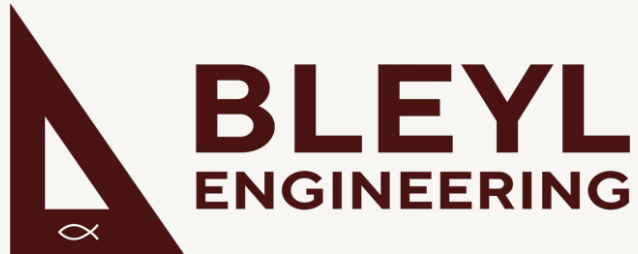


Lake Conroe Lowering Analysis

Summary Slides

Core objective: Evaluate whether available engineering data supports prerelease lowering of Lake Conroe as an effective downstream flood mitigation strategy prior to large regional storms.



Prepared for Lake Conroe Association
Bleyl Project No.: 13716
Presented by: Adam Vento, PE, CFM

Scope of Study

Question 1

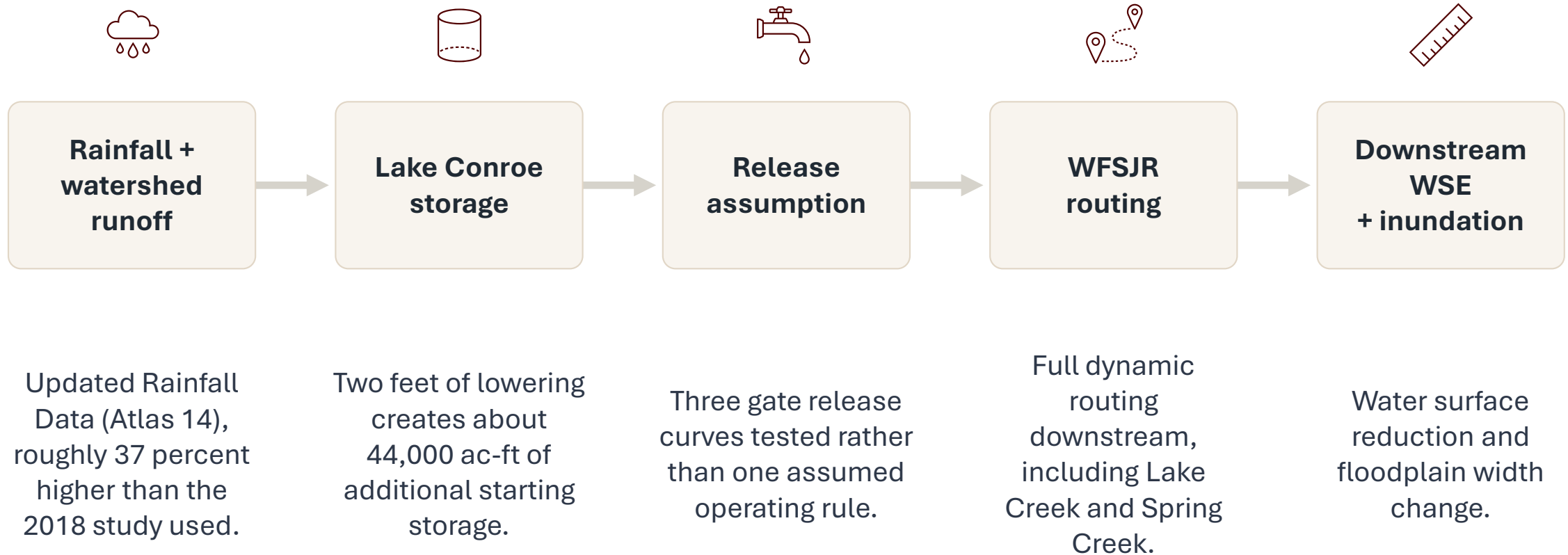
Downstream flood benefit

Does lowering produce an *effective* downstream flood reduction benefit?

Answer: The model results support that the only area to receive effective flood benefits resulting from lowering Lake Conroe are immediately downstream from Lake Conroe Dam

- Downstream mitigation benefits attenuate (“dissipate”) significantly as runoff travels further downstream from Lake Conroe
- At Kingwood and Lake Houston, this study concludes that flooding severity is significantly more influenced by other uncontrolled tributaries
- Regional flooding within the Kingwood and Lake Houston area is not effectively reduced.
 - Lowering Lake Conroe does not effectively reduce flood levels or inundation extents

How the analysis works



Base models for this study were published under the San Jacinto Regional Watershed Master Drainage Plan (SJMDP) and obtained from Harris County Flood Control District.

