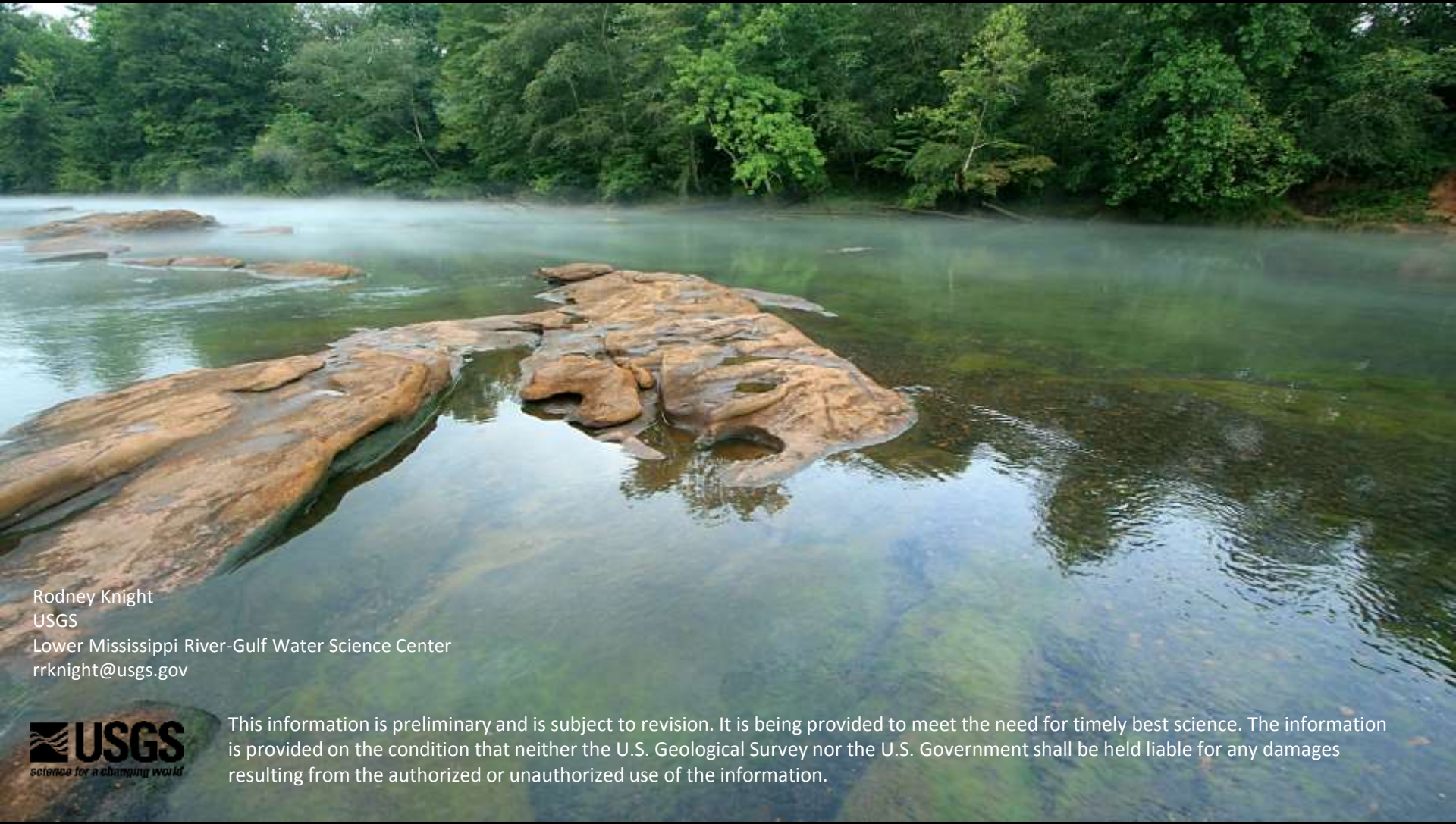


Connecting Water Level To Biological Health In Alabama



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This information is preliminary and is subject to revision. It is being provided to meet the need for timely best science. The information is provided on the condition that neither the U.S. Geological Survey nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information.

General Approaches

Physically and biologically based studies (eco-hydraulics)

- Detailed and costly
- Reach-specific measurements
- Mostly commercial species
- Incremental analyses or simulation models

Broad Statistical Characterization (eco-hydrology)

- General and less costly
- Emphasize magnitude, frequency, duration, timing, rate of change
- 30% of mean annual discharge (Tennant 1976)
- Indicators of Hydrologic Alteration (Richter et al, 2006)
- Hydrologic Integrity Toolkit (171 relevant statistics)
- Ten year drought – 7Q10
- Median flow for August or September



What is missing from these studies?

- Identification of a low-magnitude streamflow that is biologically relevant
- Bed inundation threshold –streamflow needed to keep the streambed wet
 - Protective of riffle habitats
 - Provides a variety of habitats during high-stress periods (high temps, low DO)
- Assuming that aquatic communities will fare better when:
 - Longitudinal mobility is preserved
- Can these thresholds be defined according to region?

