

PS Pre-Laramide Salt Tectonics in the Eagle Basin: A New Paradigm for the Tectonic Evolution of Central Colorado*

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Abstract

Combined field mapping, measured stratigraphic sections, and balanced cross-sections of the Pennsylvanian-aged Eagle Valley Evaporite and overlying Late Pennsylvanian- to Jurassic-aged strata indicate a long-lived phase of salt tectonics in the Eagle basin, central Colorado. Diapiric salt structures exposed at the surface represent a series of formerly connected, polygonal salt walls flanked by deep, elongate minibasins in the southern part of the basin. Previous work in this area has interpreted these structures to be the result of the Laramide Orogeny and younger tectonism; however, this phase of salt-influenced deformation in the Eagle Basin has a similar history as the Paradox Basin to the southwest, and suggests a new paradigm for the tectonic and stratigraphic evolution of this region. Structural and stratigraphic analysis of four key regions in the Roaring Fork Valley of the Eagle basin offers compelling evidence for long-term deformation compatible with salt tectonics prior to the Laramide Orogeny. This work suggests the following interpretation of a prolonged salt tectonic history subsequently overprinted by tectonic shortening: (i) over-thickened, unconformity-bound strata contain abundant growth structures and represent Permo-Triassic minibasins, which subsided into mobilized Eagle Valley Evaporites; (ii) north-northwest trending linear structures cored by evaporites represent former diapiric salt walls that grew during Pennsylvanian through Triassic time between minibasins; and (iii) Laramide-age