Introduction

Vincent C. Kelley

1950, pp. 9-11. https://doi.org/10.56577/FFC-1.9

in:

San Juan Basin (New Mexico and Colorado), Kelley, V. C.; Beaumont, E. C.; Silver, C.; [eds.], New Mexico Geological Society 1 st Annual Fall Field Conference Guidebook, 152 p. https://doi.org/10.56577/FFC-1

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INTRODUCTION

By V. C. Kelley
University of New Mexico

The San Juan Basin is located mostly in northwestern New Mexico where it embraces all of San Juan County and parts of McKinley, Rio Arriba, Sandoval, Valencia, and Bernalillo Counties. Most of the north rim of the basin is in Colorado where it occupies parts of Archuleta, La Plata, Montezuma, Hinsdale, and Mineral Counties. A narrow part of the west rim of the basin extends into Apache County, Arizona. The area of the San Juan Basin is irregularly circular and includes 15-20 thousand square miles.

Drainage from the central part of the basin is mostly toward the northwest through the San Juan River. To a very considerable extent the basin is coincident with the watershed of the San Juan River and its tributaries. The Chama River, however, drains a small sector in the northeastern part of the basin eastward into the Rio Grande, and two rivers, Rio Puerco of the west and Rio Puerco of the east, drain watersheds in the southwestern and southeastern parts of the basin.

Most of the interior of the basin is open country broken by occasional low mesas, buttes, or wide cuestas. Probably twenty per cent of the area is badland topography. Along the outer part hogbacks and pediments capped with gravel or lava flows are rather common features of the landscape. Valleys in the central part are wide and seldom of great depth. They are commonly flanked by stream terraces. Local relief in the open part of the basin is rarely more than a few hundred feet. Approaching the rim, however, the relief increases to one or two thousand feet, and along the mountain uplifts the relief reaches several thousand feet. Altitudes in the central part of the basin range from 5,000 to 7,500 feet. Altitudes of some of the prominent peaks or ranges are as follows:

North side:	Feet
Babcock Peak, La Plata Mountains	13,150
Mount Eolus, Needle Mountains	14,079
Chama Peak	12,027
Navajo Peak, Chalk Mountains	11,330
East side:	
Brazos Uplift	11,300
San Pedro Mountains	10,000
Pajarito Peak, Nacimiento Mountains	9,042
Cabezon Peak	8,000
South side:	
Mount Taylor	11,326
Mount Sedgwick, Zuni Mountains	9,300
West side:	
Defiance Uplift	8,500
Lukachukai Mountain	9,430
Chuska Mountains	8,900
Pastora Peak, Carrizo Mountains	9,420
Ship Rock	7,178

Relief of the San Juan Basin from the highest bordering peak to a point on the San Juan River where it leaves the basin is about 9,300 feet.

The principal towns on the north side of the basin are Durango, Pagosa Springs, and Cortez, all in Colorado. The villages of Chama, Park View, Tierra Amarilla, and Cuba are along the east edge of the basin. Gallup and Grants are located along U. S. Highway 66 on the south side of the basin. Ship Rock is the only village along the west side, but Farmington and Aztec are in the northwestern part of the basin. Albuquerque and Santa Fe to the southeast and east of the basin enter importantly into the economy of the basin. The basin is crossed by the paved U. S. Highways 66, 84, 160, 550, and 666. One of the principal highways across the basin is New Mexico Highway 44 which crosses the basin diagonally and connects Albuquerque and Durango through Cuba and Aztec.

The narrow-gauge Denver and Rio Grande Western Railroad enters the basin from the northeast through Cumbres Pass and serves Chama, Durango, Aztec, and Farmington in the north and central part of the basin. The southern part of the basin is crossed by the Santa Fe Railroad. Frontier Airlines serves Gallup, Farmington, Durango, and Cortez.

The precipitation varies widely. In the high mountains along the north rim the mean annual snowfall is about 16 feet, whereas in the southern and central parts of the basin the annual rainfall is about 8-15 inches.

Livelihood in the San Juan Basin has diverse bases in petroleum production, coal mining, mineral mining, grazing, farming, and tourist trade. Oil which ranges from about 32°-76° gravity A. P. I. is produced from both deep and shallow horizons. Both "sweet" and "sour" gas are encountered in the basin.

Coal mining is carried on principally near Gallup on the south side of the basin and Durango on the north side. The principal metal-mining activity centers around the Shenandoah-Dives mine and mill at

Silverton in the San Juan Mountains where gold, silver, and base metals are produced. Gold is the chief metal that has been mined in the La Plata Mountains northwest of Durango. Vanadium and uranium are mined in southwestern Colorado, and the Vanadium Corporation of America operates a vanadium and uranium smelter at Durango as agent for the Atomic Energy Commission. Exploration for these metals in the northwestern part of the basin has been spurred by recently reported strikes.

Pumice and fluorspar are mined along the south side of the basin and exploration of perlite deposits is in progress.

Grazing of sheep and cattle on open and fenced lands throughout the basin is one of the principal industries and sources of income in the area. Farming is largely restricted to the principal river valleys where irrigation is possible from permanent streams. However, in many areas some dry farming is practiced. Some lands are irrigated from wells and the entire basin has a structure favorable for artesian water, but it is doubtful whether the Cretaceous or Tertiary rocks contain aquifers capable of producing quantities of water for irrigation or other large uses.

Rocks in and around the San Juan Basin range in age from pre-Cambrian to Recent. Most of the central part of the basin is covered by a circular blanket of continental sediments of early Tertiary or very late Cretaceous age. The area of outcrop of these rocks averages about 90 miles in diameter. Outside these rocks a roughly circular outcrop ring of marine and non-marine Upper Cretaceous formations circumscribes the basin. Bituminous and subbituminous coal seams up to 10 feet thick are common in the non-marine beds and a few exploratory wells have cut in excess of 100 feet of coal broken by shale splits. Older sedimentary formations of Mesozoic and Paleozoic age surround the Cretaceous rocks in the foothills and rim areas of the basin. The total thickness of sedimentary rocks in the center of the basin ranges from 10,000-15,000 feet. Many of the sedimentary units are thicker in the central part of the basin and thinner in the flanks of the uplifts bordering the basin. Facies changes around and within the basin occur in many of the formations, and intertonguing of marine and non-marine formations is excellently displayed on a regional scale. Overlapping unconformities and local angular unconformities occur in the flanks of the uplifts around the basin, but in the large central area the beds are probably parallel or sub-parallel throughout the section from the deeply buried early Paleozoic to the surface Tertiary beds.

Structural uplifts and platforms alternate around the broadly downwarped central part of the basin. A pronounced "monoclinal" flexure circumscribes the central part of the basin on all but its south side. The floor of the basin inside the "monocline" is tilted northward and displacement on the "monoclines" therefore diminishes southward. Oil and gas structures consist principally of domes and faulted noses, and those that are known are located principally in the outer part of the basin. Stratigraphic traps are considered very important to the accumulation of gas.

Geologic exploration in the region of the San Juan Basin dates from the early railroad expeditions in the 1850s. Our present knowledge of the geology of the basin stems primarily from (1) the many U. S. Geological Survey papers on various aspects of stratigraphy, paleontology, structure, and mineral resources, (2) private papers on vertebrate paleontology and stratigraphy, and (3) the oil and gas bulletins of the New Mexico Bureau of Mines and Mineral Resources. Interest in petroleum exploration has been high since World War II. In 1950 the Federal Power Commission granted permission to El Paso Natural Gas Company to build a pipe line to California and as a result interest in exploration will probably continue high for some time.

A dozen or more geological parties have been active in the basin during the past several years. Geophysical exploration which has been carried on in the basin for a number of years, has been principally with seismographs, although many gravity and magnetometer surveys have been made. It is estimated elsewhere in this guidebook that, in all, about 39 crew years of geophysical exploration have been completed in the basin. Much general geologic and geophysical mapping remains to be done, and very little of the area has been mapped in detail by either geological or geophysical methods.

It is estimated elsewhere in this guidebook that of some 8,000,000 acres in the principal part of the basin that 45 per cent is public land; 38 per cent, Indian; 7 per cent, State; 6 per cent, patented; and 4 per cent, railroad.

It is impossible to visit all parts of the San Juan Basin in a satisfactory manner on a three-day field trip. Inasmuch as field trips have been conducted along the south and west sides in recent years, it was decided by the Conference Committee to schedule this trip along the east and north sides of the basin. Although the trip is routed in order to see exposures of most of the geologic column, the emphasis is probably on the pre-Tertiary part of the section. However, exposures of the upper Tertiary rocks are crossed in the Rio Grande Valley early the first day and exposures of the lower Tertiary are crossed later the first day and during the second day. The third day's trip covers the rather striking exposures of the older rocks down to the pre-Cambrian in the rugged margin of the San Juan Mountains.

The scenery throughout the conference will certainly please visitors from Texas and other plains states and in places it might even thrill those from California.

The guidebook consists of nine short papers on the geologic systems represented in the region, several papers of a regional nature which treat the sedimentary and structural history, and special papers concerning mineral resources, geophysical exploration, drilling practices, marketing, status of land, and history of development and production. Only a little more than two month's time was available in which to compile the guidebook. It is, therefore, almost inevitable that a number of unfortunate omissions and errors will have occurred. It is hoped that these shortcomings, together with the mere existence of this work, may result in better future guidebooks.

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