Chehalis River Basin Flood Warning System

David C. Curtis, Ph.D.

WEST Consultants, Inc.

November 21, 2013

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2007

THE OREGONIAN/Bruce Ely

Photo by Bob Walter

2009

http://www.komonews.com/weather/blogs/scott/37346554.html

http://www.katu.com/news/37243024.html

Flood Warning System

- Phase I Conceptual Design
  - Understand the “Needs” of the Authority
  - Improve Existing Flood Warning Programs
    - Technical and informational
  - Consider Additional Funding Sources
  - Present Information to Flood Authority
  - Discuss Path Forward (Phases 2 and 3)

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Needs Assessment

- Improve River Forecast
  - Precipitation Monitoring
  - Snow Pack Monitoring
  - Improve Stream Gaging
  - Reservoir Levels & Release Plans
  - Dam Failure Warning
- Improve Communication
  - Web-based Data and Warning

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Design/Build Flood Warning System

- Improve Monitoring Network
  - 8 Rain/Temperature Stations
  - 2 Rain/Temperature/Stream Stations
- Internet Data and Warning
- Inundation Mapping

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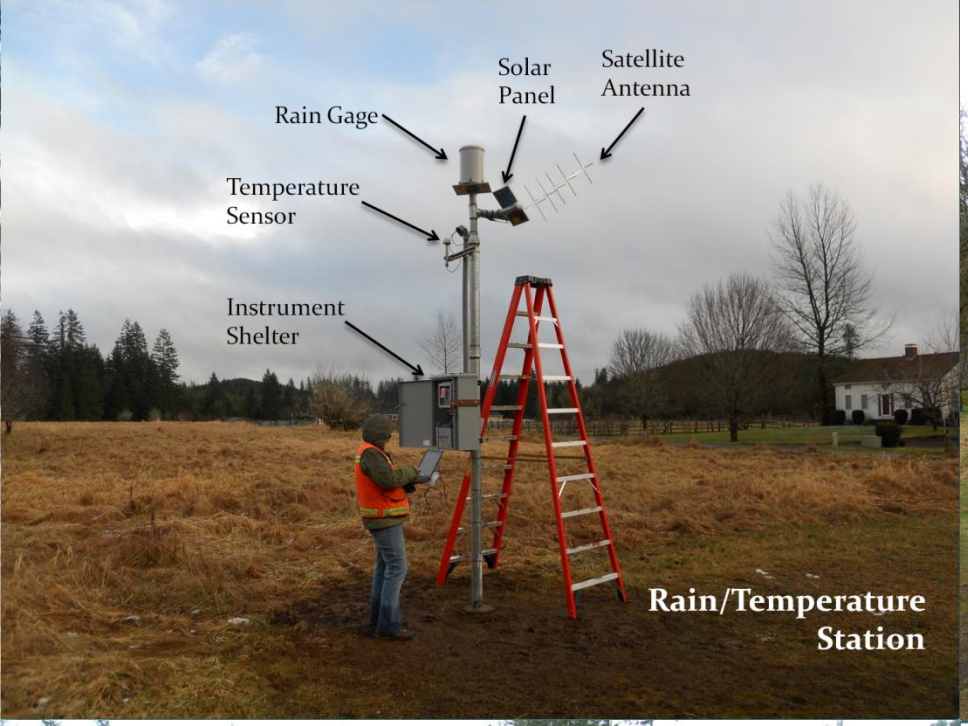
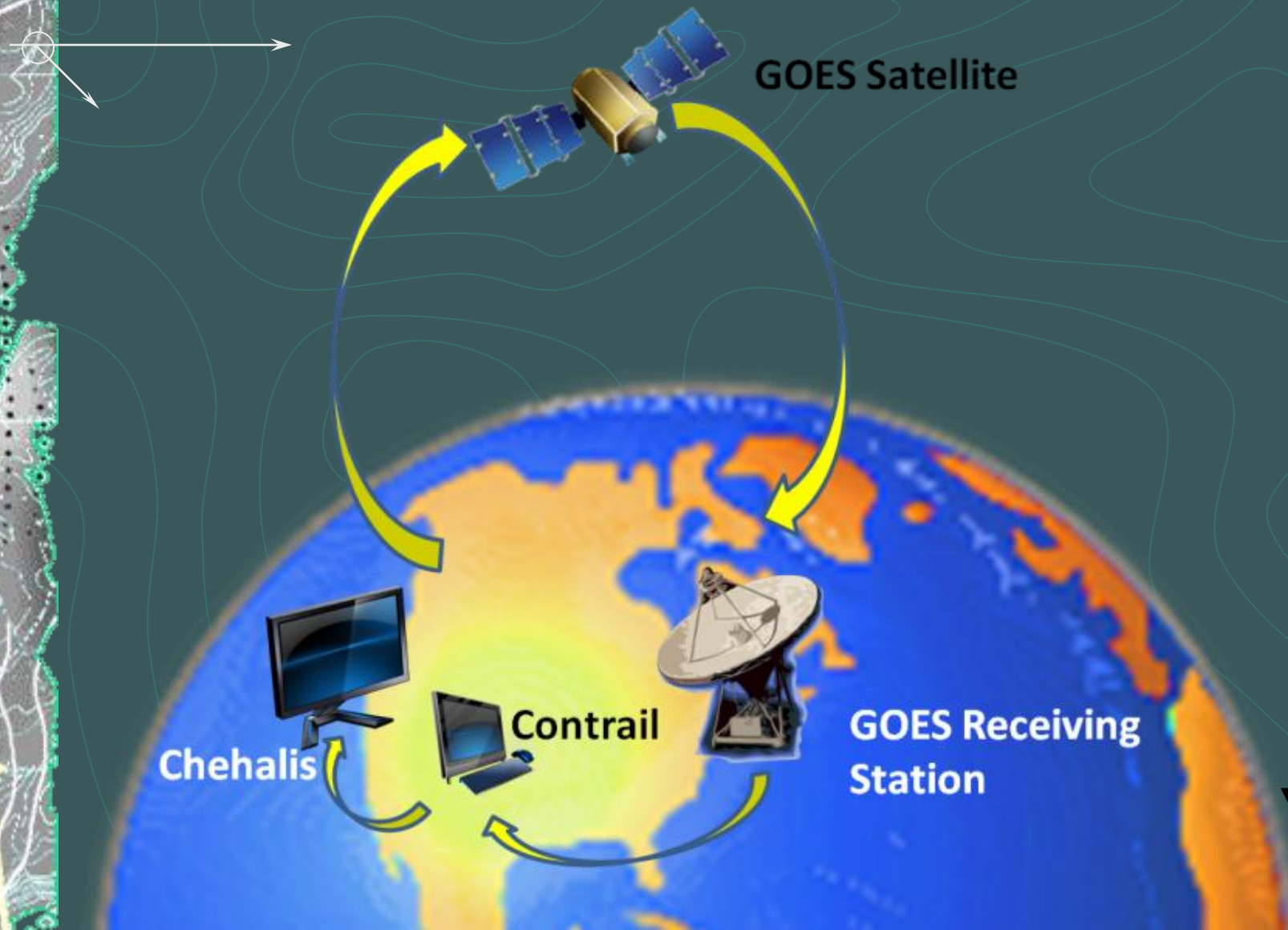


