



North Central Texas
Council of Governments

Integrated Transportation and Stormwater Infrastructure (TSI) Study: Mitigating Future Flood Events in North Texas

NCTCOG Public Meeting – March 9, 2026
Presented by: Jeff Neal, Senior Projects Manager

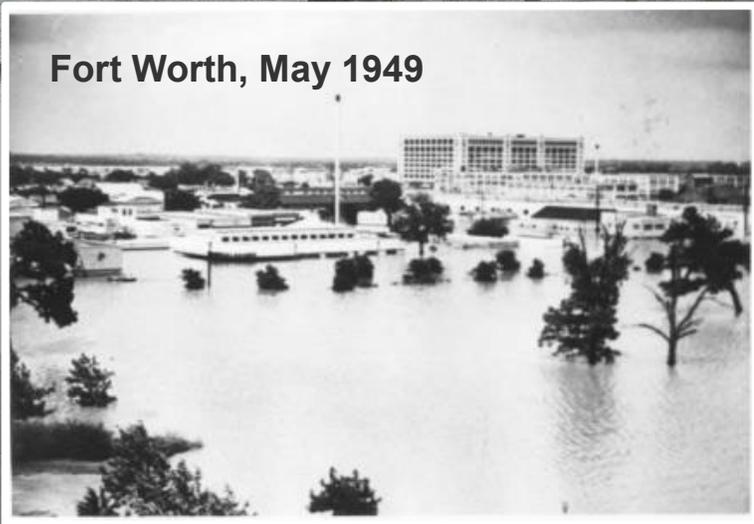


Funded by the Texas General Land Office,
Community Development Block Grant,
Disaster Recovery Program.



Also Funded by the Texas Water Development Board
and Texas Department of Transportation.

Historic events led to improvements in flood control infrastructure during the last century. New needs are developing in this century...



Fort Worth, May 1949

Rhome, May 2015
Courtesy Tarrant Regional Water District

WHAT: TSI Study Partners & Objectives

TSI STUDY – \$10 million comprehensive planning effort to address flood risk upstream of the Dallas/Fort Worth urban cores:

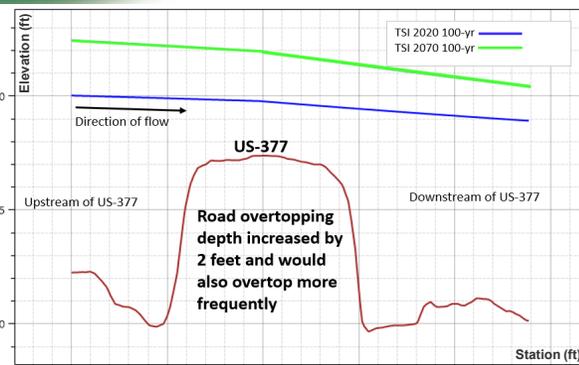
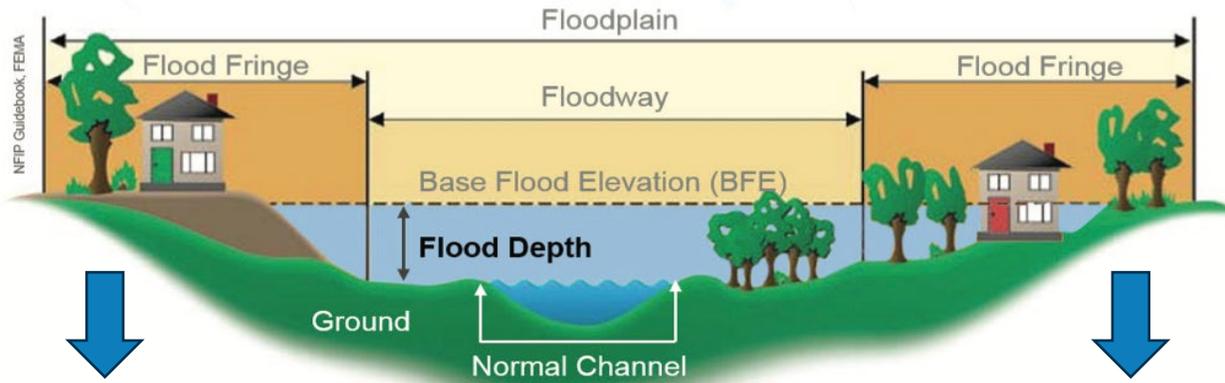
- Proactive planning (*planning-level designs*)
- Collaborative partnership between stormwater, environmental, & transportation infrastructure
- Address safety of residents, property, & infrastructure, with abilities to also improve regional water storage
- State-of-the-art flood hazard area models
- Flood warning system framework
- Innovative infrastructure & nature-based solutions, with resources to improve regulatory approaches & maximize return on investment (ROI)
- Tools, literature, & data to aid with community engagement & floodplain administration

EXPECTED COMPLETION – Fall 2026

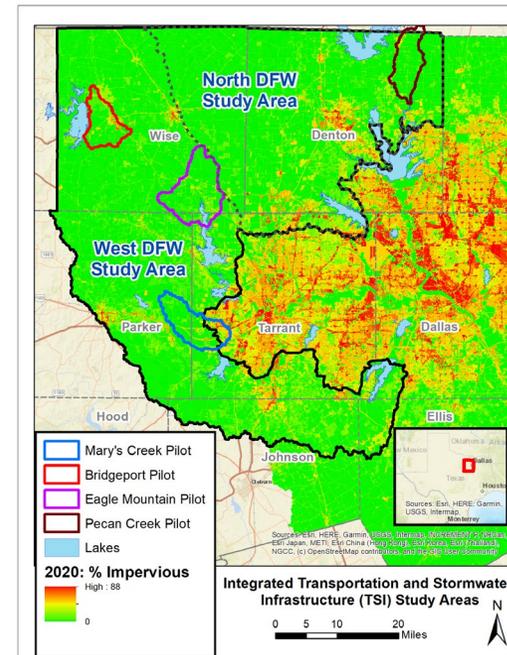
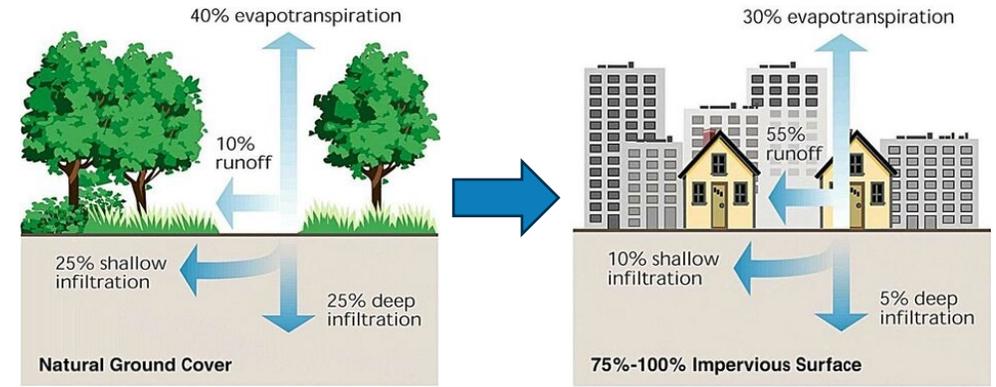


WHY: Urbanization Increases Flood Risk

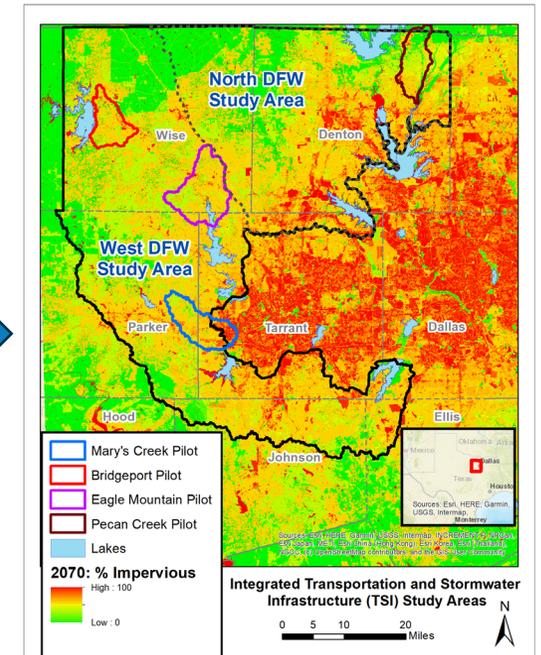
- Floodplains are among Earth's most valuable ecosystems, but also among the most threatened
- Effects of urbanization on floodplains:
 - Adds impervious cover (see right; runoff $\leq 10\%$ more)
 - Depletes valley storage (see below; runoff $\leq 30\%$ more)



