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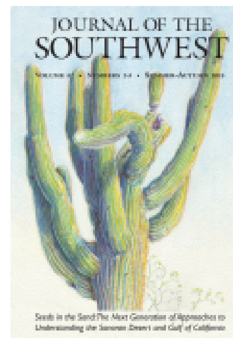

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Introduction

The La Playa site has a long and storied history in the archaeology of northwestern Sonora. This site was initially visited and described by Carl Sauer and Donald Brand as their Site No. 19 Boquillas during their pioneering reconnaissance conducted in 1930 with the objective of defining the southernmost extent of red-on-buff wares (Sauer and Brand 1931: 93–94). These self-styled "archaeogeographers" were struck by the massive sheet-flood erosion of the floodplain that was ubiquitously evident, along with the great amount of rocks, suggesting that "there are far too many stones and the individual heaps are too large to lend weight to the notion of their use in fireplaces"; importantly, they also noted that water was flowing with minnows and water plants present in the Boquillas arroyo (Sauer and Brand 1931: 93). Sauer and Brand (1931: 94) also commented on the large pestles present in the artifact assemblage, suggesting a dependence on mesquite or other gathered seeds, and noted the presence of *Glycymeris* bracelets along with hundreds of the cores produced in their production. This same year, Howard Scott Gentry reportedly collected the remains of Pleistocene fauna, including *Platygonus*, *Bison*, *Capromeryx*, *Equus*, camelid, and deer from this locality (White et al. 2010: 61). In 1935, Arthur Woodward (1936) was the first to apply the name "La Playa" to this site, which he described as being a "shell bracelet manufactory," and concluded that it was an important locus in the production of shell ornaments for exchange. Julian Hayden (p.c. 1992) visited the site in 1935 as well. Gordon F. Ekholm provided a reasonably detailed description of the artifact assemblage at La Playa in late November 1937 (La Playa, Site No. 8) during the initial phase of the Archaeology of Sonora and Sinaloa Project conducted for the American Museum of Natural History under the direction of George Vallaint; numerous projectile points and decorated ceramics were also collected, and Ekholm observed that "there has seemed to be no possibility of learning anything from excavation, as the gullies in most parts of the site show nothing washing out at any depth" (Ekholm n.d.: 5). Ekholm also observed nothing which he considered to be diagnostic of the then recently defined Cochise Culture, but noted that the mano and metate types may indicate an early occupation (Ekholm n.d.: 5).

During Emil Haury's tenure as head of the Department of Anthropology at the University of Arizona, he led students on frequent field trips to the La Playa site. In 1960, Alfred Johnson completed his master's thesis entitled "The Place of the Trincheras Culture of Northern Sonora in Southwestern Archaeology" based primarily upon limited reconnaissance and excavations conducted at La Playa, concluding that this site was predominantly associated with the Trincheras archaeological tradition between 700 and 1100 CE, and reinforced his mentor's perspective (Haury 1950: 547) that this tradition represented a "desert branch" variant of the Hohokam (Johnson 1963: 182–185). Additionally, Beatriz Braniff, who along with Arturo Oliveros had established the Centro INAH Sonora in 1973, visited the site several times between 1975 and 1980 and, as did Woodward, believed that La Playa represented a shell manufacturing site and was also likely an important node in the long-distance exchange route.

In 1992, the senior author, while a graduate student in anthropology at the University of Arizona, began efforts to relocate the site; that May, accompanied by Jonathan Mabry, the location of the La Playa site was confirmed. Subsequent frequent visits indicated that La Playa contained a complex assemblage of artifacts, features, human remains, and Pleistocene fauna. Moreover, the artifact assemblage indicated a primary affiliation associated with the Archaic and the then recently defined Early Agricultural period, and not the Trincheras tradition as had been previously proposed (Johnson 1960, 1963).

The La Playa site reflects an archaeological landscape encompassing 10 square kilometers located in northern Sonora, Mexico, and reveals archaeological evidence of more or less continuous human use since the Paleoindian period (ca. 13,000 years ago). Its most intensive use was during the Early Agricultural period (3,700–2,050 cal BP); after this period, the occupation of the Boquillas Valley greatly diminished, but the site was continuously occupied by the Trincheras tradition people, Pima groups, French goat herders, and even a hotel and restaurant was in operation there during the 1950s.

Understanding of the La Playa site has come a long ways since Sauer and Brand first visited the site and observed that "the site now is forbidden [for research] in the extreme" (1931: 94). Everyone who visits La Playa is astounded by the great amount of archaeological materials dispersed over the surface and the apparently intact features eroding from the stratigraphic profiles produced by the constant gully erosion that extends over several thousands of square meters. The site presents an extremely overwhelming mosaic of depositional, erosional, and cultural events that required us to design a unique research strategy. La Playa is truly an incredible laboratory for learning and teaching various aspects of the Sonoran Desert landscape and human adaptation of long duration (important themes currently under study at the site include the formation of the Sonoran Desert; climatic, floral, and faunal changes during the Pleistocene and Holocene; human adaptations; and processes of aridity and environmental degradation over the past 100 years).

The La Playa Site and the Geography and Geology of the Boquillas Valley

La Playa is undoubtedly among the most spectacular and significant archaeological sites within the Sonoran Desert, extending over approximately 10 square kilometers along the Río Boquillas, near Trincheras, Sonora, Mexico (figure 1). The La Playa site is situated where the Río Boquillas emerges from a narrow valley constricted by the low hills of the Cerro Boquillas onto a broad, well-developed alluvial floodplain approximately 515 meters (1,700 feet) above sea level, the alluvial fan that developed between two low groups of the Boquillas Hills separated by the channel of the Boquillas River that runs on a NE-SW direction north of the alluvium (figure 2). Five lithologies are described at the Boquillas Hills: conglomerate, gray sandstone, maroon siltstone, olive siltstone, and hematitic sandstone. The sandstone and conglomerate are often cross-cut by quartz veins (< 10 centimeters) that are bedding-parallel but dip to the northeast. The sandstone and siltstone have suffered extensive weathering; the Boquillas Hills are presently 550–600 meters above sea level, rising only 100 meters higher that the surrounding alluvial plain (McLaurin et al. 2007).

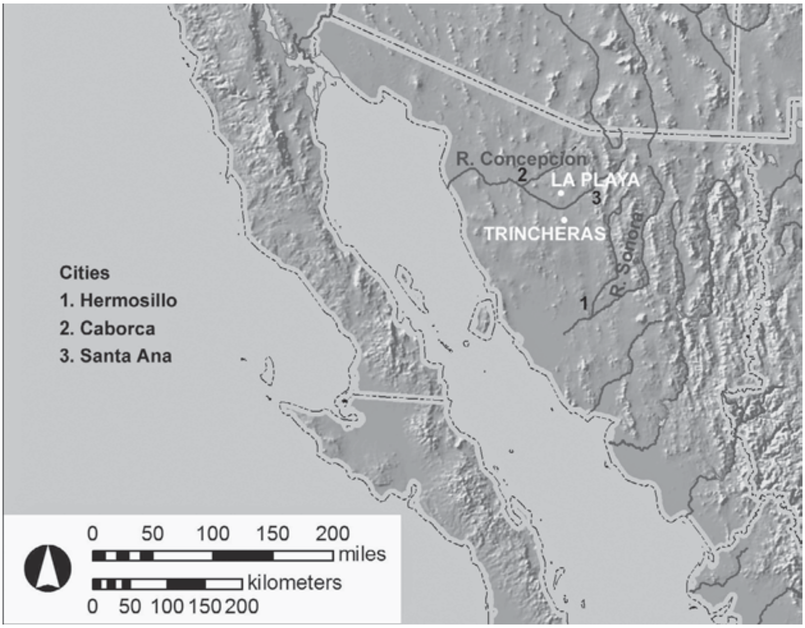

Figure 1. Location of La Playa (SON F:10:3).

