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Radioactive Occurrences in Veins and Igneous and Metamorphic Rocks of New Mexico with Annotated Bibliography

by

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ABSTRACT

From an extensive literature search and field examination of 96 nonsandstone radioactive occurrences, the author compiled an annotated bibliography of over 600 citations and a list of 327 radioactive occurrences in veins and igneous and metamorphic rocks of New Mexico. The citations are indexed by individual radioactive occurrence, geographic area, county, fluorspar deposits and occurrences, geochemical analyses, and geologic maps. In addition, the geology, mineralization, and uranium and thorium potential of 41 geographic areas in New Mexico containing known radioactive occurrences in veins and igneous and metamorphic rocks or that contain host rocks considered favorable for uranium or thorium mineralization are summarized. A list of aerial-radiometric, magnetic, hydrogeochemical, and stream-sediment survey reports is included.

PREFACE

The purpose of this report is to summarize the radioactive occurrences found in veins and igneous and metamorphic rocks of New Mexico (appendix I) and to list geologic reports describing favorable geologic environments in New Mexico for these types of nonsandstone, uranium deposits. A radioactive occurrence, for the purpose of this report, is defined as being twice the background radioactivity or as containing 0.001% U_3O_8 or ThO_2. The term nonsandstone uranium deposit refers to uranium deposits in veins and igneous and metamorphic rocks. References describing in some detail the uranium potential, geology, petrology, chemistry, or mineralogy are listed in the annotated bibliography. Reports describing uranium and thorium analyses, occurrences, and deposits are included. Only plutonic, volcanic, metamorphic (including Precambrian quartz-pebble conglomerates), and vein radioactive deposits are considered in this report; sedimentary uranium deposits (such as sandstone, shale, limestone, phosphorite, coal, evaporative precipitates, and fossil placer deposits) will be considered at a later time. It must be stressed that the geographic areas discussed may contain favorable host rocks for uranium deposits in veins and igneous and metamorphic rocks; however, further evaluation may show that economic uranium deposits may not exist in these areas.

Results of an ongoing project to compile and verify all types of radioactive occurrences in New Mexico are included where appropriate. Field investigations of some radioactive occurrences in veins and igneous and metamorphic rocks which have been made as part of this ongoing project are included in this report. Chemical analyses provided by Lynn Brandvold and assistants of the Chemistry

Laboratory at New Mexico Bureau of Mines and Mineral Resources are included in appendix I. Production data from uranium deposits in veins and igneous and metamorphic rocks of New Mexico provided by the U.S. Department of Energy (1948 to 1970, government contracts only) are included as table 4. The annotated bibliography also includes new citations not included in previous bibliographies published by the New Mexico Bureau of Mines and Mineral Resources.

This report includes an introduction, summary of areas favorable for radioactive deposits in veins and igneous and metamorphic rocks, an annotated bibliography, a subject index, and five appendices. Each report is indexed at least by county and geographic area. Appendix I includes a table of radioactive occurrences and deposits in veins and igneous and metamorphic rocks of New Mexico. Two maps are included locating the various radioactive occurrences listed in appendix I (pl. I and II). Appendices II, III, and IV list citations of reports and maps of aerial-radiometric and magnetic surveys, reports containing uranium and thorium analyses of water and stream-sediment samples, and bibliographies and mapping indexes.

The annotated bibliography includes published and unpublished reports pertaining to the geology, geochemistry, mineralogy, petrology, and mineralization of favorable geologic environments or geographic areas which are known to contain nonsandstone radioactive occurrences or deposits. Most of the references can be obtained from the New Mexico Bureau of Mines and Mineral Resources (Socorro) or the libraries at New Mexico Institute of Mining and Technology (Socorro) and the University of New Mexico (Albuquerque).

The purpose of this report is to encourage exploration for uranium and thorium deposits in veins and igneous and metamorphic rocks of New Mexico by providing 1) a list of radioactive occurrences in veins and igneous and metamorphic rocks of New Mexico (appendix I), 2) a list of references concerning the geology of areas where radioactive occurrences in veins and igneous and metamorphic rocks are found (annotated bibliography), and 3) a list of geographic areas where radioactive occurrences are found or may be favorable for containing uranium and thorium deposits in veins and igneous and metamorphic rocks.

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INTRODUCTION

Purpose and Methods of Investigation

The majority of the United States' known uranium resources are epigenetic deposits in sandstones; however, the world's largest uranium ore bodies are mostly in veins and igneous and metamorphic rocks. Large reserves of uranium and thorium are found in plutonic and metamorphic rocks, veins, unconformity-related vein-breccia deposits, volcanogenic environments, and metamorphosed Precambrian quartz-pebble conglomerates (table 1). Numerous regions in New Mexico are characterized by similar environments, but have not been examined in terms of their uranium potential except in broader geologic reports.

The primary objectives of this report are to list known radioactive occurrences in veins and igneous and metamorphic rocks in New Mexico, and to provide an annotated bibliography of geologic reports concerning these regions. Only plutonic, metamorphic, vein, and Precambrian quartz-pebble conglomerate uranium deposits are considered in this report; other nonsandstone uranium deposits (such as shale, limestone, phosphorite, coal, evaporative precipitates, and fossil placer deposits) will be considered at a later time. These objectives were achieved through a literature search. Some field examinations of some of the radioactive occurrences have been completed.

A table of known radioactive occurrences in veins and igneous and metamorphic rocks was compiled from the literature (appendix I). The primary sources for appendix I are 1) U.S. Atomic Energy Commission Preliminary Reconnaissance Reports, 2) Lovering (1956), 3) Anderson (1955, 1957), 4) Walker and Osterwald (1963), 5) U.S.

OCCURRENCE TYPE	TYPICAL DEPOSIT SIZE (short tons U_3O_8)	WORLD RESERVES (short tons U_3O_8)	EXAMPLE	GENERAL REFERENCE
Unconformity-related (vein-breccia)	1,000-200,000	1,450,000	North Saskatchewan, Canada	Marjaniemi and Basler, 1972; Rich and others, 1975; Kalliokoski and others, 1978; Dahlkamp and Adams, 1981
Precambrian Pebble Conglomerate	5,000-150,000	450,000	Blind River, Canada	Houston and Karlstrom, 1979
Plutonic-Metamorphic				
Orthomagmatic-porphyry	1,000-500,000	600,000	Rossing, Namibia	Nishimori and others, 1977; Armstrong, 1974 and 1975
Pegmatite	<5,000	50,000	Bancroft, Canada	Adams and others, 1980
Syenite	20,000-50,000	160,000	Ilimaussay, Greenland	Murphy and others, 1978
Carbonatite	10,000-100,000	150,000	Araxa, Brazil	Nishimori and Powell, 1980
Metasomatic	1,000-20,000	125,000	Mary Kathleen, Australia	Aurashov and others, 1980
	subtotal:	1,085,000		
Volcaniclastic	1,000-50,000	150,000	Pena Blanca, Mexico	Henry and Walton, 1978; Burt and Sheridan, 1980
Sandstone	<50,000	950,000	Colorado Plateau, USA	

TABLE 1 - Typical deposit size and world resources of various types of uranium deposits, suggesting that nonsandstone-type uranium deposits are larger in deposit size and reserves than sandstone uranium deposits. Modified from U.S. Dept. Energy, 1979 (p. 24).

Geological Survey (1965), 6) Hilpert (1969), 7) CRIB (Computerized Resource Information Bank), and 8) MILS (Mineral Information Location Survey) data.

A major source of information on radioactive occurrences in New Mexico is the Preliminary Reconnaissance Reports (PRR) Series of the U.S. Atomic Energy Commission (AEC, now the Department of Energy). These reports are one to three page reports of field examinations of reported radioactive occurrences and were originally intended for government use only. However, in 1966 the AEC open-filed all known PRR's as PB 172678 through PB 172702 (arranged by counties, U.S. Government Printing Office). Additional PRR's for New Mexico were found in field office files and in 1970 these reports were published as RME-160 (U.S. Atomic Energy Commission, 1970). In October, 1980, the author located additional PRR's in the Grand Junction Office of the U.S. Department of Energy (DOE) which had not been previously open-filed. These additional PRR's and the open-filed reports are on file at New Mexico Bureau of Mines and Mineral Resources (Socorro) and DOE (Grand Junction). They are cited by the report number given by AEC (ex. USAEC PRR DEB-465) or as USAEC, 1970).

As part of the NURE (National Uranium Resource Evaluation) program, radioactive occurrences were compiled for each 1 x 2 degree quadrangle and are included in the various preliminary folio reports (Green and others, 1980 a-c; Pierson and others, 1980; Reid and others, 1980a, b; Berry and others, 1980; May and others, 1981; White and Foster, 1981, and O'Neill and Thiede, 1981). For a discussion of the NURE program, see McLemore (1981) and U.S. Department of Energy (1979 and 1980). Some of the aerial-radiometric and magnetic surveys (ARMS) and hydrogeochemical and stream-sediment reconnaissance (HSSR) reports also list uranium occurrences (appendices II and III).

Geographic areas in New Mexico were recognized as containing favorable geologic environments for uranium deposits in veins and igneous and metamorphic rocks on the basis of 1) the presence of radioactive occurrences, water or stream-sediment anomalies (HSSR), or aerial-radiometric anomalies (ARMS), and 2) similarity to areas known to contain uranium deposits in veins and igneous and metamorphic rocks. A set of criteria was established by the NURE program for recognition of favorable environments and is summarized in table 2. Aerial-radiometric and magnetic surveys by the DOE (ARMS) and the U.S. Geological Survey are listed in appendix II and reports containing uranium and thorium analyses of water and stream-sediment samples, including the HSSR reports, are listed in appendix III.

The reports listed in the annotated bibliography section were compiled from a large number of sources, including bibliographies and mapping indexes listed in appendix IV. Many references were also obtained from DOE lists of open-file reports for the years 1976 through 1981 and from New Mexico Bureau of Mines and Mineral Resources lists of U.S. Geological Survey and New Mexico Bureau of Mines and Mineral Resources open-file reports. "Publications of the U.S. Geological Survey" and "Publications of the U.S. Bureau of Mines" were used to obtain citations of reports issued by these organizations. Card catalog files at the libraries at New Mexico Institute of Mining and Technology (Socorro) and University of New Mexico (Albuquerque) enabled the author to obtain unpublished master's and doctor's theses and dissertations. Many of the NURE reports include a bibliography of geologic reports as well.

Tectonic Setting	Mobile belt, rift zones, basin and range setting
Regional Structures	Cauldrons, horst and graben
Local Structures	Shear, fracture, breccia zones, ring-faulting, doming, breccia pipes, contact metamorphic zones
Host Rock	Plutonic (granitic to syenitic), metamorphic, pegmatite, carbonatite, diatremes, volcanogenic sediments, Proterozoic quartz-pebble conglomerates, migmitites
Mineralogy	Uranium- and thorium-bearing minerals, fluorite, zircon, sphene, alkali feldspars, two micas, riebeckite, sulfides
Chemistry	High SiO_2, Na_2O, K_2O, F, Rb high Fe_2O_3/FeO, Na_2O+K_2O/Al_2O_3 ratios
Associated elements	Fe, Cu, Zn, As, Zr, Mo, Sb, Pb, Be, Li, Th, Sn, REE
Alteration	Albitization, sericitization, silicification, hematization, carbonatization
Other	Known uranium-thorium occurrences, radioactive anomalies, evidence of low temperature hydrothermal mineralization, Magmatic activity of Post-Archean age

TABLE 2 - Summary of criteria for recognition of an area which may contain favorable host rocks for uranium deposits in veins and igneous and metamorphic rocks modified from Mickle (1978), Mickle and Mathews (1978), and Mathews and others (1979)

Each citation in the annotated bibliography is indexed according to geographic area, county, fluorspar deposits and occurrences, geochemical analyses, geologic maps, and radioactive occurrences. The PRR's have not been indexed and have not been cited in the annotated bibliography, but are listed under sources of data in appendix I (Radioactive occurrences in veins and igneous and metamorphic rocks of New Mexico).

Classification of Uranium Deposits in Veins and Igneous and Metamorphic Rocks

As part of the NURE program, an attempt was made to establish a classification scheme which would include all types of uranium deposits (Mathews and others, 1979; Mickle, 1978; Mickle and Mathews, 1978). Uranium deposits were characterized as 1) deposits in sedimentary rocks, 2) deposits related to plutonic igneous rocks, 3) volcanogenic deposits, and 4) uranium deposits of uncertain genesis (table 3). This classification scheme is used in this report with only one addition; uranium deposits in diatremes are added under "uranium deposits of uncertain origin". The reader is referred to Mathews and others (1979), Mickle (1978), and Mickle and Mathews (1978) for descriptions and examples of each of these types of uranium deposits.

Uranium Deposits in Veins and Igneous and Metamorphic Rocks of New Mexico

The potential for uranium and thorium deposits in veins and igneous and metamorphic rocks of New Mexico has not been well examined; even many of the NURE folio reports have not adequately evaluated the potential host rocks for these nonsandstone uranium deposits. To compete internationally, the United States needs to

Class	Type
In sedimentary rocks:	Sandstone
	Roll-type
	Tabular
	Placer
	Quartz-pebble conglomerate
	Marine black shale
	Phosphorite
	Lignite, coal, and nonmarine carbonaceous shale
	Evaporative precipitates
Related to plutonic rocks:	Orthomagmatic
	Pegmatitic
	Magmatic-hydrothermal
	Contact-metasomatic
	Autometasomatic
	Authigenic
	Allogenic
	Anatectic
Related to volcanic rocks:	Initial-magmatic
	Pneumatogenic
	Hydroauthigenic
	Hydroallogenic
Of uncertain origin:	Unconformity-related deposits
	Vein-type deposits in metamorphic rocks
	Vein-type deposits in sedimentary rocks

Table 3 - The NURE Classification of Uranium deposits

find large tonnage, high-grade uranium deposits; sandstone-type deposits are too low-grade to compete with vein-type and unconformity-related uranium deposits. New Mexico has many geographic regions (table 4, fig. 1) characterized by the occurrence of high silica and alkalic rocks (including granites, alaskites, syenites carbonatites, and quartz-pebble conglomerates) which may be favorable for large tonnage, high-grade uranium deposits.

Uranium has been produced from twenty-two uranium deposits in veins and igneous and metamorphic rocks; most are vein or pegmatite deposits (table 4). Most of the reported radioactive occurrences in veins and igneous and metamorphic rocks are in veins or pegmatites (appendix I). These occurrences and deposits may indicate the presence of other types of nonsandstone uranium deposits in the general vicinity. Table 5 lists geographic areas containing favorable host rocks for uranium deposits in veins and igneous and metamorphic rocks.

Several Precambrian quartz-pebble conglomerate sequences are known to occur in the Burro, Hatchet, Ladron, Manzano, Sangre de Cristo, and Tusas Mountains. Uraniferous Precambrian conglomerates are probably absent in New Mexico for several reasons: 1) the Precambrian conglomerates in New Mexico are younger than 1.8 b.y., 2) pyrite and uraninite have not been found in any Precambrian conglomerates in New Mexico, and 3) Archean source rocks are absent in the southwestern United States. It is believed that uraniferous quartz-pebble conglomerates were formed before 1.8 to 2.0 b.y. when the atmosphere contained insufficient oxygen to allow oxidation and dissolution of uranium minerals. Furthermore, pyrite and uraninite are found in the uraniferous conglomerate

COUNTY	NAME	YEARS IN PRODUCTION	TONS ORE	%U_3O_8	Lbs U_3O_8	Lbs V_2O_5	TYPE DEPOSIT
SOUTHERN ROCKY MOUNTAINS							
Taos	Black Copper 2	1957	5.04	0.03	3.03		hydrothermal vein
Rio Arriba	JOL	1956	7.95	0.04	6.36	5.00	hydrothermal vein
	Pineapple 1	1954	3.64	0.03	2.19	1.46	pegmatite
	Tusas East Slope	1954	8.10	0.04	6.48	4.86	hydrothermal vein
San Miguel	Sparks-Stone 1	1955-1956	14.65	0.11	32.27	13.34	pegmatite
BASIN AND RANGE							
Catron	Baby Mine	1956	7.22	0.10	14.44	98.00	hydrothermal vein
Doña Ana	Blue Star	1955	11.59	0.06	13.90	9.27	hydrothermal vein
Grant	Floyd Collins	1955, 1959, 1964	165.08	0.15	489.47	93.89	hydrothermal vein
	Inez	1955	262.12	0.16	848.33	267.68	hydrothermal vein
	Sec. 21, 18S, 15W	1956	37.52	0.04	30.02	23.00	hydrothermal vein
Hidalgo	Napane	1955	9.23	0.19	35.06	3.69	hydrothermal vein
Lincoln	Bear Canyon	1954	3.18	0.02	1.27	1.91	hydrothermal vein
Santa Fe	La Bajada	1956-1957, 1962-1966	9,648.66	0.14	27,111.04	42.00	hydrothermal vein
Sierra	Paran	1955	6.64	0.07	9.30	1.33	hydrothermal vein
	Pitchblende (Terry)	1955, 1960	126.71	0.14	359.39	26.52	hydrothermal vein
Socorro	Augua Torres	1955-1956	148.81	0.11	324.62	314.99	vein
	Jeter	1954-1958	8,825.80	0.33	58,562.42	3,202.15	vein
	Little Davie	1955	16.84	0.18	60.63	70.73	vein
	Lucky Don	1955-1956, 1960, 1962-1963	964.94	0.21	4,166.25	3,309.09	vein
	Maria	1956	45.82	0.14	125.09	88.00	vein
	San Lorenzo	1955	14.11	0.02	5.64	8.46	hydrothermal vein

TABLE 4 -- Uranium production from uranium deposits in veins and igneous and metamorphic rocks of New Mexico from U.S. Atomic Energy Commission ore production reports, government contract only, for the years 1948-1970. This includes total ore that was received at buying stations and mills, including no pay ore. Grades represent an average of the total shipments and include pay and no pay ore. AEC buying schedule did not pay for ores containing less than 0.10% U_3O_8 ; hence, these low grade shipments were known as "no pay ore".

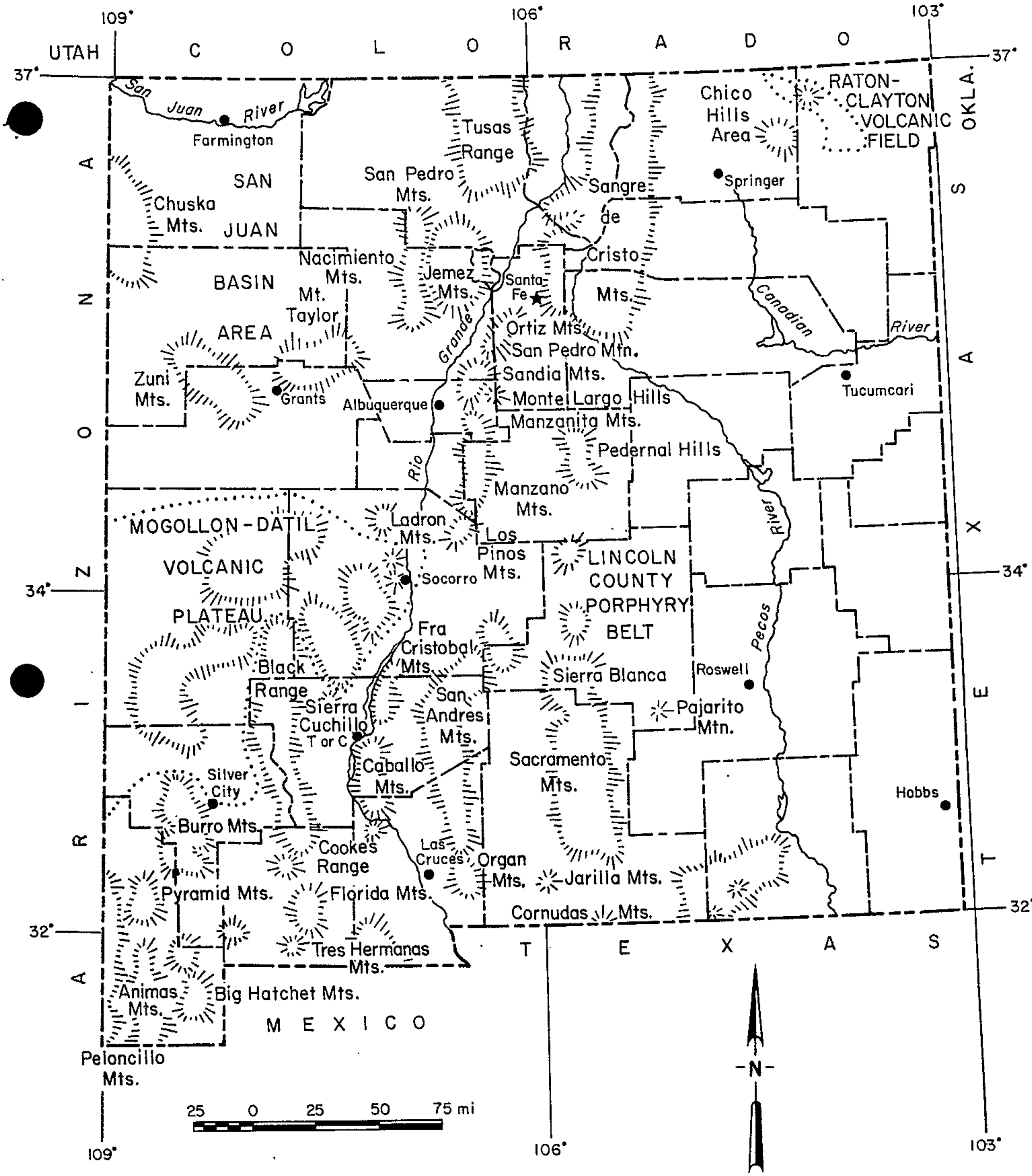

Figure 1-Favorable areas for uranium deposits in veins and igneous and metamorphic rocks of New Mexico.

Great Plains	
Raton-Clayton Volcanic Field	Colfax, Union
+ Chico Hills area	Colfax
Southern Rocky Mountains	
* Sangre de Cristo Mountains	Colfax, Taos, Rio Arriba, Santa Fe, San Miguel, Mora
* Tusas Mountains (San Juan Mountains)	Rio Arriba
Nacimiento and San Pedro Mountains	Sandoval
Jemez Mountains	Rio Arriba, Sandoval, and Los Alamos
Colorado Plateau	
San Juan Basin volcanic necks and plugs	San Juan, McKinley
Mt. Taylor	Cibola, McKinley
* Zuni Mountains	Cibola
Basin and Range	
* Ortiz Mountains area	Sandoval, Santa Fe
Sandia Mountains and Monte Largo Hills	Bernalillo, Sandoval
Manzano and Manzanita Mountains	Bernalillo, Valencia, Torrance
Pedernal Hills	Torrance
Los Pinos Mountains	Torrance, Valencia, Socorro
* Ladron Mountains	Socorro
Lemitar Mountains	Socorro
La Joyita Hills	Socorro
Oscura Mountains	Socorro, Lincoln
San Andres Mountains	Socorro, Sierra, Doña Ana
+ Lincoln County Porphyry Belt	Lincoln
Sacramento Mountains	Otero
Pajarito Mountain	Otero
Jarilla Mountains	Otero
+ Cornudas Mountains	Otero
FraCristobal Mountains	Sierra
+ Caballo Mountains	Sierra
* Mogollon-Datil Volcanic Province	Southwest New Mexico
* Magdalena Mountains	Socorro
* San Mateo Mountains	Socorro
Sierra Cuchillo	Sierra
Black and Cooke's Ranges	Catron, Grant, Sierra, Luna
* Burro Mountains	Grant, Hidalgo
Pelóncillo Mountains	Hidalgo
Animas Mountains	Hidalgo
Pyramid Mountains	Hidalgo
Hatchet Mountains	Hidalgo, Grant
Tres Hermanas Mountains	Luna
Florida Mountains	Luna
Organ Mountains	Doña Ana
Franklin Mountains	Doña Ana
Misc. Areas (including Socorro Basin area)	Southwest New Mexico

TABLE 5 -- Geographic areas containing favorable host rocks for uranium deposits in veins and igneous and metamorphic rocks shown in Figure 1. * denotes the favorable areas most likely to contain large, high-grade uranium deposits. + denotes the areas containing thorium deposits.

deposits in South Africa and Canada and uranium-rich Archean rocks are considered to be the source for these conglomerates.

Favorable host rocks for uranium deposits related to plutonic rocks occur widely scattered throughout New Mexico (fig. 1); however, most of these occurrences are not economic uranium deposits. Porphyry copper deposits are found in Grant County; however, unlike Arizona porphry copper deposits, uranium has not been produced as a byproduct. Carbonatites occur in the Lemitar and Chupadera Mountains (Socorro County) and the Monte Largo Hills (Bernalillo County), but do not appear to contain high concentrations of uranium. Radioactive occurrences are found in alkalic rocks in the Chico Hills area (Colfax County), Lincoln County porphyry belt, and Cornudas Mountains (Otero County); but thorium, not uranium, appears to be significant. Numerous radioactive pegmatites occur in Taos, Mora, San Miguel, Rio Arriba, Grant, and Hidalgo Counties; but do not contain significant tonnage of uranium or thorium to be economic. Uraniferous magmatic hydrothermal veins occur scattered throughout New Mexico (appendix I) and some of these vein deposits have produced uranium in the past (table 4).

Several volcanic centers in New Mexico appear to be favorable for containing volcanogenic uranium deposits. The DOE considers the Nogal cauldron of the San Mateo Mountains to be favorable for containing speculative vein-type uranium deposits (U.S. Department of Energy, 1980; Berry and others, 1980). The cauldron complex in the Magdalena-Socorro area may also be favorable for containing uranium deposits on the basis of several radioactive occurrences (appendix I) and water, stream-sediment, and airborne-radiometric anomalies (Planner, 1980 and Geodata International, Inc., 1979b;

cited in appendices III and II). Other cauldron complexes in southwestern New Mexico may be favorable for containing volcanogenic uranium deposits but these potential deposits would probably be low in grade and small tonnage. Many areas in southwestern New Mexico have not been mapped in detail or adequately assessed for their uranium potential; more work is warrented.

Some of the world's largest uranium deposits in terms of both tonnage and grade are found in unconformity-related deposits in Australia and Canada. The term "unconformity-related" generally refers to vein-like deposits that occur at a Precambrian unconformity between crystalline basement rocks and overlying sedimentary rocks. However, Langford (1980) suggests that all unconformities below continental deposits of Precambrian to Cretaceous times should have uranium potential. Chamberlin (1981) interprets uranium deposits that occur in Cretaceous sandstones near the Datil Mountains (Socorro and Catron Counties) to have formed at the base of a tropical weathering profile, which is unconformably buried by the Eocene Baca Formation. For the purposes of this report only hard rock unconformity-related deposits during Precambrian times are considered.

The Sangre de Cristo Mountains in northern New Mexico show the greatest similarity to the unconformity-related model (Kalliokoski and others, 1978). Precambrian unconformities are recognized in the Tusas Mountains and may have uranium potential. Other Precambrian unconformities in southern New Mexico in the Basin and Range Province have been recognized but are not considered to be favorable for uranium mineralization by this author (see discussions under Favorable Areas in New Mexico, this report).

Langford (1980) suggests that the uranium occurrences in the Zuni Mountains (Permian Abo Formation unconformably overlying Precambrian granite) and the Burro Mountains (Cretaceous conglomerates and sandstones unconformably overlying Precambrian granite) may be related to regional unconformities and other unconformities between Precambrian and younger rocks may have uranium potential.

The origins of some uranium-bearing veins in metamorphic and sedimentary rocks may not be apparent. In this case they are classified by their vein geometry and type of host rock. Other metallic mineral deposits containing copper, nickel, zinc, silver, lead, cobalt, and arsenic may be associated with these poorly understood vein-type deposits. Several radioactive occurrences in Socorro, Hidalgo, and Santa Fe Counties (appendix I) are classified as veins of uncertain origin, because the origins of these deposits are not known. One uranium deposit, the Jeter mine, may not even be a vein-type deposit; but a combination of structurally controlled epigenetic processes (Hilpert, 1969). Other radioactive occurrences listed as hydrothermal-vein deposits in appendix I may be actually of uncertain origin instead of related to plutonic rocks as indicated in the literature. Only after detailed field investigations of these deposits can their origins and classifications be determined.

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FAVORABLE GEOGRAPHIC AREAS IN NEW MEXICO

INTRODUCTION

This section includes geological summaries of geographic areas in New Mexico which contain radioactive occurrences or uranium deposits in veins and igneous and metamorphic rocks. The geology, petrology, mineralogy, chemistry, and uranium or thorium potential of each area is discussed briefly. These areas are listed in table 5 and shown in fig. 1 and plate 1. They are considered favorable on the basis of the presence of radioactive occurrences (appendix I) and similarity to areas known to contain radioactive deposits in veins and igneous and metamorphic rocks. Only a few areas in New Mexico are considered to be favorable for large, high-grade uranium deposits; these are Sangre de Cristo Mountains, Tusas Mountains, Zuni Mountains, Ortiz Mountains area, Ladron Mountains, Mogollon-Datil volcanic province, Magdalena Mountains, San Mateo Mountains, and Burro Mountains. Thorium deposits occur in the Chico Hills area, Lincoln County porphyry belt, Cornudas Mountains, and Caballo Mountains.

A list of references which are cited in the annotated bibliography follows each summary. This section is organized by physiographic provinces: 1) Great Plains, 2) Southern Rocky Mountains, 3) Colorado Plateau, and 4) Basin and Range.

GREAT PLAINS

Raton-Clayton Volcanic Field, Colfax and Union Counties

The Cenozoic lavas of the Raton-Clayton volcanic field in northeastern New Mexico (fig. 2) are divided into five groups: the Raton-Clayton lavas (alkali olivine basalts), Red Mountain lavas (hornblende andesites and dacites, discussed under Chico Hills area), Sierra Grande volcanics (pyroxene andesite), a feldspathoidal group (basanites and olivine nephelinites), and the Capulin basaltic lavas. Although uranium and thorium have not been reported from this area (except in the Chico Hills area), favorable rock types occur which may be indicative of vein-type uranium or thorium mineralization.

The Sierra Grande andesite and the feldspathoidal lavas consist of pyroxenes, quartz or feldspathoids, and magnetite; apatite and zircon are common accessory minerals. These rocks are higher in SiO_2, K_2O, and Rb and have a higher Fe_2O_3/FeO ratio than the basaltic lavas. The presence of thorium veins in the Chico Hills area to the south indicates that thorium and possibly uranium does occur in the system, although the economic potential may not be as favorable as in the Chico Hills area.

References: Cannon and Ragland (1977); Collins, R.F., (1949); Collins, R.F. and Stobbe (1942); Holser (1959b); Jones, L.M., Walker, and Stormer (1974); Kudo (1976); Lipman (1969); Lipman, Bunker, and Bush (1973); Phillmore (1970); Stormer (1972a;b); Wanek (1963); Wood, Northrop, and Griggs (1953).

Chico Hills area, Colfax County

The Chico Hills volcanics are part of the Raton-Clayton volcanic field; however, due to their unique petrology and chemistry this area is discussed separately. These alkaline rocks lie southwest of the main Raton-Clayton volcanic field (fig. 2) and

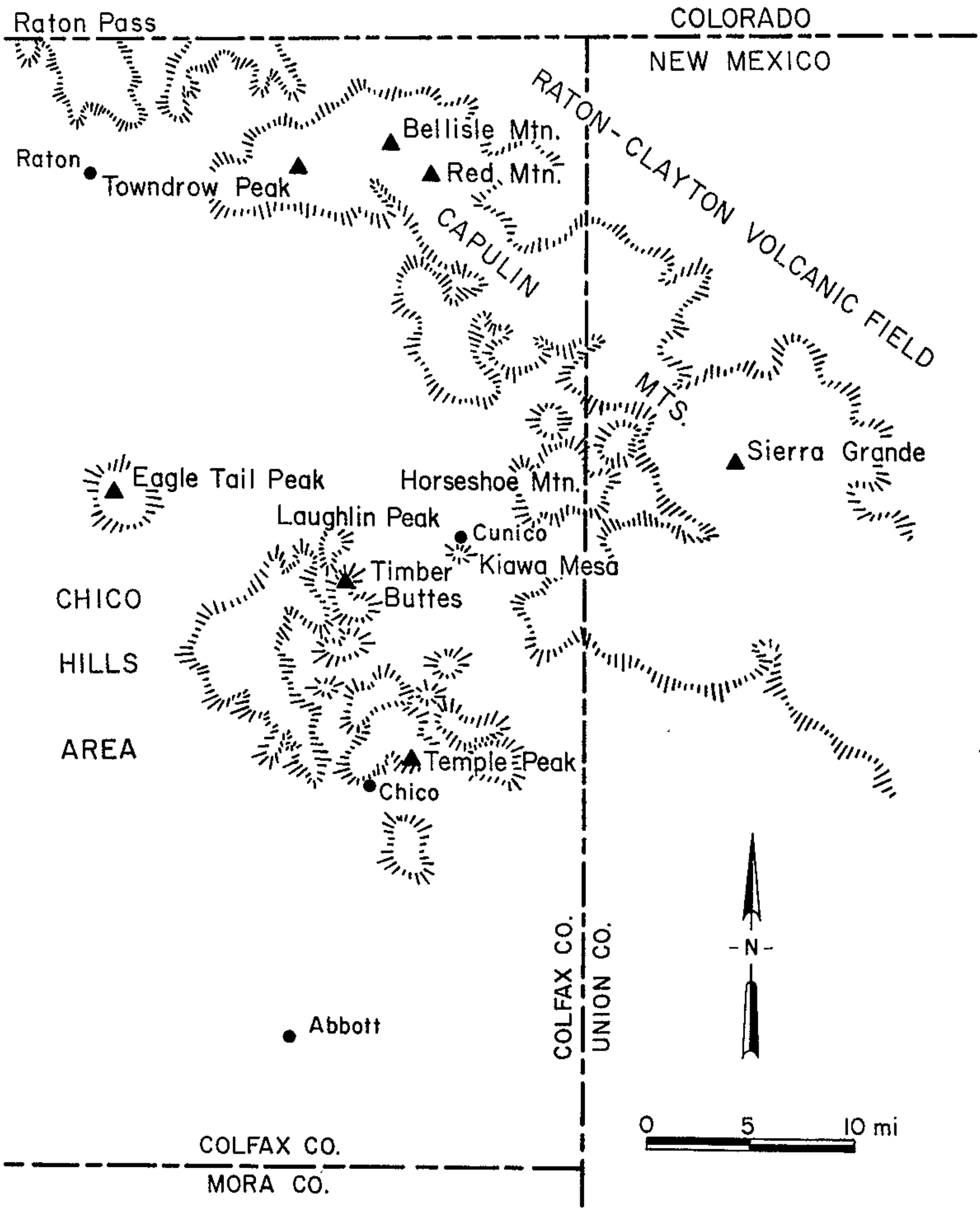

Figure 2-Chico Hills area and Raton-Clayton volcanic field.

consist of dacites, andesites, trachytes, phonolites, and basalts. These rocks are higher in silica, potassium, barium, and strontium than the volcanic rocks of the Raton-Clayton volcanic field to the north.

Five radioactive occurrences have been reported from this area (appendix I) and additional radioactive veins have been found by M.H. Staatz of the U.S. Geological Survey (personal communication, July, 1981). The potential of discovering more radioactive veins in the area is promising. The majority of the radioactivity appears to be due to thorium (Staatz, 1974), although uranium is present in low concentrations (Northrop, 1966; Griggs, 1953). The Chico Hills area contains alkaline rocks which are anomalously high in uranium and thorium. M.H. Staatz (U.S. Geological Survey) is presently mapping the Pine Buttes 7½-min quadrangle.

References: Cannon and Ragland (1977); Collins, R.F. (1949); Collins, R.F. and Stobbe (1942); Griggs (1948, 1953); Kudo (1976), Northrop (1966); Reid, Griswold, Jacobsen, and Lessard (1980b); Staatz (1974); Stobbe (1949a,b; 1950); Stormer (1972a,b); Tschanz (1958); U.S. Atomic Energy Commission (1970); Wanek (1963); Wood, Northrop, and Griggs (1953).

SOUTHERN ROCKY MOUNTAINS

Sangre de Cristo Mountains, Santa Fe, San Miguel, Mora, Rio Arriba, Taos, and Colfax Counties.

The Sangre de Cristo Mountains lie in six counties in northern New Mexico: Santa Fe, San Miguel, Mora, Rio Arriba, Taos, and Colfax Counties (pl. 1); and form the southern extension of the Rocky Mountains. The area consists of a wide range of rock types which have been locally mapped in detail. However, geologic mapping, geochemical, petrographic, and geochronological work is still needed before a complete evaluation of the uranium potential of these rocks can be made. The majority of the radioactive occurrences found in this region are pegmatite or vein type, although orthomagmatic occurrences do exist (appendix I). Two large wilderness areas, Pecos and Wheeler Peak Wilderness areas, contain many of the favorable host rocks and potential mineralization discussed. The U.S. Forest Service administers the wilderness and adjacent areas and regulates exploration and mining activity.

Precambrian metasedimentary and metavolcanic rocks are the oldest rocks exposed in the Sangre de Cristo Mountains. A conglomerate member of the Vadito Schist crops out in the Picuris Range and consists of quartz, muscovite, ilmenite, biotite, magnetite, hematite, and zircon. Other conglomerate sequences exist in the Sangre de Cristo Mountains which are older than the 1.465 b.y. Old Embudo Granite (Register and Brookins, 1979). All of these conglomerates are younger than 1.8 b.y. when a more oxidizing atmosphere appeared.

Many of the ranges of the Sangre de Cristo Mountains are underlain by high SiO_2, K_2O, and Na_2O granitic rocks. Numerous published analyses (cited at the end of this discussion) of these rocks display a wide range in uranium and thorium content. Only a few of these rock units will be described here; many of the references at the end of the discussion include geologic descriptions, chemical analyses, and uranium and thorium analyses of other favorable geologic hosts for uranium mineralization in these mountains.

One of the most promising areas for uranium mineralization was discovered by Reid and others (1980a) in northern Taos County, known as the Costilla Peak massif (fig. 3). This Precambrian granitic pluton consists of quartz, microcline, albite, and accessory biotite, muscovite, apatite, sphene, and magnetite. Allanite also occurs in trace amounts. Numerous uranium anomalies in the stream sediments, rock samples, and spring waters are found associated with this pluton (Reid and others, 1980a) and two radioactive occurrences (hydrothermal veins) occur in the area; the Billy Goat and Latir deposits (fig. 3, appendix I). Secondary uranium mineralization has been found by Craig Goodknight and Jim Dexter of Bendix Field Engineering Corporation (personal communication, November, 1981). There is not sufficient information available at the present time to classify the types of uranium deposits which might be associated with the Costilla Peak massif.

A narrow north-trending belt of syenite and associated melasyenite occurs in the Pecos Wilderness area, northeast of the radioactive Pidlite pegmatite (Redmon, 1961; fig. 4, this report). These alkalic rocks are Precambrian in age and consist of alkali feldspars, biotite, plagioclase, and various accessory minerals including apatite, quartz, allanite, zircon, sphene, and augite. The alkalic rocks are higher in Ba and Sr than quartz porphyries from the same general area and range from 2.5 to 33 ppm Th and 0.8 to 1.6 ppm U (U.S. Geological Survey and others, 1980, p. 29A).

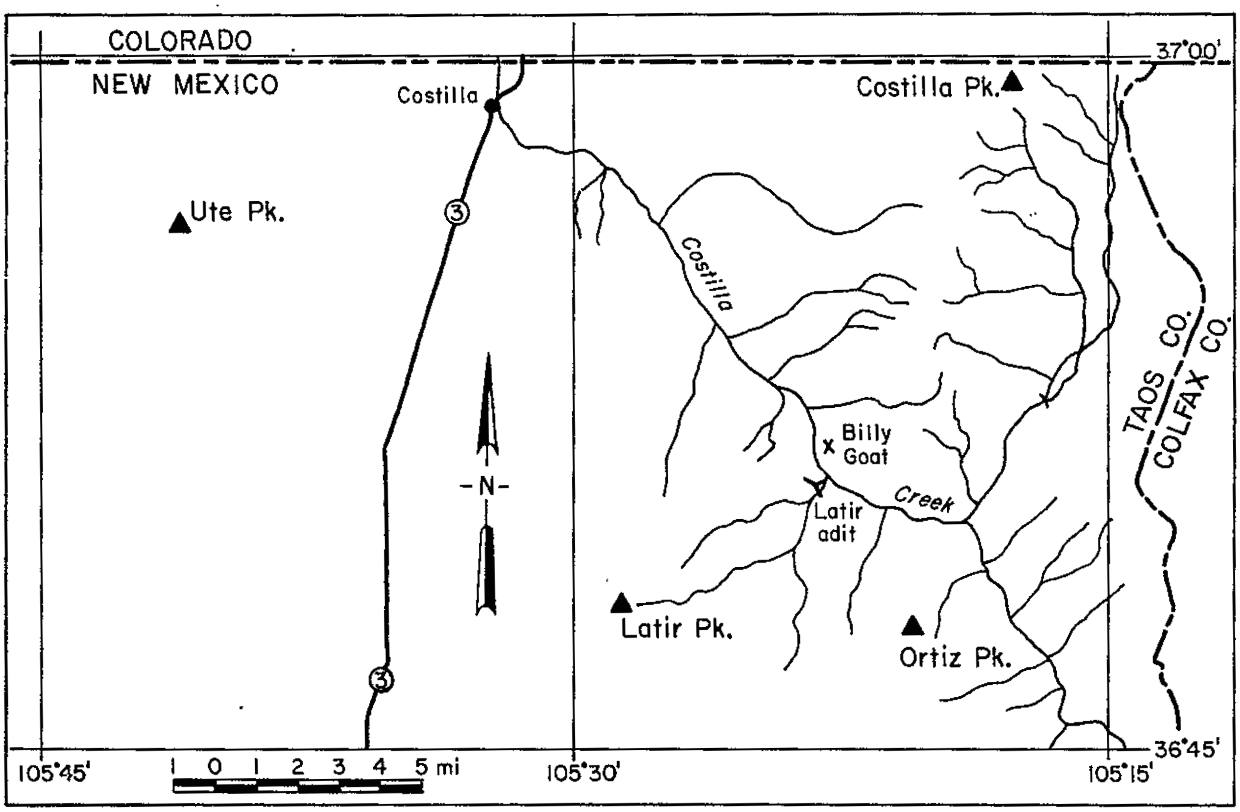

Figure 3–Costilla Peak massif, Taos County.

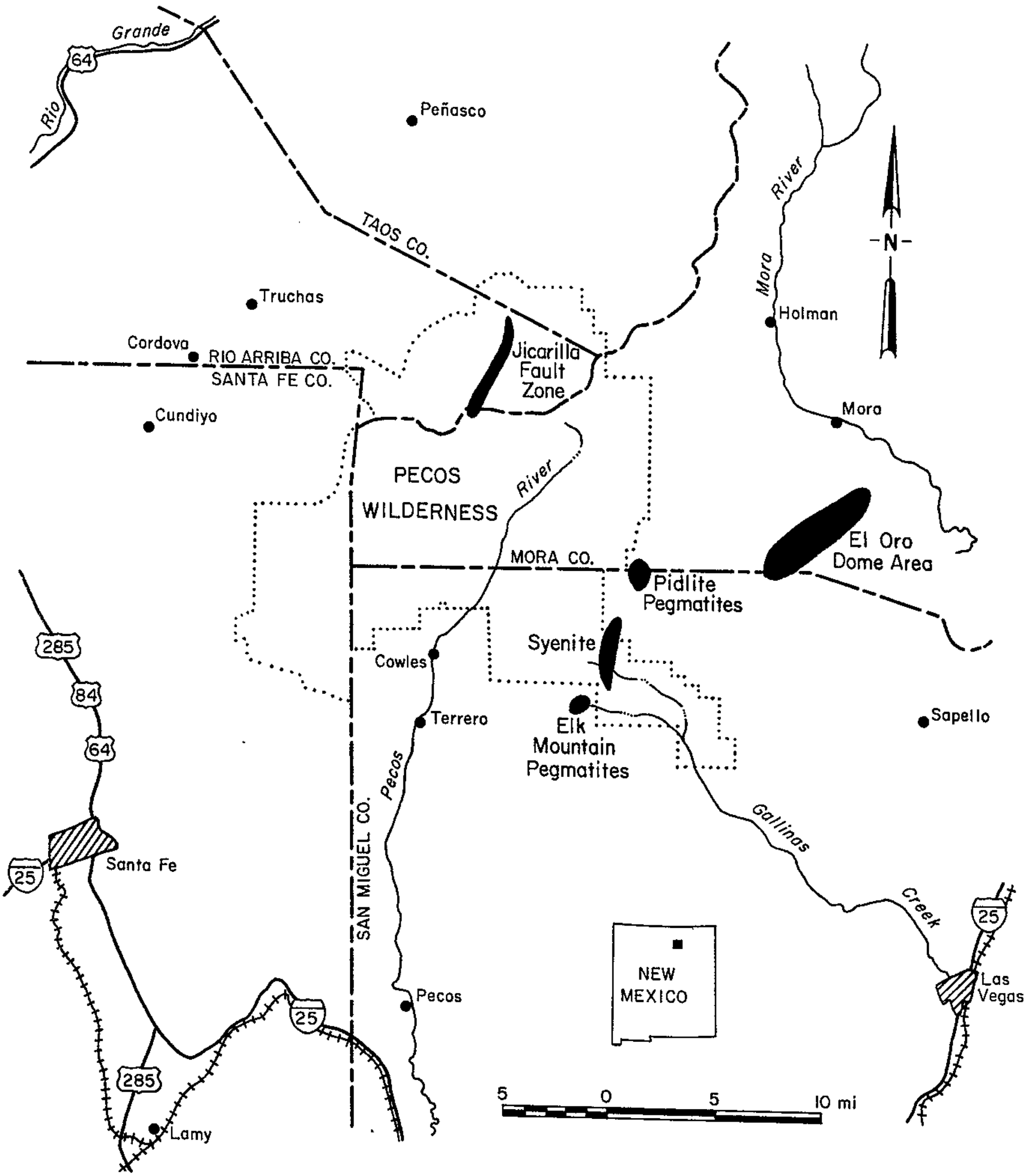

Figure 4–Pecos Wilderness and adjacent areas.

The presence of these alkalic rocks is important in uranium and thorium exploration as thorium-bearing veins are associated with similar alkalic rocks in southern Colorado and Mountain Pass, California.

Several Tertiary soda granite stocks occur in the Red River area and include an alaskite porphyry phase (McKinley, 1957; Schilling, 1956; 1960). The granite consists of albite, orthoclase, quartz, biotite, and accessory magnetite, apatite, sphene, and zircon. Three phases have been recognized by Schilling (1956): porphyritic, pegmatitic, and aplitic phases. The soda granite may represent a late phase of a granitic body which underlies the Taos Range.

Large molybdenum deposits are found along the borders of the stocks (porphyritic phase) and are associated with hydrothermal alteration. Pyrite occurs as disseminations in the stock near the molybdenum deposits. Although Reid and others (1980a, p. 10) did not detect any radioactive anomalies at the Questa (or Moly) mine, it still may be worthwhile to examine other parts of the soda granite, especially the alaskite porphyry, for potential uranium deposits related to plutonic rocks.

The Precambrian granite exposed in the Gallinas Creek area, San Miguel County, consists of alaskite and biotite granite and is classified by Condie (1978) as a high-potassium, high rare-earth elements granite. Four stream-sediment samples collected by Reid and others (1980b, p. 37) are anomalously high in uranium and eight radioactive pegmatites, veins, and orthomagmatic occurrences are reported to occur in the area: Sparks Stone, two road cuts, Black

Nugget No. 1, Locality #32, unknown adit, High Peak, and Guy No. 1 (appendix I).

The Embudo granite in the Dixon-Peñasco area consists of four major units: a metadacite stock (Cerro Alto metadacite, oldest phase), granite to quartz monzonite porphyry (Puntiagudo granite porphyry), biotite quartz monzonite (Rana quartz monzonite), and a sphene-bearing biotite quartz monzonite (Peñasco quartz monzonite, youngest unit; Long, 1974). Pegmatites intrude all of the granitic units and can be divided into five groups: 1) simple pegmatites, 2) well-zoned pegmatites with rare minerals (including the Harding pegmatite), 3) zoned pegmatites without rare minerals, 4) pegmatite-aplite pairs, and 5) tourmaline-bearing pegmatites. Three major types of alteration have affected the granitic rocks: 1) alteration along shear zones forming quartz and muscovite, 2) alteration resulting in reddening of the feldspars, and 3) alteration resulting in the formation of tourmaline-bearing rocks.

The Puntiagudo granite porphyry, Peñasco quartz monzonite, and Rana quartz monzonite all consist of biotite and muscovite. The Puntaguda granite porphyry has a low initial Sr^{87}/Sr^{86} ratio (Register and Brookins, 1979) implying a lower crust or upper mantle derivation. The Peñasco and Rana quartz monzonite are classified as high-calcium granites by Condie (1978). From this evidence, these granitic rocks may be favorable for potential plutonic-related uranium deposits.

Two pegmatite samples from the El Oro Dome area (fig. 4) contained 13.4 and 22.2 ppm U_3O_8 and may be indicative of uranium mineralization (Reid and others, 1980b, p. B-1). The dome consists of a metamorphosed sedimentary sequence of arkosic and argillaceous parent rocks. Pegmatites are numerous in and around the dome. Reid and others (1980b, p. 36) believe that the El Oro dome has numerous features in common with the Rossing deposit, South West Africa, and justifies further evaluation for uranium potential.

Evidences of mineralization have been found along the Jicarilla fault in the Pecos Wilderness and adjacent areas consisting of mylonite, breccia, and sulfides within the wall rocks (U.S. Geological Survey and others, 1980). Anomalous values of radon are distributed along the fault as well as anomalously high values of antimony, zinc, niobium, and beryllium in heavy-mineral concentrates. The significance of these chemical anomalies is not well understood.

Pegmatites are widely scattered throughout the Sangre de Cristo Mountains and many of them are radioactive (appendix I). Uranium has been produced from the Sparks Stone pegmatite (table 4) and samarskite, monazite, and microlite have been produced from many of these pegmatites. The pegmatite areas in northern New Mexico (including areas in Tusas Mountains) are located in fig. 5 and radioactive pegmatites occur in most districts. The uranium potential of these pegmatites is considered to be low because of the small tonnage and low grade; however, radioactive pegmatites may be indicative of other plutonic-related uranium mineralization.

Potential unconformity-related uranium deposits may exist

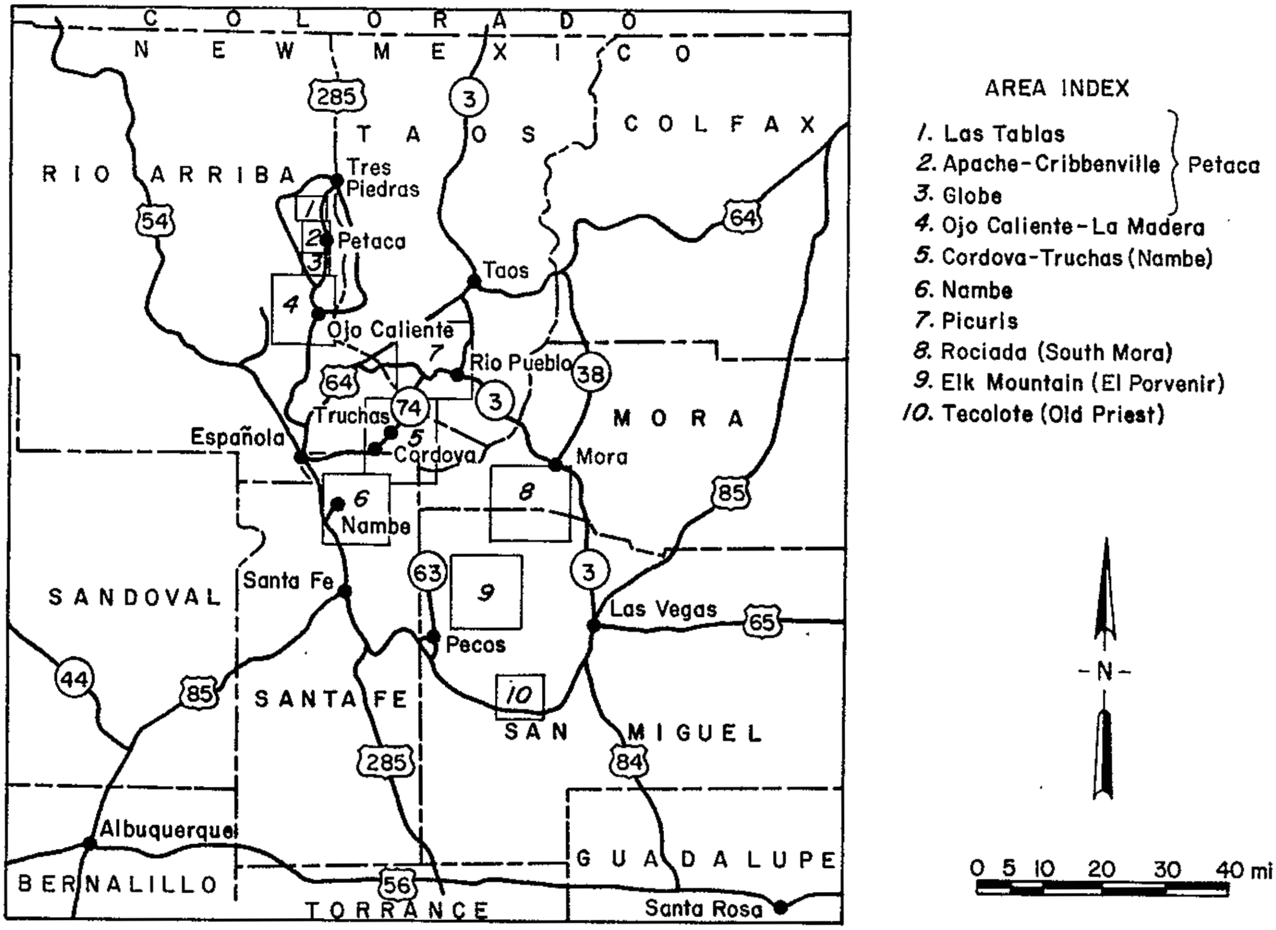

Figure 5–Pegmatite districts in Southern Rocky Mountains.

in the Picuris Range (Kalliokoski and others, 1978). An unconformity separates marine phyllites of the Ortega Group from the amphibolites and fluvial sandstones and conglomerates of the Vadito Group. The stratigraphic relationships between the Ortega and Vadito Groups is uncertain; it is currently believed that the Ortega Group is the older unit (Nielsen and Scott, 1979). These two groups consist of complex lithologies grossly simplified in this report (Nielson and Scott, 1979).

The U.S. Geological Survey and others (1980) describe an unconformity that separates a quartzite from a younger stratified sequence near Rio Mora, in the Pecos Wilderness and adjacent areas. Other unconformities may exist in the Precambrian rocks but have yet to be recognized. Phanerozoic sediments also unconformably overlie the Precambrian rocks in places (Miller and others, 1963) and may be worth investigating in terms of unconformity-related uranium mineralization.

References: Adams, Arengi, and Parrish (1980); Aldrich, L.T., Wetherill, Davis, and Tilton (1958); Anderson, E.C. (1954; 1957); Anderson, O.J. (1980); Baltz (1972); Berliner (1949); Brookins (1974); Brookins, Chakoumakos, Cook, Ewing, Landis, and Register (1979); Brookins, Eppler, and Elston (1977); Budding (1968; 1972); Budding and Cepeda (1979); Callender, Robertson, and Brookins (1976); Chenoweth (1976; 1979); Clark (1968); Clark and Read (1972); Condie (1978, 1980, 1981); Dale and McKinney (1960); Disbrow and Stoll (1957); Edwards (1975); Elston (1961, 1967); Everett, F.I. (1953); Fullagar and Shiver (1973); Goodnight (1973); Green and others (1980a); Gresens (1975); Gresens and Stensrud (1974a, b); Griggs

(1953); Harder and Wyant (1944); Harley (1940); Henrich and Levinson (1953); Hilpert (1969); Holser (1959b); Jahns (1946, 1953); Jahns and Ewing (1976, 1977); Just (1937); Kalliokoski, Langford, and Ojakangas (1978); Kottlowski (1952); Krieger (1932); Lindgren, Graton, and Gordon (1910); Lipman (1969); Lipman, Bunker, and Bush (1973); Long, P.E. (1974, 1976); Malan (1972); Malan and Sterling (1969); Marjaniemi and Basler (1972); McKinlay (1956, 1957); McWhorter (1977); Miller, Montgomery, and Sutherland (1963); Misagi (1968); Montgomery (1950, 1951, 1953); Nielson and Scott (1979); Northrop (1961, 1966); Overstreet (1967); Paige, L.R. (1950); Park, C.F., Jr. and McKinlay (1943); Raup (1953); Redmon (1961); Register and Brookins (1979); Reid, Griswold, Jacobsen, and Lessard (1980a,b); Riesmeyer (1978); Robertson (1976); Robertson and Moench (1979); Schilling (1956, 1960); Smith, H.T.U. (1938); Soulé, J.H. (1946b); Stearns (1953); Sun and Baldwin (1958); Thompson, T.B. (1965); U.S. Atomic Energy Commission (1970); U.S. Geological Survey (1965); U.S. Geological Survey and others (1980); van Alstine (1976); Woodward, L.A., Duchene, and Reed (1974); Wyman (1980); Cepeda (1972); Collins, G.E. and Freeland (1956).

Tusas Mountains, Rio Arriba County

The Tusas Mountains are in northern Rio Arriba County and form the southern extension of the San Juan Range of the Rocky Mountains (pl. 1). Precambrian, Tertiary, and Quaternary igneous and metamorphic rocks comprise the bulk of the mountain range in New Mexico.

The Precambrian geology of the Tusas Mountains is complex and more detailed geologic mapping needs to be completed. Metamorphic schists, gneisses, and quartzites are the oldest rocks preserved; parent rocks include both volcanic and sedimentary deposits. These are intruded by granites, pegmatites, and quartz veins.

Two major Precambrian conglomerate units are exposed in the Tusas Mountains: the Big Rock and Jawbone conglomerate members of the Kiawa Mountain Formation. A preliminary reconnaissance by C.A. Rautman revealed a low radioactive background and an absence of pyrite (written communication, 1977). These conglomerates are also younger than 2.0 b.y.; therefore they do not constitute a favorable host for Proterozoic quartz-pebble conglomerates.

Barker (1958) and Bingler (1968) did not recognize any unconformities occuring in the Precambrian; however, Gresens (1976) believes that an unconformity separates the younger Ortega Group (metasedimentary rocks) from an older basement of metavolcanic and metasedimentary rocks. Gibson (1981) and Kent (1980) have recently mapped this unconformity.

Pegmatite deposits are genetically related to the altered metarhyolite and may indicate a metasomatic derivation (Gresens, 1971; 1976; Gresens and Stensrud, 1974a). Many of these pegmatites contain uranium and thorium minerals and may indicate hidden uranium mineralization. Anomalous uranium in spring waters from the Rio Ojo Caliente (La Madera area) is interpreted as being derived from the Precambrian rocks of the area or from the Tertiary-Quaternary sediments (Wenrich-Verbeek, 1977; Wenrich-Verbeek and Suits, 1971a, b). The pegmatites in the Ojo Caliente and Petaca districts (fig. 5) generally contain samarskite, monazite, and primary uranium or thorium minerals. However, these pegmatites probably do not contain economic concentrations of uranium or thorium.

Uranium has been produced from the JOL and the Tusas East Slope prospects in the Tusas Mountains. Craig Goodknight and Jim Dexter (Bendix Field Engineering Corporation) have recently discovered numerous additional radioactive occurrences in this area. These occurrences are in fluorite-quartz veins, in roof pendants in the Tusas Granite, and along fractures in the Tusas Granite (personal communication, November 10, 1981). Since work is still in progress, the significance of these radioactive occurrences is not known.

Cenozoic volcanics overlie the Precambrian rocks. The oldest volcanic unit, the Conejos Formation, consists of tuffs, conglomerates, and quartz latite flows, breccias, and agglomerates and is overlain by the Treasure Mountain Formation, a series of tuffs and volcanic sediments. The youngest unit is the Abiquiu Tuff and consists of tuffs and volcanic sediments. These rocks need to be studied in detail to determine if initial magmatic or hydrothermal volcaniclastic deposits may exist.

<u>References</u>: Adams, Arengi, and Parrish (1980); Anderson, E.C. (1957); Anderson, O.J. (1980); Apsouri (1944); Barker, F. (1958, 1970); Barker, F., Arth, and Peterman (1973); Barker, F., Arth, Peterman, and Friedman (1976); Barker, F., and Friedman (1974); Benjovsky (1945); Bingler (1968, 1974); Brookins (1974); Butler (1939); Chenoweth (1974a, 1976); Collins, G.E. and Freeland (1956); Condie (1978); Condie and Budding (1979); Doney (1968); Everhart (1956, 1957); Gibson (1981); Green and others (1980a); Gresens (1967, 1971, 1975, 1976);

Gresens and Stensrud (1974a, b); Henrich and Levinson (1953); Hess and Wells (1930); Hilpert (1969); Holser (1959b); Hutchinson (1968); Jahns (1946); Just (1937); Kalliokoski, Langford, and Ojakangas (1978); Kent (1980); Larsen, E.S. Jr., Phair, Gottfried, and Smith (1956); Lindgren, Graton, and Gordon (1910); Lipman (1969); Lipman, Bunker, and Bush (1973); Long, L.E. (1972); Malan (1972); Malan and Sterling (1969); McLeroy (1972); McWhorter (1977); Muehlberger (1960, 1967, 1968); Muench (1938); Overstreet (1967); Park, C.F. Jr. and MacDiarmid (1976); Redmon (1961); Treiman (1977); U.S. Atomic Energy Commission (1970); U.S. Geological Survey (1965); Walker and Osterwald (1963); Wenrich-Verbeek (1977); Wenrich-Verbeek and Suits (1979a, b); Williams, F.E. (1966); Wright, L.A. (1948); Zielinski (1978).

Nacimiento and San Pedro Mountains, Sandoval and Rio Arriba Counties

The Nacimiento Mountains are in northern Sandoval County and the San Pedro Mountains form a northern extension into Rio Arriba County (pl. 1). Precambrian rocks form the western slopes of both ranges and Tertiary rocks related to the Valles caldera in the Jemez Mountains are exposed along the eastern portions of the Nacimiento Mountains. Only the Precambrian rocks are described here; the Tertiary volcanic rocks are described under the Jemez Mountains area.

The San Pedro Mountains, partly in the San Pedro Parks Wilderness area, consist of red granite, aplite, granite, greenstone, and dioritic gneiss and are unconformably overlain by Paleozoic rocks, including the uranium-bearing Cutler Formation (Permian). Only traces of base-metals are found in the Precambrian granite (Santos and others, 1975).

Precambrian rocks in the Nacimiento Mountains consist of metavolcanic, metasedimentary, and granitic rocks. The metavolcanic and metasedimentary rocks occur principally as inclusions or roof pendants in granitic intrusions. Three major granitic plutons have been recognized in the area: Nacimiento, San Miguel, and Joaquin (Condie, 1978). No Precambrian unconformity or quartz-pebble conglomerates have been recognized in this area; but Paleozoic rocks do unconformably overlie the Precambrian rocks.

The Nacimiento and San Miguel granites are high-calcium granites (Condie, 1978); and the Nacimiento granite contains both biotite and muscovite, a favorable crieteria in recognition of potential uranium deposits related to plutonic rocks. The Joaquin granite is a high-potassium, low rare-earth elements granite (Condie, 1978) and also contains biotite and muscovite. Pegmatites and aplites intrude the granitic rocks.

References: San Pedro Mountains - Anderson, R.Y. (1961); Bingler (1968); Chapman, Wood, and Griswold, Inc. (1977); Elston (1961, 1967); Northrop and Hall (1961); Santos, Hall, and Weisner (1975); Wood and Northrop (1946); Woodward, L.A., Anderson, Kaufman, and Reed (1973); Woodward, L.A., Gibson, and McLelland (1976); Woodward, L.A., McLelland, and Kaufman (1974);
Nacimiento Mountains - Anderson, E.C. (1957); Anderson, O.J. (1980); Brookins (1974); Brookins and Della Valle (1977); Chapman, Wood, and Griswold, Inc. (1977); Chenoweth (1974b, 1975, 1976); Condie (1978); Elston (1961, 1967); Fitzsimmons (1961); Fulp and Woodward (1981); Kaufman (1971); Northrop (1961); Northrop and Hill (1961); Perkins (1973); Schumaker (1972); Vizcaino, O'Neill, and Dotterer

(1978); Wood and Northrop (1946); Woodward, L.A., Anderson, Kaufman and Reed (1973); Woodward, L.A., Kaufman, and Reed (1973); Woodward, L.A., McLelland, Anderson, and Kaufman (1972); Woodward, L.A., McLelland, and Kaufman (1974); Woodward, L.A., McLelland, and Husler (1977); Woodward, L.A., Martinez, Duchene, Schumacher, and Reed (1974); Woodward, L.A. and Ruetschilling (1976); Woodward, L.A. and Schumacher (1973).

Jemez Mountains, Rio Arriba, Sandoval, and Los Alamos Counties

The Jemez Mountains in northern New Mexico (pl. 1) are formed by volcanic rocks associated with two cauldrons: the Toledo and Valles cauldrons; Kudo (1974) offers a good summary of the volcanic history of this area.

Volcanic activity occurred in early Pliocene times with the eruption of mafic to intermediate flows and was followed by the cauldron-forming silicic ash-flow tuff eruptions during the Pleistocene. Volcanic rocks erupting from the younger Valles cauldron partially covered the older Toledo cauldron. Volcanic activity continued at Valles cauldron with subsequent caldera collapse, ring fracturing, and intrusion of several rhyolite domes. These rhyolite domes and tuffs are perhaps the more likely targets for potential uranium mineralization.

Copper-uranium mineralization is associated with fault zones and altered basaltic to dacitic volcanic rocks in the Cochiti District. Anomalously high uranium concentrations have been reported from thermal springs, the Bandelier Tuff, and surroundings sediments (Chenoweth, 1974b and 1975).

References: Anderson, E.C. (1957); Anderson, R.Y. (1961); Bailey, Smith, and Ross (1969); Bingler (1968); Brookins and Della Valle

(1977); Bundy (1958); Chenoweth (1974b, 1975, 1976); Elston (1961, 1967); Kelley, V.C. (1977); Kudo (1974); Laughlin and Eddy (1977); Lindgren, Graton, and Gordon (1910); Northrop (1961); Northrop and Hill (1961); Perkins (1973); Ross, Smith, and Bailey (1961); Smith, R.L. and Bailey (1968); Smith, R.L., Bailey, and Ross (1970); Vizcaino, O'Neill, and Dotterer (1978); Woodward, L.A., DuChene, and Martinez (1977); Woodward, L.A., Kaufman, and Reed (1973); Woodward, L.A. and Timmer (1979).

COLORADO PLATEAU

San Juan Basin, San, McKinley, and Cibola Counties

The San Juan Basin, northwestern New Mexico is known for the extensive sedimentary uranium deposits in the Grants uranium district. However, diatremes, igneous rocks and plugs, and siliceous dikes and sills also occur throughout the basin, which may be favorable hosts for uranium mineralization.

Approximately 250 diatremes are found scattered throughout the Navajo and Hopi Indian reservation in Arizona and New Mexico; the majority of these diatremes are in Arizona. A diatreme is a funnel-shaped volcanic vent or pipe which formed by a violent eruption into the enclosing sediments. Shoemaker (1956 a,b) reports uranium and thorium analyses from a few of the diatremes in New Mexico and uranium deposits occur in or are associated with diatremes in the Hopi Buttes, Arizona. Most of the economical uranium deposits associated with diatremes occur in lacustrine sediments in and adjacent to the diatreme, but uranium also occurs along the fault contacts. None of the New Mexican diatremes have been exploited for their uranium mineralization.

Various other siliceous igneous rocks occur throughout the San Juan Basin. Secondary uranium minerals are occasionally found along faults and fractures in rhyolite dikes in the Grants uranium district. Diorite sills and laccoliths are also found in the Carrizo Mountains.

Several dikes intrude the sediments along the Grants mineral belt. Their relationship to the sandstone-type mineral deposits varies and may act as barriers or traps for uranium-bearing ground water. Uranium mineralization may be found within fractures of these dikes (Allison, 1954). Chenoweth (1966) reports of uranium analyses of samples from selected oil wells in southern San Juan Basin which penetrated the Precambrian basement. The uranium values in the Precambrian rocks range from 10 to 74 ppm U_3O_8.

References: Allen, J.E. (1955); Allison (1954); Anderson, O.J. (1980); Brookins and Della Valle (1977); Brown, W.T. Jr. (1969); Chapman, Wood, and Griswold, Inc. (1977); Chenoweth (1957, 1966, 1976); Dane (1948); Fitzsimmons (1973); Green and others (1980b, 1980c); Hilpert and Corey (1955); Kerr and Wilcox (1963); Larsen, E.S., Irving, Gonyer, and Larsen (1936); Maxwell (1976); Nishimori, Ragland, Rogers, and Greenburg (1977); Santos (1966); Shoemaker, E.M. (1956); Strobell (1956); Thadin, Santos, and Raup (1967).

Mount Taylor Volcanic Field, Cibola and McKinley Counties

Northeast of the Grants uranium district, lies the Mount Taylor volcanic field (pl. 1) consisting of a typical calc-alkaline assemblage (Baker and Ridley, 1970). However, tholeiiltes and olivine tholeiiltes normally present in a calc-alkaline assemblage are missing from the Mount Taylor sequence.

The volcanic rocks can be separated into four groups: 1) under-saturated early basalts, 2) alkali basalts, 3) "big feldspar" basalts and dacites, and 4) siliceous rhyolites. Mineralization is minor to absent; however, the alkalic rocks may be favorable hosts for potential contact-metasomatic uranium deposits, especially since uranium is found in the general area.

References: Anderson, R.Y. (1961); Baker and Ridley (1970); Brookins and Della Valle (1977); Chapman, Wood, and Griswold, Inc. (1977); Crumpler (1977); Hunt (1938); Lipman, Bunker, and Bush (1973); Lipman, Pallister, and Sargent (1979); Northrop and Hill (1961); Towle and Rapaport (1952); Zielinski (1978).

Zuni Mountains, Cibola and McKinley Counties

The Zuni Mountains trend northwest and southeast and is south of the Grants uranium district (pl. 1). Mineral deposits occur in the central and southern parts of the mountain range and consist of copper, fluorite, barite, silver, gold, and uranium.

The oldest rocks in the area consist of Precambrian gneisses, schists, quartzites, mafic rocks, and granitic rocks. Four geochemically distinct granites have been differentiated in these mountains and only one, the Oso pluton, is a high-potassium and high rare-earth elements granite (Condie, 1978). The Mt. Sedgwick pluton is a high-calcium granite, while the Cerro Colorado and Zuni plutons are high-silica, low rare-earth element granites (Condie, 1978). Pennsylvanian and Permian "red beds" sediments unconformably overlie the Precambrian rocks.

Hydrothermal-vein uranium mineralization occurs in shear zones near Diener and the Mirabal mine. Radioactive anomalies are also associated with purple fluorite in the Mirabal mine and a fluorite vein that intrudes a syenite body northeast of the Mirabal area. No radioactivity above background was found along fluorite deposits near the "21" and "27" mines (personal reconnaissance, September, 1980).

Brookins and Rautman (1978) examined the Precambrian granitic rocks to determine if these rocks would constitute a large potential in-situ uranium deposit. None of their data support any such potential. The average uranium content of 57 samples is 3.75 ppm (range 1.82-7.37 ppm) and the average thorium content of 25 samples is 17.53 ppm (range 4.07-41.76 ppm).

Anomalous water and stream-sediment samples, high in uranium, are reported from the Zuni Mountains by Maassen and LaDelfe (1980, appendix III) which may indicate uranium mineralization in the Permian Abo Formation or Precambrian granitic rocks. Uranium does occur in the Abo Formation (Gott and Erickson, 1952). Radioactive anomalies in the Zuni Mountains were also detected by aerial-radiometric surveys (Geometrics, 1979, appendix II).

References: Baumgardner (1954); Brookins (1978); Brookins and Della Valle (1977); Brookins and Rautman (1978); Chapman, Wood, and Griswold, Inc. (1977); Condie (1978); Condie and Budding (1979); Fitzsimmons (1961, 1967); Geometrics (1979, appendix II); Goddard (1945, 1966); Gott and Erickson (1952); Green and others (1980b); Hilpert (1969); Hilpert and Corey (1955); Kalliokoski, Langford, and Ojakangas (1978); Langford (1980); Lindgren, Graton and Gordon

(1910); Maassen and LaDelfe (1980, appendix III); McAnulty (1978); Rothrock (1946); Smith, C.T. and others (1958a,b); Towle and Rapaport (1952); Williams, F.E. (1966).

BASIN AND RANGE

Ortiz Mountains area, Sandoval, Santa Fe, and Bernalillo Counties

The Ortiz Mountains area includes the area between the Sandia Mountains to the south and the Sangre de Cristo Mountains to the north and includes the Ortiz Mountains, South Mountain, San Pedro Mountain, Cerrillos Hills, and the La Bajada district (fig. 6). Precambrian and Tertiary rocks are exposed in this area and provide favorable host rocks for uranium mineralization.

The Tertiary Espinaso Volcanics are exposed throughout the entire area consisting of tuffs, breccias, conglomerates, and andesitic and latitic flows. Monzonite and syenite-trachyte porphyries intrude the entire sequence forming a north-trending porphyry belt that includes the Cerrillos Hills, Ortiz Mountains, San Pedro Mountain, and South Mountain. Favorable host rocks for potential uranium mineralization occur throughout the area and one uranium deposit, the La Bajada mine, has produced uranium in the past (table 4).

The La Bajada mine has produced 9.7 tons of ore yielding 24 ounces of silver and 2,423 pounds of copper and 9,649 tons of 0.14% U_3O_8 (Chenoweth, 1979). The La Bajada deposit occurs in a tuff breccia of the Tertiary Espinaso Volcanics near a limburgite dike. Lustig (1958) describes 23 minerals from the deposit and copper, nickel, molybdenum, cobalt, germanium, and arsenic are present. Minor uranium occurs within nearby sediments (Elston,

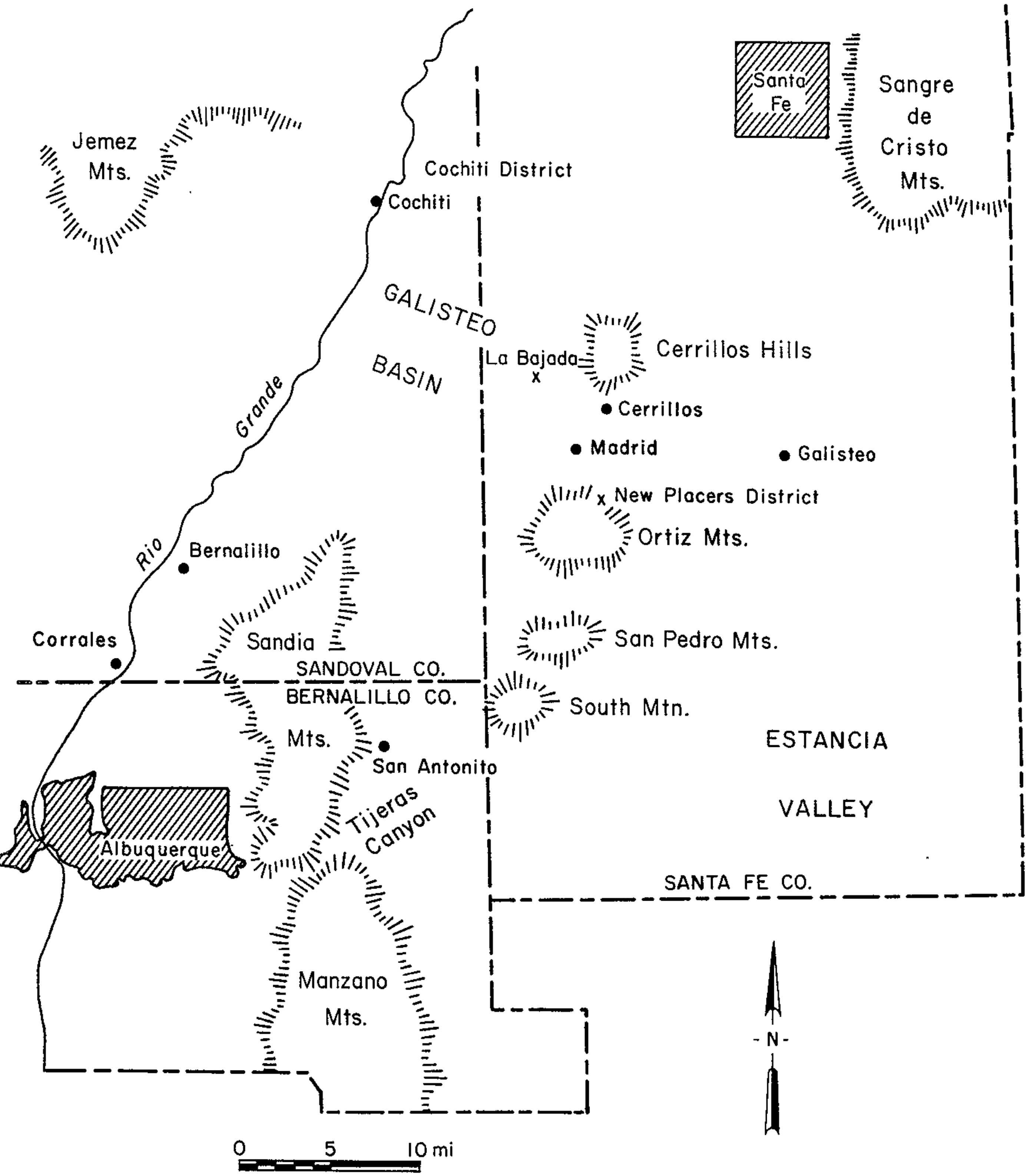

Figure 6–Ortiz Mountains area, Sandoval, Santa Fe, and Bernalillo Counties.

1967). The U.S. Department of Energy (1980) considers these sediments as containing potential economic resources of uranium (roll-type sandstone deposit).

Several radioactive occurrences are associated with copper and gold veins in the Cerrillos district (appendix I). Copper mineralization occurs in veins along fractures in the potassically altered Tertiary monzonite porphyry that surrounds a younger barren stock. Galena-silver veins occur in the district as well and a radioactive monzonite dike contains 0.0024 to 0.0047% U_3O_8 (U.S. Atomic Energy Commission, 1970, p. 163-164).

San Pedro Mountain consits of Paleozoic sediments and Tertiary monzonites, latites, and rhyolite porphyries. Contact-metasomatic copper-gold-silver-tungsten deposits occur in this area (New Placers district) and appear to be favorable hosts for uranium mineralization. Lead and zinc replacement deposits in limestone are also present.

South Mountain (south of San Pedro Mountain) consists of a monzonite laccolith that intrudes the Permian Abo and Yeso Formations. Contact-metasomatic iron deposits are found scattered along the intrusive contact.

References: Akright (1979); Anderson, E.C. (1954); Anderson, R.Y. (1961); Anderson, O.J. (1980); Atkinson (1961); Chenoweth (1976, 1979); Collins, G.E. and Freeland (1956); Disbrow and Stoll (1957); Edwards (1975); Elston (1961, 1967); Green and others (1980c); Haji-Vassiliou and Kerr (1972); Lustig (1958); Lustig and Rosenzweig (1959); Marjaniemi and Basler (1972); Northrop and Hill (1961); Stearns (1953); U.S. Atomic Energy Commission (1970); U.S. Department of Energy (1980); Wargo (1964); Griggs (1953).

Sandia Mountains and Monte Largo areas, Bernalillo and Sandoval Counties

The Sandia Mountains, east of Albuquerque, forms the eastern edge of the Rio Grande rift and the Monte Largo Hills are on the northeastern edge of the Sandia Mountains (pl. 1). Precambrian rocks overlain by Paleozoic sediments are the dominant rock types, although the Tertiary Espinaso Volcanics and intrusives do occur in the area.

Condie and Budding (1979) believe that most of the Precambrian sediments are 1.6 to 1.7 b.y. in age, therefore these rocks are unfavorable for quartz-pebble conglomerate uranium deposits. Unconformities may exist in these sediments; however, detailed geologic mapping and an understanding of the stratigraphic relationships are needed.

The escarpment of the Sandia Mountains is formed by the Sandia Granite, a light-colored porphyritic stock. Two or more petrographic and geochemically distinct plutons exist (Condie and Budding, 1979, p. 25), a quartz monzonite and granodiorite. Both plutons are high-calcium granites (Condie, 1978). Thousands of aplite and pegmatite dikes are associated with this granite; however, no rare minerals have been reported from these dikes.

A carbonatite dike, containing 0.295% Nb_2O_5, has been mapped by Lambert (1961, p. 68-70) and consists of dolomite, apatite, phlogopite, and magnetite. Carbonatites generally contain U-, Th-, Nb-, Ta-, Cu-, P-, Ba-, and F-bearing minerals.

The Espinaso Volcanics occur in the Sandia Mountains and a few Tertiary intrusive bodies are scattered throughout the area.

A number of lamprophyre dikes intrude the Sandia granite and may warrant further investigation. Some fluorspar deposits and fissure-veins of gold, silver, copper, lead, and zinc occur throughout the area.

References: Aldrich, L.T., Wetherill, Davis, and Tilton (1958); Anderson, R.Y. (1961); Bolton (1976); Brookins (1974); Brookins and Della Valle (1977); Condie (1978); Condie and Budding (1979); Elston (1961, 1967); Enz (1974); Enz, Kudo, and Brookins (1979, 1980); Feinberg (1969); Fitzsimmons (1961); Green and others (1980c); Kelley, V.C. (1977); Kelley, V.C. and Northrop (1975); Lambert (1961); McAnulty (1978); Moore (1965); Northrop (1961); Northrop and Hill (1961); Perkins (1973); Rothrock (1946); Shoemaker, J. (1965); Stearns (1953); Thompson, T.B. and Giles (1974, 1980); Williams, F.E. (1966); Woodward, L.A. (1970b).

The Manzano and Manzanita Mountains, Bernalillo and Valencia Counties

The Manzano Mountains lie east of Belen and the Manzanita Mountains lie between the Manzano and Sandia Mountains (fig. 1). These mountain ranges lie in the southern part of the Tijeras Canyon mining district where gold, silver, lead, copper, and fluorite veins occur. Precambrian rocks are the oldest rocks in the area and are overlain by Paleozoic sediments.

The metasediments in these mountains are considered to be 1.6 to 1.7 b.y. in age; therefore, are unfavorable for quartz-pebble conglomerate uranium deposits. An unconformity between older mafic metamorphosed igneous rocks and metasediments and younger metasediments is exposed in the Manzano Mountains near

Comanche Canyon (Condie and Budding, 1979). However, no uranium occurrences or anomalies have been reported.

Several Precambrian granites intrude the metamorphic rocks; the Manzanita (quartz monzonite), Ojita (granodiorite to quartz monzonite), Monte Largo (granodiorite to quartz monzonite), and Priest plutons and are either high-calcium or high-potassium, low rare-earth elements granites (Condie, 1978). These granites do not indicate any favorability for potential uranium mineralization; although a syenite phase in the Manzano Mountains may warrant further investigation (Stark, 1956).

References: Anderson, R.Y. (1961); Anderson, O.J. (1980); Brookins (1974); Brookins and Della Valle (1977); Condie (1978); Condie and Budding (1979); Elston (1967); Fitzsimmons (1961); Green and others (1980c); Kalliokoski, Langford, and Ojakangas (1978); Kelley, V.C. (1977); Kelley, V.C. and Northrop (1975); Machette (1978b); Malan and Sterling (1969); Muehlberger and Denison (1964); Myers (1977); Myers and McKay (1970, 1971, 1972, 1974, 1976); Northrop and Hill (1961); Pierson, Wenrich-Verbeek, Hanigan, and Machette (1980); Reiche (1949); Rothrock (1946); Stark (1956); U.S. Atomic Energy Commission (1970).

Pedernal Hills, Torrance County

The Pedernal Hills form a small group of hills in Torrance County (pl. 1) and consist of five major types of Precambrian rocks: Granitic gneiss, quartzite, highly differentiated metavolcanic and metasedimentary rocks, granite, and cataclastite (sheared granite and country rocks). Detailed stratigraphic relationships between these rocks have not been determined. One sample of granite displayed the chemistry typical of the high-silica, low rare-earth granites of Condie (1978). Precambrian unconformities have not been reported from the Pedernal Hills, due to poor exposures of the rocks, although detailed mapping and an understanding of the stratigraphic relationships may reveal an unconformity.

One vein-type radioactive occurrence is reported from the area (Consolidated Gas and Mining, appendix I). Syenite dikes have been reported and are similar in appearance and composition to dikes in Wet Mountains, Colorado (Loring and Armstrong, 1980). Carbonatites and thorium-bearing veins occur with the syenites in Wet Mountains.

<u>References</u>: Brookins and Della Valle (1977); Condie (1978); Condie and Budding (1979); Fallis (1958); Fulp and Woodward (1981); Gonzalez (1968); Gonzalez and Woodward (1972); Loring and Armstrong (1980); Malan and Sterling (1969); U.S. Atomic Energy Commission (1970); Woodward, L.A. (1969).

Los Pinos Mountains, Socorro and Torrance Counties

The Los Pinos Mountains lie south of the Manzano Mountains in Socorro and Torrance Counties (fig. 7). Precambrian rocks are exposed on the northwest flanks of the mountains and are overlain by Paleozoic sediments. Precambrian unconformities and quartz-pebble conglomerates have not been found in these mountains.

