New Mexico Bureau of Mines & Mineral Resources

Open-File Report 109

Availability of Geological and Geophysical Data for the Eastern Half of the U.S. Geological Survey's Southwestern Alluvial Basins Regional Aquifer Study

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INTRODUCTION

A necessary first step in the U.S. Geological Survey's Southwestern Alluvial Basins Regional Aquifer Study (SWAB) has been the assessment of information already available. The area covered by the eastern half, the New Mexico portion, of the SWAB study is shown in fig. 1. The existing hydrologic data for this area are being compiled by the Geological Survey's Albuquerque Water-Resources Division office. The sources of various types of geological and geophysical data for the area have been identified by the New Mexico Bureau of Mines and Mineral Resources.

Specific objectives of the Bureau of Mines study included 1) identifying major alluvial basins in the state, 2) determining what is known of the geological/geophysical setting of such basins, and 3) evaluating the adequacy of this data base. The purpose of this report is to present the results of the Bureau of Mines study.

ALLUVIAL BASINS IDENTIFIED

For purposes of the Bureau study 12 alluvial basins were recognized (fig. 2). As indicated in Appendix A, some of these actually include more than one adjacent basin. Because references on one of these basins commonly cover the others as well they were combined to avoid repetition in Appendix A. All basins coincide with areas of extensive

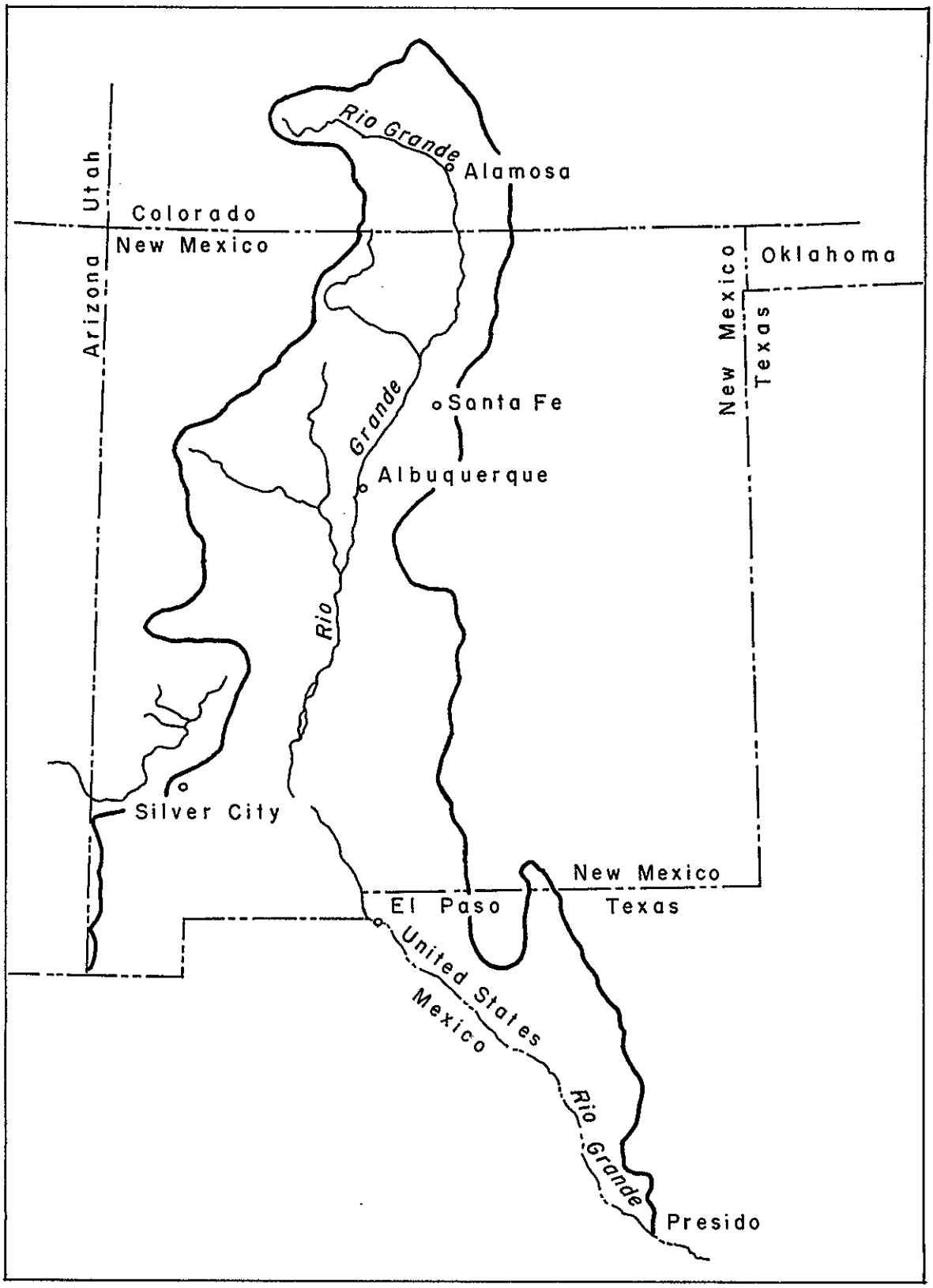

Figure 1. Area covered by New Mexico portion of Southwestern Alluvial Basin Regional Aquifer Study

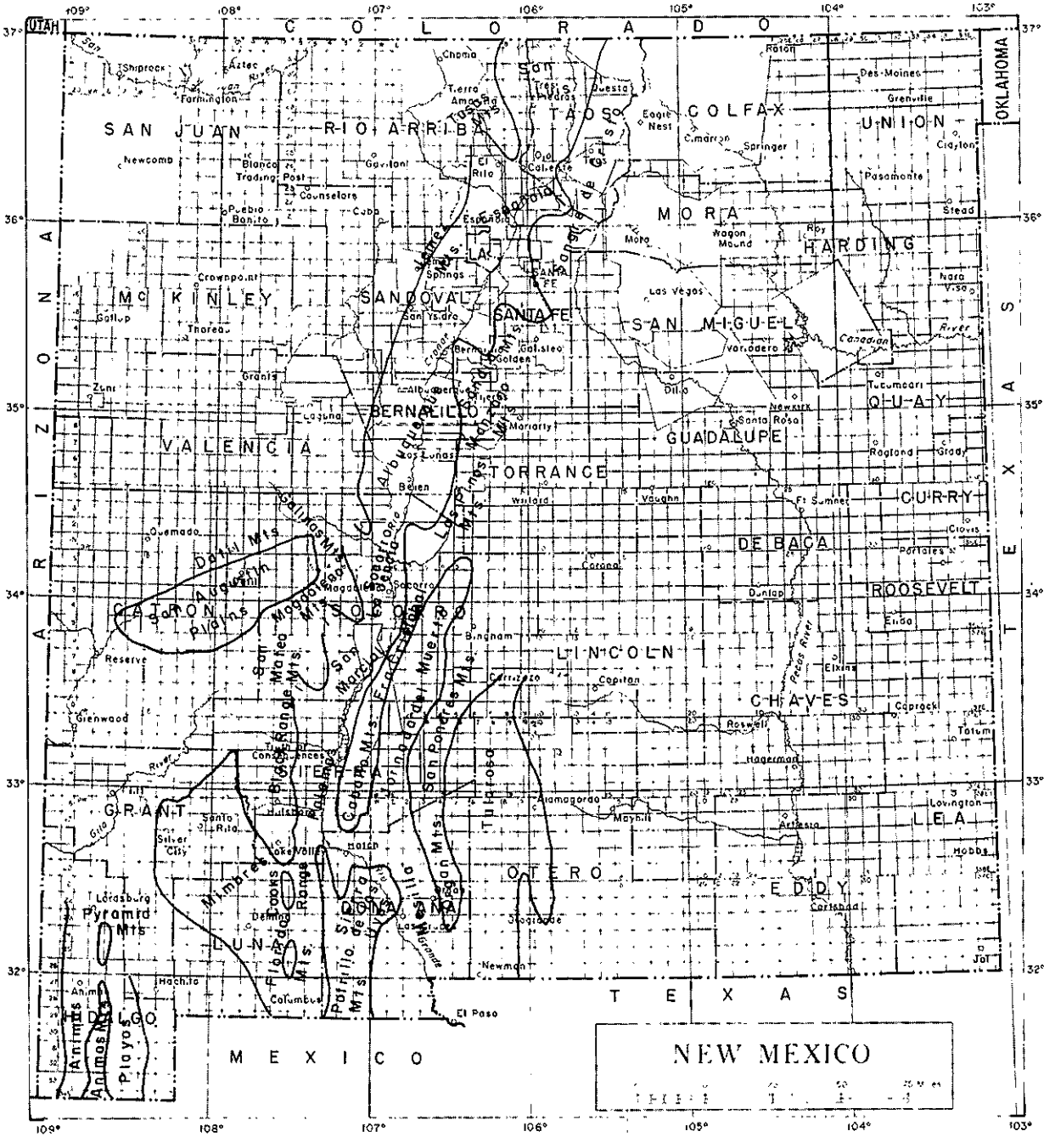

Figure 2. Location of alluvial basins recognized in New Mexico

alluvium or bolson deposits as shown on the state geologic map (Dane and Bachman, 1965). Six of these are subbasins of the Rio Grande Valley: San Luis, Espanola, Albuquerque, Socorro, Palomas, and Mesilla. Another three of the basins are peripheral to but geologically separated from the valley: Jornada del Muerto, Tularosa, and Mimbres. The remaining three basins are both geographically and geologically isolated from the Rio Grande Valley: San Augustin, Animas, and Playas. The peripheral and isolated basins are characterized by internal drainage; all other basins considered lie within the Rio Grande drainage basin.

INVENTORY OF AVAILABLE DATA/USING THIS REPORT

Sources of both geological and geophysical data were inventoried in the Bureau study (Appendix A). Geological information was subdivided into nine topics: geomorphology, structure, geologic maps, subsurface stratigraphy, Quaternary geology, surface stratigraphy, cross-sections, measured sections, and soils. Geophysical information was subdivided into seven topics: heat flow, gravity, natural seismicity, resistivity, and magnetics. The source of other miscellaneous information not covered by these 16 topics was also noted.

