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A STUDY OF RECENT SEDIMENTATION IN THE SAN LUIS HILLS

by

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The San Luis Hills of south-central Colorado are located in the southern part of the San Luis Valley. They extend from a point about nine miles east of Sanford and ten miles southwest of Blanca to the Colorado-New Mexico state line. The purpose in studying these partially exhumed hills was to quantify the sedimentary processes presently at work in this area. Originally the author thought that there would be three fairly equal sources of sediments; (1) the Rio Grande, (2) mass wasting from the hills, and (3) aeolian deposits produced by the prevailing southwesterly winds. Gradations in the percentages

of each are due to the topography and the nearness to the hills and river.

The criteria used to classify these sediments was sieve analyses according to Folk (1968, p. 3-4). To obtain samples a series of Brunton and tape traverses were made. The main series of samples were in a line from the top of the northwestern corner of the eastern San Luis Hills directly down and out across the floodplain region to the Rio Grande at the eastern edge of the La Sauses Quadrangle (fig. 1). There were two other series of samples taken that ranged from the river to the flanks of the hills. These

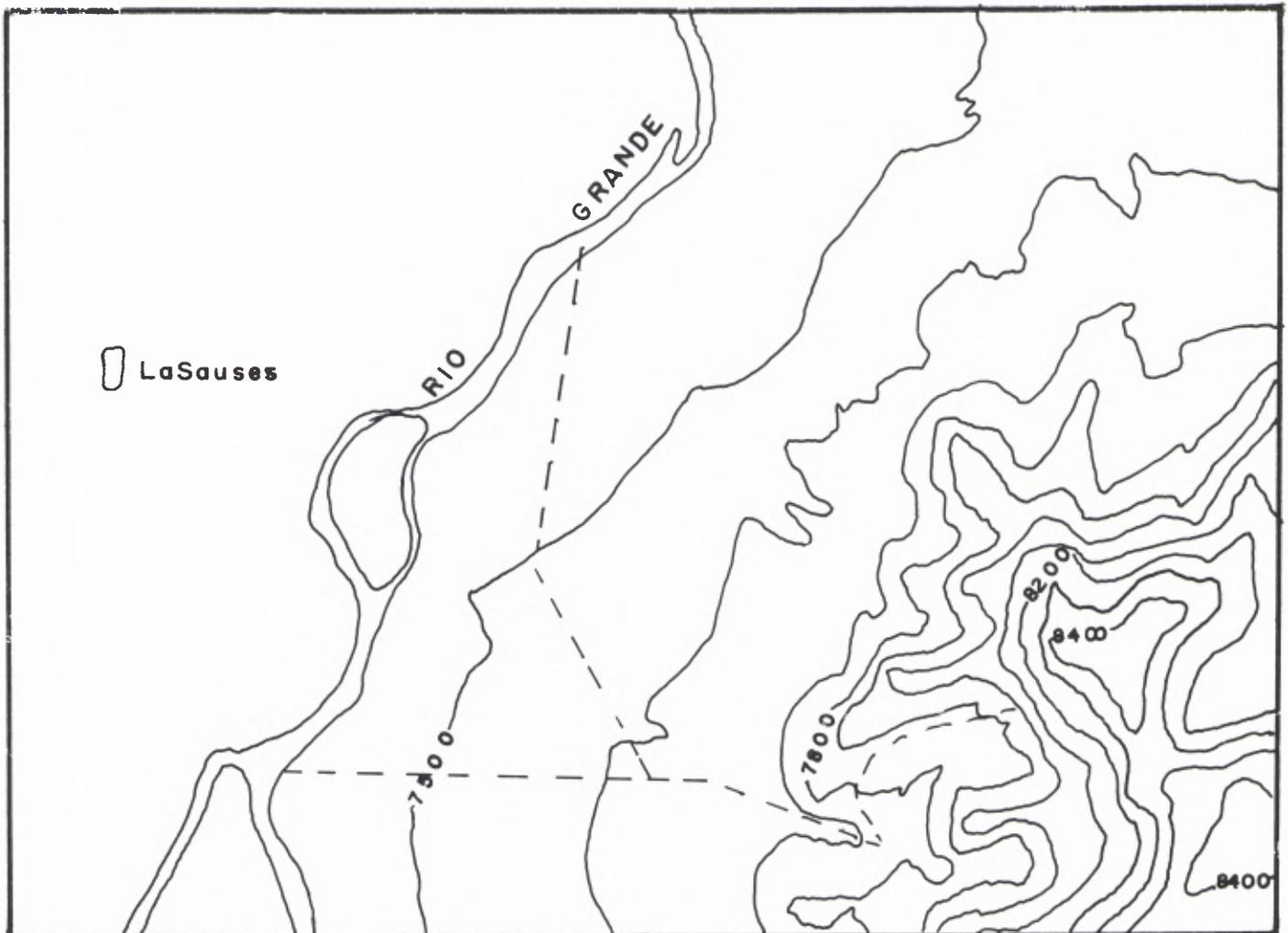


FIGURE 1.

Eastern portion of La Sauses Quadrangle. Scale 1:24000. Contour interval 100 feet. — — — sampled area.

samples were taken at 200 foot intervals at a depth of one foot. The depth was established to eliminate as much of the recent effects as possible, especially organic material.

Samples were split evenly to 100 grams. Each 100 gram sample was run through a set of ten sieves graduated from -4 phi (16mm) to +5 phi (1/32mm) in one phi increments. Each of the phi sizes was weighed and calculated as a percentage of the total sample.

