa, Tchefuncte

FGCALCLA
Calcasieu River

BACK

Site	Latest Observation	Highest Forecast Value	More Data
GLML1 Calcasieu River nr Glenmora, LA	6.26 @2016-04-18 13:45 CT	**Below action stage** --	Table Hydrograph
OKDL1 Calcasieu River nr Oakdale, LA	**Missing Value** --	**Below action stage** --	Table Hydrograph
OBCL1 Calcasieu River nr Oberlin, LA	3.46 @2016-04-18 14:00 CT	**Below action stage** --	Table Hydrograph
MTTL1 Whisky Chitto Creek nr Mittie, LA	3.82 @2016-04-18 14:00 CT	**Below action stage** --	Table Hydrograph
BKDL1 Bundick Creek at Bundick Lake, LA	95.32 @2016-04-18 13:45 CT	**Below action stage** --	Table Hydrograph
KDRL1 Calcasieu River nr Kinder, LA	4.98 @2016-04-18 14:00 CT	**Below action stage** --	Table Hydrograph
OTBL1 Calcasieu River nr Old Town Bay, LA	**Missing Value** --	4.90 (Minor) @2016-04-18 19:00 CT	Table Hydrograph
LCRL1 Calcasieu River at Sam Houston Jones State Park, LA	3.60 @2016-04-18 07:00 CT	**Below action stage** --	Table Hydrograph
LCHL1 Calcasieu River NEAR Saltwater Barrier, LA	4.83 @2016-04-18 13:00 CT	4.80 (Minor) @2016-04-18 19:00 CT	Table Hydrograph
BSLL1 Bayou Nezpique at Basile, LA	6.75 @2016-04-18 14:00 CT	**Below action stage** --	Table Hydrograph
MRML1 Mermentau River at Mermentau, LA	3.25 @2016-04-18 14:15 CT	**Below action stage** --	Table Hydrograph

Geospatial Analyses at the LMRFC
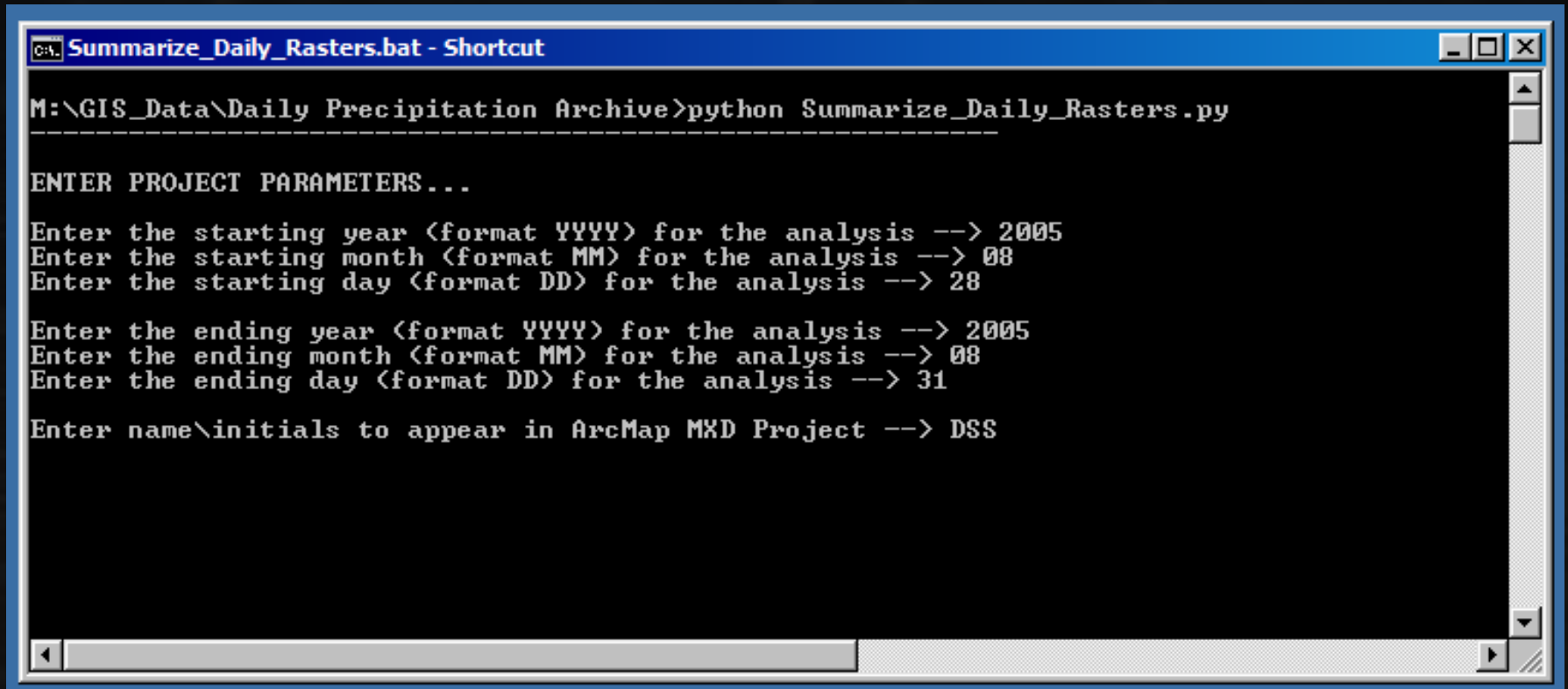Lincoln & Schlotzhauer

SA – Historical Data Availability

- Rivers tend to respond in a similar way to similar rain events, so we look for historical comparisons
- Historical daily rainfall obs dataset
    - Interpolate points to raster (Kriging)
    - Summarize/Display data

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Daily Precip. Archive Project

- Maintain database of daily obs and associated interpolated rasters

- Database utilized by separate script that prompts user for period of interest

- Script uses arcpy to create storm total raster of individual daily rasters

- Auto creates graphic from template mxd

Daily Precip. Archive Project

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Daily Precip. Archive Project

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer
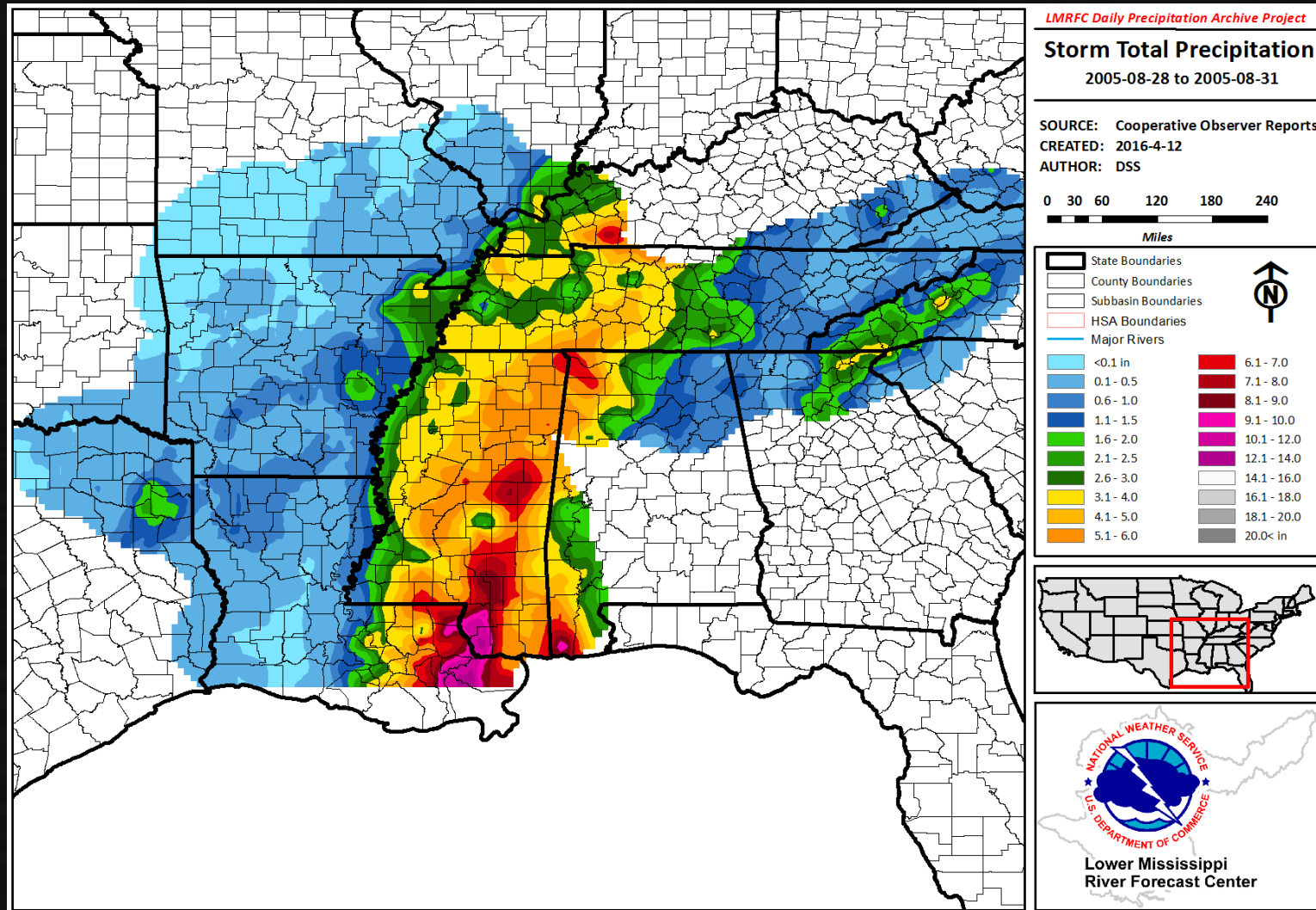
Sidebar – Point Data Interpolation

How can we compare different rainfall estimates of different types?

- Convert point data to gridded data using interpolation.

- IDW best for data where minima and maxima are well sampled. Can cause contour bullseyes. Can artificially increase rainfall between points.

- Spline best for data where minima and maxima need to be interpolated. Typically has higher interpolation errors than IDW, but not quantified. Can artificially increase rainfall between points.

- Kriging good for data that is spatially-correlated. Can provide information on how correlation changes with distance. Can assume measurement and interpolation uncertainty right at measurement point (nugget). Provides built-in methods for minimizing creation of mass.

Sidebar – Point Data Interpolation

Kriging

Semivariogram (left)

Equations that describe how data correlates spatially
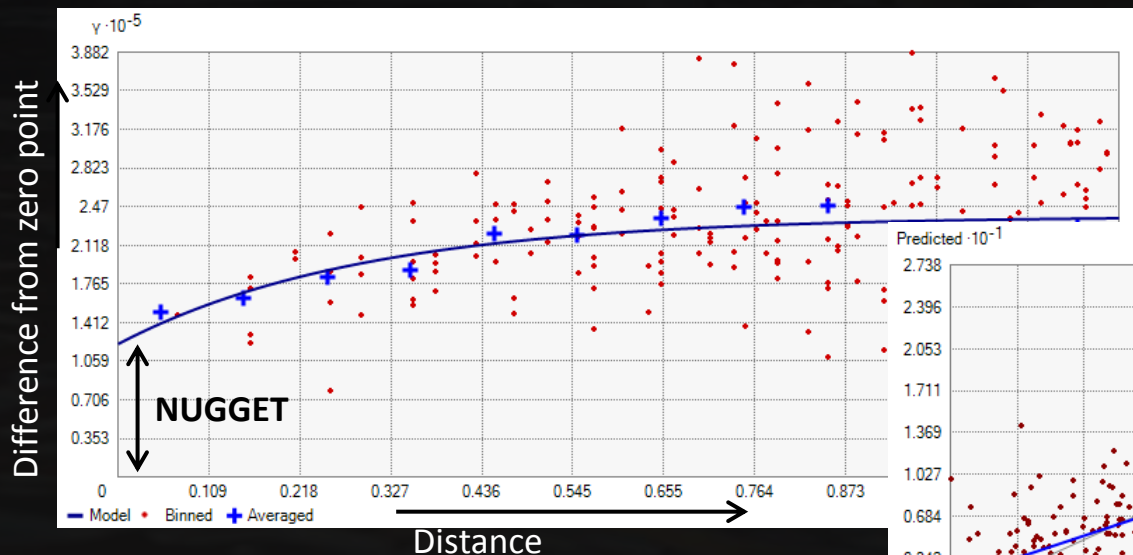
Interpolation error analysis(right)