This report may be used in several ways. First, the general extent to which a given basin has been previously studied is apparent from Appendix A. More specifically, the references on a given aspect of the geology/geophysics of a basin of interest may be learned using Appendices A and C.

Secondly, the contents of each reference on a given basin are also shown in Appendix A. Thirdly, the location and area covered by any previous study may be found by consulting Appendix B and the figure indicated for that reference.

Because the Rio Grande Valley coincides with much of the structure known as the Rio Grande Rift, Appendix A also includes references on the rift. Publications covering more than the basins of interest or more than the rift are listed in Appendix A under "General."

It should be noted that the literature search was restricted to published or readily obtainable open-file reports (U.S. Geological Survey, State Engineer, NM Bureau of Mines) and theses. Only works containing significant geological or geophysical data are included.

Inasmuch as major works on the geology and geophysics of the Rio Grande Rift were written after 1950, older works are cited only where they remain the latest or best source of information. It was assumed that reference lists in the subsequent works would identify major early works. Furthermore, an arbitrary cut-off date was established; works published or released after 5 Oct. 1979 are not included.

ADEQUACY OF DATA BASE

The basins were divided into three groups based on the adequacy of the data: well known, moderately known, and poorly known. The well known category was reserved for those basins for which both geological and geophysical topics are well

covered. Moderately known basins are those for which both geological and geophysical topics are fairly well covered. Poorly known basins are those for which either geological or geophysical data are severely limited.

As a result of this study it appears that the best known basins, from a geological/geophysical standpoint, are the Albuquerque, Socorro, and Mesilla Basins. Depending on the hydrologic data base and need for better management of groundwater resources, the selection of basins for modeling in the SWAB study should be made from this list. Although these basins are very well studied, additional data are required in some cases (Appendix A).

The following basins are categorized as moderately well known: San Luis, Espanola, Palomas, Jornada del Muerto, Tularosa, and Animas. Only a few holes exist in the data base for these areas (Appendix A). Sufficient information is available, however, to permit at least a general evaluation of their hydrogeology as may be necessary in the SWAB study.

The least is known about the remaining basins: San Augustin, Mimbres, and Playas. Numerous holes in the data base for these areas are apparent in Appendix A. Although basins in this category should be the target of future geological/geophysical studies, the SWAB project should focus on the other, better known basins.

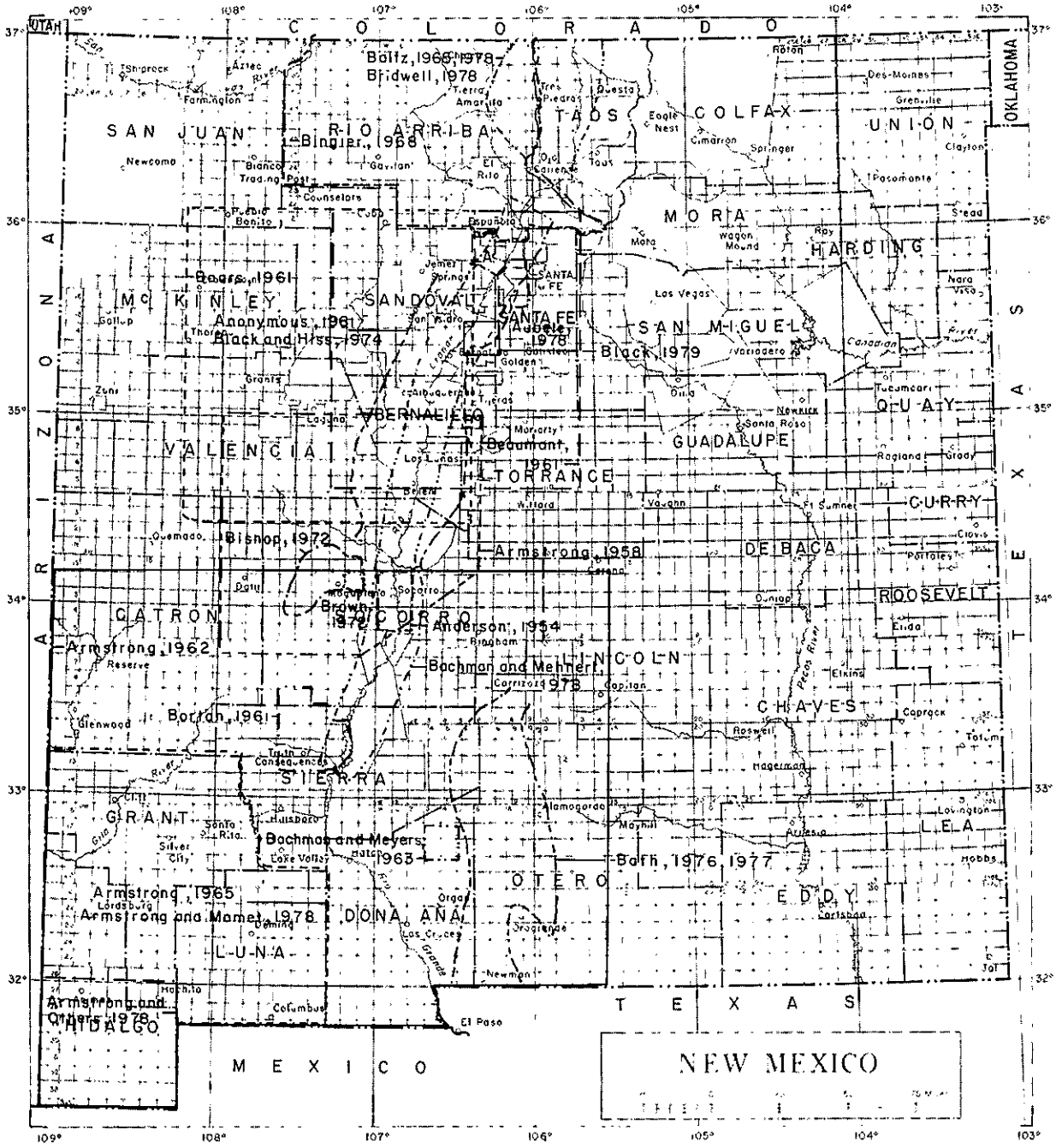

Figure 3. Areas covered by previous works:
Anderson (1954) through Brown, D.M. (1972).
See fig. 2 for relationship to alluvial basins.

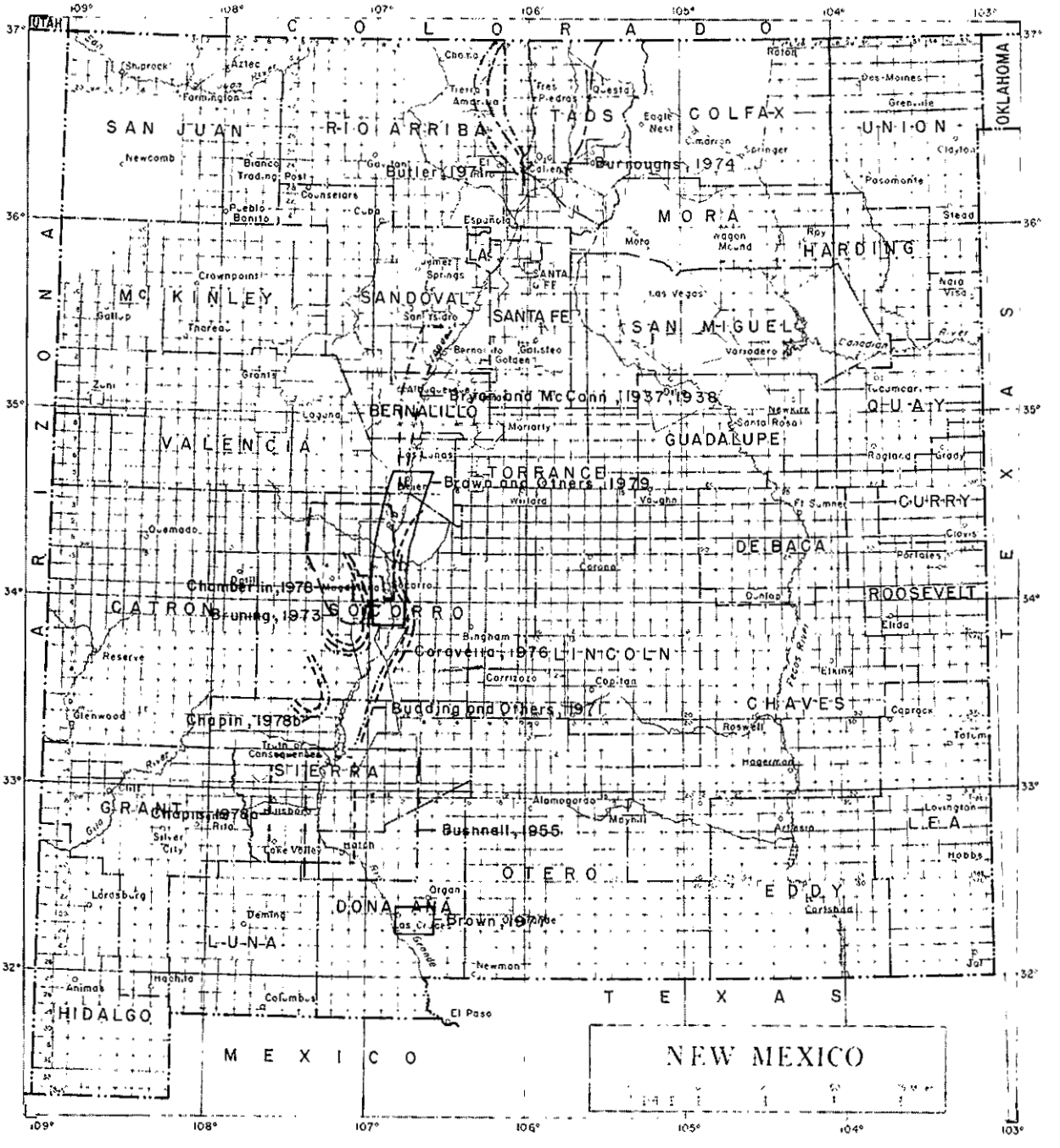

Figure 4. Areas covered by previous works: Brown, L.D., and others (1979) through Chapin (1978b). See fig. 2 for relationship to alluvial basins.

