



# The Uplift and Unroofing of the Uinta Mountains: A tectonic history recorded by conglomerates

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## Introduction

- The Uinta Mountains, located primarily in northeastern Utah and extending into southern Wyoming, are an east-west trending basement-cored anticlinal Laramide structure (Figure 1).
- The Greater Green River Basin contains conglomerates with clasts shed from the Uinta Uplift that bounds its southern margin. It is one of a number of basins formed during the Laramide orogeny that reflect tectonic partitioning of the Cretaceous foreland<sup>1</sup>.
- The basin is asymmetric (Figure 1), and the depocenter gradually shifted south during formation of the Uinta Uplift as a result of flexural accommodation<sup>2</sup>.

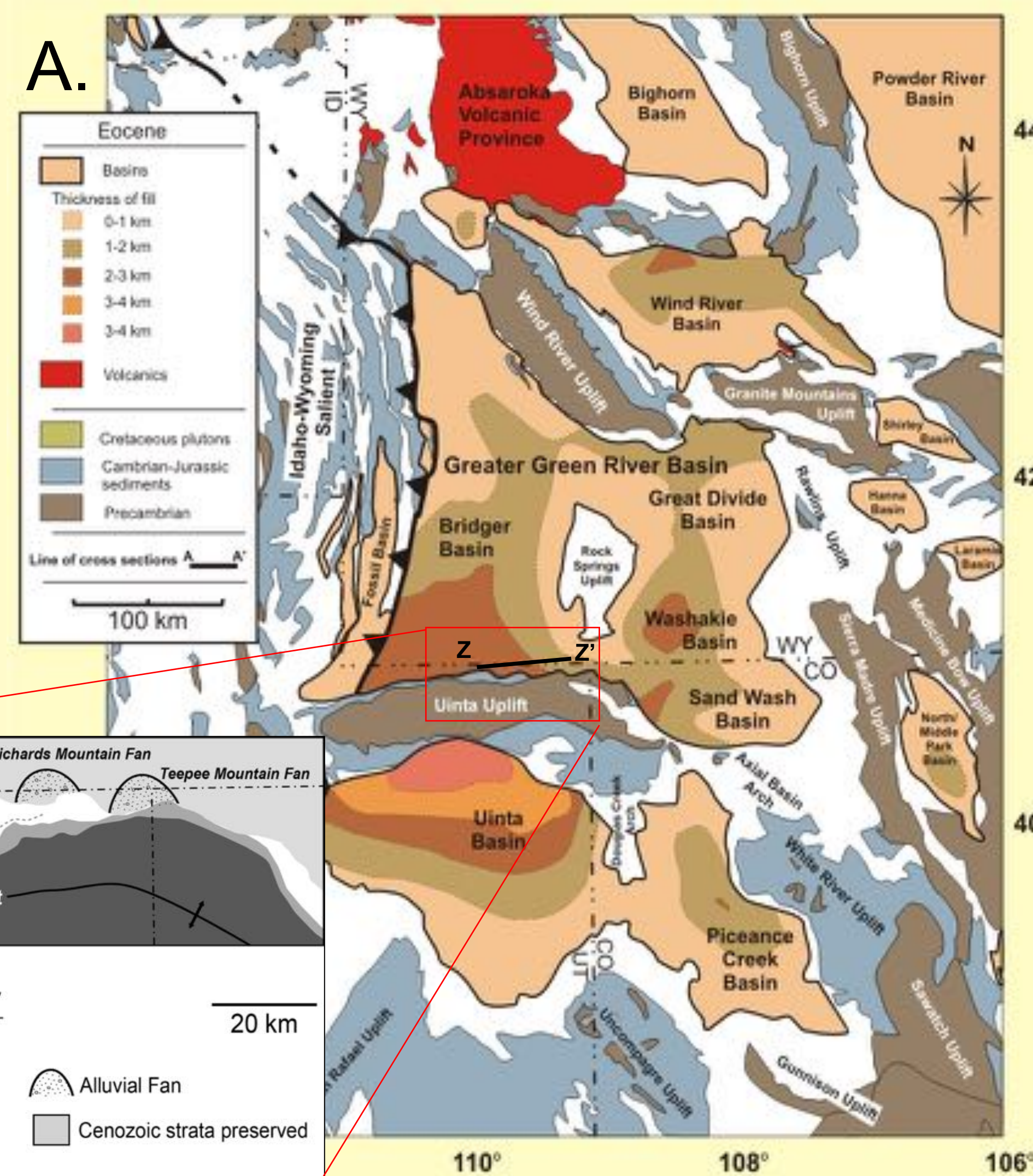
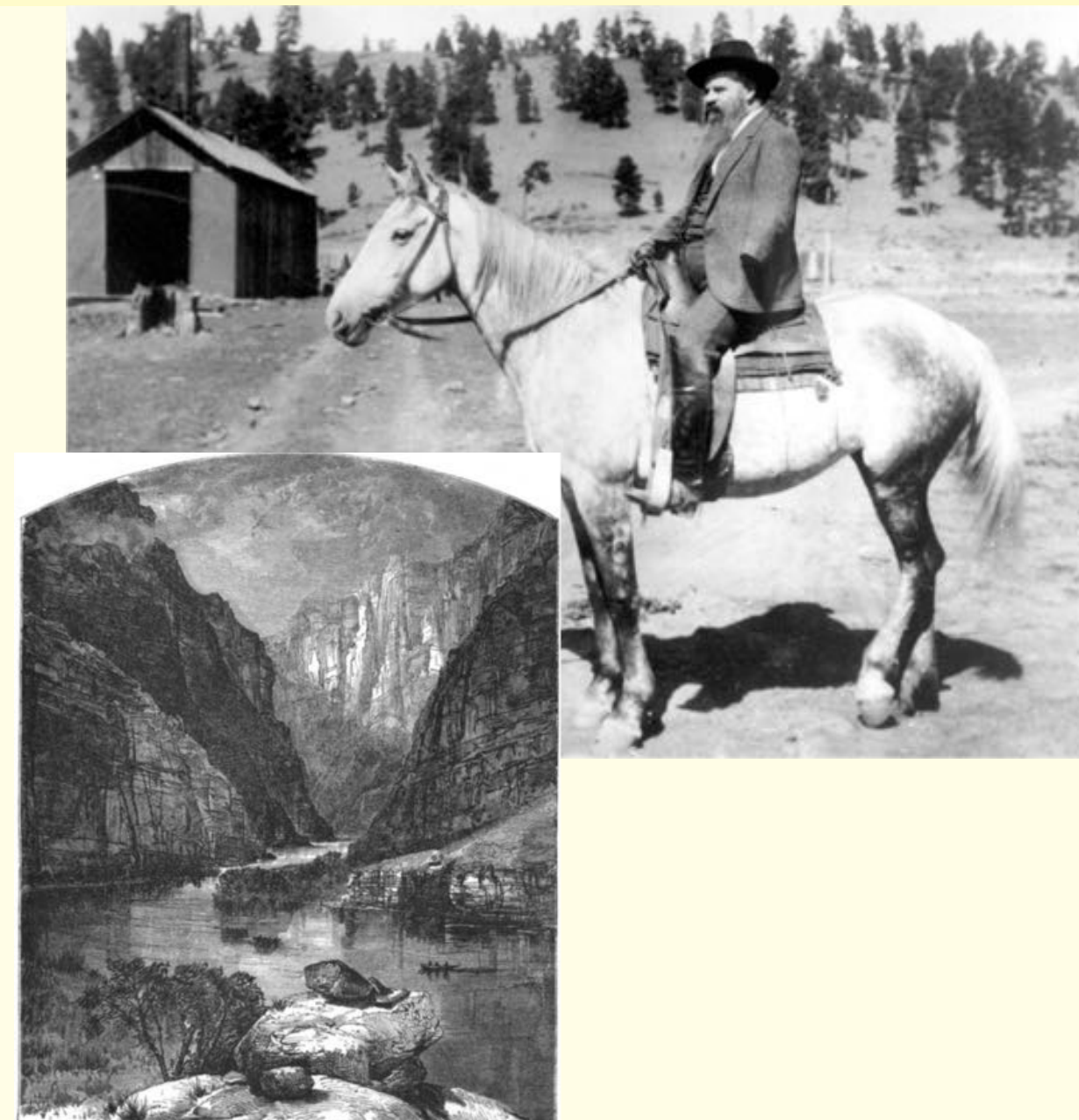


Figure 1. A. Map of fill thickness in asymmetric Laramide basins. Note the basin depocenter of the Greater Green River basin is in the south paralleling the base of the Uinta Mountains. Courtesy of Michael E. Smith. B. Eocene fanglomerate deposits along the southern margin of the Green River Basin. Note, fans become progressively younger further west. Modified from Smith et al. (2015).

