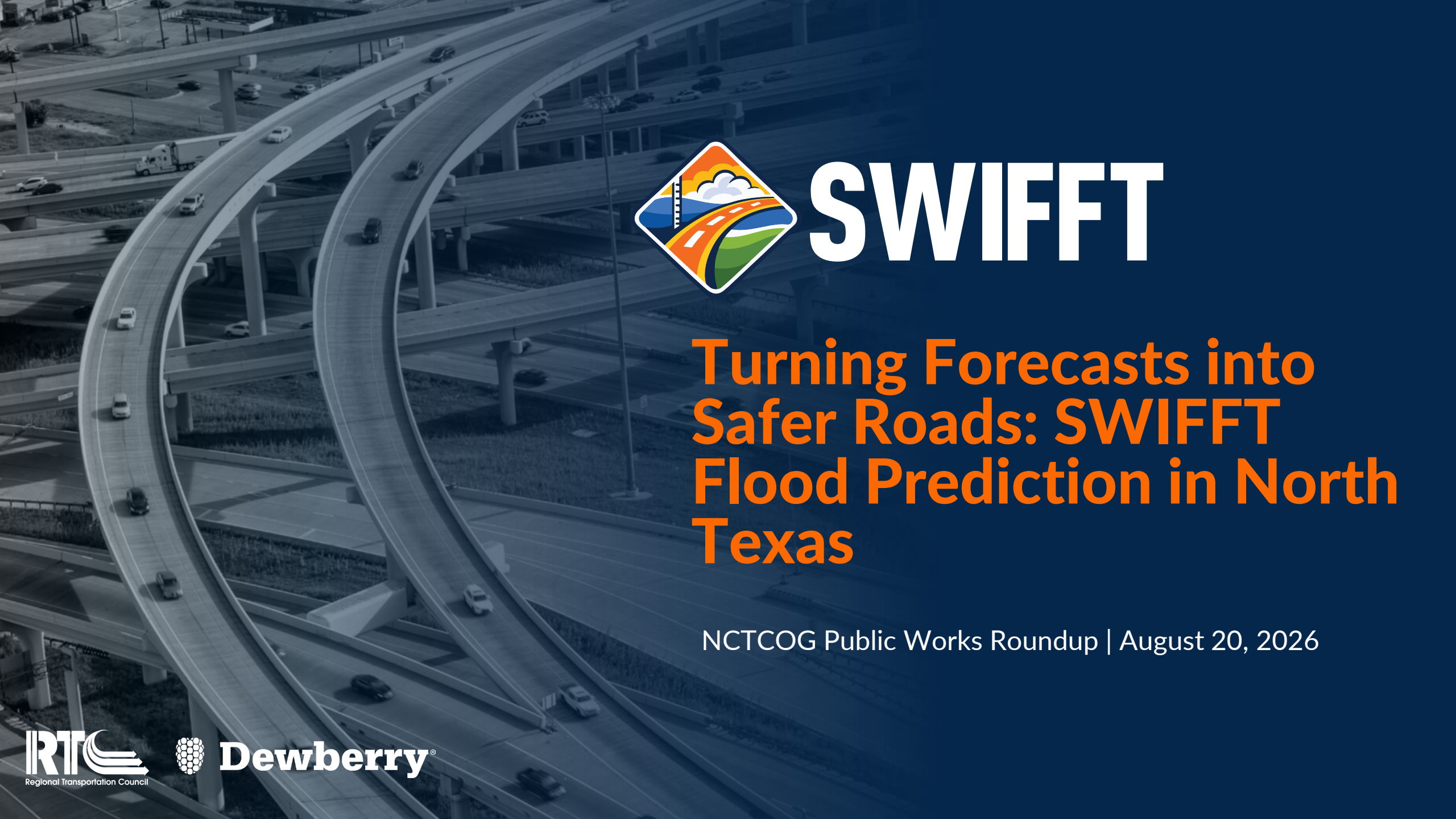

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Turning Forecasts into Safer Roads: SWIFFT Flood Prediction in North Texas

NCTCOG Public Works Roundup | August 20, 2026

RTC Regional Transportation Council

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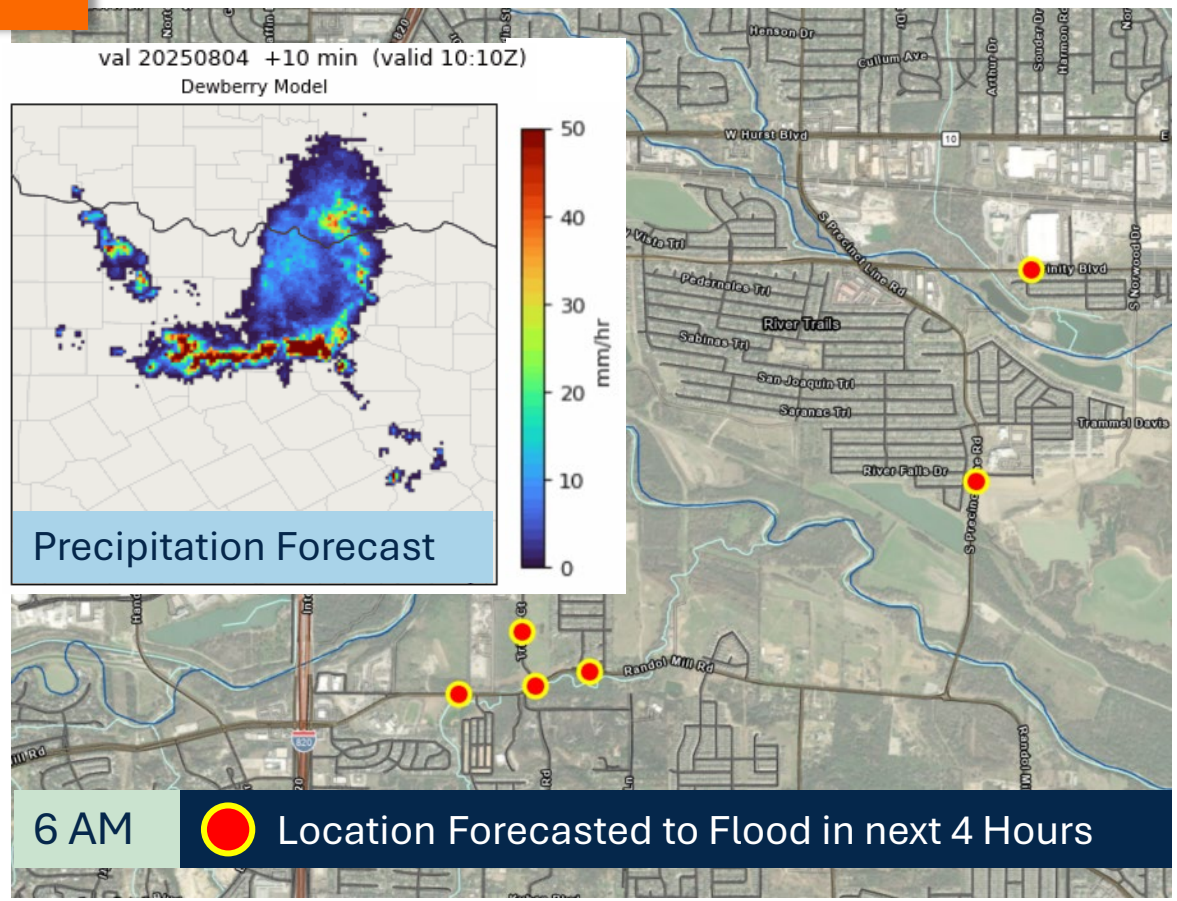
How can local **agencies** gain actionable flood intelligence before roads are underwater?



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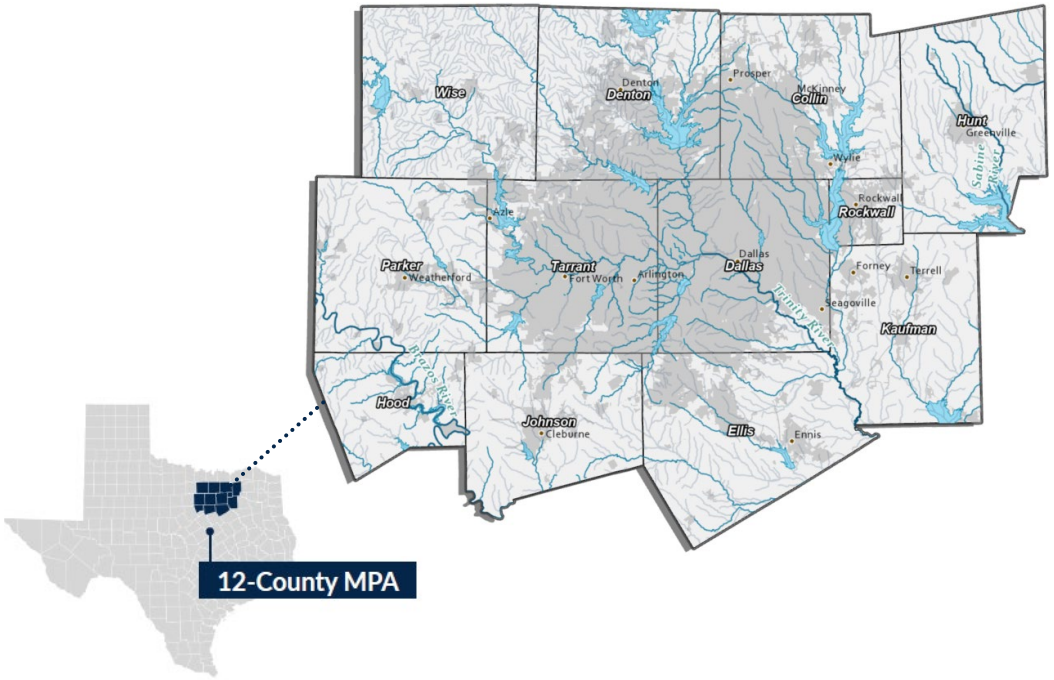
SWIFFT