More Impervious Surface = More Runoff



6.4% Impervious (2020)



35.2% Impervious (2070)

WHY: *Criticality of Transportation/Stormwater Integration*

- Most flood fatalities occur at roadway drainage crossings and other flow/storage bottlenecks
- Transportation/stormwater infrastructure impact costs among the most substantial in flood events
- Transportation failures impact access and reliability:
 - Emergency response & evacuation efficiency
 - Connectivity to/from critical services, employment/education needs, & community cohesion
 - Maintenance & asset condition degradation
- Stormwater failures affect system adaptability:
 - Lacks consistent regional infrastructure data & modeling
 - Constrains evaluation of accumulated watershed impacts
- Rebuilding costs/schedules can be excessive & difficult to accommodate with other needs
- Upstream development has rendered downstream road crossings and drainage systems inadequate

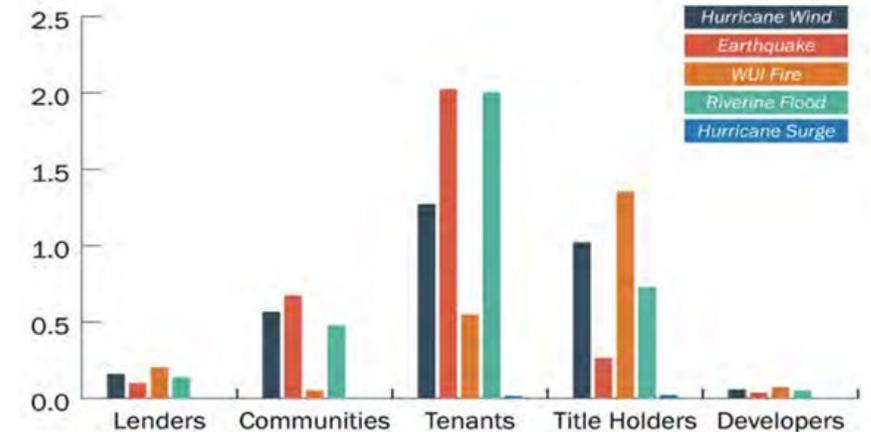


WHY: *Return on Investment (ROI)*

- 2019 “Natural Hazard Mitigation Saves” Report by: National Institute of Building Sciences, Multi-Hazard Mitigation Council
- Prepared at the direction of the U.S. Congress
- Riverine Flooding – For every \$1 invested in mitigation strategies & higher standards (*versus recovery from flooding impacts*), communities save \$5 – \$7

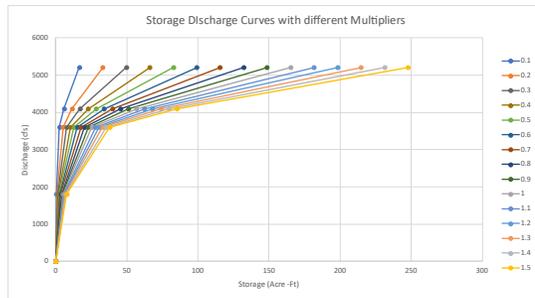
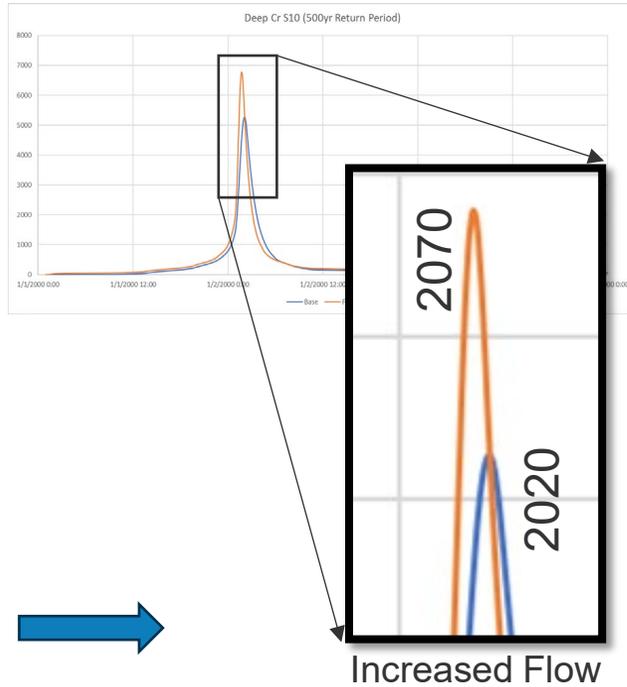
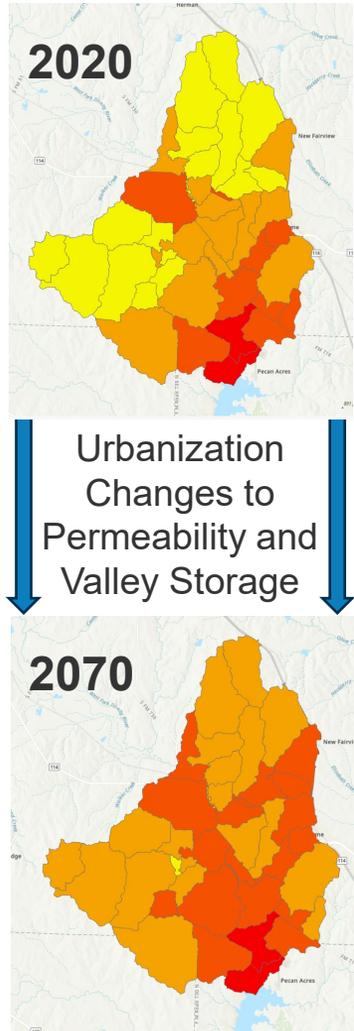


	ADOPT CODE	ABOVE CODE	BUILDING RETROFIT	LIFELINE RETROFIT	FEDERAL GRANTS
Overall Benefit-Cost Ratio	11:1	4:1	4:1	4:1	6:1
Cost (\$ billion)	\$1 _{year}	\$4 _{year}	\$520	\$0.6	\$27
Benefit (\$ billion)	\$13 _{year}	\$16 _{year}	\$2200	\$2.5	\$160
Riverine Flood	6:1	5:1	6:1	8:1	7:1
Hurricane Surge	not applicable	7:1	not applicable	not applicable	not applicable
Wind	10:1	5:1	6:1	7:1	5:1
Earthquake	12:1	4:1	13:1	3:1	3:1
Wildland-Urban Interface Fire	not applicable	4:1	2:1	not applicable	3:1



Source: https://nibs.org/wp-content/uploads/2025/04/NIBS_MMC_MitigationSaves_2019.pdf

