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Annotated Bibliography and Mapping Index of Precambrian of New Mexico

by James M. Robertson

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Preface

This bulletin summarizes who has done what and where on the Precambrian geology of New Mexico, delineates existing geologic mapping that includes Precambrian rocks, and indicates the extent to which the Precambrian has been subdivided on each map. The report is organized into an annotated bibliography of over 400 citations, a subject index, and two large map indexes (in pocket). The bibliography includes published papers, open-file reports, and graduate theses from both in-state and out-of-state institutions. The subject index is subdivided into the following major categories: counties, mountain ranges, geochronology, mineral deposits, and statewide or regional geology. The map indexes show coverage of any mapping that contains exposures of Precambrian rocks, divided or undivided. One sheet indexes mapping in published and open-file materials (Map 1), the other indexes mapping in theses (Map 2).

The bibliography lists only papers, reports, or theses that include some mention of Precambrian rocks in New Mexico. Many of the references listed are not concerned exclusively with Precambrian geology; a number have only a brief chapter, section, or paragraph on the Precambrian. Such references, however, may be the only source of information on the Precambrian geology of a particular area, and thus a significant starting point for further study.

Most of the references are available in Socorro either from the New Mexico Tech Library or the New Mexico Bureau of Mines and Mineral Resources. Many of the graduate theses were obtained through interlibrary loans. The University of New Mexico Library and Department of Geology supplied theses from that institution. The annotations preserve each author's original spelling of Precambrian formation names or lithologic units used in the text and/or accompanying geologic map. Geographic names, however, are spelled according to modern authorities, including *New Mexico Place Names* (Pearce, 1965, University New Mexico Press).

The manuscript has been critically reviewed by Robert H. Weber of the New Mexico Bureau of Mines and Mineral Resources.

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Socorro, New Mexico
March, 1976

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MAPS

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MAP 2—Theses **in pocket**

Annotated Bibliography

Acosta, L. R., Geology of Mesa Poleo area, Rio Arriba County, New Mexico: M. S. thesis, Colorado School Mines, 80 p., 13 figs., 3 pls., map scale 1:24,000, 1973

Describes the general geology, stratigraphy, structure, and "red-bed" copper mineralization in the Mesa Poleo area, along the northeastern flanks of the San Pedro Mountains, south-central Rio Arriba County. Includes a very brief paragraph on Precambrian granite exposed in two places in the south-central map area.

Adams, G. E., see Muehlberger, W. R., Longgood, T. E., Jr., and St. John, B. E., 1960

Adams, J. W., see Jahns, R. H., 1953

Aldrich, L. T., Wetherill, G. W., and Davis, G. L., Occurrence of 1350 million year-old granitic rocks in western United States: Geol. Soc. America, Bull., v. 68, p. 655-656, 1 fig., 1957

Tabulates eleven K-Ar and Rb-Sr ages of micas from Precambrian granites and pegmatites, including samples from: 1) Pidlite mine, Sangre de Cristo Mountains, western Mora County; 2) Sandia granite, Sandia Mountains, eastern Bernalillo County; and 3) Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Aldrich, L. T., Wetherill, G. W., Davis, G. L., and Tilton, G. R., Radioactive ages of micas from granitic rocks by Rb-Sr and K-Ar methods: (EOS) Am. Geophys. Union, Trans., v. 39, p. 1124-1134, 1 fig., 9 tables, 1958

Includes analytical data and ages for the: 1) Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County; 2) Pidlite pegmatite, Rociada district, Sangre de Cristo Mountains, western Mora County; and 3) Sandia granite, Sandia Mountains, eastern Bernalillo County.

Anderson, E. C., The metal resources of New Mexico and their economic features through 1954: New Mexico Bureau Mines Mineral Resources, Bull. 39, 183 p., 3 figs., 21 tables, 5 pls., 1957

County by county summary of the major mining districts (geology, mineralogy, and production) in New Mexico. Includes numerous descriptions of Precambrian-age deposits and deposits in Precambrian host rocks.

Anderson, J. B., see Woodward, L. A., Kaufman, W. H., and Reed, R. K., 1973; and Woodward, L. A., and Kaufman, W. H., 1972; and Woodward, L. A., McLelland, D., and Kaufman, W. H., 1972

Andreasen, G. E., Kane, M. F., and Zietz, I., Aeromagnetic and gravity studies of the Precambrian, northeastern New Mexico: Geophysics, v. 27, no. 3, p. 343-358, 8 figs., 1962

Presents a contour map on the Precambrian surface for northeastern New Mexico (map scale about 1:1,600,000) that includes parts of De Baca, Guadalupe, Quay, Torrance, San Miguel, Mora, Colfax, and Union Counties. Map is based on drill hole and geophysical data, and portrays several regional structures. Also presents a geologic and gravity anomaly map of the same area (map scale about 1:2,000,000).

Andrews, D. A., see Read, C. B., 1944; and Read, C. B., Wilpolt, R. H., Summerson, C. H., and Wood, G. H., 1944

Arendt, W. W., Geology of La Joyita Hills, Socorro County, New Mexico: M. S. thesis, Univ. New Mexico, 75 p., 6 figs., 29 pls., map scale 1:24,000, 1971

Describes the stratigraphy, structure and economic geology of La Joyita Hills, north-central Socorro County. Includes a very brief section on the distribution and general nature of Precambrian rocks exposed in the central portion of the map area. Subdivides the Precambrian into: 1) quartz-feldspar-biotite gneiss, and 2) quartz-feldspar gneiss.

Armstrong, A. K., and Silberman, M. K., Geologic map of the central Peloncillo Mountains, Hidalgo County, New Mexico: U. S. Geol. Survey, Open-file Map, scale 1:24,000, 1974

Precambrian porphyroblastic granite and minor greenschist outcrop in the central and southern parts of the map area in the Peloncillo Mountains, west-central Hidalgo County.

Arth, J. G., see Barker, F., and Peterman, Z. E., 1973; and Barker, F., Peterman, Z. E., and Friedman, I., 1976

Asquith, G. B., see Daugherty, F. W., 1971

Bachman, G. O., Geology of a part of northwestern Mora County, New Mexico: U. S. Geol. Survey, Oil and Gas Inv. Map OM 137, scale 1:48,000, 1953

Precambrian quartzite, with minor amounts of schist and gneiss, is exposed along the western margin of the map area which coincides with the eastern foothills of the Sangre de Cristo Mountains (locally called the Rincon Range).

Bachman, G. O., Reconnaissance map of an area southeast of Sierra Blanca in Lincoln, Otero, and Chaves Counties, New Mexico: New Mexico Geol. Soc., Guidebook 5th field conf., p. 94b, scale 1:380,160, 1954

Shows two small undifferentiated Precambrian outcrops at Bent Dome, west of Mescalero and south of Sierra Blanca. Also distinguishes Pajarito Peak, an isolated Precambrian exposure in the northeastern corner of Otero County, although this map portrays the Precambrian there as "Tertiary intrusives."

Bachman, G. O., Geologic map of the Capitol Peak Northwest quadrangle, Socorro County, New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-441, scale 1:31,680, 1965

An uncolored geologic map of the Capitol Peak Northwest (7½-min) quadrangle, in Socorro and Sierra Counties, that includes a portion of the San Andres Mountains. Shows Precambrian granite, with minor dioritic intrusives, exposed along much of the eastern flank of the range. Accompanied by a brief text that contains a short paragraph on the general nature of the Precambrian rocks in the map area.

Bachman, G. O., Geology of Mockingbird Gap quadrangle, Lincoln and Socorro Counties, New Mexico: U. S. Geol. Survey, Prof. Paper 594-J, 43 p., 10 figs., 1 table, 3 pls., map scale 1:48,000, 1969

Includes a short section on Precambrian rocks, which are exposed: 1) in a continuous belt along the western flank of the southern Oscura Mountains, southeastern Socorro and western Lincoln Counties; 2) along the western side of the Mockingbird Gap Hills, southeastern Socorro County; and 3) at the northern end of the San Andres Mountains, southeastern Socorro County. The Precambrian in the map area is subdivided into granite and diorite.

Bachman, G. O., Geologic map of the Madrid quadrangle, Santa Fe and Sandoval Counties, New Mexico: U. S. Geol. Survey, Open-file Rept. 74-175, scale 1:48,000, 1974

Uncolored geologic map of the Madrid (15-min) quadrangle, with Precambrian, undivided, in the southwestern corner of the map area, cropping out in the northeastern end of the Monte Largo Hills, southwestern Santa Fe and southeastern Sandoval Counties.

Bachman, G. O., Geologic map of the Riley quadrangle, Socorro County, New Mexico: U. S. Geol. Survey, Open-file Map, scale 1:48,000, in preparation

Bachman, G. O., and Dane, C. H., Preliminary geologic map of the northeastern part of New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-358, scale 1:380,160, 1962

Uncolored preliminary geologic map of northeastern New Mexico – a compilation from previous workers, modified and supplemented by U. S. Geological Survey reconnaissance mapping. Precambrian rocks are undivided.

Bachman, G. O., and Harbour, R. L., Geologic map of the northern part of the San Andres Mountains, central New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-600, scale 1:62,500, 1970

Geologic map of the northern San Andres Mountains that covers the Salinas Peak (15-min) quadrangle and the western half of the Capitol Peak (15-min) quadrangle, both in northeastern Sierra and southeastern Socorro Counties. Distinguishes Precambrian granite, schist, and diorite where they crop out along the east-facing slopes of the range.

Bachman, G. O., and Myers, D. A., Geology of the Bear Peak Northeast quadrangle, Doña Ana County, New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-374, scale 1:31,680, 1963

Uncolored geologic map of part of the central San Andres Mountains in eastern Doña Ana County. Distinguishes Precambrian granite, pegmatite, hornblende schist, and diorite where they crop out along the east-facing slopes of the range.

Bachman, G. O., and Myers, D. A., Geology of the Bear Peak area, Doña Ana County, New Mexico: U. S. Geol. Survey, Bull. 1271-C, 46 p., 7 figs., 1 table, map scale 1:62,500, 1969

Geologic map and report covering the eastern half of the Bear Peak (15-min) quadrangle, Doña Ana County, an area including part of the central San Andres Mountains. Distinguishes Precambrian granite, pegmatite, hornblende schist, and diorite where they crop out along the east-facing slopes of the range.

Bachman, G. O., see Baltz, E. H., Jr., 1956; and Dane, C. H., 1957; and Dane, C. H., 1958; and Dane, C. H., 1961

Bailey, R. A., see Smith, R. L., and Ross, C. S., 1970

Baldwin, B., and Muehlberger, W. R., Geologic studies of Union County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 63, 171 p., 28 figs., 5 tables, 17 pls., 1960

Geologic report on Union County that includes a brief mention of Precambrian "granite" in the subsurface and a relief map of the Precambrian surface based on oil test data.

Baldwin, B., see Spiegel, Z. E., 1963

Ballmann, D. L., The geology of the southeast quarter of the Red Rock quadrangle, New Mexico: M. S. thesis, Univ. Illinois, 9 figs., 2 pls., map scale 1:31,680, 1956

Describes the general geology, structure, and mineral resources of the southeast quarter of the Red Rock (15-min) quadrangle, south-central Grant and north-central Hidalgo Counties. Includes a very brief chapter of the distribution and megascopic petrology of Precambrian granite and mafic dikes exposed over most of the eastern half of the map area. Map area is included in New Mexico Bureau of Mines and Mineral Resources Bulletin 70 (Ballmann, 1960).

Ballmann, D. L., Geology of the Knight Peak area, Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 70, 39 p., 10 figs., 3 tables, 1 plate, map scale 1:63,360, 1960

Geologic map and cross sections of the Gallinas Creek area, comprising the Montezuma, El Porvenir, and southern third of the Rociada (7½-min) quadrangles, western San Miguel County, New Mexico. The map includes a portion of the southeastern Sangre de Cristo Mountains and distinguishes Precambrian granite, pegmatites, and metamorphic rocks that occupy a major part of the western map area.

Baltz, E. H., Jr., Geologic map and cross-sections of the Gallinas Creek area, Sangre de Cristo Mountains, San Miguel County, New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-673, scale 1:24,000, 1972

Includes geologic map and cross sections of the Gallinas Creek area, comprising the Montezuma, El Porvenir, and southern third of the Rociada (7½-min) quadrangles, San Miguel County. The map includes a portion of the southeastern Sangre de Cristo Mountains and distinguishes Precambrian granite, pegmatites, and metamorphic rocks that occupy a major part of the western map area.

Baltz, E. H., Jr., and Bachman, G. O., Notes on the geology of the southeastern Sangre de Cristo Mountains, New Mexico: New Mexico Geol. Soc., Guidebook 7th field conf., p. 96-108, 4 figs., 1956

Brief description of the distribution, structure, and lithologies of Precambrian rocks of the southeastern Sangre de Cristo Mountains in western San Miguel and Mora Counties.

Barker, F., Precambrian and Tertiary geology of the Las Tablas quadrangle, New Mexico: Ph.D. thesis, California Institute Technology, 230 p., 3 figs., 20 pls., 1954

Published as New Mexico Bureau of Mines and Mineral Resources Bulletin 45 (Barker, 1958).

Barker, F., Precambrian and Tertiary geology of Las Tablas quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 45, 104 p., 3 figs., 14 tables, 13 pls., map scale 1:48,000, 1958

Describes the distribution, lithology, stratigraphy, and metamorphism of Precambrian rocks in the Las Tablas (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County. Subdivides the Precambrian into: 1) Petaca schist, 2) Ortega Quartzite, 3) Moppin Metavolcanic Series, 4) Kiawa Mountain Formation – with 5 members, 5) Burned Mountain Metarhyolite, 6) Maquinita Granodiorite, and 7) Tres Piedras Granite.

Barker, F., Occurrence and genesis of hematite in Precambrian clastic rocks in southwestern Colorado and northern New Mexico (abs.): Geol. Soc. America, Spec. Paper 121, p. 481-482, 1969a

Includes a description of the geology and origin of hematite in Precambrian clastic rocks of the upper quartzite member of the Kiawa Mountain Formation, Las Tablas (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County.

Barker, F., Gold investigations in Precambrian clastic and pelitic rocks, southwestern Colorado and northern New Mexico: U. S. Geol. Survey, Bull. 1271-F, 22 p., 7 figs., 4 tables, 1969b

Describes a search for fossil gold placers in Precambrian clastic rocks. Units sampled in New Mexico were: 1) Ortega Quartzite, Big Rock Conglomerate, Jawbone Conglomerate, and upper quartzite member of the Kiawa Mountain Formation – all in the Tusas Mountains, eastern Rio Arriba County; and 2) lower quartzite member of the Ortega Formation and conglomerate member of the Vadito Formation – both in the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Barker, F., Ortega Quartzite and the Big Rock and Jawbone Conglomerate Members of the Kiawa Mountain Formation, Tusas Mountains, New Mexico: U. S. Geol. Survey, Bull. 1294-A, p. A21-A22, 1970

Describes a change in the stratigraphic nomenclature of the Precambrian exposed in the Las Tablas, Cañon Plaza, Burned Mountain and Mule Canyon (7½-min) quadrangles, Tusas Mountains, eastern Rio Arriba County. Identifies type localities for the redefined Ortega Quartzite, and the Big Rock and Jawbone Conglomerate Members of the Kiawa Mountain Formation.

Barker, F., Precambrian rocks of New Mexico and Colorado: Geotimes, v. 16, no. 12, p. 15-17, 1971

A summary of papers delivered at a Penrose Conference at Taos, New Mexico, that focused on Precambrian metavolcanic and plutonic igneous rocks of Colorado and northern New Mexico.

Barker, F., Arth, J. G., and Peterman, Z. E., Geochemistry of Precambrian trondhjemites of Colorado and northern New Mexico, evidence for subduction? (abs.): (EOS) Am. Geophys. Union, Trans., v. 54, p. 1220-1221, 1973

Discusses the geochemistry and petrogenesis of Precambrian trondhjemites, including an example from the Brazos Peak area, Tusas Mountains, northeastern Rio Arriba County.

Barker, F., Arth, J. G., Peterman, Z. E., and Friedman, I., The 1.7 - 1.8 b.y. - old trondhjemites of southwestern Colorado and northern New Mexico: geochemistry and depths of genesis: Geol. Soc. America, Bull., v. 87, no. 2, p. 189-198, 9 figs., 1976

Describes the general geology, major, minor and trace-element geochemistry, and petrogenesis of four trondhjemite bodies including one along the Rio Brazos, Tusas Mountains, northeastern Rio Arriba County.

Barker, F., and Friedman, I., Precambrian metavolcanic rocks of the Tusas Mountains, New Mexico: major elements and oxygen isotopes: New Mexico Geol. Soc., Guidebook 25th field conf., p. 115-117, 3 figs., 1 table, 1974

Presents major element and oxygen isotope data on ten metabasalts and metabasaltic andesites from the Moppin Metavolcanic Series and ten metarhyolites from the Burned Mountain Metarhyolite. Samples collected in the Burned Mountain, Cañon Plaza, and Las Tablas (7½-min) quadrangles, Tusas Mountains, eastern Rio Arriba County.

Barker, F., Peterman, Z. E., and Hansen, W. R., Trondhjemitic magmatism in the Precambrian of southern Colorado and northern New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 5, no. 6, p. 462-463, 1973

Includes a major element and Rb and Sr analysis of a quartzeye granite collected along the upper Rio Brazos, Tusas Mountains, northeastern Rio Arriba County.

Barker, F., Peterman, Z. E., Henderson, W. T., and Hildreth, R. E., Rubidium-strontium dating of the trondhjemite of Rio Brazos, New Mexico and of the Kroenke granodiorite, Colorado: U. S. Geol. Survey, Jour. Research, v. 2, no. 6, p. 705-709, 1974

Describes Precambrian trondhjemite and hornblendite that outcrop in the Brazos Peak (15-min) quadrangle, Tusas Mountains, northeastern Rio Arriba County. Includes petrographic descriptions, several chemical analyses, and a Rb-Sr date of 1724 ± 34 m.y.

Basham, W. L., Structure and metamorphism of the Precambrian rocks of the south Manzano Mountains, New Mexico: M. S. thesis, Northwestern Univ., 124 p., 3 tables, 29 pls., map scale 1:31,680, 1951

Describes the detailed petrology, metamorphism, and structure of Precambrian rocks exposed in the south Manzano Mountains, eastern Valencia, and western Torrance Counties. Precambrian rocks are subdivided into: 1) Sais Quartzite, 2) Blue Springs Schist, 3) White Ridge Quartzite, 4) Sevilleta Rhyolite, 5) basic schist, 6) Monte Largo Granite, and 7) Priest Granite. The geologic map accompanying this report has been published by Stark (1956).

Bates, R. L., Wilpolt, R. H., MacAlpin, A. J., and Vorbe, G., Geology of the Gran Quivira quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 26, 52 p., 4 figs., 9 pls., map scale 1:125,000, 1947

Includes a brief section on the geology and petrology of Precambrian metasediments and granite, which are exposed in the northwest corner of the map area in the Manzano Mountains, southeastern Valencia County.

Bates, R. L., see Wilpolt, R. H., MacAlpin, A. J., and Vorbe, G., 1946

Bayley, R. W., and James, H. L., Precambrian iron formations of the United States: Econ. Geology, v. 68, no. 7, p. 934-959, 19 figs. (see p. 956-957) 1973

General geology and mineralogy of Precambrian iron formations of the United States, including a brief description of occurrences at Cleveland Gulch and Iron Mountain, Tusas Mountains, eastern Rio Arriba County.

Beers, C. A., Budding, A. J., and Condie, K. C., Precambrian rocks of the Los Pinos Mountains, central New Mexico; Part I, sedimentation, magmatism, and orogeny (abs.): Geol. Soc. America, Abs. with Programs, v. 6, no. 5, p. 425, 1974

Describes the petrography, depositional history, metamorphism, and structure of Precambrian metasediments and metavolcanics exposed in Los Pinos Mountains, northeastern Socorro County. Includes geochemical data on the volcanics and two granitic plutons.

Beers, C. A., see Condie, K. C., and Budding, A. J., 1974

Benjovsky, T. D., Reconnaissance survey of the Headstone mining district, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 11, 10 p., 1945

Describes the history, general geology and ore deposits of the Headstone (Hopewell) mining district, Tusas Mountains, northeastern Rio Arriba County. The area contains

Precambrian schist, quartzite, and granodiorite, with gold-quartz veins ± Cu-Pb-Zn sulfides in the schist and granodiorite.

Benjovsky, T. D., The New Mexico Ricolite Company, Telegraph mining district, Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Open-file Rept. 14, 11 p., map scale 1:125,000, 1946

Basically a mining-engineering report on a deposit of well-banded, variegated Precambrian talc-serpentinite rock (called "ricolite") that occurs as xenoliths in Precambrian granite and metadiabase at the northwest end of the Big Burro Mountains, central Grant County.

Berliner, M. H., Investigations of the Harding tantalum-lithium deposits, Taos County, New Mexico: U. S. Bureau Mines, Rept. Inv. 4607, 7 p., 3 figs., 3 tables, 1949

Mostly a restatement of U. S. Bureau of Mines Report of Investigations 3986 (Soule, 1946). Includes data from seven additional diamond drill holes.

Bertholf, W. E., II, Magnetite taconite rock in Precambrian formations in Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 54, 24 p., 9 figs., 8 tables; 1960

Describes magnetic measurements, sampling and analytical procedures, and the predicted iron potential of the Las Tablas (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County.

Beutner, E. L., Genesis of Precambrian banded iron deposits, Rio Arriba County, New Mexico: Econ. Geology, v. 65, p. 1008, 1970

Letter suggesting similarities between Rio Arriba banded iron deposits and those in the Canadian Shield associated with Archean greenstone belts.

Bickford, M. E., and Wetherill, G. W., Compilation of Precambrian geochronological data for North America *in* Geochronology of North America: Natl. Acad. Sci. – Natl. Research Council, Pub. 1276, Nuclear Sci. Ser. Rept. 41, p. 21-179, 1965

Bieberman, R. A., see Vlissides, S. D., 1961

Bingler, E. C., Superposed folding in the Precambrian of the La Madera quadrangle, Rio Arriba County, New Mexico (abs.): Geol. Soc. America, Spec. Paper No. 76, Abs. for 1963, p. 265, 1964

Identifies three episodes of pervasive regional deformation within the Precambrian of the Tusas Mountains, eastern Rio Arriba County.

Bingler, E. C., Titanium *in* Mineral and water resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 87, p. 240-241, 1965a

Briefly describes the occurrence and uses of titanium – including ilmenite in Precambrian quartz veins and quartz-rich pegmatites in the Petaca district, Tusas Mountains, eastern Rio Arriba County.

Bingler, E. C., Sillimanite *in* Mineral and water resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 87, p. 298-299, 1965b

Briefly describes the uses and occurrence of sillimanite group minerals, mainly kyanite, in Precambrian quartzites from the Petaca district, Tusas Mountains, eastern Rio Arriba County, and in quartzites in the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Bingler, E. C., Precambrian geology of La Madera quadrangle, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 80, 132 p., 22 figs., 2 tables, 2 pls., map scale 1:24,000, 1965c

Describes the Precambrian geology, petrology, and structure of the La Madera (7½-min) quadrangle, Tusas Mountains, eastern Rio Arriba County. Precambrian rocks are subdivided into 14 lithologic units according to differences in present composition, mineralogy, and texture. No attempt is made to reconstruct an original stratigraphy.

Bingler, E. C., Geologic map of the Valle Grande Peak quadrangle, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 21, scale 1:24,000, 1968a

Precambrian Ortega Quartzite is exposed in the northeast corner and along the eastern margin of the map, and comprises about one-sixth of the total map area. Located in the Tusas Mountains, eastern Rio Arriba County.

Bingler, E. C., Geology and mineral resources of Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 91, 158 p., 22 figs., 4 tables, 7 pls., map scale 1:125,000, 1968b

Includes sections on the geology, petrology, and structure of Precambrian rocks in the Tusas Mountains, eastern Rio Arriba County. Subdivides the Precambrian into: 1) hornblende-chlorite schist, 2) leptite, 3) quartz-muscovite-biotite schist, 4) muscovitic quartzite, 5) granitic gneiss, 6) quartz diorite gneiss, 7) granite porphyry, and 8) quartzite. Describes metallic and nonmetallic deposits of Precambrian age or associated with Precambrian host rocks in the Hopewell, Bromide, Petaca, and Ojo Caliente districts. Accompanied by a geologic compilation map of the county.

Bingler, E. C., Precambrian rocks of the Tusas Mountains: New Mexico Geol. Soc., Guidebook 25th field conf., p. 109-113, 1974a

Summarizes the general geology, petrology, and metamorphism of Precambrian rocks in the Tusas Mountains, eastern Rio Arriba County.

Bingler, E. C., Metallic mineral deposits of the Tusas Mountains: New Mexico Geol. Soc., Guidebook 25th field conf., p. 317-322, 1974b

Describes the geology, mineral deposits, and mining history of the Hopewell and Bromide districts, Tusas Mountains, eastern Rio Arriba County. Includes a section on Precambrian iron deposits at Iron Mountain, Cleveland Gulch, and La Madera Mountain, eastern Rio Arriba County.

Black, B. A., The geology of the northern and eastern parts of the Ladron Mountains, Socorro County, New Mexico: M. S. thesis, Univ. New Mexico, 117 p., 7 figs., 11 pls., map scale 1:31,680, 1964

Describes the stratigraphy, structure, and economic geology of the Ladron Mountains, north-central Socorro County. Includes an extensive section on the petrology and metamorphism of Precambrian rocks exposed in the core of the range. Subdivides the Precambrian into: 1) Torres schist, 2) Blue Canyon quartzite, 3) Bright gneiss, 4) Capirote granite, 5) Ladron granite, 6) Loyd Ranch granite, and 7) dikes and sills. Two other Precambrian units, 1) Bug Springs gneiss, and 2) Cerro Colorado gneiss, appear on the map (apparently taken from E. A. Noble, 1950) but are not described in the text of the report. The map area is included in a recent map by Condie (1976).

Blakestad, R. B., Jr., Geology of the Kelly mining district, Socorro County, New Mexico:

New Mexico Bureau Mines Mineral Resources, Open-file Rept. 43, 140 p., 13 figs., 2 pls., map scale 1:1,000, 1976

Describes the stratigraphy, igneous petrology, structure, and economic geology of the Kelly mining district, Magdalena Mountains, central Socorro County. Includes a section on Precambrian rocks, which are subdivided into: 1) argillite and schist, 2) felsite, 3) granite, and 4) gabbro and diabase. Accompanying geologic map shows Precambrian rocks, undivided, exposed in several fault blocks along the eastern margin of the map area.

Bolivar, S. L., see Mukhopadhyay, B., and Brookins, D. G., 1975

Bonnichsen, W., General aspects of the Precambrian rocks of the Lemitar Mountains, Socorro County, New Mexico (abs.): New Mexico Geol. Soc., Guidebook 13th field conf., p. 174, 1962

Describes the geology, petrology, and structure of Precambrian metaigneous and metasedimentary rocks exposed along the eastern flank of the Lemitar Mountains, central Socorro County. Subdivides the Precambrian into: 1) granite gneiss, 2) schist, 3) quartzite, 4) pegmatite dikes, 5) gabbrodiorite, 6) amphibolite, and 7) metadiabase.

Bromfield, C. S., and Wrucke, C. T., Reconnaissance geologic map of the Cedar Mountains, Grant and Luna Counties, New Mexico: U. S. Geol. Survey, Misc. Field Studies Map, MF-159, scale 1:62,500, 1961

One small area of Precambrian granite is exposed on the north side of the Cedar Mountains.

Brookins, D. G., Preliminary report to Los Alamos Scientific Laboratory on the Rb-Sr geochronology of six samples from Granite Test Hole One-Barley Canyon Site: unpub. report to Los Alamos Scientific Laboratory, 5 p., 1973a

Brookins, D. G., Summary and interpretation of radiometric age determinations from the Sandia Mountains, north-central New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 5, no. 6, p. 467, 1973b

Summarizes U-Pb and Th-Pb ages for cogenetic zircons and sphenes; Rb-Sr ages for apatites, sphenes, epidotes, muscovites, and whole-rocks; and K-Ar ages for biotites, all from the Sandia Mountains, eastern Bernalillo and Sandoval Counties.

Brookins, D. G., Summary of recent Rb-Sr determinations from the Precambrian rocks of north-central New Mexico: New Mexico Geol. Soc., Guidebook 25th field conf., p. 119-121, 1 table, 1974a

Rb-Sr age determinations on: 1) metarhyolite and pegmatites from La Madera (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County; 2) Embudo Granite from the Sangre de Cristo Mountains, eastern Taos County; 3) trondhjemite from Brazos Peak Area, Tusas Mountains, northeastern Rio Arriba County; 4) Cibola gneiss and Sandia granite, Sandia Mountains, eastern Bernalillo County; 5) quartz latite and granodiorite from the Nacimiento Mountains, north-central Sandoval County; and 6) granite and amphibolite from L.A.S.L. geothermal project Test Drill Hole No. One, Jemez Mountains, north-central Sandoval County.

Brookins, D. G., Radiometric age determinations from the Florida Mountains, New Mexico: Geology, v. 2, no. 11, p. 555-557, 2 figs., 2 tables, 1974b

Summarizes the general geology of the Florida Mountains, central Luna County.

Gives Rb-Sr whole-rock ages for the two major intrusive bodies in the range, one of which is clearly Precambrian.

Brookins, D. G., Radiometric age determinations from the Sandia granite, New Mexico: Isochron/West, no. 10, p. 11-14, 1 table, 1974c

Summary and interpretation of radiometric ages from Precambrian Sandia granite, Sandia Mountains, eastern Bernalillo County.

Brookins, D. G., Enz, R. D., Kudo, A. M., and Shafiqullah, M., K-Ar and Rb-Sr age determinations of orbicular granite, Sandia Mountains, New Mexico: Isochron/West, no. 12, p. 11-12, 1975

Lists age determinations on four biotite separates and one whole rock from five orbicular Sandia granite samples collected in the Sandia Crest (7½-min) quadrangle, eastern Bernalillo County.

Brookins, D. G., and Shafiqullah, M., K-Ar ages for pegmatitic and metamorphic muscovites, Sandia Mountains, New Mexico: Isochron/West, no. 12, p. 9, 1975

Briefly reports three age dates on Precambrian muscovites from: 1) folded pegmatite – 1417 ± 30 m.y.; 2) non-folded pegmatite – 1384 ± 29 m.y.; 3) metasediment – 1376 ± 29 m.y. All samples come from the Rincon area in the Sandia Mountains east of Albuquerque, eastern Bernalillo County.

Brookins, D. G., see Mukhopadhyay, B., and Bolivar, S. L., 1975; and Taggart, J. E., 1975

Brown, B. N., Geology of the Sedillo-Cedro Canyon area, Bernalillo County, New Mexico: M. S. thesis, Univ. New Mexico, 64 p., 4 figs., 3 pls., map scale 1:24,000, 1962

Describes the stratigraphy, structure, and economic geology of the Sedillo-Cedro Canyon area on the eastern flanks of the Manzanita and Sandia Mountains, eastern Bernalillo County. Includes a very brief section on the general nature of Precambrian mica schist exposed in a small fault block in the western part of the map area. This map area is included in a recently published geologic map by Kelley and Northrop (1975).

Bruns, J. J., Petrology of the Tijeras greenstone, Bernalillo County, New Mexico: M. S. thesis, Univ. New Mexico, 70 p., 2 figs., 10 pls., map scale 1:31,680, 1959

Describes the general geology, structure, petrography, and petrogenesis of Precambrian metamorphic rocks exposed along Tijeras Canyon, in the Sandia Mountains, east-central Bernalillo County. Subdivides the Precambrian into: 1) metasediments, 2) greenstone, 3) quartzite, 4) granite and granite gneiss, 5) metarhyolite, and 6) aplite.

Budding, A. J., Precambrian granite-diabase relationships in the southwestern Sangre de Cristo Mountains (abs.): New Mexico Geol. Soc., Guidebook 19th field conf., p. 210, 1968

Describes two ages of Precambrian granitic intrusion separated by a period of diabase dike emplacement in the southwestern Sangre de Cristo Mountains, northeastern Santa Fe County.

Budding, A. J., Geologic map of the Glorieta quadrangle, Santa Fe County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 24, scale 1:24,000, 1972

Precambrian rocks are subdivided into "Embudo Granite" and "metamorphics," and occupy about one-third of the map area. Includes a description of the geology and petrography of Precambrian metamorphics, gneissic granite, leucogranite, and mafic dikes.

Budding, A. J., Geologic map and sections of the Mora quadrangle, Mora County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map, scale 1:24,000, in preparation

Geologic map and brief description of the Mora (7½-min) quadrangle, Sangre de Cristo Mountains, western Mora County. Precambrian rocks are exposed over more than half the map area and are subdivided into: 1) gneiss, 2) muscovite schist, 3) banded gneiss, 4) amphibolite, and 5) pegmatite dikes.

Budding, A. J., and Condie, K. C., Precambrian rocks of the Sierra Oscura and northern San Andres Mountains: New Mexico Geol. Soc., Guidebook 26th field conf., p. 89-93, 4 figs., 1975

Describes the geology, petrology, and structure of Precambrian rocks that crop out in a more or less continuous belt along the west flank of the Oscura Mountains in southeastern Socorro and southwestern Lincoln Counties, and along the east flank of the northern San Andres Mountains, southeastern Socorro and eastern Sierra Counties.

Budding, A. J., and Hartman, D. J., Precambrian geology of the Sais Quartzite quarry: New Mexico Geol. Soc., Guidebook 14th field conf., p. 204-208, 2 figs., 1963

Describes the general geology, petrology, structure, and metamorphism of Precambrian rocks exposed in the Sais quarry, southern Manzano Mountains, northeast Socorro County. The Precambrian is subdivided into: 1) Sais Quartzite, 2) Blue Springs Schist, and 3) White Ridge Quartzite.