shortening resulted in basinal contraction and welded salt walls that were reactivated as thrust structures. This work has significant implications for the timing and magnitude of both Ancestral Rocky Mountain uplifts and Laramide-age shortening. Additionally, diagnostic structural and stratigraphic features present in the Eagle basin are analogous to salt-dominated regions that have undergone shortening of pre-existing diapirs and minibasins such as the Sivas Basin of Turkey, the Western Gulf of Mexico, and the Pyrenees, Zagros, and Flinders ranges. This study is critical to understanding the evolution of salt basins that have been subjected to basement-involved shortening.

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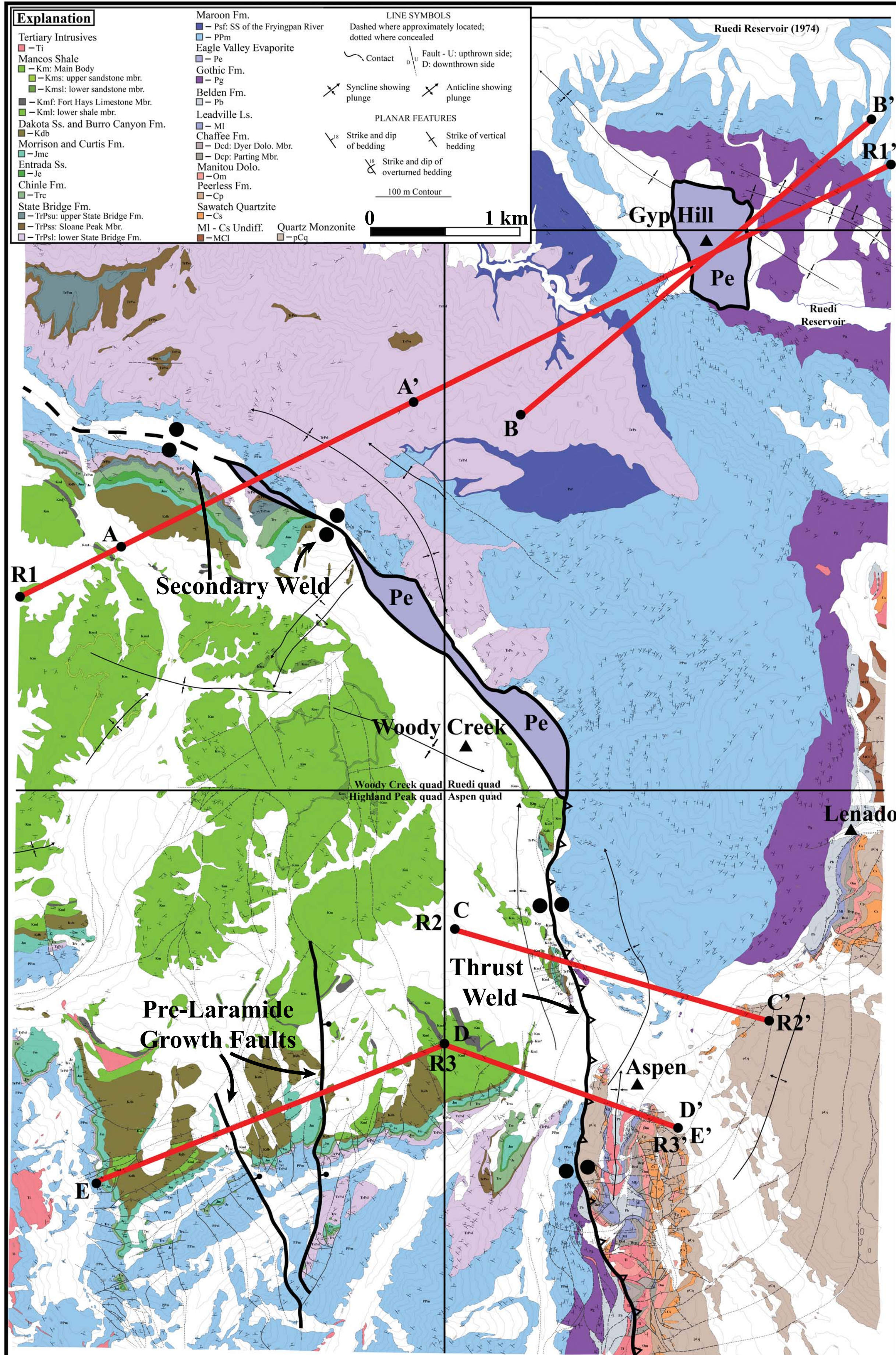
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Goals

