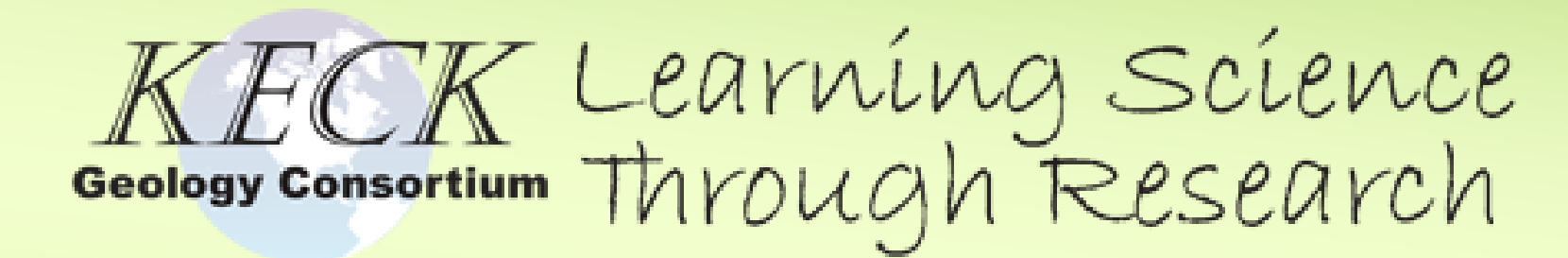




Geomorphic Parameters of Beaver Meadows along Panther Brook, NY

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Background

Beavers are ecosystem engineers because they modify the geomorphology of river valleys by building dams.

Panther Brook, NY, is a small mountain stream that hosts 6 meadows created by beaver dams.

