Sedimentology, provenance, and paleotectonic significance of the cretaceous Newark Canyon Formation, Cortez Mountains, Nevada
by James David Suydam

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Earth Sciences
Montana State University

Abstract:
Exposures of Cretaceous Newark Canyon Formation strata in east-central Nevada provide key sedimentologic data for the interpretation of depositional systems and tectonic setting of the poorly understood hinterland of the Sevier orogenic belt. The Newark Canyon Formation in the Cortez Mountains consists of up to 740 m of interbedded conglomerate, sandstone, and mudstone with minor limestone. An Albian to Maastrichtian age is constrained by biostratigraphic data, indicating temporal equivalence with other exposures of Newark Canyon Formation and Sevier foreland basin deposits. Lithofacies analysis suggests deposition by gravelly anastomosing, wandering gravel-bed, and braided fluvial systems. Anastomosing fluvial systems resulted in isolated, lenticular, fining-upward channel bodies encased in overbank fines; tabular channel sequences with abundant interbedded fine-grained lithofacies were deposited by wandering gravel-bed and perhaps gravelly braided fluvial systems. An upward trend from anastomosed to wandering gravel-bed and braided fluvial deposits may reflect possible tectonic or local climatic controls.

Paleocurrent data support a southward direction of transport for sediment deposited in Newark Canyon Formation basins. Source areas were composed of dominantly Mississippian to Permian Antler foreland basin and overlap sequence rocks and Jurassic volcanics. lower Paleozoic miogeoclinal and eugeoclinal rocks, and upper Paleozoic rocks of the Golconda allochthon may have been minor sources. Separate basins of deposition for Newark Canyon Formation strata in east-central Nevada are supported by differences in composition and fluvial style.

Newark Canyon Formation basins developed in response to uplift and sedimentation associated with Eureka thrust belt deformation. Deposition was localized by thrust loading, and between anticlinal flexures in gently deformed late Paleozoic rocks east of the Eureka thrust belt and west of the Sevier thrust belt. Newark Canyon Formation basins developed coevel with but geographically distinct from the Sevier foreland basin.

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APPROVAL

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James David Suydam

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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ABSTRACT

Exposures of Cretaceous Newark Canyon Formation strata in east-central Nevada provide key sedimentologic data for the interpretation of depositional systems and tectonic setting of the poorly understood hinterland of the Sevier orogenic belt. The Newark Canyon Formation in the Cortez Mountains consists of up to 740 m of interbedded conglomerate, sandstone, and mudstone with minor limestone. An Albian to Maastrichtian age is constrained by biostratigraphic data, indicating temporal equivalence with other exposures of Newark Canyon Formation and Sevier foreland basin deposits. Lithofacies analysis suggests deposition by gravelly anastomosing, wandering gravel-bed, and braided fluvial systems. Anastomosing fluvial systems resulted in isolated, lenticular, fining-upward channel bodies encased in overbank fines; tabular channel sequences with abundant interbedded fine-grained lithofacies were deposited by wandering gravel-bed and perhaps gravelly braided fluvial systems. An upward trend from anastomosed to wandering gravel-bed and braided fluvial deposits may reflect possible tectonic or local climatic controls.

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INTRODUCTION

Geologic Setting

The tectonic and depositional histories of the Sevier orogenic belt and associated foreland basin have been the subject of considerable investigation and are reasonably well understood. Sevier deformation is expressed by Proterozoic to Mesozoic rocks in Montana, Idaho, Wyoming, Utah, and southern Nevada that are displaced a minimum of 140 km on west-dipping thrust faults which sole into a regional decollement (Armstrong and Oriel, 1965; Armstrong, 1968; Fleck, 1970; Royse and others, 1975). Deformation is thought to have begun during Late Jurassic time (Allmendinger and Jordan, 1981) and continued until the Eocene (Dorr and others, 1977; Wiltschko and Dorr, 1983). Thrust loading and concomitant sedimentation resulted in the accumulation of thick sequences of Cretaceous to early Tertiary strata in the Rocky Mountain foreland basin (Jordan, 1981). Subsidence studies of Heller and others (1987) indicate the earliest synorogenic deposits of the foreland basin were deposited in response to thrust plate-induced subsidence beginning in Aptian time. Numerous sedimentologic and stratigraphic studies of coarse-grained deposits adjacent to the thrust belt have helped bracket the timing of Sevier deformation and characterize the types of depositional systems that operate in an actively subsiding foreland basin (for example, Lawton, 1983; Dickinson and others, 1986; Schmitt and Kohout, 1986; DeCelles and others, 1987).

