Reducing uncertainty in estimating rare flood events using paleoflood analyses: Insights from an investigation near Stillhouse Hollow Dam, Texas

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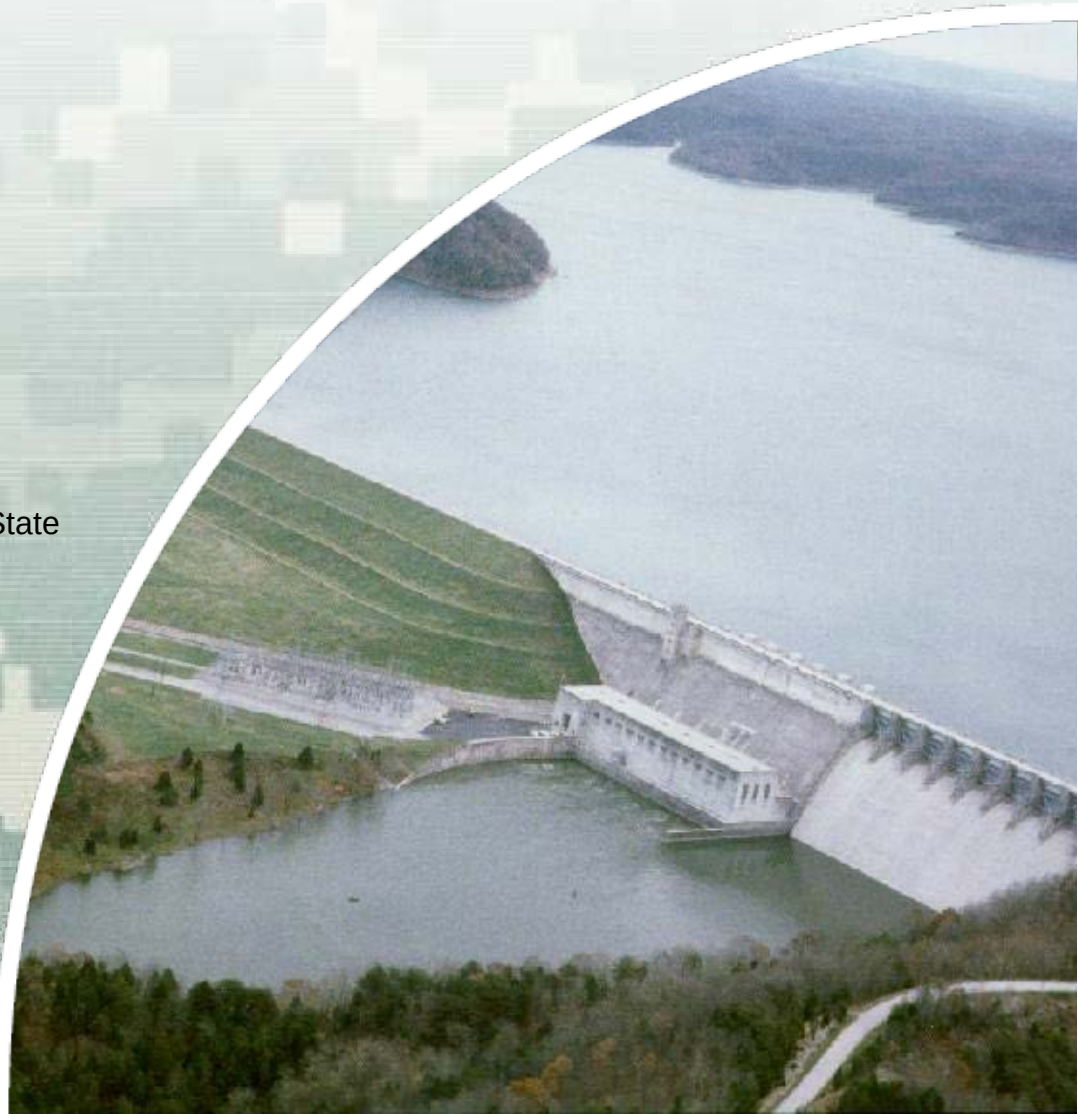

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Introduction

A reconnaissance-level paleoflood investigation to **characterize rare hydrologic events** near Stillhouse Hollow Dam, Texas, to extend flood-frequency analyses beyond the systematic record.

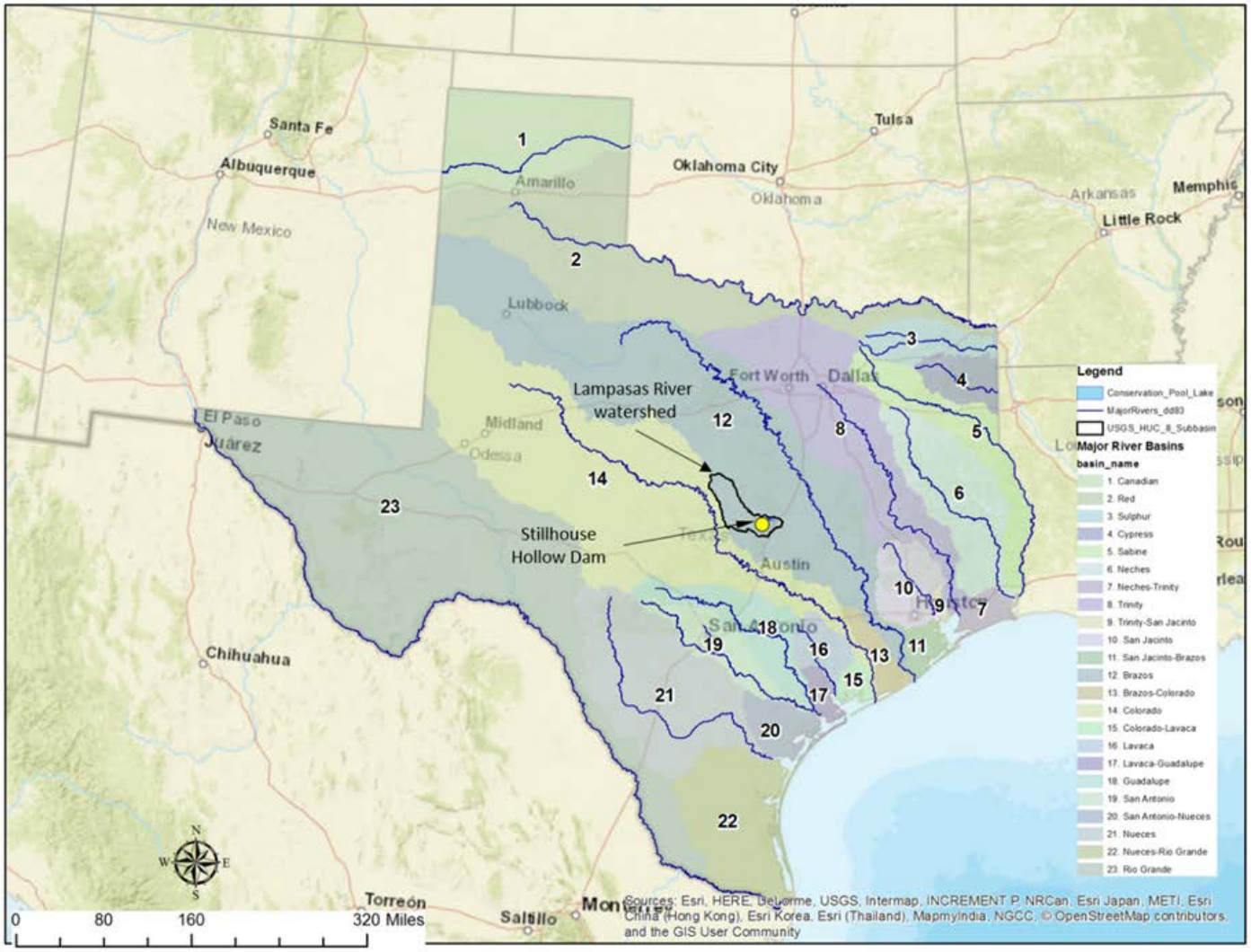
The purpose was to provide paleoflood estimates in light of risk-informed dam safety decision making and uncertain hydrologic loadings.