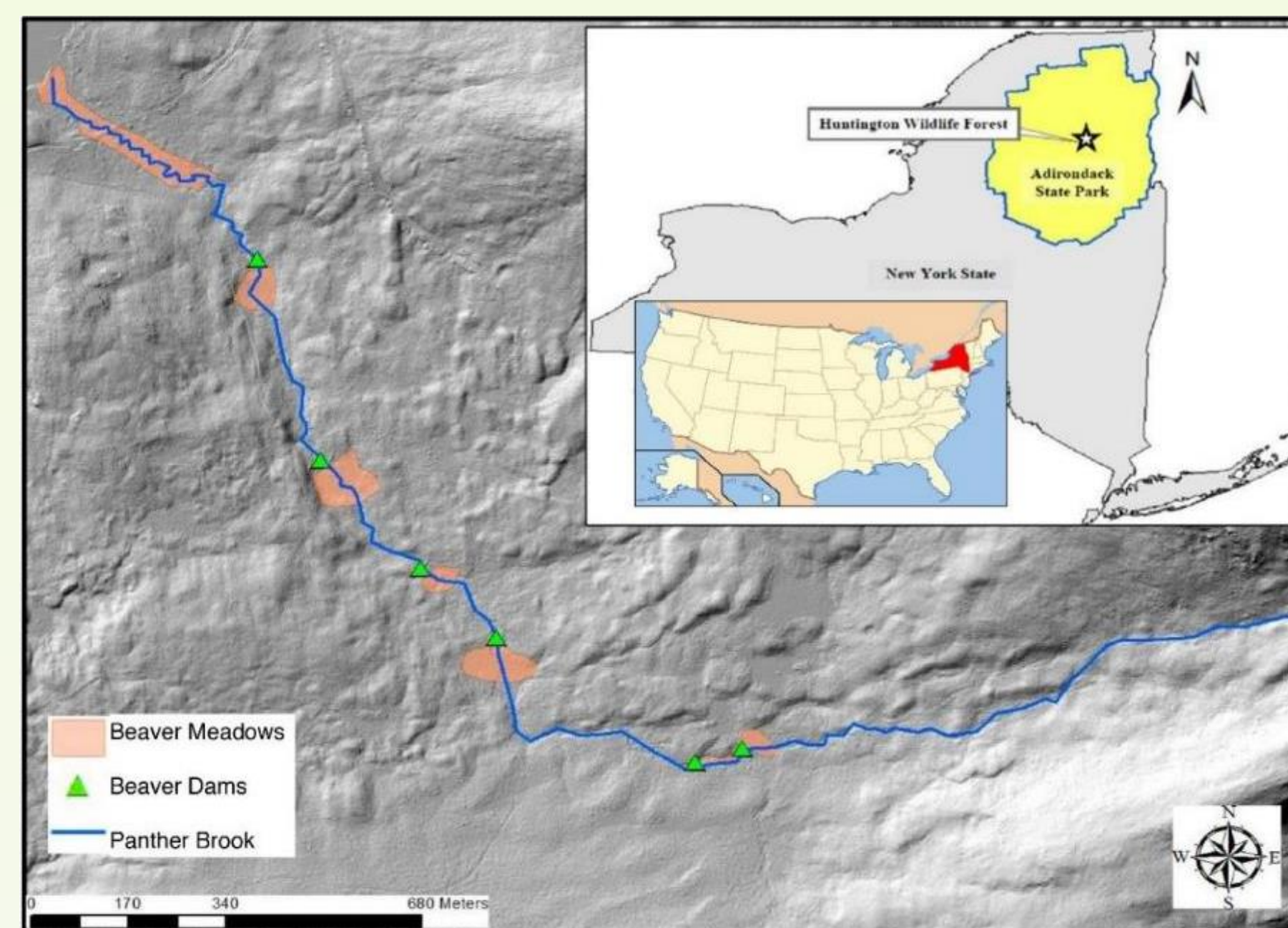


Figure 1: Panther Brook (located in Huntington Wildlife Forest) is a small stream in the center of the Adirondacks. Map of New York from Haase and Underwood (2013)

Objectives

- Determine what geomorphic parameters govern suitable beaver habitat
- Understand values of these parameters
- Useful for future beaver reintroduction in the Adirondacks



Figure 2: Typical beaver meadow along stream. Forested area in background hosts steeper boulder-reaches.

Methods

- Survey of Panther Brook: Hand level, stadia rod
- Pebble sizes (300 pebbles at each station)
- Channel width and depth
- Calculations of hydraulic parameters: Total shear stress equation, $\tau = \rho g d S$
 Stream power (bank-full), $\Omega = \rho g Q S$ (drainage area used as proxy for discharge)

Gradient

- The channel gradient in the meadows (0.001 m/m to 0.025 m/m) is lower than in non-beaver influenced boulder-reaches (0.02-0.166)

