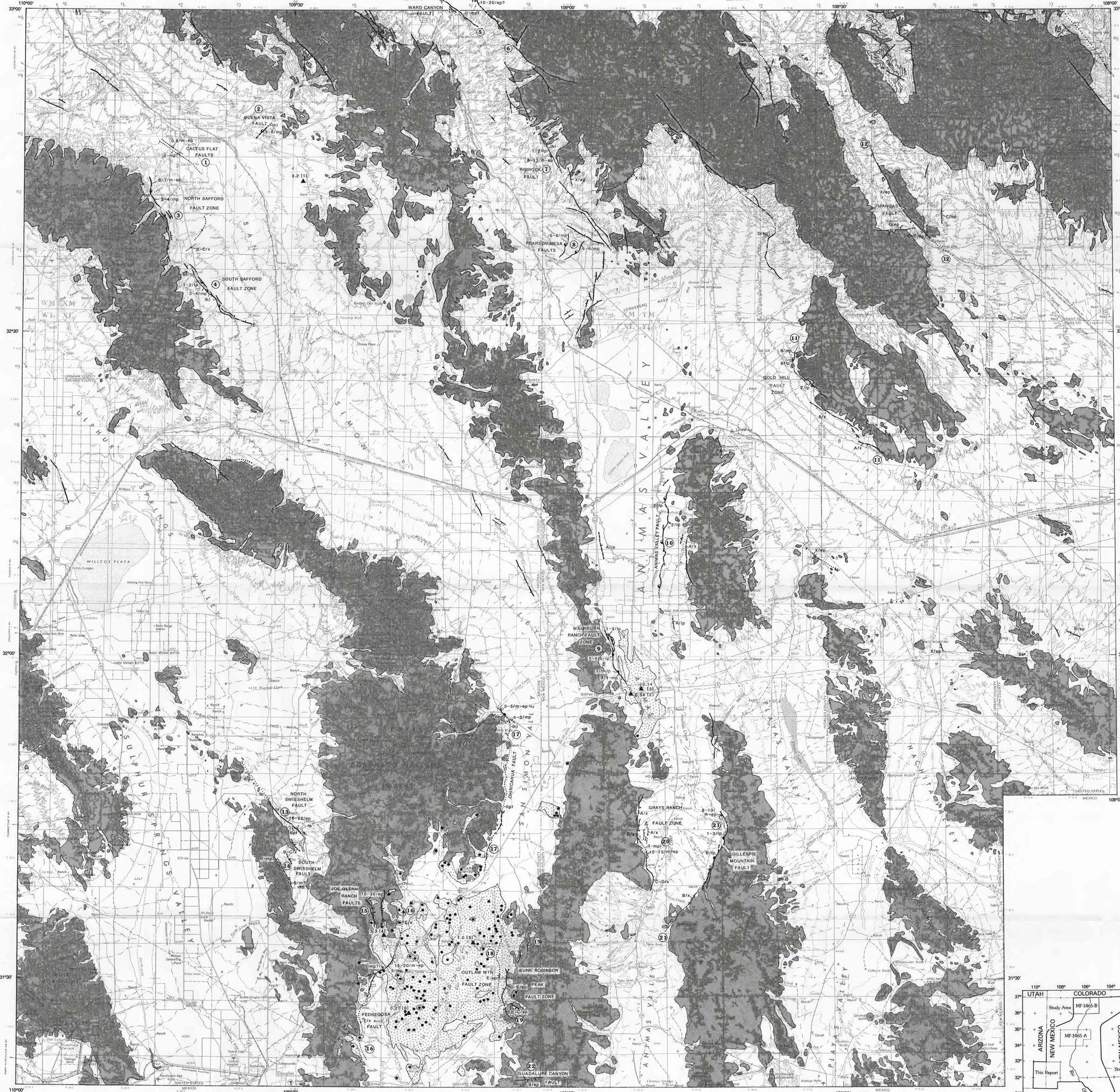
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1465-C
PAMPHLET ACCOMPANIES MAP



Base from U.S. Geological Survey Silver City, 1954 (revised 1970); Douglas, 1961 (revised 1970)