Investigated several remnant flights of **Holocene riverine terrace surfaces** along the Lampasas River near Stillhouse Hollow Reservoir that were used as physical evidence of past large floods.

Outline

- Physical setting
- Riverine Terraces
- Field data: PSI and NEB
- Peak flow frequency analysis
- Summary.

Physical Setting



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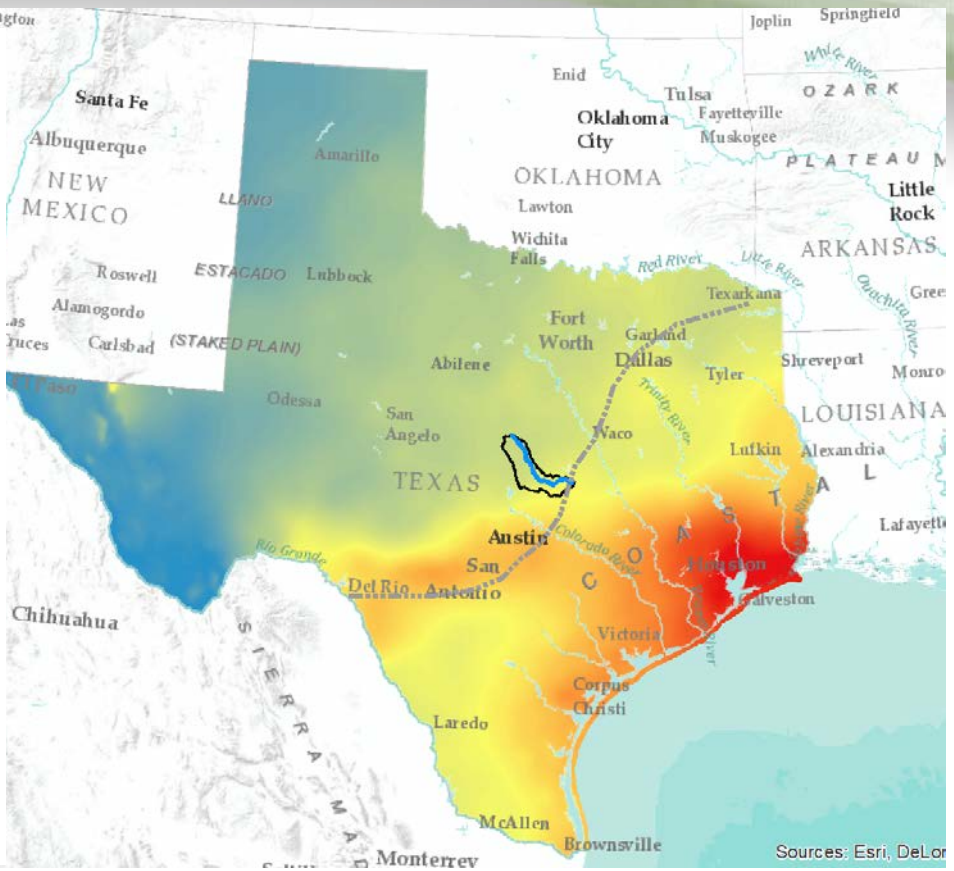
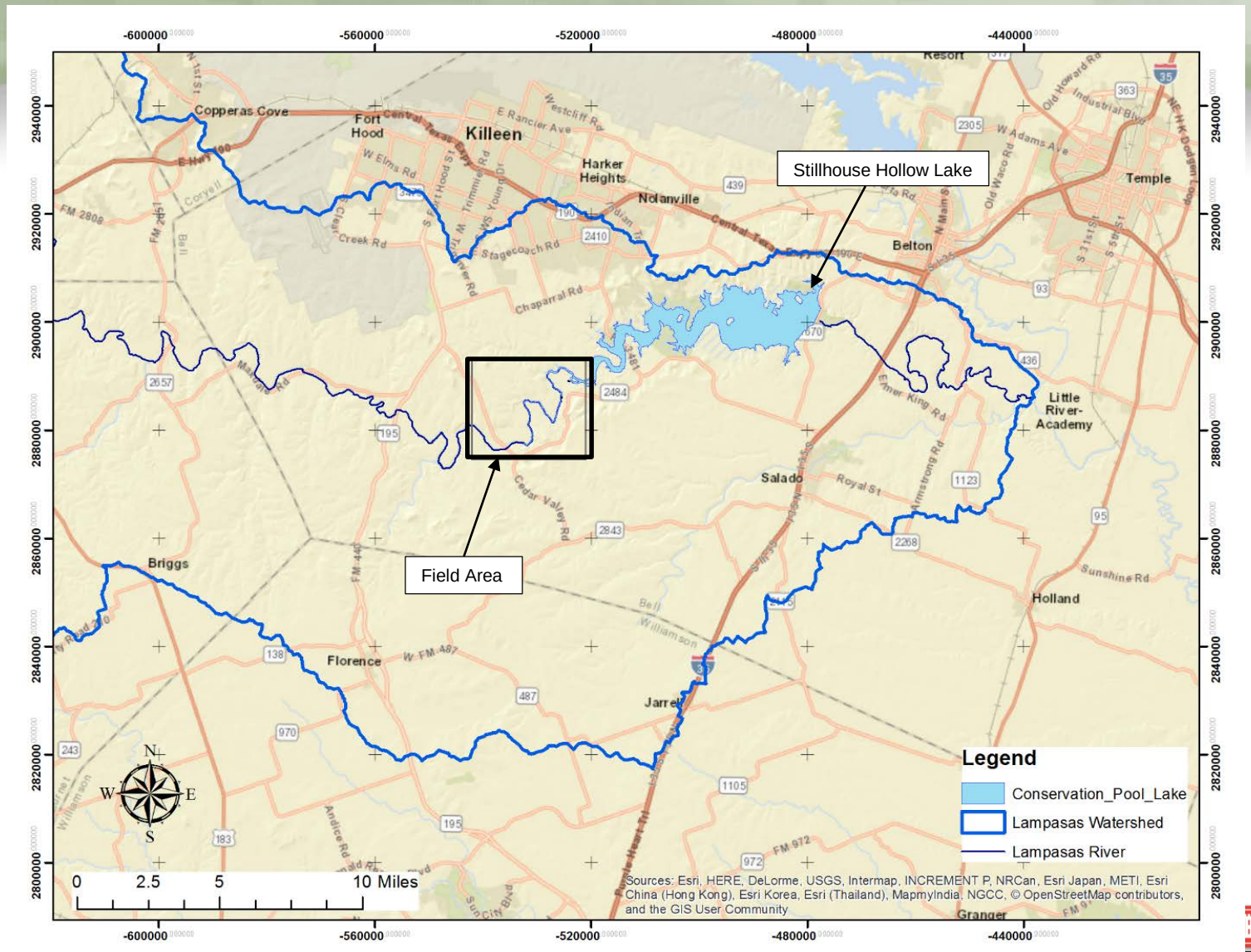
Physical Setting