1. Document distinctly pre-Laramide structural and stratigraphic features
2. Investigate the role of shortening on pre-existing salt structures
3. Generate a series of structural cross-sections and restore through time
4. Determine presence of pre-Laramide salt tectonics in the Eagle Basin

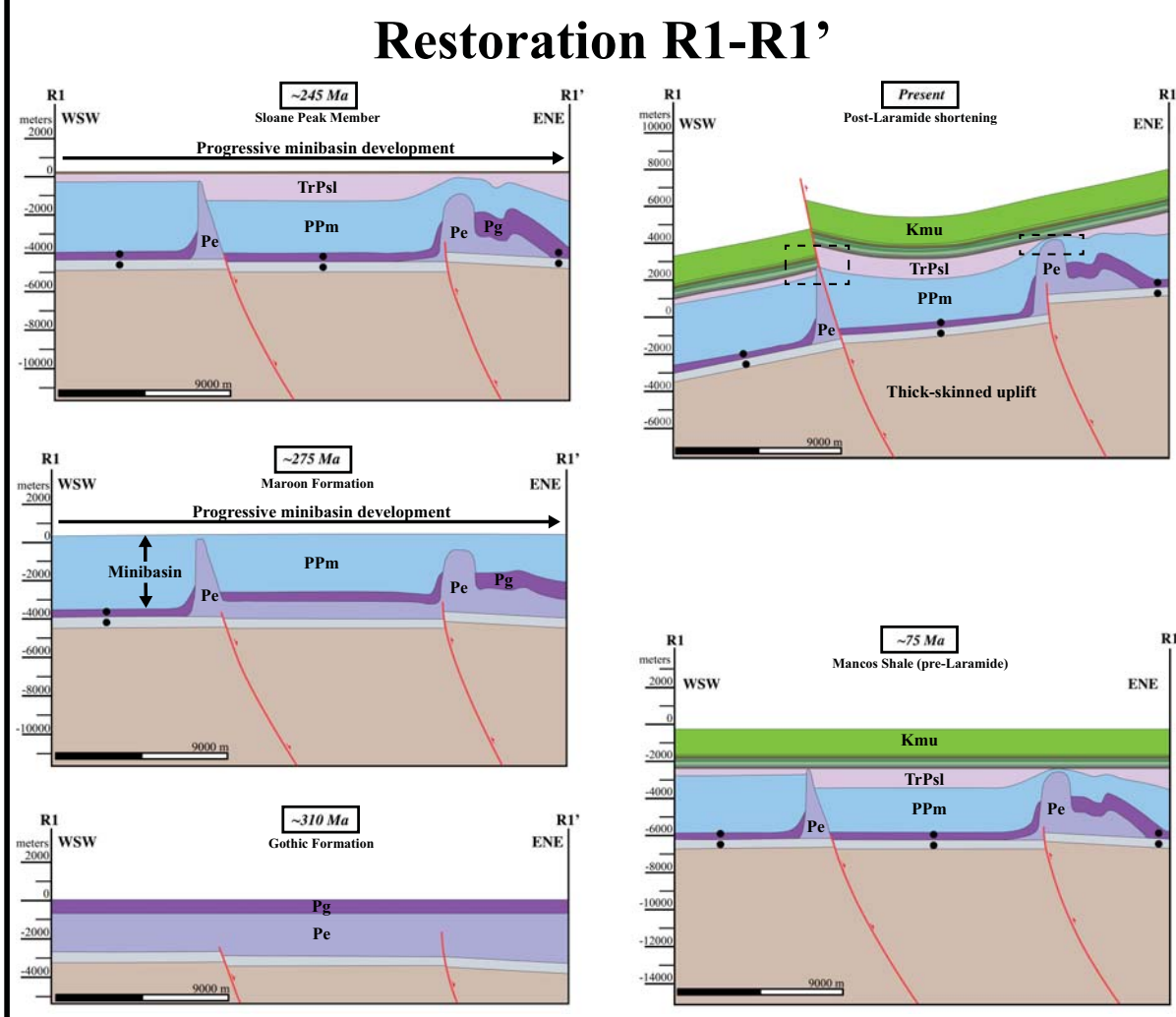
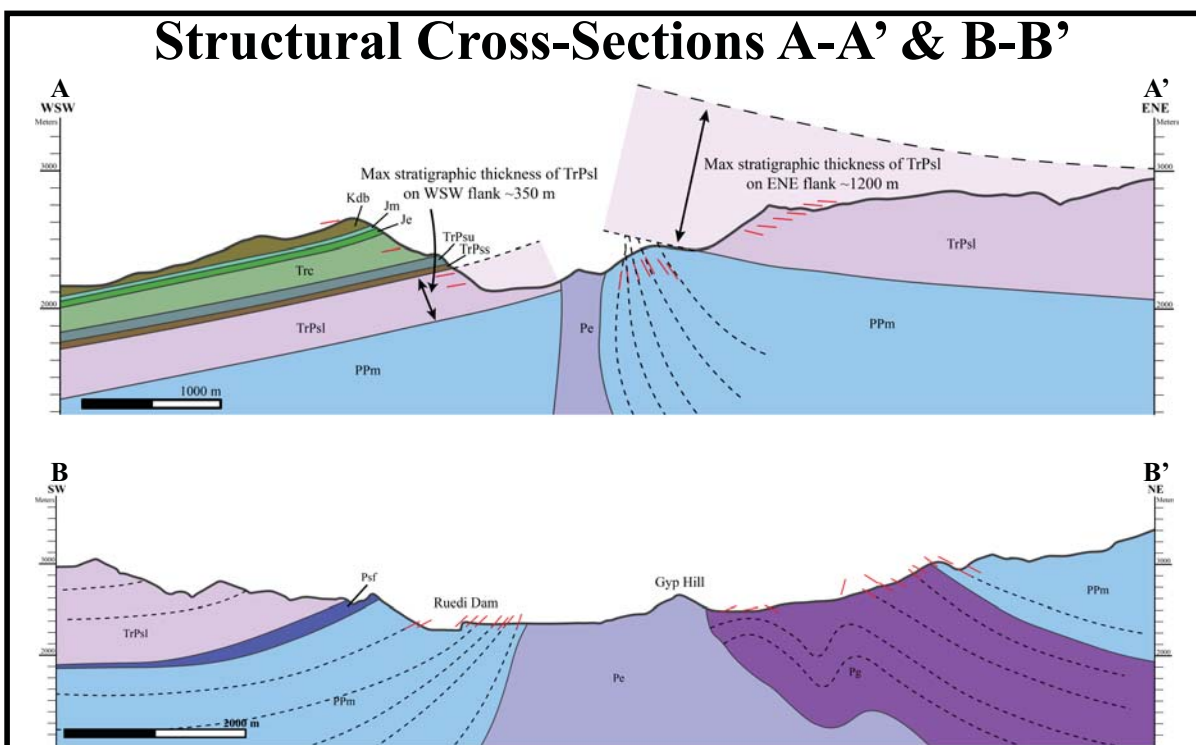
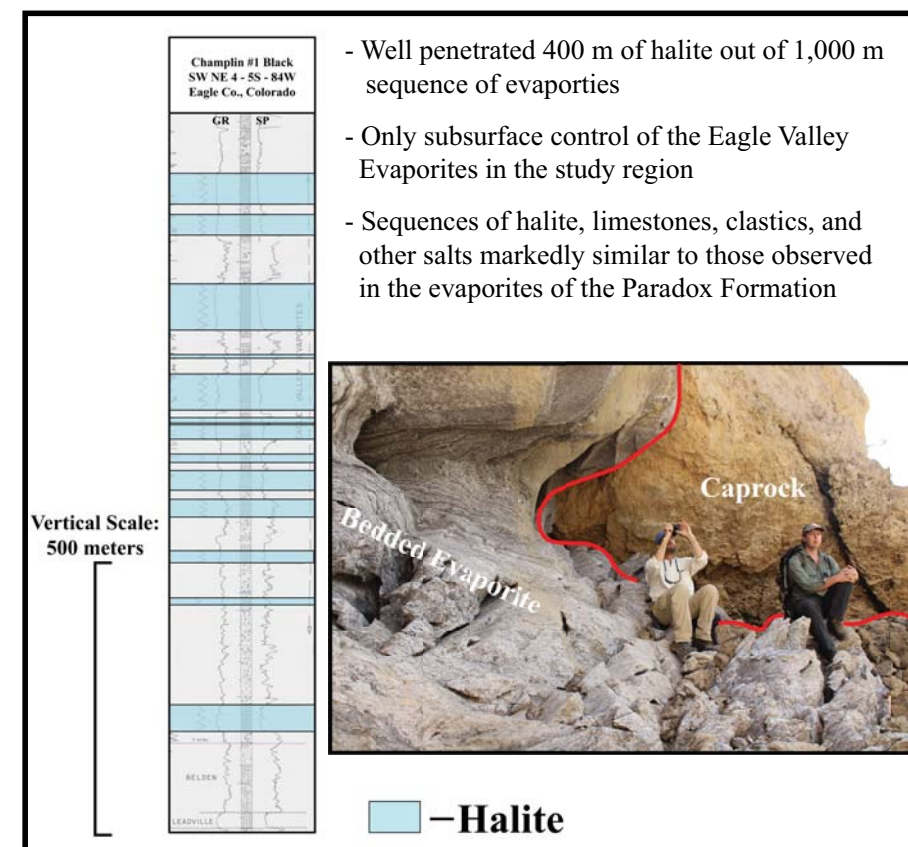
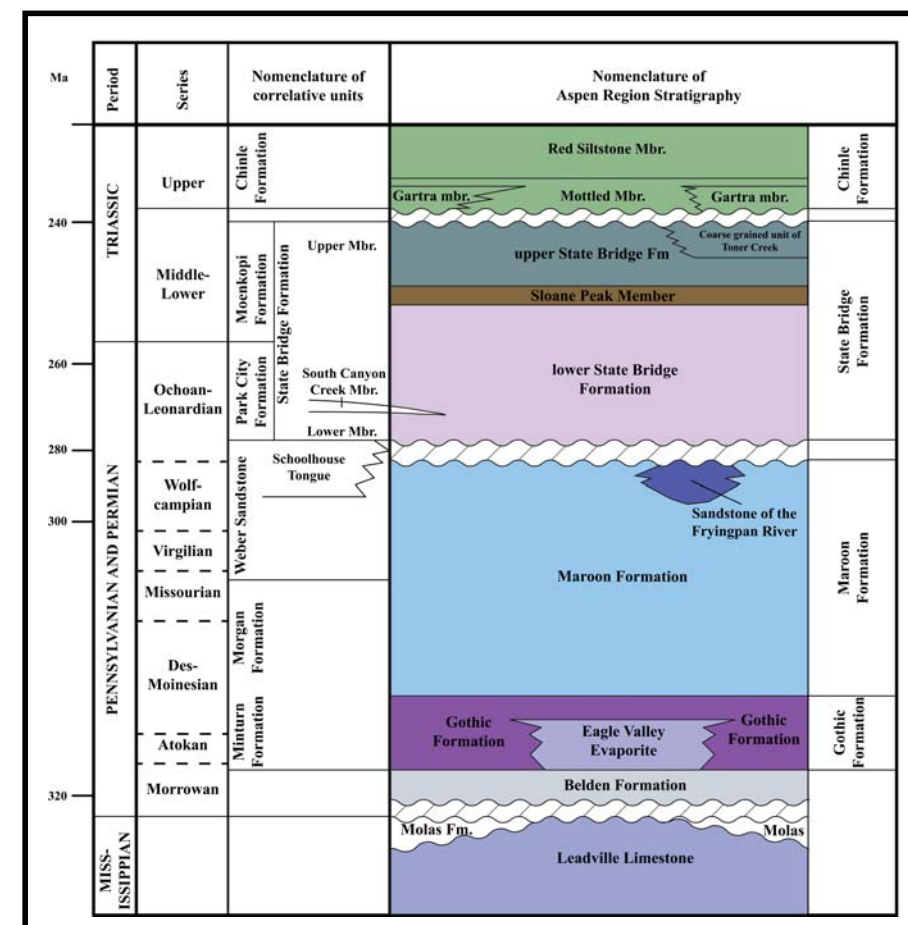
AGE (Ma)	FORMATIONS AND SELECT MEMBERS	MAJOR TECTONIC AND OROGENIC EVENTS
CRETACEOUS	Mancos Shale	LARAMIDE OROGENY
	Dakota + Burro Canyon Fmns	
JURASSIC	Cedar Mountain + Morrison Fmns	PROPOSED PHASE OF SALT TECTONICS
	Entrada Formation	
TRIASSIC	Chinle Fm.	ANCESTRAL ROCKY MOUNTAINS
	Red Siltstone Mbr.	
	Gartra Mbr.	
	Mottled Mbr.	
PERMIAN	upper State Bridge Fm.	
	Sloane Peak Mbr.	
	lower State Bridge Fm.	
