FLUVIAL GEOMORPHOLOGY: LONGITUDINAL PROFILE AND CROSS SECTIONS

ZACH HILGENDORF

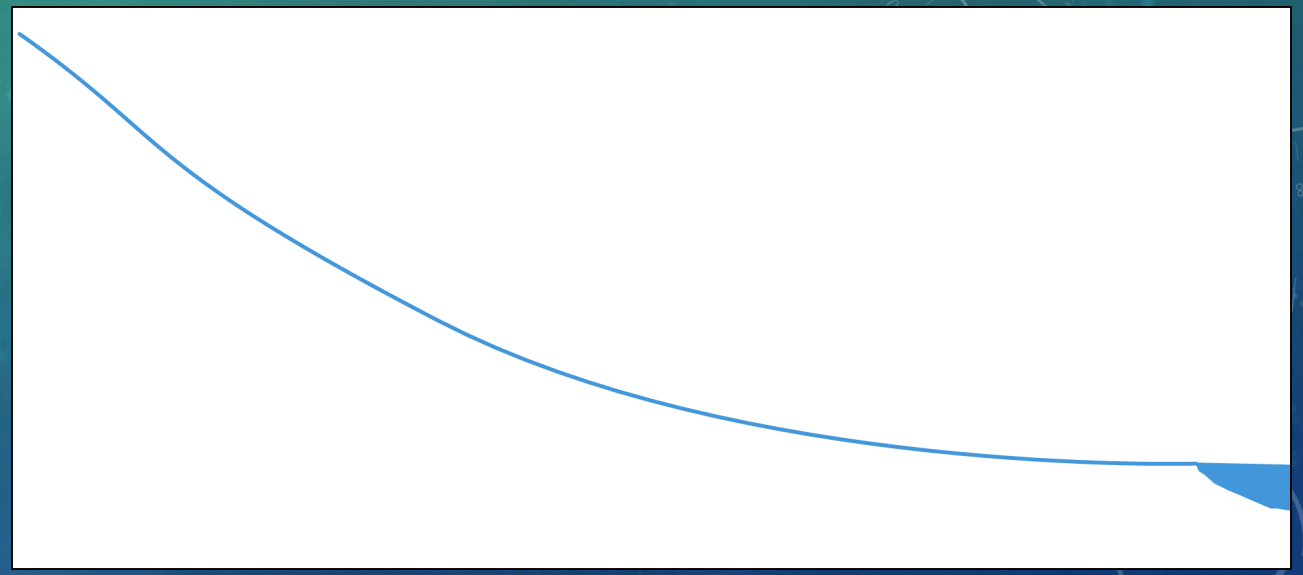
OBJECTIVES

- Understanding slope, grain, activity, and shape relationships related to the longitudinal (long) profile.

The geo-nerd currently talking…

WHAT IS THE LONG PROFILE?

- Two-Dimensional Profile of the Stream
  - Slope of water
- Measured through the center of the channel from mouth to headwaters
- Characteristically Concave Up Shape



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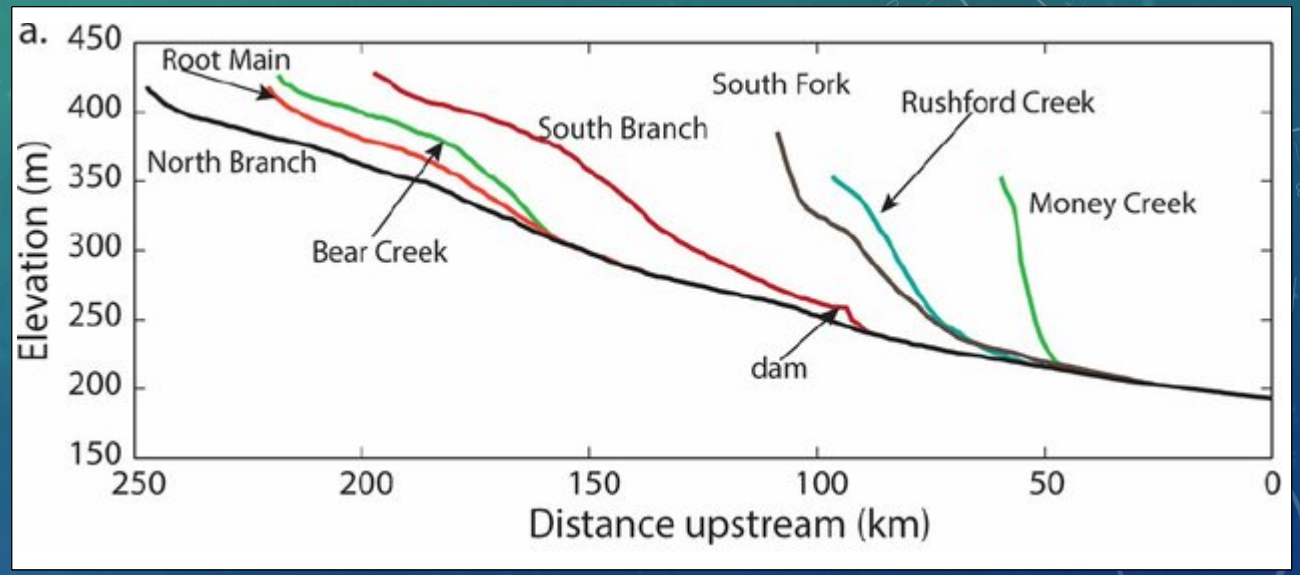