Developing a bed inundation threshold

Things we know:

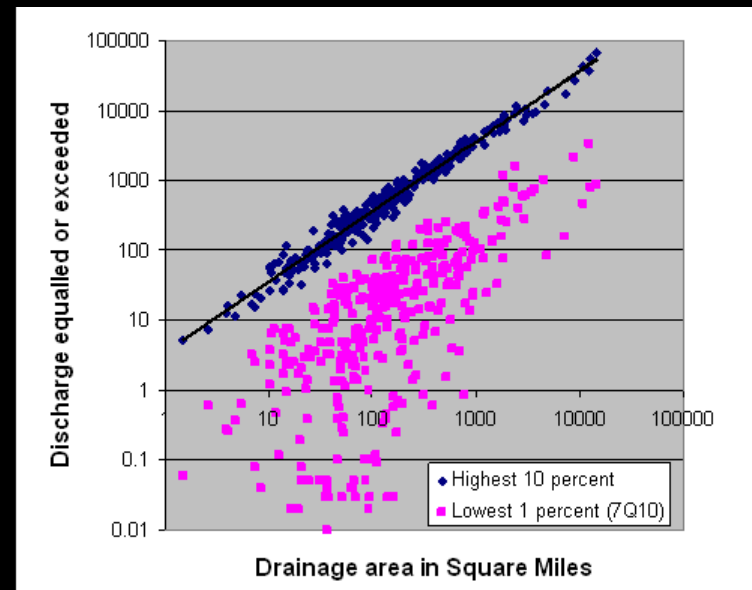
- Flow cross-sectional area is a function of basin size and unit discharge
- Riffle habitat is associated with inundation of bed control
- Maximum inundation may occur where width is greatest for a given depth relative to discharge

Things we do not know:

- How do we determine streamflow associated with maximum bed inundation?
- Does the streamflow associated bed inundation vary between regions?

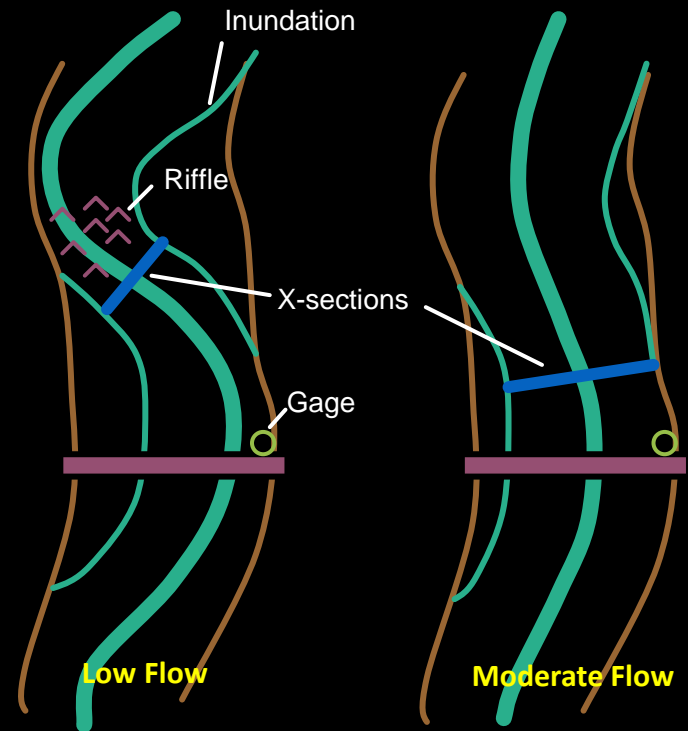
Does the streamflow associated bed inundation vary between regions?

- High flows are consistently related to basin area
- Streams are sized by basin area (high flows) and shaped by underlying geology
- Low flows vary regionally with geology (storage)
- How these interact affects aquatic habitat