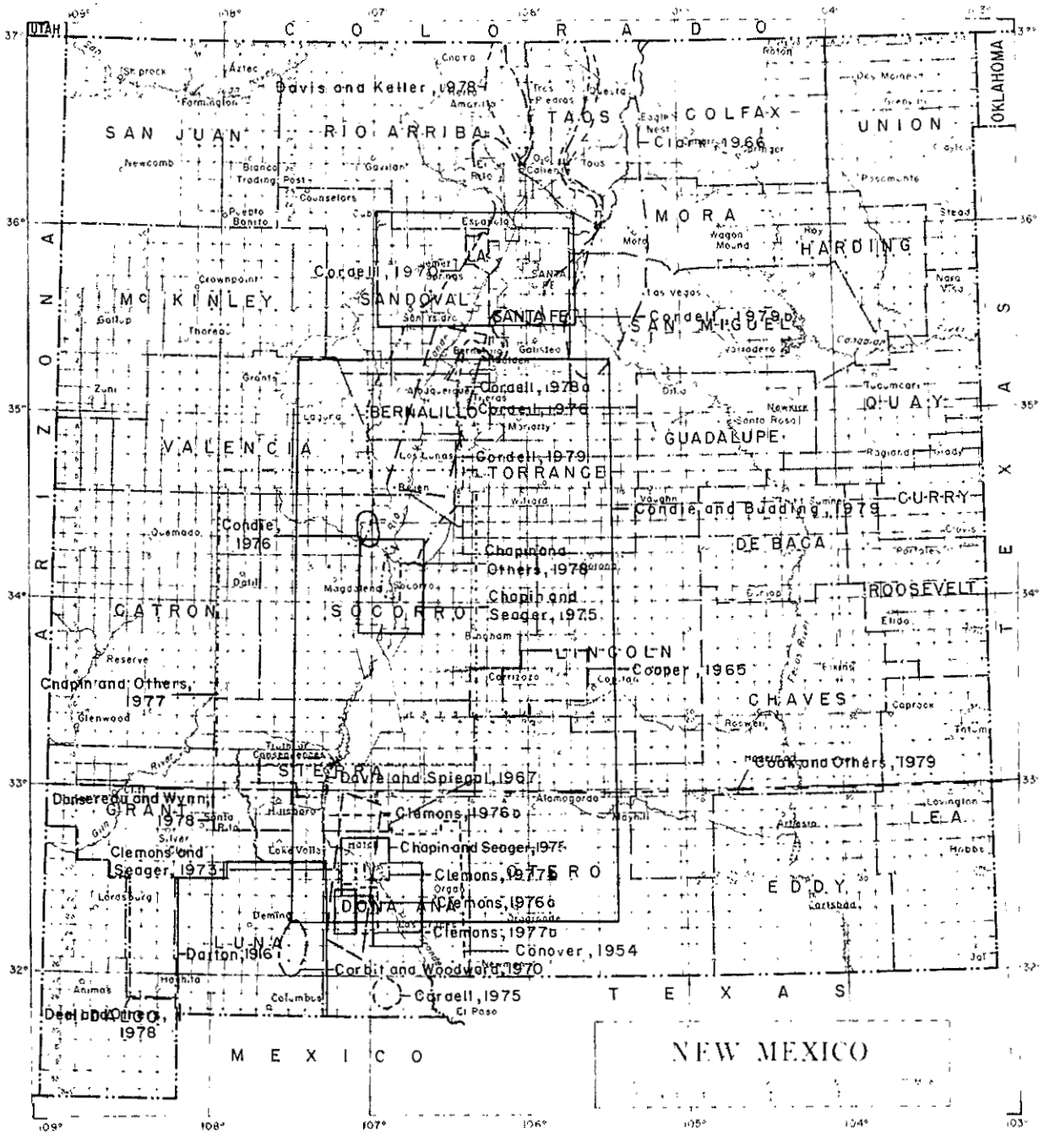

Figure 5. Areas covered by previous works: Chapin and others (1978) through Deal and others (1978). See fig. 2 for relationship to alluvial basins.

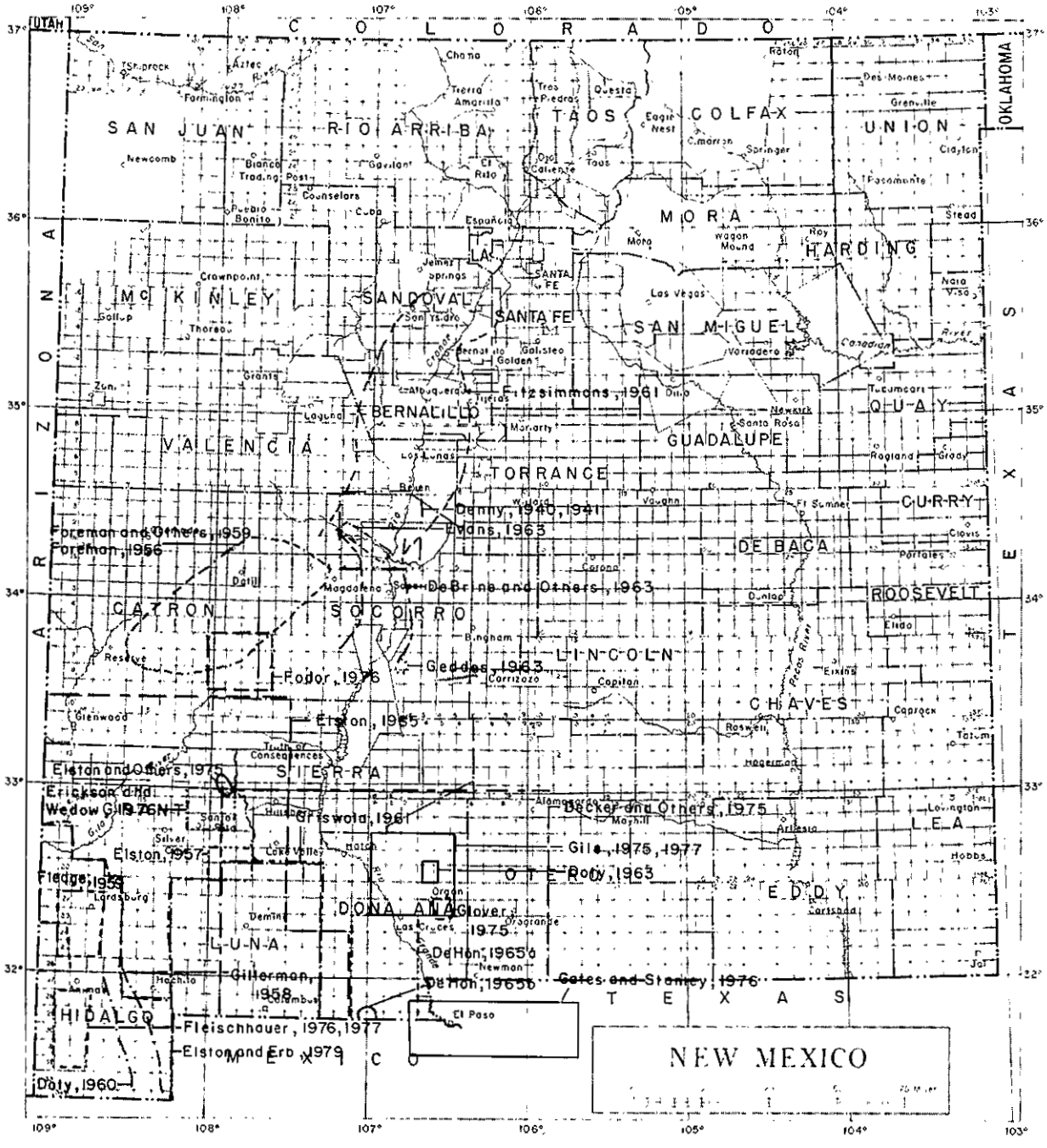

Figure 6. Areas covered by previous works: DeBrine and others (1963) through Griswold (1961). See fig. 2 for relationship to alluvial basins.