Removal of each point, comparison of predicted to actual
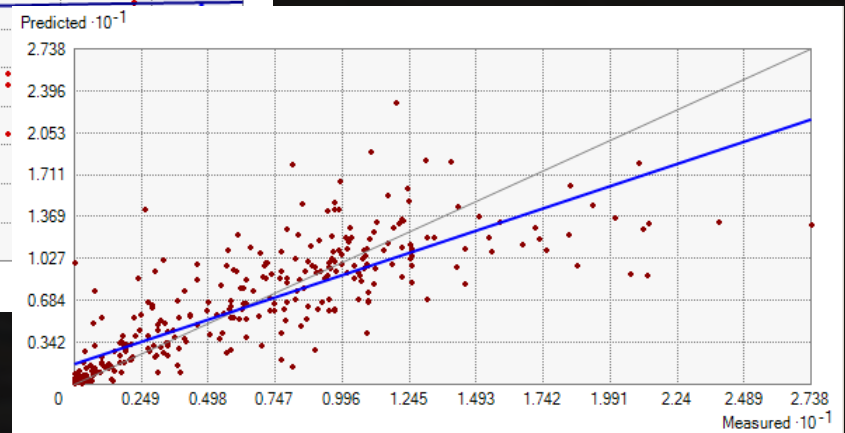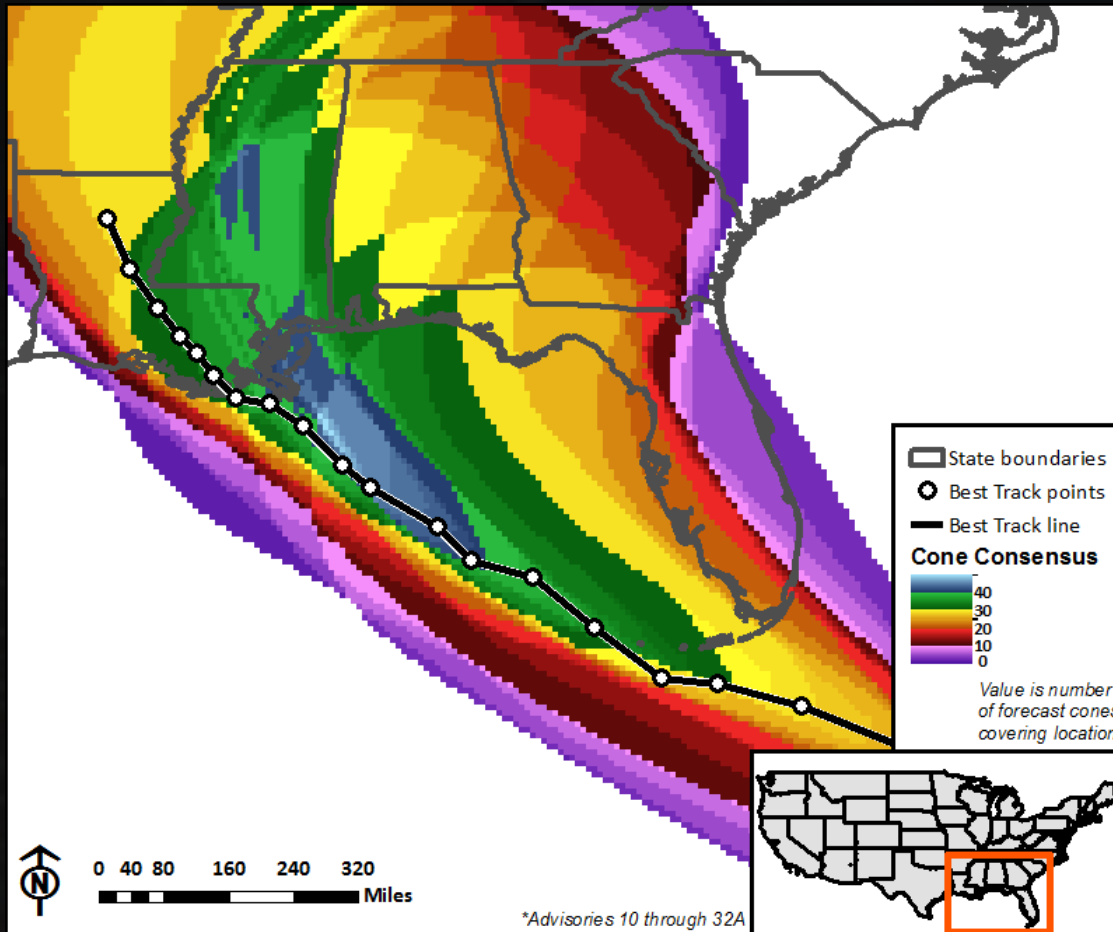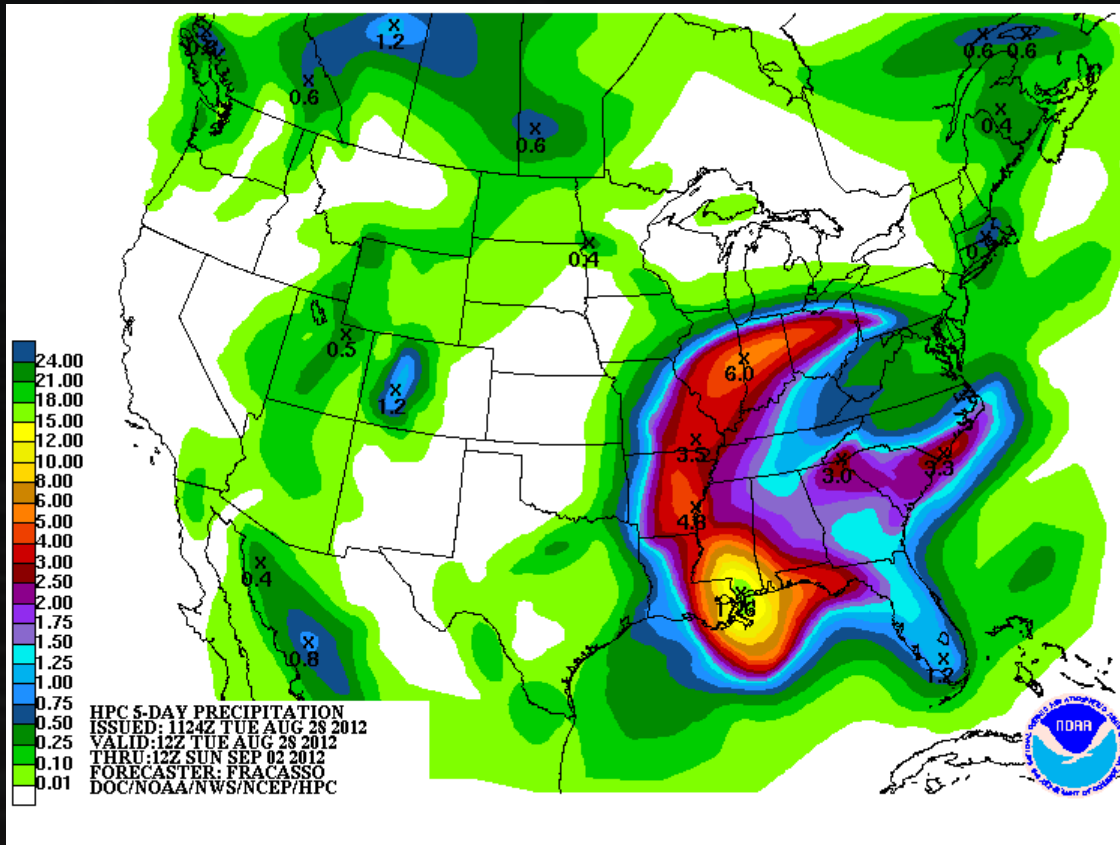
2012 HURRICANE ISAAC

- Isaac a slow moving minor storm with heavy rains across SE LA, especially NO

- What can we expect? -- Forecasting Tools
- What happened? -- Event Analysis

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Isaac Forecasting

- Consensus of forecast cones Aug 23-29

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Isaac Forecasting

- 5-day rainfall (QPF) forecast

- Issued Tuesday, August 28th 7AM

- Final forecast before heavy rain bands begin impacting coast

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Lincoln & Schlotzhauer

Isaac Forecasting
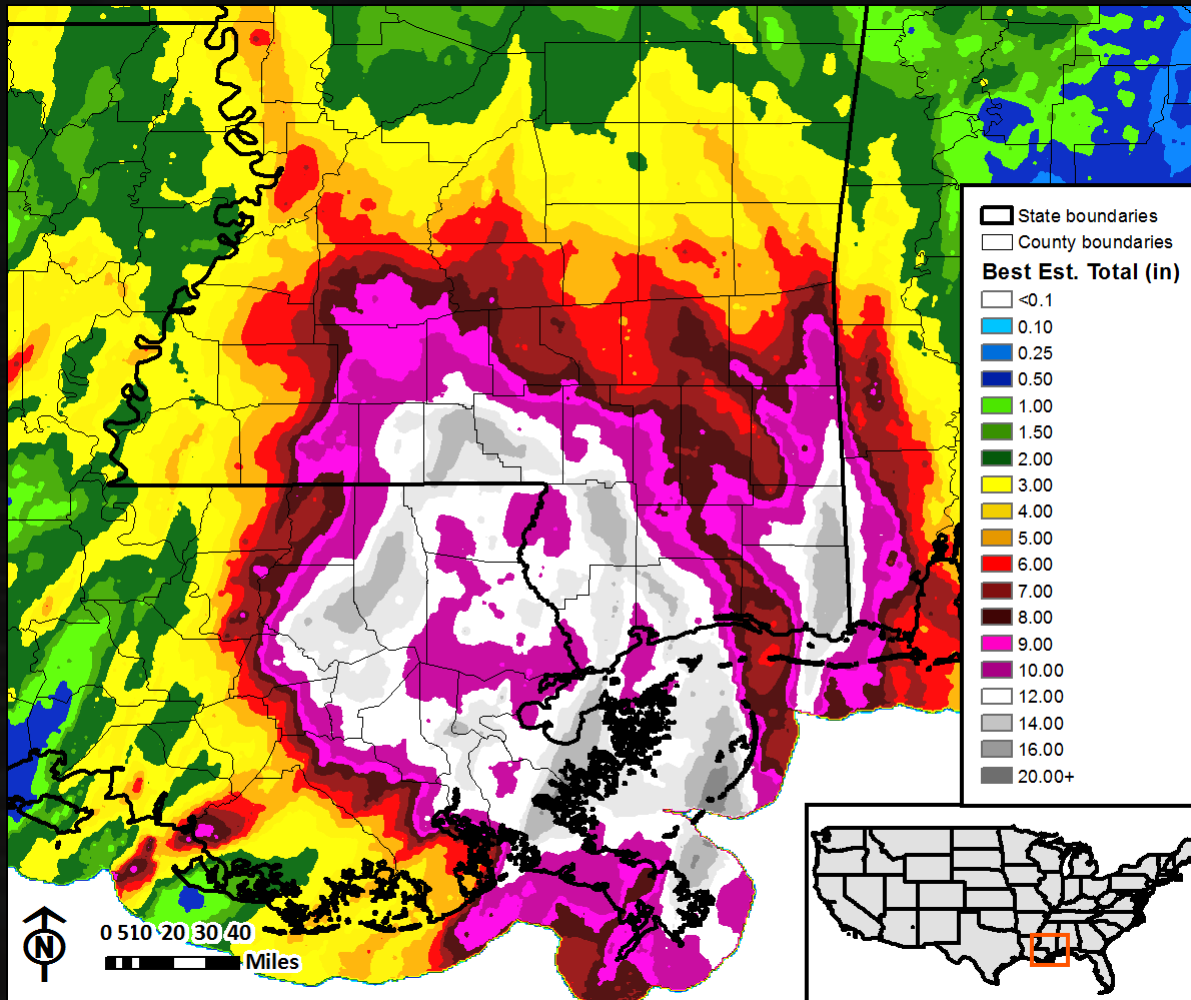
- NWS Best Estimate Rainfall
- Gridded radar data offices mosaicked, then bias-corrected to official gauge stations

Finding Isaac Impacts
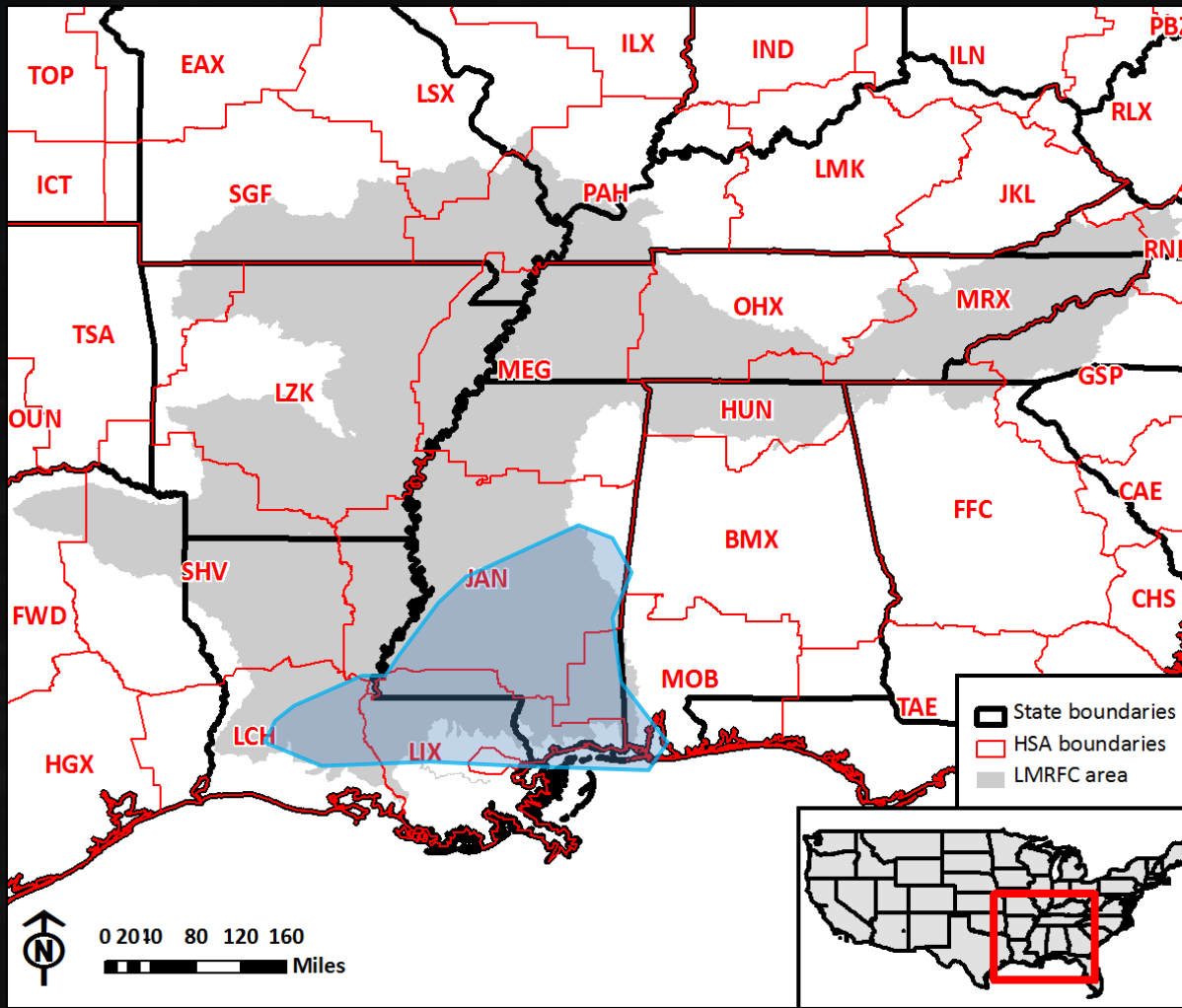
- Area of most significant flooding impacts (defined USGS 90th percentile streamflow)

Finding Isaac Impacts

- September 5th-8th, 2012: The National Weather Service (NWS) Lower Mississippi River Forecast Center (LMRFC) coordinated flood survey teams
  - Document impacts
  - Discuss forecast services with customers/partners
- September-December, 2012: Survey note compilation and analysis
  - Summarizing notes
  - Addressing concerns and action items
  - GIS analysis

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Finding Isaac Impacts

Finding Isaac Impacts

What to do with all of this different information???