HOW: Enhanced Drainage Model to Optimize Alternatives

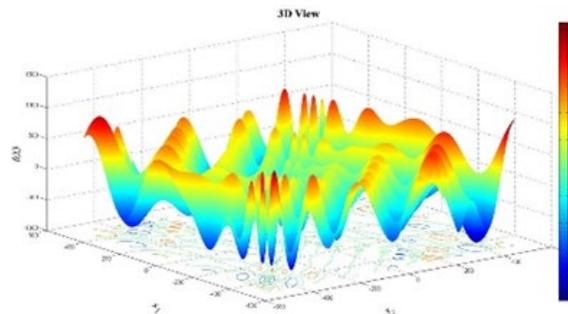


Vary Storage Values to Best Reduce the Peak Flow

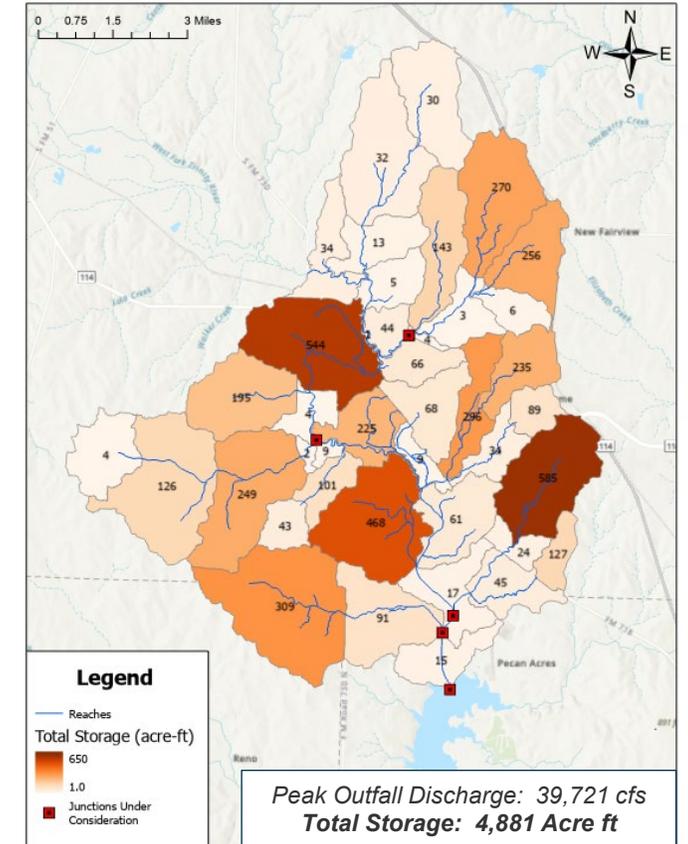
Set Up Hydrologic and Hydraulic (H&H) Model w/ Reservoirs at each Subbasin



Optimize Flow Resistance and Storage Values Generated from H&H Model Runs



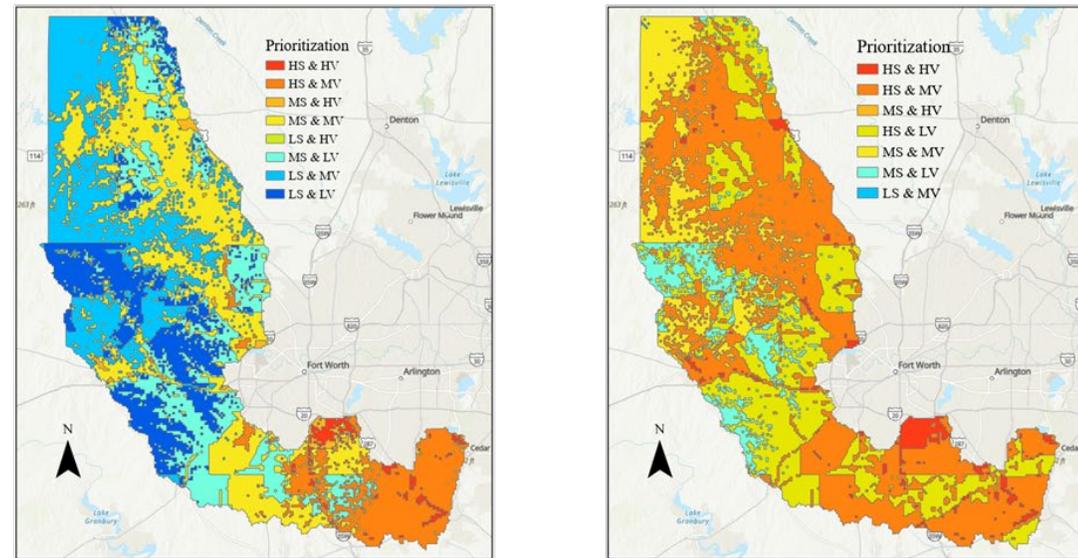
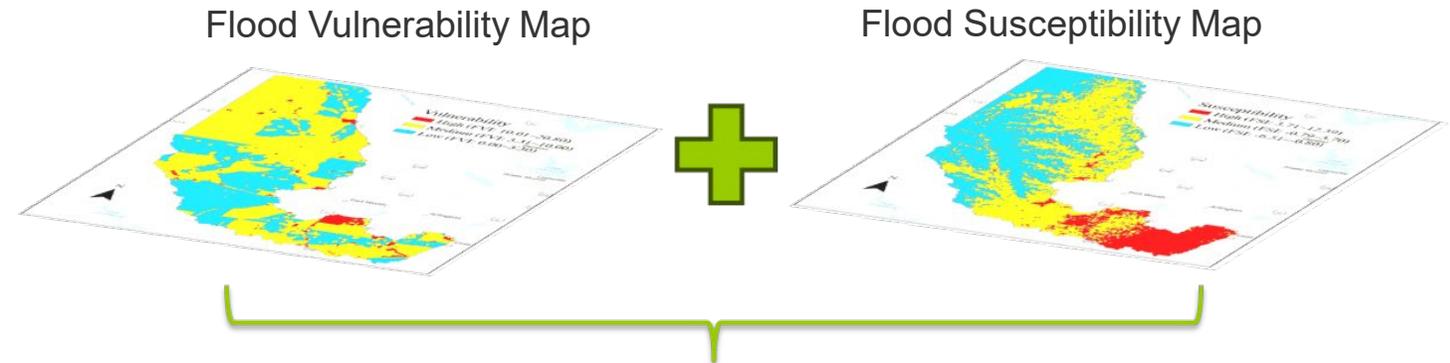
Distributed Detention Optimization Example – Eagle Mountain Pilot



Focus on Critical Reaches and Transportation Junctions for Reducing Flow to 2020 Conditions

HOW: GIS Stacking – Flood Vulnerability/Susceptibility

- Includes four conditioning factor categories (*social, environmental, institutional, & transportation*)
- Aids development of a suitability index for mitigation in the form of **Green Stormwater Infrastructure (GSI) & Nature-Based Solutions (NBS)**:
 - Which areas should be prioritized for GSI/NBS to reduce regional flood risk?
 - How can GSI/NBS be designed/modelled to achieve a target performance?
 - What is the efficiency of applying GSI/NBS at a watershed or community scale?

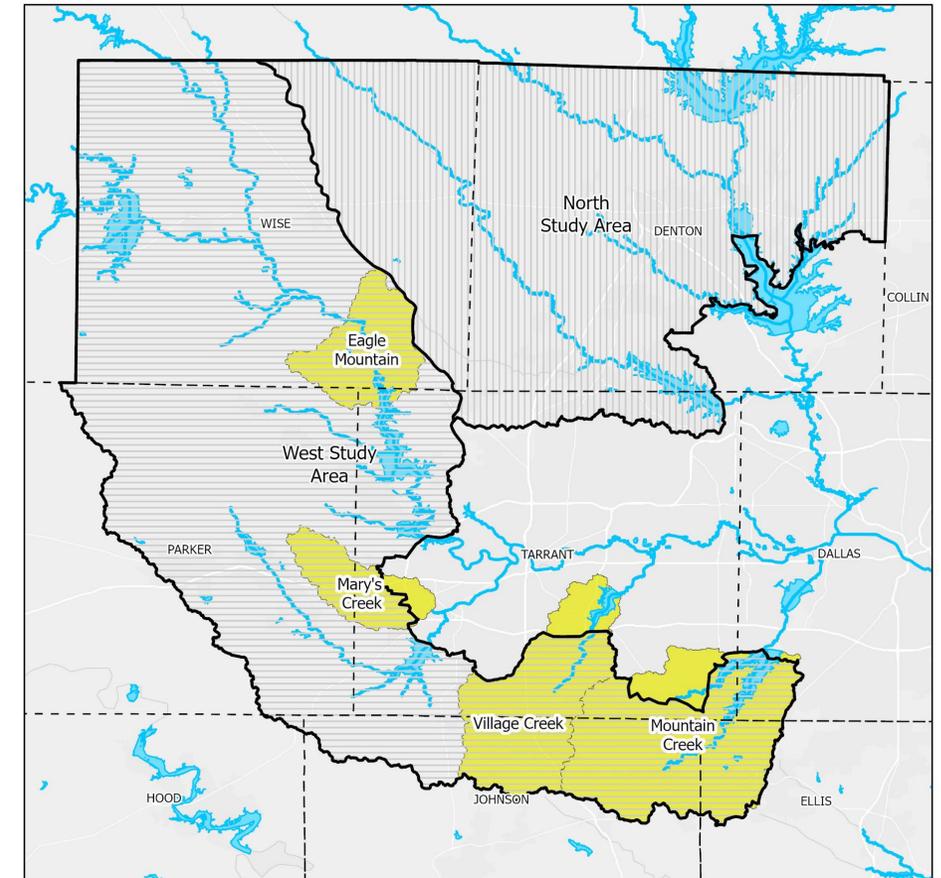


Flood control prioritization map (Left: current; Right: future)



