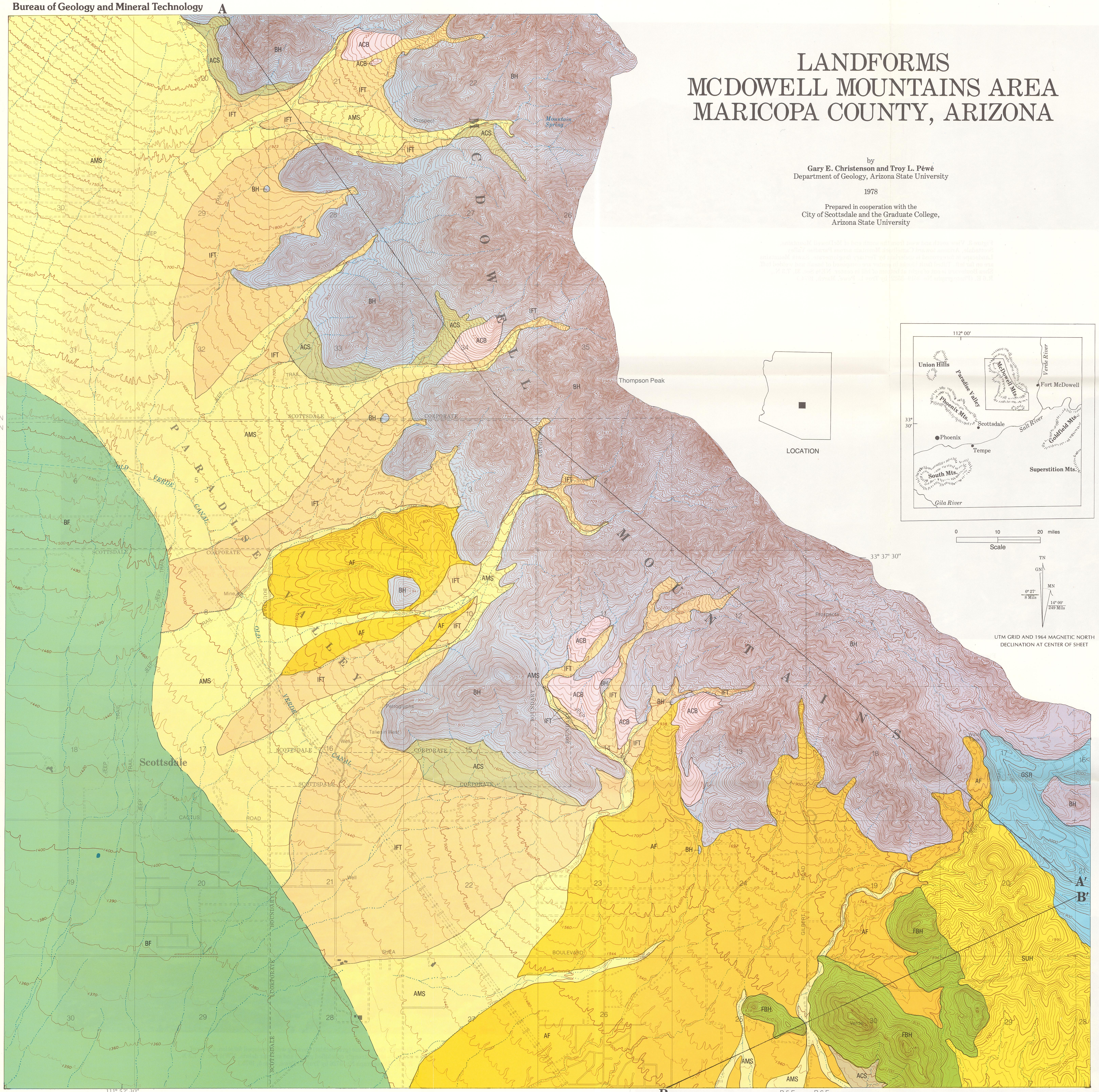
State of Arizona
Bureau of Geology and Mineral Technology

Geologic Investigation Series Map GI-1-B



Base maps from U.S. Geological Survey Topographic maps, 1:24000 series: Currys Corner (1964), McDowell Peak (1965), Paradise Valley (1965), and Sawik Mountain (1964)

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

LANDFORMS
MCDOWELL MOUNTAINS AREA
MARICOPA COUNTY, ARIZONA

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Prepared in cooperation with the
City of Scottsdale and the Graduate College,
Arizona State University

LOCATION

112° 00'
Union Hills
Paradise Valley
McDowell Mts.
Verde River
Fort McDowell
Phoenix Mts.
Scottsdale
Phoenix
Salt River
Goldfield Mts.
Tempe
South Mts.
Superstition Mts.
Gila River
0
10
20 miles
Scale