Stout et al. (2014)

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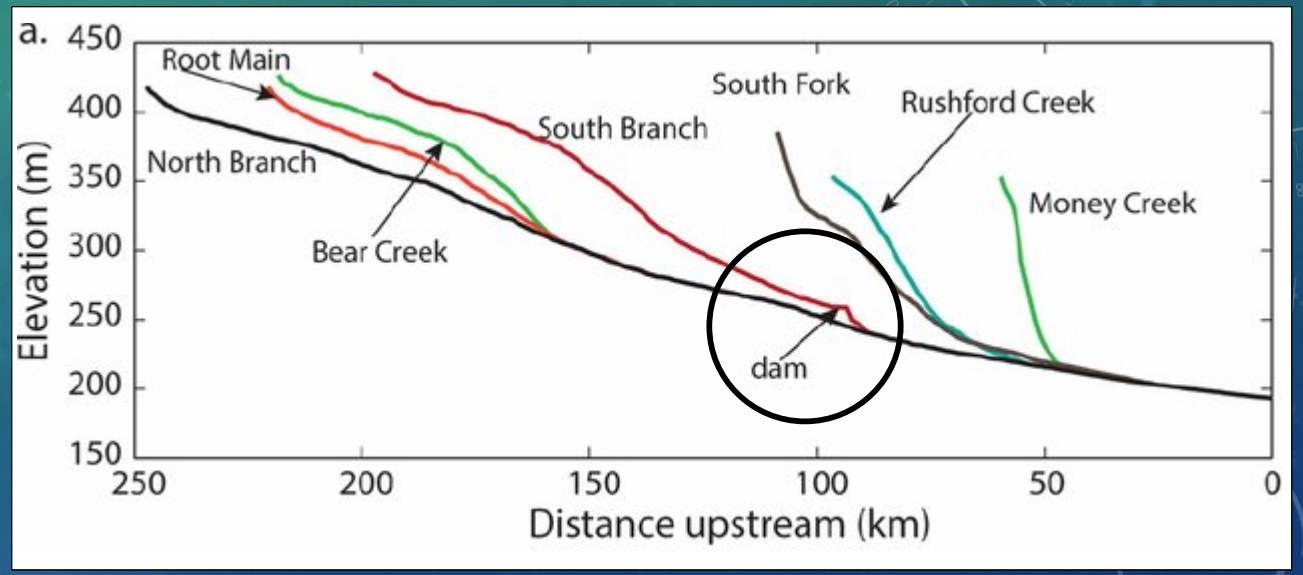

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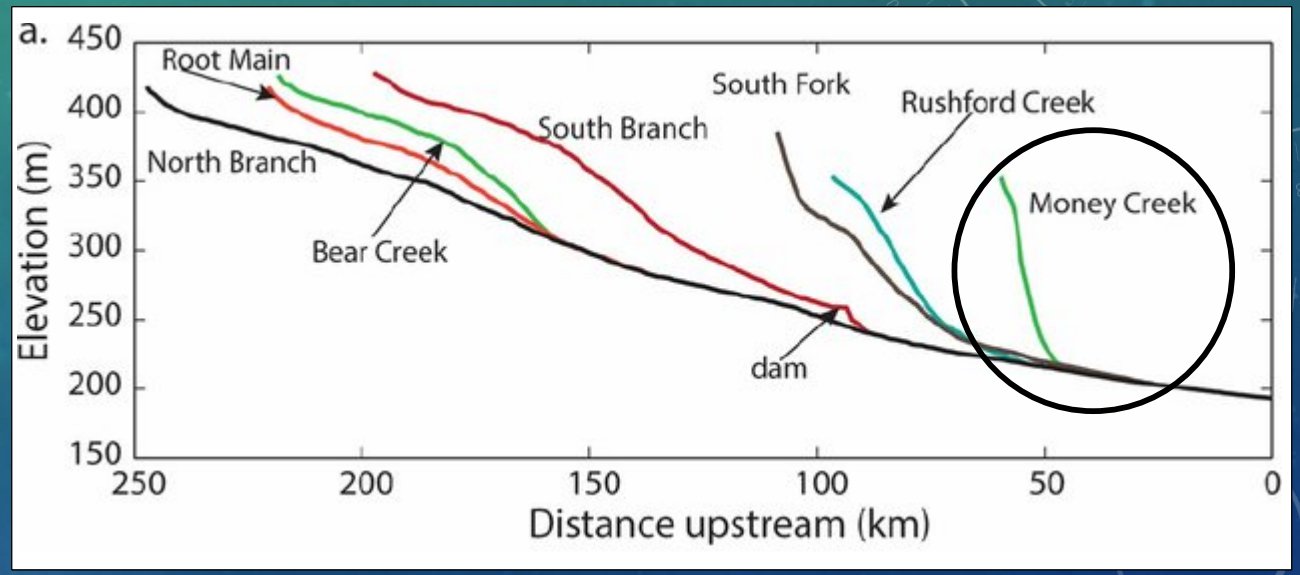