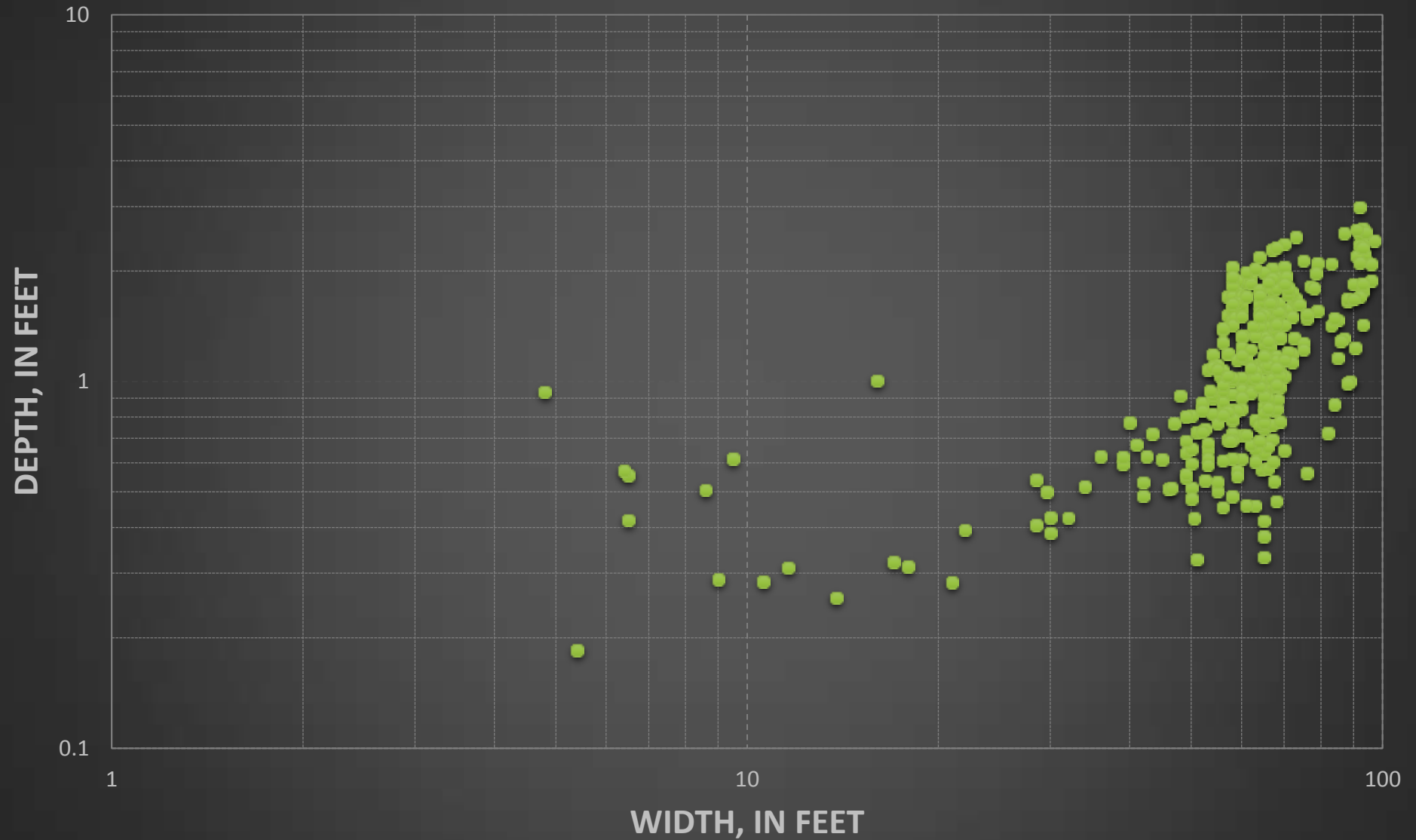
How do we determine streamflow associated with maximum bed inundation?

- Numerous streamflow measurements
- Riffle locations associated with aquatic habitat
- Detailed X-sections (width and depth)
- Narrowest point in run nearest “control”
- Repeated over time and range of discharge

