

Tertiary and Quaternary Deposits

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Deposits of Tertiary and Quaternary age in the East Mojave National Scenic Area (EMNSA) include landslide and sedimentary-breccia deposits, gravel, playa and pluvial-lake deposits, and basaltic lava flows, cinder cones, cinder deposits, and vent basalt (pl. 1). Quaternary deposits include eolian sand, alluvial fan deposits, playa and pluvial-lake deposits, basaltic lava flows, cinder cones, and cinder deposits.

General compositions of piedmont deposits in the EMNSA are delineated on plate 3, as are source areas for many alluvial fan deposits. This map was prepared from analysis of geometrically rectified Landsat Thematic Mapper (TM) image data, which was processed by R.G. Blom and R.E. Crippen of the Jet Propulsion Laboratory, Pasadena, Calif., using the following data: (1) Landsat 5, Path 39, Row 36, Quads 1 and 2 (acquired 12/12/84), and (2) Landsat 5, Path 39, Row 35, Quad 3 (acquired 1/10/85). Midwinter, low-sun-angle scenes were used to maximize topographic expression. Individual spectral bands were adjusted for path (atmospheric) radiance and sensor calibration. These data were then ratioed (bands 3:1 to emphasize ferric-iron variations, bands 5:4 to emphasize ferrous-iron variations, and bands 5:7 to emphasize hydroxyl-carbonate variations), and the resulting band-ratioed images were scaled for approximately 1 percent saturation at range extremes. The achromatic component of the TM data was computed by averaging bands 3, 4, 5, and 7, edge enhancing with a high pass 5×5 box filter, and then merging by component multiplication with each of the three band-ratioed images. Ratioed bands were combined as false-color composites where 5:7 is displayed as red, 5:4 is displayed as green, and 3:1 is displayed as blue. The resulting false-color composite images maximize compositional discrimination while at the same time retaining topographic and structural information within the merged achromatic component.

Compositional boundaries in piedmont areas were delineated on the basis of abrupt changes in color and texture on 1:100,000-scale Landsat TM images (pl. 3). Drainage divides within the ranges were mapped from 1:100,000-scale, 50-m contour maps. Compositional information was inferred from mapped bedrock lithologies exposed in these source areas (pl. 1). The most extensively exposed bedrock lithologies within a given upland source area were inferred to make up the predominant lithologic component of surface deposits on the associated piedmont surface; these dominant lithologies are shown in boldface type on plate 3. The false-color composite image of the Providence Mountains (fig. 31A) shows notable contrasts in the lithologic components of alluvial deposits on the flanking piedmont surfaces. This particular figure illustrates well the spatial distribution of uniform color responses within the band-ratioed images that were used to delineate the compositional boundaries (compare fig. 31A with fig. 31B, the geologic map of the same area).

Pediments and areas of thin (<100 m thick) late Tertiary and Quaternary alluvial cover within the EMNSA also are shown on plate 3. Contacts between range front and piedmont contacts were delineated on the basis of abrupt transitions between areas of little shadow and smooth texture (pediments) and areas of abundant shadow and coarse texture (uplands). These interpretations were supplemented by stereoscopic-photogeologic observations made from high-altitude U-2 Color IR photography. Areas of pediments and thin alluvial deposits were estimated from interpretation of the distribution of planar areas of exposed bedrock (including some areas of deformed Tertiary sedimentary rocks), small residual bedrock knobs, and inselbergs (as inferred from analysis of enhanced TM imagery, aerial photography, and available geologic mapping). These features are particularly abundant in the following areas (from north to south): intermontane valleys and piedmonts adjacent to the hills near Halloran Spring; piedmont areas within and surrounding the Cima volcanic field and Cima Dome; the north margin of Lanfair Valley; intermontane valleys and piedmonts along the east flank of the Mid Hills; the piedmonts adjacent to the east and south flanks of the Piute Range; the piedmonts surrounding the Woods Mountains, Hackberry Mountain, the Vontrigger Hills, and Homer Mountain (approximately 5 km east of the EMNSA); and the southern piedmont of the Granite Mountains. Extensive areas of thick basin-filling deposits are apparently limited to parts of Ivanpah Valley, Fenner Valley, and the valley occupied by Kelso Wash (the area of the Devils Playground).