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Finding Isaac Impacts

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer
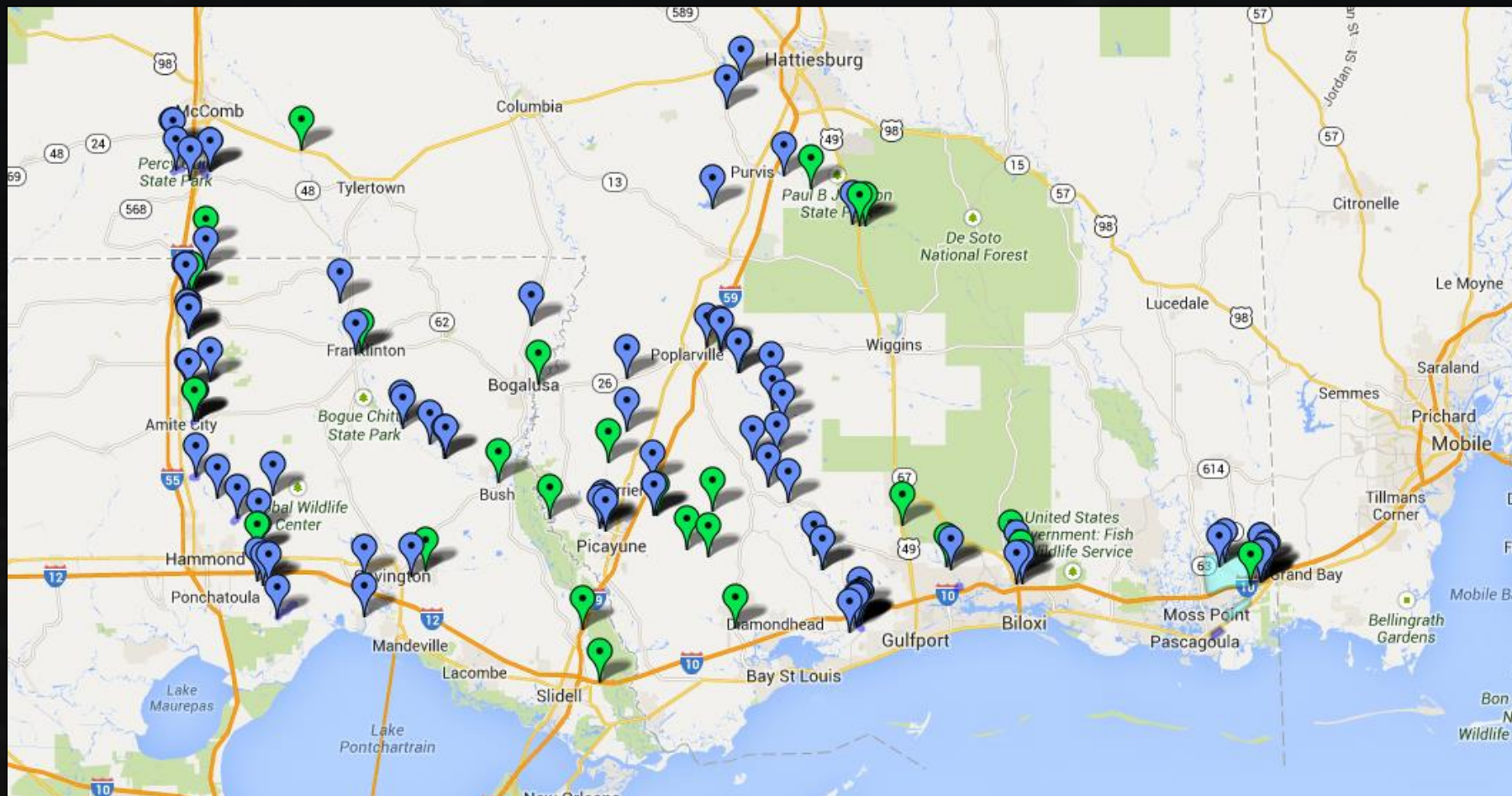
Isaac Analysis

This leads to a nearly ~~year~~ 4 year long period of:

- Compiling notes and mapped locations into a survey report
- Analyzing data
- Answering questions raised by the survey
- Compiling recommendations for improving our service
- Validating an extreme rainfall event in the New Orleans area

Isaac Analysis

Putting all high water marks onto map helped us establish Wolf River crest at 16.0ft stage (15.0ft NAVD88 due to gauge datum of -1.0ft NAVD88)
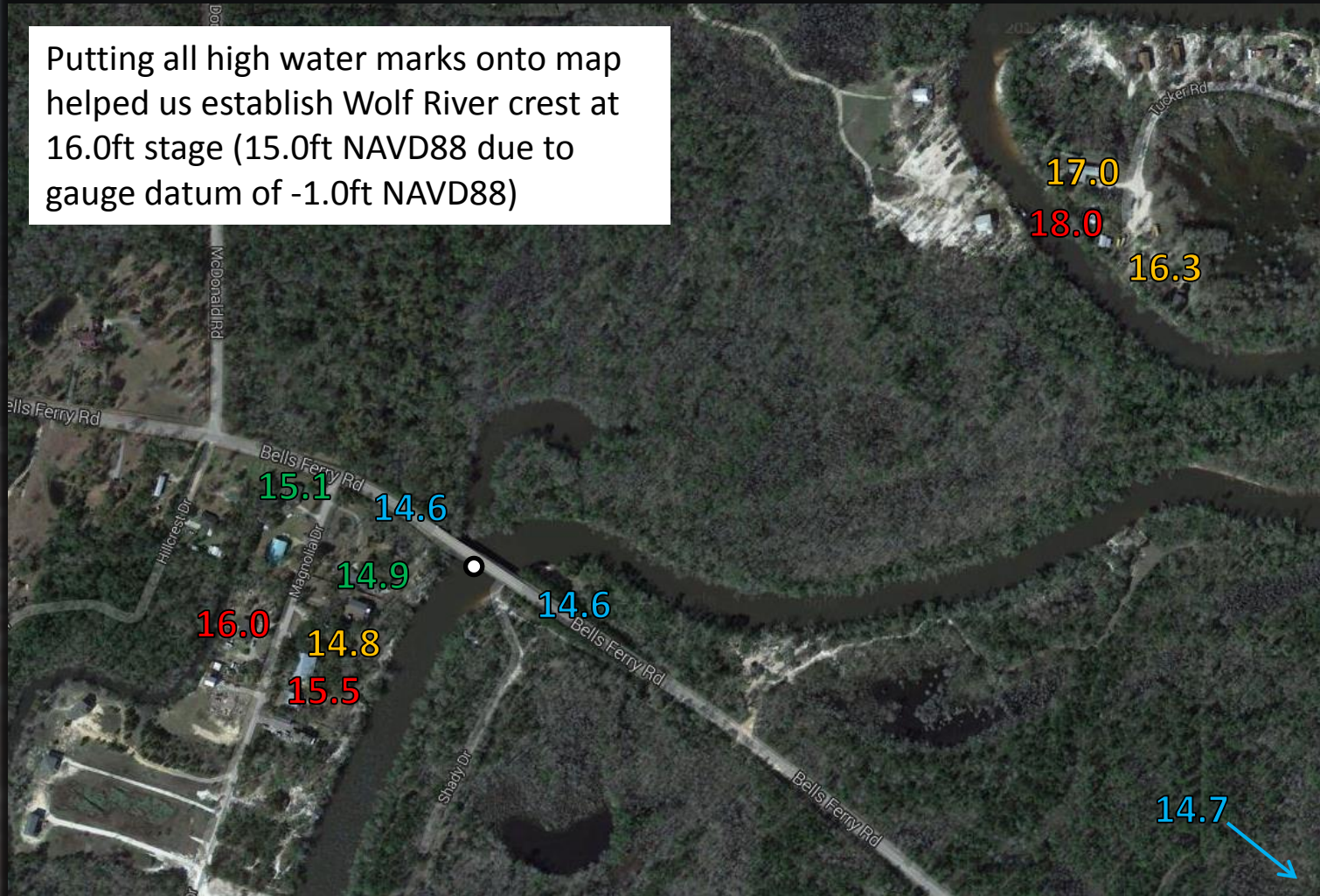
SOURCE

USGS
NWS/Survey
Public (High Confidence)
Public (Low Confidence)

The 20+ inch rainfall that started it all…

Isaac Analysis

- Official site in New Orleans area reported extreme rainfall totals, but was discounted at the time.

- *"New Orleans has never received that rainfall rate and not had significant flooding"* – common justification.

Isaac Analysis

~~**The 20+ inch rainfall**~~

The 27 inch rainfall* that made us search even harder...

Photo courtesy of Uptown Messenger

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Isaac Analysis

~~The 20+ inch rainfall~~

~~The 27 inch rainfall*~~

The 19 inch rainfall that corroborated the nearby gauges

*Additional QC from a later analysis adjusted the value downward to 19 inches.

Isaac Analysis

How can we confirm/discount rainfall maximum in New Orleans?

- Estimate storm runoff as proxy for minimum basin-averaged rainfall.

- In typical watersheds with gauges at outlet point, we can estimate runoff using a rating curve and the discharge hydrograph.

- But New Orleans is not a typical watershed and runoff does not flow downhill into streams

- Runoff flows into storm drains, which have to be pumped into canals, then pumped into Lake Pontchartrain

- So use pumping data in place of rating/discharge!

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Isaac Analysis

Courtesy New Orleans Sewerage and Water Board

Isaac Analysis

Pumping Rates from SWBNO Pumping Stations 4, 6, 7, 19
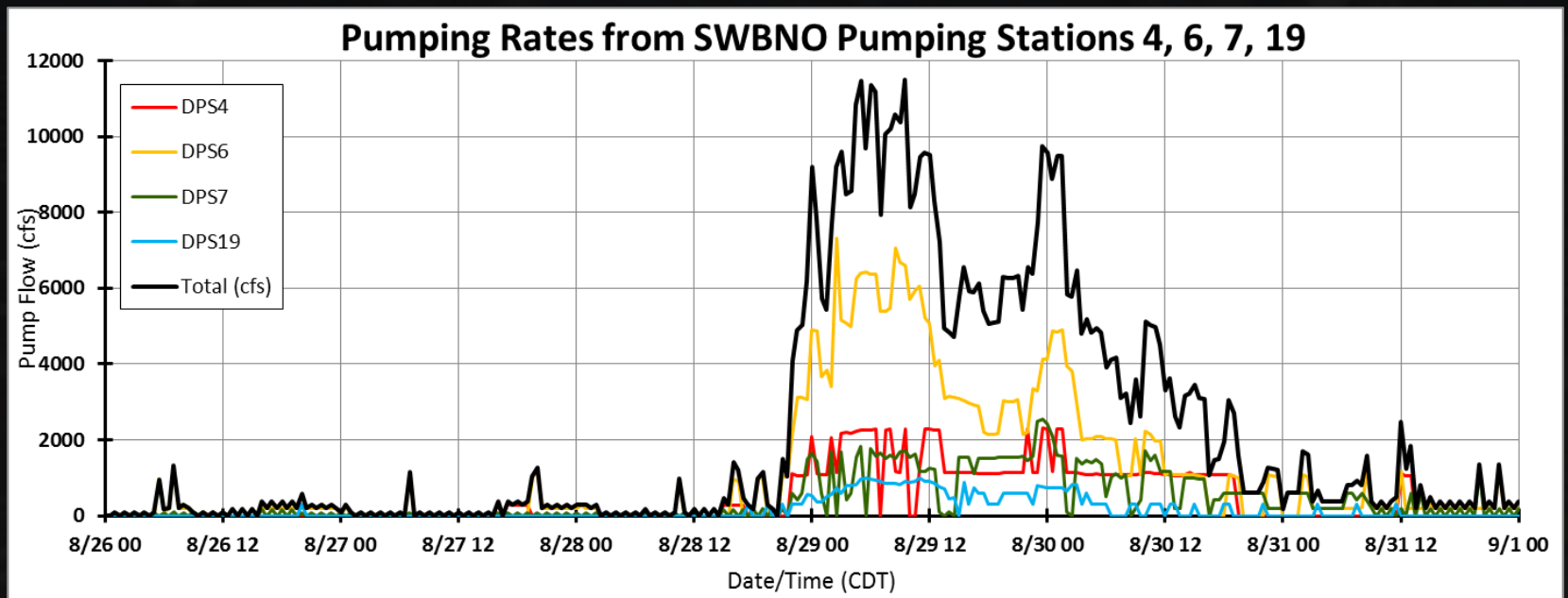
Isaac Analysis

Isaac Analysis

Rainfall Rates and Pumping Rates

Legend:
- Pumping Rate (in/hr)
- Rainfall Rate (in/hr)
- PumpingMIN (in/hr)
- PumpingNOM (in/hr)
- PumpingMAX (in/hr)
- Runoff Rate (in/hr)
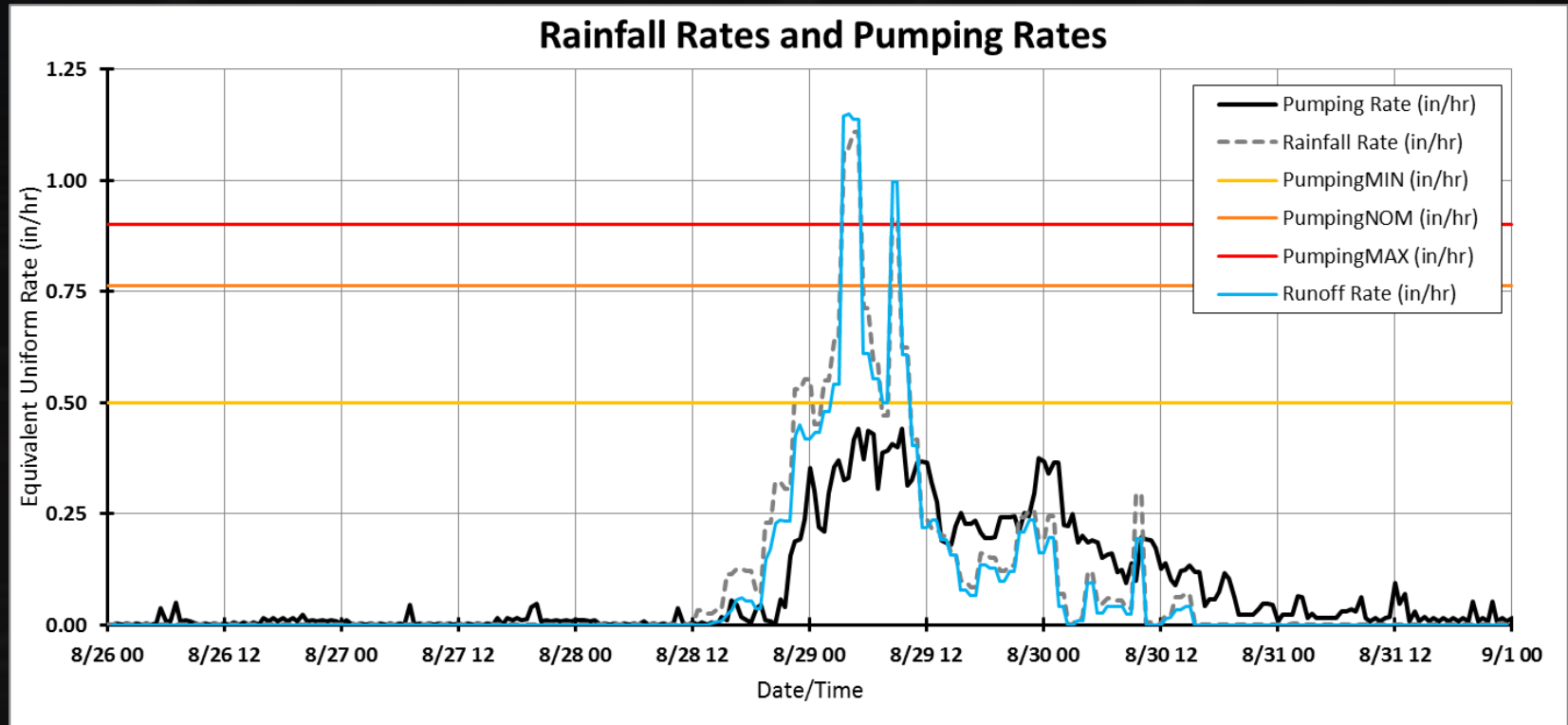
Isaac Analysis

