

# DRAINAGE PATTERNS IN THE ALAMBRE VALLEY, ARIZONA

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The influence of the arrangement of platy elements present in some granitic rocks on the stream patterns that are developed upon these rocks has been noted in the Alambre Valley, in southern Arizona.

## REGIONAL SETTING

The Alambre Valley is located between the Coyote and Quinlan Mountains in south central Arizona, approximately 30 mi. west of Tucson. The topographic appearance of this and adjacent areas has been outlined by Bryan (1922, 1923) and McGee (1897) and it need only be repeated here that the larger mountain masses exist as isolated peaks and ranges surrounded by alluvium which has accumulated, sometimes to great depths, in the broad outlying valleys. Within the mountainous areas, smaller, considerably less well developed valleys are found, of which the Alambre Valley is an example. The drainage developed in this valley provides a clue to the relationship between the stream patterns and the internal structures of the rocks that underlie the valley.

The portion of the Alambre Valley shown in figure 1 consists of approximately 3 sq. mi. of relatively flat land, enclosed on three sides by the rugged slopes of the Coyote and Quinlan Mountains. Alluvium in the valley is made up almost entirely of fragments derived from the weathering of the surrounding granodiorite, monzonite and pegmatite. That the alluvial cover is relatively thin is indicated by numerous small outcrops of bedrock some distance from the mountain front and by bedrock outcrops in the beds of shallow streams which flow in the central portion of the valley. Because of their size, these smaller outcrops have not been shown on figure 1.

## RELATIONSHIP OF STREAM PATTERNS TO STRUCTURE

The dominant structural features of the area consist of: (1) the north-south trending Pan Tak Fault which outlines the western boundary of the Coyote Mountains and (2) the northwest trending, steeply dipping planar structures (foliation) developed in the rocks of both the Coyote and Quinlan Mountains (fig. 1). Within the granitic rocks of the Quinlan Mountains the planar structures are formed by preferred alignment of biotite flakes, feldspar porphyroblasts and hand-sized clots of a schistose, biotite-rich rock. The vast majority of the planar features strike approximately northwest and dip steeply to the southwest, giving the rock a distinct northwesterly "grain".

The master stream in the Alambre Valley is denoted the Pan Tak Wash on figure 1. Near the head of this stream, its channel follows the soft gouge zone of the Pan Tak Fault. Although outcrops of the Pan Tak Fault are not found farther down in the valley, a projection of the strike of the fault closely follows the present channel.

The initial step in the development of the stream channels involved the weathering of the foliated rocks. Weathering tends to preserve and accentuate the northwesterly "grain" of the rock and results in the formation of a series of small, rather rigidly oriented and poorly interconnected grooves that develop as the softer portions of the rock are removed. When the relief is slight, as on the bedrock floor of the Alambre Valley, the internal structure of the rock serves to guide the flow of water and stream channels are developed parallel to the north-