Budding, A. J., see Beers, C. A., and Condie, K. C., 1974; and Condie, K. C., and Beers, C. A., 1974

Burnham, C. W., see Jahns, R. H., 1957; and Jahns, R. H., 1958

Bush, F. V., Romero molybdenum mine near Las Vegas: Mining Sci. Press, v. 110, p. 374, 1912

Butler, A. P., Jr., Tertiary and Quaternary geology of the Tusas-Tres Piedras area, New Mexico: Ph.D. thesis, Harvard Univ., 188 p., map scale 1:63,360, 1946

Includes a geologic map of the Tusas Mountains in eastern Rio Arriba County and along the western margin of Taos County, on which undivided Precambrian rocks occupy approximately the southwestern one-third of the map area.

Cabot, E. C., Fault border of the Sangre de Cristo Mountains north of Santa Fe, New Mexico: Jour. Geology, v. 46, p. 88-105, 12 figs., 1938

Describes the geology and structure of the western flank of the Sangre de Cristo Mountains in Santa Fe, Rio Arriba, and Taos Counties. Very brief mention of Precambrian rocks.

Callender, J. F., see Green, J. A., 1973; and Woodward, L. A., et al., 1975; and Woodward, L. A., and Zilinski, R. E., 1975

Cameron, E. N., Jahns, R. H., McNair, A. H., and Page, L. R., Internal structure of pegmatites: Econ. Geol., Monograph 2, 79 figs., 5 tables, 1949

A detailed description of the general geology and internal features of pegmatites. Examples from New Mexico include: 1) the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County, 2) Several pegmatites from the Petaca district, Tusas Mountains, eastern Rio Arriba County, and 3) several pegmatites from the Elk Mountain district, Sangre de Cristo Mountains, western San Miguel County.

Cargo, D. N., Mineral deposits of the Granite Gap area, Hidalgo County, New Mexico: M. S. thesis, Univ. New Mexico, 70 p., 9 figs., 4 tables, map scale 1″ = 300′, 1959

Describes the general geology, structure, and economic geology of the Granite Gap area, central Peloncillo Mountains, western Hidalgo County. Includes a very brief paragraph on the distribution and general nature of the Precambrian Granite Gap granite. The mineralization is thought to be related to a Late Cretaceous-early Tertiary quartz monzonite porphyry.

Carpenter, J. R., Influence of structural deformation on the mineral paragenesis of the Moppin schist, Rio Arriba County, New Mexico (abs.): Geol. Soc. America, Spec. Paper 87, p. 29-30, 1966

Describes a petrologic and structural study of the Precambrian Moppin schist in Las Tablas quadrangle, Tusas Mountains, eastern Rio Arriba County. Relates metamorphic grade and mineralogy to structural position in a large drag fold.

Carpenter, J. R., Apparent retrograde metamorphism – another example of the influence of structural deformation on metamorphic differentiation: Contr. Mineralogy and Petrology, v. 17, no. 3, p. 173-186, 3 figs., 1 table, 1968

Relates apparent retrograde metamorphism to pressure gradients caused by folding. Uses a metabasalt from the Precambrian Moppin Metavolcanic Series in Las Tablas (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County, as an example.

Case, J. E., see Jones, W. R., and Pratt, W. P., 1964

Cathey, C. A., Precambrian geology of the Montezuma quadrangle, New Mexico: M. S. thesis, Texas Tech. Univ., 70 p., 29 figs., 3 tables, 1 pl., map scale 1:24,000, 1973

Describes the general geology, detailed petrology, and structure of Precambrian rocks exposed in several places along the southeast flank of the Sangre de Cristo Mountains in the Montezuma (7½-min) quadrangle, northwestern San Miguel County. Accompanying map subdivides the Precambrian into: 1) amphibolite schist, and 2) quartzose-feldspathic gneiss. This quadrangle has been published by Baltz (1972).

Cepeda, J. C., Geology of Precambrian rocks of the El Oro Mountains and vicinity, Mora County, New Mexico: M. S. thesis, New Mexico Institute Mining Technology, 63 p., 18 figs., 4 tables, 2 pls., map scale 1:24,000, 1972

Describes the Precambrian petrology, metamorphism, and structure of El Oro Mountains and vicinity, Sangre de Cristo Mountains, southwestern Mora County. Subdivides Precambrian rocks into: 1) granitic gneiss, 2) muscovite schist, 3) banded gneiss, 4) amphibolites, and 5) pegmatite dikes.

Cepeda, J. C., Evidence for multiple Precambrian deformation in the Sangre de Cristo Mountains, New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 5, no. 6, p. 470, 1973

Describes two periods of deformation with associated intrusive activity and metamorphism as expressed in the Sangre de Cristo Mountains south of Mora, western Mora County.

Chamberlin, R. M., Geology of Socorro Peak volcanic center, Socorro County, New Mexico: Ph.D. thesis, Colo. School Mines, in preparation

Describes the geology, petrology, and volcanic stratigraphy of the Socorro and southern Lemitar Mountains, central Socorro County. Includes a section on the distribution and petrology of Precambrian rocks exposed along the eastern flank of the ranges. Subdivides the Precambrian into: 1) metasedimentary complex, 2) amphibolite, 3) granite, 4) diorite, and 5) mafic dikes.

Chapin, C. E., see Woodward, L. A., et al., 1975

Chapman, Wood, and Griswold, Inc., Geologic map of Grants uranium region: New Mexico Bureau Mines Mineral Resources, Geol. Map 31, scale 1:126,720, 1974

Set of three generalized geologic maps of the Grants uranium region of northwestern New Mexico. Includes most of McKinley County and portions of northern Valencia, northwestern Bernalillo, and western Sandoval Counties. Precambrian rocks are undivided and crop out in the Nacimiento and Zuni Mountains. The westernmost of the three map sheets shows Precambrian exposures at the northwestern end of the Zuni Uplift that are not described on any other published mapping at this scale.

Chenoweth, W. L., Uranium in the Petaca, Ojo Caliente, and Bromide districts, Rio Arriba County, New Mexico: New Mexico Geol. Soc., Guidebook 25th field conf., p. 315, 1974

Brief summary of uranium occurrences in Precambrian pegmatites in: the Petaca and Ojo Caliente districts; quartzite at Kiawa Mountain; and quartz-fluorite veins cutting schists in the Bromide district, all in the Tusas Mountains, eastern Rio Arriba County.

Chidester, A. H., Engel, A. E. J., and Wright, L. A., Talc resources of the United States: U. S. Geol. Survey, Bull. 1167, 61 p., 1964

Includes a brief description of talc occurrences in Precambrian metamorphic rocks along Hembrillo Canyon, San Andres Mountains, eastern Sierra and Doña Ana Counties (p. 37-38).

Chinner, G. A., see Schreyer, W., 1966

Clark, K. F., Geology and ore deposits of the Eagle Nest quadrangle, New Mexico: Ph.D. thesis, Univ. New Mexico, 363 p., 19 figs., 8 tables, 25 pls., map scale 1:48,000, 1966a

Describes the general geology, stratigraphy, structure, and economic geology of the Eagle Nest (15-min) quadrangle, Sangre de Cristo Mountains, northeastern Taos and northwestern Colfax Counties. Includes an extensive section on the petrology and metamorphism of Precambrian rocks exposed in the western half of the map area. Subdivides the Precambrian into: 1) metaquartzite, 2) mafic gneiss, 3) granitic rocks, 4) migmatite, 5) quartz veins, 6) pegmatite, 7) granite dikes, and 8) diabase. This report was subsequently published (Clark and Read, 1972).

Clark, K. F., Geology of the Sangre de Cristo Mountains and adjacent areas, between Taos and Raton, New Mexico: New Mexico Geol. Soc., Guidebook 17th field conf., p. 56-65, 3 figs., 1966b

Includes several paragraphs on the general geology of Precambrian metamorphic and granitic rocks of the northern Sangre de Cristo Mountains, eastern Taos and western Colfax Counties.

Clark, K. F., and Read, C. B., Geology and ore deposits of Eagle Nest area, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 94, 152 p., 23 figs., 8 tables, map scale 1:48,000, 1972

Includes a discussion of the geology, petrology, stratigraphy, metamorphism, and structure of Precambrian rocks exposed in the western half of the map area. Precambrian rocks are subdivided into: 1) granitic rocks, 2) migmatite, 3) mafic gneiss, 4) metaquartzite, 5) diabase, 6) quartz vein, 7) pegmatite, 8) granite dikes. Describes Precambrian ore deposits a) copper in the Rio Hondo district western Taos County, and b) gold, iron, and graphite in the Red River district, western Taos County.

Clemons, R. E., see Seager, W. R., and Hawley, J. W., 1971

Condie, K. C., Geochronologic and lithologic framework of Precambrian rocks in the southwestern United States (abs.): New Mexico Geol. Soc., Guidebook 26th field conf., p. 336, 1975

Identifies six major episodes of magmatic activity in the Precambrian of the southwestern United States, and characterizes each with respect to dominant lithologies and deformational style. Proposes a tentative model for the evolution of Precambrian rocks of the Southwest.

Condie, K. C., Geologic map of Precambrian rocks of the Ladron Mountains, Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 38, scale 1:24,000, 1976

Mapped Precambrian rocks are subdivided into: 1) feldspathic quartzite, 2) arkosite, 3) quartzite, 4) conglomeratic quartzite, 5) amphibolite-phyllite, 6) a felsic metavolcanic sequence, 7) Capirote granite, and 8) Ladron quartz monzonite. Short text describes the geology, petrography, and stratigraphy of Precambrian rocks in the map area.

Condie, K. C., Beers, C. A., and Budding, A. J., Precambrian rocks of the Los Pinos Mountains, central New Mexico; Part II, Origin of granitic and volcanic rocks (abs.): Geol. Soc. America, Abs. with Programs, v. 6, no. 5, p. 436, 1974

An extensive geochemical characterization and discussion of Precambrian granitic plutons and siliceous metavolcanics exposed in Los Pinos Mountains, northeastern Socorro County.

Condie, K. C., see Beers, C. A., and Budding, A. J., 1974; and Budding, A. J., 1975

Corbitt, L. L., Structure and stratigraphy of the Florida Mountains, Luna County, New Mexico: Ph.D. thesis, Univ. New Mexico, 115 p., 43 figs., 1 table, 3 pls., map scale 1:24,000, 1971

Describes the general geology, stratigraphy, and structure of the Florida Mountains, central Luna County. Includes a section on the petrology and metamorphism of Precambrian rocks exposed in the northwestern part of the range. Subdivides the Precambrian into: 1) metamorphic rocks, 2) igneous rocks (granite), and 3) diamictite. A large intrusive body of "Mesozoic syenite" at the southern end of the range subsequently has proved to be Precambrian granite and metamorphics.

Corbitt, L. L., Geology of the Florida Mountains, Luna County, New Mexico (abs.): New Mexico Geol. Soc., Guidebook 25th field conf., p. 382, 1974

Mentions two ages of Precambrian rocks – 1400 m.y. metamorphics in north and 1130 ± 200 m.y. granite in south. Also notes the presence of Precambrian diamictite underlying the Bliss Formation.

Corbitt, L. L., and Woodward, L. A., Upper Precambrian diamictite of the Florida Mountains, southwestern New Mexico: Geol. Soc. America, Bull., v. 84, no. 1, p. 171-174, 3 figs., 1973

Describes an upper Precambrian diamictite, consisting of igneous and sedimentary clasts in a shaley matrix, that outcrops in the northwestern Florida Mountains near Capitol Dome, central Luna County.

Corey, A. F., Kyanite deposits of the Petaca district, Rio Arriba County, New Mexico: Ph.D. thesis, Univ. Michigan, 1953

This work has been published as New Mexico Bureau of Mines and Mineral Resources Bulletin 47 (Corey, 1960).

Corey, A. F., Kyanite occurrences in the Petaca district, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 47, 70 p., 11 figs., 9 tables, 9 pls., 1960

Describes the general geology, detailed petrology, structure, and metamorphism of Precambrian rocks in the southeastern part of Las Tablas (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County. Includes sections on the geology, mineralogy, and origin of associated Precambrian kyanite deposits.

Corey, A. F., see Heinrich, E. W., 1959

Cserna, E., Structural geology and stratigraphy of the Fra Cristobal quadrangle, Sierra County, New Mexico: Ph.D. thesis, Columbia Univ., 16 figs., 1 table, map scale 1:48,000, 1956

Describes the general geology, stratigraphy, and structure of the Fra Cristobal (15-min) quadrangle, now subdivided into the Romero Canyon, Lava, Black Bluffs, and Crocker (7½-min) quadrangles, Fra Cristobal Mountains, north-central Sierra County. Includes a very brief section on the distribution and petrology of Precambrian rocks exposed along the northwest flank of the range. Precambrian rocks are undivided on the accompanying geologic map.

Cunningham, J. E., Geologic map and sections of Silver City quadrangle, Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 30, scale 1:24,000, 1974

Precambrian rocks are subdivided into "granite" and "metamorphics," and are exposed in the west-central part of the map area.

Cunningham, J. E., Geologic map and sections of Circle Mesa quadrangle, Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map, scale 1:24,000, in preparation

Dane, C. H., and Bachman, G. O., Preliminary geologic map of the northwestern part of New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-244, scale 1:380,160, 1957

Uncolored preliminary geologic map of the northwestern one-quarter of New Mexico. A compilation from previous workers, modified and supplemented by U. S. Geological Survey reconnaissance mapping. Precambrian rocks are undivided.

Dane, C. H., and Bachman, G. O., Preliminary geologic map of the southeastern part of New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-256, scale 1:380,160, 1958

Uncolored preliminary geologic map of the southeastern one-quarter of New Mexico. A compilation from previous workers modified and supplemented by U. S. Geological Survey reconnaissance mapping. Precambrian rocks are undivided.

Dane, C. H., and Bachman, G. O., Preliminary geologic map of the southwestern part of New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-344, scale 1:380,160, 1961

Preliminary geologic map of the southwestern one-quarter of New Mexico. A compilation from previous workers, modified and supplemented by U. S. Geological Survey reconnaissance mapping. Precambrian rocks are undivided.

Dane, C. H., and Bachman, G. O., Geologic map of New Mexico: U. S. Geol. Survey, scale 1:500,000, 1965

State geologic map – a compilation from previous workers, modified and

supplemented by U. S. Geological Survey reconnaissance mapping. Precambrian rocks are undivided.

Dane, C. H., see Bachman, G. O., 1962

Dapples, F. C., see Stark, J. T., 1946

Darton, N. H., Geology and underground water of Luna County, New Mexico: U. S. Geol. Survey, Bull. 618, 188 p., 15 figs., 13 pls., map scale approx. 1:183,000, 1916

Includes a brief section on the character, distribution, and petrography of Precambrian rocks (mainly granite) exposed: 1) in the Florida Mountains, 2) on the slopes south and north of Fluorite Ridge, 3) in a small outcrop in the midst of the Klondike Hills, and 4) in the north end of the Cookes Range.

Darton, N. H., Description of the Deming (30-min) quadrangle, Luna County, New Mexico: U. S. Geol. Survey, Geol. Folio no. 207, 1917

Darton, N. H., "Red Beds" and associated formations in New Mexico: U. S. Geol. Survey, Bull. 794, 356 p., 173 figs., 62 pls., 1928

Discusses the general stratigraphy of the state with a short section on the distribution of Precambrian rocks. Most of the paper is devoted to the local geology of selected areas, and includes detailed geologic maps of: 1) part of Valencia and Socorro Counties, 2) the Zuni Mountains, 3) the Nacimiento uplift and Chama basin, 4) the San Andres Mountains, 5) the Oscura Mountains, and 6) the Sacramento Mountains.

Daugherty, F. W., and Asquith, G. B., Orbicular rocks from Sandia Mountains, Bernalillo County, New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 3, no. 6, p. 375-376, 1971

Discusses the petrography and petrogenesis of an orbicular dike that cuts Precambrian Sandia granite in the Sandia Mountains, eastern Bernalillo County.

Davis, G. L., see Aldrich, L. T., and Wetherill, G. W., 1957; and Aldrich, L. T., Wetherill, G. W., and Tilton, G. R., 1958

Denison, R. E., and Hetherington, E. A., Jr., Basement rocks in far west Texas and south-central New Mexico, *in* Border stratigraphy symposium: New Mexico Bureau Mines Mineral Resources, Circ. 104, p. 1-16, 3 figs., 3 tables, 1969

Briefly summarizes the Precambrian geology and radiometric age data from: 1) Bent Dome, northern Otero County, 2) Pajarito Peak, northeastern Otero County, 3) the Sacramento Mountains, central Otero County, and 4) the San Andres Mountains, eastern Doña Ana and Sierra Counties.

Denison, R. E., see Muehlberger, W. R., 1964; and Muehlberger, W. R., and Lidiak, E. G., 1967; and Muehlberger, W. R., Hedge, C. E., and Marvin, R. F., 1966

Doney, H. H., Geology of the Cebolla quadrangle, Rio Arriba County, New Mexico: Ph.D. thesis, Univ. Texas (Austin), 1966

Published as New Mexico Bureau of Mines and Mineral Resources Bulletin 92 (1968).

Doney, H. H., Geology of the Cebolla quadrangle, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 92, 114 p., 21 figs., 1 table, 1 pl., map scale 1:48,000, 1968

Describes the general geology, stratigraphy, structure, and mineral resources of the Cebolla (15-min) quadrangle, Tusas Mountains, east-central Rio Arriba County. Includes descriptions of the Precambrian Moppin and Kiawa Mountain Formations, the Burned Mountain Metarhyolite, and the Maquinita Granodiorite, units exposed in the north and northeasternmost portions of the map area.

Dorman, J. H., Structure of the Priest Granite, Manzano Mountains, New Mexico: M. S. thesis, Northwestern Univ., 46 p., 9 pls., map scale 1:60,343, 1951

A statistical analysis of fracture and joint directions developed in the Precambrian Priest Granite, south Manzano Mountains, southeastern Valencia and western Torrance Counties. Includes a short section on the distribution and megascopic petrology of the granite.

Doyle, J. C., Geology of the northern Caballo Mountains, Sierra County, New Mexico: M. S. thesis, New Mexico Institute Mining Technology, 51 p., 3 figs., 19 pls., map scale 1:31,680, 1951

Describes the stratigraphy, structure, and ore deposits of the northern Caballo Mountains, central Sierra County. Includes a very brief section on the distribution and general nature of Precambrian rocks exposed along the lower part of the west flank of the range. The accompanying map shows Precambrian rocks undivided.

DuChene, H. R., Structure and stratigraphy of Guadalupe Box and vicinity, Sandoval County, New Mexico: M. S. thesis, Univ. New Mexico, 100 p., 17 figs., map scale 1:24,000, 1973

Describes the general geology, stratigraphy, and structure of the Guadalupe Box and vicinity, southern Nacimiento Mountains, central Sandoval County. Includes a section on the petrology of Precambrian rocks exposed in the western and central map areas. Subdivides the Precambrian into: 1) mafic inclusions, 2) hornblende-biotite quartz monzonite gneiss, 3) biotite quartz monzonite gneiss, 4) leuco-quartz monzonite gneiss, 5) granodiorite gneiss, and 6) granite. The northern two-thirds of the map has been published as part of the San Miguel Mountain (7½-min) quadrangle (Woodward, DuChene, and Reed, 1974).

DuChene, H. R., see Woodward, L. A., and Reed, R. K., 1974; and Woodward, L. A., Martinez, R., Schumacher, O. L., and Reed, R. K., 1974

Dunham, K. C., The geology of the Organ Mountains: New Mexico Bureau Mines Mineral Resources, Bull. 11, 272 p., 21 figs., 14 pls., map scale 1:62,500, 1935

Comprehensive description of the geology, petrology, metamorphism, structure, and mineral deposits of the Organ Mountains, eastern Doña Ana County. Includes a section on the geology and petrography of Precambrian metamorphic and igneous rocks ("basement complex") exposed along the eastern flank of the mountains. Also describes the geology and mineral resources of Doña Ana County. A detailed geologic map of the Organ mining district (scale 1:24,000) that accompanies the report, subdivides the Precambrian into: 1) quartzite, 2) schist, 3) granite, and 4) epidiorite dikes.

Dunn, D. E., see Nielson, K. C., 1974

Eaton, G. P., see Ericksen, G. E., Wedow, H., Jr., and Leland, G. R., 1970

Edwards, G. H., Geology of the central Little Burro Mountains, Grant County, New Mexico: M. A. thesis, Univ. Kansas, 60 p., 28 figs., 2 pls., map scale 1:24,000, 1961

Describes the stratigraphy, structure, and economic geology of the central Little Burro Mountains, south-central Grant County. Includes a short section on the distribution and petrology of Precambrian rocks exposed throughout the range. Subdivides the Precambrian into: 1) metamorphic rocks, and 2) Burro Mountains batholith-granite and related rocks. The report describes quartz veins carrying Pb and Cu sulfides ± Au and Ag that cut the Precambrian granite along the west flanks of the range, but no age is postulated for the mineralization.

Ellis, R. W., Geology of the Sandia Mountains: New Mexico State Univ., Bull. 108, Geol. Series, v. 3, no. 4, 45 p., 2 figs., 4 pls., 1922

Describes the geography, stratigraphy, structure, and mineral resources of the Sandia Mountains, Bernalillo and Sandoval Counties. Includes a section on geology and petrology of Precambrian rocks that distinguishes: 1) granite, 2) schist, 3) gneiss and quartz schist.

Elston, W. E., Geology and mineral resources of Dwyer quadrangle, Grant, Luna, and Sierra Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 38, 86 p., 8 figs., 10 tables, 8 pls., map scale 1:48,000, 1957

Describes the general geology, structure, and ore deposits of the Dwyer (15-min) quadrangle, southeastern Grant and north-central Luna (but not Sierra) Counties, with an emphasis on Tertiary volcanic stratigraphy, petrography, and petrogenesis. Includes a brief mention of Precambrian granite and granite gneiss exposed at the northern end of the Cookes Range, Grant and Luna Counties.

Elston, W. E., Reconnaissance geologic map of the Virden 30-minute quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 15, scale 1:126,720, 1960

Precambrian granite and metamorphic rocks crop out in east-central and southeastern map area, in the Big Burro Mountains, central Grant County; in the Knight Mountain area, southwest of the Big Burro Mountains; and about 4 miles northeast of Virden, northern Hidalgo County.

Elston, W. E., Summary of the mineral resources of Bernalillo, Sandoval and Santa Fe Counties, New Mexico (exclusive of oil and gas): New Mexico Bureau Mines Mineral Resources, Bull. 81, 81 p., 13 tables, 2 pls., 1967

Includes a brief description of some Cu-Zn occurrences ± Au, in Precambrian greenstones, and several Au prospects in Precambrian quartzite, in the Tijeras Canyon district, Manzanita Mountains, Bernalillo County. Also mentions showings of Au-Ag-Cu and Pb-Zn in Precambrian rocks along the upper reaches of the Santa Fe River and its tributaries, in the Mikado subdistrict of the Santa Fe district, Sangre de Cristo Mountains, northeastern Santa Fe County.

Emerick, W. L., Geology of the Golden area, Santa Fe County, New Mexico: M. S. thesis, Univ. New Mexico, 66 p., 8 pls., map scale 1:31,680, 1950

Describes the general geology, stratigraphy, structure, and economic geology of the Golden area, northeast of the Sandia Mountains, southwestern Santa Fe County. Includes a brief section on the distribution and general nature of Precambrian rocks exposed in the Monte Largo Hills southwest of Golden. Subdivides the Precambrian into: 1) quartzite, 2) gneiss, and 3) greenstone. The northern part of the map area is contained in the Madrid (15-min) quadrangle (Bachman, 1974).

Engle, A. E. J., see Chidester, A. H., and Wright, L. A., 1964

Entwistle, L. P., Manganiferous iron-ore deposits near Silver City, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 19, 72 p., 11 figs., 10 pls., map scale 1:6,000, 1944

Describes the general geology, structure, and iron-ore deposits south and west of Silver City, central Grant County. Includes a short section on Precambrian granite that crops out in the southwest corner of the Boston Hill district, Silver City Range.

Enz, R. D., Geochemistry and petrology of the orbicular rocks, Sandia Mountains, New Mexico: M. S. thesis, Univ. New Mexico, 73 p., 42 figs., 1 table, 1974

Describes the geochemistry, petrography, and petrogenesis of orbicular rocks associated with the Precambrian Sandia granite, Sandia Mountains, eastern Bernalillo County.

Enz, R. D., see Brookins, D. G., Kudo, A. M., and Shafiqullah, M., 1975

Ericksen, G. E., Wedow, H., Jr., Eaton, G. P., and Leland, G. R., Mineral resources of the Black Range primitive area, Grant, Sierra, and Catron Counties, New Mexico: U. S. Geol. Survey, Bull. 1319-E, 162 p., 15 figs., 7 tables, 2 pls., 1970

An evaluation of the mineral potential of the Black Range primitive area in Grant, Sierra, and Catron Counties with a summary of the geology, structure, and mineral resources. Includes a very brief section on the Precambrian that distinguishes granite and hornblende-chlorite schist.

Fallis, J. F., Jr., Geology of the Pedernal Hills area, Torrance County, New Mexico: M. S. thesis, Univ. New Mexico, 50 p., 3 figs., 2 pls., map scale 1:63,360, 1958

Describes the general geology, stratigraphy, and structure of the Pedernal Hills, north-central Torrance County. Includes a brief section on the petrology and metamorphism of Precambrian rocks exposed over approximately one-third of the map area. Subdivides the Precambrian into: 1) quartzite, 2) phyllite, 3) sericite-chlorite schist, 4) greenstone, and 5) granite.

Feinberg, H. B., Geology of the central portion of the Sandia granite, Sandia Mountains, Bernalillo County, New Mexico: M. S. thesis, Univ. New Mexico, 127 p., 4 figs., 4 tables, 12 pls., map scale 1″ = 2,000′, 1969

A detailed description of the petrology of the various phases of the Precambrian Sandia granite, central Sandia Mountains, northeastern Bernalillo County. Includes a short description of Precambrian structures. Subdivides the Sandia granite into: 1) Sandia granite, 2) biotite-rich granite, 3) pluglike aplite, 4) aplite and pegmatite dikes, 5) orbicular granite, 6) zones of hematite-chlorite-epidote alteration, and 7) younger granite porphyry.

Fitzsimmons, J. P., Precambrian rocks of the Albuquerque country: New Mexico Geol. Soc., Guidebook 12th field conf., p. 90-96, 1961

Summarizes the geology, petrology, structure, and metamorphism of Precambrian rocks exposed in the: 1) Sandia Mountains, eastern Sandoval and Bernalillo Counties, 2) Manzanita Mountains, southeastern Bernalillo County, and 3) Manzano Mountains, southeastern Bernalillo, western Torrance and southeastern Valencia Counties. The Precambrian is subdivided into: 1) quartzite, 2) quartz-mica schists, 3) quartz-feldspar gneisses, 4) greenstone, 5) metarhyolite, 6) granite, 7) pegmatites, 8) aplites, and 9) lamprophyres.

Fitzsimmons, J. P., Precambrian of the Four Corners area: Four Corners Geol. Soc., 4th field conf., p. 13-20, 1 fig., 1963

Includes a summary of subsurface Precambrian data from oil tests in the New Mexico portion of the Four Corners area, San Juan, McKinley, and western Rio Arriba Counties.

Fitzsimmons, J. P., Orbicular granites of the Sandia Mountains, New Mexico (abs.): New Mexico Geol. Soc., Guidebook 17th field conf., p. 120, 1966

Brief description of the geology and petrology of an orbicular phase of the Precambrian Sandia granite, Sandia Mountains, eastern Bernalillo County.

Fitzsimmons, J. P., Precambrian rocks of the Zuni Mountains: New Mexico Geol. Soc., Guidebook 18th field conf., p. 119-121, 1 fig., 1967

Brief summary of Precambrian rocks, mainly granite, that are extensively exposed along the crestal zone of the Zuni Mountains, northwestern Valencia County and south-central McKinley Counties.

Fitzsimmons, J. P., see Woodward, L. A., 1967

Flawn, P. T., Summary of southeast New Mexico basement rocks: New Mexico Geol. Soc., Guidebook 5th field conf., p. 114-116, 1 fig., 1954

Brief description, based on oil tests, of the geology and petrology of Precambrian basement rocks in Otero, Eddy, Chaves, Lea, Roosevelt, and Curry Counties. The Precambrian surface is contoured, and various igneous and metamorphic terranes are outlined.

Flawn, P. T., Basement rocks of Texas and southeast New Mexico: Texas Univ. Bureau Econ. Geol. Pub. 5605, 261 p., 2 figs., 12 tables, 10 pls., 1956

Describes the geology and petrography of Precambrian basement rocks of Texas and southeast New Mexico as determined from well cores. Includes data from the subsurface of Roosevelt, Chaves, Lea, Otero, Eddy, and Curry Counties.

Flawn, P. T., see Wasserburg, G. J., Wetherill, G. W., and Silver, L. T., 1962

Flower, R. H., see Kottlowski, F. E., Thompson, M. L., and Foster, R. W., 1956

Foster, R. W., Stratigraphy of west-central New Mexico: Four Corners Geol. Soc., Guidebook 2nd field conf., p. 62-72, 6 figs., 1 table, 1957

A general summary of the stratigraphy of west-central New Mexico (McKinley, Valencia, northern Catron, and northwestern Socorro Counties) with isopach maps. Precambrian information comes from the Zuni Mountains and three oil tests south of the Zunis; includes a generalized Precambrian surface map.

Foster, R. W., Precambrian rocks of the Sacramento Mountains and vicinity: Roswell Geol. Soc., Guidebook for joint field conf. in the Sacramento Mountains of Otero County, New Mexico, p. 137-153, 1 fig., 1 table, 1959

Describes the geology and petrology of Precambrian rocks in Otero, southern Lincoln, and southwestern Chaves Counties. Information comes from outcrops along the western edge of the Sacramento Mountains, Otero County, and near Bent, northern Otero County, and from twenty-one oil tests.

Foster, R. W., A regional look at the Precambrian of New Mexico (abs.): New Mexico Geol. Soc., Guidebook 17th field conf., p. 120-121, 1966

Subdivides the Precambrian of New Mexico into three major rock types: 1) granite, 2) metamorphics, and 3) rhyolite, using data from outcrops and oil tests. Includes radiometric ages and a description of the Precambrian surface.

Foster, R. W., Oil and gas potential of a proposed site for the disposal of high-level radioactive waste: New Mexico Bureau Mines Mineral Resources, Open-file Rept. 48, 296 p., 1974

Includes three pages on Precambrian basement lithologies based on oil test data, and a contour map on the Precambrian surface in southern Eddy and Lea Counties just north of the Texas-New Mexico border.

Foster, R. W., Frentress, R. M., and Riese, W. C., Subsurface geology of east-central New Mexico: New Mexico Geol. Soc., Spec. Pub. No. 4, 22 p., 11 figs., 1972

Includes a relief map of the Precambrian surface of east-central New Mexico and a map subdividing the Precambrian into a number of lithologic terranes.

Foster, R. W., and Stipp, T. F., Preliminary geologic and relief map of the Precambrian rocks of New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 57, 37 p., scale 1:609,231, 1961

A statewide map showing generalized Precambrian outcrop geology and topography on the Precambrian surface. The Precambrian is subdivided into areas of: 1) undifferentiated rocks, 2) granite and related rocks, 3) rhyolite, 4) quartzite, and 5) undifferentiated metamorphic rocks. Includes extensive references and a table of all oil test data for wells drilled to the Precambrian.

Foster, R. W., see Kottlowski, F. E., Flower, R. H., and Thompson, M. L., 1956

Frentress, R. M., see Foster, R. W., and Riese, W. C., 1972

Friedman, I., see Barker, F., 1974; and Barker, F., Arth, J. G., and Peterman, Z. E., 1976

Fullagar, P. D., and Shiver, W. S., Geochronology and petrochemistry of the Embudo Granite, New Mexico (abs.): (EOS) Am. Geophys. Union, Trans., v. 54, no. 4, p. 496, 1973a

Gives a Rb-Sr whole-rock age for the crystallization of the Embudo Granite in the southern Sangre de Cristo Mountains of Taos and Rio Arriba Counties. Also uses Sr^{87}/Sr^{86} ratios to speculate on magma origins.

Fullagar, P. D., and Shiver, W. S., Geochronology and petrochemistry of the Embudo Granite, New Mexico: Geol. Soc. America, Bull., v. 84, p. 2705-2712, 7 figs., 3 tables, 1973b

Deals with the Precambrian Embudo Granite that crops out in the Picuris Range of the southern Sangre de Cristo Mountains of Taos and Rio Arriba Counties. Uses whole-rock Rb-Sr analyses to establish both a crystallization date for the granite and a younger thermal event. Includes nine chemical analyses.

Fuller, G. W., see Tschanz, C. M., and Laub, D.C., 1958

Gibson, G. G., see Woodward, L. A., and McLelland, D., in preparation

Giles, D. L., Massive sulfide deposits in Precambrian rocks, northern New Mexico (abs.): New Mexico Geol. Soc., Guidebook 25th field conf., p. 378, 1974

Suggests that: 1) reinterpretation of the origin of the Zn-Pb-Cu-Ag-Au deposit at Terrero, Sangre de Cristo Mountains, San Miguel County; and 2) recognition of large

areas of mafic and felsic metavolcanic rocks in the Precambrian of northern New Mexico make that part of the state a volcanogenic massive sulfide province.

