Evaluation of Saturated Hydraulic Conductivity in Southern Piedmont Landscapes

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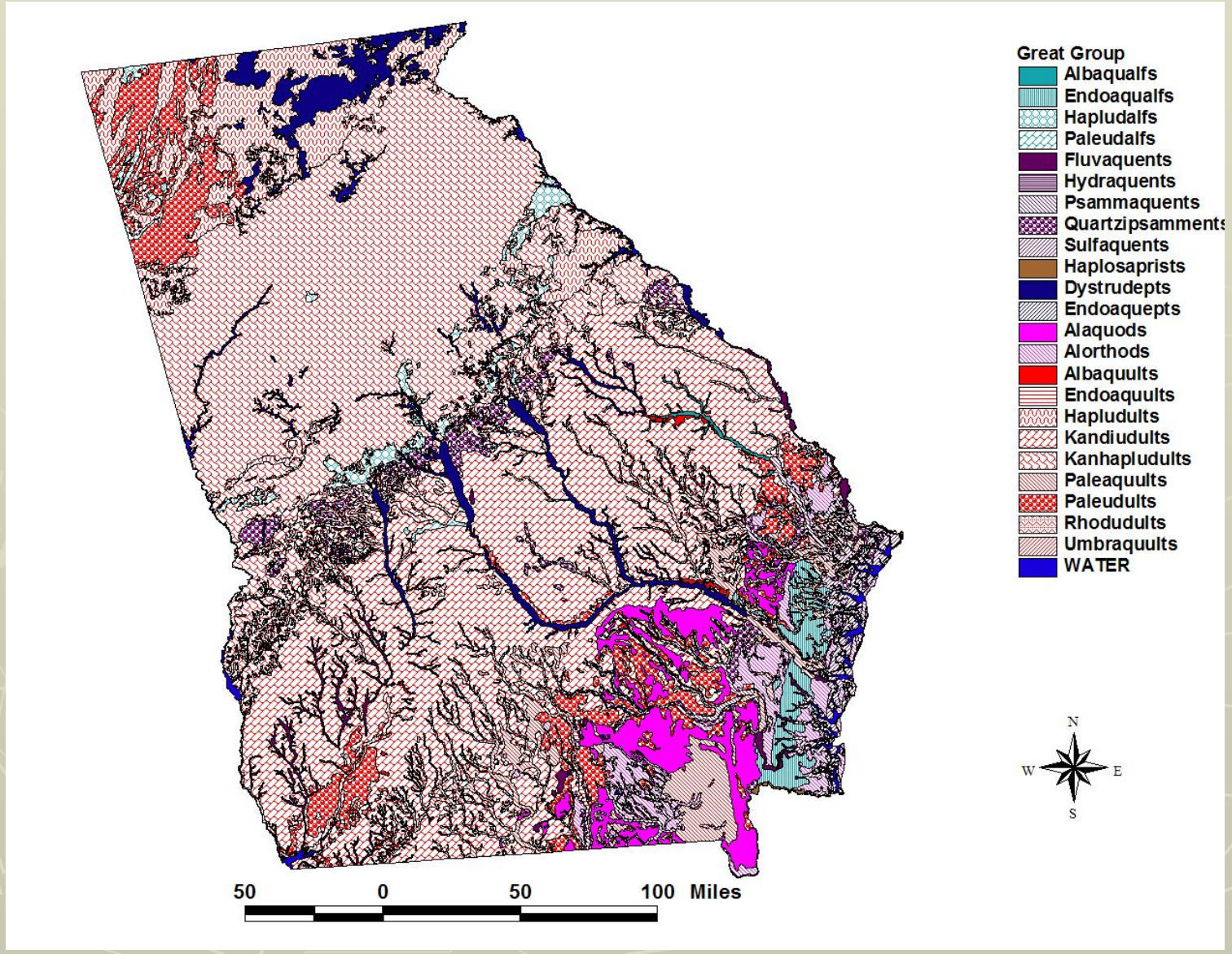
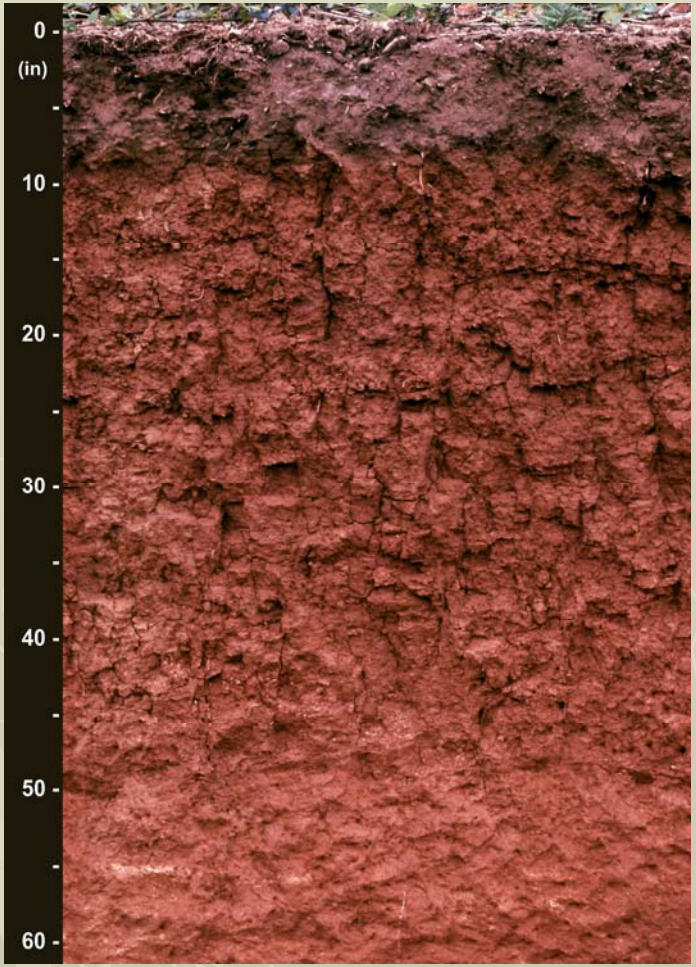
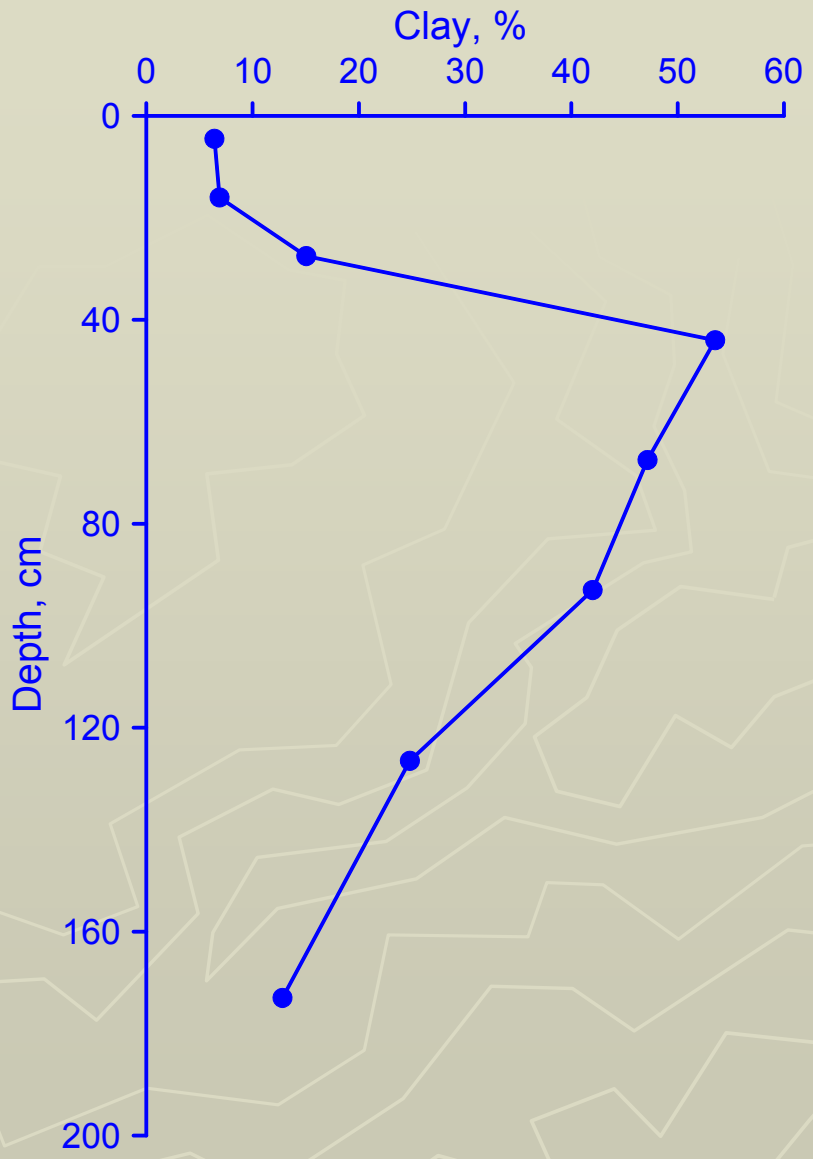
GA Great Groups

