

# SHOAL CREEK FLOOD FORUM

**Forum Hosted By:**

Austin Watershed Protection

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# Flooding in the Shoal Creek Watershed





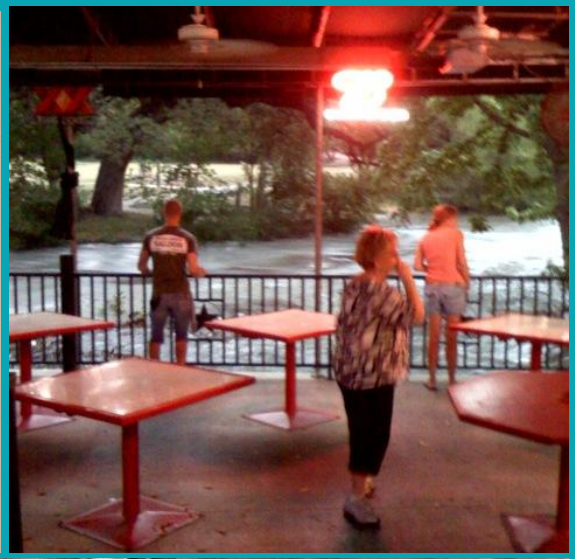
tuesday morning

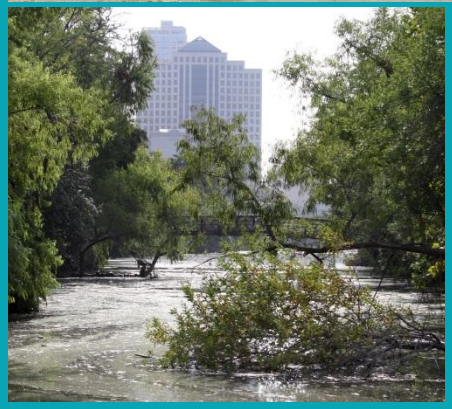
Austin American-Statesman

clear

13 die as floods ravage city; losses estimated in millions

The aftermath











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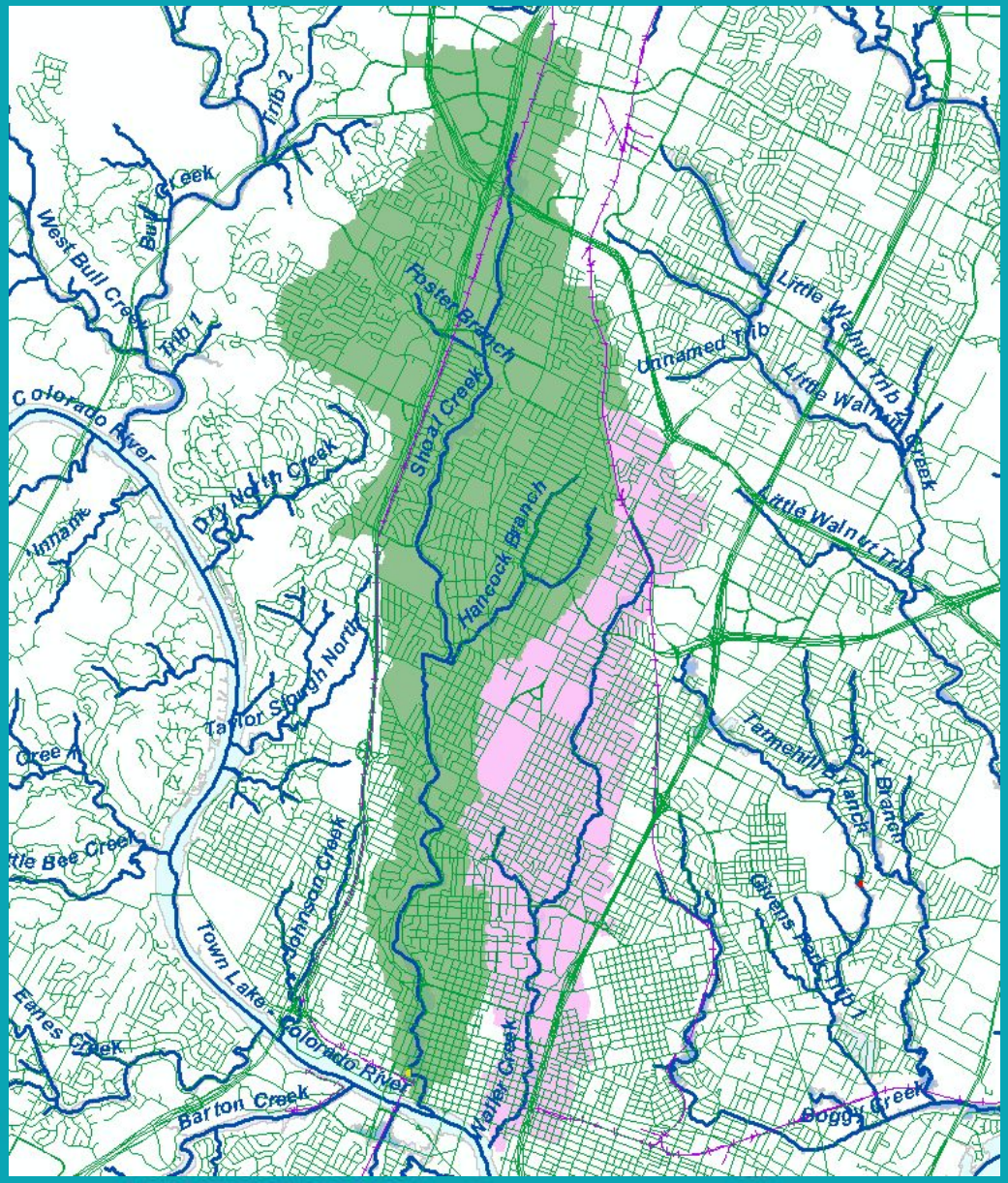
# The Shoal Creek Watershed

