Technical Memorandum Addendum

TO:	Mr. Jeff Walker, Executive Administrator Texas Water Development Board Stephen F. Austin Building 1700 N. Congress Avenue, 6th Floor Austin, Texas 78701	DATE:	March 1, 2022
THROUGH	Mr. Glenn Clingenpeel, Chair Region 3 Trinity RFPG Trinity River Authority of Texas 5300 S. Collins Street Arlington, Texas 76018	AVO:	TRA Contract No. 2101792488 43791.001 - 000430
FROM:	Halff Associates, Inc. 4000 Fossil Creek Blvd. Fort Worth, TX 76137	SUBJECT:	Region 3 Trinity Regional Flood Plan Task 4C.1.c, 4C.1.d, 4C.1.e – Technical Memorandum Addendum

Addendum Overview

In August 2021, TWDB extended the deadline for completion and submittal of three subtasks associated with the Technical Memorandum to be submitted as an addendum by March 7, 2022. The purpose of this extension was to accommodate the delayed release of the Fathom data associated with the TWDB's floodplain quilt (TWDB Data Hub, 2021). Results presented in this memorandum are considered interim due to ongoing incorporation of best available data into the floodplain quilt. The Technical Memorandum Addendum includes:

- Existing and potential future conditions flood risk (Task 4C.1.c);
- Flood hazard data gaps and additional flood-prone areas (Task 4C.1.d); and
- Available hydrologic and hydraulic models needed to evaluate FMS's and FMP's (Task 4C.1.e)

Task 4C – Technical Memorandum Addendum Deliverables

The following sections introduce the technical memorandum addendum deliverables associated with the March 7th extension. Several additional attachments are included at the end of this document. **Table 1** indicates which subtasks and information are contained in each one.

Table 1: Technical Memorandum Addendum Attachments

Attachment	TWDB Task	Description
1,2,4	4C.1.c	A geodatabase and associated maps for: region-wide 1.0% annual chance flood event and 0.2% annual chance flood event inundation boundaries, and the source of flooding for each area, for use in its risk analysis, including indications of locations where such boundaries remain undefined. Includes TWDB-required Tables 3 and 5.
2,4	4C.1.d	A geodatabase and associated maps that identifies additional flood-prone areas not included in the floodplain quilt based on hydrologic features, historic flooding, and or local knowledge.
3,4	4C.1.e	A geodatabase and associated maps in accordance with TWDB Flood Planning guidance documents that identifies areas where existing hydrologic and hydraulic models needed to evaluate FMSs and FMPs are available

4C.1.c – Existing and potential future conditions flood risk

As of May 20, 2021, TWDB provided regional planning groups with an official version of the existing conditions floodplain quilt. The quilt was provided to establish a starting point in identifying flood risk within the region. The floodplain quilt compiled flood risk boundaries from several sources.

- National Flood Hazard Layer (NFHL) Pending Data
- National Flood Hazard Layer (NFHL) Preliminary Data
- National Flood Hazard Layer Effective Data (Detailed Study Areas only)
- Estimated Base Flood Elevation Data
- National Flood Hazard Layer (NFHL) Effective Data (Approximate Study Areas only)
- First American Flood Data Services (FAFDS)

On October 29, 2021, TWDB provided the planning group with Fathom floodplain data to estimate flood risk in locations where floodplain information was unavailable. The only area identified within Region 3 completely reliant on the Fathom data was Clay County. The draft existing conditions flood risk analysis was completed with the inclusion of the Fathom data. Methodologies to determine potential future flood risk were discussed and agreed upon during the September 9, 2021, November 18, 2021, and December 16, 2021 Regional Flood Planning Group meetings. The future conditions flood risk memorandum describing the approach is located in **Attachment 1**.

On December 1, 2021, TWDB supplied the planning groups with the final buildings dataset to be used for the existing and future conditions flood exposure analysis. The interim exposure analysis was performed to determine the number of at-risk structures (buildings, roadways, critical facilities, etc.), population estimates, the length of impacted roadways and area of agricultural land contained within the previously developed existing and potential future flood hazard boundary. **Table 2** provides overall Trinity Region 3 flood exposure results.

Table 2: Trinity Region 3 Existing and Potential Future Flood Exposure Analysis Results

Potential Flood Risk Event	Number of At-Risk Structures	Number of At-Risk Critical Facilities	Number of At-Risk Roadway Crossings*	Impacted Agricultural Area (sq. mi.)
Existing 1% Annual Chance (100-year)	74,637	6,434	1,143	1,317
Future 1% Annual Chance (100-year)	125,003	7,458	1,178	1,437

**includes low water crossings only*

Following the exposure analysis, a vulnerability analysis was performed for both existing and potential future conditions using the Social Vulnerability Index (SVI) dataset. The vulnerability analysis was performed to assess a community's resilience, with values closer to 1 denoting greater vulnerability.

Enhancement of the floodplain quilt with pluvial floodplain information from the Fathom dataset will be incorporated into the Region 3 existing conditions flood hazard dataset throughout the finalization of the flood risk analyses. The flood risk analyses (existing and potential future flood risk, exposure, and vulnerability) for this submittal are considered interim. TWDB-required **Table 3** and **Table 5** located in **Attachment 2** provide the results per county of the existing and future exposure and vulnerability analysis as outlined in the Technical Guidelines for Regional Flood Planning. A geodatabase and associated **Figures 1 through 10** are provided in **Attachments 2 and 4** as digital data.

4C.1.d – Flood hazard data gaps and additional flood-prone areas

Upon receipt of the final floodplain quilt, a flood hazard data gap assessment was performed. The flood hazard quilt for the Trinity Region 3 watershed was determined to have full regional coverage apart from Clay County. Preliminary identified gaps include counties with no modernized data since the completion of the FEMA Map Modernization initiative and areas with effective data that is more than 10 years old. At this time, areas that contain Base Level Engineering (BLE) or FEMA NFHL floodplain boundaries are not considered data gaps. An ongoing effort is being made to determine the validity of the associated hydrologic and hydraulic modeling in areas of greater risk. For example, Polk, Liberty, San Jacinto, Walker, and Chambers counties located in the southern portion of the basin were greatly affected by NOAA Atlas 14, invalidating their effective floodplain information contained within the quilt. Because of this, these counties are being reported as data gaps. Fathom data was incorporated into the floodplain quilt for Clay County to achieve full flood hazard coverage for the purposes of this planning effort. The Fathom pluvial dataset provided flood risk information for rivulets, urban drainage channels, and smaller potential flooding sources. An ongoing effort is being made to incorporate Fathom pluvial flood hazard information where reasonable.

In addition to incorporation of the Fathom dataset, a region-wide data collection and outreach effort was made to identify flood-prone areas typically outside of established flood hazard boundaries. These areas were identified by the region's stakeholders along with public datasets and are based on hydrologic features, historic flooding, and local knowledge. Through the data collection and outreach effort, over 3,000 individual flooding locations were identified within the region. A data gaps and additional flood-prone area geodatabase and associated **Figures 3 and 7** are provided in **Attachments 2 and 4** as digital data.

4C.1.e – Available hydrologic and hydraulic models needed to evaluate FMS's and FMP's.

A list of previous studies containing modeling data was submitted as part of the January 7, 2022 Technical Memorandum. These studies were added to a geodatabase to provide a georeferenced representation of model-backed study areas for use when conducting FMS and FMP evaluations. Also provided in the database are areas where BLE and FEMA NFHL modeling are available. It should be noted that for use in developing an FMS or FMP, these models will need some level of enhancement to provide fully detailed flood risk reduction evaluations. As the planning process continues, the list of available studies and associated models will be enhanced to document sources of information relevant to plan development within the Trinity Region. Available model locations geodatabase and associated **Figure 11** are provided in **Attachments 3 and 4** as digital data.

4C.1.c,d,e – Technical Memorandum Addendum Geodatabase and Tables

As outlined in the TWDB Extension of Time to Complete Technical Memorandum dated August 17, 2021 and associated Technical Memorandum Data Deliverable Clarification dated October 29, 2021, documentation in **Attachment 4** outlines geodatabase deliverables included in this Technical Memorandum as well as spatial files and tables. Specific data deliverables align with the TWDB's Exhibit D: Data Submittal Guidelines for Regional Flood Planning. The geodatabase files require ArcGIS software to be used to view the files. The RFPG can provide these files to anyone requesting said files by emailing info@trinityrfpg.org. Please keep in mind that these files will continue to be updated and enhanced throughout the development of the Regional Flood Plan and simply reflect a snapshot in time of the project as it stands today.

Attachment 1

Task 4C.1c – Potential Future Conditions Flood Risk Methodology Memorandum

HALFF

4000 Fossil Creek Blvd.
Fort Worth, TX 76137
(817) 847-1422

TBPE Firm #312

MEMORANDUM

TO:	Texas Water Development Board Regional Flood Planning 1700 N Congress Ave Austin, TX 78701	DATE:	January 7, 2022
FROM:	Halff Associates, Inc. 4000 Fossil Creek Road Fort Worth, TX 76137	AVO:	43791
SUBJECT:	Flood Planning Data **Future Conditions Mapping**		

INTRODUCTION

For the 2020 – 2023 planning cycle, Regional Flood Planning Groups (RFPGs) are tasked with performing a future condition flood analysis to determine the potential location of both 1-percent (100-year) and 0.2 percent (500-year) annual-chance flood hazard. The estimated floodplain changes will be used solely for the purpose of estimating the general magnitude of potential future increases in flood risk under the equivalent of a "do-nothing" or "no-action" alternative and within the regional flood planning context will not, in any way, be used for developing new flood extent maps for any regulatory purposes.

In areas where future condition flood hazard data is not already available, Exhibit C of the Technical Guidelines for Regional Flood Planning outlines the following 4 methods for performing future condition flood identification.

1. Method 1: Increase water surface elevation based on projected percent population increase (as proxy for development of land areas)
2. Method 2: Utilize the existing condition 0.2 percent annual chance floodplain as a proxy for the future 1 percent level
3. Method 3: Combination of methods 1 and 2 or an RFPG-proposed method
4. Method 4: Request TWDB perform a Desktop Analysis

CONSIDERATIONS FOR DEVELOPING FUTURE CONDITIONS FLOOD RISK

When developing a predicative assessment for future conditions flood risk, Texas Water Development Board (TWDB) suggested each region consider two major factors: Unmitigated Population Increase and Projected Future Rainfall.

Population Increase

Within the Trinity River watershed region, concentrated population growth is predicted to occur within locations along the upper, mid, and lower region areas. The TWDB's Water User Group projects that within the upper portion of the region, ten (10) Dallas/Fort Worth surrounding communities could experience over 300% increase in population over the next 30 years. Larger communities, such as Athens and Corsicana within the mid basin area are projected to experience over 30% population growth. The lower region is expected to see overflow growth from Harris County, with significant growth occurring in Dayton and Liberty. Population growth generally correlates to an increase in urbanization. This, in turn, leads to an increase in impervious ground cover as land use changes. Unmitigated, urbanized areas will increase watershed rainfall runoff leading to higher water surface elevations in the region's rivers, creeks, and channels during extreme rainfall events.

Projected Future Rainfall

The other factor TWDB suggested the planning group consider when estimating future flood risk is future rainfall patterns. To aid the regional planning groups, the Office of the Texas State Climatologist provided TWDB with guidance on how to incorporate projected future rainfall in their April 16, 2021 report, titled *"Climate Change Recommendations for Regional Flood Planning."* The report states that 1-day 100-year rainfall amounts increased by approximately 15% between 1960 and 2020. The climatologist coupled historic rainfall data with results from climate models to develop a relationship between extreme rainfall amounts and future increases in global temperature. Percent increase in future precipitation was developed for both urbanized and rural watershed conditions. Due to the uncertainty of predicting weather patterns for extreme rainfall events, the climatologist provided a minimum and maximum range for estimating future rainfall increases. The climatologist found even more uncertainty when analyzing rural and large river catchments due to future decreases in soil moisture. This led them to providing a percent decrease as a minimum range. The climatologist recommendations for future percent rainfall increase are provided in Table 1.

Table 1: Range of Potential Future Rainfall Increase 2050-2060

Location	Range -Minimum	Range -Maximum
Urban Areas	12%	20%
Rural Areas/River	-5%	10%

CASE STUDIES - FUTURE CONDITIONS FLOOD RISK

In order to obtain a better understanding of how future conditions affect extreme rainfall flood risk within the Trinity region, preexisting available hydrologic and hydraulic models containing future flood risk data were analyzed. Results from these studies served as an estimation of how future land use and climate change impact floodplain elevations and widths when compared to existing conditions. Comparable studies were chosen based on availability, location, and similar hydrologic/hydraulic parameters. Figure 1 provides a location for the existing studies collected for this assessment.

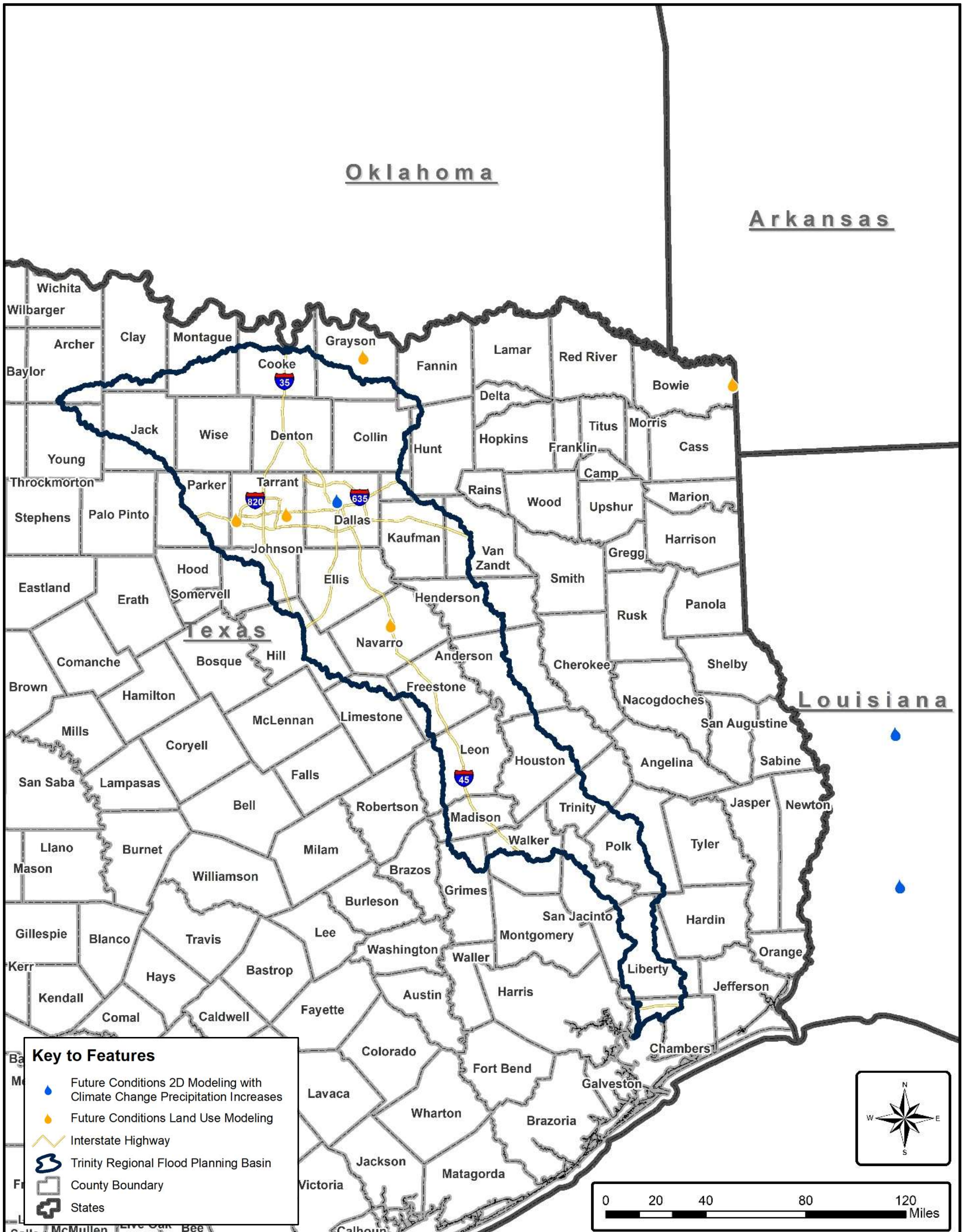
Oklahoma
Arkansas
Louisiana
Texas
Wichita
Wilbarger
Archer
Clay
Montague
Cooke
Grayson
Fannin
Lamar
Red River
Bowie
Baylor
Delta
Morris
Titus
Jack
Wise
Denton
Collin
Hunt
Hopkins
Franklin
Cass
Young
Camp
Throckmorton
Parker
Tarrant
Rains
Wood
Upshur
Marion
Stephens
Palo Pinto
Dallas
Kaufman
Harrison
Johnson
Van Zandt
Gregg
Eastland
Hood
Smith
Erath
Somervell
Ellis
Henderson
Rusk
Panola
Navarro
Comanche
Bosque
Hill
Anderson
Cherokee
Shelby
Brown
Freestone
Hamilton
Nacogdoches
McLennan
Limestone
San Augustine
Mills
Coryell
Leon
Houston
Angelina
Sabine
San Saba
Lampasas
Falls
Bell
Robertson
Madison
Trinity
Jasper
Newton
Llano
Burnet
Walker
Polk
Tyler
Mason
Milam
Williamson
Brazos
Grimes
Burleson
San Jacinto
Hardin
Gillespie
Blanco
Travis
Lee
Montgomery
Washington
Orange
Kerr
Waller
Liberty
Hays
Bastrop
Harris
Jefferson
Kendall
Austin
Comal
Caldwell
Fayette
Chambers
Colorado
Fort Bend
Galveston
Lavaca
Wharton
Brazoria
Jackson
Matagorda
Victoria
Salle
McMullen
Live Oak
Bee
Calhoun
35
820
635
45
Key to Features
Future Conditions 2D Modeling with Climate Change Precipitation Increases
Future Conditions Land Use Modeling
Interstate Highway
Trinity Regional Flood Planning Basin
County Boundary
States
N
S
E
W
0
20
40
80
120
Miles

Figure 1: Case Study Locations

Future Conditions - Land Use Studies

Five (5) drainage/floodplain master plans were utilized to assess potential flood risk increases due to future fully developed land use conditions. The future conditions analysis for these studies did not consider potential increases to rainfall data and are therefore based on land use changes only. A comparison was made between the existing and future conditions 100-year flood elevations. In addition to the future 100-year comparison, a flood elevation comparison was made between the existing 100-year and 500-year storm events to analyze the viability of utilizing Method 2 for future flood hazard data for this planning cycle. Results of the comparisons are provided in Table 2.

Table 2: Future Conditions Land Use Water Surface Elevation (WSEL) Comparison

Location	Flooding Source	Average WSEL Change Existing Vs Future 100yr (ft)	Average WSEL Change Existing 100yr vs 500yr (ft)
Parker County	Marys Creek	0.1	0.8
Grand Prairie	Fish, Kirby, Rush, Prairie Creek	0.2	1.4
Sherman	Post Oak, EF Post Oak, Sand Creek	0.7	1.0
Texarkana	Wagner, Swampoodle, Corral Creek	0.6	1.8
Corsicana	Post Oak, SF Post Oak, Mesquite Creek	0.2	1.0
Average		***0.4***	***1.2***

Future Conditions – Projected Future Rainfall

During the data collection phase, the consultant team was unable to obtain studies that analyzed future flood risk based on potential future rainfall predictions. As a substitute, two (2) large scale rain on grid studies were obtained: Dallas City-Wide Watershed Masterplan and the FEMA Louisiana Upper Calcasieu Base Level Engineering Analysis. The modeling methodology of these studies allowed for rainfall data to be quickly modified in accordance with the recommendations from the state climatologists. The 100-year storm event rainfall was increased by 15% for both studies and the flood elevation results were compared to the present-day conditions. The increase of 15% was chosen because it fell into the high range of rainfall increases and matched the historic period of record increase. The existing 100-year and 500-year flood elevations were also compared for the Method 2 consideration. Results of the comparisons are provided in Table 3.

