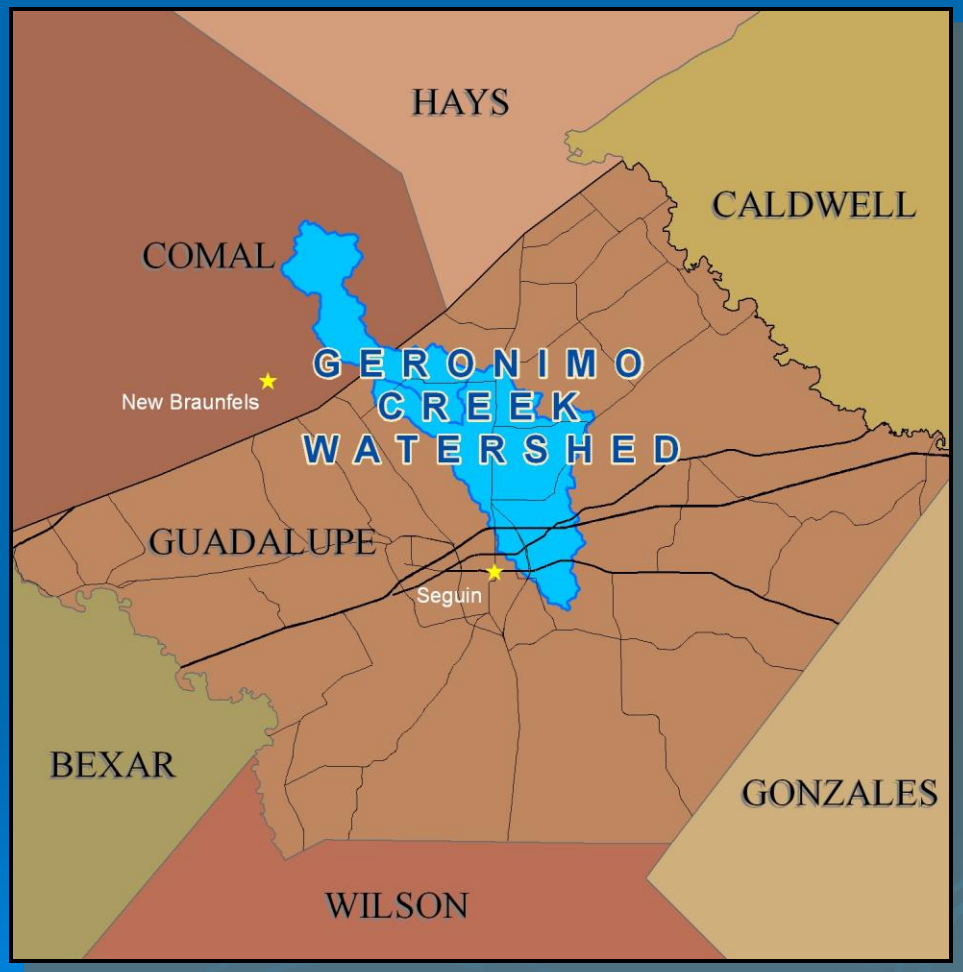
Geronimo Creek Flood Protection Plan

Lance Klein, PE, PH, CFM
M&S Engineering, LLC

Geronimo Creek Flood Protection Plan



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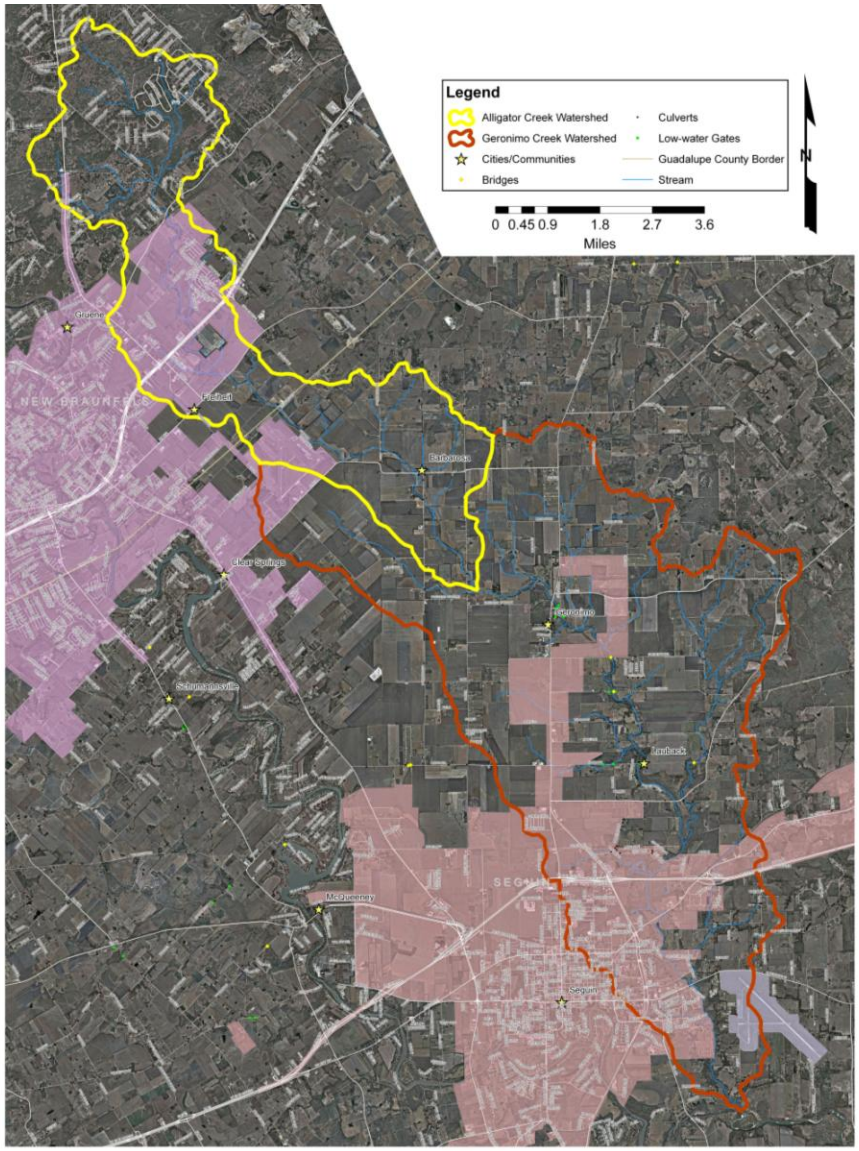

The Geronimo Creek watershed consists of two major streams and their tributaries; Geronimo and Alligator Creeks.

- *Alligator and Geronimo Creeks contribute 23- and 46-acres of drainage area, respectively.*
- *Alligator and Geronimo Creeks along with their tributaries total approximately 50 miles of channel length.*
- *Headwaters in Comal County, drains through City of New Braunfels, Guadalupe County, City of Seguin, and empties into the Guadalupe River*

