

MAP OF BASIN AND RANGE (POST 15 M.Y.A.) EXPOSED FAULTS, GRABENS, AND  
BASALT-DOMINATED VOLCANISM IN ARIZONA by Scarborough, Menges, and  
Pearthree.

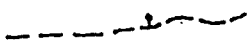
LEGEND

Arizona Bureau of Geology  
open-file report 83-21

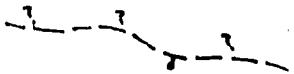
FAULT PATTERNS



accurately located faults, queried where post-15 m.y. movement is suspected but not demonstrated. Bar and dot on downthrown side, where known. Patterns and number of faults are generalized in complex areas.

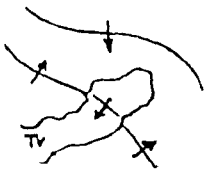


known faults, projected from sparse outcrops to buried reaches. Bar and dot on downthrown side, where known.

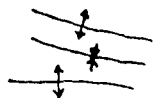


approximate position of faults suspected of being present because of various geological relationships. Includes both faults inferred but not exposed and photointerpreted faults not ground checked. Bar and dot on downthrown side, where known.

MONOCLINES AND FOLDS

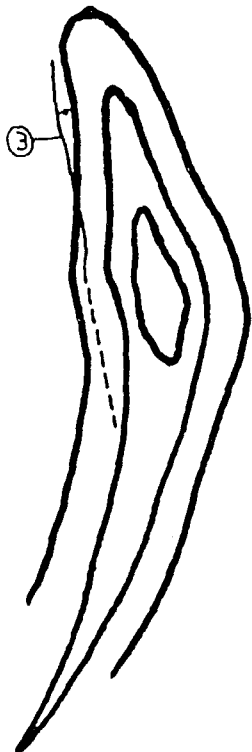


Colorado Plateau-type monoclines, with arrows centered on the middle limb, pointing down-dip. Only ones included are those where data suggests late Cenozoic reactivation in the form of either warping or high angle faulting. Sense of recent movement may follow or oppose older offsets.



open upright folds suspected to have formed in late Cenozoic time, based in most cases on geometric and spatial association with known or suspected late Cenozoic faults.

BASIN AND RANGE GRABEN SYSTEM



position and general geometry of Basin and Range graben-like depressions, now filled with sediments, caused by post-13 m.y. regional extension and horst-graben faulting. These map patterns are drawn by comparison of known local geology, bedrock pediment locations, and published residual bouguer gravity anomaly maps, assuming that negative residual anomalies are due to non-dense sedimentary fill. Zones distributed along the heavy lines on the map are presumed to be fault zones, either sharp individual breaks or distributive, mixed with tectonically produced ramps and some number of merging buried bedrock pediments. The position of lines corresponds to zones of highest gravity gradients when the gradients are parallel to mountain fronts. Generally, each closed line corresponds to about 10 mgals, three concentric closed lines to about 25-35 mgals.

Shape of closure(s) will not correspond to geometry of basin when anomalously dense basement rocks or basin fill material is present. Incomplete closure on a line indicates sparse gravity data in the area with some depth of basin fill extending outward.

This symbology implies no surface rupturing; in most cases these faults are buried by piedmont gravel caps and/or upper level basin fill of Pliocene to Quaternary age (where present, surface rupturing that rims a graben is indicated by a superposed fault trace).

(con't)

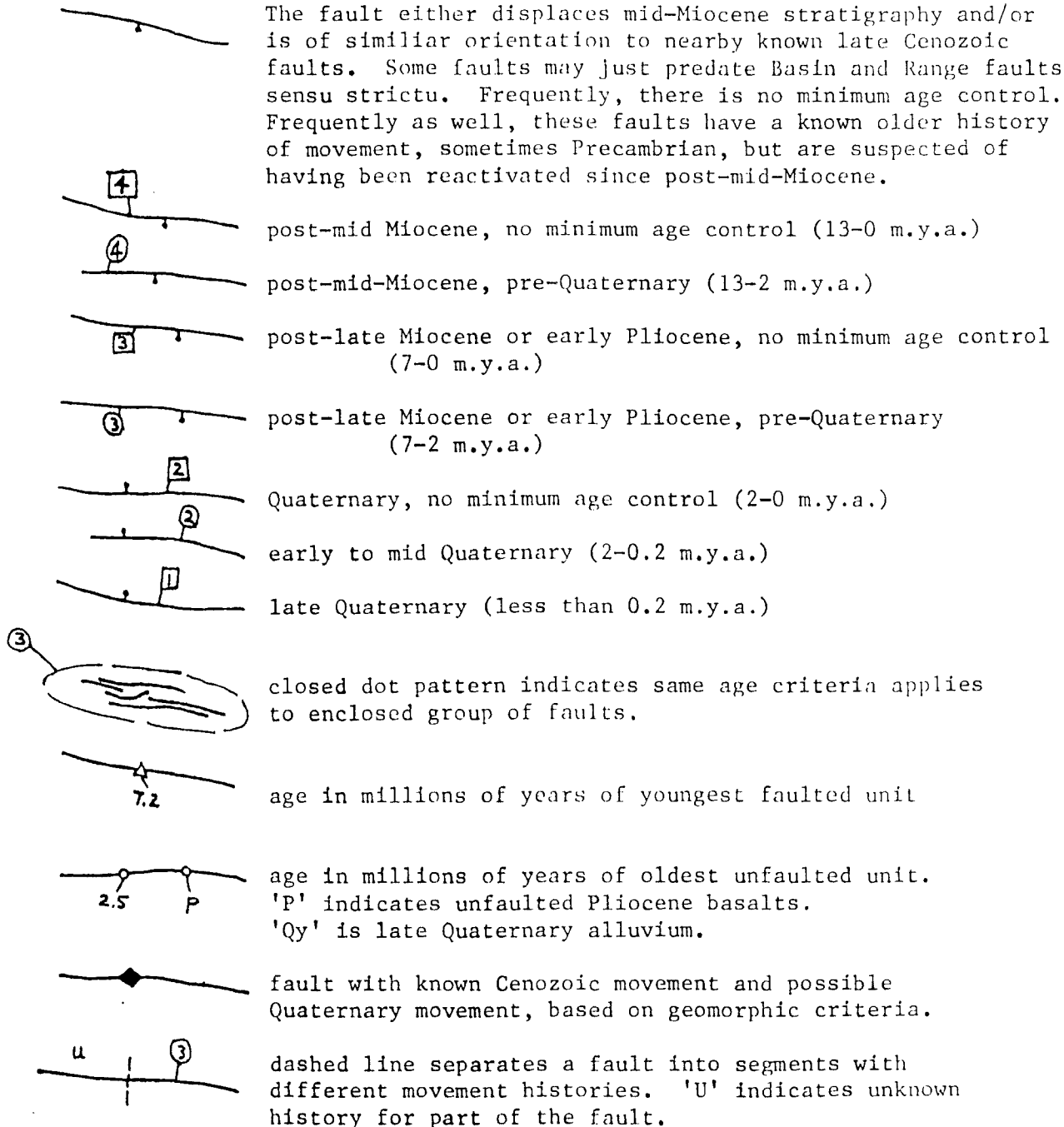
OFR 83-21 + maps

Statewide, larger valleys are filled with 2,000-5,000 feet of basin fill, where drillhole data exists. Depth to crystalline basement may be double that amount or more due to the presence of buried older Cenozoic sediments and volcanics, and Paleozoic and Mesozoic rocks.