New Gage Sites

Data Collection/Management



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Contrail® Web

www.chehalisriverflood.com

Guest | Help | Sign In

CHEHALIS RIVER BASIN FLOOD AUTHORITY

Menu

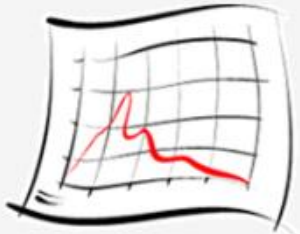
- Home
- Maps
- Sites
- Graphs
- News

Links

- Flood Authority Projects
- Grays Harbor Emerg. Mgmt.
- Thurston County Emerg. Mgmt.
- Lewis County Emerg. Mgmt
- Chehalis Basin Radar
- Chehalis Flood Authority Website
- USACE Chehalis Basin
- Chehalis River at Porter
- Chehalis River at Grand Mound
- Chehalis River at Centralia
- Chehalis River Near Doty
- Skookumchuck River at Centralia

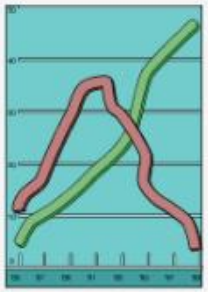
Weather Forecast

Rainfall Forecast



River Forecast

Flood Maps



Gage Data Graphs

Gage Data Maps

Flood Authority News

Road Conditions

USGS Gages

Help

For support please contact: contrail.support@onerain.com (303) 774-2033
Times are displayed in US/Pacific

Observation Network

- 60 Sites
- 156 Sensors
  - Barometric Pressure
  - Dew Point
  - Stream Stage
  - Stream Flow
  - Rain
  - Temperature
  - Tide Elevation
  - Tide Prediction
  - Water Temperature
  - Wind Direction
  - Wind Gust
  - Wind Speed
  - Reservoir Elevation

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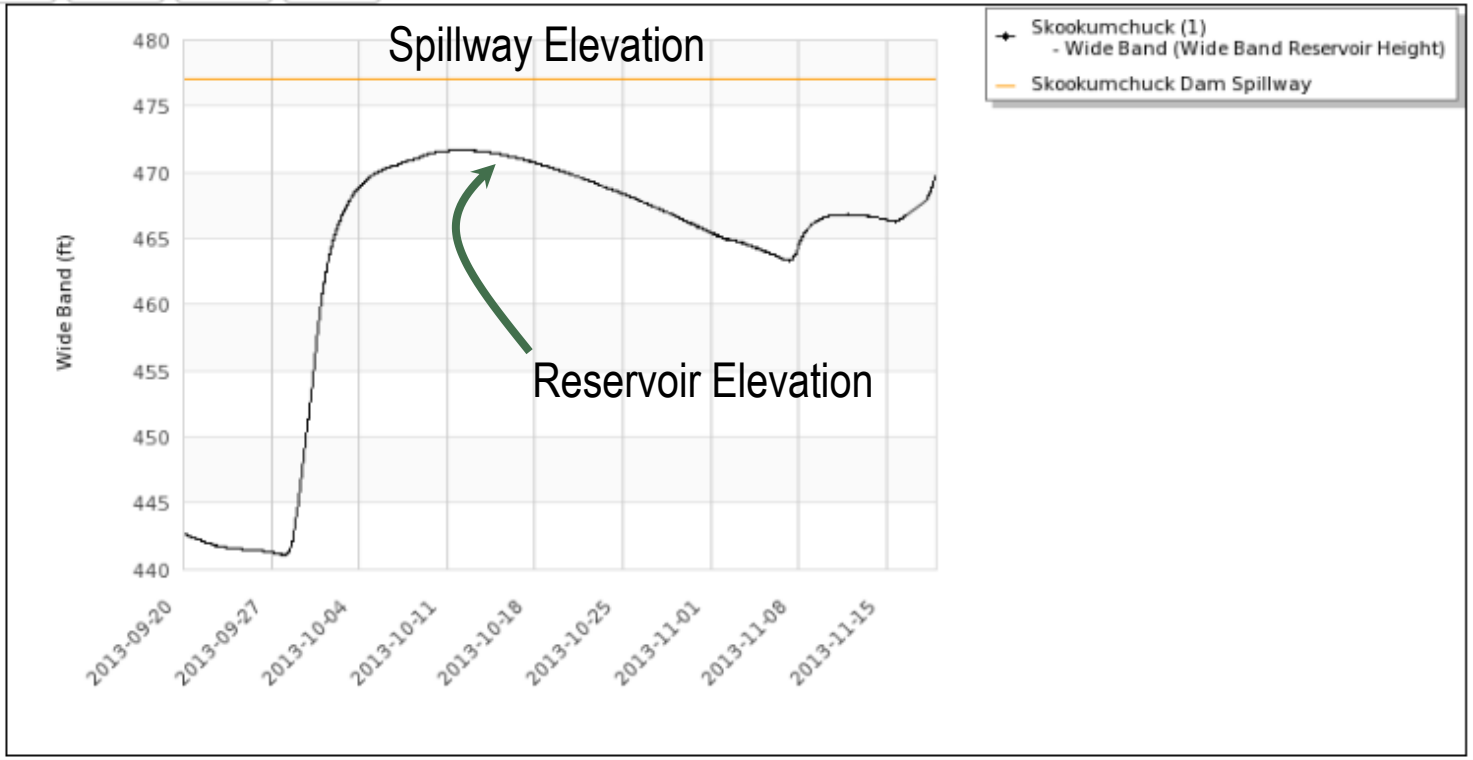
Skookumchuck Reservoir