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4000 Fossil Creek Blvd.
Fort Worth, TX 76137
(817) 847-1422

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Table 3: Future Rainfall Increase WSEL Comparison

Location	Average WSEL Change Existing Vs Future 100yr (ft)	Average WSEL Change Existing 100yr vs 500yr (ft)
Dallas	0.2	Unavailable*
Upper Calcasieu	0.4	1.7
Average	***0.3***	***N/A***

** Dallas Watershed Master Plan only considered the 100-year storm event*

REGION 3 FUTURE CONDITIONS FLOOD HAZARD APPROACH

Potential Future 100-Year Flood Hazard Methodology

The potential future conditions 100-year flood hazard approach methodologies were discussed during the September 23, 2021 Region 3 RFPG meeting. Advantages and disadvantages of each methodology along with the results of the case studies were presented for consideration. Due to the relatively large coverage of adequate existing 500-year floodplain data within the region, Method 2 was considered the most reasonable approach. The planning group had reservations about the usage of the existing 500-year as a potential future 100-year flood risk proxy due to the case studies showing the floodplain may be too conservative of an approach.

From the future conditions land use case study results, the average change in potential future 100-year WSEL compared to existing conditions was only 0.4 feet while the comparison between the existing 100-year and existing 500-year water surface elevations yielded an average 1.2 feet change. By Increasing the average change in WSEL between existing and potential future conditions from Table 2 by the average taken from Table 3 to account for future rainfall projections, the results generally yielded a comparison less than that of the differences between the existing 100-year and existing 500-year water surface elevation.

The planning group also had concerns about the potential for Region 3 entities (communities and/or insurance companies) to mistakenly use the data for regulatory purposes. As a solution to both concerns, the planning group proposed that the potential future 100-year floodplain should be presented in this planning cycle as a range between the existing 100-year and the existing 500-year (zone of potential expanded risk). The methodology complies with the Method 2 approach and covers the uncertainty and variability resulting from the case study analysis. The exposure and vulnerability assessment data would be extracted from the maximum potential future 100-year floodplain limit.

Potential Future 500-Year Flood Hazard Methodology

The potential future conditions 500-year flood hazard approach methodology was discussed during the December 17, 2021 Region 3 RFPG meeting. Under Method 2 in the TWDB Technical Guidelines, an excerpt regarding the determination of the future 500-year flood hazard states: *"RFPGs will have to utilize an alternate approach to develop a proxy for the 0.2 percent annual chance future condition floodplain, such as adding freeboard (vertical) or buffer (horizontal) estimates. The decision on what specific approach or values to use, which may vary within the region (e.g., for urban vs rural areas), for these estimates will be up to the RFPGs, but technical justification should be provided to explain how the estimates were developed. This method cannot be applied to flood risk areas that do not already have a delineated existing condition 0.2 percent annual chance floodplain, (i.e., flood-prone areas)."* Based on this statement, reasonable buffer limits were researched based on the difference in existing top widths between the 100-year and 500-year floodplain quilt within the Trinity Region. It is reasonable to assume that the difference between top widths for the existing conditions, will be similar for potential future conditions. To establish a reasonable buffer zone to represent potential future 500-year flood risk, Base Level Engineering data previously collected for the plan was analyzed. Nine (9) large-scale studies were selected to form the basis for the buffering analysis. Figure 2 shows the general location and coverage of the nine (9) studies selected.

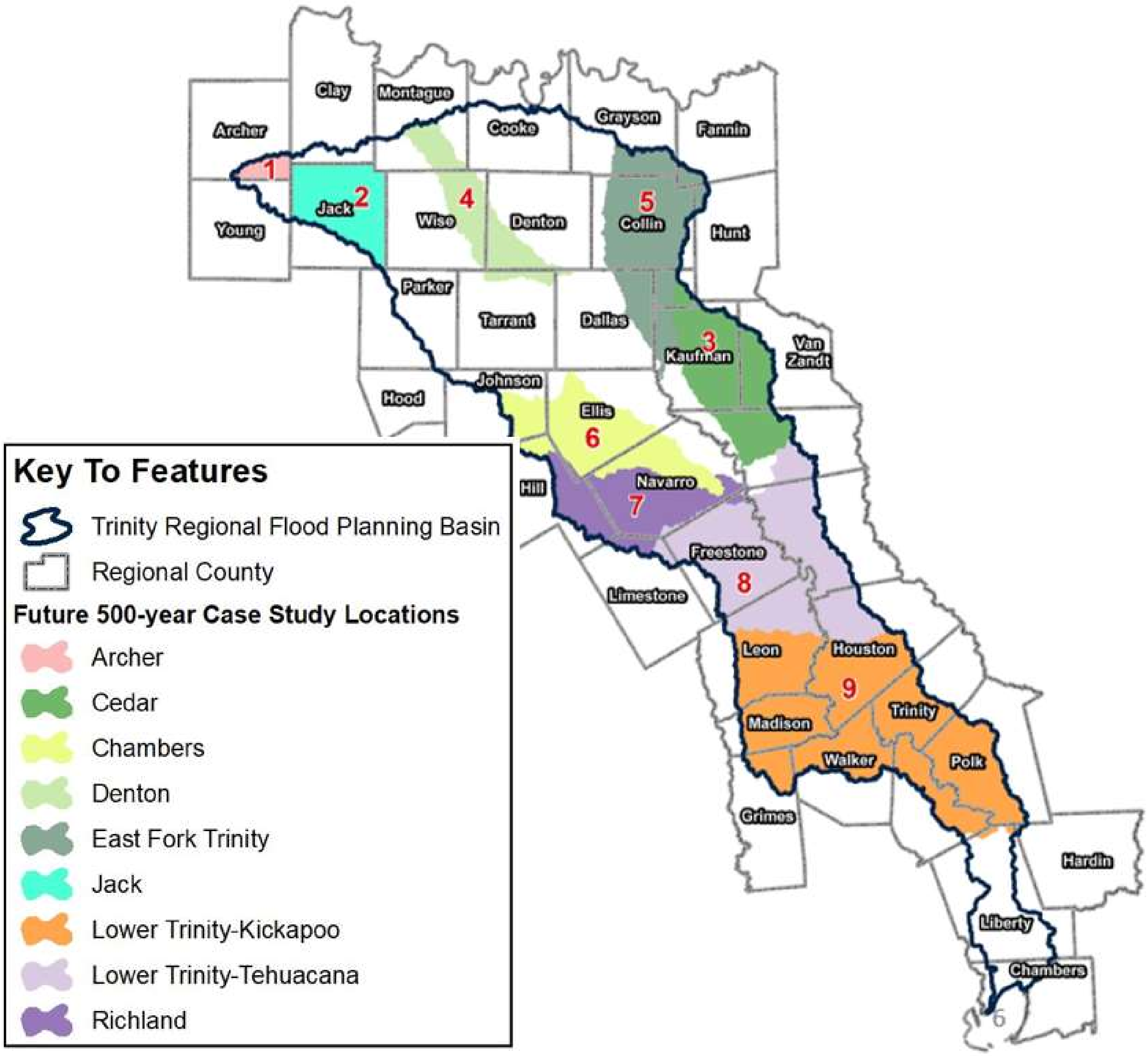

Figure 2: Future 500-year Case Study Locations

The nine (9) studies collected represent over 25,000 miles of floodplain, with over 300,000 cross-sections. Using automated means, 600,000 individual distance measurements were collected along these cross-sections between the existing 100-year and 500-year floodplains. Figure 3 shows an example of measurement locations.

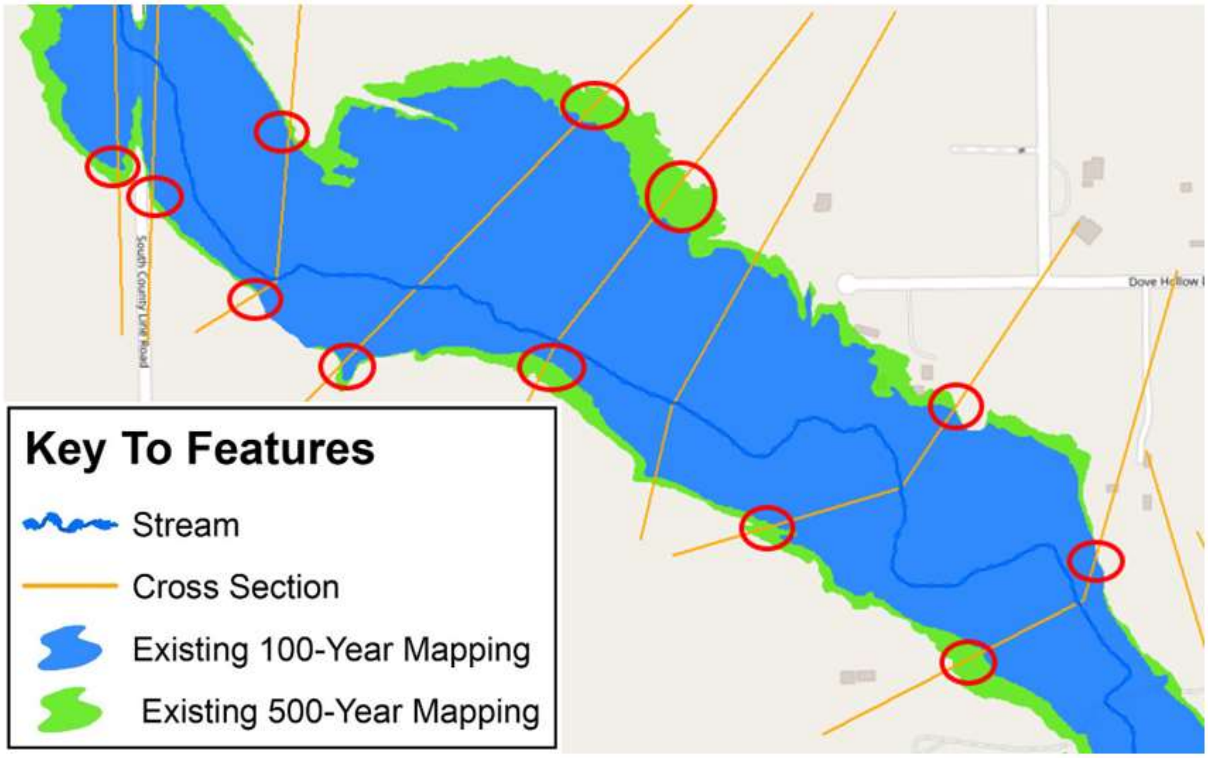

Figure 3: Measurement Locations to Develop Potential Future Condition 500-Year Flood Risk Buffer

The measurements were then averaged for each of the nine (9) study locations. The average distance measurement along the right or left overbank of the floodplain ranged from 30 feet to 50 feet. The total average overbank measurement of all nine (9) studies was determined to be approximately 40 feet, representing 80 feet total change in top width. Similar to the future 100-year flood risk boundary, the future 500-year will be presented as a range between the existing 500-year flood risk boundary and the 40-foot buffer. Table 4 provides the average measurement results of the analysis.

Table 4: Average Change in Horizontal Distance

Location	Average Width Change (Left or Right Overbank) Existing 100yr vs 500yr (ft)
1. Archer	30.8
2. Jack	32.2
3. Denton	32.6
4. Cedar	30.8
5. East Fork Trinity	42.6
6. Chambers	37.2
7. Richland	44.5
8. Lower Trinity Tehuacana	36.3
9. Lower Trinity Kickapoo	47.6
Rounded Average	***40***

CONCLUSION

The Trinity RFPG and its consultant have developed a procedure for generating potential future 100-year and 500-year flood risk data that generally follows Method 2 of the TWDB's Technical Guidance document. The existing 500-year floodplain was selected to serve as a proxy for the potential maximum 100-year flood hazard. A 40-foot buffering of the existing 500-year flood hazard boundary was selected to serve as the potential maximum future 500-year flood hazard. Using the previously described buffering methodology for potential future 500-year conditions allows for rapid development of estimated expanded risk within the constraints of the flood plan timeline and lack of future 500-year detailed data throughout the planning area. A disadvantage of this approach is that average buffering is performed independent of topographic or water surface elevation changes. For areas with relatively flat terrain, the potential 500-year flood risk limit based on buffering may underestimate the expanded urban exposure risk. This disadvantage may be less impactful on rural floodplains whose exposure risks are large tracts of agricultural land. Table 5 shows the existing and range of potential future conditions flood risk approach summary. Figure 4 presents an example of the range of potential future flood risk.

4000 Fossil Creek Blvd.
Fort Worth, TX 76137
(817) 847-1422

Table 5: Existing and Future Conditions Flood Hazard Approach

	Best Available		→		→		→		**Most Approximate**	
	Local Floodplain (if determined current)		NFHL AE		BLE		NFHL A / FAFDS		No FEMA or Better than Quilt	
	100YR	500YR	100YR	500YR	100YR	500YR	100YR	500YR	100YR	500YR
Existing	Local Study (if provided)	Local Study (if provided)	Floodplain quilt 100YR	Floodplain quilt 500YR	BLE 100YR	BLE 500YR	Replaced with Fathom 100YR	Replaced with Fathom 500YR	Fathom 100YR	Fathom 500YR
Future	Local Study (if provided)	Local Study (if provided)	Range between Existing 100-year and 500-year	40-foot buffer of the existing 500YR	Range between BLE Existing 100-year and 500-year	40-foot buffer of the existing 500YR	Range between Fathom Existing 100-year and 500-year	40-foot buffer of the existing 500YR	Range between Fathom Existing 100-year and 500-year	40-foot buffer of the existing 500YR

4000 Fossil Creek Blvd.
Fort Worth, TX 76137
(817) 847-1422

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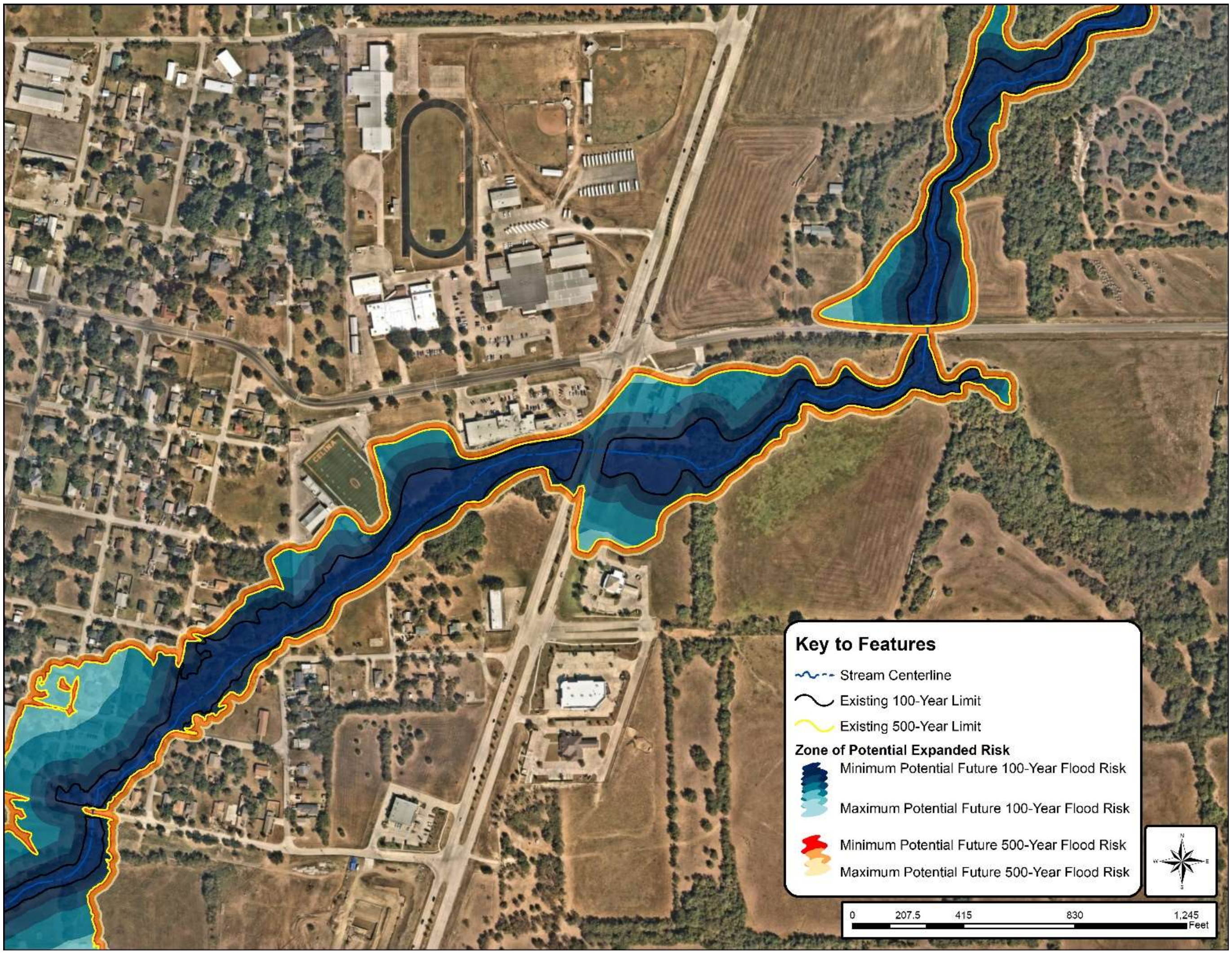


Figure 4: Example of 2020-2023 Planning Cycle Range of Potential Future Flood Risk Data

TWDB APPROVAL REQUEST

We are asking that the method discussed above be evaluated for approval to supplement future conditions mapping where data is unavailable.