### AGE CONSTRAINTS OF FAULTS

? queried where age information, although suggestive, is sparse or ambiguous.

possible post-mid-Miocene (13 m.y.), but no direct control. The fault either displaces mid-Miocene stratigraphy and/or is of similar orientation to nearby known late Cenozoic faults. Some faults may just predate Basin and Range faults, *sensu strictu*. Frequently, there is no minimum age control. Frequently as well, these faults have a known older history of movement, sometimes Precambrian, but are suspected of having been reactivated since post-mid-Miocene.



This report is preliminary and has not been edited or reviewed for conformity with Arizona Bureau of Geology and Mineral Technology standards. The observations contained herein are those of the author(s) and not necessarily endorsed by the Arizona Bureau of Geology and Mineral Technology.

## AGE CLASSIFICATION OF POST-15 M.Y. VOLCANIC ROCKS

Volcanic rocks with age designations A to F are dominated by flood basalts, with subordinate andesites to rhyolites, and strontium isotope initial ratios of about 0.704-0.706. In all parts of Arizona except for the northwest corner, these basalt-dominated volcanics constitute the post-15 m.y. suite. In the northwest corner, outcrops labeled 'S' represent a subduction-related suite of volcanics that contain abundant andesites to rhyolites with minor basalts, with strontium isotope initial ratios above 0.706 or 0.707, and ages as old as 25 m.y. and as young as 11 m.y.. Surface exposures of these subduction-related volcanics elsewhere in the State are generally not younger than 15 m.y, and hence are not plotted on this map.

□	A	0-1 m.y.	□	E	7-10.5 m.y.
□	B	0-4 m.y.	□	F	10.5-15 m.y.
□	C	1-4 m.y.	□	D/E	4-10.5 m.y.
□	D	4-7 m.y.	□	D/F	4-15 m.y.

□	S	25-11 m.y. old subduction-related volcanic suite, dominated in Arizona by pre-15 m.y. rocks, but containing in areas 15-11 m.y. strata.
---	---	---

Areas of known Plio-Quaternary intra-basin deformation



references listed on next page

areas are shown by dotted-dashed lines and numbers keyed to references below

numbers on 1:500,000 scale map

- |          |     |  |
|----------|-----|--|
| 12, 13   | D1  | Apparent northward tilting of lacustrine facies of St. David Fm. The tilt could be only apparent, caused by an early Pleistocene pedimentation of the lacustrine rocks that was controlled by the regional gradient of the San Pedro River. Within the deformed zone is a faulted monocline that trends parallel to the river. Tectonic tilting is very possible based on the down-river plunge of the beds and lack of an appropriate dam to have confined the lake in Pliocene time. |
| 4,12,13  | D2  | Gentle warping, with a local faulted monocline, of fluvial overbank facies of the Quiburis Fm., of middle Pliocene age. Simple sediment compaction does not explain the magnitude or aerial extent of the deformed beds.   |
| 1        | D3  | Possible uplift-subsidence of a portion of the San Simon Valley near Bowie, indicated by repeated recent geodetic surveys. An area of relative uplift lies between two gravity lows that probably represent Basin and Range grabens. Groundwater withdraw in the area is not of large magnitude.   |
| 12,13,15 | D4  | Deformation, both warping and faulting, of late Miocene-Pliocene Verde Fm. lacustrine and fluvial beds in the Verde Valley.  |
| 3,5      | D5  | Folding of lacustrine and fluvial beds of Tonto Basin fill of late Miocene and Pliocene age. Folds trend generally N-S, and are somewhat assymmetric.  |
| 11       | D6  | Downstream convergence of Pleistocene terraces along lower Salt River between Roosevelt Dam and Tempe, possibly attributable to either regional subsidence of the Phoenix area or uplift of the region to the northeast. Possible climatic causes for this phenomenon have not been evaluated. Somewhat more than 100 meters of downstream convergence is known in the region.   |
| 6        | D7  | Possible deformation of the Mohave Valley part of lower Colorado River Valley, based on warping of the Bouse Fm. marls and clays of Pliocene age.  |
| 8        | D8  | Deformation of Pliocene Bouse Fm. and other young basin fill sediments at the southern end of Mohave Valley.   |
| 2        | D9  | Deformation of Pliocene Bouse Fm. between Lake Havasu and Parker.  |
| 9        | D10 | Deformation of Pliocene Bouse Fm. and other young basin fills in the Cibola area.  |

- |        |     |   |
|--------|-----|---|
| 6,7,10 | D11 | Subsidence of Pliocene Bouse Fm. and younger basin fill along subsurface fault zones, Yuma Basin. |
| 14     | D12 | Deformation of Big Sandy Fm. basin fill, late Miocene to Pliocene age, in the Big Sandy Valley.   |
- 

#### PLIO-QUATERNARY DEFORMATION REFERENCES

- 1 Eaton, G.P., 1972, Deformation of Quaternary deposits in two intermontane basins of southern Arizona: 24th International Geological Congress, section 3, p. 607-616.
- 2 Frost, E.G., 1980, oral and written communication, Department of Geological Sciences, San Diego State University, San Diego, CA 92182.
- 3 Fugro, Inc., 1981a, Seismotectonic study, Roosevelt Dam, Arizona; Consulting report prepared for U.S. Department of the Interior, Water and Power Resources Service, P.O. Box 25007, Denver, CO 80225, 39 p.
- 4 Keith, S.B., and Scarborough, R. ., 1980, oral communication, Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, AZ 85719.
- 5 Lance, J.F., Downey, J.S., and Alford, M., 1962, Cenozoic sedimentary rocks of Tonto Basin, in Weber, R.H., and Peirce, H.W., editors, Guidebook to the Mogollon Rim Region, east-central Arizona, New Mexico Geological Society thirteenth Field Conference guidebook, p. 98-99.
- 6 Lucchitta, I., 1979, Late Cenozoic uplift of the southwestern Colorado Plateau and adjacent lower Colorado River region: Tectonophysics, v. 61, p. 63-95.
- 7 Mattick, R.E., Olmsted, F.H., and Zohdy, A.A., 1973, Geophysical studies in the Yuma area, Arizona and California: U.S. Geological Survey Professional Paper 726-D, 36 p.
- 8 Metzger, D.G., and Loeltz, O.J., 1973, Geohydrology of the Needles area, Arizona, California, and Nevada: U.S. Geological Survey Professional Paper 486-J, 54 p.
- 9 Metzger, D.G., Loeltz, O.J., and Irelna, Burdge, 1973, Geohydrology of the Parker-Blythe-Cibola area, Arizona and California: U.S. Geological Survey Professional Paper 486-G, 130 p.

- 10 Olmsted, F.H., Loeltz, O.J., and Ireland, Burdige, 1973, Geohydrology of the Yuma area, Arizona and California: U.S. Geological Survey Professional Paper 486-H, 227 p.
- 11 Pewe, T.L., 1978, Terraces of the lower Salt River Valley in relation to the late Cenozoic History of the Phoenix Basin, Arizona, in Burt, D.M., and Pewe, T.L., editors, Guidebook to the geology of central Arizona, Arizona Bureau of Geology and Mineral Technology, Special Paper No. 2, p. 1-14.
- 12 Scarborough, R.B., 1975, Chemistry and age of late Cenozoic air-fall ashes in southeastern Arizona (M.S. thesis): University of Arizona, Tucson, 107 p.
- 13 Scarborough, R.B., 1980, oral communication; Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, AZ 85719.
- 14 Sheppard, R.A., and Gude, A.J., 1972, Big Sandy Formation near Wikieup, Mohave County, Arizona: U.S. Geological Survey Bulletin 1354-C, 10 p.
- 15 Twenter and Metzger, 1963, Geology and ground water in Verde Valley--the Mogollon Rim region, Arizona: U.S. Geological Survey Bulletin 1177, 132 p. (1 map, 1:62,500 scale).

