

A series of overlapping squares in various shades of blue, teal, and light green, arranged in a staggered pattern across the top and right side of the slide.

# Hays County Flood Monitoring System

## *Advancing Community Safety During Floods*

Nov 5th, 2025  
TXGIO

# SPEAKERS



**MARLA KOSTUK**

GIS Team Leader

- GIS Team Leader
- 12 years as a GIS Professional across multiple disciplines.
- Leads development and implementation of GIS data-driven solutions for various industries.
- Subject matter expert leveraging the ArcGIS platform along with custom solutions for water resources and asset management practices.



**WILL BAUMANN**

GIS Specialist

- Public Safety GIS Specialist- Hays County Office of Emergency Services
- 10 years as a GIS professional across multiple disciplines.
- Additional background and certifications in Fire, EMS, Search and Rescue, and the Oklahoma Army National Guard.
- Subject matter expert leveraging GIS and decision support software in matters of public safety, mass notification and disaster response.



# AGENDA

- Overview & Introduction
  - Flood Monitoring Enhancements
  - Part of a System
  - Lessons Learned
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The background features a dark blue gradient with various geometric shapes. In the top left, there are several overlapping squares and rectangles in lighter shades of blue and white. On the right side, there are larger, tilted shapes, including a large light blue rounded rectangle and a dark blue rounded rectangle. The title text is centered in the upper half of the image.

# Overview & Introduction

# WHY?

Hays county has a history of flooding, like many communities in the Texas Hill Country.



A comprehensive flood plain study and monitoring system is a critical tool in all phases of emergency management. Before, during and after a disaster.



## BEFORE

A comprehensive study and data is useful in planning and exercising flood situations



## DURING

Real-time flood plain viewing allows OES, dispatch and first responders to see what is or isn't accessible



## AFTER

Historical info about a flooding event can be critical in the recovery after a disaster.

# BORN OUT OF DISASTER

In 2015 we suffered a devastating flood of the Blanco River. We did not have any comprehensive warning system, nor did we have a network of sensors that would be able to tell us what is happening on the river in real time. These were important factors that directly led to fatalities on the river. The take aways from the flooding were the need for:



McComb Family

- Automated Low Water Crossing Closure Systems
- Mass Notification Systems
- Comprehensive Floodplain Study
- Realtime weather and water level monitoring