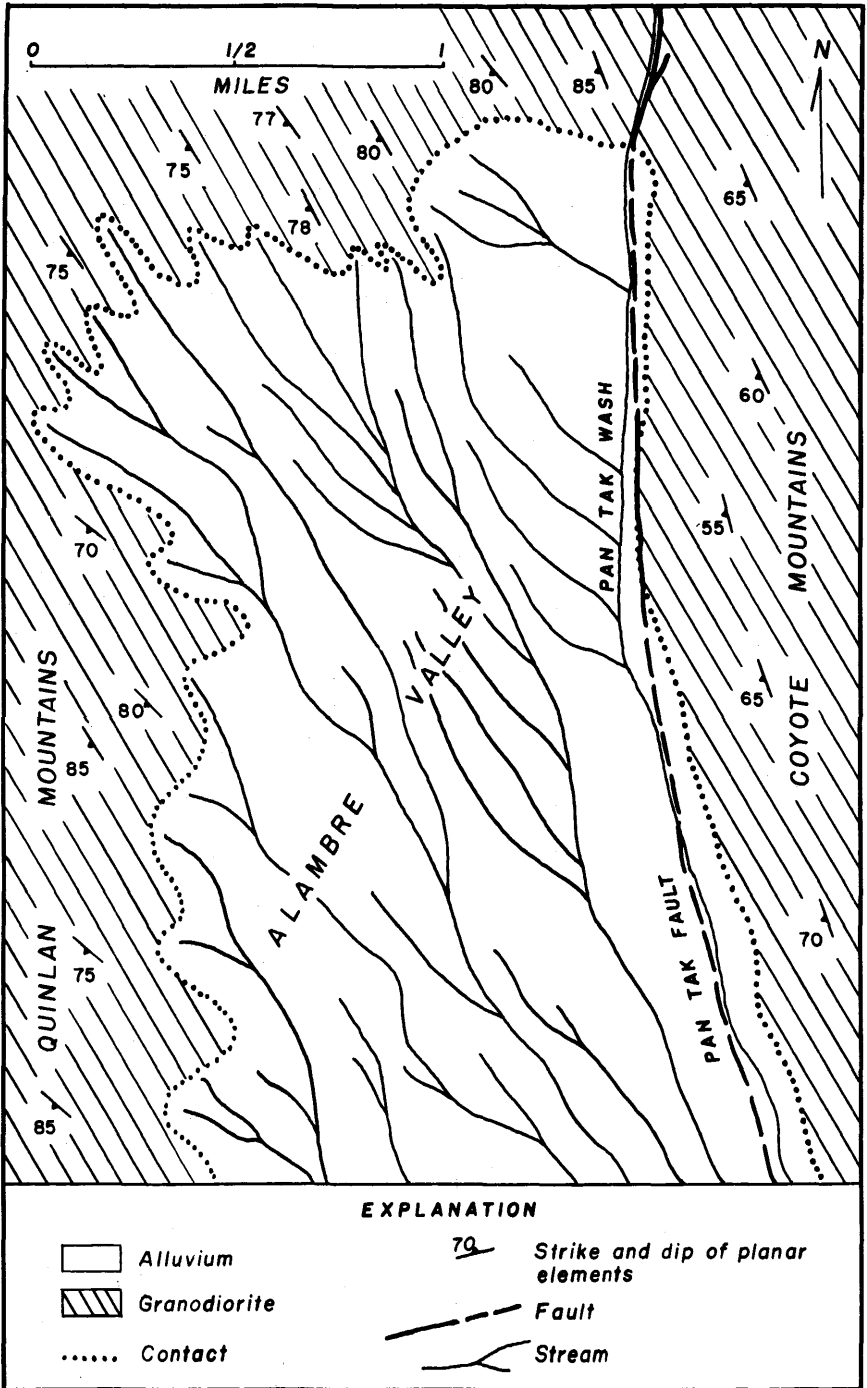


FIGURE 1. Geologic map of the Alambre Valley, Arizona.

westerly trend. In order to make an accurate comparison between the stream trends and the strikes of planar structures in the surrounding rocks, two distribution curves were plotted. The graph in figure 2 represents: (1) distribution of strike readings taken on planar structures in the Quinlan Mountains (solid line—135 readings) and (2) distribution of a number of directional readings taken

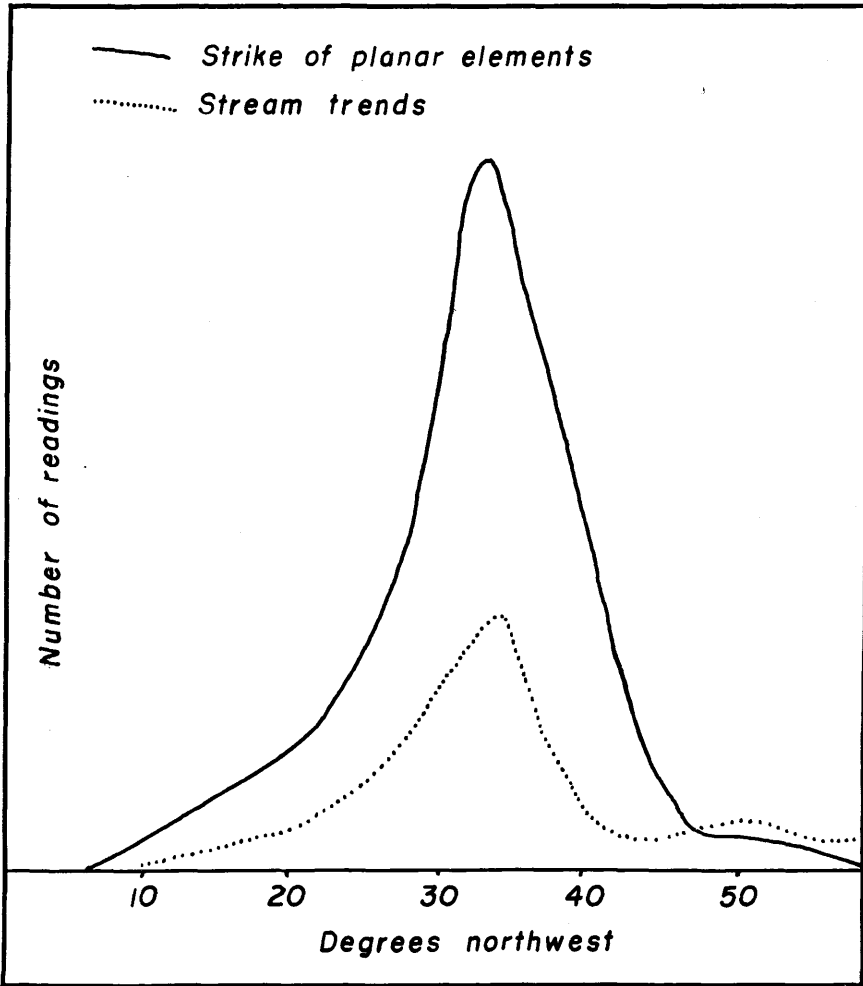


FIGURE 2. Distribution curves of stream trends and strike of planar structures, Alambre Valley, Arizona.

on short segments of streams in the Alambre Valley (dotted line—40 readings). The graph emphasizes the fact that the stream directions and the strikes of planar structures are essentially the same—approximately  $N34^{\circ}W$ —and suggests that the development of the streams was directly influenced by the planar structures present in the bedrock floor of the valley.

The stream patterns developed in the Alambre Valley serve to illustrate that even the usually somewhat obscure planar features found in some plutonic rocks

influence topographic development on a scale at times comparable to that exerted by major faults and joint systems.

#### ACKNOWLEDGMENTS

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