Why we used the region's own model

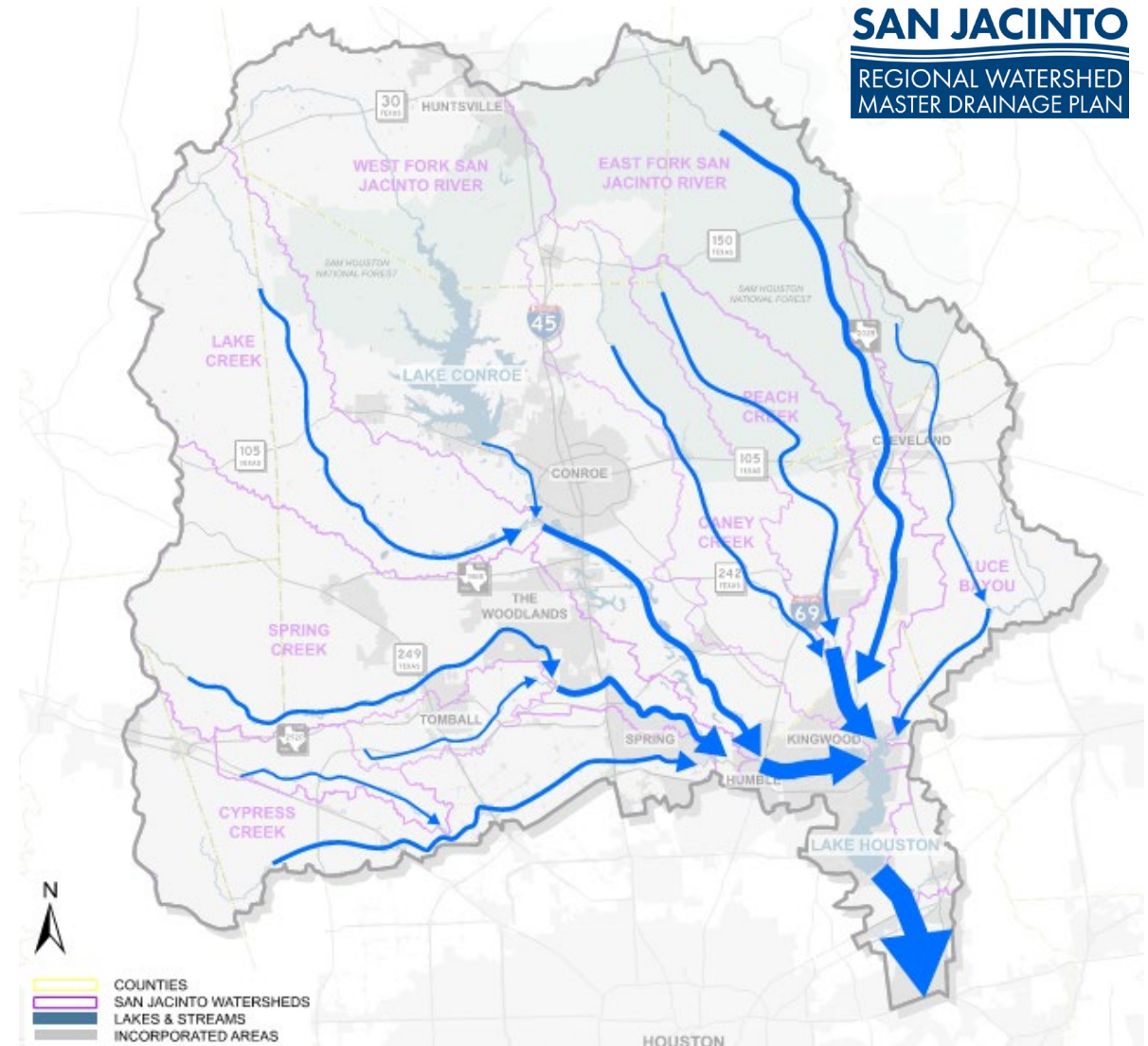
What the SJMDP is

The San Jacinto Regional Watershed Master Drainage Plan is the regional flood study commissioned by the Harris County Flood Control District, the San Jacinto River Authority, Montgomery County, and the City of Houston. It covers roughly 3,000 square miles and 535 miles of stream, and it was calibrated against Harvey, Imelda, the 2016 Memorial Day storm, and the 1994 storm. This study uses the SJMDP base models and evaluates potential downstream benefits of lower starting pool levels at Lake Conroe.

The gap it left open

The SJMDP explicitly excluded lake-lowering scenarios from its modeling, noting that gate, spillway, and pool-elevation strategies "may be considered as part of separate study efforts."

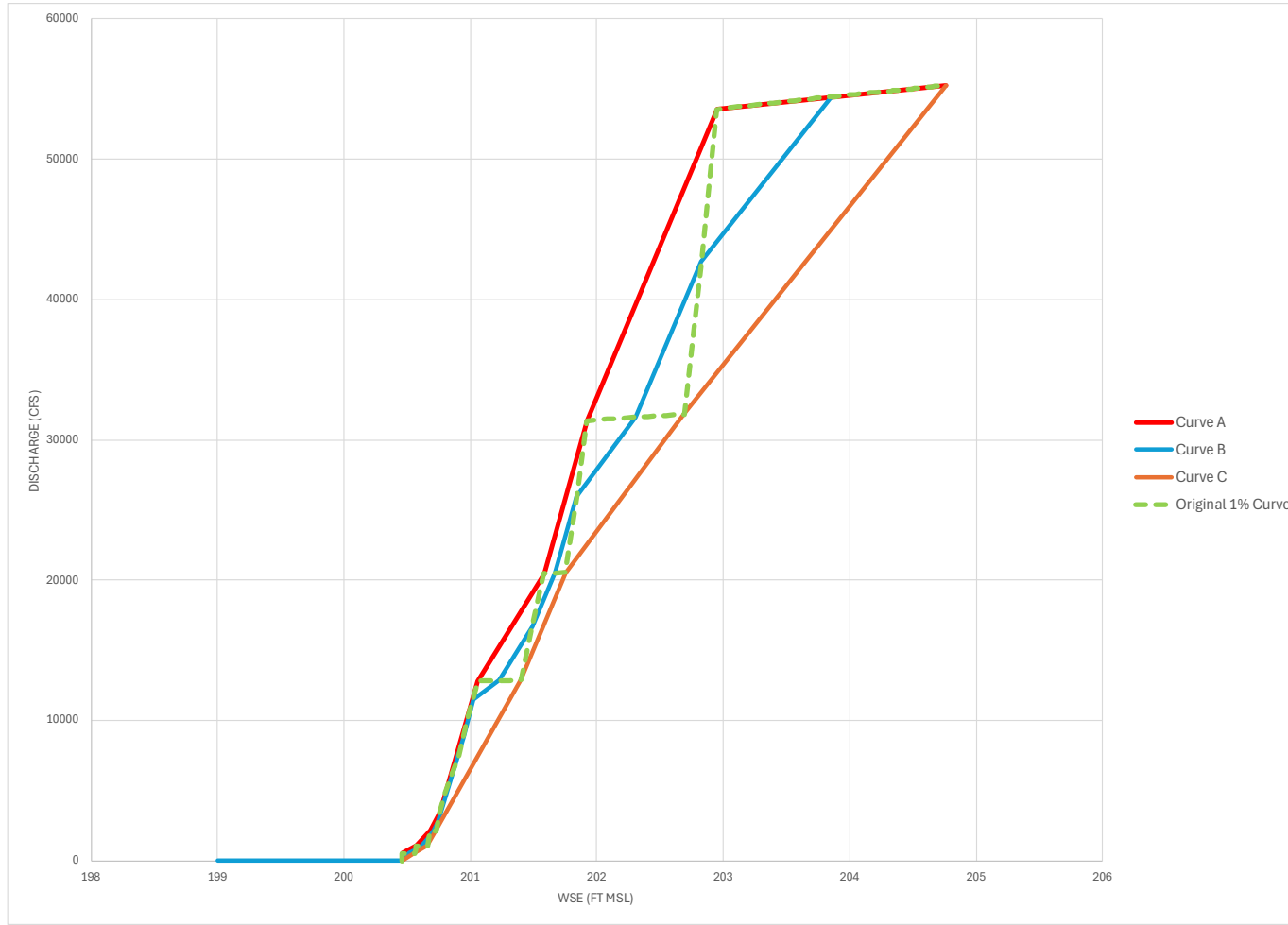
Prior to this study, no watershed-wide evaluation of a lowering program has ever been done. This report analyzes the full San Jacinto watershed in addition to incorporating the latest available data to close the gap.



