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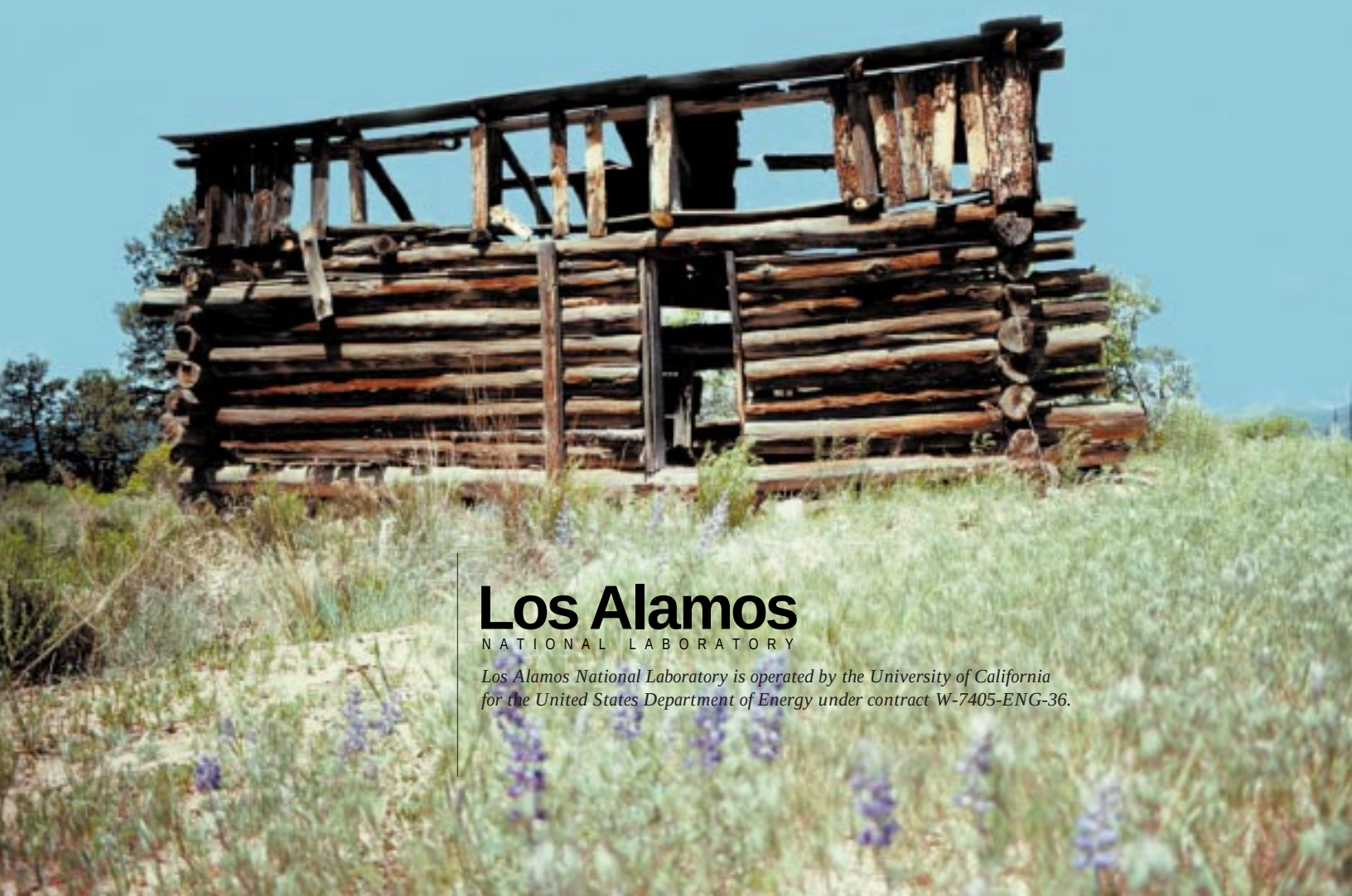
Historical Botany of the Romero Cabin:

A Family Homestead on the Pajarito Plateau



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Cover illustration: The Romero cabin in 1982 before it was dismantled and relocated next to Fuller Lodge

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Historical Botany of the Romero Cabin: A Family Homestead on the Pajarito Plateau

Compiled by Teralene S. Foxx
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FOREWORD

A Roadmap for this Report

We have returned to complete this report after a hiatus of nearly 15 years from when most of the field work and research was completed. Though our focus is on the botanical history of the Romero cabin, the picture of that site/structure presented in this report is based upon at least five disciplinary points of view–history, ethnography, archaeology, botany, and ecology. In constructing that picture, the authors have drawn almost equally from information resulting from investigative technique peculiar to these five disciplines; and they see no reason to present this information in any special order. However, a roadmap may help readers to see in advance where they are going.

Chapter 1 is a physiographic and historical overview of the Romero Cabin Complex; it briefly establishes the "where," "what," and "how" of the subject of this report and summarizes information that may receive more detailed treatment in later chapters.

In Chapter 2, the historical account is supplemented with ethnography in the form of interviews with persons or descendants of persons who lived on the Pajarito Plateau during the lifetime of the Romero cabin.

An extensive Chapter 3 discusses techniques of field botany and ecology, and results of application of those techniques, that were used to establish contemporary vegetation and soils profiles at the Romero Cabin Complex; such profiles are necessary for establishing reasonable ethnobotanical interpretations in the chapters that follow.

Emphasis on botany and ecology is continued in Chapter 4, but now from the archaeologist's and ethnobotanist's points of view. Here methods used for retrieving and interpreting vegetal and organic material from excavation fill are described, and results of analyses of materials from distinct structures within the Romero Cabin Complex are presented.

Chapter 5 is an ethnobotanical/historical interpretation of some of the organic materials that were technically analyzed in Chapter 4. The recorded history of some wild and cultivated plant species associated with the Romero Cabin Complex is largely consistent with the site-specific context in which they were encountered. There are, however, interesting exceptions to this pattern of consistency.

Chapter 6 is concerned with dendrochronology, a method of establishing the age of trees at the Romero Cabin Complex, and thereby testing consistency of physical evidence with the historical and ethnographic evidence.

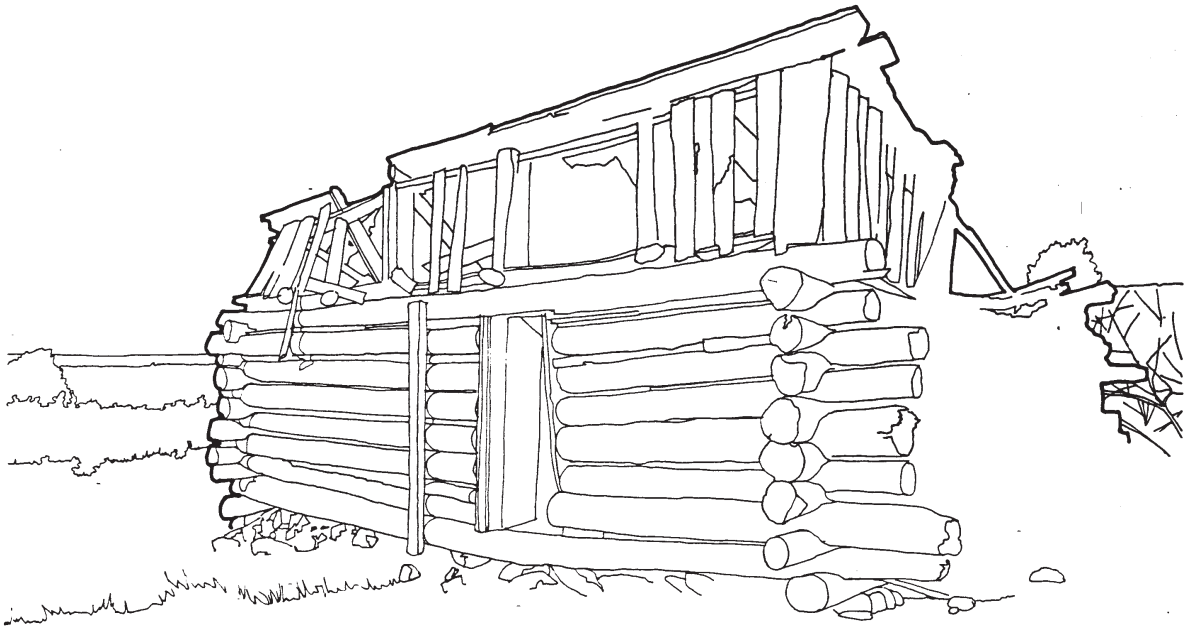
HISTORICAL BOTANY OF THE ROMERO CABIN: A FAMILY HOMESTEAD ON THE PAJARITO PLATEAU

by

Gail D. Tierney and Teralene S. Foxx

ABSTRACT

An early 20th century log cabin on the Pajarito Plateau of northern New Mexico was moved, and foundations of the cabin and other related structures were excavated. Botanical remains from the excavations and a survey of modern vegetation patterns provided some evidence of the purpose and plant-related subsistence patterns of the site. Direct evidence of this kind is compared with information from historical records and ethnographic interviews with descendants of the homestead originators and persons who lived on the Pajarito Plateau in the early 20th century. Although the historical and ethnographic information are generally consistent with the botanical evidence from the excavations, reconstruction of purpose and subsistence patterns from the direct evidence alone is shown to miss the most important, plant-related activity. The historical record repeatedly indicates that the homesteaders grew beans as a major crop, even threshing them in the packed dirt of the cabin yard; yet no remains of beans or bean pollen were found in the archaeological assemblage. An attempt to resolve this and other conflicting or confusing points has been made in the light of ethnobotanical interpretations of the botanical remains, historical information, and contemporary patterns of natural and cultivated vegetation.



Drawing by Louis Anderson, 1985, National Park Service

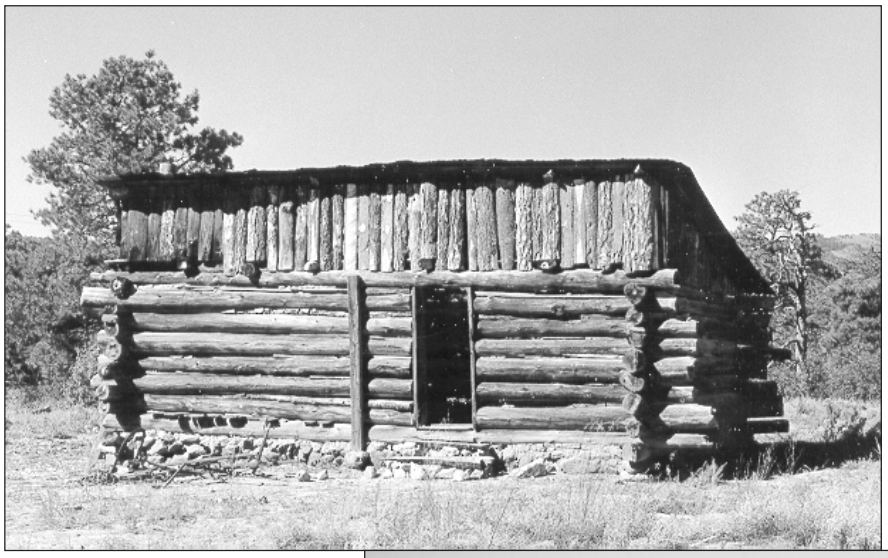


Photo courtesy of Los Alamos Historical Society

a. Romero Cabin 1967

Photo by Teralene Foxx

b. Romero Cabin 1982

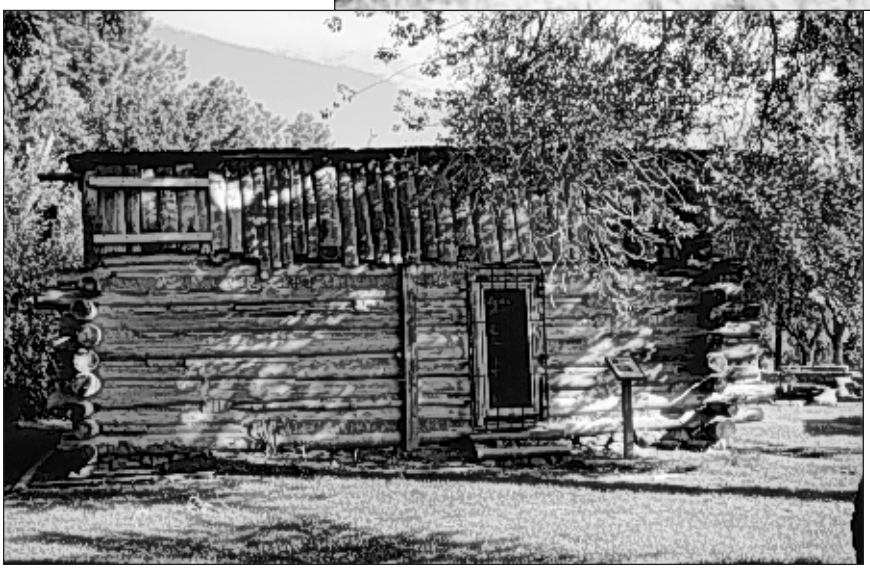


Photo by Teralene Foxx

c. Romero Cabin 1999, at Historical Museum near Fuller Lodge

Figure 1.1. The Romero Cabin, Feature I.

CHAPTER 1: OVERVIEW AND HISTORY

Gail D. Tierney and Teralene S. Foxx

1.0 OVERVIEW

1.1 The Romero Cabin: Site and Residents

The Romero Cabin (Figure 1.1) was a historically occupied homestead on the Pajarito Plateau, Los Alamos County, New Mexico (Figure 1.2). The homestead site—called the Romero Cabin Complex—was a 15-acre tract of land situated on Pajarito Mesa in the southwest quarter of Sections 21 and 22, T19N, R6E, at an elevation of about 7400 ft. The dwelling at one time belonged to Victor Romero, who first received a patent on the site in 1913. An earlier homestead of about 160 acres surrounds the Romero Cabin Complex on three sides; this larger site belonged to David and Francisquita Romero, the parents of Victor Romero. However, only the structures on the Victor Romero homestead were excavated.

The history of the homestead was recently revealed through the efforts of many people. This particular report is an interpretive compendium of analyses of archaeobotanical remains and botanical field notes, historical research, and personal interviews with Victor Romero's descendants (Figure 1.3) and informed others, including Peggy Pond Church and descendants of Adolpho Garcia, the gardener at the Los Alamos Ranch School. The original manuscript was completed in 1985, updated in 1988, and most recently augmented with results of current field and library research. Any errors in facts or the interpretation of material are strictly the authors'.

According to patents (Appendix I), the land east and north of the cabin was cleared for an estimated 80 to 100 acres before the homesteading era. These patents speak only of "breaking" the ground and specifically state that there is no timber on the land, a fact notably confirmed by the acceptability of the patents to the forester in charge of the area. Indeed, there is some definite evidence that the site was farmed by prehistoric peoples who allowed it to go fallow around 1200–1300 AD. At about that time, most occupants of the plateau moved into pueblos along the Rio Grande for reasons of drought, soil exhaustion, warfare, internal strife, religious beliefs, or convenience. However, some fields may have been reused on occasion, and many of these mesa homestead clearings still show evidence of prehistoric water-and-soil catchments, windbreaks, or breakwater systems of rectangular or L-shaped plots outlined with stones. Through the centuries this mesa site may have been used sporadically for agriculture by local Puebloans. Speaking with a Spanish school master near Santa Ana in 1846, a Lieutenant Peck was told that "the Indians have much ground under cultivation on top of these mesas" (Abert 1962). More recently, hundreds of old grid gardens have been visited and photographed on mesas above Zia Pueblo (Dunmire and Tierney 1995). The investigators were told that some of these gardens were deliberately hidden from the Spanish so that tribute or confiscation would not be exacted.

Scrub oak (*Quercus x pauciloba*) and Gambel oak (*Q. gambelii*) have invaded the edges of the cleared land of the Romero homestead, outlining and buffering these clearings from the ponderosa pine (*Pinus ponderosa*) forest. Ten to fifteen acres were fenced with barbed wire; pieces of this wire can still be seen embedded in older ponderosa (Figure 1.4). Much of this land was plowed at the end of the 19th century by the Romero family and used as a summer residence and a center for their cash-crop and stock-raising activities during the high-plateau lambing, calving, and growing season, usually April-May to October. As a homestead, the cabin was abandoned before 1938, but the fields were probably used sporadically for pasturage. In 1942, the federal government claimed the site for use in the Manhattan Project.

1.2. Project History

The Romero Cabin Complex was located in Technical Area (TA) 55, Los Alamos National Laboratory. In 1981, it was determined that the expansion of the facilities at TA-55 would affect the Romero Cabin Complex. Because of the expansion of facilities and rerouting of Pajarito Road, a program to mitigate these impacts to the site was proposed in 1984. The mitigation was issued in partial compliance with the Section 106 review process required by the National Historic Preservation Act. At the same time, the Department of Energy began a project to preserve the cabin and transfer it to the Los Alamos County Historical Museum near Fuller Lodge, where it presently stands.

The cabin was located on Pajarito Mesa between Mortandad and Two-Mile Canyon within the ecotone of the ponderosa pine forest and pinon-juniper woodland. In addition to the standing cabin (Feature I), the Romero Cabin Complex included a smaller log structure south of the cabin (Feature II), several large trash areas, a privy (Feature III), and the remains of a small wooden structure, possibly a chicken coop. Dispersed

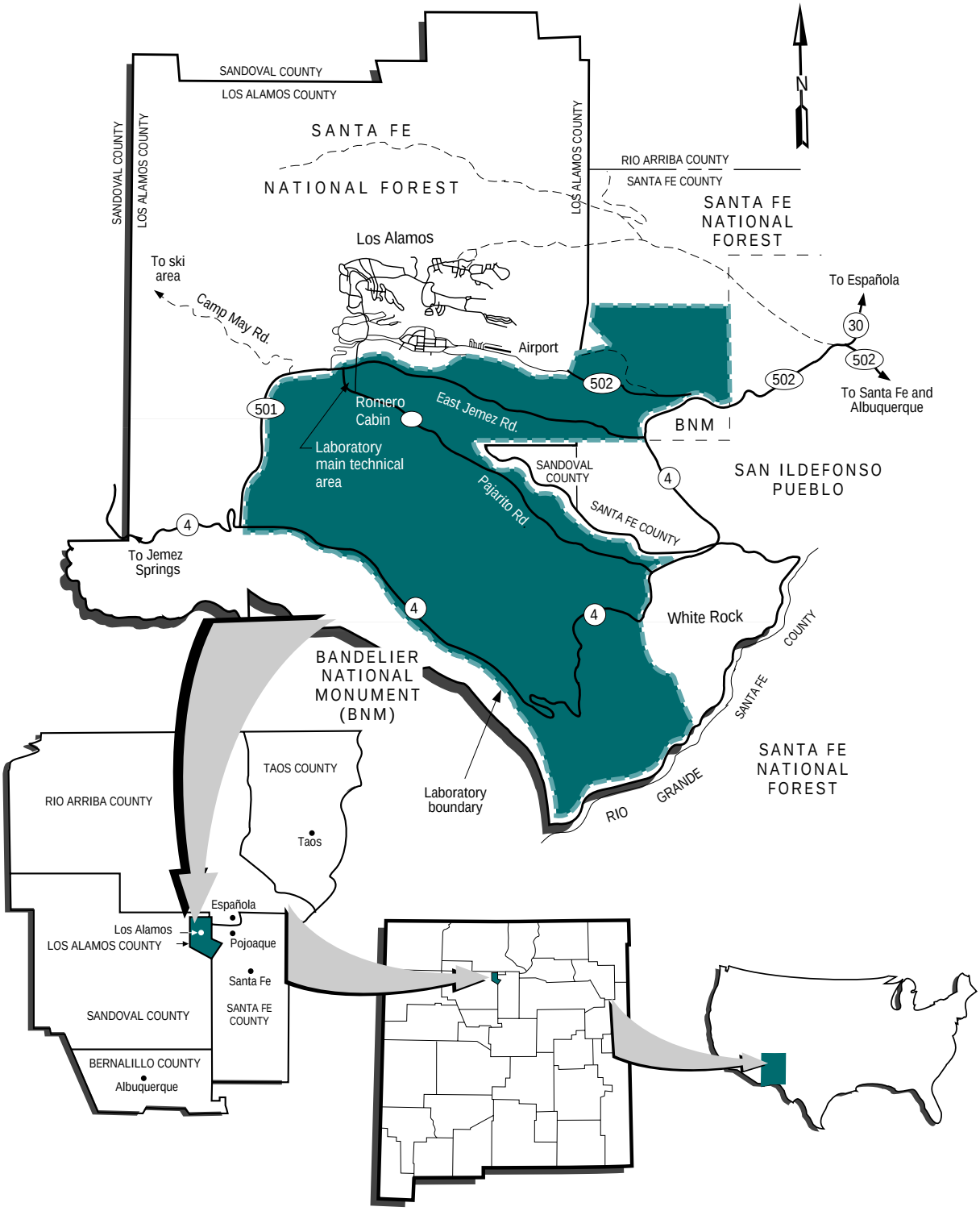


Figure 1.2. Location of the Romero Cabin Complex within Los Alamos National Laboratory.

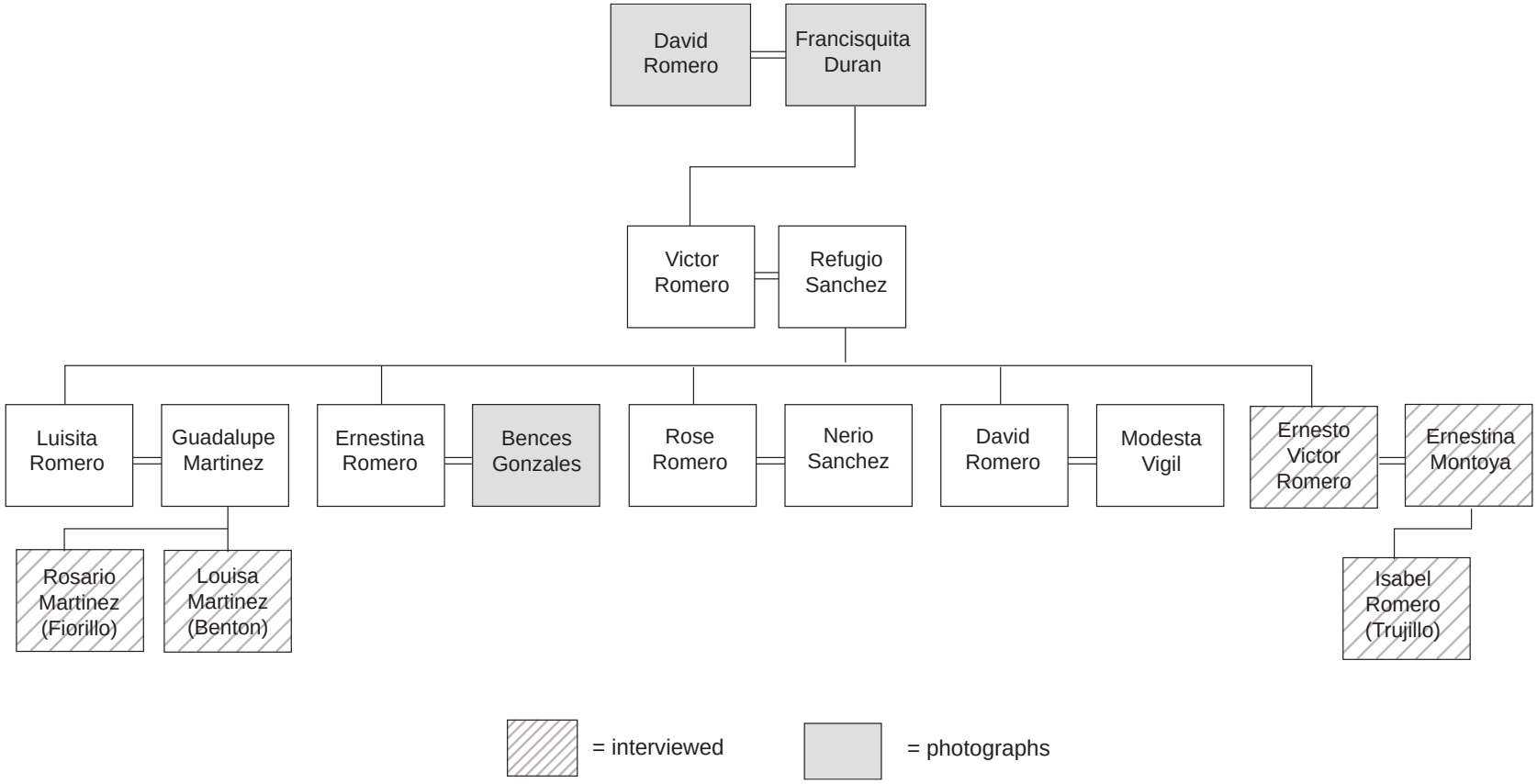


Figure 1.3. Partial genealogy of the Romero family.

Photo by Teralene Foxx

Figure 1.4. Fenceline of the Romero homestead; inset: tree with wire embedded.

trash and lumber accumulations associated with the site were found in the fields near the cabin. Not associated with the excavations were structures within the field including a corral and a dugout or cistern.

In addition to the restoration of the cabin, extensive data recovery from the site was completed in the mid-1980s. This included historical research, photographic documentation, mapping, controlled excavation, and botanical surveys. The archaeological information is recorded in McGehee et al. (no date). This report pertains to the botanical history of the site, botanical surveys, and interviews with descendants. Due to funding constraints and other events, this report is 15 years past due.

1.3 Topography

The Pajarito Plateau is situated below the eastern slopes of the Jemez Mountains, which rise to 10,000 ft. The mountains and adjacent plateau were formed over a million years ago from lava flows and volcanic ash. The plateau is dissected by narrow canyons and mostly narrow mesas with cliffs or steep sides that slope eastward towards the Rio Grande in White Rock Canyon. The plateau begins at the base of the mountains at an elevation of about 8000 ft and drops to about 6000 ft just above White Rock Canyon, which can be as much as 600 ft deep in places (Figure 1.5).

Base rock at the Romero cabin is tuff, exposed on the edges of the mesa, but covered with soil to depths of perhaps six feet or more near the middle of the mesa. (Depth was estimated by viewing the side of a partially collapsed historic dugout and cistern on the David Romero homestead east of the cabin.) The entire Victor Romero homestead lies within an ecotone dominated by ponderosa pine. In this case, the ponderosa pine cover is mixed with piñon (*Pinus edulis*) and juniper (*Juniperus monosperma*).

1.4 Climate

The Pajarito Plateau has a semiarid continental mountain climate with an annual precipitation of 45 cm. Seventy-five percent of this precipitation occurs from May to October. Lower elevations of the plateau near the Rio Grande receive 20 cm of precipitation annually; higher elevations to the west can receive up to 50 cm of precipitation annually. Since the Romero cabin is situated near the middle of the plateau, contemporary precipitation at the homestead probably averages 20 to 30 cm per year.

Maximum daytime temperature on the plateau has been recorded at 32°C, but this usually occurs no more than two days each year. Frosts have occurred in all months except July and August. January is the coldest

Photo by Teralene Foxx

Figure 1.5. White Rock Canyon from White Rock Overlook.

month with some daytime temperatures holding at 0°C; but usually there are no more than 18 days of below-freezing temperatures (Tuan et al., 1973).

Regarding past climates, historical documents indicate that years of drought were interspersed with years of abundant precipitation. The years 1914 through 1918, when most homesteading activity occurred, seem to have been especially favorable for farming activities. Historic evidence states that beans were grown on the plateau in volume through the First World War—a staple in the diets of the First World War armies. Since the bean is an early, nonhardy crop requiring early moisture and no frost, a climate of wet, warm springs is indicated.

The dust bowl years of the 1930s tended to be warm and dry in the eastern part of New Mexico, but precipitation on the Pajarito Plateau and northern New Mexico was judged to be "adequate" (Bowen 1990).

2.0 HISTORICAL ACCOUNTS OF THE REGION

The Pajarito Plateau is celebrated for many archaeological ruins. The artifacts of most importance are the dwellings of the "*Anasazi*" Indians who are claimed as ancient ancestors by the Santa Clara Tribe to the northeast, the San Ildefonso Tribe to the east, and the Cochiti Tribe to the south. However, contemporary Puebloans consider the term "*Anasazi*" to be derogatory as it is a Navajo word meaning "ancient enemy." Therefore, in this report "ancient ancestor" is substituted when referring to prehistoric relatives of the Puebloans. Associated with the ruins are prehistorically cleared lands, garden plots outlined with rock, and water catchment and diversion dams. Some historic homesteads may have been situated on such prehistorically cleared areas (Tierney and Foxx 1982). In any case, Native Americans sporadically farmed on the plateau well into the 19th century. In his 1880–1882 Southwestern Journal, Adolph Bandelier states that his informant from Cochiti assured him that "corn would grow very well on the *potreros* (mesas) when rainfall was sufficient" (Lange and Riley 1966). Archaeologist Joseph Winter (1974) has studied the modern sand-dune farming of distant relatives of the Rio Grande Puebloans: the Hopi Tribe of Arizona. He maintains that successful "dry farming" (meaning without irrigation) has three criteria: ten inches of annual rainfall with four to six inches falling in summer, enough winter moisture or spring runoff to start crops, and a growing season of no fewer than one hundred and twenty days. All things being relative, the Pajarito Plateau was a farmer's paradise according to Winter's criteria.