HOW: Optimization Study – Alternatives Analysis

- Aims to evaluate ideal location/sizing for storage, as well as consider /compare potential alternatives, to reduce future flood flows using updated models
- Collaboration with Study partners (“Menu of Options”):
 - Transportation – Locations for flow limits (*bridges/culverts*)
 - Environmental – GSI/NBS alternatives for storage allocation



- Optimization in Progress
 - HEC-HMS Main Reaches
 - Waterbodies
 - County Boundary
- Study Area Boundaries
- TSI West
 - TSI North

0 5 10 20 Miles

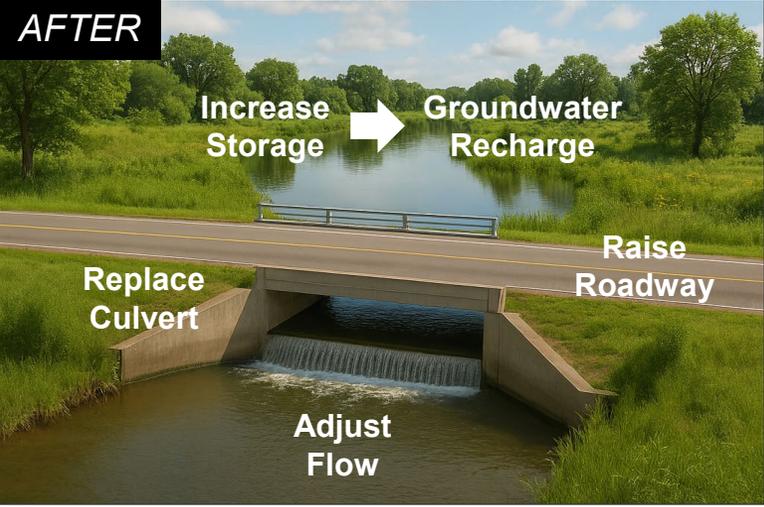


EXAMPLES: *Detention/Retention (Sarra Ln – Parker County)*

BEFORE



AFTER

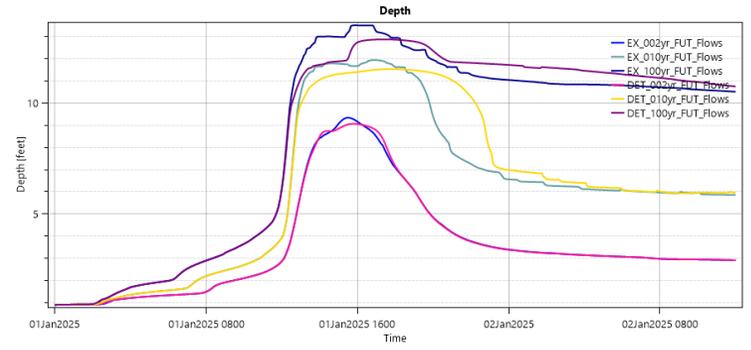
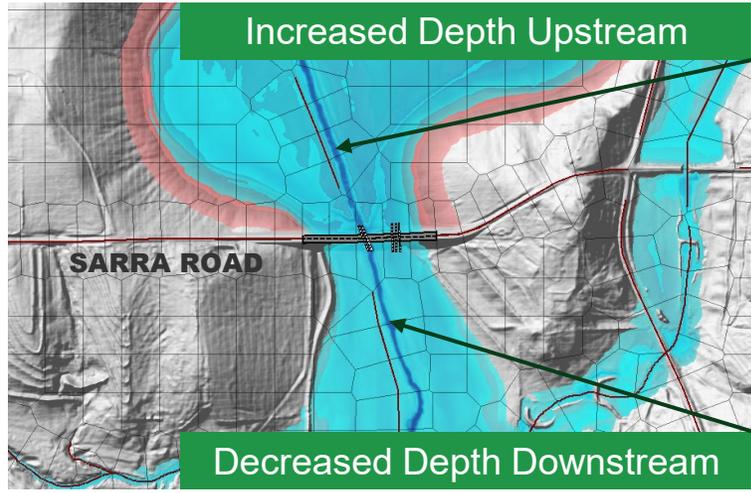
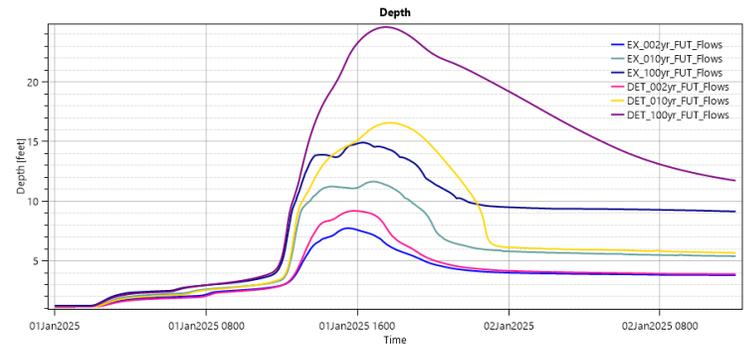