Giles, D. L., Precambrian mineralization in the southern Rocky Mountain region (abs): Geol. Soc. Am., Abs. with programs, v. 8, no. 5, p. 586-587, 1976a

Classifies Precambrian-age mineralization from central Wyoming to northern New Mexico as: 1) magmatic, 2) regional and contact metamorphic, 3) volcanogenic exhalative, 4) fissure vein, 5) pegmatite, and 6) sedimentary. Cites the Pecos mine, Sangre de Cristo Mountains, western San Miguel County, as an example of 3, and pegmatites in the Picuris Range, Sangre de Cristo Mountains, southern Taos County, as an example of 5.

Giles, D. L., Precambrian mineralization in the southern Rocky Mountain region: New Mexico Geol. Soc., Spec. Pub. No. 6, p. 127-131, 2 figs., 1976b

Brief description of Precambrian mineralization as it occurs in a variety of lithologic terranes in central Wyoming, Colorado, and northern New Mexico. Notes Precambrian-age occurrences in the : 1) Tusas Mountains, eastern Rio Arriba County; 2) Sangre de Cristo Mountains, Taos, Mora, San Miguel, and Santa Fe Counties, and 3) Zuni Mountains, northwestern Valencia County.

Giles, D. L., see Thompson, T. B., 1974

Gillerman, E., Fluorspar deposits of the Burro Mountains, and vicinity, Grant County, New Mexico: U. S. Geol. Survey, Bull. 973-F, p. 261-289, 1 fig., 14 pls., 1952

Describes fluorspar deposits localized along faults, mainly in Precambrian granite which, along with some schist and quartzite, forms the main mass of the Burro Mountains. The fluorspar is genetically related to post-middle Tertiary volcanic rocks. Includes a short petrographic description of the Precambrian granitic rocks, and a number of geologic maps of individual deposits and their Precambrian host rocks.

Gillerman, E., Geology of the central Peloncillo Mountains, Hidalgo County, New Mexico and Cochise County, Arizona: New Mexico Bureau Mines Mineral Resources, Bull. 57, 152 p., 1 fig., 2 tables, 14 pls., map scale 1:48,000, 1958

Describes the geology, petrology, structure, metamorphism, and mineral deposits of the central Peloncillo Mountains, west-central Hidalgo County. Includes a brief description of the geology and petrology of the Precambrian Granite Gap Granite, a body that crops out in the central part of the map area.

Gillerman, E., Mineral deposits of western Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 83, 213 p., 34 figs., 3 tables, 11 pls., 11 photos, map scale 1:126,720, 1964

Describes the general geology, structure, and mineral deposits of western Grant County. Includes a brief section on Precambrian metamorphic and igneous rocks, and subdivides the mapped Precambrian into: 1) Bullard Peak Series, 2) Ash Creek Series, 3) metadiabase, 4) Burro Mountain Granite, and 5) intrusive diabase. Precambrian rocks crop out over much of the south-central and southern map area.

Gillerman, E., Mineral deposits and structural pattern of the Big Burro Mountains, New Mexico: New Mexico Geol. Soc., Guidebook 21st field conf., p. 115-121, 1 fig., 1970

Summarizes the general geology, petrology, structure, and mineral deposits of the Big Burro Mountains, central Grant County. Precambrian rocks comprise the core of the range, and are subdivided into an older Bullard Peak Series and a younger Burro Mountain batholith complex. Precambrian mineralization is

characterized by small pegmatites and contact metamorphic effects marginal to the Burro Mountain batholith.

Gillerman, E., and Whitebread, D. H., Uranium-bearing nickel-cobalt-silver deposits, Black Hawk district, Grant County, New Mexico: U. S. Geol. Survey, Bull. 1009-K, p. 283-313, 5 figs., 3 tables, 3 pls., 1956

Describes the geology, petrology, and ore deposits of the northeastern foothills of the Big Burro Mountains in central Grant County. Includes sections on the geology and petrography of Precambrian quartz diorite gneiss, quartzite, schist, monzonite, and quartz monzonite. The gneiss is the most common host for fissure veins carrying Ni-Co-Ag-U, although the deposits are considered to be Tertiary in age.

Goddard, E. N., 21 and 27 fluorspar mines, Valencia County, Zuni Mountains, New Mexico: U. S. Geol. Survey, Open-file Rept. and Map, map scale 1″ = 200′, 1945

Brief summary of the geology and fluorspar deposits in the southeastern Zuni Mountains, northwestern Valencia County. Precambrian gneissic granite in host to the fluorite veins, although the mineralization is thought to be younger.

Goddard, E. N., Geologic map and sections of the Zuni Mountains fluorspar district, Valencia County, New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-454, 1:31,680, 1966

Brief description of the geology, structure, and fluorspar deposits of the southeastern Zuni Mountains, northwestern Valencia County. Precambrian rocks crop out over a majority of the map area, and are subdivided into fifteen metamorphic and igneous units.

Goldsmith, L. A., see Sheffer, H. W., 1969

Gonzalez, R. A., Petrography and structure of the Pedernal Hills, Torrance County, New Mexico: M. S. thesis, Univ. New Mexico, 78 p., 15 figs., 1 table, map scale 1:50,688, 1968

Describes the petrology, metamorphism, and structure of Precambrian rocks exposed in the Pedernal Hills, north-central Torrance County. Subdivides the Precambrian into the following map units: 1) granitic gneiss, 2) quartzite, 3) schist, 4) cataclasite, and 5) granite.

Gonzalez, R. A., and Woodward, L. A., Petrology and structure of Precambrian rocks of the Pedernal Hills, New Mexico: New Mexico Geol. Soc., Guidebook 23rd field conf., p. 144-147, 1 fig., map scale 1:147,350, 1972

Summarizes the general geology, petrology, metamorphism, and structure of the Precambrian rocks of the Pedernal Hills, north-central Torrance County. Includes a generalized geologic map which subdivides the Precambrian into: 1) metaquartzite, 2) heterogeneous unit, 3) granitic gneiss, 4) granite, and 5) cataclasite.

Goodknight, C. S., Structure and stratigraphy of the central Cimarron Range, Colfax County, New Mexico: M. S. thesis, Univ. New Mexico, 84 p., 26 figs., map scale 1:24,000, 1973

Describes the general geology, stratigraphy, structure, and ore deposits of the central Cimarron Range, Sangre de Cristo Mountains, west-central Colfax County. Includes a short section on the petrology and metamorphism of Precambrian rocks exposed along the southern margin of the map area. Subdivides the Precambrian into: 1) undifferentiated metamorphic rocks, 2) meta-granodiorite, and 3) meta-diabase.

Goolsby, R. S., Geology of the Lamy-Cañoncito area, Santa Fe County, New Mexico: M. S. thesis, Univ. New Mexico, 68 p., 1 fig., 1 pl., map scale 1:27,550, 1965

Describes the general geology, stratigraphy, structure, and ore deposits of the Lamy-Cañoncito area, southern Sangre de Cristo Mountains, east-central Santa Fe County. Includes a very brief section on the distribution and general nature of Precambrian rocks exposed in the northwest portion of the map area. Subdivides the Precambrian into: 1) gneiss, and 2) schist.

Gordon, C. H., see Lindgren, W., and Graton, L. C., 1910

Graton, L. C., see Lindgren, W., 1906; and Lindgren, W., and Gordon, C. H., 1910

Green, J. A., and Callender, J. F., 1973, Hornblende-hornfels facies metamorphism in a contact aureole adjacent to the Sandia Mountain pluton (abs.): Geol. Soc. America, Abs. with Programs, v. 7, no. 7, p. 642-643, 1973

Describes the geology and mineralogy of a contact metamorphic aureole developed in Precambrian metamorphic rocks adjacent to the Sandia granite in the northern Sandia Mountains, southeast Sandoval County.

Gresens, R. L., Tectonic-hydrothermal pegmatites I, the model: Contr. Mineralogy and Petrology, v. 15, p. 345-355, 7 figs., 1967a

Postulates a relatively static, metasomatic origin for complex zoned pegmatites that utilizes 1) an alkali chloride intergranular fluid phase, and 2) deformationally produced low pressure zones in the host rock. This is the first of a two-part article that leads into a discussion of some Precambrian pegmatites from the Petaca district, Tusas Mountains, eastern Rio Arriba County.

Gresens, R. L., Tectonic-hydrothermal pegmatites II, an example: Contr. Mineralogy and Petrology, v. 16, p. 1-28, 8 figs., 9 tables, 1967b

Describes the geology, structure, mineralogy, chemistry, and origin of the Kiawa pegmatites, Petaca District, Tusas Mountains, eastern Rio Arriba County.

Gresens, R. L., Application of hydrolysis equilibria to the genesis of pegmatite and kyanite deposits in northern New Mexico: Mtn. Geologist, v. 8, p. 3-16, 19 figs., 1 table, 1971

Describes the general geology, Precambrian pegmatites, and kyanite deposits of the Petaca district, Tusas Mountains, eastern Rio Arriba County. Develops a chemical model to explain the origin of the pegmatites, the kyanite deposits, and other regional alteration patterns.

Gresens, R. L., Staurolite-quartzite bands in kyanite at Big Rock, Rio Arriba County, New Mexico – a discussion: Contr. Mineralogy and Petrology, v. 35, p. 193-199, 1 table, 1972a

Discusses a possible metasomatic origin for staurolite-quartzite bands in kyanite quartzite of the Precambrian Petaca schist at Big Rock, Tusas Mountains, eastern Rio Arriba County.

Gresens, R. L., Geochronology of Precambrian rocks of northern New Mexico (abs.): Arizona Acad. Sci. Jour., v. 7, Proc. Supp., p. 39, 1972b

Gives details of new K-Ar and Rb-Sr dates on Precambrian rocks from the Las Tablas area, Tusas Mountains, eastern Rio Arriba County and the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Gresens, R. L., Geochronology of Precambrian metamorphic rocks, north-central New Mexico: Geol. Soc. America, Bull., v. 86, no. 10, p. 1444-1448, 2 figs., 4 tables, 1975

Describes new K-Ar and Rb-Sr dates for Precambrian rocks from the Las Tablas-La Madera area, in the Tusas Mountains, eastern Rio Arriba County, and from the

Picuris Range, Sangre de Cristo Mountains, southern Taos County. Data define three metamorphic and/or hydrothermal events at: 1257 ± 21 m.y.; 1325 ± 13 m.y.; and 1425 m.y.

Gresens, R. L., Geologic, geochemical, and geochronologic investigation of Precambrian metamorphic rocks of the Las Tablas-La Madera quadrangles and the Picuris Range, northern New Mexico – a summary: New Mexico Geol. Soc., Spec. Pub. No. 6, p. 132-137, 1 fig., 1976

Describes the widespread occurrrence of recrystallized metarhyolite in the Precambrian of: 1) Las Tablas (15-min) and La Madera (7½-min) quadrangles, Tusas Mountains, eastern Rio Arriba County, and 2) the Picuris Range, Sangre de Cristo Mountains, southern Taos County. Includes a detailed discussion of metarhyolite alteration, associated kyanite and pegmatite deposits, Precambrian stratigraphy and structure, and geochronology.

Gresens, R. L., and Stensrud, H. L., Variation of trace elements in metamorphic muscovite (abs.): Geol. Soc. America, Abs. with Programs, Rocky Mtn. Sec., p. 42, 1968

Describes variations in trace element geochemistry of muscovite from Precambrian schists collected in Las Tablas area, Tusas Mountains, eastern Rio Arriba County. Discusses the possibility that such data may be used to define a pre-metamorphic stratigraphy.

Gresens, R. L., and Stensrud, H. L., Geochemistry of muscovite from Precambrian metamorphic rocks of northern New Mexico: Geol. Soc. America, Bull., v. 85, p. 1581-1594, 10 figs., 8 tables, 1974a

Presents chemical, field, and textural evidence for metasomatic derivation of quartz-muscovite schist from metarhyolite in the Precambrian of: 1) Las Tablas area, Tusas Mountains, eastern Rio Arriba County, and 2) the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Gresens, R. L., and Stensrud, H. L., Recognition of more metarhyolite occurrences in northern New Mexico and a possible Precambrian stratigraphy: Mtn. Geologist, v. 11, no. 3, p. 109-124. 18 figs., 1 table, 1974b

Discusses recognition of Precambrian metarhyolites by means of chemical, petrographic, and field techniques in: 1) Las Tablas area, Tusas Mountains, eastern Rio Arriba County, and 2) Picuris Range, Sangre de Cristo Mountains, southern Taos County. Re-evaluates the Precambrian stratigraphy in each area and attempts to establish a regional correlation.

Gresens, R. L., see Stensrud, H. L., 1969; and Stensrud, H. L., 1970; and Stensrud, H. L., 1971; and Stensrud, H. L., 1973

Gries, J., see Woodward, L. A., et al., 1975

Griggs, R. L., and Hendrickson, G. E., Geology and ground-water resources of San Miguel County, New Mexico: New Mexico Bureau Mines Mineral Resources, Ground-water Rept. 2, 121 p., 2 figs., 3 tables, 6 pls., map scale 1:316,800, 1951

Includes a paragraph on the distribution of Precambrian rocks in a general summary of the geology and structure of San Miguel County. Contains a compilation geologic map of the county showing Precambrian rocks undivided.

Griswold, G. B., Mineral deposits of Lincoln County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 67, 117 p., 31 figs., 11 tables, 12 pls., map scale 1:377,143, 1959

Includes one paragraph on the distribution of Precambrian rocks in Lincoln County. No economic mineralization is reported from the Precambrian. Has a compilation geologic map of the county on which the Precambrian is undivided.

Griswold, G. B., Mineral deposits of Luna County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 72, 157 p., 24 figs., 14 tables, 10 pls., 1961

Describes the general geology, stratigraphy, structure, and mineral deposits of Luna County. Includes a brief section on the distribution and petrology of Precambrian rocks. Precambrian is exposed in five places in the county: 1) Florida Mountains, 2) Fluorite Ridge, 3) Cookes Range, 4) Klondike Hills, and 5) west of Cow Springs, in the extreme northwestern part of the county. Precambrian mineral deposits are limited to a single occurrence in the Florida Mountains, central Luna County, where a vein of copper-sulfides cuts Precambrian diorite. Precambrian undivided is shown on one map – the Fluorite Ridge mining district (scale 1:21,120).

Gruner, J. W., Geologic reconnaissance of the southern part of the Taos Range, New Mexico: Jour. Geology, v. 28, p. 731-742, 4 figs., 1 pl., 1920

Describes the general geology of a portion of the Sangre de Cristo Mountains in east-central Taos County, includes a section on the geology and distribution of Precambrian rocks which are subdivided into: 1) ancient gneisses and schists, 2) metasediments, 3) intrusive granites, and 4) basic dikes.

Haederle, W. F., Structure and metamorphism in the southern Sierra Ladrones, Socorro County, New Mexico: M. S. thesis, New Mexico Institute Mining Technology, 58 p., 24 figs., map scale 1:12,185, 1966

Describes the Precambrian geology, petrology, metamorphism, and structure of the southern Ladron Mountains, north-central Socorro County. Precambrian rocks are subdivided into: 1) lower quartzite, 2) hornblende schist, 3) upper quartzite, 4) massive amphibolite, 5) granodiorite augen gneiss, 6) red granodiorite, and 7) younger granodiorite. This area has been remapped in greater detail by Condie (1976).

Hahn, A. D., see Rothrock, H. E., and Johnson, C. H., 1946

Haliburton, J. L., see Sidwell, R. G., 1948

Hall, R. B., see Santos, E. S., and Weisner, R. C., 1975

Hansen, W. R., see Barker, F., and Peterman, Z. E., 1973

Harbour, R. L., see Bachman, G. O., 1970

Harley, G. T., The geology and ore deposits of Sierra County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 10, 220 p., 19 figs., 11 pls., map scale 1:337,021, 1934

Describes the general geology, stratigraphy, structure, and mineral deposits of Sierra County. Includes a brief paragraph on the distribution and nature of Precambrian rocks in the county. Reports no known Precambrian ore deposits or deposits localized in Precambrian host rocks. Generalized county geologic map shows Precambrian "granites and schists" cropping out: 1) along the west flank of the Caballo Mountains, 2) along the eastern flank of the Black Range, and 3) along the west flank of the Fra Cristobal Range.

Harley, G. T., The geology and ore deposits of northeastern New Mexico (exclusive of Colfax County): New Mexico Bureau Mines Mineral Resources, Bull. 15, 104 p., 11 figs., 5 pls., map scale 1:1,022,000, 1940

Describes the general geology, stratigraphy, and structure of Union, Mora, Harding, San Miguel, Quay, and Guadalupe Counties. Includes a short section on the distribution and nature of Precambrian rocks in the report area, and contains a generalized geologic map showing outcrops of Precambrian undivided. Chapters dealing with mineral deposits of Mora and San Miguel Counties detail a number of Precambrian deposits and occurrences. This bulletin also contains one of the two most comprehensive descriptions of the geology, mining, and production history of the Precambrian Pecos mine (Zn-Pb-Cu + Au-Ag) in western San Miguel County.

Harrer, C. M., Iron, *in* Mineral and Water Resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 87, p. 176-183, 1 fig., 1 table, 1965

Includes brief mention of Precambrian iron formation in the 1) Hopewell-Iron Mountain-Burned Mountain-Cleveland Gulch area, Tusas Mountains, eastern Rio Arriba County, and 2) Cabresto Creek area, Sangre de Cristo Mountains, northeast Taos County.

Harrer, C. M., and Kelly, F. J., Reconnaissance of iron resources in New Mexico: U. S. Bureau Mines, Inf. Circ. 8190, 122 p., 25 figs., 26 tables, 1963

Describes the location, general geology, and economic potential of a number of iron occurrences in New Mexico. Includes brief descriptions of iron in Precambrian rocks in Rio Arriba, Taos, and Santa Fe Counties.

Hartman, D. J., see Budding, A. J., 1963

Hawley, J. W., see Seager, W. R., and Clemons, R. E., 1971

Hayes, P. T., Geology of the Precambrian rocks of the northern end of the Sandia Mountains, Bernalillo and Sandoval Counties, New Mexico: M. S. thesis, Univ. New Mexico, 54 p., 4 pls., map scale 1:20,050, 1951

Describes the detailed petrology, structure, and economic geology of Precambrian rocks of the northern end of the Sandia Mountains, northeast Bernalillo and southeast Sandoval Counties. Subdivides the Precambrian into: 1) quartzite and mica schist, 2) feldspathic and sillimanitic micaceous schist, 3) greenstone, 4) Sandia granite, and 5) granitic dikes and sills. The accompanying map distinguishes only two Precambrian rock types: 1) Juan Tabo sequence of metamorphic rocks, and 2) sandia granite.

Hays, W. H., see Robinson, G. D., Wanek, A. A., and McCallum, M. E., 1964; and Wanek, A. A., Read, C. B., Robinson, G. D., and McCallum, M. E., 1964

Hedge, C. E., see Muehlberger, W. R., Denison, R. E., and Marvin, R. F., 1966

Hedlund, D. C., Geologic map of the Hillsboro quadrangle, Sierra and Grant Counties, New Mexico: U. S. Geol. Survey, Open-file Map, scale 1:48,000, 1975a

Uncolored geologic map of a 15-minute quadrangle in the Black Range of southwestern Sierra County (and a small part of Grant County). Precambrian rocks are subdivided into: 1) granite of Seven Brothers Mountain, 2) granite of Dumm Canyon, 3) granophyre of North Percha Creek, 4) quartzofeldspathic gneiss of Tank Canyon, and 5) hornblende schist, amphibolite, chlorite schist, and phyllite. Most of the Precambrian outcrops are along the north half of the western margin of the map area.

Hedlund, D. C., Geologic map of the San Lorenzo quadrangle, Grant and Sierra Counties, New Mexico: U. S. Geol. Survey, Open-file Map, scale 1:48,000, 1975b

Uncolored geologic map of a 15-minute quadrangle in the Black Range of southeastern Grant County (and a small part of Sierra County). Precambrian rocks are subdivided into: 1) granite of Seven Brothers Mountain, 2) granophyre of North Percha Creek, 3) quartzofeldspathic gneiss and leuco-granite of upper Silver Creek Canyon, and 4) hornblende and chorite schist of Mimbres Valley.

Heinrich, E. W., and Buchi, S. H., Beryl-chrysoberyl-sillimanite paragensis in pegmatites: The Indian Mineralogist, v. 10, p. 1-7, 4 figs., 1969

Includes a brief section on the mining history, general geology, and mineralogy of the Old Priest pegmatite in the Sangre de Cristo Mountains of west-central San Miguel County.

Heinrich, E. W., and Corey, A. F., Manganian andalusite from Kiawa Mountain, Rio Arriba County, New Mexico: Am. Mineralogist, v. 44, p. 1261-1271, 3 figs., 5 tables, 1959

Details the geology, petrology, and mineralogy of manganian andalusite that occurs in kyanite-hematite quartzite of the Precambrian Kiawa Mountain Formation at Kiawa Mountain, Tusas Mountains, eastern Rio Arriba County.

Heinrich, E. W., and Levinson, A. A., Studies in the mica group; mineralogy of the rose muscovites: Am. Mineralogist, v. 38, p. 25-49, 5 figs., 4 tables, 1 pl., 1953

Describes the mineralogy and paragenesis of rose muscovite, with a section on New Mexico occurrences including: 1) the Harding and Pilar pegmatites, Picuris Range, Sangre de Cristo Mountains, southern Taos County; 2) the Pidlite pegmatites, Sangre de Cristo Mountains, western Mora County, and 3) the Petaca pegmatites, Tusas Mountains, eastern Rio Arriba County.

Helsley, C. E., and Spall, H. R., A compilation of paleomagnetic investigations of rocks from North America: (EOS) Am. Geophys. Union, Trans., v. 47, no. 1, p. 291-302, 13 figs., 2 tables, 1966

Indicates the presence of a single paleomagnetic investigation in New Mexico (by H. R. Spall in the Sangre de Cristo Mountains, Taos, Mora, San Miguel, and Santa Fe Counties).

Henderson, E. P., see Schaller, W.T., 1926

Henderson, W. T., see Barker, F., Peterman, Z. E., and Hildreth, R. E., 1974

Hendrickson, G. E., see Griggs, R. L., 1951

Herber, L. J., Structural petrology and economic features of the Precambrian rocks of La Joyita Hills: M. S. thesis, New Mexico Institute Mining Technology, 36 p., 6 figs., 5 pls., map scale 1:15,304, 1963a

Describes the general geology, petrology, structure, and economic features of Precambrian rocks in La Joyita Hills, central Socorro County. Subdivides the Precambrian into: 1) gneiss series, 2) amphibolites, 3) quartz-feldspar schists, 4) quartz-feldspar-biotite schists, 5) epidosite, 6) pegmatites, and 7) aplite dikes. Geologic map published in Herber (1963b).

Herber, L. J., Precambrian rocks of La Joyita Hills: New Mexico Geol. Soc., Guidebook 14th field conf., p. 180-184, 2 figs., map scale 1:43,100, 1963b

Describes the geology, petrology, and structure of a Precambrian gneiss complex

in La Joyita Hills, central Socorro County. The Precambrian is subdivided into: 1) gneiss series, 2) amphibolite, 3) quartz-K feldspar ± biotite schist, 4) epidosite, 5) pegmatites, and 6) aplite dikes.

Hernon, R. M., Jones, W. R., and Moore, S. L., Geology of the Santa Rita quadrangle, New Mexico: U. S. Geol. Survey, Quad. Map, GQ-306, scale 1:24,000, 1964

Geologic map of the Santa Rita (7½-min) quadrangle, about eight miles east of Silver City in east-central Grant County. Precambrian biotite-granite gneiss crops out in one place in the north-central map area. The geology of this quadrangle is described in great detail in U. S. Geol. Survey Prof. Pap. 555 (Jones, et al., 1967).

Hernon, R. M., see Jones, W. R., and Moore, S. L., 1967

Herrick, C. L., Geology of the San Pedro and Albuquerque districts: Univ. New Mexico, Bull., v. 1, p. 93-116, 1899

Herrick, C. L., Report on a geological reconnaissance in western Socorro and Valencia Counties, New Mexico: Am. Geologist, v. 25, p. 331-346, 2 pls., 1900

Geological travelogue in which older "granite" is encountered at several places along a trip through Bernalillo, Sandoval, Valencia, and Catron (originally western Socorro) Counties.

Hess, F. L., The natural history of the pegmatites: Eng. and Mining Jour., v. 120, p. 289-298, 17 figs., 1925

Briefly discusses mineral relations and paragenesis of some Petaca pegmatites, Tusas Mountains, eastern Rio Arriba County.

Hess, F. L., and Wells, R. C., Samarskite from Petaca, New Mexico: Am. Jour. Sci., 5th series, v. 19, p. 17-26, 2 figs., 1930

Describes the physical and chemical properties of samarskite (Y, Ce, U, Ca, Pb) $(Nb, Ta, Ti, Sn)_2O_6$, from the Fridlund mine, Petaca district, Tusas Mountains, eastern Rio Arriba County.

Hetherington, E. A., Jr., see Denison, R. E., 1969

Hewitt, C. H., Geology and mineral deposits of the northern Big Burro Mountains-Redrock area, Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 60, 151 p., 3 figs., 10 tables, 13 pls., map scale 1:48,000, 1959

Describes the general geology, petrology, structure, and mineral resources of the northern Big Burro Mountains, west-central Grant County. Includes an extensive section on the petrology and structure of the Precambrian. Precambrian rocks form the core of the Big Burro Mountains, and are subdivided into: 1) an older Bullard Peak Series, and 2) a younger Ash Creek Series, both of which occur as xenoliths and roof pendants in the Precambrian Burro Mountains batholith. Precambrian metamorphic deposits of serpentinite, asbestos, and magnetite in Ash Creek rocks are of mineralogic significance only.

Hildreth, R. E., see Barker, F., Peterman, Z. E., and Henderson, W. T., 1974

Hilpert, L. S., Uranium resources of northwestern New Mexico: U. S. Geol. Survey, Prof. Paper 603, 166 p., 1969

Gives a very short, general description of Precambrian rocks of northwestern New Mexico. Includes a brief description of uranium occurrences in Precambrian

pegmatites and fluorite-quartz veins in the Ortega Quartzite near Petaca, Tusas Mountains, eastern Rio Arriba County.

Holdaway, M. J., Effect of rock and fluid composition on chloritoid-staurolite equilibria, Picuris Range, New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 7, no. 7, p. 1119, 1975

A geochemical evaluation of metamorphic conditions in adjacent folded Precambrian units in the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Holmquist, R. J., Exploration of the Elk Mountain mica deposit, San Miguel County, New Mexico: U. S. Bureau Mines, Rept. Inv. 3921, 7 p., 5 figs., 1 table, 1946

Describes the location, mining history, general geology of the Elk Mountain mica-pegmatite deposit, Sangre de Cristo Mountains, San Miguel County. Includes details on U. S. Bureau of Mines development work, sampling, assaying, and mica grade.

Holmquist, R. J., Apache mica mine, Rio Arriba County, New Mexico: U. S. Bureau Mines, Rept. Inv. 4037, 5 p., 2 figs., 1947

Describes the location, mining history, and geology, of the Apache pegmatite, Petaca district, Tusas Mountains, eastern Rio Arriba County. Includes details of U. S. Bureau of Mines development work.

Hubbell, A. H., Pecos mine – a new zinc-lead project: Eng. and Mining Jour., v. 122, no. 26, p. 1004-1012., 1926

Hutchinson, R. A., Geology of the Burned Mountain area, Rio Arriba County, New Mexico: M. S. thesis, Colorado School Mines, 96 p., 24 figs., 5 tables, 3 pls., map scale 1:12,000, 1968

Describes the geology, stratigraphy, structure, and economic potential of Precambrian and Tertiary rocks exposed in the Burned Mountain area, Tusas Mountains, east-central Rio Arriba County. Includes an extensive section on the distribution and petrography of Precambrian rocks. Subdivides the Precambrian into: 1) Moppin Metavolcanic Series, 2) Burned Mountain Metarhyolite, 3) Kiawa Mountain Formation, 4) diorite, 5) Maquinita Granodiorite, 6) granite and aplite, 7) gabbro porphyry, and 8) gabbro dikes. Contains a section on Precambrian deposits of Cu-Pb-Zn (in the Moppin Metavolcanic Series) and Au (now concentrated in placers, but possibly originating from conglomerates in the Kiawa Mountain Formation).

Hutson, O. C., Geology of the northern end of San Pedro Mountain, Rio Arriba and Sandoval Counties, New Mexico: M. S. thesis, Univ. New Mexico, 55 p., 6 figs., 2 pls., map scale 1:31,680, 1958

Describes the general geology, stratigraphy, structure, and economic geology of the northern end of San Pedro Mountain, north-central Sandoval and south-central Rio Arriba Counties. Includes a very brief paragraph on the distribution and general nature of Precambrian rocks exposed along the Nacimiento-San Pedro fault and on San Pedro Mountain.

Huzarski, J. R., Petrology and structure of eastern Monte Largo Hills, New Mexico: M. S. thesis, Univ. New Mexico, 68 p., 4 figs., map scale 1″= 500′, 1971

Describes the general geology, structure, and economic geology of the eastern Monte Largo Hills, Sandia Mountains, northeastern Bernalillo and southwestern Santa Fe Counties. A major part of the report deals with the petrology and metamorphism of

Precambrian rocks exposed over most of the map area. Subdivides the Precambrian into five multiple metamorphic units, granite, pegmatite, and quartz veins.

Jacobs, R. C., Geology of the central front of the Fra Cristobal Mountains, Sierra County, New Mexico: M. S. thesis, Univ. New Mexico, 47 p., 4 figs., 6 pls., map scale 1″ = 700′, 1956

Describes the stratigraphy, structure, and mineral deposits of the central front of the Fra Cristobal Mountains, north-central Sierra County. Includes several paragraphs on the distribution and general nature of Precambrian rocks exposed along the lower part of the west-facing mountain front. The accompanying geologic map shows Precambrian granite and gneiss, undivided.

Jacobs, R. C., Geology of the central front of the Fra Cristobal Mountains, New Mexico (abs.): New Mexico Geol. Soc., Guidebook 8th field conf., p. 256-257, 1957

Describes the general geology, stratigraphy, structure, and mineral deposits of the central part of the western front of the Fra Cristobal Mountains, north-central Sierra County. Area contains some Precambrian granite gneiss.

Jahns, R. H., Mica deposits of the Petaca district, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull 25, 293 p., 28 figs., 25 pls., 1946a

A comprehensive treatment of the geology and mineralogy of mica-bearing Precambrian pegmatites in the Petaca district, Tusas Mountains, eastern Rio Arriba County. Includes a section on the general geology of the area, as well as brief descriptions of mica-pegmatites in the Ojo Caliente district, Tusas Mountains, eastern Rio Arriba County, and the Elk Mountain district, Sangre de Cristo Mountains, western San Miguel County.

Jahns, R. H., Lithium-tantalum pegmatites in Mora County, New Mexico (abs.): Geol. Soc. America, Bull. 57, p. 1208, 1946b

Describes the geology and mineralogy of the Pidlite pegmatite, Rociada district, Sangre de Cristo Mountains, western Mora County.

Jahns, R. H., Milling improves northern New Mexico scrap mica outlook: Eng. and Mining Jour., v. 149, p. 96-100, 6 figs., 1948

Describes new milling procedures used on Precambrian mica-pegmatites in the Petaca district, Tusas Mountains, eastern Rio Arriba County. Includes a brief mining history and general geologic description.

Jahns, R. H., see Cameron, E. N., et al, 1949

Jahns, R. H., Geology, mining, and uses of strategic pegmatites: Mining Eng., v. 190, no. 1, p. 45-59, 18 figs., 6 tables, 1951

General survey of pegmatite geology, economic mineralogy, and mining. Includes examples of Precambrian pegmatites in northern New Mexico: 1) Harding pegmatite, in the Picuris Range of the Sangre de Cristo Mountains, southern Taos County, and 2) the Petaca district, Tusas Mountains, eastern Rio Arriba County.

Jahns, R. H., The genesis of pegmatites I, occurrence and origin of giant crystals: Am. Mineralogist, v. 38, no. 7 and 8, p. 563-598, 19 figs., 1953a

Describes the general features, distribution, and origin of giant crystals in pegmatites. Uses examples from, among other places, the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County, and the Petaca district, Tusas Mountains, eastern Rio Arriba County.

Jahns, R. H., The genesis of pegmatites II, quantitative analysis of lithium-bearing pegmatite, Mora County, New Mexico: Am. Mineralogist, v. 38, no. 11, p. 1078-1112, 8 figs., 8 tables, 1953b

Describes the geology, mineralogy, chemistry, and genesis of the Pidlite pegmatites, Rociada district, Sangre de Cristo Mountains, western Mora County.

Jahns, R. H., Geology of the Sierra Cuchillo, New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., p. 158-174, 7 figs., map scale 1:176,000, 1955

Describes the general geology, stratigraphy, structure, metamorphism, and mineral deposits of the Sierra Cuchillo Range, northwestern Sierra County (with a small extension into Socorro County). A small wedge of Precambrian amphibolite and metarhyolite is exposed along the western flank of the southern part of the range opposite Winston.

Jahns, R. H., Structural and petrogenic relationships of pegmatites in the Petaca district, New Mexico: New Mexico Geol. Soc., Guidebook 25th field conf., p. 371-376, 6 figs., 1974

Summarizes the geology, structure, wall-rock relations, and origin of Precambrian pegmatites in the Petaca district, Tusas Mountains, eastern Rio Arriba County.