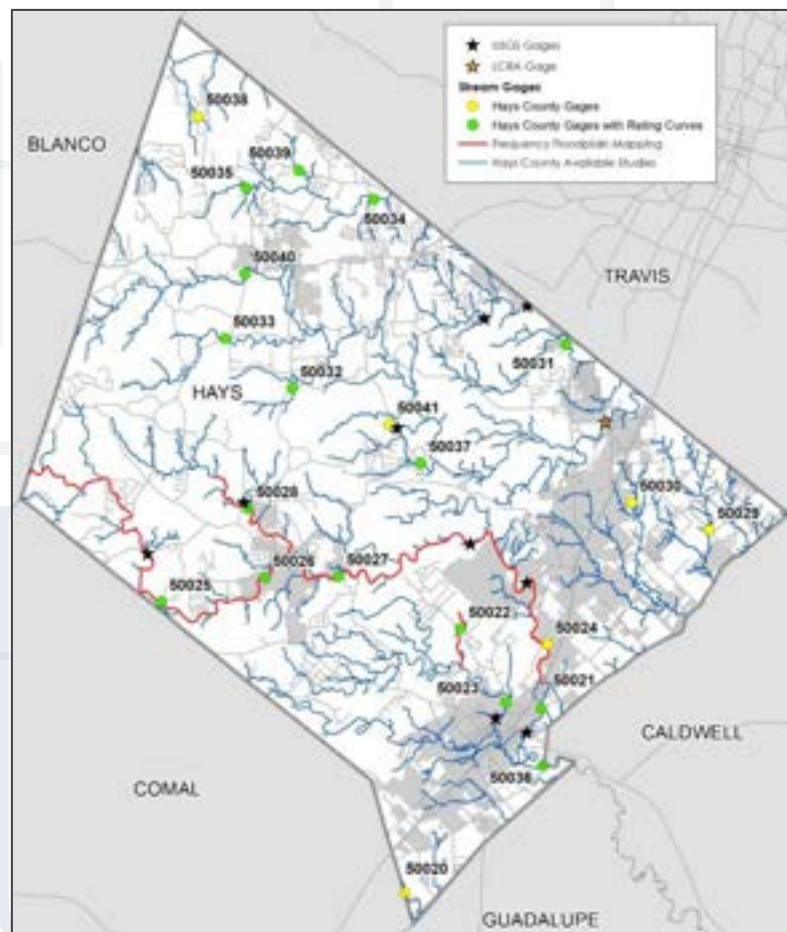






# Flood Monitoring System

History 2018 - 2021

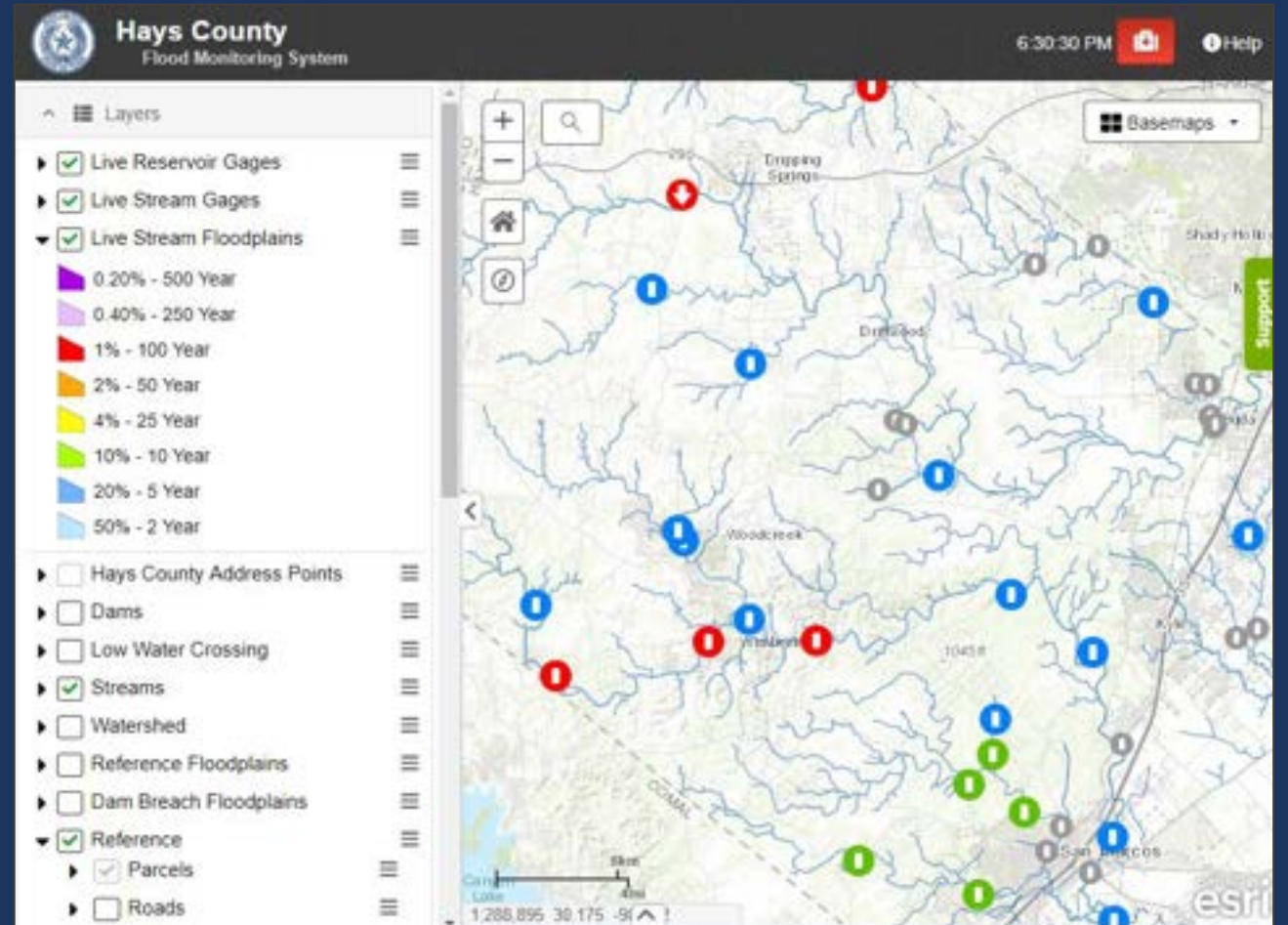


- **Survey**
  - Field Survey - 26 Gages
- **Discharge Rating Curves**
  - Hydraulic Model Updates
  - Rating Curves - 16 Gages
- **Inundation Mapping (Pre-Atlas14)**
  - Blanco River
- **Flood Response Data Collection**
- **Web Map**
  - Map Development
  - Monitoring Tools

# Flood Monitoring System

History Monitoring Tools 2018 - 2021

- Live Stream Gages
- Blanco River Live Floodplains
- Live Reservoir Gages
- Reference Data
- NWS Precipitation





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# Flood Monitoring Enhancements

