

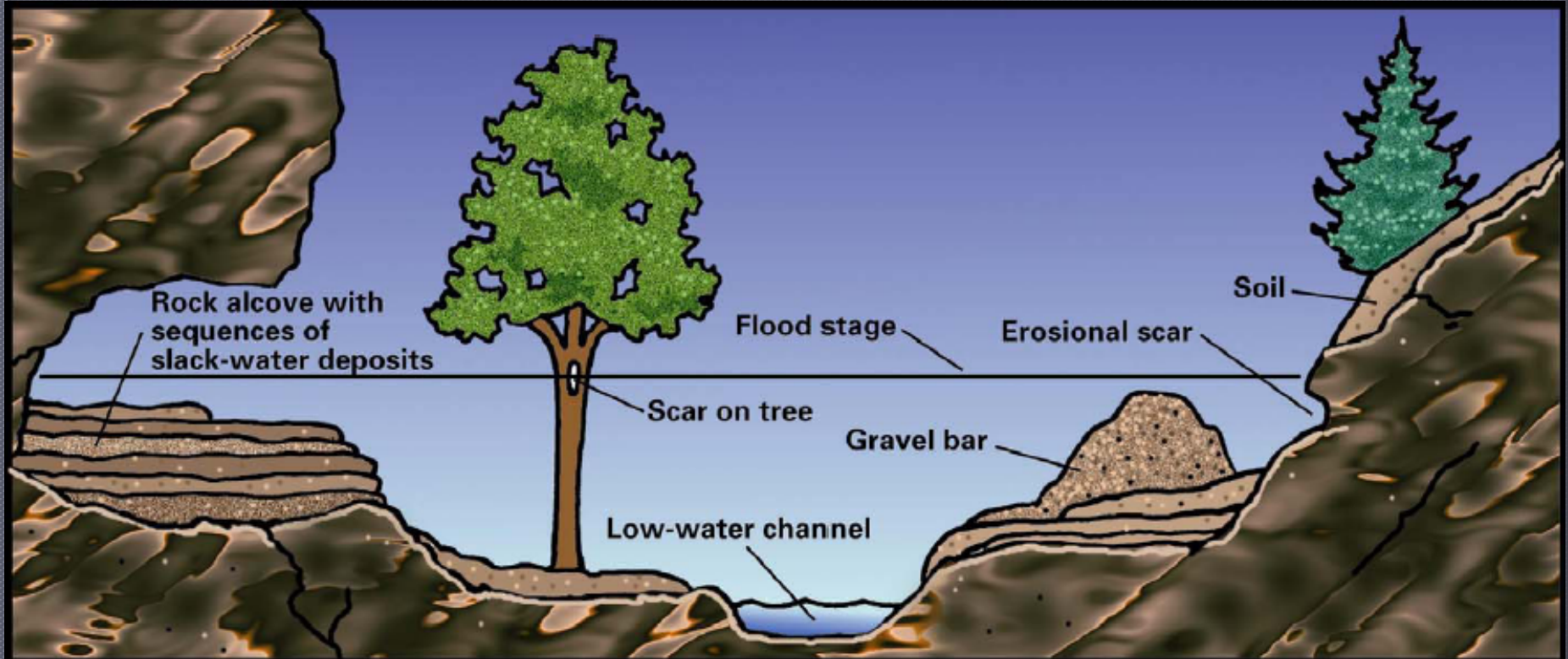
# Flood frequency analysis of the Tennessee River near Chattanooga, Tennessee using 3800 years of paleoflood data



Tess Harden – Oregon Water Science Center  
Jim O'Connor – Geology, Mineral, Energy and Geophysics

