Region 2 Lower Red-Sulphur-Cypress Regional Flood Planning Group
April 7, 2022
2:00 pm
at
Small Business Development Center
The Community Room – (2nd Floor),
105 N. Riddle Avenue,
Mt. Pleasant, TX 74555
or
Via teleconference/webinar
Use the following information to register for the meeting:
https://us06web.zoom.us/meeting/register/tZwkduuhrDMqHdaKQlT5gJcuUoi1wf7ECzMk
After registering, you will receive a confirmation email containing information about joining the meeting.

If you experience issues while registering or do not have access to a computer, please contact Paul Prange no less than two (2) workdays prior to the meeting at 903.255.3519 or pprange@atcog.org.

Agenda:

1. Call to Order
2. Welcome
3. Confirmation of attendees / determination of quorum
4. Public comments – limit 3 minutes per person
5. *Consider approval of minutes for the meeting held March 3, 2022
6. *Consider acceptance of the minutes from the RFPG Sub-Committee meetings held on March 18th and 28th, 2022

Presentations

7. Texas Water Development Board Update
8. Region 1 Canadian-Upper Red Regional Flood Planning Group Update

Technical Consultant Update

9. Technical Presentation by Halff Associates, Inc.
    1. Tech Memo Addendum and Regional Flood Plan Update
    2. Chapter 2
        a. Discuss comments
    3. Chapter 4
        a. Discuss comments
    4. Chapter 5
        a. Present Sub-Committee Recommendations
        b. *Consider Approval of Recommendations
    5. Schedule

Other Business

10. Update from Planning Group Sponsor

11. Consider date and agenda items for next meeting
12. Adjourn

***Denotes Action Items**

If you wish to provide written comments prior to or after the meeting, please email your comments to pprange@atcog.org and include "Region 2 RFPG Meeting" in the subject line of the email – OR – you may mail your comments to Region 2 RFPG, c/o ATCOG – Paul Prange, 4808 Elizabeth St, Texarkana, TX 75503.

If you wish to provide oral public comments at the meeting, please submit a request via email to pprange@atcog.org , include "Region 2 RFPG Meeting Public Comment Request" at least 2 hours prior to the meeting, and follow the registration instructions at top of page 1 of the Agenda.

Additional information may be obtained from: www.texasfloodregion2.org, or by contacting Paul Prange at pprange@atcog.org, 903-832-8636, -or- Region 2 RFPG, c/o ATCOG, 4808 Elizabeth St, Texarkana, TX 75503

All meeting agendas and notices will be posted on our website at www.texasfloodregion2.org. If you wish to be notified electronically of RFPG activities, please submit a request to pprange@atcog.org, include "Request for notification of Region 2 RFPG activities". This request will be honored via email only unless reasonable accommodations are needed.

Meeting Minutes
Region 2 Lower Red-Sulphur-Cypress Flood Planning Group Meeting
March 3, 2022
2:00 p.m.
Small Business Development Center, The Community Room – (2nd Floor), 105 N. Riddle Avenue, Mount Pleasant, TX 75455 and Via Zoom Webinar/Teleconference

Roll Call:

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Preston Ingram (William)	Agricultural interests	X
Andy Endsley	Counties	X
W. Greg Carter	Electric generating utilities	X
Laura-Ashley Overdyke	Environmental interests	X
Casey Johnson	Industries	X
Dustin Henslee	Municipalities	X
Kirby Hollingsworth	Public	
R. Reeves Hayter	River authorities	X
Kelly Mitchell	Small business	X
Joseph W. Weir III	Water districts	X
Susan Whitfield	Water utilities	X

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James (Clay) Shipes	Texas Parks and Wildlife Department	
Andrea Sanders	Texas Division of Emergency Management	X
Darrell Dean	Texas Department of Agriculture	
Tony Resendez	Texas State Soil and Water Conservation Board	
Trey Bahm	General Land Office	
Anita Machiavello (Morgan White - Alternate)	Texas Water Development Board (TWDB)	
Michelle Havelka	Texas Commission on Environmental Quality	X
Darlene Prochaska	USACE, Fort Worth District	
Travis Wilsey	USACE, Tulsa District	
Randy Whiteman	RFPG 1 Liaison	X
Richard Brontoli	Red River Valley Association	X
Jason Dupree	TxDOT – Atlanta District	
Dan Perry	TxDOT – Paris District	X

Quorum:
Quorum: **Yes**
Number of voting members or alternates representing voting members present: **10**
Number required for quorum per current voting membership of **11**: **6**

Other Meeting Attendees: **
Chris Brown - ATCOG
Kathy McCollum - ATCOG
Paul Prange – ATCOG
Joshua McClure – Halff Associates Team
David Rivera – Halff Associates Team
Parker Moore – Halff Associates Team
Ginny Connolly - Halff Associates Team
Tyler Ogle - Freese & Nichols
Chris Hartung - SRBA
Walt Sears – NETMWD
Richard Bagans - TWDB
James Bronikowski – TWDB
Tony Smith – Carollo Engineers

**Meeting attendee names were gathered from those who entered information for joining the Zoom meeting.

All meeting materials are available for the public at:
http://www.twdb.texas.gov/flood/planning/regions/schedule.asp.

AGENDA ITEM NO. 1: Call to Order
Reeves Hayter called the meeting to order at 2:05p.m.

AGENDA ITEM NO. 2: Welcome
Reeves Hayter welcomed members and attendees to the Region 2 Lower Red-Sulphur-Cypress Flood Planning Group meeting.

AGENDA ITEM NO. 3: Confirmation of attendees / determination of a quorum
Reeves Hayter asked ATCOG staff member, Paul Prange, to conduct a roll call of attendees. Each present voting and non-voting member of the Region 2 Lower Red-Sulphur-Cypress RFPG introduced themselves, establishing that a quorum had been met. Ten voting members were present and seven non-voting members were absent.

AGENDA ITEM NO. 4: Public comments – limit 3 minutes per person
Reeves Hayter opened the floor for public comments. Tony Smith, with Carollo Engineers, introduced himself and mentioned that he served as the Project Manager for the Region D Water Planning Group. Mr. Smith stated that he would be glad to coordinate with the Region 2 Flood Planning Group as we move forward with the development of the Regional Flood Plan.

ACTION ITEMS

AGENDA ITEM NO. 5: Consider approval of minutes for the meeting held Thursday, November 4, 2021.
Reeves Hayter opened the floor for discussion and approval of the minutes from the previous meeting. A motion was made by Greg Carter and was seconded by Laura-Ashley Overdyke to approve the minutes as presented. The motion carried unanimously.

AGENDA ITEM NO. 6: *Additional Action Items Below included in Technical Presentation by Halff Associates, Inc.
Reeves Hayter stated that the information will be discussed during the technical presentation and took no action on this item.

PRESENTATIONS

AGENDA ITEM NO. 7: Texas Water Development Board Update:
Reeves Hayter turned the floor over to Richard Bagans who announced that the technical memorandum submitted to TWDB in January is undergoing heavy content review by TWDB staff and informal comments will be provide to the Region 2 Flood Planning Group in late spring of 2022. Mr. Bagans stated that the second part of the Tech Memo, which is being considered for approval at this meeting, will be submitted by March 7, 2022 to TWDB for review and approval. Mr. Bagans announced that Chris Brown is working with TWDB on a contract amendment and the TWDB hosted a Technical Consultant's conference call and Chairs' conference call last week focusing on the required data for FMP/S/Es and Future Conditions.

AGENDA ITEM NO. 8: Region 1 Canadian-Upper Red Regional Flood Planning Group Updates:
Reeves Hayter asked for any updates relating to Region 1 flood planning activities. Randy Whiteman stated that he did not attend the Region 1 meeting held on February 23rd due to a conflicting schedule but he provided information listed on the agenda. Mr. Hayter asked if any items were related to activities ongoing within Region 2 and Mr. Whiteman stated that there were not. Mr. Hayter then asked if the Region 1 consultants were coordinating with the Region 2 consultants in efforts to obtain adequate information, as it pertains to the geographic boundary between the two regions. Mr. Whiteman stated that coordination is taking place and information is being shared between the regions.

TECHNICAL CONSULTANT UPDATE

AGENDA ITEM NO. 9: Technical Presentation by Halff Associates, Inc.

1. **Chapter 1**
    a. **Update on Ag Crop and Loss Data**
2. **Chapter 2**
    a. **Future Conditions Flood Quilt and Exposure Analysis**
    b. **Submittal of Chapter 2 is being delayed until March to allow for incorporation of the new agricultural data**
3. **Chapter 3**
    a. **Chapter 3 Review**
    b. **Discuss Comments**
4. **Chapter 5**
    a. **Update Status of Data Processing**
    b. **Schedule first review committee meeting**
    1. **Present Outline**
    2. **Present Future Conditions Methodology**
5. **Tech Memo Addendum**
    a. **The Tech Memo Addendum id due to TWDB on March 7, 2022**
    b. **Tech Memo Addendum Review**
    c. **Discuss Comments**
    d. ***Consider Approval of Tech Memo Addendum for submittal to TWDB**
6. **Schedule**

Reeves Hayter turned the floor over to Parker Moore who provided a Status Update focusing on the Tech Memo Addendum Submittal, Chapter 1, and Ag Crop and Loss Data Update. Mr. Parker stated that data was submitted by Reeves Hayter and Preston Ingram relating to Ag Crop Loss. Discussion took place among the group and Laura-Ashley Overdyke asked If the public comments received by Halff Associates had been addressed. Mr. Parker indicated that they had been addressed. Greg Carter asked if a "marked up" version of the changes to the data within the plan could be provided to the flood planning group for final review and Mr. Parker stated, yes. Mr. Ingram mentioned that one of the public comments addressed the log jam on the Sulphur River and he asked if that comment had been addressed. Mr. Parker stated that this particular comment would likely be addressed in Chapter 3 or 4 as a potential evaluation or project. David Rivera confirmed to Preston Ingram that the log jam comments are included within the flood plan.

Mr. Parker then turned the presentation over to GIS Director, Ginny Connolly, for discussion of Chapter 2 – Future Conditions Flood Risk Analysis based on a 30-year "no-action" scenario of growth and existing regulations in order to define the 100-Year and 500-Year Floodplain Quilt. The Future 500-Year Floodplain was established by incorporating a median distance of 22' to the existing 500-Year Floodplain, based upon analysis of over 11,000 data points. The Future Floodplain adds 57% more structures and 72% more people potentially impacted than existing conditions indicate. Ms. Conolly stated that this data is intended to be used for planning purposes, only and not regulatory requirements. Ms. Connolly also presented data relating to Future Populations, Structures, Critical Facilities, Roads, and Social Vulnerability. Discussion took place among the flood planning group. Laura-Ashley Overdyke asked where the data for Critical Infrastructures, such as Water Treatment Plants, was obtained. Ms. Conolly stated that the original data was provided by the TWDB, but other state and federal data sources were utilized, such as the TCEQ. Additionally, public input was incorporated as a data source. Reeves Hayter asked about the lack of available floodplain data in 20% of the counties and the outdated nature of most of the other 80% located within Region 2. Mr. Hayter stated that he was concerned about all of the various data sources being woven together to develop a new flood risk area. He then asked, "at what point does this become junk science?" Ms. Connolly stated that this data is being compiled more for planning purposes and not for regulatory purposes. Richard Bagans stated that the State of Texas does recognize that not all regions have current flood risk maps, therefore even approximate data, such as Fathom, should be included within the floodplain quilt to help identify potential flood risk areas in the future. Mr. Bagans added that regions with outdated or non-existent flood risk maps should be able to identify many FMEs requesting TWDB funding for future flood mapping. Mr. Hayter then stated that all of the counties located within Region 2 appear to be ranked below the .75 threshold for potential funding by the TWDB for future projects and asked if other counties within the state rank above this mark. Ms. Connolly answered that yes, some counties are ranked above the .75 threshold. Chris Brown mentioned that Red River and Delta Counties appear to be represented too low. Mr. Brown stated that ATCOG could provide some additional data related to critical infrastructure for our region, to be analyzed by Halff Associates.

David Rivera conducted a presentation focusing on Chapter 3 – Floodplain Management Practices & Flood Protection Goals. Mr. Rivera discussed the Recommended Floodplain Management Standards relating to Freeboard (1 foot above BFE) for Residential Properties / Commercial Properties, and (2 Feet above BFE) for Critical Facilities. Greg Carter asked Mr. Rivera if there is consistency between Chapter 2 and Chapter 3 as it relates to floodplain elevations and discussion took place among the group. Mr. Rivera stated that these recommended standards are not intended to be applied using the maps that are generated in Task 2. The flood planning group asked for a statement to this effect be included within the Region 2 Flood Plan. Mr. Rivera continued presenting the recommended standards for Roadway, Culvert/Bridges, Storm Drainage Systems, Detention Facilities, and Mapping Coverage. Reeves Hayter asked for the definition of "unmapped areas" listed in the Mapping Coverage section of the presentation and Mr. Rivera stated that it means flood risk is unknown, therefore hydrologic and hydraulic studies need to be conducted prior to developing these areas. Mr. Rivera then presented the Goals Summary, focusing on Education and Outreach, Flood Warning Readiness, Flood Studies and Analysis, Flood Prevention, Non-Structural Flood Infrastructure, and Structural Flood Infrastructure. Mr. Hayter mentioned that Floodproofing and Property Acquisition should be included as Non-Structural Flood Infrastructure Goals and Mr. Rivera agreed to add them to the table.

David Rivera began discussion on Chapter 4B & Chapter 5 – Identification and Recommendation of FMEs, FMPs and FMSs. Chapter 4B data is now available in a geospatial format and is being refined throughout the region. Additionally, Planning Level Cost Estimates are now compiled in a tabular format and a template has been developed to serve as an example. Mr. Rivera then presented the TWDB technical guidance requiring a "No Negative Impact Certification" for all potential FMPs. Reeves Hayter stated that he understands that this is a requirement of the TWDB, but in reality there is absolutely no way that an engineer could make such a certification until the design of the project is approximately 95% complete. Greg Carter asked if this requirement is based upon the 500-Year Flood Event and Mr. Rivera stated that it is based upon the 100-Year Flood Event. Mr. Rivera mentioned that this topic will likely need to be addressed by the flood planning group during the approval process of Chapter 5. Richard Bagans stated that this requirement has been discussed at TWDB, but it is required by the State Legislature. Mr. Rivera then presented information relating to the FMP: Benefit-Cost Analysis, Process for Recommending FMEs, and Process for Recommending FMPs. This information will be discussed in greater detail at the next two sub-committee meetings held later this month. Mr. Rivera then provided an overview of the upcoming activity schedule through March 31st.

Reeves Hayter then turned the floor over to Parker Moore to discuss establishing dates for the two Sub-Committee Meetings. Discussion took place among the board members and David Rivera and a decision was made to conduct the first meeting on March 18th and the second meeting on March 28th. Mr. Moore then asked the Region 2 Flood Planning Group if they had any additional comments regarding the Tech Memo Addendum. Comments were received regarding the language referring to the Trinity Flood Planning Region and Mr. Moore stated that the language was included in the Region 2 Tech Memo as a supplemental attachment. Greg Carter voiced some level of concern over including this language in the Region 2 Flood Plan and he and Mr. Hayter asked if a "Fly Page" could be inserted before the Trinity language, indicating that the Region 2 Tech Memo Addendum was based upon the Trinity's. Mr. Hayter asked the group if they felt comfortable approving the Tech Memo Addendum as amended with comments. A motion was made by Greg Carter and seconded by Joseph Weir to submit the Tech Memo Addendum to TWDB for review and approval. The motion carried unanimously.

Parker Moore then presented the Look-Ahead portion of his presentation and stated that in March the Region 2 Flood Planning Group approved the Final Tech Memo for submittal to TWDB and discussed the Chapter 3 comments. Halff Associates plans to submit Chapters 2, 4 and 5 to the group for review, as well. In April, discussion of Chapters 2, 4 and 5 will occur, along with submittal of Chapters 6 and 7 for review. Discussion of Chapters 6 and 7 and submittal of Chapters 8 and 9 will occur in May. Discussion of Chapters 8 and 9 and submittal of Chapter 10 will occur in June. Discussion of Chapter 10 and approval of the Draft Regional Flood Plan will occur in July, with the Draft Plan due to TWDB on August 1, 2022.

OTHER BUSINESS

AGENDA ITEM NO. 10: Update from Planning Group Sponsor

Reeves Hayter turned the floor over to Chris Brown who announced that ATCOG has hired a new Hazard Mitigation Planner, Kathy McCollum, who will assist in conducting flood planning outreach within Region 2 to increase public participation. Mr. Brown also stated that the TWDB has approved this activity and

funds from Task 11 of the contract will be utilized to conduct this outreach. Mr. Brown also presented the updated Region 2 website which now contains links to a video produced by the TWDB and a new interactive floodplain quilt website, containing the latest data from Halff Associates. Members of the public and public representatives will be directed to these two new resources to receive insight into the flood planning process and to provide input. Mr. Hayter thanked ATCOG staff for their efforts to increase public participation and also thanked Andrea Sanders with TDEM, for providing flood damage data which may be helpful in developing the regional flood plan.

AGENDA ITEM NO. 11: Consider date and agenda items for next meeting

Reeves Hayter opened the floor for discussion. The Region 2 RFPG board members agreed to conduct the next meeting on Thursday, April 7, 2022 at 2:00p.m. in Mount Pleasant, TX and via webinar/teleconference.

AGENDA ITEM NO. 12: Adjourn

Reeves Hayter opened the floor to adjourn the meeting.
The vote to adjourn was passed by unanimous consent.
The meeting was adjourned at approximately 4:10p.m. by Reeves Hayter.
Approved by the Region 2 Lower Red-Sulphur-Cypress RFPG at a meeting held on 04/07/2022.

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Reeves Hayter, CHAIR

Meeting Minutes
Region 2 Lower Red-Sulphur-Cypress Flood Planning Group
Technical Advisory Sub-Committee Meeting
March 18, 2022
10:00 a.m.
Titus County AgriLife Extension Office, 1708 Industrial Road, Mount Pleasant, TX 75455 and Via Zoom Webinar/Teleconference

Roll Call:

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Preston Ingram (William)	Agricultural interests	
Andy Endsley	Counties	
W. Greg Carter	Electric generating utilities	X
Laura-Ashley Overdyke	Environmental interests	X
Casey Johnson	Industries	
Dustin Henslee	Municipalities	X
Kirby Hollingsworth	Public	
R. Reeves Hayter	River authorities	X
Kelly Mitchell	Small business	
Joseph W. Weir III	Water districts	
Susan Whitfield	Water utilities	

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James (Clay) Shipes	Texas Parks and Wildlife Department	
Andrea Sanders	Texas Division of Emergency Management	
Darrell Dean	Texas Department of Agriculture	
Tony Resendez	Texas State Soil and Water Conservation Board	
Trey Bahm	General Land Office	
Anita Machiavello	Texas Water Development Board (TWDB)	X
Michelle Havelka	Texas Commission on Environmental Quality	
Darlene Prochaska	USACE, Fort Worth District	
Travis Wilsey	USACE, Tulsa District	
Randy Whiteman	RFPG 1 Liaison	
Richard Brontoli	Red River Valley Association	
Jason Dupree	TxDOT – Atlanta District	
Dan Perry	TxDOT – Paris District	

Quorum:

Quorum: **Yes**
Number of voting members or alternates representing voting members present: **4**
Number required for quorum per current voting membership of **5**: **3**

Other Meeting Attendees: **

Chris Brown - ATCOG
Kathy McCollum - ATCOG
Paul Prange – ATCOG
Joshua McClure – Halff Associates Team
David Rivera – Halff Associates Team
Parker Moore – Halff Associates Team
Tyler Ogle - Freese & Nichols
James Bronikowski – TWDB

**Meeting attendee names were gathered from those who entered information for joining the Zoom meeting.

All meeting materials are available for the public at:
http://www.twdb.texas.gov/flood/planning/regions/schedule.asp.

AGENDA ITEM NO. 1: Call to Order
Reeves Hayter called the meeting to order at 10:02 a.m. and welcomed members and attendees to the Region 2 Lower Red-Sulphur-Cypress Flood Planning Group Technical Advisory Sub-Committee Meeting.

AGENDA ITEM NO. 2: Confirmation of attendees / determination of a quorum
Reeves Hayter asked ATCOG staff member, Paul Prange, to conduct a roll call of attendees.
Each present voting member of the Sub-Committee introduced themselves, establishing that a quorum had been met. Four voting members were present and one was absent.

AGENDA ITEM NO. 3: *Election of Sub-Committee Officers per Article XII, Section 3 of the Bylaws
Reeves Hayter asked ATCOG Executive Director, Chris Brown to explain that the TWDB requires sub-committees to elect officers (Chair, Vice Chair and Secretary) as outlined within the Bylaws. Mr. Brown stated that the members of the sub-committee happen to be officers on the regular board, in this instance. Mr. Hayter then opened the floor up for nominations. Dustin Henslee made a motion to elect the same officers from the full board to serve as officers on the sub-committee and Greg Carter seconded that motion. The motion carried unanimously.

AGENDA ITEM NO. 4: Acknowledgement of written public comments received
Reeves Hayter opened the floor for public comments. No public comments were provided.

AGENDA ITEM NO. 5: Receive registered public comments on specific agenda items – limit 3 minutes per person
Reeves Hayter opened the floor for public comments. No public comments were provided.

TECHNICAL CONSULTANT UPDATE

AGENDA ITEM NO. 6: Technical presentation by Halff Associates, Inc.

- **a. Task 5 overview (10 min)**
  - **i. Purpose**
    1. **FME, FMP and FMS recommendations**
  - **ii. Process Overview (FME, FMP, and FMS)**
    1. **Background context and findings summary**
    2. **Questions for Sub-Committee**
    3. **Other Sub-Committee Guidance**
  - **iii. Technical Sub-Committee involvement and key roles**
- **b. FME (40 min)**
  - **i. TWDB requirements**
  - **ii. Sources**
  - **iii. Geographical distribution and categories**
  - **iv. Flood Risk Indicators and Planning Level Costs**
  - **v. Assessment examples**
  - **vi. Technical Sub-Committee guidance for recommendations**
    1. **Practical considerations and constraints for not recommending an FME**
    2. **Propose additional FME (if needed)**
- **c. FMP (30 min)**

i. **TWDB requirements for FMP**
ii. **Sources**
iii. **Geographical distribution and categories**
iv. **Assessment examples**
v. **Technical Sub-Committee guidance for recommendations**
1. **Practical considerations and constraints for not recommending an FMP**

d. **BREAK (10 min)**
e. **FMS (25 min)**
i. **TWDB requirements**
ii. **Sources**
iii. **Geographical distribution and categories**
iv. **Assessment examples**
v. **Technical Sub-Committee guidance for recommendations**
1. **Practical considerations and constraints for not recommending an FMS**
2. **Propose additional FMS (if needed)**

f. ***Action Items (15 min)**

Reeves Hayter turned the floor over to Halff Associates staff to provide a brief update on activities. Joshua McClure announced that the Tech Memo was submitted to TWDB for review and approval, and the presentation for the April meeting is currently being prepared. Mr. McClure then turned the presentation over to David Rivera to discuss Task 5 (Recommendation of FME, FMP and FMS) which is the decision-making process for recommending the actions.

David Rivera began his presentation by asking questions seeking Sub-Committee input to provide guidance for the technical consultants to develop the plan. Mr. Rivera stated that the most important part of today's meeting is to determine the Selection Philosophy (Select only RFPG priority FMXs or Include all eligible FMXs). Mr. Rivera also mentioned that the issue of Local Sponsors needs to be addressed and asked if the Sub-Committee wished to verify an entity's willingness to sponsor FMXs or just assign sponsors, who would have an option to decline in the future. Mr. Rivera stated that new FMEs and FMSs could be added to the list, as well.

David Rivera then presented a Findings Summary which included all groups of actions depicted on an interactive regional map (FMEs-61, FMPs-3, FMSs-74) that can be posted on our website for public input. Discussion took place between the technical consultants and the Sub-Committee pertaining to FMEs vs. FMPs as they relate to "No Negative Impact" as required by the TWDB. Reeves Hayter asked Joshua McClure if he could provide an explanation for a specific project located in Paris, TX being recommended as an FME and not an FMP. Mr. McClure asked Parker Moore to access the file relating to that project and Mr. Moore indicated that the project lacked adequate supporting documentation to be listed as an FMP.

David Rivera presented information relating to each of the types of actions, beginning with Flood Management Evaluations (FME) and the basic requirements which need to be met, according to the TWDB. (1.) Identify and investigate solutions to mitigate the 1% annual chance flood. (2.) Support a specific RFPG Goal. (3.) Are most likely to result in identification of potentially feasible FMPs of FMSs for the next planning cycle. Mr. Rivera also mentioned specific FME sources and categories. Greg Carter stated that all actions that meet the TWDB requirements should be included within the plan in order to be eligible for potential state or federal funding in the future. Laura-Ashley Overdyke commented on the difference between debris removal and channelization being listed in both the FME and FMS

categories. Mr. Rivera stated that the FME category refers to a specific area and the FMS refers to a larger scale. Joshua McClure announced that the source of the data was collected from Hazard Mitigation Plans, which are fairly vague in nature, and not specific to any location. Mr. McClure also stated that a proposed project would be listed as an FME if funding will be requested in the future, but if an area only requires general maintenance, it would be listed as an FMS. An example of an FME is the proposed removal of the log jam on the Sulphur River. Reeves Hayter asked if each county has requested updated flood maps and Mr. McClure stated that he did not ask each county if they wanted the maps or not. Mr. Hayter stated that at least five counties within Region 2 have not participated in the NFIP and suggested that we reach out to them and ask if they would like to participate. Discussion took place among the board members on this topic. Mr. Hayter suggested that we contact the sponsors in each county to inform them of our regional flood planning efforts. Chris Brown commented that ATCOG staff could reach out to sponsors within the region to explain specifically what we are asking of them and Mr. McClure stated that he could draft a letter that would help clarify our requests.

Reeves Hayter commented on county-wide strategies and mentioned that several counties located within Region 2 have only a small percentage of land located within our region, with the majority of the land being located within the adjoining region. Mr. Hayter asked how we should address these counties. David Rivera stated that counties located in more than one region will be mentioned in each regional plan, but the costs associated with any FMXs apply only to the areas located within each of the regional boundaries. Mr. Hayter recommended that in the counties having less than 50% of their land area located within Region 2, only be included in the adjoining region's plan, but if a community is located within our region, we should include it within our plan. The technical consultants stated that they would coordinate with other regions to address these areas. Greg Carter and Reeves Hayter discussed the Sulphur River log jam and Mr. Hayter commented that it should be considered as two potential projects. Laura-Ashley Overdyke agreed with this request. Mr. Hayter then made a comparison of FMPs/FMEs/and FMSs and stated that he respects the strict requirements placed on the FMPs by the TWDB, but he does not fully agree with these requirements because they are not realistic for small, rural communities located within Region 2. Mr. Hayter then stated that he is concerned that there are no evaluations listed for the City of Bonham, the City of Commerce, the City of Sulphur Springs, the City of Sherman, and the City of Denison. Mr. Hayter then requested the Region 2 Flood Planning Group to reach out again to these entities to make sure that they realize they will not be included in the Regional Flood Plan and will not be eligible for flood infrastructure funding. Joshua McClure responded that he is currently coordinating with these communities in an effort to identify any potential FMEs that can be added to the list. David Rivera presented the HUC 12 map which depicted flood risk ratings throughout the region and Mr. Hayter asked for reference points to be added to the map. Discussion took place among the group.

David Rivera then conducted a presentation focusing on FMPs, including TWDB requirements, sources, and geographical distribution & categories. Mr. Rivera asked Dustin Henslee to elaborate on three projects listed in Texarkana, TX and Mr. Henslee provided a summary of the proposed project activities at each of the three project areas. Reeves Hayter asked Joshua McClure to take another look at a proposed project located in Paris, TX to make sure whether or not it is eligible for inclusion within the Region 2 Flood Plan. David Rivera stated that each proposed project must show a measurable reduction in flood impacts in order to qualify for state funding and asked Anita Machiavello for guidance on this requirement. Ms. Machiavello stated that she would look into this requirement and provide feedback as soon as possible. Discussion took place among the group followed by a 10 minute break in the meeting.

David Rivera then conducted a presentation focusing on FMSs including TWDB requirements, sources, and geographical distribution & categories. Mr. Rivera stated that much of the data was collected from the Hazard Mitigation Plans within the region, which are mostly vague in nature and asked if the planning group wanted to include this broad scale information in the Regional Flood Plan. Joshua McClure spoke on the generalized nature of the Hazard Mitigation Plans and provided examples of the overall language. Greg Carter stated that he would like to include the information listed in the Hazard Mitigation Plans in the Region 2 Flood Plan. Chris Brown concurred. Mr. McClure announced that the TWDB plans to insert information from each Regional Flood Plan into the statewide Hazard Mitigation Plan. Anita Machiavello confirmed that this is correct, but no specific information about the contents of the plan have been shared with TWDB staff. Mr. McClure stated that projects must show tangible benefits associated with them in order to qualify for state funding. Discussion took place among the group. Mr. Rivera then announced that at the next Sub-Committee meeting, the technical consultants could provide the same information relating to FMEs/FMPs/FMSs with "Yes" or "No" columns added for each specific recommendation. The Sub-Committee agreed that this would be helpful and asked for the list to be provided to the members and the public prior to the next meeting scheduled for March 28th.

OTHER BUSINESS

AGENDA ITEM NO. 7: Receive registered general public comments
Reeves Hayter opened the floor for public comments. No comments were provided.

AGENDA ITEM NO. 8: Update from Planning Group Sponsor
Reeves Hayter turned the floor over to Chris Brown who announced that ATCOG has submitted a budget amendment to TWDB for review and approval, to allow ATCOG staff to conduct outreach activities. Mr. Brown stated that ATCOG staff member, Kathy McCollum has developed a public outreach plan that provides information on the interactive flood map located on our website. Mr. Hayter thanked ATCOG staff for their efforts to increase public participation in this planning process.

AGENDA ITEM NO. 9: Consider date and agenda items for next meeting
Reeves Hayter opened the floor for discussion. The Region 2 RFPG Sub-Committee agreed to conduct the next meeting on Monday, March 28, 2022 at 2:00 p.m. at the Small Business Development Center located in Mount Pleasant, TX and via webinar/teleconference.

AGENDA ITEM NO. 10: Adjourn
Reeves Hayter opened the floor to adjourn the meeting.
A motion was made by Laura-Ashley Overdyke and was seconded by Greg Carter.
The vote to adjourn was passed by unanimous consent.
The meeting was adjourned at approximately 12:58 p.m. by Reeves Hayter.
Accepted by the Region 2 Lower Red-Sulphur-Cypress RFPG at a meeting held on 04/07/2022.

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Reeves Hayter, CHAIR

Meeting Minutes
Region 2 Lower Red-Sulphur-Cypress Flood Planning Group
Technical Advisory Sub-Committee Meeting
March 28, 2022
2:00 p.m.
Small Business Development Center, The Community Room – (2nd Floor), 105 N. Riddle Avenue, Mount Pleasant, TX 75455 and Via Zoom Webinar/Teleconference

Roll Call:

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Preston Ingram (William)	Agricultural interests	
Andy Endsley	Counties	
W. Greg Carter	Electric generating utilities	X
Laura-Ashley Overdyke	Environmental interests	X
Casey Johnson	Industries	
Dustin Henslee	Municipalities	X
Kirby Hollingsworth	Public	
R. Reeves Hayter	River authorities	X
Kelly Mitchell	Small business	
Joseph W. Weir III	Water districts	
Susan Whitfield	Water utilities	

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James (Clay) Shipes	Texas Parks and Wildlife Department	
Andrea Sanders	Texas Division of Emergency Management	
Darrell Dean	Texas Department of Agriculture	
Tony Resendez	Texas State Soil and Water Conservation Board	
Trey Bahm	General Land Office	
Anita Machiavello	Texas Water Development Board (TWDB)	X
Michelle Havelka	Texas Commission on Environmental Quality	
Darlene Prochaska	USACE, Fort Worth District	
Travis Wilsey	USACE, Tulsa District	
Randy Whiteman	RFPG 1 Liaison	
Richard Brontoli	Red River Valley Association	
Jason Dupree	TxDOT – Atlanta District	
Dan Perry	TxDOT – Paris District	

Quorum:

Quorum: **Yes**
Number of voting members or alternates representing voting members present: **4**
Number required for quorum per current voting membership of **5**: **3**

Other Meeting Attendees: **

Chris Brown - ATCOG
Kathy McCollum - ATCOG
Paul Prange – ATCOG
Joshua McClure – Halff Associates Team
David Rivera – Halff Associates Team
Parker Moore – Halff Associates Team
Jim Keith – Halff Associates Team
Tyler Ogle - Freese & Nichols
Matt Nelson – TWDB
Morgan White - TWDB

**Meeting attendee names were gathered from those who entered information for joining the Zoom meeting.

All meeting materials are available for the public at:
http://www.twdb.texas.gov/flood/planning/regions/schedule.asp.

AGENDA ITEM NO. 1: Call to Order
Reeves Hayter called the meeting to order at 2:01 p.m. and welcomed members and attendees to the Region 2 Lower Red-Sulphur-Cypress Flood Planning Group Technical Advisory Sub-Committee Meeting.

AGENDA ITEM NO. 2: Confirmation of attendees / determination of a quorum
Reeves Hayter asked ATCOG staff member, Paul Prange, to conduct a roll call of attendees.
Each present voting member of the Sub-Committee introduced themselves, establishing that a quorum had been met. Four voting members were present and one was absent.

AGENDA ITEM NO. 3: *Election of Sub-Committee Officers per Article XII, Section 3 of the Bylaws
Reeves Hayter asked ATCOG Executive Director, Chris Brown if the group needed to re-elect officers at this meeting and Mr. Brown stated that this agenda item does not need any action, since the officers of the Sub-Committee have already been chosen at the previous meeting. No action was required.

AGENDA ITEM NO. 4: Acknowledgement of written public comments received
Reeves Hayter opened the floor for public comments. No public comments were provided.

AGENDA ITEM NO. 5: Receive registered public comments on specific agenda items – limit 3 minutes per person
Reeves Hayter opened the floor for public comments. No public comments were provided.

TECHNICAL CONSULTANT UPDATE

AGENDA ITEM NO. 6: Technical presentation by Halff Associates, Inc.

1. Technical Presentation by Halff Associates, Inc.
    a. Task 5 – Recommendation of FME, FMP and FMS
        i. Preliminary TC recommendations.
            1. FME
            2. FMP
            3. FMS
    b. *Sub-Committee reviews and confirms/rejects TC recommendations.
    c. *Sub-Committee considers vote to adopt the recommended actions (FME, FMP, FMS) to present to RFPG

Reeves Hayter turned the floor over to Joshua McClure who announced that the Sub-Committee will be making decisions today on which FME/FMP/FMSs will be recommended to the Region 2 Board of Directors for inclusion in the Regional Flood Plan. Mr. McClure stated that Chapters 2 and 4 this week for review by the RFPG2 and he then turned the presentation over to David Rivera to discuss Task 5.

David Rivera provided three tables indicating potential FME/FMP/FMSs for possible inclusion within the Region 2 Flood Plan. Mr. Rivera presented the table containing the list of potential FMEs to the Sub-Committee for review and approval. Reeves Hayter asked if TWDB required each item to be recommended by a vote. Joshua McClure stated that the Sub-Committee can vote on items in groups, according to their categories. Mr. Rivera presented items 1-19 (FIS Categories) for review and recommendation. A motion was made by Laura-Ashley Overdyke to accept these items as presented and Greg Carter seconded the motion. The motion carried. Mr. Rivera then presented items 26-37

(Storm Drain/Stormwater Rate Study Categories) for review and recommendation. Discussion took place among the group and Greg Carter made a motion to approve items 26-37 with suggested revisions, excluding item 36. Reeves Hayter seconded the motion. The motion carried. Mr. Rivera presented items 20-25, 59, 60 and 62 (Flood Preparedness Categories) for review and recommendation. Discussion took place among the group. Laura-Ashley Overdyke made a motion to approve these items with suggested revisions, and Reeves Hayter seconded the motion. The motion carried. Mr. Rivera then presented items 42-64 (Storm Drain Improvement/Property Buyout/Other Categories) for review and recommendation. Discussion took place among the group and Mr. Hayter suggested combining items 42-44 and items 45-53 into two FMEs. A motion was made by Greg Carter to approve these items with revisions and the motion was seconded by Reeves Hayter. The motion carried. Mr. Hayter then called for a 10-minute break in the meeting.

David Rivera then presented the table containing the list of potential FMPs to the Sub-Committee for review and approval. Mr. Rivera asked Dustin Henslee to elaborate on the projects located within Texarkana, TX and discussion took place among the group. Reeves Hayter opened the floor up for a vote on items 1-3 and a motion was made by Greg Carter to approve the items as presented. The motion was seconded by Dustin Henslee. The motion carried.

David Rivera presented the table containing the list of potential FMSs to the Sub-Committee for review and approval. Mr. Rivera began with items 1-32 (NFIP Category) for review and recommendation. Discussion took place among the group and Greg Carter made a motion to approve the items as presented. Laura-Ashley Overdyke seconded the motion. The motion carried. Mr. Rivera then presented items 33-51 and items 81 and 83 (Stormwater Management Categories) for review and recommendation. Discussion took place among the group and a consensus was reached to recommend these items as a region-wide strategy, as opposed to individual counties. Chris Brown stated that ATCOG could potentially act as a sponsor to develop an Integrated Stormwater Management Manual. A motion was made by Laura-Ashley Overdyke to approve these items with revisions. The motion was seconded by Reeves Hayter. The motion carried. David Rivera presented items 52-70 (Early Warning Systems) for review and recommendation. Discussion took place among the group regarding region-wide versus individual county notification. Mr. Brown stated that ATCOG could potentially act as a sponsor of Early Warning Systems throughout the region and suggested adding a new FMS, as number 84 on the list. Mr. Hayter opened the floor up for a vote and a motion was made by Greg Carter to approve these items with revisions. The motion was seconded by Reeves Hayter. The motion carried. Mr. Rivera then presented items 59-64 and 70-83 (Preventative Maintenance Categories) for review and recommendation. Discussion took place among the group. Mr. Hayter stated that envisions these items as one-time projects as opposed to recurring projects. Joshua McClure announced that some of these projects may not meet the requirements by the TWDB to be eligible for funding. Mr. Carter suggested the removal of items 54-64 from the flood plan and Mr. Hayter suggested that the group keep items 70-74 and 79-83, and to combine items 75 and 82. Additional discussion took place among the group and Reeves Hayter made a motion to approve these items with revisions. The motion was seconded by Greg Carter. The motion carried.

The Region 2 Flood Planning Group Sub-Committee plans to present their recommendations to the full board for approval at the next meeting, scheduled for April 7, 2022.

OTHER BUSINESS

AGENDA ITEM NO. 7: Update from Planning Group Sponsor
Reeves Hayter turned the floor over to Chris Brown for an update. No update was provided.

AGENDA ITEM NO. 8: Consider date and agenda items for next meeting
Reeves Hayter opened the floor for discussion. The Region 2 RFPG Sub-Committee agreed to conduct the next regular board meeting on Thursday, April 7, 2022 at 2:00 p.m. at the Small Business Development Center located in Mount Pleasant, TX and via webinar/teleconference.

AGENDA ITEM NO. 9: Adjourn
Reeves Hayter opened the floor to adjourn the meeting.
The vote to adjourn was passed by unanimous consent.
The meeting was adjourned at approximately 5:15 p.m. by Reeves Hayter.
Accepted by the Region 2 Lower Red-Sulphur-Cypress RFPG at a meeting held on 04/07/2022.