Attachment 2

Task 4C.1c, 4C.1d – TWDB Required Table 3 and Table 5, Figures 1 through 10 as follows:

- TWDB Table 3 Existing Conditions Flood Risk Summary
- TWDB Table 5 Future Conditions Flood Risk Summary
- Figure 1 – Data Sources
- Figure 2 - Map 4: Existing Condition Flood Hazard (2.2.A.1 Existing condition flood hazard analysis)
- Figure 3 - Map 5: Existing Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas (2.2.A.1 Existing condition flood hazard analysis)
- Figure 4 - Map 6: Existing Condition Flood Exposure (2.2.A.2 Existing condition flood exposure analysis)
- Figure 5 - Map 7: Existing Condition Vulnerability and Critical Infrastructure (2.2A.3 Existing condition vulnerability analysis)
- Figure 6 - Map 8: Future Condition Flood Hazard (2.2.B.1 Future condition flood hazard analysis)
- Figure 7 - Map 9: Future Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas (2.2.B.1 Future condition flood hazard analysis)
- Figure 8 - Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition (2.2.B.1 Future condition flood hazard analysis)
- Figure 9 - Map 11: Future Condition Flood Exposure (2.2.B.2 Future condition flood exposure analysis)
- Figure 10 - Map 12: Future Condition Vulnerability and Critical Infrastructure (2.2.B.3 Future condition vulnerability analysis)

ID	RFPG No.	RFPG Name	County	Area in Flood Planning Region (sqmi)	1% Annual Chance Flood Risk										
					Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (daytime)	Population (nightime)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	578.4	137	164	61	46	74	74	4	23.4	41.9	72
2	3	Trinity	Archer	107.5	14.2	1	0	2	5	5	0	4.2	4.9	4
3	3	Trinity	Chambers	1417	79.4	1,389	757	874	2,635	2,635	0	33	5.7	29
4	3	Trinity	Clay	122.7	19.6	32	0	2	13	13	0	18.6	10.1	3
5	3	Trinity	Collin	830.6	145.8	2,313	1,643	16,561	6,009	16,561	54	113.1	41.5	448
6	3	Trinity	Cooke	605	84.6	1,384	782	1,764	1,417	1,764	32	65.7	37.5	186
7	3	Trinity	Dallas	905.2	193.9	20,907	15,150	341,478	101,226	341,478	361	686.9	43.3	1,446
8	3	Trinity	Denton	948.7	221	4,290	2,206	11,573	8,345	11,573	98	206.8	68.3	548
9	3	Trinity	Ellis	948	183.2	1,638	1,044	3,243	3,371	3,371	56	142.6	105	379
10	3	Trinity	Fannin	43.8	4.5	129	102	30	75	75	0	3.4	2	13
11	3	Trinity	Freestone	785.2	172.2	370	97	116	212	212	2	37.2	52.4	102
12	3	Trinity	Grayson	342.8	45.4	312	236	172	393	393	1	34.9	17.7	117
13	3	Trinity	Grimes	138.4	24	100	39	11	55	55	0	6.3	10.1	24
14	3	Trinity	Hardin	6.4	0	0	0	0	0	0	0	0	0	0
15	3	Trinity	Henderson	571.1	148.9	2,481	1,067	995	2,600	2,600	11	34.1	43.1	84
16	3	Trinity	Hill	320.6	38.3	46	21	88	25	88	0	11.8	23.3	75
17	3	Trinity	Hood	2.5	0.03	0	0	0	0	0	0	0	0.03	0
18	3	Trinity	Houston	813.9	174.9	435	200	104	334	334	14	42.8	97.4	97
19	3	Trinity	Hunt	29.5	4.3	15	10	1	6	6	0	2.3	2.1	8
20	3	Trinity	Jack	657.5	75.7	158	41	85	86	86	6	30.8	29	68
21	3	Trinity	Johnson	359.4	39	1,467	1,072	2,728	2,821	2,821	22	50.2	18.1	132
22	3	Trinity	Kaufman	763.8	211.4	1,324	756	1,957	1,713	1,957	16	85.8	109.5	270
23	3	Trinity	Leon	807.3	164.7	408	7	211	229	229	5	40.9	73.2	102
24	3	Trinity	Liberty	650.4	293.6	4,767	2,823	2,643	4,899	4,899	4	157.2	61.1	77
25	3	Trinity	Limestone	95.8	15.9	32	7	15	29	29	3	6.6	11.4	28
26	3	Trinity	Madison	400.5	98.2	329	111	367	294	367	1	30	50.1	61
27	3	Trinity	Montague	404	31.1	350	159	54	229	229	0	18.8	14.8	42
28	3	Trinity	Navarro	1,081.60	279	1,379	544	2,321	1,630	2,321	61	110.1	117.2	232
29	3	Trinity	Parker	473.5	39.5	1,164	390	2,300	1,647	2,300	19	39	21.3	138
30	3	Trinity	Polk	570.7	139.3	4,142	2,537	2,932	5,028	5,028	3	57.2	20.7	98
31	3	Trinity	Rockwall	115.8	31.9	485	306	849	1,047	1,047	15	26.1	5.6	56
32	3	Trinity	San Jacinto	307.5	113.4	2,701	2,159	1,635	2,507	2,507	0	64.9	15.6	33
33	3	Trinity	Tarrant	900.6	138.4	15,217	10,913	76,975	44,912	76,975	341	429.4	26.7	1,138
34	3	Trinity	Trinity	368.3	76.5	1,302	875	924	1,669	1,669	1	25.1	9.8	32
35	3	Trinity	Van Zandt	220.4	37.1	256	124	104	195	195	2	19.3	20.4	59
36	3	Trinity	Walker	403	102.7	1,398	1,008	3,654	2,609	3,654	5	36.4	39.5	50
37	3	Trinity	Wise	919.8	121.9	1,741	1,031	1,751	2,004	2,004	6	65.9	63.3	175
38	3	Trinity	Young	111.6	9.6	11	2	0	0	0	0	5.7	3.7	8
Total				**19,129**	**3,710**	**74,637**	**48,280**	**478,565**	**200,343**	**489,554**	**1,143**	**2,767**	**1,317.3**	**6,434**

ID	RFPG No.	RFPG Name	County	0.2% Annual Chance Flood Risk									
				Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (daytime)	Population (nightime)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	6.4	28	15	12	38	38	1	6.6	2.2	6
2	3	Trinity	Archer	1.1	1	0	0	0	0	0	0.9	0.5	2
3	3	Trinity	Chambers	6.7	766	381	651	1,142	1,142	0	21.2	1.9	0
4	3	Trinity	Clay	1.8	3	0	0	1	1	0	2.7	1.2	2
5	3	Trinity	Collin	7	1,730	1,470	12,331	7,023	12,331	0	44.3	2.6	69
6	3	Trinity	Cooke	2.5	315	242	2,526	922	2,526	0	6.8	1.2	2
7	3	Trinity	Dallas	51.5	25,394	19,243	232,966	97,022	232,966	26	530.4	10.3	515
8	3	Trinity	Denton	14	4,098	3,360	33,060	21,976	33,060	0	84	4.9	82
9	3	Trinity	Ellis	11.5	563	392	862	1,190	1,190	0	24.4	8	31
10	3	Trinity	Fannin	0.4	39	22	45	30	45	0	1.2	0.2	1
11	3	Trinity	Freestone	10.8	88	36	23	60	60	0	9.5	4.7	12
12	3	Trinity	Grayson	1	27	27	17	62	62	0	1.4	0.6	2
13	3	Trinity	Grimes	2	32	17	2	17	17	0	1.4	1.2	2
14	3	Trinity	Hardin	0	0	0	0	0	0	0	0	0	0
15	3	Trinity	Henderson	4.9	59	32	17	43	43	0	3.3	2.2	3
16	3	Trinity	Hill	5.9	25	14	7	22	22	0	5.7	4.4	11
17	3	Trinity	Hood	0	0	0	0	0	0	0	0	0	0
18	3	Trinity	Houston	9.8	128	66	184	169	184	3	8.6	5.1	5
19	3	Trinity	Hunt	0.02	0	0	0	0	0	0	0	0.01	0
20	3	Trinity	Jack	8.3	54	10	27	26	27	0	7.8	4.3	2
21	3	Trinity	Johnson	2.9	323	230	1,778	664	1,778	0	8.5	1.5	13
22	3	Trinity	Kaufman	8.8	311	183	357	404	404	0	12.8	6.2	9
23	3	Trinity	Leon	11.6	77	0	37	50	50	0	8.5	6.6	6
24	3	Trinity	Liberty	33.1	3,412	2,373	8,323	6,506	8,323	1	77.1	16.4	34
25	3	Trinity	Limestone	1.8	18	8	26	17	26	0	2.6	1.6	4
26	3	Trinity	Madison	6.1	83	35	53	47	53	0	6.3	3.4	5
27	3	Trinity	Montague	2.1	7	0	1	3	3	0	2.4	1.3	2
28	3	Trinity	Navarro	13.8	329	241	250	384	384	1	23.6	9.2	15
29	3	Trinity	Parker	0.9	89	25	711	201	711	0	3.4	0.5	2
30	3	Trinity	Polk	9.7	693	533	581	1,096	1,096	0	18.9	2.7	11
31	3	Trinity	Rockwall	0.6	23	16	52	50	52	0	1	0.4	0
32	3	Trinity	San Jacinto	7.1	536	483	283	618	618	0	15.5	2.1	4
33	3	Trinity	Tarrant	20.8	10,533	9,039	43,207	37,945	43,207	4	204.4	4.4	152
34	3	Trinity	Trinity	7.1	187	144	115	196	196	0	4.9	1.2	3
35	3	Trinity	Van Zandt	3.2	84	42	17	63	63	0	5.6	2.3	6
36	3	Trinity	Walker	6.7	253	167	1,382	300	1,382	0	7.1	1.9	2
37	3	Trinity	Wise	4	59	52	28	86	86	0	2.7	2.6	8
38	3	Trinity	Young	0	0	0	0	0	0	0	0	0.0001	0
Total				**286**	**50,367**	**38,898**	**339,931**	**178,373**	**342,146**	**36**	**1,165.5**	**119.8**	**1,023**

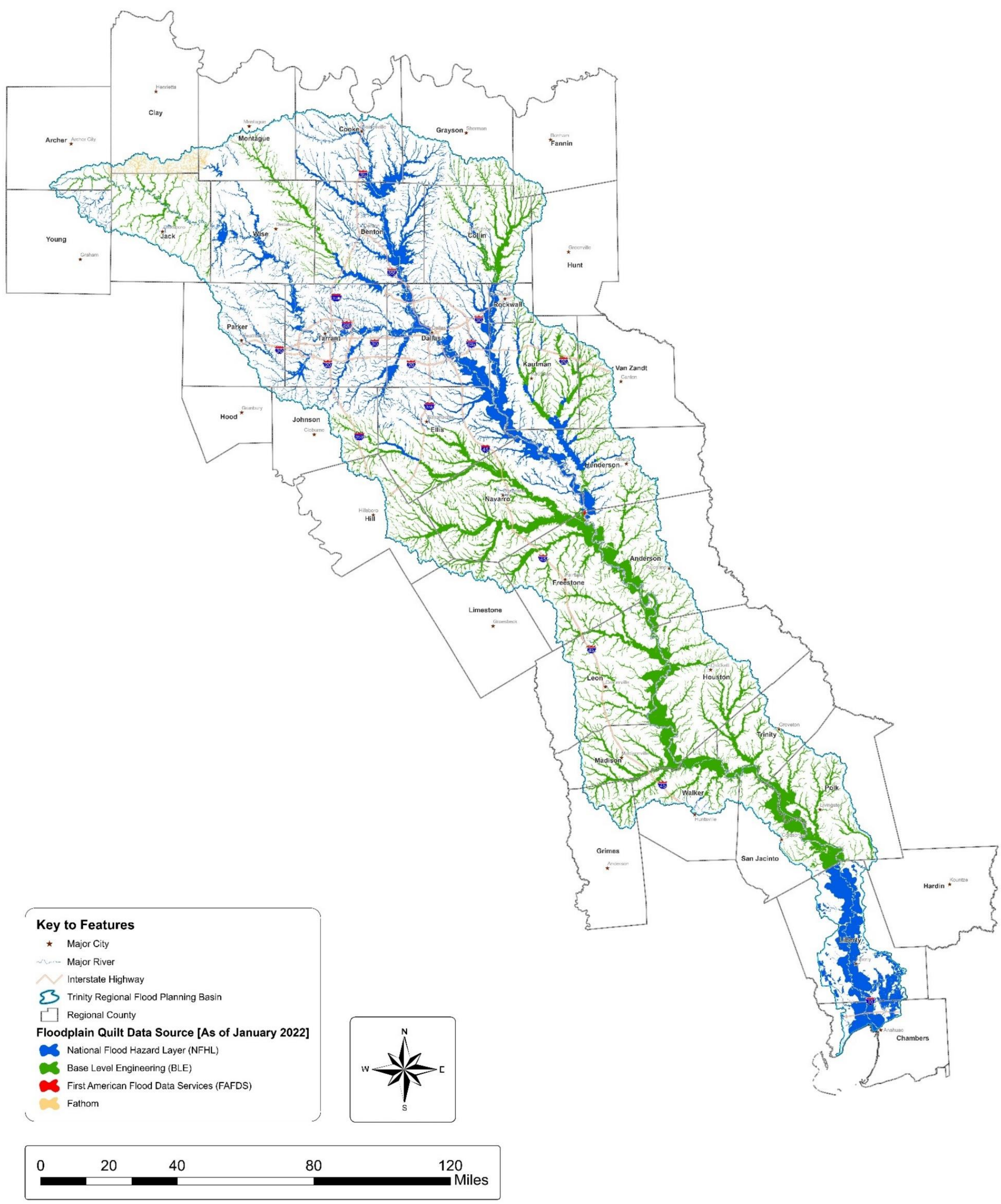
ID	RFPG No.	RFPG Name	County	Possible Flood Prone Areas										Average SVI of features in floodplain or flood prone areas
				Area (sqmi)	Number of Structures in Flood Prone Area	Residential Structures in in Flood Prone Area	Population (daytime)	Population (nightime)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)	
1	3	Trinity	Anderson	0.03	0	0	0	0	0	0	0.03	0.02	0	0.39
2	3	Trinity	Archer	0	0	0	0	0	0	0	0	0	0	0.44
3	3	Trinity	Chambers	0	838	559	610	2,088	2,088	0	16.46	0.65	0	0.32
4	3	Trinity	Clay	0	0	0	0	0	0	0	0	0	0	0.21
5	3	Trinity	Collin	8.43	30	29	35	142	142	0	0.77	0.01	0	0.20
6	3	Trinity	Cooke	0.15	2	0	0	0	0	0	0	0.08	0	0.39
7	3	Trinity	Dallas	11.67	7,380	5,448	227,603	46,603	227,603	0	178.21	0.57	181	0.56
8	3	Trinity	Denton	0.05	1	0	553	0	553	0	0.04	0.01	0	0.26
9	3	Trinity	Ellis	0.25	1	0	1	2	2	0	0.37	0.18	1	0.41
10	3	Trinity	Fannin	0	0	0	0	0	0	0	0	0	0	0.33
11	3	Trinity	Freestone	0	0	0	0	0	0	0	0	0	0	0.56
12	3	Trinity	Grayson	0	0	0	0	0	0	0	0	0	0	0.27
13	3	Trinity	Grimes	0	0	0	0	0	0	0	0	0	0	0.46
14	3	Trinity	Hardin	0	0	0	0	0	0	0	0	0	0	-999
15	3	Trinity	Henderson	1.75	3	1	0	0	0	0	0.74	1.39	0	0.45
16	3	Trinity	Hill	0.29	4	3	2	7	7	0	0.36	0.21	0	0.64
17	3	Trinity	Hood	0	0	0	0	0	0	0	0	0	0	0.09
18	3	Trinity	Houston	0.19	0	0	0	0	0	0	0.03	0.16	0	0.45
19	3	Trinity	Hunt	0	0	0	0	0	0	0	0	0	0	0.39
20	3	Trinity	Jack	0.03	2	0	0	1	1	0	0.26	0.23	0	0.34
21	3	Trinity	Johnson	0	2	0	0	0	0	0	0.05	0.03	0	0.36
22	3	Trinity	Kaufman	1.27	110	92	64	202	202	0	2.53	0.93	0	0.46
23	3	Trinity	Leon	0.05	0	0	0	0	0	0	0	0.01	0	0.59
24	3	Trinity	Liberty	0.01	27	18	82	58	82	0	0.12	0	0	0.60
25	3	Trinity	Limestone	0.01	0	0	0	0	0	0	0	0.01	0	0.57
26	3	Trinity	Madison	0	0	0	0	0	0	0	0	0	0	0.43
27	3	Trinity	Montague	0.94	2	0	0	0	0	0	0.06	0.24	0	0.40
28	3	Trinity	Navarro	1.01	6	0	3	10	10	0	1.93	0.83	2	0.64
29	3	Trinity	Parker	0.05	0	0	0	0	0	0	0.03	0.02	0	0.25
30	3	Trinity	Polk	0	0	0	0	0	0	0	0	0	0	0.50
31	3	Trinity	Rockwall	0.06	0	0	0	0	0	0	0.04	0.06	0	0.15
32	3	Trinity	San Jacinto	0	0	0	0	0	0	0	0	0	0	0.52
33	3	Trinity	Tarrant	1.19	1,239	954	15,596	6,519	15,596	0	17.96	0.07	23	0.40
34	3	Trinity	Trinity	0	0	0	0	0	0	0	0	0	0	0.56
35	3	Trinity	Van Zandt	0	0	0	0	0	0	0	0	0	0	0.35
36	3	Trinity	Walker	0	0	0	0	0	0	0	0	0	0	0.39
37	3	Trinity	Wise	1.73	376	335	230	558	558	0	2.94	0.76	3	0.32
38	3	Trinity	Young	0	0	0	0	0	0	0	0	0	0	0.48
Total				**29**	**10,023**	**7,439**	**244,779**	**56,190**	**246,844**	**0**	**222.93**	**6.47**	**210**	

ID	RFPG No.	RFPG Name	County	Area in Flood Planning Region (sqmi)	1% Annual Chance Flood Risk									
					Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (Day)	Population (Night)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	578.4	143.4	192	76	58	112	112	4	30.1	44.1	78
2	3	Trinity	Archer	107.5	15.3	2	0	2	5	5	0	5.1	5.4	6
3	3	Trinity	Chambers	1417	86.2	2,155	1,138	1,525	3,777	3,777	0	54.6	7.6	29
4	3	Trinity	Clay	122.7	21.4	35	0	2	14	14	0	21.6	11.3	5
5	3	Trinity	Collin	830.6	152.8	4,042	3,112	28,891	13,029	28,891	54	158.1	44.1	518
6	3	Trinity	Cooke	605	87.1	1,699	1,024	4,290	2,339	4,290	32	72.5	38.7	188
7	3	Trinity	Dallas	905.2	245.4	46,300	34,393	573,935	198,248	573,935	387	1,219.70	53.6	1,962
8	3	Trinity	Denton	948.7	235	8,389	5,566	45,142	30,321	45,142	98	291.5	73.2	630
9	3	Trinity	Ellis	948	194.6	2,201	1,436	4,105	4,561	4,561	56	167.4	112.9	409
10	3	Trinity	Fannin	43.8	4.9	168	124	75	105	105	0	4.6	2.2	14
11	3	Trinity	Freestone	785.2	182.9	458	133	139	272	272	2	47	57.2	114
12	3	Trinity	Grayson	342.8	46.4	339	263	189	455	455	1	36.4	18.2	119
13	3	Trinity	Grimes	138.4	26	132	56	13	72	72	0	7.8	11.3	26
14	3	Trinity	Hardin	6.4	0	0	0	0	0	0	0	0	0	0
15	3	Trinity	Henderson	571.1	153.7	2,540	1,099	1,012	2,643	2,643	11	37.5	45.3	87
16	3	Trinity	Hill	320.6	44.2	71	35	95	47	95	0	17.7	27.6	86
17	3	Trinity	Hood	2.5	0.03	0	0	0	0	0	0	0	0.03	0
18	3	Trinity	Houston	813.9	184.7	563	266	288	503	503	17	51.6	102.4	102
19	3	Trinity	Hunt	29.5	4.3	15	10	1	6	6	0	2.3	2.1	8
20	3	Trinity	Jack	657.5	84	212	51	112	112	112	6	38.7	33.3	70
21	3	Trinity	Johnson	359.4	41.9	1,790	1,302	4,506	3,485	4,506	22	58.9	19.6	145
22	3	Trinity	Kaufman	763.8	220.1	1,635	939	2,314	2,117	2,314	16	98.8	115.6	279
23	3	Trinity	Leon	807.3	176.3	485	7	248	279	279	5	49.6	79.8	108
24	3	Trinity	Liberty	650.4	326.7	8,179	5,196	10,966	11,405	11,405	5	234.5	77.5	111
25	3	Trinity	Limestone	95.8	17.7	50	15	41	46	46	3	9.3	12.9	32
26	3	Trinity	Madison	400.5	104.3	412	146	420	341	420	1	36.5	54.1	66
27	3	Trinity	Montague	404	33.2	357	159	55	232	232	0	21.2	16.1	44
28	3	Trinity	Navarro	1081.6	292.8	1,708	785	2,571	2,014	2,571	62	134.3	126.4	247
29	3	Trinity	Parker	473.5	40.4	1,253	415	3,011	1,848	3,011	19	42.5	21.8	140
30	3	Trinity	Polk	570.7	149	4,835	3,070	3,513	6,124	6,124	3	76.4	23.4	109
31	3	Trinity	Rockwall	115.8	32.6	508	322	901	1,097	1,097	15	27.2	6	56
32	3	Trinity	San Jacinto	307.5	120.5	3,237	2,642	1,918	3,15	3,15	0	80.6	17.7	37
33	3	Trinity	Tarrant	900.6	15.2	25,750	19,952	120,182	82,857	120,182	345	636.2	31.2	1,290
34	3	Trinity	Trinity	368.3	83.7	1,489	1,019	1,039	1,865	1,865	1	30.1	11	35
35	3	Trinity	Van Zandt	220.4	40.3	340	166	121	258	258	2	24.9	22.7	65
36	3	Trinity	Walker	403	109.4	1,651	1,175	5,036	2,909	5,036	5	43.6	41.4	52
37	3	Trinity	Wise	919.8	125.9	1,800	1,083	1,779	2,090	2,090	6	68.7	65.9	183
38	3	Trinity	Young	111.6	9.6	11	2	0	0	0	0	5.7	3.7	8
Total				**19,128.8**	**3,852**	**125,003**	**87,177**	**818,495**	**375,588**	**826,426**	**1,178**	**3,943**	**1,437.3**	**7,458**