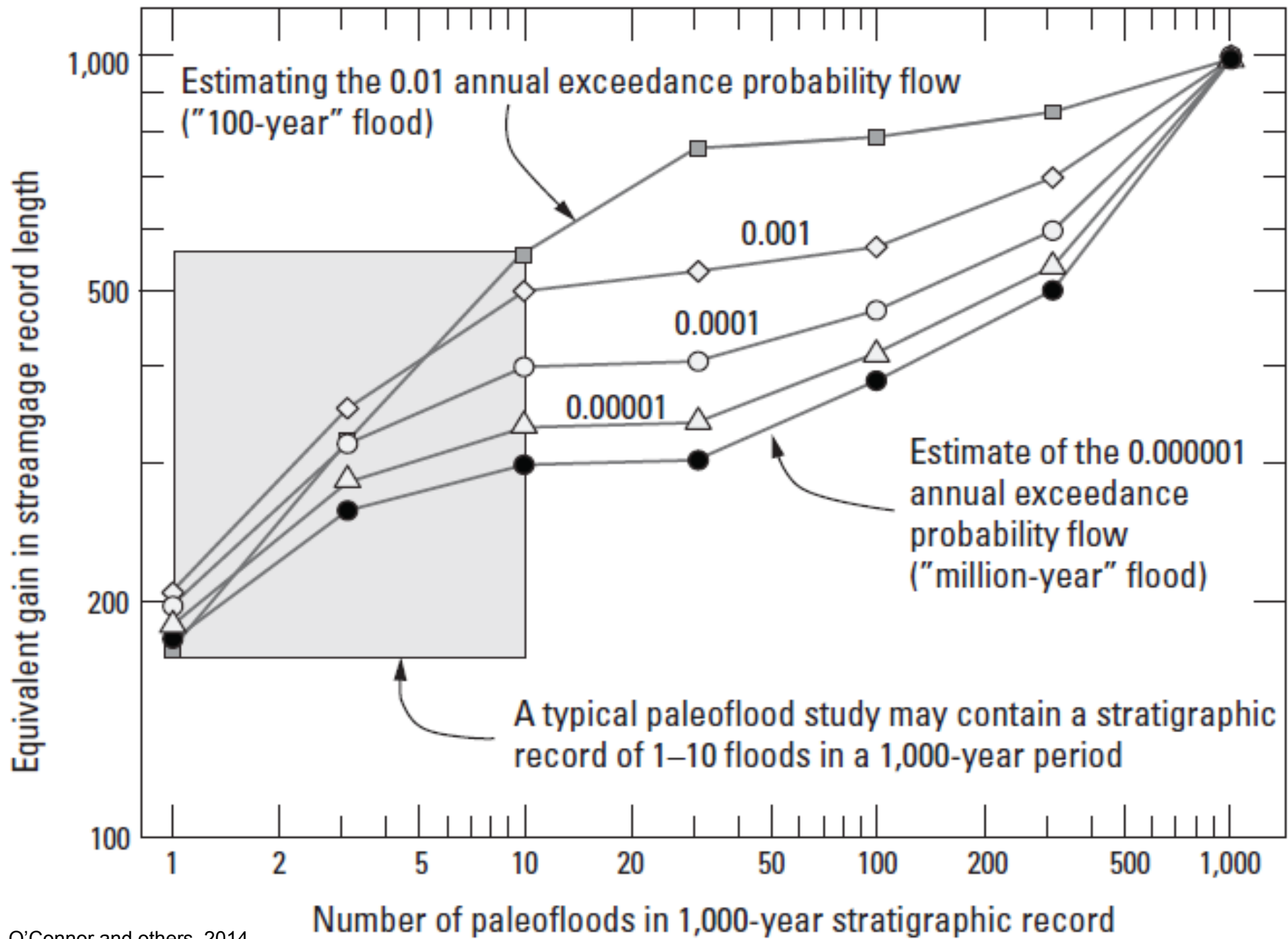
U.S. Geological Survey, Portland, OR

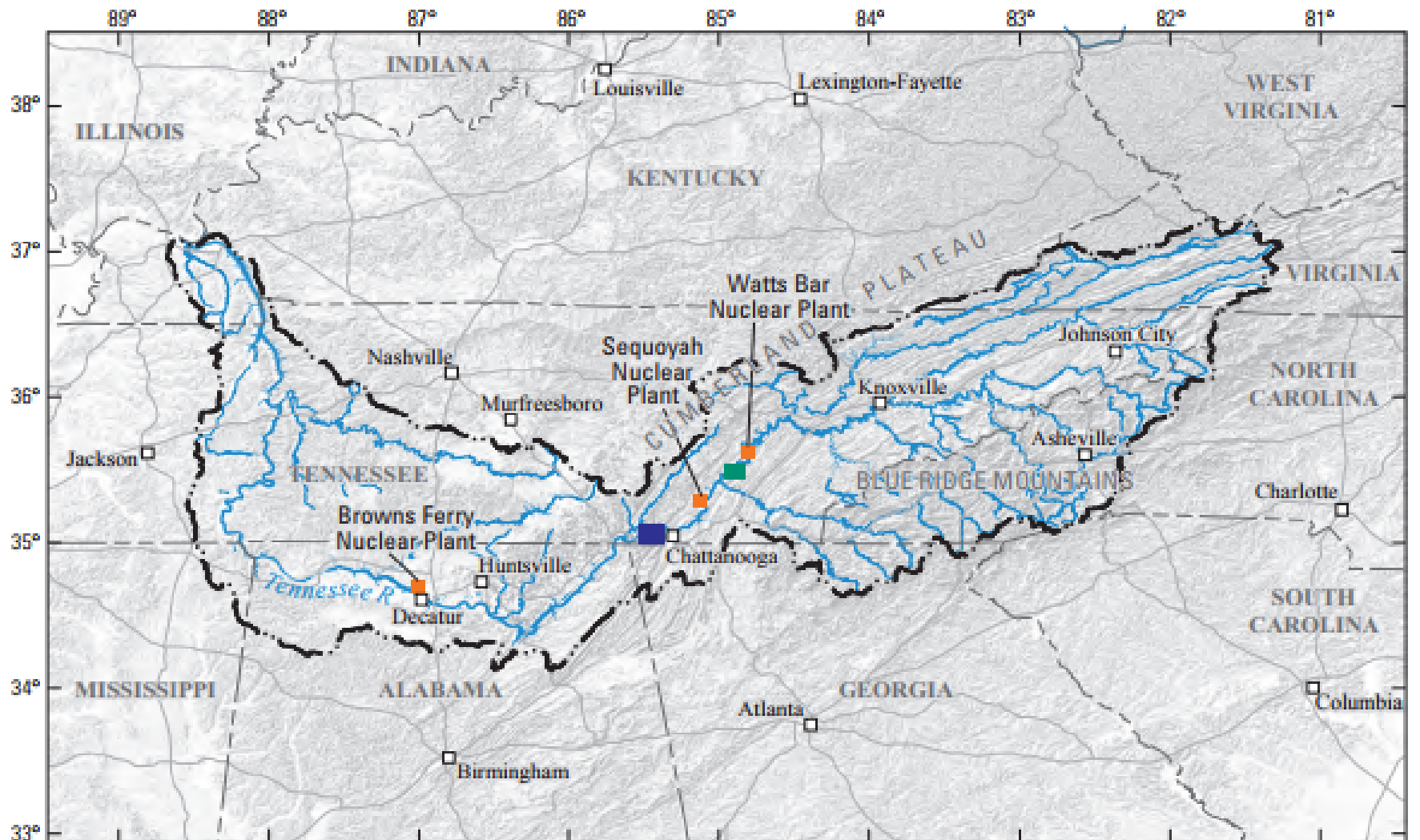
# What is “Paleoflood” Hydrology



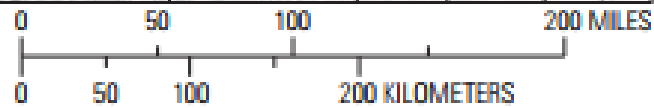
....using geologic evidence to understand flood history...







Basemap modified from U.S. Geological Survey and other digital data, various scales and dates. Coordinate reference system: GCS\_North\_American\_1927, WKID: 4267 Authority: EPSG. Horizontal datum is North American Datum of 1927.