# DATA DEVELOPMENT

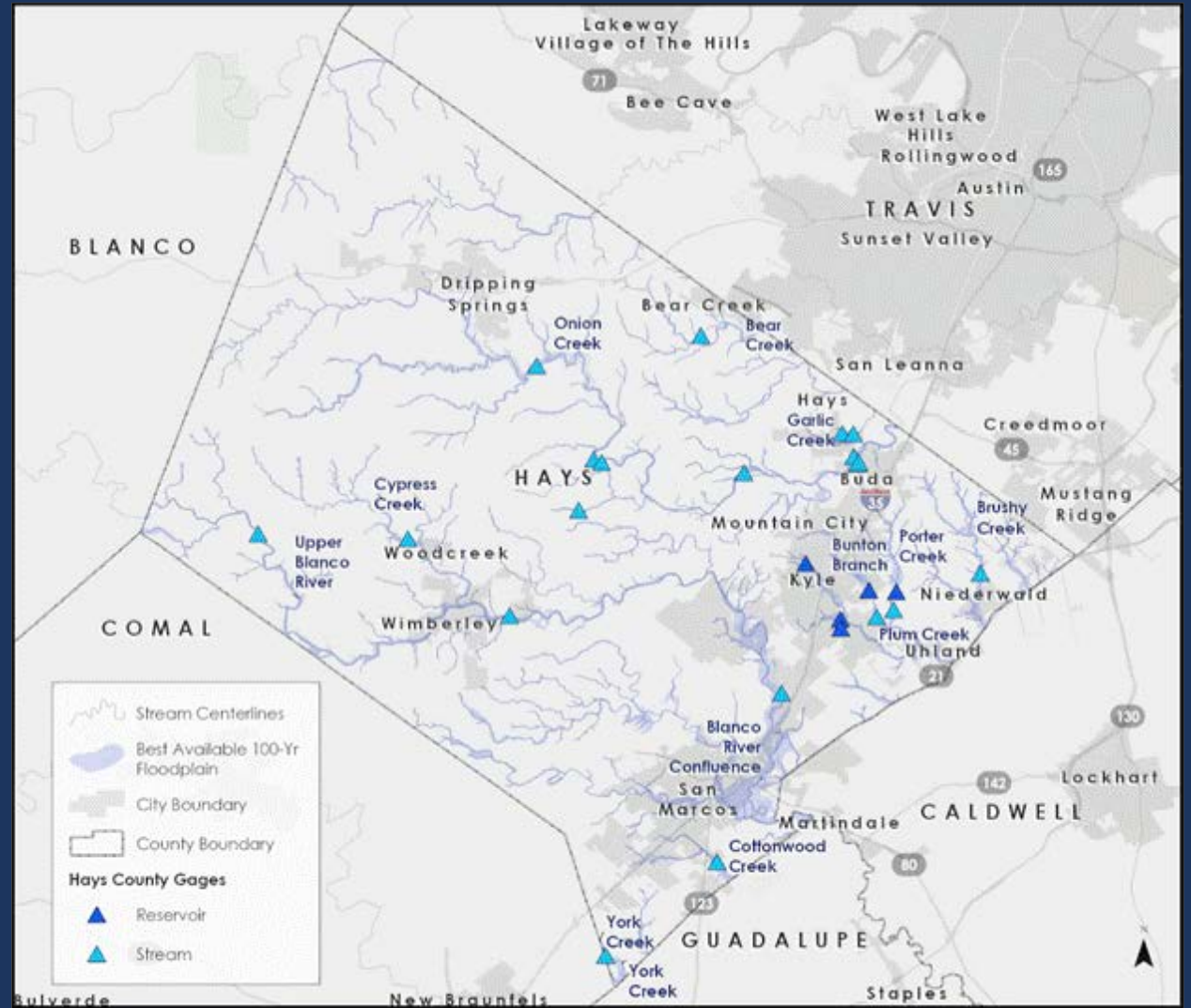
Using *collected* and *previously developed* data to enhance the Flood Monitoring System.

- Trigger Elevations -26 live stream gages
- Trigger Elevations - 6 Onion Creek gages at flood frequencies
- Reservoir volumes
- Updated 2-foot contour data
- Risk area compilation of flood risk per frequency event



# GAGE SOURCES

- WET – Water Earth Technologies
- USGS - U.S. Geological Survey



# WEB MAP ENHANCEMENTS

Enhance the existing secured Hays County Flood Monitoring System web map with these *features*.

- Technology Updates
  - SQL Server Migration
  - Authentication Model
  - ArcGIS Maps SDK for JavaScript
  - Migration to Enterprise 11.3
- Trigger Elevations
  - 26 Live Stream Gages
- Live Stream Floodplains to Include Onion Creek Floodplains
  - Flood Inundation Maps (Pre-Atlas 14)
  - Reference Floodplains
- Reservoir Volume Pop-Up
- 2-Foot Contours
- Risk Area Layer of Flood Risk per Frequency Event





# LIVE STREAM GAGES

## ▼ ☒ Live Stream Gages

- ☐ Static, Normal
- ☐ Static, Elevated
- ☐ Static, Observe
- ☐ Static, Unknown
- ☐ Falling, Normal
- ☐ Falling, Elevated
- ☐ Falling, Observe
- ☐ Falling, Unknown
- ☐ Rising, Normal
- ☐ Rising, Elevated
- ☐ Rising, Observe
- ☐ Rising, Unknown