## Early Exploration of the Uinta Mountains

- In 1876 J.W. Powell first described these packages of conglomerates, comprised of quartzite, sandstone, and limestone clasts<sup>3</sup>.
- These clasts appeared to be sourced from the adjacent uplift.
- Since 1876, many have noted this same sequence of clast lithology<sup>4,5,6,7</sup>.
- These gravels are now recognized as recording the denudation of the Uinta Mountains<sup>6,7</sup>.



## Uinta Stratigraphy & Clast Composition

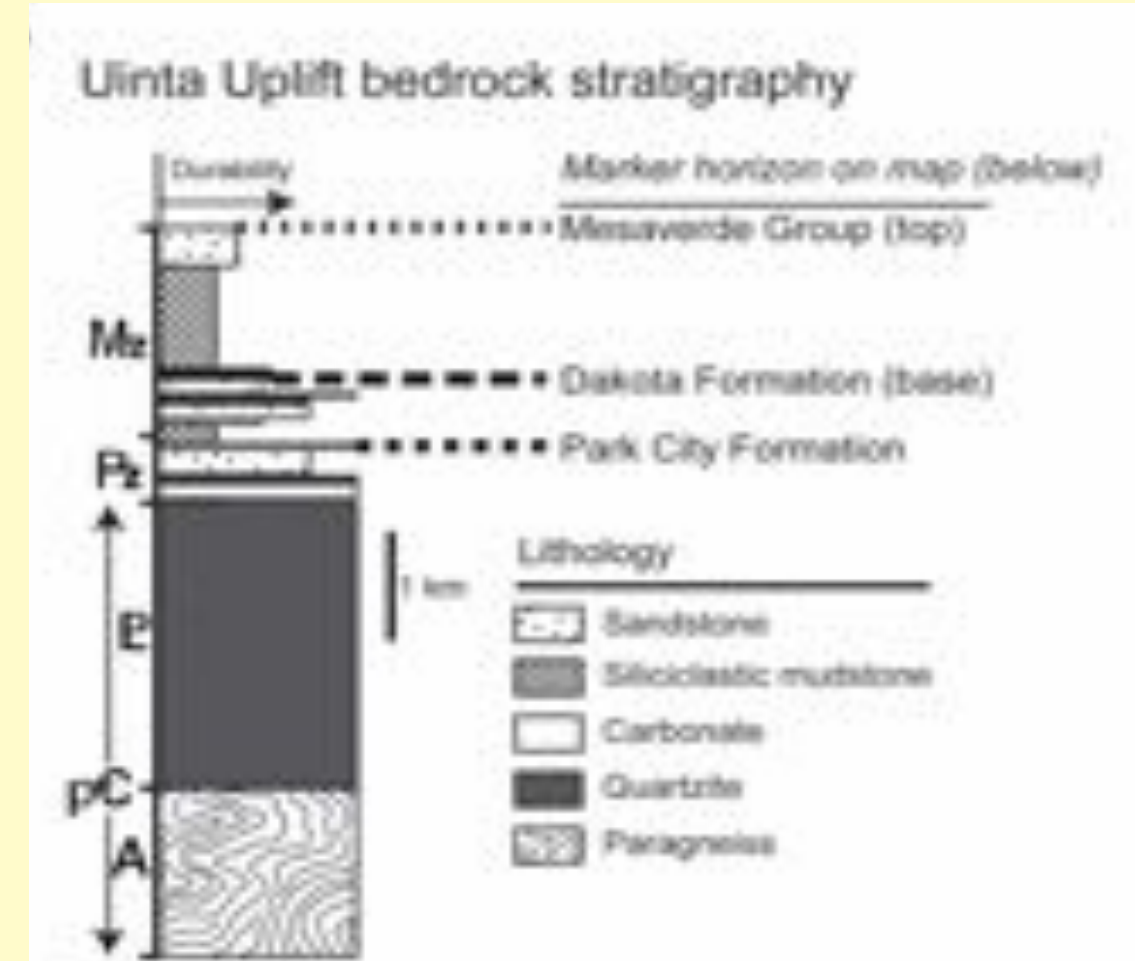


Figure 2. Generalized stratigraphy of the Uinta Uplift with durability increasing to the right. Precambrian lithologies are comprised of highly durable quartzite and meta-sediment. Younger lithologies are comprised of less durable sandstone and shales. Modified from Smith et al. (2015).