Jahns, R. H., and Adams, J. W., Beryl deposits in the Harding pegmatites, Taos County, New Mexico (abs.): Econ. Geology, v. 48, no. 4, p. 328-329, 1953

A brief discussion of the mineralogy of beryl occurrences at the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Jahns, R. H., and Burnham, C. W., Preliminary results from experimental melting and crystallization of the Precambrian-age Harding, New Mexico, pegmatite (abs.): Geol. Soc. America, Bull., v. 68, no. 12, p. 1751-1752, 1957

Brief description of experimental results from samples of the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Jahns, R. H., and Burnham, C. W., Experimental studies of pegmatite genesis: melting and crystallization of granite and pegmatite (abs.): Geol. Soc. America, Bull., v. 69, no. 12, p. 1592-1593, 1958

Describes laboratory studies of liquidus-solidus relations and crystallization features of natural representatives of the system "granite-water," including samples from the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Jahns, R. H., Smith, C. T., and Muehlberger, W. R., Ojo Caliente quadrangle, Rio Arriba and Taos Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Open-file Map, scale 1:24,000, in preparation

Jahns, R. H., and Wright, L. A., The Harding beryllium-tantalum-lithium pegmatites, Taos County, New Mexico (abs.): Econ. Geology, v. 39, no. 1, p. 96-97, 1944

Describes the general geology and beryllium-tantalum-lithium mineralogy of the Precambrian Harding pegmatite in the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Jahns, R. H., and Wright, L. A., Origin of the remarkable beryl concentrations in the Harding pegmatite, New Mexico (abs.): Geol. Soc. America, Bull., v. 70, no. 12, p. 1725, 1959

Discusses beryl mineralogy, distribution, and genesis in the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County.

James, H. L., see Bayley, R. W., 1973

Jicha, H. L., Jr., Kyanite deposits on Belen Grant, sec. 1, T3N, R3E, and sec. 35, T4N, R3E, Valencia County, New Mexico: New Mexico Bureau Mines Mineral Resources, unpub. field notes, 2 p., 1 fig., 1951

Brief description of some kyanite-quartz veins in the Precambrian White Ridge Quartzite in the southern Manzano Mountains, southeast Valencia County.

Jicha, H. L., Jr., Geology and mineral deposits of the Lake Valley quadrangle, Grant, Luna, and Sierra Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 37, 93 p., 13 figs., 8 tables, 5 pls., map scale 1:59,774, 1954

Describes the general geology, stratigraphy, structure, and mineral deposits of the Lake Valley (15-min) quadrangle, north-central Luna, southwestern Sierra, and southeastern Grant Counties. Includes a very brief description of Precambrian granite exposed over a small area at the extreme northern end of the Cookes Range along the western margin of the map area.

Jicha, H. L., Jr., and Lochman-Balk, C., Lexicon of New Mexico geologic names: Precambrian through Paleozoic: New Mexico Bureau Mines Mineral Resources, Bull 61, 137 p., 1958

Includes all published geologic names applied to Precambrian rocks in New Mexico through 1958, along with original references and type localities.

Johnson, C. H., see Rothrock, H. E., and Hahn, A. D., 1946

Johnson, J. H., Iceland spar in Taos County, New Mexico: Am. Mineralogist, v. 25, no. 2, p. 151-152, 1940a

Brief description of the location, geology, origin, and mining of an optical grade calcite deposit near the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Johnson, J. H., Iceland spar mine in New Mexico: Mines Mag., v. 30, no. 2, p. 59-60, 1940b

Johnson, R. B., Geologic map of Villanueva quadrangle, San Miguel County, New Mexico: U. S. Geol. Survey, Geol. Quad. Map GQ-869, scale 1:62,500, 1970

Geologic map of the Villanueva (15-min) quadrangle, southern Sangre de Cristo Mountains, western San Miguel County. Precambrian rocks, undivided, crop out in the north-central map area.

Jones, F. A., New Mexico mines and minerals, Santa Fe: New Mexico Printing Co., 349 p., 1904

Contains a brief summary of the geology and ore deposits of New Mexico, a list of New Mexico minerals, and historical accounts of a number of mining districts-including several with Precambrian deposits and/or host rocks.

Jones, W. R., Case, J. E., and Pratt, W. P., Aeromagnetic and geologic map of part of the Silver City mining region, Grant County, New Mexico: U. S. Geol. Survey, Geophys. Inv. Map GP-424, scale 1:63,360, 1964

Combination aeromagnetic and reconnaissance geologic map that includes "Precambrian to Devonian," undivided, three to four miles west of Hurley, central Grant County.

Jones, W. R., Hernon, R. M., and Moore, S. L., General geology of the Santa Rita quadrangle,

Grant County, New Mexico: U. S. Geol. Survey, Prof. Paper 555, 144 p., 50 figs., 23 tables, 3 pls., map scale 1:24,000, 1967

Includes a brief section on the geology and petrography of Precambrian granitic gneiss that crops out in one place just east of Fierro in the north-central part of the map area.

Jones, W. R., see Hernon, R. M., and Moore, S. L., 1964

Just, E., Geology and economic features of the pegmatites of Taos and Rio Arriba Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 13, 73 p., 1 fig., 3 pls., 1937

Details the general geology, stratigraphy, and Precambrian mineral resources of: 1) the Petaca district, Tusas Mountains, eastern Rio Arriba County, and 2) the Picuris Range, Sangre de Cristo Mountains, southern Taos County. Has lengthy sections on the stratigraphy and petrology of Precambrian rocks from both areas.

Kalish, P., Geology of the Water Canyon area, Magdalena Mountains, Socorro County, New Mexico: M. S. thesis, New Mexico Institute Mining Technology, 48 p., 4 figs., 3 pls., map scale 1:15,840, 1953

Describes the geology, structure, and ore deposits of the east-central portion of the Magdalena Mountains, central Socorro County. Includes a section on the geology and petrology of Precambrian greenstone and granite exposed along the northwest side of Water Canyon.

Kane, M. F., see Andreasen, G. E., and Zietz, I., 1962

Kaufman, W. H., Structure, stratigraphy, and ore deposits of the central Nacimiento Mountains, New Mexico: M. S. thesis, Univ. New Mexico, 87 p., 21 figs., 1 table, map scale 1:24,000, 1971

Describes the stratigraphy, structure, and economic geology of the central Nacimiento Mountains, north-central Sandoval and south-central Rio Arriba Counties. Includes a very brief section on the distribution and petrography of Precambrian rocks exposed in the western and northeastern portions of the map area. Subdivides the Precambrian into: 1) quartz monzonite, 2) quartz monzonite gneiss, and 3) mafic dikes. This map area has been included in published mapping by Woodward et al. (1972, 1973, 1973, 1974).

Kaufman, W. H., see Woodward, L. A., Anderson, J. B., and Reed, R. K., 1973; and Woodward, L. A., and Anderson, J. B., 1972; and Woodward, L. A., and Reed, R. K., 1973; and Woodward, L. A., McLelland, D., and Anderson, J. B., 1972; and Woodward, L. A., and McLelland, D., 1974

Kelley, V. C., Iceland spar in New Mexico: Am. Mineralogist, v. 25, p. 357-367, 3 figs., 1940

Describes the general geology, mineralogy, and possible origin of an optical-grade calcite deposit in Precambrian hornblende schist adjacent to the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Kelley, V. C., Stratigraphy and structure of the Gallinas Mountains, New Mexico (abs.): Geol. Soc. America, v. 57, p. 1254, 1946

Kelley, V. C., Geology and economics of New Mexico iron-ore deposits: Univ. New Mexico, Pubs. Geology, no. 5, 246 p., 46 figs., 16 pls., 1949

Includes only a brief mention of Precambrian banded magnetite deposits north of Red Rock, along the west side of the Big Burro Mountains, southwestern Grant County.

Kelley, V. C., Precambrian rocks of the San Juan Basin: New Mexico Geol. Soc., Guidebook 1st field conf., p. 53-55, 1 fig., 1950

Very brief summary of the general geology of Precambrian rocks bordering the San Juan Basin that crop out in the : 1) Tusas Mountains, central Rio Arriba County, 2) Nacimiento Mountains, north-central Sandoval County, and 3) Zuni Mountains, northwest Valencia and south-central McKinley Counties.

Kelley, V. C., Geologic map of the Sierra County region, New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., scale 1:154,536, 1955

Geologic compilation map of the eastern two-thirds of Sierra County showing Precambrian, undivided, cropping out: 1) along the eastern flank of the San Andres Mountains, 2) along the western flank of the Fra Cristobal Mountains, 3) along the western edge of the Caballo Mountains, 4) on the southwest corner of the Mud Springs Mountains, and 5) in the west-central part of the Cuchillo Mountains.

Kelley, V. C., Geologic map of the Sandia Mountains and vicinity, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 18, scale 1:48,000, 1963

Geologic map of the Sandia Mountains and Monte Largo Hills area, Bernalillo, Sandoval, and Santa Fe Counties. Precambrian rocks are subdivided into: 1) muscovite schist, 2) quartzite, 3) gneiss, 4) Sandia granite, 5) greenstone and chlorite schist, and 6) Precambrian undifferentiated in the Monte Largo area. This map is replaced by one accompanying New Mexico Bureau of Mines and Mineral Resources Memoir 29 (Kelley and Northrop, 1975).

Kelley, V. C., Geology of the alkaline Precambrian rocks at Pajarito Mountain, Otero County, New Mexico: Geol. Soc. America, Bull., v. 79, p. 1565-1572, 2 figs., 5 pls., 1968

Describes the geology, petrography, and petrogenesis of syenitic Precambrian rocks that form the core of Pajarito Mountain, northeast Otero County.

Kelley, V. C., Geology of the Pecos country, southeastern New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 24, 75 p., 26 figs., 1 table, 7 pls., 1971

Describes the general geology, stratigraphy, and structure of southeast Lincoln, eastern Otero, western Chaves, and western Eddy Counties. Includes a short paragraph on Precambrian syenitic rocks at Pajarito Mountain, northeast Otero County, along with a geologic map (scale 1:28,800) and cross section.

Kelley, V. C., Geology of the Fort Sumner sheet, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 98, 55 p., 8 figs., map scale 1:190,843, 1972

Describes the general geology, stratigraphy, igneous petrology, and structure of the Fort Sumner (2°) sheet (104° to 106° W by 34° to 35° N) covering eastern Torrance, northern Lincoln, southern Guadalupe, and De Baca Counties. Precambrian rocks are subdivided into: 1) granite gneiss, 2) mica and chlorite schist, 3) quartzite, and 4) greenstone and metabasalt, that crop out in: 1) Pedernal Hills, northeast Torrance County, 2) Cerrito del Lobo, north-central Torrance County, 3) Rattlesnake Hills, central Torrance County, 4) Cerro del Pino, south-central Torrance County, 5) Chameleon Hills, southeast Torrance County, and 6) Gallinas Mountains, northwest Lincoln County.

Kelley, V. C., and Northrop, S. A., Geology of Sandia Mountains and vicinity, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 29, 136 p., 92 figs., 4 tables, map scale 1:48,000, 1975

Detailed description of the geology, petrology, structure, and mineral resources of the Sandia Mountains, the Monte Largo area, and the north end of the Manzanita Mountains, Bernalillo and Sandoval Counties. Includes a detailed section on Precambrian geology and petrology. Precambrian on the geologic map is subdivided into: 1) mica schist, 2) quartzite, 3) Cibola gneiss, 4) Sandia granite, 5) Tijeras greenstone, and 6) Precambrian undifferentiated in the Monte Largo area. Also has a contour map of the Precambrian surface.

Kelley, V. C., Rothrock, H. E., and Smalley, R. G., Geology and mineral deposits of the Gallinas district, Lincoln County, New Mexico: U. S. Geol. Survey, Prelim. Strategic Mineral Inv. Map 3-211, scale 1:5,000,000, 1947

A reconnaissance geologic map of part of the Gallinas Mountains, northwestern Lincoln County. Shows several outcrops of Precambrian granite and biotite gneiss, undivided, along Red Cloud Canyon in the north-central map area. Brief text describes iron and fluorspar deposits.

Kelley, V. C., and Silver, C., Geology of the Caballo Mountains with special reference to regional stratigraphy and structure and to mineral resources, including oil and gas: Univ. New Mexico Pubs. Geology, no. 4, 286 p., 26 figs., 19 pls., map scale 1:63,360, 1952

Describes the general geology, stratigraphy, structure, physiography, ground water, and mineral deposits of the Caballo Mountains, south-central Sierra County. Includes a short section on the distribution and petrology of Precambrian rocks which are exposed along the west flank of the range. Precambrian rocks on the accompanying map are undivided. Some placer gold deposits are thought to have been derived from Precambrian gold-quartz veins.

Kelley, V. C., and Wood, G. H., Geology of the Lucero uplift, Valencia, Socorro, and Bernalillo Counties, New Mexico: U. S. Geol. Survey, Prelim. Oil and Gas Inv. Map 47, scale 1:62,500, 1946

Reconnaissance geologic map of the Lucero uplift, north-central Socorro, eastern Valencia, and western Bernalillo Counties. Precambrian rocks, undivided, are exposed in the Ladron Mountains, north-central Socorro County.

Kelly, F. J., see Harrer, C. M., 1963

Koschmann, A. H., see Loughlin, G. F., 1942

Kottlowski, F. E., Precambrian rocks in the Sangre de Cristo Mountains near Santa Fe, New Mexico (abs.): Geol. Soc. America, Bull., v. 63, no. 12, pt. 2, p. 1335-1336, 1952

Describes the general geology and petrology of Precambrian metamorphic and granitic rocks in the Seton Village and Santa Fe (7½-min) quadrangles, Sangre de Cristo Mountains, north-central Santa Fe County.

Kottlowski, F. E., Geology of San Andres Mountains: New Mexico Geol. Soc., Guidebook 6th field conf., p. 136-145, 8 figs., 1955

Includes a short paragraph on the distribution and general nature of Precambrian rocks that crop out along the eastern flank of the San Andres Mountains, eastern Sierra and Doña Ana Counties.

Kottlowski, F. E., Sedimentary rocks of the San Andres Mountains: Roswell Geol. Soc. and Soc. Econ. Paleontologists and Mineralogists, Guidebook 12th field conf., p. 259-277, 3 figs., 1959

Includes a short paragraph on the distribution and general nature of Precambrian rocks that crop out along the lower part of the eastern flank of the San Andres Mountains, eastern Sierra and Doña Ana Counties.

Kottlowski, F. E., Summary of Pennsylvanian sections in southwestern New Mexico and southeastern Arizona: New Mexico Bureau Mines Mineral Resources, Bull. 66, 187 p., 34 figs., 2 tables, 13 pls., 1960a

Includes a map and a short section on Precambrian rocks in the Coyote Hills (fig. 14; scale 1:44,620) – a southern extension of the Socorro Mountains in south-central Socorro County. Divides the Precambrian into: 1) granite and granite gneiss, and 2) metamorphics. Also has a geologic map showing Precambrian granite outcrops around Eaton Ranch. (fig. 34; scale 1:34,250), southwestern Socorro County.

Kottlowski, F. E., Reconnaissance geologic map of the Las Cruces 30-minute quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 14, scale 1:126,720, 1960b

Reconnaissance map of the Las Cruces (30-min) quadrangle, southeastern Doña Ana County. Precambrian rocks are undivided, and crop out in two places along the eastern flank of the San Andres Mountains.

Kottlowski, F. E., Flower, R. H., Thompson, M. L., and Foster, R. W., Stratigraphic studies of the San Andres Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 1, 132 p., 15 figs., 6 tables, 5 pls., 1956

Describes the general geology, detailed stratigraphy, and structure of the San Andres Mountains, eastern Sierra and Doña Ana Counties. Includes a short section on the distribution and petrology of Precambrian rocks which are exposed along the eastern flank of the range.

Kottlowski, F. E., and Stewart, W. J., The Wolfcampian Joyita uplift in central New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 23, pt. 1, p. 1-31, 13 figs., 1970

Includes passing reference to the Precambrian granitic gneiss core of the Joyita Hills, northeast Socorro County, and a sketch map of the Joyita Hills.

Krewedl, D. A., Geology of the central Magdalena Mountains, Socorro County, New Mexico: Ph.D. thesis, Univ. Arizona, 128 p., 27 figs., map scale 1:12,000, 1974

Describes the general geology, structure, regional alteration, economic geology, and tectonic setting of the central Magdalena Mountains, central Socorro County. Includes a brief section on the distribution and petrology of Precambrian granite and argillite exposed in the north-central map area. The accompanying map is on open-file at the New Mexico Bureau of Mines and Mineral Resources in Socorro (Open-file Rept. 44).

Krieger, P., Geology of the zinc-lead deposits at Pecos, New Mexico: Ph.D. thesis, Columbia Univ., 1932a

Published in Economic Geology (1932b).

Krieger, P., Geology of the zinc-lead deposit at Pecos, New Mexico: Econ. Geology, v. 27, pt. I; p. 344-364; pt. II; p. 450-470, 16 figs., 1932b

One of the two most comprehensive descriptions of the Pecos mine and immediate vicinity, Sangre de Cristo Mountains, northwestern San Miguel County. Describes the

general geology, detailed petrology, and structure of Precambrian rocks that are host to the largest known Precambrian ore deposit (Zn-Pb-Cu + Au-Ag) in New Mexico.

Kudo, A. M., see Brookins, D. G., Enz, R. D., and Shafiqullah, M., 1975

Kuellmer, F. J., Geologic section of the Black Range at Kingston, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 33, 100 p., 28 figs., 13 tables, 3 pls., map scale 1:31,680, 1954

Describes the general geology, stratigraphy, igneous petrology, structure, and ore deposits of a NE-SW strip across the southern Black Range, southwestern Sierra and southeastern Grant Counties. Includes a short section on the geology and petrology of Precambrian rocks that are subdivided into: 1) graywacke, 2) granite, and 3) metadiabase. Precambrian rocks crop out along Silver and South Percha Creeks, and in the northwestern portion of the map area.

Kuellmer, F. J., Geologic map of Hillsboro Peak 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 1, scale 1:126,720, 1956

Reconnaissance and compilation geologic map of the Hillsboro Peak (30-min) quadrangle, Luna, Grant, and Sierra Counties. Map area contains Precambrian, undivided, in the Black Range, western Sierra, and eastern Grant Counties, in the north end of the Cookes Range, north-central Luna and southeastern Grant Counties, and along NM-61 just west of San Lorenzo, eastern Grant County.

Lambert, P. W., Petrology of the Precambrian rocks of part of the Monte Largo area, New Mexico: M. S. thesis, Univ. New Mexico, 108 p., 4 figs., 6 tables, 12 pls., map scale 1:24,000, 1961

Describes the general geology, detailed petrology, structure and economic potential of the western half of the Monte Largo Hills, northeastern Bernalillo and southeastern Sandoval Counties. Subdivides the Precambrian into: 1) quartz-feldspar gneiss, 2) quartzite, 3) hornblende gneiss, 4) quartz-mica schist, 5) undifferentiated, 6) granite associated with quartz-feldspar gneiss, and 7) granite. The map area is included in a recent map by Kelley and Northrop (1975).

Lambert, R. S., Jr., Geology of the country east of the Santa Rita mining district, Grant County, New Mexico: M. S. thesis, Univ. New Mexico, 81 p., 22 figs., 16 tables, 2 pls., map scale 1:24,000, 1973

Describes the stratigraphy, structure, and economic geology of the southwest quarter of the San Lorenzo (15-min) quadrangle, southern Mogollon Mountains, east-central Grant County. Includes a very brief section on the distribution and petrology of Precambrian diabase exposed in a narrow strip along the Mimbres River. This report area is included in recent mapping by Hedlund (1975).

Lasky, S. G., The ore deposits of Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 8, 139 p., 21 figs., 4 pls., 1932

Describes the geology, stratigraphy, structure, and ore deposits of Socorro County, including a short paragraph on the Precambrian rocks. It should be noted that at the time this bulletin was written, the eastern third of Sierra County (including the northern half of the San Andres Mountains) was part of Socorro County. Precambrian ore deposits are thought to be lacking in Socorro County, with the possible exception of a small copper occurrence near the mouth of Sulfur Canyon along the east flank of the San Andres Mountains.

Lasky, S. G., Geology and ore deposits of the Little Hatchet Mountains, Hidalgo and Grant Counties, New Mexico: U. S. Geol. Survey, Prof. Paper 208, 101 p., 18 figs., 27 pls., map scale 1:31,250, 1947

Lasky shows the south end of the Little Hatchet Mountains to be a Cretaceous or Tertiary granite stock consisting of three phases: 1) porphyritic granite, 2) aplitic granite, and 3) seriate porphyritic granite. Petrographic descriptions are given. Subsequent work (Zeller, 1970) indicates phases 1 and 2 are Precambrian in age.

Lasky, S. G., and Wootton, T. P., The metal resources of New Mexico and their economic features: New Mexico Bureau Mines Mineral Resources, Bull. 7, 178 p., 4 figs., 2 pls., 1933

Contains a historical review of mining in New Mexico, a listing of the occurrence and distribution of New Mexico ore minerals, brief descriptions of mining districts by county, and a summary of production by metal. A number of districts have Precambrian-age deposits or deposits in Precambrian host rocks.

Laub, D. C., see Tschanz, C. M., and Fuller, C. W., 1958

Leach, A. A., Black Hawk silver-cobalt ores: Eng. and Mining Jour., v. 102, p. 456, 1916

Brief description of the history, mining operations, and general geology of the Black Hawk district, Big Burro Mountains, central Grant County, where Ni-Co-Ag ores occur in fissure veins in Precambrian quartz diorite gneiss.

Leach, A. A., The mining of radium ore in New Mexico: Mining Jour., v. 10, n. 22, p. 3-4, 1927

Leach, F. I., Radium ore discovered in White Signal district, New Mexico: Eng. and Mining Jour., v. 109, p. 989, 1920

Gives a brief history of the White Signal district, Big Burro Mountains, southern Grant County, and includes a description of the geology and mineralogy of uranium minerals disseminated in "dark felsite dikes" that cut Precambrian granite.

Leland, G. R., see Ericksen, G. E., Wedow, H., Jr. and Eaton, G. P., 1970

Levinson, A. A., see Heinrich, E. W., 1953

Lidiak, E. G., see Muehlberger, W. R., and Denison, R. E., 1967

Lindgren, W., and Graton, L. C., A reconnaissance of the mineral deposits of New Mexico: U. S. Geol. Survey, Bull. 285, p. 74-86, 1 fig., 1906

A preliminary report on the ore deposits of New Mexico that includes brief summaries of the state geology, structure, and mineral resources. Approximately one page is devoted to deposits of Precambrian age located at: 1) Hamilton (Pecos) mine, western San Miguel County, 2) Frazer Mountain Copper Company, central Taos County, and 3) Hopewell and Bromide districts, eastern Rio Arriba County.

Lindgren, W., Graton, L. C., and Gordon, C. H., The ore deposits of New Mexico: U. S. Geol. Survey, Prof. Paper 68, 361 p., 33 figs., 22 pls., 1910

Detailed county by county descriptions of the state's known ore deposits and districts (1910). Includes a section on distribution, mineralogy, and genesis of Precambrian deposits.

Lindholm, R. C., Structural petrology of the Ortega Quartzite, Ortega Mountains, Rio Arriba County, New Mexico: M. S. thesis, Univ. Texas (Austin), 43 p., 4 figs., 1 table, 8 pls., map scale 1:24,000, 1963

Describes the detailed petrology and structural geology of the Precambrian Ortega Quartzite, Tusas Mountains, eastern Rio Arriba County.

Lochman-Balk, C., The Capital Dome section, Florida Mountains: Roswell Geol. Soc., Guidebook 11th field conf., p. 47-52, 4 figs., 1958

Includes a very brief mention of Precambrian granitic basement rocks that crop out along part of the western and southern flanks of Capitol Dome, in the northwestern Florida Mountains, central Luna County.

Lochman-Balk, C., see Jicha, H. L., Jr., 1958

Lodewick, R. B., Geology and petrography of the Tijeras gneiss, Bernalillo County, New Mexico: M. S. thesis, Univ. New Mexico, 63 p., 4 figs., 3 pls., map scale 1:15,840, 1960

Describes the general geology, structure, petrography, and petrogenesis of the Precambrian Tijeras gneiss, Sandia and Manzanita Mountains, eastern Bernalillo County. The accompanying geologic map subdivides the Precambrian into: 1) quartz-sillimanite gneiss, 2) quartz-feldspar gneiss – coarse grained, 3) quartz-feldspar gneiss – fine grained, 4) quartzite, 5) Tijeras greenstone, and 6) Tijeras granite. The map area is included in recent mapping by Kelley and Northrop (1975).

Long, L. E., Rb-Sr geochronology of Precambrian rocks, northern New Mexico (abs.): (EOS) Amer. Geophys. Union, Trans., v. 53, no. 4, p. 542, 1972a

Gives Rb-Sr average age of 1420 ± 10 m.y. from samples of metarhyolite and granite pegmatites collected in the La Madera quadrangle, Tusas Mountains, eastern Rio Arriba County.

Long, L. E., Rb-Sr chronology of Precambrian schist and pegmatite, La Madera quadrangle, northern New Mexico: Geol. Soc. America, Bull., v. 83, p. 3425-3432, 5 figs., 2 tables, 1972b

Describes Rb-Sr isotopic data from metarhyolite whole-rocks, muscovite, and pegmatitic "book" muscovite separates collected from the Precambrian of La Madera quadrangle, Tusas Mountains, eastern Rio Arriba County.

Long, P. E., Precambrian granitic rocks of the Dixon-Peñasco area, northern New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 6, no. 5, p. 453, 1974a

Identifies at least four distinct episodes of granitic magmatism in the Picuris Range, Sangre de Cristo Mountains, southern Taos and southeastern Rio Arriba Counties. Summarizes the distribution and petrology of major bodies representing these episodes.

Long, P. E., Contrasting types of Precambrian granitic rocks in the Dixon-Peñasco area, northern New Mexico: New Mexico Geol. Soc., Guidebook 25th field conf., p. 101-108, 8 figs., 1 table, 1974b

Reviews the Precambrian metamorphic and igneous geology of the southwestern portion of the Picuris Range, Sangre de Cristo Mountains, southern Taos County. Subdivides the "Embudo granite" of Montgomery (1953) into four major units (+ pegmatites): 1) Cerro Alto metadacite, 2) Puntiagudo granite porphyry, 3) Rana quartz monzonite, and 4) Peñasco quartz monzonite. Reinterprets existing radiometric data in light of new igneous field relations.

Long, P. E., and Luth, W. C., Genetic implications of Ba zoning in microcline megacrysts from Precambrian granitic rocks of the Dixon-Peñasco area, northern New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 7, no. 7, p. 1176, 1975

Describes variations in Ba content across microcline megacrysts from the Puntiagudo granite porphyry and the Peñasco quartz monzonite, Precambrian intrusives in the Picuris Range, Sangre de Cristo Mountains, southern Taos and southeastern Rio Arriba Counties.

Longgood, T. E., Jr., see Muehlberger, W. R., Adams, G. E., and St. John, B. E., 1960

Loughlin, G. F., and Koschmann, A. H., Geology and ore deposits of the Magdalena mining district, New Mexico: U. S. Geol. Survey, Prof. Paper 200, 168 p., 28 figs., 38 pls., map scale 1:12,000, 1942

A comprehensive description of the geology, stratigraphy, igneous petrology, structure, and mineral deposits of the northwestern Magdalena Mountains, central Socorro County. Includes a section on the geology and petrology of Precambrian rocks. These rocks crop out along the eastern flank of the mountains, and have been subdivided into: 1) argillite and schist, 2) gabbro, 3) felsite, 4) granite, and 5) diabase.

Luth, W. C., see Long, P. E., 1975

MacAlpin, A. J., see Bates, R. L., Wilpolt, R. H., and Vorbe, G., 1947; and Northrop, S. A., Sullwold, H. H., Jr., and Rogers, C. P., Jr., 1946; and Wilpolt, R. H., Bates, R. L., and Vorbe, G., 1946

Malan, R. C., see Sterling, D. A., 1970

Mallon, K. M., Precambrian geology of the northern part of the Los Pinos Mountains, New Mexico: M. S. thesis, New Mexico Institute Mining Technology, 88 p., 28 figs., 2 tables, 8 pls., map scale 1:16,620, 1966a

Describes the Precambrian petrology, metamorphism, and structure of the northern part of Los Pinos Mountains, [southern half of the Becker (7½-min) quadrangle], Socorro County. Includes detailed petrographic descriptions of: 1) leptynolite – a very fine-grained granulitic rock composed mainly of quartz and feldspar, 2) feldspathic-quartz-mica schist, and phyllite, 3) muscovitic quartzite, 4) granitic gneiss, and 5) hornblende-chlorite schist.

Mallon, K. M., Precambrian geology of the northern part of the Los Pinos Mountains, New Mexico (abs.): New Mexico Geol. Soc., Guidebook 17th field conf., p. 121, 1966b

Summarizes the geology and metamorphic history of Precambrian rocks exposed in the northern Los Pinos Mountains, north-central Socorro County.

Martinez, R., Geology of the Pajarito Peak area, Sandoval County, New Mexico: M. S. thesis, Univ. New Mexico, 72 p., 17 figs., 1 map, map scale 1:24,000, 1974

Describes the stratigraphy, structure, and economic geology of the Pajarito Peak area, southern Nacimiento Mountains, central Sandoval County. Includes a section on the distribution and petrology of Precambrian rocks exposed along the eastern margins of the map area. Subdivides the Precambrian into: 1) xenoliths of amphibolite and muscovite-quartz schist, 2) quartz diorite gneiss, 3) biotite quartz monzonite gneiss, 4) muscovite-biotite quartz monzonite gneiss,

5) feldspathized quartz diorite gneiss, 6) muscovite quartz monzonite, and 7) granite. Map area is included in recent mapping by Woodward and Martinez, 1974.

Martinez, R., see Woodward, L. A., 1974; and Woodward, L. A., Duchene, H. R., Schumacher, O. L., and Reed, R. K., 1974

Marvin, R. F., see Muehlberger, W. R., Hedge, C. E., and Denison, R. E., 1966

Mason, J. T., The geology of the Caballo Peak quadrangle, Sierra County, New Mexico: M. S. thesis, Univ. New Mexico, 131 p., 30 figs., 1 table, map scale 1:24,000, 1976

Describes the stratigraphy, structure, and economic geology of the southwest ¼ of the Engle (15-min) quadrangle, north end of the Caballo Mountains, central Sierra County. Includes a short section on the distribution and petrology of Precambrian rocks exposed along the lower part of the west-facing flank of the range. Subdivides the Precambrian into: 1) metamorphic rocks, and 2) granite.

Maxon, J. R., Age and implications of the Tres Piedras Granite, north-central New Mexico (abs.): Geol. Soc. Am., Abs. with Programs, v. 8, no. 5, p. 608, 1976

Describes U-Pb zircon ages, as well as whole-rock and mineral isochron ages, obtained from Tres Piedras Granite exposed in three places in the Tusas Mountains, eastern Rio Arriba County.

McCallum, M. E., see Robinson, G. D., Wanek, A. A., and Hays, W. H., 1964; and Wanek, A. A., Read, C. B., Robinson, G. D., and Hays, W. H., 1964

McCleary, J. T., Geology of the northern part of the Fra Cristobal Range, Sierra and Socorro Counties, New Mexico: M. S. thesis, Univ. New Mexico, 59 p., 3 figs., 4 pls., map scale 1:31,680, 1960

Describes the stratigraphy, structure, and mineral deposits of the northern part of the Fra Cristobal Mountains, north-central Sierra and south-central Socorro Counties. Includes a very brief section on the distribution and general nature of Precambrian rocks exposed along the western flanks of the range. The accompanying map shows Precambrian granite, gneiss, and schist undivided.

McKay, E. J., see Myers, D. A., 1970; and Myers, D. A., 1971; and Myers, D. A., 1972; and Myers, D. A., 1974

McKinlay, P. F., Geology of Costilla and Latir Peak quadrangles, Taos County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 42, 32 p., 1 fig., 1 pl., map scale 1:48,000, 1956

Describes the geology, structure, metamorphism, and mineral deposits of the northern half of the Taos Range, Sangre de Cristo Mountains, north-central Taos County. Includes a section on the distribution and petrology of Precambrian rocks that crop out over a majority of the eastern map area. The Precambrian is subdivided into: 1) Cabresto Quartzite, 2) undifferentiated metamorphic rocks, 3) granite, 4) pegmatites, and 5) metagabbro.

McKinlay, P. F., Geology of Questa quadrangle, Taos County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 53, 23 p., 1 table, 1 pl., map scale 1:48,000, 1957

Describes the geology, structure, metamorphism, and mineral deposits of southwestern quarter of the Taos Range, Sangre de Cristo Mountains, north-central Taos County. Includes a section on Precambrian rocks that crop out along a

major portion of the eastern map area. The Precambrian is subdivided into: 1) Cabresto Quartzite, 2) undifferentiated metamorphic rocks, 3) granite, and 4) pegmatites.

McKinlay, P. F., see Park, C. F., Jr., 1948

McLelland, D., see Woodward, L. A., Anderson, J. B., and Kaufman, W. H., 1972; and Woodward, L. A., and Kaufman, W. H., 1974; and Woodward, L. A., and Gibson, G. G., in preparation

McLeroy, D. F., Genesis of Precambrian banded iron deposits, Rio Arriba County, New Mexico: Econ. Geology, v. 65, p. 195-205, 4 figs., 1970a

Discusses the geology, petrography, structure, and genesis of Precambrian banded iron deposits in the Moppin formation at Cleveland Gulch and Iron Mountain, Tusas Mountains, eastern Rio Arriba County. Includes a detailed stratigraphic description of the Moppin formation.

McLeroy, D. F., Genesis of Precambrian banded iron deposits, Rio Arriba County, New Mexico – a reply: Econ. Geology, v. 65, p. 1008-1009, 1970b

Response to letter suggesting similarities between Rio Arriba banded iron deposits and those in the Canadian Shield associated with Archean greenstone belts.

McLeroy, D. F., Geochemical background values in iron-bearing rocks of Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 121, 11 p., 2 figs., 1 table, 1972

Briefly describes the general geology, stratigraphy, and iron deposits of Precambrian rocks at Cleveland Gulch, Iron Mountain, and Cañon Plaza, in the Tusas Mountains, eastern Rio Arriba County. Tabulates semi-quantitative spectrochemical analyses for 62 whole-rock samples collected from Precambrian iron formation and enclosing host rocks.