Stormwater Integrated Flood Forecasting Tool

The Vision

- Creates a new preemptive warning system for potential flooded roads in the DFW Metroplex
- Integrates observed and forecast data to predict where and when flooding may impact roads
- Reroutes traffic through existing navigational systems
- Informs emergency responders

Project Area



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Public Works Benefit

Tool Capability

- Real-time stream monitoring
- Forecast inundation mapping
- Rainfall intelligence
- Flood Alerts
- Historical data

Public Works Benefit

- Early road closures
- Better resource deployment
- Targeted field inspections
- Faster emergency notifications
- Capital improvement planning

Public Works Benefit

Traditional Approach

- Wait for reports
- Dispatch crews
- Verify conditions
- Close roads

Enhanced Approach

- Monitor rainfall and stream conditions
- Receive alerts
- Anticipate impacts
- Deploy crews proactively

Advisory Council

Local

- **Emergency Managers & Floodplain Administrators** (from small and large communities)
- **NCTCOG** Emergency Managers, Director of Environment and Development, Transportation Planners
- Tarrant Regional Water District (**TRWD**) - Engineer

State

- Texas Division of Emergency Management (**TDEM**) – Regional Preparedness Coordinator
- Texas Department of Transportation (**TxDOT**)– State Hydraulic Engineer

National

- **NOAA** National Weather Service (**NWS**) – Senior Service Hydrologist
- **NOAA** West Gulf River Forecast Center (**RFC**) – Hydrologist in Charge
- **USGS** – Branch Chief, Hydrology

Development Framework

Phase 1: Exploration

Understanding stakeholder needs and decision workflows.

Phase 2: Co-Design

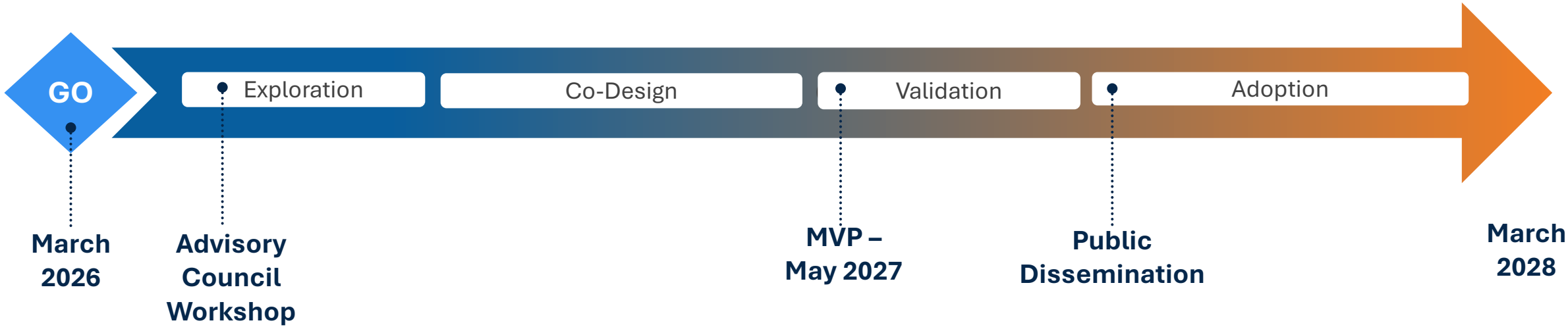
Collaborating with stakeholders via Advisory Council to refine messaging and system outputs.

Phase 3: Validation

Testing the system and gathering user feedback.

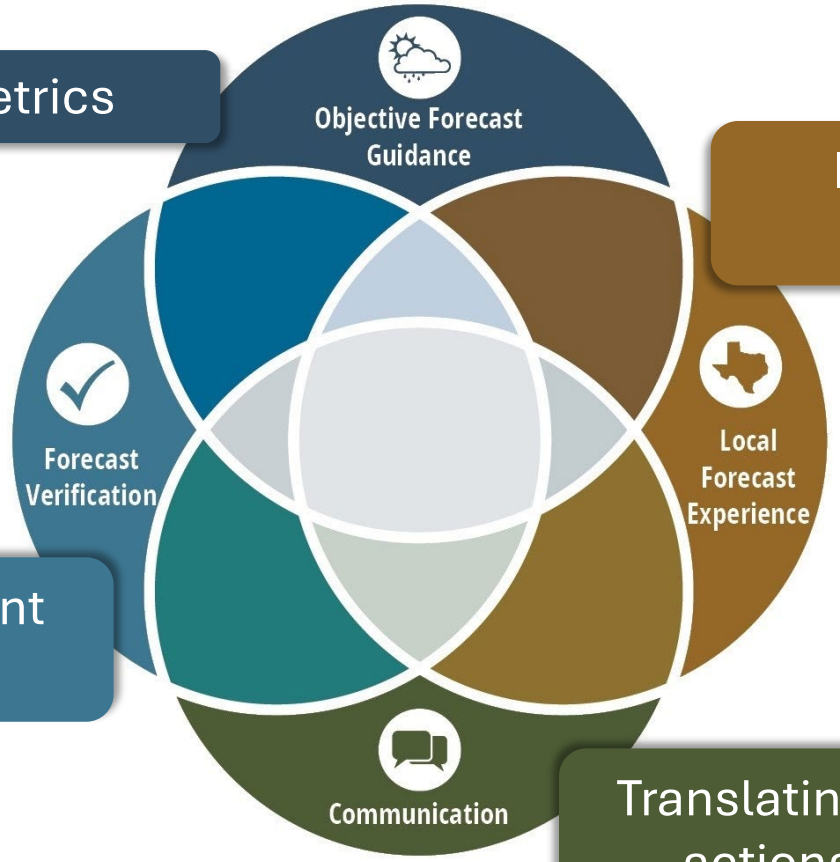
Phase 4: Adoption

Training users and supporting implementation.



Forecasting Philosophy

Using data-driven metrics



Incorporating regional historical knowledge

Continuous self-assessment against observed events

Translating complex data into actionable public alerts

System Design Principles

Building to the Future

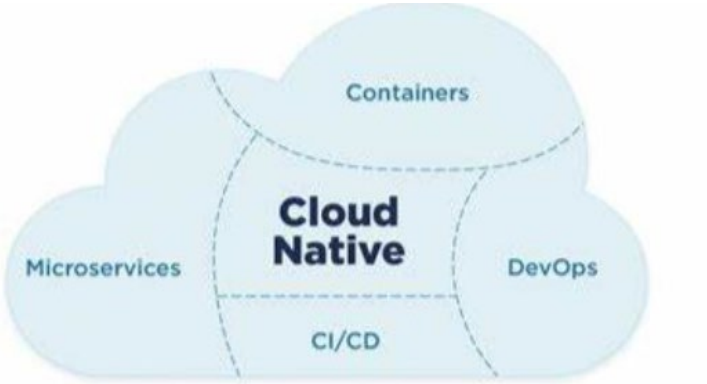
- Data Ingestion Interfaces
- Model Agnostic

