Water Resources Council (WRC)

January 14, 2026

North Central Texas Council of Governments
Environment & Development

www.nctcog.org/WaterResources

Procedures for Online Meeting

- Today's presentation will be posted on the WRC website at: https://www.nctcog.org/envir/committees/water-resources-council
- Roll call today in lieu of sign-in sheet.
- Please keep your microphone on mute when not speaking.
- Please use the "raise hand" feature to ask a question or provide a comment. When called on, state your name and entity you are representing.
- Approval of action items will still be done by a voice vote. Please only vote if you are a member of the WRC.

Welcome and Introductions

- Roll call in lieu of a sign-in sheet
- Welcome guests.
- Thank you all for attending!

Action Item

Meeting Summary

- The October 15, 2025 meeting summary will be presented for approval.

Speaker Presentation

Erin Blackman and Jeffrey Neal,
NCTCOG

North Central Texas Council of Governments

Integrated Transportation & Stormwater Infrastructure (TSI) Study

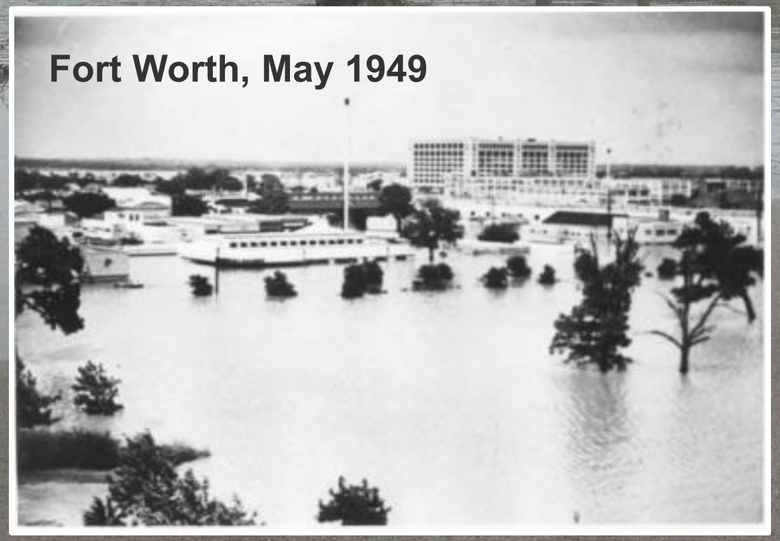
Water Resources Council – January 14, 2026

Presented by: Jeffrey C. Neal (NCTCOG – Transportation) & Erin Blackman (NCTCOG – E&D)

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

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

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

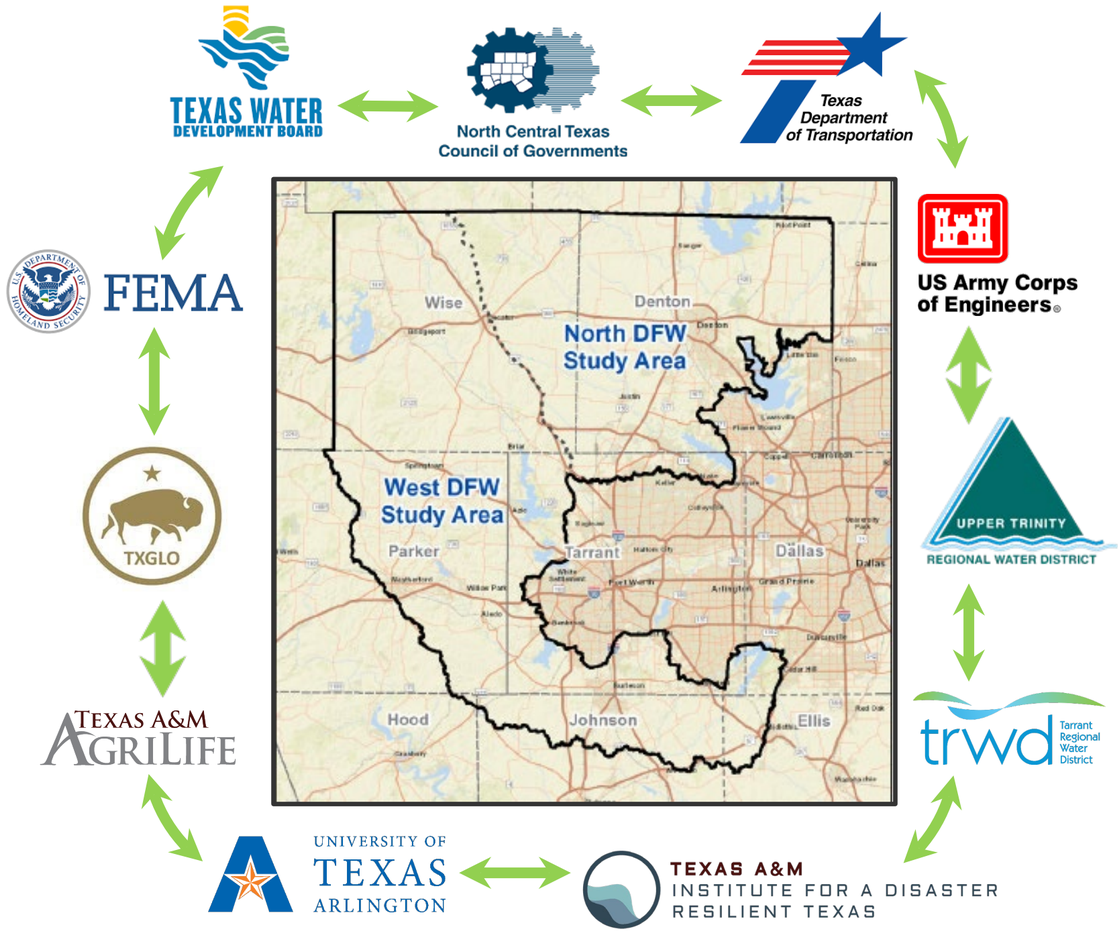


Rhome, May 2015
Courtesy Tarrant Regional Water District

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 opportunities to also improve regional water storage & water quality**
- **State-of-the-art flood hazard area models**
- **Flood warning system framework**
- **Innovative infrastructure & nature-based solutions, with resources to improve regulatory approaches**
- **Tools, literature, & data to aid with community engagement & floodplain administration**



- **Consultant Partners:**
  - Freese & Nichols, Inc.
  - Halff Associates, Inc.
  - Highland Economics
- **Expected Completion:**
  - **Fall 2026**

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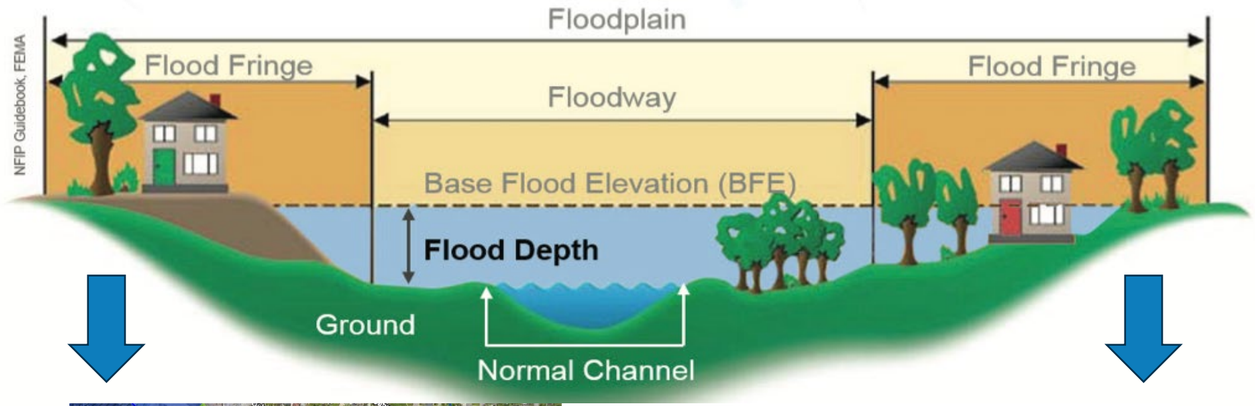
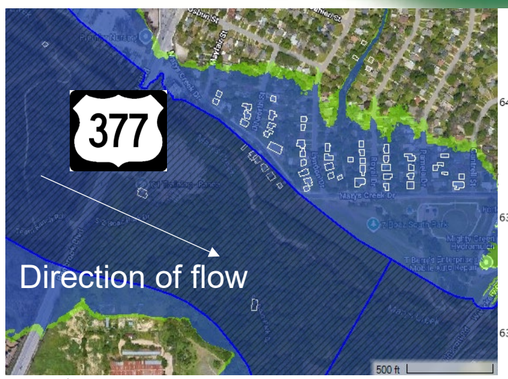
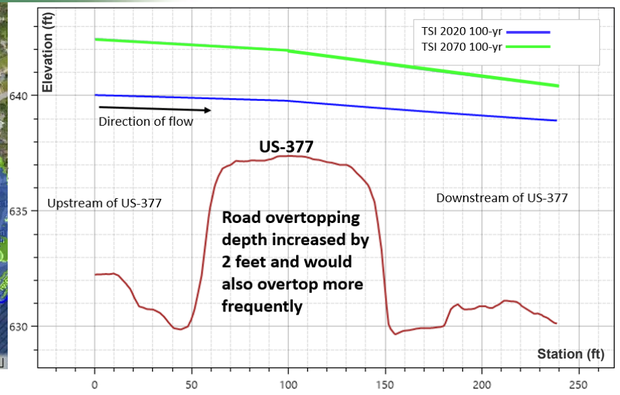
WHY: *Urbanization Increases Flood Risk*

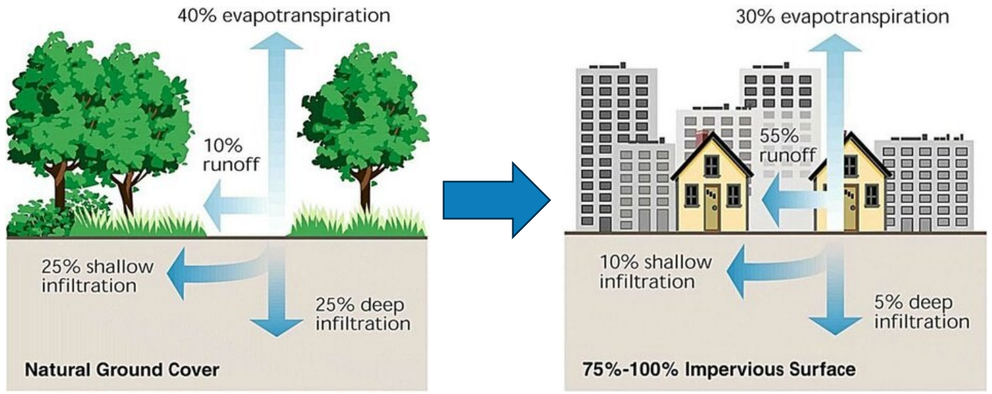
- **Floodplains among Earth's most valuable ecosystems, but also among the most threatened**
- **Effects of urbanization on floodplains:**
  - Adds imperious cover *(see right; runoff ≤ 10% more)*
  - Depletes valley storage *(see below; runoff ≤ 30% more)*

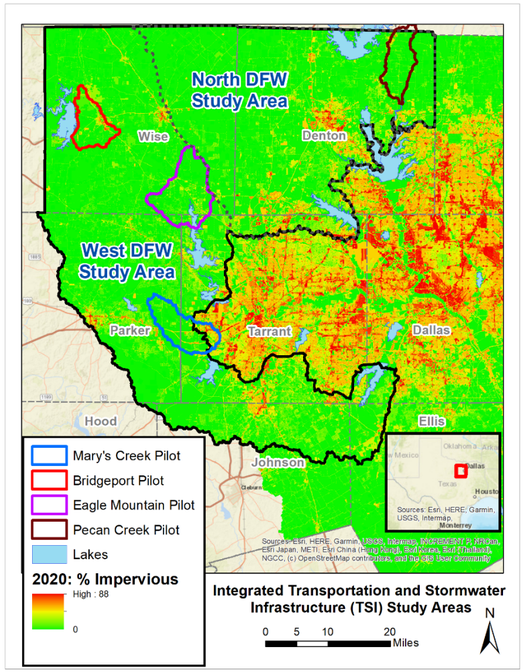


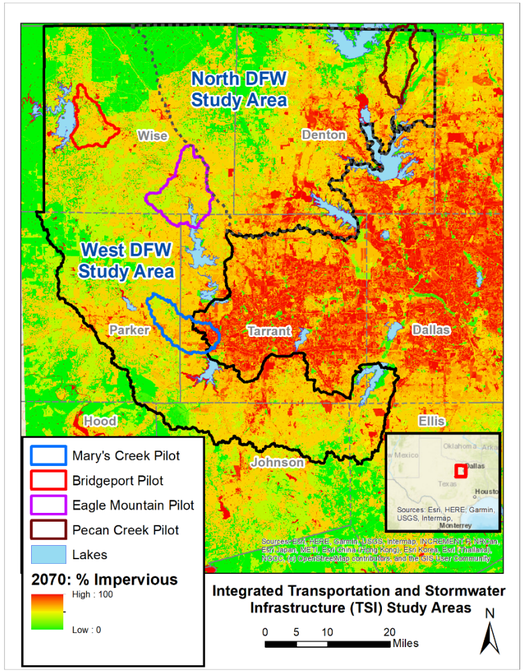




More Impervious Surface = More Runoff







6.4% Impervious
(2020)

35.2% Impervious
(2070)

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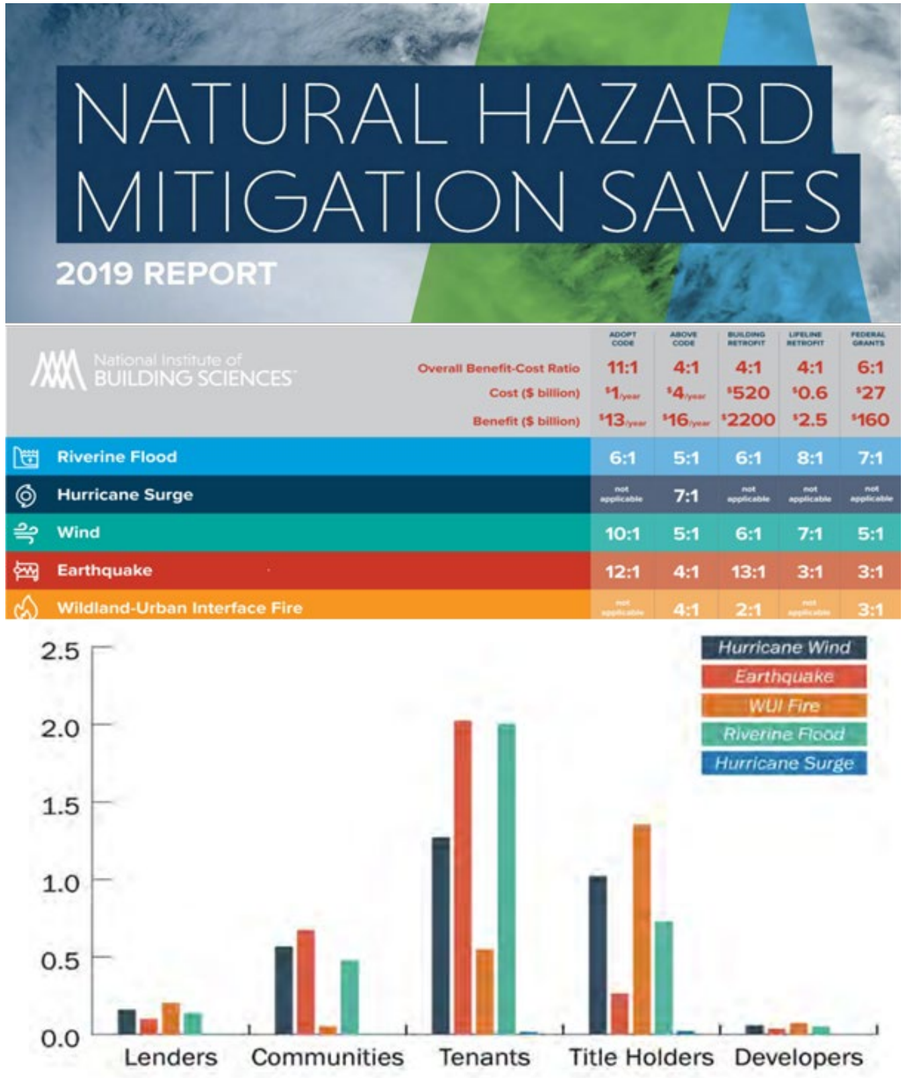
WHY: *Criticality of Transportation/Stormwater Integration*

- **Transportation & stormwater infrastructure costs are some of the most substantial in flood events**
- **Transportation failures impact access & 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**
- **Most flood fatalities occur at roadway drainage crossings & other water flow/storage bottlenecks**
- **Upstream development has rendered downstream road crossings & drainage systems inadequate**

WHY: *Return on Investment*

- **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 $1 invested in mitigation strategies & higher standards (versus recovery from flooding actions), communities save $5-$7**



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

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Progress to Date

Outreach Tasks

- 4 rounds of meetings in study area
- 9 Technical Advisory Group meetings
- 8 Steering Committee meetings
- 4 Workshops
- 24 Community site visits
- 1 Multi-community site visit
- Stakeholder Engagement Plan
- Local Government FAQ
- Policy Recommendations

Technical Tasks

- Literature review
- Pilot studies
- H&H SOPs
- Storm shifting SOPs
- H&H – West Study Area
- Stacking model – West Study Area
- Optimization study – West Study Area
- H&H launch – North Study Area
- Flood Warning System Planning

Local Government FAQ

www.nctcog.org/tsi

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LOCAL GOVERNMENT FAQ

What is the integrated Transportation and Stormwater Infrastructure (TSI) study?

This planning study coordinates transportation planning, stormwater management, and environmental planning to mitigate flooding risks and optimize infrastructure while supporting sustainable development. The study will recommend tools and best practices to address community health, safety, and growth. The study is led by the North Central Texas Council of Governments with support from local, state, and federal partner agencies.

How will the study help protect the safety of people and property in my community?

The TSI study will provide models of current and future flood risks and maps of potential locations for stormwater detention and green stormwater infrastructure. Additionally, the study will recommend strategies to improve the resiliency and siting of current and future transportation infrastructure. This will be accomplished using advanced hydrology and hydraulics modeling and future growth scenarios. Additionally, the study will recommend improvements to real-time flood warning systems to ensure communities stay informed during emergencies.

What regulatory tools or guidance will the TSI study produce?