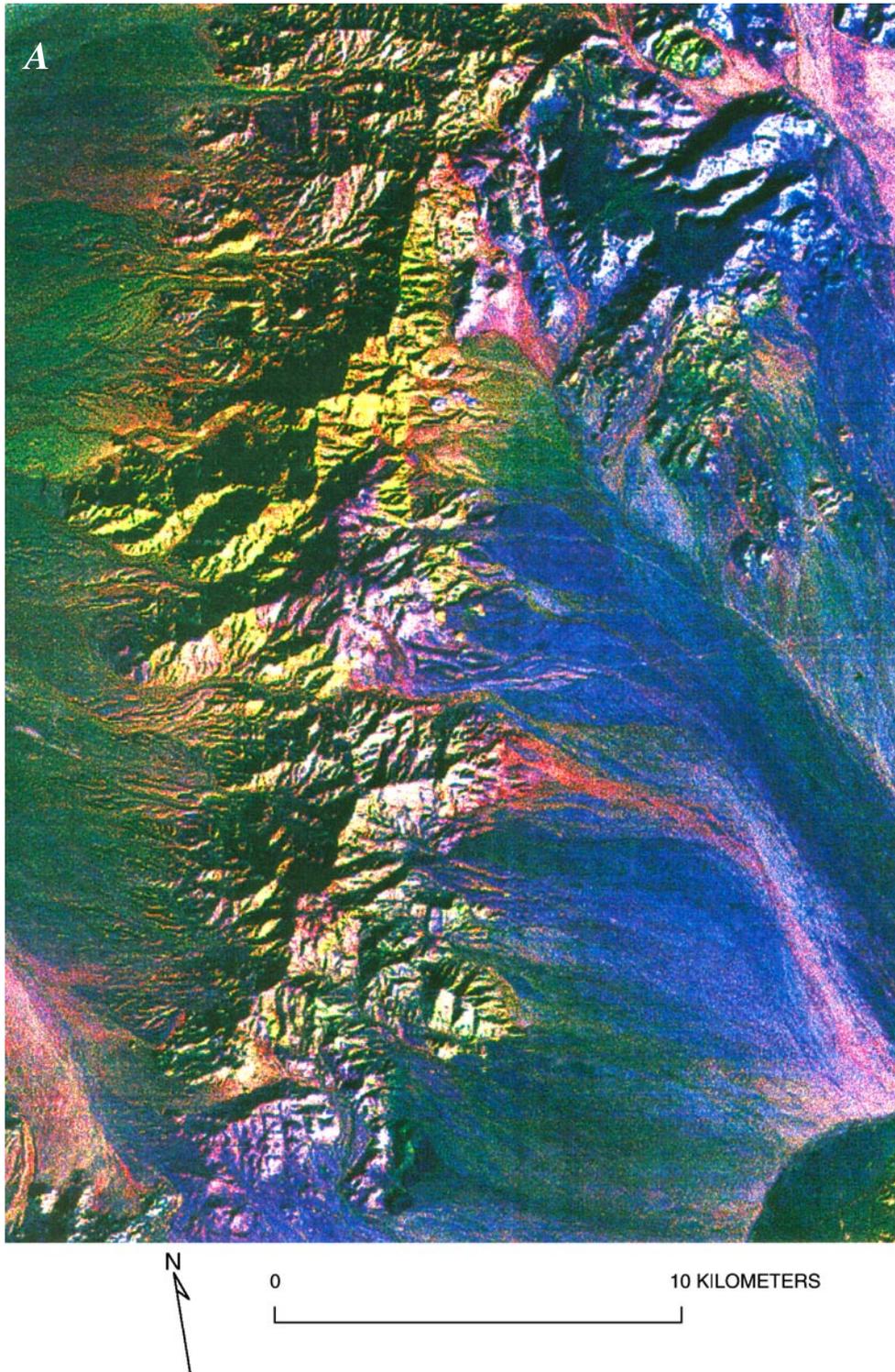


Figure 31. Compositional domains on piedmonts adjoining Providence Mountains (fig. 2), East Mojave National Scenic Area, Calif. *A*, Satellite image of Providence Mountains and adjacent piedmonts (from Landsat 4 Thematic Mapper, Scene 40149–17441, Path 39, Row 36; acquired 12/12/84). Image enhanced to emphasize lithologic compositions of piedmont deposits and source areas from which they were derived. Individual spectral bands were corrected for atmospheric absorption and scattering, as well as for variations in scanner sensitivity. Differences between spectral bands were then calculated and presented as false-color composite image, using following ratios: red, band 5:7; green, band 5:4; and blue, band 3:1. *B*, Geologic map of same area as 31A, showing geology of bedrock areas and predominant composition of piedmont deposits.