UTM GRID AND 1964 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

INTRODUCTORY STATEMENT*

The McDowell Mountains are in southcentral Arizona at the northern edge of the Sonoran Desert Section of the Basin and Range Physiographic Province. The physiography of this section is generally characterized by alternating, rough, northwest-trending ranges, and was formed during a period of faulting in late Tertiary times. The result was the formation of mountain ranges on the relatively upthrown sides of faults, with basins formed on the relatively down-dropped sides. Paradise Valley and the McDowell Mountains are one such basin and range separated by a large fault. Perhaps associated with this major faulting, minor small-scale faulting along a similar trend uplifted and tilted the basalt-covered fanglomerate seen in the southeastern corner of the area (fault-block hills). Weathering and erosion of the evolving McDowell Mountains occurred continuously as the mountains rose, resulting in the movement of large volumes of debris into the neighboring Paradise and Verde basins. The uplifted, older Tertiary fanglomerate is deeply dissected where the basalt cover has been removed, and part of this Tertiary fanglomerate has been planed off to form a flat surface that slopes gently toward the Verde River. This surface has also been dissected, and leaving only a series of flat-topped, gently sloping, finger-like ridges that project into the Verde Valley.

As erosion of the entire highland was taking place, alluvium was accumulating in Paradise Basin. Seven distinct but coalescing alluvial fans can be distinguished in the alluvial fill adjacent to the McDowell Mountains. These fans can be differentiated on the basis of morphology, relation to a parent stream valley, and lithology. Within each fan, active, inactive, and abandoned segments can be delineated. It is in the study of these alluvial fan segments that an understanding of landforms and geomorphology take on greatest environmental significance. Different landforms represent differing sets of geologic conditions, which, in turn, represent differing sets of construction and maintenance conditions. Thus, identification of a particular landform allows a prediction of the relative flood hazard, development of caliche, permeability, and contribution to ground water recharge. Parameters used to differentiate alluvial fan segments include drainage texture, depth of incision, elevation, soil type, and caliche development.

Abandoned alluvial fan segments forming high-level erosional remnants of preexisting fans, and cut by deeply incised streams, generally have strongly developed caliche horizons, and a simple drainage texture. They are presently being eroded and are rarely flooded by modern streams. In contrast, modern active fan segments exhibit no stream incision, generally have no noticeable caliche exposed in stream cuts, and have an intricate drainage texture. Deposition is presently occurring here, and these segments are frequently flooded. Inactive segments of modern fans are intermediate in character, and, in general, are undergoing erosion but occasionally receive debris from overbank flooding of modern streams. The sum of all of the alluvial entities is termed the bajada or alluvial piedmont, and grades into the basin-fill (basin floor) away from the mountain front where individual fans become indistinguishable.

Talus slopes form near the steeper mountain front. Several smooth bedrock surfaces covered by a sheet of alluvium or colluvium occur within the larger mountain valleys.

SELECTED REFERENCES

Blissenbach, E., 1954, Geology of alluvial fans in semi-arid regions: Geol. Soc. American Bull., v. 65, p. 175–190
Denny, C.S., 1965, Alluvial fans in the Death Valley region, California and Nevada: U.S. Geol. Survey Prof. Paper 466, 62 p.
______, 1967, Fans and pediments: Am. Jour. Sci., v. 265, p. 81–105.
Hunt, C.B., 1967, Physiography of the United States: San Francisco, W. H. Freeman and Co., 480 p.

*This map involves a general evaluation on a broad scale and does not preclude the necessity of site investigation.

EXPLANATION

BF

Basin floor—Nearly level plain (0–2% slope) near the center of the basin at the lower end of alluvial fans. Individual fans are no longer discernable and merge to form a basin-fill deposit of relatively uniform character. Land surface generally very flat with dry washes incised less than 5 feet (1.6m). Relief in areas between washes generally less than 1 foot (0.3m). Drainage moderately good but ponding possible.

AMS

Active alluvial fan segments and major modern stream channels—Gently sloping surface (less than 5% slope) with intricate drainage texture. Land surface generally undulatory with many subparallel stream channels and natural levees trending downslope. Channels generally not incised more than 5 feet (1.6m) with no caliche visible in stream cuts on active fans. Active alluvial fans form when a major modern stream from a mountain valley emerges from an incised channel and spreads out onto the surface, usually at the toe of an older fan. Relief generally does not exceed 5 feet (1.6m). Flooding common after major storms.

IFT

Inactive alluvial fan segments and stream terraces—Gently sloping surfaces (not exceeding 6% slope) with intermediate drainage texture. Land surface undulatory with relief of not more than 5 feet (1.6m) except near stream channels which may be incised up to 15 feet (4.6m). Small stream terraces occur upstream from the apices of inactive fans at elevation of 2–15 feet (0.6–4m) above the level of the modern stream. Terraces have flat tread and generally a front and back scarp. Caliche is visible in stream cuts in inactive fans and in stream terraces. Well drained and occasionally flooded.

AF

Abandoned alluvial fan segments—Moderately sloping surface (not greater than 8% slope) with coarse drainage texture. Land surface locally strongly undulatory with relief up to 35 feet (11m) near incised stream channels. Steep to vertical scarps border major incised stream channels. Well drained and rarely flooded.