Subbasin	Rainfall (in)	Loss (%)	Loss (in)	Modeled Runoff (in)	Equivalent Depth Pumped (in)
1	16.97	13.5%	2.29	14.77	
2	11.29	1.5%	0.17	11.02	
3	10.42	*2.2%*	0.22	10.11	
4	12.02	4.3%	0.51	11.43	
6	17.35	20.4%	3.54	13.88	
7	12.28	3.3%	0.40	11.76	
19	9.11	2.7%	0.24	8.77	
PolderAVG	13.54	10.2%	1.39	12.13	11.94

Isaac Analysis

- Uncertainty analysis shows that without the rainfall maximum, modeled runoff drops to around 10 inches, even though around 12 inches was pumped out

- How could the city pump ~2.0 inches more was pumped than what actually fell?

- So YES, this evidence supports this high rainfall maximum

Flash Flood Data -- Crowdsourcing

- Current methods of collecting flash flood reports inadequate for verifying new models/techniques under development

- Data-mining of social media, news media, and other web sources is one potential way to complement NWS LSRs

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Why care about flash flooding?

- Among short-fuse weather events from 1994-2015, ***flash*** flooding is just shy of #1* in:
    - Number of fatalities
    - Crop/property damage

NOTE: Ignoring the big tornado year of 2011, flash flooding would be just slightly higher than tornadoes.

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Flash Flooding Statistics

U.S. Weather Fatalities:
All
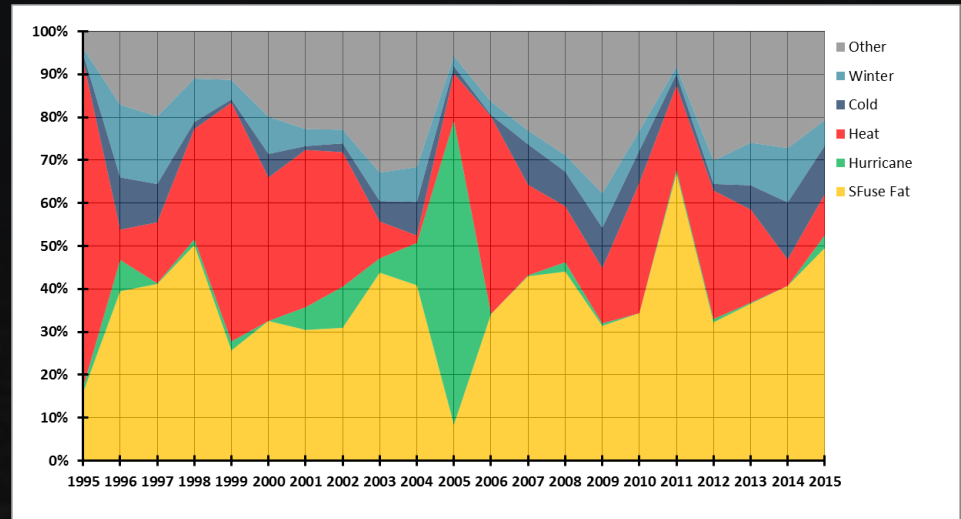
U.S. Weather Fatalities:
Short-fuse events
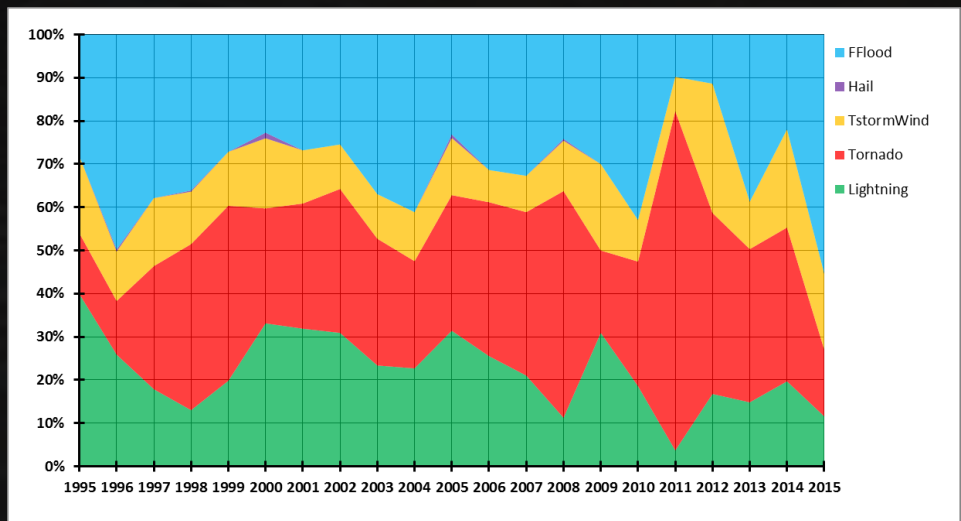
Source: National Weather Service Office of Climate, Water, & Weather Services

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Why improve flash flood warnings?
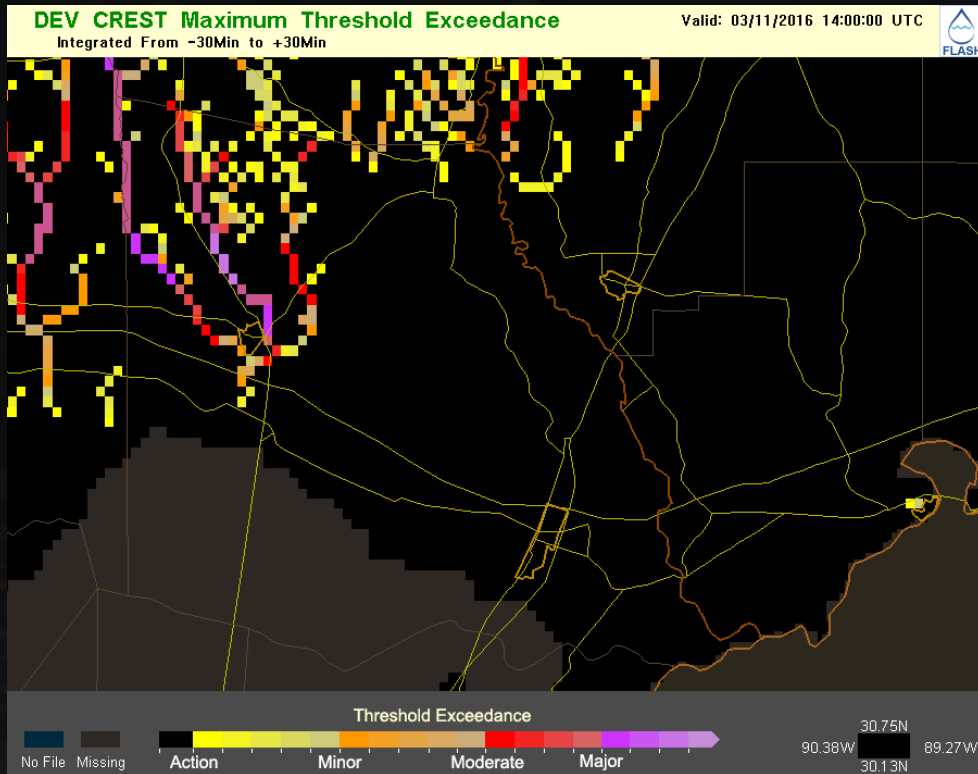
Source: Flooded Locations and Simulated Hydrographs Project. OU/CIMMS/NSSL/NOAA

9:00 CST

…NUMEROUS ROADWAYS FLOODED ACROSS WESTERN PORTIONS OF THE COUNTY…

How do we validate the model at left which is *spatial* against report above?

How to improve flash flood warnings?

- Techniques need to be verified and/or calibrated against actual flash flooding

- Current reports of flash flooding come from NWS Local Storm Reports (LSRs)
  - Data is inconsistent by event and by office
  - Data lacks areas of confirmed "no flooding"
  - Data isn't used to verify warnings *spatially*

How to improve flash flood warnings?

- What can we do?

  – Search for as much data as possible for real events and quantify the severity

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Severe weather post-event surveys

- For tornadoes/straight-line winds NWS surveys damaged areas after event to determine scope and cause

- Damage for high-end wind events typically evident even in lower population areas

Severe weather post-event surveys

Jenna Beall

- Where's the evidence of high-end flash flood event?

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Severe weather post-event surveys

Jenna Beall

- Where's the evidence of high-end flash flood event?

Severe weather post-event surveys

- With quick onset of flooding and quick drainage, sometimes there is no debris nor obvious mud/dirt marks in vegetation within just a few days

Occupants escaped through attic

Water reported as reaching top of fence

Jenna Beall

Jenna Beall

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer
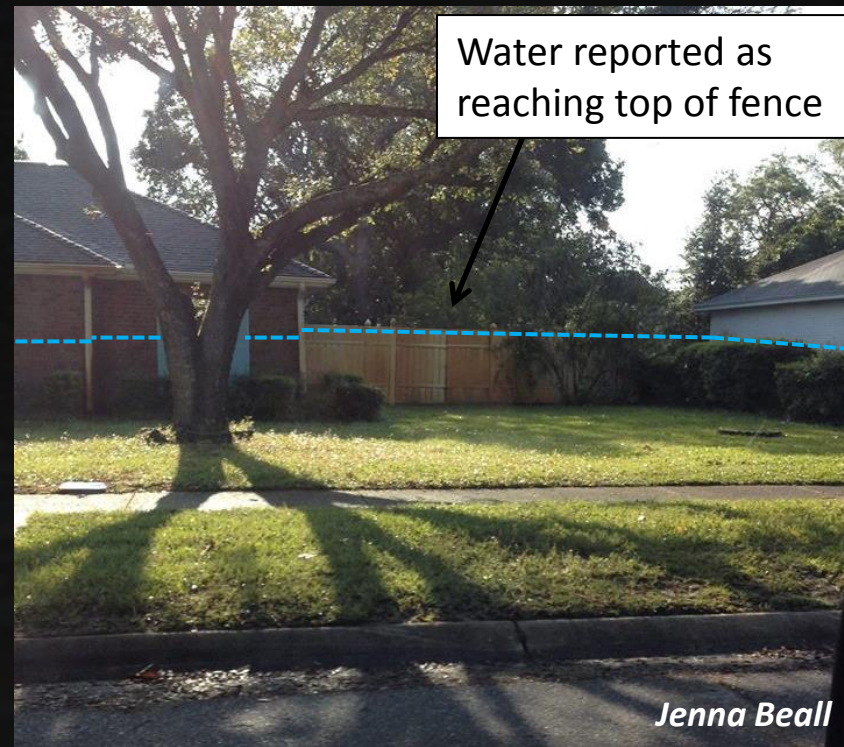
Sources for additional reports

- Social media
  - Facebook pages for TV, radio, newspaper
  - Twitter posts using tags Pensacola and Flood
  - Youtube videos
- News media
  - TV, radio, newspaper websites
- Other web sources
  - Blogs
  - Google Traffic