**EXPLANATION**

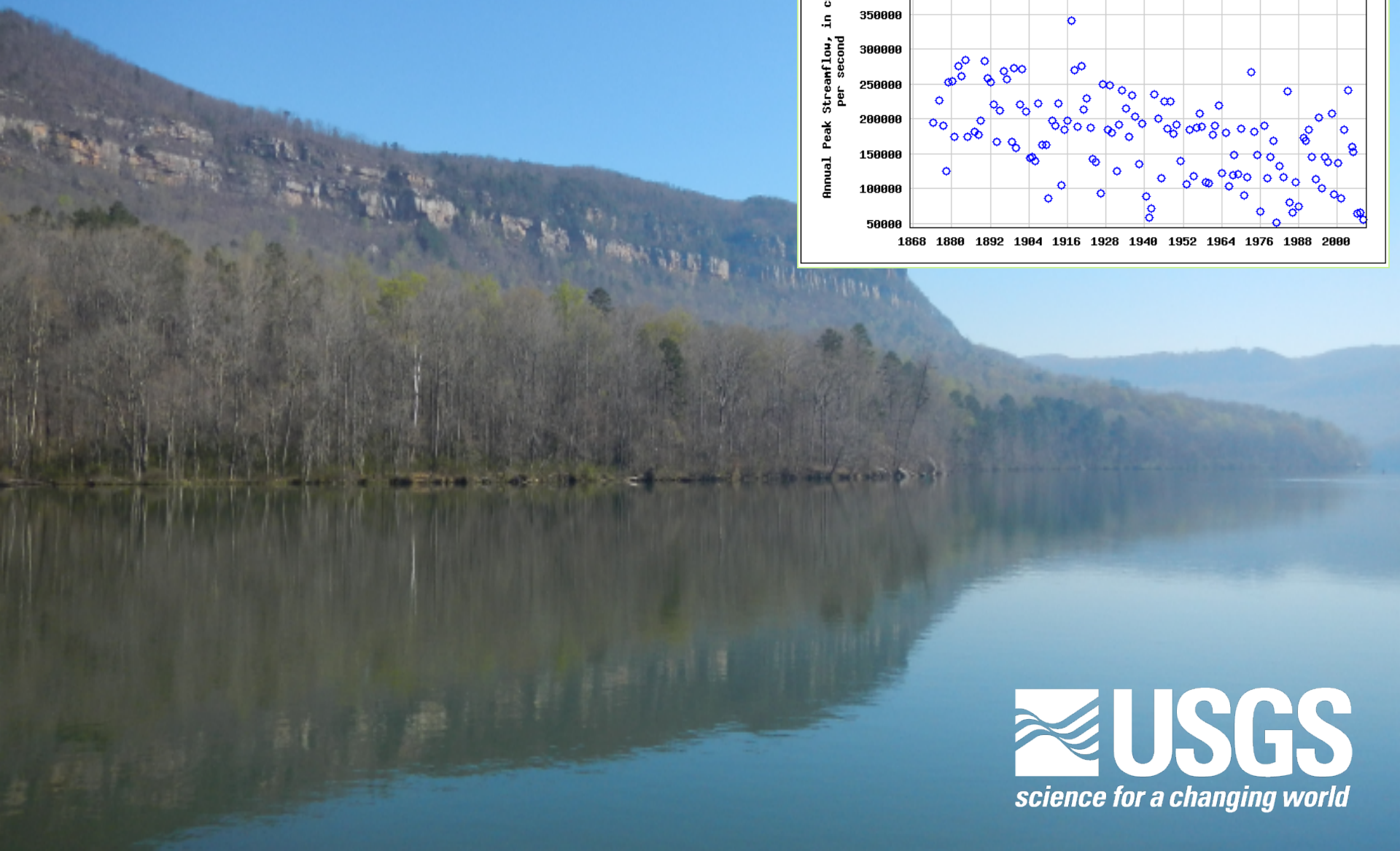
- Tennessee River Gorge, main study reach
- Eaves Ferry study reach
- Tennessee River Basin
- Nuclear power plant