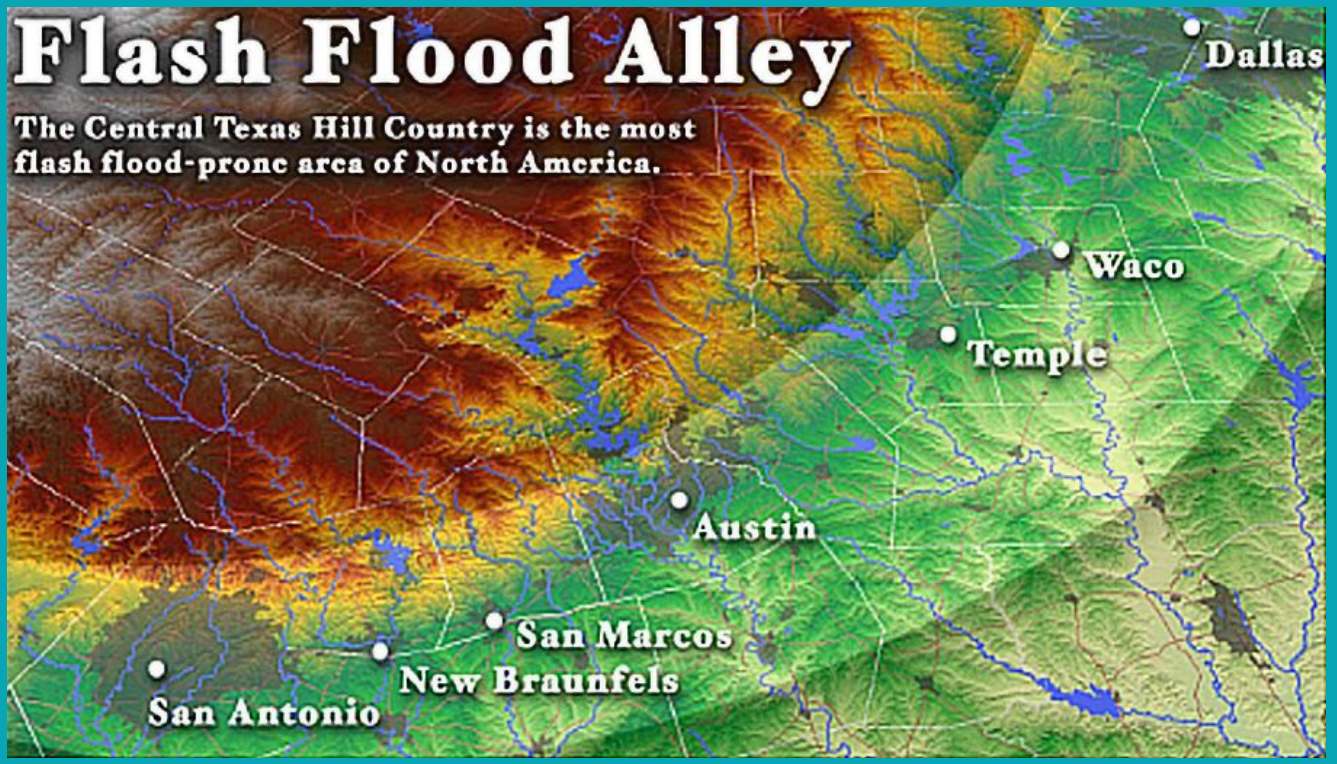
**The Watershed is the area of land that drains to a particular creek**

- 13.3 square miles of drainage area
- 14.3 miles of studied streams (Shoal Creek, Hancock Tributary, Grover Tributary)
- Fully developed watershed
- 100-year peak flow over 17,500 cubic feet per second at Cesar Chavez St.
- FEMA map dated 2021



# Flash Flood Alley – Global and Local Factors

- El Nino
- Tropical Systems in the Gulf of Mexico and the Pacific Ocean
- The Convergence of Cold Fronts with Gulf Air Mass
- Hilly terrain
- First substantial increase in elevation from Gulf of Mexico
- Thin topsoil

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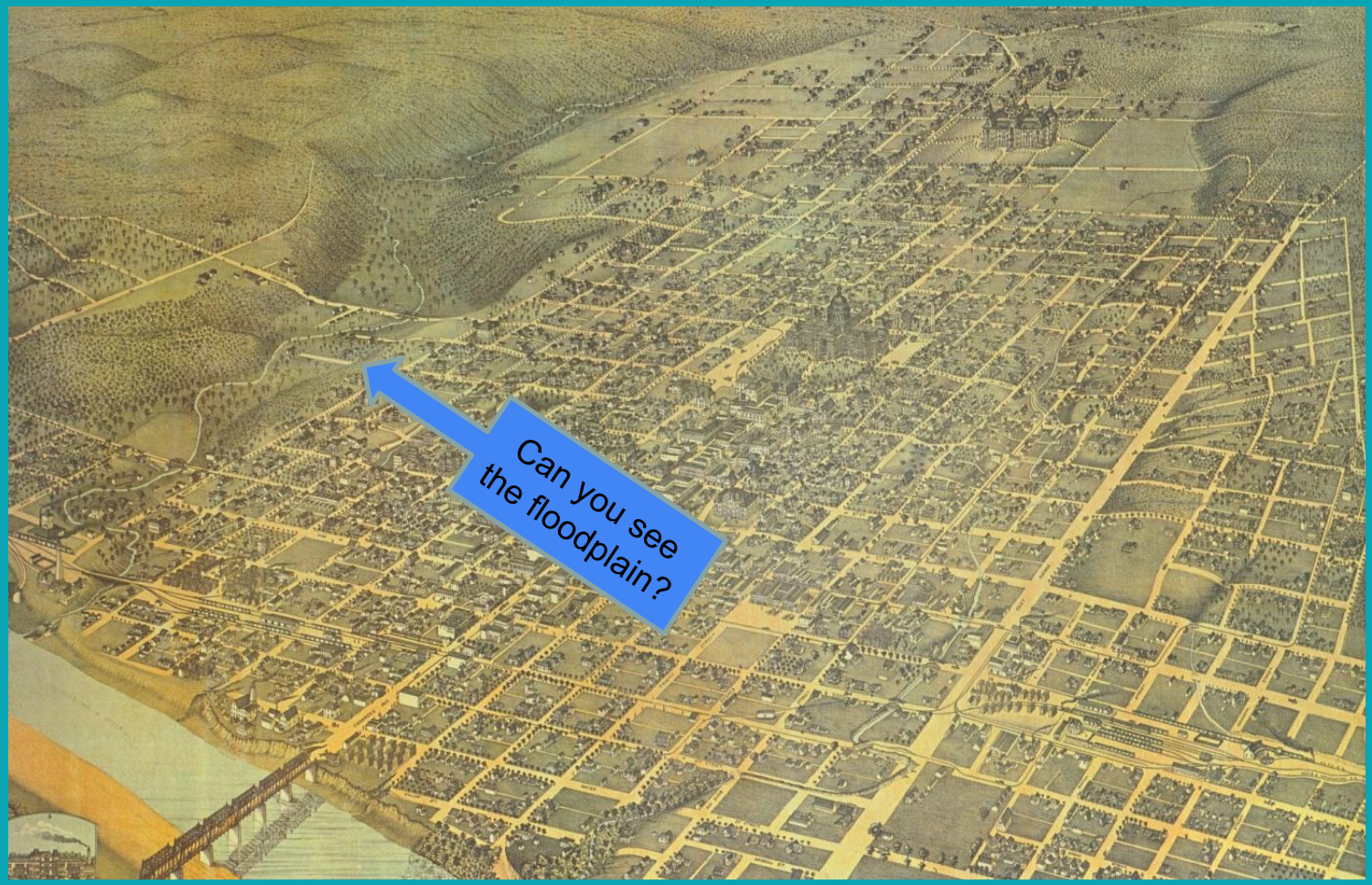
# Flash Flood Alley – Human Factors

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# Flash Flood Alley – Human Factors




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# Historic Rain Events on Shoal Creek

**July 6, 1869**

Flood of record for the Colorado River; Newspaper reports complete change to mouth of Shoal Creek after water recedes




**April 23, 1915**

"There is not a section of the city traversed by the treacherous little stream, docile most months of the year, which has not felt the finger of death" *Austin American*

**October 28, 1960**

7"-10" of rain fell, 2.5 Million Dollars in Damages

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# Historic Rain Events on Shoal Creek

**May 27, 1981**

The original Memorial Day Flood. Made the threat of flooding a topic of conversation in Austin once again. Prompted many of our floodplain regulations.