Comparison with Prior and Regional Studies

Attribute	FNI Study (2018)	Bleyl Preliminary (2020)	SJMDP Watershed Model	SJRA/TWDB Joint Ops (Ongoing)	This Study Bleyl Updated Report (2026)
Sponsor / Client	San Jacinto River Authority	Lake Conroe Association	SJRA / City of Houston / Montgomery County / HCFC	SJRA / TWDB	Lake Conroe Association
Study Extents	Lake Conroe Dam to I-45 (limited)	Review of FNI scope, available WFSJR data	Full San Jacinto basin (~3,000 sq mi)	Full watershed, joint Lake Conroe & Lake Houston dam/gate operations review	Lake Conroe Dam to Kingwood / Lake Houston area
Rainfall Dataset	Pre-Atlas 14 rainfall	Identified need for Atlas 14 and extension of model from I-45 to Lake Houston	NOAA Atlas 14	NOAA Atlas 14	NOAA Atlas 14
Primary Conclusion	Limited benefits: 0.74 ft (100-yr) and 0.80 ft (500-yr) at I-45 for a 2-ft lowering. Conclusion: “Not enough to be considered wholesale improvements to the flood hazard” (FNI).	Confirmed FNI local findings, estimated that benefits would diminish downstream, resulting in no “wholesale improvements” to flood hazards near Kingwood / Lake Houston	Baseline modeling framework for regional planning and project screening. Produced a comprehensive set of data and models for the full San Jacinto watershed.	In progress: evaluating coordinated gate releases	Confirmed FNI conclusion of near-dam effectiveness. No effective benefits in primary areas of downstream regional flooding from lake lowering.

Lake Conroe Hypothetical Releases - Why three release curves instead of one?



SJRA manages Lake Conroe gates from a real-time operational spreadsheet that is not publicly available.

Rather than treat one assumed curve as correct, the study brackets a reasonable range of lake discharges.

Curve A aggressive releases

Curve B mid-range

Curve C conservative

Why it matters: if the results changed significantly depending on which curve we used, the study's conclusion would not be defensible.

The finding is consistent across all three curves, which is what allows this report to state the conclusions with confidence.