General References listing Tertiary Radiometric Age Dates Used in  
Formulating Outcrops of post-15 m.y. Volcanics

1. Aldrich, M.J., Jr., and Laughlin, A.W., 1981, Location, age, and rock type of volcanic rocks younger than 5 m.y. in Arizona and New Mexico. Los Alamos Scientific Laboratory report LA-8820-MS, 21 p.
2. Damon, P.E., and others, 1962-1970, Correlation and chronology of ore deposits and volcanic rocks. Annual reports submitted to Research Division, U.S. Atomic Energy Commission under contract no. AT(11-1)-689.
3. Keith, S.B., 1976, Compilation of radiometric age dates for Arizona. Arizona Bureau of Geology open file report 77-1a, 187p. Accompanied by map with age dates plotted, open file report 77-1.
4. Luedke, R.G. and Smith, R.L., 1978, Map showing distribution, composition, and age of Late Cenozoic volcanic centers in Arizona and New Mexico. U.S. Geological Survey Miscellaneous Investigation Series map I-1091-A. two sheets, main scale 1:1,000,000.
5. Marvin, R.F., and others, 1978, Tabulation of radiometric ages—including unpublished K/Ar and fission track ages—for rocks in southeastern Arizona and southwestern New Mexico. New Mexico Geological Society guidebook #29, Land of Cochise, p. 243-252.
6. Scarborough, R.B. and Wilt, J.C., 1979, A study of uranium favorability of Cenozoic sedimentary rocks, Basin and Range province, Arizona, Part 1 - pre-late Miocene. U.S. Geological Survey open file report 79-1429, 101p.
7. Shafiqullah, M., and others, 1978, Mid-Tertiary magmatism in southeastern Arizona. New Mexico Geological Society guidebook #29, Land of Cochise, p. 231-242.
8. Shafiqullah, M., and others, 1980, K/Ar geochronology and geologic history of southeastern Arizona and adjacent areas. Arizona Geological Society Digest 12, p. 201-260.
9. Suneson, N. and Lucchitta, I., 1979, K/Ar ages of Cenozoic volcanic rocks of west-central Arizona. Isochron/West, no. 24, April 1979, p. 25-29.

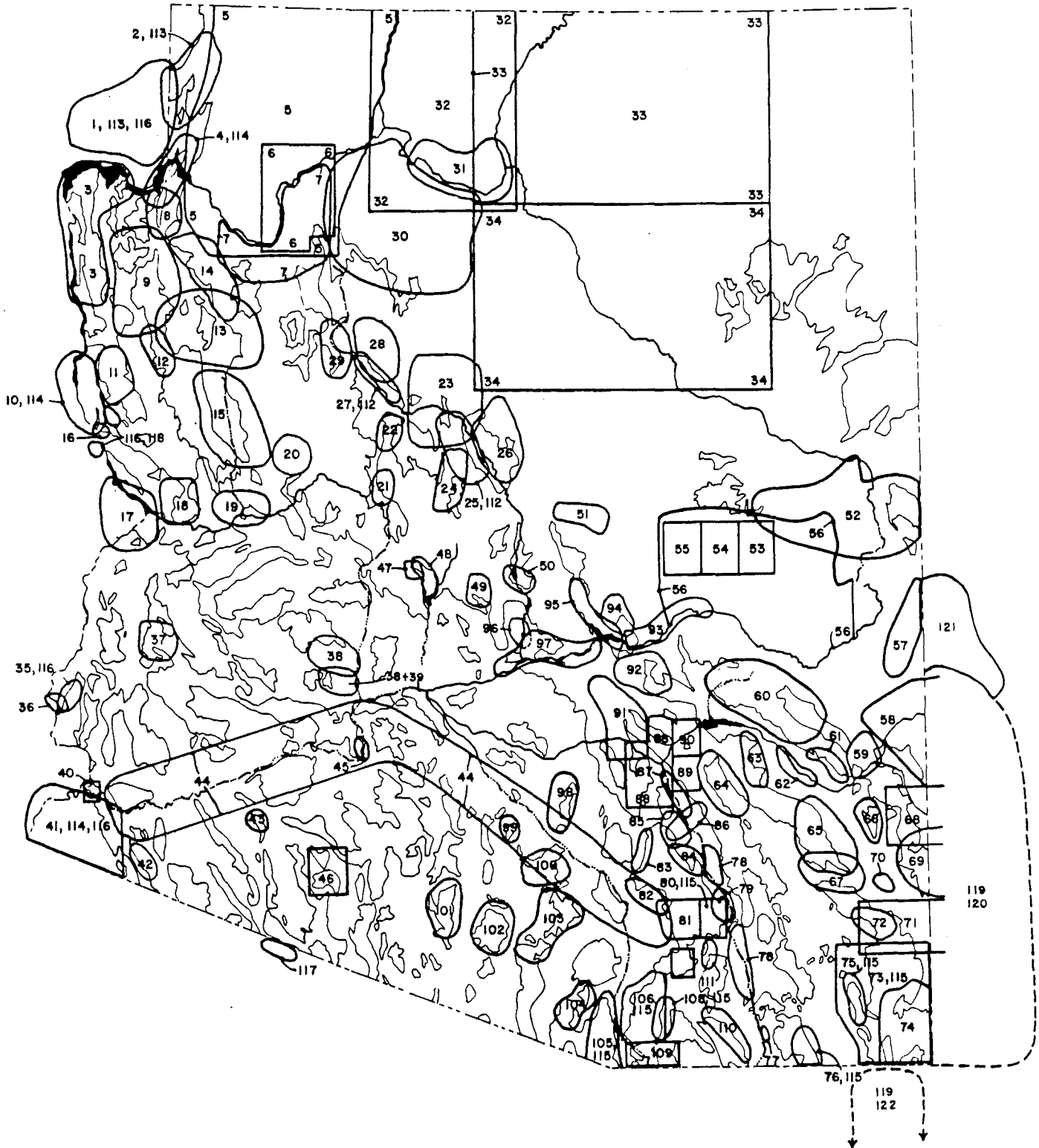
References for gravity information

1. Aiken, C.L.V., Lysonski, J.C., Sumner, J.S., and Hahman, W.R., Jr., 1981, A series of 1:250,000 complete residual Bouguer gravity anomaly maps of Arizona. Text in Arizona Geological Society Digest, v. 13, p. 31-38. Maps on open-file at Arizona Bureau of Geology and Mineral Technology, Tucson.
2. Oppenheimer, J.M., and Sumner, J.S., 1981, Gravity modeling of the basins in the Basin and Range province, Arizona. Arizona Geological Society Digest, v. 13, p. 111-116, and accompanying 1:1,000,000 scale map.
3. Oppenheimer, J.M., 1980, Gravity modeling of the alluvial basins, southern Arizona. Univ. of Arizona (Tucson) unpublished M.S. Thesis, 81 p.

STATE OF ARIZONA  
BUREAU OF GEOLOGY  
AND MINERAL TECHNOLOGY  
OPEN - FILE REPORT

Interpretations and conclusions in th  
report are those of the consultant an  
do not necessarily coincide with thos  
of the staff of the Bureau of Geology  
and Mineral Technology.

**83-21** Index map for references cited in both 1:500,000  
maps. Numbered areas on this map correspond to  
numbered entries on accompanying bibliography.





Combined references for both 1:500,000 scale maps, keyed to numbers within circled areas on small accompanying map.

1. Bohannon, R. G., 1978, Preliminary geologic map of the Las Vegas 1 x 2° Quadrangle, Nevada, Arizona, and California: U. S. Geological Survey Open-File Report 78-670, map scale 1:250,000.  
  
Brenner, E. F., and Glanzman, R. K., 1979, Tertiary sediments in the Lake Mead area, Nevada, in Basin and Range Symposium: Rocky Mountain Association of Geologists and Utah Geologic Association, pp. 313-323.  
  