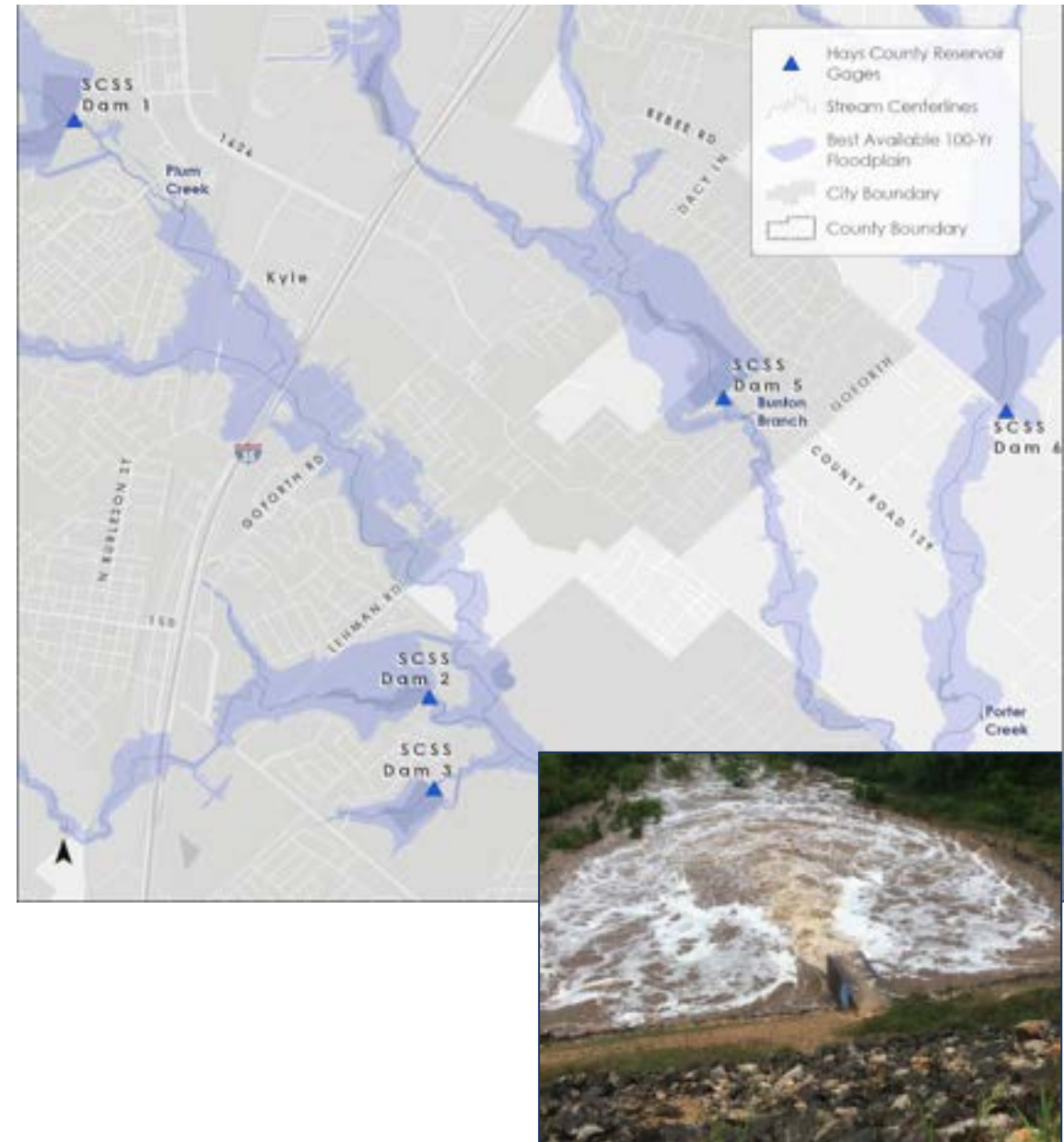
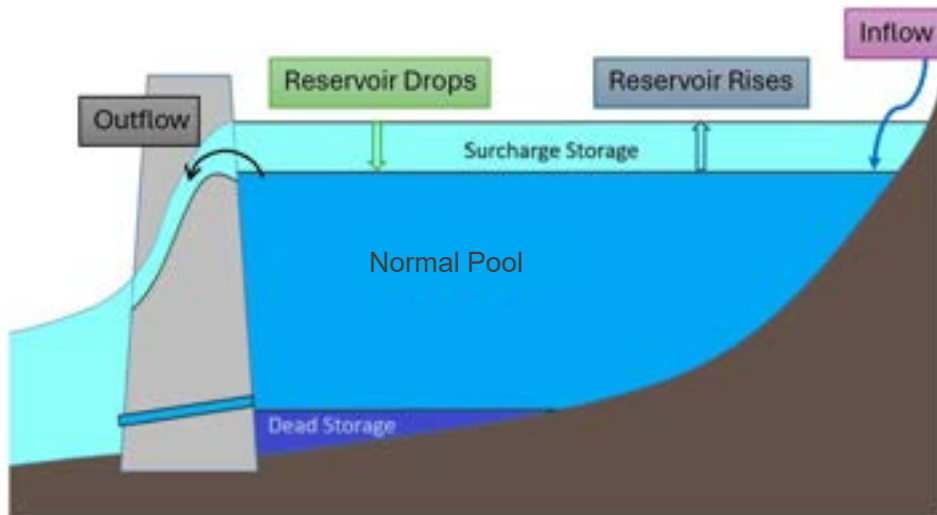


Low Water Level	At or Below 0.5 ft from Trigger Elevation, Equal to 0.6 ft Below Top of Road
Elevated Water Level	From 0.5 ft Below Top of Road and Above
Trigger Elevation	At or Above Trigger Elevation, Equal to 0.1 ft Below Top of Road
Unknown Risk	Additional Hays County stream gages (no survey available)



# RESERVOIR GAGES

- SCSS and NRCS
  - Height of the normal pool and the spillway variation
  - 5ft difference vs 10ft difference
- Associated elevations at 5 more gages
- 10 out of 10 reservoir gages have trigger elevations



# LIVE RESERVOIR GAGES

## ▼ ☒ Live Reservoir Gages

-  Static, Normal
-  Static, Elevated
-  Static, Observe
-  Static, Unknown
-  Falling, Normal
-  Falling, Elevated
-  Falling, Observe
-  Falling, Unknown
-  Rising, Normal
-  Rising, Elevated
-  Rising, Observe
-  Rising, Unknown

## NRCS Dams

Normal Water Level	At or Below 10 ft from Normal Pool
Elevated Water Level	Between 10 ft below Normal Pool Elevation and 5 ft below auxiliary spillway
Observance Elevation	At or above 5 ft Below Auxiliary Spillway Elevation

## SCSS Dams

Normal Water Level	At or Below 5 ft from Normal Pool
Elevated Water Level	More than 5 ft Above Normal Pool Elevation
Observance Elevation	5 ft Below Emergency Spillway Elevation