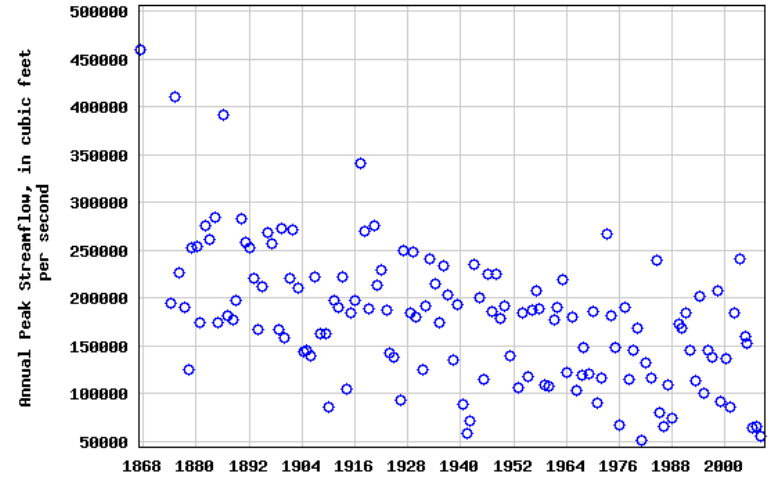


**Chattanooga**





### USGS 03568000 TENNESSEE RIVER AT CHATTANOOGA, TN







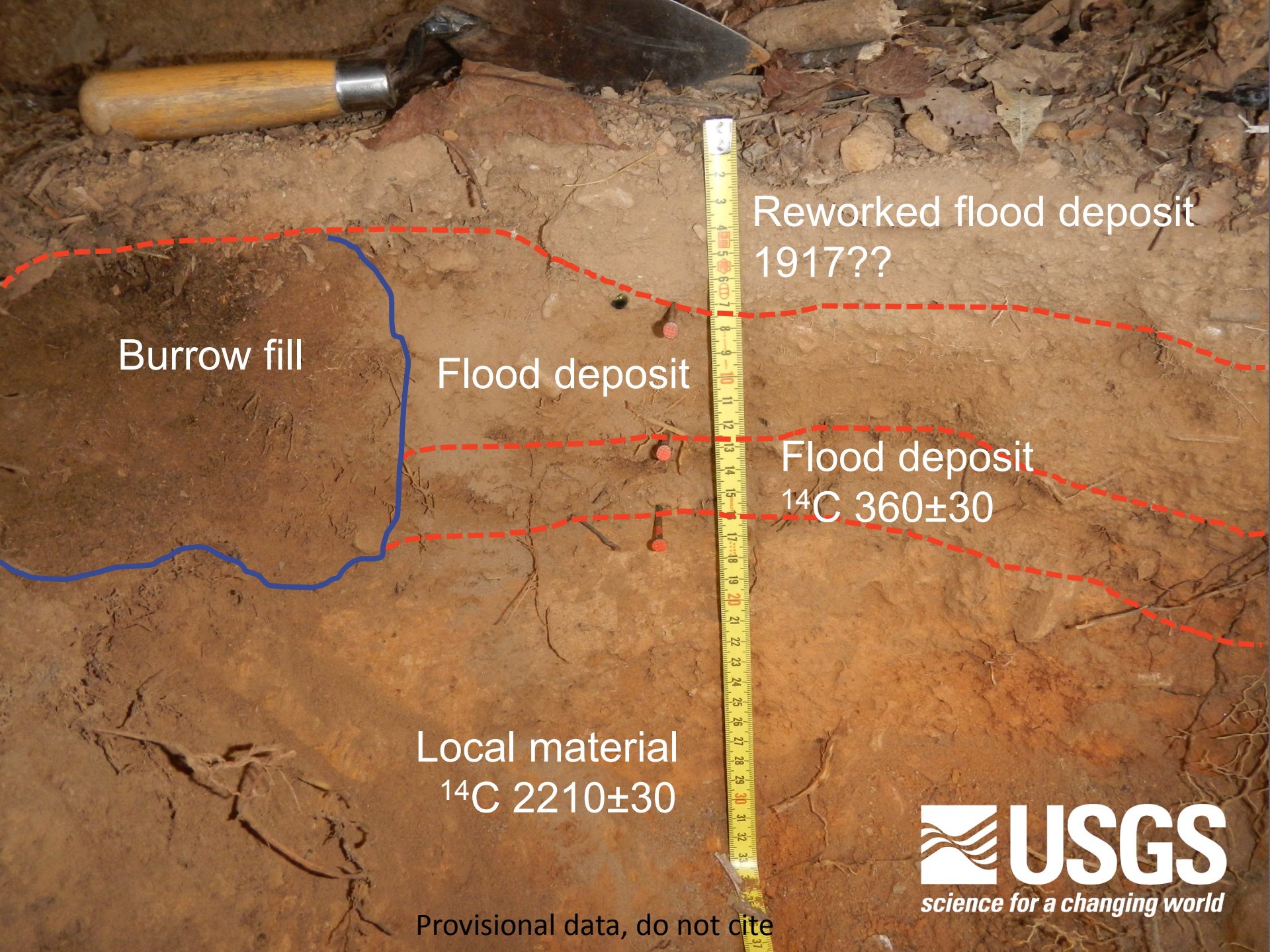












Reworked flood deposit  
1917??