PENNSYLVANIAN	Maroon Formation	
	Gothic Formation	
	Eagle Valley Evaporite	
	Belden Formation	
MISS.-CAMB.	Leadville Limestone + older	



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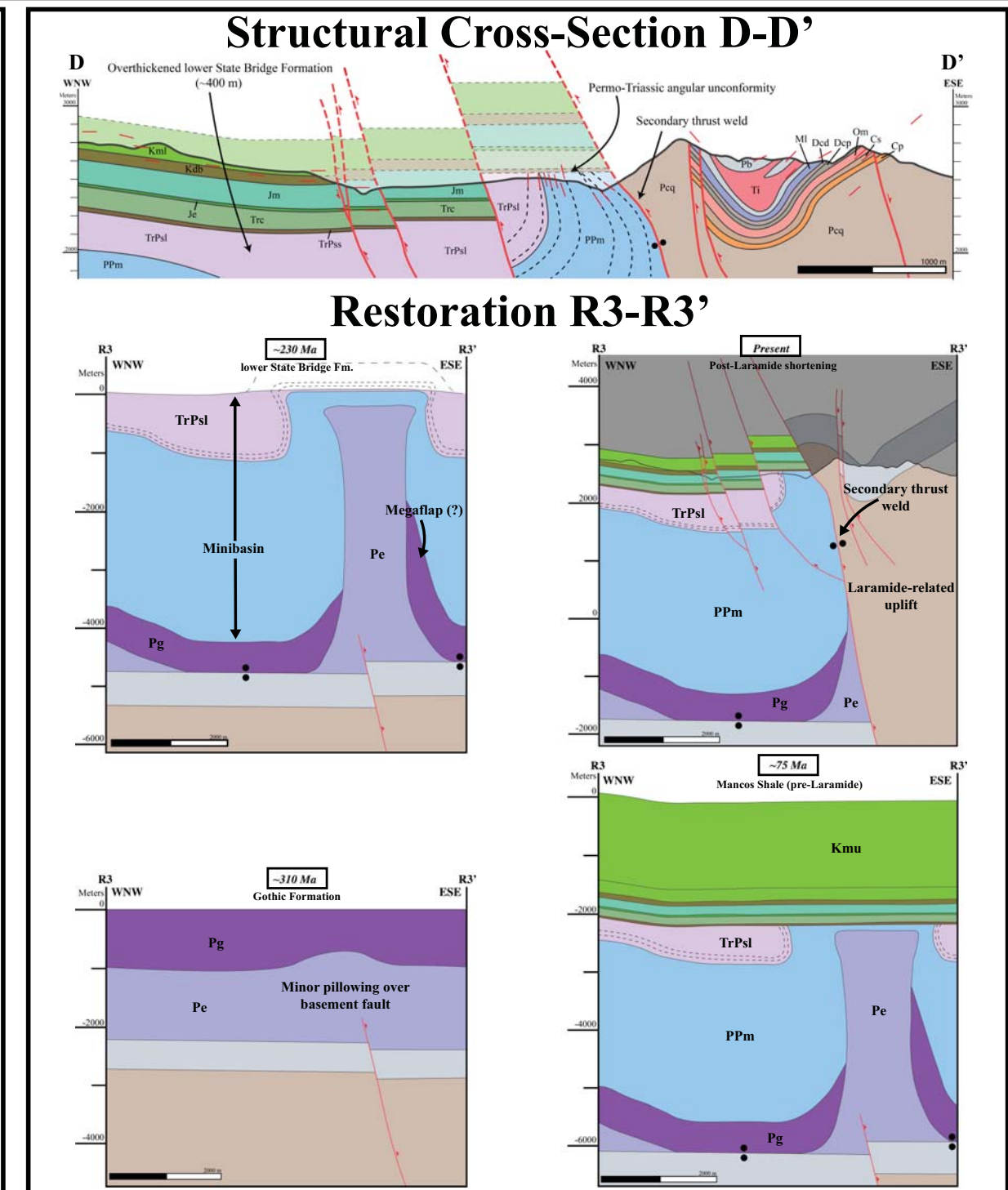
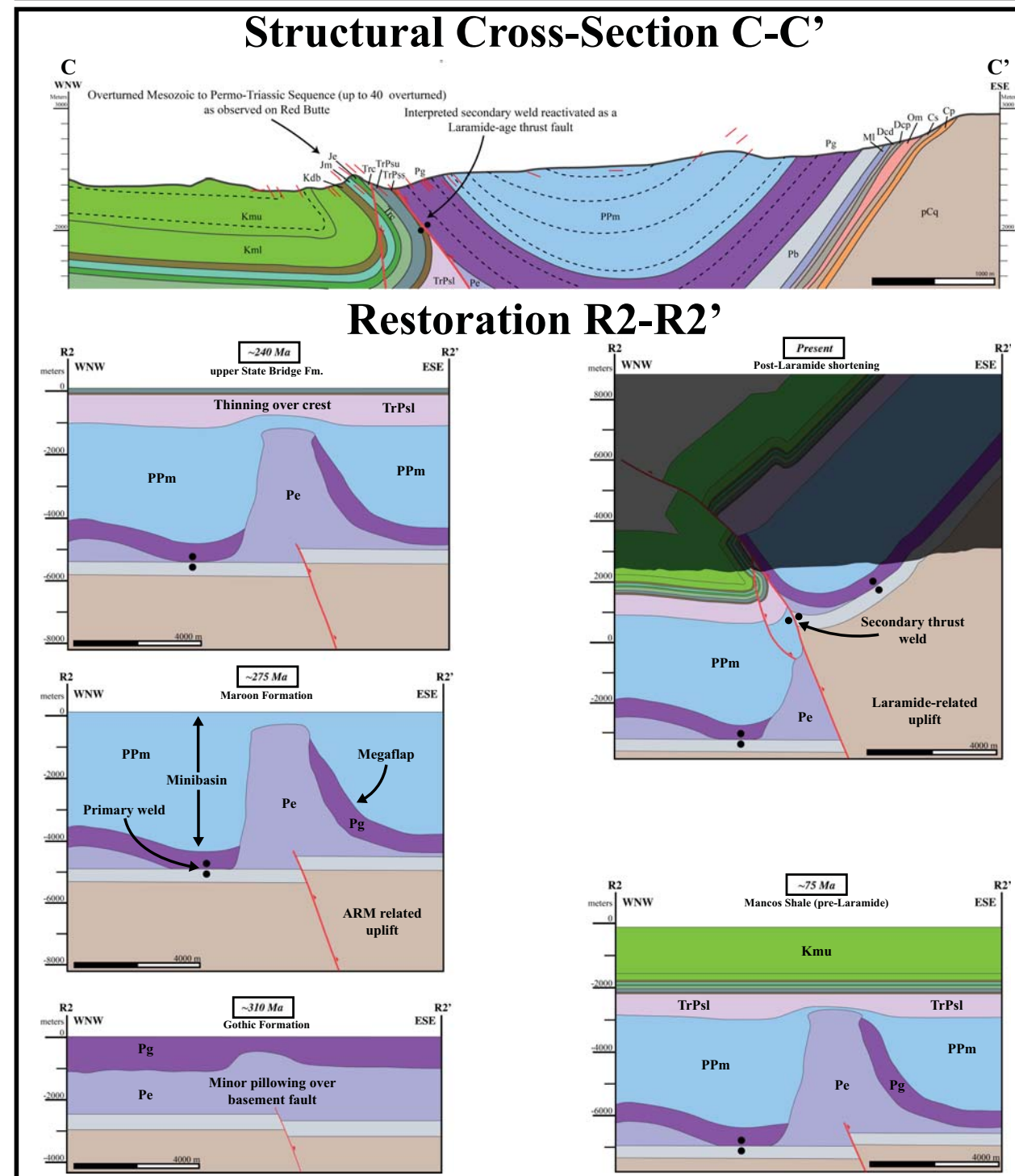