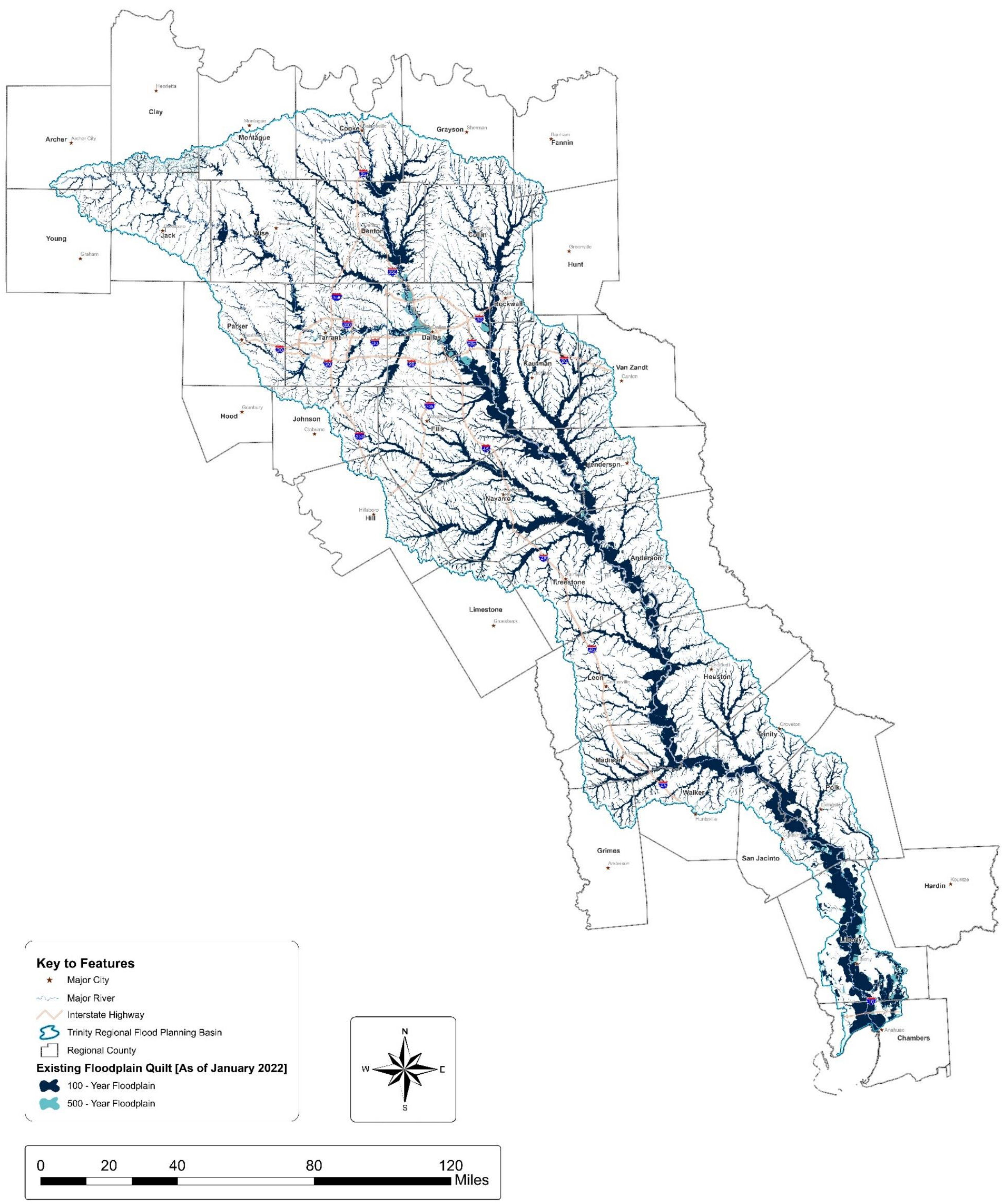
ID	RFPG No.	RFPG Name	County	0.2% Annual Chance Flood Risk									
				Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (Day)	Population (Night)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	8.4	134	63	55	106	106	0	12.9	2.1	16
2	3	Trinity	Archer	1.5	3	0	0	0	0	0	2.3	0.8	0
3	3	Trinity	Chambers	2.8	848	458	1,062	1,569	1,569	0	14.3	0.7	3
4	3	Trinity	Clay	6.7	46	4	5	26	26	0	14.1	4.5	4
5	3	Trinity	Collin	14.3	6,661	5,883	41,287	30,790	41,287	4	76.9	5.3	216
6	3	Trinity	Cooke	6.7	884	630	3,338	1,710	3,338	0	11.5	4	10
7	3	Trinity	Dallas	15.1	19,734	16,665	178,631	110,524	178,631	28	113.4	1.8	402
8	3	Trinity	Denton	15	6,537	5,300	35,486	24,327	35,486	2	61	7.6	119
9	3	Trinity	Ellis	13.8	1,608	1,193	4,793	4,052	4,793	0	43	8.4	47
10	3	Trinity	Fannin	1	150	109	131	164	164	0	4.8	0.6	7
11	3	Trinity	Freestone	10.4	364	217	275	495	495	0	17.7	4.1	14
12	3	Trinity	Grayson	5.3	244	218	143	421	421	0	12.1	3	15
13	3	Trinity	Grimes	2.7	67	33	11	56	56	0	3.9	1.5	6
14	3	Trinity	Hardin	0.01	0	0	0	0	0	0	0.01	0.0001	0
15	3	Trinity	Henderson	9.6	2,515	1,978	1,892	5,070	5,070	1	15.4	3.4	18
16	3	Trinity	Hill	5.7	69	33	101	54	101	0	18.9	3.9	23
17	3	Trinity	Hood	0.01	0	0	0	0	0	0	0	0.01	0
18	3	Trinity	Houston	10.9	359	219	287	408	408	0	16.7	4	19
19	3	Trinity	Hunt	0.6	18	13	1	13	13	0	1.7	0.4	0
20	3	Trinity	Jack	11	159	45	115	137	137	0	19.6	5	15
21	3	Trinity	Johnson	5.9	1,350	970	5,263	3,066	5,263	0	22	3.2	17
22	3	Trinity	Kaufman	10.5	1,098	754	3,235	2,020	3,235	1	45.4	6.7	48
23	3	Trinity	Leon	9.9	282	1	547	265	547	1	19.4	3.7	20
24	3	Trinity	Liberty	7.8	970	616	2,482	2,243	2,482	0	36.4	3	9
25	3	Trinity	Limestone	1.6	40	14	65	62	65	1	5.1	1.3	2
26	3	Trinity	Madison	5.3	169	87	185	135	185	1	13.6	3.1	14
27	3	Trinity	Montague	4.6	172	86	48	149	149	0	8.4	2.3	9
28	3	Trinity	Navarro	16.6	1,002	775	2,344	1,841	2,344	1	43.9	10.2	43
29	3	Trinity	Parker	6	965	459	2,920	1,903	2,920	0	11.9	3.2	8
30	3	Trinity	Polk	8.7	1,736	1,503	1,729	3,095	3,095	0	17.6	1	19
31	3	Trinity	Rockwall	2.4	695	596	1,673	2,109	2,109	2	9.7	1.2	10
32	3	Trinity	San Jacinto	4.5	1,072	998	1,145	1,363	1,363	0	13.6	0.5	5
33	3	Trinity	Tarrant	17.9	21,830	19,016	108,809	91,344	108,809	9	127.9	4.1	257
34	3	Trinity	Trinity	5.9	398	302	332	538	538	0	7	0.8	9
35	3	Trinity	Van Zandt	5.1	331	175	1,112	291	1,112	0	18.2	3.4	10
36	3	Trinity	Walker	6.6	536	369	4,844	1,854	4,844	0	7.4	1.4	6
37	3	Trinity	Wise	11.9	857	627	1,087	1,351	1,351	0	17.1	6.5	22
38	3	Trinity	Young	1.7	4	1	0	2	2	0	1.3	0.8	1
Total				**274**	**73,907**	**60,410**	**405,433**	**293,553**	**412,514**	**51**	**886**	**117.5**	**1,443**

ID	RFPG No.	RFPG Name	County	Possible Flood Prone Areas										Average SVI of features in floodplain or flood prone areas
				Area (sqmi)	Number of Structures in Flood Prone Area	Residential Structures in in Flood Prone Area	Population (Day)	Population (Night)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)	
1	3	Trinity	Anderson	0.03	0	0	0	0	0	0	0.03	0.02	0	0.39
2	3	Trinity	Archer	0	0	0	0	0	0	0	0	0	0	0.44
3	3	Trinity	Chambers	0	838	559	610	2,088	2,088	0	16.46	0.65	0	0.32
4	3	Trinity	Clay	0	0	0	0	0	0	0	0	0	0	0.21
5	3	Trinity	Collin	8.43	30	29	35	142	142	0	0.77	0.01	0	0.20
6	3	Trinity	Cooke	0.15	2	0	0	0	0	0	0	0.08	0	0.39
7	3	Trinity	Dallas	11.67	7,380	5,448	227,603	46,603	227,603	0	178.21	0.57	181	0.56
8	3	Trinity	Denton	0.05	1	0	553	0	553	0	0.04	0.01	0	0.26
9	3	Trinity	Ellis	0.25	1	0	1	2	2	0	0.37	0.18	1	0.41
10	3	Trinity	Fannin	0	0	0	0	0	0	0	0	0	0	0.33
11	3	Trinity	Freestone	0	0	0	0	0	0	0	0	0	0	0.56
12	3	Trinity	Grayson	0	0	0	0	0	0	0	0	0	0	0.27
13	3	Trinity	Grimes	0	0	0	0	0	0	0	0	0	0	0.46
14	3	Trinity	Hardin	0	0	0	0	0	0	0	0	0	0	-999
15	3	Trinity	Henderson	1.75	3	1	0	0	0	0	0.74	1.39	0	0.45
16	3	Trinity	Hill	0.29	4	3	2	7	7	0	0.36	0.21	0	0.64
17	3	Trinity	Hood	0	0	0	0	0	0	0	0	0	0	0.09
18	3	Trinity	Houston	0.19	0	0	0	0	0	0	0.03	0.16	0	0.45
19	3	Trinity	Hunt	0	0	0	0	0	0	0	0	0	0	0.39
20	3	Trinity	Jack	0.03	2	0	0	1	1	0	0.26	0.23	0	0.34
21	3	Trinity	Johnson	0	2	0	0	0	0	0	0.05	0.03	0	0.36
22	3	Trinity	Kaufman	1.27	110	92	64	202	202	0	2.53	0.93	0	0.46
23	3	Trinity	Leon	0.05	0	0	0	0	0	0	0	0.01	0	0.59
24	3	Trinity	Liberty	0.01	27	18	82	58	82	0	0.12	0	0	0.60
25	3	Trinity	Limestone	0.01	0	0	0	0	0	0	0	0.01	0	0.57
26	3	Trinity	Madison	0	0	0	0	0	0	0	0	0	0	0.43
27	3	Trinity	Montague	0.94	2	0	0	0	0	0	0.06	0.24	0	0.40
28	3	Trinity	Navarro	1.01	6	0	3	10	10	0	1.93	0.83	2	0.64
29	3	Trinity	Parker	0.05	0	0	0	0	0	0	0.03	0.02	0	0.25
30	3	Trinity	Polk	0	0	0	0	0	0	0	0	0	0	0.50
31	3	Trinity	Rockwall	0.06	0	0	0	0	0	0	0.04	0.06	0	0.15
32	3	Trinity	San Jacinto	0	0	0	0	0	0	0	0	0	0	0.52
33	3	Trinity	Tarrant	1.19	1,239	954	15,596	6,519	15,596	0	17.96	0.07	23	0.40
34	3	Trinity	Trinity	0	0	0	0	0	0	0	0	0	0	0.56
35	3	Trinity	Van Zandt	0	0	0	0	0	0	0	0	0	0	0.35
36	3	Trinity	Walker	0	0	0	0	0	0	0	0	0	0	0.39
37	3	Trinity	Wise	1.73	376	335	230	558	558	0	2.94	0.76	3	0.32
38	3	Trinity	Young	0	0	0	0	0	0	0	0	0	0	0.48
Total				**29**	**10,023**	**7,439**	**244,779**	**56,190**	**246,844**	**0**	**223**	**6.47**	**210**	

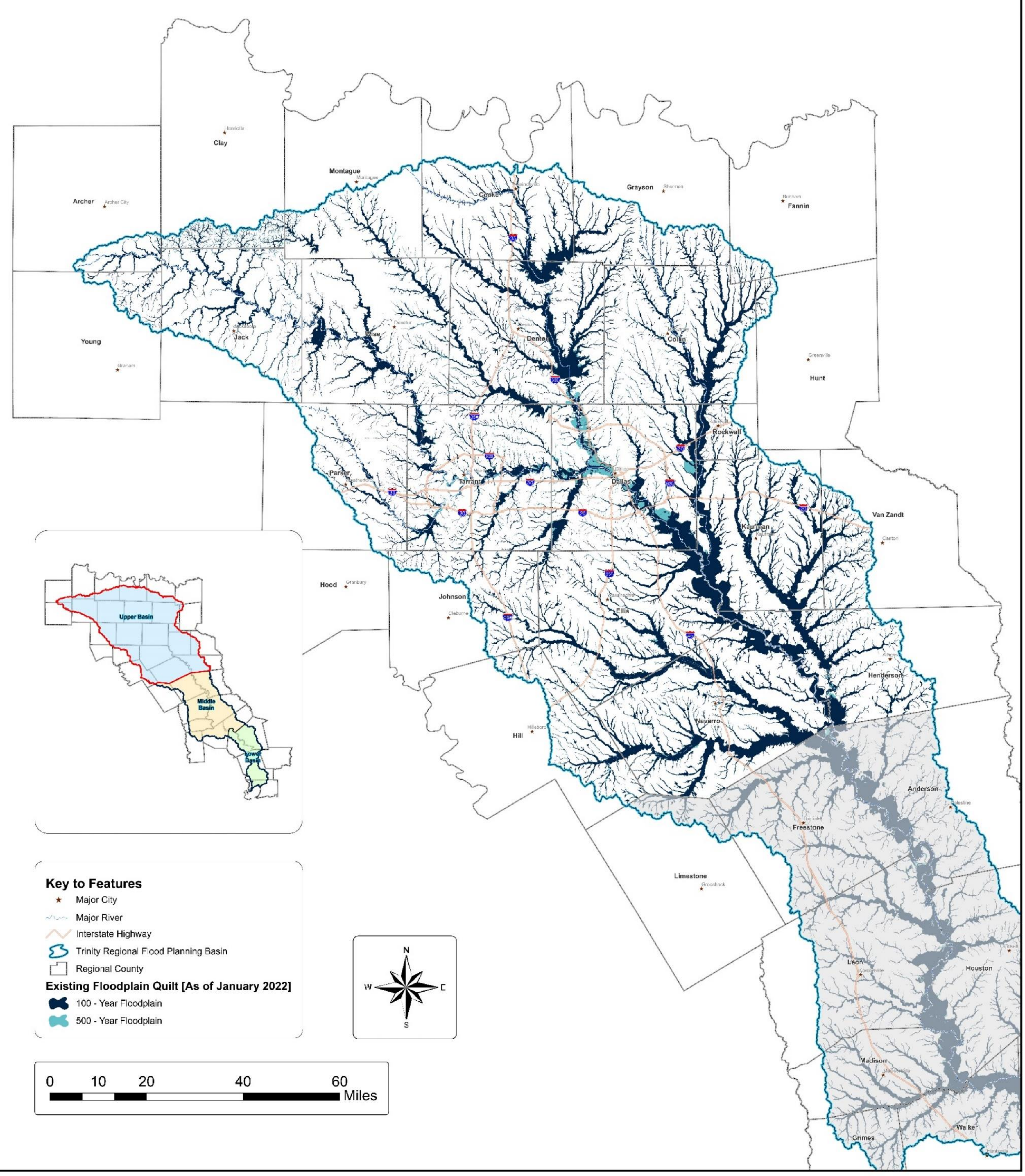
Trinity Basin: Figure 1: Floodplain Quilt Data Sources



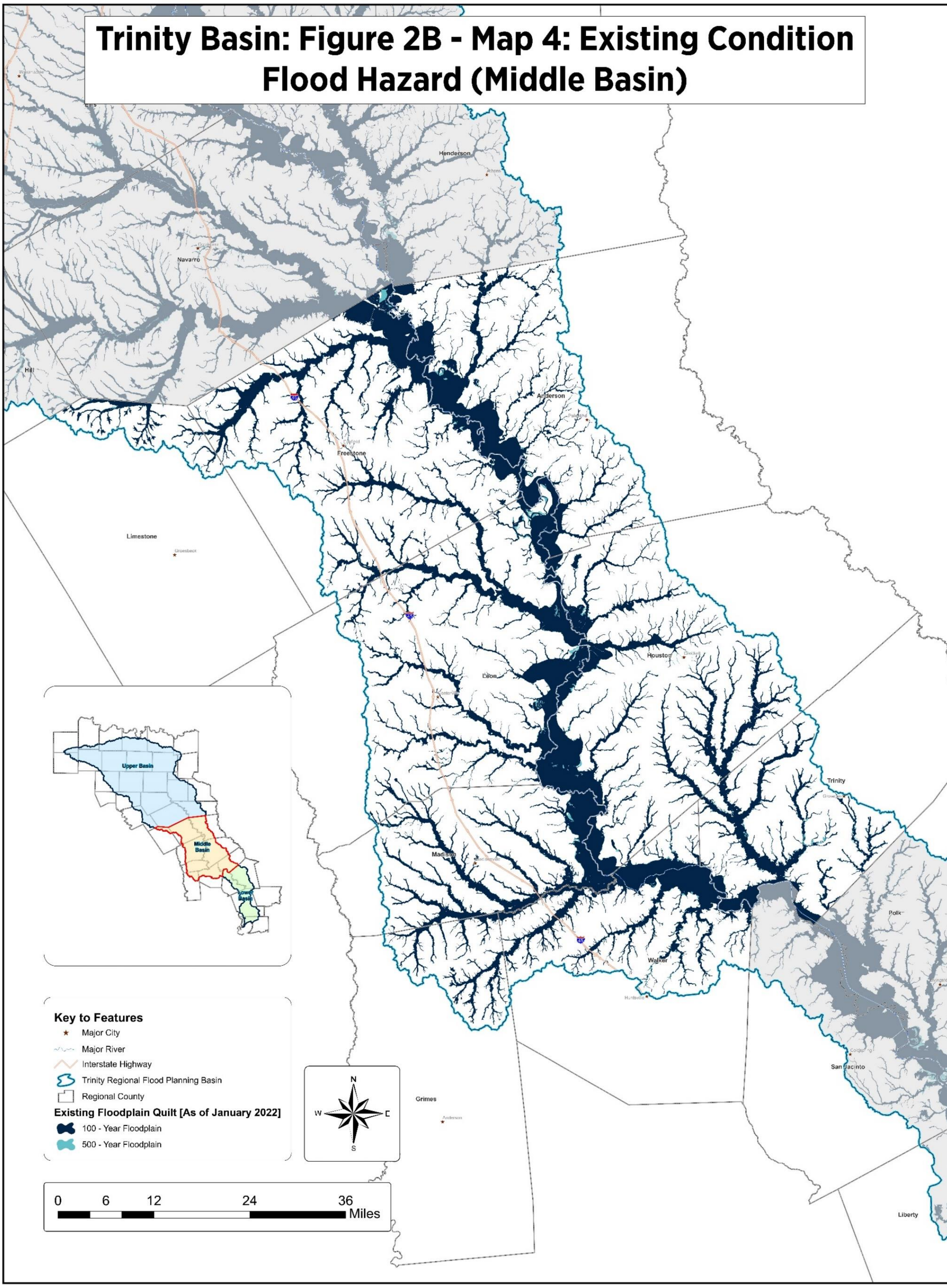
Trinity Basin: Figure 2 - Map 4: Existing Condition Flood Hazard (Overview)



