DESERT PAVEMENT

Not shown on map [illegible] closely spaced stones [illegible] Stones collect at the [illegible] or salt heaving, or swell [illegible] pavement may be partly eolian in [illegible] thickness of silt increases [illegible] surface, due to advanced [illegible] desert pavement also forms [illegible] leaving behind the coarser [illegible] runoff it protects the ground [illegible]

CAVE DEPOSITS

[illegible] commonly [illegible] at base, recording an early [illegible] The gravel is overlain by clay [illegible] as the flow of water [illegible] and this in turn is overlain by [illegible] Stalagmites are [illegible] Fossil remains of Pleistocene [illegible] remains of Holocene [illegible] occur in basaltic [illegible] Mountains. These deposits include [illegible] fallen from the roofs [illegible]

ORGANIC DEPOSITS

Not shown on map. [illegible] fibrous peat in sedge marshes [illegible] woody peat accumulated in small [illegible] depressions and [illegible] Mostly less than 15 ft

DESERT VARNISH

Not shown on map. A [illegible] and manganese oxides on bare rock surfaces and on pebbles of desert pavement. Predates prehistoric pottery [illegible] Probably mostly middle Holocene, partly late [illegible] Many of these [illegible] have petroglyphs carved by pre-[illegible] peoples.

TRANSITIONAL DEPOSITS

Deposits transitional between those formed in situ and those transported deposits moved down [illegible] chiefly by gravity, particularly slow creep (colluvium). Also includes rock falls. Landslides and avalanches are shown as periglacial features.

Colluvium includes the heterogeneous mixture of soil and rock fragments [illegible] from bedrock and/or unconsolidated surficial deposits moved slowly [illegible] by gravitational force and sheet wash. Slopes generally steeper than 20 percent. Mass wasting, the process causing debris to move downslope, is [illegible] weight and lubrication of water-saturated debris, frost heaving, [illegible] wetting and drying of clays, crystallization of salts, growth of roots, [illegible] falling of trees, and impact of hail or rain. These, [illegible] processes, may be accelerated by man's activities.

[illegible] is typically a chaotic mixture of angular rock fragments and [illegible] in New Mexico colluvium is generally less than 10 ft thick [illegible] thick cones of debris at bases of hills [illegible] northeast and northwest parts of the state where steep shale slopes [illegible] caprock of sandstone [illegible] two, and locally three, ages of colluvium may be distinguished. These are thought to be mid Holocene, late [illegible] and early Wisconsinan, respectively. Such occurrences provide [illegible] of retreat of cliffs. Some shale slopes are armored and protected against [illegible] by blocks of the caprock.

[illegible] slopes such as [illegible] of the Zuni Mountains and east flank of [illegible] Mountains, the colluvium is generally thin (commonly 1 to 2 ft thick) [illegible] base of steep hillsides and is composed of the resistant rock forming the dipslope. Some of this colluvium could as well be mapped as [illegible] limestone. Hillsides on granitic and volcanic rocks may also [illegible] thin but bouldery sandy colluvium. Colluvium on steep, faulted [illegible] consists of a mixture of stones representing all the exposed formations [illegible]

co COLLUVIUM — Subscripts indicate the underlying hillside formation [illegible] colluvium on Tertiary volcanic rocks)

TRANSPORTED DEPOSITS

Most surficial deposits [illegible] weathered from bedrock in one area [illegible] wind, ice, or gravity to an area of deposition and are [illegible] further erosion and transportation. These deposits are much younger than [illegible] the underlying bedrock. They are [illegible] according to [illegible] mode of transportation to the site of deposition.

ALLUVIUM IN FLOODPLAINS AND STREAM CHANNELS

[illegible] deposits with gravel lenses, gravel [illegible] complex response [illegible] were comparatively wet during [illegible] during the interglaciations, [illegible] were drier, with [illegible] Holocene environments. Alluvial deposits locally contain fossils, including bones of mammals and rodents, and shells of freshwater snails and clams. Late Pleistocene deposits contain fossil remains of extinct animals such as elephants, camels, horses (not re-introduced until the arrival of the Spaniards), sloths, and long-horned bison. Archaeological remains are common in [illegible] Holocene [illegible] date them. Three ages of alluvium generally can be distinguished [illegible] Pleistocene, mid Holocene, and historic. At least three recognized types of alluvial floodplain deposits reflect relative [illegible] for sediment [illegible] by the main stream and its tributaries. A [illegible] along the Pecos [illegible] in the southeastern part of the state, is [illegible] ground. A fifth is restricted to basalt-capped mesas.