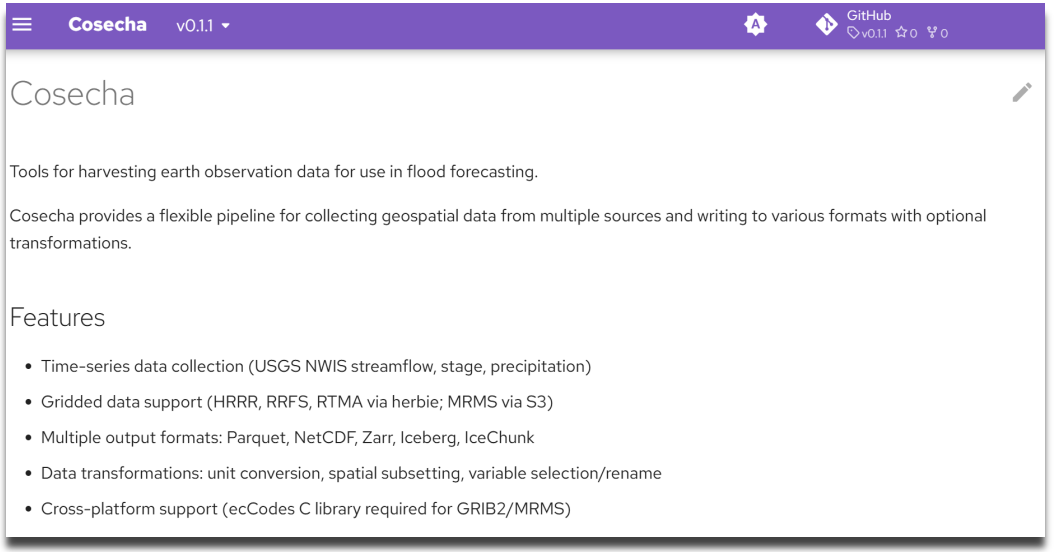
Open Standards

- Cloud Native Formats

Open Source Software

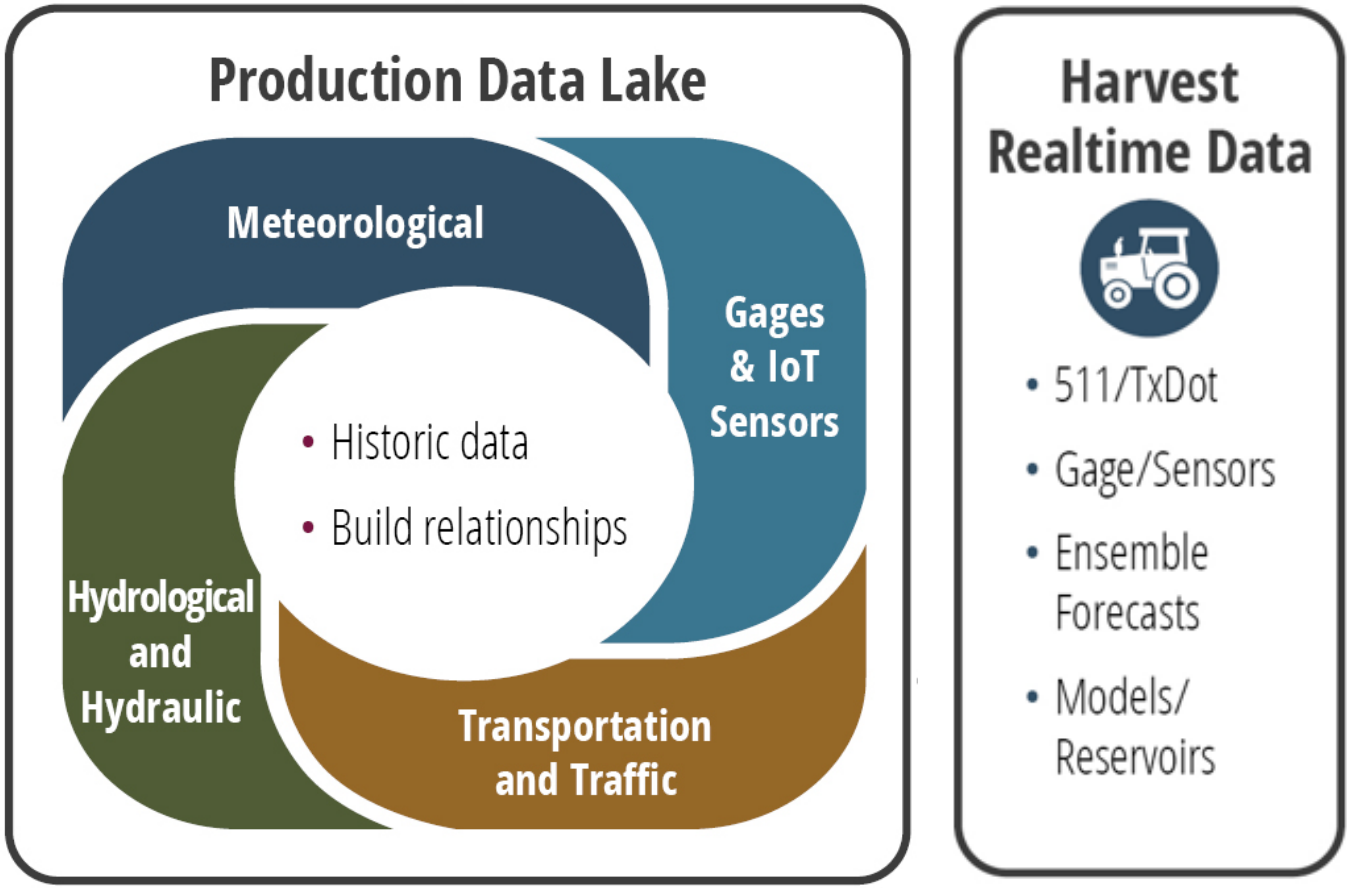
- No Vendor Lock
- Extensibility





Data Engineering

- Data Lake
- Harvesting
- Critical Datasets
  - Bridge/roadway elevations
  - Local gage/sensor networks outside of USGS
  - NOAA/USGS Hydrofabric



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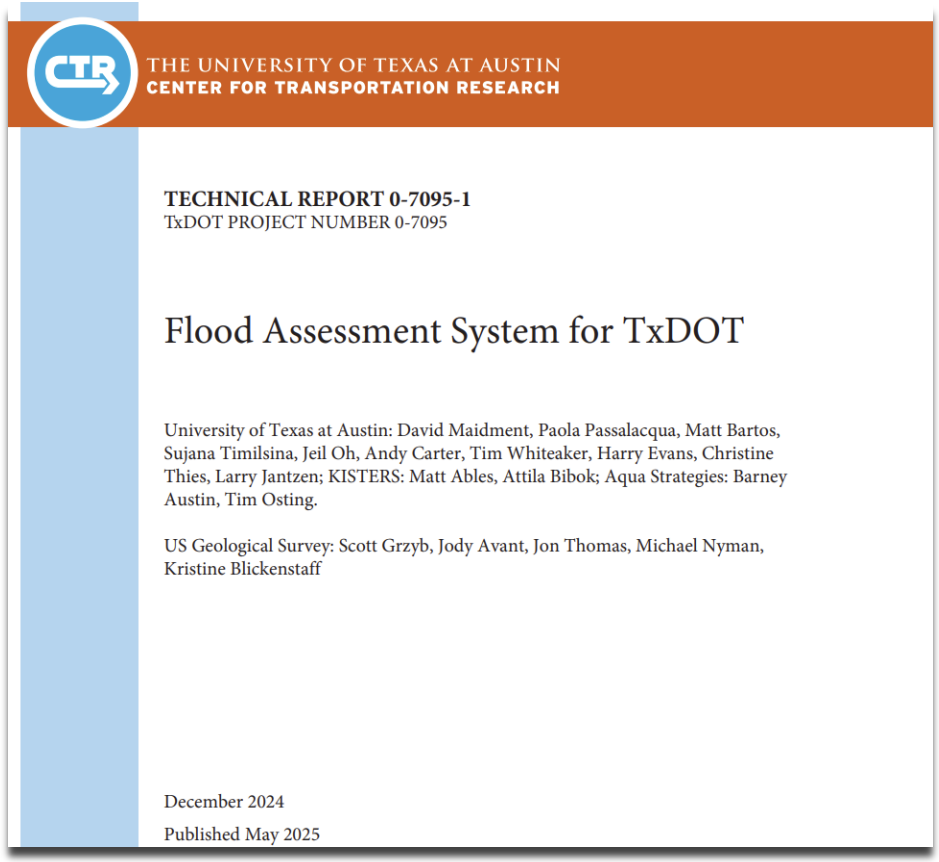
Foundational Data

Roadway Elevations



THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

TECHNICAL REPORT 0-7095-1
TxDOT PROJECT NUMBER 0-7095

Flood Assessment System for TxDOT

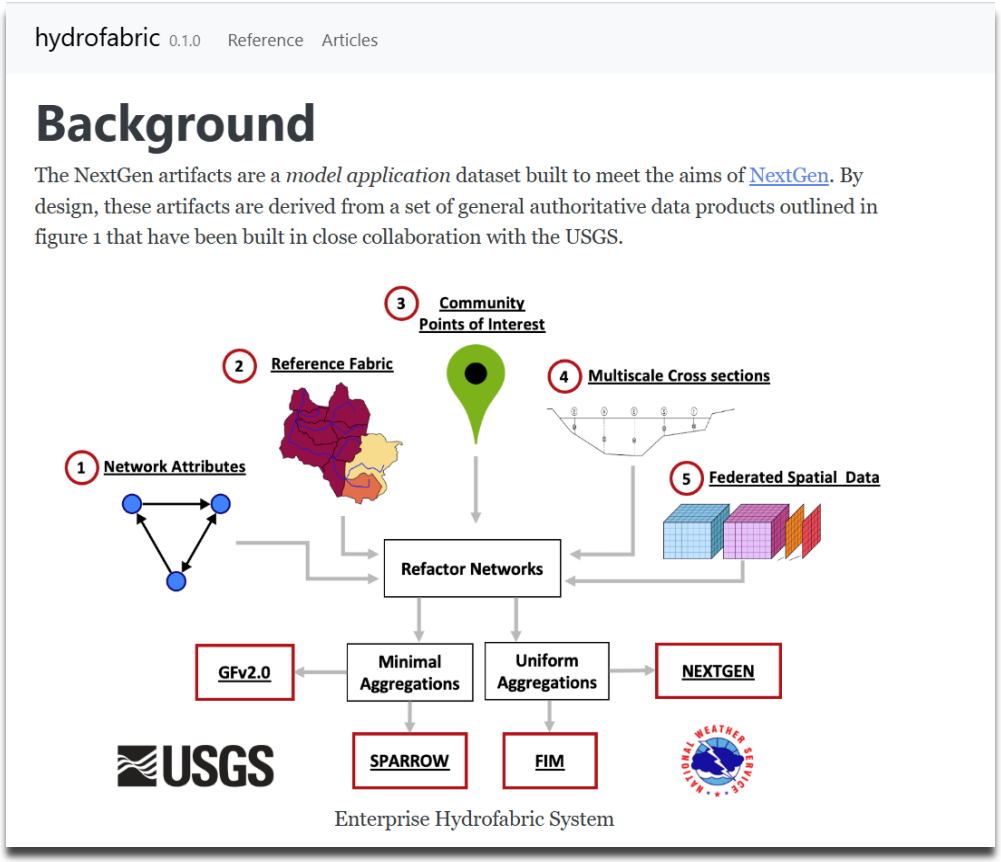
University of Texas at Austin: David Maidment, Paola Passalacqua, Matt Bartos, Sujana Timilsina, Jeil Oh, Andy Carter, Tim Whiteaker, Harry Evans, Christine Thies, Larry Jantzen; KISTERS: Matt Ables, Attila Bibok; Aqua Strategies: Barney Austin, Tim Osting.

