Project/Study Need

During early development of the first-ever basin-wide flood plan for the Nueces River Basin (NRB), the 2023 Nueces Basin (Region 13) Regional Flood Plan, it was determined that very little accurate flood data existed for the predominantly rural NRB. Many areas of the basin have no floodplain inundation maps (La Salle and Frio counties) prior to the regional flood planning efforts. Other areas have potentially inaccurate or old mapping performed prior to 2010 (Edwards, Real, Kinney, Zavala, Dimmit, McMullen, Jim Hogg, and Kenedy counties). Furthermore, several areas have mapping based on old rainfall data that differs from new rainfall data by more than 30% (Maverick, Uvalde, Bandera, Medina, Webb, Bee, Brooks, and Goliad counties).

Without accurate flood inundation boundaries, the existing flood risk is not well understood. In response, the Nueces Regional Flood Planning Group developed specific and achievable flood mitigation and flood management goals with the objective to protect against the loss of life and property, which included:

- Performing flood mapping evaluations and update of floodplain maps,
- Improving safety at low water crossings,
- Reducing risks at high-hazard dams,
- Implementing flood warning systems, and
- Increasing nature-based practices through land conversation and restoration programs.

In accordance with these goals, the Nueces River Authority (NRA) sponsored the following flood management evaluations (FME), accordingly:

- FME 131000177: Nueces Basin Floodplain Map Updates
- FME 131000175: Nueces Basin Low Water Crossing Study and Upgrade Prioritization
- FME 131000176: Nueces Basin High Hazard Dam Identification and Risk Assessment
- FME 131000174: Nueces Basin Early Flood Warning System
- FME 131000179: Nueces Basin Scaling Up Nature Based Solutions (co-sponsored with the The Nature Conservancy)

The proposed planning projects complement and leverage the FMEs identified in the 2023 Nueces Basin (Region 13) Regional Flood Plan and included in the 2024 State Flood Plan towards achieving the basin and region-wide floodplain goals and does not duplicate previous or ongoing flood planning efforts.

As identified and described in the 2023 Region 13 Nueces Regional Flood Plan, the projects will benefit a historically, highly flood-prone river basin (refer to Project Location Map below).

A summary of historic flood events (excerpted from the 2023 Region 13 Nueces Regional Flood Plan Appendix C1) is as follows (2020 – present; see Appendix C1 for full table):

Flood Event	Description
2025 July Flash Flood	On July 4, a catastrophic flash flood hit the Texas Hill Country, particularly devastating areas in Kerr and Bandera County. While a majority of the destruction occurred outside of the Region 13 Boundary, this recent flood event is included for its topical and tragic nature. The Guadalupe River surged over 26 feet in just 45 minutes, claiming at least 135 lives, including 27 children and staff at Camp Mystic.
2017 Hurricane Harvey	Hurricane Harvey is the most expensive storm on record, costing an estimated $4.28 billion dollars in damages to Region 13 counties. Aransas county experienced the most extensive damages with an estimated cost totaling $1.75 billion. Nueces, San Patricio, and Refugio counties saw losses of $1.32 billion, $520 million, and $520 million respectively. The National

Flood Event	Description
	Weather Service (NWS) reports that 64 injuries and 2 fatalities were caused in Region 13 by Hurricane Harvey.
2003 Flash Floods	In late June and early July of 2003, flash floods hit the northwestern counties of Region 13 after a hurricane turned tropical storm blew across the coastal counties.
2002 Frio River Flood	In July and September of 2002, the Frio River saw record stages near Tilden. The July storm represents the flood of record for parts of the middle basin. The tributaries of the complex northwestern portion of the basin see peak stages in different storm events.

