

2024 State Flood Plan

Working Towards a Flood Resilient Texas

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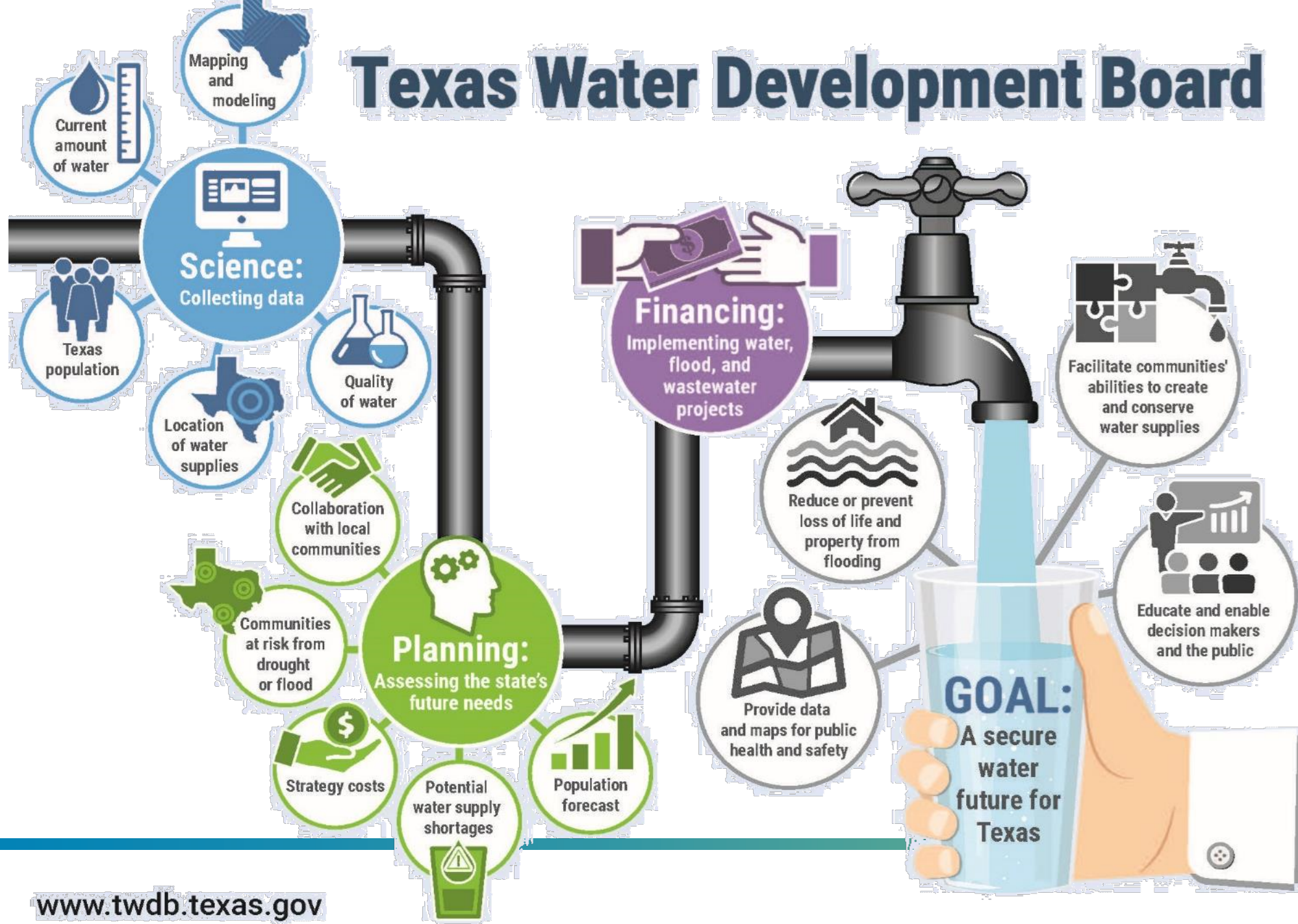
Texas Water Development Board

September 6, 2024

2024 State Flood Plan

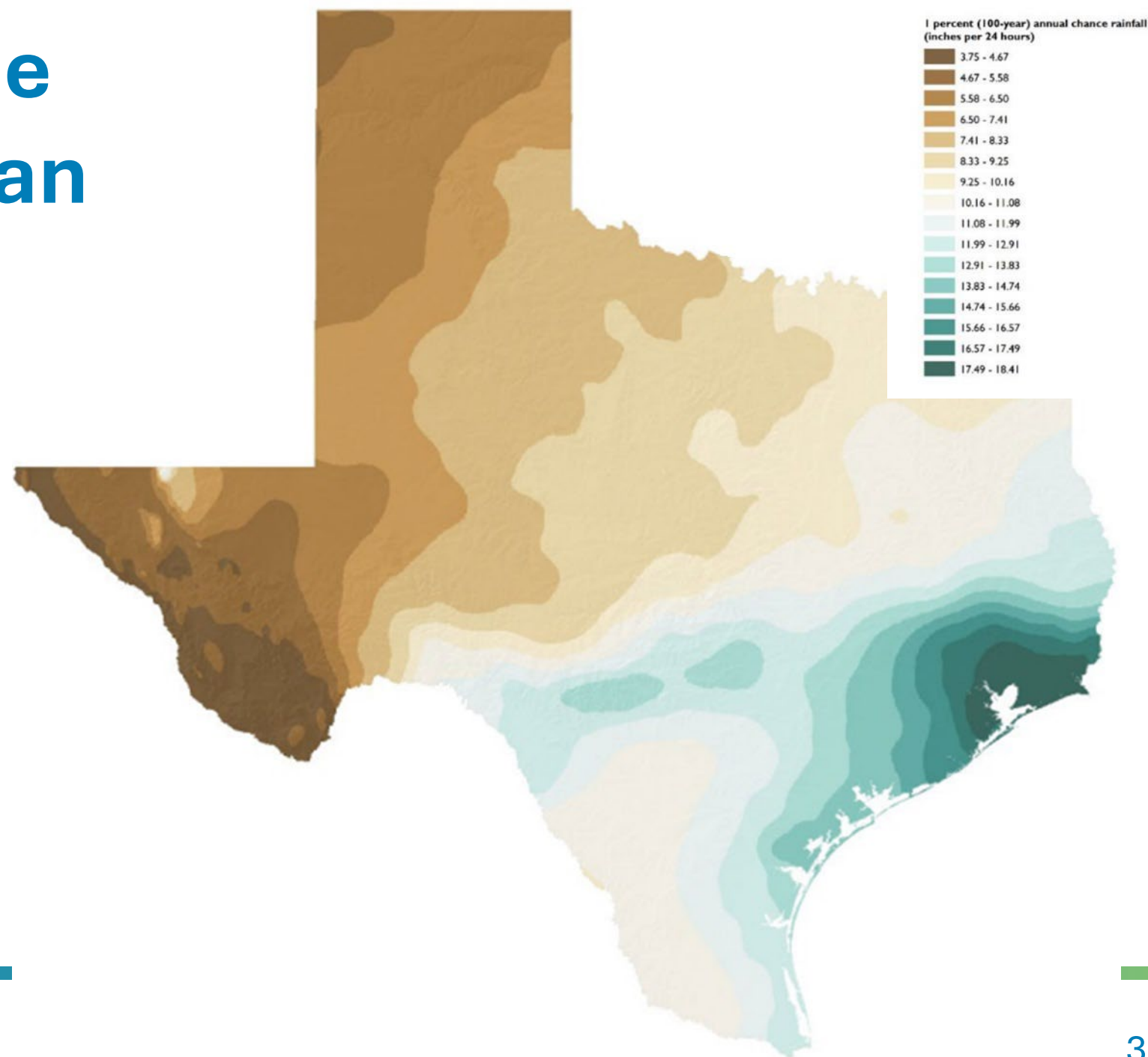


Texas Water Development Board



Purpose of the State Flood Plan

- Per Senate Bill 8, TWDB administers the program and develops state flood plan
- The plan must develop a state flood plan
 - to provide for orderly preparation for and response to flood conditions **to protect against the loss of life and property;**
- We *rarely fully mitigate* all flood risk. But we can *reduce* the risk and *prepare* for it. There will always be **residual risk**.



How do we plan?

- Statewide
- Watershed based
- Bottom-up approach
- The state flood plan integrates information from 15 regional flood plans



An overview of 2024 State Flood Plan findings

Existing flood risk

(in 1 percent [100-year] and 0.2 percent [500-year] annual chance flood hazard areas)



5,219,900
Population



1,664,200
Buildings



12,654,000
Agricultural area (acres)



63,900
Roadway miles



1,295,700
Residential buildings



6,258
Hospitals, emergency services, fire stations, police stations, and schools

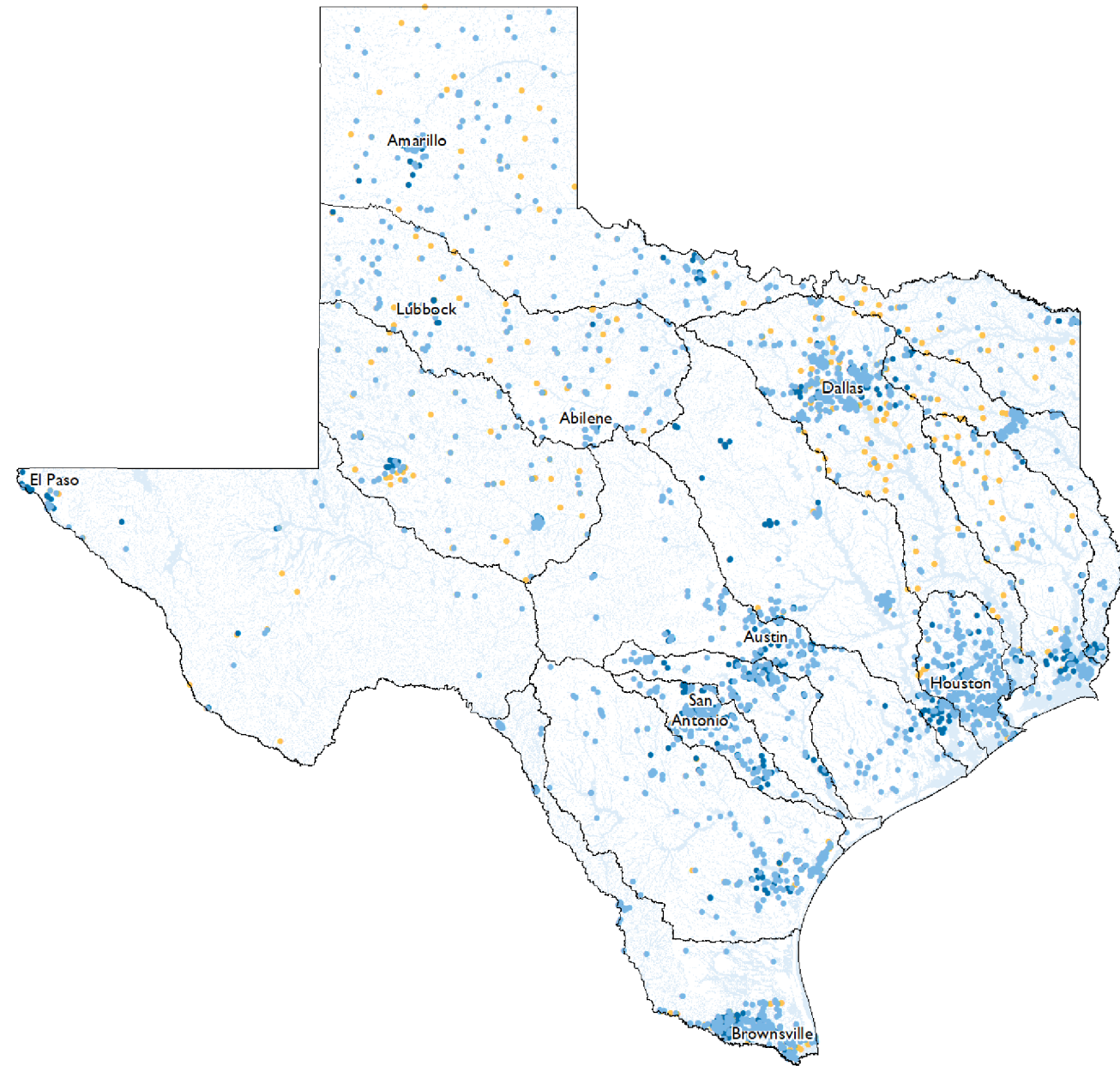
Recommended Studies, Projects and Strategies