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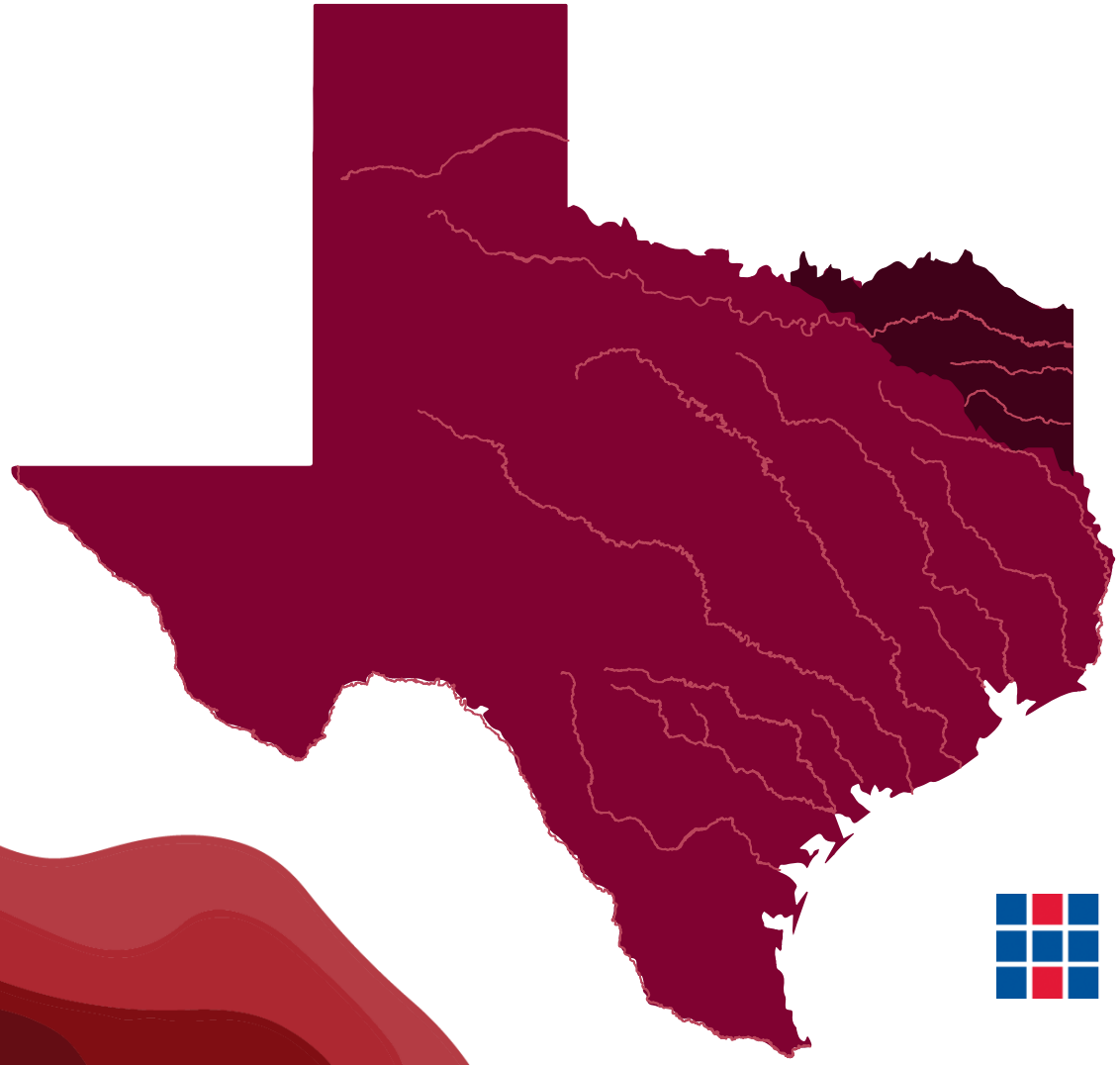
Reeves Hayter, CHAIR



Regional Flood Planning Group 2 Meeting Lower Red-Sulphur-Cypress

April 7, 2022

HALFF

FREESE AND NICHOLS

MTG engineers & surveyors

H2O PARTNERS

Outline/Agenda

- Tech Memo Addendum Status Update
- Chapter 2 – Existing and Future Conditions Flood Risk Analysis
  - Discuss comments
- ~~Chapter 4- Review and discuss comments~~
  - Delayed submittal to next month to combine with Chapter 5
- Chapter 5 - Recommendation of FMEs, FMPs and FMSs
  - Present Sub-Committee Recommendations
  - Consider Approval of Recommendations
- Schedule

Status Update

Tech Memo Addendum Submittal

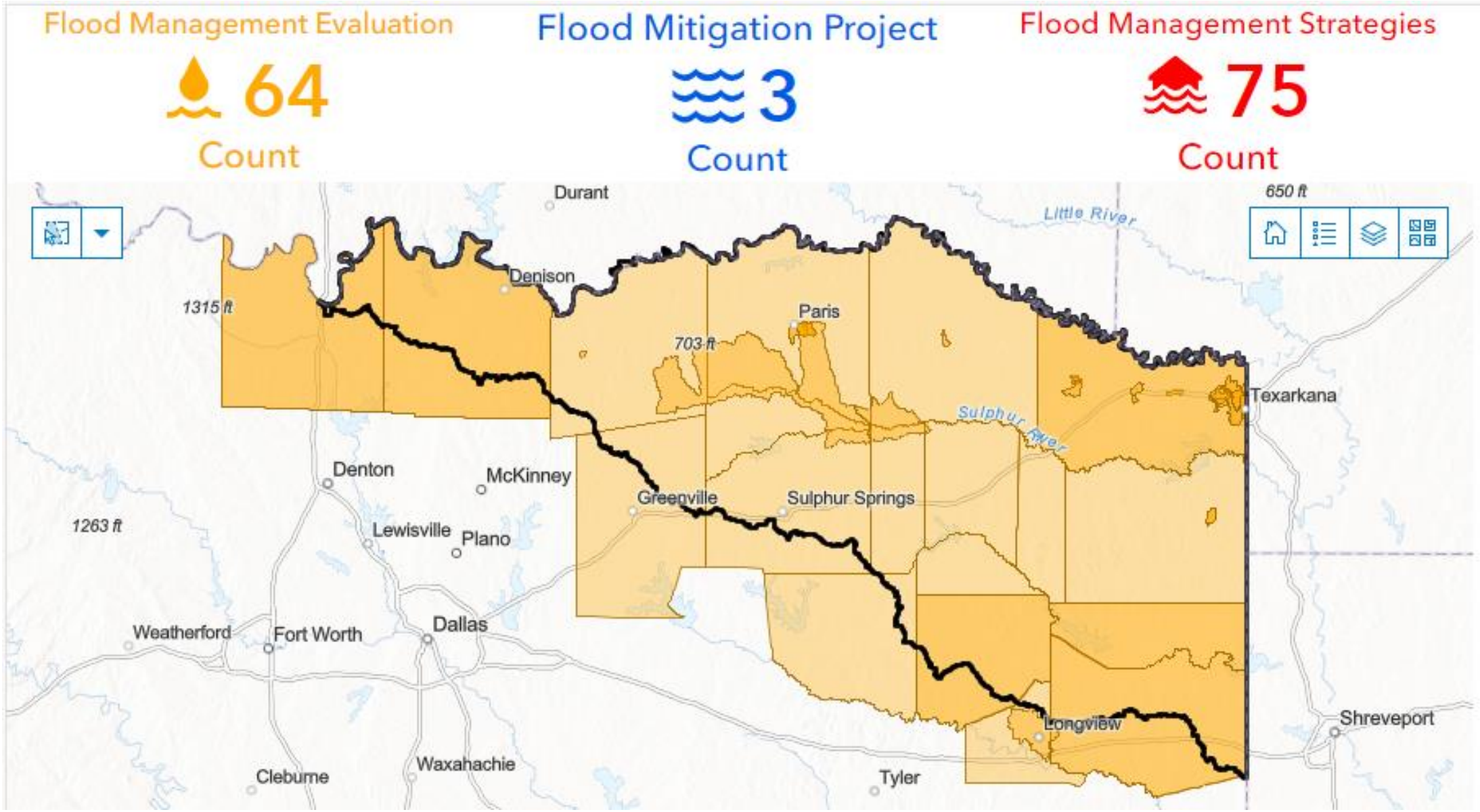
- Initial Tech Memo was submitted January 7
  - January 7 Tech Memo has been administratively approved
- Final Tech Memo due to TWDB Monday, March 7.
  - Required data that was not included in the January 7 tech memo
- Administratively approved on March 22

Chapter 2 – Existing and Future Conditions Flood Risk Analysis

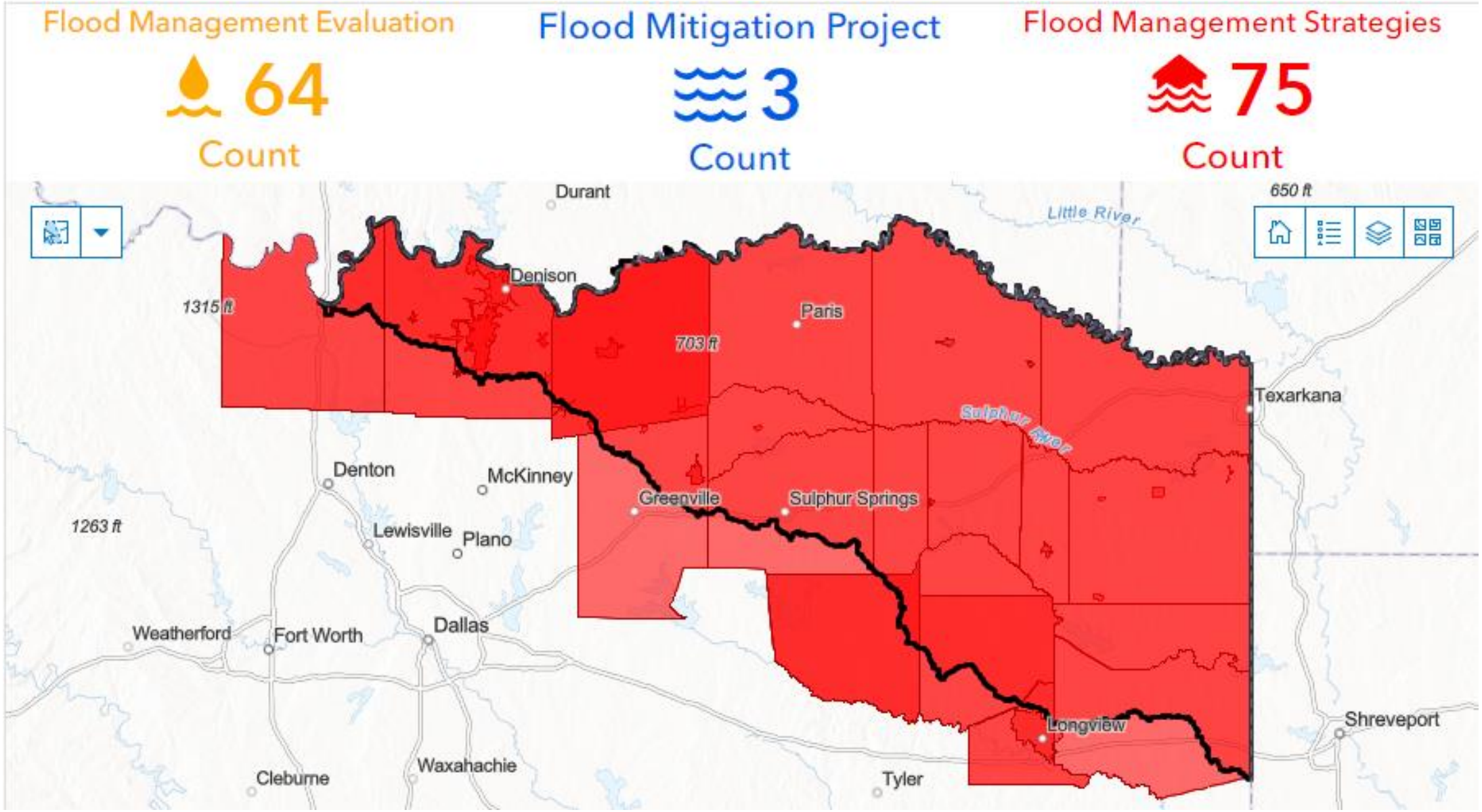
Discuss Comments

Chapter 4B & 5 – Identification and Recommendation of FME, FMP and FMS

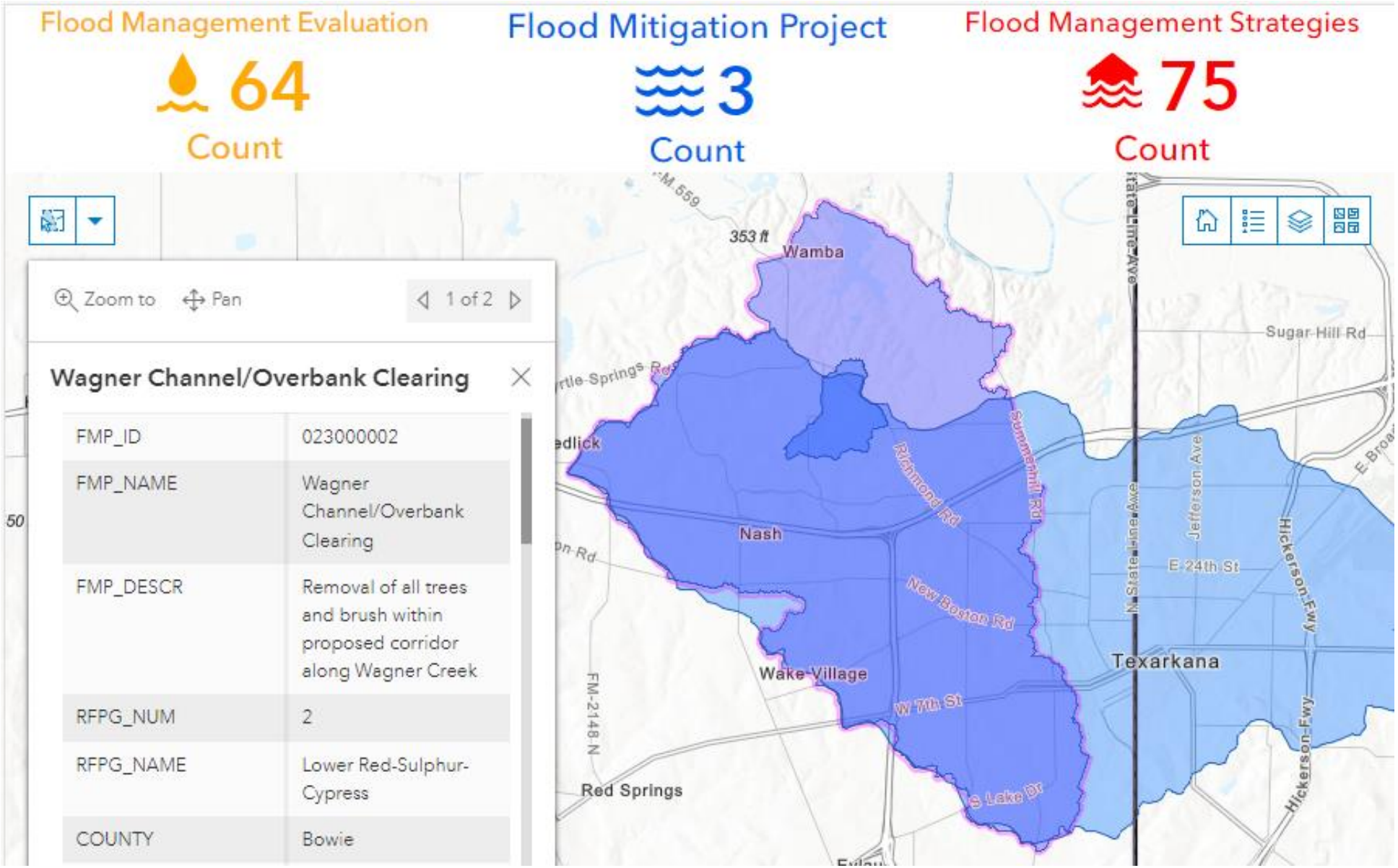
Task 4B Update



Task 4B Update



Task 4B Update



Task 5
Recommendation of FME, FMP, and FMS

Technical Subcommittee Meeting #1 - March 18, 2022

Decision-making	• Guidance provided to TC for Y/N
Selection Philosophy	• Select only RFPG priority FMXs • Include all eligible FMXs
Local Sponsor	• Verify an entity's willingness to sponsor FMX • "Assign" Sponsors, option to decline later
Additions	• New FMEs • New FMSs

Technical Subcommittee Meeting #1 - Topics

- TWDB Requirements
- Sources
- FMX Categories
- Geographical Distribution & Flood Risk Indicators
- Assessment Examples

Technical Subcommittee Meeting #1 - Guidance

Contact Non-NFIP communities before recommending a Floodplain Mapping FME

No need to confirm Sponsor support for all other FMXs

Do not recommend if FMX area < 50% within Region 2

Willing to accept Level of Service < 100-yr

Willing to accept Benefit/Cost Ratio < 1

Technical Subcommittee Meeting #2 - March 28, 2022

Region 2 - Potential FME's								Subcommittee Agrees/Disagrees	
FME ID	FME Name	Description	Counties	Study Type	Sponsor	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action	Agree	Disagree
21000001	Cooke County FIS	Update County maps to Zone AE	Cooke	Watershed Planning	Cooke County	N	Less than 50% within Region 2		
21000002	Grayson County FIS	Update remainder of county to Zone AE	Grayson	Watershed Planning	Grayson County	Y			
21000005	Lamar County FIS	Update County maps to Zone AE	Lamar	Watershed Planning	Lamar County	Y/?	Pending confirmation from Sponsor		
21000035	Cowhorn West Creek	Arroyo Street additional modeling to address flooding	Bowie	Watershed Planning	City of Texarkana	Y			
21000029	De Kalb Flood Control Levee System	Flood control levee system to reduce flood risk for De Kalb and surronding entities along Red River	Bowie	Project Planning	City of DeKalb	Y			
21000030	City of Hooks Infrastructure	Widen ditches to increase volume capacity of flash flood waters	Bowie	Project Planning	City of Hooks	Y			
21000021	City of Clarksville Deleware Creek	Debris, Vegetation Removal, and Channelization	Red River	Preparedness	City of Clarksville	Y			
21000039	City of Atlanta High School Lane Project/Phase No. 2	Perform channel improvements between Hwy 77 & Main St	Cass	Other	City of Atlanta	Y			

Reasons for Not Recommending FME

Region 2 - Potential FME's

FME ID	FME Name	Description	Counties	Study Type	Sponsor	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action
21000001	Cooke County FIS	Update County maps to Zone AE	Cooke	Watershed Planning	Cooke County	N	Less than 50% within Region 2
21000036	Cowhorn Creek	Creek crosses interstate near St. Michaels and existing flooding risk upstream of interstate	Bowie	Watershed Planning	City of Texarkana	N	Sponsor indicated action is not needed
21000043	City of Paris Big Sandy Cr Tribs 4 and 6 Improvements Phase 2	Channel improvements in the upper portion of Tributary 4	Lamar	Other	City of Paris	N	3 separate FMEs were combined into 1
21000055	City of Longview Property Buyout	Purchase properties in floodplain areas to reserve them from development	Gregg	Other	City of Longview	N	Project area outside of Region 2

Reasons for Not Recommending FMS

Region 2 - Potential FMS's							Subcommitee Agrees/Disagrees		
FMS ID	FMS Name	Description	Project Type	Sponsor	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action	Agree	Disagree	Meeting Notes
22000015	Cooke County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	NFIP/CRS	Cooke County	N	< 50% within Region 2	X		Make sure TC coordinates with Adjacent regions so they can include them in their plans.
22000033	Bowie County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrustructure design standards	Regulatory and Guidance	Bowie County	N	Recommended a region wide stormwater manual vs. per county	X		
22000054	City of Avery Storm Drainage Maintenance	Develop protocol for cleaning debris from ditches and drains within Avery to protect existing and new buildings	Preventive Maintenance Programs	City of Avery	Y	Not a capital type project.		X	SC decided not to recommend.
22000063	Fannin County Stream Maintenance	Regular maintenance, such as sediment and debris clearance, is needed so that the stream or waterway may carry out its designed function.	Preventive Maintenance Programs	Fannin County	Y	Not a capital type project.		X	SC decided not to recommend.

Evaluation of FMPs

Region 2 - Potential FMP's

						Flood Risk Indicators									
FMP ID	FMP Name	Description	Counties	Project Type	Sponsor	Area (sq.mi) in 100yr (1% annual chance) Floodplain	Area (sq.mi) in 500yr (0.2% annual chance) Floodplain	Estimated structures at 100yr flood risk (#)	Residential structures at 100yr flood risk (#)	Estimated Population at 100-year flood risk	Critical facilities at 100yr flood risk (#)	Low water crossings at flood risk (#)	Estimated road closures (#)	Estimated length of roads at 100yr flood risk (Miles)	Estimated farm & ranch land at 100yr flood risk (acres)
23000001	Ferguson Park Feasibility Study	Improvements to existing culverts and channelization	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	3.02	3.33	251	247	1100	5	6	715	22.63	20.89
23000002	Wagner Creek	Channel/Over bank Clearing	Bowie	Regional Channel Improvements	City of Texarkana	3.01	3.32	250	247	1099	5	6	715	22.66	20.65
23000003	Stream WC-2	Independence Circle & Lexington Place Bridge Improvements	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	0.076	0.08	4	22	70	0	0	25	0.426	0.299

Evaluation of FMPs

Region 2 - Potential FMP's

								Subcommittee Agrees/Disagrees		
FMP ID	**FMP Name**	**Description**	**Counties**	**Project Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
23000001	Ferguson Park Feasibility Study	Improvements to existing culverts and channelization	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	**Y/?**		**X**		Pending confirmation of No Negative Impacts
23000002	Wagner Creek	Channel/Over bank Clearing	Bowie	Regional Channel Improvements	City of Texarkana	**Y/?**		**X**		Pending confirmation of No Negative Impacts
23000003	Stream WC-2	Independence Circle & Lexington Place Bridge Improvements	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	**Y/?**		**X**		Pending confirmation of No Negative Impacts

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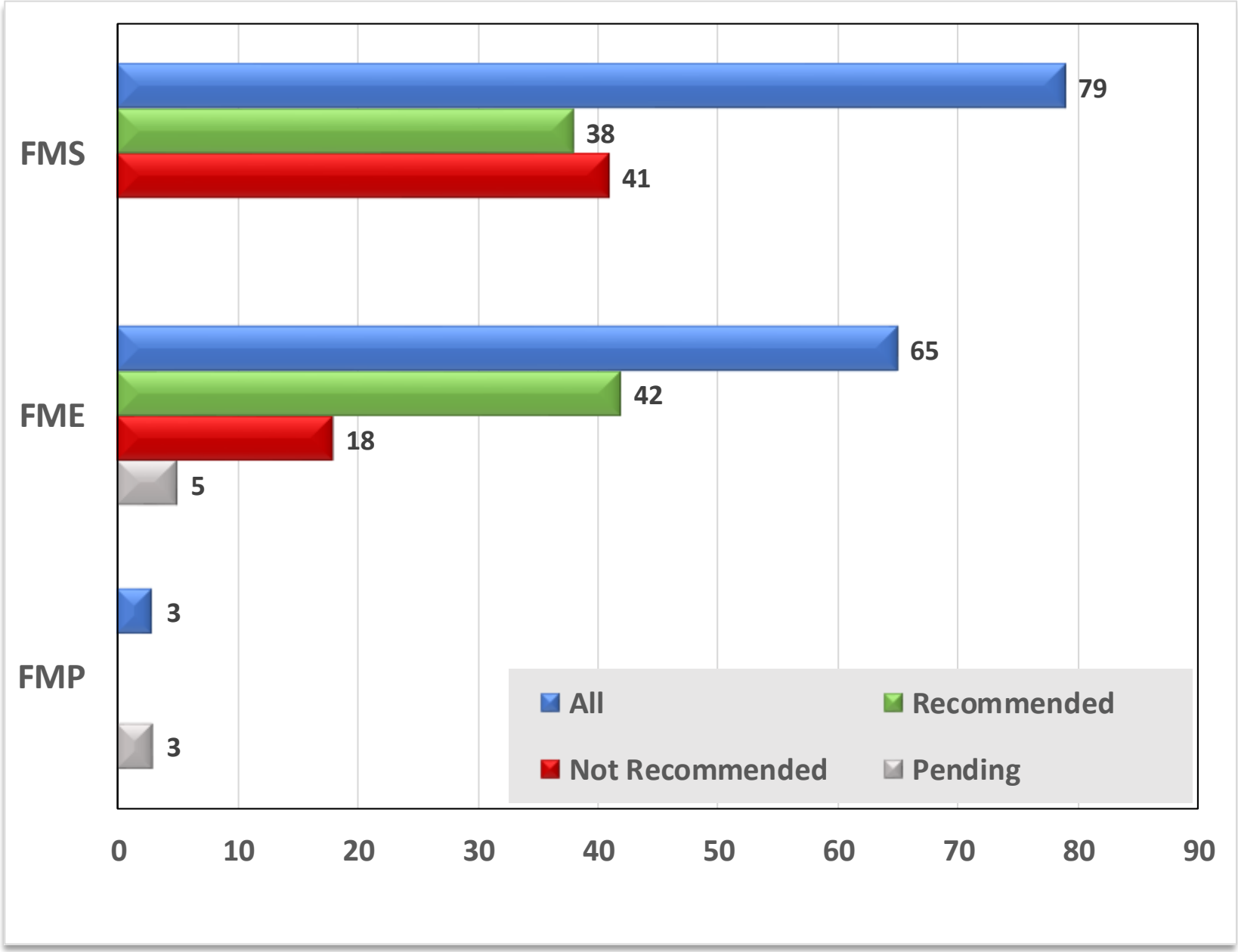
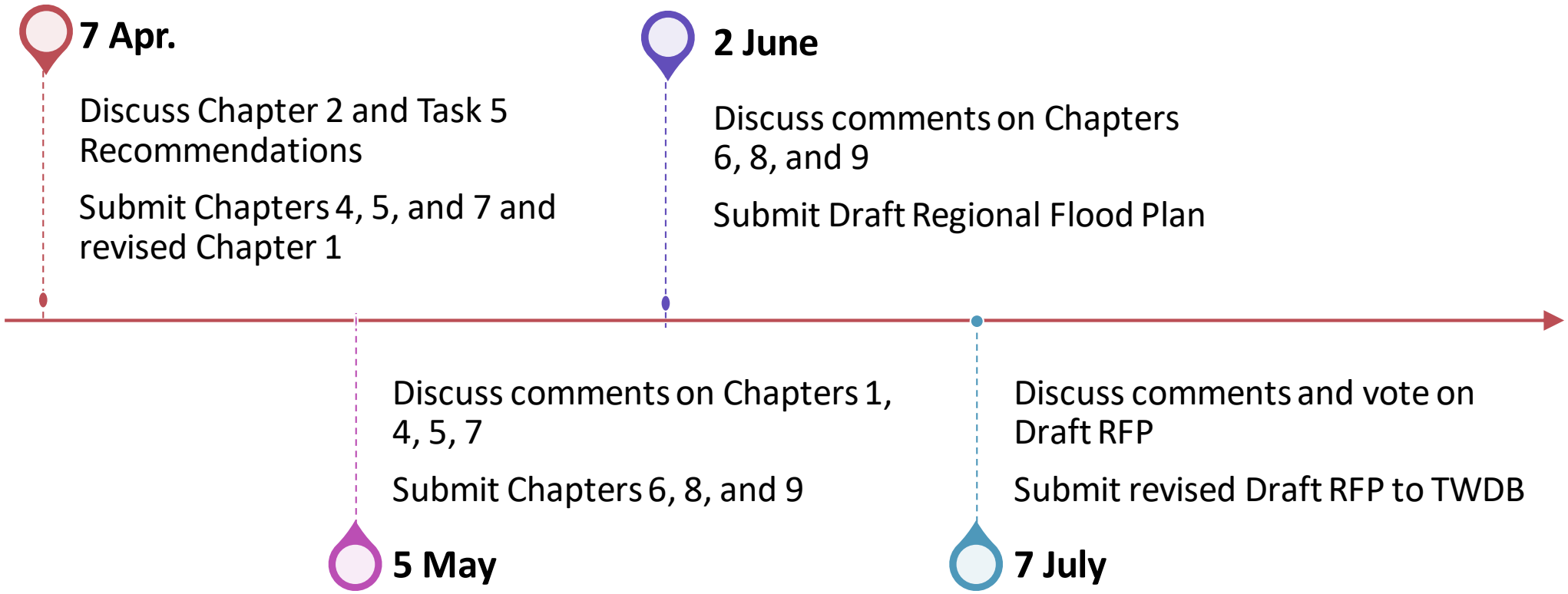

FMS
79
38
41
FME
65
42
18
5
FMP
3
3
All
Recommended
Not Recommended
Pending
0
10
20
30
40
50
60
70
80
90

Consider Vote for Adopting Technical Subcommittee Recommendations

What' Left – A Lot!

- Task 4A – Flood Mitigation Needs Analysis
- Task 4B – Identification and Evaluation of Potential FME/S/Ps
- Task 4C – Prepare and Submit Technical Memorandum
- Task 5 – Recommendation of FME/S/Ps
- Task 6A – Impacts of Regional Flood Plan
- Task 6B – Contributions to and Impacts on Water Supply Development and the State Water Plan
- Task 7 – Flood Response Information and Activities
- Task 8 – Administrative, Regulatory, and Legislative Recommendations
- Task 9 – Flood Infrastructure Financing Analysis
- Task 10 – Finalize Regional Flood Plan (RFP)

Schedule


7 Apr.
Discuss Chapter 2 and Task 5 Recommendations
Submit Chapters 4, 5, and 7 and revised Chapter 1
2 June
Discuss comments on Chapters 6, 8, and 9
Submit Draft Regional Flood Plan
Discuss comments on Chapters 1, 4, 5, 7
Submit Chapters 6, 8, and 9
5 May
Discuss comments and vote on Draft RFP
Submit revised Draft RFP to TWDB
7 July

Chapter 2 :Task 2 Flood Risk Analyses

To assess flood risk in the Lower Red-Sulphur-Cypress Flood Planning region, existing conditions including flooding history and flood hazard areas were gathered and analyzed, to determine the best available estimated location of 1.0 % and 0.2% annual chance flood events from the best available data. Locations of community populations, structures and identified critical facilities affected by the flood hazard were studied to identify flooding exposure, as well as community vulnerability in these areas.

Future flooding conditions were projected using the best available flooding data and projected regional growth to determine the extent of risk if no action was taken to mitigate the expansion and/or effect of the flood hazard areas. The exposure analysis was run again with the future flood hazard areas to determine the impact of expansion in the region. The current and future flood risk analyses highlight potential areas of concern, and vulnerability within the region.

Task 2A – Existing Condition Flood Risk Analyses

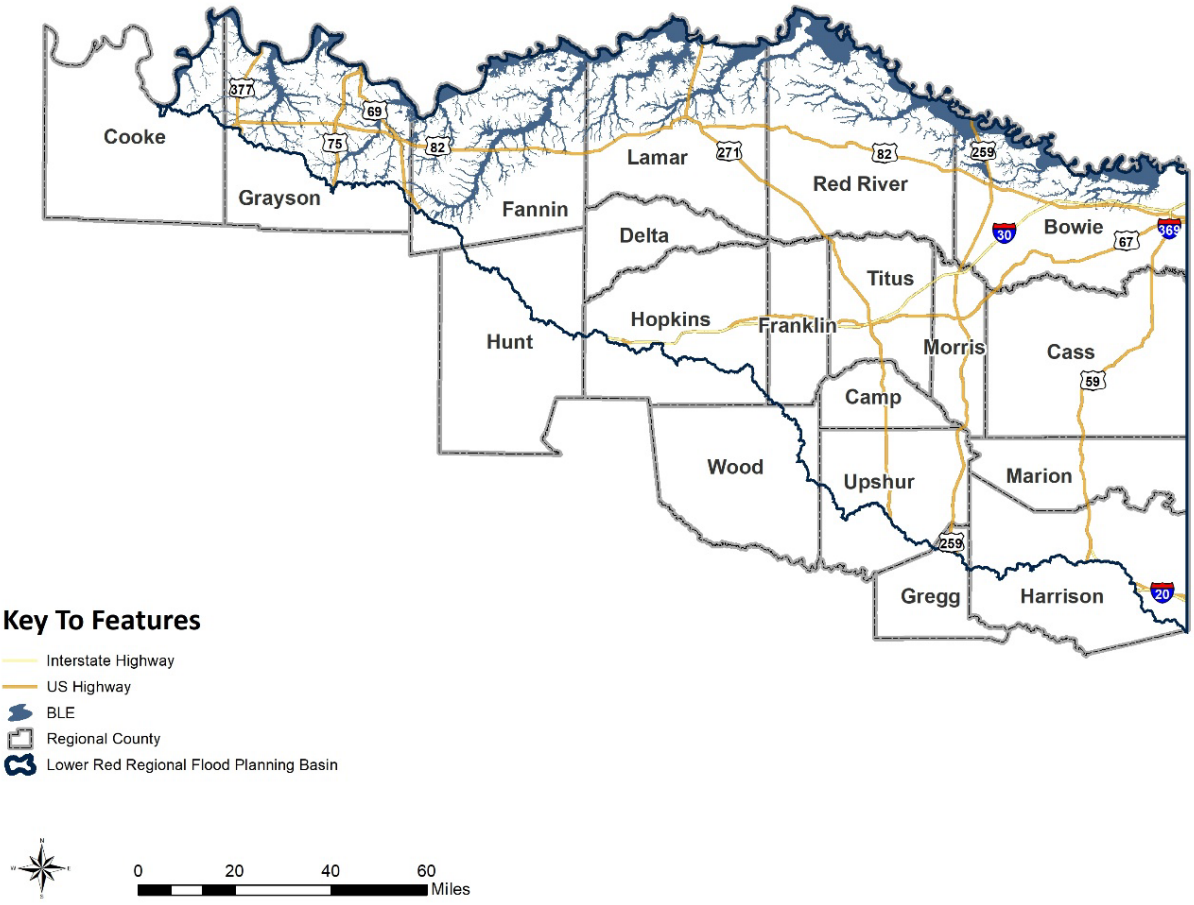
2.A.1 Existing Condition Flood Hazard Analysis

Data for Existing Conditions for Planning Purposes

Existing flood risk for the region was determined by evaluating a variety of existing data sources, as well as collecting public input in the planning process to assess the frequency and magnitude of flooding at locations throughout the Lower Red-Sulphur-Cypress basin. FEMA regulatory, effective products provided the foundation of the assessment, although 6 counties out of 19 counties that comprise the region do not have any Special Flood Hazard Areas (SFHA) mapped yet. Out of 13 counties with some SFHA mapped by FEMA, only 10 of the counties have detailed studies (Zone AE). Even in these counties, the detailed studies are generally limited to the urban centers with the rest of the county mapped as approximate (Zone A).

New FEMA-provided Base Level Engineering (BLE) data was published in the Fall of 2021 for most of the Lower Red River Basin within the region, including the Lake Texoma, Bois D'Arc, and Pecan Waterhole HUC 8's. These are not regulatory products but often intended to supplement the regulatory products, provide an estimate of the base flood elevations (BFE)'s, and provide communities approximate modeling on which to build their own modeling and regulations. BLE for the Red River tributaries were derived from 1D modeling using regression analysis. For the main stem Red River, the USACE's frequency analysis was utilized to account for the regulation due to Lake Texoma. Light detection and ranging (LiDAR) ground elevation data is also used to produce this BLE information. This new BLE data provides mapping extents including the potential for 1% and .2% annual chance of flooding events to primarily unmapped areas and is very valuable in assessing the flood risk to these areas.

Figure 2-1 New Base Level Engineering (BLE) Released for Region



A cursory statewide dataset from an external contractor, Fathom, was acquired by the Texas Water Development Board to assist in determining the locations of flood risk. The modeling process determined the extents of different frequencies of flooding events (floodplains) based on Texas-provided LiDAR data, historical NOAA Atlas 14 rain frequency, stream gauges and other land cover data on a 30-meter grid, and then mapped onto a 3-meter resolution topographic dataset. The approach is also referred to as "rain-on-mesh" or "rain-on-grid" but there are different types of modeling collection methods that comprise the data.

Reports of flooding gathered from the public input process were incorporated when determining locations of flood risk. Over 400 stakeholders of mostly governmental agencies in the region were surveyed, and open public input was solicited using interactive maps asking for local knowledge of flooding and flood risks. During this process, 24 locations of known flooding were gathered through the

input tool, while other more detailed information came from subsequent meetings and phone calls with region stakeholders.

Fifteen years of NOAA flooding-related data with narrative flooding descriptions, often reported from law enforcement and emergency management officials through the National Weather Service was used to understand the locations and extent of previous floods to determine existing flooding conditions. The data reported deaths, injuries, and often property and crop value lost. Based on stakeholder input, the impacted property values did not seem to report and/or reflect the true value of property damaged in some of these events.

Precipitation

In 1973 the National Flood Insurance Program (NFIP) set the standard for flood hazard areas based on the 1.0% annual chance exceedance or as it is commonly referred to as the 100-year flood. Much of the floodplain mapping at that time was developed using the Weather Bureau's (U.S. Department of Commerce) Technical Paper 40 (TP-40) Rainfall Frequency Atlas f the United States (1961). TP-40 provided isopluvial (contours of qual rainfall) maps of the continental United States for various frequencies and durations from 1-year, 30-minute rainfalls through the 100-year, 24-hour. No 0.2% ACE (500-year) rainfalls were included. Figure 2-2 shows the 100-year (1% ACE), 24-hour duration rainfall isopluvials for the continental United States. Figure 2-3 shows the same rainfall isopluvials with a focus on Texas. As summarized in Table 2-1, the 1% ACE (100-yr), 24-hour rainfall totals range from 9.3 inches at the northwest corner of the region to 10.5 inches at the southwest corner of the region. TP-40 was used as the basis of most flood studies in Region 2.

Table 2-1 Technical Paper 40 Precipitation Frequency Estimates

Region 2 Watershed	1-yr 24 hour Rainfall (in)	100-yr 24 hour Rainfall (in)	500-yr 24 hour Rainfall (in)
Northwest Portion	**3.1**	**9.3**	**NA**
Northeast Portion	**3.65**	**9.8**	**NA**
Southeast Portion	**3.7**	**10.5**	**NA**

Source: NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/index.html

Figure 2-2. TP-40 Rainfall Isopluvials for the Continental U.S. for the 100-year (1% ACE), 24-hour rainfall Event

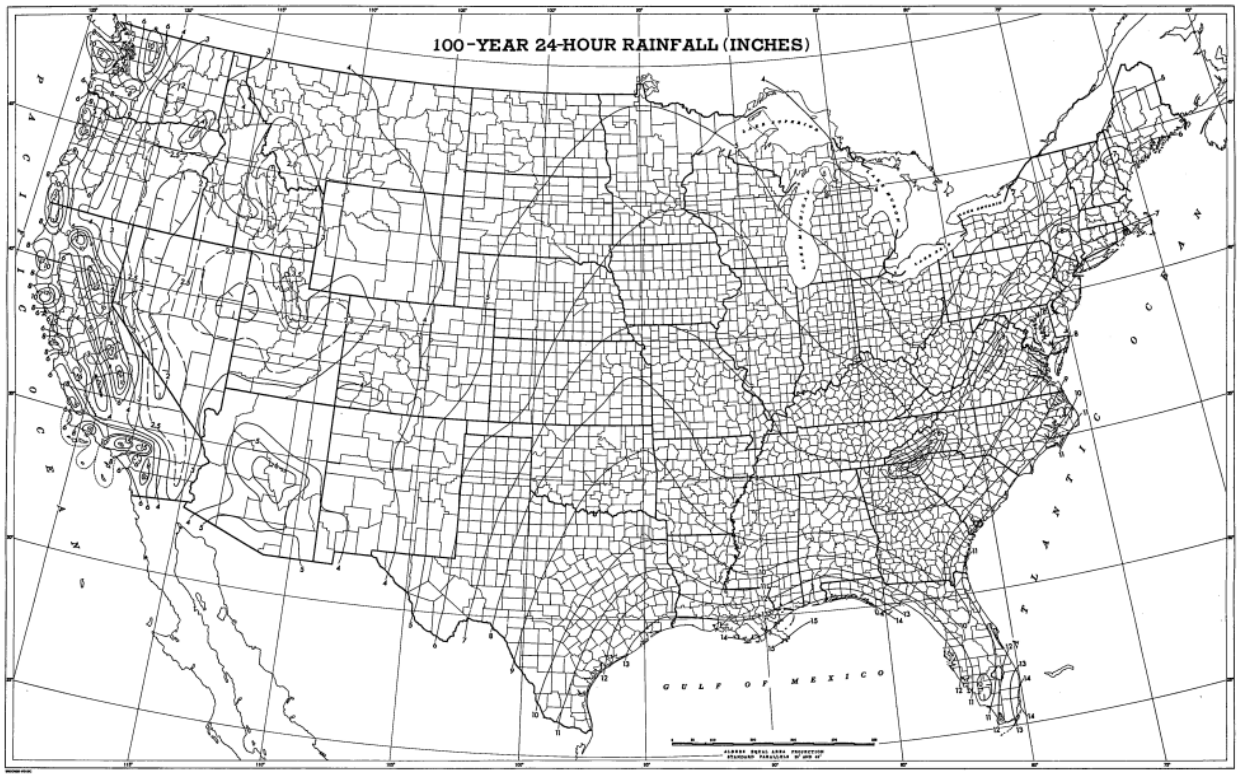
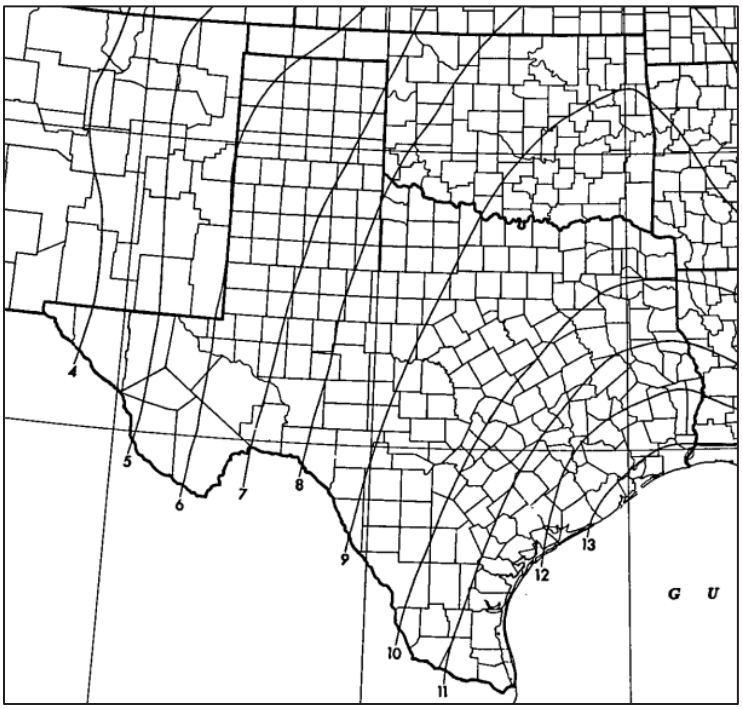


Figure 2-3. TP-40 Isopluvials across Texas for the 100-year (1% ACE), 24-hour rainfall event



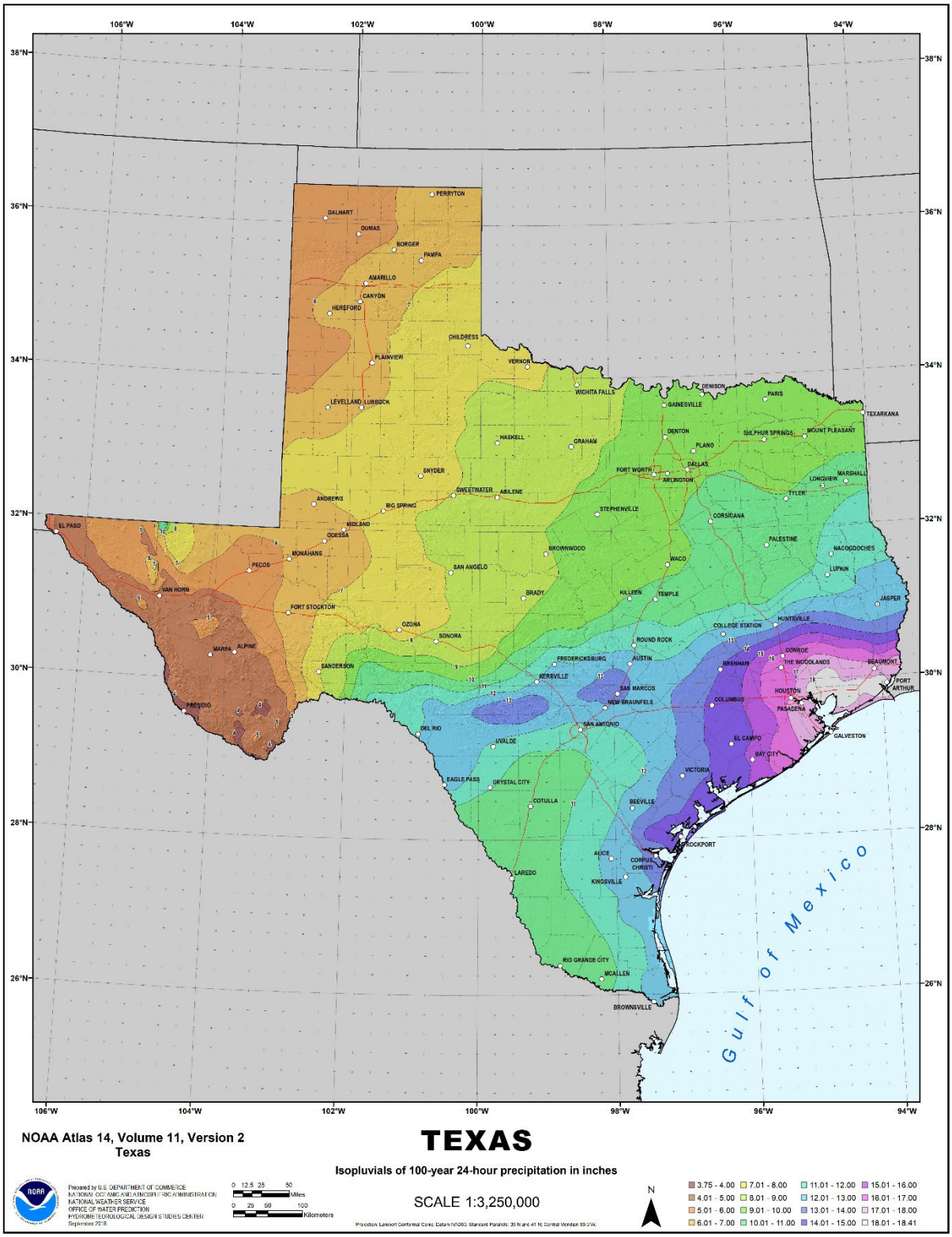
In 2018, The National Oceanic and Atmospheric Administration (NOAA) developed hypothetical rainfall in Texas based on historic rainfall data in its NOAA Atlas 14, Volume 11 study. Rainfall data was broken down in terms of duration and recurrence interval. As shown in Table 2-2 and Figure 2-4 NOAA 100-yr (1% ACE), 24-hr Rainfall Isopluvials – Rainfall Intensity MapFigure 2-4, the general isopluvial patterns and rainfall totals are similar to those seen in TP-40. Other than in specific local situations, Atlas 14 is not expected to have major impacts on the floodplain boundaries in the Region. Over time, Atlas 14 will be used to create new floodplain mapping in Region 2 and it is advised that local jurisdictions adopt Atlas 14 as the basis of design since it provides a more up-to-date and complete picture of rainfall frequencies; however, most of the floodplain mapping used in this flood plan is likely based on TP-40.