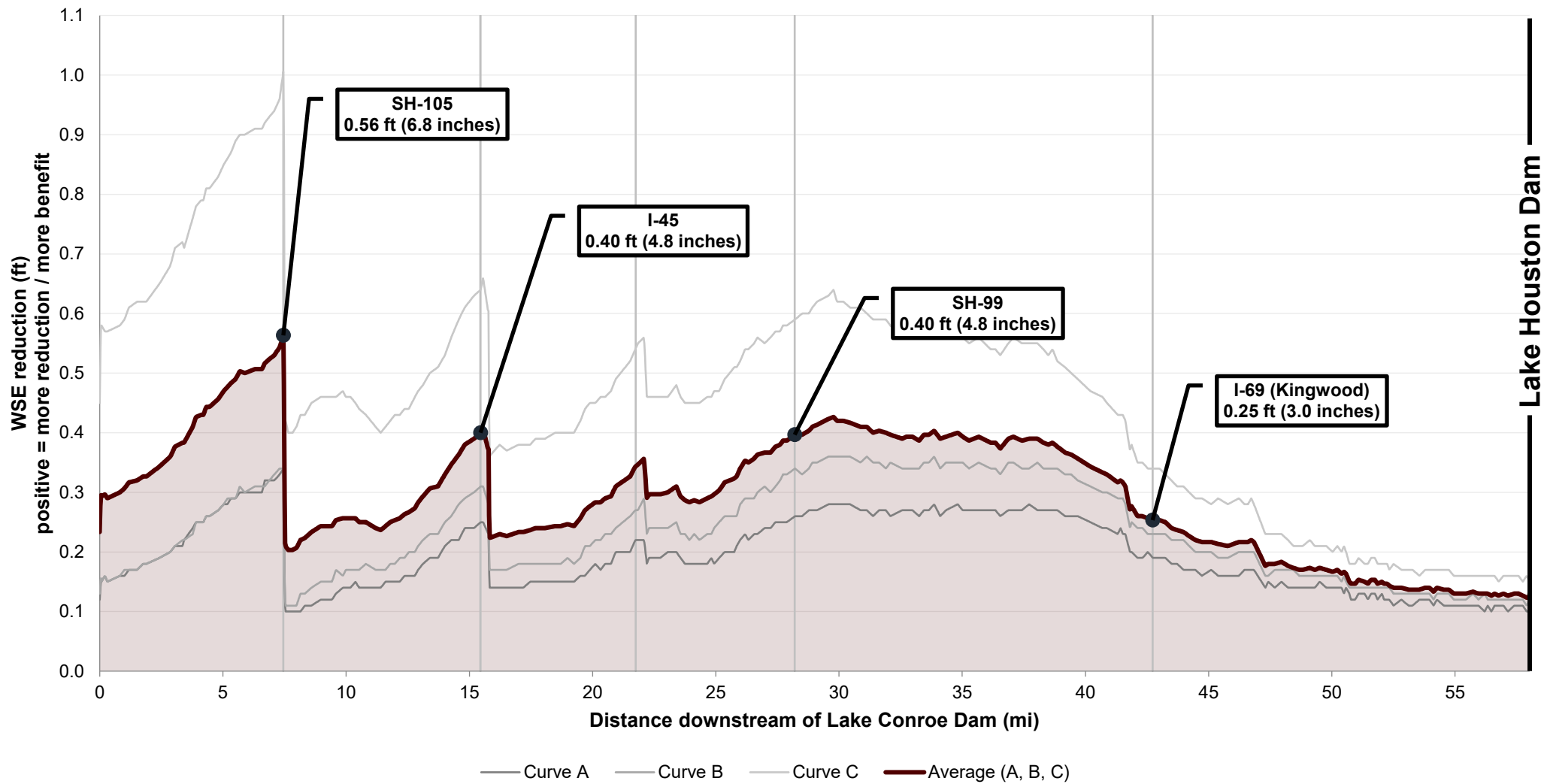
Finding 1: Downstream Flood Reduction Benefits are Limited

Downstream Location	Average Reduction in Downstream Flood Severity			
	1-ft Lowered <i>(Starting WSE = 199.50)</i>	1.5-ft Lowered <i>(Starting WSE = 199.00)</i>	2-ft Lowered <i>(Starting WSE = 198.50)</i>	2.5-ft Lowered <i>(Starting WSE = 198.00)</i>
Upstream of I-45 WSE reduction	0.16 ft (~2 inches)	0.28 ft (3.4 inches)	0.39 ft (4.6 inches)	0.50 ft (6 inches)
Upstream of SH-99 WSE reduction	0.18 ft (2.2 inches)	0.31 ft (3.7 inches)	0.42 ft (5.1 inches)	0.55 ft (6.6 inches)
At I-69 (Kingwood) WSE reduction	0.12 ft (1.4 inches)	0.20 ft (2.4 inches)	0.27 ft (3.2 inches)	0.35 ft (4.2 inches)

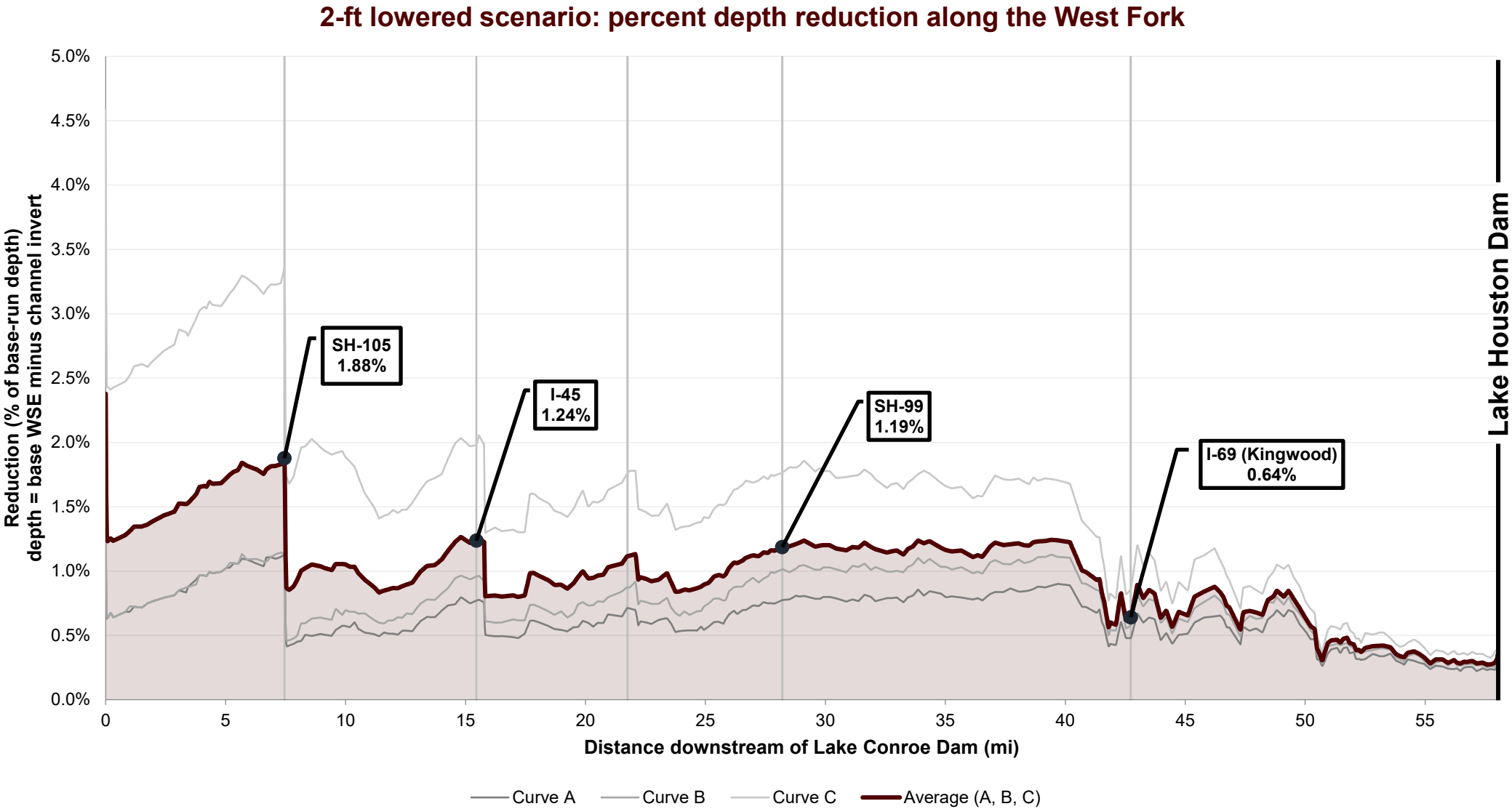
Note: The starting pool elevation for this study was adjusted from 201.00 to 200.46 due to a datum adjustment to be consistent with current downstream flood datums. (NGVD29 -> NAVD88)