The study will recommend model regulatory tools, including example development code and floodplain management ordinances. In some communities, data produced by the study may be the best available flood hazard information for mitigation and recovery decisions. The study will identify ways local governments can utilize green infrastructure and nature-based solutions in development and planning processes. The study will provide guidance on integrating transportation

KEY TERMS

Community:
A local government or political entity that adopts and enforces ordinances, orders, or regulations applicable to the area under its jurisdiction.

Flood Warning Systems:
Systems that provide real-time data and alerts regarding flood risks. They are designed to monitor flood events, enabling communities to take timely actions to protect lives and property.

Green Stormwater Infrastructure:
Vegetation and soil systems that have been engineered to improve urban flood management and water quality by mimicking natural hydrological processes.

Hydrology:
The study of water in the environment, focusing on its distribution, movement, and properties. It involves understanding how water interacts with the land, atmosphere, and ecosystems, as well as its role in natural processes like precipitation, runoff, infiltration, and groundwater flow.

Policy Recommendations

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

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Policy Recommendations

Development Regulations:

- **Identifying best practice strategies that can be incorporated into development** *(land use/ zoning/subdivision)* **codes to help proactively alleviate &/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
  - Open space creation/preservation & maintenance
  - 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 codes can address principles & accountability for enhanced development & construction standards in flood-prone areas**
- **Examples:**
  - Critical facilities
  - Freeboard
  - Ingress/egress
  - No rise in Special Flood Hazard Area *(SFHA)*
  - Setback in erosion-prone areas/riparian corridors
  - Preserving valley storage *(e.g., Trinity River Corridor Development Certificate Program)*

Model Development Code & Floodplain Ordinances Workshop

Purpose: To review green stormwater infrastructure, nature-based solutions, & enhanced floodplain standards across the region, assess what's working, & explore strategies to improve the effectiveness & ease of implementation through model development code/floodplain ordinances.

Intended Audience: Anyone with technical expertise, experience, or interest in the areas of flood prevention or mitigation using development or floodplain regulatory tools.

Thursday, January 29, 2026, 10:00 AM-12:00 PM

NCTCOG, 616 Six Flags Drive, Centerpoint II, Arlington, Transportation Council Room

Hybrid meeting format

For more info, visit http://www.nctcog.org/tsi

Register Here:

https://www.addevent.com/event/fcqv17r29868

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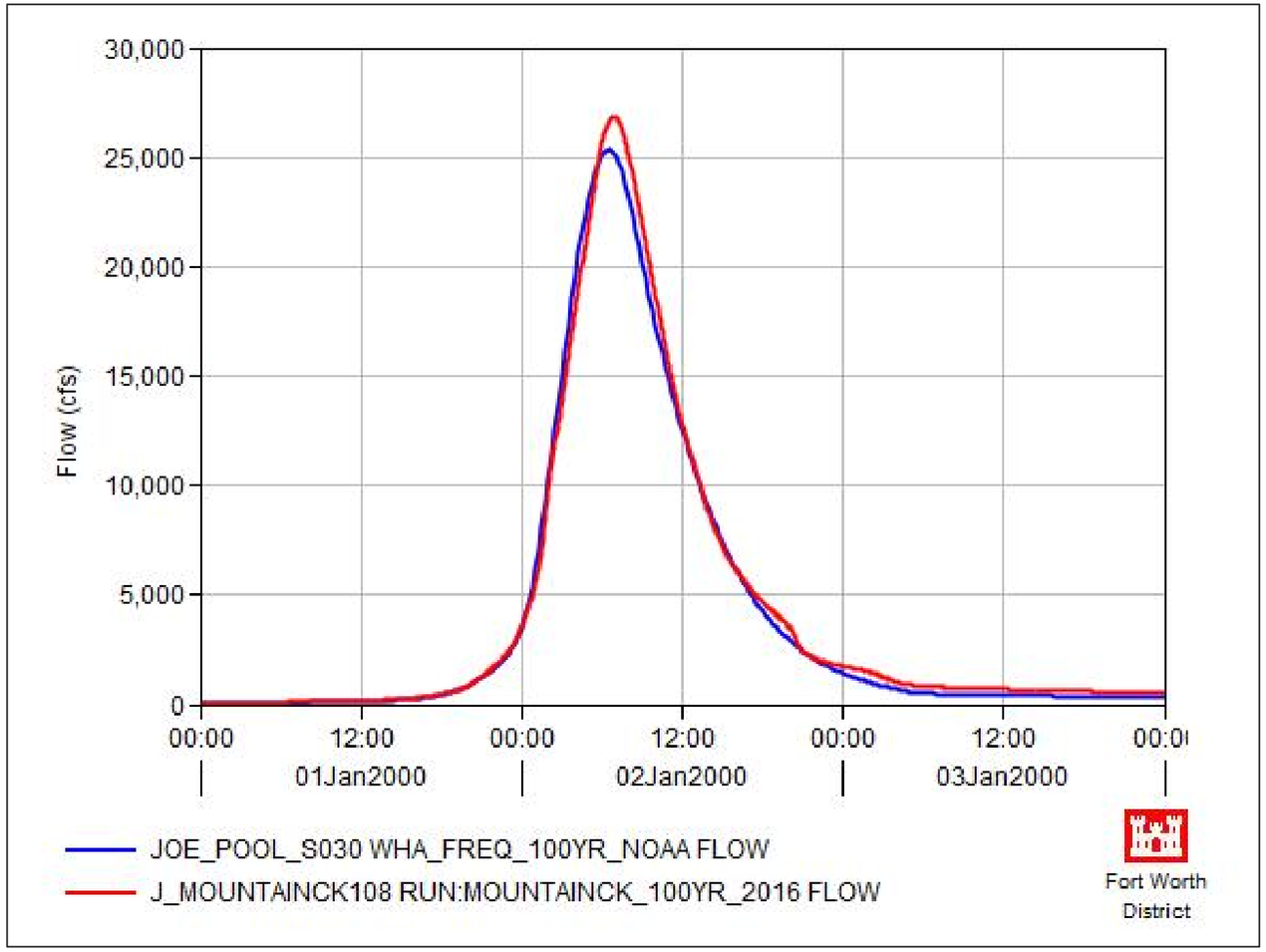
Hydrology Modeling

- Increase spatial model resolution
- Calculate and apply initial Hydrology Modeling System (HMS) parameters - 2016 conditions
- Calibrate results to Watershed Hydrology Assessment (WHA) methodology
- Update for Existing (2020) and Future (2070) Conditions
- Simulate frequency events
- Inform optimization analysis



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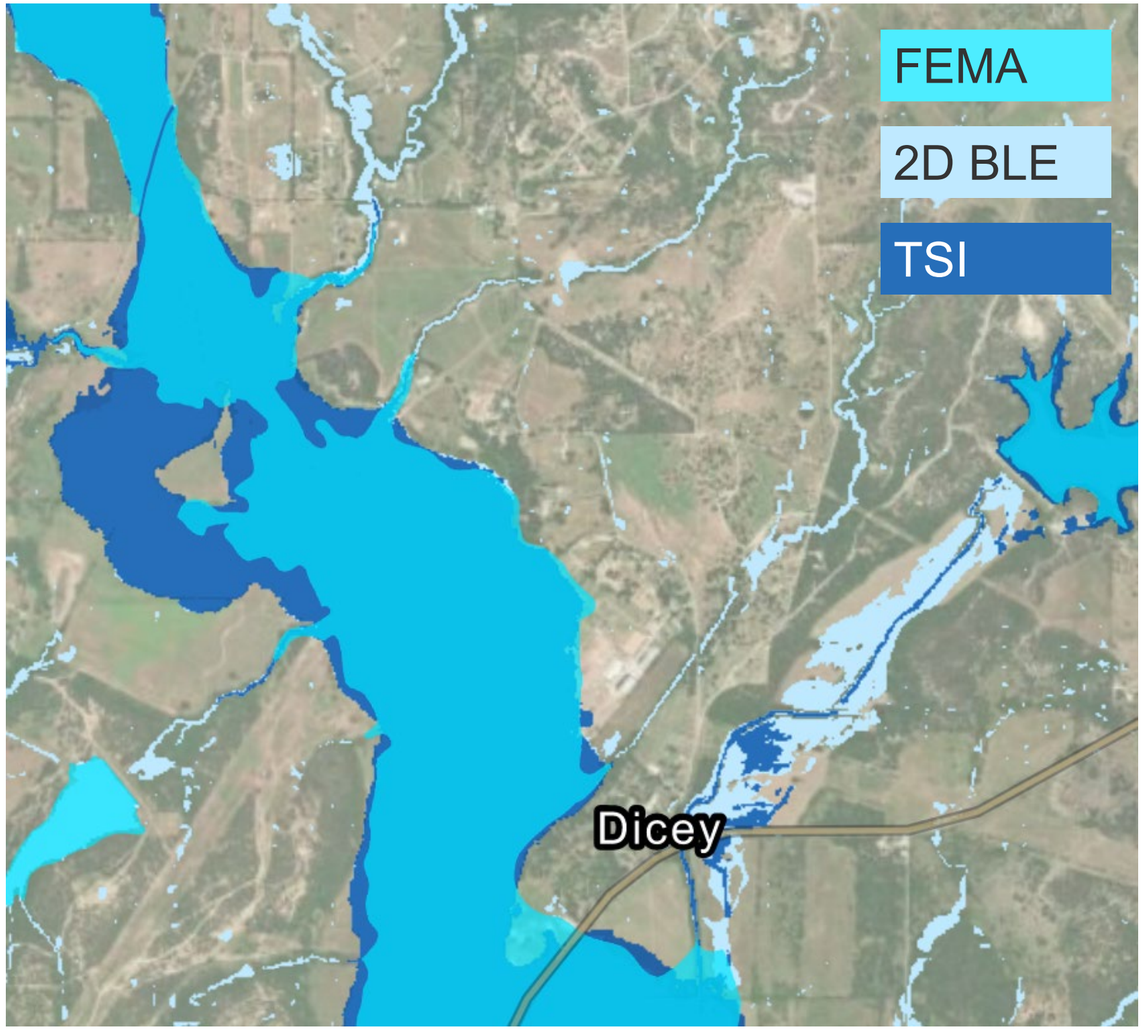
Hydraulic Modeling

- Enhanced geometry, flow, and plan files
- Add hydraulic structures using TxDOT as-built data
- Enhance resolution of Manning's roughness coefficients (flow resistance)
- Add lake bathymetry
- Simulate frequency events for Existing (2020) and Future (2070) conditions



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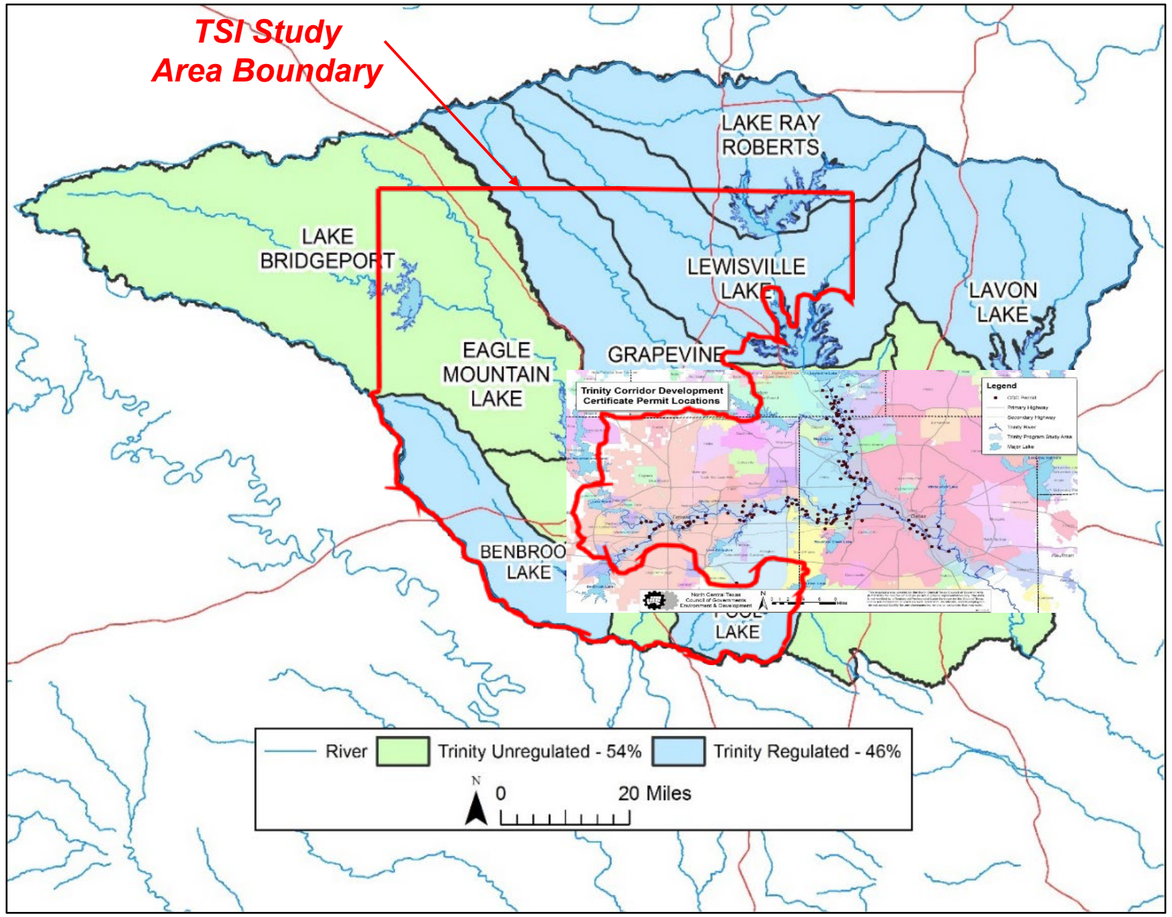
Regional Governance/Regulation Considerations

Trinity River COMMON VISION – Corridor Development Certification (CDC) Program

- **Communities & counties along Trinity River:**
  - Consistent & transparent development criteria
  - Allows development, but not adverse impacts
  - Preserves storage & water surface elevations
- **Current/future H&H simulations are dynamic living models:**
  - Check-in, check-out
  - Fee structure
- **3rd party reviews** *(USACE)*
- **Could duplicate program within the TSI region**
- **Drive future collaboration across developers, infrastructure providers, & communities**



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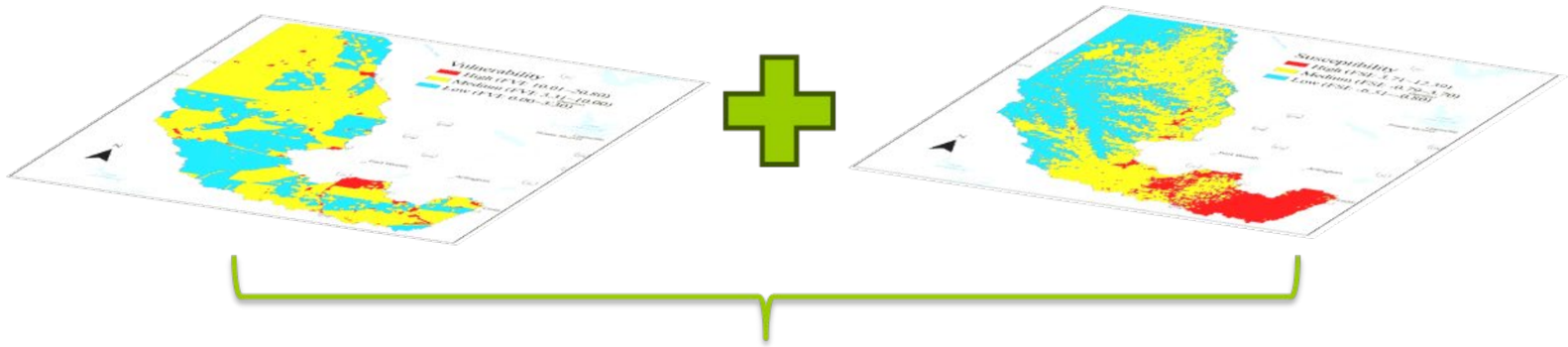
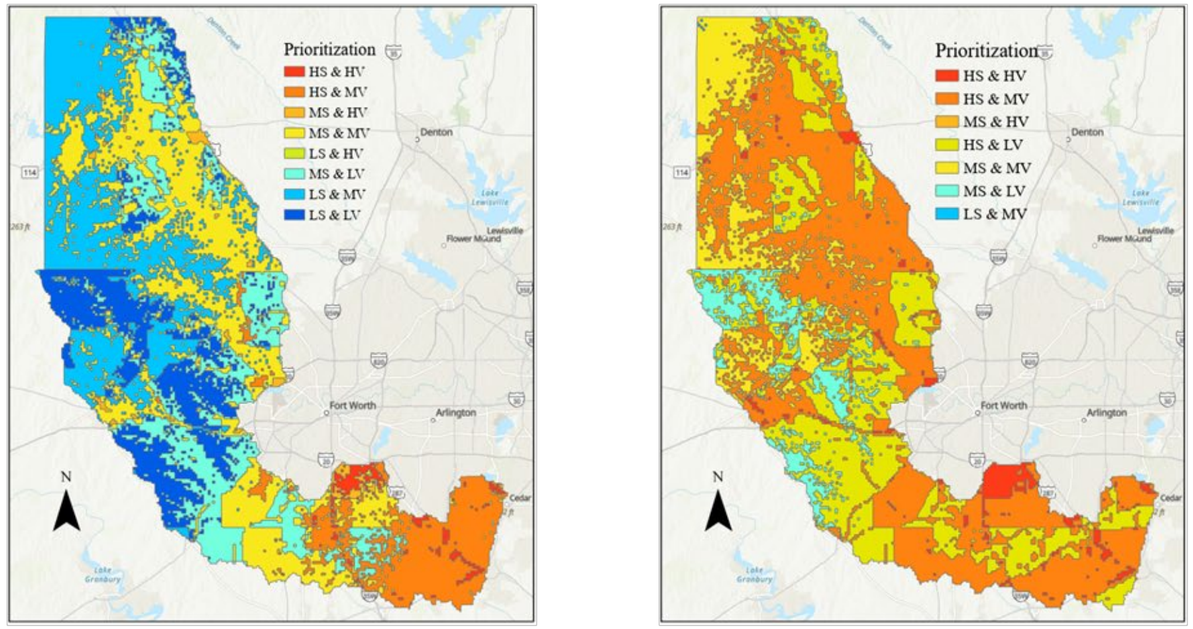
Stacking Model

- Develop a flood susceptibility/vulnerability map using a GIS Stacking Model
- Include four categories of conditioning factors & vulnerabilities (transportation, social)
- Will additionally aid in development of a suitability index for mitigation in the form of green stormwater infrastructure (GSI) & nature-based solutions (NBS)

Flood vulnerability map

Flood susceptibility map





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

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Stacking Model

Questions to Answer:

- Which areas should be prioritized for implementing GSI to reduce flood risk at a regional scale (e.g., across multiple counties)?
- How can GSI (e.g., bioretention) be designed/modeled to achieve a target performance (e.g., runoff reduction, peak flow attenuation) under a design rainfall event at the plot scale?
- What is the efficiency (e.g., runoff reduction, peak flow attenuation) of applying GSI at a watershed scale or community scale?