McNair, A. H., see Cameron, E. N., et al., 1949

Miller, J. P., Montgomery, A., and Sutherland, P. K., Geology of part of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 11, 106 p., 22 figs., 13 pls., map scale 1:63,360, 1963

Includes a major section on the lithology, structure, and metamorphism of Precambrian rocks in southern Sangre de Cristo Mountains, Taos, Rio Arriba, Santa Fe, Mora, and San Miguel Counties. The Precambrian is subdivided into: 1) Ortega Formation – 3 members, 2) Vadito Formation – 2 members, and 3) the Embudo Granite, and crops out over approximately one-third of the map area. Has a short section on Precambrian mineral deposits: 1) in pegmatites, 2) in quartz veins, and 3) at the Pecos mine, western San Miguel County.

Missaghi, F. L., Geochemical and biogeochemical studies in the Eagle Nest quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 94, 24 p., 17 figs., 1 table, 1968

Describes sampling procedures and analytical results (Cu, Zn, Pb, Mo, As) of a geochemical study of bedrock, soil, and plant samples from the Sangre de Cristo Mountains, Taos and Colfax Counties. Ninety-seven of 204 rock samples were from Precambrian terrane.

Montgomery, A., Geochemistry of tantalum in the Harding pegmatite, Taos County, New Mexico: Am. Mineralogist, v. 35, p. 853-866, 3 figs., 2 tables, 1950

Describes the general geology and mineralogy of the Precambrian Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County. Includes an extensive discussion of tantalum geochemistry, mineralogy, and origin.

Montgomery, A., Precambrian geology of the Picuris Range, north-central New Mexico: Ph. D. thesis, Harvard Univ., 1951a

Published as New Mexico Bureau of Mines and Mineral Resources Bulletin 30 (1953).

Montgomery, A., The Harding pegmatite – remarkable storehouse of massive white beryl: Mining World, v. 13, no. 8, p. 32-35, 6 figs., 1951b

Describes the general geology and distribution of beryl at the Harding pegmatite, Picuris Range, Sangre de Cristo Mountains, southern Taos County. Includes a detailed account of beryl mining operations.

Montgomery, A., Precambrian geology of the Picuris Range, north-central New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 30, 89 p., 2 figs., 4 tables, 9 pls., map scale 1:46,588, 1953

A comprehensive description of the geology, stratigraphy, igneous petrology, structure, and metamorphism of Precambrian rocks in the Picuris Range, Sangre de Cristo Mountains, southern Taos County. Subdivides the Precambrian into: 1) Ortega Formation – with three members, 2) Vadito Formation – with two members, 3) Embudo Granite, and 4) diabase dikes.

Montgomery, A., Precambrian geology of the Picuris Range, north-central New Mexico: New Mexico Geol. Soc., Guidebook 7th field conf., p. 143-146, 1 fig., 1956

Briefly summarizes the Precambrian geology, petrology, and structure of the Picuris Range, Sangre de Cristo Mountains, southern Taos County. This is a partial summary of work detailed in New Mexico Bureau of Mines and Mineral Resources Bulletin 30 (1953).

Montgomery, A., and Sutherland, P. K., Trail guide to the upper Pecos: New Mexico Bureau Mines Mineral Resources, Scenic Trip No. 6, 116 p., 27 figs., 8 pls., 51 photos, map scale 1:62,500, 1960 (revised, 1975)

A popularized description of the geology and trails in the Pecos Wilderness area, Sangre de Cristo Mountains, Mora, San Miguel, and Santa Fe Counties. Precambrian rocks comprise over one-third of the map area, and are subdivided into: 1) quartzite, 2) schist, 3) amphibolite, and 4) granite.

Montgomery, A., see Miller, J. P., and Sutherland, P. K., 1963

Moore, S. L., see Hernon, R. M., and Jones, W. R., 1964; and Jones, W. R., and Hernon, R. M., 1967

Morris, R. W., Geology and fluorspar deposits of the northern Cookes Range (abs.): New Mexico Geol. Soc., Guidebook 25th field conf., p. 381, 1974

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

Geologic map of Duncan and Canador Peak (15-min) quadrangles, Arizona and New Mexico (western Grant and northern Hidalgo Counties). Precambrian granite crops out over a small area in northern Hidalgo County. Includes a short text with a brief description of the geology and petrology of the Precambrian granite.

Muehlberger, W. R., Precambrian rocks of the Tusas Mountains, Rio Arriba County, New Mexico: New Mexico Geol. Soc., Guidebook 11th field conf., p. 45-47, 1960

Summarizes the general geology, stratigraphy, igneous petrology, and structure of Precambrian rocks in the Tusas Mountains, eastern Rio Arriba County. The Precambrian is subdivided into: 1) Ortega Quartzite, 2) Moppin Metavolcanic Series, 3) Kiawa Mountain Formation, 4) Petaca Schist, 5) Burned Mountain Metarhyolite, 6) Maquinita Granodiorite, 7) Tres Piedras Granite, and 8) pegmatites.

Muehlberger, W. R., Geology of Chama quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 89, 114 p., 17 figs., 1 table, 2 pls., map scale 1:48,000, 1967

Describes the general geology, stratigraphy, and structure of the Chama (15-min) quadrangle, north-central Rio Arriba County. Includes a very brief section on the Precambrian Kiawa Mountain Formation (locally a massive quartzite), which is exposed in the Tusas Mountains along the eastern margin of the map.

Muehlberger, W. R., Geology of Brazos Peak quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 22, scale 1:48,000, 1968

Geologic map, sections, and brief text on the geology and structure of the Brazos Peak (15-min) quadrangle, Tusas Mountains, northeastern Rio Arriba County. Includes a short section on the distribution and petrology of Precambrian rocks which crop out over much of the southwestern and southern map areas. Subdivides the Precambrian into: 1) schist, 2) metarhyolite, 3) quartzite, 4) gneiss, and 5) granite.

Muehlberger, W. R., Adams, G. E., Longgood, T. E., Jr., and St. John, B. E., Stratigraphy of the Chama quadrangle, northern Rio Arriba County, New Mexico: New Mexico Geol. Soc., Guidebook 11th field conf., p. 93-102, 1 table, 1960

Includes a short paragraph on the distribution and general nature of Precambrian rocks exposed along the eastern margin of the Chama platform in the Brazos uplift, Tusas Mountains, north-central Rio Arriba County.

Muehlberger, W. R., and Denison, R. E., Precambrian geology of south-central New Mexico: New Mexico Geol. Soc., Guidebook 15th field conf., p. 62-69, 2 figs., 1964

General description of the regional Precambrian geology and petrologic terranes in eastern Socorro, Sierra, and Doña Ana, southern Torrance and Guadalupe, western De Baca, Chaves, and Eddy, and Lincoln and Otero Counties. Based on outcrop data in the western one-third, and oil tests in the eastern two-thirds of the map area. Includes petrographic descriptions of thirty-two oil test samples and several outcrop specimens.

Muehlberger, W. R., and Denison, R. E., and Lidiak, E. G., Basement rocks in continental interior of the United States: Am. Assoc. Petroleum Geologists, Bull., v. 51, p. 2351-2380, 13 figs., 1967

Paper outlines the Precambrian geologic history of the continental interior of the United States by describing selected areas including eastern New Mexico. Subdivides

the Precambrian basement of eastern New Mexico into different petrographic and tectonic terranes, primarily on the basis of oil well data.

Muehlberger, W. R., Hedge, C. E., and Denison, R. E., and Marvin, R. F., Geochronology of the midcontinent region, United States, Part 3, southern area: Jour. Geophys. Research, v. 71, no. 22, p. 5409-5426, 3 figs., 5 tables, 1966

Summarizes the geochronology of the southern midcontinental United States, includes Precambrian dates from the eastern half of New Mexico, both from cores and outcrop.

Muehlberger, W. R., see Baldwin, B., 1960; and Jahns, R. H., and Smith, C. T., in preparation; and Smith, C. T., 1960

Mukhopadhyay, B., Brookins, D. G., and Bolivar, S. L., Rb-Sr whole-rock study of the Precambrian rocks of the Pedernal Hills, New Mexico: Earth and Planetary Sci. Letters, v. 27, p. 283-286, 2 figs., 1 table, 1975

Describes the geologic setting, sample collection, analytical techniques, and results of a Rb-Sr whole-rock study of Precambrian rocks from the Pedernal Hills, north-central Torrance County. Rocks sampled include granite, quartzite, and schist.

Myers, D. A., and McKay, E. J., Geologic map of the Mount Washington quadrangle, Bernalillo and Valencia Counties, New Mexico: U. S. Geol. Survey, Geol. Quad. Map GQ 886, scale 1:24,000, 1970

Geologic map of the Mount Washington (7½-min) quadrangle, Manzanita Mountains, southeast Bernalillo and eastern Valencia Counties. Precambrian rocks crop out along the western front of the mountains, and are subdivided into: 1) quartzite, 2) Sevilleta Rhyolite, 3) phyllite and schist, 4) rhyolite dikes, 5) greenstone complex, and 6) granite and gneiss.

Myers, D. A., and McKay, E. J., Geologic map of the Bosque Peak quadrangle, Torrance, Valencia, and Bernalillo Counties, New Mexico: U. S. Geol. Survey, Geol. Quad. Map GQ 948, scale 1:24,000, 1971

Geologic map of the Bosque Peak (7½-min) quadrangle, Manzano Mountains, southeastern Bernalillo, eastern Valencia, and western Torrance Counties. Precambrian rocks form the western front of the mountains and are subdivided into: 1) greenstone complex, 2) metaclastic series, 3) quartzose and olivine gabbro, 4) Ojito granite, 5) amphibolite, 6) pegmatite, and 7) aplite dikes.

Myers, D. A., and McKay, E. J., Geologic map of the Capilla Peak quadrangle, Torrance and Valencia Counties, New Mexico: U. S. Geol. Survey, Geol. Quad. Map GQ 1008, scale 1:24,000, 1972

Geologic map of the Capilla Peak (7½-min) quadrangle, Manzano Mountains, eastern Valencia and western Torrance Counties. Precambrian rocks crop out along the western and south-central parts of the mountains, and are subdivided into: 1) Sevilleta Metarhyolite, 2) basic schist, 3) mixed flow zone, 4) flaggy schist zone, 5) White Ridge Quartzite, 6) Sais Quartzite, 7) massive quartzite, 8) metamorphics (metaclastics) undifferentiated, and 9) granite of the Monte Largo stock.

Myers, D. A., and McKay, E. J., Geologic map of the southwest quarter of the Torreon 15-min quadrangle, Torrance and Valencia Counties, New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-820, scale 1:24,000, 1974

Geologic map of the southwest quarter of the Torreon (15-min) quadrangle, Manzano Mountains, southeast Valencia and western Torrance Counties. Precambrian rocks crop

out along the west flank of the mountains and are subdivided into: 1) Sevilleta Metarhyolite, 2) basic schist, 3) mixed flows, 4) flaggy schist, 5) argillite, 6) White Ridge Quartzite, 7) Sais Quartzite, 8) metaclastic series, 9) Priest Canyon granite, and 10) Monte Largo Granite.

Myers, D. A., see Bachman, G. O., 1963; and Bachman, G. O., 1969

Naeser, C. W., Geochronology of the Navajo-Hopi diatremes, Four Corners area: Jour. Geophys. Research, v. 76, no. 20, p. 4978-4985, 2 figs., 2 tables, 1971

Describes fission track ages of Precambrian xenoliths in diatremes and dikes from the Four Corners area of Utah, Colorado, Arizona, and New Mexico. The two New Mexico sample locations are: 1) Mitten Rock, western San Juan County, and 2) Shiprock, western San Juan County, also includes a fission track age for gneissic granite from the Zuni Mountains, northwestern Valencia County.

Nielsen, K. C., Structural evolution of the Picuris Mountains, New Mexico: M. S. thesis, North Carolina Univ., 47 p., 27 figs:, 1 table, 1 pl., map scale 1:16,250, 1972

Mainly a detailed structural analysis of Precambrian rocks exposed in the Picuris Range, Sangre de Cristo Mountains, southern Taos County. Identifies four deformational phases and related metamorphic changes. Revises the Precambrian stratigraphy of Montgomery (1953) by raising the Rinconada and Pilar members of the Ortega Formation to formational status. Includes a brief section on the petrography of the major units in this new Precambrian "metasedimentary" stratigraphy. The accompanying compilation map subdivides the Precambrian into: 1) Ortega Quartzite, 2) Rinconada Formation, with six members, 3) Pilar Formation, with two members, 4) Vadito Formation, with five members, 5) Embudo Granite, 6) pegmatite, and 7) diabase dike.

Nielsen, K. C., and Dunn, D. E., Structural evolution of the Picuris Mountains, New Mexico (abs.): Geol. Soc. America, Abs. with Programs (Rocky Mountain Section) v. 6, no. 5, p. 463, 1974

Identifies four deformational events (and related metamorphic changes) that have affected Precambrian rocks in the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Noble, E. A., Geology of the southern Ladron Mountains, Socorro County, New Mexico: M. S. thesis, Univ. New Mexico, 72 p., 3 figs., 5 tables, 9 pls., map scale 1:31,680, 1950

Describes the general geology, stratigraphy, structure, and ore deposits of the southern Ladron Mountains, north-central Socorro County. Includes an extensive section on the petrology and metamorphism of Precambrian rocks exposed in the central and eastern map area. Subdivides the Precambrian into: 1) Blue Canyon quartzite, 2) Torres schist, 3) undifferentiated complex, 4) Bug Springs gneiss, 5) Cerro Colorado gneiss, and 6) Capirote granite.

Northrop, S. A., Sullwold, H. H., Jr., MacAlpin, A. J., and Rogers, C. P., Jr., Geologic map of a part of the Las Vegas basin and of the foothills of the Sangre de Cristo Mountains, San Miguel and Mora Counties, New Mexico: U. S. Geol. Survey, Prelim. Oil and Gas Inv. Map 54, scale 1:42,240, 1946

Precambrian rocks are undivided, and crop out along the east flank of the Sangre de Cristo Mountains, western San Miguel County, along the west edge of the map area.

Northrop, S. A., see Kelley, V. C., 1975; and Wood, G. H., 1946

Norton, J. J., see Staatz, 1942

Page, L. R., see Cameron, E. N., et al., 1949

Paige, S., Metalliferous ore deposits near the Burro Mountains, Grant County, New Mexico: U. S. Geol. Survey, Bull. 470-C, p. 131-150, 8 figs., 1 pl., map scale 1:125,000, 1911

Primarily a discussion of the ore deposits of the Big Burro and Little Burro Mountains, south-central Grant County. Describes quartz veins, fracture systems, and shear zones in Precambrian granite and Cretaceous-Tertiary quartz monzonite that carry copper, silver, and gold. Includes a generalized geologic map of the Burro Mountains.

Paige, S., Description of the Silver City quadrangle, New Mexico: U. S. Geol. Survey, Geol. Atlas, Silver City Folio, no. 199, 1916

Park, C. F., Jr., and McKinlay, P. F., Geology and ore deposits of Red River and Twining districts, Taos County, New Mexico – a preliminary report: New Mexico Bureau Mines Mineral Resources, Circ. 18, 35 p., 7 figs., 1948

Describes the general geology, petrology, structure, and mineral deposits of the Red River and Twining districts, Sangre de Cristo Mountains, northeastern Taos County. Includes brief sections on Precambrian metamorphic and granitic rocks. Copper-sulfide mineralization (probably Precambrian) is concentrated in a shear-zone in Precambrian amphibole-talc schist in the Twining district.

Perhac, R. M., Resume of the geology of the Gallinas Mountains: New Mexico Geol. Soc., Guidebook 15th field conf., p. 87-91, 1 fig., 1 table, 1964

Summary of the general geology, stratigraphy, igneous petrology, and structure of the Gallinas Mountains, northern Lincoln and south-central Torrance Counties. Includes a brief section on Precambrian granite which forms three small outcrops along the core of the range.

Perhac, R. M., Geology and mineral deposits of the Gallinas Mountains, Lincoln and Torrance Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 95, 51 p., 11 figs., 7 tables, 2 pls., map scale 1:31,680, 1970

Describes the general geology, petrology, structure, and mineral deposits of the Gallinas Mountains, northwestern Lincoln and south-central Torrance Counties. Includes a very brief section on the geology and petrology of Precambrian granite which crops out in three places along Red Cloud Canyon in the central map area.

Perkins, P. C., Petrography of some rock types of the Precambrian basement near the Los Alamos Scientific Laboratory geothermal test site, Jemez Mountains, New Mexico: Los Alamos Scientific Lab. Rept., LA-5129, 1973

Details the petrography of twenty-five Precambrian drill core samples taken from granite Test Hole One, Jemez Mountains, Sandoval County, and also twelve samples of Precambrian rocks collected from the surrounding region (Sandia Mountains, Nacimiento Mountains, Soda Dam, Guadalupe Box).

Peterman, Z. E., see Barker, F., and Arth, J. G., 1973; and Barker, F., and Hansen, W. R., 1973; and Barker, F., Henderson, W. T., and Hildreth, R. E., 1974; and Barker, F., Arth, J. G., and Friedman, I., 1976

Petersen, J. W., Geology of the Tienditas Creek-La Junta Canyon area, Taos and Colfax Counties, New Mexico: M. S. thesis, Univ. New Mexico, 82 p., 15 figs., 5 tables, 9 pls., map scale 1:24,000, 1969

Describes the stratigraphy and structure of the Tienditas Creek-La Junta Canyon area, Sangre de Cristo Mountains, southeastern Taos and southwestern Colfax Counties. Includes a short section on the distribution and petrology of Precambrian rocks exposed in several fault blocks in the southeastern map area. Subdivides the Precambrian into: 1) gneiss, 2) mafic schist, and 3) granite.

Pradhan, B. M., and Singh, Y. L., Geology of the area between Virden and Red Rock, Hidalgo and Grant Counties, New Mexico: M. S. thesis, Univ. New Mexico, 75 p., 2 figs., 9 tables, 7 pls., map scale 1:24,000, 1960

Describes the stratigraphy, structure, and economic geology of the area between Virden and Red Rock, northern Hidalgo and western Grant Counties. Includes a very brief section on the distribution and general nature of Precambrian granitic rocks exposed over a small area about three miles northeast of Virden.

Pratt, W. P., Geology of the Hurley West quadrangle, Grant County, New Mexico: U. S. Geol. Survey, Bull. 1241-E, 91 p., 20 figs., 3 tables, 1 pl., 11 strat. sections, map scale 1:24,000, 1967

Describes the geology, structure, geomorphology, and mineral resources in the Hurley West (7½-min) quadrangle, southeast of Silver City, Mogollon Mountains, central Grant County. Includes a short description of Precambrian rocks – mostly granite and granite pegmatites – exposed in several small outcrops in the north-central map area.

Pratt, W. P., see Jones, W. R., and Case, J. E., 1964

Pray, L. C., Stratigraphy of the escarpment of the Sacramento Mountains, Otero County, New Mexico: Ph.D. thesis, California Institute Tech., 1952

Published as New Mexico Bureau of Mines and Mineral Resources Bulletin 35 (1961).

Pray, L. C., Outline of the stratigraphy and structure of the Sacramento Mountain escarpment: New Mexico Geol. Soc., Guidebook 5th field conf., p. 92-107, 7 figs., 1954

Includes a paragraph on Precambrian unmetamorphosed sediments and diabase sills exposed in several small outcrops along the west flank of the Sacramento Mountains in north-central Otero County.

Pray, L. C., Stratigraphic and structural features of the Sacramento Mountain escarpment, New Mexico: Roswell Geol. Soc., Guidebook joint field conf. in the Sacramento Mountains of Otero County, New Mexico, p. 87-130, 7 figs., 1959

Includes a short section on the general geology of Precambrian sediments exposed in several places along the base of the Sacramento Mountains escarpment in north-central Otero County.

Pray, L. C., Geology of the Sacramento Mountains escarpment, Otero County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 35, 144 p., 34 figs., 3 pls., 12 strat. sections, map scale 1:31,680, 1961

Describes the general geology, stratigraphy, and structure of the Sacramento Mountains escarpment, north-central Otero County. Includes a section on the distribution and detailed stratigraphy of Precambrian unmetamorphosed sediments exposed in several places along the base of the west flank of the range.

Quaide, W. L., Geology of the central Peloncillo Mountains, Hidalgo County, New Mexico: M. S. thesis, Univ. California, 1953

Raitz, C. H., The geology of a portion of southwestern Mora County, New Mexico: M. S. thesis, Iowa State Univ., 94 p., 12 figs., 4 pls., map scale 1:31,680, 1951

Describes the general geology, stratigraphy, structure, and economic geology of an area incorporating the southeast quarter of the Mora and southwest quarter of the Rainsville (7½-min) quadrangles, along the eastern flanks of the Sangre de Cristo Mountains, western Mora County. The western half of the map area, shown as Pennsylvanian Madera Formation, contains a large amount of unrecognized Precambrian quartz-feldspar gneiss and amphibolite.

Ray, L. L., see Smith, J. F., Jr., 1943

Read, C. B., Stratigraphy of Paleozoic, Mesozoic rocks in parts of central New Mexico: New Mexico Geol. Soc., Guidebook 3rd field conf., p. 106-126, 4 figs., 1952

Includes short paragraphs on the distribution and general nature of Precambrian rocks exposed in: 1) The Joyita Hills, Los Pinos Mountains, and northern Oscura Mountains, Socorro County, 2) Ladron Mountains and along the east flank of the Lucero uplift, Socorro County, and 3) Caballo Mountains, south-central Sierra and northwestern Doña Ana Counties.

Read, C. B., and Andrews, D. A., The upper Pecos River and Rio Galisteo region, New Mexico: U. S. Geol. Survey, Prelim. Oil and Gas Inv. Map 8, 1:94,567, 1944

Shows outcrop areas of Precambrian, undivided, in the southern Sangre de Cristo Mountains, Santa Fe and San Miguel Counties.

Read, C. B., Wilpolt, R. H., Andrews, D. A., Summerson, C. H., and Wood, G. H., Geologic map and stratigraphic sections of Permian and Pennsylvanian rocks of parts of San Miguel, Santa Fe, Sandoval, Bernalillo, Torrance, and Valencia Counties, north-central New Mexico: U. S. Geol. Survey, Prelim. Oil and Gas Inv. Map 21, 1:189,134, 1944

Shows outcrop areas of Precambrian, undivided, in: 1) Manzano Mountains, western Torrance and eastern Valencia Counties, 2) Manzanita Mountains, eastern Bernalillo County, 3) Sandia Mountains, eastern Bernalillo and southeastern Sandoval Counties, 4) Cerrito de Lobo, and Pedernal Hills, north-central Torrance County, and 5) Sangre de Cristo Mountains, northeastern Santa Fe and northwestern San Miguel Counties.

Read, C. B., see Clark, K. F., 1972; and Wanek, A. A., Robinson, G. D., Hays, W. H., and McCallum, M. E., 1964

Redmon, D. E., Reconnaissance of selected pegmatite districts in north-central New Mexico: U. S. Bureau Mines, Info. Circ. 8013, 79 p., 19 figs., 4 tables, 1961

Describes the location, mining history, and general geology of ninety Precambrian pegmatites from ten districts in the Tusas and Sangre de Cristo Mountains, Mora, Rio Arriba, San Miguel, Santa Fe, and Taos Counties. This is probably the most comprehensive listing of pegmatite occurrences in north-central New Mexico.

Reed, R. K., Precambrian geology of the central Nacimiento Mountains, Sandoval County, New Mexico: Ph. D. thesis, Univ. New Mexico, 116 p., 47 figs., map scale 1:12,000, 1971

Describes the detailed petrology and structure of Precambrian rocks exposed in the core of the central Nacimiento Mountains, north-central Sandoval County. Subdivides the Precambrian into: 1) mafic and ultramafic inclusions, 2) granodiorite gneiss, 3) muscovite-biotite-quartz-plagioclase schist, 4) mafic dikes, 5) leucocratic dikes, and 6) granite. The map area is included in published maps of San Pablo (7½-min) quadrangle (Woodward, L. A., Anderson, J. B., et al., 1973); Rancho del Chaparral

(7½-min) quadrangle (Woodward, L. A., Kaufman, W. H., and Reed, R. K., 1973); La Ventana (7½-min) quadrangle (Woodward, L. A., and Schumacher, O. L., 1973); and San Miguel Mountain (7½-min) quadrangle (Woodward, L. A., et al., 1974).

Reed, R. K., see Woodward, L. A., Anderson, J. B., and Kaufman, W. H., 1973; and Woodward, L. A., and DuChene, H. R., 1974; and Woodward, L. A., and Kaufman, W. H., 1973; and Woodward, L. A., and Martinez, R., DuChene, H. R., and Schumacher, O. L., 1974

Reiche, P., Geology of the Manzanita and north Manzano Mountains, New Mexico: Geol. Soc. America, Bull., v. 60, p. 1183-1212, 5 figs., 5 pls., map scale 1:62,500, 1949

Describes the general geology, stratigraphy, structure and mineral deposits of the Manzanita and north Manzano Mountains, Torrance, Valencia, and Bernalillo Counties. Includes an extensive section on Precambrian stratigraphy, petrology, and structure. Precambrian rocks are exposed more or less continuously along the western flanks of the range, and are subdivided into twelve separate map units.

Renick, B. C., Geology and ground water resources of western Sandoval County, New Mexico: U. S. Geol. Survey, Water Supply Paper 620, 117 p., 1931

Includes a brief section on Precambrian "granite" and "mafic dikes" exposed in a continuous belt along the crest of the Nacimiento Mountains, central Sandoval County.

Restrepo, J. J., Geology and mineral deposits of the Rio Hondo-Red River divide, Taos County, New Mexico: M. S. thesis, Colorado School Mines, 132 p., 37 figs., 4 tables, 5 pls., map scale 1:6,000, 1972

Describes the general geology, petrology, structure, and mineral deposits of a small area along the Rio Hondo-Red River divide in the Sangre de Cristo Mountains, east-central Taos County. A major part of this report deals with the detailed petrology, structure, and mineral deposits of Precambrian rocks exposed over more than three-fourths of the map area. Subdivides the Precambrian into: 1) amphibolite group, 2) hornblende gneiss group, 3) metabasite, 4) mica schists, 5) itabirite, 6) foliated granodiorite, 7) leuco-granodiorite, 8) meta-aplite, 9) pegmatite, 10) quartz vein, and 11) diabase dike. Includes a section on the geology, mineralogy, and origin of Precambrian copper deposits in the southwestern and central parts of the map area. A much less detailed version of the map area is included in New Mexico Bureau of Mines and Mineral Resources Bulletin 94 (Clark and Read, 1972).

Reynolds, C. B., Geology of the Hagan-La Madera area, Sandoval County, New Mexico: M. S. thesis, Univ. New Mexico, 82 p., 8 figs., map scale 1:31,680, 1954

Describes the stratigraphy, structure, and economic geology of the Hagan-La Madera area, northeastern Sandia Mountains, southeastern Sandoval County. Includes a very short section on the distribution and general nature of Precambrian rocks exposed in the southwestern and northwestern map areas. Subdivides the Precambrian into: 1) schist, and 2) Sandia granite.

Reynolds, C. B., Structural geology of the Hagan-La Madera area, New Mexico: Compass, v. 33, no. 1, p. 55-65, 1955

Riese, R. W., Precambrian geology of the southern part of the Rincon Range: M. S. thesis, New Mexico Institute Mining Technology, 183 p., 38 figs., 6 tables, 2 pls., map scale 1:24,000, 1969

Describes the general geology, petrology, metamorphism, and structure of Precambrian rocks in the southern part of the Rincon Range, Sangre de Cristo Mountains, western Mora County. Subdivides the Precambrian into: 1) granitic

gneiss, 2) muscovite schist, 3) muscovite-quartz schist, and 4) pegmatites and quartz veins.

Riese, W. C., see Foster, R. W., and Frentress, R. M., 1972

Ritchie, A. W., Geology of part of Las Tablas quadrangle, Rio Arriba County, New Mexico: M. A. thesis, Univ. Texas (Austin), 58 p., 3 figs., 2 pls., map scale 1:24,000, 1969

Mainly a detailed account of the petrology and structural geology of Precambrian rocks exposed in the south-central part of the Las Tablas (7½-min) quadrangle, Tusas Mountains, eastern Rio Arriba County. Subdivides the Precambrian into: 1) vitreous quartzite, 2) fine-grained quartzite, 3) granitic gneiss, 4) kyanite-muscovite schist, 5) hornblende-chlorite schist, 6) quartz-pebble conglomerate, 7) feldspathic schist, 8) muscovitic quartzite, and 9) quartz-muscovite-feldspar schist.

Robinson, G. D., Wanek, A. A., Hays, W. H., and McCallum, M. E., 1964, Philmont country, the rocks and landscape of a famous New Mexico ranch: U. S. Geol. Survey, Prof. Paper 505, 1964

An informal, relatively nontechnical account of the geology of the Philmont Scout Ranch Cimarron Range, Sangre de Cristo Mountains, western Colfax County. Includes generalized descriptions of Precambrian metamorphic and igneous rocks that crop out in the southwestern part of the ranch area.

Robinson, G. D., see Wanek, A. A., Read, C. B., Hays, W. H., and McCallum, M. E., 1964

Rogers, C. P., Jr., see Northrop, S. A., Sullwold, H. H., Jr., and MacAlpin, A. J., 1946

Roos, A., Mining lepidolite in New Mexico: Eng. and Mining Jour., v. 121, no. 26, p. 1037-1042, 4 figs., 1 table, 1926

Ross, C. S., see Smith, R. L., and Bailey, R. A., 1970

Rothrock, H. E., Johnson, C. H., and Hahn, A. D., Fluorspar resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 21, 245 p., 15 figs., 22 pls., 1946

Describes the geology, mineralogy, wall-rock alteration, and origin of fluorspar deposits in New Mexico. Includes a county by county summary of the general geology and detailed accounts of individual mines and prospects. Although none of these deposits is thought to be Precambrian in age, the deposits quite often occur in Precambrian host rocks. Thus a description of the geology of many fluorspar deposits is likely to include a section on the Precambrian.

Rothrock, H. E., see Kelley, V. C., and Smalley, R. G., 1947

Ruetschilling, R. L., Structure and stratigraphy of the San Ysidro quadrangle, Sandoval County, New Mexico: M. S. thesis, Univ. New Mexico, 79 p., 21 figs., map scale 1:24,000, 1973

Describes the stratigraphy, structure, and economic geology of the San Ysidro (7½-min) quadrangle, Nacimiento Mountains, central Sandoval County. Includes a short section on the distribution and petrology of Precambrian rocks exposed in several places in the western map area. Subdivides the Precambrian into: 1) mafic xenoliths, 2) quartz monzonite gneiss, and 3) leucocratic dike rocks. The accompanying geologic map is about to be published by Woodward and Ruetschilling (1976).

Ruetschilling, R. L., see Woodward, L. A., 1976

St. John, B. E., see Muehlberger, W. R., Adams, G. E., and Longgood, T. E., Jr., 1960

Sandeen, W. M., Geology of the Tularosa Basin, New Mexico: New Mexico Geol. Soc., Guidebook 5th field conf., p. 81-88, 1 fig., 1954

Includes a very brief section on the distribution and general nature of Precambrian rocks exposed along the margins of the Tularosa Basin in: 1) San Andres Mountains, eastern Doña Ana and Sierra Counties, 2) Oscura Mountains, southeastern Socorro and southwestern Lincoln Counties, and 3) Sacramento Mountains, central Otero County.

Santos, E. S., Hall, R. B., and Weisner, R. C., Mineral resources of the San Pedro Parks Wilderness and vicinity, Rio Arriba and Sandoval Counties, New Mexico: U. S. Geol. Survey, Bull. 1385-C, 29 p., 2 figs., 3 tables, 1 pl., map scale 1:24,000, 1975

Brief description of the general geology, stratigraphy, structure, and ore deposits of the San Pedro Mountains, south-central Rio Arriba and north-central Sandoval Counties. Includes a short section on Precambrian rocks that distinguishes: 1) granite and granite porphyry, 2) aplitic granite, 3) greenstone, and 4) diorite gneiss. Precambrian rocks on the accompanying geologic map are undivided, and occupy the central portion of the map area. Most of the Precambrian in this area is covered in greater detail on New Mexico Bureau of Mines and Mineral Resources Geologic Maps 32 (Nacimiento Peak quadrangle, Woodward, McLelland, and Kaufman, 1974) and 39 (Gallina quadrangle, Woodward, Gibson, and McLelland, in preparation).

Schaller, W. T., and Henderson, E. P., Purple muscovite from New Mexico: Am. Mineralogist, v. 11, p. 5-16, 3 tables, 1926

Describes rose muscovite occurrences at the Precambrian Harding and Pilar pegmatites, Picuris Range, Sangre de Cristo Mountains, southern Taos County. Includes a discussion of the geology and mineralogy of the deposits, and details of the mineral's physical, optical, and chemical characteristics.

Schilling, J. H., Geology of the Questa molybdenum mine area, Taos County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 51, 87 p., 29 figs., 1 table, 5 pls., map scale 1" = 500', 1956

Describes the general geology, petrology, structure, alteration, and mineral deposits of the Questa mine area, Sangre de Cristo Mountains, north-central Taos County. Includes a rather extensive section on the petrology of Precambrian rocks exposed in the eastern third of the map area. The Precambrian is subdivided into: 1) amphibolite complex, 2) Cabresto Metaquartzite, 3) granite, 4) pegmatites, and 5) diabase dikes.

