High Water Mark Documentation
October 25, 2016
Association of State Floodplain Managers
AGENDA

• Welcome and Call Instructions (5 min)
• ASFPM Science Services Program (5 min)
• High Water Mark Hunting (USGS, 20 min)
• USGS Flood Event Viewer (USGS, 20 min)
• Discussion Topics (webinar topics), (5 min)
• Closing Comments (5 min)
Open and hide your control panel using the red arrow button

Join audio:
- Choose “Mic & Speakers” to use VoIP
- Choose “Telephone” and dial using the information provided

Submit questions and comments via the Questions panel
AUDIO AND WEB SETTINGS

• All lines will be automatically be muted.
• Use the Question window in your webinar control panel to submit your question or comment to the ASFPM Organizer.
• Select questions will be read to the presenter and answered.
• Questions not asked during the webinar will be answered and made available in a follow-up email.
ASFP FM FLOOD MAPPING FOR THE NATION

- Audience: Congress
- National Cost: $4.5 billion - $7.5 billion to map
- Maintenance: $116 million – $275 million annually
- Cited in congressional testimony and in comments on TMAC report
ASFPM SCIENCE SERVICES PROGRAM

ASFPM Science Services Program

FEMA RiskMAP support

• Provide training via routine webinars
• Document Best Practices
• Provide mentoring to Cooperating Technical Partners
Co-chairs:
• Amanda Flegel, PE, CFM; Illinois State Water Survey
• Thuy Patton, PE, CFM; Colorado Water Conservation Board

Goals:
Identify common concerns, provide opportunities for information exchange, identify training needs, promote and document the value of CTPs
HWM Hunting
Field guide and best practices

Todd Koenig,
USGS Office of Surface Water

(USGS T&M 3-A24 by Todd Koenig, Jennifer Bruce, Jim O’Connor, Ben McGee, Bob Holmes, Ryan Hollins, Brandon Forbes, Mike Kohn, Matt Schellekens, Zach Martin, and Marie Peppler)

https://pubs.er.usgs.gov/publication/tm3A24
Tranquil-water vs Rapid-water HWMs
Common tranquil-water HWMs

- Mud lines
- Seed lines
- Debris lines
- Ice Rings
Common tranquil-water HWMs

- Mud lines
- Seed lines
- Debris lines
- Ice Rings
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USGS
Common tranquil-water HWMs

- Mud lines
- Seed lines
- Debris Lines
- Ice Rings
Common *rapid*-water HWMs

- Cut lines
- Wash lines
- Mud lines
- Debris snags
Common *rapid*-water HWMs

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Engineered HWMs

- Crest-stage gages (CSGs)
- Crest-stage indicators
- Image Capture
Engineered HWMs

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...Questions so far?
Preserving HWM data

- Location
- Evaluation
- Marking and flagging
- Recording
Preserving HWM data

- Location
Preserving HWM data

- **Location**

- **Evaluation**

- **Marking and Flagging**

- **Recording**

<table>
<thead>
<tr>
<th>Vertical Uncertainty</th>
<th>Shorthand</th>
</tr>
</thead>
<tbody>
<tr>
<td>within ±0.05 feet</td>
<td>Excellent (E)</td>
</tr>
<tr>
<td>within ±0.10 feet</td>
<td>Good (G)</td>
</tr>
<tr>
<td>within ±0.20 feet</td>
<td>Fair (F)</td>
</tr>
<tr>
<td>within ±0.40 feet</td>
<td>Poor (P)</td>
</tr>
<tr>
<td>more than ±0.40 feet</td>
<td>Very Poor (V)</td>
</tr>
<tr>
<td>HWM defines min height of unknown peak</td>
<td>At least this high (ALTH)</td>
</tr>
</tbody>
</table>
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Preserving HWM data

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![USGS HIGH WATER MARK FORM]