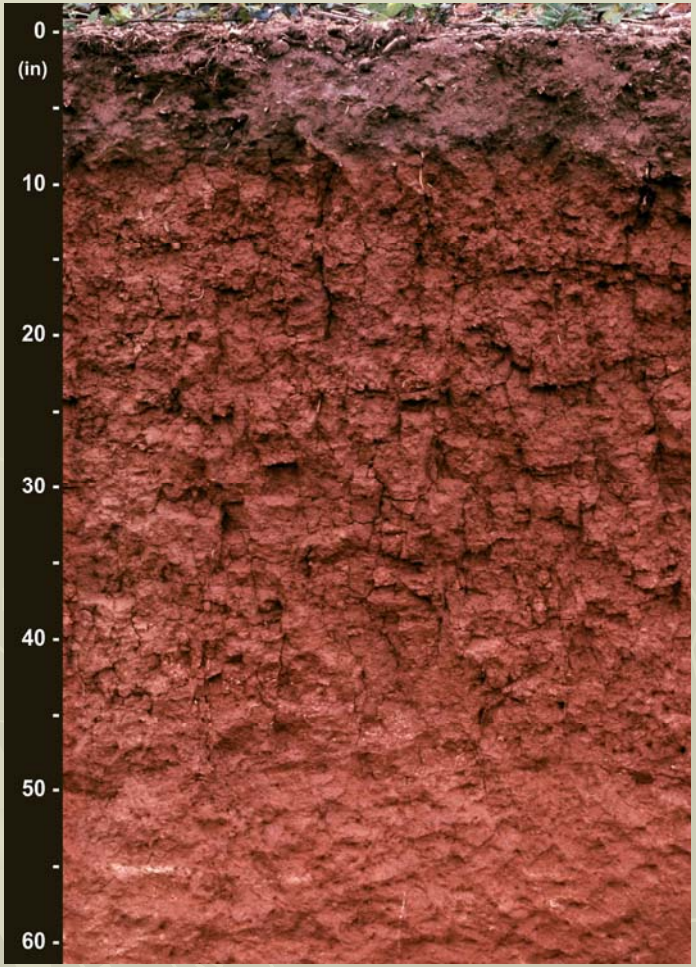


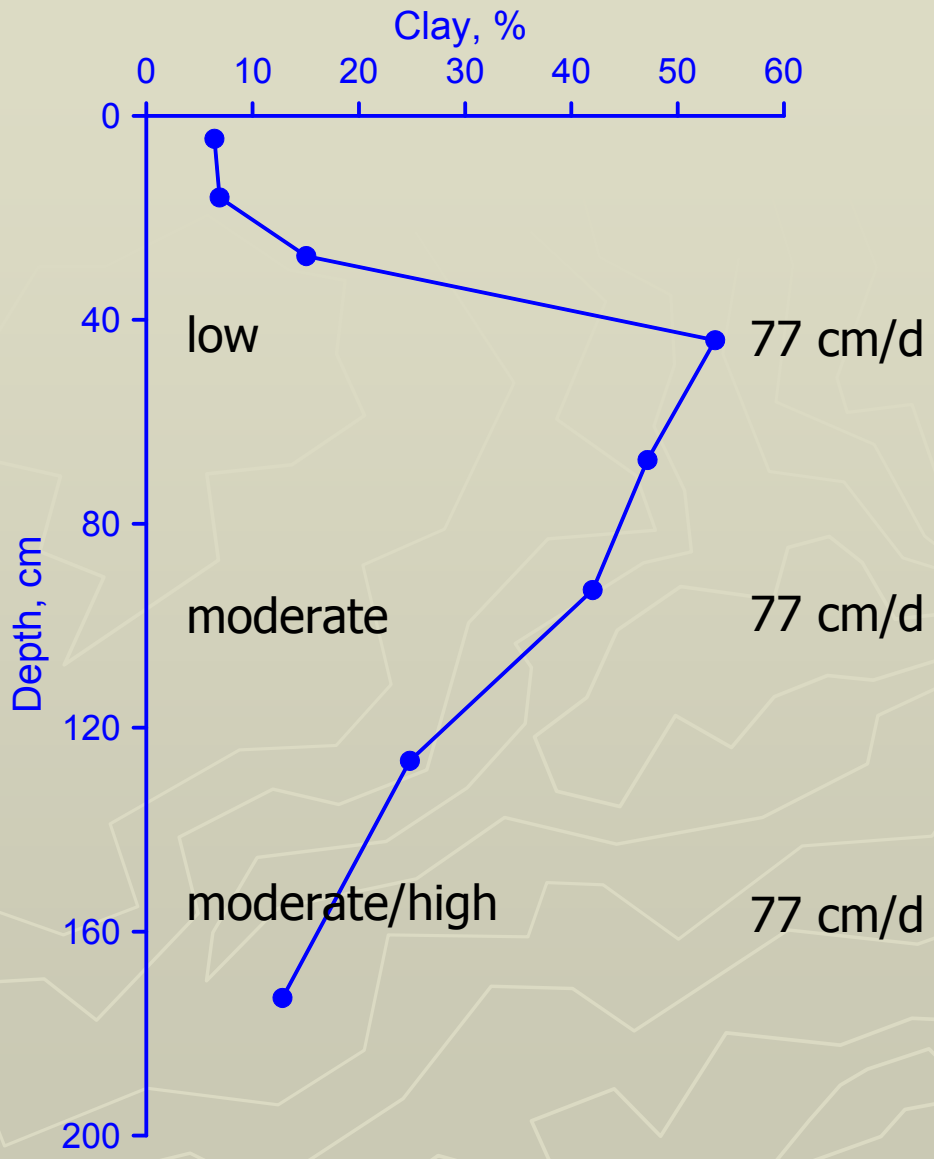
Southern Piedmont Soils





K_s Estimates





Water Movement Rate in Piedmont Soils

Horizon	Depth	Structure	Texture	K_s
	ft			cm/hr
Bt	2	Strong	Clay	8
BC	5	Weak	Sandy clay loam	3
C	13	Massive	Sandy loam	6