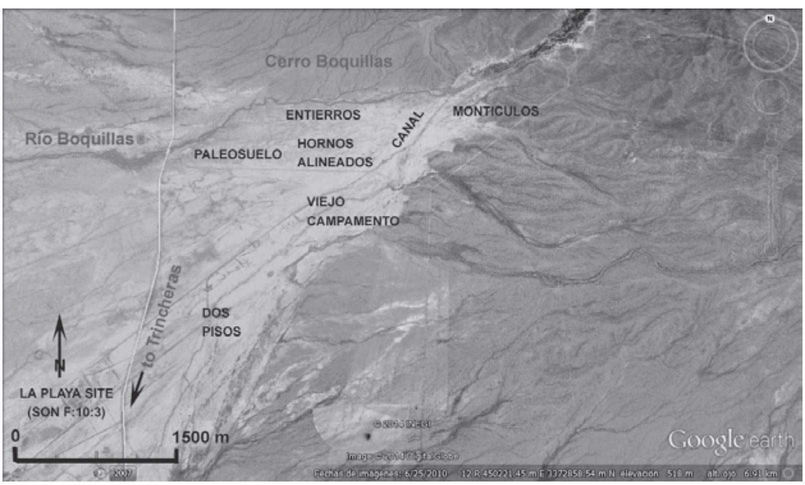

Figure 2. La Playa localities.

La Playa is located in the Sonoran Desert province that extends over 50% of the state of Sonora. The region is characterized by plains that gently descend to the coast from an elevation of 1,000 meters to sea level (Escárcega 1985; INEGI 2002). La Playa is located in the hydrological region number eight (north of Sonora) in the Río Concepcion basin, comprised by the Alisios, Magdalena, Altar, Asunción, Boquillas, and Concepción Rivers (Pérez Bedolla 1985). The Río Boquillas rises in the Sierra Cibuta near Nogales and flows southwest to its eventual confluence with the Río Magdalena a few kilometers to the west of Estación Trincheras. Currently a deeply entrenched arroyo (figure 3), the Boquillas maintained a perennial flow as recently as the early 1960s.

Figure 3. Massive sheet and gully erosion.

Here, several thousand roasting features, several hundred inhumation and cremation burials, along with numerous dog burials, and countless shell and chipped and ground stone artifacts are continuously being exposed and eroded by massive sheet and gully erosion (figure 4). The abundant rocks that had astounded Carl Sauer and Donald Brand during their initial visit to the site are not the remains of architectural features as they had surmised, but the remnants of countless disarticulated roasting pit features; virtually every rock observed on the site is culturally associated and can be attributed to human agency.

Much of the research of La Playa project focused on documenting the thousands of prehistoric cultural features. Archaeological interpretation of these features has been hampered by a limited understanding of the site's alluvial history due in part to extensive historic erosion and dissection of the floodplain, as well as local complexity in geomorphic features. The site is located on a floodplain, but geomorphic features are also suggestive of an alluvial fan, complicating stratigraphic interpretation and

Figure 4. Photo showing entrenchment of the Río Boquillas..

documentation. The relatively good state of preservation of the archaeological and paleontological features appears to indicate that during long periods of time in the Pleistocene and Holocene the weather was uniform and constant, which permitted the preservation of features. Over the past eight years, studies of the geologic setting of La Playa, stratigraphic horizons, and geochronological contexts have recently begun to increase understanding of the broader context of the site's setting (Copeland et al. 2012; McLaurin and Elliott 2009; McLaurin et al. 2012; Schott 2012).

Of Soils, Carbonates, and Gastropods: Stratigraphy and Paleoenvironmental Reconstruction

The oldest date that has been obtained from the Quaternary deposits at the site is approximately 44,000 years ago, obtained from two radiocarbon dates on fossil mollusks (*Anodonta* sp.) found within an old Pleistocene river channel (JQ-11a C14-40, 720 +/- 260 and JQ-11b C14-39, 130 +/- 210) (Copeland et al. 2012). The deepest exposed stratigraphic horizon at La Playa extended in the central and south areas of the site is the San Rafael Paleosol (SRP) a Pleistocene red soil that have been identified in many localities of northern Sonora (Cruz-y-Cruz 2011; Cruz-y-Cruz et al. 2014); the red paleosol is a fairly planar surface that represents the Pleistocene surface of the site. Pleistocene gravels within the paleosol are exposed in the Los Entierros and Hornos Alineados localities. There, gravels are preserved within a 30-meter-wide zone within the paleosol. The gravels are cemented with reddish sand and contain a diverse assemblage of clast compositions that include schist, gneiss, volcanics, plutonics, and sedimentary rocks. The clasts are extremely coarse and are in the cobble size range (up to 10 centimeters) (McLaurin and Elliott 2009). These gravels represent Pleistocene channel deposits and possibly the abandoned course of an ancestral Río Boquillas (McLaurin and Elliott 2009). The formation of the SRP probably indicates a prolonged environmental stability period, which began during the late Pleistocene and ended during the Middle Holocene (14,910 to 4,250 cal BP). The soil signal appears to indicate that a humid environment was present and encouraged chemical weathering, but with a sufficient rate of evaporation that allowed for the accumulation of carbonates in the underlying horizons. Pleistocene fauna have been found in the SRP (Jim Mead, p.c. 2001; White et al. 2010). Development of the paleosol was abruptly terminated in the Middle Holocene, when the environment drastically changed and the cycles of erosion and sedimentation intensified (Cruz-y-Cruz et al. 2014).