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Lincoln & Schlotzhauer

Sources for additional reports

- Data from social media… community TV facebook

Neda Burtman, posted to social media

Power lines

Boathouse

Grandview Pond

Google Maps
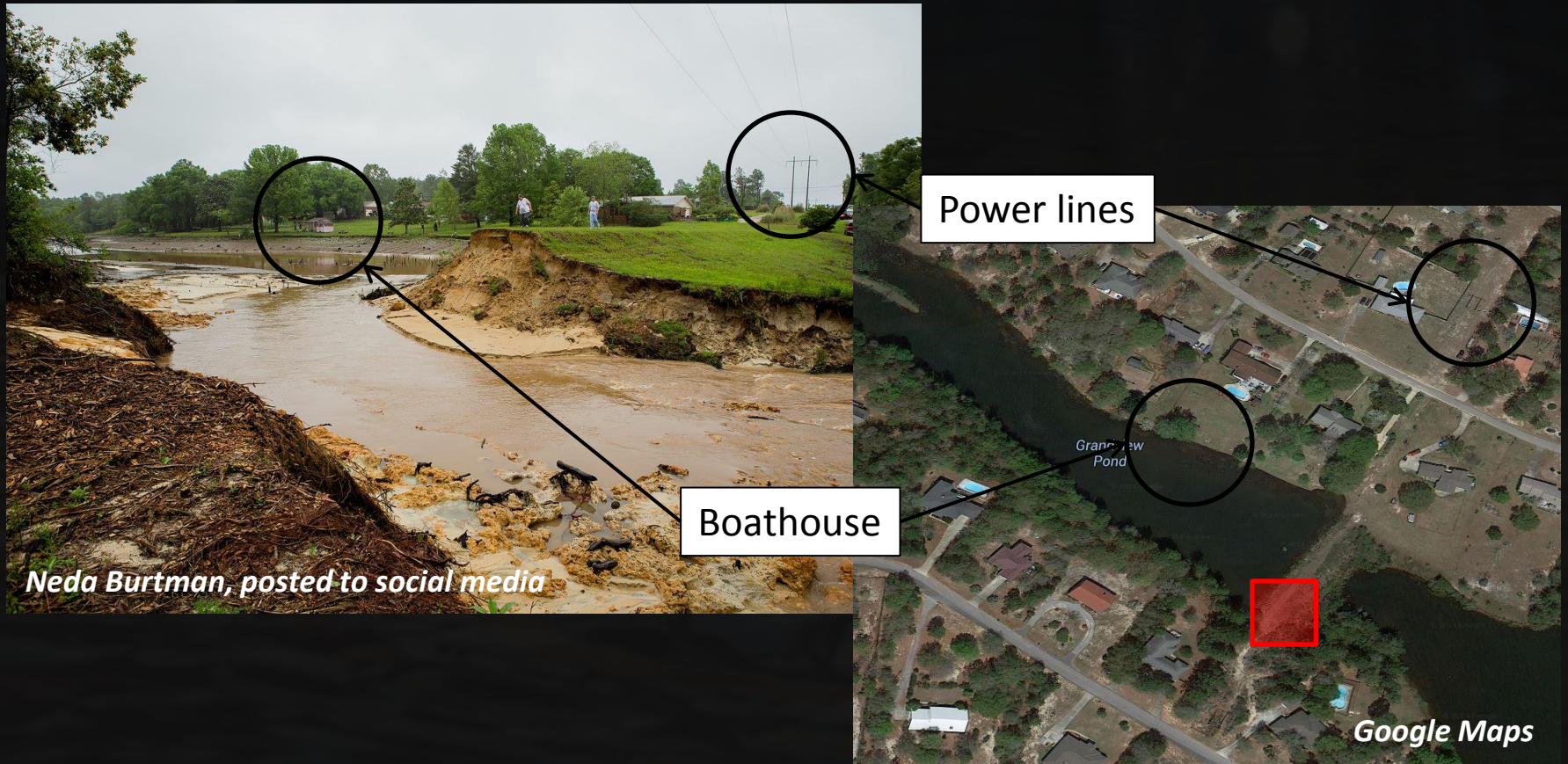
Sources for additional reports

- ## Data from social media… Twitter

32 tweets
over 9 hours!

Rob McGahen, posted to social media
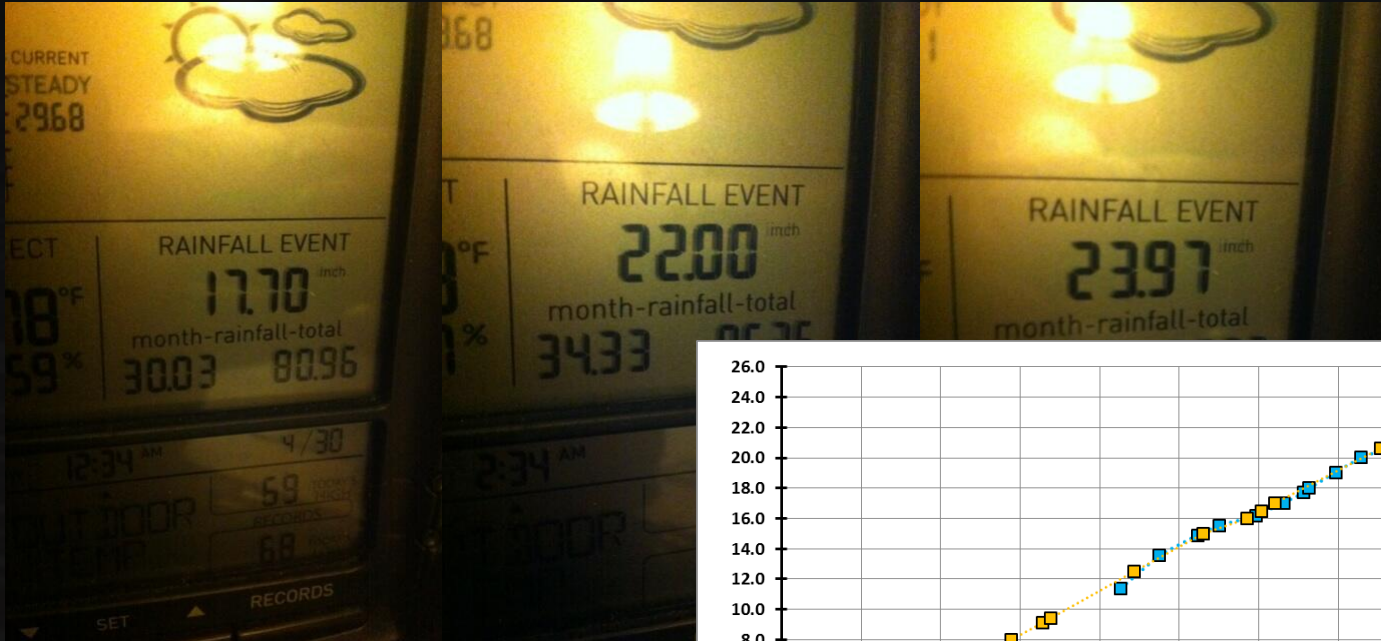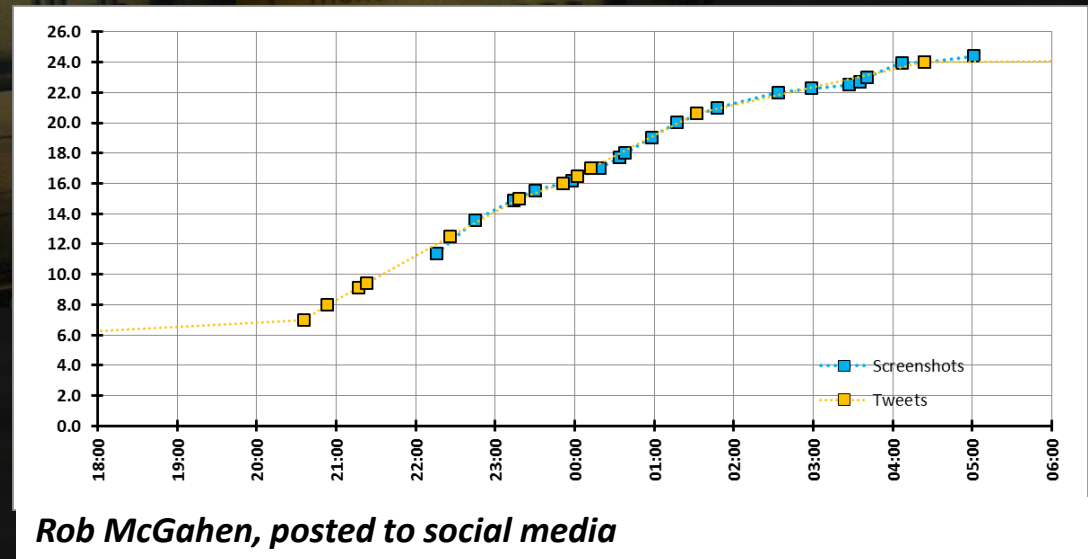
Sources for additional reports

- Google Traffic

Gap in traffic data coincident with waterway

Gap in traffic data with standstill traffic

Data recreation
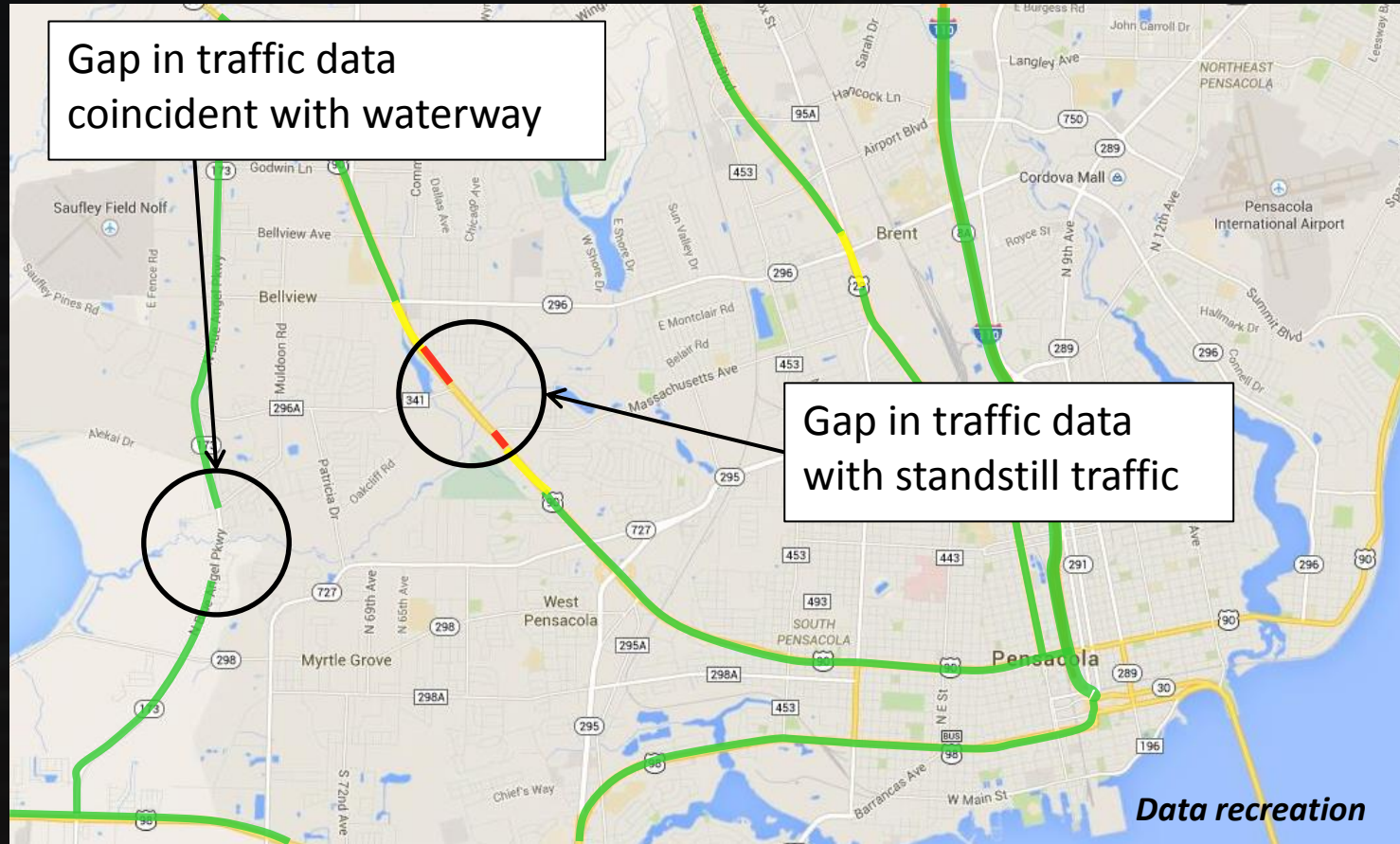
Sources for additional reports

- Youtube

Vehicle washed off road

Youtube: Mike Locke

Youtube: Mike Locke

Sources for additional reports

- Blog posts

Corroboration of other reports

04-30-2014, 04:49 PM   #125

wld1985
Senior Member
Blue Marlin

Join Date: Oct 2007
Location: Pensacola
Posts: 4,498

Quote:

Originally Posted by **Realtor**
Just got through to one of my tenants over on Crescent lake they told me the dam gave way and the lake will be empty in another hour. There was a vehicle in the trees from when the dam let go, it washed the car off Massachusetts ave. into the trees. such a shame.

Im in Gulf South Manor, and when i let this morning around 8am.. There were 3 automobiles pushed off the side of michigan where cresent lake flows out and under Michigan.. One truck was about 100ft off the road and into the woods.. (where people sometimes fish at the bottom of the hill).. I've got pics but, Not sure how to post them.. Also of Mobile hwy,where the carragie hills and Bayou Marcus I think spill into.. That whole bridge before massachutes was flooded over and running like a river.

Share

Quote

Pensacola Fishing Forum

Sources for additional reports

- News Media

Roadway followed natural low spot

Pensacola News Journal

Google Maps

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Quantifying report severity

Severity Label	Description/Criteria
Roadway flooded	Minor nuisance flooding of roadways
Roadway flooded (major)	Flooding of roadways deep enough to stall cars, or overtopping of bridges along major highways of modern design standards
Structure flooded	Residences or businesses flooded
Washout	Roadways or culverts completely washed away
Water rescue	Reports of persons needing to be rescued from residences or their vehicles
Dam failure	Dam eroded away to allow impounded water to release uncontrolled
Unknown	Flooding reported but little additional information provided

Adapted from:

Lincoln, W. S., 2014: Analysis of the 15 June 2013 isolated extreme rainfall event in Springfield, Missouri. *J. Operational Meteor.*, **2** (19), 233–245.