**October 31, 2013**

The original Halloween Flood. While much of the focus was directed to Onion Creek, Lower Shoal Creek saw significant flooding as well.

**May 25, 2015**

Memorial Day Flood

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# Historic Rain Events on Shoal Creek

100+ years of Shoal Creek flooding 1915-2025






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# Historic Rain Events on Shoal Creek



May 1981

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# Historic Rain Events on Shoal Creek



November 2001

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# Historic Rain Events on Shoal Creek



October 2015

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# City of Austin Floodplain Studies

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# Previous Floodplain Studies

| | |
|---|---|
| **Travis Countywide Map Modernization** | ▪ Study completed 2005, FEMA maps effective September 26, 2008 |
| **Gilleland Creek** | ▪ Study completed 2009, FEMA maps effective August 18, 2014 |
| **Bull, Shoal, Carson, Cottonmouth, Boggy** | ▪ Study completed 2013, FEMA maps effective January 6, 2016 |
| **Lake, Rattan, South Brushy** | ▪ Study completed 2016, FEMA maps effective December 20, 2019 |
| **Onion Creek** | ▪ Study completed 2017, FEMA maps effective January 22, 2020 |

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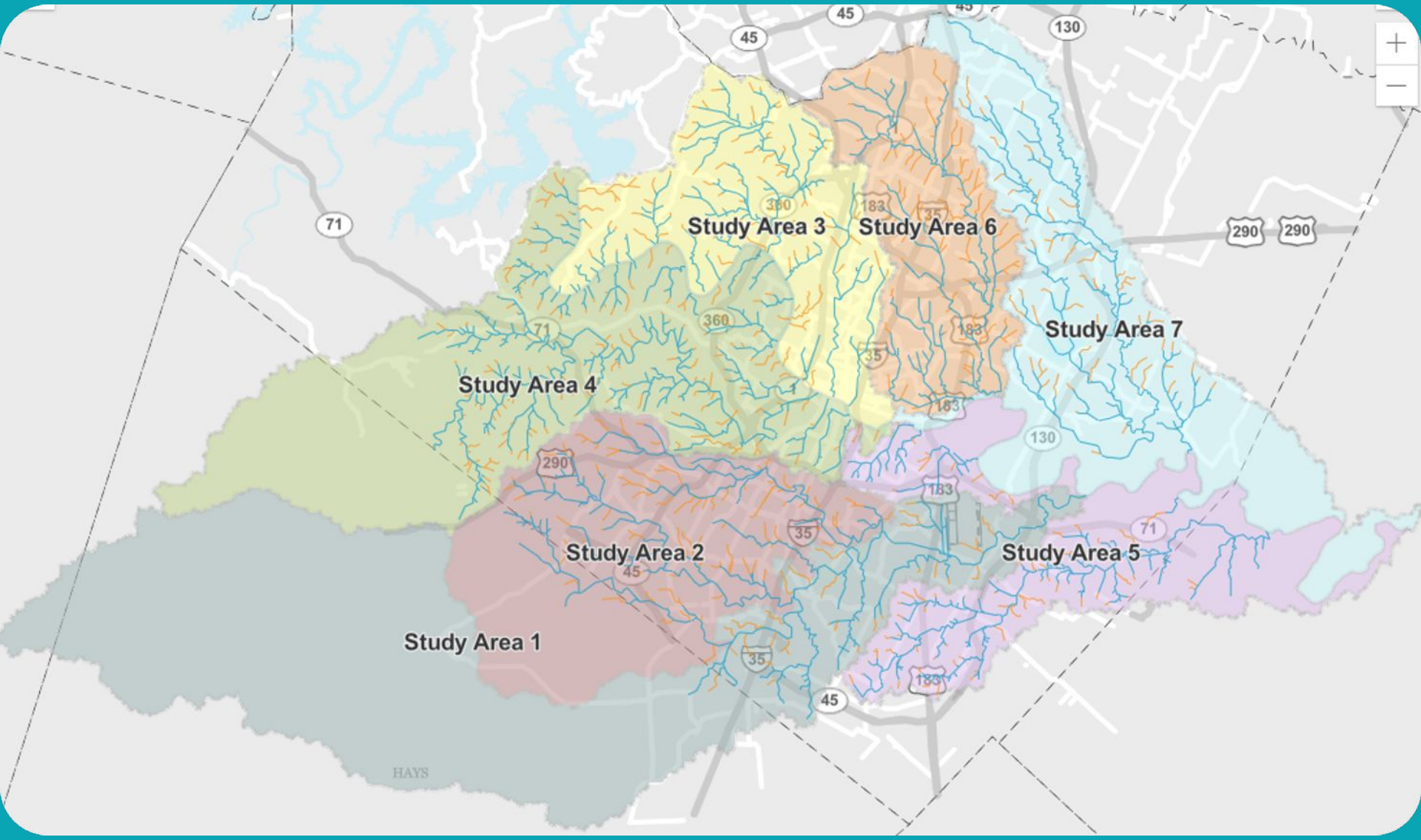


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# Scope of Work

- Total Drainage Area for Hydrologic Modeling
  - 877.67 square miles
- Total Length of Streams to be Studied
  - 857 miles  Existing study
  - 250 miles  New study
- Level of Study
  - 37 miles  Detailed with Survey (Floodway)
  - 570 miles  Detailed with Survey
  - 500 miles  Limited Detail with Field Measurement
  - All to be mapped as AE zone

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# Fully Developed vs. FEMA Floodplains

- There are two types of floodplain maps used in Austin
  - –FEMA floodplains are printed on Flood Insurance Rate Maps (FIRMs) and show the risk as it exists today. They are used to establish flood insurance requirements.
  - –Fully-developed floodplain maps depict what flood risk is anticipated to be based on future development. These maps are used by the City to regulate development and ensure new buildings will remain protected from floods as development occurs.