Project Location Map
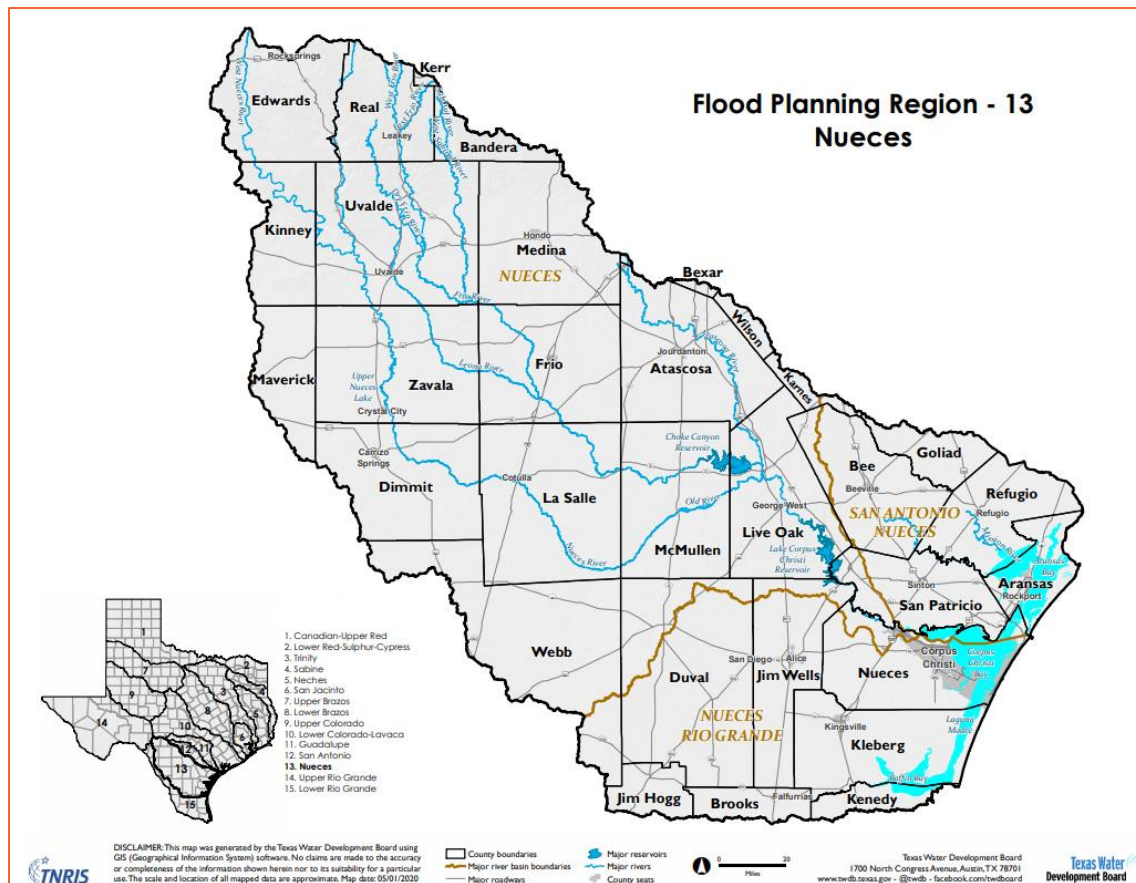
Nueces Basin Floodplain Map Updates

This project proposes to develop enhanced hydrologic and hydraulic models for the Nueces River Basin (NRB), prepare updated flood inundation mapping for select events, identify areas of high flood risk, evaluate alternatives to reduce flood risk, and utilize the InFRM HEC-HMS model to cover the extents of the basin as described in the Region-13 Flood Plan. The basin includes the 20 HUC8 watersheds and extends from the headwaters of the Nueces River to the Gulf.

Hydrologic and hydraulic modeling will leverage existing studies, such as InFRM and Base Level Engineering (BLE) studies. This project is an enhancement of the prior BLE study for the Nueces River Basin by upgrading existing Class B models to Class C throughout the basin, with targeted Class D and E models in high-risk areas. FEMA modeling classifications referenced throughout this project are outlined in Guidance for Flood Risk Analysis and Mapping General Hydraulics Considerations (November 2024) and are summarized as follows:

- Class C Modeling: This represents a lower level of detail, often used for non-regulatory, planning-level flood analyses. It involves medium resolution 2D grids with and simplified structure representation. It is suitable for watershed wide floodplain delineation in rural or low-density suburban areas.