Schilling, J. H., Mineral resources of Taos County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 71, 124 p., 43 figs., 3 tables, 2 pls., 1960

Describes the general geology, stratigraphy, structure, and mineral deposits of Taos County. Includes a district by district listing of mines and prospects, primarily in the Sangre de Cristo Mountains, eastern Taos County. A variety of Precambrian-age deposits are listed: 1) pegmatites, 2) Cu, W, Au, Ag-bearing quartz veins, 3) kyanite-sillimanite concentrations in quartzites, 4) graphitic gneiss and schist, and 5) banded magnetite-hematite-quartz rock.

Schowalter, T. T., Geology of part of the Creston Range, Mora County, New Mexico: M. S. thesis, Univ. New Mexico, 70 p., 4 figs., 12 pls., map scale 1:24,000, 1969

Describes the stratigraphy, structure, and mineral deposits of part of the Creston

Range, Sangre de Cristo Mountains, northwestern Mora County. Includes a section on the petrology and structure of Precambrian rocks exposed along the west-facing flank of the range. Subdivides the Precambrian into: 1) quartzite, 2) quartz-mica schist, 3) mica schist, 4) amphibolite, 5) undifferentiated metamorphics, and 6) pegmatites.

Schreyer, W., and Chinner, G. A., Staurolite-quartzite bands in kyanite quartzite at Big Rock, Rio Arriba County, New Mexico: Contr. Mineralogy and Petrology, v. 12, p. 223-244, 9 figs., 5 tables, 1966

Describes the geology, mineralogy, petrography, and petrogenesis of quartz-staurolite-magnetite layers within kyanite-bearing quartzites of the Precambrian Petaca schist at Big Rock, Tusas Mountains, eastern Rio Arriba County.

Schumacher, O. L., Geology and ore deposits of the southwest Nacimiento Range, Sandoval County, New Mexico: M. S. thesis, Univ. New Mexico, 79 p., 20 figs., map scale 1:24,000, 1972

Describes the stratigraphy, structure, and economic geology of the southwestern Nacimiento Mountains, central Sandoval County. Includes a section on the distribution and petrology of Precambrian rocks exposed along the eastern margin of the map area. Subdivides the Precambrian into: 1) mafic xenoliths, 2) quartz-plagioclase schistose gneiss, 3) quartz monzonite gneiss, 4) mafic dike rocks, 5) pink, fine-grained granite, and 6) leucocratic dike rocks. The accompanying map has been published as part of La Ventana (7½-min) quadrangle (Woodward and Schumacher, 1973).

Schumacher, O. L., see Woodward, L. A., 1973; and Woodward, L. A., Martinez, R., Du Chene, H. R., and Reed, R. K., 1974

Seager, W. R., Geologic map and sections of south half San Diego Mountain quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 35, scale 1:24,000, 1975

Geologic map and short description of the south half of the San Diego Mountain (15-min) quadrangle, northwestern Doña Ana County. Precambrian granitic rocks, undivided, form the core of the Tonuco uplift along the northeast flank of San Diego Mountain.

Seager, W. R., Hawley, J. W., and Clemons, R. E., Geology of San Diego Mountain area, Doña Ana County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 97, 38 p., 3 figs., 2 pls., map scale 1:16,330, 1971

Describes the general geology, detailed stratigraphy, and structure of the San Diego Mountain area, northwestern Doña Ana County. Includes a very brief paragraph on Precambrian granitic rocks exposed in the Tonuco uplift along the northeast flank of San Diego Mountain.

Seager, W. R., see Woodward, L. A., et al., 1975

Shaffer, W. L., see Woodward, L. A., et al., 1975

Shafiqullah, M., see Brookins, D. G., 1975; and Brookins, D. G., Enz, R. D., and Kudo, A. M., 1975

Sheffer, H. W., and Goldsmith, L. A., Tantalum project, Rociada, New Mexico: New Mexico Bureau Mines Mineral Resources, Mining Resources Rept. 2, 15 p., 4 figs., 3 tables, 1969

Describes a program of sampling and evaluation of tantalum-bearing Precambrian pegmatites in the Rociada district, along the eastern flanks of the Sangre de Cristo Mountains in northwestern San Miguel and southwestern Mora Counties.

Shiver, W. S., see Fullagar, P. D., 1973a; and Fullagar, P. D., 1973b

Shoemaker, E. M., Petrology of the Hopewell series in the Ojo Caliente district of New Mexico: M. S. thesis, California Institute Technology, 66 p., 18 figs., 7 pls., map scale 1:12,000, 1948

Describes the general geology, stratigraphy, and structure of the Ojo Caliente district, Tusas Mountains, eastern Rio Arriba County. The main part of the report covers the detailed petrography and metamorphism of Precambrian rocks exposed over much of the map area. The accompanying map subdivides the Precambrian into: 1) Hopewell series, with seven mappable units, 2) Ortega Quartzite, 3) Vallecitos Rhyolite, 4) gabbro, 5) quartz veins, and 6) pegmatites.

Shomaker, J. W., Geology of the southern portion of the Sandia granite, Sandia Mountains, Bernalillo County, New Mexico: M. S. thesis, Univ. New Mexico, 80 p., 3 figs., 1 table, 6 pls., map scale 1" = 2,000', 1965

Describes the general geology of the area, and the detailed petrography, structure, and petrogenesis of Precambrian rocks that comprise the southwestern portion of the Sandia Mountains, eastern Bernalillo County. Subdivides the Precambrian into: 1) quartz-microcline gneiss, 2) quartz-sillimanite gneiss, 3) Sandia granite, 4) younger granite porphyry, and 5) aplite and pegmatite dikes. The map area is included in New Mexico Bureau of Mines and Mineral Resources Memoir 29 (Kelley and Northrop, 1975).

Sidwell, R. G., and Haliburton, J. L., Sediments from Precambrian rocks of southern Sangre de Cristo Mountains, New Mexico: Jour. Sed. Petrology, v. 18, no. 2, p. 74-78, 2 figs., 1948

Examines the mineralogy of sediments derived from the Precambrian core of the southern Sangre de Cristo Mountains, northwestern San Miguel and western Mora Counties, and attempts to distinguish the parent rock for individual grains.

Silberman, M. K., see Armstrong, A. K., 1974

Silver, C., see Kelley, V. C., 1952

Silver, L. T., see Wasserburg, G. J., Wetherill, G. W., and Flawn, P. T., 1962

Singh, Y. L., see Pradhan, B. M., 1960

Smalley, R. G., see Kelley, V. C., and Rothrock, H. E., 1947

Smith, C. T., and others, Geologic map of Inscription Rock 15-minute quadrangle, Valencia and McKinley Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 4, scale 1:48,000, 1958

Reconnaissance geologic map of Inscription Rock (15-min) quadrangle (now subdivided into Ramah, Kettner Canyon, Togeye Lake, and El Morro 7½-min quadrangles), northwest Valencia and south-central McKinley Counties. Precambrian rocks are subdivided into: 1) granite gneiss, and 2) metarhyolite and metasediments, and crop out in the Zuni Mountains in the northeast corner of the map area.

Smith, C. T., Preliminary notes on the geology of part of the Socorro Mountains, Socorro County, New Mexico: New Mexico Geol. Soc., Guidebook 14th field conf., p. 185-196,

4 figs., map scale 1:21,120, 1963

Describes the general geology, stratigraphy, structure, and ore deposits of the central part of the Socorro Mountains, central Socorro County. Includes a very brief section on the location and macroscopic petrology of Precambrian argillite and quartzite exposed in one place along the eastern flank of the mountains.

Smith, C. T., and others, Geologic map of Foster Canyon quadrangle, Valencia and McKinley Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 9, scale 1:48,000, 1959

Reconnaissance geologic map of Foster Canyon (15-min) quadrangle (now subdivided into Chiniza, Continental Divide, Page, and Cottonwood Canyon 7½-min quadrangles), northwestern Valencia, and south-central McKinley Counties. Precambrian rocks, undivided, crop out in the Zuni Mountains in the west-central map area.

Smith, C. T., and Muehlberger, W. R., Geologic map of the Rio Chama Country: New Mexico Geol. Soc., Guidebook 11th field conf., 1960

Geologic compilation map of part of north-central New Mexico: 36° to 37+°N by 106° to 107° W. Includes Precambrian, undivided, in the Tusas Mountains, eastern Rio Arriba County, and the San Pedro Peaks, south-central Rio Arriba and north-central Sandoval Counties.

Smith, C.T., see Jahns, R. H., and Muehlberger, W. R., in preparation

Smith, J. F., Jr., and Ray, L.L., Geology of the Cimarron Range, New Mexico: Geol. Soc. America, Bull., v. 54, p. 891-924, 2 figs., 6 pls., map scale 1:120,000, 1943

Describes the general geology, stratigraphy, structure, physiography, and mineral resources of the Cimarron Range, Sangre de Cristo Mountains, western Colfax County. Includes a very brief description of the Precambrian rocks which are undivided on the geologic map.

Smith, R. E., Geology and ground-water resources of Torrance County, New Mexico: New Mexico Bureau Mines Mineral Resources, Ground-water Rept. 5, 186 p., 7 figs., 16 tables, 5 pls., map scale 1:166,000, 1957

Includes sections on the general geology, stratigraphy, and structure of Torrance County, as well as brief summaries of local geology of six areas within the county. The distribution and general nature of Precambrian rocks are briefly noted in the section on stratigraphy. The report is accompanied by a geologic compilation map that shows Precambrian rocks, undivided, exposed at: 1) Cerrito del Lobo, 2) Pedernal Hills, and 3) Manzano Mountains.

Smith, R. L., Bailey, R. A., and Ross, C. S., Geologic map of the Jemez Mountains, New Mexico: U. S. Geol. Survey, Misc. Geol. Inv., Map I-571, scale 1:125,000, 1970

Geologic map of the Jemez Mountains, southeast Rio Arriba, northeast Sandoval, and Los Alamos Counties. Shows Precambrian granitic rocks, undivided, along the western margin of the map area in the Nacimiento Mountains.

Somers, R. E., Geology of the Burro Mountains copper district, New Mexico: Am. Inst. Mining Eng., Bull. 101, p. 957-996, 25 figs., 1915

Describes the general geology and ore deposits of the Big and Little Burro Mountains, central Grant County. Includes a brief section on the petrology and structure of Precambrian granite exposed mainly in the northern part of the Burro Mountain area.

Soule, J. H., Exploration of Harding tantalum-lithium deposits, Taos County, New Mexico: U. S. Bureau Mines, Rept. Inv. 3986, 10 p., 6 figs., 1946

Describes the geology, and mineralogy of Precambrian pegmatite deposits southwest of Taos in the Sangre de Cristo Mountains, southern Taos County. Includes a history of ownership and mining, and some sampling and milling data generated by the U. S. Bureau of Mines.

Spall, H. R., see Helsley, C. E., 1966

Spiegel, Z. E., Geology and ground-water resources of northeastern Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Ground-water Report 4, 99 p., 8 figs., 6 tables, 2 pls., map scale 1:62,500, 1955

Includes some information on the general geology, stratigraphy, and structure of northeastern Socorro County. Has one paragraph on the distribution and nature of Precambrian rocks. Accompanying geologic compilation map shows Precambrian, undivided, exposed in: 1) Manzano Mountains, 2) Los Pinos Mountains, 3) Joyita Hills, and 4) Ladron Mountains.

Spiegel, Z. E., and Baldwin, B., Geology and water resources of the Santa Fe area, New Mexico: U. S. Geol. Survey, Water-Supply Paper 1525, 258 p., 1963

Describes the general geology, stratigraphy, structure, economic geology, and water resources of the Santa Fe area – Agua Fria, Turquoise Hill, Santa Fe, and Seton Village (7½-min) quadrangles – Sangre de Cristo Mountains, central Santa Fe County. Includes a brief section on Precambrian rocks exposed along the eastern margins of the Santa Fe and Seton Village quadrangles. Subdivides the Precambrian into: 1) gneiss, 2) schist, 3) gray granite, 4) amphibolite, and 5) pink granite.

Spradlin, E. J., Geologic map and sections of the Joyita Hills area, Socorro County, New Mexico: U. S. Geol. Survey, Open-file Rept., Map 75-139, scale 1:24,000, 1975

Reconnaissance geologic map of the Joyita Hills area, central Socorro County. Precambrian rocks are undivided, and crop out in a four mile-long, north-south band in the northwestern portion of the map area.

Staatz, M. H., and Norton, J. J., Precambrian geology of the Los Pinos Range, New Mexico: M. S. thesis, Northwestern Univ., 150 p., 3 figs., 20 pls., map scale 1:62,500, 1942

Describes the general geology, detailed petrology, metamorphism, and structure of Precambrian rocks exposed in the Los Pinos Mountains, northeastern Socorro County. Subdivides the Precambrian into: 1) Sais Quartzite, 2) Blue Springs Formation, 3) White Ridge Quartzite, 4) Sevilleta Rhyolite, 5) basic schist, 6) Los Pinos Granite, and 7) Priest Granite.

Stark, J. T., Geology of the south Manzano Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 34, 46 p., 1 fig., 8 pls., map scale 1:48,000, 1956

Entire bulletin on the geology, petrology, metamorphism, and structure of Precambrian rocks of the south Manzano Mountains, western Torrance and eastern Valencia Counties. Precambrian rocks are subdivided into: 1) lower metaclastics, 2) Sais Quartzite, 3) Blue Springs Schist, 4) White Ridge Quartzite, 5) Sevillita Metarhyolite, 6) basic schists, 7) Monte Largo Granite, and 8) Priest Granite.

Stark, J. T., and Dapples, E. C., Geology of the Los Pinos Mountains, New Mexico: Geol. Soc. America, Bull., v. 57, p. 1121-1172, 1 fig., 7 pls., map scale 1:63,360, 1946

Describes the geology, stratigraphy, and structure of the Los Pinos Mountains, north-central Socorro County. Includes an extensive section on the geology, petrology, and metamorphism of the Precambrian core of the range and distinguishes: 1) Sais Quartzite, 2) Blue Springs Schist, 3) White Ridge Quartzite, 4) Sevilleta Rhyolite,

5) basic schists, 6) granites, 7) pegmatite and aplite dikes, and 8) quartz and quartz-feldspar dikes.

Stauber, I. J., Burro Mountain mining district: Mines and Minerals, v. 30, p. 380-382, 4 figs., 1910

Describes the location and history, geology, and mining operations in the Burro Mountain mining district, Burro Mountains, central Grant County. Copper, fluorspar, gold, bismuth, molybdenum, manganese, and turquoise occur in veins and fracture zones in Precambrian granite and Cretaceous-Tertiary quartz monzonite.

Stearns, C. E., Tertiary geology of the Galisteo-Tonque area, New Mexico: Geol. Soc. America, Bull., v. 64, p. 459-508, 10 figs., 1 table, 3 pls., map scale 1:125,000, 1953

Includes a very brief description of the Precambrian rocks in the foothills of the Sangre de Cristo Mountains, northeastern Santa Fe County, and in the north end of the Sandia Mountains, southeastern Sandoval County.

Steiger, R. H., see Wasserburg, G. J., and Towell, D. , 1965

Stensrud, H. L., Trace and minor element geochemistry of Precambrian muscovites of northern New Mexico: Ph. D. thesis, Univ. Washington, 130 p., 1970

Published in a number of journals, see especially the Geological Society of America Bulletin, (Gresens, R. L., and Stensrud, H. L., 1974a).

Stensrud, H. L., Does piemontite represent only greenschist facies metamorphism?: Contr. Mineralogy and Petrology, v. 40, no. 1, p. 79-82, 1973

Discussion of piemontite (Mn^{+3} - bearing epidote) distribution and stability range in metamorphic rocks from several localities including the Precambrian of Las Tablas area, Tusas Mountains, eastern Rio Arriba County, and the Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Stensrud, H. L., and Gresens, R. L., Geochemistry of Precambrian muscovite from northern New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 1, no. 3, p. 64-65, 1969

Muscovites from: 1) Las Tablas (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County, and 2) Picuris Range, Sangre de Cristo Mountains, southern Taos County, have been analyzed for: K, Fe, Na, Mn, Rb, Zn, Cr, Mg, Li, and Cu.

Stensrud, H. L., and Gresens, R. L., Trace element partitioning between co-existing muscovite and biotite (abs.): Geol. Soc. America, Abs. with Programs, v. 2, no. 5, p. 350-351, 1970

Describes trace-element analyses obtained from coexisting muscovite-biotite pairs collected from quartz-mica-feldspar schists in the: 1) Las Tablas area, Tusas Mountains, eastern Rio Arriba County, and 2) Picuris Range, Sangre de Cristo Mountains, southern Taos County.

Stensrud, H. L., and Gresens, R. L., Phlogopite occurrences in low magnesium feldspathic schists from the Precambrian of northern New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 3, no. 2, p. 200-201, 1971

Describes phlogopite occurrences and origins in Precambrian quartz-feldspar schists from Las Tablas (15-min) quadrangle, Tusas Mountains, eastern Rio Arriba County.

Stensrud, H. L., and Gresens, R. L., A model for phlogopite development in low magnesium rocks: Lithos, v. 6, no. 1, p. 91-102, 1973

Describes the occurrence, geochemistry, and possible origin of phlogopite from three samples of the Precambrian Kiawa Mountain Formation, Las Tablas area, Tusas Mountains, eastern Rio Arriba County.

Stensrud, H. L., see Gresens, R. L., 1968; and Gresens, R. L., 1974a; and Gresens, R. L., 1974b

Sterling, D. A., and Malan, R. C., Distribution of uranium and thorium in Precambrian rocks of the southwestern United States: Am. Inst. Mining Engineering, Soc. Mining Engineers, Trans. v. 247, p. 255-259, 5 figs., 1 table, 1970

Briefly summarizes the Precambrian geochronology of the southwestern United States; describes sample collection, analysis, and interpretation from areas including western New Mexico. Contains no specific sample data.

Sterrett, D. B., Mica in Idaho, New Mexico, and Colorado: U. S. Geol. Survey, Bull. 530, p. 375-390, 3 figs., 1913

Mica in Rio Arriba County, New Mexico, is described on pages 383-388. The section details workings and general geology of several Precambrian mica-pegmatites in the Petaca and Ojo Caliente districts, Tusas Mountains, eastern Rio Arriba County.

Sterrett, D. B., Mica deposits of the United States: U. S. Geol. Survey, Bull. 740, 342 p., 1923

Includes a general discussion of geology, mineralogy, and mining of mica deposits, as well as a description of the Cribbenville, American (Coats), Globe, and Antonio Joseph deposits, Petaca and Ojo Caliente districts, Tusas Mountains, eastern Rio Arriba County (p. 158-164).

Stewart, W. J., see Kottlowski, F. E., 1970

Stipp, T. F., Precambrian rocks of south-central New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., p. 62-64, 1955

Summarizes published work on the geology and petrology of Precambrian rocks in: 1) the San Andres Mountains, eastern Sierra and Doña Ana Counties, 2) the Caballo Mountains, south-central Sierra County, 3) the Mud Springs Mountains, central Sierra County, 4) the Fra Cristobal Range, north-central Sierra County, 5) the Black Range, western Sierra and eastern Grant Counties, and 6) the Sierra Cuchillo, northwestern Sierra County.

Stipp, T. F., see Foster, R. W., 1961

Stott, C. E., Geology of the Pecos mine: Eng. and Mining Jour., v. 131, no. 6, p. 270-275, 3 figs., 1931

Describes the development history, general geology, structure, and ore deposits of the Pecos mine located at the confluence of Willow Creek and the Pecos River, Sangre de Cristo Mountains, northwestern San Miguel County. One of the more comprehensive published accounts of the Pecos mine.

Sullwold, H. H., Jr., see Northrop, S. A., MacAlpin, A. J., and Rogers, C. P., Jr., 1946

Summerson, C. H., see Read, C. B., Wilpolt, R. H., Andrews, D. A., and Wood, G. H., 1944

Sutherland, P. K., Precambrian structure, key to Pennsylvanian depositional history in the southern Sangre de Cristo Mountain area, New Mexico (abs.): Geol. Soc. America, Spec. Paper 73, p. 251-252, 1963

Relates Precambrian movement along the Pecos-Picuris fault and subsequent late Paleozoic dip-slip motion to Pennsylvanian depositional history in the southern Sangre de Cristo Mountains, Taos, Rio Arriba, Mora, San Miguel, and Santa Fe Counties.

Sutherland, P. K., see Miller, J. P., and Montgomery, A., 1963; and Montgomery, A., 1960

Taggart, J. E., and Brookins, D. G., Rb-Sr whole rock age determinations for Sandia granite and Cibola gneiss, New Mexico: Isochron/West, no. 12, p. 5-8, 3 figs., 1 table, 1975

Short article giving new Rb-Sr whole rock isotopic ages for the Cibola gneiss (1610 ± 73 m.y.) and the Sandia granite (1504 ± 15 m.y.). Samples come from the Sandia Mountains east-northeast of Albuquerque in eastern Bernalillo County.

Talmage, S. B., and Wootton, T. P., The non-metallic mineral resources of New Mexico and their economic features: New Mexico Bureau Mines Mineral Resources, Bull. 12, 159 p., 4 figs., 2 pls., 1937

Briefly discusses the geologic history of New Mexico. Contains sections on the general features and uses of a number of resources including Precambrian deposits of asbestos, beryl, graphite, lithium, and mica.

Thompson, M. L., see Kottlowski, F. E., Flower, R. H., and Foster, R. W., 1956

Thompson, S., III, Geology of the Fra Cristobal Range: New Mexico Geol. Soc., Guidebook 6th field conf., p. 155-157, 1955

Brief summary of the general geology, stratigraphy, and structure of the Fra Cristobal Range, north-central Sierra County. Includes a short paragraph on Precambrian granitic rocks which are exposed along the western flank of the northern part of the range.

Thompson, T. B., and Giles, D. L., Orbicular rocks of the Sandia Mountains, New Mexico: Geol. Soc. America, Bull., v. 85, p. 911-916, 6 figs., 3 tables, 1974

Describes the field relations, petrography, and petrogenesis of Precambrian orbicular rocks associated with the Sandia granite, Sandia Mountains, northeastern Bernalillo County.

Tilton, G. R., see Aldrich, L. T., Wetherill, G. W., and Davis, G. L., 1958

Timmer, R. S., Geology and sedimentary copper deposits in the western part of the Jarosa and Seven Springs quadrangles, Rio Arriba and Sandoval Counties, New Mexico: M. S. thesis, Univ. New Mexico, 151 p., 31 figs., map scale 1:24,000, 1976

Describes the stratigraphy, regional tectonic setting, structure, and economic geology of parts of the Jarosa and Seven Springs (7½-min) quadrangles, northeastern Nacimiento Mountains, north-central Sandoval and south-central Rio Arriba Counties. Includes a short section on the distribution and petrology of Precambrian muscovite-biotite granite exposed in three places in the northern map area.

Titus, F. B., Jr., Geology and ground-water conditions in eastern Valencia County, New Mexico: New Mexico Bureau Mines Mineral Resources, Ground-water Rept. 7, 113 p., 16 figs., 7 tables, 6 pls., map scale 1:62,500, 1963

Includes a section on the general geology, structure, and stratigraphy of eastern Valencia County containing a short paragraph on the general nature of Precambrian rocks that crop out along the west face of the Manzano Mountains. Accompanying map is a geologic compilation from previous workers and shows Precambrian rocks, undivided.

Towell, D., see Wasserburg, G. J., and Steiger, R. H., 1965

Trauger, F. D., Water resources and general geology of Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Hydrologic Rept. 2, 211 p., 50 figs., 15 tables, map scale 1:172,800, 1972

Has a very brief section on the general geology of Grant County that mentions the distribution of Precambrian rocks in: 1) Big Burro Mountains, 2) Little Burro Mountains, 3) Silver City Range, 4) north end of the Cookes Range, 5) Black Range, and 6) along the west side of the Mimbres Valley. Accompanying geologic map is a compilation from previous workers, and shows Precambrian rocks subdivided into: 1) granite and granite-like rocks, 2) metamorphics, and 3) undifferentiated.

Trice, E. L., Geology of Lagunitas Lakes area, Rio Arriba County, New Mexico: M. A. thesis, Univ. Texas (Austin), 99 p., 30 figs., 1 pl., map scale 1:48,738, 1957

Describes the general geography, stratigraphy, petrology, structure, geomorphology, and economic geology of the northeast quarter of the Brazos Peak (15-min) quadrangle, Tusas Mountains, northeastern Rio Arriba County. Includes sections on the distribution and detailed petrography of Precambrian rocks exposed in scattered outcrops throughout the central map area. Subdivides the Precambrian into: 1) amphibolite, 2) quartz-biotite schist, 3) quartz-feldspar gneiss, 4) granite breccia, 5) granite, and 6) pegmatite, although the accompanying map distinguishes only granite and undifferentiated metamorphics. The map area is published as part of the Brazos Peak (15-min) quadrangle (Muehlberger, 1968).

Tschanz, C. M., Laub, D. C., and Fuller, G. W., Copper and uranium deposits of the Coyote district, Mora County, New Mexico: U. S. Geol. Survey, Bull. 1030-L, 56 p., 7 figs., 12 tables, 11 pls., map scale 1″ = 2,000′, 1958

Describes the general geology, stratigraphy, structure, and mineral deposits of the Coyote district, along the eastern slopes of the Rincon Range, Sangre de Cristo Mountains, northwestern Mora County. Includes a brief paragraph on Precambrian rocks, undivided, exposed in the northwestern map area.

U. S. Geological Survey, Mineral and water resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 87, 437 p., 1965

Includes a section on the general geology of New Mexico that contains several paragraphs on the distribution and nature of Precambrian rocks. A major portion of the bulletin is devoted to a commodity by commodity summary of the state's mineral resources including a relatively small number of Precambrian-age deposits.

Vlissides, S. D., and Bieberman, R. A., Map of New Mexico showing oil and gas fields, unsuccessful test wells, Precambrian rocks, and pipelines: U. S. Geol. Survey, Oil and Gas Inv. Map OM-207, scale 1:500,000, 1961

State map showing major outcrops of Precambrian rocks, undivided.

Vorbe, G., see Bates, R. L., Wilpolt, R. H., and MacAlpin, A. J., 1947; and Wilpolt, R. H., MacAlpin, A. J., and Bates, R. L., 1946

Wade, W. R., Burro Mountain copper district, New Mexico: Eng. and Mining Jour., v. 84, p. 355-356, 5 figs., 1907

Brief summary of the history of the mining operations through 1907 and geology of copper deposits in the Burro Mountains, central Grant County. Some copper sulfides occupy fissure veins in Precambrian granite, although the mineralization is thought to be related to Cretaceous-Tertiary quartz monzonite intrusives.

Wanek, A. A., Read, C. B., Robinson, G. D., Hays, W. H., and McCallum, M. E., Geologic map and sections of the Philmont Ranch region, New Mexico: U. S. Geol. Survey, Misc. Geol. Inv. Map I-425, scale 1:48,000, 1964

Geologic map of the Philmont Scout Ranch, Cimarron Range, Sangre de Cristo Mountains, southwestern Colfax County. Precambrian rocks are exposed in the southwestern portion of the map area and are subdivided into: 1) gneiss, schist, and minor quartzite, and 2) granodiorite. This map is the same as plate 3 from U. S. Geological Survey Professional Paper 505 (1964).

Wanek, A. A., see Robinson, G. D., Hays, W. H., and McCallum, M. E., 1964; and Wilpolt, R. H., 1951

Wargo, J. G., The geology of the Schoolhouse Mountain quadrangle, Grant County, New Mexico: Ph. D. thesis, Univ. Arizona, 187 p., 1959

Wasserburg, G. J., Towell, D., and Steiger, R. H., A study of Rb-Sr systematics in some Precambrian granites of New Mexico (abs.): (EOS) Am. Geophys. Union, Trans., v. 46, p. 173-174, 1965

Summarizes results of a detailed study of Rb-Sr isotopes of whole-rock and mineral separates of a suite of granites from: 1) San Andres Mountains, eastern Doña Ana and Sierra Counties, 2) Oscura Mountains, western Lincoln and southeastern Socorro Counties, 3) Los Pinos Mountains, northeastern Socorro County, 4) Ladron Mountains, north-central Socorro County, 5) Sandia Mountains, eastern Bernalillo and Sandoval Counties.

Wasserburg, G. J., Wetherill, G. W., and Silver, L. T., and Flawn, P. T., A study of the ages of the Precambrian of Texas: Jour. Geophys. Research, v. 67, no. 10, p. 4021-4047, 11 figs., 9 tables, 1962

Describes the petrology, distribution, and ages of Precambrian rocks in central and trans-Pecos Texas; includes data from three drill holes in Eddy and Roosevelt Counties, New Mexico.

Wedow, H., Jr., see Ericksen, G. E., Eaton, G. P., and Leland, G. R., 1970

Weir, J. E., Jr., Geology and availability of ground water in the northern part of the White Sands Missile Range and vicinity, New Mexico: U. S. Geol. Survey, Water Supply Paper 1801, 78 p., 11 figs., 5 tables, 1 pl., map scale 1:125,000, 1965

Includes a section on the general geology, stratigraphy, and structure of the northern part of the White Sands Missile Range and vicinity, Socorro, Lincoln, Sierra, and Otero Counties. Shows Precambrian rocks, undivided, exposed in the San Andres and Oscura Mountains.

Weisner, R. C., see Santos, E. S., and Hall, R. B., 1975

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Wilpolt, R.H., MacAlpin, A. J., Bates, R. L., and Vorbe, G., Geologic map and stratigraphic sections of Paleozoic rocks of Joyita Hills, Los Pinos Mountains, and northern Chupadera Mesa, Valencia, Torrance, and Socorro Counties, New Mexico: U. S. Geol. Survey, Prelim. Oil and Gas Inv. Map 61, 1:62,500, 1946

Reconnaissance geologic map that includes Precambrian rocks, undivided, exposed in the Joyita Hills and Los Pinos Mountains, north-central Socorro County.

Wilpolt, R. H., and Wanek, A. A., Geology of the region from Socorro and San Antonio east to Chupadera Mesa, Socorro County, New Mexico: U. S. Geol. Survey, Oil and Gas Inv. Map OM 121, 1:62,500, 1951

Reconnaissance geologic map that includes Precambrian rocks, undivided, exposed in the Joyita Hills, the western slopes of the Oscura Mountains, and in isolated outcrops east of Socorro, central Socorro County.

Wilpolt, R. H., see Bates, R. L., MacAlpin, A. J., and Vorbe, G., 1947; and Read, C. B., Andrews, D. A., Summerson, C. H., and Wood, G. H., 1944

Wood, G. H., and Northrop, S. A., Geology of the Nacimiento Mountains, San Pedro Mountain, and adjacent plateaus in part of Sandoval and Rio Arriba Counties, New Mexico: U. S. Geol. Survey, Oil and Gas Inv. Map OM 57, scale 1:95,278, 1946

Reconnaissance geologic map that includes Precambrian rocks, undivided, exposed in the: 1) Nacimiento Mountains, central Sandoval County, and 2) San Pedro Mountains, north-central Sandoval and south-central Rio Arriba Counties.

Wood, G. H., see Kelley, V. C., 1946; and Read, C. B., Wilpolt, R. H., Andrews, D. A., and Summerson, C. H., 1944

Woodward, L. A., Metamorphic and igneous rocks of Pedernal Hills area, Torrance County, New Mexico (abs.): Geol. Soc. America, Spec. Paper 121, p. 579-580, 1969

Describes the geology and petrology of Precambrian metamorphic and igneous rocks exposed in the Pedernal Hills, northeastern Torrance County. Subdivides the Precambrian into: 1) granitic gneiss, 2) quartzite and schist, 3) heterogeneous unit, and 4) pink granite.

Woodward, L. A., Lamprophyre dikes in Sandia Mountains and vicinity, New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 2, no. 5, p. 355-356, 1970a

Describes the petrography and petrogenesis of lamprophyre dikes, a majority of which cut Precambrian rocks in the Sandia Mountains, eastern Bernalillo County. The dikes themselves may not be Precambrian.

Woodward, L. A., Differentiation trends in spessartite dikes, Sandia Mountains, New Mexico: Jour. Geology, v. 78, p. 741-745, 2 figs., 1 table, 1970b

Outlines the petrography, chemistry, and petrogenesis of lamprophyre dikes, a majority of which cut Precambrian granitic and metamorphic rocks in the Sandia Mountains, eastern Bernalillo County. The dikes themselves may not be Precambrian.

Woodward, L. A., Precambrian rocks of southwestern New Mexico: New Mexico Geol. Soc., Guidebook 21st field conf., p. 27-31, 1 fig., 1970c

Summarizes the distribution and lithologies of Precambrian rocks exposed in

Grant, Luna, and Hidalgo Counties. Identifies, locates, and references twenty-two separate Precambrian exposures or areas in southwestern New Mexico.

Woodward, L. A., Anderson, J. B., Kaufman, W. H., and Reed, R. K., Geologic map and sections of San Pablo quadrangle, Sandoval County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 26, scale 1:24,000, 1973

Geologic map of the San Pablo (7½-min) quadrangle, northern Nacimiento Mountains, north-central Sandoval County. Precambrian rocks are exposed along the east edge of the map area and are subdivided into: 1) gneiss, 2) quartz monzonite, 3) pegmatite and aplite dikes, and 4) mafic dikes.

Woodward, L. A., Callender, J. F., Gries, J., Seager, W. R., Chapin, C. E., Shaffer, W.L., and Zilinski, R. E., Tectonic map of the Rio Grande region, Colorado-New Mexico border to Presidio, Texas: New Mexico Geol. Soc., Guidebook 26th field conf., scale 1:1,000,000, 1975

Tectonic map that includes major outcrops of Precambrian rocks, undivided, along both sides of the Rio Grande depression, in New Mexico and west Texas.

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Tectonic map that includes major outcrops of Precambrian rocks, undivided, along both sides of the Rio Grande rift.