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- Two-Dimensional Profile of the Stream
  - Slope of water
- Measured through the center of the channel from mouth to headwaters
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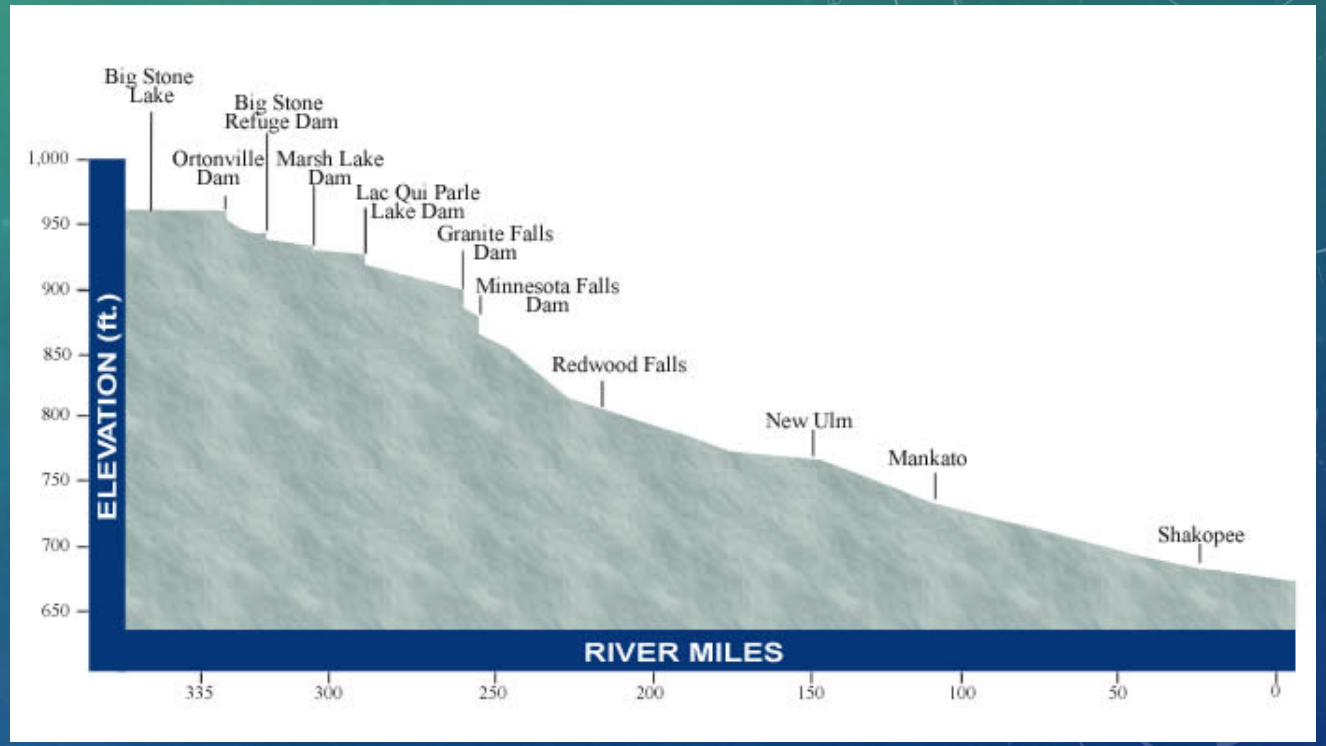
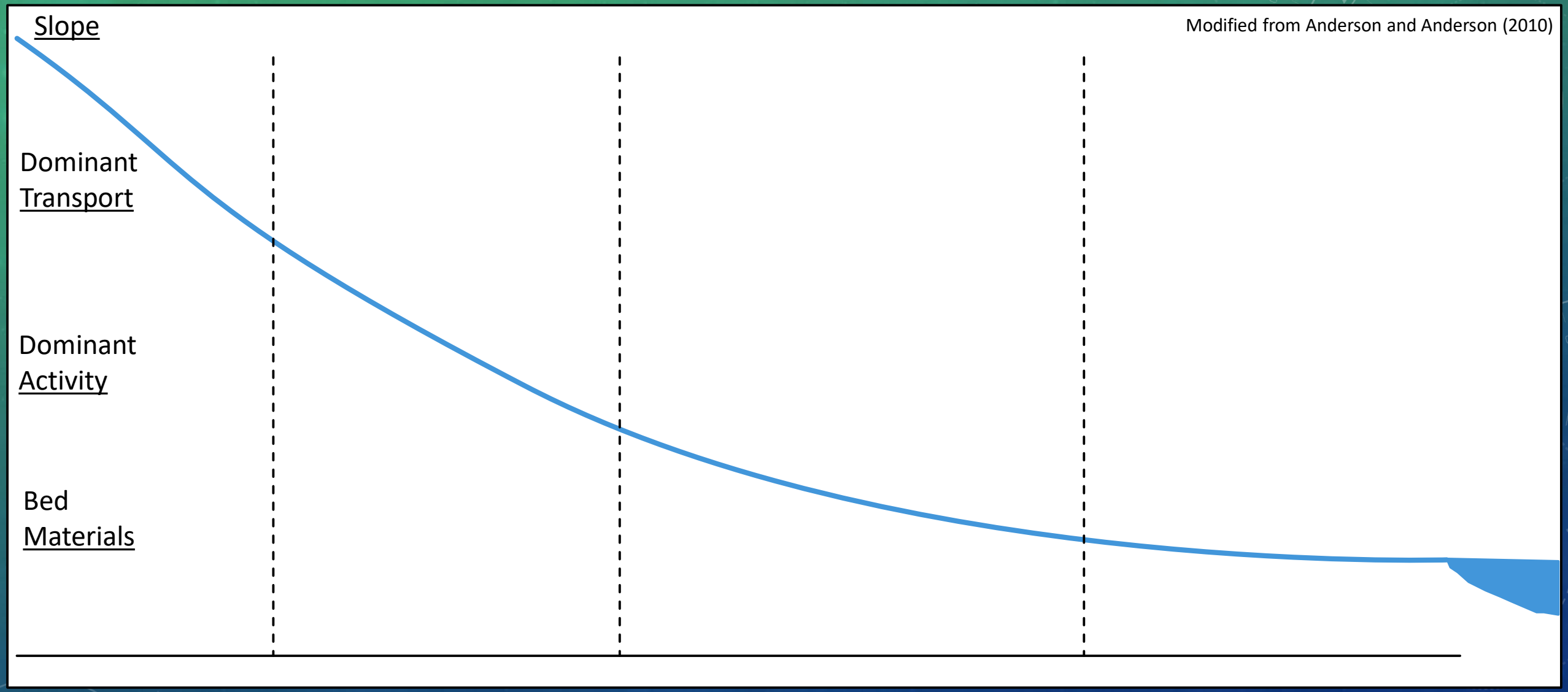
- Never That Simple!
- Can be Controlled by:
  - Geology
  - Tectonics
  - Climate
  - Human Modifications