- Class D/E Modeling: Class D/E modeling represents higher-detail hydraulic modeling appropriate for regulatory studies and areas with development. These models include fine-resolution 2D meshes, detailed structure representation using field data or as-built plans. Class D/E modeling enables detailed evaluation of infrastructure impacts, mitigation alternatives, and urban flood risk.

The project includes the following primary tasks:

- Collect available data and information to support hydrologic and hydraulic modeling and perform a gap analysis relative to additional information needed to complete the modeling.

- Perform measurements or survey at select structures for input into the hydraulic models.

- Leverage the InFRM HEC-HMS model and prepare hydrologic models for the NRB to determine flow patterns and estimate inflows to hydraulic models.

- Prepare updated and enhanced hydraulic models using HEC-RAS (2D) to assess the extent of flood risk in the basin.

- Develop a FEMA compliant flood hazard mapping database and associated products to support informed community planning and flood risk identification

- Identify areas of high flood risk and perform alternatives analyses to evaluate potential flood risk reduction measures.

The project will consider flood risk reduction needs of the entire basin. The intent is to leverage and/or enhance models throughout the basin for all areas with drainage areas greater than 1 square mile (and potentially further upstream in certain areas). Flood risks will be estimated using a transparent framework that considers stakeholder input throughout the basin.

The primary potential benefits of the project include:

- Enhanced identification of flood risks in the NRB.

- Enhanced hydrologic and hydraulic models that can be utilized for evaluation of proposed projects and development.

Updated models and mapping can be utilized to support evaluation of related efforts in the NRB, such as development of Flood Early Warning Systems, evaluation and prioritization of Low Water Crossings, and in developing inflows for dam assessments.

Nueces Basin Flood Early Warning System

This project includes conducting a study to assess the feasibility of implementing a flood early warning system (FEWS) for the Nueces River Basin (NRB). This proposed study aligns with the Nueces Basin (Region 13) Regional Flood Planning Group goals and FME_ID 131000174 "Early Flood Warning System" as recommended in the Amended 2023 Region 13 Nueces Regional Flood Plan. Implementing a flood warning system in the basin has the potential to reduce the risk of future loss of life by providing flood hazard prediction information in advance of the impacts of a storm event.

The primary tasks are as follows:

- Review existing flood warning systems and methods for potential integration into a basin-wide system.

- Coordinate with stakeholders and planners in the Nueces River Basin to understand existing FEWS and needs/preferences with respect to enhanced FEWS.

- Identify data gaps in the basin and assess feasibility of various FEWS types applied in the NRB.

- Develop a framework for implementation of a FEWS in two phases. Phase 1 would include a FEWS based on current infrastructure and monitoring systems already in place, Phase 2 would include a FEWS based on implementation of forecast-based systems and/or deployment of additional gages/models. Both would be allow for implementation in locations throughout the Nueces River Basin.

The project will include coordination with the Region 13 Regional Flood Planning Group, the Texas Water Development Board (TWDB), and local stakeholders to garner and employ feedback at multiple points in the framework development. The final deliverable of this project is a FEWS implementation framework which will be dictated by community needs and preferences for a FEWS; the process of development will be heavily reliant on community outreach and stakeholder engagement.

Primary potential benefits of the project may include the following:

- Provide flood warning information to residents where FEWS does not currently exist.

- Improve disaster response preparation and flood resilience throughout the NRB.

- Reduce the future risk of loss of life due to flooding through enhanced warning systems.

- Improve communication and understanding of flood risk for individuals and residents in NRB communities.