Ouachita Mountains, AR: June 2010

3hr Rainfall Average Recurrence Interval

Flood LSRs
- ● Street Flooding
- ● Street Flooding (sig)
- ● Water Rescue
- ● 1% Floodplain
- ● Residence Flooded
- ● Washout
- ● 0.2% Floodplain
- ○ Unknown
- ☐ >50% (<2yr)
- ☐ 50% (2yr)
- ☐ 20% (5yr)
- ☐ 10% (10yr)
- ☐ 4% (25yr)
- ☐ 2% (50yr)
- ☐ 1% (100yr)
- ☐ 0.5% (200yr)
- ☐ 0.2% (500yr)
- ☐ 0.1% (1000yr)
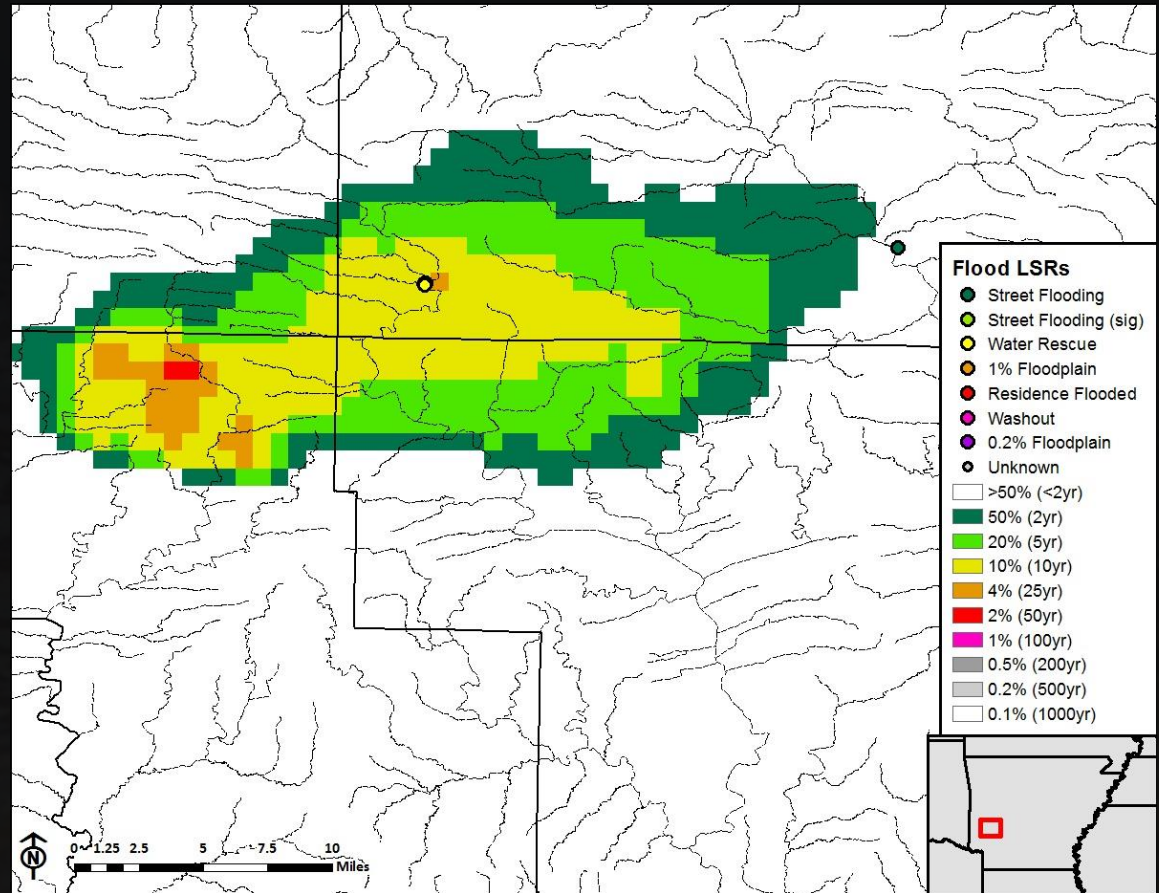
Reports to NWS (LSRs)

5*

Ouachita Mountains, AR: June 2010
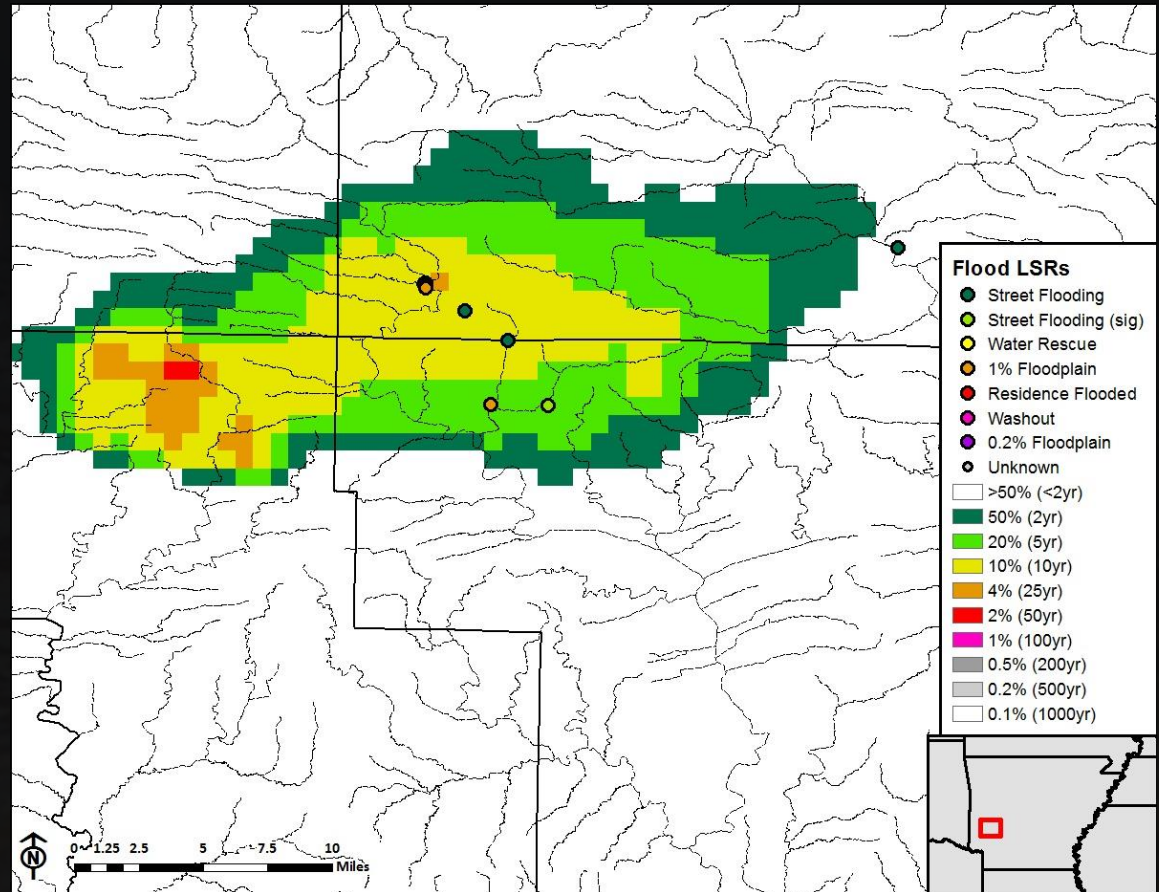
3hr Rainfall Average Recurrence Interval

LSRs & CrowdSourced

11

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Eastern TN: August 2012

3hr Rainfall Average Recurrence Interval

Flood LSRs
- Street Flooding
- Street Flooding (sig)
- Water Rescue
- 1% Floodplain
- Residence Flooded
- Washout
- 0.2% Floodplain
- Unknown

- >50% (<2yr)
- 50% (2yr)
- 20% (5yr)
- 10% (10yr)
- 4% (25yr)
- 2% (50yr)
- 1% (100yr)
- 0.5% (200yr)
- 0.2% (500yr)
- 0.1% (1000yr)
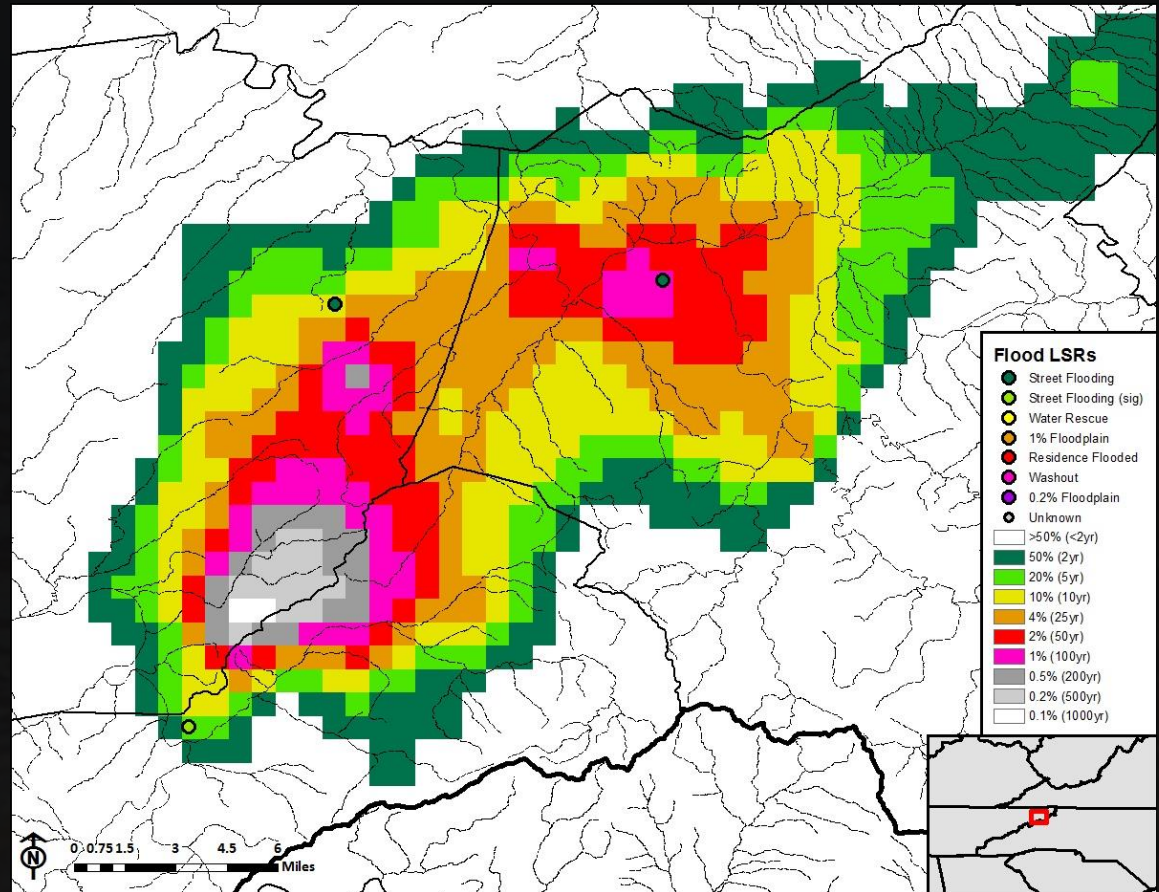
Reports to NWS (LSRs)
3

Eastern TN: August 2012

3hr Rainfall Average Recurrence Interval

Flood LSRs
- Street Flooding
- Street Flooding (sig)
- Water Rescue
- 1% Floodplain
- Residence Flooded
- Washout
- 0.2% Floodplain
- Unknown

- >50% (<2yr)
- 50% (2yr)
- 20% (5yr)
- 10% (10yr)
- 4% (25yr)
- 2% (50yr)
- 1% (100yr)
- 0.5% (200yr)
- 0.2% (500yr)
- 0.1% (1000yr)

0 0.75 1.5   3   4.5   6
Miles
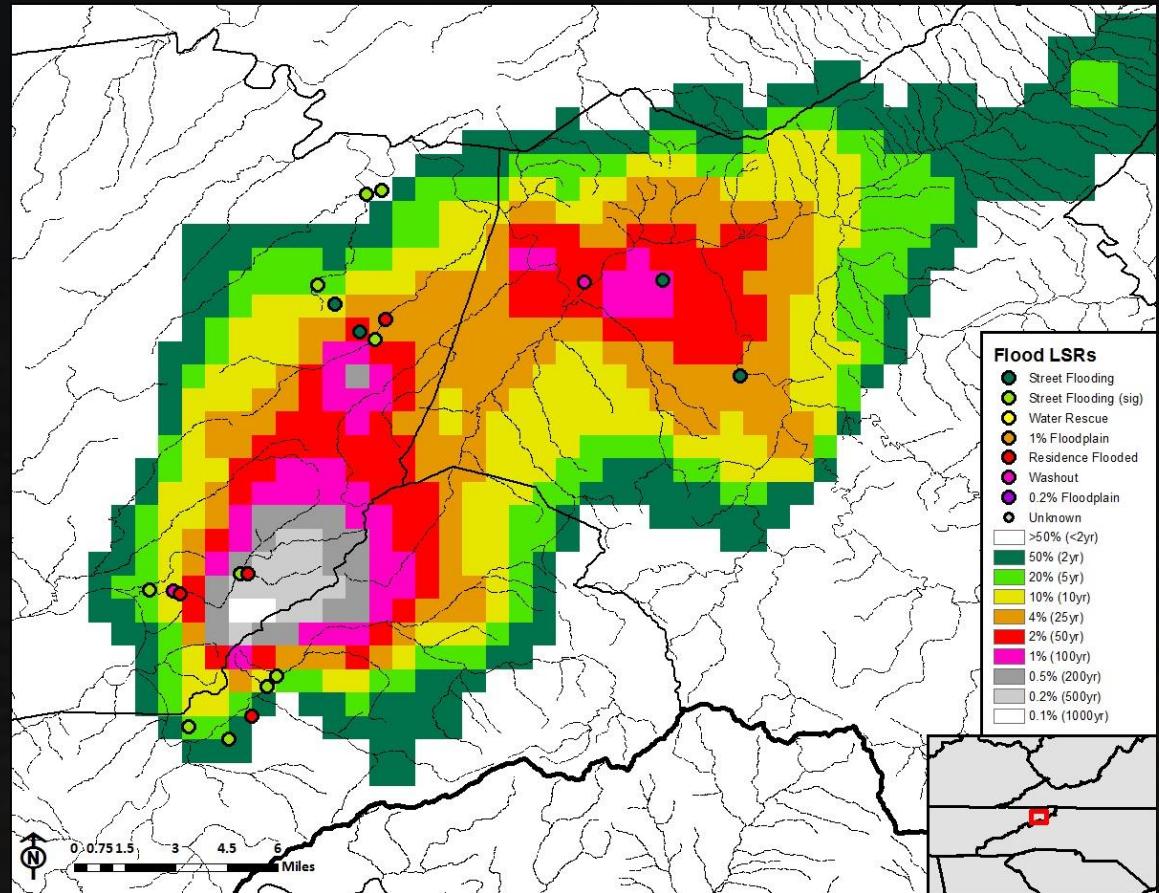
LSRs & CrowdSourced

20

Coastal MS: May 2013

3hr Rainfall Average Recurrence Interval

Flood LSRs
- ● Street Flooding
- ● Street Flooding (sig)
- ○ Water Rescue
- ● 1% Floodplain
- ● Residence Flooded
- ● Washout
- ● 0.2% Floodplain
- ○ Unknown
- □ >50% (<2yr)
- ■ 50% (2yr)
- ■ 20% (5yr)
- ■ 10% (10yr)
- ■ 4% (25yr)
- ■ 2% (50yr)
- ■ 1% (100yr)
- ■ 0.5% (200yr)
- ■ 0.2% (500yr)
- □ 0.1% (1000yr)

Reports to NWS (LSRs)