# Flood Safety Resources

Road closures due to flooding…and cameras

**ATXfloods.com**

Floodplain maps and information

**ATXFloodPro.com**

Sign up for notification of flood warnings

**warncentraltexas.org**

View City of Austin rain gauge data

**hydromet.lcra.org/coa/**

Learn more about the National Flood Insurance Program and flood insurance

**floodsmart.gov**




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# Contacts


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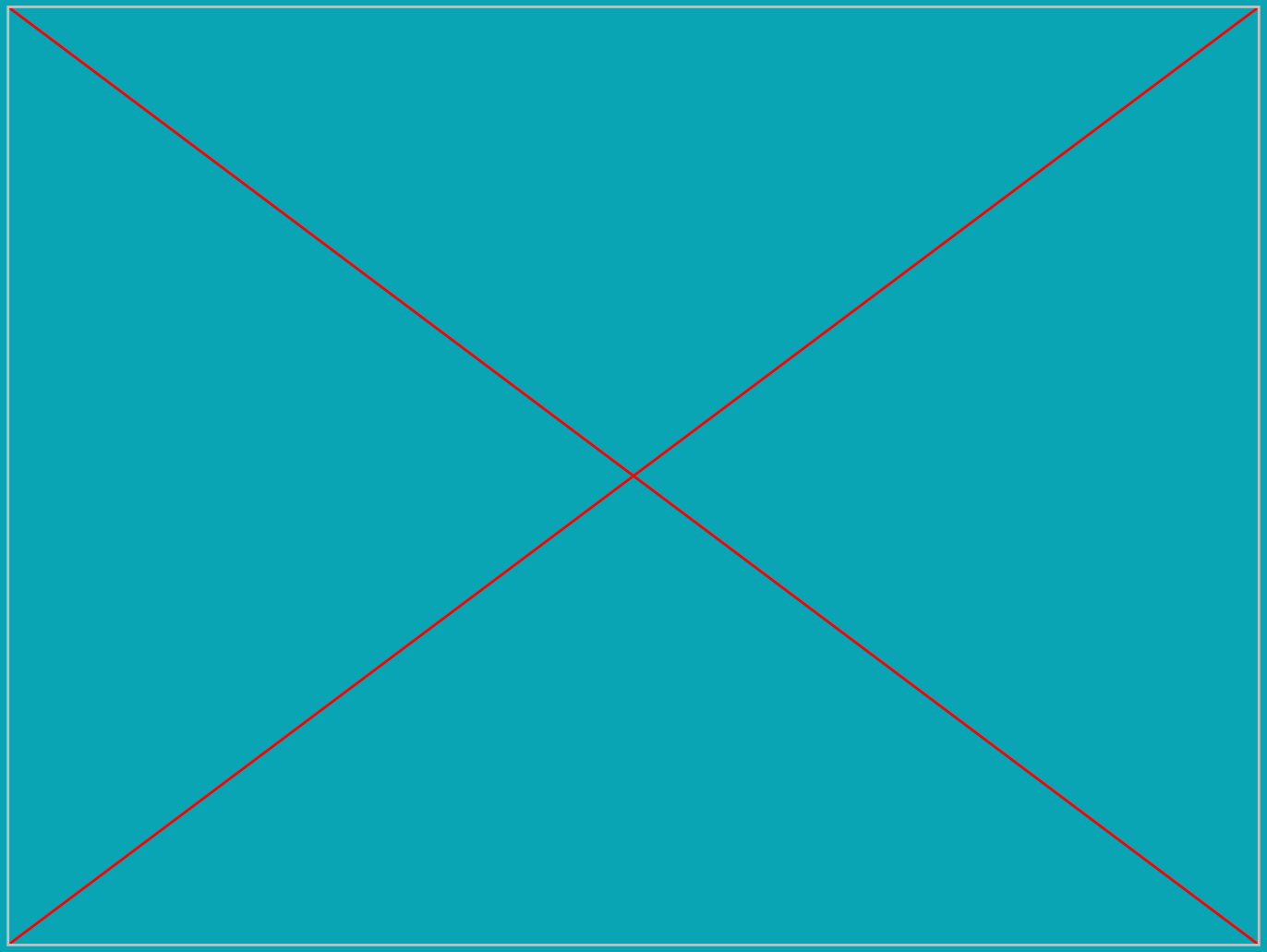
# Flood Early Warning System (FEWS)



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# FEWS: About Our Team

It takes a team of dedicated professionals to operate our Flood Early Warning System 24/7/365 days a week.

- The Flood Early Warning System (FEWS) was initiated and funded by Austin City Council action following the tragic Memorial Day Storm in 1981.
- Our team consists of trained scientists, engineers and IT networking professionals.
- Our educational backgrounds include Environmental Science, Meteorology, Hydrology, Geology, Civil Engineering, Environmental Engineering, Military and IT Networking, Emergency Management
- Our team is committed to saving lives, protecting property and educating the public about the risks of flooding.

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# FEWS: What We Do

## BEFORE A STORM...

- **MONITOR** the weather for potential flooding.
- **COMMUNICATE** potential flood risks to WPD Public Information Office (PIO), Austin Emergency Management (AEM), and Community Stakeholders.
- **COORDINATE** with WPD Field Operations Barricade Crews, National Weather Service, and AEM Duty Officers.
- **PERFORM** equipment readiness checks.




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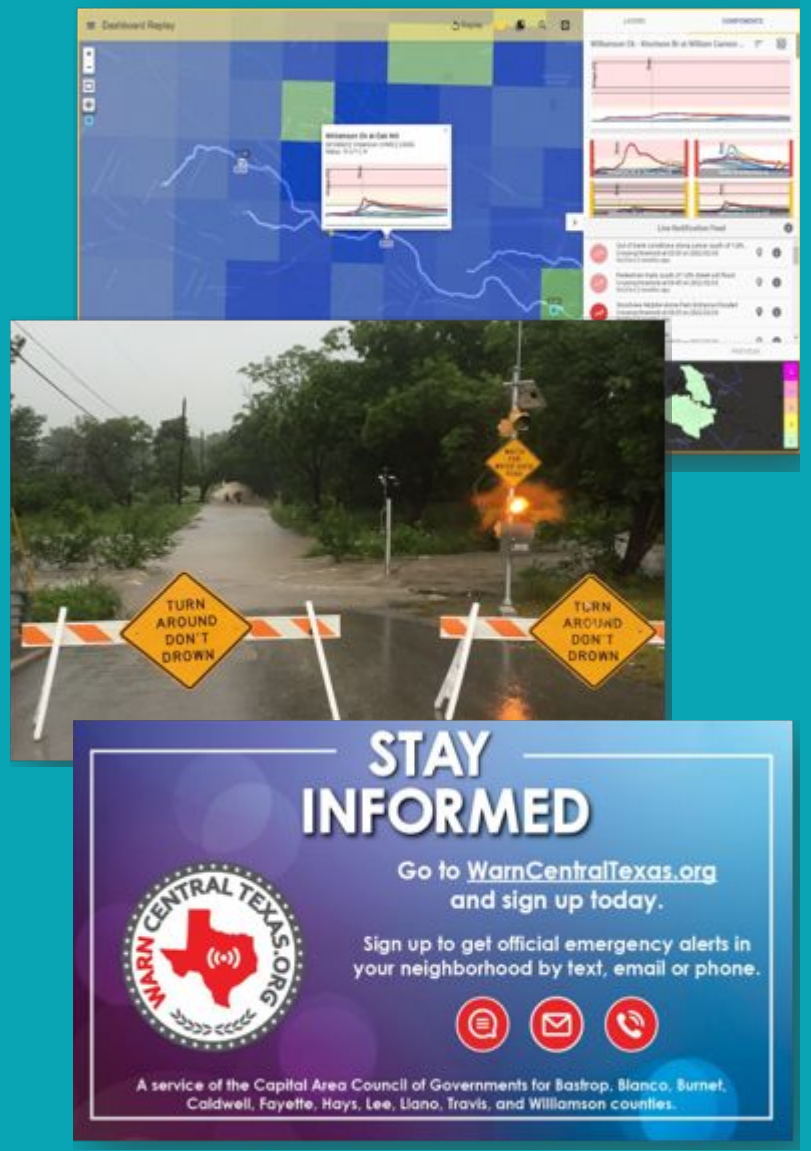
# FEWS: What We Do

## DURING A STORM…

- **MONITOR** gages, flood sensors, weather radar and real-time flood and weather modeling.
- **ACTIVATE** remote controlled low water crossing gates and flashing beacons; deploy WPD Field Operations Barricade Crews.
- **COMMUNICATE** immediate flood hazards to HSEM, WPD PIO and Stakeholders.
- **UPDATE** road closures on ATXFloods.com, @ATXfloods on Twitter, WPD social media.