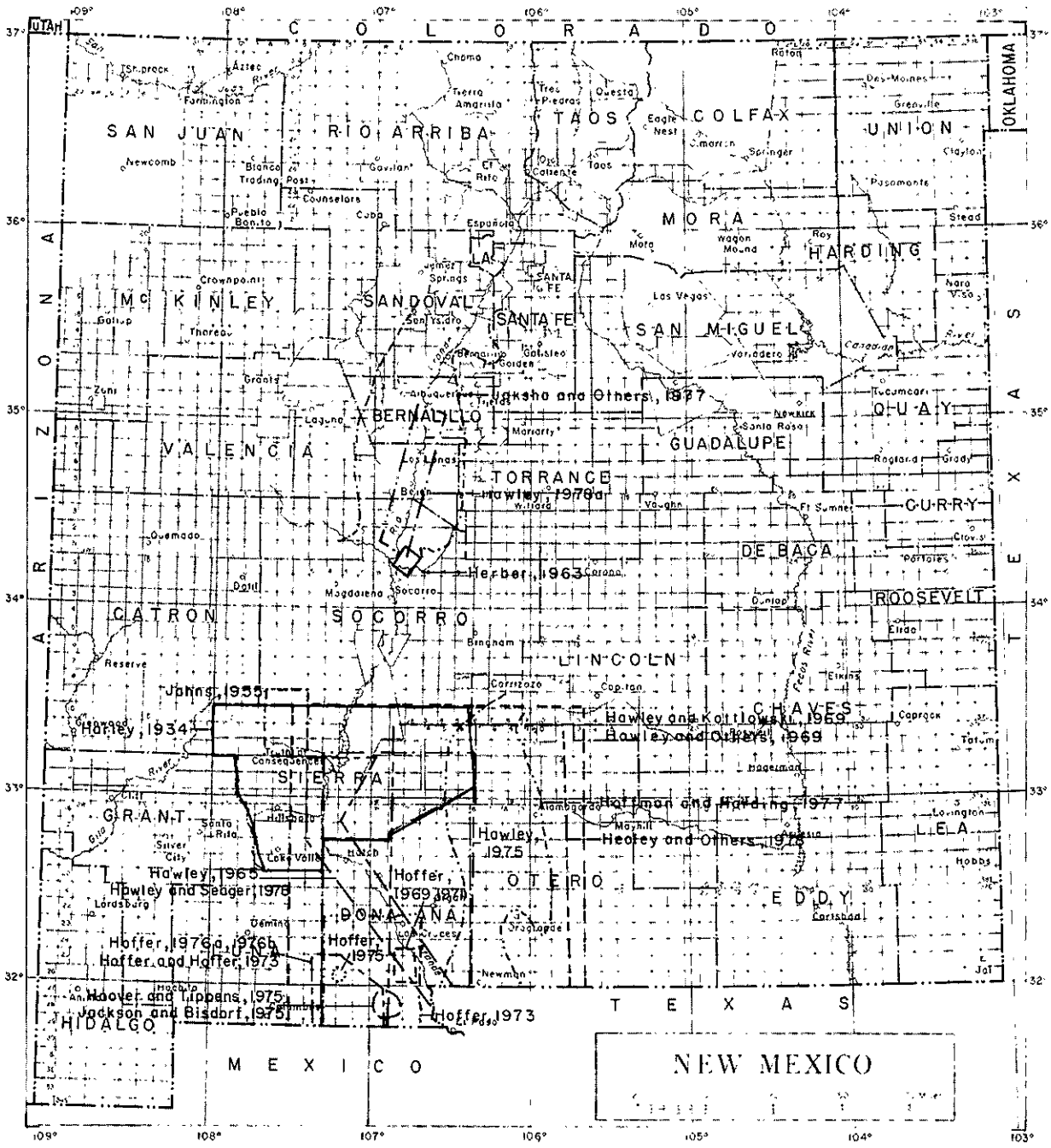

Figure 7. Areas covered by previous works:
Harley (1934) through Jaksha and others (1977).
See fig. 2 for relationship to alluvial basins.

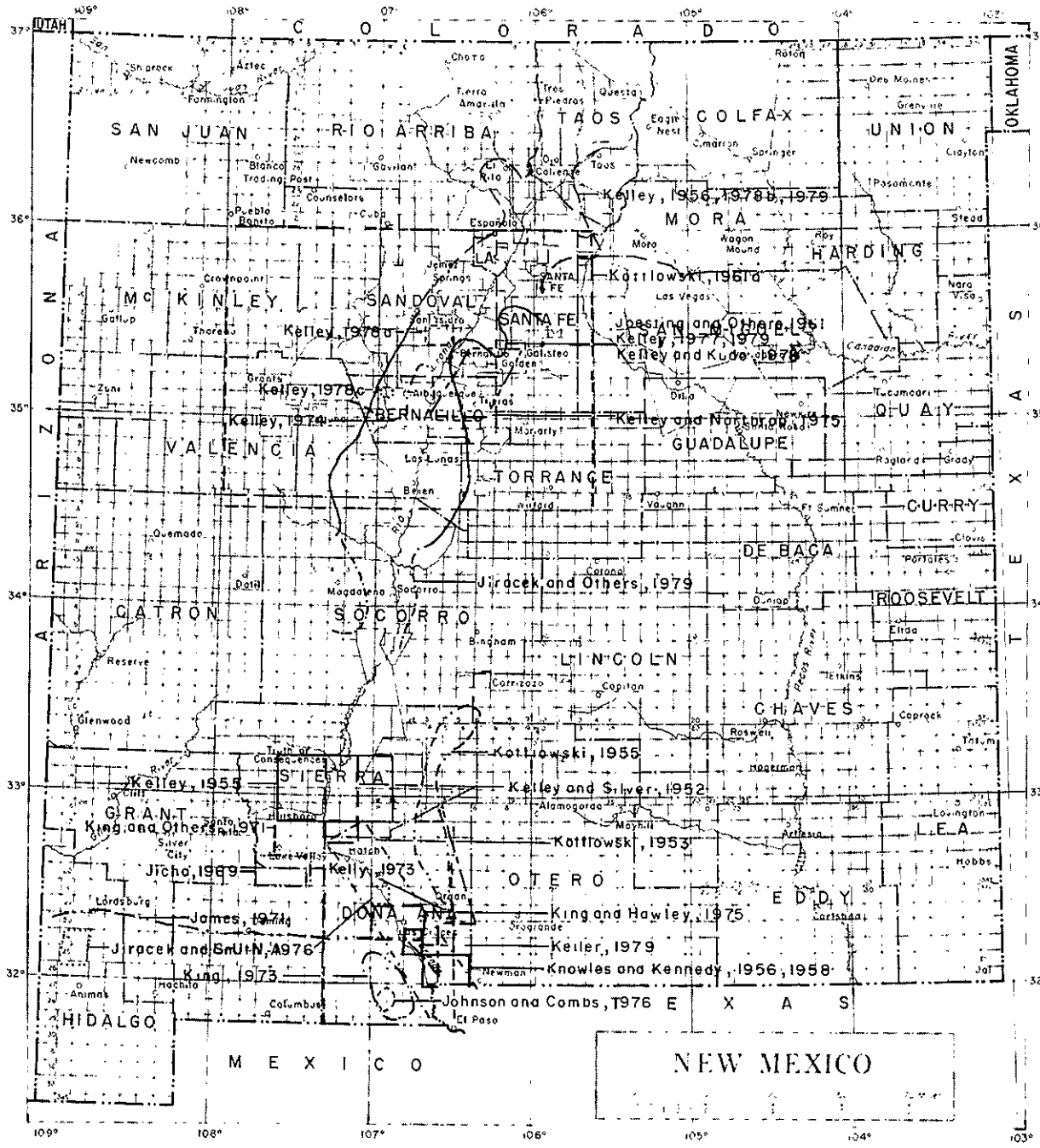

Figure 8. Areas covered by previous works:
James (1971) through Kottlowski (1961a).
See fig. 2 for relationship to alluvial basins.

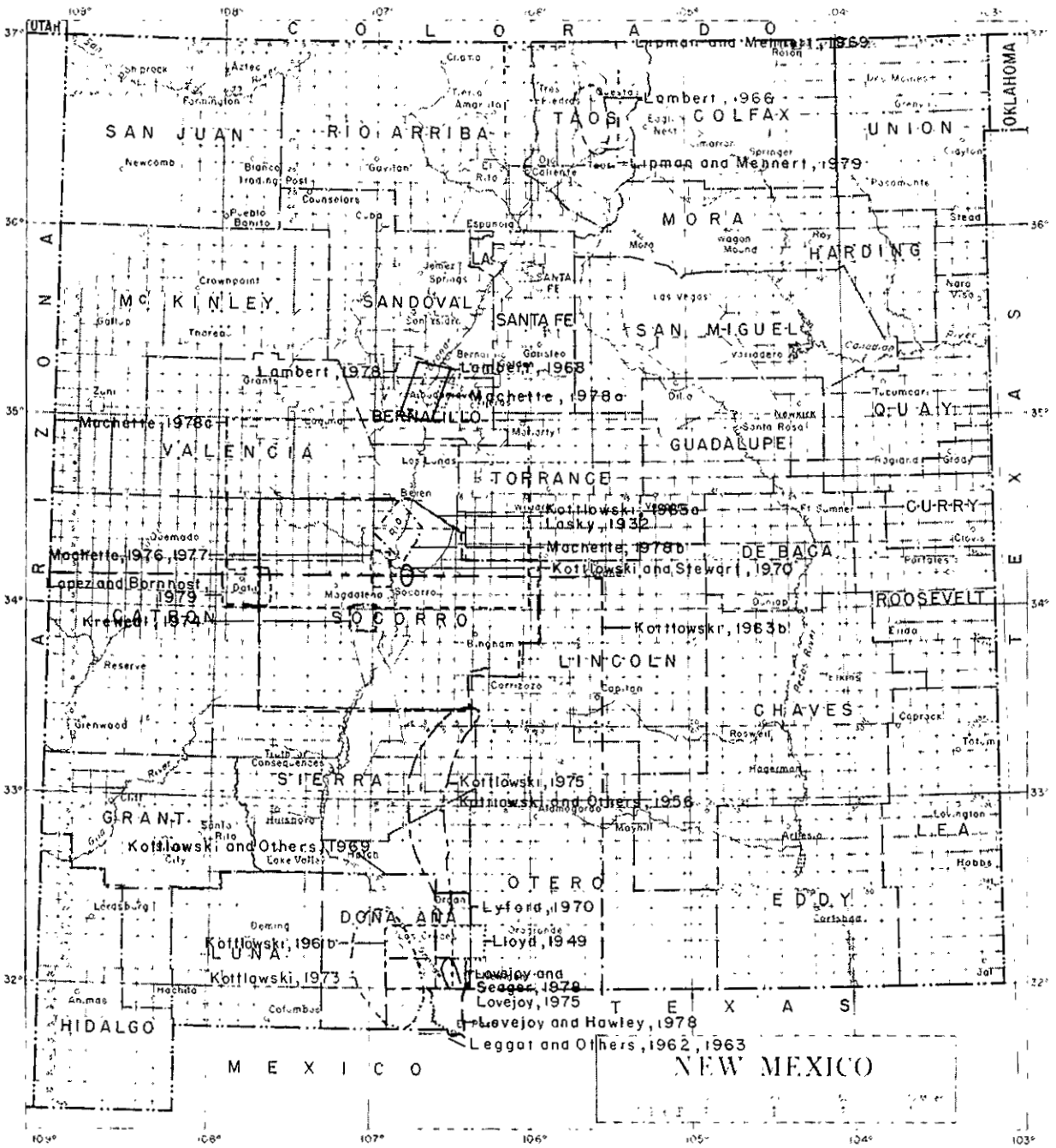

Figure 9. Areas covered by previous works: Kottlowski (1961b) through Machette (1978c). See fig. 2 for relationship to alluvial basins.