Shaded elevation relief map



NOAA Atlas 14: 100-yr, 24-hr precip.

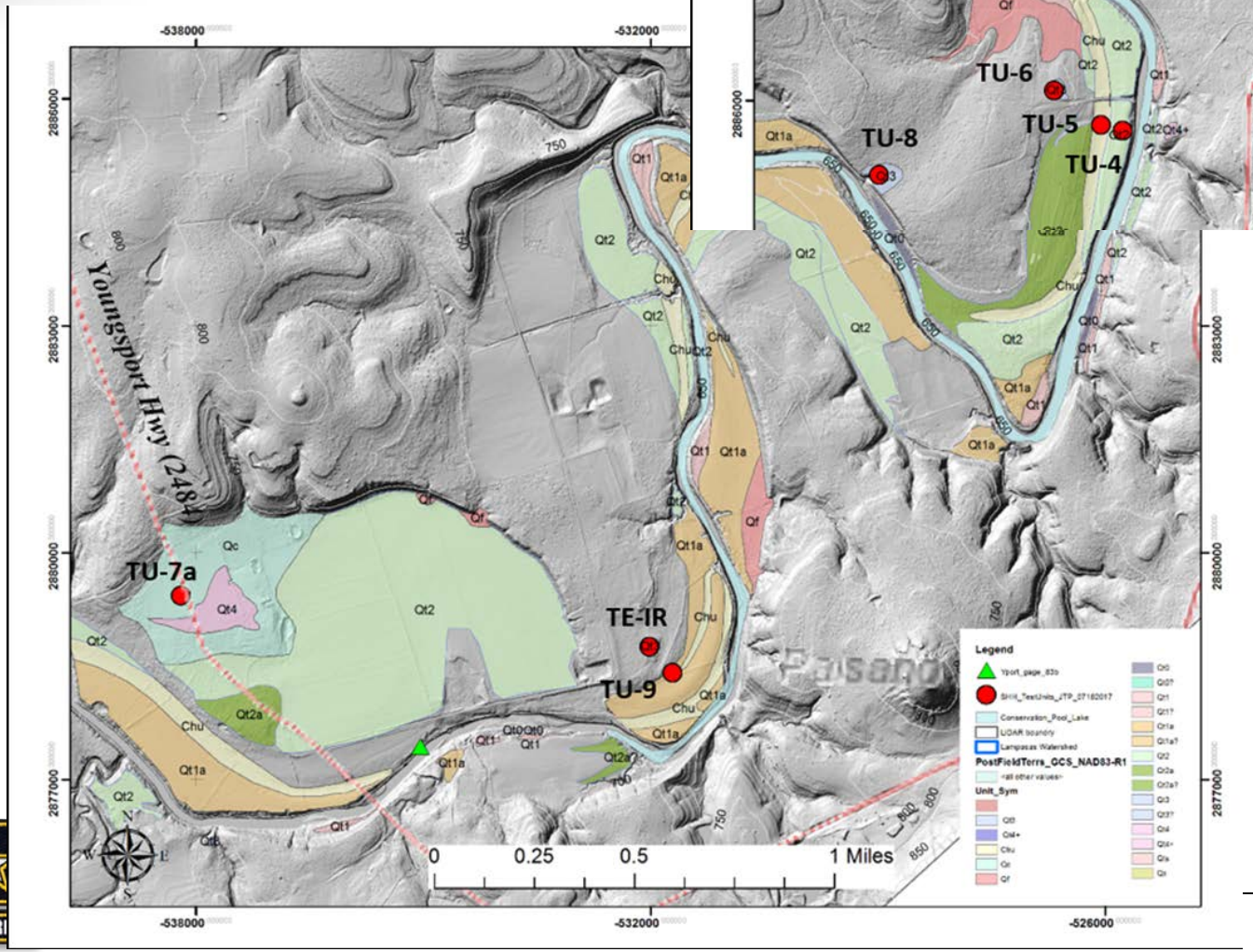
Physical Setting



Physical Setting

Riverine Terraces

Riverine Terraces



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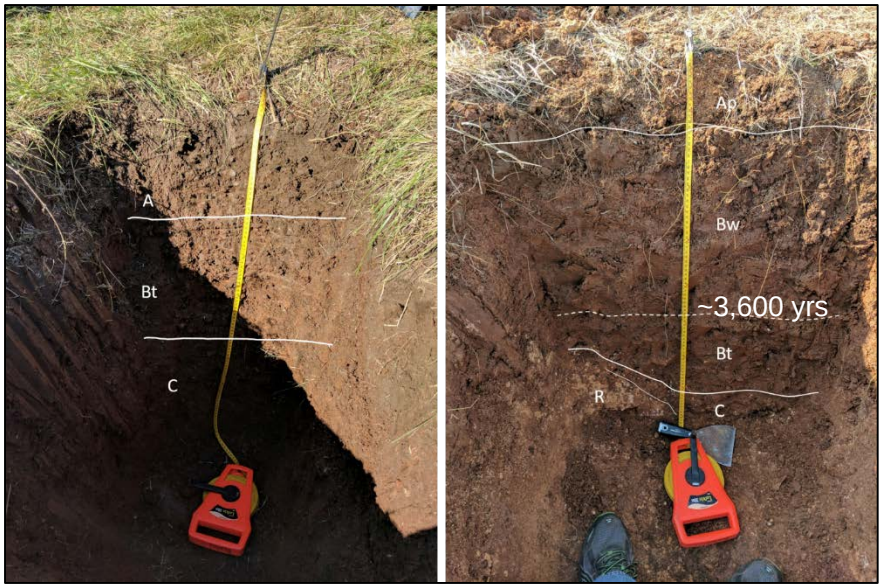
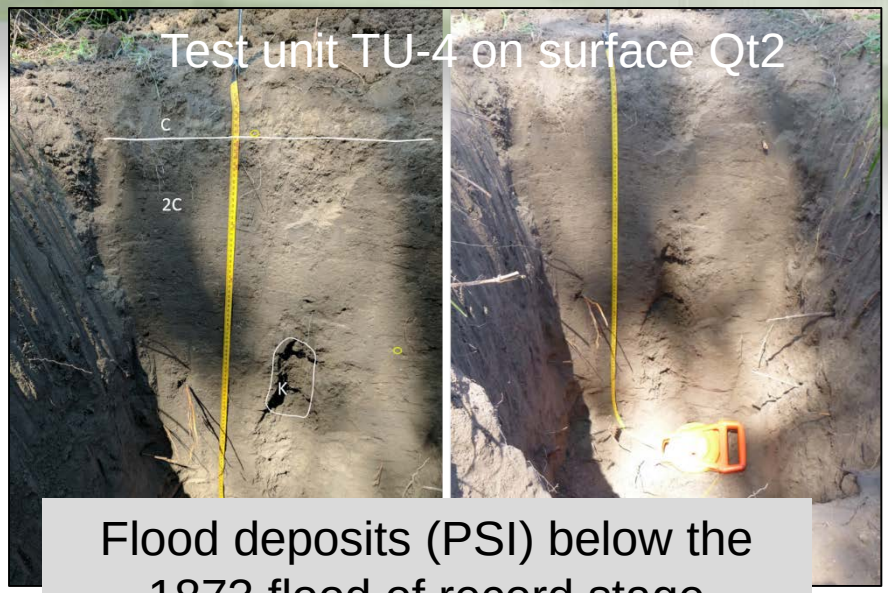
Field Data: NEB and PSI

Non-exceedance bound (NEB)