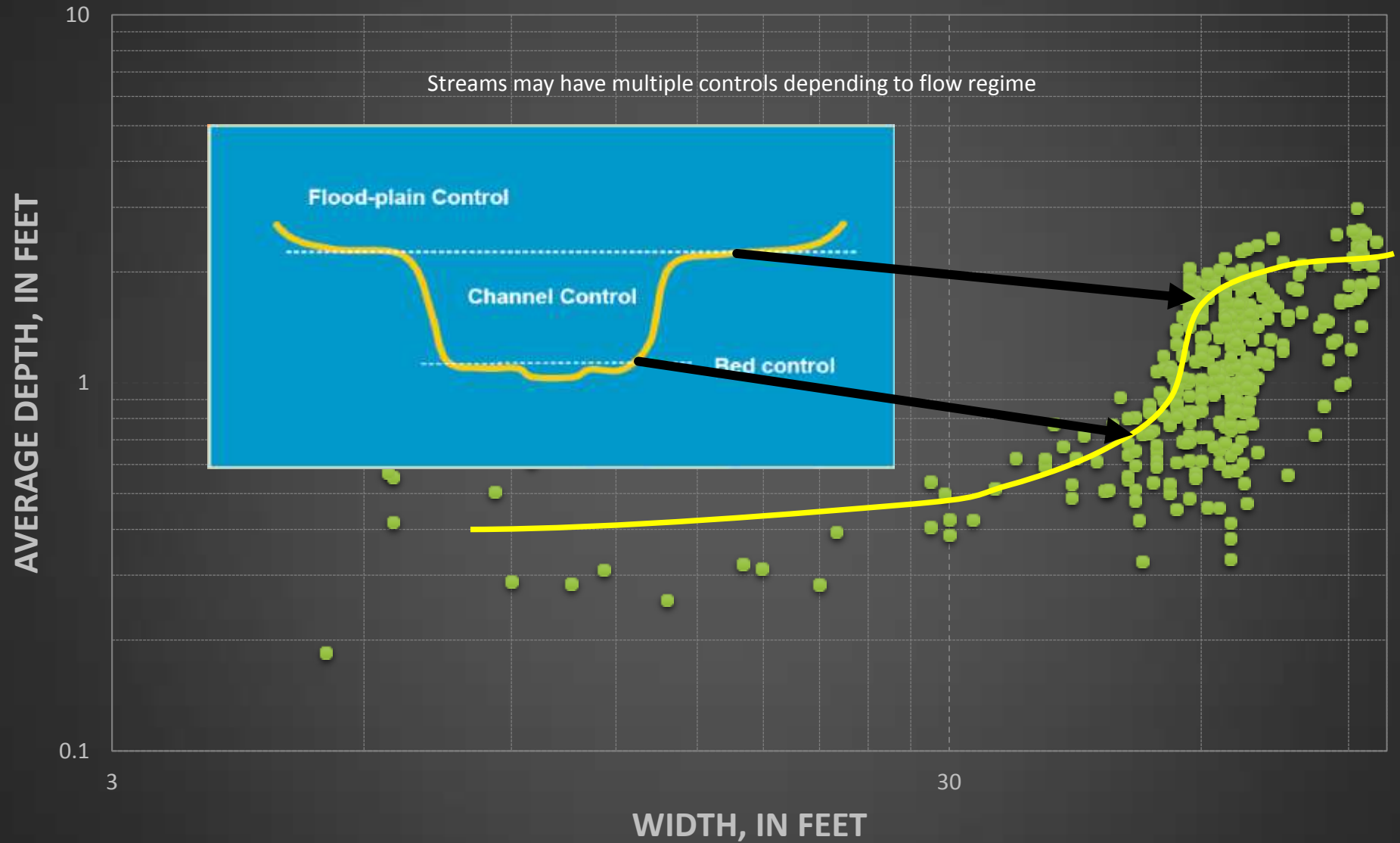


“Control” is the channel feature that determines water-surface elevation for a given flow rate