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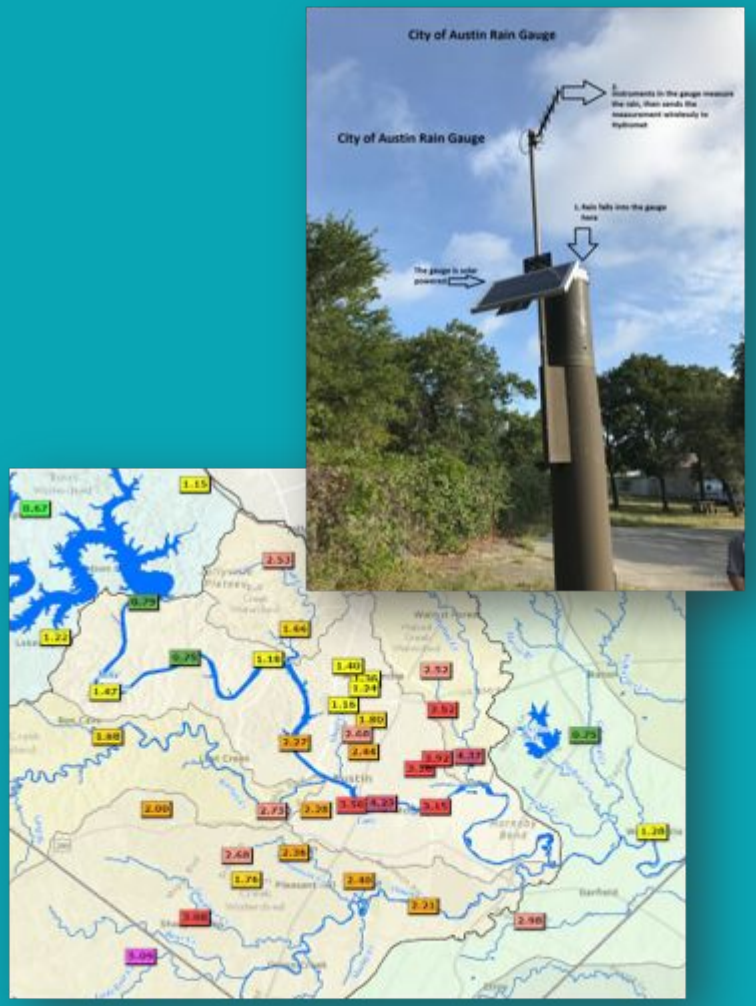
# FEWS: Our Flood Monitoring Tools

## Gages and Hydromet

- FEWS operates over 80 rain and stream gages across the City of Austin.
- Gage system is maintained by four full-time COA IT Support Analysts.
- FEWS partners with USGS on two dozen gages.
- FEWS partners with LCRA to transmit and display gage data on Hydromet.
- See for yourself at https://hydromet.lcra.org!

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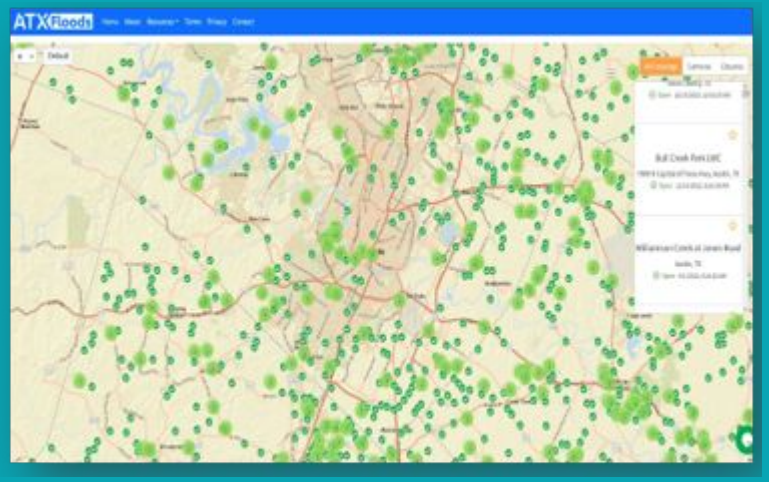
# FEWS: Our Flood Monitoring Tools

**ATXfloods.com and Cameras**

- FEWS launched ATXFloods.com in 2012 to improve public awareness of flooded roads in Austin.
- Through partnerships with surrounding jurisdictions, the site now includes flooded road closure information across most of Central Texas.
- Cameras have been placed at over a dozen low water crossings in Austin and can be viewed on ATXFloods.com.



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# FEWS: Our Flood Monitoring Tools

**Gate Arms, Flashing Lights, and Field Sensors**

- FEWS operates two sets of gate arms and two dozen flashing beacons at low water crossings across the City of Austin.
- Gates are operated remotely using a radio frequency network. FEWS personnel operate the gates and beacons through a user interface.
- Float switches and pressure transducer cables are located at low water crossings to indicate water levels. Float switches can activate flashing beacons.



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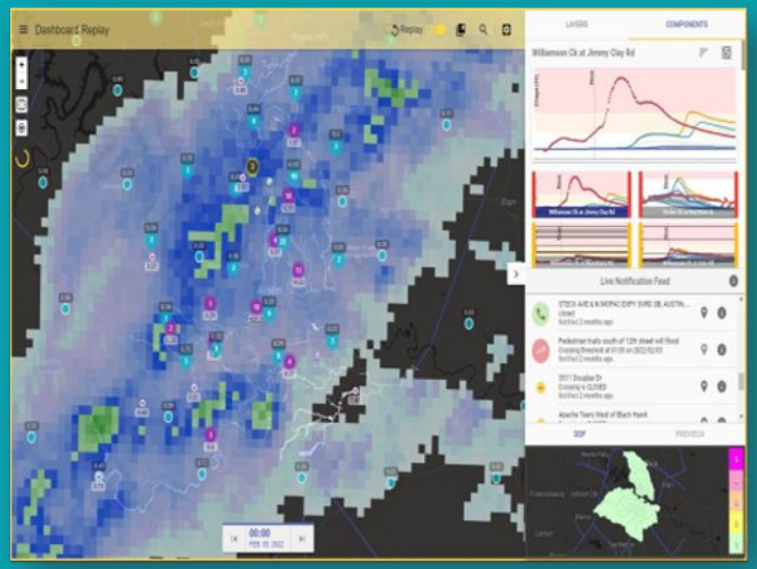
# FEWS: Our Flood Monitoring Tools

## Predictive Flood Modeling & The Common Operating Picture (COP)

- Vieux & Associates, Inc. (Vieux), has been collaborating with FEWS to provide essential flood monitoring applications such as quality-controlled gage adjusted radar rainfall (GARR) data and predictive flood modeling.