Nueces Basin High Hazard Dam Identification and Risk Assessment

This project will conduct a High Hazard Dam Identification and Risk Assessment project in the Nueces River Basin (NRB) and addresses up to 34 high and potentially significant hazard state regulated dams within the NRB. This project involves assessment of risks at high hazard dams located throughout the NRB. Failure or overtopping of these structures could lead to flood risk in downstream areas and potentially place water supplies (in both upstream and downstream areas) at risk in select locations. Flood risk associated with these structures will be estimated by reviewing existing breach and/or capacity analyses or performing rapid assessments of the breach inundation area and/or spillway capacity. The risk of structural failure will be considered by performing screening level risk assessments using industry standards similar to those applied by NRCS.

This project is anticipated to include the following primary tasks:

- Data collection and review for up to 34 high and potentially significant hazard state regulated dams in the NRB to identify data needed to support evaluation of risks at the structures

- Field reconnaissance for up to 27 high hazard state regulated dams in the NRB to observe conditions at the dam and collect additional information

- Completion of a planning/screening level risk assessment in the NRB in general accordance with federal dam safety risk management guidelines and industry best practices for dam safety risk informed decision making, stakeholder feedback and collaboration with NRA. This assessment will consider hydraulic capacity, known structural deficiencies, downstream hazards among other items.

- Following completion of the screening level risk assessment, identified deficiencies will be prioritized

- Development of recommendations for dam mitigation plans (DMPs) to address high priority deficiencies.

The risk informed approach described in this scope of services applies the principles of risk and uncertainty to guide the NRA's future flood risk management planning and mitigation projects through evaluation of downstream consequences, detailed data review, initial planning of risk reduction measures and recommendations for dam mitigation plans. The identification of risk drivers within the basin will help guide the basin-wide dam safety management planning efforts over the next several years to facilitate effective and defensible use of available funding resources on projects that:

- Reduce dam safety risks within the NRB and corresponding risk of uncontrolled releases of water downstream.

- Improve the reliability and resilience of the existing dams to serve surrounding communities within the basin as designed (e.g., as water supply sources, for flood protection, etc.).

- Follow industry best practices with regards to screening level risk processes that will help develop a prioritized list of DMPs and direct future capital fund planning for NRA.

Nueces Basin Low Water Crossing Study and Upgrade Prioritization

This project proposes to conduct an inventory of low water crossings (LWC) within the Nueces River basin, characterize flood risk at each LWC, and prioritize developing Flood Mitigation Projects (FMPs) for LWCs with high risk. The project will consider LWCs throughout the Nueces River Basin (NRB) (see Figure 1) and therefore considers flood risk reduction needs throughout the basin. This proposed study aligns with the Nueces Basin (Region 13) Regional Flood Planning Group goals and FME_ID 131000175 "Nueces Basin Low Water Crossing Study and Upgrade Prioritization" as recommended in the Amended 2023 Region 13 Nueces Regional Flood Plan.

The project includes the following primary tasks

- Compile available data and information regarding LWCs in the basin. Develop a digital inventory of the LWCs and available information.

- Collect additional data to supplement currently available data, including site visit observations and structure measurements

- Develop a prioritization matrix that considers information at each crossing, such as flood risk, average daily trafficl, occurrences of fatal incidents, proximity to critical facilities, community input, and other parameters.

- Prepare limited hydrologic and hydraulic analyses of select crossings (where information currently does not exist) to support prioritization relative to flood risk.

- Prioritize LWCs based on prioritization matrix.

- Develop FMPs or proposed mitigation concepts for select LWCs.

- Prepare reporting in accordance with TWDB FIF grant requirements.

Potential benefits realized from this project will be reduced risk of flooding at LWCs and improved access to critical infrastructure during flood events. Specifically, this project will target localized flooding at roadway crossings to improve navigability, and emergency evacuation, during flood events. The Amended 2023 Region 13 Nueces Regional Flood Plan indicates LWCs are a repetitive hazard that have contributed to loss of life throughout the NRB during flood events. The plan identified:

- 548 LWCs from TWDB HUB low water crossing data dated May 2021.
- 22 LWCs from available TxDOT data to be subject to frequent flooding.
- 6 LWCs from the City of Beeville to be subject to frequent flooding.

