QUATERNARY GEOLOGIC MAPS OF THE WESTERN SAN MATEO MOUNTAINS, SOCORRO AND CATRON COUNTIES, NEW MEXICO.

KELLOG WELL, OAK PEAK, DUSTY, WELTY HILL, WAHOO RANCH, AND MONTOYA BUTTE 7.5-MINUTE QUADRANGLES

by

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INTRODUCTION

Location, land status, and terrain

The 6 7.5-minute quadrangles covered in this report extend south of the San Agustin Plains between the San Mateo Mountains to the east and the Luera Mountains to the west in Socorro and easternmost Catron Counties, west-central New Mexico. From north to south, Kellog Well, Oak Peak, Dusty, and Wahoo Ranch extend from 34°00′N to 33°30′N, between 107°37′30″W and 107°45′W. Welty Hill and Montoya Butte are immediately east of Dusty and Wahoo Ranch, respectively, extending from 33°45′N to 33°30′N, between 107°30′W. and 107°37′30″W. Each quadrangle covers an area of approximately 158 km^2 (61 mi^2), roughly totaling an area of 948 km^2 (1,517mi^2).

Kellog Well and the northern part of Oak Peak lie in the southern San Agustin basin, a large semiarid to arid closed basin, which contained one of the largest Pleistocene lakes in New Mexico. Kellog Well lies one quadrangle south of the National Radio Astronomy Observatory (NRAO) Very Large Array (VLA) facility, which dominates the open, grass-covered landscape of the San Agustin Plains. Present day surface drainage for this area flows into a playa which extends into the northwestern Kellog Well quadrangle. Elevations range from 2,109 m (6,918 ft) in this playa basin to 2,650 m (8,695 ft) in the northeastern mountain area of the Oak Peak quadrangle (Oak Peak itself has an elevation of 2,649 m –8,694 ft). This area covers lands administered by the National Forest Service in the east and either Bureau of Land Management or the State Land Office elsewhere, with a few large private ranches scattered in between. No towns lie in either quadrangle; the only public roads are NM state highway 52, which divides the 2 quadrangles running north-south, NM state highway 163 which heads to the southwest from highway 53 in Oak Peak (both are improved dirt), and Forest Service roads 476, 477, and 549, which ascend into the San Mateo Mountains.

South of the basin divide extending roughly east-west in the center of Oak Peak at an elevation of around 2,200 m or 7,200 ft, lies the Alamosa Creek basin, which straddles the 4 remaining quadrangles. Elevations range in this area from 1,753 m (5,750 ft) where Alamosa Creek flows out of Montoya Butte to 2,548 m (8,358 ft) in the Luera Mountains and 2,545 m (8,350 ft) in the San Mateo Mountains. The San Mateo Mountains are the higher of the two, culminating at 3,125 m (10,252 ft) at Vicks Peak. Surface drainage flows either from the northeast out of the San Mateo Mountains through a series of deeply cut canyons, or from the west out of the Luera Mountains into Alamosa Creek, which in turn flows through the water gap of Monticello Box, and the deeply incised Cañada del Alamosa before emptying into the Rio Grande immediately above Elephant Butte Reservoir. There are no towns in Dusty, Welty Hill, Wahoo Ranch, or Montoya Butte either, although the community of Dusty once had a post office. NM state highway 53 extends south from Oak Peak through Dusty and Wahoo Ranch, the southern boundary of which lies 19.2 km (12 mi) north of Winston. The only other public roads are Forest Service roads 71, 72, 76, 94, 97, 140, 377, 478, 511, and 960, which ascend into the San Mateo Mountains, and 642, 909, and 913 extending into the Luera Mountains.