Graph

Reload Open Bookmark

Event Data



Advanced Panel

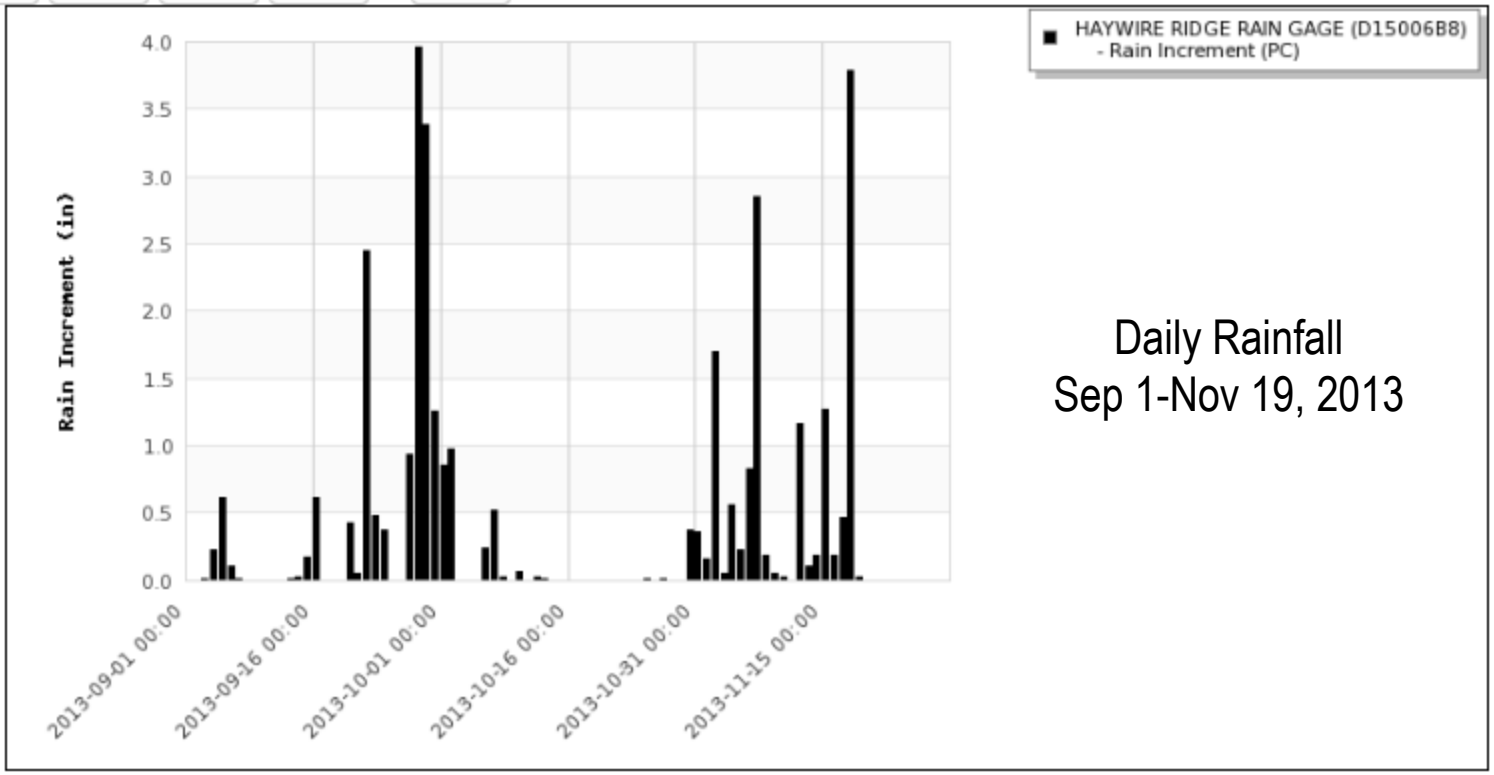
Close

Haywire Rain Observations

Graph

Reload | Open | Bookmark

Hyetograph



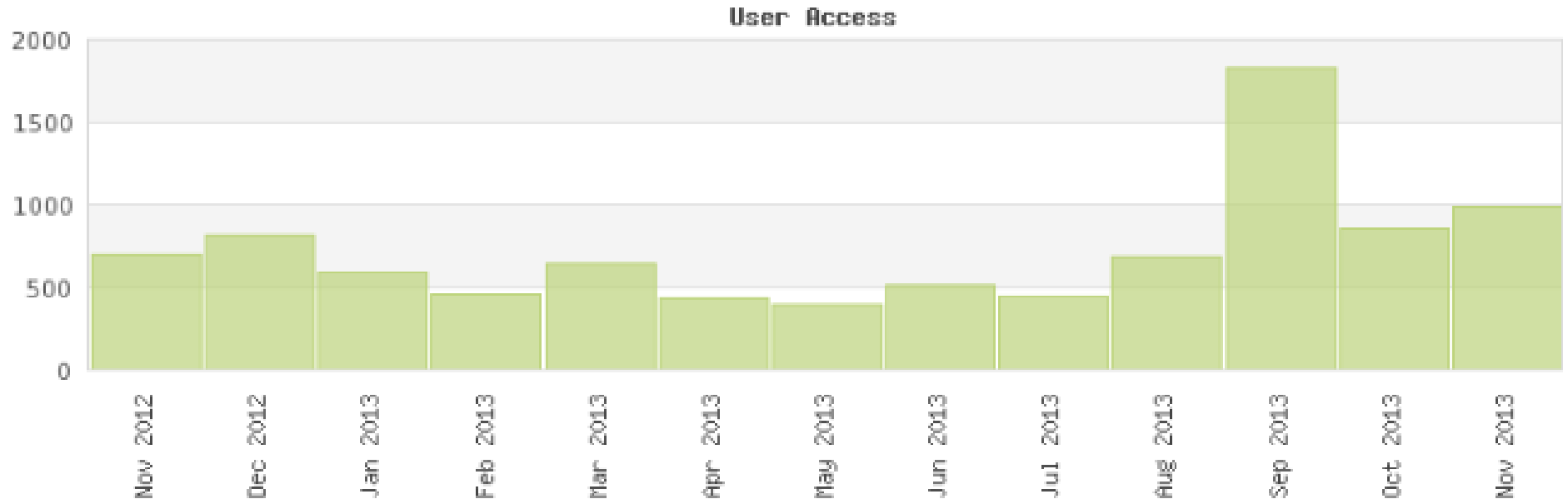
Daily Rainfall
Sep 1-Nov 19, 2013

Close

Website Usage

Account Administration

User access. Logins and logouts.



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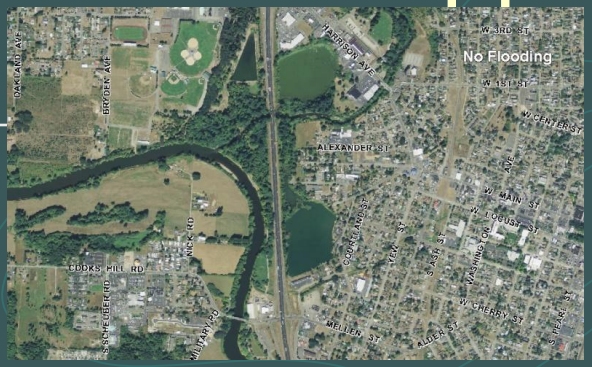
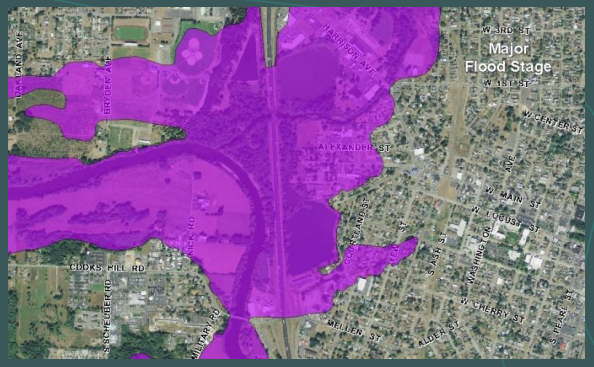
Inundation Mapping