12

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

3hr Rainfall Average Recurrence Interval
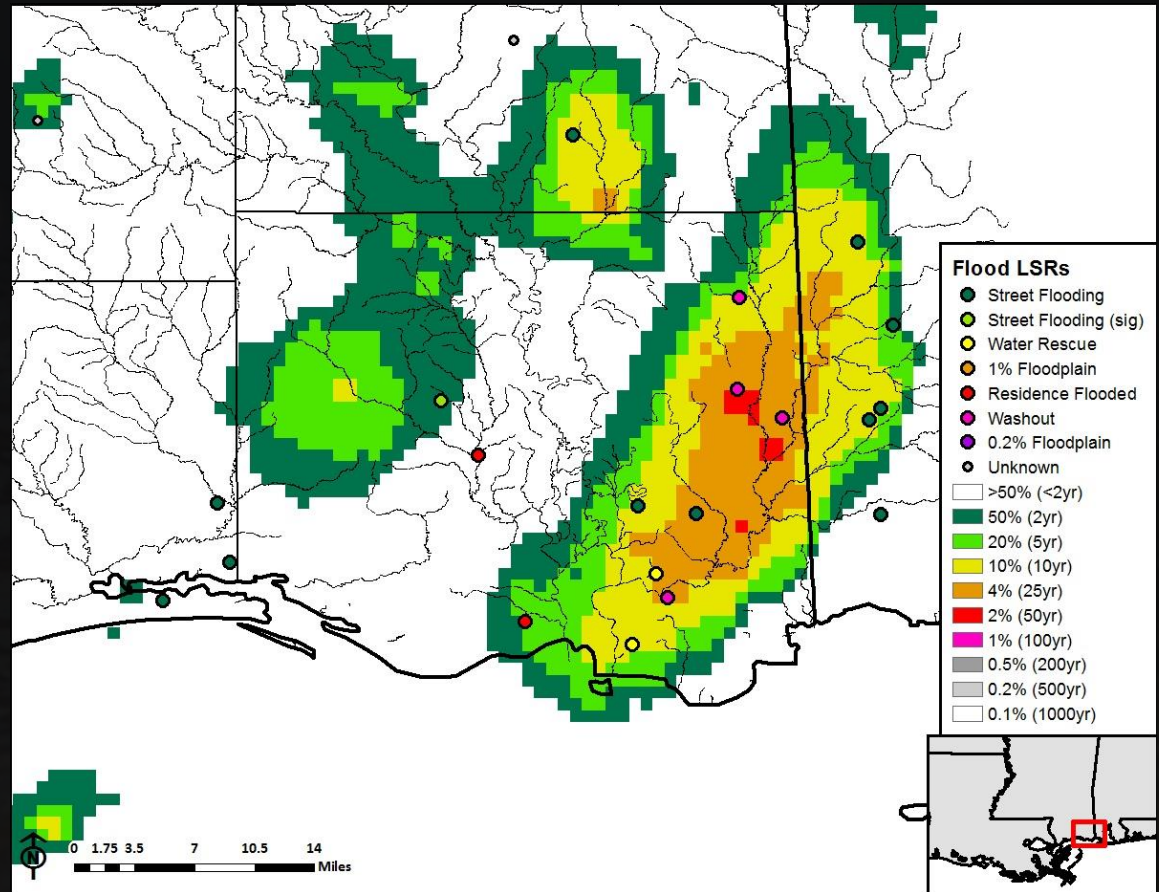
LSRs & CrowdSourced

23

Springfield, MO: June 2013

3hr Rainfall Average Recurrence Interval

Flood LSRs
- Street Flooding
- Street Flooding (sig)
- Water Rescue
- 1% Floodplain
- Residence Flooded
- 0.2% Floodplain
- Unknown
- >50% (<2yr)
- 50% (2yr)
- 20% (5yr)
- 10% (10yr)
- 4% (25yr)
- 2% (50yr)
- 1% (100yr)
- 0.5% (200yr)
- 0.2% (500yr)
- 0.1% (1000yr)
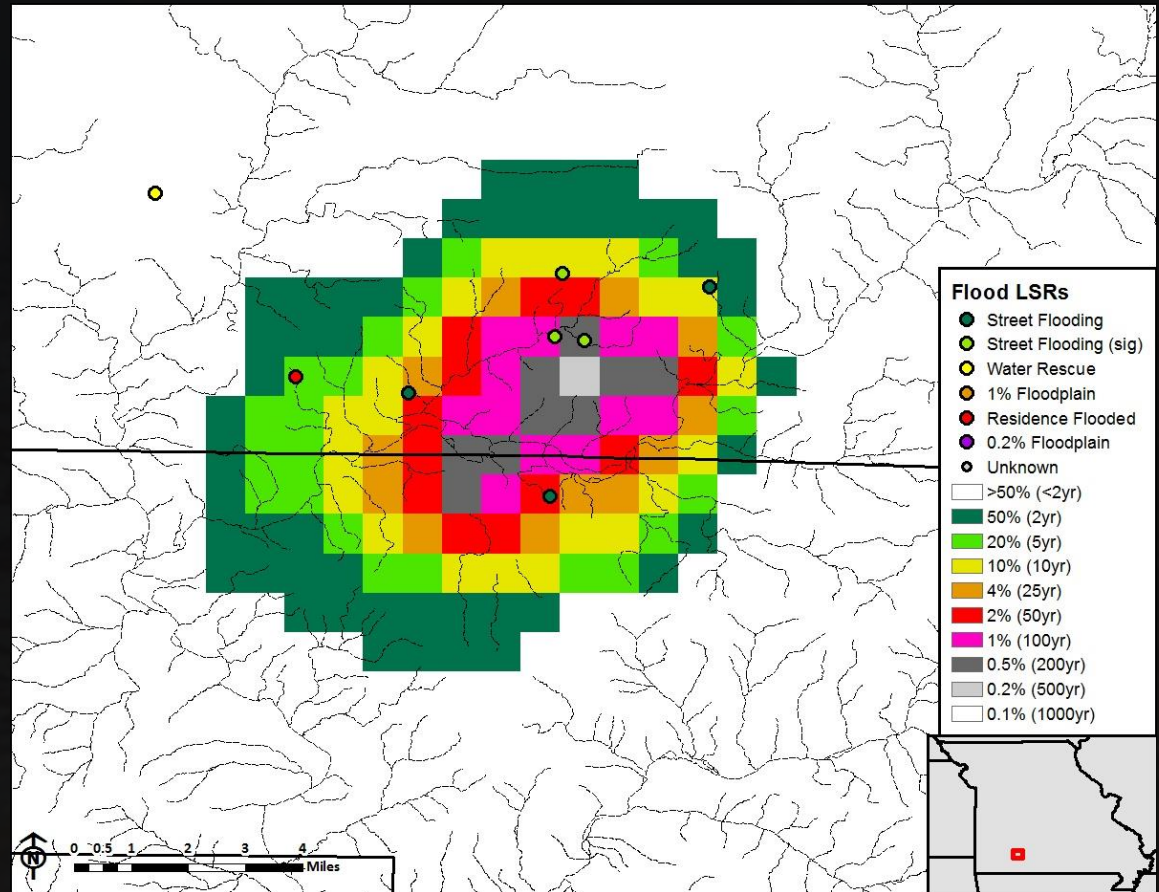
Reports to NWS (LSRs)
8

Springfield, MO: June 2013

3hr Rainfall Average Recurrence Interval

Flood LSRs
- Street Flooding
- Street Flooding (sig)
- Water Rescue
- 1% Floodplain
- Residence Flooded
- 0.2% Floodplain
- Unknown
- >50% (<2yr)
- 50% (2yr)
- 20% (5yr)
- 10% (10yr)
- 4% (25yr)
- 2% (50yr)
- 1% (100yr)
- 0.5% (200yr)
- 0.2% (500yr)
- 0.1% (1000yr)
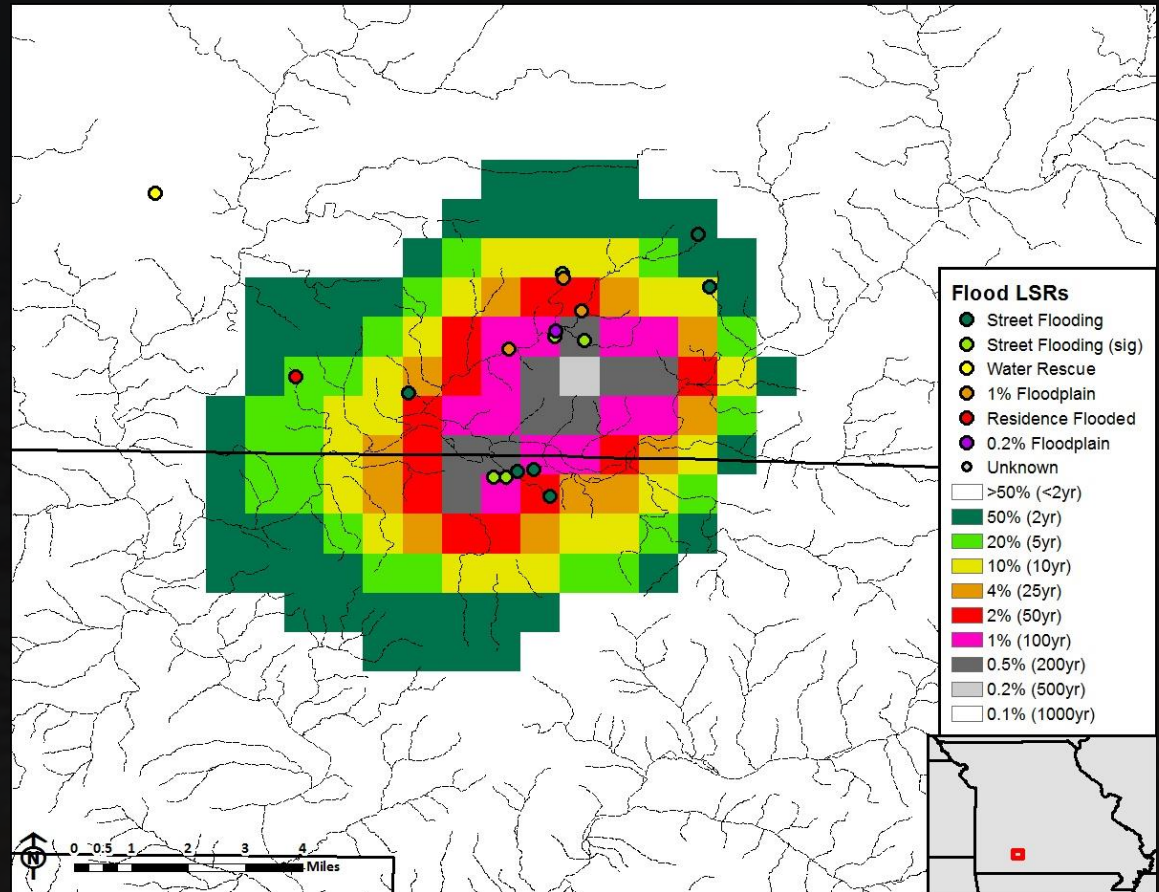
LSRs & CrowdSourced
17

Southwest MS: March 2014

3hr Rainfall Average Recurrence Interval

Flood LSRs
- Street Flooding
- Street Flooding (sig)
- Water Rescue
- 1% Floodplain
- Residence Flooded
- Washout
- 0.2% Floodplain
- Unknown
- >50% (<2yr)
- 50% (2yr)
- 20% (5yr)
- 10% (10yr)
- 4% (25yr)
- 2% (50yr)
- 1% (100yr)
- 0.5% (200yr)
- 0.2% (500yr)
- 0.1% (1000yr)

Reports to NWS (LSRs)
2

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Southwest MS: March 2014

3hr Rainfall Average Recurrence Interval

Flood LSRs
- Street Flooding
- Street Flooding (sig)
- Water Rescue
- 1% Floodplain
- Residence Flooded
- Washout
- 0.2% Floodplain
- Unknown
- >50% (<2yr)
- 50% (2yr)
- 20% (5yr)
- 10% (10yr)
- 4% (25yr)
- 2% (50yr)
- 1% (100yr)
- 0.5% (200yr)
- 0.2% (500yr)
- 0.1% (1000yr)