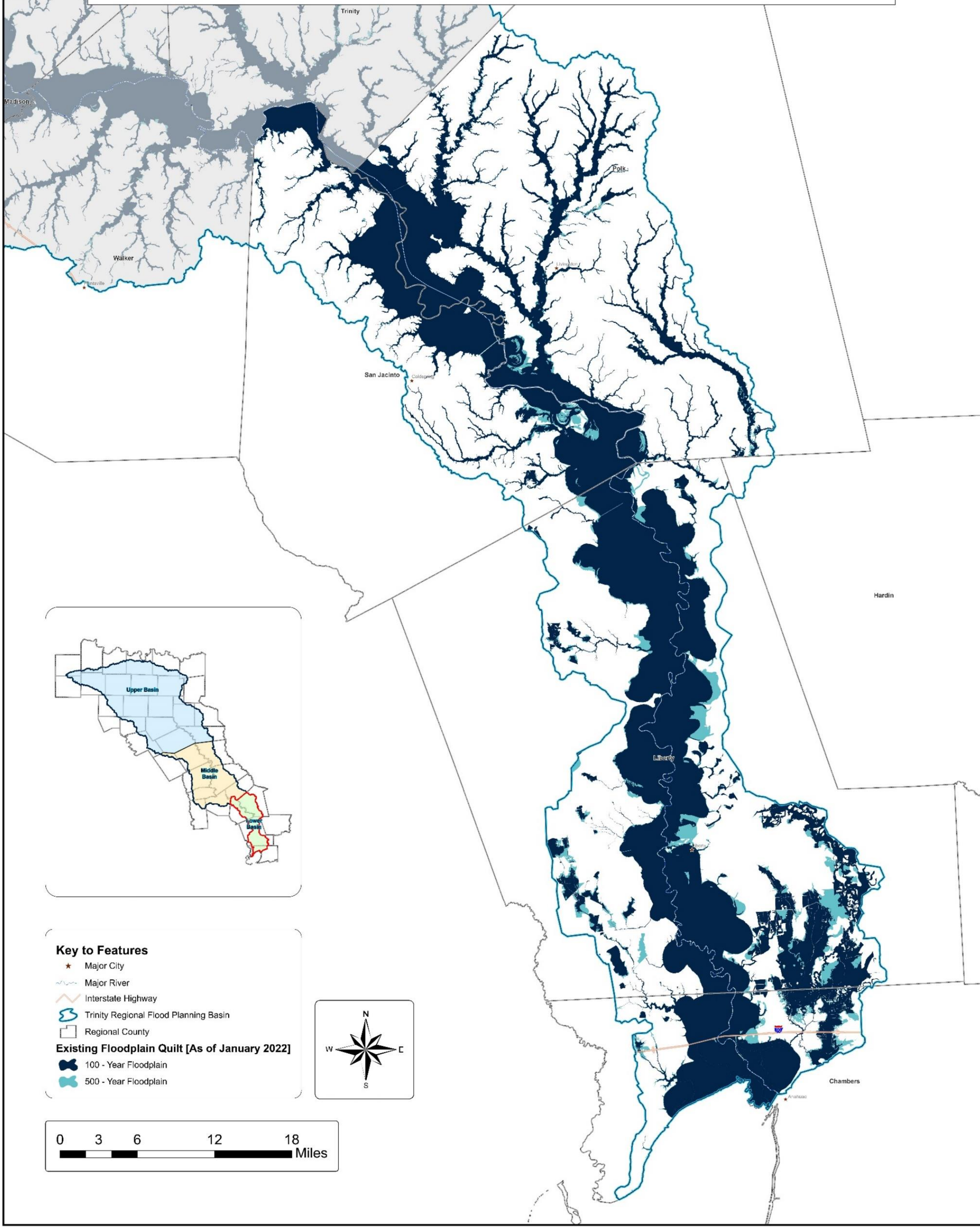
Trinity Basin: Figure 2A - Map 4: Existing Condition Flood Hazard (Upper Basin)



Trinity Basin: Figure 2B - Map 4: Existing Condition Flood Hazard (Middle Basin)

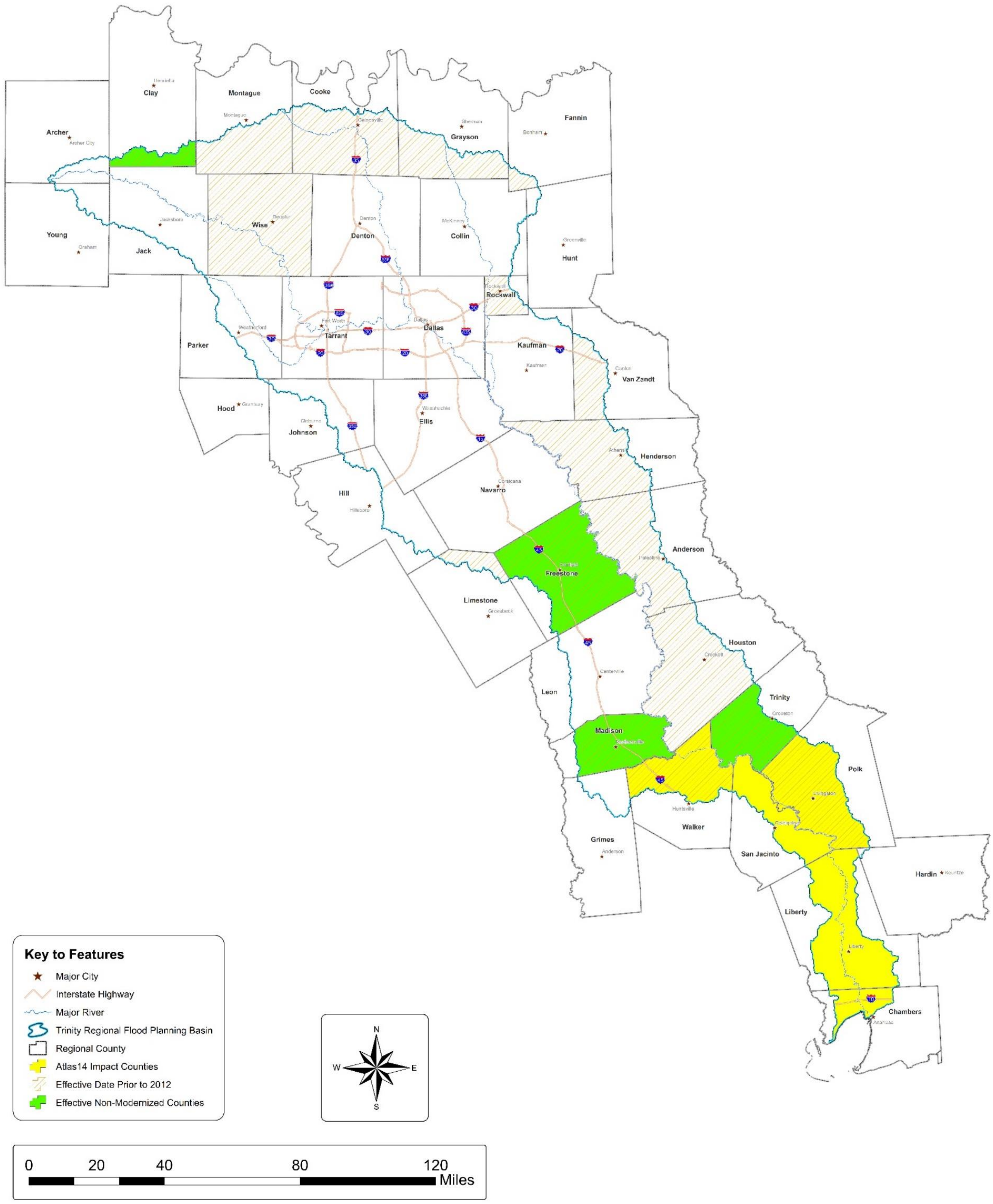


Trinity Basin: Figure 2C - Map 4: Existing Condition Flood Hazard (Lower Basin)



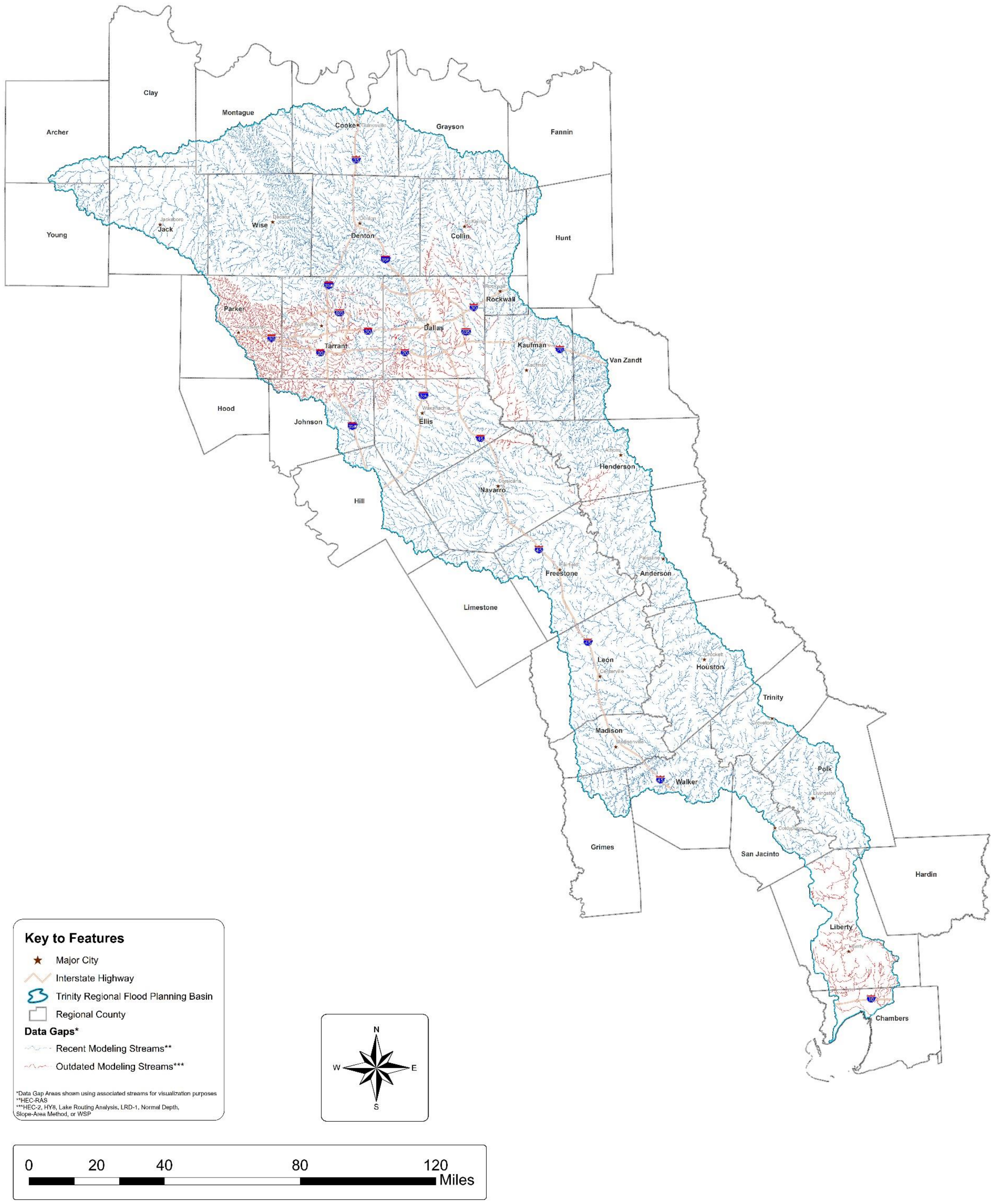
Trinity Basin: Figure 3A - Map 5: Floodplain Quilt Data Gaps

(Counties impacted by NOAA Atlas 14 Rainfall, non-modernized with historic data, and/or have data that is more than a decade old)



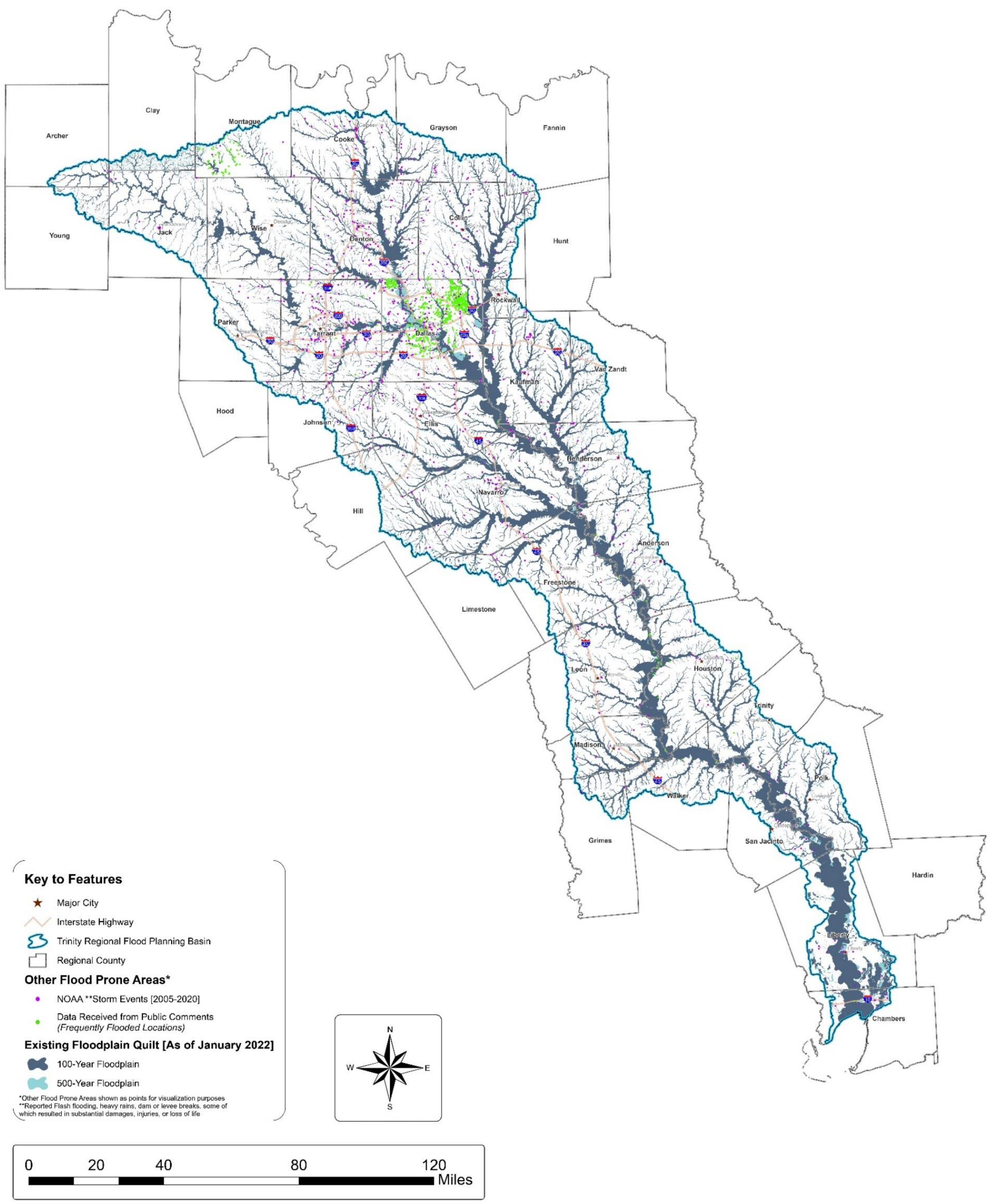
Trinity Basin: Figure 3B - Map 5: Floodplain Quilt Data Gaps

(Streams *recently-modeled and in digital format vs streams with **outdated and/or no modeling)

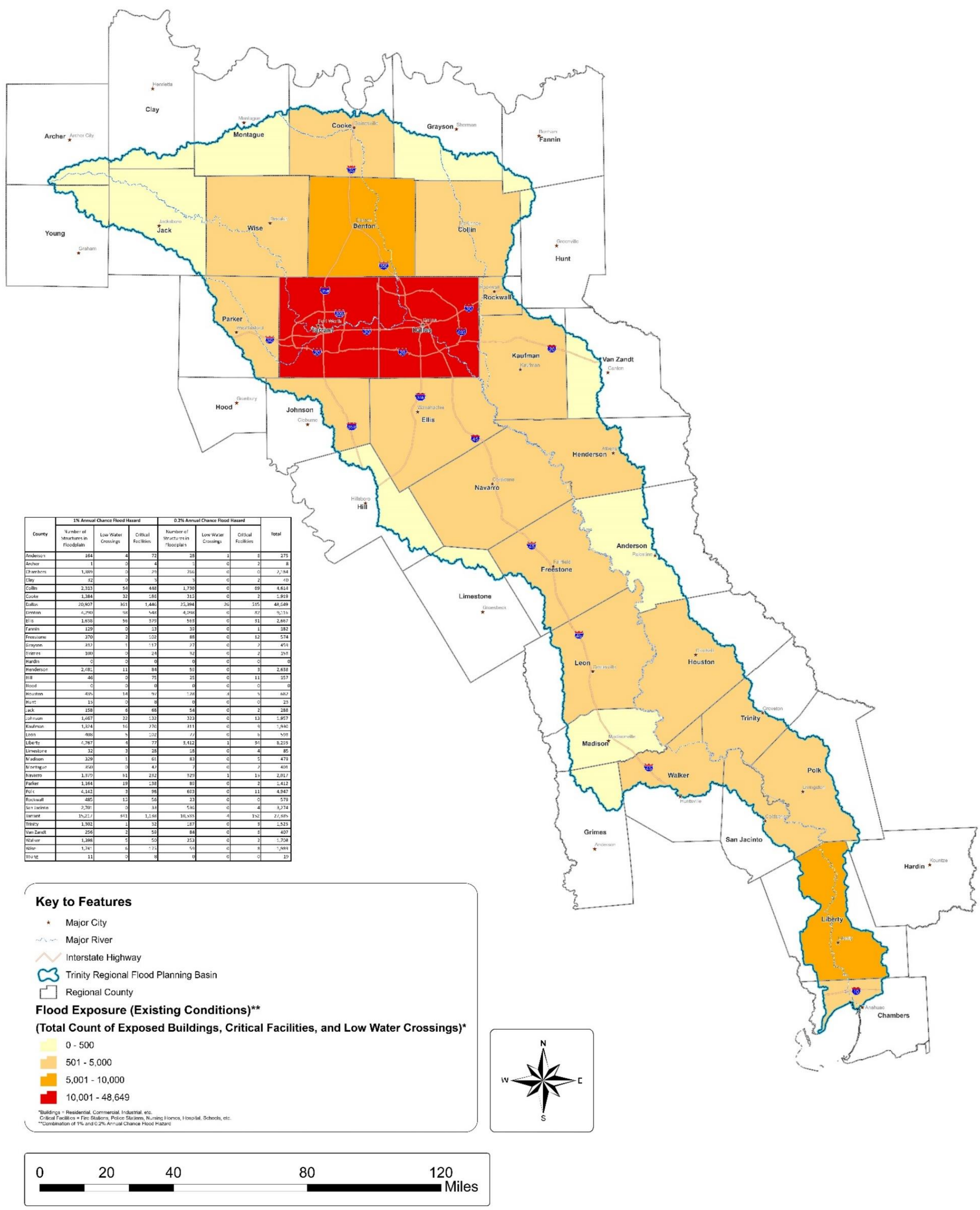


Trinity Basin: Figure 3C - Map 5: Other Flood Prone Areas

(Data received from public comments and NOAA Storm Events Database [2005 - 2020])