No Flood



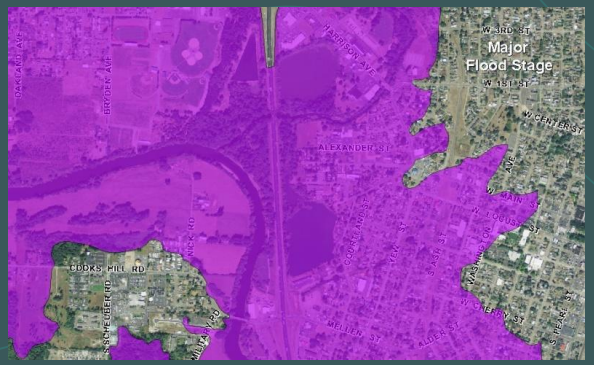
Moderate

Action



Major

Minor



Major

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New Inundation Maps

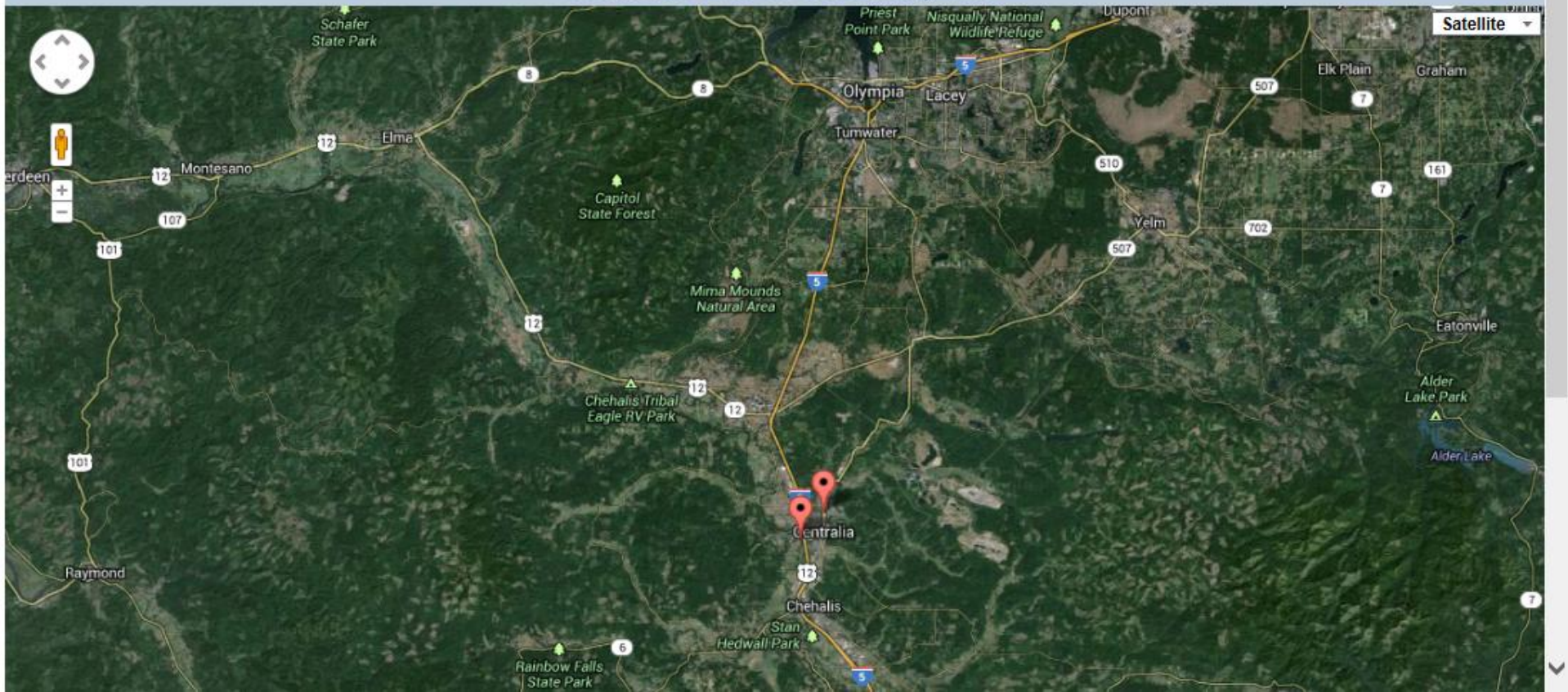
www.chehalisriverflood.com

CHEHALIS RIVER BASIN FLOOD AUTHORITY

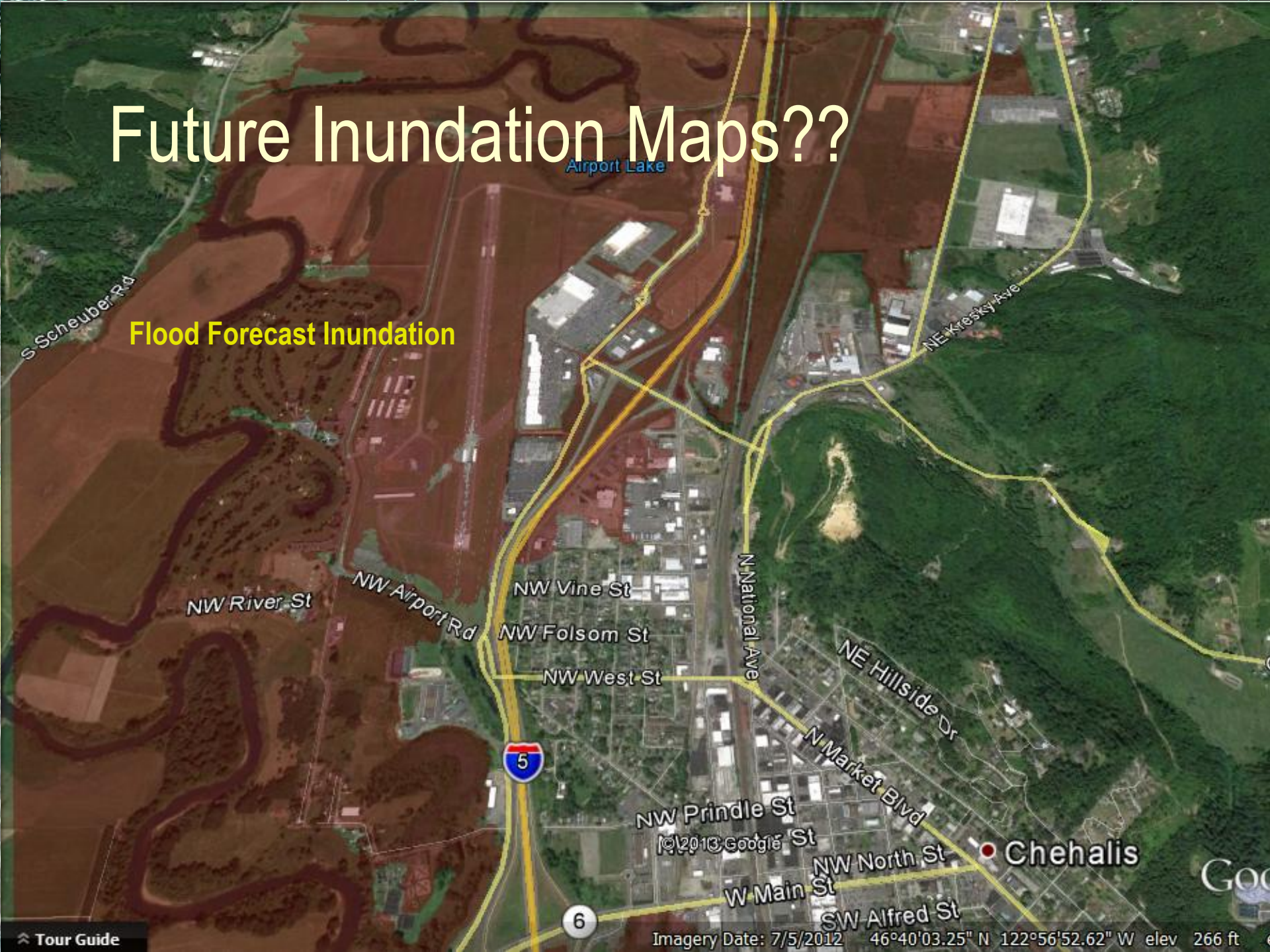
Flood Inundation Maps

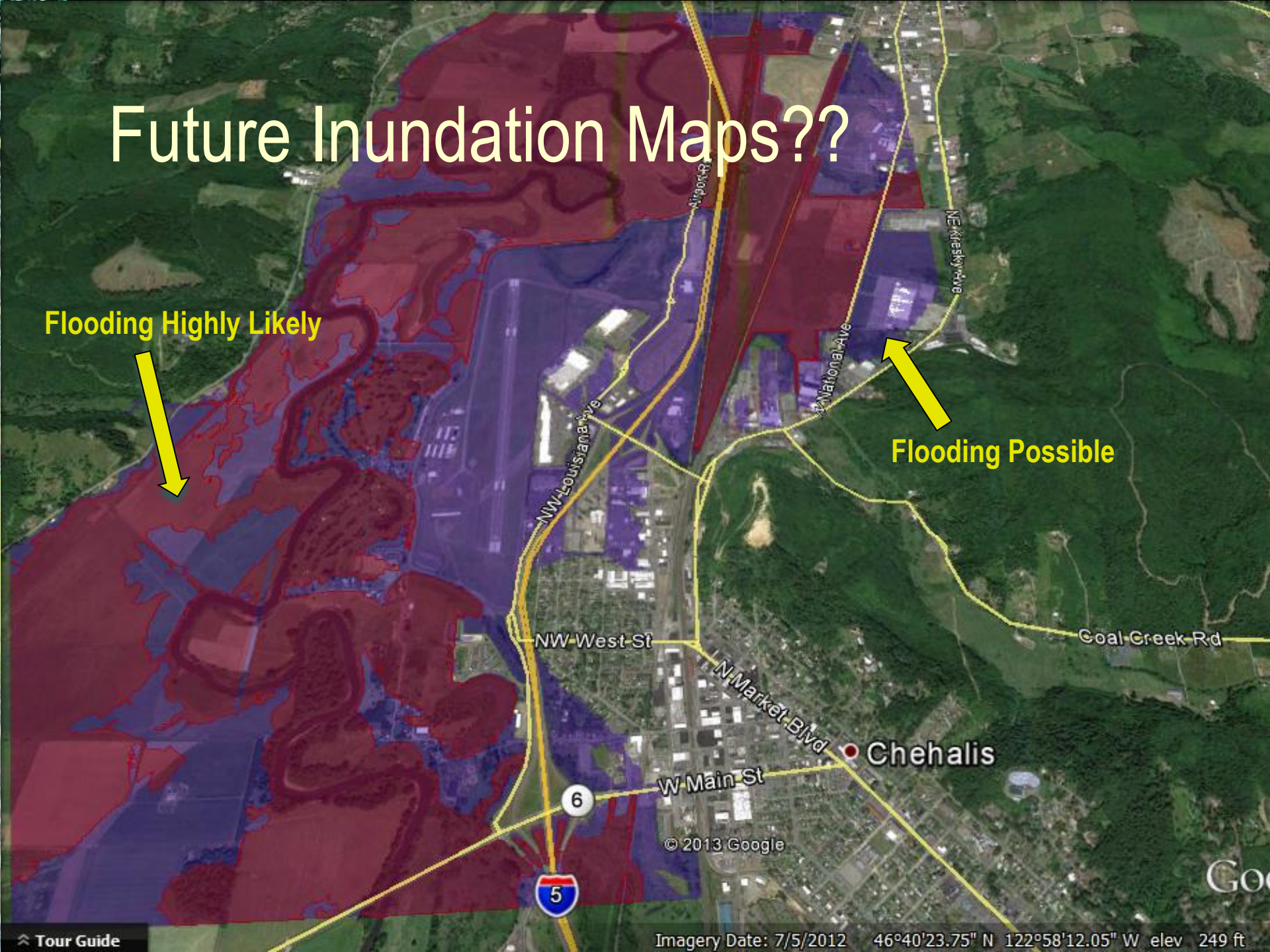
Select a gage location: Base Map

Chehalis River at Centralia, WA



Future Inundation Maps??




Future Inundation Maps??
Flooding Highly Likely
Flooding Possible