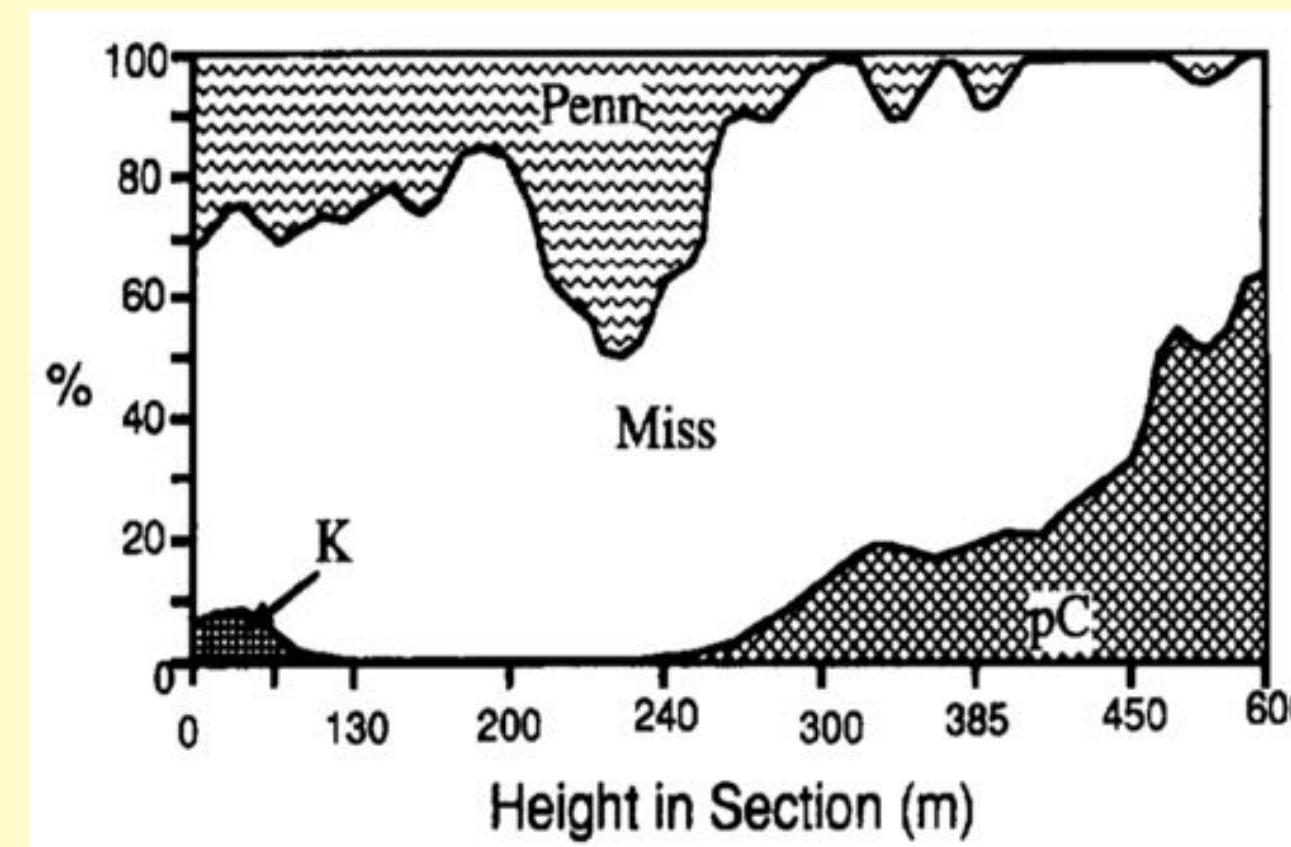


Figure 3. Percent lithology present in conglomerate clasts by stratigraphic height at Richards Mt. fan. Higher in the section there is an absence of Cretaceous material, and an increase in the percent of Precambrian clasts. Modified from Crews & Ethridge (1993).