US Geological Survey: Scott Grzyb, Jody Avant, Jon Thomas, Michael Nyman, Kristine Blickenstaff

December 2024

Published May 2025

Stream Network



hydrofabric 0.1.0 Reference Articles

Background

The NextGen artifacts are a *model application* dataset built to meet the aims of NextGen. By design, these artifacts are derived from a set of general authoritative data products outlined in figure 1 that have been built in close collaboration with the USGS.

Enterprise Hydrofabric System

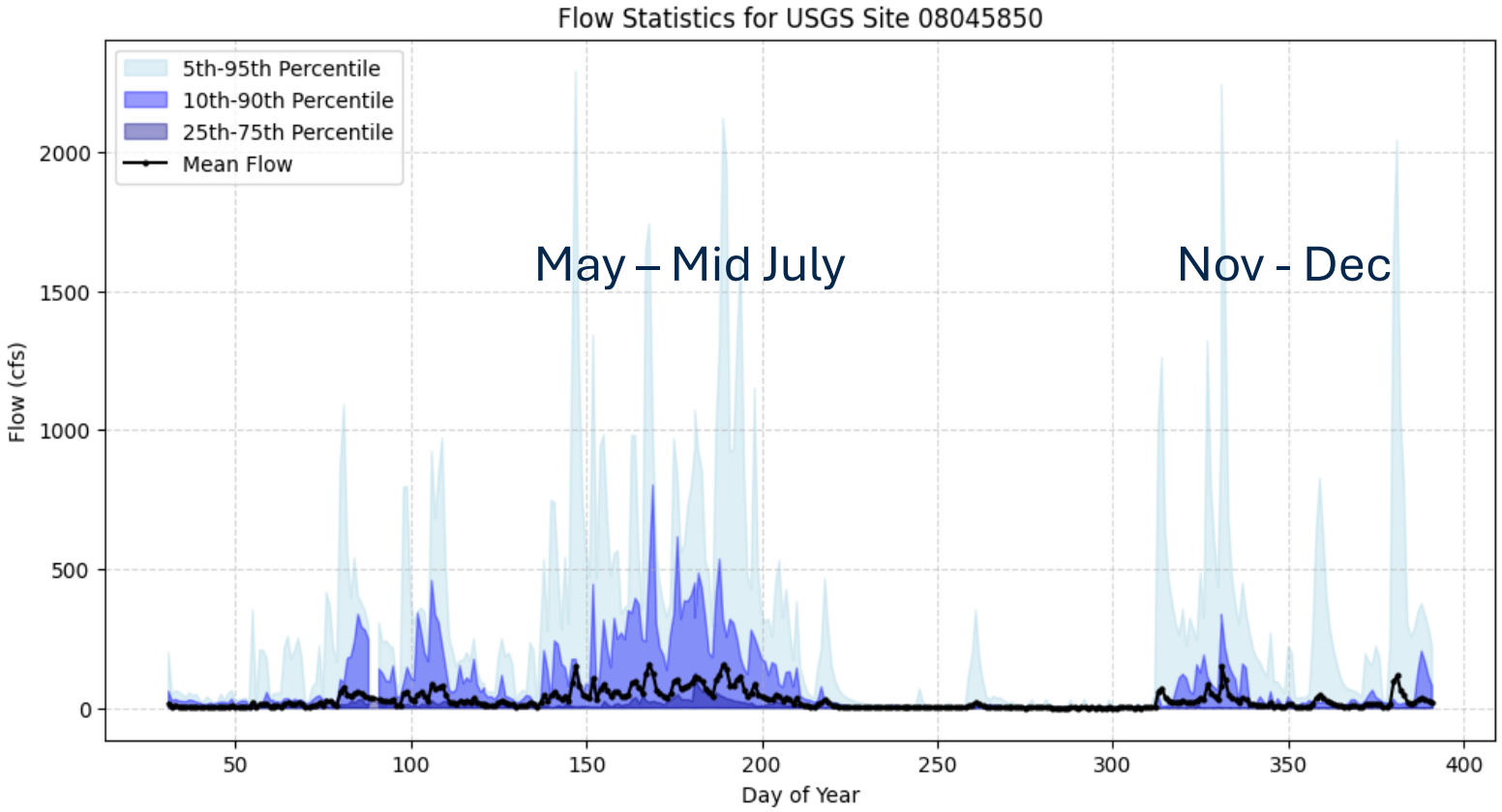
Hazard Data

Observations

- Precipitation
- Streamflow
- Lake Levels
- Crowd sourced Data

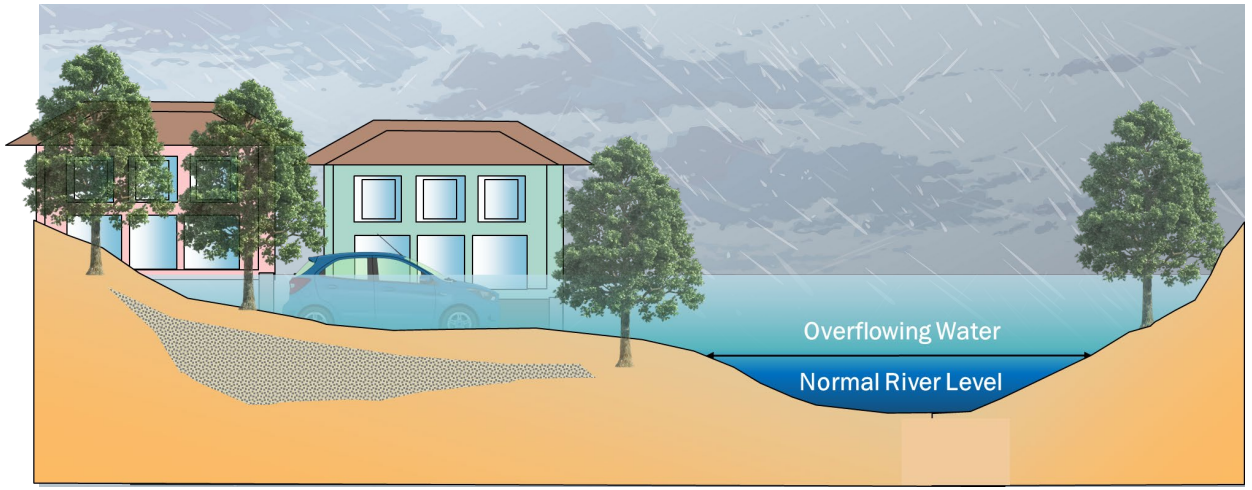
Forecasts

- Models
- Partners

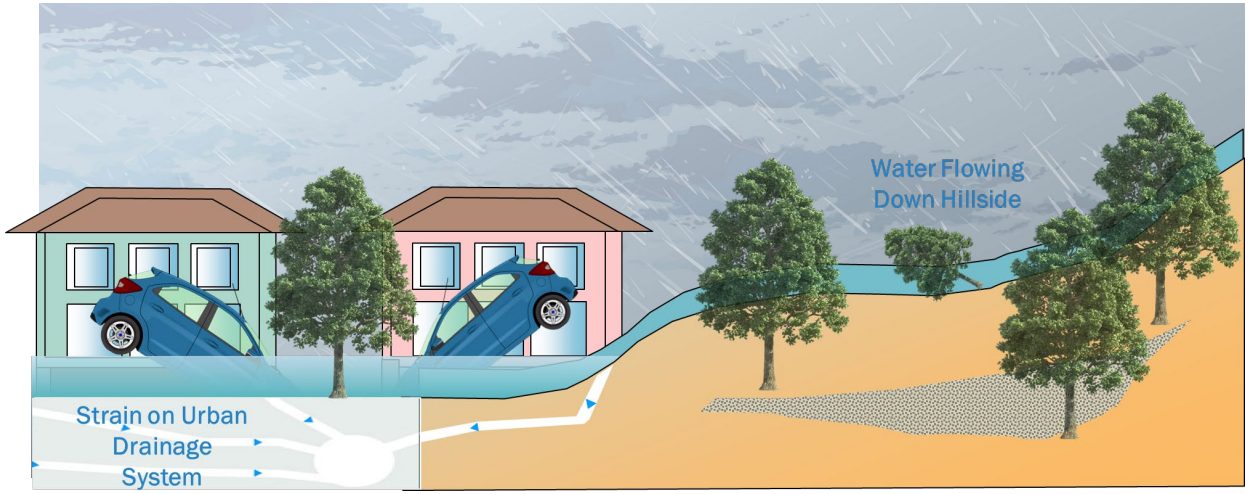


Flood Hazards

- **Fluvial** (Riverine): Streamflow coming up and over the riverbanks onto roadways and into communities.



- **Pluvial** (Rainfall): Precipitation falling so rapidly stormwater infrastructure is overwhelmed, flooding roads and communities.