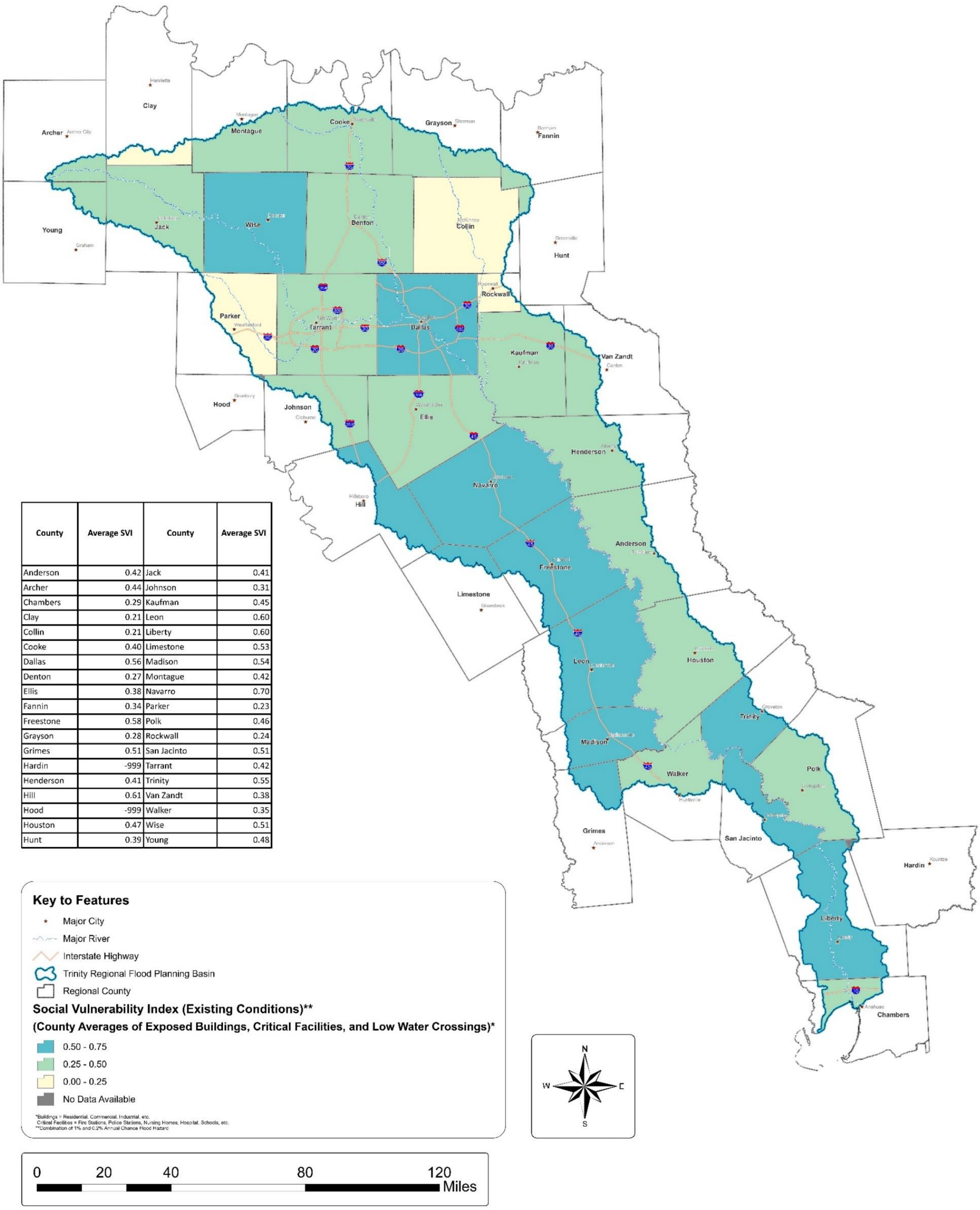


Trinity Basin: Figure 4 - Map 6: Existing Condition Flood Exposure



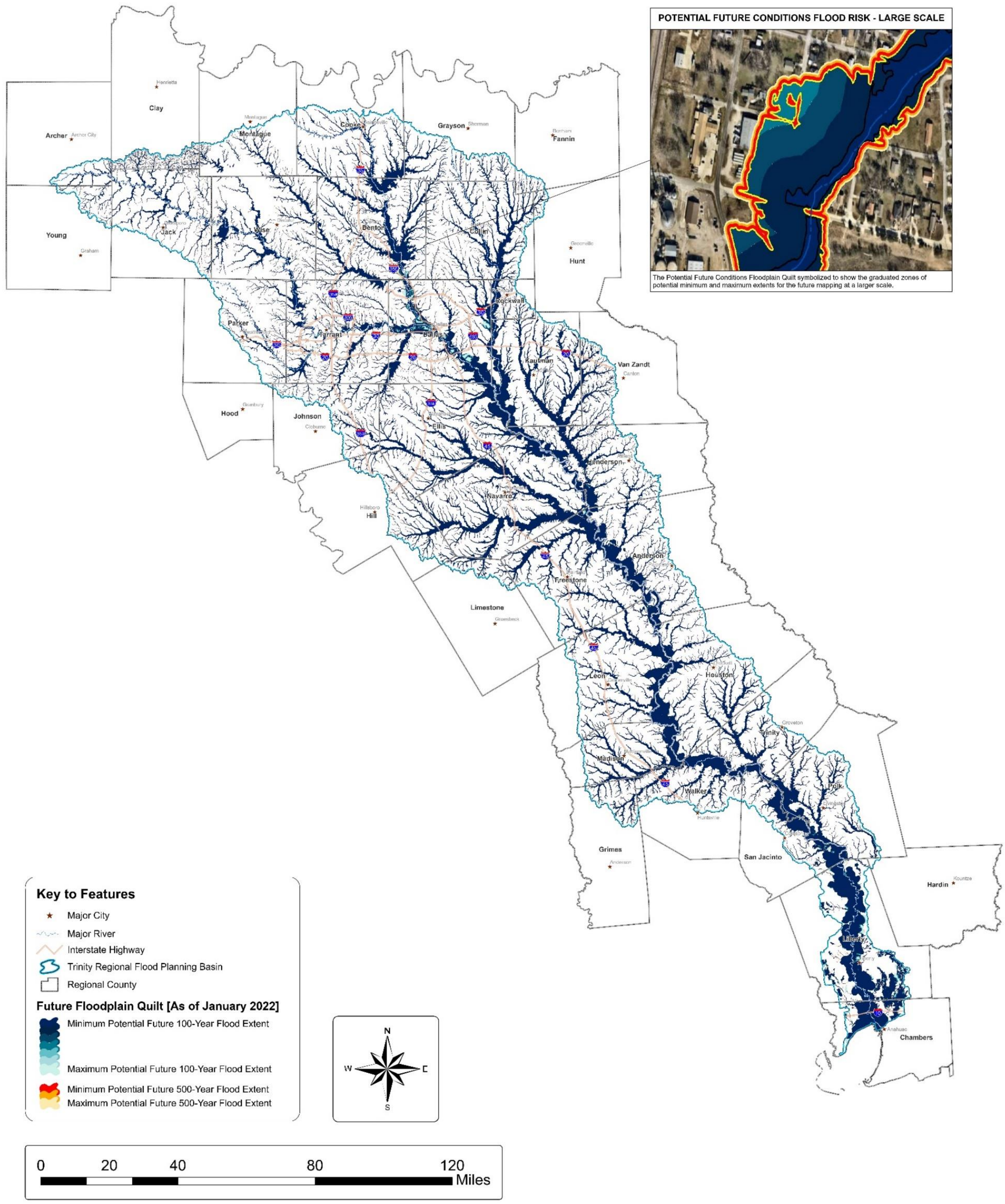
County	1% Annual Chance Flood Hazard			0.2% Annual Chance Flood Hazard			Total
	Number of Structures in Floodplain	Low Water Crossings	Critical Facilities	Number of Structures in Floodplain	Low Water Crossings	Critical Facilities	
Anderson	164	4	72	28	1	6	275
Archer	1	0	4	1	0	2	8
Chambers	1,389	0	29	766	0	0	2,184
Clay	32	0	3	3	0	2	40
Collin	2,313	54	448	1,730	0	69	4,614
Cooke	1,384	32	186	315	0	2	1,919
Dallas	20,907	361	1,446	25,394	26	515	48,649
Denton	4,290	98	548	4,098	0	82	9,116
Ellis	1,638	56	379	563	0	31	2,667
Fannin	129	0	13	39	0	1	182
Freestone	370	2	102	88	0	12	574
Grayson	312	1	117	27	0	2	459
Grimes	100	0	24	32	0	2	158
Hardin	0	0	0	0	0	0	0
Henderson	2,481	11	84	59	0	3	2,638
Hill	46	0	75	25	0	11	157
Hood	0	0	0	0	0	0	0
Houston	435	14	97	128	3	5	682
Hunt	15	0	8	0	0	0	23
Jack	158	6	68	54	0	2	288
Johnson	1,467	22	132	323	0	13	1,957
Kaufman	1,324	16	270	311	0	9	1,930
Leon	408	5	102	77	0	6	598
Liberty	4,767	4	77	3,412	1	34	8,295
Limestone	32	3	28	18	0	4	85
Madison	329	1	61	83	0	5	479
Montague	350	0	42	7	0	2	401
Navarro	1,379	61	232	329	1	15	2,017
Parker	1,164	19	138	89	0	2	1,412
Polk	4,142	3	98	693	0	11	4,947
Rockwall	485	15	56	23	0	0	579
San Jacinto	2,701	0	33	536	0	4	3,274
Tarrant	15,217	341	1,138	10,533	4	152	27,385
Trinity	1,302	1	32	187	0	3	1,525
Van Zandt	256	2	59	84	0	6	407
Walker	1,398	5	50	253	0	2	1,708
Wise	1,741	6	175	59	0	8	1,989
Young	11	0	8	0	0	0	19

Trinity Basin: Figure 5 - Map 7: Existing Condition Vulnerability and Critical Infrastructure

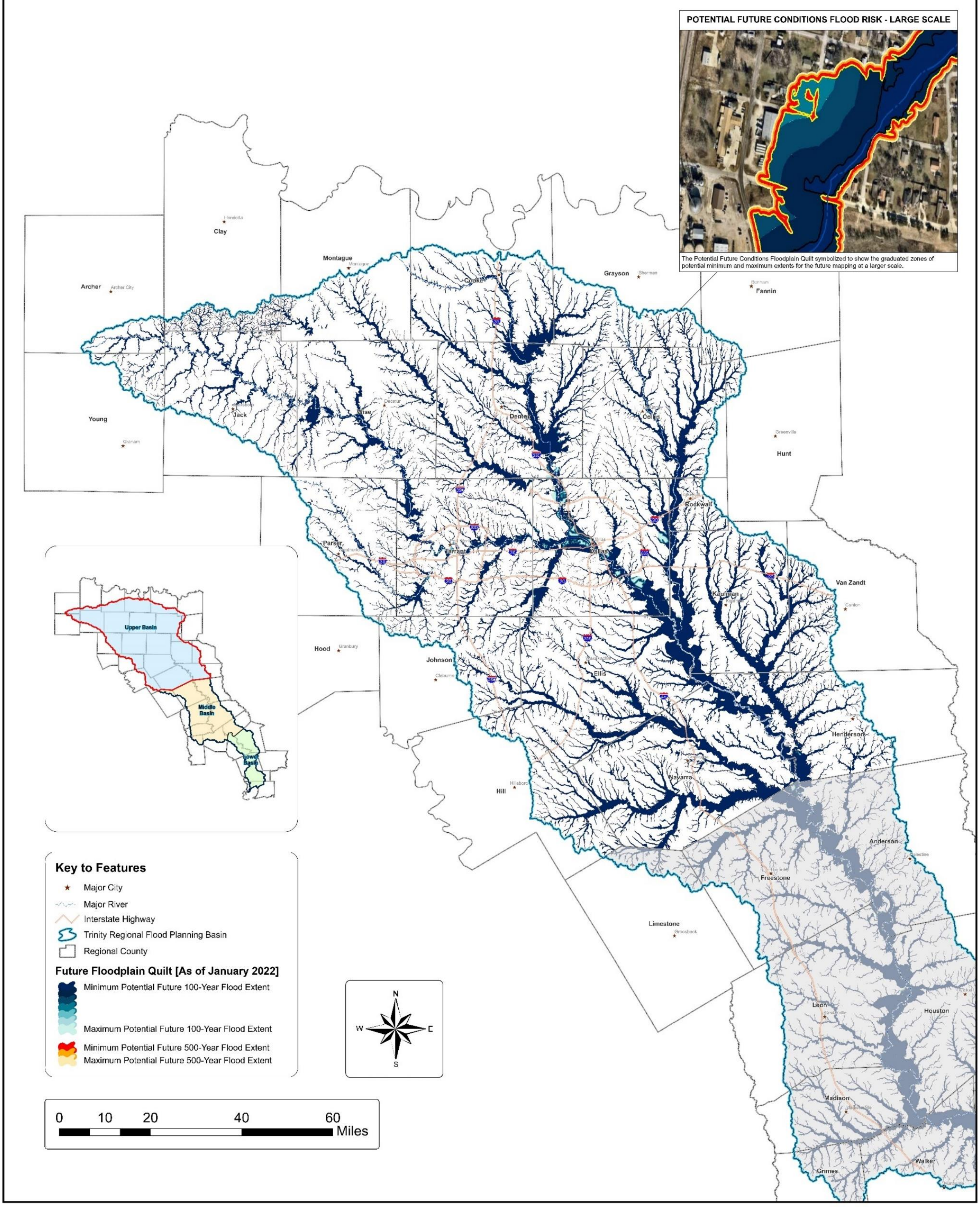


County	Average SVI	County	Average SVI
Anderson	0.42	Jack	0.41
Archer	0.44	Johnson	0.31
Chambers	0.29	Kaufman	0.45
Clay	0.21	Leon	0.60
Collin	0.21	Liberty	0.60
Cooke	0.40	Limestone	0.53
Dallas	0.56	Madison	0.54
Denton	0.27	Montague	0.42
Ellis	0.38	Navarro	0.70
Fannin	0.34	Parker	0.23
Freestone	0.58	Polk	0.46
Grayson	0.28	Rockwall	0.24
Grimes	0.51	San Jacinto	0.51
Hardin	-999	Tarrant	0.42
Henderson	0.41	Trinity	0.55
Hill	0.61	Van Zandt	0.38
Hood	-999	Walker	0.35
Houston	0.47	Wise	0.51
Hunt	0.39	Young	0.48

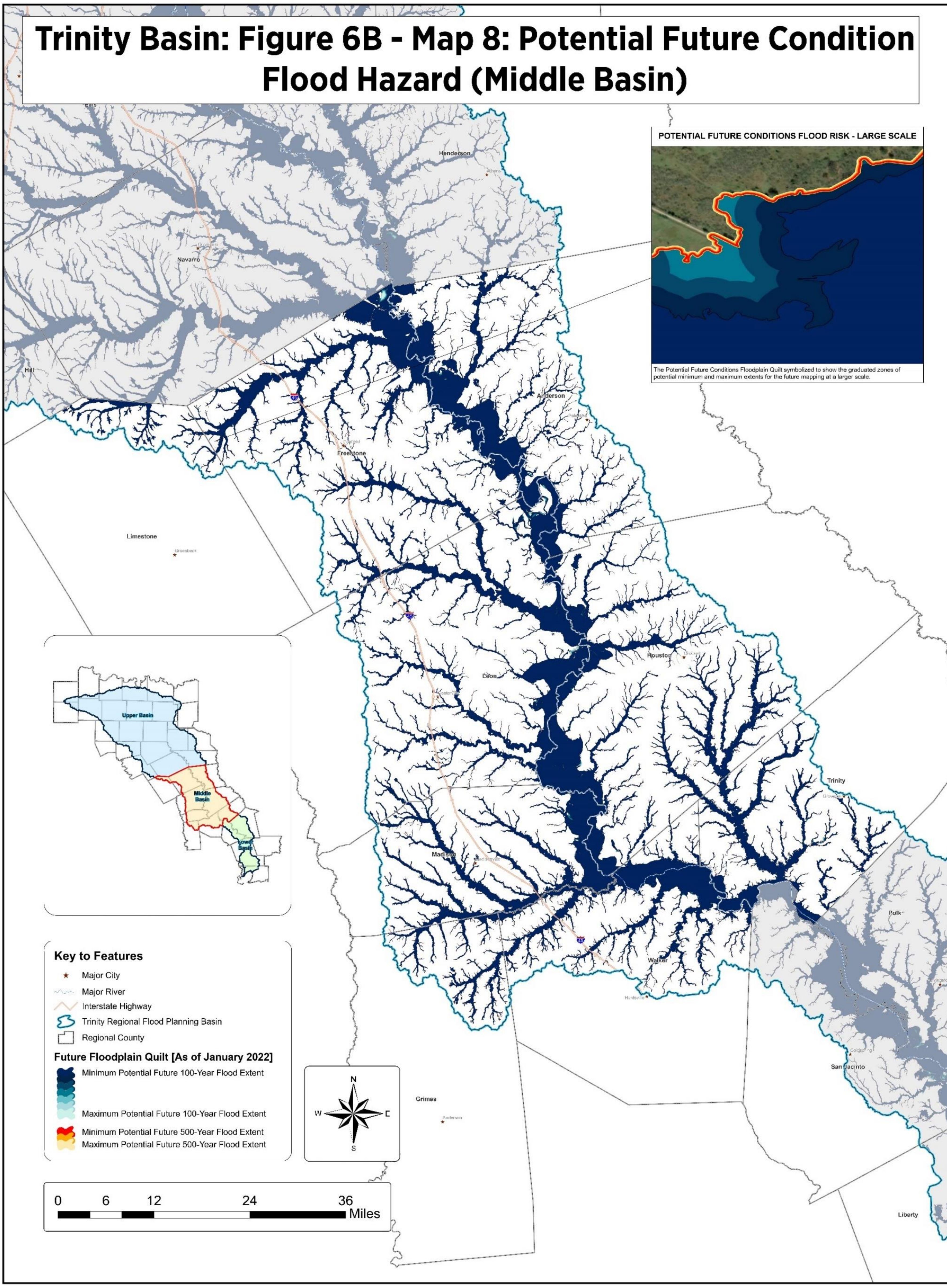
Trinity Basin: Figure 6 - Map 8: Potential Future Condition Flood Hazard (Overview)



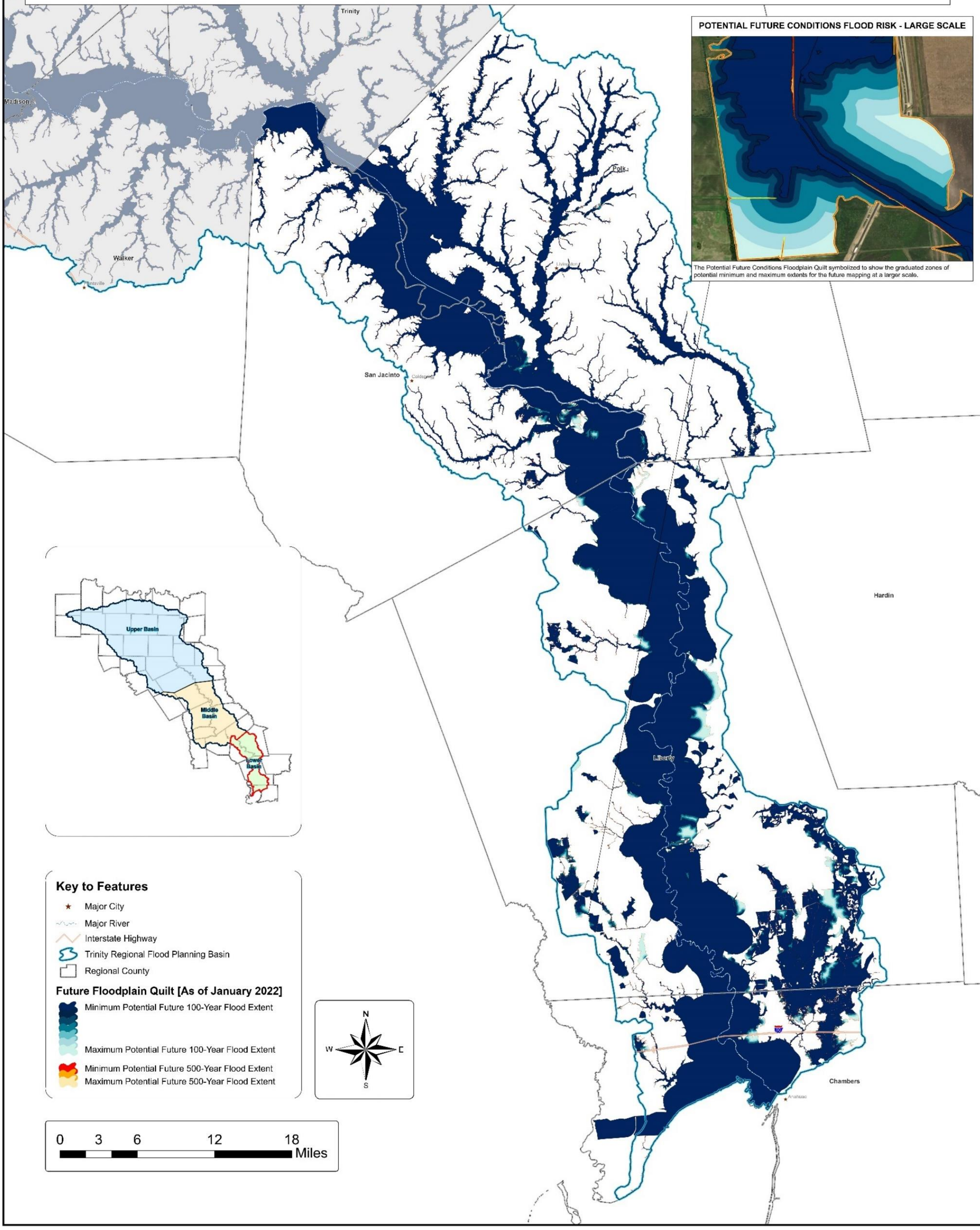
Trinity Basin: Figure 6A - Map 8: Potential Future Condition Flood Hazard (Upper Basin)