- The Common Operating Picture displays our flood monitoring applications, including a feed of operational information such as 3-1-1 data and COA gage data, on a singular real-time graphical user interface.

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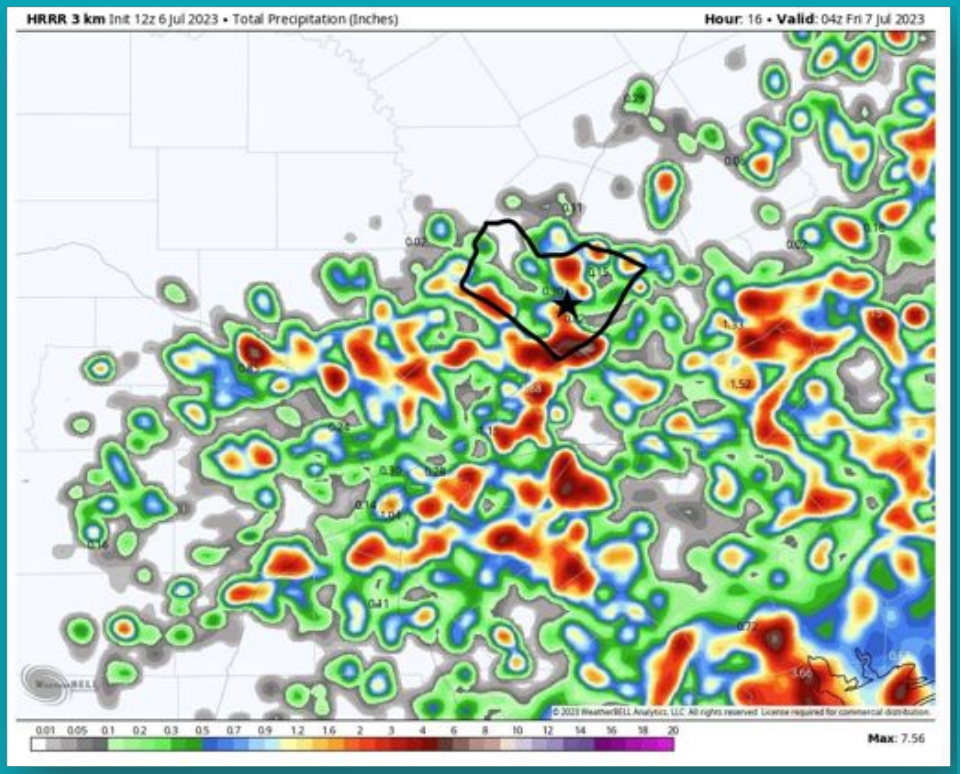
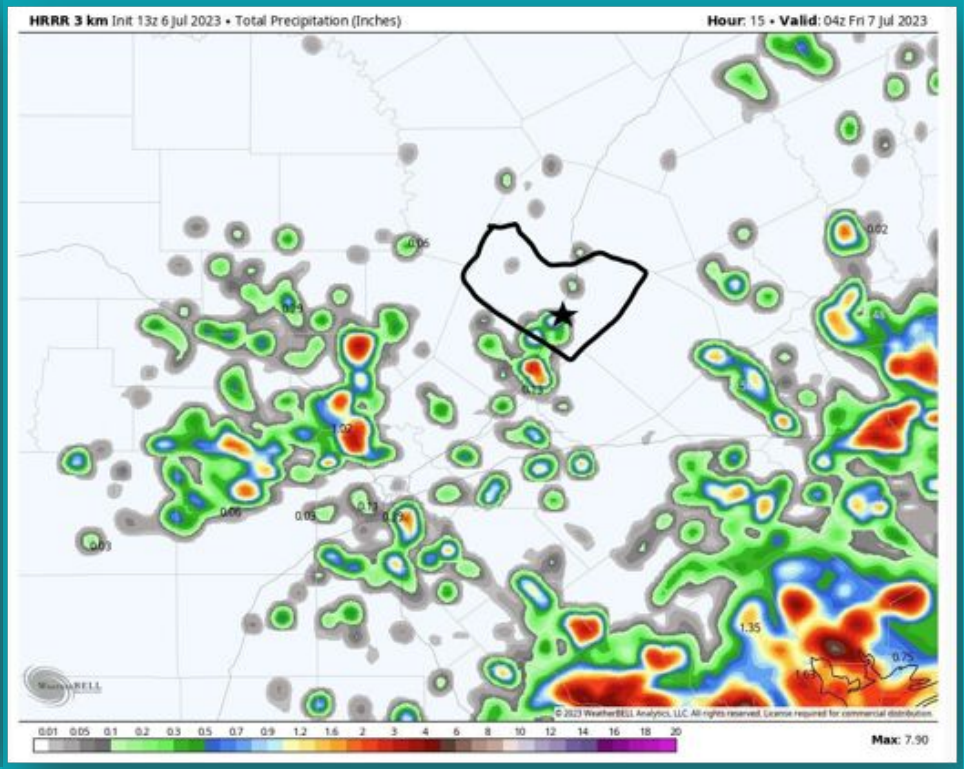
# FEWS: Our Flood Monitoring Tools

## Forecast Models

HRRR, 7am Run, 7/6/2023




HRRR, 8am Run, 7/6/2023

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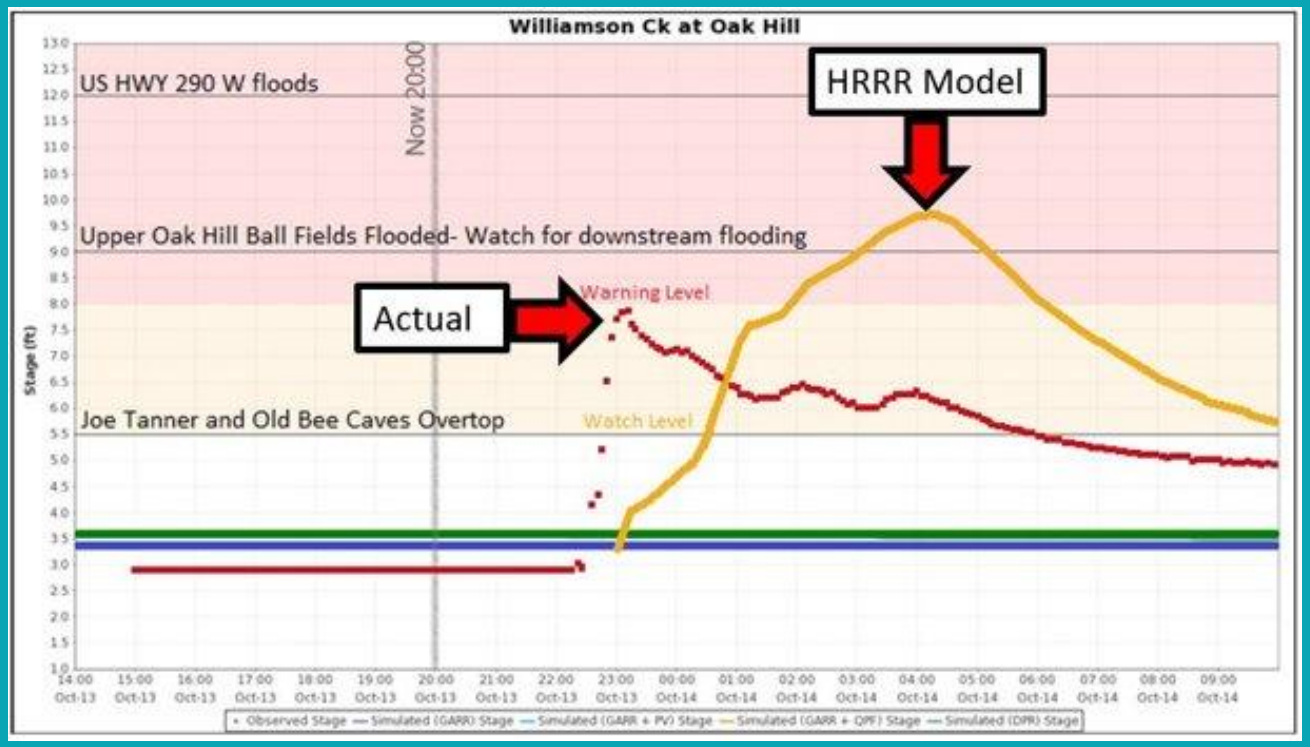
# FEWS: Our Flood Monitoring Tools

