

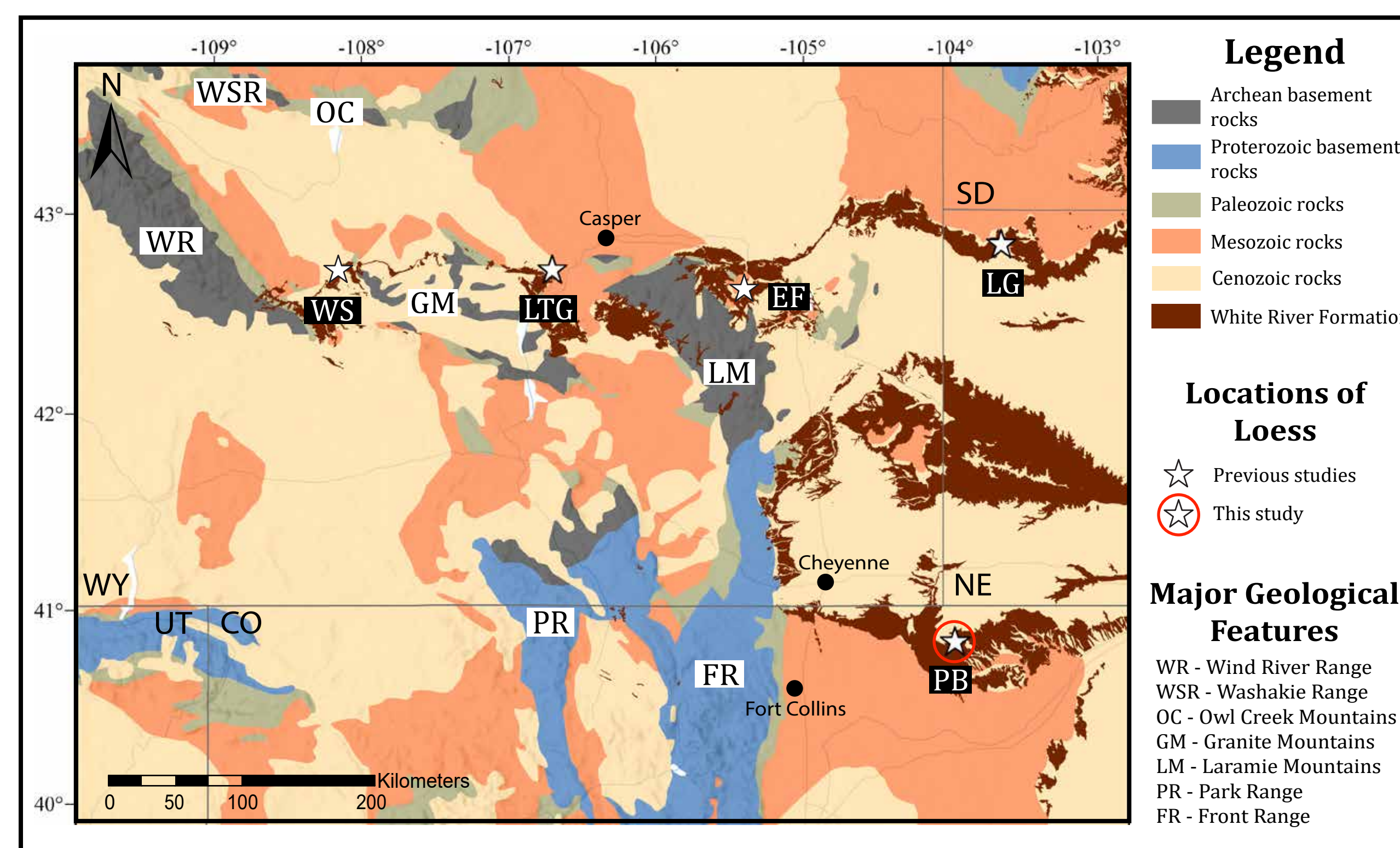
Abstract

In the western interior of the USA, eolian sedimentary rocks of the middle and late Cenozoic age are widely distributed. Previously, late Paleogene loess deposits have been identified in Wyoming and western Nebraska. This study explores a new site near the Pawnee Buttes (PB) in northeastern Colorado to assist understanding of the spatiotemporal extent of loess deposition during this period. Here we present the results of field lithofacies studies and laboratory grain-size analysis of samples from the White River Group at two nearby sections (PB and PBE). The two sections were stitched together based on the elevation difference and lithological markers. Field sedimentology data of the White River Group show that the sections contain mostly pink to grey, massive siltstone or very fine-grained sandstone with interbedded brick red, laminated siltstone. End member analysis of the grain-size data shows three modes at 10 μm (EM1), ~30 μm (EM2), and ~70 μm (EM3). The massive siltstone and sandstone all contains EM1 and EM2, with most of them also have EM3 up to 30%. The laminated siltstone contains 20-30% EM1, 20-30% EM2, and 40-60% EM3. The grain size distribution of the massive beds is similar to the loess deposits found on the Chinese Loess Plateau, suggesting the presence of loess-like deposits in the Pawnee Buttes during the Oligocene. EM1 reflects long-range transport by higher-altitude winds, while EM2 and EM3 were possibly transported by strong, episodic lower-level winds from nearby or regional sources as fallout of suspension. The beds with root casts generally have a higher clay content suggesting more pedogenesis under a warmer and humid climate during those interval.

Objectives

- Finding the deposition environment of the White River Group at northeastern Colorado?
- Finding the earliest time of loess deposition deposition?
- How did the sediments have been transported to form the loess?