Increase Storage → Groundwater Recharge

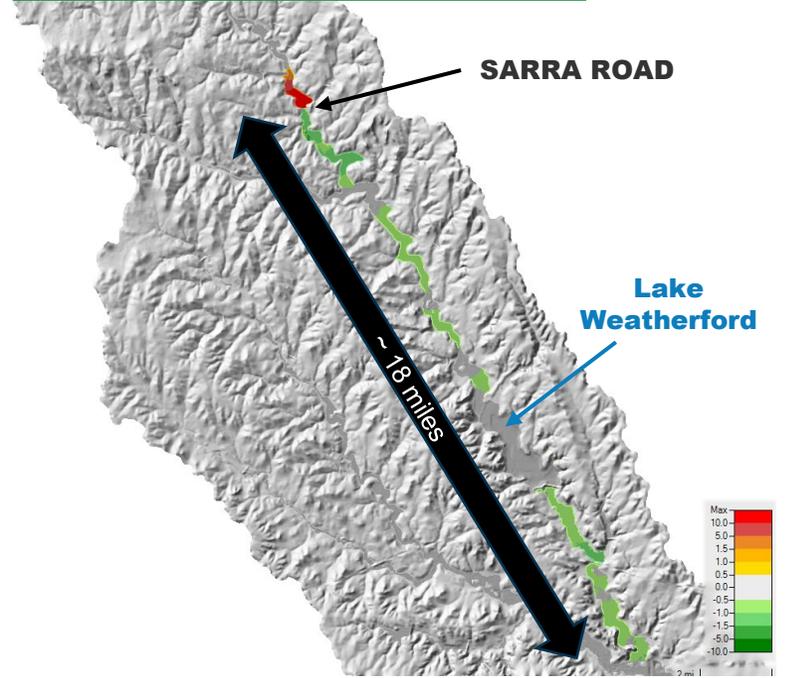
Replace Culvert

Raise Roadway

Adjust Flow



Reduced Flow Downstream

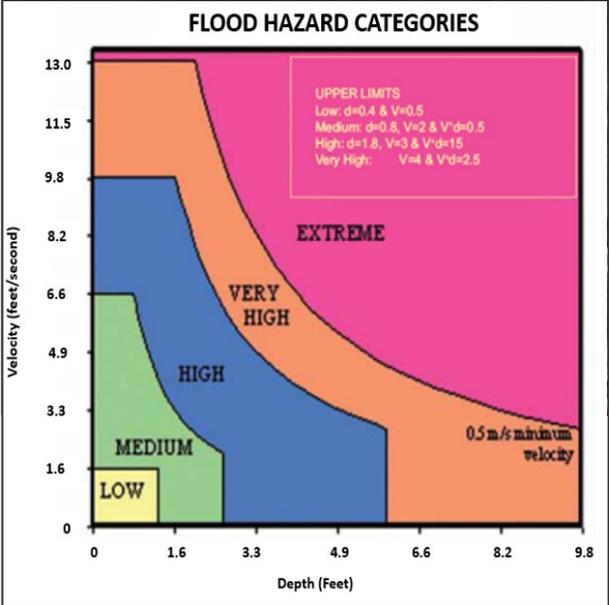
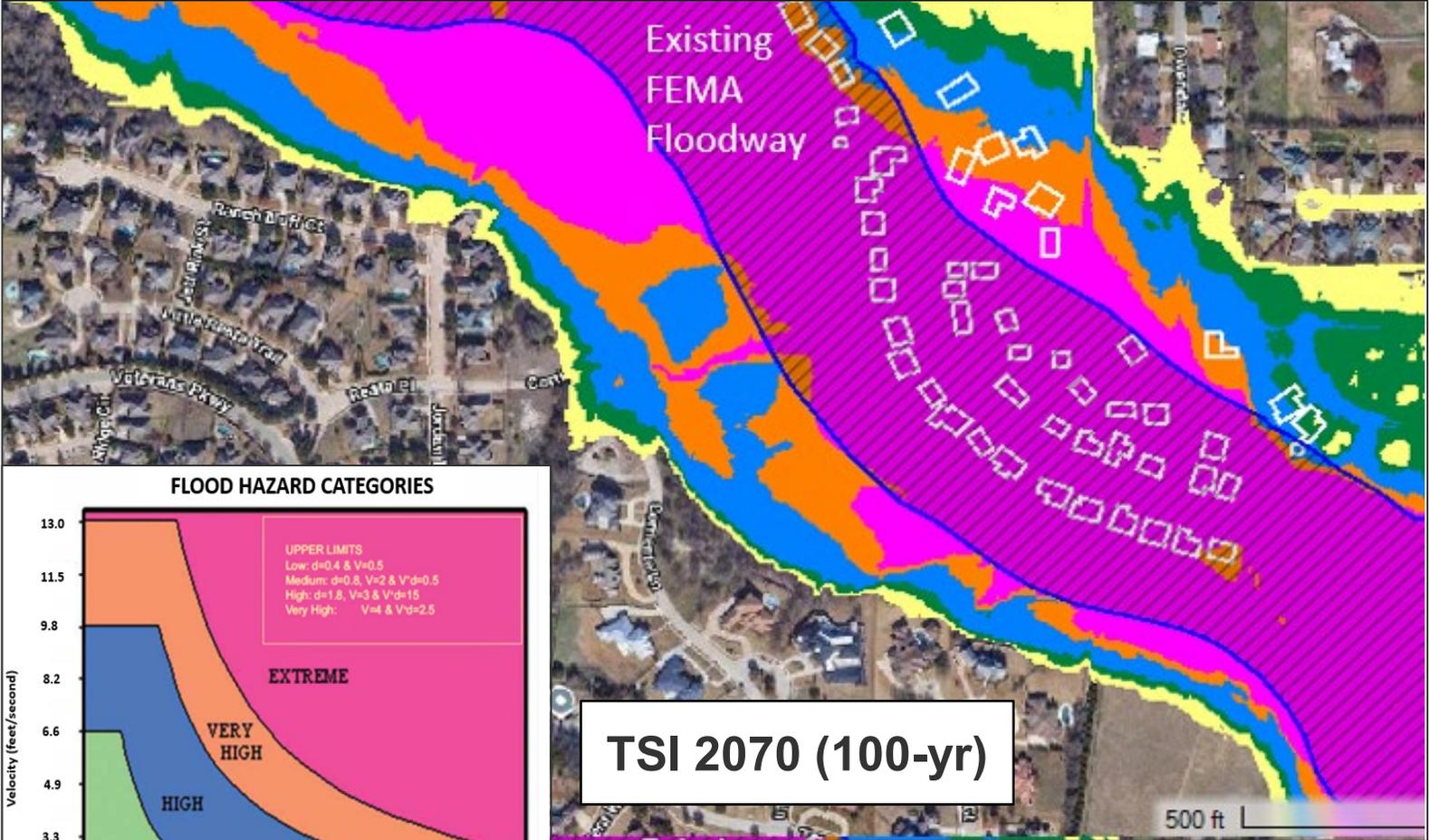


Key Summary Statistics – 2070

- **100-year Conditions (upstream):**
 - Valley Storage: + 2,000 acre-ft
 - Flow Rate: - 3,000 ft³/sec
- **10-year Conditions (downstream):**
 - Flow Rate: - 1,000 ft³/sec
 - Elevation Reduction: 0.5-1.0 ft

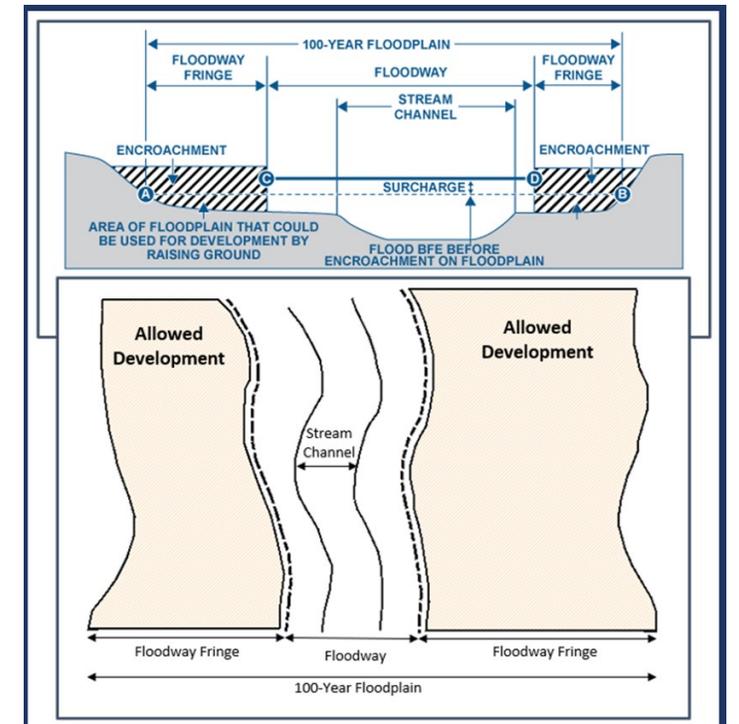
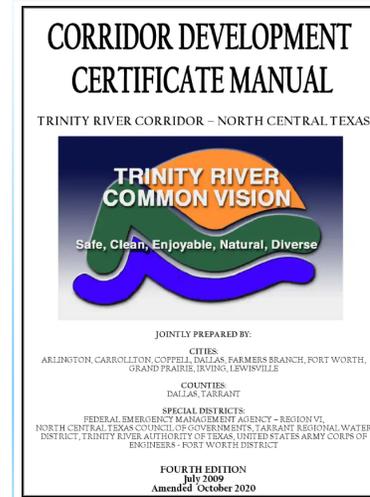
EXAMPLES: *Buyouts (Mary's Creek – Benbrook)*

- “Flashy” watershed like Texas Hill Country
- History of flooding and projected increases from enhanced models and storm shifting scenarios
- Federal Emergency Management Agency (FEMA) Flood Hazard Categories link flood depth and velocity
- Homes built within the FEMA floodway, with some structures in the “Extreme Flood Hazard Area”