Table 2-2 Precipitation Frequency Estimates

Region 2 Watershed	1-yr 24 hour Rainfall (in)	100-yr 24 hour Rainfall (in)	500-yr 24 hour Rainfall (in)
Northwest Portion	**3.27**	**9.62**	**12.8**
Northeast Portion	**3.61**	**9.26**	**11.9**
Southeast Portion	**3.44**	**10.6**	**14.7**

Source: NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/index.html

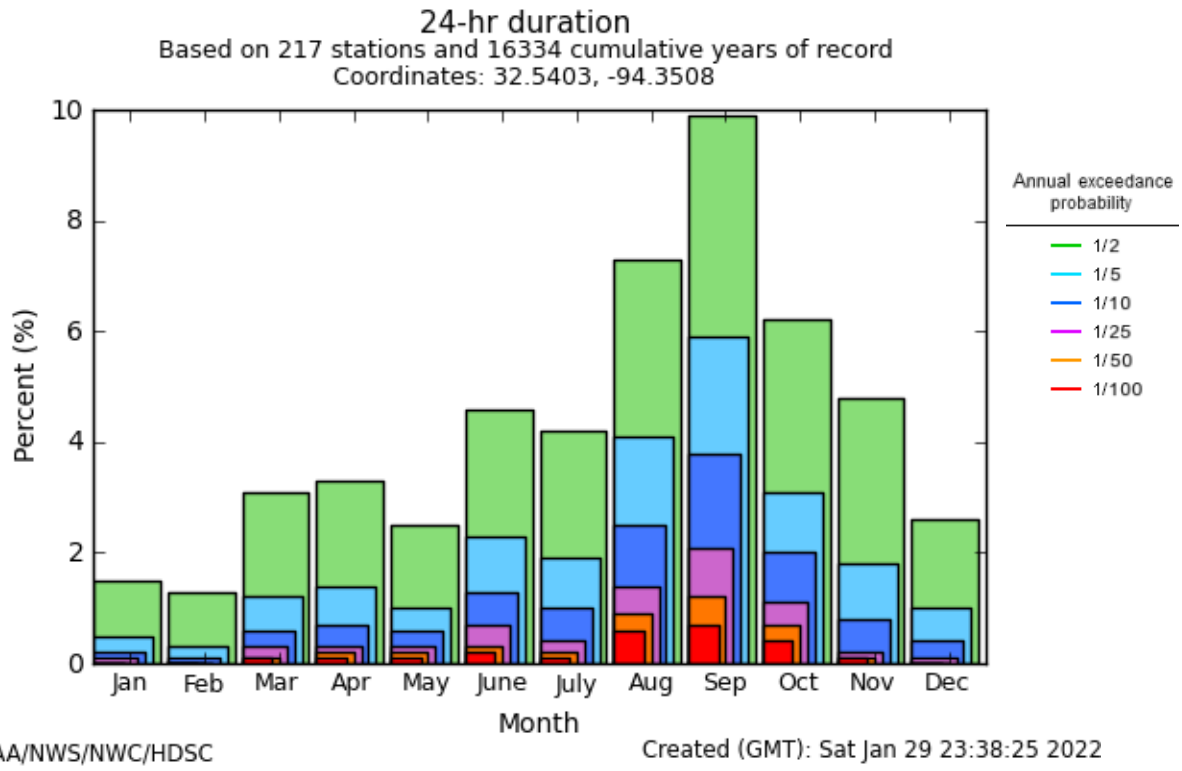
Figure 2-4 NOAA 100-yr (1% ACE), 24-hr Rainfall Isopluvials – Rainfall Intensity Map



Source: NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/index.html

The following NOAA seasonality graphs illustrate when extreme rainfall events typically occur during the year at various portions of the region. These show the percentage of precipitation totals for a 24-hour duration that exceeded the precipitation frequency estimates for the duration and selected annual exceedance probabilities in each month for each region. The precipitation frequency estimates were derived from annual maximum series at each station in the region. Results are provided for 24-hr durations and for annual exceedance probabilities of 1/2 (or 1-in-2, 50% AC), 1/5 (20% AC), 1/10 (10% AC), 1/25 (4% AC), 1/50 (2% AC), and 1/100 (1% AC). These graphs show that for most of the region, extreme rainfall is most likely to occur in the late summer and early fall and is least likely to occur in the winter. In the western portion of the region there is increased risk of heavy rainfall in the spring as well. These trends suggest that flood risks to agriculture are high since flooding is most likely to occur during the growing and harvesting season of most crops.

Figure 2-5 Seasonality Graph from Marshall NOAA Station (near Southeast Corner of Region)



Source: NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/index.html

Figure 2-6 Seasonality Graph from Sulphur Springs NOAA Station (near Center of Region)

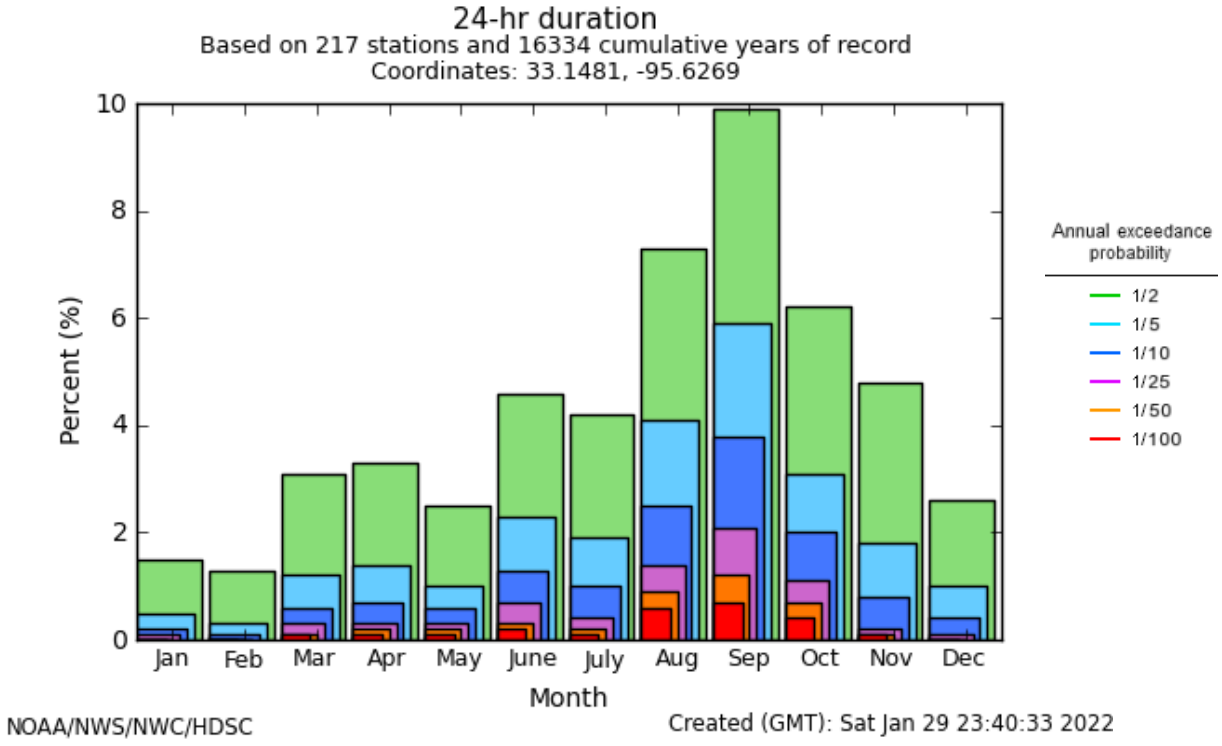
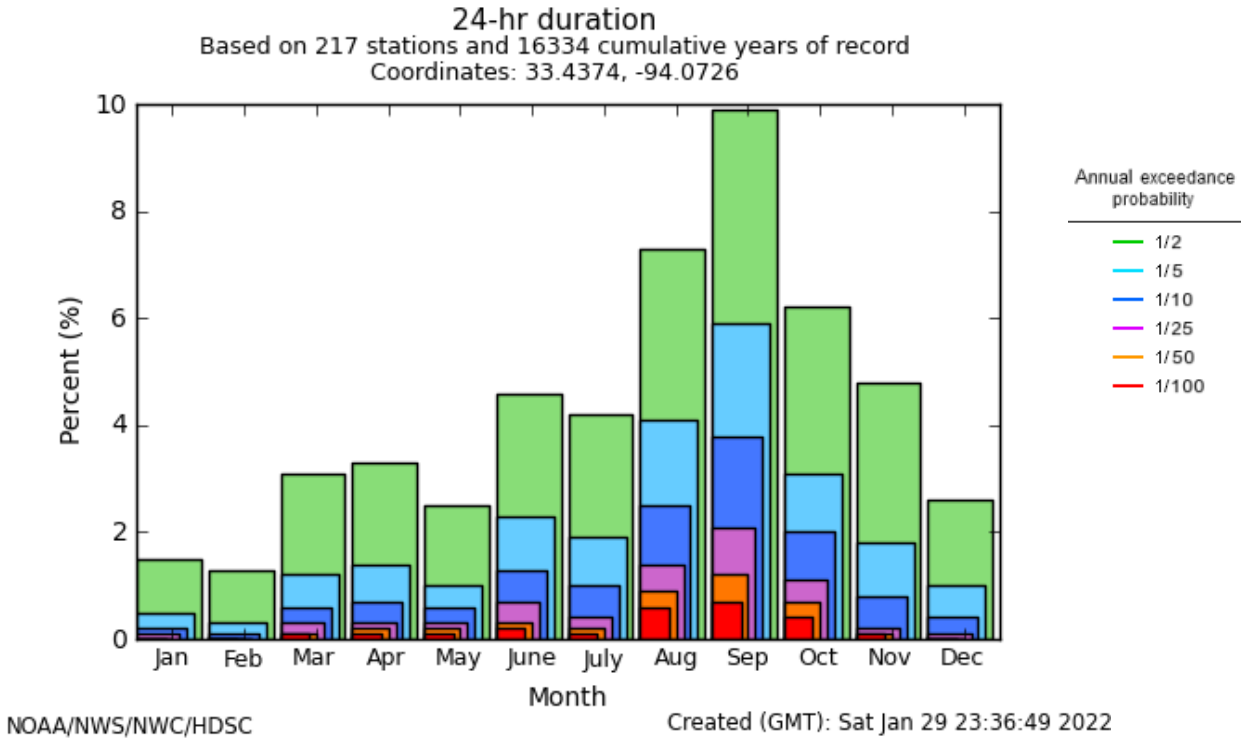


Figure 2-7 Seasonality Graph from Texarkana NOAA Station (northeast Corner of Region)



Source: NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/index.html

Figure 2-8 Seasonality Graph from Gainesville NOAA Station (northwestern Corner of region)

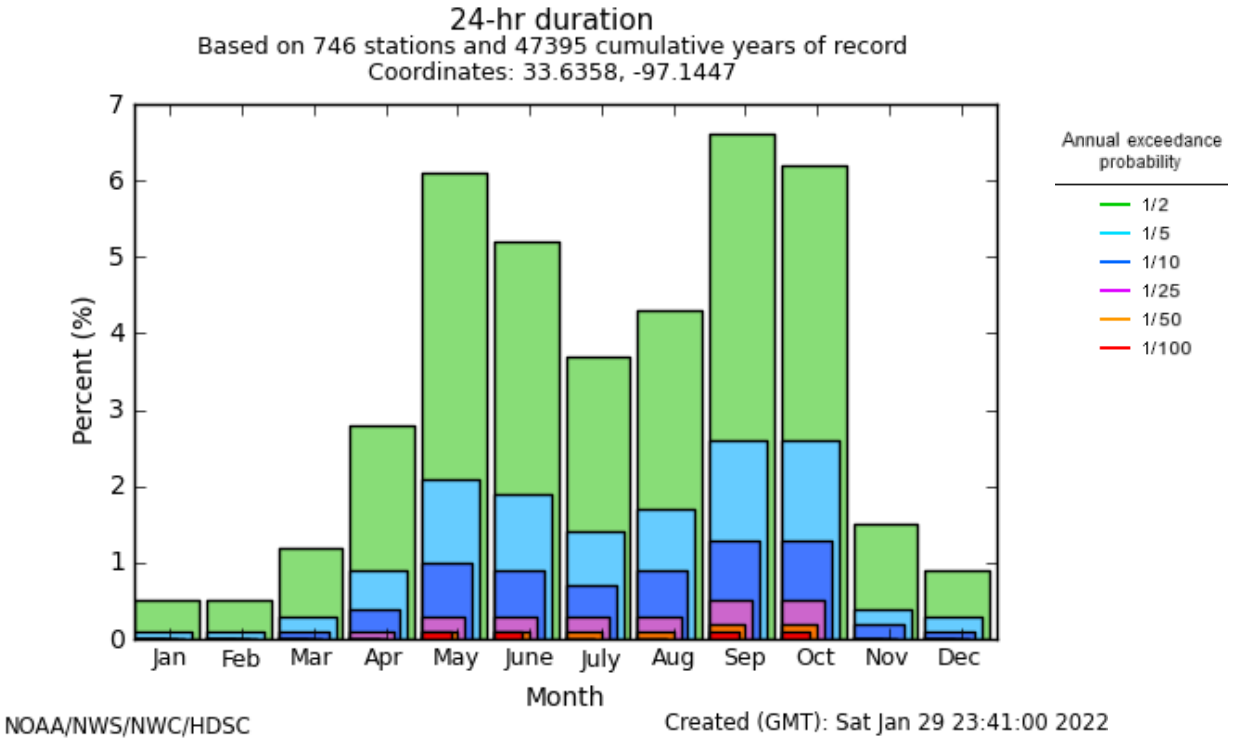
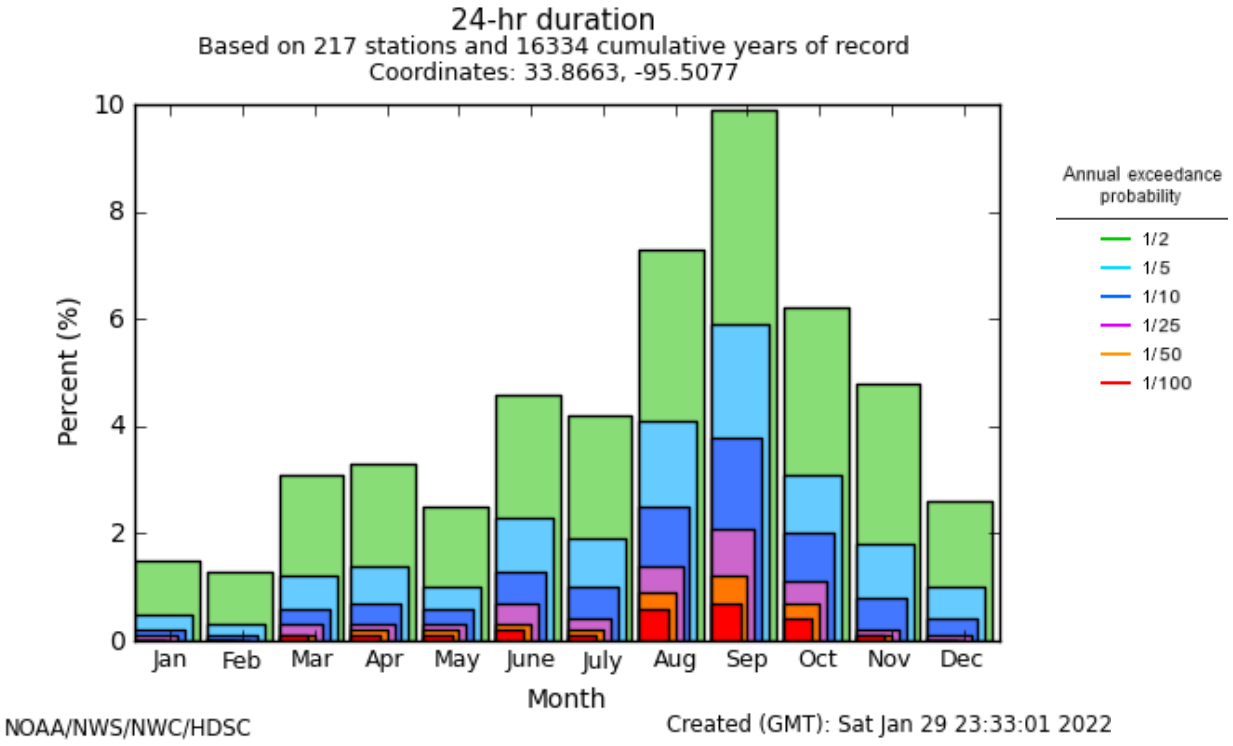


Figure 2-9 Seasonality Graph from Arthur City NOAA Station (northern Center of Region)

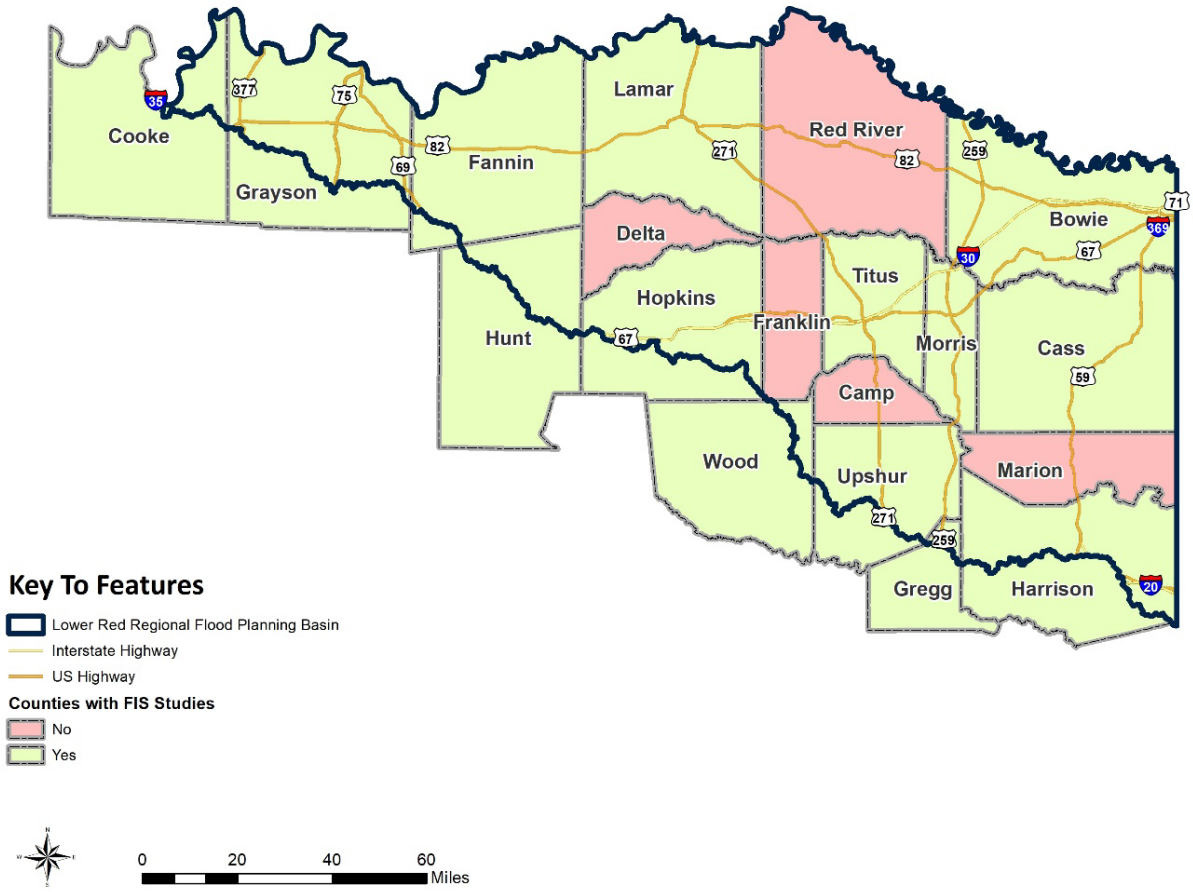


Source: NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/index.html

Existing Hydrologic & Hydraulic Model Availability

Known hydraulic and hydrologic models exist for areas of the City of Paris, City of Texarkana and City of Sherman from local drainage studies. These models were all conducted or updated within the last 10 years. USACE conducted Corps Water Management System (CWMS) watershed modeling for Lower Red-Sulphur-Cypress areas for forecasting and dam safety studies. FIS studies are presumed to exist for 13 of out of the 19 primary counties in the region, but this data has not been requested from FEMA. Out of the 13 counties with FIS studies, 9 counties had studies performed within the last 10 years.

Figure 2-10 Lower Red-Sulphur-Cypress Counties with FIS Studies



Best Available Data

A seamless flood hazard GIS layer, referred to as the "flood quilt" was assembled using the best available data for each area in the region. The data sources were prioritized by their accuracy for each area, including the collection method and the spatial representation, establishing a data hierarchy. The intent was not to create a regulatory product, but one for planning purposes to identify existing conditions, areas of exposure risk and vulnerability. Table 2-3 summarizes the hierarchy of flood quilt data sources used for existing conditions.

Existing detailed studies, FEMA effective Zone AE areas were prioritized as the highest quality data source of established flood risk. Flood risk has been established in these locations based on detailed studies. The largest area of AE exists in Grayson County; otherwise, only the large cities in the region have detailed Zone AE floodplains. The recently published BLE data was usually considered second most accurate in the quilt, having been recently modeled from high-quality LiDAR data. BLE data was used both where there was no previous mapping. It was also used instead of less-reliable FEMA Zone A zones. In Grayson county, in an AE area just downstream of Lake Texoma, BLE was used instead of the AE because the last updated date for that mapping was 1991, being originally studied in 1978.

BLE products were released for areas within the Red River basin. The drainage areas that fall outside of the Red River basins are mostly comprised of FEMA Zone A flood risk mapping or are unmapped. Detailed hydraulic analyses have not been performed to determine Zone A floodplains, so they are often referred to as *approximate*. No FIS studies exist for Camp, Delta, Franklin, Marion, Morris and Red River Counties therefore there are no regulatory floodplains are mapped. The Fathom data was used in these counties in its entirety to represent the limits of the 1% and 0.2% annual chance flood events.

Table 2-3 Lower Red-Sulphur-Cypress Flood Quilt Data Source Hierarchy Matrix

Best Available		→		→		→		**Most Approximate**	
Local Floodplain (if determined current)		NFHL AE		BLE		NFHL A		FAFDS, or No FEMA	
1% ACE	0.2% ACE	1% ACE	0.2% ACE	1% ACE	0.2% ACE	1% ACE	0.2% ACE	1% ACE	0.2% ACE
Local Study, if provided (no better studies were provided)	Local Study, if provided	Zone AE + Pluvial Fathom *	Zone AE + Pluvial Fathom *	BLE + Pluvial Fathom	BLE + Pluvial Fathom	Zone A + Pluvial Fathom	Pluvial Fathom (no 0.2% ACE Zone in most Zone A areas)	Combined Fathom Pluvial & Fluvial (Replaced FAFDS with Fathom)	Combined Fathom Pluvial & Fluvial (Replaced FAFDS with Fathom)

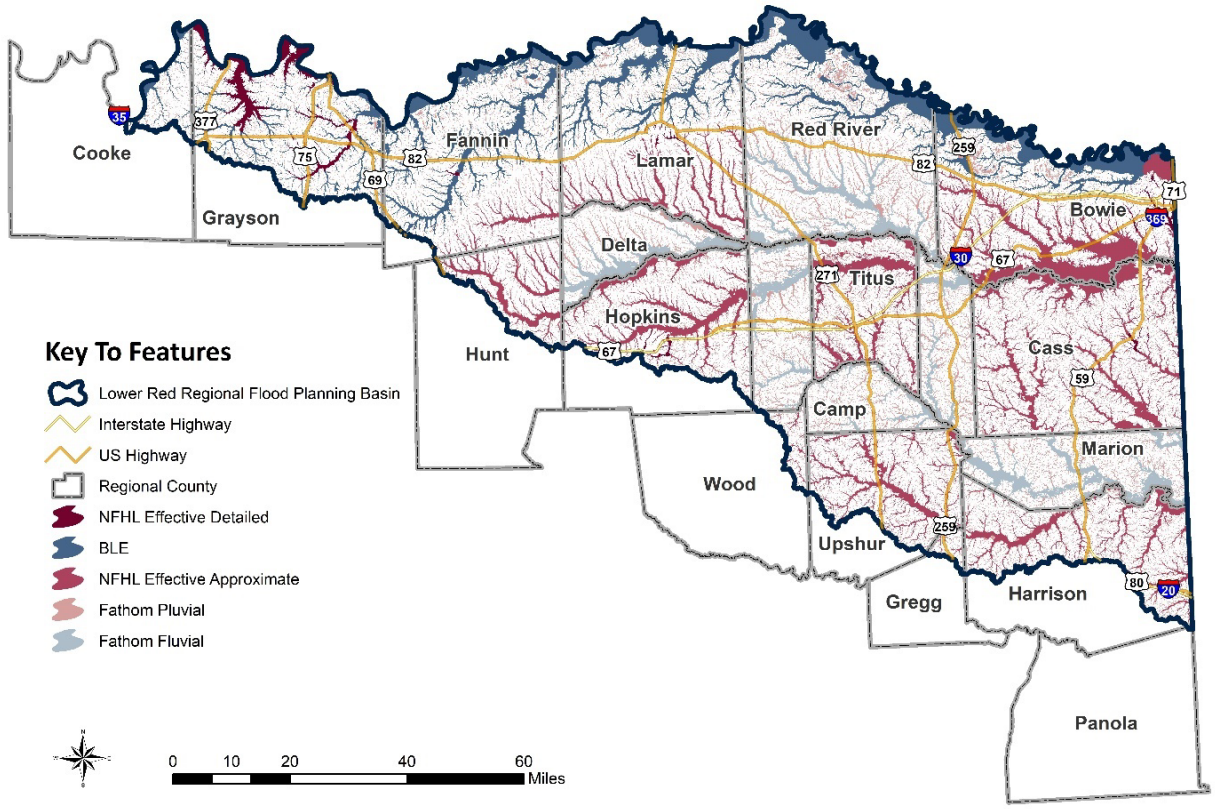
For the Lower Red-Sulphur-Cypress region, pluvial and fluvial products from the TWDB-provided Fathom dataset were incorporated into the flood quilt to represent areas of flood risk where there was missing or limited data. Pluvial boundary data was created from a complex, proprietary, hydraulic model using intensity-duration-frequency (IDF) curves from historic rainfall data mapped to a 30-meter grid. Intended to represent river flooding conditions, the fluvial boundary data is created from a similar modeling process, but stream discharge at inflow points, water levels and downstream boundaries are all incorporated for each river reach. Both data sets were then mapped to a 3-meter resolution with Texas provided LiDAR data. The data is intended to be used to understand areas of flood risk where there is no data or limited data.

Both pluvial and fluvial data sets were used to represent riverine and upland flooding in counties where there was no existing mapping, Camp, Delta, Franklin, Marion, Morris and Red River. New BLE data in the northern part of Red River County was utilized instead of fathom fluvial. All other areas were supplemented with fathom pluvial to better capture flood risks in the Region. Between 2015-2019, more than 40% of all NFIP paid losses occur in areas outside of mapped high-risk areas (FEMA Answers to Questions About the National Flood Insurance 2020, https://www.fema.gov/sites/default/files/2020-05/f084_atq_11aug11.pdf), so a fuller understanding of flood risks will help the region better plan and prepare.

1% and 0.2% Annual Chance Exceedance Floodplains

Through this process, the most current and accurate data was pieced together for the region, tying different data sources together without overlap to create a most current GIS flood hazard layer of the 1% and 0.2% annual chance existing conditions flood quilt, as shown in Figure 2-11 below.

Figure 2-11 Lower Red-Sulphur-Cypress Finalized Flood Quilt



With the addition of the non-regulatory data sources, total areas of flood hazard by frequency and by county can be summarized, as seen in Figure 2-12. The percentage of area in a county within the 1% or 0.2% annual chance flood quilt is noted in Table 2-4.

Figure 2-12 Square Miles of Flood Hazard in Each County in Region

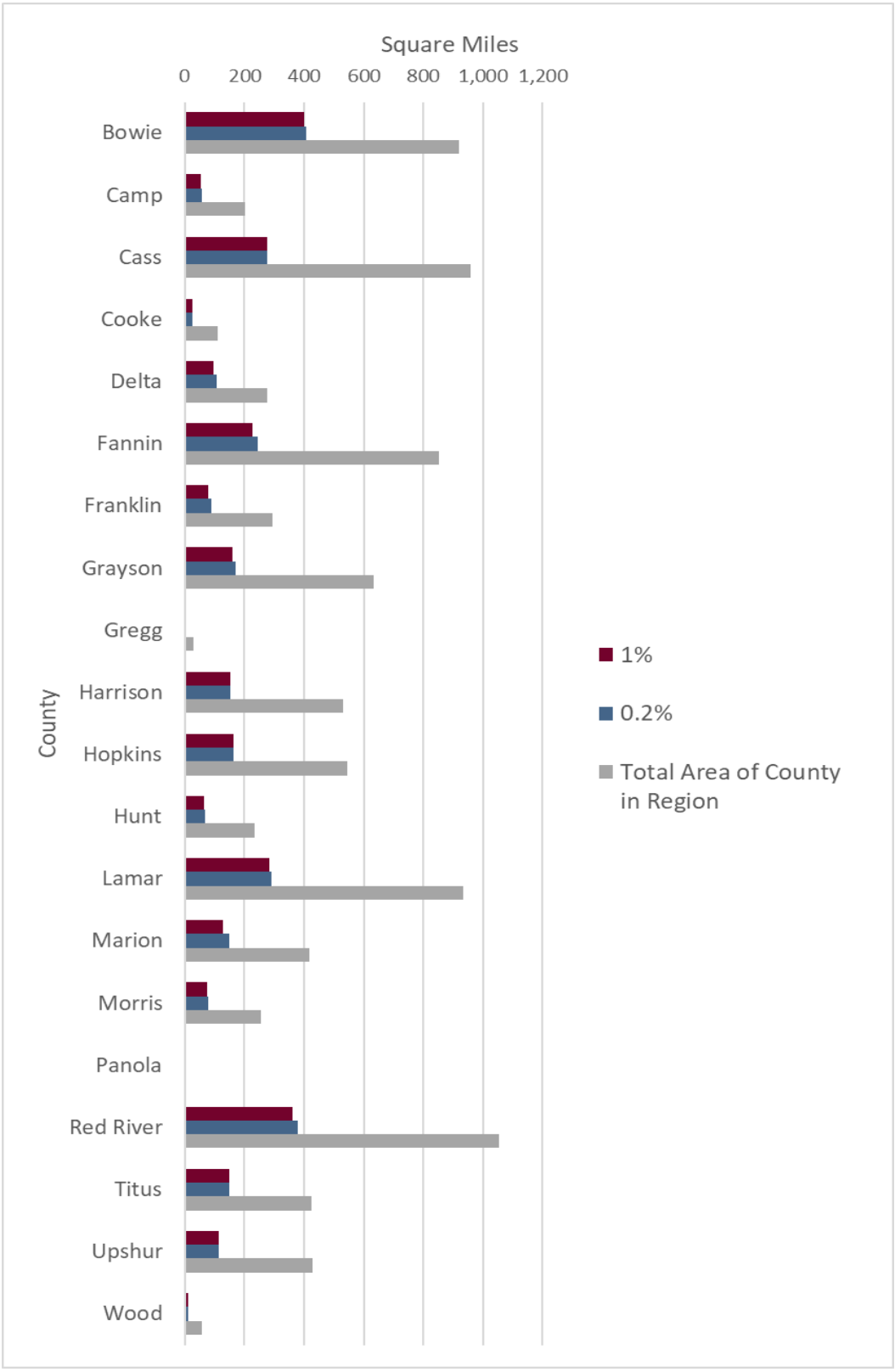


Table 2-4 Percentage of County in Flood Hazard Area

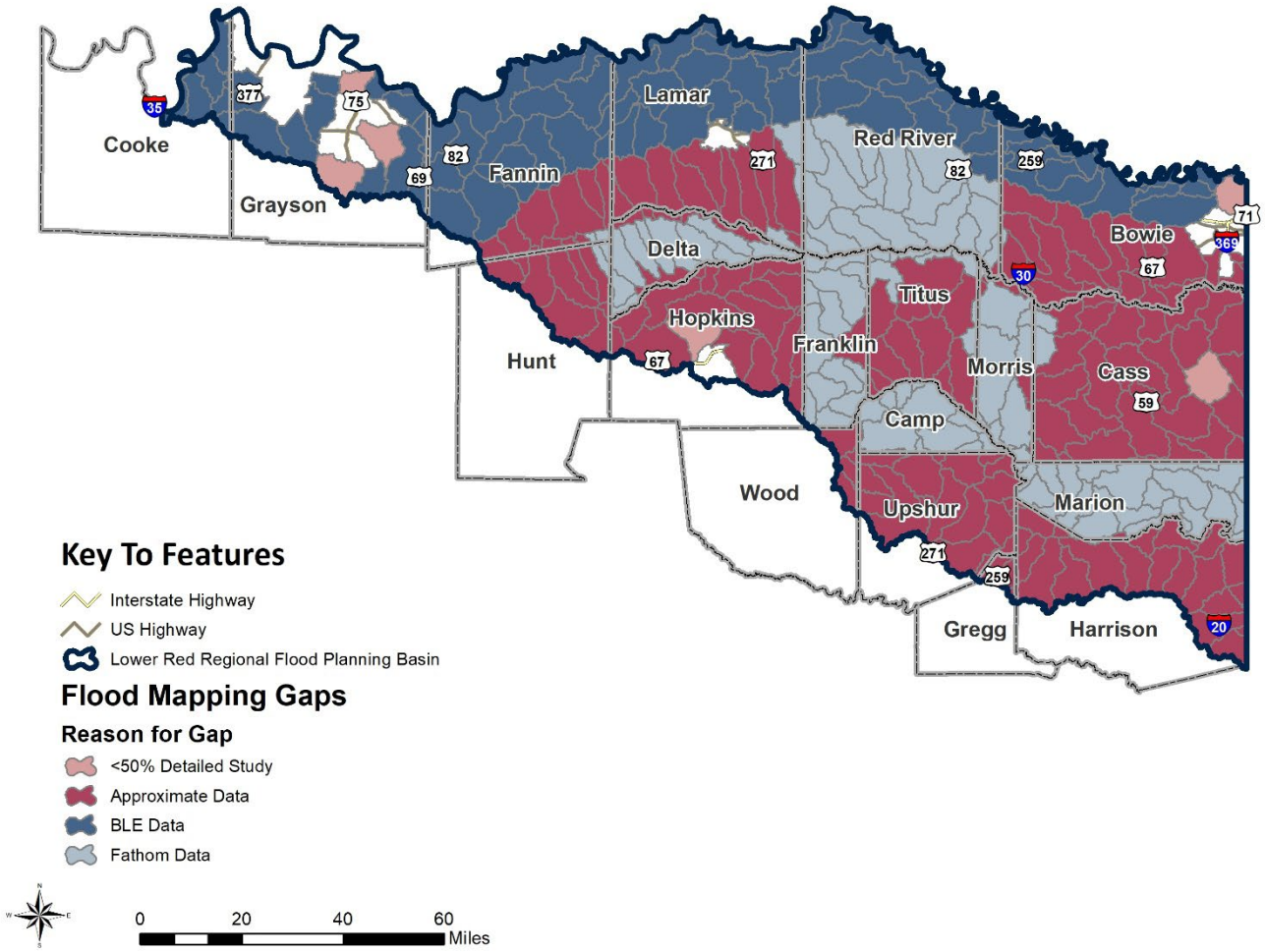
County	Percentage of County in Region in 1.0 & 0.2% Flood Hazard Area
Bowie	44.2%
Camp	27.6%
Cass	28.9%
Cooke*	24.5%
Delta	39.0%
Fannin*	28.5%
Franklin*	29.8%
Grayson*	26.7%
Gregg*	20.8%
Harrison*	28.7%
Hopkins*	30.1%
Hunt*	28.3%
Lamar	31.3%
Marion	35.5%
Morris	30.0%
Panola*	9.2%
Red River	35.9%
Titus	35.4%
Upshur*	26.7%
Wood*	20.2%

*Entire county not within Flood Planning Region Boundary.

Data Gaps

Data gaps are considered areas that lack current modeling and/or mapping, which could include missing data and/or outdated data. Data gaps were identified through the process of identifying the best available data sources of flood hazard studies. Local knowledge of flooding was also collected through the process of community input. Gaps were captured at the HUC 12 level to understand the extent of needs for detailed studies in the region.

Figure 2-13 Gaps in Current, Detailed Flooding Data



2.A.2 Existing Condition Flood Exposure Analysis

Existing Development and FEMA Floodplains

A region wide GIS analysis was conducted to understand who and what might be affected by both the 1.0% and 0.2% annual chance flood events indicated in the extents of the flood quilt. Structures, populations, critical facilities, infrastructure and agricultural areas were all evaluated at a high-level for an understanding of the regional impact of flooding. Most of these data sets were provided by the Texas Water Development Board and were confirmed and sometimes supplemented through the public input process of the Regional Flood Planning Group.

Each of the datasets was intersected with the flood quilt to create exposure-related output files to glean summaries of flooding impact for all areas within the region. The related exposure output GIS files are part of the results of the flood planning process.

Existing regulatory FEMA floodplains exist for many counties in the region. Table 2-5 shows areas of identified increased flood risk in each county in the flood quilt compared to the limited areas of FEMA

regulatory mapping, as well as possible structures at risk in those areas. It is important to understand flood risks beyond the FEMA floodplains because over 20 percent of National Flood Insurance Program (NFIP) claims occur outside of high risk (1% ACE) flood zones (https://www.fema.gov/press-release/20210318/fact-sheet-flood-plain-management-insurance-and-rebuilding). In larger events, such as Hurricane Harvey, more than 50 percent of were outside a designated flood zone (https://www.tdi.texas.gov/tips/flood-insurance-cost.html). For this planning cycle, structures are identified from high-level mapping efforts and they have not been verified to be a fully walled or finished-out building.

Table 2-5 Square Miles in FEMA Regulatory Floodplain vs Determined Flood Hazard Area

County	Sq Miles in FEMA Regulatory Floodplain (1% & 0.2%)	Sq Miles in Determined Flood Quilt (1% & 0.2%)	Structures in FEMA Regulatory Floodplain (1% &0.2%)	Structures in Determined Flood Quilt Area (1% & 0.2%)
Bowie	324	407	1839	3,055
Camp	0	56	0	276
Cass	175	276	290	583
Cooke*	10	27	6	38
Delta	1	108	1	127
Fannin*	153	243	749	1,256
Franklin*	0	88	0	555
Grayson*	109	169	1689	2,924
Gregg*	3	6	14	58
Harrison*	84	153	663	917
Hopkins*	108	164	340	710
Hunt*	45	66	202	432
Lamar	184	292	1259	1,904
Marion	0	149	1	390
Morris	0	77	1	265
Panola*	0	0	0	0
Red River	0	379	0	441
Titus	103	151	266	634
Upshur*	70	114	189	432
Wood*	5	11	7	26

*Entire county not within Flood Planning Region Boundary.

Potential Flood Mitigation Projects

Through the extensive public input process of this planning cycle, no flood mitigation projects with dedicated construction funding, and scheduled for completion were identified. There are water supply projects (Bois d'Arc Lake and Lake Ralph Hall) under construction, but these projects do not have a flood control function.

Flood Exposure Due to Existing Levees or Dams

The exposure analysis takes into consideration populations and properties potentially impacted by levees that do not meet FEMA accreditation. Through the regional infrastructure inventory process, 19 levee systems were identified in the region however 11 of those levees are considered *Non-Accredited* by FEMA's classification standards. This classification occurs when an area goes through a remapping process and the levee is no longer certified as meeting the minimum federal requirements for reducing the flood hazard.

TCEQ provided a list of dams in their inventory and, for that that had been inspected, the dam condition. Due to security concerns, TCEQ does not release the hazard classification, which is based on how much damage and loss of life would be expected in the event of a breach, emergency action plans or potential inundation areas that would be caused by dam breaches. To get a sense of the potential risks of dam breach in the region, we have included a summary of the number of dams that have been inspected and listed in poor condition, as provided by TCEQ, in Table 2-6. Dams in poor condition are not necessarily in risk of imminent failure but are at a higher risk than those that are in good or fair condition. Dams in fair or good condition can still breach, especially if they are overtopped by a flood larger than their capacity. Unfortunately, TCEQ does not provide information to assess the capacity of the dam to handle design flows.

Table 2-6 Populations and Structures Potentially Impacted by Non-Accredited Levees per County in Region

County	Population at Risk	Structures at Risk
Bowie	**174**	**151**
Delta	**0**	**1**
Hopkins	**25**	**6**
Marion	**35**	**14**

Source: USACE, National Levee Database *& TWDB-provided structures including nighttime population from Oak Ridge National Laboratory 2019 Landscan population estimates.*

Table 2-7 Number of Dams Inspected Known to be in Poor Condition per County in Region

County	Dams Known to be in Poor Condition
Bowie	4
Cass	2
Franklin	1
Grayson	5
Harrison	1
Hopkins	1
Hunt	3
Lamar	2
Morris	4
Red River	2
Titus	5
Upshur	3

Source: TCEQ, Dam Inventory, 2021 and National Inventory of Dams

Potential Flood Exposure

Residential Properties and Associated Population

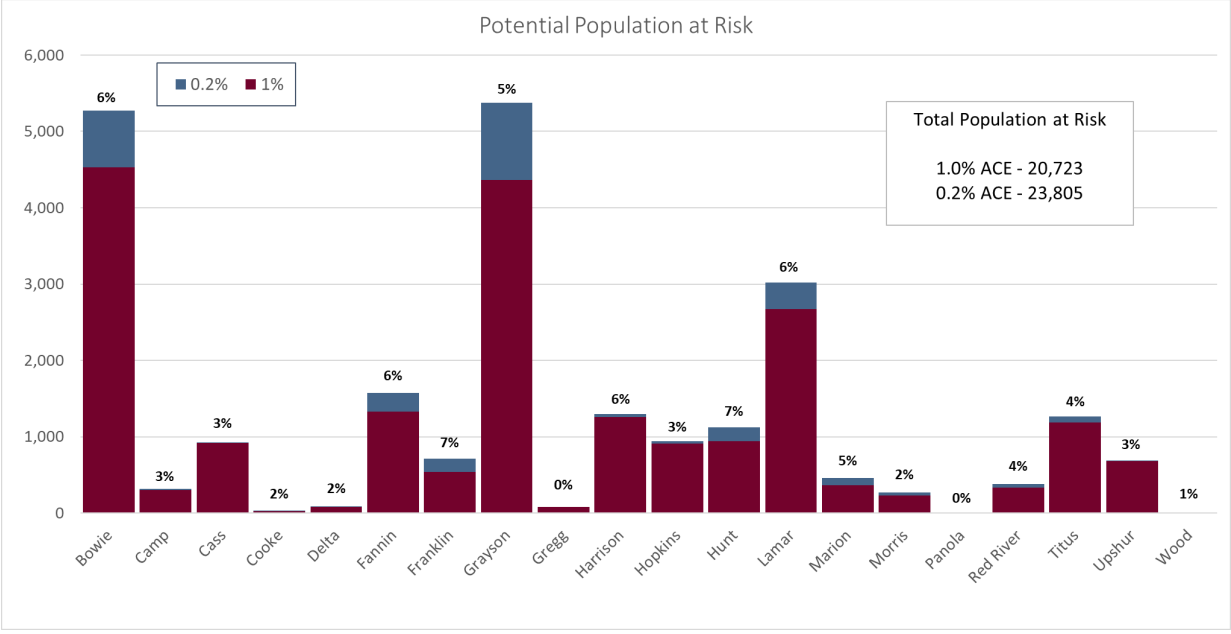
Building footprints were provided by the Texas Water Development Board in November 2021, through the Flood Planning Data Hub. They are comprised of building footprint locations developed by Texas Natural Resources Information System TNRIS, utilizing information from Microsoft Buildings and Stratmap LiDAR each containing 1) a Land Use Type derived from TNRIS parcel data land use categories, 2) a Social Vulnerability Index value from the Centers for Disease Control CDC gathered from the U.S. Census tract 3) a day and night population from 2019 Landscan population estimates from Oak Ridge National Laboratory and 4) an estimate of floors in a structure when heights were available from LiDAR.