In 1916, Harrington translated some of the San Ildefonso place names for the plateau from the *Tewa*

language (Harrington 1916). Among these translations is *sandiapa*, a combination Spanish and *Tewa* word meaning "place where watermelon grows." According to Harrington's map, this place is in Sandia Canyon, which is north of Mortandad Canyon.

A search of the literature yielded some translations of late 16th, 17th, and 18th century Spanish letters, official reports, and chronicles. These early reports, diaries, journals, and accounts of visits to New Mexico by Spanish speakers in the early and mid-nineteenth century revealed considerable information on the crops grown by Spanish and Mexican settlers of the region during those years. Perhaps the earliest, and certainly the most extensive, list of crop plants grown during the early years of Spanish colonization is in the Benevides Memorial of 1630. This document mentions native and imported cultigens including "corn, wheat, kidney beans, lentils, chick-peas, lima beans, vetches, pumpkins, watermelons, cantaloupes, cucumbers, cabbage, lettuce, carrots, artichokes, garlic, onions, plums, apricots, peaches . . . and many other things which I omit lest I seem unduly wordy" (Benevides 1954 cited in Lopinot 1986).

Another solid account of early orchards and gardens in the immediate region is the one given by Fray Anastacio Domingues, who visited missions and villas (including San Ildefonso) in northern New Mexico in 1776 (Adams and Chavez 1956). To date, the most revealing work on these first Spanish colonies and how they grew European, Mexican, and native crops is the work of ethnobotanist Richard Ford (1987).

Although there is an occasional reference to agricultural activities of the "Indians" on the mesas above the Rio Grande Valley (Abert 1962), there is little evidence that people of European descent farmed plateau lands before the late 19th century. The only exception is a 1780 document purported to be title to the *Rito de los Frijoles* grant that claims that the owners once farmed Frijoles Canyon. Although it does show a "ruined Mexican house," Lieutenant George Wheeler's map of the Pajarito Plateau and military trails to the "hayfields" at the Valle Grande does not show any viable settlement in the years 1873 to 1876. Most indications are that non-natives did not successfully practice agriculture on the plateau until after 1880.

There were good reasons for an absence of permanent settlement before 1880. The rugged country, isolation, and danger of marauding Indians were very real from before 1846, when Stephen Watts Kearney proclaimed New Mexico as a territory of the United States, until the 1870s, when nomadic, raiding tribes were finally suppressed. Brigadier General James H. Carlton conducted a four-year campaign against the marauding tribes of New Mexico and Arizona that culminated in Colonel Christopher Carson's successful punitive expedition to the Navajo country west of the Jemez Mountains and the Jicarilla Apache country northward. For the most part, these military actions were successful in eliminating the Indian danger in northern New Mexico, though sporadic raiding occurred well into the 1880s. Early in this period, when Major Rafael Chacon of the Army of the West was guarding hay cutters from Apaches in the *Valles de la Sierra de San Ildefonso* (the Valle Grande), he stated that "almost every day we had encounters with them" (Meketa 1986). In the 1880s, Adolph Bandelier heard reports of Cochiti farmers being slain by Apache raiders only a few years before he arrived in New Mexico (Lange and Riley 1966). There is also an account of an 1858 kidnapping of an eight-year-old boy and the slaying of his companions by Navajo in Garcia Canyon, only a few miles north of the Romero homestead (Adams 1977). Therefore, apart from some large land holdings where shepherds and stockmen had the protection of numbers, it is unlikely that smaller haciendas would have been successful.

In addition to the Apache threat, New Mexico was in a period of drought in the 1850s and 1860s. Even military farms were mostly failures at that time. Scurvy was a problem among the troops, and a local newspaper, the Santa Fe Republican, urged citizens to improve their crops (Frazer 1983); it seems that the local population did not have a surplus of farm produce and were unable to safely use local unprotected areas for farming and grazing.

Patented homesteads on the Pajarito Plateau (Figure 1.6) began in 1893. Before homesteading on the plateau, fenced farmlands were located primarily in the nearby Pojoaque-Española valley, and stock was sent to summer pasturage on the plateau where they would not be a menace to summer valley crops. Sheep grazing requires a shepherd who, with his dogs, controls the sheep; for this reason it is unlikely that sheep would have interfered with unfenced crops or summer gardens. Thus, in the late 1890s and early 1900s, it had to be cattle and perhaps burros roaming the plateau that precluded cultivation of unfenced lands or fragile unattended gardens.

Members of the Romero family probably cleared the Romero cabin site again in the early 1900s. These members had previously resided in the Pojoaque valley on lands that are now owned exclusively by the San Ildefonso Pueblo. There are several historical factors that may have contributed to the relocation of the Romero family to the Pajarito Plateau at that time. In 1913, a year after New Mexico became a state, the US Supreme Court ruled that Indian tribes could not sell or

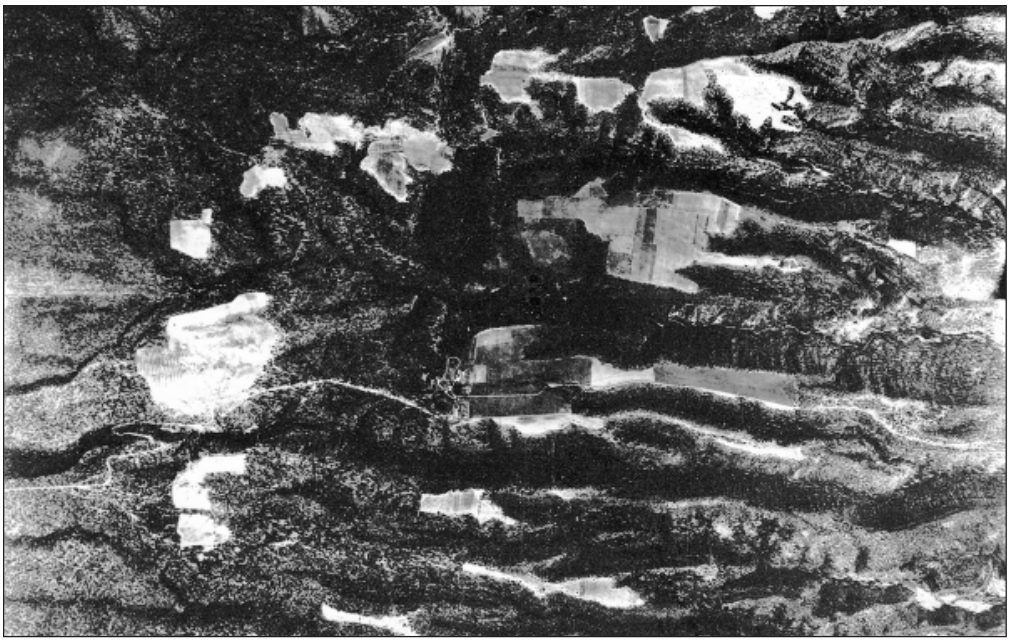


Photo courtesy of National Archives and Record Service

Figure 1.6. Aerial photograph of the Los Alamos area showing the extensive land areas used for dryland farming.

give the lands granted to them by the government to persons who were not tribal members. Furthermore, tribes were entitled to reclaim tribal lands from persons who were currently residing on those lands and were not tribal members. The United Pueblo Agency was charged with clearing the lands deemed to belong to the Pueblo tribes, and in 1938 a final settlement was made which compensated non-pueblo and non-tribal members for lost lands (Dozier 1970). Not that the court's decision was unjustified: "In 1919 the Board of Indian Commissioners reported that San Ildefonso had probably suffered greater land loss through squatters than had any of the other Pueblos." In addition, "commercial (non-Indian) timber removed on the hills above the Pueblo had drastically affected the terrain and watershed and therefore the ability of natives to feed themselves . . . ." Nearly 10% of *Tewa* deaths around the turn of the century were from malnourishment. The *Tewa* Basin Study indicates that "probably not one farm produced enough food for its family" (Adelman 1979).

In 1915, the Jemez National Forest was combined with the Santa Fe National Forest. At that time grazing permits were curtailed, and the grazing of goats was prohibited on Forest Service lands. This could have been a severe blow to the subsistence economy practiced by Hispanic families such as the Romeros (Dickey 1949). Goats were important to subsistence farmers for several reasons. They are browsers and can eat and digest shrubs and plants that cattle and sheep cannot. Goat milk keeps better than cow's milk and is more digestible by certain lactose-intolerant peoples such as many Hispanics and most Indians (Harris 1985). Goat cheese was an important barter item and an excellent source of protein for local Hispanics.

While it may be that the court decision of 1913 and the reduction of grazing permits on Forest Service lands caused the Romero family to leave their farm, orchards, and home in San Ildefonso, the Romero family undoubtedly suffered from the general poverty and malaise of these times. Some of the descendants of David and Victor Romero may have moved to El Rancho, a village a few miles east of San Ildefonso; there were many Romeros in El Rancho in the late 1940s.

A homestead entry recorded at the US Land Office in Santa Fe on February 25, 1913, records Victor Romero's application for 15 acres of land (Appendix I). Under the Homestead Act of 1906, 34 Stat., 233, Victor Romero of San Ildefonso, New Mexico, made application for a tract of land in the Jemez National Forest described as NE1/4 NE1/4 SE1/4, NE1/4 SE1/4 NE1/4 SE1/4, NE1/4 NW1/4 NE1/4 SE1/4, Sec. 21, Township 19 North, Range 6 East, NMP Meridian. The patent papers show that Mr. Romero conscientiously applied each year between 1913 and 1916 for a leave of absence from these lands during the winter months (from about November 11 through April 15). In this period, his address is given as a post office box number in Buckman, New Mexico, a logging town on the Rio Grande southeast of the homestead site (Figure 1.7). Perhaps the change of address to Buckman in 1915 indicates that some of the Romero men were employed

Buckman Bridge

Buckman Siding

Buckman Post Office

Buildings in Buckman

Photos courtesy of Los Alamos Historical Society

Figure 1.7 The town of Buckman.

cutting the plateau's ponderosa pine forests for the Buckman sawmill.

When final proof of the homestead claim was made on March 28, 1916, Victor Romero stated that he was 45 years old with a wife and six children, that the one-room cabin with two windows remained as built in 1913, that 13 of the 15 acres were cultivable, and that there was no timber on the claim. His replies to the "testimony of claimant" portions of the homestead papers are of considerable interest in terms of ethnobotany. When asked to "state the number of acres cultivated, the kind of crop planted, and the amount harvested, each year," he answered, "I broke about seven acres and planted it to beans. I harvested about 1200 lb." This was in 1913. In 1914 he answered, "I broke about six acres and planted all the broken land to beans and corn. Harvested about 300 lb of beans and 4 *fanegas* of corn." [Note: A *fanega* is approximately one English bushel or 35.2 liters.] In 1915 he reported, "I planted all the land to beans and corn. Harvested about 2100 lb of beans and about 1800 lb of corn." When asked to "describe fully and in detail the amount and kinds of improvements and number of acres under cultivation on each subdivision," he stated that the improvements "are located on the east side of the claim and consist of a one-room log house with one door and two windows and a corral, three sides of the claim are under a wire and post fence, and the improvements are worth about $450." When asked "have you any personal property of any kind elsewhere than on this claim?" he replied, "yes sir, I have some house furniture and kitchen utensils at San Ildefonso, New

Mexico."

During the final proof of the Romero claim, a witness was called to attest to the validity of the claim. The witness, Mr. J. Crestino Montoya, stated that "the improvements are on the eastern portion of the claim and consist of a one-room log house with one door and two windows, a corral, a stable, a small reservoir; and three sides of the claim are under a wire and post fence. Value of improvements about $400." The reservoir mentioned by Mr. Montoya may be the stone-lined cistern east of the cabin on the David Romero homestead, or it may be the hole in the canyon to the east mentioned by Mrs. Ernesto Romero (see interview in Chapter 2 of this report). Additionally, stone-lined "walk-in wells," some of prehistoric origin, have been discovered near intermittent streams in other areas of the Southwest (Woodbury and Zubrow 1979, Frigout 1979).

Beans are a constant theme in accounts of the Pajarito Plateau in the early 20th century (Figure 1.8). Heirs of the Romero family remember two kinds of beans being grown in their fields: pinto (a variety of *Phaseolus vulgaris*) and a small white bean, which they say is still sold in local stores that specialize in native foods. The oldest such store in the area was *La Tienda de Salud* in Santa Fe (the store was closed in 1991). The proprietor of this store, Mr. Delfino Lujan, at one time sold two white beans; the small lima (*Phaseolus cuneata*) and a small, round, yellowish white bean called a *boleta*. In an interview with the author on August 28, 1986, Mr. Lujan said the beans were no longer commercially available. Incidentally, Mr. Lujan worked at the Los Alamos Ranch School for five years between 1924 and 1929. He was 13 years old when he first went to the plateau; his family lived at the Nambé Pueblo at that time and ran cattle on the plateau.

That beans were grown on the Pajarito Plateau in significant volume probably indicates a climate with wet, warm springs, since beans are a nonhardy crop requiring early moisture and no frost. Early records show that farming was indeed a profitable pursuit when, during the First World War, New Mexico provided train shipments of tons of the common bean for the war effort. In 1917, the bean crop on the plateau was not only successfully grown, but Otowi, an accessible rail shipment stop at the base of the plateau, was nearby. The Denver and Rio Grande narrow-gauge railroad, known as the "Chile Line" (Figure 1.9), ran from Santa Fe, passed the base of the plateau, to Antonito, Colorado. Elsewhere, towns in eastern New Mexico vied for the title of "bean capitol of the world" (American Guide Series 1940). What is now Los Alamos County apparently did its share of provisioning the Country at that time. According to M. B. Chambers (1974), beans were grown on the plateau and shipped out by the train load.

These historical accounts are consistent with what is known about the homesteading patterns of Hispanics in northern New Mexico at the turn of the 20th century.

Photo courtesy of Los Alamos Historical Society

Figure 1.8. Bean fields on Anchor Ranch.

The pattern appears to be one of sporadic residence at the homestead from April to November, weather permitting, primarily for the purpose of keeping livestock, but also for growing cash or tradable crops. The early herding involved flocks of sheep and shepherds; later, cattle were driven to the mountain flanks where spring and summer forage was abundant. Farming of beans and corn was common near these warm-weather homesteads. Of the nearby areas of Abiquiu and Canjilon, Frances Swadesh writes, "the range was open and only milk cows and mares with young colts were kept in fenced, irrigated pastures," and "agricultural land, especially in the canyons, was limited; and diversion of water for irrigation was difficult due to the steep canyon walls and many *ancones* (bends). However, the latter made excellent lambing grounds . . . croplands were to be fenced and livestock kept from invading the fields of others" (Swadesh 1974). (Note: New Mexico is still an "open range" state. This means that range animals must be fenced out, and the burden of fencing and maintenance falls on the farmer. In New Mexico, the State Highway Department is charged with fencing animals out of the highways.)

Staples such as flour and sugar were brought up to the homesteads of the plateau by wagon early on. Later, some supplies could be purchased at the nearby Los Alamos Ranch School store after the school was established in 1916. Fresh and dried fruit were probably brought up to the Pajarito Plateau in season. Most of the homesteading families probably had land in the Española-Pojoaque valley where they or their relatives grew peaches, apricots, mulberries, apples, pears, and grapes, that is, all orchard crops that can be grown in a temperate climate. Even today, a visitor to New Mexico's Hispanic villages can see the pattern of vegetable crops in bottomland, orchards on the first high terrace, and houses placed on the higher points of land.

In the 1920s and 30s, a family in northern New Mexico was considered "well off" if they had a small farm, a few fruit trees, and someone in the family bringing in a little cash income. Frequently, cash income came from fathers and sons working as shepherds on the large ranches in Colorado. If they were lucky, they found jobs as shepherds nearer to home. The Bond family operated a large ranch that kept flocks at the Baca Location in the Jemez Mountains above the plateau. Other fathers and sons apparently found work at the sawmill at Buckman or on the railroad that passed through Buckman (Foxx and Tierney 1985).

The precarious economy of the plateau virtually collapsed in 1941 when the "Chile Line" was dismantled. Nationwide weather patterns had also changed, and drought had affected some of the western states for nearly ten years. Economic patterns had been disrupted by the Depression. Still, some life continued on the plateau, much as it had for perhaps 60 years, with the only means of transportation being by foot, horse, burro, sled, or wagon.

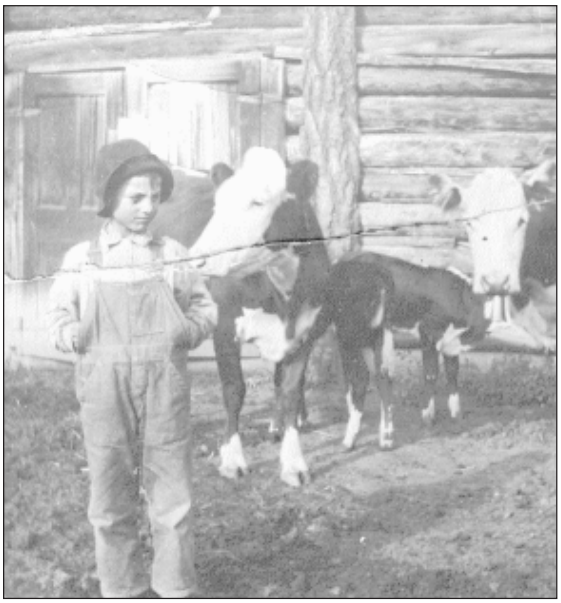
Photo courtesy of Los Alamos Historical Society

Figure 1.9. The "Chile Line" locomotive.

Homesteaders also used burros (Figure 1.10) to transport firewood, fruit, and other heavy commodities. At the end of the journey to the mountains, the burro grazed with the cattle, which were now more numerous than sheep and required less care. Once or twice a year, cattle were returned to the valleys by groups of cooperating neighbors. Some burros also voluntarily returned; they seemed to like the company of cows and the promise of grain on return to the valley. Other burros became feral, and descendants of these once useful, docile creatures were a threat to vegetation and antiquities of the plateau (Koehler 1974) and were removed in the 1970s.

In early 1942, the government requisitioned the Los Alamos Ranch School and other homesteads on the Pajarito Plateau, including the Romero homestead (Figure 1.11). After 1942, the homestead was repaired by Boy Scouts. In the mid-1980s the cabin was relocated to Los Alamos community lands near Fuller Lodge and placed under the care of the city and the Los Alamos Historical Society.

a. Homestead child with burro



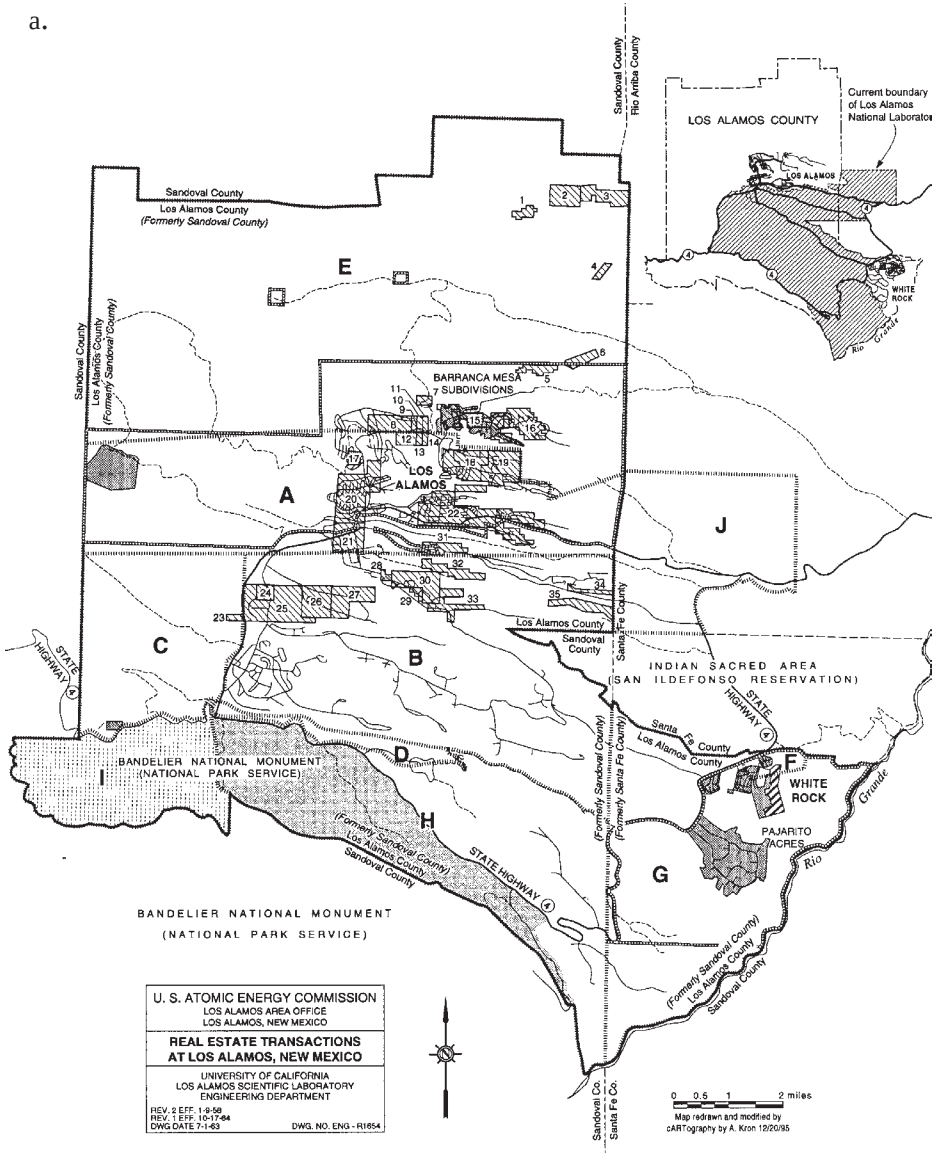
b. Homestead child with cows

c. Mattie Brook of Brook homestead feeding a lamb

Photos courtesy of Los Alamos Historical Society

Figure 1.10 Examples of Pajarito Plateau livestock.

a.



b.

PARCELS ACQUIRED BY CONDEMNATION OR PURCHASE over which the United States held exclusive jurisdiction from the respective dates of acquisition until March 15, 1949 (the effective date of retrocession to the State of New Mexico of such exclusive jurisdiction)

NO.	TRACT	VENDOR	ACRES
1	E-28	Esequel Garcia, Estate	57.48
2	E-24	Adolfo Garcia, et al.	160.00
3	E-25	Adolfo Garcia	139.50
4	E-29	Jose L. Garcia	35.53
5	E-4	Federico Gonzales	72.50
6	E-3	Jose M. & Fidel Serna	62.25
7	E-7	O. O. Grant	30.00
8	E-9	Elfego Gomez	120.00
9	E-8-A	O. O. Grant	10.00
10	E-8-B	Ernesto Montoya	15.00
11	E-8-C	Adolfo Montoya	15.00
12	A-7-A	O. O. Grant	50.00
13	A-7-B	Ernesto Montoya	15.00
14	A-7-C	Adolfo Montoya	15.00
15	E-6	Estanislado & Cirilo Gonzales	152.50
16	E-5	Noberto Roybal	125.00
17	A-10	Francisco Gonzales	22.50
18	A-13	Manuel Lujan & Elfego Gomez	150.00
19	A-14	Martin Lujan	160.00
20	A-11-B	Los Alamos Ranch School	320.00
21	A-12	Ramon Duran, et al.	160.00
22	A-11-A	Los Alamos Ranch School	470.00
23	B-19-B	Walter V. Grottenthaler	20.90
24	B-19-A	Walter V. Grottenthaler	40.00
25	B-16	A. M. Ross Est., Anchor Ranch	322.16
26	B-17	Donaciano Gomez	160.00
27	B-18	Jose Elfego & Jose Patricio Montoya	160.00
28	B-12	Ramon Duran, et al.	10.00
29	B-21	Victor Romero	15.00
30	B-20	Mrs. Francisquita Romero, et al.	160.00
31	A-15	Enriquez Montoya	62.50
32	B-22	Montoya Bros.	90.00
33	B-23	Ramon R. Roybal	107.50
34	B-1	Mrs. Sanaida Archuleta	34.07
35	B-2	Fermin L. Vigil	60.31
		TOTAL	3,599.70

ACRES*	AREA	MANNER OF ACQUISITION
8,407.50	A	Previously acquired by Manhattan Engineer District from U.S. Forest Service by Memorandum of Understanding dated May 15, 1943.
9,360.06	B	Previously acquired by Manhattan Engineer District from U.S. Forest Service by Memorandum of Understanding dated May 15, 1943.
4,650.00	C	Previously acquired by Manhattan Engineer District from U.S. Forest Service by Memorandum of Understanding dated May 15, 1943
544.00	D	Previously acquired by Manhattan Engineer District from U.S. Forest Service by Supplement No. 1, dated July 5, 1943, to original Memorandum of Understanding.
22,705.24	E	Previously acquired by Manhattan Engineer District from U.S. Forest Service by Memorandum of Understanding dated May 15, 1943; withdrawn from appropriation by Public Land Order No. 230, dated May 10, 1944.
240.00	F	Acquired by Atomic Energy Commission from U.S. Forest Service by Supplement No. 2, dated October 15, 1947, to original Memorandum of Understanding.
12,329.60	G	Acquired by Atomic Energy Commission from U.S. Forest Service by superseding Memorandum dated April 14, 1948.
4,505.60	H	Acquired by Atomic Energy Commission from U.S. Forest Service by superseding Memorandum dated April 14, 1948.
2,649.60	I	Acquired by Atomic Energy Commission from U.S. Forest Service by superseding Memorandum dated April 14, 1948.
3,925.±	J	Transferred to administrative control of Atomic Energy Commission by Presidential Proclamation No. 3539, dated May 27, 1963.

*Acreages of areas A, B, C, D, E, F, & J were computed from metes and bounds descriptions and are correct; acreages of areas G, H, & I were scaled by planimeter and are subject to correction by metes and bounds computation when available.

Previously acquired by Manhattan Engineer District through condemnation or purchase (as enumerated above)

TRACTS SOLD BY ATOMIC ENERGY COMMISSION

Sold contingently, with right of re-entry by Atomic Energy Commission

AREAS TRANSFERRED TO NATIONAL PARK SERVICE:

December 9, 1959

March 5, 1963

Boundaries of the "minimum geographic area" comprising the Los Alamos Community, as established by the Act of September 28, 1962 (76 stat. 664; 42 U.S.C. 2304)

Boundaries of land acquired by the Atomic Energy Commission as enumerated above

Los Alamos County boundary

County boundary

Indian Reservation

Paved road

Dirt road

Figure 1.11 Homestead map (a) and legend (b).

CHAPTER 2: INTERVIEWS WITH RESIDENTS AND DESCENDANTS OF RESIDENTS OF THE REGION

Gail D. Tierney

1.0 INTRODUCTION

We hope that the previous pages have conveyed a sense of the antiquity of farming on the Pajarito Plateau and the challenges that an unpredictable Southwestern mountain environment presented and still presents to the would-be farmer. The previous pages also acquainted the reader with the families associated with the Romero cabin who, beginning with statehood, were made to leave the Indian pueblos where they had lived and farmed for generations. And, following what must have been the wrenching expulsion from their pueblo homes, we learned of the benevolent years on their mesa homesteads with warm springs and sufficient moisture to dry-farm beans, perhaps their first-ever cash crops.

In this chapter, interviews with residents and descendants of residents of the Pajarito Plateau emphasize the difficulty of those homesteading years, but also establish the deep affection for the land and history of family life before and during the homesteading period.

The following are accounts of the author's interviews with persons who lived on the Pajarito Plateau between 1900 and 1941 and their families or descendants. In the response narration to follow, the author has attempted to reflect the same charming language that was used by the interviewees. No attempt was made to resolve discrepancies between the accounts.

1.1 Louisa Martinez Benton

Mrs. Louisa Martinez Benton is the granddaughter of Victor Romero. Her mother was Luisita Romero Martinez, daughter of Victor Romero (see partial geneaology in Chapter 1, Figure 1.3). Mrs. Benton says that an aunt who had no children raised her mother. Even though the aunt also lived in San Ildefonso, Louisa seldom went to the ranch on the plateau and doesn't remember much about the place. This account is mainly based on stories that were shared among members of the family. The following interview with Mrs. Louisa Martinez Benton was conducted during two telephone conversations in October 1986.