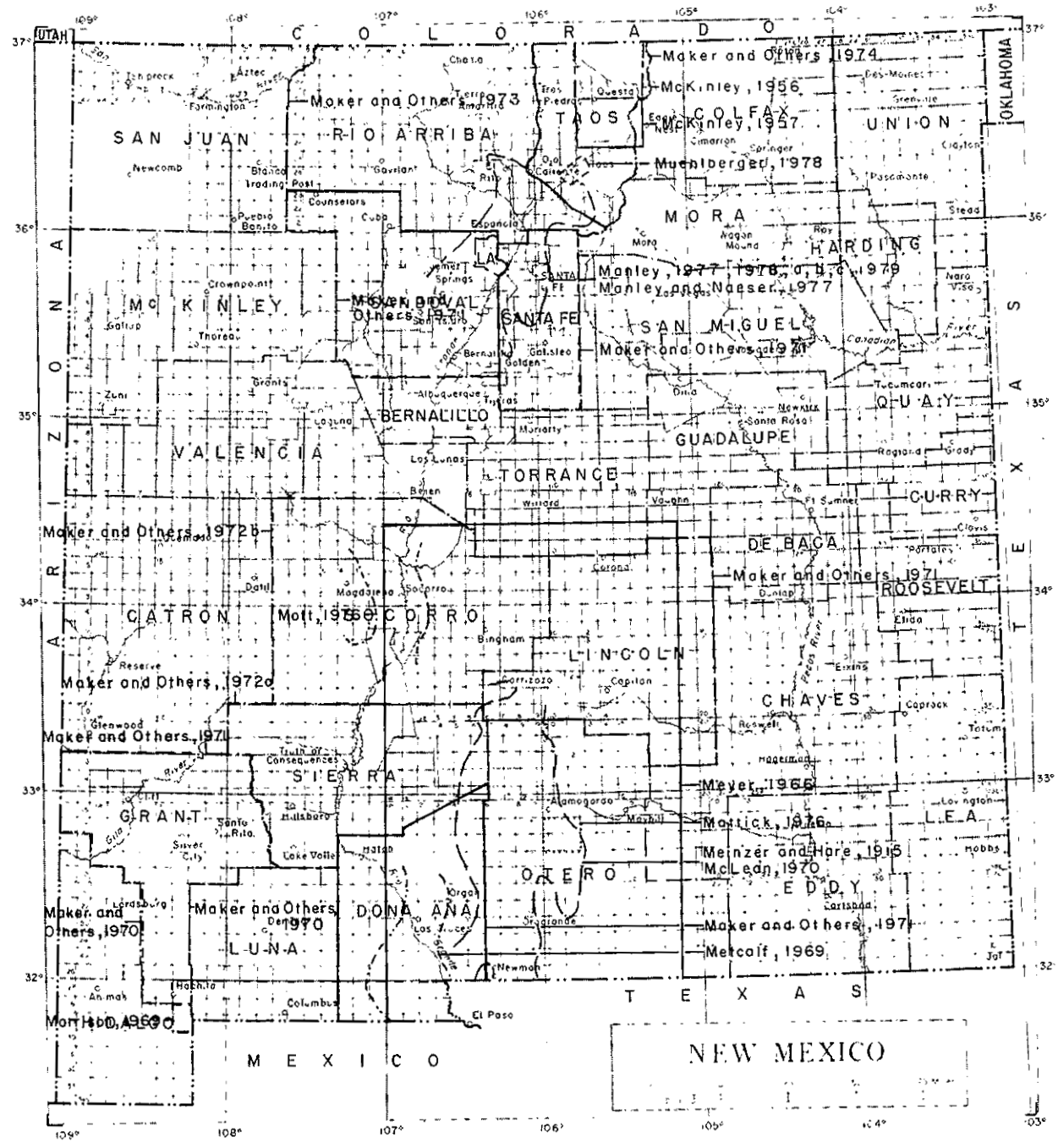

Figure 10. Areas covered by previous works:
Maker and others (1970) through McLean (1970).
See fig. 2 for relationship to alluvial basins.

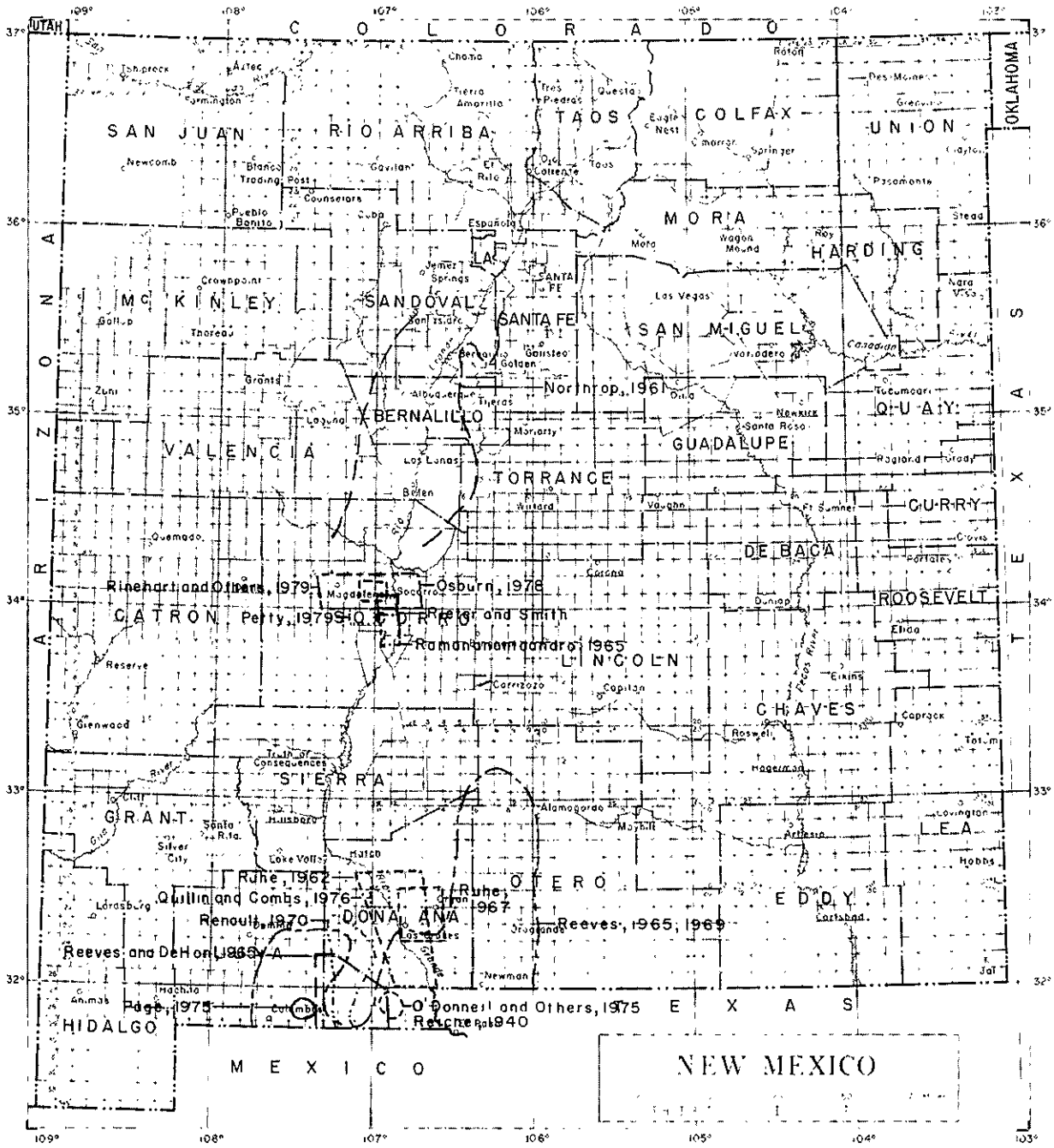

Figure 11. Areas covered by previous works:
Northrop (1961) through Ruhe (1967).
See fig. 2 for relationship to alluvial basins.

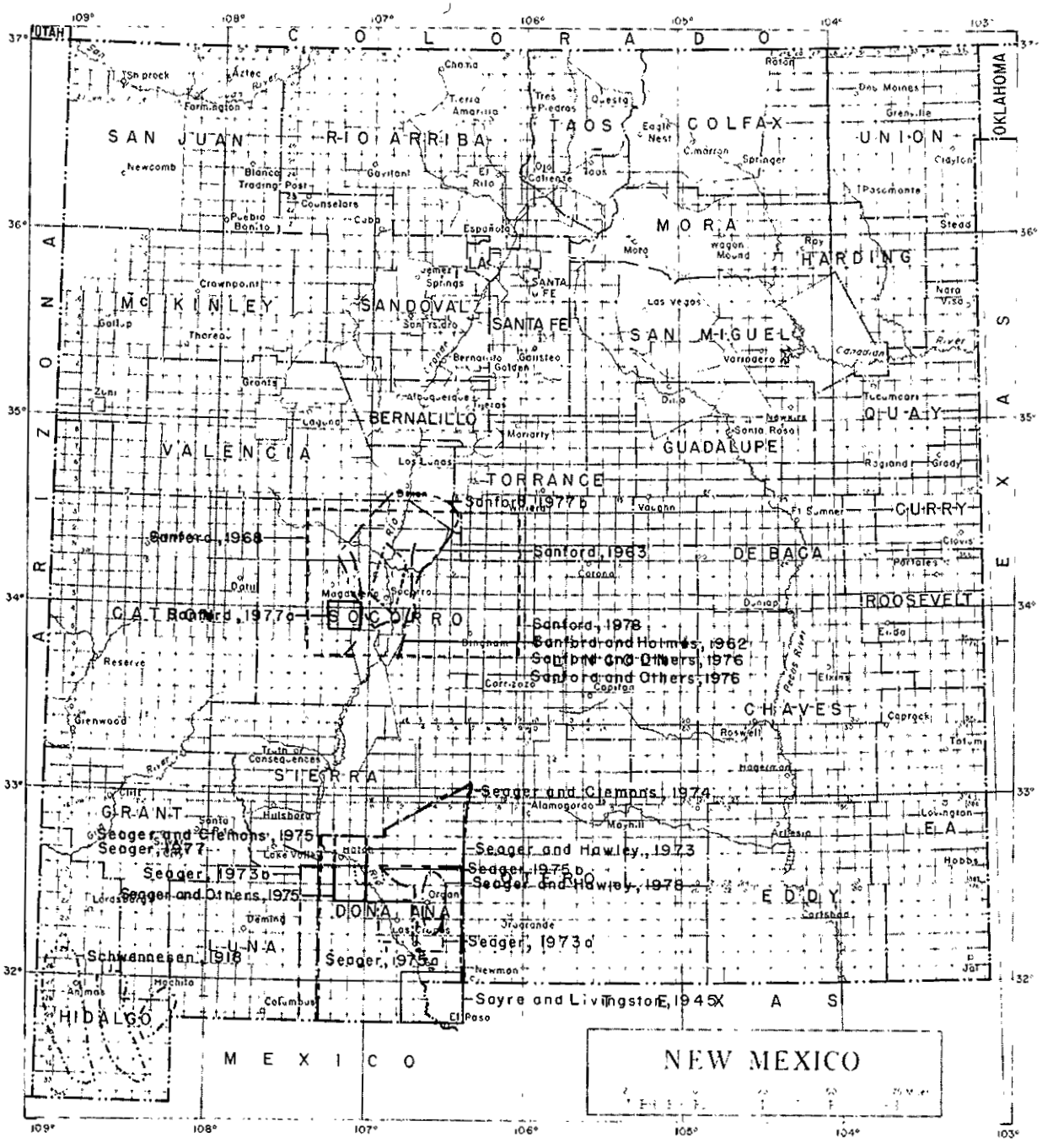

Figure 12. Areas covered by previous works: Sanford (1963) through Seager and Hawley (1978). See fig. 2 for relationship to alluvial basins.