Bohannon, R. G., 1979, Strike-slip faults of the Lake Mead region of Southern Nevada, in Cenozoic Paleogeography of the Western United States; Pacific Coast Paleogeography Symposium 3: Pacific Section of Society of Economic Petrologists and Mineralogists, Los Angeles, pp. 129-139.
2. Moore, R. T., 1972, Geology of the Virgin and Beaverdam Mountains, Arizona: Arizona Bureau of Mines Bulletin 186, 65p.
3. Longwell, C. R., 1963, Reconnaissance geology between Lake Mead and Davis Dam, Arizona-Nevada: U. S. Geological Survey Professional Paper 374-E, 51 p.  
  
Anderson, R. E., 1978, Geologic map of the Black Canyon 15-minute Quadrangle, Mohave County, Arizona, and Clark County, Nevada: U. S. Geological Survey Geologic Quadrangle Map GQ-1394, scale 1:62,500.  
  
Anderson, R. E., 1963, Reconnaissance geology between Lake Mead and Davis Dam, Arizona-Nevada: U. S. Geological Survey Professional Paper 374-E, 51p.
4. Lucchitta, Ivo, 1966, Cenozoic geology of the upper Lake Mead area adjacent to the Grand Wash Cliffs, Arizona: unpublished PhD dissertation, Pennsylvania State University, Pittsburgh, 218p.
5. Hamblin, W. K., and Best, M. G., eds., 1970, The Western Grand Canyon District, in Guidebook to the Geology of Utah, No. 23: Utah Geological Society, 156p., plate 1, scale 1:250,000.
6. Koons, E. D., 1945, Geology of the Uinkaret Plateau, northern Arizona: Geological Society of America Bulletin, v. 56, pp. 151-180.  
  
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, Grand Canyon, Arizona, scale 1:48,000.

7. Twenter, F. R., 1962, Geology and promising areas for ground-water development in the Hualapai Indian Reservation: U. S. Geological Survey Water-Supply Paper 1576-A, 38p.
- Koons, E. D., 1964, Structure of the eastern Hualapai Indian Reservation, Arizona: Arizona Geological Society Digest, v. 7, pp. 97-114.
8. Blacet, P. M., 1975, Preliminary geologic map of the Garnet Mountain Quadrangle, Mohave County, Arizona: U. S. Geological Survey Open-File Report 75-93, scale 1:48,000.
9. Gillespie, J. B., and Bentley, C. B., 1971, Geohydrology of Hualapai and Sacramento Valleys, Mohave County, Arizona: U. S. Geological Survey Water-Supply Paper 1899-H, 37p., map scale 1:125,000.
11. Lausen, Carl, 1931, Geology and ore deposits of the Oatman and Katherine districts, Arizona: Arizona Bureau of Mines Geological Series 6, Bulletin 131, 126p., plate 1 scale 1:42,240; plate 2 scale 1:100,000.
12. Thomas, B. E., 1953, Geology of the Chloride Quadrangle, Arizona: Geological Society of America Bulletin, Society America Bulletin, v. 64, no. 4, pp. 391-420, plate 1 scale 1:125,000.
- Dings, M. G., 1951, The Wallapai mining district, Cerbat Mountains, Mohave County, Arizona: U. S. Geological Survey Bulletin 978-E, pp. 123-163.
13. Young, R. A., 1966, Cenozoic geology along the edge of the Colorado Plateau in northwestern Arizona: unpublished PhD dissertation, Washington University, St. Louis, 167p.
14. Young, R. A., and Brennan, W. J., 1974, Peach Springs tuff: its bearing on structural evolution of the Colorado Plateau and development of Cenozoic drainage in Mohave County, Arizona: Geological Society of America Bulletin, v. 85, pp. 83-90.
15. Sheppard, R. A., and Gude, A. J., 1972, Big Sandy Formation near Wikieup, Mohave County, Arizona: U. S. Geological Survey Bulletin, 1354-C, 10p.
- Scarborough, R. B., 1979, Field reconnaissance: Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, 85719. See also "Uranium in Cenozoic sediments, Basin and Range Province of Arizona: U. S. Geological Survey Open-File Report 79-1429, 101p.
16. Metzger, D. G., and Loeltz, O. J., 1973, Geohydrology of the Needles area, Arizona, California, and Nevada: U. S. Geological Survey Professional Paper 486-J, 54p.
17. Frost, E. G., 1980, oral and written communication: Department of Geological Sciences, San Diego State University, San Diego, CA 92182.

18. Suneson, Neil, and Lucchitta, Ivo, 1979, K/Ar ages of Cenozoic volcanic rocks west-central Arizona: Isochron/West, no. 24, April 1979, pp. 25-29.
19. Lasky, S. G., and Webber, B. N., 1944, Manganese deposits in the Artillery Mountains region, Mohave County, Arizona: U. S. Geological Survey Bulletin 936-R, 31p.
20. Anderson, C. A., Scholz, E. A., and Strobell, J. D., Jr., 1955, Geology and ore deposits of the Bagdad area, Yavapai County, Arizona: U. S. Geological Survey Professional Paper 278, 103p., plate 3 scale 1:20,000.
21. Krieger, M. H., 1967, Reconnaissance geologic map of the Iron Springs Quadrangle, Yavapai County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map, scale 1:62,500.
22. Krieger, M. H., 1967, Reconnaissance geologic map of the Simmons Quadrangle, Yavapai County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-503, scale 1:62,500.
23. Lehner, R. E., 1958, Geology of the Clarkdale Quadrangle, Arizona: U. S. Geological Survey Bulletin 1021-N, 88p.
- Lehner, R. E., 1962, Cenozoic history of the Jerome region, Yavapai County, Arizona: New Mexico Geological Society Guidebook 13, pp. 95-97.
- Krieger, M. H., 1965, Geology of the Prescott and Paulden Quadrangles, Arizona: U. S. Geological Survey Professional Paper 467, 127p.
- Huff, L. C., and Santos, Elmer, 1966, Mineral resources of the Sycamore Canyon primitive area, Arizona: U. S. Geological Survey Bulletin 1230-F, 19p.
- Krieger, M. H., 1967, Reconnaissance geologic map of the Ash Fork Quadrangle, Yavapai and Coconino Counties, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-499, scale 1:62,500.
24. Krieger, M. H., 1965, Geology of the Prescott and Paulden Quadrangles, Arizona: U. S. Geological Survey Professional Paper 467, 127p.
25. McKee, E. H., and Anderson, C. A., 1971, Age and chemistry of Tertiary volcanic rocks in north-central Arizona and relation of the rocks to the Colorado Plateaus: Geological Society of America Bulletin, v. 82, no. 10, pp. 2767-2782.
- Lindberg, P. A., and Jacobson, H. S., 1974, Economic geology and field guide of the Jerome district, Arizona, in Karlstrom, N. V., Swann, G. A., and Eastwood, R. L., eds., Geology of Northern Arizona, with Notes on Archeology and Paleoclimate: Part II: Area Studies and Field Guides: Geological Society of America, Rocky Mountain Section Meeting, Flagstaff, pp. 794-804.