The Romero family remembers life being very difficult on the ranch, even though they eagerly left for the mountains the first part of spring, usually in late April, and stayed until cold weather set in at about the middle of November. Trying to get an early start, the men sometimes drove the animals to the plateau in early April, but this was risky because heavy snow might fall and it was impossible to plow if the fields were mucky from melt water. Furthermore, children were still in school, "roads" were nearly impassable for wagons, and care was taken not to exhaust those same animals that pulled both the wagon and the plow.

Members of the family went to the Pajarito Plateau to grow beans, which was their primary means of exchange. They also grew squash, pumpkins, peas, and corn for their own consumption. The squash was sliced and threaded or cut in coils to be strung and dried as *reunites*. The kitchen garden was small because everyone worked in the fields. The big crop was beans, and there were acres of them. Melons, watermelons, and green chile were grown in the Pojoaque valley.

Since Bences Gonzales (Figure 2.1), the manager of the Los Alamos Ranch School store, was also Luisita's brother-in-law, the Romero family was able to buy some supplies from the store (an occasional loaf of bread). However, they usually had little cash available for store-bought items.

There was a spring in a nearby canyon (near present-day Technical Area 55) from which they hauled water in barrels on a sled pulled by a horse. Drinking water was hauled from the valley. Wild plums grew on their place. They also collected *quelitas*, or wild spinach, which was reddish in color and velvety looking. [Note: Although contemporary local Hispanos refer to goosefoot (*Chenopodium* spp.) as *quelitas*,

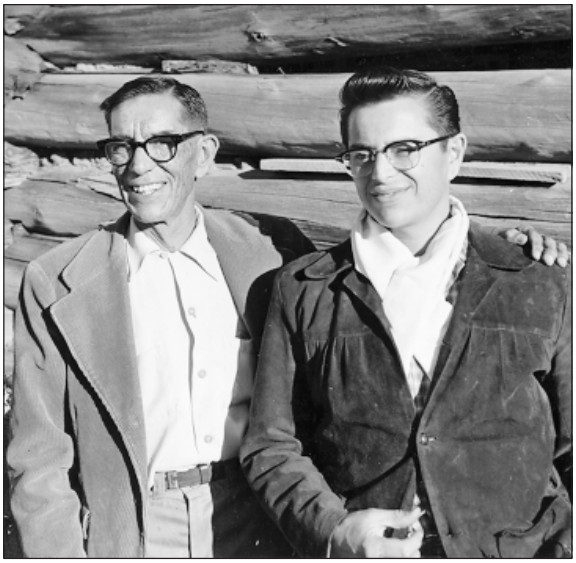


Photo courtesy of Los Alamos Historical Society.

Figure 2.1. Bences Gonzales with his son, Ray.

quelitas can be any species of green-leafed amaranthus or chenopodiums harvested as edible greens. This description of *quelitas* best fits the redroot amaranth (*Amaranthus retroflexus*), a prehistorically introduced, transcontinental garden weed, which is edible as a green when young, tastes much like spinach, and is the same species of amaranth that grew near the Romero cabin before it was excavated and in the disturbed ground afterwards.] In the springtime, they brought chickens and a pig to the ranch in the horse-drawn wagon. Mrs. Benton and her mother think that sheep were also kept at the ranch. One outstanding memory of Mrs. Benton's mother is of a huge pine tree with a swing in front of the cabin. [Note: That pine tree was still there in 1982 (Figure 2.2) when this picture was taken and in 1999 (See Figure 6.2 in Chapter 6.).]

Photo by Teralene Foxx

Figure 2.2. The lone pine tree next to the cabin that had supported a rope swing during occupation.

1.2 Peggy Pond Church

Peggy Pond Church (Figure 2.3) was the daughter of Ashley Pond who managed the Pajarito Club (Figure 2.4), a ranch in Pajarito Canyon, for several years. Pajarito Canyon is about one and one-half miles east of the Romero homestead. The following information is from an interview with Peggy Pond Church in April of 1986.

Mrs. Church lived in Pajarito Canyon for one year and two summers in 1912 and 1913 when she was about 12 years old. She remembered the summer of 1912 as the one in which "the springs in Pajarito Canyon dried up to a trickle" (Church 1983).

Mrs. Church's mother maintained a kitchen garden (food for the house), and her father grew the farm crops (food for animals mostly). When the Pond family

Photo courtesy of Los Alamos Historical Society

Figure 2.3. Peggy Pond Church.

moved to the Pajarito Club, there was already an established farm in the canyon, so that many of the perennials she remembers from her childhood had probably been established before she arrived.

Mrs. Pond grew climbing roses and had window boxes of nasturtiums and morning glories. She also maintained hot beds with horse manure and forced bulbs for houseplants. Her main seed source was Beatrice Nurseries catalogues (address unknown) and Boyle's Nursery in Santa Fe (then located on the present site of El Castillo Apartments on Alameda Street). Mrs. Church recalled certain plants that were grown in Pajarito Canyon at that time: oats, nasturtiums, marigolds, delphiniums, currants, and other berries. She did not recall any orchards in the canyon but does remember peaches being a favorite breakfast fruit. Another favorite memory was a spring drive through the Española Valley to [the Pueblo of] San Juan to view the peach trees in bloom.

Mrs. Church showed the author some of Ashley Pond's letters from 1914. Following are some excerpts from these letters as they relate to agricultural life "on the Pajarito" during those early years:

Photos courtesy of Los Alamos Historical Society

Figure 2.4. The Pajarito Club located in Pajarito Canyon at present site of Technical Area 18.

(04/10/14) ". . . a mixed orchard of 24 fruit trees-in a few days will have own garden seed planted . . . ."

(05/09/14) ". . . have put in 20 acres of oats . . . ."

(05/14/14) ". . . with a farm already on the place making our own butter . . . ."

(07/05/14) ". . . next fall I want to plant millet; in a couple of weeks an abundance of sweet corn . . . ."

(08/11/14) ". . . fine summer-have raised sufficient oats, hay, and corn to last . . . ."

In 1924, Mrs. Church moved to the Los Alamos Ranch School on the Pajarito Plateau as the 21-year-old bride of Fermor Church, an instructor at the school. She and her husband built a cabin at the ranch, about one mile north of the Romero homestead. She remembers growing wisteria, climbing rose, Bolleana poplar, crab apple, apricot, clematis (virgin's bower), and Russian olive in the vicinity of their new home.

1.3 Evelyn Frey

Evelyn Frey (Figure 2.5) arrived at Frijoles Canyon Ranch in 1921. The following information is excerpted from Virginia Robicheau's interviews with Mrs. Evelyn Frey. Bandelier National Monument staff taped these interviews.

The Frijoles Canyon Ranch (called the Ten Elders Ranch) had previously been owned by a Judge Abbot (Figure 2.6) who had planted fields and a small orchard there (Figure 2.7). Up creek about this time, the Lindley family had planted a second orchard, mostly of apples. A few trees from this orchard were said to be alive in 1986.

Mrs. Frey mentioned native plants growing in Frijoles Canyon during her long residence there (Table 2.1). Cultivated plants (Table 2.2) were either intro-

Photo courtesy of Los Alamos Historical Society

Figure 2.5. Evelyn Frey.

Photo courtesy of Los Alamos Historical Society

Figure 2.6. Judge and Mrs. A. J. Abbott, owners of the Ten Elders Ranch in Frijoles Canyon.

duced by Judge Abbot or acquired by Mrs. Frey from the Forest Service or the Agriculture Department of the State University at Las Cruces. Mrs. Frey stated that she was able to "procure all that was needed" from her own gardens.

In the taped interviews was an interesting comment about redwood trees (*Sequoia gigantea*) growing on Judge Abbot's land. There are at least five living *S. gigantea* trees in Santa Fe. These trees were purportedly brought to the Santa Fe area from California in the 1930s (perhaps even earlier) by Boyle's Nursery mentioned in the above interview with Mrs. Peggy Pond Church.

1.4 Rosa Montoya Olivas and Adelina Montoya Montaño

Mrs. Rosa Montoya Olivas is the daughter of Adolpho Montoya who was the gardener at the Los Alamos Ranch School for many years before 1942. Mrs. Olivas and her sister, Mrs. Adelina Montoya Montaño, collaborated in recalling the many crops and flowers grown at the Ranch School while her father was the gardener there (Table 2.3). The following information is from the author's interview with the sisters in June 1986.

This information is of interest in understanding the possibilities of agricultural life on the plateau in the first forty years of the 20th century. The diversity of the Olivas and Montaño plant list (Table 2.3) shows that aesthetics were not neglected at the Ranch School. Both interviewees mentioned cultivating flowers there themselves, and some of these may have found their way to the Romero cabin site, remaining there until 1986 (see Chapter 5).

Adolpho Montoya was in charge of providing the Ranch School (Figure 2.8) and his own family with produce. In view of the many flower and vegetable species listed in Table 2.3, he was entirely successful in this task; the only edible items that were unsuccessful were apricots, apples, peaches, and melons. On the ranch proper, the Montoya sisters recall one apricot tree, one cherry tree, two pear trees, and seven or eight apple trees, but fruit produced on the plateau was never sufficient for the needs of the community there. The latter kinds of produce were provided to the school from Adolpho Montoya's own orchard on an eight-and-a-half-acre farm in San Pedro, which he leased out (though always directing its operations: for instance, he personally sprayed fruit trees there four times a year). According to his daughters, Mr. Montoya read everything he could on horticulture and had such exemplary gardens and orchards (Figure 2.9) that the County Agent took him to Las Cruces to explain his techniques

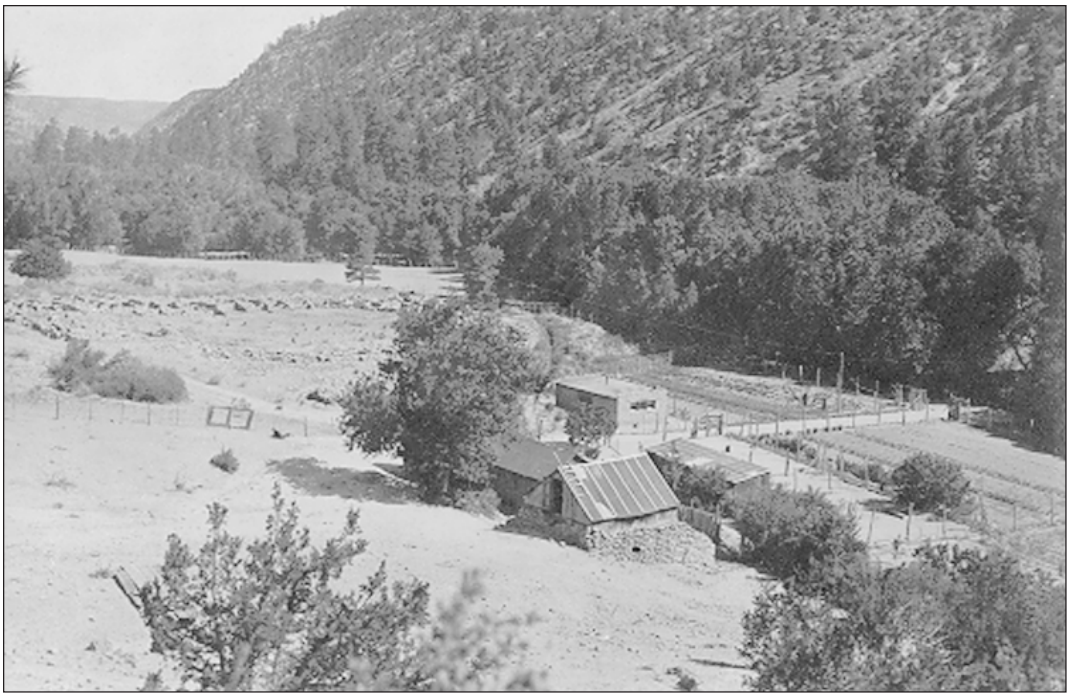


Photo courtesy of Los Alamos Historical Society

Figure 2.7. The Ten Elders homestead in Frijoles Canyon ca. 1920.

Table 2.1. Evelyn Frey's List of Native Plants in Frijoles Canyon.

Mrs. Frey's Identification	Probable Species	Mrs. Frey's Identification	Probable Species
Pinon	*Pinus edulis*	Currants	*Ribes aureum*
Cedar	*Juniperus monosperma* or *J. scopulorum*	Oak	*Quercus gambelli*
Squawtree	*Pinus ponderosa*	Cottonwood	*Populus angustifolia*
Black alder	*Alnus oblongifolia*	Datura	*Datura meteloides*
Black walnut	*Juglans microcarpa*	Strawberries	*Fragaria* spp.
Wild grape	*Vitus arizonica*	Raspberries	*Rubus strigosa*
Gooseberries	*Ribes cereum*		

Table 2.2. Cultivated Plants Mentioned by Mrs. Frey.

Wild plums	Sugar pears	Irises	Peaches
Nectarines	Weeping willow	Mint	Lilies
Apples	English black walnut	Cabbage	Redwood trees
Banana apples			

Table 2.3. The Montaño-Olivas List of Crops Grown at the Ranch School

		Flowers		
Roses	Petunias	Zinnias	Bachelor buttons	Peonies
Baby's breath	Pansies	Daisies	Sweet peas	Hollyhocks
Violets	Hyacinths	Dahlias	Carnations	Cannas
Gladiolas	Calendulas	Flax	Tritoma	Gladiolas
Asters	Lilacs	Marigolds	Oriental poppies	Red hot pokers
Tulips	Snapdragons	Sweet William	Shasta poppies	
Delphiniums	Irises	Larkspur	Chrysanthemums	
		Fruits and Vegetables		
Cherries	Apricots	Strawberries	Cauliflower	Radishes
Carrots	Cucumber	Pumpkins	Spinach	Brussels sprouts
Mushrooms	Bell peppers	Parsley	Corn	Shallots
Dill	Havas (horse beans)	Pears	Raspberries	Leaf lettuce
Head lettuce	Celery	Turnips	Rutabagas	Yellow squash
Zucchini squash	Green squash	Scallopini squash	Red onions	White onions
Swiss chard	Okra	Peas	Yellow hots	Chives
Popcorn	Leeks	Eggplant	Apples	Gooseberries
Cabbage	Celeriac	Parsnips	Tomatoes	Green onions
Mustard greens	Broccoli	English peas	Beets	Rhubarb
Green beans	Garlic	Asparagus	Pinto beans	

Photo courtesy of Los Alamos Historical Society

Figure 2.8. The Los Alamos Ranch School.

Photo courtesy of Los Alamos Historical Society

Figure 2.9. Gardens around the Los Alamos Ranch School.

at the Agricultural School. He did much of his own grafting and consistently won awards at the Santa Fe County Fair.

Seeds were ordered every year from "Durkees" (Burpee's?) Seed Company, but Mr. Montoya would usually save and replant some seeds of vegetables he particularly liked, e.g., the long, hot yellow chiles. The Ranch School had a dairy and everyone had milk. Mr. Montoya used manure from the cows for his gardens. Apparently, there was plenty of water (no one remembers a water shortage at this time), and Mr. Montoya watered his gardens from a hose and small ditch. The water came from Ashley Pond, which was originally a livestock tank supplied by runoff. Later, the pond was said to not properly hold water, and so water for the community was piped in from upper Los Alamos Canyon.

There was an icehouse south of the pond, but most of the food was preserved by drying or canning. A fruit cellar was maintained for the Ranch School, and vegetables were often stored in pits in the ground in the gardens (and also near the Montoya's homestead; see below). These storage pits were two to three feet deep and four to five feet long, lined with straw, covered with boards, and mounded with earth. In wintertime, these mounds so resembled graves that strangers to the region would occasionally mistake them for such.

Rosa Montoya canned fruit and vegetables on a wood stove with a pressure cooker. She dried fruit on screens covered with cheesecloth and cut squash and melons into coils and hung them on strings to dry—these were called *reuditas*. Squash preserved in this manner remained chewy and substantial; when reconstituted in the stew pot, it was especially popular for Lenten dishes. *Pastillitas* (pies) were made in a large pan from dried apples; dried apricots were made into a dessert dish called *orejon*; and fava beans were soaked and toasted in a little oil in a pan to be eaten as snacks. Piñon nut collecting was a family affair in season when the nut was plentiful. Staples such as flour, coffee, sugar, and cereals (hot porridges such as oatmeal or Cream of Wheat) were purchased in Santa Fe once a month. Breads were baked once a week. Though Mrs. Montoya remembers that the alfalfa fields in the valleys were full of bees, none of the interviewees recall using native honey. Ernestina Romero (see next interview) does remember lots of people in the valley keeping bees in boxes and that the bees "used to run away." In this vein, the author remembers many empty bee boxes in the fields of the El Rancho-Pojoaque areas during the late 1940s-early 1950s.

Adolpho Montoya also homesteaded a ranch north of the Ranch School, and his wife Rosa had property from the Gomez homestead to the south. Adolpho hunted bear and turkey on these lands and hung the meat on lines to dry. [Note: Apparently, blowflies were unknown in northern New Mexico at this time; the author recalls her own father's amazement in the early 1940s over air so pure and dry that meat could be hung outside and uncovered in autumn without being contaminated by flies.]

1.5 Ernesto and Ernestina Romero

Mrs. Romero is a Montoya from Pajarito, a village west of Black Mesa, and is cousin of Rose

Montoya Olivas. Ernesto Romero was born in 1915, and is the son of Victor Romero, the homesteader of the Romero cabin (see Figure 1.3 in Chapter 1). The following information is from an interview with Ernesto and Ernestina Romero at their home in Mesilla, New Mexico, on the evening of October 2, 1986.

Ernesto lived at the Romero cabin in the summertime when he was about 8 to 13 years old. Ernesto's grandparents, David and Francisquita Romero (Figure 2.10), homesteaded the land east of the Romero cabin and had built a house there. David may have built the cistern and dugout, but Ernesto does not remember these structures. David Romero applied for a patent on the land in 1906; his son Victor, who had applied for a patent to the land west of the David Romero claim in 1913, had already begun to build a cabin, or to repair an existing cabin, in 1912. Bences Gonzales (the Ranch School store manager) rebuilt the David Romero cabin at one time, or perhaps he helped Victor. The sequence of events is not clear. By the time Ernesto remembers living at the cabin, his grandfather was staying summers in San Ildefonso at the family home and farm.

The grandfather, David Romero, also had a home in San Ildefonso. He was a midwife (*partero*) and natural physician (*curandero*). Ernesto remembers his grandfather riding out on horseback in the middle of the night to deliver babies in El Rancho and Pojoaque. So far as Ernesto knew, his grandfather had no formal education, but was respected as a natural healer. He kept his medicinal herbs in a dark back room of the family house at San Ildefonso. Two of these medicinal herbs remembered by Ernesto are *Yerba de San Carpio* and osha. [Note: Osha is *Ligusticum porteri*; I have been unable to identify *Yerba de San Carpio*.]

Ernesto also remembers that it was very rainy in those days and that the growing season was longer than it is now. He and his family would go from the family home in the Pueblo of San Ildefonso to the plateau in March or April where they raised good crops without manuring the soil. Ernesto describes bean plants that were as big as bushes. The kitchen garden was on the south side of the cabin and manure was used there. The family grew peas, pumpkins, sweet corn, and melons in the little garden; the melons were small and round and very delicious. Although most fruit was brought up from the valley orchards and vineyards, some peach trees and wild plums grew near the cabin. *Verdolaga* (*Portulaca* spp.) and *quelitas* were gathered from the garden. The pumpkins from the kitchen gardens were eaten green like squash; and when they got bigger they were cut up and hung to dry in the attic and on the porch. Plums and peaches from the ranch were also dried, and they were also delicious. Fresh corn from the ranch was boiled outside in big kettles and then dried to make chicos. [Note: Hominy is made with lye; the Romeros did not make hominy.] Chiles from the valley were strung and dried at the cabin.

When asked about the wild plants the family might have used, both Ernesto and Ernestina sang out, "strawberries!" In the spring, strawberries apparently grew wild and in profusion among the freshets on the canyon sides at that time. They remember that the strawberries were large, delicious, and plentiful. Wild *quelitas* were also gathered and cooked, the couple remembers these as red and fuzzy. [Note: Although amaranth fits Earnestina's discription best, chenopods

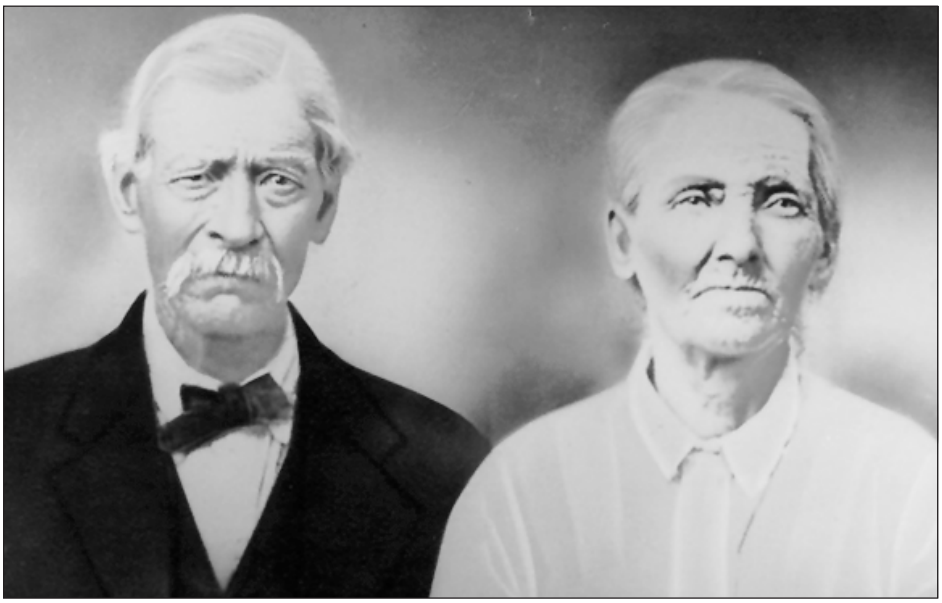


Photo courtesy of the Romero family

Figure 2.10. David and Francisquita Romero.

(*Chenopodium* spp.), often referred to as goosefoot, are the greens most often associated with the term *quelita* in northern New Mexico, but the term can also refer to any early, wild, edible green encouraged or sown in domestic gardens.] Amole root (*Yucca angustissima*) was also dug up, dried, and stored. According to Ernestina, it makes nice suds. Osha (*Ligusticum porteri*) was collected from the mountains to be used for seasoning or was boiled and the "tea" was used to clean cuts and infections. The men tending the livestock often brought home the roots from the mountains as a gift for the women. [Note: Nowadays, the European lovage (*Livisticum officinalis*) is grown in northern New Mexico gardens and is referred to as osha. It has much the same fragrance and properties as *L. porteri*. Although *L. porteri* has not been officially reported from the east flank of the Jemez Mountains, this may be because it has been over collected there as it has been in other parts of the state. It has been reported from the mountains around Santa Fe and elsewhere in New Mexico, but it is becoming rare and should be protected.]

The family brought about 10 to 12 chickens and one or two pigs to the ranch each summer. The couple recalled that life at the cabin was very simple, and little time was spent on tending livestock and the kitchen garden because everyone, including the women, worked in the fields. Indeed, the primary reason for being there at all was to raise a cash crop of beans. In spite of this effort, no one really had much cash, and the beans were bartered for other commodities such as wheat. They rarely traded at the Los Alamos Ranch School store, not because it was expensive, but because they simply lacked the cash. Bences Gonzales, who ran the store, was a relative and so they could always get things they might need in emergencies. They periodically made trips to the valley for "ranch grub."

All of the fields were cleared and fenced with barbed wire. Ernesto doesn't remember anyone clearing much land and believes most of the land was already cleared, even when his grandfather had a house there. The bean fields were plowed with the same horses that drew the family wagon; the bean plants—mostly pintos but also some fabas—were dry farmed because it rained a lot at that time. [Note: Pinto beans are a variety of the common bean (*Phaseolus L.*) that was prehistorically domesticated in middle America and grown in the Southwest for centuries. Faba beans (*Faba vulgaris*) were introduced from Mexico and then brought up the *Camino Real* by the first Europeans to colonize what is now New Mexico.] During the harvest, the whole bean plant was pulled up by the roots, thrown in the wagon, and hauled and dumped to dry in the front of the cabin where the ground was hard-packed earth. The beans were winnowed by hand or the horses were driven through the piles of plants to thresh out the beans, which were shoveled into burlap bags.

The front yard of a house or cabin in northern New Mexico was usually clean-swept, packed earth. The author remembers women in El Rancho regularly sweeping their front yards in the morning to remove chicken droppings (chickens were allowed to range freely about the property during the day) and to discourage weeds from growing near the walls of the house where they might pipe water into the adobe walls. Dirt floors inside the house were covered with linoleum.

According to the Romeros, the lack of water was not a problem for homesteaders of the Pajarito Plateau in the early years. Though some springs may have temporarily dried up in 1912 (see interview with Peggy Pond Church), the water usually ran freely from springs in the sides of the canyons. Drinking water for the Romero cabin was brought in barrels on a horse-drawn sled from a spring hole located at the bottom of the canyon to the south of the ranch. When water was short, they went to Los Alamos Canyon on the mesa for water. Later, in the 1930s, "you couldn't grow anything," and water for the crops had to be hauled from the Rio Grande.

Ernesto and his brothers all slept outside on the porch of the cabin. He remembers hunting deer and turkeys with his brothers in the early years; even later, when it became too dry to farm on the Pajarito Plateau, they would still come to the mountains to hunt.

1.6 Isabel Romero Trujillo and Rosario Martinez Fiorillo

In September 1999, Teralene Foxx met with Isabel Romero Trujillo and Rosario Martinex Fiorillo to confirm information. Isabel is the daughter of Ernesto and Ernestina Romero and Rosario is the daughter of Luisita Romero, sister to Ernesto (see Figure 1.3 in Chapter 1). [Note: Ernesto is now deceased; Luisita is 99 years old.] Isabel and Rosario corroborated the information given by other descendants. They also indicated that when the Romeros traveled from San Ildefonso to the cabin it took them all day. They traveled by wagon leaving early in the morning. They ate lunch under the shade of a tree that still stands near the intersection of Highway 30 and State Road 502 (Figure 2.11) and then continued to the cabin via *Camino del la Culebra* (Snake Road, which was the precursor to the Main Hill Road [Figure 2.11]). It was along this road that an earlier ancestor, Antonio Sanchez, former owner of the Ramon Vigil Grant was killed when a boulder hit him on the head.

Photos by Gail Tierney

Figure 2.11. Cottonwood and “sacred” pear tree at the spring where homesteaders stopped for lunch. Picture taken in 1986, cottonwood still stands but pear tree is gone. Inset: Pear tree blossom.

Photo courtesy of Los Alamos Historical Society

Figure 2.12. Carriages going up the *Camino de la Culebra* (Main Hill Road).

CHAPTER 3: VEGETATION AND SOIL ANALYSES OF THE ROMERO CABIN COMPLEX

Teralene S. Foxx

1.0 INTRODUCTION

Interviews with some of the people or their relatives who lived on the Pajarito Plateau were the main theme of Chapter 2. We learned something of their strategies for survival: the use of dry-farmed fields, edible wild plants, and vegetables and fruit from the Española-Pojoaque valley. For those who were better off, we learned of the astounding array of vegetables and fruits that could be grown on the mesas with the help of cold frames and irrigation.

This chapter deals with the natural vegetation surrounding, and in the vicinity of, the Romero Cabin Complex and the soils that promote that vegetation.

Studying the processes of change within patches of disturbance, both natural and humanmade, is important to the understanding of plant community development and of landscape structure (Pickett and White 1985). Patches created by abandoned agricultural lands are important study areas not only to the ecologist but also to the archaeologist/anthropologist. Combined with ethnographic information, specific field studies can be used to understand settlement and subsistence patterns of the late 19th and early 20th centuries. Although this historical period is recent in time, specifics of settlement and subsistence were often not recorded and must be extrapolated from archaeological remains and ecological data. The Romero Cabin Complex provided a unique opportunity to study the processes of change on abandoned lands on the Pajarito Plateau.

The Romero Cabin Complex was one of the few structural remains of the homestead lifestyle left on the southern portion of the plateau. Although the Homestead Act was passed in 1862, homesteading did not play an important part in the economy of the area until after 1894 (Chambers 1974). Between 1894 and the 1920s homestead patents were filed on the land now under the protection of Los Alamos National Laboratory. These patents were abruptly terminated by the wartime acquisition of land for the Manhattan Project.

The homestead era represents years of Hispanic subsistence and economic lifestyle. The Romero cabin represents a piece of that history. The cabin and associated fields provide an excellent opportunity to understand something of the influence of these early inhabitants on the plateau. Besides being of historical interest, the study provides some important information on successional patterns that have occurred because of land use during and since the late 1800s. Understanding these successional processes can be significant to future land use planning (Tierney and Foxx 1982).

The purpose of this study was to examine the fields and structures associated with the cabin (Figure 3.1) to determine influence of agriculture and settlement on the ecology and landscape. The examination was done by vegetation and soil analyses and dendrochronology (see Chapter 6). The field studies were supported by an extensive ethnobotanical study (see Chapter 5).