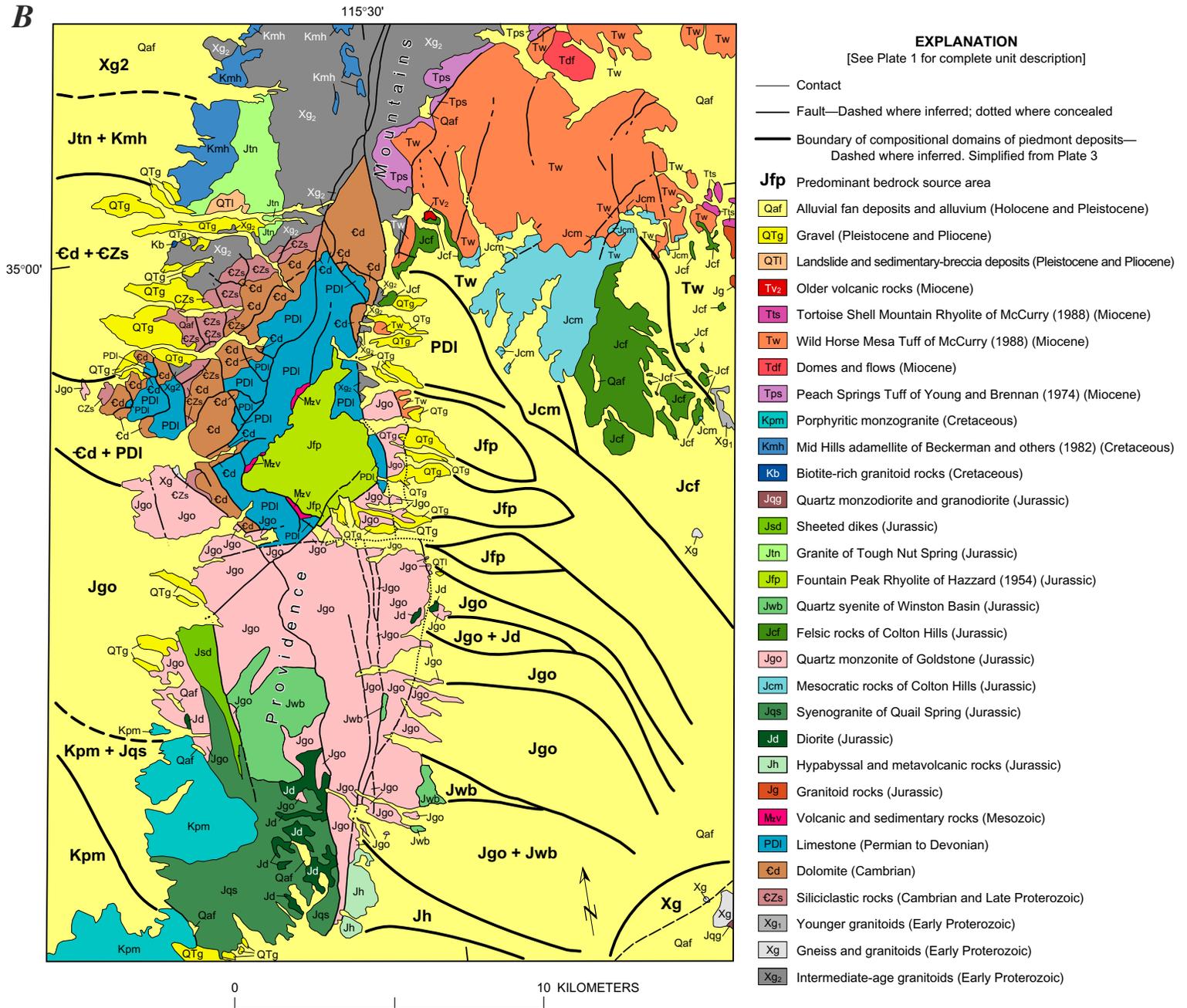
B

Figure 31. Compositional domains on piedmonts adjoining Providence Mountains (fig. 2), East Mojave National Scenic Area, Calif. A, Satellite image of Providence Mountains and adjacent piedmonts (from Landsat 4 Thematic Mapper, Scene 40149–17441, Path 39, Row 36; acquired 12/12/84). Image enhanced to emphasize lithologic compositions of piedmont deposits and source areas from which they were derived. Individual spectral bands were corrected for atmospheric absorption and scattering, as well as for variations in scanner sensitivity. Differences between spectral bands were then calculated and presented as false-color composite image, using following ratios: red, band 5:7; green, band 5:4; and blue, band 3:1. B, Geologic map of same area as 31A, showing geology of bedrock areas and predominant composition of piedmont deposits—Continued.