Flood management evaluations (3,097)
\$2.6 billion+

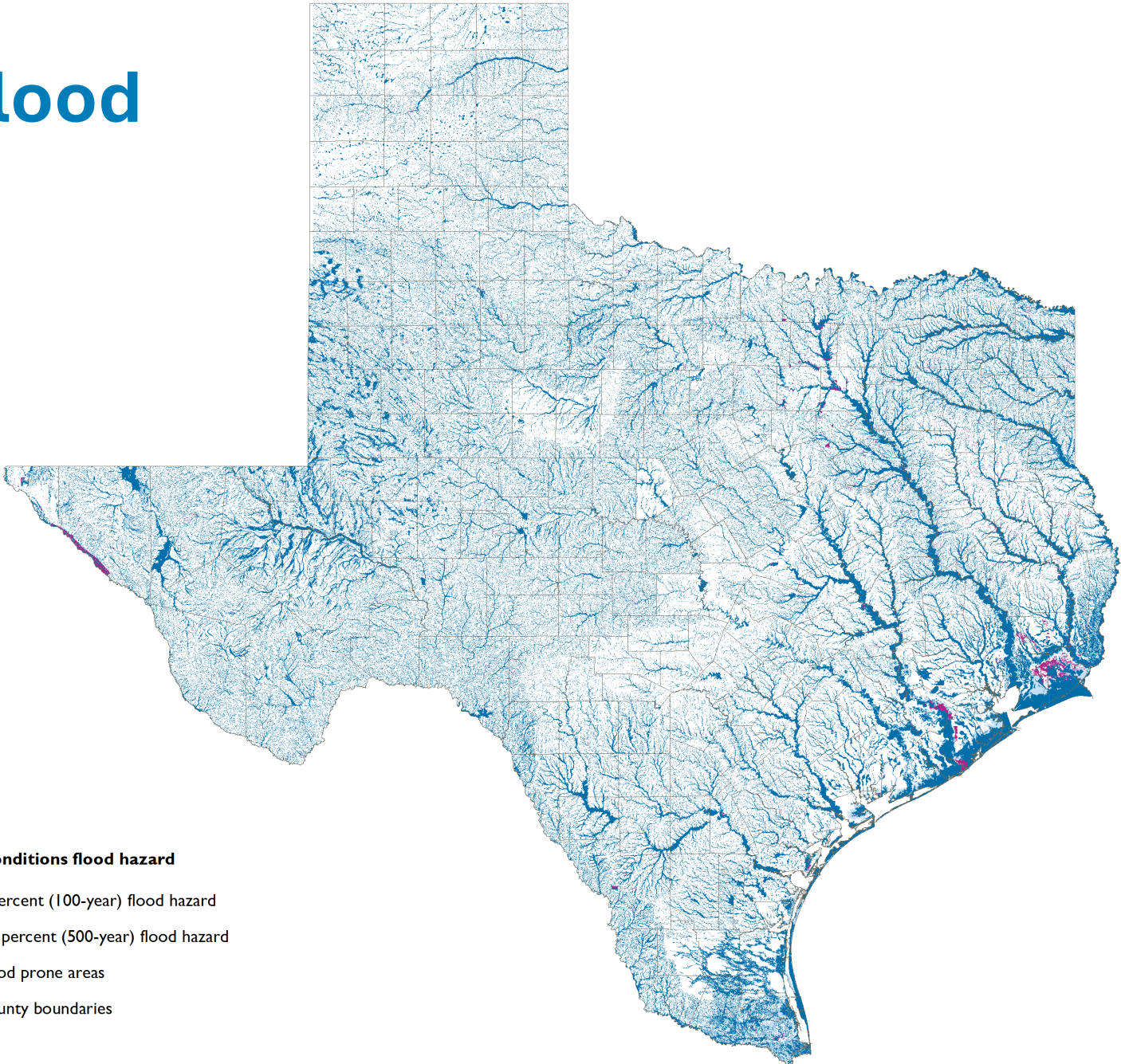
Flood mitigation projects (615)
\$49 billion+

Flood management strategies (897)
\$2.8 billion+





Total \$54.5 billion+



Where are our flood hazards?

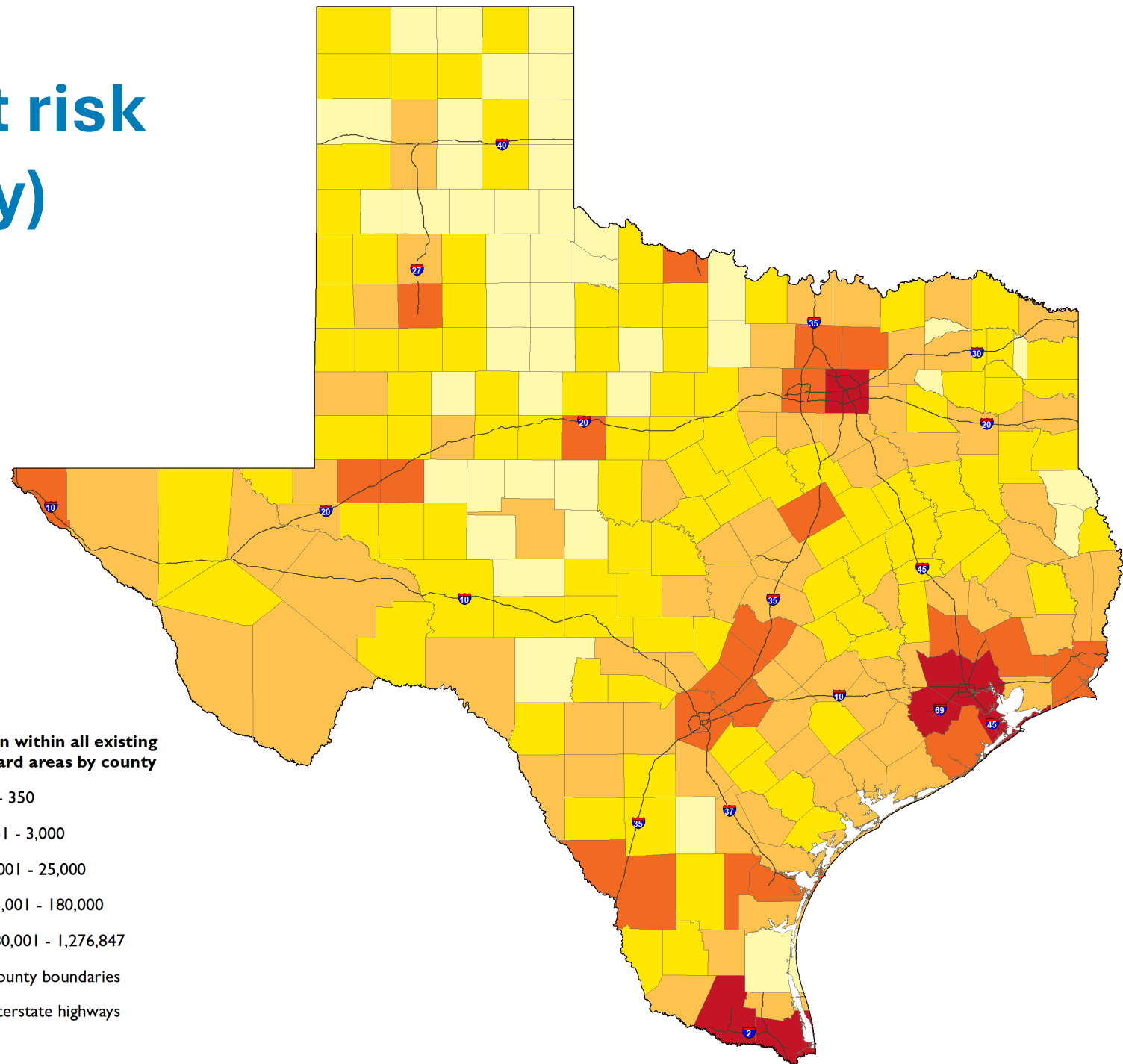
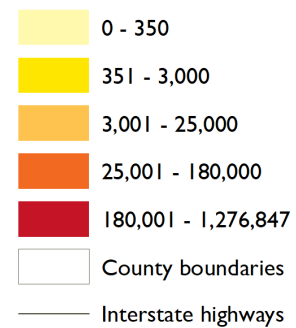


Existing conditions flood hazard

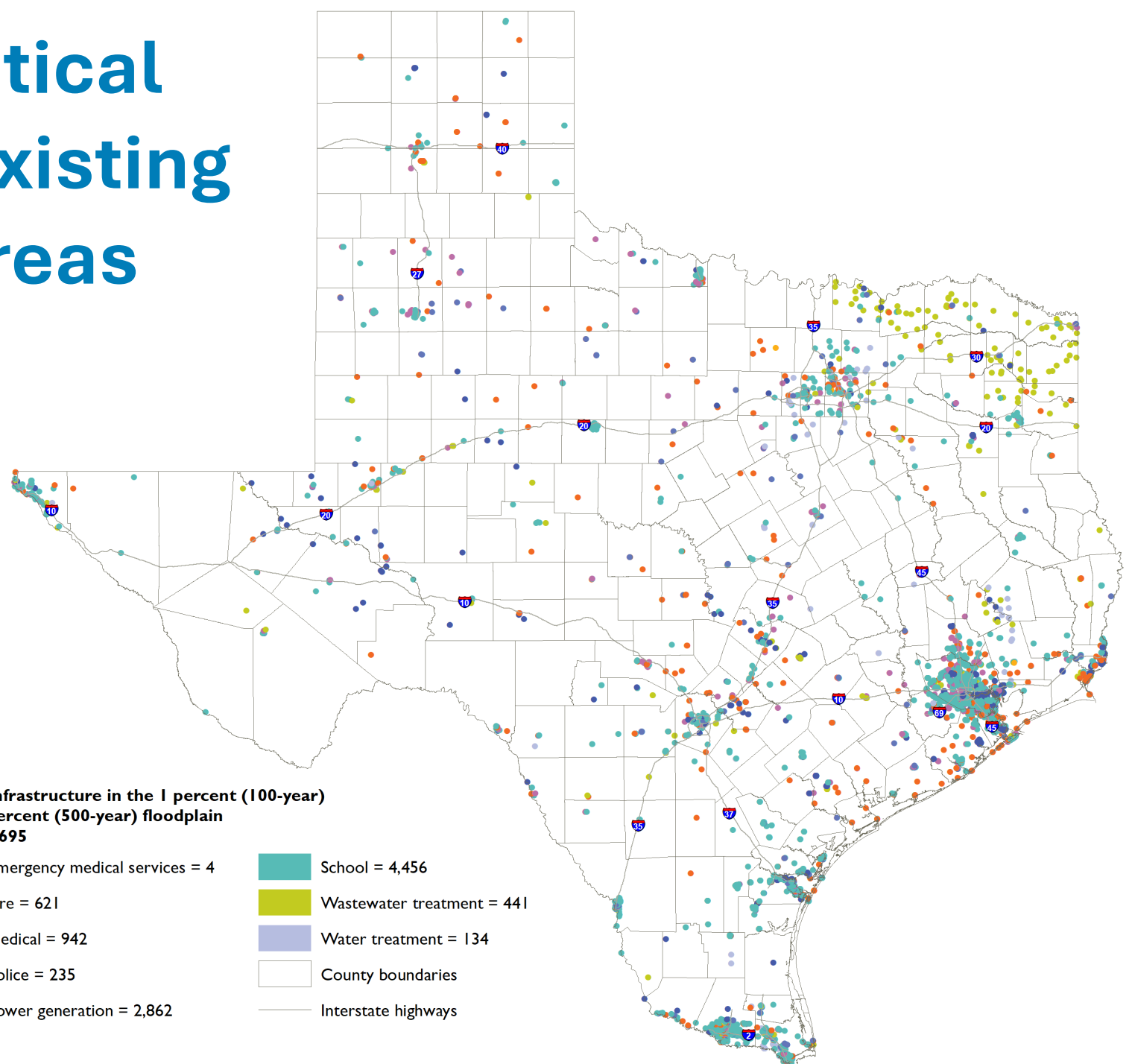
-  1 percent (100-year) flood hazard
-  0.2 percent (500-year) flood hazard
-  Flood prone areas
-  County boundaries

Population at risk (by County)