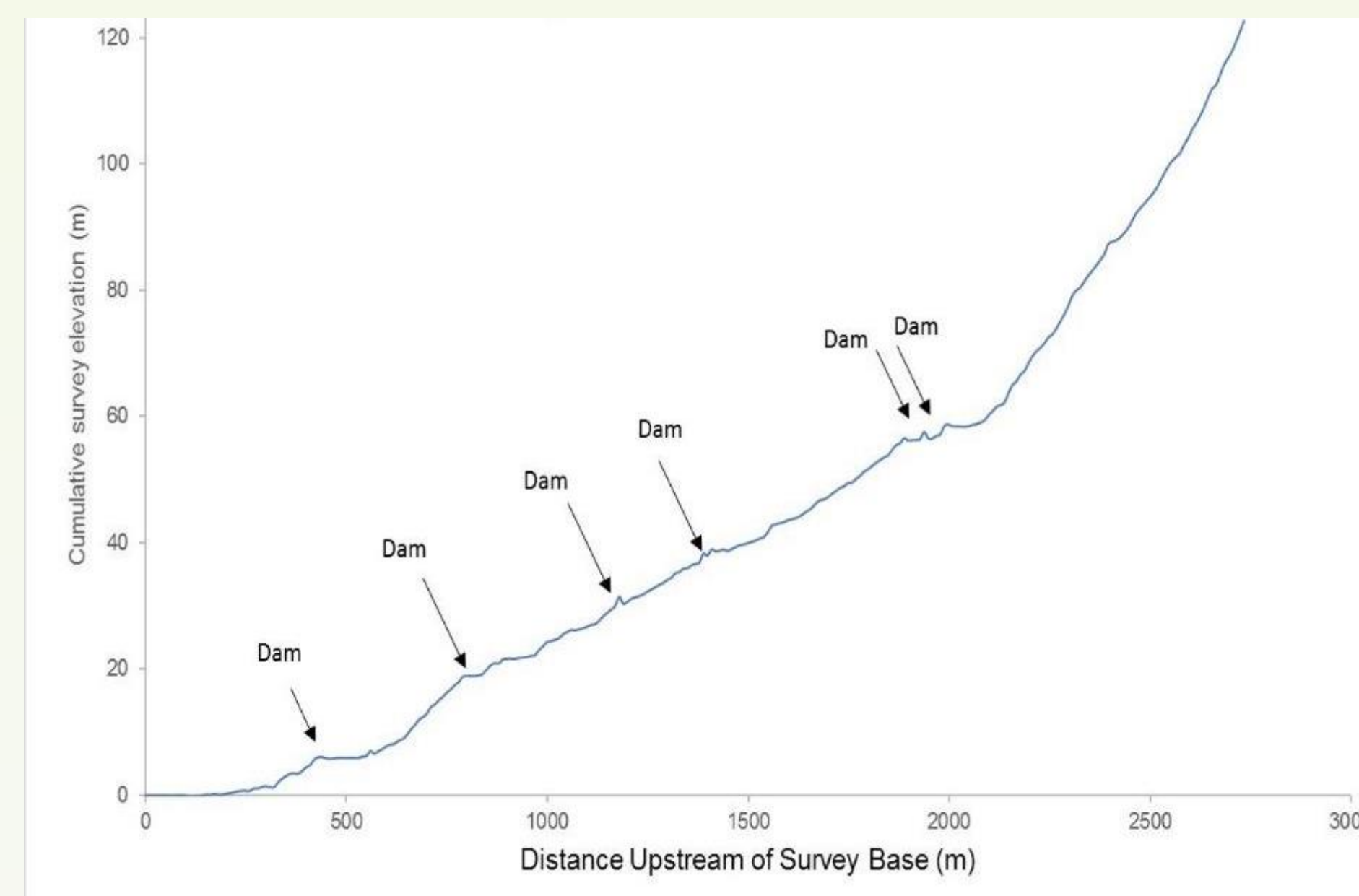


Figure 3: Longitudinal Profile of Panther Brook, indicating locations of beaver dams and the resulting meadows (flat areas). Areas in between meadows are the boulder-reaches.

Sediment Size

- Median sediment sizes in meadows range from 0.05 cm to 0.9 cm and amongst themselves have an average value of 0.5 cm
- This is lower than the sediment size in boulder-reaches, since the median at each survey station there ranges from 0.6 cm-3.8 cm