NW Louisiana Ave
NW West St
N Market Blvd
Chehalis
W Main St
6
5
Coal Creek Rd
© 2013 Google
Tour Guide
Imagery Date: 7/5/2012 46°40'23.75" N 122°58'12.05" W elev 249 ft

Statewide Application

- Scalable Solution
- Washington Emergency Management
- Department of Ecology
- Build commitment

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Flood Warning Systems Around the US

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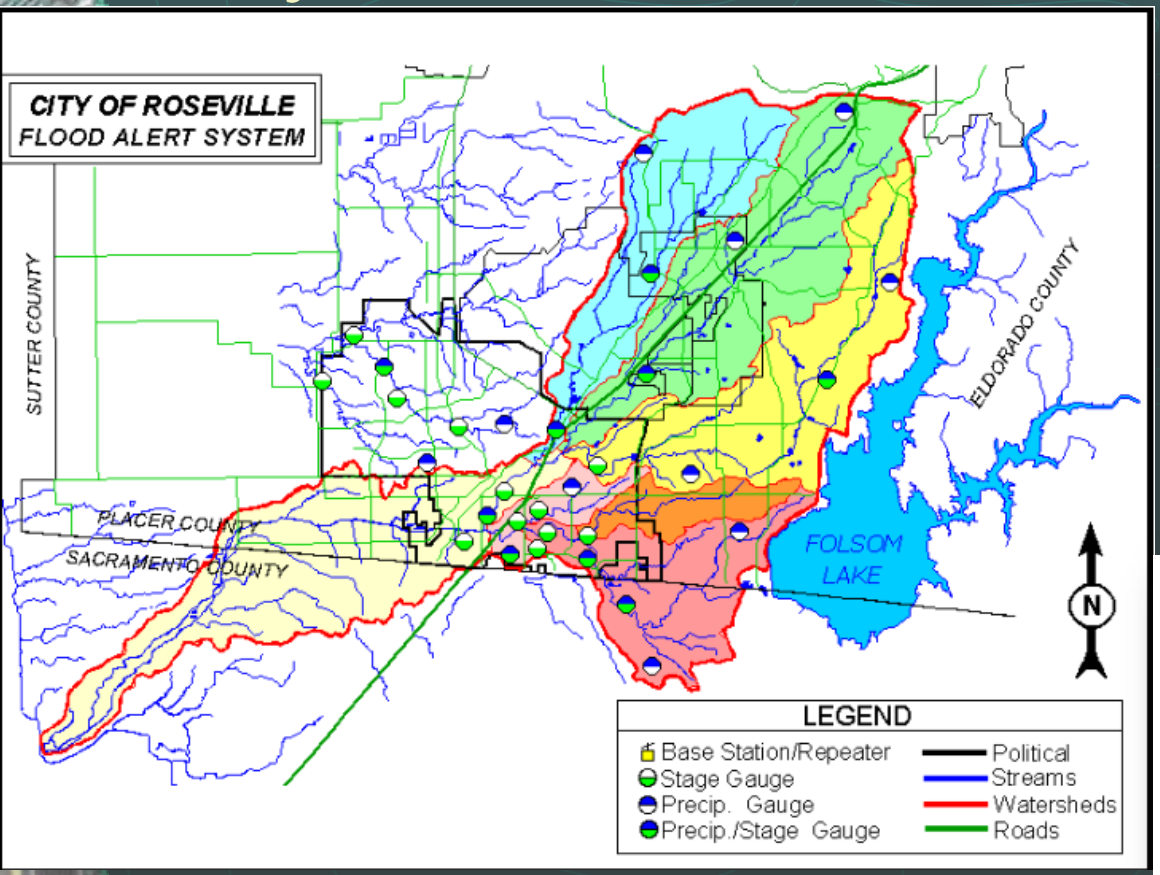
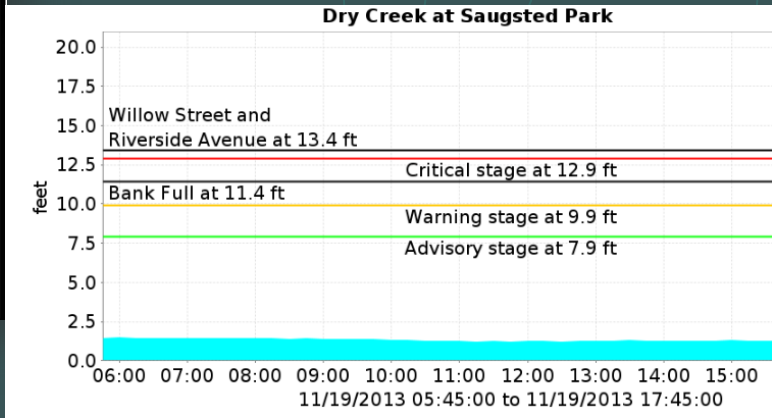
City of Roseville, CA