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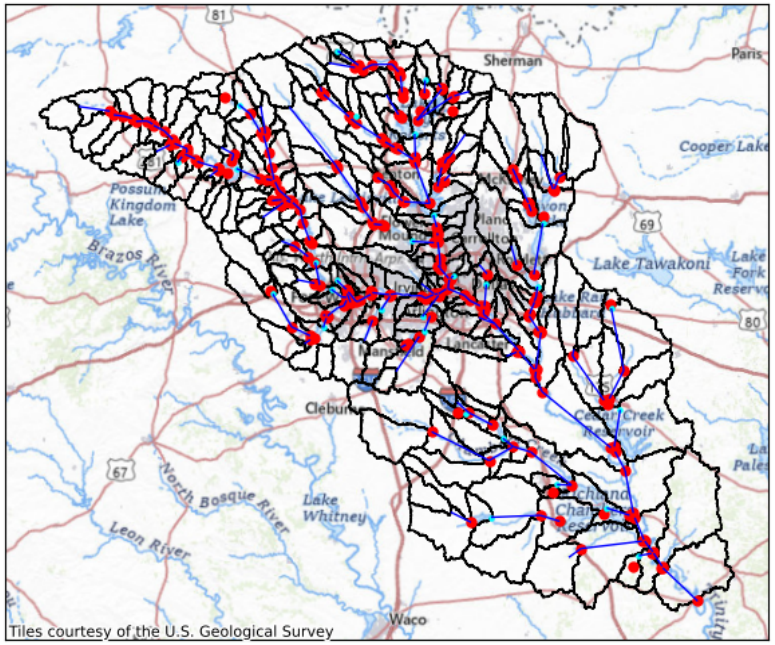
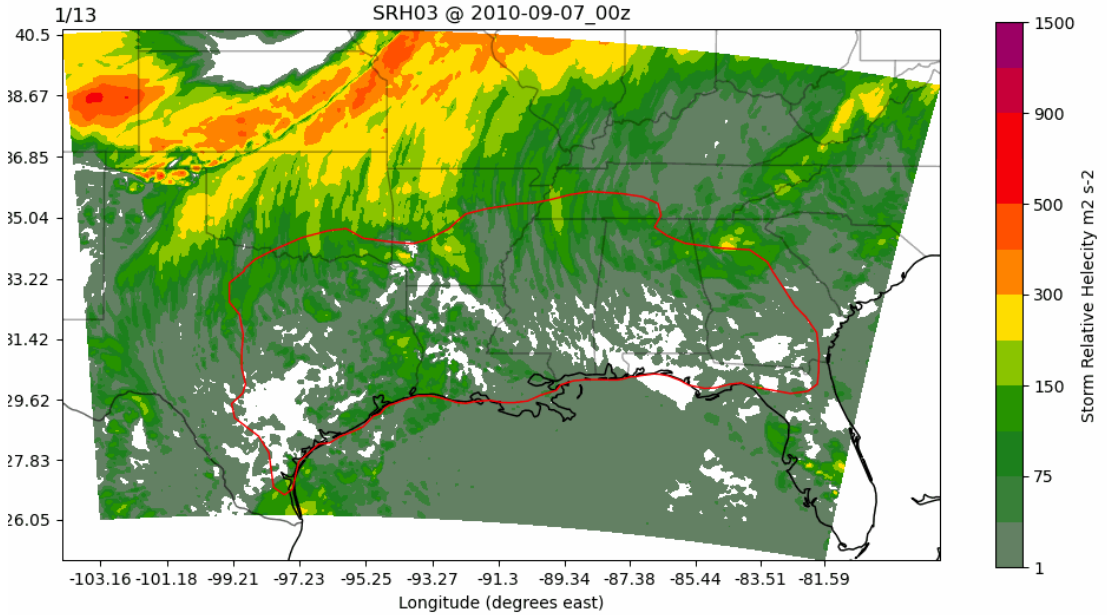
Hydro-Met Models

(Flood Drivers: How much water and when)

- **Fluvial:** HEC-HMS & National Water Model



- **Pluvial:** Quantitative Precipitation Forecasts & Estimates



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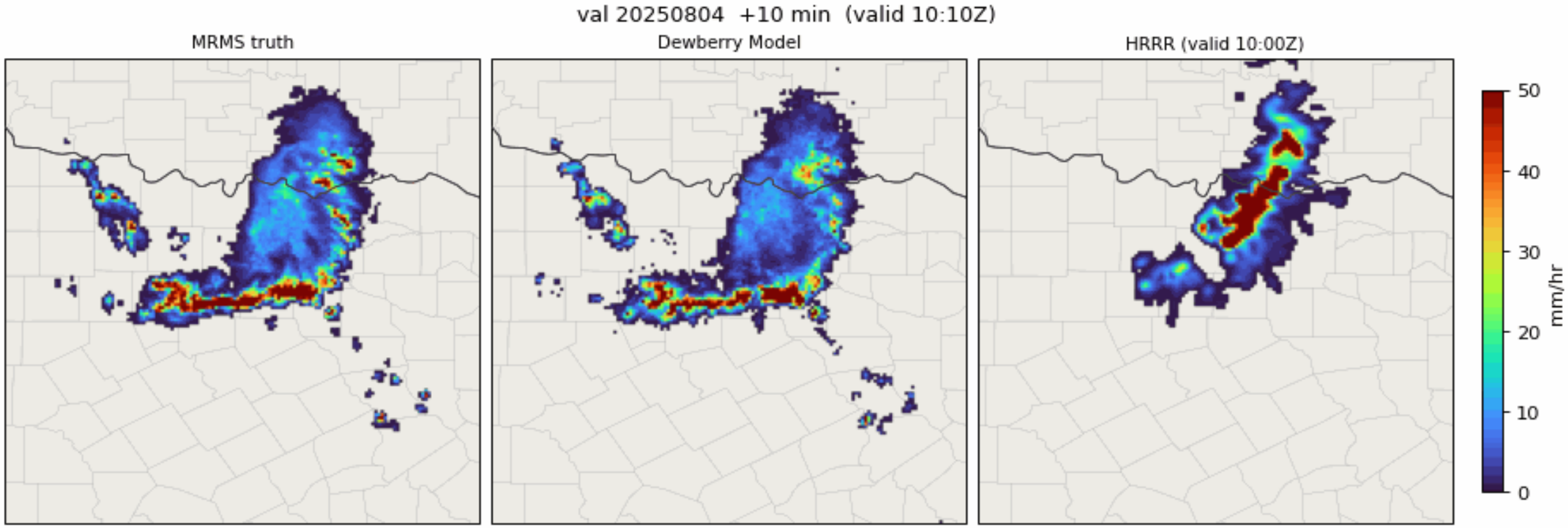
Meteorological Forecasts

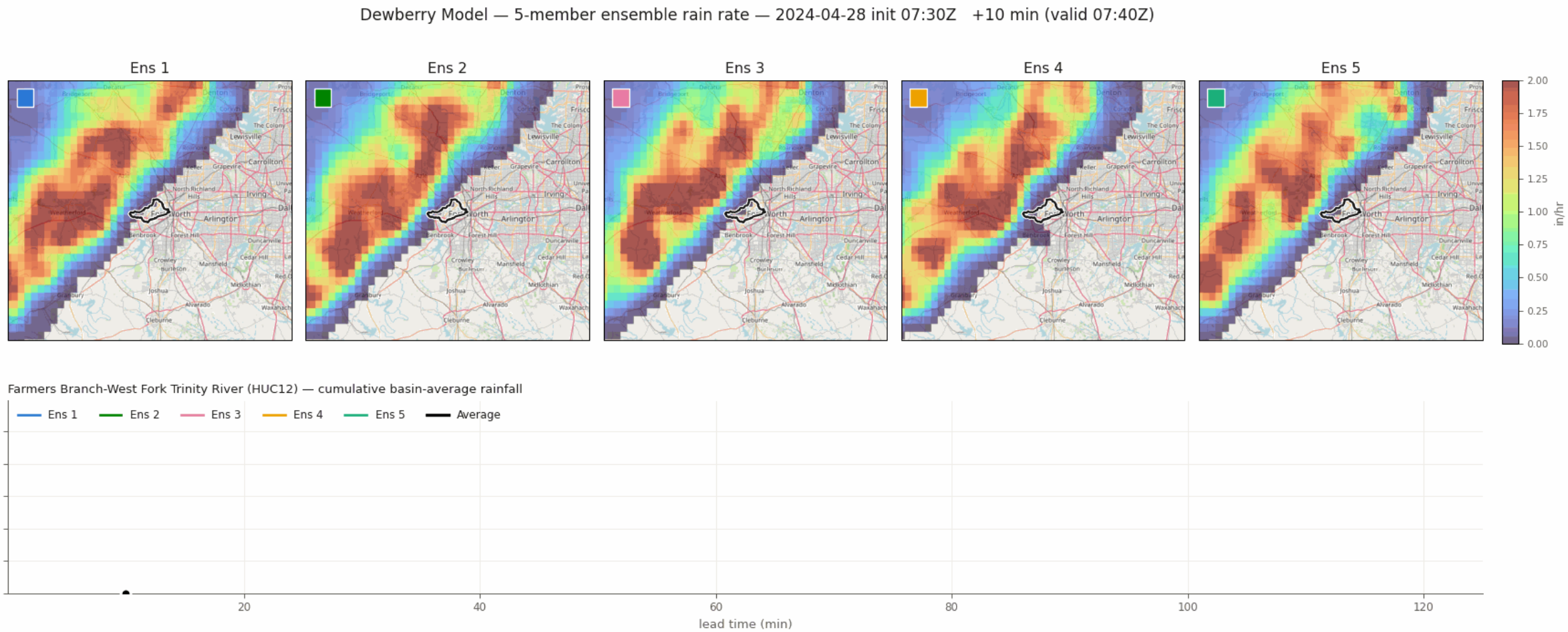
(The largest driver of uncertainty and latency)