## Conglomerate Stratigraphic Sequences

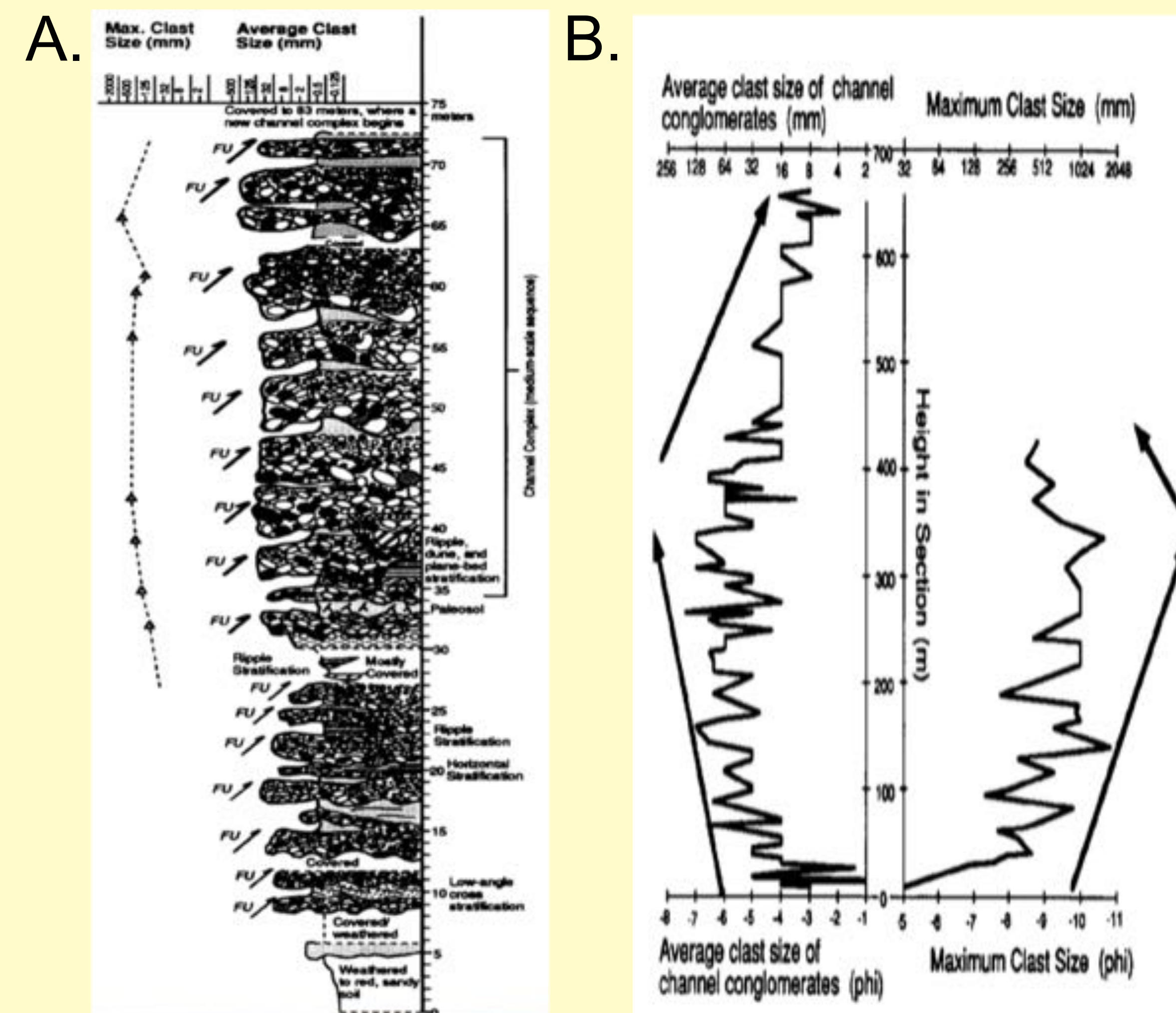


Figure 4. The coarsening upwards within the megasequence is interpreted as an increase in sediment flux from uplift, while the fining upwards indicates a gradual decrease in tectonic activity. The smaller scale sequences are consistent with river avulsions within an alluvial fan. Modified from Crews & Ethridge (1993).

