MORPHOLOGY AND ORIGIN OF SOME CALIFORNIA MOUNDS

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Several groups of low mounds were encountered in late October 1938 during the soil survey of the Stockton Area, Calif. The mounds occurred within a large area of Stockton clay (adobe) which is especially noted for its flat uniform relief. The first rain since May fell on October 6, and was sufficient to moisten the surface of the Stockton clay to a depth of about 4 inches, but the profile was extremely dry and hard below this depth. In sharp contrast only a few feet away the profiles of the mounds were wet to near field capacity throughout their entire depth, a condition not reconcilable with the small amount of rain. These marked differences led to a study of the mounds in an effort to determine their origin and relationship to the associated land forms.

Odd forms of microrelief have attracted some attention in the past. Nikiforoff (5) described the occurrence of mounds in Siberia and suggested they were formed by stresses exerted during freezing and thawing. Mounds or hummocks of windblown sands are common to most deserts. The sands accumulate at the base of scattered shrubs and often attain considerable size. Widely discussed mounds ("hog-wallows") occur in the San Joaquin Valley of California in association with some areas of San Joaquin and Madera soils. Concerning these and similar mounds, Hilgard (3) suggested an origin related to surface erosion and Shaw (7) suggested wind as the causative factor, but Nikiforoff (4) offered evidence suggesting an origin related to hydrostatic pressure generated by underground waters descending from adjacent higher slopes. He discounted the possible roles of erosion or rodent action but points out that these agencies are active in mound formation in other places. A series of large mounds associated with the Merced soils (moist and wet basin soils) in Kern County, Calif., have been noted (1), but an explanation of their genesis has not been attempted. For mounds associated with certain flat coastal plain formations, Dietz (2) has suggested that offshore clumps of marsh grasses in shallow lagoon and coastal waters catch sediments and eventually build up a series of small islets which form mounds as the shore line moves. Professoring with a theory of mound "alluvial fans, and foothills. The geography of the land forms is shown in Fig. 1A and a cross profile along line X-Y in Fig. 1A is shown in Fig. 1B. This arrangement is typical of the land near the San Joaquin and Sacramento valleys.

RECENT ALLUVIAL FANS

During the rainy summer months, the Stanislaus and Calaveras rivers carry little water, and in the winter and when the Sierra snows melt in April and May they frequently go into severe floods. The apices of these alluvial fans, point C, are located at the canyon mouths where the sediments and sediment-laden waters first spread, resulting in a loss of velocity and carrying power and consequent deposition of sediment. The Stanislaus River carries a larger volume of water in the larger watershed than does the Calaveras River. The Stanislaus River has constructed a fan of fine gravel through which subsurface water passes readily, whereas the Calaveras River sediments are silt and clays which tend to restrict intergranular movements.

During fan construction the Stanislaus River has many anastomosing branches or channels, many sandy or gravelly ridges which were often above the general level of the fan. Subsequent channel entrenchment occurred only in the upper and lower portions of the fan are now filled. Calaveras River has not entrenched its fans to this degree.

THE STOCKTON BASIN

An interfan or basin area occurs between the alluvial fans. The Stockton basin is flat and depression. It has been built up by the slow deposition of fine textured sediments laid down by Johns Creek and many lesser local streams. The old alluvial fans and foothills to the east of the shallow meandering channels are scattered in the basin. Surface gravel and sand deposits are not abundant. They may occur as pockets or local deposits along the larger channels where flood waters were active. Odd forms of microrelief have attracted some attention in the past. Nikiforoff (5) described the occurrence of mounds in Siberia and suggested they were formed by stresses exerted during freezing and thawing. Mounds or hummocks of windblown sands are common to most deserts. The sands accumulate at the base of scattered shrubs and often attain considerable size. Widely discussed mounds ("hog-wallows") occur in the San Joaquin Valley of California in association with some areas of San Joaquin and Madera soils. Concerning these and similar mounds, Hilgard (3) suggested an origin related to surface erosion and Shaw (7) suggested wind as the causative factor, but Nikiforoff (4) offered evidence suggesting an origin related to hydrostatic pressure generated by underground waters descending from adjacent higher slopes. He discounted the possible roles of erosion or rodent action but points out that these agencies are active in mound formation in other places. A series of large mounds associated with the Merced soils (moist and wet basin soils) in Kern County, Calif., have been noted (1), but an explanation of their genesis has not been attempted. For mounds associated with certain flat coastal plain formations, Dietz (2) has suggested that offshore clumps of marsh grasses in shallow lagoon and coastal waters catch sediments and eventually build up a series of small islets which form mounds as the shore line moves. Professoring with a theory of mound formation and relationship to the associated land forms.

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