Burrow fill

Flood deposit

Flood deposit  
14C 360±30

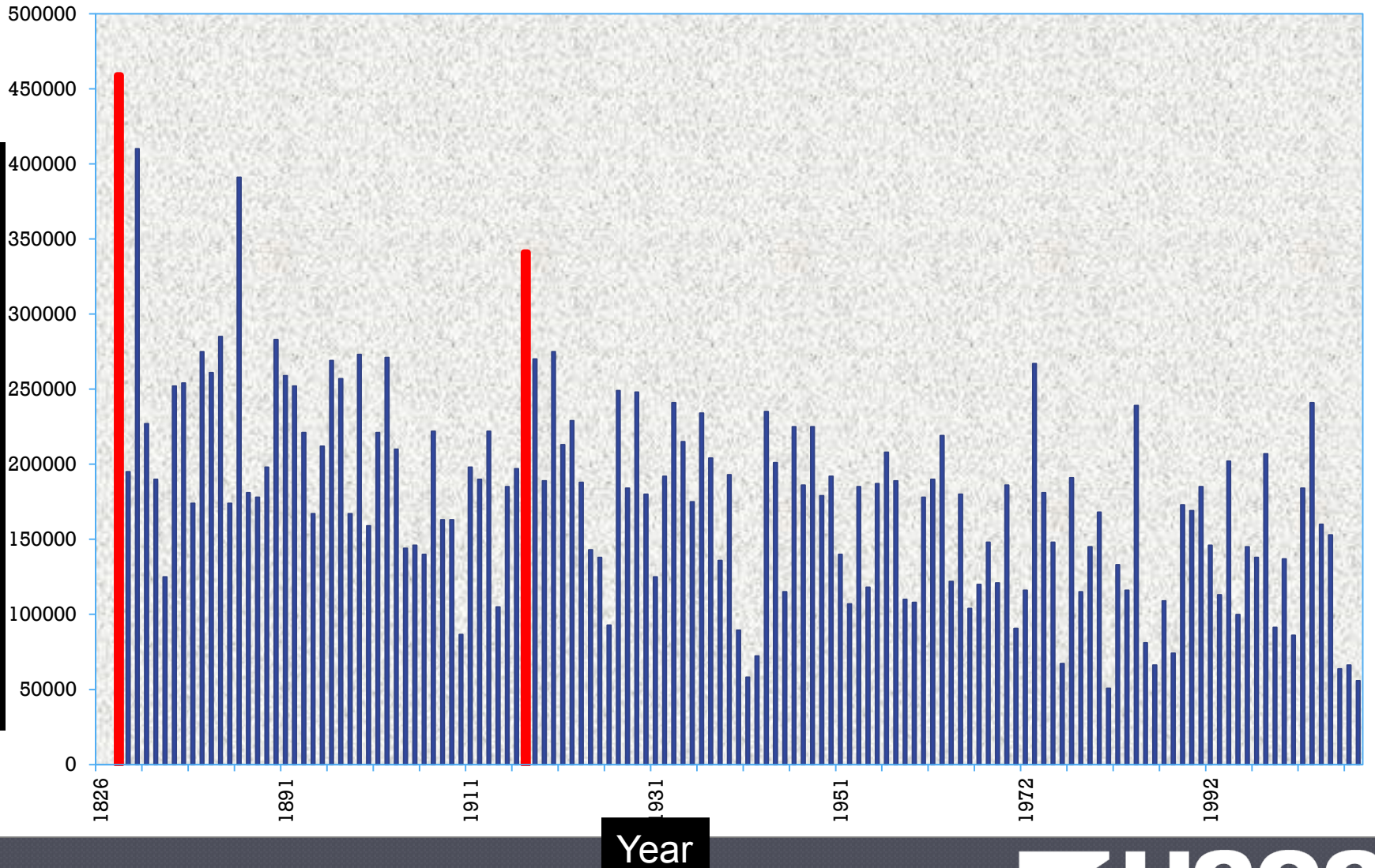
Local material  
14C 2210±30



Provisional data, do not cite



Discharge, cubic feet per second



# Frequency Analysis

- Bulletin 17C
- EMA
- Discharge uncertainty and perception thresholds
- LP3 distribution
- USGS PeakFQ



## Guidelines for Determining Flood Flow Frequency Bulletin 17C

Chapter 5 of  
Section B, Surface Water  
Book 4, Hydrologic Analysis and Interpretation