For this first regional analysis, the term structure and building are interchangeable. The numbers and classification of their use is derived from this generalized, but detailed mapping process at the state level. These numbers could be higher than actual insured structures with finished foundations in areas, but it was noted in some areas these footprints did not capture recently constructed finished buildings.

Night and daytime population estimates were distributed to the buildings based on their identified square footage of the building footprint from high-level mapping efforts. Nighttime populations were used for the analysis since they are more representative of the distribution of people and homes in a community. The distribution of population potentially living in the identified areas of flood hazard is shown in Figure 2-14. All counties with any area included in the flood planning region are included in the exposure analysis graphs, but the amount of impact only refers to the area of the county within the flood planning region. Approximately 23,800 people are living within the 0.2% annual chance area.

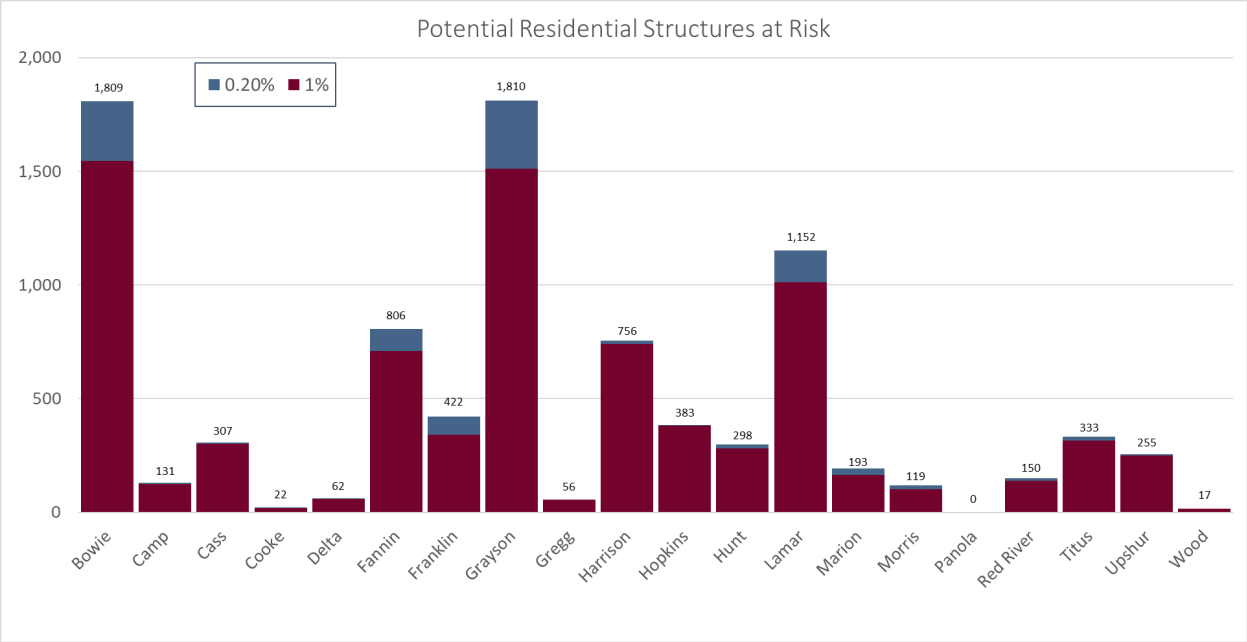
The population potentially at risk from the identified 1.0% and 0.2% chance flood hazard is proportionate to the most populated counties with the highest number of people and residential structures in Grayson, Bowie and Lamar, in that order. It is important to note that Grayson County is only partially in the flood planning region, so the potentially impacted population of 5,376 represents the portions of the county that are within the flood planning region. Bowie has slightly more people and residential structures at risk in the 1.0% annual flood chance areas, with an estimated population of 4,529 living in the 1.0% annual chance flood hazard area. Red River has the largest land area in the region, and the second largest amount of identified flood hazard area, but one of the smaller amounts of residential structures with a nighttime population impacted in the 1.0% and 0.2% annual chance area of 380 people.

Figure 2-14 Potential Nighttime Population at Risk in Flood Hazard Area



Percentage indicates percentage of total nighttime county population within Flood Planning Region.

Figure 2-15 Potential Residential Structures at Risk in Flood Hazard Area



Non-Residential Properties

The type (use) of the structure was assumed to be the same as the land use, as provided by TNRIS. Figure 2-16 shows a summary of the structure type for the region. Figure 2-17 shows a breakdown of the non-residential structures by county. The most populated counties also have the most non-residential properties at risk. However, the number of non-residential properties is highest in Bowie County with an estimated 1,246 non-residential structures in the 1.0% and 0.2% annual chance flood hazard area. The highest number of commercial buildings potentially at risk, 577 is in the portion of Grayson County within the flood planning region. Agricultural buildings are the second highest type of structure at risk after residential buildings with an estimated 2,142 buildings in the flood risk area. Lamar has 395 agricultural buildings in the risk area while Grayson has 386.

Figure 2-17 below shows the regional composition of the types of structures within the flood hazard area. The land use categories were developed by TNRIS.

Figure 2-16 Types of Structures Within Flood Hazard

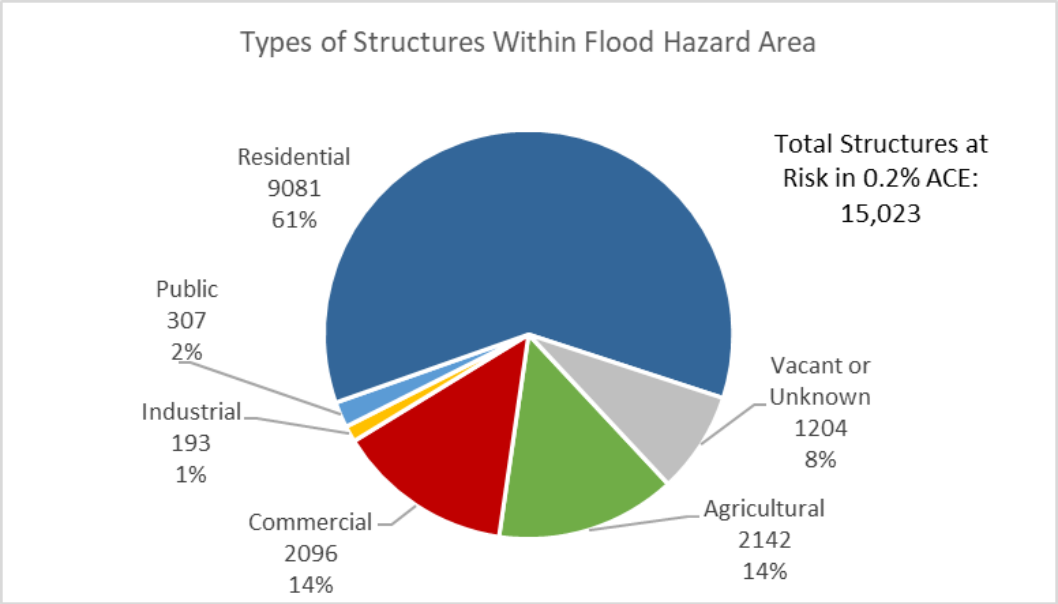
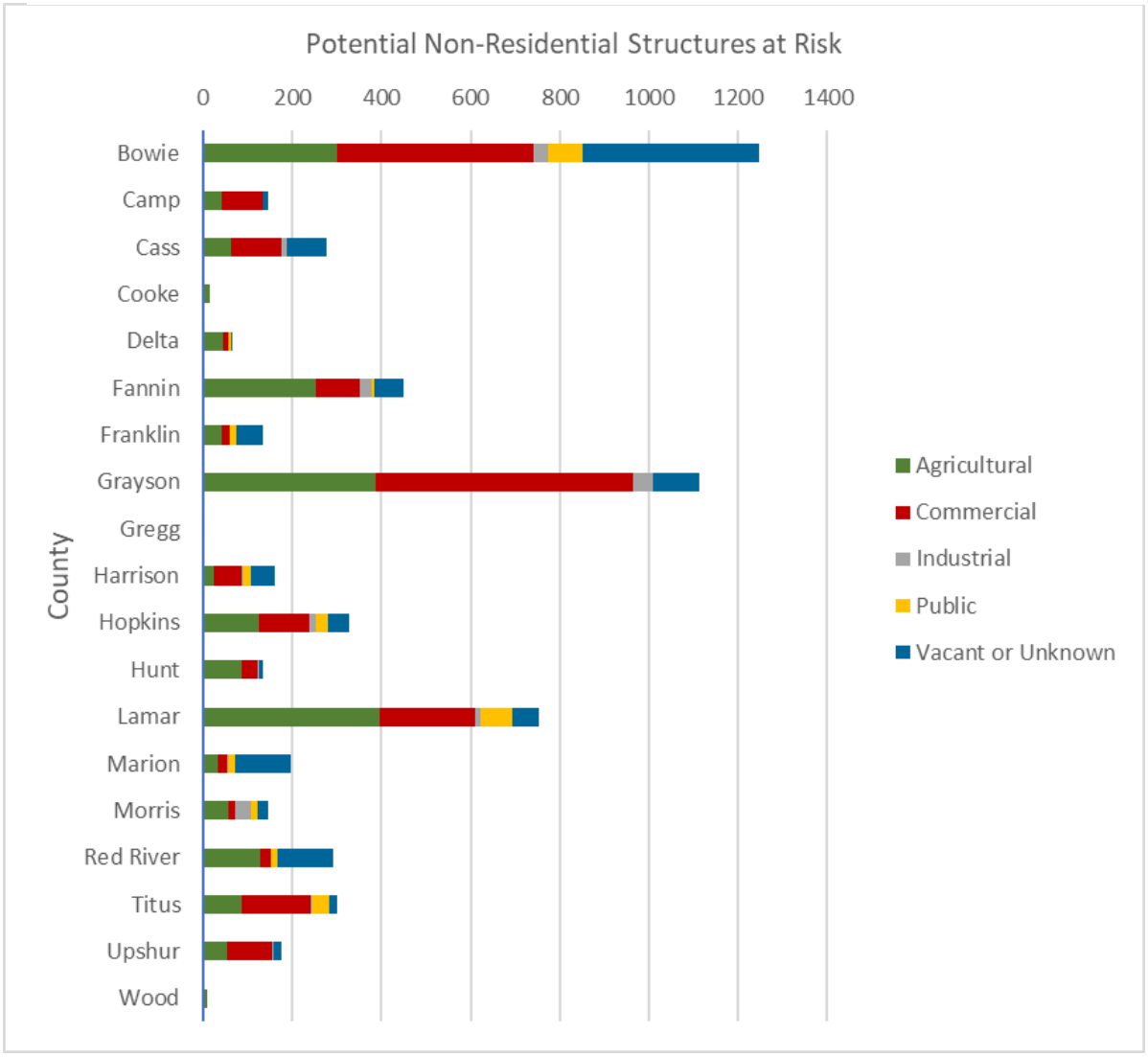


Figure 2-17 Number and Type of Non-Residential Structures in Flood Hazard Area



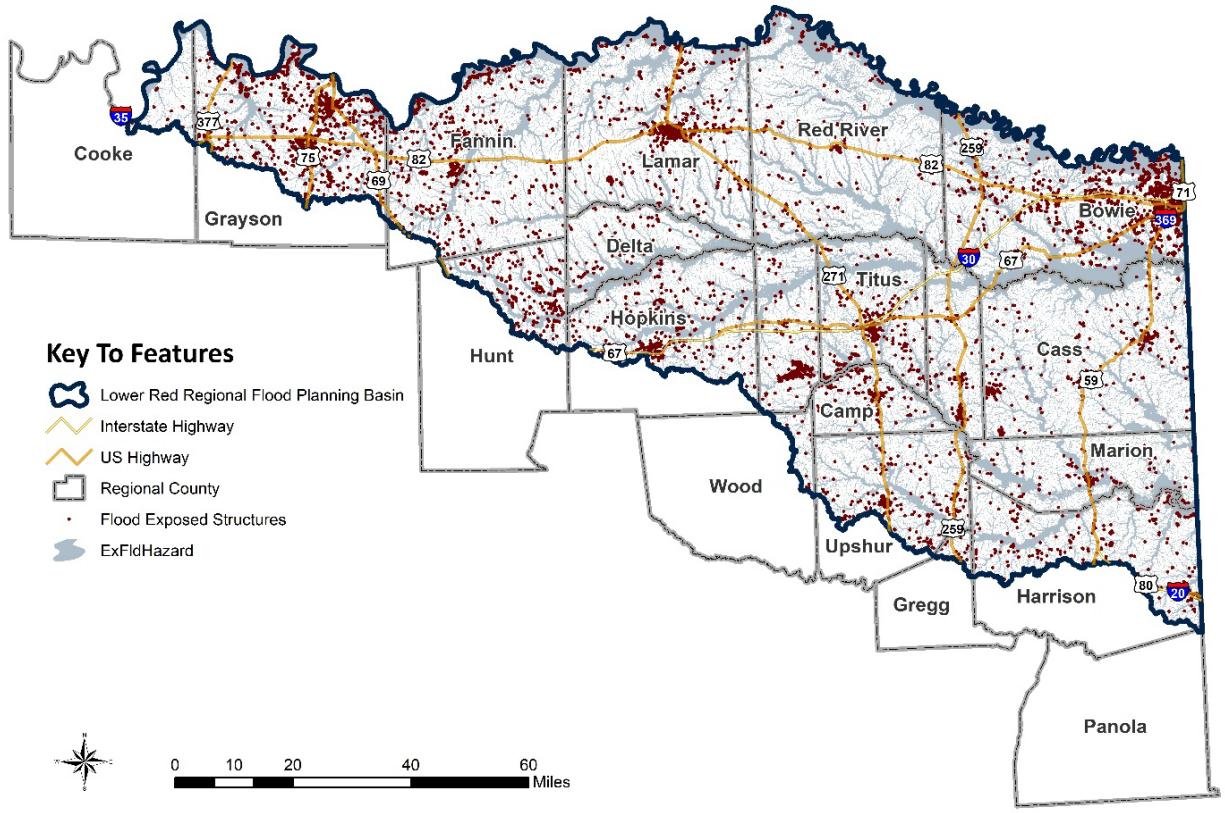
Structures - Loss of Function

Residential structures are the predominant structure at risk, with approximately 8,000 homes in the determined 1.0% annual chance event area. Grayson County has the highest number of residential homes in the combined 1.0% and 0.2% ACE areas. Sherman and Denison are 2 of the 3 most populated cities in the region. However, Bowie County has nearly the same number of impacted structures but with about half of the population of the portion of Grayson County in the region. Bowie County has slightly more residential structures in the 1.0% ACE than Grayson County.

Residential displacement from a disaster can have ripple effects on a community depending on the extent of the disaster impacting everything from employment to basic human needs. The 2017 Atlantic hurricane season was the seventh most active season since recording in 1851, displacing 3 million

people in 16 countries (https://www.internal-displacement.org/sites/default/files/publications/documents/2018-GRID-spotlight-atlantic-hurricane-season_0.pdf). By 2020, 20% of a sample survey of 1,065 respondents of people displaced by Hurricane Harvey were still in temporary housing and over 23% reported a related job loss in the family from the hurricane (https://uh.edu/hobby/harvey/).

Figure 2-18 Structures in Flood Hazard



Utility Infrastructure

The exposure analysis looked at many facets of the effects of flooding at a regional level including public infrastructure. Readily available data sets were included, as well as data collected during the public input process. This included airports, roads, power plants, gas and power lines, wastewater outfalls and water/wastewater treatment plants as well as publicly entered lift stations. GIS files for airports, power plants, major gas and electric transmission lines were all obtained from either the TWDB data HUB site or the federal Homeland Infrastructure Foundation-Level Data (HIFLD) repository. Wastewater outfalls and water treatment plant locations were acquired from the Texas Commission on Environmental Quality (TCEQ).

Potentially impacted large gas and electric transmission lines are located throughout the region with over 515 linear miles of gas lines and over 720 miles of electric lines within the determined flood hazard area. These transmission lines were not deemed critical for this round of analysis as it is difficult to determine how great of a flooding event would affect the lines. Both Cedar Mills Airport in Grayson County and Greater Morris County Airport fall within the determined flood hazard areas.

Treatment plants in Diana, Paris and Bonham all fall within the flood hazard area, as well as over 90 TCEQ-permitted wastewater outfalls. Eight lift stations that fall within the flood hazard area were reported as critical infrastructure through the public input process. While they were only reported for the City of Paris, they are likely found within the flood hazard throughout the region. Water outfalls, treatment plants and lift stations are designed to exist in lower elevations but are all considered critical to health and human safety. Any sustained inundation in these areas could potentially impact the operations of water and wastewater treatment. Inundation at an outfall location could cause potential upstream operational issues, resulting in additional flooding and/or water and wildlife contamination.

Major Industrial and Power Generation Facilities

Five of the region's 18 power plants on file with the HIFLD fall within the determined 1.0% annual flood chance hazard area. Out of these five, four use fossil fuel and one is a hydroelectric facility. Two of these plants are in Titus County. The hydroelectric power plant is in Grayson County, outside of the City of Denison. The turbines in this plant have recently been replaced and will increase the electrical generation capability of the plant from about 42 megawatts to over 50 megawatts (https://www.kxii.com/2021/01/20/historic-work-underway-at-denison-dam-powerhouse/).

Power and Utility Infrastructure - Loss of Function

Wastewater treatment facilities throughout the region have a high level of risk in the event of a flood. These low-lying facilities, as well as lift stations, are vulnerable because of their lower elevations and proximity to streams and the floodplain. Dysfunction of wastewater systems can result in system failures and contamination of surface water from sanitary sewer overflows, potentially killing wildlife and affecting ecosystems. Smaller components of wastewater systems such as wastewater transmission mains and manhole locations were not submitted for analysis.

Five power plants in the 1.0% annual chance area have the potential to impact electric services in the region. Two of these plants are in Titus County which makes this area of the region more susceptible to loss of extended power in a localized flooding event. More analysis would need to be conducted to understand the resiliency of the plants, and the energy network.

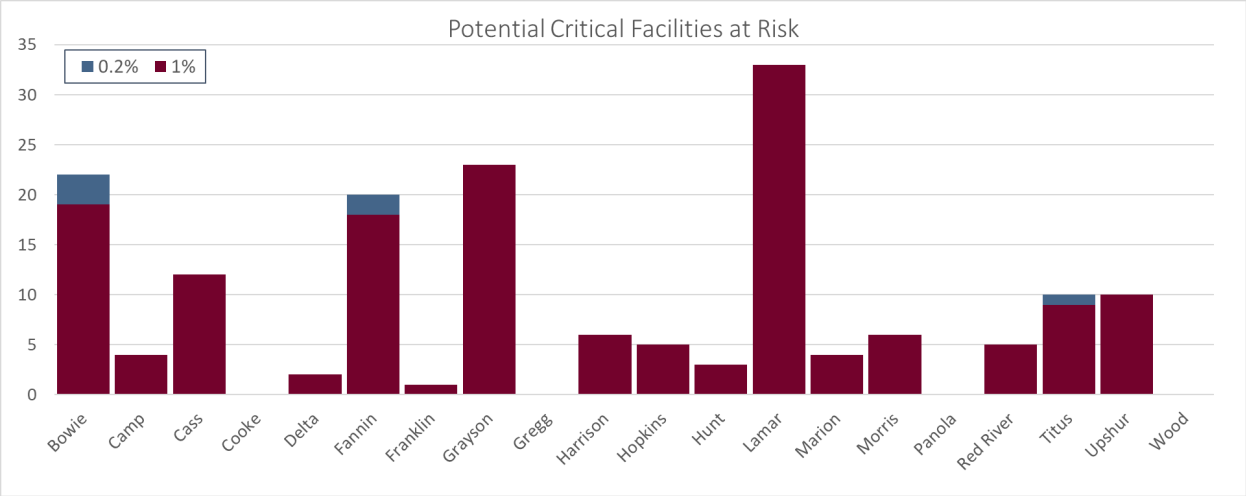
Critical Facilities

A critical facility is defined by the State of Texas as including all public and private assets, systems, and functions vital to the security, governance, public health and safety, economy, or morale of the state of the nation (https://statutes.capitol.texas.gov/Docs/GV/htm/GV.421.htm). In this plan, schools, hospitals, police stations, fire stations, emergency shelters, nursing homes, assisted living centers, power generation facilities, superfund sites and wastewater outfalls were all deemed critical facilities. These GIS data sets were all gathered from either the TWDB Flood Planning Hub, which were from HIFLD, TEA, or TCEQ.

The critical facility locations were overlaid with the existing flood hazard areas to determine the magnitude of community exposure in the event of a significant flood. Similar to population and structure impacts, the top three highest impacted counties are Grayson, Bowie and Lamar; however, Lamar County had the highest number of critical facilities potentially impacted by the flood hazard. The City of Paris submitted many critical facility locations such as their lift stations through the public input process. Throughout the region, 166 critical facilities were at risk of potentially flooding from the determined food hazard. Of these, there are 15 schools, 3 police stations, 6 fire stations, 2 hospitals, 7 nursing homes and 19 shelters, which could be churches, schools, or other community centers. The rest are comprised of infrastructure type critical facilities including the permitted wastewater outfalls.

The initial dataset of over 1,000 critical facilities for the region was reviewed at a high level, prioritized, and reviewed for accuracy but all locations could not realistically be verified for this planning cycle. The initial datasets are often created for state-wide or national analysis, and not necessarily located in the precise location of the structure.

Figure 2-19 Number Critical Facilities in Flood Hazard Area



Health and Human Services - Loss of Function

Critical facilities provide the essential services during and after a disaster. The Wadley Hospital system in Texarkana is in a pluvial mapped 1.0% ACE. Nursing homes in Bowie, Camp, Grayson, and Hopkins counties fall in the 1.0% ACE. 19 designated emergency shelters which includes churches, schools and community center fall within the flood hazard area. The City of Paris has both a fire and a police station in the 1.0% ACE area. Harrison County has two volunteer fire department buildings in 1.0% ACE, in Nesbitt and Uncertain. Critical care facilities in flood hazard areas put patients and caretakers at risk during times of emergency, and in a worst-case flooding scenario become inoperative.

Roadway Stream Crossings

Roads were analyzed at a high level to understand potential impacts from a 1.0% or 0.2% annual chance flood event. To get an understanding for the number of potential exposures for this planning cycle, road locations from TXDOT were intersected with the best and latest stream data, which was a combination of named NHD tributaries and recently aligned BLE streams (being performed in the region under a separate TWDB contract) to get a count and location of potential crossings. Elevations were not considered in this analysis.

Figure 2-20 captures the potential impacts flooding could have on roads, based on the number of locations of intersections of streams. The fourth largest county in the region, Bowie had the highest number of potential stream crossings, at 448 with both the Sulphur and Red River converging within County limits. Fannin County had the second highest number of road stream crossings, at 362.

Locations of Low Water Crossings were also incorporated into the exposure analysis. These locations were provided from TWDB Flood Planning HUB site, collected by TNRIS. Because some low water crossings did not happen at actual stream and road intersections, both data sets have been kept and identified separately. Table 2-8 below identifies the locations of Low Water Crossings by county.

Roadway Segments

The determined flood hazard area GIS layers were overlaid with the TXDOT roads, which includes all TXDOT and other known public roads to determine the miles of roads potentially impacted by a flooding event. Similar to roadway stream crossings, Bowie has the most linear miles, 336 in the identified 1.0% and 0.2% ACE. Between the Red River and the Sulphur River, Lamar County has nearly 240 miles within the 1.0% and 0.2% ACE areas.

Figure 2-20 Number of Road and Stream Crossings in Flood Hazard Area

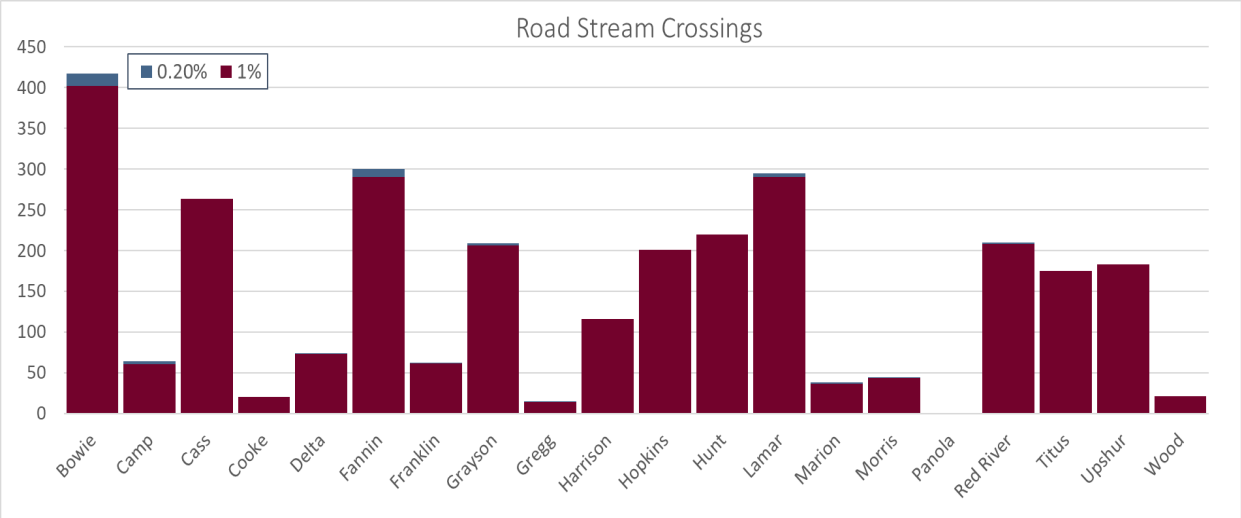


Figure 2-21 Road and Stream Crossings in Flood Hazard Area

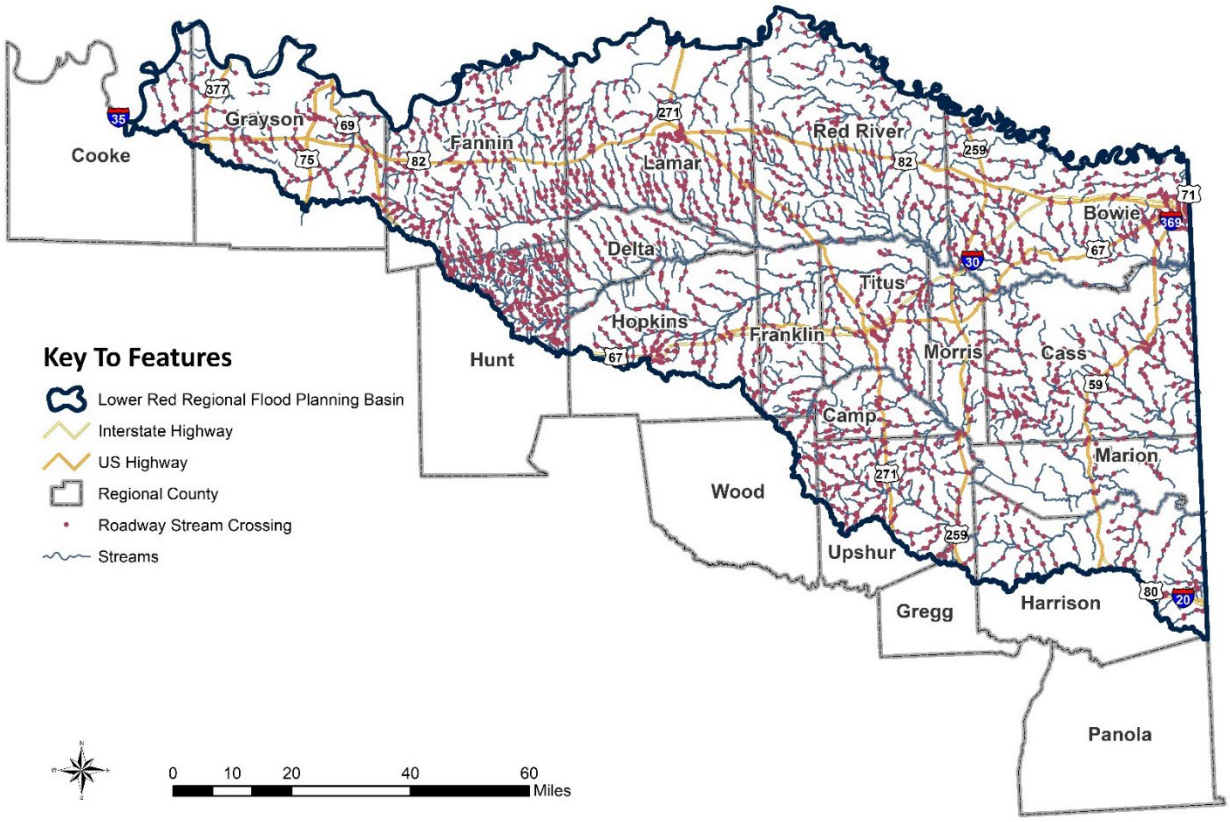
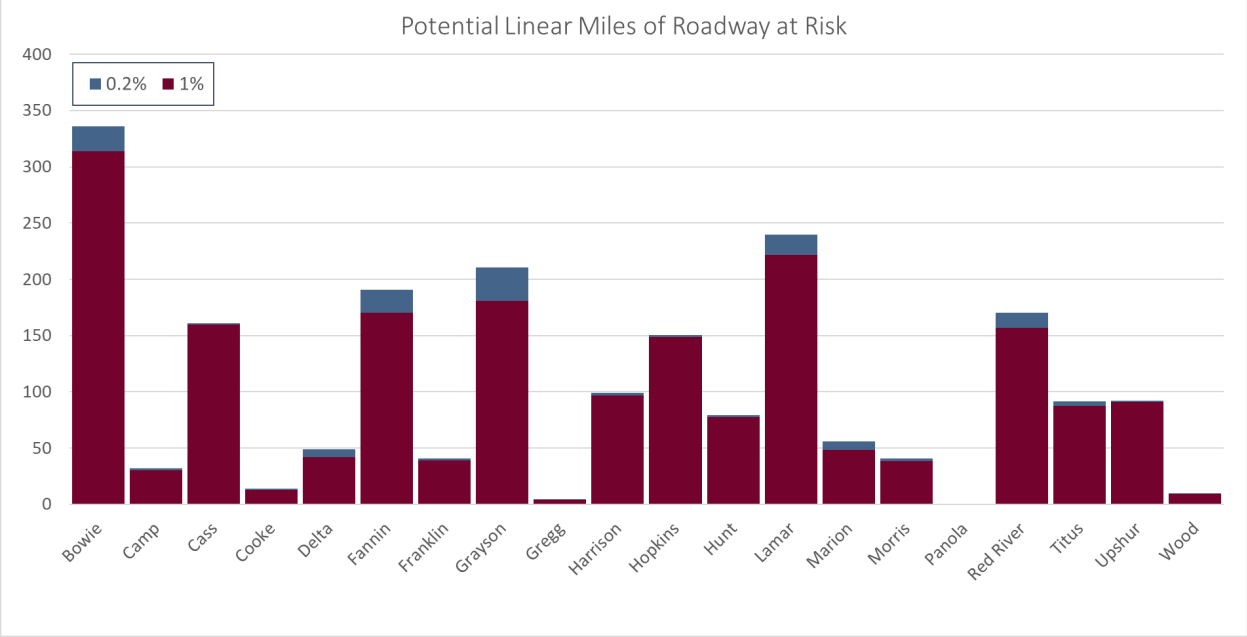


Table 2-8 Low Water Crossings by County

County	Number of Low Water Crossings
Bowie	7
Camp	1
Cass	7
Delta	8
Fannin	26
Franklin	5
Grayson	8
Harrison	5
Hopkins	3
Lamar	15
Marion	1
Morris	2
Red River	16
Titus	9
Upshur	3

Source: TNRIS, Region 2 Flood Planning Public Input

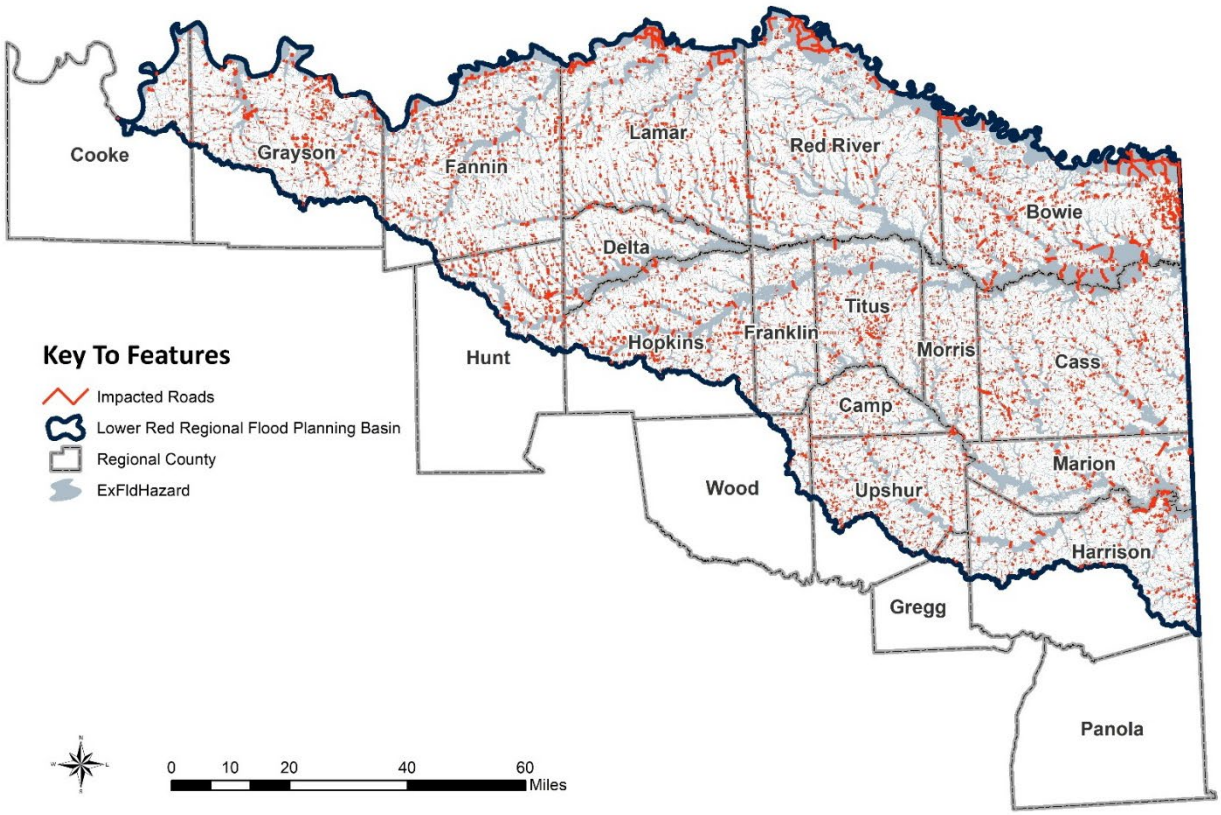
Figure 2-22 Miles of Roadway in Flood Hazard Area



Transportation - Loss of Function

Flooding is a considerable threat to the road network of the region. The vast system of tributaries and floodplain of the Sulphur, Cypress and Red Rivers intersect with 2,927 roads in the determined 0.2% flood hazard area. County roads account for 36% of these intersections, which means access for providing emergency services or fleeing from hazard areas could be compromised. Out of all flood hazards, traveling on flooding roads provides the most imminent danger to human life. Texas has the highest number of flooding related fatalities in the country, with 222 reported from 2010-2020 (https://www.weather.gov/images/arx/floodeaths/2020_total.png). Within the State of Texas, and in the country, flash flooding is the leading cause of weather-related deaths, and 76% of those deaths are vehicle-related (https://www.floodsafety.com/national/life/statistics.htm). Between lack of access during emergencies and the risk of being washed away during a flood, these potentially flooded roadways represent a significant risk in the region.

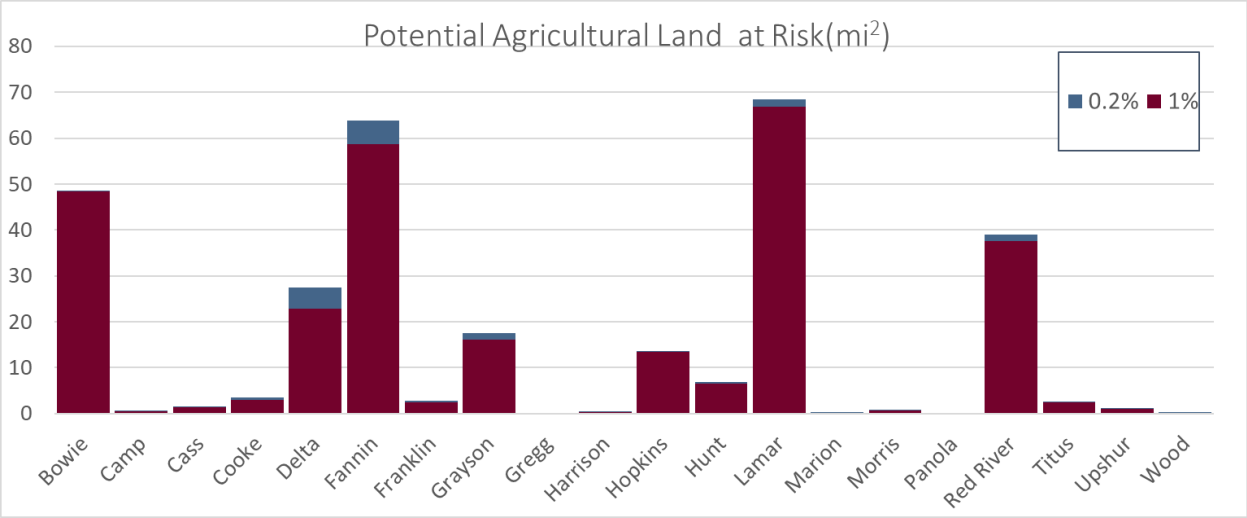
Figure 2-23 Road Segments in Flood Hazard Area



Agricultural Area

As a primary economic driver for the region, the effects of agricultural flooding were evaluated for the Lower Red-Sulphur-Cypress Flood Planning Region. The USDA CropScape data layer was intersected with the flood quilt to show the types of land cover and crops potentially impacted by a 1.0% and a 0.2% annual rain event. Just under 300 square miles of farmland in the region falls within the determined flood hazard area, which accounts for 10% of the total land in the flood hazard area. The distribution of the farmland can be seen in Figure 2-24.

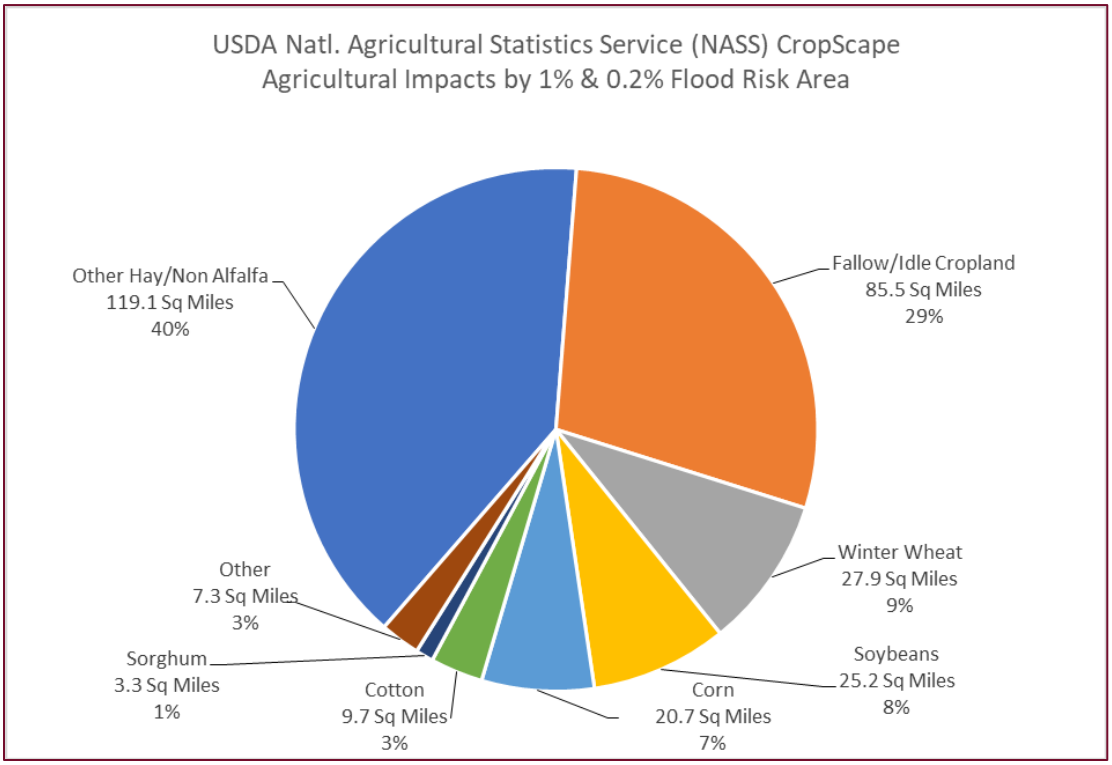
Figure 2-24 Square Miles of Agricultural Land in Flood Hazard Area



The breakdown of the type of crops in the flood hazard area can be seen in Figure 2-25. At a regional planning level, it is difficult to determine what type of a rain event would affect which crops because of differences in harvesting schedules and crop suitability. The value of the top six producing crops for the area at risk exceeds $45.7 million.
Table 2-9 illustrates the value of the top six crops assuming average published commodity prices and yields from 2021 USDA reports.

Depending on the severity and length of a flooding event, the suitability of the farmland itself can be compromised, as such, we estimated the value of cropland within the region potentially exposed to flooding. The 2021 USDA value of cropland is $2,150/acre. The value of the 191,209 acres in the determined 1.0% and .02% annual chance area is over $411 million.