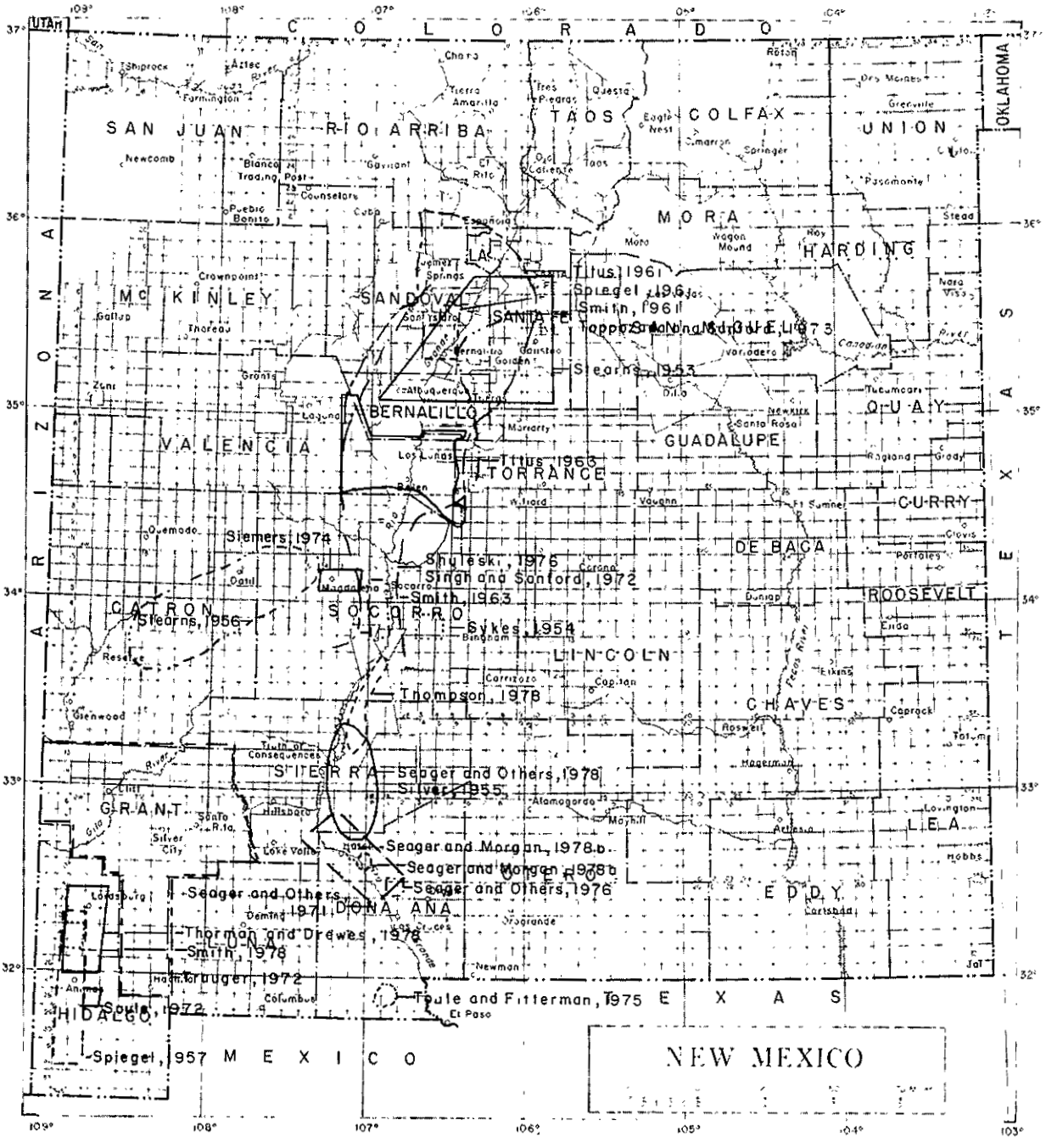

Figure 13. Areas covered by previous works:
Seager and others (1971) through Trauger (1972).
See fig. 2 for relationship to alluvial basins.

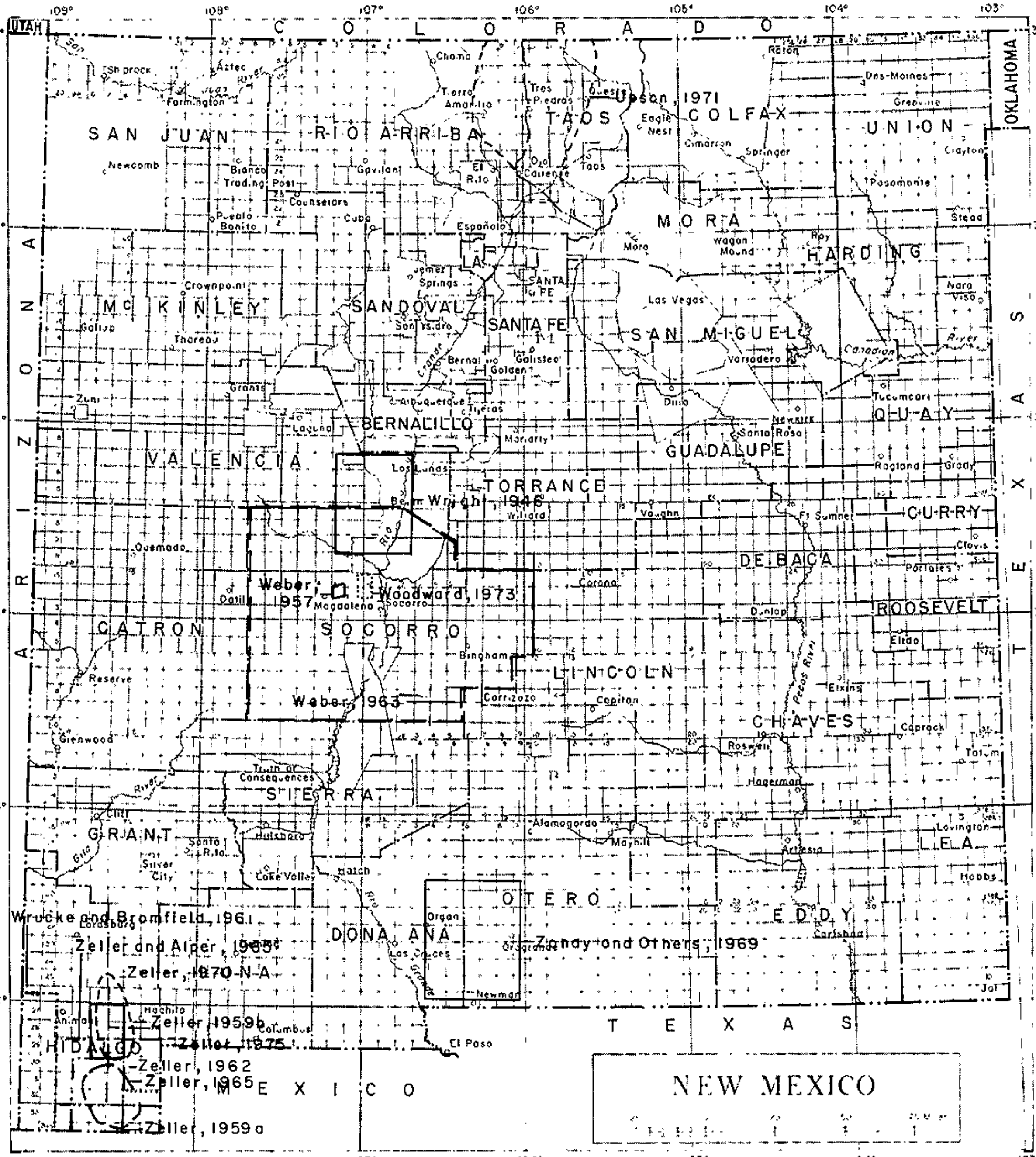

Figure 14. Areas covered by previous works:
Upson (1971 through Zohdy and others (1969).
See fig. 2 for relationship to alluvial basins.

APPENDIX A

Summary of available geological and geophysical data by basin and topic. See Appendix B for general location of areas covered by references. Numbers refer to references in Appendix C.