1.1 Literature Review

Old field succession became of interest in the late 1800s. This was primarily because time of abandonment of lands could generally be defined and the years since abandonment determined. Early studies were devoted to classifying the patterns of change seen through time. Shantz (1917), one of the earliest researchers, reported that roadside succession had an early weed stage, a late weed stage, a short-lived grass stage, a perennial stage, an early short-grass stage, and a late short-grass stage leading to a typical short-grass sod characteristic of the undisturbed environment. Other researchers including Savage and Runyon (1937), Judd and Jackson (1939), and Weaver and Albertson (1956), found similar stages from time of abandonment of fields.

Costello (1944) reported successional processes to be (1) replacement of annuals by perennials, (2) gradual reduction in percentage composition contributed by forbs, (3) increasing abundance of grass, and (4) increased density of ground cover. Succession in his model was accompanied by increased floristic composition.

Dyksterhuis (1948) determined that fields with little or no grazing and those protected from excessive erosion would recover more quickly than those that had been grazed. He listed four successional stages including weed, annual three-awn, bluestem, and little bluestem.

Laughbaugh (1955) outlined three stages after abandonment of fields: (1) forb and annual grass, (2) subclimax perennial grass, and (3) perennial grass climax. Tomanek et al. (1955) found a basal cover of 33% in abandoned fields in central Kansas. Two-thirds of the species were long-lived perennials, the other one-third, short-lived perennials.

More recent studies have incorporated the influence of soil resources such as nitrogen, water, and

Figure 3.1 Components of the Romero Cabin Complex

phosphorus on successional dynamics (Olson 1959; Rice et al., 1960; Lloyd and Pigott 1967; Walker et al., 1981). Changes in soil resources have been shown to influence community structure. Fertilization of an area can lead to dramatic shifts in species composition and diversity (Milton 1947; Willis and Yenn 1961; Specht 1963; Ginzo et al., 1982; Tilman 1982, 1984). Tilman (1986) suggests that it is possible to predict the effect of resource availability on community structure and succession if the resource-dependent plant growth is known.

Tilman (1986) studied nitrogen dependency of nine species of plants that occur during different successional stages in the old field Cedar Creek Natural History Area, Minnesota. He predicted that the early successional species would grow best in nitrogen-deficient soils while those species characteristic of later successional stages would grow more rapidly in soils with higher nitrogen levels. He concluded that the early successional species had a greater ability to acquire nitrogen and grow in nitrogen-poor soils making them superior competitors for soil nitrogen as compared with later successional species. Once the nitrogen levels are higher, these initial successional species cannot compete with species that are nitrogen dependent.

In addition to gaining an understanding of the internal changes within the disturbed patch created by the old fields, there has also been interest in identifying the plants that may indicate previous subsistence patterns. Early studies such as those by Chamberlin (1877) used indicator plants to determine agricultural capabilities of a region. Settlers to an area were often aware of plant species that indicated fertile soils for tilling (Sampson 1939). More recently, indicator species have been used in prospecting for uranium (Cannon 1960, 1971, Massingil 1979), locating former burial locations for radioactive and hazardous wastes (Becker and Foxx 1986), and locating archaeological structures (Tierney 1971, 1977, 1979; Foxx 1982; Housley 1974; Yarnell 1958). Researchers have found a strong correlation between soil chemistry and local disturbance of plants (Snaydon 1962, Pigott and Taylor 1964, Tilman 1986,

Whittaker and Niering 1975). Archaeologically, settlement patterns have been examined by changes of soil chemistry (Arrhenius 1963).

2.0 METHODS

2.1 Vegetative Analysis of Fields and Associated Structures

In August 1984, fields, areas surrounding the Romero cabin (Figure 3.2), and other homestead structures were examined for floristic composition and foliage cover. Low-altitude aerial maps were used to initially determine vegetative patterns (Figure 3.3). Transects were established in each area to determine floristic composition, frequency, and foliage cover. Figure 3.4 shows the vegetation mosaic in the field area.

The vegetational analysis was done by using a modification of Lindsey's (1955) line intercept method. This method provides a measure of foliage cover of the tree, shrub, and herb strata; the species composition in all strata. Six separate transects were done: areas of the cabin, animal pen, cistern, field, corral/stable, and the adjacent undisturbed control.

The sampling unit for trees and shrubs was 50 m long by 28 m. Herbaceous vegetation was recorded in 20- by 50-cm quadrats placed every meter along the line.

The following calculations were made from the field data:

1. Frequency. Frequency indicates the uniformity of distribution of a species (a quality) whereas abundance and density indicate quantity. Two calculations can be made to define the uniformity of distribution of a species—total frequency and relative frequency. Relative frequency is the number of points of occurrence of a species over the number of points of occurrence of all species multiplied by 100.

2. Cover. Percentage of cover is an expression of the percentage of the ground included in the vertical projection of foliage of the individual or combined species. Cover serves as a criterion of relative dominance of a species. Both relative cover and percentage of cover can be calculated.

3. Species composition. Species composition is a measure of the diversity of species within an area. It is obtained by counting the different species recorded for each site. The diversity may be expressed by the total species present in an area or by families or other groupings.

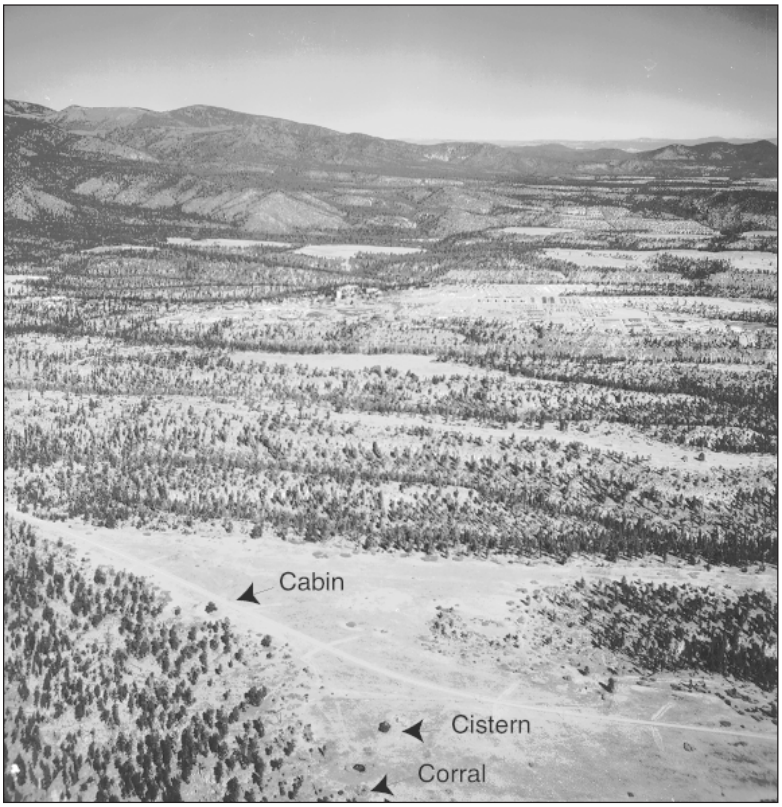


Photo courtesy of LANL, P1990-40-1-3202

Figure 3.2 Aerial photograph showing Romero cabin and field (1946).

a.

b.

Photos courtesy of LANL, RN84-076104

Figure 3.3. Low-altitude aerial photographs taken in the 1980s showing the view of the Romero Cabin (a) and fields (b).

2.2 Soil Analysis

The floristic survey indicated a significant difference in species composition as related to the land usage, i.e., field, stable, corral, cistern, cabin floor, cabin yard, and animal pen. Soil analyses were then used in an attempt to define the land use influence on the apparent landscape, species composition, and successional patterns.

Where possible, at least 10 locations were sampled within each area of specific land use, i.e., field, corral, stable. Soils were collected at three depths (0 to 1 cm, 1 to 10 cm, and 10 to 30 cm). Samples were collected from three layers by the use of stainless steel rings of varying size and depth. A stainless steel ring was placed on the surface of the soil at the sampling point. The soil enclosed by the first ring was then collected by undercutting the ring with a spatula and transferring the sample to a recloseable plastic bag. The second stainless steel core was used to collect a sample from the 10- to 30-cm layer. The core was placed directly on the surface, cleared by the first sample, and driven into the ground. The last layer was collected using a 2-in. polyvinylchloride (PVC) pipe from 10 to 30 cm (Figure 3.5). All layers were preserved frozen until analysis was possible. Before analysis was done, soils were divided into equal portions using a soil separator. Because of budget constraints, soils from the surface were not sent for analysis. Soil samples were sent to Colorado State University for analysis. Analysis techniques used by Colorado State University are given in Table 3.1.

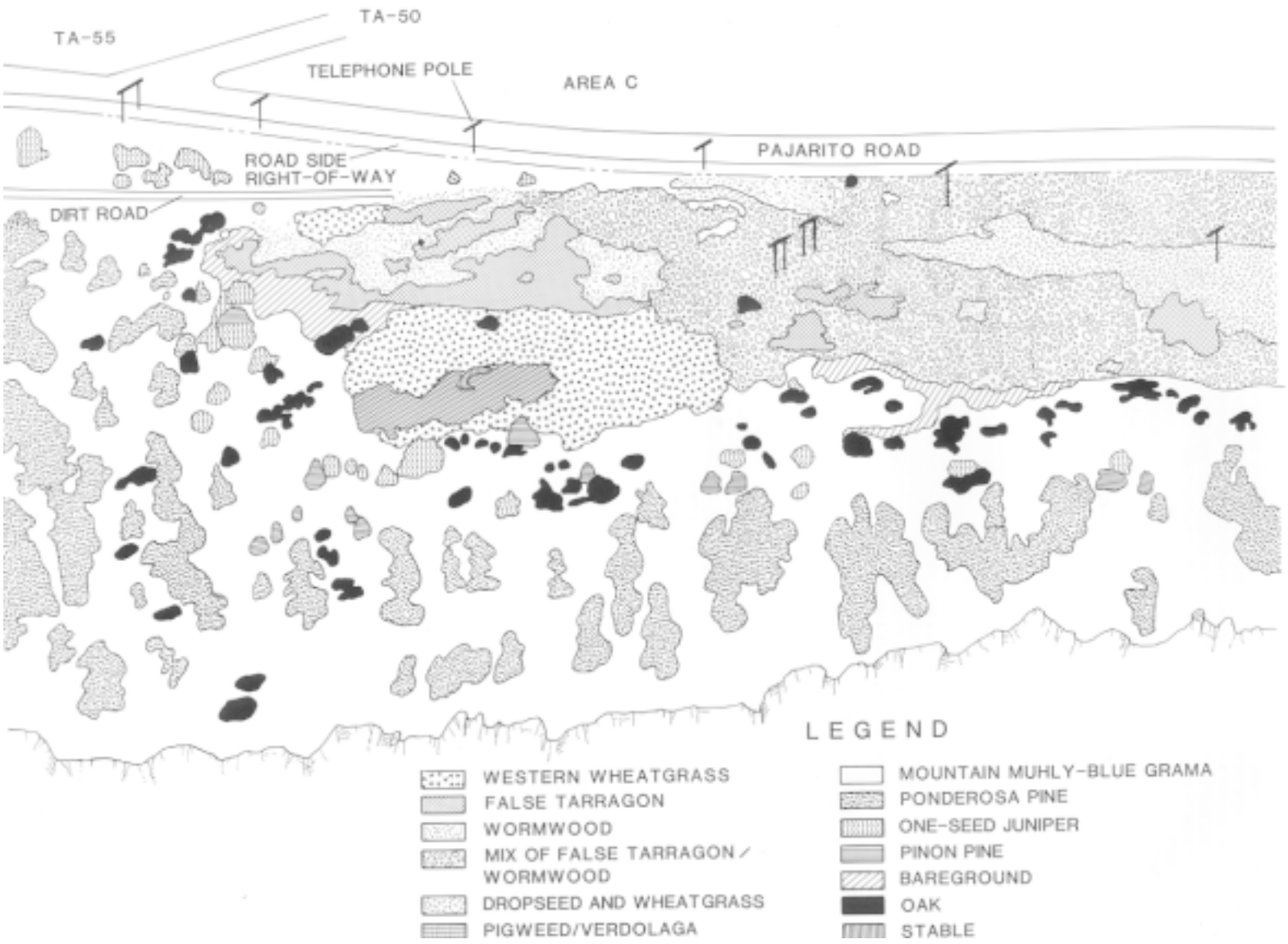


Figure 3.4. Vegetation mosaic in Romero fields.

Photo by Teralene Foxx

Figure 3.5. Collecting soil samples with a 2-in. PVC pipe.

3.0 RESULTS

3.1 Vegetative Analysis

The Romero cabin (Figure 3.1) and the adjacent control are at approximately 7000 feet elevation on the gentle, south-facing slope of a wide mesa between Two-Mile Canyon and Mortandad Canyon. The cabin and an adjacent structure, thought to be an animal pen, were located on a shelf approximately 50 feet above the grade of the field to the east. The cabin location had a full to slightly north-facing aspect. The cistern/dugout was located to the northern portion of a wide cleared area believed to have been David Romero's field. To the southern end of the clearing the remains of a stable and evidence of a corral were found.

The historic complex (Figure 3.1) was situated at the ecotone between the ponderosa pine forest and the piñon-juniper woodland. The cabin and the animal pen were sited on a shelf within the ponderosa pine zone; whereas, the field, cistern, and stable/corral were located at the immediate ecotone of the two plant communities. The eastern end of the field was dominated by a piñon-juniper woodland; the southern margins a mixture of ponderosa pine, piñon, and juniper; and the western margin a ponderosa pine forest. A Laboratory road (Pajarito Road) provided a boundary on the northern margins of the complex with areas continually disturbed by road maintenance. Ecotones and disturbed sites generally have a larger species diversity than the pure stand community (Daubenmire 1959, Costello 1944). Because the site was at an ecotone with the presence of powerline and pipeline easements and the continual disturbance for roadway maintenance, a large variety of species were identified. Ecological and biological information about plants identified within the study area are in Table 3.2. The common names and synonyms are in Appendix II. Seventy-nine species were noted for the area. Fifty-five of the 79 were recorded along the transects established in the complex and the adjacent control. Species not recorded in the vegetative plots were occasional, and foliage cover represented less than 1%. Fifty-two species were recorded within the quadrats in the Romero Cabin Complex and 19 in the adjacent control. Of the species recorded in the adjacent control, 85% were also found in the ecological plots in the Romero Cabin Complex.

Voucher specimens have been curated at the University of New Mexico herbarium and herbarium at Los Alamos National Laboratory, Environment, Safety, and Health Division, Ecology Group. Five areas within the Romero Cabin Complex were examined and compared. Relative cover (Tables 3.3 and 3.4) and relative frequency (Table 3.5) were calculated for each species recorded in the vicinity of the cabin, within the field, the corral/stable, the animal pen and surrounding area, and an adjacent undisturbed control. Each of these areas was found to be vegetatively distinct, each dominated by different species.

The relative foliage cover and species diversity (Table 3.6) were compared for the six plots. The highest foliage cover and species diversity were found in the vicinity of the cabin, and the lowest cover and diversity were in the field. Twenty-six species were recorded for the cabin area and only eight for the field. The increased species diversity in the cabin area may have been a result of a recent disturbance of the area for road maintenance and pipeline construction as well as the presence of a slightly north- to northwest-facing slope.

An importance index was calculated for the six areas to determine those species that had the greatest foliage cover and frequency (Table 3.7). Grasses and four species in the genera *Artemisia* spp. were found to have the highest foliage cover and frequency of occurrence. Blue grama (*Bouteloua gracilis*) and squirreltail (*Elymus elymoides*) were the dominant grasses within the field, but western wheatgrass (*Pascopyrun smithii*) and blue grama dominated the cabin area. The species of *Artemisia* that dominated the plots were Carruth sage (*A. carruthii*) and false tarragon (*A. dracunculus*). False tarragon was found to have the highest importance index of the six sites. Although false tarragon was found in all plots, it was found to have the highest

Table 3.1. Soil Methods at Colorado State University

Parameter	Description
pH 1:1	pH of 1:1 soil-water suspension (Page et al., 1982)
Bulk density	Determined on disturbed samples by weight a volume of soil. The soil volume was determined by tamping the soil in a graduated cylinder until there are no changes in volume (Page et al., 1982)
Organic matter	Walkley-Black Method wet oxidation (Soltanpour and Workman 1981)
Nitrate ion Ammonium ion	2 molar potassium chloride extraction (Page et al., 1982)
Phosphorus	0.5 molar sodium bicarbonate extraction (Page et al., 1982)
Calcium	1 molar ammonium acetate extraction (Page et al., 1982)
Cation Exchange Capacity	Sodium Method (Black 1965)
Total potassium	Hydrofluoric-perchloric acid digest (Page et al., 1982)
Percentage of sand, silt, clay	Hydrometer (Black 1965)
1/3 bar, 15 bar water retention	Pressure plate extraction (Black 1965)
Phosphorus fixation index	Measure amount of phosphorus absorbed from solution by the soil (Bache and Williams 1971)
Nitrogen	Kjeldahl digestion in an aluminum block followed by automatic colorimetric determination of ammonium (Nelson and Sommers 1980)
Phosphorus, calcium, potassium	Nitric acid digestion, ICN analysis (Havlin and Soltanpour 1980)

Table 3.2. Ecological and Biological Information on Plants Identified in the Romero Cabin Complex and Adjacent Control

Species	Origin	Life Cycle	Carbon Fixation	Nodule Forming	Nitrogen Fixing	Disturbed
AMARANTHACEAE						
*Amaranthus retroflexus**	I	A	C4			x
ANACARDIACEAE						
Rhus trilobata	N	S				
APOCYNACEAE						
Apocynum androsaemifolium	N	P				
ASTERACEAE						
Ambrosia artemisiifolia	N	A				
Antennaria parvifolia	N	P				
Artemisia carruthii	N	P	C3			OF
Artemisia dracunculus	N	P				OF
Artemisia frigida	N	P	C3	possibly	maybe	OF
Artemisia ludoviciana	N	P				
Bahia dissecta	N	A				
Cirsium spp.	N	B				x
Conyza canadensis	I	A	C3			x
Ericameria nauseosus	N	S				
Erigeron divergens	N	P, B	C3			
Erigeron flagellaris	N	P				x
Erigeron philadelphicus	N	P				
Grindelia nuda var. *aphanactis*	N	B				x
Gutierrezia sarothrae	N	P	C3			
Helianthus annus		A				x
Heterotheca villosa	N	B				x
Hymenoxys richardsonii var. *floribunda*	N	P				
Lactuca spp.	I	A				x
Liatris punctata	N	P				
Solidago spp.	N	P				
Stephanomeria spp.	N	P				
Tetraneuis acaulis var. *acaulis*	N	P				
Thelesperma filifolium var. *filifolium*	N	P, A	C3			
Tragopogon dubius	I	B	C3			x
Verbesina encelioides	N	A	C3			x
BORAGINACEAE						
Lappula spp.	N	A	C3			x
Lithospermum multiflorum	N	P				
BRASSICACEAE						
Capsella bursa-pastoris	I	A				
CACTACEAE						
Opuntia spp.	N	P				
CAPPARIDACEAE						
Cleome serrulata	N	P			possibly	x

*Scientific names according to USDA Plants Data Base. For synonyms and common names see Appendix II.

Table 3.2. Ecological and Biological Information on Plants Identified in the Romero Cabin Complex and Adjacent Control (Cont.)

Species	Origin	Life Cycle	Carbon Fixation	Nodule Forming	Nitrogen Fixing	Disturbed
CHENOPODIACEAE						
Chenopodium album	I	A				x
Kochia scoparia	I	A				x
CUPRESSACEAE						
Juniperus monosperma	N	T				
CYPERACEAE						
Carex spp.	N	P	C3			
FABACEAE						
Lupinus caudatus	N	P				
Medicago sativa	I	P				
Melilotus spp.	I	B				
FAGACEAE						
Quercus gambelii	N	S				
Quercus x pauciloba	N	S				
GERANIACEAE						
Erodium cicutarium	I	A				
IRIDACEAE						
Iris spp. (domestic)	I	P				
LILIACEAE						
Allium cernuum var. *obtusum*	N	P				
Asparagus officinalis	I	P				
Yucca angustissima	P	N				
Yucca baccata	N	P				
LINACEAE						
Linum neomexicanum	N	P				
MALVACEAE						
Spheralcea spp.	P	N	C3			x
NYCTAGINACEAE						
Mirabilis linearis	P	N				
ONAGRACEAE						
Guara coccinea	P	N	C3			
Oenthera coronopifolia	N	A				
PINACEAE						
Pinus edulis	T	N				
Pinus ponderosa	T	N				
Psuedotsuga menziesii	T	N				
PLANTAGINACEAE						
Plantago patagonica		N				

Table 3.2. Ecological and Biological Information on Plants Identified in the Romero Cabin Complex and Adjacent Control (Cont.)

Species	Origin	Life Cycle	Carbon Fixation	Nodule Forming	Nitrogen Fixing	Disturbed
POACEAE						
Agropyron desertorum	I	P	C3			
Andropogon gerardii	N	P	C3			
Blepharoneuron tricholepis	N	P				
Bouteloua gracilis	N	P	C4			
Bromus tectorum	I	A				
Buchloe dactyloides	N	P	C4			
Elymus elymoides spp. *elymoides*	N	P	C3			
Hesperostipa comata	N	P	C3			
Koeleria macrantha	N	P				
Muhlenbergia montana	N	P				
Pascopyrum smithii	I	P	C3			
Pleuraphis jamesii	N	P				
Poa fendleriana	N	P				
Schizachyrium scoparium	N	P	C3			
Sporobolus cryptandrus	N	P	C4			
POLEMONIACEAE						
Ipomopsis aggregata	B	N				
POLYGONACEAE						
Eriogonum spp.	P	N				
PORTULACACEAE						
Portulaca oleracea	I	A				
Talinum	N	P				
ROSACEAE						
Cercocarpus montanus var. *montanus*	I	S				
Fallugia paradoxa	I	S				
Prunus americana	I	S				
SAXIFRAGACEAE						
Ribes cereum	N	S				
SCROPHULARIACEAE						
Castilleja integra	N	P				
Penstemon secundiflorus	N	P				
Verbascum thapsus	I	P				x
VITACEAE						
Parthenocissus quinquefolia var. *quinquefolia*	N	P				

Table 3.3. Percentage of Cover of Plants Found in the Romero Cabin Complex

Species	Cabin	Cistern	Animal Pen	Stable	Field	Control
AMARANTHACEAE						
*Amaranthus retroflexus**				1.2		
ANACARDIACEAE						
Rhus trilobata			1.0			
ASTERACEAE						
Artemisia carruthii	0.9	3.7			1.2	
Artemisia dracunculus	1.3	1.8	0.8		1.8	0.9
Artemisia frigida		1.3				
Artemisia ludoviciana			0.5			0.3
Bahia dissecta	0.1	0.02				
Erigeron flagellaris	0.06					
Heterotheca villosa			0.5			0.7
Conyza canadensis		1.0				
Grindelia nuda var. *aphanactis*	0.2					0.2
Gutierrezia sarothrae	0.7					
Helianthus annuus				0.02		
Hymenoxys richardsonii	0.3					
Lactuca spp.		0.02				
Tetraneuris acoulis var. *nana*			0.02			
Tragopogon dubius	0.1					0.007
Thelesperma filifolium var. *filifolium*		0.2				
Verbesina enceliodes				1.0		
BORAGINACEAE						
Lappula spp.			0.7			
Lithospermum multiflorum			0.1			0.1
CACTACEAE						
Opuntia spp.						0.1
CAPPARIACEAE						
Cleome serrulata					0.2	
CHENOPODIACEAE						
Kochia scoparia		0.4		2.5		
CYPERACEAE						
Carex spp.						0.07
FABACEAE						
Melilotus spp.	0.09					
FAGACEAE						
Quercus gambelii	8.5					0.8
Quercus x pauciloba	0.9					
IRIDACEAE						
Iris spp. (domestic)			1.0			
LILIACEAE						
Yucca angustissima	0.7					0.3
NYCTAGINACEAE						
Oxybaphus linearis		0.2				

*Scientific names according to USDA Plants Data Base. For synonyms and common names see Appendix II.

Table 3.3. Percentage of Cover of Plants Found in the Romero Cabin Complex (Cont.)

Species	Cabin	Cistern	Animal Pen	Stable	Field	Control
ONAGRACEAE						
Guara coccinea		0.1				0.4
PINACEAE						
Pinus ponderosa	0.007		1.4			
POACEAE						
Agropyron desertorum	0.2	2.8			0.6	
Andropogon gerardii	0.3					0.2
Bouteloua gracilis	12.1	5.6	0.7		1.8	
Bouteloua dactyloides	0.2					
Elymus elymoides	0.7	0.2	0.1	0.2	2.3	0.2
Hesperostipa comata	0.5				0.02	
Muhlenbergia montana	0.5		3.6			4.3
Pascopyrum smithii	3.0	0.6		8.7	0.8	
Pleuraphis jamesii	0.04					
Poa fendleriana	0.2		0.6			0.1
Schizachyrium scoparium			2.2			1.4
Sporobolus cryptandrus	0.5	0.1	0.8		0.4	
Unknown	0.05					
POLEMONIACEAE						
Ipomopsis aggregata			0.2			
PORTULACACEAE						
Portulaca oleracea			0.3	1.0		
ROSACEAE						
Cercocarpus montanus						0.2
SCROPHULARIACEAE						
Castilleja integra	0.04					
Penstemon secundiflorus			0.1			0.007
VITACEAE						
Parthenocissus inserta		0.7				

Table 3.4. Percentage of Cover of Plants Found in the Romero Cabin Complex and Adjacent Control by Life Form and Family

	Percentage of Cover					
Species	Cabin	Cistern	Animal Pen	Stable	Field	Control
Composites	3.7	8.0	1.8	1.0	3.0	2.1
Graminoides	18.3	9.3	8.0	13.6	5.9	6.2
Forbs[a]	4.3	4.1	2.4	8.9	0	1.8
Shrub	9.1	0	1.0	0	0	0.8
Vine	0	0.7	0	0	0	0
Tree	0.007	0	1.4	0	0	0

[a]Forbs other than those in the Family Compositae.

Table 3.5. Relative Frequency (%) of Occurrence and Adjacent Control

Species	Cabin	Cistern	Animal Pen	Stable	Field	Control
AMARANTHACEAE						
*Amaranthus retroflexus**				16		
ANACARDIACEAE						
Rhus trilobata			2			
ASTERACEAE						
Artemisia carruthii	16	33			14	
Artemisia dracunculus	24	13	9		38	3
Artemisia frigida		8				
Artemisia ludoviciana			11			6
Bahia dissecta	3	3				
Erigeron divergens					3	
Erigeron flagellaris	1					
Heterotheca villosa			11			14
Conyza canadensis		10				
Grindelia aphanactis	2					?
Gutierrezia sarothrae	12					
Helianthus annuus				2		
Tetraneuris acaulis var. *nana*			2			
Hymenoxys richardsonii	6					
Lactuca spp.		3				
Tragopogon dubius	2				3	
Thelesperma filifolium var. *filifolium*		3				?
Verbesina enceliodes				2		
BORAGINACEAE						
Lappula spp.			6			
Lithospermum multiflorum			2			0.9
BRASSICACEAE						
Capsella bursa-pastoris	2					
CACTACEAE						
Opuntia spp.						2
CAPPARIDACEAE						
Cleome serrulata				2		
CHENOPODIACEAE						
Kochia scoparia		8		6		
CUPRESSACEAE						
Juniperus monosperma			2			
CYPERACEAE						
Carex spp.						3
FAGACEAE						
Quercus gambelii	13					4
Quercus x pauciloba	2					3
POACEAE						
Agropyron desertorum	2	31		2		

*Scientific names according to USDA Plants Data Base. For synonyms and common names see Appendix II.

Table 3.6. Species Composition for the Romero Cabin Complex and Adjacent Control

	Number of Species					
Species	Cabin	Cistern	Animal Pen	Stable	Field	Control
Composites	8	7	4	2	2	5
Graminoides	12	5	6	2	6	5
Forbs[a]	3	3	6	4	0	6
Shrub	2	2	1	0	0	0
Vine	0	1	0	0	0	0
Tree	1	0	1	0	0	0
Total	26	18	18	8	8	16

[a]Forbs other than those in the Family Compositae.