Copeland et al. (2012) provide the first systematic study of the chronostratigraphy and paleoclimate of the Holocene deposits at La

Playa. The authors described and defined the stratigraphy of the central and southern portions of the site, with several stratigraphic units being nearly ubiquitous in these areas (Copeland et al. 2012; Copeland and Quade 2008). In addition, they investigated the paleoclimatic history of the site from gastropod and carbonate isotopic studies. Unit B0 is a bedded sand and clayey silt unit exposed only in Dos Pisos (located at the southeastern edge of the site) where modern erosion has revealed deeper exposures and is dated to 4,690–4,350 cal BP; no archaeological features have been found in situ at this unit. Unit B1/B2 is ubiquitous where exposures are deep enough in the central and southern portions of the site, and occasionally present as two distinct layers. It is composed of bioturbated silt, rarely contains artifacts, and dates to 4,350–4,160 cal BP. Both B0 and B1/B2 appear to be fluvial deposits; gastropods suggest the site at this time lacked standing permanent water, but soil may have been moist. Unit B3 is ubiquitous in most of the site, is sandier and more bedded than units above it, often appears as a white band, and represents rapid deposition on the floodplain. Gastropods suggest perennial standing water. This stratigraphic unit contains scattered cultural remains and dates to 3,770–3,110 cal BP, though the top of the unit is undated. Thus most of the archaeology from this unit dates to the San Pedro phase of occupation (1200–800 BCE or 3,150–2,750 cal BP). Copeland et al. (2012) suggest that the wet environment is due to anthropogenic activities, although a natural wetland cannot be ruled out. Unit B4 contains a sharp irregular contact with Unit B3, and contains extensive artifacts and canal features in the upper part of the unit. Dates range from 3,140–1,950 cal BP, though the top of this unit is undated. Unit B5 contains bedded sand and silt, abundant archaeological remains, and extensive canal systems. It dates to 2,330–1,580 cal BP, and often grades into Unit B4. Gastropods suggest permanent water, which, along with the extensive canal system, is another indication of an anthropogenic wetland. Units B4 and B5 show a sharp increase in archaeological features, which places the peak occupation at the site in the Cienega phase (800 BC–AD 150 or 2,750–1,900 cal BP). Where Unit B5 is missing, Unit C rests directly on B4, often separated by artifacts and fire-cracked rock.

Evolution of the Boquillas Valley Landscape

The Sonoran Desert biome began to develop around 11,000 years ago. From Late Wisconsin times to the present, environmental changes in the Sonoran Desert in general have been unidirectional with a desertification tendency that commenced at the end of the Pleistocene and continues today (Nabhan 1985; Van Devender 1990). The macrobotanical record obtained from packrat (*Neotoma*) middens and pollen records suggest that by the end of the Pleistocene stable pinyon-juniper-oak woodlands were present under a winter-dominated precipitation regime (Davis and Shafer 1992; Van Devender and Spaulding 1979). The upslope retreat of pinyon (*Pinus monophylla*) from the Sonoran Desert occurred by 11,000 years ago, leaving juniper-oak woodlands, chaparral shrub, and some modern desert plants including saguaro, yucca, prickly pear, agave, and nolina (Van Devender 1990; Van Devender et al. 1994). Recent interdisciplinary studies at the La Playa site have given us insights into the local environment. Jim Mead and colleagues reported the presence of *Cynomis ludiviciaanus* at La Playa collected at the red paleosol (SRP); this type of prairie dog represents the first ones found in Sonora, because in general they are found at higher elevations associated with grassland/woodland vegetation (Mead et al. 2010). The macrobotanical record of the large and diverse sequences of neotoma fossil middens analyzed by Van Devender (2007) indicates that milder winter temperatures coupled with cooler summers created a more equable climate for the region (Van Devender 2007).

The Sonoran Desert province begins to demonstrate its modern characteristics at about 8,000 years ago when mesquite bosques replaced juniper-oak woodlands and plants adapted to arid climate proliferate (e.g., saguaro, yucca, prickly pear, agave, nolina, together with summer grasses). The pedogenic process at the site appears to indicate a long period of stability in the landscape, which allowed the formation of well-developed soils under a predominantly semiarid climate with marked seasonal changes (Cruz-y-Cruz et al. 2014). The pedogenic development that began in the Pleistocene apparently lasted for 10,000 years. The only drastic climate change that left a signature in the soils occurred during the Middle Holocene and probably corresponded to the Althitermal period defined by Ernst Antevs (1948, 1955) as a climate oscillation lasting for several millennia (7,000–4,500 years BP) that was characterized by very warm weather and very little precipitation (Cruz-y-Cruz et al. 2014). The pedogenic signal together with the paleobotanical record of the Late Holocene appear to indicate that a seasonal precipitation system with summer monsoons and winter *equipatas* was established at this time. The paleobotanical record of La Playa, with species such as mesquite, cottonwood, and phragmites, indicates a mosaic of biotic communities that included wetlands, mesquite bosques, riparian zones with a low-energy river system, and a well-drained floodplain that attracted the first farmers of the Boquillas Valley.

Although the Boquillas is presently dry for the majority of the year, it was considered to be a perennial river as recently as the early 1960s (Johnson 1963). Today, the Río Boquillas is deeply entrenched, in some areas as much as 10 meters below the surrounding ground surface. As elsewhere in the Sonoran Desert, stream entrenchment began in the late 1880s as a result of overgrazing, groundwater depletion, and alternating years of drought and exceedingly wet years. In combination, these factors led to increased erosion as a result of the depleted ground cover. Prior to these erosive processes, many of the local rivers were perennial, and often were associated with cienegas along their courses (e.g., Bryan 1925; Cooke and Reeves 1976; Hastings and Turner 1965).

Precipitation reflects the bimodal pattern characteristic of the Sonoran Desert region, with slightly more rain falling during the summer *chubascos* than during the winter *equipatas*. Annual precipitation is highly variable in this region of Sonora; climatological data gathered between 1960 and 1976 from Estación Trincheras indicate mean annual precipitation of 266.5 millimeters, ranging from an annual low of 147.7 millimeters to a maximum of 392.8 millimeters (Durrenberger and Murrieta 1978: 20). The mean annual temperature is 21° C, with average monthly temperatures varying from 12.1° C in January to 30.5° C in July (Durrenberger and Murrieta 1978: 33); temperatures from June through September normally exceed 40° C (Pérez Bedolla 1985: 121). The Boquillas Valley is among the westernmost valleys with a historic perennial stream flow; from approximately the Altar Valley to the coast, cultivation was impossible without the aid of modern wells and irrigation technology.

The La Playa setting is characteristic of the transitional zone between the Arizona Upland and the Lower Colorado River subdivisions of the Sonoran Desertscrub biome. Here, plant communities are dominated by creosote (*Larrea tridentata*), with mesquite (*Prosopis juliflora*), paloverde (*Cercidium microphyllum*), ironwood (*Olneya tesota*), saguaro (*Carnegiea gigantea*), pitahaya (*Lemaireocereus thurberi*), several types of cholla (*Opuntia fulgida*, *O. versicolor*, *O. bigelovii*, *O. arbuscula*) and a variety of prickly pears (*Opuntia* sp.), bisnaga (*Ferrocactus wislizeni*), *Mammillaria microcarpa*, *Echinocereus fasciculatus*, ocotillo (*Fouquiera spendens*), along with various annuals and grasses (Pérez Bedolla 1985:

138–139; Turner and Brown 1994). Characteristic fauna include antelope (*Antilocapra americana sonorensis*), mule deer (*Odicoileus hemionus crooki*), coyote (*Canis latrans*), javalina (*Dicotyles tajacu*), rabbit (*Sylvilagus audubon*), hare (*Lepus californicus*), desert tortoise (*Gopherus agassizi*), several species of rodents (*Neotoma* sp., *Peromyseus* sp., *Perognathus* sp.), and birds (Turner and Brown 1994).