Traditional NWP Models	Vs.	Regional AI Models
• Strong at 4–18-hour forecasts	→	• Optimized for 0–3-hour nowcasting
• Forecast generation can take over an hour	→	• Forecasts generated in minutes
• Sensitive to imperfect initial conditions	→	• Initialized from real radar observations
• Storms can be misplaced or missed	→	• Improved storm placement and intensity tracking
• Limited ensemble runs due to computational cost	→	• Fast, low-cost ensemble forecasting
• Spin-up can reduce reliability in earliest forecast hours	→	• Designed to fill the short-term forecasting gap

Meteorological Forecasts: AI



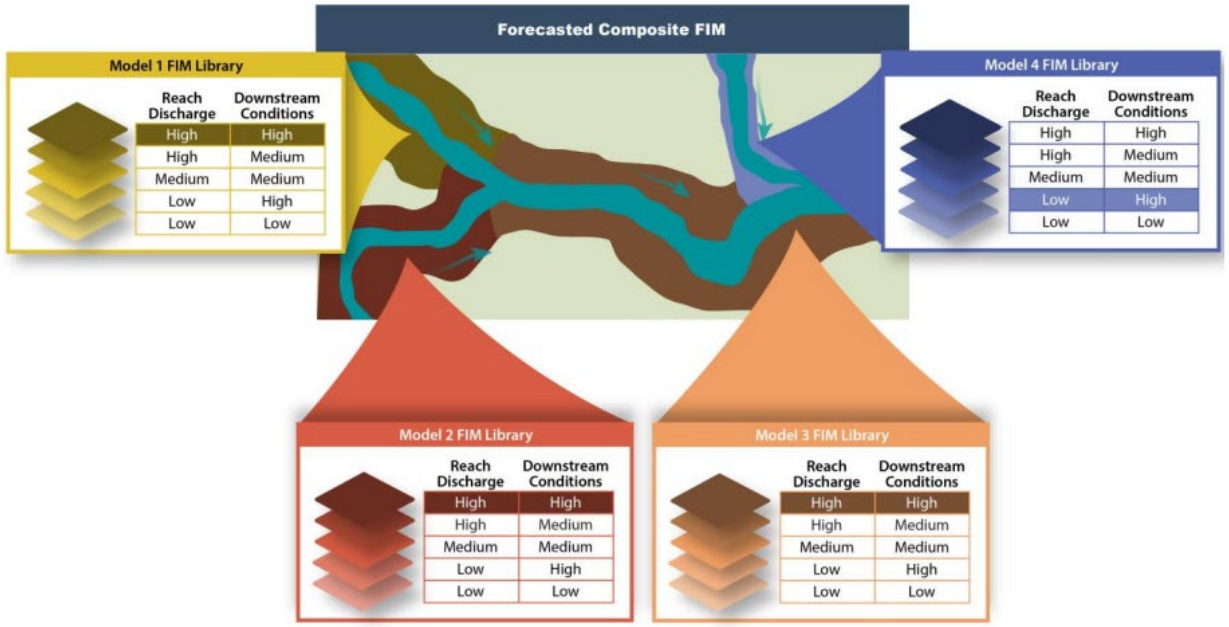
Meteorological Forecasts: Ensembles

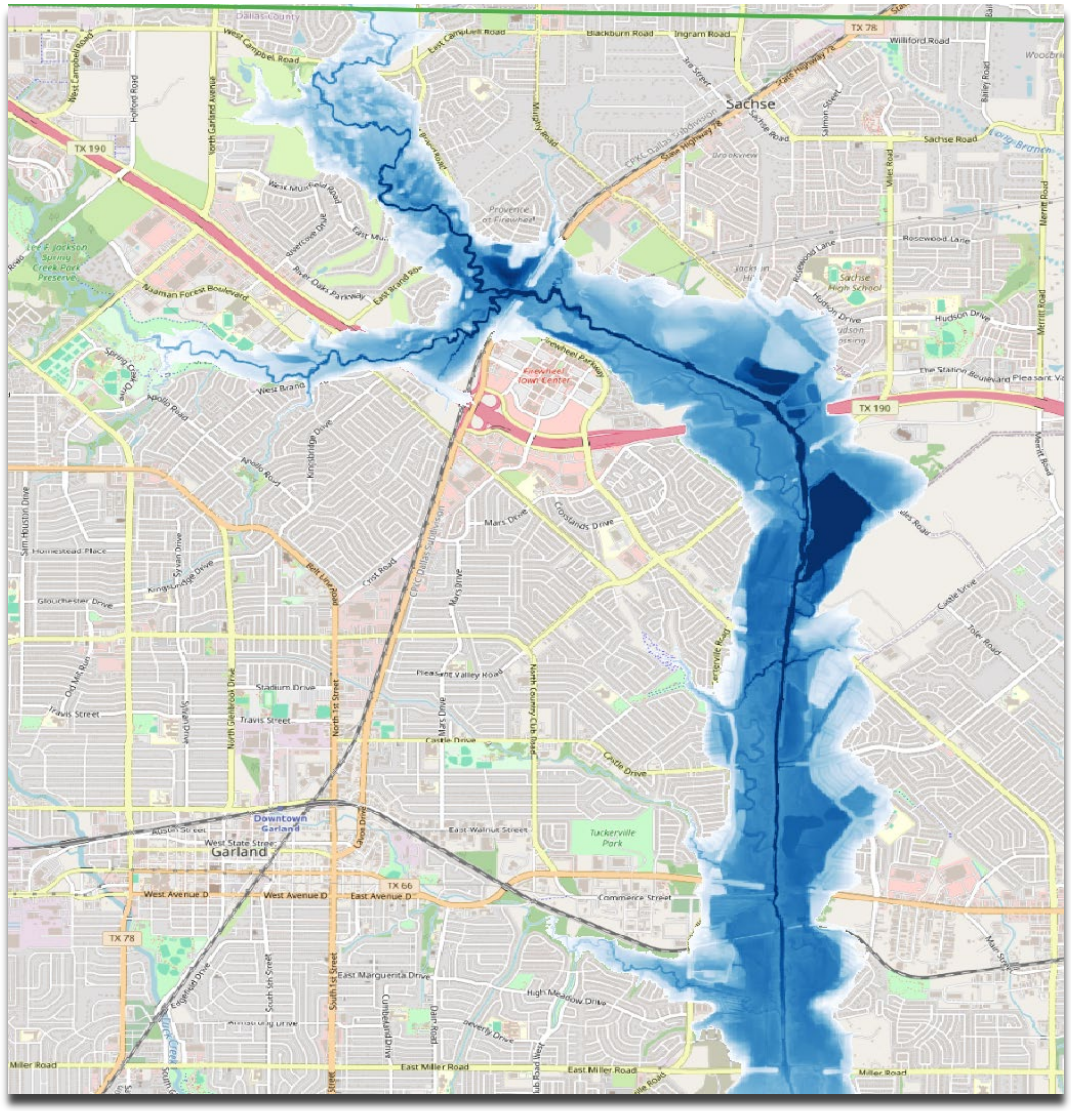


Hydraulic Models

(Impact: How high and where)

Flood Inundation Maps (FIMS)





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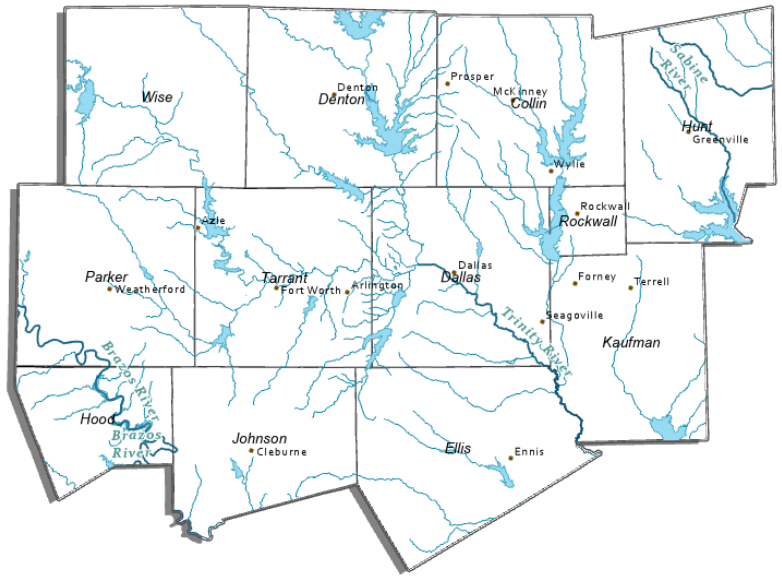
Operational Realities & Challenges

Reservoirs



Flash Flooding

Forecasting Error

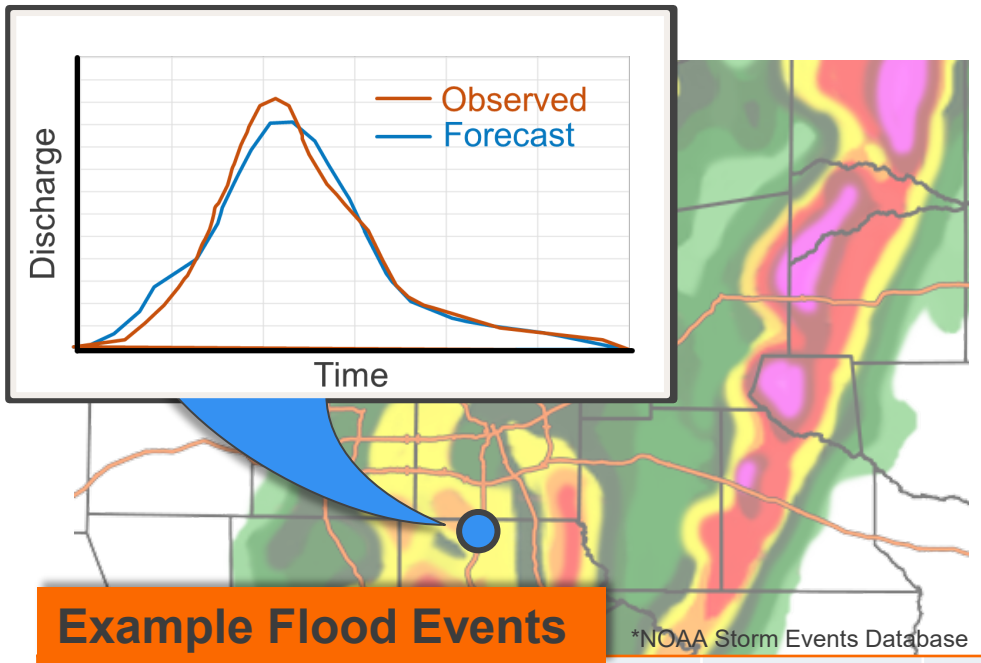
Type 1 (False Positive)