# ONION CREEK GAGES



Gage 50062	
Onion Creek at Ranch Road 150	
Top of Road:	978.15
Trigger Elevation:	978.05
HEC-RAS XS:	298084

Frequency	Flow Rate (cfs)	Elevation (ft. msl)
50%	1,550	981.56
20%	8,380	990.05
10%	17,550	994.92
4%	35,140	1000.02
2%	52,330	1003.14
1%	69,510	1005.65
0.4%	89,570	1008.18
0.2%	106,420	1010.11





# LIVE STREAM FLOODPLAINS

## ▼ ☒ Live Stream Floodplains

0.20% - 500 Year

0.40% - 250 Year

1% - 100 Year

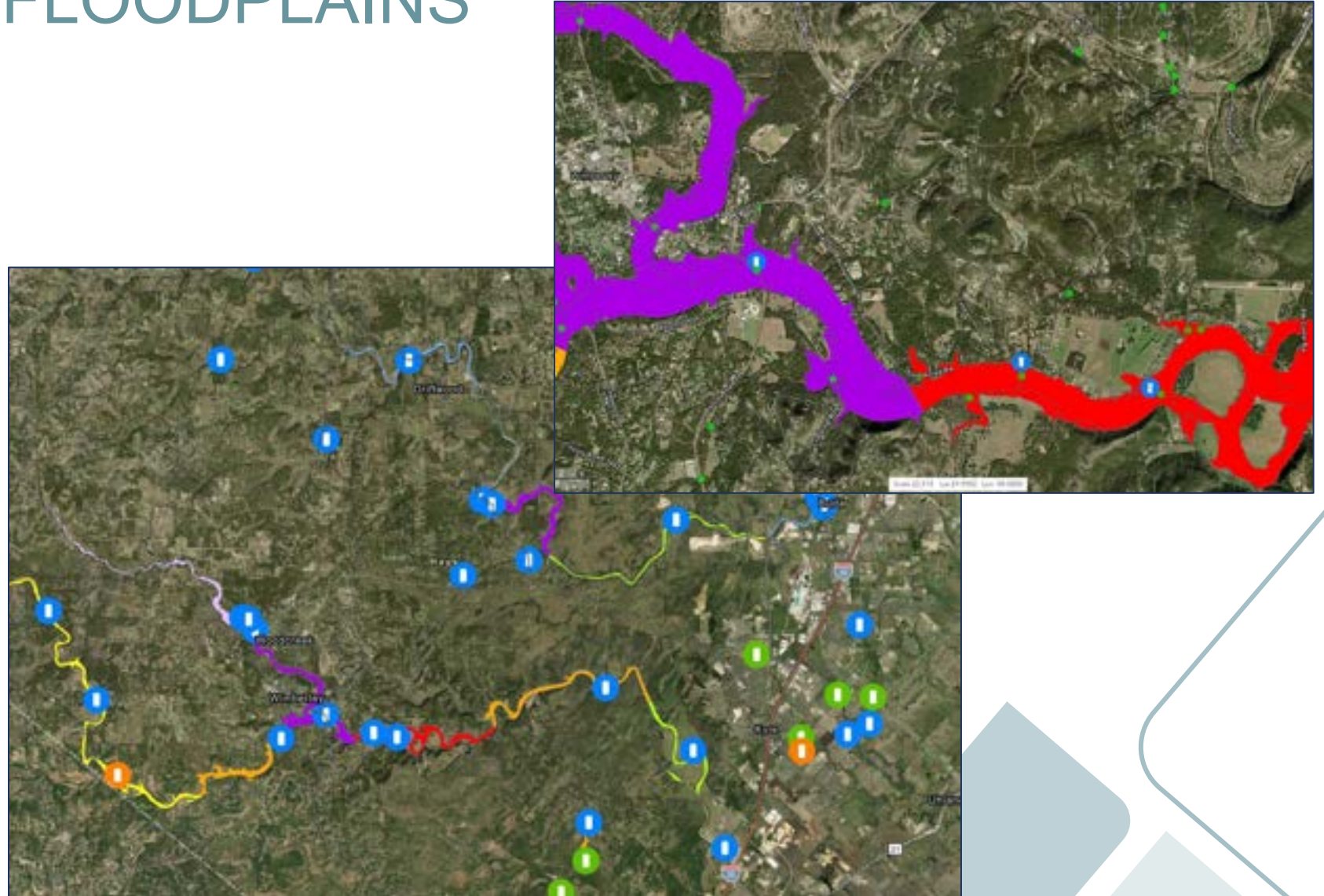
2% - 50 Year

4% - 25 Year

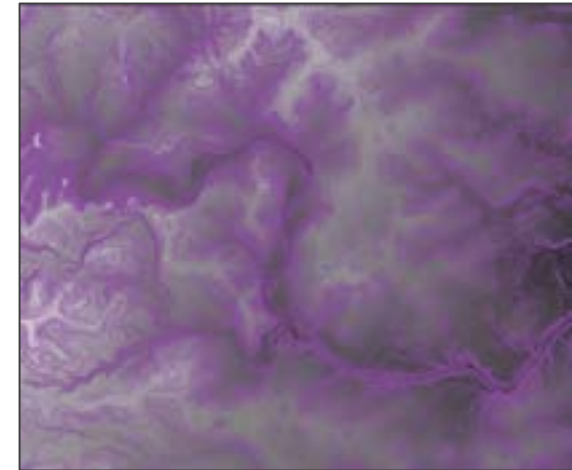
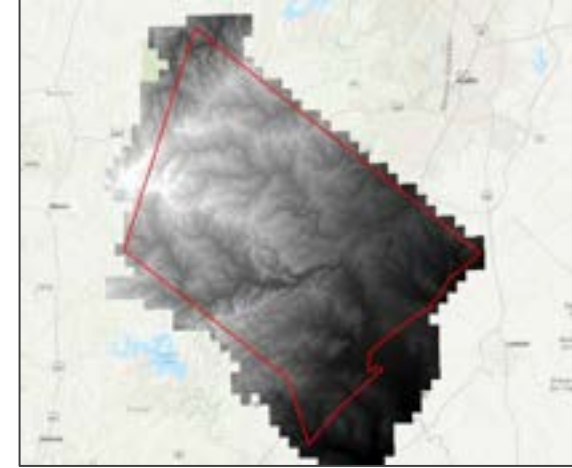
10% - 10 Year

20% - 5 Year

50% - 2 Year



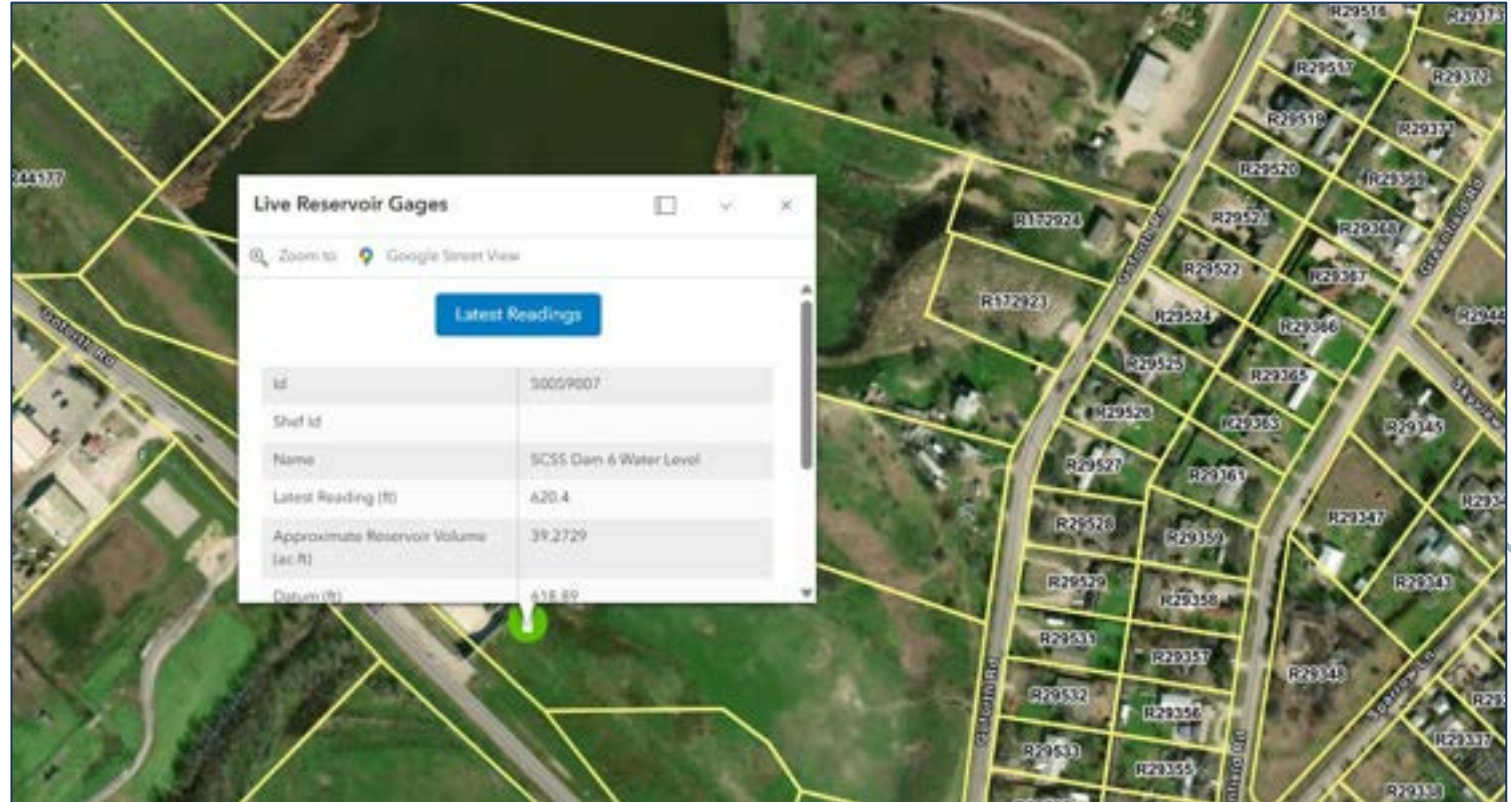
# CONTOURS





# RESERVOIR VOLUMES

- Volumes reported for every 0.5 ft increment for all the reservoir gages added to SQL table
- Elevation range determines the approximate volume based on elevation storage curve
- Reservoir gage feature popup



# RISK AREAS

- Identify hotspots of structures located within the 1% floodplain to highlight areas at higher risk of flooding
  - Current effective 1% NFHL floodplains
  - 2024 address points from Hays County
  - TWDB structures
- Attribution using best available floodplain data
  - City
  - County
  - Floodplain Source
  - Emergency Service District (ESD)
  - County Precinct
  - Exposed Structure Count
  - Exposed Critical Facility Count
  - Texas Flood Social Vulnerability Index (TX F-SVI)
  - Ingress or Egress impacted by that flood frequency