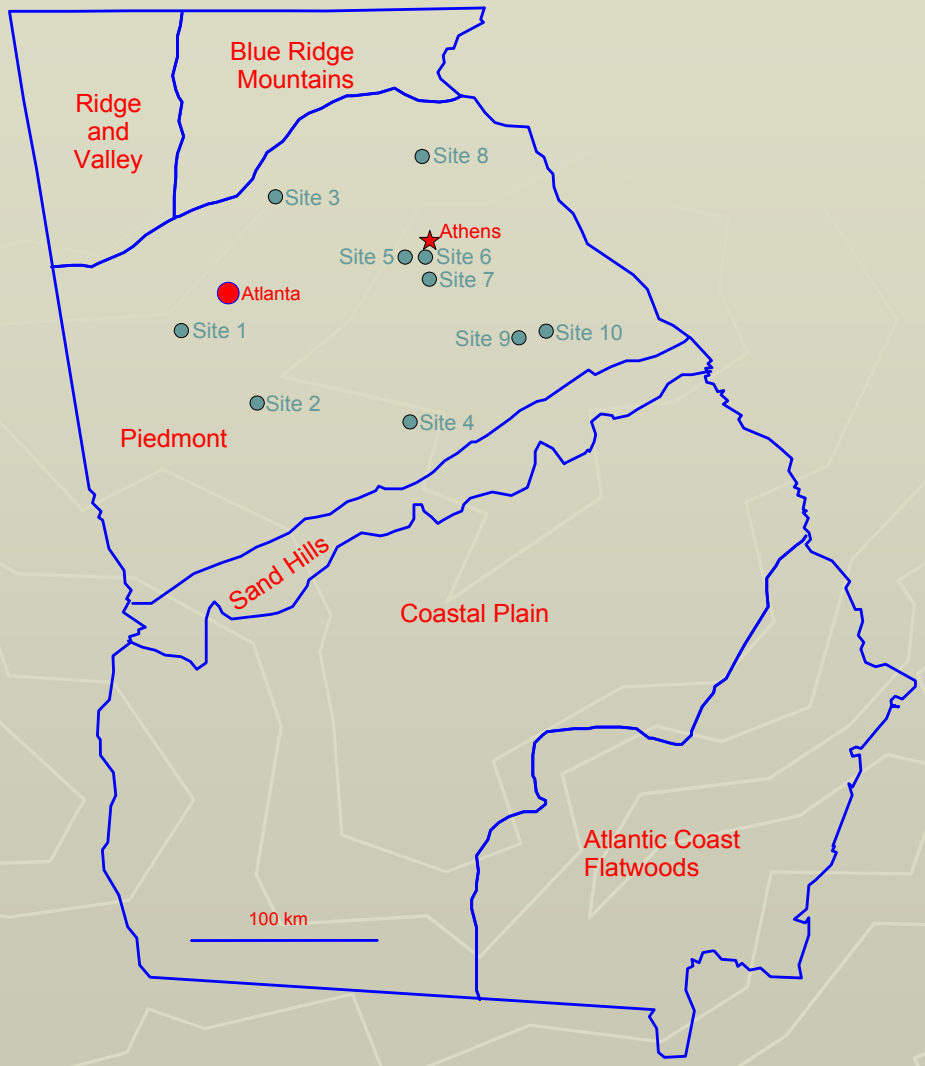
Objectives

- Evaluate K_s for major horizons in soils on Piedmont landscapes
- Evaluate landscape effects on K_s
- Suggest morphological/landscape features that indicate exception to trend in data

Methods

- K_s measured in field with constant head permeameter
  - 10 hillslopes
  - 3 transects per hillslope
    - Summit or upper backslope to footslope
  - 7 equally spaced measurement sites per transect
    - 21 locations/hillslope
  - 3 depths - upper Bt, mid to lower Bt, and lower Bt, BC, or C (140 cm)
- Soil described from bucket auger
  - NRCS soil scientists