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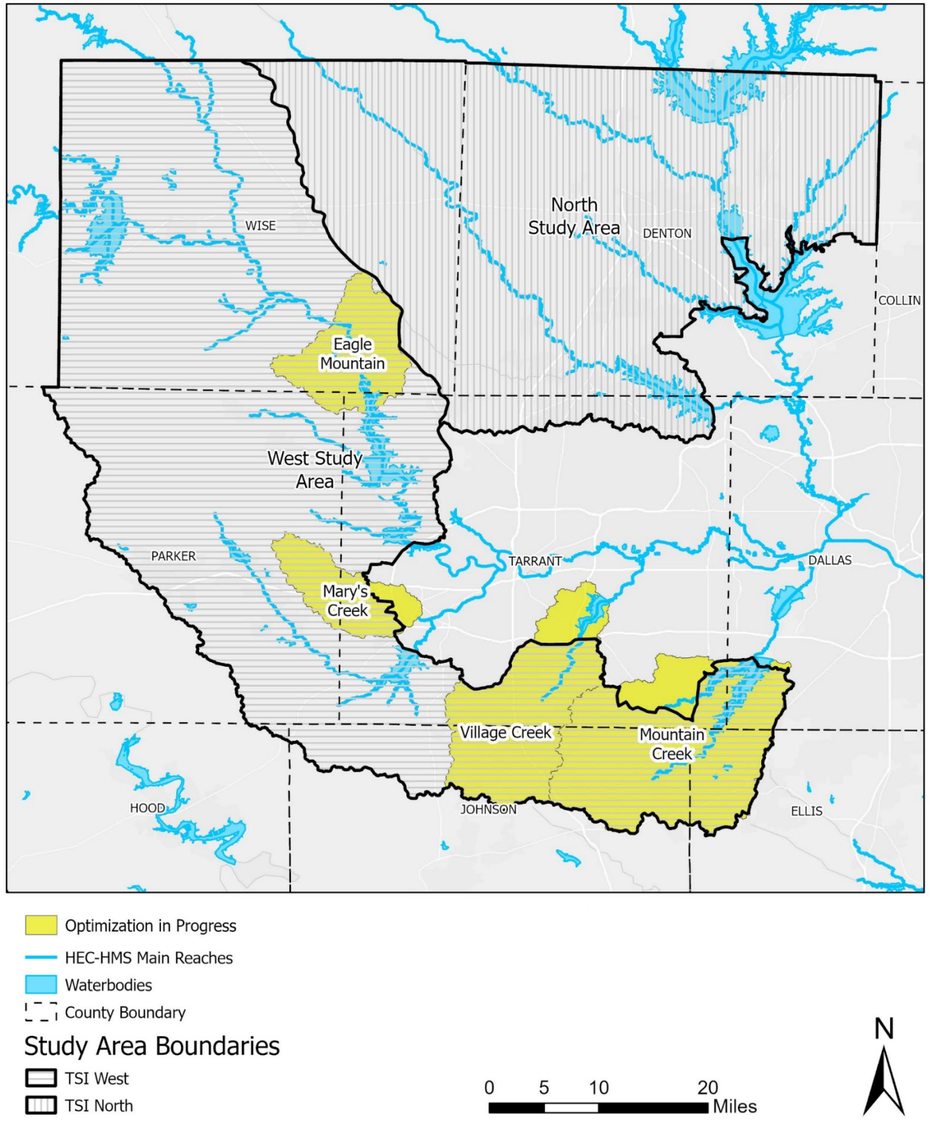
Optimization Study

- **Aims to model ideal location & sizing for storage & consider potential alternatives (e.g., detention, GSI/NBS) to reduce future flows to current levels due to anticipated urbanization changes in imperviousness & valley storage, using updated models**
- **Collaboration with Study Partners:**
  - Transportation: Locations for flow limits
  - Environmental: GSI/NBS alternatives for storage allocation



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Optimization Study

- **Determine resulting allocated future storage & create storage allocation maps (via input/models from AgriLife)**
- **Analyze how the required storage can be achieved with:**
  - Detention Ponds
  - GSI/NBS (Environmental Input)
  - Combination
- **Compare alternatives (“menu of options”)**

Newly Constructed Bioretention Area Newly Planted Bioretention Area After Storm

Figure 2.1 Bioretention Area Examples

Source: NCTCOG iSWM Site Development (2014)

Figure 23. The Green at College Park (University of Texas – Arlington).

Figure 71. The Perot Museum parking lot bioswales uses native and drought-tolerant plants.

Source: NCTCOG Green Infrastructure Guide (2017)

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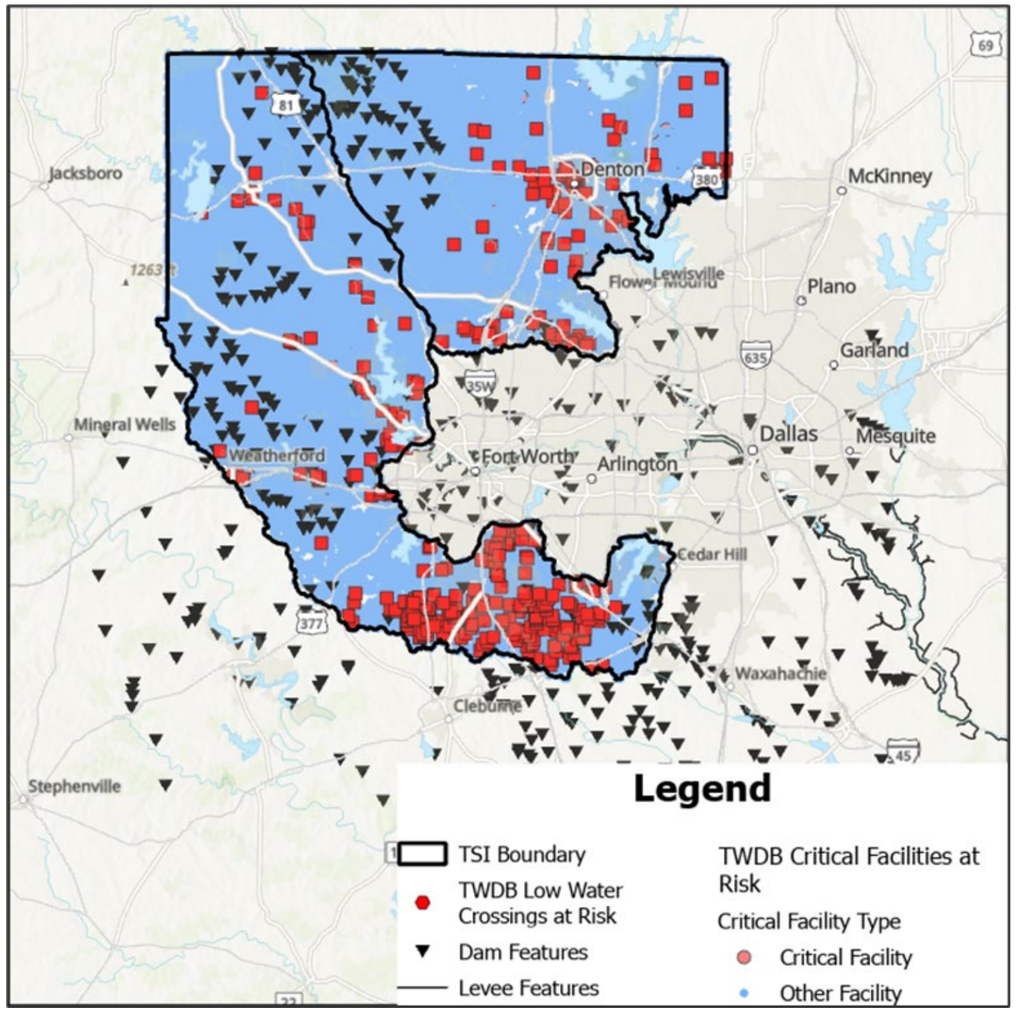
Flood Warning System Planning

- **Develop fully transferrable “roadmap” to develop or strengthen Flood Early Warning System (FEWS) understanding & capacity**
- **FEWS Standard Operating Procedure (SOP)**
  - Transferrable & scalable
  - Assists entities in creating a FEWS Masterplan
- **FEWS Masterplan**
  - Defines objectives
  - Summarizes regional characteristics
  - Documents existing capacity
  - Performs gap analysis
  - Develops framework or “roadmap” for increasing capacity
  - Develop implementation plan (beyond TSI scope)



TWDB Structures at Risk, Critical Infrastructure, and Low Water Crossings

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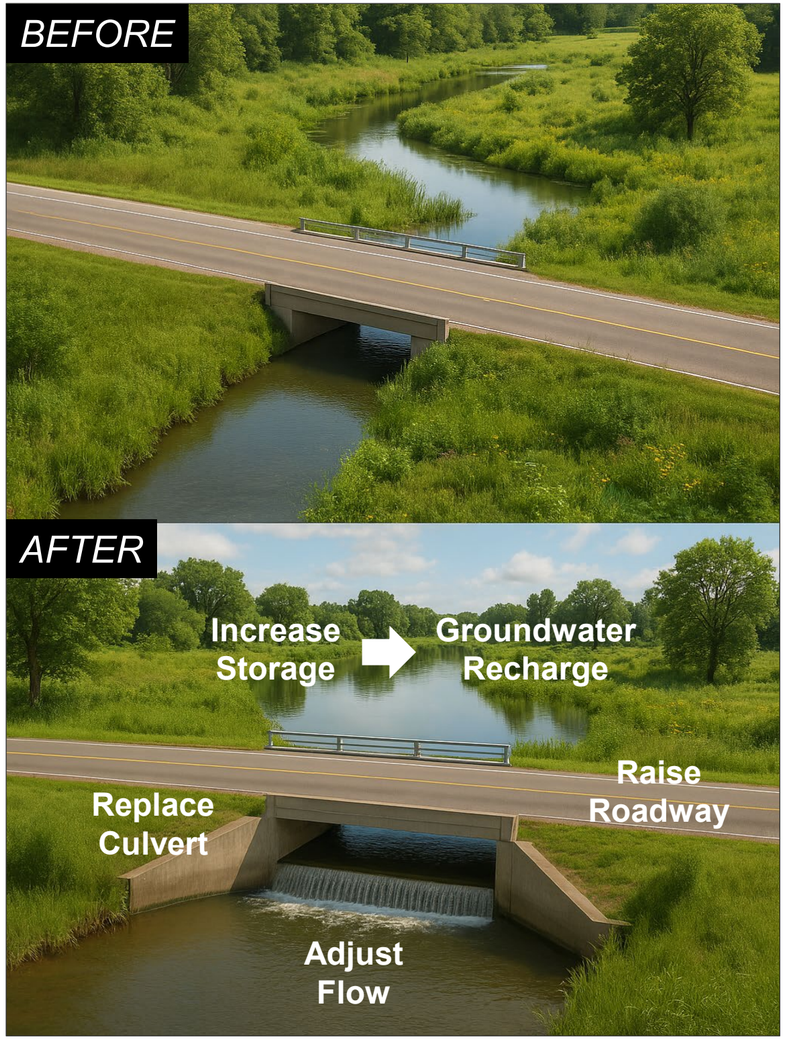
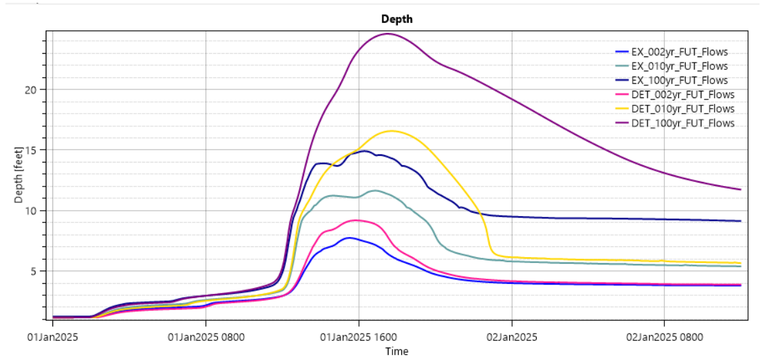
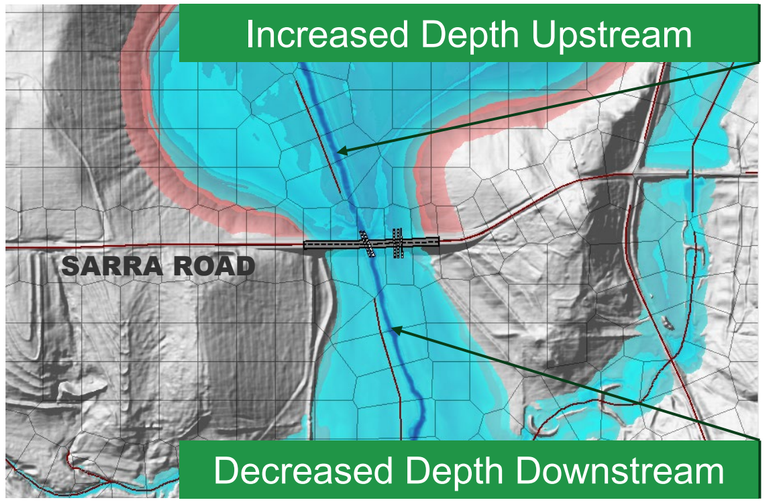
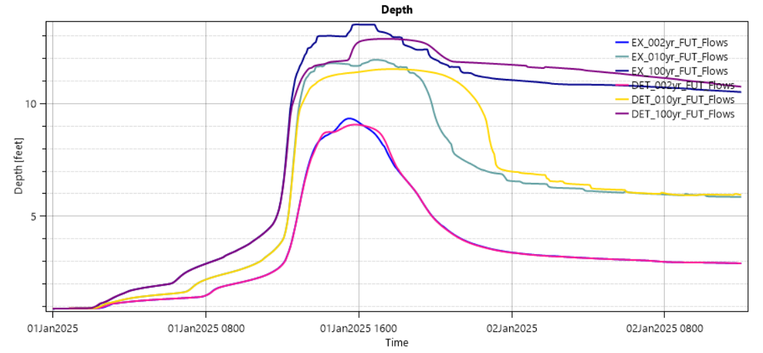
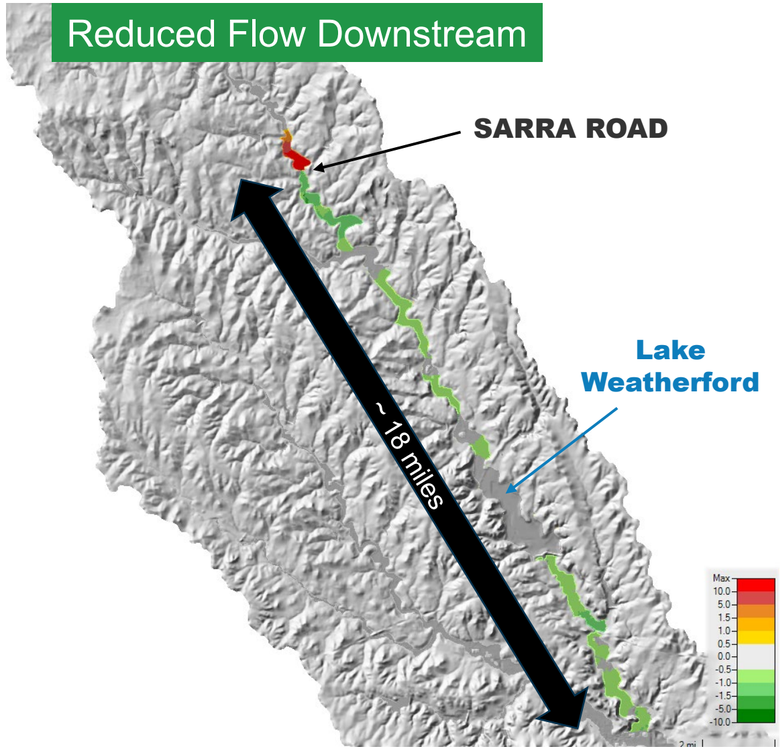
INTEGRATION: *Sarra Road – Parker County*











Key Summary Statistics – 2070

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

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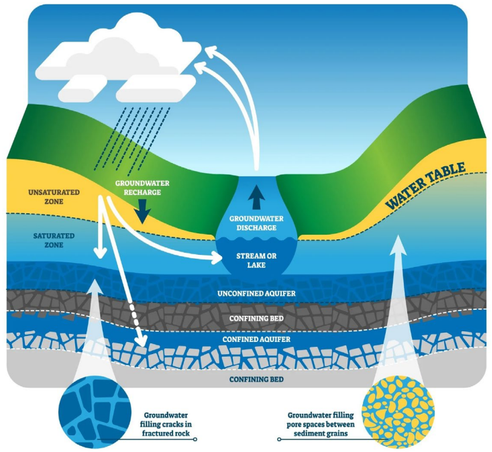
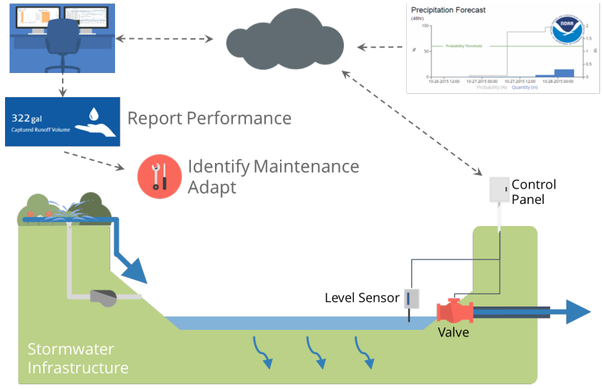
INTEGRATION: *Building Upon Model Codes/Ordinances*

Groundwater Recharge/Reuse



Smart Stormwater Infrastructure



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Upcoming Opportunities/Resources

Flood Warning System Pre-Workshop Meeting

January 15, 2026 – 10:00 a.m. to 11:00 a.m.
Virtual via Microsoft Teams
Details & Add to Your Calendar:
https://www.addevent.com/event/yyqpm7vd2cgh

Flood Warning System Workshop

February 17, 2026 – 10:00am to Noon
Hybrid – NCTCOG Transportation Council Room
(Virtual via Microsoft Teams)
Details & Add to Your Calendar:
https://www.addevent.com/event/skb38xv9sgjc

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Discussion

Review of New Elements of the 2026 Water Quality Management Plan Update (WQMP)