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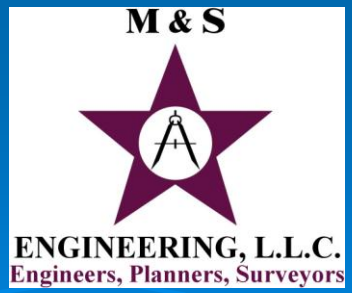
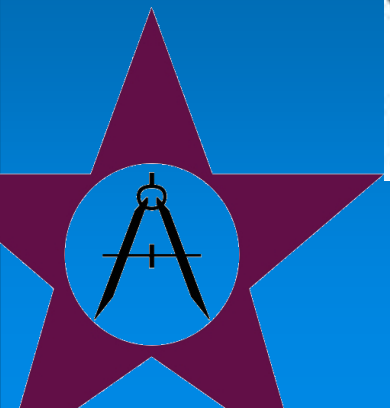
Participants:





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Purpose of Study:

- Hydrologic and Hydraulic modeling (Revised Floodplains)
- Identify 5 potential flood mitigation projects
- Use study results to apply for funding assistance for construction

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Hydrologic and Hydraulic Modeling (Revise Floodplains)

- Initial goal was to update Effective FEMA models and execute
- Found that models were created in mid-1970's
- FEMA backup data was incomplete

The decision was made to start from scratch!