Figure 2-25 Composition of Cropland in Flood Hazard Area



Source: USDA NASS CropScape Cropland Data Layer

Table 2-9 Valuation of Top Six Crops in Flood Hazard

Crop	Acreage	Nov 2021 Value Per Unit	2021 Yield Avg per Acre	Estimated Value
Other Hay/Non-Alfalfa	**76,225**	**$147/ton**	**1.85**	**$20.7 Million**
Winter Wheat	**17,865**	**$7.78/bushel1**	**30**	**$4.2Million**
Soybeans	**16,141**	**$12.20/bushel**	**38**	**$7.5 Million**
Corn	**13,267**	**$5.27/bushel**	**128**	**$8.9 Million**
Cotton	**6,210**	**$.86/lb**	**695**	**$3.7 Million**
Sorghum	**2,100**	**$5.60/cwt**	**61**	**$717,000**

Source: USDA https://downloads.usda.library.cornell.edu/usda-esmis/files/c821gj76b/02871x558/bz60dx529/agpr1221.pdf, https://www.nass.usda.gov/Statistics_by_State/Texas/Publications/Current_News_Release/2022_Rls/spr-ann-crop-prod-2022.pdf

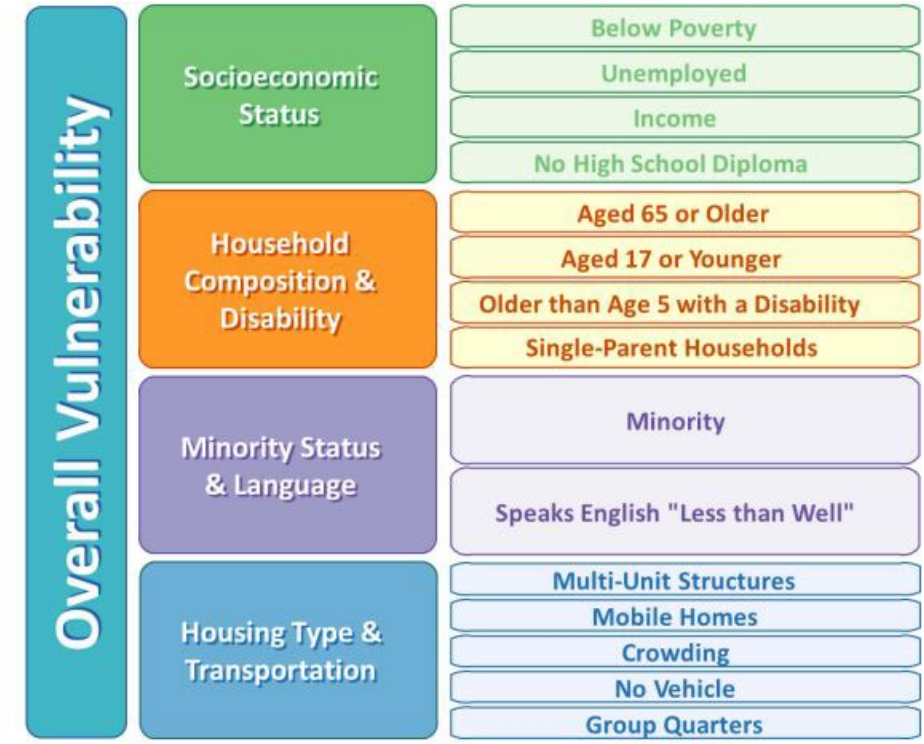
2.A.3 Existing Condition Vulnerability Analysis

Resiliency of Communities

The resiliency of a community refers to the ability of a community to use its assets and resources to recover from a crisis or disaster situation. This not only refers to individual and governmental financial assets but the strength of political cooperation and planning to prepare and plan for emergencies such as flooding events, so recovery efforts are smoother and more coordinated. Understanding existing vulnerabilities through the region helps the community understand where flood mitigation solutions and funding are most needed.

A standard measure of community vulnerability is the Social Vulnerability Index (SVI), provided by the Centers for Disease Control (CDC). The Social Vulnerability Index ranks Census tracts on 15 social factors listed in Figure 2-26 on their ability to recover from a disaster. All features that fell within the flood quilt in the exposure analysis, including structures, roads, agricultural land, power lines, electric lines and identified critical facilities were assigned the SVI value of the Census tract that they fall within, and averaged at the county level to get an understanding of the county's mean SVI of exposed features.

Figure 2-26 Factors of the 2018 Social Vulnerability Index (SVI)



Source: CDC https://svi.cdc.gov/Documents/Data/2018_SVI_Data/SVI2018Documentation.pdf

The mean social vulnerability indexes by county are shown in Figure 2-28. When averaged at the county level, no county was considered to have an SVI above .75, which is defined by the TWDB as a high SVI, meaning the area will have a much more difficult time recovering from a disaster. Although the county

averages for all of the flood exposures stay below .75, Figure 2-29 shows most developed communities within the region have areas of high SVI. Table 2-10 highlights all cities within the region with flood exposure points with SVI values over .75.

Vulnerabilities of Critical Facilities

Critical facilities are the key asset to community resiliency and recovery. The region's critical facilities are generally more vulnerable than other flood-exposed parts of the community. Figure 2-29 compares the county mean SVI of all flood exposures (including structures, roads, critical facilities, agricultural land, pipelines) with the mean SVI of only the critical facilities in the county. Most of the counties' critical facilities are in areas with higher SVI's indicating some impedance to access and ability to recover. Franklin County only has one critical facility in the flood hazard and it's in area with a higher SVI.

Figure 2-27 Social Vulnerability Index (SVI) of All Flood Exposures by County

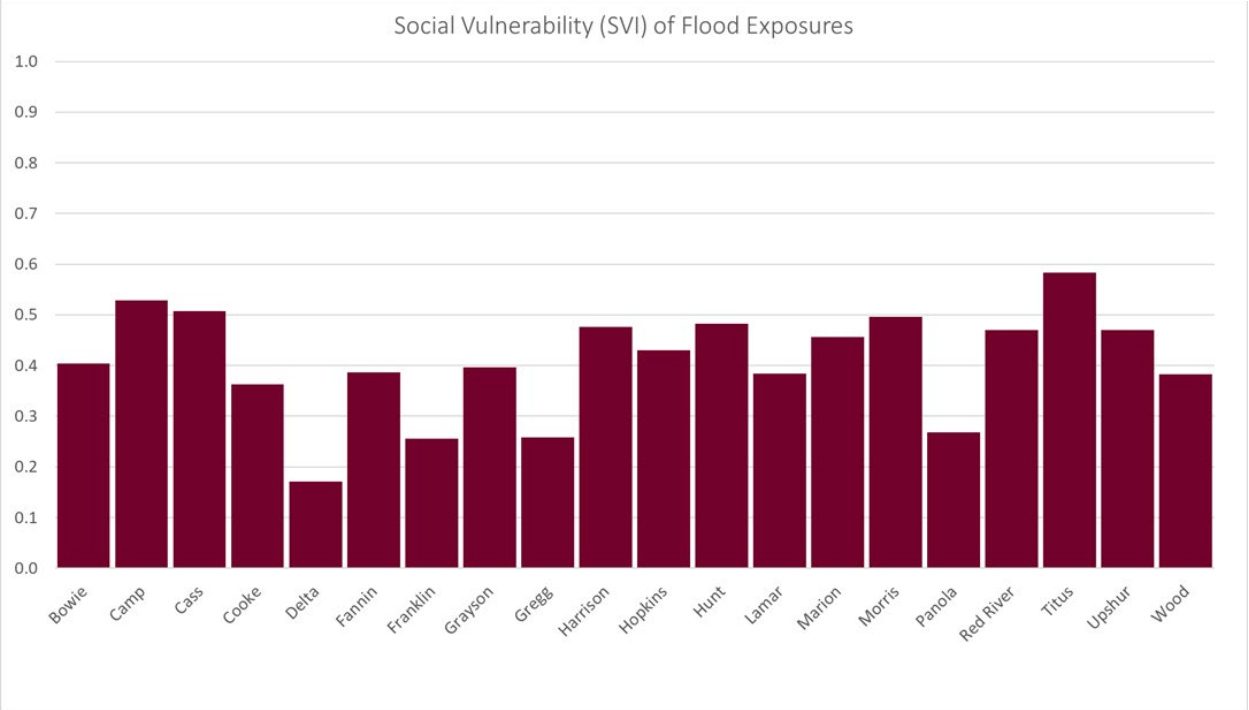


Figure 2-28 Social Vulnerability Index (SVI) of All Flood Exposures

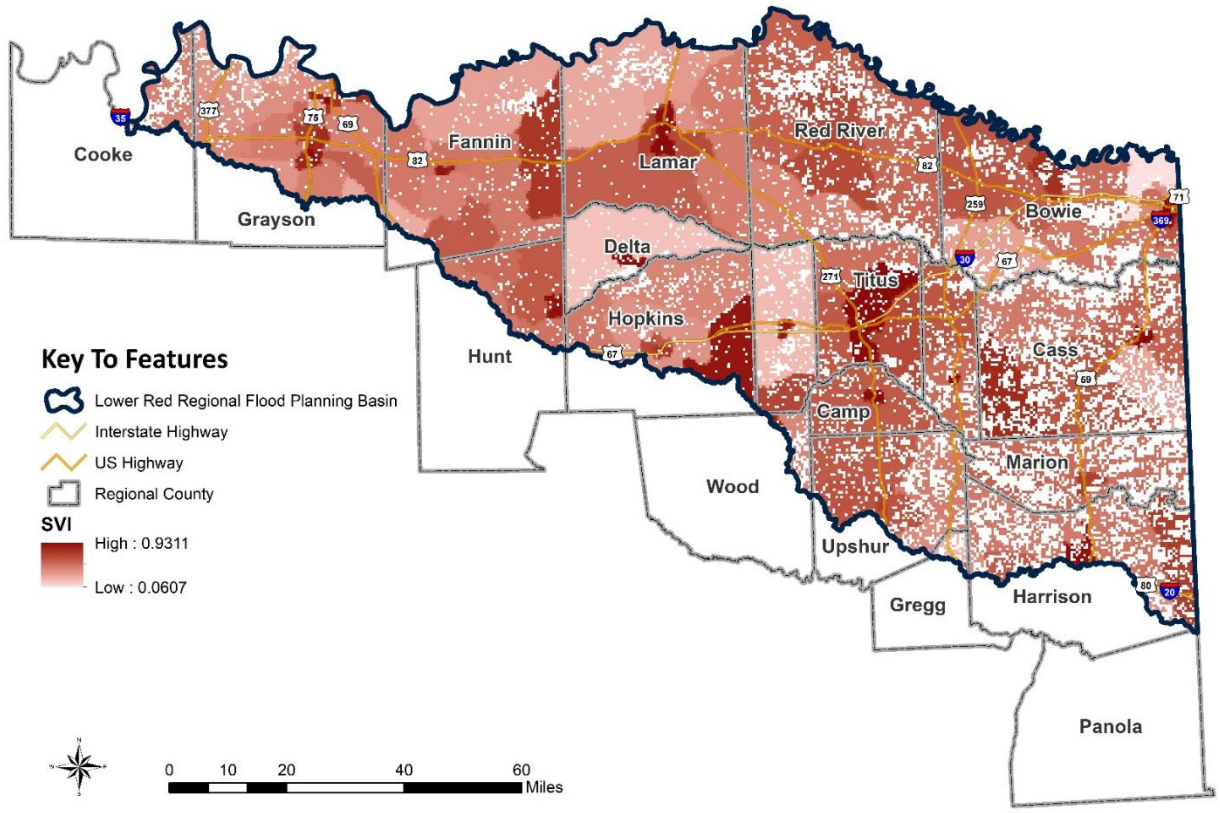
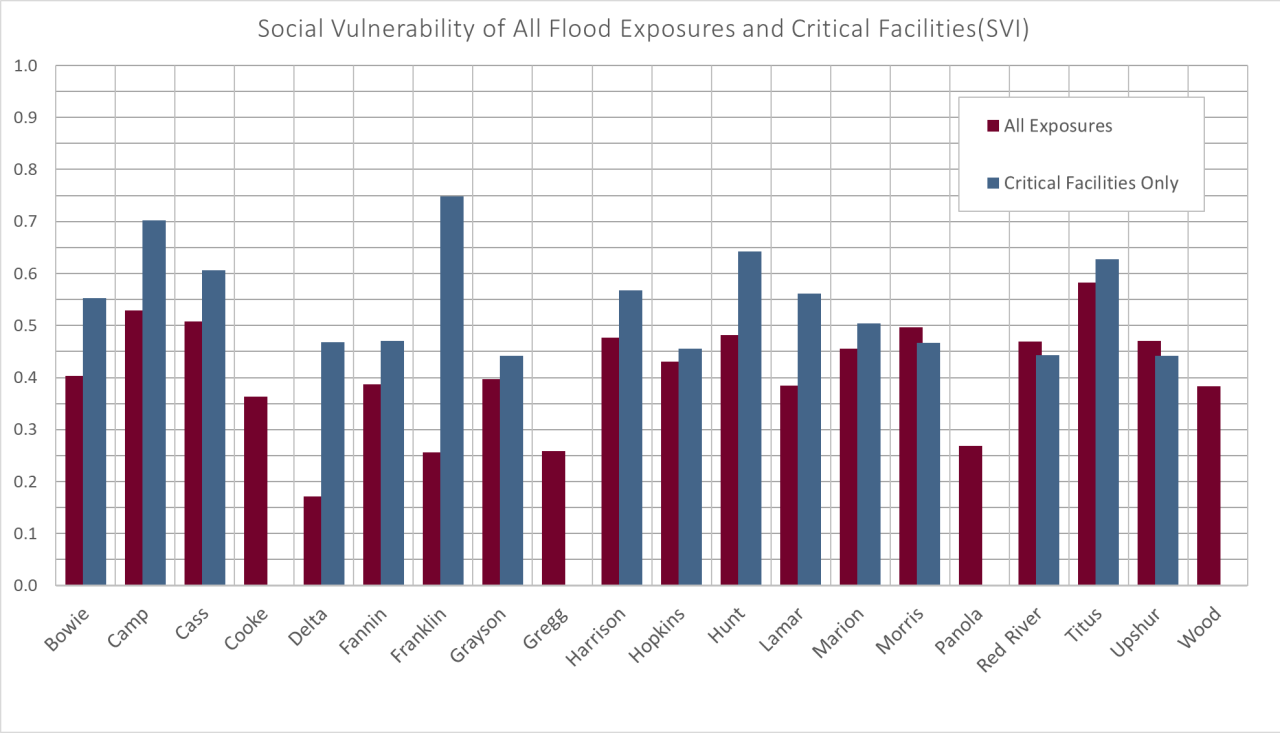


Table 2-10 Cities with Flood Exposures with SVI over .75

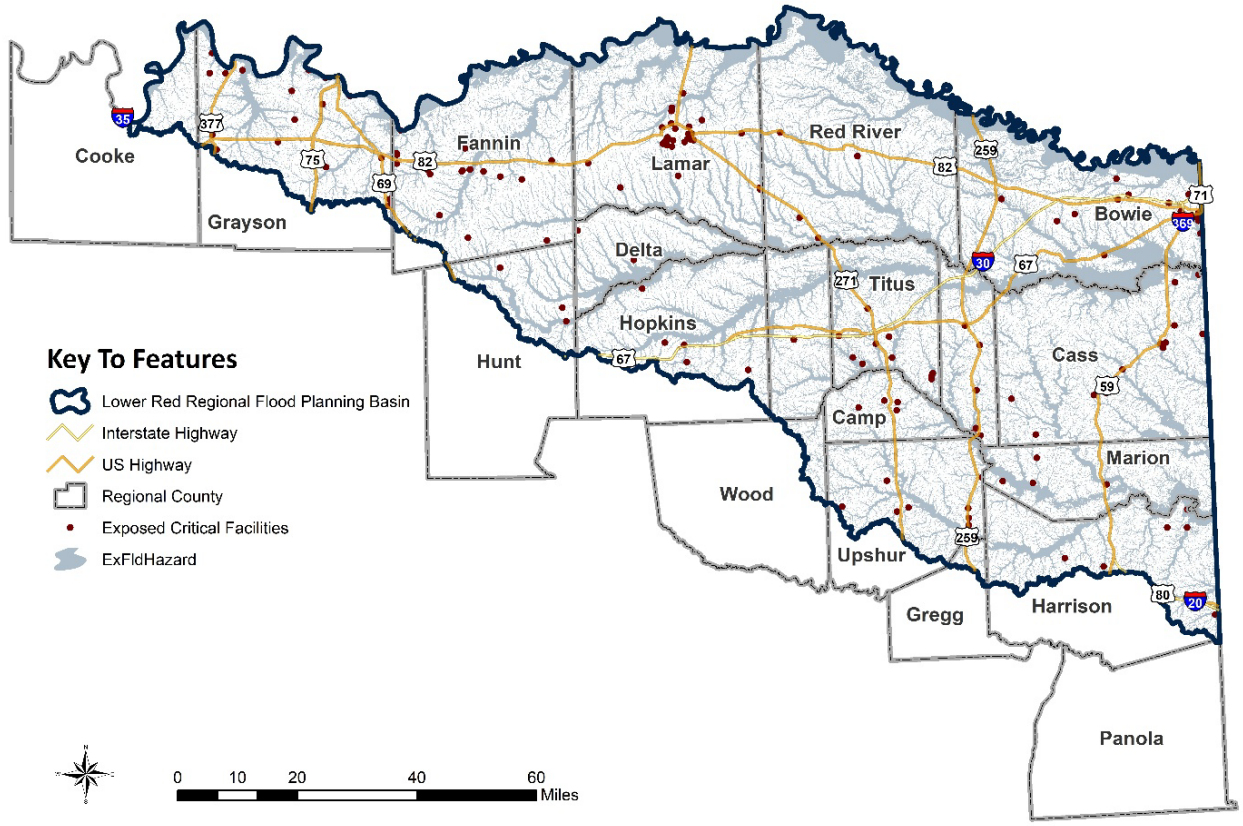
City	Number of Flood Exposure Points with SVI Over .75
Atlanta	516
Bonham	399
Commerce	337
Como	7
Cooper	19
Daingerfield	116
Denison	145
Marshall	126
Mount Pleasant	932
Paris	1595
Pittsburg	139
Sherman	424
Texarkana	1929

Figure 2-29 Social Vulnerability Index (SVI) of All Flood Exposures Compared to Critical Facilities



*All exposures include all structures, agricultural land, roads, pipelines & critical facilities within the flood hazard area.

Figure 2-30 Exposed Critical Facility Locations



2A.4 Summary of Existing Conditions Flood Exposure Analysis and Vulnerability

Community impacts from flooding within the Lower Red-Sulphur-Cypress region became better understood after the exposure and vulnerability analysis. Perhaps the most significant regional impact is the number of roads within the flood hazard, because of threat to human life and emergency services. Concentrations of structures and populations are impacted in most of the developed cities within the region, but those with higher concentration of higher SVI exposures are more vulnerable to the impacts of a flood. Texarkana, Paris, Mount Pleasant and Atlanta all had over 500 flood exposure points with SVI values of over .75 indicating highly vulnerable communities.

Table 3: Existing Condition Flood Risk Summary Table (by County)

#	County	Area in Flood Planning Region (sq mi)	1% Annual Chance Flood Risk								0.2% Annual Chance Flood Risk							
			Area in Floodplain (sq mi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)	Area in Floodplain (sq mi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	Bowie	920.10	398.39	2,657	1,546	4,529	402	313.6	48.31	19	406.92	3,055	1,809	5,272	417	336.0	48.63	22
2	Camp	202.66	53.40	256	124	301	60	29.9	0.56	4	55.90	276	131	314	64	31.6	0.61	4
3	Cass	956.77	274.93	573	302	917	263	159.5	1.34	12	276.04	583	307	921	263	160.8	1.35	12
4	Cooke	111.18	25.22	34	20	26	20	12.7	3.06	0	27.23	38	22	30	20	13.9	3.46	0
5	Delta	277.13	96.16	120	59	82	73	41.5	22.90	2	108.19	127	62	87	74	48.6	27.55	2
6	Fannin	853.20	227.07	1,077	709	1,328	290	170.3	58.60	18	243.03	1,256	806	1,575	300	190.5	63.87	20
7	Franklin	293.47	79.20	455	341	535	61	38.6	2.46	1	87.55	555	422	713	62	40.4	2.82	1
8	Grayson	633.94	161.17	2,569	1,511	4,360	206	180.7	16.15	23	169.29	2,924	1,810	5,376	209	210.2	17.49	23
9	Gregg	28.44	5.88	58	56	76	14	3.6	0.03	0	5.91	58	56	76	15	3.8	0.03	0
10	Harrison	532.16	151.52	897	740	1,254	116	96.6	0.40	6	152.77	917	756	1,294	116	99.0	0.41	6
11	Hopkins	543.36	162.66	702	381	907	201	148.6	13.49	5	163.77	710	383	940	201	150.5	13.66	5
12	Hunt	235.01	65.51	411	282	941	220	77.2	6.62	3	66.50	432	298	1,123	220	78.9	6.89	3
13	Lamar	931.80	283.21	1,644	1,013	2,670	290	221.8	66.90	33	291.77	1,904	1,152	3,016	295	239.8	68.42	33
14	Marion	418.82	127.71	313	163	360	36	48.0	0.21	4	148.50	390	193	460	38	55.8	0.32	4
15	Morris	256.93	73.83	234	102	232	43	38.4	0.62	6	77.05	265	119	268	44	40.7	0.66	6
16	Panola	0.41	0.04	0	0	0	0	0.0	0.00	0	0.04	0	0	0	0	0.0	0.00	0
17	Red River	1,055.00	359.94	391	138	336	208	156.7	37.57	5	378.96	441	150	380	210	170.1	39.05	5
18	Titus	425.48	149.78	596	315	1,182	175	87.1	2.45	9	150.80	634	333	1,262	175	91.2	2.47	10
19	Upshur	427.79	113.79	425	250	677	183	90.8	0.96	10	114.31	432	255	688	183	92.2	0.96	10
20	Wood	56.77	11.40	26	17	10	21	8.9	0.12	0	11.44	26	17	10	21	8.9	0.13	0
		Totals	**2,821**	**13,438**	**8,069**	**20,723**	**2,882**	**1,924**	**283**	**160**	**2,936**	**15,023**	**9,081**	**23,805**	**2,927**	**2,063**	**299**	**166**

Task 2B – Future Condition Flood Risk Analyses

The future conditions flood risk assessment estimates the flood risk in 30 years based on a "no action" scenario considering changes in population, development and impervious area, sedimentation in flood control structures as well as any changes to sea level or possible rainfall patterns due to climate change. The assessment of future hazard areas is being used only for the purpose of recognizing the general magnitude of flood risk in a regional flood planning context and will not be used in any way for developing maps for any regulatory process.

2.B.1 Future Condition Flood Hazard Analysis

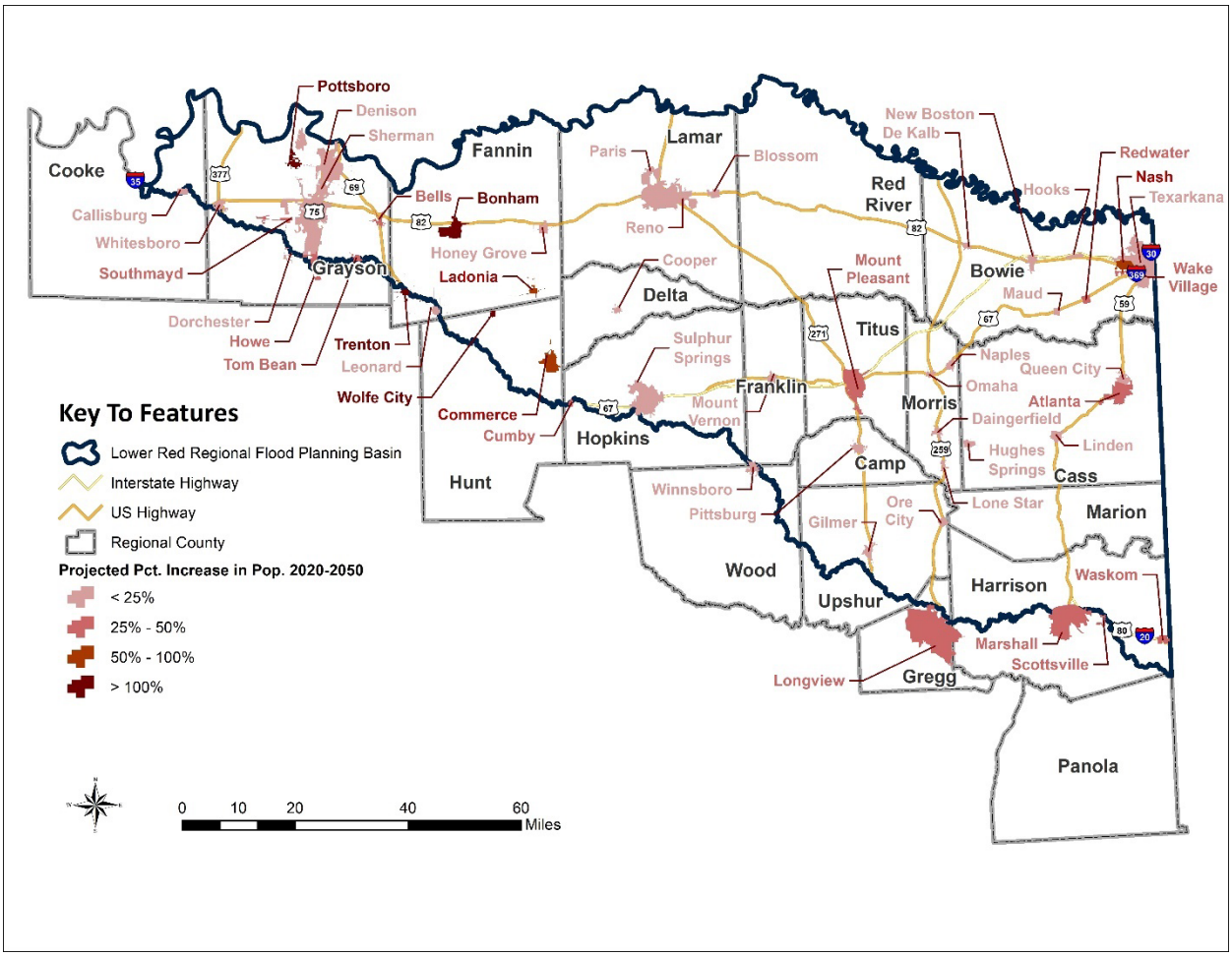
Future Conditions Based on "No Action" Scenario

Population Change, Land Use and Development Trends

According to World Bank, 2.2 billion people, or around 29% of the world population, live in the areas that experience various levels of inundation during 100-year flood event (Rentschler and Salhab, 2020). The U.S. Federal Emergency Management Agency (FEMA) estimates that 13 million people live within a 100-year flood zone, which recent research argues that the real number is about 41 million (Wing et al., 2018). On one hand, the future flood conditions will significantly affect the people exposed to flood risks, leading to higher flood vulnerability over the areas with rapid population growth in the United States (Swain et al. 2020). On the other hand, the population dynamics, which shows how and why populations change in structure and size over time, also has important interrelationships with the changes of land cover, land use, as well as water demands for all uses (National Research Council, 1994). Rapid population growth results in expansion of urban and industrial lands, and depletion of wetlands, floodplains, and waterbodies, which can potentially impact the flood dynamics (Rahman et al., 2021). Identifying future growth, composition and distribution of a population is crucial for flood planning and related works by governments and policymakers.

The population in Texas is expected to increase 42 percent between 2020 and 2050, from 29.7 million to 42.3 million people (TWDB, 2021a). The projection was made based on a standard demographic methodology known as a cohort-component model, which uses different cohorts (combinations of age, gender, and racial-ethnic groups) and components of cohort change (birth, survival, and migration rates) to estimate future population in a county level. The Texas State Data Center provides the Texas Water Development Board (TWDB) with the initial 30-year population projections for each county. The population in Region 2 is expected to increase 24% between 2020 and 2050, from 531,000 to 660,000. *Figure 2-31* shows the expected change in population across the Region, with the greatest increases near the Dallas-Fort Worth Metroplex and along the I-30 and I-20 corridors, but with increases in most communities. Not only will the population growth demand for significant higher water supply but also will change regional land cover and land use conditions that could alter the floodplain and increase flood risks in these areas.

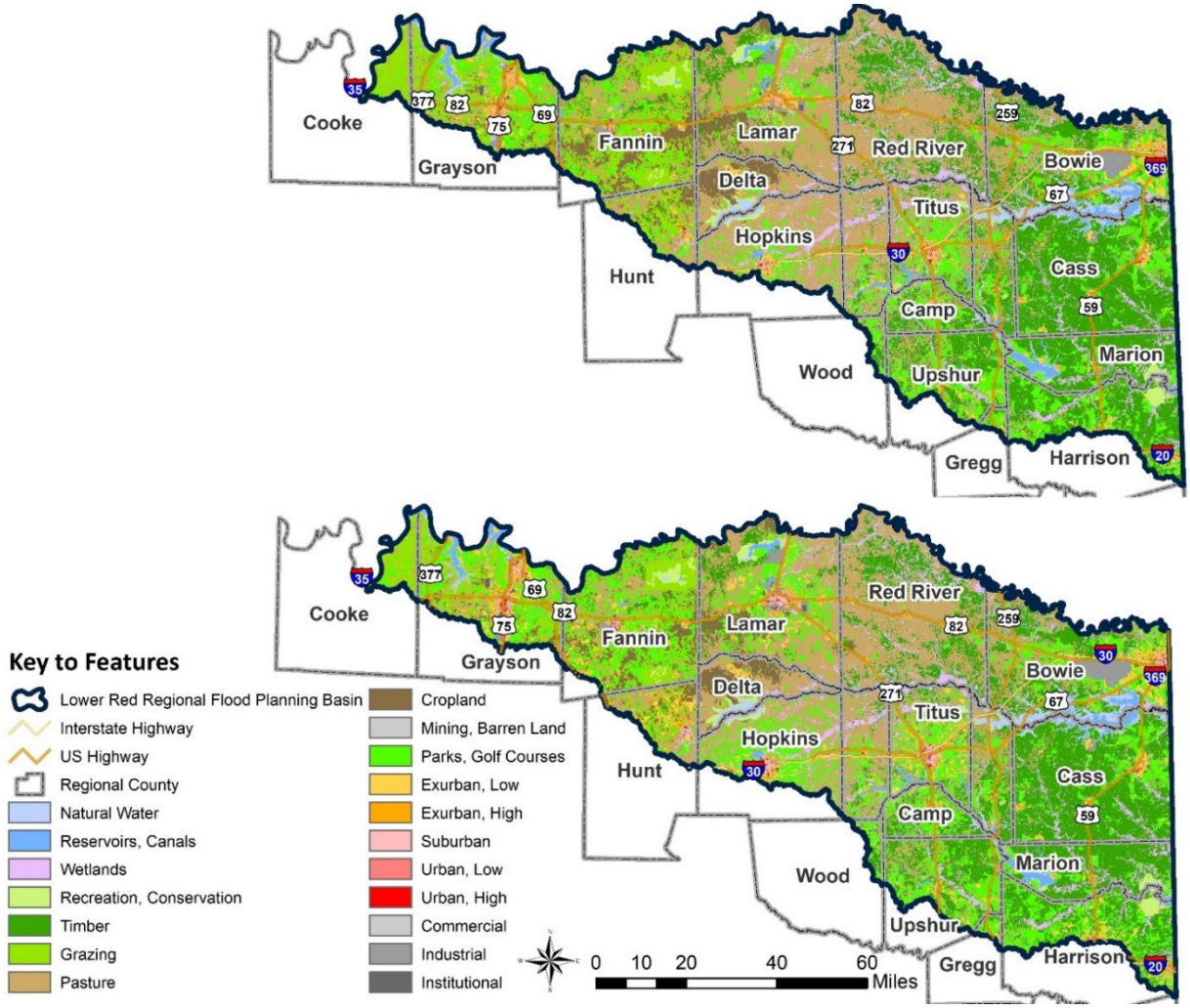
Figure 2-31 TWDB Estimated population increases from 2020 to 2050.



It is generally expected for land use to change from rural uses (forest, farms, etc.) to more developed uses (residential, commercial, etc.) as population increases. Minimal future land use data was provided for the region, so other widely available data sets were considered for evaluating future land use changes. The U.S. Environmental Protection Agency (EPA) has developed the Integrated Climate and Land Use Scenarios (ICLUS) as an estimate of future conditions for climate modeling purposes. ICLUS is based on the EPA demographic and spatial allocation models to produce land use changes according to different scenarios. The dataset includes land use classifications of the conterminous United States at a spatial resolution of 90 meters. A demographic model generates population estimates that are distributed by a spatial allocation model (SERGoM v3) (Theobald, 2005) into housing density (HD) across the landscape; land-use outputs were developed for the four main Intergovernmental Panel on Climate Change (IPCC) Special Report on Emissions Scenarios (SRES) (A1, A2, B1, and B2) and a baseline. The land use outputs are available for each scenario by decade from 2010 to 2100. Two of the new Shared Socioeconomic Pathways (SSPs) (SSP2 and SSP5) and two Representative Concentration Pathways (RCPs) (RCP 4.5 and RCP 8.5) were added in the recent version 2. (U.S. EPA, 2009 and 2016). Figure 2-33 illustrates the land use conditions of the TRB based on the ICLUS dataset of the years of 2020 and 2050. Most of the region's land uses are not projected to change substantially, except in Hunt County, where rapid develop is occurring and some expansion of the urban footprint along US-75. Most other changes

are fairly undetectable at the scale of these exhibits. As discussed in the following section, the expected population increase and other development impacts will be considered in this future conditions flood risk analysis.

Figure 2-32 ICLUS Land Use Projections 2020 & 2050



Sea Level Change

Global mean sea level has risen by about 0.2 m (8 inches) at a rate of 1.7 mm/yr. since reliable record keeping began in 1880 (Church and White, 2006). Research shows that rising sea levels can affect coastal regions in many ways including shoreline erosion, loss of land, tidal flooding, and saltwater intrusion into groundwater (Anthoff et al., 2006; Nicholls and Tol, 2006; Nicholls and Cazenave, 2010; Church and White, 2011). The contributions to sea level rise come primarily from two factors related to

global warming — increases in water mass from melting ice and glaciers and thermal expansion of seawater (Church et al., 2007; Nicholls and Cazenave, 2010; Church and White, 2011). The rapid changes observed in polar regions suggest that the ice sheets melt faster than previously anticipated due to global warming (IPCC, 2021) and many studies show that the sea level is projected to rise another 0.3 to 1.8 m (1 to 4 feet) by 2100 as global warming continues (Rahmstorf, 2007; Vermeer and Rahmstorf, 2009; Grinsted, 2010; Nicholls and Cazenave, 2010; Walsh et al., 2014). The Upper Red-Sulphur-Cypress Basins do not drain directly into the ocean or other coastal bay and are at least 160 feet above mean sea level; therefore, the anticipated sea level rise this century will not impact the Region's floodplains.

Subsidence

Land subsidence, as a sudden sinking or a gradual settling of the Earth's surface on account of the subsurface movement of earth materials, is regarded as a worldwide problem leading to numerous adverse impacts on infrastructure and the environment (Galloway et al., 1999). The natural and human-induced causes of land subsidence include tectonic motion, aquifer-system compaction associated with groundwater, soil, and gas withdrawals, underground mining, etc. (Galloway et al., 1999; Xue et al., 2005; Braun and Ramage, 2020; Herrera-García et al., 2021). During the past century, land subsidence caused by the groundwater depletion took place at around 200 locations in 34 countries (Herrera-García et al., 2021).

In the United States, more than 17,000 square miles in 45 states have been directly affected by land subsidence and as much as 30 feet (9 meters) of subsidence was measured in California's Central Valley (Galloway et al., 1999). It is of particular concern especially in flat coastal areas such as the Houston-Galveston Region since land subsidence in conjunction with the sea level rise would exacerbate the severity of flooding in the neighboring watersheds (Coplin and Galloway, 1999). A report produced by the United States Geological Survey (USGS, Galloway 1999), land subsidence in not mentioned as a significant concern in Region 2; therefore, no subsidence considerations are address in this Regional Flood Plan.

Future Rainfall Variability and Climate Change

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 expected 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 2-11. The maximum potential impact of this range will be evaluated in following sections.

Table 2-11 Range of Potential Future Rainfall Changes in 2050-2060 Relative to NOAA Atlas 14

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

Sedimentation and Major Geomorphic Changes

Anticipated Impacts of Sedimentation in Flood Control Structures

Flood control structures prevent floodwaters, either stormwater or coastal water, from inundating vast amounts of land and property. Hydraulic works (levees, flood walls, dams, river diversions, etc.) represent the most important single form of human adaptation to the flood hazard. In the Lower Red-Sulphur-Cypress River basin, the most prominent flood control structures at a regional scale are levees, dams, and their associated reservoirs. In general, reservoirs are the flood control facilities that are most susceptible to the impacts of sediment deposition over time within this watershed. While sedimentation in reservoirs is a directly measurable impact and is typically accounted for in the design, the plan needs to recognize the reduction in conveyances due to sedimentation in channels and floodplain fringes.

Historically, reservoirs have been designed with relatively large storage capacities to offset sediment deposition and achieve the desired reservoir life. In general, reservoir design includes a sedimentation pool, commonly known as “dead storage”, which is a portion of its storage capacity that is essentially set aside for sediment deposition during the design life of the structure. It could be argued that the operation of the reservoir for authorized purposes, such as municipal water supply, flood control, hydropower generation, and recreation, is not significantly impacted if sediment accumulation does not exceed the dead storage capacity. However, large flood events will carry relatively large loads of sediment that can be deposited in portions of the reservoir that are outside of the designated dead storage areas. Thus, provisions need to be taken into consideration for sediment management in order to achieve a sustainable long-term use of the facility.

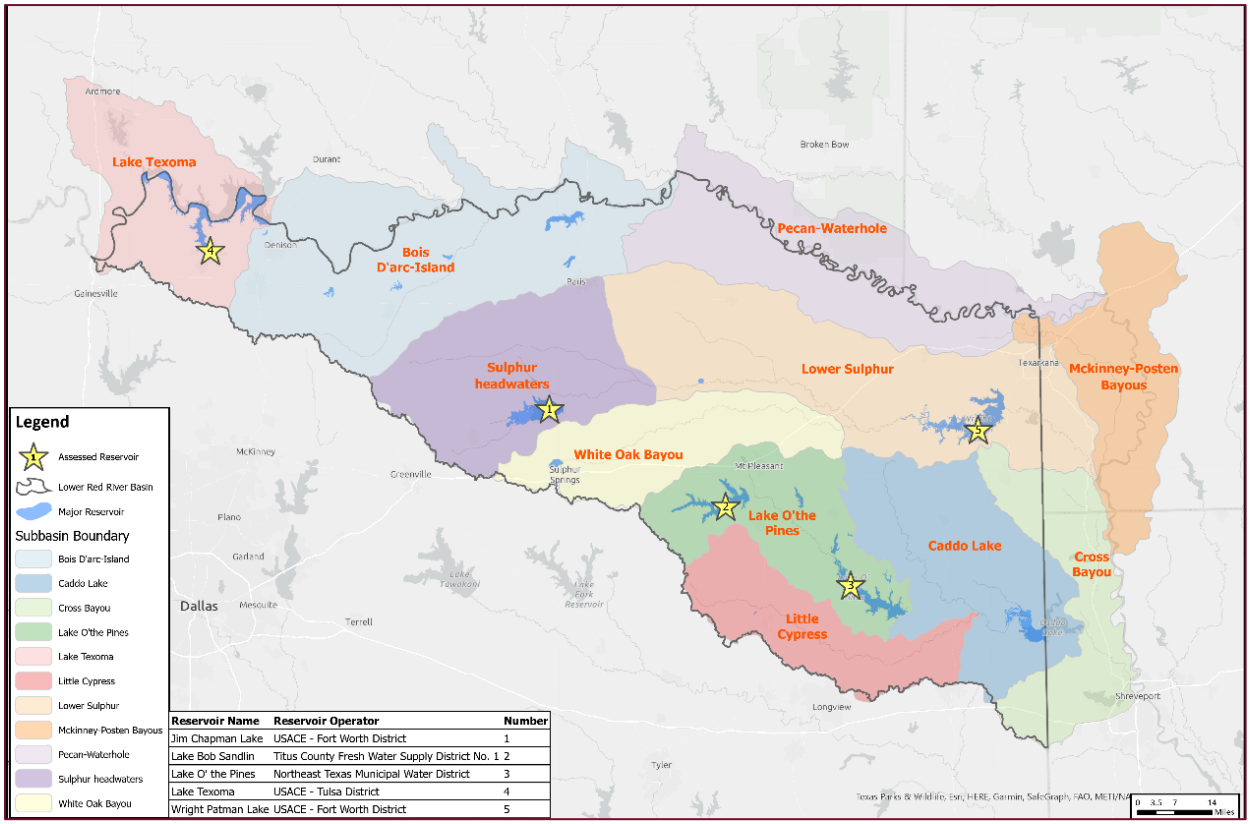
Within the framework of this Regional Flood Plan for the Lower Red-Sulphur-Cypress River Basin, the loss of flood storage is considered the primary impact of sedimentation in terms of increasing future flood risk. Reservoir flood operations can be severely impacted by the time fifty percent of the sedimentation volume has been filled with sediment, but operational issues may arise even when smaller percentages of flood storage area lost. The intent of this section is to provide a high-level assessment of the expected loss of flood storage capacity due to sedimentation in the region’s flood control facilities and determine if these losses would result in a significant increase to flooding risks. Data for this assessment was obtained from Natural Resources Conservation Service (NRCS) historical documents and TWDB volumetric and sedimentation surveys. The assessment was subdivided into two main groups: major reservoirs and NRCS floodwater retarding structures.

It is recognized, however, that sediment transport on a river system is a complex phenomenon with substantial geographic and temporal variability. The assessment and information provided in this section is based on a series of simplifying assumptions and is only intended to serve as a general indicator of the potential impacts of sedimentation in future flood risk at a regional scale within a 30-year planning horizon.

Major Reservoirs Assessment

The TWDB recognizes 21 major lakes and reservoirs within the Lower Red-Sulphur-Cypress River basin. A body of water that contains at least 5,000 acre-feet of storage capacity at its normal operating level is considered a major reservoir, according to the TWDB. Some of the operators of these reservoirs include the United States Army Corps of Engineers (USACE) and Municipal Water Districts. These facilities may serve multiple purposes including municipal water supply, irrigation, flood control, and/or recreation. Not all reservoirs are designed with flood control capacity. Five of these reservoirs were selected for this high-level assessment as a representative sample for the watershed (see Figure 2-33).

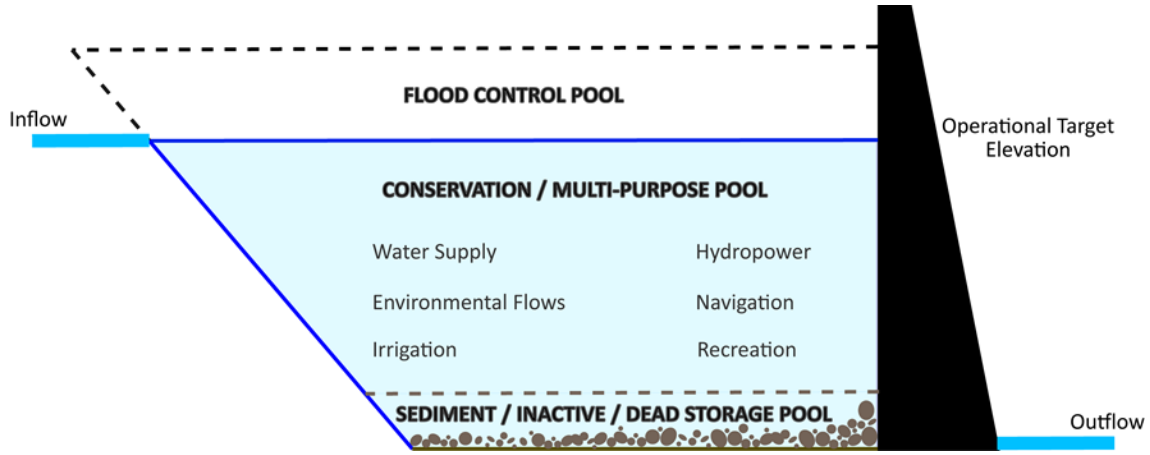
Figure 2-33 Major Reservoirs within the Lower Red-Sulphur-Cypress River Basin



Design and Operation of Multipurpose Reservoirs

The design and operation of reservoirs includes allocating volumes of reservoir storage (typically referred to as “pools”) for each purpose. There are three broad categories of pools (Figure 2-34): flood control, conservation (also referred to as multi-purpose), and sediment (also referred to as inactive or dead storage). In Figure 2-34, these water storage areas are depicted. Each reservoir is designed with specific capacity limits for each pool. The conservation pool is generally the largest layer, with the greatest capacity. The top of the conservation pool is typically varied based on seasonal patterns. Reservoir operators attempt to maintain this pool at the highest possible level. On top of the conservation pool is the zone reserved for flood control, which is also influenced by seasonal variations. Major reservoirs that provide flood control benefits are designed to capture upstream runoff, store it, and then release it at a controlled rate to minimize the flooding downstream.