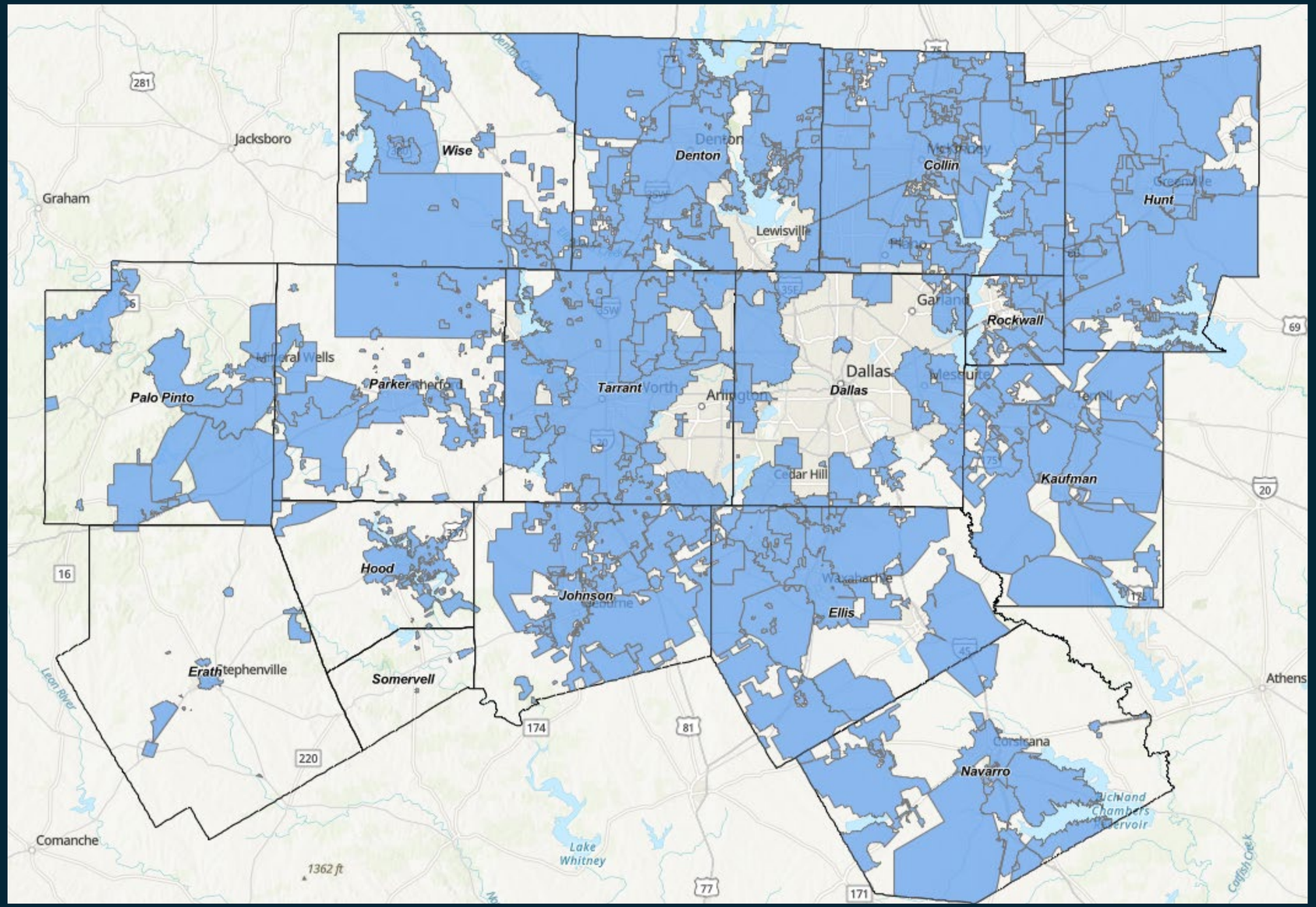
- NCTCOG will share relevant items being incorporated into the 2026 WQMP, and the WRC will review feedback from the 2025 WQMP to make appropriate additions to this year's update.

Discussion

New for 2026:

CCN data from the Public Utility Commission of Texas

Draft Water Service Boundaries



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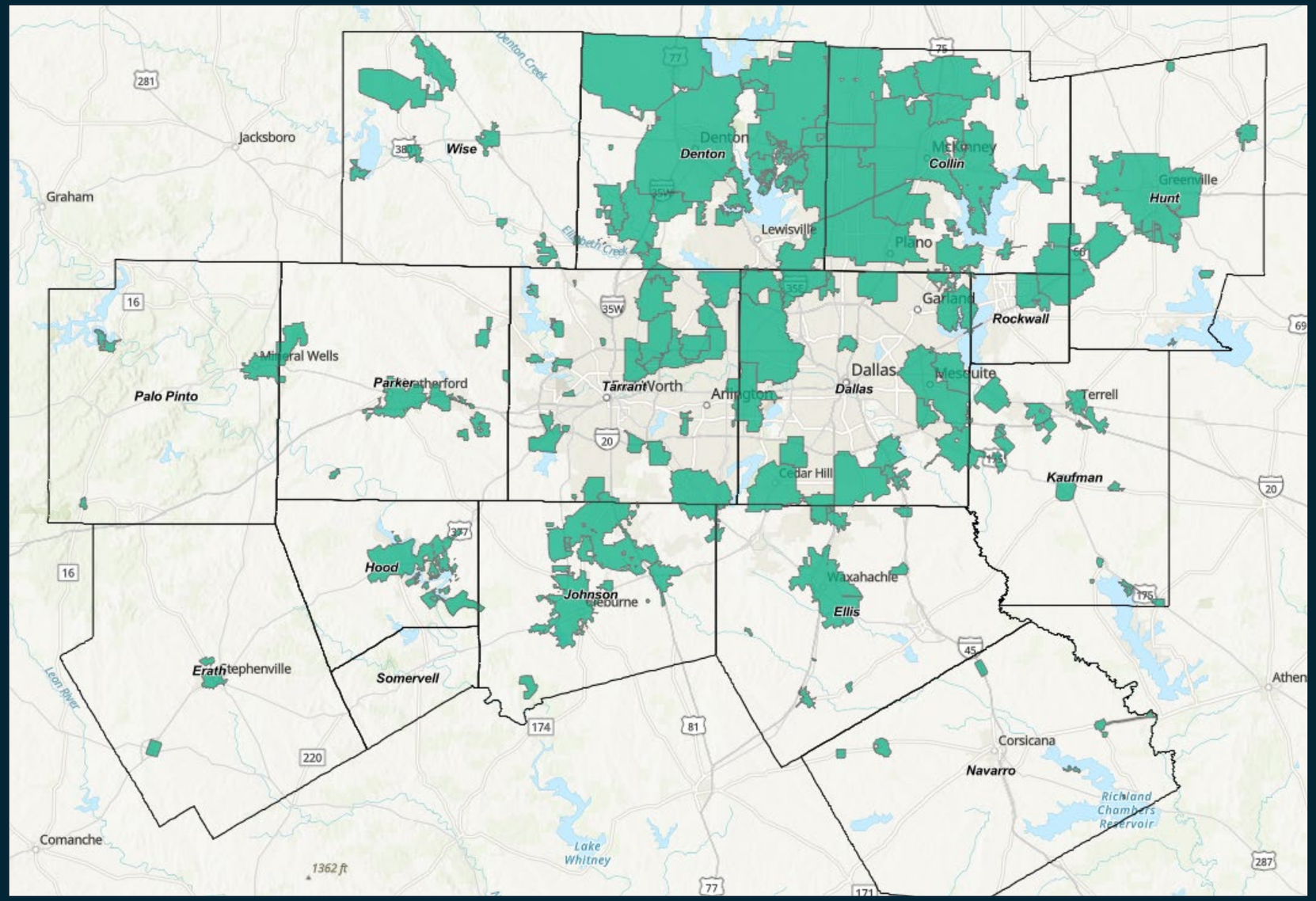
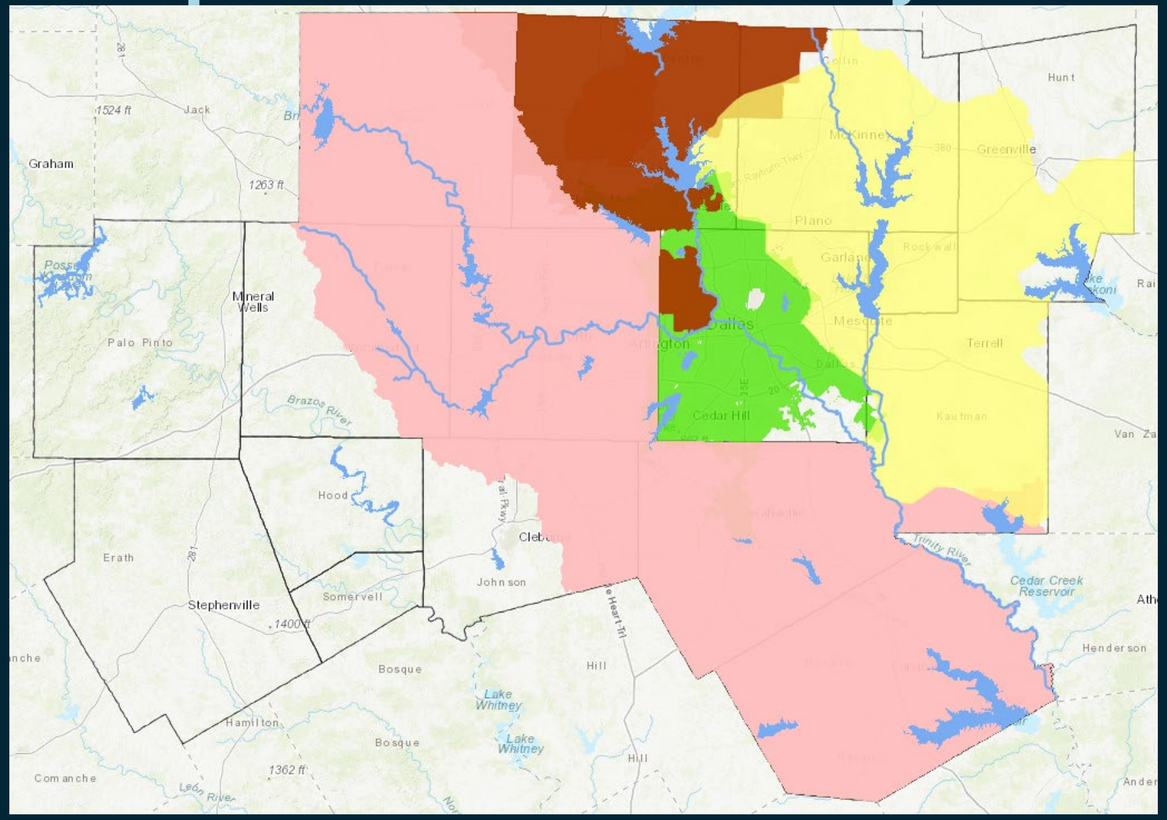
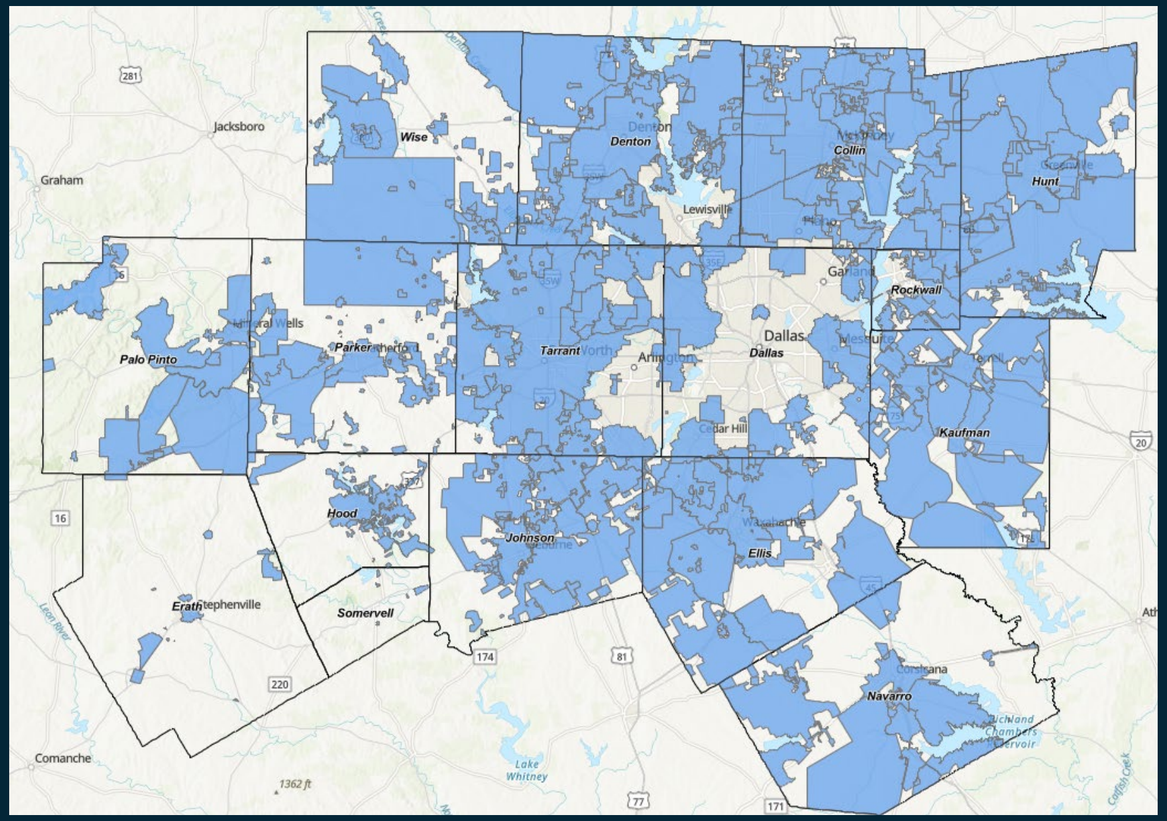


Discussion

Comparison: 2026 Major Water Providers vs. CCN data

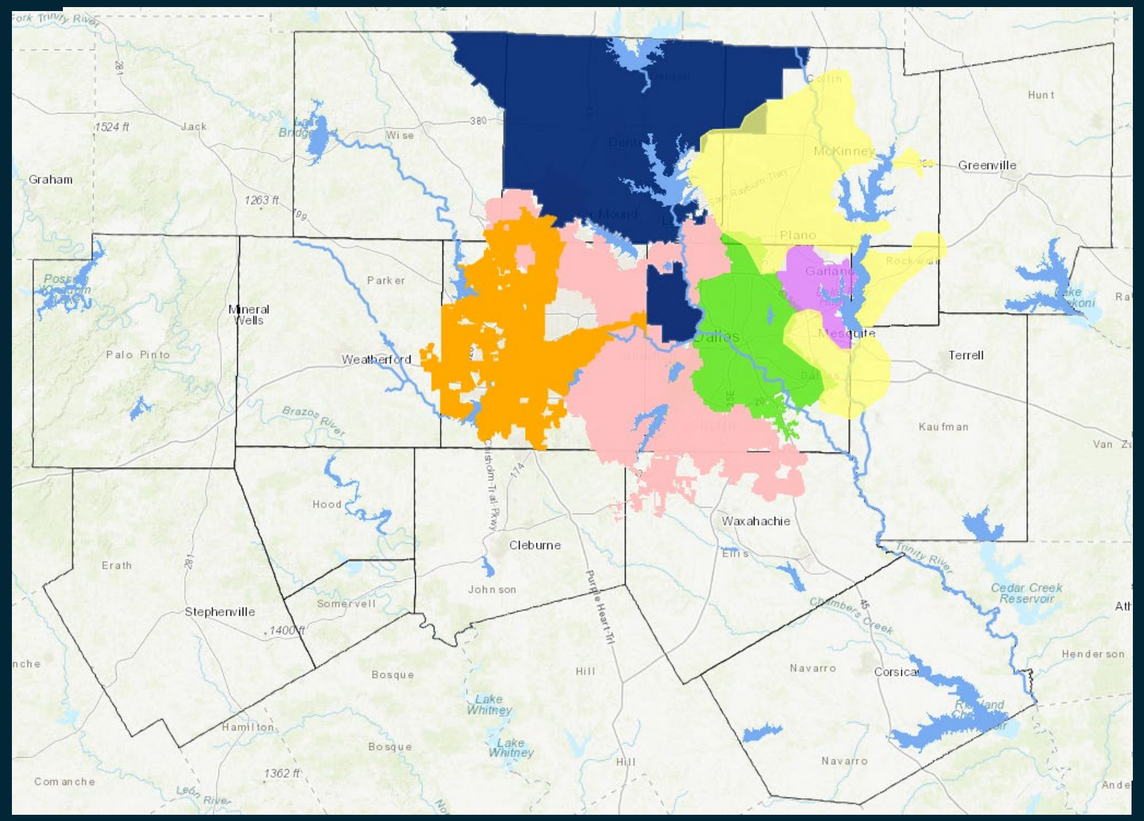


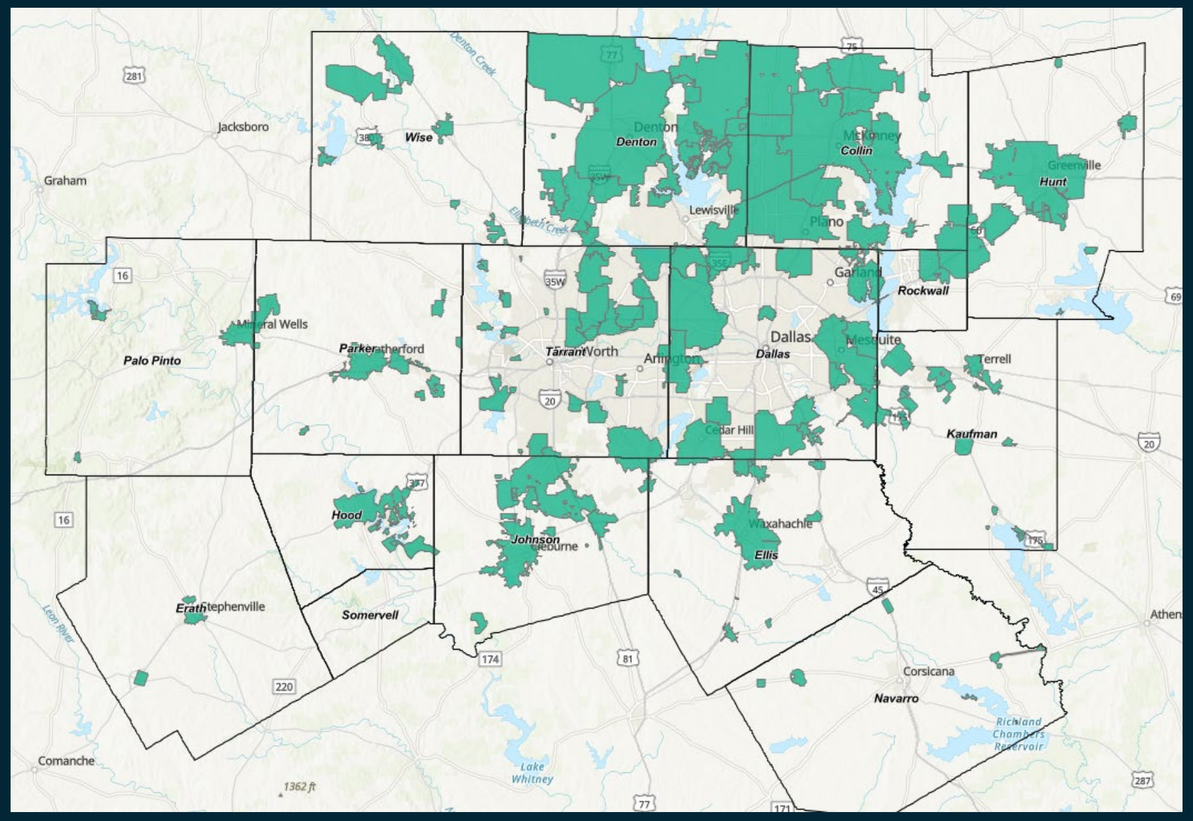


All maps are in DRAFT form

Discussion

Comparison: Major Wastewater Providers vs. CCN data





All maps are in DRAFT form

Discussion

Comparison: Major Water Providers vs. CCN data

- Feedback Requested: Does the WRC prefer the Major Provider maps used in previous updates or the new CCN maps? Should both be included in the 2026 WQMP?