Four statistical tests were made of these samples; mean grain size, a test of the average particle size. Sorting, a measure of the degree of particle similarity in a sample, or the spread of a distribution on either side of an average. Inclusive graphic skewness, a measure of the departure of a frequency curve describing the sediment from a normal curve. A normal curve is unimodal while a skewed curve is usually bimodal. Kurtosis measures the difference in the sorting of the tails of the curve versus the central portion, thus indicating the proportion of the modes. A well sorted sample with one dominant mode is leptokurtic while a bimodal sample with subequal modes is platykurtic.

Histograms of phi size versus percentage were made for

each sample. These histograms fell into three basic categories: strongly bimodal sediments with subequal amounts of two modes (platykurtic, river environment); weakly bimodal with one dominant mode (leptokurtic, composite of mass wasting and dune environment); and well sorted with a mean size of +1 phi to +2 phi (dune environment).

The floodplain deposits had a composite mean size of -1.7 phi. They were strongly bimodal with one mode in the -6 phi to -5 phi range and one in the 0 phi to +2 phi range. According to Folk (1968, p. 44) there is a relative scarcity in nature of very coarse sand so that a mean size in the -1 phi to -2 phi range would indicate a mixture of sand and pebbles. As seen in figure 2, the floodplain samples have kurtosis values of +0.5 to +0.7 indicating a bimodal characteristic which accounts for an extremely platykurtic value.

Samples progressively away from the river channel, across the floodplain, show progressively better sorting approaching a value of 0.5 indicating a dune type deposit (fig. 2). The distribution curves for the samples also approach normal nonskewed distributions indicating per-