Trinity Basin: Figure 6B - Map 8: Potential Future Condition Flood Hazard (Middle Basin)

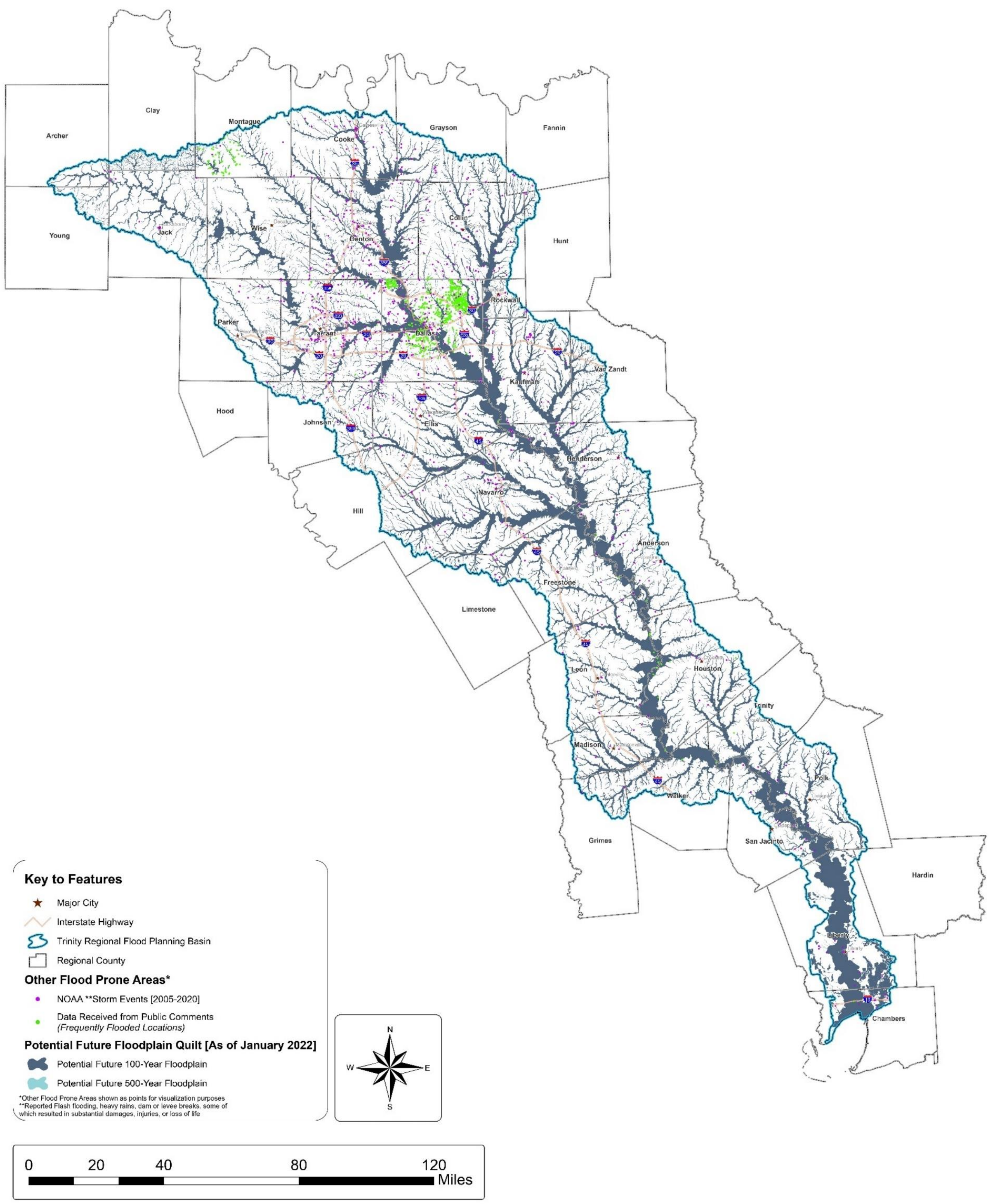


Trinity Basin: Figure 6C - Map 8: Potential Future Condition Flood Hazard (Lower Basin)

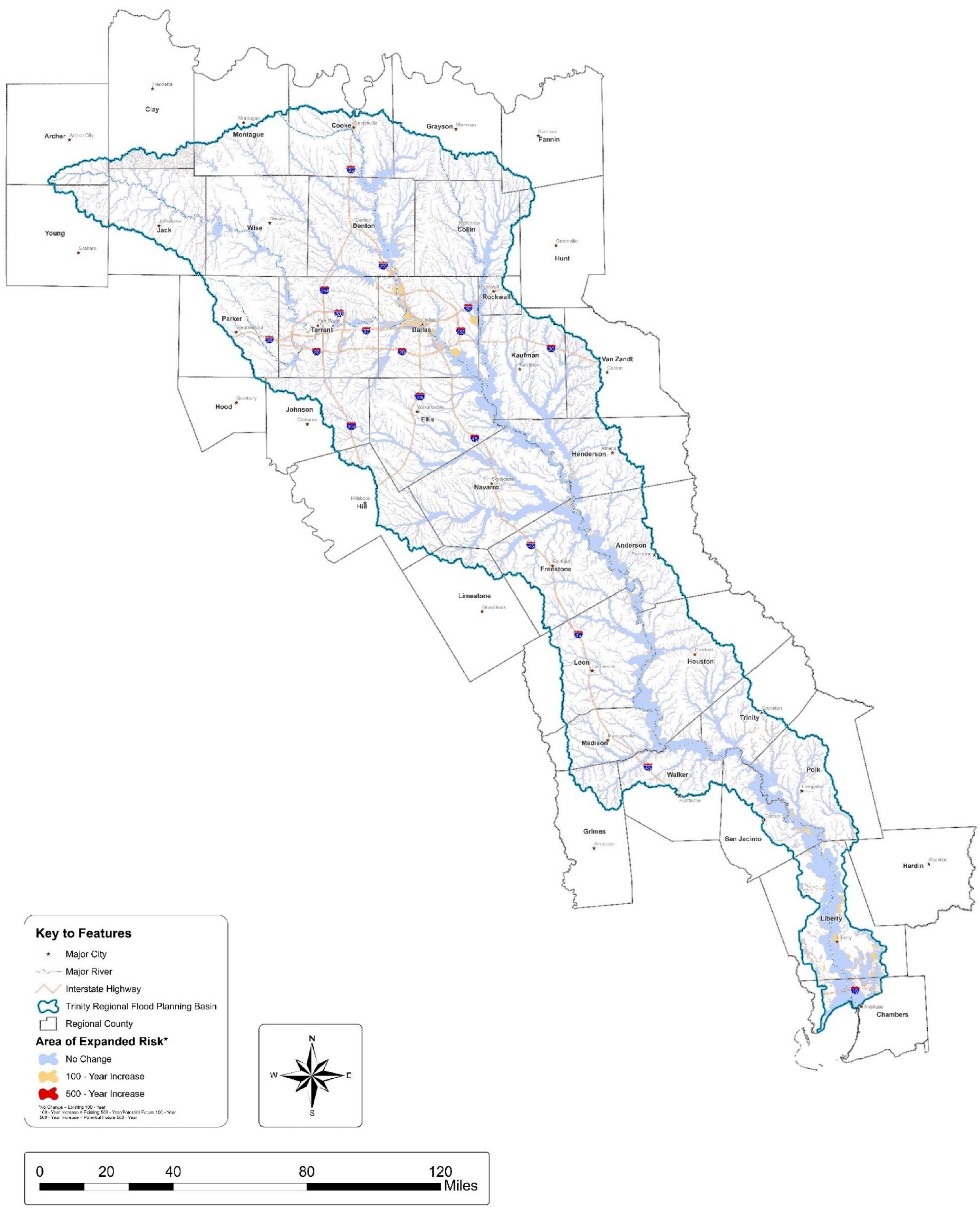


Trinity Basin: Figure 7 - Map 9: Other Flood Prone Areas

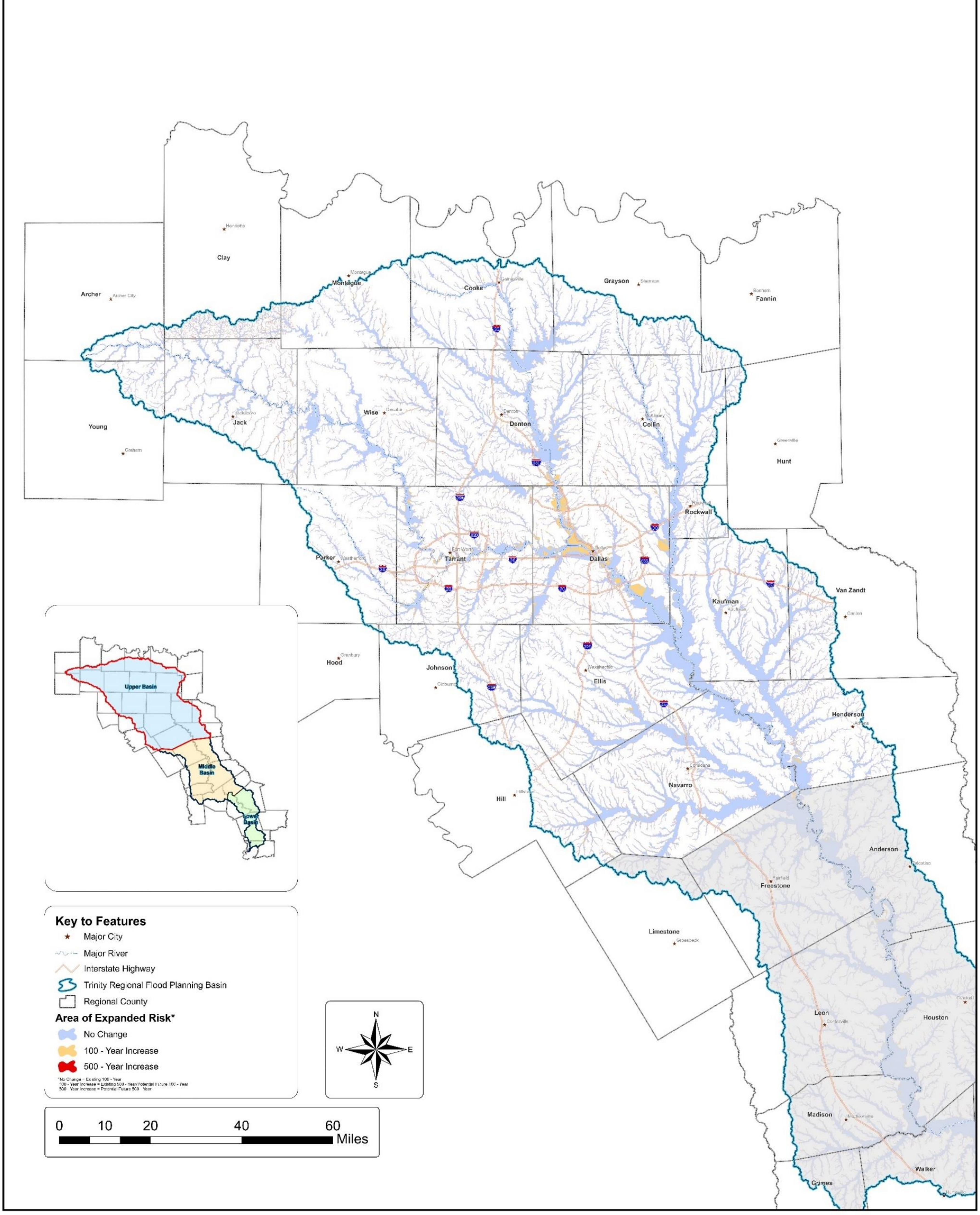
(Data received from public comments and NOAA Storm Events Database [2005 - 2020])



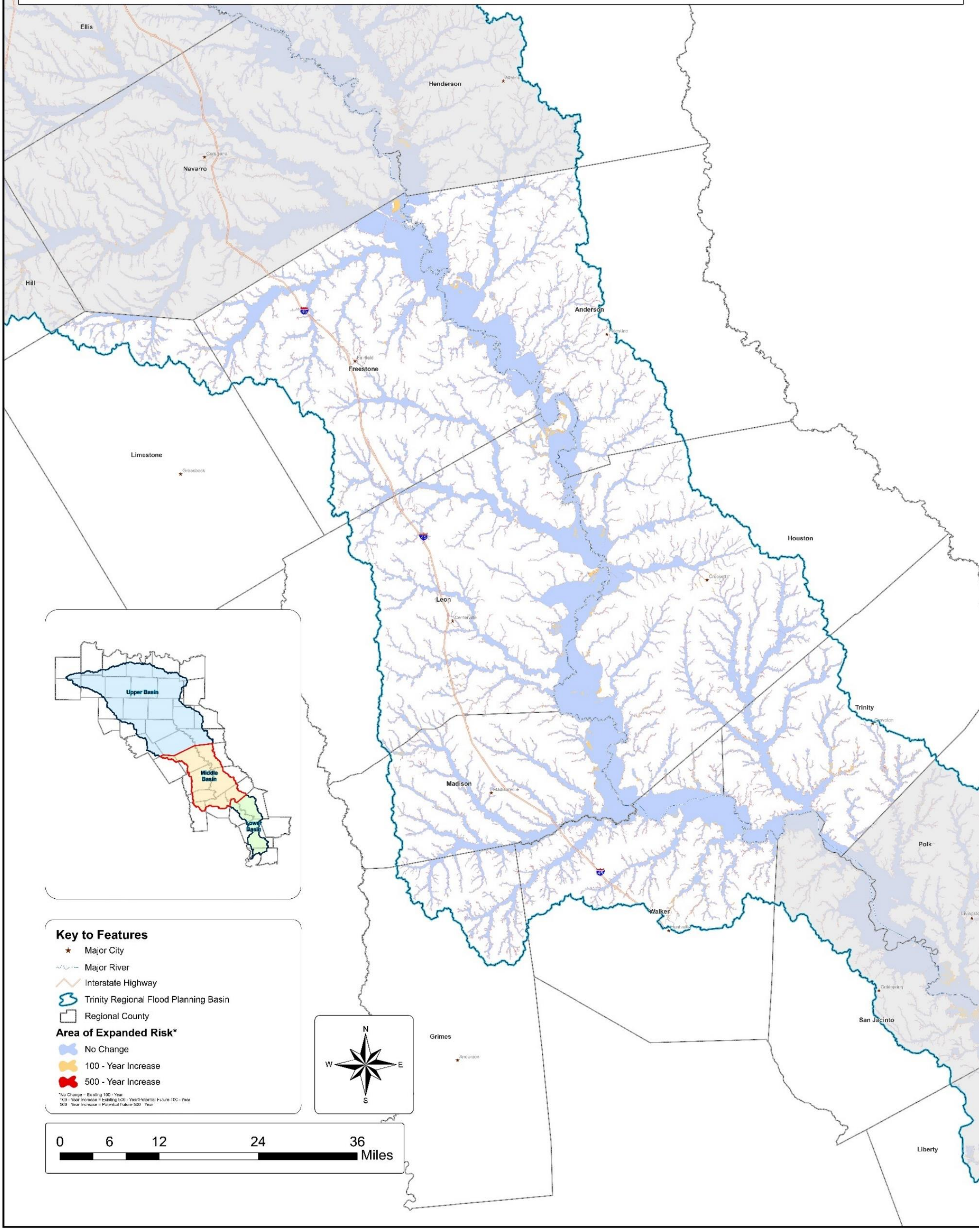
Trinity Basin: Figure 8 - Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition (Overview)



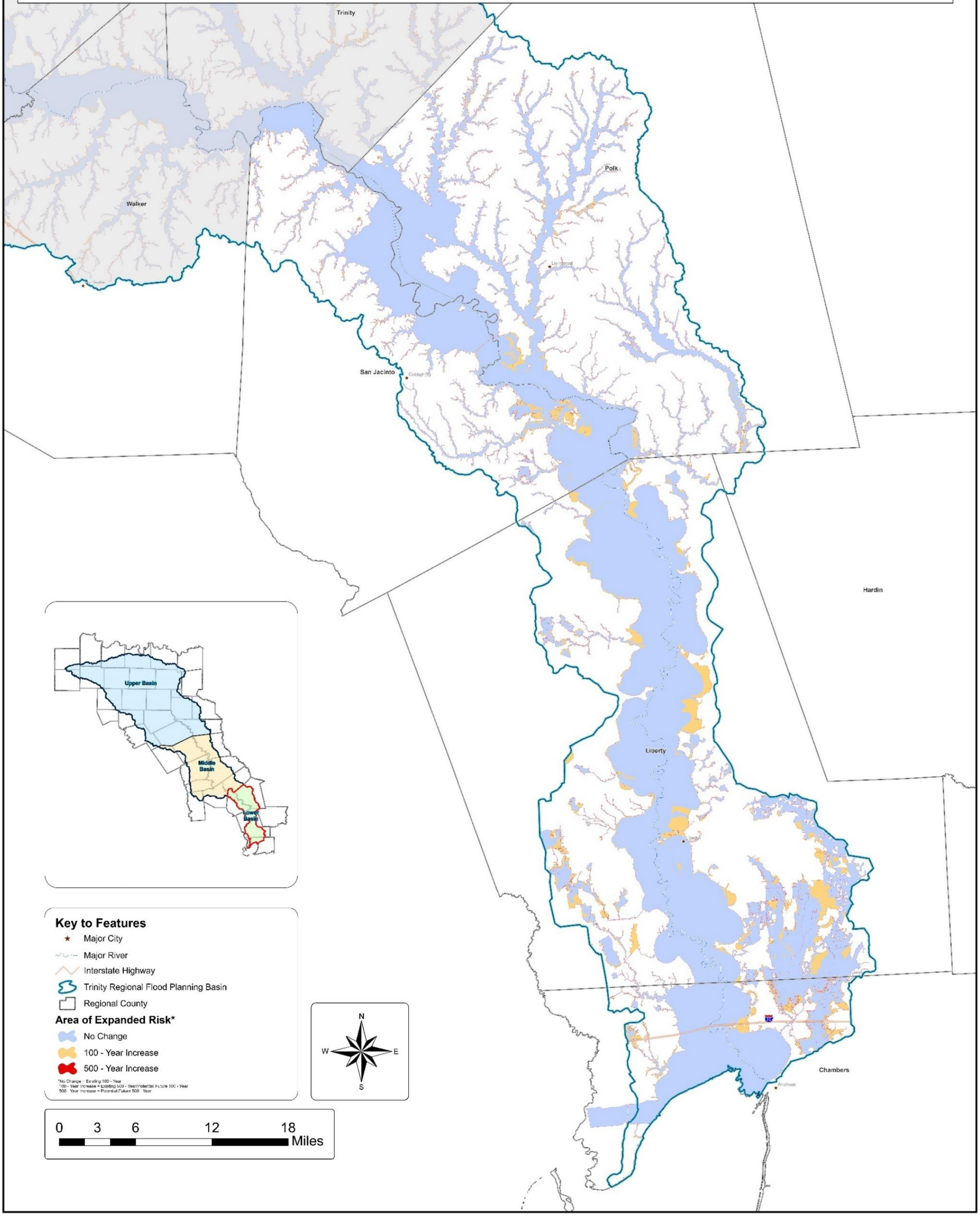
Trinity Basin: Figure 8A - Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition (Upper Basin)



