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1964, pp. 79-81. https://doi.org/10.56577/FFC-15.79

in:

Ruidoso Country (New Mexico), Ash, S. R.; Davis, L. R.; [eds.], New Mexico Geological Society 15th Annual Fall Field Conference Guidebook, 195 p. https://doi.org/10.56577/FFC-15

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GLACIAL DEPOSITS ON SIERRA BLANCA PEAK, NEW MEXICO

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Recently Gerald M. Richmond of the U.S. Geological Survey, Denver, Colorado published a short article concerning glacial deposits in New Mexico. The parts of that article which concern glacial deposits on Sierra Blanca Peak are given below. A few minor changes have been made in the excerpts with the permission of the author.

GERALD M. RICHMOND, 1962, CORRELATION OF SOME GLACIAL DEPOSITS IN NEW MEXICO: ART. 213 *IN* U.S. GEOLOGICAL SURVEY PROF. PAPER 450-E, P. E121-E125.

Clear evidence of Pleistocene glaciation in New Mexico is mostly confined to the higher parts of the Sangre de Cristo Mountains, and to the Sierra Blanca in the south-central part of the State. (See index map, fig. 1.) An ancient till, correlated with the Cerro Till of the San Juan Mountains, has also been reported from the Canjillon Divide area in the north-central part of the State, west of the Rio Grande (Ellis, 1935; Smith, 1936).

Glaciation in the Sangre de Cristo Mountains has been reported by Salisbury (1901) and Stone (1901), and subsequently by Ellis (1931). Ray (1940) was the first to recognize multiple glaciation in the region. He described moraines of five "substages" of the Wisconsin "glacial stage" in the vicinity of Wheeler Peak, northeast of Taos, and in the vicinity of Lake Peak, northeast

TABLE 1. — Correlation of Wisconsin "substages" of Ray (1940) with moraines found by the writer

(Figures are altitudes of end moraines, in feet)

		Wheeler Peak, Rio Hondo		Lake Peak, South Fork Rio Nambe			Sierra Blanca Peak		
		Richmond, 1962b	Ray (1940)		Richmond, 1962b	Ray (1940)		Richmond, 1962b and this article	Smith & Ray (1941)
RECENT	Neoglaciation	Gannett Peak Stade 12,000 (avg.)		Neoglaciation					
		Temple Lake Stade 11,850 (avg.)	W V		Temple Lake Stade 11,500				
LATE PLEISTOCENE	Pinedale Glaciation	Late stade 11,000	W IV W III	Pinedale Glaciation	Late stade 11,400	W IV	Pinedale Glaciation	Late stade 11,300	Complex of Wisconsin moraines
		Middle stade 10,850			Middle stade 11,100			Middle stade 10,900	
		Early stade 10,200			Early stade 10,750	W III		Early stade 10,500	
	Bull Lake Glaciation	Late stade 9,700	W I	Bull Lake Glaciation	Late stade 10,500		Bull Lake Glaciation	Late stade 10,400	
		Early stade 9,400			Early stade 10,100	W II		Early stade 9,850	
MIDDLE PLEISTOCENE				Third pre-Bull Lake Glaciation	10,000				

of Santa Fe. He also showed that deposits described as moraines in the Moreno Valley (Ellis, 1931), are not of glacial origin. Smith and Ray (1941) further reported a complex of Wisconsin moraines on the northeast side of Sierra Blanca Peak below a cirque mentioned briefly by Antevs (1935).

In order to correlate Ray's "substages" with the glaciations of the Wind River Mountains of Wyoming (Blackwelder, 1915; Richmond, 1948, 1957a, 1962; Moss, 1951b; Holmes and Moss, 1955), the writer briefly reexamined the succession of glacial deposits along Rio Hondo on the slopes of Wheeler Peak, along Rio Nambe on the slopes of Lake Peak and on Sierra Blanca Peak (fig. 1). New topographic maps in two of these areas have made possible a more accurate means of plotting end moraines and of determining their altitudes than was available to Ray. Deposits of glaciations recognized by the writer are correlated with those described by Ray (1940) as shown in table 1.

CRITERIA OF CORRELATION

Deposits of three glaciations—from oldest to youngest, the Buffalo, Bull Lake, and Pinedale—were described in the Wind River Mountains of Wyoming by Blackwelder in 1915. Subsequent work has demonstrated 3 pre-Bull Lake glaciations (Richmond, 1962) included in deposits formerly called Buffalo, 2 stades of Bull Lake Glaciation (Richmond, 1948; Moss, 1951a; Holmes and Moss, 1955), 3 stades of Pinedale Glaciation (Richmond, 1948, 1962), and 2 stades (Temple Lake and Gannett Peak) of Neoglaciation (Hack, 1943; Moss 1951a, 1951b; Richmond, 1957b). Criteria for recognition of these glaciations and their subdivisions in the Wind River Mountains and elsewhere have been described in many papers (Blackwelder, 1915, 1931; Fryxell, 1951; Moss, 1951a; Holmes and Moss, 1955; Richmond, 1957a, 1962; Nelson, 1954).

The following characteristics of the deposits in the Wind River Mountains were used as the basis for correlation with the deposits in New Mexico described here.

First and second pre-Bull Lake Glaciations.—deeply weathered; red clayey soils; lack glacial topography; confined to interstream divides.