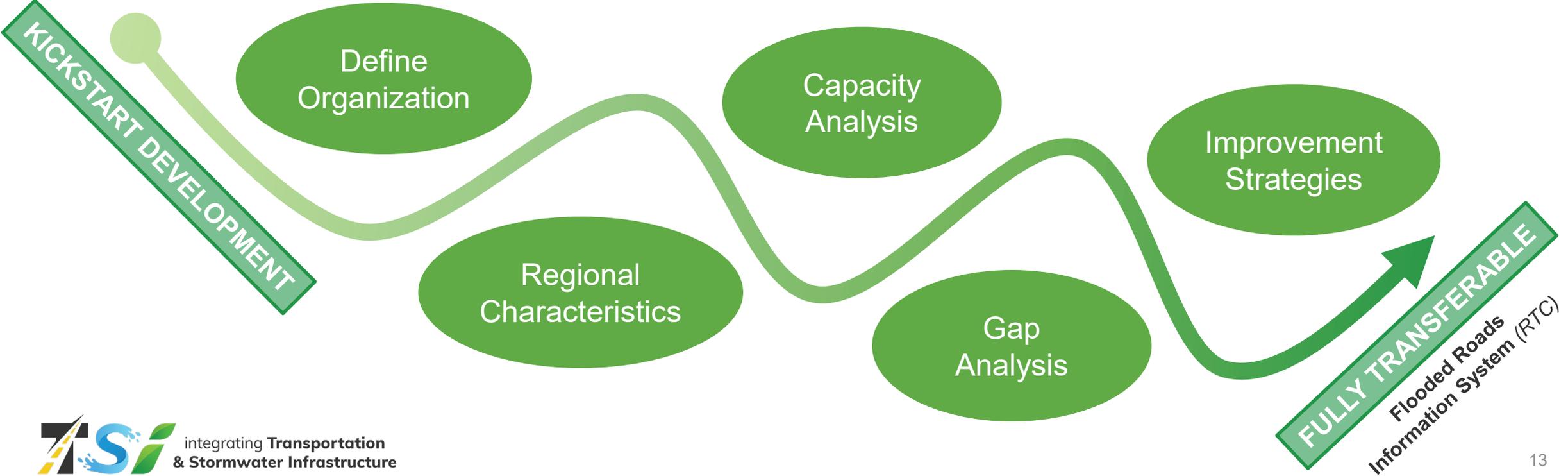


EXAMPLES: *Valley Storage Preservation*

- **Definition** – Volume of water in a river’s floodplain during a flood event
- **Function** – Flood water storage...like a reservoir
- **Regulation** – FEMA National Flood Insurance Program (NFIP)
- **Downstream Impacts of Valley Storage Loss:**
 - Peak flow and water surface elevation increases
 - Deeper and more frequent/damaging roadway overtopping
 - Shorter flood response times and greater life safety threats
- **TSI Study calculates economic benefits for preserving valley storage**
- **Policies for Preserving Valley Storage:**
 - Prevent new development within the floodplain
 - Adopt compensatory volume ordinance to allow development – **Corridor Development Certificate (CDC) Program**

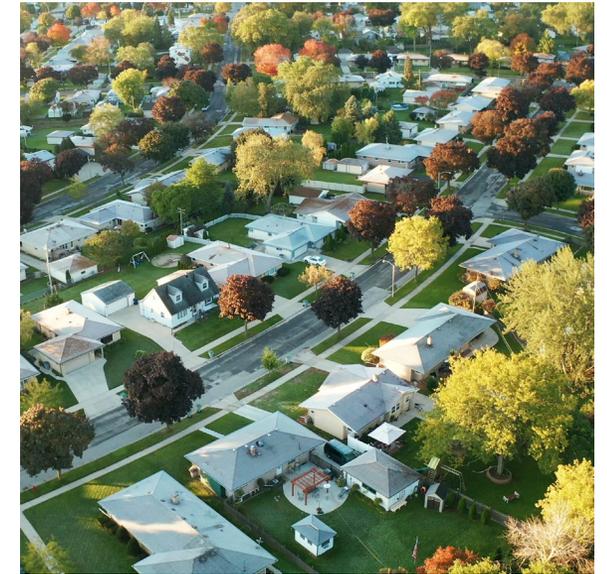
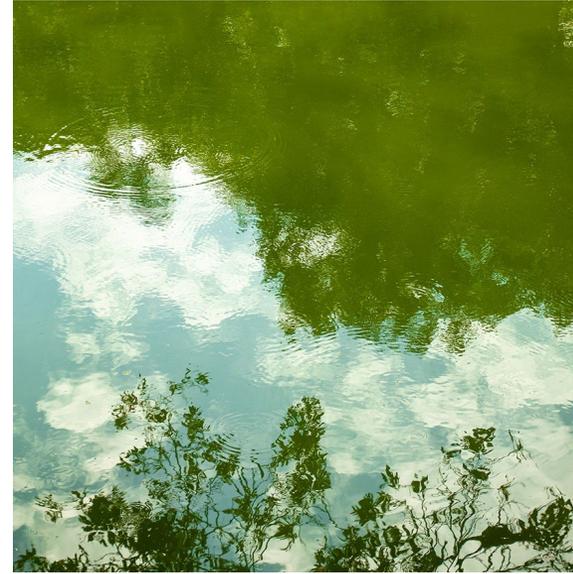


EXAMPLES: *Flood Early Warning System (FEWS)*



EXAMPLES: *Policy Considerations (Codes/Ordinances)*

- Identify template development codes and floodplain ordinances that support TSI Study goals for reducing flood risk and integrating transportation, stormwater, & environmental planning.
- Identify enabling/supportive State codes.
- Receive and incorporate feedback from stakeholders on code/ordinance elements, constraints, & effectiveness.
- Local governments may choose to use the model ordinances/codes as resources for regulatory updates to improve flood prevention and mitigation.



EXAMPLES: *Policy Considerations (Codes/Ordinances)*

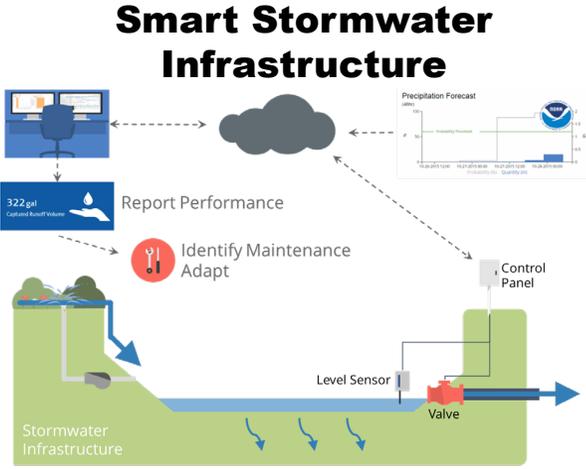
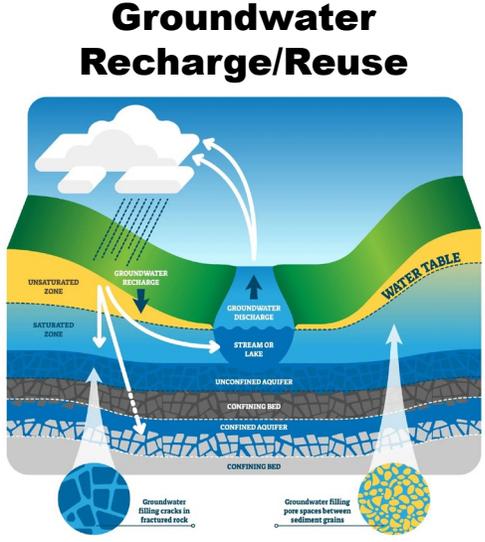
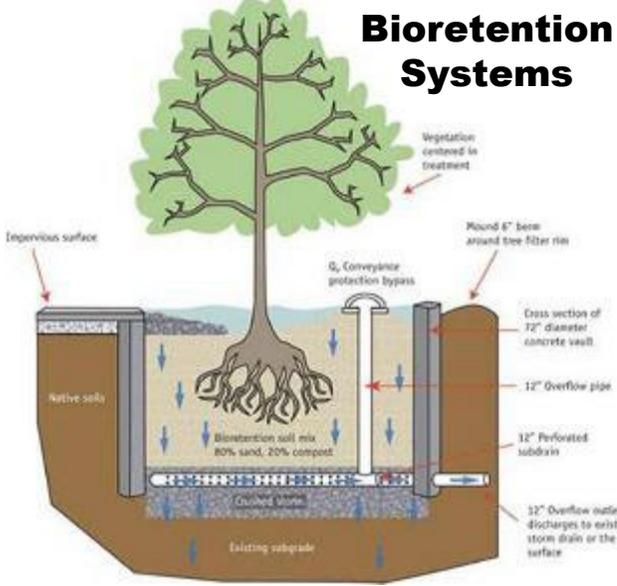
Development Regulations:

- Identifying best practice strategies that can be incorporated into development (*land use/zoning/subdivision*) codes to help proactively alleviate and/or adapt to future flood events
- Model codes can address green stormwater infrastructure, nature-based solutions, low-impact development, & other strategies
- Examples:
 - Impervious cover limits
 - Clustered development
 - Creation/preservation & maintenance of open space
 - Green parking lot infrastructure (*e.g., bioswales, permeable surfaces, etc.*)
 - Incentive zoning

Floodplain Ordinances:

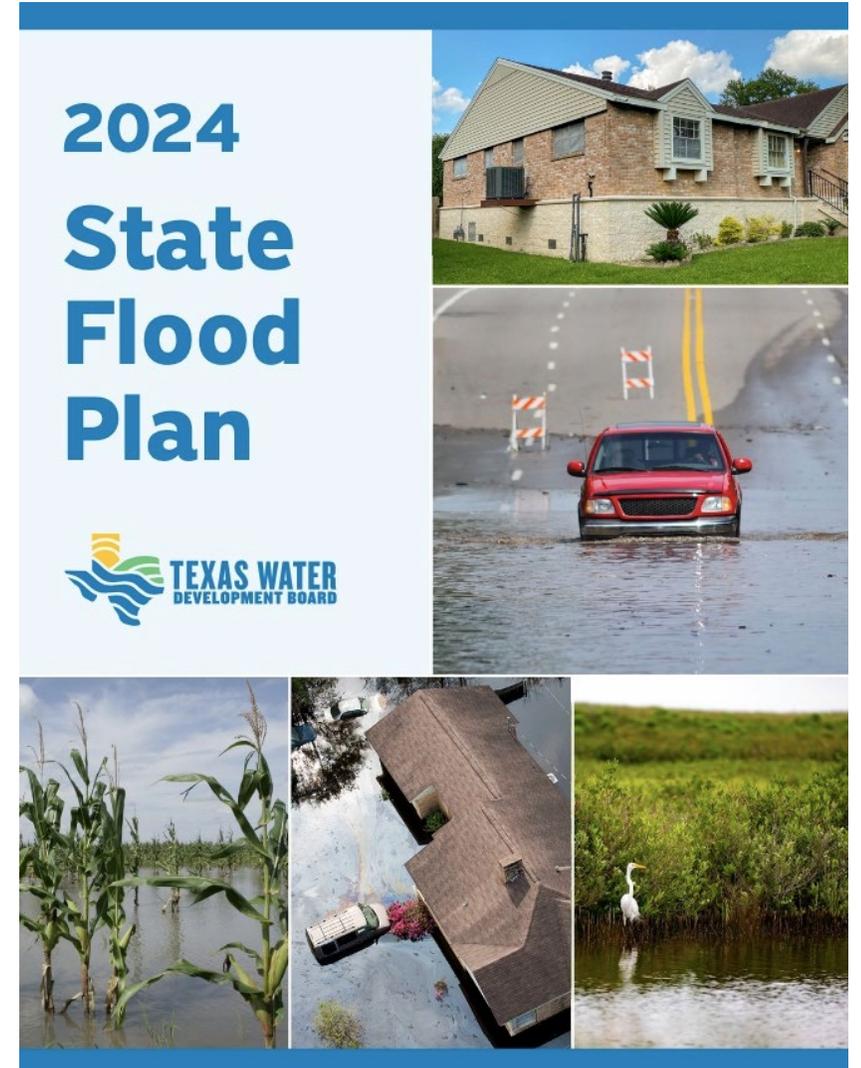
- Identifying higher standards within flood damage prevention ordinances to help reduce economic losses, prevent future flood hazards, & protect public health/safety
- Model ordinances can address principles & accountability for enhanced development & construction standards in flood-prone areas
- Examples:
 - Freeboard – Elevating lowest floor/portion of a structure above a predicted flood elevation by an extra height
 - Critical facilities for ingress/egress
 - Setbacks in erosion-prone areas
 - Matching pre-development site runoff
 - No rise in flood water elevations

INTEGRATION: *Blending Assets, Actions, & Regulations*



TSI STUDY: *Uniqueness & Notable Takeaways*

- **Multi-purpose infrastructure approach** → unlocks diverse funding sources in a tight fiscal environment
- **Proactive stormwater planning** → transforms stormwater from afterthought to integrated system that can accommodate growth
- **Full integration with transportation & environmental planning** → aligns resilience with mobility & quality of life needs (*strong early institutional support from TxDOT & other stakeholders*)
- **Strategic transportation partnership** → elevates stormwater priority & credibility alongside critical roadway systems
- **Improved flood science applications** → more consistent, efficient, & data-driven decisions (*removes gap in measuring accumulated impacts of valley storage loss*)
- **Potential expanded Federal roles (e.g., USACE)** → opportunity to scale impact beyond current review functions
- **Unlocks new regional possibilities** → enables smarter, more informed, & more resilient growth (*transferrable concept with support for smaller communities*)



ENGAGEMENT: View Interactive TSI Results/Products

TSI Website

Featured Items

- January 15, 2026 Flood Warning System Pre-Workshop Meeting (Virtual)
- January 29, 2026 Model Development Code & Floodplain Ordinances Workshop (Hybrid)
- February 17, 2026 Flood Warning System Workshop (Hybrid)
- December 5, 2025 Technical Advisory Group Meeting Materials
- Stakeholder Subarea Meetings- Round 4, Meeting Materials
- Local Government FAQ

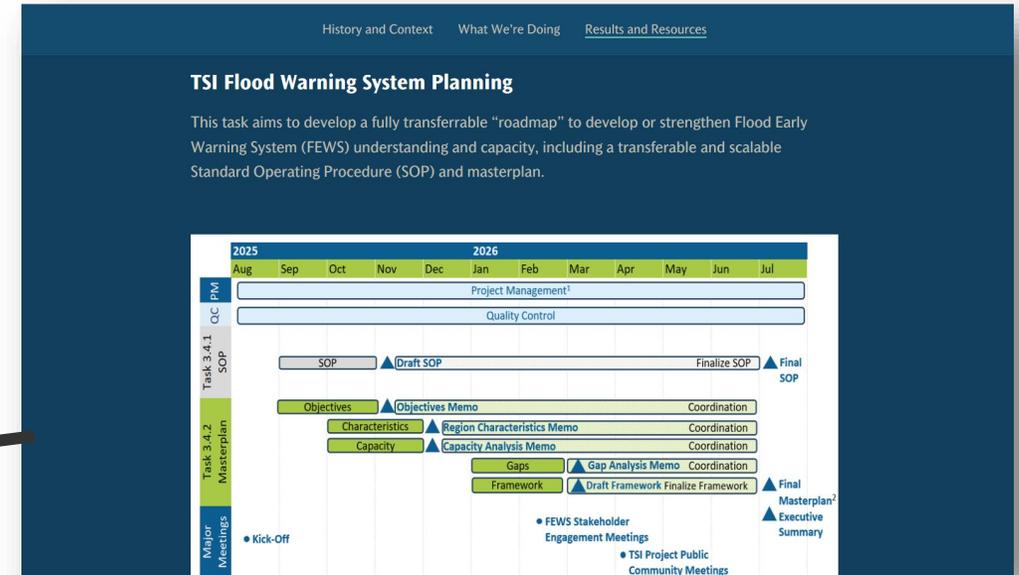


The screenshot shows a grid of seven engagement options, each with an icon and a 'Learn More' button:

- Events**: Calendar icon
- Technical Advisory Group**: Three people icon
- Outreach Documents**: Document with speech bubble icon
- Contract Documents**: Document icon
- Map Your Watershed!**: Map with location pin icon
- StoryMap**: Document with checkmark icon (highlighted with an arrow)
- Stakeholder Engagement**: Megaphone icon

nctcog.org/tsi

TSI Story Map

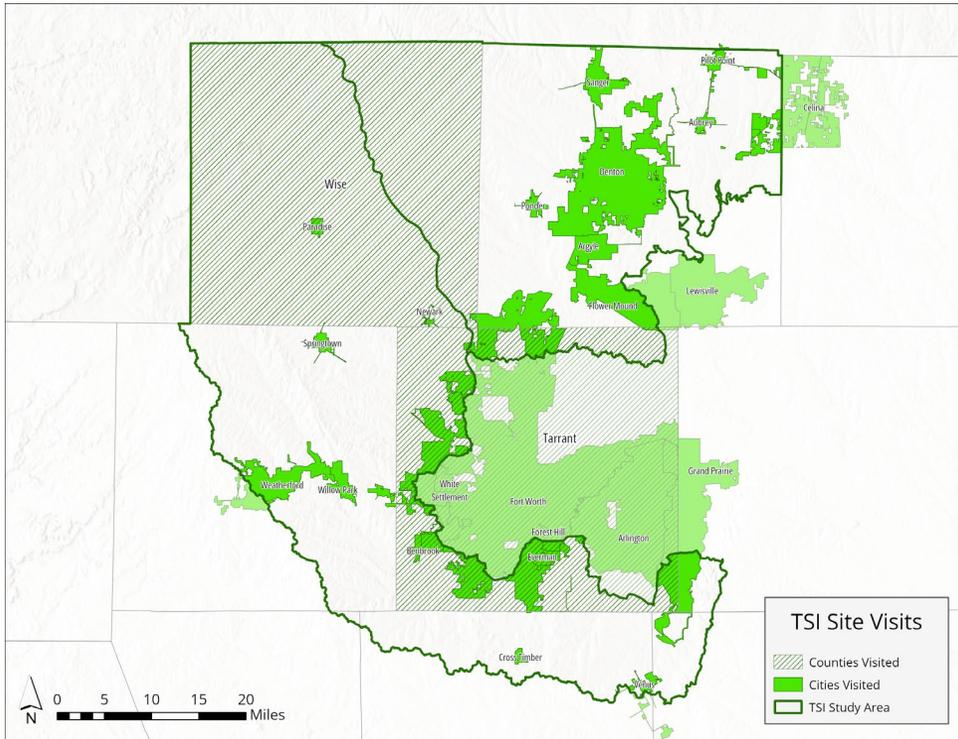


The screenshot shows a story map titled "TSI Flood Warning System Planning". It includes a navigation menu at the top: "History and Context", "What We're Doing", and "Results and Resources". The main content area describes the task's goal: "This task aims to develop a fully transferrable 'roadmap' to develop or strengthen Flood Early Warning System (FEWS) understanding and capacity, including a transferable and scalable Standard Operating Procedure (SOP) and masterplan." Below the text is a Gantt chart showing the project schedule from August 2025 to July 2026. The chart is divided into several tasks and sub-tasks, including "Project Management", "Quality Control", "SOP", "Objectives", "Characteristics", "Capacity", "Gaps", and "Framework". Key milestones are marked with triangles, such as "Draft SOP", "Finalize SOP", "Final SOP", "Objectives Memo", "Region Characteristics Memo", "Capacity Analysis Memo", "Gap Analysis Memo", "Draft Framework", and "Finalize Framework". A legend at the bottom identifies symbols for "Kick-Off", "FEWS Stakeholder Engagement Meetings", "TSI Project Public Community Meetings", "Final Masterplan", and "Executive Summary".

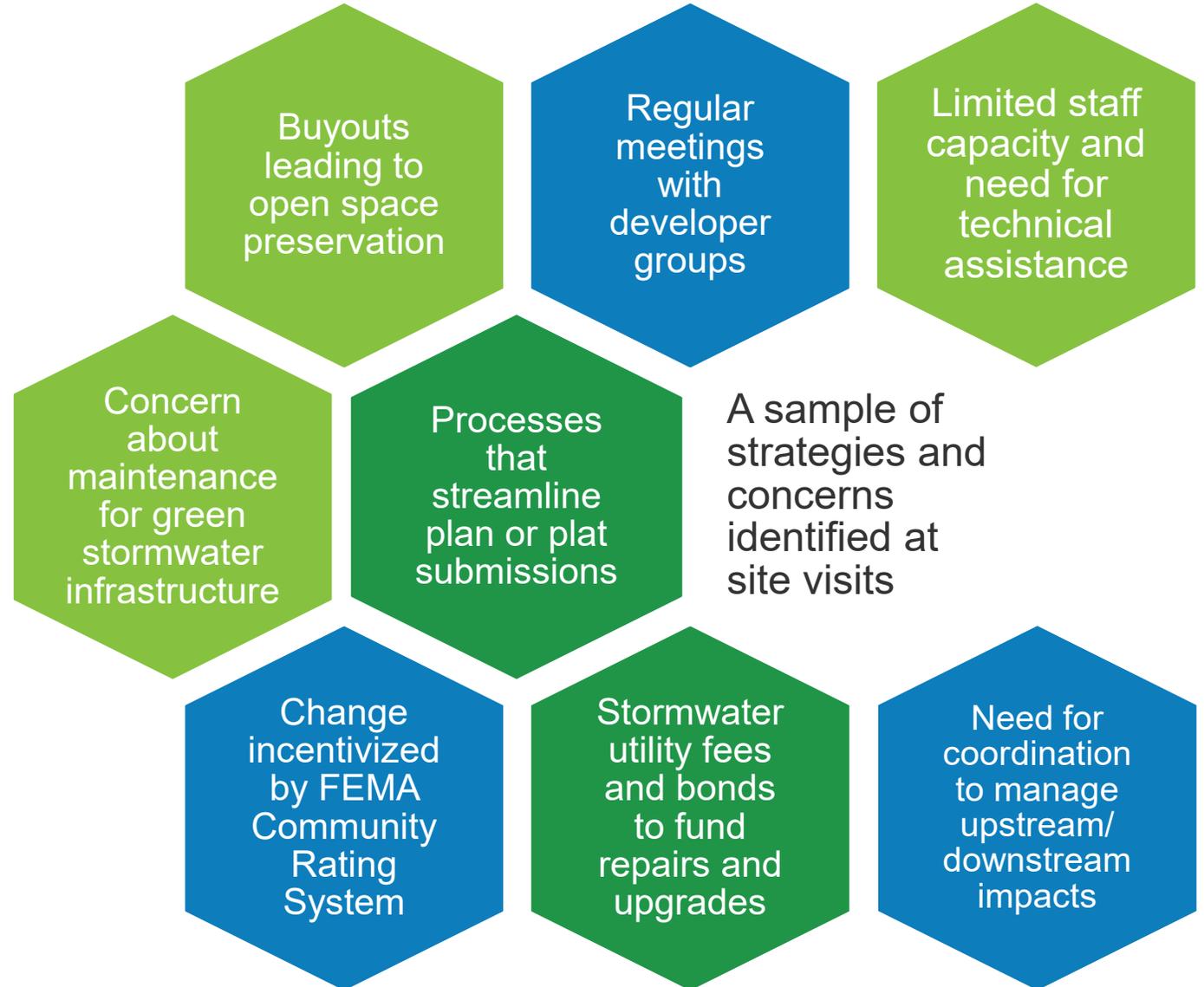
INCLUDES:

- History and Context
- What We're Doing
- Results and Resources

ENGAGEMENT: Community Site Visits



To schedule a site visit, please e-mail Kaitlin Hunter at khunter@nctcog.org.



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