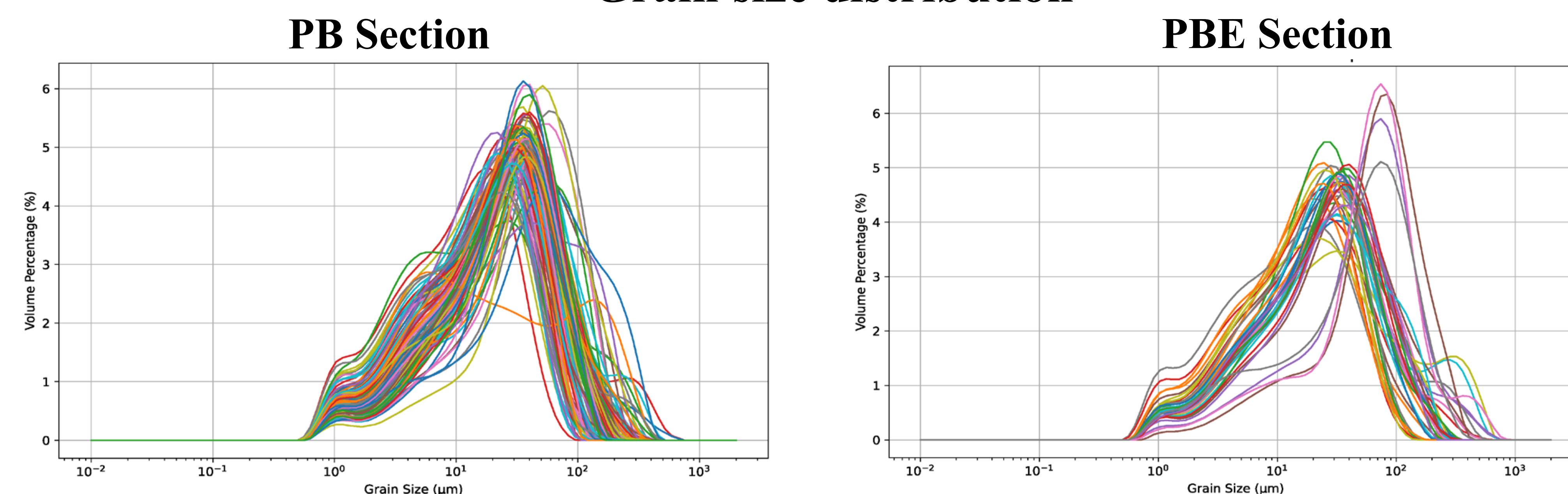
Location of