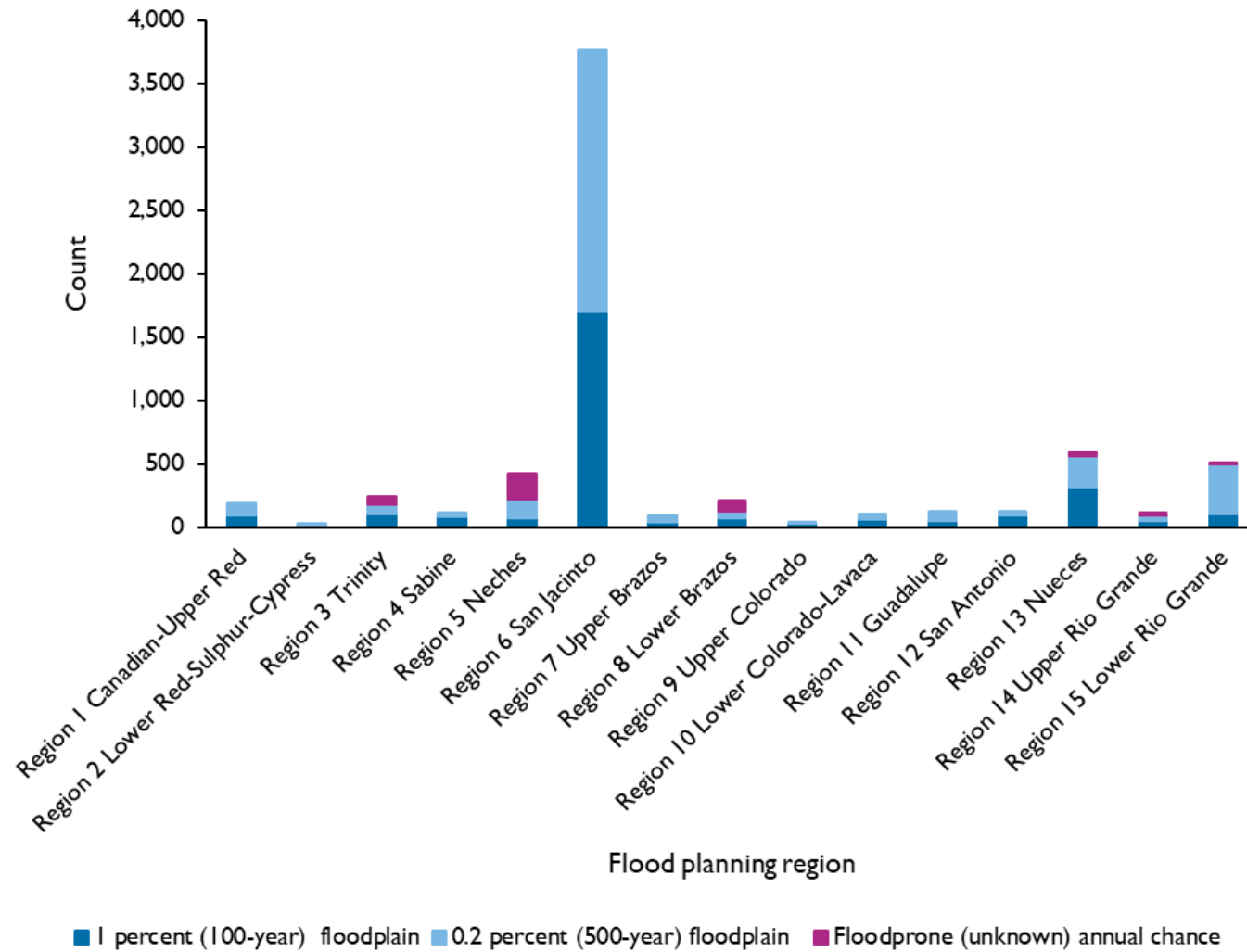
Population within all existing flood hazard areas by county



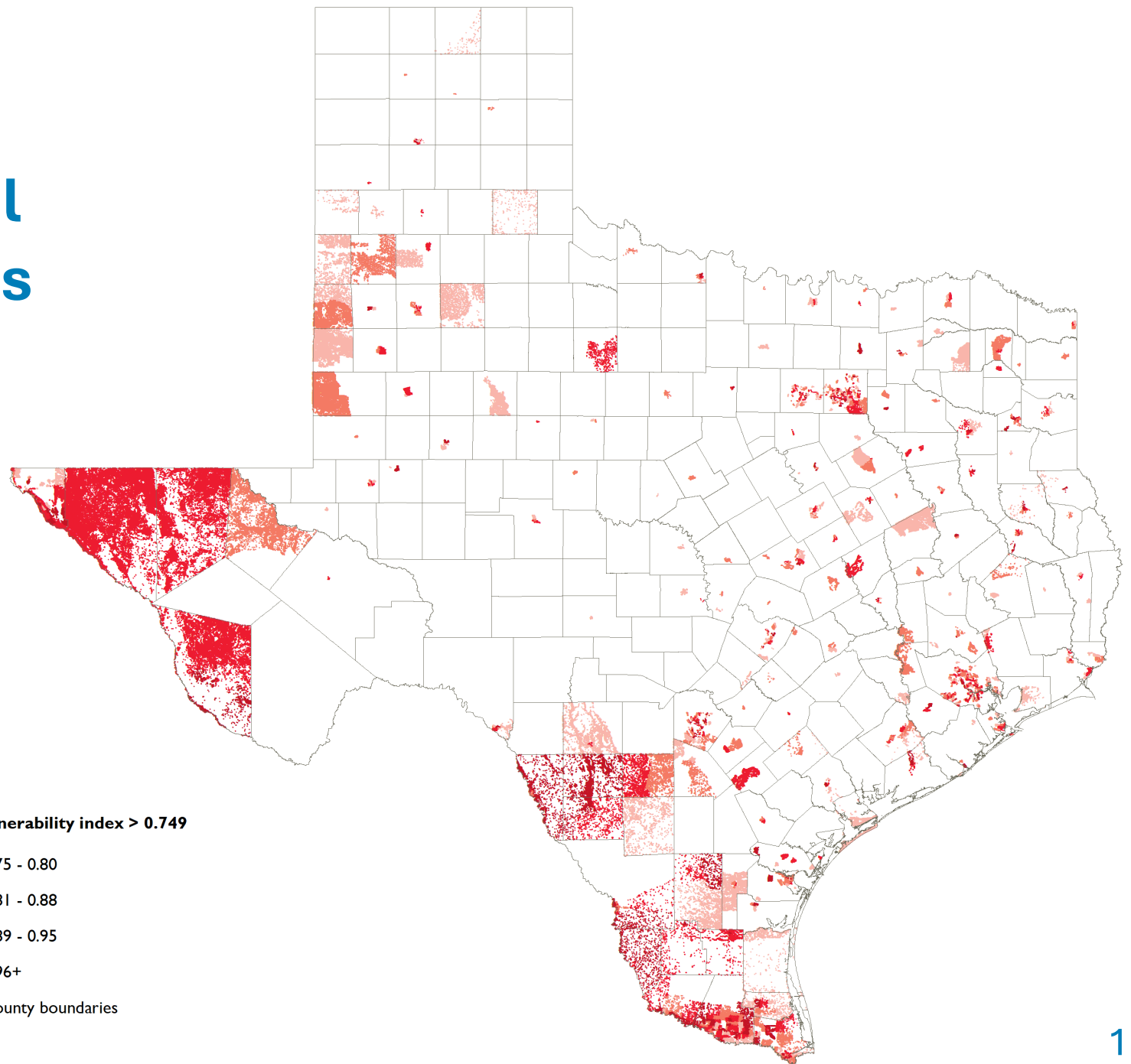
Locations of critical facilities within existing flood hazard areas



Count of hospitals, emergency medical services, fire stations, police stations, and schools within existing flood hazard areas



Locations of Texan communities within 1 percent (100-year) annual chance flood hazard areas and who are considered vulnerable



Social vulnerability index > 0.749

0.75 - 0.80

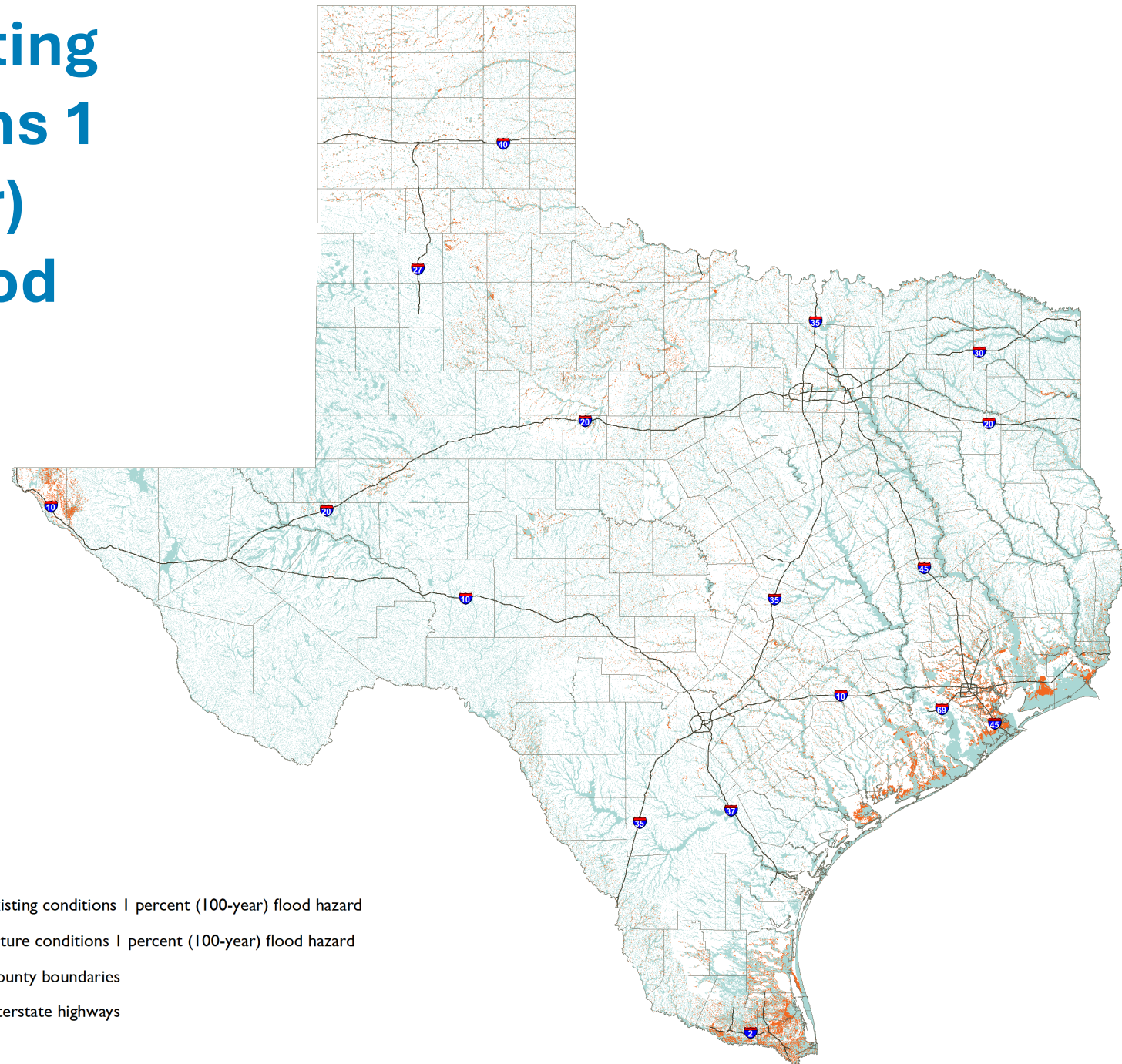
0.81 - 0.88

0.89 - 0.95

0.96+

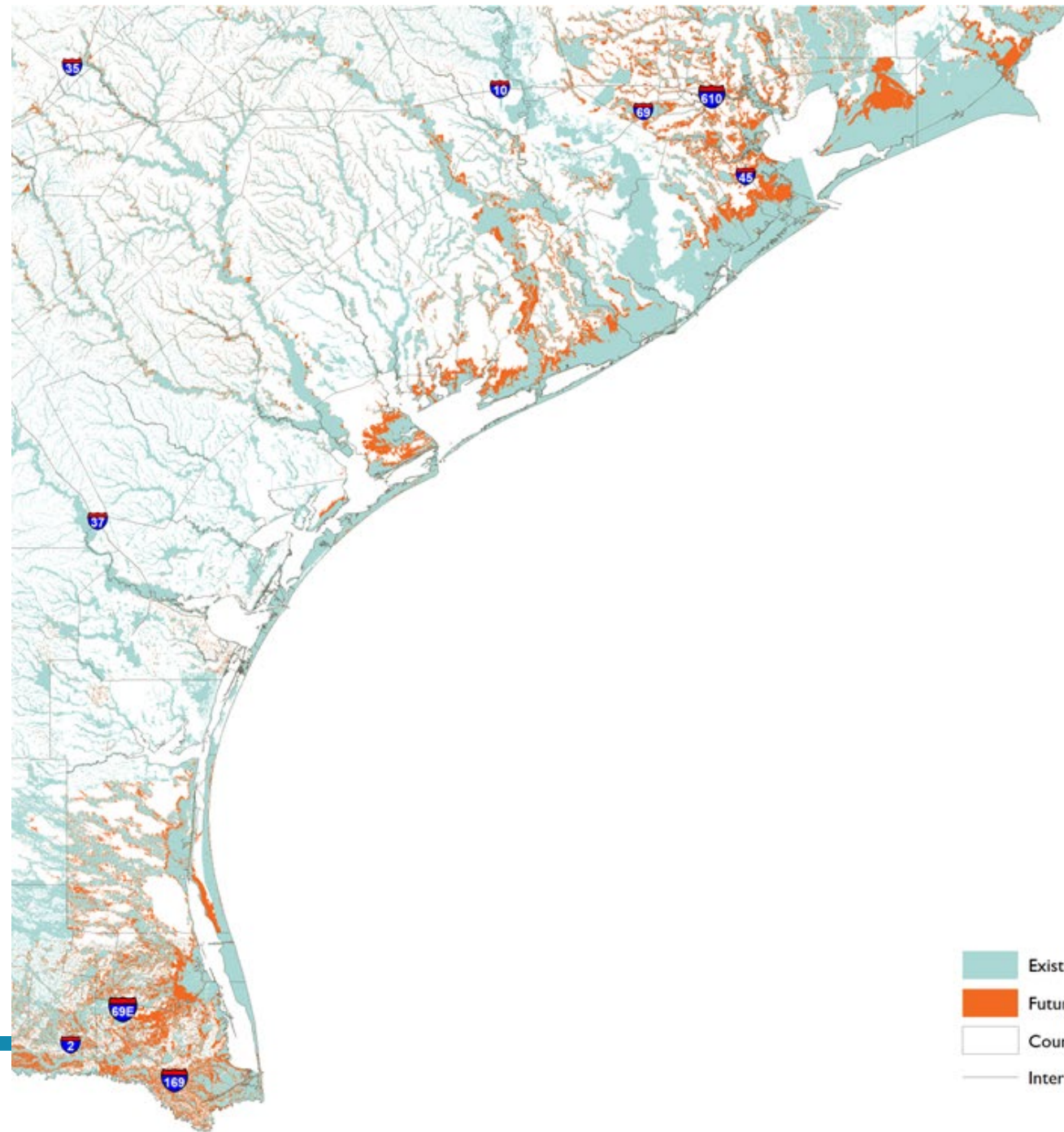
County boundaries

Comparison of existing and future conditions 1 percent (100-year) annual chance flood hazard area*