# TEXAS FLOOD SOCIAL VULNERABILITY INDEX

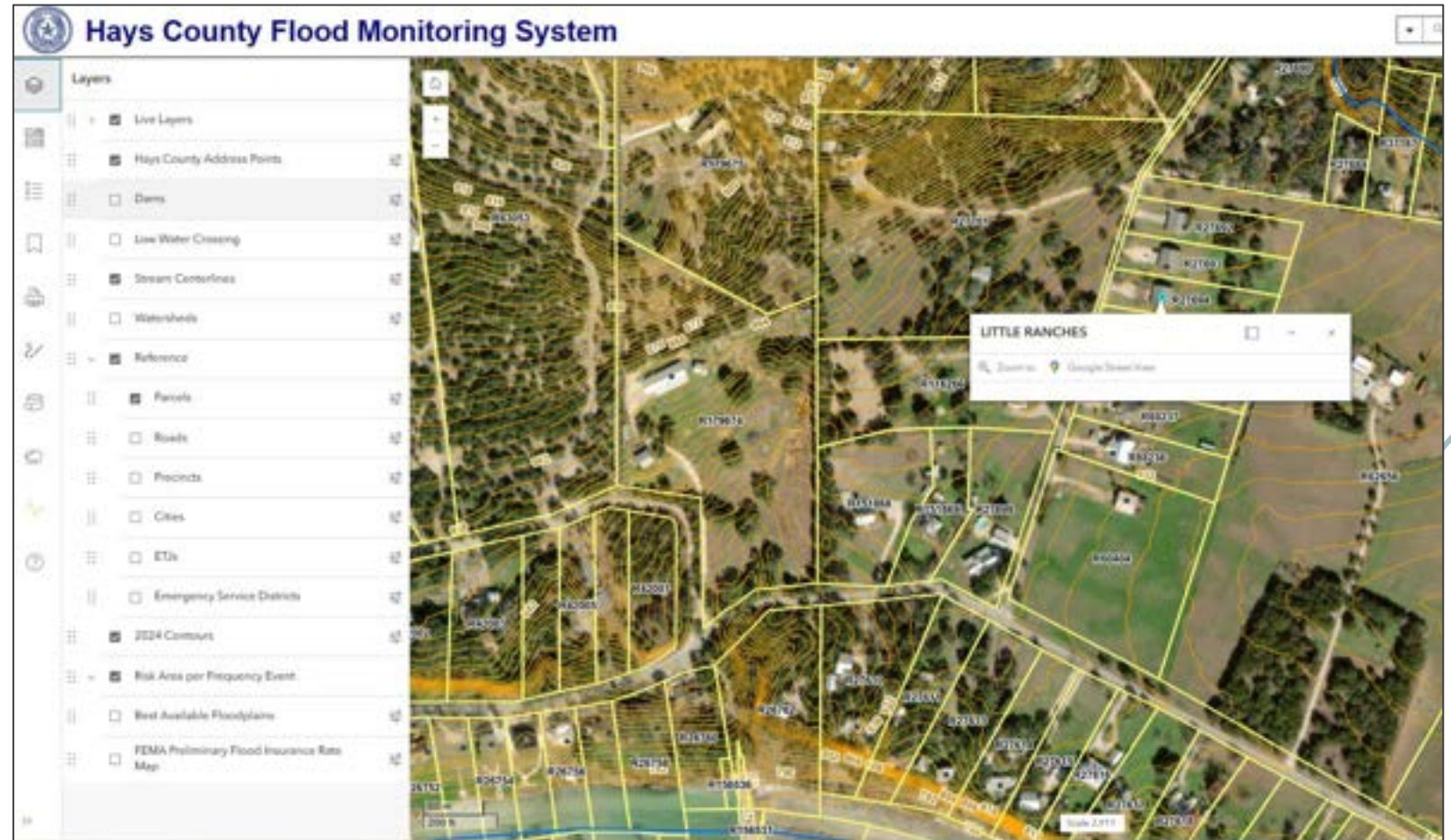
- TWDB released a Texas specific Social Vulnerability Index, referred to as TX-F SVI
- This index was developed specifically for Texas flood planning to evaluate factors relevant to recovery from a flood

Variable	TX F-SVI	CDC SVI
Access to phone/internet	X	
Age	X	X
Disability	X	X
Environmental Risk Factors	X	
Housing Age	X	
Housing Value	X	X
Income	X	
Language	X	X
Migration	X	
Mobile Homes	X	X
No Vehicle	X	X
Minority	X	X
Poverty	X	X
Renters	X	
Rural-Urban	X	
Employment Type	X	
Single Parent Household	X	X
Unemployment	X	X
Crowding		X
Group Quarters		X
Housing Type		X
No Health Insurance		X
No High School Diploma		X
<b>TOTAL</b>	<b>18</b>	<b>15</b>



# REFERENCE LAYERS

- Authoritative dataset from Hays County Open Data Portal
- Halff Hosted Datasets
  - 2024 contours
  - Risk areas
  - Best available floodplains
  - FEMA preliminary flood insurance rate map
  - Dams
  - Low water crossings
  - Stream centerlines
  - Live Layers