Figure 2-34 Typical Multipurpose Reservoir Design



(Source: https://nicholasinstitute.duke.edu/reservoir-reallocation/)

Sediment Deposition

The amount of sediment accumulation in a reservoir depends on the sediment yield to the reservoir and the trap efficiency. Trap efficiency is the amount (percentage) of the sediment delivered to a reservoir that remains in it. How the accumulated sediment is distributed within the reservoir pools depends on the character of the inflowing sediment, the operation of the reservoir, detention time, and other factors. The incoming sediment that is deposited under water is called "submerged sediment". The sediment deposited above the conservation pool elevation is referred to as "aerated sediment" (Soil Conservation Service National Engineering Handbook, Section 3, 1983).

The distinction between submerged and aerated sediment is important in determining the capacity that each will displace within a reservoir. The high-level assessment presented in the following sections assumes that 90% of the incoming sediment will be submerged and 10% aerated. This assumption is based on guidelines established on the Soil Conservation Service National Engineering Handbook, Section 3 - Chapter 8 (1983) and a study performed by Strand and Pemberton (1987) for 11 reservoirs in the US Great Plains region. In this study, the reported percent of aerated sediment deposited in the flood control pool for Lake Texoma was approximately 10%, and this same value was adopted for all other reservoirs included in this assessment. Due to the complexity in determining the trap efficiency for each reservoir, a conservative assumption of 100% trap efficiency was adopted for the purposes of this assessment. A 100% trap efficiency indicates that all sediment delivered to a given reservoir remains in it and there are no sedimentation management practices being implemented.

Flood Control Capacity Loss Assessment

The TWDB in conjunction with the USACE - Fort Worth District and USACE – Tulsa District developed Volumetric and Sedimentation Surveys for several major reservoirs within the Lower Red-Sulphur-Cypress Basin (https://www.twdb.texas.gov/surfacewater/surveys/completed/files/). The five water bodies chosen for this study (See Figure 2-33**)** span across the entire Lower Red-Sulphur-Cypress River Basin, as a representative sample of all the major reservoirs in the watershed for this high-level assessment.

In the sedimentation surveys, a range of values is typically provided for the annual sedimentation rates of each reservoir. The reported high and low annual sedimentation rate estimates are reflected in Table 2-12. These sedimentation rates are generally determined based on a comparison of storage capacity from volumetric surveys over time. In addition to the TWDB Volumetric and Sedimentation Surveys, the TWDB's Water Data for Texas website, and the USACE – Fort Worth District website were used to collect pertinent reservoir data. The flood control storage volume was not provided as part of the TWDB surveys; however, those volumes were collected from multiple sources including data sheets from the USACE – Fort Worth and Tulsa Districts websites.

The objective of this assessment is to estimate the potential loss of flood control storage capacity for the selected reservoirs over a 30-year planning horizon. Sediment accumulation was calculated from the year of the latest volumetric survey for each reservoir until year 2053. The percent of reservoir capacity lost from the conservation and flood pools by year 2053 was determined using both the high and low annual sedimentation rates. This calculation assumes that the annual sedimentation rate will be constant over time and that, as stated in the previous section, 90% of the annual sediment load will deposit in the conservation pool and 10% in the flood control pool. A conservative 100% trap efficiency assumption was adopted for this assessment. It was also assumed that the conservation storage included any additional volume designated as dead pool storage.

A summary of analysis results is presented in Table 2-12 and Figure 2-35. Detailed calculations are provided in Table 2-13. Analysis results suggest that, overall, sedimentation will have a minor impact in the flood control function of the major reservoirs in the Lower Red-Sulphur-Cypress River Basin, as nearly all reservoirs resulted in over 97% of their flood control storage capacity still available by the end of the 30-year planning horizon.

Table 2-12 Estimate of Flood Control Storage Capacity Remaining by 2053 – Representative Reservoirs

Reservoir Name	Reservoir Operator	Drainage Area (sq.mi)	Total Conservation Storage (ac-ft)	Total Flood Control Storage (ac-ft)	Annual Sedimentation Rate (ac-ft/yr)		Remaining Flood Control Capacity (%) by 2053	
					Low	High	Low	High
Lake Texoma	USACE - Tulsa District	37,719	1,401,466	3,531,606	3774	16440	99.6%	98.1%
Jim Chapman Lake	USACE - Fort Worth District	479	260,332	137,043	711	711	97.9%	97.9%
Lake Bob Sandlin	Titus County Fresh Water Supply District No. 1	239	199,975	81,207	191	191	99.2%	99.2%
Wright Patman Lake	USACE - Fort Worth District	3,400	231,496	1,516,292	730	1362	99.8%	99.6%
Lake O'the Pines	Northeast Texas Municipal Water District	880	239,122	602,978	636	636	99.6%	99.6%

Figure 2-35 Estimate of Flood Control Storage Capacity Remaining by 2053 – Representative Reservoirs

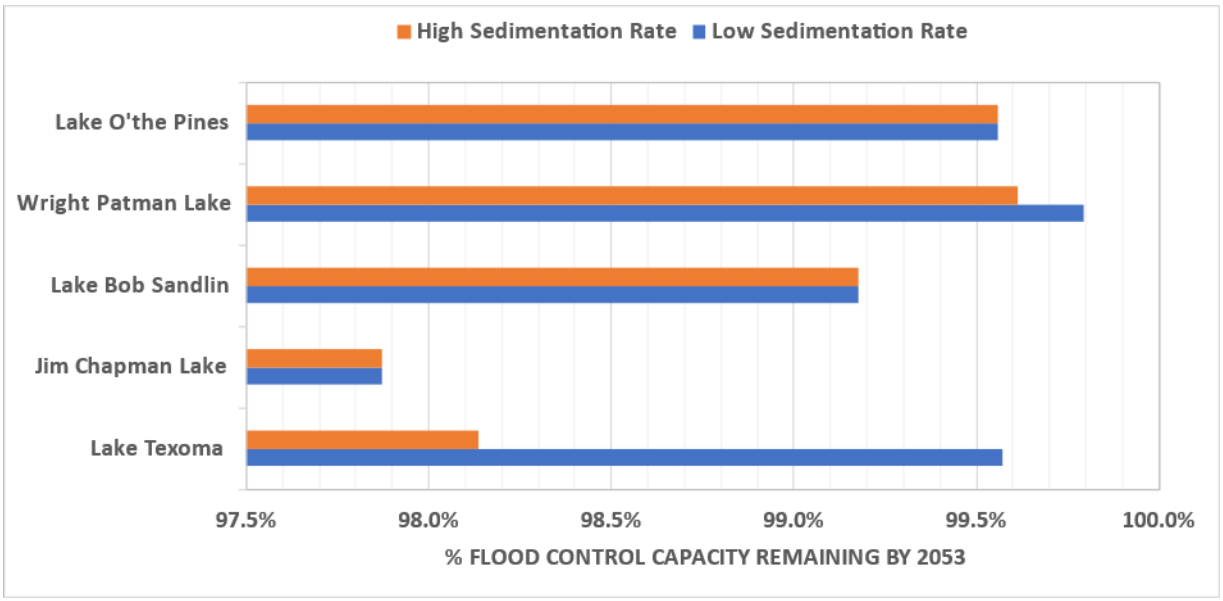


Table 2-13 Estimated loss of Conservation Pool and Flood Control Pool Capacity due to Sedimentation – Detailed Calculations

Reservoir Name	Reservoir Operator	Drainage Area (sq.mi)	Survey Year	Years to 2053	Total Conservation Storage (ac-ft)	Total Flood Control Storage (ac-ft)	Annual Sedimentation Rate (ac-ft/yr)		% Capacity lost from Conservation Pool by 2053		% Capacity lost from Flood Control Pool by 2053		Remaining Flood Control Capacity (%) by 2053	
							Low	High	Low	High	Low	High	Low	High
Lake Texoma	USACE - Tulsa District	37,719	2013	40	1,401,466	3,531,606	3774	16440	9.7%	42.2%	0.4%	1.9%	99.6%	98.1%
Jim Chapman Lake	USACE - Fort Worth District	479	2012	41	260,332	137,043	711	711	10.1%	10.1%	2.1%	2.1%	97.9%	97.9%
Lake Bob Sandlin	Titus County Fresh Water Supply District No. 1	239	2018	35	199,975	81,207	191	191	3.0%	3.0%	0.8%	0.8%	99.2%	99.2%
Wright Patman Lake	USACE - Fort Worth District	3,400	2010	43	231,496	1,516,292	730	1362	12.2%	22.8%	0.2%	0.4%	99.8%	99.6%
Lake O'the Pines	Northeast Texas Municipal Water District	880	2011	42	239,122	602,978	636	636	10.1%	10.1%	0.4%	0.4%	99.6%	99.6%

NRCS Floodwater Retarding Structures

The NRCS, formerly known as the Soil Conservation Service (SCS), has a long history of designing and building dams and reservoirs with the primary purpose of serving rural/agricultural areas. Based on a combination of data from the USACE's National Dam Inventory and the Texas State Soil and Water Conservation Board's (TSSWCB) Local Dams Inventory, there are 164 NRCS dams within the Lower-Red-Sulphur-Cypress River Basin (Figure 2-37), most of which were designed and built during the early 1950's and 1960's. These dams are one of the elements that comprise what is known as a Watershed Work Plan (WWP). The typical goals of a WWP are to improve agricultural practices, apply land treatment practices that will reduce upland erosion, and implement structural measures to reduce flood damages and provide for sediment control.

The WWPs refer to their dams and reservoirs as "Floodwater Retarding Structures". Their intent is to reduce flood-related damages to both private property and agricultural crops. Reduction of floodplain scour and capturing excess sediment is also a typical goal for these facilities. A section of a typical floodwater retarding structure is shown in Figure 2-36. It is important to note that the design of these structures includes a sediment pool and a sediment reserve. Thus, sedimentation may be considered to have an adverse impact to the structure's flood control performance only when the sediment pool capacity has been depleted and sediment starts to accumulate in the detention pool. However, as stated earlier, large flood events will carry relatively large loads of sediment that can be deposited in portions of the reservoir that are outside of the designated sediment pool, which results in some loss of detention storage prior to filling the entire sediment pool.

Figure 2-36 Section of a Typical NRCS Floodwater Retarding Structure (Source: Auds Creek Watershed Work Plan, SCS, 1975)

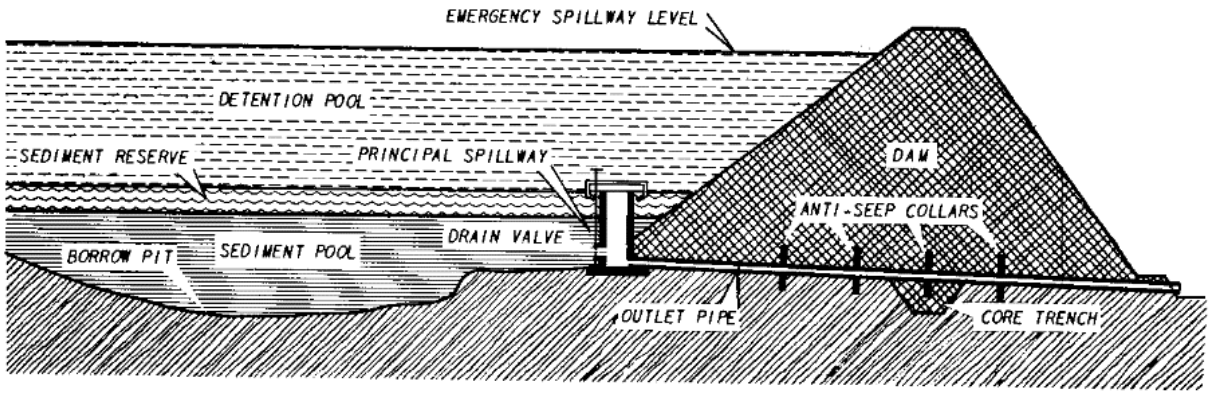
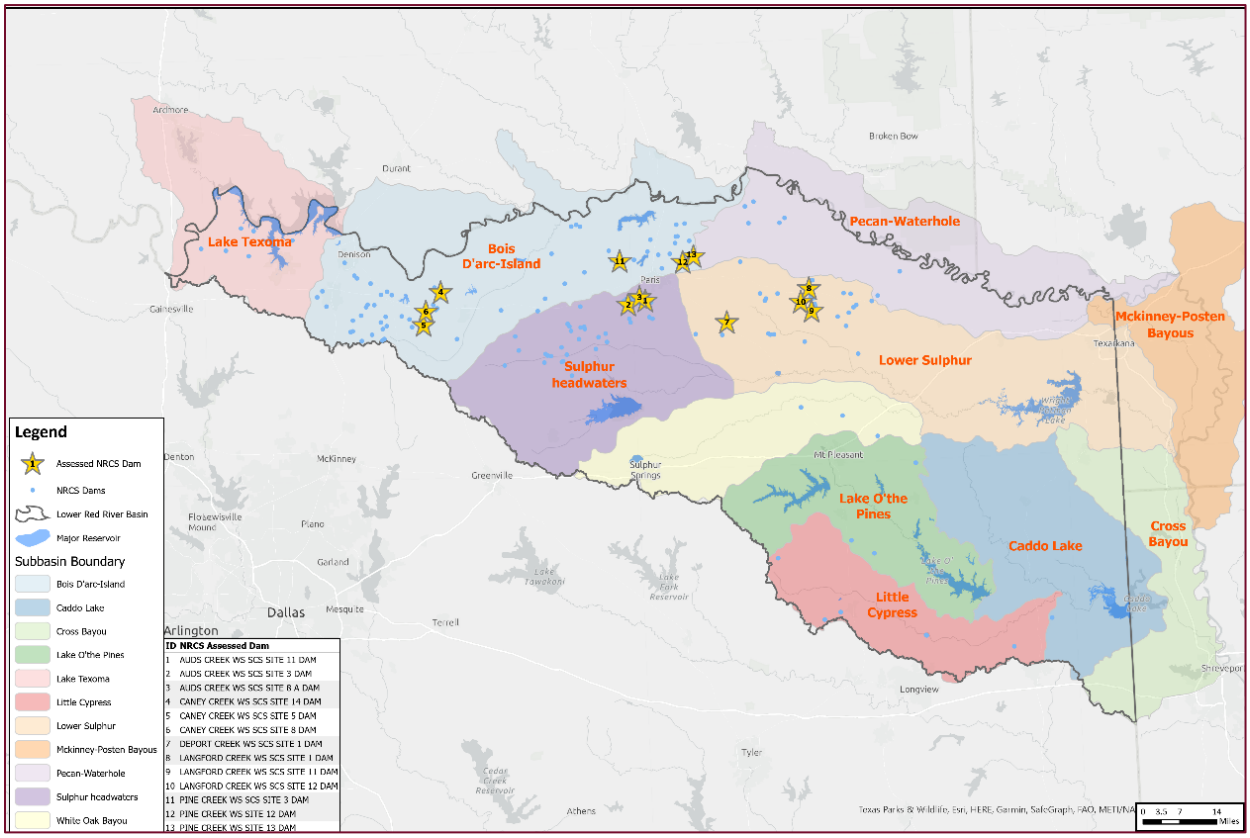


Figure 2-37 NRCS Floodwater Retarding Structures within the Lower Red-Sulphur-Cypress River Basin



Flood Storage Loss Assessment

A high-level assessment of the loss of flood storage capacity due to sedimentation in the region's NRCS facilities was conducted as part of this Regional Flood Plan. A total of 9 WWPs were reviewed in this effort. The watershed areas included in these WWPs (PL 566 Watersheds) are scattered throughout the Lower Red-Sulphur-Cypress River basin. WWPs can be downloaded from the following NRCS website: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/tx/programs/planning/wpfp/?cid=stelprdb1186445.

The WWPs include relevant data about each of the floodwater retarding structures, including sedimentation pool storage, detention storage, drainage area, and the year the facility was built. Most WWPs include a "Sedimentation Investigation" section or similar that provides an average annual rate per area of sediment deposition into the floodwater retarding structures. This data was used to perform approximate calculations of the time it would take to fill the sedimentation pool and the time it would take to fill a given percentage of the detention or flood control storage. For the purposes of this high-level assessment, it is assumed that the performance of the structure in terms of reducing flooding risk start to be significantly affected once 20% of the flood control pool is lost due to sedimentation.

Given the large number of NRCS floodwater retarding structures in the region and other limitations, the assessment was limited to 13 representative structures. The selected structures are primarily located on the three Sub-Basins with the greatest concentration of NRCS dams: Bois D'Arc Island, Sulphur Headwaters, and Lower Sulphur (Figure 2-37).

Based on the sedimentation rates reported in the above-mentioned references, an average rate was calculated for each structure. To calculate the time it would take to fill 100% of the sediment pool and 20% of the flood control pool, it was assumed that 90% of the annual sediment deposition would occur within the sediment pool and 10% within the flood pool. Once the sediment pool was filled, then the entire sediment accumulation would occur within the flood pool. A conservative 100% trap efficiency assumption was adopted for this assessment. The results of these calculations are presented graphically in Figure 2-38 and summarized in Table 2-14. Further details on the data used and calculations are presented in Table 2-15.

Figure 2-38 shows a series of bar graphs representing each site. The first point on the bar represents the year the structure was built. The segment between the first and second points represents the time it would take to fill the sedimentation pool. At that point, the facility would no longer perform its sediment control purpose as designed. The segment between the second and third points represents the additional time it would take to fill 20% of the flood control pool. This point represents a conservative assumption of when flood control benefits could start to be significantly reduced due to loss of storage capacity. The red dashed line marks year 2053, which is the long-term planning horizon for this first Regional Flood Plan. Based on these calculations, flood control operations would not be significantly affected for any of the selected sites within the next 30 years. All sites would still have residual capacity in their sedimentation pool to continue accumulating sediment beyond year 2053. For the flood retarding structures located in the Pine Creek Watershed, the bars extend beyond the limits of the time axis, indicating extensive time frames to reach the set storage losses. Furthermore, FNI's long term professional experience with NRCS ponds suggest that sedimentation rates reported in these early documents can be quite conservative and are typically much lower due to significant improvements in agricultural practices and the implementation of erosion control policies among other factors.

The results of this high-level assessment suggest that at a regional scale, sedimentation will not pose a significant limitation to achieving flood control benefits from these structures within the 30-year planning horizon. However, it is recognized that 13 structures is a relatively small sample size, and that further analysis is certainly required to comprehensively assess the impacts of sedimentation on these structures, especially at the local scale.

Figure 2-38 Estimate of Time to Lose Sediment Pool and Flood Control Pool Capacity due to Sedimentation – Representative NRCS Structures

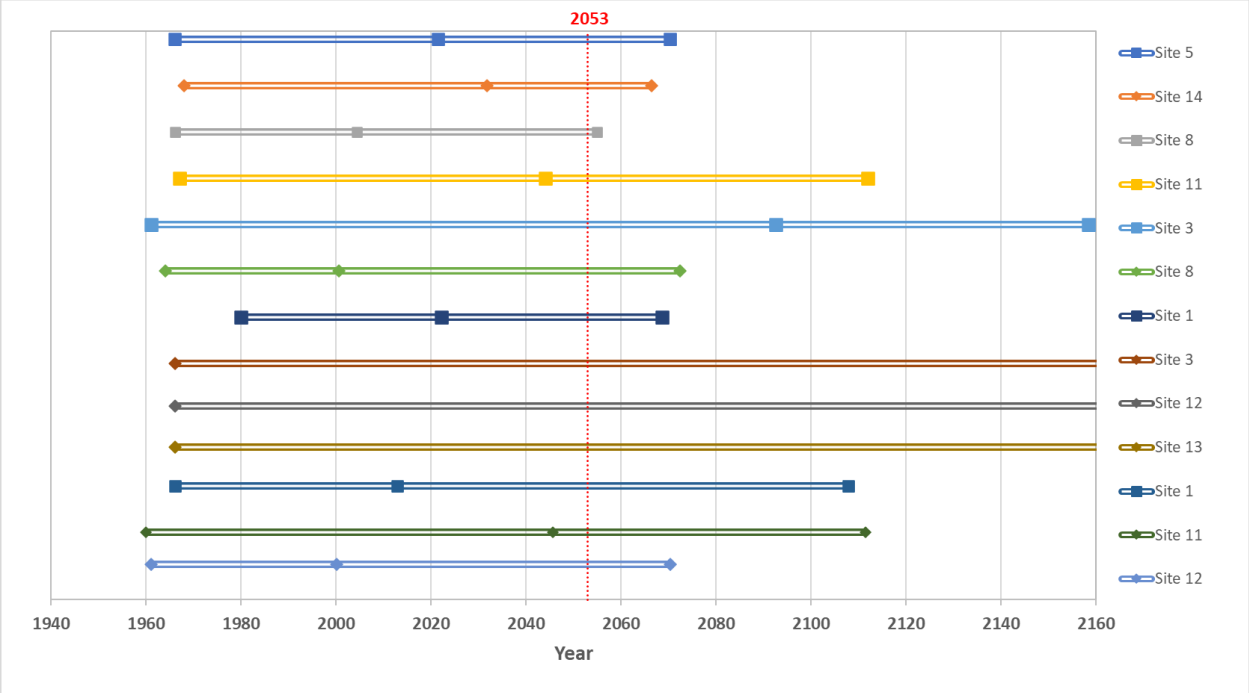


Table 2-14 Estimate of Time to Lose Sediment Pool and Flood Control Pool Capacity due to Sedimentation – Representative NRCS Structures

Lower Red-Sulphur-Cypress sub-basin	Creek	NRCS Dam ID	Sed. Rate Estimate (ac-ft/sqmi/yr)	Year Built	Estimated Year Sediment Pool is Filled	Estimated Year Flood Pool is Filled 20%
Caney Creek Watershed	Hutchins Creek	Site 5	1.39	1966	2021	2070
Caney Creek Watershed	Wilhoit Branch	Site 14	1.39	1968	2032	2066
Caney Creek Watershed	Caney Creek	Site 8	1.39	1966	2004	2055
Auds Creek Watershed	Cottonwood Branch	Site 11	0.84	1967	2044	2112
Auds Creek Watershed	Cottonwood Branch	Site 3	0.84	1961	2092	2158
Auds Creek Watershed	Cottonwood Branch	Site 8	0.84	1964	2001	2072
Deport Creek Watershed	Mustang Creek	Site 1	1.49	1980	2022	2069
Pine Creek Watershed	Little Pine Creek	Site 3	0.04	1966	3707	5663
Pine Creek Watershed	Sevenmile Creek	Site 12	0.04	1966	3139	5084
Pine Creek Watershed	Nine Mile Creek	Site 13	0.04	1966	3317	5286
Langford Creek Watershed	Langford Creek	Site 1	0.76	1966	2013	2108
Langford Creek Watershed	Lynch Creek	Site 11	0.76	1960	2046	2112
Langford Creek Watershed	Boggy Creek	Site 12	0.76	1961	2000	2070

Table 2-15 Estimated Loss of Sediment Pool and Flood Control Pool Capacity due to Sedimentation – Detailed Calculations

Lower Red-Sulphur-Cypress sub-basin	Creek	NRCS Dam ID	Year Built	Drainage Area (sqmi)	Sediment Pool Storage (ac-ft)	Flood Pool Storage (ac-ft)	Total Capacity (ac-ft)	Sed. Rate Estimate (ac-ft/sqmi/yr)	Sed. Rate Estimate (ac-ft/yr)	Estimated Years to fill Sediment Pool	Estimated Year when Sediment Pool is Filled	Additional Years to fill 20% of Flood Pool	Estimated Year when 20% of Flood Pool is lost
Caney Creek Watershed	Hutchins Creek	Site 5	1966	2.8	197	1,075	1,272	*1.39*	*3.9*	*55*	*2021*	*49*	*2070*
Caney Creek Watershed	Wilhoit Branch	Site 14	1968	1.9	154	551	705	*1.39*	*2.7*	*64*	*2032*	*35*	*2066*
Caney Creek Watershed	Caney Creek	Site 8	1966	1.0	47	371	418	*1.39*	*1.4*	*38*	*2004*	*51*	*2055*
Auds Creek Watershed	Cottonwood Branch	Site 11	1967	2.3	135	737	872	*0.84*	*1.9*	*77*	*2044*	*68*	*2112*
Auds Creek Watershed	Cottonwood Branch	Site 8	1964	2.5	70	801	871	*0.84*	*2.1*	*37*	*2001*	*72*	*2072*
Auds Creek Watershed	Cottonwood Branch	Site 3	1961	1.7	169	564	733	*0.84*	*1.4*	*131*	*2092*	*66*	*2158*
Deport Creek Watershed	Mustang Creek	Site 1	1980	5.7	322	*2,156*	2,478	*1.49*	*8.5*	*42*	*2022*	*47*	*2069*
Pine Creek Watershed	Little Pine Creek	Site 3	1966	7.5	428	2,908	3,336	*0.04*	*0.3*	*1741*	*3707*	*1956*	*5663*
Pine Creek Watershed	Sevenmile Creek	Site 12	1966	6.7	256	2,501	2,757	*0.04*	*0.2*	*1173*	*3139*	*1945*	*5084*
Pine Creek Watershed	Nine Mile Creek	Site 13	1966	3.4	149	1,289	1,438	*0.04*	*0.1*	*1351*	*3317*	*1969*	*5286*
Langford Creek Watershed	Langford Creek	Site 1	1966	3.0	95	1,120	1,215	*0.76*	*2.2*	*47*	*2013*	*95*	*2108*
Langford Creek Watershed	Lynch Creek	Site 11	1960	2.2	126	608	734	*0.76*	*1.6*	*86*	*2046*	*66*	*2112*
Langford Creek Watershed	Boggy Creek	Site 12	1961	7.2	192	2,028	2,220	*0.76*	*5.5*	*39*	*2000*	*70*	*2070*

Anticipated Impacts of Major Geomorphic Changes in Flood Risk

Geomorphic changes in fluvial systems have a clear relationship with flood hazard protection. Fluvial systems are a series complex feedback loops where many interrelated variables influence both flood hazards and changes in a river condition. In short, the geometry of river systems changes when the influencing variables, such as hydrology (caused by things such as climate change, land use changes, stormwater infrastructure, etc.) and sediment dynamics such as erosion, sediment deposition, and sediment transport change. This ultimately relates back to flood hazards because of increases or decreases in flood conveyance inherent to changes in river geometry.

Regardless, most flood hazard assessments assume the capacity of river channels to convey flood flows is stationary, with the thought that changes in flood frequency are primarily driven by hydrology. However, several studies have shown that while hydrology has a greater influence on flood hazards and flood variability, identifying potential geomorphic changes are important because flood hazards and flood variability is not driven by hydrology alone.

Predicting Geomorphic Changes

Effectively predicting geomorphic channel changes quantitatively requires intense data collection and modeling. These requirements are further magnified at larger scales because the factors that control the geomorphology of a system are variable throughout a watershed. At the regional scale there is significant heterogeneity within a river system. As such geomorphic channel changes and sediment dynamics are difficult to quantify at the regional scale because of the lack of available data, number of interrelated influential variables, and differences in the local conditions within a watershed.

Including predicted geomorphic changes into flood assessment is often not appropriate or feasible at the regional scale. This is because the uncertainty of predictions become exceedingly high with the introduction of additional variables/complexity, which can lead to erroneous flood predictions (3). However, this does not mean that general effects of geomorphic channel changes on flood risks should not be considered.

Effects of Geomorphic Changes on Flood Risks

While major geomorphic changes can occur at the regional scale, their effect on flood risks are most apparent at the local level. This is because of the variability of geomorphic conditions within a river. Local changes in the channel geometry and sediment dynamics of the system can have profound effects on flood inundation extents at smaller scales. This section provides high-level descriptions of how geomorphic changes can affect flood risks.

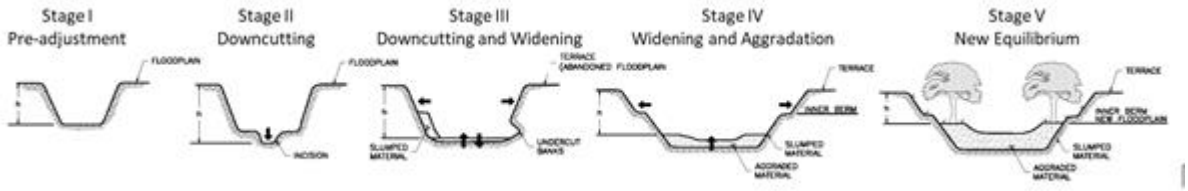
Hydrology and Channel Changes

River geometry changes to accommodate the amount of flow it receives. Both increases and decreases in flow regime can initiate these changes. Common causes of hydrologic changes include urbanization / land-use changes, implementation of stormwater infrastructure (such as detention / retention ponds), climate change, and reservoir release schedules.

Increased flow often occurs when a watershed urbanizes or has land-use changes. Flow in streams become flashier because surface runoff reaches streams more quickly and in greater magnitude due to increased smooth impermeable surfaces that prevent infiltration of water into the ground. While this

gets flood-waters downstream more quickly, stream geometries will enlarge via erosion to accommodate the additional flow. This is manifested first by channel downcutting until the stream slope can accommodate the discharge without scouring the channel bed; and second by channel widening caused by overly steepened stream banks following downcutting. Figure 2-39 below shows the processes involved in the channel evolution model.

Figure 2-39 Diagram of Channel Downcutting and Channel Widening (adapted from Schumm et al, 1984)



Channel enlargement is a gradual process that migrates from downstream to upstream between local baselevels or hardpoints. Local baselevels are features that prevent the channel from downcutting. Examples may include tributary confluences, bedrock outcrops, concrete-lined channels, and culvert crossings. Geometric changes to the channel (i.e., channel enlargement) typically affect flood levels within these bounded local baselevels.

Locally, channel enlargement may increase the flow capacity and reduce flood risks. This effect scales with river size/drainage area. Flood capacity is less impacted by erosion in larger streams than in smaller streams because the amount of material removed relative to the channel size is less in larger streams. In smaller streams it is common for erosion to create enough capacity to completely remove overbank flows during flood events. Likewise, significant amounts of erosion in larger streams may only have a marginal effect on flood inundation levels.

This does not mean that erosion is solely beneficial to flood risks, there are adverse impacts of erosion brought about by increased hydrology including:

- Direct erosion impacts to homes, infrastructure (e.g., stormwater outfalls, waterlines, sewer lines, roads, bridges, culverts, etc.), and private property adjacent to the stream.
- Channel geometry used in flood assessment analyses becoming outdated.
- Excess sediment yields sourced from channel erosion and subsequent downstream effects.

Lastly, decreased flow in the stream can occur due to the presence of detention/retention ponds, lakes/reservoirs, or climate change. This can cause channels to aggrade because flows no longer have enough stream power to carry the sediment in the system. As a result, channel capacity will decrease as sediment aggrades in the channel and flood levels can rise for a given storm event. In addition to aggradation, erosion can also occur on stream banks caused by deposition patters/sediment bars directing flow into stream banks.

Changes to Sediment Dynamics and Culvert Sedimentation

Sediment transport is a fundamental function of stream systems. However, changes in sediment dynamics can affect flood risk. These changes are often interrelated with hydrologic changes, the presence of man-made structures, or local disturbances to channel geomorphology.

Upstream channel change/erosion can account for as much as 90% of sediment yield volumes. When sediment yields increase, the resulting excess sediment typically has one of three fates:

(1) Sediment can be redeposited downstream within the channel or floodplain. This reduces flood capacity in locations where the stream no longer has the sediment transport capacity to move the sediment through the system. This can happen in locations where the channel has become overly wide as a result of historic channel downcutting and widening.
(2) Sediment can be transported and stored within reservoirs or retention/detention ponds. This can reduce flood storage if not properly addressed by maintenance (as discussed in previous sections). This then becomes a maintenance responsibility for the owner the reservoir.
(3) Sediment is effectively transported out of the watershed over time.

Sedimentation within culverts or stormwater infrastructure is also a common source of increased local flood risk. Culverts designs are typically based on maximum expected flood events. However, culvert designs have traditionally not considered lower-level flood events or sediment transport. As such many culverts are oversized for more frequent storm events. Flows entering culverts spread out laterally, increasing the channel width and decreasing the channel depth. This reduces the stream power through the culvert. The result is a loss in sediment transport capacity and deposition within the culvert. As deposition continues, culverts lose capacity. This can cause increased flood risks as water stacks up behind filled in culverts and road crossings. This phenomenon is often not accounted for in flood risk analysis.

There are two primary solutions to local sedimentation at culverts and road crossings. First is on-going monitoring and maintenance by the owner of the culvert to ensure that sedimentation is reducing culvert capacities that could lead to local increases in flood risks. Second is to consider sediment transport and stream geomorphology during culvert design.

One example of culverts that account for sediment transport are tiered culverts or staged culverts. These have shown to be considerably more effective at reducing sedimentation while still maintaining flood capacity than the traditional practice of oversizing of culverts. A tiered culvert set-up has a primary culvert that accommodates more frequent flow events and maintains the stream channels width-depth ratio and sediment transport capacity. Adjacent culverts are placed at higher flow elevations and become activated during larger flood events. This allows flood capacity to be maintained while reducing sedimentation within culverts. An example of a staged culvert is shown below in Figure 2-40.

Figure 2-40 Staged or Tiered Culvert Design used in North Texas with Multiple Culvert Sizes and Flow Elevations

Other Considerations

In summary, it often not feasible to evaluate region scale geomorphic changes and their potential effects on flood hazards because of the significant uncertainties introduced into flood hazard assessment without accounting for the intensive data requirements, extensive analysis of interrelated variables, and system heterogeneity. Major geomorphic changes and their effects of flood hazards are most prominently experienced at the local level and can be accounted for at this scale.

The above sections provide high-level examples of the connection between geomorphic changes and flood hazards at specific locations due to local sediment dynamics or bank erosion. Because these effects are occurring at a specific location or piece of infrastructure, it reasons that mitigating these flood hazards are primarily a maintenance issue; and therefore, are often the responsibility of the owner of the easement, culvert, retention/detention pond, reservoir, etc.

However, one method used by numerous cities and regulatory bodies to account for uncertainty in geomorphic changes at a high level includes erosion hazard setbacks (also known as erosion clear zone, stream buffer area, etc.). This consists of a buffer area around the stream system that is not allowed to be disturbed without prior investigation. Multiple methods of creating this setback distance have been developed in design criteria manuals and local flood plans as a means of accounting for the uncertainty in future geomorphic changes without intense data requirements. Maintaining a buffer around streams provides numerous benefits including:

- Allowing for geomorphic channel adjustments to occur within an allotted lateral extent without significantly affecting flood inundation extents.
- Reducing hydrologic changes in the stream by slowing overland flow via riparian vegetation.
- Improving water quality via riparian vegetation filtering surface runoff.

- Reduction of bank erosion and subsequent excess sediment due to streambanks increased resistance to bank erosion from the roots of established riparian vegetation (i.e., bank vegetation reduces stream bank erosion).
- Prevention of erosion impacts to homes, infrastructure, and property adjacent to the stream.

In larger drainage area streams with more thorough flood inundation mapping, these setbacks may not be as effective at reducing flood risk due to their relatively small buffer distances from streams compared to mapped floodplains. However, in smaller watersheds with limited flood analysis these can be an effective means of providing an extra layer of protection with relatively low effort.

Future Conditions Hydrologic & Hydraulic Model Availability

Only two areas had models representing future conditions in the region. A summary of these studies are as follows:

1. Texarkana – A fully-developed (future) conditions model was prepared for the City of Texarkana that used the 2010 zoning map to represent future conditions. This would represent a fully developed condition within the City limits and would therefore be a conservative estimate of the 30-year future conditions required by TWDB.
2. Sherman - Future conditions modeling for the 100-year floodplain has been conducted for the City of Sherman as part of a drainage study.

Because the models are somewhat outdated and limited to the 100-year floodplain, neither was used to develop the flood quilt.

Hydrologic & Hydraulic Models Without Future Conditions

Limited existing conditions modeling was available in the region and only covered some of the municipal areas and portions of Grayson County. Of this, only the models previously discussed included future conditions of any kind. Many of these models are thirty or more years old would need to be updated to existing conditions before updating them to future conditions. Due to the limited timeframe and budget of the initial regional flood planning project, these models could not be updated to include future conditions. Such modeling has been identified as data gaps and is being considered as potential FMEs.

Future Conditions Estimation

Since no reliable future conditions modeling and mapping were available in the region, another method was needed for approximating future conditions. TWDB allows for the following four methods to determine future flooding conditions:

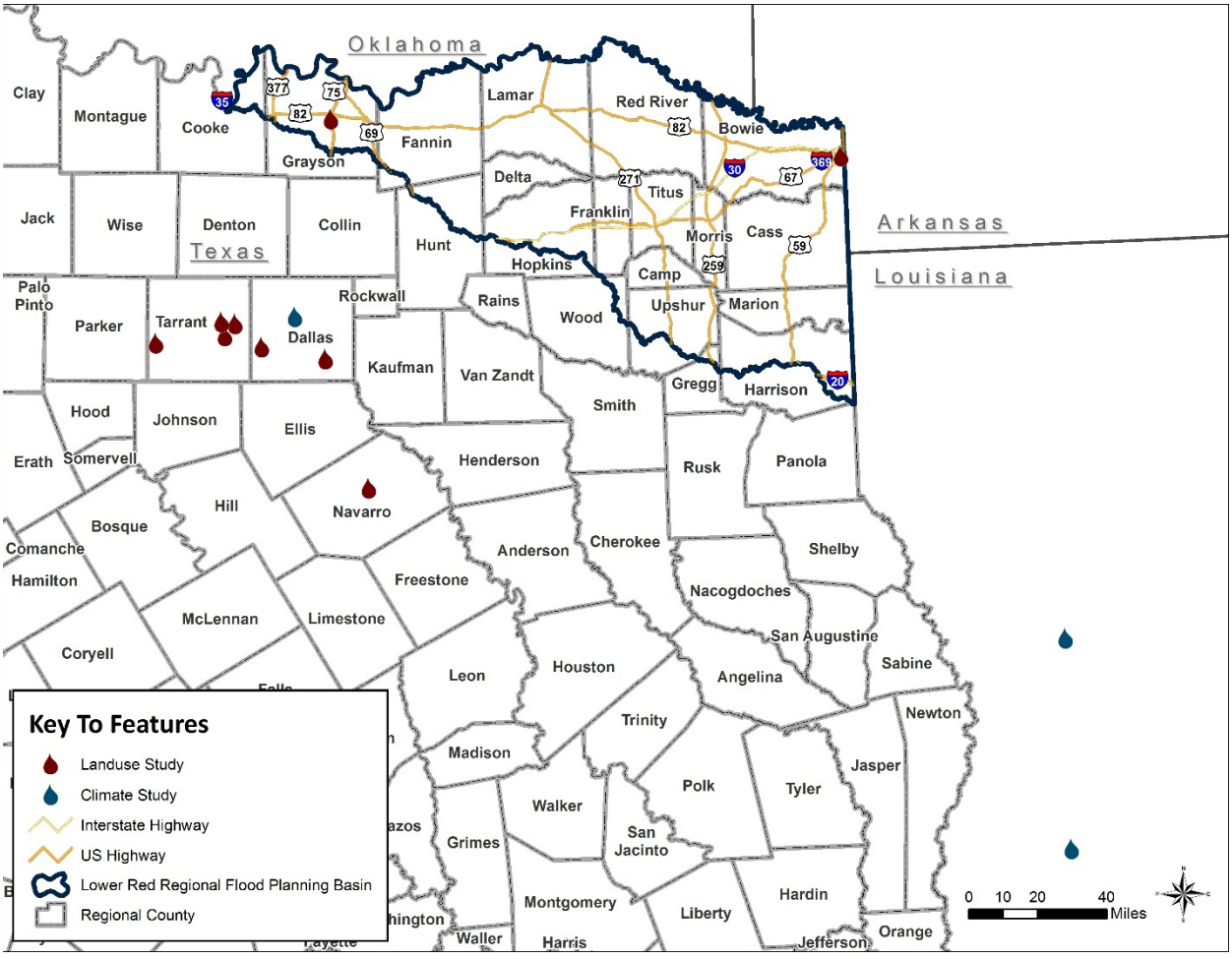
1. Increase water surface elevation based on projected percent population increase (as proxy for development of land areas)
2. Utilize the existing condition 0.2 percent ACE floodplain as a proxy for the future 1 percent ACE.
3. Combination of methods 1 and 2 or an RFPG-proposed method
4. Request TWDB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

To help decide which method was best for the Region, an analysis was conducted to evaluate existing future conditions studies.

Future Conditions Flood Risk Case Studies

In order to obtain a better understanding of how future conditions affect flood risk within Region 2, 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 2-40 provides a location for the existing studies collected for this assessment.

Figure 2-41 Future Conditions 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 2-16.

Table 2-16 Case Stud Future Conditions Land Use Water Surface Elevations (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
Texarkana	Wagner, Swampoodle, Corral Creek	0.6	1.8
Corsicana	Post Oak, SF Post Oak, Mesquite Creek	0.2	1
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 1% ACE 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 1% ACE and 0.2% ACE flood elevations were also compared for the Method 2 consideration. Results of the comparisons are provided in Table 2-17.

Potential Future 100-Year Flood Hazard Methodology

The potential future conditions 1% ACE flood hazard approach methodologies were discussed during the September 2, 2021 Region 2 RFPG meeting. Due to the existing 0.2% ACE floodplain coverage developed in the flood quilt, Method 2 was considered the most reasonable approach. The planning group had reservations about the usage of the existing 0.2% ACE as a potential future 1% ACE flood risk proxy due to the case studies showing the floodplain may be too conservative of an approach.

Table 2-17 Case Study 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

From the future conditions land use case study results, the average change in potential future 1% ACE WSEL compared to existing conditions was only 0.4 feet while the comparison between the existing 1% ACE and existing 0.2% ACE 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 2-16 by the average taken from Table 2-17 to account for future rainfall projections, the results generally yielded a comparison less than that of the differences between the existing 1% ACE and existing 0.2% ACE water surface elevation. In Region 2, this concern is mitigated because the 0.2% ACE floodplain mapping was developed primarily from Fathom Fluvial and Pluvial data, which was often narrower than the existing 1% ACE Zone A floodplains. Because of this, most of the region that had Zone A mapping shows 0.2% ACE floodplain that matches the 1% ACE floodplain; therefore, overestimation in these areas is unlikely. There will be some overestimation in the more developed areas and those that had no mapping previously available (where Fathom 1% and 0.2% ACE floodplain was relied upon), but this is unavoidable using these approximate methods.

Potential Future 500-Year Flood Hazard Methodology

The potential future conditions 0.2% ACE flood hazard approach methodology was discussed during the February 3, 2022 Region 2 RFPG meeting. Under Method 2 in the TWDB Technical Guidelines, an excerpt regarding the determination of the future 0.2% ACE 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 1% ACE and 0.2% ACE floodplain quilt in and near Region 2. 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 0.2% ACE flood risk, Base Level Engineering (BLE) data previously collected for the plan was analyzed. The average difference in top width between 0.1% ACE and 0.2% ACE floodplain was determined for the Pecan Waterhole HUC 8using the flood hazard layer and mapped cross sections, as shown in Figure 2-41. This HUC is part of the Red River's drainage area crossing Lamar, Red River and Bowie Counties. Over 11,400 cross sections were analyzed and the average buffer between 1% ACE and 0.2% ACE floodplain was

found to be 22 feet (in the TWDB specified NAD 83 2011 Texas Centric Lambert projection). A 22-foot buffer has been applied to the existing 0.2% ACE floodplain to approximate the future floodplain. shows a typical future conditions floodplain offset.