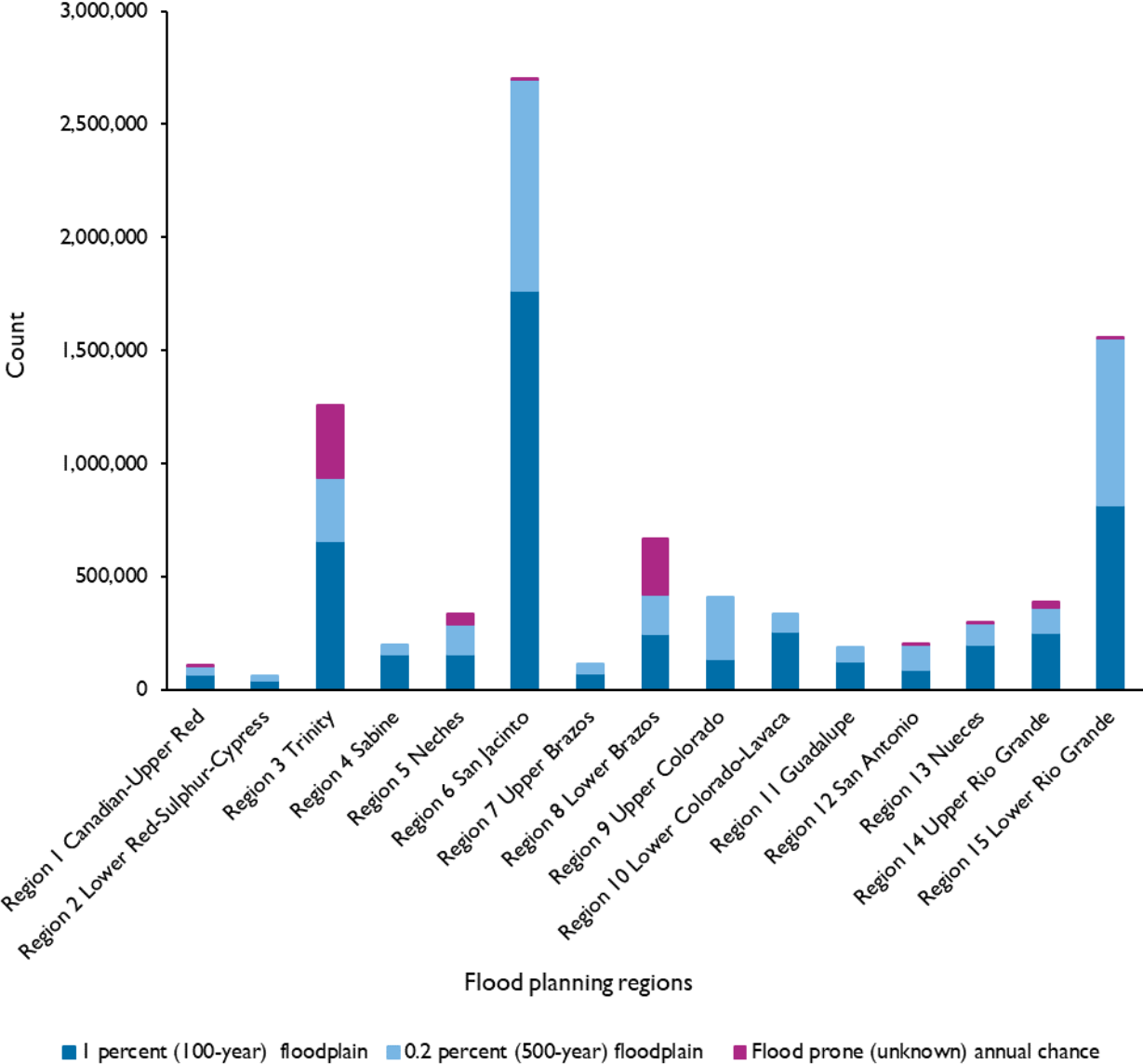


- Existing conditions 1 percent (100-year) flood hazard
- Future conditions 1 percent (100-year) flood hazard
- County boundaries
- Interstate highways

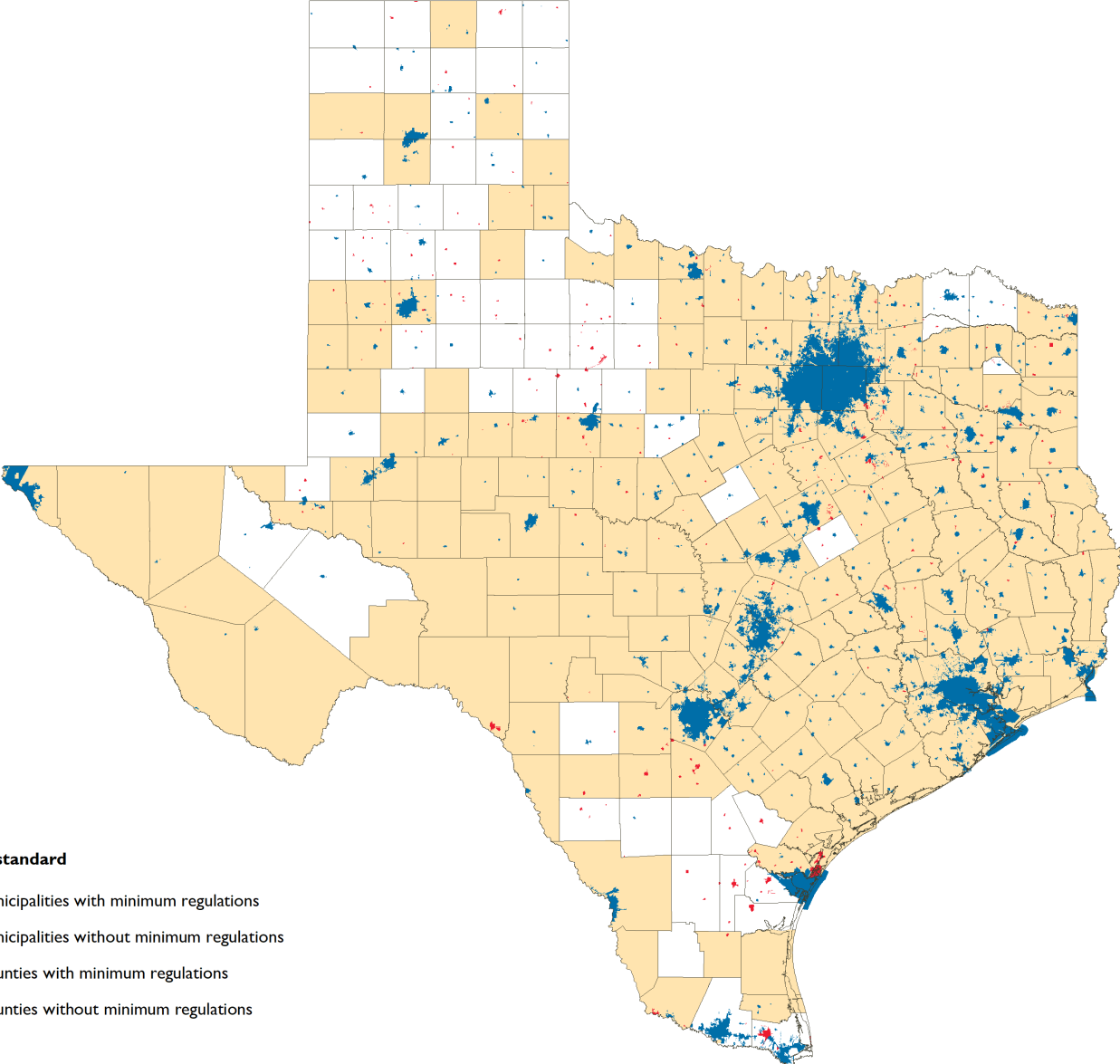
Comparison of existing and future conditions 1 percent (100-year) annual chance flood hazard area along the Texas Coast



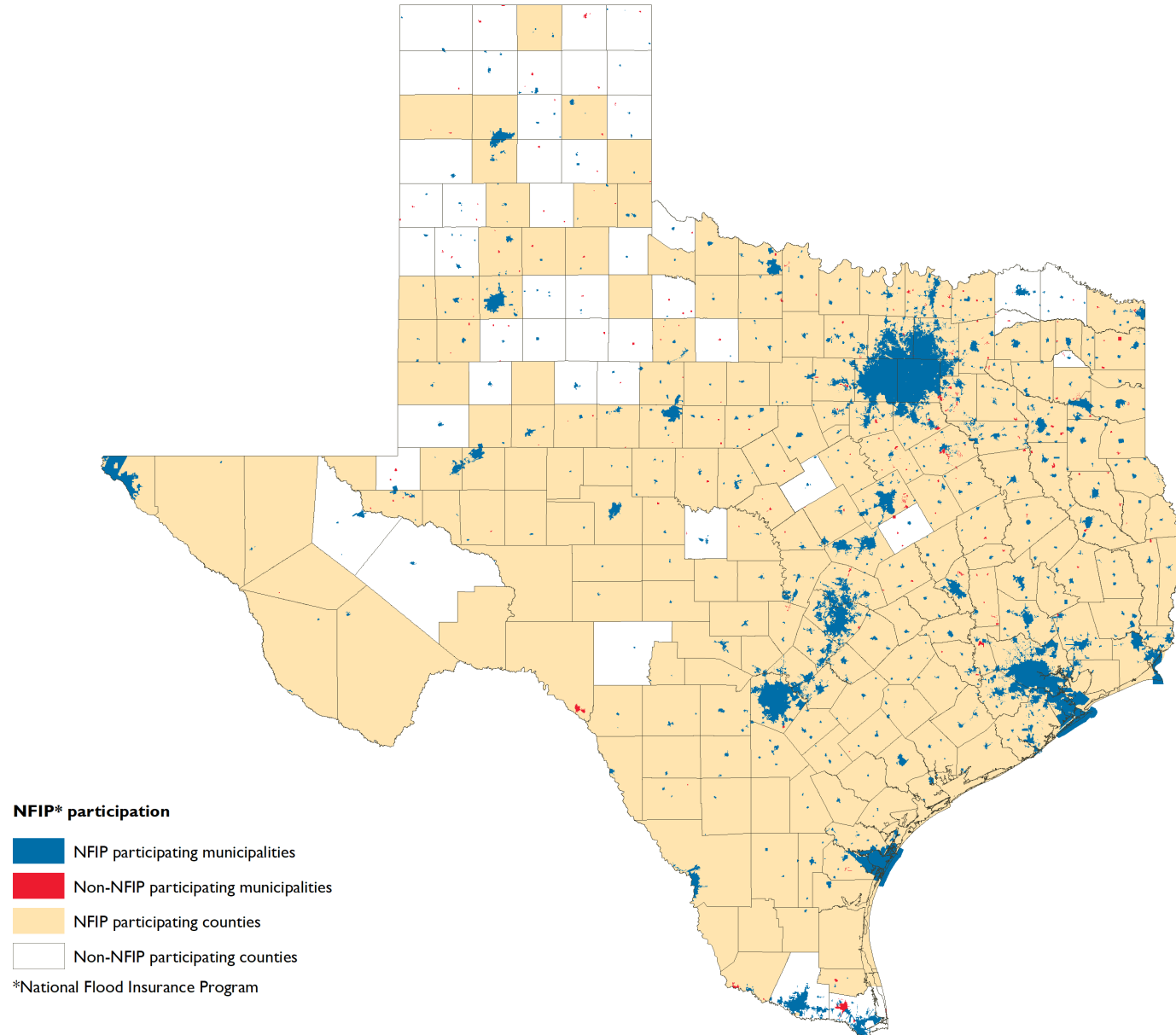
Populations within future flood hazard areas by flood planning region