al FLOODPLAIN AND CHANNEL DEPOSITS ALONG MAIN [illegible] flat but includes terraces to about [illegible] meanders, and local stabilized dunes [illegible] layers of gravel. Caliche absent or weakly developed in [illegible] nodules. Deposits commonly 25 [illegible] water [illegible] subject to pollution. Extensively farmed, [illegible]

al_2 FLOODPLAIN AND CHANNEL DEPOSITS ALONG GENERALLY [illegible] ARROYOS AND WASHES — Includes deposits along some [illegible] Extent exaggerated to emphasize drainage patterns. [illegible] gradients 5 to 15 percent. Arroyos 10 ft deep common. Surface [illegible] deposit was formed by stream overflowing its banks, hummocky where [illegible] fans at mouths of tributaries that crowd the main stream [illegible] grades laterally into fan sand [illegible] perched water tables under some [illegible] exaggerated but total area [illegible] omitted

al_3 COALESCING SILTY AND SANDY ALLUVIAL FANS [illegible] between [illegible] deposits fs and fsi

al_4 [illegible] ALLUVIUM — Borders Pecos River south of Fort Sumner

al/b ALLUVIUM OVER BASALT — Restricted to basalt-capped [illegible] in old valleys, thickness [illegible] or more [illegible]

tg GRAVEL TERRACES — Well-rounded stream gravels with cobbles 6 inches or more in diameter, some terraces 250 ft higher than the streams. Especially well developed along the San Juan River, less so along the Pecos, Gila, and Canadian Rivers. Most represent deposits by Pleistocene melt waters from mountains. Abundant caliche deposits, especially on the higher terraces, which may be Kansan, lowest are Wisconsinan.

ALLUVIAL FAN DEPOSITS

In alluvial fans, unlike floodplain alluvium, beds tend to be thick, massive, and highly lenticular rather than well stratified. This is characteristic of all the facies, whether boulder, gravel, sand, or silt. Beds lenticular and elongated down the slope of the fans; slopes 2 to 20 percent. Deposition mostly by flash floods, with poor sorting and mixed textures. Coarse-textured lenses commonly form ridges extending down the fan onto generally finer grained sediment. Boundaries between the textural facies of the deposits roughly parallel the fan contour, but detailed boundaries are irregularly lobate; those shown are approximations. Fan textures and slopes depend partly on composition of the parent rocks and partly on height and steepness of the bordering hill or mountain. Fans extensive in the Basin and Range part of the state where they comprise about half the total area; in other parts of the state, fans are small. On the larger fans, arroyos become shallower towards the toe, many head at low mounds that probably mark old mudflows. Ground subject to sheet flooding.

fg GRAVEL FACIES — Bouldery towards apex of fan, grading downslope to cobble and fine gravel with increasing proportion of sand and finer grained material. Commonly dissected to form 2 to 3 levels of gravel benches up to 50 ft above present washes. A few streams (e.g., Mulligan Wash, Alamosa River, Cuchillo Negro Creek, and Rincon Arroyo) are incised 100 ft below fan surfaces. On short, steep fans, depths of valleys generally decrease downslope. On the broad Palomas surface, west of the Rio Grande above Hatch, valleys maintain their depth. Except near the apex, extensive surfaces have smooth desert pavement. On short, steep fans, gravels show minimal weathering and are weakly cemented with caliche, age probably Wisconsinan and Holocene. On broad, more gently sloping fans, gravels are more weathered and commonly cemented by caliche, age probably pre-Wisconsinan. In south half of the state, gravel facies is characterized by creosote bush cover. Thin alluvial gravel covering pediments is denoted by fg over subscript that identifies parent formation.

fs SAND FACIES — Sandy alluvium with subordinate amounts of fine gravel, silt, and clay. Forms at least four kinds of ground: 1) On short, steep fans sloping from the mountains of granitic or gneissic rock (e.g., parts of the Florida Mountains), this facies may form a smooth sandy layer a few feet thick covering gravel below; slopes 5 to 20 percent; washes 1 to 10 ft deep may expose underlying gravel. 2) On other short fans, sand facies may form arcuate belt at toe of fan with slopes averaging 10 percent, commonly reworked into coppice dunes 3 to 7 ft high (sm). 3) Other belts of smooth sandy ground commonly slope 5 percent or less and consist of sand mounds approximately 1 ft high over caliche (fs_2). 4) Gypsiferous sand (fs_3), especially in the Jornada del Muerto, Tularosa Valley and east side of the Pecos Valley. Sand facies absent on the broad Las Palomas surface. Thin fan sand covering pediments is denoted by fs over subscript that identifies underlying formation. Boundary with residual sand, fan gravel, and fan silt is approximate.