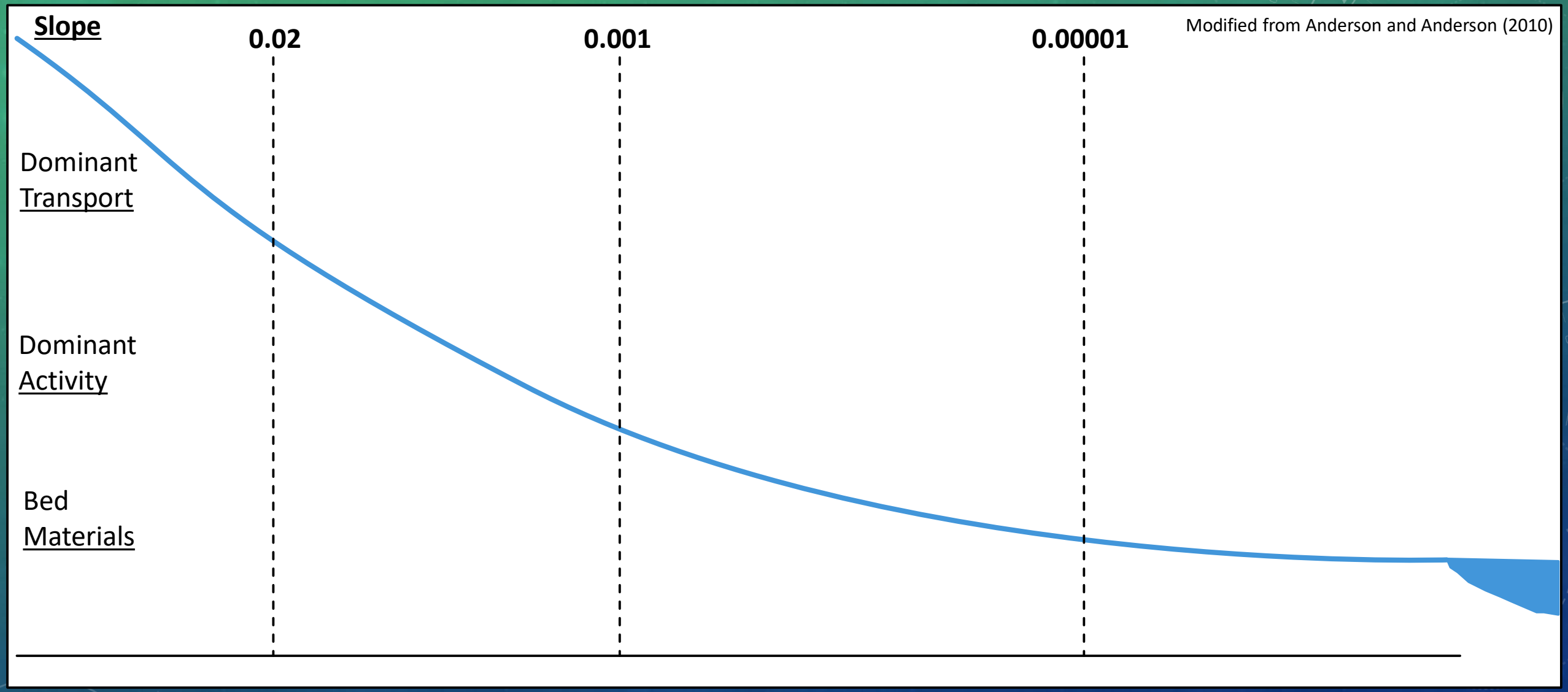
Minnesota River Basin Data Center (2003)