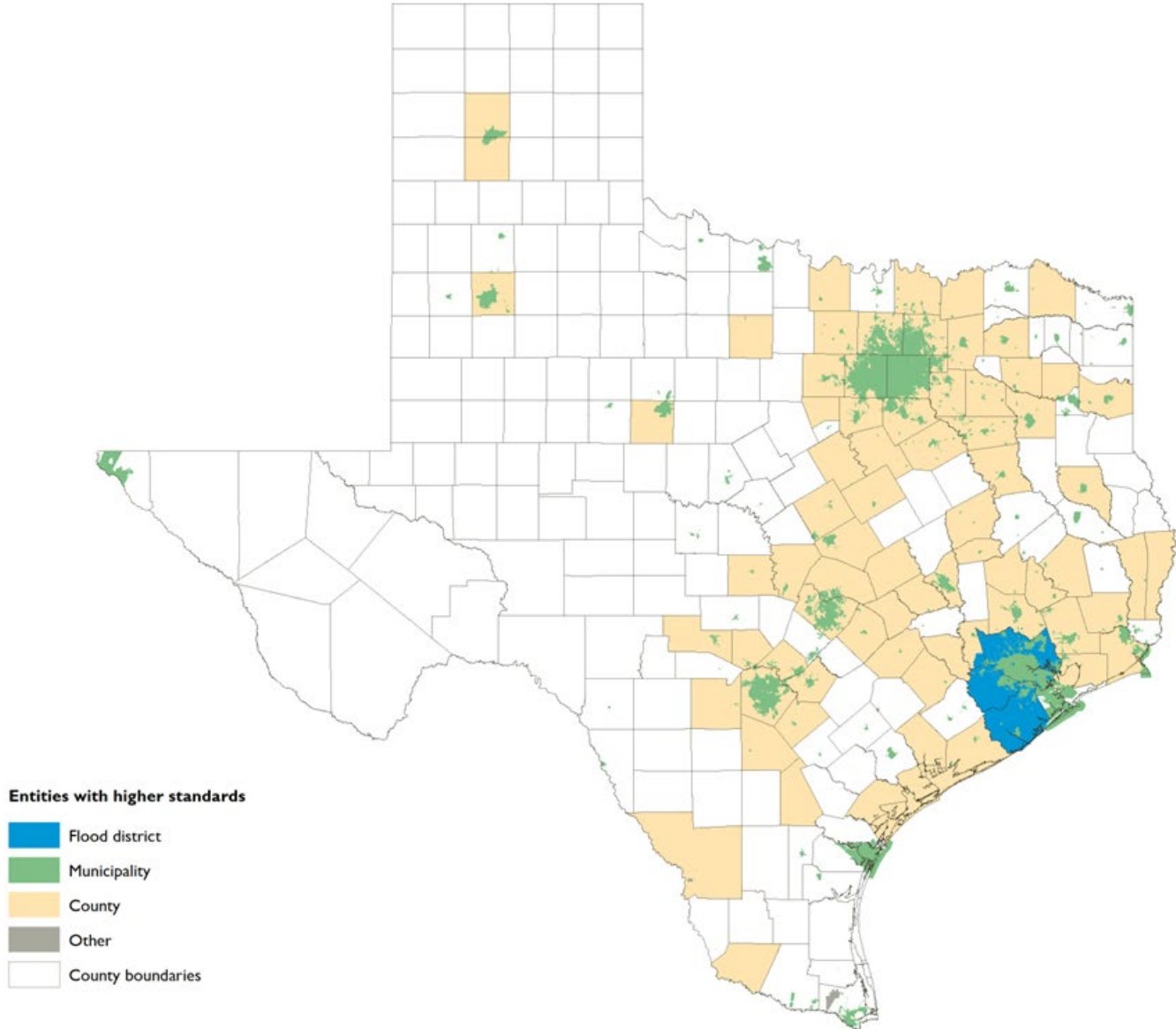
Locations of entities with and without minimum floodplain management regulations*



Locations of entities participating in the National Flood Insurance Program



Locations of entities with higher floodplain management standards



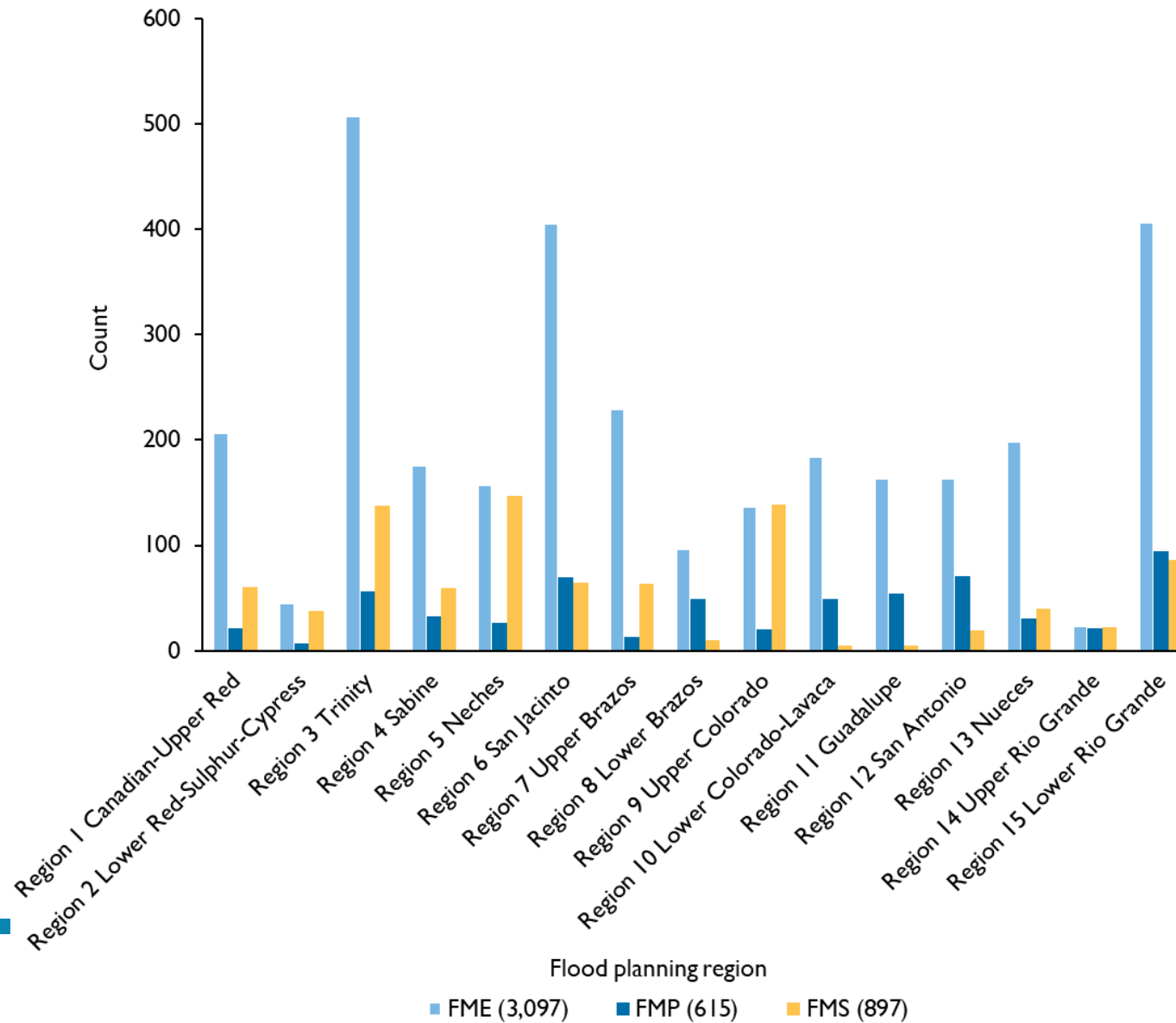
Recommending Flood Risk Reduction Solutions

Flood Management Evaluation (FME): A proposed study to identify flood risk or flood risk reduction solution (e.g., FMPs)

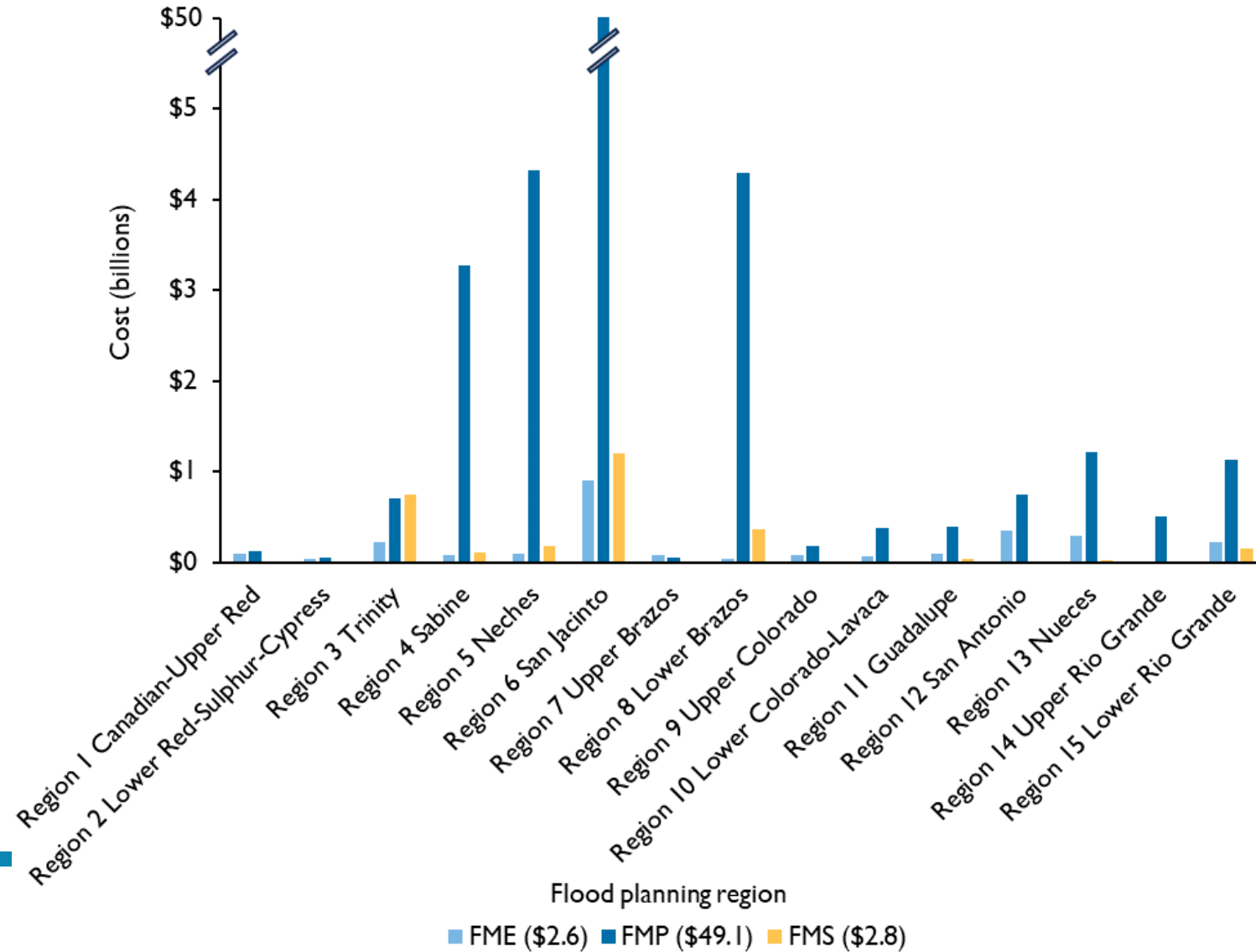
Flood Mitigation Projects (FMP): A proposed project, both structural and nonstructural, that has a non-zero capital costs or other non-recurring cost and that when implemented will reduce flood risk, mitigate flood hazards to life or property

Flood Management Strategies (FMS): Long term flood risk reduction solution ideas that still need to be formulated, for example, regulatory enhancements. All solutions and strategies that do not belong in FME or FMP belong to FMS