Hillslope Locations

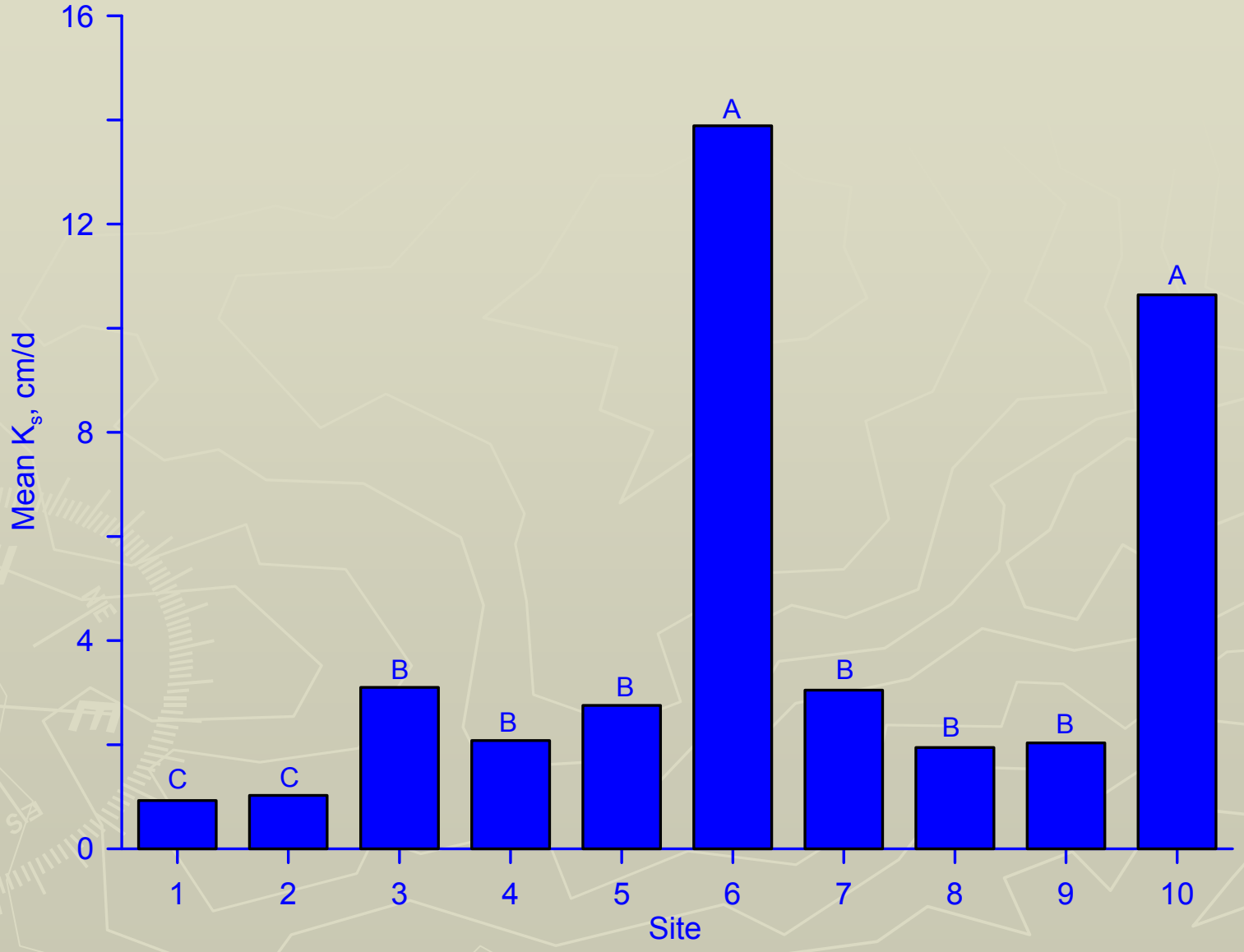


Methods 2

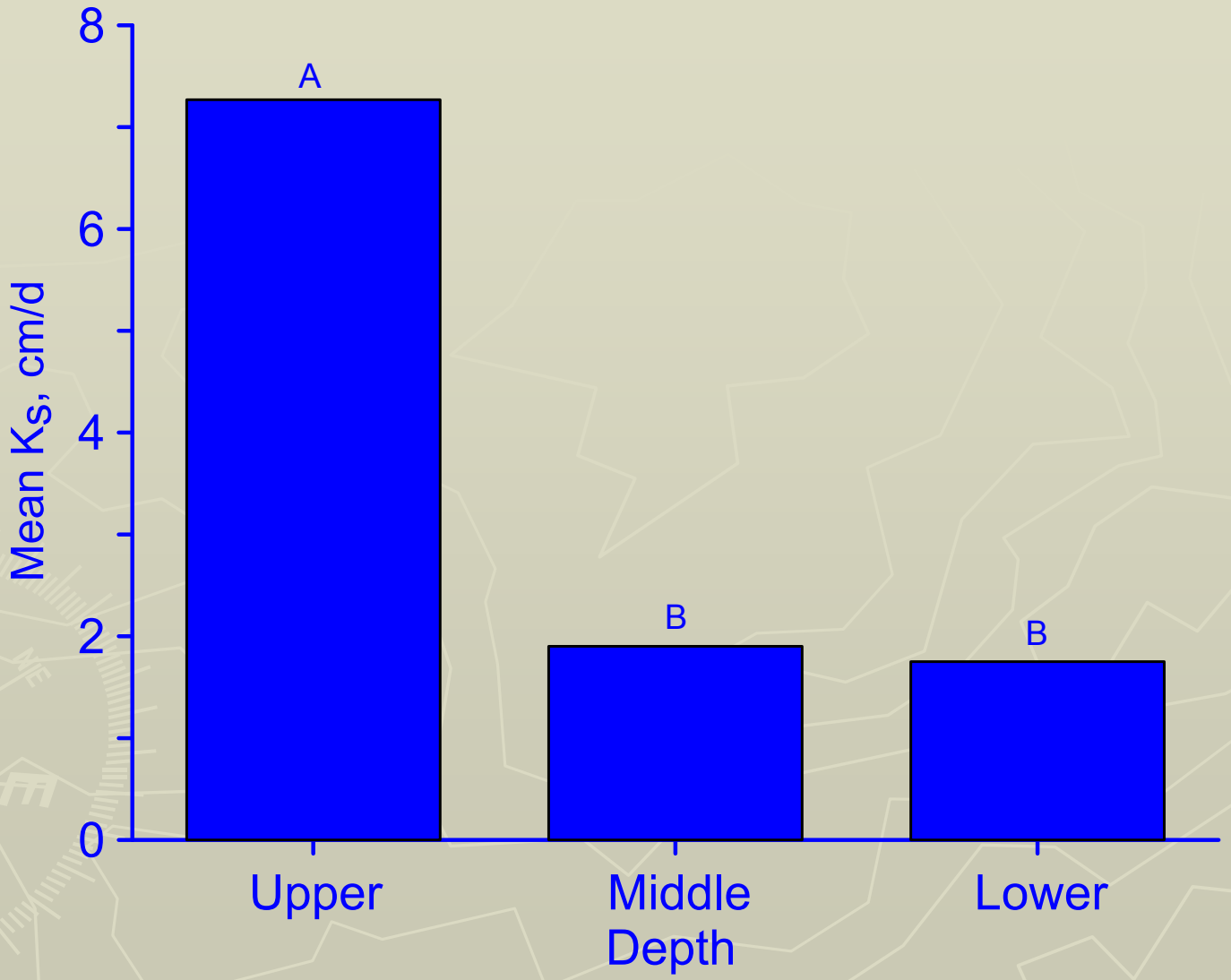
- 3 pedons described and sampled from pit