ACS

Alluvial-colluvial slopes—Accumulations of unconsolidated debris at the bases of slopes where small, steep mountain channels intersect the more gently sloping valley surface. Accumulations are cone-shaped to nearly flat with apex in a small mountain valley and toe on the alluvial plain. Slopes generally exceed 15%, but locally are very gentle where material has spread out onto an alluvial fan surface. Caliche is generally strongly developed in these slopes. Well drained, flooding slight.

ACB

Smooth alluvium-colluvium covered bedrock surfaces—Accumulations of unconsolidated alluvial and colluvial debris on moderate to steeply sloping bedrock surfaces (10–18% slope) forming smooth, rounded (convex upward) slopes with bedrock locally cropping out from beneath the cover. Bedrock is generally inferred to be at depths of from 5–30 feet (1.6–9.1m) everywhere. Well drained, flooding slight.

SUH

Strongly undulating hills—alternating nonparallel elongate ridges and valleys in Tertiary fanglomerate. Elevations range from 1600–2800 feet, (488–854m) but individual ridges generally are no more than 300 feet (91m) high. Slopes exceed 15% except along gently sloping ridge tops. Drainage excellent with flooding rare, except in valley bottoms.

GSR

Gently sloping ridges—Erosion surface cut on Tertiary fanglomerate. Surface generally slopes less than 5%, but is deeply dissected by stream valleys not greater than 100 feet (30m) deep bounded by steep walls. Surfaces are graded to an ancient higher level of the Verde River to the east, and are very strongly calichified. Well drained and flooding rare.

FBH

Fault-block hills—Hills formed on the relatively upthrown sides of faults which trend to the northwest. Built of, or capped by, volcanic rocks and underlain by fanglomerate. The rock units composing the fault-block hills dip 15°–29° to the southwest, and three such fault-blocks are present. The hills are steep (greater than 15% slope) and are covered with accumulations of boundary colluvium. Elevations range from 1580–2390 feet (482–726m).

BH

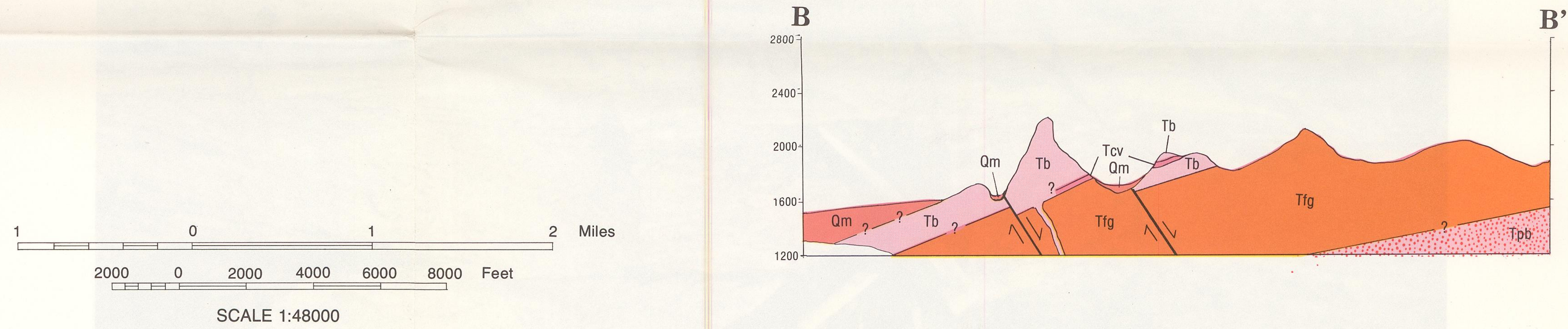
Bedrock highlands—Highland areas of bedrock locally covered by thin accumulations of talus and colluvium. Slopes generally exceed 15% and topography is rugged and steep with elevations ranging from 1600 feet (488m) adjacent to the alluvial fans up to 4034 feet (1230m) at McDowell Peak, the highest point in the McDowell Mountains. Land surface generally very steep and rugged.

Geologic Cross-Sections

EXPLANATION*

Qvc — *Very coarse-grained alluvium*
Qc — *Coarse-grained alluvium*
Qm — *Medium-grained alluviumm*
Tb — *Basalt (includes Qbc)*
Tvc — *Volcaniclastics*
Tfg — *Fanglomerate*
Tpb — *Papago Buttes deposits*
p€g — *Granite*
p€gd — *Granodiorite*
p€d — *Diorite*
p€vr — *Taliesin quartzite*
p€va — *Quartz-mica schist*
p€gs — *Greenschist*
p€mg — *Micaceous quartzite*
p€rq — *Red quartzite*
p€bq — *Blue quartzite*
p€ap — *Argillite-phyllite*
Contact
Fault, showing relative movement

*See geologic map for location of cross sections and explanation of units. (Alluvial units lumped).



SCALE 1:48000

VERTICAL EXAGGERATION 4X