- Messaging fatigue

Type 2 (False Negative)

- Incidents and casualties

Retrospective Analysis



Short-Medium (3-12 hr):
- High-intensity flash floods
- Greatest vehicle and rescue risk

Medium (12-24 hr):
- Mesoscale convective-driven rainfall
- Urban + small basin response

Long (≥24 hr):
- Basin-scale river flooding
- Reservoir operations and prolonged disruption

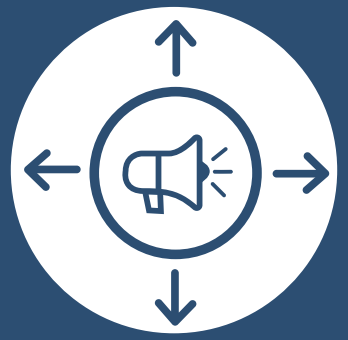
Example Flood Events

*NOAA Storm Events Database

Year	Flood Event	Flood Type	Duration	Key Impacts
2022	Aug 21 Dallas Flash Flood	Flash Flood	Short - Medium	Deep water on major arterials
2023	Jun 15–16 North TX Flooding	Flash Flood	Medium	Vehicle-related incidents
2024	May 28–30 Trinity Basin Flood	Flood	Long	Reservoir releases, prolonged closures

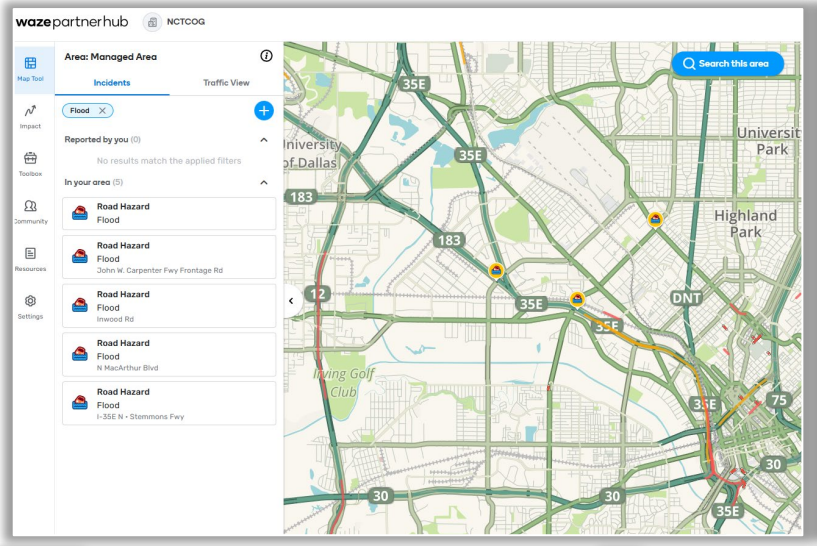
Continuous stress-testing by running the model against past events to evaluate spatial and temporal accuracy.

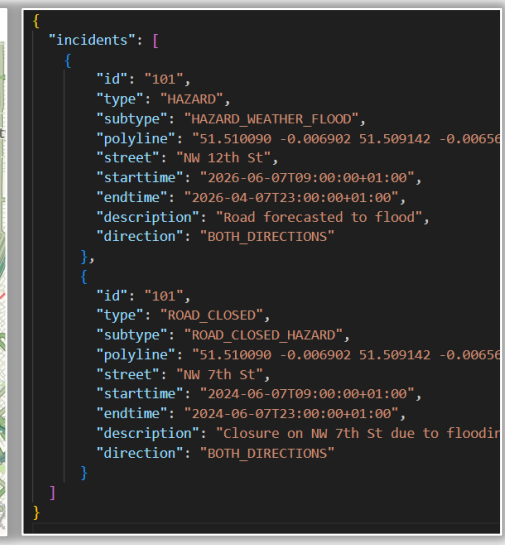
Dissemination

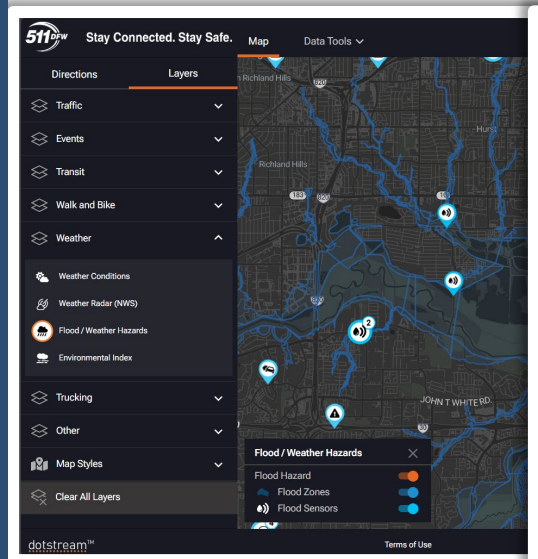


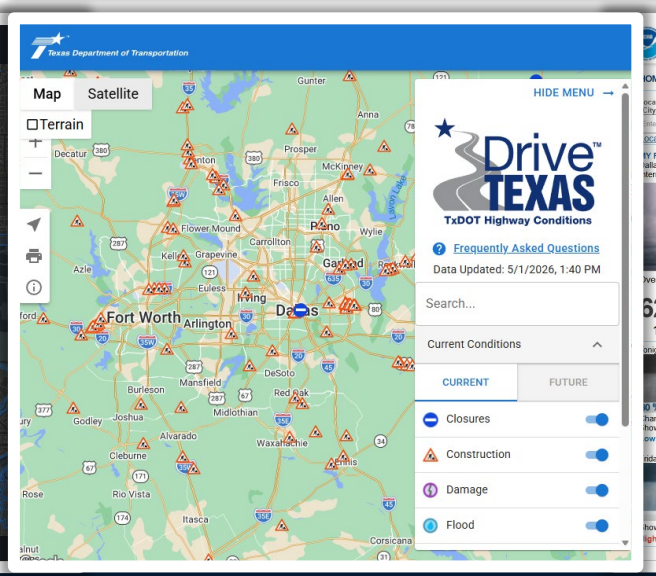
Public Navigation Apps

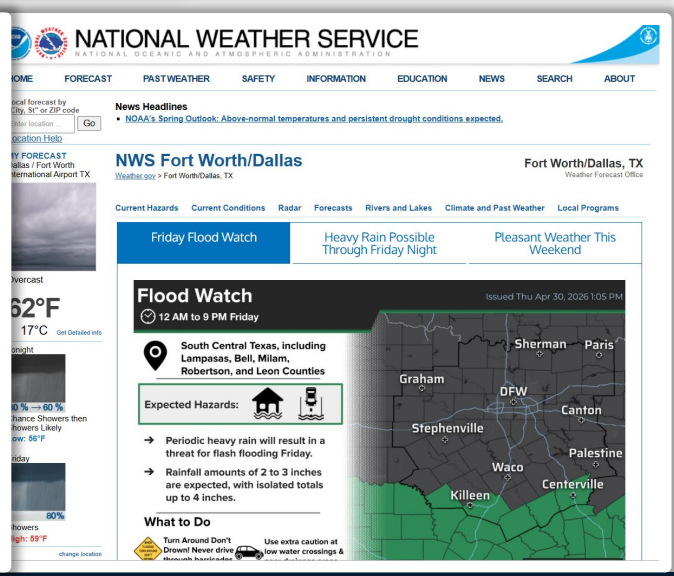
Partners











Publish flood warning outputs to public platforms and service providers.