  - Range in K_s and landscape position
- Laboratory characterization
  - PSD, bulk density, CEC, porosity

Results

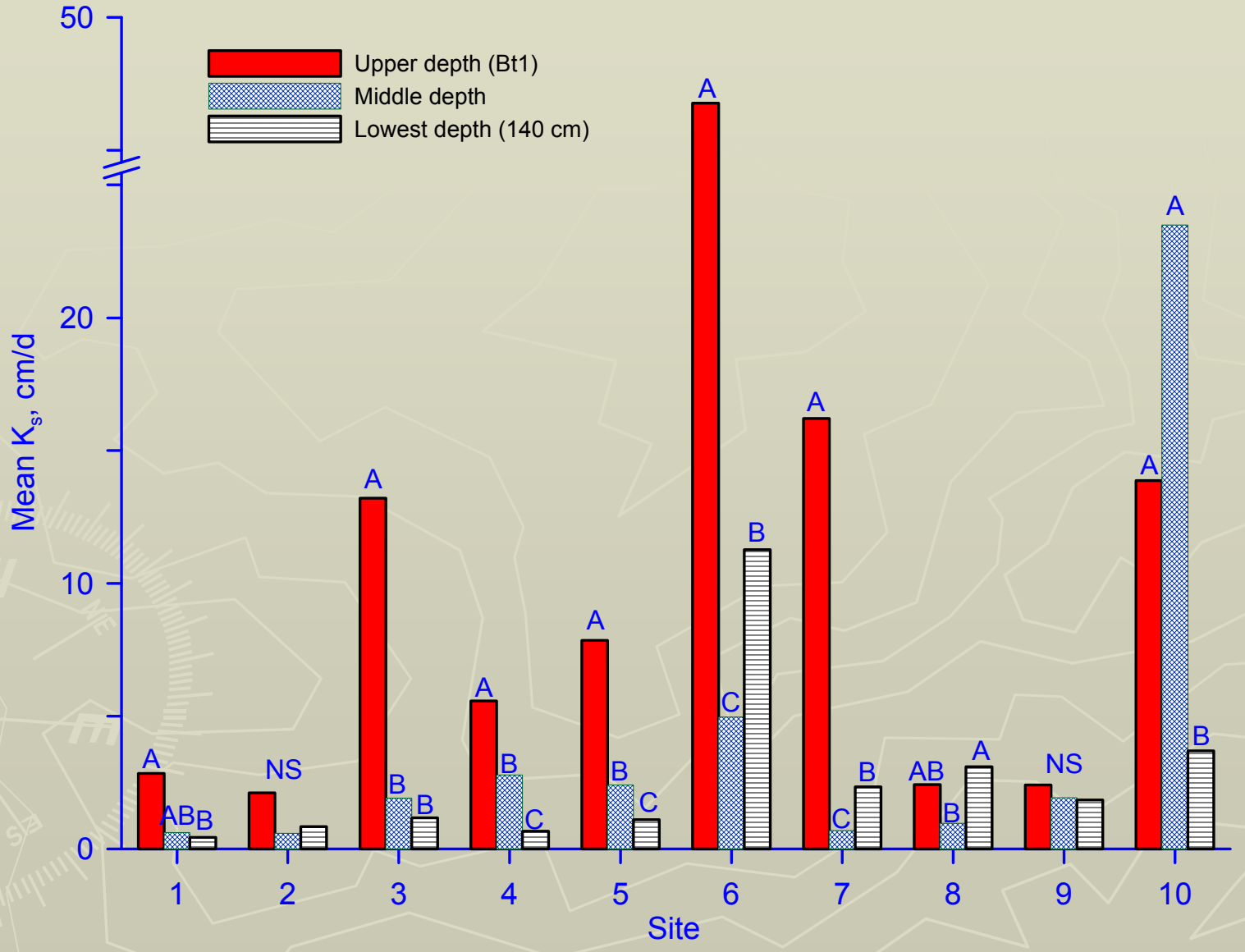
Mean K_s by Site (all depths)



