LANDSLIDE BLOCKS ALONG THE MARGIN OF THE DIABLO PLATEAU, TEXAS

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Large landslide masses of the kind Reiche has called "Toreva-blocks" are found in several places along the southern margin of the Diablo Plateau in Hudspeth County, Texas. Those described in this report occur along the north side of the valley that separates the northwestern end of the Finlay Mountains from the plateau proper. This locality

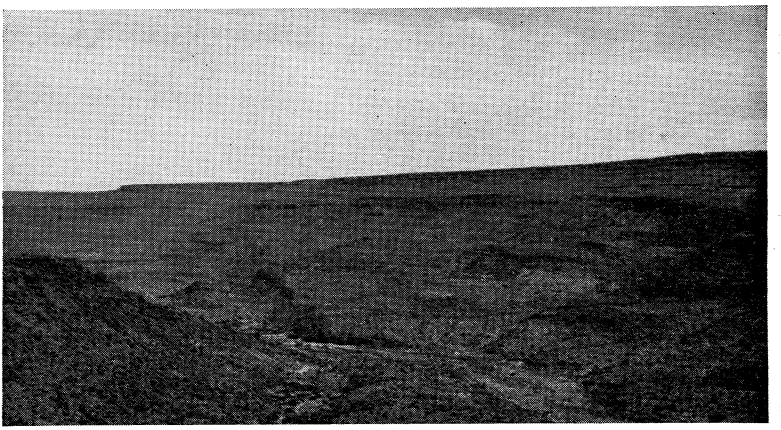


Figure 1.—Landslide blocks along southern margin of Diablo Plateau, viewed from the northern edge of the Finlay Mountains, looking toward the northwest.

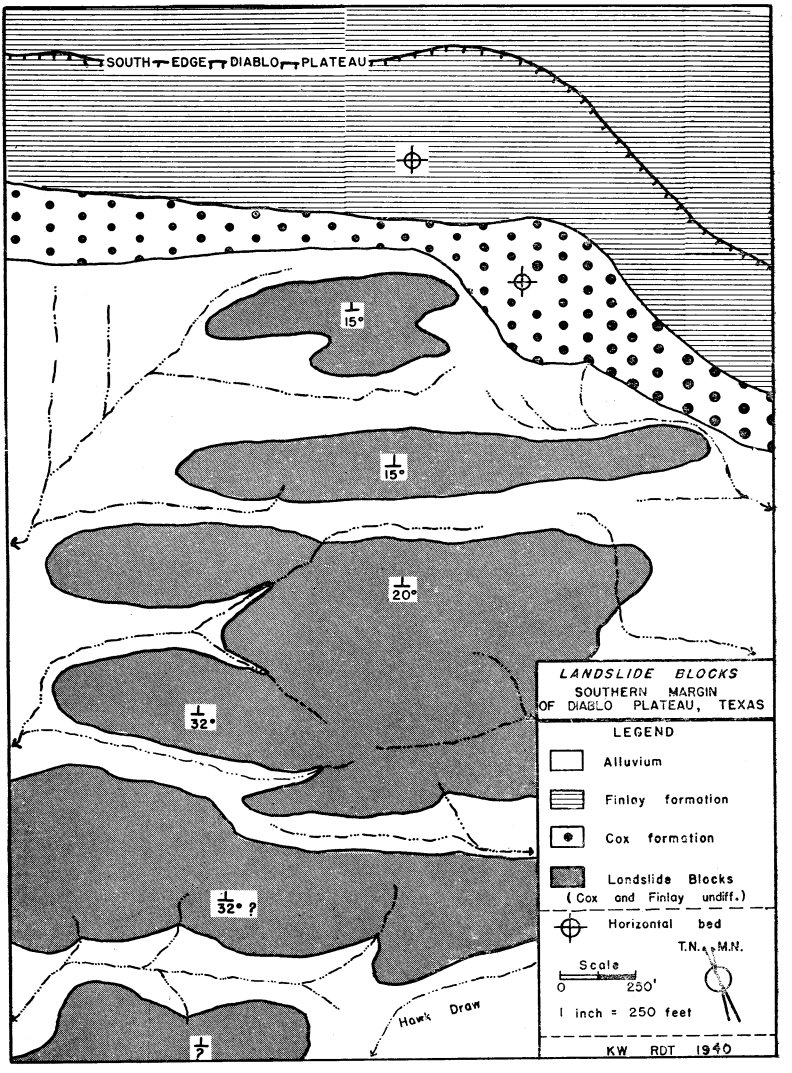
is easily found on the Fort Hancock topographic sheet. The landslide blocks are noteworthy not only because of their size and for the light they shed on the manner of recession of the Diablo escarpment, but also because of their apparent antiquity. Landsliding on the scale that produced these blocks seems to have been a process of the past and to have progressed under climatic conditions somewhat different from those of the present.