## Forecast Models




- Models are not perfect!
- Knowledge of model bias & error
- Verify using GARR & upstream gages
- Verify with eyes in the field
- We are NOT at a place where models can make decisions for us.

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# FEWS: What We Do

## PLANNING IN THE OFF-SEASON…

- FEWS planned and conducted two flood event exercises alongside the Floodplain Office & Modeling that brought together work groups from across the department:
  - 2023 – Discussion-based tabletop exercise of pre- and during-storm operations
  - 2024 – Operational tabletop exercise roleplaying WPD's response in the aftermath of a major flood event





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# Contacts


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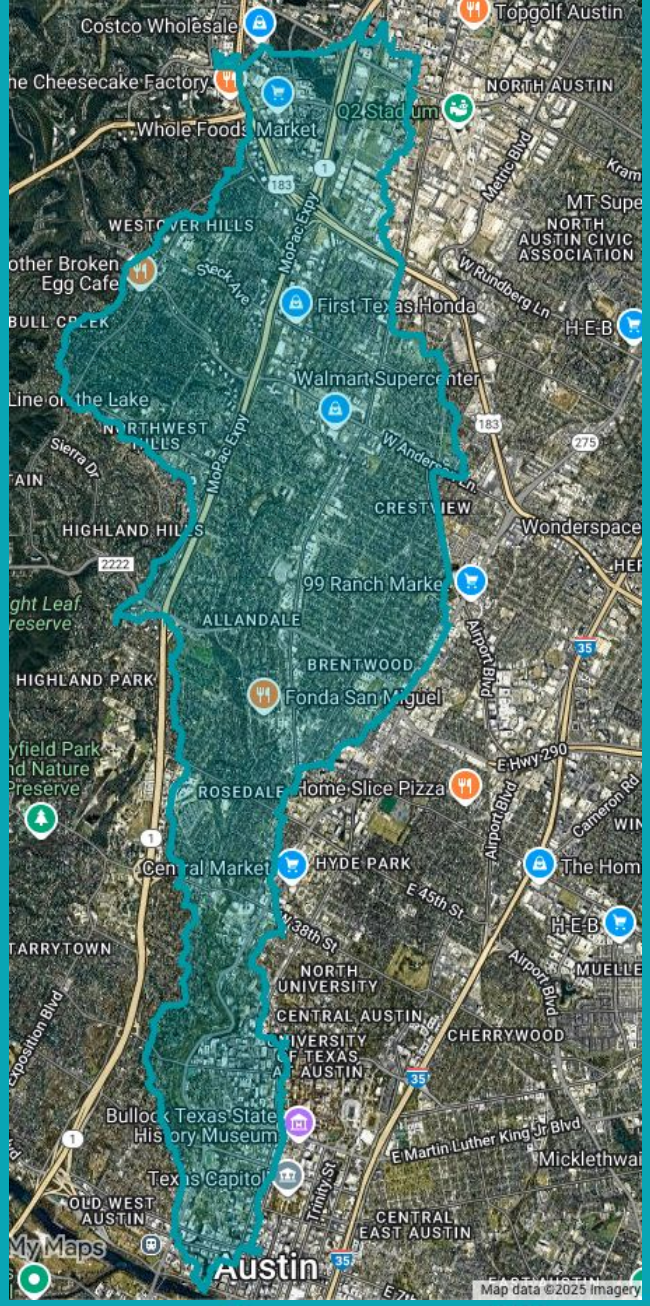
# Holland's Tips for Evaluating Rain Events

## Conditions to consider

- Storm speed and direction
- Intensity and duration of the storm
- Soil saturation/recent rain activity
- Leaf load

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# USGS Stations

## Data & Alerts

- Shoal Creek and 12th St
- Shoal Creek and Silverway
- Desktop and mobile site
- Alerts -
  - Primary sensor: 5 ft, on the hour
  - Secondary sensor: 5-min update: 5 ft, on the hour
  - Primary sensor: 10 ft, on the hour
  - Secondary sensor: 5-min update, 10 ft, on the hour