Data list **Show data**

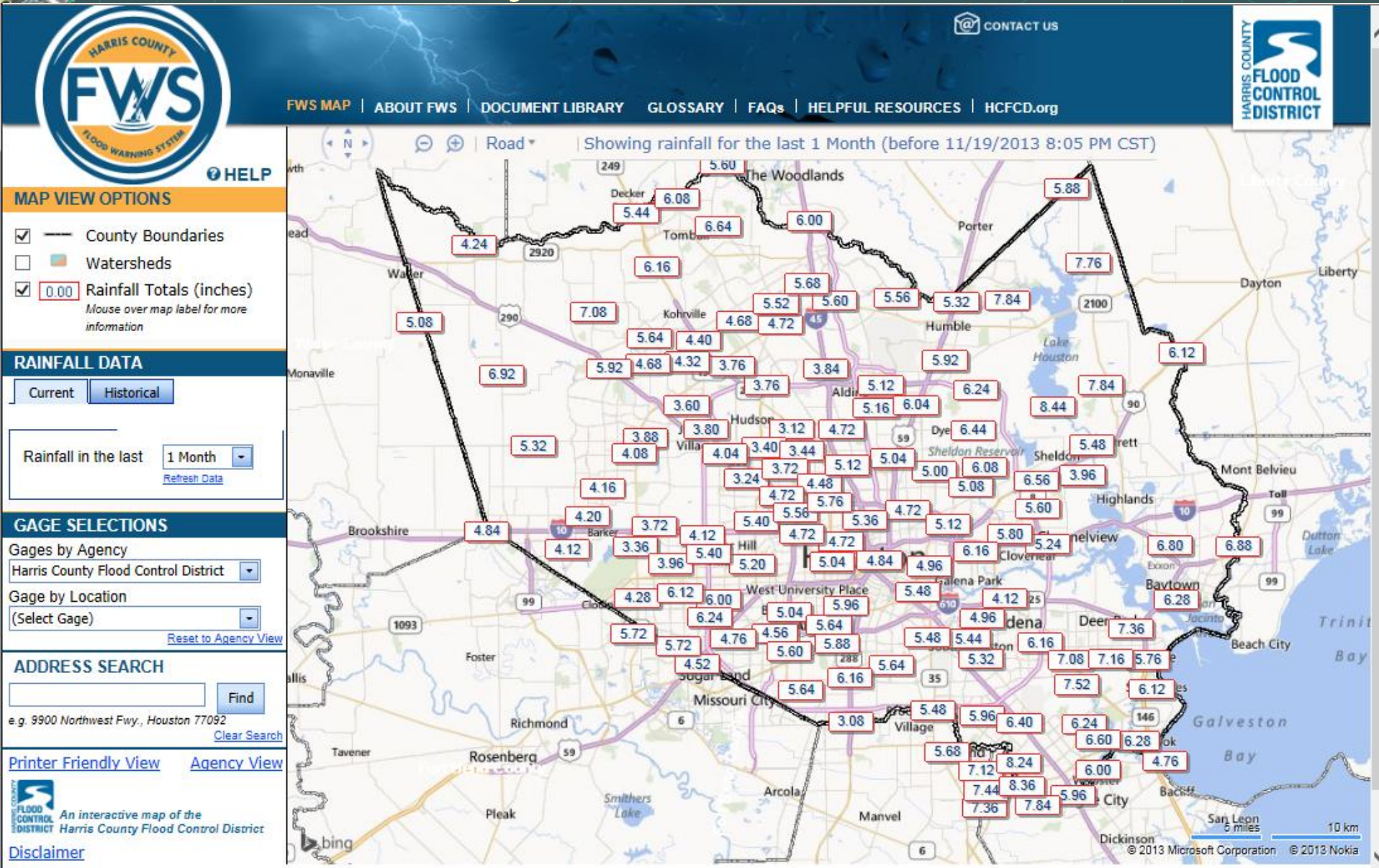
Water Level

Current Elevation	Last Report Time	15 Minute Change
1.34	11/19/2013 17:30:23	0.00

Plot precipitation data **Show watershed precipitation**

Warning! This report contains provisional data from automated gages and has **NOT** been verified for accuracy.

Harris County, TX



The Rice University and Texas Medical Center
Flood Alert System

RICE
Unconventional Wisdom

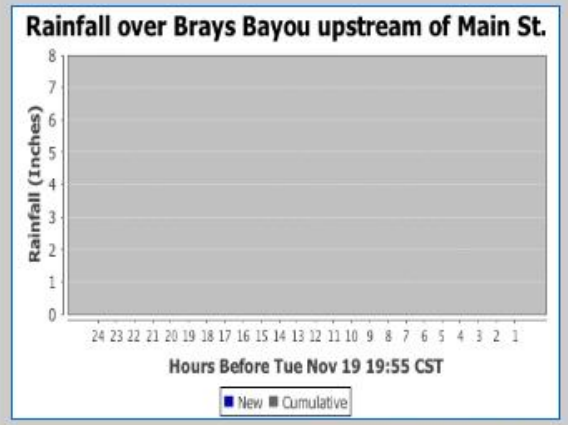
Home | Radar | Rainfall | Bayou Cam | Hydrology | Case Studies

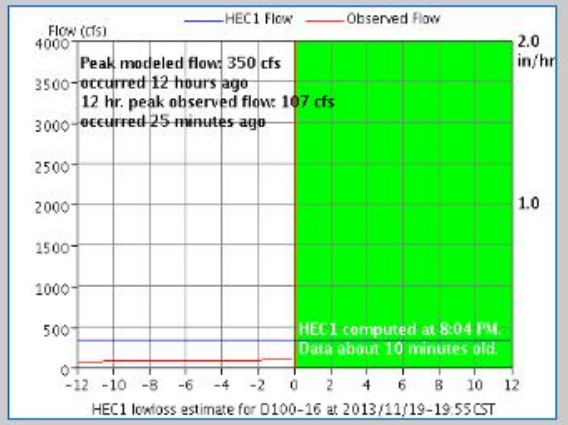
SubBasins Intensity: 1-Hour | 3-Hour | 6-Hour

MajorBasins Intensity: 3-Hour

MajorBasins Total: 3-Hour | 6-Hour

The map overlay depicts rainfall intensity (inches per hour) in SubBasins from the most recent 3-Hour cumulative rainfall estimate. The legend from the radar page is also used here.