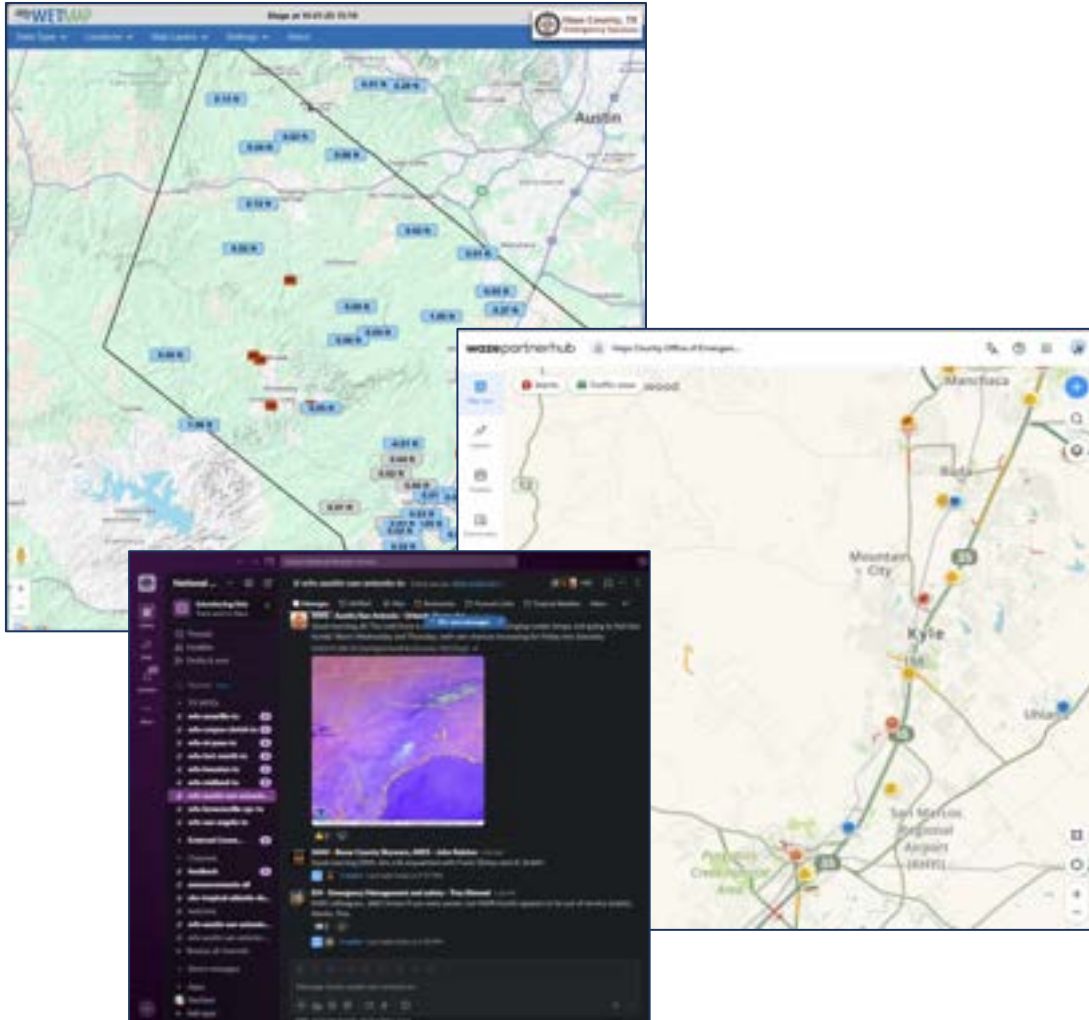
# Flood Monitoring System Tools

- Live Layers-
  - 52 of 62 gages have elevation triggers
  - Live Blanco and Onion Creek floodplains
- Rainfall
- Risk Area Hotspots
- Location bookmark
- Search and zoom
- Map exports
- Gage health
- Approximate reservoir volume
- Latest WET reading





# PART OF A SYSTEM



In addition to the Flood Monitoring System from Halff, we use other systems to assist with communicating with the public and situational awareness.

- Water and Earth Technologies (WETmap) low water crossing sensors and map dashboard
- Waze for Cities and ATXFloods.com
- Mass notification systems through WarnCentralTexas (Everbridge) through CAPCOG to include IPAWS/WEA
- HaysInformed.com and County Social Media Pages
- National Weather Service alerting, automatic notifications, and participation in the NWSChat. We are a StormReady entity.

# USEFUL IN RECOVERY

Moving from Response to Recovery is a turbulent time. Data drives a lot of decisions being made in short and long term recovery.



Knowing contours, flood elevations, and historical flood heights over a large sensor network provides invaluable information useful to recovery. Starting with a disaster declaration and following through to debris and case management.



# LESSONS TO LEARN



# INCIDENT SUPPORT TASK FORCE

The Incident Support Task Force (ISTF) is a state resource, deployable under the direction of the Texas Division of Emergency Management, comprised of multi-disciplined, multi-talented, and high qualified subject-matter experts with experience in all phases of emergency management.

The Incident Support Task Force maintains a reservist roster comprised of local-level government employees who may be requested to deploy to assist other local jurisdictions in the response to and recovery from disasters.

In this “locals helping locals” effort, members deploy from unimpacted regions of the state to assist affected communities with all hazards.

If you are employed by any level of local government (City, County, ISD, ESD) you are eligible to participate!



<https://tdem.texas.gov/response/incident-support-task-force>

# THANK YOU! QUESTIONS?

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