Table 3.7. Plant Species with the Highest Importance Index in each of the Plots

Cabin	Cistern	Animal Pen	Stable	Field	Control
BOGR	ARCA	MUMO	PASM	ARDR	MUMO
PASM	AGDE	SCSC	AMRE	ELEL	SCSC
ARDR	BOGR	HEVI	POOL	BOGR	HEVI
QUGA	ARDR	ARLU	KOSC	ARCA	ARLU
ARCA	HEVI	ARDR	HEAN	PASM	SPCR

AGDE	Desert wheatgrass, *Agropyron desertorum*
AMRE	Redroot pigweed, *Amaranthus retroflexus*
ARCA	Carruth sage, *Artemisia carruthii*
ARDR	False tarragon, *Artemisia dracunculus*
ARLU	Wormwood, *Artemisia ludoviciana*
BOGR	Blue grama, *Bouteloua gracilis*
ELEL	Bottlebrush squirreltail, *Elymus elymoides*
HEVI	Goldenweed, *Heterotheca villosa*
HEAN	Common sunflower, *Helianthus annuus*
KOSC	Summer cypress, *Kochia scoparia*
MUMO	Mountain muhly, *Muhlenbergia montana*
PASM	Western wheatgrass, *Pascopyrum smithii*
POOL	Verdolaga, *Portulaca oleraceae*
QUGA	Gambel's oak, *Quercus gambelii*
SCSC	Little blue stem, *Schizachyrium scoparium*
SPCR	Sand dropseed, *Sporobolus cryptandrus*

Note: Importance index calculated by adding together relative frequency and percentage of cover.

importance index in the field, cabin, cistern, and animal pen area. It was the species with the highest foliage cover and frequency in the field.

Wormwood (*A. ludoviciana*), on the other hand, was found in only two of the six sites. Both locations where it was recorded showed minimal disturbance. *Estafiata* was confined to the field; this sage has been reported to be nodule forming and nitrogen fixing (Dittbeiner and Olson 1983). False tarragon, carruth sage, and *estafiata* have been consistently found on old fields on this part of the Pajarito Plateau (Tierney and Foxx 1982).

Verdolaga (*Portulaca oleraceae*) was found in only two of the plots, both had been used for animal habitation. The stable had a large number of species generally found in areas of high nitrogen content including beeplant (*Cleome serrulata*), redroot pigweed (*Amaranthus retroflexus*), and *verdolaga*.

Two grasses dominated the cabin area, western wheatgrass and blue grama. Two introduced grasses commonly used in reclamation of disturbed lands, western wheatgrass and desert wheatgrass, may have been introduced into the Romero Cabin Complex when revegetation was done after road building and trenching. Native species found in the area included blue grama, little bluestem, and mountain muhly. These species are prevalent understory grasses in the piñon-juniper woodland and/or ponderosa pine forests of the Pajarito Plateau.

Five species found within the Romero Cabin Complex have been reported to reproduce vegetatively as well as sexually. They are false tarragon, *estafiata*, western wheatgrass, bluegrass, and buffalo grass. All of these species have the highest percentage of relative cover in the disturbed soils. he success may be attributed to the ability to reproduce vegetatively as well as with seed.

3.2 Soils Analyses

3.2.1 Soil Description

Nyhan et al. (1978) classifies soils within the Romero Cabin Complex as being in the Hackroy, Seaby, and Carjo Series. The agricultural field is within the Nyjack Series and the immediate surrounding area in the Seaby and Carjo Series. These soils are moderately deep and well drained from weathered tuff. The surface layers are brown loams to very sandy loams. Subsoil is a brown clay loam approximately 50 cm deep. Depth to tuff bedrock is from 50 to 102 cm. These soils have a moderate permeability and a low to medium water-holding capacity.

Along the edges of the mesas and within the control area, both soils are classified in the Hackroy Outcrop and Rock Outcrop Frigid. These soils are shallow, well drained, and formed from weathered tuff. The surface layers are brown sandy loam or loam with subsoil of reddish brown clay, gravelly clay, or clay loam with many rock outcrops. The depth to tuff bedrock and the effective rooting depth are from 20 to 50 cm. These soils have slow permeability and low available water capacities.

3.2.2 Results of Analyses

Results of analyses for soils from seven different locations are in Table 3.8. Three locations were associated with human habitation—cabin, cabin floor, and cistern. Three were associated with animals—stable, corral, animal pen. One was agricultural—the field. The final location was an undisturbed control. The analyses included texture, water-holding capacity, pH, organic matter, bulk density, and nutrient content. Analysis of variance and a Sheffle comparison (Zar 1974) were done to compare the eight sites. For purposes of this comparison, the two soil layers were combined because the differences in the means were generally less than 10%.

Texture. Texture is an important soil characteristic because it will determine the water intake rates, water storage in the soil, the ease of tilling the soil, the amount of aeration, and will influence soil fertility. The United States Department of Agriculture has established limits of variation for the soil separates and has assigned a textural name to each group. The three texture classes are sand, silt, and clay. Sand ranges from 2 to 0.05 mm, silt from 0.05 to 0.002 mm, and clay is smaller than 0.002 mm.

The percentage of sand, silt, and clay for each of the locations was examined. Statistical analyses indicated that the percent of sand, silt, and clay in the control plot was significantly different from soils associated with areas of habitation (human and animal). The agricultural areas and locations of habitation had greater amounts of silt and clay than the control.

Organic Matter. Organic matter is the percentage of living and dead organisms, plant and animal, added to the soil. Organic matter is extremely important in that it is the source to the soil of nitrogen and up to 60% phosphorus.

A comparison of the organic matter content of the eight locations indicated that the stable had a greater amount of organic matter than all other plots. Both the animal pen and cabin floor had higher amounts of organic matter than the agricultural sites, but did not have significantly greater amounts of organic matter than did the stable. The high organic matter content of the stable area is consistent with the animals being impounded.

Table 3.8. Results of Soil Analyses

Parameter	Cabin	Cistern	Animal Pen	Stable	Corral	Field	Control
Sand							
Layer 1	40	38		35	31	33	54
Layer 2	38	33		33	29	28	54
Silt							
Layer 1	38	43		43	47	44	33
Layer 2	33	44		43	45	44	31
Clay							
Layer 1	22	19		21	22	23	14
Layer 2	29	23		24	27	28	16
Texture							
Layer 1	Loam	Loam	Loam	Loam	Loam	Loam	Loam
Layer 2	Loam	Loam	Loam	Loam	Loam	Loam	Loam
0 Bar							
Layer 1	40.2	36.9		49.2	39.8	34.1	34.6
Layer 2	45.3	36.5		43.9	37.7	43.0	31.1
1/3 Bar							
Layer 1	23.4	20.0		27.0	22.6	18.6	13.8
Layer 2	29.1	23.2		25.9	24.6	20.0	13.8
15 Bar							
Layer 1	8.8	8.4		11.9	8.6	8.5	5.6
Layer 2	11.8	9.7		11.3	9.7	11.9	5.5
pH							
Layer 1	7.0	7.0		7.3	6.5	7.2	6.6
Layer 2	7.0	7.5		7.5	7.2	7.4	6.1
Bulk Density							
Layer 1	1.51	1.50		1.32	1.45	1.58	1.28
Layer 2	1.50	1.60		1.41	1.53	1.57	1.33
Organic Matter							
Layer 1	2.2	2.4		5.0	2.9	1.3	3.3
Layer 2	1.4	1.3		3.9	1.5	0.8	2.2
Nitrate							
Layer 1	20	6		62	34	13	1.0
Layer 2	6	34		45	9	6	0.64
Ammonium							
Layer 1	14	12		17	18	11	4
Layer 2	12	11		16	9	8	5
Phosphorus							
Layer 1	4	4		104	12	5	5
Layer 2	4	16		108	8	3	5
Calcium							
Layer 1	190	223		324	160	173	1155
Layer 2	223	178		342	177	201	452
Cation Exchange Capacity							
Layer 1	25.9	32.4		43.0	29.8	25.0	17.7
Layer 2	32.4	24.3		41.8	29.4	29.7	15.5
Phosphorus Fixation							
Layer 1	11.3	17.3		1.2	8.1	10.8	5.8
Layer 2	17.3	11.3		1.7	12.2	13.4	5.2

Bulk Density. Bulk density is the mass per unit volume of soil as it exists naturally. This includes air space and organic materials in the soil volume. Bulk density can be used to estimate differences in compaction of a given soil, such as might result in tillage. The bulk density is used to indirectly calculate total water storage capacity per soil volume.

The bulk density was significantly different for the field, cistern, and animal pen. The bulk density was greater for the field and cistern as compared to the stable and less for the animal pen. The bulk densities for the cabin, fields, and cistern versus the control probably indicate compaction in areas of habitation and "fluffing" of the soils in areas of tilling.

pH. An indication of the acidity or alkalinity of the soil is measured in pH units. A pH above 7 is more acidic, a pH below 7 is more alkaline. The soil pH can influence plant growth. Most nitrogen-fixing legume bacteria are not very active in strongly acid soils. Bacteria that decompose soil organic matter and thus release nitrogen and other nutrients of plant use are also hindered by strong acidity. Soil alkalinity may reduce the solubility of micronutrients.

Soils within the agricultural areas were all slightly alkaline as were soils surrounding the cabin and cistern. However, soils in the animal pen and corral were slightly acidic. The soils within the control were slightly acidic as compared with those found in the agricultural areas and the places of human habitation.

Water Retention. The water content of the soils has an effect on soil formation, erosion, and structure stability. The primary concern is water for plant growth. The forces that hold water in soil are measured by bars of suction or pressure. Different portions of the water films in soils are held with different suctions. The most useful classifications of water content relate water to plant growth and are labeled as gravitational (drainage) water, available water, field capacity, and wilting point.

Gravitational water is held with suctions of less than one-third bar and is that portion of the soil water that will drain freely from the soil by the force of gravity. Available water is the portion stored in soil that can be absorbed fast enough by plant roots to sustain life. It is defined as the total soil moisture held with forces of suction between one-third and 15 bars. Water held at greater than 15 bars is absorbed only slowly and in small amounts by plants. Plants will wilt if only 15-bar water is present because the water loss through transpiration is faster and greater than that amount absorbed by the roots of these higher suctions. The wilting point is defined as the moisture percentage of soil water held at 15 bars of suction. Field capacity is the percentage of soil moisture that is contained at one-third bar suction and is a measure of the greatest amount of water that a soil will hold or store under conditions of complete wetting followed by free drainage.

Soil texture and organic matter content are important in determining the amount of water soils can hold. Increased clay and organic matter content increase total water retention. The less clay, the less surface area or less organic matter, more of the total water will be held less strongly.

Generally, the water holding capacity of the agricultural areas as compared with the control is significantly different, probably because of the higher percentages of sand within the control sites.

Soil Nutrients. Three soil nutrients were analyzed: nitrogen, calcium, and phosphorus. Both the ammonium and nitrate forms of nitrogen were examined. The nitrate nitrogen is most easily leached. The main source of nitrogen is organic materials. When soil organic matter is decomposed, nitrogen is released as the usable nutrient ion, ammonium. The ions, however, have a short lifetime. The nitrate ion is most readily leached. Both ammonium and nitrate ions are very soluble in water.

Ammonia: The ammonia levels were found to be significantly different in the stable as compared with the control and significantly different in the corral as compared with the control but not significantly different from any of the other locations. The nitrate ion concentrations were significantly different when the stable was compared with the field and control but not in the other locations. Nitrates were also found to be significantly different in the soils taken from the cabin floor and the animal pen as compared with the field and the control.

Phosphorus: Phosphorus is the second most critical plant nutrient. Generally, the total supply of phosphorus in most soils is low, and it is not readily available for plant use. The original soil source for phosphorus is the mineral apatite, a calcium phosphate of low solubility. The solubilized ions rapidly react in soils, often to form insoluble phosphates with the calcium ion or with hydrous oxides of iron and aluminum. In alkaline soils, tricalcium phosphate is formed, which also has a low solubility. Thus phosphorus is not very mobile in soil solutions. Leaching losses are low.

When phosphorus levels in the eight locations were compared, it was found that there were significantly greater phosphorus levels in the stable as compared with levels in the agricultural areas and soils surrounding the cabin and cistern, but not in soils of the cabin floor or animal pen. Soils of the cabin floor showed a significantly higher level than those of any other area other than the stable.

Calcium: Variations in calcium contents of soils are usually variable because many calcium minerals are fairly soluble.

Levels of calcium within soils from the eight locations were compared. There were found to be a significantly higher level of calcium in the control as compared with the other locations.

Cation Exchange Capacity (CEC). The CEC is important in soil fertility. The plant nutrients, calcium, magnesium, and potassium, are supplied to plants in a large measure from exchangeable forms. The amount of cations in the soil solution is intimately related to the exchangeable ions, and any change in concentration of a cation in the solution forces a change in proportions of exchangeable ions. The CEC is the amount of exchangeable cations per weight of soil. Soils high in humus and montmorillonite clays will have high CECs.

Soils of the eight locations were compared. The soils within the Romero Cabin Complex had a significantly higher CEC than did those of the control. Within the complex the soils of the stable, the animal pen, and the cabin floor had significantly higher CECs.

4.0 CONCLUSIONS

Soil and floristic analyses were done on six different locations with different land use history. The locations were a historic cabin and associated outbuildings, an animal pen, a cistern/dugout, a field, a stable/corral, and an adjacent control. A total of 87 species were identified within the study area. One species, *Talinium* spp., had not been previously reported for the Laboratory environs.

Vegetative patterns within the Romero Cabin Complex were distinct because of the various land use patterns (human and animal habitation, agriculture, road building, and easement maintenance) and topography. This was reflected in the results of the soil and floristic analyses.

An analysis of variance showed all plots to be significantly different from all other plots. However, when individual parameters were examined, general patterns did emerge. The following conclusions were made based on comparisons of parameters.

1. The disturbed areas of the Romero Cabin Complex had a higher species diversity than did the adjacent undisturbed control.

2. Within the Romero Cabin Complex, the highest foliage cover and species diversity were found within the cabin area and the lowest within the field.

3. Species within the genera *Artemisia* were found throughout the area. False tarragon, carruth sage, and *estafiata* were generally found in the largest abundance within the field and associated structures. Wormwood was confined to the less disturbed plots.

4. Two introduced grasses (western wheatgrass and desert wheatgrass) commonly used for reclamation were abundant within the complex. These grasses may have been used in reclamation of disturbed areas after road building and pipe trenching.

5. Those areas that were high in nitrates, ammonium and phosphorus, and organic matter were associated with animal or human habitation. Within these areas, plants known to uptake nitrate or thrive best in nitrogen-rich soils were present including beeplant, pigweed, and *verdolaga*.

6. All agriculturally related areas were lower in calcium than the control areas. This may have been caused by calcium leaching due to tilling or differences in soil types. Those control areas were generally within the rock outcrop fringe where soils within the Romero Cabin Complex were identified as being in the Nyjack series.

7. Tilling also apparently had affected the percentage of sand, silt, and clay. The control was higher in clay content than any of the tilled or inhabited sites.

CHAPTER 4: ARCHAEOLOGY: BOTANICAL REMAINS FROM SITE EXCAVATION

Gail D. Tierney

1.0 INTRODUCTION

According to the previous chapter, both the vegetation and soil analyses are consistent with the artifact find of the Romero homestead placement. Even if there were no artifacts found, one could determine where the animal pen was located because of the presence of *Amaranthus retroflexus*, a species that favors nitrate-rich soil. Purslane, the edible worldwide garden weed, was growing in an area thought to have been a small kitchen garden. And the sunflower, *Helianthus annus*, seen growing in profusion in the ruins of the cabin, is a well-known camp follower. The soil analysis confirmed that the degree of nitrogen in the soil was consistent with use of the different areas: fields, pens, and garden areas.

Foundations for the structures of the Romero cabin were excavated in the fall of 1985 as part of a cultural resources reclamation project on lands administered by the US Department of Energy. Among the materials recovered in the excavations were a collection of botanical samples, mostly in the form of seeds or seed shells of edible plants. In this paper, the larger materials are called macrofossils and the flotation samples are called microfossils as was the tradition at the time the paper was first written. This section treats the processes by which fossil botanical materials were retrieved and identified. Chapter 5 provides some historical and ecological notes on the plant species associated with identified specimens.

2.0 METHODS

Botanical remains were retrieved by archaeologists from three structures and two trash areas at the Romero homestead (Figure 4.1). The structures were a log cabin, a log animal enclosure, and a burned privy. No seeds or identifiable plant parts other than pollen were found in the privy; however, each of the first two structures contained discrete assemblages of botanical fossils, which are described below. Scattered surface trash deposits were found in the cleared southeast field

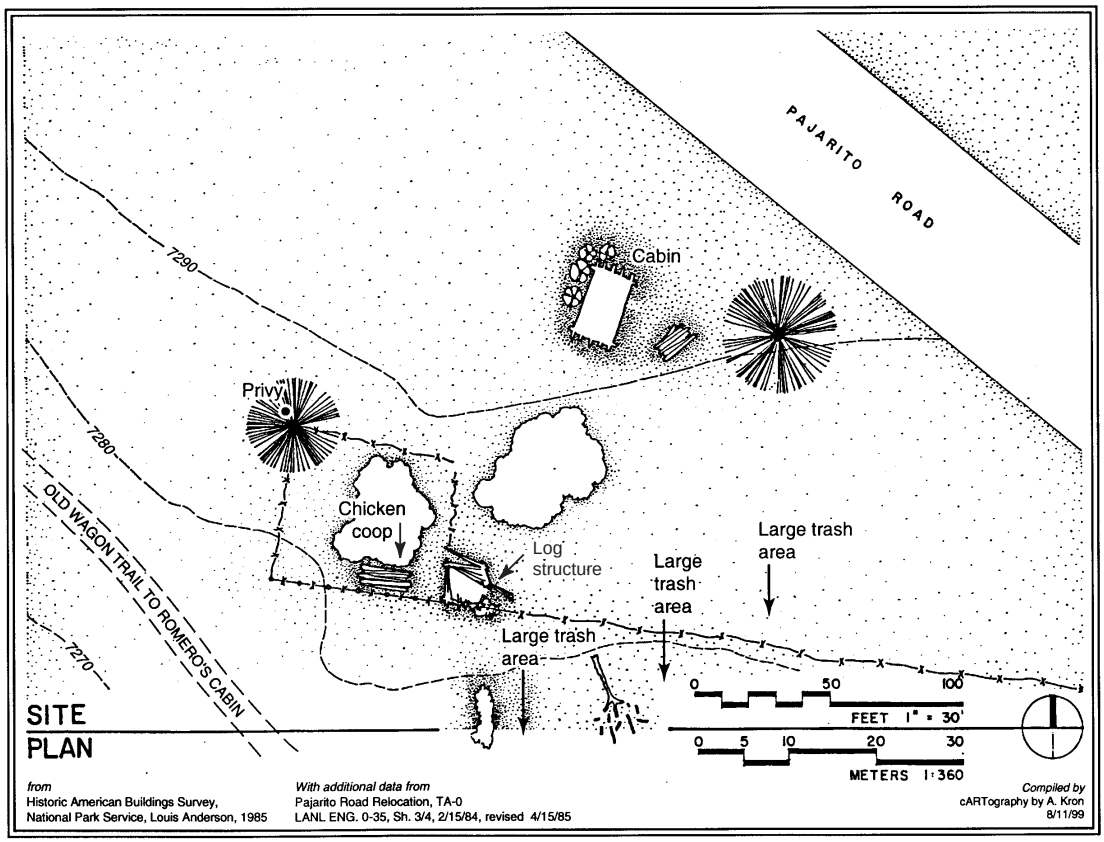


Figure 4.1. Layout of the Romero Cabin Complex.

and downslope from the cabin; however, few soil samples were taken from these deposits as they appeared to provide less information than what was found in the remains from the structures. Nevertheless, seeds and corncobs from marked surface deposits have been included in the count of botanical specimens found at the site.

Archaeologists utilized various methods to extract botanical material from the site: visually obvious seeds or plant parts were gathered from the floors of structures, and fill excavated from structure floors was coarse-screened and larger plant material picked out. Only fill from the log enclosure and privy was subjected to the flotation method. Flotation involves mixing a selected sample with water, skimming the lighter material off, and pouring the remainder through a series of graduated sieves where very small items such as seeds and insect parts are captured. A collection of botanical microfossils (i.e., seeds less than about 1.5 mm in diameter) was obtained by this method. Pollen samples were also taken from the cabin and privy (Dean 1988). Botanical macrofossils associated with the site were usually sampled by screening soil excavated from Romero cabin structures through three screens ranging in mesh size from about 4.5 mm to 1.5 mm and capturing the obvious vegetable matter that remained on top of the screen. The remains were then bagged and marked with a provenience, i.e., type of material and location. No microfossils were extracted by this process, although some seeds less than 1 mm in diameter were inadvertently retrieved through being embedded in soil attached to the macrofossils. Nearly 100 packets of botanical macrofossils were submitted for identification. Of these, only 36 packets marked "unknown seeds" were examined in detail after it was determined that packets not marked as "unknown" contained only peach stones; the latter are easily identified from their distinctively thick, deeply furrowed and pitted shell.

Using the flotation method, archaeologist Ellen McGehee saved some microfossils and macrofossils from the log animal enclosure. (Identification of these microfossils is made in the last part of this chapter.) The cabin had been excavated earlier under less than exacting circumstances, and the flotation method was not applied to that material. This limited sampling of microfossil material recovered in these samples. More associated domesticated plants might have come to light, if unanalyzed soils were sampled. This is because some cultigens are known to have a characteristic "weed" crop associated with them. Furthermore, more evidence of associated native species would have contributed to the present knowledge of people-plant associations that were present on the Pajarito Plateau before the disturbances of the 1940s.

Several botanical studies and collections made in the vicinity of the Pajarito Plateau over the past ten years proved invaluable to the author in identifying archeobotanical materials from the Romero homestead. A botanical survey of the Romero cabin and adjacent fields had been completed two years before the excavation to facilitate an old fields and homestead study (Foxx et al., 1997). A plant-succession study on waste disposal sites (Tierney and Foxx 1982) included a portion of the Romero homestead. The checklist of vascular plants of the Pajarito Plateau (Foxx and Tierney 1985) was helpful, as was the author's collection of seeds from northern New Mexico. Available seed-identification manuals were useful. By far the most valuable of these were Paul Knight's 1978 MS thesis (Knight 1978) and Vorsila Bohrer's and Karen Adam's Salmon Ruin manual (Bohrer and Adams 1977).

3.0 RESULTS

3.1 Romero Cabin: Feature I

The Romero cabin is shown in Figure 4.2. Soil samples from each excavated grid of the cabin floor were screened using a mesh screen size that allowed only botanical macrofossils to be retrieved. Samples were placed in paper sacks and labeled with observed content and provenience. In these samples, only whole or large fragments of seeds and corncobs were found.

In the analysis, seeds that were more than 50% intact were considered whole and counted as one unit. Identifiable seed parts that were less than 50% intact were counted and divided by two to estimate total whole seeds in the sample. For the most part, only large seeds (macrofossils) remained on the screen. The dirt in the bottom of the paper sacks was examined for small seeds, such as those of cacti and cheno-ams[1], or they were found adhering to the larger seeds. (Small seeds were removed and identified with the aid of a microscope.) No plant or insect parts were found in these samples. None of the seeds in the cabin collection were charred, and all appeared to be about the same age.

Table 4.1 shows the scientific name, the common name, and total seeds or plant parts identified among

[1] The lack of distinction between Amaranthus and Chenopodium is preserved in archaeological terminology for practical reasons. Charred seeds of the two plants excavated from prehistoric sites are often indistinguishable. Consequently, they are simply called "cheno-ams" since both are acknowledged food plants and are used in the same way. The seeds of both plants are ancient South and North American Indian grain foods.

Photo by Teralene Foxx

Figure 4.2. The Romero Cabin, south side.

Table 4.1. Botanical Macrofossils from the Log Cabin

Scientific Name	Common Name	Number of seeds or seed pieces	
Chenopodium/Amaranthus	cheno-ams	2	
Citrullus vulgaris	watermelon	11	
Curcurbita maxima	winter squash	2	
Curcurbita moschata	winter squash (cushaw)	9	
Curcurbita pepo	summer squash, pumpkin	11	
Helianthus annus	sunflower	4	
Juniperus monosperma	one-seed juniper	1	
Opuntia imbricata	cholla, walkingstick cactus	1	
Pinus edulis	pinon pine	52	
Prunus armeniaca	apricot	11	
Prunus americana	wild purple plum	8	
Prunus angustifolia	peach leaf plum	4	
Prunus cerasus	domestic cherry	30	
Prunus domestica	cultivated plum	3	
Prunus persica	peach	318	
Prunus virginiana	chokecherry	2	
Quercus spp.	acorn (oak)	12	
Zea mays	corn (maize)	3	(cobs)
Total		**484**	

the macrofossils retrieved from the Romero cabin. Eighteen different species are identified. Of these, ten are from cultivated plants. Two native plums, *P. americana* (purple American) and *P. angustifolia* (yellow sand or peach-leaf), appear to be semi-domesticated species in that they are nearly always found associated with dwellings, ditches, or fence rows.

Both varieties were seen growing in the vicinity of the Romero cabin or nearby cistern before the excavations took place. Neither plum has been reported from elsewhere on the plateau, although they are often associated with older dwellings elsewhere in the state. Appreciation for New Mexico's native plums has consistently been expressed in the literature since the 17th century.

A large percentage of the botanical material was found in clusters as shown on the grids of Figure 4.3. Grid numbers 69, 70, 60, 61, 51, 52, 43, and 34 were one such cluster; this area appears to be just within the front door of the cabin. Another cluster, grid numbers 13, 14, 22, 23, and 31, also contained significant amounts of the botanical materials; these grids were near the north wall to which a lean-to had been attached. Northside lean-tos seem to be a common feature of homestead cabins on the plateau. The only other standing cabins known to the author, the Montoya/Gomez and Archuleta cabins, both have this feature as well as a shelf-like extension from the outside cabin wall (where perishable food was probably kept in a wooden box, garden produce was prepared, and the family washed up). The lean-tos and shelves are likely places for the accumulation of plant material discarded by humans and also places to which rodents would be attracted. Several instances of prehistoric Indian's attempts to block entry of rodents into the granaries with stones have been found (Cordell 1980). Crops of the first Spanish settlement in northern New Mexico were apparently destroyed by rodents; some even ate chile plants but ignored the cheese used to trap them (Ford 1987).

Fill depth of the cabin was very shallow, and most of the grids had a depth of only a few centimeters. Each of the botanically significant grid clusters had a few samples from level two, indicating deposition of material at a greater depth. According to notes on the specimen bags, each of these grid clusters showed evidence of rodent disturbance.

3.2 Log Animal Enclosure: Feature II

Surface fill from the log enclosure was sieved through a wide-mesh screen, and larger botanical remnants were recovered and identified in the same manner as the macrofossils of the cabin. This work resulted in the list of macrofossils exhibited in Table 4.2. Twenty-two seeds were located in one cluster, and a second cluster contained twelve seeds. Both clusters of seeds were found to lie directly over bedrock, so the excavations were necessarily shallow.

Abundant and diverse microfossil materials were also retrieved from the log animal enclosure. Soil samples were taken from the fill of grids in this structure having sufficient depth to warrant excavation. These fill samples were then floated by archaeologist Ellen McGehee, and suspended material was passed through three screens of sizes ranging from about 4.5 mm to window-screen mesh, 1.5 mm in size. The material was then dried, bagged according to grid sample, and subdivided into packets according to screen size. Fourteen flotation samples representing nine grids were submitted for analysis. Each sample contained at least one packet from each screen size; the volume of each packet varied from approximately two cubic centimeters to two liters. All of the samples were uncharred, although there were a few very small pieces of charcoal and some charred cheno-ams within the sample.

An average of two cubic centimeters of the contents of each packet was examined under a standard dissecting microscope. Any seeds or diagnostic plant parts were counted and removed to labeled vials. The remainder was scanned under the microscope for seeds that may not have shown up in the initial examination. A total of 108 packets were examined in this way. All seeds and other diagnostic plant parts were picked out with a sable brush or dissecting pin and deposited into vials. This log animal enclosure was an open, shallow site, but as imperfect as it was, it is still one of only a few late-historic (19th century) excavations in New Mexico that has been examined by ethnobotanical techniques. The result is one of the longest, if not most interesting, listing of plant species recovered from such a site (Table 4.3). Miscellaneous items found in the microscopic examination of fill are pieces of needles, twigs, and cones of piñon and ponderosa pine; soil mollusks; rodent pellets (probably woodrat); and the carapaces of ants, weevils, and grasshoppers.

More than 500 seeds were recognized from the flotation samples of Feature II. The count for each species terminated at 100+. A total of 26 different species were recovered from this feature. Species with over 100 seeds counted in the sample are common western garden weeds: amaranth, pigweed (*Amaranthus* spp.), chenopod, goosefoot (*Chenopodium* spp.), and ground cherry (*Physalis* spp.). Seeds and greens from both chenopods and amaranths are edible, and were staple foods in antiquity for both Indians and Hispanics of the Southwest. The fruit of ground cherry is also eaten by both groups. More recently, the fruits of commercial

Feature 1: Romero Cabin foundation grid system for excavation of cabin interior and extramural areas.