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Hydrologic and Hydraulic Modeling (Revise Floodplains)

- Hydrologic Methodology:
  - SCS Unit Hydrograph
  - TR-55 Time of Concentration (2-ft contours)
  - Land use determinations were made from Appraisal District records, aerial photographs, and field observations
  - TR-55 Curve Numbers

- Hydraulic Methodology:
  - Detailed surveys performed on bridges, culverts, and low water crossings
  - Cross-sections cut using 2-ft contours from aerial photography
  - GeoRAS
  - HEC-RAS

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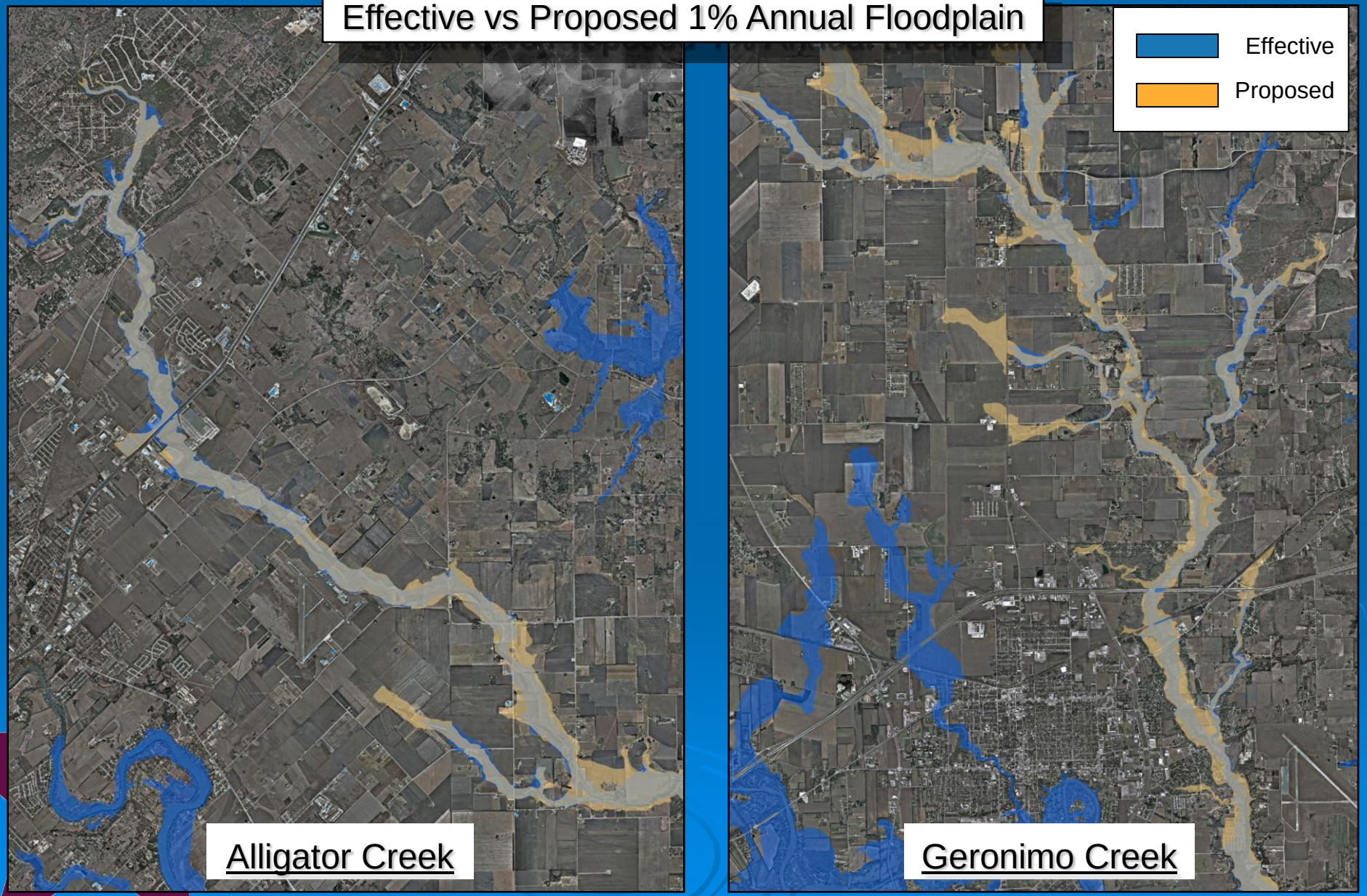
Effective vs Proposed 1% Annual Floodplain



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Mitigation Alternative Evaluations

Structural options were evaluated to determine the impacts to the water surface elevations through out the entire watershed. The following were investigated in numerous combinations and locations:

- Brush removal in the channels
- Channel modifications
- Stream crossing modifications
- Detention Ponds

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Mitigation Alternative Evaluations

The following non-structural options were also considered. These alternatives do not reduce existing flood hazards, but may reduce future property damage and loss of life.