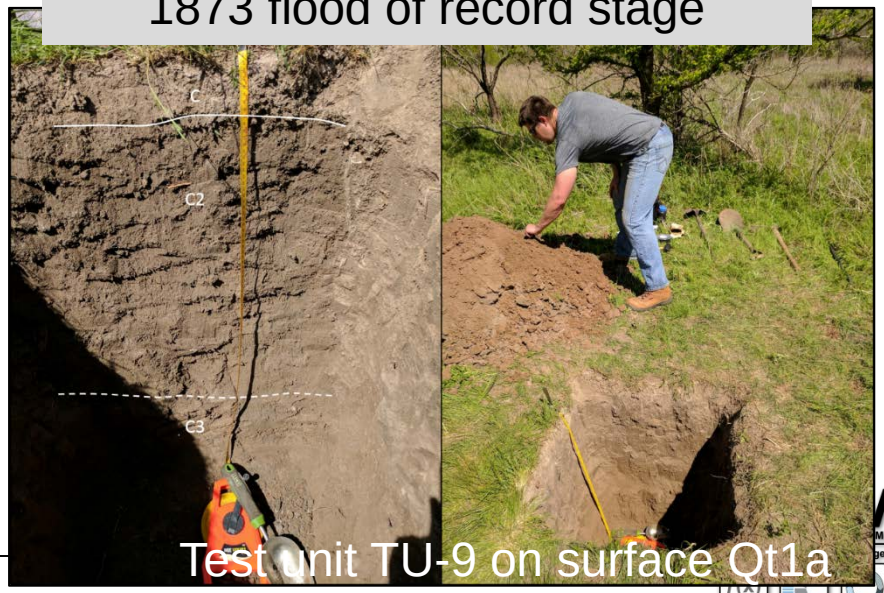


Test unit TU-6 on surface Qt3



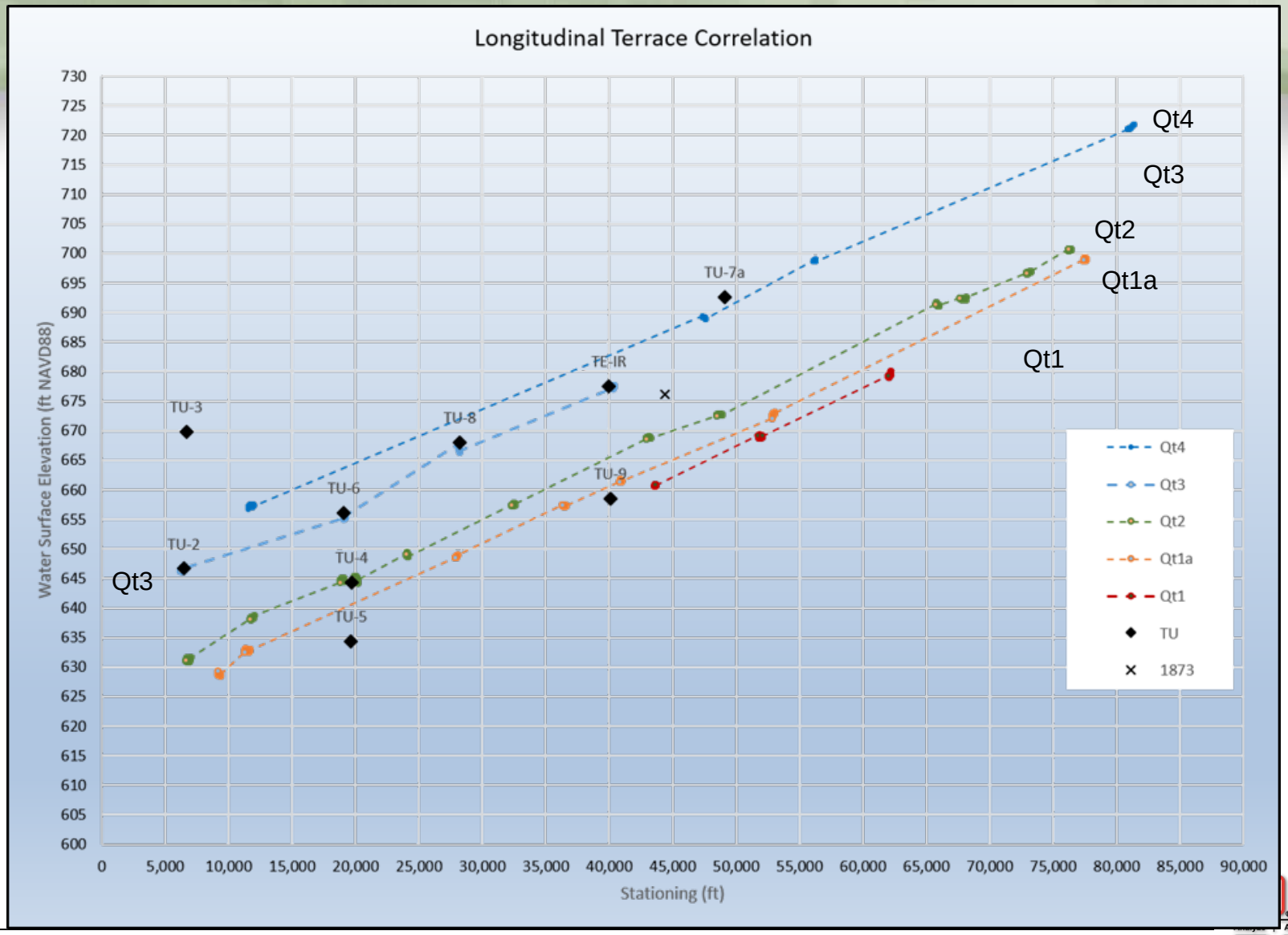
Test unit TU-4 on surface Qt2

Flood deposits (PSI) below the 1873 flood of record stage

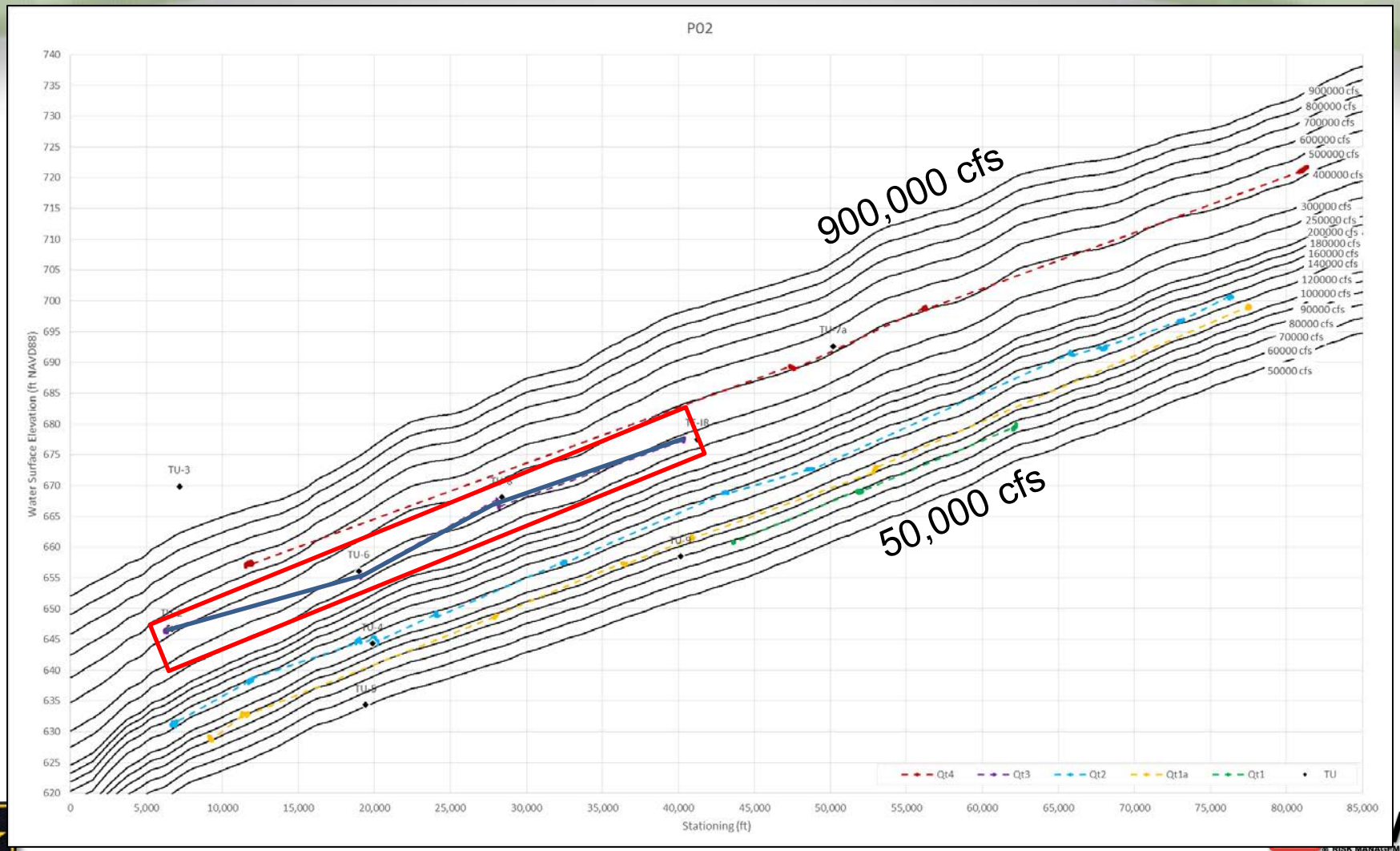


Test unit TU-9 on surface Qt1a

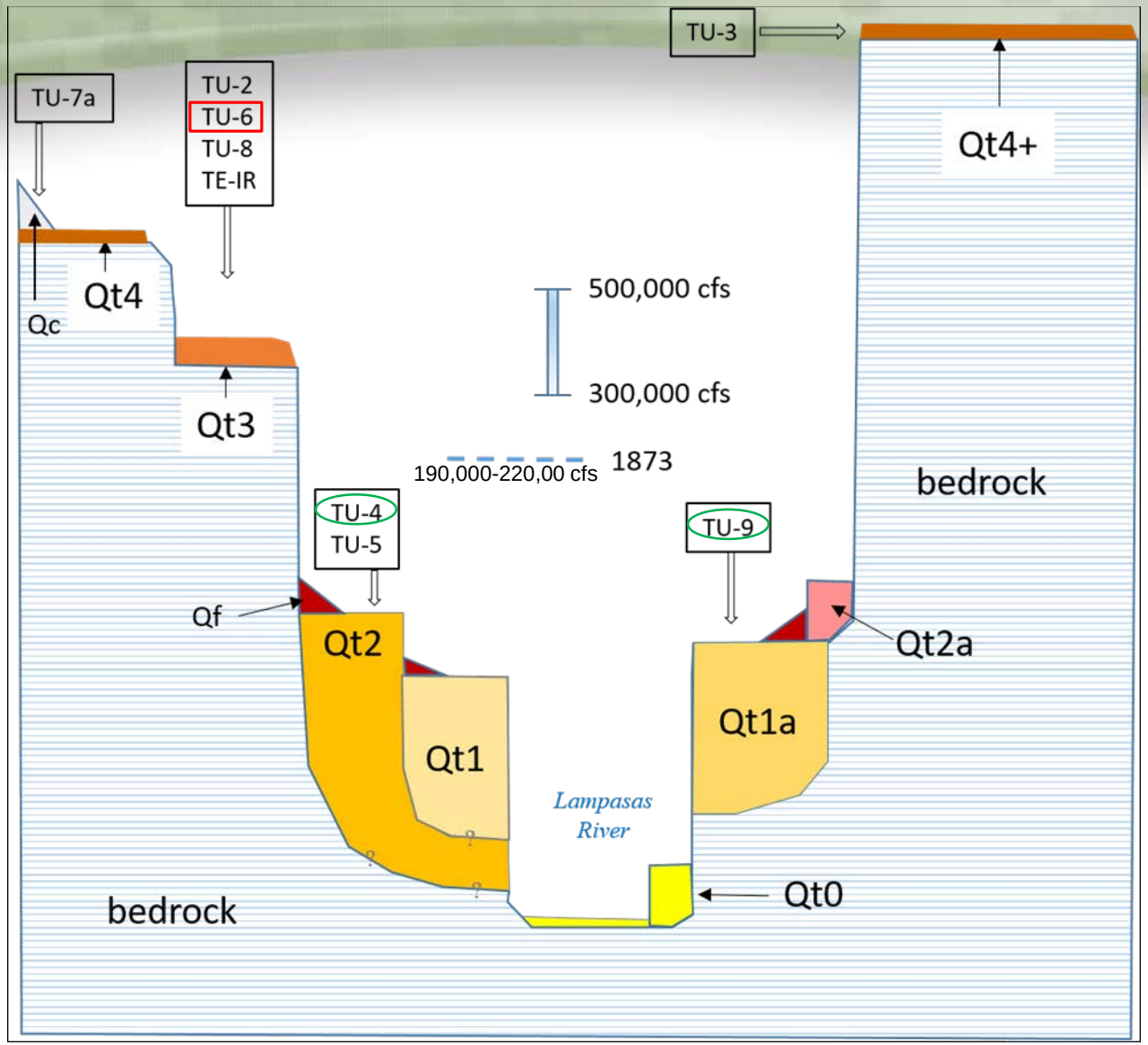
Field Data


Longitudinal Terrace Correlation
Water Surface Elevation (ft NAVD88)
Stationing (ft)
730
725
720
715
710
705
700
695
690
685
680
675
670
665
660
655
650
645
640
635
630
625
620
615
610
605
600
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
60,000
65,000
70,000
75,000
80,000
85,000
90,000
TU-3
TU-2
TU-6
TU-8
TU-4
TU-5
TU-7a
FE-IR
TU-9
Qt4
Qt3
Qt2
Qt1a
Qt1
Qt3
Qt4
Qt3
Qt2
Qt1a
Qt1
TU
1873