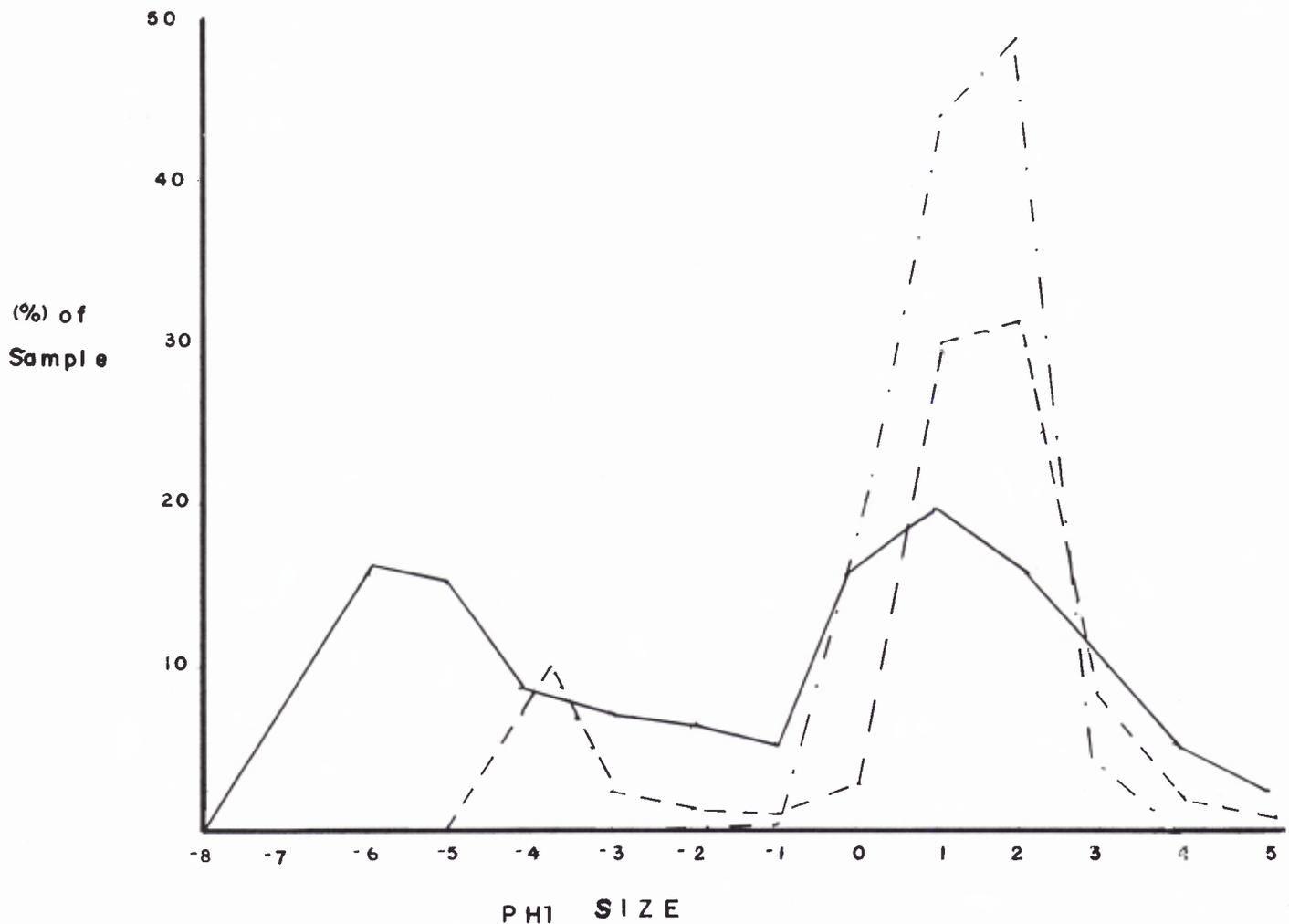


FIGURE 2.

Composite histogram of sedimentary environments in the San Luis Hills. ——— river environment; - · - aeolian environment; - - - mass wasting and aeolian environments.

haps a single origin. A great abundance of particles in the +1 phi to +3 phi range were found in these samples. This range was found to comprise at least 30% of every sample and ranged up to a maximum of 88%. The best sorting was found near the middle of an alluvial fan area with poorer sorting both above and below it.

At the top of the alluvial fan the samples were once more bimodal, but in this case the two modes were extremely unequal. The dominant mode was in the +1 phi to +3 phi range with the secondary in the -4 phi to -3 phi range (fig. 2). This is indicative of a mixing of the mass wasting environment from above and the aeolian deposits being swept up from below.

On the northeast faces of the summits of the lower hills extensive dune deposits were found that had dropped into the wind shadow of the prevailing southwesterly winds. Analysis of these deposits showed 84% to 91% in the +1

phi to +3 phi range for all samples. This gives a sorting value of 0.62 indicating a very well sorted sample.

At this stage of the study it may be concluded that at an elevation of 7,470 feet the river is depositing a highly mixed load in the floodplain region. This is subsequently being reworked by the wind with grains in the +1 phi to +3 phi range being transported across the flat alluvial fan up to the higher reaches where dunes have developed at elevations of about 8,100 feet.

Suggestions for future studies to substantiate the theory might include heavy mineral analysis and mineralogy of the sediments.

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