LSRs & CrowdSourced
26

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

3d Rainfall Average Recurrence Interval

Reports to NWS (LSRs)
20
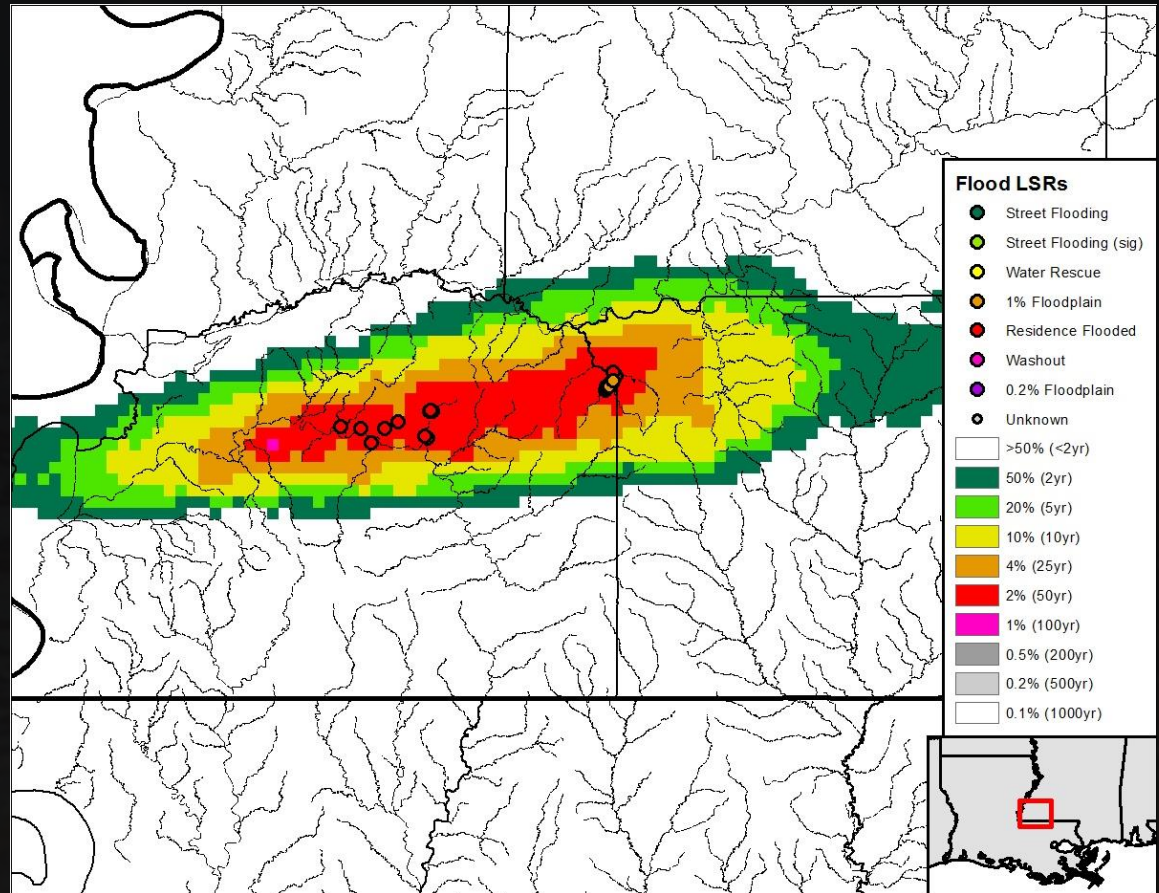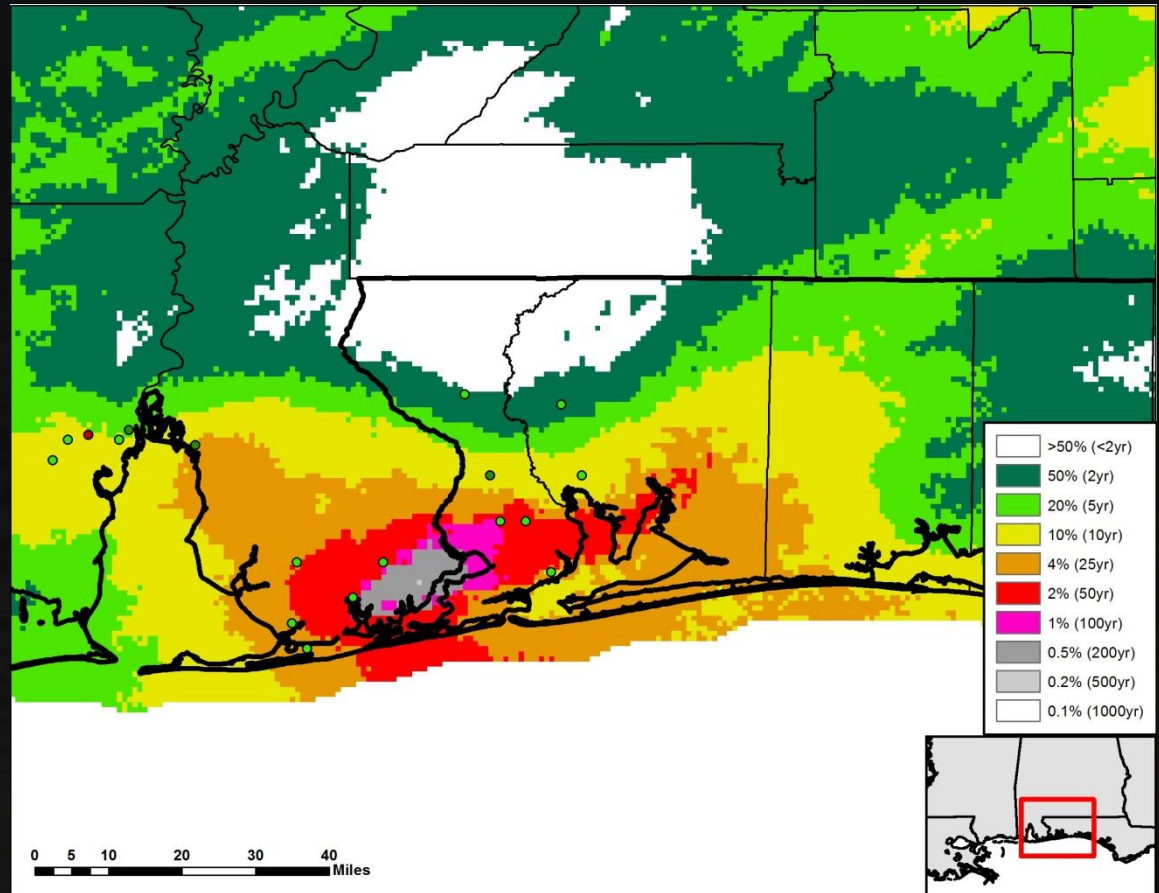
Coastal FL/AL: April 2014

3d Rainfall Average Recurrence Interval

LSRs & CrowdSourced
147

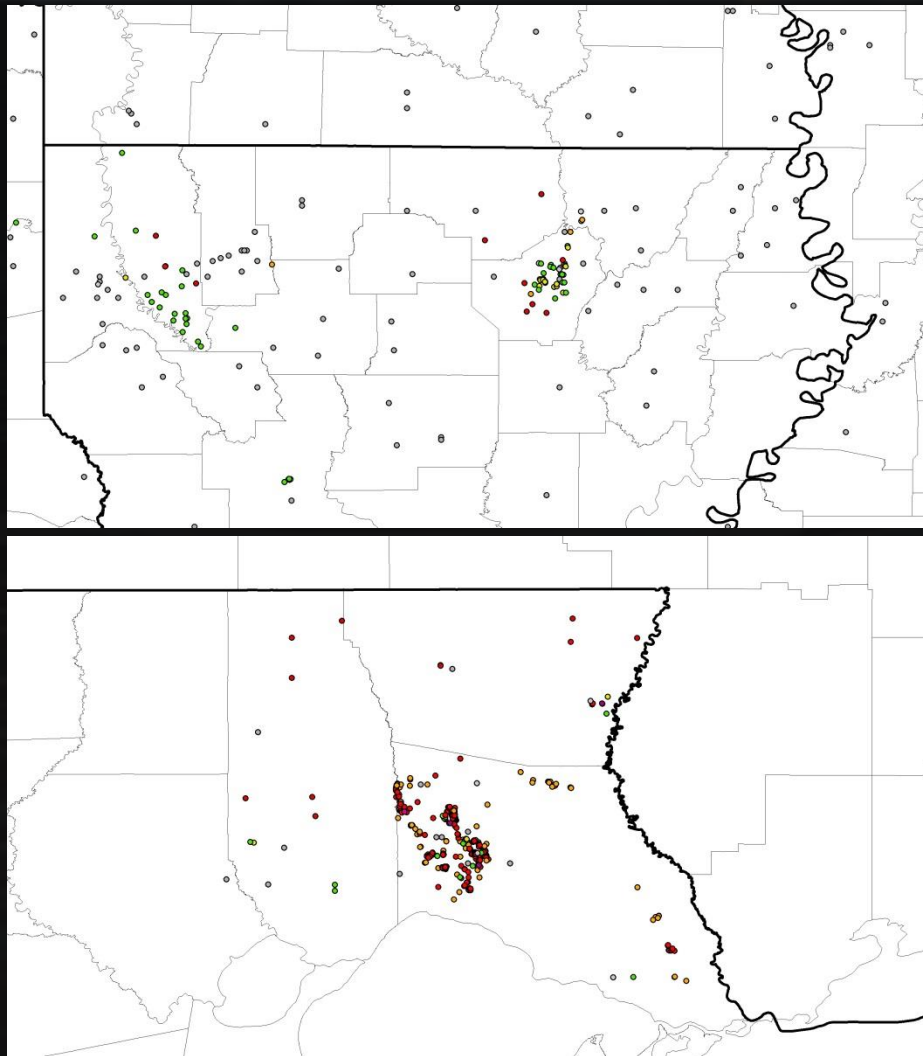Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer
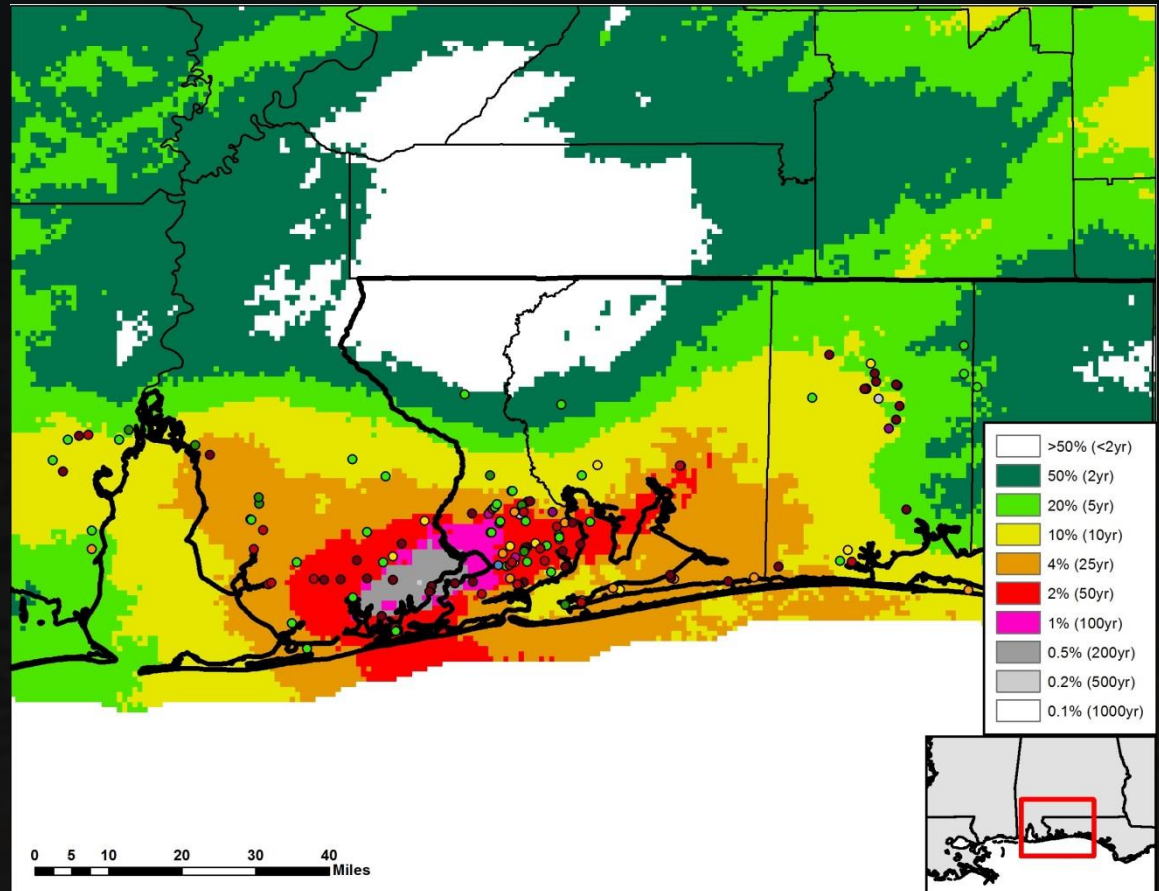
LA: February 2016 & March 2016
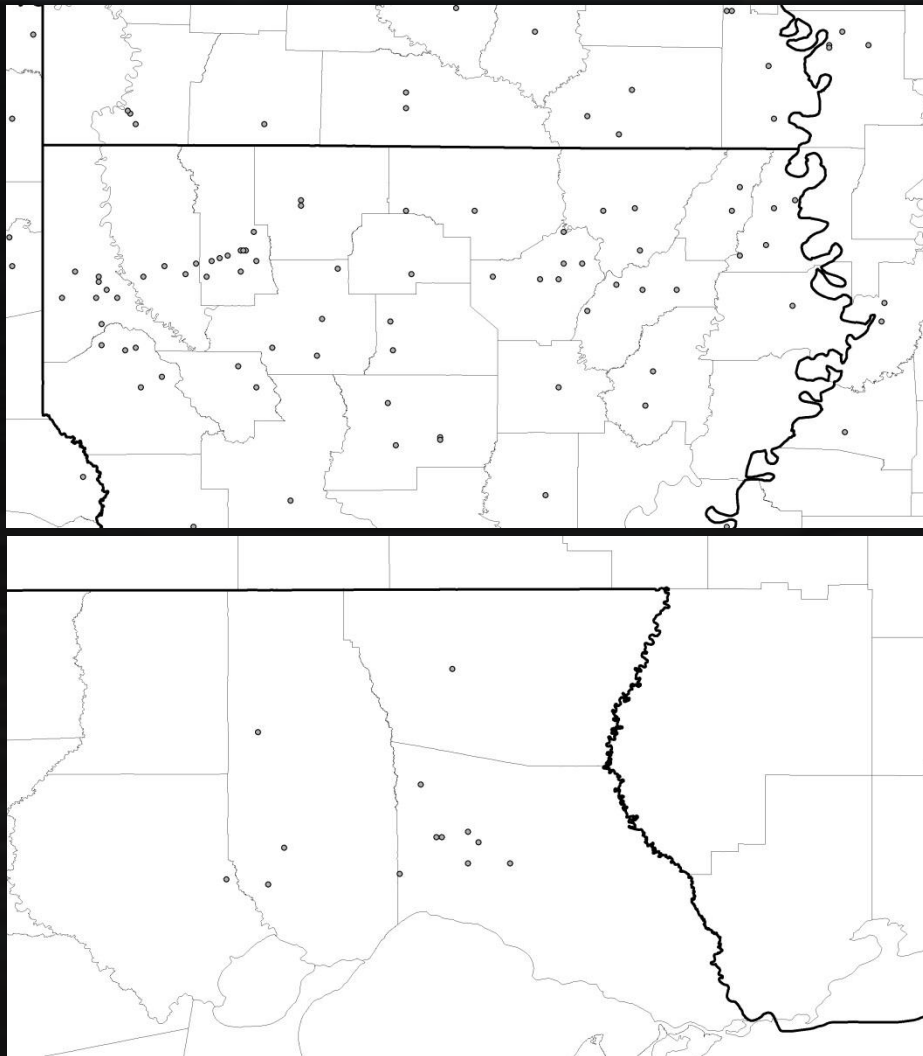
Analysis ongoing...

LA: February 2016 & March 2016

Analysis
ongoing...

Summary

- Geospatial analysis is about products and techniques

- Automation is key in operations

- Cross-platform considerations

- Expand thinking on how to obtain information and make it actionable data

- Expand thinking on what we think of as a geospatial analysis tool

REMOTE SENSING - GIS

- RADAR
- Weather Satellite
- River Gauges

- Flood Analysis
  - High Water Marks
  - Gauging records
  - International Charter
    - Satellite images of flooding
      - Extent AND Temporal record

Geospatial Analyses at the LMRFC
Lincoln & Schlotzhauer

Questions/Comments?

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