What that means in practical terms – Impacts on Water Surface Elevations (WSE)

2-ft lowered scenario: WSE reduction along the West Fork



What that means in practical terms - % Reduction in Flood Depth



A limiting case: what if Lake Conroe had not released any water during Hurricane Harvey?

The hypothetical question

If Lake Conroe had held every drop of inflow during Harvey, what is the difference in downstream modeled flood area?

How to read the exhibits

Yellow: flooded in both scenarios

Purple: flooded during Harvey but not in the scenario with no release from Lake Conroe.



Area flooded in both scenarios

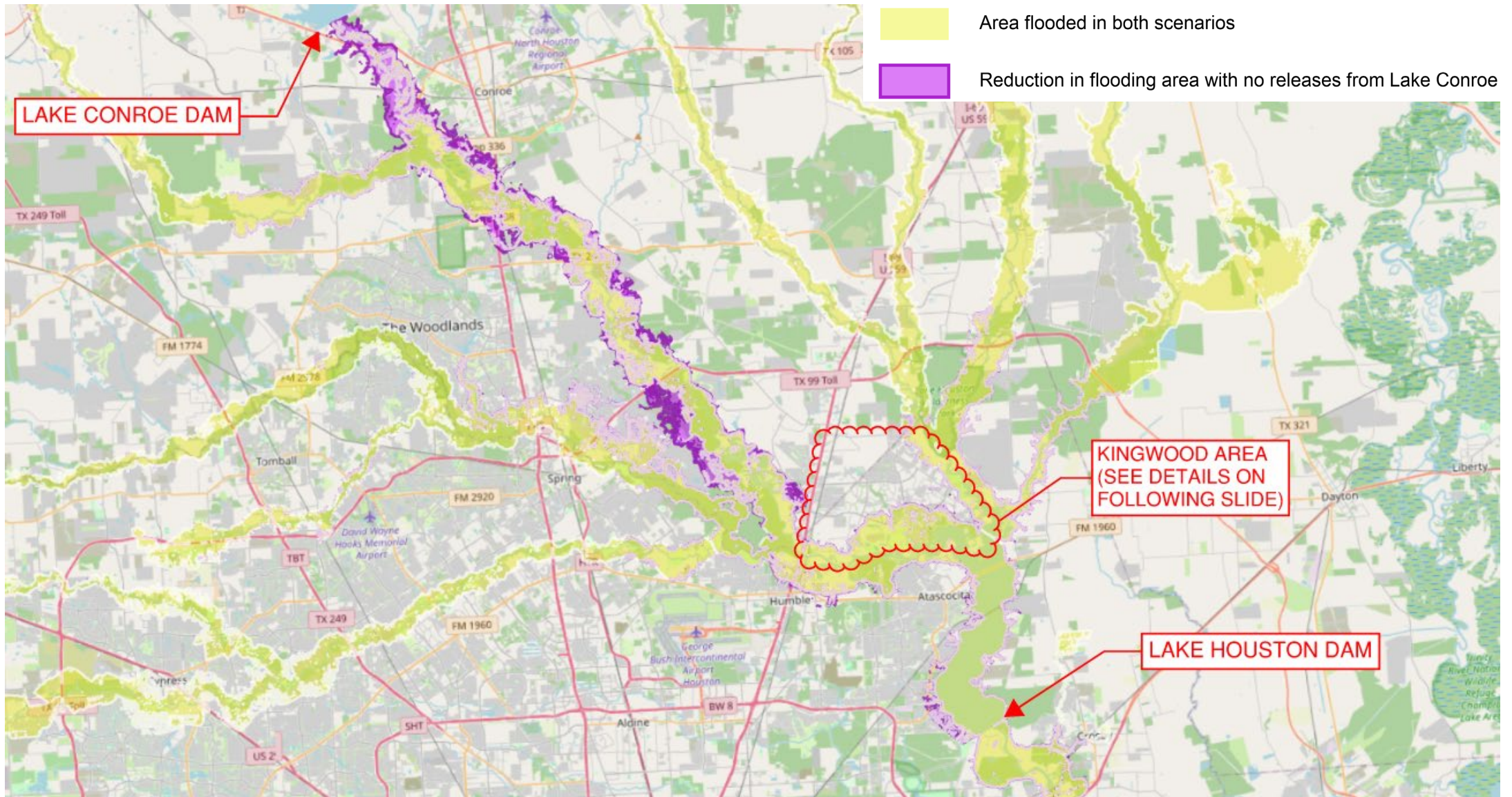


Reduction in flooding area with no releases from Lake Conroe

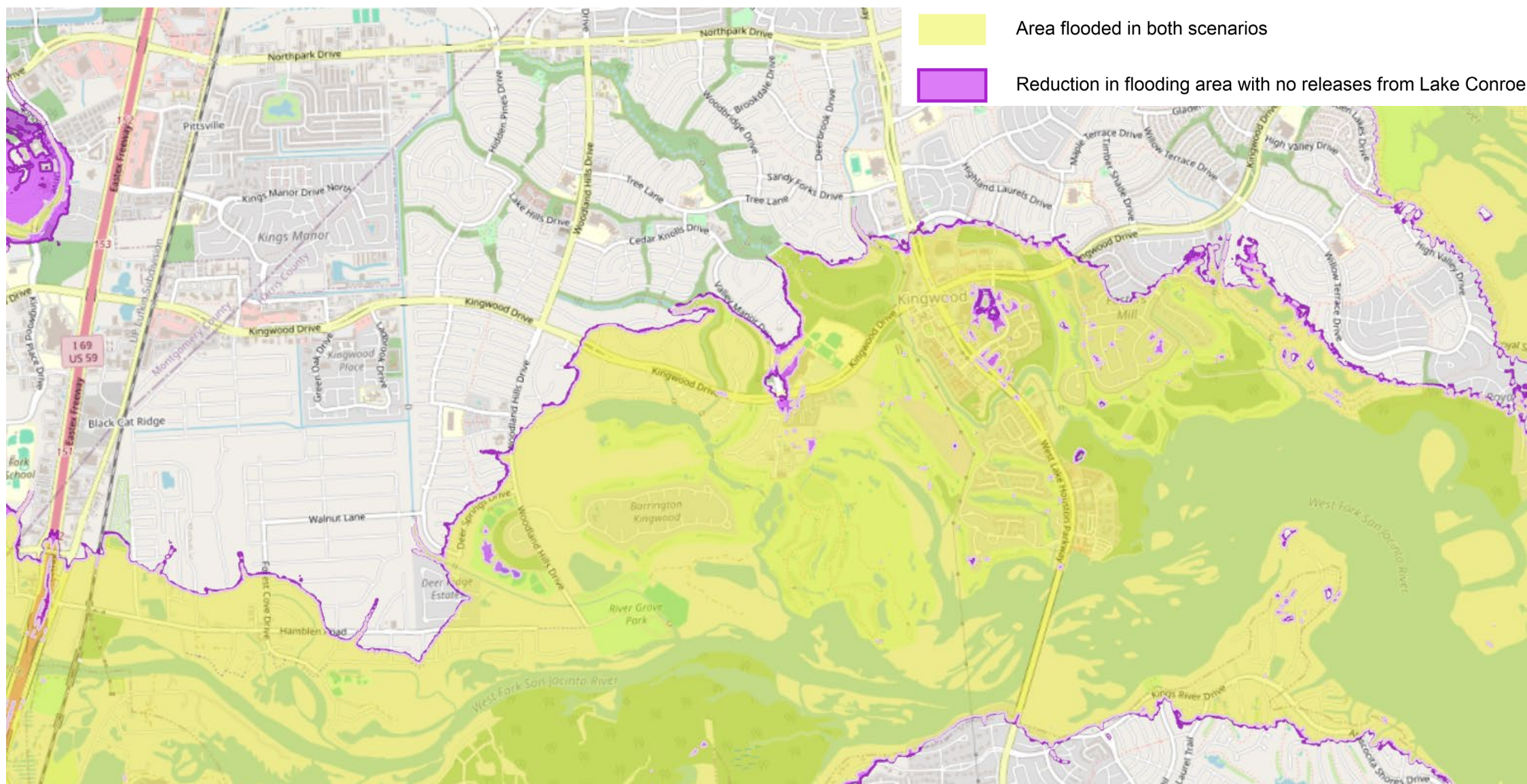
Hypothetical "what-if" scenario to gauge the potential maximum influence that Lake Conroe has on the downstream areas of concern.

Note: This scenario is presented as a reasonable bounding estimate of the maximum potential benefit that Lake Conroe could have practically provided for downstream impacted areas. It does not represent a realistic real-world scenario as Lake Conroe is required to discharge during large storm events to maintain the integrity of the dam.

What if Lake Conroe did not release during Hurricane Harvey?



What if Lake Conroe did not release during Hurricane Harvey?



What these results mean in practical terms

Engineering finding

Pre-lowering reduces peak releases and produces a reduction in water surface elevation immediately downstream from the dam.

Downstream benefits attenuate sharply as Lake Creek, Spring Creek, and the other tributaries add flow to the West Fork system.