The *Longue Durée*: Occupation of the Boquillas Valley

Our investigations have identified a large number of Pleistocene fauna associated with the San Rafael Paleosol (SRP), including an exceptional number of tortoise (*Gopherus* or *Hesperotestudo*), along with equus, camelid, deer, mammoth, and *Bison antiquus* along with a probable Paleoindian component, a possible Malpais/San Dieguito assemblage, a Middle Archaic (ca. 3500 to 1500/1200 BCE) component, and evidence for a more or less continuous occupation extending from the Late Archaic/Early Agricultural period (ca. 2100 BC to AD 150) through the first half of the 20th century. The greatest number of artifacts and features, however, appear to be associated with the Early Agricultural period, and include what may likely be the largest Early Agricultural period burial population in western North America.

We follow Berry and Berry (1986) and Mabry (1998b) in characterizing the occupational history of La Playa principally in terms of major environmental periods in years before present (BP). The chronological scheme for these periods is based upon Mabry's (1998c) review of current paleoclimatic data. However, culturally defined periods/phases, e.g., Early Agricultural period, Trincheras tradition, Protohistoric period, etc., are denoted by their common era (BCE/CE) calendric designations.

Terminal Pleistocene (ca. 14,500–10,500 BP) and Early Holocene (10,500–7,500 BP)

During the Late Pleistocene/Early Holocene, we believe that the Boquillas Valley offered an oasis-like environment that most likely attracted a large number of animals. Paleoindian artifacts include a previously collected Clovis point (Robles and Manzo 1972), an unfluted

Clovis point preform, and two fossilized antler billets. A single tapering stem point is included in the La Playa collection at the Arizona State Museum. Similar types (e.g., Jay, Lake Mojave, Silver Lake, San Dieguito) are widespread throughout the western United States, and dated to circa 10,700 and 7,000 BP (Lorentzen 1998: 142).

What appear to be Malpais/San Dieguito I artifacts are associated with the gravel and cobble deposits of an inverted Pleistocene stream channel that sits immediately atop the paleosol. This assemblage is characterized by thickly patinated crude cobble choppers and scraper-planes, and large flake sidescrapers and knives, manufactured from igneous (basalt, rhyolite, andesite, diorite, latite) stream cobbles derived from the channel deposits. The dating of Malpais/San Dieguito assemblages remains problematic, with age estimates ranging from approximately 37,000 BP (Hayden 1974, 1976) to 4,000 BP (Rogers 1939, 1958). The association with the inverted channel deposits indicates an occupation following the abandonment of the channel and, thus, either is contemporary with or postdates the terminal Pleistocene deposits. Following her technological analysis, based upon the degree of patination present on more than 1,000 artifacts, Cristina García (2005: 194–195) concluded that at least 50% of the assemblage was representative of the San Dieguito Phases I or II, with a wide range of dates from 9,000 to 5,000 BP. García (2005: 196) also recognized a correlation between the San Dieguito crude artifacts and the Early Archaic period tapering-stem projectile point tradition present at La Playa. At least 29% of the artifacts are representative of Phase III or later (García 2005: 195). However, a heavily patinated grooved ax fragment, and thus dating to no earlier than 950 BP, was also identified within the La Playa Malpais assemblage, contributing to suspicions regarding the presumed correlation between the formation processes of desert varnish and the purported antiquity of artifacts.

Middle Holocene (7,500–4,500 BP)

The Middle Holocene, or Altithermal period, was initially defined by Antevs (1955) as a shift to higher temperatures and decreased precipitation. The severity of the environmental conditions extant during the Altithermal continues to be debated (Betancourt 1990; Martin 1963; Van Devender 1990), although a marked gap in the radiocarbon record for this period suggests that the Sonoran Desert region was largely abandoned, supporting models that advocate more harsh environmental conditions (Berry and Berry 1986; Mabry 1998c, 1998d). Few artifacts at La Playa can be positively assigned to this period. Possible evidence for occupation during this period is limited to a few widely dated projectile point styles, including 11 Pinto and 12 San Jose projectile points. These are variably dated to between 9,500 and 2,800 BP (Lorentzen 1998: 145), although Berry and Berry (1986: 315) present a reasonable argument for placing the Pinto tradition within the Middle Holocene period.

Late Holocene (5,500–2,000 BP)

Increased utilization of the Boquillas Valley appears to coincide with a return to more amenable climatic conditions with the onset of the Late Holocene after 5,500 BP. Seventeen percent of the projectile points may best be associated with the early portion of the Late Holocene (that is, prior to the Early Agricultural period) and include five Chiricahua points (4,800–2,500 BP), 39 Cortaro points (4,300–2,300 BP), and three Gypsum points (4,500–1,500 BP) (Lorenztzen 1998: 144–147).

The Early Agricultural period is believed to begin around 2100 BCE, and is represented by an as yet unnamed initial phase (2100 to 1200 BCE), the San Pedro phase (ca. 1200 to 800 BCE), and the Cienega phase (800 BCE to ca. 150 CE) (Mabry 2008). A total of 91 radiocarbon dates has been obtained from features at La Playa (table 1). Of these, two dates are assigned to the Archaic period just prior to the beginning of the Early Agricultural period (EAP), 69 dates (76%) can be securely assigned to the EAP, 19 dates are distributed within the Trincheras tradition, and one burial was dated to the Protohistoric period.

The most characteristic diagnostic elements of the EAP identified at La Playa are the presence of maize, small pithouses, irrigation canals, bordered fields or waffle gardens, and the manufacture of shell ornaments including bracelets of *Glycymeris* sp., along with Empire, San Pedro, and Cienega projectile points (figure 5). Other Early Agricultural period artifacts include “eared” stone trays, proto-palettes, both slab and basin metates, cobble manos, diorite hammerstones, and a wide range of flake and core tools, stone cruciforms, and shell ornaments and waste together with the reamers, rasps, awls, and antler-tine punches used in their production. Large (20- to 50-centimeter) pestle-like implements, tabular flaked “hoes,” and flaked and/or ground stone disks may also form part of the Early Agricultural period assemblage.