<table>
<thead>
<tr>
<th>Site Visit Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATION ID:</td>
</tr>
<tr>
<td>STATION NAME:</td>
</tr>
<tr>
<td>SITE DESCRIPTION:</td>
</tr>
<tr>
<td>WATERBODY:</td>
</tr>
<tr>
<td>LAND OWNER:</td>
</tr>
<tr>
<td>ADDRESS:</td>
</tr>
<tr>
<td>EMAIL:</td>
</tr>
<tr>
<td>PARTY:</td>
</tr>
<tr>
<td>START TIME(UTC):</td>
</tr>
<tr>
<td>END TIME(UTC):</td>
</tr>
<tr>
<td>WEATHER:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site Visit Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flagging HWMs only</td>
</tr>
<tr>
<td>Retrieving flagged HWMs</td>
</tr>
<tr>
<td>Levels Run</td>
</tr>
<tr>
<td>Pictures Taken</td>
</tr>
<tr>
<td>Site Sketch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Datum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal datum:</td>
</tr>
<tr>
<td>How was it determined:</td>
</tr>
<tr>
<td>Vertical datum:</td>
</tr>
<tr>
<td>How was it determined:</td>
</tr>
<tr>
<td>Type of &quot;on-site&quot; Objective Point used to determine HWM elevation(NGSBM, RM, RP):</td>
</tr>
<tr>
<td>Elevation:</td>
</tr>
<tr>
<td>Name(If NGSBM, PID/DES):</td>
</tr>
<tr>
<td>Description:</td>
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</tbody>
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<table>
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<tr>
<th>High Water Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWM Elevation:</td>
</tr>
<tr>
<td>(+/-):</td>
</tr>
<tr>
<td>Razed:</td>
</tr>
<tr>
<td>Environment (coastal, riverine):</td>
</tr>
<tr>
<td>Type (runup, wave, stillwater):</td>
</tr>
<tr>
<td>Location (lat/long):</td>
</tr>
<tr>
<td>How was elevation determined:</td>
</tr>
<tr>
<td>Description (seed line, debris, mud):</td>
</tr>
<tr>
<td>Height above ground:</td>
</tr>
<tr>
<td>Date Flagged:</td>
</tr>
<tr>
<td>Date Surveyed:</td>
</tr>
</tbody>
</table>
Best practices (avoiding pitfalls)

- Safety First
- Respond Quickly
- Look up
- Stand back
- Visualize the flood
- Hunt for hidden clues
- Think ahead
- When in doubt, collect more data
Best practices (avoiding pitfalls)

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- Visualize the flood

- Imagine water at its peak stage.
- How would the water need to behave to meet HWMs (e.g. super-elevation at bends)?
- Are roadways interfering with flow or providing side channels?
- How did the water behave around large obstructions (build-up, draw-down, slack-water)?
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http://water.usgs.gov/floods/resources/igm/
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Photo courtesy of Ben McGee, LMG-WSC
...Questions so far?
Collecting Data: Flood Event Viewer

EVENT:
Matthew October 2016
3 Oct 2016

BASEMAPS ➔
FILTERS ➔
GET DATA ➔

POWERED BY WIM

1:9,244,649 | 6
33.9454 | -86.2732
Collecting Data: Flood Event Viewer

Flood Event Viewer

EVENT:
Matthew October 2016
3 Oct 2016

BASEMAPS

STREETS
SATELLITE
TOPO
TERRAIN
GRAY
NATGEO

FILTERS

GET DATA

POWERED BY WIM

MAP LAYERS

Sensor Data
- Real-time Stream Gage *
- Barometric Pressure Sensor
- Storm Tide Sensor
- Meteorological Sensor
- Wave Height Sensor
- Rapid Deployment Gage

Observed Data
- High Water Mark
- Peak Summary

NOAA Layers
- Tropical Cyclone Track
- National Geodetic Survey Imagery

*available at zoom level 8 and above
Collecting Data: Flood Event Viewer
Collecting Data: Flood Event Viewer
Collecting Data: Flood Event Viewer

HWM Files

Photo of Mark inside residence at HWM found and surveyed with RTN Campaign. USGS Survey nail in road inside residence could be used to establish future cross sections. Photograph by Ryan Hembree, USGS FL.