the site



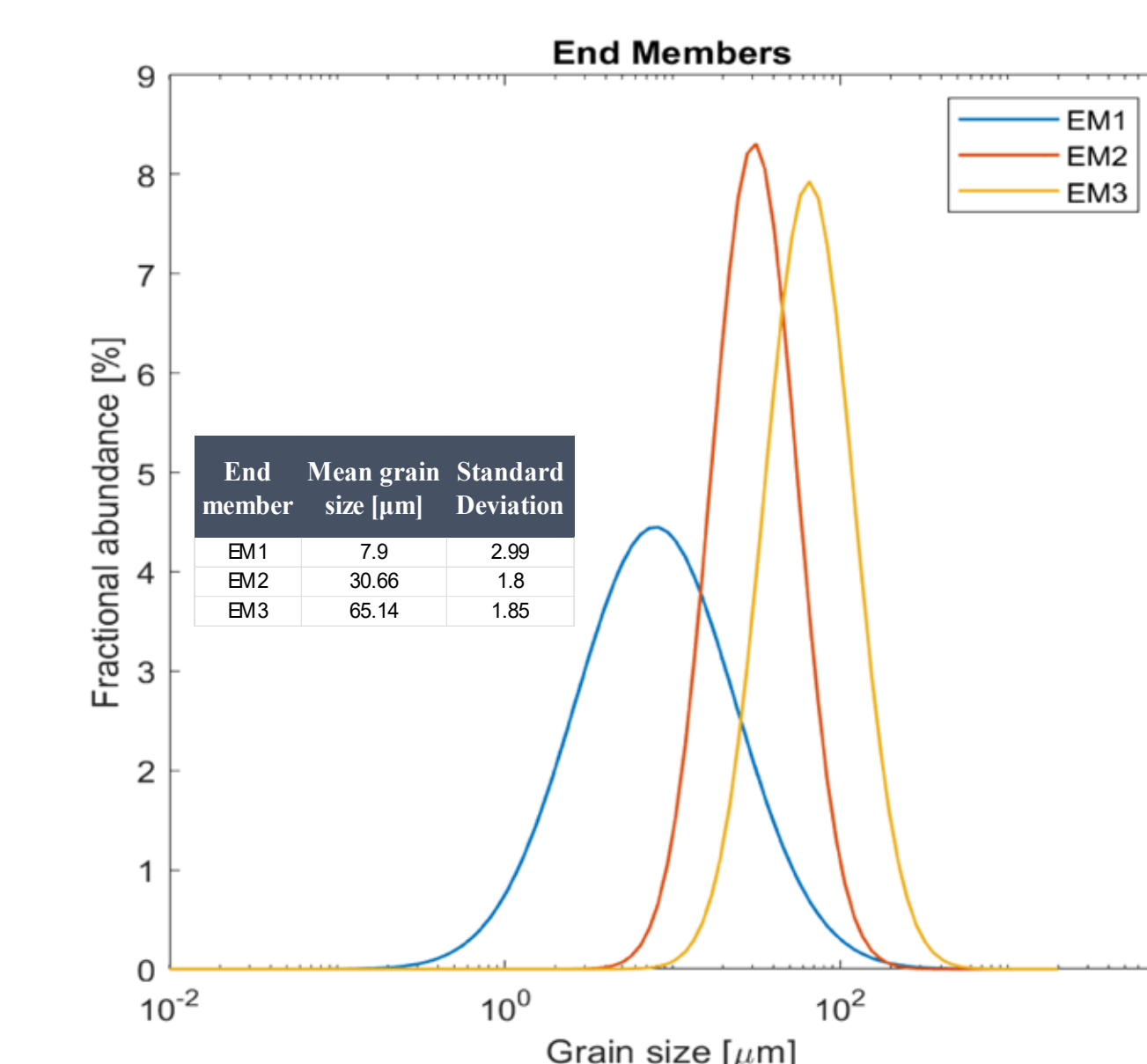