Table 1: *Radiocarbon Dates from La Playa*

Lab No.	Feat #	Feature Type Material	Dated	14C Date BP	13C ‰	Calibration OxCal 4.2	Cultural Period
UA-AA53243	323	Inhumation	Collagen	3,720 ± 320	-19.8	3027 BC (95.2%) 1386 BC	Archaic
UA-AA79746	511	Inhumation	Collagen	3,400 ± 200	-9.8	2290 BC (95.1%) 1258 BC	Archaic
UA-AA90485	539	Inhumation	Collagen	3,262 ± 41	-9.9	1630 BC (95.4%) 1439 BC	EAP
BA-B169395	118	Inhumation	Collagen	3,250 ± 40	-9.4	1617 BC (95.4%) 1437 BC	EAP
UA-A13521	406	Horno	Charcoal	3,120 ± 150	-24.5	1740 BC (95.4%) 979 BC	EAP
UA-AA79751	411	Inhumation	Collagen	3,080 ± 53	-10	1455 BC (94.2%) 1208 BC	EAP
UA-A13519	146	Horno	Charcoal	3,010 ± 125	-24.6	1515 BC (95.4%) 916 BC	EAP
UA-AA93230	535	Inhumation	Collagen	3,064 ± 56	-9.3	1444 BC (92.2%) 1190 BC	EAP
UA-AA53246	364	Inhumation	Collagen	2,975 ± 51	-8	1325 BC (88.2%) 1045 BC	EAP
UA-AA33182	52	Inhumation	Mesquite seed	2,960 ± 50		1316 BC (92.8%) 1019 BC	EAP
UA-A13278	431	Inhumation	Charcoal	2,945 ± 90	-23.8	1397 BC (95.4%) 926 BC	EAP
UA-AA79747	506	Inhumation	Collagen	2,869 ± 52	-10.3	1213 BC (94.8%) 910 BC	EAP
UA-AA53249	414	Inhumation	Collagen	2,867 ± 47	-7.34	1209 BC (95.4%) 913 BC	EAP
BA-B169394	52	Inhumation	Collagen	2,850 ± 40	-8.9	1130 BC (94.8%) 906 BC	EAP
UA-AA79749	499	Inhumation	Collagen	2,845 ± 51	-9.6	1134 BC (89.6%) 895 BC	EAP
UA-AA90483	533	Inhumation	Collagen	2,816 ± 40	-10.5	1089 BC (90.7%) 893 BC	EAP
UA-AA79745	503	Inhumation	Collagen	2,776 ± 50	-8.3	1046 BC (95.4%) 817 BC	EAP
UA-AA58391	3	Inhumation	Collagen	2,621 ± 44	-10.5	901 BC (90.2%) 752 BC	EAP
UA-AA53241	113	Inhumation	Collagen	2,587 ± 61	-10.2	859 BC (93.5%) 519 BC	EAP
UA-AA53242	291	Inhumation	Collagen	2,572 ± 64	-9.9	843 BC (93.3%) 506 BC	EAP
UA-AA53244	324	Inhumation	Collagen	2,556 ± 54	-9.8	823 BC (95.4%) 511 BC	EAP
UA-AA79744	356	Inhumation	Collagen	2,536 ± 49	-9.7	806 BC (94.8%) 510 BC	EAP
UA-AA79750	476	Inhumation	Collagen	2,508 ± 50	-11.4	795 BC (90.1%) 501 BC	EAP
UA-AA58399	445	Inhumation	Collagen	2,492 ± 45	-10.5	785 BC (89.4%) 486 BC	EAP
BA-B169392	11	Inhumation	Collagen	2,490 ± 40	-10.5	781 BC (90.4%) 486 BC	EAP
UA-AA90486	540	Inhumation	Collagen	2,473 ± 39	-10.4	766 BC (85.4%) 481 BC	EAP
BA-B204291	427	Inhumation	Collagen	2,390 ± 40	-11.1	554 BC (80.8%) 390 BC	EAP
UA-AA60710	362	Canid	Collagen	2,362 ± 81	-14.76	674 BC (72.3%) 351 BC	EAP
BA-B204292	429	Inhumation	Collagen	2,360 ± 40	-11.2	545 BC (89.6%) 372 BC	EAP
UA-AA58394	292	Inhumation	Collagen	2,318 ± 44	-11.5	517 BC (73.1%) 350 BC	EAP
UA-AA79748	504	Inhumation	Collagen	2,302 ± 53	-9.6	511 BC (54.8%) 339 BC	EAP
BA-B169396	93	Inhumation	Collagen	2,280 ± 40	-9.4	317 BC (49.6%) 207 BC	EAP
UA-AA90487	541	Inhumation	Collagen	2,257 ± 77	-8.9	513 BC (95.4%) 98 BC	EAP
UA-AA53245	360	Inhumation	Collagen	2,254 ± 47	-8	398 BC (95.4%) 203 BC	EAP
UA-AA79752	246	Inhumation	Collagen	2,249 ± 52	-10.2	400 BC (95.4%) 197 BC	EAP
UA-AA58395	430	Inhumation	Collagen	2,249 ± 44	-11	396 BC (95.4%) 203 BC	EAP
BA-B244111	356	Inhumation	Collagen	2,240 ± 40	-10.2	331 BC (67.7%) 203 BC	EAP
UA-AA90480	513	Inhumation	Collagen	2,226 ± 39	-9.7	387 BC (95.4%) 202 BC	EAP
UA-AA90482	526	Inhumation	Collagen	2,224 ± 40	-6.2	387 BC (95.4%) 201 BC	EAP
UA-AA53248	366	Inhumation	Collagen	2,195 ± 45	-9.71	388 BC (94.1%) 162 BC	EAP
BA-B244114	498	Inhumation	Collagen	2,140 ± 40	-10.9	234 BC (72.0%) 50 BC	EAP
UA-AA83052	463	Canid	Collagen	2,135 ± 58	-14	366 BC (95.4%) 40 BC	EAP
BA-B245418	315	Inhumation	Collagen	2,120 ± 40	-9.2	211 BC (83.5%) 43 BC	EAP
BA-B204288	316	Inhumation	Collagen	2,070 ± 40	-15.5	196 BC (94.6%) 5 AD	EAP
BA-B169397	111	Inhumation	Collagen	2,010 ± 40	-10.1	113 BC (93.3%) AD 75	EAP
UA-A13524	344	Horno	Charcoal	2,010 + 55/-50	-24.5	170 BC (94.4%) AD 86	EAP
UA-A8747	6	Horno	Charcoal	2,000 ± 80	-25	203 BC (93.9%) AD 181	EAP
UA-AA93229	534	Inhumation	Collagen	2,569 ± 52	-10.1	827 BC (95.2%) 537 BC	EAP
UA-AA93228	529	Inhumation	Collagen	2,396 ± 51	-12.2	596 BC (73.3%) 390 BC	EAP
UA-AA93225	524	Cremation	Collagen	2,234 ± 52	-10.6	396 BC (95.4%) 186 BC	EAP
UA-AA93227	526	Inhumation	Collagen	2,227 ± 53	-6.9	396 BC (95.4%) 175 BC	EAP
UA-AA58397	437	Inhumation	Collagen	1,991 ± 43	-11.7	105 BC (93.4%) AD 89	EAP
UA-A8744	9	Horno	Charcoal	1,960 ± 85	-24.6	177 BC (95.4%) AD 240	EAP
BA-B169398	313	Inhumation	Collagen	1,960 ± 40	-9.2	43 BC (95.4%) AD 126	EAP
UA-A8745	7	Horno	Charcoal	1960 + 50 / -45	-19.4	95 BC (94.7%) AD 139	EAP
UA-AA90489	543	Crematorio	Charcoal	1,956 ± 36	-22.4	41 BC (95.4%) AD 125	EAP
UA-A8741	18	Horno	Charcoal	1,940 ± 55	-23.9	51 BC (95.4%) AD 220	EAP
UA-AA53240	12	Inhumation	Collagen	1,919 ± 52	-10.5	4 BC (90.9%) AD 221	EAP
UA-AA79743	330	Horno	Charcoal	1,918 ± 37	-24.5	AD 2 (92.5%) AD 179	EAP
UA-AA60708	334	Canid	Hueso	1,916 ± 46	-10.65	1 BC (94.3%) AD 222	EAP
UA-A13276	343	Horno	Charcoal	1,915 ± 50	-24.2	2 BC (93.1%) AD 224	EAP
UA-AA93711	550	Pithouse	Charcoal	1,900 ± 30	121	AD 28 (95.4%) AD 214	EAP
UA-A13526	449	Pithouse	Charcoal	1,890 ± 50	-24.2	AD 5 (95.4%) AD 240	EAP
UA-AA90488	542a	Inhumation	Collagen	1,888 ± 46	-9.9	AD 25 (95.4%) AD 236	EAP
UA-AA33184	59	Posthole	Zea mays	1,885 ± 50		AD 18 (95.4%) AD 242	EAP
UA-A8742	18	Horno	Charcoal	1,885 + 55/-50	-24.1	AD 2 (95.4%) AD 251	EAP
UA-AA58392	20	Horno	Charcoal	1,882 ± 42	-14.99	AD 51 (94.1%) AD 236	EAP
UA-A13525	448	Storage pit	Charcoal	1,880 ± 50	-24.1	AD 20 (95.4%) AD 245	EAP
UA-AA53247	365A	Crematorio	Collagen	1,877 ± 39	-23.23	AD 56 (95.4%) AD 236	EAP