Woodward, L. A., DuChene, H. R., and Reed, R. K., Geologic map and sections of San Miguel Mountain quadrangle, Sandoval County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 34, scale 1:24,000, 1974

Geologic map and short description of the San Miguel Mountain (7½-min) quadrangle, Nacimiento Mountains, north-central Sandoval County. Precambrian rocks are exposed over approximately one-third of the map area along its western margin, and are subdivided into: 1) hornblendite and amphibolite, 2) schist, 3) gneiss, 4) leucogneiss, 5) granite, and 6) pegmatite, aplite, and granitic bodies.

Woodward, L. A., and Fitzsimmons, J. P., Precambrian banded iron formation, Pedernal Peak, Torrance County, New Mexico (abs.): New Mexico Geol. Soc., Guidebook 18th field conf., p. 228, 1967

Describes the geology, petrology, and possible origins of Precambrian iron formation exposed at Pedernal Peak, Pedernal Hills, north-central Torrance County.

Woodward, L. A., Gibson, G. G., and McLelland, D., Geologic map and sections of Gallina quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 39, scale 1:24,000, in preparation

Geologic map and brief description of the Gallina (7½-min) quadrangle, San Pedro Mountains, south-central Rio Arriba County. Precambrian rocks are exposed over the southwestern quarter of the map area, and are subdivided into: 1) metamorphic rocks, 2) amphibolite, 3) quartz diorite, 4) hybrid zone, 5) biotite granite, 6) fine-grained granite, and 7) muscovite-biotite granite.

Woodward, L. A., Kaufman, W. H., and Anderson, J. B., Nacimiento fault and related structures, northern New Mexico: Geol. Soc. America, Bull., v. 83, p. 2383-2396, 15 figs., 1972

Describes the regional geology and structure of the Nacimiento Mountains, central Sandoval and south-central Rio Arriba Counties. Speculates on the origin of the Nacimiento fault.

Woodward, L. A., Kaufman, W. H., and Reed, R. K., Geologic map and sections of Rancho del Chaparral quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 27, scale 1:24,000, 1973

Geologic map and brief description of the Rancho del Chaparral (7½-min) quadrangle, Nacimiento Mountains, north-central Sandoval County. Precambrian rocks are exposed in the southwestern and north-central map area, and are subdivided into: 1) gneiss, 2) quartz monzonite, 3) leucogranite, 4) mafic dikes, and 5) pegmatite and aplite dikes.

Woodward, L. A., and Martinez, R., Geologic map and sections of Holy Ghost Spring quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 33, scale 1:24,000, 1974

Geologic map and brief description of the Holy Ghost Spring (7½-min) quadrangle, Nacimiento Mountains, central Sandoval County. Precambrian gneissic granite is exposed over a small area in the northeast corner of the map.

Woodward, L. A., Martinez, R., DuChene, H. R., Schumacher, O. L., and Reed, R. K., Precambrian rocks of the southern Sierra Nacimiento, New Mexico: New Mexico Geol. Soc., Guidebook 25th field conf., p. 95-99, 2 figs., 1974

Describes the distribution and petrology of Precambrian rocks exposed in the Nacimiento Mountains, north-central Sandoval County. Subdivides the Precambrian into: 1) mafic xenoliths, 2) muscovite-quartz schist, 3) hornblendite, 4) quartz diorite gneiss, 5) San Miguel gneiss, 6) hornblende biotite, quartz monzonite gneiss, 7) leucoquartz monzonitic gneiss, 8) biotite quartz monzonitic gneiss, 9) muscovite-biotite quartz monzonitic gneiss, 10) mafic dike rocks, 11) Joaquin granite, 12) muscovite quartz monzonite, and 13) leucocratic dike rocks.

Woodward, L. A., McLelland, D., Anderson, J. B., and Kaufman, W. H., Geologic map of Cuba quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 25, scale 1:24,000, 1972

Geologic map and brief text on the Cuba (7½-min) quadrangle, Nacimiento Mountains, north-central Sandoval and south-central Rio Arriba Counties. Precambrian rocks are exposed along the eastern margin of the map area, and are subdivided into: 1) ultramafic rocks, 2) quartz diorite, 3) quartz monzonite, 4) hybrid zone, and 5) dikes.

Woodward, L. A., McLelland, D., and Kaufman, W. H., Geologic map and sections of Nacimiento Peak quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 32, scale 1:24,000, 1974

Geologic map and brief text on the Nacimiento Peak (7½-min) quadrangle, Nacimiento and San Pedro Mountains, south-central Rio Arriba County. Precambrian rocks are exposed over a majority of the map area, and are subdivided into: 1) metavolcanics, 2) hornblende gabbro and diorite, 3) quartz diorite, 4) hybrid zone, 5) quartz monzonite, 6) muscovite-biotite granite, and 7) leucogranite.

Woodward, L. A., and Ruetschilling, R. L., Geologic map and sections of San Ysidro quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 37, scale 1:24,000, 1976

Geologic map and brief text on the San Ysidro (7½-min) quadrangle, Nacimiento Mountains, central Sandoval County. Precambrian rocks are exposed over less than 5 percent of the map area along faults and in the core of an anticline, and are subdivided into: 1) granite, 2) leucogranite, 3) gneiss, and 4) schist.

Woodward, L. A., and Schumacher, O.L., Geologic map and sections of La Ventana quadrangle, Sandoval County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 28,

scale 1:24,000, 1973
Geologic map and brief text on La Ventana quadrangle, Nacimiento Mountains, north-central Sandoval County. Precambrian rocks are exposed along the eastern margin of the map area, and are subdivided into: 1) hornblende schist, 2) gneiss, 3) granite, 4) mafic dikes, and 5) pegmatite and aplite.

Woodward, L. A., see Corbitt, L. L., 1973; and Gonzalez, R. A., 1972

Woodward, T. M., Geology of the Lemitar Mountains, Socorro County, New Mexico: M. S. thesis, New Mexico Institute Mining Technology, 73 p., 19 figs., map scale 1:12,000, 1973
Describes the geology, stratigraphy, petrology, and structure of the Lemitar Mountains, central Socorro County. Includes a section on the distribution, petrology, and metamorphism of Precambrian rocks exposed over approximately one-third of the map area. Subdivides the Precambrian into: 1) Corkscrew Canyon sequence-interbedded quartzite and micaceous quartz-feldspar gneiss and schist, 2) Lemitar metagabbro stock, 3) Polvadera granite, and 4) mafic dikes.

Wootton, T. P., see Lasky, S. G., 1933; and Talmage, S. B., 1937

Wright, L. A., The Globe pegmatite, Rio Arriba County, New Mexico: Am. Jour. Science, v. 246, p. 665-688, 5 figs., 2 pls., 1948
Describes the geology, mineralogy, and paragenesis of the major mica-pegmatite deposit in the Petaca district, Tusas Mountains, eastern Rio Arriba County.

Wright, L. A., see Chidester, A. H., and Engel, A. E. J., 1964; and Jahns, R. H., 1944; and Jahns, R. H., 1959

Wrucke, C. T., see Bromfield, C. S., 1961

Zeller, R. A., Jr., Reconnaissance geologic map of Playas 15-min quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 7, scale 1:62,500, 1958a
Geologic map of the Playas (15-min) quadrangle, central Hidalgo and southern Grant Counties. Precambrian granite is exposed over a small area in the northern end of the Animas Mountains, south-central Hidalgo County.

Zeller, R. A., Jr., The geology of the Big Hatchet Peak quadrangle, Hidalgo County, New Mexico: Ph.D. thesis, Univ. California (Los Angeles), 1958b
Published as New Mexico Bureau of Mines and Mineral Resources Memoir 16 (1965) and Circular 146 (1976).

Zeller, R. A., Jr., Stratigraphy of the Big Hatchet Mountains area, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 16, 128 p., 18 figs., 3 tables, 6 pls., 1965
Describes the general geology and detailed stratigraphy of the Big Hatchet Mountains and vicinity, southeastern Hidalgo County. Includes a brief section on the distribution and lithologies of Precambrian rocks exposed in Hatchet Gap, and along the western and eastern flanks of the Big Hatchet Mountains.

Zeller, R. A., Jr., Geology of the Little Hatchet Mountains, Hidalgo and Grant Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 96, 23 p., 2 pls., map scale 1:31,680, 1970a

Describes the general geology, stratigraphy, igneous petrology, structure, and mineral potential of the Little Hatchet Mountains, east-central Hidalgo and south-central Grant Counties. Includes a very brief mention of Precambrian granite and aplite exposed at the southern end of the range.

Zeller, R. A., Jr., Stratigraphy of the Big Hatchet Mountains area, New Mexico: New Mexico Geol. Soc., Guidebook 21st field conf., p. 44-57, 1 fig., 1970b

A condensation of New Mexico Bureau of Mines and Mineral Resources Memoir 16 that includes a brief section on the distribution and lithologies of Precambrian rocks exposed in several places in the Big Hatchet Mountains and vicinity, southeastern Hidalgo County.

Zeller, R. A., Jr., Structural geology of Big Hatchet Peak quadrangle, Hidalgo County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 146, 3 figs., 2 pls., map scale 1:48,000, 1975

Describes the general geology and structure of the Big Hatchet Peak (15-min) quadrangle, Big Hatchet Mountains and vicinity, southeastern Hidalgo County. Accompanying geologic map shows Precambrian granite and aplite exposed in the northern end of the range and in Hatchet Gap.

Zietz, I., see Andreasen, G. E., and Kane, M. F., 1962

Zilinski, R. E., see Woodward, L. A., et al., 1975; and Woodward, L. A., and Callender, J. F., 1975

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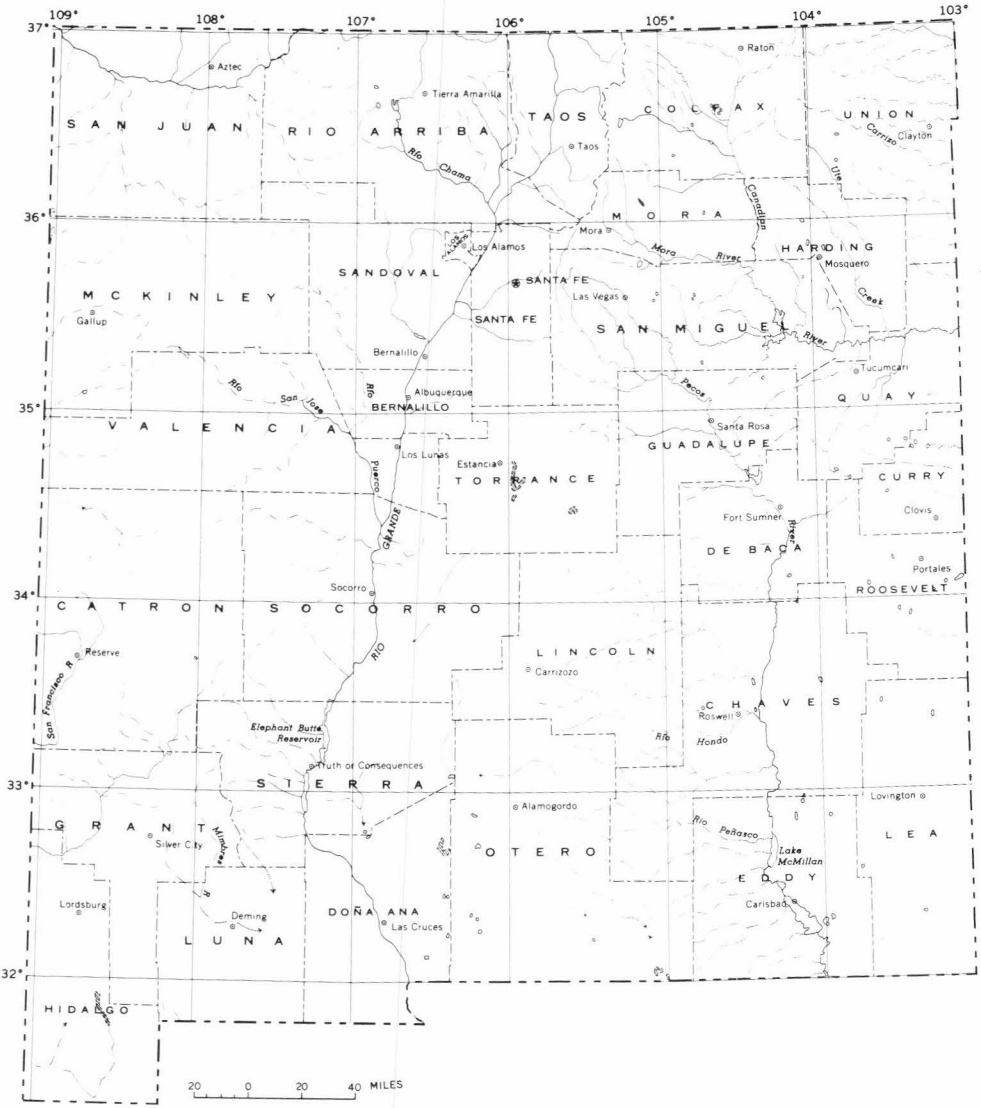

INDEX MAP OF COUNTIES.

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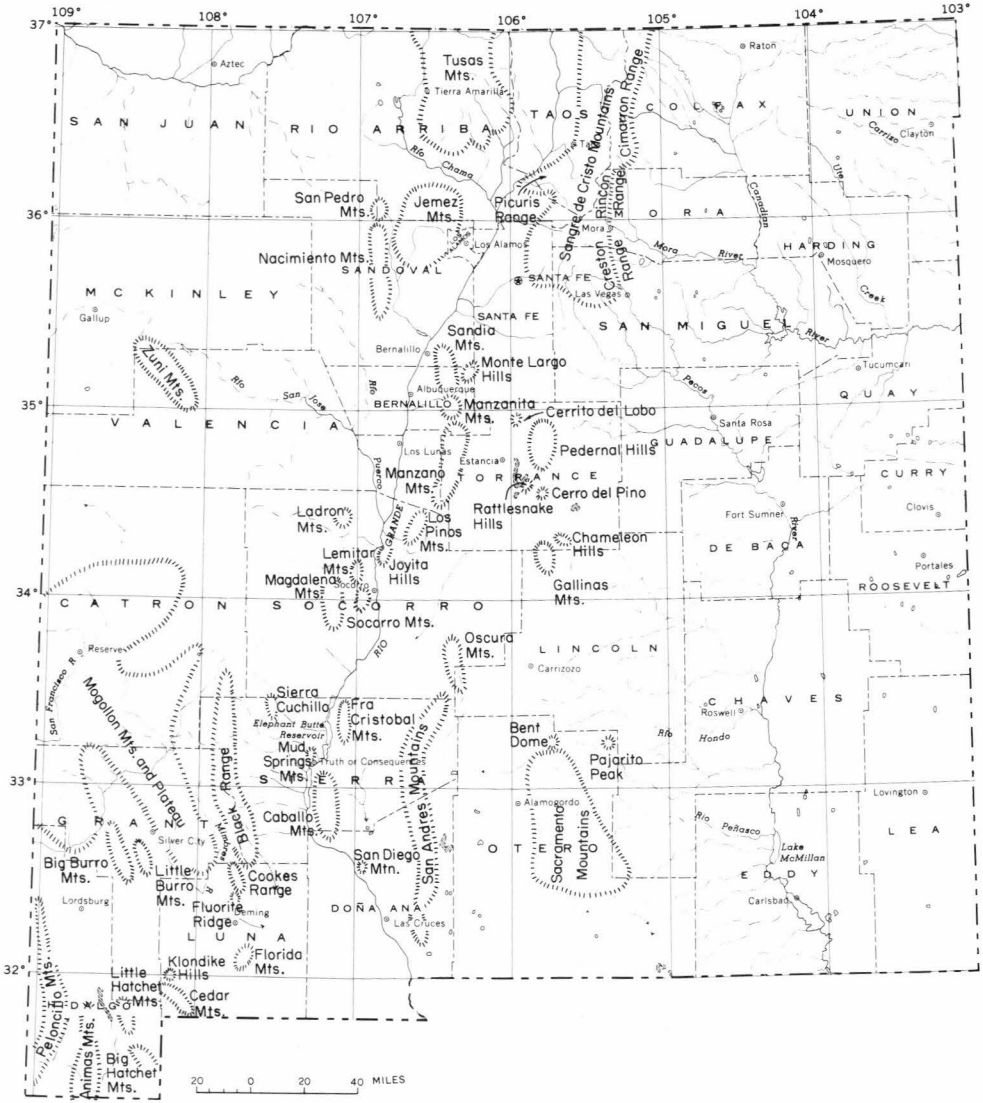

INDEX MAP OF MOUNTAIN RANGES REFERENCED IN BIBLIOGRAPHY.

MOUNTAIN RANGES

Classifies publications according to mountain range in which work was done. "Mountain Range" here covers a multitude of land forms, including actual ranges, isolated peaks, hills, ridges, and structural domes. The Sangre de Cristo Mountains are subdivided into several distinct ranges, although a single listing of all publications on this major mountain belt is also given. Somewhat arbitrary decisions have been made in several cases with respect to the name or extent of a particular range. The accompanying index map shows the names and locations used in this bulletin.

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- Zeller, R. A., Jr., 1958a

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- Bachman, G. O., 1954
- Denison, R. E., and Hetherington, E. A., Jr., 1969

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- Zeller, R. A., Jr., 1958b
- Zeller, R. A., Jr., 1965
- Zeller, R. A., Jr., 1970b
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- Ericksen, G. E., et al., 1970
- Harley, G. T., 1934
- Hedlund, D. C., 1975a
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- Jicha, H. L., Jr., 1954
- Kuellmer, F. J., 1954
- Kuellmer, F. J., 1956
- Stipp, T. F., 1955
- Trauger, F. D., 1972

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- Ballmann, D. L., 1960
- Benjovsky, T. D., 1946
- Cunningham, J. E., in preparation
- Edwards, G. H., 1961
- Elston, W. E., 1960
- Gillerman, E., 1952
- Gillerman, E., 1964
- Gillerman, E., 1970
- Gillerman, E., and Whitebread, D. H., 1956
- Hewitt, C. H., 1959
- Kelley, V. C., 1949
- Leach, A. A., 1916
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- Leach, F. I., 1920
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- Stauber, I. J., 1910
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- Wargo, J. G., 1959

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- Doyle, J. C., 1951
- Harley, G. T., 1934
- Kelley, V. C., 1955
- Kelley, V. C., and Silver, C., 1952
- Mason, J. T., 1976
- Read, C. B., 1952
- Stipp, T. F., 1955

CEDAR MOUNTAINS (Grant, Luna)
- Bromfield, C. S., and Wrucke, C. T., 1961

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- Kelley, V. C., 1972
- Smith, R. E., 1957

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- Kelley, V. C., 1972

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- Kelley, V. C., 1972

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- Darton, N. H., 1916
- Elston, W. E., 1957
- Griswold, G. B., 1961
- Jicha, H. L., Jr., 1954
- Morris, R. W., 1974

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- Brookins, D. G., 1974b
- Corbitt, L. L., 1971
- Corbitt, L. L., 1974
- Corbitt, L. L., and Woodward, L. A., 1973
- Darton, N. H., 1916
- Griswold, G. B., 1961
- Lochman-Balk, C., 1958

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- Darton, N. H., 1916
- Griswold, G. B., 1961

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- Cserna, E., 1956
- Harley, G. T., 1934
- Jacobs, R. C., 1956
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- Kelley, V. C., 1955
- McCleary, J. T., 1960
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- Thompson, S., III, 1955

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- Kelley, V. C., 1946

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Dunham, K. C., 1935

OSCURA MOUNTAINS (Lincoln, Socorro)
Bachman, G. O., 1969
Budding, A. J., and Condie, K. C., 1975
Darton, N. H., 1928
Read, C. B., 1952
Sandeen, W. M., 1954
Wasserburg, G. J., et al., 1965
Weir, J. E., Jr., 1965
Wilpolt, R. H., and Wanek, A. A., 1951

PAJARITO PEAK (Otero)
Bachman, G. O., 1954
Denison, R. E., and Hetherington, E. A., Jr., 1969
Kelley, V. C., 1968
Kelley, V. C., 1971

PEDERNAL HILLS (Torrance)
Fallis, J. F., Jr., 1958
Gonzalez, R. A., 1968
Gonzalez, R. A., and Woodward, L. A., 1972
Kelley, V. C., 1972
Mukhopadhyay, B., et al., 1975
Smith, R. E., 1957
Woodward, L. A., 1969
Woodward, L. A., and Fitzsimmons, J. P., 1967

PELONCILLO MOUNTAINS (Hidalgo)
Armstrong, A. K., and Silberman, M. K., 1974
Cargo, D. N., 1959
Gillerman, E., 1958
Quaide, W. L., 1953

PICURIS RANGE – see Sangre de Cristo Mountains

RATTLESNAKE HILLS (Torrance)
Kelley, V. C., 1972

RINCON RANGE – see Sangre de Cristo Mountains

SACRAMENTO MOUNTAINS (Otero, Lincoln)
Darton, N. H., 1928
Denison, R. E., and Hetherington, E. A., Jr., 1969
Foster, R. W., 1959
Pray, L. C., 1952
Pray, L. C., 1954
Pray, L. C., 1959
Pray, L. C., 1961
Sandeen, W. M., 1954

SAN ANDRES MOUNTAINS (Doña Ana, Sierra, Socorro)
Bachman, G. O., 1965
Bachman, G. O., 1969
Bachman, G. O., and Harbour, R. L., 1970
Bachman, G. O., and Myers, D. A., 1963
Bachman, G. O., and Myers, D. A., 1969
Budding, A. J., and Condie, K. C., 1975
Chidester, A. H., et al., 1964
Darton, N. H., 1928
Denison, R. E., and Hetherington, E. A., Jr., 1969
Kelley, V. C., 1955
Kottlowski, F. E., 1955
Kottlowski, F. E., 1959
Kottlowski, F. E., 1960b
Kottlowski, F. E., et al., 1956
Lasky, S. G., 1932
Sandeen, W. M., 1954
Stipp, T. F., 1955
Wasserburg, G. J., et al., 1965
Weir, J. E., Jr., 1965

SANDIA MOUNTAINS (Sandoval, Bernalillo)
Aldrich, L. T., et al., 1957
Aldrich, L. T., et al., 1958
Brookins, D. G., 1973b
Brookins, D. G., 1974a
Brookins, D. G., 1974c
Brookins, D. G., et al., 1975
Brookins, D. G., and Shafiqullah, M., 1975

Brown, B. N., 1962
Bruns, J. J., 1959
Daugherty, F. W., and Asquith, G. B., 1971
Ellis, R. W., 1922
Enz, R. D., 1974
Feinberg, H. B., 1969
Fitzsimmons, J. P., 1961
Fitzsimmons, J. P., 1966
Green, J. A., and Callender, J. F., 1973
Hayes, P. T., 1951
Kelley, V. C., 1963
Kelley, V. C., and Northrop, S. A., 1975
Lodewick, R. B., 1960
Reynolds, C. B., 1954
Reynolds, C. B., 1955
Shomaker, J. W., 1965
Stearns, C. E., 1953
Taggart, J. E., and Brookins, D. G., 1975
Thompson, T. B., and Giles, D. L., 1974
Wasserburg, G. J., et al., 1965
Woodward, L. A., 1970a
Woodward, L. A., 1970b

SAN DIEGO MOUNTAIN (Doña Ana)
Seager, W. R., 1975
Seager, W. R., et al., 1971

SANGRE DE CRISTO MOUNTAINS (Santa Fe, San Miguel, Mora, Rio Arriba, Taos, Colfax)
Aldrich, L. T., et al., 1957
Aldrich, L. T., et al., 1958
Andreasen, G. E., et al., 1962
Bachman, G. O., 1953
Baltz, E. H., Jr., 1972
Baltz, E. H., Jr., and Bachman, G. O., 1956
Barker, F., 1969b
Berliner, M. H., 1949
Bingler, E. C., 1965b
Brookins, D. G., 1974a
Budding, A. J., 1968
Budding, A. J., 1972
Budding, A. J., in preparation
Bush, F. V., 1912
Cabot, E. C., 1938
Cameron, E. N., et al., 1949
Cathey, C. A., 1973
Cepeda, J. C., 1972
Cepeda, J. C., 1973
Clark, K. F., 1966a
Clark, K. F., 1966b
Clark, K. F., and Read, C. B., 1972
Elston, W. E., 1967
Fullagar, P. D., and Shiver, W. S., 1973a
Fullagar, P. D., and Shiver, W. S., 1973b
Giles, D. L., 1974
Giles, D. L., 1976a
Giles, D. L., 1976b
Goodknight, C. S., 1973
Goolsby, R. S., 1965
Gresens, R. L., 1972b
Gresens, R. L., 1975
Gresens, R. L., 1976
Gresens, R. L., and Stensrud, H. L., 1974a
Gresens, R. L., and Stensrud, H. L., 1974b
Griggs, R. L., and Hendrickson, G. E., 1951
Gruner, J. W., 1920
Harley, G. T., 1940
Harrer, C. M., 1965
Harrer, C. M., and Kelly, F. J., 1963
Heinrich, E. W., and Buchi, S. H., 1960
Heinrich, E. W., and Levinson, A. A., 1953
Helsley, C. E., and Spall, H. R., 1966
Holdaway, M. J., 1975
Holmquist, R. J., 1946
Hubbell, A. H., 1926
Jahns, R. H., 1946a
Jahns, R. H., 1946b
Jahns, R. H., 1951
Jahns, R. H., 1953a
Jahns, R. H., 1953b
Jahns, R. H., and Adams, J. W., 1953
Jahns, R. H., and Burnham, C. W., 1957
Jahns, R. H., and Burnham, C. W., 1958
Jahns, R. H., and Wright, L. A., 1944
Jahns, R. H., and Wright, L. A., 1959
Johnson, J. H., 1940a
Johnson, J. H., 1940b
Johnson, R. B., 1970
Just, E., 1937
Kelley, V. C., 1940
Kottlowski, F. E., 1952
Krieger, P., 1932a
Krieger, P., 1932b
Lindgren, W., and Graton, L. C., 1906
Long, P. E., 1974a
Long, P. E., 1974b
Long, P. E., and Luth, W. C., 1975
McKinlay, P. F., 1956
McKinlay, P. F., 1957
Miller, J. P., et al., 1963
Missaghi, F. L., 1968
Montgomery, A., 1950
Montgomery, A., 1951a
Montgomery, A., 1951b
Montgomery, A., 1953
Montgomery, A., 1956
Montgomery, A., and Sutherland, P. K., 1960
Nielsen, K. C., 1972
Nielsen, K. C., and Dunn, D. E., 1974
Northrop, S. A., et al., 1946

Park, C. F., Jr., and McKinlay, P. F., 1948
Petersen, J. W., 1969
Raitz, C. H., 1951
Read, C. B., and Andrews, D. A., 1944
Redmon, D. E., 1961
Restrepo, J. J., 1972
Riese, R. W., 1969
Robinson, G. D., et al., 1964
Roos, A., 1926
Schaller, W. T., and Henderson, E. P., 1926
Schilling, J. H., 1956
Schilling, J. H., 1960
Schowalter, T. T., 1969
Sheffer, H. W., and Goldsmith, L. A., 1969
Sidwell, R. G., and Haliburton, J. L., 1948
Smith, J. F., Jr., and Ray, L. L., 1943
Soule, J. H., 1946
Spiegel, Z. E., and Baldwin, B., 1963
Stearns, C. E., 1953
Stensrud, H. L., 1970
Stensrud, H. L., 1973
Stensrud, H. L., and Gresens, R. L., 1969
Stensrud, H. L., and Gresens, R. L., 1970
Stott, C. E., 1931
Sutherland, P. K., 1963
Tschanz, C. M., et al., 1958
Wanek, A. A., et al., 1964

CIMARRON RANGE

Goodknight, C. S., 1973
Robinson, G. D., et al., 1964
Smith, J. F., Jr., and Ray, L. L., 1943
Wanek, A. A., et al., 1964

CRESTON RANGE

Schowalter, T. T., 1969

PICURIS RANGE

Aldrich, L. T., et al., 1957
Aldrich, L. T., et al., 1958
Barker, F., 1969b
Berliner, M. H., 1949
Bingler, E. C., 1965b
Cameron, E. N., et al., 1949
Fullagar, P. D., and Shiver, W. S., 1973a
Fullagar, P. D., and Shiver, W. S., 1973b
Gresens, R. L., 1972b
Gresens, R. L., 1975
Gresens, R. L., 1976
Gresens, R. L., and Stensrud, H. L., 1974a
Gresens, R. L., and Stensrud, H. L., 1974b
Heinrich, E. W., and Levinson, A. A., 1953
Holdaway, M. J., 1975
Jahns, R. H., 1951
Jahns, R. H., 1953a
Jahns, R. H., and Adams, J. W., 1953
Jahns, R. H., and Burnham, C. W., 1957
Jahns, R. H., and Burnham, C. W., 1958
Jahns, R. H., and Wright, L. A., 1944
Jahns, R. H., and Wright, L. A., 1959
Johnson, J. H., 1940a
Johnson, J. H., 1940b
Just, E., 1937
Kelley, V. C., 1940
Long, P. E., 1974a
Long, P. E., 1974b
Long, P. E., and Luth, W. C., 1975
Miller, J. P., et al., 1963
Montgomery, A., 1950
Montgomery, A., 1951a
Montgomery, A., 1951b
Montgomery, A., 1953
Montgomery, A., 1956
Nielsen, K. C., 1972
Nielsen, K. C., and Dunn, D. E., 1974
Roos, A., 1926
Schaller, W. T., and Henderson, E. P., 1926
Soule, J. H., 1946
Stensrud, H. L., 1970
Stensrud, H. L., 1973
Stensrud, H. L., and Gresens, R. L., 1969
Stensrud, H. L., and Gresens, R. L., 1970

RINCON RANGE

Heinrich, E. W., and Buchi, S. H., 1960
Riese, R. W., 1969
Tschanz, C. M., et al., 1958

SAN PEDRO MOUNTAINS (Rio Arriba)

Acosta, C. R., 1973
Hutson, O. C., 1958
Santos, E. S., et al., 1975
Smith, C. T., and Muehlberger, W. R., 1960
Wood, G. H., and Northrop, S. A., 1946
Woodward, L. A., Gibson, G. G., and McLelland, D., 1976
Woodward, L. A., McLelland, D., and Kaufman, W. H., 1974

SIERRA CUCHILLO (Sierra, Socorro)

Jahns, R. H., 1955
Kelley, V. C., 1955
Stipp, T. F., 1955

SIERRA OSCURA – see Oscura Mountains

SOCORRO MOUNTAINS (Socorro)

Chamberlin, R. M., in preparation
Kottlowski, F. E., 1960a
Smith, C. T., 1963

COYOTE HILLS
Kottlowski, F. E., 1960a
TUSAS MOUNTAINS (Rio Arriba)
Barker, F., 1954
Barker, F., 1958
Barker, F., 1969a
Barker, F., 1969b
Barker, F., 1970
Barker, F., Arth, J. G., and Peterman, Z. E., 1973
Barker, F., et al., 1976
Barker, F., and Friedman, I., 1974
Barker, F., Peterman, Z. E., and Hansen, W. R., 1973
Barker, F., et al., 1974
Bayley, R. W., and James, H. L., 1973
Benjovsky, T. D., 1945
Bertholf, W. E., II, 1960
Beutner, E. L., 1970
Bingler, E. C., 1964
Bingler, E. C., 1965a
Bingler, E. C., 1965b
Bingler, E. C., 1965c
Bingler, E. C., 1968a
Bingler, E. C., 1968b
Bingler, E. C., 1974a
Bingler, E. C., 1974b
Brookins, D. G., 1974a
Butler, A. P., Jr., 1946
Cameron, E. N., et al., 1949
Carpenter, J. R., 1966
Carpenter, J. R., 1968
Chenoweth, W. L., 1974
Corey, A. F., 1953
Corey, A. F., 1960
Doney, H. H., 1966
Doney, H. H., 1968
Giles, D. L., 1976b
Gresens, R. L., 1967a
Gresens, R. L., 1967b
Gresens, R. L., 1971
Gresens, R. L., 1972a
Gresens, R. L., 1975
Gresens, R. L., 1976
Gresens, R. L., and Stensrud, H. L., 1968
Gresens, R. L., and Stensrud, H. L., 1974a
Gresens, R. L., and Stensrud, H. L., 1974b
Harrer, C. M., 1965
Harrer, C. M., and Kelly, F. J., 1963
Heinrich, E. W., and Corey, A. F., 1959
Heinrich, E. W., and Levinson, A. A., 1953
Hess, F. L., 1925
Hess, F. L., and Wells, R. C., 1930
Hilpert, L. S., 1969
Holmquist, R. J., 1947
Hutchinson, R. A., 1968
Jahns, R. H., 1946a
Jahns, R. H., 1948
Jahns, R. H., 1951
Jahns, R. H., 1953a
Jahns, R. H., 1974
Jahns, R. H., et al., in preparation
Just, E., 1937
Kelley, V. C., 1950
Lindgren, W., and Graton, L. C., 1906
Lindholm, R., 1963
Long, L. E., 1972a
Long, L. E., 1972b
Maxon, J. R., 1976
McLeroy, D. F., 1970a
McLeroy, D. F., 1970b
McLeroy, D. F., 1972
Muehlberger, W. R., 1960
Muehlberger, W. R., 1967
Muehlberger, W. R., 1968
Muehlberger, W. R., et al., 1960
Redmon, D. E., 1961
Ritchie, A. W., 1969
Schreyer, W., and Chinner, G. A., 1966
Shoemaker, E. M., 1948
Smith, C. T., and Muehlberger, W. R., 1960
Stensrud, H. L., 1970
Stensrud, H. L., 1973
Stensrud, H. L., and Gresens, R. L., 1969
Stensrud, H. L., and Gresens, R. L., 1970
Stensrud, H. L., and Gresens, R. L., 1971
Stensrud, H. L., and Gresens, R. L., 1973
Sterrett, D. B., 1913
Sterrett, D. B., 1923
Trice, E. L., 1957
Wright, L. A., 1948
ZUNI MOUNTAINS (Valencia, McKinley)
Chapman, Wood, and Griswold, Inc., 1974
Darton, N. H., 1928
Fitzsimmons, J. P., 1967
Foster, R. W., 1957
Giles, D. L., 1976b
Goddard, E. N., 1945
Goddard, E. N., 1966
Kelley, V. C., 1950
Naeser, C. W., 1971
Smith, C. T., et al., 1958
Smith, C. T., et al., 1959

GEOCHRONOLOGY

An alphabetical listing of publications containing radiometric data on the Precambrian of New Mexico.