General Geology and Previous Mapping

Both the Luera and San Mateo Mountains are comprised of volcanic rocks from a series of cauldrons, which are part of the much larger mid Tertiary Datil-Mogollon volcanic field covering much of southwestern NM. Excellent overviews of the Datil-Mogollon field are found in Elston and Northrop (1976) and Chapin and Elston (1978). A wide variety of lavas (basaltic, rhyolitic, andesitic), tuffs, ash flow tuffs, and intrusive rocks of the Datil Group and other formations are found in these mountains. Since mid Tertiary time, massive amounts of volcaniclastic sediments have been shed by these uplands into the San Agustin and Alamosa Creek basins and piedmont alluvium is commonly 100s of meters thick. These deposits, previously called the Gila conglomerate by many workers are better correlated with the Upper Santa Fe Group of the Rio Grande Valley.

Myers, et al. (1994), while not actively mapping the geology of the area, produced a series of excellent cross sections of the area in their hydrogeologic investigation. The only complete mapping of this area was by Willard (1957). Hillard (1969) mapped a small area around the Apache Warm Springs and the Monticello Box. Fodor’s (1976) mapping of the northern Black Range (i.e., the Luera Mountains) extends as far east as NM 52, but he doesn’t distinguish between piedmont and stream alluvium. Mapping of Lake San Agustin deposits and features are largely taken from R. H. Weber (unpublished). C. A. Ferguson and G. R. Osburn have mapped the northern San Mateo Mountains (Ferguson, 1990; Ferguson and Osburn, 1994), and are actively mapping the mountain range, heading south. This mapping, the Quaternary Geology of the western San Mateo Mountains, is meant to compliment this ongoing work.

Since Datil-Mogollon time, a series of mainly north-south normal faults have cut these basins associated with basin and range faulting since around 21 Ma. The development of the Winston Graben (containing the Alamosa Creek basin) occurred at this time and active faulting in the basin has continued into the late Quaternary. The western side of the graben has dropped considerably more than the east. This is probably the result of the westward dipping, upthrust fault block that make up the Luera Mountains (Fodor, 1976). Santa Fe Group piedmont surfaces are around 75 m (200 ft) lower west of Alamosa Creek than those to the east on the Dusty quadrangle, and have since been covered by extensive early to middle Pleistocene fan deposits. This drop in base level undoubtedly facilitated canyon cutting by streams debouching from the San Mateo Mountains to the northeast. This active tectonic setting combined with wetter climates of the Pleistocene has resulted in the spectacular flight of 9 Alamosa Creek stream terraces and terrace straths presently seen in the basin.

Hillard (1969) described a series of intersecting normal faults with considerable displacement in the vicinity of Monticello Box and Fodor (1976) speculated that a subsided cauldron might be found in the center of the basin in the vicinity of the Box, since covered by Quaternary alluvium, which might be the source for the Railroad Canyon ash-flow tuff. Instead of a buried cauldron, structures mapped on the Wahoo Ranch quadrangle and presented here indicate the presence of 5 buried volcanic stocks, located along the intersection of major basin faults.

COMMENTS TO MAP USERS

Mapping of this quadrangle was funded by a matching-funds grant from the 2001-2003 STATEMAP program of the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under USGS award number 00HQAG0078, to the New Mexico Bureau of Geology and Mineral Resources (Dr. Peter Scholle, Director; Dr. Paul W. Bauer, P.I. and Geologic Mapping Program Manager). This quadrangle map has been Open-Filed in order to make it available as soon as possible. The map has not been reviewed according to NMBGMR standards, and due to the ongoing nature of work in the area, revision of this map is likely. As such, dates of revision are listed in the upper right corner of the map and on the accompanying report. ***The contents of the report and map should not be considered final and complete until it is published by the New Mexico Bureau of Geology and Mineral Resources.***

A geologic map graphically displays information on the distribution, nature, orientation, and age relationships of rock and surficial units and the occurrence of structural features such as faults and folds. Geologic contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic map are based on field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown everywhere.