1	2	3	4 P	5	6	7 P, Pu	8	9
10	11	12	13 Ac, Ju, P, Pu, Sq	14 P, Pi, Pu	15 P, Pu	16	17	18
19	20 Ac	21	22 A, Ac, C, P, Pi, Pu	23 P	24 P, Sq	25 Ac, P, Pi, Pu	26	27
28 A, Ac, C, Pi, Pu	29	30 Pu	31 A, Ac, C, P, Pi, Pu Sq	32	33	34 A, P, Pi, Pu	35	36
37	38	39 P	40 P, S	41 P, Pi, S	42	43 A, C, P Pi, Pu, Sq, W	44	45
46	47	48	49	50	51 A, C, Cc, P, Pu, S, Sq, W	52 P, Pu, W	53	54
55	56	57	58	59	60 C, P, Pi Pu, Sq, W	61 A, Ac, C, Ca, Ch, Ju, P, Pi, Pu, Sq, W	62	63
64	65	66	67	68 Ac, P, S	69 A, C, P, Pi, Pu, Sq W	70 A, C, Cc, P, Pi, Pu, Sq	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90

= 1 meter

Approx North, not exact

A = Apricot
Ac = Acorn
C = Cherry
Ca = Cactus
Cc = Corncob
Ch = Cheno-ams
Ju = Juniper
P = Peach
Pi = Piñon
Pu = Plum
S = Sunflower
Sq = Squash
W = Watermelon

Figure 4.3. The grid diagram of the Romero Cabin floor.

Table 4.2. Botanical Macrofossils from the Log Animal Enclosure

Scientific Name	Common Name	Number of seeds or seed pieces
Pinus edulis	pinon pine	6
Prunus armeniaca	apricot	2
Prunus persica	peach	12
Quercus spp.	acorn (oak)	14
Total		**34**

varieties of all three of these plants have found their way into supermarkets.

Three species could be early European (Spanish) crop weed introductions, while one, burdock (*Arctium minus*), is of especially dubious heritage. Burdock, although medicinally and historically known in Spain, is of minor importance there (Quer 1995), and is probably not an early Spanish introduction into New Mexico. I base this opinion on the following facts: burdock was not represented in Curtin's book on healing herbs of the Rio Grande (Curtin 1965), nor have I seen it in local stores where medicinal herbs are sold. Today burdock occurs only occasionally on the plateau, and, although it is more frequently found along watercourses elsewhere in New Mexico, it does not seem to have a history of use here. Perhaps it was a later introduction by other European ethnic groups. An especially popular herb in England, it may even have been introduced here via the Santa Fe Trail. Burdock has an edible second-year root. The first-year root is used medicinally.

Three other plants represented by the microfossils are possibly of European introduction, but the genera are also represented here by native species and the seeds were indistinguishable by the author. Tansy mustard is a common name sometimes used for two genera

Table 4.3. Botanical Microfossils from the Log Animal Enclosure

Scientific Name	Common Name	Number of seeds or plant parts
Amaranthus spp.	pigweed	seeds 100+
Artemisia spp.	sagebrush	flower 1
Arctium minus	burdock	seed 1
Astralagus spp.	locoweed	seed 1
Bahia spp.	wild chrysanthemum	seed 1
Chenopodium spp.	goosefoot	seeds 100+
Coryphantha vivipara	pincushion cactus	seeds 2
Croton texensis	doveweed	seeds 5
Graminae	grass	seeds, roots 3
Juniperus monosperma	one-seed juniper	seed 1
Lappula (redowski?)	tickseed	seeds 2
Oryzopsis spp.	ricegrass	florets 2
Panicum spp.	panicgrass	seeds 18
Physalis (neomexicana?)	groundcherry	seeds 100+
Polygonum spp.	smartweed	seed 1
Pinus edulis	pinon pine	seeds, needles 7
Pinus ponderosa	ponderosa pine	seeds 2
Quercus spp.	oak	acorns 25
Rhus trilobata	squawberry, limonata	seed 1
Rosa spp.	rose	seeds 2
Salvia spp.	chia	seed 1
Solanum fendleri	wild potato	seeds 9
Scirpus spp.	sedge	seeds 2
Sisymbrium spp.	mustard	seeds 4
Verbesina encelioides	crownbeard	seeds 5
Zea mays	corn, maize	cobs 8, tassels 3

of the mustard family: *Sisymbrium* spp. and *Descurainia* spp. All the tansys have edible seeds and greens and have been used medicinally. The native western tansy mustard (*D. pinnata*) thrives on prehistoric ruins and is likely to be the mustard so commonly retrieved from archaeological excavations. The introduced *S. altissimum* is frequently found in historic fields and was growing near the Romero cabin.

Seeds of indigenous weeds that colonize or invade waste areas and especially old fields on the plateau were also represented in the archaeobotanical remains of the animal pen: bahia (*Bahia* spp.), doveweed (*Croton* spp.), stickseed (*Lappula* spp.), and crownbeard (*Verbesina encelioides*). Of these, doveweed and crownbeard are in the repertoire of medicinals for both Native Americans and Hispanics of northern New Mexico (Moore 1979). Four native shrubs represented in the archaeobotanical record are probable indicator plants for land-use practices in the Los Alamos area. Big sage (*Artemesia tridentata*) is often indicative of severe overgrazing, but under some conditions it can be an indicator of good, deep farming soil. On the plateau it is now found in large amounts only in certain places; for instance, Pajarito Canyon, which has been farmed or used for pasture. The combination of low-growing native sages such as *A. carruthii*, *A. ludoviciana*, and *A. frigida*, along with certain other weeds, is characteristic of once-plowed lands and pasture.

3.3 Burned Privy: Feature III

The pollen record identified by Glenna Dean (1988) is the principle botanical evidence associated with this structure. The structure had evidently been burned, resulting in the charring of much of the privy's contents. This fact, along with the intense bacterial and fungal activity in privy fill, may explain the virtual nonexistence of botanical remains in the form of seeds or plant parts. All that remained was pollen, one of the most indestructible organic materials. Dean's record of pollen types (Table 4.4) offers no surprises in terms of species composition. Each taxa mentioned in the list is present on the Pajarito Plateau, some in abundance. According to Dean,

> ". . . since a privy is usually an enclosed structure, there are relatively few ways for pollen grains to become deposited in the pit fill. Three major ways include fecal deposit containing pollen grains incidentally ingested along with food items; wind drafts, bearing seasonal pollen, entering the privy on those occasions when the door might have been left open; and pollen-containing household garbage or floor sweeping deposited in the privy. These considerations render the enclosed privy pit a highly specialized pollen trap. Its selective pollen record is further susceptible to destruction as the results of human behavior, as by the use of lime, or possibly wood ashes to control odor or insects."

The reason for beans seldom being found in archaeological sites is that they are so fragile: they are sprung from the pod when it dries; there is no protective seed coat so it can be easily eaten by animals; the bean sprouts readily after absorbing water, but will dry out just as readily and die. A conversation with Glenna Dean revealed the following information on why bean pollen is also a rare occurrence in the archaeological record:

- Beans are self-pollinating so that the pollen in the blossom stays within and is not wind blown.
- Blossoms fall off immediately after the fruit (pod) is set.
- Beans are encased within the pod so that pollen does not reach them.
- Pods of pinto beans are not usually eaten.
- The beans are thrashed from the pods elsewhere from the house interior.
- Bean pollen is nondescript, and, if it is degraded at all, it is impossible to identify.
- There is a great distance between when and where the bean plant blossoms and when and where the bean is utilized.

4.0 CONCLUSIONS

A large number of seeds were recovered from the three features examined. A total of 481 seeds and three corn cobs were recovered from the cabin. The largest numbers of seeds were peach (318). The next largest number was piñon pine and then domestic cherry. There was a large number of seeds recovered from grids that were right next to the door and along the wall where a lean-to had been attached. Fewer large seeds were collected out of the log animal enclosure but a large number of seeds of weedy plants such as pigweed and lambsquarters were recovered from the flotation samples. Native species such as piñon and oak made up over 50% of the large seeds collected and apricot and peach the remainder. Many of the seeds collected around the log structure are from typical weedy species found around dwellings or within disturbed areas. Eight corn cobs and three tassels were also found in the soils from the log animal enclosure. Pollen samples identified by Glenna Dean confirmed the presence of several species including corn and various native forbs, shrubs, and trees.

Table 4.4. Pollen Types Recognized from Sediment and Privy Samples (from Table 2, Dean 1988)

Taxon	Common Name
Pinaceae	saccata genera of the pine family
Pinus	pine
Picea	spruce
Abies	fir
Pseudotsuga	Douglas fir
Juniperus	juniper
Populus	cottonwood
Juniperus/Populus	Pollen grains indistinguishable as juniper or cottonwood because of crumpling or degradation
Quercus	oak
Celtis	hackberry
Anacardiaceae	genera of the goosefoot family
Cheno/Am	genera of the goosefoot family (Chenopodiaceae) and species of the genus *Amaranthus* (pigweed)
Gramineae	genera of the grass family
Ephedra	Mormon tea
Low-spine Asteraceae	wind-borne genera of the sunflower family
Artemisia	sagebrush
High-spine Asteraceae	insect-borne genera of the sunflower family
Zea	corn
Opuntia	species of prickly pear and cholla cactus
Platyopuntia	prickly pear cactus subgenus
Sphaeralcea	globe-mallow
Caryophyllaceae	genera of the pink family
Brassicaceae	genera of the mustard family
Onagraceae	genera of the evening primrose family
Rhamnaceae	genera of the buckthorn family
Unknown A	unidentifiable, psilate 3-colporate grain with transverse furrows joined about the equator

CHAPTER 5: ETHNOBOTANY: INTERPRETING THE PLANT REMAINS FROM THE ROMERO CABIN

Gail D. Tierney

1.0 INTRODUCTION

With one outstanding exception, the archaeobotanical remains support the remembrances of the Romero family. The exception was the lack of evidence of beans, the main field crop and the main reason for the historic cultivation at the Romero homestead. This absence of bean remains is a common phenomenon of Southwestern archaeological sites and is explained, for the most part, by the natural history and harvesting methods of beans. Beans, as are corn and squash, are ancient Native American domesticates. In this chapter we focus mostly on interpreting remains of European cultivars. We also discuss the incidental presence of three wild seed plants.

The following is a list of botanical fossils appearing in samples taken from the Romero cabin. The types are listed in order of decreasing frequency in the macrofossil record.

Peach pits (whole and partial)
Acorns (two types-probably *Quercus gambelli* and Q. *grisea*)
Piñon shells (fragments)
Plum pits (three seed types according to shape and size)
Cherry pits (whole and partial)
Squash seeds (partial, perhaps two types)
Watermelon seeds (whole and partial)
Apricot pits (whole and partial)
Juniper seeds (*Juniperus monosperma*)
Sunflower seed shells
A single Cylindropuntia seed (probably Cholla, *Opuntia imbricata*)
A single Cheno-Am seed (Chenopodium or Amaranthus)

A considerable ethnobotanical history is associated with each of these 12 species. Some excerpts from the histories of the major members of this list may add to our understanding of the historic uses of these plants on the Pajarito Plateau.

2.0 DOMESTICATED PLANTS

2.1 Peaches

The peach (*Prunus persica L.*) is a native of China where it has been cultivated for several thousand years. Between 2000 and 3000 varieties are grown worldwide, although only a few varieties are commercially important (Figure 5.1). The peach is a small tree, only about 15 to 20 feet high. Peach tree growth is sensitive to early frost, and bitter cold will kill the tree. The stone is readily disengaged from the flesh even in the cling varieties, and new trees are easily propagated from seed. These stones are exceedingly hard and thick; they have been used to make charcoal wherever the seeds were abundant. Although the peach tree is easily injured at low temperatures and is relatively short-lived, the short life is also contingent upon nematode damage to the root system. In moist climates peach tree orchards are usually replanted every 8 to 10 years, while in arid to semiarid climates, with care, a peach tree may remain quite productive for 30 years or more. Nematode and virus damage is minimal where the soil is allowed to dry out between irrigation, orchards are isolated, farming tools are not shared between orchards (unless they are sterilized), and manure from farm animals is not contaminated. In favorable climates, the peach tree grows well on a variety of soil types and is responsive to applications of nitrogen-rich fertilizer or natural manure. As far as we know, ancient ancestors of the Puebloans did not regularly fertilize their fields. The Spanish introduced the process of fertilization with their domesticated animals (Dunmire and Tierney 1997).

Photo by Teralene Foxx

Figure 5.1. Peach.

Spanish colonists were the first to bring the peach to the New World. It arrived in Mexico and Florida before 1600, and, by trade diffusion, was found growing in Indian gardens in Pennsylvania in the east and Sonora to the southwest by the early 1700s (Hedrick 1919). In 1776, Fray Francisco Atanasio Domingues visited the mission and villa at San Ildefonso. In his description of the mission, Fray Domingues lists the following fruits and vegetables as being produced there: wheat, maize, legumes, vetch, green vegetables, melons, watermelons, pears, apricots, *chabaconos* (a variety of apricot), peaches, and *priscos*. [Note: *Priscos* are said to be a variety of peach indigenous to the Americas. However, since there are no indigenous true peaches, the identity of this fruit remains a mystery.] Other vegetables mentioned were *frijoles*, broadbean, and chile. He also stated that "melons and watermelons gathered at San Ildefonso were better and larger than those from *Tierra Caliente*," and that there were ten orchards of two varieties of peaches and an occasional apricot tree. Since San Ildefonso is only about 10 to 15 miles from the Romero cabin, Fray Domingues' lists may be the earliest account of the introduction of European cultigens to the Pajarito Plateau (Adams and Chavez 1956).

Historical accounts of available produce in mid- to late-19th-century New Mexico, such as Abert's in 1846 or Cushing's in 1884, mention both fresh and dried peaches as being abundant. However, this reported abundance probably reflects growing conditions in the more favorable climates of New Mexico's Rio Grande valley. Peaches, melons, and grapes were mentioned as being among seasonal fruits sold on the plaza in Santa Fe when the US Army of Occupation arrived there in 1846 (Magoffin 1926). Peggy Pond Church recalled that fruit production was not generally successful at the Ranch School and that bushels of fresh peaches were brought up from the valley in season.

Conversations with archaeologist Charlie Steen indicated that peach trees were growing near the Romero cabin in the 1970s, but no evidence of these was noticed near the cabin when excavations were taking place in the 1980s. A producing peach tree was found in Area B before it was renovated. This tree was cut down in 1983, but in 1986 put on bushy new growth and bloomed profusely in the spring. The fruit was white-fleshed. A variety of white-fleshed peach is still to be found in older Santa Fe gardens. The tree is easily propagated by suckering and seed. The small peach pits found in the Romero cabin are consistent in size to the author's collection of peach pits from old trees in the Santa Fe area. In most domesticated fruits and vegetables, the ratio of flesh to seed is exaggerated; this is not always the case with peaches and plums.

The hundreds of peach pits found at the Romero cabin appear to be of two types: a very small, slightly elongated pit with average dimensions of 2.4 by 1.7 cm, and a larger, more rounded pit with averaged dimensions of 2.8 by 2.3 cm. Both peach pit types are about one-half the size of local and commercial varieties examined at local markets. This does not indicate that the Romero cabin pits are necessarily grown from seed (as opposed to an improved, grafted type) or are from small-fruited, less productive trees or small trees grown close together or even trees deprived of water and nutrients. The seed-size range is consistent with the size range of pits found beneath existing productive peach trees in orchards in the Rio Grande valley. The author has examined peach pits from trees in all of the previous situations, and, although variable, they are all relatively small. So the size of these pits is probably not the result of seed desiccation over the years.

The peach stones found at the Romero cabin could be from an "heirloom" variety. That is, they are the progeny of trees grown from early times that were hardy in New Mexico winters, self-fertile, and easily propagated from seed. On the other hand, although not likely, the seeds may have come from canned peaches, and the tree that Mr. Steen saw was really the peach-leaf plum (or sand plum) that was growing near the cabin when it was excavated.

2.2 Sweet Cherry, Sour Cherry, and Chokecherry

The cherry was domesticated from wild forms growing in south-central Europe and Asia Minor. It was known in England by the early 1600s, but it is likely that Spain acquired the cherry before England. Now more than 1200 varieties are grown throughout the temperate regions of the world (Hartman et al., 1981). Both native wild and cultivated cherries grow in northern New Mexico. A canyon south of Bandelier is called *Capulin*, which means chokecherry in Spanish (Figure 5.2). The canyon was so named because of the once abundant wild cherry bushes growing there. A few still grow in the canyon, but they have been severely damaged by feral burros.

In interviews recorded by the Bandelier National Monument staff, Mrs. Evelyn Frey speaks about her early days managing the guest ranch in Frijoles Canyon, only a few miles south of the Romero cabin. She states that she acquired trees from the Agricultural School in Las Cruces in the early 1920s and that among those trees were cherries. There are no remains of these trees, however. As part of the US Park Service plan for restoring Frijoles Canyon to its original environment, the irrigation ditch watering Mrs. Frey's orchard was diverted back to the stream, and the orchard was left to

Photo by Teralene Foxx

Figure 5.2. Chokecherry (*Prunus virginiana*).

die, leaving only a few old apple trees elsewhere in the park.

The two varieties of interest are the sweet cherry and the sour cherry. Sweet cherries require cross-pollination, and bees are important for setting a full crop. In general, the sweet cherry is less tolerant of low winter temperatures than the sour cherry. Sour cherries are self-fertile and have been found as an escaped cultivar in New Mexico. It is a small tree with red fruit (Martin and Hutchins 1981).

In size and shape, some of the cherries in the sample of cherry pits from the Romero cabin resemble the escaped sour cherry (seeds collected in Taos), the native local chokecherry (*Prunus virginia*), and the local sweet cherries (but not Bing). Cherrystones are round and smooth. The size of chokecherry pits are considerably smaller and more round than the cultivated ones from the author's collection. It seems that the cherrystones from the Romero Cabin Complex were from all three types of trees.

Although cherry trees were among the very early orchard trees brought to New Mexico in Spanish colonial times, very little is said about them (which leads one to suspect that they were not sweet). It may have been that the sweet cherry did not survive in colonial times either because it was not adapted to the northern climate or because the supply of wild bees was insufficient to adequately cross-pollinate the trees. The author is unaware of any reference to bee keeping in either the colonial or precolonial times in New Mexico. The identity of the Romero cabin cherry pits remains problematic.

2.3 Acorns

It is well known that the fruit of the oak (acorns) can be rendered edible and nutritious by removal of the tannin that almost all species contain. However, the native species of the Pajarito Plateau do not contain this bitter tannin. Acorns of this region require no elaborate leaching processes to render the meat edible. Indeed, the species of acorns in New Mexico have sweet meat, and were not only eaten prehistorically but are collected and eaten today out of hand or saved for winter snacks (Ford 1992).

The Romero cabin is in the transition life zone, and oaks are a part of the characteristic flora of that life zone. The species *Q. gambelii*, *Q. paucilopa*, and perhaps *Q. grisea* were growing in the vicinity of the Romero cabin in 1985. Since acorns (Figure 5.3) were found in considerable quantities in both structures outside the cabin, they were perhaps collected for animal feed. Acorns are a favorite food of pigs. The Romeros were known to have kept pigs, and the lower south structure was identified as a pigpen. [Note: James Meline [1868] reported the following about pig picketing in 1866: "Pigs in New Mexico have somewhat the appearance of a cross between a wild animal and a distinguished visitor, being generally seen in a single specimen with a leather collar about the neck, to which is attached an iron chain or rope whose extremity is securely picketed to the ground."]

Photo by Teralene Foxx

Figure 5.3. Gambel oak (*Quercus gambelii*) acorns and leaves.

2.4 Piñon Pine

Piñon trees are a main component of transition ecotonal areas, and there are many individual young trees scattered on the old Romero homestead fields as well as older stands nearby. A succulent nut (Figure 5.4), the fruit of this tree was eaten as a staple by humans and rodents. It is surprising that there were not more remains of this nut in the samples taken from the excavations. The nuts that were retrieved were gnawed at the smaller end, indicating that these shells were cracked by rodents, and some were split in a transverse manner, suggesting that humans had shelled the nut between their incisor teeth.

The usefulness of this small, native tree is well known and need not be discussed in detail here. Suffice it to say that two people can collect over one hundred pounds of nuts in a day. Half of that amount is meat, and on a pound-for-pound basis, piñon nut meat is at least as nutritious as steak. In any given area, a piñon crop can be expected every three to five years. Local lore has it that a bumper crop occurs every seven years, and that there is always some protected area where at least some trees fruit. It takes two years for a piñon cone to mature. Usually, the trees will rest for a year before setting a new crop, which can be aborted if conditions are not right. Crops of piñon nuts are harvested after the first hard frost, which usually occurs in late September in northern New Mexico. Lanner (1981) gives an excellent account of all that is known about *Pinus edulis*.

Photo by Louis Naranjo, Jr.

Figure 5.4. Piñon nuts (*Pinus edulis*).

2.5 Plums

Native plums have been used by various Indian groups historically, and plum remains are common in eastern American prehistoric sites. There is, however, no published record of plum remains from archaeological excavations on the Pajarito Plateau or its vicinity. Except for the native *P. americana* found on streambanks below 7000 ft, wild plums are not common on the Pajarito Plateau. Several factors may conspire in depressing plum abundance there. Plum trees tend to propagate by root shoots as well as seed, and, therefore, cluster in small groves, which makes them vulnerable to grazing. In addition, seed viability in plums decreases after two to four years of growth. The combination of these factors and the heavy grazing on the plateau in the past century may account for the rarity of plum thickets, except for those locations where they were protected by major roads or encouraged by decaying human dwelling (with the extra moisture and nutrients that human habitation implies). The author suspects that native plums may be indicators of historic sites in New Mexico, as they are certainly not common around prehistoric sites.

Plums were mentioned in both the Benevides and Domingues documents and must have been cultivated or gathered wild in New Mexico by at least the 18th century. In 1889, Adolph Bandelier remarked on the "beautiful plums and pears" for sale in the markets of Santa Fe (Lange and Riley 1984). In view of the fact that Bandelier was not one to effuse over native foods, and in view of the drought conditions prevalent in the state at that time, it is likely that these market plums were domesticates and harvested from irrigated orchards.

The stones of plums were second only to peach pits in abundance among the macrofossils retrieved from the Romero cabin and nearby log structure. Three types of plum pits were distinguished according to size: a small oval-shaped stone, a stone of intermediate size and deep sulcus, and a larger stone with acute ends.

The smallest stone of oval shape appears to be identical with stones of living fruit collected in 1984 at the cistern associated with the Romero cabin (Figure 5.5) and identified as a variety or form of *P. americana* (a species having some 260 forms). The fruit of this species is similar in size and shape to plums currently growing near ditches, orchards, and garden waste areas in the Nambé and Santa Fe valleys. The fruit is either red-purple or deep purple in color with tart yellow or green flesh.

The stone type of intermediate size is most similar in shape and size to the stones of the sand plum, a free-growing yellow plum frequently found in thickets along irrigation ditches in New Mexico. This plum has a yellow outer skin with a deep pink blush and/or red dots. The flesh is bright yellow and has a slightly bitter taste when fresh. None of these native plums are particularly palatable to modern tastes when eaten fresh, but drying them reduces the bitter taste and concentrates the fruc-

Photo by Gail Tierney

Figure 5.5. Plum growing near the cistern.

tose. Nowadays, they are usually stewed with sugar or made into jam.

The third and largest type of plum stone is oval shaped with acute ends. Oddly, it is most similar in size and shape to specimens in the author's collection of flowering plum tree pits (introduced from Japan in the 1870s) or commercial prune plums. The latter are usually a cross between native and European species (Hartman et al., 1981 and Schery 1972).

2.6 Squash/Pumpkins

Squash are indigenous to the New World, originating in tropical South America. Selective pressure developed new varieties that matured rapidly in the prehistoric, semiarid southwest. The earliest unassailable dates for the introduction of squash from Mexico into the southwest is about 1000 BC (Ford 1981). The beans-corn-squash triad of domesticated plants has long been recognized as the staple diet of precolonial Puebloans. Squash was prehistorically grown in Frijoles Canyon and historically at the Los Alamos Ranch School. Contemporary residents of Los Alamos and White Rock grow squash successfully in their gardens (Figure 5.6). Squash and melons are especially successful when grown under a gravel mulch in White Rock gardens (Teralene Foxx personal communication). This suggests a possible crop and reason for the pebble or cobble mulch observed on many of the prehistoric gardens of northern New Mexico.

Squashes can be divided into two main types or culinary groups according to the season in which they are harvested (Whitaker and Davis 1962). Summer squash is picked in summer while immature. The seeds are distinctively small, flat, and tender, and the rind is soft, thin, and easily damaged. The fruit must be broken from the vine. If not picked in this stage, the flesh of most summer squash cultivars becomes thin and stringy, the rind thin and dry, and the seeds woody and tough. If not dried properly, the summer squash will rot early.

Although it can be eaten when immature, the second squash type, winter squash, is usually harvested in late summer or early autumn. The rind of this type is hard and, if not damaged, keeps well. The stems must be cut in order to avoid damage to the vine. The flesh is thick and substantial, and the seeds are large, thick, and can be eaten separately. Squash seeds are high in protein and edible oils. Some scholars believe that squash may have been unconsciously selected from wild forms not only for the substantial marrow as in pumpkins or hubbard squash, but also because of the large oily seeds. Both types of squash were cultivated and eaten fresh or dried for later use by prehistoric and historic peoples of the Southwest.

Eleven whole squash seeds and several fragments were found in samples labeled "unknown" from the Romero cabin excavations. Only the whole or nearly whole seeds were examined. Of these, the seven largest specimens had a thickened rim, probably indicating that the squash (or pumpkin) was harvested when the fruit was mature. The other four seeds appeared immature, probably indicating that they were harvested with the intent of consuming them in a fresh or dried form.

Photo by Teralene Foxx

Figure 5.6. Domestic squash in blossom.

2.7 Watermelons

The watermelon is an annual plant native to tropical Africa that requires fertile sandy soil. The vines are extensive, and modern varieties each may require from 100 to 200 sq ft of space to grow successfully. The fruit can weigh more than 50 lb and requires a four-month growing season. Watermelons have been successfully grown in the nearby Española-Pojoaque valley. Varieties that are smaller, requiring less space and a shorter growing period, have been grown at the Rio Grande Pueblos since at least late prehistoric times.

This esteemed Old World plant appears to have spread from mestizo gardens in Mexico to the Southwest, and from Spanish gardens in Florida to the southern United States, much in advance of the presence of Europeans in these regions. In 1582, the explorer Espejo saw watermelons among the Indians of the present state of Texas (Blake 1981). Sixteen years later, and only 60 years after Cortez conquered Mexico, the colonizer Oñate reported that the Pueblo Indians of the southwest commonly grew watermelon. In 1629, Father Kino found Sonoran Indians growing watermelons (Blake 1981). Early in this century at San Ildefonso "watermelons [were] gathered in September just before corn harvest [began]; they [were] preserved until late winter by hanging from the rafters in a network of split yucca" (Robbins et al., 1916). Somewhat earlier, Adolph Bandelier was told that watermelons from the Cochiti area could be kept until spring if they were collected while the flesh still clung to the seeds (Lange and Riley 1984). Thus, it seems that Pueblo Indians and their Hispanic neighbors in the Rio Grande valley have grown "heirloom" varieties of melons for centuries.

In the early 1900s, San Ildefonso Indians told the ethnographer J. P. Harrington that watermelons were once grown in Sandia Canyon below the "neck." The Tewa word for this place is *sandianabahu'u* which means watermelon field arroyo: *naba* means field; *hu'u* means large-groove arroyo (Robbins et al., 1916). The Spanish *Cañada de los Sandias* means narrow mountain valley of the watermelons. Sandia Canyon is broad at its mouth, is filled with deep alluvial soil, and has a full eastern or southeastern exposure. In wet years it may have indeed been a good place to grow watermelon. Incidentally, the short-lived Ramon Vigil Ranch was probably located in the southern, broad section of Sandia Canyon where it intersects Pueblo Canyon (personal communication, Dorothy Hoard and Peggy Pond Church, Spring 1986).

2.8 Apricots

Apricots (*Prunus armeniaca L.*) are eastern Asiatic in origin. There is no prehistoric record of apricots in Europe. Records indicate that it was introduced in England no earlier than 1524, and some sources claim no earlier than 1620. Early historical reports from the eastern United States mention cultivation of apricots only after 1820 (Hedrick 1919). Arab Iberia grafted apricots with almond rootstock to produce both fruit and sweet kernels. The presence of at least a "few" apricot trees in Spain's New Mexico colony is mentioned by Benevides even before 1776 when Fray Domingues reported their presence at San Ildefonso (Lopinot 1986). According to Schery (1972), apricots were not introduced into California until the late 18th century. In the accounts of several keen observers of the Southwest of the 1840s, apricots were mentioned as being among the seasonal fruits offered for sale. The fruit is easily split and dried as are peaches. Presently, Spain and the United States are the major producers of commercial apricots, which are grown from budding on rootstocks. In earlier times, trees were probably grown locally in small farms, haciendas, and Pueblos from seeds.