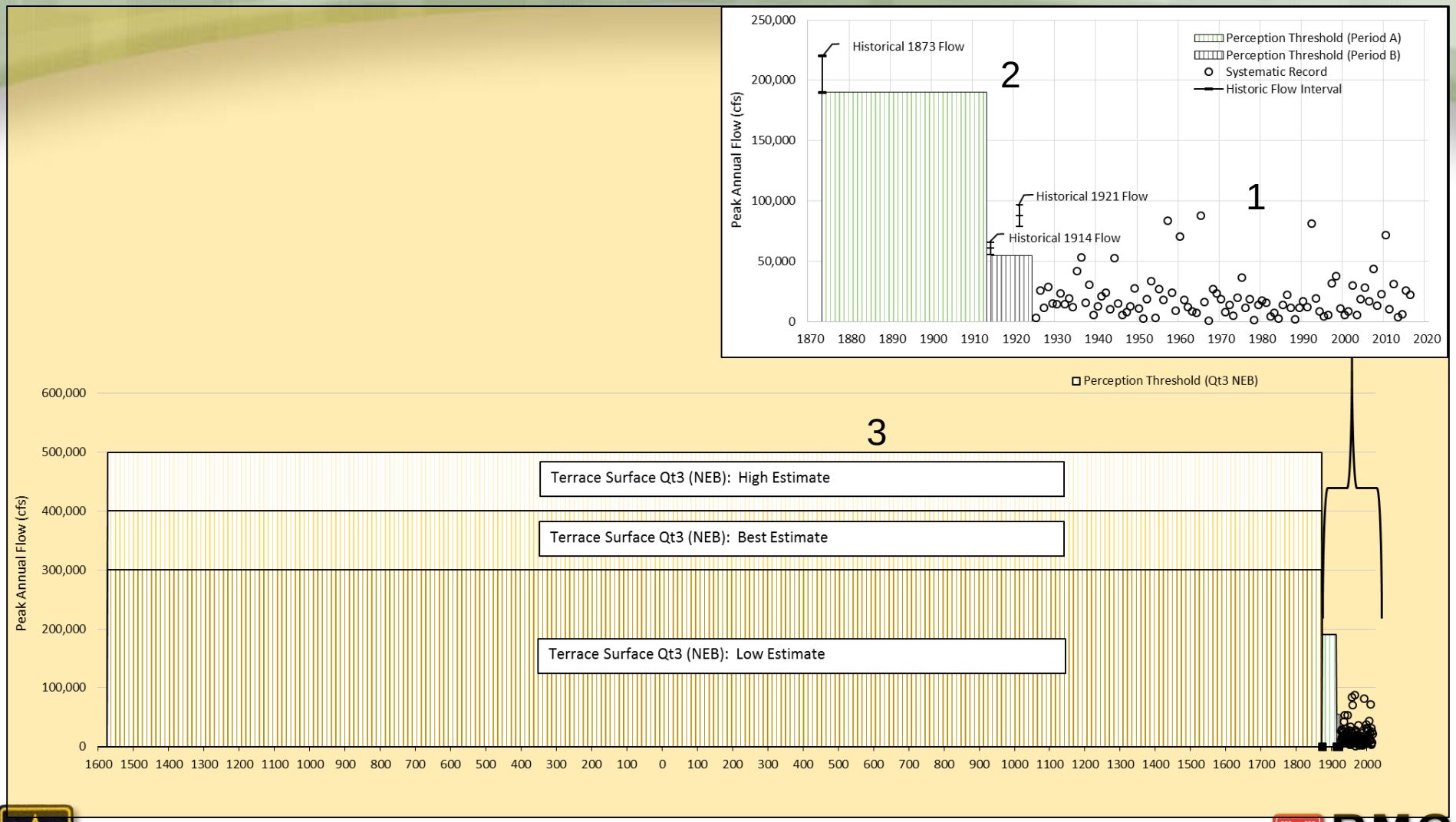
Paleodischarges



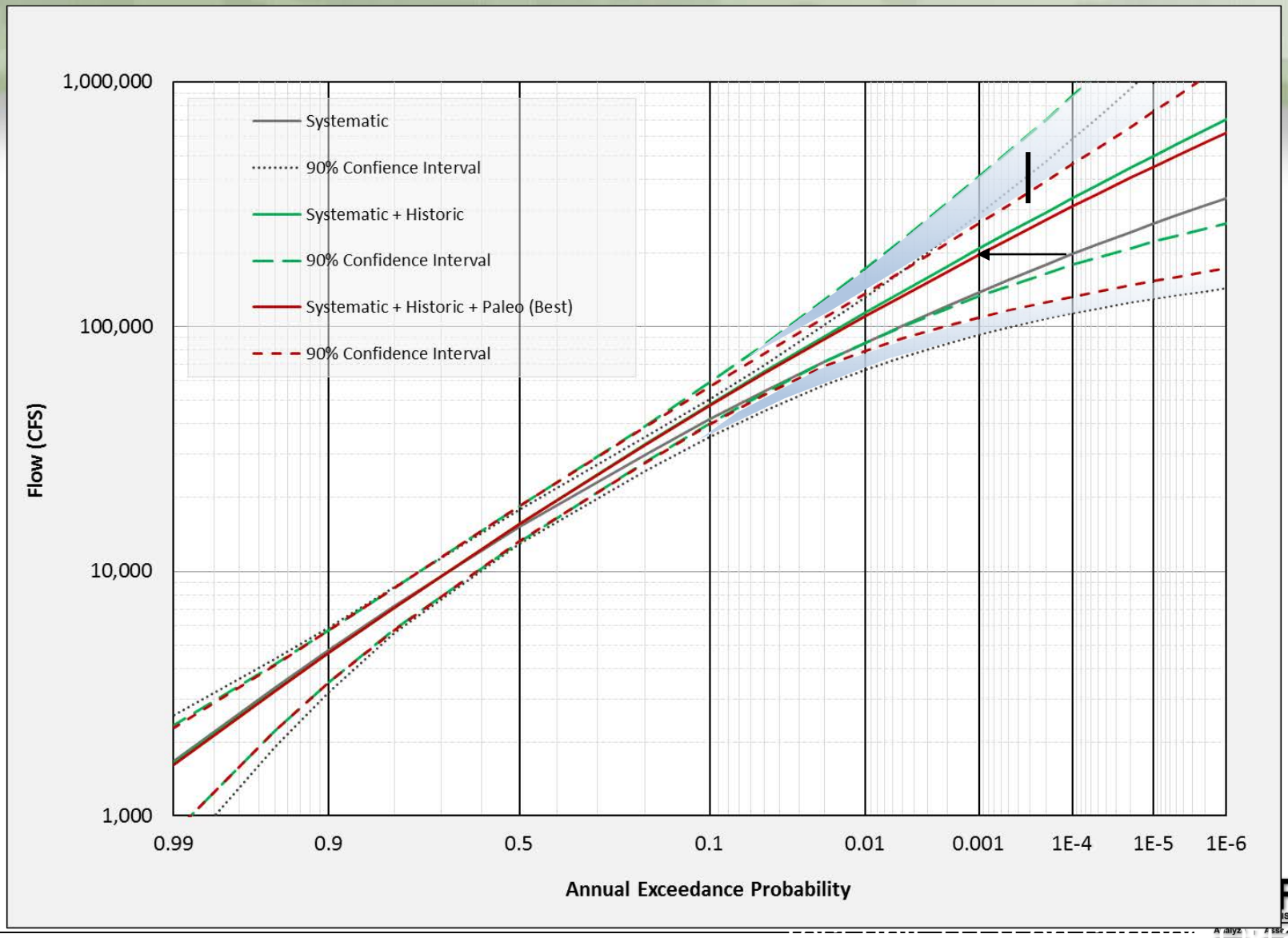
Geomorphic Model



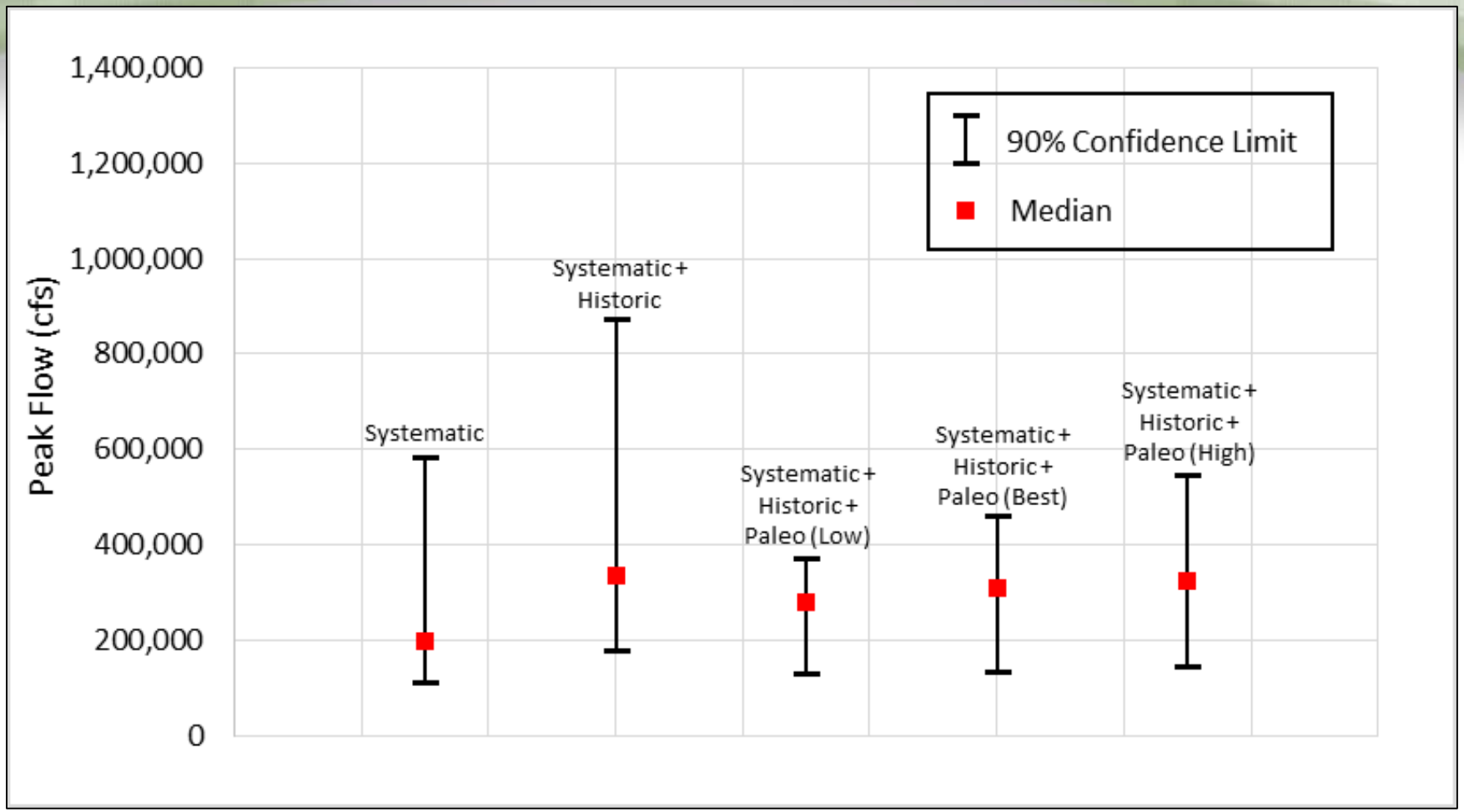
Perception Thresholds



Peak Flow Freq. Analysis

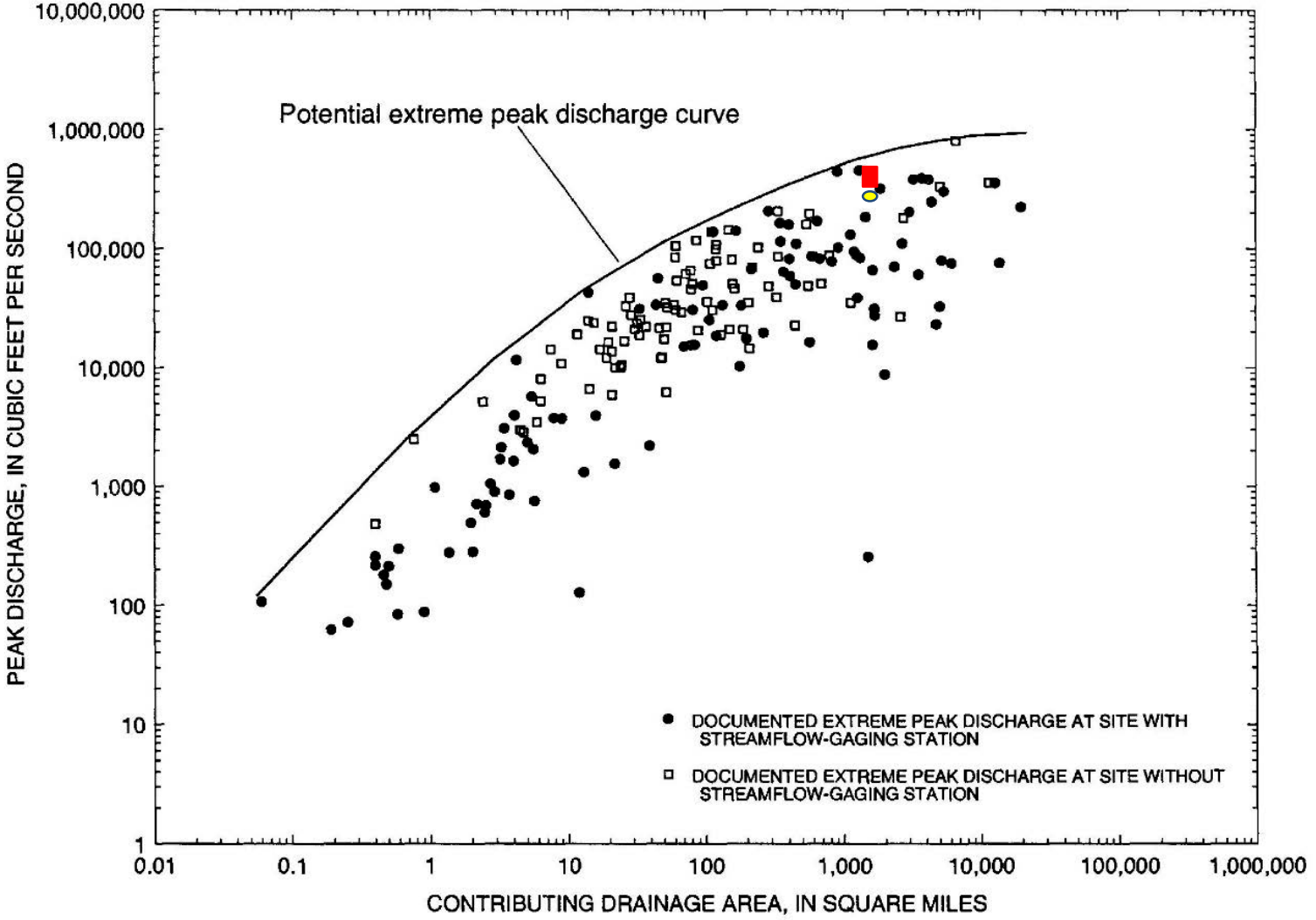


Peak Flow Freq. Analysis



At 1/10,000 annual exceedance probability

Peak Flow Freq. Context



Asquith and Slade (1995), TX Region 4

Summary

Riverine terraces are used to characterize the presence or absence of physical records of past rare flood events.

For this watershed, including historical large flood events to the systematic record had the effect of “making” large floods more frequent.

Using the paleodischarge non-exceedance bound estimation to the systematic-plus-historical record slightly shifted the frequency curve to the right, however,

Addition of paleoflood NEB to the systematic-plus-historical **record reduces uncertainty** in the peak discharge estimates at the 1/10,000 AEP by about a factor of 1.5, and **helps with describing the upper tail shape**.