Recommended flood risk reduction solutions by type and region



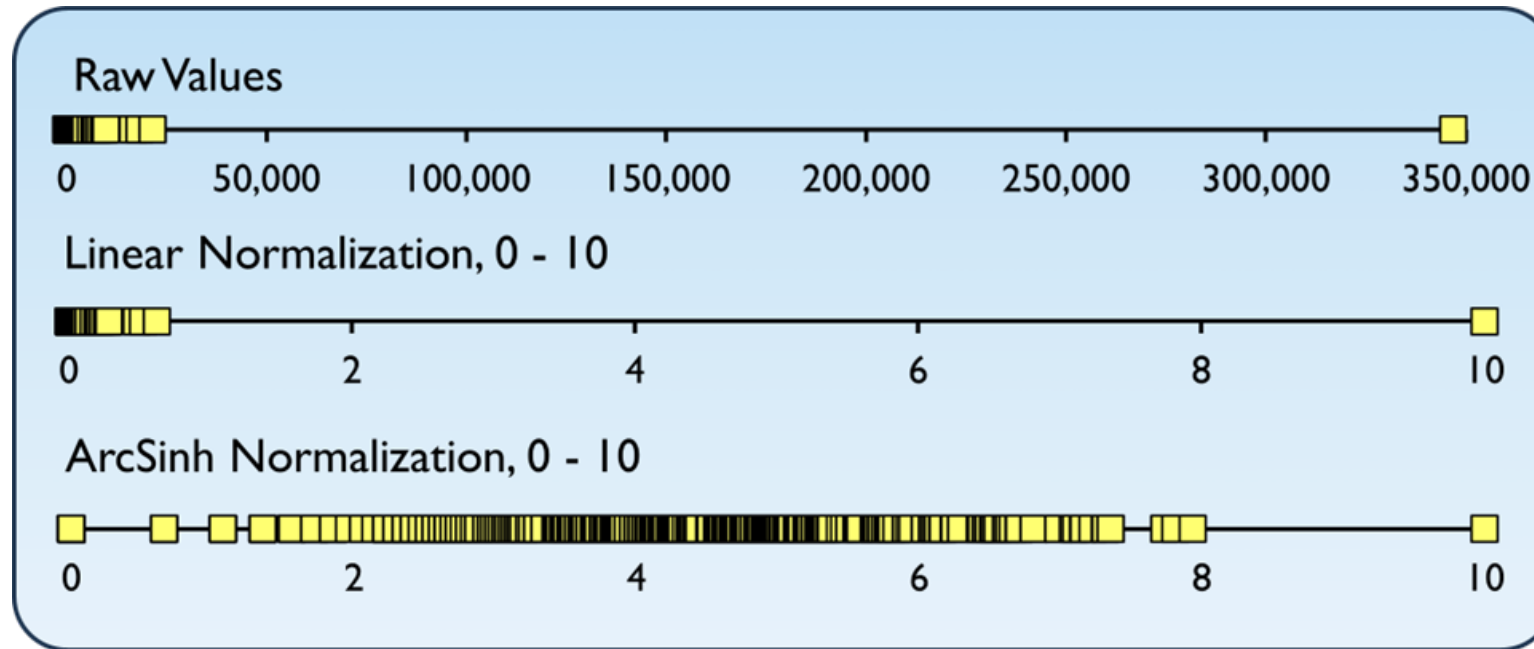
Estimated cost of all recommended flood risk reduction solutions by region



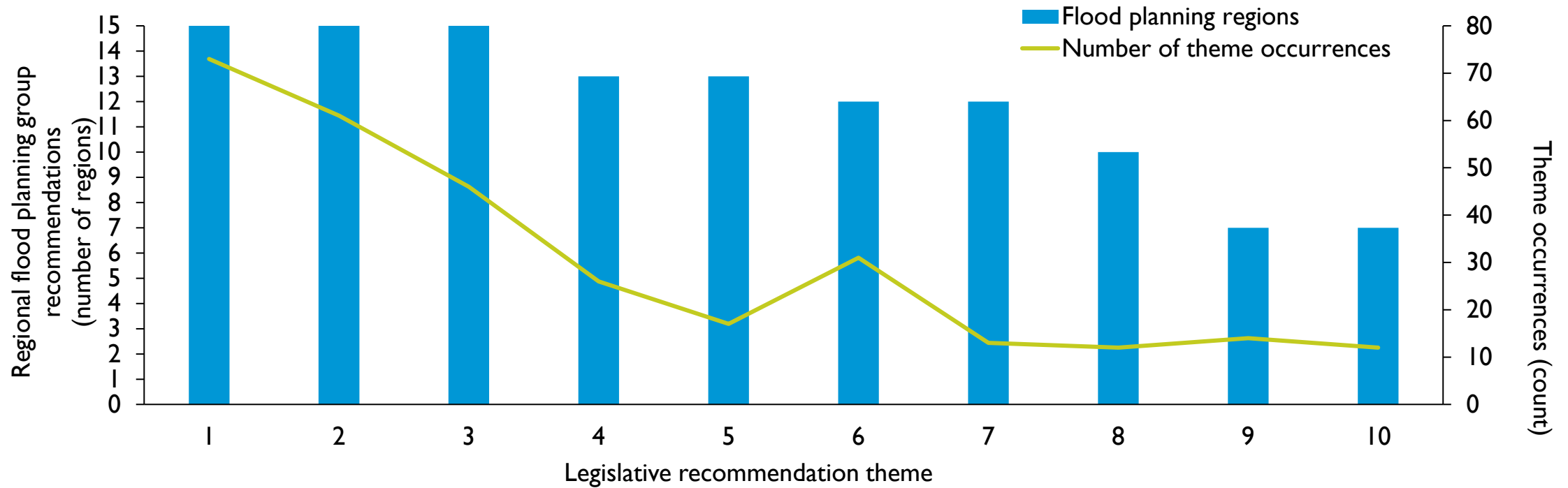
Ranking Flood Risk Reduction Solutions

	Criterion	Criterion type	Criteria grouping	FME ranking criterion?	FME ranking weight	FME grouping weight	FMP ranking criterion?	FMP ranking weight	FMP grouping weight	FMS ranking criterion?	FMS ranking weight	FMS grouping weight	Max score	
Reported data from FME, FMP, and FMS GIS feature classes	1	Estimated structures at 1 percent (100-year) flood risk**	Flood risk	Yes	15.0%	75.0%	No	0.0%	0.0%	Yes	10.0%	40.0%	10	
	2	Estimated population at 1 percent (100-year) flood risk**	Flood risk	Yes	15.0%		No	0.0%		Yes	10.0%		10	
	3	Critical facilities at 1 percent (100-year) flood risk**	Flood risk	Yes	25.0%		No	0.0%		Yes	10.0%		10	
	4	Low water crossings at flood risk**	Flood risk	Yes	20.0%		No	0.0%		Yes	10.0%		10	
	5	Estimated road closures**	Flood risk	Mobility	Yes	5.0%	No	0.0%	0.0%	Yes	5.0%	15.0%	10	
	6	Estimated road miles at 1 percent (100-year) flood risk**	Flood risk		Yes	10.0%	No	0.0%		Yes	10.0%		10	
	7	Estimated farm & ranch land at 1 percent (100-year) flood risk (acres)**	Flood risk	Agriculture	Yes	10.0%	10.0%	No	0.0%	0.0%	Yes	5.0%	5.0%	10
	8	Structures removed from 1 percent (100-year) floodplain**	Flood risk reduction	Life, safety, and property				Yes	5.0%	45.0%	Yes	10.0%	25.0%	10
	9	Percent structures removed from 1 percent (100-year) floodplain (Calculated by TWDB from reported data)	Flood risk reduction					Yes	10.0%		No	0.0%		10
	10	Residential structures removed from 1 percent (100-year) floodplain**	Flood risk reduction					Yes	2.5%		Yes	5.0%		10
	11	Estimated population removed from 1 percent (100-year) floodplain**	Flood risk reduction					Yes	10.0%		Yes	10.0%		10
	12	Critical facilities removed from 1 percent (100-year) floodplain**	Flood risk reduction					Yes	10.0%		No	0.0%		10
	13	Low water crossings removed from 1 percent (100-year) floodplain**	Flood risk reduction					Yes	7.5%		No	0.0%		10
	14	Estimated roadway miles removed from 1 percent (100-year) floodplain**	Flood risk reduction	Mobility				Yes	5.0%	5.0%	No	0.0%	0.0%	10
	15	Estimated farm & ranch land removed from 1 percent (100-year) floodplain (acres)**	Flood risk reduction	Agriculture				Yes	5.0%	5.0%	No	0.0%	0.0%	10
	16	Percent nature-based solution (by cost)	Other					Yes	5.0%		Yes	7.5%		10
	17	Benefit-cost ratio	Other					Yes	2.5%					10
	18	Water supply benefit (Y/N)	Other					Yes	5.0%		Yes	5.0%		10
	19	FMP project type (10 points) Low water crossing (4 points) Preparedness	Other					Yes	2.5%		No	0.0%		
	20	FMS project type (10 points) Flood measurement and warning (8 points) Regulatory and guidance (6 points) Education and outreach (4 points) Property acquisition and structural elevation (4 points) Infrastructure projects (2 points) Other	Other					No	0.0%		Yes	2.5%		10
	Subtotal					100.0%			70.0%			100.0%		
FMP project details scoring (computed by the regional flood planning groups)**	21	Score 1: Severity - Pre-project average depth of flooding (100-year)	Flood risk				Yes	5.0%					10	
	22	Score 2: Severity - Community need (percent population)	Flood risk				Yes	5.0%					10	
	23	Score 6: Life and safety	Flood risk reduction				Yes	5.0%					10	
	24	Score 8: Social vulnerability	Other				Yes	5.0%					10	
	25	Score 10: Multiple benefits	Other benefits				Yes	2.5%					10	
	26	Score 13: Environmental benefit	Other benefits				Yes	2.5%					10	
	27	Score 15: Mobility	Other benefits				Yes	5.0%					10	
		Subtotal					0.0%			30.0%			0.0%	
	Total (must add to 100 percent)					100.0%			100.0%			100.0%		

Effect of inverse hyperbolic sine normalization methods for ranking

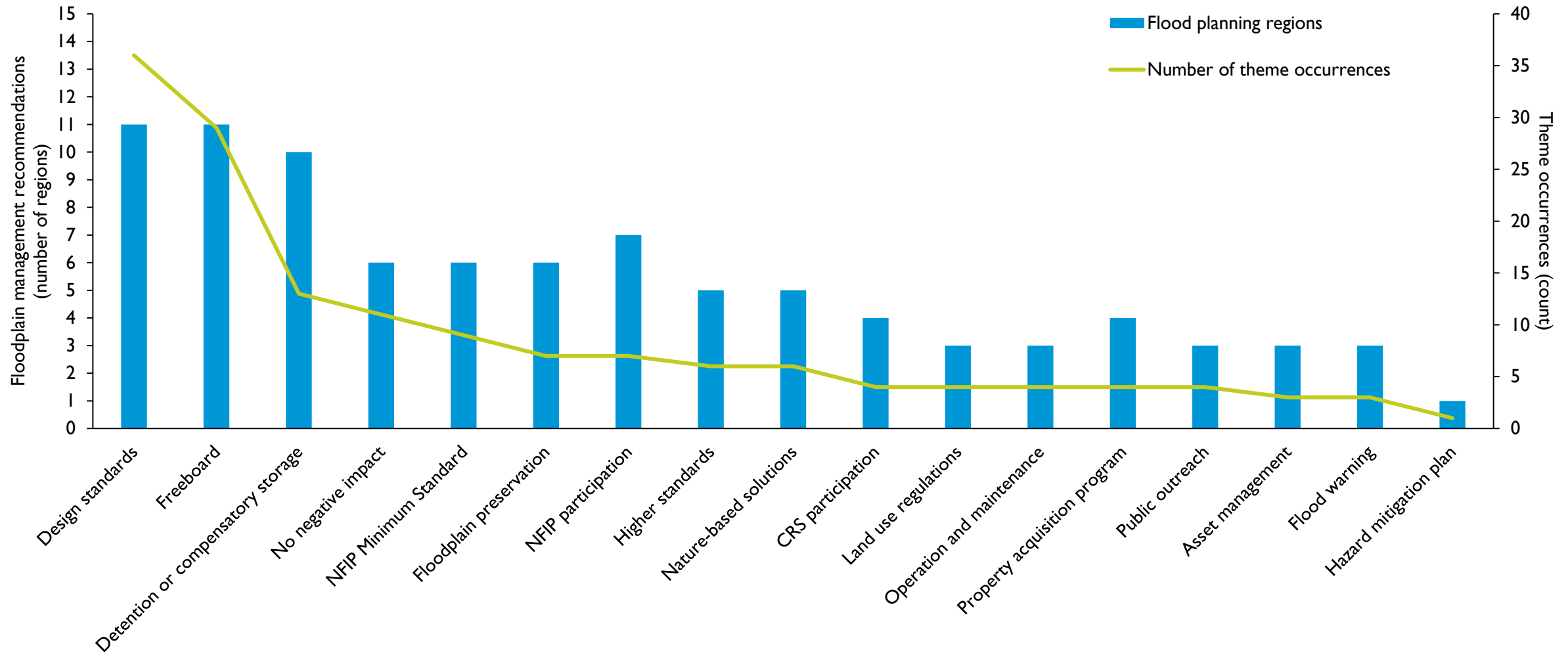


Summary of Administrative, Legislative, and Regulatory Recommendations made by Regional Flood Planning Groups



1. Infrastructure/Stormwater/Project Design Standards and Infrastructure Programs (Dams, Levees, Roadways, Channels, LWCs)
2. Funding and Financial Mechanisms
3. Public Education, Outreach, Interjurisdictional Collaboration and Admin Training
4. Data, Mapping, and Modeling Updates
5. Small/Rural Jurisdiction Assistance
6. Floodplain Ordinances and Regulatory Authority
7. Drainage Utility Fee Authority
8. Alternative BCA Calculation
9. NBS, Green Infrastructure, Conservations Easements, Open Space Preservation
10. Federal Program Participation and Collaboration

Summary of Floodplain Management Recommendations made by Regional Flood Planning Groups