Scaling Up Nature Based Solutions in the Nueces Flood Planning Region

The Nueces River Authority (NRA) proposes this project in partnership with The Nature Conservancy (TNC), a trusted leader with over 60 years of experience in conservation, community resilience, and water resource management in Texas and worldwide. TNC will contribute valuable data, methodologies, and insights on ecosystem resources and priority conservation areas to guide project planning and prioritization.

The project will be delivered by a collaborative Project Team composed of NRA, TNC, and a group of specialized consultants. NRA will serve as project manager, overseeing coordination, stakeholder engagement, and deliverables. TNC will provide in-kind staffing support and leverage its ongoing statewide nature-based solution (NbS) guidance work, as well as lessons from similar efforts in Florida and Alabama. Consultants will support both technical execution and coordination, contributing expertise in hydrology, GIS, NbS design, and community engagement to ensure the project is actionable, inclusive, and implementation-ready.

This Nueces Basin Scaling Up Nature Based Solutions (SUNS) project was identified by TNC as part of the Region 13 – Amended 2023 Nueces Regional Flood Plan. This project is defined as a multi-jurisdictional feasibility analysis to identify and prioritize a portfolio of NbS flood mitigation projects and strategies that consider both risk reduction and ecological benefits in targeted areas of the Nueces River Basin (NRB) Regional Planning Area.

The project objectives are based on the TWDB Flood Plan Goal 7 - Nature-based Solutions which calls for the increased use of land conservation and restoration programs and landowner incentive programs to manage floodwaters, slow runoff and dissipate flood energy to include riparian, wetland, forest, upland, and other habitat protection programs. While NbS rely on natural components, they still require thoughtful design and engineering to ensure appropriate placement, sizing, and construction.

Through the development of a basin-wide prioritized portfolio of NbS, the project will meet the following objectives:

- Identify high-impact, site specific opportunities for nature-based flood mitigation that align with both ecological priorities and community needs across the Nueces Basin.
- Establish a replicable framework for evaluating, ranking, and advancing NbS projects based on flood risk reduction potential, ecological benefits, feasibility, and community buy-in.
- Strengthen local implementation capacity through technical assistance, training, and tools that enable the communities to move NbS projects from concept to action.

The Nueces Basin SUNS project will produce a set of durable, regionally relevant deliverables that not only support immediate planning needs but also establish a foundation for long-term, community-led implementation of NbS. These deliverables are designed to be integrated into future flood planning cycles and to serve as a replicable model for other regions across Texas.

- **Stakeholder Working Groups** – Formation of a working group for each of the main Texas Parks and Wildlife Department (TPWD) eco-regions within the basin (Gulf Coast Prairies, South Texas Plains and Edwards Plateau) to guide project development, ensure regional relevance, and support community-driven prioritization. The working groups will serve as lasting collaboratives to continue advancing NbS projects beyond the life of the Nueces Basin SUNS.

- **GIS Mapping** – Development of spatial datasets incorporating key feasibility inputs such as flood risk, land cover, soil, land ownership, ecological value and results from the analysis for NbS opportunity areas. Results will be integrated into the TNC SUNS GIS toolbox to support continued use by local planners and communities.

- **NbS Project Portfolio** – Creation of a tailored NbS plan for each ecoregion, including a portfolio of priority projects informed by stakeholder input, flood risk data, ecological value, and implementation feasibility. Each plan will include a project needs assessment, alternatives analysis, and a reusable prioritization framework. Select high-priority projects will include preliminary design concepts to accelerate readiness for funding and inclusion in the next Region 13 Flood Plan update.

- **Presentations and Knowledge Sharing –** Delivery of project findings to the Region 13 Flood Planning Group and the Texas General Land Office's Coastal Resiliency Master Plan team, along with materials to support the cross-regional learning, broader knowledge transfer, replication, and integration into state-level planning efforts.