This paper is the result of field work which was completed in the summer of 1940 under the supervision of Dr. C. C. Albritton, Jr. Mr. Keith Walker, a student of geology at Southern Methodist University, helped prepare the accompanying map and deserves the writer's hearty thanks for his unselfish exertions in this hot and dry part of western Texas.

The landslide blocks may be seen in perspective in Figure 1 and in plan on the areal map. They lie at the base and along the slopes of an escarpment that rises some 650 feet above the bed of the ephemeral stream which runs for a distance along its foot. Approximately the upper 200 feet of the escarpment is made of limestone belonging to the Finlay formation of Lower Cretaceous age. The slopes below are developed on shale, sandstone and thin-bedded limestone of the Cox formation, likewise Lower Cretaceous. Reddish shale crops out in places along the base. The Cretaceous rocks in this area are nearly horizontal, and nowhere have dips exceeding a few degrees, except, of course, where the original dips have been altered by landsliding.

The landslide blocks have a maximum length of 1,700 feet, a maximum width of 300 feet. They are generally capped by hard sandstone strata of the Cox formation. The beds within the blocks strike generally parallel with the trend of the escarpment and dip northward toward it at angles ranging from 15 to 30 degrees. These dips give approximate measures of the backward rotation the blocks underwent in process of sliding. Beds in the lower blocks generally show greater angles of dip than beds in the blocks higher up the slope. Thus it seems that the higher slides have not been permitted to rotate as much as they might on account of the obstructions provided by the lower.

In their general features the landslide masses along the southern margin of the Diablo Plateau are like those in Arizona described by Reiche (1937) and Strahler (1940). Each mass conforms well with Reiche's definition of a "Toreva-block" as "a single large mass of unjostled material which, during descent, has undergone a backward rotation toward the parent cliff about a horizontal axis which roughly parallels it."



Mass movements of the magnitude necessary to produce Toreva-blocks along the edge of the Diablo Plateau are not in progress at present. The blocks themselves are being destroyed by stream erosion. The lower blocks indeed are evenly truncated along the pediment slope that

slants to the west where it merges with an expansive pediment along the northern edge of the Hueco Basin. Between this pediment level and the floodplain of the Rio Grande are at least two intermediate erosional surfaces. Since the lowest landslide blocks must be older than the highest pediment on the Hueco Basin, and since this pediment in turn must be at least two erosional stages removed from the time of formation of the Rio Grande floodplain, the landslide blocks must have considerable antiquity, although at present it is not possible to give a good estimate of this in terms of years.

Of the strata exposed in the escarpment of the Diablo Plateau the weakest, both in a structural and in an erosional sense, are the shales of the Cox formation. When wet these shales are plastic, when dry they are tough and brittle. There seems to be little doubt that the forward movement of the landslide blocks was accomplished along shear zones in the shales. Since there is no large-scale mass movement of materials on the face of the escarpment at present, it would seem that the Toreva blocks found here were formed during some past time when the shales were more plastic. At that time the local water table must have been considerably higher than at present, and the local annual precipitation must have exceeded the few inches that now fall on this area each year.

Evidence is accumulating to indicate that there have been rather frequent alternations between relatively moist and relatively dry climates in the Southwest during recent geologic time (Albritton and Bryan, 1939; Hack, 1942). At present it would not be profitable to speculate on the place that the humid interval, during which the Toreva blocks here described were formed, might find in any of the climatic chronologies formulated to date. It is sufficient to conclude that these landslide masses belong to a landscape which is now in process of destruction, that the critical factor which locally determines whether or not Toreva blocks will form is the degree of plasticity of the Cox shales, and thus that the blocks moved at a time when the water table was higher and the climate more humid than at present.

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