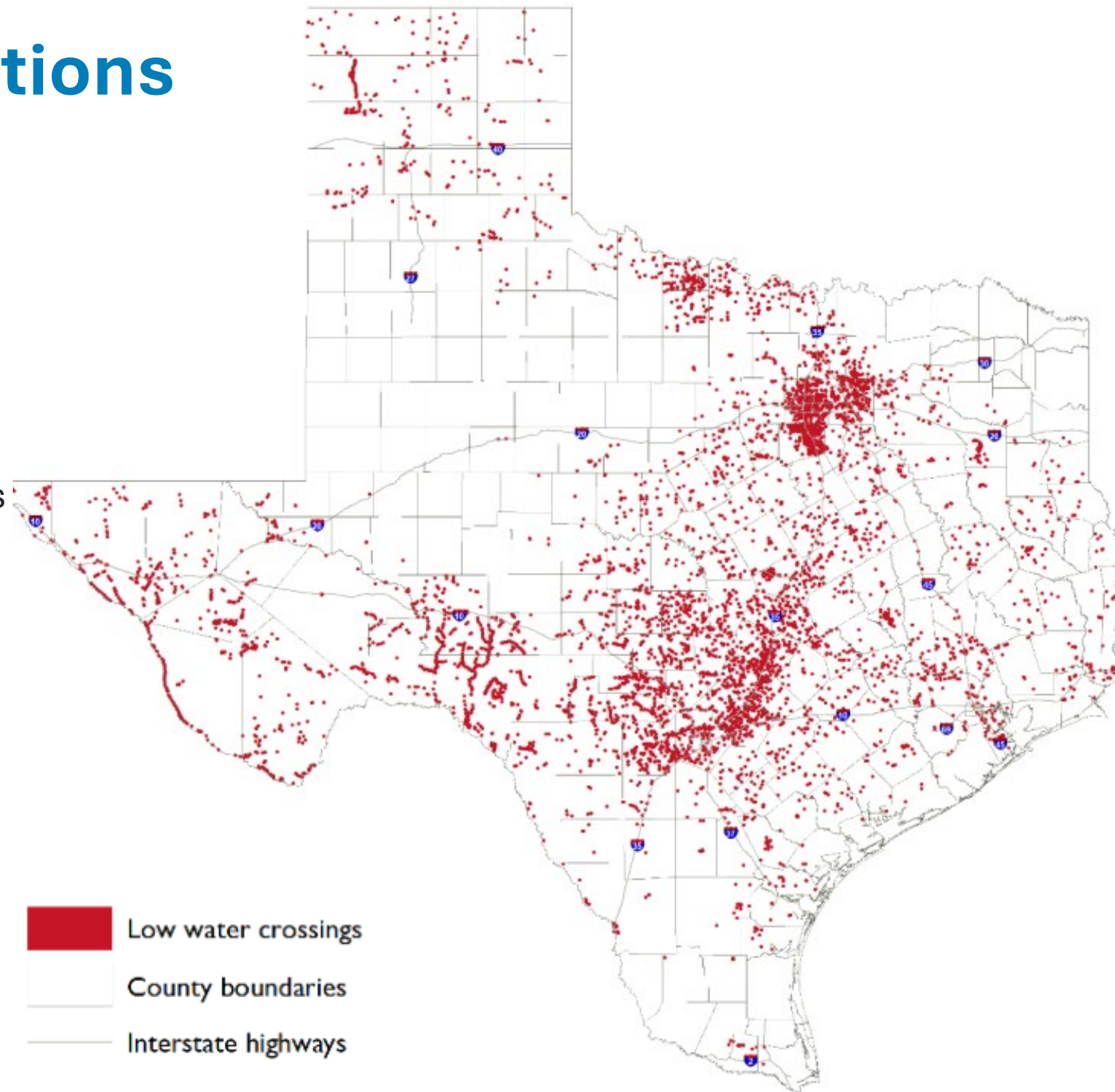
Legislative Recommendations

TWDB legislative recommendations includes recommendations regarding

1. Flood funding and financial mechanisms
2. Community financial and technical assistance
3. Low water crossing safety
4. Flood early warning systems
5. Enhanced dam and new levee safety programs

Select regional flood planning group legislative recommendations includes recommendations regarding

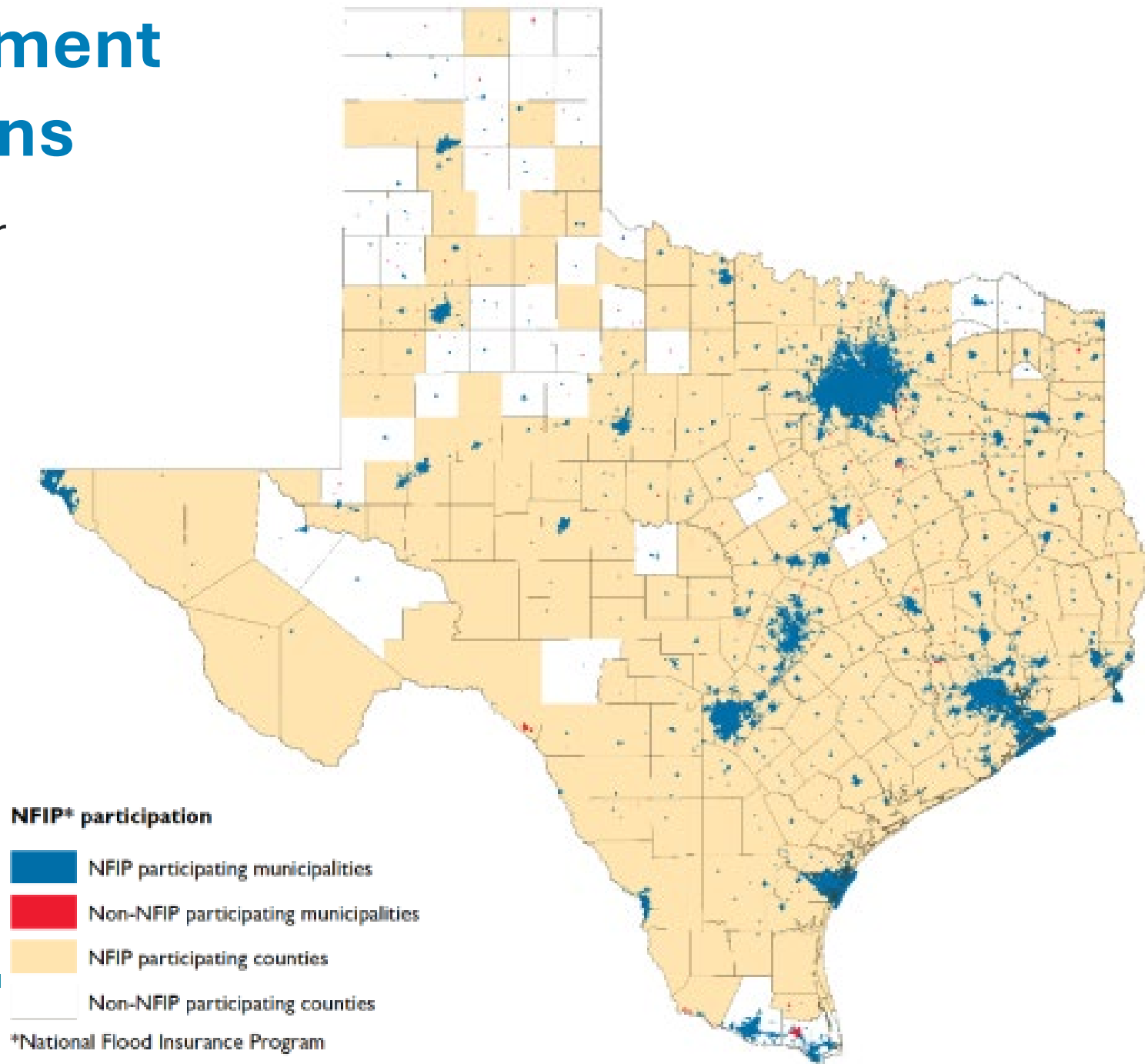
1. Authority of counties, including regarding drainage fees
2. Statewide floodplain management standards for infrastructure and buildings for flood risk reduction
3. Statewide building codes regarding flood risk
4. Transportation infrastructure considerations



Floodplain Management Recommendations

TWDB general recommendations for floodplain management includes

1. Existing minimum FEMA floodplain standards required for cities and counties under Texas Water Code § 16.3145 and recommendations for higher standards
2. Enhance current floodplain management activities
3. Nature-based solutions
4. Asset management
5. Education and outreach
6. State flood planning continued coordination



TWDB Recommendations for Higher Floodplain Management Standards

Description of select minimum FEMA NFIP standards

(Currently required for all counties and cities under Texas Water Code § 16.3145)

Recommendations to consider for higher standard

<p>1 Managing flood risks to at least the 1 percent (100-year) event, in accordance with NFIP minimum standards.</p>	<p>Consider developing standards for a range of flood event frequencies starting with 50 percent (2-year) events up to 0.2 percent (500-year) events.</p>
<p>2 Restricting development and use of fill within SFHA to prevent increasing the risk of flooding.</p>	<p>Consider setting a baseline of criteria ensuring safe development in flood-prone areas, including limiting construction within certain high-hazard areas, such as within 10 percent (10-year) annual chance floodplain, and considering flood mitigation approaches, such as detention requirements for new developments, as appropriate.</p>
<p>3 Requiring elevation of the lowest floor of all new residential buildings and substantial improvements to buildings in the SFHA to or above the BFE or the 1 percent (100-year) annual chance water surface elevation.</p>	<p>Consider requiring a minimum freeboard for finished first floor elevation of buildings, (e.g., 1 foot to 2 feet above the BFE and/or an elevation equivalent to a 0.2 percent (500-year) flood event, especially for critical infrastructure) for all new development and substantial improvements within the 1 percent annual chance floodplain, as applicable.</p>
<p>4 Requiring that development in floodplains not increase the base flood elevation by more than 1 foot to ensure no negative impacts on other properties from proposed projects.</p>	<p>Consider adopting smaller allowance for increases to the base flood elevation (less than 1 foot) to limit negative impacts and the potential cumulative impacts of new developments, including those outside of floodplain.</p>
<p>5 Requiring certain construction materials and methods that minimize future flood damage, in accordance with NFIP minimum standard.</p>	<p>Consider meeting flood protection aspects of the 2018 or 2021 versions of International Building Code for all new development and substantial improvements within the 1 percent (100-year) annual chance floodplain, as applicable.</p>

Interactive State Flood Plan Viewer

<https://texasstatefloodplan.org/overview>

The screenshot displays the Texas State Flood Plan Viewer interface. The main map shows Texas divided into 15 Regional Flood Planning Groups (RFPGs), each color-coded and numbered:

- 1 - Canadian-Upper Red
- 2 - Lower Red Sulphur-Cypress
- 3 - Trinity
- 4 - Sabine
- 5 - Neches
- 6 - San Jacinto
- 7 - Upper Brazos
- 8 - Lower Brazos
- 9 - Upper Colorado
- 10 - Lower Colorado-Lavaca
- 11 - Colorado
- 12 - San Antonio
- 13 - Nueces
- 14 - Upper Rio Grande
- 15 - Lower Rio Grande

The right sidebar, titled "Overview of findings from the 2024 State Flood Plan", provides the following data:

Statewide Existing Flood Risk

(In 1 percent and 0.2 percent annual chance flood hazard areas)

Population	5,886,000	Buildings	1,789,800
Agricultural land (acres)	13,099,990	Roadway miles	66,000
Residential buildings	1,402,000	Critical facilities*	6,659

Recommended Studies, Projects and Strategies**

Flood management evaluations (3,097)	\$2.63B
Flood mitigation projects (615)	\$49.06B
Flood management strategies (897)	\$2.84B
Total count (4,609)	\$54.52B

*Hospitals, emergency medical services, fire stations, police stations, and schools
 **Due to rounding, numbers presented may not add up precisely to the totals provided and percentages may not precisely reflect the absolute figures.