- Regional detention regulations (increase design criteria where necessary)
- Revised development regulations for flood prone areas
- Flood early warning systems
- Automatic gates at problem stream crossings
- Buyouts for repetitive loss structures

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Brush Removal

Manning's n-values were reduced in the hydraulic model to simulate the impacts of "cleaning up" the main stem of Alligator and Geronimo Creeks.

- Utilized aerials to target areas of dense trees for removal.
- Evaluated areas identified as problem areas by residents.
- Evaluated areas of concentrated insurance claims.

  • In areas where reductions were anticipated it was determined that the flow area of the floodplain was so large that the reduction in friction due to brush removal was neglible.

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Channel Modifications

- Initially modeled in proximity to identified problem areas and stream crossings
  - •No localized effects were seen in the water surface elevations of any storm frequency.
- An exaggerated cross section was used to create a modified channel the entire length of Geronimo Creek
  - • Again no impacts to the water surface elevations were observed
  - • It was determined that the flow area of the cross sections were so large that adding wide channels resulted in a negligible increase to the flow area

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Stream Crossing Modifications

The top 5 ranked stream crossings were evaluated in detail to determine if reasonable improvements would allow for increased conveyance of stormwater under the roadway.

- Increased conveyance may possibly reduce the depth, frequency, or even the occurrence of flood water over the road.

- The crossings were iteratively modified in HEC-RAS to determine the effects on the water surface elevations over the road.

- Three considerations were found to be true in analyzing the roadways:

  • The majority of the roads have limiting slopes and can not be raised without creating high spot in the road that causes the floodwater to seek an alternate path around.

  • The bridges analyzed could not be significantly raised without creating increased threat of backwater to upstream and adjacent structures.

  • Due to the previous two concerns it is not economically feasible to construct culverts or bridge sections to convey enough flood water to reduce the magnitude and frequency at which the roads overtop.

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Detention Pond Evaluations

In order to evaluate the effectiveness of detention as a flood mitigation strategy, a large number of possible detention pond configurations were modeled. Locations for possible ponds were selected based on potential availability of land and likelihood of beneficial timing effects.

- Regional Ponds
- Multiple Ponds
- In-line Ponds
- Off-line Ponds
- Various combinations of the above

To reduce the water surface elevations by 1-foot a total detention pond volume of 2,666 acre-feet (4,301,147 cubic yards).

Estimated construction cost to accomplish 1-foot decrease would range from $17 Million to $19 Million depending on fees and market values for engineering, permitting, construction, and land acquisition.

It is important to recognize the magnitude of detention required to have any beneficial effect on flood depths.

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Non-Structural Mitigation Alternative Evaluations

- **Regional detention regulations (increase design criteria where necessary)**
  - *Currently all local municipalities have existing detention regulations on varying degrees.*
  - *Increasing design criteria to include all storm frequencies can have significant impacts on the severity and frequency of flooding.*

- **Revised development regulations for floodplains**
  - *Adopting more stringent standards for building in floodplain and floodways can reduce the risk of property damage and loss of life.*

- **Flood early warning systems**
  - *The primary objective of early warning systems is to notify local officials, emergency services, and the general public imminent danger in order to assist with the organization and implementation of evacuations.*
  - *Early warning systems can prevent loss of life and property during a flood event if the information is distributed in a timely and accurate manner.*

- **Automatic gates at problem stream crossings**
  - *Automatic gates at stream crossings can significantly reduce the risk of loss of life.*
  - *The gates can be integrated with flood warning system and designed to close the road during flood events.*

- **Buyouts for repetitive loss structures**
  - *Removing structures and relocating residents from the floodplain is the most effective means of reducing flood damages and potential loss of life and property.*

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Recommendations

- Regional detention regulations (increase design criteria where necessary)
- Revised development regulations for floodplains
- Flood early warning systems
- Automatic gates at problem stream crossings
- Buyouts for repetitive loss structures

Questions?

Lance Klein, PE, PH, CFM
M&S Engineering, LLC
(830) 228-5446
lklein@msengr.com