GENERAL LONG PROFILE TRENDS

Longitudinal Profile



Longitudinal Profile



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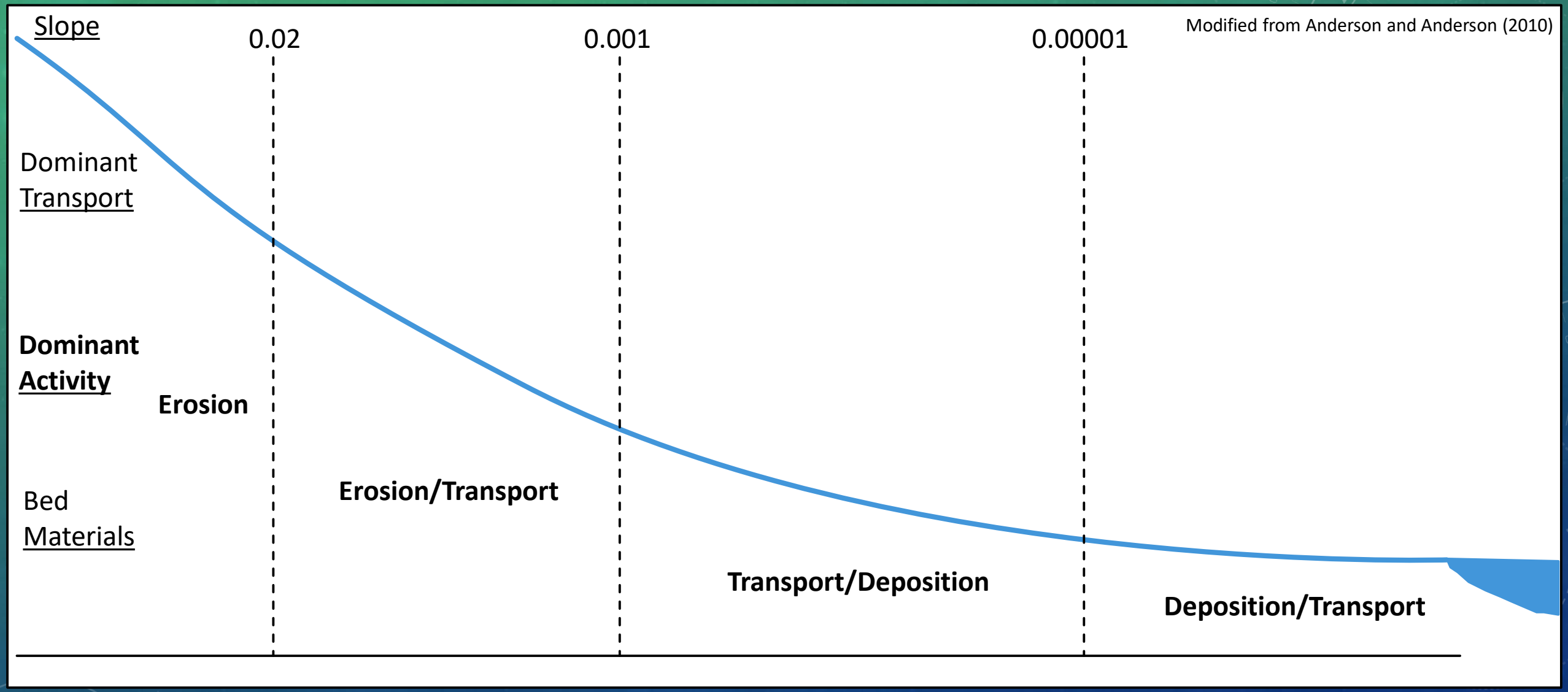