Three types of granites intrude the metamorphic rocks: Priest, Los Pinos, and Sepultura plutons (Beers, 1976). The Los Pinos and Sepultura plutons are high-silica, high rare-earth elements

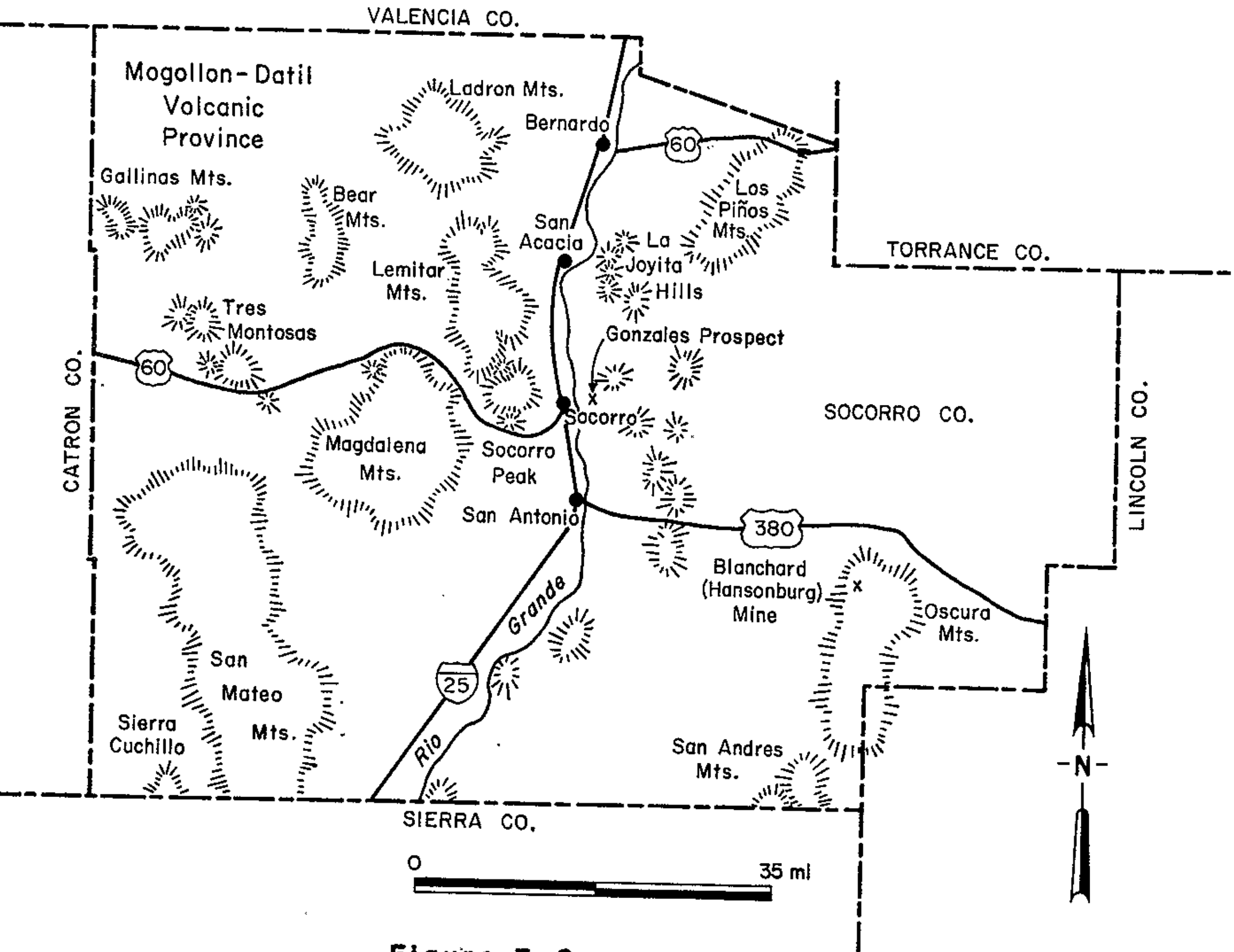

Figure 7–Socorro County

granites, while the Priest pluton is a high-calcium granite (Condie, 1978). The Los Pinos pluton is a pink, medium-grained, biotite granite and the Sepultura pluton is porphyritic, but contains less magnetite and biotite than the Los Pinos pluton. Pegmatites, aplites, quartz veins, and quartz-feldspar dikes intrude the granitic rocks.

Only one vein-type radioactive occurrence is found in these mountains (Parker Ranch, appendix I). Uranium is also associated with the red-bed copper deposits in the Scholle district in northern Los Pinos and southern Manzano Mountains and in the Rayo district, Los Pinos Mountains.

References: Anderson, O.J. (1980); Beers (1976); Brookins and Della Valle (1977); Condie (1978); Condie and Budding (1979); Kelley, V.C. (1977); Machette (1978b); Mallon (1966); Muehlberger and Denison (1964); Myers and McKay (1974); Northrop and Hill (1961); Pierson, Wenrich-Verbeek, Hanigan, and Machette (1980); Stark and Dapples (1946).

Ladron Mountains, Socorro County

The Ladron Mountains form part of the western edge of the Rio Grande rift in northern Socorro County (fig. 7). Precambrian rocks are exposed in these mountains and are overlain by Phanerozoic rocks, including Tertiary andesitic and rhyolitic flows. The Sevilleta Wildlife refuge and the proposed Ladron Wilderness area include most of the Ladron Mountains.

A Precambrian conglomerate unit is present in the Ladron Mountains, but is too young in age to be favorable for quartz-pebble conglomerate-type uranium deposits (Condie, 1976). Precambrian unconformities have not been recognized in this area.

Two granitic plutons, the Capirote and Ladron plutons, intrude the metamorphic rocks. The Capirote granite consists of four facies: medium-grained, coarse-grained, altered, and a transitional facies and is chemically a high-silica, low rare-earth elements granite (Condie, 1976, 1978). The Capirote granite consists of two micas and the altered and transitional facies may warrant further investigation. The Ladron quartz monzonite is the youngest Precambrian unit in the Ladrons Mountains and is chemically a high-potassium and low rare-earth elements granite (Condie, 1978).

Two radioactive occurrences are found in the Ladron Mountains; the Juan Torres and the Jeter prospects (appendix I). The Juan Torres prospect consists of a radioactive quartz-fluorite vein. The Jeter prospect (north of the wilderness and game refuge areas) has produced uranium in 1954-1958 (table 4) and the U.S. Department of Energy (1980) considers this area as favorable for containing uranium resources (Pierson and others, 1981). Uranium minerals occur along a fault breccia zone between the Precambrian Capirote granite and the Tertiary Popotosa Formation. Anomalous uranium concentrations in water and stream-sediment samples from the area around the Jeter mine indicate that uranium mineralization may still be in the area (Pierson and others, 1981; Planner, 1980; McCarn and Freeman, 1976; cited in appendix III). The New Mexico Bureau of Mines and Mineral Resources is currently evaluating the mineral resources of the Ladrons Wilderness areas for the U.S. Bureau of Land Management.

<u>References</u>: Anderson, E.C. (1954); Black, B.A. (1964); Chenoweth (1976);

Collins, G.E. and Nye (1957); Collins, G.E. and Smith (1956); Condie (1976, 1978); Condie and Budding (1979); Cookro (1978); Duschatko and Poldervaart (1955); Haederle (1966); Kelley, V.C. (1977); Lasky (1932); Machette (1978b); Mallon (1966); McAnulty (1978); McCarn and Freeman (1976, appendix III); Northrop and Hill (1961); Pierson, Wenrich-Verbeek, Hanigan, and Machette (1980); Planner (1980, appendix III); Rothrock (1946); U.S. Atomic Energy Commission (1970); U.S. Department of Energy (1980); U.S. Geological Survey (1965); Williams, F.E. (1966).

Lemitar Mountains, Socorro County

The Lemitar Mountains lie along the western edge of the Rio Grande rift and are north of the Socorro Mountains (fig. 7). Precambrian rocks are exposed along the eastern flanks and consist of granite, schists, metasediments, and pegmatite, quartz, and carbonatite dikes. Tertiary volcanic rocks are exposed west of the Precambrian rocks and have undergone a potassium metasomatism (Chapin and others, 1978).

A Precambrian two-mica granite occurs north of Corkscrew Canyon and radioactive carbonatites intrude the Precambrian rocks (McLemore, 1980a, b). The carbonatites are Ordovician in age (V.T. McLemore, in preparation) and contain up to 0.25% U_3O_8. Thorium, barite, fluorite, and rare-earth elements are also present. Similar carbonatites are also found in the Chupadera Mountains, about 20 miles south of the Lemitar Mountains.

High silica and potassium Tertiary volcanic rocks from the Socorro cauldron overlie the Precambrian rocks and may be favorable hosts for volcanogenic uranium deposits. Radioactive occurrences also occur in the Popotosa Formation north of the Precambrian outcrops (appendix I).

References: Anderson, E.C. (1954, 1957); Anderson, O.J. (1980); Bonnichsen (1962); Chapin, Chamberlin, Osburn, White, and Sanford (1978); Chenoweth (1976); Collins, G.E. and Smith (1956); Condie and Budding (1978); Elston (1976); Elston, Rhodes, Coney, and Deal (1976); Hilpert (1969); Lasky (1932); Machette (1978a, b); McLemore (1980a, b, 1982); Pierson and others (1980); U.S. Geological Survey (1965); Woodward, T.M. (1973).

La Joyita Hills, Socorro County

The Joyita Hills lie east of the Rio Grande near San Acacia (fig. 7) and consists of a group of north-trending hills. Precambrian rocks form the core of these hills and are composed of coarse-grained granite and biotite gneiss. Aplite and pegmatite dikes intrude the granite. Tertiary rhyolite, andesite, and latite occur in the eastern part of the area. Minor galena and silver veins occur within the sediments adjacent to the Precambrian granite and fluorite is common within these veins. Minor radioactive occurrences are reported to occur in this area (appendix I).

References: Arendt (1971); Condie and Budding (1979); Herber (1963a,b); Laskey (1932); Machette (1978b); McAnulty (1978); Pierson and others (1980); Rothrock (1946); Spradlin (1975); Williams, F.E. (1966).

Oscura Mountains, Socorro and Lincoln Counties

The Oscura Mountains lie in Socorro and Lincoln Counties (fig. 7) and the southern portions are on the White Sands military reservation. Precambrian rocks form the western face of the range and are overlain by Paleozoic rocks.

Three Precambrian granitic plutons are exposed in these mountains: the Oscura, the Mockingbird Gap, and the Capitol Peak plutons. The Oscura pluton is the dominant pluton. The Mockingbird Gap and Capitol Peak plutons (described under San Andres Mountains) are exposed in the southern part of the Oscura Mountains and in the San Andres Mountains.

Three facies of the Oscura pluton are recognized: medium- to coarse-grained granite, foliated and porphyritic granite, and a younger leucogranite. This granite is similar in composition to the Capitol Peak pluton and is classified as a high-potassium, low rare-earth elements granite by Condie (1978). Accessory minerals in this granite include biotite, muscovite, apatite, zircon, and sphene.

The Hansonburg mining district encompasses the western face of the mountains. Copper, lead, fluorite, and barite have been produced intermittantly since 1901 from veins in the Paleozoic sediments.

The southern part of the Oscura Mountains has not been examined in terms of uranium or thorium potential because the area was withdrawn from mineral exploration in 1940's, before the uranium exploration boom in the 1950's. The data from a detailed geochemical survey of the San Andres and Oscura Mountains has been released by the U.S. Department of Energy (LaDelfe and others, 1981, appendix III); but has not been evaluated at this time. Birsoy (1977) has examined uranium and thorium concentrations in the Hansonburg fluorite. Recent mining has also exposed several rhyolite dikes in the Hansonburg area which may warrant further investigation.

References: Birsoy (1977); Budding and Condie (1975); Condie (1978); Condie and Budding (1979); Kottlowski (1953); Kottlowski and Steensma (1979); Lindgren, Graton, and Gordon (1910); McAnulty (1978); Muehlberger and Denison (1964); Williams, F.E. (1966).

San Andres Mountains, Socorro, Sierra, and Doña Ana Counties

The San Andres Mountains in south-central New Mexico are bounded on the east by the Tularosa Valley and on the west by the Jornado del Muerto (fig. 1). The northern end of the range is bounded by Mockingbird Gap and the Oscura Mountains and the southern end is bounded by the San Augustin Pass and the Organ Mountains.

Precambrian rocks are the oldest rock units in the San Andres Mountains and consist of six granitic plutons: the Capitol Peak, Mockingbird Gap, Strawberry Peak, Mayberry, San Andres, and Mineral Hill plutons. The Mockingbird Gap, Mayberry, Strawberry Peak, and Mineral Hill plutons are high-potassium, high rare-earth elements granites. The Capitol Peak and San Andres plutons are high-potassium, low rare-earth elements granites (Condie, 1978). The Strawberry Peak and Mayberry plutons consist of accessory allanite, sphene, apatite, and zircon and the Capitol Peak pluton consists of accessory muscovite and biotite. Pegmatites intrude these granites. The granitic plutons exposed in these mountains have mineralogies and chemistries similar to granitic rocks found associated with plutonic-related uranium deposits; however, the San Andres Mountains lie on the White Sands Missile Range and have not been open for mineral exploration since before the uranium boom in the 1950's.

Numerous purple fluorite and barite deposits occur in these mountains and it is rumored that a uranium mineral was found occurring with purple fluorite somewhere in the San Andres Mountains. Uranium has been reported from a fault zone in the Permian Abo Formation near Black Top Mountain (Templain and Dotterer, 1978). Precambrian metamorphic rocks occur in these mountains but no unconformities or quartz-pebble conglomerates have been recognized. The data from a detailed geochemical survey of the San Andres and Oscura Mountains has been released by the U.S. Department of Energy (LaDelfe and others, 1981, appendix III); but has not been evaluated at this time.

References: Anderson, E.C. (1955); Anonymous (1955); Bachman (1965); Bachman and Harbour (1970); Bachman and Myers (1963, 1969); Budding and Condie (1975); Condie (1978); Condie and Budding (1979); Dunham (1935); Harley (1934); Kalliokoski, Langford, and Ojakangas (1978); Kottlowski (1955, 1961); Kottlowski, Flower, Thompson, and Foster (1956); Lasky (1932); McAnulty (1978); Muehlberger and Denison (1964); Rothrock (1970); Seager (1981); Templain and Dotterer (1978); U.S. Geological Survey (1965); Williams, F.E. (1966).

Lincoln County Porphyry Belt

The Lincoln County porphyry belt consists of a series of Tertiary alkaline igneous rocks forming the Gallinas, Jicarilla, and Capitan Mountains and Carrizo Peak and Sierra Blanca (fig. 8). Precambrian granites and gneisses are exposed only in the Gallinas

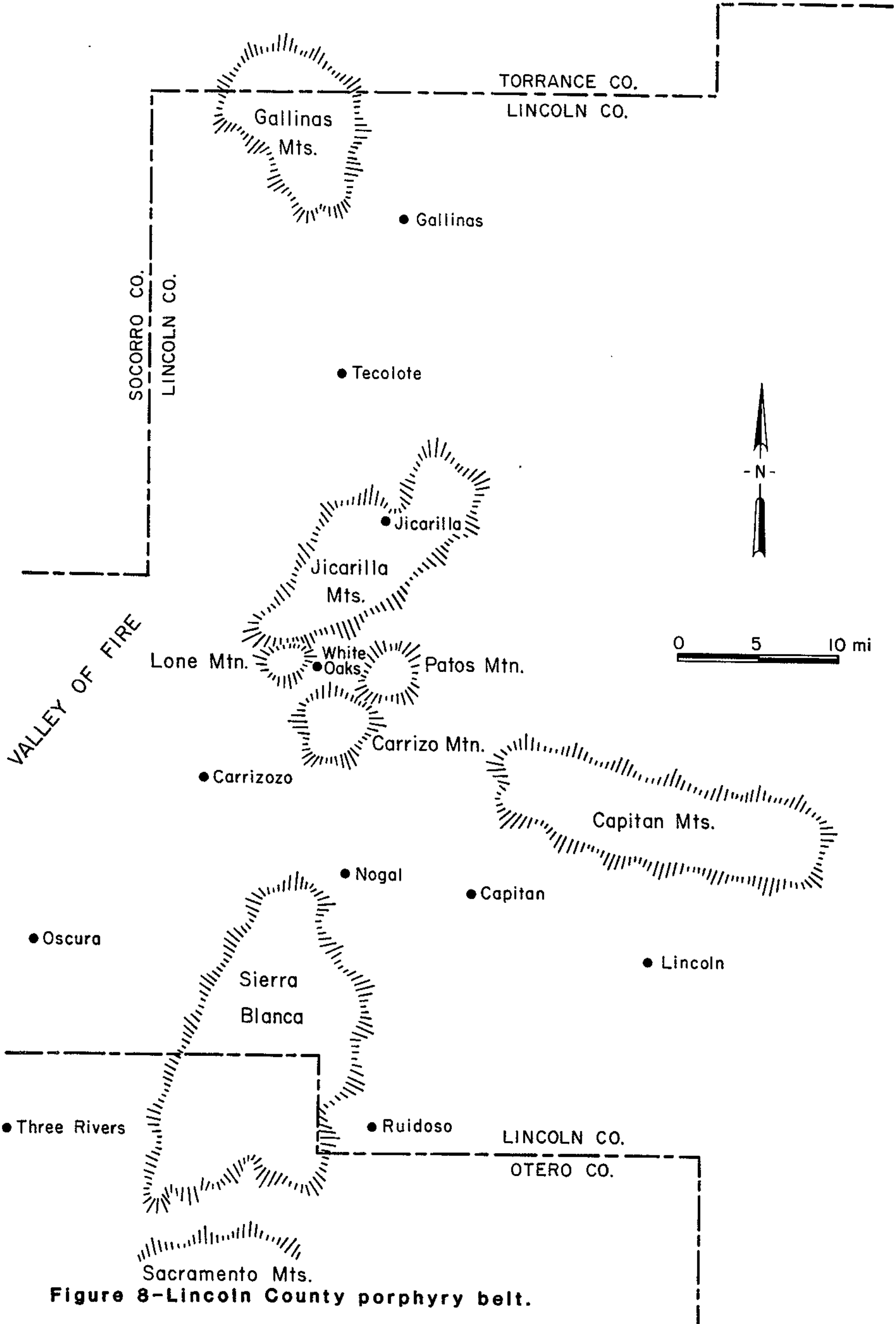

Figure 8–Lincoln County porphyry belt.

Mountains.

Radioactive occurrences are known to occur in eight mining districts or areas (appendix I): Gallinas Mountains, White Oaks, Jicarilla, Nogal, and Capitan districts and the Carrizozo area; and are generally associated with the alkaline rocks. Hydrothermal-vein deposits of gold, silver, lead, zinc, copper, fluorite, and tungsten and molybdenum and manganese deposits also appear to be related to the alkaline rocks. Contact-metasomatic iron deposits, some of which are radioactive, occur in the Tecolote, White Oaks, Gallinas, Capitan, and Jicarilla districts (appendix I).

The Gallinas Mountains mining district in northwestern Lincoln County is noted for its fluorite-copper-bastnaesite and iron deposits. The fluorite-copper-bastnaesite deposits occur in breccia and fault zones within the Permian Yeso Formation in the vicinity of syenite to monzonite laccoliths and sills. The district has produced 71 tons of bastnaesite, a rare-earth element carbonate mineral containing some uranium and thorium. Bastnaesite is reported as occurring in most of the prospects in this district (appendix I). Fluorite, silver, lead, copper, and zinc have also been produced from these mines. The iron deposits show a close relationship to the intrusive contacts within the syenite and folded limestones of the Yeso Formation. Epidote and tremolite are common gangue minerals and magneitte and hematite are the dominant ore minerals. The highest radioactive anomalies are associated with the highest concentrations of magnetite and hematite, although the radioactive minerals have not yet been identified (personal reconnaissance, August, 1980).

Lone Mountain (White Oaks district) consists of a quartz monzonite intrusive composed of quartz, microcline, antiperthite, and various mafic minerals. Gold-tungsten deposits (two of which are radioactive) and radioactive iron deposits occur around the Lone Mountain stock. The gold-tungsten deposits are of a hydrothermal origin and found in fractures and breccia zones of monzonite to rhyolite dikes intruding the Paleozoic sediments. Contact-metasomatic iron deposits occur in the adjacent sediments, especially where these sediments have been folded, near the intrusive contacts. These deposits are radioactive (appendix I) and torbernite and metatorbernite have been reported from the Prince mine on the north side of Lone Mountain (R.H. Weber, personal communication, July 13, 1981).

The Sierra Blanca in the Nogal and Bonita districts (partly in the White Mountain wilderness area) consist of 3,340 feet of volcanic rocks. Four major alkaline stocks intrude the volcanics: Rialto (monzonite), Bonito (syenite), Three Rivers (leuco-syenite porphyry), and Chaves Mountain (syenite) stocks and provide favorable host rocks for potential radioactive deposits. Black (1977) describes the rhyolite plugs and dikes of the Cone Peak rhyolite as a likely target for uranium mineralization. Minor radioactive occurrences are found in the area (appendix I) and several molybdenum deposits or occurrences are present (Segerstrom and others, 1975, p. 21-22).

The Capitan Mountains are formed by an alaskite to monzonite intrusive stock, which probably represents the most siliceous major intrusive in the Lincoln County porphyry belt. Two iron deposits, the Smokey Iron mine (Pittsburg and Grace claims, presently active) and the Copeland Canyon claims, are radioactive; however, most of the radioactive occurrences in this area are thorium-bearing veins (appendix I). Numerous claims have been staked in the past for uranium and thorium and a test shipment of "no pay" low-grade uranium ore was shipped from the Bear Canyon mine (table 4). One vein at the Bareljon No. 1 claim is reported as having significant uranium content (appendix I). Other potential commodities associated with the Capitan Mountains stock include rare-earth elements, molybdenum, iron, copper, and gold. The Capitan Mountains are extremely rugged and the higher elevations are now within the Capitan Mountains Wilderness area.

References: Anderson, E.C. (1954, 1957); Black, K.D. (1977); Collins, G.E. (1956); Collins, G.E., and Mallory (1954); Dale and McKinney (1960); Elston and Snider (1964); Giles and Thompson (1972); Glass and Smalley (1945); Griswold (1959); Griswold and Missaghi (1964); Holser (1959b); Kelley, F.J. (1962); Kelley, V.C. (1949, 1971, 1972); Marjaniemi and Basler (1972); McAnulty (1978); Moore (1965); Patton (1951); Perhac (1970); Perhac and Heinrich (1963, 1964); Poe (1965); Ryberg (1968); Schnake (1977); Segerstrom and Ryberg (1974); Segerstrom, Stotelmeyer, Williams, and Cordell (1975); Sheridan (1947); Sidwell (1946); Smith, C.T. and others (1964); Soulé, J.H. (1946a); Staatz (1974); Thompson, T.B. (1964, 1968, 1972, 1973); Twenhofel and Brick (1956); U.S. Atomic Energy Commission (1970); U.S. Geological Survey (1965); Walker and Osterwald (1956, 1963); Willard and Jahns (1974); Williams, F.E. (1966).

Sacramento Mountains, Otero County

The Sacramento Mountains form part of the eastern boundary of the Basin and Range Province (fig. 1). Sierra Blanca lies to the north and the Gaudalupe and Delaware Mountains to the south. The Tularosa valley lies to the west of these mountains and the Pecos River valley and the Great Plains lie to the east.

A small exposure of Precambrian metamorphic rocks occurs on the western flanks of the Sacramento Mountains near Nigger Ed Canyon (Pray, 1961). Although no Precambrian unconformities or quartz-pebble conglomerates have been recognized in these mountains, the Precambrian rocks are unconformably overlain by Paleozoic rocks which contain radioactive occurrences.

Diorite porphyry and camptonite porphyry sills and dikes intrude the Precambrian and Paleozoic rocks and appear to be cogmamatic (Asquith, 1974). A diorite porphyry occurs at the Virginia mine in the Tularosa district and may be related to the copper mineralization occurring in the Abo Formation (Permian). Field reconnaissance of this mine and the adjacent area revealed only slightly above background radioactivity (personal field notes, August 4, 1981).

References: Asquith (1973a,b, 1974); Kalliokoski, Langford, and Ojakangao (1977); Pray (1961).

Pajarito Mountain, Otero County

Pajarito Mountain lies in northeastern part of the Mescalero Indian Reservation, Otero County (fig. 1) and rises about 600 feet above the plateau to an elevation of 8,014 feet. Crystalline rocks probably of Precambrian age, are exposed in the center of the mountain and consists of somber-colored melasyenite, which locally grades into a monzonite or quartz-syenite. A granitoid syenite intrudes the melasyenite and pegmatitic syenite intrudes the older intrusives. Although no radioactive occurrences have been reported from this area, these rocks are considered favorable for containing uranium or thorium veins since thorium veins and carbonatites are associated with syenitic bodies in southern Colorado.

References: Condie and Budding (1979); Kelley, V.C. (1968); Motts and Gaal (1960).

Jarilla Mountains, Otero County

The Jarilla Mountains lie in the Tularosa valley near Orogrande and consist of a small range of hills about six miles wide and ten miles long (fig. 1). Intrusive igneous rocks form the bulk of the range and are of intermediate composition. Major rock types include biotite syenodiorite, leucorhyolite, monzonite-adamellite, adamellite, and basic to intermediate dikes. Contact metamorphism of the sediments occurs at the intrusive contacts.

Three principle types of ore deposits have been recognized: contact-metasomatic iron deposits, contact-metasomatic copper and lead-silver-gold deposits, and placer gold deposits. Two uranium and thorium analyses have been reported by Edwards (1975) and Malan (1972) to be low compared to other igneous rocks in New Mexico. One radioactive occurrence has been reported (appendix I). Contact-metasomatic iron deposits in Lincoln County are radioactive and may indicate similar ore deposits in these mountains.

References: Bloom (1975); Edwards (1975); Malan (1972); Schmidt and Craddock (1964).

Cornudas Mountains, Otero County

The Cornudas Mountains are in southern Otero County and form the northern part of an intrusive alkalic belt extending into Texas (fig. 1). Rock types in the area include syenite, phonolite, and aplite.

A complex system of irregular bodies of calcite, quartz, limonite, and siderate occurs in the area and anomalous amounts of rare-earth elements, Nb, Rb, Li, and Zr have been reported (Meeves, 1966). Uranium occurs in the Llewellyn and Jones prospects near Wind Mountain and thorium-bearing veins intrude the sediments northwest of Wind Mountain (Collins, 1958). The geology and mineralization of the Cornudas Mountains has not received much attention. However, thorium-bearing veins are common in alkalic terrains and more veins may exist in this area.

References: Barker, D.S. and Long (1974); Clabaugh (1941, 1950); Collins, G.E. (1958); Holser (1959a, b); Meeves (1966); Timm (1941); Zapp (1941).

Fra Cristobal Range, Sierra County

The Fra Cristobal Range lies east of Elephant Butte Reservoir, northeast of Truth or Consequences and forms part of the eastern edge of the Rio Grande rift. This area is on private land of the Pedro Armendaris Grant. Precambrian granite, schist, hornblende diorite, and pegmatites are exposed along the western flank of these mountains. Most of the range is composed of Paleozoic sediments.

This range is not highly mineralized; only a few fluorite and copper-galena-gold veins have been described. Anomalous radioactivity occurs with purple fluorite veins (Anderson, 1955). One sample of a highly altered, red, coarse-grained granite contains up to 0.20% U_3O_8 (Templain and Dotterer, 1978).

References: Anderson, E.C. (1955); Anonymous (1955); Boyd (1955); Condie and Budding (1978); Harley (1934); Jacobs (1956); McCleary (1960); Templain and Dotterer (1978); Thompson, S. III (1955a,b).

Caballo Mountains, Sierra and Doña Ana Counties

The Caballo Mountains form part of the eastern edge of the Rio Grande rift zone (fig. 1) and consist of Precambrian rocks unconformably overlain by Paleozoic sediments. Precambrian gneissic granite, syenite, quartz monzonite (the Caballo pluton) and an amphibolite complex occurs in this area (Condie and Budding, 1979). Most of these mountains consist of Paleozoic sediments.

Red syenites (microcline-rich bodies) in the Red Hills area of southwestern Caballo Mountains contain anomalous amounts of uranium and thorium (Staatz and others, 1965; appendix I). These syenites may be related to metasomatism, similar to the fenitization which characterizes carbonatite intrusives (McLemore, 1980a, b; Staatz and others, 1965). Larger syenite bodies in the central portion of the Caballo Mountains may also be a product of metasomatism; if so, they may contain uranium and thorium mineralization.

Radioactive occurrences have been reported along fault zones in Precambrian rocks and along the fault contacts between Precambrian granite and Paleozoic limestone (appendix I). Radioactive fluorite veins of Tertiary age also are reported by Boyd (1955). Low-temperature vein deposits of lead, copper, and fluorite are scattered throughout the Caballo Mountains; many of them appear to be low in uranium and thorium (personal reconnaissance, July, 1980; U.S. Atomic Energy Commission preliminary reconnaissance reports). Minor gold, silver, and barite veins occur in the area.

The most likely hosts for potential uranium and thorium deposits in this area are the Precambrian (?) syenites, the fault zones within the Precambrian rocks, and between the Precambrian and Paleozoic rocks. Detailed mapping of these areas is needed for a better estimate of the uranium-thorium potential.

References: Anderson, E.C. (1954, 1955); Anderson, O.J. (1980); Anonymous (1955); Boyd (1955); Boyd and Wolfe (1953); Condie and Budding (1979); Dale and McKinney (1960); Doyle (1951); Dunham (1935); Harley (1934); Jahns, Kottlowski, and Kuellmer (1955); Kelley, V.C. and Silver (1952); Mason (1976); McAnulty (1978); Melancon (1952); Rothrock (1946, 1970); Seager (1973a); Silver (1955); Staatz, Adams, and Conklin (1965); Templain and Dotterer (1978); U.S. Geological Survey (1965); van Alstine (1976); Williams, F.E. (1966); U.S. Atomic Energy Commission (1970).

Mogollon-Datil Volcanic Province

The Mogollon-Datil volcanic province is part of a large volcanic belt of Oligocene to Miocene age extending from Oregon southwards into Mexico and consists of 400-500 cauldrons (Elston, 1978). This field extends over seven counties in southwestern New Mexico (Socorro, Catron, Sierra, Grant, Doña Ana, Luna, and Hidalgo) and consists of numerous mountain ranges, some of which are described separately in this report (fig. 9).

Volcanic cauldrons form the cores of many of these mountains and many cauldrons have not been mapped in detail. These cauldrons tend to form clusters and occasionally overlap older cauldron complexes. Granitic stocks intrude the cauldron centers and the ring fractures. Precambrian basement rocks tend to be exposed in or around the cauldron complex.

Lead, copper, zinc, and molybdenum deposits occur along the ring fracture zones of resurgent cauldrons (Elston, 1978) and fluorite mineralization is widespread throughout the province. Porphyry copper deposits occur in Tertiary granitic stocks in Grant County. Uranium deposits tend to be associated with the more siliceous volcanic centers (Elston, 1978); they occur as uraninite-pitchblende veins, radioactive opal in rhyolite flows, and radioactive fluorite veins. All rock units within, at, and adjacent to the cauldron margins, are favorable sites for volcanogenic uranium deposits.

Volcanic rocks associated with the Mogollon cauldron in Catron County are considered favorable for volcanogenic uranium deposits by White and Foster (1981). The Baby mine, once a productive uranium and gold mine (table 4), and the Evelyn prospect are located along fractures within the Whitewater Creek member of the

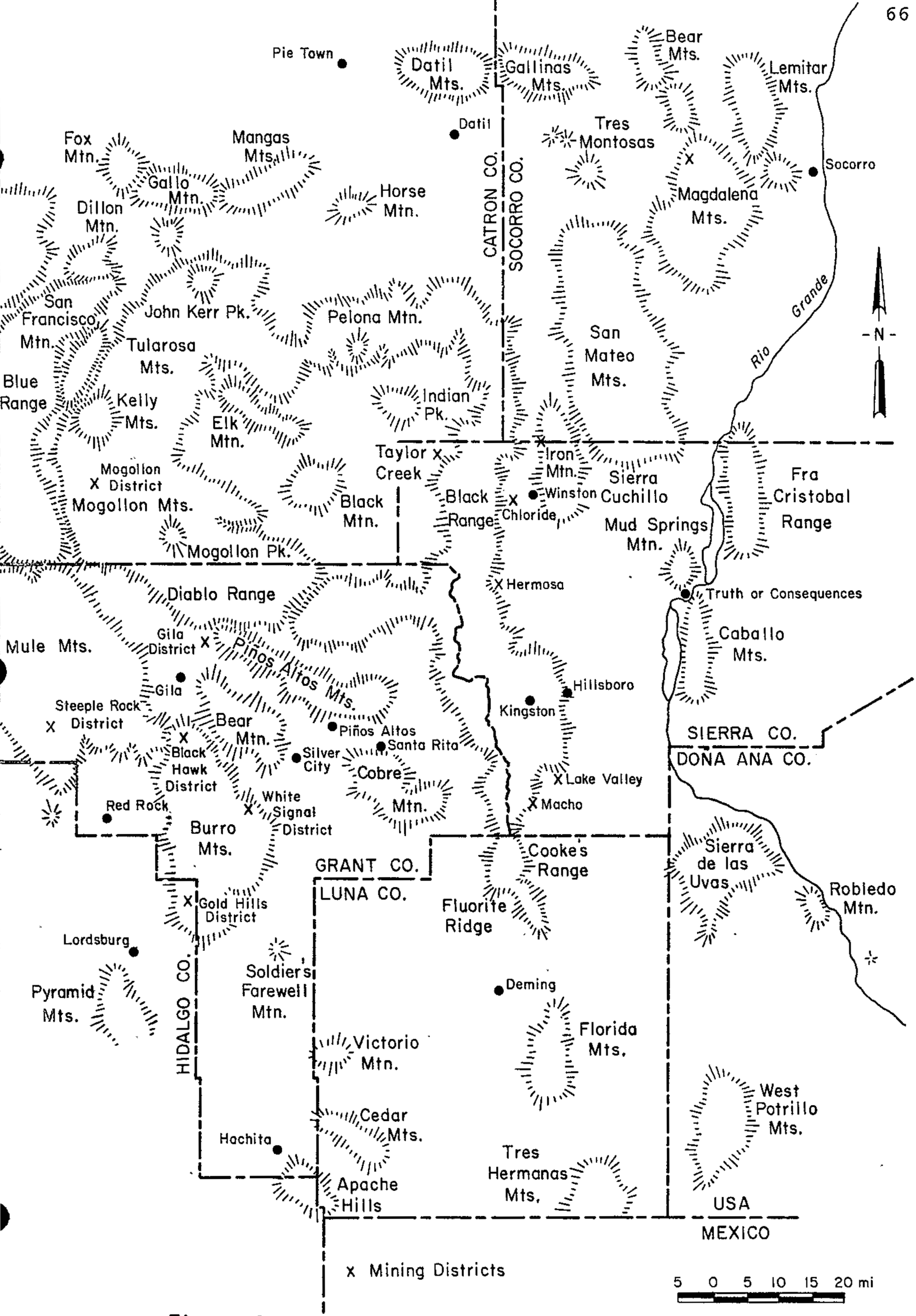

Figure 9–Mogollon-Datil volcanic province.

Cooney Rhyolite Tuff.

The Red Mountain Cauldron, in the Blue Range Wilderness area, may also have uranium mineralization associated with it. An aerial-radiometric anomaly and fluorite occurrences are associated with this cauldron (White and Foster, 1981).

The Alum Mountain area, south of the Gila Cliff dwellings and surrounded by the Gila Wilderness area, is slightly enriched in molybdenum and vanadium; although no uranium occurrences or anomalies were found by White and Foster (1981). However, the surrounding country rocks are hydrothermally altered and numerous anomalies on aerial-radiometric surveys and stream-sediment and water analyses occur in the vicinity of Alum Mountain. Geologic mapping and geochemical sampling are needed to adequately evaluate the mineral potential.

The porphyry copper deposits in Grant County (Tyrone, Santa Rita, and Hanover mines) may need to be re-evaluated in terms of their uranium potential. Uranium occurrences are found at Tyrone and Santa Rita (Allison and Ove, 1957; Foran and Perhac, 1954; Granger and others, 1952; Kolessar, 1970; Raup, 1953) and may indicate the possibility of producing uranium as a byproduct of copper production as in some of the Arizona and Utah porphyry deposits. O'Neill and Thiede (1981) consider the Tyrone laccolith as favorable for containing uranium deposits.

The Mogollon-Datil volcanic province contains numerous favorable environments and host rocks for potential nonsandstone uranium deposits; many of these areas not already discussed are described separately following this discussion. Wilderness areas and national forests occupy a large portion of this vast volcanic province.

References: Aldrich, M.J., Jr. (1976); Allison and Ove (1957); Anderson, E.C. (1957); Anderson, O.J. (1980); Anonymous (1959); Arnold (1974a,b); Bachman (1965); Ballmann (1960); Bauer (1950b); Belt (1960); Berry, Nagy, Spreng, Barnes, and Smouse (1980); Biggerstaff (1974); Birsoy (1977); Bornhorst (1976); Bornhorst, Erb, and Elston (1976); Bornhorst, Elston, Della Valle, and Balagna (1980); Boyd and Wolfe (1953); Bromfield and Wrucke (1961); Brown, D.M. (1972); Chamberlin (1974, 1980, 1981); Chapin, Chamberlin, Osburn, White, and Sanford (1978); Chenoweth (1976); Collins, G.E. (1957); Collins, G.E. and Nye (1957); Condie (1978); Coney (1976); Cunningham (1974); Dale and McKinney (1959); Dane and Bachman (1961); Davis and Guilbert (1973); Elston (1960, 1964, 1970, 1976, 1978); Elston, Coney, and Rhodes (1968); Elston, Damon, Coney, Rhodes, Smith, and Bikerman (1973); Elston, Rhodes, Coney, and Deal (1976); Elston, Rhodes, and Erb (1976); Everett, F.D. (1964); Everhart (1956, 1957); Farkas (1969); Ferguson (1920, 1927); Finnell (1976a, b); Foran and Perhac (1954); Giles (1965); Gilluly (1965); Givens (1957); Gott and Erickson (1952); Graft and Kerr (1950); Granger, Bauer, Lovering, and Gillerman (1952); Griffitts and Alminas (1968); Griffitts and Nakagawa (1960); Griggs (1953); Griggs and Wagner (1966); Hedlund (1975a, 1977, 1980a, b, c); Hernon and Jones (1968); Hernon, Jones, and Moore (1953, 1964); Hillard (1969); Hilpert (1969); Holser (1959b); Jicha (1958); Jones, W.R., Hernon, and Moore (1967); Jones, W.R., Hernon, and Pratt (1961); Jones, W.R., Moore, and Pratt (1970); Kalliokoski, Langford, and Ojakangas (1978); Keith (1944); Kelley, V.C. (1977); Kelley, V.C. and Branson(1947); Kerr, Kulp, Patterson, and Wright (1950); Kolessar (1970); Lamarre, Perry, and Johnson (1974); Laroche (1980); Lasky (1930, 1932, 1936a); Lindgren, Graton, and Gordon (1910); Lopez (1975); Lovering (1956); Machette (1978a, b); Massingill (1979); May, Smith, Dickson, and Nystrom (1981); Myerson (1979); Meeves (1966); Morrison (1965); Northrop (1944); O'Neill and Thiede (1981); Osburn, Petty, and Chapin (1981); O'Sullivan (1953); Paige, S. (1908); Park, C.F., Jr. and MacDiarmid (1975); Pierson, Wenrich-Verbeek, Hannigan, and Machette (1980); Potter (1970); Powers (1941); Ratte (1975); Ratte, Eaton, Gaskill, and Peterson (1974); Ratte and Gaskill (1975); Ratte and Grotbo (1979); Ratte, Landis, Gaskill, and Damon (1969); Ratte, Landis, Gaskill, and Raabe (1967); Raup (1953); Rhodes (1970, 1976a, b); Rhodes and Smith (1976); Rothrock (1946, 1970); Simon (1973); Smith, E.I. (1976); Spencer and Paige (1935); Stearns (1962); Strogin (1957); Sur (1947); Thorman (1977); Thorman and Drewes (1979); Tonking (1957); U.S. Atomic Energy Commission (1970); U.S. Department of Energy (1980); U.S. Geological Survey (1965); van Alstine (1976); van der Spuy (1970); Walker and Osterwald (1963); Walton, Salter, and Zetterlund (1980a, b); Weber (1963); Weber and Bassett (1963); Weber and Willard (1959a, b); White and Foster (1981); Wilkinson (1976); Willard (1957a, b, 1959); Willard and Givens (1958); Willard and Stearns (1971); Willard, Weber, and Kuellmer (1961); Williams, F.E. (1966); Wilpolt and Wanek (1951); Wolfe (1953); Woodward, L.A. (1970a); Wynn (1981).

Magdalena Mountains, Socorro County

The Magdalena Mountains lie in western Socorro County (fig. 9) and consist of Precambrian, Paleozoic, and Tertiary rocks. The Precambrian rocks have been mapped by Sumner (1980), Loughlin and

Koschmann (1942), and Condie and Budding (1979). Sumner (1980) conducted a partial scintollometer survey and found the Precambrian Magdalena granite to have the highest background radioactivity. Sumner (1980) concluded that these rocks have little or no potential for uranium mineralization. Condie (1978) classified the Magdalena granite as a high-silica, high rare-earth elements granite suggesting that this granite may be anomalously high in uranium (Condie and Brookins, 1980).

The Magdalena Mountains are formed by a complex cauldron and is currently being mapped by C.E. Chapin, G.R. Osburn, and associated graduate assistants. It is currently believed that three cauldrons are exposed in this area (G.R. Osburn, personal communication, December 8, 1981). The Magdalena and Sawmill Canyon cauldrons are interconnected and are the sources for the two members of the A-L Peak Tuff (Osburn and Chapin, in press). The third cauldron, the Socorro cauldron, is the source for the Hells Mesa Tuff and not the tuff of Lemitar Mountain as proposed by Chapin and others (1978). The North Baldy cauldron is now considered to be part of the Socorro cauldron and the Hop Canyon cauldron is no longer considered to be a cauldron (G.R. Osburn, personal communication, December 9, 1981). Future publications by C.E. Chapin and G.R. Osburn will further explain the current theories involving this complex system of cauldrons.

The Magdalena Mountains are a highly mineralized area (Lasky, 1932; Loughlin and Koschmann, 1942). Five mining districts occur in these mountains (Hop Canyon, Magdalena, Mill Canyon, North Magdalena, and Water Canyon) and consist of gold, district), at the Cocar Lease, and at the Taylor prospects (appendix I). Fluorite, calcite, and quartz veins containing copper, lead, and iron sulfides occur with the uranium-beryllium mineralization in the Vicks Peak Rhyolite (Correa, 1980). Uranium minerals occur in red siltstones and limestones of the Permian Abo Formation in this area and may be genetically related to the felsic intrusives closely associated with these occurrences (Boyd, 1955). Tungsten, iron, beryllium, and tin have been found in the Iron Mountain district as hydrothermal veins and contact-metasomatic deposits (Jahns, 1955). Lead, zinc, and copper have been produced from the Cuchillo Negro district (fig. 10); fluorite occurs further south at Cross Mountain (McAnulty, 1978).

References: Alminas, Watts, Griffitts, Siems, Kraxberger, and Curry (1975); Anderson, E.C. (1955); Anderson, O.J. (1980); Anonymous (1955); Boyd (1955); Correa (1980); Dale and McKinney (1960); Griffitts and Alminas (1968); Griffitts and Nakagawa (1960); Harley (1934); Hillard (1969); Holser (1959b); Huskinson (1975); Jahns (1944, 1955); Jahns, Kottlowski, and Kuellmer (1955); Jahns, McMillan, O'Brient, and Fisher (1978); Lasky (1932); Lindgren, Graton, and Gordon (1910); Maldonado (1974); McAnulty (1978); Meeves (1966); Rothrock (1946, 1970); Storms (1947a, b); U.S. Geological Survey (1965); van Alstine (1976); Williams, F.E. (1966).

Black and Cooke's Ranges, Caton, Sierra, Grant, and Luna Counties

The Black and Cooke's Ranges in south-central New Mexico consist of Precambrian igneous and metamorphic rocks, Paleozoic and Cretaceous sediments, and Tertiary volcanic and intrusive rocks.

silver, barite, copper, manganese, lead, zinc, perlite, vanadium, and tungsten mineralization in Tertiary volcanic rocks, veins in Tertiary volcanic rocks, and replacement deposits in limestones.

At least four radioactive occurrences are reported from the Magdalena Mountains (appendix I) and one sample from the C and K claims contained 1,035 ppm U. Stream-sediment, water, and aerial-radiometric anomalies also occur in this area (Berry and others, 1980). Minor uranium occurrences are also found associated with the ore bodies in the mining districts in the Magdalena Mountains (appendix I). Berry and others (1980) initially considered the Magdalena cauldron system as favorable for containing uranium mineralization based on this evidence, but reclassified this area as unfavorable because of low tonnage.

References: Allen, P. (1979); Anderson, O.J. (1980); Belt (1960); Berry, Nagy, Spreng, Barnes, and Smouse (1980); Birsoy (1977); Blakestad (1977); Bowring (1980); Chapin (1971); Chapin, Chamberlin, Osburn, White, and Sanford (1978); Condie (1978); Condie and Budding (1979); Dane and Bachman (1961); Donze (1980); Elston (1976); Johnson, J.T. (1955); Kalish (1953); Krewdl (1974); Lasky (1932); Lindgren, Graton, and Gordon (1910); Loughlin and Koschmann (1942); Machette (1978b); Northrop (1944); Osburn (1978); Osburn and Chapin (in press); Osburn, Petty, and Chapin (1981); Park, D.E. (1971); Petty (1979); Pierson, Wenrich-Verbeek, Hannigan and Machette (1980); Roth (1981); Sumner (1980); Titley (1959); U.S. Atomic Energy Commission (1970); Weber (1963); Williams, F.E. (1966).

NOTE: Also see list of references under Mogollon-Datil Volcanic province.

San Mateo Mountains, Socorro and Sierra Counties

The San Mateo Mountains are in southwestern Socorro and northern Sierra Counties, southwest of the Magdalena Mountains. The mountains consist of a complex series of Tertiary volcanics overlying Paleozoic sediments. Two major cauldrons have been recognized in this area by Deal and Rhodes (1976): the Mt. Withington (northernmost cauldron) and the Nogal Canyon cauldrons.

The volcanic rocks range in composition from andesite to rhyolite and overly Paleozoic sediments. The Mt. Withington cauldron is approximately 18-25 mi in diameter and is filled with more than 4,900 ft of rhyolite ash-flow tuffs (A-L Peak and Potato Canyon Rhyolites). Rhyolite domes and flows occur along the ring fractures. The Nogal Canyon cauldron is approximately 9-12 mi in diameter and is filled with 2,100 ft of ash-flow tuffs (Vicks Peak Rhyolite).

Numerous radioactive occurrences are scattered around the Nogal and Mt. Withington cauldrons (appendix I). One deposit, the Pitchblende (Terry) prospect has produced uranium in the past (table 4). Anomalies from stream-sediment and water samples and aerial-radiometric surveys are associated with the Nogal Canyon cauldron. Berry and others (1980) consider this cauldron as favorable for containing 100 or more tons of uranium ore, primarily in the Madera Limestone. The Mt. Withington cauldron to the north is a zone of minimal radioactive anomalies; however, a few radioactive occurrences and stream-sediment, water, and rock anomalies suggest that this cauldron may have associated uranium mineralization. Initially, Berry and others (1980) considered this cauldron as being favorable for containing uranium mineralization; but reclassified the cauldron as unfavorable due to low grade and small tonnage of known uranium occurrences.

References: Anderson, O.J. (1980); Bassett (1954); Berry, Nagy, Spreng, Barnes, and Smouse (1980); Bornhorst, Elston, Della Valle, and Balagna (1980); Boyd and Wolfe (1953); Chapin, Chamberlin, Osburn, White, and Sanford (1978); Correa (1980); Dane and Bachman (1961); Deal (1973); Deal and Rhodes (1976); Elston (1976); Farkas (1969); Furlow (1965); Hillard (1969); Lasky (1932); Lindgren, Graton, and Gordon (1910); Lovering (1956); Machette (1978b); U.S. Atomic Energy Commission (1970); U.S. Department of Energy (1980); Weber (1963); Willard (1957a, b); Wolfe (1953).

Sierra Cuchillo, Sierra and Socorro Counties

Sierra Cuchillo is in northwestern Sierra and southern Socorro Counties in the Mogollon-Datil volcanic province, near Winston and Monticello, New Mexico (fig. 10). Precambrian rocks are exposed in two narrow belts along the western edge of the mountain range, where metarhyolite and amphibolite are mapped. Jahns and others (1978) divide the thick succession of Cenozoic volcanic rocks into six groups (from youngest to oldest); olivine basalt, upper andesite, rhyolite-trachyte, lower andesite, dacite-rhyodacite, and latite-andesite. The volcanics have been intruded by numerous monzonite plugs and laccoliths, latite sills and dikes, felsite sills and dikes, porphyritic rhyolite dikes and plugs, aplite dikes and granitic plutons.

Sierra Cuchillo is a highly mineralized area. Beryllium and uranium occur in the Apache Warm Springs area (northern Iron Mountain

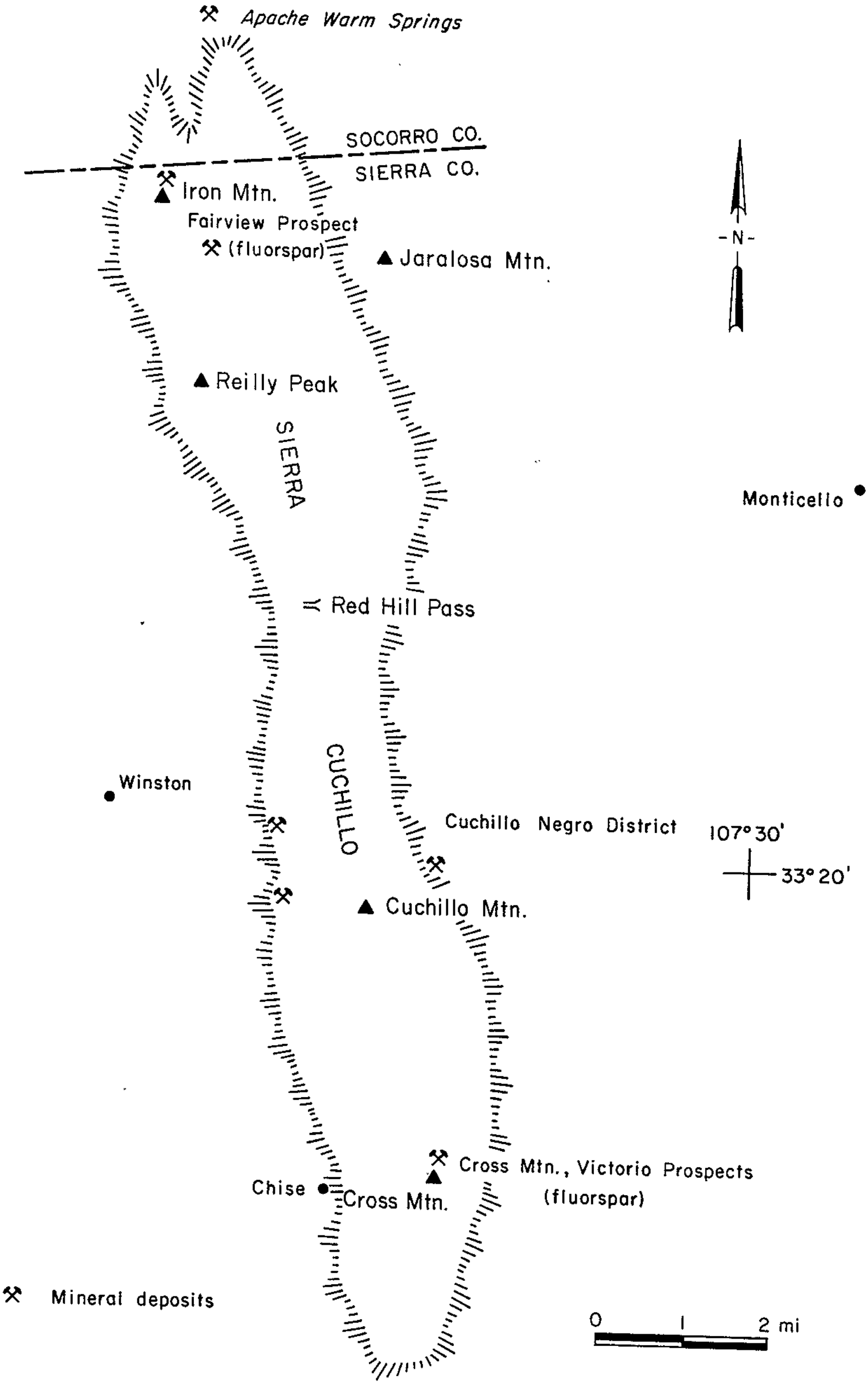

Figure 10–Sierra Cuchillo, Sierra and Socorro Counties.

Small outcrops of Precambrian granite are found scattered throughout the range; one sample was classified as a high-silica, high rare-earth elements granite by Condie (1978). The granite consists of essential perthite, quartz, plagioclase, biotite, and accessory magnetite, ilmenite, zircon, fluorite, and chlorite (Kuellmer, 1954, p. 6-10). Hornblende-chlorite schists (metadiabase) are exposed in some of these Precambrian terrains and the Precambrian rocks are unconformably overlain by Paleozoic sediments or by Tertiary volcanics.

Two cauldrons have been recognized in the Black Range, the Corduroy Canyon (poorly defined) and Emory (or Kneeling Nun) cauldrons; other cauldrons may exist in the area (Elston, 1978). The andesitic flows are high in silica and potash. The ash-flow tuffs are low-silica rhyolite to quartz latite in the lower part and high-silica rhyolite in the upper part of the volcanic sequence (Ericksen and others, 1970, p. 22-23). Trace elements such as Ba, Co, Cr, Cu, Ni, Sc, Sr, Li, and V tend to be more abundant in the andesitic rocks, while B, Be, Mo, Nb, and Sn tend to be more abundant in the rhyolitic rocks (Ericksen and others, 1970, p. 23). The Taylor Creek Rhyolite is high in silica and potassium and contains large tin deposits. This rhyolite is related to one of the two cauldrons and may be favorable for uranium mineralization.

These mountain ranges are highly mineralized locally, with gold-copper-lead-silver-zinc veins; replacement deposits of copper, gold, and silver; tin deposits; and fluorite veins. Uranium occurs in the Cooke's Peak area and in the Kingston district at the Virginia mine, Ingersoll mine, and Barite Hill No. 1 claim.

Pitchblende is reported as occurring along the crest of the Black Range (in the Black Range Primitive area); however, Granger and Bauer (1950b) could not verify the location of this occurrence. A radioactive occurrence is present along Dry Gallinas Canyon on the west side of the range, where radioactivity is associated with chert or opal in rhyolite boulders (appendix I).

The Emory cauldron may be a favorable environment for volcanogenic uranium deposits; three radioactive occurrences are located in this area (appendix I). A group of stream-sediment and water anomalies are found east of the cauldron margin in Seco Creek and Los Animas Creek (Berry and others, 1980, p. 17); although rock analyses are generally low in uranium (Berry and others, 1980, appendix B). Uranium is also reported as occurring in the Permian Abo Formation in the Kingston district (U.S. Atomic Energy Commission, 1970, p. 187).

References: Anderson, E.C. (1954); Anonymous (1955); Condie (1978); Correa (1980); Darton and Burchard (1911); Elston (1955, 1957, 1978); Ericksen and Wedow (1976); Ericksen, Wedow, Eaton, and Leland (1970); Fishback (1910); Fodor (1975, 1976); Fries (1940); Fries, Schaller, and Glass (1942); Granger and Bauer (1950b); Griffitts and Nakagawa (1960); Griswold (1961); Harley (1934); Hedlund (1975b, 1977); Holser (1959b); Jicha (1954a, b); Kuellmer (1952, 1955, 1956); Lindgren, Graton, and Gordon (1910); Lovering (1956); Lufkin (1972); McAnulty (1978); Morris (1974); Raup (1953); Rothrock (1946, 1970); Russell (1947); U.S. Atomic Energy Commission (1970); U.S. Geological Survey (1965); Williams, F.E. (1966); Wynn (1978); Berry, Nagy, Spreng, Barnes, and Smouse (1980).

Burro Mountains, Grant and Hidalgo Counties

The Big and Little Burro Mountains, southwest of Silver City (fig. 11), consist of a Precambrian basement overlain unconformably by Cretaceous sediments and Tertiary volcanics. Tertiary intrusives are also present. The Precambrian Bullard Peak and Ash Creek metamorphic series are intruded by granitic and basic intrusives. In the Burro Mountain batholith, five varieties of granitic rocks are present: hornblende-biotite granite, biotite granite, alaskite, porphyritic granite, pegmatites, and aplites (Hewitt, 1959; Gillerman, 1952a, 1964). Condie (1978) classified a sample from this granitic pluton as a high-potassium, high rare-earth elements granite. Gold, silver, copper, lead, zinc, uranium, and fluorspar mineralization occurs in six mining districts: Telegraph, White Signal, Black Hawk, Burro Mountains, Malone, and Gold Hills districts.

Quartz-pebble conglomerates and unconformities of Precambrian age have not been recognized in the Precambrian terrain; however, migmitites occur in the Bullard Peak series and may offer a potential host for anatectic uranium deposits.

Lenses, dikes, and irregular bodies of pegmatites intrude the older Precambrian rocks and consist of quartz, microcline, oligoclase, muscovite, biotite and accessory garnet, magnetite, molybdenite, allanite, and opal (Hewitt, 1959). Thorium- and rare-earth elements-bearing minerals (allanite, euxenite, samarskite, and cyrtolite) are found in the pegmatites in the Gold Hills district (fig. 11, appendix I). The uranium-,

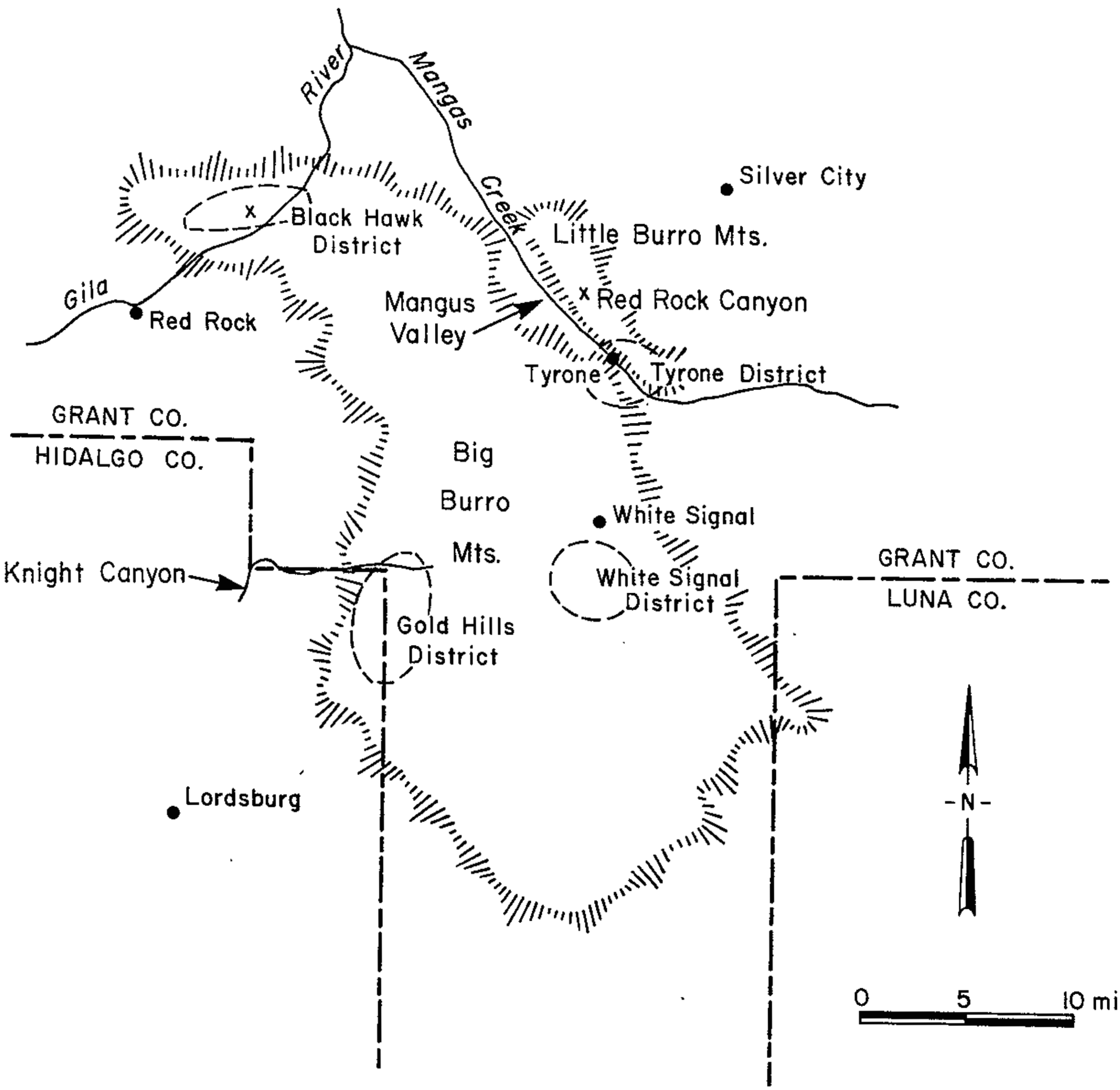

Figure 11–Burro Mountains, Grant and Hidalgo Counties.

thorium-, and rare-earth elements potential of these pegmatites is uneconomical because of low tonnage and low grade.

Various dikes, stocks, and plugs have intruded the Burro Mountain batholith, consisting of quartz monzonite, monzonite porphyry, rhyolite, and diabase. A thick series of Tertiary andesite and rhyolite flows overlie the Precambrian and Cretaceous rocks along the northern end of the Burro Mountains.

Uranium occurs within veins along fractures, fault, and breccia zones. Fluorite, gold, copper, silver, lead, bismuth and uranium minerals, and turquoise and garnet may also occur as disseminations through the altered rocks in the oxidation zone. Most of the uranium deposits in the White Signal district are associated with quartz-pyrite veins at or near their intersections with diabase and rhyolite dikes (Gillerman, 1964). Large quantities of pitchblende occur in the Black Hawk district. Radioactive fluorite is found in the Redrock and Wild Horse Mesa areas (Telegraph district). Uranium minerals also occur along the fault between the Precambrian granite and Cretaceous Beartooth quartzite in the Wild Horse Mesa area (Gillerman, 1964). Radioactive anomalies and occurrences are scattered around the Tyrone copper deposit (Kolessar, 1970; Allison and Ove, 1957; O'Neill and Thiede, 1981). Other radioactive occurrences inthis area are listed in appendix I. Uranium was produced as a source of radium in the 1920's (Gillerman, 1964) and then as uranium ore in the 1950's (table 5). The U.S. Department of Energy (1980) considers the Precambrian rocks of the Burro Mountains to contain possible resources of uranium.

Langford (1980) suggests that the uranium and thorium occurrences in the Burro Mountains may be related to the unconformity between the Precambrian and Cretaceous rocks. Gillerman (1970) believes that the uranium mineralization associated with fluorite-gold deposits is related to late Tertiary volcanism. The genesis of these deposits must be understood to be used as an exploration tool.

References: Adams, Arengi, and Parrish (1980); Allison and Ove (1957); Anderson, E.C. (1954, 1957); Anderson, O.J. (1980); Bastin (1939); Bauer (1950a, 1951); Chenoweth (1976); Condie (1978); Dale and McKinney (1960); Dyer (1953); Elston (1960, 1964, 1965, 1970); Everhart (1956, 1957); Ferris and Ruud (1971); Gillerman (1952a, b, c, 1953a, b, 1964, 1967, 1968, 1970); Gillerman and Granger (1952); Gillerman, Swinney, Whitebread, Crowley, and Kleinhample (1954); Gillerman and Whitebread (1954, 1956); Granger (1950); Granger and Bauer (1950a, 1951a, b, 1952); Granger and others (1952); Handley (1945); Harder and Wyant (1944); Hedlund (1978a-j, 1980a-c); Hewitt (1957, 1959); Holser (1959b); Kalliokoski, Langford, and Ojakangas (1978); Keith (1944, 1945); Kolessar (1970); Krieger (1935); Langford (1980); Leach, A.A. (1916); Leach, F.I. (1920); Lindgren, Graton and Borden (1910); Lovering (1956); Malan and Sterling (1969); McAnulty (1978); McKelvey (1955); O'Neill and Thiede (1981); Raup (1953); Rothrock (1946, 1970); Staatz (1974); U.S. Atomic Energy Commission (1970); U.S. Department of Energy (1980); van Alstine (1976); Walker and Osterwald (1963); Williams, F.E. (1966); Woodward, L.A. (1970a); Wynn (1981).

Peloncillo and Gaudalupe Mountains, Hidalgo County

The Peloncillo and Guadalupe Mountains lie in western Hidalgo County and extend into Arizona (fig. 12). These ranges are bounded on the east by the Animas Valley and on the west by the San Simon and San Bonadilo Vallies in Arizona.

Small outcrops of Precambrian rocks are exposed in the central portion of the range in New Mexico. Medium-grained, pink biotite granite of uncertain age is the major rock type. One sample of this granite is classified by Condie (1978) as a high-silica, low rare-earth elements pluton. The remainder of the central part of the Peloncillo Mountains consists of Paleozoic and Cretaceous sediments and Tertiary volcanic and intrusive rocks.

Two cauldrons have been recognized: the Rodeo and Geronimo Trail Cauldrons (Elston and others, 1979). The rhyolite of Clanton Draw and the tuff of Guadalupe Canyon (Geronimo Trail cauldron) contains high uranium values (Walton and others, 1980; May and others, 1981). Aerial-radiometric anomalies are present in the northeastern part of the Geronimo Trail cauldron (May and others, 1981). The volcanic rocks associated with the Rodeo Cauldron are about average in uranium content compared to other volcanic rocks (Walton and others, 1980). Aerial-radiometric anomalies are found in the area; however, ground-radiometric traverses by May and others (1981) could not locate any additional anomalies.

Four major mining districts are associated with these cauldrons: the Kimball, San Simon, Granite Gap, and Silver Tip districts. They contain base-metal sulfides, silver, and gold veins (fig. 12). Purple fluorite has been found in a fault zone west of Animas

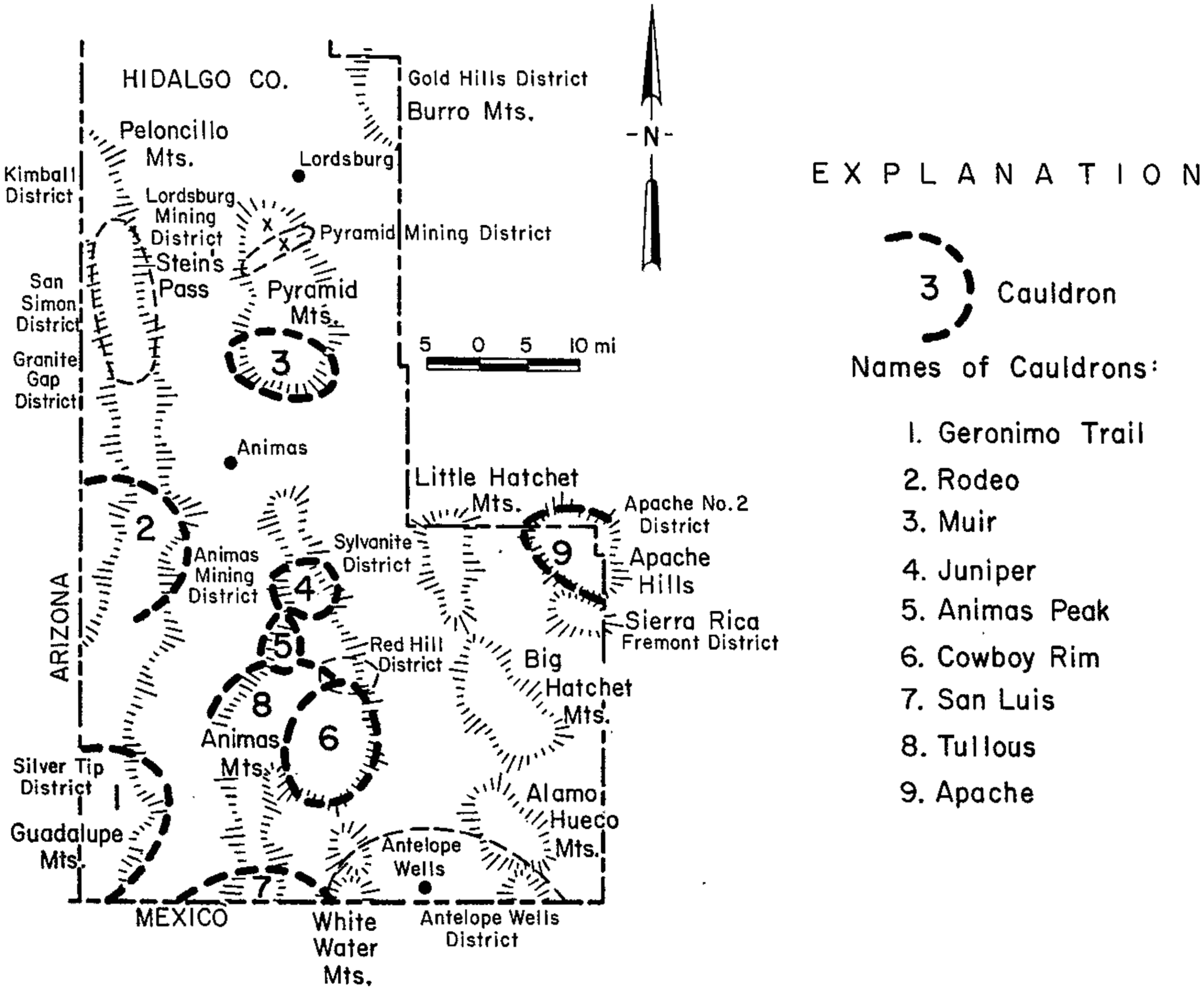

Figure 12–Mountain ranges in Hidalgo County.

(Purple Star prospect) and radioactive occurrences are found in the area (appendix I).

References: Cargo (1959); Carten, Silberman, Armstrong, and Elston (1974); Condie (1978); Dale and McKinney (1960); Deal, Elston, Erb, Peterson, Reiter, Damon, and Shafiqullah (1978); Drewes and Thorman (1980); Elston (1974); Elston, Erb, and Deal (1979); Erb (1978); Gillerman (1958); May, Smith, Dickson, and Nystrom (1981); McAnulty (1978); Rothrock (1946, 1970); Walton, Salter, and Zetterlund (1980a, b); Williams, F.E. (1966); Williams, S.A. (1978); Woodward, L.A. (1970a); Wrucke and Bromfield (1961).

Pyramid Mountains, Hidalgo County

The Pyramid Mountains lie south of Lordsburg (fig. 12) and contain Cretaceous and Tertiary igneous rocks. Only one cauldron, the Muir cauldron, is recognized in this area; it controls the mineralization in the Lordsburg (Virginia) and Pyramid mining districts (Elston, 1978).

Anomalous radioactivity has been found in opal veins along a fault zone and radioactive pegmatites are reported from this area (appendix I, this report; Williams, F.E., 1966; Allison and Ove, 1957). Radioactive mineralization may be associated with the siliceous volcanic and intrusive rocks which erupted from the Muir cauldron.

References: Allison and Ove (1957); Belt (1960); Boyd and Wolfe (1953); Deal, Elston, Erb, Peterson, Reiter, Damon, and Shafiqullah (1978); Elston (1964, 1965, 1974, 1978); Elston, Erb, and Deal (1979);

Flege (1959); Lasky (1935, 1936b, 1938); May, Smith, Dickson, and Nystrom (1981); McAnulty (1978); Rothrock (1946, 1970); Thorman (1977); Thorman and Drewes (1978a,b); Williams, F.E. (1966); Wynn (1981) ; Walton, Salter, and Zetterlund (1980a,b).

Animas Mountains area, Hidalgo County

The Animas Mountains area in southern Hidalgo County (fig. 12) includes the Animas, Alamo Hueco, and Dog Mountains. A Precambrian coarse-grained porphyritic granite is exposed at the northern end of the Animas Mountains. Most of the area consists of Paleozoic and Cretaceous sediments and Tertiary volcanic and intrusive rocks.

Five volcanic cauldrons are recognized: Tullous, Juniper, Animas Peak, Cowboy Rim, and San Luis cauldrons. The Animas and Walnut Wells stocks of monzonite porphyry intrude the Juniper cauldron. Many of the volcanic and intrusive rocks are high in silica and potassium (Zeller and Alper, 1965); however, May and others (1981) classified all of these cauldrons except the San Luis cauldron as unfavorable for containing uranium deposits. Reductants for the precipitation of uranium are absent in these cauldrons and the volatile contents were too low to transport uranium effectively during the cauldera formation (May and others, 1981).

The San Luis cauldron contains peralkaline, silicic rhyolites; favorable hosts for volcanogenic uranium deposits. Only the northern part of the cauldron is exposed in New Mexico; the southern part is in Mexico. More geologic mapping and geochemical sampling is needed to adequately evaluate the uranium potential in this area.

Small deposits of psilomelane veins and uraniferous opal veins are reported in the Alamo Hueco Mountains (Everhart, 1957; Elston, 1965). Radioactive opal veins in the Oak Creek Tuff are found in the Dog Mountains (appendix I).

References: Alper and Poldervaart (1957); Deal (1973); Elston (1964, 1965, 1974); Elston and Erb (1977); Elston, Erb, and Deal (1979); Erb (1978); Everhart (1957); Jahns, Kottlowski, and Kuellmer (1955); Lindgren, Graton, and Gordon (1910); May, Smith, Dickson, and Nystrom (1981); McAnulty (1978); Rothrock (1946, 1970); Soulé, J.M. (1972); U.S. Geological Survey (1965); Williams, F.E. (1966); Woodward, L.A. (1970a); Zeller (1958a, 1962); Zeller and Alper (1965); Walton, Salter, and Zetterlund (1980a, b).

Hatchet Mountains area, Hidalgo and Grant Counties

The Hatchet Mountains area in southeastern Hidalgo and Grant Counties includes the Big and Little Hatchet Mountains, the Apache Hills, and the Sierra Rica areas. Precambrian rocks are exposed in the northern part of the Big Hatchet Mountains and in the southern part of the Little Hatchet Mountains. Condie (1978) classifies the Little Hatchet pluton as a high-silica, high rare-earth elements granite. Quartzites and aplite-quartz veins are also found in the Little Hatchet Mountains.

One deeply eroded, cauldron is recognized in this area, the Apache cauldron, and may be associated with mineralization in the Apache No. 2 and Fremont districts (fig. 12). May and others (1981) indicate that magmatic-hydrothermal uranium veins may occur in the Hatchet Mountain area in Cretaceous sediments of the U-Bar and Mojado Formations. Lead-zinc-copper mineralization with some gold and fluorite is found in the Fremont district where uranium was produced at the Napane mine (appendix I, table 5).

References: Allison and Ove (1957); Anderson, O.J. (1980); Condie (1978); Dale and McKinney (1960); Elston (1965, 1974); Elston, Erb, and Deal (1979); Holser (1959b); Lasky (1940, 1947); May, Smith, Dickson, and Nystrom (1981); McAnulty (1978); Peterson (1976); Reiter (1980); Rothrock (1946, 1970); Strogin (1957); Van der Spuy (1970); Walton, Salter and Zetterlund (1980a, b); Williams, F.E. (1966); Zeller (1958a, b, 1970, 1975).

Tres Hermanas Mountains, Luna County

The Tres Hermanas Mountains, northwest of Columbus (fig. 9) consist of Paleozoic sediments and Tertiary igneous rocks. Replacement bodies and veins of silver, lead, zinc, and gold are found in the area. Fluorescent aragonite occurs in a cave on South Peak.

Analyses of uranium and thorium are reported from this area of 4.9 ppm U and 21.7 ppm Th (Marjaniemi and Basler, 1972). Although no radioactive occurrences are reported, the siliceous intrusive and volcanic rocks may be favorable hosts for uranium mineralization. Little geologic work has been done in this remote area.

References: Balk (1962); Griswold (1961); Homme and Rosenzwerg (1970); Lindgren (1908); Lindgren, Graton, and Gordon (1910); Marjaniemi and Basler (1972).

Florida Mountains, Luna County

The Florida Mountains lie south of Deming (fig. 9) and consist of Precambrian rocks, Paleozoic and Cretaceous sediments, and Tertiary volcanics and intrusives.

Precambrian rocks are exposed along the northwest flanks and in the southern one-third of the mountains. Three types of granite are found: coarse-grained granite, porphyritic granite, and gneissic granite. Diorite, gabbro, and metamorphic rocks are also exposed in these mountains. A reddish, coarse-grained syenite to anorthosite of pre-Bliss age (Cambrian to Ordovician) is exposed in the central portion of the mountains. These alkalic bodies may be of several ages. Some of these syenites show a depletion in uranium, indicating the leaching of uranium from the syenites and possible concentration in surrounding sediments (Brookins, Rautman, and Corbett, 1978). The presence of syenites may be indicative of similar thorium-veins and carbonatites known to occur with similar syenites in southern Colorado.

Tertiary volcanics and intrusives are exposed in the northern part of the range; rhyolite dikes have intruded these rocks. Lead-zinc-copper and fluorite veins occur in these mountains. The numerous thrust faults in these mountains provide conduits for migration of mineralizing solutions which may be associated with the Tertiary intrusives. Russell Clemons is currently remapping this area.

<u>References</u>: Anderson, E.C. (1954); Brookins (1978); Brookins and Della Valle (1977); Brookins, Rautman, and Corbitt (1978); Corbitt (1971); Griswold (1961); Lindgren, Graton, and Gordon (1910); Malan and Sterling (1969); Marjaniemi and Basler (1972); McAnulty (1978);

Rothrock (1946); Williams, F.E. (1966); Woodward, L.A. (1970a).

Organ Mountains, Doña Ana County

The Organ Mountains are a distinct mountain range east of Las Cruces formed by the Organ cauldron of Tertiary age (fig. 13). The eruption of approximately 9,000 feet of siliceous, rhyolitic ash-flow tuffs from this cauldron triggered major cauldron collapse. The potassic Soledad Rhyolite is the major flow unit (Seager and Brown, 1978). The Organ batholith, consisting of four or five phases, intruded the eastern margin of the cauldron. All but one phase (a rhyolitic porphyry) is monzonite to quartz monzonite in composition. Pegmatites and aplites intrude the batholith.

Copper-lead-zinc-gold-silver mineralization occurs in the Organ district in the northern part of the mountain range. This mineralization appears to be related to a disseminated pyrite-bearing stock. Fluorspar and barite veins occur around the entire rim of the cauldron. The largest deposits are at Tortugas Mountain and Bishop Cap; some of these fluorite veins at Bishop Cap are radioactive (appendix I). Numerous pegmatites intrude the Organ batholith in the San Agustin and Sugarloaf Peaks areas which may contain potential uranium or thorium mineralization (Seager, 1981). Most of these mountains are within the White Sands Military Reservation or are on private lands.

References: Anderson, E.C. (1954); Condie (1978); Condie and Budding (1979); Dunham (1935); Everett, F.D. (1964); Glover (1975a, b); Holser (1959b); Jahns, Kottlowski, and Kuellmer (1955); Kottlowski (1961); Kramer (1970); Malan and Sterling (1969);

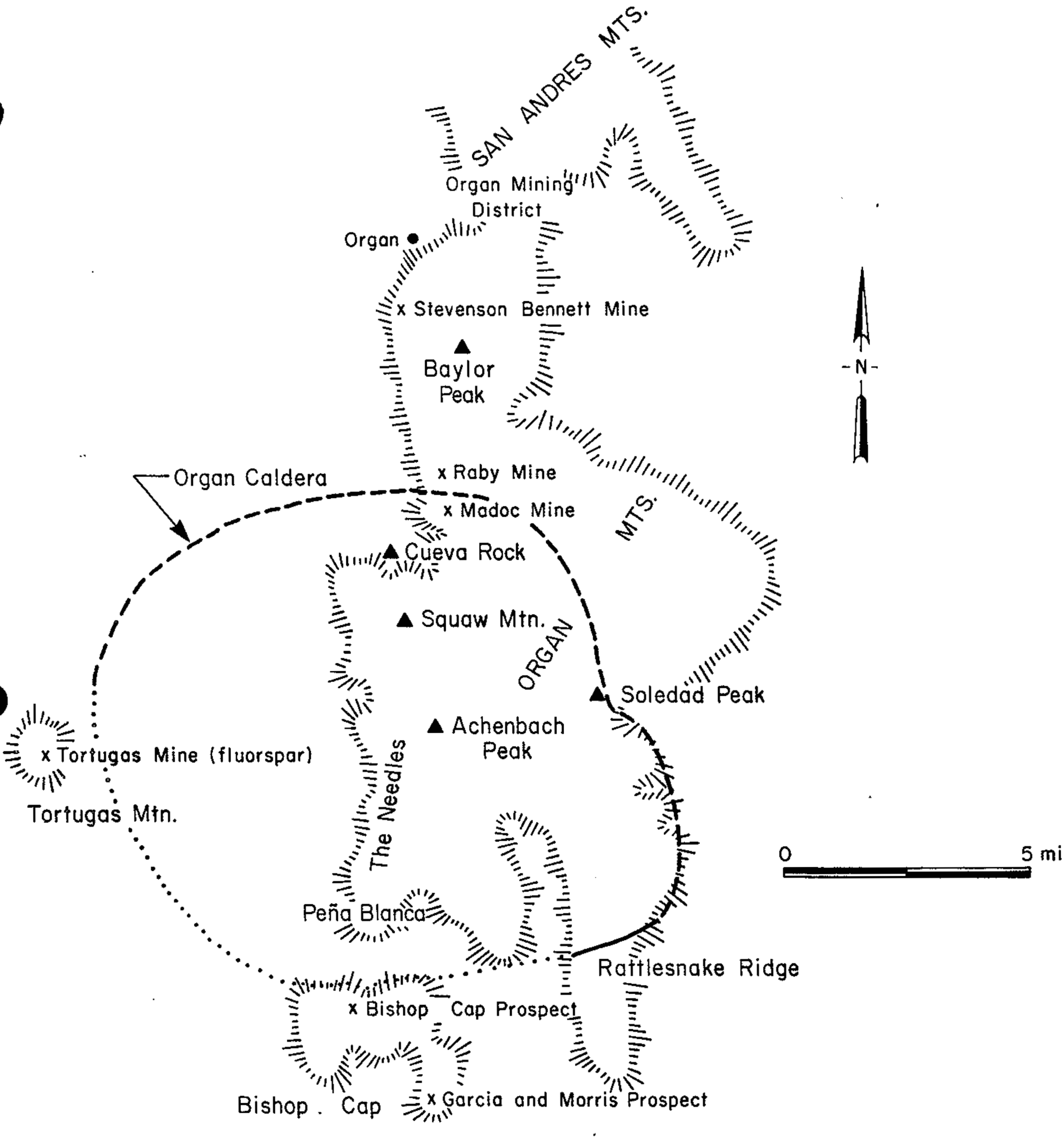

Figure 13–Organ Mountains area, Dona Ana County

Marjaniemi and Basler (1972); McAnulty (1978); Rothrock (1946, 1970); Seager (1973b, 1981); Seager and Brown (1978); Sur (1946); U.S. Geological Survey (1965); Williams, F.E. (1966).

Franklin Mountains, Doña Ana County

The Franklin Mountains lie southeast of Las Cruces and extend into Texas. Precambrian rocks are exposed south of the New Mexico-Texas border. Similar rocks probably underlie the Paleozoic sediments in New Mexico (Muehlberger and Denison, 1964). The Precambrian rocks exposed in Texas consist of the Castner Limestone, Mundy Breccia (a flow or sill), Lanoria quartzite, granite porphyry, rhyolitic ash-flow and air-fall tuffs, pink granite, white granite, and diabase dikes. Uranium contents of the various granitic rocks range from 4.0 to 357 ppm; thorium contents range from 9 to 259 ppm (W. Thomann and A. Pyron, written communication, May, 1979). Fluorite is disseminated in some of these granites. A tin mining district, with uraniferous Precambrian granites, occurs immediately south of the New Mexico-Texas border. These granites are anomalously high in uranium and thorium and may be associated with magmatic, pegmatitic, or hydrothermal uranium deposits.

References: Denison and Hetherington (1969); Dunham (1935); Harbour (1960, 1972); Muehlberger and Denison (1964); Pyron (in preparation); Thomann (in preparation).

Miscellaneous Areas

Several small areas of predominantly Tertiary volcanics and intrusives occur in Grant, Hidalgo, Luna, and Doña Ana Counties on which only limited geologic information is available. These areas include the Cedar Mountains, Grant and Luna Counties; Doña Ana Mountains, Doña Ana County; Sierra de la Uvas, Doña Ana County; and Victorio Mountains, Luna County (fig. 1, pl. 1). These areas consist of siliceous volcanic and intrusive rocks.

The Socorro Basin area (east of Socorro) consists of several small bodies of Precambrian granite and the radioactive Gonzales fluorspar prospects occur in this area (appendix I). Not enough is known about this area to evaluate its uranium potential.

Two prospects northeast of Socorro, in the Socorro Basin area, have produced uranium: the Agua Torres and the Marie prospects (appendix I). Uranium minerals are found in the Mississippian Madera Group as vein-type deposits of uncertain origin.

Two prospects east of Socorro, in the Socorro Basin area, have produced uranium: Little Davie and Lucky Don (appendix I). Uranium minerals are found in the limestones of the Permian San Andres and Yeso Formations as fillings along fractures and bedding planes. The U.S. Department of Energy (1980) considers this area as containing speculative uranium resources.