Faults and geology compiled 1980-84

SCALE 1:250 000

CONTOUR INTERVAL 200 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

DESCRIPTION OF MAP UNITS

QUATERNARY AND PLIOCENE BASIN-FILL AND SURFICIAL DEPOSITS—Young basin-fill deposits (middle or early Pleistocene to Pliocene) consisting of poorly consolidated, sandy fluvial deposits, silty or sandy to gravelly piedmont-slope deposits, and locally derived, coarse-grained alluvial-fan deposits. These sediments are mapped as the upper part of the Gila Conglomerate in the western part of the map area where they are well exposed. They are interbedded with Pliocene and Quaternary basalt in the San Bernardino volcanic field. Surficial deposits (Holocene to middle Pleistocene) consist mainly of strath and cut-and-fill terrace, piedmont-slope, alluvial-fan, and eolian deposits. These are commonly less than 10 m thick and either overlie basin-fill deposits or form channels cut into them. However, near mountain fronts coarse-grained alluvium forms thick fans that thin outward into broad piedmont-slope deposits

PLEISTOCENE AND PLIOCENE VOLCANIC ROCKS—Mainly basaltic flows less than 5 Ma (age determinations shown in table 1)

Vents, including cinder cones, explosion craters (maars), and plugs

CENOZOIC BASIN-FILL DEPOSITS AND TERTIARY TO PRECAMBRIAN BEDROCK—Miocene and upper(?) Oligocene basin-fill deposits of the lower part of the Gila Conglomerate and Miocene and older volcanic, sedimentary, igneous, and metamorphic rocks. These rocks are exposed mainly in northern part of map area, but are also found in and around several isolated mountain ranges in the southern part of the map area

CONTACT

FAULT—Solid line where age of most recent movement is known; dashed line where age is inferred; dotted line where fault is suspected or a known fault is concealed; queried where time of faulting is poorly controlled. Circled numbers correspond to faults listed in table 2 and to discussion of prominent faults in pamphlet. Although many faults are present, only faults having known (or suspected) Pliocene or Quaternary offset are shown

Estimated age of the most recent fault movement (shown by symbol on downdropped side of fault)

- Holocene (0-10 ka)
- Late Pleistocene (10-150 ka)
- Middle Pleistocene (150-750 ka)
- Early Pleistocene (0.75-2.0 Ma) or Pliocene (2.0-5.0 Ma)
- Age unknown

Amount of surface offset—The amount of vertical surface offset (throw, in meters) is shown in combination with a symbol for the age of faulted deposit, as shown in figure 1 and table 2. For example, the symbol 5/mp means a measured offset of 5 m in deposits of middle Pleistocene age, and the symbol B/ep means an estimated offset of 5-20 m in deposits of early Pleistocene to Pliocene age. Further, the range in age of faulted deposits is shown in some places; for example, as 1-mp (late to middle Pleistocene). Specific amounts of offset (numerical values) are generally derived from topographic profiles of fault scarps, whereas ranges in values are commonly derived from topographic maps, from published estimates of offset, or by photogrammetric methods.

Ranges in offset		Age of deposits	
A	0-5 m	h	Holocene
B	5-20 m	lp	Late Pleistocene
C	20-50 m	mp	Middle Pleistocene
D	50-150 m	ep	Early Pleistocene to Pliocene
E	More than 150 m	x	Quaternary or Pliocene undivided
X	Unknown amount	(h)	Unfaulted deposit (for example, Holocene)

▲ 3.2[1] SAMPLE LOCALITY—Showing potassium-argon age determination (in Ma) and reference number (in brackets, table 1) for dated Pleistocene and Pliocene volcanic rocks in the map area

REFERENCES CITED

Cooper, J. R., 1959, Reconnaissance geologic map of southeastern Cochise County, Arizona: U.S. Geological Survey Mineral Investigations Field Studies Map MF-213, scale 1:125,000.

Cunningham, J. E., 1979, Geologic map of the Clifton area, Arizona: Arizona Bureau of Geology and Mineral Technology, unpublished map, scale 1:24,000.

Drewes, Harald, 1980, Tectonic map of southeast Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1109, scale 1:125,000.