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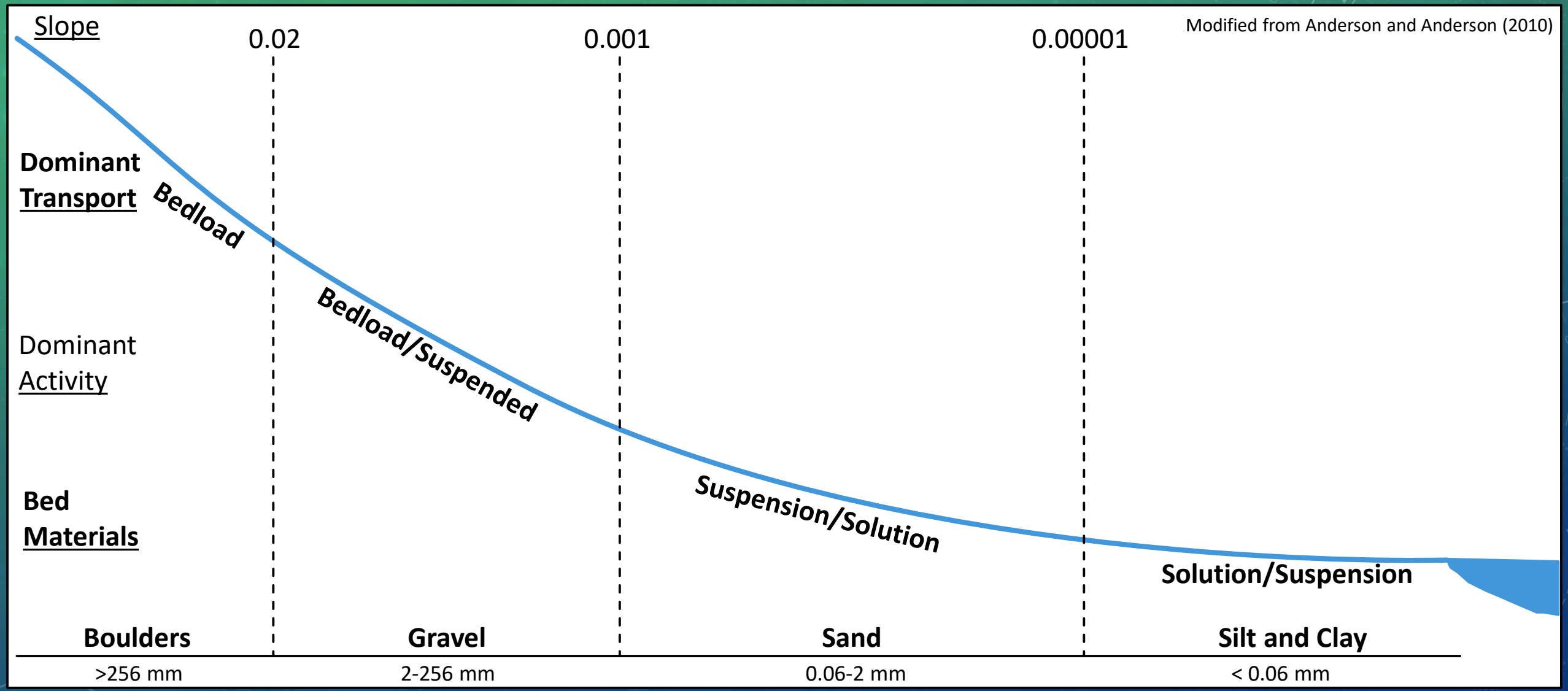