Best Available Data

The method used for determining the best available data is similar to that described in the existing condition section above and detailed in Table 2-3, but with changes due to the future conditions analysis discussed above. Table 2-18 shows the best available hierarchy used for Region 2.

Figure 2-42 Cross Sections Comparing distances between 1.0% & 0.2% ACE New BLE in Pecan Waterhole HUC

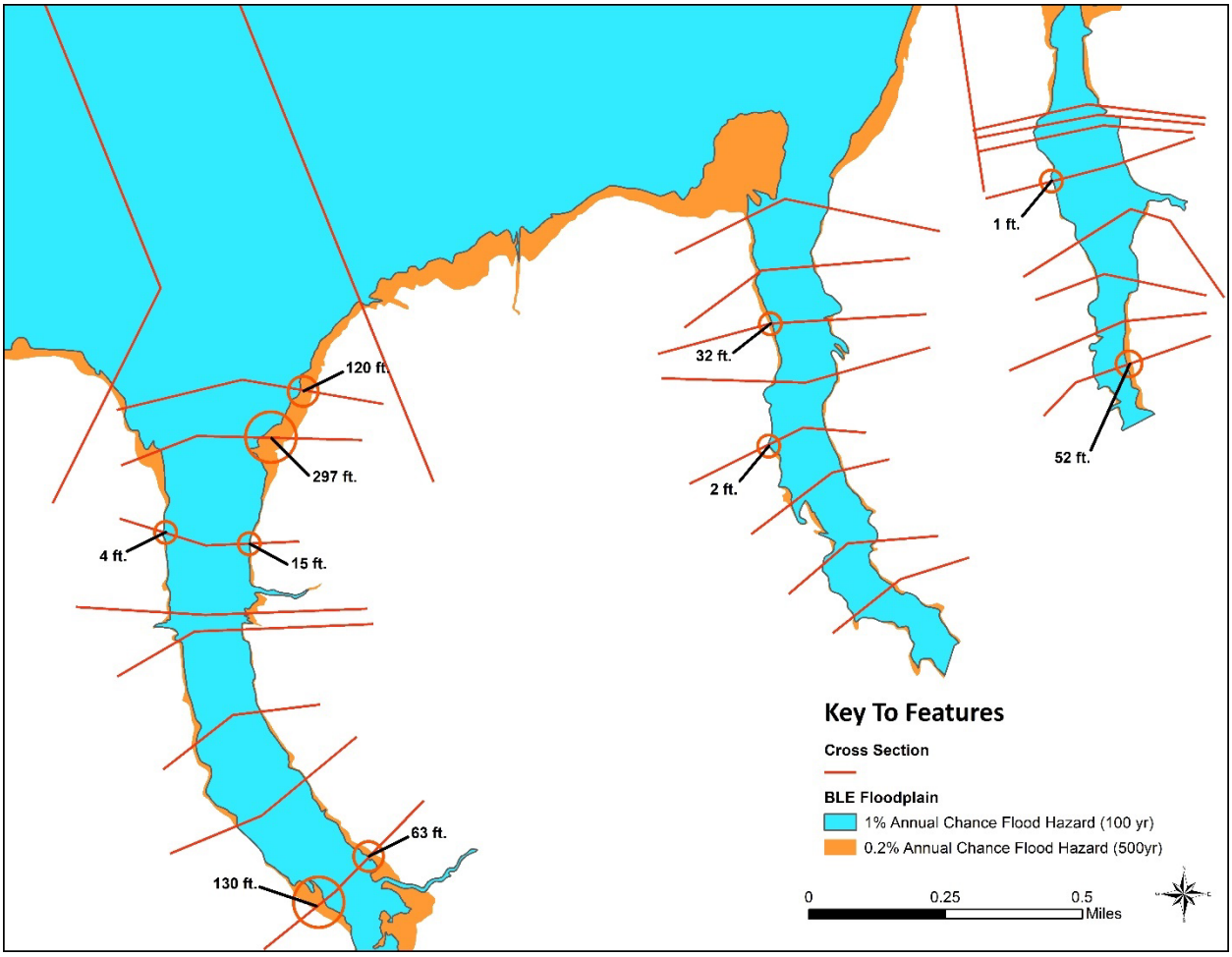


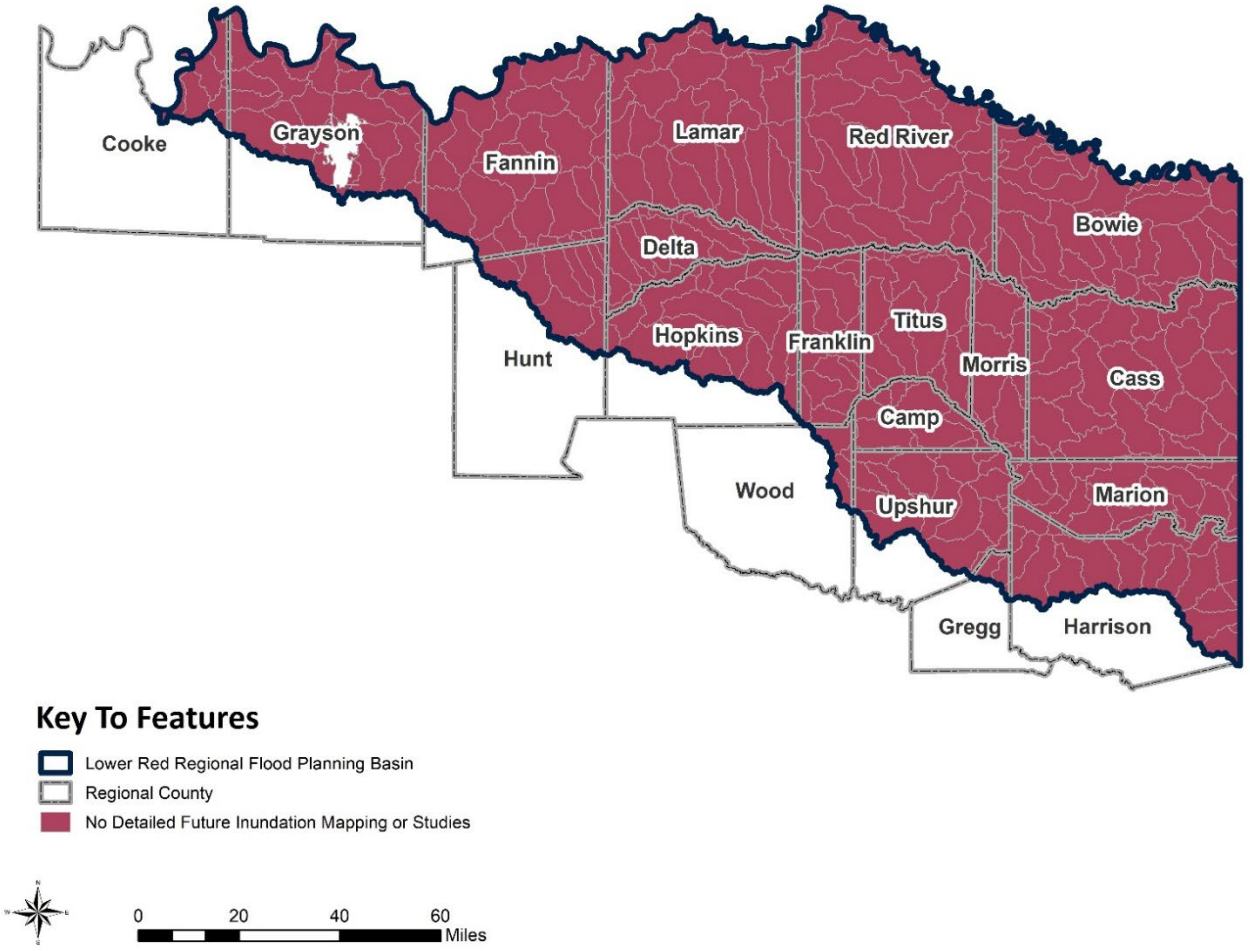
Table 2-18 Lower Red-Sulphur-Cypress Flood Flood Quilt Data Source Hierarchy Matrix

	Best Available		→		→		→		Most Approximate	
	Local Floodplain (if determined current)		NFHL AE		BLE		NFHL A		FAFDS, or No FEMA	
	1% ACE	0.2% ACE	1% ACE	0.2% ACE	1% ACE	0.2% ACE	1% ACE	0.2% ACE	1% ACE	0.2% ACE
Existing	Local Study, if provided	Local Study, if provided	Zone AE + Pluvial Fathom*	Zone AE + Pluvial Fathom*	BLE + Pluvial Fathom	BLE + Pluvial Fathom	Zone A + Pluvial Fathom	Zone A + Pluvial Fathom	Combined Pluvial & Fluvial (Replaced FAFDS with Fathom)	Combined Pluvial & Fluvial (Replaced FAFDS with Fathom)
Future	Local Study, if provided	Local Study, if provided	Existing 500-Year	22’ Buffer of Existing 500’ Year	Existing 500-Year	22’ Buffer of Existing 500’ Year	Existing 500-Year	22’ Buffer of Existing 500’ Year	Fathom Existing 500-Year	22' Buffer of Existing 500’ Year

Data Gaps

The same data gaps exist for future conditions mapping as existing conditions mapping since existing conditions were used to assess the future extents. The City of Sherman did analyze and create 100-year future conditions in their modeling and drainage studies, so it has been excluded from the data gaps shown in Figure 2-43.

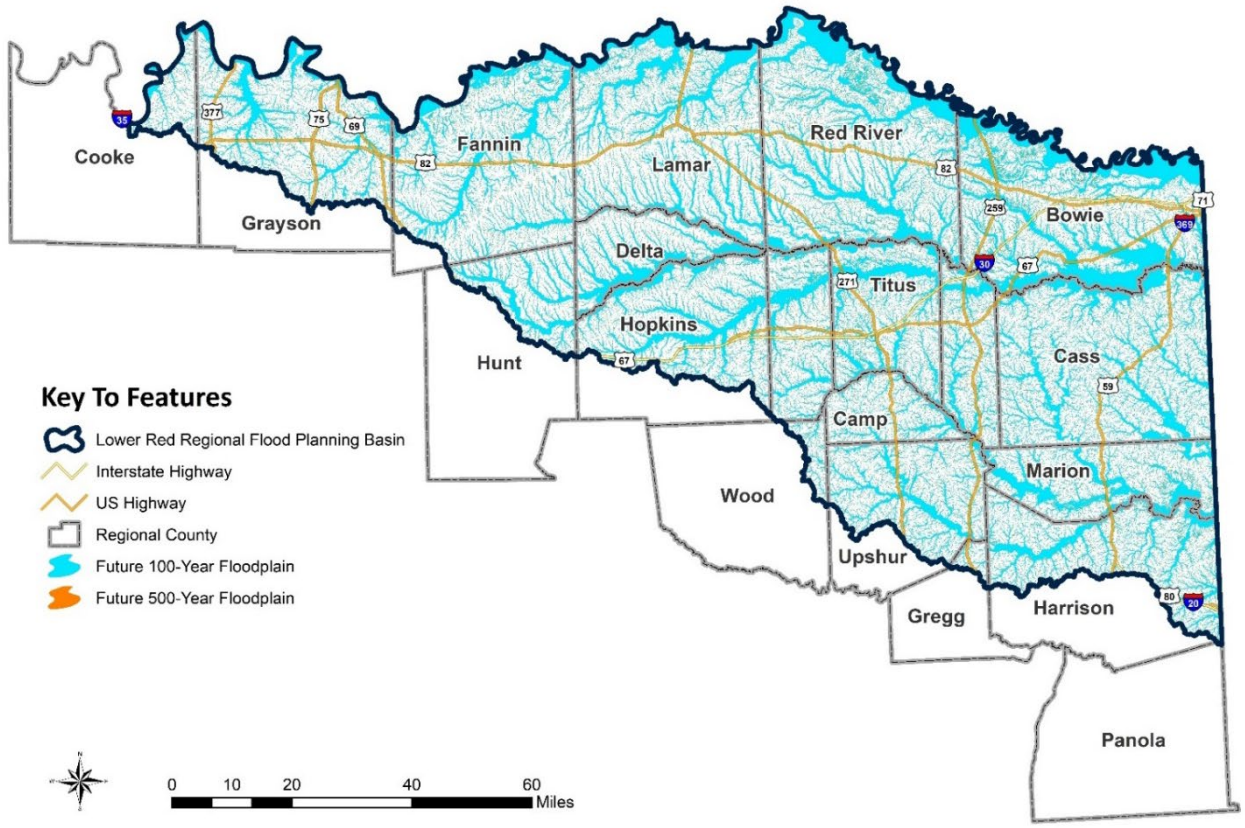
Figure 2-43 Future Conditions Data Gaps



1% and 0.2% Annual Chance Exceedance Future Floodplains

Future floodplain data developed for Region 2 includes only the 1-percent and 0.2-percent ACE events to describe the flood hazards and perform the exposure and vulnerability analyses. The future floodplains developed as described above and can be seen in Figure 2-44.

Figure 2-44 Map of Future 1.0% and 0.2% Annual Chance Exceedance Areas



2.B.2 Future Condition Flood Exposure Analysis

Existing Development within the Existing Conditions Floodplains

The 30-year future conditions flood quilt was intersected with all of the same GIS exposure layers as in 2A to get an understanding of the effects of an increase in flood hazard area assuming no changes in policy, population growth and related development, climate change and natural sedimentation.

Existing and Future Developments within the Future Conditions Floodplains

The future floodplain would impact 57% more structures and 72% more people than existing conditions, while only adding 12% of more land area. The greater effects are seen in the more developed cities, highlighting the amount of development that does happen just outside existing floodplains, as seen in Figure 2-44 below. The graphs below show the considerable difference from the existing conditions graphs, where most of the impacted structures are in the 1.0% ACE area.

Figure 2-45 Potential Total Structures at Risk in Future Flood Hazard Area

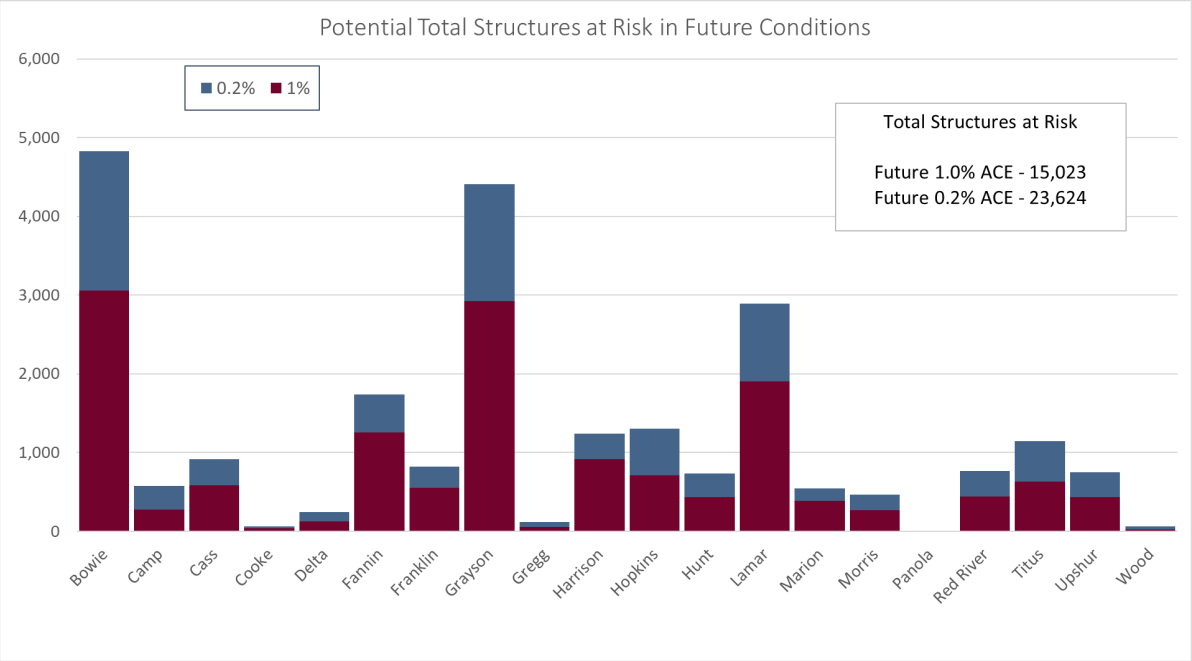


Figure 2-46 Potential Residential Structures at Risk in Future Flood Hazard Area

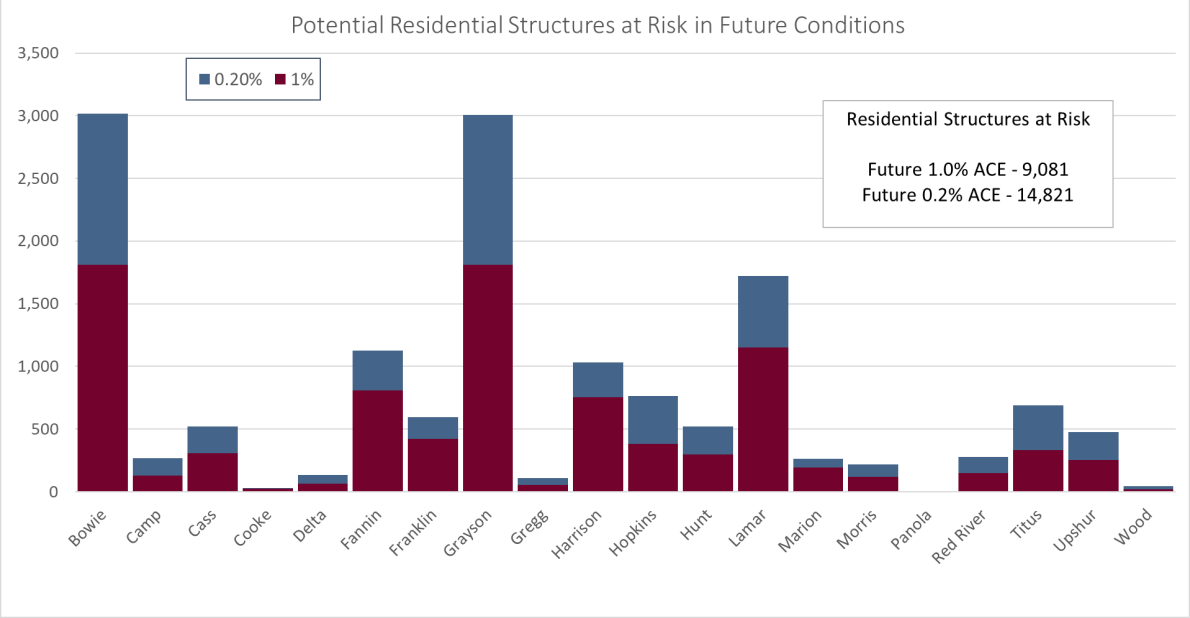


Figure 2-47 Structures Impacted in the Future 0.2% ACE

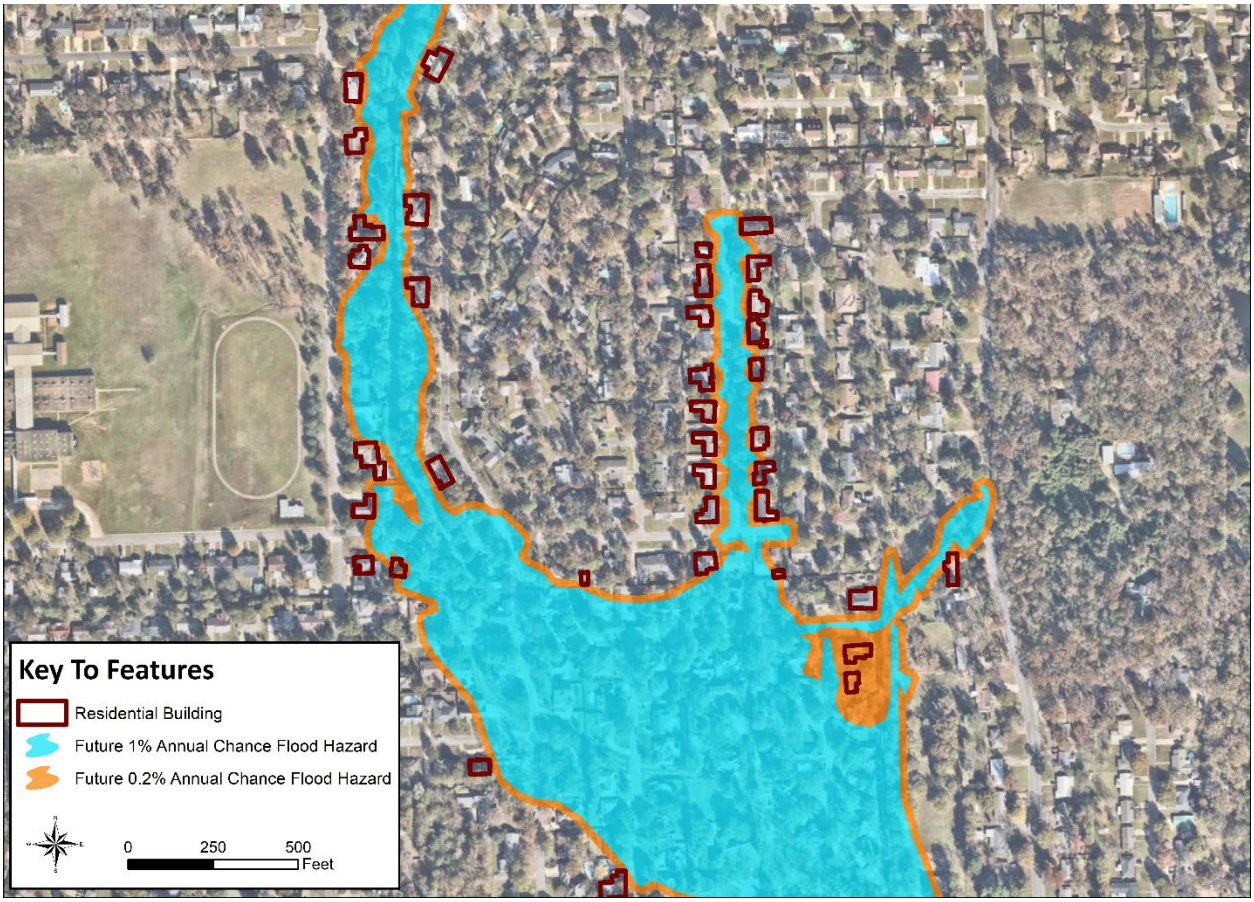


Figure 2-45 above illustrates that even a small expansion of the floodplain in future conditions can impact significantly more structures. This is generally to the success in the past of preventing construction in the existing floodplain, but also highlights the need to consider future conditions in land planning or regulations. Table 2-19 shows also highlight the disproportionate impact to structures compared to roadway crossing and low water crossings, which are often design with some amount of freeboard above existing conditions floodplains. Roadway segments show a 46% increase in floodplain impacts, mainly because many neighborhoods and their roads near the floodplain are built just above the existing conditions floodplain. Agricultural lands would be minimally impacted since they are directly related to the increase in area, and most rural areas will see less increases in the floodplain than urban areas that will see greater development.

Table 2-19 Percent of Increase in Flood Exposures between Existing and Future Conditions

Exposure	Percentage Increase from Existing 0.2% to Future 0.2%
Residential Buildings	**63%**
Roadway Stream Crossings	**15%**
Low Water Crossings*	**9%**
Length of Roadway Segments	**46%**
Agricultural Land	**9%**

*Low Water Crossings are counted separately than Roadway Stream Crossings.

2B.2.b Potential Flood Mitigation Projects

Throughout the flood planning region, multiple projects are in various stages of a project lifecycle. As weather and development patterns change, it is crucial that such projects address the changing risks of future disasters. Communities that invest forward-looking projects will see fewer impacts and are more likely to recover quickly after severe events. Projects completed with the consideration of future conditions will eliminate structures from being in the floodplain and reduce losses to life and property over time.

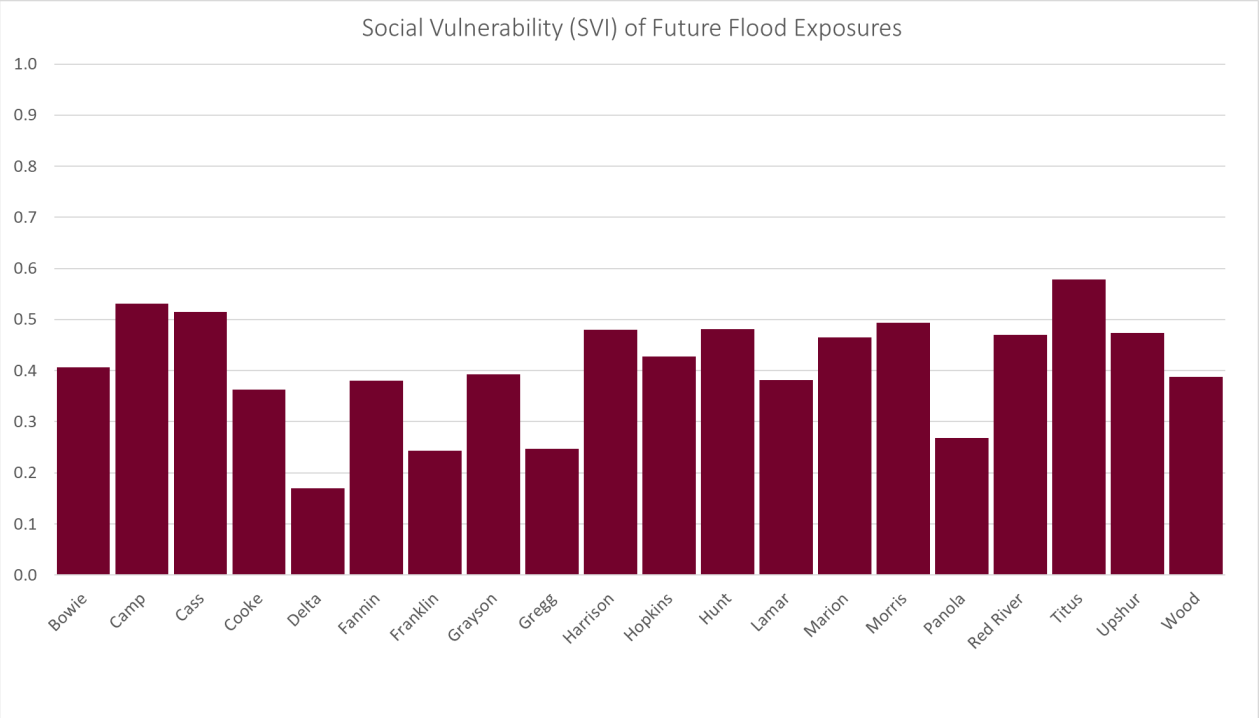
When asked what flood management strategies or flood mitigation projects are currently in progress. While we received many responses, no upcoming projects were provided.

2.B.3 Future Condition Vulnerability Analysis

Resiliency of Communities

Similar to existing vulnerability, there are not highly vulnerable counties when averaging at the county level, but there are still vulnerable areas with higher SVI's in more developed Census tracts indicating the inability for many parts of cities within the region to adequately recover and respond to a flooding disaster.

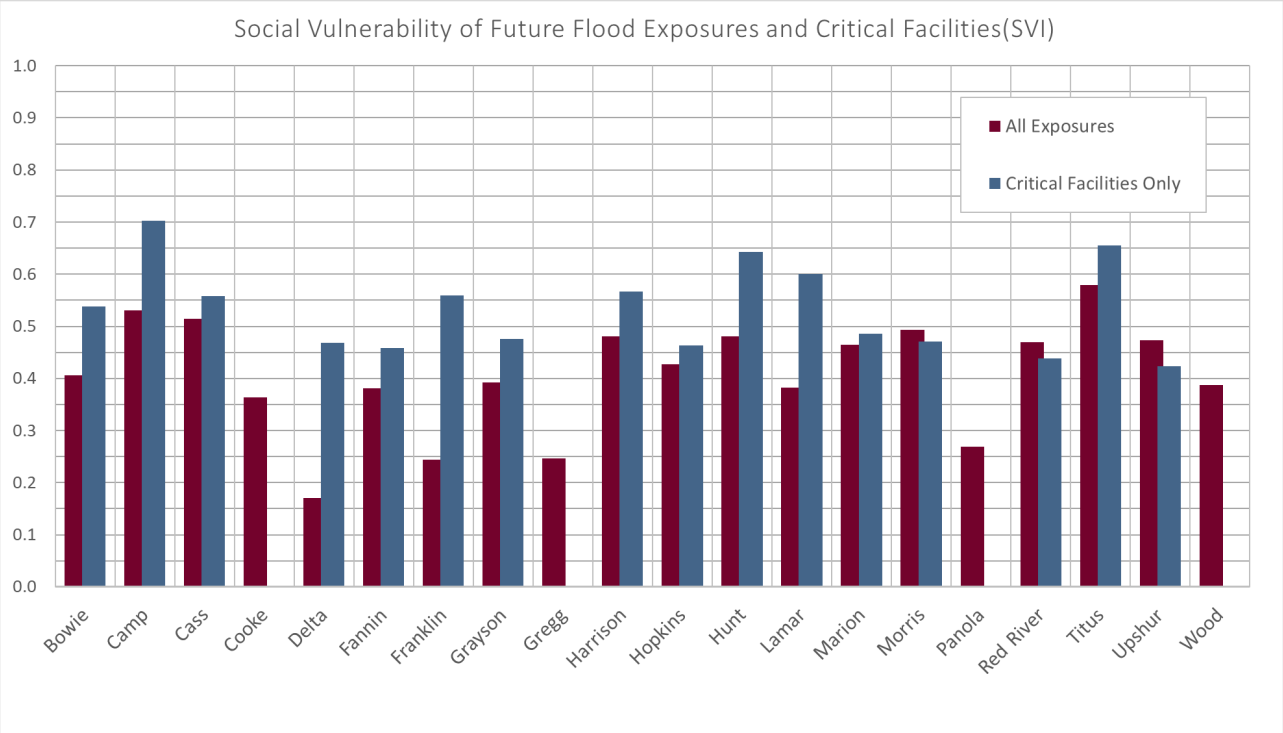
Figure 2-48 Social Vulnerability Index (SVI) of All Future Flood Exposures by County



Vulnerabilities of Critical Facilities

Figure 2-48 contrasts the average SVI for all future flood exposure with the SVI for just critical facilities by County. It is worth noting that while critical facility SVI is usually higher because they are located in more developed areas, there are fewer critical facilities that comprise this SVI calculation than total exposures.

Figure 2-49 Social Vulnerability Index (SVI) of All Future Flood Exposures and Critical Facilities by County



2B.4 Summary of Future Conditions Flood Exposure Analysis and Vulnerability

The future floodplain anticipates that there will be 57% more structures and 72% more people in the floodplain than existing conditions, while only adding 12% of more land area. This shows the importance of floodplain regulations and planning for future conditions.

The future flood risk, exposure, and vulnerability assessment for the Trinity Region are summarized in TWDB-required Table 5 located in Appendix A. The TWDB Table 5 provides the results per county of the future flood exposure and vulnerability analysis as outlined in the Technical Guidelines for Regional Flood Planning.

A geodatabase with applicable layers as well as associated TWDB required Figures 1 through 10 are provided in Appendix B as digital data. Table 2.2, included in Appendix B, outlines the geodatabase deliverables included in this Technical Memorandum as well as spatial files and tables.

Table 5: Future Conditions Flood Risk Summary Table (by County)

#	County	Area in Flood Planning Region (sq mi)	1% Annual Chance Flood Risk								0.2% Annual Chance Flood Risk							
			Area in Floodplain (sq mi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)	Area in Floodplain (sq mi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	Bowie	920.10	406.92	3,055	1,809	5,272	417	336.0	48.63	22	441.80	4826	3019	9,159	448	452.33	49.86	28
2	Camp	202.66	55.90	276	131	314	64	31.6	0.61	4	64.83	575	268	818	92	51.74	0.75	4
3	Cass	956.77	276.04	583	307	921	263	160.8	1.35	12	312.09	918	522	1,468	283	221.63	1.66	13
4	Cooke	111.18	27.23	38	22	30	20	13.9	3.46	0	31.55	60	30	50	24	21.78	3.55	0
5	Delta	277.13	108.19	127	62	87	74	48.6	27.55	2	116.81	241	135	241	91	86.77	30.07	2
6	Fannin	853.20	243.03	1,256	806	1,575	300	190.5	63.87	20	275.98	1741	1128	2,374	362	293.36	70.94	22
7	Franklin	293.47	87.55	555	422	713	62	40.4	2.82	1	100.92	825	595	1,109	82	73.88	3.22	3
8	Grayson	633.94	169.29	2,924	1,810	5,376	209	210.2	17.49	23	192.53	4410	3008	9,353	231	307.22	19.72	31
9	Gregg	28.44	5.91	58	56	76	15	3.8	0.03	0	7.03	120	109	182	21	7.13	0.04	0
10	Harrison	532.16	152.77	917	756	1,294	116	99.0	0.41	6	176.26	1237	1030	1825	123	147.55	0.49	6
11	Hopkins	543.36	163.77	710	383	940	201	150.5	13.66	5	185.58	1300	764	2226	214	211.23	15.20	7
12	Hunt	235.01	66.50	432	298	1,123	220	78.9	6.89	3	74.40	737	522	1995	282	120.06	8.14	4
13	Lamar	931.80	291.77	1,904	1,152	3,016	295	239.8	68.42	33	326.09	2892	1721	4509	333	343.15	74.95	40
14	Marion	418.82	148.50	390	193	460	38	55.8	0.32	4	165.25	544	264	697	46	81.68	0.38	6
15	Morris	256.93	77.05	265	119	268	44	40.7	0.66	6	88.26	467	220	519	66	65.73	0.80	8
16	Panola	0.41	0.04	0	0	0	0	0.0	0.00	0	0.05	0	0	0	0	0.05	0.00	0
17	Red River	1,055.00	378.96	441	150	380	210	170.1	39.05	5	423.63	768	277	713	274	250.01	41.10	10
18	Titus	425.48	150.80	634	333	1,262	175	91.2	2.47	10	169.69	1147	688	2,343	185	139.40	2.89	14
19	Upshur	427.79	114.31	432	255	688	183	92.2	0.96	10	131.97	751	475	1,306	190	121.36	1.10	10
20	Wood	56.77	11.44	26	17	10	21	8.9	0.13	0	13.97	65	46	48	24	13.78	0.16	0
1		**Totals**	**2,936**	**15,023**	**9,081**	**23,805**	**2,927**	**2,063**	**299**	**166**	**3,299**	**23,624**	**14,821**	**40,935**	**3,371**	**3,010**	**325**	**208**

Region 2 - Potential FME's

FME ID	FME Name	Description	Counties	Study Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
21000001	Cooke County FIS	Update County maps to Zone AE	Cooke	Watershed Planning	Cooke County	N	Less than 50% within Region 2	
21000002	Grayson County FIS	Update remainder of county to Zone AE	Grayson	Watershed Planning	Grayson County	Y		
21000003	Fannin County FIS	Update County maps to Zone AE	Fannin	Watershed Planning	Fannin County	Y		
21000004	Hunt County FIS	Update County maps to Zone AE	Hunt	Watershed Planning	Hunt County	N	Less than 50% within Region 2	
21000005	Lamar County FIS	Update County maps to Zone AE	Lamar	Watershed Planning	Lamar County	Y/?	Pending confirmation from Sponsor	Yes, contingent upon confirmation from a Sponsor (County or City). Will update sponsor accordingly.
21000006	Delta County FIS	Develop FIS for the County	Delta	Watershed Planning	Delta County	Y/?	Pending confirmation from Sponsor	Yes, contingent upon confirmation from a Sponsor (County or City). Will update sponsor accordingly.
21000007	Hopkins County FIS	Update County maps to Zone AE	Hopkins	Watershed Planning	Hopkins County	Y		
21000008	Red River County FIS	Develop FIS for the County	Red River	Watershed Planning	Red River County	Y/?	Pending confirmation from Sponsor	Yes, contingent upon confirmation from a Sponsor (County or City). Will update sponsor accordingly.
21000009	Franklin County FIS	Develop FIS for the County	Franklin	Watershed Planning	Franklin County	Y		
21000010	Titus County FIS	Update County maps to Zone AE	Titus	Watershed Planning	Titus County	Y		
21000011	Camp County FIS	Develop FIS for the County	Camp	Watershed Planning	Camp County	Y/?	Pending confirmation from Sponsor	Yes, contingent upon confirmation from a Sponsor (County or City). Will update sponsor accordingly.
21000012	Wood County FIS	Update County maps to Zone AE	Wood	Watershed Planning	Wood County	N	Less than 50% within Region 2	
21000013	Upshur County FIS	Update County maps to Zone AE	Upshur	Watershed Planning	Upshur County	Y		
21000014	Gregg County FIS	Update County maps to Zone AE	Gregg	Watershed Planning	Gregg County	N	Less than 50% within Region 2	
21000015	Harrison County FIS	Update County maps to Zone AE	Harrison	Watershed Planning	Harrison County	Y		
21000016	Marion County FIS	Develop FIS for the County	Marion	Watershed Planning	Marion County	Y/?	Pending confirmation from Sponsor	We had it as Y but we need to confirm if they want to participate. Not sure about who will make calls to sponsors.
21000017	Cass County FIS	Update County maps to Zone AE	Cass	Watershed Planning	Cass County	Y		

Region 2 - Potential FME's

FME ID	FME Name	Description	Counties	Study Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
21000018	Bowie County FIS	Update County maps to Zone AE	Bowie	Watershed Planning	Bowie County, City of De Kalb	Y		
21000019	Morris County FIS	Update County maps to Zone AE	Morris	Watershed Planning	Morris County	Y		
21000020	Sulphur River (Main Stem) Log Jams	Log and debris jams along Sulphur River near Highway 37	Franklin, Hopkins, Delta	Preparedness	Sulphur River Basin Authority	Y		Will add new FME to cover additional location. 37 is on Sulphur River main, 71 is on South Sulphur River.
21000021	City of Clarksville Deleware Creek	Debris, Vegetation Removal, and Channelization	Red River	Preparedness	City of Clarksville	Y		
21000022	New Boston Unnamed Stream 1	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	City of New Boston	Y		
21000023	New Boston Unnamed Stream 2	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	City of New Boston	Y		
21000024	Nash Unnamed Stream 1	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	Bowie County	Y		
21000025	Nash Unnamed Stream 2	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	Bowie County	Y		
21000026	Anderson Creek WWTP Flood Study	WWTP impacted by flooding from Anderson Creek. Study to evaluate whether existing berm meets 100-year protection and to evaluate the needs for sump pumps and lift station.	Bowie	Project Planning	City of De Kalb	Y		Study to evaluate whether existing berm meets 100-year protection and to evaluate the needs for sump pumps and lift station
21000027	De Kalb Stormwater Drainage	Evaluation of flooding impacts on streets and drainage structures	Bowie	Watershed Planning	City of De Kalb	Y		
21000028	De Kalb Stormwater Rate Study	City wide storm water rate study	Bowie	Watershed Planning	City of De Kalb	N		What they actually want is to be a sponsor for a new FIS to ensure that they are getting the correct insurance rates. Do not recommend this FME and add them to the Bowie County FIS as a sponsor.
21000029	Red River Levee and Navigation System	Study flood mitigation benefits of a levee and navigation system on the Lower Red, based on planning by USACE.	Bowie	Project Planning	Red River Valley Association, City of De Kalb	Y		Possibly goal 6001, 6002
21000030	City of Hooks Infrastructure	Widen ditches to increase volume capacity of flash flood waters	Bowie	Project Planning	City of Hooks	Y		
21000031	Upshur County Drainage	Raise elevations and improve drainage for certain roads and streets within Region 2.	Upshur	Project Planning	Upshur County	Y		Assumes roads are within Region 2

Region 2 - Potential FME's

FME ID	FME Name	Description	Counties	Study Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
21000032	Cowhorn Creek East	Extend current H&H study limits to upstream detention pond. Evaluate existing flooding and develop mitigation actions.	Bowie	Watershed Planning	City of Texarkana	Y		Extension of where current models end. Evaluate exiting flooding and develop mitigation actions.
21000033	Wadley Hospital Flood Study	Flood study to define flood risk and mitigation options.	Bowie	Project Planning	City of Texarkana	Y		No maps in this area. Need to map to define flood risk and mitigation options.
21000034	Urban Flooding at 19th and Wood Street	Flood study to define flood risk and mitigation options. Houses flood 4-5 times per year.	Bowie	Project Planning	City of Texarkana	Y		No maps in this area. Need to map to define flood risk and mitigation options.
21000035	Cowhorn West Creek	Arroyo Street additional modeling to address flooding	Bowie	Watershed Planning	City of Texarkana	Y		
21000036	Cowhorn Creek	Creek crosses interstate near St. Michaels and existing flooding risk upstream of interstate	Bowie	Watershed Planning	City of Texarkana	N		Dustin H. suggested to take out.
21000037	Stream WC-1	Street flooding near McKnight and Jonathan Street. Stormdrain system evaluation and development of alternatives.	Bowie	Project Planning	City of Texarkana	Y		Stormdrain FME, study to help community (40-50 houses) access.
21000038	City of Texarkana Buyouts Study	Prepare a strategy and support program for voluntary purchase of at risk properties	Bowie	Other	City of Texarkana	Y		No particular properties identified yet. This is a study to develop a program. It is an engineering type project.
21000039	City of Atlanta High School Lane Project/Phase No. 2	Perform channel improvements between Hwy 77 & Main St	Cass	Other	City of Atlanta	Y		
21000040	City of Atlanta Eleanor St and Red Bluff St. Project/Phase No. 3	Replace culvert crossings	Cass	Other	City of Atlanta	Y		
21000041	City of Atlanta Park View St and Jefferson St. Project/Phase No. 4	Install culvert crossing	Cass	Other	City of Atlanta	Y		
21000042	City of Paris Big Sandy Creek Tribs 4 and 6 Improvements	Re-grade channel downstream of Clarksville Ave. and establish concrete channel upstream of Clarksville Ave. Channel improvements in the upper portion of Tributary 4. Tributary 6 channel improvements and culvert replacement.	Lamar	Other	City of Paris	Y		Just missing DSA. Could be turned to FMP fairly easy. Big Sandy Creek Tribs 4 and 6 improvements - create just one FME. Update FME description. This has 3 phases and we are lumping them into just one.
21000043	City of Paris Big Sandy Cr Tribs 4 and 6 Improvements Phase 2	Channel improvements in the upper portion of Tributary 4	Lamar	Other	City of Paris	N		Represented as a group for Big Sandy Creek

Region 2 - Potential FME's

FME ID	FME Name	Description	Counties	Study Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
21000044	City of Paris Big Sandy Cr Tribs 4 and 6 Improvements Phase 3	Tributary 6 channel improvements and culvert replacement	Lamar	Other	City of Paris	N		Represented as a group for Big Sandy Creek
21000045	Update to City of Paris Comprehensive Stormwater Plan Study	City of Paris Comprehensive Stormwater Plan - Projects 1-3 and 5-9	Lamar	Other	City of Paris	Y		Group as "Update to City Comprehensive Stormwater Plan" (FME 45-47 & 49-53).
21000046	City of Paris Compr. Plan Project 2	Improve drainage along 5th and 7th Street	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	
21000047	City of Paris Compr. Plan Project 3	Improve drainage along Trail de Paris	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	
21000048	City of Paris Compr. Plan Project 4	Improve drainage along S. Collegiate St	Lamar	Other	City of Paris	N	Channel segment included within City of Paris Big Sandy Creek Tribs 4 and 6 Improvements	
21000049	City of Paris Compr. Plan Project 5	Improve drainage along E. Sycamore	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	
21000050	City of Paris Compr. Plan Project 6	Improve drainage along Trail de Paris	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	
21000051	City of Paris Compr. Plan Project 7	Improve drainage along 31 St	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	
21000052	City of Paris Compr. Plan Project 8	Improve drainage along Wilburn	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	
21000053	City of Paris Compr. Plan Project 9	Improve drainage along 4 St.	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	
21000054	City of Ector Property Buyout	Acquire flood prone properties for use as park areas.	Fannin	Other	City of Ector	Y		Requires a study for land use change.
21000055	City of Longview Property Buyout	Purchase properties in floodplain areas to reserve them from development	Gregg	Other	City of Longview	N	Project area outside of Region 2	
21000056	Cooke County Acquisition of Repetitive Loss and Damaged Properties	Purchase and removal of damaged homes that are located in the floodplain in Region 2. These homes are currently a hazard to the community and pose a large threat if a large rain event were to happen before removal (NFIP). Buyout of repetitive flood loss properties.	Cooke	Other	Cooke County	Y		