The cross-sections in this report are constructed based on surficial geology, and where available, subsurface and geophysical data. The cross sections are interpretive and should be used as an aid to understand the geologic framework and not used as the sole source of data in locating or designing wells, buildings, roads, or other structures.

The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

DESCRIPTION OF MAP UNITS

af — **Artificial fill** – areas of disturbed ground, either excavated or fill. Commonly seen as check dams for stock tanks.

Qca — **Colluvium and alluvium**, undivided (Holocene to upper-middle Pleistocene) – sands and volcanic gravels on hillslopes and adjacent to upland stream channels.

Pleistocene Lake San Agustin Deposits

Qpl — **Playa deposits** (Historic to uppermost Pleistocene) – clay to fine-grained sand lake bed sediments.

Qbs — **Beach-ridge sand deposits** (Holocene to uppermost Pleistocene) – well sorted, fine- to medium-grained sands, deposited along linear beach-ridges.

Qds — **Sand sheets and dune sand deposits** (Historic to Holocene) – well sorted, fine-grained sands deflated from Qpl deposits to the west, coomonly stabilized by grasses and low shrubs. Where active, they often exhibit parabolic dunal forms with associated adjacent areas of deflation, seen migrating to the east-northeast.

Stream Alluvium

QHa — **Youngest stream alluvium** (Historic to Holocene) – sands and volcanic gravel lag deposits found in active stream channels and adjacent floodplains.

Qay — **Younger stream alluvium** (Holocene to uppermost Pleistocene) – sands and volcanic gravels found in stream channels, especially in upland streams. Subdivided by age/inset relationships where possible (Qay_2, Qay_1).

Qat — **Stream terrace alluvium** (upper to lower Pleistocene) – sands and volcanic gravels found flanking larger stream channels and canyons. Oldest terraces of Alamosa Creek are seen as strath-cut surfaces in QTsp or bedrock and are differentiated by ($at_{5\text{-}1}$) symbology.

Piedmont Alluvium

Qpy **Youngest piedmont alluvium**, undivided (Holocene to uppermost Pleistocene) – sands and volcanic gravels found in fans and bajadas, especially in toe-slope landscape positions adjacent to playa deposits or major stream channels. Soils developed in these deposits commonly exhibit stage I to I+ pedogenic carbonate morphology in lower elevations.

Qpm **Older piedmont alluvium**, undivided (upper to middle Pleistocene) – sands and volcanic gravels found in fans and bajadas, often occurring in mid-slope landscape positions. Soils developed in these deposits commonly exhibit stage III pedogenic carbonate morphology in lower elevations.

Qpo **Old piedmont alluvium**, undivided (middle Pleistocene to Plio-Pleistocene) – sands and volcanic gravels found in fans and bajadas adjacent to uplands. Soils developed in these deposits commonly exhibit stage III to V+ pedogenic carbonate morphology in lower elevations. Subdivided by age/inset relationships where possible (Qpo_2, Qpo_1).

Santa Fe Group

QTsp **Upper Santa Fe Group piedmont alluvial deposits**, undivided (lower Pleistocene to Pliocene) – sands and volcanic gravels, often partially indurated, found in fans and bajadas adjacent to uplands. Soils developed in these deposits commonly exhibit stage IV to V+ pedogenic carbonate morphology in lower elevations.

Tu **Tertiary bedrock**, undifferentiated

DESCRIPTION OF GEOLOGIC MAP SYMBOLS

Geologic contact – solid where exposed; dashed where approximately located.

Geologic contact between stream terrace strath-cut surfaces, found on QTsp or bedrock

Pleistocene Lake San Agustin shoreline – solid with barbs where scarp-forming; dashed where approximately located; dash-dotted where shoreline etched a wave-cut notch in bedrock.

Normal fault – solid where exposed; dashed where approximately located; dotted where concealed. Bar and ball on downthrown block.

Strike-slip fault – solid where exposed; dashed where approximately located; dotted where concealed.

Strike and dip of bedding.

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