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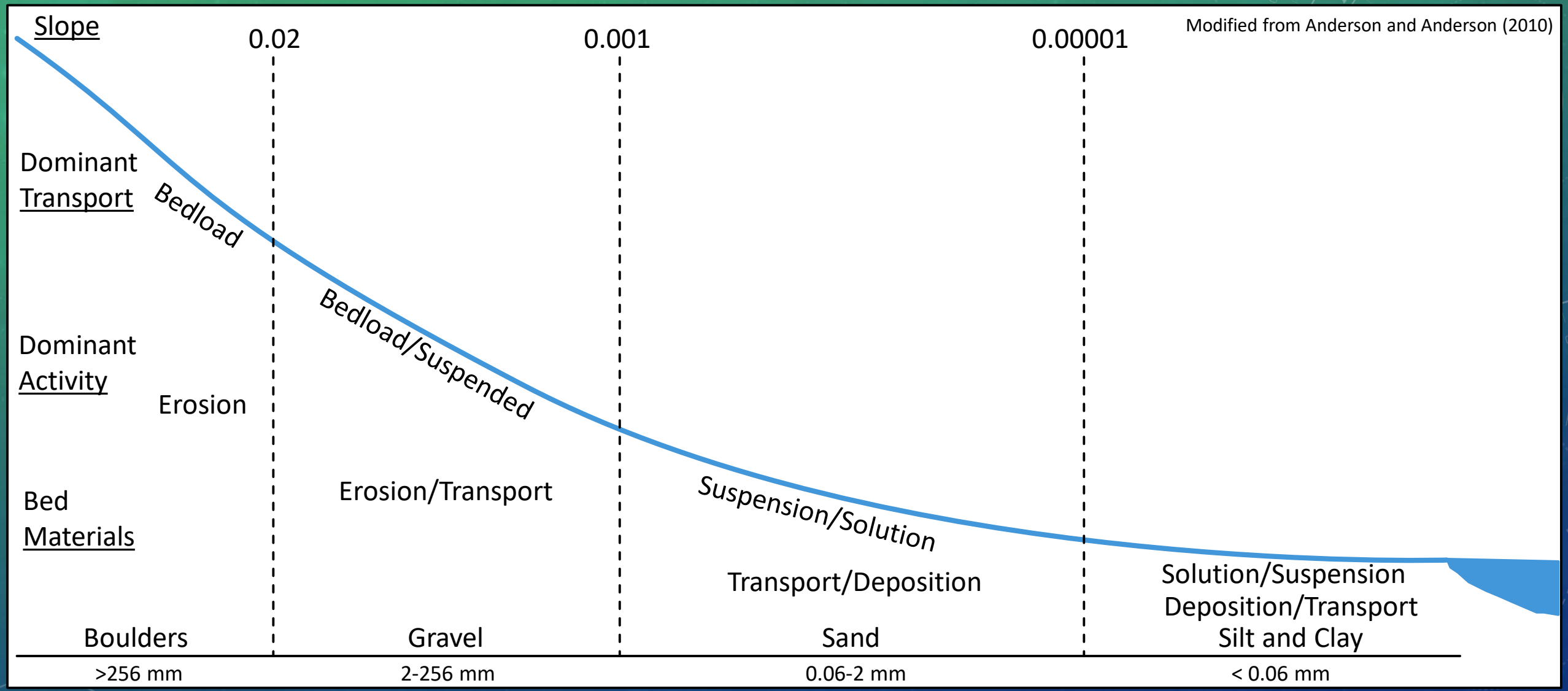

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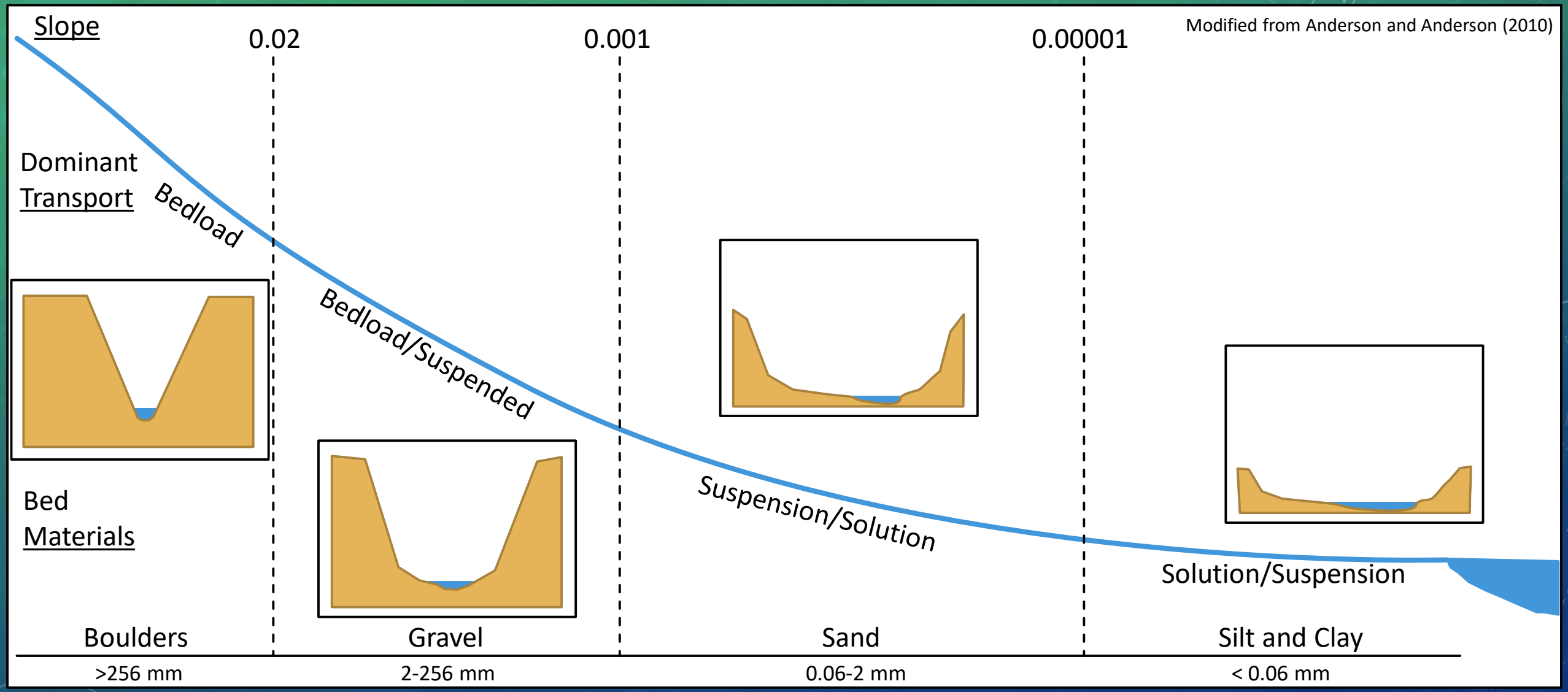