Table 1: *Radiocarbon Dates from La Playa (continued)*

Lab No.	Feat #	Feature Type Material	Dated	14C Date BP	13C ‰	Calibration OxCal 4.2	Cultural
UA-A13522	397	Horno	Charcoal	1,855 ± 55	-25.3	AD 48 (90.4%) AD 260	EAP
UA-AA33185	32	Horno	Maíz	1,825 ± 50		AD 73 (85.4%) AD 264	EAP
UA-A13271	198	Horno	Charcoal	1,855 + 100/-95	24.6	54 BC (95.4%) AD 410	Trincheras
UA-A13520	243	Cremation	Charcoal	1,845 ± 125	-22	165 BC (95.1%) AD 434	Trincheras
UA-A13523	328	Horno	Charcoal	1,835 ± 50	-24.2	68 AD (88.8%) 261 AD	Trincheras
UA-A13518	86	Cremation	Charcoal	1,835 + 180-175	-22.3	209 BC (94.0%) 581 AD	Trincheras
UA-AA83050	150	Canid	Collagen	1,801 ± 52	-9.3	AD 84 (95.0%) 347 AD	Trincheras
UA-A13272	199	Horno	Charcoal	1,790 ± 45	-24	125 AD (93.6%) 355 AD	Trincheras
UA-AA79742	336	Horno	Charcoal	1,762 ± 37	-23.4	AD 209 (85.7%) AD 383 A	Trincheras
UA-AA58396	348	Horno	Carbonized seed	1,756 ± 38	-10.42	AD 209 (89.0%) AD 389	Trincheras
UA-A13279	435	Cremation	Charcoal	1,725 + 50/-45	-25.1	AD 210 (92.6%) AD 424	Trincheras
UA-A8746	2	Cremation	Charcoal	1,675 ± 60	-23.7	AD 240 (95.4%) AD 535	Trincheras
UA-A13277	381	Horno	Charcoal	1,655 + 45/-40	-23.5	AD 319 (85.8%) AD 535	Trincheras
UA-A13274	250	Horno	Charcoal	1,585 ± 45	-22.9	AD 386 (95.4%) AD 580	Trincheras
UA-AA60709	317	Inhumation	Collagen	1,560 ± 54	-16.5	AD 392 (95.4%) AD 611	Trincheras
BA-B204289	361A	Inhumation	Collagen	1,530 ± 40	-20.5	AD 427 (95.4%) AD 609	Trincheras
UA-AA60711	279	Inhumation	Collagen	1,503 ± 72	-17.1	AD 416 (95.4%) AD 656	Trincheras
UA-A13273	213	Horno	Charcoal	1,420 ± 40	-24.1	AD 565 (95.4%) AD 666	Trincheras
BA-B207294	469b	Horno	Carbonized material	1,400 ± 60	-23.7	AD 540 (91.1%) AD 721	Trincheras
UA-A8743	17	Horno	Charcoal	795 ± 50	-23.5	AD 1154 (93.7%) AD 1289	Trincheras
BA-B204293	469a	Cremation	Carbonized material	650 ± 50	-23.3	AD 1275 (95.4%) AD 1404	Trincheras
BA-B204290	420	Inhumation	Collagen	240 ± 40	-12.2	AD 1619 (40.1%) AD 1685	Protohistoric

Trincheras Tradition (150 to 1450 CE)

The transition from the Early Agricultural period to the ceramic Trincheras period is marked mainly by the widespread production of pottery and a shift from inhumation burials to predominantly secondary cremation burials. Continuity in occupation is otherwise reflected in the artifact assemblages, and we believe that the transition reflects *in situ* developments.

Decorated pottery first appears early in the subsequent Trincheras tradition phase (350/400–800 CE). We have identified two potential local sand temper procurement zones: the Magdalena and Boquillas petrofacies. Temper differences between Trincheras Purple-on-red and Trincheras Purple-on-brown suggest diverse production areas; Trincheras Purple-on-red is consistently associated with a lithic volcanic or sedimentary temper, whereas Trincheras Purple-on-brown is predominantly associated with a mineral-rich temper source. Jars, tecomates, and bowls represent the predominant vessel form in this phase (Morales 2006).

Curiously, only a very few intrusive ceramics have been recovered; a few sherds of Vahki Plain indicate Early Pioneer period contacts with the Hohokam area, and four Medio period polychromes from the Paquimé region along with a single Santa Cruz Polychrome bowl document limited contacts with southern Arizona and eastern Chihuahua between approximately 1225 CE and 1450 CE. We suspect that during the Cerro phase (1300–1450 CE) most of the population relocated to Cerro Trincheras, on the Río Magdalena 10 kilometers to the south.

Figure 5. (A) Empire, (B) San Pedro, and (C) Cienega projectile points.

Protohistoric Period (1450–1690 CE)

Sparse sherds of Wingfield Plain, along with an archaeomagnetic date of 1750–1820, obtained from an unusual, thickly plastered horno, purportedly excavated by Emil Haury in 1938 (Johnson 1960: 22), provide evidence for a limited occupation during the Protohistoric period.

Historic Period (1690–1960 CE)

Historic occupations date from the late 1800s to 1960. It appears that it was a difficult task to make a living based solely upon livestock animals or crops, as these components were never very substantial (Velásquez 2005). Beginning in the 1920s, the last family to occupy the site derived their livelihood providing food and beverages for the bus and automobile traffic traveling along the principal artery connecting mainland Mexico to Baja California Norte, and even serving as a customs station; local lore recounts that the great Mexican entertainer Pedro Infante spent time here when his bus was waylaid by the flooding arroyo. In 1960, when the *Carretera* 2 was completed—shifting the traffic 10 kilometers to the north—the family was forced to abandon their home and relocate to Estación Trincheras (Bojalil 2004).

Identifying and Interpreting the Early Agricultural Period (EAP) Community

It was during the Early Agricultural period (2100 BCE to 150 CE) that La Playa reached its maximum size and population; at its zenith, the site grew to encompass approximately 10 square kilometers during the latter portion of the Cienega phase (800 BCE to 150 CE) occupation. At La Playa, the earliest radiocarbon date for this period is 3,720 +/- 320 (AA53243) and is associated with the burial of an adult female 25–35 years old (Feature 323).