Region 2 - Potential FME's

FME ID	FME Name	Description	Counties	Study Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
21000057	Grayson County Buyout of Repetitive Flood Properties	Work with local jurisdiction in the buyout of repetitive flood properties. This includes any structures found to be located in flood areas that are in incorporated and unincorporated areas.	Grayson	Other	Grayson County	Y		
21000058	Harrison County Property Acquisition	Acquisition and management strategies of land to preserve open space within Region 2 for flood mitigation and water quality in the floodplain.	Harrison	Other	Harrison County	Y		
21000059	Marion County Barriers	Install low water crossing barriers, similar to railroad crossing barriers.	Marion	Preparedness	Marion County	Y		
21000060	City of Texarkana Gauges	Install depth gauges and radio-controlled guard arms at three flood-prone underpasses and warning lights and “Do Not Enter” sign at flood-prone residential intersection.	Bowie	Preparedness	City of Texarkana	Y		
21000061	City of Texarkana Buyouts	Partial buy-out of Harriet Hubbard Heights Subdivision and replacement with low-impact recreational area for use by general public. Priority: Original HMP – High	Bowie	Other	City of Texarkana	N		Combined with the other Texarkana buyout (FME 38) program FME.
21000062	North Sulphur River Channel Stability and Flooding Study	Channel Stability along North Sulphur River and Highway 24	Lamar, Delta, Fannin	Preparedness	Sulphur River Basin Authority	Y		Update FME name (take out "Log jams"). Revise FME area extents. This is the North Sulphur River.
21000063	City of Nash Floodplain Study	Drainage study to adopt floodplain	Bowie	Watershed Planning	City of Nash	Y		
21000064	Pecan to Waggoner Creek Channel Improvements	Channel improvements east of Pecan to Waggoner Creek	Bowie	Project Planning	City of Nash	Y		
21000065	South Sulphur River Log Jams	Log and debris jams along South Sulphur River near FM 71	Franklin, Hopkins, Delta	Preparedness	Sulphur River Basin Authority	Y		

Region 2 - Potential FMP's

FMP ID	FMP Name	Description	Counties	Project Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
23000001	Ferguson Park Feasibility Study	Improvements to existing culverts and channelization	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	**Y/?**		Pending confirmation of No Negative Impacts
23000002	Wagner Creek	Channel/Overbank Clearing	Bowie	Regional Channel Improvements	City of Texarkana	**Y/?**		Pending confirmation of No Negative Impacts
23000003	Stream WC-2	Independence Circle & Lexington Place Bridge Improvements	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	**Y/?**		Pending confirmation of No Negative Impacts

						Flood Risk Indicators									
FMP ID	FMP Name	Description	Counties	Project Type	Sponsor	Area (sq.mi) in 100yr (1% annual chance) Floodplain	Area (sq.mi) in 500yr (0.2% annual chance) Floodplain	Estimated structures at 100yr flood risk (#)	Residential structures at 100yr flood risk (#)	Estimated Population at 100yr flood risk	Critical facilities at 100yr flood risk (#)	Low water crossings at flood risk (#)	Estimated road closures (#)	Estimated length of roads at 100yr flood risk (Miles)	Estimated farm & ranch land at 100yr flood risk (acres)
23000001	Ferguson Park Feasibility Study	Improvements to existing culverts and channelization	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	3.02	3.33	251	247	1100	5	6	715	22.63	20.89
23000002	Wagner Creek	Channel/Overbank Clearing	Bowie	Regional Channel Improvements	City of Texarkana	3.01	3.32	250	247	1099	5	6	715	22.66	20.65
23000003	Stream WC-2	Independence Circle & Lexington Place Bridge Improvements	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	0.076	0.08	4	22	70	0	0	25	0.426	0.299

Region 2 - Potential FMS's

FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
22000001	City of Avinger NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Avinger	Y		
22000002	City of Bells NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Bells	Y		
22000003	City of Cooper NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Delta	NFIP/CRS	City of Cooper	Y		
22000004	City of Domino NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Domino	Y		
22000005	City of Dorchester NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Dorchester	N	Dorchester is out of Region 2	
22000006	City of Douglassville NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Douglassville	Y		
22000007	City of Leonard NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Fannin	NFIP/CRS	City of Leonard	N	Majority of Leonard is out of Region 2	
22000008	City of Marietta NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Marietta	Y		
22000009	City of Sherman NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Sherman	Y		
22000010	City of Tom Bean NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Tom Bean	Y		
22000011	City of Wolfe NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Hunt	NFIP/CRS	City of Wolfe	Y		
22000012	Bowie County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Bowie	NFIP/CRS	Bowie County	Y		
22000013	Camp County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Camp	NFIP/CRS	Camp County	Y		
22000014	Cass County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	Cass County	Y		
22000015	Cooke County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cooke	NFIP/CRS	Cooke County	N	< 50% within Region 2	Make sure TC coordinates with adjacent regions so they can include them in their plans.
22000016	Delta County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Delta	NFIP/CRS	Delta County	Y		
22000017	Fannin County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Fannin	NFIP/CRS	Fannin County	Y		
22000018	Franklin County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Franklin	NFIP/CRS	Franklin County	Y		
22000019	Grayson County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	Grayson County	Y		
22000020	Gregg County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Gregg	NFIP/CRS	Gregg County	N	< 50% within Region 2	Make sure TC coordinates with adjacent regions so they can include them in their plans.
22000021	Harrison County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Harrison	NFIP/CRS	Harrison County	Y		

Region 2 - Potential FMS's

FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
22000022	Hopkins County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Hopkins	NFIP/CRS	Hopkins County	Y		
22000023	Hunt County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Hunt	NFIP/CRS	Hunt County	N	< 50% within Region 2	
22000024	Lamar County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Lamar	NFIP/CRS	Lamar County	Y		
22000025	Marion County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Marion	NFIP/CRS	Marion County	Y		
22000026	Morris County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Morris	NFIP/CRS	Morris County	Y		
22000027	Red River County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Red River	NFIP/CRS	Red River County	Y		
22000028	Titus County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Titus	NFIP/CRS	Titus County	Y		
22000029	Upshur County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Upshur	NFIP/CRS	Upshur County	Y		
22000030	Wood County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Wood	NFIP/CRS	Wood County	N	< 50% within Region 2	
22000031	City of Commerce CRS Involvement	Become an NFIP Community Rating System (CRS) Community	Hunt	NFIP/CRS	City of Commerce	Y		
22000032	City of Whitewright CRS Involvement	Become an NFIP Community Rating System (CRS) Community	Grayson	NFIP/CRS	City of Whitewright	Y		
22000033	Bowie County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Bowie	Regulatory and Guidance	Bowie County	N	Recommended a regionwide stormwater manual vs. per county	
22000034	Camp County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Camp	Regulatory and Guidance	Camp County	N	Recommended a regionwide stormwater manual vs. per county	
22000035	Cass County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Cass	Regulatory and Guidance	Cass County	N	Recommended a regionwide stormwater manual vs. per county	
22000036	Cooke County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Cooke	Regulatory and Guidance	Cooke County	N	< 50% within Region 2	
22000037	Delta County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Delta	Regulatory and Guidance	Delta County	N	Recommended a regionwide stormwater manual vs. per county	

Region 2 - Potential FMS's

FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
22000038	Fannin County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Fannin	Regulatory and Guidance	Fannin County	N	Recommended a regionwide stormwater manual vs. per county	
22000039	Franklin County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Franklin	Regulatory and Guidance	Franklin County	N	Recommended a regionwide stormwater manual vs. per county	
22000040	Grayson County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Grayson	Regulatory and Guidance	Grayson County	N	Recommended a regionwide stormwater manual vs. per county	
22000041	Gregg County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Gregg	Regulatory and Guidance	Gregg County	N	Recommended a regionwide stormwater manual vs. per county	
22000042	Harrison County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Harrison	Regulatory and Guidance	Harrison County	N	Recommended a regionwide stormwater manual vs. per county	
22000043	Hopkins County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Hopkins	Regulatory and Guidance	Hopkins County	N	Recommended a regionwide stormwater manual vs. per county	
22000044	Hunt County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Hunt	Regulatory and Guidance	Hunt County	N	< 50% within Region 2	
22000045	Lamar County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Lamar	Regulatory and Guidance	Lamar County	N	Recommended a regionwide stormwater manual vs. per county	
22000046	Marion County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Marion	Regulatory and Guidance	Marion County	N	Recommended a regionwide stormwater manual vs. per county	
22000047	Morris County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Morris	Regulatory and Guidance	Morris County	N	Recommended a regionwide stormwater manual vs. per county	
22000048	Red River County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Red River	Regulatory and Guidance	Red River County	N	Recommended a regionwide stormwater manual vs. per county	

Region 2 - Potential FMS's

FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
22000049	Titus County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Titus	Regulatory and Guidance	Titus County	N	Recommended a regionwide stormwater manual vs. per county	
22000050	Upshur County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Upshur	Regulatory and Guidance	Upshur County	N	Recommended a regionwide stormwater manual vs. per county	
22000051	Wood County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Wood	Regulatory and Guidance	Wood County	N	< 50% within Region 2	
22000052	City of Sherman Emergency Alerts	Maintain and Operate Early Alert System - an outdoor warning system composed of nine sirens throughout the City. Public announcements through reverse telephonic system as well through broadcasting local cable channels.	Grayson	Flood Warning Systems	City of Sherman	Y		
22000053	Cooke County Warning and Emergency Response Program	Develop a community coordinated warning system and emergency response program that can detect flood threats and provide timely responses of impending flood danger.	Cooke	Flood Warning Systems	Cooke County	N	< 50% within Region 2	
22000054	City of Avery Storm Drainage Maintenance	Develop protocol for cleaning debris from ditches and drains within Avery to protect existing and new buildings	Red River	Preventive Maintenance Programs	City of Avery	N	Not a capital type project.	SC decided not to recommend.
22000055	City of Clarksville Storm Drainage Maintenance	Bi-Annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Red River	Preventive Maintenance Programs	City of Clarksville	N	Not a capital type project.	SC decided not to recommend.
22000056	City of Commerce Storm Drainage Maintenance	Activate Sulphur River clean-up efforts in order to prevent flooding from buildup of debris.	Hunt	Preventive Maintenance Programs	City of Commerce	N	Not a capital type project.	SC decided not to recommend.
22000057	City of Daingerfield Storm Drainage Maintenance	Bi-Annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Morris	Preventive Maintenance Programs	City of Daingerfield	N	Not a capital type project.	SC decided not to recommend.
22000058	City of Denison Storm Drainage Maintenance	Bi-annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Grayson	Preventive Maintenance Programs	City of Denison	N	Not a capital type project.	SC decided not to recommend.
22000059	City of Dorchester Storm Drainage Maintenance	As development and construction continue, keep waterways clean and clear of obstruction for proper flow. Continued upkeep for erosion control and water flow.	Grayson	Preventive Maintenance Programs	City of Dorchester	N	Dorchester is out of our Region	
22000060	City of Ladonia Storm Drainage Maintenance	Bi-annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Fannin	Preventive Maintenance Programs	City of Ladonia	N	Not a capital type project.	SC decided not to recommend.

Region 2 - Potential FMS's

FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
22000061	City of Southmayd Storm Drainage Maintenance	Routinely inspect and clear debris from drainage systems. To conduct clearing activities, the city would require purchasing/renting backhoe to help with drainage ditches, retention tanks, etc	Grayson	Preventive Maintenance Programs	City of Southmayd	N	Not a capital type project.	SC decided not to recommend.
22000062	City of Trenton Storm Drainage Maintenance	Improvements and clearing of storm drainage system to reduce the impact of heavy rain events.	Fannin	Preventive Maintenance Programs	City of Trenton	N	Trenton is out of our Region	
22000063	Fannin County Stream Maintenance	Regular maintenance, such as sediment and debris clearance, is needed so that the stream or waterway may carry out its designed function.	Fannin	Preventive Maintenance Programs	Fannin County	N	Not a capital type project.	SC decided not to recommend.
22000064	Gregg County Storm Drainage Maintenance	Monitor flood-prone areas and remove debris from drainage culverts when needed to alleviate potential flooding hazards.	Gregg	Preventive Maintenance Programs	Gregg County	N	Majority of Gregg County is out of Region 2	
22000070	Grayson County Flood Warning and Public Safety Improvements	Create improved gauge notification system. Increase public awareness prior to occurrences and during flooding.	Grayson	Public Awareness & Educational Programs	Grayson County	Y		Add new FMS 84 and have ATCOG as sponsor to evaluate potential for future flood warning systems in the region.
22000071	City of Bonham Floodplain Manager	Establish a floodplain manager for the city to regulate floodplain development and provide public information concerning flood areas.	Fannin	Regulatory and Guidance	City of Bonham	Y		
22000072	City of Longview Flood Mitigation Training	Seek state and FEMA sponsored training in flood mitigation for key personnel.	Gregg	Regulatory and Guidance	City of Longview	N	City of Longview is out of Region 2	
22000073	Fannin County Floodplain Manager	Apply for assistance in establishing a Certified Countywide Floodplain Manager position. Funding on the continuation of the position would be from permit fees and local budgets. The focus of this role would be to mitigate flooding and protect the flood	Fannin	Regulatory and Guidance	Fannin County	Y		
22000074	City of Sadler Lift Station Flood-Proofing	Raise electrical panels and connections on lift stations above expected flood levels in flood prone areas.	Grayson	Property Acquisition and/or Floodproofing Programs	City of Sadler	Y		
22000075	City of Miller's Cove Outreach	Educational outreach	Titus	Education and Outreach	City of Miller	N		Put under FMS 82
22000076	City of Winfield NFIP	Participate in NFIP	Titus	Regulatory and Guidance	City of Winfield	Y		
22000077	Wood County Outreach	Educate the public on mitigation strategies for all hazards.	Wood	Education and Outreach	Wood County	N	< 50% within Region 2	

Region 2 - Potential FMS's

FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Subcommittee Recommendation (Y/N)	Reason for NOT Recommending Action	Meeting Notes
22000078	Wood County Land Preservation	Acquisition and management strategies of land to preserve open space for flood mitigation and water quality in the floodplain	Wood	Property Acquisition and Structural Elevation	Wood County	N	< 50% within Region 2	
22000079	Upshur County NFIP	The County Hazard Mitigation Officer will assist those cities within the county that are not participating in NFIP to take appropriate actions to qualify for, and maintain participation in NFIP with a goal of having 100% participation within the county	Upshur	Regulatory and Guidance	Upshur County	Y		
22000080	Turn Around/Don't Drown	Educate public on Turn Around/Don't Drown program	Regionwide	Public Awareness & Educational Programs	ATCOG	Y		ATCOG confirmed they can sponsor
22000081	Flood Safety Awareness Education	Educate public on flood safety	Grayson, Fannin	Public Awareness & Educational Programs	Honey Grove & Denison	Y		
22000082	Public NFIP Education	Educate public on the NFIP program and the importance of purchasing flood insurance.	Regionwide	Public Awareness & Educational Programs	ATCOG	Y		
22000083	Creation of Regionwide Stormwater Management Manual	Creation of stormwater management manual and assistance to Region 2 communities for adoption.	Regionwide	Regulatory and Guidance	ATCOG	Y		
22000084	Regional Flood Warning System Study	Evaluate potential for future flood warning systems in the region.	Regionwide	Flood Warning Systems	ATCOG	Y		Add new FMS 84 and have ATCOG as sponsor to evaluate potential for future flood warning systems in the region.

Region 2 - Potential FME's								Subcommittee Agrees/Disagrees		
FME ID	**FME Name**	**Description**	**Counties**	**Study Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
21000001	Cooke County FIS	Update County maps to Zone AE	Cooke	Watershed Planning	Cooke County	N	Less than 50% within Region 2	X		
21000002	Grayson County FIS	Update remainder of county to Zone AE	Grayson	Watershed Planning	Grayson County	Y		X		
21000003	Fannin County FIS	Update County maps to Zone AE	Fannin	Watershed Planning	Fannin County	Y		X		
21000004	Hunt County FIS	Update County maps to Zone AE	Hunt	Watershed Planning	Hunt County	N	Less than 50% within Region 2	X		
21000005	Lamar County FIS	Update County maps to Zone AE	Lamar	Watershed Planning	Lamar County	Y/?	Pending confirmation from Sponsor	X		Yes, contingent upon confirmation from a Sponsor (County, or City). Will update sponsor accordingly.
21000006	Delta County FIS	Develop FIS for the County	Delta	Watershed Planning	Delta County	Y/?	Pending confirmation from Sponsor	X		Yes, contingent upon confirmation from a Sponsor (County, or City). Will update sponsor accordingly.
21000007	Hopkins County FIS	Update County maps to Zone AE	Hopkins	Watershed Planning	Hopkins County	Y		X		
21000008	Red River County FIS	Develop FIS for the County	Red River	Watershed Planning	Red River County	Y/?	Pending confirmation from Sponsor	X		Yes, contingent upon confirmation from a Sponsor (County, or City). Will update sponsor accordingly.
21000009	Franklin County FIS	Develop FIS for the County	Franklin	Watershed Planning	Franklin County	Y		X		
21000010	Titus County FIS	Update County maps to Zone AE	Titus	Watershed Planning	Titus County	Y		X		
21000011	Camp County FIS	Develop FIS for the County	Camp	Watershed Planning	Camp County	Y/?	Pending confirmation from Sponsor	X		Yes, contingent upon confirmation from a Sponsor (County, or City). Will update sponsor accordingly.
21000012	Wood County FIS	Update County maps to Zone AE	Wood	Watershed Planning	Wood County	N	Less than 50% within Region 2	X		
21000013	Upshur County FIS	Update County maps to Zone AE	Upshur	Watershed Planning	Upshur County	Y		X		
21000014	Gregg County FIS	Update County maps to Zone AE	Gregg	Watershed Planning	Gregg County	N	Less than 50% within Region 2	X		
21000015	Harrison County FIS	Update County maps to Zone AE	Harrison	Watershed Planning	Harrison County	Y		X		
21000016	Marion County FIS	Develop FIS for the County	Marion	Watershed Planning	Marion County	Y/?	Pending confirmation from Sponsor	X		We had it as Y but we need to confirm if they want to participate. Not sure about who will make calls to sponsors.

Region 2 - Potential FME's								Subcommittee Agrees/Disagrees		
FME ID	**FME Name**	**Description**	**Counties**	**Study Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
21000017	Cass County FIS	Update County maps to Zone AE	Cass	Watershed Planning	Cass County	Y		X		
21000018	Bowie County FIS	Update County maps to Zone AE	Bowie	Watershed Planning	Bowie County, City of DeKalb	Y		X		
21000019	Morris County FIS	Update County maps to Zone AE	Morris	Watershed Planning	Morris County	Y		X		
21000020	Sulphur River (Main Stem) Log jams	Log and debris jams along Sulphur River near Highway 37	Franklin, Hopkins, Delta	Preparedness	Sulphur River Basin Authority	Y		X		Will add new FME to cover additional location. 37 is on Sulphur river main, 71 is on south Sulphur.
21000021	City of Clarksville Deleware Creek	Debris, Vegetation Removal, and Channelization	Red River	Preparedness	City of Clarksville	Y		X		
21000022	New Boston Unnamed Stream 1	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	City of New Boston	Y		X		
21000023	New Boston Unnamed Stream 2	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	City of New Boston	Y		X		
21000024	Nash Unnamed Stream 1	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	Bowie County	Y		X		
21000025	Nash Unnamed Stream 2	Debris, Vegetation Removal, and Channelization	Bowie	Preparedness	Bowie County	Y		X		
21000026	Anderson Creek WWTP Flood Study	WWTP impacted by flooding from Anderson Creek. Study to evaluate whether existing berm meets 100-year protection and to evaluate the needs for sump pumps and lift station.	Bowie	Project Planning	City of De Kalb	Y		X		Study to evaluate whether existing berm meets 100-year protection and to evaluate the needs for sump pumps and lift station
21000027	De Kalb Stormwater Drainage	Evaluation of flooding impacts on streets and drainage structures	Bowie	Watershed Planning	City of De Kalb	Y		X		From Josh McClure on 3/29/22: "This will be a bit of a stretch"
21000028	De Kalb Stormwater Rate Study	City wide storm water rate study	Bowie	Watershed Planning	City of De Kalb	N		X		Josh McClure: What they actually want is to be A sponsor for a new FIS to ensure that they are getting the correct insurance rates. Do not recommend this FME and add them to the Bowie County FIS as a sponsor.
21000029	Red River Levee and Navigation System	Study flood mitigation benefits of a levee and navigation system on the Lower Red, based on planning by USACE.	Bowie	Project Planning	Red River Valley Association, City of De Kalb	Y		X		Possibly goal 6001, 6002

Region 2 - Potential FME's								Subcommittee Agrees/Disagrees		
FME ID	**FME Name**	**Description**	**Counties**	**Study Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
21000030	City of Hooks Infrastructure	Widen ditches to increase volume capacity of flash flood waters	Bowie	Project Planning	City of Hooks	Y		X		
21000031	Upshur County Drainage	Raise elevations and improve drainage for certain roads and streets within Region 2.	Upshur	Project Planning	Upshur County	Y		X		Assumes roads are within Region 2
21000032	Cowhorn Creek East	Extend current H&H study limits to upstream detention pond. Evaluate existing flooding and develop mitigation actions.	Bowie	Watershed Planning	City of Texarkana	Y		X		Extension of where current models end. Evaluate exiting flooding and developing mitigation actions.
21000033	Wadley Hospital Flood Study	Flood study to define flood risk and mitigation options.	Bowie	Project Planning	City of Texarkana	Y		X		No maps in this area. Need to map to define flood risk and mitigation options.
21000034	Urban Flooding at 19th and Wood Street	Flood study to define flood risk and mitigation options. Houses flood 4-5 times per year	Bowie	Project Planning	City of Texarkana	Y		X		No maps in this area. Need to map to define flood risk and mitigation options.
21000035	Cowhorn West Creek	Arroyo Street additional modeling to address flooding	Bowie	Watershed Planning	City of Texarkana	Y		X		
21000036	Cowhorn Creek	Creek crosses interstate near St. Michaels and existing flooding risk upstream of interstate	Bowie	Watershed Planning	City of Texarkana	N		X		Dustin H. suggested to take out.
21000037	Stream WC-1	Street flooding near McKnight and Jonathan Street. Stormdrain system evaluation and development of alternatives.	Bowie	Project Planning	City of Texarkana	Y		X		Stormdrain FME, study to help community (40-50 houses) access.
21000038	City of Texarkana Buyouts Study	Prepare a strategy and support program for voluntary purchase of at risk properties	Bowie	Other	City of Texarkana	Y		X		No particular properties id yet. This is study to develop a program. It is an engineering type project.
21000039	City of Atlanta High School Lane Project/Phase No. 2	Perform channel improvements between Hwy 77 & Main St	Cass	Other	City of Atlanta	Y		X		
21000040	City of Atlanta Eleanor St and Red Bluff St. Project/Phase No. 3	Replace culvert crossings	Cass	Other	City of Atlanta	Y		X		
21000041	City of Atlanta Park View St and Jefferson St. Project/Phase No. 4	Install culvert crossing	Cass	Other	City of Atlanta	Y		X		

Region 2 - Potential FME's								Subcommittee Agrees/Disagrees		
FME ID	FME Name	Description	Counties	Study Type	Sponsor	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action	Agree	Disagree	Meeting Notes
21000042	City of Paris Big Sandy Creek Tribs 4 and 6 Improvements	Re-grade channel downstream of Clarksville Ave. and establish concrete channel upstream of Clarksville Ave. Channel improvements in the upper portion of Tributary 4. Tributary 6 channel improvements and culvert replacement.	Lamar	Other	City of Paris	Y		X		Just missing DSA. Could be turned to FMP fairly easy. Big Sandy Creek Tribs 4 and 6 improvements - Create just one FME. Update FME description. This has 3 phases and we are lumping them into just one.
21000043	City of Paris Big Sandy Cr Tribs 4 and 6 Improvements Phase 2	Channel improvements in the upper portion of Tributary 4	Lamar	Other	City of Paris	N		X		Represented as a group for Big Sandy Creek
21000044	City of Paris Big Sandy Cr Tribs 4 and 6 Improvements Phase 3	Tributary 6 channel improvements and culvert replacement	Lamar	Other	City of Paris	N		X		Represented as a group for Big Sandy Creek
21000045	Update to City of Paris Comprehensive Stormwater Plan Study	City of Paris Comprehensive Stormwater Plan - Projects 1-9	Lamar	Other	City of Paris	Y		X		Group as "Update to City Comprehensive Stormwater Plan" (FME 45-53).
21000046	City of Paris Compr. Plan Project 2	Improve drainage along 5th and 7th Street	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	X		
21000047	City of Paris Compr. Plan Project 3	Improve drainage along Trail de Paris	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	X		
21000048	City of Paris Compr. Plan Project 4	Improve drainage along S. Collegiate St	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	X		
21000049	City of Paris Compr. Plan Project 5	Improve drainage along E. Sycamore	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	X		
21000050	City of Paris Compr. Plan Project 6	Improve drainage along Trail de Paris	Lamar	Other	City of Paris	N	Represented as a group for City of Paris	X		

Region 2 - Potential FME's								Subcommittee Agrees/Disagrees		
FME ID	**FME Name**	**Description**	**Counties**	**Study Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
21000051	City of Paris Compr. Plan Project 7	Improve drainage along 31 St	Lamar	Other	City of Paris	**N**	Represented as a group for City of Paris	**X**		
21000052	City of Paris Compr. Plan Project 8	Improve drainage along Wilburn	Lamar	Other	City of Paris	**N**	Represented as a group for City of Paris	**X**		
21000053	City of Paris Compr. Plan Project 9	Improve drainage along 4 St.	Lamar	Other	City of Paris	**N**	Represented as a group for City of Paris	**X**		
21000054	City of Ector Property Buyout	Acquire flood prone properties for use as park areas.	Fannin	Other	City of Ector	**Y**		**X**		Requires a study for land use change.
21000055	City of Longview Property Buyout	Purchase properties in floodplain areas to reserve them from development	Gregg	Other	City of Longview	**N**	Project area outside of Region 2	**X**		
21000056	Cooke County Acquisition of Repetitive Loss and Damaged Properties	Purchase and removal of damaged homes that are located in the floodplain in Region 2. These homes are currently a hazard to the community and pose even large threat of danger if a large rain event were to happen before removal (NFIP). Buyout of repetitive flood loss	Cooke	Other	Cooke County	**Y**		**X**		
21000057	Grayson County Buyout of Repetitive Flood Properties	Work with local jurisdiction in the buyout of repetitive flood properties. This includes any structures found to be located in flood areas that are in incorporated and unincorporated areas.	Grayson	Other	Grayson County	**Y**		**X**		
21000058	Harrison County Property Acquisition	Acquisition and management strategies of land to preserve open space within Region 2 for flood mitigation and water quality in the floodplain.	Harrison	Other	Harrison County	**Y**		**X**		
21000059	Marion County barriers	Install low water crossing barriers, similar to railroad crossing barriers.	Marion	Preparedness	Marion County	**Y**		**X**		

Region 2 - Potential FME's								Subcommittee Agrees/Disagrees		
FME ID	FME Name	Description	Counties	Study Type	Sponsor	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action	Agree	Disagree	Meeting Notes
21000060	City of Texarkana gauges	Install depth gauges and radio-controlled guard arms at three flood-prone underpasses and warning lights and “Do Not Enter” sign at flood-prone residential intersection.	Bowie	Preparedness	City of Texarkana	Y		X		
21000061	City of Texarkana buy-outs	Partial buy-out of Harriet Hubbard Heights Subdivision and replacement with low-impact recreational area for use by general public. Priority: Original HMP – High	Bowie	Other	City of Texarkana	N		X		Combined with the other Texarkana buyout (FME 38) program FME.
21000062	North Sulphur River Channel Stability and Flooding Study	Channel Stability along North Sulphur River and Highway 24	Lamar, Delta, Fannin	Preparedness	Sulphur River Basin Authority	Y		X		Update FME name (take out "Log jams"). Revise FME area extents. This is the North Sulphur River.
21000063	City of Nash Floodplain Study	Drainage study to adopt floodplain	Bowie	Watershed Planning	City of Nash	Y		X		
21000064	Pecan to Waggoner Creek Channel Improvements	Channel improvements east of Pecan to Waggoner Creek	Bowie	Project Planning	City of Nash	Y		X		
21000065	South Sulphur River Log jams	Log and debris jams along South Sulphur River near FM 71	Franklin, Hopkins, Delta	Preparedness	Sulphur River Basin Authority	Y		X		

Region 2 - Potential FMP's

						Flood Risk											Subcommittee Agrees/Disagrees		
FMP ID	FMP Name	Description	Counties	Project Type	Sponsor	Area (sq.mi) in 100yr (1% annual chance) Floodplain	Area (sq.mi) in 500yr (0.2% annual chance) Floodplain	Estimated structures at 100yr flood risk (#)	Residential structures at 100yr flood risk (#)	Estimated Population at 100-year flood risk	Critical facilities at 100yr flood risk (#)	Low water crossings at flood risk (#)	Estimated road closures (#)	Estimated length of roads at 100yr flood risk (Miles)	Estimated farm & ranch land at 100yr flood risk (acres)	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action	Agree	Disagree	Meeting Notes
23000001	Ferguson Park Feasibility Study	Improvements to existing culverts and channelization	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	3.02	3.33	251	247	1100	5	6	715	22.63	20.89	Y/?		X		Pending confirmation of No Negative Impacts
23000002	Wagner Creek	Channel/Overbank Clearing	Bowie	Regional Channel Improvements	City of Texarkana	3.01	3.32	250	247	1099	5	6	715	22.66	20.65	Y/?		X		Pending confirmation of No Negative Impacts
23000003	Stream WC-2	Independence Circle & Lexington Place Bridge Improvements	Bowie	Infrastructure (channels, ditches, ponds, pipes, etc.)	City of Texarkana	0.076	0.08	4	22	70	0	0	25	0.426	0.299	Y/?		X		Pending confirmation of No Negative Impacts

Region 2 - Potential FMS's								Subcommittee Agrees/Disagrees		
FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action	Agree	Disagree	Meeting Notes
22000001	City of Avinger NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Avinger	Y		X		
22000002	City of Bells NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Bells	Y		X		
22000003	City of Cooper NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Delta	NFIP/CRS	City of Cooper	Y		X		
22000004	City of Domino NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Domino	Y		X		
22000005	City of Dorchester NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Dorchester	N	Dorchester is out of Region 2	X		
22000006	City of Douglassville NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Douglassville	Y		X		
22000007	City of Leonard NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Fannin	NFIP/CRS	City of Leonard	N	Majority of Leonard is out of Region 2	X		
22000008	City of Marietta NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	City of Marietta	Y		X		
22000009	City of Sherman NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Sherman	Y		X		
22000010	City of Tom Bean NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	City of Tom Bean	Y		X		
22000011	City of Wolfe NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Hunt	NFIP/CRS	City of Wolfe	Y		X		
22000012	Bowie County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Bowie	NFIP/CRS	Bowie County	Y		X		
22000013	Camp County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Camp	NFIP/CRS	Camp County	Y		X		
22000014	Cass County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cass	NFIP/CRS	Cass County	Y		X		
22000015	Cooke County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Cooke	NFIP/CRS	Cooke County	N	< 50% within Region 2	X		Make sure TC coordinates with Adjacent regions so they can include them in their
22000016	Delta County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Delta	NFIP/CRS	Delta County	Y		X		
22000017	Fannin County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Fannin	NFIP/CRS	Fannin County	Y		X		
22000018	Franklin County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Franklin	NFIP/CRS	Franklin County	Y		X		
22000019	Grayson County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Grayson	NFIP/CRS	Grayson County	Y		X		
22000020	Gregg County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Gregg	NFIP/CRS	Gregg County	N	< 50% within Region 2	X		Make sure TC coordinates with Adjacent regions so they can include them in their
22000021	Harrison County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Harrison	NFIP/CRS	Harrison County	Y		X		
22000022	Hopkins County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Hopkins	NFIP/CRS	Hopkins County	Y		X		
22000023	Hunt County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Hunt	NFIP/CRS	Hunt County	N	< 50% within Region 2	X		
22000024	Lamar County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Lamar	NFIP/CRS	Lamar County	Y		X		
22000025	Marion County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Marion	NFIP/CRS	Marion County	Y		X		

Region 2 - Potential FMS's

FMS ID	FMS Name	Description	Counties	Project Type	Sponsor	Technical Consultant Recommendation (Y/N)	Reason for NOT Recommending Action	Subcommittee Agrees/Disagrees: Agree	Subcommittee Agrees/Disagrees: Disagree	Meeting Notes
22000026	Morris County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Morris	NFIP/CRS	Morris County	Y		X		
22000027	Red River County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Red River	NFIP/CRS	Red River County	Y		X		
22000028	Titus County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Titus	NFIP/CRS	Titus County	Y		X		
22000029	Upshur County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Upshur	NFIP/CRS	Upshur County	Y		X		
22000030	Wood County NFIP Involvement	Application to join NFIP or adoption of equivalent standards	Wood	NFIP/CRS	Wood County	N	< 50% within Region 2	X		
22000031	City of Commerce CRS Involvement	Become an NFIP Community Rating System (CRS) Community	Hunt	NFIP/CRS	City of Commerce	Y		X		
22000032	City of Whitewright CRS Involvement	Become an NFIP Community Rating System (CRS) Community	Grayson	NFIP/CRS	City of Whitewright	Y		X		
22000033	Bowie County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Bowie	Regulatory and Guidance	Bowie County	N	Recommended a region wide stormwater manual vs. per county	X		
22000034	Camp County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Camp	Regulatory and Guidance	Camp County	N	Recommended a region wide stormwater manual vs. per county	X		
22000035	Cass County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Cass	Regulatory and Guidance	Cass County	N	Recommended a region wide stormwater manual vs. per county	X		
22000036	Cooke County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Cooke	Regulatory and Guidance	Cooke County	N	< 50% within Region 2	X		
22000037	Delta County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Delta	Regulatory and Guidance	Delta County	N	Recommended a region wide stormwater manual vs. per county	X		
22000038	Fannin County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Fannin	Regulatory and Guidance	Fannin County	N	Recommended a region wide stormwater manual vs. per county	X		
22000039	Franklin County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Franklin	Regulatory and Guidance	Franklin County	N	Recommended a region wide stormwater manual vs. per county	X		
22000040	Grayson County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Grayson	Regulatory and Guidance	Grayson County	N	Recommended a region wide stormwater manual vs. per county	X		

Region 2 - Potential FMS's								Subcommittee Agrees/Disagrees		
FMS ID	**FMS Name**	**Description**	**Counties**	**Project Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
22000041	Gregg County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Gregg	Regulatory and Guidance	Gregg County	N	Recommended a region wide stormwater manual vs. per county	X		
22000042	Harrison County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Harrison	Regulatory and Guidance	Harrison County	N	Recommended a region wide stormwater manual vs. per county	X		
22000043	Hopkins County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Hopkins	Regulatory and Guidance	Hopkins County	N	Recommended a region wide stormwater manual vs. per county	X		
22000044	Hunt County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Hunt	Regulatory and Guidance	Hunt County	N	< 50% within Region 2	X		
22000045	Lamar County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Lamar	Regulatory and Guidance	Lamar County	N	Recommended a region wide stormwater manual vs. per county	X		
22000046	Marion County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Marion	Regulatory and Guidance	Marion County	N	Recommended a region wide stormwater manual vs. per county	X		
22000047	Morris County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Morris	Regulatory and Guidance	Morris County	N	Recommended a region wide stormwater manual vs. per county	X		
22000048	Red River County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Red River	Regulatory and Guidance	Red River County	N	Recommended a region wide stormwater manual vs. per county	X		
22000049	Titus County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Titus	Regulatory and Guidance	Titus County	N	Recommended a region wide stormwater manual vs. per county	X		
22000050	Upshur County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Upshur	Regulatory and Guidance	Upshur County	N	Recommended a region wide stormwater manual vs. per county	X		
22000051	Wood County Integrated Stormwater Management Manual	Create and implement an integrated stormwater management manual that contains minimum stormwater infrastructure design standards	Wood	Regulatory and Guidance	Wood County	N	< 50% within Region 2	X		
22000052	City of Sherman Emergency Alerts	Maintain and Operate Early Alert System - an outdoor warning system composed of nine sirens throughout the City. Public announcements through reverse telephonic system as well through broadcasting local cable channels.	Grayson	Flood Warning Systems	City of Sherman	Y		X		

Region 2 - Potential FMS's								Subcommittee Agrees/Disagrees		
FMS ID	**FMS Name**	**Description**	**Counties**	**Project Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
22000053	Cooke County Warning and Emergency Response Program	Develop a community coordinated warning system and emergency response program that can detect flood threats and provide timely responses of impending flood danger.	Cooke	Flood Warning Systems	Cooke County	N	< 50% within Region 2	X		
22000054	City of Avery Storm Drainage Maintenance	Develop protocol for cleaning debris from ditches and drains within Avery to protect existing and new buildings	Red River	Preventive Maintenance Programs	City of Avery	Y	Not a capital type project.		X	SC decided not to recommend.
22000055	City of Clarksville Storm Drainage Maintenance	Bi-Annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Red River	Preventive Maintenance Programs	City of Clarksville	Y	Not a capital type project.		X	SC decided not to recommend.
22000056	City of Commerce Storm Drainage Maintenance	Activate Sulphur River clean-up efforts in order to prevent flooding from buildup of debris.	Hunt	Preventive Maintenance Programs	City of Commerce	Y	Not a capital type project.		X	SC decided not to recommend.
22000057	City of Daingerfield Storm Drainage Maintenance	Bi-Annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Morris	Preventive Maintenance Programs	City of Daingerfield	Y	Not a capital type project.		X	SC decided not to recommend.
22000058	City of Denison Storm Drainage Maintenance	Bi-annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Grayson	Preventive Maintenance Programs	City of Denison	Y	Not a capital type project.		X	SC decided not to recommend.
22000059	City of Dorchester Storm Drainage Maintenance	As development and construction continue, keep waterways clean and clear of obstruction for proper flow. Continued upkeep for erosion control and water flow.	Grayson	Preventive Maintenance Programs	City of Dorchester	N	Dorchester is out of our Region			
22000060	City of Ladonia Storm Drainage Maintenance	Bi-annual storm drainage cleaning program to be implemented to keep debris from hampering drainage	Fannin	Preventive Maintenance Programs	City of Ladonia	Y	Not a capital type project.		X	SC decided not to recommend.
22000061	City of Southmayd Storm Drainage Maintenance	Routinely inspect and clear debris from drainage systems. To conduct clearing activities, the city would require purchasing/renting backhoe to help with drainage ditches, retention tanks, etc	Grayson	Preventive Maintenance Programs	City of Southmayd	Y	Not a capital type project.		X	SC decided not to recommend.
22000062	City of Trenton Storm Drainage Maintenance	Improvements and clearing of storm drainage system to reduce the impact of heavy rain events.	Fannin	Preventive Maintenance Programs	City of Trenton	N	Trenton is out of our Region	X		
22000063	Fannin County Stream Maintenance	Regular maintenance, such as sediment and debris clearance, is needed so that the stream or waterway may carry out its designed function.	Fannin	Preventive Maintenance Programs	Fannin County	Y	Not a capital type project.		X	SC decided not to recommend.
22000064	Gregg County Storm Drainage Maintenance	Monitor flood-prone areas and remove debris from drainage culverts when needed to alleviate potential flooding hazards.	Gregg	Preventive Maintenance Programs	Gregg County	N	Majority of Gregg County is out of Region 2	X		
22000070	Grayson County Flood Warning and Public Safety Improvements	Create improved gauge notification system. Increase public awareness prior to occurrences and during flooding.	Grayson	Public Awareness & Educational Programs	Grayson County	Y		X		Add new FMS 84 and have ATCOG as sponsor to evaluate potential for future flood warning systems in the region.
22000071	City of Bonham Floodplain Manager	Establish a floodplain manager for the city to regulate floodplain development and provide public information concerning flood areas.	Fannin	Regulatory and Guidance	City of Bonham	Y		X		
22000072	City of Longview Flood Mitigation Training	Seek state and FEMA sponsored training in flood mitigation for key personnel.	Gregg	Regulatory and Guidance	City of Longview	N	City of Longview is out of Region 2	X		

Region 2 - Potential FMS's								Subcommittee Agrees/Disagrees		
FMS ID	**FMS Name**	**Description**	**Counties**	**Project Type**	**Sponsor**	**Technical Consultant Recommendation (Y/N)**	**Reason for NOT Recommending Action**	**Agree**	**Disagree**	**Meeting Notes**
22000073	Fannin County Floodplain Manager	Apply for assistance in establishing a Certified Countywide Floodplain Manager position. Funding on the continuation of the position would be from permit fees and local budgets. The focus of this role would be to mitigate flooding and protect the flood	Fannin	Regulatory and Guidance	Fannin County	Y		X		
22000074	City of Sadler Lift Station Flood-Proofing	Raise electrical panels and connections on lift stations above expected flood levels in flood prone areas.	Grayson	Property Acquisition and/or Floodproofing Programs	City of Sadler	Y		X		
22000075	City of Miller's Cove outreach	Educational outreach	Titus	Education and Outreach	City of Miller	Y			X	Put under FMS 82
22000076	City of Winfield NFIP	Participate in NFIP	Titus	Regulatory and Guidance	City of Winfield	Y		X		
22000077	Wood County outreach	Educate the public on mitigation strategies for all hazards.	Wood	Education and Outreach	Wood County	N	< 50% within Region 2	X		
22000078	Wood County land preservation	Acquisition and management strategies of land to preserve open space for flood mitigation and water quality in the floodplain	Wood	Property Acquisition and Structural Elevation	Wood County	N	< 50% within Region 2	X		
22000079	Upshur County NFIP	The County Hazard Mitigation Officer will assist those cities within the county that are not participating in NFIP to take appropriate actions to qualify for, and maintain participation in NFIP with a goal of having 100% participation within the county	Upshur	Regulatory and Guidance	Upshur County	Y		X		
22000080	Turn Around/Don't Drown	Educate public on Turn Around/Don’t Drown program	Region Wide	Public Awareness & Educational Programs	ATCOG	Y		X		ATCOG confirmed they can sponsor
22000081	Flood Safety Awareness Education	Educate public on flood safety	Grayson, Fannin	Public Awareness & Educational Programs	Honey Grove & Denison	Y		X		
22000082	Public NFIP Education	Educate public on the NFIP program and the importance of purchasing flood insurance.	Region Wide	Public Awareness & Educational Programs	ATCOG	Y		X		
22000083	Creation of region wide stormwater management manual	Creation of stormwater management manual and assistance to Region 2 communities for adoption.	Region Wide	Regulatory and Guidance	ATCOG	Y		X		
22000084	Regional Flood Warning System Study	Evaluate potential for future flood warning systems in the region.	Region Wide	Flood Warning Systems	ATCOG	Y		X		Add new FMS 84 and have ATCOG as sponsor to evaluate potential for future flood warning systems in the region.