- Anderson, C. A., and Creasey, S. C., 1967, Geologic map of the Mingus Mountain Quadrangle, Yavapai County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-715, scale 1:48,000.
26. Twenter, F. R., and Metzger, D. G., 1963, Geology and ground water in Verde Valley - the Mogollen Rim Region, Arizona: U. S. Geological Survey Bulletin 1177, 132p., plate scale 1:62,500.
  27. Soule, C. H., 1978, Tectonic geomorphology of the Big Chino fault, Yavapai County, Arizona: unpublished M.S. thesis, University of Arizona, Tucson, 114p.
  28. Krieger, M. H., 1967, Reconnaissance geologic map of the Picacho Butte Quadrangle, Yavapai and Coconino Counties, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-500, scale 1:62,500.
  29. Krieger, M. H., 1967, Reconnaissance geologic map of the Turkey Canyon Quadrangle, Yavapai County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-501, scale 1:62,500.
  30. Shoemaker, E. M., Squires, R. L., and Abrams, M. J., 1978, Bright Angel and Mesa Butte fault systems of northern Arizona: Geological Society of America Memoir no. 152, pp. 341-367.
  31. Huntoon, P. W., and others, 1976, Geologic map of the Grand Canyon National Park, Arizona: Grand Canyon Natural History Association, Grand Canyon, Arizona, and Museum of Northern Arizona, Flagstaff, scale 1:62,500.
  32. Huntoon, P., 1974, The post-Paleozoic structural geology of the eastern Grand Canyon, Arizona, in Breed, W. J., and Roat, E. C., eds., Geology of the Grand Canyon: Museum of Northern Arizona, Flagstaff, and Grand Canyon Natural History Association, Grand Canyon, Arizona, pp. 82-115.
  33. Haynes, D. D., and Hackman, R. J., 1978, Geology, structure, and uranium deposits of the Marble Canyon 1° x 2° Quadrangle, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-1003, scale 1:250,000.
  34. Ulrich, G. E., Hereford, R., Nealey, L. D., and Wolfe, E. W., 1979, Preliminary geologic map of the Flagstaff 1° x 2° Quadrangle: U. S. Geological Survey Open-File Report 79-294.
  35. Miller, D. G., 1980, Written communication on Lost Trigos fault zone, Cibola, Arizona: Fugro Inc., 3777 Long Beach Boulevard, Long Beach, California 90807.
  36. Metzger, D. G., Loeltz, O. J., and Irelan, Burdge, 1973, Geohydrology of the Parker-Blythe-Cibola area, Arizona and California: U. S. Geological Survey Professional Paper 486-G, 130p.

37. Miller, F. K., 1970, Geologic map of the Quartzsite Quadrangle, Yuma County, Arizona: U. S. Geological Survey Geological Quadrangle Map GQ-841, scale 1:62,500.
38. Fugro, Inc., 1974, Preliminary safety analysis report, Palo Verde Nuclear Generating Plants 1, 2, and 3: Arizona Public Service Company, section 2.5, volumes II and III.
39. Euge, K. M., Lund, W. R., and Scott, J. D., 1978, Geology of the Palo Verde Nuclear Generating Station and adjacent areas, Maricopa County, Arizona: Arizona Bureau of Geology and Mineral Technology Special Paper 2, pp. 115-129.
40. Olmsted, F. H., 1972, Geologic map of the Laguna Dam 7.5-minute Quadrangle, Arizona and California: U. S. Geological Survey Geological Quadrangle Map GQ-1014, scale 1:24,000.
41. Woodward-McNeill & Associates, 1974, Geotechnical Investigation, Yuma Dual-Purpose Nuclear Plant, Yuma, Arizona, v. I and II, Appendix A-L, 47p.  
  
Mattick, R. E., Olmsted, F. H., and Zohdy, A. A., 1973, Geophysical studies in the Yuma area, Arizona and California: U. S. Geological Survey Professional Paper 726-D, 36p.  
  
Olmsted, F. H., Loeltz, O. J., and Ireland, Burdge, 1973, Geo-hydrology of the Yuma area, Arizona and California: U. S. Geological Survey Professional Paper 486-H, 227p.
42. Lynch, D. J., and Lundin, R. J., 1980, Marine Corps Gunnery Range (road log): Arizona Geological Society Digest 12, pp. 299-308.
43. Tucker, W. C., 1980, Geology of the Aguila Mountains Quadrangle, Yuma, Maricopa, and Pima Counties, Arizona: Arizona Geological Society Digest 12, pp. 111-122; figure 1, scale 1:160,000.
44. Eberly, L. D., and Stanley, T. B., 1978, Cenozoic stratigraphy and geologic history of southwestern Arizona: Geological Society of America Bulletin 89, pp. 921-940.
45. Heindl, L. A., and Armstrong, C. A., 1963, Geology and ground-water conditions in the Gila Bend Indian Reservation, Maricopa County, Arizona: U. S. Geological Survey Water-Supply Paper 1647-A, 48p.
46. Gilluly, James, 1946, The Ajo mining district, Arizona: U. S. Geological Survey Professional Paper 209, 112p., plate 3 scale 1:62,500.
47. Ward, M. B., 1977, Volcanic geology of the Castle Hot Springs area, Yavapai County, Arizona: unpublished M.S. thesis, Arizona State University, Tempe, 74p.
48. Scarborough, R. B., 1980, fieldwork; Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson 85719.

49. Gomez, E., 1979, Geology of part of the south-central New River Mesa Quadrangle, Cave Creek area, Maricopa County, Arizona: U. S. Geological Survey Open-File Report 79-1312, map scale 1:12,000. Additional fieldwork by Scarborough, R. B., 1979, Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, 85719.
  50. Scarborough, R. B., 1980, fieldwork; Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, 85719. See also Scarborough, R. B., and Wilt, J. C., 1979, Uranium Favorability of Cenozoic sedimentary rocks, Basin and Range Province, Arizona: U. S. Geological Survey Open-File Report 79-1429, 101p.
  51. Titley, S. R., 1962, Geology along the Diamond Rim and adjoining areas, Gila and Navajo Counties, Arizona: New Mexico Geological Society Guidebook 13, pp. 123-128.
  52. Crumpler, Larry, 1982, oral communication: Department of Space Sciences, University of Arizona, Tucson, 85721.
  53. McKay, E. J., 1972, Geologic map of the Show Low Quadrangle, Navajo County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-973, scale 1:62,500.
  54. Finnell, T. L., 1966, Geologic map of the Cibique Quadrangle, Navajo County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-545, scale 1:62,500.
  55. Finnell, T. L., 1966, Geologic map of the Chediski Peak Quadrangle: U. S. Geological Survey Geologic Quadrangle Map GQ-544, scale 1:62,500.
  56. Moore, R. T., 1968, Mineral deposits of the Fort Apache Indian Reservation, Arizona: Arizona Bureau of Mines Bulletin 177, scale 1:250,000.
  57. Ratte, J. C., Landis, E. R., and Gaskill, D. L., 1969 Mineral resources of the Blue Range primitive area, Greenlee County, Arizona, and Catron County, New Mexico: U. S. Geological Survey Bulletin 1261-E, pp. E1-E90, scale 1:62,500.
  58. Cunningham, J. E., 1981, Preliminary detailed geologic map and cross-sections of the Clifton Hot Springs and San Francisco River area: Arizona Bureau of Geology and Mineral Technology, Geothermal Group, Open-File Report 81-22, scale 1:24,000.
- Wahl, D. E., Jr., 1980, Mid-Tertiary volcanic geology in parts of Greenlee County, Arizona, Grant and Hidalgo Counties, New Mexico: unpublished PhD dissertation, Arizona State University, Tempe, 147p.
- Ratte, J. C., and Hedlund, D. C., 1981, Geologic map of the Hells Hole further planning area (Rare II), Greenlee County, Arizona and Grant County, New Mexico: U. S. Geological Survey Miscellaneous Field Studies Map MF-1344-A, scale 1:62,500.

59. Richter, D. H., and Lawrence, V. A., 1981, Geologic map of the Gila-San Francisco wilderness study area, Graham and Greenlee Counties, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map, scale 1:62,500.  
  
Heindl, L. A., 1958, Cenozoic alluvial deposits of the upper Gila River area, New Mexico and Arizona: unpublished PhD dissertation, University of Arizona, 249p.  
  