Sediment Size

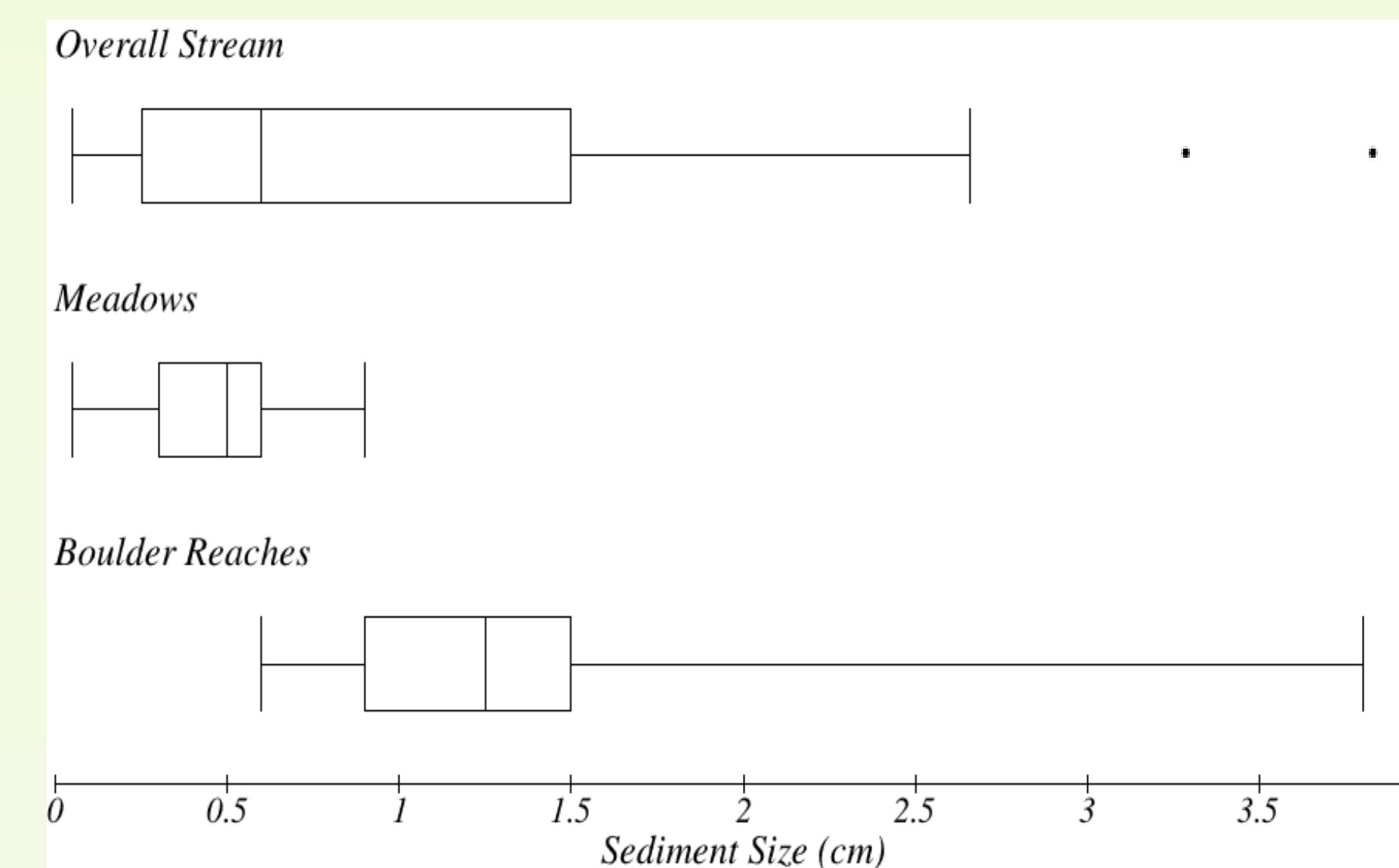


Figure 4: A stacked boxplot of the median sediment sizes from each station along the stream. The sizes vary between meadows and boulder-reaches