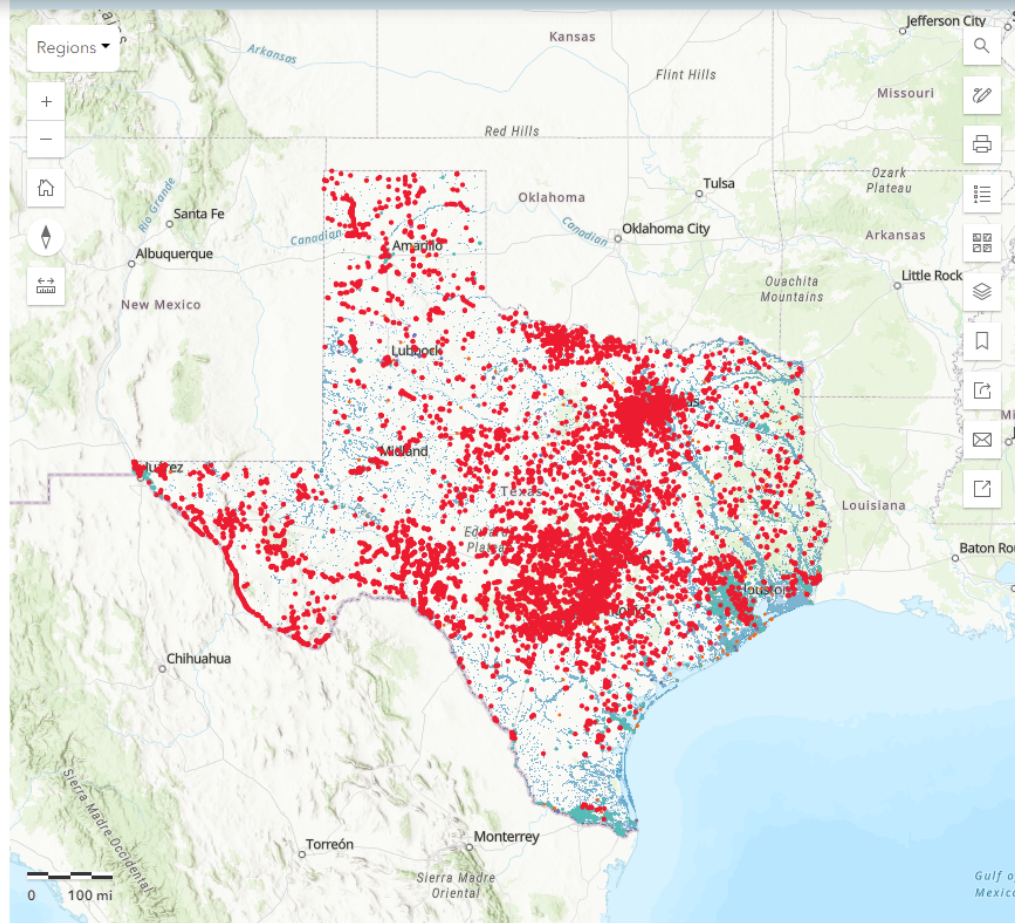
Interactive State Flood Plan Viewer

<https://texasstatefloodplan.org/>



Overview **Flood Risks** Recommended Solutions Existing Infrastructure Floodplain Management Explore the Data Resources

Sign In



Esri, USGS | Texas Parks & Wildlife, CQNAAR, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS | Transportation Planning and Progra... Powered by Esri

Key stats

Statewide

Total count of Low Water Crossing	9,330
Total count of structures	1,789,800
Total count of residential structures	1,402,000
Total count of roadway crossings	78,500
Total square miles of 1 percent floodplain	56,100
Total square miles of 0.2 percent floodplain	10,900
Total square miles of unknown floodplain	600
Total square miles of agricultural land	13,099,990
Total miles of impacted roadways	66,000
Total population of impacted structures	5,886,000
Total count critical facilities*	6,659

*Hospitals, emergency medical services, fire stations, police stations, and schools
 **Due to rounding, numbers presented may not add up precisely to the totals provided and percentages may not precisely reflect the absolute figures.

- + Flood hazards
- + Exposure
- + Vulnerabilities
- + Administrative flood risk

Interactive State Flood Plan Viewer

<https://texasstatefloodplan.org/>

The screenshot displays the Texas Water Development Board's Interactive State Flood Plan Viewer. The main map shows various flood management regions across Texas, including the Upper Brazos region. A pop-up window titled "Flood Mitigation Projects (FMP) - Recommended" provides details for a specific project in the Upper Brazos region.

Flood Mitigation Projects (FMP) - Recommended	
FMP ID	073000023
FMP Name	Clovis & Quaker - Storm Drain Alternative 4
FMP Description	Detention, channel, and storm drain improvements from Ursuline Street and Quaker Avenue to US-84 and L.289
Region (RFPG) Number	7
Region (RFPG) Name	Upper Brazos
County	Lubbock
HUC 8	12050001
HUC 10	1205000113
HUC 12	120500011305
Watershed ID	
Originating Study or Plan	

Flood management evaluations

Flood mitigation projects

Flood mitigation projects are proposed projects, **structural** or **non-structural**, that when implemented will reduce or mitigate flood risk to life and property. Flood mitigation projects have capital costs or other non-recurring costs. A single flood mitigation project may be associated with multiple flood management strategies or vice versa. As part of the flood planning process, regional flood planning groups identified and recommended flood management strategies and projects.

Structural	Non-structural
<ul style="list-style-type: none"> Low water crossings Bridge improvements Infrastructure (channels, ditches, ponds, stormwater, pipes) Regional detention Regional channel improvements Storm drain improvements Dam improvement, maintenance, and repair Flood wall and levees Coastal protections Nature-based projects Comprehensive regional projects 	<ul style="list-style-type: none"> Property or easement acquisition Elevation of individual structures Flood readiness and resilience Other

Flood mitigation projects can be viewed by selecting the *Flood Mitigation Projects (FMP)* layer from *Map Layers*.

Region 7: Upper Brazos

Total count of recommended FMP	13
Total cost of recommended FMP	\$48.84M

Interactive State Flood Plan Viewer

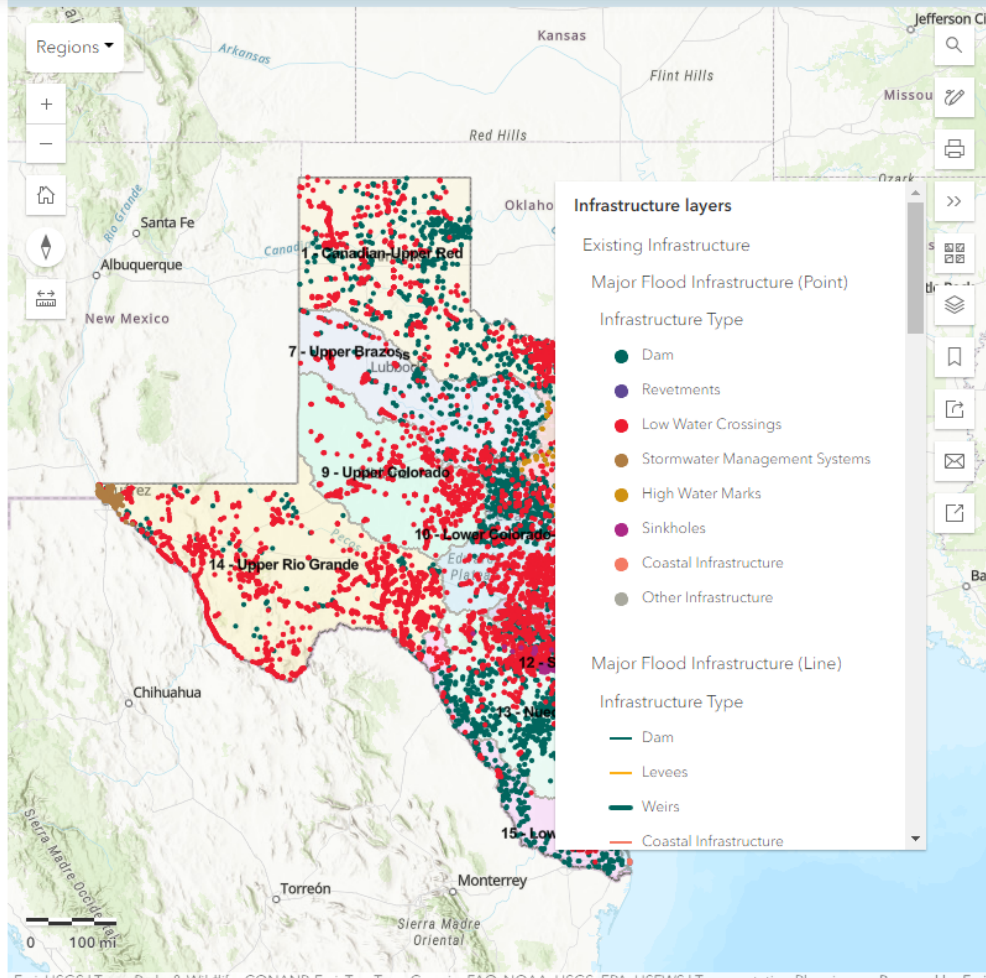
<https://texasstatefloodplan.org/>

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Overview Flood Risks Recommended Solutions **Existing Infrastructure** Floodplain Management Explore the Data Resources

Sign In



Key stats

Statewide

Total miles of river tributaries	190,000
Total acres of wetlands	3,379,000
Total acres of playas	352,000
<hr/>	
Total count of existing flood projects	2,798
Total cost of existing flood projects	\$8.02B
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Total acres of open parks	781,000
Total count of sink holes	138
Total count of reservoirs	1,443
Total count of dams	6,731
Total miles of levees	1,884
Total count of low water crossings	11,395
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Total count of ponds	266,065
Total miles of storm drain systems	7,940
Total count of existing proposed projects	2,115
Total count of existing ongoing projects	683

*Due to rounding, numbers presented may not add up precisely to the totals provided and percentages may not precisely reflect the absolute figures.

- + Features
- + Functionality



Ongoing Efforts to Support Regional Flood Planning

- Benefit-cost analysis guidance*
- Nature-based solutions statewide manual*
- Infrastructure condition assessment toolkit*
- Statewide future condition flood hazard dataset (2060)*

* TWDB-funded

What's Next?

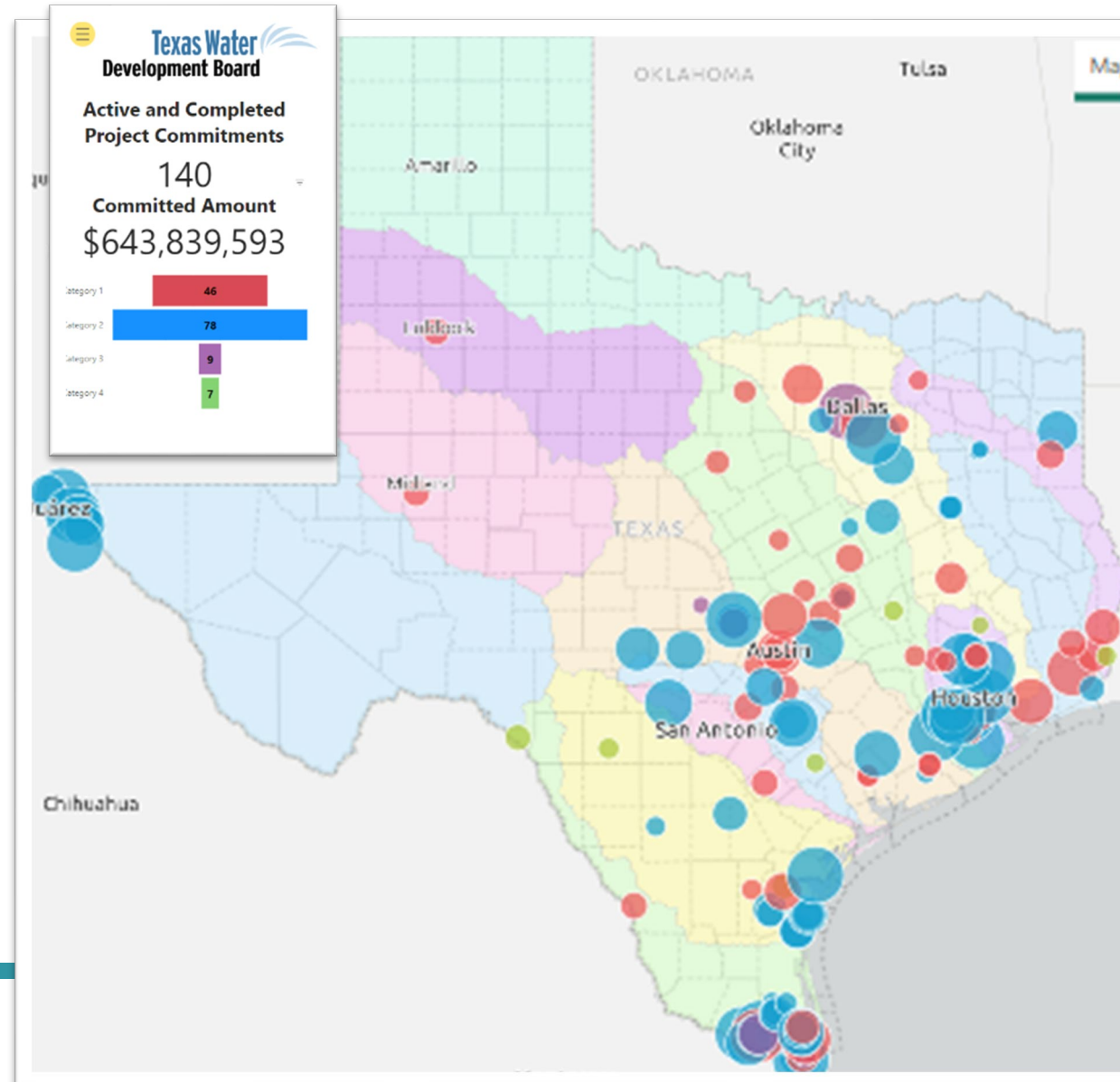
- Beginning the second cycle of flood planning.
- **\$38M** have been allocated to the RFPGs.
- Recommended flood risk reduction solutions will be funded via **FIF** Second Cycle.
- Updating the **Flood Planning Data HUB** for the RFPGs.



<https://twdb-flood-planning-resources-twdb.hub.arcgis.com/>

Flood Infrastructure Fund (FIF)

- Created by 86th Texas Legislature in 2019 and approved by voters on Nov 5, 2019
- Original funding was \$770M; 140 active projects totaling \$643M
- In 2023 the legislature appropriated an additional \$624M
- TWDB anticipates utilizing \$375 million during this two-year cycle (SFYs 2024-2025).
- FIF Second cycle is currently underway



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www.twdb.texas.gov/flood/planning