Heindl, L. A., and McCullough, R. A., 1961, Geology and the availability of water in the lower Bonita Creek area, Graham County, Arizona: U. S. Geological Survey Bulletin 1589, 56p.
60. Bromfield, C. S., and Shride, A. F., 1954, Mineral resources of the San Carlos Indian Reservation, Arizona: U. S. Geological Survey Bulletin 1027-N, plate 2 scale 1:25,000.
61. Langton, J. M., and Williams, S. A., 1982, Structural petrological, and mineralogical controls for the Dos Pobres orebody, Graham County, Arizona, in Titley, S. R., ed., Advances in Geology of the Porphyry Copper Deposits, Southwestern North America: University of Arizona Press, Tucson, pp. 335-352.
62. Witcher, J. C., 1980 and 1981, oral communication: Stone and Witcher, consultants, 5933 E. Pima Street, Tucson, AZ 95712.
63. Blacet, P. M., and Miller, S. T., 1978, Reconnaissance geologic map of the Jackson Mountain Quadrangle, Graham County, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-939, scale 1:62,500.
64. Simons, F. S., 1964, Geology of the Klondyke Quadrangle, Graham and Pinal Counties, Arizona: U. S. Geological Survey Professional Paper 461, 174p.
65. Thorman, C. H., 1981, Geology of the Pinaleno Mountains, Arizona: a preliminary report: Arizona Geological Society Digest 13, pp. 5-12, figure 3 scale 1:200,000.
66. Richter, D. H., Shafiqullah, Mohammed, and Lawrence, V. A., 1981, Geologic map of the Whitlock Mountains and vicinity, Graham County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-1302, scale 1:48,000.
67. Cooper, J. R., 1960, Reconnaissance map of the Willcox, Fisher Hills, Cochise, and Dos Caberzas Quadrangles, Cochise and Graham Counties, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-231, scale 1:62,500.
68. Morrison, R. B., 1965, Geologic map of the Duncan and Canados Peak Quadrangles, Arizona and New Mexico: U. S. Geological Survey, Miscellaneous Investigations Series Map I-442, scale 1:48,000.
69. 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, 152p.

70. Eaton, G. P., 1972, Deformation of Quaternary deposits in two intermontane basins of southern Arizona, 24th International Geological Congress Proceedings, section 3, pp. 607-616.
71. Sabins, F. F., Jr., 1957, Geology of the Cochise Head and western part of the Vanar Quadrangles, Arizona: Geological Society of America Bulletin, v. 68, no. 10, pp. 1315-1342.
72. Drewes, Harold, 1981, Geologic map and sections of the Bowie Mountain South Quadrangle, Cochise County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series I-1363, scale 1:24,000.
73. Cooper, J. R., 1959, Reconnaissance geologic map of southeastern Cochise County, Arizona: U. S. Geological Survey Miscellaneous Investigations Field Studies Map MF-213, scale 1:125,000.  
  
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 MF-1425-A, scale 1:62,500.
74. Lynch, D. H., 1978, The San Bernardino volcanic field of southeastern Arizona, in Callender, J. F. and others, eds., Land of Cochise - Southeastern Arizona: New Mexico Geological Society Guidebook, 29th Field Conference, pp. 261-268.  
  
Lynch, D. J., 1972, Reconnaissance geology of the Bernardino volcanic field: unpublished M.S. thesis, University of Arizona, Tucson, 78p.
75. Menges, C., 1977 and 1979, fieldwork: Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, 85719.
76. Hayes, P. T., and Landis, E. R., 1964, Geologic map of southern part of the Mule Mountains, Cochise County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-418, scale 1:48,000.
77. Haynes, C. Vance, 1980, written and oral communication: Department of Anthropology, University of Arizona, Tucson, 85721.
78. Johnson, N. M., Opdyke, N. D., and Lindsay, E. H., 1975, Magnetic polarity stratigraphy of Pliocene-Pleistocene terrestrial deposits and vertebrate faunas, San Pedro Valley, Arizona: Geological Society of America Bulletin, v. 86, pp. 5-12.
79. Lingrey, S. H., 1982, Structural geology and tectonic evolution of the northeastern Rincon Mountains, Cochise and Pima Counties, Arizona: unpublished PhD dissertation, University of Arizona, Tucson, 202p.
80. Drewes, Harold, 1974, Geologic map and sections of the Happy Valley Quadrangle, Cochise County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-832, scale 1:48,000.



81. Drewes, Harold, 1977, Geologic map and sections of the Rincon Valley Quadrangle, Pima County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series I-997, scale 1:48,000.
82. Pashley, E. F., Jr., 1966, Structure and stratigraphy of the central, northern, and eastern parts of the Tucson basin, Arizona: unpublished PhD dissertation, University of Arizona, Tucson, 273p.
83. Menges, C. M. and McFadden, L. D., 1981, Evidence for a latest Miocene to Pliocene transition from Basin-Range tectonic to post-tectonic landscape evolution in southeastern Arizona: Arizona Geological Society Digest 13, pp. 151-160.  
  
Banks, N. G., 1976, Reconnaissance geologic map of the Mount Lemmon Quadrangle, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-747, scale 1:48,000.
84. Scarborough, R. B., 1980, fieldwork: Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, 85719.
85. Creasey, S. C., 1967, General geology of the Mammoth Quadrangle, Pinal County, Arizona: U. S. Geological Survey Bulletin 1218, 94p.
86. Heindl, L. A., 1963, Cenozoic geology in the Mammoth area, Pinal County, Arizona: U. S. Geological Survey Bulletin -141-E, 41p.
87. Keith, S. B., and Scarborough, R. B., 1980, oral communication: Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, 85719.
88. Banks, N. G., and Krieger, M. H., 1977, Geologic map of the Hayden Quadrangle, Pinal and Gila Counties, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1391, scale 1:24,000.  
  
Cornwall, H. R., and Krieger, M. H., 1975b, Geologic map of the Grayback Quadrangle, Pinal County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1206, scale 1:24,000.  
  
Cornwall, H. R., and Krieger, M. H., 1978, Geologic map of the El Capitan Mountain Quadrangle, Gila and Pinal Counties, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1442, scale 1:24,000.  
  
Krieger, M. H., 1974, Geologic map of the Black Mountain Quadrangle, Pinal County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1108, scale 1:48,000.  
  
Krieger, M. H., 1974, Geologic map of the Putnam Wash Quadrangle, Pinal County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1109, scale 1:24,000.  
  
Krieger, M. H., 1974, Geologic map of the Winkleman Quadrangle, Pinal and Gila Counties, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1106, scale 1:24,000.