Other areas in New Mexico probably contain favorable host rocks for uranium deposits in veins and igneous and metamorphic rocks but have not been included here because of the lack of geologic information. These areas would probably represent small tonnage and low grade and may be of limited access.

<u>References</u>: <u>Cedar Mountains, Grant and Hidalgo Counties</u> — Bromfield and Wrucke (1961).

<u>Doña Ana Mountains, Doña Ana County</u> — Dunham (1935); Seager,

Hawley, and Clemons (1971); Seager, Kottlowski, and Hawley (1976);

Goodsight and San Diego Mountains, Luna and Doña Ana Counties — Condie and Budding (1979); Clemons (1979); Jahns, Kottlowski, and Kuellmer (1955); Seager (1973a); Seager and Clemons (1975); Seager, Clemons, and Hawley (1975); Seager, Hawley, and Clemons (1971).

Sierra de las Uvas, Doña Ana County — Clemons (1976a, b, 1977); Seager (1973a); Seager, Clemons, and Hawley (1975).

Victorio Mountains, Luna County — Griswold (1961); Holser (1953).

Eastern New Mexico, Pecos River Area — Johnson, R.B. (1970); Kelley, V.C. (1971, 1972); Muehlberger and Denison (1964); Wynn (1981).

Socorro Basin Area (east of Socorro), New Mexico — Anderson, O.J. (1980); Birsoy (1977); Collins, G.E. and Mallory (1954); Condie and Budding (1979); Hilpert (1969); Lasky (1932); McAnulty (1978); Pierson and others (1981); U.S. Atomic Energy Commission (1970); U.S. Department of Energy (1980); U.S. Geological Survey (1965); Williams, F.E. (1966); Wilpolt and Wanek (1951).

ANNOTATED BIBLIOGRAPHY

This section includes reference citations with annotations of published and unpublished reports pertaining to the geology, mineralogy, petrology, geochemistry, mineralization, and uranium potential of favorable geologic environments or geographic areas which are known to contain radioactive occurrences in veins and igneous and metamorphic rocks in New Mexico. A list of publications and abbreviations is included. These citations are indexed in the Subject Index, following the annotated bibliography, by county, flourspar deposits and occurrences, geochemical analyses, geologic maps, and radioactive occurrences. The citations are also indexed by geographic area after the discussion of each area in Favorable geographic areas in New Mexico and by individual radioactive occurrences in veins and igneous and metamorphic rocks in appendix I. Reports and maps of aerial-radiometric and magnetic surveys and reports containing uranium and thorium analyses of water and stream-sediment samples in New Mexico are listed as appendices II and III.

Publications and abbreviations

Am. Assoc. Petroleum Geologists, Bull.; Mem.: American Association of Petroleum Geologists, Bulletin; Memoir
Am. Chem. Soc., Jour.: American Chemical Society, Journal
Am. Geophys. Union (EOS), Trans.: American Geophysical Union (EOS), Transactions
Am. Inst. Mining Engineers, Trans.: American Institute of Mining Engineers, Transactions (see American Institute of Mining, Metallurgical, and Petroleum Engineers)
Am. Inst. Mining, Metall., Petroleum Engineers, Trans.; Soc. Mining Engineers: American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions; Society of Mining Engineers
Am. Jour. Sci.: American Journal of Science
Am. Mineralogist: American Mineralogist
Univ. Arizona: University of Arizona
Chem. Geology: Chemical Geology
Univ. Chicago: University of Chicago
Colorado School Mines: Colorado School of Mines
Colorado School Mines, Quart.: Quarterly of the Colorado School of Mines
Univ. Colorado: University of Colorado
Columbia Univ.: Columbia University
Compass: The Compass of Sigma Gamma Epsilon, School of Geology and Geophysics, University of Oklahoma
Contr. Mineralogy and Petrology: Contributions to Mineralogy and Petrology
Earth and Planet. Sci. Letters: Earth and Planetary Science Letters, North-Holland Publishing Company
Econ. Geology: Economic Geology and the Bulletin of the Society of Economic Geologists
Electric Power Research Inst.: Electric Power Research Institute
Eng. Mining Jour.: Engineering and Mining Journal
Geochem. Jour.: Geochemical Journal
Geol. Soc. America, Rocky Mtn. Sec., Spec. Paper; Bull.; Abs. with Programs; Map and Chart Series: Geological Society of America, Rocky Mountain Section, Special Paper; Bulletin; Abstracts with Programs; Map and Chart Series
Geology
Isochron/West
Jour. Geology: Journal of Geology, University of Chicago Press
Jour. Sed. Petrology: Journal of Sedimentary Petrology
Los Alamos Sci. Lab., Rept.: Los Alamos Scientific Laboratory, Report
Univ. Michigan: University of Michigan
Mining and Eng.: Mining and Engineering
Mining World
Mtn. Geologist: Mountain Geologist, The Rocky Mountain Association of Geologists
Mineralogical Record
Univ. New Mexico: University of New Mexico
Univ. New Mexico, Pub. Geol. Series: University of New Mexico, Publications in Geology Series
New Mexico Bureau Mines Mineral Resources, Bull.; Mem.; Open-file Rept.; Circ.; Geol. Map: New Mexico Bureau of Mines and Mineral Resources, Bulletin; Memoir; Open-file Report; Circular; Geologic Map
New Mexico Energy Inst.: New Mexico Energy Institute
New Mexico Geology
New Mexico Geol. Soc., Guidebook; Spec. Pub.: New Mexico Geological Society, Guidebook; Special Publication
New Mexico Inst. Mining and Tech: New Mexico Institute of Mining and Technology
Rocky Mtn. Assoc. Geologists: Rocky Mountain Association of Geologists

Stanford Univ.: Stanford University
Univ. Texas (El Paso): University of Texas (El Paso)
U.N. Internat. Conf. Peaceful uses Atomic Energy, Proc.: U.N. International Conference in the Peaceful uses of Atomic Energy, Proceedings
U.S. Atomic Energy Comm., Ann. Prog. Rept.; Rept.; Tech. Memo.; Tech. Memo. Rept.: U.S. Atomic Energy Commission, Annual Progress Report; Report; Technical Memorandum; Technical Memorandum Report
U.S. Bureau Mines, Bull.; Inf. Circ.; Rept. Inv.: U.S. Bureau of Mines, Bulletin; Information Circular; Report of Investigation
U.S. Dept. Energy, Open-file Rept.; Prelim. Rept.: U.S. Department of Energy, Open-file Report; Preliminary Report
U.S. Energy Research Develop. Adm., Open-file Rept.: U.S. Energy, Research and Development Administration, Open-file Report
U.S. Geol. Survey, Bull.; Circ.; Coal Inv. Map; Geol. Quad. Map; Geophys. Map; Jour. Research; Memo.; Mineral Inv. Resource Map; Misc. Geol. Inv. Map; Oil and Gas Inv. Map; Open-file Rept.; Misc. Field Studies Map; Prof. Paper; Resource Map; Trace Element Inv., Rept.; Trace Element Memo, Rept., Inv.: U.S. Geological Survey, Bulletin; Circular; Coal Investigation Map; Geologic Quadrangle Map; Geophysical Map; Journal of Research; Memorandum; Mineral Investigation Resource Map; Miscellaneous Geologic Investigation Map; Oil and Gas Investigation Map; Open-file Report; Miscellaneous Field Studies Map; Professional Paper; Resource Map; Trace Element Investigation, Report; Trace Element Memorandum, Report, Investigation
U.S. Govt. Printing Office: U.S. Government Printing Office

Adams, J.W., Arengi, J.T., and Parrish, I.S., 1980, Uranium- and thorium-bearing pegmatites of the United States: U.S. Dept. Energy, Open-file Rept. GJBX-166 (80), 127 p. 20 tables, 8 figs., appendix, maps, index, bibliography

Part I describes the general geology, geochemistry, mineralogy, and distribution of pegmatites and includes a list of chemical analyses from various occurrences. Part II is an index to uranium- and thorium-bearing pegmatites in the United States, including 13 pegmatites in Grant, Hidalgo, Rio Arriba, Taos, Mora, and San Miguel Counties, New Mexico. Includes a table briefly describing the geology and mineralogy of each pegmatite occurrence with four location maps. Part III is an annotated bibliography and index.

Area: Tusas Mountains, Rio Arriba County; Sangre de Cristo Mountains, San Miguel, and Mora Counties; Burro Mountains, Grant and Hidalgo Counties.

Adams, J.W., see Staatz, M.H., and Conklin, N.M., 1965

Akright, R.L., 1979, Geology and mineralogy of the Cerrillos copper deposit, Santa Fe County, New Mexico, in Santa Fe country: New Mexico Geol. Soc., Guidebook 30th field conf., p. 257-260, 6 figs.

Describes the history, geology, and mineralogy of the Cerrillos copper deposit. Includes a geologic map and cross sections.

Area: Ortiz Mountains, Santa Fe County.

Aldrich, L.T., Wetherill, G.W., Davis, G.L., and Tilton, G.R., 1958, Radioactive ages of micas from granitic rocks by Rb-Sr and K-Ar methods: Am. Geophys. Union (EOS), Trans., v. 39, p. 1,124-1,134, 9 tables, 1 fig.

Briefly describes the Sandia granite in the Sandia Mountains and pegmatites from the Harding mine and Pidlite mine in the Sangre de Cristo Mountains. Includes analytical data from muscovite and microlite from pegmatites of the Harding mine, including U, Pb, Ar^{40}, K^{40}, Rb^{87}, and Sr^{87} analyses.

Area: Sandia Mountains, Sandoval and Bernalillo Counties and Sangre de Cristo Mountains, Taos and Mora Counties.

Aldrich, M.J., Jr., 1976, Geology and flow directions of volcanic rocks of the North Star Mesa quadrangle, Grant County, New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc. Spec. Pub. 5, p. 79-81, 1 fig.

Briefly describes rhyolite tuff and basaltic andesite flows of the area. Includes flow directions.

Area: Mogollon-Datil volcanic province, Grant County.

Allen, J.E., 1955, Mineral resources of the Navajo Reservations in New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 44, map and text, 1 sheet, scale 1 inch = 2 mi

Geologic map showing the locations of igneous rocks and uranium resources of the area. Several diatremes (Shiprock, Mitten Rock, Bennett Peak, and Ford Butte) are located on the map.

Area: San Juan Basin.

Allen, P., 1979, Geology of the west flank of the Magdalena Mountains, south of the Kelly mining district, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 119, 153 p., 1 table, 23 figs., scale 1:12,000

Describes the geology of the Hop Canyon area in the Magdalena Mountains, New Mexico. Includes descriptions of the Spears Formation (volcaniclastic sediments, ash-flow tuffs, and lavas), Hells Mesa tuff (rhyolitic ash-flow tuff), A.L. Peak tuff (rhyolitic ash-flow tuff), unit of Sixmile Canyon (andesite and rhyolite lavas, ash-flow tuffs, and volcaniclastic sediments), tuff of Lemitar Mountains (rhyolitic ash-flow tuff), tuff of South Canyon (rhyolitic ash-flow tuff), rhyolites of Magdalena Peak, and latite porphyrys and rhyolite dikes. Gold mineralization is commonly associated with the rhyolite dikes. Includes a discussion of the alteration associated with the mineralization.

Area: Magdalena Mountains, Socorro County.

Allison, J.W., 1954, Intrusives of the Jackpile area, Valencia County, New Mexico: U.S. Atomic Energy Comm., Tech. Memo. TM-59 (54), 3 p., 1 fig. (now Cibola County)

Brief report describing six intrusive dikes in the Jackpile area and their relationship to the sandstone uranium deposits in the vicinity of the dikes. Several of the dikes contain secondary uranium minerals along fractures. Includes a geologic map showing the dikes.

Area: San Juan Basin, Cibola County.

Allison, J.W., and Ove, W.E., 1957, A report on an airborne survey and ground investigations at Silver City, New Mexico: U.S. Atomic Energy Comm., Rept. RME-1081, 15 p., 2 figs.

Seventeen occurrences of anomalous radioactivity were discovered in Grant and Hidalgo Counties. Six of these are in fault zones (trace - 0.11% U_3O_8), nine are in Precambrian granite, one is in a diabase dike, and one is in a rhyolite dike of Tertiary age. Includes radiometric and chemical-uranium analyses.

Area: Mogollon-Datil volcanic province, Burro Mountains, Pyramid Mountains, and Hatchet Mountains, Grant and Hidalgo Counties.

Alminas, H.V., Watts, K.C., Griffitts, W.R., Siems, D.L., Kraxberger, V.E., and Curry, K.J., 1975, Map showing anomalous distribution of tungsten, fluorite, and silver in stream-sediment concentrates from the Sierra Cuchillo-Animas uplifts and adjacent areas, southwestern New Mexico: U.S. Geol. Survey, Misc. Geol. Inv. Map I-880, 2 sheets, scale 1:48,000

Geologic map showing the geology and distribution of anomalous fluorite, tungsten, and silver in the Sierra Cuchillo. Mapped units include Tertiary rhyolite, andesite, latite, and monzonite.

Area: Sierra Cuchillo, Sierra and Socorro Counties.

Alminas, H.V., <u>see</u> Griffitts, W.R., 1968

Alper, A.M., and Poldervaart, A., 1957, Zircons from the Animas stock and associated rocks, New Mexico: Econ. Geology, v. 52, p. 952-

971
Includes major-element analyses of the Tertiary Animas, Oak Creek, and Walnut Wells stocks, in the Animas Mountains.
Area: Animas Mountains, Hidalgo County (Walnut Wells quadrangle).

Alper, A.M., see Zeller, R.A., Jr., 1965

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

Anderson, E.C., 1954, Occurrences of uranium ores in New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 29, 27 p., revised 1955, 39 p.
Tabulates the distribution, with brief descriptions, of uranium occurrences by county. Includes 11 occurrences related to igneous rocks: 1) granite and diabase in the Lemitar Mountains, Socorro County; 2) granite in the Ladron Mountains (Jeter prospect), Socorro County; 3) Bishop Cap fluorspar prospects, Organ Mountains, Dona Ana County; 4) White Signal, Black Hawk, Gold Hill, and Burro Mountain districts, Burro Mountains, Grant County; 5) monzonite in the Capitan Mountains, Lincoln County; 6) andesite in the La Bajada district, Ortiz Mountains, Santa Fe County; 7) pegmatite and granite in the Gallinas Canyon area, Sangre de Cristo Mountains, San Miguel County; 8) granite and schist in the Caballo Mountains, Sierra County; 9) pegmatite in the Red River district, Sangre de Cristo Mountains, Taos County; 10) fluorspar in the Cooke's Peak and Little Florida Mountains, Luna County; and 11) torbernite in manganese ore in the granite of the Capitan Mountains, Lincoln County.
Area: Statewide.

Anderson, E.C., 1955, Mineral deposits and mines in south-central New Mexico, New Mexico Geol. Soc., Guidebook 6th field conf., p. 121-122
Briefly discusses fluorspar deposits in the San Andres Mountains, Sierra and Dona Ana Counties; Sierra Cuchillo, Sierra County; and Caballo Mountains, Sierra County. Uranium is found in three localities: 1) Precambrian granite in the Caballo Mountains, 2) monzonite porphyry associated with purple fluorite near Truth or Consequences, and 3) with Iron Mountain tungsten in the Sierra Cuchillo.
Area: San Andres Mountains, Sierra and Dona Ana Counties; Sierra Cuchillo and Caballo Mountains, Sierra County.

Anderson, E.C., 1957, The metal resources of New Mexico and their economic features through 1954: New Mexico Bureau of Mines Mineral Resources, Bull. 39, 183 p., 21 tables, 3 figs., 5 pls., scale 1 inch = 50 mi
Briefly reviews and describes fluorite, uranium, and thorium mines, prospects, and occurrences by county. Includes a section listing uranium minerals and their localities within the state, including several localities associated with igneous rocks: 1) autunite in the White Signal district, Burro Mountains, Grant County, 2) carnotite in the Carrizo Mountains, Catron County and

Cochiti district, Jemez Mountains, Sandoval County, 3) gummite, samarskite, uraninite, and uranophane in the Petaca district, Tusas Mountains, Rio Arriba County, 4) torbernite in the White Signal district, Burro Mountains, Grant County and in the San Lorenzo distict, Socorro County, and 5) uranophane in the San Lorenzo district, Socorro County. Includes a map showing the locations of uranium occurrences in New Mexico.

Area: Grant, Catron, Sandoval, Rio Arriba, and Socorro Counties.

Anderson, O.J., 1980, Abandoned or inactive uranium mines in New Mexico: New Mexico Bureau Mines Mineral Resources, Open-file Rept. 148, 778 p., photographs, maps

Includes a one page brief description of the geology, location, history, and present workings of over 200 abandoned or inactive mines and prospects in New Mexico. Photographs and mine maps are included for each mine or prospect.

Area: Statewide.

Anderson, R.Y., 1961, Physiography, climate, and vegetation of the Albuquerque region, in Albuquerque country: New Mexico Geol. Soc., Guidebook 12th field conf., p. 63-71

Briefly describes the rocks found in the Albuquerque region. Describes andesite, latite, and rhyolite found in the Jemez Mountains, Sandoval and Rio Arriba Counties; Precambrian granite in the Sandia and Manzano Mountains, Sandoval, Bernalillo, and Torrance Counties; monzonite, latite, and andesite in the Ortiz and San Pedro Mountains, Sandoval County; and latite, trachyte, and andesite in the Mount Taylor region, Cibola and McKinley Counties.

Area: Jemez Mountains, Sandoval and Rio Arriba Counties; Sandia Mountains, Sandoval and Bernalillo Counties; Manzano Mountains, Torrance County; Ortiz Mountains, Sandoval County; Mount Taylor region, Cibola and McKinley Counties.

Anonymous, 1955, Precambrian rocks of south-central New Mexico, in South-central New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., p. 62-64

Briefly describes the Precambrian geology of the San Andres, Caballo, Mud Springs, and Fra Cristobal Mountains, Sierra Cuchillo, and the Black Range in Sierra and Dona Ana Counties.

Area: San Andres Mountains, Sierra and Dona Ana Counties; Caballo and Fra Cristobal Mountains, Sierra Cuchillo, and the Black Range, Sierra County.

Anonymous, 1959, Uranium deposits in Datil Mountains-Bear Mountains region, New Mexico, in West-central New Mexico: New Mexico Geol. Soc., Guidebook 10th field conf., p. 135-143, 1 table, 5 figs.

Discusses the geology of uranium occurrences in the Datil Formation. Reports 0.004% eU and 0.001% U (chemical) in a rhyolitic tuff.

Area: Mogollon-Datil volcanic province, Socorro and Catron

Counties.

Apsouri, C.N., 1944, Reconnaissance study of pegmatite deposits in Petaca area, New Mexico: Union Mines Development Corp., Rept. RMO-105, 58 p., tables, 2 figs., 1 map (open filed by U.S. Atomic Energy Comm.)

Reconnaissance report of the geology, mineralogy, and history of the pegmatite deposits in the Petaca area. Includes descriptions of eight mines containing samarskite, monazite, and/or fergusonite. Also describes other pegmatite mines where radioactive minerals were not found. Includes a geologic map showing the location of the pegmatites.

Area: Tusas Mountains, Rio Arriba County.

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

Mapped area includes Precambrian gneiss and Tertiary rhyolite and andesite. Includes descriptions of the igneous rocks and some modal analyses are included. Discusses fluorite mineralization and hypogene galena, silver, gold, and copper deposits.

Area: La Joyita Hills, Socorro County.

Arengi, J.T., see Adams, J.W., and Parrish, I.S., 1980

Armstrong, A.K., see Carten, R.B., Silberman, M.L., and Elston, W.E., 1974

Armstrong, D.G., see Loring, A.K., 1980

Arnold, R.I., 1974a, Fluorspar deposits of the Little Whitewater Canyon, Holt Gulch, and Goddard Canyon area, Catron County, New Mexico (abs.), in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 377

Briefly describes Tertiary quartz latite, andesites, and flow-banded rhyolite exposed in the Mogollon Mountains. Mineralization consists of fluorite, calcite, minor gold, and minor silver. The fluorspar is associated with the rhyolite as void- and replacement-fillings in breccia and fault zones.

Area: Mogollon-Datil volcanic province, Catron County.

Arnold, R.I., 1974b, Geology and mineral deposits of Little Whitewater Canyon, Holt Gulch, and Goddard Canyon, Catron County, New Mexico: M.S. thesis, Univ. Texas (El Paso), 63 p., 2 tables, 7 figs., 7 pls., 3 sheets

Includes geologic maps of the Huckelberry mine (1 inch = 100 ft), in the Little Whitewater Canyon, Holt Gulch, and Goddard Canyon area (1:12,000), and a claim map. Describes andesite, rhyolite intrusives, and rhyolite flows and describes the mineralization and alteration of the area.

Area: Mogollon-Datil volcanic province, Catron County.

Arth, J.G., see Barker, F., and Peterman, Z.E., 1973

Asquith, G.B., 1973a, High-viscosity "conglomerate" channel deposits in Tertiary lamprophyre sill, Sacramento Mountains, New Mexico: Geology, v. 1, p. 149-151, 4 figs.

Describes the petrology and geology of lamprophyre sills found occurring in the Sacramento Mountains. Uses methods of sedimentation to describe the sills.

Area: Sacramento Mountains, Otero County.

Asquith, G.B., 1973b, Flow differentiation in Tertiary lamprophyres (camptonites), Sacramento Mountains, Otero County, New Mexico: Jour. Geology, v. 81, p. 643-647, 3 tables, 3 figs.

Describes the occurrence of lamprophyre dikes. Includes modal and chemical analyses of the dikes.

Area: Sacramento Mountains, Otero County.

Asquith, G.B., 1974, Petrography and petrogenesis of Tertiary camptonites and diorites, Sacramento Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 141, 6 p., 4 tables, 6 figs.

Discusses the geology and petrology of the comagmatic diorite and camptonite dikes and sills in the Sacramento Mountains. Includes modal and chemical analyses.

Area: Sacramento Mountains, Otero County.

Atkinson, W.W., Jr., 1961, Geology of the San Pedro Mountains, Santa Fe County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 77, 50 p., 2 figs., 10 pls., scale 1 inch = 1 mi

Describes diabase porphyry, monzonite, monzonite porphyry, latite porphyry, and rhyolite porphyry and includes some modal analyses. Describes copper, gold, lead-zinc, and iron deposits. Includes geologic maps showing the distribution of dikes and sills.

Area: Ortiz Mountains (San Pedro Mountain), Santa Fe County.

Bachman, G.O., 1965, Geologic map of the Capitol Peak northwest quadrangle, Socorro County, New Mexico: U.S. Geol. Survey, Misc. Geol. Inv. Map I-441, 5 p. text, scale 1:31,680

Geologic map showing the distribution, with descriptions, of Precambrian granite, diorite, and Tertiary diorite flows. Includes a discussion of the occurrence of copper with fluorite along the fault boundary between the Precambrian units and the Bliss Sandstone and maps the geology of part of the San Andres Mountains.

Area: Mogollon-Datil volcanic province and San Andres Mountains, Socorro and Sierra Counties.

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

Geologic map showing the distribution of the Tertiary rhyolite sill, diorite dikes and sills, and Precambrian granite and diorite. This map covers the Salinas Peak 15-min quadrangle and the western half of the Capitol Peak 15-min quadrangle.

Area: San Andres Mountains, Sierra and Socorro Counties.

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

Geologic map showing the distribution of the Tertiary dikes and Precambrian diorite, granite, pegmatites, and gneissic granite of the central part of the San Andres Mountains.

Area: San Andres Mountains, Dona Ana County.

Bachman, G.O., and Myers, D.A., 1969, Geology of the Bear Peak area, Dona Ana County, New Mexico: U.S. Geol. Survey, Bull. 1271-C, p. C1-C46, 1 table, 7 figs. 1 pl., scale 1:62,500

Includes a geologic map showing the distribution of Precambrian granite, pegmatites, and diorite. Describes the geology of the Bear Peak quadrangle in the central part of the San Andres Mountains.

Area: San Andres Mountains, Dona Ana County.

Bachman, G.O., <u>see</u> Dane, C.H., 1961

Bailey, R.A., Smith, R.L., and Ross, C.S., 1969, Stratigraphic nomenclature of volcanic rocks in the Jemez Mountains, New Mexico: U.S. Geol. Survey, Bull. 1274-P, 19 p., 2 figs.

Divides the upper Tertiary and Quaternary rocks into three groups: 1) the Keres Group in the south, 2) the Polvadera Group in the north, and 3) the Tewa Group in the central and flanking parts of the Jemez Mountains. The Keres Group consists of the Chamisa Mesa basalt, Canovas Canyon Rhyolite, Paliza Canyon Formation, and the Bearhead Rhyolite. The Polvadera Group consists of the Lobato Basalt, Tschicoma Formation (andesites, dacites, and quartz latites), and El Rechuelos Rhyolite. The Tewa Group consists of the Bandelier Tuff (rhyolite), Cerro Rubio Quartz Latite, Cerro Toledo Rhyolite, and the Valles Rhyolite. Includes geologic sketches and a stratigraphic table.

Area: Jemez Mountains, Sandoval and Rio Arriba Counties.

Bailey, R.A., <u>see</u> Ross, C.S., and Smith, R.L., 1961; Smith, R.L., 1968; and Smith, R.L., and Ross, C.S., 1970

Baker, I., and Ridley, W.I., 1970, Field evidence and potassium, rubidium, strontium data bearing on the origin of the Mount Taylor volcanic field, New Mexico, U.S.A.: Earth and Planet. Sci. Letters, v. 10, p. 106-114, 3 tables, 4 figs.

Describes the calc-alkaline extrusive rocks of the Mount Taylor volcanic field; rhyolite, dacite, alkali andesite, basaltic andesite, alkali basalts, and basanite flows and pipes. Includes chemical analyses, including K, Rb, and Sr concentrations.

Area: Mount Taylor, Cibola and McKinley Counties.

Balagna, J.P., <u>see</u> Bornhorst, T.J., Elston, W.E., and Della Valle, R.S., 1980

Baldwin, B., see Sunn, M.S., 1958

Balk, R., 1962, Geologic map and sections of Tres Hermanas Mountains: New Mexico Bureau Mines Mineral Resources, Geol. Map 16, scale 1:48,000

Geologic map showing the distribution of Tertiary rhyolite, latite, monzonite, quartz monzonite, and andesite. Includes geochemical analyses of the quartz monzonite.

Area: Tres Hermanas Mountains, Luna County.

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

Briefly describes and discusses the distribution of Precambrian granite (includes modal analyses) and diabase dikes and Tertiary rhyolites and andesites. Also discusses some fluorite occurrences southwest of the Big Burro Mountains.

Area: Mogollon-Datil volcanic province, Grant County.

Baltz, E.H., Jr., 1972, 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, 2 sheets, scale 1:24,000

Geologic map showing the distribution of the Tertiary mafic dikes and the Precambrian Embudo granite and associated pegmatites. Mapped area includes the Montezuma, El Porvenir, and part of the Rociada 7 1/2-min quadrangles.

Area: Sangre de Cristo Mountains, San Miguel County.

Barker, D.S., and Long, L.E., 1974, The Trans-Pecos magmatic province, southeastern New Mexico and west Texas (abs.), in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 377-378

Mentions the occurrence of alkalic rocks in west Texas and in the Cornudas Mountains in New Mexico and Texas. The differentiation sequence is basalt to phonolite to trachyte to sodic rhyolite. These rocks are enriched in Zr and the rare-earth elements.

Area: Cornudas Mountains, Otero County.

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

Discusses the geology and petrology of the Burned Mountain Metarhyolite, Maquinita Granodiorite, Tres Piedras Granite, Kiawa Mountain Formation, and pegmatites. Includes geochemical analyses.

Area: Tusas Mountains, Rio Arriba County.

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

Briefly describes the Precambrian Big Rock and Jawbone Conglomerate Members of the Kiawa Mountain Formation.

Area: Tusas Mountains, Rio Arriba County.

Barker, F., Arth, J.G., and Peterman, Z.E., 1973, Geochemistry of Precambrian trondhjemites of Colorado and northern New Mexico, evidence for subduction? (abs.): Am. Geophys. Union (EOS), Trans., v. 54, p. 1,220-1,221
Briefly discusses the geochemistry and petrogenesis of Precambrian trondhjemites from the Tusas Mountains.
Area: Tusas Mountains, Rio Arriba County.

Barker, F., Arth, J.G., Peterman, Z.E., and Friedman, I., 1976, 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, p. 189-198, 9 figs.
Describes the geology, major, minor, and trace element geochemistry of trondhjemites from the Tusas Mountains.
Area: Tusas Mountains, Rio Arriba County.

Barker, F., and Friedman, I., 1974, Precambrian metavolcanic rocks of the Tusas Mountains, New Mexico--major elements and oxygen isotopes, in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 115-117, 1 table, 3 figs.
Discusses the major element chemistry, oxygen isotope studies, and age of the Precambrian basalt, metamorphosed andesite, and rhyolite of the Tusas Mountains. One sample is reported as having an alkalic basaltic-andesite composition.
Area: Tusas Mountains, Rio Arriba County.

Barnes, C.W., see Berry, V.P., Nagy, P.A., Sprerg, W.C., and Smouse, P., 1980

Basler, A.L., see Marjaniemi, D.K., 1972

Bassett, W.A., 1954, Mineralogical and geological investigations of the Terry uranium prospect near Monticello, New Mexico: New Mexico Bureau Mines Mineral Resources, Open-file Rept. 19, 15 p., 3 figs.
Describes the geology and mineralogy of a uranium deposit associated with a nearby quartz monzonite. Includes modal analyses of the quartz monzonite.
Area: San Mateo Mountains, Sierra County.

Bassett, W.A., see Weber, R.H., 1963

Bastin, E.S., 1939, The nickel-cobalt-native silver ore type: Econ. Geology v. 34, p. 1-40, tables, figs.
Describes the geology of a nickel-cobalt-silver ore deposit in Bullard Peak (Black Hawk district), New Mexico. Mentions the occurrence of pitchblende in the ore body.
Area: Burro Mountains, Grant County.

Bauer, H.L., Jr., 1950a, Autunite at the Monarch No. 2, Moneymaker, and Wild Irishman claims, White Signal district, Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept. TEM-160, 2 p., 1 fig.
Brief report describing the location, workings, geology, and

uranium mineralization of the Monarch No. 2 claim. No abnormal radioactivity was found on the Moneymaker or Wild Irishman claims. Includes a geologic map of the area.

Area: Burro Mountains, Grant County.

Bauer, H.L., Jr., 1950b, Radioactive ilmenite, Virginia claim, Hillsboro mining district, Sierra County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept TEM-139, 2 p.

Brief account describing a piece of radioactive ilmenite float from the Virginia claim. However, no abnormal radioactivity was found during a field investigation.

Area: Mogollon-Datil volcanic province, Black Range, Sierra County.

Bauer, H.L., Jr., 1951, Apache Trail uranium prospect, White Signal district, Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., TEM-121 (51), 11 p., 1 table, 3 figs.

Briefly describes the geology and ore deposits of the Apache Trail uranium prospect, where Precambrian granite is cut by a diabase dike and a quartz-hematite vein. The quartz-hematite vein is radioactive and contains 0.011-0.012% uranium. The diabase dike contains 0.008-0.041% uranium. Includes iron and copper contents of the quartz-hematite vein.

Area: Burro Mountains, Grant County.

Bauer, H.L., Jr., see Granger, H.C., 1950a,b, 1951a,b, and 1952; and Granger, H.C., Lovering, T.G., and Gillerman, E., 1952

Baumgardner, L., 1954, Preliminary study of the relationship between uranium and fluorine, Zuni uplift, Grants, New Mexico: U.S. Atomic Energy Comm., Tech. Mem. TM-248, 10 p.

Brief reconnaissance report describing the mineralogy and geology of the "21" and "27" fluorite mines in the Precambrian rocks in the Zuni Mountains. No anomalous radioactivity was detected in the "21" mine. Includes a brief description of the development of each mine.

Area: Zuni Mountains, Cibola County.

Beers, C.A., 1976, Geology of Precambrian rocks of the southern Los Pinos Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 228 p., 5 tables, 35 figs., 3 pls., scale 1 inch = 1,000 ft

Discusses the geology and petrology of the Precambrian Sevilleta Metarhyolite and Los Pinos and Sepultura granites found in the Los Pinos Mountains. Includes modal, chemical, and rare-earth elements analyses. Uranium and thorium were not detected. The Los Pinos Granite was found to be high in potassium.

Area: Los Pinos Mountains, Socorro County.

Belt, C.B., Jr., 1960, Intrusion and ore deposition in New Mexico: Econ. Geology, v. 55, p. 1,244-1,271, 16 figs., 65 pls.

Study of the petrology, hydrothermal alteration, and distribution of copper and zinc deposits in silicic igneous plutons. Includes discussions on the Hanover-Fierro intrusives, Granite Mountain intrusive at Magdalena, and four outliers of the

Lordsburg instrusive.
Area: Mogollon-Datil volcanic province, Magdalena Mountains, Grant and Socorro Counties and Pyramid Mountains, Hidalgo County.

Benjovsky, T.D., 1945, Reconnaissance survey of the Headstone mining district, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 11, 10 p., map
Discusses the geology of the ore deposits of the Headstone mining district. Describes a Precambrian granodiorite. Gold-quartz veins, often with Cu-Pb-Zn sulfides, occur within the granodiorite and Precambrian schist.
Area: Tusas Mountains, Rio Arriba County.

Berliner, M.H., 1949, Investigation of the Harding tantalum-lithium deposits, Taos County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-4607, 7 p., 3 tables, 3 figs.
A detailed report describing the history, production, geology, mineralogy, and workings at the Harding pegmatite. Mentions the occurrence of microlite. Includes lithium analyses.
Area: Sangre de Cristo Mountains, Taos County.

Berry, V.P., Nagy, P.A., Spreng, W.C., Barnes, C.W., and Smouse, D., 1980, Uranium resource evaluation, Tularosa quadrangle, New Mexico: U.S. Dept. Energy, Prelim. Rept. PGJ-004 (80), 31 p., 3 figs., 10 pls., 4 appendices
This detailed geologic report evaluates the uranium resources of the Tularosa 1 by 2 degree quadrangle using all available geologic, geochemical, and geophysical information. Includes a table of 13 uranium occurrences in appendix A (11 nonsandstone-type occurrences) and uranium occurrence reports for most of the occurrences. Includes petrographic analyses, a comprehensive bibliography, geologic map of the 1 by 2 degree quadrangle, and a stratigraphic column. Four cauldron complexes (Magdalena, Mt. Withington, Nogal Canyon, and Emory cauldrons) were classified as favorable for uranium deposits, although in a reclassification of the uranium potential of the quadrangle, only the Nogal cauldron remained favorable. The other three cauldrons were rejected as being favorable due to low tonnage and/or grade.
Area: Mogollon-Datil volcanic province, Magdalena Mountains, San Mateo Mountains, Sierra, Socorro, Catron, and Grant Counties.

Biggerstaff, B.P., 1974, Geology and ore deposits of the Steeple Rock-Twin Peaks area, Grant County, New Mexico: M.S. thesis, Univ. Texas (El Paso), 103 p., 1 table, 5 figs., 11 pls., 2 appendices; abs. in Ghost Ranch (central-northern New Mexico), New Mexico Geol. Soc., Guidebook 25th field conf., p. 382
Describes the Steeple Rock group (pyroclastics, andesites, and volcanic flows), andesite porphyry, and the Vanderbilt Peak intrusives. Describes the origin, nature, and mode of occurrence of sulfide and fluorite mineralization. Describes various mines and prospects and includes measured sections (Appendix A), microscopic descriptions of the igneous rocks (Appendix B), a geologic map (1:20,000), a claims map, and an alteration map (1:40,000) of the Steeple Rock-Twin Peaks area (Summit Mountains).

Area: Mogollon-Datil volcanic province, Grant County.

Bikerman, M., see Elston, W.E., Damon, P.E., Coney, P.J., Rhodes, R.C., and Smith, E.I., 1973

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

Describes the geology and stratigraphy of Rio Arriba County. Includes descriptions of Precambrian granitic gneiss, granite porphyry, Tertiary dacite, Quaternary rhyolite, and andesite. Discusses the geology of the Hopewell-Bromide and El Rito fluorite deposits. Also mentions the presence of uraninite and uranophane in pegmatites found within Rio Arriba County. Includes a map showing mineral commodities (fluorite and rare-earth elements).

Area: Rio Arriba County.

Bingler, E.C., 1974, Precambrian rocks of the Tusas Mountains, in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 109-113

Briefly describes metarhyolite, granitic gneiss, quartz diorite gneiss, and a granite porphyry. Discusses the effects of metamorphism.

Area: Tusas Mountains, Rio Arriba County.

Birsoy, R., 1977, Coloring of fluorites and problems related to their design: Ph.D. thesis, New Mexico Inst. Mining and Tech., 115 p.

Includes uranium and thorium analyses of fluorite from the Bingham, Magdalena, and Gila districts, and the Gonzales fluorspar prospect. Other elements which were analyzed include La, Ce, Nd, Sm, Eu, Tb, Yb, Lu, Y, and Na.

Area: Oscura Mountains, Magdalena Mountains, and Mogollon-Datil volcanic province, Socorro and Grant Counties and Socorro Basin area, Socorro County.

Black, B.A., 1964, 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., scale 1:31,680

Discusses the geology and petrology of granites, pegmatites, and aplite dikes. Includes a discussion on the Jeter mine - a copper and uranium deposit.

Area: Ladron Mountains, Socorro County.

Black, K.D., 1977, Geology and uranium mineralization of the Cone Peak rhyolite, Lincoln County, New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 9, p. 709

Briefly discusses the geology of a "likely target for uranium mineralization" in a hydrothermally altered rhyolite plug and dikes in the White Mountain Wilderness area.

Area: Lincoln County porphyry belt.

Blakestad, R.B., Jr., 1977, Geology of the Kelly mining district, Socorro County, New Mexico: M.S. thesis, Univ. Colorado, New Mexico Bureau Mines Mineral Resources, Open-file Rept. 43, 162 p., 17 figs., 2 pls., scale 1:1,000

Briefly describes Precambrian gabbro, diorite, felsite, and granite, and the Tertiary Spears, Hells Mesa, A.L. Peak, Anchor Canyon (granite), Nitt (monzonite), and Linchburg (monzonite) Formations.
Area: Magdalena Mountains, Socorro County.

Bloom, M.S., 1975, Mineral paragenesis and contact metamorphism in the Jarilla Mountains, Orogrande, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 107 p., 7 tables, 15 figs., 22 pls., scale 1:1,000
Describes Tertiary granodiorite, quartz latite, monzonite, and andesite intrusives. Discusses rock alteration and includes major-element analyses.
Area: Jarilla Mountains, Otero County.

Bolton, W.R., 1976, Precambrian geochronology of the Sevilleta Metarhyolite and the Los Pinos, Sepultura, and Priest plutons of the southern Sandia uplift, central New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 57 p., 1 table, 6 figs.
Briefly discusses the geology and lithology of three granitic plutons (Priest quartz monzonite, Los Pinos and Sepultura granite) and the Sevilleta Metarhyolite. Includes modal, major-element, and rare-earth element analyses. The Rb-Sr ages range from 1,410 to 1,700 m.y.; with anomalously high initial strontium ratios.
Area: Sandia Mountains, Bernalillo County.

Bonnichsen, W., 1962, General aspects of the Precambrian rocks of the Lemitar Mountains, Socorro County, New Mexico (abs.), in Mogollon rim region: New Mexico Geol. Soc., Guidebook 13th field conf., p.174
Summarizes the geology and petrology of Precambrian granite, pegmatite dikes, and "Tertiary" lamprophyre dikes of the Lemitar Mountains. Mentions the occurrence of barite, fluorite, galena, calcite, and quartz veins.
Area: Lemitar Mountains, Socorro County.

Bornhorst, T.J., 1976, Volcanic geology of the Crosby Mountains and vicinity, Catron County, New Mexico: M.S. thesis, Univ. New Mexico, 113 p., 17 tables, 38 figs.
Describes the Datil Formation which consists of andesite, quartz latite, rhyolite, and rhyodacite flows and tuffs. Includes modal and major-element analyses.
Area: Mogollon-Datil volcanic province, Catron County.

Bornhorst, T.J., Elston, W.E., Della Valle, R.S., and Balagna, J.P., 1980, Distribution of uranium in mid-Tertiary volcanic rocks, Mogollon-Datil volcanic field, New Mexico (abs.): Am. Assoc. Petroleum Geologists, Southwest Sec., Ann. Mtg., Prog. and Abs., p. 17; 1981, Bull., v. 65, p. 755
"The uranium abundances in mid-Tertiary volcanic rocks of the Mogollon-Datil volcanic field, southwestern New Mexico, have been determined as part of a major petrogenetic study (Bornhorst, Ph.D. dissertation, in progress). Over 350 samples of mid-Tertiary to Quaternary volcanic rocks have been analyzed for their uranium content by delayed neutron activation analysis.

Of the volcanic associations previously proposed for southwestern New Mexico, calc-alkalic andesite, ±43 to ±35 m.y., has a mean of 2.3 ppm U (range 0.9-5.4 ppm); calc-alkalic quartz latite to rhyolite, ±35 to ±29 m.y., has a mean of 3.9 ppm U (range 1.7-6.2 ppm); basaltic andesite and associated rocks, ±32 to ±18 m.y., has a mean of 2.3 ppm U (range 0.8-6.9 ppm); and high-silica rhyolite, ±32 to ±18 m.y., has a mean of 5.2 ppm U (range 1.6-9.4 ppm). Anomalous values in the range of 14 to 35 ppm U where found for a riebeckite-bearing lava from the central San Mateo Mountains, a sample of intrusive andesite from the Alum Mountain area, and a lithophysal rhyolite lava and associated ash-flow tuff from the Sierra Cuchillo. Post-13 m.y. bimodal basalt-rhyolite is sparse within the Mogollon-Datil volcanic field. A few determinations from this study, and published and unpublished data for other localities in New Mexico, indicate U abundance from 0.3 to 1.5 ppm U in post-13 m.y. basalt and about 7 to 8 ppm U in rhyolite."

Area: Mogollon-Datil volcanic province.

Bornhorst, T.J., Erb, E.E., and Elston, W.E., 1976, Reconnaissance geologic map of part of the Mogollon-Datil volcanic province, New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, scale 1:325,000

Geologic map showing the distribution of Tertiary igneous rocks in the Mogollon-Datil volcanic province.

Area: Mogollon-Datil volcanic province.

Bowring, S.A., 1980, The geology of the west-central Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., New Mexico Bureau Mines Mineral Resources, Open-file Rept. 120; 135 p., 14 figs., 2 pls., scale 1:24,000

Geologic report describing the Oligocene to Miocene volcanic rocks of the area around Langmuir Laboratory in the Magdalena Mountains. Portions of three overlapping cauldrons are mapped--Sawmill Canyon, Magdalena, and North Baldy cauldrons. Very few prospects or mines are found in the mapped area and only copper mineralization and silicification were found by the author.

Area: Magdalena Mountains, Socorro County.

Boyd, F.S., Jr., 1955, Some recent discoveries of uranium in Sierra County, New Mexico; in south-central New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., p. 123

Describes the geology and occurrence of uranium in three localities: 1) fissure veins of fluorite adjacent to the Precambrian granite in the Caballo Mountains, 2) a shear zone in Precambrian schist and granite east of Truth or Consequences, and 3) felsitic Tertiary intrusives near Iron Mountain.

Area: Caballo and southern Fra Cristobal Mountains and Sierra Cuchillo, Sierra County.

Boyd, F.S., Jr., and Wolfe, H.D., 1953, Recent investigations of radioactive occurrences in Sierra, Dona Ana, and Hidalgo Counties, New Mexico, in Southwestern New Mexico: New Mexico Geol. Soc., Guidebook 4th field conf., p. 141-142

Briefly describes the occurrence of uranium in four

localities in Sierra, Dona Ana, and Hidalgo Counties: 1) fluorite near Monticello, Sierra County, 2) syenite dikes in the Caballo Mountains, Sierra County, 3) a Precambrian granitic pegmatite near Lordsburg, and 4) radioactive tufa near Hatch.
Area: Mogollon-Datil volcanic province, Sierra, Dona Ana, and Hidalgo Counties; Caballo Mountains, Sierra County; Pyramid Mountains, Hidalgo County.

Branson, O.T., see Kelley, V.C., 1947

Brick, K.L., see Twenhofel, W.S., 1956

Bromfield, C.S., and Wrucke, C.T., 1961, Reconnaissance geologic map of the Cedar Mountains, Grant and Luna Counties, New Mexico: U.S. Geol. Survey, Mineral Inv. Field Studies Map MF-159, scale 1:62,500
Geologic map showing the distribution of Tertiary andesite, latite, porphyric quartz latite, rhyolite, and Precambrian granite.
Area: Cedar Mountains, Mogollon-Datil volcanic province, Grant and Luna Counties.

Bromfield, C.S., see Wrucke, C.T., 1961

Brookins, D.G., 1974, Summary of recent Rb-Sr age determinations from the Precambrian rocks of north-central New Mexico, in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 119-121, 1 table
Summarizes the Rb-Sr age determinations from basement granites, pegmatites, gneisses, latites, and leuco-granodiorite from the La Madera district, Sangre de Cristo Mountains, Tusas Mountains, Sandia Mountains, Manzanita Mountains, and the Nacimiento uplift. The ages range from 1.87 to 1.42 b.y.
Area: Sangre de Cristo, Tusas, Sandia, Manzanita, and Nacimiento Mountains, north-central New Mexico.

Brookins, D.G., 1978, A study of silicic plutonic rocks in the Zuni and Florida Mountains to evaluate the possible occurrence of disseminated uranium and thorium deposits--radiogenetic heat contribution to heat flow from potassium, uranium, and thorium in the Precambrian silicic rocks of the Florida Mountains and the Zuni Mountains, New Mexico: New Mexico Energy Inst., Open-file Rept. 77-1104A; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 98, 13 p., 2 tables
Brief report on the radiogenetic heat generation from rocks from the Zuni and Florida Mountains. Includes thorium and uranium analyses.
Area: Florida Mountains, Luna County and Zuni Mountains, Cibola and McKinley Counties.

Brookins, D.G., Chakoumakos, B.C., Cook, C.W., Ewing, R.C., Landis, G.P., and Register, M.E., 1979, The Harding pegmatite--summary of recent research, in Santa Fe country: New Mexico Geol. Soc., Guidebook 30th field conf., p. 127-133, 6 figs.
Summary of recent work on the genesis of the Harding

pegmatite. Includes description of fluid-inclusion studies and analyses of microlite (pyrochlore group--a uranium-bearing mineral).

Area: Sangre de Cristo Mountains, Taos County.

Brookins, D.G., and Della Valle, R.S., 1977, Uranium abundances in some Precambrian and Phanerozoic rocks from New Mexico: Rocky Mtn. Assoc. Geologists, 1977 Symposium, p. 353-362, 3 tables, 1 fig.

Discusses a study of uranium concentrations in sediments and igneous rocks from throughout the state. Chemical and radiometric analyses are included from various Precambrian and Tertiary igneous rocks.

Area: Nacimiento Mountains, Sandoval County; Manzanos Mountains, Bernalillo and Torrance Counties; Florida Mountains, Luna County; Pedernal Hills, Torrance County; Sandia Mountains, Bernalillo and Sandoval Counties; Zuni Mountains and McCarthy's flow, Cibola County; Bandera Crater and Jemez Mountains, Sandoval County.

Brookins, D.G., Eppler, D., and Elston, W.E., 1977, Sr-isotope initial ratios from the San Antonio Mountain area, New Mexico: Isochron/West, no. 20, p. 17

Reports Sr-isotope initial ratios from rocks of the San Antonio Mountains area, Taos County:

Rock type	$^{87}Sr/^{86}Sr$
alkali basalt	0.7032 (whole rock)
andesite	0.7036
latite	0.7075
rhyolite	0.7070

Area: Sangre de Cristo Mountains, Taos County.

Brookins, D.G., and Rautman, C.A., 1978, A study of silicic plutonic rocks in the Zuni and Florida Mountains to evaluate the possible occurrence of disseminated uranium and thorium deposits--uranium and thorium abundances, whole rock chemistry, and trace element chemistry, Zuni Mountains, New Mexico: New Mexico Energy Inst., Open-file Rept. 77-1104B; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 99, 47 p., 3 tables, 26 figs., 1 appendix

Brief report on the uranium and thorium abundances in the Zuni Mountains. Includes 57 uranium and thorium analyses averaging 3.75 ppm U and 17.53 ppm Th. Includes major- and trace-element analyses.

Area: Zuni Mountains, Cibola and McKinley Counties.

Brookins, D.G., Rautman, C.A., and Corbitt, L.L., 1978, A study of silicic plutonic rocks in the Zuni and Florida Mountains to evaluate the possible occurrence of disseminated uranium and thorium deposits--uranium and thorium abundances and whole-rock chemistry of the Florida Mountains, New Mexico--preliminary study: New Mexico Energy Inst., Open-file Rept. 77-1104C; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 101, 23 p., 6

tables, 7 figs.
Brief report on the study of uranium and thorium abundances in the Precambrian granitic and syenitic rocks of the Florida Mountains. Includes 90 uranium and thorium analyses, averaging 3.12 ppm U and 12.33 ppm Th. Briefly describes the geology and includes a geologic map and whole-rock analyses.
Area: Florida Mountains, Luna County.

Brookins, D.G., see Callender, J.F., and Robertson, J.M., 1976; Condie, K.C., 1980; Enz, R., and Kudo, A.M., 1979, 1980; and Register, M.E., 1979

Brown, D.M., 1972, Geology of the southern Bear Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 42, 110 p., 5 tables, 18 figs., 1 sheet
Describes the Spears, Hells Mesa, and La Jara Peak formations and monzonite porphyry, latite, and rhyolite dikes. Includes modal analyses.
Area: Mogollon-Datil volcanic province, Socorro County.

Brown, L.F., see Seager, W.R., 1978

Brown, W.T, Jr., 1969, Igneous geology of the Rio Puerco necks, Sandoval and Valencia Counties, New Mexico: M.S. thesis, Univ. New Mexico, 89 p., 5 tables, 4 figs., 30 pls. (now Cibola County)
Describes the geology and petrology of the Rio Puerco volcanic necks and includes modal and chemical analyses of the alkali basalts in the area east of Mount Taylor.
Area: San Juan Basin, Cibola County.

Budding, A.J., 1968, Precambrian granite-diabase relationships in the southwestern Sangre de Cristo Mountains (abs.), in San Juan-San Miguel-La Plata region (New Mexico and Colorado): New Mexico Geol. Soc., Guidebook 19th field conf., p. 210
Describes the Embudo Granite as consisting of foliated biotite granite and leucocratic granite cut by diabase dikes, leucocratic granite, aplitic and pegmatitic dikes.
Area: Sangre de Cristo Mountains, Santa Fe County.

Budding, A.J., 1972, Geologic map of the Glorieta quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 24, with text, scale 1:24,000
Geologic map showing the distribution of Precambrian granite, leucogranite, and aplite and pegmatite veins.
Area: Sangre de Cristo Mountains, Santa Fe County.

Budding, A.J., and Cepeda, J.C., 1979, Tectonics and metamorphism of the El Oro Gneiss dome, near Mora, north-central New Mexico, in Santa Fe country: New Mexico Geol. Soc., Guidebook 30th field conf., p. 159-164, 1 table, 3 figs.
Describes the tectonics and geology of the gneiss dome in in the El Oro Mountains. The gneiss consists of quartz, microcline, oligoclase, muscovite, and biotite. Pegmatite bodies are numerous around the dome.

Area: Sangre de Cristo Mountains, Mora County.

Budding, A.J., and Condie, K.C., 1975, Precambrian rocks of the Sierra Oscura and northern San Andres Mountains, in Las Cruces country (central-southern New Mexico): New Mexico Geol. Soc., Guidebook 26th field conf., p. 89-93, 4 figs.
Describes and discusses the occurrence of Precambrian granite in the Sierra Oscura and San Andres Mountains. Three types of granite are found in the Sierra Oscura: 1) coarse-grained biotite granite, 2) gray granite, and 3) leucogranite.
Area: Oscura and San Andres Mountains, Socorro, Lincoln, and Sierra Counties.

Budding, A.J., see Condie, K.C., 1979

Bundy, W.M., 1958, Wall-rock alteration in the Cochiti mining district, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 59, 71 p., 7 tables, 34 figs., 2 pls., scale 1 inch = 1,000 ft
Briefly describes Tertiary andesite flows, monzonite stock and dikes, quartz veins, rhyolite intrusives, and the Bandelier Formation (rhyolite). Includes some modal and chemical analyses. Discusses sulfide mineralization and wall-rock alteration as a guide to prospecting.
Area: Jemez Mountains, Sandoval County.

Bunker, C.M., see Lipman, P.W., and Bush, C.A., 1973

Burchard, E.F., see Darton, N.H., 1911

Bush, C.A., see Lipman, P.W., and Bunker, C.M., 1973

Butler, A.P., Jr., 1939, Tertiary and Quaternary geology of the Tusas-Tres Piedras area, Rio Arriba County, New Mexico: New Mexico Bureau Mines Mineral Resources, Open-file Rept. 20, 30 p., 1 table, 2 figs., 2 sheets
Describes and shows the distribution of quartz latite and rhyolite.
Area: Tusas Mountains, Rio Arriba County.

Callender, J.F., Robertson, J.M., and Brookins, D.G., 1976, Summary of Precambrian geology and geochronology of northeastern New Mexico, in Vermejo Park (northeastern New Mexico): New Mexico Geol. Soc., Guidebook 27th field conf., p. 129-135, 1 table, 1 fig.
Summarizes the lithology and distribution of Precambrian rocks in northeastern New Mexico. Includes geochronologic studies on the Precambrian rocks.
Area: Sangre de Cristo Mountains, Colfax, Mora, and San Miguel Counties.

Callender, J.F., see Woodward, L.A., and Zilinski, R.E., 1975

Cannon, R.P., and Ragland, P.C., 1977, Petrology and geochemistry of the Palisades sill, northern New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 9, no. 6, p. 713-714
Discusses major-element analyses, Rb-Sr analyses, and thin-

section descriptions of dacite sills.
Area: Chico Hills area, Raton-Clayton volcanic field, Colfax County.

Cargo, D.N., 1959, Mineral deposits of the Granite Gap area, Hidalgo County, New Mexico: M.S. thesis, Univ. New Mexico, 70 p., 9 figs.
Area: Peloncillo Mountains, Hidalgo County.

Carmichael, I.S.E., see Stormer, J.C., Jr., 1970

Carten, R.B., Silberman, M.L., Armstrong, A.K., and Elston, W.E., 1974, Geology, trace metal anomalies, and base-metal mineralization in the central Peloncillo Mountains, Hidalgo County, New Mexico (abs.), in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 378
Mentions the occurrence of Precambrian granite, quartz monzonite, quartz monzonite porphyry, fine-grained felsite dikes, and latite porphyry dikes. Anomalous copper, lead, zinc, and silver are present in some of the dikes, and sulfide veins are found around some of the larger faults.
Area: Peloncillo Mountains, Hidalgo County.

Cepeda, J.C., 1972, Geology of Precambrian rocks of the El Oro Mountains and vicinity, Mora County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 63 p., 4 tables, 18 figs., 8 pls.
Area: Sangre de Cristo Mountains, Mora County.

Cepeda, J.C., see Budding, A.J., 1979

Chakoumakos, B.C., see Brookins, D.G., Cook, C.W., Ewing, R.C., Landis, G.P., and Register, M.E., 1979

Chamberlin, R.M., 1974, Geology of the Council Rock district, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 40, 134 p., 5 tables, 19 figs., 1 pl., scale 1:24,000
Describes the Spears, Hells Mesa, and A.L. Peak Formations, and the Tres Montosas stock and discusses the hydrothermal silver veins with fluorite in the Iron Mountain district.
Area: Mogollon-Datil volcanic province, Socorro County.

Chamberlin, R.M., 1980, Cenozoic stratigraphy and structure of the Socorro Peak volcanic center, central New Mexico: Ph.D. thesis, Colorado School Mines; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 118, 462 p., 8 tables, 41 figs., map and cross sections, two vol.
Describes the geology of the Socorro Peak area, including descriptions of the A.L. Peak Tuff (rhyolite ash-flow tuff), La Jara Peak basaltic andesite, Lemitar tuff (rhyolite and quartz latite tuffs), rhyolite lavas and tuffs of the Luis Lopez formation, tuff of South Canyon (high-silica rhyolite), and Socorro Peak rhyolite. Includes modal analyses of the Lemitar tuff and chemical data for the Lemitar tuff, lavas and tuffs of the Luis Lopez formation, and the Socorro Peak rhyolite.
Area: Mogollon-Datil volcanic province, Socorro County.

Chamberlin, R.M., 1981, Cenozoic stratigraphy and structure of the Socorro Peak volcanic center, central New Mexico--a summary: New Mexico Geology, v. 3, no. 2, p. 22-24, 2 figs.
Summary of Chamberlin's (1980) work on the Socorro Peak volcanic center.
Area: Mogollon-Datil volçanic province, Socorro County.

Chamberlin, R.M., see Chapin, C.E., Osburn, G.R., White, D.W., and Sanford, A.R., 1978

Chapin, C.E., 1971, K-Ar age of the La Jara Peak andesite and its possible significance to mineral exploration in the Magdalena mining district, New Mexico: Isochron/West, no. 2, p. 43-44
Briefly discusses the Tertiary volcanic stratigraphy of the Magdalena mining district. Mineralization consists of veins intruding the hydrothermally altered La Jara Peak andesite. Reports an age of 23.8 m.y. for the La Jara Peak andesite.
Area: Magdalena Mountains, Socorro County.

Chapin, C.E., Chamberlin, R.M., Osburn, G.R., White, D.W., and Sanford, A.R., 1978, Exploration framework of the Socorro geothermal area, New Mexico, in Field guide to selected cauldrons and mining districts of the Datil-Mogollon volcanic field, New Mexico: New Mexico Geol. Soc., Spec. Pub. 7, p. 115-130, 1 table, 3 figs.
Briefly describes the geologic setting, structural and stratigraphic controls, and geothermal potential in the Socorro area. Includes partial chemical analyses (Fe_2O_3, Na_2O, and K_2O) of the A.L. Peak Tuff and the tuff of the Lemitar Mountains. Includes a stratigraphic section and a generalized map of the Rio Grande rift, showing major crustal lineaments.
Area: Mogollon-Datil volcanic province, Magdalena Mountains, and Lemitar Mountains, Socorro County.

Chapin, C.E., see Osburn, G.R., and Petty, D.M., 1981

Chapman, Wood, and Griswold, Inc., 1974, Geologic map of Grants uranium region: New Mexico Bureau Mines Mineral Resources, Geol. Map 31, 3 sheets, scale 1 inch = 2 mi (revised 1979)
Geologic map showing the distribution of Precambrian granitic and metamorphic rocks and undifferentiated Tertiary and Quaternary volcanic rocks (locally intrusive). Includes the location of mines and mineralized areas in the Morrison Formation. Shows the extent of the Precambrian in the Zuni and Nacimiento Mountains--some of which have not been previously mapped.
Area: Zuni and Nacimiento Mountains, Mount Taylor, and San Juan Basin, Cibola, McKinley, and Sandoval Counties.

Chenoweth, W.L., 1957, A reconnaissance for uranium in the uppermost Cretaceous and early Tertiary rocks of the eastern San Juan Basin, New Mexico: U.S. Atomic Energy Comm., Rept. RME-97, pt. 2, 19 p., 1 table, 4 figs.
Discusses the occurrence of uranium in nearby sediments. Describes augite andesite sills and lamprophyre dikes.
Area: San Juan Basin.

Chenoweth, W.L., 1966, Uranium analyses of samples from selected oil wells, southern San Juan Basin, New Mexico: U.S. Atomic Energy Comm., Tech. Memo. TM-250, 27 p., 3 tables

Seven wells in the southern San Juan Basin which penetrated the Precambrian basement were analyzed for uranium by the U.S. Atomic Energy Commission. The uranium values in the Precambrian rocks ranged from 10 to 74 ppm U_3O_8.

Area: San Juan Basin.

Chenoweth, W.L., 1974a, Uranium in the Petaca, Ojo Caliente, and Bromide districts, Rio Arriba County, in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 315

Discusses the occurrence of uranium minerals in some of the pegmatites of the Tusas Mountains. Uraninite and samarskite occur with albite and quartz in the pegmatites of the Petaca and Ojo Caliente districts. Uranium also occurs with magnetite and quartzite in the Kiawa Mountain area. Several uranium minerals occur within quartz-fluorite veins of the Bromide district, north of the Petaca district and uranium minerals are found within the Precambrian Tres Piedras Granite.

Area: Tusas Mountains, Rio Arriba County.

Chenoweth, W.L., 1974b, Uranium occurrences of the Nacimiento-Jemez region, Sandoval and Rio Arriba Counties, New Mexico, in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 309-313, 2 figs.; U.S. Atomic Energy Comm., Tech. Rept. TM-194(74)

Uranium minerals occur in rhyolite breccia in the Cochiti mining district. Describes the occurrence of uranium in the Bandelier Tuff where some samples of the tuff contain 0.0003-0.008% U_3O_8. Reports several radioactive thermal springs near the Valles caldera; Jemez Springs, Jemez Pueblo, and San Ysidio and discusses the chemistry and possible origins from volcanic waters. Springs from Soda Dam contain 0.036 and 0.04 ppm uranium. The uranium in these spring waters may have been derived from the Bandelier rocks.

Area: Nacimiento and Jemez Mountains, Sandoval and Rio Arriba Counties.

Chenoweth, W.L., 1975, Uranium deposits of Nacimiento-Jemez region, Sandoval and Rio Arriba Counties, New Mexico (abs.): Am. Assoc. Petroleum Geologists, Bull., v. 59, p. 907

Uranium minerals are found filling interstices of a rhyolite breccia. Uranium has also been found in the sedimentary rocks of the region. States that the source may be the overlying Bandelier Tuff.

Area: Jemez and Nacimiento Mountains, Sandoval and Rio Arriba Counties.

Chenoweth, W.L., 1976, Uranium resources of New Mexico; in Tectonics and mineral resources of southwestern North America: New Mexico Geol. Soc., Spec. Pub. 6, p. 138-143, 2 tables, 2 figs.; U.S. Dept. Energy, Tech. Memo TM-193(76)

A good summary of uranium occurrences and deposits in New Mexico. Discusses history of exploration, production, processing facilities, geologic setting, and resources. Fourteen properties of vein-type uranium deposits have produced 113 tons U_3O_8.
Area: General-statewide.

Chenoweth, W.L., 1979, Uranium in the Santa Fe area, New Mexico, in Santa Fe country: New Mexico Geol. Soc., Guidebook 30th field conf., p. 261-264, 2 figs.
Briefly describes the uranium occurrences in: 1) the pegmatites found in the Rincon Range, 2) in fractures in Precambrian quartzite in the Picuris Range, 3) in a trachyte sill and a monzonite dike in the Hagan Basin, and 4) the La Bajada deposit in Espinaso Volcanics.
Area: Sangre de Cristo Mountains and Ortiz Mountains area, Santa Fe County.

Clabaugh, S.E., 1941, Geology of the northwestern portion of the Cornudas Mountains, New Mexico: M.S. thesis, Univ. Texas (El Paso), 66 p., 22 figs., 2 pls., scale 1 inch = 2,000 ft
Describes the geology of the northwestern portion of the Cornudas Mountains. Includes detailed petrographic descriptions of the alkali igneous intrusives, consisting of augite syenite, analcite nepheline syenite, trachyte porphyry, and phonolite porphyry.
Area: Cornudas Mountains, Otero County.

Clabaugh, S.E., 1950, Eudialyte and eucolite from southern New Mexico (abs.): Am. Mineralogist, v. 35, p. 279-280; Geol. Soc. America, Bull., v. 60, no. 12, pt. 2, p. 1,879-1,880(1949)
Briefly describes the occurrence of eudialyte and eucolite in small irregular dikes associated with the Wind Mountain laccolith (a nepheline-analcime syenite), Otero County.
Area: Cornudas Mountains, Otero County.

Clark, K.F., 1968, Structural controls in the Red River district, New Mexico: Econ. Geology, v. 63, p. 553-566, 2 tables, 6 figs.
Describes Precambrian granite, pegmatites, and diabase dikes and Tertiary andesite, latite, rhyolite, granite, granite porphyry, biotite granite, and monzonite. Discusses widespread hydrothermal alteration throughout the district. Describes structurally controlled molybdenum ore deposits which occur as disseminations, veinlets, coatings along fractures, and fissure vein deposits.
Area: Sangre de Cristo Mountains, Taos County.

Clark, K.F., and Read, C.B., 1972, Geology and ore deposits of Eagle Nest area, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 94, 152 p., 4 tables, 23 figs., 1 pl., 2 charts, 5 maps, scale 1:48,000
Describes Precambrian granite, pegmatites, quartz veins, and diabase dikes, and Tertiary andesite, latite, rhyolite, granite, diorite, quartz diorite, and monzonite porphyry. Includes some modal and chemical analyses.
Area: Sangre de Cristo Mountains, Taos and Colfax Counties.

Clemons, R.E., 1976a, Sierra de las Uvas ash-flow field, south-central New Mexico, in Tectonics and mineral resources of southwestern North America: New Mexico Geol. Soc., Spec. Pub. 6, p. 115-121, 4 figs.

Describes the Bell Top Formation (tuffs, rhyolite flows and domes, and interbedded volcanics) and the Cedar Hills rhyolite tuffs. Includes a tectonic map of the area, crystal compositions, and chemical analyses.

Area: Sierra de las Uvas, Dona Ana County.

Clemons, R.E., 1976b, Geology of east half Corralitos Ranch quadrangle, Dona Ana County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 36, 2 sheets, with text, scale 1:24,000 Map 36, 2 sheets, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Oligocene rhyolite and Miocene andesite.

Area: Sierra de las Uvas, Dona Ana County.

Clemons, R.E., 1977, Geology of west half Corralitos Ranch quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 44, 2 sheets, with text, scale 1:24,000

Geologic map showing the distribution with descriptions of andesite and rhyolite east of Deming.

Area: Sierra de las Uvas, Dona Ana County.

Clemons, R.E., 1979, Geology of Good Sight Mountains and Uvas Valley, southwestern New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 169, 32 p., 1 table, 23 figs., scale 1:48,000

Describes the geology of the Good Sight Mountains and the Uvas Valley in Luna, Dona Ana, and Sierra Counties, New Mexico. Includes descriptions of the Rubio Peak Formation (latite and andesite tuffs, breccias, flows, dikes, plugs, and stocks), Bell Top Formation (rhyolite tuffs, vitrophyre flows and dikes, and flow-banded rhyolite flows and domes), Kneeling Nun Tuff (ash-flow tuffs), Tenaga Canyon formation (andesites and latites), Nutt Mountain rhyolite, and Uvas basaltic andesite. Includes measured sections, geologic maps, and petrographic data of the ash-flow tuffs.

Area: Good Sight Mountains (Misc. Areas).

Clemons, R.E., see Seager, W.R., 1975; and Seager, W.R., and Hawley, J.W., 1971 and 1975

Collins, G.E., 1956, Thorium occurrences in the Capitan Mountains area, Lincoln County, New Mexico: U.S. Atomic Energy Comm., Tech. Memo. Rept. DAO-4-TM-1, 11 p., 2 tables, 2 figs.

Detailed geologic report describing the geology and mineralogy of the uranium- and thorium-bearing veins in quartz monzonite of the Capitan Mountains, Lincoln County. Includes location maps and chemical analyses.

Area: Lincoln County porphyry belt.

Collins, G.E., 1957, Reconnaissance for uranium in the Mogollon mining district, Catron County, New Mexico: U.S. Atomic Energy Comm.,

Tech. Memo. Rept. DAO-4-TM-7, 20 p., 2 tables, 5 figs.
A good geologic report describing the uranium deposits at the Baby and Evelyne mines in the Mogollon mining district. Includes assay data and chemical analyses. Concludes that the deposits are too low grade and too small to justify further exploration. Includes a mine map and a geologic map of the Baby mine.
Area: Mogollon-Datil volcanic province, Catron County.

Collins, G.E., 1958, Preliminary reconnaissance for uranium in the Cornudas Mountains, Otero County, New Mexico and Huspeth County, Texas: U.S. Atomic Energy Comm., Tech. Memo. Rept. DBO-4-TM-5, 17 p., 1 table, 2 figs.
A brief reconnaissance report of the Llewellyn and Jones prospects near Wind Mountain in the Cornudas Mountains. Both prospects contain anomalous uranium and are associated with a syenite sill or dike. Reports the occurrence of thorium-bearing dikes north of Wind Mountain.
Area: Cornudas Mountains, Otero County.

Collins, G.E., and Freeland, R.E., 1956, A report on the airbourne radiometric survey and ground geologic reconnaissance in the Espanola area, New Mexico: U.S. Atomic Energy Comm., Open-file Rept. RME-1075, 16 p., 1 table, 3 figs.
Describes the results of a ground reconnaissance of radiometric anomalies detected by airbourne radiometric methods. Locates and describes several vein-type radioactive occurrences in the Santa Fe Group and includes a table of uranium and vanadium analyses.
Area: Tusas and Ortiz Mountains, Rio Arriba and Santa Fe Counties.

Collins, G.E., and Mallory, N.S., 1954, Airbourne radiometric survey and ground geologic reconnaissance in the Socorro and Carrizozo areas, New Mexico: U.S. Atomic Energy Comm., Open-file Rept. RME-1054, 16 p., 1 fig.
A geologic report describing the results of a ground reconnaissance of radioactive anomalies detected by airbourne radiometric techniques. Describes several radioactive vein occurrences in the Socorro Basin and one near Carrizozo, New Mexico.
Area: Socorro Basin, Socorro County and Lincoln County porphyry belt.

Collins, G.E., and Nye, T.S., 1957, Exploration drilling in the Ladron Peak area, Socorro County, New Mexico: U.S. Atomic Energy Comm., Tech. Memo. Rept. DAO-4-TM-8, 25 p., 5 figs.
Discusses the general geology and mineralogy of an uranium occurrence at the Jeter mine in a fault between Precambrian rocks and Tertiary volcanics. Describes the uranium deposit, mentioning the occurrence of coffinite. Includes lithologic descriptions of cores drilled by the Atomic Energy Commission.
Area: Ladron Mountains, Socorro County.

Collins, G.E., and Smith, B.C., 1956, Airborne radiometric survey in the

Lemitar-Ladron area, New Mexico: U.S. Atomic Energy Comm., Rept. RME-1073 (rev.), 10 p., 1 fig.
Brief report discussing the results of an airborne radiometric survey in the Lemitar and Ladron Mountains. Briefly describes uranium occurrences at the San Acacia mine, Jeter mine, Polvadera Mountain, and Lemitar area. Of these known occurrences only the Jeter mine could be detected from the survey and no new anomalies were found.
Area: Ladron and Lemitar Mountains, and Mogollon-Datil volcanic province, Socorro County.

Collins, R.F., 1949, Volcanic rocks of northeastern New Mexico: Geol. Soc. America, Bull., v. 60, p. 1,017-1,040, figs.
Includes petrographic descriptions of phonolites, trachytes, dacites, andesites, and leucocratic dikes found in Colfax County.
Area: Chico Hills area, Colfax County.

Collins, R.F., and Stobbe, H.R., 1942, Extrusive and related rocks of northeastern New Mexico (abs.): Geol. Soc. America, Bull., v. 53, p. 1,846
Briefly discusses andesites, trachytes, soda trachytes, and phonolites as approximate contemporaries to basalt flows. Mentions that there are "sizable areas of feldspathoid extrusives in western Colfax County".
Area: Chico Hills area and Raton-Clayton volcanic field, Colfax County.

Condie, K.C., 1976, Precambrian rocks of the Ladron Mountains, Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 38, with text, scale 1:24,000
Geologic map showing the distribution of Precambrian rocks in the Ladron Mountains. Describes quartz monzonite and granite and discusses copper, galena, fluorite, and uranium mineralization. Uranium is found and was once mined at the Jeter mine.
Area: Ladron Mountains, Socorro County.

Condie, K.C., 1978, Geochemistry of Proterozoic granitic plutons from New Mexico, U.S.A.: Chem. Geology, v. 21, p. 131-149, 2 tables, 8 figs.
Discusses major-element analyses from 38 Precambrian plutons in New Mexico, including plutons from the Tusas, Sangre de Cristo, Nacimiento, Sandia, Manzanita, Manzano, Los Pinos, Ladron, Oscura, Magdalena, San Andres, Burro, Little Hatchet, Zuni, Peloncillo, and Organ Mountains, Pedernal Hills, and the Black Range. Divides the plutons into one of four groups on the basis of major-element and rare-earth element analyses: 1) high-Si (further subdivided into low-REE and high-REE), 2) high-K (further subdivided into low-REE and high-REE), 3) high-Ca, and 4) trondhjemite.
Area: Rio Arriba, Sandoval, Cibola, Santa Fe, Taos, Socorro, Bernalillo, Torrance, Sierra, Dona Ana, Hidalgo, and Grant Counties.

Condie, K.C., 1980, Precambrian rocks of Red River-Wheeler Peak area, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol.

Map 50, with text, scale 1:48,000

An outcrop geologic map of an area bounded by Cubresto Creek drainage (north), Lucero Canyon (south), the Sangre de Cristo Mountains escarpment (west), and the Moreno Valley (east). Divides the Precambrian rocks into: 1) felsic volcanic rocks, 2) mafic volcanic rocks, 3) volcanic breccia, 4) ultramafic rocks, 5) gneisses, 6) graphic paragneiss, 7) quartzite, 8) granite and quartz monzonite, 9) tonalite-trondhjemite, and 10) diabase dikes. Briefly describes each unit.

Area: Sangre de Cristo Mountains, Taos County.

Condie, K.C., 1981, Precambrian rocks of the southwestern United States and adjacent area of Mexico: New Mexico Bureau Mines Mineral Resources, Resource Map 13, 2 sheets, scale 1 inch = 25 mi

Map showing the distribution of Precambrian rocks in southern Idaho, southern Wyoming, Nevada, Utah, Colorado, California, Arizona, New Mexico, Texas, and northern Mexico. Divides the rock units into: 1) quartzite and shales, 2) volcanics and sediments, 3) graywacke and subgraywacke, 4) gneissic complexes, 5) granite, 6) granodiorite and tonalite, 7) granitic rocks undifferentiated and 8) anorthosite. Includes radiometric age dates and accepted names of individual rock units.

Area: Statewide.

Condie, K.C., and Brookins, D.G., 1980, Composition and heat generation of the Precambrian crust in New Mexico: Geochem. Jour. v. 14, p. 95-99, 2 tables, 1 fig.

Briefly describes the Precambrian rocks in New Mexico and includes major- and minor-element (including U, Th, and the rare-earth elements) analyses of major rock types in the Precambrian terrains of New Mexico. Concludes that the upper crust is enriched in U, Th, and the rare-earth elements. Presents a model for the derivation of the Precambrian granites in New Mexico.

Area: Statewide.

Condie, K.C., and Budding, A.J., 1979, Geology and geochemistry of Precambrian rocks, central and south-central New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 35, 60 p., 13 tables, 48 figs., 4 appendices, 3 sheets

Summarizes the geology and petrology of Precambrian rocks and includes maps, stratigraphic sections, petrographic descriptions, modal and geochemical analyses. Includes geologic maps of the San Andres, Oscura, Ladron, Caballo, Magdalena, Fra Cristobal, Lemitar, and Organ Mountains, San Diego Mountain (Dona Ana County), Pajarito Peak, Pedernal, La Joyita, and Coyote Hills (Socorro County).

Area: Sandia Mountains, Sandoval and Bernalillo Counties; Monte Largo area and Manzanita Mountains, Bernalillo County; Ladron, Lemitar, Magdalena, Oscura, and Los Pinos Mountains, and La Joyita Hills, Socorro County; Manzano Mountains and Pedernal Hills, Torrance County; San Andres Mountains, Socorro, Sierra, and Dona Ana Counties; Fra Cristobal and Caballo Mountains, Sierra County; Organ Mountains, Dona Ana County; and Pajarito

Peak, Otero County.

Condie, K.C., see Budding, A.J., 1975

Coney, P.J., 1976, Structure, volcanic stratigraphy, and gravity across the Mogollon plateau, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 29-41
Briefly describes quartz latite, andesite, rhyolite, and latite of the Mogollon plateau.
Area: Mogollon-Datil volcanic province.

Coney, P.J., see Elston, W.E., and Rhodes, R.C., 1968; Elston, W.E., Damon, P.E., Rhodes, R.C., Smith, E.I., and Bikerman, M., 1973; Elston, W.E., Rhodes, R.C., and Deal, E.G., 1976

Conklin, N.M., see Staatz, M.H., and Adams, J.W., 1965

Cook, C.W., see Brookings, D.G., Chakoumakos, B.C., Ewing, R.C., Landis, G.P., and Register, M.E., 1979

Cookro, T.M., 1978, Petrology of Precambrian granitic rocks from the Ladron Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 86 p., 15 tables, 10 figs., 9 pls.
Describes the geology, petrography, and major element geochemistry of the granitic rocks in the Ladron Mountains. Includes modal and chemical analyses of the Capirote and Ladron quartz monzonite. Allanite, sphene, fluorite, calcite, and zircon occur as accessory minerals in the Capirote quartz monzonite.
Area: Ladron Mountans, Socorro County.

Corbitt, L.L., 1971, Structure and stratigraphy of the Florida Mountains, Luna County, New Mexico: Ph.D. thesis, Univ. New Mexico, 115 p., 1 table, 43 figs., 3 pls., scale 1:24,000
Describes granite, syenite, gabbro-anorthosite, diabase-diorite, and rhyolite. Includes estimated modal analyses of the syenite.
Area: Florida Mountains, Luna County.

Corbitt, L.L., see Brookins, D.G., and Rautman, C.A., 1978

Cordell, L., see Segerstrom, K., Stotelmeyer, R.B., and Williams, F.E., 1975

Corey, A.F., see Hilpert, L.S., 1955

Correa, B.P., 1980, Fluorine and lithophile element mineralization in the Black Range and Sierra Cuchillo, New Mexico, in Uranium mineralization in fluorine-enriched volcanic rocks, by D.M. Burt and M.F. Sheridan: U.S. Dept. Energy, Open-file Rept. GJBX-225 (80), p. 459-494, 5 tables, 9 figs., 2 appendices
Report discusses the results of quantitative analysis of phenocrysts, major and trace element (including U) whole-rock chemistry, determination of magma type and its origin, sources and controls of ore deposits, and the role of fluorine and pyroclastic rocks in uranium concentration. Includes discussions

on the volcanic geology, petrology, chemistry, petrogenesis, and tin deposits of the Taylor Creek Rhyolite in the Black Range. Also discusses uranium and beryllium mineralization near Apache Warm Springs and Iron Mountain, Sierra Cuchillo.
Area: Black and Cooke's Ranges, Sierra Cuchillo, Sierra County.

Craddock, C., see Schmidt, P.G., 1964

Crowley, R.J., see Gillerman, E.G., Swinney, C.M., Whitebread, D.H., and Kleinhampl, F.J., 1954

Crumpler, L.S., 1977, Alkali basalt-trachyte suite and volcanism, northern part of the Mount Taylor volcanic field, New Mexico: M.S. thesis, Univ. New Mexico, 131 p., 9 tables, 43 figs.
Describes and discusses three stages of volcanism: 1) alkalic basalt trachyte, 2) alkali basalt, and 3) porphyritic alkali basalt. Includes modal and chemical analyses of the igneous rocks.
Area: Mount Taylor, Cibola and McKinley Counties.

Cunningham, J.E., 1974, Geologic map and sections of Silver City quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 30, with text, scale 1:24,000
Geologic map shows the distribution of Tertiary rhyolite, latite, andesite, and dacite and Precambrian granite with aplite and pegmatite dikes. Shows occurrences of Fe, Mn, Cu, Pb, and Zn mineralization.
Area: Mogollon-Datil volcanic province, Grant County.

Curry, K.J., see Alminas, H.V., Watts, K.C., Griffitts, W.R., Siems, D.L., and Kraxberger, V.E., 1975

Dale, V.B., and McKinney, W.A., 1960, Tungsten deposits of New Mexico: U.S. Bureau Mines, Rept. Inv. RI-5517, 72 p., 7 tables, 29 figs.
Brief to very detailed descriptions of the geology and tungsten potential of 30 tungsten deposits in Dona Ana, Grant, Hidalgo, Lincoln, Luna, Santa Fe, Sierra, Socorro, and Taos Counties. The majority of these deposits are small, discontinuous bodies of vein fillings or disseminated deposits. Exceptions include the Iron Mountain (Sierra County) and the Cunnington Hill deposits (Santa Fe County). Uranium may occur at these localities.
Area: Dona Ana, Grant, Hidalgo, Lincoln, Luna, Santa Fe, Sierra, Socorro, and Taos Counties.

Damon, P.E., see Deal, E.G., Elston, W.E., Erb, E.E., Petersen, S.L., Reiter, D.E., and Shafiqullah, M., 1978; Elston, W.E., Coney, P.J., Rhodes, R.C., Smith, E.I., and Bikerman, M., 1973; and Ratte, J.C., Landis, E.R., and Gaskill, D.L., 1969

Dane, C.H., 1948, Geologic map of part of eastern San Juan Basin, Rio Arriba County, New Mexico: U.S. Geol Survey, Oil and Gas Inv. Prelim. Map 78, with text, scale 1 inch = 1 mi
Geologic map shows the distribution of augite, andesite,

and lamprophyre dikes.
Area: San Juan Basin, Rio Arriba County.

Dane, C.H., and Bachman, G.O., 1961, Preliminary geologic map of the southwestern part of New Mexico: U.S. Geol. Survey, Misc. Geol. Inv. Map I-344, scale 1:380,160
Geologic map shows the distribution of rhyolites and andesites of the Datil Formation, Cretaceous syenodiorites, granodiorite, and granite, and Precambrian granite.
Area: Mogollon-Datil volcanic province.

Dane, C.H., and Bachman, G.O., 1965, Geological map of New Mexico: U.S. Geol. Survey, 2 sheets, scale 1:500,000
Area: Statewide.

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

Darton, N.H., and Burchard, E.F., 1911, Fluorspar near Deming, New Mexico: U.S. Geol. Survey, Bull. 470, p. 533-545, maps
Describes Precambrian granite and Tertiary monzonite porphyry. Fluorite veins cut the monzonite porphyry.
Area: Black and Cooke's Ranges, Luna County.

Davis, J.D., and Guilbert, J.M., 1973, Distribution of the radioelements potassium, uranium, and thorium in selected porphyry copper deposits: Econ. Geology, v. 68, p. 145-160, 1 table, 7 figs.
A study of the distribution of uranium, thorium, and potassium in the porphyry bodies at Santa Rita, New Mexico (among other porphyry bodies in Arizona). Uranium and thorium show a symmetrical outwardly increasing zonation. The range in uranium concentration is 0.3-4.7 ppm. Includes a brief discussion of the geology and alteration of the granodiorite stock at Santa Rita. It may be possible that uranium and thorium increase in concentration further outward from the area of this report.
Area: Mogollon-Datil volcanic province, Grant County.

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

Deal, E.G., 1973, Geology of the northern part of the San Mateo Mountains, Socorro County, New Mexico--a study of a rhyolite ash-flow tuff cauldron and the role of laminar flow in ash-flow tuffs: Ph.D. thesis, Univ. New Mexico, 136 p., 1 table, 38 figs., map
Describes the geology of the northern San Mateo Mountains including the Mt. Withington cauldron. Includes petrographic descriptions and chemical analyses of volcanic rocks, including several high SiO_2 and K_2O rocks.
Area: San Mateo Mountains, Socorro County.

Deal, E.G., Elston, W.E., Erb, E.E., Peterson, S.L., Reiter, D.E., Damon, P.E., and Shafiqullah, M., 1978, Cenozoic volcanic geology of the Basin and Range province in Hidalgo County, southwestern New Mexico, in Land of Cochise (southwestern Arizona): New Mexico Geol. Soc., Guidebook 29th field conf., p. 219-229, 1 table, 5 figs.

Describes the volcanic geology of Apache Hills, Pyramid Mountains, Coyote Hills, Alamo Hueco Mountains, Animas Mountains, and Peloncillo Mountains. Includes potassium concentrations.

Area: Pyramid, Animas (including the Alamo Hueco Mountains), and Peloncillo Mountains, Hidalgo County.

Deal, E.G., and Rhodes, R.C., 1976, Volcano-tectonic structures in the San Mateo Mountains, Socorro County, New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 51-56, 2 tables, 5 figs.

Describes Vicks Peak Rhyolite, Springtime Canyon quartz latite, rhyolite, and the Spears, Hells Mesa, A.L. Peak, Potato Canyon, and Bear Trap Canyon formations. Includes some modal analyses.

Area: San Mateo Mountains, Socorro County.

Deal, E.G., see Elston, W.E., and Erb, E.E., 1979; and Elston, W.E., Rhodes, R.C., and Coney, P.J., 1976

Della Valle, R.S., see Bornhorst, T.J., Elston, W.E., and Balagna, J.P., 1980; and Brookins, D.G., 1977

Denison, R.E., and Hetherington, E.A., Jr., 1969, 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 tables, 3 figs.

Briefly describes the geology and lithology of the igneous rocks (diabasic) of Franklin Mountains, granite and syenite, Pajarito Peak, and various subsurface occurrences.

Area: Franklin Mountains, Dona Ana County; Pajarito Peak, Otero County.

Denison, R.E., see Muehlberger, W.R., 1964

Dickson, R.E., see May, R.T., Smith, E.S., and Nystrom, R.J., 1981

Disbrow, A.E., and Stoll, W.C., 1957, Geology of the Cerrillos area, Santa Fe County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 48, 73 p., 2 tables, 8 figs., 5 pls., scale 1:31,680

Briefly describes monzonite, syenite-trachyte, and limburgite. Discusses the geology and alteration associated with lead-zinc mineralization.

Area: Ortiz Mountains, Santa Fe County.

Dobson, P.F., see Wobus, R.A., 1981

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

Area: Tusas Mountains, Rio Arriba County.

Donze, M.A., 1980, Geology of the Squaw Peak area, Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file

Rept. 123, 131 p., 21 figs., 2 pls., 3 appendices, scale 1:24,000
Describes and maps the volcanic rocks from two or possibly three overlapping cauldrons (North Baldy, Magdalena, and unnamed cauldrons). Rhyolitic domes and intrusives are exposed throughout the area. Describes the prophylitic alteration and manganese, quartz, calcite, and silver mineralization.
Area: Magdalena Mountains, Socorro County.

Dotterer, F.E., see Templain, C.L., 1978; and Vizcaino, H.P., and O'Neill, A.J., 1978

Doyle, J.C., 1951, Geology of the northern Caballo Mountains, Sierra County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 51 p., 3 figs., 19 pls., scale 1:31,680
Describes Precambrian granite and pegmatite dikes and fluorite fissure veins. Describes fluorite prospects and mines.
Area: Caballo Mountains, Sierra County.

Drewes, H., and Thorman, C.H., 1980, Geologic map of the Steins quadrangle and the adjacent part of the Vanar quadrangle, Hidalgo County, New Mexico: U.S. Geol. Survey, Misc. Inv. Series I-1220, scale 1:24,000
Maps Tertiary volcanic and intrusive rocks including rhyolite porphyry, quartz veins, rhyolite of Steins, quartz monzonite, quartz latite, and rhyolitic intrusive breccia. A Precambrian granodiorite porphyry also is exposed in this area.
Area: Peloncillo Mountains, Hidalgo County.

Drewes, H., see Thorman, C.H., 1978a,b, and 1979

DuChene, H.R., see Woodward, L.A., and Martinez, R., 1977; 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., 1935, The geology of the Organ Mountains, with an account of the geology and mineral resources of Dona Ana County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 11, 272 p., 21 figs., 14 pls., scale 1:62,500
Describes Precambrian granite, diorite, and epidiorite dikes and Tertiary monzonite, quartz monzonite, aplite, rhyolite, and andesite. Discusses pegmatite and vein deposits. Includes some modal and chemical analyses.
Area: Organ, San Andres, Franklin, Dona Ana, and Caballo Mountains, Dona Ana County.

Duschatko, R.W., and Poldervaart, A., 1955, Spilitic intrusion near Ladron Peak, Socorro County, New mexico: Geol. Soc. America, Bull., v. 66, p. 1,097-1,108, 3 tables, 5 figs., 1 pl.
Describes the highly altered spilitic basaltic to doleritic rocks. These rocks are associated with leucocratic albitites. Discusses the mineralogy, petrology, and alteration of these rocks. Includes modal, major-element, and spectrographic analyses.
Area: Ladron Mountains, Socorro County.

Dyer, B.C. (compiler), 1953, The Black Hawk mining district: New Mexico Bureau Mines Mineral Resources, open-file rept., 115 p.

A collection of geological information, correspondence, and newspaper articles concerning the mineralization in the Black Hawk mining district--an uranium deposit in Grant County.

Area: Burro Mountains, Grant County.

Eaton, G.P., see Ericksem G.E., Wedow, H., Jr., and Leland, G.R., 1970; and Ratte, J.C., Gaskill, D.L., and Peterson, D.L., 1974; Ratte, J.C., Landis, E.R., Gaskill, D.L., and Raabe, R.G., 1967

Eddy, A., see Laughlin, A.W., 1977

Edwards, C.L., 1975, Terrestrial heat flow and crustal radioactivity in northeastern New Mexico and southeastern Colorado: Ph.D. thesis, New Mexico Inst. Mining and Tech., 100 p., 9 tables, 23 figs., 4 appendices

Includes uranium, thorium, and potassium chemical analyses for seven areas within the state:

Ruby Mountain monzonite	1.95 ppm U	5.41 ppm Th
Questa #1 granite	13.02 ppm U	31.71 ppm Th
Questa #2 granite	13.61 ppm U	25.07 ppm Th
Los Alamos granite	0.92 ppm U	15.95 ppm Th
San Pedro #3 monzonite	2.51 ppm U	10.95 ppm Th
San Pedro #4 monzonite	3.99 ppm U	12.02 ppm Th
Sierra Blanca monzonite	9.97 ppm U	28.65 ppm Th
Animas Peak granite	5.18 ppm U	14.5 ppm Th
Orogrande granodiorite	1.96 ppm U	7.37 ppm Th

Area: Sangre de Cristo and Ortiz Mountains, northeastern New Mexico.

Elevatorski, E.A., 1977, Uranium ores and minerals: Minobras, California, 89 p., 8 figs., 1 pl.

Includes good descriptions of uranium and uranium-bearing minerals and lists several localities for each description.

Area: Statewide.

Elston, W.E., 1955, Volcanic succession and possible mineralization in the Dwyer quadrangle, southwestern New Mexico (abs.): Geol. Soc. American, Bull., v. 66, p. 1,553; Econ. Geology, v. 50, p. 773

Briefly describes the Tertiary volcanics of the calc-alkaline suite (andesites, latites, and rhyolites). Mentions possible fluorite mineralization in the lower sediments covered by the volcanics.

Area: Black and Cooke's Ranges, Grant, Sierra, and Luna Counties.

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

Discusses the geology and petrology of Tertiary andesites,

latites, rhyolites, granodiorites, and monzonite. Includes chemical analyses and describes the geology of fluorspar mines.
Area: Black and Cooke's Ranges, Grant, Luna, and Sierra Counties.

Elston, W.E., 1960, Reconnaissance geologic map of Virden 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 15, scale 1:126,720
Geologic map shows the distribution of the Tertiary rhyolite, andesite, latite, and Precambrian granite. Locates uranium mines and occurrences of the Black Hawk mining district within the mapped area.
Area: Mogollon-Datil volcanic province and Burro Mountains, Grant and Hidalgo Counties.

Elston, W.E., 1961, Mineral resources of Bernalillo, Sandoval, and Santa Fe Counties, New Mexico (exclusive of oil and gas), in Albuquerque country: New Mexico Geol. Soc., Guidebook 12th field conf., p. 155-167
Summarizes the mineral resources of Bernalillo, Sandoval, and Santa Fe Counties. Mentions that uranium was mined from the La Bajada district where the mineralization follows a fault cutting a Miocene limburgite.
Area: Sangre de Cristo, Sandia, Jemez, Nacimiento, and Ortiz Mountains, Bernalillo, Sandoval, and Santa Fe Counties.

Elston, W.E., 1964, Orogenesis and periods of mineralization in ten selected mining districts, southwestern New Mexico (abs.): Geol. Soc. America, Spec. Paper 76, p. 272
Divides ore deposits into four periods: 1) Precambrian radioactive pegmatites (Gold Hill district), 2) porphyry copper deposits (contact metasomatic and base-metal sulfide vein deposits), 3) middle to late Tertiary vein deposits contemporaneous with rhyolite flows, and 4) late Tertiary to Quaternary epithermal fluorite and psilomelane veins related to hot springs (Doubtful fluorspar mine, Animas Mountains).
Area: Mogollon-Datil volcanic province, and Animas, Pyramid, and Burro Mountains, Hidalgo and Grant Counties.

Elston, W.E., 1965, Mining districts of Hidalgo County, New Mexico, in Southwestern New Mexico II: New Mexico Geol. Soc., Guidebook 16th field conf., p. 210-214, 3 tables, 1 fig.
Mentions the occurrence of uraniferous opal veins in volcanic rocks in the Antelope Wells district and radioactive minerals in Precambrian pegmatites of the Gold Hill district, Burro Mountains. Briefly describes these and other mining districts in Hidalgo County.
Area: Animas, Pyramid, Hatchet, and Burro Mountains, Hidalgo County.

Elston, W.E., 1967, Summary of the mineral resources of Bernalillo, Sandoval, and Santa Fe Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 81, 81 p., 13 tables, 2 pls., scale 1 inch = 15 mi
Discusses the geology and mineralization of the mining

districts in Bernalillo, Sandoval, and Santa Fe Counties. Includes a discussion of the La Bajada district and describes the fluorite mineralization.

Area: Ortiz, Sandia, Jemez, Nacimiento, Sangre de Cristo, and Manzano Mountains, Bernalillo, Sandoval, and Sante Fe Counties.

Elston, W.E., 1970, Volcano-tectonic control of ore deposits, southwestern New Mexico, in Tyrone-Big Hatchet Mountains-Florida Mountains region (southwestern New Mexico): New Mexico Geol. Soc., Guidebook 21st field conf., p. 147-153, 4 figs.

Proposes the theory that hypogene ore deposits are related to volcano-tectonic structures. Mentions the occurrence of uranium in Precambrian pegmatites at Gold Hill.

Area: Mogollon-Datil volcanic province, Burro Mountains, Grant and Hidalgo Counties.

Elston, W.E., 1974, Some guides to mineralization in Hidalgo County, New Mexico (abs.), in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 378

Possible locations of mineralization include: 1) Lordsburg granodiorite stock, 2) Johnny Bull fault zone, San Simon district, 3) rhyolite dikes and plugs in the Fremont district, 4) composite stock in the west-central portion of the Pyramid Mountains, 5) altered andesites in Steins Pass area, 6) felsite dikes in the San Simon, Fremont, and Apache No. 2 districts, 7) rhyolite vents associated with base-metal, precious-metal, and fluorspar veins in the Kimball and Gillespie districts, and 8) border faults of the Animas Valley which control manganese and fuorspar veins formed under hot-spring conditions.

Area: Animas, Peloncillo, Hatchet, and Pyramid Mountains, Hidalgo County.

Elston, W.E., 1976, Glossary of stratigraphic terms of the Mogollon-Datil volcanic province, New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 131-144

Includes brief descriptions of each of the 135 stratigraphic units in the Mogollon-Datil volcanic province. Includes area of occurrence, rock type, thickness, stratigraphic position, and source of the eruption.

Area: Mogollon-Datil volcanic province.

Elston, W.E., 1978, Mid-Tertiary cauldrons and their relationship to mineral resources, southwestern New Mexico--a brief review, in Field guide to selected cauldrons and mining districts of the Mogollon-Datil volcanic field, New Mexico: New Mexico Geol. Soc., Spec. Pub. 7, p. 107-113, 1 table, 4 figs.

Briefly discusses the formation of cauldrons, cauldron complexes, and ore deposits. Mentions that calc-alkaline cauldrons tend to be associated with copper, lead, and zinc deposits; while high-silica rhyolite cauldrons tend to be associated with molybdenum, tin, and beryllium. Uranium tends to be associated with siliceous volcanic centers.

Area: Mogollon-Datil volcanic province.

Elston, W.E., Coney, P.J., and Rhodes, R.C., 1968, A progress report on the Mogollon plateau volcanic province, southwestern New Mexico: Colorado School Mines, Quart., v. 63, no. 3, p. 261-287, 1 table, 6 figs.

Briefly describes three sequences of volcanic rocks in the Mogollon plateau: 1) Datil Formation (29-38 m.y. ago), including Datil-age rocks, 2) Apache Spring Quartz Latite-Bloodgood Canyon Rhyolite (23-27.5 m.y.), and 3) Deadwood Gulch Rhyolite Tuff. Chemical studies show that each ash-flow sequence is, on the average, more felsic than the preceding one. Includes partial analyses of the La Jara Peak Basalt and the Bear Springs Basalt and discusses local mineralization (gold, silver, tellurium, tin, and tungsten) and widespread alteration.

Area: Mogollon-Datil volcanic province.

Elston, W.E., Damon, P.E., Coney, P.J., Rhodes, R.C., Smith, E.I., and Bikerman, M., 1973, Tertiary volcanic rocks, Mogollon-Datil province, New Mexico and surrounding region--K-Ar dates, patterns of eruption, and periods of mineralization: Geol. Soc. America, Bull., v. 84, p. 2,259-2,274, 5 figs.

Discusses three major overlapping volcanic cycles consisting of lava flows of andesitic to rhyolitic composition, ash flow tuffs (ignimbrite), and basaltic andesite and associated calc-alkaline suite. Includes maps and ages of the volcanics. Fluorspar is associated with manganese mineralization.

Area: Mogollon-Datil volcanic province.

Elston, W.E., and Erb, E.E., 1977, Cenozoic volcano-tectonic setting of KCM No. 1 Forest Federal Well, Animas Mountains, Hidalgo County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 152, p. 53-62, 5 figs.

Brief summary of the Cenozoic volcano-tectonic setting of the north-central Animas Mountains. The Juniper cauldron has been recognized in this area.

Area: Animas Mountains, Hidalgo County.

Elston, W.E., Erb, E.E., and Deal, E.G., 1979, Tertiary geology of Hidalgo County, New Mexico: New Mexico Geology, v. 1, no. 1, p. 1-6, 5 figs.

A preliminary report on the economic geology of the Tertiary cauldrons in Hidalgo County. Metallic minerals include copper, lead, zinc, gold, silver, and tungsten. Includes a correlation chart of Cenozoic igneous rocks found in Hidalgo County. Shows occurrences of fluorite veins in the Peloncillo and Animas Mountains. Shows the occurrences of uranium in the Alamo Hueco Mountains and the Fremont district.

Area: Animas, Peloncillo, Pyramid, and Hatchet Mountains, Hidalgo County.

Elston, W.E., Rhodes, R.C., Coney, P.J., and Deal, E.G., 1976, Progress report on the Mogollon plateau volcanic field, southwestern New Mexico, No. 3--surface expression of a pluton, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 3-28, 2 tables, 18 figs.

Discusses three overlapping suites of volcanism: 1) calc-alkalic andesite to rhyolite, 2) high-silica rhyolite, and 3) basalt and calc-alkali basaltic andesite. Includes variation diagrams.
Area: Mogollon-Datil volcanic province.

Elston, W.E., Rhodes, R.C., and Erb, E.E., 1976, Control of mineralization by mid-Tertiary volcanic centers, southwestern New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 125-130, 5 figs.
Describes calc-alkalic andesite, felsitic tuff, and high-silica rhyolite. Discusses copper, zinc, lead, silver, fluorite, tin, molybdenum, and beryllium mineralization.
Area: Mogollon-Datil volcanic province.

Elston, W.E., and Snider, H.I., 1964, Differentiation and alkali metasomatism in dike swarm complex and related igneous rocks near Capitan, Lincoln County, New Mexico, in Ruidoso country: New Mexico Geol. Soc., Guidebook 15th field conf., p. 140-147, 2 tables, 4 figs.
Briefly describes seven different dikes, includes texture and alteration descriptions and mineral contents. Briefly describes the Carrizo Mountain intrusive and surrounding dikes and sills, and the Sierra Blanca volcanic complex.
Area: Lincoln County porphyry belt.

Elston, W.E., see Bornhorst, T.J., and Erb, E.E., 1976; Bornhorst, T.J., Della Valle, R.S., and Balagna, J.P., 1980; Brookings, D.G., and Eppler, D., 1977; Carten, R.B., Silberman, M.L., and Armstrong, A.K., 1974; and Deal, E.G., Erb, E.E., Petersen, S.L., Reiter, D.E., Damon, P.E., and Shafiqullah, M., 1978

Enz, R.D., 1974, Geochemistry and petrology of the orbicular rocks, Sandia Mountains, New Mexico: M.S. thesis, Univ. New Mexico, 73 p., 1 table, 42 figs.
Describes monzonite and granite. Includes modal and chemical analyses with variation diagrams.
Area: Sandia Mountains, Bernalillo and Sandoval Counties.

Enz, R.D., Kudo, A.M., and Brookins, D.G., 1979, Igneous origin of the orbicular rocks of the Sandia Mountains, New Mexico: Geol. Soc. America, Bull., v. 90, pt. II, p. 349-380, 1 table, 1 fig.
Presents chemical and petrographical information which suggests that the orbicular rocks in the Sandia Mountains are igneous in origin.
Area: Sandia Mountains, Bernalillo County.

Enz, R.D., Kudo, A.M., and Brookins, D.G., 1980, Igenous origin of the orbicular rocks of the Sandia Mountains, New Mexico--Reply: Geol. Soc. America, Bull., v. 91, p. 246-247
A reply to Thompson and Giles (1980) concerning the authors' article (1979) presenting an igneous origin to the orbicular rocks of the Sandia Mountains instead of a metasomatic origin as presented by Thompson and Giles (1980). Refutes many of Thompson and Giles' (1980) arguments and concludes that an igneous origin

is a possibility although a metasomatic origin cannot be completely ruled out.
Area: Sandia Mountains, Bernalillo County.

Eppler, D., see Brookins, D.G., and Elston, W.E., 1977

Erb, E.E., 1978, Evolution of mid-Tertiary ash-flow tuff cauldrons in the Animas, southern Peloncillo, and Guadalupe Mountains, Hidalgo County, New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 10, p. 104-105
Area: Animas and Peloncillo Mountains, Hidalgo County.

Erb, E.E., see Bornhorst, T.J., and Elston, W.E., 1976; Deal, E.G., Elston, W.E., Petersen, S.L., Reiter, D.E., Damon, P.E., and Shafiqullah, M., 1978; Elston, W.E., 1977; and Elston, W.E., and Deal, E.G., 1979; and Elston, W.E., and Rhodes, R.C., 1976

Ericksen, G.E., and Wedow, H., Jr., 1976, Tertiary extrusive sheets and related intrusions in the Black Range, New Mexico, in Cenozoic--Volcanism in southwestern New Mexico: New Mexico Geol. Soc. Spec. Pub. 5, p. 63-67, 1 table, 4 figs.
Describes quartz latite, rhyolite porphry dikes and plugs, felsitic rhyolite, and tin-bearing rhyolite.
Area: Black Range, Sierra, Grant, and Catron Counties.

Ericksen, G.E., Wedow, H., Jr., Eaton, G.P., and Leland, G.R., 1970, Mineral resources of the Black Range primitive area, Grant, Sierra, and Catron Counties, New Mexico: U.S. Geol. Survey, Bull. 1319-E, 162 p., 7 tables, 16 figs., 2 pls., with aeromagnetic interpretation
Describes the Datil Formation. Includes major- and minor- (Ba, Be, Cu, Mo, Sn, Sr, V, Ti) element analyses.
Area: Black Range, Sierra, Grant, and Catron Counties.

Erickson, R.L., see Gott, G.B., 1952

Everett, F.D., 1964, Reconnaissance of tellurium resources in Arizona, Colorado, New Mexico, and Utah: U.S. Bureau Mines, Rept. Inv. RI-6350, 38 p., 3 tables, 4 figs., 4 appendices
Describes the geology and occurrence of tellurium in southwestern United States, including New Mexico. Reports the lack of tellurium at several uranium mines in New Mexico. Describes the ecology and mineralogy of several occurrences of tellurium in New Mexico; Hilltop and Memphis mines, Organ Mountains, Dona Ana County, and the Lone Pine mine, Catron County. Includes a map of the states of Arizona, Colorado, New Mexico, and Utah showing principal areas of tellurium investigations and a table listing properties sampled and tellurium and selenium determinations.
Area: Mogollon-Datil volcanic province, Organ Mountains.

Everett, F.I., 1953, Metal and nonmetal mineral resources in Mora County, New Mexico: U.S. Geol. Survey, open-file rept., 12 p., 4 tables, 3 figs.
Includes descriptions of potential and reserves of fluorite

veins intruding Precambrian granite in Mora County.
Area: Sangre de Cristo Mountains, Mora County.

Everhart, D.L., 1956, Uranium-bearing vein deposits in the United States, in Geology of uranium and thorium: U.N. Internat. Conf. Peaceful uses Atomic Energy, 1st Proc., Geneva, Aug. 8-20, 1955, v. 6, p. 257-264, 2 tables, 1 fig.
Describes and classifies uranium-bearing vein deposits in the United States. Includes a table listing uranium-bearing vein deposits, with seven deposits in New Mexico: 1) Pitchblende strike, Sierra County, 2) Merry Widow mine, Grant County, 3) Tusas Mountains, Rio Arriba County, 4) Plainview prospect, Sierra County, 5) Antelope Wells district, Hidalgo County, 6) San Acacia mine, Socorro County, and 7) Black Hawk mine, Grant County.
Area: Burro Mountains, Grant County; Mogollon-Datil volcanic province, Sierra, Hidalgo, and Socorro Counties; Tusas Mountains, Rio Arriba County.

Everhart, D.L., 1957, Uranium-bearing veins in the U.S., in Contributions to the geology of uranium and thorium: U.S. Geol. Survey, Prof. Paper 300, p. 97-104, 2 tables, 1 fig.
Briefly describes eight uranium-bearing vein deposits in New Mexico: 1) Black Hawk mine, Burro Mountains, Grant County where uraninite is associated with cobalt, nickel, and base-metal sulfides, 2) a pitchblende deposit in Sierra County where uraninite and uranophane occur within andesite and brecciated chert, 3) Merry Widow mine, Burro Mountains, Grant County where autunite and torbernite occur within Precambrian granite and diabase, 4) Tusas Mountains, Rio Arriba County where uraninite occurs within the Tusas granite, 5) Plainview prospects, Sierra County where uraninite is associated with galena, fluorite, and chlorite in granite, 6) Antelope Wells, Hidalgo County where uraniferous opal occurs in quartz veins, 7) San Acacia, Socorro County where uranium minerals occur within intermediate volcanic flows, and 8) Black Hawk mine, Burro Mountans, Grant County where pitchblende occurs with sulfides in porphyritic biotite gneiss.
Area: Burro Mountains, Grant County; Tusas Mountains, Rio Arriba County; Mogollon-Datil volcanic province, Hidalgo, Socorro, and Sierra Counties.

Ewing, R.C., see Jahns, R.H., 1976 and 1977; and Brookins, D.G., Chakoumakos, B.C., Cook, C.W., Landis, G.P., and Register, M.E., 1979

Fallis, J.F., Jr., 1958, Geology of the Pedernal Hills area, Torrance County, New Mexico: M.S. thesis, Univ. New Mexico, 50 p., 3 figs., 2 pls., 4 sheets, scale 1:63,360
Area: Pedernal Hills, Torrance County.

Farkas, S.E., 1969, Geology of the southern San Mateo Mountains, Socorro and Sierra Counties, New Mexico: Ph.D. thesis, Univ. New Mexico, 137 p., 5 tables, 18 figs., 18 pls.
Area: San Mateo Mountains, Socorro and Sierra Counties.

Feinberg, H.B., 1969, Geology of the central portion of the Sandia Mountains, Bernalillo County, New Mexico: M.S. thesis, Univ. New Mexico, 127 p., 4 tables, 4 figs., 12 pls., scale 1 inch = 2,000 ft
Describes granite, aplite, lamprophyre dikes, and granite porphyry.
Area: Sandia Mountains, Bernalillo County.

Ferguson, H.G., 1920, The Mogollon district, New Mexico: U.S. Geol. Survey, Bull. 715, p. 171-204, 7 figs., scale 1:24,000
Describes Tertiary andesite porphyry, rhyolite, andesite, dacite, and latite. Includes partial chemical analyses (SiO_2, CuO, K_2O, Na_2O) of rhyolite and latite. Fluorite occurs as a gangue mineral in some of the ore deposits.
Area: Mogollon-Datil volanic province, Catron County.

Ferguson, H.G., 1927, Geology and ore deposits of the Mogollon mining district, New Mexico: U.S. Geol. Survey, Bull. 787, 100 p., 5 figs., 25 pls., 2 sheets, scale 1:62,500 and 1:12,000
Describes rhyolite, latite, andesite, and quartz latite. Describes silver-quartz veins and copper deposits and reports the occurrence of fluorite.
Area: Mogollon-Datil volcanic province, Catron County.

Ferris, C.S., and Ruud, C.O., 1971, Brannerite--its occurrences and recognition by microprobe: Colorado School Mines, Quart., v. 66, no. 4, p. 1-35, 3 tables, 8 figs.
Mentions two occurrences of brannerite in New Mexico: 1) Truth or Consequences in a Precambrian shear zone in schist and granite and 2) White Signal, Grant County in a hydrothermal disseminated porphyry copper prospect. Includes microprobe analyses of brannerite from White Signal and basic geological description of disseminated grains of brannerite in rhyolitic porphyry at White Signal (p. 19-21).
Area: Burro and Caballo Mountains, Grant and Sierra Counties.

File, L., and Northrop, S.A., 1966, County, township, and range locations of New Mexico's mining districts: New Mexico Bureau Mines Mineral Resources, Circ. 84, 66 p., 2 tables, 2 figs.
A listing of the locations and major commodities of the mining districts in New Mexico by county.
Area: Statewide.

Finnell, T.L., 1976a, Geologic map of the Twin Sisters quadrangle, Grant County, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-779, scale 1:24,000
Geologic map showing the distribution of Tertiary rhyolite, latite, andesite, quartz latite, felsite dikes, quartz monzonite, and syenodiorite to monzonite in the Twin Sisters 7 1/2-min quadrangle.
Area: Mogollon-Datil volcanic province, Grant County.

Finnell, T.L., 1976b, Geologic map of the Reading Mountain 7 1/2-min quadrangle, Grant County, New Mexico: U.S. Geol. Survey, Misc.

Field Studies Map MF-800, scale 1:24,000
Geologic map showing the distribution of rhyolite, quartz latite, carbonate breccia, quartz monzonite, syenodiorite, andesite, and Precambrian granite in the Reading Mountain quadrangle.
Area: Mogollon-Datil volcanic province, Grant County.

Fishback, M., 1910, The Black Range mining district, New Mexico: Eng. Mining Jour., v. 89, p. 911-912
Discusses the geology of gold, silver, and quartz vein deposits cutting rhyolites and andesites on the east slope of the Black Range.
Area: Black Range, Sierra County.

Fisher, D.L., see Jahns, R.H., McMillan, D.K., and O'Brient, J.D., 1978

Fitzsimmons, J.P., 1961, Precambrian rocks of the Albuquerque country, in Albuquerque country: New Mexico Geol. Soc., Guidebook 12th field conf., p. 90-96
Brief summary of Precambrian rocks of the Albuquerque area. Mentions the occurrence of metarhyolite, gray and red granite, pegmatites, aplite dikes, and lamprophyres.
Area: Sandia, Manzanita, Manzano, Nacimiento, and Zuni Mountains, Bernalillo, Valenica, Cibola, and Sandoval Counties.

Fitzsimmons, J.P., 1967, Precambrian rocks of the Zuni Mountains, in Defiance-Zuni-Mount Taylor region (Arizona and New Mexico): New Mexico Geol. Soc., Guidebook 18th field conf., p. 119-121, 1 fig.
Briefly describes the geology, petrology, and occurrences of Precambrian granite, leucogranite, and gneissic granite. Mentions the occurrence of fluorite in fracture zones in the Precambrian rocks.
Area: Zuni Mountains, Cibola County.

Fitzsimmons, J.P., 1973, Tertiary igneous rocks of the Navajo country, Arizona, New Mexico, and Utah, in Monument Valley (Arizona, Utah, and New Mexico): New Mexico Geol. Soc., Guidebook 24th field conf., p. 106-113, 4 figs.
Briefly describes alkalic igneous dikes and plugs throughout the southern San Juan Basin. These igneous rocks include hornblende gabbro, minettites, and diatremes.
Area: San Juan Basi, San Juan and McKinley Counties.

Flege, R.F., Jr., 1959, Geology of Lordsburg quadrangle, Hidalgo County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 62, 36 p., 2 tables, 2 figs., 10 pls., scale 1:62,500
Describes and maps Tertiary granodiorite stock, pyroxene andesite, monzonite stock, rhyolite tuff-breccias, flows and tuffs, dikes and plugs. Copper, gold, silver, lead, and zinc veins and several fluorite veins are reported throughout the Pyramid Mountains.
Area: Pyramid Mountains, Hidalgo County.

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

Fodor, R.V., 1975, Petrology of basalt and andesite of the Black Range, New Mexico: Geol. Soc. America, Bull., v. 86, p. 295-304, 7 figs.
Includes petrographic descriptions, modal, and major-element analyses of basalt, basaltic andesite, and andesite. Includes sample descriptions and sample localities.
Area: Black Range, Catron, Sierra, and Grant Counties.

Fodor, R.V., 1976, Volcanic geology of the northern Black Range, New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 68-70, 1 table, 1 fig.
Describes andesite, quartz latite, siliceous lava, and tin-bearing rhyolite. Includes norms and chemical analyses.
Area: Black Range, Sierra County.

Foran, J.F., and Perhac, R.M., 1954, Investigation of radioactivity at the Kennecott Copper Corporation's Chino mine, Santa Rita, New Mexico: U.S. Atomic Energy Comm., Rept. RME-1047, 9 p., 2 tables, 2 figs.
Reconnaissance report investigating the radioactive anomalies on several benches of the Chino mine. A total of 24 rock samples and three solution samples indicated that the uranium concentration was too low at the time to warrant further investigation.
Area: Mogollon-Datil volcanic province, Grant County.

Foster, M., see White, D.L., 1981

Foster, R.W., and Stipp. T.F., 1961, 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
Includes state geologic map showing the distribution of granites, undifferentiated Precambrian rocks, and rhyolites. Includes text with brief descriptions of the Precambrian rocks.
Area: Statewide.

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

Freeland, R.E., see Collins, G.E., 1956

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

Fries, C., Jr., 1940, Tin deposits of the Black Range, Catron and Sierra Counties, New Mexico: U.S. Geol. Survey, Bull. 922-M, p. 355-370, 2 figs., 9 pls., 4 sheets, scale 1 inch = 1,000 ft, 1 inch = 2,000 ft
Briefly describes rhyolitic rocks of the Black Range. Tin occurs in stringers in altered and fractured parts of porphyritic rhyolite.
Area: Black and Cooke's Ranges, Catron and Sierra Counties.

Fries, C., Jr., Schaller, W.T., and Glass, J.J., 1942, Bixbyite and pseudobrookite from the tin-bearing rhyolite of the Black Range,

New Mexico: Am. Mineralogist, v. 27, p. 305-322, 2 figs.
Discusses the occurrence of bixbyite ($(Mn, Fe)_2O_3$) and pseudobrookite ($Fe_2O_3.TiO_2$) within the Black Range tin-bearing rhyolite. Fluorite and sphene occur with these minerals.
Area: Black and Cooke's Ranges, Sierra and Catron Counties.

Fullagar, P.D., and Shiver, W.S., 1973, Geochronology and petrochemistry of the Embudo Granite, New Mexico: Geol. Soc. America, Bull., v. 84, p. 2,705-2,712, 3 tables, 7 figs.
Describes three phases of the 1,673 m.y. old Embudo Granite: 1) biotite granite, 2) gneissic granite, and 3) granitic to pegmatitic leucogranite. An initial strontium ratio of 0.7012 indicates a mantle derivation. Nine major-element analyses indicates a calc-alkaline trend.
Area: Sangre de Cristo Mountains, Sandoval and Santa Fe Counties.

Fulp, M.S., and Woodward, L.A., 1981, Precambrian metallic mineralization in New Mexico: New Mexico Geology, v. 3, no. 3, p. 33-36, 41-42, 1 fig.
Briefly describes the known metallic mineral deposits of probable Precambrian age. Discusses lithologic framework, mineralization, and implications for exploration. Also includes a list of base or precious metal prospects in Precambrian host rocks. Mentions the occurrence of uranium in the Copper Hill-Copper Mountain district in the Picuris Range, Taos County. This paper is based only on a literature search.
Area: Statewide.

Furlow, J.W., 1965, Geology of the San Mateo Peak area, Socorro County, New Mexico: M.S. thesis, Univ. New Mexico, 83 p., 9 figs., 7 pls.
Describes Precambrian granite, Tertiary rhyolite, andesites, and monzonite. Discusses a vein of silver and gold with fluorite.
Area: San Mateo Mountains, Socorro County.

Gaal, R.A., <u>see</u> Motts, W.S., 1960

Gaskill, D.L., <u>see</u> Ratte, J.C., Eaton, G.P., and Peterson, D.L., 1974; Ratte, J.C., 1975; Ratte, J.C., Landis, E.R., and Damon, P.E., 1969; and Ratte, J.C., Landis, E.R., Raabe, R.G., and Eaton, G.P., 1967

Gibson, G.G., <u>see</u> Woodward, L.A., and McLelland, D., 1976

Gibson, T.R., 1981, Precambrian geology of the Burned Mountain-Hopewell Lake area, Rio Arriba County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 105 p., 5 tables, 40 figs., 1 pl., scale 1:12,000, 2 appendices
The rocks of the Moppin series, Burned Mountain metarhyolite, and the Kiowa Mountain Formation (Precambrian) are mapped and described in this report. Three stages of mineralization occur in the area: 1) replacement veins of pyrite, chalcopyrite, galena, sphalerite, and fluorite; 2) hydrothermal gold-bearing veins, and 3) placer gold deposits. Includes rock descriptions (appendix A), geochemical analyses, and a geologic map.

Area: Tusas Mountains, Rio Arriba County.

Giles, D.L., 1965, Some aspects of the Kneeling Nun rhyolite tuff, in Southwestern New Mexico II: New Mexico Geol. Soc., Guidebook 16th field conf., p. 164-174, 2 figs.
Summarizes the geology and petrology of the Datil Group and later rhyolites and latites.
Area: Mogollon-Datil volcanic province and Black and Cooke's Ranges, Grant County.

Giles, D.L., and Thompson, T.B., 1972, Petrology and mineralization of a molybdenum-bearing alkalic stock, Sierra Blanca, New Mexico: Geol. Soc. America, Bull., v. 83, p. 2,129-2,148, 12 figs.
Describes the geology, petrology, and chemistry of the Three Rivers stock. Includes three phases: 1) syenite porphyry, 2) nordmarkite, and 3) quartz syenite to alkali granite. Includes modal and major-element analyses and describes the alteration.
Area: Lincoln County porphyry belt.

Giles, D.L., see Thompson, T.B., 1974 and 1980

Gillerman, E.G., 1952a, Fluorspar deposits of Burro Mountains and vicinity, Grant County, New Mexico: U.S. Geol. Survey, Bull. 973-F, p. 261-288, 1 fig., 14 pl.
Briefly describes Precambrian granite, aplite, and pegmatite dikes, Tertiary diabase dikes, rhyolite, quartz monzonite, and granodiorite. Also, describes fluorspar deposits and prospects.
Area: Burro Mountains, Grant County.

Gillerman, E.G., 1952b, Uranium deposits in the Black Hawk district, Grant County, New Mexico (abs.): Geol. Soc. America, Bull., v. 63, p. 1,254; Am. Mineralogist, v. 38, p. 340 (1953); Econ. Geology, v. 47, p. 770 (1952)
Explains the geology and ore deposition of pitchblende associated with silver-nickel-cobalt mineralization in fissure veins.
Area: Burro Mountains, Grant County.

Gillerman, E.G., 1952c, Uranium deposits of the White Signal district, New Mexico (abs.): Geol. Soc. America, Bull., v. 63, p. 1,329
Describes the occurrence of uranium in fractures and disseminations in dike material at the White Signal district.
Area: Burro Mountains, Grant County.

Gillerman, E.G., 1953a, Fluorite deposits of Burro Mountains and vicinity, in Southwestern New Mexico: New Mexico Geol. Soc., Guidebook 4th field conf., p. 137-138
Describes the occurrence of vein fluorite in Precambrian granite and in Tertiary volcanics.
Area: Burro Mountains, Grant County.

Gillerman, E.G., 1953b, White Signal uranium deposits, New Mexico, in Southwestern New Mexico: New Mexico Geol. Soc., Guidebook 4th field conf., p. 133-137, 1 fig.
Includes the geology and description of the White Signal

district, Grant County. Uranium is found within rhyolitic dikes which intruded Precambrian granite.
Area: Burro Mountains, Grant County.

Gillerman, E.G., 1958, Geology of the central Peloncillo Mountains, Hidalgo County, New Mexico and Cochise County, Arizona: New Mexico Bureau Mines Mineral Resources, Bull. 57, 152 p., 2 tables, 1 fig., 14 pls., scale 1:48,000
Describes the geology and petrology of granite, quartz monzonite, latite porphyry, andesite, rhyolite, and ignimbrite. Mentions an occurrence of fluorite.
Area: Peloncillo Mountains, Hidalgo County.

Gillerman, E.G., 1964, Mineral deposits of western Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 83, 213 p., 3 tables, 34 figs., 11 pls., scale 1:126,720
Good geologic and petrographic descriptions of plutonic and volcanic rocks. Uranium mineralization is found in late Tertiary or Precambrian rocks and is associated with fluorite, gold, silver, nickel, cobalt, and manganese. Includes descriptions of Precambrian rocks. Includes geologic maps of the Big Burro Mountains (scale 1 inch = 1 mi), Merry Widow deposit (scale 1 inch = 200 ft), White Signal deposit (scale 1 inch = 2,000 ft), claim maps, and a mineral resource map.
Area: Burro Mountains, Grant County.

Gillerman, E.G., 1967, Structural framework and character of mineralization, Burro Mountains, New Mexico: Econ. Geology, v. 62, p. 370-375, 1 fig.
Divides the Burro Mountains into three geological and topographic provinces separated by faults: 1) Big Burro Mountains, 2) Mangas Valley, and 3) Little Burro Mountains. Briefly describes the Burro Mountain granite batholith and Tyrone stock (quartz monzonite). Two periods of mineralization occurred in the area: 1) an early base-metal mineralization (gold and silver included) and 2) late fluorspar deposits (including uranium and gold).
Area: Burro Mountains, Grant County.

Gillermam, E.G., 1968, Uranium mineralization in the Burro Mountains, New Mexico: Econ. Geology, v. 63, p. 239-246, 1 table, 3 figs.
Uranium mineralization is present and has been mined from two localities--the Bullard Peak and the White Signal districts. Mineralogy, mineral associations, geologic environment, and genesis differ significantly between the two areas. The uranium in the White Signal district occurs within an oxidized zone along fractures in altered granite and diabase dikes and as disseminations in the altered diabase. Three types of uranium-bearing veins are discussed: 1) quartz and pyrite with gold and chalcopyrite, 2) quartz-specularite, and 3) silver and silver-lead veins. The uranium in the Black Hawk district occurs as uraninite within silver veins containing nickel and cobalt in gneissic quartz diorite, granite, or monzonite porphyry. Includes P_2O_5 analyses.
Area: Burro Mountains, Grant County.

Gillerman, E.G., 1970, Mineral deposits and structural patterns of the Big Burro Mountains, in Tyrone-Big Hatchet Mountains-Florida Mountains region (southwestern New Mexico): New Mexico Geol. Soc., Guidebook 21st field conf., p. 115-122, 1 fig.

Describes quartz diorite, Shrine Granite, Burro Mountain granite, rhyolite, quartz monzonite, and monzonite. Base-metal and gold-fluorite mineralization occur in the Big Burro Mountains.

Area: Burro Mountains, Grant County.

Gillerman, E.G., and Granger, H., 1952, The Hines and Langford uraniferous fluorspar prospects, Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept. TEM-120, 15 p., 1 table, 4 figs.

Reconnaissance report describing the geology and mineralization of the uraniferous fluorspar deposits at the Hines and Langford prospects, White Signal district. Includes geologic maps of both prospects and concludes that both areas are too low grade and too small to be of commercial interest.

Area: Burro Mountains, Grant County.

Gillerman, E.G., Swinney, C.M., Whitebread, D.H., Crowley, R.J., and Kleinhampl, F.J., 1954, Geologic map of the central part of the White Signal district, Grant County, New Mexico: U.S. Geol. Survey, open-file rept., scale 1 inch = 1,000 ft

Geologic map showing the distribution of Tertiary and Cretaceous rhyolite dikes, andesites, dacites, quartz monzonite porphyry, monzonite porphyry, latite, quartz latite, rhyolite, diabase, and Precambrian granite. Also, shows the location of uranium pits, prospects, and shafts.

Area: Burro Mountains, Grant County.

Gillerman, E.G., and Whitebread, D.H., 1954, Geologic map of the Black Hawk mining district, Grant County, New Mexico: U.S. Geol. Survey, open-file rept., scale 1 inch = 500 ft

Geologic map showing the distribution of andesite, quartz diorite, monzonite porphyry, quartz monzonite, rhyolite, diabase, syenite, and diorite. Also, shows the locations of uranium veins and mines.

Area: Burro Mountains, Grant County.

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

Describes the geology, petrology, and ore deposits of the Black Hawk district, Grant County, New Mexico. Detailed descriptions, geologic maps, and sections of the mines are included. Precambrian granite diorite gneiss intrudes schist, monzonite, and quartz monzonite. Younger diorite, granite, diabase, monzonite porphyry, and andesite intrude the Precambrian rocks. Pitchblende, silver, argentite, nickel, and cobalt minerals occur in veins cutting the quartz diorite gneiss. Chemical analyses from samples of the vein material range from 0.07 to 0.24% U_3O_8.

Area: Burro Mountains, Grant County.

Gillerman, E.G., see Granger, H.C., Bauer, H.L., Jr., and Lovering, T.G., 1952

Gilluly, J., 1965, Volcanism, tectonism, and plutonism in the western United States: Geol. Soc. America, Spec. Paper 80, 69 p., 7 figs., appendix

Briefly discusses and describes volcanism throughout the western United States, including volcanism in New Mexico during the Cretaceous (andesite and basalts), Eocene (rhyolites and andesites), Neogene (basalts, andesites, rhyolites, latites, Datil Formation), and Miocene (granitic intrusives near Hachita). Includes an appendix summarizing the volcanic history of the western United States.

Area: Mogollon-Datil volcanic province.

Givens, D.B., 1957, Geology of Dog Springs quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 58, 40 p., 1 sheet, scale 1:48,000

Describes the geology, distribution (map), and petrology of the Datil Formation within the Dog Springs 15-min quadrangle.

Area: Mogollon-Datil volcanic province, Socorro and Catron Counties.

Givens, D.B., see Willard, M.E., 1958

Glass, J.J., and Smalley, R.G., 1945, Bastnaesite: Am. Mineralogist, v. 30, no. 9-10, p. 601-615, 1 fig.

Discussion of the occurrence, geology, and associated mineralogy of bastnasite--an uranium- and thorium-bearing mineral. Discusses the occurrence of bastnasite in the Gallinas Mountains.

Area: Lincoln County porphyry belt.

Glass, J.J., see Fries, C., Jr., and Schaller, W.T., 1942

Glover, T.J., 1975a, Geology and ore deposits of the northwestern Organ Mountains, Dona Ana County, New Mexico: M.S. thesis, Univ. Texas (El Paso); New Mexico Bureau Mines Mineral Resources, Open-file Rept. 63, 93 p., 1 table, 12 figs., 10 pls., scale 1 inch = 1,200 ft

Discusses Orejon Andesite, Cueva Rhyolite, Soledad Rhyolite, andesite dikes, Organ Mountain batholith (quartz monzonite), quartz latite, granite, and rhyolite. Discusses fluorspar, copper, lead, silver, and zinc deposits.

Area: Organ Mountains, Dona Ana County.

Glover, T.J., 1975b, Fluorspar and metallic mineral deposits along the west side of the Organ Mountains, Dona Ana County, New Mexico (abs.), in Las Cruces country (central-southern New Mexico): New Mexico Geol. Soc., Guidebook 26th field conf., p. 339

Mentions that multiple intrusions of quartz monzonite are the dominant rock type. Other rock types include Precambrian granite and andesite-latite. The third stage of the quartz monzonite intrusive is the source of the copper-lead-silver-gold-

zinc mineralization and fluorpsar deposits, and is controlled by fractures and faults.
Area: Organ Mountains, Dona Ana County.

Goddard, E.N., 1945, The 21 and 27 fluorpsar mines, Zuni Mountains, Valencia County, New Mexico: U.S. Geol. Survey, open-file rept., 4 p., scale 1 inch = 200 ft (now Cibola County)
Geologic map shows the distribution of quartz monzonite gneiss, granitic aplite dikes, diorite dikes, and granite porphyry dikes. Shows the distribution of fluorspar veins, prospects, pits, and mines and includes brief petrographic descriptions in the text.
Area: Zuni Mountains, Cibola County.

Goddard, E.N., 1966, Geologic map and sections of the Zuni Mountains fluorspar district, Valencia County, New Mexico: U.S. Geol. Survey, Misc. Geol. Inv. Map I-454, with 3 p. text, scale 1:31,680 (now Cibola County)
Geologic map shows the distribution and description of Tertiary diabase dikes and Precambrian granite, syenite, diorite, monzonite, aplite, and gneissic granite. Discusses the alteration of fluorspar deposits.
Area: Zuni Mountains, Cibola County.

Gonyer, F.A., <u>see</u> Larsen, E.S., Irving, J., and Larsen, E.S. III, 1936

Gonzalez, R.A., 1968, Petrology and structure of the Pedernal Hills, Torrance County, New Mexico: M.S. thesis, Univ. New Mexico, 78 p., 1 table, 15 figs., scale 1:50,688
Includes petroanalyses of Precambrian granite, granite gneiss, pegmatites, and aplitic veins.
Area: Pedernal Hills, Torrance County.

Gonzalez, R.A., and Woodward, L.A., 1972, Petrology and structure of Precambrian rocks of the Pedernal Hills, New Mexico, <u>in</u> East-central New Mexico: New Mexico Geol. Soc., Guidebook 23rd field conf., p. 144-147, 1 fig.
Describes Precambrian granite gneiss, pegmatite and aplite dikes, porphyric granite, alkali granite, quartz monzonite, and quartz diorite.
Area: Pedernal Hills, Torrance County.

Goodknight, C.S., 1973, Structure and stratigraphy of the central Cimarron Range, Colfax County, New Mexico: M.S. thesis, Univ. New Mexico, 84 p., 26 figs., scale 1:24,000
Describes the Precambrian rocks of the Cimarron Range. The rocks include metasediments, metavolcanics, metadiabase, and metagranodiorite.
Area: Sangre de Cristo Mountains, Colfax County.

Gordon, C.H., <u>see</u> Lindgren, W., and Graton, L.C., 1910

Gott, G.B., and Erickson, R.L., 1952, Reconnaissance of uranium and copper deposits in parts of New Mexico, Colorado, Utah, Idaho, and Wyoming: U.S. Geol. Survey, Circ. 219, 16 p., 2 tables, 1 fig.

(revised 1953)
Briefly describes the geology and mineralogy of uranium in igneous rocks at two localities in New Mexico; San Acacia and Zuni Mountains. Includes radiometric and chemical uranium analyses, and reports 0.026% uranium in the San Acacia area.
Area: Mogollon-Datil volcanic province, Socorro County and Zuni Mountains, Cibola County.

Gottfried, D., see Larsen, E.S., Jr., Phair, G., and Smith, W.L., 1956

Graf, D.L., and Kerr, P.F., 1950, Trace element studies, Santa Rita, New Mexico: Geol. Soc. America, Bull., v. 61, p. 1,023-1,052, 1 table, 20 figs.
Discusses trace element distribution (Mn, V, Pb, Cu, As, Zn) in fault gouge and breccia and silicified rhyolite of the Santa Rita mining district, including the Groundhog, Hanover, Georgetown, and Lone Mountain areas.
Area: Mogollon-Datil volcanic province, Grant County.

Granger,H.C., 1950, Preliminary investigation of radioactivity in the Black Hawk district, Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept. TEM-118, 7 p., 1 table, 1 fig.
Preliminary reconnaissance report describing the mineralization at the Black Hawk mine.
Area: Burro Mountains, Grant County.

Granger, H.C., and Bauer, H.L., Jr., 1950a, A radiometric examination of the Tunnel Site No. 1 claim, Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept. TEM-134, 3 p., 1 fig.
Brief reconnaissance report describing the radioactive anomalies and mineralization at the Tunnel Site No. 1 claim, White Signal district. A chemical analysis showed only 0.001% U.
Area: Burro Mountains, Grant County.

Granger, H.C., and Bauer, H.L., Jr., 1950b, Reported occurrence of pitchblende, Black Range, Grant and Sierra Counties, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept. TEM-119, 3 p., 1 fig.
Briefly describes a possible occurrence of pitchblende reported by a prospector in the Black Range. Subsequent field investigation could not locate any occurrence of mineralization.
Area: Black and Cooke's Ranges, Grant and Sierra Counties.

Granger, H.C., and Bauer, H.L., Jr., 1951a, Uranium occurrences in the Blue Jay claim, White Signal district, Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept. TEM-117 (51), 21 p., 1 table, 2 figs., scale 1 inch = 30 ft
Briefly describes the geology and ore deposits of the Blue Jay claim. Describes granite, diabase, basalt, latite, aphanitic dikes, rhyolite, and veins. The uranium occurs in the intermediate or basic rocks near quartz-pyrite veins. Includes uranium (0.003-0.11% U) and P_2O_5 contents and a geologic map.
Area: Burro Mountains, Grant County.

Granger, H.C., and Bauer, H.L., Jr., 1951b, Results of diamond drilling, Merry Widow claims, White Signal, Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Memo., Rept. TEM-146A, 11 p., 2 figs.
Briefly describes the basic geology and petrology of core drilling in a gold-copper-uranium ore deposit in the White Signal district.
Area: Burro Mountains, Grant County.

Granger, H.C., and Bauer, H.L., Jr., 1952, Uranium occurrences on the Merry Widow claim, White Signal district, Grant County, New Mexico: U.S. Geol. Survey, Circ. 189, 16 p., 2 tables, 3 figs., 2 pls., scale 1 inch = 100 ft
Includes 133 chemical and radiometric uranium analyses (trace to 1.88% U) of uranium vein mineralization. Describes the basic geology of each occurrence. The uranium occurs in basalt or diabase dikes or near quartz-pyrite veins.
Area: Burro Mountains, Grant County.

Granger, H.C., Bauer, H.L., Jr., Lovering, T.G., and Gillerman, E., 1952, Uranium deposits in Grant County, New Mexico: U.S. Geol. Survey, Trace Elements Inv., Rept. TEI-156, 65 p., 7 tables, 10 figs.
Good detailed report describing the geology, uranium deposits, and mine descriptions of the White Signal and Black Hawk districts. Part II is a description of the uranium reserves at the Merry Widow mine, the only property in Grant County with any economic reserves of ore grade.
Area: Burro Mountains, Grant County.

Granger, H., see Gillerman, E.G., 1952

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

Green, M.W., and others, 1980a, Uranium resource evaluation, Aztec 1 x 2 degree quadrangle, New Mexico and Colorado: U.S. Dept. Energy, Prelim. Rept. PGJ-012 (80), 146 p., 3 figs., 13 pls., 5 appendices
This detailed report evaluates the uranium resources of the Aztec quadrangle using all available geologic, geochemical, and geophysical data. Includes a table of uranium occurrences (appendix A) listing 86 occurrences (15 nonsandstone-type occurrences) and uranium-occurrence reports. Includes maps showing the distribution of Precambrian and Tertiary igneous rocks. None of the Precambrian and Tertiary igneous rocks are considered favorable for 100 or more tons of uranium.
Area: Tusas and Sangre de Cristo Mountains, Santa Fe, Rio Arriba, and Taos Counties.

Green, M.W., and others, 1980b, Uranium resource evaluation, Gallup 1 x 2 degree quadrangle, Arizona and New Mexico: U.S. Dept. Energy, Prelim. Rept. PGJ-013 (80), 159 p., 5 figs., 13 pls., 5 appendices
This detailed geologic report evaluates the uranium resources of the Gallup quadrangle using all available geologic, geochemical, and geophysical data. Includes a table of uranium occurrences (appendix A) listing 137 uranium occurrences (5

nonsandstone-type occurrences) and uranium-occurrence reports. Includes maps showing the distribution of Precambrian and Tertiary igneous rocks. Classifies the Hopi Buttes diatremes in Arizona as favorable for uranium deposits. Other Precambrian and Tertiary igneous rocks are considered unfavorable for uranium deposits of 100 or more tons of uranium.

Area: Zuni Mountains, San Juan Basin, Cibola, McKinley, and San Juan Counties.

Green, M.W., and others, 1980c, Uranium resource evaluation, Albuquerque 1 x 2 degree quadrangle, New Mexico: U.S. Dept. Energy, Prelim. Rept. PGJ-016 (80), 168 p., 3 tables, 3 figs., 13 pls., 5 appendices

This detailed geologic report evaluates the uranium resources of the Albuquerque quadrangle using all available geologic, geochemical, and geophysical data. Includes a table of uranium occurreces (appendix A) listing 337 uranium occurrences (9 nonsandstone-type occurrences) and uranium-occurrence reports. Includes maps showing the distribution of Precambrian and Tertiary igneous rocks. None of the Precambrian or Tertiary igneous rocks are considered by the authors to be favorable for uranium deposits of 100 or more tons of uranium.

Area: Rio Grande Valley, San Juan Basin, Cibola, Valencia, Bernalillo, Santa Fe, and Sandoval Counties.

Greenberg, J., see Nishimori, R., Ragland, P., and Rogers, J., 1977

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

Briefly discusses the geology and mineralogy of the Kiawa pegmatite group in the Petaca district. Minerals present in the pegmatites include quartz, microcline, albite, garnet, fluorite, beryllium, rare-earth elements, and minor sulfides. Includes major- and trace-element analyses on the muscovite, perthite, hornblende, and chlorite.

Area: Tusas Mountains, Rio Arriba County (Las Tablas 7 1/2-min quadrangle).

Gresens, R.L., 1971, Applications of hydrolysis equilibra to the genesis of pegmatites and kyanite deposits in northern New Mexico: Mtn. Geologist, v. 8, no. 1, p. 3-16, 1 table, 19 figs.

Includes the geology and possible origins of pegmatites. Oxide geochemical analyses of muscovite from schists and meta-rhyolite are included.

Area: Tusas Mountains, Rio Arriba County (Las Tablas and La Madera 7 1/2-min quadrangles).

Gresens, R.L., 1975, Geochronology of Precambrian metamorphic rocks, north-central New Mexico: Geol. Soc. America, Bull., v. 86, p. 1,444-1,448, 4 tables, 2 figs.

Discusses the geology and geochemistry of the Embudo Granite (1673 m.y.), pegmatites (1425 m.y.), and three metamorphic and/or hydrothermal events at; 1257 m.y., 1325 m.y., and 1425 m.y.

Area: Tusas Mountains, Rio Arriba County (Las Tablas and La Madera 7 1/2-min quadrangles) and Sangre de Cristo Mountains,

Taos County.

Gresens, R.L., 1976, 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; in Tectonics and mineral resources of southwestern North America: New Mexico Geol. Soc., Spec. Pub. 6, p. 132-137, 1 fig.

Summarizes the results of ten years work on the Precambrian metamorphic rocks in the Tusas Mountains. Proposes that an unconformity separates the Ortega formation from an underlying basement and that the pegmatite and kyanite deposits are genetically related to the altered metarhyolite.

Area: Tusas Mountains, Rio Arriba County (Las Tablas and La Madera 7 1/2-min quadrangles).

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

Mentions the occurrence of quartz-muscovite schist and metarhyolite in the Picuris Range, Sangre de Cristo Mountains and the Tusas Mountains.

Area: Tusas Mountains, Rio Arriba County and Sangre de Cristo Mountains, Taos County.

Gresens, R.L., and Stensrud, H.L., 1974b, Geochemistry of muscovite from Precambrian metamorphic rocks of northern New Mexico: Geol. Soc. America, Bull., v. 85, p. 1,581-1,594, 8 tables, 10 figs.

Includes major- and minor-element analyses of 200 mica and 65 whole-rock samples from quartz-muscovite schist and metarhyolite of the Picuris Range, Sangre de Cristo Mountains, and the Tusas Mountains. Includes a description of the metarhyolite and presents a theory for the metasomatic derivation of quartz-muscovite schist from the metarhyolite.

Area: Tusas Mountains, Rio Arriba County and Sangre de Cristo Mountains, Taos County.

Griffitts, W.R., and Alminas, H.V., 1968, Geochemical evidence for possible concealed mineral deposits near the Monticello box, northern Sierra Cuchillo, Socorro County, New Mexico: U.S. Geol. Survey, Circ. 600, 13 p., 8 figs.

Briefly describes rhyolite, andesite, and latite flows and tuffs. Discusses mineralization, including fluorite deposits and includes geochemical analyses (Cu, Zn, Mo, Pb, Ba).

Area: Sierra Cuchillo, Socorro County and Mogollon-Datil volcanic province.

Griffitts, W.R., and Nakagawa, H.M., 1960, Variations in base-metal contents of monzonitic intrusives: U.S. Geol. Survey, Prof. Paper 400-B, B93-B95, 1 fig.

Gives metal content (Cu, Pb, Zn) of monzonites from: 1) Cooke's Mountain, 2) Santa Rita, 3) Hanover, 4) Black Range, and 5) Iron Mountain.

Area: Black and Cooke's Ranges, Mogollon-Datil volcanic province, and Sierra Cuchillo, Grant, Sierra, and Luna Counties.

Griffitts, W.R., see Alminas, H.V., Watts, K.C., Siems, D.L., Kraxberger, V.E., and Curry, K.J., 1975

Griggs, R.L., 1948, Geology and groundwater resources of the eastern part of Colfax County, New Mexico: New Mexico Bureau Mines Mineral Resources, Groundwater Rept. 1, 182 p., map

Describes the petrology and occurrence of rhyolite to latite tuffs, monzonite dikes and sills, quartz latites, and andesites near the Chico Hills area.

Area: Chico Hills area, Colfax County.

Griggs, R.L., 1953, A reconnaissance for uranium in New Mexico: U.S. Geol. Survey, Circ. 354, 9 p., 1 table, 3 figs. (revised 1954)

Briefly describes the geology and petrology of 12 uranium occurrences in the Datil Formation, two occurrences in the Colfax sills, and in monzonites in the Cerrillos area. Includes chemical and radiometric uranium analyses from each occurrence: Datil Formation 0.0005-0.0085% U, Colfax sills 0.0004-0.0041% U.

Area: Mogollon-Datil volcanic province, Socorro, Catron, and Grant Counties; Chico Hills area, Colfax County; Sangre de Cristo Mountains, Santa Fe County.

Griggs, R.L., and Wagner, H.C., 1966, Geology and ore deposits of the Steeple Rock mining district, Grant County, New Mexico: U.S. Geol. Survey, Bull. 1222-E, E1-E29, 1 table, 6 figs., 4 pls.

Describes andesite porphyry, diorite, and rhyolite. Discusses wall rock alteration and the geology and ore bodies of the gold-silver-copper-lead-zinc deposits. Fluorite is mentioned as a gangue mineral in some of the deposits.

Area: Mogollon-Datil volcanic province, Grant County.

Griggs, R.L., see Wood, G.H., Jr., and Northrop, S.A., 1953

Griswold, G.B., 1959, Mineral Deposits of Lincoln County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 67, 117 p., 11 tables, 33 figs., 12 sheets, scale 1:377,143

Describes granite, gneiss, and diorite of the Gallinas and Oscura Mountains and Tertiary volcanics (monzonite, rhyolite, gabbro, and syenite) of the Sierra Blanca area. Mentions the occurrence of fluorite and bastnaesite in the Gallinas mining area. Discusses tungsten, gold, iron, copper, thorium, lead, zinc, molybdenum, uranium, fluorite, and manganese prospects and mines.

Area: Lincoln County porphyry belt.

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

Discusses the geology and petrology of Luna County. Includes chemical analyses of granodiorite porphyry, quartz, monzonite, andesite, quartz latite, and rhyolite. Describes occurrences of fluorite deposits. Includes geologic maps of the Tres Hermanas Mountains (1 inch = 3,000 ft), Mahoney mining area (1 inch = 600 ft), Victorio Mountains (1 inch = .4 mi), Mine Hill (1 inch = 400 ft), and Fluorite Ridge (1 inch = 1/2 mi).

Area: Black and Cooke's Ranges, Tres Hermanas, and Victorio Mountains, Luna County.

Griswold, G.B., and Missaghi, F.M., 1964, Geology and geochemical survey of a molybdenum deposit near Nogal Peak, Lincoln County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 67, 24 p., 7 figs., 2 pls. scale 1 inch = 2,000 ft
Describes andesite and syenodiorite and discusses the hydrothermal molybdenum deposits of the Sierra Blanca area.
Area: Lincoln County porphyry belt.

Griswold, G.B., see Reid, B.E., Jacobsen, L.C., and Lessard, R.H., 1980a,b

Grotbo, T., see Ratte, J.C., 1979

Guilbert, J.M., see Davis, J.D., 1973

Haederle, W.F., 1966, Structure and metamorphism in the southern Sierra Ladrones, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 57 p., 24 figs., 2 pls., maps
Describes and maps the Precambrian rocks of the southern Ladron Mountains including quartzite, schists, amphibolites, red granodiorite, and younger granodiorite (two-mica granite). Mentions the occurrence of several prospect pits associated with secondary copper mineralization and of thin galena veins.
Area: Ladron Mountains, Socorro County.

Haji-Vassiliou, A., and Kerr, P.F., 1972, Uranium-organic matter association at La Bajada, New Mexico: Econ. Geology, v. 67, p. 41-54, 7 tables, 11 figs.
Briefly describes the Espinaso Formation (ore-bearing tuff-breccia) and basalt to latite or monzonite dikes and plugs. Reports an uranium content of 1.0-3.5% UO_2. The hydrothermal deposit is associated with sulfide mineralization along a fault in altered tuff-breccia.
Area: Ortiz Mountains, Santa Fe County.

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

Handley, R.W., 1945, Merry Widow mine, White Signal district, Grant County, New Mexico--interim report on treatment procedures applicable to ores sampled by S.B. Keith: U.S. Atomic Energy Comm., Rept. RMO-402, 11 p., 2 tables
Brief report describing chemical procedures used to determine chemical analyses of samples from the Merry Widow mine. Includes some chemical analyses.
Area: Burro Mountains, Grant County.

Hannigan, B.J., see Pierson, C.T., Wenrich-Verbeek, K.J., and Machette, M.N., 1980

Harbour, R.L., 1960, Precambrian rocks at northern Franklin Mountains, Texas: Am. Assoc. Petroleum Geologists, Bull., v. 44, p. 1,785-1,792

Area: Franklin Mountains, Dona Ana County.

Harbour, R.L., 1972, Geology of the northern Franklin Mountains, Texas and New Mexico: U.S. Geol. Survey, Bull. 1298, 129 p., 12 tables, 6 figs., 3 pls., scale 1:24,000

Describes the occurrence of Precambrian granite porphyry sills, rhyolite (porphyric), massive pink granite, diabase dikes, and a Tertiary felsite sill. Tin occurs within quartz veins cutting the granite.

Area: Franklin Mountains, Dona Ana County.

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

Harder, J.O., and Wyant, D.G., 1944, Preliminary report on a trace element reconnaissance in western states: U.S. Geol. Survey, Trace Elements Inv., Rept. TEI-4, 60 p., 19 figs., 4 pls., 3 appendices

Briefly describes the geology and mineralogy of two uranium prospects in New Mexico; the Harding mine and White Signal deposit. Includes uranium analyses: 1) Harding mine, Dixon: microlite, 0.008% U_3O_8, 0.1% ThO_2, 2) White Signal, Grant County: black dikes, 0.005-0.330% U_3O_8, 0.008-0.3% ThO_2. Includes a location map and a map of the Merry Widow mine.

Area: Burro Mountains, Grant County and Sangre de Cristo Mountains, Taos County.

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

Briefly discusses and describes Precambrian granite and Tertiary volcanics. The geology and ore deposits of each district are described. Includes sketch maps of the Black Range, Apache, Kingston, Tierra Blanca, Hillsboro, and Lake Valley mining districts.

Area: Fra Cristobal, Caballo, and San Andres Mountains, Sierra Cuchillo, and the Black and Cooke's Ranges, Sierra County.

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

Describes mining districts by county (Union, Mora, and San Miguel Counties) and the lithology and occurrence of Precambrian granite, diabase, Tertiary camptonite, and andesite.

Area: Sangre de Cristo Mountains, Union, Mora, and San Miguel Counties.

Hawley, J.W., see Seager, W.R., and Clemons, R.E., 1971 and 1975; Seager, W.R., and Kottlowski, F.E., 1976

Hedlund, D.C., 1975a, Geologic map of the Hillsboro quadrangle, Sierra and Grant Counties, New Mexico: U.S. Geol. Survey, Open-file Rept. 75-108, 19 p., scale 1:48,000

Geologic map showing the distribution of Pollack Quartz Latite, andesite, Mimbres Peak Rhyolite, Copper Flat stock (quartz monzonite), quartz latite, diorite, quartz diorite, Precambrian granite, and granophyre. Discusses the economic geology of the

silver, gold, and manganese deposits.
Area: Mogollon-Datil volcanic province and Black and Cooke's Ranges, Sierra and Grant Counties.

Hedlund, D.C., 1975b, Geologic map of the San Lorenzo quadrangle, Grant and Sierra Counties, New Mexico: U.S. Geol. Survey, Open-file Rept. 75-109, scale 1:48,000
Area: Mogollon-Datil volcanic province and Black and Cooke's Ranges, Sierra and Grant Counties.

Hedlund, D.C., 1977, Mineral resources map of the Hillsboro and San Lorenzo quadrangles, Sierra and Grant Counties, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-900B, with text, 2 sheets, scale 1:48,000
Geologic map shows the distribution and includes descriptions of rhyolite, andesite, quartz latite, quartz monzonite, and Precambrian granite. Mentions the occurrence of autunite (0.07% eU_3O_8).
Area: Mogollon-Datil volcanic province and Black and Cooke's Ranges, Sierra and Grant Counties.

Hedlund, D.C., 1978a, Geologic map of the Wind Mountain quadrangle, Grant County, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1031, 1 table, scale 1:24,000
Geologic map covering portions of the Little and Big Burro Mountains. Lists three fluorspar deposits.
Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978b, Geologic map of the Soldiers Farewell Hill quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1033, scale 1:24,000
Includes distribution and description of the Bullard Peak Series, Burro Mountain granite, rhyolite of Burro Cienaga, Kneeling Nun Tuff, and latite and rhyolite of Malpais Hills.
Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978c, Geologic map of the Ninetysix Ranch quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1034, scale 1:24,000
Includes the distribution and description of the Bullard Peak Series, Burro Mountain granite, and Tertiary diabase and rhyolite dikes.
Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978d, Geologic map of the Gold Hill quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1035, 1 table, scale 1:24,000
Includes the distribution and description of the Bullard Peak Series, Burro Mountain granite, other granitic rocks, diabase, and Tertiary rhyolite dikes. Reports two new occurrences of pegmatites containing rare-earth elements minerals, allanite, and samarskite.
Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978e, Geologic map of the Hurley East quadrangle, New

Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1036, scale 1:24,000

Includes the distribution and description of the Rubio Peak Formation (ash-flow tuff), Sugarlump Tuff, Kneeling Nun Tuff, Caballo Blanco Rhyolite Tuff, and Razorback rhyolite.

Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978f, Geologic map of the Tyrone quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1037, 1 table, scale 1:24,000

Includes the distribution and description of the Burro Mountain granite, Tertiary andesite, quartz monzonite porphyries and dikes, ash-flow and ash-fall tuffs, and latite and basaltic andesite lavas.

Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978g, Geologic map of Werney Hill quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1038, 1 table, scale 1:24,000

Includes the distribution and description of the Bullard Peak Series, Burro Mountain granite, syenite porphyry, and Tertiary andesite and rhyolite ash-flow tuffs, dikes, and volcaniclastic sediments.

Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978h, Geologic map of the C Bar Ranch quadrangle, New Mexico: U.S. Geol. Survey Misc., Field Studies MF-1039, scale 1:24,000

Includes the distribution and description of the Bullard Peak Series, Burro Mountains granite, diabase, and Tertiary andesite and rhyolite ash-flow tuffs, volcaniclastic sediments, and a mudflow complex. Lists fluorspar deposits and one radioactive pegmatite.

Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978i, Geologic map of the Burro Peak quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1040, 1 table, scale 1:24,000

Includes the distribution and description of the Bullard Peak Series, Burro Mountain granite, diabase dikes, and Tertiary quartz monzonite and latite dikes and ash-flow and ash-fall tuffs. Lists uranium and base metal occurrences and mines.

Area: Burro Mountains, Grant County.

Hedlund, D.C., 1978j, Geologic map of the White Signal quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1041, 1 table, scale 1:24,000

Geologic map of the White Signal 7 1/2-min quadrangle, Grant County, including the location and distribution of 14 uranium and base metal deposits in Precambrian and Tertiary igneous rocks.

Area: Burro Mountains, Grant County.

Hedlund, D.C., 1980a, Geologic map of the Redrock NW quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1263, 1 table, scale 1:24,000

Geologic map of the Redrock NW quadrangle showing the distribution of various Tertiary and Precambrian igneous rocks. Lists the mines, prospects, and mineral occurrences in the 7 1/2-min quadrangle, including one slightly radioactive fluorite deposit near Redrock.
Area: Mogollon-Datil volcanic field, Grant County.

Hedlund, D.C., 1980b, Geologic map of the Redrock NE quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1264, 1 table, scale 1:24,000
Geologic map of the Redrock NE quadrangle showing the distribution of various Tertiary and Precambrian igneous rocks. Lists the mines, prospects, and mineral occurrences in the 7 1/2-min quadrangle, including the Osmer silver mine where pitchblende is reported to occur.
Area: Burro Mountain, Grant County.

Hedlund, D.C., 1980c, Geologic map of the Redrock SE quadrangle, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1265, 1 table, scale 1:24,000
Geologic map of the Redrock SE quadrangle showing the distribution of various Tertiary and Precambrian igneous rocks. Lists the mines, prospects, and mineral occurrences in the 7 1/2-min quadrangle.
Area: Burro Mountains, Mogollon-Datil volcanic field, Grant County.

Heinrich, E.W., <u>see</u> Perhac, R.M., 1963 and 1964

Henrich, E.W., and Levinson, A.A., 1953, Studies in the mica group; mineralogy of the rose muscovites: Am. Mineralogist, v. 38, p. 25-49, 4 tables, 5 figs., 1 pl.
Describes the geology and mineralogy of the pegmatites at the Harding mine, Taos County, where lepidolite, spodumene, beryl, tantalite, and microlite have been produced. Discusses the zoning and mineralogy. Also includes a discussion of the Pilar pegmatite, Taos County; Pidlite pegmatite, Mora County; and the Petaca district, Rio Arriba County.
Area: Sangre de Cristo Mountains, Taos and Mora Counties; Tusas Mountains, Rio Arriba County.

Herber, L.J., 1963a, Structure, petrology, and economic features of the Precambrian rocks of La Joyita Hills: M.S. thesis, New Mexico Inst. Mining and Tech., 36 p.
Discusses and describes the lithology and occurrence of Precambrian gneiss, pegmatite, and aplite dikes.
Area: La Joyita Hills, Socorro County.

Herber, L.J., 1963b, Precambrian rocks of La Joyita Hills, <u>in</u> Socorro region: New Mexico Geol. Soc., Guidebook 14th field <u>conf.</u>, p. 180-184, 2 figs.
Area: La Joyita Hills, Socorro County.

Hernon, R.M., and Jones, W.R., 1968, Ore deposits of the Central mining district, Grant County, New Mexico, <u>in</u> Ore Deposits of the United

States, vol. II, J.D. Ridge, ed.: Am. Inst. Mining, Metall., Petroleum Engineers, publishers, p. 1,211-1,238, 3 tables, 4 figs.

Discusses and describes the geology and ore deposits of the Central mining district. Briefly describes four groups of intrusive rocks: 1) concordant plutons, sills, laccoliths, and batholiths of syenodiorite and quartz diorite, 2) mafic plugs and dikes, 3) discordant plutons and stocks, and 4) dike swarms and plugs. Describes three types of mineralization: 1) porphyry copper, 2) pyrometasomatic iron and zinc, and 3) zinc-lead veins which are clustered around three granitic stocks.

Area: Mogollon-Datil volcanic province, Grant County.

Hernon, R.M., Jones, W.R., and Moore, S.L., 1953, Some geological features of the Santa Rita quadrangle, New Mexico, *in* Southwestern New Mexico: New Mexico Geol. Soc., Guidebook 4th field conf., p. 117-130, 1 table, 6 figs.

Describes the geology of Zn-Pb-Cu veins associated with igneous rocks and includes descriptions of quartz diorite porphyry sills and laccoliths, gabbro plugs and basic dikes, granodiorite porphyry, quartz monzonite dikes, and salic quartz monzonite dikes. Includes a geologic map and a table listing the formations within the Santa Rita quadrangle.

Area: Mogollon-Datil volcanic province, Grant County.

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

Geologic map showing the distribution of Cretaceous syenodiorite porphyy, trachyte porphyry, quartz diorite, rhyolite porphyry, andesite porphyry, and Precambrian granite gneiss.

Area: Mogollon-Datil volcanic province, Grant County.

Hernon, R.M., *see* Jones, W.R., and Moore, S.L., 1967; and Jones, W.R., and Pratt, W.P., 1961

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

Discusses the geology of samarskite (Y, Ce, U, Ca, Fe, Pb, Th) (Nb, Ta, Ti, Sn)$_2O_6$ from the Fredlund mine in the Tusas Mountains, Rio Arriba County.

Area: Tusas Mountains, Rio Arriba County.

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

Hewitt, C.H., 1957, Geology and mineral deposits of the northern Big Burro Mountains-Redrock area, Grant County, New Mexico: Ph.D. thesis, Univ. Michigan, 370 p., 11 tables, 5 figs., 44 pls.

See Hewitt, C.H., 1959.

Hewitt, C.H., 1959, 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., 10 tables, 3 figs., 13 pls., scale 1:48,000

Includes good descriptions, modal analyses, and chemical analyses of the Precambrian rocks. The Precambrian rocks are

subdivided into the Bullard Peak Series and the Ash Creek Series. Describes the occurrence of uranium veins. Discusses rock alteration and the geology of the area.
Area: Burro Mountains, Grant County.

Hill, A., see Northrop, S.A., 1961

Hillard, P.D., 1969, Geology and beryllium mineralization near Apache Warm Springs, Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 103, 16 p., 2 tables, 1 fig., 1 sheet, scale 1 inch = 1 mi
Describes Tertiary pyroclastic latite, andesite and latite flows, rhyolitic tuffs, massive rhyolite, latite dikes, porphyritic andesite dikes, quartz latite dikes, and a quartz monzonite plug. Includes modal analyses. Beryllium occurs along faults in altered andesite and latite flows. Includes beryllium content of various rocks. Mentions the production of uranium from the highly altered rocks at the western end of Monticello Canyon.
Area: Sierra Cuchillo and Mogollon-Datil volcanic province, Socorro County.

Hilpert, L.S., 1964, Uranium, in Mineral and water resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 87, p. 209-226, 3 tables, 1 fig.

Hilpert, L.S., 1969, Uranium resources of northwestern New Mexico: U.S. Geol. Survey, Prof. Paper 603, 166 p., 16 tables, 20 figs., 4 pls.
Describes the basic geology of uranium occurrences and includes descriptions and lists occurrences of prospects in veins, igneous, and metamorphic rocks. Most of the uranium occurrences are sedimentary-type. Includes brief descriptions of some uranium deposits associated with igneus rocks: 1) pegmatites and quartz-fluorite veins in the Tusas Mountains, Rio Arriba County, 2) pegmatites in the Sangre de Cristo Mountains, Sandoval and Santa Fe Counties, and 3) Lemitar Mountains and the Mogollon-Datil volcanic province, Socorro County.
Area: Tusas Mountains, Rio Arriba County; Sangre de Cristo Mountains, Sandoval and Santa Fe Counties; and Mogollon-Datil volcanic province and Lemitar Mountains, Socorro County; Zuni Mountains, Cibola County.

Hilpert, L.S., and Corey, A.F., 1955, Northwest New Mexico, in Geologic investigations of radioactive deposits--semiannual progress report for June 1 to November 30, 1955: U.S. Geol. Survey, Trace Elements Inv., Rept. TEI-590, p. 104-118
Brief summary of the uranium deposits of northwestern New Mexico. Includes an index map which shows the locations of the deposits. A table lists the deposits and their location and host rock.
Area: Zuni Mountains, Cibola County; Rio Grande Valley, Socorro, Bernalillo, and Santa Fe Counties; San Juan Basin, McKinley County.

Holser, W.T., 1953, Beryllium minerals in the Victorio Mountains, Luna County, New Mexico: Am. Mineralogist, v. 38, p. 599-611, 1 table,

2 figs.
Discusses the occurrence of beryl, helvite, and beryllium idocrase within a quartz-tungsten vein. Associated minerals include molybdenite, fluorite, and wolframite. A series of Tertiary andesite and rhyolite flows occur within the Victorio Mountains, but the beryllium minerals occur in a Paleozoic limestone.
Area: Victorio Mountains, Luna County.

Holser, W.T., 1959a, Trans-Pecos region, Texas and New Mexico, in Occurrence of nonpegmatite beryllium in the United States, by L.A. Warner, W.T. Holser, V.R. Wilmarth, and E.N. Cameron: U.S. Geol. Survey, Prof. Paper 318, p. 130-143, 5 tables, 1 fig., 5 pls.
Good geological report describing the geology of the Cornudas Mountains, New Mexico and adjacent regions in Texas. Describes the geology and occurrence of beryllium at Wind Mountain, including three geologic maps and analyses of zirconium silicates.
Area: Cornudas Mountains, Otero County.

Holser, W.T., 1959b, New Mexico, in Occurrence of nonpegmatite beryllium in the United States, by L.A. Warner, W.T. Holser, V.R. Wilmarth, and E.N. Cameron: U.S. Geol. Survey, Prof. Paper 318, p. 107-130, 10 tables, 9 figs.
Briefly describes the occurrence of non-pegmatite beryllium in various geologic settings in the Black Range, Catron County; Elizabethtown district and Raton volcanic field, Colfax County; Organ Mountains, Dona Ana County; Burro Mountains and Central districts, Grant County; Apache No. 2 and San Simon districts, Hidalgo County; Capitan and Gallinas Mountains, Lincoln County; Luna County; Otero County; San Miguel County; Cochiti, Sandoval County; Santa Fe County; Apache No. 1, Cuchillo Negro, and Iron Mountain, Sierra County; Jones Camp, Socorro County; and Red River, Taos County. Many of these areas are near or contain uranium mineralization. Uranium contents are given for the Raton volcanic rocks. Beryllium analyses, mine or location maps, and sample descriptions of many of the areas are included.
Area: Statewide.

Homme, F.C., and Rosenzweig, A., 1970, Contact metamorphism in the Tres Hermanas Mountains, Luna County, New Mexico, in Tyrone-Big Hatchet Mountains-Florida Mountains region: New Mexico Geol. Soc., Guidebook 21st field conf., p. 141-145, 3 figs.
Describes the geology and mineralogy of the igneous rocks in the Tres Hermanas Mountains and includes geologic maps. Describes the contact metamorphism associated with the igneous rocks.
Area: Tres Hermanas Mountains, Luna County.

Hunt, C.B., 1938, Igneous geology and structure of the Mount Taylor volcanic field, New Mexico: U.S. Geol. Survey, Prof. Paper 189-B, p. 51-80, 15 figs., 19 pls.
Describes rhyolite, andesite, dacite, trachyte, latite, and porphyritic andesite. Includes some chemical and modal analyses.
Area: Mount Taylor, Cibola County.

Huskinson, E.J., Jr., 1975, Geology and fluorspar deposits of the Chise

fluorspar district, Sierra County, New Mexico: M.S. thesis, Univ. Texas (El Paso), 74 p., 6 tables, 7 figs., 12 pls., 3 maps
Describes and includes three geologic maps of the Chise fluorspar district (1:92,000), Concordant fluorspar district (1:720), and Victorio prospect, Cross Mountain (1:480). Describes Tertiary intrusives (diabase, monzonite, and syenite) and volcanics (andesite flows and tuffs) of the areas.
Area: Sierra Cuchillo, Sierra County.

Husler, J.W., see Woodward, L.A., and McLelland, D., 1977

Hutchinson, R.A., 1968, Geology of the Burned Mountain area, Rio Arriba County, New Mexico: M.S. thesis, Colorado School Mines, 96 p., 5 tables, 24 figs., 3 pls., scale 1:12,000 and 1:1,200
Describes the geology and mineralization associated with the Precambrian units in the Burned Mountain area, including the Moppin metavolcanic series, Burned Mountain Metarhyolite, Kiawa Mountain Formation, and the Maguinita Granodiorite. Includes chemical analyses of the Precambrian rocks and geologic maps of the Burned Mountain area (scale 1:12,000) and Eureka Canyon (1:1,200).
Area: Tusas Mountains, Rio Arriba County.

Irving, J., see Larsen, E.S., Gonyer, F.A., and Larsen, E.S. III, 1936

Jacobs, L.C., see Reid, B.E., Griswold, G.B., and Lessard, R.H., 1980a,b

Jacobs, R.C., 1956, 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., scale 1 inch = 700 ft
Describes Precambrian granite and gneiss. One small fissure vein of fluorspar occurs in the area.
Area: Fra Cristobal Mountains, Sierra County.

Jahns, R.H., 1944, "Ribbon-rock"--an unusual beryllium-bearing tactite (at Iron Mountain, New Mexico): Econ. Geology, v. 39, p. 173-205, 8 figs.
Describes the occurrence of rhyolite, aplite, and granite. Fluorite deposits are found throughout the igneous rocks. The beryllium deposits occur in tactite.
Area: Sierra Cuchillo, Sierra County.

Jahns, R.H., 1946, Mica deposits of the Petaca district, Rio Arriba County, with brief description of the Ojo Caliente district, Rio Arriba County and the Elk Mountain district, San Miguel County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 25, 294 p., 28 figs., 25 pls., maps
A comprehensive detailed geologic report describing Precambrian metarhyolite, granite, and pegmatites in the Petaca district. Discusses the mineralogy of the pegmatite, including the occurrence of fluorite, monazite, samarskite, and uraninite within some of the pegmatites. Includes geologic maps of many of the pegmatites. Includes brief descriptions of the Ojo Caliente district, Rio Arriba County and the Elk Mountain district, San Miguel County.

Area: Tusas Mountains, Rio Arriba County and Sangre de Cristo Mountains, San Miguel County.

Jahns, R.H., 1953, The genesis of pegmatites, II--quantitative analysis of lithium-bearing pegmatite, Mora county, New Mexico: Am. Mineralogist, v. 38, p. 1,078-1,112, table, 8 figs.

Describes the geology, mineralogy, and zonation of the Pidlite pegmatite, including modal and chemical analyses. Hatcheltolite (uranium microlite) and monazite occur in this pegmatite. On the basis of their distribution, structural, textural, and compositional relationships, the zones of the Pidlite dike are thought to have been developed by fractional crystallization of a pegmatitic magma.

Area: Sangre de Cristo Mountains, Mora County.

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

Describes Precambrian metarhyolite and Tertiary andesite, latite, rhyolite, and monzonite. Discusses the Iron Mountain tungsten deposit. Mentions the occurrence of uranium mineralization in the Abo red beds within the area.

Area: Sierra Cuchillo, Sierra and Socorro Counties.

Jahns, R.H., and Ewing, R.C., 1976, The Harding mine, Taos County, New Mexico, in Vermejo Park (northwestern New Mexico): New Mexico Geol. Soc., Guidebook 27th field conf., p. 263-275, 5 tables, 8 figs.

Describes the geology and mineralogy of the Harding pegmatite in the Picuris Range. Includes a geologic map, bulk geochemistry (major elements), and mineralogy descriptions of the deposits. Includes chemical analyses on muscovite samples, including the amount of UO_2 (trace-0.32%), UO_3 (1.63-7.73%), and ThO_2 (trace-0.11%). Mentions the occurrence of thorite, zircon, monazite, and fluorite.

Area: Sangre de Cristo Mountains, Taos County.

Jahns, R.H., and Ewing, R.C., 1977, The Harding mine, Taos County, New Mexico: Mineralogical Record, v. 8, no. 2, p. 115-126, 11 figs.

Comprehensive report describing the history, geology, and mineralogy of the Harding pegmatite. Radioactive minerals that occur at the Harding mine include microlite, allanite, and thorite.

Area: Sangre de Cristo Mountains, Taos County.

Jahns, R.H., Kottlowski, F.E., and Kuellmer, F.J., 1955, Volcanic rocks of the south-central New Mexico, in South-central New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., p. 92-95

Briefly describes the volcanic rocks in the Caballo, Organ, and Animas Mountains and the Sierra Cuchillo. Mentions the occurrence of fluorite in the Iron Mountain, Sierra Cuchillo, and San Diego Mountain (Dona Ana County).

Area: Caballo, Organ, and Animas Mountains, San Diego Mountain, and Sierra Cuchillo, Sierra, Dona Ana, and Hidalgo Counties.

Jahns, R.H., McMillan, D.K., O'Brient, J.D., and Fisher, D.L., 1978, Geologic section in the Sierra Cuchillo and flanking areas, Sierra and Socorro Counties, New Mexico, in Field guide to selected cauldrons and mining districts of the Datil-Mogollon volcanic field, New Mexico: New Mexico Geol. Soc., Spec. Pub. 7, p. 131-138, 3 tables, 3 figs.

Briefly describes Precambrian metarhyolite and Cenozoic latite-andesite, dacite-rhyodacite, andesite, and rhyolite-trachyte sequences.

Area: Sierra Cuchillo, Sierra and Socorro Counties.

Jahns, R.H., see Willard, M.E., 1974

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

Discusses the geology, petrology, and chemistry of granodiorite, andesite, latite, quartz latite, rhyolite, and Precambrian granite. Includes chemical and modal analyses. Mentions the occurrance of fluorite.

Area: Black and Cooke's Ranges, Grant, Sierra, and Luna Counties.

Jicha, H.L., Jr., 1954b, Paragenesis of the ores of the Palomas (Hermosa) district, southwestern New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 27, 19 p., 11 figs.; Econ. Geology, v. 49, p. 759-778

Describes lead, zinc, and silver mineralization in Tertiary igneous rocks. Includes discussions of the mineralization and alteration of dikes and latitic volcanics.

Area: Black and Cooke's Ranges, Sierra County.

Jicha, H.L., Jr., 1958, Geology and mineral resources of Mesa del Oro quadrangle, Socorro and Valencia Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 56, 67 p., 2 figs., 5 pls., map (now Cibola County)

Describes Cenozoic sodaclase diorite intrusives. Includes modal analyses.

Area: Mogollon-Datil volcanic province (Mesa del Oro quadrangle), Socorro and Cibola Counties.

Johnson, J.T., 1955, A northern extension of the Magdalena mining district, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 46 p., 4 figs., scale 1 inch = 1/2 mi

Describes Tertiary extrusive rocks (latite, rhyolite, and andesite) and intrusive rocks (rhyolite porphyry, monzonitic stocks, augite andesite, lamprophyre dikes, and white rhyolite dikes). Discusses rock alteration and ore potential. Mentions recent exploration for uranium in the area.

Area: Magdalena Mountains, Socorro County.

Johnson, R.B., 1970, Geologic map of the Villanueva quadrangle, San Miguel County, New Mexico: U.S. Geol. Survey, Geol Quad. Map

GQ-869, scale 1:62,500
Geologic map showing the distribution of small outcrops of Precambrian rocks including granite gneiss, alaskitic granite, pegmatites, and aplites.
Area: near Pecos River (Villanueva quadrangle), San Miguel County.

Jones, L.M., Walker, R.L., and Stormer, J.C., Jr., 1974, Isotope composition of strontium and origin of volcanic rocks of the Raton-Clayton district, northeastern New Mexico: Geol. Soc. America, Bull., v. 85, p. 33-36, 1 fig.
Discusses the isotopic composition of volcanic rocks ranging from hauyne-olivine nephelinite to tridymite-bearing hornblende dacite. The initial strontium isotopic ratios range from 0.7028-0.7041, indicating an upper mantle source. Includes SiO_2, K, Rb, and Sr concentrations.
Area: Raton-Clayton volcanic field, Colfax County.

Jones, W.R., Hernon, R.M., and Moore, S.L., 1967, General geology of Santa Rita quadrangle, Grant County, New Mexico: U.S. Geol. Survey, Prof. Paper 555, 144 p., 23 tables, 50 figs., 3 pls., scale 1:24,000
Includes petrographic descriptions, modal analyses, chemical analyses, and spectrographic analyses of Precambrian granite, quartzite, and greenstone on more than 30 varities of Tertiary stocks, sills, dikes, and plugs. Their composition ranges from syenodiorite to granodiorite to quartz monzonite and monzonite to granite. An alaskite porphyry sill is exposed in the Kearney mine (sec. 22 and 27, T. 17 S., R. 12 W.). Describes the copper porphyrys of Hanover, Santa Rita, and Copper Flat (quartz latite porphyry). Describes Miocene volcanic rocks including Rubio Peak Formation (rhyodacites), Kneeling Nun rhyolite tuff, and felsitic rhyolite plugs and dikes. Includes major and accessory minerals of each rock type.
Area: Mogollon-Datil volcanic province, Grant County.

Jones, W.R., Hernon, R.M., and Pratt, W.P., 1961, Geologic events culminating in primary metallization in the Central mining district, New Mexico: U.S. Geol. Survey, Prof. Paper 424-C, C11-C16
Describes the occurrence of granodiorite porphyry, quartz monzonite, quartz latite, and rhyodiorite porphyry. Includes norms and modes of these rocks.
Area: Mogollon-Datil volcanic province, Grant County.

Jones, W.R., Moore, S.L., and Pratt, W.P., 1970, Geologic map of the Fort Bayard quadrangle, Grant County, New Mexico: U.S. Geol. Survey, Geol. Quad. Map GQ-865, with text, scale 1:24,000
Geologic map showing the distribution of Tertiary syenodiorite to monzonite, andesite, and Cretaceous quartz diorite.
Area: Mogollon-Datil volcanic province, Grant County.

Jones, W.R., <u>see</u> Hernon, R.M., 1968; Hernon, R.M., and Moore, S.L., 1953 and 1964

Jonson, D.C., see Lamarre, A.L., and Perry, A.J., 1974

Just, E., 1937, 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.
Brief descriptions of igneous rocks. Some uranium minerals occur in the pegmatite mines and prospects.
Area: Tusas Mountains, Rio Arriba County; Sangre de Cristo Mountains, Taos County.

Kalish, P., 1953, Geology of the Water Canyon area, Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 48 p., 4 figs., 3 pls.
Area: Mogollon-Datil volcanic province, Socorro County.

Kalliokoski, J., Langford, F.F., and Ojakangas, R.W., 1978, Criteria for uranium occurrences in Saskatchewan and Australia as guides to favorability for similar deposits in the United States: U.S. Dept. Energy, Open-file Rept. GJBX-114 (78), 480 p., (section on New Mexico, p. 348-358, 2 tables, 3 figs.)
Includes a list of uranium occurrences in New Mexico. Briefly describes the conglomerates of the Vadito Formation and suggests that these conglomerates may be lower Proterozoic-type radioactive deposits.
Area: Sangre de Cristo, Zuni, Tusas, Manzano, San Andres, Burro, and Sacramento Mountains, and the Kingston-Hillsboro area.

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

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

Keith, S.B., 1944, Reconnaissance of the White Signal, Black Hawk, and San Lorenzo districts and the Swanson-Lauer property, New Mexico: Union Mines Development Corp., Rept. RMO-104, 16 p., 3 figs. (open filed by U.S. Atomic Energy Comm.)
Briefly describes three deposits in New Mexico which are associated with igneous rocks: 1) White Signal, Grant County; 2) Black Hawk, Grant County; and 3) San Lorenzo, Socorro County. At White Signal, Precambrian granite is cut by felsite dikes, monzonite porphyry dikes, and quartz veins. The uranium is assoicated with the felsite dikes. Briefly describes five mines and prospects within the district. At the Black Hawk mine, Precambrian gneiss is cut by monzonite or diorite dikes and associated quartz veins with silver, cobalt, and nickel mineralization. Uranium occurs in the quartz veins and along fractures in the dikes. At the San Lorenzo (San Acacia) deposit, uranium minerals are reportedly associated with a copper deposit occurring along a fault zone in volcanic flows.
Area: Mogollon-Datil volcanic province, Socorro County;

Burro Mountains, Grant County.

Keith, S.B., 1945, Union Mines Development Corporation report on detailed examination of White Signal and associated districts, Grant County, New Mexico: Union Mines Development Corp., Rept. RMO-103, 57 p., 20 figs. (open filed by U.S. Atomic Energy Comm.)
This detailed geologic report describes the geology, mineralization, and ore reserves of various claims in the White Signal district, including mine maps of many of the claims. Also describes the geology and mineralization of the Apache Trail claim and Black Hawk district. Reports that no radioactive anomalies were found in the Tyrone-Leopold or Pinos Altos districts.
Area: Burro Mountains, Grant County.

Kelley, F.J., 1962, Technological and economic problems of rare-earth metal and thorium resources in Colorado, New Mexico, and Wyoming: U.S. Bureau of Mines, Inf. Circ., IC-8124, 38 p., 5 tables, 1 fig.
Briefly describes the occurrence of bastnaesite in the Gallinas Mountains where igneous rocks intrude the Precambrian basement. The bastnaesite occurs with fluorite along fractures and veins. Most of the thorium in the United States (as of 1962) is recovered from monazite and bastnaesite.
Area: Lincoln County porphyry belt.

Kelley, V.C., 1949, Geology and economics of New Mexico iron-ore deposits: Univ. New Mexico, Pub. Geol. Series, no. 2, 246 p., figs., pls.
Describes various iron-ore deposits in New Mexico, including the iron-ore deposits in Lincoln County, some of which are radioactive. Includes mine and geological maps for many of the deposits.
Area: Statewide

Kelley, V.C., 1968, Geology of the alkaline Precambrian rocks of Pajarito Mountain, Otero County, New Mexico: Geol. Soc. America, Bull. v. 79, p. 1,565-1,572, 2 figs., 6 pls.
Describes the geology and petrology of alkalic Precambrian syenite, diorite, diabase, granitoid syenite, melasyenite, pegmatitic syenite, and riebeckite granite.
Area: Pajarito Mountains, Otero County.

Kelley, V.C., 1971, Geology of the Pecos country, southeastern New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 24, 75 p., 1 table, 26 figs., 7 pls., scale 1 inch = 3 mi
Briefly discusses the occurrence and distribution and petrology of the Sierra Blanca volcanics and Precambrian granite, syenite, diabase, leucocratic syenite, and syenite pegmatites.
Area: Lincoln County porphyry belt and Pecos River area (Roswell and Carlsbad 1 by 2 degree quadrangles).

Kelley, V.C., 1972, Geology of the Fort Sumner sheet, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 98, 55 p., 8 figs., 2 sheets, scale 1:190,843
Includes brief descriptions of syenite porphyry, rhyolite porphyry, miarolitic leucosyenite, diorite, and monzonite dikes.

Includes geologic map of the Pedernal Hills, Gallinas Mountains, Vaughn area, and Pecos River Valley-Fort Sumner area.
Area: Lincoln County porphyry belt and Pecos River area.

Kelley, V.C., 1977, Geology of the Albuquerque basin, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 33, 60 p., 9 tables, 24 figs., 2 sheets, scale 1:190,000
Includes a geologic map showing the distribution of the Espinaso Formation, Datil Formation, Bandelier Tuff, rhyolite, Canovas Canyon Rhyolite of the Jemez area, andesite flows and intrusives, shallow dikes and sills (basalt, latite, rhyolite), and undivided Precambrian rocks.
Area: Jemez Mountains, Mogollon-Datil volcanic province, Sandia, Ladron, Manzanita, Manzano, and Los Pinos Mountains, Sandoval, Santa Fe, Bernalillo, Valencia, and Socorro Counties.

Kelley, V.C., and Branson, O.T., 1947, Shallow, high-temperature pegmatites, Grant County, New Mexico: Econ. Geology, v. 42, p. 699-712, 5 figs.
Discusses the geology and mineralogy of Tertiary pegmatites within a rhyolite porphyry plug.
Area: Mogollon-Datil volcanic province, Grant County.

Kelley, V.C., and Northrop, S.A., 1975, Geology of Sandia Mountains and vicinity, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 29, 136 p., 4 tables, 92 figs., 4 sheets, scale 1:48,000
Describes the geology, petrology, and mineral resources of the Sandia Mountains, Monte Largo Hills, and Manzanita Mountains. Precambrian granite outcrops throughout these areas. Mentions the occurrence of a carbonatite dike in the Monte Largo area.
Area: Sandia and Manzanita Mountains, Sandoval and Bernalillo Counties.

Kelley, V.C., and Silver, C., 1952, Geology of the Caballo Mountains: Univ. New Mexico, Pub. Geol. Series no. 4, 286 p., 26 figs., 19 pls., scale 1:63,360
Describes Precambrian granite, Tertiary rhyolite, and monzonite. Discusses fluorite, lead, copper, silver, gold, barite, and manganese mines and prospects.
Area: Caballo Mountains, Sierra County.

Kent, S.C., 1980, Precambrian geology of the Tusas Mountain area, Rio Arriba County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 151 p., 7 tables, 26 figs., 1 pl, 2 appendices, scale 1:12,000
Precambrian mafic volcanic-volcaniclastic rock sequence, felsic schists, and arkosic sediments are intruded by a granodiorite and the Tusas granite in this 12 sq-mi area in the Tusas Mountains. A geologic map includes portions of the Burned Mountain, Carrin Plaza, Las Tablas, and Mule Canyon 7 1/2-min quadrangles and chemical analyses and petrographic descriptions of the Precambrian rocks. Mentions the occurrence of fluorite within the Tusas granite and greenschists along the contact.
Area: Tusas Mountains, Rio Arriba County.

Kerr, P.F., Kulp, J.L., Patterson, C.M., and Wright, R.J., 1950, Hydrothermal alteration at Santa Rita, New Mexico: Geol. Soc. America, Bull., v. 61, p. 275-347, maps

Describes mineralized quartz diorite sills the Hanover and Santa Rita stocks (granodiorite porphyry), Lucky Boy intrusive (highly altered porphyry), granodiorite dikes, and aplite dikes. Discusses alteration and mineralization and describes four types of mineralization: 1) contact metamorphic magnetite deposits, 2) zinc ore bodies replacing limestone, 3) zinc-ore fillings in fault zones, and 4) copper mineralization associated with the Santa Rita stock.

Area: Mogollon-Datil volcanic province, Grant County.

Kerr, P.F., and Wilcox, J.T., 1963, Structure and volcanism, Grants Ridge area, in Geology and technology of the Grants uranium region, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 15, p. 205-213, 4 figs.

Discusses two phases of volcanism in the Grants Ridge area: 1) felsite-rhyolite tuff and rhyolite complex and 2) mafic-porphyry basalts and basalt flows.

Area: San Juan Basin, Cibola County.

Kerr, P.F., see Graf, D.L., 1950; and Haji-Vassiliou, A., 1972

Kleinhampl, F.J., see Gillerman, E.G., Swinney, C.M., Whitebread, D.H., and Crowley, R.J., 1954

Kolessar, J., 1970, Geology and copper deposits of the Tyrone district, in Tyrone-Big Hatchet Mountains-Florida Mountains region (southwestern New Mexico): New Mexico Geol. Soc., Guidebook 21st field conf., p. 127-132, 3 figs.

Discusses and describes the copper porphyry deposit at Tyrone in a quartz monzonite laccolith. Mentions two major periods of mineralization in the Burro Mountains: 1) Laramide copper, iron, zinc, and molybdenum and 2) Tertiary fluorite, uranium, lead, and precious metals deposits.

Area: Burro Mountains, Grant County.

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

Kottlowski, F.E., 1952, Precambrian rocks in the Sangre de Cristo Mountains, near Santa Fe, New Mexico (abs.): Geol. Soc. America, Bull., v. 63, p. 1,335-1,336

Precambrian granite, metadiorite, pegmatites, aplite dikes, quartz veins, and lamprophyre dikes occur in the Truchas Range.

Area: Sangre de Cristo Mountains, Santa Fe County.

Kottlowski, F.E., 1953, Geoloy and ore deposits of a part of the Hansonburg mining district, Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 23, 11 p., 2 figs.

Discusses the geology and ore deposits of the barite-fluorite-galena deposits at Hansonburg mining district. Monzonite and diorite sills and dikes occur at the mine.

Area: Oscura Mountains, Socorro County.

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

Describes Precambrian granite and Tertiary andesite, rhyolite, monzonite, and quartz monzonite. Mentions the occurrence of fluorite throughout the San Andres Mountains.

Area: San Andres Mountains, Socorro, Sierra, and Dona Ana Counties.

Kottlowski, F.E., 1961, Reconnaissance geologic map of Las Cruces 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 14, scale 1:126,720

Geologic map showing the distribution of Tertiary rhyolite, quartz latite, quartz monzonite, andesite, latite, and Precambrian granite and pegmatites.

Area: Organ and southern San Andres Mountains, Dona Ana County.

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

Briefly describes Precambrian granite and pegmatite dikes and Tertiary andesite, latite, rhyolite, monzonite, and basaltic andesite.

Area: San Andres Mountains, Socorro, Sierra, and Dona Ana Counties.

Kottlowski, F.E., and Steensma, R.S., 1979, Barite-fluorite-lead mines of Hansonburg mining district in central New Mexico: New Mexico Geology, v. 1, no. 2, p. 19-20, 1 table, 2 figs.

Mentions the occurrence of Precambrian pink muscovite granite intruding gray quartzite near the mining district. A few Tertiary monzonite-diorite sills and dikes intrude the Paleozoic rocks within the district. The ore deposits are generally fillings in fissures, fault breccia, and small cavities. Purple fluorite is common.

Area: Oscura Mountains, Socorro County.

Kottlowski, F.E., see Jahns, R.H., and Kuellmer, F.J., 1955; and Seager, W.R., and Hawley, J.W., 1976

Kramer, W.V., 1970, Geology of the Bishop Cap Hills, Dona Ana County, New Mexico: M.S. thesis, Univ. Texas (El Paso), 76 p., 1 table, 6 figs., 5 pls.

Describes fluorite, barite, calcite, and quartz mineralization along fault zones and mentions that some of these deposits are radioactive. Includes geologic maps of the Bishop Cap Hills (1 inch = 2,000 ft), Grants prospect (1:15,000), and Blue Star prospect (1:440).

Area: Organ Mountains, Dona Ana County.

Kraxberger, V.E., see Alminas, H.V., Watts, K.C., Griffitts, W.R., Siems, D.L., and Curry, K.J., 1975

Krewedl, D.A., 1974, Geology of the central Magdalena Mountains, Socorro County, New Mexico: Ph.D. thesis, Univ. Arizona, 128 p., 27 figs., scale 1:12,000; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 44
Area: Magdalena Mountains, Socorro County.

Krieger, P., 1932, Geology of the lead-zonc deposit at Pecos, New Mexico: Econ. Geology, v. 27, p. 344-364, 450-470, 8 figs.
Includes petrographic studies of Precambrian granite and schists. Describes the zinc, lead, and copper sulfide deposits that replace the schists.
Area: Sangre de Cristo Mountains, San Miguel County.

Krieger, P., 1935, Primary native silver ores at Batopilas, Mexico and Bullard Peak, New Mexico: Am. Mineralogist, v. 20, no. 10, p. 715-723, 8 figs.
Describes silver, cobalt, and nickel mineralization at Bullard Peak (Black Hawk district)--a known uranium occurrence.
Area: Burro Mountains, Grant County.

Kudo, A.M., 1974, Outline of the igneous geology of the Jemez Mountains Mountains volcanic field, in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 287-289, 1 table, 1 fig.
Briefly describes the volcanic history and igneous geology of the Jemez Mountains. Includes a stratigraphic chart.
Area: Jemez Mountains, Sandoval and Los Alamos Counties.

Kudo, A.M., 1976, A review of the volcanic history and stratigraphy of northeastern New Mexico, in Vermejo Park (northeastern New Mexico): New Mexico Geol. Soc., Guidebook 27th field conf., p. 109-110, 1 table
Briefly outlines the volcanic stratigraphy of Union, Colfax, and Mora Counties. Includes a description of the Sierra Grande andesite (1.9 m.y.) and the Red Mountain Dacite.
Area: Chico Hills area and Raton-Clayton volcanic field, Colfax County.

Kudo, A.M., see Enz, R., and Brookins, D.G., 1979 and 1980

Kuellmer, F.J., 1952, Geologic section of the Black Range at Kingston, New Mexico: Ph.D. thesis, Univ. Chicago, 100 p.; New Mexico Bureau Mines Mineral Resources, Bull. 33, 1954, 100 p., 28 figs., 3 pls., scale 1:31,680
Describes Precambrian granite, metadiabase, Tertiary andesite, latite, rhyolite, and quartz monzonite. Includes some modal and chemical analyses.
Area: Black and Cooke's Ranges, Sierra and Grant Counties.

Kuellmer, F.J., 1955, Geology of a disseminated copper deposit near Hillsboro, Sierra County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 34, 46 p., 5 tables, 11 figs.
Describes quartz monzonite occurring in the Animas Hills area. Includes brief descriptions of Tertiary andesites and

latite dikes.
Area: Black and Cooke's Ranges, Sierra County.

Kuellmer, F.J., 1956, Geologic map of Hillsboro Peak 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 1, scale 1:126,720
Geologic map showing the distribution of Precambrian granite, granite gneiss, diabase, rhyolite, Tertiary rhyolite, rhyolite porphyry, and quartz monzonite porphyry.
Area: Black and Cooke's Ranges, Sierra, Grant, and Luna Counties.

Kuellmer, F.J., see Jahns, R.H., and Kottlowski, F.E., 1955; and Willard, M.E., and Weber, R.H., 1961

Kulp, J.L., see Kerr, P.F., Patterson, C.M., and Wright, R.J., 1950

Lamarre, A.L., Perry, A.J., and Jonson, D.C., 1974, The Salado fluorspar deposit, Sierra County, New Mexico (abs.), in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 379
Precambrian granite, metadiorite, and schist are exposed at the south end of the mountains. Mentions the occurrence of Tertiary basalt, felsic ash-flow tuffs, and andesite. Andesites, monzonite, and nepheline monzodiorite bodies intrude the sediments. Fluorite occurs in fault breccia associated with the alkalic rocks.
Area: Mogollon-Datil volcanic province, Sierra County.

Lambert, P.W., 1961, Petrology of the Precambrian rocks of part of Monte Largo area, New Mexico: M.S. thesis, Univ. New Mexico, 108 p., 6 tables, 4 figs., 12 pls., scale 1:24,000
Discusses the geology, petrology, and economic potential of the Monte Largo area. Describes granite, aplite, pegmatites, and a carbonatite dike. Includes chemical analyses of quartz-feldspar gneiss and discusses the occurrence of hydrothermal barite and fluorite veins.
Area: Sandia Mountains, Sandoval and Bernalillo Counties.

Landis, E.R., see Brookins, D.G., Chakoumakos, B.C., Cook, C.W., Ewing, R.C., and Register, M.E., 1979; and Ratte, J.C., Gaskill, D.L., and Damon, P.E., 1969; Ratte, J.C., Gaskill, D.L., Raabe, R.G., and Eaton, G.P., 1967

Langford, F.F., 1980, Stratigraphic implications of uranium deposits, in Geology and technology of the Grants uranium region, 1979, C.A. Rautman, compiler: New Mexico Bureau Mines Mineral Resources, Mem. 38, p. 36-39, 5 figs.
Proposes a model for the deposition of vein-type uranium deposits in Saskatchewan, Canada and Australia and relates this model to deposits in New Mexico. Suggests that all areas in New Mexico where continental sandstones unconformably overlie basement rocks indicate favorable areas for the exploration of unconformity-related vein-like uranium deposits. The Abo Formation overlies Precambrian rocks in the Zuni Mountains and the

occurrence of uranium vein deposits may be similar to deposits found in Canada. Uranium also occurs in the Burro Mountains and perhaps the basal unconformity is favorable for uranium deposits.
Area: Zuni Mountains, Cibola County; Burro Mountains, Grant County.

Langford, F.F., see Kalliokoski, J., and Ojakangas, R.W., 1978

Laroche, T.M., 1980, Geology of the Gallinas Peak area, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 128, 145 p., 1 table, 17 figs., 2 pls.
Describes Tertiary volcanic rocks (Spears Formation, Hells Mesa tuff, A.L. Peak Tuff, South Canyon tuff) and intrusives (mafic dikes, quartz latite dikes and plugs) of the Gallinas Peak area. Briefly discusses the uranium potential within the Baca Formation.
Area: Mogollon-Datil volcanic province, Socorro County.

Larsen, E.S., Irving, J., Gonyer, F.A., and Larsen, E.S. III, 1936, Petrologic results of a study of the minerals from Tertiary volcanic rocks of the San Juan region, Colorado (and New Mexico): Am. Mineralogist, v. 21, p. 679-701, 7 figs. (1936), v. 22, p. 889-905, 5 figs. (1937), v. 23, p. 227-257, 13 figs., 417-430 (1938)
Describes the petrology of volcanic rocks in the San Juan Basin. Includes modal and chemical analyses and lists accessory minerals.
Area: San Juan Basin.

Larsen E.S., Jr., Phair, G., Gottfried, D., and Smith, W.S., 1956, Uranium in magmatic differentiation--geology of uranium and thorium: U.N. Internat. Conf. Peaceful uses Atomic Energy, 1955, p. 240-247, 13 tables, 3 figs.
Includes the uranium content of latite, basalt, andesite, rhyolite, and quartz latite lavas in the San Juan Mountains, Colorado (northern extension of the Tusas Mountains, Rio Arriba County).
Area: San Juan Mountains, Colorado.

Larsen, E.S. III, see Larsen E.S., Irving, J., and Gonyer, F.A., 1936

Lasky, S.G., 1930, Geology and ore deposits of the Groundhog mine, Central district, Grant County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 2, 14 p., 2 figs., 1 pl.
Describes lead and copper mineralization in quartz diorite, granodiorite, and rhyolite. Describes the rocks and discusses the alteration of the ore deposits.
Area: Mogollon-Datil volcanic province, Grant County.

Lasky, S.G., 1932, The ore deposits of Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 8, 139 p., 21 figs., 4 pls., map
Describes Precambrian granite gneiss, granite, Tertiary monzonite, monzonite porphyry, granite, andesite, latite, and

rhyolite. Discusses gold, silver, copper, lead, and zinc deposits.
Area: Socorro County.

Lasky, S.G., 1935, Igneous assimilation and associated contact metamorphism in the Virginia mining district, New Mexico: Am. Mineralogist, v. 20, p. 552-561, 5 figs., map
Describes a Tertiary granodiorite intrusion and the occurrence of rhyolitic intrusive plugs.
Area: Pyramid Mountains, Hidalgo County.

Lasky, S.G., 1936a, Geology and ore deposits of the Bayard area, Central mining district, New Mexico: U.S. Geol. Survey, Bull. 870, 144 p., 21 figs., 17 pls.
Describes mines and prospects of lead, copper, silver, gold, and vanadium mineralization. Discusses alteration of the ore bodies and surrounding rock. Describes quartz diorite, granodiorite porphyry, and quartz latite sills, dikes, and flows.
Area: Mogollon-Datil volcanic province, Grant County.

Lasky, S.G., 1936b, Hydrothermal leaching in the Virginia mining district, New Mexico: Econ. Geology, v. 31, p. 156-169, 7 figs., map
Discusses the solution and removal of material by hydrothermal solutions (leaching). Briefly describes a granodiorite stock, granodiorite porphyry dikes, aplite dikes, rhyolite breccias and plugs, quartz latite dikes, and felsic dikes. Mineralization (gold, silver, copper) is within veins along fracture zones. Fluorite is mentioned as a gangue mineral deposited during final stages of mineralization.
Area: Pyramid Mountains, Hidalgo County.

Lasky, S.G., 1938, Geology and ore deposits of the Lordsburg mining district, Hidalgo County, New Mexico: U.S. Geol. Survey, Bull. 885, 62 p., 9 figs., 25 pls.
Describes porphyritic granodiorite, quartz latite, felsite dikes, and rhyolite and discusses the copper deposition.
Area: Pyramid Mountains, Hidalgo County.

Lasky, S.G., 1940, Outlook for further ore discoveries in the Little Hatchet Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 7, 31 p., 6 figs.; Econ. Geology, v. 33, p. 365-389, 6 figs.
Discusses the general geology of the Little Hatchet Mountains. Mentions the occurrence of granite, monzonite, and diorite sills. Describes copper, lead, and gold vein deposits.
Area: Hatchet Mountains, Hidalgo and Grant Counties.

Lasky, S.G., 1947, 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., scale 1:31,250
Describes Tertiary diorite sills, Old Hachita monzonite (including a sodic phase), monzonite porphyry dikes, Sylvanite stock (monzonite, quartz monzonite), Granite Pass stock (porphyry granite and aplitic granite), lamprophyre and aplite dikes, latite

dikes and sills, felsite, and granite. Includes some modal and chemical analyses. Includes descriptions of the mineralogy of the Eureka silver-lead and the Sylvanite gold mining districts. Includes descriptions of the mines and prospects.
Area: Hatchet Mountains, Hidalgo and Grant Counties.

Laughlin, A.W., and Eddy, A., 1977, Petrography and geochemistry of Precambrian rocks from GT-2 and EE-1: Los Alamos Sci. Lab., Open-file Rept. LA-6930-MS, UC66a, 50 p., 7 tables, 10 figs.
Describes the subsurface occurrence of granite gneiss, granite to granodiorite, leucocratic granodiorite gneiss, leucocratic granite gneiss, and schists. Includes petrologic descriptions and geochemical analyses. Includes a drill core summary.
Area: Jemez Mountains, Sandoval County.

Leach, A.A., 1916, Black Hawk silver-cobalt ores: Eng. Mining Jour., v. 102, p. 456
Area: Burro Mountains, Grant County

Leach, F.I., 1920, Radium ore discovered in White Signal district, New Mexico: Eng. Mining Jour., v. 109, no. 17, p. 989
Discusses the occurrence of torbernite (a copper-uranium phosphate) and autunite (a copper-uranium phosphate) in Precambrian granite and felsite dikes. Includes uranium analyses. Mentions the occurrence of pitchblende in the Black Hawk district.
Area: Burro Mountains, Grant County.

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

Lessard, R.H., see Reid, B.E., Griswold, G.B., and Jacobsen, L.C., 1980a,b

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

Lindgren, W., 1908, The Tres Hermanas mining district, New Mexico: U.S. Geol. Survey, Bull. 380, p. 123-128
Discusses the geology and ore deposition of a lead-zinc fissure vein in the Tres Hermanas mining district. The host rock is a granite porphyry. Includes analyses of the zinc ore.
Area: Tres Hermanas Mountains, Luna County.

Lindgren, W., Graton, L.C., and Gordon, C.H., 1910, The ore deposits of New Mexico: U.S. Geol. Survey, Prof. Paper 68, 361 p., 33 figs., 22 pls.
Describes in detail the ore deposits of New Mexico, arranged by county. Includes the geology and some modal and chemical analyses from these deposits. Includes a section describing the Precambrian rocks.
Area: Statewide.

Lipman, P.W., 1969, Alkalic and theoleiitic basaltic volcanism related to the Rio Grande depression, southern Colorado and northern New Mexico: Geol. Soc. America, Bull., v. 80, p. 1,343-1,354, 2 tables, 2 figs., 2 pls.

Includes major-element analyses of basalts and uranium and thorium analyses of alkali basalt and theoleiites of the San Juan Mountains. Uranium content for alkali basalts averaged 1.1 ppm and thorium content averaged 1.8 ppm. Includes brief petrographic descriptions.

Area: San Juan Mountains (Tusas Mountains), Sangre de Cristo Mountains, Raton-Clayton volcanic field, Rio Arriba, Colfax, and Taos Counties.

Lipman, P.W., Bunker, C.M., and Bush, C.A., 1973, Potassium, thorium, and uranium contents of upper Cenozoic basalts of the Southern Rocky Mountain region, and their relation to the Rio Grande depression: U.S. Geol. Survey, Jour. of Research, v. 1, no. 4, p. 387-401, 2 tables, 5 figs.

Major-element, potassium, uranium, and thorium analyses of basalts from New Mexico and southern Colorado have shown that K, Th, and U contents and Th/K and U/K ratios increase away from the Rio Grande depression. Briefly describes the geology and petrology of basalts studied, including basalts from the Tusas Mountains, Mount Taylor, Cimarron Mountains, and high plains area (Raton-Clayton volcanic field). Includes U, Th, and K contents of these basalts.

Area: Statewide.

Lipman, P.W., Pallister, J.S., and Sargent, K.A., 1979, Geologic map of the Mount Taylor quadrangle, Valencia County, New Mexico: U.S. Geol. Survey, Geol. Quad. Map, GQ-1523, scale 1:24,000 (now Cibola County)

Geologic map showing the distribution of rhyolite tuffs, porphyritic breccias, tuffaceous rocks, trachytes, porphyritic flows, and latite dikes; most of the igneous rocks are associated with the Mount Taylor intrusive.

Area: Mount Taylor, Cibola County.

Long, L.E., 1972, Rb-Sr chronology of Precambrian schist and pegmatite, La Madera quadrangle, northern New Mexico: Geol. Soc. America, Bull., v. 83, p. 3,425-3,432, 2 tables, 5 figs.

Briefly describes the geology and lithology of the La Madera 7 1/2-min and Las Tablas 15-min quadrangles. The area includes a siliceous volcanic rock (metarhyolite) and pegmatites. Includes isotopic analyses of the metarhyolite and the pegmatites.

Area: Tusas Mountains, Rio Arriba County.

Long, L.E., <u>see</u> Barker, D.S., 1974

Long, P.E., 1974, Contrasting types of Precambrian granitic rocks in the Dixon-Penasco area, northern New Mexico, <u>in</u> Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 101-108, 1 table, 8 figs.

Describes the geology and occurrence of Precambrian Cerro Alto metadacite, Puntiagudo quartz monzonite, Harding pegmatite, and other pegmatites. Includes modal analyses and discusses the alteration of the granitic rocks. Includes Rb-Sr dating and estimated depths of emplacement.

Area: Sangre de Cristo Mountains, Taos County.

Long, P.E., 1976, Precambrian granitic rocks of the Dixon-Penasco area, northern New Mexico--a study in contrasts: Ph.D. thesis, Stanford Univ.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 71, 533 p., 7 tables, 152 figs., 4 pls., 2 sheets, scale 1:24,000 and 1:12,000

Describes the emplacement of four granitic plutons in the Dixon-Penasco area; Cerro Alto metadacite, Puntiagudo granite porphyry, Rana quartz monzonite, and Penasco quartz monzonite. Pegmatites intrude these granitic rocks. Describes the Precambrian sediments which consist of the Vadito Formation (including a conglomerate member). Includes modal compositions, petrochemistry, and petrogenetic descriptions.

Area: Sangre de Cristo Mountains, Taos County.

Lopez, D.A., 1975, Geology of the Datil area, Catron County, New Mexico: M.S. thesis, Univ. New Mexico, 72 p., 3 tables, 21 figs.

Describes andesite breccia, porphyritic andesite, and rhyolite. Includes some modal and chemical analyses.

Area: Mogollon-Datil volcanic province, Catron County.

Loring, A.K., and Armstrong, D.G., 1980, Cambrian-Ordovician syenites of New Mexico, part of a regional alkalic intrusive episode: Geology, v. 8, p. 344-348, 2 tables, 4 figs.

Describes the age, geology, and whole-rock chemistry of two syenite dikes in the Pedernal Hills area. These syenites are lithologically similar to syenite dikes found in Wet Mountains, Colorado.

Area: Pedernal Hills, Torrance County.

Loughlin, G.F., and Koschmann, A.H., 1942 (1943), Geology and ore deposits of the Magdalena mining district, New Mexico: U.S. Geol. Survey, Prof. Paper 200, 168 p., 28 figs., 35 pls., scale 1:12,000

Area: Magdalena Mountains, Socorro County.

Lovering, T.G., 1956, Radioactive deposits in New Mexico: U.S. Geol. Survey, Bull. 1009-L, p. 315-390, 12 tables, 9 figs., 7 pls.

Describes and discusses the occurrence and geology of radioactive deposits in New Mexico. Uranium, thorium, and rare-earth elements are reported from the Petaca pegmatite district, in Rio Arriba County. Two anomalous radioactive deposits are reported near thermal springs, Jemez Springs and Caseman Springs, in Sandoval County. Radioactive deposits associated with veins cutting Precambrian granite and younger intrusives are reported from the Black Hawk and White Signal deposits, Burro Mountains, Grant County. Other occurrences include: 1) San Acacia, Socorro County; 2) Terry prospect, Sierra County; 3) radioactive ilmenite float near Hillsboro, Sierra County; 4) pitchblende in the Black Range; 5) abnormal radioactivity in the Tyrone and Chino districts, Grant County; and 6) anomalous radioactivity in Precambrian granite in the Zuni Mountains. Discusses possible occurrences of uranium in the veins and igneous rocks of the Elizabethtown district, Colfax County; Penalta Canyon, Sandoval County; Rociada district, Mora County; Organ Mountains, Dona Ana County; Little Hatchet Mountains, Grant County; Glorieta area,

Santa Fe County; and Elk Mountain, San Miguel County. Geologic maps, sketches, and sections are included of several prospects. A few chemical and radiometric analyses are included. A table summarizing the deposits is also included.
Area: Statewide.

Lovering, T.G., see Granger, H.C., Bauer, H.L., Jr., and Gillerman, E., 1952

Lufkin, J.L., 1972, Tin mineralization within rhyolite flow-domes, Black Range, New Mexico: Ph.D. thesis, Stanford Univ.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 57, 148 p., 8 tables, 48 figs., 6 pls., scale 1:12,000
Discusses the geology, alteration, and mineralogy of Paramount Canyon-Taylor Peak area and South Kemp Mesa-Beaver Creek area. Includes modal, major-element, and minor-element analyses. Zircon appears as an accessory mineral in the ore deposits.
Area: Black and Cooke's Ranges, Sierra County.

Lustig, L.K., 1958, The mineralogy and paragenesis of the Lone Star deposit, Santa Fe County, New Mexico: M.S. thesis, Univ. New Mexico, 55 p., 5 tables, 10 figs.
Describes the mineralogy of the Lone Star deposit in the La Bajada Canyon, Santa Fe County. Briefly describes an augite-biotite monzonite and monzonite porphyry plug and discusses the occurrence of brannerite (TiO_2, UO_3, UO_2, ThO_2, Y_2O_3, (Ca, Fe)O) which was not seen by the author but mentioned in an unspecified report. Includes uranium analyses of ore samples (0.07-1.5 ppm U).
Area: Ortiz Mountains, Santa Fe County.

Lustig, L.K., and Rosenzweig, A., 1959, Mineralogy of the Lone Star deposit, Santa Fe County, New Mexico: Compass, v. 36, no. 3, p. 172-183, 5 figs.
Area: Sangre de Cristo Mountains, Santa Fe County.

MacDiarmid, R.A., see Park, C.F., Jr., 1975

Machette, M.N., 1978a, Geologic map of the San Acacia quadrangle, Socorro County, New Mexico: U.S. Geol. Survey, Geol. Quad. Map GQ-1415, scale 1:24,000
Includes the distribution and description of the andesite at Cerritos de las Minas and volcaniclastic fanglomerate facies.
Area: Lemitar Mountains, Socorro County.

Machette, M.N., 1978b, Preliminary geologic map of Socorro, 1 x 2 degree quadrangle, central New Mexico: U.S. Geol. Survey, Open-file Rept. 78-607, scale 1:250,000
Area: Socorro, Catron, Torrance, and Valencia Counties.

Machette, M.N., see Pierson, C.T., Wenrich-Verbeek, K.J., and Hannigan, B.J., 1980

Malan, R.C., 1972, Summary report--distribution of uranium and thorium in the Precambrian rocks of the western U.S.: U.S. Atomic Energy Comm., Rept. AEC-RD-12, 59 p., 16 tables, 12 figs.

Includes uranium and thorium analyses of Precambrian conglomerates of the Kiawa Mountain Formation in the Tusas Range and of the Vadito Formation in the Picuris Range, Taos County:

Kiawa Mountain Formation	12.4 ppm U	2.6 ppm Th
Vadito Formation	1.1 ppm U	3.3 ppm Th

Area: Tusas Mountains, Rio Arriba County and Sangre de Cristo Mountains, Taos County.

Malan, R.C., and Sterling, D.A., 1969, A geological study of uranium resources in Precambrian rocks of the western U.S.: U.S. Atomic Energy Comm., Rept. AEC-RD-9, 54 p., 10 tables, 16 figs., appendix

Includes uranium, thorium, and potassium analyses of rocks from various parts of New Mexico.

Area: Statewide.

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

Maldonado, F., 1974, Geology of the northern part of the Sierra Cuchillo, Socorro and Sierra Counties, New Mexico: M.S. thesis, Univ. New Mexico, 59 p., 1 table, 24 figs.

Describes andesite, latite, rhyolite, quartz latite, and quartz monzonite and includes modal analyses. Reports beryllium mineralization.

Area: Sierra Cuchillo, Socorro and Sierra Counties.

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

Area: Los Pinos Mountains, Socorro County.

Mallory, N.S., see Collins, G.E., 1954

Marjaniemi, D.K., and Basler, A.L., 1972, Geochemical investigations of plutonic rocks in the western U.S. for the purpose of determining favorability for vein-type uranium deposits: U.S. Atomic Energy Comm., Rept. GJO-912-16, 134 p., 17 tables, 83 figs., 2 pls., appendix

Includes the uranium, thorium, and potassium contents of various plutonic rocks throughout New Mexico:

	U ppm	Th ppm
Duran, Torrance County	2.6-1.6	4.9-6.0
Capitan Mountains, Lincoln County	2.3-4.3	24.4-26.2
Jarilla Mountains, Otero County	2.2	13.4
Organ Mountains, Dona Ana County	3.6-3.9	22.4-24.7
Tres Hermanas, Luna County	4.9	
Sangre de Cristo Mountains	12.2	28.2
Ortiz Mountains, Santa Fe County	3.4-11.3	16.0-46.4

Concludes that geologic subdivisions with the highest average uranium content are in the southern Rocky Mountains of Colorado and the Mexican Highlands of southwestern New Mexico. The Colorado Plateau contans the lowest average uranium values.
Area: Lincoln County porphyry belt; Organ Mountains, Dona Ana County; Tres Hermanas Mountains, Luna County; Sangre de Cristo Mountains, Mora, Taos, San Miguel, Santa Fe, and Colfax Counties; Ortiz Mountains, Santa Fe County.

Martinez, R., see Woodward, L.A., and DuChene, H.R., 1977; and Woodward, L.A., DuChene, H.R., Schumacher, O.L., and Reed, R.K., 1974

Mason, J.T., 1976, The geology of the Caballo Peak quadrangle, Sierra County, New Mexico: M.S. thesis, Univ. New Mexico, 131 p., 1 table, 30 figs., scale 1:24,000
Describes Precambrian granite (alaskite to quartz syenite), gneiss, and pegmatite dikes. Discusses fluorite occurrences and mentions the occurrence of uranium in sediments in the area covered.
Area: Caballo Mountains, Sierra County.

Massingill, G.L., 1979, Geology of Riley-Puertecito area, southeastern margin of Colorado Plateau, Socorro County, New Mexico: Ph.D. thesis, Univ. Texas (El Paso); New Mexico Bureau Mines Mineral Resources, Open-file Rept. 107, 301 p., 37 figs., 3 pls., scale 1:24,000
Describes the geology of the Riley-Puertecito area, near Magdalena, New Mexico, including the Spears Formation (volcaniclastic sediments), Hells Mesa tuff (rhyolite ash-flow tuff), A.L. Peak Tuff (rhyolite tuff), La Jara Peak basaltic andesite, and intrusive basaltic andesite dikes and sills and basaltic necks. Includes a chemical analysis of one of the dikes and a discussion of the uranium potential in some of the sedimentary units and the Oligocene ash-flow tuffs, which may be the source rocks for the uranium in the area.
Area: Mogollon-Datil volcanic province, Socorro County.

Maxwell, C.H., 1976, Geologic map of the Acoma Pueblo quadrangle, Valencia County, New Mexico: U.S. Geol. Survey, Geol. Quad. Map GQ-1298, scale 1:24,000 (now Cibola County)
Geologic map showing the distribution of diabase dikes and sills and lamprophyre sills. Most of the area is mapped as Paleozoic sediments.
Area: San Juan Basin, Cibola County.

May, R.T., Smith, E.S., Dickson, R.E., and Nystrom, R.J., 1981, Uranium resource evaluation, Douglas quadrangle, Arizona and New Mexico: U.S. Dept. Energy, Prelim. Rept. PGJ-118 (81), 93 p., 6 tables, 7 figs., 4 appendices
Comprehensive geologic report describing the geology and uranium potential of the various host rocks in the Douglas 1 by 2 degree quadrangle, covering a portion of the Mexican Highlands area of the Basin and Range physiographic province. Geologic environments favorable for uranium deposits include

magmatic-hydrothermal veins in sandstones and permeable limestones of the U-Bar and Mojado Formations (Cretaceous) in the Sierra Rica-Hachita Valley-Little Hatchet Mountains. Discusses the various reasons why other cauldron-related volcanic rocks are not favorable for uranium deposition (i.e. Juniper, Cowboy Rim, and Animas Peak cauldron). The Geronimo Trail, Apache and Rodeo cauldrons are unevaluated as to their uranium potential because insufficient geologic information is available. Includes a table of uranium occurrences (appendix A) and uranium-occurrence reports. Includes a comprehensive bibliography, chemical analyses, and petrographic reports.

Area: Mogollon-Datil volcanic province; Hatchet, Pyramid, Animas and Peloncillo Mountains, Hidalgo County.

Mayerson, D.L., 1979, Geology of the Corkscrew Canyon-Abbe Spring area, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 112, 125 p., 2 tables, 18 figs., 1 pl., 2 appendices, scale 1:24,000

Describes the geology of the Corkscrew Canyon-Abbe Springs area, near Magdalena, New Mexico. Includes descriptions of the Tertiary Spears Formation (volcaniclastic sediments), Hells Mesa Tuff (rhyolite tuff), A.L. Peak Tuff (rhyolite tuff), and the La Jara Peak basaltic andesite. Also briefly describes the uranium potential of several sedimentary units and suggests that the uranium may be leached from the overlying volcanic rocks.

Area: Mogollon-Datil volcanic province, Socorro County.

McAnulty, W.N., 1978, Fluorspar in New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 34, 64 p., 6 tables, 31 figs., 11 pls., 14 sheets

Describes the geology and occurrence of over 40 fluorspar deposits and prospects in New Mexico. Includes a table listing more than 200 known fluorite deposits in the state. Geologic maps, sections, and photographs of some of the deposits are included. Describes several radioactive fluorspar deposits including the Bishop Cap fluorspar district (25, T. 24 S., R. 3 E.), Dona Ana County and the Salado fluorspar district (T. 13, 14 S. R. 7 W.), Sierra County. Several other fluorspar deposits contain uranium minerals.

Area: Catron, Dona Ana, Grant, Hidalgo, Luna, Sierra, Cibola, Sandoval, Lincoln, Bernalillo, Torrance, and Socorro Counties.

McCleary, J.T., 1960, 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., scale 1:31,680

Describes the occurrence of Precambrian granite and the copper and galena deposits.

Area: Fra Cristobal Mountains, Sierra and Socorro Counties.

McKay, E.J., see Myers, D.A., 1970, 1971, 1972, 1974, and 1976

McKelvey, V.E., 1955, Search for uranium in the U.S.: U.S. Geol. Survey, Bull. 1030-A, p. 1-64, 5 figs.

Mentions vein and replacement uranium deposits in the White Signal and Black Hawk districts, Grant County. Briefly discusses uranium potential in igneous rocks, pegmatites, hydrothermal vein deposits, and replacement deposits.
Area: Burro Mountains, Grant County.

McKinlay, P.F., 1956, 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., scale 1:48,000
Briefly describes Precambrian granite and pegmatites and Tertiary Latir Peak Latite, rhyolite flows and intrusives, granite, and monzonite porphyry dikes. Briefly discusses their alteration. Includes a geologic map.
Area: Sangre de Cristo Mountains, Taos County.

McKinlay, P.F., 1957, Geology of Questa quadrangle, Taos County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 53, 23 p., 1 table, 1 pl., scale 1:48,000
Briefly describes Precambrian granite, granite gneiss, and pegmatites and Tertiary Latir Peak Latite, granite, rhyolite flows and intrusives, soda granite, and monzonite porphyry dikes. Briefly describes the Questa molybdenum mine where molybdenum occurs in veins cutting a soda granite stock. Other vein minerals include fluorite, silver, gold, copper, lead, and zinc and are associated with Tertiary intrusives. Divides the mineralization into three types: 1) molybdenum-fluorite-pyrite-quartz veins, 2) chalcopyrite and galena in quartz veins, and 3) pyrite zones within quartzite. Includes a geologic map.
Area: Sangre de Cristo Mountains, Taos County.

McKinlay, P.F., see Park, C.F., Jr., 1943

McKinney, W.A., see Dale, V.B., 1960

McLelland, D., see Woodward, L.A., and Gibson, G.G., 1976; Woodward, L.A., Anderson, J.B., and Kaufman, W.H., 1972; Woodward, L.A., and Kaufman, W.H., 1974; and Woodward, L.A., and Husler, J.W., 1977

McLemore, V.T., 1980a, Geology of the Precambrian rocks of the Lemitar Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., New Mexico Bureau Mines Mineral Resources, Open-file Rept. 122, 169 p., 19 tables, 15 figs., 29 pls., scale 1:6,000
Describes the geology of the Precambrian rocks in the eastern Lemitar Mountains consisting of granitic rocks and carbonatite dikes. Includes modal analyses, petrographic descriptions, and chemical analyses. Includes uranium analyses of some carbonatite dikes.
Area: Lemitar Mountains, Socorro County.

McLemore, V.T., 1980b, Carbonatites in the Lemitar Mountains, Socorro County, New Mexico: New Mexico Geology, v. 2, no. 4, p. 49-52, 3 tables, 1 fig.
Describes the geology, mineralogy, and chemistry of

carbonatite dikes in the Lemitar Mountains. Includes chemical analyses of the carbonatites. Uranium concentrations of the carbonatites range from trace to 0.08% U_3O_8.
Area: Lemitar Mountains, Socorro County.

McLemore, V.T., 1982 (in progress), The geology and geochemistry of radioactive carbonatite dikes in the Lemitar Mountains, Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Open-file Rept. 158, figs., tables, plates
Detailed geologic report describing the Lemitar carbonatites. Includes chemical analyses, mineralogy, and geologic maps. Uranium analyses range from 0.001 to 0.25% U_3O_8.
Area: Lemitar Mountains, Socorro County.

McLeroy, D.F., 1972, 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
Briefly describes the geology and chemical analyses of the host rocks and of the banded iron-formation in the Cleveland Gulch, Iron Mountain, and Canon Plaza areas in the Tusas Mountains. Includes a geologic map of the Canon Plaza area and spectrochemical analyses.
Area: Tusas Mountains, Rio Arriba County.

McMillan, D.K., see Jahns, R.H., O'Brient, J.D., and Fisher, D.L., 1978

McWhorter, R.J., editor, 1977, Uranium exploration activities in the United States: Electric Power Research Inst., prepared by S.M. Stoller Corp., Open-file Rept. EPRI EA-401, 152 p.
Includes a table (p. B-32-B38) listing significant uranium discoveries which include 1) undifferentiated Precambrian rocks, San Juan Mountains, Colorado and 2) andesite dike in the Espinaso Volcanics, La Bajada district, Santa Fe County.
Area: San Juan Mountains (Tusas Range), Colorado and Sangre de Cristo Mountains, Santa Fe County.

Meeves, H.C., 1966, Nonpegmatitic beryllium occurrences in Arizona, Colorado, New Mexico, Utah, and four adjacent states: U.S. Bureau Mines, Rept. RI-6828, 68 p., 2 tables, 25 figs., 3 appendices
Discusses beryllium deposits of the Cornudas Mountains, Iron Mountain, and Warm Springs. The Cornudas Mountains consist of individual peaks of laccolith cores with a nepheline syenite composition, surrounded by narrow syenite dikes. Anomalous amounts of rare-earth elements and Nb, Rb, Li, and tin are reported. The Warm Springs deposit consists of beryllium along a fault between the Rubio Peak Formation (rhyolites) and the Santa Fe Group. The Iron Mountain deposit consists of iron-rich formations of tungsten, gold, base-metals, and beryllium. Ribbon rock in the area contains magnetite and fluorite. Includes a summary table of fifteen other properties.
Area: Cornudas Mountains, Otero County; Mogollon-Datil volcanic province, Socorro and Sierra Counties; Sierra Cuchillo, Sierra County.

Melancon, P.E., 1952, Uranium occurrences in the Caballo Mountains, Sierra County, New Mexico: U.S. Atomic Energy Comm., Tech. Memo. TM-213, 7 p., 2 tables, 2 figs.

This brief reconnaissance report describes the geology and mineralization of three uranium occurrences in the Caballo Mountains. Uranium and thorium are found within syenite dikes intruding Precambrian granite at the Red Rock No. 1 claim. Uranium occurs within conglomerate lenses within the Bliss Formation at the Red Rock No. 3 claim. Low grade uranium mineralization occurs along a fault zone in sediments of the Magdalena Group at the Hot Rock No. 2 and 4 claims. Uranium analyses and location maps are included.

Area: Caballo Mountains, Sierra County.

Miller, J.P., Montgomery, A., and Sutherland, P.K., 1963, Geology of part of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 11, 106 p., 23 figs., 13 pls., scale 1:63,360

Describes the Embudo Granite, consisting of three facies: 1) biotite granite, 2) gneissic granite, and 3) leucogranite. Describes granite pegmatites and quartz veins. Mentions the occurrence of copper mineralization in quartz veins. Briefly describes ore deposits of the Pecos mine (zinc, copper, lead, gold, and silver).

Area: Sangre de Cristo Mountains, Rio Arriba, Santa Fe, San Miguel, and Taos Counties.

Misagi, F.L., 1968, Geochemical and biogeochemical studies in the Eagle Nest quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 94, 24 p., 1 table, 17 figs., 3 sheets, scale 1:48,000

Includes copper, zinc, lead, molybdenum, and argon concentrations for Precambrian granite and metaquartzite and Tertiary latite, granite, rhyolite, and andesite. Includes a geochemical map, a soil sampling map, and a plant sampling map.

Area: Sangre de Cristo Mountains, Colfax County.

Missaghi, F.M., <u>see</u> Griswold, G.B., 1964

Moench, R.H., <u>see</u> Robertson, J.M., 1979

Montgomery, A., 1950, Geochemistry of tantalum in the Harding pegmatite, Taos County, New Mexico: Am. Mineralogist, v. 35, no. 9-10, p. 853-866, 2 tables, 3 figs., map

Discusses the origin of the tantalum in the Harding pegmatite as being due to 1) parental tantalum-rich granite, 2) favorable environment, 3) absence of tantalum-bearing sphene from adjacent granite, and 4) long deformation acting on the granite and pegmatite. Includes a geologic map showing the distribution of leucogranite, Penasco granite, and the Harding granite.

Area: Sangre de Cristo Mountains, Taos County.

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

Discusses the geology and distribution of beryl at the

Harding pegmatite.
Area: Sangre de Cristo Mountains, Taos County.

Montgomery, A., 1953, Precambrian geology of the Picuris Range, north-central New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 30, 89 p., 4 tables, 3 figs., 9 pls., scale 1:46,588

Includes the geology and petrology of the Picuris Range. Describes felsites, diorite, quartz diorite, granodiorite, granite, leucogranite, pegmatites, and aplite dikes. Includes modal and chemical analyses of the Embudo Granite.

Area: Sangre de Cristo Mountains, Taos and Rio Arriba Counties.

Montgomery, A., <u>see</u> Miller, J.P., and Sutherland, P.K., 1963

Moore, D.G., Jr., 1965, The niobium and tantalum content of some alkali igneous rocks: M.S. thesis, New Mexico Inst. Mining and Tech., 90 p., 7 tables, 16 figs.

Includes brief descriptions of the geology and petrology of the Monte Largo and Gallinas Mountains alkali complexes. A carbonatite dike occurs within the Monte Largo area. Includes Nb_2O_5 and Ta_2O_5 contents of various rocks from each area and includes brief petrographic descriptions and geologic maps.

Area: Sandia Mountains, Bernalillo and Sandoval Counties and Lincoln County porphyry belt.

Moore, S.L., <u>see</u> Hernon, R.M., and Jones, W.R., 1953 and 1964; and Jones, W.R., and Hernon, R.M., 1967; Jones, W.R., and Pratt, W.P., 1970

Morris, R.W., 1974, Geology and mineral deposits of the northern Cooke's Range, Sierra County, New Mexico: M.S. thesis, Univ. Texas (El Paso), 47 p., 1 table, 3 figs., 9 pls., 3 sheets

Describes Tertiary volcanic flows (andesites, latites) and Tertiary intrusive rocks (andesite, rhyolite). Describes Precambrian granite and pegmatites. Describes lead, silver, and fluorspar occurrences. Includes geologic maps of the northern Cooke's Range (1 inch = 900 ft), White Eagle mine and vicinity (1 inch = 50 ft), and Linda Vista and Wagon Tire prospects (1 inch = 100 ft).

Area: Black and Cooke's Ranges, Sierra County.

Morrison, R.B., 1965, Geologic map of the Duncan and Canador Peak quadrangles, Arizona and New Mexico: U.S. Geol. Survey, Misc. Geol. Inv. Map I-442, 7 p. text, scale 1:48,000

Geologic map including the distribution and brief descriptions of Precambrian granite, pegmatite, aplite dikes, and diorite dikes, and Tertiary andesite, rhyolite, and latite of the Datil Formation.

Area: Mogollon-Datil volcanic province, Grant and Hidalgo Counties.

Motts, W.S., and Gaal, R.A., 1960, Geology of Pajarito Mountain area, Otero County, New Mexico: Am. Assoc. Petroleum Geologists, Bull., v. 44, p. 108-110, 2 figs.

Describes the intrusives of Pajarito Mountain, consisting of hornblende granite grading into a syenite core.
Area: Pajarito Mountain, Otero County.

Muehlberger, W.R., 1960, Precambrian rocks of the Tusas Mountains, Rio Arriba County, in Rio Chama country (northern New Mexico): New Mexico Geol. Soc., Guidebook 11th field conf., p. 45-47
Summarizes the distribution and petrology of Precambrian rocks of the Tusas Mountains. Includes descriptions of the Burned Mountain Rhyolite, Maguinita Granodiorite, Tres Piedras Granite, and Precambrian pegmatites.
Area: Tusas Mountains, Rio Arriba County.

Muehlberger, W.R., 1967, Geology of the Chama quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 89, 114 p., 1 table, 17 figs., 2 pls., scale 1:48,000
Discusses the geology and petrology of quartz latite occurring throughout the Chama quadrangle. Includes thin-section analyses.
Area: Tusas Mountains, Rio Arriba County.

Muehlberger, W.R., 1968, Geology of Brazos Peak quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 22, with 7 p. text, scale 1:48,000
Geologic map showing the distribution of Tertiary rhyolite, quartz latite, Precambrian granite, and metarhyolite.
Area: Tusas Mountains, Rio Arriba County.

Muehlberger, W.R., and Denison, R.E., 1964, Precambrian geology of south-central New Mexico, in Ruidoso country: New Mexico Geol. Soc., Guidebook 15th field conf., p. 62-69, 2 figs.
Summarizes the Precambrian geology of Socorro, Sierra, Dona Ana, Torrance, Guadalupe, De Baca, Chaves, Eddy, Lincoln, and Otero Counties. Divides the area into four belts of Precambrian rocks: 1) northwest metamorphic area (Manzano and Los Pinos Mountains, 2) central granitic belt (San Andres Mountains and Sierra Oscura), 3) sediment and diabase belt (San Andres and Franklin Mountains), and 4) southeast granite gneiss area (subsurface). Includes petrogrphic descriptions of 32 oil well cores and several outcrop samples.
Area: Manzano Mountains, Bernalillo County; Los Pinos and Oscura Mountains, Socorro County; San Andres Mountains, Socorro, Sierra, and Dona Ana Counties; Franklin Mountains, Dona Ana County.

Muench, O.B., 1938, Glorieta monazite: Am. Chem. Soc., Jour., v. 60, p. 2,661-2,662
Includes chemical analyses on monazite for lead, thorium (7.5%), and uranium (0.106%) and obtained an age of 858 m.y.
Area: Tusas Mountains, Rio Arriba County.

Myers, D.A., 1977, Geologic map of the Scholle quadrangle, Socorro, Valencia, and Torrance Counties, New Mexico: U.S. Geol. Survey, Geol. Quad. Map GQ-1412, scale 1:24,000
Geologic map showing the distribution of Precambrian Priest

Granite.
Area: Manzano Mountains, Socorro, Valencia, and Torrance Counties.

Myers, D.A., and McKay, E.J., 1970, 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
Geologic map showing the distribution of Precambrian granite and rhyolite.
Area: Manzano Mountains, Bernalillo and Valencia Counties.

Myers, D.A., and McKay, E.J., 1971, 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
Geologic map showing the distribution of Precambrian granite, pegmatites, and aplites.
Area: Manzano Mountains, Torrance, Valencia, and Bernalillo Counties.

Myers, D.A., and McKay, E.J., 1972, 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
Geologic map showing the distribution of the Monte Largo stock (granite) and the Sevilleta Metarhyolite.
Area: Manzano Mountains, Torrance and Valencia Counties.

Myers, D.A., and McKay, E.J., 1974, Geologic map of the southwest quarter of the Torreon 15-min quadrangle, Torrance and Valencia Counties, New Mexico: U.S. Geol. Survey, Misc. Inv. Map I-820, scale 1:24,000
Geologic map showing the distribution of Precambrian Monte Largo stock (granite), Priest Granite, quartz dikes, and metarhyolite.
Area: Manzano and Los Pinos Mountains, Torrance and Valencia Counties.

Myers, D.A., and McKay, E.J., 1976, Geologic map of the north end of the Manzano Mountains, Tijeras and Sedillo quadrangles, Bernalillo Counties, New Mexico: U.S. Geol. Survey, Misc. Inv. Map, I-968, scale 1:24,000
Geologic map showing the distribution of Tertiary andesite dikes, Precambrian granite, and metarhyolite.
Area: Manzano Mountains, Bernalillo County.

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

Nagy, P.A., see Berry, V.P., Sprerg, W.C., Barnes, C.W., and Smouse, P., 1980

Nakagawa, H.M., see Griffitts, W.R., 1960

Nelson, M.A., 1975, Geology and fluorspar deposits of the southern Caballo Mountains, Sierra and Dona Ana Counties, New Mexico: M.S. thesis, Univ. Texas (El Paso), 55 p., 8 figs., 6 plates
Describes the geology and mineral deposits in the southern

Caballo Mountains. Includes mine descriptions, geologic maps, and claim maps of the various fluorite mines and prospects (including the Lydia K mine, a radioactive occurrence). The only igneous rocks exposed in this area are Precambrian granite and the Tertiary Salem Plug (quartz latite).

Area: Caballo Mountains, Sierra County.

Nielsen, K.C., and Scott, T.E., Jr., 1979, Precambrian deformational history of the Picuris Mountains, New Mexico, in Santa Fe country: New Mexico Geol. Soc., Guidebook 30th field conf., p. 113-120, 1 table, 15 figs.

Describes the stratigraphy and deformational history of the Ortega Quartzite and Vadito Formation. Conglomerates are found in the younger Vadito Formation.

Area: Sangre de Cristo Mountains, Santa Fe and Taos Counties.

Nishimori, R.K., Ragland, P.C., Rogers, J.W., and Greenburg, J.K., 1977, Uranium deposits in granitic rocks: U.S. Energy Research Develop. Adm., Rept. GJBX-13(77), 308 p., tables, figs., 4 appendices, (open-file)

Describes the basic geology of three diatremes: Outlet Neck, Bennette Peak, and Mitten Rock. Includes the uranium content of of these rocks.

Area: San Juan Basin.

Northrop, S.A., 1944, Minerals of New Mexico: Univ. New Mexico Press, 665 p., 1 pl. revised 1959

Describes and discusses the occurrence of uranium- and thorium-bearing minerals.

Area: Statewide.

Northrop, S.A., 1961, Check lists of minerals for mining districts and other localities near Albuquerque, in Albuquerque country: New Mexico Geol. Soc., Guidebook 12th field conf., p. 172-174

Mentions the occurrences of uranium minerals in Tijeras Canyon, Bernalillo County; Cerro Colorado, Bernalillo County; Jemez Springs mining district, Sandoval County; Nacimiento Mountains, Sandoval County; and La Bajada, Santa Fe County.

Area: Sandia Mountains, Bernalillo County; Jemez and Nacimiento Mountains, Sandoval County; and Sangre de Cristo Mountains, Santa Fe County.

Northrop, S.A., 1966, Check lists of minerals for mining districts of Colfax, northern Taos, and Union Counties, New Mexico, in Taos-Raton-Spanish Peaks country (New Mexico and Colorado): New Mexico Geol. Soc., Guidebook 17th field conf., p. 99-102

Mentions four uranium occurrences: 1) uraninite in Elizabethtown district, Colfax County, 2) thorium and uranium minerals in eastern Colfax County, 3) thorium-bearing veins in the Chico Hills area, and 4) uraninite and other uranium minerals in the Red River district.

Area: Chico Hills area and Sangre de Cristo Mountains, Colfax and Taos Counties.

Northrop, S.A., and Hill, A., 1961, Geologic map of the Albuquerque country, _in_ Albuquerque country: New Mexico Geol. Soc., Guidebook 12th field conf., scale 1:380,160

Geologic map showing the distribution of undifferentiated Precambrian and Tertiary volcanic rocks.

Area: Jemez, Nacimiento, and San Pedro Mountains, Sandoval and Rio Arriba Counties; Mount Taylor, Cibola County; Ladron and Los Pinos Mountains, Socorro County; Ortiz, Manzano, and Sandia Mountains, Bernalillo and Santa Fe Counties.

Northrop, S.A., _see_ Kelley, V.C., 1975; Wood, G.H., 1946; Wood, G.H., Jr., and Griggs, R.L., 1953; and File, L., 1966

Nye, T.S., _see_ Collins, G.F., 1957

Nystrom, R.J., _see_ May, R.T., Smith, E.S., and Dickson, R.E., 1981

O'Brient, J.D., _see_ Jahns, R.H., McMillan, D.K., and Fisher, D.L., 1978

Ojakangas, R.W., _see_ Kalliokoski, J., and Langford, F.F., 1978

O'Neill, A.J. and Thiede, D.S., 1981, Uranium resource evaluation, Silver City quadrangle, New Mexico and Arizona: U.S. Dept. Energy, Prelim. Rept. PGJ-131(81), 139 p., 3 figs., 6 tables, 15 pls., 5 appendices

This detailed geologic report evaluates the uranium resources of the Silver City 1 by 2 degree quadrangle using all available geologic, geochemical, and geophysical data available. Includes a table of uranium occurrences (most are nonsandstone-type occurrences) and uranium occurrence reports. Includes maps showing favorable areas for uranium deposits, uranium occurrences, interpretation of aerial-radiometric and hydrogeochemical analyses, and locations of geochemical samples. Geologic map indexes and a comprehensive bibliography are included. The White Signal district, Black Hawk region, northern Big Burro and Little Burro Mountains, and Tyrone laccolith are classified as favorable for potential nonsandstone uranium deposits. Did not evaluate the uranium potential in the Schoolhouse Mountain region (Schoolhouse Mountain caldera).

Area: Burro Mountains, Mogollon-Datil volcanic province, Grant, Hidalgo, and Luna Counties.

O'Neill, A.J., _see_ Vizcaino, H.P., and Dotterer, F.E., 1978

Osburn, G.R., 1978, Geology of the eastern Magdalena Mountains, Water Canyon to Pound Ranch, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 113, 150 p., 35 figs., 1 pl., 3 appendices, scale 1:24,000

Describes the geology of the Water Canyon area in the Magdalena Mountains. Describes the Spears Formation (volcaniclastic sediments), Hells Mesa Tuff (rhyolite ash-flow tuff), A.L. Peak Tuff (rhyolite ash-flow tuffs), rhyolitic ash flow unit of Sixmile Canyon, Lemitar tuff (rhyolitic ash-flow tuff), South Canyon tuff (rhyolite ash-flow tuffs), intermediate to silicic

lavas, rhyolite domes and dikes, and monzonite dikes. Includes discussions of plagioclase alteration, manganese mineralization, and calcite veining. Includes major-element chemical analyses of some of the volcanic rocks.
Area: Magdalena Mountains, Socorro County.

Osburn, G.R. and Chapin, C.E., in press, Stratigraphic nomenclature for Cenozoic rocks of the northeastern Datil-Mogollon volcanic field, New Mexico: New Mexico Bureau Mines Mineral Resources, Stratigraphic Chart 1
Area: Magdalena Mountains and Mogollon-Datil volcanic province.

Osburn, G.R., Petty, D.M., and Chapin, C.E., 1981, Geology of the Molino Peak quadrangle: New Mexico Bureau Mines Mineral Resources, Open-file Rept. 139, 24 p., 2 pls., scale 1:24,000
Briefly describes the geology of the Molino Peak 7 1/2-min quadrangle and includes a geologic map. Tertiary volcanic rocks from the Socorro, Magdalena, and Sawmill Canyon cauldrons are exposed in the mapped area. Mentions the occurrence of manganese-oxide mineralization in the area.
Area: Magdalena Mountains, Socorro County.

Osburn, G.R., see Chapin, C.E., Chamberlin, R.M., White, D.W., and Sanford, A.R., 1978

Osterwald, F.W., see Walker, G.W., 1956 and 1963

O'Sullivan, R.B., 1953, Geology and mineralogy of the Fierro-Hanover district, Grant County, New Mexico: M.S. thesis, Univ. New Mexico, 76 p., 3 figs., 2 pls.
Includes the occurrence and descriptions of Cretaceous granodiorite, quartz diorite, and Tertiary mafic dikes. Mentions the occurrence of fluorite.
Area: Mogollon-Datil volcanic province, Grant County.

Ove, W.E., see Allison, J.W., 1957

Overstreet, W.C., 1967, The geologic occurrence of monazite: U.S. Geol. Survey, Prof. Paper 530, 327 p., 91 tables, 2 pls., (New Mexico section on p. 174-179)
Summarizes the occurrence of monazite found in the pegmatites at Petaca district, Rio Arriba County; Harding mine, Taos County; Pidlite mine, Mora County; Elk Mountain; Ribera, Manzanares Creek, Pecos, and Bull Creek areas, San Miguel County; and Dalton Creek area, Santa Fe County. Includes chemical analyses from some of the monazites.
Area: Tusas and Sangre de Cristo Mountains, Rio Arriba, Taos, Mora, San Miguel, and Santa Fe Counties.

Paige, L.R., 1950, Uranium in pegmatites: Econ. Geology, v. 45, p. 12-34, 6 figs.
Discusses the occurrence of uranium in pegmatites. Describes the mineralogy and chemistry of uranium-bearing pegmatites. Discusses the geology of the Pidlite pegmatite, Mora County--an

uranium-bearing pegmatite.
Area: Sangre de Cristo Mountains, Mora County.

Paige, S., 1908, The Hanover iron-ore deposits, New Mexico: U.S. Geol. Survey, Bull. 380, p. 199-214, map
Includes a brief description of diorite porphyry, quartz diorite porphyry, quartz monzonite, granite, and aplite dikes. Discusses the ore deposition of the iron mineralization, including analyses of the ore.
Area: Mogollon-Datil volcanic province, Grant County.

Paige, S., see Spencer, A.C., 1935

Pallister, J.S., see Lipman, P.W., and Sargent, K.A., 1979

Park, C.F., Jr., and MacDiarmid, R.A., 1975, Ore Deposits: W.H. Freeman and Company, San Francisco, 529 p., 139 figs.
Includes a discussion of the Petaca (p. 263-265) and the Central mining districts (p. 272-279). The Petaca district consists of Precambrian pegmatites that intrude Precambrian granites, rhyolites, and metamorphic rocks. The source of the pegmatitic fluids appears to be the same source that gave rise to the Tusas granite. Fifty pegmatites occur in the area and contain significant amounts of mica, beryllium, columbium, tantalum, bismuth, uranium, thorium, and rare-earth elements.
The Central mining district is in Grant County and includes iron and zinc igneous-metamorphic deposits, disseminated copper deposits (porphyry copper), zinc replacement in limestone related to igneous acitivity, and zinc-lead-copper veins. The igneous rocks include Precambrian granite, Tertiary diorite sills, andesite intrusives, quartz diorite sills, granodiorite and quartz monzonite stocks, rhyolite pyroclastics, and basalt flows. Includes descriptions of the Hanover-Fierro stock, Santa Rita stock, and the Copper Flat stock and includes geologic maps of the Santa Rita quadrangle and a discussion of the ore paragenesis.
Area: Mogollon-Datil volcanic province, Grant County and Tusas Mountains, Rio Arriba County.

Park, C.F., Jr., and McKinlay, P.F., 1943, 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.
Briefly describes Precambrian granite and gneiss and Tertiary granodiorite, diorite, and andesite. Discusses gold, copper, iron, molybdenum, and silver deposits and includes brief descriptions of the mines and prospects. A list of associated minerals mentions fluorite occurring with some of the deposits.
Area: Sangre de Cristo Mountains, Taos County.

Park, D.E., 1971, Petrology of the Tertiary Anchor Canyon stock, Magdalena Mountains, central New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 92 p., 30 figs., 6 appendices
Divides the Anchor Canyon stock into four subgroups: 1) augite-quartz monzonite, 2) hornblende-biotite-quartz monzonite, 3) augite granite, and 4) hornblende-biotite granite.

Describes aplitic and pegmatitic phases. Includes modal and chemical analyses (major-element, K, Ar, Ba, Cu, Ni, Rb, Sr, Zn). Briefly describes felsite, granite, and the Nitt stock (monzonite)--the host rocks of the Anchor Canyon stock.
Area: Magdalena Mountains, Socorro County.

Parrish, I.S., see Adams, J.W., and Arengi, J.T., 1980

Patterson, C.M., see Kerr, P.F., Kulp, J.L., and Wright, R.J., 1950

Patton, L.T., 1951, Igneous rocks of the Capitan quadrangle, New Mexico and vicinity: Am. Mineralogist, v. 36, no. 9-10, p. 713-716, 7 tables
Includes modal analyses of kalialaskites, alaskites, orthosites, diabase porphyry, diabase, and meladiabase from the Capitan 15-min quadrangle.
Area: Lincoln County porphyry belt.

Perhac, R.M., 1970, Geology and mineral deposits of the Gallinas Mountains, Lincoln and Torrance Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 95, 51 p., 7 tables, 11 figs., 2 pls., scale 1:31,680
Describes and includes modal analyses of Prcambrian granite and Tertiary porphryritic-latite, trachyte, microsyenite, rhyolite, and prophyritic andesite. Discusses fluorite-bastnaesite-sulfide deposits occurring within the alkali rocks.
Area: Lincoln County porphyry belt.

Perhac, R.M., and Heinrich, E.W., 1963, Epithermal bastnaesite and its bearing on the geology of bastnaesite (abs.): Geol. Soc. America, Spec. Paper 73, p. 214-215
Briefly describes the occurrence and geology of bastnaesite. Reports "numerous bastnaesite deposits in the Gallinas Mountains" which are underlain by alkalic igneous rocks (trachyte and rhyolite laccoliths). The bastnaesite occurs within veins and breccia zones in sandstone and is associated with fluorite and copper minerals.
Area: Lincoln County, porphyry belt.

Perhac, R.M., and Heinrich, E.W., 1964, Fluorite-bastnaesite deposits of the Gallinas Mountains, New Mexico and bastnaesite paragenesis: Econ. Geology, v. 59, p. 226-239
The Gallinas Mountains contain a core of Precambrian granite and are intruded by two alkalic intrusives--porphyritic trachyte and porphyritic leucorhyolite, and alkalic dikes and minor intrusives. Describes the mineral deposits of the Red Cloud district (iron, lead, copper, gold, silver, fluorite, and bastnaesite) which consists of 29 mines and prospects. The bastnaesite is associated with copper-fluorite deposits occurring in porphyritic trachyte and with the Yeso sandstone and siltstones as breccia and fault zone fillings.
Area: Lincoln County porphyry belt.

Perhac, R.M., see Foran, J.F., 1954

Perkins, P.C., 1973, Petrography of some rock types of the Precambrian basement near the Los Alamos Scientific Laboratory geothermal test site, Jemez mountains, New Mexico: Los Alamos Sci. Labl., Rept. LA-5129, 12 p.
Area: Jemez, Sandia, and Nacimiento Mountains, Sandoval and Los Alamos Counties.

Perry, A.J., see Lamarre, A.L., and Jonson, D.C., 1974

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

Peterson, S.L., 1976, Geology of the Apache No. 2 mining district, Hidalgo County, New Mexico: M.S. thesis, Univ. New Mexico, 86 p.
Area: Hidalgo County.

Peterson, S.L., see Deal, E.G., Elston, W.E., Erb, E.E., Rieter, D.E., Damon, P.E., and Shafiqullah, M., 1978

Peterson, D.L., see Ratte, J.C., Eaton, G.P., and Gaskill, D.L., 1974

Petty, D.M., 1979, Geology of the southeastern Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 106, 163 p., 25 figs., 2 sheets, sclae 1:24,000
Describes the geology of part of the southern Magdalena Mountains. Includes descriptions of the Spears Formation (volcaniclastic sediments, lava flows, and ash-flow tuffs), Hells Mesa Tuff (quartz latite to rhyolite tuff), unit of Hardy Ridge (rhyolite lavas), A.L. Peak Tuff (rhyolite ash-flow tuff), unit of Sixmile Canyon (andesite and rholite lavas, ash-flow tuffs, and volcaniclastic sediments), sanidine rhyolite lavas, tuff of Caronita Canyon (andesite and rhyolite tuffs), tuff of Lemitar Mountains (rhyolite tuff), rhyolite lavas and diks, and monzonite dikes. Discusses the gold-silver and manganese mineralization.
Area: Magdalena Mountains, Socorro County.

Petty, D.M., see Osburn, G.R., and Chapin, C.E., 1981

Phair, G., see Larsen, E.S., Jr., Gottfried, D., and Smith, W.L., 1956

Pierson, C.T., Wenrich-Verbeek, K.J., Hannigan, B.J., and Machette, M.N., 1980, National uranium resource evaluation, Socorro Quadrangle, New Mexico: U.S. Dept. Energy, Prelim. Rept. PGJ-068(81), 81 p., 3 figs., 13 pls., 3 appendices
Detailed geologic report evaluating the uranium resources of the Socorro 1 by 2 degree quadrangle to a depth of 5,000 ft using all available geologic, geochemical, and geophysical data. Includes a table of uranium occurrences (appendix A) listing 66 uranium occurrences (19 non-sandstone-type occurrences) and uranium-occurrence reports for most of those listed. Includes a comprehensive bibliography. Classifies the Jeter mine area as favorable for vein-type uranium deposits in sedimentary rocks and the Marie-Agua Torres area (Rio Grande Valley) as favorable for vein-type uranium deposits in limestones. Other areas of uranium mineralization in plutonic rocks, volcanogenic deposits, and veins

in sedimentary rocks are classified as unfavorable for uranium deposits of greater than 100 tons.
Area: Ladron, Lemitar, Manzano, Magdalena, and Los Pinos Mountains, Socorro Basin area, Mogollon-Datil volcanic province, Socorro, Catron, Torrance, and Valencia Counties.

Pillmore, C.L., 1970, Geologic map of the Casa Grande quadrangle, Colfax County, New Mexico and Las Animas County, Colorado: U.S. Geol. Survey, Geol Quad. Map GQ-823, with text, scale 1:62,500
Geologic map shows the distribution of the Tertiary diorite sills and syenodiorite stock.
Area: Raton-Clayton volcanic field, Colfax County.

Poe, T.I., III, 1965, The intrusive sequence of igneous rocks in the Gallinas Mountains, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 28 p., 1 table, 8 figs.
Describes Tertiary porphyritic latite, porphyritic trachyte, and porphyritic rhyolite. Includes modal analyses and determines the intrusive sequences (latite-trachyte-rhyolite) by using thermal-state data.
Area: Lincoln County porphyry belt.

Poldervaart, A., see Alper, A.M., 1957; and Duschatko, R.W., 1955

Potter, S.C., 1970, Geology of Baca Canyon, Socorro County, New Mexico: M.S. thesis, Univ. Arizona, 54 p., 13 figs., scale 1:12,000
Describes the Datil, Hells Mesa, and Spears Formations and the La Jara Peak basalt. Mentions the occurrence of low-grade uranium in the sediments in the Baca Canyon, Bear Mountains.
Area: Mogollon-Datil volcanic province, Socorro County.

Powers, R.S., 1976, Geology of the Summit Mountains and vicinity, Grant County, New Mexico, and Greenlee County, Arizona: M.S. thesis, Univ. Houston, 107 p., 13 figs., 4 tables, 4 pls.
Describes the volcanic and intrusive rocks of the Summit Mountains area which includes the Steeple Rock and Duncan mining districts. Gold, silver, copper, lead and zinc, and fluorite veins are believed to result from localized deuteric alteration in a sulfur-rich volcanic pile. Includes a geologic map, map showing the locations of mines and prospects, and cross sections.
Area: Mogollon-Datil volcanic province, Grant County.

Powers, W.E., 1941, Volcanic rocks of the western San Augustin Plains district, New Mexico: Jour. Geology, v. 49, p. 207-217, 7 tables, 5 figs.
Briefly describes the Tertiary volcanic rocks (rhyolite, andesite, basalt, and siliceous and basic tuff). Includes stratigraphic sections.
Area: Mogollon-Datil volcanic province, Catron County.

Pratt, W.P., see Jones, W.R., and Hernon, R.M., 1961; and Jones, W.R., and Moore, S.L., 1970

Pray, L.C., 1961, Geology of the Sacramento Mountains escarpment, Otero County, New Mexico: New Mexico Bureau Mines Mineral Resources,

Bull. 35, 144 p., 34 figs., 3 pls., scale 1:31,680
Describes the Precambrian diabase dikes and sills, Tertiary andesite, latite, and trachyte-andesite porphyry.
Area: Sacramento Mountains, Otero County

Pyron, A.J., in preparation, A geochemical analysis of the El Paso tin deposit, Franklin Mountains, El Paso County, Texas: M.S. thesis, Univ. Texas
Area: Franklin Mountains, Texas.

Raabe, R.G., see Ratte, J.C., Landis, E.R., Gaskill, D.L., and Eaton, G.P., 1967

Ragland, P.C., see Cannon, R.P., 1977; and Nishimori, R., Rogers, J., and Greenberg, K., 1977

Rapaport, I., see Towle, C.C., 1952

Ratte, J.C., 1975, Geologic setting and revised volcanic stratigraphy of the Mogollon mining district, Catron County, New Mexico, in Symposium on base- and precious-metals districts of New Mexico and Arizona, Silver City, New Mexico May 22, 1975: U.S. Geol. Survey, Open-file Rept. 75-497, 12 p., 4 figs.,; (abs.) New Mexico Geol. Soc., Guidebook 26th field conf., p. 342-343
Discusses a revised stratigraphy for the rhyolites, andesites, and latites of the Mogollon mining district.
Area: Mogollon-Datil volcanic province, Catron County.

Ratte, J.C., Eaton, G.P., Gaskill, D.L., and Peterson, D.L., 1974, Targets for mineral exploration in the Mogollon region of southwestern New Mexico (abs.), in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 379
Discusses the resource potential of the Mogollon Mountains. Copper and molybdenum porphyry deposits may be found in Tertiary intrusives and other potential commodities include fluorspar, base-metal, epithermal base- and precious-metal veins. Thermal springs are reported in the Gila drainage.
Area: Mogollon-Datil volcanic province, Grant and Catron Counties.

Ratte, J.C., and Gaskill, D.L., 1975, Reconnaissance geologic map of the Gila Wilderness study area, southwestern New Mexico: U.S. Geol. Survey, Misc. Inv. Map, I-886, 2 sheets, scale 1:62,500
Geologic map shows the distribution of Tertiary andesites, latite, and rhyolite. Includes the locations of fluorite and quartz veins.
Area: Mogollon-Datil volcanic province, Grant and Catron Counties.

Ratte, J.C., and Grotbo, T., 1979, Chemical analyses and norms of 81 volcanic rocks from part of the Mogollon-Datil volcanic field, southwestern New Mexico: U.S. Geol. Survey, Open-file Rept. 79-1435 (copy on file at NMBMMR)
Major- and minor-element analyses of andesitic, quartz

latitic to rhyolitic, and post ash-flow tuffs. Includes brief petrological descriptions of each sample.
Area: Mogollon-Datil volcanic field.

Ratte, J.C., Landis, E.R., Gaskill, D.L., and Damon, P.E., 1969, Geology of the Blue Range Primitive area, Arizona-New Mexico (abs.): Geol. Soc. America, Spec. Paper 121, p. 549
Briefly describes the occurrences of rhyolite, latite-rhyolite, and andesite. Includes stratigraphic sequences.
Area: Mogollon-Datil volcanic province, Catron County.

Ratte, J.C., Landis, E.R., Gaskill, D.L., Raabe, R.G., and Eaton, G.P., 1967, Mineral resources of the Blue Range Primitive area, Greenlee County, Arizona and Catron County, New Mexico: U.S. Geol. Survey, Bull. 1261-E, 91 p., 8 tables, 22 figs., 2 pls., with aeromagnetic interpretation
Describes quartz latite and rhyolite. Includes major- and minor-element analyses.
Area: Mogollon-Datil volcanic province, Catron County.

Raup, O.B., see Thadin, R.E., and Santos, E.S., 1967

Raup, R.B., Jr., 1953, Reconnaissance for uranium in the United States-Southwest district, in Geologic investigations of radioactive deposits semiannual progress report, June 1 to November 30, 1953: U.S. Geol. Survey, Trace Elements Inv., Rept. TEI-390, p. 209-212, 1 fig.
This progress report briefly describes the occurrence of radioactive anomalies in several core drill holes at Tyrone mine, Grant County. Includes a map showing the locations of three radioactive occurrences in New Mexico--Tyrone, Grant County; Hillsboro-Kingston, Sierra County; and Elizabethtown district, Colfax County.
Area: Burro Mountains, Grant County; Black and Cooke's Ranges, Mogollon-Datil volcanic province, Sierra County; Sangre de Cristo Mountains, Colfax County.

Rautman, C.A., see Brookins, D.G., 1978; and Brookins, D.G., and Corbitt, L.L., 1978

Read, C.B., see Clark, K.F., 1972

Redman, D.E., 1961, Reconnaissance of selected pegmatite districts in north-central New Mexico: U.S. Bureau Mines, Inf. Circ., IC-8013, 79 p., 4 tables, 19 figs.
This report includes good geologic descriptions of various pegmatites in the Tusas and Sangre de Cristo Mountains. History of the deposits' locations, development, and mineralogy (including radioactive minerals) are discussed. Index maps are included.
Areas: Tusas Mountains, Rio Arriba County; Sangre de Cristo Mountains, Mora, Rio Arriba, San Miguel, Santa Fe, and Taos Counties.

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

Kaufman, W.H., 1973; and Woodward, L.A., Martinez, R., DuChene, H.R., and Schumacher, O.L., 1874

Register, M.E., and Brookins, D.G., 1979, Geochronologic and rare-earth study of the Embudo Granite and related rocks, in Santa Fe country: New Mexico Geol. Soc., Guidebook 30th field conf., p. 155-158, 2 tables, 4 figs.

Briefly describes geochronologic and geochemical studies of the granitic rocks exposed between the Picuris Range and Santa Fe. Includes major-element analyses and rare-earth elements distribution patterns for the Puntiagudo granite porphyry, the Rana quartz monzonite, and the Embudo Granite.

Area: Sangre de Cristo Mountains, Santa Fe and San Miguel Counties.

Register, M.E., see Brookins, D.G., Chakoumakos, B.C., Cook, C.W., Ewing, R.C., and Landis, G.P., 1979

Reiche, P., 1949, Geology of the Manzanita and north Manzano Mountains, New Mexico: Geol. Soc. America, Bull., v. 60, p. 1,183-1,212, 5 figs., 5 pls., scale 1:62,500

Describes thin-section analyses of rhyolite, schist, gneiss, granite, and pegmatites. Fluorspar, lead, gold, and copper mineralization occurs in the area.

Area: Manzanita and Manzano Mountains, Torrance, Valencia, and Bernalillo Counties.

Reid, B.E., Griswold, G.B., Jacobsen, L.C., and Lessard, R.H., 1980a, National uranium resource evaluation, Santa Fe quadrangle, New Mexico: U.S. Dept. Energy, Prelim. Rept. PGJ-021(80), 55 p., 3 tables, 4 figs., 27 pls., 14 appendices

Comprehensive geologic report describing uranium occurrences, favorable environments for uranium deposition, and rock analyses in the Santa Fe 1 by 2 degree quadrangle. Describes the El Oro Mountain gneissic dome (Precambrian granitic body near Santa Fe Baldy), Gallinas Creek metasediments, and Spring Mountain metasediments. Includes a table of uranium occurrences (appendix A) listing 41 uranium occurrences (10 nonsandstone-type occcurrences) and uranium-occurrence reports for most of those listed. Includes chemical analyses, an index of oil and gas wells, stratigraphic sections, petrographic studies, a comprehensive bibliography, and a geologic map. Classifies the Sangre de Cristo and Morrison Formations as favorable for uranium deposits; authors did not evaluate the Precambrian rocks of the Galisteo and Espinaso Formations for their uranium potential.

Area: Sangre de Cristo Mountains, San Miguel, Mora, Santa Fe, and Guadalupe Counties.

Reid, B.E., Griswold, G.B., Jacobsen, L.C., and Lessard, R.H., 1980b, National uranium resource evaluation, Raton quadrangle, New Mexico and Colorado: U.S. Dept. Energy, Open-file Rept. GJQ-005(80), 83 p., 11 tables, 3 figs., 33 pls., 7 appendices

Comprehensive report describing uranium occurrences, favorable environments for uranium deposition, and stream-sediment and rock analyses. One of the favorable environments for uranium deposition is the Precambrian granitic massif at Costilla Peak massif and the Precambrian rocks exposed in Rio Hondo Canyon. Unfavorable environments for uranium deposition include quartz pebble conglomerates of the Vadito Formation (Precambrian), Precambrian pegmatites, and Tertiary granitic stocks. Thin-section studies and soil-sampling studies were undertaken as well. Includes a table listing 15 uranium occurrences (12 nonsandstone-type occurrences) and uranium-occurrence reports. Includes a comprehensive bibliography, chemical analyses, an index of oil and gas wells, stratigraphic sections, and a geochemical survey of Costilla Peak massif.

Area: Sangre de Cristo Mountains, Colfax, Mora, and Taos Counties.

Reiter, D.E., 1980, Geology of Alamo Hueco and Dog Mountains, Hidalgo County, New Mexico: M.S. thesis, Univ. New Mexico, 110 p.

Area: Hatchet Mountains, Hidalgo County.

Rhodes, R.C., 1970, Volcanic rocks associated with the western part of the Mogollon Plateau volcanic-Tectonic complex, southern New Mexico: Ph.D. thesis, Univ. New Mexico, 145 p., 13 tables, 18 figs., 13 pls.

Area: Mogollon-Datil volcanic province, Catron and Grant Counties.

Rhodes, R.C., 1976a, Volcanic geology of the Mogollon Range and adjacent areas, Catron and Grant Counties, New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 42-50, 7 tables, 5 figs.

Describes quartz latite, andesite, and rhyolite. Includes modal and major-element analyses.

Area: Mogollon-Datil volcanic province, Catron and Grant Counties.

Rhodes, R.C., 1976b, Petrologic framework of the Mogollon Plateau volcanic ring complex, New Mexico--surface expression of a major batholith, in Cenozoic volanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 103-112, 4 tables, 10 figs.

Describes rhyolite, andesite, and quartz latite of the Catron volcanic suite. Includes modal and chemical analyses.

Area: Mogollon-Datil volcanic province, Catron County.

Rhodes, R.C., and Smith, E.I., 1976, Stratigraphy and structure of the northwestern part of the Mogollon Plateau volanic province, Catron County, New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 57-62, 2 tables, 4 figs.

Describes andesite, rhyolite, and quartz latite. Discusses minor alteration of the rocks. Includes chemical analyses.

Area: Mogollon-Datil volcanic province, Catron County.

Rhodes, R.C., see Deal, E.G., 1976; Elston, W.E., and Coney, P.J.; Elston, W.E., Damon, P.E., Coney, P.J., Smith, E.I., and Bikerman, M., 1973; Elston, W.E., Coney, P.J., and Deal, E.G., 1976; and Elston, W.E., and Erb, E.E., 1976

Ridley, W.I., see Baker, I, 1970

Riesmeyer, W.D., 1978, Precambrian geology and ore deposits of the Pecos mining district, San Miguel and Santa Fe Counties, New Mexico: M.S. thesis, Univ. New Mexico, 215 p., 42 figs., 2 tables, 6 pls., scale 1 inch = 500 ft, 2 appendices

Describes the geology and mineral deposits of the Pecos mining district, a massive sulfides deposit. Dacite, granodiorite, diabase, and Embudo Granite are intruded into the volcanic section. Includes whole-rock and trace-element analyses of the Precambrian rocks and geologic maps of the Jones mine and Pecos mine areas. Only sulfide ores have been described.

Area: Sangre de Cristo Mountains, San Miguel, and Santa Fe Counties.

Rieter, D.E., see Deal, E.G., Elston, W.E., Erb, E.E., Petersen, S.L., Damon, P.E., and Shafiqullah, M., 1978

Robertson, J.M., 1976, Mining districts of northeastern New Mexico, in Vermejo Park (northeastern New Mexico): New Mexico Geol. Soc., Guidebook 27th field conf., p. 257-262, 1 table, 1 fig.

Describes the mining districts of Colfax, Guadalupe, Mora, San Miguel, and Union Counties. Mining districts include gold, silver, copper, iron, lead, and tungsten vein deposits in the Elizabethtown-Baldy district (Colfax County); zinc, copper, lead, gold, silver, and molybdenum lenses and fissures in the Rociada district (San Miguel County); Precambrian pegmatites in the Rociada, Elk Mountain, and El Porvenir districts (San Miguel County); and sulfide dikes, veins, and shear zones in the Tecolote and Willow Creek districts (San Miguel County). Includes a location map.

Area: Sangre de Cristo Mountains, Colfax and San Miguel Counties.

Robertson, J.M., and Moench, R.H., 1979, The Pecos greenstone belt--a Proterozoic volcano-sedimentary sequence in the southern Sangre de Cristo Mountains, New Mexico, in Santa Fe country: New Mexico Geol. Soc., Guidebook 30th field conf., p. 165-173, 12 figs.

Describes the granitic complex in the Pecos area. Granitic rocks include alkali feldspar-biotite granite, quartz porphyries, porphyritic granite, pegmatites, and a sill-like body of syenite. Mentions that several pegmatites have yielded small quantities of uranium and rare-earth elements. Microlite (pyrochlore group--often noed as an uranium-bearing mineral) has been produced from the Pidlite mine.

Area: Sangre de Cristo Mountains (Picuris Range).

Robertson, J.M., see Callender, J.F., and Brookins, D.G., 1976

Rogers, J., see Nishimori, R., Ragland, P., and Greenberg, J., 1977

Rosenzweig, A., see Homme, F.C., 1970, and Lustig, L.K., 1959

Ross, C.S., Smith, R.L., and Bailey, R.A., 1961, Outline of the geology of the Jemez Mountains, New Mexico, in Albuquerque country: New Mexico Geol. Soc., Guidebook 12th field conf., p. 139-143

Briefly summarizes the volcanic stratigraphy of the Jemez Mountains a part of the Valles caldera--a large volanic crater. The volcanic rocks include (from oldest to youngest)--early basalts, andesites, quartz latites, dacites, rhyolotes, volcanic sediments, late basalts, Bandelier Tuff, and post-caldera rhyolite. Mentions the volcanic rocks of the Bland mining district where basaltic to dacitic rocks have been faulted, altered, and mineralized. Includes a generalized geologic map.

Area: Jemez Mountains, Sandoval and Rio Arriba Counties.

Ross, C.S., see Bailey, R.A., and Smith, R.L., 1969

Roth, S., 1981, Geology of the Sawmill Canyon area of the Magdalena Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 129, 96 p., 2 sheets, scale 1:24,000

Area: Magdalena Mountains, Socorro County.

Rothrock, H.E., 1946, Geology and descriptions of the deposits, in Fluorspar resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 21, p. 11-194, 15 figs., 23 pls.

Includes the geology and descriptions of fluorspar occurrences and deposits in igneous rocks by county. Includes chemical analyses.

Area: Bernalillo, Catron, Dona Ana, Grant, Hidalgo, Lincoln, Luna, Rio Arriba, Sierra, Socorro, Torrance, and Cibola Counties.

Rothrock, H.E., 1970, Fluorpsar, in Tyrone-Big Hatchet Mountains-Florida Mountains region (southwestern New Mexico): New Mexico Geol. Soc., Guidebook 21st field conf., p. 123-125, 1 fig.

Briefly discusses fluorite occurrences in southwestern New Mexico. Includes a map showing the fluorite occurrences.

Area: Dona Ana, Hidalgo, Catron, Socorro, Sierra, Grant, and Luna Counties.

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

Russell, P.L., 1947, Exploration of Fluorite Ridge fluorspar district, Luna County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-3987, 7 p., 6 figs.

Describes the fluorite deposits of Fluorite Ridge where fluorite occurs along fractures in rocks of all ages--mostly in thick intrusives of monzonite porphyry. Includes sketches of the Greenleaf no. 1 mine and locations and claim maps of other deposits.

Area: Black and Cooke's Ranges, Luna County.

Ruud, C.O., see Ferris, C.S., 1971

Ryberg, G.E., 1968, The geology of the Jicarilla Mountains, Lincoln County, New Mexico: M.S. thesis, Univ. New Mexico, 95 p., 2 tables, 7 figs., 9 pls.

Includes petrographic descriptions of Tertiary latite, diorite, andesite, and latite porphyry.
Area: Lincoln County porphyry belt.

Ryberg, G.E., see Segerstrom, K., 1974

Salter, T.L., see Walton, A.W., and Zetterlund, D., 1980a,b

Sanford, A.R., see Chapin, C.E., Chamberlin, R.M., Osburn, G.R., and White, D.W., 1978

Santos, E.S., 1966, Geologic map of the San Mateo quadrangle, McKinley and Valencia Counties, New Mexico: U.S. Geol. Survey, Geol. Quad. Map GQ-517, scale 1:24,000 (now Cibola County)
Geologic map showing the distribution of Tertiary sills, tuffs, and flows and andesites. Most of the area is mapped as Paleozoic sediments.
Area: San Juan Basin, McKinley and Cibola Counties.

Santos, E.S., Hall, R.B., and Wéisner, R.C., 1975, 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., 3 tables, 2 figs., 1 pl., scale 1:24,000
Describes Precambrian granite, granite porphyry, aplitic granite, and dioritic gneiss. Discusses mining claims and prospects. Mentions the occurrence of uranium in nearby sediments (0.03-0.3% U_3O_8). Includes minor-element analyses (Cu, Co, As, Mo, Pb, Zn, Ag, B, Ba, Be, Cr, La, Mn, Nb, Ni, Sc, Sn, Sr, V, Y, Ar, Fe, Mg, Ca, Ti).
Area: Nacimiento and San Pedro Mountains, Sandoval and Rio Arriba Counties.

Santos, E.S., see Thadin, R.E., and Raup, O.B., 1967

Sargent, K.A., see Lipman, P.W., and Pallister, J.S., 1979

Schaller, W.T., see Fries, C., Jr., and Glass, J.J., 1942

Schilling, J.H., 1956, Geology of the Questa molybdenum (Moly) mine area, Taos County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 51, 87 p., 1 table, 29 figs., 5 pls., scale 1 inch = 500 ft
Discusses the geology and ore deposition of molybdenum ore deposits. Includes descriptions of Precambrian granite, pegmatites, Tertiary andesite, rhyolite, and soda granite and discusses the alteration of the rocks. Mentions the occurrence of fluorite as a gangue mineral.
Area: Sangre de Cristo Mountains, Rio Arriba County.

Schilling, J.H., 1960, Mineral resources of Taos County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 71, 124 p., 3 tables, 43 figs., 2 pls.
Describes Precambrian granite, aplite, pegmatites, diabase dikes, and Tertiary andesite, quartz latite, rhyolite, quartz monzonite, and granite. Discusses pegmatite deposits, copper-

tungsten-gold-silver mineralization.
Area: Sangre de Cristo Mountains, Taos County.

Schilling, J.H., 1965, Molybdenum resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 76, 76 p., 1 table, 7 figs., 2 pls.
Describes molybdenum resources in New Mexico including molybdenum in pegmatite dikes, quartz veins, porphyry copper deposits, and tungsten deposits. Molybdenum is often associated with uranium especially in sedimentary uranium deposits.
Area: Statewide.

Schmidt, P.G., and Craddock, C., 1964, The geology of the Jarilla Mountains, Otero County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 82, 55 p., 13 figs., 2 pls., scale 1:24,000
Discusses the geology and petrology of syenodiorite, leucorhyolite, monzonite, and adamellite and the occurrence of iron, lead, copper, silver, and gold. Includes a tabulation of thin-section data.
Area: Jarilla Mountains, Otero County.

Schnake, D.W., 1977, Conditions of formation of the iron-bearing skarns at Lone Mountain, Lincoln County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 88 p., 28 figs., 2 appendices, 1 sheet, scale 1:12,000
Describes the geology and geochemistry of the Lone Mountain laccolith (quartz monzonite) and quartz monzonite dikes. Includes major-element analyses. Discusses the alteration of the laccolith and describes the ore deposits. Uranium is associated with these deposits although the author could not find any uranium minerals.
Area: Lincoln County porphyry belt.

Schumacher, O.L., <u>see</u> Woodward, L.A., Martinez, R., DuChene, H.R., and Reed, R.K., 1974; and Woodward, L.A., 1973

Schumaker, O.L., 1972, Geology and ore deposits of the southwest Nacimiento Range, Sandoval County, New Mexico: M.S. thesis, Univ. New Mexico, 79 p., 20 figs., scale 1:24,000
Describes Precambrian quartz monzonite gneiss, granite, leucocratic dikes. Includes mineralogy descriptions and discusses a uranium deposit in the Dakota Sandstone which contains 1.4% U_3O_8.
Area: Nacimiento Mountains, Sandoval County.

Scott, T.E., Jr., <u>see</u> Nielsen, K.C., 1979

Seager, W.R., 1973a, Resurgent volano-tectonic depression of Oligocene age, south-central New Mexico: Geol. Soc. America, Bull., v. 84, p. 3,611-3,626, 10 figs.
Describes the volcanic rocks of the Good Sight-Cedar Hills volcanic field, including the southern part of the Caballo Mountains, Good Sight Mountains, Sierra de las Uvas, Cedar Hills, and West Potrillo Mountains. Describes the Rubio Peak Formation (andesite to latite flows), Bell Top and Lower Thurman formations

(interlayered basalt and rhyolite ash-flow tuffs and rhyolite tuffs and breccias), Uvas Basalt, and Upper Thurman formation (volcanic sandstones and mudstones).

Area: Caballo, Good Sight, and West Potrillo Mountains, and Sierra de las Uvas Mountains, Dona Ana, Sierra, and Hidalgo Counties.

Seager, W.R., 1973b, Geologic map and sections of Bishop Cap-Organ Mountains area, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 29, with text, scale 1:24,000

Mapped units include La Cueva Tuff (Tertiary) and Soledad Rhyolite. Also includes a discussion of the stratigraphy and economic geology of the Bishop Cap district and a brief description of the Grant's and Bluestar prospects--both fluorite prospects. Radioactive purple fluorite does occur at the Bluestar prospect.

Area: Organ Mountains, Dona Ana County.

Seager, W.R., 1981, Geology of Organ Mountains and southern San Andres Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Mem. 36, 97 p., 8 tables, 88 figs., 2 appendices, 4 sheets, scale 1:31,250

Describes the Tertiary volcanic rocks and the Organ batholith of the Organ Mountains. Discusses the Laramide orogeny, late Tertiary deformation, and mineral deposits in the Organ Mountains. Describes lenticular pegmatites in the San Agustin Peak and Sugarloaf Peak areas which were not tested for uranium or thorium. Concludes that uranium-thorium mineralization and precious metal deposits may still occur in the Organ batholith. Includes a geologic map, cross sections, columnar section, and chemical analyses.

Area: Organ and San Andres Mountains, Dona Ana County.

Seager, W.R., and Brown, L.F., 1978, The Organ caldera, in Field guide to selected cauldrons and mining districts of the Datil-Mogollon volcanic field, New Mexico: New Mexico Geol. Soc., Spec. Pub. 7, p. 139-149, 1 table, 6 figs.

Briefly describes volcanic rocks related to the Organ caldera, including the Organ batholith (monzonite to quartz monzonite). Briefly describes copper, lead, zinc, silver, and fluorite mineralization occurring in fissure veins, pegmatites, or replacement deposits in limestone or dolomite.

Area: Organ Mountains, Dona Ana County.

Seager, W.R., and Clemons, R.E., 1975, Middle to late Tertiary geology of Cedar Hills-Seldon Hills area, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 133, 25 p., 2 tables, 14 figs., 2 sheets, scale 1:24,000

Includes chemical analyses and brief descriptions of Tertiary rhyolite and basaltic andesite.

Area: Good Sight Mountains, Dona Ana County (Corralitos Ranch, Las Cruces, San Diego Mountain, and Sierra Alta quadrangles).

Seager, W.R., Clemons, R.E., and Hawley, J.W., 1975, Geology of Sierra

Alta quadrangle, Dona Ana County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 102, 56 p., 2 tables, 13 figs., scale 1:24,000

Discusses the geology and petrology of andesite, latite, and rhyolite. Includes modal analyses.

Area: Good Sight Mountains and Sierra de las Uvas, Dona Ana County.

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

Briefly describes Precambrian microcline granite, Tertiary andesite, Bell Top Formation (rhyolite tuffs), and the Thurman Formation (rhyolites). Includes a geologic map.

Area: Good Sight Mountains and San Diego Mountain, Dona Ana County.

Seager, W.R., Kottlowski, F.E., and Hawley, J.W., 1976, Geology of Dona Ana Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 147, 36 p., 2 tables, 13 figs., 3 pls., scale 1:24,000

Discusses the petrology and chemistry of andesite, rhyolite, and monzonite within the mapped area. Mentions the occurrence of copper, gold, and silver deposits.

Area: Dona Ana Mountains, Dona Ana County.

Segerstrom, K., and Ryberg, G.E., 1974, Geology and placer-gold deposits of the Jicarilla Mountains, Lincoln County, New Mexico, U.S. Geol. Survey, Bull. 1308, 25 p., 3 tables, 1 fig., 1 pl.

Discusses the geology and geochemistry of Tertiary granodiorite, granite, monzonite, diorite, and quartz latite. Includes a discussion of the hypogene sulfide veins in granodiorite and monzonite.

Area: Lincoln County porphyry belt.

Segerstrom, K., Stotelmeyer, R.B., Williams, F.E., and Cordell, L., 1975, Mineral resources of the White Mountain Wilderness and adjacent areas, Lincoln County, New Mexico: U.S. Geol. Survey, Open-file Rept. 75-385, 245 p., 3 tables, 17 figs.

Describes Walker Andesite Breccia, Nogal Peak Trachyte, Church Mountain Latite, andesite porphyry, Rialto stock (syenodiorite), syenite dikes, Bonito Lake stock (syenite), Three Rivers stock (syenite, nordmarkite), and rhyolite. Describes mining claims and occurrences of fluorite. Includes geochemical analyses (Cu, La, Mo, Nb, Pb, Se, Sr, Y, Zr).

Area: Lincoln County porphyry belt.

Shafiqullah, M., <u>see</u> Deal, E.G., Elston, W.E., Erb, E.E., Petersen, S.L., Rieter, D.E., and Damon, P.E., 1978

Shiver, W.S., <u>see</u> Fullagar, P.D., 1973

Sheridan, M.J., 1947, Lincoln County iron deposits, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-3988, 19 p. 24 figs.

Describes the various iron-ore deposits in Lincoln County, some of which are radioactive. Includes mine and geological maps for many of the deposits.
Area: Lincoln County porphyry belt.

Shoemaker, E.M., 1956, Occurrence of uranium in diatremes in the Navajo and Hopi Reservations, Arizona, New Mexico, and Utah, in Contributions to the geology of uranium and thorium: U.S. Geol. Survey, Prof. Paper 300, p. 179-185, 2 figs.; U.N. Internat. Conf. Peaceful uses Atomic Energy, 1st Proc., Geneva, v. 6, p. 412-417
Describes uranium occurrences in 250 diatremes. Includes uranium and thorium analyses; Outlet Neck, 11.9 ppm U and 28.4 ppm Th, Bennett Peak, 12.3 ppm U and 31.5 ppm Th, and Mitten Rock, 10.6 ppm U and 50.1 ppm Th.
Area: San Juan Basin.

Shoemaker, J., 1965, Aplite dikes of the Sandia Mountains, New Mexico (abs.), in Southwestern New Mexico II: New Mexico Geol. Soc., Guidebook 16th field conf., p. 242
Discusses the intrusion of aplite dikes in Precambrian granite and metamorphic rocks.
Area: Sandia Mountains, Bernalillo County.

Sidwell, R.G., 1946, Sediments from alaskite, Capitan Mountain, New Mexico: Jour. Sed. Petrology, v. 16, no. 3, p. 121-123, 1 fig.
Briefly discusses the formation of sediments by the erosion of intrusive alaskite. Briefly describes the alaskite.
Area: Lincoln County porphyry belt.

Siems, D.L., see Alminas, H.V., Watts, K.C., Griffitts, W.R., Kraxberger, V.E., and Curry, K.J., 1975

Silberman, M.L., see Carten, R.B., Armstrong, A.K., and Elston, W.E., 1974

Silver, C., 1955, Geology of the Caballo Mountains, in South-central New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., p. 146-154, 2 figs.
Precambrian granite and gneiss and Tertiary rhyolite occurs in the Caballo Mountains. Mentions the occurrence of supergene uranium deposits.
Area: Caballo Mountains, Sierra County.

Silver, C., see Kelley, V.C., 1952

Simon, D.B., 1973, Geology of the Silver Hill area, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 41, 101 p., 2 tables, 18 figs., 1 pl., map
Discusses the petrology and geology of the Hells Mesa, A.L. Peak, and La Jara Peak formations. Includes modal analyses.
Area: Mogollon-Datil volcanic province, Socorro County.

Smalley, R.G., see Glass, J.J., 1945

Smith, B.C., see Collins, G.E., 1956

Smith, C.T., and others, 1958a, Geologic map of Inscription Rock 15-min quadrangle, Valencia County, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 4, scale 1:48,000 (now Cibola County)
Geologic map shows the distribution of undifferentiated Precambrian rocks including granite gneiss, aplite facies, quartz veins, and metarhyolite. Most of the area is mapped as Paleozoic sediments.
Area: Zuni Mountains, Cibola County.

Smith, C.T., and others, 1958b, 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 (now Cibola County)
Geologic map shows the distribution of Precambrian granite gneiss with aplite facies and quartz veins. Most of the area is mapped as Paleozoic sediments.
Area: Zuni Mountains, Cibola and McKinley Counties.

Smith, C.T., and others, 1964, Reconnaissance geology of the Little Black Peak quadrangle, Lincoln and Socorro Counties, New Mexico, in Ruidoso country: New Mexico Geol. Soc., Guidebook 15th field conf., p. 92-99, 1 table, 1 sheet, scale 1:62,500; New Mexico Bureau Mines Mineral Resources, Circ. 75
Briefly describes the Lone Mountain stock (kalialaskite), nordmarkite, and basalt flows (including chemical analyses). Mapped units include volcanic breccia, quartz-bearing intrusives and extrusives, granite dikes, monzonite and monzonite porphyry dikes and stocks, latite, syenite, and the Lone Mountain stock.
Area: Lincoln County porphyry belt.

Smith, E.I., 1976, Structure and petrology of the John Kerr Peak Dome complex, southwestern New Mexico, in Cenozoic volcanism in southwestern New Mexico: New Mexico Geol. Soc., Spec. Pub. 5, p. 71-78, 3 tables, 9 figs.
Includes chemical analyses of quartz latites and a geologic map (scale 1 inch = 1 mi)
Area: Mogollon-Datil volcanic province, Catron County.

Smith, E.I., see Elston, W.E., Damon, P.E., Coney, P.J., Rhodes, R.C., and Bikerman, M., 1973; and Rhodes, R.C., 1976

Smith, E.S., see May, R.T., Dickson, R.E., and Nystrom, R.J., 1981

Smith, H.T.U., 1938, Tertiary geology of the Abiquiu quadrangle, New Mexico: Jour. Geology, v. 46, no. 7, p. 933-965, 12 figs.
Includes brief descriptions of Precambrian gneiss and granite and Tertiary Chicoma volcanic formation (andesite, latite, and rhyolite), Abiquiu Tuff, and Canones andesite.
Area: Sangre de Cristo Mountains, Rio Arriba County.

Smith, R.L., and Bailey, R.A., 1968, Stratigraphy, structure, and volcanic evolution of the Jemez Mountains, New Mexico (abs.):

Colorado School Mines, Quart., v. 63, no. 3, p. 259-260; Geol. Soc. America, Spec. Paper 115, p. 447-448
Briefly describes the Jemez volcanic field, consisting of a cyclic progression of basalts to rhyolites. Divides the sequence into four parts: 1) Pliocene basalt-rhyolite, 2) Pliocene basalt-andesite and dacite-rhyodacite-quartz latite-rhyolite, 3) Pliocene basalt-andesite-dacite-rhyodacite-quartz latite-rhyolite complex (mafic to felsic sequence), and 4) Pleistocene rhyolite suite, including the Bandelier Tuff.
Area: Jemez Mountains, Rio Arriba and Sandoval Counties.

Smith, R.L., Bailey, R.A., and Ross, C.S., 1970, Geologic map of the Jemez Mountains, New Mexico: U.S. Geol. Survey, Misc. Geol. Inv. Map I-571, scale 1-125,000
Geologic map showing the distribution of quartz latite, rhyolite, rhyodacite, andesite, and Precambrian granite.
Area: Jemez Mountains, Rio Arriba and Sandoval Counties.

Smith, R.L., see Bailey, R.A., and Ross, C.S., 1969; and Ross, C.S., and Bailey, R.A., 1961

Smith, W.L., see Larsen, E.S., Jr., Phair, G., and Gottfried, D., 1956

Smouse, P., see Berry, V.P., Nagy, P.A., Sprerg, W.C., and Barnes, C.W., 1980

Snider, H.I., see Elston, W.E., 1964

Soule, J.H., 1946a, Exploration of Gallinas fluorspar deposits, Lincoln County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-3854, 25 p., 21 tables, 7 figs.
Mentions the occurrence of Precambrian granite, quartz monzonite porphyry, and syenite dikes. Describes the fluorspar deposits, including the occurrence of bastnaesite. Includes chemical analyses (Ce, F., CO_2, Ca, Ba, Fe, H_2O).
Area: Lincoln County porphyry belt.

Soule, J.H., 1946b, Exploration of Harding tantalum-lithium deposits, Taos County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-3986, 10 p., 6 figs.
A detailed report describing the geology and mineralogy of the tantalum and lithium pegmatites in the Picuris Range. Host rocks include Precambrian schists and gneisses. Mentions the occurrence of microlite.
Area: Tusas Mountains, Rio Arriba County.

Soule, J.H., 1947, Capitan iron deposits, Lincoln County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-4022, 8 p., figs.
Area: Lincoln County porphyry belt.

Soule, J.H., 1948, Investigation of Capitan iron deposits, Lincoln County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-4514, 5 p., 8 figs.
Area: Lincoln County porphyry belt.

Soule, J.M., 1972, Structural geology of northern part of Animas Mountains, Hidalgo County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 125, 15 p., 8 figs., scale 1:24,000
Briefly describes Precambrian granite, Tertiary rhyolite, quartz monzonite porphyry, quartz latite, and vitrophyre.
Area: Animas Mountains, Hidalgo County.

Spencer, A.C., and Paige, S., 1935, Geology of the Santa Rita mine area, New Mexico: U.S. Geol. Survey, Bull. 859, 78 p., 1 fig., 6 pls., scale 1:24,000
Describes the Tertiary quartz diorite porphyry, granodiorite, granodiorite porphyry, rhyolite, latite, andesite, and diorite flows, stocks, sills, and dikes.
Area: Mogollon-Datil volcanic province, Grant County (Silver City quadrangle).

Spradlin, E.J., 1975, Geologic map and sections of the Joyita Hills area, Socorro County, New Mexico (with emphasis on Tertiary volcanic rocks): U.S. Geol. Survey, Open-file Rept. 75-139, scale 1:24,000
Geologic map shows the distribution of rhyolites, andesites, and latites, of the A.L. Peak, Hells Mesa, and Spears formations.
Area: La Joyita Hills, Socorro County.

Sprerg, W.C., <u>see</u> Berry, V.P., Nagy, P.A., Barnes, C.W., and Smouse, P., 1980

Staatz, M.H., 1965, Thorium, <u>in</u> Mineral and water resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 87, p. 230-234, 1 fig.

Staatz, M.H., 1974, Thorium veins in the United States: Econ. Geology, v. 69, p. 494-507, 4 tables, 6 figs.
Briefly describes thorium veins in the Capitan Mountains, Lincoln County (0.01-1.12% Th); Gold Hill district, Grant County (0.05-0.72% Th); and Laughlin Peak, Colfax County (0.05-0.82% Th).
Area: Lincoln County porphyry belt; Burro Mountains, Grant County; Chico Hills, Colfax County.

Staatz, M.H., Adams, J.W., and Conklin, N.M., 1965, Thorium-bearing microcline-rich rocks in the southern Caballo Mountains, Sierra County, New Mexico: U.S. Geol. Survey, Prof. Paper 525-D, p. D48-D51, 1 table, 2 figs.
Describes the radioactive metasomatic bodies which are high in microcline. Includes chemical analyses (Th, La, Ce, Nd, Yb, Y, Nb, U). Thorite, uranophane, fluorcarbonate, and bastnaesite were identified. The uranium and thorium analyses are as follows:

microcline--north end Caballos Mountains, Red Rock claim	0.44% Th	0.03% U
microcline--center Caballo Mountains, Red Rock claim	0.16% Th	0.00% U
microcline--Plainview claim	0.086% Th	0.07% U

Area: Caballo Mountains, Sierra County.

Stark, J.T., 1956, Geology of the south Manzano Mountains, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 34, 48 p., 1 fig., 8 pls., scale 1:48,000

Includes modal analyses and stratigraphic sections of the Precambrian Sevilleta Metarhyolite, Priest Granite, Monte Largo stock, pegmatites, and aplite dikes.

Area: Manzano Mountains, Torrance and Valencia Counties.

Stark, J.T., and Dapples, E.C., 1946, Geology of the Los Pinos Mountains, New Mexico: Geol. Soc. America, Bull., v. 57, p. 1,121-1,172, 1 fig., 7 pls., scale 1:63,360

Describes the Precambrian quartzites, schists, rhyolites, and granites (Los Pinos and Priest plutons) of the Los Pinos Mountains. The region also includes pegmatites, aplites, quartz veins, and quartz-feldspar dikes.

Area: Los Pinos Mountains, Socorro County.

Stearns, C.E., 1953, Tertiary geology of the Galisteo-Tongue area, New Mexico: Geol. Soc. America, Bull., v. 64, p. 459-508, 1 table, 10 figs., 3 pls., scale 1:125,000

Describes the Espinaso Volcanics (andesites to quartz latites).

Area: Sandia, Ortiz, and Sangre de Cristo Mountains, Bernalillo, Santa Fe, and Sandoval Counties.

Stearns, C.E., 1962, Geology of the north half of the Pelona quadrangle, Catron County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 78, 46 p., scale 1:63,360

Describes and discusses the geology of the Datil Formation occurring in the north half of the Pelona quadrangle. Includes geologic map showing the distribution of the Datil Formation.

Area: Mogollon-Datil volcanic province, Catron County.

Stearns, C.E., <u>see</u> Willard, M.E., 1971

Steensma, R.S., <u>see</u> Kottlowski, F.E., 1979

Stensrud, H.L., <u>see</u> Gresens, R.L., 1974a,b

Sterling, D.A., and Malan, R.C., 1970, Distribution of uranium and thorium in Precambrian rocks of southwestern U.S.: Am. Inst. Mining Engineers, Trans., v. 247, no. 3, p. 255-259, 1 table, 5 figs.

Summarizes the investigations of the U.S. Atomic Energy Commission (now the Dept. of Energy) on the distribution of uranium and thorium in the southwest, including New Mexico. Includes maps showing the locations of samples (analyses are not given). Average contents of uranium and thorium in igneous rocks are given; igneous rocks (3.5 ppm eU_3O_8, 19.6 ppm $eThO_2$), metamorphic rocks (2.8 ppm eU_3O_8, 8.5 ppm $eThO_2$). Granites generally contain more uranium and thorium than quartz monzonites,

which generally contain more than granodiorites.
Area: Statewide.

Sterling, D.A., see Malan, R.C., 1969

Stipp, T.F., see Foster, R.W., 1961

Stobbe, H.R., 1949a, Dacites from Laughlin Peak, Colfax County, New Mexico (abs.): Geol. Soc. America, Bull., v. 60, p. 1,922
Describes Tertiary dacites of the Chico Hills area. Includes modal analyses.
Area: Chico Hills area, Colfax County.

Stobbe, H.R., 1949b, Petrology of volcanic rocks of northeastern New Mexico: Geol. Soc. America, Bull., v. 60, p. 1,041-1,095, figs.
Includes geochemical and petrographic descriptions of volcanic rocks. Describes analcime basanite, Red Mountain Dacite, andesite, Slagle trachyte, Chico Phonolites, analcime microcline fayalites, and leucocratic dikes.
Area: Chico Hills area, Colfax County.

Stobbe, H.R., 1950, Dacites from Laughlin Peak, Colfax County, New Mexico (abs.): Am. Mineralogist, v. 35, nos. 3-4, p. 288-289
Describes dacites from Laughlin Peak and includes modal analyses.
Area: Chico Hills area, Colfax County.

Stobbe, H.R., see Collins, R.F., 1942

Stolle, W.C., see Disbrow, A.E., 1957

Stormer, J.C., Jr., 1972a, Ages and nature of volcanic activity on the southern High Plains, New Mexico and Colorado: Geol. Soc. America, Bull., v. 83, p. 2,443-2,448, 2 tables, 2 figs.
Includes stratigraphic sections of the Raton-Clayton region. Includes age and potassium contents and a normative quartz-olivine-diopside diagram.
Area: Raton-Clayton volcanic field, Colfax County.

Stormer, J.C., Jr., 1972b, Mineralogy and petrology of the Raton-Clayton volcanic field, northeastern New Mexico: Geol. Soc. America, Bull., v. 83, p. 3,299-3,322, 11 figs.
Divides the alkaline lavas of the Raton-Clayton region into five groups: 1) Raton-Clayton alkali olivine basalts, 2) Red Mountain hornblende andesites and dacites, 3) Sierra Grande volcanic pyroxene andesites, 4) basanites and olivine nephelinites, and 5) Capulin-type basaltic lavas. Includes detailed mineralogical descriptions and chemical analyses (major-element) and discusses the petrogenesis.
Area: Raton-Clayton volcanic field and Chico Hills area, Colfax and Union Counties.

Stormer, J.C., Jr., and Carmichael, I.S.E., 1970, Villiaumite and the occurrence of fluoride minerals in igneous rocks: Am. Mineralogist, v. 55, p. 126-134, 3 figs.

Describes the occurrence and significance of villiaumite found in a peralkaline phonolitic sill in Colfax County.
Area: Chico Hills, Colfax County.

Stormer, J.C., Jr., see Jones, L.M., and Walker, R.L., 1974

Storms, W.R., 1947a, Iron Mountain beryllium deposits, Sierra and Socorro Counties, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-4024, 13 p., tables, 12 figs.
Describes the geology and beryllium deposits at Iron Mountain and in an area to the north of Iron Mountain in Socorro County. Includes location maps, assay maps, and tables of chemical analyses. Iron, zinc, and fluorite are present in various amounts.
Area: Sierra Cuchillo, Sierra and Socorro Counties.

Storms, W.R., 1947b, Iron Mountain tungsten deposits, Sierra County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-4035, 5 p., 7 figs.
Briefly describes the tungsten deposits at Iron Mountain. Includes location maps and assay maps.
Area: Sierra Cuchillo, Sierra County.

Stotelmeyer, R.B., see Segerstrom, K., Williams, F.E., and Cordell, L., 1975

Strobell, J.D., Jr., 1956, Geology of the Carrizo Mountains area in northeastern Arizona and northwestern New Mexico: U.S. Geol. Survey, Oil and Gas Inv. Map, OM-160, 2 sheets with text and sections
Geologic map showing the distribution of diorite sills and laccoliths. Most of the area is mapped as Paleozoic and Mesozoic sediments.
Area: San Juan Basin.

Strongin, O., 1957, Geology and ore deposits of Apache Hills and northern Sierra Rica, Hidalgo County, New Mexico: Ph.D. thesis, Columbia Univ., 221 p., 5 tables, 33 figs., 16 pls.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 18, scale 1:24,000
Detailed thesis describing the geology, contact metamorphism, and ore deposits of the Apache Hills and Sierra Rica area. Igneous rocks include the Last Chance volcanics, granitic intrusives, and rhyolite flows. Good descriptions and mine maps of the ore deposits of the Apache-Chapo and Fremont copper-gold-silver-lead-zinc mining districts. A geologic map accompanies the thesis. The ore deposits at the Apache-Chapo mines are contact metasomatic, while the deposits in the Fremont district are vein- and fracture-filling. Mentions that uranium was discovered at the Napane mine and claims were filed in 1955 for radioactive deposits.
Area: Mogollon-Datil volcanic province and Hatchet Mountain area, Hidalgo County.

Suits, V.J., see Wenrich-Verbeek, 1979a,b

Sumner, W., 1980, Geology of the Water Canyon-Jordan Canyon area,

Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 151 p., New Mexico Bureau Mines Mineral Resources, Open-file Rept. 135, 1 table, 37 figs., 1 pl., scale 1:12,000

Describes Precambrian rhyolite of North Baldy, the Magdalena granite, Tertiary quartz monzonite stock, and rhyolite dikes. Briefly discusses the results of a partial scintillometer survey where it is reported that the Magdalena granite has the highest reading. No uranium anomalies were found and the author concluded that no evidence was found to indicate that the Proterozoic rocks of the Magdalena Mountains are favorable for uranium deposits.

Area: Magdalena Mountains, Socorro County.

Sun, M.S., and Baldwin, B., 1958, Volcanic rocks of the Cienega area, Santa Fe County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 54, 80 p., 14 tables, 8 figs., 6 pls., map

Describes andesite breccia, augite monzonite, latite, and limburgite. Includes some modal and chemical analyses.

Area: Sangre de Cristo Mountains, Santa Fe County.

Sur, F.J., 1946, Exploration of the Bishop Cap fluorspar project, Dona Ana County, New Mexico: U.S. Bureau Mines, Rept. Inv. RI-3946, 7 p., tables, 6 figs.

Brief report on the fluorspar deposits of Bishop Cap, Organ Mountains. These deposits include fluorite-quartz-calcite veins. Includes CaF_2, $CaCO_3$, SiO_2, and $BaSO_4$ analyses on the ore.

Area: Organ Mountains, Dona Ana County.

Sur, F.J., 1947, Huckleberry spar mine, Catron County, New Mexico: U.S. Bureau Mines, Rept. Inv., RI-4053, 11 p., 5 pls.

Discusses the geology and ore deposition of fluorite deposits in the Mogollon Mountains. Host rocks include andesite, rhyolite, and altered andesites. Includes major-element analyses.

Area: Mogollon-Datil volcanic province, Catron County.

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

Swinney, C.M., see Gillerman, E.G., Whitebread, D.H., Crowley, R.J., and Kleinhampl, F.J., 1954

Templain, C.J., and Dotterer, F.E., 1978, Preliminary study of the uranium favorability of the Jornada del Muerto Basin and adjacent areas, south-central New Mexico: U.S. Dept. Energy, Open-file Rept. GJBX-80(78), 22 p., 3 tables, 7 figs.

Mentions the occurrence of Precambrian granite, granite gneiss, aplite, and pegmatite dikes in the Caballo and Fra Cristobal Ranges. Gives three occurrences of anomalous uranium: 1) Precambrian shear zones in gneiss (0.02% eU_3O_8), 2) fault zone with fluorite, and 3) fault zone between granite and syenite dikes.

Area: Caballo and Fra Cristobal Mountains, Sierra County.

Thaden, R.E., Santos, E.S., and Raup, O.B., 1967, Geologic map of the Grants quadrangle, Valencia County, New Mexico: U.S. Geol. Survey, Geol. Quad. Map GQ-681, scale 1:24,000 (now Cibola County)

Geologic map showing the distribution of Tertiary rhyolite. Uranium is found in adjacent sediments.
Area: San Juan Basin, Cibola County.

Thomann, W., in preparation, Igneous and metamorphic petrology of Thunderbird Formation, El Paso County, Texas: Ph.D. thesis, Univ. Texas (El Paso)
Area: Franklin Mountains, Texas.

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

Thompson, S., III, 1955a, Geology of the southern Fra Cristobal Range, Sierra County, New Mexico: M.S. thesis, Univ. New Mexico, 75 p., 5 figs., 3 pls. (revised 1960)
Area: Fra Cristobal Mountains, Sierra County.

Thompson, S., III, 1955b, Geology of the Fra Cristobal Range, in South-central New Mexico: New Mexico Geol. Soc., Guidebook 6th field conf., p. 155-157
Mentions Precambrian granite, schist, diorite, and pegmatites occurring in the area. Discusses the occurrence of gold.
Area: Fra Cristobal Mountains, Sierra County.

Thompson, T.B., 1964, A stratigraphic section of the Sierra Blanca volcanics in the Nogal Peak area, Lincoln County, New Mexico, in Ruidoso country: New Mexico Geol. Soc., Guidebook 15th field conf., p. 76-78, 3 figs.
Brief stratigraphic section of the Nogal Peak alkalic igneous rock complex.
Area: Lincoln County porphyry belt.

Thompson, T.B., 1965, Pegmatites of the Elk Mountain district, San Miguel County, New Mexico (abs.), in Southwestern New Mexico II: New Mexico Geol. Soc., Guidebook 16th field conf., p. 243
Discusses the occurrences of discordant pegmatites near the Embudo Granite. The pegmatites include minor amounts of rare-earth elements.
Area: Sangre de Cristo Mountains, San Miguel County.

Thompson, T.B., 1968, Hydrothermal alteration and mineralization of the Rialto stock, Lincoln County, New Mexico: Econ. Geology, v. 63, p. 943-949, 3 tables, 8 figs.
The Rialto stock consists of dominantly hornblende-biotite monzonite. Eight known breccia zones occur within the stock and are hydrothermally altered to quartz and sericite. The porphyritic alteration zone has been invaded by magnetite and sphene veinlets. Molybdenum and copper mineralization occur within the stock near or within the breccia zones. Includes spectrochemical and modal analyses of the stock. Mineral zonation consists of copper surrounded by molybdenum surrounded by magnetite.
Area: Lincoln County porphyry belt.

Thompson, T.B., 1972, Sierra Blanca igneous complex, New Mexico: Geol.

Soc. America, Bull., v. 83, p. 2,341-2,356, 7 figs.
A detailed discussion of Tertiary monzonite to quartz syenite stocks, sills, and dikes intruding the andesite, trachytes, and latites. Includes detailed geochemical analyses.
Area: Lincoln County porphyry belt.

Thompson, T.B., 1973, Mineral deposits of Nogal and Bonito mining districts, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 123, 30 p., 15 figs., scale 1 inch = 1 mi
Describes the Sierra Blanca volcanics (trachyte porphyry and andesite), Rialto stock (monzonite), Bonito Lake stock (syenite), Three Rivers stock (leucocratic syenite porphyry), diabase porphyry, diabase, rhyolite, latite, and phonolites. Includes chemical analyses and a geologic map.
Area: Lincoln County porphyry belt.

Thompson, T.B., and Giles, D.L., 1974, Orbicular rocks of the Sandia Mountains, New Mexico: Geol. Soc. America, Bull., v. 85, p. 911-916, 3 tables, 6 figs.
Describes three types of orbicular rocks within a biotite-rich Precambrian granite: 1) multi-shelled orbicules with a core of biotite monzonite surrounded by biotite and plagioclase shells, 2) plagioclase orbicules, and 3) plagioclase or hornfels core surrounded by biotite and plagioclase bands. Includes chemical analyses of the orbicules and summarizes the characteristics of the orbicular rocks.
Area: Sandia Mountains, Bernalillo County.

Thompson, T.B., and Giles, D.L., 1980, Igneous origin of the orbicular rocks of the Sandia Mountains, New Mexico--Discussion: Geol. Soc. America, Bull., v. 91, p. 245-246
Presents opposing viewpoint on an article by Enz and others (1979 and 1980) concerning the orbicular rocks of the Sandia Mountains. Thompson and Giles (1974) favored a metasomatic origin. Concludes that the new information presented by Enz and others (1979) does not resolve the controversy concerning the origin of these rocks.
Area: Sandia Mountains, Bernalillo County.

Thompson, T.B., see Giles, D.L., 1972

Thorman, C.H., 1977, Geologic map of the Coyote Peak and Brockman quadrangles, Hidalgo and Grant Counties, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map, MF-924, scale 1:24,000
Geologic map showing the distribution of Tertiary andesite, granodiorite, rhyolite, and quartz latite. Includes some chemical analyses.
Area: Mogollon-Datil volcanic province, Hidalgo and Grant Counties.

Thorman, C.H., and Drewes, H., 1978a, Cretaceous-early Tertiary history of the northern Pyramid Mountains, southwestern New Mexico, in Land of Cochise (southeastern Arizona): New Mexico Geol. Soc., Guidebook 29th field conf., p. 215-218, 2 figs.
Briefly describes andesites, the Lordsburg granodiorite

stock, aplite dikes, rhyolite vents and breccia pipes, quartz veins, and latite dikes. Briefly describes copper-silver-gold-lead deposits.
Area: Pyramid Mountains, Hidalgo County.

Thorman, C.H., and Drewes, H., 1978b, Geologic map of the Gary and Lordsburg quadrangles, Hidalgo County, New Mexico: U.S. Geol. Survey, Misc. Inv., I-1151, scale 1:24,000
Geologic map of the Gary and Lordsburg 7 1/2-min quadrangles, Hidalgo County. Shows the distribution of rhyolite breccia, andesite of Shakespeare, andesite flows of Gore Canyon, aplite, granodiorite, intrusive rhyolite, latite porphyry dikes, rhyolite flow of Pyramid Peak, rhyolite tuff of Dogshead, rhyolite tuff, rhyolite of Mudhole Draw, and Moonstone rhyolite ash-flow.
Area: Pyramid Mountains, Hidalgo County.

Thorman, C.H., and Drewes, H., 1979, Geologic map of parts of the Grandmother Mountains East and Grandmother Mountains West quadrangles, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-1088, scale 1:24,000
Geologic map showing the distribution and description of latite of Clabber Top Hill, rhyolite ash-flow tuffs, and basaltic andesites.
Area: Mogollon-Datil volcanic province, Luna County.

Thorman, C.H., <u>see</u> Drewes, H., 1980

Tilton, G.R., <u>see</u> Aldrich, L.T., Wetherill, G.W., and Davis, G.L., 1958

Timm, B.C., 1941, The geology of the southern Cornudas Mountains, Texas and New Mexico: M.S. thesis, Univ. Texas (El Paso), 56 p., 2 figs., 10 pls., scale 1 inch = 1.2 mi
Describes the geology of the southern Cornudas Mountains, including San Antonio Mountain, Washburn Mountain, and Chatfield Mountain. Includes detailed petrographic descriptions of the alkali igneous intrusives, including; analcite nepheline syenite, analcite nepheline-syenite porphyry, and phonolite porphyry.
Area: Cornudas Mountains, Otero County.

Timmer, R.S., <u>see</u> Woodward, L.A., 1979

Titley, S.R., 1959, Geological summary of the Magdalena mining district, Socorro County, New Mexico, <u>in</u> West-central New Mexico; New Mexico Geol. Soc., Guidebook 10th field conf., p. 144-148, 3 figs.
Briefly describes the igneous rocks of the Magdalena area. Precambrian gabbro, felsite, granite, and diabase and Tertiary andesite, latite, rhyolite porphyry, granite, and monzonite are found within the district. Describes the lead-zinc replacement deposits.
Area: Magdalena Mountains, Socorro County.

Tonking, W.H., 1957, Geology of Puertecito quadrangle, Socorro County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 41, 67 p., 3 tables, 9 figs., 1 pl., scale 1:48,000
Describes the Spears, Hells Mesa, and La Jara Peak Members

of the Datil Formation and syendiorite sills, dikes, and plugs. Includes modal and chemical analyses.
Area: Mogollon-Datil volcanic province, Socorro County.

Towle, C.C., Jr., and Rapaport, I., 1952, Uranium deposits of the Grants district, New Mexico: Mining and Eng., v. 4, no. 11, p. 1,037-1,040, figs.
Mainly discusses the uranium in the sedimentary rocks, but mentions the nearby Precambrian rocks in the Zuni Mountains and the Tertiary igneous rocks of Mount Taylor.
Area: Zuni Mountains and Mount Taylor, Cibola County.

Treiman, A.H., 1977, Precambrian geology of the Ojo Caliente quadrangle, Rio Arriba and Taos Counties, New Mexico: M.S. thesis, Stanford University, 93 p., 22 figs., 3 tables, 3 pls., scale 1:12,000
Describes the Precambrian geology and metamorphism of the Ojo Caliente 7 1/2-min quadrangle. Describes an unconformity within the Canado Pueblo Group (Precambrian). Below the unconformity, the rocks are metapelites, amphibolites, and metarhyolites; while above the unconformity the rocks are metapelites, conglomerate, metarhyolites, and amphibolites. Includes modal analyses of the meta-igneous rocks and a geologic map and cross section of the area.
Area: Tusas Mountains, Rio Arriba County.

Tschanz, C.M., 1958, Radioactive phonolite and associated thorium-rare-earth-niobium veins in the Laughlin Peak area, Chico Hills, Colfax County, New Mexico: U.S. Geol. Survey, Trace Elements Inv. Rept. TEI-230, 4 p.
Radioactive veins associated with a thick radioactive phonolite sill (Tertiary) occurring near Laughlin Peak are briefly described in this report. Thorium, iron, and niobium minerals are reported to occur in the vein.
Area: Chico Hills, Colfax County.

Twenhofel, W.S., and Brick, K.L., 1956, The geology of thorium deposits in the United States: U.N. Internat. Conf. Peaceful uses Atomic Energy, 1st Proc., Geneva, v. 6, p. 562-567, 1 fig.
Describes the geology of thorium deposits, including vein deposits related to alkalic igneous rocks. Mentions the occurrence of thorium veins in the Gallinas Mountains, Lincoln County.
Area: Lincoln County porphyry belt.

U.S. Atomic Energy Commission, 1970, Preliminary reconnaissance for uranium in New Mexico, 1950-1958: U.S. Atomic Energy Comm., RME-160, Supt. of Doc., Tech. Information Division, TID U651, 224 p.
This collection of 1-3-page field reconnaissance reports of uranium and thorium prospects, mines, and occurrences represents preliminary field work done in the 1950's by Atomic Energy Commission geologists. Includes some radiometric and chemical analyses.
Area: Statewide.

U.S. Bureau of Mines, <u>see</u> U.S. Geological Survey and New Mexico Bureau

Mines Mineral Resources, 1980

U.S. Department of Energy, 1980, An assessment report on uranium in the United States of America: U.S. Dept. Energy, Rept. GJO-111(80), 150 p., 60 tables, 92 figs., 2 appendices, microfiche.

This progress report on the NURE (National Uranium Resource Evaluation) program discusses recent assessment of uranium resources in the United States, including New Mexico. Four nonsandstone uranium deposits in New Mexico are considered to contain uranium reserves: the Madera Limestone, San Mateo Mountains; Precambrian granitic rocks, Burro Mountains; Popotosa Formation, Ladron Mountains; and Yeso Formation, Chupadera Mountains (Socorro Basin).

Area: Mogollon-Datil volcanic provence, Ladron Mountains, Burro Mountains, Socorro Basin.

U.S.Geological Survey, compiler, 1965, Mineral and water resources of New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 87, 437 p., 56 tables, 89 figs.

Briefly describes the geology and petrology of Precambrian and Tertiary igneous rocks. Discusses the occurrences of uranium and thorium throughout the state. Also includes occurrences of fluorite, pegmatites, and other commodities throughout New Mexico. Includes maps and tables showing and describing the occurrences of uranium, thorium, fluorite, pegmatites, and other commodities.

Area: Statewide.

U.S. Geological Survey, U.S. Bureau of Mines, and New Mexico Bureau Mines and Mineral Resources, 1980, Mineral resources of the Pecos Wilderness and adjacent areas, Santa Fe, San Miguel, Mora, Rio Arriba, and Taos Counties, New Mexico: U.S. Geol. Survey, Open-file Rept. 80-382, 103 p., 4 tables, 15 figs., 6 pls., scale 1:48,000

This comprehensive report describes the geology and mineral resources of the Precambrian rocks in and around the Pecos Wilderness area, Sangre de Cristo Mountains. This area consists of Precambrian stratified rocks (including conglomerates), gneisses, intrusives, volcanics, and syenites. Discusses the possibility of uranium occurring along the Jicarilla fault and in pegmatites. Includes good geologic descriptions of the mines, prospects, and mineralized areas and includes mine maps and sample analyses. One table gives the uranium and thorium determinations of quartz porphyry (4 samples), syenite (5 samples) and melasyenite (3 samples) in the area.

Note: Individual authors are R.H. Moench, S.J. Surley, L. Cordell (U.S. Geological Survey), J.M. Robertson (New Mexico Bureau of Mines and Mineral Resources), and M.E. Lane (U.S. Bureau of Mines).

Area: Sangre de Cristo Mountains, Santa Fe, San Miguel, Mora, Rio Arriba, and Taos Counties.

Van Alstine, R.E., 1976, Continental rifts and lineaments with major fluorspar districts: Econ. Geology, v. 71, p. 977-986, 2 figs.

Relates the Fluorite Ridge, Cooke's Peak, Burro Mountains, Gila and Mogollon Mountains, Sierra Caballo, Sierra Cuchillo, Gallinas, and Zuni fluorspar and the Questa molybdenum-fluorspar districts to the Rio Grande rift zone. Suggests that the association of these fluorspar districts to continental rifts may be a regional guide in the search for new fluorspar districts (and perhaps uranium deposits?). The fluorspar is often accompanied by economic quantities of uranium, molybdenum, lead, zinc, barite, thorium, niobium, tin, beryllium, and/or rare-earth elements.

Area: Mogollon-Datil volcanic province, Black and Cooke's Ranges, Burro Mountains, Sierra Caballo, Sierra Cuchillo, Zuni Mountains, and Sangre de Cristo Mountains, Hidalgo, Sierra, Grant, Luna, Dona Ana, Socorro, Cibola, and Santa Fe Counties.

Van der Spuy, P.M., 1970, Geological and geochemical investigations of geophysical anomalies, Sierra Rica, Hidalgo County, New Mexico: M.S. thesis, Colorado School Mines; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 62, 156 p., 3 tables, 32 figs., 6 pls., scale 1:12,000

Describes latite-dacite, granite, lamprophyre dikes, latite, rhyolite porphyry, felsite, quartz latite, and rhyolite. Includes chemical analyses (Cu, Pb, Zn, Mo).

Area: Hatchet Mountains area, Hidalgo County.

Vizcaino, H.P., O'Neill, A.J., and Dotterer, F.E., 1978, Preliminary study of the favorability for uranium in the Madera Limestone and Cutler and Chinle Formations of the Sierra Nacimiento-Jemez Mountains area, New Mexico: U.S. Dept. Energy, Open-file Rept. GJBX-4(78), 18 p., 2 tables, 2 figs., 3 pls.

Includes nine uranium analyses of the Bandelier Tuff (4-17 ppm U_3O_8) and three analyses of the Precambrian granite (3-6 ppm U_3O_8). Mentions that the source of uranium in the sediments may be from the igneous rocks.

Area: Nacimiento and Jemez Mountains, Sandoval and Rio Arriba Counties.

Wagner, H.C., see Griggs, R.L., 1966

Walker, G.W., and Osterwald, F.W., 1956, Uraniferous magnetite-hematite deposit at the Prince mine, Lincoln County, New Mexico: Econ. Geology, v. 51, p. 213-222, 1 table, 3 figs.

Describes the pyrometasomatic uraniferous magnetite-hematite deposit within the Permian sediments near the Lone Mountain monzonite stock. Briefly describes the monzonite stock which is locally porphyritic. Fluorite and sulfides occur within veins in an aureole associated with the deposit. Includes spectrographic analyses. The deposit contains 0.015-0.031% uranium.

Area: Lincoln County porphyry belt.

Walker, G.W., and Osterwald, F.W., 1963, Introduction to the geology of uranium-bearing veins in the conterminous United States: U.S. Geol. Survey, Prof. Paper 455-A, p. 1-28, 1 table, scale 1:5,000,000

Classifies uranium-bearing veins as: 1) fluorite-bearing veins, 2) base-metal sulfide veins, 3) veins of uranium minerals, 4) magnetite or other iron-bearing veins, 5) thorium-

or rare-earth-element-bearing veins, 6) brannerite-bearing quartz veins, 7) davidite-bearing veins, and 8) hydrocarbon-rich uranium-bearing veins. Includes a table listing uranium-bearing veins in the United States--including 32 localities from New Mexico.

Area: Colfax, Rio Arriba, San Juan, Cibola, San Miguel, Santa Fe, Bernalillo, Torrance, Socorro, Lincoln, Catron, Grant, Luna, Hidalgo, and Dona Ana Counties.

Walker, R.L., see Jones, L.M., and Stormer, J.C., Jr., 1974

Walton, A.W., Salter, T.L., and Zetterlund, D., 1980a, Post-emplacement uranium mobility in an ash-flow tuff and several rhyolite lavas (all Oligocene) from Hidalgo County, New Mexico (abs.): Am. Assoc. Petroleum Geologists, Southwest Sec., Ann. Mtg., Prog. and Abs., p. 60; 1981, Bull., v. 65, p. 771

"Uranium is concentrated in highly evolved, silica- or alkali-rich magmas during fractional melting or differentiation. As these magmas crystallize, the uranium may be disseminated through the rock or released into the surroundings. Uranium that is released either during crystallization or subsequently during weathering or alteration of the products of glass crystallization can be concentrated into secondary deposits.

"We investigated the distribution of uranium and other trace and minor elements in a major welded ash-flow tuff (the Gillespie Tuff) and in several rhyolite flow units. These investigations included petrographic examination to detect characteristic textures produced during the process of crystallization, and comparison of the chemical composition of rocks that had an identical original composition, but crystallized by different processes. In all units investigated, unaltered vitrophyres were used to indicate initial content of uranium and elements.

"The major process of crystallization in these rocks involved growth of spherulitic and large crystal units in a supercooled magma, beginning at temperatures some 200 degrees C below the liquids and continuing at lower degrees of supercooling. This is not strictly devitrification because it probably occurs above the glass transition temperature. Several distinctly different textures probably result from different crystallization conditions. Vapor phase crystallization is rare in the Gillespie Tuff. "Granophyric" texture is common in both lavas and the Gillespie tuff. In other areas, rocks displaying this texture may have lost some uranium, suggesting that volcanic rocks in Hidalgo County may have released considerable amounts during crystallization."

Area: Hidalgo County.

Walton, A.W., Salter, T.L., and Zetterlund, D., 1980b, Uranium potential of southwestern New Mexico (southern Hidalgo County), including observations on crystallization, history of lavas and ash tuffs and the release of uranium from them--final report: U.S. Dept. Energy, Open-file Rept. GJBX-169(80), 114 p., 17 tables, 16 figs., 5 appendices

This report presents the results of a study to evaluate the uranium potential of southern Hidalgo County. The general geology

(including tertiary volcanic activity), chemical results, and uranium mobility are discussed. Major- and minor-element analyses are listed in the appendices. Anomalous uranium values in stream sediments, water samples, and whole rocks are tabulated. A table of five uranium occurrences in southern Hidalgo County, including locations, name, production, and uranium mineralization is included. It is concluded that the results of this study indicate that neither the lavas nor the ash flows of the area are likely to have been sources for uranium deposits.
Area: Hidalgo County.

Wanek, A.A., 1963, Geology and fuel resources of the southwestern part of the Raton coal field, Colfax County, New Mexico: U.S. Geol. Survey, Coal Inv. Map C-45, 2 sheets, scale 1 inch = 1 mi
Geologic map showing the distribution of dacite and dacite porphyry.
Area: Raton and Clayton volcanic field and Chico Hills, Colfax County.

Wanek, A.A., see Wilpolt, R.H., 1951

Wargo, J.G., 1964, Geology of a disseminated copper deposit near Cerrillos, New Mexico: Econ. Geology, v. 59, p. 1,525-1,538, 7 figs.
Describes the geology and petrology of Tertiary monzonite porphyry, andesite flows and intrusives, the Franklin Hill igneous series (syenite, andesine monzonite porphyry, and augite-biotite monzonite), monzonite, and basalt. Copper is associated with the monzonite porphyry which invaded the monzonite and syenite.
Area: Ortiz Mountains, Santa Fe County.

Watts, K.C., see Alminas, H.V., Griffitts, W.R., Siems, D.L., Kraxberger, V.E., and Curry, K.J., 1975

Weber, R.H., 1963, Cenozoic volcanic rocks of Socorro County, in Socorro region: New Mexico Geol. Soc., Guidebook 14th field conf., p. 132-143, 2 figs.
Summarizes the occurrence of rhyolite, latite, and andesite in Socorro County. Discusses the occurrence of these rocks in the Lemitar, Ladron, Bear, Gallinas, San Mateo, and Magdalena Mountains, and Sierra Cuchillo.
Area: Mogollon-Datil volcanic province, Socorro County.

Weber, R.H., and Bassett, W.A., 1963, K-Ar ages of Tertiary volcanic and intrusive rocks in Socorro, Catron, and Grant Counties, New Mexico, in Socorro region: New Mexico Geol. Soc., Guidebook 14th field conf., p. 220-223, 1 table
Briefly describes Tertiary monzonites and granites, including K-Ar ages of the Mogollon-Datil volcanic field.
Area: Mogollon-Datil volcanic province, Socorro, Catron, and Grant Counties.

Weber, R.H., and Williard, M.E., 1959a, Reconnaissance geologic map of Mogollon 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 10, scale 1:126,720

Geologic map showing the distribution of Tertiary rhyolite, quartz latite, latite, and andesite of the Datil Formation.
Area: Mogollon-Datil volcanic province, Catron and Grant Counties.

Weber, R.H., and Willard, M.E., 1959b, Reconnaissance geologic map of Reserve 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 12, scale 1:126,720
Geologic map showing the distribution of Tertiary rhyolite, latite, and andesite of the Datil Formation.
Area: Mogollon-Datil volcanic province, Catron County.

Weber, R.H., see Willard, M.E., and Kuellmer, F.J., 1961

Wedow, H., Jr., see Ericksen, G.E., 1976; and Ericksen, G.E., Eaton, G.P., and Leland, G.R., 1970

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

Wells, R.C., see Hess, F.L., 1930

Wenrich-Verbeek, K.J., 1977, Anomalous uranium in the waters of the Rio Ojo Caliente, New Mexico, in Short papers of the U.S. Geol. Survey, Uranium-Thorium Symposium 1977: U.S. Geol. Survey, Circ. 753, p. 73-75, 1 table, 1 fig.
Short paper summarizes a stream-sediment and spring-water sampling program in the Tusas Mountains. Concludes that water samples from springs were more valuable than sediment samples in locating an anomalous area of uranium in the Tertiary-Quaternary sediments or in the Precambrian rocks.
Area: Tusas Mountains, Rio Arriba County.

Wenrich-Verbeek, K.J., and Suits, V.J., 1979a, Chemical data and statistical analyses from a uranium hydrogeochemical survey of the Rio Ojo Caliente drainage basin, New Mexico; part I--Water: U.S. Geol. Survey, Open-file Rept. 79-996, 143 p., 6 tables, figs.

Wenrich-Verbeek, K.J., and Suits, V.J., 1979b, Chemical data and statistical analyses from a uranium hydrogeochemical survey of the Rio Ojo Caliente drainage basin, New Mexico: part II--stream sediments: U.S. Geol. Survey, Open-file Rept. 79-997, 125 p., 6 tables, figs.
These two reports present the chemical analyses and statistical evaluation of water- and stream-sediment samples collected in the Ojo Caliente area near the Precambrian pegmatite district. Concludes that the water samples were of more value in detecting an anomaly of uranium in the area.
Area: Tusas Mountains, Rio Arriba County.

Wenrich-Verbeek, K.J., see Pierson, C.T., Hannigan, B.J., and Machette, M.N., 1980

Wetherill, G.W., see Aldrich, L.T., Davis, G.L., and Tilton, G.B., 1958

White, D.L., and Foster, M., 1981, Uranium resource evaluation, Clifton quadrangle, Arizona and New Mexico: U.S. Dept. Energy, Prelim. Rept. PG5-116(81), 53 p., 9 tables, 4 figs., 13 pls., 5 appendices

Comprehensive geologic report describes the geology and uranium potential of the various host rocks in the Douglas 1 by 2 degree quadrangle covering a portion of the Basin and Range physiographic province. Only one geologic environment is considered favorable for uranium deposits, the Whitewater Creek Rhyolite member of the Coney tuff. However, the Baca Formation and Gila conglomerate are not evaluated for their uranium potential because insufficient geologic information is available. Interprets the aerial-radiometric (ARMS) and hydrogeochemical and stream-sediment reconnaissance (HSSR) data. Includes a table of uranium occurrences (appendix A) and uranium-occurrence reports. Includes a comprehensive bibliography, rock analyses, and petrographic reports. Briefly describes the processes involved in cauldron development and the origin, stratigraphy, and correlation of Tertiary volcanic rocks in the Clifton quadrangle.

Area: Mogollon-Datil volcanic province, Catron and Grant Counties.

White, D.W., see Chapin, C.E., Chamberlin, R.M., Osburn, G.R., and Sanford, A.R., 1978

Whitebread, D.H., see Gillerman, E.G., Swinney, C.M., Crowley, R.J., and Kleinhampl, F.J., 1954; and Gillerman, E.G., 1954 and 1956

Wilcox, J.T., see Kerr, P.F., 1963

Wilkinson, W.H., Jr., 1976, Geology of the Tres Montosas-Cat Mountain area, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech.; New Mexico Bureau Mines Mineral Resources, Open-file Rept. 39, 158 p., 26 figs., 3 pls.

Describes the geology and petrology of the Datil Formation (andesite, latite, and rhyolite flows and tuffs), Tres Montosas stock, and Monica Canyon pluton (monzonite). Includes modal analyses of the Tres Montosas stock. Discusses alteration and mineralization of gold, copper, lead, and silver veins.

Area: Mogollon-Datil volcanic province, Socorro County.

Willard, M.E., 1957a, Reconnaissance geologic map of Luera Spring 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 2, scale 1:126,720

Geologic map showing the distribution of the Datil Formation. Includes porphyritic rhyolite, rhyolite tuff, latite, rhyolite flows, and andesite flows.

Area: Mogollon-Datil volcanic province, Catron and Socorro Counties.

Willard, M.E., 1957b, Reconnaissance geologic map of Pinonville 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 3, scale 1:126,720

Geologic map showing the distribution of Tertiary rhyolite, latite, and andesite.

Area: Mogollon-Datil volcanic province, Catron County.

Willard, M.E., 1959, Tertiary stratigraphy of the northern Catron County, New Mexico, in West-central New Mexico: New Mexico Geol. Soc., Guidebook 10th field conf., p. 92-99, 10 figs.
Gives a general description of the Datil Formation (andesite, rhyolite, and latite flows and tuffs).
Area: Mogollon-Datil volcanic province, Catron County.

Willard, M.E., and Givens, D.B., 1958, Reconnaissance geolgic map of Datil 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 5, scale 1:126,720
Geologic map showing the distribution of the Datil Formation. Includes andesite, latite, and diorite flows and tuffs.
Area: Mogollon-Datil volcanic province, Catron and Socorro Counties.

Willard, M.E., and Jahns, R.H., 1974, Gold and tungsten mineralization in the White Oaks district, Lincoln County, New Mexico (abs.), in Ghost Ranch (central-northern New Mexico): New Mexico Geol. Soc., Guidebook 25th field conf., p. 384
Gold and tungsten mineralization occurs within syenite, monzonite, and breccias. The mineralization occurs in veins with quartz, calcite, fluorite, gypsum, limonite, and sooty manganese oxides.
Area: Lincoln County porphyry belt.

Willard, M.E., and Stearns, C.E., 1971, Reconnaissance geologic map of the Pelona 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 23, scale 1:126,720
Geologic map showing the distribution of the Datil Formation. Includes latite, rhyolite, and andesite flows and tuffs.
Area: Mogollon-Datil volcanic province, Catron County.

Willard, M.E., Weber, R.H., and Kuellmer, F.J., 1961, Reconnaissance geologic map of Alum Mountain 30-min quadrangle: New Mexico Bureau Mines Mineral Resources, Geol. Map 13, scale 1:126,720
Geologic map showing the distribution of Tertiary rhyolite, andesite, and latite flows and tuffs of the Datil Formation.
Area: Mogollon-Datil volcanic province, Catron and Grant Counties.

Willard, M.E., see Weber, R.H., 1959a,b

Williams, F.E., 1966, Fluorspar deposits of New Mexico: U.S. Bureau Mines, Inf. Circ. IC-8307, 143 p., 3 tables, 46 figs.
Describes 147 fluorspar deposits and mentions 54 occurrences and prospects. Gives 72 fluorspar analyses. Discusses history, production, deposition, and mineralogy of the deposits. Fluorspar is found in Bernalillo, Catron, Dona Ana, Grant, Hidalgo, Lincoln, Luna, Rio Arriba, Sandoval, Sierra, Socorro, San Miguel, Torrance, and Cibola Counties. Includes sketch maps and figures for several of the deposits. Describes many known radioactive fluorite deposits and known deposits containing radioactive minerals.
Area: Bernalillo, Catron, Dona Ana, Grant, Hidalgo, Lincoln, Luna, Rio Arriba, Sierra, Socorro, Torrance, and Cibola Counties

Williams, F.E., see Segerstrom, K., Stotelmeyer, R.B., and Cordell, L., 1975

Williams, S.A., 1978, Mineralization at Granite Gap, Hidalgo County, New Mexico, in Land of Cochise (southeastern Arizona): New Mexico Geol. Soc., Guidebook 29th field conf., p. 329-330, 1 fig.
Description of the Granite Gap Granite, including a new age date indicating that the granite is Tertiary not Precambrian. A contact metamorphic aureole surrounds the granitic intrusive. Sulfide mineralization, associated with the granite, occurs within the metamorphosed limestone surrounding the granite.
Area: Peloncillo Mountains, Hidalgo County.

Wilpolt, R.H., and Wanek, A.A., 1951, Geology of the region from Socorro and San Antonio east to the Chupadera Mesa, Socorro County, New Mexico: U.S. Geol. Survey, Oil and Gas Inv. Map OM-121, 2 sheets, scale 1 inch = 1 mi
Area: Mogollon-Datil volcanic province and the area east of Socorro, Socorro County.

Wobus, R.A., and Dobson, P.F., 1981, Proterozoic intrusive history of the Tusas Mountains, north-central New Mexico (abs.): Geol. Soc. America, Abs. with Programs, v. 13, no. 4, p. 230
Briefly describes the geochemistry and intrusive and metamorphic history of granitic rocks found in the Tusas Mountains. Three types of granitic rocks are differentiated; Maquinita Granodiorite, Tres Piedras Granite, and the granite at Tusas Mountain (Tusas granite). The Tusas granite is locally enriched in fluorine.
Area: Tusas Mountains, Rio Arriba County.

Wolfe, H.D., 1953, Preliminary examination of Hanosh Mines, Inc. property, Monticello, New Mexico, and reconnaissance of other fluorite properties in Grant, Lincoln, Sierra, and Socorro Counties, New Mexico: U.S. Atomic Energy Comm., Rept. RME-1020, 13 p., 2 figs.
A preliminary reconnaissance study of the Hanosh mine (Terry prospect), Monticello, and 29 other fluorite properties in Grant, Sierra, Lincoln, and Socorro Counties disclosed only one other property with anomalous radioactivity besides the Hanosh mine, the Purple Rock mine near Redrock. A brief geologic description of the Hanosh mine and the Purple Rock mine is included.
Area: Mogollon-Datil volcanic province, Sierra and Grant Counties.

Wolfe, H.D., see Boyd, F.S., 1953

Wood, G.H., and Northrop, S.A., 1946, Geology of the Nacimiento Mountains, San Pedro Mountain, and adjacent plateaus in parts of Sandoval and Rio Arriba Counties, New Mexico: U.S. Geol. Survey, Oil and Gas Inv. Map, OM-57, with text, scale 1 inch = 1.5 mi
Geologic map including the distribution and brief descriptions of Precambrian granite and Tertiary rhyolite and basalt flows and tuffs.

Area: Nacimiento and San Pedro Mountains, Rio Arriba and Sandoval Counties.

Wood, G.H., Jr., Northrop, S.A., and Griggs, R.L., 1953, Geology and stratigraphy of Koehler and Mount Laughlin quadrangles and parts of Abbott and Springer quadrangles, eastern Colfax County, New Mexico: U.S. Geol. Survey, Oil and Gas Inv. Map OM-141, text, 2 sheets, scale 1 inch = 1 mi

Geologic map showing the distribution of alkalic igneous rocks around the Chico Hills area.

Area: Chico Hills area, Colfax County.

Woodward, L.A., 1969, Metamorphic and igneous rocks of Pederanl Hills area, Torrance County, New Mexico (abs.): Geol. Soc. America, Spec. Paper 121, p. 579-580

Describes the occurrence of granite gneiss, quartzite, schist, quartz monzonite, and pink granite. The granite gneiss is high in microcline and contains zircons. The pink granite is high in microcline and albite and also contains zircons.

Area: Pedernal Hills, Torrance County.

Woodward, L.A., 1970a, Precambrian rocks of southwestern New Mexico, in Tyrone-Big Hatchet Mountains-Florida Mountains region (southwestern New Mexico): New Mexico Geol. Soc., Guidebook 21st field conf., p. 27-30, 1 fig.

Briefly discusses the lithology and occurrences of Precambrian granites and local metamorphics in the Burro Mountains, Lone Mountain, Fluorite Ridge, Hanover-Fierro area, Florida Mountains, Animas Mountains, Peloncillo Mountains, and the Virden area.

Area: Mogollon-Datil volcanic province, Burro, Florida, Animas, and Peloncillo Mountains, Hidalgo, Grant, and Luna Counties.

Woodward, L.A., 1970b, Differentiation trends of spessartite dikes, Sandia Mountains, New Mexico: Jour. Geology, v. 78, p. 741-745, 1 table, 2 figs.

Discusses leucocratic dikelets which occur within hornblende-spessartite dikes in the Sandia Mountains. These dikelets are hornblende syenite. Includes major-element analyses of the syenite dikelets and of the spessartite dikes.

Area: Sandia Mountains, Bernalillo and Sandoval Counties.

Woodward, L.A., Anderson, J.B., Kaufman, W.H., and Reed, R.K., 1973, Geologic map and sections of San Pablo quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 26, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Precambrian pegmatites and aplite dikes, quartz monzonite, and gneiss. Mentions the occurrence of uranium in the Mesaverde coal and shale and Dakota Sandstone within the mapped area.

Area: Nacimiento and San Pedro Mountains, Sandoval and Rio Arriba Counties.

Woodward, L.A., Callender, J.F., and Zilinski, R.E., 1975, Tectonic map of the Rio Grande rift, New Mexico: Geol. Soc. America, Map and Chart series, MC-11, scale 1:500,000

Geologic and tectonic map of the Rio Grande rift from the New Mexico-Colorado border to Hatch, New Mexico. Shows the distribution of caldera margins, major basins, and a structure-contour map on top of the Precambrian. Shows trend of foliation in Precambrian rocks, fold axes in Precambrian rocks, and various trends of major fault zones.

Area: Statewide.

Woodward, L.A., DuChene, H.R., and Martinez, R., 1977, Geology of Gilman quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 45, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Precambrian granite, leucogranite, syenite, monzonite, and quartz diorite.

Area: Jemez Mountains, Sandoval County.

Woodward, L.A., DuChene, H.R., and Reed, R.K., 1974, Geologic map and sections of San Miguel Mountain quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 34, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Precambrian pegmatite, aplite, granite, and leucogneiss.

Area: Sangre de Cristo Mountains, Sandoval County.

Woodward, L.A., Gibson, G.G., and McLelland, D., 1976, Geology of Gallina quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 39, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Precambrian granite and quartz diorite. Mentions the occurrence of uranium in the Abo Formation within the mapped area.

Area: Nacimiento and San Pedro Mountains, Sandoval and Rio Arriba Counties.

Woodward, L.A., Kaufman, W.H., and Reed, R.K., 1973, Geologic map and sections of Rancho del Chaparral quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 27, with text, scale 1:24,000

Geologic map showing the distribution of pegmatites, aplite dikes, leucogranite, quartz monzonite, and Tertiary Bandelier Tuff (rhyolite and pumice).

Area: Nacimiento and Jemez Mountains, Sandoval and Rio Arriba Counties.

Woodward, L.A., McLelland, D., Anderson, J.B., and Kaufman, W.H., 1972, Geologic map and sections of Cuba quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 25, with text, scale 1:24,000

Geologic map showing the distribution of Precambrian quartz diorite, leucogranite, quartz monzonite, and chlorite-biotite-quartz-feldspar dikes.

Area: Nacimiento Mountains, Sandoval and Rio Arriba Counties.

Woodward, L.A., McLelland, D., and Kaufman, W.H., 1974, Geologic map and sections of Nacimiento Peak quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 32, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Precambrian leucogranite, granite, quartz monzonite, quartz diorite, and diorite.

Area: Nacimiento Mountains, Rio Arriba County.

Woodward, L.A., McLelland, D., and Husler, J.W., 1977, Precambrian rocks of the north part of the Nacimiento uplift, New Mexico, in San Juan Basin III (northeastern New Mexico): New Mexico Geol. Soc., Guidebook 28th field conf., p. 93-98, 3 tables, 2 figs.

Briefly describes the Precambrian rocks of the Nacimiento Mountains, including metavolcanics (metaquartz-latite composition), tonalite, leucogranodiorite, quartz monzonite, muscovite-biotite granite, biotite granite, and leucogranite. Includes chemical analyses.

Area: Nacimiento Mountains, Sandoval and Rio Arriba Counties.

Woodward, L.A., Martinez, R., DuChene, H.R., Schumacher, O.L., and Reed, R.K., 1974, Precambrian rocks of the southern Sierra Nacimiento, New Mexico, in East-central New Mexico: New Mexico Geol. Soc., Guidebook 25th field conf., p. 95-99, 2 figs.

Briefly describes Precambrian quartz diorite gneiss, leuco-quartz monzonitic gneiss, biotite quartz monzonitic gneiss, muscovite-biotite quartz monzonitic gneiss, the Joaquin granite (fine- to medium-grained, slightly porphyritic), muscovite quartz monzonite and leucocratic dikes (aplite, pegmatite, and granite to quartz monzonite).

Area: Nacimiento Mountains, Sandoval and Rio Arriba Counties (San Pablo, Rancho del Chaparral, San Miguel Mountain, Gilman, San Ysidro, Holy Ghost Spring, and La Ventana quadrangles).

Woodward, L.A., and Ruetschilling, R.L., 1976, Geology of San Ysidro quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 37, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Precambrian granite and leucogranite. Mentions the occurrence of uranium in sediments within the mapped area.

Area: Nacimiento Mountains, Rio Arriba and Sandoval Counties.

Woodward, L.A., and Schumacher, O., 1973, Geologic map and sections of La Ventana quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 28, with text, scale 1:24,000

Geologic map showing the distribution with petrographic descriptions of Precambrian pegmatite, aplite, and granite. Mentions the occurrence of uranium in coal, shale, and sandstone within the mapped area.

Area: Nacimiento Mountains, Sandoval County.

Woodward, L.A., and Timm, R.S., 1979, Geology of Jarosa quadrangle, New Mexico: New Mexico Bureau Mines Mineral Resources, Geol. Map 47, with text, scale 1:24,000

Geologic map of the Jarosa 7 1/2-min quadrangle, Rio Arriba County. The area includes the Bandelier Tuff (rhyolite ash-flow tuff) and Precambrian muscovite-biotite granite.

Area: Jemez Mountains.

Woodward, L.A., see Gonzalez, R.A., 1972

Woodward, L.A., see Fulp, M.S., 1981

Woodward, T.M., 1973, Geology of the Lemitar Mountains, Socorro County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 73 p., 19 figs., scale 1:12,000

Describes Precambrian granite, pegmatite dikes, and Tertiary Spears, Hells Mesa, A.L. Peak, and Potato Canyon formations.

Area: Lemitar Mountains, Socorro County.

Wright, H.E., 1943, Cerro Colorado, an isolated non-basaltic volcano in central New Mexico: Am. Jour. Sci., v. 241, no. 1, p. 43-56, 2 tables, 5 figs., 1 pl.

Discusses the geology and petrology of quartz latite and trachyte. Includes major-element analyses. (Note: uranium mineralization has been found at Cerro Colorado volcano.)

Area: Bernalillo County.

Wright, L.A., 1948, The Globe pegmatite, Rio Arriba County, New Mexico: Am. Jour. Sci., v. 246, no. 11, p. 665-688, 5 figs., 2 pls.

Describes the zoned Globe pegmatite which consists of albite, quartz, muscovite, fluorite, beryl, microcline, and minor quantities of columbite, monazite, samarskite, and sulfide minerals. Includes a geologic map of the pegmatite (scale 1 inch = 50 ft)

Area: Tusas Mountains, Rio Arriba County.

Wright, R.J., see Kerr, P.F., Kulp, J.L., and Patterson, C.M., 1950

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

Geologic map showing the distribution of rhyolite, andesite, dacite, and quartz latite.

Area: Peloncillo Mountains, Hidalgo County.

Wrucke, C.T., see Bromfield, C.S., 1961

Wyant, D.O., see Harder, J.O., 1944

Wyman, W.F., 1980, Precambrian geology of the Cow Creek ultramafic complex, San Miguel County, New Mexico: M.S. thesis, New Mexico Inst. Mining and Tech., 125 p., 6 tables, 47 figs., 2 pls., scale 1:6000

Describes the geology, geochemistry, and mineralization potential of the Precambrian ultramafic complex at Cow Creek. Six mineralogically and texturally distinct granitic rocks intrude the ultramafic complex including a tonalite-trondhjemite, diorite and quartz diorite, foliated granite, foliated quartz monzonite, and unfoliated granite. Potassic and sodic metasomatism is associated with the intrusion of the foliated quartz monzonite. Includes chemical analyses of the ultramafic and granitic rocks, thin-section descriptions, sample-location maps, and two geologic maps.

Area: Sangre de Cristo Mountains, San Miguel County.

Wynn, J.C., 1978, Parallel-surface-continued aeromagnetic map of the San Lorenzo and Hillsboro quadrangles, Grant and Sierra Counties, New Mexico: U.S. Geol. Survey, Misc. Field Studies Map MF-900L, scale 1:48,000

This aeromagnetic map uses a geologic map of the Hillsboro and San Lorenzo quadrangles as a base map. Various volcanic and intrusive rocks and Precambrian hornblendic and granitic rocks are mapped in this area.

Area: Black Range, Grant and Sierra Counties.

Wynn, J.C., 1981, Complete bouquer gravity anomaly map of the Silver City 1 x 2 degree quadrangle, New Mexico-Arizona: U.S. Geol. Survey, Misc. Inv. Series I-1310A, scale 1:250,000

This bouquer gravity anomaly map of the Silver City quadrangle uses a geologic map as a base map. Various Precambrian and Tertiary volcanic and intrusive rocks are mapped.

Area: Burro, Pyramid, and Victorio Mountains and Mogollon-Datil volcanic provence, Grant, Luna, and Hidalgo Counties.

Zapp, A.D., 1941, Geology of the northeastern Cornudas Mountains, New Mexico: M.S. thesis, Univ. Texas (El Paso), 63 p., 17 figs., 1 pl., scale 1 inch = 200 ft

Describes the geology of the northeastern Cornudas Mountains, including Cornudas and Wind Mountains. Includes detailed petrographic descriptions, including soda syenite, analcite-soda trachyte, analcite-nepheline syenite, eudialyte-nepheline syenite aplite, analcite-chalcedony-limonite-siderite veins.

Area: Cornudas Mountains, Otero County.

Zeller, R.A., Jr., 1958a, Reconnaissance geologic map of Playas 15-min quadrangle, Hidalgo and Grant Counties: New Mexico Bureau Mines Mineral Resources, Geol. Map 7, scale 1:62,500

Geologic map showing the distribution of Precambrian granite, Cretaceous andesite, monzonite porphyry, quartz monzonite porphyry, and Tertiary quartz latite and rhyolite.

Area: Animas and Hatchet Mountains, Hidalgo County.

Zeller, R.A., Jr., 1958b, Reconnaissance geologic map of Dog Mountains quadrangle, Hidalgo County: New Mexico Bureau Mines Mineral Resources, Geol. Map 8, scale 1:62,500

Geologic map showing the distribution of Tertiary andesite, quartz latite, and rhyolite.

Area: Hatchet Mountains area, Hidalgo County.

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

Geologic map showing the distribution of Tertiary latite, felsite, and monzonite in the area southwest of Deming.

Area: Animas Mountains, Hidalgo County.

Zeller, R.A., Jr., 1970, Geology of the Little Hatchet Mountains, Hidalgo and Grant Counties, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 96, 23 p., 2 pls., scale 1:31,650

Describes Sylvanite intrusive complex (diorite and monzonite) and Old Hachita stock (monzonite). Includes geologic map.

Area: Hatchet Mountains area, Hidalgo County (Hachita and Playas quadrangles).

Zeller, R.A., Jr., 1975, Structural geology of Big Hatchet Peak quadrangle, Hidalgo County, New Mexico: New Mexico Bureau Mines Mineral Resources, Circ. 146, 23 p., 3 figs., 2 sheets, scale 1:48,000

Includes brief description of mapped units. Mapped units include quartz latite, andesite, latite dikes and sills, and Precambrian granite.

Area: Hatchet Mountains area, Hidalgo County.

Zeller, R.A., Jr., and Alper, A.M., 1965, Geology of the Walnut Wells quadrangle, Hidalgo County, New Mexico: New Mexico Bureau Mines Mineral Resources, Bull. 84, 105 p., 15 tables, 13 figs., 2 pls., scale 1:48,000

Discusses the geology, petrology, and chemistry of Walnut Wells quadrangle. Includes descriptions of quartz monzonite, monzonite, andesite, latite, and quartz latite. Describes the occurrence of fluorite mineralization. Includes chemical and modal analyses. Mentions the occurrence of zircons.

Area: Animas Mountains, Hidalgo County.

Zetterlund, D., see Walton, A.W., and Salter, T.L., 1980a,b

Zielinski, R.A., 1978, Uranium abundances and distribution in associated glassy and crystalline rhyolites of the western United States: Geol. Soc. America, Bull., v. 89, p. 409-414, 1 table, 2 figs.

Includes uranium analyses in calc-alkaline rocks of the San Juan Mountains (obsidian 8.3 ppm U, perlite 8.3 ppm U, felsite 8.6 ppm U) and Grants Ridge, Mount Taylor (obsidian 8.2 ppm U, perlite 7.7 ppm U, felsite 7.6 ppm U).

Area: San Juan Mountains, Colorado and Mount Taylor, Cibola County.

Zilinski, R.E., see Woodward, L.A., and Callender, J.F., 1975

Subject Index

This index is organized into the following major categories; counties, fluorspar deposits and occurrences, geochemical analyses, geologic maps, radioactive occurrences. Some of these categories include subheadings. The most extensive listing is by county. Indexing by mountain ranges or areas can be found after each summary in Section II.

COUNTIES

Classifies articles by county. Articles pertaining to regional studies or statewide areas are listed under the first subheading--Statewide or Regional.

Gaskill, Eaton, Peterson, Stotelmeyer, and Meeves (1979); Ratte, Landis, and Gaskill (1969); Ratte, Landis, Gaskill, and Raabe (1967); Rhodes (1970, 1976a,b); Rhodes and Smith (1976); Smith, E.I. (1976); Stearns (1962); Sur (1947); Weber and Willard (1959a,b); White and Foster (1981); Willard (1957a,b, 1959); Willard and Givens (1958); Willard and Stearns (1971); Willard, Weber, and Kuellmer (1961)

CIBOLA

Allison (1954); Anderson, R.Y. (1961); Baker and Ridley (1970); Baumgardner (1954); Brookins (1978); Brookins and Della Valle (1977); Brookins and Rautman (1978); Brown, W.T., Jr. (1969); Chapman, Wood and Griswold, Inc. (1977); Chenoweth (1957); Crumpler (1977); Fitzsimmons (1961, 1967); Goddard (1945, 1966); Gott and Erickson (1952); Green and others (1980b); Hilpert (1969); Hilpert and Corey (1955); Hunt (1930); Jicha (1958); Kalliokiski, Langford, and Ojakangas (1978); Kerr and Wilcox (1963); Langford (1980); Lipman, Pallister, and Sargent (1979); Maxwell (1976); McAnulty (1978); Santos (1966); Smith, C.T., and others (1958a,b); Thaden, Santos, and Raup (1967); Towle and Rapaport (1952); Zielinski (1978)

COLFAX (including parts of Union)

Callender, Robertson, and Brookins (1976); Cannon and Ragland (1977); Clark and Read (1972); Collins, R.F. (1949); Collins, R.F. and Stobbe (1942); Goodknight (1973); Griggs (1948, 1953); Holser (1959b); Jones, L.M., Walker and Stormer (1974); Kudo (1976); Lipman (1969); Lipman, Bunker, and Bush (1973); Misagi (1968); Northrop (1966); Pillmore (1970); Raup (1953); Reid, Griswold, Jacobsen, and Lessard (1980b); Robertson (1976); Staatz (1974); Stobbe (1949a,b, 1950); Stormer (1972a,b); Stormer and Carmichael (1970); Tschanz (1958); Wanek (1963); Wood, Northrop, and Griggs (1953)

DONA ANA

Anderson, E.C. (1954, 1955, 1957); Anonymous (1955); Bachman and Myers (1963, 1969); Boyd and Wolfe (1953); Clemons (1976a,b, 1977, 1979); Dane and Bachman (1961); Denison and Hetherington (1969); Dunham (1935); Glover (1975a,b); Harbour (1960, 1972); Jahns, Kottlowski, and Kuellmer (1955); Kottlowski (1955, 1961); Kottlowski, Flower, Thompson, and Foster (1956); Kramer (1970); Nelson (1974); Seager (1973, 1981); Seager and Brown (1978); Seager and Clemons (1975); Seager, Clemons, and Hawley (1975); Seager, Hawley, and Clemons (1971); Seager, Kottlowski, and Hawley (1976); Sur (1946)

GRANT

Adams, Arengi, and Parrish (1980); Aldrich, M.J., Jr. (1976); Allison and Ove (1957); Anderson, E.C. (1954); Anderson, O.J. (1980); Ballmann (1960); Bastin (1939); Bauer (1950, 1951); Belt (1960); Biggerstaff (1974); Birsoy (1977); Bornhorst, Erb and Elston (1976); Bromfield and Wrucke (1961); Chenoweth (1976); Condie (1978); Cunningham (1974); Dale and McKinney (1960); Dane and Bachman (1961); Davis and Guilbert (1973); Dyer (1953); Elston (1955, 1957, 1960, 1964, 1970); Elston, Rhodes, and Erb (1976); Ericksen and Wedow (1976); Ericksen, Wedow, Eaton, and Leland (1970); Everhart (1956, 1957); Ferris and Ruud (1971); Finnell (1976a,b); Fodor (1975, 1976); Foran and Perhac (1954); Giles (1965); Gillerman (1952a-c,

1953a,b, 1964, 1967, 1968, 1970); Gillerman and Granger (1952); Gillerman, Swinney, Whitebread, Crowley, and Kleinhampl (1954); Gillerman and Whitebread (1954, 1956); Graft and Kerr (1950); Granger (1950); Granger and Bauer (1950a,b, 1951a,b, 1952); Granger, Bauer, Lovering, and Gillerman (1952); Griffitts and Nakagawa (1960); Griggs and Wagner (1966); Handley (1945); Harder and Wyant (1944); Hedlund (1975a,b, 1977, 1978a-j, 1980a-c); Hernon and Jones (1968); Hernon, Jones, and Moore 1953, 1964); Hewitt (1957, 1959); Holser (1959b); Jicha (1954a); Jones, W.R., Hernon, and Moore (1967); Jones, W.R., Hernon, and Pratt (1961); Jones, W.R., Moore, and Pratt (1970); Kalliokski, Langford, and Ojakangas (1978); Keith (1944, 1945); Kelley, V.C., and Branson (1947); Kerr, Kulp, Patterson, and Wright (1950); Kolessar (1970); Krieger (1935); Kuellmer (1954, 1956); Langford (1980); Lasky (1930, 1936a, 1940a,b, 1947); Leach, A.A. (1916); Leach, F.I. (1920); Lovering (1956); Lufkin (1972); McKelvey (1955); Morris (1974); Morrison (1965); O'Neill and Thiede (1981); O'Sullivan (1953); Paige, S. (1908); Park C.F., Jr., and MacDiarmid (1975); Powers (1976); Ratte, Eaton, Gaskill, and Peterson (1974); Ratte and Gaskill (1975); Ratte, Gaskill, Eaton, Peterson, Stotelmeyer, and Meeves (1979); Raup (1953); Rhodes (1970, 1976a); Spencer and Paige (1935); Staatz (1974); Thorman (1977); Van Alstine (1976); Weber and Willard (1959a); White and Foster (1981); Willard, Weber, and Kuellmer (1961); Woodward, L.A. (1970a); Zeller (1958a, 1970)

HIDALGO

Adams, Arengi, and Parrish (1980); Allison and Ove (1957); Alminas, Watts, Griffitts, Siems, Kraxberger, and Curry (1975); Alper and Poldervaat (1957); Belt (1960); Boyd and Wolfe (1953); Cargo (1959); Carten, Silberman, Armstrong, and Elston (1974); Dale and McKinney (1960); Dane and Bachman (1961); Deal, Elston, Erb, Peterson, Reiter, Damon, and Shafiqullah (1978); Drewes and Thorman (1980); Elston (1960, 1964, 1970, 1974); Elston, Damon, Coney, Rhodes, Smith, and Bikerman (1973); Elston and Erb (1977, 1979); Elston, Erb, and Deal (1975); Elston, Rhodes, and Erb (1975); Everhart (1956, 1957); Fledge (1959); Gillerman (1958); Jahns, Kottlowski, and Kuellmer (1955); Lasky (1935, 1936b, 1938, 1940a,b, 1947); May, Smith, Dickson, and Nystrom (1981); Morrison (1965); Peterson (1976); Reiter (1980); Seager (1973); Soule, J.M. (1972); Strongen (1957); Thorman (1977); Thorman and Drewes (1978); Van der Spuy (1970); Walton, Salter, and Zetterlund (1980a,b); Williams, S.A. (1978); Woodward, L.A. (1970a); Wrucke and Bromfield (1961); Zeller (1958a,b, 1962, 1970, 1975); Zeller and Alper (1965)

LINCOLN

Anderson, E.C., (1954, 1957); Black, K.D. (1977); Collins, G.E. (1956); Collins G.E. and Mallory (1954); Dale and McKinney (1960); Denison and Hetherington (1969); Elston and Snider (1964); Giles and Thompson (1972); Glass and Smalley (1945); Griswold (1959); Griswold and Missaghi (1964); Holser (1959b); Kelley, F.J. (1962); Kelley, V.C. (1971); Moore (1965); Patton (1951); Perhac (1970); Perhac and Heinrich (1963, 1964); Poe (1965); Ryberg (1968); Schnake (1977); Segerstrom and Ryberg

(1974); Segerstrom, Stotelmeyer, Williams, and Cordell (1975, 1979); Sidwell (1946); Smith, C.T., and others (1964); Soule, J.H. (1946a, 1947, 1948); Staatz (1974); Thompson, T.B. (1964, 1968, 1972, 1973); Twenhofel and Brick (1956); Walker and Osterwald (1956); Willard and Jahns (1974)

LOS ALAMOS (see Sandoval)

LUNA

Balk (1962); Bromfield and Wrucke (1961); Brookins (1978); Brookins, Rautman, and Corbitt (1978); Clemons (1979); Corbitt (1971); Dane and Bachman (1961); Darton and Burchard (1911); Elston (1955, 1957, 1970); Elston, Damon, Coney, Rhodes, Smith, and Bikerman (1973); Griswold (1961); Holser (1953); Homme and Rosenzweig (1970); Jicha (1954a); Kuellmer (1956); Lindgren (1908); May, Smith, Dickson, and Nystrom (1981); O'Neill and Thiede (1981); Russell (1947); Thorman and Drewes (1979); Woodward, L.A. (1970a)

MCKINLEY

Allen, J.E. (1955); Brookins (1978); Brookins and Rautman (1978); Chapman, Wood, and Griswold, Inc. (1977); Crumpler (1976, 1977); Fitzsimmons (1967); Hilpert (1969); Hilpert and Corey (1955); Santos (1966); Smith, C.T., and others (1958b)

MORA

Adams, Arengi, and Parrish (1980); Aldrich, L.T., Wetherill, Davis, and Tilton (1958); Budding and Cepeda (1979); Callender, Robertson, and Brookins (1976); Cepeda (1972); Everett, F.I. (1953); Harley (1940); Henrich and Levinson (1953); Jahns (1953); Kudo (1976); Overstreet (1967); Paige, L.R. (1950); Reid, Griswold, Jacobsen, and Lessard (1980a,b); U.S. Geological Survey and others (1980)

OTERO

Asquith (1973a,b, 1974); Barker, D.S., and Long (1974); Bloom (1975); Clabaugh (1941, 1950); Collins, G.E. (1958); Denison and Hetherington (1969); Edwards (1975); Giles and Thompson (1972); Holser (1959a); Kalliokski, Langford, and Ojakangas (1978); Kelley, V.C., (1968, 1971); Malan (1972); Meeves (1966); Motts and Gaal (1960); Pray (1961); Schmidt and Craddock (1964); Thompson, T.B. (1972); Timm (1941); Zapp (1941)

RIO ARRIBA

Adams, Arengi, and Parrish (1980); Apsouri (1944); Barker, F., (1958, 1970); Barker, F., Arth, and Peterman (1973); Barker, F., Arth, Peterman, and Friedman (1976); Barker, F., and Friedman (1976); Benjovsky (1945); Bingler (1968, 1974); Brookins (1974); Butler (1939); Chenoweth (1974a,b, 1976); Collins, G.E. and Freeland (1956); Dane (1948); Doney (1968); Everhart (1956, 1957); Gibson (1981); Green and others (1980a); Gresens (1967, 1971, 1975); Gresens and Stensrud (1974a,b); Henrich and Levinson (1953); Hess and Wells (1930); Hilpert (1969); Holser (1959b); Hutchinson (1968); Jahns (1946); Just (1937); Kalliokoski, Langford, and Ojakangas (1978); Larsen, E.S., Jr., Phair, Gottfried, and Smith (1956); Lipman (1969); Lipman, Bunker, and Bush (1973); Long (1972); Malan (1972); McLeroy (1972); McWhorter (1977); Miller, Montgomery, and Sutherland (1963); Montgomery (1953); Muehlberger (1960, 1967, 1968); Muench (1938); Overstreet (1967); Park and

MacDiarmid (1975); Redman (1961); Santos, Hall, and Weisner (1975); Smith, H.T.U. (1939); Smith, R.L., Bailey, and Ross (1970); Treiman (1977); U.S. Geological Survey and others (1980); Vizcaino, O'Neill, and Dotterer (1978); Wenrich-Verbeek (1977); Wenrich-Verbeek and Suits (1979a,b); Wobus and Dobson (1981); Wood and Northrop (1946); Woodward, L.A., Anderson, Kaufman, and Reed (1973); Woodward, L.A., Gibson, and McLelland (1976); Woodward, L.A., Kaufman, and Reed (1973); Woodward, L.A., McLelland, Anderson, and Kaufman (1972); Woodward, L.A., McLelland, and Kaufman (1974); Woodward, L.A., McLelland, and Husler (1977); Woodward, L.A., and Timm (1979); Wright, L.A. (1948)

SANDOVAL (including parts of Los Alamos)

Aldrich, L.T., Wetherill, Davis, and Tilton (1958); Anderson, R.Y. (1961); Bailey, Smith, and Ross (1969); Bolton (1976); Brookins (1974); Brookins and Della Valle (1977); Brown (1969); Bundy (1958); Chapman, Wood, and Griswold, Inc. (1977); Chenoweth (1974b, 1975); Elston (1961, 1967); Fullagar and Shriver (1973); Gresens and Stensrud (1974b); Kaufman (1971); Kelley and Northrop (1975); Kudo (1974); Lambert (1961); Laughlin and Eddy (1977); Northrop (1961); Perkins (1973); Ross, Smith, and Bailey (1961); Santos, Hall, and Weisner (1975); Schumaker (1972); Smith, R.L. and Bailey (1968); Smith, R.L. Bailey, and Ross (1970); Vizcaino, O'Neill, and Dotterer (1978); Wood and Northrop (1946); Woodward, L.A., Anderson, Kaufman, and Reed (1973); Woodward, L.A., DuChene, and Martinez (1977); Woodward, L.A., DuChene, and Reed (1974); Woodward, L.A., Kaufman, and Reed (1973); Woodward, L.A., McLelland, Anderson, and Kaufman (1972); Woodward, L.A., Martinez, DuChene, Schumacher, and Reed (1974); Woodward, L.A., and Ruetschilling (1976); Woodward, L.A., and Schumacher (1973)

SAN JUAN

Allen, J.E. (1955); Fitzsimmons (1973); Hilpert (1969); Larsen, E.S., Irving, Gonyer, and Larsen (1936); Nishimori, Ragland, Rogers, and Greenburg (1977); Shoemaker, E.M. (1956); Strobell (1956)

SAN MIGUEL

Adams, Arengi, and Parrish (1980); Anderson, E.C. (1954); Baltz (1972); Callender, Robertson, and Brookins (1976); Harley (1940); Jahns (1946); Johnson, R.B. (1970); Krieger (1932); Miller, Montgomery, and Sutherland (1963); Overstreet (1967); Register and Brookins (1979); Reid, Griswold, Jacobsen, and Lessard (1980a); Riesmeyer (1978); Robertson (1976); U.S. Geological Survey and others (1980)

SANTA FE

Akright (1979); Anderson, E.C. (1954); Anderson, R.Y. (1961); Atkinson (1961); Brookins (1974); Budding (1968, 1972); Chenoweth (1979); Collins, G.E. and Freeland (1956); Disbrow and Stoll (1957); Elston (1961, 1967); Fullagar and Shiver (1973); Green and others (1980a); Gresens and Stensrud (1974b); Haji-Vassiliou and Kerr (1972); Kottlowski (1952); Long, L.E. (1972); Lustig (1958); McWhorter (1977); Miller, Montgomery, and Sutherland (1963); Montgomery (1950, 1951); Nielson and Scholtz (1979); Northrop (1961); Overstreet (1967); Register and Brookins (1979); Reid, Griswold, Jacobsen, and Lessard (1980a); Riesmeyer (1978); Smith, R.L., Bailey, and Ross

(1970); Stearns (1953); Sun and Baldwin (1958); Thompson, T.B. (1965); U.S. Geological Survey and others (1980); Wargo (1964)

SIERRA

Alminas, Watts, Griffitts, Siems, Kraxberger, and Curry (1975); Anderson, E.C. (1954, 1955); Anderson, O.J. (1980); Anonymous (1955); Bachman and Harbour (1970); Bassett (1954, 1955); Bornhorst, Erb, and Elston (1976); Boyd (1955); Boyd and Wolfe (1953); Clemons (1979); Correa (1980); Dale and McKinney (1960); Dane and Bachman (1961); Doyle (1951); Elston (1955, 1957); Elston, Damon, Coney, Rhodes, Smith, and Bikerman (1973); Ericksen and Wedow (1976); Ericksen, Wedow, Eaton, and Leland (1970); Everhart (1956, 1957); Ferris and Ruud (1971); Fishback (1910); Fodor (1975, 1976); Fries (1940); Fries, Schaller, and Glass (1942); Griffitts and Alminas (1968); Griffitts and Nakagawa (1960); Harley (1934); Hedlund (1975a,b, 1977); Hillard (1969); Holser (1959b); Huskinson (1975); Jacobs (1956); Jahns (1944, 1955); Jahns, Kottlowski, and Kuellmer (1955); Jahns, McMillan, O'Brient, and Fisher (1978); Jicha (1954a,b); Kelley, V.C. and Silver (1952); Kottlowski (1955); Kottlowski, Flower, Thompson, and Foster (1956); Kuellmer (1954-1956); Lamarre, Perry, and Jonson (1974); Lufkin (1972); Maldonado (1974); Mason (1976); McAnulty (1978); McCleary (1960); Meeves (1966); Melancon (1952); Nelson (1975); Raup (1953); Seager (1973a); Silver (1955); Staatz, Adams, and Conklin (1965); Storms (1947a,b); Templain and Dotterer (1978); Thompson, S. III (1955a,b); Van Alstine (1976); Williams, F.E. (1966); Wolfe (1953);

SOCORRO

Anderson, E.C. (1954, 1955); Allen, P., (1979); Anonymous (1955); Anonymous (1959); Arendt (1971); Bachman (1965); Bachman and Harbour (1970); Beers (1976); Belt (1960); Birsoy (1977); Black, B.A. (1964); Blakestad (1977); Bonnichsen (1962); Bornhorst, Erb, and Elston (1976); Bowring (1980); Brookins and Della Valle (1977); Brown, D.M. (1972); Budding and Condie (1975); Chamberlin (1974, 1980, 1981); Chapin (1971); Chapin, Chamberlin, Osburn, White, and Sanford (1978); Chenoweth (1976); Collins, G.E., and Mallory (1954); Collins, G.E., and Nye (1957); Collins, G.E., and Smith (1956); Condie (1976); Cookro (1978); Dane and Bachman (1961); Deal (1973); Deal and Rhodes (1976); Donze (1980); Duschattio and Poldervaart (1955); Elston (1976); Elston, Damon, Coney, Rhodes, Smith, and Bikerman (1973); Everhart (1957); Furlow (1965); Givens (1957); Gott and Erickson (1952); Griffitts and Alminas (1968); Griggs (1953); Haederle (1966); Herber (1963a,b); Hillard (1969); Hilpert (1969); Jahns (1944, 1955); Jahns, McMillan, O'Brient, and Fisher (1978); Jicha (1958); Johnson, J.T. (1955); Keith (1944); Kelley, V.C. (1977); Kottlowski (1953, 1955); Kottlowski and Steensma (1979); Krewedl (1974); Laroche (1980); Lasky (1932); Loughlin and Loschmann (1942); Machette (1978); Maldonado (1974); Mallon (1966); Massingill (1979); Mayerson (1979); McCleary (1960); McLemore (1980a,b, 1982); Meeves (1966); Muehlberger and Denison (1964); Myers (1977); Osburn (1978); Osburn, Petty, and Chapin (1981); Park, D.E. (1971); Petty (1979); Pierson, Wenrich-Verbeek, Hannigan, and Machette (1980); Potter (1970);

Roth (1981); Simon (1973); Spradlin (1975); Stark and Dapples (1946); Sumner (1980); Titley (1959); Tonking (1957); Weber (1963); Weber and Bassett (1963); Wilkinson (1976); Willard (1957a); Willard and Givens (1958); Wilpolt and Wanek (1951); Woodward T.M. (1973)

TAOS

Aldrich, L.T., Wetherill, Davis, and Tilton (1958); Anderson, E.C. (1954); Berliner (1949); Brookins (1974); Brookins, Chakoumakos, Cook, Ewing, Landis, and Register (1979); Brookins, Eppler, and Elston (1977); Clark (1968); Clark and Read (1972); Condie (1980); Green and others (1980a); Harder and Wyant (1944); Henrich and Levinson (1953); Jahns and Ewing (1976, 1977); Kalish (1953); Long, P.E. (1974, 1976); McKinlay (1956, 1957); Miller, Montgomery, and Sutherland (1963); Montgomery (1950, 1951, 1953); Nielson and Scott (1979); Northrop (1966); Park and McKinlay (1943); Reid, Griswold, Jacobsen, and Lessard (1980b); Register and Brookins (1979); Schilling (1956, 1960); Soule, J.H. (1946b); U.S. Geological Survey and others (1980)

TORRANCE

Brookins and Della Valle (1977); Fallis (1958); Fitzsimmons (1967); Fulp and Woodward (1981); Gonzalez (1968); Gonzalez and Woodward (1972); Kelley, V.C. (1972); Loring and Armstrong (1980); Myers (1977); Myers and McKay (1971, 1972, 1974); Perhac (1970); Perhac and Heinrich (1963); Stark (1956); Woodward, L.A. (1969)

UNION (see Colfax)

VALENCIA

Hilpert (1969); Myers (1977); Myers and McKay (1970,1972, 1974); Reiche (1949); Stark (1956)

FLUORSPAR DEPOSITS AND OCCURRENCES

Classifies articles pertaining to fluorspar deposits or occurrences. Includes articles pertaining to the geology of fluorspar deposits.

Alminas, Watts, Griffitts, Siems, Kraxberger, and Curry (1975); Anderson, E.C. (1955, 1957); Anderson, O.J. (1980); Arendt (1971); Arnold (1974a,b); Ballmann (1960); Baumgardner (1954); Biggerstaff (1974); Bingler (1968); Birsoy (1977); Bonnichsen (1962); Boyd (1955); Cookro (1978); Darton and Burchard (1911); Doyle (1951); Elston (1957, 1964, 1974); Elston, Damon, Coney, Rhodes, Smith, and Bikerman (1973); Elston, Rhodes, and Erb (1975, 1976); Ferguson (1920); Fledge (1959); Fries, Schaller, and Glass (1942); Furlow (1965); Gillerman (1952a, 1953a, 1958 1970); Gillerman and Granger (1951); Glover (1975a,b); Goddard (1945, 1966); Gresens (1967); Griggs and Wagner (1966); Griswold (1959, 1961); Harley (1934); Hedlund (1978a,h,j, 1980 a-c); Huskinson (1975); Jahns and Ewing (1976); Jahns, Kottlowski, and Kuellmer (1955); Jicha (1954a); Jones, W.R., Hernon, and Moore (1967); Kelley, V.C., and Silver (1952); Kottlowski (1953, 1955); Kottlowski and Steensma (1979); Kramer (1970); Lambert (1961); Lasky (1936b); Lindgren, Graton, and

Gordon (1910); Mason (1976); McAnulty (1978); Morris (1974); Nelson (1975); O'Sullivan (1953); Perhac and Heinrich (1964); Powers (1976); Ratte, Eaton, Gaskill, and Peterson (1974); Ratte and Gaskill (1975); Reiche (1949); Rothrock (1946, 1970); Russell (1947); Seager (1973a,b, 1981); Seager and Brown (1978); Segerstrom, Stotelmeyer, Williams, and Cordell (1975); Soule, J.M. (1946a); Sur (1946, 1947); U.S. Geological Survey (1965); Van Alstine (1976); Willard and Jahns (1974); Williams, F.E. (1966); Zeller and Alper (1965)

GEOCHEMICAL ANALYSES

Classifies articles pertaining to the geochemistry of an area. Includes chemical analyses of igneous and/or metamorphic rocks.

Aldrich, L.T., Wetherill, Davis, and Tilton (1958); Alper and Poldervaart (1957); Asquith (1973b, 1974); Baker and Ridley (1970); Barker, F. (1958); Barker, F., Arth, and Peterman (1973); Barker, F., Arth, Peterman, and Friedman (1976); Barker, F., and Friedman (1974); Beers (1976); Bloom (1975); Bolton (1976); Bornhorst (1976); Brookins (1974); Brookins, Chakoumakos, Cook, Ewing, Landis, and Register (1979); Brookins and Rautman (1978); Brookins, Rautman, and Corbitt (1978); Brown, W.T., Jr. (1969); Bundy (1958); Cannon and Ragland (1977); Chapin, Chamberlin, Osburn, White, and Sanford (1978); Clark and Read (1972); Clemons (1976); Condie (1978); Condie and Budding (1979); Cookro (1978); Correa (1980); Deal (1973); Dunham (1935); Duschattio and Poldervaart (1955); Elston (1957); Elston, Coney, and Rhodes (1968); Elston, Rhodes, Coney, and Deal (1976); Enz (1974); Ericksen, Wedow, Eaton, and Leland (1970); Ferguson (1920); Fodor (1975, 1976); Giles and Thompson (1972); Graft and Kerr (1950); Green and others (1980a-c); Gresens (1967, 1971, 1975); Gresens and Stensrud (1974b); Griffitts and Alminas (1968); Griffitts and Nakagawa (1960); Griswold (1961); Hunt (1930); Jahns and Ewing (1976); Jicha (1954a); Jones, W.R., Hernon, and Moore (1967); Jones, L.M., Walker, and Stormer (1974); Kuellmer (1954); Lambert (1961); Larsen, E.S., Irving, Gonyer, and Larsen (1936); Lasky (1947); Laughlin and Eddy (1977); Lindgren, Graton, and Gordon (1910); Lipman, Bunker, and Bush (1973); Long, L.E. (1976); Lopez (1975); Loring and Armstrong (1980); Misagi (1968); Montgomery (1953); Moore (1965); Park, D.E. (1971); Pyron (in preparation); Ratte and Grotbo (1979); Ratte, Landis, Gaskill, and Raabe (1967); Register and Brookins (1979); Rhodes (1976a,b); Rhodes and Smith (1976); Schnake (1977); Seager and Clemons (1975); Seager, Kottlowski, and Hawley (1976); Segerstrom and Ryberg (1974); Segerstrom, Stotelmeyer, Williams, and Cordell (1975); Smith, C.T., and others (1964); Smith, E.I. (1976); Soule, J.H. (1946a); Stobbe (1949b); Stormer (1972a,b); Sur (1946, 1947); Thomann (in preparation); Thompson, T.B. (1968, 1972); Thompson and Giles (1974); Thorman (1977); U.S. Geological Survey and others (1980); Van der Spuy (1970); Woodward, L.A., McLelland, and Husler (1977); Wright, H.E. (1943); Zeller and Alper (1965)

GEOLOGIC MAPS

Lists all geologic maps and references containing geologic maps.

Akright (1979); Allen, J.E. (1955); Allen, P. (1979); Allison (1954); Apsouri (1944); Arendt (1971); Atkinson (1961); Bachman (1965); Bachman and Harbour (1970); Bachman and Myers (1963, 1969); Balk (1962); Ballman (1960); Baltz (1972); Bauer (1950a); Barker, F. (1958); Beers (1976); Benjovsky (1945); Berry, Nagy, Spreng, Barnes, and Smouse (1980); Biggerstaff (1974); Bingler (1968); Black, B.A. (1964); Blakestad (1977); Bloom (1975); Bolton (1976); Bornhorst (1976); Bornhorst, Erb, and Elston (1976); Bowring (1980); Bromfield and Wrucke (1961); Brown, D.M. (1972); Budding (1972); Bundy (1958); Butler (1939); Cepeda (1972); Chamberlin (1974, 1980); Chapman, Wood, and Griswold, Inc. (1977); Clabaugh (1941); Clark and Read (1972); Clemons (1976, 1977, 1979); Collins, G.E., (1957); Condie (1980, 1981); Condie and Budding (1979); Corbitt (1971); Cunningham (1974); Dane (1948); Dane and Bachman (1961); Deal (1973); Doney (1968); Donze (1980); Doyle (1951); Dunham (1935); Elston (1957, 1960); Fallis (1958); Feinberg (1969); Ferguson (1920, 1927); Finnell (1967a,b); Fledge (1959); Foster and Stipp (1961); Fries (1940); Gibson (1981); Gillerman (1952a, 1958, 1964, 1967); Gillerman, Swinney, Whitebread, Crowley, and Kleinhampl (1954); Gillerman and Whitebread (1954); Givens (1957); Glover (1975a); Goddard (1966); Gonzales (1968); Goodknight (1973); Granger and Bauer (1951a); Griggs (1948); Griggs and Wagner (1966); Griswold (1959, 1961); Griswold and Missaghi (1964); Haederle (1966); Harbour (1972); Harley (1934, 1940); Hedlund (1975a,b, 1977, 1978a-j, 1980a-c); Hernon, Jones, and Moore (1964); Hewitt (1957, 1959); Hillard (1969); Holser (1959a); Hutchinson (1968); Hunt (1938); Jacobs (1956); Jahns (1955); Jahns and Ewing (1976); Jicha (1954a); Johnson, J.T., (1955); Johnson, R.B. (1970); Jones, W.R., Hernon, and Moore (1967); Jones, W.R., Moore, and Pratt (1970); Kaufman (1971); Kelley, V.C. (1971, 1972, 1977); Kelley, V.C., and Northrop (1975); Kelley, V.C., and Silver (1952); Kent (1980); Kottlowski (1961); Krewedl (1974); Kuellmer (1954, 1956); Lambert (1961); Laroche (1980); Lasky (1947); Lipman, Pallister, and Sargent (1979); Long, P.E. (1976); Lopez and Koschmann (1942); Lufkin (1972); Machette (1978a,b); Mallon (1966); Mason (1976); Massingill (1979); Maxwell (1976); Mayerson (1979); McCleary (1960); McKinlay (1956, 1957); McLemore (1980a, 1982); Miller, Montgomery, and Sutherland (1963); Misagi (1968); Montgomery (1950, 1953); Moore (1965); Morrison (1965); Muehlberger (1967, 1968); Myers (1977); Myers and McKay (1970-1972, 1974, 1976); Northrop and Hill (1961); Osburn (1978); Osburn, Petty, and Chapin (1981); Perhac (1970); Peterson (1976); Petty (1979); Pillmore (1970); Potter (1970); Powers (1976); Pray (1961); Ratte and Gaskill (1975); Raup (1953); Roth (1981); Santos (1966); Santos, Hall, and Weisner (1975); Schilling (1956); Schmidt and Craddock (1964); Schnake (1977); Schumaker

(1972); Seager (1973, 1981); Seager and Clemons (1975); Seager, Clemons, and Hawley (1975); Seager, Hawley, and Clemons (1971); Seager, Kottlowski, and Hawley (1976); Segerstrom, Stotelmeyer, Williams, and Cordell (1975); Simon (1973); Smith, C.T., and others (1958a,b); Smith, E.I. (1976); Soule, J.H. (1946a); Soule, J.M. (1972); Spencer and Paige (1935); Spradlin (1975); Stark (1956); Stark and Dapples (1946); Stearns (1953, 1962); Strobell (1956); Strongin (1957); Sumner (1980); Sun and Baldwin (1958); Thaden, Santos, and Raup (1967); Thompson, T.B. (1973); Thorman (1977); Thorman and Drewes (1978, 1979); Timm (1941); Tonking (1957); Treiman (1977); U.S. Geological Survey and others (1980); Van der Spuy (1970); Wanek (1963); Weber and Willard (1959a,b); Willard (1957a,b); Willard and Givens (1958); Willard and Stearns (1971); Willard, Weber, and Kuellmer (1961); Wilpolt and Wanek (1951); Wood and Northrop (1946); Wood, Northrop, and Griggs (1953); Woodward, T.M. (1973); Woodward, L.A., Callender, and Zilinski (1975); Woodward, L.A., DuChene, and Martinez (1977); Woodward, L.A., DuChene, and Reed (1974); Woodward, L.A., Gibson, and McLelland (1976); Woodward, L.A., Kaufman, and Reed (1973); Woodward, L.A., McLelland, Anderson, and Kaufman (1972); Woodward, L.A., McLelland, and Kaufman (1974); Woodward, L.A., and Ruetschilling (1976); Woodward, L.A., and Schumacher (1973); Woodward, L.A., and Timm (1979); Wrucke and Bromfield (1961); Wyman (1981); Wynn (1981); Zapp (1941); Zeller (1958a,b, 1962, 1970, 1975); Zeller and Alper (1965)

RADIOACTIVE OCCURRENCES

Classifies articles pertaining to uranium and thorium occurrences and deposits. Includes reconnaissance reports on radioactive deposits. Articles describing the geology of radioactive deposits are included. Includes references pertaining to chemical and radiometric uranium and thorium analyses.

BASTNAESITE OCCURRENCES IN THE LINCOLN COUNTY PORPHYRY BELT

Griswold (1959); Glass and Smalley (1945); Kelley, F.J. (1962); Perhac (1970); Perhac and Heinrich (1963, 1964); Walker and Osterwald (1956)

URANIUM DEPOSITS IN THE BURRO MOUNTAINS

Adams, Arengi, and Parrish (1980); Anderson, O.J. (1980); Bastin (1939); Bauer (1950a, 1951); Dyer (1953); Gillerman (1952b,c, 1953a,b, 1964, 1967, 1968); Gillerman and Granger (1951); Gillerman, Swinney, Whitebread, Crowley, and Kleinhampl (1954); Gillerman and Whitebread (1954, 1956); Granger (1950); Granger and Bauer (1950a, 1951a,b, 1952); Granger, Bauer, Lovering, and Gillerman (1952); Griggs (1953); Handley (1945); Hedlund (1978a,h-j, 1980b); Hewitt (1957, 1959); Leach, F.I. (1920); McKelvey (1955)

RADIOACTIVE OCCURRENCES

Adams, Arengi, and Parrish (1980); Aldrich, Wetherill, Davis, and Tilton (1958); Allen, J.E. (1955); Allison and Ove (1957); Anderson, E.C. (1954, 1955, 1957); Anderson, O.J. (1980); Anonymous (1959); Apsouri (1944); Bassett (1954, 1955); Bauer

(1950a); Baumgardner (1954); Berliner (1949); Berry, Nagy, Spreng, Barnes, and Smouse (1980); Birsoy (1977); Black, B.A. (1964); Black, K.D. (1977); Boyd (1955); Boyd and Wolfe (1953); Brookins (1978); Brookins and Della Valle (1977); Brookins and Rautman (1978); Brookins, Rautman, and Corbitt (1978); Chenoweth (1957, 1974a,b, 1975, 1976, 1979); Collins, G.E. (1956-1958); Collins, G.E., and Freeland (1956); Collins, G.E., and Mallory (1954); Collins, G.E., and Nye (1957); Collins, G.E., and Smith (1956); Condie (1976); Davis and Guilbert (1973); Edwards (1975); Elevatorski (1979); Elston (1960, 1961, 1965, 1970, 1978); Elston, Erb, and Deal (1979); Everhart (1956, 1957); Ferris and Ruud (1971); Gott and Erickson (1952); Granger and Bauer (1950b); Green and others (1980a-c); Haji-Vassiliou and Kerr (1972); Harder and Wyant (1944); Hedlund (1977, 1980a); Hess and Wells (1930); Hilpert (1969); Hilpert and Corey (1955); Jahns (1946, 1955); Jahns and Ewing (1976); Johnson, J.T. (1955); Just (1937); Kalliokoski, Langford, and Ojakangas (1978); Keith (1944, 1945); Kolessar (1970); Larsen, E.S., Phair, Gottfried, and Smith (1956); Lipman (1969); Lovering (1956); Lustig (1958); Malan (1972); Malan and Sterling (1969); Marjaniemi and Basler (1972); Mason (1976); May, Smith, Dickson, and Nystrom (1981); McAnulty (1978); McLemore (1980a,b, 1982); McWhorter (1977); Melancon (1952); Muench (1938); Nishimori, Ragland, Rogers, and Greenburg (1977); Northrop (1944, 1961, 1966); Paige, L.R. (1950); Park, C.F., Jr., and MacDiarmid (1975); Pierson, Wenrich-Verbeek, Hannigan, and Machette (1980); Potter (1970); Rautman (1977); Reid, Griswold, Jacobsen, and Lessard (1980a,b); Santos, Hall, and Weisner (1975); Schumaker (1972); Seager (1973); Shoemaker, E.M. (1956); Silver (1955); Soule, J.H. (1946a); Staatz (1974); Staatz, Adams, and Conklin (1965); Sterling and Malan (1970); Templain and Dotterer (1978); Thaden, Santos, and Raup (1967); Towle and Rapaport (1952); Tschanz (1958); Twenofel and Brick (1956); U.S. Atomic Energy Commission (1970); U.S. Geological Survey (1965); U.S. Geological Survey and others (1980); Vizcaino, O'Neill, and Dotterer (1978); Walker and Osterwald (1963); Walton, Salter, and Zetterlund (1980); White and Foster (1981); Wolfe (1953); Woodward, L.A., Anderson, Kaufman, and Reed (1973); Woodward, L.A., Gibson, and McLelland (1976); Woodward, L.A., and Ruetschilling (1976); Woodward, L.A., and Schumacher (1973); Zielinzki (1978)

Appendix I

Radioactive occurrences in veins and igneous and metamorphic rocks of New Mexico

Explanation of Headings

Map No.--The reference number refers to the location or approximate location shown on plate 1 (#1-#41, #90-#225, and #326-#343) or plate 2 (#42-#89 and #226-#327).

Name--The name of the occurrence or property as found in the literature. Aliases are in parentheses.

Location--The location of the occurrence is given by the section, township, and range (land-grid system) and by latitude and longitude. If there is any uncertainty with respect to the location, then the latitude and longitude are omitted.

Quadrangle--The name of the 7½- or 15-min U.S. Geological Survey topographic quadrangle map that the occurrence lies within.

Type--Type of occurrence refers to the classification scheme used by the Department of Energy (table 3, this report) and explained by Mickle (1978), Mickle and Mathews (1978), and Mathews and others (1979).

Development--Refers to any information regarding the development of the occurrence. For many occurrences, development information is not available. Production data and reserve data are included, if known.

Host rock, mineralization--Briefly describes the geology, host rock type, and uranium or other mineralization at the occurrence locality. Includes any additional information such as identified uranium or thorium minerals, radiometric surveys or chemical analyses. Some of the chemical analyses were provided by the New Mexico Bureau of Mines and Mineral Resources Chem Lab, Lynn Brandvold, analyst. These are referred to as New Mexico Bureau Chem Lab and date of analysis (month/day/year or month/year).

Source of Data--Author and date of pertinent references are given to permit cross reference to the annotated bibliography section. The U.S. Atomic Energy Commission Preliminary Reconnaissance Reports (PRR's) open-filed in 1966 are listed by report number and prefixed by USAEC PRR. Occurrences visited by the author are indicated by FN (field notes), and the date (month/date/year or month/year). Some of the citations end with a number prefixed by # (example: Hedlund, 1978, #5); this number refers to the occurrence identification number in the given cited reference. Other citations end with the page number the occurrence is discussed in the cited reference (example: Gillerman, 1964, p. 101). USAEC, 1970, refers to Preliminary Reconnaissance Reports in U.S. Atomic Energy Commission (1970).

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
	GREAT PLAINS						
	Colfax County [Chico Hills Area]						
1	Ace Construction	NE¼17T27NR25E 36°34'45"N 104°18'10"W	Tres Hermanos Peak 7½	Contact-metasomatic	4 shallow pits	radioactivity along contact between Tertiary diorite porphyry and rhyolite flow, 278 ppm U	USAEC, 1970, p. 11; Reid and others, 1980b, #11
2	Shell Prospect	3T26NR25E 36°31'1"N 104°16'13"W	Tres Hermanos Peak 7½	Orthomagmatic	4 ft. adit, 12 ft adit	radioactive Tertiary rhyolite sill	USAEC, 1970, p. 12; Reid and others, 1980b, #14
3	Blasted Pine	NW¼SE¼1T27NR25E 36°36'9"N 104°13'53"W	Pine Buttes 7½	Hydrothermal vein	small pit	radioactivity along joints and fractures in Cretaceous Dakota Sandstone near a Tertiary sill	USAEC PRR DEB-RRA-1433;Wood and others, 1953; Reid and others, 1980b, #12
4	Laughlin Peak	12T27NR25E	Pine Buttes 7½	Hydrothermal vein	10 prospect pits, 4-15 ft deep	radioactive fault gouge in Tertiary andesitic flow, 0.005-0.72% Th	USAEC, 1970, p. 13; Staatz, 1974; Reid and others, 1980b, #13
5	Langley Prospect	18T26NR27E	Lawrence Arroyo 7½	Hydrothermal vein (?)	prospect pit	radioactivity in Tertiary andesite and monzonite, 0.11% U_3O_8	USAEC PRR DEB-RRA-1439; Reid and others, 1980b,#15
	SOUTHERN ROCKY MOUNTAINS						
	Mora County						
6	A and M Mining	T21NR16E unsurveyed	Comanche Peak, Lucero 7½	Pegmatite	several pits	radioactive pegmatite introducing Precambrian rocks	USAEC, 1970, p. 90
	San Miguel County [Rociada district]						
7	Pidlite Mine	7,8,18,19T19NR14E unsurveyed	Elk Mountain 7½	Pegmatite	several shafts, adits, pits, trenches	lithium-bearing radioactive pegmatite intruding Precambrian rocks, radioactive rhabdophanite, monazite, crytolite, betafite, microlite, sabugalite	Jahns, 1953; Redmon, 1966, p. 70; Elevatorski, 1979, p. 71; Adams and others, 1980; U.S. Geol. Survey and others, 1980
	[Elk Mountain district]						
8	Elk Mountain	14T12NR13E unsurveyed	Elk Mountain 7½	Pegmatite	pits	radioactive pegmatite, uraninite, samarskite euxenite, fergusonite, gadolinite, monazite, betafite	Adams and others, 1980; Jahns, 1946
9	Guy No. 1	SW¼36T18NR13E	Honey Boy Ranch 7½	Pegmatite	pit (350 pounds of Ta, U, REE minerals produced; Redmon, 1961)	radioactive pegmatite intruding Precambrian rocks, tantalum-uranium minerals, monazite, uraninite, samarskite	Jahns, 1946; Redmon, 1961
	[El Pornevir district]						
10	High Peak	NE¼30T17NR13E 35°40'45"N 105°36'5"W	Honey Boy Ranch 7½	Pegmatite	100 ft cut, 15 ft adit, cuts, pits	radioactive pegmatite intruding Precambrian pyroxenite and amphibolite schist, monazite, 5-946 ppm U	USAEC PRR-DEB-RRA-1423; Jahns, 1946; Redmon, 1961;USAEC, 1970, p. 140, 147; Anderson, O.J., 1980; Reid and others, 1980, #7
11	Sparks-Stone (Sparks-Stone #1)	5,6,T16NR14E 31, 32T17NR14E	El Pornevir 7½	Pegmatite	pit (15 tons of ore at 0.11% U_3O_8, 0.05% V_2O_5, USAEC ore production reports,1948-1970)	radioactive pegmatite intruding Precambrian rocks, euxenite, autunite, radioactive biotite	USAEC, 1970, p. 145; Redmon, 1961;Adams and others, 1980; Anderson, O.J., 1980; Reid and others, 1980a, #11,12
12	Unknown-road cut	S½5T17NR14E 35°43'40"N 105°29'28"W	El Pornevir 7½	Pegmatite	no workings-road cut	radioactive pegmatite intruding Precambrian schists and amphibolites, radioactivity twice background radioactivity	Baltz, 1972; FN 5/29/81
13	Unknown-road cut (Youngs Canyon)	SW¼8T17NR14E 35°43'00"N 105°29'27"W	El Pornevir 7½	Pegmatite, Hydrothermal vein	no workings-road cut	radioactive fractures along Precambrian pegmatite and alaskite and mafic dikes, twice background radioactivity	Baltz, 1972; Reid and others, 1980a, #8; FN 5/29/81
14	Black Nugget No. 1	11T17NR14E 35°42'53"N 105°26'24"W	El Pornevir 7½	Orthomagmatic	small pit	radioactive biotite-rich pod in Precambrian granite, 4-383 ppm U	USAEC, 1970, p. 126; Reid and others, 1980a, #9
15	Locality #33 (Baker Gulch)	14T17NR14E 35°42'22"N 105°26'4"W	El Pornevir 7½	Pegmatite	no workings-road cut	radioactive pegmatite in Precambrian gneiss and quartz monzonite dike, three times background radioactivity, 129 ppm U	USAEC, 1970, p. 126; Baltz, 1972; Reid and others, 1980a, #10; FN 5/29/81
16	Unknown-adit	NW¼15T17NR14E 35°42'29"N 105°27'27"W	El Pornevir 7½	Hydrothermal vein	15 ft adit	radioactive fault zone between schist and granite, four times background radioactivity	Baltz, 1972; FN 5/29/81
17	Las Vegas Grant (Montezuma)	32T17NR15E	Montezuma 7½	Pegmatite	?	radioactive magnetite in pegmatite intruding Precambrian rocks,1.10% U_3O_8	USAEC PRR DEB-A-531; Reid and others, 1980a,#13
	[Tecolite district]						
18	Quintana	.18T15NR14E	San Geronimo 7½	Pegmatite	3 shallow pits	radioactive pegmatite intruding Precambrian hornblende schist, uranophane, 0.02-0.1% U_3O_8	USAEC, 1970, p. 149; Reid and others, 1980a, #15

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
19	Lost Creek Claims	C34T16NR14E 35°34'30"N 105°26'43"W	San Geronimo 7½	Hydrothermal vein	bulldozer cuts	radioactive brecciated fault zone in Precambrian granite	USAEC, 1970, p. 150; Reid and others, 1980a, #14
	Taos County [Picuris District]						
20	Wichita Mine (Tungsten mine)	N½SE¼16T23NR11E 36°13'30"N 105°46'15"W	Trampas 7½	Hydrothermal vein	2 shafts (100 ft), pits	radioactive tungsten-copper vein intruding metaquartzite of the Precambrian Ortega Formation	Schilling, 1960; Anderson, O.J., 1980
21	Copper Hill Claims	17,20,T23NR11E 36°13'7"N 105°47'19"W	Trampas 7½	Hydrothermal vein	70 ft shaft, 50 ft incline with drift, open pit	radioactive quartz vein in breccia zone in Precambrian quartzite and schist, copper oxides, 0.016-0.038% U_3O_8	USAEC, 1970, p. 210; Reid and others, 1980b, #7
22	Harding Mine (presently owned by Univ of New Mexico as a field laboratory)	S½29T23NR11E 36°11'34"N 105°47'39"W	Trampas 7½	Pegmatite	pits, underground rooms, 5 adits	radioactive pegmatite intruding Precambrian amphibolite schists, uranium microlite, allanite, thorite, apatite, 1.63-7.73% U_3O_8 locally in muscovite	Soulé, 1946b; USAEC PRR DEB-RRA-1428; Berliner, 1949; Redman, 1961; Schilling, 1960; Just, 1937; Jahns and Ewing, 1976; Reid and others, 1980b, #8;FN 5/14/81
23	Blue Feather Claims	20,21,22,27,28,29,30T23N R11E	Trampas and Penasco 7½	Pegmatite	?	radioactive pegmatite intruding Precambrian schist, radioactive columbite-tantalite	USAEC, 1970, p. 208
	[Arroyo Seco area]						
24	San Antonio Claims	28T27NR13E	Arroyo Seco 7½	Pegmatite	15 ft adit, 20 ft shaft, 75 ft lower adit	radioactive minerals in Precambrian pegmatite intruding gneiss	USAEC, 1970, p. 209; Reid and others, 1980b, #5
	[Anchor district]						
25	Bitter Creek (unnamed)	20,21T29NR15E 36°43'42"N 105°20'15"W	Red River Pass 7½	Pegmatite	100 ft adit, 50 ft adit, pits	radioactive pegmatite intruding Precambrian quartz amphibolite gneiss, up to 40 times background radioactivity	USAEC PRR DAO-P-4-1498; USAEC, 1970, p. 213; Reid and others, 1980b, #4; FN 11/11/81
	[Red River district]						
26	Black Copper Mines (Black Copper 2)	NE¼30T28NR15E 36°38'15"N 105°22'20"W	Red River Pass 7½	Hydrothermal vein	300 ft shaft, 3 adits (5 tons ore at 0.03% U_3O_8 USAEC ore production reports, 1948-1970)	radioactive vein in Precambrian granodiorite, once was gold producer	USAEC, 1970, p. 211; Schilling, 1960; Clark and Read, 1972; Anderson, O.J., 1980
	[Costilla Massif area]						
27	Billy Goat (Baldy Peak)	7T30NR15E 36°51'45"N 105°23'4"W	Latir Peak 7½	Hydrothermal vein	shallow pit	radioactive breccia zone in Precambrian granite, 305 ppm U	USAEC, 1970, p. 212; Reid and others, 1980b, #1; FN 11/9/81
28	Costilla	7T30NR15E 36°51'43"N 105°22'37"W	Latir Peak 7½	Orthomogmatic (?)	outcrop	radioactive Precambrian granite	Reid and others, 1980b, #2
29	Latir	18T30NR15E 36°50'49"N 105°22'53"W	Latir Peak 7½	Hydrothermal vein	4-5 ft open cut	radioactive brecciated vein intruding Precambrian granite	USAEC, 1970, p. 212; Reid and others, 1980b, #3; FN 11/9/81
	Santa Fe County [Nambe district]						
30	Rogers (Becky)	SW¼17T20NR9E 35°58'15"N 106°00'50"W	Espanola 7½	Hydrothermal Vein- Veins of uncertain origin in sandstone	pits	radioactive fracture zone in sandstone of the Tertiary Santa Fe Group (Tesque mbr), 0.019-0.32% U_3O_8, carnotite, schroeckingerite, meta-autunite	Collins and Freeland, 1956; USAEC, 1970, p. 160; Hilpert, 1969, p. 53; Green and others, 1980a, #1; Anderson, O.J., 1980
31	Unknown	SE¼17T20NR9E 35°57'35"N 106°00'35"W	Espanola 7½	Hydrothermal vein-Veins of uncertain origin in sandstone	?	radioactive fracture zone in sandstone of Tertiary Santa Fe Group (Tesque mbr.)	Collins and Freeland, 1956; Hilpert, 1969; Green and others, 1980a, #3
32	Unknown	NW¼20T20NR9E 35°57'20"N 106°00'50"W	Espanola 7½	Hydrothermal Vein-Veins of uncertain origin in sandstone	?	radioactive fracture zone in sandstone of Tertiary Santa Fe Group (Tesque mbr)	Collins and Freeland, 1956; Hilpert,1969; Green and others, 1980a, #2
33	Sangre de Cristo (Jerry Hubbard)	6,7,T20NR10E	Cundiyo 7½	Hydrothermal vein	25 ft drift	radioactive vein in altered gabbroic granite, 0.44% U_3O_8	USAEC, 1970, p. 158-159
34	Shaw No.2	NW¼7T20NR10E 35°58'58"N 105°55'18"W	Cundiyo 7½	Hydrothermal vein	cuts, 2-9 ft adits	radioactive vein in Precambrian biotite schist and granitic dikes, copper oxides	USAEC, 1970, p. 156; Reid and others, 1980a, #1
35	Marion	CN½7T20NR10E 35°58'55"N 105°55'5"W	Cundiyo 7½	Hydrothermal vein	cuts	radioactive veins in Precambrian biotite schist and biotite-microcline granite	USAEC, 1970, p.156; Anderson, O.J., 1980; Miller and others, 1963
	Sandoval County						
36	Anomaly #3	17T15NR1E	San Ysidro 7½	Hydrothermal vein	?	radioactive anomaly along the Naciemento fault in Precambrian granite	USAEC PRR ED-R-412
37	Anomaly #1	12T16NR1E	Gilman 7½	Hydrothermal Vein	?	radioactive anomaly along Sierrita fault in Precambrian granite	USAEC PRR ED-R-410
38	Anomaly #2	8T16NR1E 35°39'00"N 106°51'30"W	Gilman 7½	Hydrothermal Vein	?	radioactive anomaly along Naciemento fault in Precambrian granite	USAEC PRR ED-R-411; Green and others, 1980c, #321
39	Anomaly #6 (Jemez Reservation)	18T17NR2E 35°42'18"N 106°46'22"W	Gilman 7½	Hydrothermal Vein	?	radioactive tuffaceous pumice along fault zone	USAEC PRR ED-R-1541; Green and others, 1980c, #322
40	Cochiti district	T18NR4E, T18NR5E T17NR4E, T17NR5E	Canada and Bland 7½	Hydrothermal Vein	shafts, adits, pits	radioactive veins and breccia zones in Tertiary	Anderson, 1957; Bundy 1958;Lindgren and others, 1910; Smith and others, 1970; Chenoweth, 1974b

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
41	Peralta Canyon	SE¼9T17NR5E 35°43'00"N 106°24'40"W	Canada 7½	Hydrothermal vein	?	radioactive fractures and breccia zones in Tertiary Lapilli Tuff (rhyolite), torbernite, uranophane, copper oxides	Lindgren and others, 1910; Hilpert 1969, p. 49; Chenoweth, 1974b; Green and others, 1980c, #12
	Rio Arriba County [Ojo Caliente district]						
42	Joseph	NE¼SE¼11T24NR8E 36°19'35"N 106°3'15"W	Ojo Caliente 7½	Pegmatite	open pit, adits	radioactive pegmatite, samarskite, fluorite	Jahns, 1946; USAEC, 1970, p. 120
43	Star Mine	NE¼SW¼12T24NR8E 36°19'30"N 106°2'58"W	Ojo Caliente 7½	Pegmatite	open cuts, adits	radioactive pegmatite	Jahns, 1946
44	Unnamed (#6)	NW¼NE¼11T24NR8E 36°20'5"N 106°3'50"W	Ojo Caliente 7½	Pegmatite	pit	radioactive pegmatite, samarskite, monazite, fluorite	Jahns, 1946
	[Petaca district]						
45	Guadalupe	NE¼SE¼36T26NR8E 36°26'30"N 106°2'30"W	La Madera 7½	Pegmatite	cuts, pits, adits	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961
46	Carmelita	SW¼NE¼36T26NR8E 36°26'40"N 106°2'45"W	La Madera 7½	Pegmatite	cut	radioactive pegmatite, samarskite, monazite, fluorite	Jahns, 1946; Redmon, 1961
47	Globe	NE¼NE¼36T26NR8E 36°27'00"N 106°2'25"W	La Madera 7½	Pegmatite	pits, cuts, adits, 25 ft shaft	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Wright, L.A., 1948; Apsouri, 1944; Redmon, 1961
48	Red (Peacock)	SE¼SE¼25T26NR8E 36°27'10"N 106°2'25"W	La Madera 7½	Pegmatite	cuts, pits, shaft	radioactive, pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961
49	Sunnyside	E½SW¼25T26NR8E 36°27'15"N 106°2'50"W	La Madera 7½	Pegmatite	incline, pits	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961; Adams and others, 1980
50	Lucky Seven Claim	26T26NR8E 36°27'29"N 106°3'10"W	La Madera 7½	Hydrothermal vein	trench	radioactive vein in Pre-cambrian Petaca schist, copper oxides, 0.021% U_3O_8	USAEC, 1970, p. 21
51	Alamos	NE¼SW¼25T26NR8E	La Madera 7½	Pegmatite	6 pits, cuts	radioactive pegmatite, samarskite, monazite	Redmon, 1961
52	La Blanca	25T26NR8E 36°27'00"N 106°2'00"W	La Madera 7½	Pegmatite	?	radioactive pegmatite	USAEC PRR DEB-RRA-1417; Green and others, 1980a, #76
53	White (Lyons, Frances No.2)	SW¼NE¼25T26NR8E 36°27'40"N 106°2'40"W	La Madera 7½	Pegmatite	cuts	220 ft long, 50 ft wide radioactive pegmatite, apatite, samarskite, monazite	Jahns, 1946; Redmon, 1961
54	Hillside	NE¼NW¼25T26NR8E 36°27'45"N 106°2'45"W	La Madera 7½	Pegmatite	shaft, incline, pits	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961
55	El Foto	NE¼SW¼30T26NR9E 36°27'20"N 106°1'45"W	La Madera 7½	Pegmatite	24 ft shaft with drifts, winzes	radioactive pegmatite, samarskite, fluorite, monazite	Jahns, 1946; Redmon, 1961
56	Pineapple Group	SW¼NE¼30T26NR9E 36°27'35"N 106°1'32"W	La Madera 7½	Pegmatite	bulldozer cuts, shaft (4 tons of ore at 0.03% U_3O_8 and 0.02% V_2O_5, U.S. government ore production reports, 1948-1970)	radioactive pegmatite	USAEC, 1970, p. 119; Anderson, O.J., 1980
57	La Paloma Mine	C N½N½30T26NR9E 36°27'50"N 106°1'40"W	La Madera 7½	Pegmatite	50 ft shaft, pits, cuts	five radioactive pegmatites, samarskite, monazite fergusonite	Jahns, 1946; Redmon, 1961; Bingler, 1968; Elevatorski, 1979
58	Little Julia	NW¼SW¼24T26NR8E 36°28'18"N 106°3'15"W	La Madera 7½	Pegmatite	cut, 40 ft shaft	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961
59	Nambe (Turkey Track Mine, Unknown)	SW¼SW¼18T26NR9E 36°28'50"N 106°2'00"W	La Madera 7½	Pegmatite	open cuts, 65 ft shaft	radioactive pegmatite, copper oxides, samarskite, monazite, purple fluorite	Apsouri, 1944; Jahns, 1946; USAEC PRR DEB-RRA-1417; Green and others, 1980a, #78
60	Capitan Mine	NE¼SE¼13T26NR8E 36°29'00"N 106°2'15"W	La Madera 7½	Pegmatite	Open cut, adit, incline	radioactive pegmatite, samarskite, monazite, purple fluorite	Jahns, 1946
61	Cribbenville (New Cribbenville, Ajax, El Capitan)	SW¼SW¼18T26NR9E 36°29'00"N 106°2'20"W	La Madera 7½	Pegmatite	cuts, adits	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961; USAEC PRR DEB-RRA-1417; Green and others, 1980a, #78
62	Pino Verde (Luna)	SW¼NW¼18T26NR9E 36°29'15"N 106°2'10"W	La Madera 7½	Pegmatite	5 prospect pits	radioactive pegmatite, uraninite in albite-rich zone, samarskite, monazite	Bingler, 1968, p. 68; Hilpert, 1969; Green and others, 1980a, #49
63	Fridlund (Blue Eagle No.1)	NW¼NW¼18T26NR9E 36°29'32"N 106°2'15"W	La Madera 7½	Pegmatite	2 pits, 2 adits, open cuts (500 lbs columbite, samarskite, monazite shipped)	radioactive pegmatite, uraninite in albite-quartz zones, samarskite, monazite, fergusonite	Jahns, 1946, p. 68; Apsouri, 1944; Bingler, 1968
64	Gabalon (Gavilan)	NW¼NW¼18T26NR9E 36°29'40"N 106°2'10"W	La Madera 7½	Pegmatite	cut, adit	radioactive pegmatite, samarskite. monazite,	Jahns, 1946; Apsouri, 1944
65	Bluebird	SW¼NE¼7T26NR9E 36°30'15"N 106°2'20"W	Las Tablas 7½	Pegmatite	3 pits	radioactive pegmatite, samarskite, monazite, fluorite	Apsouri, 1944; Jahns, 1946; Redmon, 1961; USAEC PRR DEB-RRA-1417; Green and others, 1980a, #74
66	Apache (Porter, Blue, Blowout)	NW¼12T26NR8E 36°30'23"N 106°3'00"W	Las Tablas 7½	Pegmatite	cuts, adits (3), 75 ft shaft	radioactive pegmatite, samarskite, monazite, fluorite, carnotite	Apsouri, 1944; Jahns 1946; Redmon, 1961; USAEC PRR DEB-RRA-1417; Green and others, 1980a, #72

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
67	Sandoval (Old Black Horse, Kentucky)	N½NW¼12T26NR8E 36°30'30"N 106°3'00"W	Las Tablas 7½	Pegmatite	cuts, pits	radioactive pegmatite, samarskite in quartz zones	Jahns, 1946
68	Silver Plate	NW¼NE¼11T26NR8E 36°30'30"N 106°3'40"W	Las Tablas 7½	Pegmatite	90 ft adit, cut	radioactive pegmatite, samarskite, monazite	Jahns, 1946
69	Keystone-Western	SW¼SE¼1T26NR8E 36°39'40"N 106°2'45"W	Las Tablas 7½	Pegmatite	30 ft incline, drifts, vertical shaft	radioactive pegmatite, samarskite, fluorite	Jahns, 1946
70	Wyoming	NW¼SE¼1T26NR8E	Las Tablas 7½	Pegmatite	pits, cuts	radioactive pegmatite, samarskite	Jahns, 1946
71	Beryl (this may be the Lonesome mine #77 this appendix)	NE¼NW¼1T26NR8E	Las Tablas 7½	Pegmatite	2 shafts, open cut	radioactive pegmatite, samarskite, uraninite, gummite, monazite	Just, 1937
72	Conquistador (Augusta)	NE¼SW¼1T26NR8E 36°30'50"N 106°2'50"W	Las Tablas 7½	Pegmatite	pit, incline	radioactive, pegmatite, samarskite, monazite,	Jahns, 1946; Redmon, 1961
73	Consolation (Mica Lode)	N½NE¼1T26NR8E	Las Tablas 7½	Pegmatite	cut	radioactive pegmatite, samarskite	Jahns, 1946
74	St. Joseph	C N½1T26NR8E,36T27NR8E 36°31'26"N106°3'00"W	Las Tablas 7½	Pegmatite	?	two radioactive pegmatites, samarskite	Jahns, 1946
75	Miller Mine (Mary, Etter, Werner)	NW¼NW¼6T26NR9E SE¼36T27NR8E 36°31'15"N 106°2'10"W	Las Tablas 7½	Pegmatite	shafts, pits, 25 ft adit	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Apsouri, 1944; Redmon, 1961; USAEC PRR DEB-RRA-1417; Green and others, 1980a, #75
76	North Star (Miller)	SW¼SW¼31T27NR9E SE¼SE¼36T27NR8E 36°31'35"N 106°2'15"W	Las Tablas 7½	Pegmatite	open cuts, pits	radioactive pegmatite, samarskite, monazite, purple fluorite	Jahns, 1946; Hilpert, 1969, p. 47; Green and others, 1980a, #52
77	Co-operative Mine (Mary 1 and 2)	31T27NR9E, 36T27NR8E 36°32'5"N 106°1'40"W	Las Tablas 7½	Pegmatite	2 shafts, pits	radioactive pegmatite in Precambrian Ortega Quartzite	USAEC PRR DEB-RRA-763; Hilpert, and Corey, 1955; Green and others, 1980a, #55
78	Lonesome (Beryl?)	SW¼SW¼36T27NR8E 36°31'30"N 106°3'10"W	Las Tablas 7½	Pegmatite	cuts, 78 ft incline shaft, (12 lbs samarskite and monazite produced)	radioactive pegmatite, samarskite, monazite, uraninite	Jahns, 1946; Redmon, 1961; Bingler,1968; Elevatorski, 1979, p. 56; Green and others, 1980a, #48
79	El Contento	C SW¼36T27NR8E 36°31'40"N 106°3'00"W	Las Tablas 7½	Pegmatite	cuts, pits	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961
80	Vestegard	W½36T27NR8E 36 31'55"N 106 3'00"W	Las Tablas 7½	Pegmatite	cuts, pits	radioactive pegmatite, samarskite	Jahns, 1946; Redmon, 1961
81	La Jarita	SW¼SW¼25T27NR8E 36°32'20"N 106°3'00"W	Las Tablas 7½	Pegmatite	trenches,cuts, shafts	radioactive pegmatite, samarskite, monazite, fluorite	Jahns, 1946; Redmon, 1961
82	Canary Bird	NW¼SW¼25T27NR8E 36°32'40"N 106°3'5"W	Las Tablas 7½	Pegmatite	3 pits	radioactive pegmatite, monazite, samarskite	Jahns, 1946
83	Meadow Deposit	SW¼NW¼25T27NR8E 36°32'55"N 106°3'5"W	Las Tablas 7½	Pegmatite	cuts	radioactive pegmatite, samarskite, fluorite	Jahns, 1946; Redmon, 1961
84	Silver Spur (Old Eureka,Hoyt-Seward, Las Tablas)	NE¼25T27NR8E 36°33'5"n 106°2'15"W	Las Tablas 7½	Pegmatite	open cuts, 30 ft adit, 60-70 ft shaft	radioactive pegmatite, samarskite, fluorite, monazite	Jahns, 1946; Redmon 1961
85	Alma Deposit (Kansas City)	C 26T27NR8E 36°32'50"N 106°3'50"W	Las Tablas 7½	Pegmatite	cuts, pits, adit	radioactive pegmatite, samarskite, monazite	Jahns, 1946; Redmon, 1961
86	Eureka	C S½24T27NR8E 36°33'15"N 106°2'55"W	Las Tablas 7½	Pegmatite	pits	radioactive pegmatite, monazite	Jahns, 1946; Adams and others, 1980
87	Buena Vista	SW¼SW¼11T27NR8E 36°35'5"N 106°4'5"W	Las Tablas 7½	Pegmatite	cuts, pits	2 radioactive pegmatites, samarskite, monazite	Jahns, 1946; Redmon, 1961
88	Kiawa, South Kiawa	W½11T27NR8E 36°35'20"N 106°4'15"W	Las Tablas 7½	Pegmatite	shaft,adit, pits (100 lbs samarskite produced)	radioactive pegmatite, samarskite (4.64% Th), monazite, purple fluorite, in Precambrian Kiawa Mountain Formation	Just, 1937; Jahns, 1946; Apsouri, 1944; Redmon,1961; Barker, 1958; Bingler, 1968; Hilpert, 1969; Green and others, 1980a, #51
89	Rancho AAA (Parker, Wilmeth, Washburn)	NE¼SE¼10T27NR8E 36°35'20"N 106°5'00"W	Las Tablas 7½	Pegmatite	4 adits,cuts	radioactive pegmatite, samarskite, uraniferous magnetite in quartz zone	Jahns, 1946;USAEC PRR ED-201; Hilpert, 1969,p.48; Green and others, 1980a, #50
	[Bromide No. 2 district]						
90	Moran, Sawyer, and McLind claims (USGS JOL)	24T28NR7E 36°38'40"N 106°8'45"W	Burned Mountain 7½	Hydrothermal' vein-Contact metasomatic	pit	radioactive zones in mica schist (Hopewell Series), quartz veins, and granite, fluorite, copper oxides	USAEC PRR DEB-RRA-1431; Green and others, 1980a,#81; FN 11/10/81
91	Tusas East Slope #5 (Tusas, Welch and Royal, Rough and Ready)	NE¼24T28NR7E 36°39'5"N 106°8'5"W	Burned Mountain 7½	Hydrothermal vein-Anatectic	bulldozer cuts (8 tons of ore at 0.04% U_3O_8, 0.03% V_2O_5, US government ore production reports, 1948-1970)	radioactive fluorite veins in Precambrian Petaca Schist and Tusas granite sample 0.013%U	Hilpert, 1969, p.48; Anderson, O.J., 1980; Green and others, 1980a, #53; Kent, 1980; FN 11/10/81
92	J.O.L.(Royal)	SE¼NW¼24T28NR7E 36°38'50"N 106°8'35"W	Burned Mountain 7½	Hydrothermal vein-Anatectic	50 ft adit, pits (8 tons of ore at 0.04% U_3O_8, 0.03% V_2O_5,U.S. Government ore production reports, 1948-1970)	radioactive fluorite veins in Precambrian Petaca Schist and Tusas granite granite	Hilpert, 1969, p. 48; Bingler, 1968, p. 89; Anderson, O.J., 1980; Green and others, 1980a, #54; Kent, 1980; FN 11/10/81

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
	COLORADO PLATEAU						
	San Juan County						
93	Shiprock	T29NR19W	Shiprock 7½	Diatreme	none	radioactive diatreme	Shoemaker, 1956
94	East Side	T29NR21W	Red Valley 15	Diatreme	none	radioactive diatreme	Shoemaker, 1956
95	Mitten Rock	T27NR20W	Mitten Rock 7½	Diatreme	none	radioactive feldspathic minette, 10.6 ppm U, 50.1 ppm Th	Shoemaker, 1956; Nishimori and others, 1977
96	Bennett Peak	32T25NR18W	Newcomb 7½	Diatreme	none	radioactive minette, 12.3 ppm U, 31.5 ppm Th	Shoemaker, 1956
97	Outlet Neck	35°59'N 109°00'W	Tohatchi 15	Diatreme	none	basic minette diatreme, 11.9 ppm U, 28.4 ppm Th	Shoemaker, 1956
	Cibola County [Zuni Mountains district]						
98	Mirabal Mine	NE¼7T11NR12W 35°11'50"N 108°8'10"W	Post Office Flats 7½	Hydrothermal-vein	3 adits (one 269 ft),2 50 ft shafts, open cuts	radioactive fluorite vein in Precambrian gneissic granite, twice background radioactivity, copper oxides, fluorite	Rothrock, 1946; Goddard, 1966; USAEC PRR D-242; Gott and Erickson, 1952; Green and others, 1980b; #110; FN 9/14/80
99	Unknown-Mirabal Copper Mine	W½7T11NR12W 35°11'50"N 108°8'10"W	Post Office Flats 7½	Hydrothermal-vein	bulldozer cuts, pits, 12 ft. shaft; adit	radioactivity associated with copper mineralization along fractures and shear zones in Precambrian gneissic granite and Permian Abo Formation (unconformable contact), up to five times background radioactivity	Gott and Erickson, 1952; Hilpert and Corey, 1955; Hilpert,1969; Goddard, 1966; Green and others, 1980b, #111; FN 9/14/80
100	Unknown-road cut	17,18T11NR12W 35°10'55"N 108°8'00"W	Post Office Flats 7½	Hydrothermal-vein	road cut, pit reported nearby	radioactivity associated with copper minerals in shear and fracture zones in Precambrian granite, twice background radioactivity	USAEC PRR D-239, Goddard, 1966; FN 9/14/80
101	Mt. Sedgwick Copper Mine (Diener)	SW¼ 17T11NR12W 35°10'30" N 108°7'45"W	Post Office Flats 7½	Hydrothermal-vein	2 shafts, open cuts, adit	radioactivity associated with copper mineralization in shear and fracture zones in Precambrian granite, twice background radioactivity	FN 9/14/80; Goddard, 1966; Green and others, 1980b, #133
102	Unknown-sec.1	SW¼1T11NR13W	Post Office Flats 7½	Hydrothermal-vein	no workings-outcrop	radioactive fluorite vein cutting Precambrian syenite and granite, twice background radioactivity	Goddard, 1966; FN 7/24/81
103	Unknown-Zuni Indian Reservation	4T9NR17W	Horsehead Canyon 7½	Orthomagmatic		radioactive Tertiary andesite plug that has intruded Mancos Shale	USAEC PRR RR-207
	[Laguna district]						
104	Windwhip Mine	NW¼35T11NR5W 35°8'30"N 107°20'35"W	Moquino 7½	Hydrothermal-vein-Sandstone	Open pit mined in 1954	typical sandstone-type deposit adjacent to the Windwhip dike which contains uranium minerals along fractures, host rock is Jurassic Morrison Formation-Brushy Basin member	Allison, 1954; Green and others, 1980b, #77
105	Sonora 1-4 Claims (Windy Claims)	NE¼12T7NR5W 34°51'20"N 107°18'30"W	Cerro Verde 7½	Contact-metasomatic	Open pit	garnet-epidote skarn deposit in Triassic Chinle Formation intruded by granite and andesite, carnotite, lead-copper-silver-nichel minerals	USAEC PRR Ed-R-392; Hilpert, 1969; Pierson and others, 1981, #7
	BASIN AND RANGE						
	Sandoval County [Placitas district]						
106	Mimi 4	NE¼4T12NR6E 35°17'55"N 106°17'55"W	Hagan 7½	Hydrothermal-vein		radioactive minerals (autunite) along fractures and joints in Tertiary trachyte sill which intrudes Cretaceous Mesa Verde group	USAEC PRR DEB-P-4-1444; Hilpert and Corey, 1955; Hilpert,1969, p.48; Green and others, 1980c, #16

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
	BASIN AND RANGE						
	Santa Fe County						
107	Cash Entry Mine	SE¼5T14NR8E	Madrid 15'	Hydrothermal-vein	450 ft. shaft, pits	radioactive copper vein in hornblende monzonite porphyry	Griggs, 1953; Disbrow and Stoll, 1957, p. 59
10[illegible]	Turquoise Mine	5T14NR8E	Madrid 15'	Hydrothermal-vein	shaft	radioactive vein	Griggs, 1953
109	Ortiz Mine Grant	35T14NR8E	Madrid 15'	Orthomagmatic		radioactive monzonite dike in Galisteo Formation, 0.0024-0.0047% U_3O_8	USAEC, 1970., p.163-164
110	Turquoise Mine	21T15NR8E	Turquoise Hill 7½	Vein	shaft	radioactive vein	Griggs, 1953
111	Evelyn Copper Mine	19T15NR8E	Tetilla Peak 7½	Hydrothermal-vein	247 ft. shaft, pits, cuts, adits	seven radioactive copper veins in Tertiary augite-biotite monzonite	Griggs, 1953; Disbrow and Stoll, 1957, p. 51
112	La Bajada (Lone Star)	NW¼9T15NR7E 35°32'45"N 106°12'30"W	Tetilla Peak 7½	Hydrothermal-vein	open-pit, 170 ft. shaft; 9,649 tons of 0.14% U_3O_8, U.S. government ore production reports, 1948-1970)	uranium is associated with organic material in fault zone in Cienequilla Limburgite in the Espinaso Formation, brannerite, copper minerals, up to 30 times background radioactivity	Anderson, O.J., 1980; Elston, 1967; Lustig, 1957; 1959; Haji-Vassiliou and Kerr, 1972; Green and others, 1980c, #10; FN 5/28/81
113	Hiser-Moore 1	E½8T15NR7E 35°32'35"N 106°13'5"W	Tetilla Peak 7½	Hydrothermal-vein		radioactive vein in Espinaso volcanics, 0.07-0.15% U_3O_8	Hilpert, 1969; USAEC PRR DEB-RRA-1425; Green and others, 1980b, #9; USAEC, 1970, p. 165
	Bernalillo County						
114	Monte Largo Carbonatite	16T11NR6E	Sandia Park 7½	Orthomagmatic (Carbonatite)	none	carbonatite dike intruding Precambrian metamorphic rocks	Lambert, 1961; Kelly, and Northrop, 1975, p. 104
115	Lucky Strike Claim	N½25T10NR4E	Tijeras 7½	Pegmatite	open cut	radioactive magnetite in pegmatite intruding Precambrian quartz diorite	USAEC, 1970, p. 5
116	Grandview Mining Claim, Wac Mine	6,7T9NR5E	Tijeras 7½	Hydrothermal-vein	25 ft. inclined shaft, 15 ft. adit, 3 300-400 ft. adits	radioactive fluorite veins along fractures and shears in Precambrian schist, copper oxides	USAEC PRR DEB-RRA-643; Rothrock, 1946
117	Cerro Colorado-Archuleta (L.W. Claims, Junio Mine)	NW¼1T9NR1W 35°1'50"N 106°54'00"W	La Mesita Negra 7½	Hydrothermal-vein	pits, 75 ft. adit	yellow uranium minerals in brecciated rhyolite, 0.28% U	Hilpert, 1969, p. 32; Green and others, 1980b, #18; USAEC, 1970, p. 6; Wright, H.E., 1943
	Torrance County [Pedernal Hills district]						
118	Consolidated Gas and Mining	28,29T7NR12E	Pedernal Mountain 7½	Hydrothermal-vein	pits	radioactive manganese vein in Precambrian rocks	USAEC, 1970, p. 217
	Socorro County [Rayo Hills district]						
119	Parker Ranch	28T2NR4E	Cerro Montosa 7½	Hydrothermal-vein	pit	radioactive vein along shear zones in Precambrian talc schist, copper oxides	USAEC, 1970, p. 216
	[Ladron Mountain district]						
120	Jeter Mine (Charley #2, Jeter and Hattie, Hattie #2)	SW¼NE¼35T3NR2W 34°26'20"N 107°1'00"W	Riley 15'	vein	shaft, pit, trenches, open pit (8,826 tons 0.39% U_3O_8 produced, U.S. government ore production reports, 1948-1970)	oxidized uranium minerals along fault zone between Precambrian granite and Tertiary Popotosa Formation	Anderson, E.C., 1955; Collins and Nye, 1957; USAEC PRR-ED-R-368; Condie, 1976; Pierson and others, 1981; #33; Anderson, O.J., 1980; Collins and Smith, 1956; FN 6/28/80
121	Juan Torres	SE¼SE¼18T2NR2W 34°23'28"N 107°4'32"W	Riley 15'	Hydrothermal-vein	25 ft. shaft, 4 pits	radioactive quartz-fluorite veins in Precambrian granite, copper oxides, up to 4 times background radioactivity	USAEC, 1970, p. 193; Williams, 1966; Lasky, 1932; FN 9/11/81
122	Shaft	SE¼10T1SR2W	Magdalena 15'	Volcanogenic ?	4o ft. shaft	radioactive shear zone in Tertiary andesite lava, copper oxides, 0.026% U	Gott and Erickson, 1952, p. 4, 13; US Geol. Survey, 1965; FN 7/13/81
	[San Acacia Area]						
123	San Acacia Copper Mine	NE¼2T1SR2W 34°15'25"N 107°1'00"W	Riley 15'	Hydrothermal-vein	pits, shafts, adits	radioactive vein in Tertiary andesite and rhyolite, 0.0035-0.0054% U_3O_8	USAEC, 1970, p. 200; Gott and Erickson, 1957, 1952; Pierson and others, 1981, #38
124	Unknown-San Acacia	NE¼2T1SR2W 34°15'30"N 107°1'00"W	Riley 15'	Volcanogenic ?	20 ft shaft, pits	radioactive copper vein in Popotosa Formation	Gott and Erickson, 1951; Pierson and others, 1981, #37
125	Silver Creek Prospect	NE¼15T1NR2W 34°18'45"N 107°2'00"W	Riley 15'	Volcanogenic ?	short adit	radioactive zone in Popotosa Formation, copper oxides	Hilpert, 1969; Pierson and others, 1981, #34
	[Lemitar Mountains district]						
126	San Lorenzo #1 (Sam Loren 20)	18T1SR1W 34°13'20"N 106°59'00"W	Lemitar 7½	Volcanogenic	pits (14 tons 0.02% U_3O_8, U.S. government ore production reports, 1948-1970)	radioactive vein in Tertiary volcanics possibly with copper minerals	Pierson and others, 1981, #41; Keith, 1945
127	Lemitar Carbonatites (Carter-Tolliver-Cook, Volcan, Jackpot)	6,7T2SR1W 30,31T1SR1W 34°14'52"N 106°59'4"W	Lemitar 7½	Orthomagmatic (carbonatites)	pits, adit, trench	radioactive carbonatite dikes intruding Precambrian granite	McLemore, 1980a,b; Anderson, 1954; 1957; USAEC PRR DEB-RRA-1410; FN 1978-1980; Pierson and others, 1981, #42, 43

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
	[Socorro Basin Area]						
128	Black Butte (Bernardo)	12T2NR2E 34°24'40"N 106°40'50"W	Black Butte 7½	Volcanogenic	open pit	yellow-green uranium minerals in rhyolite	USAEC PRR DEB-RRA-1412; Pierson and others, 1981, #54
129	Unknown-La Joyita	31T1NR2E 34°16'00"N 106°46'30"W	La Joyita 7½	Hydrothermal-vein	pits, 2 short adits	radioactive vein in Precambrian rocks, copper oxides	Collins and Mallory, 1954, p. 12; Pierson and others, 1981, #50
130	Unknown-La Joyita	23T1NR1E 34°17'30"N 106°48'45"W	La Joyita 7½	Hydrothermal-vein	inclined shafts, pits, adits	radioactive fault zone between Madera Group (Miss.) and Precambrian granite, quartz, barite, jarosite	USAEC PRR DEB-RRA-1159; Pierson and others, 1981, #49; Collins and Mallory, 1954, p. 12
131	Aqua Torres	13T1SR2E 34°13'45"N 106°40'45"W	Sierra de la Cruz 7½	Vein	pits (149 tons of 0.11% U_3O_8)	radioactive vein in Mississippian Madera Group (limestone)	Hilpert, 1969; Pierson and others, 1981, #53; USAEC ore production reports
132	Marie Prospect (Mary Ball #1)	1T1SR2E 34°14'40"N 106°40'40"W	Sierra de la Cruz 7½	Vein	pit (46 tons of 0.14% U_3O_8)	radioactive vein in Mississippian Madera Group (limestone)	Pierson and others, 1981, #52; Hilpert, 1969; USAEC ore production reports
133	Little Davie	S½NE¼35T2SR2E 34°5'50"N 106°42'00"W	Bustos Well 7½	Vein	pits, cuts, short adit (16 tons of 0.18% U_3O_8)	yellow uranium oxides along fault zone in Permian San Andres Limestone, 1.4% U_3O_8 (sample, NM Bureau Chem Lab, 10/20/80)	Hilpert, 1969; Pierson and others, 1981, #48; Anderson, 1980; USAEC ore production reports; FN 8/31/80
134	Lucky Don (Bonanza)	NE¼NE¼35T2SR2E 34°5'55"N 106°42'00"W	Bustos Well 7½	Vein	cuts, 6 stub adits, one adit 20 ft long (965 tons of 0.23% U_3O_8, USAEC ore production reports)	mineralization along fault zone in Permian San Andres Limestone, 0.1-1.1% U_3O_8; 0.38% U_3O_8 (sample, New Mexico Bureau Chem Lab, 10/20/80)	FN 8/31/80; USAEC, 1970, p. 202; Hilpert, 1969; Pierson and others, 1981, #47; Anderson, 1980
135	Gonzales (Fabian Gonzales)	NE¼2T3SR1E 34°4'50"N 106°48'25"W	Loma de las Canas 7½	Hydrothermal-vein	pits, 2 adits	radioactive fault zone in Precambrian granite and Mississippian Magdalena Group, up to four times background radioactiviey	Williams, 1966; McAnulty, 1979; Rothrock, 1946; Collins and Mallory, 1954; FN 7/3/80
136	Minas del Chupadera (Duke, Dutchess, Texas No. 1-2)	C 26T2SR1E 34°6'40"N 106°48'50"W	Loma de las Canas 7½	Vein	pits, trench, adit, shaft	radioactive veins in limestone of Mississippian Magdalena Group, copper oxides, 3000 ppm U, up to four times background radioactivity	Lasky, 1932; USAEC PRR DEB-RRA-1148; [illegible] Pierson and others, 1981, #46; FN 7/3/80
137	Unknown-Socorro area	C SE¼14T3SR1E 34°3'00"N 106°48'10"W	Loma de las Canas 7½	Vein	drill holes, pits	radioactive barite-fluorite vein in Precambrian granite	Pierson and others, 1981, #45; Collins and Mallory, 1954, P. 11, #3
138	Unknown-Carthage	SW¼NE¼5T4SR3E	Carthage 15'	Volcanogenic	none-outcrop	radioactive rhyolite flow of the Tertiary Datil Group	Collins and Mallory, 1954, p. 12
139	Unknown-Carthage	NW¼7T4SR3E	Carthage 15'	Volcanogenic	none-outcrop	radioactive rhyolite lava of the Tertiary Datil Group, three times background radioactivity	Collins and Mallory, 1954, p. 11
140	Grefco Socorro Perlite Mine (operating)	NE¼28T3SR1W 34°1'30"N 106°56'30"W	Socorro 7½	Volcanogenic	2 shafts, open pit (producing perlite)	radioactive perlite of the Tertiary Santa Fe Formation(?)	Pierson and others, 1981, #44; Collins and Mallory, 1954, p. 12
141	Luis Lopez	16,17,20,21T4SR1W	San Antonio 15'	Vein	open pit	radioactive veins in quartz diorite, manganese, calcite	USAEC PRR DEB-RRA-1101
142	Unknown-Chupadera carbonatites (Pedro Armendaris Grant)	33°50'N 107°00'W unsurveyed	San Antonio SW 7½	Orthomagmatic	none-outcrop	radioactive carbonatite dikes intruding Precambrian metasediments, up to five times background radioactivity, 0.0016, 0.0018% U_3O_8 (samples, New Mexico Bureau Chem Lab, 2/9/81)	unpublished geologic map by Sue Kent, 1980; FN 10/7/80
	[Magdalena area]						
143	Council Rock (Unknown)	9,10,T1SR6W 34°11'10"N 107°28'00"W	Silver Hill 7½	Volcanogenic	?	radioactive quartz veins in Tertiary andesite and rhyolite	USAEC PRR DEB-RRA-800; Pierson and others, 1980, #29
144	Jack Frost	NE¼16T2SR4W 34°8'22"N 107°15'21"W	Silver Hill 7½, Magdalena 15'	Volcanogenic	shaft, pits	radioactive shear zones in rhyolite with lead, copper, barite, and fluorite	Williams, 1966;USAEC PRR DEB-RRA-1175
145	Pleasant View	14,15,16,21T2SR4W	Magdalena 15'	Volcanogenic	shaft, pits	radioactive shear zones in rhyolite with lead, copper, barite, and fluorite	USAEC PRR DEB-RRA-1175
146	C and K Claims (Big Chief #4, Don Killgore, S. Magdalena Canyon)	SW¼3T4SR3W 33°59'21"N 107°8'41"W	South Baldy 7½	Vein	100 ft. adit, drifts (stockpiled 100 tons 0.15% U_3O_8 in Socorro)	radioactive quartz veins within fault zone and fractures in Tertiary Datil Group (andesite), 621-1035 ppm U	Anderson, O.J., 1980; Berry and others, 1980, #5; USAEC, 1970; Lasky, 1932
	[San Mateo Mountains and Sierra Cuchillo]						
147	Bear Trap Canyon	NW¼18T6SR7W 33°47'34"N 107°36'19"W	Bay Buck Peaks 7½	Volcanogenic	no workings, outcrop	radioactive zones in sediments between rhyolite flows of Tertiary Datil Group, up to four times background radioactivity	Berry and others, 1980, #8; FN 8/29/81