Today in New Mexico there are yet orchards started from seeds. Here, apricot pits are still toasted, cracked open, and the meat eaten. Some trees produce tastier "nuts" than others, and their owners know which trees they are. Whatever cyanide the seeds contain is dissipated with heat. They taste much like their close relative the almond when toasted. Not toasted, they are bitter and inedible. Apricot trees are cherished in New Mexico. They offer beauty and fragrance in spring with their blossoms and fruit, shade in the summer, and "nuts" that can be used throughout the year.

Apricots are early blooming and produce best where there are no late frosts. They are a medium sized tree, from 20 to 30 ft tall, and are long-lived (sometimes well over 100 years) if located in well-drained soils. The seed is round, slightly flattened on one side, smooth, and with a pronounced ridge on one edge. There is a furrow on each side of the ridge and a lesser ridge outside of each furrow. About ten whole or partial apricot seeds were found in the fill from both Romero cabin structures. There is no evidence of apricot trees near those structures. However, if there ever were apricot trees near the Romero homestead, the open nature and late spring frosts of the site probably precluded the maturing of fruit.

A small, shrub-like apricot tree found growing near a homestead in Garcia Canyon appears to be the Siberian apricot, which was introduced into New Mexico in the 1930s or earlier, principally for erosion control (the

fruit being nearly inedible). Today there are two regular apricot trees on Pajarito Road, one on each side of the road. These trees are evidently volunteers: the author has observed them for ten years and has noted that they usually bloom each spring but never set fruit.

2.9 Sunflowers

Native of the North American Great Plains, the sunflower (Figure 5.7) was a prehistorically domesticated and cultivated food plant in the eastern and midwestern parts of the continent. The sunflower is the only plant to have been domesticated in the continental United States that is still cultivated. Although there is evidence that a few other native plants were selected and at least semicultivated—that is, allowed to share the sun, water, and extra nutrients in gardens—there is no indication that their form was permanently changed by natural and human selection like the sunflower was. These other native plants have reverted to their wild state. Modern commercially cultivated sunflowers are products of selective breeding from the prehistoric domesticated types. A single-headed sunflower on a tall, stout stem was a Native American accomplishment well before the arrival of Europeans.

Cultivated sunflower seeds have never been found in prehistoric sites in the Southwest, indicating that their cultivation here is not of great antiquity. It is known, however, that during late historic times, the Hopi Indians of northern Arizona were cultivating a sunflower with purple shells for both dye and food; this variety is extant and is well adapted to semiarid environments (Heizer 1976).

When identifying sunflower seeds (achenes), one observes three basic habitat types, all of the same species (*H. annus*). The smallest-seeded type comes from wild sunflowers growing in their native habitat of naturally disturbed areas. The second type are weedy sunflowers, sometimes called camp followers because of their habit of growing in the disturbed areas provided by people. Extra nutrients in old animal pens or extra water along roadsides are where these sunflowers flourish. The seed from this type is distinctly larger than that of the wild sunflower. The third type is the cultivated giant sunflower that was derived from selected wild mutants with the growth habits of a single stem and a very large single flower head on each plant. The seeds from this type are at least three times larger than seeds from noncultivated types and often distinctively colored (Heizer 1976). All species of sunflower must be pollinated by bees (Hartman et al., 1981).

The sunflower seeds and fragments of seeds found near the Romero cabin were of a size and color (striped) that allows their definite identification as seeds of giant cultivated sunflowers, comparable to those found in the modern marketplace and possibly cultivated historically on the plateau. Typical to form, however, in the summer following the removal of the cabin, the site was rampant with a new growth of the weedy sunflower type.

Photos by Teralene Foxx

Figure 5.7. Sunflower.

3.0 WILD PLANTS

3.1 Beeweed: *Guaco*

Cleome serrulata, also called Rocky Mountain beeweed, or *guaco* in New Mexican Spanish, is a member of the Caper Family (Figure 5.8). This plant has been utilized by the Tewa Indians as paint and foodstuff. For paint, the plant is boiled and reduced to a thick paste that is dried and formed into cakes. When these cakes are reconstituted in water, the resulting paste can be used to form the dull black designs on pottery characteristic of the Pueblo of San Ildefonso. The cakes can also be softened in water, fried in fat, and eaten (Robbins et al., 1916). The very young greens of this plant are also boiled and eaten, though the cooking water must be frequently changed.

Photo by Teralene Foxx

Figure 5.8. Rocky Mountain beeweed, *guaco* (*Cleome serrulata*).

Hispanic Americans use *guaco* medicinally to cure several ailments: externally for insect bites and internally for stomach complaints. During drought and times of famine, tortillas are made from the ground seeds of the plant (Curtin 1965).

3.2 Iris: Lirio

The iris (*Iris* spp., f*leur de lis*, or lirio) is in the family Iridaceae, which is native to north temperate zones. The genus *Iris L.* includes many ornamental species as well as species that yield medicine. The roots of some species have the fragrance of violets, and they are used in the manufacture of perfumes (Bailey and Bailey 1976). Iris rhizomes are amazingly hardy, long lived, easily dug up, and durable through extended transport.

A cluster of cultivated irises was found growing south of the cabin on a narrow terrace. The terrace was about 10 ft in diameter and had been built up with stones at its southern, down-sloping side. The plants in this cluster have not been observed when they are in bloom, so the colors of their flags are unknown. It is known that these irises are a cultivated type because the only wild iris in the Southwest is *Iris missouriensis*, a species with narrow leaves, while the Romero cabin specimens have very thick, long, and broad leaves characteristic of the cultivated types. There is another cluster of cultivated irises on the right-hand side, upward bound, of the Los Alamos Ski Basin road. These have faithfully bloomed in a pale yellow color every summer for the past 10 years (written in 1986).

The author has found clusters of cultivated irises growing in remote areas of New Mexico, usually within a few hundred feet of an historic ruin or trash heap. The reasons for their presence are a mystery; but perhaps, being the most enduring remembrance available, some were used to mark graves of loved ones. In several historic New Mexico village graveyards (*camposantos*), irises are tended on Decoration Day. Planting irises on Decoration Day is a tradition in some Indian pueblos, Cochiti in particular. Barbara Lathan's painting, "Decoration Day," on exhibit at the Harwood Foundation Museum in Taos depicted this New Mexico tradition (Figure 5.9).

During interviews with surviving members of the Romero family, there were no recollections of irises or any other plant inessential to existence. New Mexicans of Spanish descent have traditionally considered the iris to be poisonous (Curtin 1965) and a potent medicinal plant (Moore 1979). Perhaps David Romero, a knowledgeable natural healer and the original settler on the Romero family holdings, planted the cluster of irises at the Romero homestead. Or the cluster could have been planted as a memorial to some deceased member of the family.

3.3 Three Inadvertent Artifacts

3.3.1 Amaranthus

A single seed each of pigweed (*Amaranthus* spp.), lamb's quarters (*Chenopodium* spp.), and walking cane or cholla cactus (*Opuntia imbricata*) were attached to soil on macrofossils collected from under the cabin floor. Like all seeds found in excavating the Romero cabin, these were uncharred and relatively fresh. Pollen of these species was abundant in the fill of the burned privy. I have no doubt that, if microfossils had been saved from the cabin floor, there would have been many cheno-am seeds found. The pigweed specimen resembled in size, shape, and color local specimens of *Amaranthus retroflexus* in the author's collection.

Amaranthus is the generic name for one of several species of plants commonly called pigweed or, locally

Painting reproduction courtesy of Harwood Museum of the University of New Mexico

Figure 5.9. Decoration Day, painted by Barbara Latham.

in New Mexico, *quelitas* (Figure 5.10). *Quelitas* refers to spring greens, but usually and specifically to *Chenopodium* spp. and *Amaranthus* spp. Such greens volunteer and are used as an intercrop since they are among the first edible plants to appear in the spring and are pulled from among young cultivated plants and eaten as spinach. Amaranth seeds contain the highest amount of protein of the known grains. Its leaves, which taste like spinach, are also high in calcium, iron, and oxalic acid and are sometimes canned and sold commercially (National Academy of Sciences 1984).

The cheno-am seed found at the Romero cabin is probably of the species *A. retroflexus*, a native of the eastern United States that appears to prefer gardens and fertile waste areas for its habitat. This species was one of the most common weeds growing in the cabin's animal pen and corral areas during the summers of 1983 and 1988.

3.3.2 Purslane: *Verdolaga*

Purslane (Figure 5.11) was found growing in abundance in two areas of the Romero homestead in 1983 when the vegetation survey was conducted. The first area was southeast, downslope from the animal pen, and about 36 square feet in area. Another patch of purslane was observed growing within an almost

Photo by Teralene Foxx

Figure 5.10. Amaranthus, or pigweed, found in Romero field and complex.

perfect rectangle on the south side of the cabin. The structure or organic-residue pattern responsible for this phenomenon had long since vanished.

Purslane commonly volunteers in gardens or waste areas of New Mexico and elsewhere. Until recently, *P. oleraceae* was believed to be a plant introduced from Europe where it was grown as a summer salad green, while *P. retusa* was the native purslane found in prehistoric ruins and recorded as having been used by several Southwestern Indian tribes, including the nearby Tewa and other Rio Grande pueblos (Robbins et al., 1916). Recently, both species of *Portulaca* have been recovered from prehistoric sites in the Southwest (Toll 1986), and both species are found on the Pajarito Plateau. Because *P. oleraceae* was believed to be an historical introduction, these recent findings have posed a problem for ethnobotanists. There may be some confusion in the identification of these species because they are alike morphologically and in their growth habits, even in the diagnostic seed texture.

Sprawling and succulent with small yellow flowers and tiny capsules containing hundreds of minute, black seeds, the stems and leaves are cooked as a vegetable, or they are dried or canned and stored. Called *verdolagas* in New Mexico, purslane is an old and popular summer vegetable, especially when prepared with a little bacon.

3.3.3 Walking Stick Cactus: Cholla

Opuntia imbricata (Figure 5.12), variously called cane cactus, cholla, or *entrana* in Spanish, is out of its normal range on this part of the Pajarito Plateau. The cholla is usually found on the plateau in association with prehistoric sites where it may have been allowed to grow not only for food but also for fortifications. Cholla tuna (fruit) was a popular foodstuff among native peoples, and some cholla plants on the plateau may have grown from seeds dropped when the tunas were brought to dwellings or campsites to be prepared or consumed. The Tewas prepared cholla tunas by boiling them after rubbing off the spines. The tunas were then eaten with cornmeal porridge and sugar (Robbins et al., 1916). Some elderly Hispanics told the author that, in difficult times, cholla fruit was used to extend green chile stew or in place of *tomatillos* (husk tomatoes) in *salsa*. For extensive treatment of *O. imbricata* habitats on the Pajarito Plateau, see Yarnell (1958) and Housley (1974).

Photo by Teralene Foxx

Figure 5.11. Purslane (*Portulaca oleraceae*), or *verdolagas*.

Photos by Teralene Foxx

Figure 5.12. Walkingstick cholla cactus; inset, flower.

CHAPTER 6: DENDROCHRONOLOGY OF TREES AT THE ROMERO CABIN COMPLEX

Teralene S. Foxx

1.0 INTRODUCTION

We previosly discussed the ethnobotany of those European and Native American cultivars, as well as the few native plants, whose seeds were found at the Romero Cabin Complex. In this last chapter, we discuss dendrochronological study methods and the interpretation of the tree rings taken from trees growing in the vicinity of the homestead. Although not conclusive, we can detect years of drought, length of average time between forest fires, and when the forest began to reclaim the Romero fields.

A. E. Douglass (1928), a pioneer in dendrochronology, was able to show that annual rings in trees in the arid and semiarid southwestern United States correlate with variations in climate. The favorable or unfavorable meteorological conditions that affect a tree's growth are reflected in the rings in a particular year. Although most research has been done on the climatic correlation of tree ring variation (in fact, they avoid anomalies), other factors can indeed affect ring width. Studies done by Schubert (1971) and Helvey (1975) have shown increases in diameter growth after thinning of dense ponderosa pine stands. Fire is a thinning agent, and prescribed burning has been a tool to reduce fuels and to thin stagnant stands (Weaver 1951, Cooper 1961, Schubert 1971).

There are a number of factors that affect ring width. Primarily, of course, are those factors directly affecting photosynthetic activity, thus, the production of food and growth regulators. Factors may also be external, such as precipitation and temperature, or internal, such as increasing size of the tree and competition of the cells for available nutrients. As the tree becomes larger, the rings become narrower. The variation from a normal trend of an individual ring width, however, is closely correlated to climate, particularly precipitation before the growing season. The amount of precipitation and the effect on soil moisture, thus, the water balance of the tree, indirectly influences the rate of cell growth during the growing season. Fritts (1966) indicated that the ring width in coniferous species growing in semiarid sites represents the effect of climate of the 14 or 15 months before the period of food making and accumulation in the crown of the tree. Schubert (1971) indicated that most of the growth occurs from May to September.

In a stagnant forest with the crowns close together, the competition for sunlight used in photosynthesis is high. In addition, the competition for available water is also greater (Dahms 1973). Since both of these factors affect ring width, the rings would be narrower under greater stress. The increased water stress within the tree, the reduced net photosynthesis, and the low accumulation of food would reduce cambial activity with a net result of the formation of a narrow ring. Helvey (1975) has shown that tree crowns are wider and thicker in areas that have been mechanically thinned. Fire is also a means by which competition between individual trees can be reduced. Fire may thin the dense crowns, thus, reducing the competition for water and sunlight with resulting increase in growth rates of trees.

After natural or mechanical thinning, there may be a delay in the growth rate from several factors, the first being the amount of initial damage to the trees. In studies reported by Helvey (1975) and Dahms (1973) on mechanically thinned plots, in the first few years following thinning there is a reduction of retention of water in the soil, probably because of the lack of shading of the soils. This might cause water stress within a tree and cause narrower rings until some herbaceous material shades the soil or crowns increase in area. Fire (particularly more severe fire) denudes the soil and reduces soil wet ability and permeability for a period of time, and this might explain initially-reduced growth after fire (Weaver 1967). The reduced growth may be a result of reduced soil moisture.

Nutrients released into the soils after fire may also have an effect on the rate of growth of trees. Wagle and Kitchen (1972) found nutrient increases in soils after fire. Valmis et al. (1965) found soils in heavily burned plots had substantial increases in both nitrogen and phosphate to a depth of eight inches. These increases were prevalent for two years.

Many factors influence the growth rate of a specific tree. To determine if increase or decrease in tree ring width was from influences of thinning, fire, or climatic conditions, we graphed winter precipitation from October to May—the period of time that most influences ring formation (Fritts 1966). In addition, snowfall accumulations were tabulated for the same years. Snowpack would be particularly important in protecting the tree roots from temperature extremes and would also influence humidity, thus, photosynthesis.

In 1979, Foxx and Potter compared the growth rates of trees surrounding burned areas in Bandelier National Monument. They found, with only one

exception, that the major fires in Bandelier occurred when there were several years of below-normal precipitation and generally below-normal annual precipitation. Snowpack was below normal (50 inches is average) (Bowen 1990) for the winters of 1936-1937, 1954-1955, and 1976-1977 and exceptionally low for the winters of 1949-1950 and 1975-1976, with only approximately 10 inches. The winters of 1944-1945 and 1974-1975 had above-normal snowpack.

In their study, Foxx and Potter (1979) observed three different patterns in ring width in relation to fire occurrence. The first was a temporary increase in growth evidenced by increased ring width, the second was depressed growth followed by increased growth, and the third was an immediate and sustained increase in growth. They found that inner canyon sites had a greater degree in variation in ring width than did mesa sites.

Tree ring analysis was used in two ways in association with the Romero Cabin Complex. The first was specific dating of the logs within the cabin structure. These logs were dated by the Tree Ring Laboratory of the University of Arizona as part of the larger project (McGehee et al.) (Table 6.1). The second analysis was to determine if and when the field and cabin areas had been cleared or if the structures had been placed within a natural opening. Patterns of tree growth should indicate if there had been substantial clearing of the area, which would have reduced competition and enhanced conditions for increased photosynthesis for a specific tree. For this second analysis we initiated a study in growth rates of trees that surrounded the field, the cabin, and the fence lines.

Table 6.1. Log cut dates for the Romero Cabin. Dated by Tree Ring Laboratory, University of Arizona, Tucson, AZ.

Date	Number of Logs
1908	1
1913	1
1933	1
1934	29
1935	1
1937	2
1938	1
1960	3
1961	2
1966	6

2.0 METHODS

2.1 Field Methods

With evidence that tree growth will increase with either mechanical or natural thinning, selected trees within areas surrounding the Romero cabin, the field, and the fence line were cored (Figure 6.1). The boundary of the property was assumed to be the fence line; therefore, the fence line was followed, and trees along the boundary were cored. Information about the construction of the fence and the diameter of the trees along the line was taken. Selected trees along the line were cored, and other pertinent data were recorded. A 3/16-inch-diameter core was removed from each tree with a standard 3/16-inch Swedish increment borer. Samples were collected from the south side of the tree, placed in plastic tubes, and transported to the laboratory. Each core was then glued into a slotted mount and labeled. After the glue was set, the core was sanded with varying grades of sandpaper to obtain a smooth surface. The ring widths were then measured with a Hansen Tree Ring Reading Machine and an Apple Computer with a software program called Computa.

2.2 Constructing a Trend Line

Because of the growth characteristics of each tree, a trend line was developed for each specimen. A tree adds wider rings when it is young and the stem is small. The radial growth slows as the tree ages and the stem grows larger. A line describing this trend would have a sharply declining curve during the early years and a flatter curve for the later years.

A mean growth curve, or “trend line,” is constructed by completing a running-mean ring width. To compute a 10-year mean, ring width for each 10-year interval is averaged, and this average is plotted at the five-and-a-half-year point of the interval. After all the average points are plotted, they are used as a guide in drawing a trend line. The trend line constructed for the tree adjacent to the Romero Cabin (Figure 6.2) is shown in Figure 6.3.

2.3 Computing Annual Ring Indices

To be able to compare trees of different ages and growth rates, ring widths of a specimen are expressed in terms of the growth trend of a particular tree. The relative narrowness and width of a particular ring is compared to the trend line.

2.4 Master Chronology

Indices from a number of specimens from an area may be averaged on a year-by-year basis. This series of

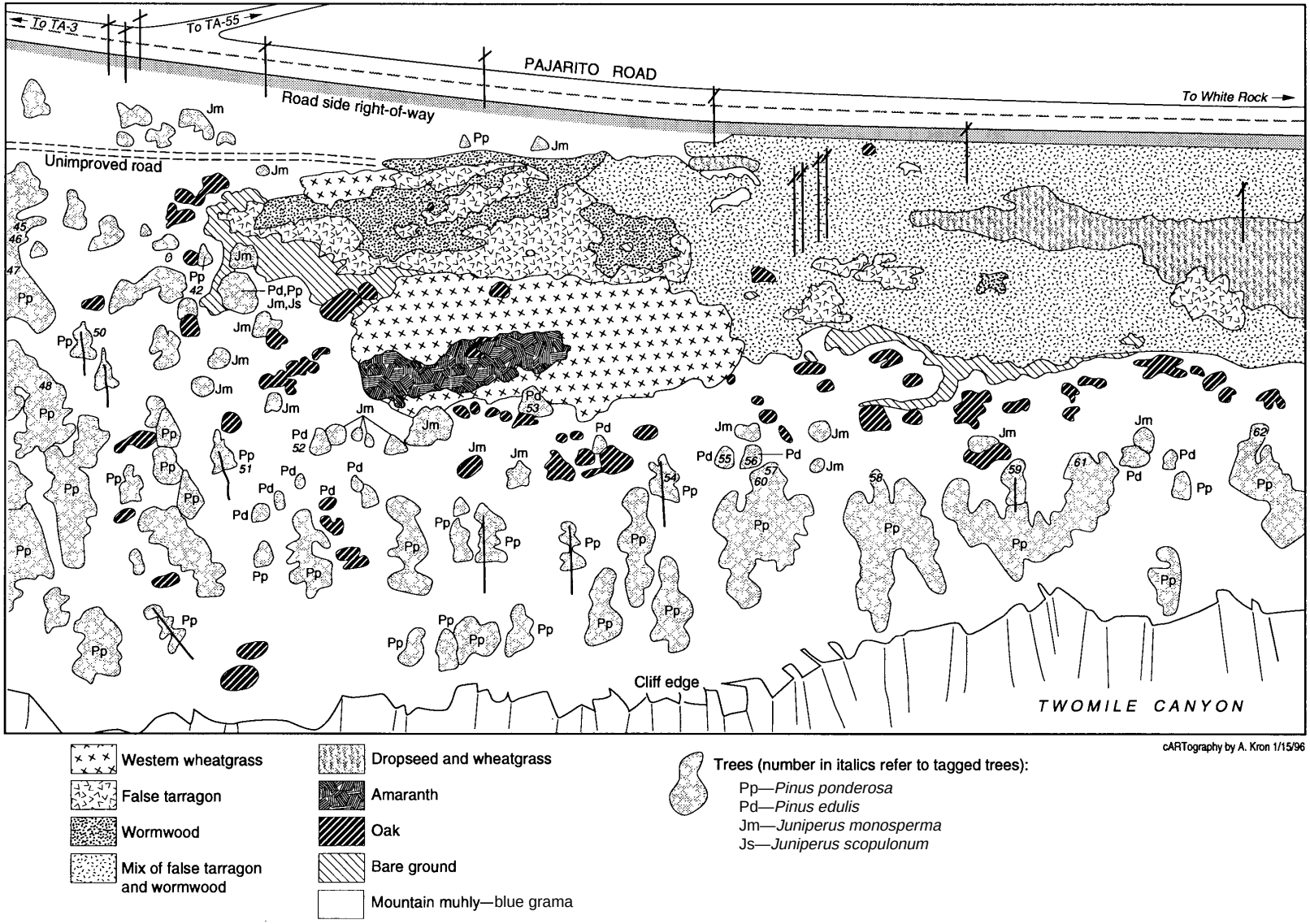


Figure 6.1. Selected trees within areas of the Romero Cabin Complex.

Photo by Teralene Foxx

Figure 6.2. Tree that was next to the Romero cabin now standing outside the fence at TA-55 in 1999.

average yearly indices constitutes a master chronology and may be plotted and used for dating additional specimens within the area. Using a master chronology, specific rings can be assigned a specific date.

3.0 RESULTS

Sixty-two trees were recorded along the fence line, around the cabin, and on the field perimeter (Figure 6.1).

3.1 Along the Fence Line

The fence line in the location of the cabin followed just below or on the rim of the bench on which the cabin was situated. There were very few fence posts, and trees had been used to hold the wire. Along the fence line, some large trees (approximately 20-inch diameter) had been logged. In several cases, these trees provided a corner post. Trees throughout the area had fire scars, generally on the south side or the east side. In some cases, the scars were not visible on the outside surface, but were found when the trees were cored.

The east-west fence line had a four-strand barbed wire fence with a two-pronged barb (Figure 6.4a). The north-south fence line was sometimes two strands of wire with a different barb (Figure 6.4b). Southwest of the cabin, below the bench line, a tree was found to have a boundary marker stating “Form 1505. This marks the boundary between National Forest and private land.”

Understory vegetation along the fence line was primarily Gambel’s oak and mountain mahogany. Herbaceous vegetation included mountain muhly, junegrass,

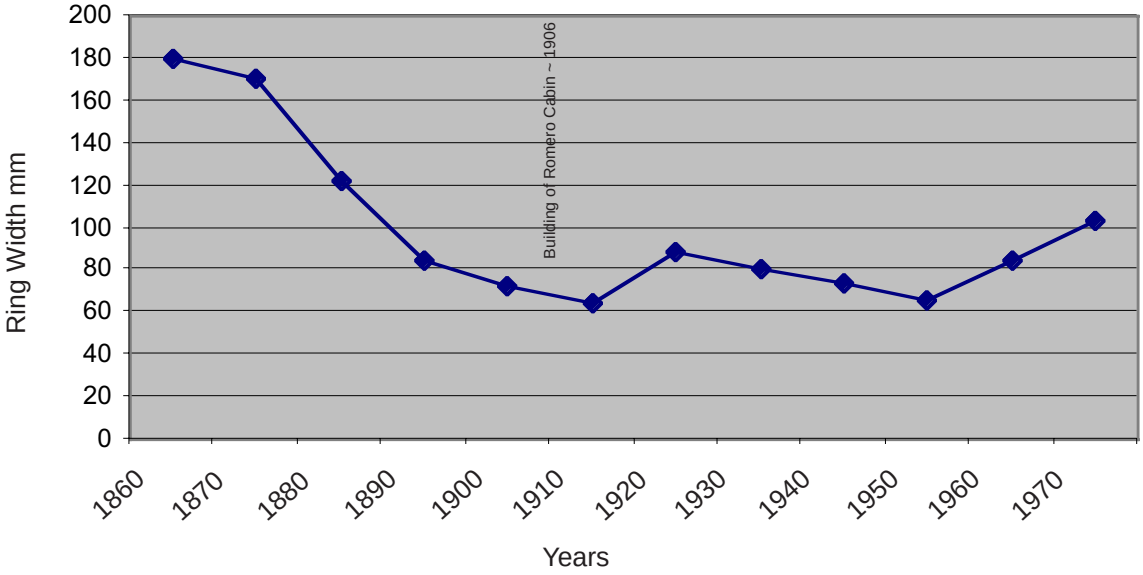


Figure 6.3. Tree-ring analysis trend line for the tree adjacent to the Romero cabin. Sample was collected December 12, 1984.

a.

b.

Photos by Teralene Foxx

Figure 6.4. Four- (a) and two-strand (b) barbed wire.

narrowleaf yucca, and wormwood. On the southern perimeter of the field, the predominant herbaceous vegetation was blue grama, pine dropseed, wormwood, and yucca.

The trees found along the fence line, and to which barbed wire had been attached, were ponderosa pines. The average diameter for the trees utilized as fence posts was about 15 inches diameter at breast height (DBH). In many cases the xylem wood had grown over the wire, and the wire was hidden from view (Figure 6.5).

Photo by Teralene Foxx

Figure 6.5. Barbed wire embedded into the tree trunk.

3.2 Around the Cabin

The tree adjacent to the cabin was too large to get a complete core. The tree had relatively large rings and showed the normal decrease in growth until the early 1900s at which time there was an increase in growth, a decline, and then another increase in growth in the late 1940s, coinciding with paving of the road. A sample of this tree should be obtained if it is ever cut down. It is presently still standing outside the fence at Technical Area 55 (Figure 6.2). Other trees in the vicinity of the cabin (13, 22, and 25) (Table 6.2) also show similar growth trends. Those trees located in groves or away from the cleared area (31 and 27) have a more normal trend line.

3.3 Along the Field Perimeter

Trees cored along the field perimeter consistently show an increase in growth after 1900. Specimen 46 has an increase in growth in the mid-1880s that may be a result of fire. There were a number of trees in the area that had fire scars. The fire dates can not be established unless the trees are cut down and the fire-scarred boles are examined. However, Foxx and Potter (1979) found evidence of increased growth rates after fire in ponderosa pine in Bandelier National Monument. They also found the area to have frequent fires (every 13.5 years) before establishment of homesteading. It is possible that the field area had been thinned by fire and then cleared for tilling.

3.4 Growth Rates

Selected cores were processed, and ring widths were measured. Eighteen trees were dated, and trend lines were developed for 13 of them. The average age of the trees that were cored was 149 years (Table 6.3). Trend lines for the trees indicate the normal slowing of growth from the center, then a rapid increase of growth in the early 1900s, which ceases after approximately 1940. There is another increase in growth after 1945.

The increase in growth in the early 1900s coincides with the homesteading of the Romero Cabin Complex. This would indicate that there was considerable clearing, at least of the margins for building structures and fields. The tilling of the soil in the field area would affect runoff and nutrient cycling in the area. Old maps from 1947 and 1948 indicate that a road was relocated and upgraded through the Romero Cabin Complex. This activity would probably account for the increase in growth during the period after 1945. The increased runoff from the road would change the moisture regimes along the road. Specimen 33 is in an area away from substantial clearing and shows the normal growth trend.

Table 6.2. Trees Within the Romero Cabin Complex Cored for Age and Growth Rates.