- Krieger, M. H., 1974 , Geologic map of the Crozier Peak Quadrangle, Pinal County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1107, scale 1:24,000.
89. Krieger, M. H., 1968 , Geologic map of the Saddle Mountain Quadrangle, Pinal County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-671, scale 1:24,000.
90. Willden, Ronald, 1964, Geology of the Christmas Quadrangle, Gila and Pinal Counties, Arizona: U. S. Geological Survey Bulletin 1161-E, 64p., scale 1:62,500.
91. Peterson, N. P., 1963, Geology of the Pinal Ranch Quadrangle, Arizona: U. S. Geological Survey Bulletin 1141-H, 18p., scale 1:24,000.
- Cornwall, H. R., Banks, N. G., and Phillips, C. H., 1971, Geologic map of the Sonora Quadrangle, Pinal and Gila Counties, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1021, scale 1:24,000.
- Cornwall, H. R., and Krieger, M. H., 1975 , Geologic map of the Kearney Quadrangle, Pinal County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-1188, scale 1:24,000.
- Peterson, D. W., 1960, Geology of the Haunted Canyon Quadrangle, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-128.
- Peterson, D. W., 1969, Geologic map of the Superior Quadrangle, Pinal County, Arizona: U. S. Geological Survey Geologic Quadrangle Map GQ-818, scale 1:24,000.
- Creasey, S. C., Peterson, D. W., and Gambell, N. A., 1975, Preliminary geologic map of the Teapot Mountain Quadrangle, Pinal County, Arizona: U. S. Geological Survey Open-File Report 75-314, scale 1:24,000.
- Hammer, D. F., and Webster, R. N., 1962, Some geologic features of the Superior area, Pinal County, Arizona: New Mexico Geological Society Guidebook 13, pp. 148-152.
- Keith, S. B., 1980, The great southwestern Arizona overthrust oil and gas play: drilling commences: in FIELDNOTES: Arizona Bureau of Geology and Mineral Technology, v. 10, no. 1, pp. 1-8.
92. Reed, E. F., and Simmons, W. W., 1962, Geological notes on the Miami-Inspiration Mine: New Mexico Geological Society Guidebook 13, pp. 153-157.
- Peterson, N. P., 1962, Geology and ore deposits of the Globe Quadrangle: New Mexico Geological Society Guidebook 13, pp. 159-161.
- Peterson, N. P., 1962, Geology and ore deposits of the Globe-Miami district, Arizona: U. S. Geological Survey Professional Paper 342, 151p.

93. Davis, G. H., and others, 1981, Guide to the geology of the Salt River Canyon region, Arizona: Arizona Geological Society Digest 13, pp. 47-98.
94. Bergquist, J. R., Shride, A. F., and Wrucke, C. T., 1981, Geologic map of Sierra Ancha wilderness and Salome study area, Gila County, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-1162-A, scale 1:48,000.
95. Fugro, Inc., 1981, Seismotectonic study, Roosevelt Dam, Arizona: consulting report prepared for U. S. Department of the Interior, Bureau of Reclamation, P. O. Box 25007, Denver, CO 80225, 39p.  
  
Lance, J. F., Downey, J. S., and Alford, Malcolm, 1962, Cenozoic sedimentary rocks of Tonto Basin, in Weber, R. H., and Peirce, H. W., eds., Guidebook to the Mogollon Rim Region, East-central Arizona: New Mexico Geological Society Thirteenth Field Conference Guidebook, pp. 98-99.
96. Menges, C. M., 1980, fieldwork: Arizona Bureau of Geology and Mineral Technology, 845 N. Park Ave., Tucson, 85719.
97. Scarborough, R. B., 1981, Reconnaissance geology: Goldfield and northern Superstition Mountains, in FIELDNOTES: Arizona Bureau of Geology and Mineral Technology, v. 11, no. 4, pp. 6-10.
98. Yeend, Warren, 1976, Reconnaissance geologic map of the Picacho Mountains, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-778, scale 1:48,000.
99. Bergquist, J. R., Banks, N. G., and Blacet, P. M., 1978, Reconnaissance geologic map of the Eloy Quadrangle, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-990, scale 1:62,500.
100. Graybeal, F. T., 1982, Geology of the El Tiro area, Silverbell mining district, Pima County, Arizona, in Titley, S. R., Advances in Geology of the Porphyry Copper Deposits, Southwestern North America: University of Arizona Press, Tucson, pp. 487-505.  
  
Banks, N. G., and Dockter, R. D., 1976, Reconnaissance geologic map of the Vaca Hills Quadrangle, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-793, scale 1:62,500.
101. Rytuba, J. J., Till, A. B., Blair, Will, and Haxel, Gordon, 1978, Reconnaissance geologic map of the Quijotoa Mountains Quadrangle, Pima County, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-937, scale 1:62,500.
102. Haxel, Gordon, and others, 1978, Reconnaissance geologic map of the Comobabi Quadrangle, Pima County, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-964, scale 1:62,500.

103. Keith, W. J., 1976, Reconnaissance geologic map of the San Vicente and Cocoraque Butte 15' Quadrangles, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-769, scale 1:62,500.
104. Keith, W. J., and Theodore, T. G., 1975, Reconnaissance geologic map of the Arivaca Quadrangle, Arizona: U. S. Geological Survey Miscellaneous Field Studies Map MF-678, scale 1:63,360.
106. Drewes, Harold, 1971, Geologic map of the Sahuarita Quadrangle, southeast of Tucson, Pima County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-613, scale 1:48,000.  
  
Drewes, Harold, 1971, Geologic map of the Mount Wrightson Quadrangle, southeast of Tucson, Santa Cruz and Pima Counties, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-614, scale 1:48,000.
107. Babcock, R. S., and others, 1976, Geologic map of the Grand Canyon National Park, Arizona: Grand Canyon Natural History Association and Museum of Northern Arizona, scale 1:62,500.  
  
Finell, T. L., 1971, Preliminary geologic map of the Empire Mountain Quadrangle, Pima County, Arizona: U. S. Geological Survey Open-File Map, scale 1:48,000w
108. Menges, C. M., 1981, Sonoita Creek Basin - Implications for late Cenozoic tectonic evolution of basins and ranges in southeastern Arizona: unpublished M.S. thesis, University of Arizona, Tucson, 239p. See also summary paper in Arizona Geological Society Digest 13, pp. 151-160.
109. Simons, F. S., 1974, Geologic map and sections of the Nogales and Lochiel Quadrangles, Santa Cruz County, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-762, scale 1:48,000.
110. Hayes, P. T., and Raup, R. B., 1968, Geologic map of the Huachuca and Mustang Mountains, southeastern Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-509, scale 1:48,000.
111. Creasey, S. C., 1967, Geologic map of the Benson Quadrangle, Cochise and Pima Counties, Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-470, scale 1:48,000.
112. Whitney, R. A., 1981, oral and written communication; MacKay School of Mines, University of Nevada, Reno, NV 89557.
113. Mayer, Larry, 1982, Quantitative tectonic geomorphology with applications to neotectonics of northwestern Arizona: unpublished PhD dissertation, University of Arizona, Tucson, 85721, 512p.
114. Lucchitta, Ivo, 1979, Late Cenozoic uplift of the southwestern Colorado Plateau and adjacent lower Colorado River region: Tectonophysics, v. 61, pp. 63-95.

115. Drewes, Harold, 1980, Tectonic map of southeast Arizona: U. S. Geological Survey Miscellaneous Investigations Series Map I-1109, scale 1:125,000.
  116. Schell, B. A., and Wilson, K. L., 1981, Regional neotectonic analysis of the Sonoran Desert: U. S. Geological Survey Open-File Report 82-57, 60p. with 2 maps, scale 1:500,000.
  117. Merriam, R., 1972, Reconnaissance geologic map of the Sonoyta Quadrangle, northwest Sonora, Mexico: Geological Society of America Bulletin, v. 83, pp. 3533-3536.
  118. Purcell, C. R., and Miller, D. G., 1980, Grabens along the lower Colorado River, California and Arizona, in Fife, D. L., and Brown, A. R., eds., Geology and Mineral Wealth of the California Desert: South Coast Geological Society, Dibblee volume, pp. 475-484.
  119. Nakata, J. K., Wentworth, C. M., and Machette, M. N., 1982, Index to Quaternary fault maps of the Basin and Range and Rio Grande rift provinces, Western United States: U. S. Geological Survey Open-File Report 82-579, scale 1:2,500,000.
  120. Drewes, Harold, and Thorman, C. H., 1980, 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.
  120. Gillerman, Elliott, 1964, Mineral deposits of western Grant County, New Mexico: New Mexico Bureau Mines and Mineral Resources Bulletin 83, 213p.
- Machette, M. N., 1982, written communication: U. S. Geological Survey Central Regional Geology (M.S. 913), Denver Federal Center, Denver, CO 80225, map in preparation with C. Menges and P. Pearthree.
- Smith, Christian, 1978, Geophysics, geology, and geothermal leasing status of the Lightning Dock KGRA, Animas Valley, New Mexico, in Callender, J. F., and others, eds., Land of Cochise - Southeastern Arizona: New Mexico Geological Society Twenty-ninth Field Conference, pp. 343-348.
- 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 Miscellaneous Field Studies MF-160, scale 1:62,500.
- Zeller, R. A., Jr., 1962, Reconnaissance geologic map of 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, 105p.

