WEATHERING AND TRANSPORT OF SEDIMENT IN THE CHEYENNE RIVER BASIN, EASTERN WYOMING

by

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ABSTRACT

The weathering and fluvial transport stages of a sedimentation sequence of the Cheyenne River in eastern Wyoming are discussed. The river heads in east-central Wyoming crosses several rock units in its eastward path before reaching Angostura Reservoir in southwestern South Dakota. The drainage area of the Cheyenne River above Angostura Dam comprises 9100 square miles.

Weathering profiles of the rock units traversed by the river in this drainage area were sampled to determine their respective contributions to the sediment load. Among these formations are the lithologically diverse Chadron, Brule, Fort Union, Lance, Pierre, and Spearfish. The textural and mineralogical analyses of the weathered outcrops were compared with those of sediment samples collected at gauging stations operated by the Water Resources Division of the U.S. Geological Survey.

X-ray diffraction studies of the weathered rock profiles and of the suspended sediment indicate a diverse clay mineral assemblage in the $2-1\mu$ diameter size fraction. Kaolinite, illite, and vermiculite occur along with quartz and feldspar. However, the $<1\mu$ size fraction of the suspended sediment contained only montmorillonite. The kaolinite content of the $2-1\mu$ size fraction of the suspended sediment increased in the direction of flow, at the expense of illite; there was no vermiculite in the suspended sediment.

The computed and observed amounts of sediment contributions by the various rock units show a fairly good fit; the data indicate the importance of defining mineral composition in terms of discrete size separates, even under 2μ diameter. The increase in kaolinite content in the $2-1\mu$ size fraction of the suspended sediment may be due to bank contribution downstream from the gauging stations. The montmorillonite content of the $<1\mu$ size fraction is unchanged by transport.