## References

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## Timing of Unroofing & Fan Deposition

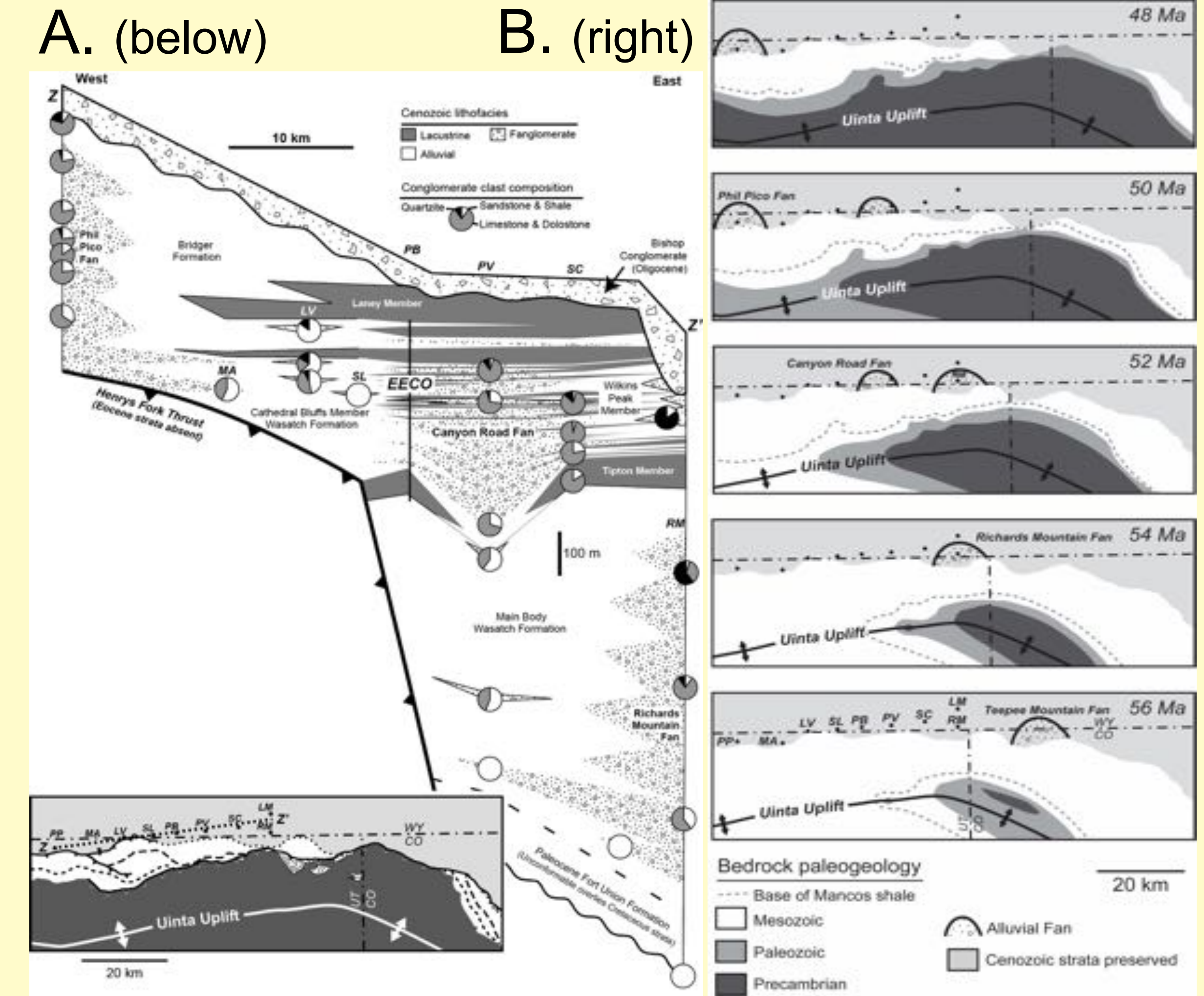


Figure 5. A. Cross-section along Z-Z' line show in Figure 1 showing relative clast composition for conglomerate deposits. Sample location abbreviations are as follows: Phil Pico Mountain (PP), Manila (MA), Luverne (LV), State Line (SL), Pipeline Valley (PV), Spring Creek (SC), Richards Mountain (RM), and Little Mountain (LM). Timing of Precambrian bedrock exposure and fan deposition during Eocene time. The westward decrease in age of fan deposits indicates an east to west trend in the uplift of the Uinta Mountains. Modified from Smith et al. (2015).