Discussion

New for 2026: Current Pollutant Inventory and Indicators of Concern for Use Attainment and Screening Levels

Text on each pollutant/indicator present in NCTCOG waters has been added, including information on potential points of exposure and potential impacts on human health.

Includes a breakdown of pollutant presence.

Discussion

New for 2026: Current Pollutant Inventory

Current impairments in NCTCOG reservoirs

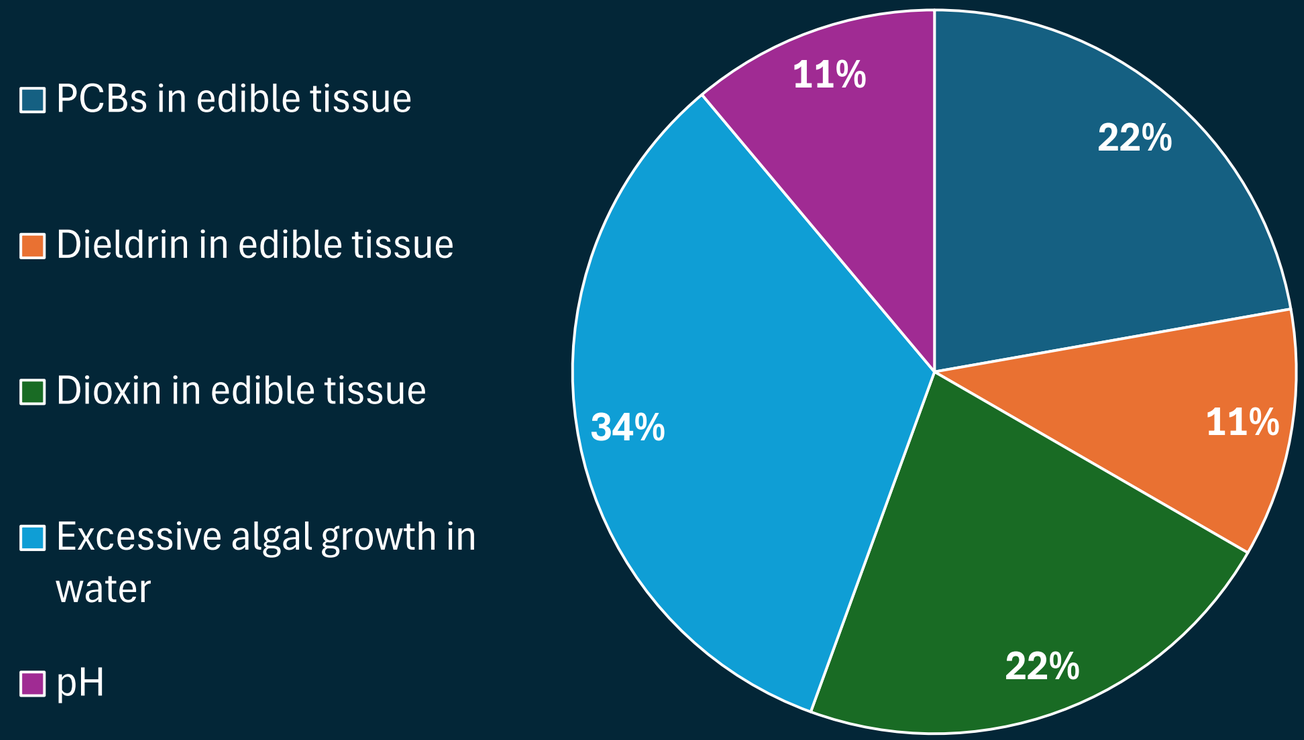
Parameter	Impaired Segments
PCBs in edible tissue	4
Dieldrin in edible tissue	2
Dioxin in edible tissue	4
Excessive algal growth in water	6
pH	2

Source: 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)

Discussion

New for 2026: Current Pollutant Inventory

Current impairments in NCTCOG reservoirs



Source: 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)

Discussion

New for 2026: Current Pollutant Inventory

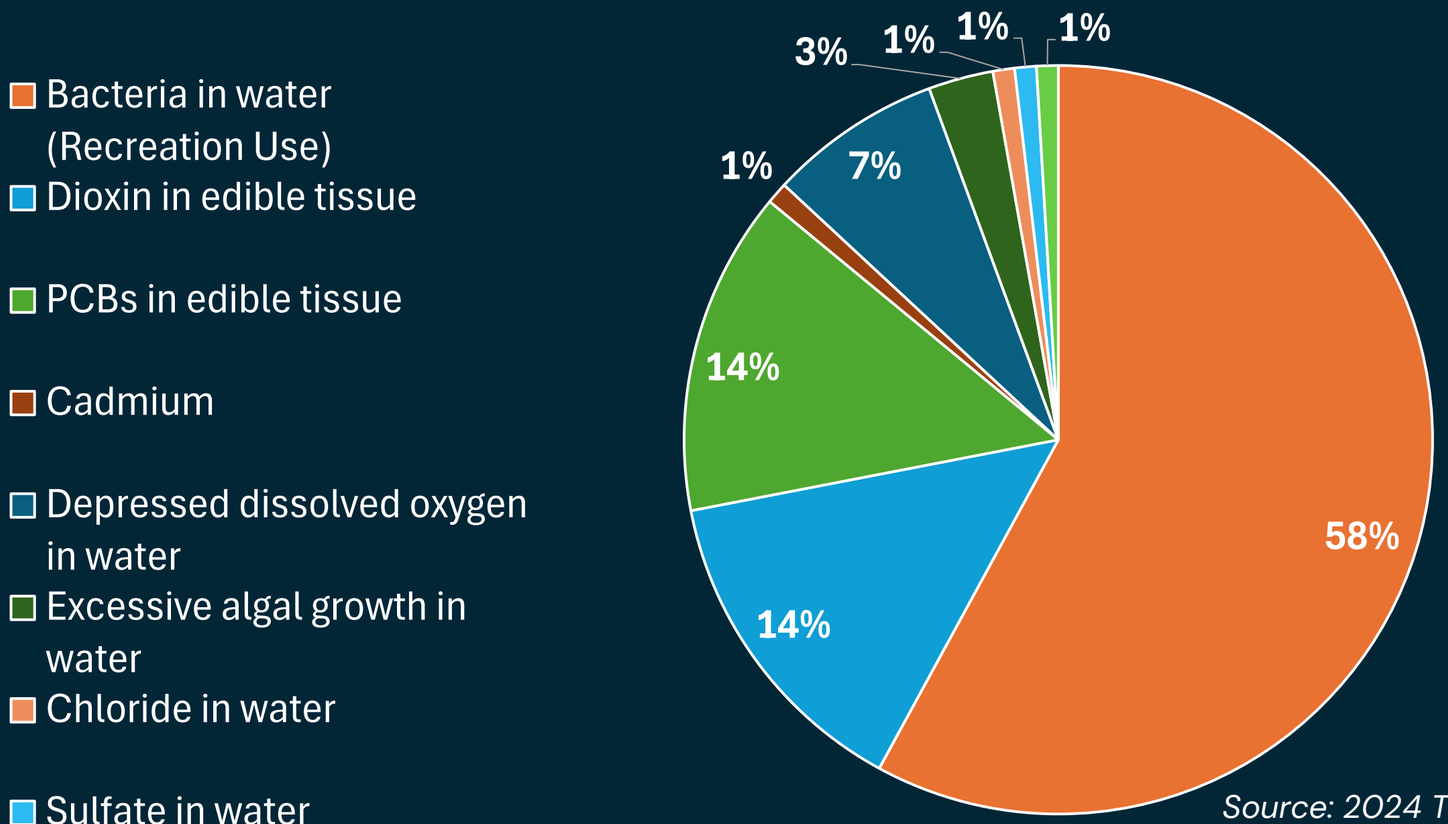
Current impairments in NCTCOG stream segments

Parameter	Impaired Stream Segments
Bacteria in water (Recreational Use)	62
Dioxin in edible tissue	15
PCBs in edible tissue	15
Cadmium	1
Depressed dissolved oxygen in water	8
Excessive algal growth in water	3
Chloride in water	1
Sulfate in water	1
Total dissolved solids in water	1

Discussion

New for 2026: Current Pollutant Inventory

Current impairments in NCTCOG stream segments



Source: 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)

Discussion

New for 2026: Indicators of Concern for Use Attainment and Screening Levels

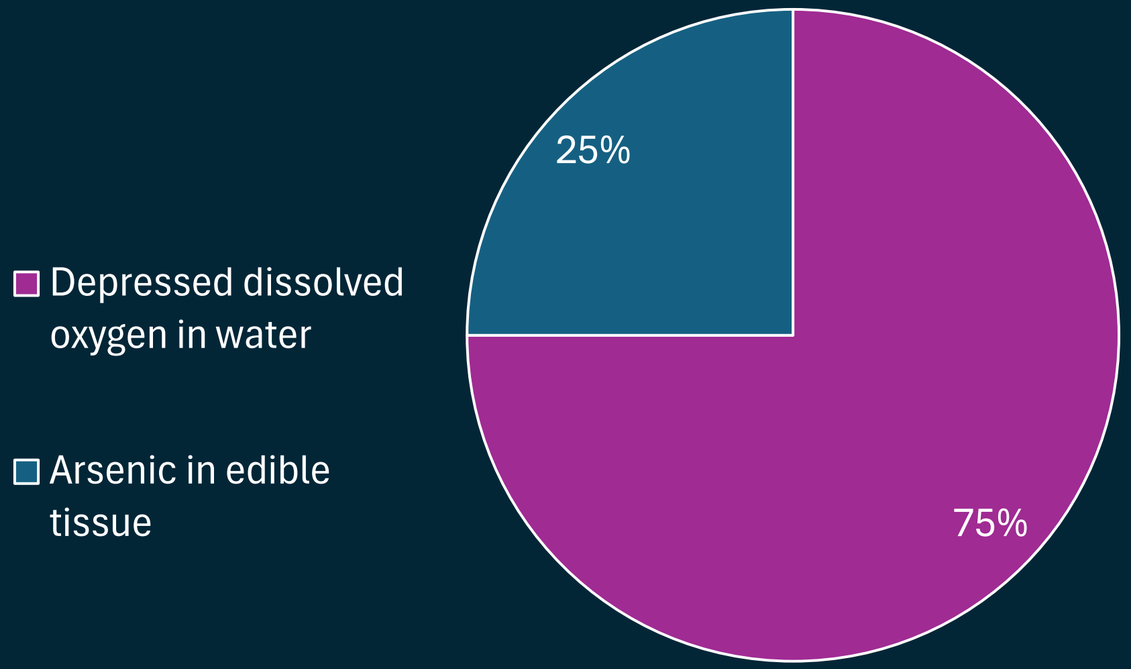
Parameter	Reservoirs of Concern
Depressed dissolved oxygen in water	6
Arsenic in edible tissue	2

Indicators of Concern in NCTCOG Reservoirs

Source: 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)

Discussion

New for 2026: Indicators of Concern for Use Attainment and Screening Levels



Indicators of Concern in NCTCOG Reservoirs

Source: 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)

Discussion

New for 2026: Indicators of Concern for Use Attainment and Screening Levels

Indicators of Concern in NCTCOG Stream Segments

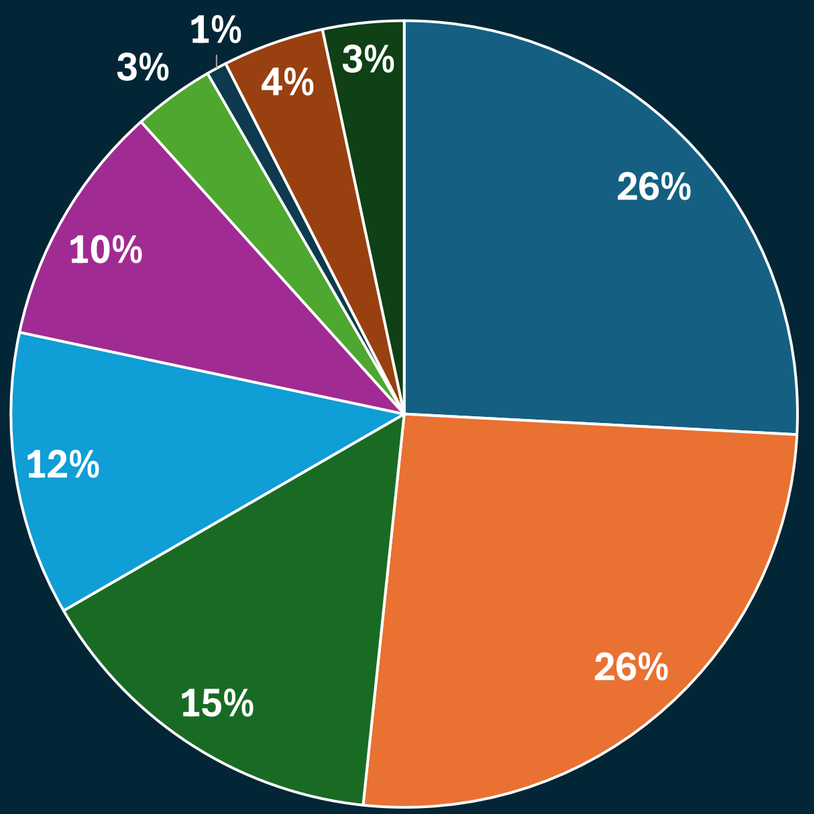
Parameter	Stream Segments of Concern
Chlorophyll-a in water	31
Nitrate in water	31
Total Phosphorus in water	18
Depressed dissolved oxygen in water	14
Bacteria in water (Recreation Use)	12
Ammonia in Water	4
Arsenic in edible tissue	1
Impaired macrobenthic community in water	5
Impaired habitat in water	4

Source: 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)

Discussion

New for 2026: Indicators of Concern for Use Attainment and Screening Levels

Indicators of Concern in NCTCOG Stream Segments



Source: 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)

Discussion

Addressing 2025 Public Comments

Comment from 2025 Water Quality Management Plan Update:

"Add Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) goals (e.g., "Reduce E. coli levels by X% by 2030"). Setting clear targets would enhance accountability and facilitate progress tracking."

Feedback Requested: Are there clear water quality goals related to pollutant reduction that should be included in the 2026 WQMP update?

Discussion

Review of New Elements of the 2026 Water Quality Management Plan Update (WQMP)

- Additional feedback or questions?

Discussion

Results of the 2025 North Central Texas Water Resources Questionnaire.

- NCTCOG staff will review the results of the 2025 North Central Texas Water Resources Questionnaire distributed in the spring. The council will share ideas on incorporating the results into water quality activities in FY27.

