Quaternary Geologic Strip Map of the Toroweap Fault and Vicinity, Western Grand Canyon, Arizona

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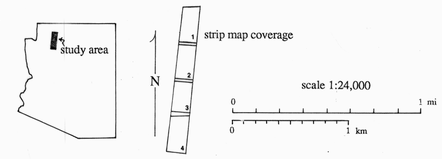
EXPLANATION



	Contact; dashed where gradational; queried where uncertain.
	Normal fault; dashed where approximate; dotted where uncertain. Number in brackets indicates cumulative displacement.
	Strike and dip of beds; 2 = dip of beds in degrees.
	Horizontal Beds.
	Monocline; dashed where fold dies out; dotted where concealed; length of arrows indicates approximate distance between anticlinal and synclinal hinges.
3.5(2)	Average displacement of Quaternary surfaces at a site; number in parentheses shows number of measurements, if more than one.
	Volcanic vents.
A	Large letters (A,B,C) separated by heavy dashed lines indicate proposed segments of the Toroweap fault.

	Axial valley units	
Quaternary	p	Playa deposits; found only at Toroweap Lake, near Vulcan's Throne.
	ch	Active stream channel.
	t4	Late Holocene terraces. Occur extensively in Toroweap Valley, forming a broad area of discontinuous channels and deposits; forms a narrow strip in Prospect Valley. Typically is less than 1 meter above active stream channel. Soil is undeveloped or weakly developed.
	t3	Latest Pleistocene to early Holocene terraces. Occur extensively in Toroweap Valley and as a narrow, discontinuous strip in Prospect Valley. In Toroweap Valley the unit lies 2-3 meters above active channels and is displaced by the fault. In Prospect Valley, it lies up to 5 meters above the active channels. Soils are weakly to moderately developed, containing stage II+ to III- calcic horizons.
	t2	Middle (?) to late Pleistocene terraces. Occur in isolated localities near the escarpment (cliffs on the east side of the fault) in Toroweap Valley and extensively in Prospect Valley. Lies up to 36 meters above active stream channels. Soils are well developed, containing stage III+ to IV- calcic horizons.
	Piedmont deposits	
	f4	Late Holocene alluvial fans. Includes active and recently abandoned alluvial fans. Debris flow levees and channels are numerous, giving the surface a hummocky appearance. Soils are undeveloped to weakly developed; maximum carbonate development is stage I. Not displaced by the fault.
	f3	Late Pleistocene to early Holocene alluvial fans undifferentiated (found in Toroweap Valley).
	f3c	Middle Holocene (?) alluvial fan. Very limited in extent, occurring only at one locality in Prospect Valley. Soil is weakly developed, containing a stage I calcic horizon. Displacement has been obscured by subsequent erosion, deposition, and road construction.
	f3b	Latest Pleistocene to middle Holocene alluvial fans. Occur at the base of the escarpment in both valleys.
	f3a	Late Pleistocene alluvial fans. Occurs between the apices of younger fans in Prospect Valley. Soil development poorly known. Age is bracketed by other units. Bar and swale topography subdued; surface is subplanar. Streams have incised up to 4 meters. The fans are displaced and average of 4.4 meters.
	f2	Late Pleistocene alluvial fans. Occur as isolated patches in Toroweap Valley and as one large fan in Prospect Valley. Soil development is moderate, containing stage II+ to III- calcic horizons. Surface is planar, with no expression of bar and swale topography. Streams have incised up to 10 meters. This unit is displaced an average of 6.6 meters.
	f1	Early (?) to middle Pleistocene alluvial fans. Very limited in extent. Original surface poorly preserved. Surficial clasts are highly weathered. In Prospect Valley, this unit is displaced at least 40 m.
	f1-f2	Hyphen between two units means that both units occur in the outlined area, but are two small in area and/or closely spaced, making them undifferentiable at this scale.
	Colluvial deposits	
	co_2	Active and recently active colluvial slopes.
	co_1	Relict colluvial slopes. Soils have stage IV calcic horizons. These slopes are distinguished from co2 by their relatively higher topographic position. These surfaces lie several meters above active slopes, and in many cases, their apices have been removed, exposing bedrock immediately upslope.
	co_u	Undifferentiated colluvium.
	Base map units*	
	Qr	Colorado River gravels (Holocene).
	Qal	Undifferentiated Quaternary alluvium.
	Qb	Basalt flows.
	Qbc	Basaltic cinder deposits.
Quaternary-Tertiary	QTb	Older basalt flows.
	QTbc	Older basaltic cinder deposits.
	QTi	Older basaltic dikes and sills.
	QTl	Landslide deposits, including rotation blocks.
	QTt	Undifferentiated travertine deposits.
Tertiary	Tbm	Blue Mountain Gravels.
Permian	Pk	Kaibab Formation.
	Pt	Toroweap Formation.
	Pc	Coconino Sandstone.
	Ph	Hermit Shale.
Penn.	Pe	Esplanade Sandstone.
Miss.	IPs	Undivided Watahomigi, Manakacha, and Wescogame Formations.
	Mr	Redwall Limestone.
Dev.	Dtb	Temple Butte Formation.
Cambrian	Cm	Muav Limestone.
	Cba	Bright Angel Shale.
	Ct	Tapeats Sandstone.

Quaternary Geology, © 1990, Arizona Geological Survey.

Geologic base map, © 1981, 1983, Grand Canyon Natural History Association.

*Geologic base map compiled from:

Huntoon, P.W., Billingsley, G.H., Jr., and Clark M.D., 1981, Geologic map of the Hurricane fault zone and vicinity, western Grand Canyon, Arizona: Grand Canyon Natural History Association, scale 1:48,000.

_____, 1983, Geologic map of Vulcan's Throne and vicinity, western Grand Canyon, Arizona: Grand Canyon Natural History Association, scale 1:48,000.

Topography by the U.S. Geological Survey.

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