Drewes, Harald, and Thorman, C. H., 1980b, Geologic map of the Cotton City quadrangle and the adjacent part of the Vanar quadrangle, Hidalgo County, New Mexico: U.S. Geological Survey Miscellaneous Investigations Series Map I-1221, scale 1:24,000.

Druke, P. A., 1979, Geomorphology of the Swisshelm scarp, Cochise County, Arizona: Tucson, University of Arizona, M.S. thesis, 86 p.

Elston, W. E., Rhodes, R. C., Coney, P. J., and Deal, E. G., 1976, Progress report on the Mogollon Plateau volcanic field, southwestern New Mexico—No. 3, surface expression of a pluton, in Elston, W. E., and Northrop, S. A., eds., Cenozoic volcanism in southwestern New Mexico: New Mexico Geological Society Special Publication, no. 5, p. 328.

Gillerman, Elliot, 1958, Geology of the central Peloncillo Mountains, Hidalgo County, New Mexico, and Cochise County, Arizona: New Mexico Bureau of Mines and Mineral Resources Bulletin 57, 152 p.

_____1964, Mineral deposits of western Grant County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 83, 213 p.

Hayes, P. T., 1982, Geologic map of Bunk Robinson Peak and Whitmire Canyon roadless areas, Coronado National Forest, New Mexico and Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1425-A, scale 1:62,500.

Hedlund, D. C., 1978a, Geologic map of the Gold Hill quadrangle, Hidalgo and Grant Counties, New Mexico: U.S. Geological Survey Miscellaneous Field Studies Map MF-1035, scale 1:24,000.

_____1978b, Geologic map of the Wind Mountain quadrangle, Grant County, New Mexico: U.S. Geological Survey Miscellaneous Field Studies Map MF-1031, scale 1:24,000.

_____1978c, Geologic map of the Tyrone quadrangle, Grant County, New Mexico: U.S. Geological Survey Miscellaneous Field Studies Map MF-1037, scale 1:24,000.

Keith, S. B., and Reynolds, S. J., 1977, Compilation of radiometric age dates for Arizona: Arizona Bureau of Geology and Mineral Technology Open-File Report 77-1, 187 p., plate 1, scale 1:1,000,000.

Lynch, D. J., 1972, Reconnaissance geology of the San Bernardino volcanic field, Cochise County, Arizona: Tucson, University of Arizona, M.S. thesis, 101 p.

_____1978, The San Bernardino volcanic field of southeastern Arizona, in Callender, J. F., Wilt, J. C., and Clemons, R. E., eds., Guidebook of Land of Cochise, southeastern Arizona: New Mexico Geological Society, 29th Field Conference, p. 261-268.

Marvin, R. F., and Cole, J. C., 1978, Radiometric ages—compilation A, U.S. Geological Survey: Isochron/West no. 22, p. 3-14.

Marvin, R. F., Naesar, C. W., and Mehnert, H. H., 1978, Tabulation of radiometric ages—including unpublished K-Ar and fission-track ages—for rocks in southeastern Arizona and southwestern New Mexico, in Callender, J. F., Wilt, J. C., and Clemons, R. E., eds., Guidebook of Land of Cochise, southeastern Arizona: New Mexico Geological Society, 29th Field Conference, p. 243-252.

Morrison, R. B., 1965, Geologic map of the Duncan and Canador Peak quadrangles, Arizona and New Mexico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-442, scale 1:48,000.

Reeder, H. O., 1957, Groundwater in Animas Valley, Hidalgo County, New Mexico: New Mexico State Engineers Technical Report 11, 101 p.

Scarborough, R. B., 1975, Chemistry and age of late Cenozoic air-fall ashes in southeastern Arizona: Tucson, University of Arizona, M.S. thesis, 107 p.

Smith, Christian, 1978, Geophysics, geology and geothermal leasing status of the Lightning Dock KGRA, Animas Valley, New Mexico, in Callender, J. F., Wilt, J. C., and Clemons, R. E., eds., Guidebook of Land of Cochise, southeastern Arizona: New Mexico Geological Society, 29th Field Conference, p. 343-348.