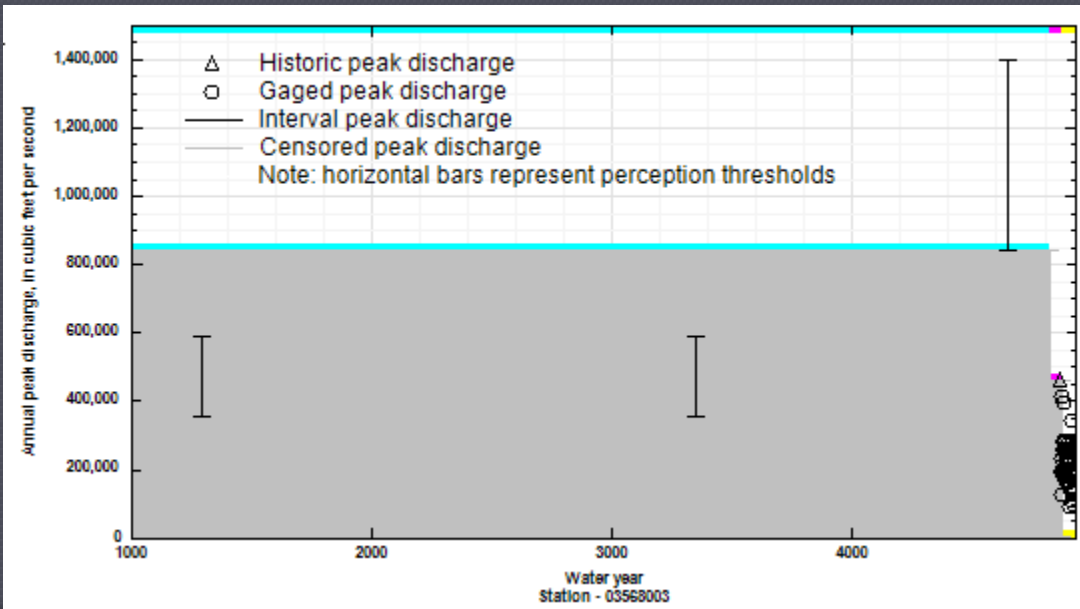
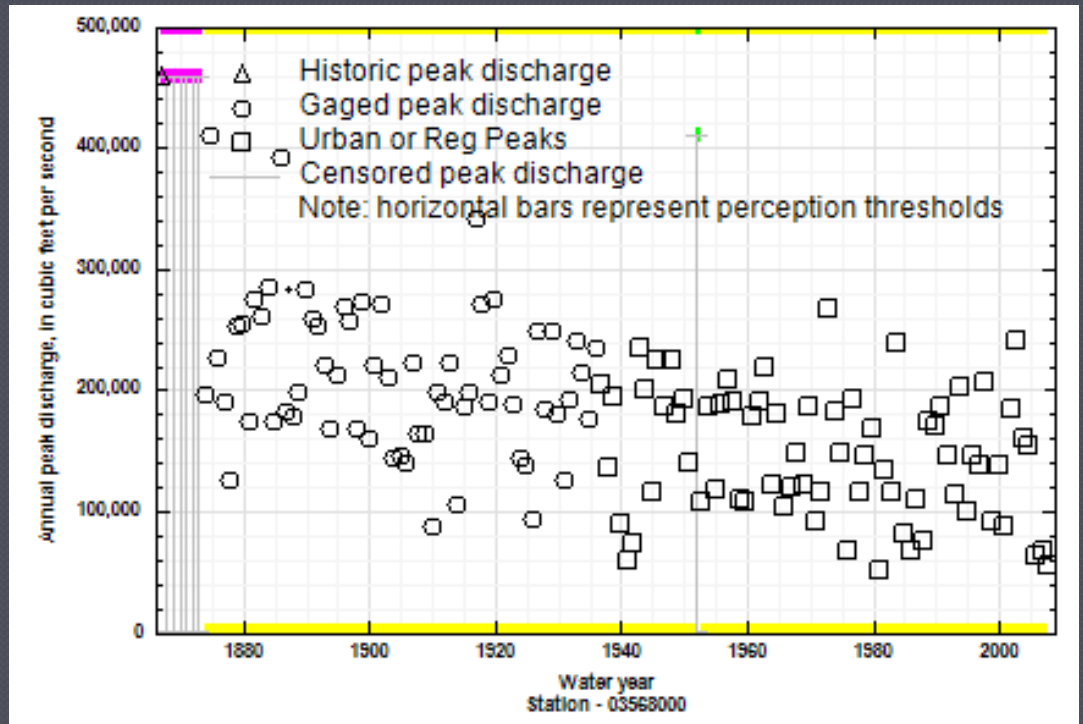
Techniques and Methods 4–B5