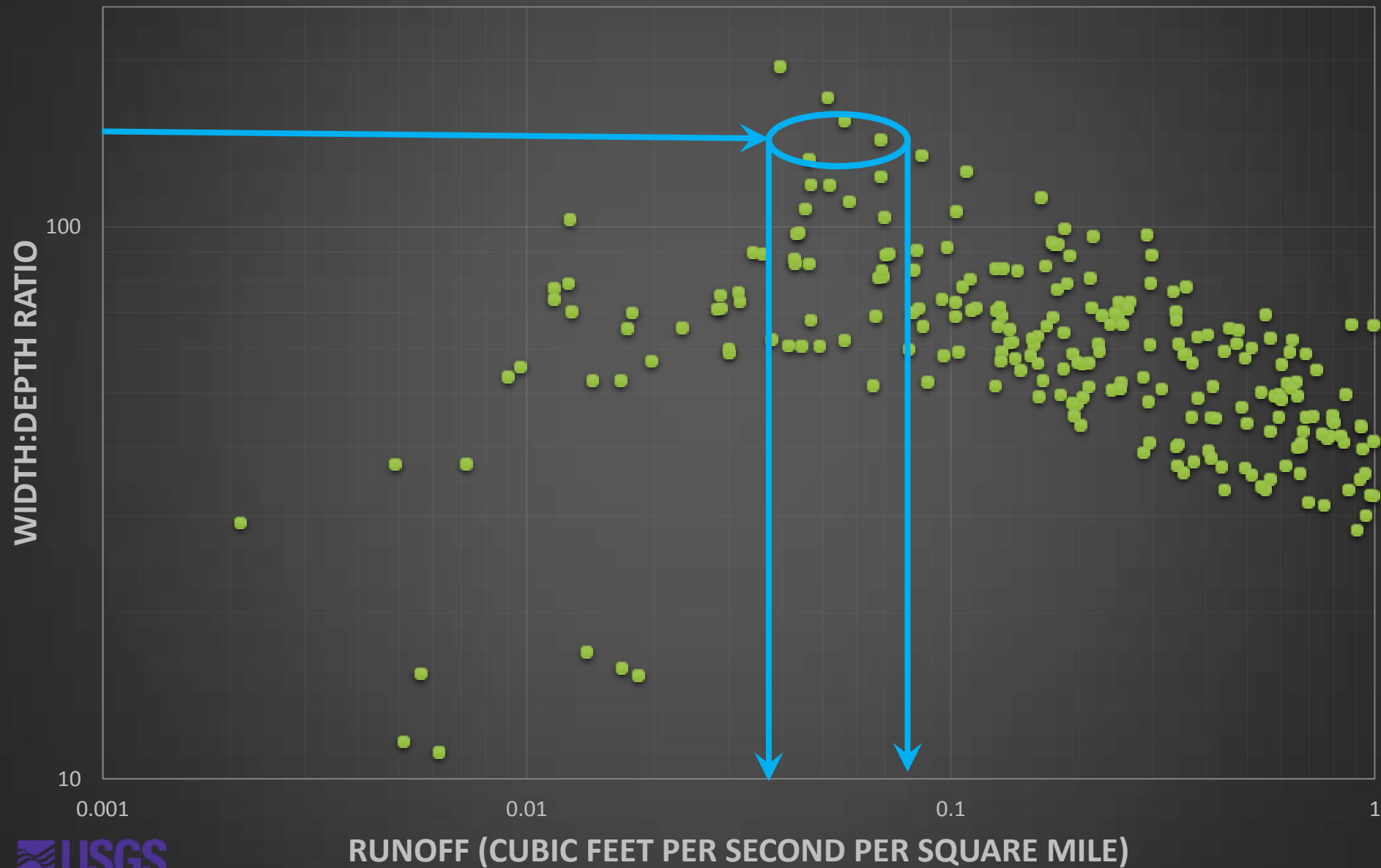
North River near Samantha, Alabama



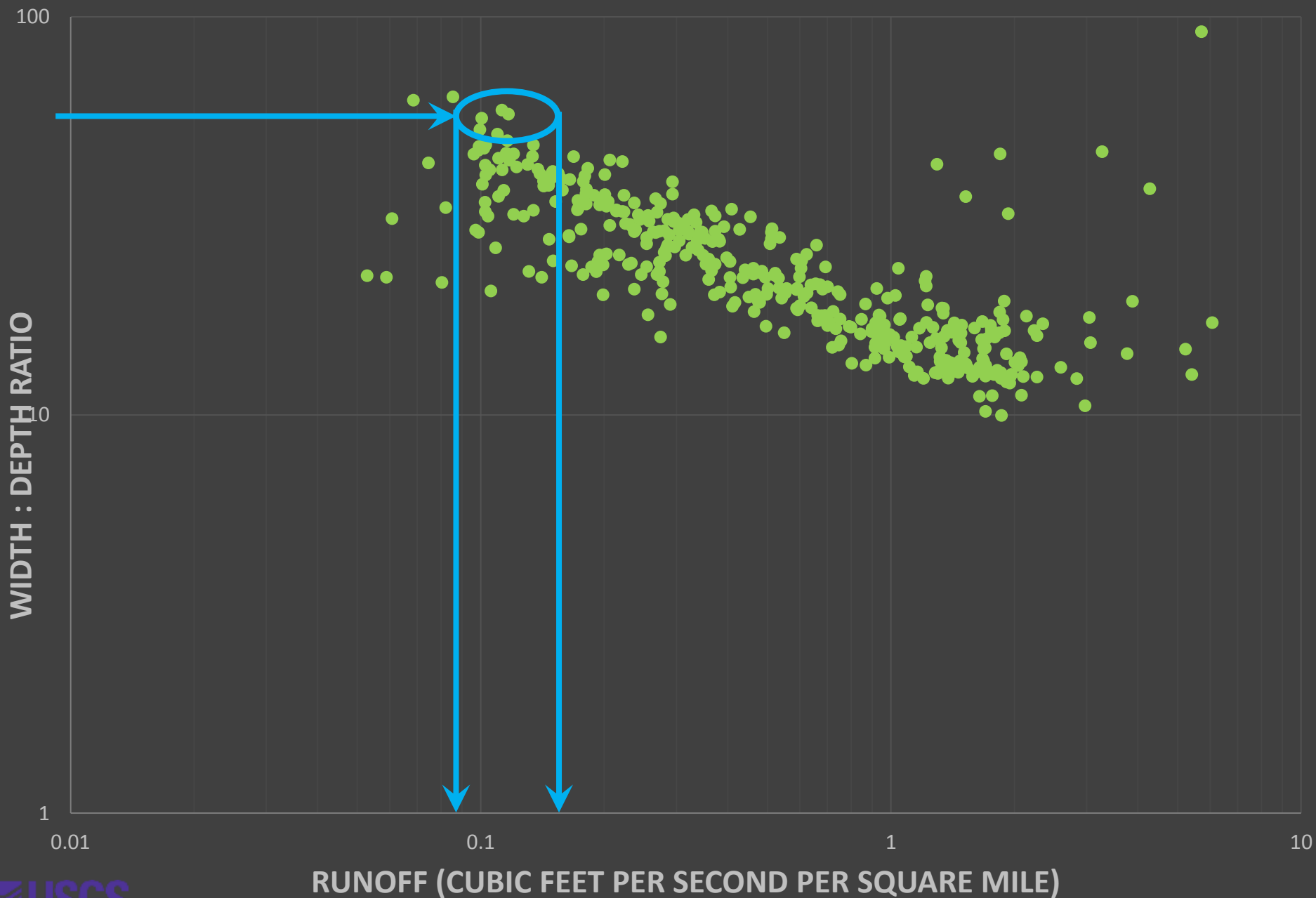
North River near Samantha, Alabama



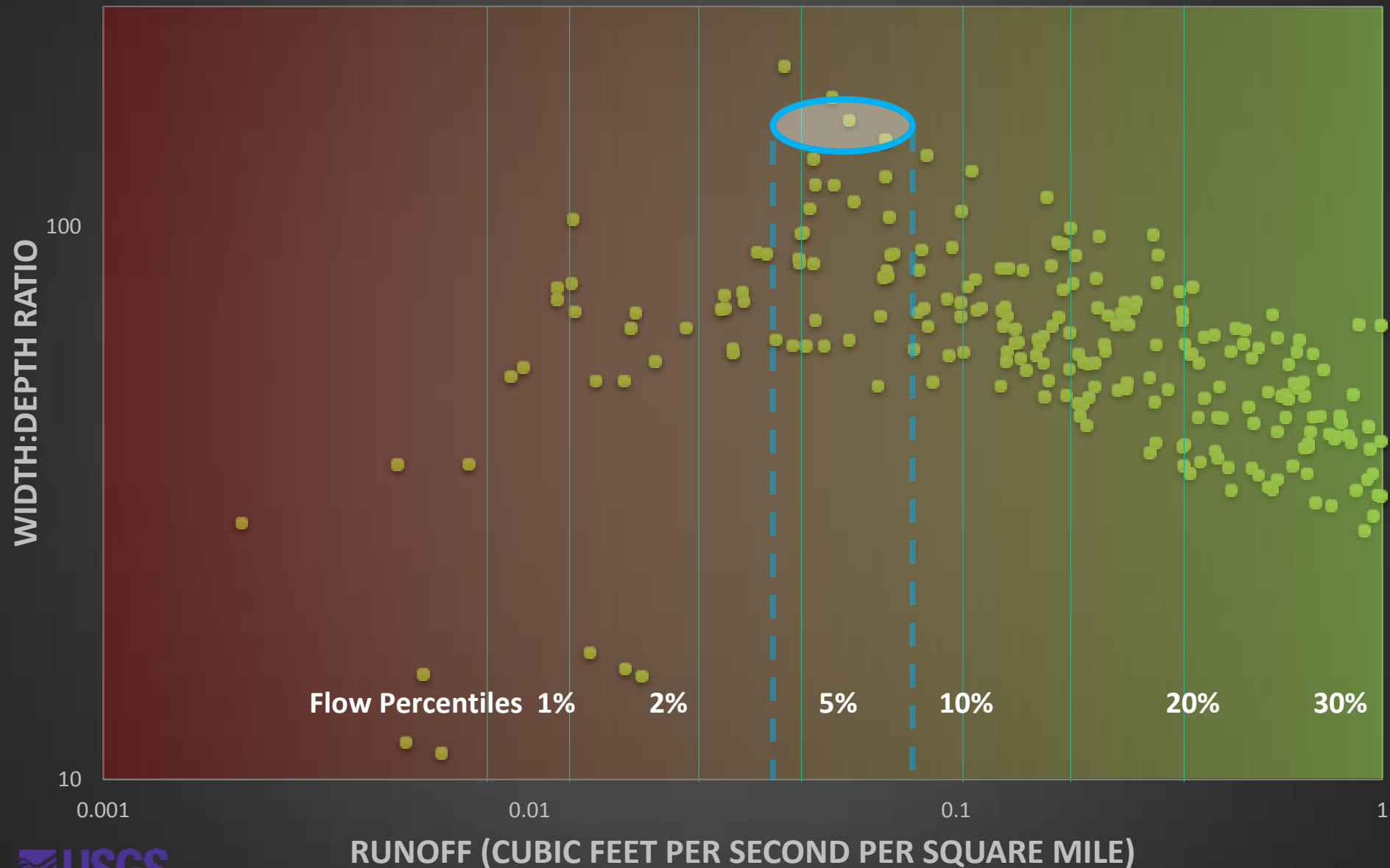
North River near Samantha, Alabama



Sipsey near Elrod, Alabama