Your browser retrieved this information Tuesday at 6:09 PM.

The Rice University and Texas Medical Center Flood Alert System is an integrated system utilizing radar, rain gage information, bayou stage data, and hydrologic modeling for the purpose of issuing flood warnings and forecasts for the Rice University / TMC Complex.

350 CFS, Flat at 5:55 PM

System Status

Last Data Retrieved: 6:09 PM
Next Data Check: 6:10:51 PM
Rain Data: Current
Look for new data

Bayou Cam One

Bayou Cam Two

Gulf Activity

Rainfall Estimate

Rice University Texas Medical Center

WEST Consultants, Inc.

Overland Park, KS

STORMWATCH
Johnson County Kansas Regional Weather

11/19/2013 8:22 PM CST
Create New Account or Login

Home | Graphs | Raw Data | Rainfall Data | Sites | Resources | About

StormWatch

StormWatch Home

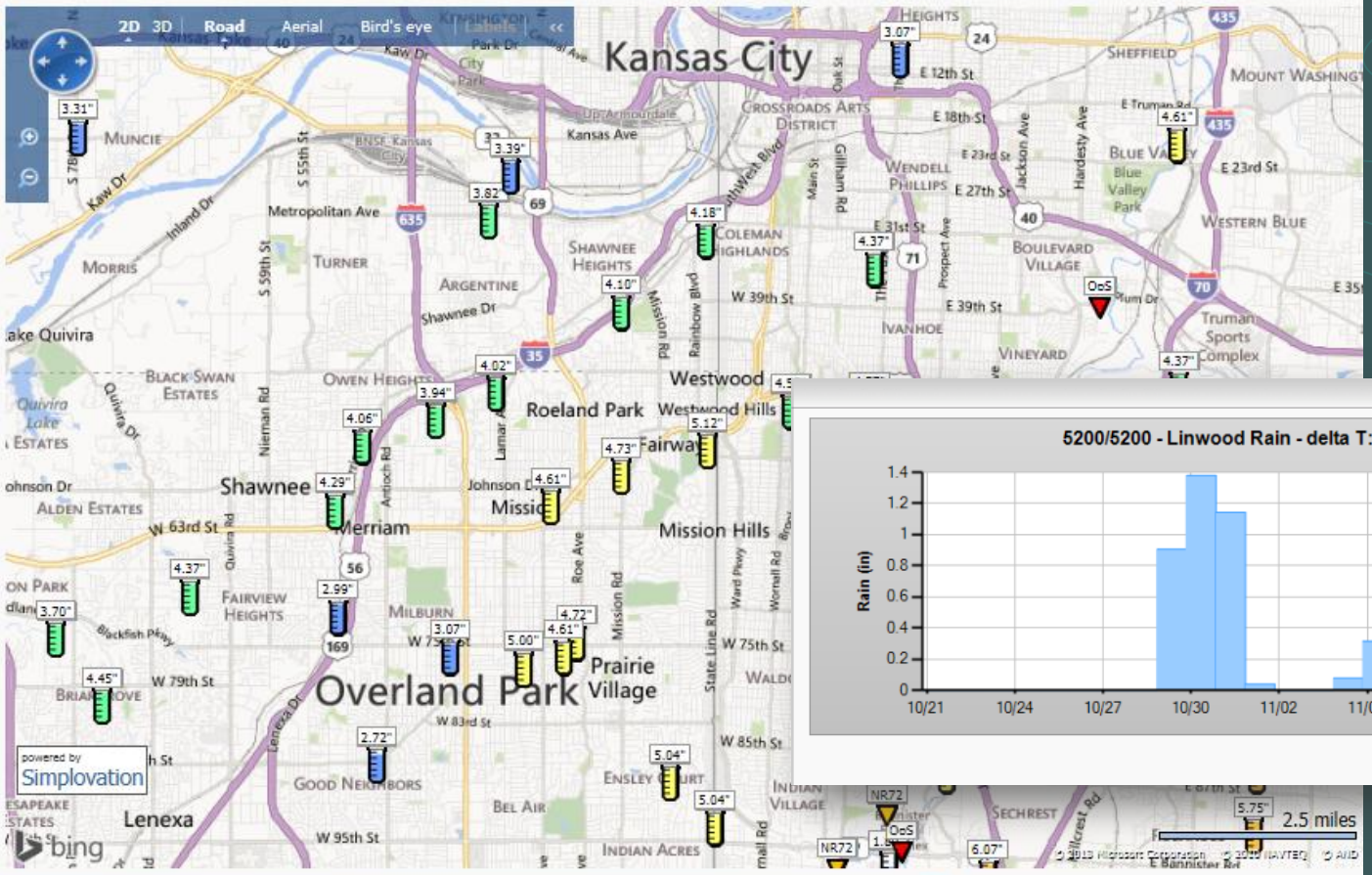
Map Sensors of Type: Rain | Show/Hide Advanced Options

Time Select Options: Latest Readings | Beg Date/End Date | End Date/Time Span | Beg Date/Time Span

Time Span: 30 Days

Refresh Map

- Air Temp
- Barometric Pressure
- Battery Voltage
- Bridge Deck Temp
- Dissolved Oxygen
- Flasher Command
- Flasher Status
- Pavement Conductivity
- Peak Wind
- pH
- Rain
- Relative Humidity
- Road State
- Road Temp
- Soil Moisture
- Soil Temperature
- Solar Radiation
- Specific Conductance
- Turbidity
- Water Level
- Water Temp
- Wind Direction
- Wind Run