Aldrich, L. T., et al., 1957 (Mora, Taos, Bernalillo)
Aldrich, L. T., et al., 1958 (Taos, Mora, Bernalillo)
Barker, F., and Friedman, I., 1974 (Rio Arriba)
Barker, F., et al., 1974 (Rio Arriba)
Bickford, M. E., and Wetherill, G. W., 1965 (Statewide)
Brookins, D. G., 1973a (Sandoval)
Brookins, D. G., 1973b (Bernalillo, Sandoval)
Brookins, D. G., 1974a (Rio Arriba, Taos, Bernalillo, Sandoval)
Brookins, D. G., 1974b (Luna)
Brookins, D. G., 1974c (Bernalillo)
Brookins, D. G., et al., 1975 (Bernalillo)
Brookins, D. G., and Shafiqullah, M., 1975 (Bernalillo)
Condie, K. C., 1975 (Statewide)
Denison, R. E., and Hetherington, E. A., Jr., 1969 (Otero, Doña Ana, Sierra)
Fullagar, P. D., and Shiver, W. S., 1973a (Taos, Rio Arriba)
Fullagar, P. D., and Shiver, W. S., 1973b (Taos, Rio Arriba)
Gresens, R. L., 1972b (Rio Arriba, Taos)
Gresens, R. L., 1975 (Rio Arriba, Taos)
Gresens, R. L., 1976 (Rio Arriba, Taos)
Long, L. E., 1972a (Rio Arriba)
Long, L. E., 1972b (Rio Arriba)
Muehlberger, W. R., et al., 1966 (eastern New Mexico)
Mukhopadhyay, B., et al., 1975 (Torrance)
Naeser, C. W., 1971 (Valencia, San Juan)
Taggart, J. E., and Brookins, D. G., 1975 (Bernalillo)
Wasserburg, J. G., et al., 1962 (Eddy, Roosevelt)
Wasserburg, J. G., et al., 1965 (Doña Ana, Sierra, Socorro, Lincoln, Bernalillo, Sandoval)
Wetherill, G. W., et al., 1965 (Statewide)

MINERAL DEPOSITS

Classifies publications according to the nature of the major metal or mineral concentrated in the deposit described. These deposits or occurrences are at present presumed to be Precambrian in age, or at least occur extensively, if not exclusively, in Precambrian host rocks. Much work remains to be done on many of these deposits, and some will undoubtedly prove to be younger.

CALCITE (optical grade)
Johnson, J. H., 1940a (Taos)
Johnson, J. H., 1940b (Taos)
Kelley, V. C., 1940 (Taos)

GOLD ± SILVER
Anderson, E. C., 1957 (Statewide)
Barker, F., 1969b (Rio Arriba, Taos)
Benjovsky, T. D., 1945 (Rio Arriba)
Bingler, E. C., 1968b (Rio Arriba)
Bingler, E. C., 1974b (Rio Arriba)
Bruns, J. J., 1959 (Bernalillo)
Clark, K. F., and Read, C. B., 1972 (Taos)
Doney, H. H., 1968 (Rio Arriba)
Elston, W. E., 1967 (Bernalillo, Santa Fe)
Gillerman, E., 1964 (Grant)
Harley, G. T., 1940 (Mora, San Miguel)
Hutchinson, R. A., 1968 (Rio Arriba)
Jones, F. A., 1904 (Statewide)
Kelley, V. C., and Northrop, S. A., 1975 (Bernalillo)
Kelley, V. C., and Silver, C., 1952 (Sierra)
Lasky, S. G., and Wootton, T. P., 1933 (Statewide)
Lindgren, W., and Graton, L. C., 1906 (Rio Arriba)
Lindgren, W., et al., 1910 (Grant, Rio Arriba, San Miguel, Santa Fe, Taos, Valencia)
Miller, J. P., et al., 1963 (San Miguel)
Reiche, P., 1949 (Valencia)
Schilling, J. H., 1960 (Taos)
Woodward, L. A., McLelland, D., Anderson, J. B., and Kaufman, W. H., 1972 (Sandoval)

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GRAPHITE
Clark, K. F., and Read, C. B., 1972 (Taos)
McKinlay, P. F., 1956 (Taos)
McKinlay, P. F., 1957 (Taos)
Schilling, J. H., 1960 (Taos)
Talmage, S. B., and Wootton, T. P., 1937 (Taos)

IRON
Anderson, E. C., 1957 (Rio Arriba)
Bayley, R. W., and James, H. L., 1973 (Rio Arriba)
Bertholf, W. E., II, 1960 (Rio Arriba)
Beutner, E. L., 1970 (Rio Arriba)
Bingler, E. C., 1968b (Rio Arriba)
Bingler, E. C., 1974b (Rio Arriba)
Clark, K. F., and Read, C. B., 1972 (Taos)
Harrer, C. M., 1965 (Rio Arriba, Taos)
Harrer, C. M., and Kelly, F. J., 1963 (Rio Arriba, Santa Fe, Taos)
Kelley, V. C., 1949 (Grant)
Lasky, S. G., and Wootton, T. P., 1933 (Rio Arriba)
McKinlay, P. F., 1956 (Taos)
McLeroy, D. F., 1970a (Rio Arriba)
McLeroy, D. F., 1970b (Rio Arriba)
McLeroy, D. F., 1972 (Rio Arriba)
Restrepo, J. J., 1972 (Taos)
Schilling, J. H., 1960 (Taos)
Woodward, L. A., and Fitzsimmons, J. P., 1967 (Torrance)

KYANITE
Bingler, E. C., 1968b (Rio Arriba)
Corey, A. F., 1953 (Rio Arriba)
Corey, A. F., 1960 (Rio Arriba)
Gresens, R. L., 1971 (Rio Arriba)
Gresens, R. L., 1972a (Rio Arriba)
Gresens, R. L., 1976 (Rio Arriba)
Jicha, H. L., Jr., 1951 (Valencia)
Schilling, J. H., 1960 (Taos)
Schreyer, W., and Chinner, G. A., 1966 (Rio Arriba)

PEGMATITES (Mica, Li-Nb-Ta-Be)
Anderson, E. C., 1957 (Rio Arriba, Taos, San Miguel, Mora)
Berliner, M. H., 1949 (Taos)
Bingler, E. C., 1968b (Rio Arriba)
Cameron, E. N., et al., 1949
Elston, W. E., 1967 (Santa Fe)
Giles, D. L., 1976a (Taos)
Gillerman, E., 1964 (Grant)
Gillerman, E., 1970 (Grant)
Gresens, R. L., 1967b (Rio Arriba)
Gresens, R. L., 1971 (Rio Arriba)
Gresens, R. L., 1976 (Rio Arriba)
Harley, G. T., 1940 (San Miguel, Mora)
Heinrich, E. W., and Buchi, S. H., 1960 (San Miguel)
Heinrich, E. W., and Levinson, A. A., 1953 (Taos, Mora, Rio Arriba)
Hess, F. L., 1925 (Rio Arriba)
Hess, F. L., and Wells, R. C., 1930 (Rio Arriba)
Holmquist, R. J., 1946 (San Miguel)
Holmquist, R. J., 1947 (Rio Arriba)
Jahns, R. H., 1946a (Rio Arriba, San Miguel)
Jahns, R. H., 1946b (Mora)
Jahns, R. H., 1948 (Rio Arriba)
Jahns, R. H., 1951 (Rio Arriba, Taos)
Jahns, R. H., 1953a (Rio Arriba, Taos)
Jahns, R. H., 1953b (Mora)
Jahns, R. H., 1974 (Rio Arriba)
Jahns, R. H., and Adams, J. W., 1953 (Taos)
Jahns, R. H., and Burnham, C. W., 1957 (Taos)
Jahns, R. H., and Burnham, C. W., 1958 (Taos)
Jahns, R. H., and Wright, L. A., 1944 (Taos)
Jahns, R. H., and Wright, L. A., 1959 (Taos)
Jones, J. A., 1904 (Statewide)
Just, E., 1937 (Rio Arriba, Taos)
Lasky, S. G., and Wootton, T. P., 1933 (Rio Arriba, Taos)
McKinlay, P. F., 1956 (Taos)
Miller, J. P., et al., 1963 (Taos)
Montgomery, A., 1950 (Taos)
Montgomery, A., 1951a (Taos)
Montgomery, A., 1951b (Taos)
Montgomery, A., 1953 (Taos)
Redmon, D. E., 1961 (Mora, Rio Arriba, San Miguel, Santa Fe, Taos)
Roos, A., 1926 (Taos)
Schaller, W. T., and Henderson, E. P., 1926 (Taos)
Schilling, J. H., 1960 (Taos)
Sheffer, H. W., and Godsmith, L. A., 1969 (Mora, San Miguel)
Soule, J. H., 1946 (Taos)
Sterrett, D. B., 1913 (Rio Arriba)
Sterrett, D. B., 1923 (Rio Arriba)
Talmage, S. B., and Wootton, T. P., 1937 (Rio Arriba, Taos)
Wright, L. A., 1948 (Rio Arriba)

RICOLITE
Benjovsky, T. D., 1946 (Grant)
Talmage, S. B., and Wootton, T. P., 1937 (Grant)

SILLIMANITE
Bingler, E. C., 1965b (Rio Arriba, Taos)

Bingler, E. C., 1968b (Rio Arriba)
Schilling, J. H., 1960 (Taos)

TALC
Chidester, A. H., et al., 1964 (Doña Ana, Sierra)
Jones, F. A., 1904 (Doña Ana, Sierra)

TITANIUM
Anderson, E. C., 1957 (Mora)
Bingler, E. C., 1965a (Rio Arriba)

URANIUM
Chenoweth, W. L., 1974 (Rio Arriba)
Hilpert, L. S., 1969 (Rio Arriba)

ZN-PB-CU SULFIDES ± MO
Anderson, E. C., 1957 (Mora, San Miguel, Santa Fe, Taos)
Benjovsky, T. D., 1945 (Rio Arriba)
Bingler, E. C., 1968b (Rio Arriba)
Bingler, E. C., 1974b (Rio Arriba)
Bruns, J. J., 1959 (Bernalillo)
Bush, F. V., 1912 (San Miguel)
Clark, K. F., and Read, C. B., 1972 (Taos)
Doney, H. H., 1968 (Rio Arriba)
Elston, W. E., 1967 (Bernalillo, Santa Fe)
Giles, D. L., 1974 (San Miguel)
Giles, D. L., 1976a (San Miguel, Taos)
Gillerman, E., 1964 (Grant)
Griswold, G. B., 1961 (Luna)
Harley, G. T., 1940 (Mora, San Miguel)
Hutchinson, R. A., 1968 (Rio Arriba)
Jones, F. A., 1904 (Statewide)
Kelley, V. C., and Northrop, S. A., 1975 (Bernalillo)
Krieger, P., 1932a (San Miguel)
Krieger, P., 1932b (San Miguel)
Lasky, S. G., 1932 (Sierra–formerly Socorro)
Lasky, S. G., and Wootton, T. P., 1933 (Rio Arriba, San Miguel, Taos)
Lindgren, W., and Graton, L. C., 1906 (Rio Arriba, San Miguel, Taos)
Lindgren, W., et al., 1910 (Grant, Rio Arriba, San Miguel, Taos, Valencia)
McKinlay, P. F., 1956 (Taos)
Miller, J. P., et al., 1963 (San Miguel, Taos)
Missaghi, F. L., 1968 (Colfax, Taos)
Park, C. F., Jr., and McKinlay, P. F., 1948 (Taos)
Restrepo, J. J., 1972 (Taos)
Schilling, J. H., 1960 (Taos)
Stott, C. E., 1931 (San Miguel)
Woodward, L. A., McLelland, D., Anderson, J. B., and Kaufman, W. H., 1972 (Sandoval)

STATEWIDE OR REGIONAL GEOLOGY

An alphabetical listing of publications that deal with the general geology of at least two mountain ranges and/or counties. County summaries, typically accompanied by county-wide geologic compilations, are included here.

Anderson, E. C., 1957 (Statewide)
Andreasen, G. E., et al., 1962 (Colfax, De Baca, Guadalupe, Mora, Quay, San Miguel, Torrance, Union)
Bachman, G. O., 1954 (Chaves, Lincoln, Otero)
Bachman, G. O., and Dane, C. H., 1962 (northeastern New Mexico)
Baltz, E. H., Jr., and Bachman, G. O., 1956 (Mora, San Miguel)
Barker, F., 1971 (northern New Mexico)
Budding, A. J., and Condie, K. A., 1975 (Lincoln, Sierra, Socorro)
Cabot, E. C., 1938 (Rio Arriba, Santa Fe, Taos)
Cameron, E. N., et al., 1949 (Rio Arriba, San Miguel, Taos)
Clark, K. F., 1966b (Colfax, Mora, Rio Arriba, San Miguel, Santa Fe, Taos)
Condie, K. C., 1975 (Statewide)
Dane, C. H., and Bachman, G. O., 1957 (northwestern New Mexico)
Dane, C. H., and Bachman, G. O., 1958 (southeastern New Mexico)
Dane, C. H., and Bachman, G. O., 1961 (southwestern New Mexico)
Dane, C. H., and Bachman, G. O., 1965 (Statewide)
Darton, N. H., 1928 (Statewide)
Denison, R. E., and Hetherington, E. A., Jr., 1969 (Doña Ana, Otero, Sierra)
Elston, W. E., 1967 (Bernalillo, Sandoval, Santa Fe)
Fitzsimmons, J. P., 1961 (Bernalillo, Sandoval, Torrance)
Fitzsimmons, J. P., 1963 (McKinley, Rio Arriba, San Juan)
Flawn, P. T., 1954 (Chaves, Curry, Eddy, Lea, Otero, Roosevelt)
Flawn, P. T., 1956 (Chaves, Lea, Roosevelt)
Foster, R. W., 1957 (Catron, McKinley, Socorro, Valencia)
Foster, R. W., 1966 (Statewide)
Foster, R. W., et al., 1972 (Curry, DeBaca, Guadalupe, Harding, Lincoln, Mora, Quay, San Miguel, Torrance)

continued on next page

Foster, R. W., and Stipp, T. F., 1961 (Statewide)
Giles, D. L., 1976b (Mora, Rio Arriba, San Miguel, Santa Fe, Taos, Valencia)
Harley, G. T., 1940 (Guadalupe, Harding, Mora, Quay, San Miguel, Union)
Harrer, C. M., and Kelly, F. J., 1963 (Rio Arriba, Santa Fe, Taos)
Herrick, C. L., 1900 (Bernalillo, Catron, Sandoval, Valencia)
Hilpert, L. S., 1969 (northwestern New Mexico)
Jicha, H. L., Jr., and Lochman-Balk, C., 1958 (Statewide)
Jones, F. A., 1904 (Statewide)
Kelley, V. C., 1950 (McKinley, Rio Arriba, Sandoval, Valencia)
Kelley, V. C., 1971 (Chaves, Eddy, Lincoln, Otero)
Kelley, V. C., 1972 (DeBaca, Guadalupe, Lincoln, Torrance)
Kelley, V. C., and Wood, G. H., 1946 (Bernalillo, Socorro, Valencia)
Lasky, S. G., and Wootton, T. P., 1933 (Statewide)
Lindgren, W., and Graton, L. C., 1906 (Statewide)
Lindgren, W., et al., 1910 (Statewide)
Miller, J. P., et al., 1963 (Mora, Rio Arriba, San Miguel, Santa Fe, Taos)
Muehlberger, W. R., and Denison, R. E., 1964 (Chaves, DeBaca, Doña Ana, Eddy, Guadalupe, Lincoln, Otero, Sierra, Socorro, Torrance)
Muehlberger, W. R., et al., 1967 (eastern New Mexico)
Read, C. B., 1952 (Doña Ana, Sierra, Socorro)
Read, C. B., and Andrews, D. A., 1944 (San Miguel, Santa Fe)
Read, C. B., et al., 1944 (Bernalillo, Sandoval, San Miguel, Santa Fe, Torrance, Valencia)
Redmon, D. E., 1961 (north-central New Mexico)
Reiche, P., 1949 (Bernalillo, Torrance, Valencia)
Rothrock, H. E., et al., 1946 (Statewide)
Sandeen, W. M., 1954 (Doña Ana, Lincoln, Otero, Sierra, Socorro)
Smith, C. T., and Muehlberger, W. R., 1960 (Rio Arriba, Sandoval)
Stipp, T. F., 1955 (Doña Ana, Grant, Sierra)
Sutherland, P. K., 1963 (Mora, Rio Arriba, San Miguel, Santa Fe, Taos)
Talmage, S. B., and Wootton, T. P., 1937 (Statewide)
United States Geological Survey, 1965 (Statewide)
Vlissides, S. D., and Bieberman, R. A., 1961 (Statewide)
Weir, J. E., Jr., 1965 (Lincoln, Otero, Sierra, Socorro)
Wilpolt, R. H., et al., 1946 (Socorro, Torrance, Valencia)
Wood, G. H., and Northrop, S. A., 1946 (Rio Arriba, Sandoval)
Woodward, L. A., 1970c (Grant, Hidalgo, Luna)
Woodward, L. A., et al., 1975 (Rio Grande rift)

CONTENTS OF POCKET

MAP 1—INDEX OF PRECAMBRIAN MAPPING IN NEW MEXICO—PUBLISHED OR OPEN-FILED
MAP 2—INDEX OF PRECAMBRIAN MAPPING IN NEW MEXICO—THESES

Composition: Camera-ready copy prepared by NM Bureau of Mines & Mineral Resources

Presswork: Text—38" Miehle Offset
Cover—20" Harris Offset

Binding: Saddlestitched

Stock: Text—60 lb. White Offset
Cover—17 pt. Kivar

Inks: Text—Cal Mira-jet Black
Cover—Cal PMS 320 & varnish

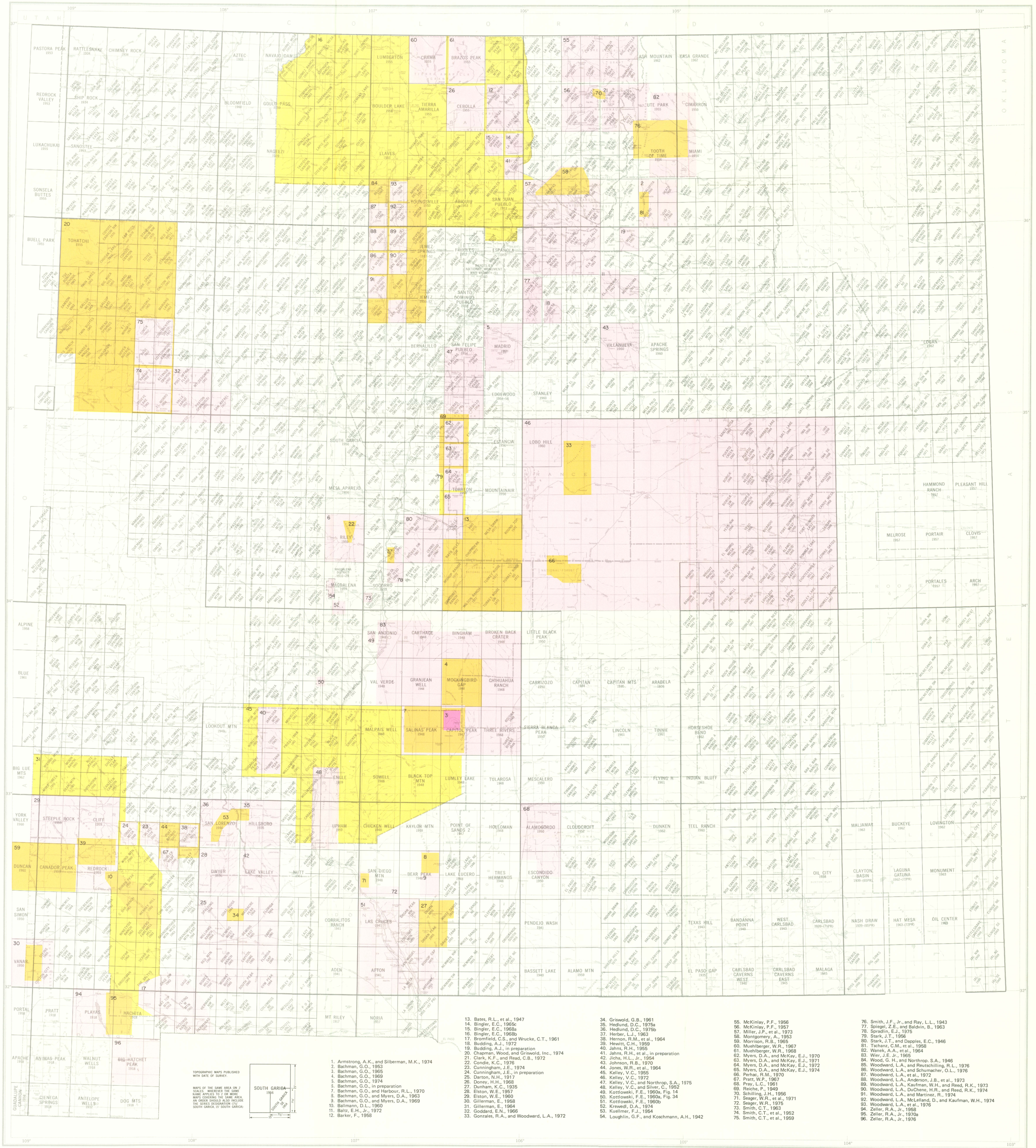
Errata Sheet

BULLETIN 103
MAP 1

Add number **85** to upper left-hand corner of pink area indicating San Ysidro quadrangle (7½-minute)
Location: 106°45'W. longitude and 35°30'N. latitude

Add number **1** to upper left-hand corner of goldenrod area indicating portions of Vanar, Steins, and Cotton City quadrangles
Location: 109°W. longitude and 32°N. latitude

Correct coauthor's name to:
77. Spiegel, Z. E., and Baldwin, B., 1963



TOPOGRAPHIC MAPS PUBLISHED WITH DATE OF SURVEY.

MAPS OF THE SAME AREA ON 2 SCALES. WHEREVER THE SAME NAME APPLIES TO 2 OR MORE MAPS COVERING THE SAME AREA, AN ORDER SHOULD ALSO INCLUDE THE SERIES DESIGNATION (7½' SOUTH GARICA, 15' SOUTH GARICA)

1. Armstrong, A.K., and Silberman, M.K., 1974
2. Bachman, G.O., 1953
3. Bachman, G.O., 1965
4. Bachman, G.O., 1969
5. Bachman, G.O., 1974
6. Bachman, G.O., in preparation
7. Bachman, G.O., and Harbour, R.L., 1970
8. Bachman, G.O., and Myers, D.A., 1963
9. Bachman, G.O., and Myers, D.A., 1969
10. Ballmann, D.L., 1960
11. Baltz, E.H., Jr., 1972
12. Barker, F., 1958
13. Bates, R.L., et al., 1947
14. Bingler, E.C., 1965c
15. Bingler, E.C., 1968a
16. Bingler, E.C., 1968b
17. Bromfield, C.S., and Wrucke, C.T., 1961
18. Budding, A.J., 1972
19. Budding, A.J., in preparation
20. Chapman, Wood, and Griswold, Inc., 1974
21. Clark, K.F., and Read, C.B., 1972
22. Condie, K.C., 1976
23. Cunningham, J.E., 1974
24. Cunningham, J.E., in preparation
25. Darton, N.H., 1917
26. Doney, H.H., 1968
27. Dunham, K.C., 1935
28. Elston, W.E., 1957
29. Elston, W.E., 1960
30. Gillerman, E., 1958
31. Gillerman, E., 1964
32. Goddard, E.N., 1966
33. Gonzales, R.A., and Woodward, L.A., 1972
34. Griswold, G.B., 1961
35. Hedlund, D.C., 1975a
36. Hedlund, D.C., 1975b
37. Herber, L.J., 1963
38. Hernon, R.M., et al., 1964
39. Hewitt, C.H., 1959
40. Jahns, R.H., 1955
41. Jahns, R.H., et al., in preparation
42. Jicha, H.L., Jr., 1954
43. Johnson, R.B., 1970
44. Jones, W.R., et al., 1964
45. Kelley, V.C., 1955
46. Kelley, V.C., 1972
47. Kelley, V.C., and Northrop, S.A., 1975
48. Kelley, V.C., and Silver, C., 1952
49. Kottlowski, F.E., 1960a, Fig. 14
50. Kottlowski, F.E., 1960a, Fig. 34
51. Kottlowski, F.E., 1960b
52. Krewedl, D.A., 1974
53. Kuellmer, F.J., 1954
54. Loughlin, G.F., and Koschmann, A.H., 1942
55. McKinlay, P.F., 1956
56. McKinlay, P.F., 1957
57. Miller, J.P., et al., 1973
58. Montgomery, A., 1953
59. Morrison, R.B., 1965
60. Muehlberger, W.R., 1967
61. Muehlberger, W.R., 1968
62. Myers, D.A., and McKay, E.J., 1970
63. Myers, D.A., and McKay, E.J., 1971
64. Myers, D.A., and McKay, E.J., 1972
65. Myers, D.A., and McKay, E.J., 1974
66. Perhac, R.M., 1970
67. Pratt, W.P., 1967
68. Pray, L.C., 1961
69. Reiche, P., 1949
70. Schilling, J.H., 1956
71. Seager, W.R., et al., 1971
72. Seager, W.R., 1975
73. Smith, C.T., 1963
74. Smith, C.T., et al., 1952
75. Smith, C.T., et al., 1959
76. Smith, J.F., Jr., and Ray, L.L., 1943
77. Spiegel, Z.E., and Baldvin, B., 1963
78. Spradlin, E.J., 1975
79. Stark, J.T., 1956
80. Stark, J.T., and Dapples, E.C., 1946
81. Tschanz, C.M., et al., 1958
82. Wanek, A.A., et al., 1964
83. Wier, J.E. Jr., 1965
84. Wood, G. H., and Northrop. S.A., 1946
85. Woodward, L.A., and Reutschilling, R.L., 1976
86. Woodward, L.A., and Schumacher, O.L., 1976
87. Woodward, L.A., et al., 1972
88. Woodward, L.A., Anderson, J.B., et al., 1973
89. Woodward, L.A., Kaufman, W.H., and Reed, R.K., 1973
90. Woodward, L.A., DuChene, H.R., and Reed, R.K., 1974
91. Woodward, L.A., and Martinez, R., 1974
92. Woodward, L.A., McLelland, D., and Kaufman, W.H., 1974
93. Woodward, L.A., et al., 1976
94. Zeller, R.A., Jr., 1958
95. Zeller, R.A., Jr., 1970a
96. Zeller, R.A., Jr., 1976

Base from U.S. Geological Survey

Colors used are solely to distinguish individual mapped areas, and have no geologic significance.

INDEX OF PRECAMBRIAN MAPPING IN NEW MEXICO - published or open-file

Compiled by

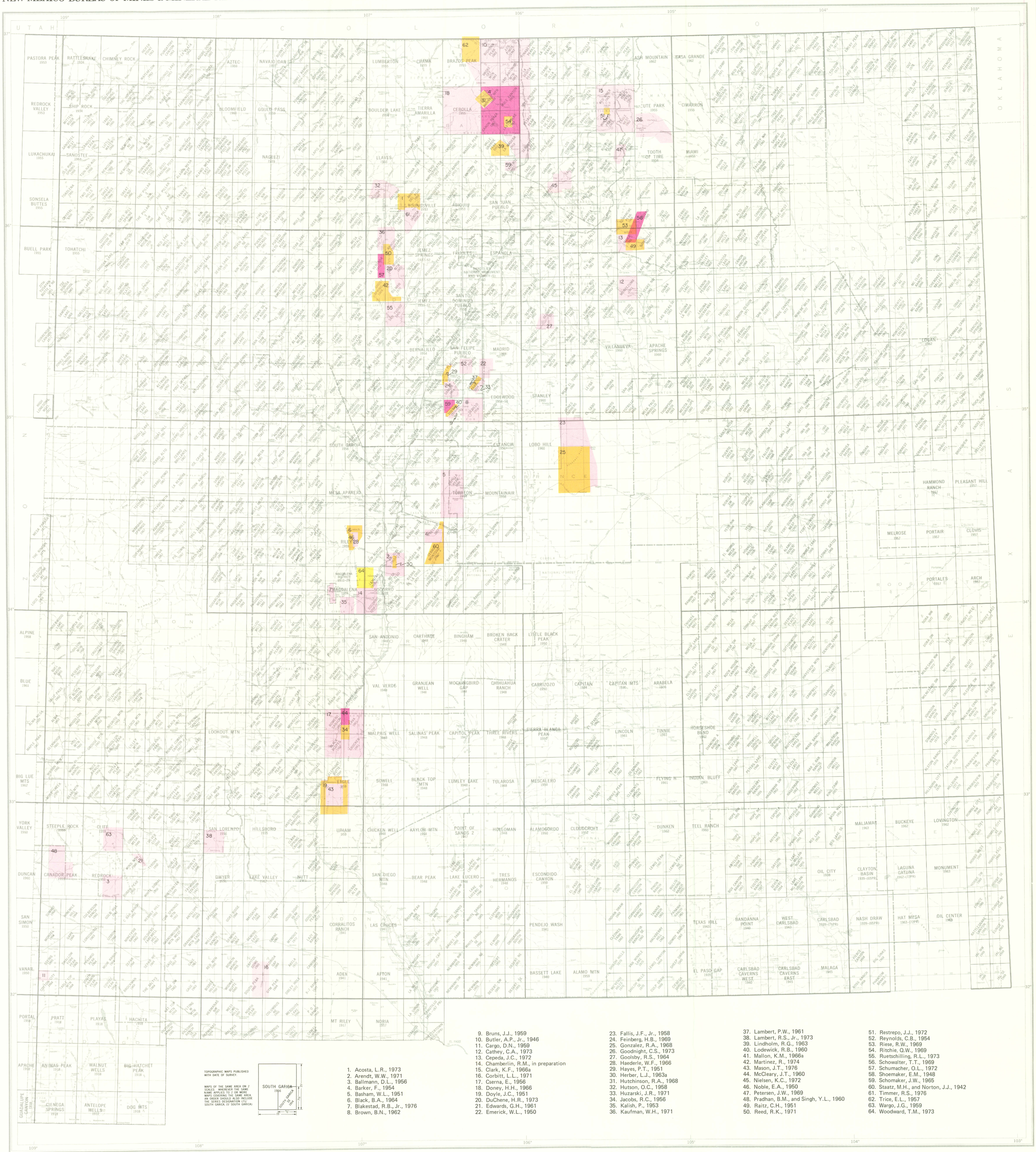
James M. Robertson

1976

SCALE 1:1,000,000

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers



1. Acosta, L.R., 1973
2. Arendt, W.W., 1971
3. Ballmann, D.L., 1956
4. Barker, F., 1954
5. Basham, W.L., 1951
6. Black, B.A., 1964
7. Blakestad, R.B., Jr., 1976
8. Brown, B.N., 1962
9. Bruns, J.J., 1959
10. Butler, A.P., Jr., 1946
11. Cargo, D.N., 1959
12. Cathey, C.A., 1973
13. Cepeda, J.C., 1972
14. Chamberlin, R.M., in preparation
15. Clark, K.F., 1966a
16. Corbitt, L.L., 1971
17. Cserna, E., 1956
18. Doney, H.H., 1966
19. Doyle, J.C., 1951
20. DuChene, H.R., 1973
21. Edwards, G.H., 1961
22. Emerick, W.L., 1950
23. Fallis, J.F., Jr., 1958
24. Feinberg, H.B., 1969
25. Gonzalez, R.A., 1968
26. Goodnight, C.S., 1973
27. Goolsby, R.S., 1964
28. Haederle, W.F., 1966
29. Hayes, P.T., 1951
30. Herber, L.J., 1963a
31. Hutchinson, R.A., 1968
32. Hutson, O.C., 1958
33. Huzarski, J.R., 1971
34. Jacobs, R.C., 1956
35. Kalish, P., 1953
36. Kaufman, W.H., 1971
37. Lambert, P.W., 1961
38. Lambert, R.S., Jr., 1973
39. Lindholm, R.G., 1963
40. Lodewick, R.B., 1960
41. Mallon, K.M., 1966a
42. Martinez, R., 1974
43. Mason, J.T., 1976
44. McCleary, J.T., 1960
45. Nielsen, K.C., 1972
46. Noble, E.A., 1950
47. Petersen, J.W., 1969
48. Pradhan, B.M., and Singh, Y.L., 1960
49. Raitz, C.H., 1951
50. Reed, R.K., 1971
51. Restrepo, J.J., 1972
52. Reynolds, C.B., 1954
53. Riese, R.W., 1969
54. Ritchie, Q.W., 1969
55. Ruetschilling, R.L., 1973
56. Schowalter, T.T., 1969
57. Schumacher, O.L., 1972
58. Shoemaker, E.M., 1948
59. Schomaker, J.W., 1965
60. Staatz, M.H., and Norton, J.J., 1942
61. Timmer, R.S., 1976
62. Trice, E.L., 1957
63. Wargo, J.G., 1959
64. Woodward, T.M., 1973

Base from U.S. Geological Survey

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Compiled by

James M. Robertson

1976

SCALE 1:1,000,000

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers