History of the Galisteo Basin

The Galisteo Basin has been continuously occupied by a diverse collection of peoples and cultures since pre-historic times (Figure 1) (Nelson, 1914; Wallis, 1972; Eddy et al., 1996; Mednick, 1996). The earliest known humans to inhabit the Galisteo Basin were Paleo Indians who arrived in the Basin as early as 7500 to 6000 B.C. By 3000 B.C., the Galisteo Basin was inhabited by small groups of Paleo Indians whose diet consisted of wild plants and occasionally mule deer and antelope. Around 1500 B.C., people began to supplement their gathered foods with farming practices. It is believed that the early inhabitants of the Galisteo Basin moved seasonally, growing crops in the spring and summer at clearly established camps while sustaining their diet with game and wild plants (Nelson, 1914; Eddy et al., 1996). The Galisteo Basin remained sparsely populated until about the 12th century (Wallis, 1972; Mednick, 1996). Up to that time, the Basin was a trade route for turquoise, malachite,
and lead—materials mined in the Cerrillos Hills. Between 1100 and 1300 A.D., New Mexico and the entire southwestern U.S. experienced a prolonged, severe drought (Johnson, 2001; Snead, 2005). As the great pueblos at Chaco Canyon and Mesa Verde lost population, it is believed that some of the Anasazi people migrated to northern New Mexico—ultimately establishing a number of present-day Pueblo cultures. Other Anasazi people are presumed to have migrated to the Galisteo Basin, eventually sharing bloodlines with the Tanoan-speaking people already in residence (Nelson, 1914; Wallis, 1972; Eddy et al., 1996; Mednick, 1996).

**Pueblo San Marcos**

The Galisteo Basin lies just east of Santa Fe, New Mexico and is home to thousands of years of human occupation and was the site of significant 'cultural contact' between native Pueblo Indians and Spanish colonizers (Figure 1) (Mednick, 1996; CWCP, 2004). San Marcos Pueblo was one of the largest Pueblos in the Southwest (approximately 2,000 rooms) in the 15th and 16th centuries. By the early 17th century, Spanish Jesuits began construction of a mission inside the Pueblo. Nels C. Nelson of the American Museum of Natural History first visited and conducted test excavations at Pueblo San Marcos in 1912 and again in 1915 after obtaining permission from site owner Levi Hughes of Santa Fe (Figure 2) (Nelson, 1914; Wallis, 1972; Eddy et al., 1996). All
of Nelson’s test trenches remain untreated across the site, all of them having filled in naturally over time. Some remain visible as swales in the site’s surface.

Figure 3: Sketch reconstruction of Pueblo San Marcos. San Marcos Pueblo was one of the largest prehistoric adobe settlements in North America, consisting of an estimated 2,000 adobe rooms in 22 roomblocks, some thought to be two and three stories high, enclosing ten to twelve plazas; nine estimated midden areas; ten estimated kiva depressions; the remains of an early seventeenth-century Spanish Colonial mission complex; a possible cemetery; agricultural features southeast and west of the site’s main architectural features; at least two Spanish Colonial–period metallurgical smelting features; and a sherd and lithic artifact scatter that extends from the central architectural portion of the site in all directions (after Nelson, 1919).

Based on ceramic analyses and limited dendrochronology studies (Kroeber, 1916; Lyman et al., 1999; Lyman et al., 1998), Pueblo San Marcos dates from the mid to late 1200s to 1680 CE. The site’s proximity to Cerrillos Hills, a source of highly valued turquoise and lead deposits, as well as an abundance of turquoise and lead-glazed pottery found on the
site’s surface, has led many scholars to believe that Pueblo San Marcos controlled the Cerrillos turquoise and lead mines for many centuries (Milford, 1995). Chemical analyses of ceramics from Pueblo San Marcos and other pueblos in the Galisteo Basin indicate the village was a major manufacturing center for the ceramic types included in the Rio Grande Glazewares (Figure 4). This pottery was exported in large quantities from the village to other pueblos in the upper Rio Grande area and possibly as far away as the southern Plains (Eddy et al., 1996).

The site’s Spanish mission complex was started in 1610–1611 by Fray Alonso Peinado, at which time the village and the immediate area were patented as the San Marcos Pueblo Grant by the king of Spain (Figure 5) (Nelson, 1914; Wallis, 1972; Eddy et al., 1996). The mission began in several converted pueblo rooms, but eventually grew into a large two story adobe church and 18-room convento, complete with priests' quarters, offices, reception area, and kitchen. The mission lasted for approximately 70 years, until the Pueblo Revolt of 1680 resulted in the priest's deaths and the abandonment of the mission (Nelson, 1914; Eddy et al., 1996).

An estimated 600 people lived at Pueblo San Marcos, known as Ya’atze in the Keres language, shortly before the Pueblo Revolt (Sando, 1979). According to oral history and descendants of Ancestral Puebloan peoples, the inhabitants of Pueblo San Marcos moved south and west to join Santo Domingo, Cochiti, San Felipe, and Hopi. Recent research suggests there may have been some Puebloan reoccupation of the site following the
Revolt, but its extent and timing is uncertain. Today members of Santo Domingo, Cochiti, San Felipe, and Tesuque Pueblos, as well as the Hopi Tribe, claim Pueblo San Marcos as an ancestral site and continue to use the area for traditional purposes. Unlike other Southwestern missions, however, San Marcos was never re-occupied by the Spanish and remains an important 'time capsule' for archaeological research.

The site is currently listed as number 114 in the State Register of Cultural Properties. The ownership of the site is very complex, including portions held by the Archaeological Conservancy, the State of New Mexico, and multiple private individuals.

Figure 5: The Mission at San Marcos. Excavations in the late 1990's using remote sensing technologies (ground penetrating radar, proton magnetometry and electrical resistivity) provide a better understanding of the site layout then previous revealed with standard excavation techniques (Eddy et al., 1996).
Geophysical Exploration of the San Marcos Site

Through the application of numerous geophysical techniques over the past several years, the students and faculty of the Summer of Applied Geophysical Experience (SAGE) field program have defined several anomaly patterns in the geophysical data and these have allowed the detection of subsurface Pueblo-era features (e.g., Hinz et al., 2008). Estimation of the underlying Quaternary stream Terrace geology and the detection of subsurface Pueblo-related features utilized seismic refraction and reflection, electromagnetic, magnetic and ground-penetrating radar methods. The SAGE field program continues to investigate the pueblo site and to date only a relatively small number of features at the site have been investigated with geophysical methods. We will visit the site during ongoing SAGE operations and it is likely that Professor John Ferguson, SAGE faculty, will show us current site investigations.

Hinz et al. (2008) summarized the SAGE work to date, and the three figures shown below are directly from their contribution in Archaeological Prospection (Figure 6, Figure 7, Figure 8). Many anthropogenic structures and collections of debris have been identified using geophysical methods. The data collected revealed the presence of excavations in the Quaternary/Holocene stream terrace sequence in areas thought to contain kivas, identified the position of walls over a closed room block, and defined an area of anomalous magnetic susceptibility/remanence considered to be debris associated with a smelting operation. Several anomalies detected with the use of a total magnetic field magnetometer do not appear to directly correlate with features of anthropogenic affinity. Rather, they appear to be associated with cut-and-fill channels.
Figure 6: Location map of middens, room blocks, and kivas as defined by University of New Mexico archeologists. (Figure 3, directly from Hinz et al., 2008).

Figure 7. Geophysical profile over Kiva A: (A) Ground penetrating radar vertical time slice. (B) two residual profile lines, showing total magnetic field data after regional trend is removed and a synthetic profile response for a cylindrical magnetic shape with a radius of 4.5 m, a total depth of 1.2 m, a bottom depth of 2.5 m, and a contrast in magnetic susceptibility of -0.001 SI with surrounding sedimentary rocks and sediment. (C) velocity model based on seismic-refraction data. Bold, dashed lines show the extent of the kiva. (Figure 8, directly from Hinz et al., 2008).
Figure 8. Maps showing the magnetic and ground penetrating radar anomalies associated with Room Block 38: (A) residual total field magnetic anomaly map (background of 50600 nT); (B) GPR depth slice that integrates a depth from 0.6 to 0.7 m; (C) GPR depth slice that integrates a depth from 0.9 to 1.0 m. (Figure 10, taken directly from Hinz et al., 2008).
SURROUNDING GEOLOGY
Modified from Maynard et al., 2001 and http://www.cerrilloshills.org/history/natural-history/geologic-features

Late Cretaceous to Paleocene

During the late Cretaceous a shallow sea extended from the Gulf of Mexico to the Arctic Ocean and covered most of the Rocky Mountain area and High Plains. The Dakota Formation, often displaying its characteristic cross-bedding and fossil worm burrows and other trace fossils, crops out in several locations throughout the Galisteo Basin. The black to gray shale of the Mancos Formation are widely exposed in the region overlying the Dakota Formation; ammonites are often found in the Mancos Shale. The sea retreated and was replaced by braided low energy streams and swamps separated from the sea by broad sandy beaches. These rocks are part of the Mesa Verde Group, which extends over much of the Four Corners region, but outcrops are scarce in the area near the San Marcos Pueblo (Johnson, 1903).

Paleocene to Neogene

From about 65 Ma to about 35 Ma, a broad intermontane basin existed in the area that extended from Lamy to Placitas and slowly filled with sedimentary material derived from the nearby mountains uplifted during the Laramide Orogeny. These sedimentary rocks are sandstones and mudstones of the Diamond Tail and Galisteo Formations. Sandstone of the Diamond Tail Formation forms the buff-colored cliffs along NM-14 between Madrid and Cerrillos. The Diamond Tail and Galisteo Formations are well exposed on the eastern side of the Cerrillos Hills, where they have been tilted to vertical. The vivid red mudstone between the sandstone layers is the Galisteo Formation.

Figure 9: The Diamond Tail and Galisteo Formations are well exposed on the eastern side of the Cerrillos Hills, where they have been tilted to vertical. The vivid red mudstone between the sandstone layers is the Galisteo Formation.
present form with the invasion of the sedimentary rocks by molten rock (magma) 34 to 30 million years ago.

**Cerrillos Hills Igneous Complex**

The Cerrillos Hills Igneous Complex is part of the Ortiz Porphyry Belt, a 40.2 kilometer long, north-south trending group of igneous rocks that begins at South Mountain in the south, and ends at La Ciénega in the north (Lindgren and Graton, 1906; Lindgren et al., 1910; Lee, 1913; Milford, 1994). Throughout the Ortiz Porphyry Belt, the igneous rocks intruded sediments ranging from the Mississippian Period to the early-mid Paleogene. In the San Pedro Mountains, the Ortiz Mountains, and in the Cerrillos Hills, the igneous rocks are host to the ore deposits in the region. Ore mineralization include copper, lead, zinc, and silver as well as turquoise and other widely traded (ancient and historical) mineral deposits (Figure 10).

![Plaque near the entrance of Cerrillos Hills State Park describing the Native American to post Spanish mining activities in the district.](image)

**Recent Deposits**

From about 30 Ma to about 3 Ma, a series of linked basins forming the Rio Grande Rift developed and filled with sediment. The Galisteo area was eroded and the broad plain of the Santa Fe Plateau formed, with the highest hills left standing above its sloping surface (Figure 11). During the Pliocene and Pleistocene, streams draining the Sangre de Cristo Mountains deposited sand and gravel on the Santa Fe Plateau forming the Ancha Formation, which covers the Plateau with up to 120 meters of sand and gravel. A similar deposit called the Tuerto Gravel caps the Ortiz Surface that flanks the Ortiz Mountains (Figure 11). As the Rio Grande Valley deepened in the last 1.5 million years as did the
Galisteo Creek. Tributary arroyos and gulches cut down through the rock, first stripping away the Ancha Formation and Tuerto Gravel deposits, leaving them perched on mesa tops. Both Galisteo Creek and San Marcos Arroyo have significant terrace deposits that record times in recent geologic history when the streams were tens of feet higher than they are now and left stream-worn gravel on benches above their present courses. The stage was set for the establishment of the San Marcos Pueblo a few million years later.

Figure 11: View to the south towards the Ortiz Mountains from the Cerrillos Hills. Note the broad plainer surfaces of the Santa Fe Plateau.
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