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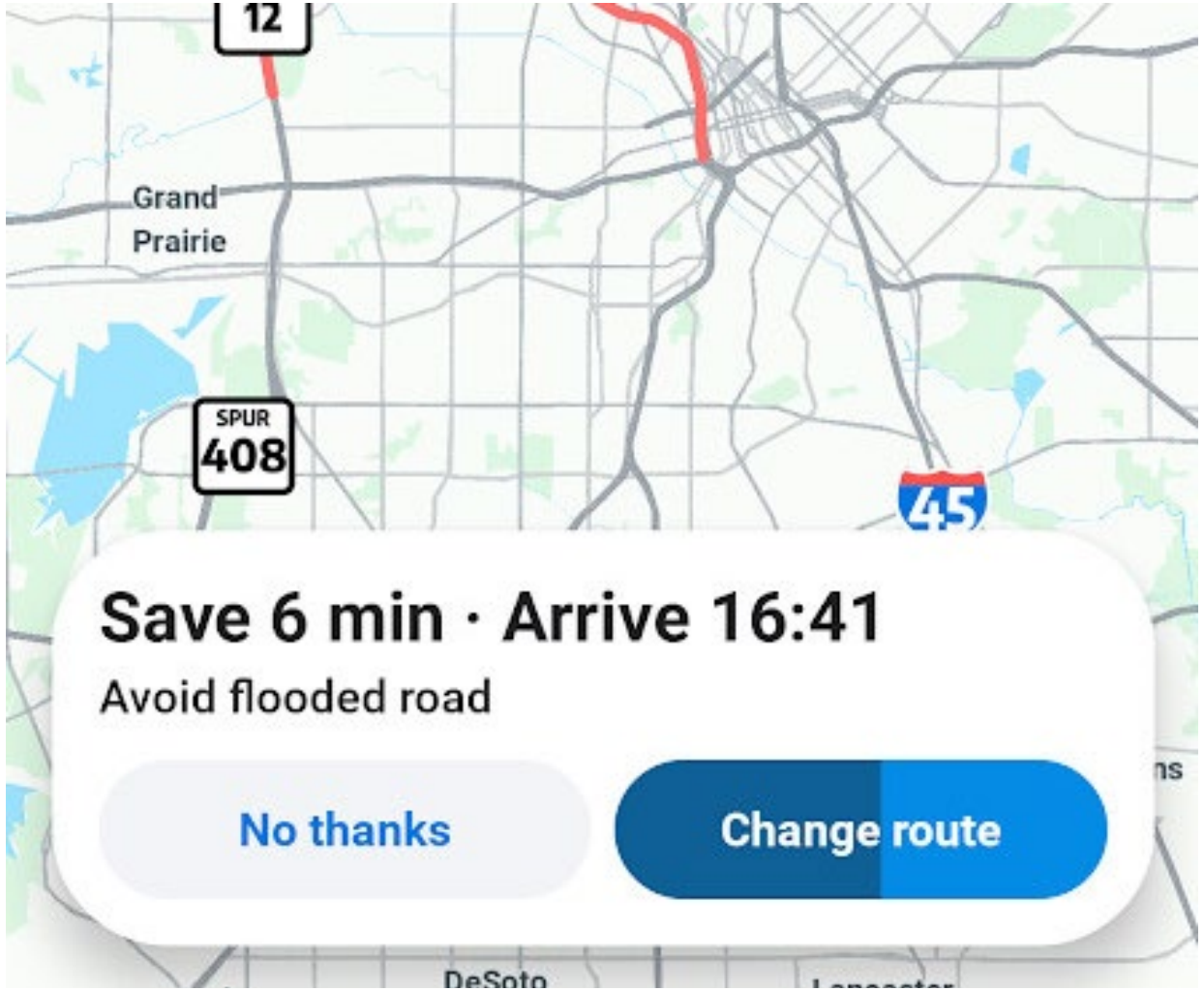
Navigation Apps “Close” the Road



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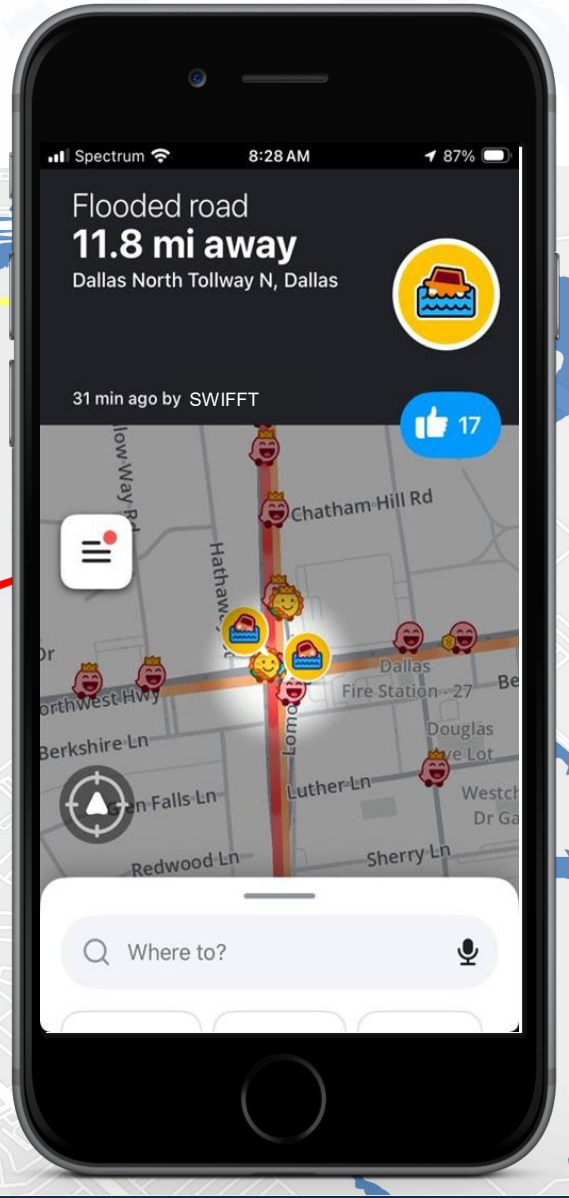
Waze Flood Validation

SWIFFT forecasted flooded road hazards will be validated in real-time using Waze's published feed service.



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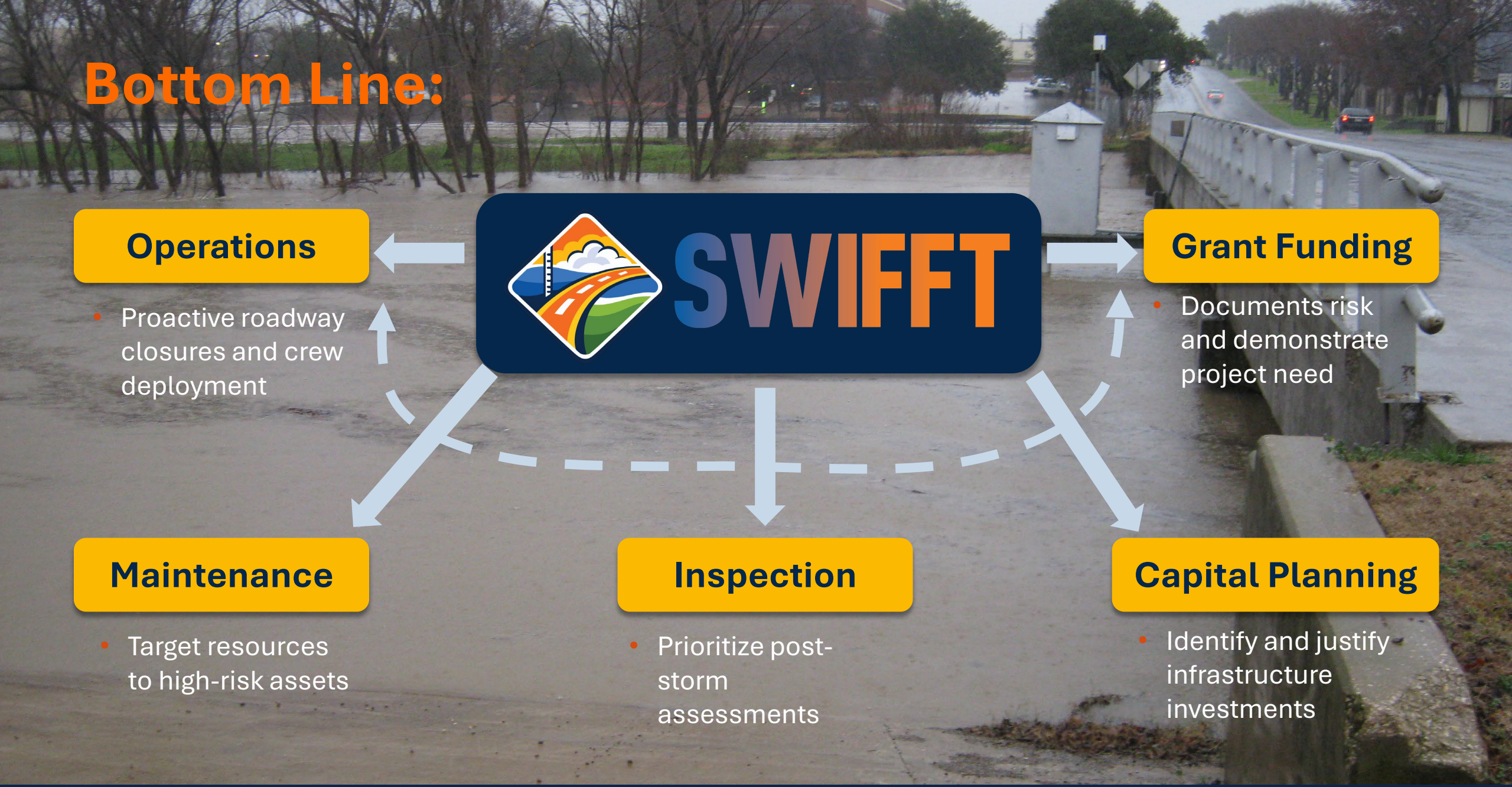
Bottom Line:



Operations

- Proactive roadway closures and crew deployment

Grant Funding

- Documents risk and demonstrate project need

Maintenance

- Target resources to high-risk assets

Inspection

- Prioritize post-storm assessments

Capital Planning

- Identify and justify infrastructure investments

You are Important to SWIFFT's Success

- Local knowledge !
- Where are your problem assets?
- Flash flooding: where does it always flood?
- Do you operate a Ready-Set-Go model?

Take the SWIFFT Survey!

Questions

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