Mean K_s with Depth (all sites)

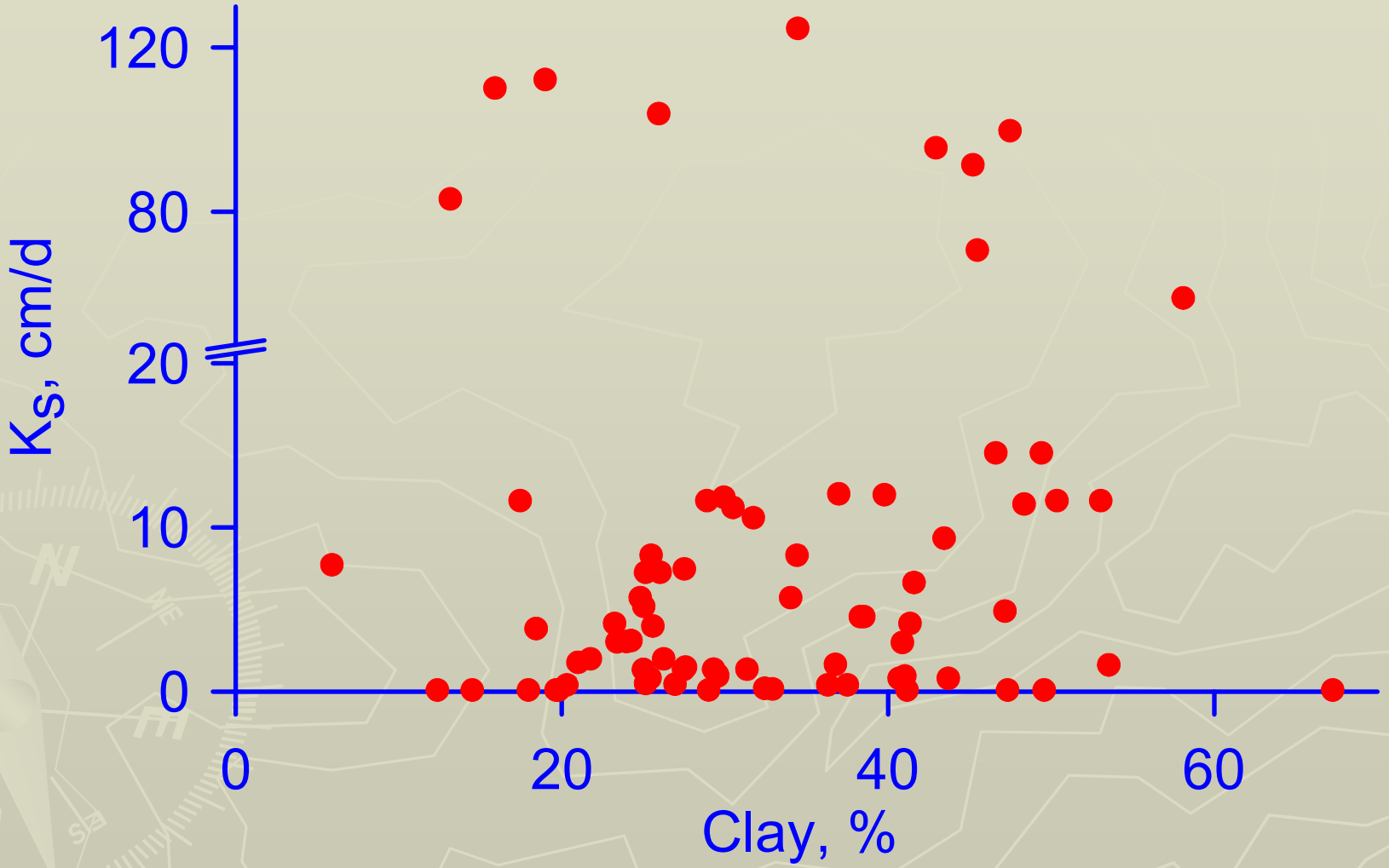


Mean K_s with Depth by Site

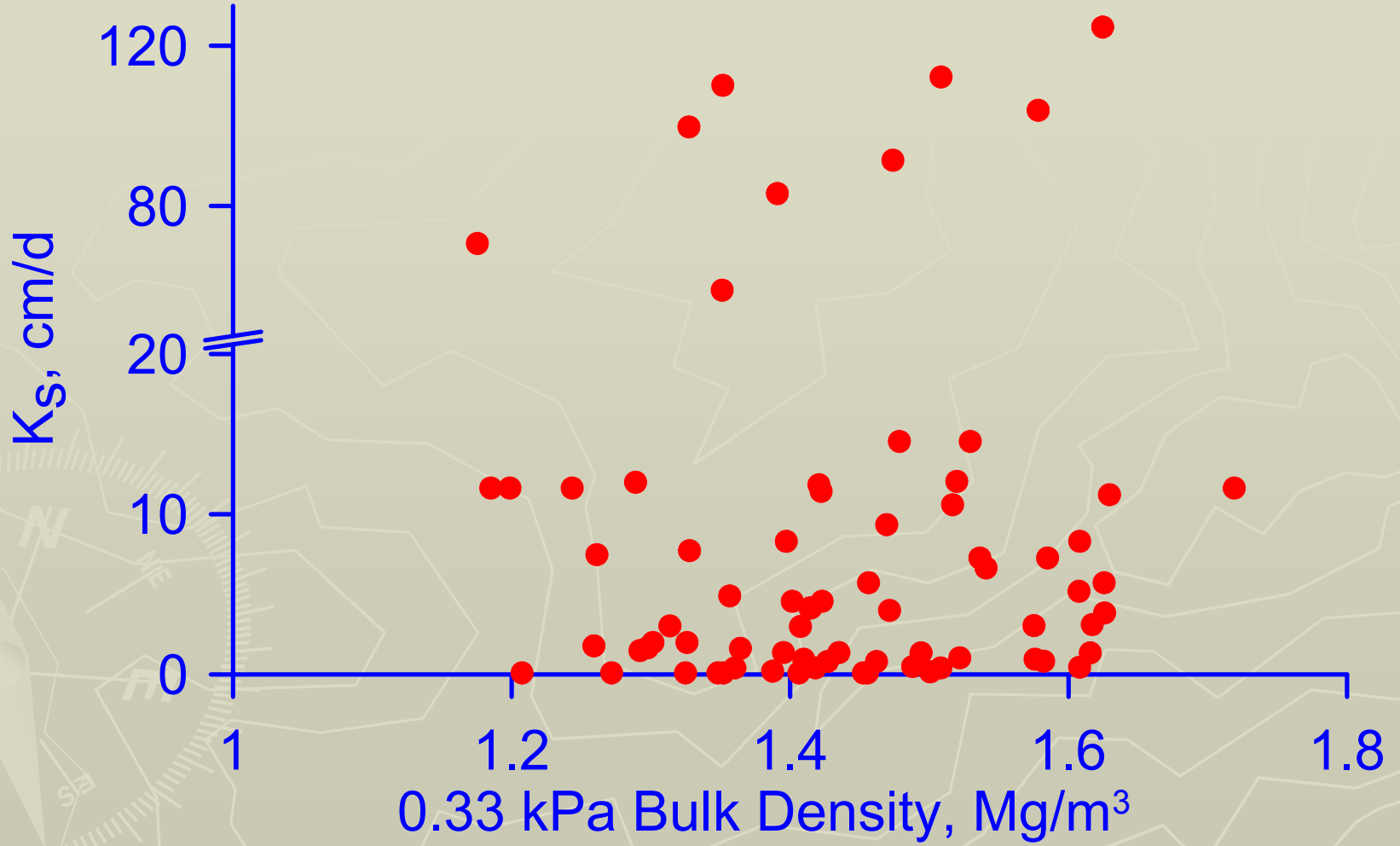


Why?