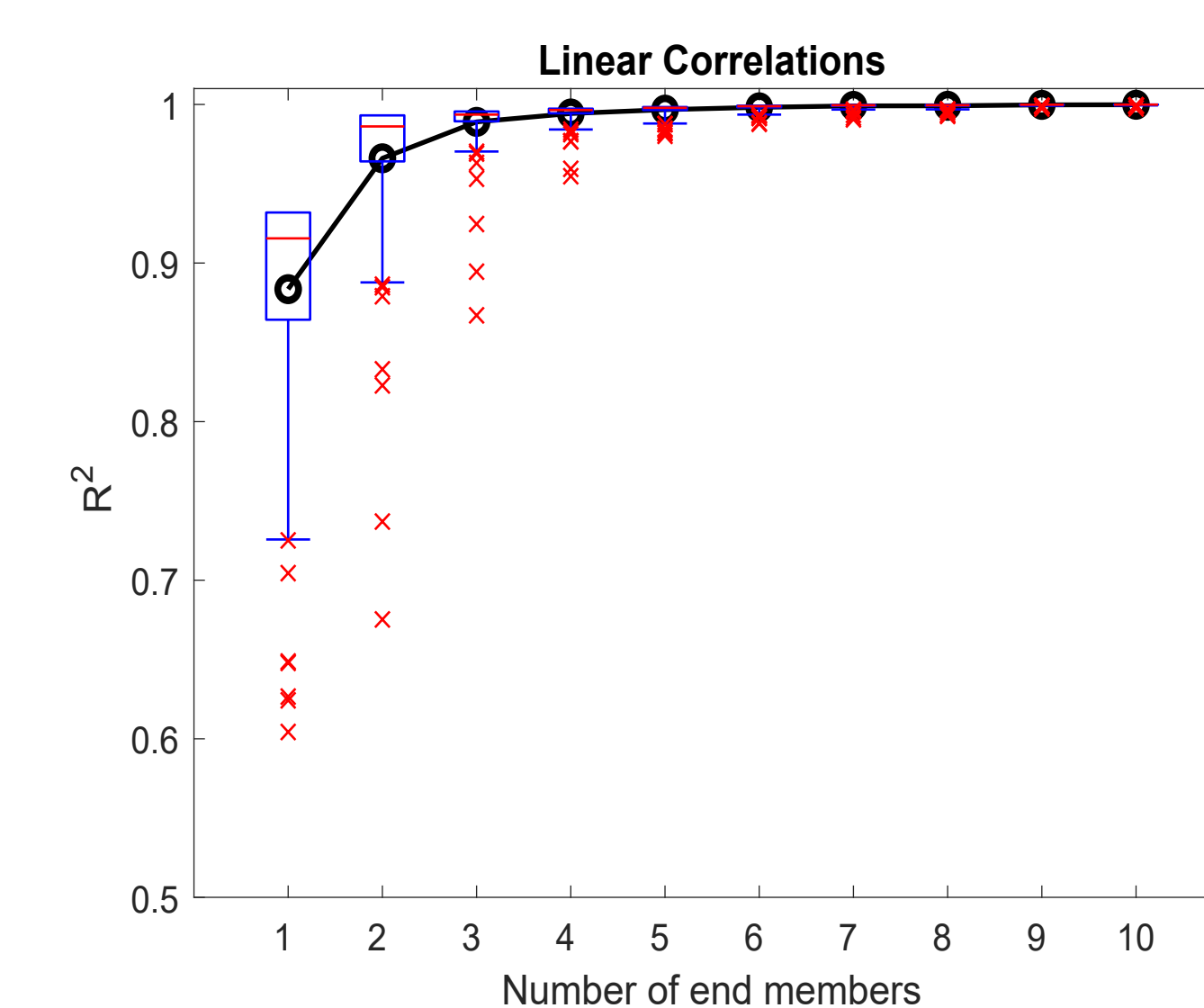
Methods