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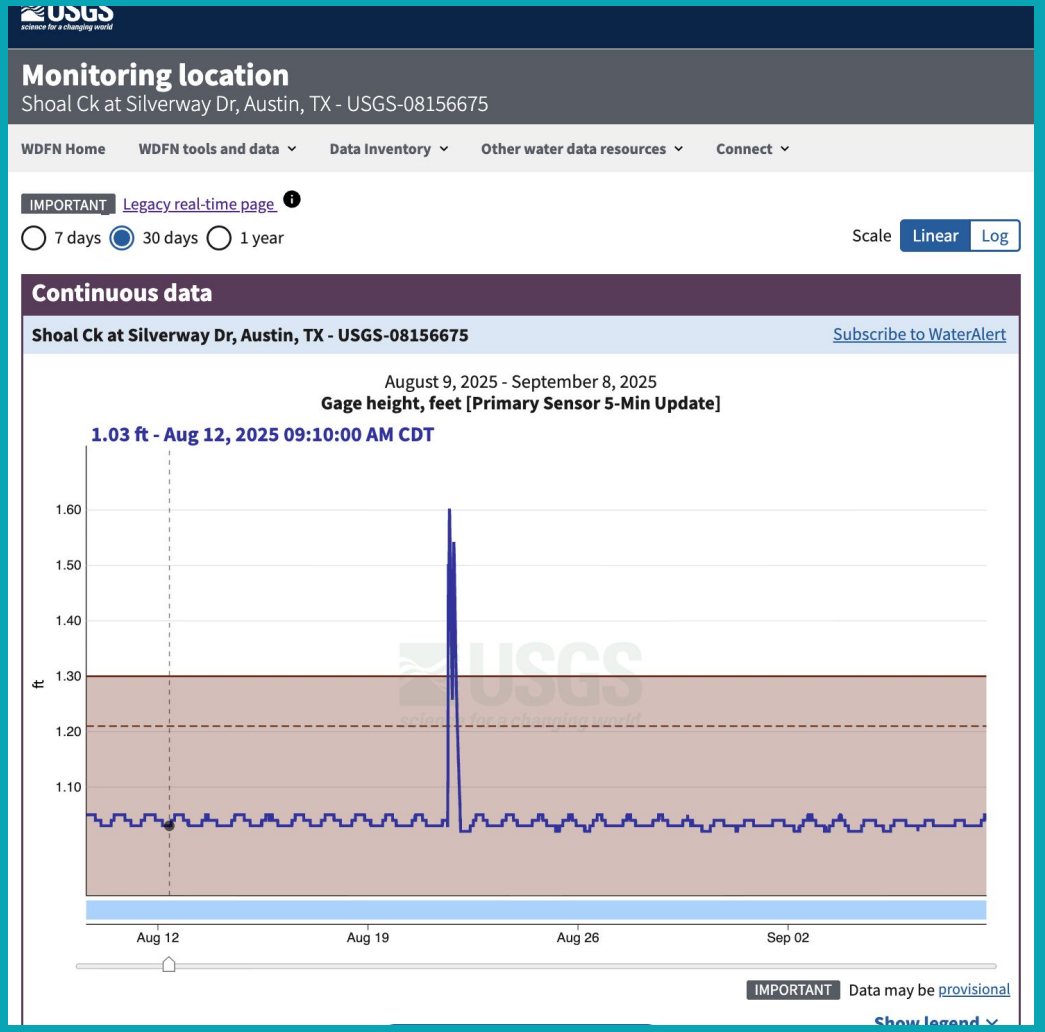
# USGS Stations

## Levels

- *5 ft*
  If it gets here and you weren't already watching, get moving
- *7 ft*
  The National Weather Service Flood Stage level
- *10 ft*
  Critical level; the creek is at or over its banks, margin of error is gone

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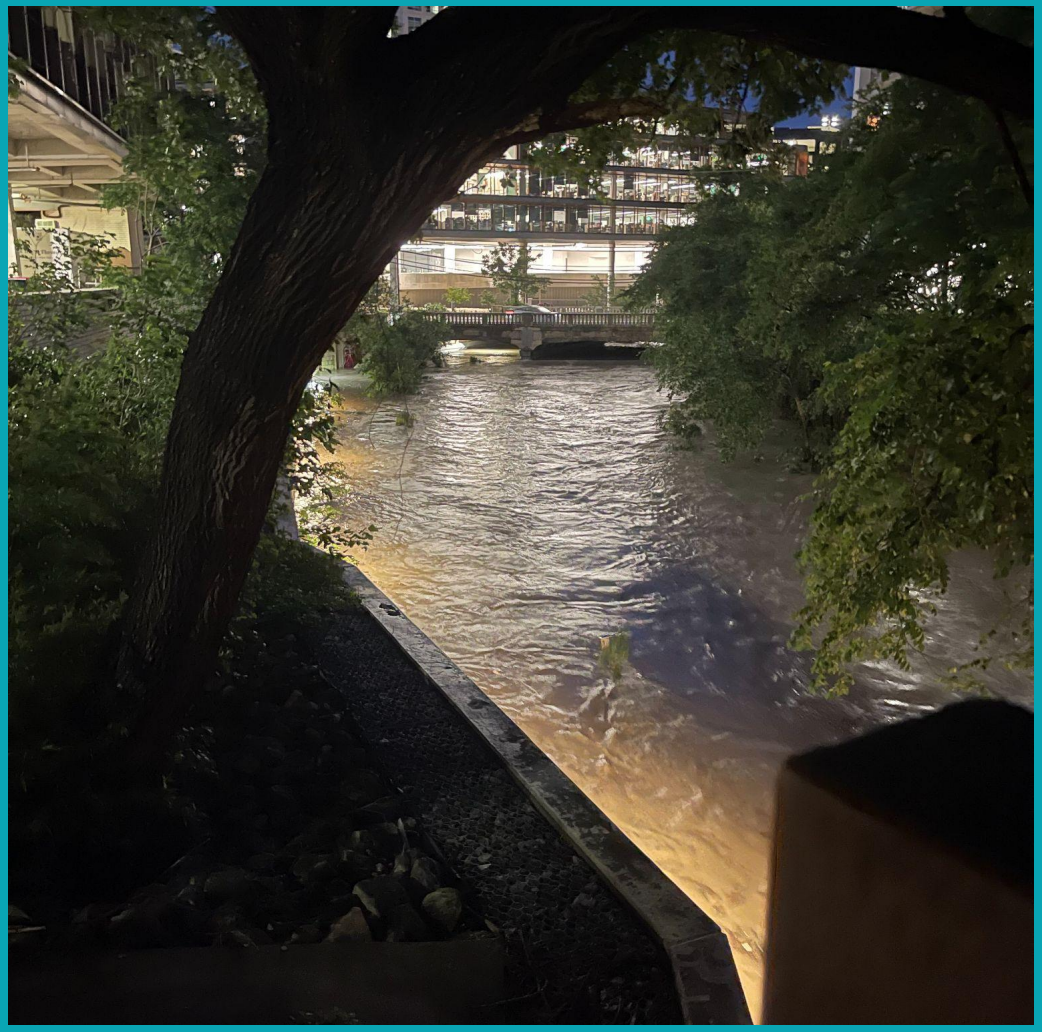
# Flood Levels

**NOAA Atlas 14 Point Precipitation frequency estimates in 24 hours**

- *25 year storm* 8.59”
- *100 year storm* - 12.23”
- *500 year storm - 18.05”*



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# Historic Flood Levels

| Height | CFS | Date | Notes |
|---|---|---|---|
| 12.05 | 3,200 | July, 2025 | |
| 12.30 | 3,310 | March, 2006 | back patio of Shoal Creek Saloon |
| 14.22 | 4,280 | May, 2015 | accumulating in 10th and lamar |
| 15.00 | 4,770 | March, 2006 | Water rushing down Lamar |
| 15.41 | | May, 2025 | Top of Whole Earth driveway appron |
| 16.74 | 6,060 | Nov, 2004 | Lamar closed at 9th, water in Cheapos & Wildflower |
| 16.95 | 6,250 | Sept, 2010 | water at lip of patio in front of Whole Earth |
| 18.78 | 8,150 | Sept, 2014 | water in front half of Whole Earth |
| 19.22 | 8,710 | Nov, 2001 | water 6" deep in Whole Earth, cars washed away |
| 20.76 | 11,000 | May, 2015 | water 3' + deep in Whole Earth |
| 23.25 | 16,000 | May, 1981 | worse flood on record. |

| Floods/month since '81 | |
|---|---|
| January | 2 |
| February | 2 |
| March | 5 |
| April | 4 |
| May | 28 |
| June | 3 |
| July | 9 |
| August | 5 |
| September | 8 |
| October | 10 |
| November | 4 |
| December | 4 |

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