Identification Number	Species*	DBH (in.)**	Comments
Surrounding Cabin			
1	PIPO	34.7	Front of cabin. Barbed wire in part of tree.
2	PIPO	16.4	Southeast of cabin. Used as fence post. Barbed wire.
3	PIPO	20.4	Southeast of cabin. Used as fence post. On the edge of bench. Tree is lightning struck.
4	PIED	11.4	Just below bench. Can dump is to the west.
5	PIED	12.0	Just below bench. Can dump is to the west.
6	PIED	8.8	Just below bench. Can dump is to the west.
7	PIPO	23.4	Snag, not cored.
13	PIPO	19.5	Southwest of cabin. Fire scarred.
14	PIED	6.2	
15	PIED	3.5	
16	PIED	3.5	
17	PIED	10.0	
18	PIED	6.4	
19	JUMO	4.0	
22	PIPO	19.3	Three strands of barbed wire to the north side of tree.
25	PIPO	12.1	Three strands of barbed wire to the south side of tree.
26	PIPO	22.7	Tree with a dead top. Sign attached to northeast side that reads "Form 1505."
27	PIPO	21.4	Standing alone, has barbed wire. In cluster of QUGA.
28	PIPO	23.6	Tree without wire.
29	PIPO	18.0	Stump, nearly rotten.
30	PIPO	25.2	Tree is hollow, lightning struck. Has three-strand barbed wire.
31	PIPO	19.9	Three-strand barbed wire to the south.
32	PIPO	17.6	Fire scarred. Three-strand barbed wire to the south.
33	PIPO	18.0	Three-strand barbed wire to the north.
Field Area			
34	PIPO	16.0	Near corner of field. No barbed wire.
35	PIPO	8.3	
36	PIED	8.0	
37	PIED	7.0	
42	PIPO	7.6	Tree inside fence line.
43	PIPO	12.4	In a clump of PIED, JUMO
44	PIED	10.2	In a clump of QUGA
46	PIPO	21.1	Off picture, fire scarred on southwest side.
47	PIPO	9.5	Off picture, south of 46, west of field.
48	PIPO	16.9	Tree with two-barbed wire. Part of north-south fence. The east-west fence has different barb.
50	PIPO	13.9	Fence not attached to tree.
51	PIPO	16.2	Directly south of stable area.
52	PIED	6.0	
53	PIED	10.0	
54	PIPO	17.0	Tree has nail in west side and a healed fire scar.

Table 6.2. Trees Within the Romero Cabin Complex Cored for Age and Growth Rate (Cont.).

Identification Number	Species*	DBH (in.)**	Comments
Field Area (Cont.)			
55	PIED	5.5	
56	PIED	5.5	
57	PIPO	15.4	Double tree with one base cut.
58	PIPO	15.9	Fire scarred at base to the east.
59	PIPO	15.0	
60	PIPO	13.0	Many downed trees in the area. Appears to have been fire.
61	PIPO	14.7	Healed fire scars on both sides of tree.

* PIPO = *Pinus ponderosa* (ponderosa pine); PIED = *Pinus edulis* (piñon); JUMO = *Juniperus monosperma* (one-seed juniper); and QUGA = *Quercus gambelii* (Gambel's oak)
** Diameter at breast height

Table 6.3. Ages of Trees Adjacent to Cabin, along Field Perimeter, and along Fence Line

Identification Number	Species	DBH	Dates to	Age in Years (from 1998)
1	PIPO	34.7	1844[a]	154
2	PIPO	16.4	1898[b]	100
13	PIPO	19.5	1860	138
22	PIPO	19.3	1853	145
25	PIPO	12.1	1841	157
27	PIPO	21.4	1763	235
31	PIPO	19.9	1747	251
34	PIPO	16.0	1911	87
35	PIPO	8.3	1925	73
42	PIPO	7.6	1941	57
43	PIPO	12.4	1926	72
46	PIPO	21.1	1829[b]	169
49	PIPO	17.0	1841	157
52	PIED	6.0	1828	170
54	PIPO	17.0	1853[b]	145
61	PIPO	13.0	1813	185
62	PIPO		1762	236

[a]Date is approximate because the center is not visible.
[b]Tree was too large for the borer to extend to the middle.

4.0 CONCLUSION

Growth trend lines of trees along the perimeter show that some clearing occurred for building structures and for establishing agricultural areas. Growth trends show decreasing growth after the government took over the area.

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APPENDIX I

First pages of (1) Homestead Entry for Victor Romero, filed March 25, 1913, and (2) Final proof of Homestead Entry for Victor Romero, filed March 28, 1916. (Some text has been altered to enhance legibility.)

Form approved by the Secretary of the Interior December 11,

DEPARTMENT OF THE INTERIOR.

FEB 25 1912

HOMESTEAD ENTRY.

U. S. LAND OFFICE. SANTA FE. N. M. SERIAL NO. 018000

RECEIPT NO. 1155746

Act of June 11, 1906. List No. 3-2091. APPLICATION.

I, Victor Romero (Male), a resident of (Give full Christian name.) (Male or female.)

Ildefonso N. M., do hereby apply (Town, County, and State.)

to enter, under Section 2289, Revised Statutes of the United States, the

The NE¼ of NE¼ of SW¼, the W½ of SE¼ of NW¼ of SE¼, the NW¼ of NW¼ of NW¼ of SE¼, Sec. 21, T. 19 N., R. 6 E., 15 acres, application of Victor Romero, of Ildefonso, New Mexico, List 3-2091.

Township 19 N., Range 6 E., Meridian, containing 15 acres, within the Santa Fe N M land district;

and I do solemnly swear that I am not the proprietor of more than 160 acres of land in any State or Territory; that I am a native born citizen of the United States, and (Applicant must state whether native born, naturalized, or has filed declaration of intention to become a citizen. If not native born, certified copy of naturalization or declaration of intention, as case may be, must be filed with this application.)

am head of a family over 21 years of age (State whether the head of a family, married or unmarried, or over twenty-one years of age, and if not over twenty-one, applicant must set forth the fact which constitute him the head of a family.)

that my post-office address is Ildefonso N M;

that this application is honestly and in good faith made for the purpose of actual settlement and cultivation, and not for the benefit of any other person, persons, or corporation; that I will faithfully and honestly endeavor to comply with all the requirements of law as to settlement, residence, and cultivation necessary to acquire title to the land applied for; that I am not acting as agent of any person, corporation, or syndicate in making this entry, nor in collusion with any person, corporation, or syndicate to give them the benefit of the land entered, or any part thereof, or the timber thereon; that I do not apply to enter the same for the purpose of speculation, but in good faith to obtain a home for myself, and that I have not directly or indirectly made, and will not make, any agreement or contract, in any way or manner, with any person or persons, corporation or syndicate whatsoever, by which the title which I may acquire from the Government of the United States will inure in whole or in part to the benefit of any person except myself. I further swear that since August 30, 1890, I have not entered and acquired title to, nor am I now claiming, under an entry made under any of the nonmineral public-land laws, an amount of land which, together with the land now applied for, will exceed in the aggregate 320 acres; and that I have not heretofore made any entry under the homestead laws, or filed a soldier's or sailor's declaratory statement, ~~except~~

(Here describe former homestead entry by section, township, range, land district, and number of entry; how perfected, or if not perfected state that fact.)

that I am well acquainted with the character of the land herein applied for and with each and every legal subdivision thereof, having personally examined same; that there is not to my knowledge within the limits thereof any vein or lode or quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, or copper, nor any deposit of coal, placer, cement, gravel, salt spring, or deposit of salt, nor other valuable mineral deposit; that no portion of said land is claimed for mining purposes under the local customs or rules of miners, or otherwise; that no portion of said land is worked for mineral during any part of the year by any person or persons; that said land is essentially nonmineral land, and that my application therefor is not made for the purpose of fraudulently obtaining title to mineral land; that the land is not occupied and improved by any Indian.

Victor Romero
(Sign here, with full Christian name.)

NOTE.—Every person swearing falsely to the above affidavit will be punished as provided by law for such offense. (See Sec. 125, U. S. Criminal Code, over.)

6/223.75 JUN 2 MAY 28 1913 NON COAL - F. S. M.

I HEREBY CERTIFY that the foregoing affidavit was read to or by affiant in my presence before affiant affixed signature thereto; that affiant is to me personally known ~~(or has been satisfactorily identified before me by~~ .....
(Give full name and post-office address.)); that I verily believe affiant to be a qualified applicant and the identical person hereinbefore described; and that said affidavit was duly subscribed and sworn to before me, at my office, in SANTA FE, N. M. (Town.) SANTA FE, N. M. (County and State.), within the SANTA FE, N. M. land district, this 25 day of February, 1913.

R. C. Hernandez
Receiver
(Official designation of officer.)

UNITED STATES LAND OFFICE at SANTA FE, N. M.
MAR 27 1913, 19....

I HEREBY CERTIFY that the foregoing application is for surveyed land of the class which the applicant is legally entitled to enter under Section 2289, Revised Statutes of the United States, that there is no prior valid adverse right to the same, and has this day been allowed.

Manuel R. Otero
Register.

UNITED STATES CRIMINAL CODE.—CHAP. 6.

SEC. 125. Whoever, having taken an oath before a competent tribunal, officer, or person, in any case in which a law of the United States authorizes an oath to be administered, that he will testify, declare, depose, or certify truly, or that any written testimony, declaration, deposition, or certificate by him subscribed, is true, shall willfully and contrary to such oath state or subscribe any material matter which he does not believe to be true, is guilty of perjury, and shall be fined not more than two thousand dollars and imprisoned not more than five years. (Act, March 4, 1909. 35 Stat., 1111.)

o 4—771

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C.

October 3, 1912.

The Honorable,

The Secretary of the Interior.

Sir:

I have the honor to request that the following described land (List No. 3-2093), in the Jemez National Forest, New Mexico, be opened to settlement and entry in accordance with the Act of June 11, 1906, (34 Stat., 233): Township 19 North, Range 6 East, N. M. P. Meridian.

Section 21 (Santa Fe Land District)

NE/4 NE/4 SE/4,
NE/4 SE/4 NE/4 SE/4,
NE/4 NW/4 NE/4 SE/4.

Area 15 acres.

Victor Romero, Ildefonso, New Mexico, applied on August 12, 1912, for this tract.

The tract above described can be restored to entry under the Act of June 11, 1906, without prejudicing power development, since no power possibilities exist on the tract.

I have the honor to be, Sir,

Very respectfully,

Your obedient servant,

Acting Secretary.

4—800

Form approved by the Secretary of the Interior November 14, 1914.

MAR 28 1916
10 a M
Francisco Delgado
RECEIVER

DEPARTMENT OF THE INTERIOR.

HOMESTEAD ENTRY.

U. S. LAND OFFICE Santa Fe, New Mexico, No. 018000

FINAL PROOF.

Receipt No. 119576

TESTIMONY OF CLAIMANT.

QUESTION 1. What is your full name, age, and post-office address?

ANSWER. Victor Romero; 45 years old; Buckman, N. M.

QUESTION 2. Are you a native-born citizen of the United States, and if so, in what State or Territory were you born? (If foreign born, or if native born and later naturalized in a foreign country, see Note 1.)

ANSWER. I am; I was born in New Mexico.

QUESTION 3. Are you the same person who made Homestead Entry No. 018000, at the Santa Fe, N. M. Land Office on the 3rd day of February, 1913, for the NE¼ NE¼ SE¼, NW¼ SW¼ NE¼ SE¼, NE¼ NW¼ NE¼ SE¼,

Section 21,

Township 19 N. Range 6 E. N. M. P. Meridian?

If not, give relationship to entryman.

ANSWER. I am.

QUESTION 4. Are you married or single? ANSWER. Married.

QUESTION 5. If married, of whom does your family consist?

ANSWER. My wife and six children.

QUESTION 6. If a married woman, state whether your husband now has an unperfected homestead entry, and during what time he has resided on this land with you. Also state his citizenship qualifications. (See Note 1 at bottom of third page.)

ANSWER.

QUESTION 7. When did you first establish actual residence upon this land?

ANSWER. In the month of April, 1913.

QUESTION 8. When was your house built on this land?

ANSWER. In the month of June, 1913.

QUESTION 9. Have either you or your family ever been absent from the homestead since establishing residence?

ANSWER. Yes, sir.

QUESTION 10. If there has been such absence, give the dates covered by each absence; and as to each absence state whether you, your family, or both, were thus absent and the reason for each such absence.

ANSWER. During the months of December, January, February and March, each year.

QUESTION 11. Describe the land embraced in above entry by legal subdivisions, showing fully the character of same, and kind and amount of timber, if any.

ANSWER.

Subdivision.	Acres cultivable.	Acres timbered.	Feet timber.
About 13 acres are cultivable.			
There is no timber on the claim.			

QUESTION 12. State the number of acres cultivated, kind of crop planted, and amount harvested, each year.

ANSWER. 1913, I broke about seven acres and planted it to beans. I harvested about 1200 lbs.
1914, I broke about six acres and planted all the broken land to it to beans and corn. Harvested about 3000 lbs beans and about 4 fanegas of corn.
1915, I planted all the land to beans and corn. Harvested about 2100 labs of beans and about 1800 lbs of corn.
19...,
19...,
19...,
19...,

QUESTION 13. Describe fully and in detail the amount and kind of improvements and number of acres under cultivation on each subdivision. State total value of improvements on the claim.

ANSWER.

Subdivision.	Character of improvements.
The improvements are located on the east side of the claim and consist of a one room log house with one door and two windows; a corral. Three sides of the claim are under a wire and post fence. The improvements are worth about $450.00.	

QUESTION 14. Is your present claim within the limits of an incorporated town or selected site of a city or town, or used in any way for trade or business?

ANSWER. No, sir.

QUESTION 15. Are there any indications of coal, salines, or minerals of any kind on the land? If so, describe what they are.

ANSWER. No, sir.

QUESTION 16. Have you sold, conveyed, or agreed to sell or convey any portion of the land? If so, to whom and for what purpose?

ANSWER. No, sir.

QUESTION 17. Have you optioned, mortgaged, or agreed to option or mortgage, or convey this land, or any part thereof? If so, when, to whom, and for what purpose and in what amount?

ANSWER. No, sir.

QUESTION 18. Have you any personal property of any kind elsewhere than on this claim? If so, describe the same, and state where the same is kept.

ANSWER. Yes, sir. I have some house furniture and kitchen utensils at San Ildefonso, N. M.

QUESTION 19. Have you ever made any other homestead entry? If so, describe the same.

ANSWER. No, sir.

QUESTION 20. Describe by legal subdivisions, or by number, kind of entry, and office where made, any entry or filing (not mineral) other than homestead made by you since August 30, 1890.

ANSWER. I have not made any other entry or filing (not mineral) than homestead made by me since August 30, 1890.

Victor Romero
(Sign plainly, with full Christian name.)

☞ NOTE 1.—If applicant is alien born, he should state the fact and file evidence of citizenship in due form, either a certificate of his own naturalization in a court of competent jurisdiction, or, if claiming to be a citizen by virtue of his father's naturalization and his own minority and residence in the United States at the date thereof, or, if a married woman claiming citizenship by virtue of her husband's nativity or naturalization, then record evidence of the naturalization of the father, or husband, or an affidavit as to the nativity of the latter. Applicants who were at one time citizens of the United States, but who later became citizens of a foreign country, must file record evidence of their naturalization. Any female citizen of the United States invoking the benefits of the act of October 17, 1914 (38 Stat., 740), shall make oath showing the nationality of her husband, and that he is entitled to become a citizen of the United States.

☞ NOTE 2.—The officer before whom the proof is made will see that all answers are complete and responsive to the questions.

☞ NOTE 3.—The officer before whom the deposition is taken should call the attention of the witness to section 125 of the U. S. Criminal Code (over), and state to him that it is the purpose of the Government, if it be ascertained that he testifies falsely, to prosecute him to the full extent of the law.

I HEREBY CERTIFY that the deponent was examined separately and apart from the other witnesses in the case; that the foregoing deposition was read to or by deponent in my presence before deponent affixed signature thereto; that I verily believe deponent to be the identical person hereinbefore described, and that said deposition was duly subscribed and sworn to before me at my office, in Santa Fe, Santa Fe County, (Town, county, and State.) New Mexico within the Santa Fe, N. M. land district, this 28th day of March, 1916.

Francisco Delgado

Register, U. S. Land Office.
(Official designation of officer.)

8—1574

4—969 a

Form approved by the Secretary of the Interior November 14, 1914.

MAR 28 1916

DEPARTMENT OF THE INTERIOR.

HOMESTEAD ENTRY.

M

REGISTER

U. S. LAND OFFICE Santa Fe, New Mexico, No. 018000

FINAL PROOF.

TESTIMONY OF WITNESS.

QUESTION 1. What is your full name, age, and post-office address?

ANSWER. J. Crestino Montoya; 28 years old; Buckman, N. M.

QUESTION 2. Was your name correctly given in the published notice?

ANSWER. Yes, sir.

QUESTION 3. How long have you known the claimant in this case and the

NE¼ NE¼ SE¼, NE¼ SE¼ NE¼ SE¼, NE¼ NW¼ NE¼ SE¼ Section 21,

Township 19 N., Range 6 E., N. M. P. Meridian,

the land embraced in Homestead Entry, No. 018000, made at the

Santa Fe, N. M. Land Office?

ANSWER. I have known him ever since I can remember, and the land also ever since I can remember.

QUESTION 4. Is entryman married? ANSWER He is married.

QUESTION 5. Is said tract within the limits of an incorporated town, or used in any way for trade or business?

ANSWER. No, sir.

QUESTION When did entryman settle on the homestead?

ANSWER: In the month of April, 1913.

QUESTION 7. At what date did entryman establish actual residence thereon?

ANSWER: In the month of June, 1913.

QUESTION 8. Have entryman and family resided continuously on the homestead since thus establishing residence thereon?

ANSWER. No, sir.

QUESTION 9. Have entryman and family ever been absent from the homestead since thus establishing residence thereon?

ANSWER. Yes, sir.

QUESTION 10. If there have been any such absences, give the dates covered by such absences, stating who was absent and for what reason.

ANSWER They have been absent from the land during the winter months - December, January, February and March in each year.

QUESTION 11. Describe the land embraced in above entry by legal subdivisions, showing fully the character of same, and kind and amount of timber, if any.

ANSWER.

Subdivision.	Acres cultivable.	Acres timbered.	Feet timber.
13 or 14 acres are cultivable.			
There is no timber on this claim.			

QUESTION 12. State the number of acres cultivated and kind of crop planted, each year.

ANSWER. 1913., He broke about 7 acres and planted it to beans;
19..., harvested about 1500 lbs.
1914., He broke about 5 acres of land and planted all the land to
19..., beans; harvested about 3500 lbs.
1915., He planted all of the broken land to beans and corn; harvested
19..., about 17 fanegas of beans and about three fanegas of corn.
19...,

QUESTION 13. Describe fully and in detail the amount and kind of improvements and number of acres under cultivation on each subdivision. State total value of improvements on the claim.

ANSWER.

Subdivision.	Character of improvements.
The improvements are on the eastern portion of the claim and consist of a one room log house with one door and two windows; a corral, a stable, a small reservoir; three sides of the claim are under a wire and post fence. Value of improvements about $400.00.	

QUESTION 14. Are there any indications of coal, salines, or minerals of any kind on the land? If so, describe what they are.

ANSWER. No, sir.

QUESTION 15. Have you any knowledge or information that claimant has sold or contracted to sell, optioned, mortgaged, or agreed to option or mortgage this land? If so, give full details as to whom, for what purpose and in what amount.

ANSWER. No, sir.

QUESTION 16. Have you personal knowledge, from your own observation, that claimant and his family (if any) actually resided upon and cultivated this land each year in accordance with your above testimony?

ANSWER. Yes, sir.

QUESTION 17. How many times each year have you seen this land, and the claimant and his family residing thereon; and what other personal knowledge have you upon which your answers are based?

ANSWER. I have been working for seven years very clode to this claim and saw him and his familly almost all the time they were living on the claim.

QUESTION 18. Are you interested in this claim, or related to the claimant? If so, how?

ANSWER. No, sir. He is not related to me.

J. Crestino Montoya
(Sign plainly, with full Christian name.)

☞ NOTE 1.—The officer before whom the proof is made will see that all answers are complete and responsive to the questions.

☞ NOTE 2.—The officer before whom the deposition is taken should call the attention of the witness to section 125 of the U. S. Criminal Code (below), and state to him that it is the purpose of the Government, if it be ascertained that he testifies falsely, to prosecute him to the full extent of the law.

I HEREBY CERTIFY that the deponent was examined separately and apart from the other witnesses in the case; that the foregoing deposition was read to or by deponent in my presence before deponent affixed signature thereto; that I verily believe deponent to be the identical person hereinbefore described, and that said deposition was duly subscribed and sworn to before me at my office, in Santa Fe, Santa Fe, New Mexico, (Town, county, and State.) within the Santa Fe, New Mexico land district, this 28th day of March, 1916.

Francisco Delgado

Register, U. S. Land Office.
(Official designation of officer.)

UNITED STATES CRIMINAL CODE.

SEC. 125. Whoever, having taken an oath before a competent tribunal, officer, or person, in any case in which a law of the United States authorizes an oath to be administered, that he will testify, declare, depose, or certify truly, or that any written testimony, declaration, deposition, or certificate by him subscribed, is true, shall willfully and contrary to such oath state or subscribe any material matter which he does not believe to be true, is guilty of perjury, and shall be fined not more than two thousand dollars and imprisoned not more than five years.

APPENDIX II

Plant Species Names, Synonyms, and Abbreviations

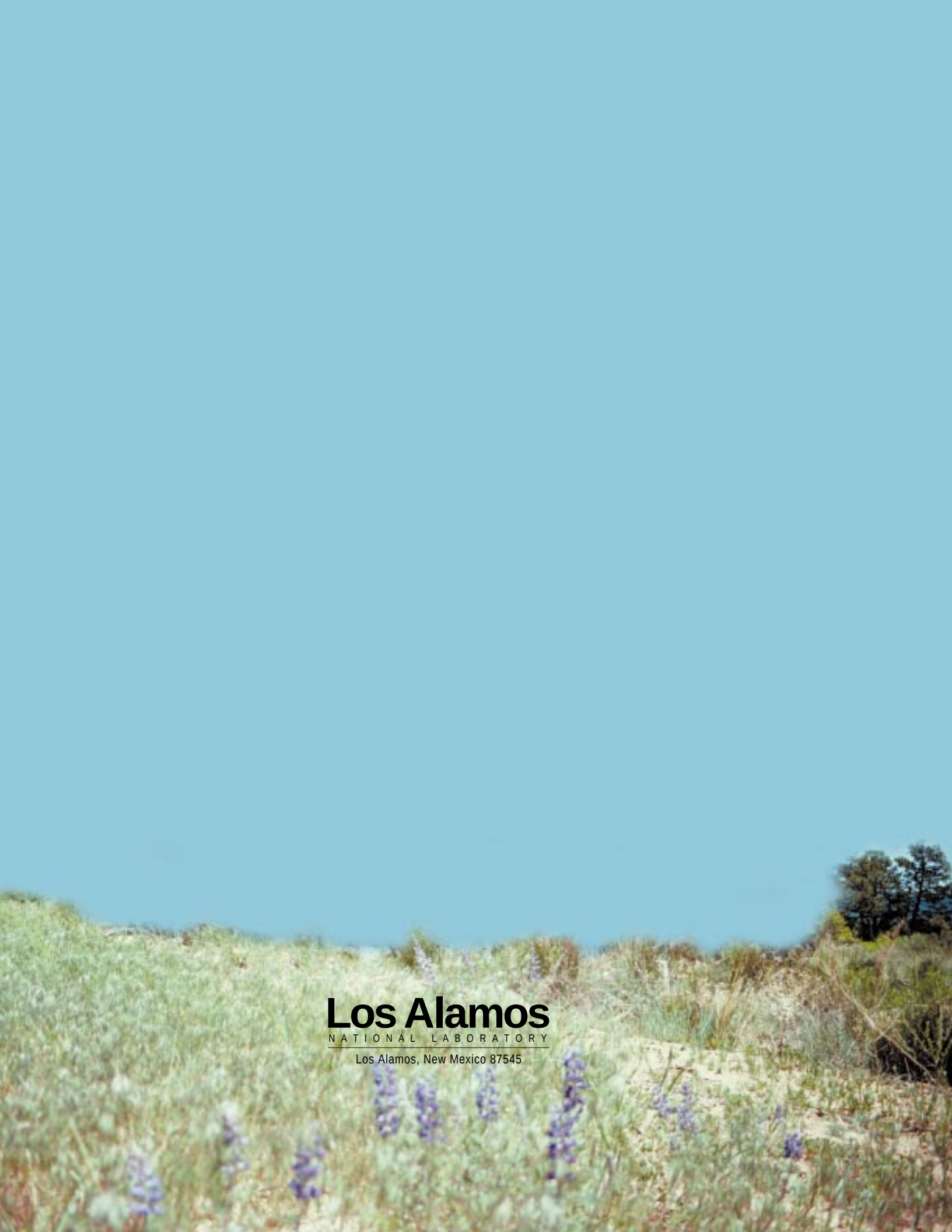
Scientific Name from USDA NRCS Plants	Synonym from Martin and Hutchins (1980)	Common Name from USDA NRCS Plants
AMARANTHACEAE		
Amaranthus retroflexus		redroot amaranth
ANACARDIACEAE		
Rhus trilobata		skunkbush sumac
APOCYNACEAE		
Apocynum androsaeifolium		spreading dogbane
ASTERACEAE		
Ambrosia artemisiifolia		annual ragweed
Antennaria parvifolia		smallleaf pussytoes
Artemisia carruthii		Carruth's sagewort
Artemisia dracunculus		wormwood
Artemisia frigida		fringed sagewort
Artemisia ludoviciana		Louisana sagewort
Bahia dissecta		ragleaf bahia
Cirsium spp.		thistle
Conyza canadensis		Canadian horseweed
Ericameria nauseosa	*Chrysothamnus nauseosus*	rubber rabbitbrush
Erigeron divergens		spreading fleabane
Erigeron flagellaris		trailing fleabane
Erigeron philadelphicus		Philadelphia fleabane
Grindelia nuda var. *aphanactis*	*Grindelia aphanactis*	curlytop gumweed
Gutierrezia sarothrae		broom snakeweed
Helianthus annus	*Helianthus annuus*	common sunflower
Heterotheca villosa var. *villosa*	*Chrysopsis villosa*	hairy goldenaster
Hymenoxys richardsonii var. *floribunda*		Colorado rubberweed
Lactuca spp.		lettuce
Liatris punctata		dotted gayfeather
Solidago spp.		goldenrod
Stephanomeria spp.		skeletonweed
Tetraneuris acaulis var. *nana*	*Hymenoxys argentea*	
Thelesperma filifolium var. *filifolium*	*Thelesperma trifidum*	stiff greenthread
Tragopogon dubius		yellow salsify
Verbesina encelioides		golden crownbeard
BORANGINACEAE		
Lappula spp.		stickseed
Lithospermum multiflorum		many flowered gromwell
BRASSICACEAE		
Capsella bursa pastoris		shepherd's purse

Plant Species Names, Synonyms, and Abbreviations (Cont.)

Scientific Name from USDA NRCS Plants	Synonym from Martin and Hutchins (1980)	Common Name from USDA NRCS Plants
CUPRESSACEAE		
Juniperus monosperma		one-seed juniper
CYPERACEAE		
Carex spp.		sedge
FABACEAE		
Lupinus caudatus		Kellogg's spurred lupine
Medicago sativa		alfalfa
Melilotus spp.		sweetclover
FAGACEAE		
Quercus gambelii		Gambel's oak
Quercus X pauciloba	*Quercus undulata*	wavyleaf oak
GERANIACEAE		
Erodium cicutarium		redstem stork's bill
IRIDACEAE		
Iris spp. (domestic)		iris
LILIACEAE		
Allium cernuum var. *obtusum*		nodding onion
Asparagus officinalis		garden asparagus
Yucca angustissima		narrowleaf yucca
Yucca baccata		banana yucca
LINACEAE		
Linum neomexicanum	*Linum neomexicana*	New Mexico yellow flax
MALVACEAE		
Sphaeralcea spp.		mallow
NYCTAGINACEAE		
Mirabilis linearis	*Oxybaphus linearis*	narrowleaf four o'clock
ONAGRACEAE		
Gaura coccinea		scarlet beeblossom
PINACEAE		
Pinus edulis		two needle pinyon
Pinus ponderosa var. *scopulorum*		ponderosa pine
Pseudotsuga menziesii var. *glauca*		Rocky Mt. douglas fir
PLANTAGINACEAE		
Plantago patagonica	*Plantago purshii*	wolly plantain
POLEMONIACEAE		
Ipomopsis aggregata		skyrocket gilia
POLYGONACEAE		
Eriogonum spp.		buckwheat
PORTULACACEAE		
Portulaca oleracea		little hogweed
Talinum		sunbright

Plant Species Names, Synonyms, and Abbreviations (Cont.)

Scientific Name from USDA NRCS Plants	Synonym from Martin and Hutchins (1980)	Common Name from USDA NRCS Plants
ROSACEAE		
Cercocarpus montanus var. *montanus*		birchleaf mountain mahogany
Fallugia paradoxa		Apacheplume
Prunus americana		American plum
SAXIFRAGACEAE		
Ribers cereum		wax currant
SCROPHULARIACEAE		
Castilleja integra		wholeleaf Indian paintbrush
Penstemon secundiflorus		sidebells penstemon
Verbascum thapsus		common mullein
VITACEAE		
Parthenocissus quinquefolia var. *quinquefolia*	*Parthenocissus inserta*	Virginia creeper



Los Alamos
NATIONAL LABORATORY
Los Alamos, New Mexico 87545