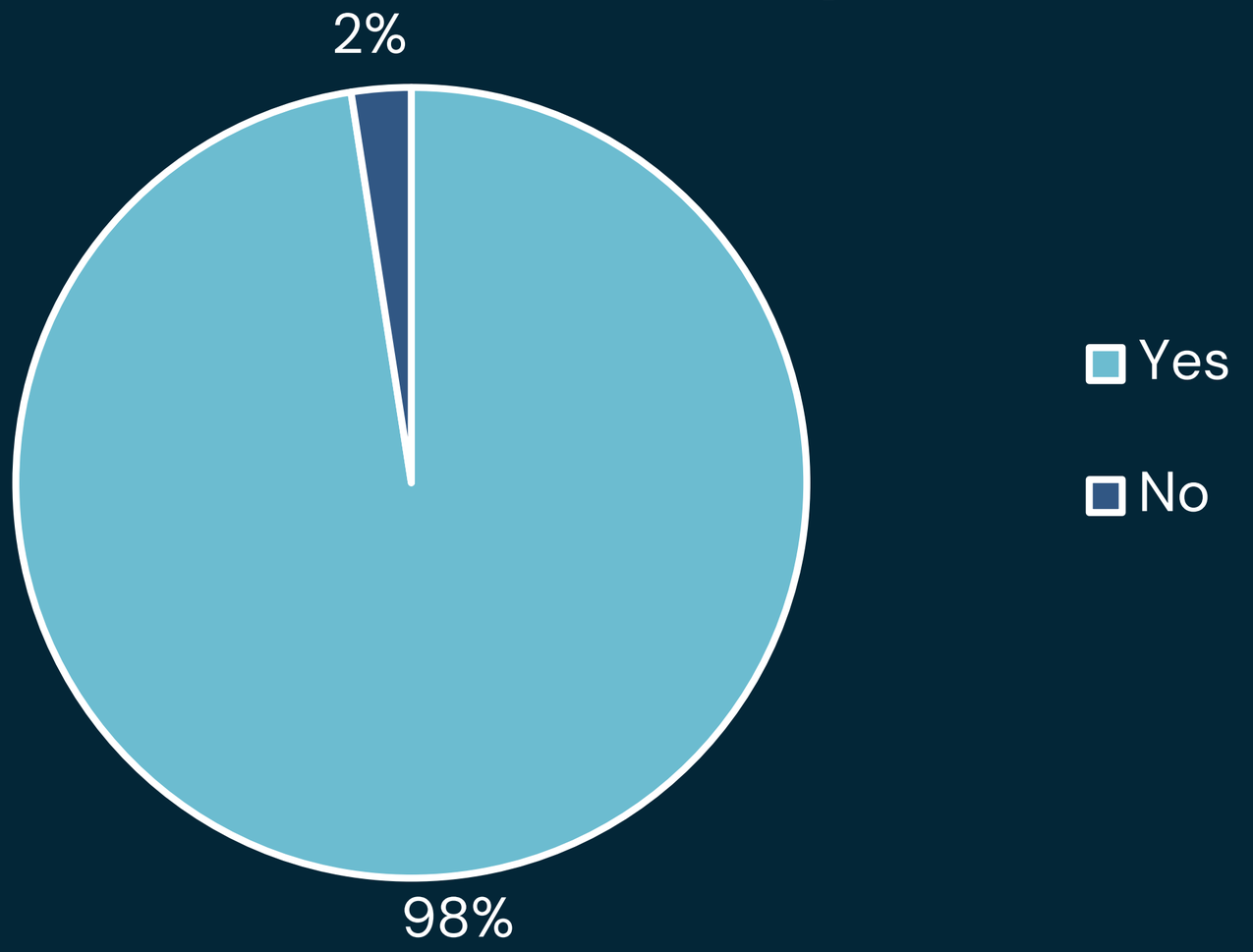
Discussion

Results of the North Central Texas Water Resources Questionnaire

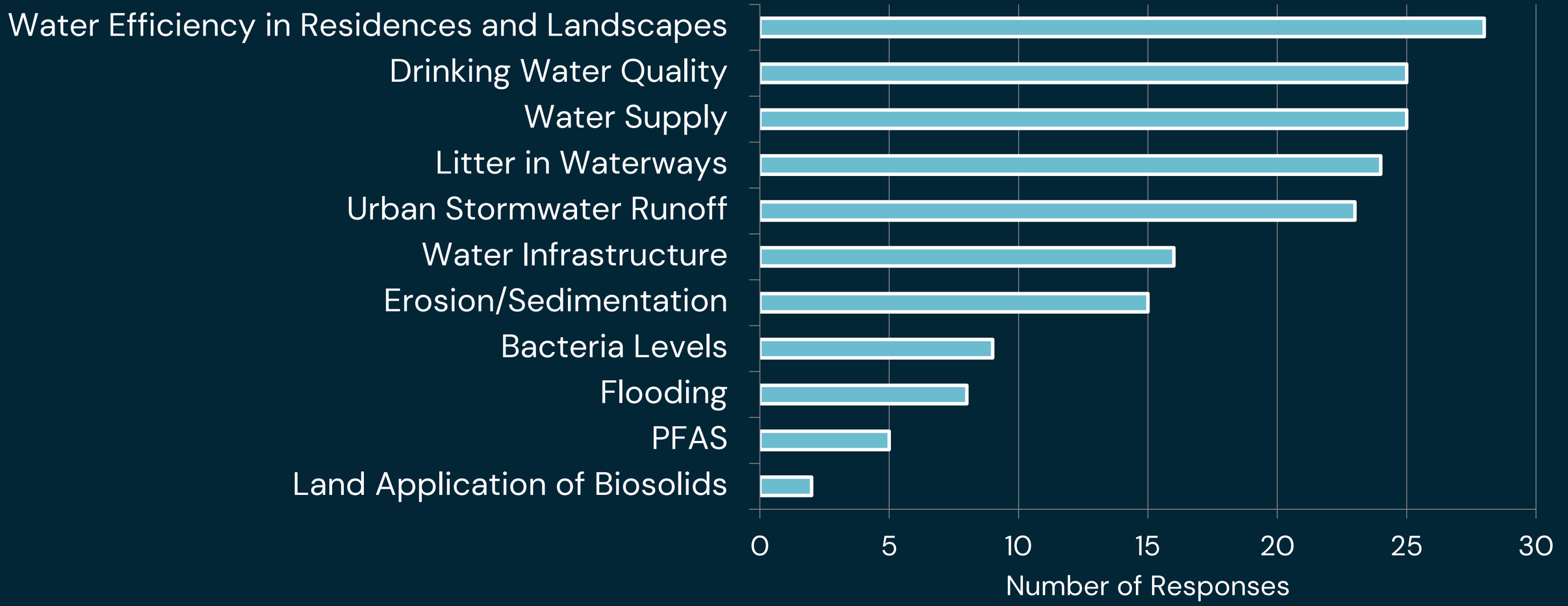
- Last spring, NCTCOG distributed the 2025 North Central Texas Water Resources Questionnaire

- Responses were received from 39 different entities

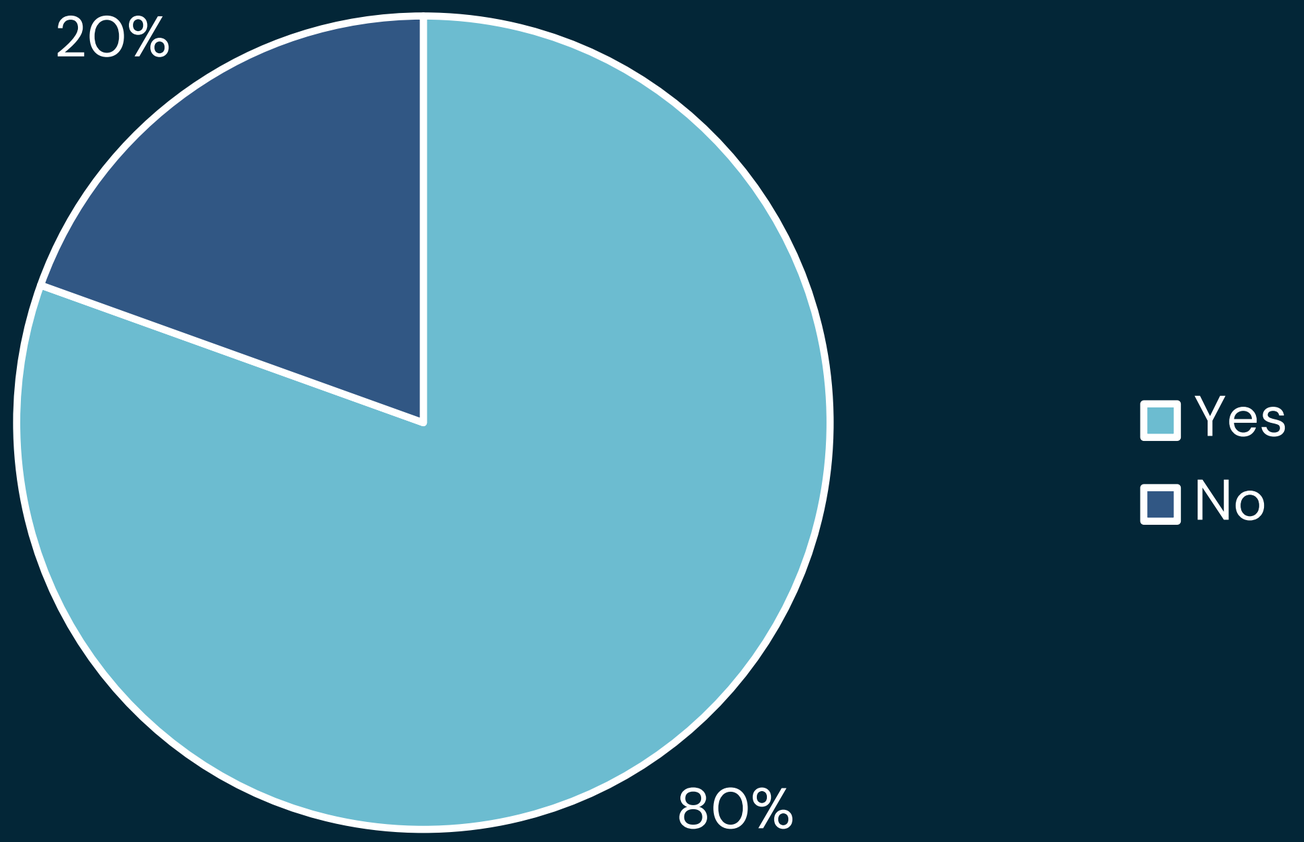
Does your entity engage in outreach on water resource topics?



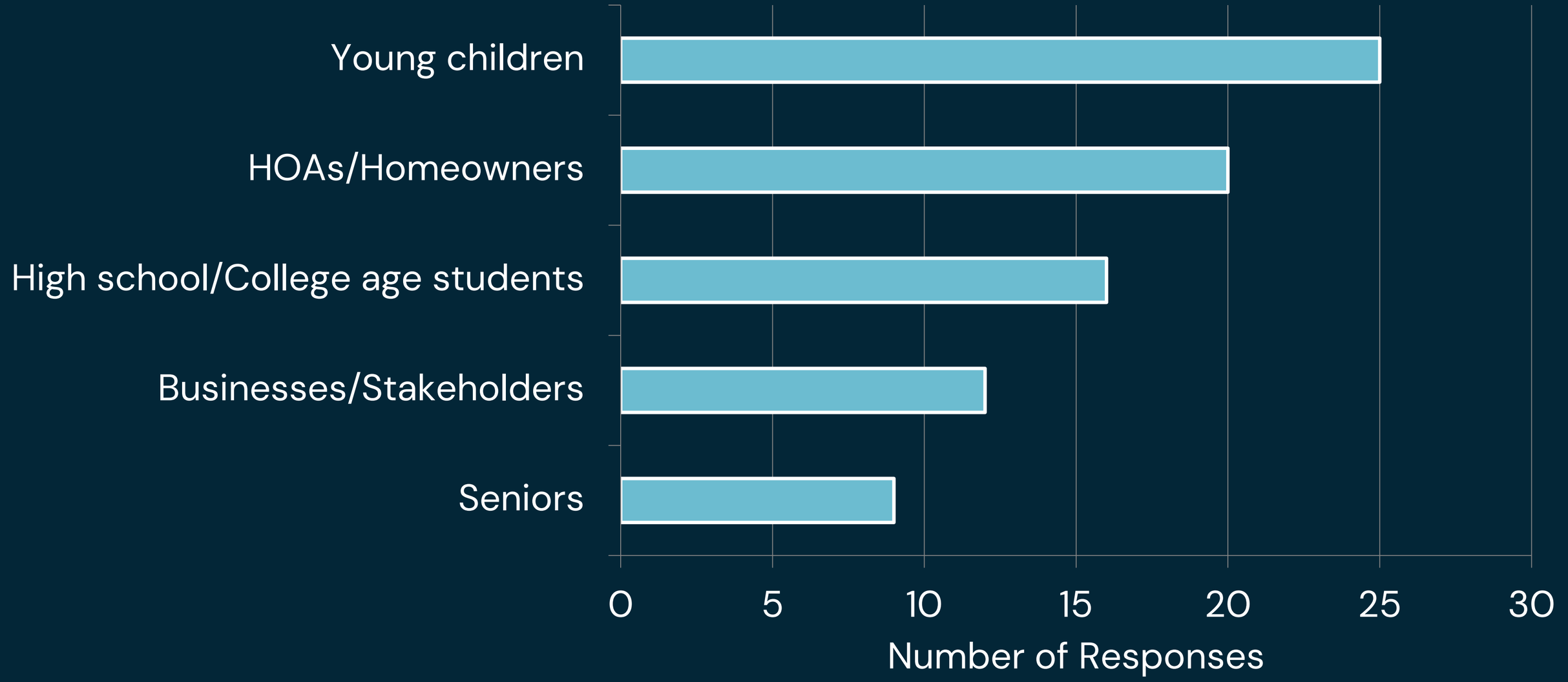
Which topics are the focus of your outreach efforts?



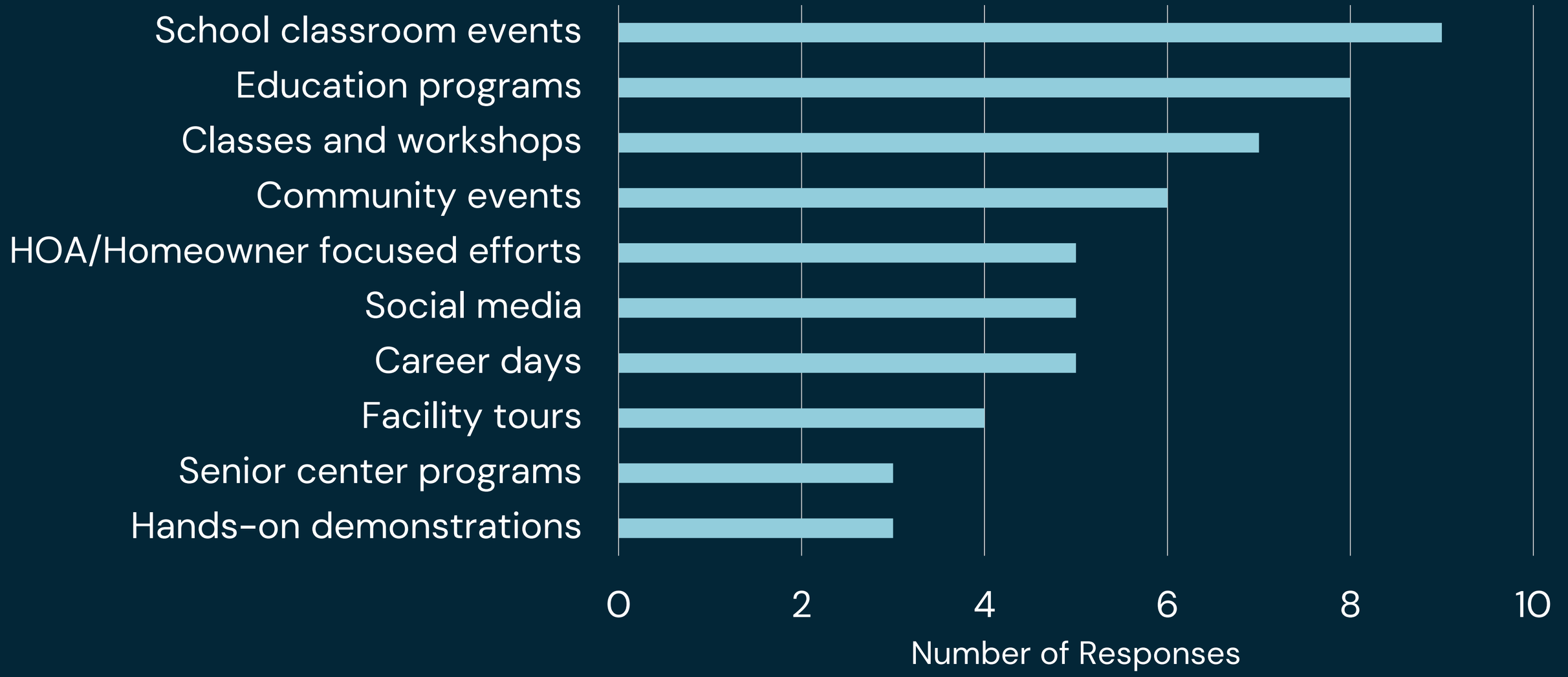
Do you engage in outreach tailored for a specific group?



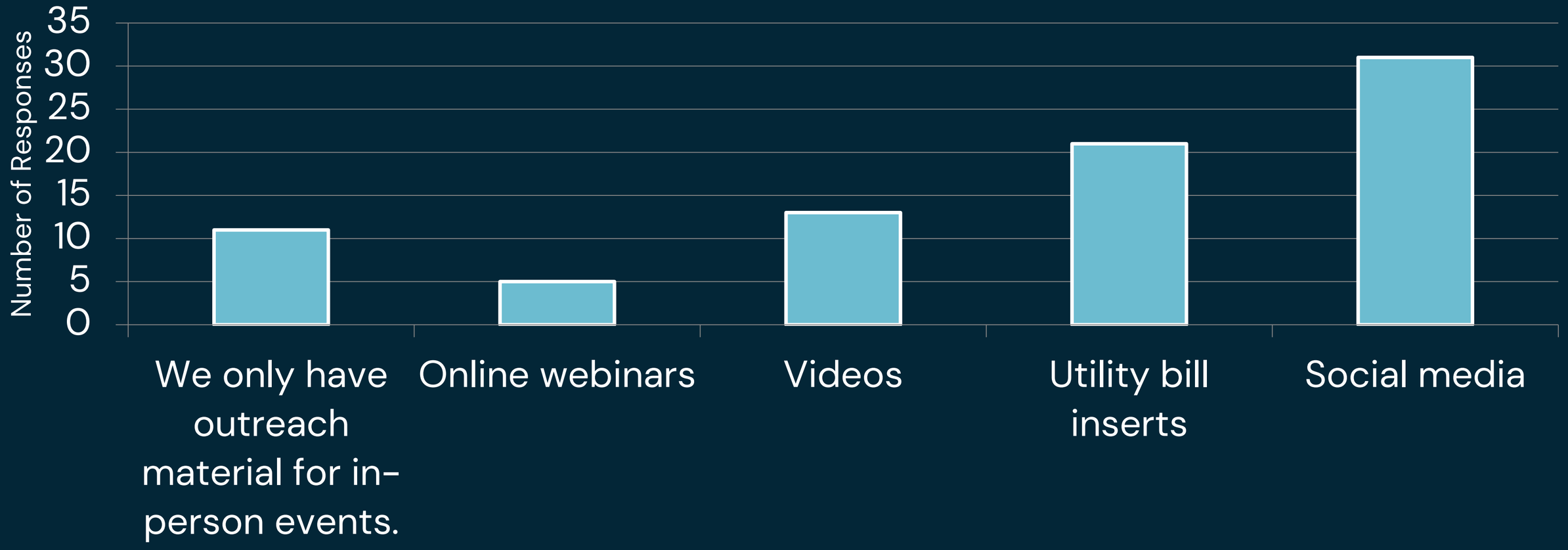
Which groups do you engage with?