England and others, 2018

Estimating Magnitude and Frequency of Floods Using the PeakFQ 7.0 Program

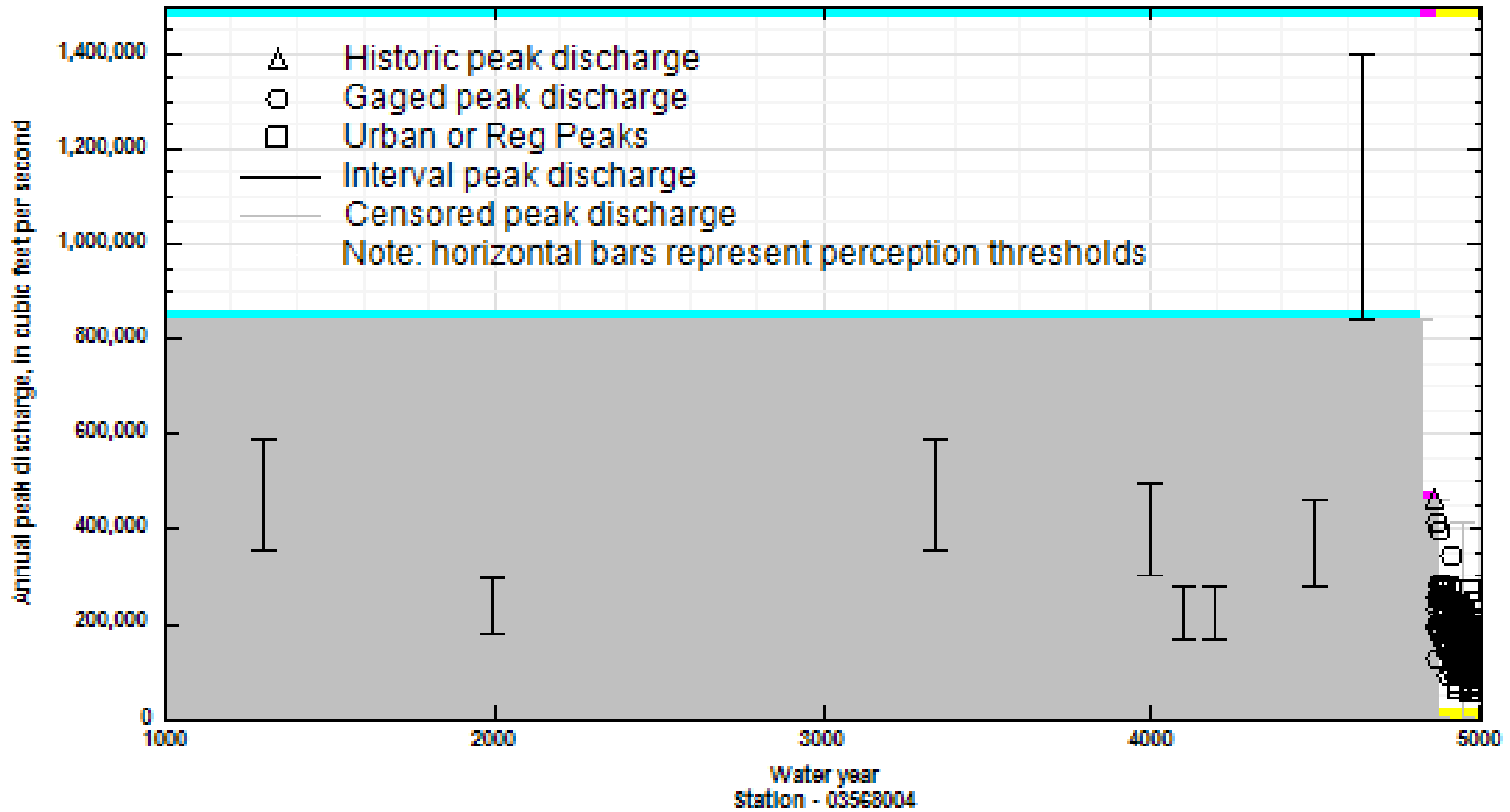
Gaged record only  
at Chattanooga  
~1867-2008



Gaged plus paleofloods  
(at benchmark) sites  
~4000 years of record

Provisional data, do not cite





## Gaged record plus all 8 paleofloods

# summary

---

- Adding several thousand years of paleoflood data reduces uncertainty of the very small AEP's even with the addition of an exceptionally large flood
- Fitted frequency curve and 95% confidence limits increase for rare events.
- The shape of frequency curve is heavily influenced by just a few of the very largest floods