2015-2016 Winter Flood
Retrospective

USGS Missouri Water Science Center
Our Missouri Waters – Lower Meramec River Meeting

Photos courtesy of Post-Dispatch
Historic Rainfall

Annual Average Precipitation

Guinan, P., 2015, December 2015 Weather and Its Impacts on Missouri, Commercial Agriculture/University of Missouri Extension

USGS
Flood evolution depicted by real-time streamflow
Deployments and Logistics

Tethered Platforms

Manned Boat Platforms
# 1982-2015 Winter Flood Comparisons

<table>
<thead>
<tr>
<th>River / Location</th>
<th>1982 Crest (ft)</th>
<th>2015 Crest (ft)</th>
<th>Difference (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meramec Pacific</td>
<td>32.7</td>
<td>33.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Meramec Eureka</td>
<td>42.9</td>
<td>46.1</td>
<td>3.2</td>
</tr>
<tr>
<td>Meramec Valley Park</td>
<td>39.7</td>
<td>44.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Meramec Arnold</td>
<td>43.9 45.3 ('93)</td>
<td>47.3 2.0 ('93)</td>
<td>3.4 2.0 ('93)</td>
</tr>
<tr>
<td>Bourbeuse Union</td>
<td>33.8</td>
<td>34.3</td>
<td>0.5</td>
</tr>
</tbody>
</table>
### Preliminary Gage Statistics

**Period of Record Peak Stage/Discharge**

<table>
<thead>
<tr>
<th>Years of Record</th>
<th>Number of Streamgages</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;90</td>
<td>4</td>
</tr>
<tr>
<td>20-90</td>
<td>9</td>
</tr>
<tr>
<td>10-20</td>
<td>8</td>
</tr>
</tbody>
</table>
Peak Measurements

...and Annual Exceedance Probabilities (AEP’s)

USGS 07016500 Bourbouse River at Union, MO

0.2% < AEP > 0.5%

USGS 07019000 Meramec River near Eureka, MO

AEP 1%

USGS 06933500 Gasconade River at Jerome, MO

AEP 1%

USGS 05514860 Dardenne Creek at Old Town St. Peters, MO

AEP 1%
Meramec Flood Peak – December 30, 2015
Storage and Attenuation
Meramec Valley - Map Differencing

Early 80’s Topo/DEM contrasted with modern LiDAR
Floodplain Surface Change

Peerless Park

George Winter Park
Floodplain Surface Change

Valley Park / Peerless Landfill

Kirkwood Material Supply
Water Quality Sampling - Meramec River Flood

Feb, 2016 shifted to 3 sites on lower reach

Cross sections (left, mid, right) at most sites

Green circles are permitted outfalls
Meramec River Flood Deposit Sample Collection

- Concern about metals from historic mined areas in Big River (Ba, Cd, Pb, Zn)
- 121 Total Samples
- 94 Flood sediment
- 27 underlying soil

Samples to be analyzed for metals using X-ray fluorescence
Post Flood Data Collection

What?

Monumentation
- Perishable High-Water Marks
- Flood Extents

Observation and record of flood dynamics
Post-Flood Data Collection

High Water Marks

Pacific
Post-Flood Data Collection

High Water Marks

Valley Park - Grand Glaize WWTP
Post-Flood Data Collection

High Water Marks

Keyes Summit
Post-Flood Data Collection

High Water Marks

Fenton WWTP
Post-Flood Data Collection

Base Flood Elevation Corrections?

Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Meramec River at Eureka, MO.
Post Flood Data Collection

*Base Flood Elevation Corrections?*

Meramec River at Valley Park, MO

High Water Mark Cluster

Gage Peak

BFE 431

BFE 435.0

BFE 436.2

BFE 430
Post Flood Data Collection

High-Water Marks – Deer / Black Creek
Post Flood Data Collection

High-Water Marks – Bourbeuse River Union
Post Flood Data Collection

High-Water Marks – Big River Reach
Post Flood Data Collection
High-Water Marks - Lower Meramec Basin
High Water Marks to Hydraulic Modeling
Flood Inundation Maps translate a hydrograph into operational maps that communicate risk and consequences.
FIM becomes a tool for flood…

- Preparedness
  - “What-if” scenarios
- Response
  - Tied to gage & forecast data
- Recovery
  - Damage assessment

- Mitigation & planning
  - Flood risk analyses
- Environmental & ecological assessments
FIM Mapper – more than just maps