Close

OVERLAND PARK KANSAS

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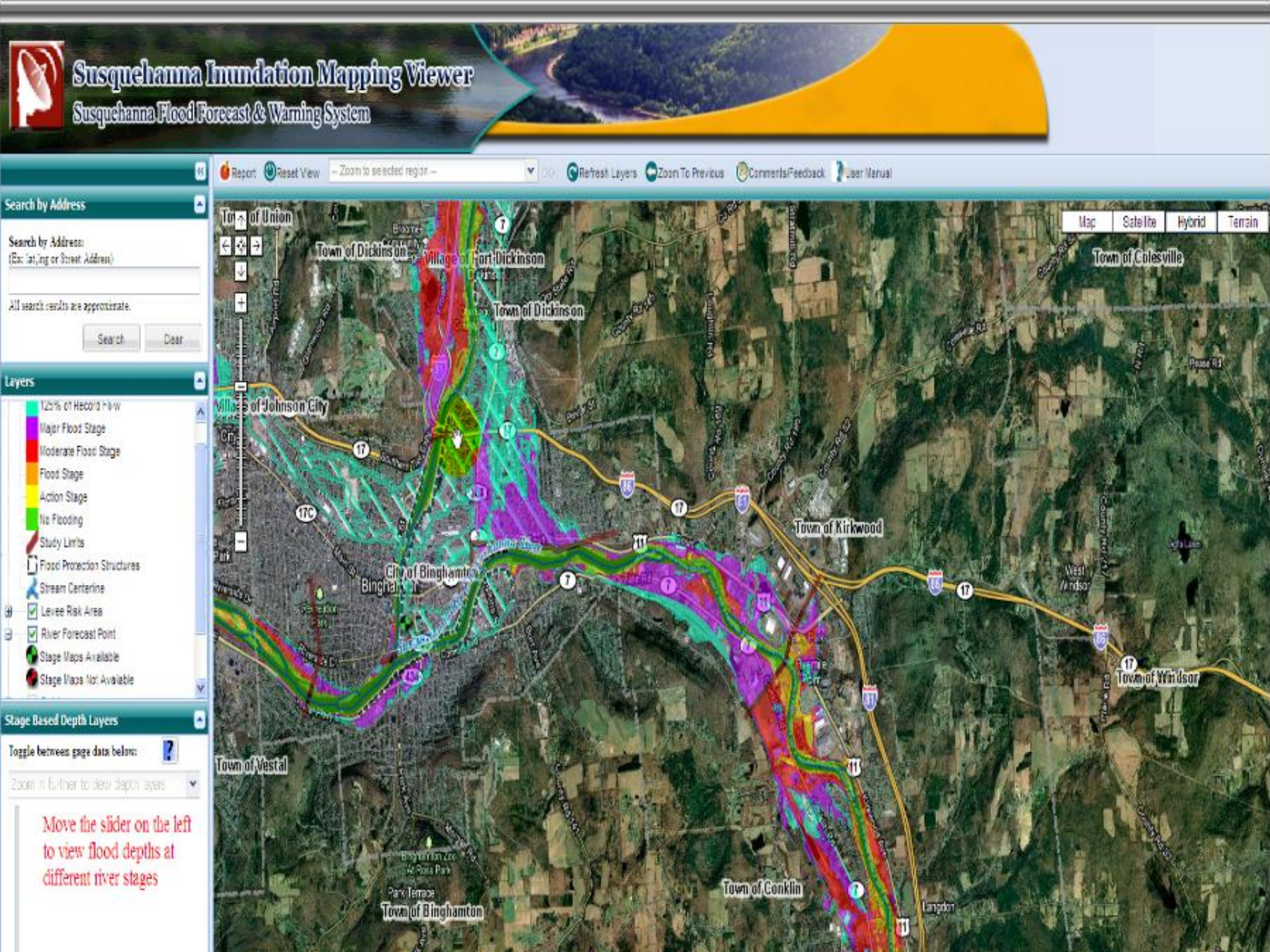
Susquehanna Inundation Mapping Viewer
Susquehanna Flood Forecast & Warning System
Report
Reset View
-- Zoom to selected region --
Refresh Layers
Zoom To Previous
Comments/Feedback
User Manual
Search by Address
Search by Address:
(Enter Lat,Long or Street Address)
All search results are approximate.
Search
Clear
Layers
125% of Record Flow
Major Flood Stage
Moderate Flood Stage
Flood Stage
Action Stage
No Flooding
Study Limits
Flood Protection Structures
Stream Centerline
Levee Risk Area
River Forecast Point
Stage Maps Available
Stage Maps Not Available
Stage Based Depth Layers
Toggle between gage data below:
Zoom in further to view depth layers
Move the slider on the left to view flood depths at different river stages
Map
Satellite
Hybrid
Terrain
Town of Union
Town of Dickinson
Village of Fort Dickinson
Town of Dickinson
Town of Colesville
Village of Johnson City
City of Binghamton
Town of Kirkwood
Town of Windsor
Town of Vestal
Town of Conklin
Town of Binghamton

Flood Insurance

CRS Section 610: Flood Warning & Response

2007 Manual	Max Points		2012 Manual	Max Points
FTR- Flood Threat Recognition system	40		**FTR** – Flood Threat Recognition system	75
EWD – Emergency Warning Dissemination	60		**EWD** – Emergency Warning Dissemination	75
ORE – Other Response Efforts	50		**FRO** – Flood Response Operations	115
CFP – Critical Facility Planning	50		**CFP** – Critical Facilities Planning	75
SRC – StormReady Community	25		**SRC** – StormReady Community	25
- TsunamiReady Community	30		- TsunamiReady Community	35
Max	255			395

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CRS Requirement

611.b. Activity Credit Criteria:

2. The community must have a description of its flood hazard that includes information about:
   - Nature of the flood hazard;
   - The development exposed to flooding;
   - Expected impacts of flooding community.

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CRS Requirement

611.b. Activity Credit Criteria:

3. The community must have flood inundation maps.
   - Maps must show three different flood elevations.
   - Used in planning the community's flood response.

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CRS Requirement

611.b. Activity Credit Criteria:

5. The community must implement outreach projects that tell its residents and businesses how they will be warned and safety measures they should take.

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Chehalis River Basin Flood Warning System

- Strengths
  - Transparent & public information
  - High leverage from existing systems
  - CRS building blocks
  - Reliable

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Chehalis River Basin Flood Warning System

- Things to work on
  - Integrated flood risk management
  - Basin-wide gage strategy
  - CRS building blocks → Rate reduction
  - Incorporate map “uncertainty”
  - Local FWS coordinator

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Warning Systems Work

- Colorado Floods 2013
  - Big Thompson Canyon, 1976, 140+ deaths
  - Colorado, 2013, 8 deaths
- Tropical Cyclone Phailan, India, 2013
  - Cyclone Orissa, 1999, 10,000 deaths
  - Cyclone Phailan 2013, ~50 deaths
- Typhoon Haiyan, Philippines, 2013
  - 750,000 evacuated, 5,000 deaths
  - https://www.youtube.com/watch?v=LaYuGyQ0F7g

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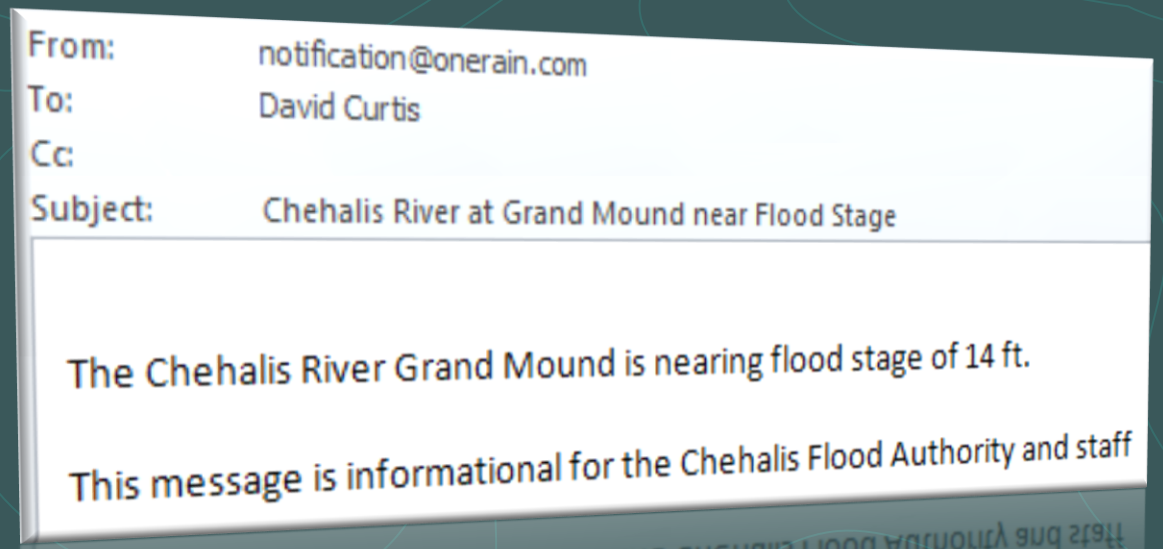
Contrail Alerts

- Email alerts when rivers approach flood stage.



- Sign up now.

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Questions

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