- Stratigraphic sections were measured at two locations (PB and PBE) at the Pawnee Buttes.
- Sections were stitched based on elevation and lithological markers.
- Rock samples were collected at a minimum interval of 0.5 meters for grain size studies
- After crushing and chemical treatment, grain size analysis was performed using laser diffraction on bulk sediment samples at Baylor University.
- End-member modeling analysis was conducted on the grain size data using Analysize in MATLAB to determine the contribution of distinct transport populations (Paterson and Heslop, 2015).

Grain size distribution



End Member Analysis



- EM1 could be transported by high-altitude winds from a distal source.
- EM2 and EM3 were possibly transported by surface winds from local or regional sources.

Conclusions

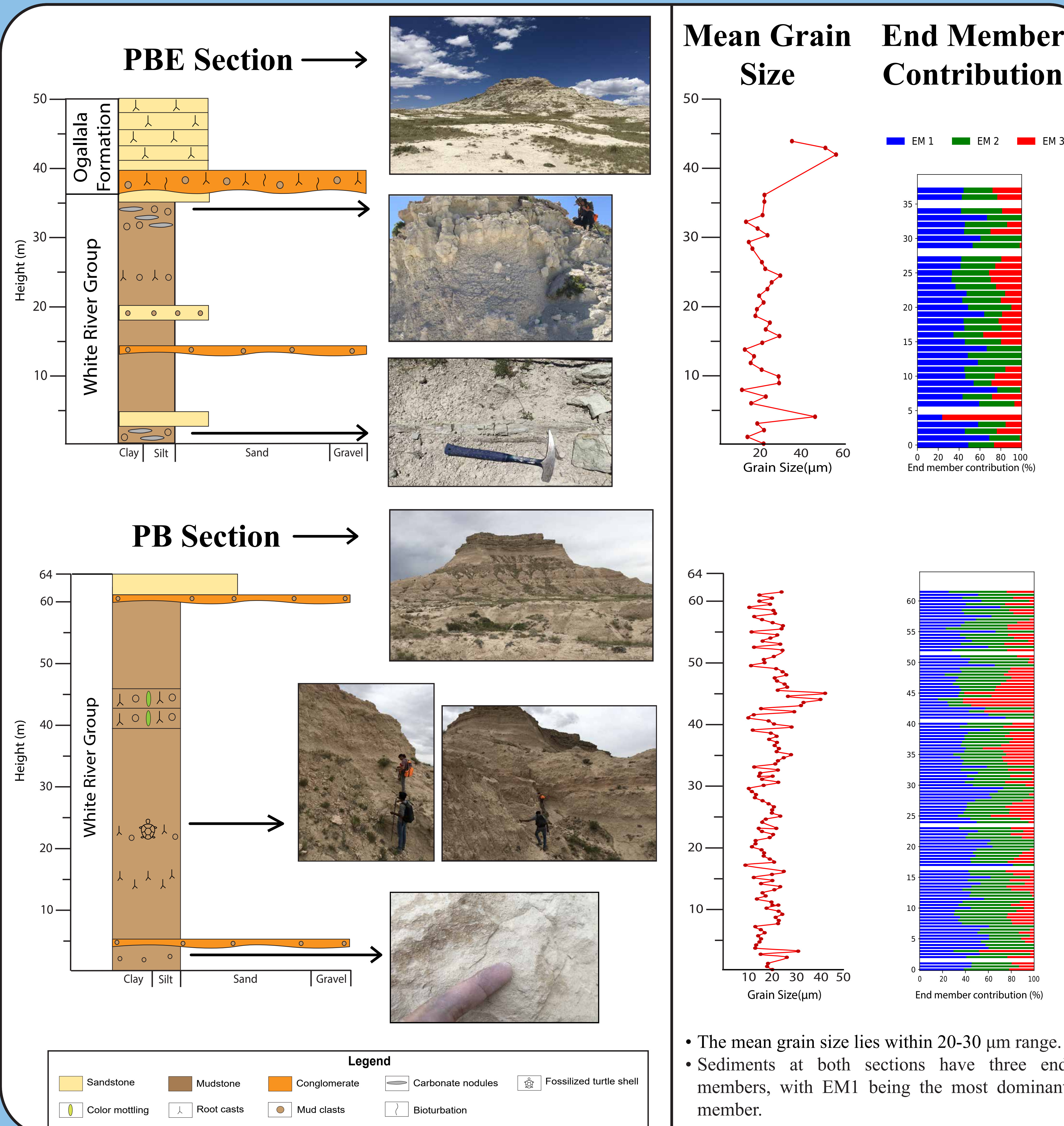
- Field evidence, corroborated by grain size data, confirms the presence of loess within the White River Group at the Pawnee Buttes area.
- Loess deposition predominantly characterizes the White River Group in the study area.
- The mean grain size is finer (~20-30 μm) compared to other loess deposits (~30-60 μm) previously identified in Wyoming and Nebraska (Fan et al., 2020).