Total Shear Stress

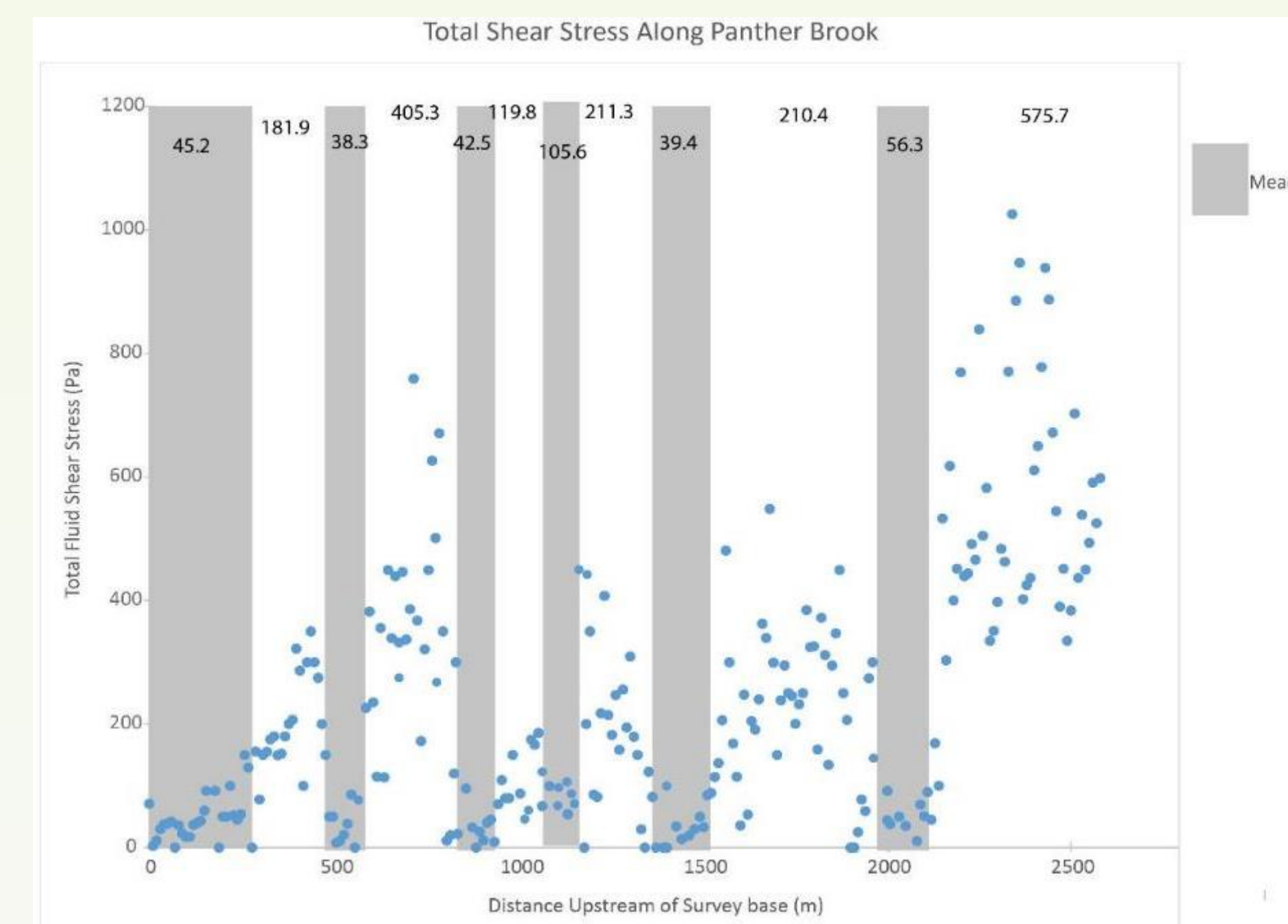


Figure 5: Plot of bank-full shear stress along Panther Brook. The gray areas indicate meadowed reaches, and the white areas represent boulder-reaches with the average shear stress at the top of each bar

- Total shear stress measures the force of the stream per unit area on the channel bed
- The areas of decreasing and low shear stress match up to the locations of beaver meadows
- Median of 54.9 Pa in meadows, compared to 284.1 Pa in boulder-reaches

Total Stream Power

- Total bank-full stream power measures energy dissipated against the sides of the channel, and determines if erosion or sediment aggradation occurs.
- Meadows have an average stream power of 102.9 W/m. Steep boulder-reaches have high stream power, with an average of 471.2 W/m.