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
148	Rosedale Mine	1,12T6SR6W 33°48'31"N 107°24'22"W	Grassy Lookout 7½	Vein	shaft, adit	radioactive gold vein in Tertiary Potato Canyon rhyolite, up to twice background radioactivity	Lasky, 1932; Lindgren and others, 1910; Deal and Rhodes; 1976; FN 6/29/80
149	Bell Mine	12T6SR6W	Grassy Lookout 7½	Vein	doghole, adit	radioactive gold vein in Tertiary Potato Canyon rhyolite, up to twice background radioactivity	Lindgren and others, 1910; Deal and Rhodes, 1976; FN 6/29/80
150	Craig, Dike Claims (Venture Group, Malcomb Reeves Group)	NW¼14T8SR5W 33°37'10"N 107°19'30"W	Steel Hill 7½	Volcanogenic	pit	radioactive opal veins in Tertiary Vicks Peak rhyolite, 0.0016% U_3O_8 (NM Bureau Chem Lab, 2/9/81)	USAEC, 1970, p. 199; Deal and Rhodes, 1976; Berry and others, 1980, #1; FN 6/29/80
151	Taylor Prospect (Apache Warm Springs, Monticello Box)	C 10,C25T9SR7W	Montoya Butte 7½	Volcanogenic	100 ft. shaft, adit	radioactive quartz vein in Tertiary volcanic rocks with Beryllium mineralization, 78 ppm U	Hillard, 1969; Correa, 1980
152	Cocar Lease (Ojo Caliente)	5,6T9SR7W	Montoya Butte 7½	Volcanogenic	pits	radioactive zone in Tertiary rhyolite	USAEC, 1970, p. 198
153	Vicks Peak No. 1	SE¼11T9SR6W 33°32'22"N 107°25'8"W	Vicks Peak 7½	Volcanogenic	no workings-road cut	radioactive zone in Tertiary Datil Group (rhyolite) 103-828 ppm U	Berry and others, 1980, #10
154	San Juan Peak	C W½35T7SR5W 33°39'44"N 107°19'55"W	San Juan Peak 7½	Volcanogenic	no workings-drill holes	radioactive zone in Tertiary Datil Group (rhyolite tuff), 51-248 ppm U	Berry and others, 1980, #13
155	White Mule Canyon (San Juan Peak)	SE¼27T7SR5W 33°40'22"N 107°20'35"W	San Juan Peak 7½	Volcanogenic	cuts, drill holes	uraniferous opal in Tertiary Datil Group (rhyolite tuff), 124-621 ppm U	Berry and others, 1980, #12
	<u>Lincoln County</u> [Gallinas Mountains district]						
156	Sky High	NW¼SE¼14T1SR11E 34°13'20"N 105°45'30"W	Pajaro Canyon 7½	Hydrothermal-vein	100 ft. caved adit, pit	bastnaesite-fluorite veins in Permian Yeso Formation	Perhac, 1970; Rothrock, 1946
157	American (Iron Hammer No. 2)	NE¼22T1SR11E 34°12'35"N 105°46'10"W	Pajaro Canyon 7½	Contact-metasomatic	60-100 ft. caved adit, open cuts	radioactive iron-replacement veins in Permian Yeso Formation and Tertiary Syenite, 0.0074% U_3O_8 (sample, NM Bureau Chem Lab, 10/29/80)	Griswald, 1959; Perhac, 1970; Kelley, 1949; Sheridan, 1947; FN 8/16/80; USAEC PRR DEB-RRA-639 plus 2 supplements
158	Rare Metals	SE¼22T1SR11E 34°12'25"N 105°46'25"W	Pajaro Canyon 7½	Contact-metasomatic	150 ft. adit, 50 ft. shaft, trenches, pits	radioactive iron replacement veins in Permian Yeso Formation and Tertiary syenite	Griswald, 1959; Perhac, 1970; Kelley, 1949, Sheridan, 1947; USAEC PRR DEB-RRA-639
159	All American	NE¼23T1SR11E 34°12'50"N 105°45'30"W	Pajaro Canyon 7½	Hydrothermal-vein	85 ft. vertical shaft	bastnaesite-fluorite veins in breccia zone in Permian Yeso Formation intruded by Tertiary syenite porphyry sill (no anomalous radioactivity on 8/15/80)	Griswald, 1959; Rothrock, 1946; Williams, 1966; FN 8/15/80; USAEC PRR DEB-RRA-646, 789
160	Pride No. 2, E and M No. 13	SW¼27T1SR11E 34°11'N 105°46'15"W	Pajaro Canyon 7½	Hydrothermal-vein		bastnaesite in veins in Permian Yeso Formation	Perhac, 1970
161	Congress Prospect	SW¼19T1SR12E 34°12'30"N 105°43'55"W	Rough Mountain 7½	Hydrothermal-vein	2 pits	fluorite-bastnaesite veins in Permian Yeso Formation	Rothrock, 1946; Perhac, 1964
162	Red Cloud Mine (Red Cloud Copper, Conqueror No. 4, Hilltop)	24,25T1SR11E 34°12'20"N 105°44'40"W	Rough Mountain 7½	Hydrothermal-vein	cuts, adit, shafts, pits	bastnaesite-fluorite veins in Permian Yeso Formation; 6 times background radioactivity	Griswald, 1959; Perhac, 1970; Rothrock, 1946; Williams, 1966; Soule, 1946a; Perhac and Heinrich, 1964; FN 8/16/80
163	Rio Tinto (Conqueror)	SE¼25T1SR11E 34°11'35"N 105°44'5"W	Rough Mountain 7½	Hydrothermal-vein	230 ft. shaft, open pit	fluorite-bastnaesite veins in Permian Yeso Formation	Griswald, 1959; Perhac 1964
164	Eagle Nest	E½24T1SR11E 34°12'30"N 105°44'15"W	Rough Mountain 7½	Hydrothermal-vein	3 pits, trenches	bastnaesite-fluorite veins in Permian Yeso Formation	Rothrock, 1946; Perhac, 1970
165	Bottleneck Prospect	SE¼24T1SR11E 34°12'14"N 105°45'8"W	Rough Mountain 7½	Hydrothermal-vein	25 ft. shaft	bastnaesite reported with fluorite in veins in Permian Yeso Formation (no anomalous radioactivity on 8/16/80)	Rothrock, 1946; Perhac, 1970; FN 8/16/80
166	Summit	SW¼19T1SR12E 34°12'5"N 105°43'50"W	Rough Mountain 7½	Hydrothermal vein	25 ft. pit	2-4 ft. thick fluorite-bastnaesite vein reported in Permian Yeso Formation	Perhac, 1970; FN 8/16/80
167	Last Chance	NW¼19T1SR12E 34°12'50"N 105°43'50"W	Rough Mountain 7½	Hydrothermal vein		bastnaesite in fluorite veins in Permian Yeso Formation	Perhac, 1970.
168	Little Wonder, Old Hickory, Eureka	NW¼SW¼19T1SR12E 34°12'25"N 105°43'45"W	Rough Mountain 7½	Hydrothermal vein	pits, 3 shafts, adit, cuts	bastnaesite-fluorite veins in Permian Yeso Formation with copper oxides	USAEC PRR DEB-RRA-638 plus supplement; Rothrock, 1946; Perhac, 1970
169	Hoosier Girl (Hoosier Girl North and South)	SW¼19T1SR12E 34°12'25"N 105°43'45"W	Rough Mountain 7½	Hydrothermal vein	pits, shafts, trenches	<5% bastnaesite in fluorite veins in Permian Yeso Formation, twice background radioactivity	Perhac, 1964; Griswald, 1959; Soule, 1946; Perhac and Heinrich, 1964; Rothrock, 1946; Williams, 1966; FN 8/16/80

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
	[White Oaks District]						
170	Prince Mine (House, Carolyn O, Las Cinco Reinas)	14T6SR11E 33°47'30"N 105°46'10"W	Little Black Peak 15'	Contact-metasomatic	cuts, pits, 200 ft. adit (caved)	radioactive zones in iron replacements and veins in Permian San Andres Formation intruded by Tertiary Lone Mountain Stock, torbernite, 0.015-0.031% U_3O_8	Walker and Osterwald, 1956; Griswald, 1959; Kelley, 1949; FN 8/13/80; Robert Weber, personal communication 7/13/81; USAEC PRR-DEB-RRA-583
171	Ferro (J.B. Close, Lone Mountain)	15,16T6SR11E 33°47'20"N 105°47'30"W	Little Black Peak 15'	Contact-metasomatic	cuts, open pit	radioactive zones in iron replacements and veins in Permian San Andres Formation intruded by Tertiary Lone Mountain Stock, 0.0083-0.0094% U_3O_8	USAEC PRR-DEB-RRA-548 plus supplement #1; Griswald, 1959; Smith, 1964; FN 8/12/80; Schnacke, 1977
172	Eagle Nest No. 1 and 2 (Stoddard Mine)	21,22T6SR11E 33°46'30"N 105°47'30"W	Little Black Peak 15'	Contact-metasomatic	cuts	radioactive zones in iron replacements and veins in Permian San Andres Formation intruded by Tertiary Lone Mountain Stock, 0.020-0.034% U_3O_8, 0.01% U_3O_8 (sample, NM Bureau Chem Lab, 10/20/80)	USAEC, 1970, p. 63; Smith, 1964; FN 8/13/80; Schnacke, 1977
173	Yellow Jacket (Wasp Claims)	22T6SR11E 33°46'10"N 105°46'40"N	Little Black Peak 15'	Contact-metasomatic	pits, open cuts, inclined shaft, 150 ft. adit	radioactive zones in iron-replacements and veins in San Andres Formation intruded by Tertiary Lone Mountain Stock; 6-7 times background radioactivity	Griswald, 1957; USAEC PRR-DEB-RRA-585; Kelley, 1949, p. 154; Sheridan, 1947; Smith, 1964; Schnacke, 1977; FN 8/13/80
174	Black Night-Good Night (Black Knight, Hudspeth)	24T6SR11E 33°46'30"N 105°46'20"W	Little Black Peak 15'	Contact-metasomatic	cuts, pits	radioactive zones in iron-replacements and veins in San Andres Formation intruded by Tertiary Lone Mountain Stock, 3 times background radioactivity	USAEC PRR-DEB-RRA-645 plus supplement #1; Smith, 1964; Griswald, 1959; Sheridan, 1947; Kelley, 1949; FN 8/12/80; Schnacke, 1977
175	Little Mac (Little Mack, Henry Clay)	NW¼25T6SR11E 33°45'30"N 105°44'40"W	Little Black Peak 15'	Hydrothermal vein	150 ft. shaft, 100 ft adit, open cuts, trenches (present owner Bud Grenshaw, White Oaks, NM)	radioactive veins along rhyolite dike intruded into Tertiary Lone Mountain Stock, 4 times background radioactivity, wolframite	USAEC PRR-DEB-RRA-697; Griswald, 1959; FN 8/12/80
176	Unknown-Section 2	2T7SR11E, 35T6SR11E 33°44'00"N 105°45'20"W	Carrizozo 15'	Orthomagmatic	shaft, outcrop	radioactive rhyolite dike intruding Cretaceous Mancos Formation, 0.01% U_3O_8	USAEC PRR-ED-R-1249; Griswald, 1959; USAEC, 1966, p. 44; Collins and Mallory, 1954; FN 8/12/80
	[Jicarilla District]						
177	Pittsburg Iron Claims, Grace 5,7,8 (now listed as Smokey Mine, operating)	11,14,15T6SR14E	Jicarilla Peak 7½	Contact-metasomatic	pits	radioactive zones in iron-replacements in San Andres Formation, 3-4 times background radioactivity	USAEC PRR-DEB-RRA-616; Soûle, 1949; Kelley, 1949; FN 6/4/81
	[Carrizozo Area]						
178	Valley of Fire (Unknown, road cut)	NW¼28T7SR10E 33°41'45"N 105°54'45"W	Carrizozo 15'	Orthomagmatic, hydrothermal-vein	road cut	radioactive syenite dike intruding Cretaceous Mancos Shale, 207 ppm U, 24 times background radioactivity	Berry and others, 1980, #3; FN 3/19/81
	[Nogal District]						
179	Unknown-Tortolita Canyon	NE¼13T9SR11E	Carrizozo 15'	Hydrothermal-vein	open cut	radioactive quartz-pyrite vein in andesite of Sierra Blanca Volcanics, twice background radioactivity	FN 6/13/81
180	Richardson Claims	NW¼15T9SR11E 33°31'40"N 105°47'29"W	Carrizozo 15'	Hydrothermal-vein	pits	radioactive vein in Tertiary Sierra Blanca complex	USAEC, 1970, p. 61
181	Unknown	19T9SR11E	Carrizozo 15'	Hydrothermal-vein	50 ft. adit	radioactive vein in Tertiary Sierra Blanca complex, slightly above background	USAEC PRR-DEB-RRA-1119
182	Unknown	NE¼27T9SR11E	Carrizozo 15'	Hydrothermal-vein	adit, pits	radioactive vein in Tertiary Rialto Stock, 5 times background radioactivity	FN 6/5/81
183	Spur Adit	3T10SR11E	Sierra Blanca Peak 15'	Hydrothermal-vein	adit	radioactive vein in Sierra Blanca complex, 3 times background radioactivity	FN 6/3/81
184	Bonita Claims 1-13	4,9 (line) T10SR11E	Sierra Blanca Peak 15'	Hydrothermal-vein	4'x10' cut, 20 ft. adit	radioactive quartz-sulfide veins in Sierra Blanca volcanics, up to 20 times background radioactivity	USAEC, 1970, p. 60; Thompson, J.B., 1973; FN 6/13/81
185	Maud Mine	SW¼6T10SR11E	Sierra Blanca Peak 15'	Hydrothermal-vein	200 ft. shaft, adits	radioactive quartz vein in Tertiary Sierra Blanca complex, twice background radioactivity	FN 6/3/81

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
	[Capitan Mountains District]						
186	Piney (Pinie, Summit)	SW¼15T8SR15E 33°36'30"N 105°28'5"W	Capitan Pass 7½	Hydrothermal-vein	cuts, pits, drill holes	radioactive veins in Tertiary alaskite, up to 20 times background radioactivity	USAEC, 1970, p. 65; FN 5/8/81; Collins, 1956
187	Barlejon No. 2	SE¼16T8SR15E 33°36'40"N 105°28'25"W	Capitan Pass 7½	Hydrothermal-vein	shallow pit	radioactive breccia zone in Tertiary alaskite, 0.03-0.39% U_3O_8, up to 8 times background radioactivity	USAEC, 1970, p. 62; FN 5/8/81
188	Hopeful Claims	17T8SR15E	Capitan Pass 7½	Hydrothermal-vein	pit	radioactive breccia veins in Tertiary alaskite, purple fluorite	USAEC, 1970, p. 66; Collins, 1956
189	King	15,22 (line) T8SR15E	Capitan Pass 7½	Hydrothermal-vein	cuts	radioactive breccia veins in Tertiary alaskite	Griswald, 1959
190	Wee Three 1-3	22T8SR15E	Capitan Pass 7½	Hydrothermal-vein	pits, trenches	radioactive vein in Tertiary alaskite, 0.001-0.002% U_3O_8, 0.17% ThO_2, allanite	USAEC PRR DEB-P-1462; Collins, 1956; Griswald, 1959; FN 6/4/81
191	Monso Group 2,4,5 (Monzo, Silvertone)	22T8SR15E	Capitan Pass 7½	Hydrothermal-vein	cuts, pits	radioactive vein in Tertiary alaskite, 0.003-0.010% U_3O_8, 3.57% ThO_2	USAEC PRR DEB-P-1453; DEB-RR-452; Collins, 1956; FN 6/4/81
192	Drunzer	NE¼22T8SR15E 33°36'25"N 105°27'20"W	Capitan Pass 7½	Hydrothermal-vein	cuts, trenches, pits	radioactive breccia vein in Tertiary alaskite, allanite, twice background radioactivity	Griswald, 1959; FN 5/8/81, 6/4/81
193	El Tigré	NE¼23T8SR15E	Capitan Pass 7½	Hydrothermal-vein	pit	radioactive vein in Tertiary alaskite	BLM Claim notices, p. 3330
194	Unknown	SE¼36T7SR14E	Capitan NE 7½	Hydrothermal-vein	pit(?)	thorium vein in Tertiary alaskite	unpublished anonymous map on file at NMBMMR
195	Unknown	NW¼31T7SR15E	Capitan NE 7½	Hydrothermal-vein	pit	thorium vein in Tertiary alaskite	see above
196	McCrory (North Group)	SE¼36T7SR14E C 31T7SR15E 33°38'31"N 105°25'45"W	Encinoso 7½	Hydrothermal-vein	cuts, trenches	radioactive vein in Tertiary alaskite, purple fluorite, up to 64 times background radioactivity	Griswald, 1969; FN 6/6/81, 8/20/81
197	Capitan Uranium Co. No. 14,18 (CPU 11-18)	33,34T7SR14E	Encinoso 7½	Hydrothermal-vein	pits, trenches	radioactive vein in Tertiary alaskite, 0.06-0.18% U_3O_8, 0.35-1.00% ThO_2	USAEC, 1970, p. 64; Collins, 1956
198	Fuzzy Nut 1-18 (Sparky 1-3)	3T8SR15E	Encinoso 7½	Hydrothermal-vein	pits	radioactive vein in Tertiary alaskite	Collins, 1956
199	Koprian Springs	11T8SR15E	Encinoso 7½	Hydrothermal-vein	pits	radioactive vein in Tertiary alaskite, 0.002-0.051% U_3O_8, 0.34% ThO_2	Collins, 1956
200	Mina Tiro Estrella	SE¼27T8SR16E 33°34'N 105°21'W	Capitan Peak 7½	Hydrothermal-vein	trench	radioactive vein in Tertiary alaskite, allanite, titanite, 3-4 times background radioactivity	FN 8/13/81
201	Bear Canyon Group (Mert, Big Chief, Silver Dollar, Busy Bee, Dutchman)	E½9T8SR17E 33°37'30"N 105°16'00"W	Capitan Peak 7½	Hydrothermal-vein	pits, trench, 80 ft. adit (3 tons of 0.02% U_3O_8 shipped, US government ore production reports 1948-1970)	radioactive vein in Tertiary alaskite, six-seven times background radioactivity	Lincoln County Courthouse records; FN 8/14/81
202	Copeland Canyon (Bunton's Iron and Metal 1-3)	S½8,N½17T8SR17E 33°36'50"N 105°17'5"W	Capitan Peak 7½	Hydrothermal-vein	3 pits	radioactive magnetite veins in Tertiary alaskite, twice background radioactivity	FN 7/16/81; Lincoln County Courthouse records
203	San Pedro-Link-Nob Hill Claims (East Group)	SW¼35T8SR17E 33°33'50"N 105°15'00"W	Capitan Peak 7½, Arabela 7½	Hydrothermal-vein	pit	radioactive vein in Tertiary alaskite, twice background radioactivity	FN 8/21/81; Lincoln County Courthouse records
	<u>Otero County</u> [Orogrande District]						
204	Torbernite Claim	3T22SR8E	Orogrande N 7½	Hydrothermal-vein-contact-metasomatic(?)	pits, adits	radioactive copper veins in Chupadera Formation	USAEC PRR DEB-RRA 1106
	[Cornudas Hills]						
205	Llewellyn	SW¼2T26SR14E	McVeigh Hills 7½	Hydrothermal-vein	25 ft. adit	radioactive vein in altered syenite sill intruding Permian Hueco Formation, 0.021-0.047% U_3O_8, 0.07% Th, 0.7% Nb, 0.7% Zr	Collins, 1958; Zapp, 1941
206	Jones Prospect	S½22T26SR14E	Alamo Mountain 15'	Hydrothermal-vein		radioactive vein in syenite dike intruding Permian Hueco Formation, beryllium mineralization associated	Collins, 1958; Zapp, 1941
207	Wind Mountain	north of Wind Mountain (1 mile)	Alamo Mountain 15'	Hydrothermal-vein		thorium veins in syenite dikes intruding Permian Bone Spring Limestone, 0.03% Th	Collins, 1958; Zapp, 1941
	<u>Sierra County</u> [San Mateo Mountains and Sierra Cuchillo]						
208	Terry Prospect (Jan, Koomagray, Pitchblende 1-4, Hanosh mine)	26T10SR6W 33°24'45"N 107°25'36"W	Monticello 7½	Volcanogenic	trenches, pits, caved shaft (50 ft), open pit (127 tons of ore at 0.14% U_3O_8, 0.05% V_2O_5 produced, US government ore reports, 1948-1970)	uranium minerals (uranophane) associated with purple fluorite veins in jasperoid breccea and andesite, 0.05% U_3O_8 (sample NM Bureau Chem Lab, 10/20/80)	Bassett, 1954; Boyd and Wolfe, 1953; Lovering, 1956; Anderson, O.J., 1980; Berry and others, 1980, #2; FN 7/6/80

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
209	Fifty-fifty (Questa Blanca Canyon)	NE¼6T11SR5W 33°23'11"N 107°23'16"W	Monticello 7½	Volcanogenic	2 shafts, 6 and 45 ft. deep	radioactive breccia dike intruding Pennsylvanian Madera Formation, 518 ppm U	Berry and others, 1980, #11
210	Luna Claims (La Questa)	SE¼35T9SR6W 33°28'59"N 107°25'13"W	Monticello 7½	Volcanogenic	pits	uranium minerals along fractures in andesite porphyry dikes of Tertiary Vicks Peak Group	Berry and others, 1980, #9
211	Lookout No. 1	5T10SR5W	Monticello 7½	Volcanogenic		radioactive veins in volcanics	USAEC PRR DEB-RRA-1157
	[Kingston District]						
212	Virginia-Templer-Keystone Mines	NE¼26T15SR9W 32°58'50"N 107°44'00"W	Hillsboro 15'	Hydrothermal-vein	120 ft. inclined shaft, 2 shafts	radioactive lead-silver-gold vein, radioactive ilmenite float sample, 1.4% eU	USAEC PRR D-687; Harley, 1934; Bauer, 1950b; Hedlund, 1977; Elston and others, 1975
213	Ingersoll (Marjery, Dumm, Lost Mine No. 2, operating)	SW¼13T15SR9W 32°53'20"N 107°45'00"W	Hillsboro 15', Apache Peak 7½	Hydrothermal-vein	464 ft. adit, 100 ft. raise, 100 ft. and 40 ft. levels	radioactive silver-gold-galena-sphalerite vein along shear zones in Precambrian or Tertiary granite, radioactivity up to 15 times background radioactivity (locally)	E.H. Hale, Jr., personal communication, 6/18/81; Hedlund, 1977; USAEC PRR DEB-P-4-1454; Berry and others, 1980, #4; FN 6/18/81
214	Barite Hill No. 1 (Hope, Midnight)	NE¼13T15SR9W 32°59'57"N 107°42'57"W	Apache Peak 7½	Hydrothermal-vein	pits	radioactive lead-silver-gold veins in Precambrian Tertiary granite	E.H. Hale, Jr., personal communication, 6/18/81; Hedlund, 1977
215	Coral Snake, Hidden Valley	35T17SR9W	San Lorenzo 15'	Volcanogenic	prospect pit	radioactive tuffaceous, rhyolite	USAEC, 1970, p. 179
	[Caballo Mountains]						
216	Walker Claims	4T14SR4W	Williamsburg 7½	Hydrothermal-vein		radioactive shear zone in Precambrian metamorphic rocks and granite	USAEC, 1970, p. 190
217	Lydia K Mine	S½29T16SR4W 32°52'50"N 107°15'36"W	Caballo 7½	Hydrothermal-vein	shafts, pits, adit	radioactive fluorite vein in Precambrian granite, radioactivity twice background radioactivity	Staatz and others, 1965; Kelley and Silver, 1952; Harley, 1934; McAnulty, 1978; Nelson, 1975; FN 7/9/80
218	Red Rock No. 1	NE¼33T1SR4W 32°52'40"N 107°15'17"W	Caballo 7½	Contact-metasomatic	pits, cuts	radioactive syenite bodies in Precambrian granite, 0.005% U_3O_8 (NM Bureau Chem Lab, 10/29/80)	Staatz and others, 1965; Boyd and Wolfe, 1953; Kelley and Silver, 1952; USAEC, 1970, p. 195 189; Anderson, 1980 Melancon, 1952; FN 7/9/80
219	Red Rock No. 3	33T16SR4W 32°52'15"N 107°15'28"W	Garfield 7½	Hydrothermal-vein	pits	radioactive zone along contact between Precambrian granite and Cambrian-Ordovician Bliss Formation	Melancon, 1952
220	Caballo Mountains	4T17SR4W	Garfield 7½	Contact-metasomatic	pits	radioactive syenite bodies in Precambrian granite	Boyd and Wolf, 1953; Kelley and Silver, 1952; USAEC, 1970, p. 75, 189; Staatz and others, 1965; FN 7/9/80
221	Paran (Derry)	27T17SR4W	Upham 15'	Hydrothermal-vein	2 open cuts (7 tons at 0.07% U_3O_8, 0.01% V_2O_5, U.S. government ore production reports, 1948-1970)	uranophane in silicified zone along Garfield fault in Permian Abo Formation	USAEC, 1970, p. 184, 191
222	Hot Rock No. 2,4	29,30T17SR4W	Garfield 7½	Hydrothermal-vein		radioactive silicified vein in Pennsylvanian Magdalena Group	Melancon, 1952
	Catron County [Mogollon Mountains]						
223	Baby Mine	SW¼20T10SR19W (projected) 32°25'15"N 108°48'45"W	Mogollon 7½	Hydrothermal-vein	130 and 40 ft. adits (7 tons of 0.10% U_3O_8 shipped)	radioactive purple fluorite vein in shear zones with pyrite in Tertiary Last Chance Andesite intruding Whitewater Creek rhyolite, up to 3.18% U_3O_8	USAEC PRR DEB-P-4-1461; USAEC ore production records; Collins, G.E., 1957; Anderson, O.J., 1980; Weber and Willard, 1959a; FN 4/8/81; White and Foster, 1981, #1
224	Evelyn No. 1 and 2	N½5T11SR19W 33°23'00"N 108°49'30"W	Holt Mountain 7½	Hydrothermal-vein	adit (65 ft. long)	radioactive shear zones in Tertiary Whitewater Creek rhyolite	USAEC PRR DEB-RRA-1438; Collins, G.E., 1957; Weber and Willard, 1959a; White and Foster, 1981, #2
225	Mogollon	7,8T9SR16W 11,12T9SR17W	Telephone Canyon 7½	Hydrothermal-vein	pits	radioactive opal in Tertiary lavas and tuffs, slightly above background radioactivity	USAEC PRR D-311

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
	<u>Grant County</u> [Black Range]						
226	Black Range-Dry Gallinas Canyon (Unknown)	SE¼23T16SR10W 33°53'45"N 107°50'30"W	San Lorenzo 15'	Volcanogenic	no workings	radioactivity associated with chert or opal in rhyolite boulders, 0.16, 0.068% U_3O_8	Lovering, 1956; Granger and others, 1952; USAEC PRR 3879; FN 7/21/80
227	Black Range-Wilderness Area	2,11,14T14SR10W 33°5'N 107°51"W	Victoria Peak 7½	?	no workings	pitchblende float (could not be verified by Granger and Bauer, 1950b)	Granger and Bauer, 1950b
	[Fierro-Hanover]						
228	Fierro-Hanover (Continental Mines Complex)	4,9T17SR12W 32°50'31"N 108°5'9"W	Santa Rita 7½	Orthomagmatic	open pit, shaft	porphyry copper deposit, 0.3-0.8 ppm U	Jones and others, 1967; Davis and Guilbert, 1973
229	Chino Mine (Santa Rita)	34T17SR12W 32°47'38"N 108°3'57"W	Santa Rita 7½	Orthomagmatic, hydrothermal-vein	open pit	radioactive veins and disseminations in south-western part of pit, .002-.003% U_3O_8, torbernite	Davis and Guilbert, 1973; Foram and Perhac, 1954; Granger and others, 1952; Allison and Ove, 1957; Kerr and others, 1950; Hernon and others, 1964
	[Burro Mountains District]						
230	Tyrone Copper Mine	14,22,23T19SR15W 32°38'25"N 108°22'20"W	Tyrone 7½	Orthomagmatic	open pit	porphyry copper deposit, torbernite and autunite in kaolinized areas of quartz monzonite laccolith	Kolessar, 1970; Gillerman, 1964; Raup, 1953; Hedlund, 1978f;
231	Anomaly No. 1 (Nigger Canyon)	NW¼11T19SR15W 32°40'30"N 108°21'55"W	Tyrone 7½	Hydrothermal-vein		radioactive fracture zones in Precambrian granite	USAEC, 1970, p. 26-27; Allison and Ove, 1957; Hedlund, 1978f
232	Anomaly No. 2 (Little Burro Mts.)	SW¼2T19SR15W 32°40'40"N 108°22'5"W	Tyrone 7½	Hydrothermal-vein	open pits	radioactive fracture zones in Precambrian granite	USAEC, 1970, p. 28-29; Allison and Ove, 1957; Hedlund, 1978f
233	Anomaly No. 3 (Red Rock Canyon, Tunoco Mining)	N½28T18SR15W 32°43'00"N 108°23'45"W	Wind Mountain 7½	Hydrothermal-vein		radioactive fracture zones in Precambrian granite	USAEC, 1970, p. 30-31; Allison and Ove, 1957; Hedlund, 1978a
234	Anomaly No. 4 (Little Burro Mts., Tunoco Mining, Redrock Canyon)	NE¼28T18SR15W 32°43'5"N 108°23'45"W	Wind Mountain 7½	Hydrothermal-vein	pits	radioactive fracture zones in Precambrian granite, 0.06-0.11% U_3O_8	USAEC, 1970, p. 32-33; Allison and Ove, 1957; Hedlund, 1978a; O'Neill and Thiede, 1981, #37
235	Section 21 18S 15W (Anomaly No. 5, Little Burro Mts., Oil Center Tool Co., Redrock Canyon)	21,28T18SR15W (line) 32°43'21"N 108°23'31"W	Wind Mountain 7½	Hydrothermal-vein	pits (37.52 tons of 0.04% U_3O_8, U.S. government ore production reports, 1948-1970)	radioactive quartzite along fault between Precambrian granite and Beartooth quartzite, .03% U_3O_8, uranophane, galena	USAEC, 1970, p. 34-36; Allison and Ove, 1957; USAEC PRR DEB-P-4-1478; Hedlund, 1978a; O'Neill and Thiede, 1981, #36
236	Copper King 1,2 (Whitewater Canyon)	15T19SR15W 32°24'30"N 108°23'40"W	Wind Mountain 7½	Hydrothermal-vein	30 ft. caved adit, pit, 60 and 200 ft. shafts (covered by Tyrone dumps)	radioactivity associated with copper mineralization along fractures in Precambrian granite, 0.005-0.016% U	O'Neill and Thiede, 1981, #38; USAEC PRR-M-854, D-694; Hedlund, 1978a, #10
237	Anomaly No. 10	SE¼36T18SR16W 32°31'5"N 108°26'50"W	Wind Mountain 7½	Hydrothermal-veins		radioactive veins in Precambrian granite	USAEC, 1970, p. 49-52; Allison and Ove, 1957; Hedlund, 1978a
238	Anomaly No. 9	SW¼36T18SR16W 32°31'5"N 108°27'00"W	Wind Mountain 7½	Hydrothermal-veins		radioactive veins in Precambrian granite	USAEC, 1970, p. 46-48; Allison and Ove, 1957; Hedland, 1978a
	[Black Hawk District]						
239	Silver King (Hobson)	NE¼21T18SR16W 32°43"40"N 108°24'55"W	Wind Mountain 7½	Hydrothermal-vein	300 ft adit, 2 inclined shafts	pitchblende reported in veins within a fault zone in Precambrian granite	Gillerman and Whitebread, 1956; Gillerman, 1964, p. 149; Hedlund, 1978a #20; FN 7/23/80
240	Black Hawk Mine (Good Hope, Alhambra, Hunecke)	21T18SR16W 32°43'35"N 108°30'00"W	Wind Mountain 7½, Redrock 15'	Hydrothermal-vein	5 shafts, 1 inclined shaft, trenches, pits (presently being dewatered)	pitchblende reported in veins along fault zone cutting Precambrian granite	Gillerman, 1964;1968; Keith, 1945; USAEC PRR-D-185, D-186, D-188, D-189,D-187; O'Neill and Thiede, 1981, #29, 30, 31, 32; Hedlund, 1978a; Gillerman and Whitebread, 1956; Granger, 1950; FN 7/23/80
241	Alhambra	SW¼21T18SR16W 32°43'10"N 108°29'55"W	Redrock 15'	Hydrothermal-vein	350 ft. inclined shaft, 420 ft. shaft, adit	pitchblende reported in veins along fault zone cutting Precambrian quartz diorite gneiss, sample 0.17% U_3O_8 (NM Bureau Chem Lab 10/20/80)	Gillerman, 1964, p. 146-149; Granger, 1950; Gillerman, 1968; Gillerman and Whitebread, 1956; O'Neill and Thiede, 1981, #33; FN 7/23/80

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
242	Rose	28,29 (line) T18SR16W 32°42'50"N 108°30'40"W	Redrock 15'	Hydrothermal-vein	200 ft shaft, 2 adits	pitchblende reported in veins along faults cutting Precambrian Burro Mountain granite	Gillerman, 1964; Gillerman and Whitebread, 1956; Granger, 1950; O'Neill and Thiede, 1981, #34; FN 7/23/80
243	Osmer Silver	SE¼29T18SR16W 32°42'10"N 108°29'50"W	Redrock 15'	Hydrothermal-vein	40 ft. shaft with drift	pitchblende reported in veins cutting Precambrian Burro Mountain granite	Gillerman, 1964, p. 151; O'Neill and Thiede, 1981, #354; FN 7/23/80
	[Malone District]						
244	Unknown (Little Cookie No. 1?)	18T20SR16W 32°34'5"N 108°32'20"W	Redrock 15'	Hydrothermal-vein	shaft, pit	radioactive psilomelane and quartz veins in Precambrian granite, 2-3 times background radioactivity	FN 7/22/80
245	Pitman Claims	CN½19T20SR16W 32°33'35"N 108°32'10"W	Redrock 15'	Hydrothermal-vein	pits	radioactive psilomelane veins in Precambrian granite, twice background radioactivity	USAEC, 1970, p. 23; FN 7/22/80; O'Neill and Thiede, 1981, #52x
246	Unknown	NW¼SE¼SE¼30T20SR16W 32°32'00"N 108°31'51"W	Redrock 15'	Hydrothermal-vein	shaft	radioactive vein	O'Neill and Thiede, 1981, #53
247	Unknown	SW¼NE¼SE¼6T21SR16W 32°30'25"N 108°31'23"W	Redrock 15'	Hydrothermal-vein	shaft	radioactive vein	O'Neill and Thiede, 1981, #54
	[Telegraph District]						
248	Purple Rock Mine	N½22T18SR18W 32°43'40"N 108°41'25"W	Redrock 15'	Hydrothermal-vein	adit, shafts, pits	radioactive quartz-fluorite veins in Tertiary rhyolite dike intruding Precambrian granite, 0.002-0.014% U_3O_8	Gillerman, 1964; Hewitt, 1959, p. 124; USAEC PRR DEB-A-532; McAnulty, 1978; Wolfe, 1953, p. 10; FN 8/19/80; O'Neill and Thiede, 1981, #20
249	Sandy Group	15,22 (line) T18SR18W 32°44'00"N 108°41'25"W	Redrock 15'	Hydrothermal-vein	80 ft. shaft, pits	radioactive quartz-fluorite veins in fractures in Precambrian granite, 0.03% U_3O_8	USAEC PRR A-22; Hewitt, 1959; O'Neill and Thiede, 1981, #21Y
250	Rambling Ruby	C 1T18SR17W 32°46'15"N 108°33'20"W	Cliff 15'	Hydrothermal-vein	pits, shaft, trenches	radioactive quartz veins and copper mineralization in Precambrian Burro Mountain granite, twice background radioactivity	Gillerman, 1964; FN 8/21/80
251	Prince Albert	1,2T18SR17W 32°46'10"N 108°33'40"W	Cliff 15'	Hydrothermal-vein	10 ft. pit	autunite associated with fractures in shear zone in Precambrian granite, 0.14% U_3O_8, 0.19% ThO_2	USAEC PRR DEB-P-4-1447; USAEC PRR DEB-P-4-1446; O'Neill and Thiede, 1981, #27, 28
252	Reed Mine	N½2T18SR17W 32°46'25"N 108°34'20"W	Cliff 15'	Hydrothermal-vein	3 shafts, trenches, open cuts	radioactive fluorite veins intruding Precambrian Burro Mountain granite, twice background radioactivity	Gillerman, 1964; FN 8/21/80
253	Purple Heart Mine	SE¼3T18SR17W 32°46'00"N 108°35'00"W	Cliff 15'	Hydrothermal-vein	65 and 108 ft. shafts, adit	radioactive fluorite veins in Precambrian Burro Mountain granite, twice background radioactivity	Gillerman, 1964; Hewitt, 1959; FN 8/21/80
254	Union Hill Claims - Wild Horse Mesa Area	NE¼10T18SR17W 32°45'25"N 108°34'40"W	Cliff 15'	Hydrothermal-vein, Unconformity-type (?)	180 ft. adit, cuts (adit driven by court order for assessment evaluation)	radioactivity along fractures and veins near contact between Beartooth quartzite and Precambrian Burro Mountain granite, 0.009, 0.15% U_3O_8 (NM Bureau Chem Lab 10/20/80)	Gillerman, 1964; FN 8/21/80; O'Neill and Thiede, 1981, #23
255	Springfield Claim	9T18SR17W 32°45'15"N 108°36'00"W	Cliff 15'	Hydrothermal-vein	2 pits	radioactive fault zone in Precambrian granite, uranophane	USAEC PRR DEB-P-4-1412; O'Neill and Thiede, 1981, #22; FN 7/22/80
256	Yukon Group (May Day 1,2)	35T17SR17W 2T18SR17W 32°46'30"N 108°34'20"W	Cliff 15'	Hydrothermal-vein		radioactive minerals along fault zone in Precambrian granite, 0.08% U_3O_8	USAEC PRR DEB-P-4-1448; O'Neill and Thiede, 1981, #24, 26Y
257	Unknown-Cliff-Gila area	SW¼22T16SR17W 32°53'52"N 108°35'40"W	Cliff 15'	Hydrothermal-vein (?)	2 caved shafts	radioactive veins in highly altered Schoolhouse Mountain volcanics	O'Neill and Thiede, 1981, #25
	[GILA DISTRICT]						
258	Clum, Aquilar Mines (George, Spar 1-6, East Vein)	28,33T14SR16W 33°2'30"N 108°30'00"W	Canteen Canyon 7½ Canyon Hill 7½	Hydrothermal-vein	shaft, trenches, pits, adit	radioactive fluorite in breccia fillings in Tertiary latite, andesite, 0.29 ppm U, 0.09 ppm Th	Birsoy, 1977; FN 7/25/80; Williams, 1966
	[White Signal District]						
259	Unknown-Tyrone	NE¼SE¼SE¼27T19SR15W 32°37'14"N 108°22'34"W	Burro Peak 7½	Hydrothermal-vein		radioactive anomaly in Tertiary Tyrone Stock	O'Neill and Thiede, 1981, #41
260	Unknown-Tyrone	SE¼SW¼SW¼28T19SR15W 32°37'15"N 108°24'12"W	Burro Peak 7½	Hydrothermal-vein	pits	radioactive anomaly in Tertiary Tyrone Stock	O'Neill and Thiede, 1981, #39
261	Unknown-Tyrone	NE¼SE¼NE¼32T19SR15W 32°36'52"N 108°24'30"W	Burro Peak 7½	Hydrothermal-vein		radioactive anomaly in Tertiary Tyrone Stock	O'Neill and Thiede, 1981, #40
2[illegible]	Austin-Amazon Mine (High Point Extension)	25,26,35,36T19SR16W 32°36'50"N 108°27'40"W	Burro Peak 7½	Hydrothermal-vein	200-400 ft. shafts, pits, trenches, short adits	radioactivity associated with copper mineralization along fault zone in Precambrian granite intruded by rhyolite, andesite, and quartz monzonite dikes	Gillerman, 1964; FN 7/22/80; Hedlund, 1978i, #25; USAEC PRR 1040

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
263	Unknown	NE¼SE¼NW¼14T20SR16W	Burro Peak 7½	Hydrothermal-vein		radioactive anomaly in Precambrian granite	O'Neill and Thiede, 1981, #48
264	Unknown (Barnett Shaft, Jimmy Thwarts, Wild Irishman claims)	NE¼NE¼NE¼26T20SR16W 32°32'40"N 108°27'35"W	Burro Peak 7½	Hydrothermal-vein	shafts, adits, pits	radioactive vein in Precambrian granite and rhyolite dike	O'Neill and Thiede, 1981, #50Y, USAEC PRR, no number
265	Summit (Wes Williams Shaft, Hope, No. 1)	C 23T20SR16W 32°34'15"N 108°27'50"W	Burro Peak 7½	Hydrothermal-vein	75 ft. shaft, pits	radioactive vein along basic dike intruding granite, copper oxides	USAEC PRR D-279; Gillerman, 1964; Hedlund, 1978i, #18
266	Little Cookie #1	18T20SR15W	Burro Peak 7½	Hydrothermal-vein		radioactive psilomeane vein in Precambrian Burro Mountain granite	USAEC, 1970, p. 20, O'Neill and Thiede, 1981, #122x
267	Red Hill Turquoise Mine	NE¼16T20SR15W 32°34'15"W 108°24'00"W	Burro Peak 7½	Hydrothermal-vein	3 pits, adit, open cut	radioactive fault gouge, 0.007% U	USAEC PRR 3909; Hedlund, 1978i, #30; Gillerman, 1964; O'Neill and Thiede, 1981, #62
268	High Noon No. 1 Claim (Unnamed, Pegmatite)	17,20T20SR15W 32°33'50"N 108°24'30"W	Burro Peak 7½	Pegmatite	open cut	pegmatite in Precambrian granite, euxenite	Gillerman, 1964; Hedlund, 1978i, #29; O'Neill and Thiede, 1981, #63Y; PRR DEB-P-4-1455; Adams and others, 1980
269	Buckhorn No. 2 Claim	19T20SR15W 32°33'30"N 108°25'30"W	Burro Peak 7½	Hydrothermal-vein	pit	radioactive vein in Precambrian granite	USAEC PRR 3877; O'Neill and Thiede, 1981, #51Y; Keith, 1945
270	Monarch No. 2, Moneymaker, Wild-Irishman Claims	19T20SR15W 32°33'50"N 108°26'30"W	Burro Peak 7½	Hydrothermal-vein	pit	fluorite and autunite in veins cutting rhyolite dike and Precambrian Burro Mountain granite, 0.011% U	USAEC PRR 3875; Lovering, 1956; Bauer, 1950a; Granger and others, 1952
271	Pegmatites	NW¼28T20SR15W 32°32'30"N 108°24'20"W	Burro Peak 7½	Pegmatite	2 pits	5-10 ft pegmatite in Precambrian Burro Mountain granite, euxenite	Gillerman, 1964; Hedlund, 1978i, #28; FN 7/25/80
272	Paymaster, Silver Lode	W½21,28T20SR15W 32°32'50"N 108°24'15"W	Burro Peak 7½	Hydrothermal-vein	2 shafts, pits, adit	radioactive veins in rhyolite and basic dikes and Precambrian Burro Mountain granite	Gillerman, 1964; Hedlund, 1978i, #6; O'Neill and Thiede, 1981, #64Y, 66Y, 67Y
273	Lindsey No. 2	21T20SR15W 32°33'20"N 108°23'46"W	Burro Peak 7½	Hydrothermal-vein	pits	radioactive vein in Precambrian basic dike intruding granite	USAEC PRR D-196; Hedlund, 1978i; O'Neill and Thiede, 1981, #68Y, 70Y
274	Alhambra #1-Blue Bell #2-Lindsey #2 (Denver claims)	NE¼21T20SR15W 32°33'28"N 108°23'50"W	Burro Peak 7½	Hydrothermal-vein	2 shafts, trench, pits	radioactive veins along fractured diabase dike in Precambrian Burro Mountain granite, metatorbernite, twice background radioactivity	Gillerman, 1964; Keith, 1945; Hedlund, 1978i, #4; Anderson, O.J., 1980; FN 7/12/80; O'Neill and Thiede, 1981, #69; USAEC PRR D-187, D-191, D-192; USAEC, 1970, p. 21
275	Lettie May	22T20SR15W 32°33'20"N 108°23'15"W	Burro Peak 7½	Hydrothermal-vein	2 shafts, 2 pits	radioactive quartz-pyrite veins in Precambrian Burro Mountain granite	USAEC PRR D-194; D-193 Hedlund, 1978i; O'Neill and Thiede, 1981, #85, 86
276	Floyd Collins (Leachs)	21,22 (line) T20SR15W 32°33'15"N 108°23'25"W	Burro Peak 7½	Hydrothermal-vein	40 ft. and 80 ft. shafts, pits, open cuts (165 tons 0.15% U_3O_8 produced, U.S. government ore production reports, 1948-1970)	radioactive veins in altered diabase dike and Precambrian Burro Mountain granite, autunite, torbernite, 0.77% U_3O_8, up to 30 times background radioactivity	Gillerman, 1964; 1953; Keith, 1945; FN 7/12/80; USAEC PRR D-190; Anderson, 1980 O'Neill and Thiede, 1981, #71; Hilpert, 1969; Hedlund, 1978i, #5
277	Merry Widow (Leachs Claims, Hill Claims)	S½22T20SR15W 32°33'10"N 108°23'00"W	Burro Peak 7½	Hydrothermal-vein	150 ft. shaft, pits, trenches, 16 ft. shaft (unknown radium production in 1920's)	radioactive quartz-pyrite vein and altered diabase dike in Precambrian Burro Mountain granite, tobernite, autunite, 0.02% U_3O_8 (NM Bureau Chem Lab 10/20/80), up to 15 times background radioactivity	Gillerman, 1964, 1953 1968; Keith, 1944, 1945; FN 7/13/80; Hedlund, 1978i, #11; Anderson, O.J., 1980; O'Neill and Thiede, 1981, #72; Lovering, 1956; Granger and others, 1952; USAEC PRR D-196, 3872, 3913
278	Arrowhead Claim	22,27T20SR15W 32°32'45"N 108°22'50"W	Burro Peak 7½	Hydrothermal-vein	trench, 30 ft. shaft, pit	radioactive vein in Precambrian Burro Mountain granite and latite dike, 0.026-0.109% eU_3O_8	USAEC PRR DEB-P-4-1445; O'Neill and Thieda, 1981, #76Y
279	Acme-Utah-California (Hill Claims)	SE¼22T20SR15W 32°33'10"N 108°22'40"W	Burro Peak 7½	Hydrothermal-vein	2 shafts (18 and 35 ft.), pits, road cuts	radioactive vein in Precambrian diabase and rhyolite dike in Burro Mountain granite	Gillerman, 1964; Hedlund, 1978, #9, 10; USAEC PRR 3910, 3912; O'Neill and Thiede, 1981, #73-75; Keith, 1945; FN 7/12/80

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
280	Edmonds shaft	C 34T20SR15W 32°31'29"N 108°22'50"W	Burro Peak 7½	Hydrothermal-vein	shaft	radioactive vein in Precambrian Burro Mountain granite	Hedlund, 1978i, #7; Gillerman, 1964 O'Neill and Thiede, 1981, #79y
281	Little Burro Mountains	27,28,34T19SR15W	Burro Peak 7½	Hydrothermal vein		radioactive vein in Precambrian granite and Beartooth quartzite	Hedlund, 1978i; Gillerman, 1964
282	John Malone Shaft	SE¼16T20SR16W	Burro Peak 7½	Hydrothermal-vein	shaft, pits	radioactive veins in Precambrian granite	Hedlund, 1978i, #27
283	Bisbee	SE¼27T20SR15W 32°32'00"N 108°23'00"W	Burro Peak 1½	Hydrothermal-vein	80-90 ft. shaft, 100 ft. adit, pits	radioactive vein in Precambrian Burro Mountain granite, diabase dike and rhyolite dike	Gillerman, 1964; Hedlund, 1978i, #8; O'Neill and Thiede, 1981, #78Y
284	Edwards No. 5 Claim	27T20SR15W 32°32'00"N 108°22'35"W	Burro Peak 7½	Hydrothermal-vein	pit	radioactive vein in Precambrian granite	USAEC PRR D-178; O'Neill and Thiede, 1981, #77Y
285	Blue Jay	23,26T20SR15W 32°32'40"N 108°21'50"W	White Signal 7½	Hydrothermal-vein	pits, trenches, shaft (Granger and others, 1952 reported 2400 tons of 0.04-0.01% U reserves)	radioactive quartz-pyrite vein along Blue Jay Fault in Precambrian Burro Mountain granite, 0.019-0.22% U, torbernite, autunite, pitchblende reported	USAEC PRR D-170; Gillerman, 1964; Hedlund, 1978j, #2; Anderson, O.J., 1980; FN 7/12/80; O'Neill and Thiede, 1981, #100, 101, 106; Granger and Bauer, 1951; Granger and others, 1952
286	Banner	N½26,27T20SR15W 32°32'40"N 108°22'25"W	White Signal 7½	Hydrothermal-vein	shaft, pits	radioactive quartz-pyrite vein along Blue Jay Fault in Precambrian Burro Mountain granite	Hedlund, 1978j, #6; Gillerman, 1964; O'Neill and Thiede, 1981, #80, 81y, 107Y
287	Red Bird	SW¼23T20SR15W 32°33'00"N 108°22'15"W	White Signal 7½	Hydrothermal-vein	200 ft. shaft	mineralized quartz-pyrite vein in rhyolite dike and Precambrian Burro Mountain granite, radioactive clay	Gillerman, 1964; Hedlund, 1978j, #11 Keith, 1945; O'Neill and Thiede, 1981, #82; USAEC PRR 3943
288	Shamrock	SW¼23T20SR15W 32°33'12"N 108°22'5"W	White Signal 7½	Hydrothermal-vein	30 ft. shaft, pits, trenches	radioactive quartz-pyrite veins in 2 diabase dikes and Precambrian Burro Mountain granite, torbernite	USAEC PRR 3939; Anderson, 1980; Keith, 1945; Gillerman, 1964; O'Neill and Thiede, 1981, #84; Hedlund, 1978j, #5
289	New Years Gift	S½23T20SR15W 32°33'8"N 108°22'18"W	White Signal 7½	Hydrothermal-vein	2 shafts (now covered by Highway 180)	tobernite-bearing quartz-pyrite veins in diabase dike intruding Precambrian Burro Mountain granite	Gillerman, 1964, p. 96-97; Keith, 1945; Hedlund, 1978j; O'Neill and Thiede, 1981, #94Y
290	Calamity Mine	SE¼23T20SR15W 32°32'55"N 108°21'30"W	White Signal 7½	Hydrothermal-vein	2 shafts, trenches, pits	radioactive vein intersects diabase dike in Precambrian granite	Gillerman, 1968; Hedlund, 1978j; O'Neill and Thiede, 1981, #99; Anderson, O.J., 1980
291	Paddy Ford (Book Claims, Wisconsin Group)	SE¼23T20SR15W 32°33'5"N 108°21'40"W	White Signal 7½	Hydrothermal-vein	120 ft. shaft	quartz-pyrite vein with secondary uranium minerals along diabase and rhyolite dikes in Precambrian granite	Gillerman, 1964; Hedlund, 1978j; Keith, 1945; O'Neill and Thiede, 1981, #95
292	Copper Glance	NE¼23T20SR15W 32°33'00"N 108°21'25"W	White Signal 7½	Hydrothermal-vein	85 ft. shaft, trench, cut, pit	radioactive quartz-pyrite vein cutting rhyolite dike in Precambrian granite	Gillerman, 1964, p. 98-99; Hedlund, 1978j, #21; O'Neill and Thiede, 1981, #93Y; USAEC PRR 3944
293	Combination	NE¼23T20SR15W 32°33'30"N 108°21'25"W	White Signal 7½	Hydrothermal-vein	3 shafts, pits	metatorbernite in parallel veins cutting Precambrian granite	Gillerman, 1964; Keith, 1945; USAEC PRR 3949; O'Neill and Thiede, 1981, #92; Hedlund, 1978j #22
294	Wisconsin Group (Book Claims, Alberstine, Fitzi, Janet)	23,24T20SR15W 32°33'15"N 108°21'10"W	White Signal 7½	Hydrothermal-vein	pits	weakly radioactive diabase dikes in Precambrian Burro Mountain granite	USAEC PRR D-159, 162, 163, 164; Keith, 1945; O'Neill and Thiede, 1981, #91, 96, 98; Hedlund, 1978j
295	Lone Jack	24T20SR15W 32°33'12"N 108°21'00"W	White Signal 7½	Hydrothermal-vein	pits	torbernite and pyrite veins in Precambrian Burro Mountain granite	USAEC PRR 3950; O'Neill and Thiede, 1981, #97y
296	Inez-Hummer (Good Luck, 7-X-V-Ranch)	SE¼24T20SR15W 32°32'58"N 108°21'5"W	White Signal 7½	Hydrothermal-vein	open cuts, 100 ft. adit, pits, shaft (262 tons 0.16% U_3O_8 produced, U.S. government ore production reports, 1948-1970)	radioactive quartz-pyrite veins and diabase dike intruding Precambrian Burro Mountain granite, torbernite	Anderson, O.J., 1980; Gillerman, 1964, p. 93; Hilpert, 1969; Hedlund, 1978j #4,10; O'Neill and Thiede, 1981, #108, 109Y; Keith, 1945

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
297	Bouncing Bet	24T20SR15W 32°33'10"N 108°20'30"W	White Signal 7½	Hydrothermal-vein	2 shafts, pits, trenches	radioactive quartz-pyrite veins and mafic dike intruding Precambrian granite, 0.020% U, copper oxides, twice background radioactivity	USAEC PRR D-164,163, 159, 162; Hedlund, 1978j, #9; Gillerman, 1964, p. 101; O'Neill and Thiede, 1981, #110, 111, 112; FN 8/20/80
298	Eugenie	NE¼26T20SR15W 32°32'30"N 108°21'30"W	White Signal 7½	Hydrothermal-vein	80 ft. shaft	radioactive quartz-pyrite vein in diabase dike and Precambrian Burro Mountain granite, torbernite	Anderson, O.J., 1980; Gillerman, 1964; Hedlund, 1978j, #3; O'Neill and Thiede, 1981, #102; USAEC PRR D-173
299	Unknown	NE¼NE¼SE¼26T20SR15W 32°31'45"N 108°21'25"W	White Signal 7½	Hydrothermal-vein	small pit	radioactive quartz-pyrite vein in Precambrian granite, 292 ppm U_3O_8, copper oxides	O'Neill and Thiede, 1981, #104Y; USAEC PRR D-175; Hedlund, 1978j
300	Tunnel Site No. 1	26T20SR15W 32°32'25"N 108°21'20"W	White Signal 7½	Hydrothermal vein	10 ft. shaft, 250 ft. adit with 20 ft. and 40 ft. winzes	radioactive quartz-pyrite vein along contact between Precambrian granite and Tertiary rhyolite dike, 0.001% U	Granger and Bauer, 1950a; Granger and others, 1952; USAEC PRR D-174; Hedlund, 1978j, #3A; O'Neill and Thiede, 1981, #103; Lovering, 1956; FN 7/21/80
301	Tullock Peak (Anomaly No. 8, White Signal)	SE¼25T20SR15W 32°32'20"N 108°21'40"W	White Signal 7½	Hydrothermal-vein	3 shafts (deepest to 260 ft.), pits, cuts	radioactive copper veins in Precambrian Burro Mountain granite and diabase dike, torbernite	Gillerman, 1964; Keith, 1944; Hedlund, 1978j, #7; O'Neill and Thiede, 1981, #105; Allison and Ove, 1957; FN 7/21/80; USAEC, 1970, p.43-45
302	Chapman Turquoise Mine	25T20SR15W 32°32'20"N 108°20'20"W	White Signal 7½	Hydrothermal-vein	shaft, adit	radioactive veins and diabase dike in Precambrian Burro Mountain granite	Gillerman, 1964; Hedlund, 1978j, #8; O'Neill and Thiede, 1981, #113; FN 8/20/80
303	Unknown Pegmatites	W½30T20SR14W 32°32'8"N 108°20'10"W	White Signal 7½	Pegmatite	open cuts	pegmatite in Precambrian granite with rare-earth and uranium minerals	Hedlund, 1978j, #26; O'Neill and Thiede, 1981, #114, 115
304	Black Beauty Lode (Anomaly No. 7?)	35T20SR15W 32°31'30"N 108°21'50"W	White Signal 7½	Hydrothermal-vein	open cut (no workings found 7/21/80)	radioactive vein in Precambrian granite	U.S. Bureau of Mines classified reports USAEC, 1970,p.40-42
305	Uncle Sam and adjacent properties	29-32T20SR14W 32°31'30"N 108°18'45"W	White Signal 7½	Hydrothermal-vein	pits, shafts, adits	radioactive silver-lead vein along Uncle Sam fault in Precambrian granite, up to four times background radioactivity	Granger and others, 1952; Gillerman, 1964; 1968; Hedlund 1978j, #16; Lovering, 1956; USAEC PRR-3951, 3954; USAEC, 1970, p. 22; O'Neill and Thiede, 1981, #116-121; FN 7/12/80
306	Unknown	23T20SR14W 32°33'17"N 108°16'45"W	White Signal 7½	Hydrothermal-vein	pits	radioactive vein in Precambrian granite	USAEC PRR, no number; O'Neill and Thiede, 1981, #61Y
307	Golden Eagle	14T20SR15W 32°34'15"N 108°21'40"W	White Signal 7½	Hydrothermal-vein	pits, shaft (80-90 ft. deep)	radioactivity along vein and diabase dike intruding Precambrian Burro Mountain Granite, twice background radioactivity	O'Neill and Thiede, 1981, #88, 89; Gillerman, 1964, p. 99; Hedlund, 1978j, #15; FN 7/12/80
308	Red Dodson	E½14T20SR15W 32°34'5"N 108°21'30"W	White Signal 7½	Hydrothermal-vein	pits, 200 ft. adit, 60-80 ft. shaft	radioactivity associated with quartz-pyrite vein in Precambrian Burro Mountain Granite	Gillerman, 1964, p. 100; Hedlund, 1978j, #14; FN 7/12/80;
309	Unknown	NE¼SE¼NW¼14T20SR15W 32°34'15"N 108°21'52"W	White Signal 7½	Hydrothermal-vein		radioactive vein in Precambrian granite	USAEC PRR, no number; O'Neill and Thiede, 1981, #87Y
310	Unknown	13T20SR15W 32°34'2"N 108°20'50"W	White Signal 7½	Hydrothermal-vein		radioactive vein in Precambrian granite	USAEC PRR, no number; O'Neill and Thiede, 1981, #91Y
311	Apache Trail-Black Cat	NE¼2T20SR15W 32°36'00"N 108°21'20"W	White Signal 7½	Hydrothermal-vein	200 ft. shaft, inclined shaft, pits	radioactive fault zone in Precambrian granite intruded by quartz veins, diabase dike, metatorbernite, 0.008-0.041% U_3O_8, copper minerals	Gillerman, 1964; Hedlund, 1978j, #23; USAEC PRR DEB-P-4-1464, 1467, D-181; Keith, 1945; Bauer, 1951; O'Neill and Thiede, 1981, #47Y; Granger and others, 1952
312	Miss Virginia Lode	SW¼NW¼SE¼36T19SR15W 32°36'27"N 108°20'50"W	White Signal 7½	Hydrothermal-vein	10-15 ft. shaft, 2 pits	radioactive vein along fault in Precambrian granite, autunite	USAEC PRR D-184; Hedlund, 1978j; O'Neill and Thiede, 1981, #44Y
313	Unknown	NE¼SW¼SW¼36T19SR15W 32°36'25"N 108°21'7"W	White Signal 7½	Hydrothermal-vein		radioactive anomaly in in Precambrian granite	USAEC PRR, no number; O'Neill and Thiede, 1981, #46Y

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
314	Unknown	NE¼SW¼NW¼36T19SR15W 32°36'45"N 108°21'10"W	White Signal 7½	Hydrothermal-vein		radioactive anomaly in Precambrian granite	USAEC PRR D-183; O'Neill and Thiede, 1981, #42Y
315	Unknown	SW¼SW¼NW¼36T19SR15W 32°36'45"N 108°21'17"W	White Signal 7½	Hydrothermal-vein		radioactive anomaly in Precambrian granite	USAEC PRR D-182; O'Neill and Thiede, 1981, #43Y
3[illegible]	Hines-Werney	NE¼34T21SR14W 32°26'25"N 108°16'40"W	Werney Hill 7½	Hydrothermal-vein	40 ft. shaft, pit, trenches	radioactive zones along fault and bedding planes in breccia zone cutting Cambrian Bliss Sandstone, 0.004-0.027% U_3O_8, 0.02% U_3O_8 (NM Bureau Chem Lab 10/20/80), up to 40 times background radioactivity	O'Neill and Thiede, 1981, #60; FN 8/20/80; Hedlund, 1978g, #1; Lovering 1956; Gillerman, 1952; 1964; Williams, 1966; USAEC PRR DEB-P-4-1456
317	Anomaly No. 15 (Gold Hill)	NW¼31T21SR15W 32°26'20"N 108°26'15"W	C-Bar Ranch 7½	Hydrothermal-vein-Unconformity-type		radioactive veins along contact between Precambrian granite and Beartooth quartzite	USAEC, 1970, p. 52; Allison and Ove, 1957; Hedlund, 1978h
318	Anomaly No. 16 (Gold Hill)	NE¼31T21SR15W 32°26'15"N 108°25'50"W	C-Bar Ranch 7½	Hydrothermal-vein-Unconformity-type		radioactive veins along contact between Precambrian granite and Beartooth quartzite	USAEC, 1970, p. 53; Allison and Ove, 1957; Hedlund, 1978h
319	Anomaly No. 17 (Gold Hill)	S½31T21SR15W 32°26'00"N 108°26'00"W	C-Bar Ranch 7½	Hydrothermal-vein-Unconformity-type		radioactive veins along contact between Precambrian granite and Beartooth quartzite	USAEC, 1970, p. 54; Allison and Ove, 1957; Hedlund, 1978h
320	White Top Hill	S½27T21SR16W 32°27'00"N 108°28'50"W	C-Bar Ranch 7½	Pegmatite	pit	zoned radioactive pegmatite intruding Precambrian granite	Gillerman, 1964, p. 127; Hedlund, 1978h
	[Gold Hill District]						
321	Grandview Group	17,18,22,23T22SR16W 32°23'30"N 108°30'45"W	Gold Hill 7½, Lisbon 7½	Hydrothermal-vein	2 pits	radioactive veins in Precambrian granite and basic dikes, 0.067% U_3O_8	USAEC PRR DEB-P-4-1449; O'Neill and Thiede, 1981, #58Y
322	North and South Pegmatites (White Top, Gold Hill Pegmatites)	SE¼29T21SR16W 32°27'28"N 108°29'58"W	Gold Hill 7½	Pegmatite	40 ft. adit, 20 ft. shaft, pits	pegmatites intruding Precambrian Burro Mountain granite, euxenite, samarskite	Hedlund, 1978d, #25; Gillerman, 1964; FN 7/13/80; Boyd and Wolfe, 1953
323	Coop Mine area (Good Luck)	SE¼29SW¼28 T21SR16W 32°27'10"N 108°29'58"W	Gold Hill 7½	Hydrothermal-vein	shaft, pits, adits	radioactive silver-lead veins in fault cutting Precambrian Burro Mountain granite, 235 ppm U_3O_8	Gillerman, 1964; Hedlund, 1978d, #22 FN 7/13/80; O'Neill and Thiede, 1981, #57
324	White Rock Pegmatites	SE¼13 T21SR16W 32°30'00"N 108°33'14"W	Gold Hill 7½	Pegmatite	pits, trench	radioactive zoned pegmatite intruding Precambrian granite, euxenite, allanite, samarskite	Gillerman, 1964; Hedlund, 1978d, #24; O'Neill and Thiede, 1981, #55
325	Rhoda #1-8, Beal #1-2, Ruby #1-5, Rugby #6-15, Sidney #1-7	1,12T21SR17W 6,7T21SR16W 32°29'N 108°32'W	Gold Hill 7½ Redrock 15'	Pegmatite	pits, 20 ft. shaft, 10 ft. adit, road cuts	radioactive zoned pegmatite intruding Precambrian granite, euxenite, allanite, samarskite	USAEC PRR DEB-A-515; O'Neill and Thiede, 1981, #56x
	[Langford District]						
326	Langford Fluorspar	25,36T22SR16W 32°21'35"N 108°26'28"W	Ninetysix Ranch 7½	Hydrothermal-vein	pit	radioactive breccia zone 5 ft. wide in Precambrian granite which is intruded by rhyolite and diabase dikes, autunite, fluorite	Hedlund, 1978c, #2; Gillerman, 1952; 1964; Gillerman and Granger, 1952; Granger and others, 1952; O'Neill and Thiede, 1981, #59x
	[Steeple Rock District]						
327	Carlisle Claims	1,12T17SR21W	Steeple Rock 15'	Hydrothermal vein	shafts, pits	radioactive fault zones in Tertiary rhyolite	USAEC, PRR DEB-RRA-1169
	Hidalgo County						
328	Unknown (Peloncillo Mountains)	32T27SR20W 31°54'45"N 108°54'10"W	Pratt 15'	Vein in sedimentary rock	open pit	fault zone in Cretaceous Sarten Sandstone	Walton and others, 1980; USAEC PRR DEB-RRA-1196
329	Unknown (Animas)	8,9T29SR21W (unsurveyed) 31°48'N 108°59'W	Pratt 15'	Volcanogenic		radioactive zone in conglomerate in Tertiary volcanic breccia, 0.13% eU_3O_8	USAEC, 1970, p. 57; Walton and others, 1980; May and others, 1981, #6x
330	Napone (Occidental, Yucca, Nutshell)	S½25T29SR14W 31°45'15"N 108°12'50"W	Victoria Ranch 7½	Hydrothermal-vein	trench (9 tons 0.19% U_3O_8, U.S. government ore production reports, 1948-1970)	radioactive veins in silicified U-Bar Formation-Oyster Member, 0.084-0.474% U_3O_8, up to 60 times background radioactivity	Anderson, O.J., 1980; Elston, 1965, p. 212; Hilpert, 1969; Walton and others, 1980; May and others, 1981, #8; FN 12/2/81
331	Unknown-Gold Hill	15,22T21SR17W	Gold Hill 7½	Pegmatite	pits	pegmatite intruding Precambrian granite, euxenite, allanite, cyrtolite, samarskite, radioactive magnetite	USAEC PRR DEB-A-518; Boyd and Wolfe, 1953, p. 142; Gillerman, 1964; Adams and others, 1980
332	Unknown-Lordsburg	34T22SR19W 32°20'59"N 108°47'25"W	Gary 7½	Volcanogenic	pits, open cuts	slightly radioactive zone in rhyolite and andesite (Tertiary), jarosite reported but not seen on 12/1/81	USAEC PRR DEB-A-519, FN 12/1/81

Map No.	Name	Location	Quadrangle	Type	Development	Host rock, mineralization	Source of data
333	Anomaly No. 11 (Pyramid Mountains)	5T26SR18W	South Pyramid Peak 7½	Volcanogenic		radioactive opal in fault zone cutting Tertiary rhyolite, 0.002% U_3O_8	Allison and Ove, 1957
334	Anomaly No. 12 (Big Hatchet Mountains)	31T30SR15W	Big Hatchet Peak 15'	Hydrothermal-vein		radioactive fault zone between Precambrian granite and arkosic sediments, 0.005% U_3O_8	Allison and Ove, 1957
335	Anomaly No. 13 (Big Hatchet Mountains)	20T32SR14W	Big Hatchet Peak 15'	Orthomagmatic		radioactive Tertiary rhyolite	Allison and Ove, 1957
336	Opportunity Claims (Neglect, Dog Claims)	SE¼15T34SR15W 31°20'50"N 108°21'00"W	Dog Mountains 15', Dog Mountains SE 7½'	Volcanogenic	2 pits	radioactive opal veins in fault zone cutting Tertiary Oak Creek Tuff (rhyolite), 0.16-0.77% U_3O_8, up to 22 times background radioactivity (FN 12/3/81)	Elston and Erb, 1979, USAEC PRR DEB-RRA-1437; Walton and others, 1980; Keith, 1969; Reiter, 1980; May and others, 1981, #7
337	Anomaly No. 14	14T34SR16W	Dog Mountains 15'	Orthomagmatic		radioactive Precambrian granite	Allison and Ove, 1957
	Luna County						
338	Cooks Peak	29T20SR8W	Lake Valley 15'	Hydrothermal-vein	shafts, pits, adits, trenches	radioactive fractures and lenses in Mississippian Lake Valley Limestone, copper oxides	USAEC PRR DEB-RRA-1145
339	Lookout Claims 1-3 (Bond Prospect)	SE¼11,NW¼13T20SR9W	Dwyer 15', Lake Valley 15'	Hydrothermal-vein	open cuts	radioactive fluorite-galena veins	USAEC, 1970, p. 69; Williams, 1966; Rothrock and others, 1946
340	High Hope Claims 1-8	12T29SR11W	Hermanas 7½	Hydrothermal-vein	pit	radioactive fault zone in limestone breccia, autunite reported	USAEC PRR DEB-P-4-1457
341	Rambler No. 1	2T28SR9W	Columbus 7½	Hydrothermal-vein	2 shafts, pits	radioactive quartz-pyrite vein	USAEC PRR DEB-RRA-1191
	Dona Ana County						
342	Blue Star (Diamond Gravel Mine, Ellingson)	SW¼NW¼25T24SR3E 32°22'25"N 107°35'42"W	Bishop Cap 7½	Hydrothermal-vein	30 ft. adit, 75 ft. adit, open cuts (12 tons of 0.06% U_3O_8 produced, U.S. government ore production reports, 1948-1970)	radioactive fluorite veins in fault zone cutting Pennsylvanian Magdalena Group, 0.17% U_3O_8	USAEC, 1970, p. 15; Williams, 1966; Seager, 1973; USAEC PRR F-1036; Anderson, 1980; McAnulty, 1978, p. 24; Kottlowski, 1961
343	Unknown-Mesilla Park	13,24,25T24SR3E	Bishop Cap 7½	Hydrothermal-vein	pits	radioactive fluorite veins in fault zone cutting Pennsylvanian Magdalena Group, 0.057% U_3O_8	USAEC PRR DEB-RRA-1424 (see above)

Appendix II

Reports and maps of aerial-radiometric and magnetic surveys done in New Mexico

Andreasen, G.E., Kane, M.F., and Zietz, I., 1960, Regional geological interpretation of aeromagnetic and gravity data for Rowe-Mora area, New Mexico: U.S. Geol. Survey, Prof. Paper 400-B, p. 238-239.

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

Bath, G.D., 1976, Interpretation of magnetic surveys in intermontane valleys of Nevada and southern New Mexico: U.S. Geol. Survey, Open-file Rept. 76-440, p. 15.

Bath, G.D., 1977, Aeromagnetic maps with geologic interpretations for the Tularosa Valley, south-central New Mexico: U.S. Geol. Survey, Open-file Rept. 77-258, map scale 1:62,500 and 1:400,000.

Carson Helicopters, Inc., 1981a, NURE aerial gamma-ray and magnetic reconnaissance survey of portions of New Mexico, Arizona and Texas; Vol. II, New Mexico - Roswell NI 13-8 quadrangle: U.S. Dept. Energy, Open-file Rept. GJBX-412(81), 23 p., maps.

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Appendix III

Reports containing uranium and thorium chemical analyses of water and stream-sediment samples (the HSSR studies) done in New Mexico

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Appendix IV

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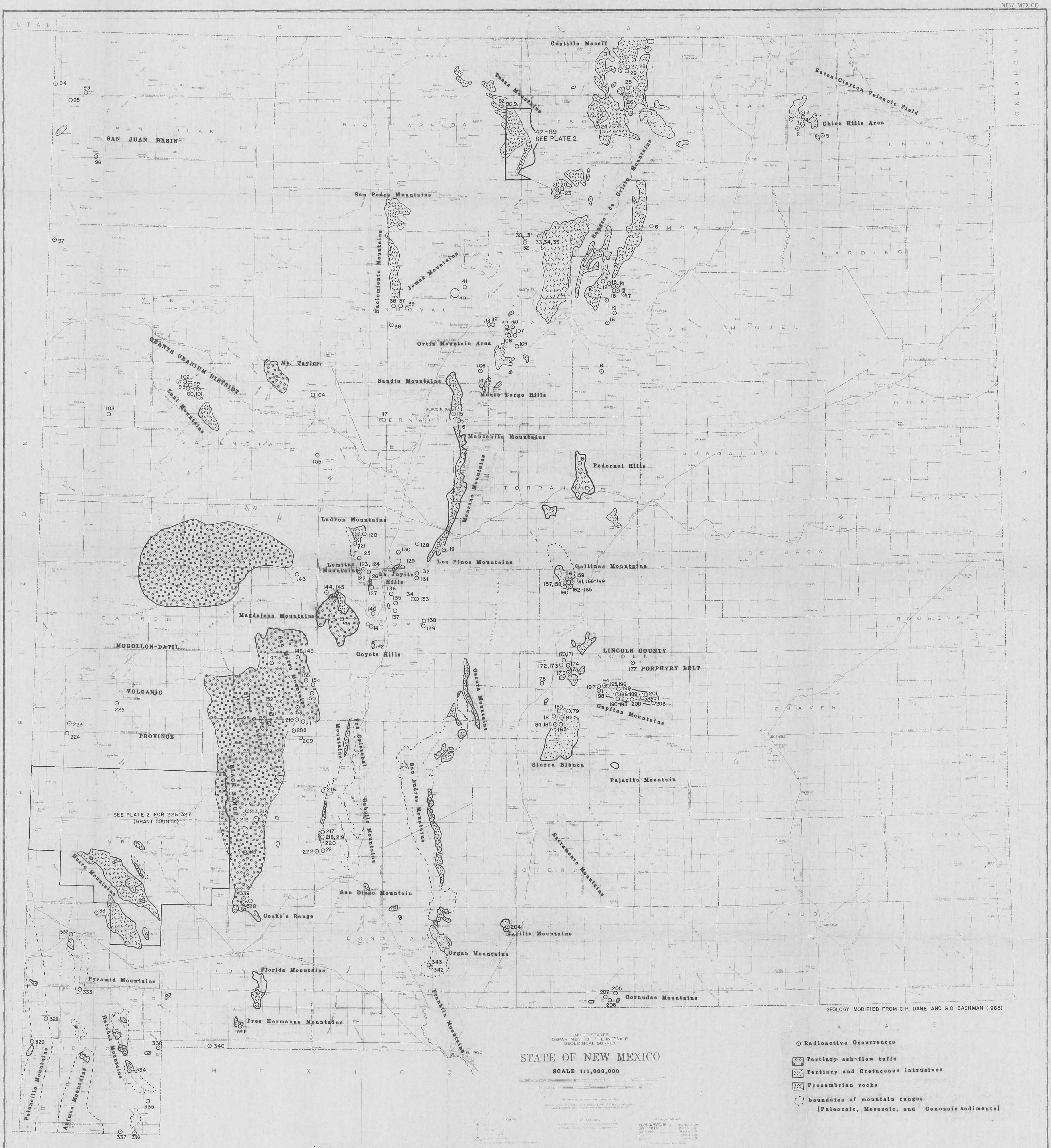
PLATE 1

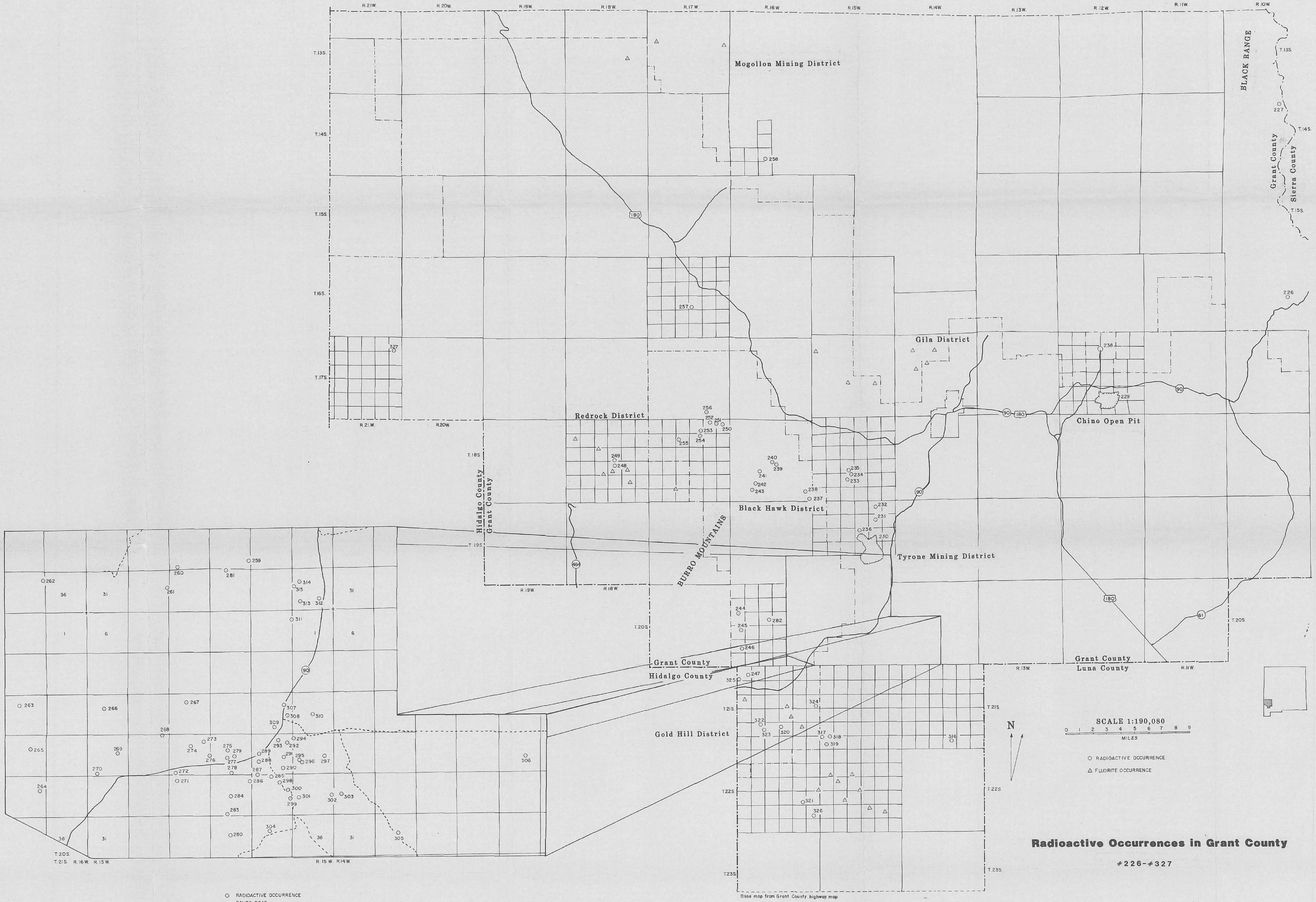
OPEN-FILE REPORT 155



Radioactive Occurrences in Veins and Igneous and Metamorphic Rocks in New Mexico

PLATE 2

OPEN-FILE REPORT 155



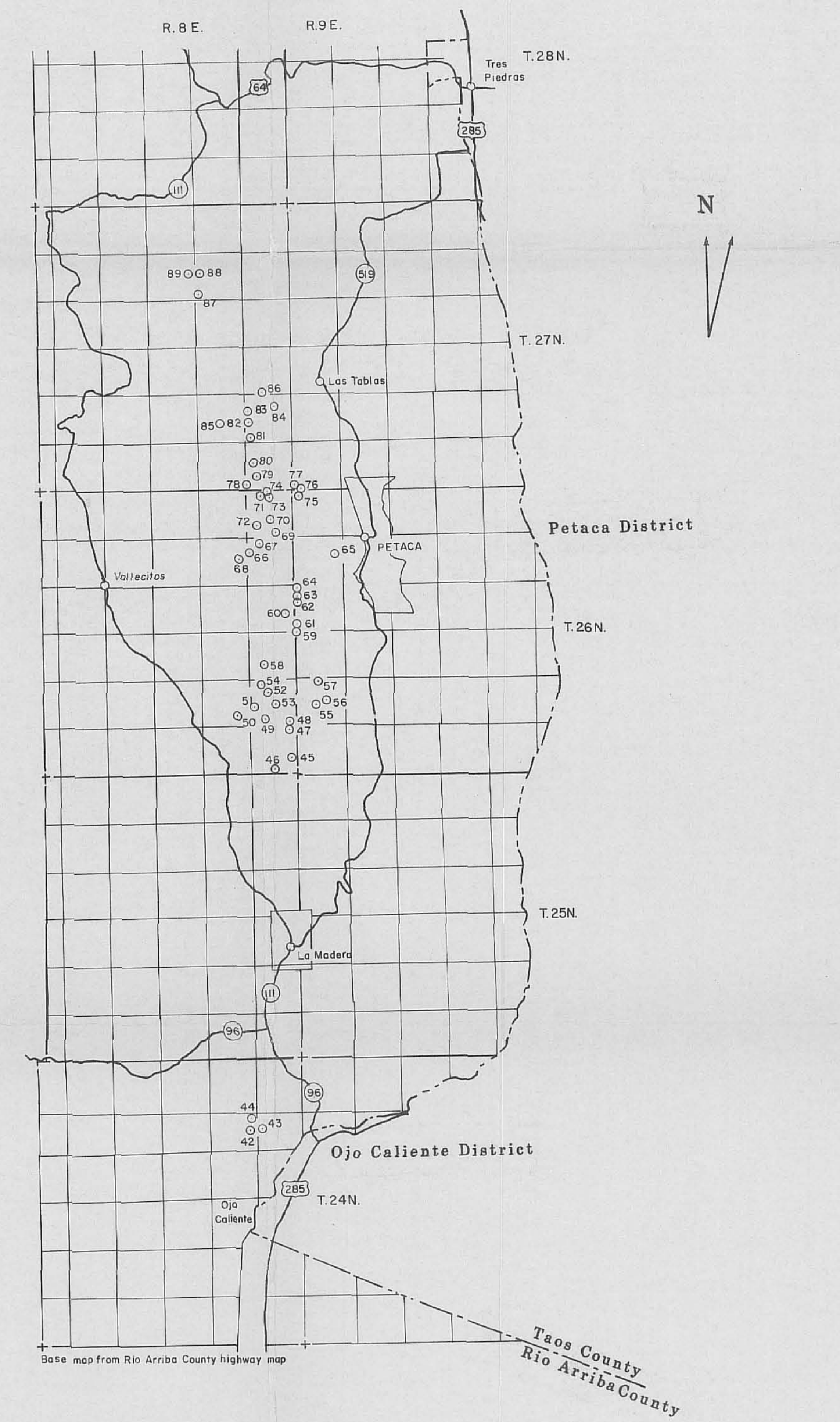
Radioactive Occurrences in Grant County

#226-#327

Radioactive Occurrences in the White Signal District, Grant County #259-#281, #283-#315

SCALE 1 in = 1 mi

MILES



Radioactive Occurrences in part of Rio Arriba County #42-#89

SCALE 1:126,720

MILES

RADIOACTIVE OCCURRENCES

PAVED ROADS

Radioactive Occurrences in Veins and Igneous and Metamorphic Rocks in Grant and part of Rio Arriba Counties