Third pre-Bull Lake Glaciation.—Weathering as above, but forming poorly preserved broad, mature moraines on canyon walls or floors.

Locally deposits of all three glaciations are superposed and separated by thick red clayey soils.

Bull Lake Glaciation.—Commonly two broad, mature moraines (early and late stades) in canyons; dissected by axial and tributary streams; mature zonal soils 3 to 4 feet thick. The two tills grade into separate outwash deposits, which, where superposed, are separated and overlain by mature zonal soils similar to those on the moraine deposits.

Pinedale Glaciation.—Commonly 3 well-preserved rough, bouldery moraines (early, middle, and late stades) in canyons upstream from moraines of the Bull Lake Glaciation. Immature zonal soils 1 to 2 feet thick. Outwash gravels underlie separate terraces or form compound fills. Locally thin azonal soil or dark alluvial silty-clay layer separates outwash of early and middle stades.

Neoglaciation. — Temple Lake Stade — small moraines or rock glaciers in cirques. Thin azonal soil, tundra or scrub spruce vegetation. Gannett Peak Stade—fresh moraines or rock glaciers above those of Temple Lake Stade; no soil; commonly barren, but locally with lichen on boulders and sparse pioneer vegetation; moraines lie in front of existing glaciers or in recently evacuated cirques.

SIERRA BLANCA

From the shallow cirque on the northeast side of Sierra Blanca Peak (altitude 12,003 feet), a bouldery lateral moraine extends along the north side of the canyon of the North Fork of the Rio Ruidoso to a terminal moraine 50 feet high at an altiude of 9,850 feet about a mile from the cirque headwall (fig. 1). The deposit

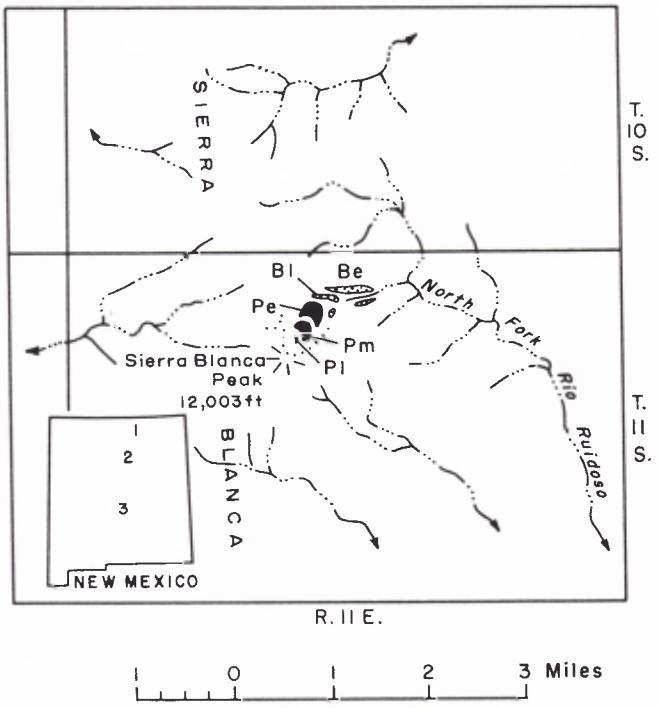


Figure 1. Moraines on Sierra Blanca Peak, Sierra Blanca, New Mexico. Be and Bl, early and late stades of Bull Lake Glaciation; Pe, Pm, and Pl, early, middle, and late Stades of Pinedale Glaciation. Index map: 1, Wheeler Peak; 2, Lake Peak; 3, Sierra Blanca. Adapted from Richmond, 1962b, figure 213.3.

is trenched about 30 to 40 feet by the creek, and bears a mature Brown Podzolic soil about 3 feet thick. The B horizon of the soil is strong-brown (7.5 *YR* 5/6) and contains noticeable illuviated clay, though it is not plastic. The boulders are mostly of granite porphyry, and many, both on and in the till, are deeply disintegrated. A second broad terminal moraine of similar character lies at an altitude of 10,400 feet. It also is about 50 feet

high and is littered with boulders, some 10 to 12 feet in diameter. These two moraines are believed to represent the early and late stades of Bull Lake Glaciation. A small lake basin back of the upper moraine is filled with arkosic sand and gravel which extends upslope as an outwash plain into still another bouldery morainal ridge, about 30 feet high, which forms an arcuate loop on the steep slope leading into the cirque at an altitude of 10,500 feet. The moraine is grass covered except for a few spruce along its outer slope and lateral extensions. It is but little dissected, bears an immature Brown Podzolic soil about 10 inches thick, and is yellowish brown (10*YR* 5/4). A similar moraine, nearly 100 feet high, lies across the slope at an altitude of 10,900 feet, and a third, about 60 feet high, at 11,300 feet. These three moraines are believed to represent the early, middle, and late stades of Pinedale Glaciation.

The cirque floor is between 11,400 and 11,500 feet in altitude. Talus along the cliffed headwall is stable and covered by soil and grass or spruce, and spruce extends as scattered clumps to the top of the peak. No deposits having the characteristics of the Temple Lake or Gannett Peak Stades of Neoglaciation were seen, and no snowbanks were present on July 10, 1957.

A steep basinlike slope on the northwest side of the peak may have been occupied by ice during the Bull Lake Glaciation, but not in Pinedale time. The slope is steep and no moraines have been preserved.

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