Swan, M. M., 1976, The Stockton Pass fault—an element of the Texas lineament: Tucson, University of Arizona, M.S. thesis, 119 p.

Thorman, C. H., and Drewes, Harald, 1978, Geologic map of the Gary and Lordsburg quadrangles, Hidalgo County, New Mexico: U.S. Geological Survey Miscellaneous Investigations Series Map I-1151, scale 1:24,000.

Witcher, J. C., 1980, Heat flow and the thermal regime in the Clifton, Arizona, area: Arizona Bureau of Geology and Mineral Technology Open-File Report 80-1a, 80 p.

Wrucke, C. T., and Bromfield, C. S., 1961, Reconnaissance geologic map of part of the southern Peloncillo Mountains, Hidalgo County, New Mexico: U.S. Geological Survey Mineral Investigations Field Studies Map MF-160, scale 1:62,500.

Zeller, R. A., Jr., 1962, Reconnaissance geologic map of the southern Animas Mountains: New Mexico Bureau of Mines and Mineral Resources Geologic Map 17, scale 1:62,500.

Zeller, R. A., Jr., and Alper, A. M., 1965, Geology of the Walnut Wells quadrangle, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 84, 79 p.

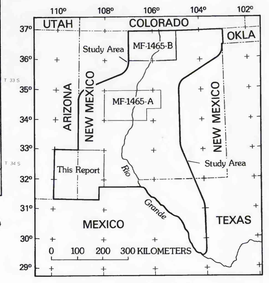


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Table 1.--Potassium-argon age determinations for Pliocene and Pleistocene volcanic rocks and tephra in the map area

No. on map	K-Ar age (Ma)	Name of sampled site or name of rock unit	References	Sample No.
1	3.19 ± 0.12	Air-fall ash in basin-fill of San Simon Valley.	Scarborough (1975), Keith and Reynolds (1977).	RBS-206-68
2	0.54 ± 0.05	Basalt of Animas Valley, near Antelope Pass.	Lynch (1978)----------	UAKA 74-44
3	0.14 ± 0.02	Basalt of Animas Valley---	Marvin and others (1978)-	77D98
4	3.30 ± 0.12	Joe Glenn Ranch, older San Bernardino basalt flow.	Lynch (1978)----------	UAKA 72-61
5	1.0 ± 0.1	Paramore Crater, basalt in south wall.	Marvin and Cole (1978)---	72D6
6	0.27 ± 0.05	Cinder Hill, younger San Bernardino basalt flow.	Lynch (1978)----------	UAKA 75-109

Table 2.--Location, time of last movement, and height and length of some prominent fault scarps in the map area

[Ages: h, Holocene; lp, late Pleistocene; mp, middle Pleistocene; ep, early Pleistocene to Pliocene; queried(?) where uncertain. Symbol e indicates scarp height estimated from topographic map. Types of fault movement determined from scarp morphology, ages of faulted deposits, and(or) map pattern: normal, segmented (segm), or recurrent (recur); n.d., no data; <, less than]