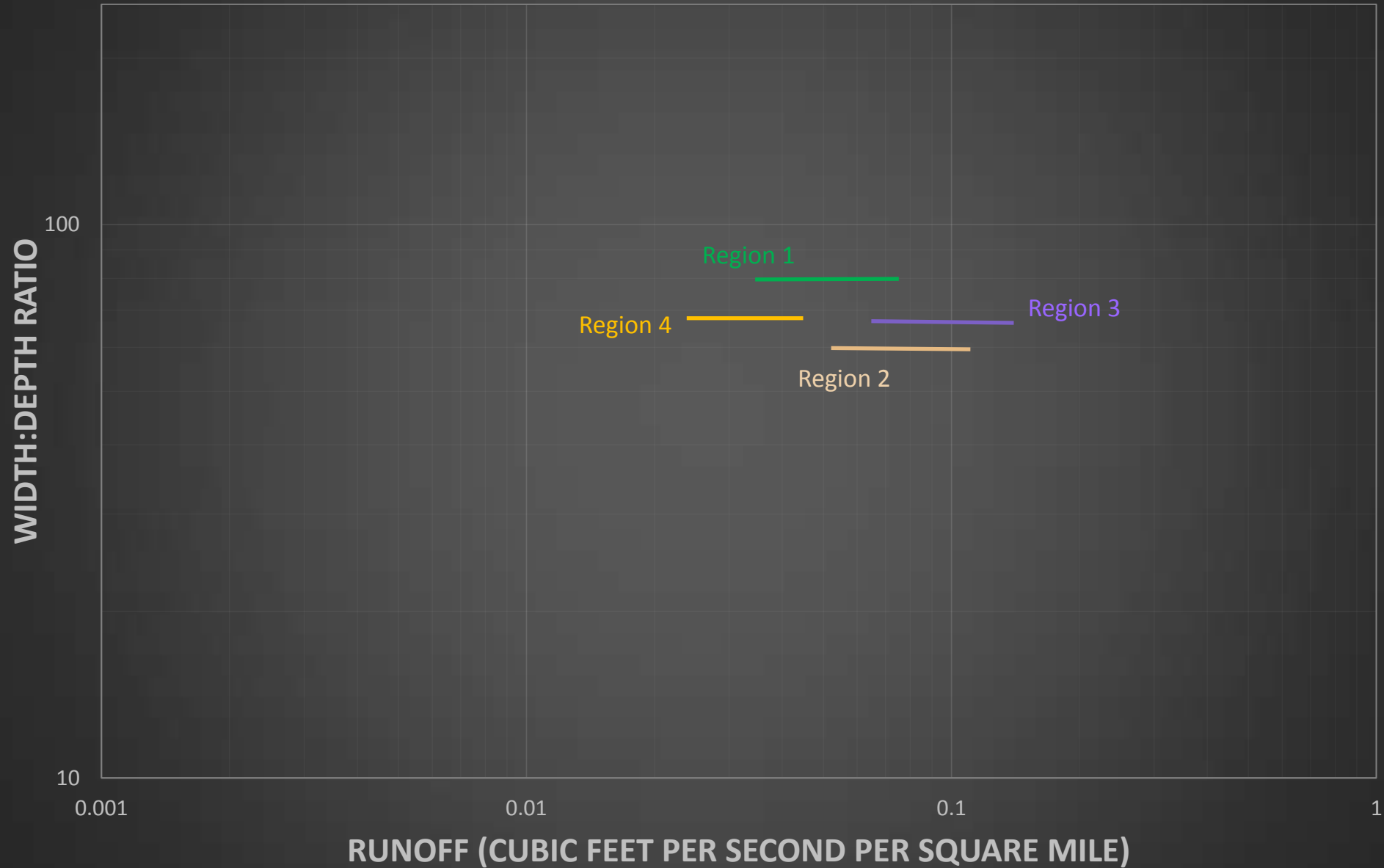
North River near Samantha, Alabama



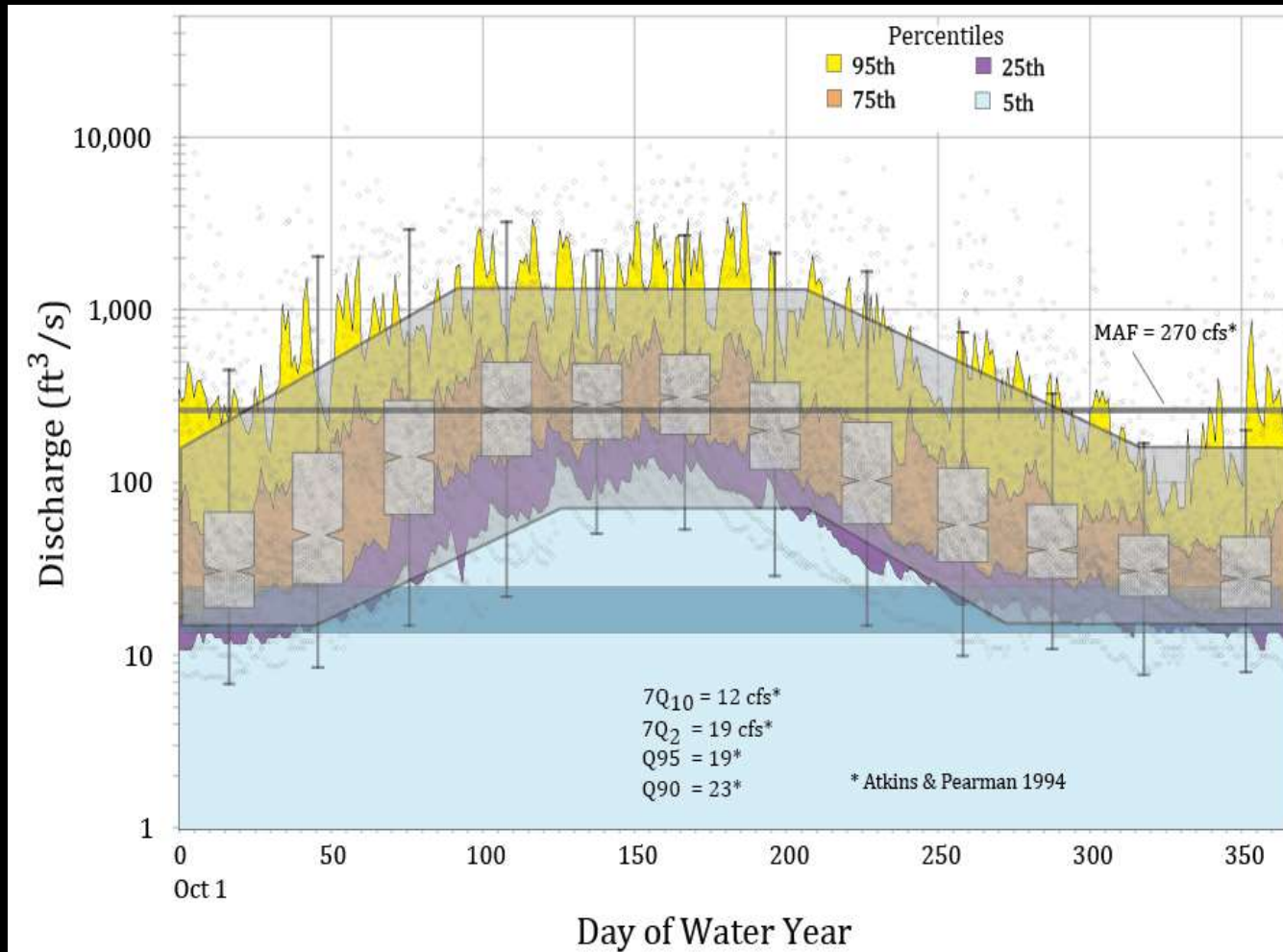
Flow Percentiles 1% 2% 5% 10% 20% 30%

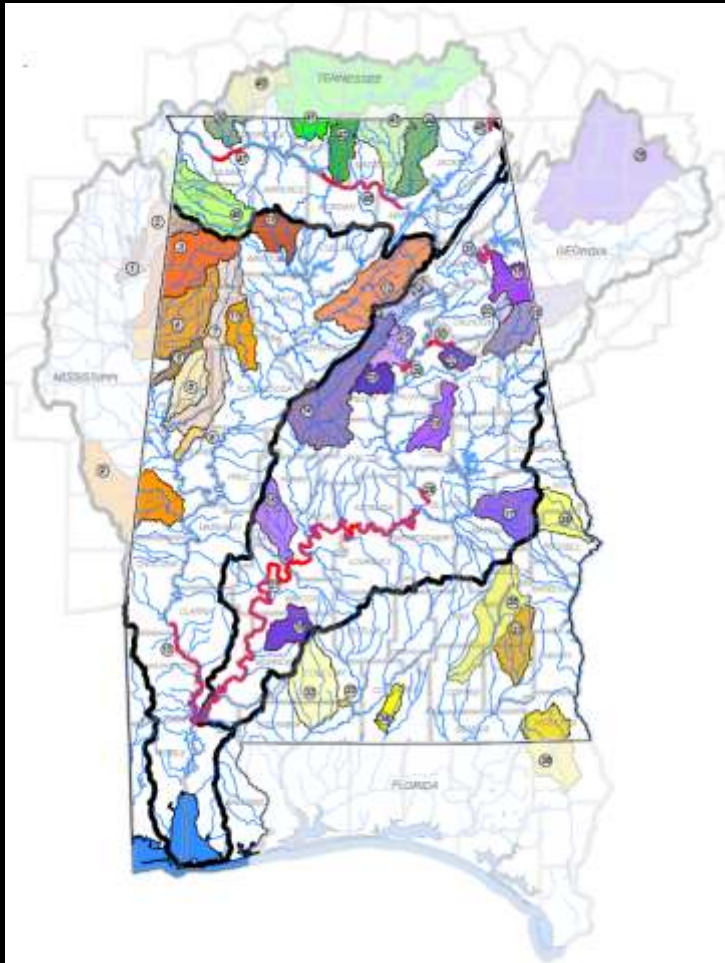
RUNOFF (CUBIC FEET PER SECOND PER SQUARE MILE)

Bed inundation thresholds defined by region?



Hypothetical "Stream" Rule Curve





Initial project:

- ~25 sites using SHU framework as a guide
- Existing information
- Evaluate the method
- Evaluate potential for regionalization:
 - Geologic framework
 - Physiographic province
 - Basin size class
 - Seasons
 - Others???
- Working with GSA

Future:

- Evaluate USGS database
- Develop regional definition for bed inundation thresholds
- Associate with flow percentiles

For more information:

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