Countless thousands of hornos (roasting features), several hundred human inhumation and cremation burials, numerous dog burials, shell ornament production and lithic reduction activity areas, caches of manos and tabular “lap stone” slabs, and a schist quarry are the predominant features associated with the Early Agricultural period. Intriguing evidence for agricultural fields covering some 35 hectares and canals has also been identified. These features are evident only in aerial photos, and remain invisible to surface inspection. Although we initially suspected that these features were associated with historic farming, several alignments of contiguous roasting pits, each ranging from 50 to 150 meters in length, are oriented parallel to the canals and at right angles to widely spaced (approximately 10 meters) furrows/feeder canals. Radiocarbon dates from adjacent features suggest that these horno alignments are most likely associated with the Cienega phase. Additionally, the highly fractured condition of the fire-cracked rock within the roasting features suggests that water may have been employed in the roasting process, and their linear arrangement may reflect placement along canals.

Canals

An extensive network of ditches observed from aerial photography (Carpenter et al.

2003b, 2005) as well as from observations in the field (Carpenter et al. 2003b, 2008; Copeland et al. 2012; Schott 2012) clearly indicates intensive cultural modification to the landscape, and is likely the result of a canal network, perhaps similar to that observed at Las Capas (Mabry 2008). Systematic investigation of the canals at La Playa is currently being conducted by Rachel Cajigas, a graduate student in geosciences at the University of Arizona.

Recent geoarchaeological investigations by Copeland et al. (2012) suggest that the canal networks began to be constructed during the San Pedro phase (1200–800 BCE or 3,150–2,750 cal BP); gastropods suggest that perennial standing water existed during the formation of Unit B3 (dated to 3,770–3,110 cal BP), corresponding to the San Pedro phase. A date of 5,220 ± 220 cal BP was reported from a canal in the Los Montículos locality by Schott (2012: 38); however, she cautioned that the charcoal is likely reworked from an older deposit, as this radiocarbon age is much older than any known dated archaeological features at the site. Copeland et al. (2012) recorded abundant archaeological remains and extensive canal systems from Units B4/B5 dated to 2,330–1,580 cal BP. Gastropods suggest permanent water, which, along with the extensive canal system, is evidence that an anthropogenic wetland existed during the peak occupation at the site in the Cienega phase (800 BCE–50 CE or 2,750–1,900 cal BP).

Similar canal systems have been documented at EAP sites in the Tucson Basin and dated to between 1500 and 1100 BCE (Mabry 2008, 2009; Jim Vint, p.c. 2014); these canals are among the earliest known for the Americas.

Hornos

The excavated roasting pits range from 0.45 to 4.02 meters in diameter and range from 0.50 to 1.18 meters in depth, and most reflect a globular profile (figure 6). However, some roasting features reach monumental mound proportions, exceeding 10 meters in diameter and rising to 2 meters above the surrounding surface; at least some would appear to have been constructed as mounds and do not likely reflect the result of surrounding deflation of previously subterranean features. Their immense proportions are likely indicative of community-wide ritual feasting activity. Sampled roasting pit features were bisected, with one-half of the feature excavated in its entirety, preserving and recording the remaining half in profile. Both flotation and pollen samples were collected from within the matrix.

Figure 6. Excavating roasting pit features.

Analyses of the horno contents reveal abundant plant and animal remains. A total of 94 flotation samples (379.71 liters) was analyzed, 12 pollen samples and 44 charcoal grab samples, representing a total of 83 features; these included 68 roasting pits (or 0.4 percent of the approximately 1,500 documented thermal features) and five burned storage pits (Martínez-Tagüeña 2005; Martínez-Tagüeña and Sánchez 2005; Sánchez 1998). The archaeobotanical samples yield several evidences: seeds, achenes, caryopsis, fruit, and involucre, which permitted the identification of 27 different taxa; the charcoal specimens provided three trees and one cactus, and monocots that indicate the presence of four different plants (grasses, reed, and yucca). Among the plants identified are legumes (acacia, mesquite, ironwood), goosefoot, amaranth, chia, globe mallow, purslane, ground cherry, mustard, various grasses, reed, yucca, prickly pear, cholla, saguaro, wild tobacco, and maize as the only cultigens (table 2). The La Playa floral inventory includes plants of all seasons, suggesting that the La Playa population lived in the site year-round, and reflects a sedentary population, although, as yet, only two possible habitation features have been documented at the site. The high density of midden deposits, the great quantity of burials, and the thousands of manos and metates present in the archaeological record are an indication that the La Playa population was unquestionably fully sedentary and the paucity of houses appears to be the result of the erosional forces affecting the site preservation.

The only domesticated plant identified at the site is maize, present in 47% of the analyzed samples. Legumes such as mesquite represent the most abundant wild seed (51%), followed by chenopod and amaranth combined with 42%, and purslane and graminea with a ubiquity of 28% and 21%, respectively. Fifteen radiocarbon dates have been obtained from roasting pits and storage pits, and 12 of these contain maize remains indicating that maize was abundant at La Playa by at least 2,000 years ago; however, it is very probable that maize was present at the site at least 1,000 years earlier.

Along with the quantitative values, crucial information for further interpretation of the plant repertoire of La Playa was obtained by consulting the ethnobotanical literature of the Pima and Tohono O'odham groups (Castetter and Underhill 1935; Rea 1997; Russell 1975 [1908]). Ethnobotanical accounts of these groups written in the late 19th and early 20th centuries continue to provide a great source of information. Historically, there were more than 12 different groups of

Table 2. *Plants Identified in the La Playa Roasting Features*

Plants Identified	Common Name	Part Identified
Acacia Type	Catclaw	Seed
Ambrosia Type	Bursage, Canyon Ragweed	Achene
Atriplex Type	Saltbush, Desert Holly	Fruit and Charcoal
Boerhaavia Type	Spiderling	Seed
Carnegia gigantea Type	Saguaro	Fiber
Cenchrus Type		Involucre
Cheno-am Type	Goosefoot and Amaranth	Seed
Cruciferae Type	Mustard Family	Seed
Descurainia Type	Tansy Mustard	Seed
Erigeron Type	Princely Daisy, Aspen Fleabane	Achene
Euphorbia Type	Spurge	Seed
Gramineae Type	Grasses	Caryopsis
Leguminosae Type	Legumes	Seed
Nicotiana Type	Wild Tobacco	Seed
Olneya Type	Ironwood	Charcoal
Physalis/Solanum Type	Groundcherry	Seed
Populus/Salix Type	Cottonwood/Willow	Charcoal
Portulaca Type	Purslane	Seed
Phragmites Type	Reedgrass	Monocot
Prosopis Type	Mesquite	Seed and Charcoal
Rumex Type	Curly Dock, Canaigre	Achene
Salvia Type	Chia, Desert Sage	Seed
Sphaeralcea Type	Globemallow	Seed
Yucca baccata Type	Banana Yucca	Seed
Zea mays Type	Maize	Cupule, Kernel, Shank

O´odham living in the northern half of Sonora and we use the ethnographies of these groups as analogs because of their long adaptations to the difficult and extreme conditions of the desert.