Longitudinal Profile

Modified from Anderson and Anderson (2010)

Slope

0.02

0.001

0.00001

Dominant Transport

Bedload

Bedload/Suspended

Suspension/Solution

Solution/Suspension

Photo Credit: Tim Kiser (Wikimedia Commons)

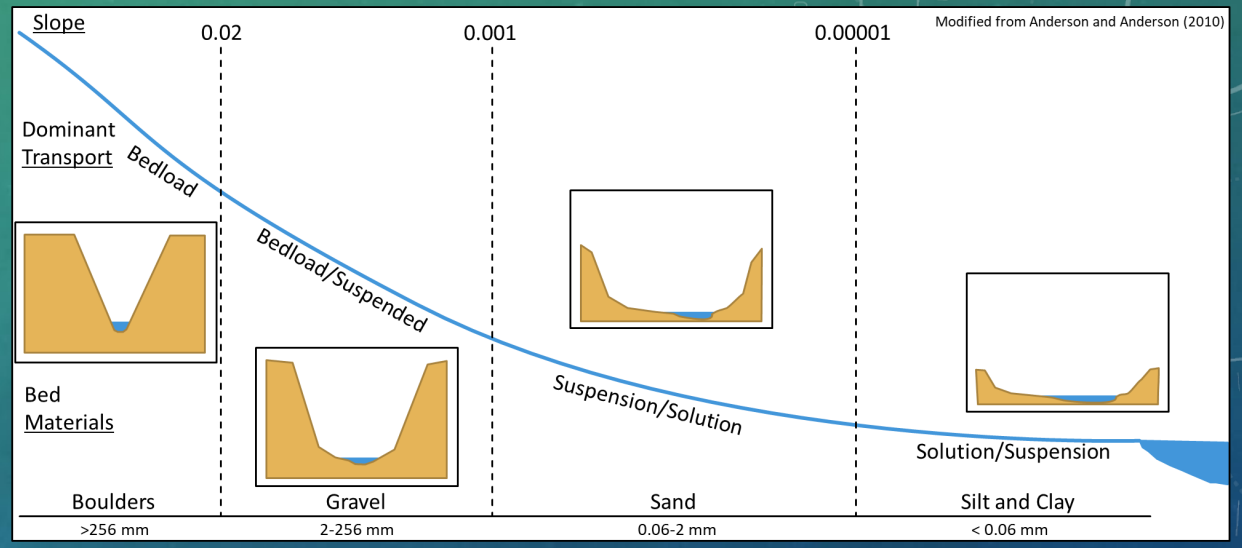
Photo Credit: dontworry (Wikimedia Commons)

Bed Materials

Boulders	Gravel	Sand	Silt and Clay
>256 mm	2-256 mm	0.06-2 mm	< 0.06 mm

RECAP

- Long Profile and Slope can Inform on Dominant Processes
- Slope Tends to Decrease Downstream
- Channels Widen Downstream
- Activity Shifts From Erosion to Deposition
- Sediment Tends to Fine Downstream
- Mode of Transport Shifts from Bedload to Suspended or Dissolved Load



A segmentation approach for the reproducible extraction and quantification of knickpoints from river long profiles

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Received: 23 August 2018 – Discussion started: 27 September 2018
Revised: 18 January 2019 – Accepted: 29 January 2019 – Published: 18 February 2019