HWM Information

- Provisional or Approved: Provisional
- Event: Hermin
- HWM Type: Seed line
- Marker: Not marked
- HWM Environment: Coastal
- Bank: Excellent: +/- 0.05 ft
- Location Description: N/A
- Latitude: 29°47'17.64", 83°35'37.53"
- Longitude: -83.59388
- Horizontal Datum: WGS84 (from Digital Map)
- Horizontal Collection Method: Handheld GPS
- Height Above Ground: 3.01
- Flag/Found Date: 09/09/2016
- Surveyed Date: 09/12/2016
- Surveyed Elevation: 9.31
- Vertical Datum: NAVD88
- Vertical Collection Method: Level Gun
- Notes: Ran from GNS5 BM established 1

Photo of HWM at HWM found and surveyed with RTN Campaign. USGS Survey nail in road inside residence could be used to establish future cross sections. Photograph by Ryan Hembree, USGS FL.
Collecting Data: Flood Event Viewer

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Matthew October 2016
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BASEMAPS
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POWERED BY WIM

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Collecting Data: Flood Event Viewer

Use buttons to access event-based data, reflecting the filters chosen above.

- Sensor Data
- High-water Mark Data
- Peak Summary Data

Visit the STN Data Portal for broader data retrieval capability.
Introduction

The USGS Short-Term Network (STN) System includes data services that power the web data entry application, public and internal mapping application and numerous other applications. The services can be directly accessed using the STN Service API documented here, or consumed by a custom client application using HTTP protocols. If you have any questions about the services or need additional services, please contact Marie Peppler (mpeppler@usgs.gov).

The STN Web Services API performs multiple high level procedures which include: database queries, geospatial queries and service requests in order to compile and create simple objects that can be consumed by custom client applications. As documented by this page, which can also serve as an URL builder, the STN Service API is built following RESTful principles to ensure scalability and predictable URLs.

Getting Started

The URL of each resource can be obtained by accessing one of the resources located to the left.

Every resource is exposed as a URL and follows the outlined pattern described below:
- The description of the resource
USGS Floods Website:

http://water.usgs.gov/floods

or search: USGS floods

USGS Flood Information

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MONTH</th>
<th>TYPE</th>
<th>EVENT NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Oct</td>
<td>Hurricane</td>
<td>Hurricane Matthew</td>
<td>A severe hurricane crossed Cuba and the Bahamas on its way toward the Florida coast.</td>
</tr>
<tr>
<td>2016</td>
<td>Sep</td>
<td>Inland Flooded</td>
<td>2016 September Northern Plains Floods</td>
<td>More than 12 inches of rain fell across the northern Plains.</td>
</tr>
</tbody>
</table>

USGS Flood Reports:

Examination of flood characteristics at selected streamgages in the Meramec River Basin, eastern Missouri, December 2015–January 2016 (September 13, 2016) Heavy rainfall resulted in major flooding in the Meramec River Basin in eastern Missouri during late December 2015 through early January 2016.

Flood publications
(by year of flood):

- 2010 to present
- 2000 to 2009
- 1990 to 1999
- 1970 to 1989
- 1950 to 1969
- 1900 to 1949
Questions?

High-water marks:

https://pubs.er.usgs.gov/publication/tm3A24

or search: USGS HWM TM

Flood Event Viewer:

http://water.usgs.gov/floods/FEV/

or search: USGS FEV
STRATEGIES TO ESTABLISH FLOOD FREQUENCIES ASSOCIATED WITH FLOOD EVENT HIGH WATER MARKS

June 2014

CLOSING COMMENTS

- ASFPM Abstracts for 2017 Conference in Kansas City Due October 31, 2016
- To suggest future CTP web meeting topics contact Alan Luloff (alan@floods.org)
- Or type in suggested topics in comment line today

Thank You for Joining Us!