Number on map	Name of fault	Location of fault	Age of the most recent movement	Measured height of scarp (m)	Age of displaced deposits	Fault length (km)	Type of fault movement	Sources of data other than this report
1	Cactus Flat (new name).	4 km S. of Safford, Ariz.	mp-----	<0.5	ep, mp-	n.d.	Normal--------	J. C. Witcher (oral commun., 1981.
2	Buena Vista (new name).	15 km E. of Safford, Ariz.	mp-lp?	3-6	mp-----	2	Normal--------	None.
3	North Safford zone (new name).	10-22 km S. of Safford, Ariz.; E. front of Pinaleño Mts.	lp-h?-	1-10	ep?, mp	15	Normal, recur, segm(?).	Swan (1976), J. C. Witcher (oral commun., 1981).
4	South Safford zone (new name).	24-33 km S. of Safford, Ariz.; E. front of Pinaleño Mts.	lp-h?-	1-5	mp, lp-	9	Normal, recur, segm(?).	Do.
5	Ward Canyon (new name).	6 km NE. of Three Way, N. Mex.	mp?----	10-20e	ep?-----	15	Normal--------	Cunningham (1979), J. C. Witcher, (1980 and oral commun., 1981).
6	Maverick Hill (new name).	10 km E. of Three Way, N. Mex.	ep?----	10-20e	ep?-----	12	Normal--------	Do.
7	Rimrock (new name).	8 km NE. of Duncan, N. Mex.	lp----	1-13	mp, lp-	7	Normal, recur	None.
8	Pearson Mesa (new name).	12-15 km SE. of Duncan, N. Mex.	lp----	5-6	mp-----	5	Normal--------	Morrison (1965).
9	Washburn zone (new name).	8-15 km NW. of Animas, N. Mex.; E. front of Pelloncillo Mts.	h-----	0.5-5	mp-h?--	15	Normal, recur, segm.	Gillerman (1958), Drewes and Thorman (1980b).
10	Animas Valley-----	6-18 km NE. of Cotton City, N. Mex., W. front of Pyramid Mts.	lp----	1-2	mp?, lp	19	Normal, recur	Reeder (1957), Elston and others (1976), Smith (1978), Thorman and Drewes (1978).
11	Gold Hill zone (new name).	15 km NE. of Lordsburg, N. Mex.; SW. front of Big Burro Mts.	lp----	2-9	mp, lp-	24	Normal, recur, segm.	Hedlund (1978b).
12	Mangas----------	N. and NW. of Tyrone, N. Mex.; W. front of Little Burro Mts.	ep?----	20-100e	ep?-----	24	Normal--------	Gillerman (1964), Hedlund (1978a, 1978c).
13	North Swisshelm (new name).	40-45 km N. of Douglas, Ariz.; NE. front of Swisshelm Mts.	ep-mp?	20-60	ep-----	8	Normal--------	Druke (1979).
14	South Swisshelm (new name).	23-35 km N. of Douglas, Ariz.; SE. front of Swisshelm Mts.	mp?---	5-20e	ep, mp?	7	Normal--------	None.
15	Joe Glenn Ranch (new name).	32-35 km NE. of Douglas, Ariz.	ep----	15-30e	ep-----	6	Normal--------	Cooper (1959), Lynch (1972), Drewes (1980).
16	Pedregosa (new name).	25 km NE. of Douglas, Ariz.; E. front of Pedregosa Mts.	mp----	5-20	ep?, mp	16	Normal--------	Cooper (1959), Drewes (1980).
17	Chiricahua (new name).	Portal to Apache, Ariz.; E. front of Chiricahua Mts.	h-----	1-7	mp-----	30	Normal, recur	Lynch (1972), Drewes (1980).
18	Outlaw Mountain zone (new name).	40 km E.-NE. of Douglas, Ariz.; W. front of Pelloncillo Mts.	ep----	>150e	ep-----	10	Normal--------	Cooper (1959), Drewes (1980).
19	Bunk Robinson Peak zone (new name).	43 km E.-NE. of Douglas, Ariz.	ep----	20-150e	ep-----	9	Normal--------	Cooper (1959), Drewes (1980), Hayes (1982).
20	Grays Ranch (new name).	20-32 km S.-SW. of Animas, N. Mex.; E. front of Pelloncillo Mts.	mp----	10-15	ep, mp-	25	Normal--------	Wrucke and Bromfield (1961).
21	Gillespie Mountain (new name).	23-35 km S.-SE. of Animas, N. Mex.; W. front of Animas Mts.	h-----	1-13	ep-lp--	25	Normal, recur	Zeller (1962), Zeller and Alper (1965).
22	Guadalupe Canyon (new name).	45 km E. of Douglas, Ariz.	ep----	10-20e	ep-----	3	Normal--------	Hayes (1982).

MAP SHOWING QUATERNARY AND PLIOCENE FAULTS IN THE SILVER CITY 1° X 2° QUADRANGLE AND THE DOUGLAS 1° X 2° QUADRANGLE, SOUTHEASTERN ARIZONA AND SOUTHWESTERN NEW MEXICO

By

Michael N. Machette and Stephen F. Personius, U.S. Geological Survey,
Christopher M. Menges, University of New Mexico, and
Philip A. Pearthree, University of Arizona and Arizona Bureau of Mines and Mineral Technology

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