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OIL AND GAS EXPLORATION IN THE SANTA FE-GALISTEO-HAGAN AREA OF NEW MEXICO

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INTRODUCTION

Oil and gas exploration in the basins and subbasins of the Rio Grande rift of New Mexico and southern Colorado generally has been a sporadic endeavor. The first sustained exploration effort in the rift area has been centered in the Albuquerque basin. Here, Shell Oil Company drilled five wells between 1972 and 1976 to test the pre-Tertiary rocks, followed by a sixth deep test well by TransOcean Oil Co. in 1978.

Exploration in the Santa Fe area also was very sporadic until 1973. Table 1 is a chronology of oil and gas tests in the Santa Fe, Galisteo and Hagan areas. Figure 1 shows the locations of these wells. The heavy hatchured line on Figure 1 is the author's estimate of where the Cretaceous rocks still are preserved, and generally outlines the basinal areas. In most of this hatchered area, the Cretaceous is covered by Tertiary sandstones, conglomerates, shales and volcanics. No discussion of the wells drilled outside of the basin outlines on Figure 1 will be attempted in this article. The majority of these wells are relatively old (pre 1960) tests in the Paleozoic.

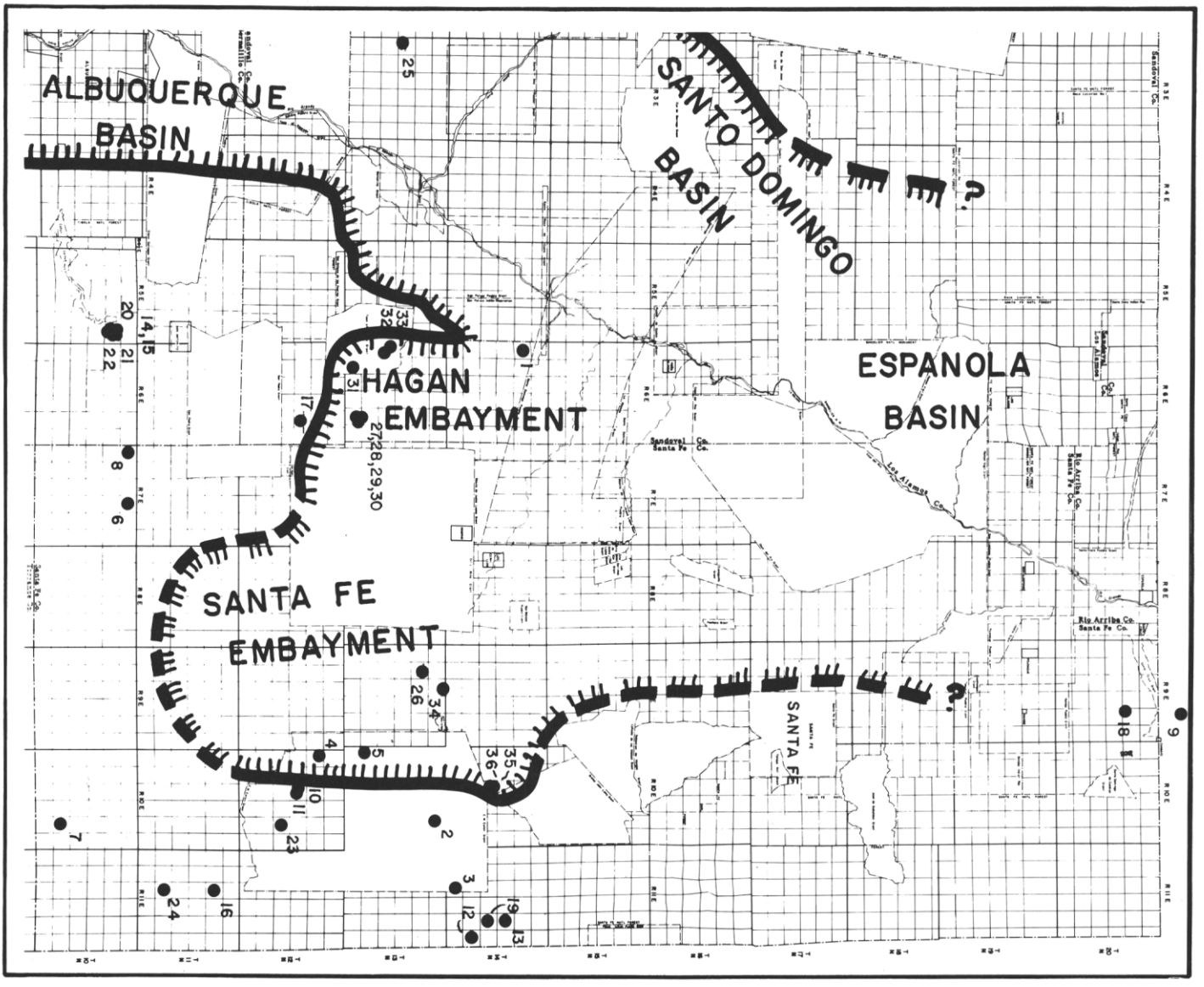


Figure 1. Map showing locations of wells listed in Table 1. Hatchured line outlines estimated limit of preserved Cretaceous rocks. See text for discussion. North is to the right.

Table 1. Chronology of Oil and Gas Tests in the Santa Fe-Galisteo-Hagan Area.

Well Name	Section Township (N) Range (E)	Total Depth	Year Completed	Deepest Formation Penetrated	Remarks
1. *Tejon Oil & Development Co. No. 1	7-14-6	1850′	1914	Santa Fe	Rptd. oil show at 1000′ and 1087′
2. Toltec Oil Co. Pankey No. 1	2-13-10	2165′	1918		
3. Toltec Oil Co. Pankey No. 2	33-14-11	2898′	1918?		
4. *Wood et al. Galisteo No. 1	7-12-10	3240′	1921		Numerous oil and gas shows rptd. between 760′ and 2715′
5. *Wood et al. Galisteo No. 2	30-13-10	1540′	1925		
6. Fisher and Wolcott Fisher No. 1	3-10-7	980′	1933	Penn.	
7. Kelsey Clients Devel. Co. No. 1	26-10-10	1052′	1933	Penn.?	
8. Forty Eight Petroleum Co. Fisher No. 1	6-10-7	2750′	1935	Precambrian	Rptd. show of oil at 1635′ and 2005′
9. E. M. Elliott No. 1	26-21-9	1760′	1937	Penn.	Rptd. oil show at 775′ and 1100-25′, gas show at 1175-1200′
10. P. B. English Fullerton-Dobson No. 1	16-12-10	3210′	1945	Precambrian	
11. P. B. English Ray Moore No. 1	16-12-10	?	1945		
12. Richfield Oil No. 1 Fed.	25-14-11	2589′	1945	Precambrian	Minor oil shows rptd. 300-400′
13. Richfield Oil No. 2 Fed.	14-14-11	2725′	1945	Precambrian	Minor oil shows rptd. between 550′ and 800′
14. Hickerson Wright No. 1	12-10-5	?	?	?	
15. Hickerson Wright No. 2	12-10-5	1510′	1948	Dakota?	
16. Blackstone Neville No. 1	9-11-11	1215′	1951	Sangre De Cristo ?	
17. Associated Oil & Gas Co. Vigil No. 1	14-12-6	1201′	1954	Penn.	
18. Castle and Wigzell Kelly Fed. No. 1	11-20-9	2703′	1961	Penn.	Minor oil shows rptd.
19. Black Drlg. Co. Fed. No. 1	23-14-11	?	1963	?	Rptd. rainbow shows of oil and unflammable gas
20. Southern Union Tijeras Canyon Unit No. 1	12-10-5	1903′	1964	Chinle	
21. Southern Union Tijeras Canyon Unit No. 2	12-10-5	?	1964	?	
22. Southern Union Tijeras Canyon Unit No. 3	12-10-5	2228′	1964	Entrada	
23. Bar-S-Bar Ranch No. 1	23-12-10	4202′	1967	Precambrian	
24. Ramsey Petroleum Corp. White Lakes No. 1	28-11-11	1058′	1969	Yeso	
25. Shell Oil Co. SFP No. 1	18-13-3	11,046′	1972	Precambrian	Rptd. shows of gas and oil
26. *Eastland Oil Co. McKee No. 1	8-13-9	2092′	1974	Morrison	Rptd. show of gas and oil
27. *C.P.G.S. Bicentennial No. 1 Fed.	35-13-6	1416′	1976	Morrison	Rptd. show of gas
28. *C.P.G.S. Bicentennial No. 2 Fed.	35-13-6	1411′	1976	Morrison	Rptd. show of gas
29. *C.P.G.S. Bicentennial No. 3 Fed.	35-13-6	1112′	1976	Mancos	Rptd. show of gas
30. *C.P.G.S. Bicentennial No. 4 Fed.	35-13-6	1403′	1976	Morrison	Rptd. show of gas

Well Name	Section Township (N) Range (E)	Total Depth	Year Completed	Deepest Formation Penetrated	Remarks
31. *Brent Exploration No. 1	29-13-6	1875′	1978	Morrison	
32. *Brent Exploration No. 3	19-13-6	2070′	1978	Entrada	Rptd. show of oil
33. *Brent Exploration No. 5	19-13-6	769′	1978	Dakota	Rptd. show of gas
34. *TransOcean Oil Co. McKee No. 1	4-13-9	8128′	1978	Penn.	Rptd. show of gas
35. *Whigham Inc. Piñon-Davis No. 1	21-14-10	1514′	1979	Dakota	Rptd. show of oil and gas
36. *Whigham Inc. Piñon-Davis No. 2	21-14-10	1150′	1979	Greenhorn	Rptd. show of oil and gas

*Wells drilled within the area of preserved Cretaceous rocks.

HISTORY OF OIL AND GAS EXPLORATION

Pre-1972 Exploration

Prior to 1972, only three wells had been drilled inside the hatchered area of Figure 1. The first and oldest well in the area was the Tejon Oil and Development Co. No. 1 drilled in sec. 7, T14N, R6E. This well reportedly was drilled in 1914 to a total depth of 1,850 ft (564 m) and reported oil shows at 1,000 and 1,087 ft (305 and 332 m, respectively). The other two wells were the Wood et al. Galisteo No. 1 and No. 2 completed in 1921 and 1925. The No. 1 well was located in sec. 7, Ti 2N, R1 0E, and had several oil and gas shows between 760 and 2,715 ft (232 and 828 m, respectively). No shows were reported in the No. 2 well drilled several years later in sec. 30, T13N, R10E. No other oil and gas wildcats were drilled in the area until amost 50 years later in 1972.

Post 1972 Exploration

Modern oil and gas exploration in the area began in the 1970's, and was concurrent with Shell's exploration efforts in the Albuquerque basin. Since 1972, twelve modern wildcat wells have been drilled within the basin outlines. All of these wells have reported oil and/or gas shows in the Cretaceous section. In 1974, Eastland Oil Co. drilled a Dakota test in sec. 8, T13N, R9E. This well was spudded in Mancos Shale in the center of a Tertiary anticline on the McKee Ranch southwest of Galisteo. The well encountered both oil and gas shows in the Cretaceous section. It was T.D.ed at 2,092 ft (638 m) in the top of the Morrison. Two years later (1976), Colorado Plateau Geological Services drilled four shallow tests in sec. 35, T13N, R6E in the Hagan embayment east of the ghost town of Hagan. These wells were drilled to test reported shows in a nearby uranium core hole. None of these wells was completed, but all saw both oil and gas shows in the Cretaceous section. This activity was followed in 1978 by three wells drilled by Brent Exploration west and northwest of Hagan. Again, these wells were dry, but had shows of oil or gas.

The only deep test within the Hagan and Santa Fe embayment areas was drilled in 1978 by TransOcean Oil Co. This well in sec. 4, Ti 3N, R9E was spudded in the Tertiary Galisteo Formation. The well penetrated the entire Cretaceous, Jurassic, Triassic and Permian sections, and was T.D.ed at 8,128 ft (2,479 m) in the Pennsylvanian. Data on the well are unreleased; however, oil and gas shows were reported from more than one formation. The last wells in the area were completed in May, 1979 by Whigham, Inc. southeast of Lamy. The Whigham Pii-ion-Davis No. 1 reported both oil and gas shows in the Mancos Shale above the Dakota. The well was T.D.ed at 1,514 ft (462 m) in the Burro Canyon (Jackpile equivalent). Several days later, the rig was moved 330 ft (101 m) south, and the Whigham PH-ion-Davis No. 2 was air-drilled to 1,150 ft (351 m). Both wells were plugged and abandoned in May, 1979.

EFFECTS OF TERTIARY TECTONICS

The recent wildcat activity in the areas underlain by Cretaceous rocks emphasizes the current interest in the Mesozoic rocks. For a better understanding of the Cretaceous rocks and some of their important facies, the reader is referred to the other article in this guidebook by Black.

Exploration in the Santa Fe and Hagan embayments is more difficult than exploration for the same rocks in the San Juan Basin due to the complex Tertiary history in this area. Figure 2 illustrates the profound effects of the Neogene rift on the earlier relatively simple Paleogene setting.

Figure 2 shows the partial extent of the Eocene Galisteo depositional basin as it might have appeared at the close of the Laramide compressional event (see Gorham and Ingersoll, this guidebook). The Galisteo basin probably was bounded, at least partially, on the west by the Nacimiento Mountains and their southern positive extension in the Rio Puerco area. To the north, the basin may have been bounded partially by the Tusas uplift, and on the north and northeast by the Sangre de Cristos. To the east, the Eocene basin probably was bounded by the northern Pedernal uplift. The southern boundaries of the basin are unknown.

The Nacimientos, Tusas and Sangre de Cristos were uplifted during the Laramide orogeny and exposed to erosion. They were stripped to the Precambrian in some areas, with deposition taking place east and west of the uplifts in separate basinal areas (e.g., Galisteo and San Juan basins). At this time, the Galisteo basin probably looked much like the San Juan Basin.

Laccolithic intrusion into the Mesozoic section took place in the Madrid and Cerrillos areas, and surface expressions of this activity were the Espinaso Volcanics in the Oligocene (fig.

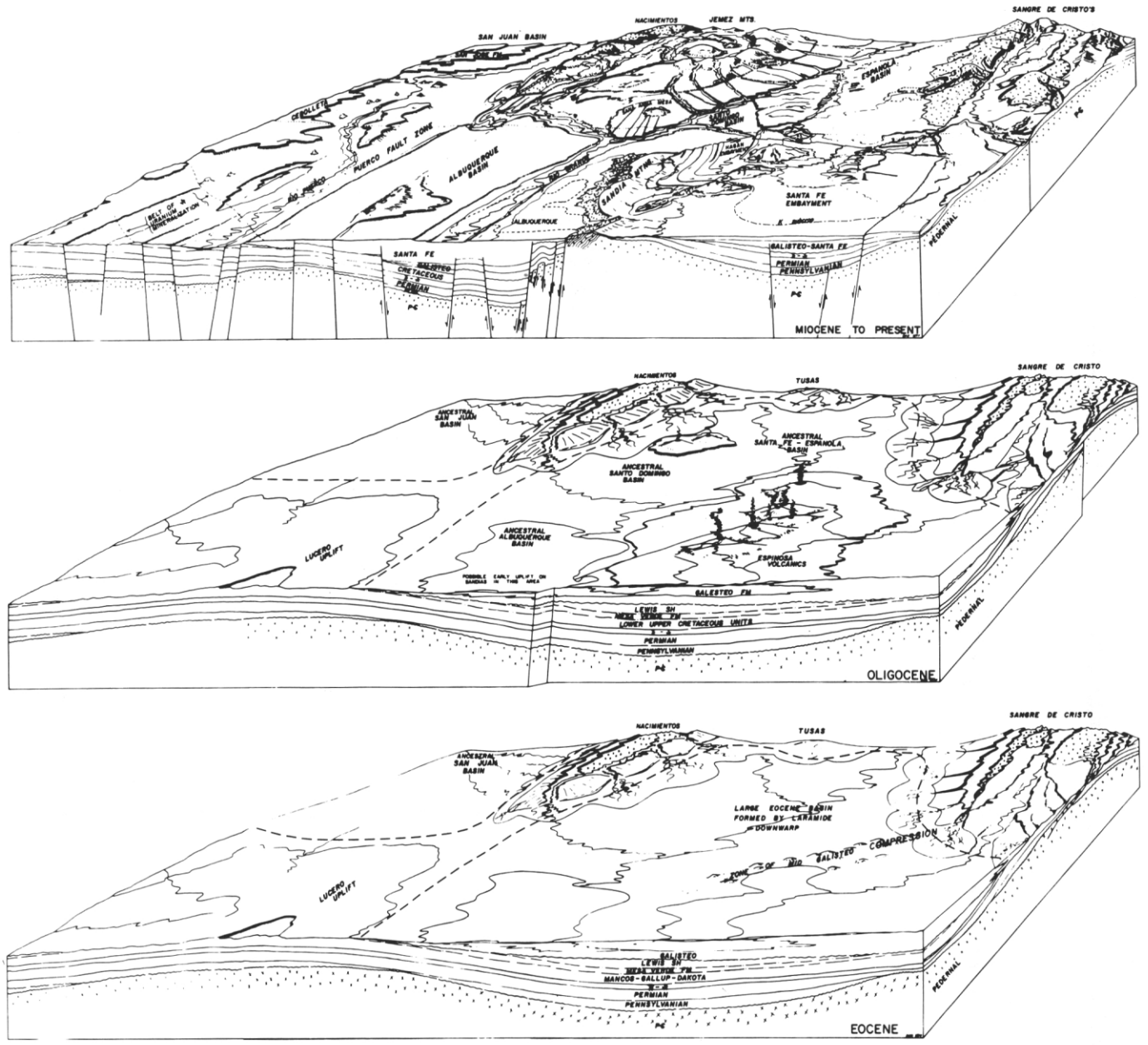


Figure 2. Schematic paleogeographic diagrams showing the Cenozoic evolution of the Santa Fe-Galisteo-Hagan area. The diagrams depict the area from an east-west line through the Albuquerque area, north as far as Española, and from the Lamy area in the east to Cebolleta Mesa in the west.

2). It is possible that large-scale normal faulting (down to the west) already was occurring in the Hagan area as a preview to rifting in the Albuquerque basin area. The Galisteo basin was, however, essentially still intact, although lateral movement on the Tijeras shear (see Lisenbee and others, this guidebook) probably was taking place. Deposition continued to fill the basinal areas.

Figure 2 also shows the radical effects of Neogene tectonics. Rifting in the Albuquerque area was the result of tensional tectonics, as contrasted to the earlier Laramide compression. Figure 3 shows the probable shape and relative depths of the preserved section in the northern Albuquerque and Santo Domingo basins, and the Hagan and Santa Fe embayments.

Figure 4 is an artistic depiction of the Cretaceous rocks with the older and younger rocks stripped away. Although severely faulted and folded, a large package of Cretaceous rocks probably is present beneath the Santa Fe and Hagan embayment areas, and in the northern Albuquerque, Santo Domingo and Esparlola basins.

CONCLUSIONS

Future exploration in the area probably will continue to pursue the deeply covered Mesozoic objectives and must rely on surface geology, well control and seismic interpretations to unravel the complex and covered geology in this area.

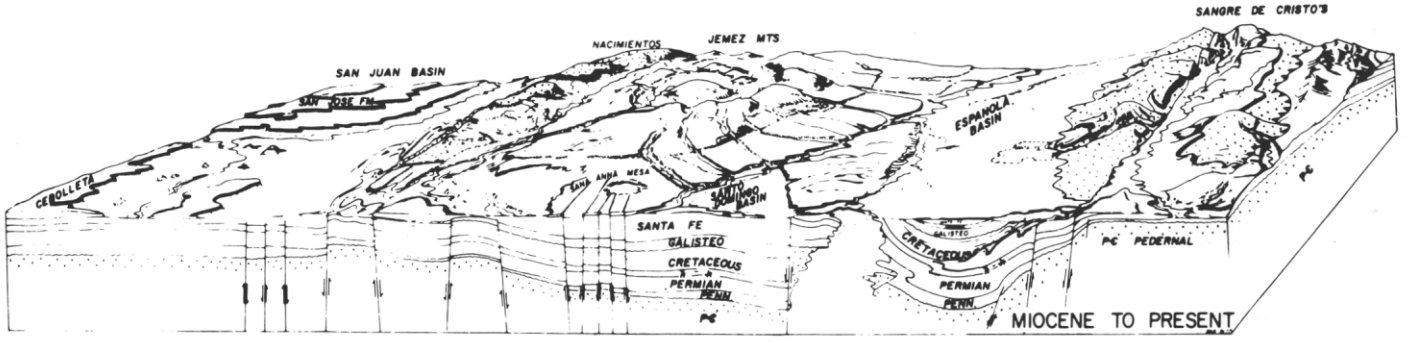


Figure 3. Cut away diagram through a line running from Mesa Cebolleta in the west through Santa Anna Mesa to Lamy on the east.

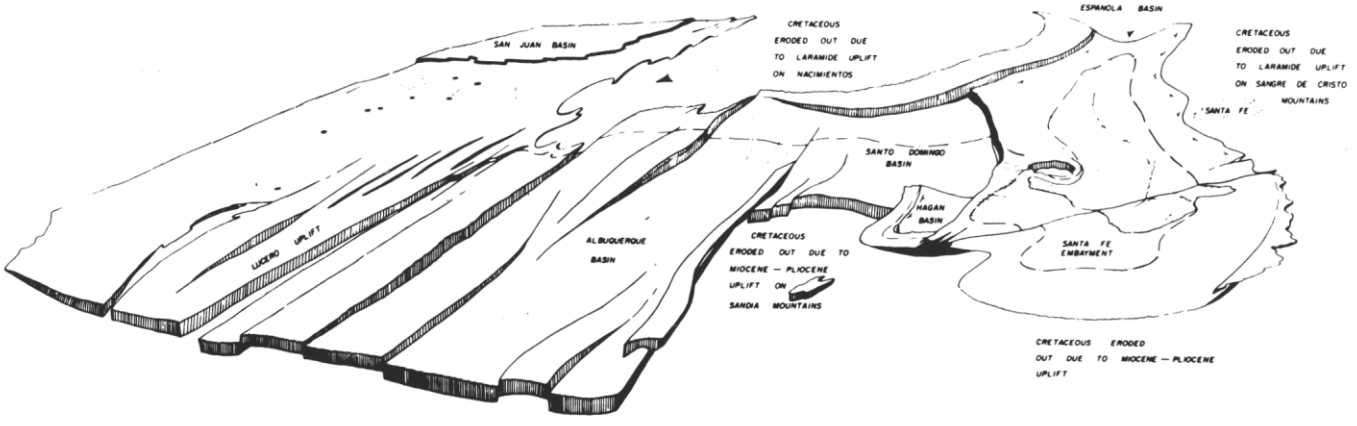
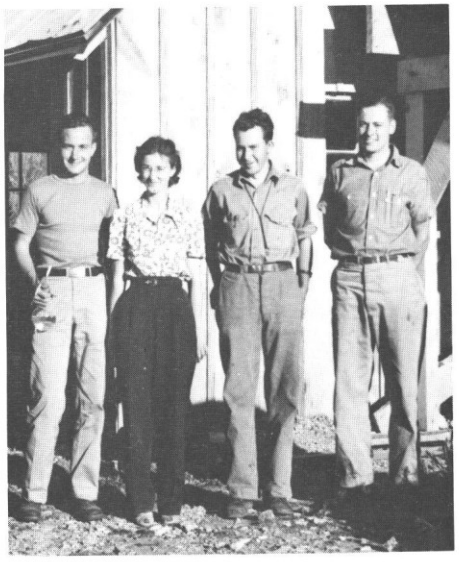
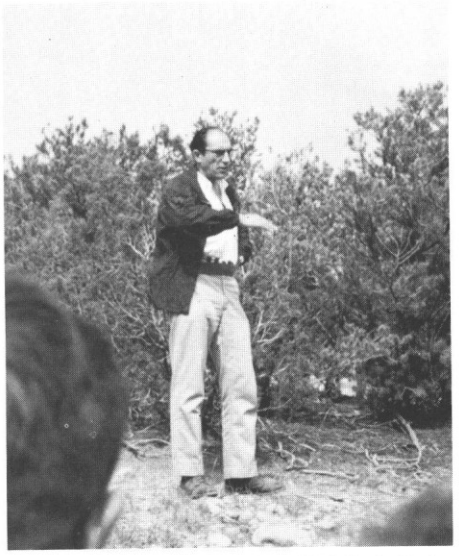


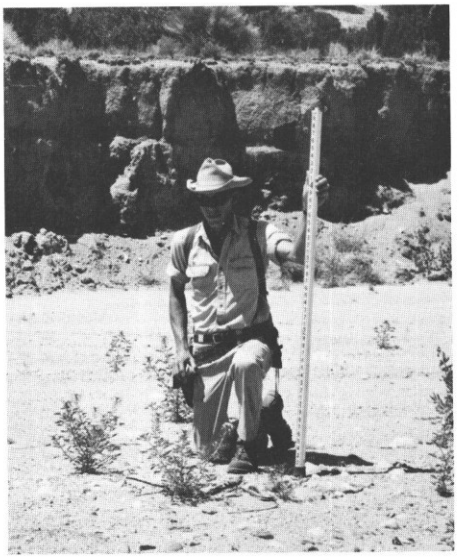
Figure 4. Schematic diagram showing shape and depths of Cretaceous rocks with older and younger rocks removed.



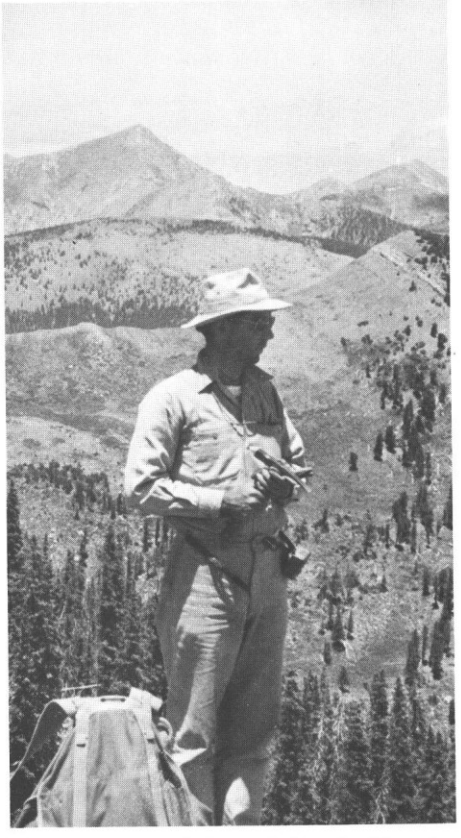
William P. Irwin (USGS), Frances Jahns, Lauren A. Wright (then USGS, now Penn State) and Dick Jahns (then USGS, now Stanford) at the Harding mine office, Taos Co., New Mexico, 1943.—R. H. Jahns.



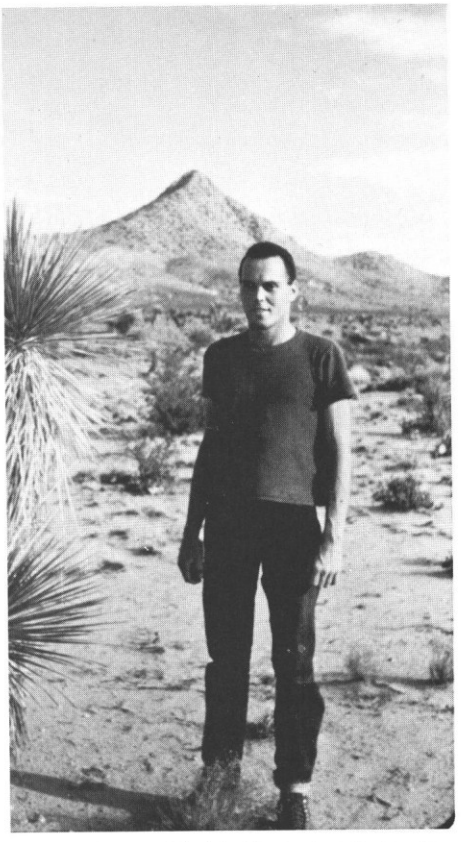
Luna B. Leopold, formerly Chief Hydrologist, USGS, now at the University of California, Berkeley, leading field trip to Arroyo de los Frijoles a few miles northwest of Santa Fe, fall 1965. Leopold's work included fundamental research on erosion by streams. Those who visited the project will remember the painted and numbered rocks, buried chains and steel pins used to measure stream bed-load and changes in shape of the channel.—W. L. Hiss.



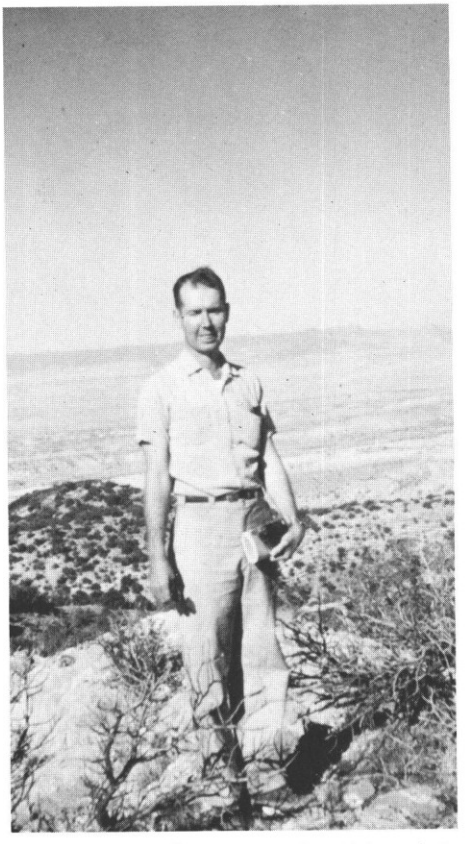
William W. Emmett on Arroyo de los Frijoles, Santa Fe, 1962.—L. B. Leopold.



From a ridge of Pecos Baldy, looking due north, over Pecos Baldy Lake, to the Truchas Peaks on skyline in the Pecos Wilderness. Dr. Patrick K. Sutherland, Professor of Geology, University of Oklahoma. Photo by John Miller, 1956.—P. K. Sutherland.



Gus Armstrong, Florida Mountains, September, 1952.—A. K. Armstrong.



Pat Sutherland (University of Oklahoma) in Nacimiento Mountains; Cabazon Peak in background, 1952.—A. K. Armstrong.