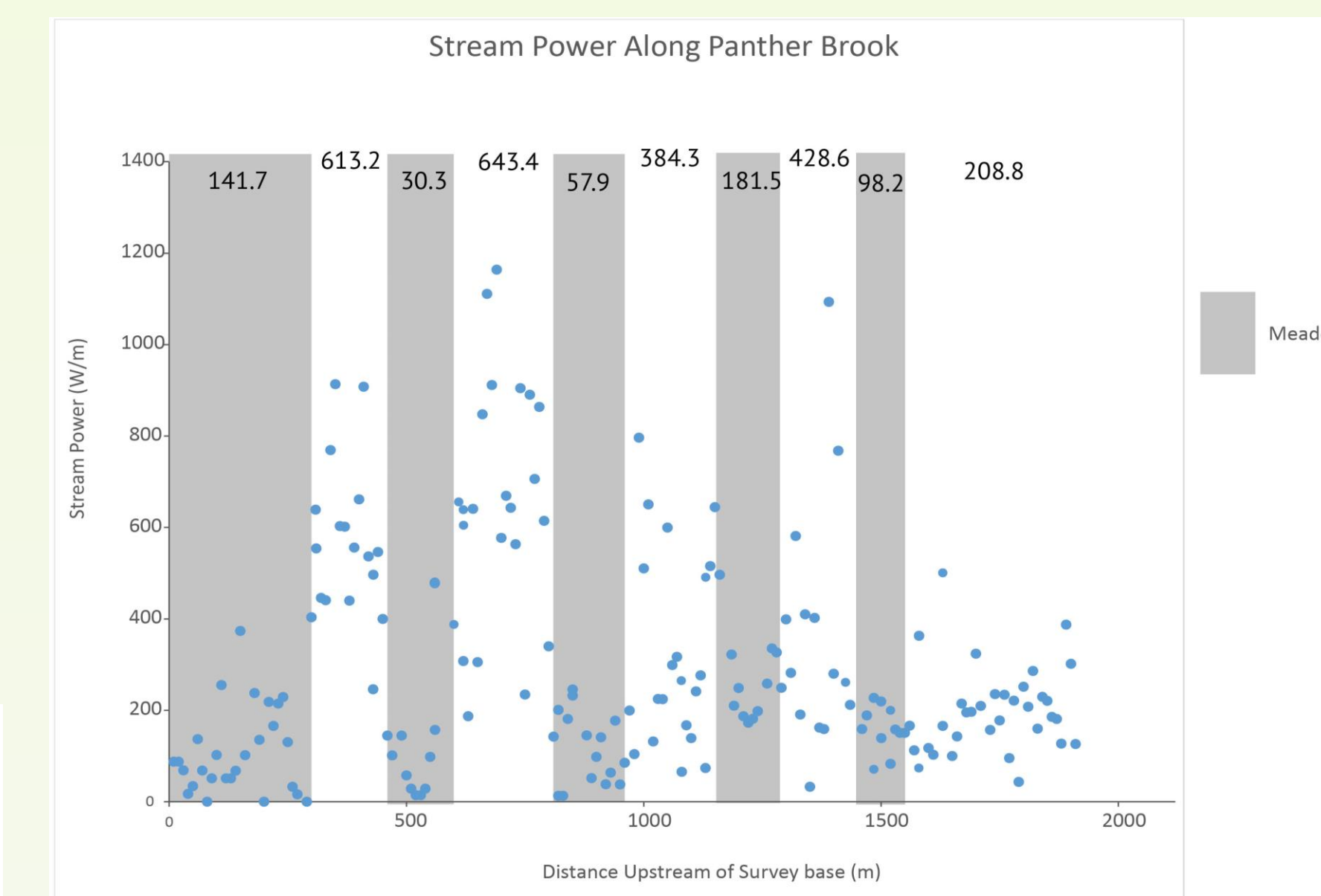


Figure 6: Plot of stream power along the stream

Conclusions

- Along Panther Brook, reaches with gradients of 0.001 m/m to 0.025 m/m, sediment of average size 0.05 cm to 0.9 cm, shear stress values under 142.9 Pa, and stream power under 513.9 W/m, indicate areas of suitable beaver habitat.
- In similar stream catchments in the area, these parameters may indicate places where beaver have already lived, or potential sites for reintroduction.

References

Haase, C.G. and H.B. Underwood. 2013. Integrating thermal constraints into habitat suitability for moose in the Adirondack State Park, NY. *Alces* 49: 49-64.

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