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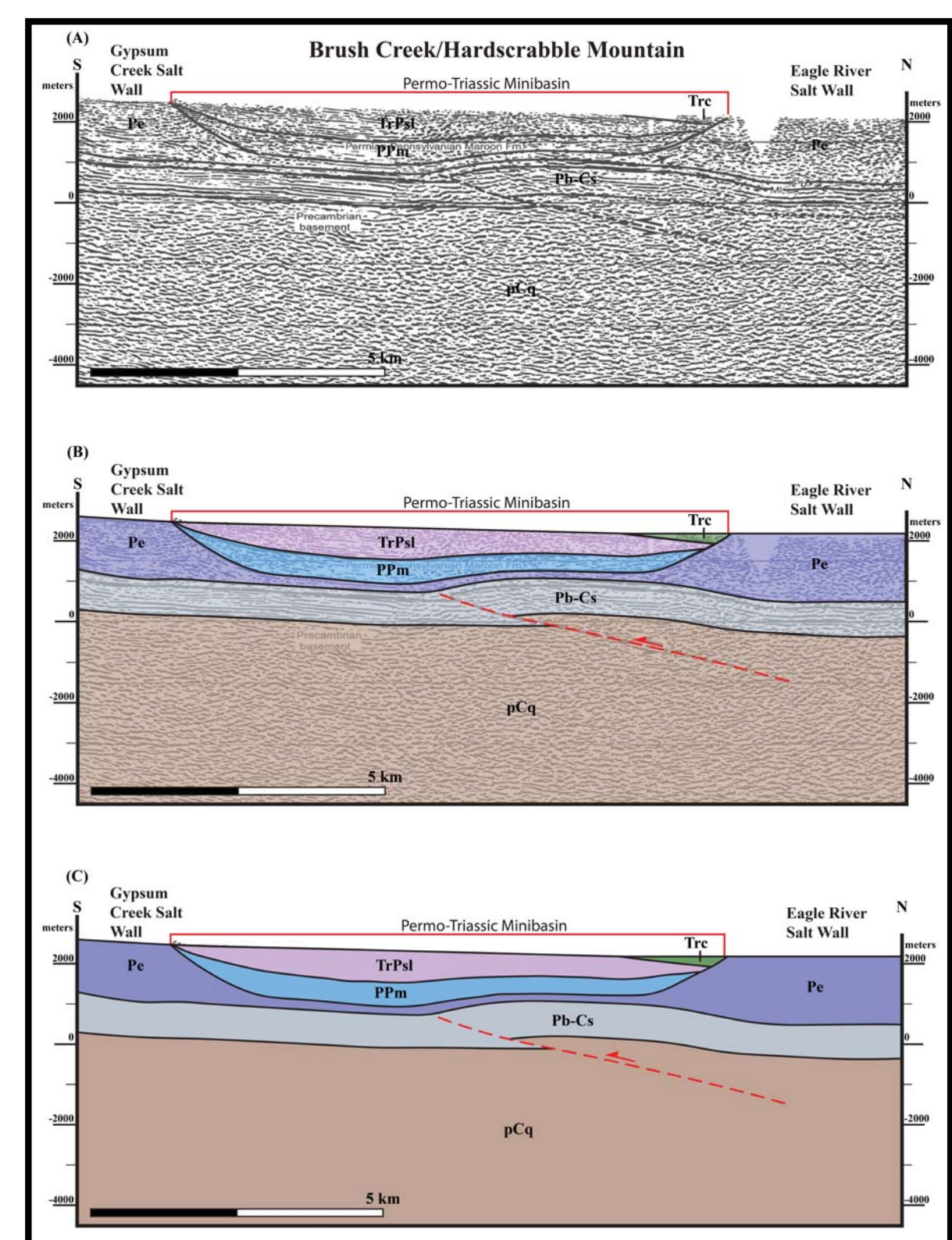
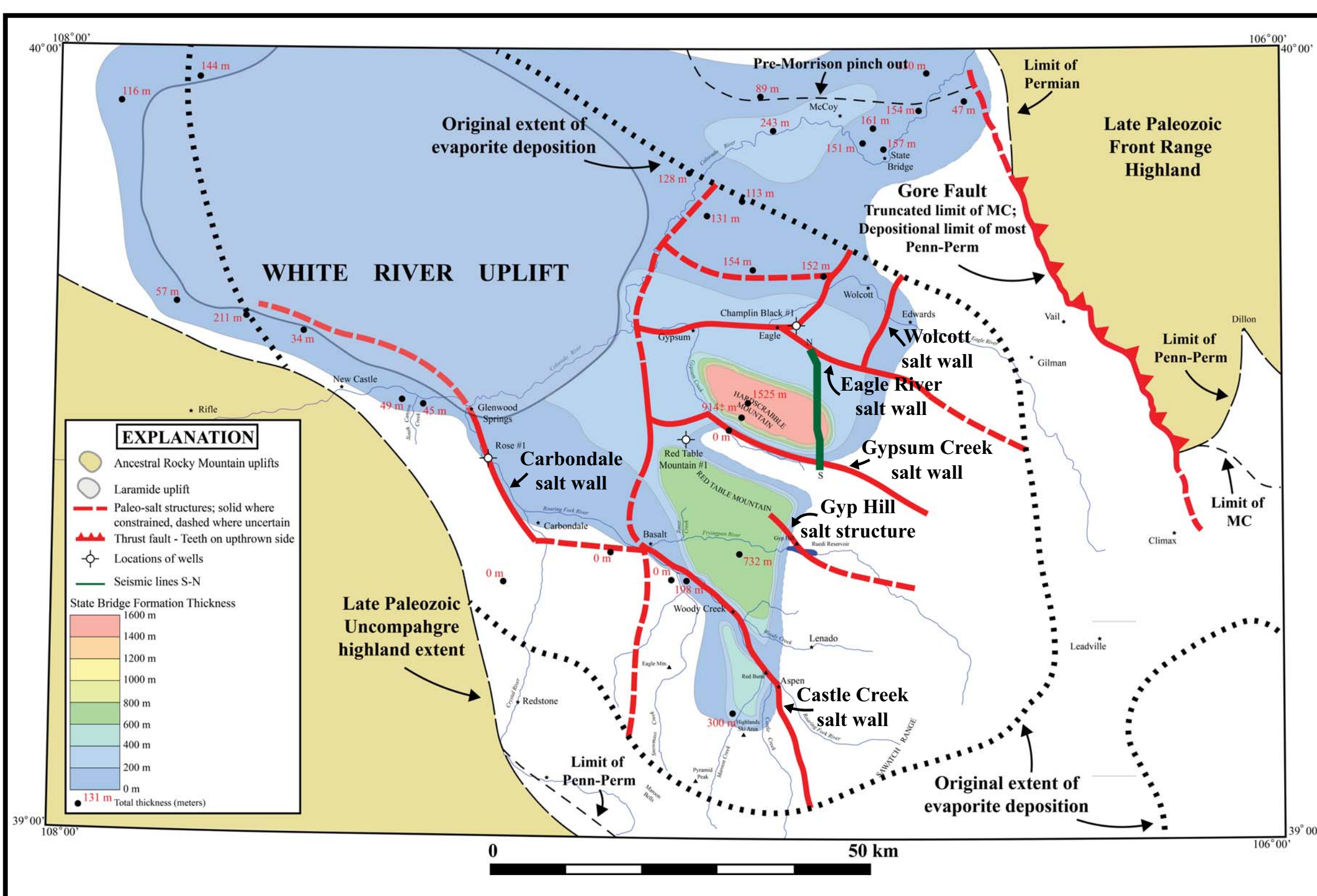
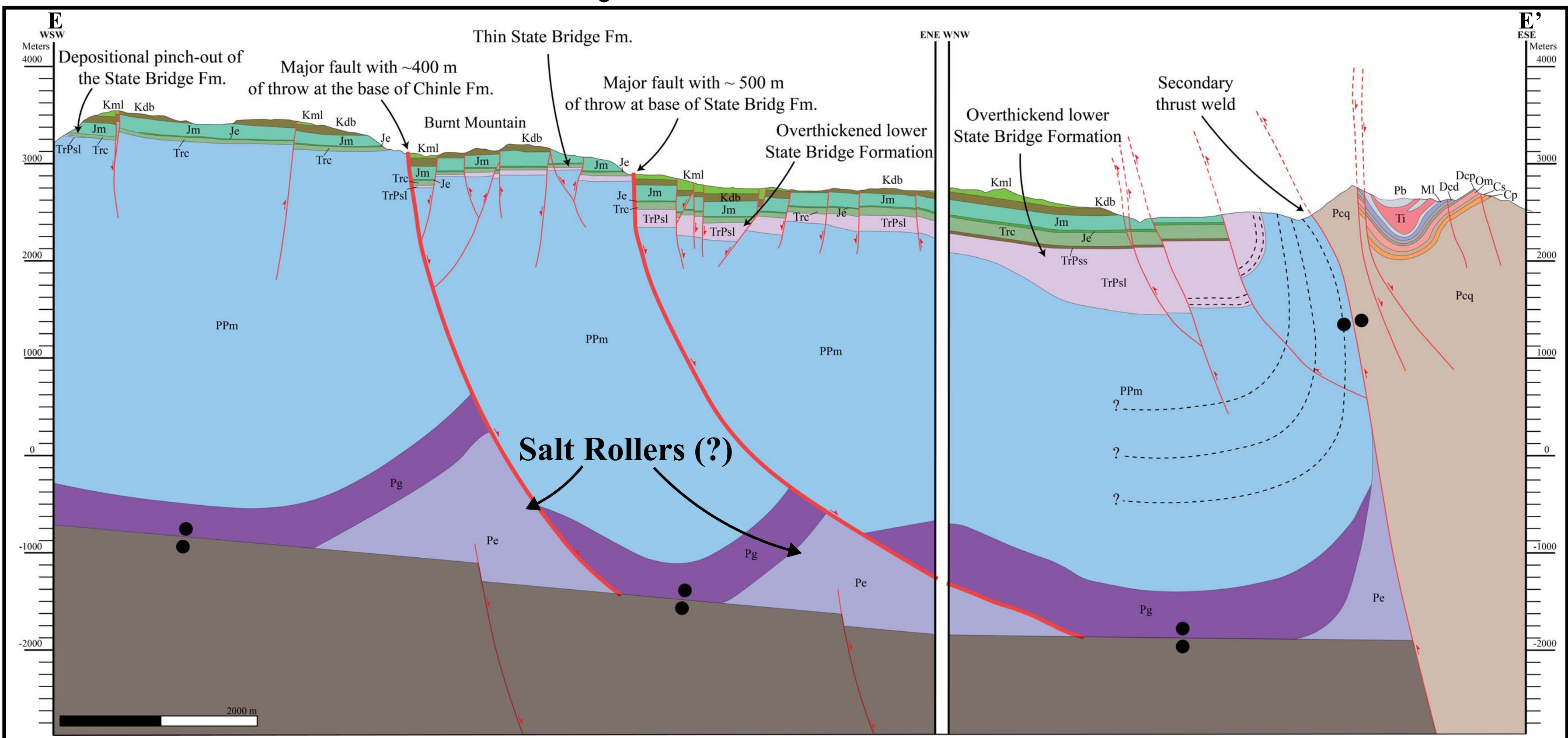


1-Minute Summary:

Cyclic flooding and desiccation of the Eagle Basin during the early Pennsylvanian led to the deposition of a thick sequence of evaporitic cycles, markedly similar to those of the neighboring Paradox Basin. Progradation of Pennsylvanian- through Triassic-aged sediments led to the development of a complex network of salt walls and associated minibasins, as evidenced by overthickened Pennsylvanian- to Triassic-aged strata, minibasin-scale drape folding, and other distinctly pre-Laramide structural features. These salt-related structures were then affected by thick-skinned Laramide shortening, resulting in complex structural geometries including vertical secondary welds and associated thrust welds.



Summary



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