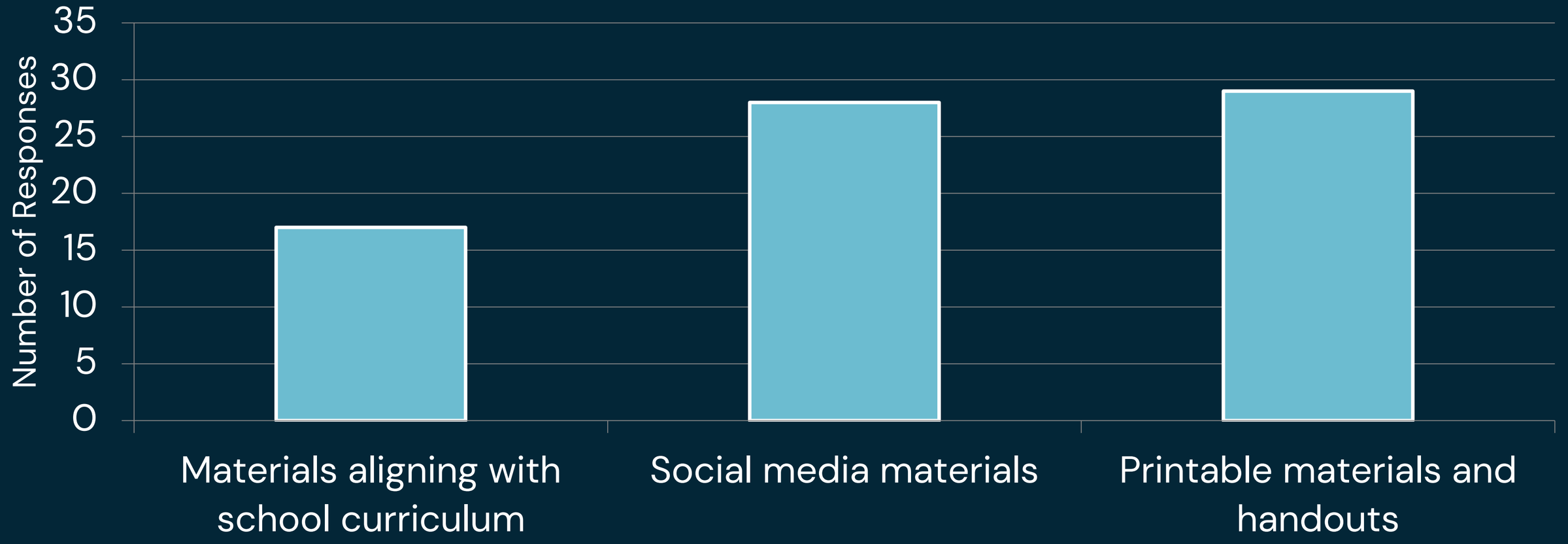
Please describe your campaign efforts.



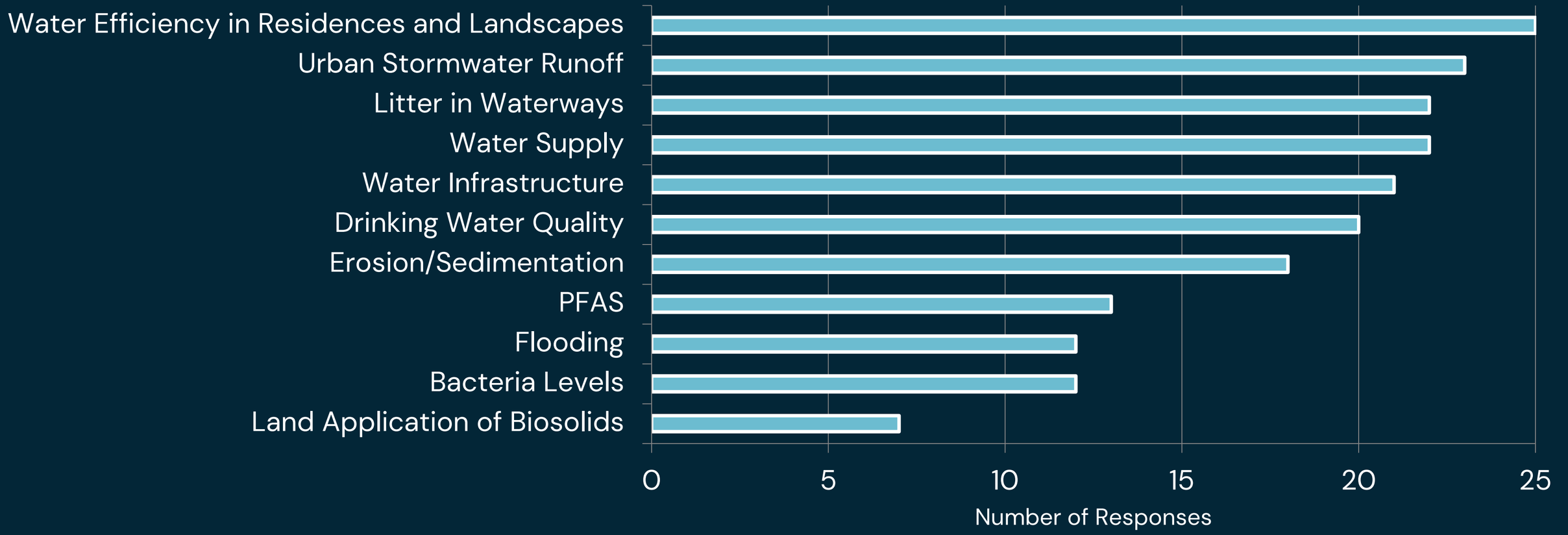
What have you found to be the best way to reach your outreach audience outside of in-person events?



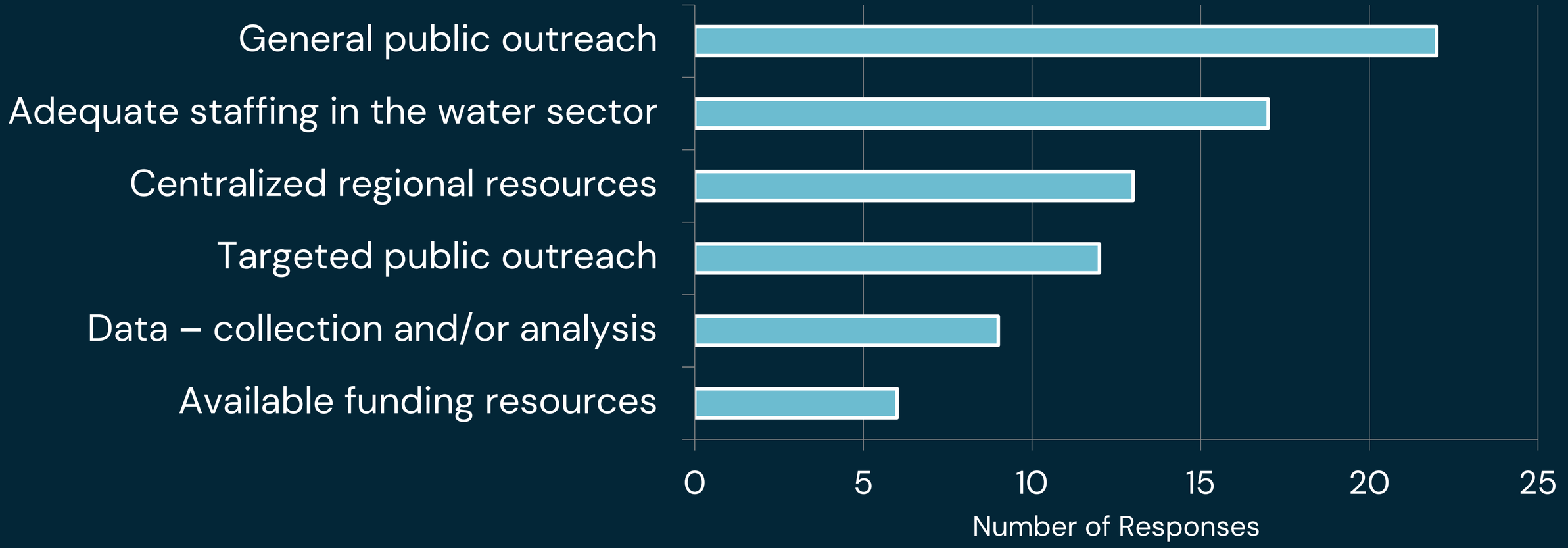
What types of resources could NCTCOG provide or consolidate at the regional level that would assist your outreach efforts?



What information could NCTCOG provide resources on that would assist with your outreach efforts?



What water quality resources, information, or tools do you think are lacking in the North Central Texas region?



Available Funding

- Grant hub that collates opportunities
- Funding for Infrastructure
- Advertising
- Funding for water programs similar to solid waste

Data Types

- Water savings or equivalent
- Water conservation ROI
- Watershed ROI
- Accurate water loss data
- Data on impactful events
- Effectiveness and results of outreach

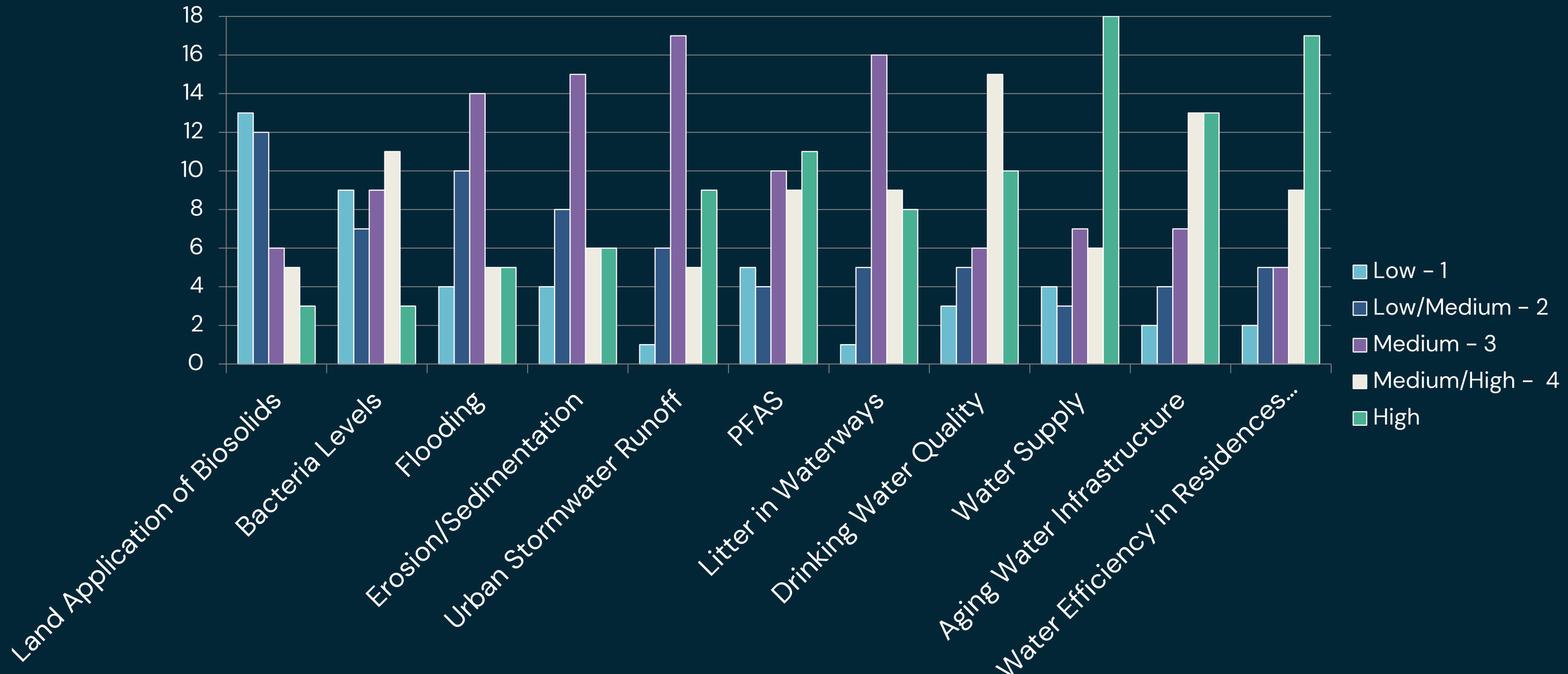
Targeted Outreach Topics

- Landscape design and conservation
- Native plants
- Residential watering
- HOA targeted outreach
- New FOGs (ex. vapes)
- Targeted at youth
- Targeted at municipal decision makers

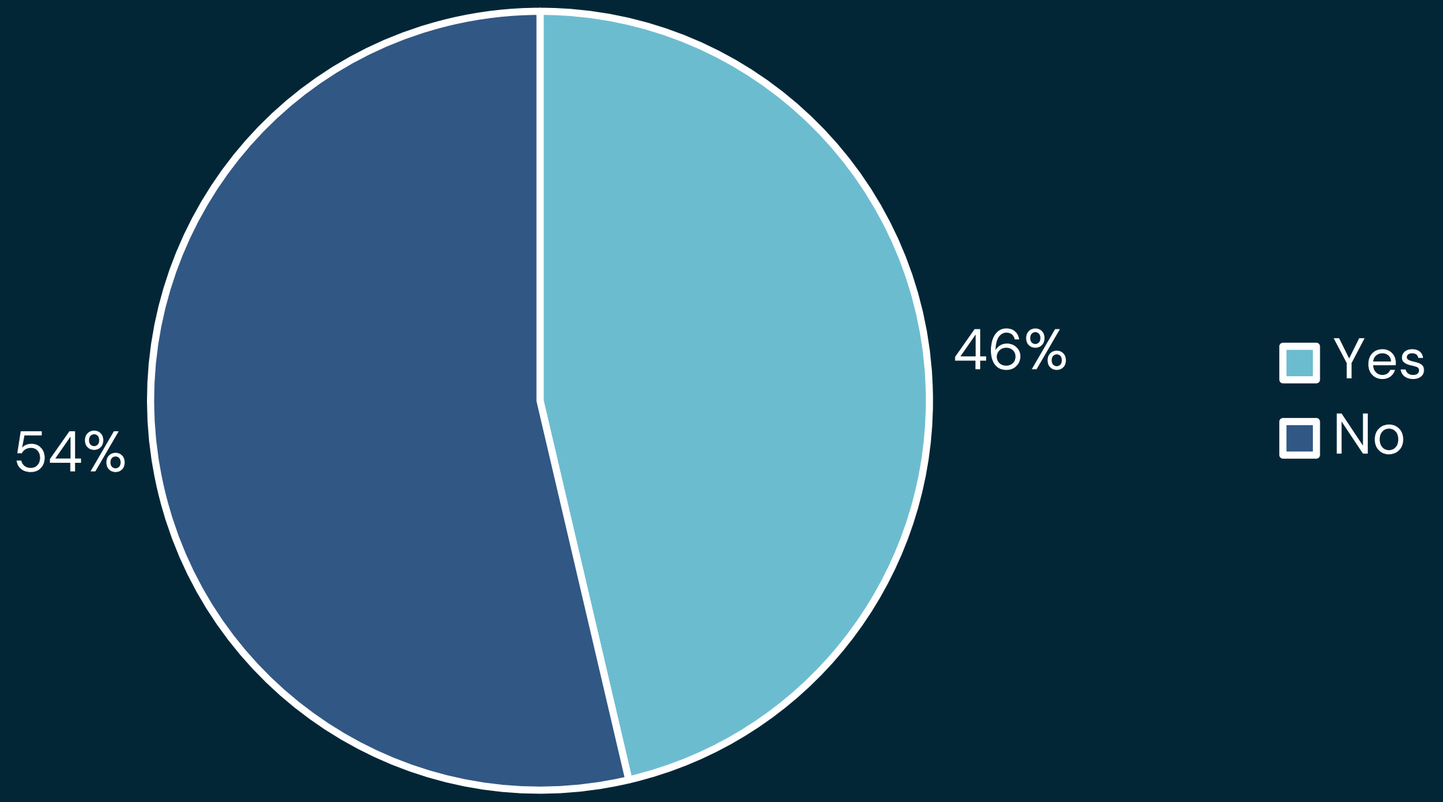
Other

- Fact sheet highlighting main water quality issues in the region
- Map highlighting BMPs
- Treatment and infrastructure focused resources
- Staffing resources
- Legal support for enforcement

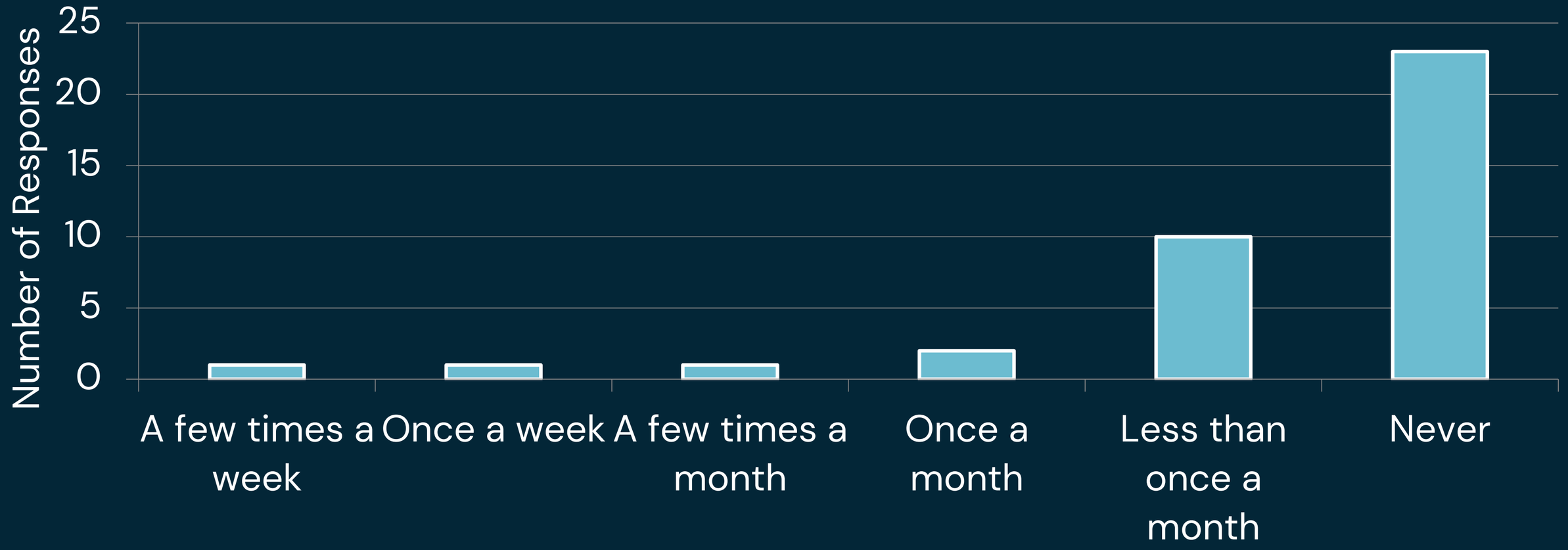
What is your level of concern with these issues?