	Geological Information										Geophysical Information						
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics	Other *
San Luis	13	12 13 35 37 48	13 37		13	13 35 37 48	13 37 48				60					
	148			72			72				72					
	180	180 187 188				180	188		207 208							
			225		225	225	225	225								

* TG - Temperature (geothermal) gradient; GC - Geochemical; R - Reference material (bibliography, glossary, geoscience research projects)

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
Espanola			226		226	226	226	226									
	311																
		8	8		8	8											
	13	13	13		13	13	13										
	18	18	18		18	18	18										
		20		20													
										24	24		24				
											60						
			66				66				66						
		148															
		153	153				153										
									205								
									206								
									207								
									208								
			212														
			213			213											
		214				214											
	215	215	215		215	215	215										
						217											
		224				224											
	300	300	300	300	300	300	300	300									

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
Albuquerque		2															
		3				3											
		9		9		9	9	9	9								
				16													
		20		20													
		21		21	21	21											
		26	26				26						26				
			28			28											
		31	31		31	31	31										
	32	32															
			54														
											62				62		
											63				63		
			65		65	65	65				65						
	79	79	79		79	79	79										
	80	80			80		80										
		90				90											
	113	113	113		113	113											
													135				
											141				141		
	150	150			150	150											
	151	151	151		151	151	151	151									
		152	152			152	152										
		154				154	154										
		156	156			156	156										
	157	157	157														

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
		168				168											
		170		170		170											
	181				181	181											
	182					182											
	183	183	183		183	183		183									
				195													
		196	196				196										
		197	197		197		197		197								
			198		198	198			198								
			199														
									203								
									205								
									206								
												257					
		293				293											
		299	299				299										
	300	300	300	300	300	300	300	300									
		305	305														
	306	306	306		306	306		306									
			313			313	313										
San Augustin		3				3											
						4											
	19	19	19	19													
		46	46			46											

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
		95			95	95											
				96													
				97	97	97											
		170		170		170											
	179	179	179			179											
	183	183		183	183		183										
		188	188				188										
			190				190										
			199														
									202								
		233	233		233	233	233	233									
											258						
		289			289		289										
	301	301			301	301											
			314			314	314										
Socorro-La Jencia (San Marcial)			1				1				1						
		3				3											
						4											
	19	19	19	19													
		25	25		25	25	25	25									
		26	26				26						26				
			28			28											
		33										33					
			36	36		36											
												38					
			40				40										

	Geological Information									Geophysical Information						
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics	Other
		44			44											
	45	45	45		45	45	45	45								
		46	46			46						46			46	46TG
	47	47				47										
	74	74			74	74	74									
	79	79	79		79	79	79									
	80	80			80		80									
		89	89		89	89	89									
		101	101		101	101					101					
	119	119	119			119										
							140						140			
		170		170		170										
						179										
	179	179	179			179										
	183	183	183		183		183									
				195												
		196	196				196									
			199													
									203							
	221	221														
												223				
		232	232		232	232	232	232								
	234	234	234		234	234	234	234								
															236	
																246TG
		249		249			249									

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
							253				255	253					
										256							256TG
												257					
											258						
												259					
												262					
											264	264					
												265					
												288					
		289			289		289										
												291					
		294			294												
						302	302										
			312														
			313			313	313										
	315	315	315		315	315	315										
Palomas						4											
		22		22	22	22											
			36	36		36											
	43	43															
	47	47					47										
		53	53		53		53	53									
				56	56												
		71	71	71	71	71	71										
						75				75							

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
		87				87	87										
	107	107	107		107	107	107	107									
	108		108		108												
	109				109		109										
	115				115												
	116	116			116		116										
	117	117	117		117	117	117				117						
		134	134		134	134	134										
														138			
	158	158	158		158	158	158	158	158								
	162	162	162	162	162	162	162	162	162								
			166					166									
									202								
									210								
	221	221															
	252																
		276															
		278	278				278	278									
		279	279		279		279	279									
		281	281			281		281									
	284	284			284	284											
	286	286			286	286	286										
		290			290	290											
	303	303				303											
			11				11										
Jornada del Muerto		27	27				27			27							
			36	36		36											
				56	56												

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured Section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
Jornada del Muerto (con.)							75			75							
	102								102								
	103								103								
		105	105		105	105											
	108		108		108												
	115				115												
	116	116			116		116										
	117	117	117		117	117	117										
			118				118				118						
												127					
		147															
	158	158	158		158	158	158	158	158								
			161		161	161	161										
	162	162	162	162	162	162	162	162									
			166					166									
						167											
						173	173										
	175	175			175	175	175	175									
									210								
									211								
	221	221															
	251		251		251	251											
	252																
		274	274			274	274	274									
		276			276												
		280			280	280											
	282	282	282		282	282	282	282									

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
Tularosa	284	284	284		284	284					284						
	286	286			286	286	286										
		290			290	290											
															14		
							15								15		
		58		58													
			62		62												
						75				75	75						
	102								102								
	103								103								
	115				115												
	116	116			116		116										
		147															
				159			159										
						166											
						167											
		189		189		189	189	189									
		191				191											
	192	192	192		192	192											
				194													
									210								
							218				218		218				
	219		219														
	221	221															

	Geological Information									Geophysical Information						
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics	Other
			227	227	227	227	227									
	239					239										
						240										
				314			314									
		331		331	331	331	331				331		331	331		
Mesilla		27	27				27				27					
	47	47					47									
						50	50									
							52									
				56	56											
											61				61	
			77		77		75			75	75					
	78															
				83												
	102								102							
	103								103							
	108		108		108											
	109				109		109									
	115				115											
	116	116			116		116									
	117	117	117		117	117										
		120				120										
	121	121			121											
		122	122			122										
	123	123														

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
Mesilla (con.)		124	124		124	124											
	125	125				125											
					126	126											
														128	128		
														133			
														138			
												142					
															143		
			160	160		160											
			161		161	161	161										
	162	162	162	162	162	162	162	162	162								
				163	163	163											
				164	164	164											
			166					166									
			169														
	172				172	172											
						173	173										
				176													
				184		184	184										
				185		185	185										
		191															
	192	192	192		192	192											
		193				193											
								210									
	220																
	221	221															
	222		222		222			222									

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
		233			233									229	229		
												235					
						239											
						240											
	241		241														
	242	242					242										
						247											247GC
	251		251		251	251											
	252																
	267	267	267	267	267	267								267			
	272	272															
			273				273										
		274	274		274	274	274										
		275	275			275	275								275		
			276														
	277	277	277		277		277										
	278	278	278		278	278	278	278									
	282	282	282		282	282	282	282									
															309		
Mimbres						4											
						5	5										
			49														
			51														

	Geological Information									Geophysical Information							
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics		Other
Animas	270	270	270 321 323	270	270	270	270		270								
	324	324 325 326	324 325 326	324		324 325	324 326	324									
	327	327	327		327	327	327	327									
	6	7	7			5 6	5 7										
		73 86	73			73 86	73 86										
	91	91	91		91 92	91	91										
	104 136	104	104		104	104		104	93								
									201					138			
	270	270 295	270	270 295	270 295	270 295	270 295		270			295	295		295		
	297 298	297	297		297	297	297										
		304	304 320			304											

	Geological Information									Geophysical Information						
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics	Other
			323													
Rio Grande Rift	10				10	10										
		13	13			13										
	17															
										23	23	23				23TG
	29	29			29	29										
	30	30	30		30	30										
		41														
		42														
										57	57		57			
		64					64			64	64	64	64	64	64	64TG
	67	67	67				67	67		67	67	67		67	67	
										76						
	81					81			81							
				98												
					110		110									
						111										
	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112
														139		
		144					144							144		
						145				145	145			145		
		146														
		147														
	149	149														
		155	155		155		155									
						178										

	Geological Information									Geophysical Information						
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics	Other
General		237	237			186 237	237				237 238					
			245							243 244 245						
	248	248	248	248	248	248	248	248		248	248	248 259 260 266	248	248	248	
	283	283 285	266 285		283 285	283	285			285	285	283			285 292	283TG 285TG
			314							296	296 328					
										329						330TG
																34R 39R
		55	68			55 94	94	55								
					114											99R

	Geological Information									Geophysical Information						
BASIN	Geomorphology	Structure	Geologic Map	Subsurface Stratigraphy	Quaternary Geology	Surface Stratigraphy	Cross-section	Measured section	Soils	Heat flow	Gravity	Natural Seismicity	Seismic Refraction	Resistivity	Magnetics	Other
General (con.)			129 130 131 132													
				171		171										165R
	177	177	177		177	177	177	177	204							
	248	248	248	248	248	248	248	248		248	248	248	248	248	248	230R 250R
												254 261 263				
																268R 269R
										287						
												308				
																316R 317R 318R

APPENDIX B

Key to maps (figs. 3-14) showing location of studies cited in Appendix A. Numbers refer to references in Appendix C. References in parentheses are general, cover the entire state, or cover the Rio Grande Rift and thus are not shown on the maps.

Figure	Reference Number	References
3	1	Anderson, 1954
	2	Anonymous, 1961
	3	Armstrong, 1958
	4	Armstrong, 1962
	5	Armstonrg, 1965
	6	Armstrong, and Mamet, 1978
	7	Armstrong, and others, 1978
	8	Aubele, 1978
	9	Baars, 1961
	10	Bachman, and Mehnert, 1978
	11	Bachman, and Meyers, 1963
	12	Baltz, 1965
	13	Baltz, 1978
	14	Bath, 1976
	15	Bath, 1977
	16	Beaumont, 1961
	17	(Belcher, 1975)
	18	Bingler, 1968
	19	Bishop, 1972

Figure	Reference Number	References
3	20	Black, 1979
	21	Black, and Hiss, 1974
	22	Borton, 1961
	23	(Bridwell, 1976)
	24	Bridwell, 1978
	25	Brown, D.M., 1972
4	26	Brown, L.D., and others, 1979
	27	Brown, L.F., 1977
	28	Bruning, 1973
	29	(Bryan, 1937)
	30	(Bryan, 1938)
	31	Bryan, and McCann, 1937
	32	Bryan, and McCann, 1938
	33	Budding, and others, 1971
	34	(Burks, and Schilling, 1955)
	35	Burroughs, 1974
	36	Bushnell, 1955
	37	Butler, 1971
	38	Caravella, 1976
	39	(Cash, 1971)
	40	Chamberlin, 1978
	41	(Chandler, and others, 1976)
	42	(Chapin, 1971)
	43	Chapin, 1978a
	44	Chapin, 1978b

Figure	Reference Number	References
5	45	Chapin, and others, 1978
	46	Chapin, and others, 1977
	47	Chapin, and Seager, 1975
	48	Clark, 1966
	49	Clemons, 1976a
	50	Clemons, 1976b
	51	Clemons, 1977a
	52	Clemons, 1977b
	53	Clemons, and Seager, 1973
	54	Condie, 1976
	55	Condie, and Budding, 1979
	56	Conover, 1954
	57	Cook, and others, 1979
	58	Cooper, 1965
	59	Corbitt, and Woodward, 1970
	60	Cordell, 1970
	61	Cordell, 1975
	62	Cordell, 1976
	63	Cordell, 1978a
	64	(Cordell, 1978b)
	65	Cordell, 1979a
	66	Cordell, 1979b
	67	(Cordell, and Kottlowski, 1975)
	68	(Dane, and Bachman, 1965)
	69	Dansereau, and Wynn, 1978