Benefits in the Kingwood / Lake Houston area fall off sharply and produce no effective flood reduction.

Why the benefit dissipates downstream

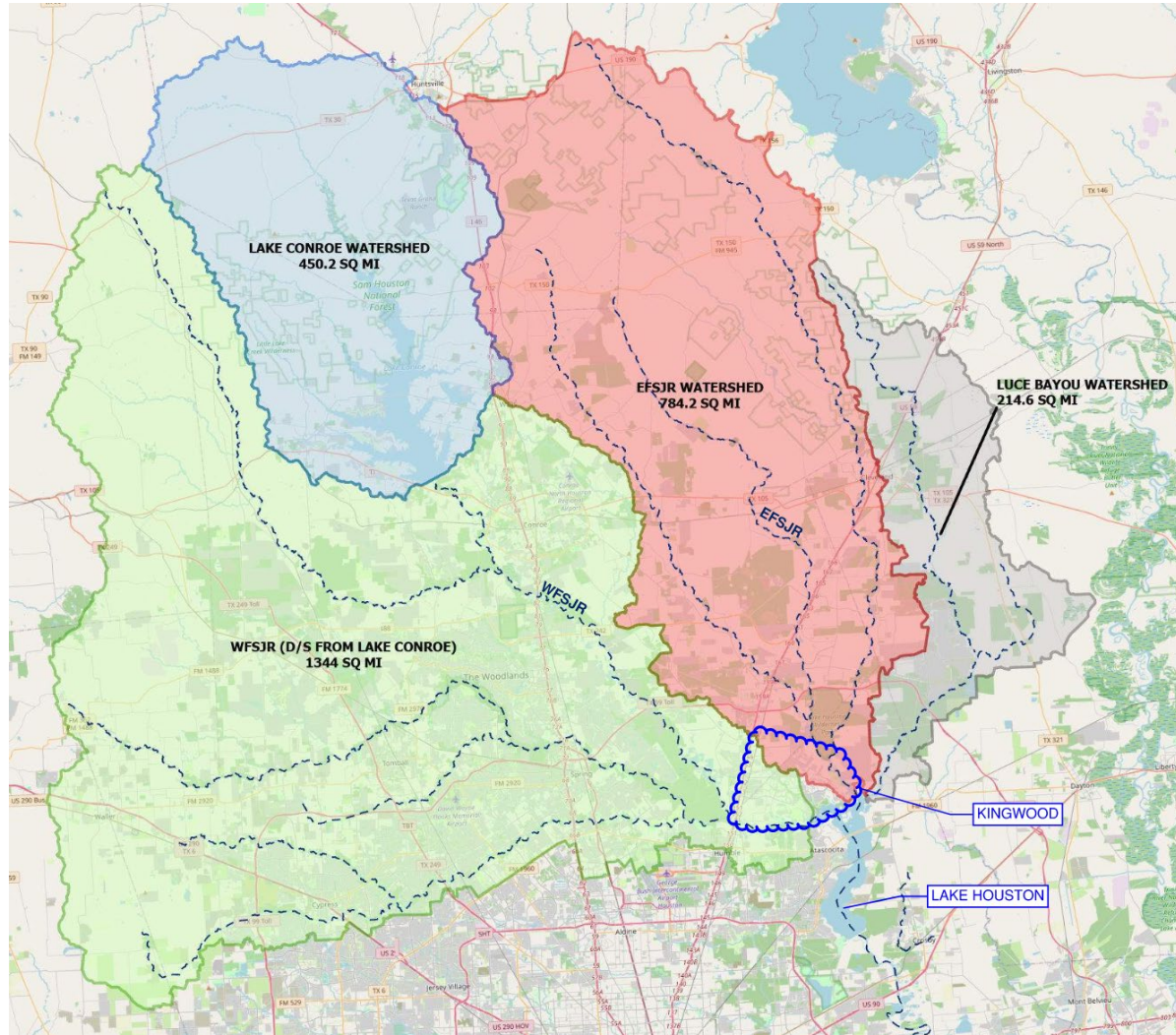
Kingwood and Lake Houston are at the downstream end of the system, where Lake Conroe's share of total flow is smallest and where multiple uncontrolled tributaries have significant influence on downstream flooding severity.

Lake Houston has limited controlled release capacity and receives significantly more inflow than it can discharge during major storms.

Real world storm variability, storm centering, tributary timing, and starting lake conditions determine the impact of actual storm events on the downstream communities that are prone to flooding.

Finding 2: Watershed Proportionality

Lake Conroe relative to all other tributary watersheds feeding into Lake Houston



West Fork San Jacinto watershed and contributing area to Lake Houston

- By drainage area:
 - 25 percent of the area near Kingwood,
 - 16 percent of the area draining to Lake Houston
- By runoff volume
 - SJMDP study attributes 12.2 percent of Lake Houston's 1% annual chance (100-year storm) inflow to Lake Conroe
- By Harvey peak flow:
 - Lake Conroe's 79,100 cfs release was roughly 19 percent of the 410,000 cfs peak inflow, and the two peaks did not coincide
- 12%-19% of Lake Houston inflow originates in the Lake Conroe watershed. The remaining 81% to 88 % from other tributaries.
- Two feet of lowering at Lake Conroe equals ~44,000 ac-ft of added storage
 - ~17 % of the runoff volume discharged through the Lake Conroe Dam during the 1% (100-year) event.