fsi SILT FACIES — In Basin and Range parts of the state, toes of fans may be silty and clayey rather than sandy; surface smooth, with slopes less than 5 percent. Slow infiltration rates and low slopes result in sluggish runoff. Forms a belt below the sand facies and grades downward to playa silt (psi) with slopes less than 2 percent. Abundant swelling clays and exchangeable sodium. Surface layers predominantly Holocene; subject to sheet flooding, gradational with al_3. East and west of Sangre de Cristo Mountains, also forms fans of sandy or silty loam with little gravel in upper 3 to 4 ft, but abundant gravel below the loam. Caliche soft. Includes loess on isolated hilltops. Boundary with residual loam (rl), playa silt (psi), and fan sand (fs) approximate.

EOLIAN DEPOSITS

Eolian deposits are laid down by wind, mostly as sheets of sand or silt (loess). Rarely, after prolonged drought on shale desert in the San Juan Basin, shale flakes may accumulate in rippled sheets or even small dunes, but with the next rain, these become mud. Sand dune shapes depend on topography, relative strength of the winds, supply of sand, and vegetation. Some dunes are concave towards the windward (parabolic), others are concave towards the leeward (barchans), and others are longitudinal or transverse. Some dune clusters (e.g., Great White Sands) have all four kinds. Dunes may climb a windward slope or fall on a leeward slope. Most of New Mexico's eolian sand sheets have a basal layer of weathered, partly cemented, reddish stabilized sand. Some sand surfaces on such layers are smooth. In the Basin and Range and Great Plains parts of the state, these surfaces are generally underlain by caliche; in the San Juan Basin, sand sheets commonly overlie residuum, fan deposits, or bedrock. Where sand is thick, as on sand facies of fans in the Basin and Range and at climbing dunes east of the Pecos River (Mescalero Sands) the sand is in mounds (coppice dunes) with profuse growth of vegetation — mesquite, and saltbush in the Basin and Range, sand sage, shinnery oak, small soapweed yucca, and occasional mesquite on the Mescalero Sands. Sand sheets are predominantly late Pleistocene; mounds and dunes are largely Holocene.

s/b SAND UNDERLAIN BY BASALT — Extensive on basaltic plains south and east of Zuni Mountains and on West Potrillo Mountains. At Kilbourne Hole and Hunt's Hole, the sand is of volcanic origin

s/ca/QTs SAND UNDERLAIN BY CALICHE ON SANTA FE GROUP — Mostly on La Mesa and south part of the Jornada del Muerto

s_1/ca/To THIN SAND ON CALICHE ON OGALLALA FORMATION — Thickness about 1 ft. Chips of caliche comprise 30 percent of the sand. Generally too shallow for farming, but good shallow source for aggregates

s_2/ca/To MODERATELY THICK SAND ON CALICHE ON OGALLALA FORMATION — Sand 1 to 3 ft thick. Surface layers noncalcareous over reddish loam. Local sand mounds. Ground favoring for farming. Boundaries approximate

s_3/ca/To THICK SAND ON CALICHE ON OGALLALA FORMATION — Sand 3 to 5 ft thick. Local mounds. Brownish-red, fine sandy loam over reddish-brown, sandy clay loam; noncalcareous to depths of 3 ft, calcareous subsoil contains filaments of lime carbonate. Where farmed, ground is subject to wind erosion. Boundaries approximate

sm LOOSE SAND IN MOUNDS — Coppice dunes, commonly 3 to 7 ft high and 25 to 50 ft in diameter, generally elongated north of east but a local exception lies east of Columbus where elongation is south of east. Age is Holocene. Boundaries fairly accurate

es, s SAND SHEETS — Surfaces smooth except for ripples 2 to 3 inches high and scattered sand mounds 3 to 12 inches high, especially around small shrubs. Thickness of loose sand generally no more than about 12 to 24 inches, but commonly overlies stabilized sand. Underlying material where known identified by subscript

ds LONGITUDINAL DUNES — Sand commonly 5 ft thick, locally 10 ft. Forms distinct ridges generally oriented north of east. Locations diagrammatic and width exaggerated

ds OTHER DUNES — ds_1, quartzose sand, ds_2, gypsiferous sand

l/b LOAM ON OLD BASALTIC LAVA — Probably pre-Wisconsinan loess

si EOLIAN SILT

EXPLANATION OF SURFICIAL GEOLOGY

by Charles B. Hunt 1977