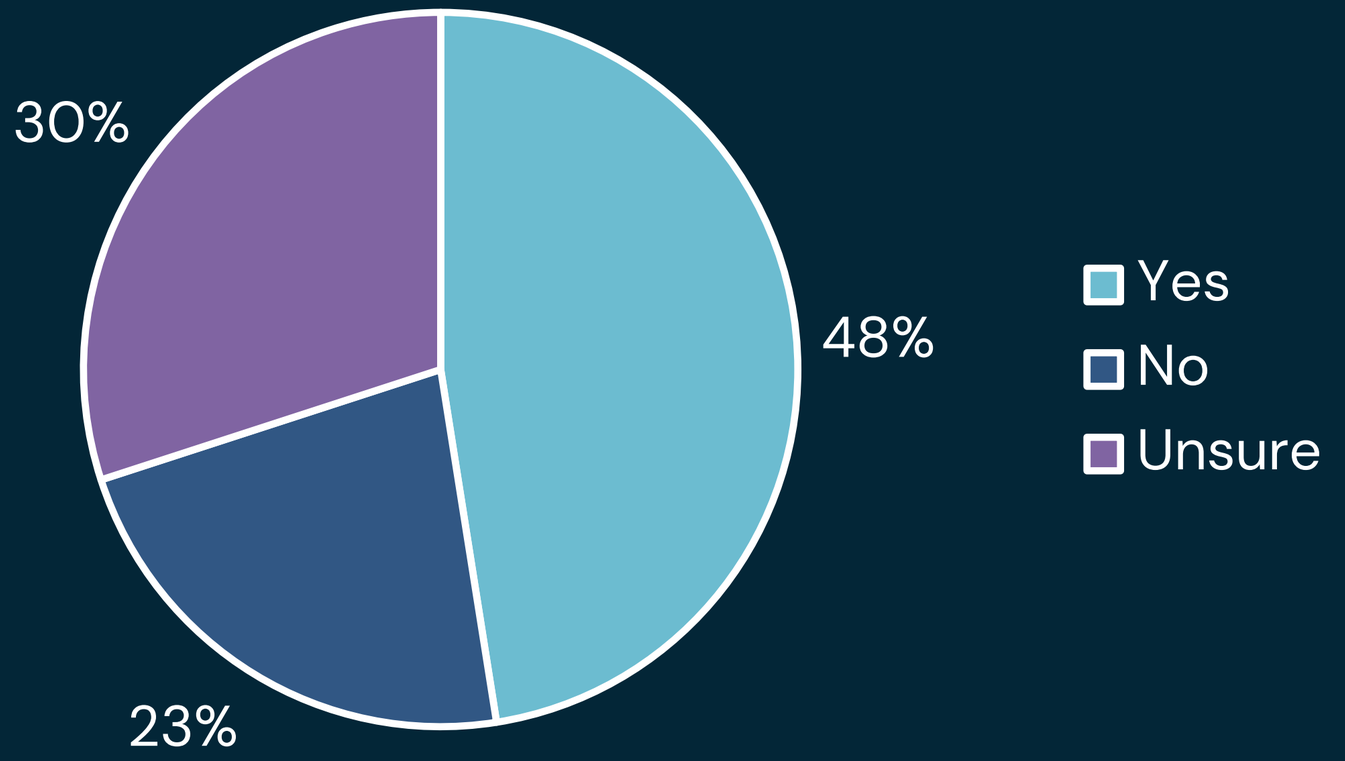
Are you familiar with the Water for North Texas online resources?



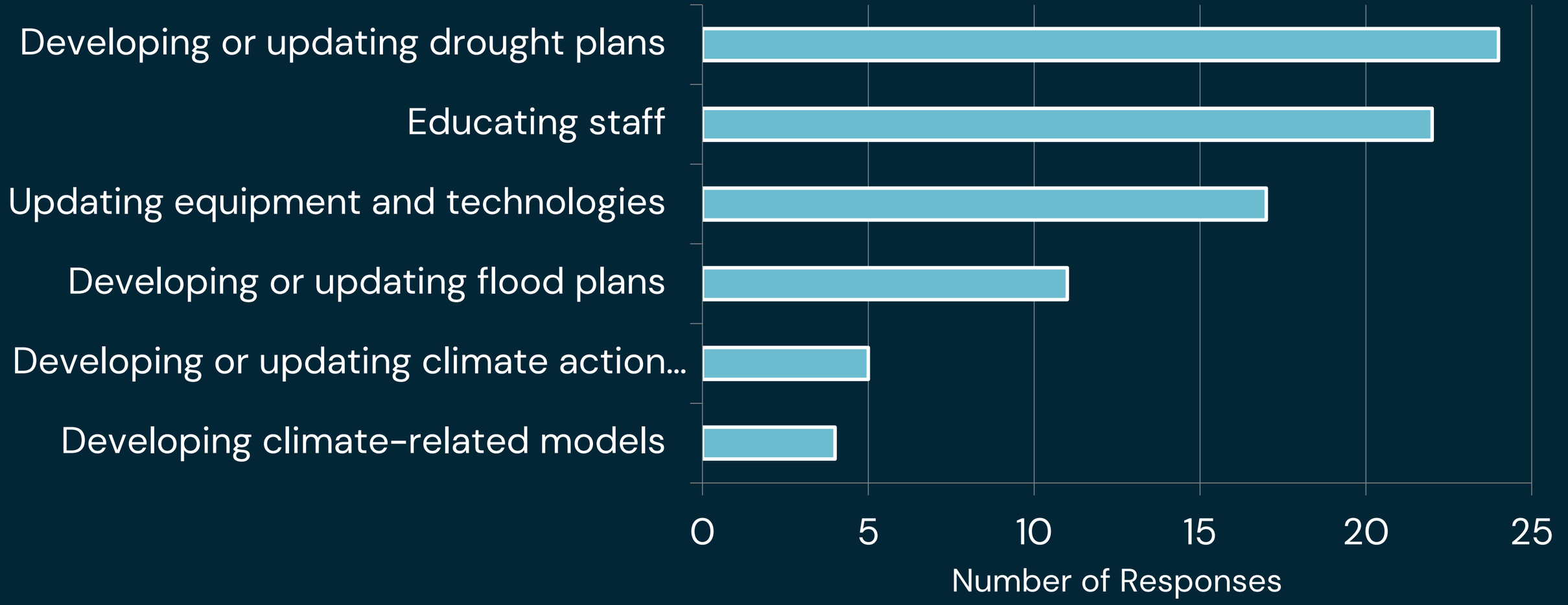
How often do you utilize the resources from Water for North Texas to accomplish your organization's goals?



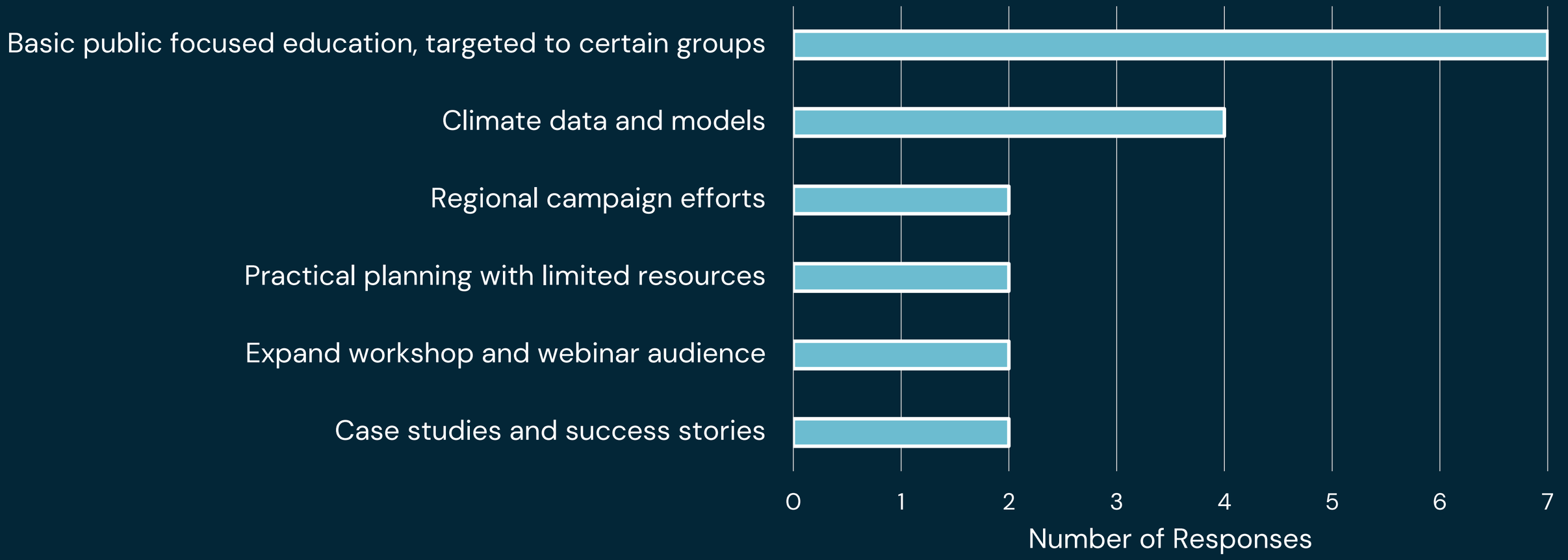
Has your entity either already developed or planned to develop plans or projects to prepare for anticipated changes to weather trends?



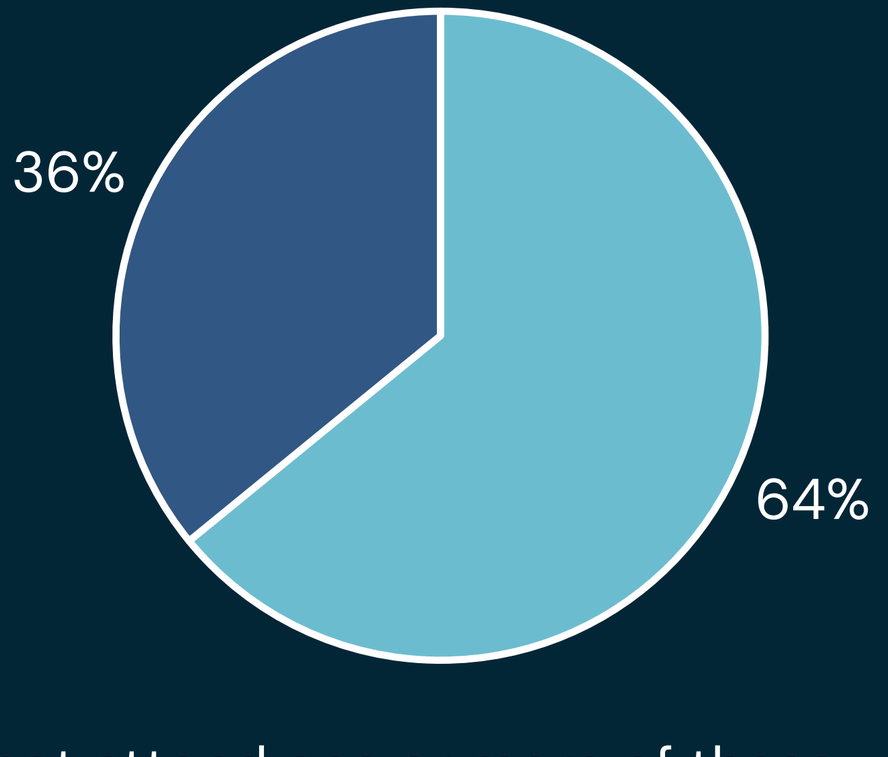
What types of plans or past efforts has your entity engaged with?



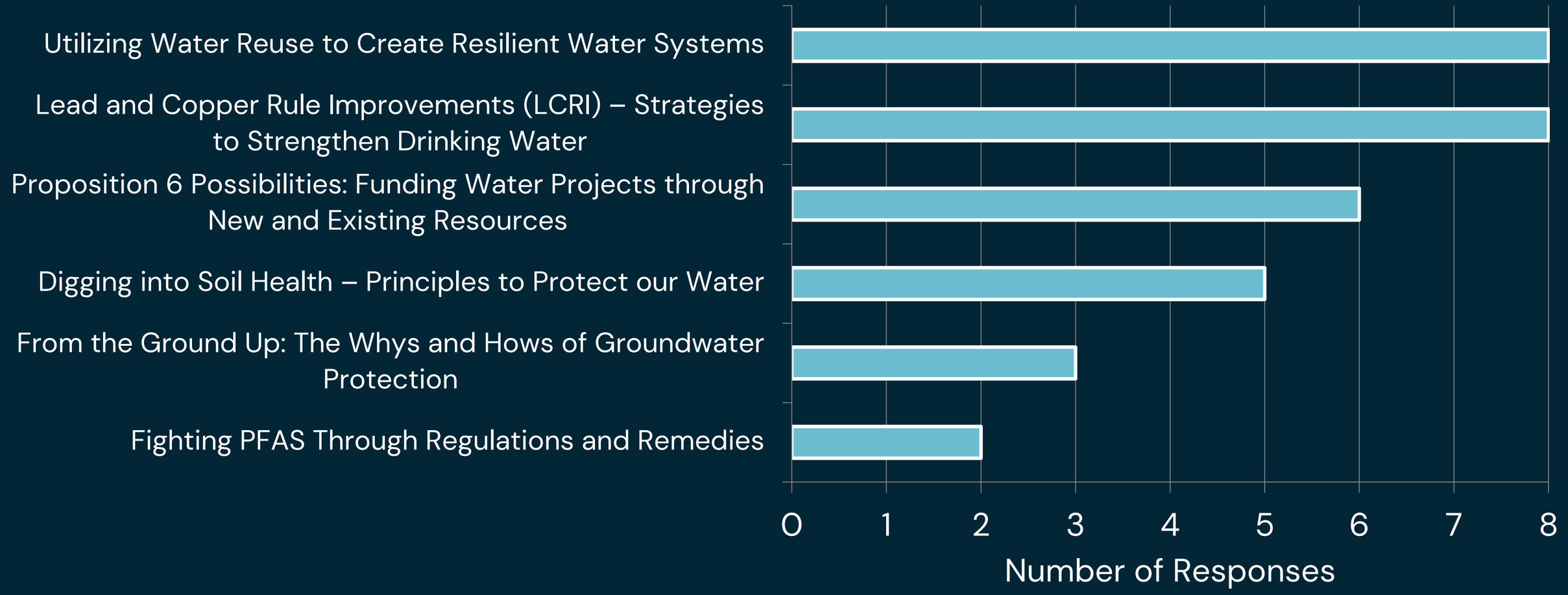
What information could NCTCOG provide at a workshop or webinar that would be useful for preparing for expected future weather trends in Texas?



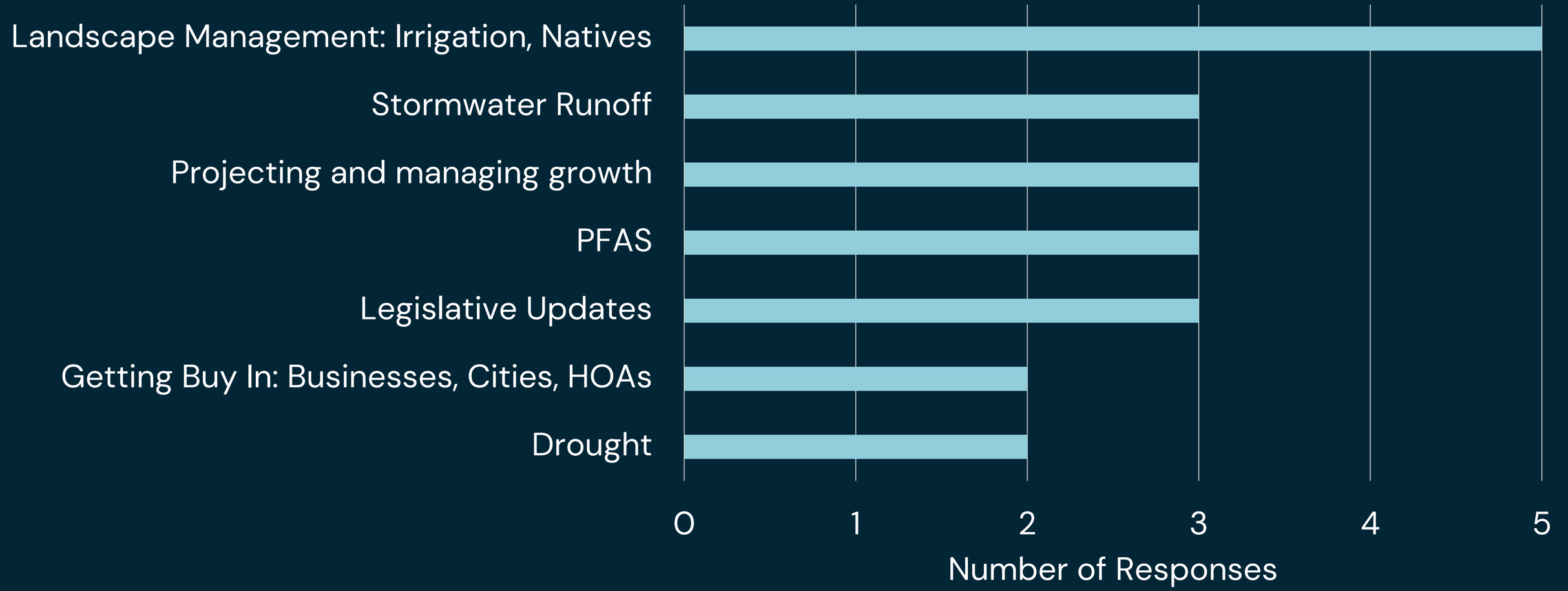
Have you attended any NCTCOG webinars hosted through the WQMP?



Which previous NCTCOG webinar topics did you find to be the most useful?



What would you like to see covered at an NCTCOG webinar?



Discussion

Results of the North Central Texas Water Resources Questionnaire

- Based on the survey results, what are the most important tasks for the WRC and the WQMP program in FY27?

NCTCOG Updates

NCTCOG Webinar: *What's Bugging You? Battling Invasive Pests in North Texan Forests*

- Thursday, February 26, 2026; 10:00 a.m.
- Virtual, via Microsoft Teams
- Register here

NCTCOG Updates

2026 North Central Texas Watershed Stakeholders Meeting

- March 3, 2026; 10:00 a.m.
- NCTCOG campus; William Pitstick Conference Room
- Register here

Model Development and Floodplain Ordinances Workshop

Purpose: To receive feedback on elements such as green stormwater infrastructure and nature-based solutions to incorporate into a model development code and model floodplain ordinance for flood prevention and mitigation.

Intended Audience: Anyone with technical expertise, experience, or interest in the areas of flood prevention or mitigation using development or floodplain regulatory tools.

Thursday, January 29, 2026, 10:00 am-12:00 pm

NCTCOG, 616 Six Flags Drive, Centerpoint II, Arlington, Transportation Council Room

Hybrid meeting format

For more info, visit http://www.nctcog.org/TSI

This effort is part of the Upper Trinity River Transportation and Stormwater Infrastructure (TSI) Project that seeks to reduce future flood risk through the integration of transportation, environmental, and stormwater planning.

integrating **Transportation & Stormwater Infrastructure**

NCTCOG Updates

TSI Flood Warning System Workshop (Hybrid)

- February 17, 2026; 10:00 a.m.- 12:00 p.m.
- Location: NCTCOG Campus (Transportation Council Room) & virtual, via Microsoft Teams
- Register here.

Future Agenda Items

- The WRC can present future agenda items & discuss the priority and format of previously requested items.

Roundtable

The WRC is invited to share what is happening in their communities.

Next Meeting

Wednesday, April 22, 2026

- 10:30 AM – 12:30 PM
- NCTCOG campus; William Pitstick Conference Room
- Add to Calendar

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