What the SJMDP regional study concluded about the West Fork

Table 15: Watershed Mitigation Potential

	Benefit in Watershed	Open Space	Regional Reductions	Potential
Luce Bayou		✓		Low
East Fork	✓	✓	✓	High
Peach Creek	✓	✓	✓	High
Caney Creek	✓	✓	✓	High
West Fork	✓			Low
Lake Creek		✓	✓	Moderate
Spring Creek	✓	✓	✓	High
Willow Creek	✓			Low
Little Cypress	✓			Low
Cypress Creek	✓			Low
Jackson Bayou				Low

SJMDP Table 15 - Watershed Mitigation Potential

The SJMDP ranked every subwatershed for flood mitigation potential. Spring Creek, the East Fork, Caney Creek, and Peach Creek were rated High. Lake Creek was rated Moderate.

The West Fork was rated Low and received no regional reduction designation.

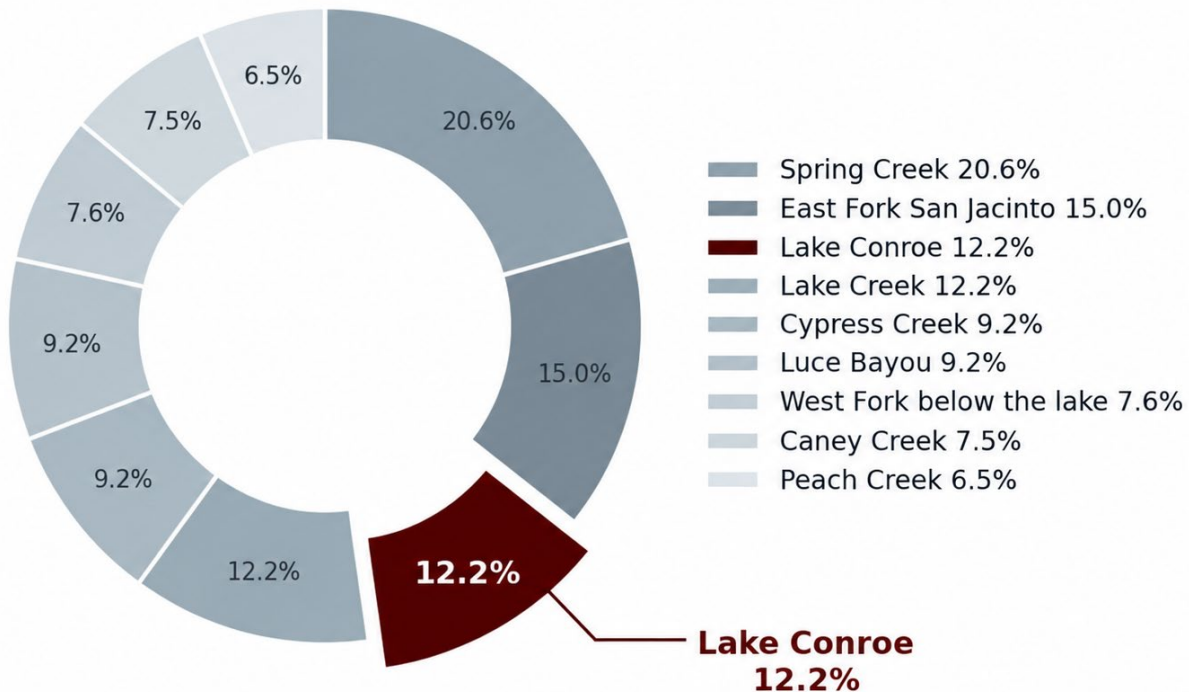


SJMDP Figure 17 - Lake Houston Zone of Influence

The SJMDP study also mapped Lake Houston’s zone of influence upstream to West Lake Houston Parkway and noted that water surface elevations there are “primarily influenced by Lake Houston Dam.”

Where Lake Houston's inflow comes from (SJMDP)

100-year storm event (1% annual chance event)
total inflow volume to Lake Houston = 620 billion gallons



SJMDP Data: Of the 620 billion gallons that reach Lake Houston in a 100-year storm event, the Lake Conroe watershed contributes 12.2% of Lake Houston's inflow volume.

Lake Houston Inflow

- Two feet of lowering is about 44,000 ac-ft, **only roughly 2.3% of the total** 100-year storm event inflow volume to Lake Houston
- Spring Creek, the East Fork, Lake Creek, and Cypress Creek combined contribute more than 50% of the inflow volume to Lake Houston during a 100-year storm event
- Lake Conroe / WFSJR is the only subbasin within the Lake Houston watershed that has a controllable reservoir outflow with enough above normal pool capacity to have regional influence.

Source: SJMDP Executive Summary, Figure 1.7 — 1% annual chance inflow volume to Lake Houston

Conclusion

What the study found

Pre storm lowering does not produce an effective reduction in downstream flooding severity within the Kingwood and Lake Houston areas.

This study quantifies the potential benefits produced by a variety of storm events and hypothetical gate release ranges and compares with non-lowered scenarios to evaluate reductions in flooding extents and elevations. This result was consistent across a range of assumed pre-lowering elevations and Lake Conroe release assumptions.

Only a small share of the runoff reaching Lake Houston passes through Lake Conroe, limiting the ability of lowering to reduce regional flooding.

What the study does not say

It does not say the Lake Conroe dam provides no benefit.

Severe flooding in the watershed is a major problem. This study does not seek to diminish or dismiss the associated cost or burden associated with these historical events.

Other regional flood-mitigation measures warrant further evaluation, particularly in tributaries where the SJMDP regional plan identifies greater potential to reduce flooding.

Lake Conroe stores floodwater by design from its watershed. The limited downstream benefit of a lake lowering program does not diminish the importance of that retention function.

A regional flood problem needs a regional solution, sized and placed where it will have the most effective and efficient benefit for downstream impacted communities.