Flood Library

USGS Flood Forecast

http://water.usgs.gov/osw/flood_inundation/
ESTIMATED FLOOD CONDITIONS

Selected Gage Height: 20.00 feet
Selected NAVD88 Altitude: 718.43 feet

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor flooding</td>
<td>28.86 feet</td>
</tr>
<tr>
<td>Moderate flooding</td>
<td>31.40 ft</td>
</tr>
<tr>
<td>Major flooding</td>
<td>32.00 ft</td>
</tr>
</tbody>
</table>

2/27/12 2/29/12 3/2/12 3/4/12 3/6/12 3/8/12 3/10/12

Action Stage

Current Gage Height: 28.86 feet
Discharge: 15,100 cfs

USGS Site Number: 04189260 Provisional Data, Subject to Revision
NWS Site ID: OTTO1 Forecast Subject to Revision
ESTIMATED FLOOD CONDITIONS

Selected Gage Height: 23.00 feet
Selected NAVD88 Altitude: 721.43 feet

Observed Predicted

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>32</td>
<td>30</td>
<td>28</td>
<td>26</td>
<td>24</td>
<td>22</td>
<td>20</td>
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<tr>
<td>2/27/12</td>
<td>2/29/12</td>
<td>3/2/12</td>
<td>3/4/12</td>
<td>3/6/12</td>
<td>3/8/12</td>
<td>3/10/12</td>
</tr>
</tbody>
</table>

Action stage
- Minor flooding
- Moderate flooding
- Major flooding

Current Gage Height: 28.86 feet
Discharge: 15,100 cfs

USGS Site Number: 04169260  Provisional Data, Subject to Revision
NWS Site ID: OTTO  Forecast Subject to Revision
ESTIMATED FLOOD CONDITIONS

Selected Gage Height: 29.00 feet
Selected NAVD88 Altitude: 727.43 feet

Observed Predicted
2/27/12 2/29/12 3/2/12 3/4/12 3/6/12 3/8/12 3/10/12

Action stage
Minor flooding
Moderate flooding
Major flooding

Current Gage Height: 28.86 feet
Discharge: 15,100 cfs

USGS Site Number: 04189260  Provisional Data, Subject to Revision
NWS Site ID: OTTO1  Forecast Subject to Revision
Blue River, Kansas City, Missouri - Historical Flooding

Click on an historical flood to see the estimated extent. Due to changes in the channel and urbanization over time, these areas are only an estimate using 2012 modeled conditions. These numbers are provided for historical context only and are not reviewed inundation areas for the selected flood height.

*Please visit the USGS NWIS Flood Peaks Page for more information on flagged peaks and the full flood peak record.
Blue River, Kansas City, Missouri
Services and Data – Water Alert....

Sign up for WaterAlert for this site
Water information texted directly to you...
simply subscribe to WaterAlert!

Project Contacts for more information
Maps created by
Missouri Water Science Center
Maps reviewed by
Illinois Water Science Center
Rhode Island Water Science Center

Data Downloads and Metadata
Download Data

References
Download Report
### WaterAlert form

**Site number, sent by mapper**

**Personal info**

**Threshold level, selected by mapper**

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**Subscription Form**

<table>
<thead>
<tr>
<th>Site Info:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Number:</td>
<td>04182000</td>
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<tr>
<td>Agency:</td>
<td>USGS</td>
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<tr>
<td>Transaction ID:</td>
<td>mw3Kc</td>
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</table>

**Send Notification To:**

- My mobile phone
  - 608-239-2702
  - AT&T

**Notification Frequency:**

- Hourly
- Daily

**Parameter:**

undefined (undefined)

**Threshold Condition:**

Real-time value is: Greater than [ ] ft

I have read and acknowledge the Provisional Data Statement [link] and [link].

[Submit, Reset, Cancel]
Water Depth: 4.5 - 5.5 ft
BENEFITS of Flood Inundation Mapping

State Agencies
- State EMA can better focus state flood response & recovery resources
- State DOT can quickly assess potential road/bridge damage
- State health departments can focus resources on special populations and facilities
- State environmental agencies can determine where pollutant impacts may occur from infrastructure damage
BENEFITS of Flood Inundation Mapping

Local Agencies

- EMA director can focus warnings using automated technologies to get people/property out of harm’s way
- Evacuation routes can be assessed quickly for flood access
- Police would know where to place barricades in advance of flood crest to block flooded roads and prevent accidents
- Officials would have answers quickly
- Public can be better educated to threat of floods