## Paleocene Gravels In Laramide Basins

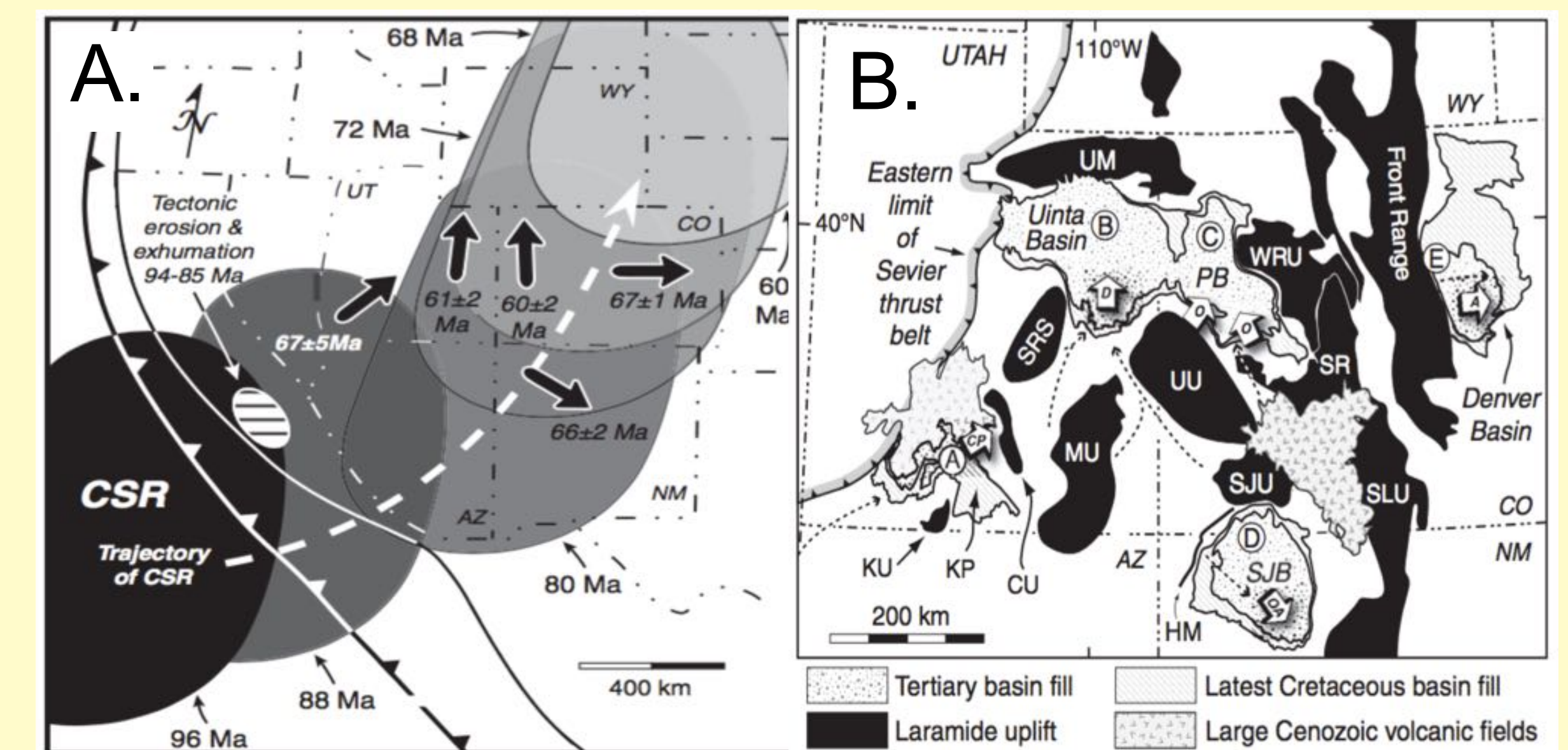


Figure 6. During Paleocene time Laramide basins south of the Greater Green River Basin sheet gravels were deposited that are hypothesized to record the passage of the Shatsky Rise conjugate under North America during flat slab subduction. Modified from Heller et al., 2013.

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