K_s and Clay



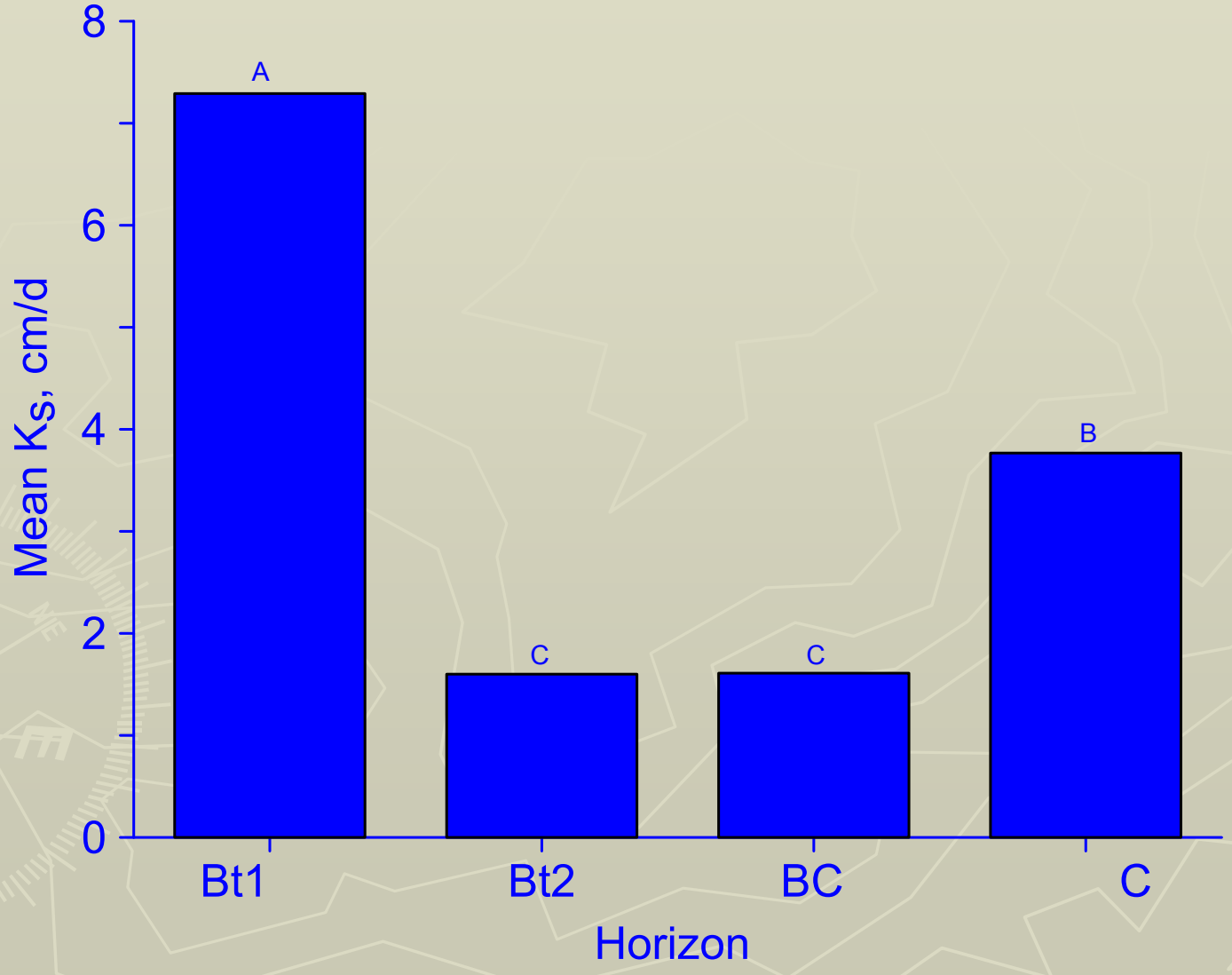
K_s and Bulk Density



Structure?

- Bt1 horizons – moderate (strong) subangular blocky
  - Tendency for low K_s if firm consistence
- Bt2 and Bt3 horizons – moderate subangular blocky
  - Very weak platy?
- BC horizons – weak subangular blocky structure (mostly)
- Horizons with highest K_s
  - Bt horizons in more deeply weathered soils
    - 10R hue
  - Sandy loam C horizons

Mean K_s by Horizon (all sites)



Summary of Field Results

- Upper depth (Bt1 horizon) had highest K_s at 7 of 10 sites
  - 2 sites had uniformly low K_s in all horizons
- Mid and lower depths generally had similar K_s
- No difference in K_s with hillslope position

Summary

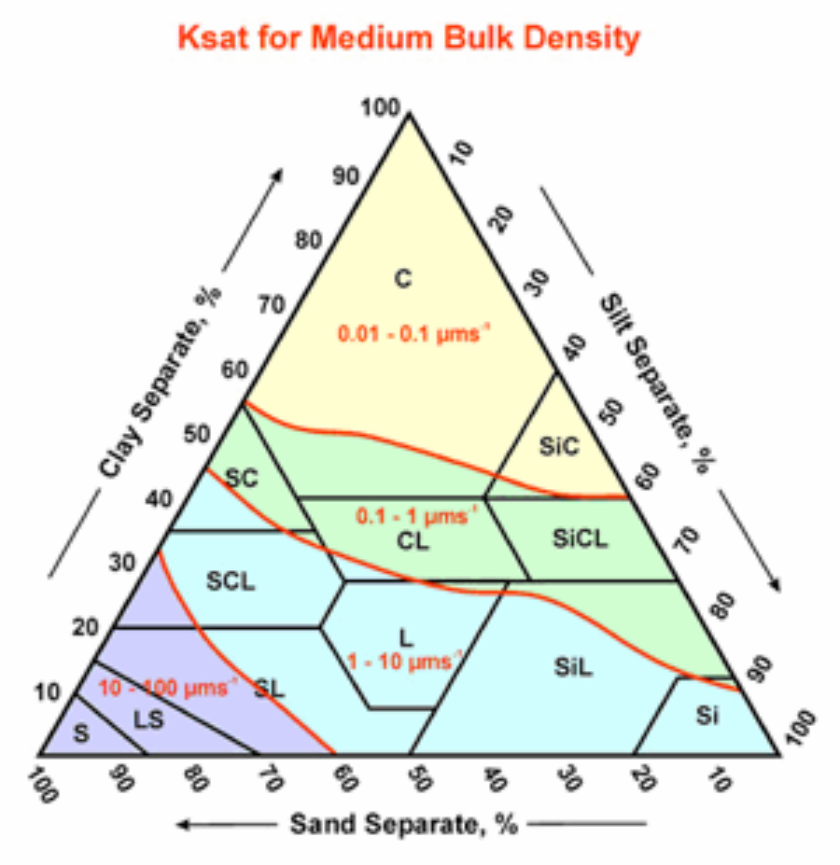
- Bt1 horizon $K_s \geq$ subjacent horizons
- No difference in K_s with hillslope position
- Clay and bulk density ineffective in explaining K_s variation
- Structure and/or consistence influencing K_s but not reliable predictors
- Bioturbation of upper Bt?
  - Relatively old landscapes
  - Observed in similar soils

Comparison with K_s Estimates for Piedmont Soils

	K_s	
Horizon	Tabular Data	Measured
	cm/d	cm/d
Bt1	77	7.2
Bt2, Bt3	77	1.7
BC	77	1.6

Tabular data from WSS

NSH Guide for Estimating K_s



≥ 35 percent clay, soft, slightly hard, very friable or friable, no stress surfaces or slickensides and the clay is subactive after subtracting the quantity (2 x (OC x 1.7)) - 1 – 10 µm/s (8.6 – 86 cm/d)

Is one system applicable to estimate K_s for all soils?

- Probably not
- Local estimates can be incorporated into the database
- With limited data, is this a viable option?

Is There an Alternative?

- 144 MLRA Soil Survey Offices
  - Intelligent, energetic, and interested staff
- Field evaluation of K_s for 1 pedon per month (12 days/year)
  - 1,600+ evaluations per year
  - 8,000 evaluations after 5 years
    - 5 reps per series/map unit = reliable data for 1,500+ series
- Data to populate database
- Data to test/develop pedotransfer functions
- Good use of time?