Additional references to be added, with areas of coverage

- (general) Bull, W. B., and McFadden, L. D., 1977, Tectonic geomorphology north and south of the Garlock Fault, California: in Doehring, D. O., ed., Geomorphology in Arid Regions, Proceedings, 8th Annual Geomorphology Symposium: State University of New York, Binghamton, pp. 115-138.
- (general) Reneau, S., 1980, written communication, University of California, Berkeley.
- 106, 115 Pearthree, P. A., and Calvo, S. S., 1982, Late Quaternary faulting west of the Santa Rita Mountains, south of Tucson, Arizona: University of Arizona, unpublished M.S. thesis, 49 p.
- 106, 115 Calvo, S. S., and Pearthree, P. A., 1981, Tectonic geomorphology of the Santa Rita faults scarps, Southeastern Arizona (abs.): Geological Society of America Abstracts with Programs, v. 13, No. 2, p. 47.
- 1, 2, 113, 116 Mayer, Larry, 1982, oral communication, Miami University, Oxford, Ohio.
- 119, 122 Herd, D. G., and McMasters, C. R., 1982, Surface faulting in the Sonora, Mexico, earthquake of 1887 (abs.): Geological Society of America Abstracts with Programs, v. 14, No. 4, p. 172.
- 119, 122 Bull, W. B., Calvo, S. S., Pearthree, P. A., and Quade, Joy, 1981, Frequencies and magnitudes of surface rupture along the Pitaycachi fault, northeastern Sonora, Mexico (abs.): Geological Society of America Abstracts with Programs, v. 13, No. 2, p. 47.
- 74, 119, 120 Seager, W. R., and Morgan, Paul, 1979, Rio Grande Rift in southern New Mexico, west Texas, and northern Chihuahua: in Reiker, R. E., ed., Rio Grande Rift: Tectonics and Magmatism: American Geophys. Union, pp. 87-106.
- 34 Wolfe, E. W., 1981, oral communication, U. S. Geological Survey, Flagstaff, AZ.
- 6 Huntoon, P. W., 1977, Holocene faulting in the western Grand Canyon, Arizona: Geological Society of America Bulletin, v. 88, pp. 1619-1622. See also discussion and reply by R. E. Anderson and P. Huntoon in Geological Society Bulletin, v. 90, part 1, pp. 221-224.
- 33 Haynes, D. D., and Hackman, R. J., 1978, Geology, structure, and uranium deposits of the Marble Canyon 1° x 2° Quadrangle, Arizona: U.S. Geological Survey Miscellaneous Investigation Series Map I-1003.
- 34 Reiche, Parry, 1937, Quaternary deformation in the Cameron district of the Plateau Province: American Journal of Science, 5th Series, v. 34, No. 200, pp. 128-138.

- 120 Wynn, J. C., 1981, Complete Bouguer gravity anomaly map of the Silver City 1° x 2° Quadrangle, New Mexico-Arizona: U.S. Geological Survey Miscellaneous Investigations Map I-1310-A, 1:250,000 scale.
- ? VanHorn, R., 1981, oral and written communication, U. S. Geological Survey, Denver Federal Center, Denver, CO 80225.
- ? VanHorn, R., 1976, Probable Quaternary fault scarp in Arizona: Crossroads (internal publication of the U.S. Geological Survey), v. 6, No. 6, p. 8-9.
- 27 Soule, C. H., 1978b, Paleoseismicity as deduced from studies of stream terraces of tectonic origin (abs.): Geological Society of America Abstracts with Programs, v. 10, No. 7, p. 495-496.
- 41 Olmsted, F. H., Loeltz, O. J., and Irelna, B., 1973, Geohydrology of the Yuma area, Arizona and California: U.S. Geological Survey Professional Paper 486-H, 227 p.
- 34 ? Moore, R. B., and Wolfe, E. W., 1976, Geologic map of the eastern San Francisco volcanic field: U.S. Geological Survey Miscellaneous Investigations Map I-953, 1:50,000 scale.
- 41 Bull, W. B., 1974a, Summary of the geomorphic reconnaissance of the region of the Yuma Dual Purpose Nuclear Plant (YDPNP), in Woodward-McNeil & Associates, Geotechnical Investigation, Yuma Dual Purpose Nuclear Plant, Appendix F, Part 1, 24 p.
- 41 Bull, W. B., 1974b, Reconnaissance of the Colorado River terraces near the Yuma Dual Purpose Nuclear Plant, in Woodward-McNeil & Associates, Geotechnical Investigation, Yuma Dual Purpose Nuclear Plant, Appendix F, Part 1, 31 p.
- 34 Akers, J. P., Irwin, J. H., Stevens, P. R., and McClymond, N. E., 1962, Geology of the Cameron Quadrangle, Arizona: U.S. Geological Survey Geological Quadrangle Map GQ-162, 1 sheet, 1:62,500 scale.
- 23 Lehner, R. E., 1958, Geology of the Clarkdale Quadrangle, Arizona: U.S. Geological Survey Bulletin 1021-N, p. 511-592.
- 56 Merrill, R. K., 1972, Late Quaternary glacial chronology of the White Mountains, east-central Arizona: Journal of Geology, v. 80, No. 4, pp. 493-501.
- 34 Ulrich, G. E., and Moore, R. B., 1981, written communication, U.S. Geological Survey, Flagstaff, AZ.
- 75,115 Druke, P. A., 1979, Geomorphology of the Swisshelm scarp, Cochise County, Arizona: unpublished M.S. thesis, University of Arizona, Tucson.

121. Leopoldt, Winfried, 1981, Neogene geology of the central Mangas graben, Cliff-Gila area, Grant County, New Mexico: unpublished M.S. thesis, University of New Mexico, Albuquerque, 160p.
- Ratte, J. C., 1981, Geologic Map of the Mogollon Quadrangle, Catron County, New Mexico: U. S. Geological Survey Geological Quadrangle Map GQ-1557, scale 1:24,000.
- Weber, R. H., and Willard, M. E., 1959, Reconnaissance geologic map of the Mogollon thirty-minute Quadrangle: New Mexico Bureau of Mines and Mineral Resources, scale 1:128,720.
122. Bull, W. B., and Pearthree, P. A., 1981-82, written and oral communication: Department of Geosciences, University of Arizona, Tucson, 85721.



- 34 Condit, C. D., 1974, Geology of Shadow Mountain, Arizona: in Geology of Northern Arizona, Part II; Geological Society of America Guidebook, Rocky Mountain Section Meeting, Flagstaff, pp. 454-463.
- (general) Wilson, E. D., Moore, R. T., and Cooper, J. R., 1969, Geologic Map of Arizona: Arizona Bureau of Mines and U.S. Geological Survey, 1:500,000 scale.
- 65 Swan, M. M., 1976, the Stocton Pass fault: an element of the Texas Lineament: University of Arizona unpublished M. S. thesis, 119 p.
- (off map) Bull, W. B., 1978, South front of the San Gabriel Mountains, southern California: Final Technical Report to the Office of Earthquake Studies, U.S. Geological Survey, 100 p.
- (off map) Bull, W. B., 1977, Tectonic geomorphology of the Mojave Desert, California: Final Report to the Office of Earthquake Studies, U.S. Geological Survey contract 14-08-0001-G-394, 188 p.