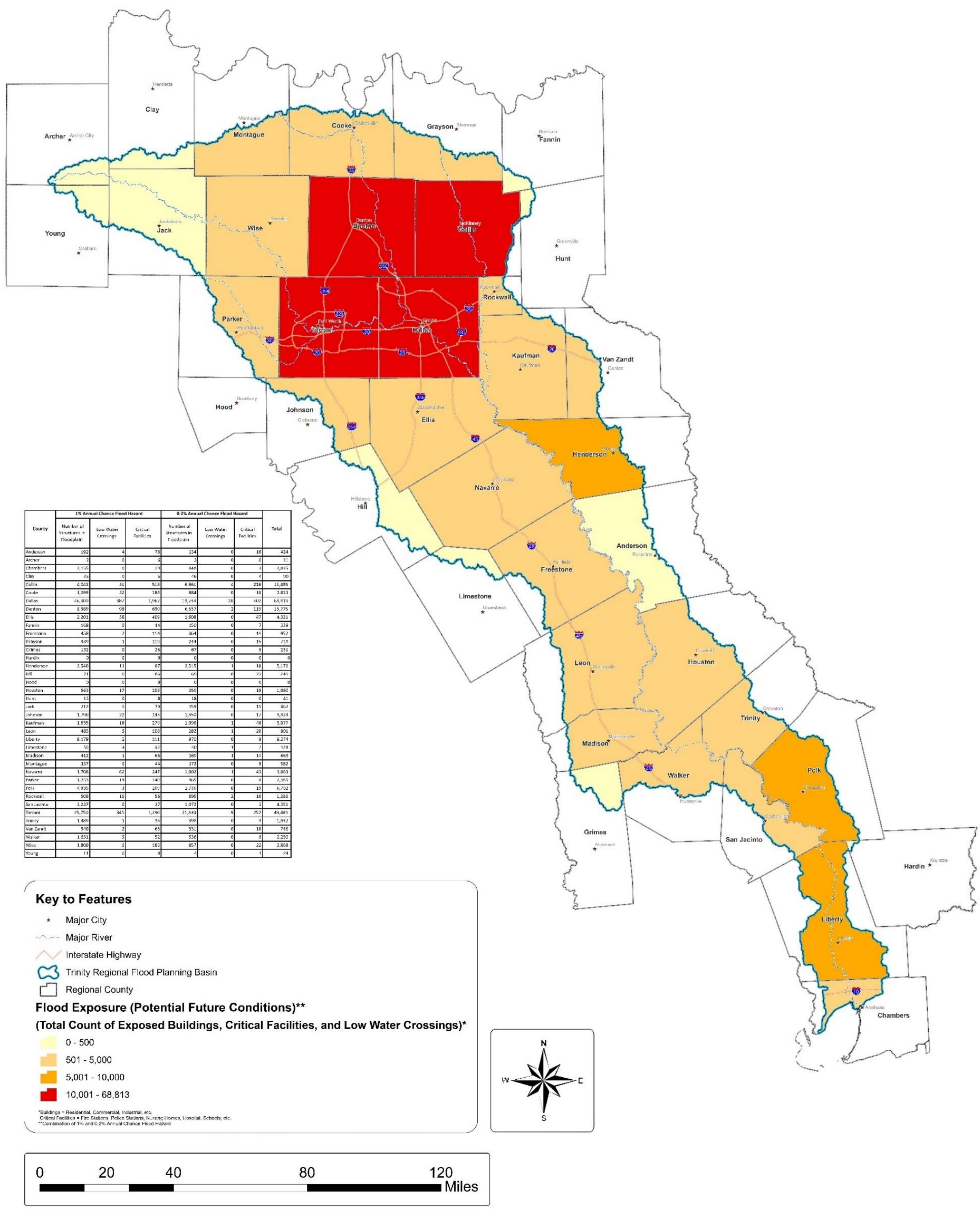
Trinity Basin: Figure 8B - Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition (Middle Basin)



Trinity Basin: Figure 8C - Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition (Lower Basin)



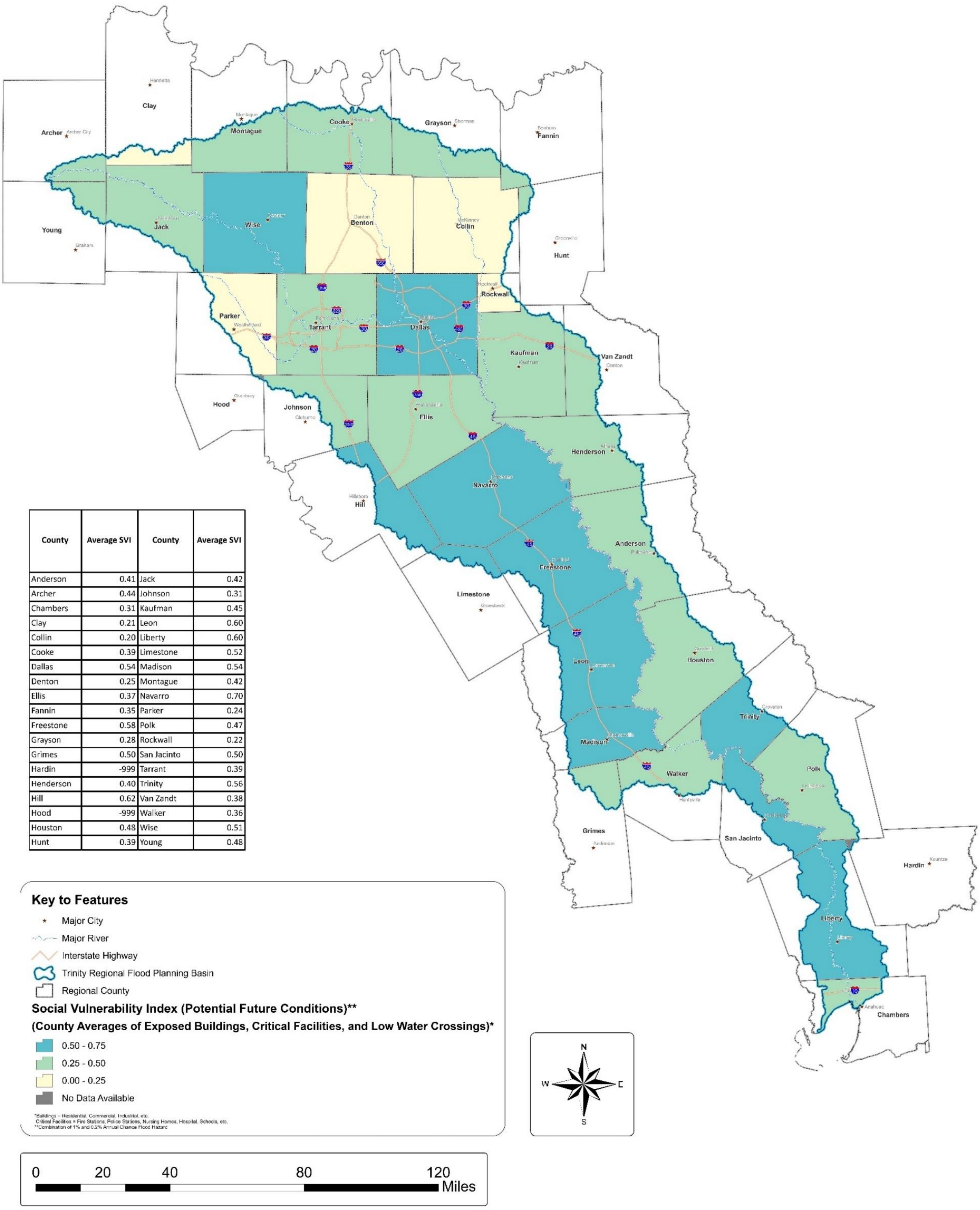
Trinity Basin: Figure 9 - Map 11: Potential Future Condition Flood Exposure



County	1% Annual Chance Flood Hazard			0.2% Annual Chance Flood Hazard			Total
	Number of Structures in Floodplain	Low Water Crossings	Critical Facilities	Number of Structures in Floodplain	Low Water Crossings	Critical Facilities	
Anderson	192	4	78	134	0	16	424
Archer	2	0	6	3	0	0	11
Chambers	2,155	0	29	848	0	3	3,035
Clay	35	0	5	46	0	4	90
Collin	4,042	54	518	6,661	4	216	11,495
Cooke	1,599	32	188	884	0	10	2,813
Dallas	46,300	887	1,962	19,744	28	402	68,813
Denton	8,389	98	630	6,537	2	119	15,775
Ellis	2,201	56	409	1,608	0	47	4,321
Fannin	168	0	14	150	0	7	339
Freestone	458	2	114	364	0	14	952
Grayson	339	1	119	244	0	15	718
Grimes	132	0	26	67	0	6	231
Hardin	0	0	0	0	0	0	0
Henderson	2,540	11	87	2,515	1	18	5,172
Hill	71	0	86	69	0	23	249
Hood	0	0	0	0	0	0	0
Houston	563	17	102	359	0	19	1,060
Hunt	15	0	8	18	0	0	41
Jack	212	6	70	159	0	15	462
Johnson	1,790	22	145	1,350	0	17	3,324
Kaufman	1,635	16	279	1,098	1	48	3,077
Leon	485	5	108	282	1	20	901
Liberty	8,179	5	111	970	0	9	9,274
Limestone	50	3	32	40	1	2	128
Madison	412	1	66	169	1	14	663
Montague	357	0	44	172	0	9	582
Navarro	1,708	62	247	1,002	1	43	3,063
Parker	1,253	19	140	965	0	8	2,385
Polk	4,835	3	109	1,736	0	19	6,702
Rockwall	508	15	56	695	2	10	1,286
San Jacinto	3,237	0	37	1,072	0	5	4,351
Tarrant	25,750	345	1,290	21,830	9	257	49,481
Trinity	1,489	1	35	398	0	9	1,932
Van Zandt	340	2	65	331	0	10	748
Walker	1,651	5	52	536	0	6	2,250
Wise	1,800	6	183	857	0	22	2,868
Young	11	0	8	4	0	1	24

*Buildings = Residential, Commercial, Industrial, etc.
Critical Facilities = Fire Stations, Police Stations, Nursing Homes, Hospital, Schools, etc.
**Combination of 1% and 0.2% Annual Chance Flood Hazard

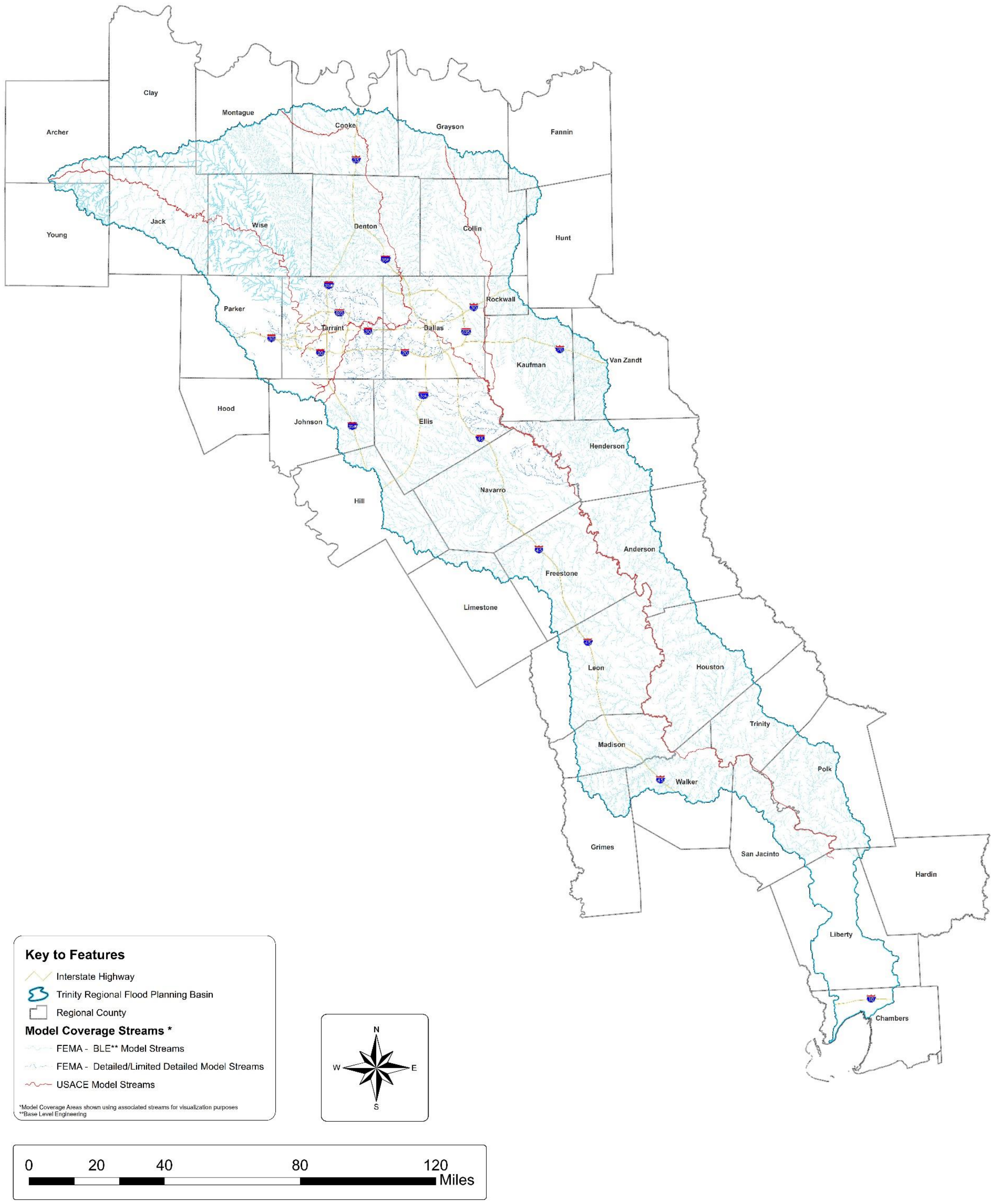
Trinity Basin: Figure 10 - Map 12: Potential Future Condition Vulnerability and Critical Infrastructure



County	Average SVI	County	Average SVI
Anderson	0.41	Jack	0.42
Archer	0.44	Johnson	0.31
Chambers	0.31	Kaufman	0.45
Clay	0.21	Leon	0.60
Collin	0.20	Liberty	0.60
Cooke	0.39	Limestone	0.52
Dallas	0.54	Madison	0.54
Denton	0.25	Montague	0.42
Ellis	0.37	Navarro	0.70
Fannin	0.35	Parker	0.24
Freestone	0.58	Polk	0.47
Grayson	0.28	Rockwall	0.22
Grimes	0.50	San Jacinto	0.50
Hardin	-999	Tarrant	0.39
Henderson	0.40	Trinity	0.56
Hill	0.62	Van Zandt	0.38
Hood	-999	Walker	0.36
Houston	0.48	Wise	0.51
Hunt	0.39	Young	0.48

Trinity Basin: Figure 11 - Map 13: Available Hydrology and Hydraulic (H&H) Model Locations

(Existing H&H Model Locations for Evaluation of Flood Management Strategies [FMSs] and Flood Mitigation Projects [FMPs])

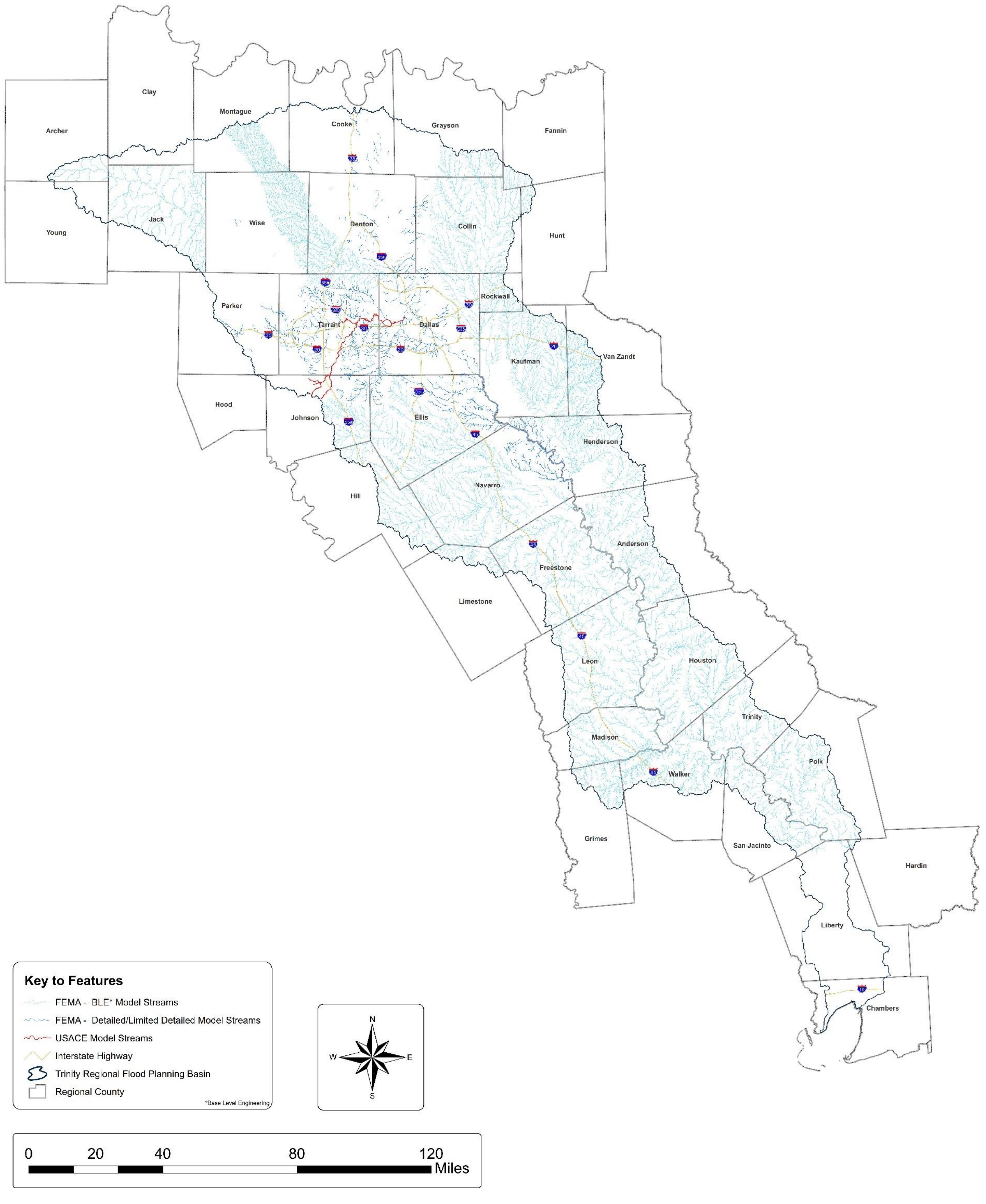


Attachment 3

Task 4C.1e – Figure 11- Available Models for Potential FMSs and FMPs Development.

Trinity Basin: Figure 11 - Map 13: Available Hydrology and Hydraulic (H&H) Model Locations

(Existing H&H Model Locations for Evaluation of Flood Management Strategies [FMSs] and Flood Mitigation Projects [FMPs])



Attachment 4

Task 4C – Geodatabase

This Technical Memorandum Addendum submittal for the Trinity Basin includes the following geodatabase named 03_RFP_GIS_Data_03072022.gdb

The geodatabases are populated with the layers and tables below:

Item Name	Description	Feature Class Name	Data Format Polygon/Line/ Point/GDB Table
Existing Flood Hazard	Perform existing condition flood hazard analyses to determine the location and magnitude of both 1.0% annual chance and 0.2% annual chance flood events	ExFldHazard	Polygon
Flood Mapping Gaps	Gaps in inundation boundary mapping	Fld_Map_Gaps	Polygon
Existing Exposure	Develop high-level, region-wide, and largely GIS-based existing condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	ExFldExpPol	Polygon
	Develop high-level, region-wide, and largely GIS-based existing condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	ExFldExpLn	Polyline
	Develop high-level, region-wide, and largely GIS-based existing condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	ExFldExpPt	Point
	Combines the Exposure Poly, Line, and Point data into a single master layer, also includes Vulnerability data	ExFldExpAll	Point
Future Flood Hazard	Perform future condition flood hazard analyses to determine the location and magnitude of both 1.0% annual chance and 0.2% annual chance flood events	FutFldHazard	Polygon

Item Name	Description	Feature Class Name	Data Format Polygon/Line/ Point/GDB Table
Future Exposure	Perform future condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	FutFldExpPol	Polygon
	Perform future condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	FutFldExpLn	Polyline
	Perform future condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	FutFldExpPt	Point
	Combines the Exposure Poly, Line, and Point data into a single master layer, also includes Vulnerability data	FutFldExpAll	Point