Despite the large volume of knowledge concerning the Sevier orogenic belt and foreland basin, comparatively little work has been done in the hinterland, defined by Armstrong (1968) as the region west of the Sevier thrust belt and east of the Sierra Nevada magmatic arc (Figure 1). Studies in the hinterland have been hampered by complex structural relations and a paucity of Cretaceous strata. Several

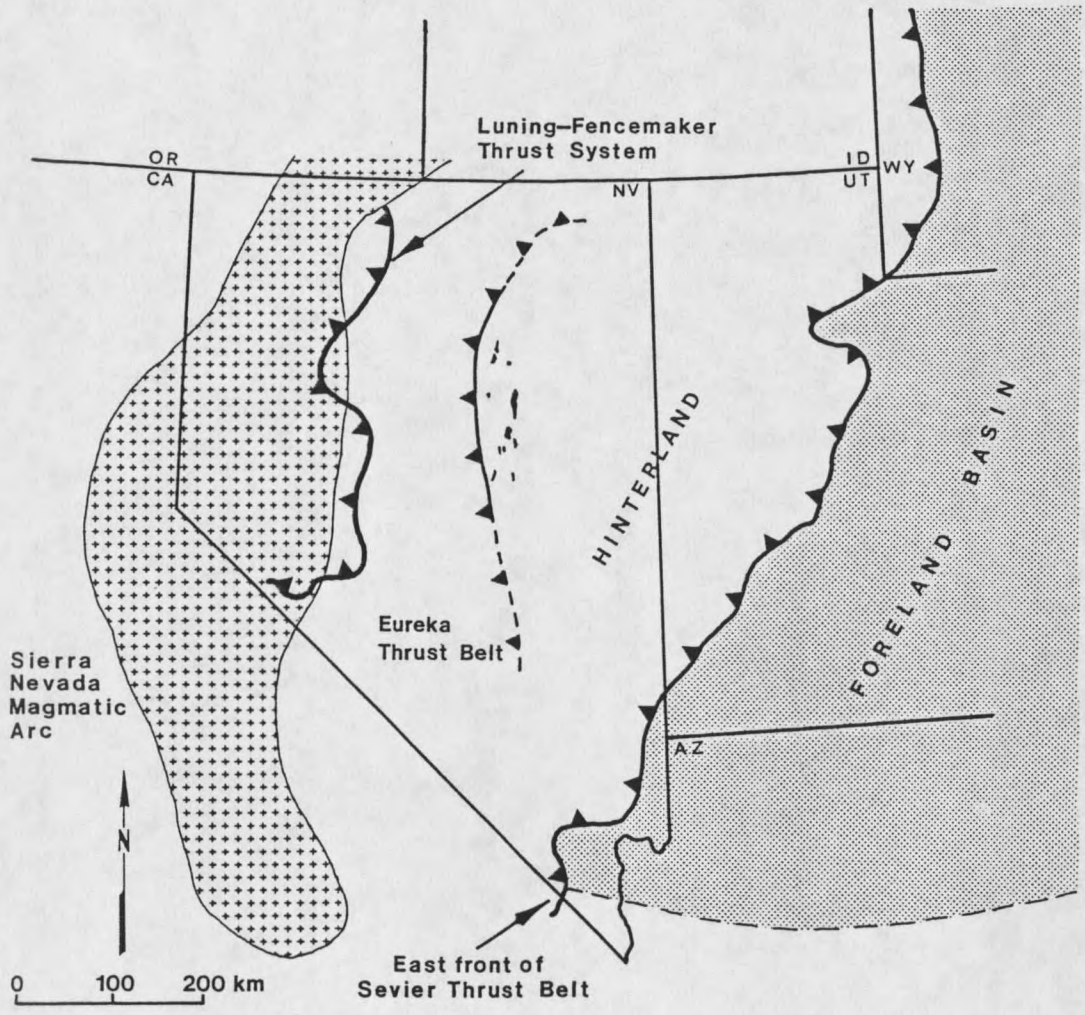

Figure 1. Regional map of the central western U.S. Cordillera showing late Mesozoic tectonic features in relation to exposures of Cretaceous Newark Canyon Formation (solid pattern). Data from Stewart (1980), Speed (1983), Allmendinger and others (1987), Little (1987), and Bartley (personal communication, 1988).

workers have interpreted distinct belts of shortening within the hinterland (Ketner and Smith, 1974; Allmendinger and Jordan, 1981; Coats and Riva, 1983; Speed, 1983; Oldow, 1984; Bartley and others, 1987); however, the magnitude and extent of these are largely obscured by late Tertiary extension and volcanism. Coney and Harms (1984) suggest the hinterland was an elevated plateau created by lower crustal thickening and was therefore not a favorable site for late Mesozoic to early Tertiary sedimentation. A detailed sedimentologic and provenance study of Cretaceous basin-fill in the hinterland is a vital link in discerning the tectonic history and depositional systems of this poorly understood region.

The distribution of Cretaceous rocks in Nevada is limited to a discontinuous belt of exposures in east-central Nevada that have been assigned to the Newark Canyon Formation (see Figure 1). The type area for the Newark Canyon Formation was defined by Nolan and others (1956) for exposures of Cretaceous rocks in the southern Diamond Mountains near Eureka, Nevada (Figure 2). Cretaceous rocks in the southern Fish Creek Range have also been mapped as Newark Canyon Formation (Hose, 1983). Smith and Ketner (1976b) recognized the Newark Canyon Formation in the Cortez Mountains and Pinon Range south of Carlin, Nevada (Figure 2). Scattered exposures also occur in the Pinon Range (Smith and Ketner, 1976b) and Simpson Park Range (Stewart and Carlson, 1978).

Objectives of Study

The primary objective of this study is to conduct detailed sedimentologic and provenance analyses of the Cretaceous Newark Canyon