Figure	Reference Number	References
	70	Darton, 1916
	71	Davie, and Spiegal, 1967
	72	Davis, and Keller, 1978
	73	Deal, and others, 1978
6	74	DeBrine, and others, 1963
	75	Decker, and others, 1975
	76	(Decker, and Smithson, 1973)
	77	DeHon, 1965a
	78	DeHon, 1965b
	79	Denny, 1940
	80	Denny, 1941
	81	(Dinwiddie, 1967)
	82	Doty, 1960
	83	Doty, 1963
	84	Elston, 1957
	85	Elston, 1965
	86	Elston, and Erb, 1979
	87	Elston, and others, 1975
	88	Erickson, and Wedow, 1976
	89	Evans, 1963
	90	Fitzsimmons, 1961
	91	Fledge, 1959
	92	Fleischhauer, 1976
	93	Fleischhauer, 1977
	94	(Flower, 1965)

Figure	Reference Number	References
	95	Fodor, 1976
	96	Foreman, 1956
	97	Foreman, and others, 1959
	98	(Foster, 1978)
	99	(Gary, and others, 1974)
	100	Gates, and Stanley, 1976
	101	Geddes, 1963
	102	Gile, 1975
	103	Gile, 1977
	104	Gillerman, 1958
	105	Glover, 1975
	106	Griswold, 1961
7	107	Harley, 1934
	108	Hawley, 1965
	109	Hawley, 1975
	110	(Hawley, 1978a)
	111	(Hawley, 1978b)
	112	(Hawley, 1978c)
	113	Hawley, 1978d
	114	(Hawley, and others, 1976)
	115	Hawley, and Kottlowski, 1969
	116	Hawley, and others, 1969
	117	Hawley, and Seager, 1978
	118	Healey, and others, 1978
	119	Herber, 1963

Figure	Reference Number	Reference
	120	Hoffer, 1969
	121	Hoffer, 1971
	122	Hoffer, 1973
	123	Hoffer, 1975
	124	Hoffer, 1976a
	125	Hoffer, 1976b
	126	Hoffer, J.M., and Hoffer, R.L., 1973
	127	Hoffman, and Harding, 1977
	128	Hoover, and Tippens, 1975
	129	(Hunt, 1977a)
	130	(Hunt, 1977b)
	131	(Hunt, 1977c)
	132	(Hunt, 1977d)
	133	Jackson, and Bisdorf, 1975
	134	Jahns, 1955
	135	Jaksha, and others, 1977
8	136	James, 1971
	137	Jicha, 1954
	138	Jiracek, and Smith, 1976
	139	(Jiracek, and others, 1976)
	140	Jiracek, and others, 1979
	141	Joesting, and others, 1961
	142	Johnson, and Combs, 1976
	143	Keller, 1979
	144	(Keller, and others, 1979)
	145	(Keller, and others, 1978)

Figure	Reference Number	References
	146	(Kelley, 1952)
	147	Kelley, 1955
	148	Kelley, 1956
	149	(Kelley, 1970)
	150	Kelley, 1974
	151	Kelley, 1977
	152	Kelley, 1978a
	153	Kelley, 1978b
	154	Kelley, 1978c
	155	Kelley, 1979
	156	Kelley, and Kudo, 1978
	157	Kelley, and Northrop, 1975
	158	Kelley, and Silver, 1952
	159	Kelly, 1973
	160	King, 1973
	161	King, and Hawley, 1975
	162	King, and others, 1971
	163	Knowles, and Kennedy, 1956
	164	Knowles, and Kennedy, 1958
	165	(Koehn, M.A., and Koehn, H.H., 1973)
	166	Kottlowski, 1953
	167	Kottlowski, 1955
	168	Kottlowski, 1961a
9	169	Kottlowski, 1961b
	170	Kottlowski, 1963a
	171	Kottlowski, 1963b

Figure	Reference Number	Reference
	172	Kottlowski, 1973
	173	Kottlowski, 1975
	174	(Kottlowski, 1976)
	175	Kottlowski, and others, 1956
	176	Kottlowski, and others, 1969
	177	(Kottlowski, and LeMone, 1969)
	178	Kottlowski, and Stewart, 1970
	179	Krewedl, 1974
	180	Lambert, 1966
	181	Lambert, 1968
	182	Lambert, 1978
	183	Lasky, 1932
	184	Leggat, and others, 1962
	185	Leggat, and others, 1963
	186	(Lipman, 1969)
	187	Lipman, and Mehnert, 1969
	188	Lipman, and Mehnert, 1979
	189	Lloyd, 1949
	190	Lopez, and Bornhorst, 1979
	191	Lovejoy, 1975
	192	Lovejoy, and Hawley, 1978
	193	Lovejoy, and Seager, 1978
	194	Lyford, 1970
	195	Machette, 1976
	196	Machette, 1977
	197	Machette, 1978a

Figure	Reference Number	Reference
	198	Machette, 1978b
	199	Machette, 1978c
10	200	Maker, and others, 1970
	201	Maker, and others, 1970
	202	Maker, and others, 1972a
	203	Maker, and others, 1972b
	204	(Maker, and others, 1974)
	205	Maker, and others, 1971
	206	Maker, and others, 1971
	207	Maker, and others, 1973
	208	Maker, and others, 1974
	209	Maker, and others, 1971
	210	Maker, and others, 1971
	211	Maker, and others, 1971
	212	Manley, 1977
	213	Manley, 1978a
	214	Manley, 1978b
	215	Manley, 1978c
	216	Manley, 1979
	217	Manley, and Naeser, 1977
	218	Mattick, 1976
	219	Meinzer, and Hare, 1915
	220	Metcalf, 1969
	221	Meyer, 1966
	222	Morrison, 1969
	223	Mott, 1976

Figure	Reference Number	Reference
	224	Muehlberger, 1978
	225	McKinley, 1956
	226	McKinley, 1957
	227	McLean, 1970
11	228	Northrop, 1961
	229	O'Donnell, and others, 1975
	230	(Olsen, and Foster, 1973)
	231	(Olsen, and others, 1979)
	232	Osburn, 1978
	233	Page, 1975
	234	Petty, 1979
	235	Quillin, and Combs, 1976
	236	Ramananantoandro, 1965
	237	(Ramberg, and others, 1978)
	238	(Ramberg, and others, 1974)
	239	Reeves, 1965
	240	Reeves, 1969
	241	Reeves, and Dehon, 1965
	242	Reiche, 1940
	243	(Reiter, and others, 1975)
	244	(Reiter, and others, 1978)
	245	(Reiter, and others, 1979)
	246	Reiter, and Smith, 1977
	247	Renault, 1970
	248	(Riecker, 1979)
	249	Rinehart, and others, 1979

Figure	Reference Number	Reference
	250	(Robertson, 1976)
	251	Ruhe, 1962
	252	Ruhe, 1967
12	253	Sanford, 1963
	254	(Sanford, 1965)
	255	Sanford, 1968
	256	Sanford, 1977a
	257	Sanford, 1977b
	258	Sanford, 1978
	259	(Sanford, and others, 1973)
	260	(Sanford, and others, 1972)
	261	(Sanford, and Cash, 1969)
	262	Sanford, and Holmes, 1962
	263	(Sanford, and Long, 1965)
	264	Sanford, and others, 1976
	265	Sanford, and others, 1976
	266	(Sanford, and others, 1979)
	267	Sayre, and Livingston, 1945
	268	(Schilling, C.F., and Schilling, J.H., 1956)
	269	(Schilling, C.F., and Schilling, J.H., 1961)
	270	Schwennson, 1918
	271	Seager, 1973a
	272	Seager, 1973b
	273	Seager, 1975a
	274	Seager, 1975b
	275	Seager, 1977

Figure	Reference Number	Reference
	276	Seager, and Clemons, 1974
	277	Seager, and Clemons, 1975
	278	Seager, and others, 1975
	279	Seager, and Hawley, 1973
	280	Seager, and Hawley, 1978
13	281	Seager, and others, 1971
	282	Seager, and others, 1976
	283	Seager, and Morgan, 1978a
	284	Seager, and Morgan, 1978b
	285	(Seager, and Morgan, 1979)
	286	Seager, and others, 1978
	287	(Shearer, and Reiter, 1978)
	288	Shuleski, 1976
	289	Siemers, 1974
	290	Silver, 1955
	291	Singh, and Sanford, 1972
	292	(Smith, C.S., 1976)
	293	Smith, C.T., 1961
	294	Smith, C.T., 1963
	295	Smith, C.T., 1978
	296	(Smithson, and Decker, 1972)
	297	Soule, 1972
	298	Spiegel, 1957
	299	Spiegel, 1961
	300	Stearns, 1953
	301	Stearns, 1956

Figure	Reference Number	Reference
	302	Sykes, 1954
	303	Thompson, 1978
	304	Thorman, and Drewes, 1978
	305	Titus, 1961
	306	Titus, 1963
	307	(Toppozada, and Sanford, 1972)
	308	Toppozada, and Sanford, 1973
	309	Toule, and Fitterman, 1975
	310	Trauger, 1972
14	311	Upson, 1971
	312	Weber, 1957
	313	Weber, 1963
	314	(West, and Broadhurst, 1975)
	315	Woodward, 1973
	316	(Wright, A.F., 1978)
	317	(Wright, A.F., 1979)
	318	(Wright, A.F., in preparation)
	319	Wright, H.E., Jr., 1946
	320	Wrucke, and Bromfield, 1961
	321	Zeller, 1959a
	322	Zeller, 1959b
	323	Zeller, 1962
	324	Zeller, 1965
	325	Zeller, 1970
	326	Zeller, 1975
	327	Zeller, and Alper, 1965

Figure	Reference Number	Reference
	328	(Zilinski, and others, 1976)
	329	(Zilinski, and others, 1976a)
	330	(Zilinski, and others, 1976b)
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