References

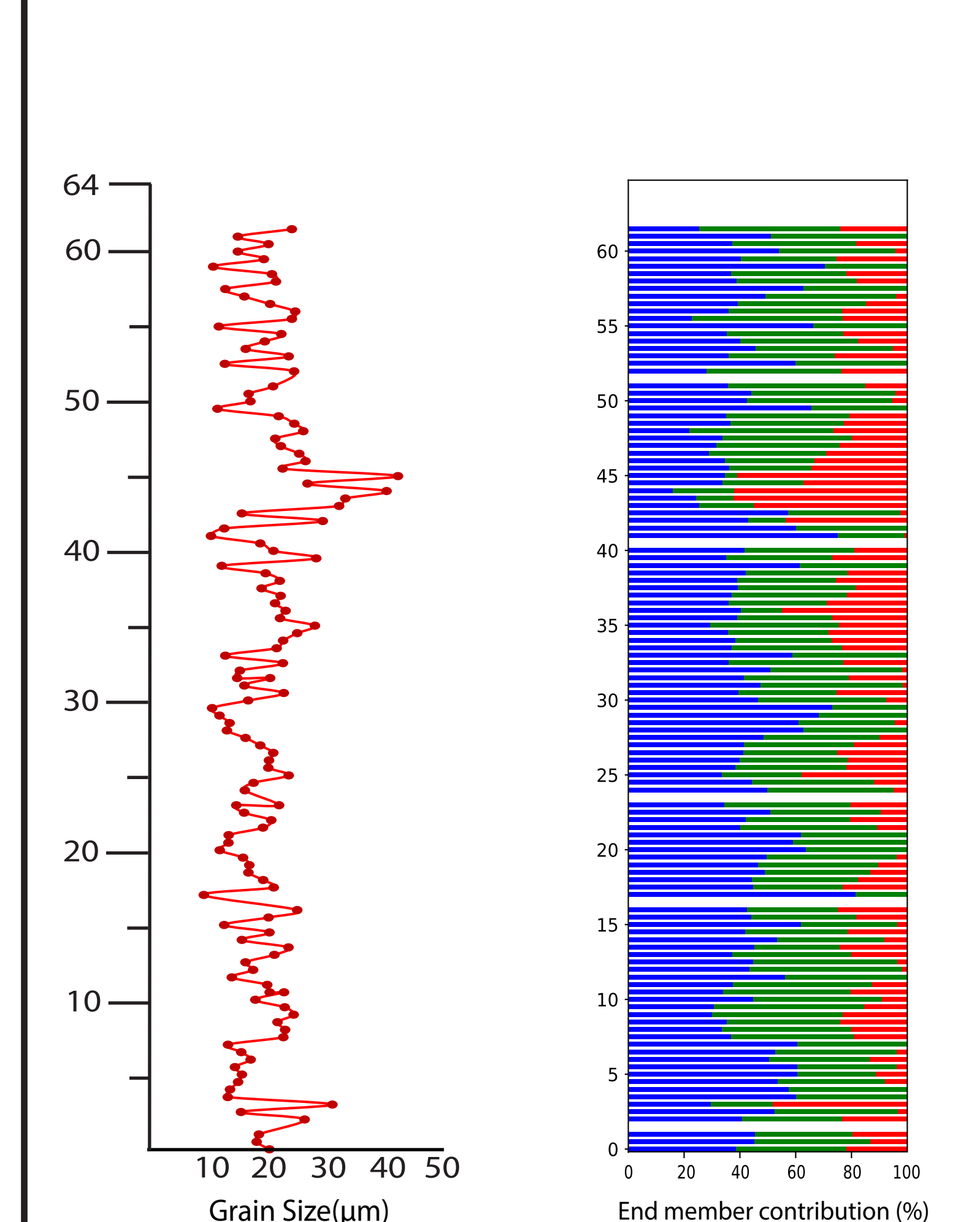
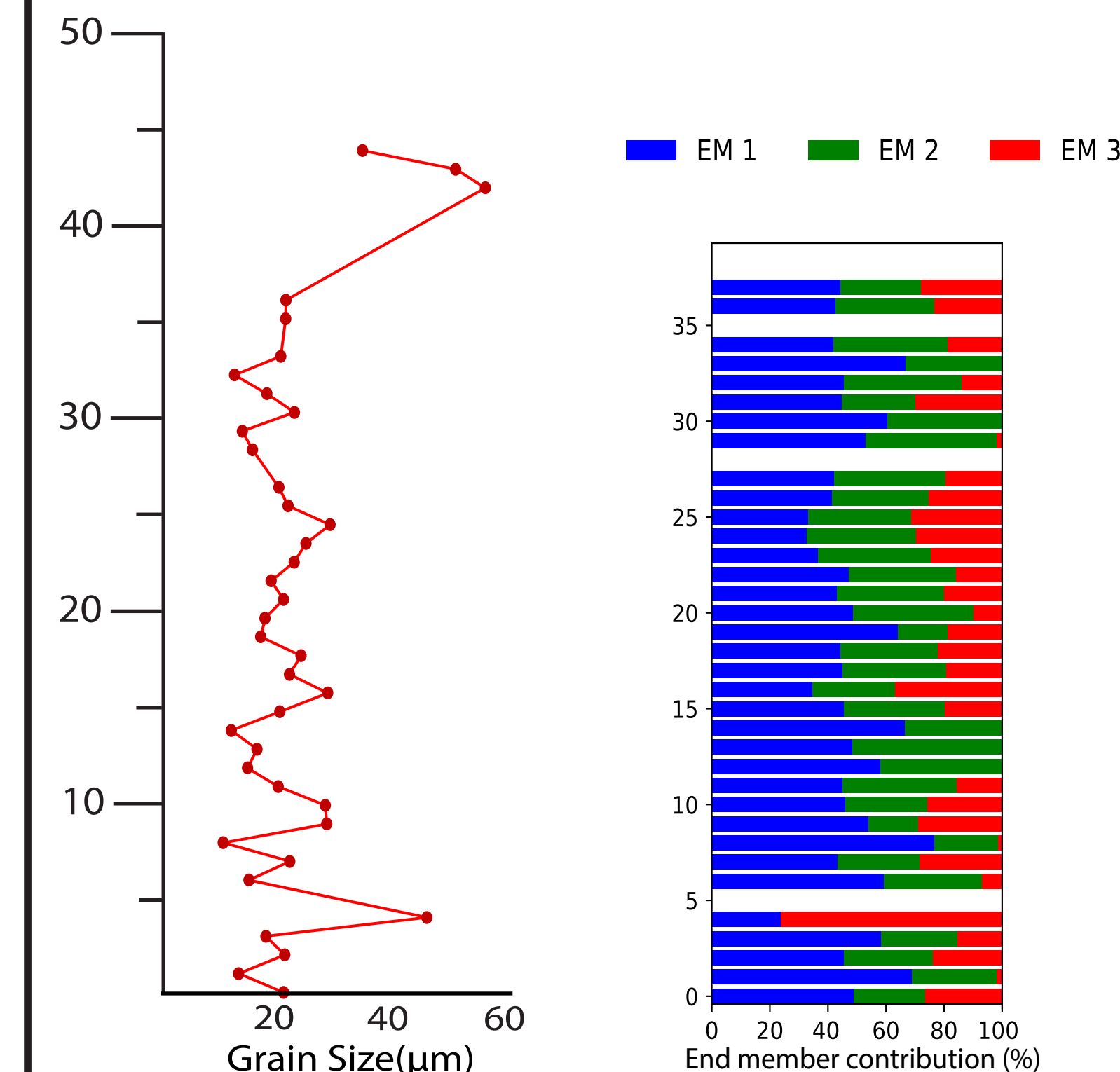
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Acknowledgement

We sincerely thank Rijumon Nandy, Brenna Curtis, Adrian Dias and Xiangwei Guo for helping us with sample collection, preparation and analysis. Special thanks to Dr. Steven Forman and Ms. Lilliana Marin for letting us use their lab at Baylor University. This project is supported by National Science Foundation (NSF) under the grant EAR-2114166.



Mean Grain Size End Member Contribution



- The mean grain size lies within 20-30 μm range.
- Sediments at both sections have three end members, with EM1 being the most dominant member.