Most of the plants recovered in the samples were utilized as food by the indigenous groups, with the exception of four taxa (princely daisy, reedgrass, zacate, and wild tobacco), which were primarily utilized in construction, tools, instruments, fuel, ritual objects, and basketry. Among those plants used as food, only four (maize, mesquite, opuntia, and saltbush) are generally considered to have been processed in roasting pits. The other plants that are prepared using fire in general are boiled, parched, or roasted (like amaranth, purslane, goosefoot, and chia) and roasting pits are not the ideal feature for their preparation; it is probable that seeds fell into the fire while being processed.

Recent studies carried out by Copeland and colleagues (2012) provide the first systematic study of the chronostratigraphic Holocene deposits at La Playa; of special interest is Unit B1/B2, found especially at the Dos Pisos locality, where exposures are deep enough in the central and southern portions of the site and it occasionally presents as two distinct layers. The strata have been dated to 4,330 +/- 90 and 4,160 +/- 80 cal BP with charcoal obtained from two occupational surfaces that contained charcoal (Copeland et al. 2012: 2937). With this new information and with the objective being to recover and date the earlier evidence for *Zea mays* at La Playa, we began focusing attention upon roasting features found within B1/B2 which predated the San Pedro phase. In 2012, we excavated and extracted flotation samples from 10 roasting pits. Five hornos contained *Zea mays* cupules and grains; we anticipate that radiocarbon dating of these remains will provide an early date.

The presence of species such as mesquite, cottonwood, and phragmites in the La Playa plant inventory provides clear evidence of the extreme disturbance that this region of the Sonoran Desert has suffered as a result of recent human impacts, and it is clear that during the Early Agricultural period the Boquillas River was a highly dynamic river system that contained a mosaic of biotic communities that included wetlands, mesquite bosques, and riparian zones. The botanical values for abundance and ubiquity observed at the La Playa site reveal that the most economically important food resources were legumes, chenopods, amaranths, and maize, followed by purslane and grasses. The plant inventory for La Playa contains maize, as well as weeds and opportunistic weeds associated with the fields, suggesting that during the Early Agricultural period a mixed economy of foraging and farming was practiced. The changes in food resources that apparently occurred throughout this period probably indicate increased dependence on wild resources and maize, probably due to a population growth during the Cienega phase and the existence of a full-time agricultural community. An increase in plants that preferred disturbed habitats likely correlates with greater areas impacted by human activities. This investigation supports the idea that cultigens were an important economic resource from the beginning, and maize was incorporated into the economic strategies of the community as an important food that eased the uncertainty of acquiring enough food resources, which permitted them to continue harvesting wild resources.

Faunal Remains

Analyses of the La Playa fauna recovered from excavated roasting pits indicate that rabbit/hare and deer comprise the majority of the remains recovered (Martínez-Lira 2006; Martínez-Lira et al. 2011). A single horno (Feature 145) produced the remains of over 20 rabbits, and perhaps indicates the use of communal net drives. Desert bighorn, pronghorn antelope, tortoise, and turkey are also represented within the assemblage (Martínez-Lira et al. 2011: 37–41). Crab, sea urchin, and fish remains were recovered in small amounts, and reflect marine resources transported approximately 120 kilometers from the Sea of Cortéz (Martínez-Lira et al. 2011: 38). One horno (Feature 146) contained elements representing at least 10 redtailed hawks (*Buteo jamaicensis*) (Martínez-Lira et al. 2011: 42); the lack of charring or cut marks on a number of bones representing wings and phalanges is suggestive of bird bundles utilized for medicinal rituals (Martínez-Lira et al. 2005). Similarly, another unusual horno feature was found to contain the remains of 24 crows (*Corvus corax*), sans cranial and rib elements, and may also likely represent a ritual bird bundle (Martínez-Lira et al. 2011: 44).

Canid Burials

Dog burials are among the most abundant feature types at the site, and 28 burials containing 36 individuals have been excavated to date. They are most often located within the large, dispersed “cemetery” areas, but do not occur in direct association with their human counterparts. Dogs were generally placed upon their left sides in a curled, semi-flexed position, without grave offerings. No evidence of consumption of dogs has been found. Taking license with Saxe (1970), placement within areas utilized for human inhumations may likely reflect upon the role of canids vis-à-vis group membership.

Regarding the evidence of double and multiple canid burials at La Playa, we propose that the dogs’ relationship with humans was significant enough that they were buried in a communal and/or ritual manner (figure 7). In the case of Feature 463 with the remains of seven dogs, all were juvenile and were found jumbled, one on top of the other; according to Hill (2000) similar age at death may suggest some kind of ritual or communal burial (Martínez-Lira et al. n.d.)

The identification of the canid bone remains from the La Playa site

Figure 7. Double dog burial.

represents the first research of this type carried out in the north of Mexico for the Early Agricultural period. The La Playa sample is, without doubt, the most abundant for this time period in northwestern Mexico/southwestern United States. The data obtained are a contribution to studies related to this region, especially because there was no information regarding the sites located south of the U.S. border. The results obtained will be of use as reference for subsequent analysis regarding the presence of canid burials and types of dogs of the first agricultural villages in this area. By comparing the dog remains at La Playa and in Arizona to other types found in Mexico and in the southwestern United States, it was observed that they are of the same size as the common dog or common Indian dog. Nevertheless, the data obtained from La Playa and the Arizona sites are not sufficient to effectively corroborate that we are dealing with this type of dog; presently, it can only be suggested that the Arizona and La Playa dogs have a height that fits into the limits established for the common dog or common Indian dog (Martínez-Lira 2009; Martínez-Lira et al. n.d.).

Shell Ornament Production

Tremendous quantities of marine shell are found throughout the site. Forty-nine genera representing 58 marine shell species have been identified; what percentage reflects the Early Agricultural period assemblage cannot be precisely determined. However, the greatest variability in shell species is apparently associated with the preceramic components, and charred shell is present in the hornos dating to the Cienega phase. Comparison with the Cerro Trincheras assemblage (ca. AD 1300–1450) indicates considerable differences between the two assemblages, with few species in common and drastically different percentages. For example, *Conus* sp. dominates the Cerro Trincheras assemblage at 58.35% (Vargas 2011) and represents but 0.13% at La Playa. *Glycymeris gigantea* dominates the La Playa shell assemblage, with 6,471 blanks, bracelets, and debitage representing 68.3% of all recovered shell; lap stones, rasps, reamers, gravers, split metapodial awls, and antler-tine punches are commonly associated with shell-working areas (figure 8). Other prominent shell species include *Nacarada* sp. (8.4%), *Modiolus subnodosus* (7.6%), *Laevicardium elatum* (1.6%), *Vermetid* sp. (0.87%), *Chione purpurissata* (0.70%), *Olivella dama* (0.30%), and *Arene fricki* (0.26%).

Figure 8. Shell bracelet production process.

Lithic Industry

The flaked stone assemblage, in general, is consistent with Early Agricultural period assemblages from the Donaldson and Los Ojitos sites in southeast Arizona (Huckell 1995), and includes a full complement of bifaces, drills, backed knives, scrapers, planes, denticulates, and notched, retouched, and utilized flakes (Ochoa 2004). Tabular agave knives are also present.

Approximately 90% of the flaked stone industry utilized locally available raw materials, including quartz, fine- and medium-grained basalt, rhyolite, andesite, diorite, and latite. Fine-grained crypto-crystalline materials comprise approximately 9% of the assemblage, with obsidian comprising approximately 0.01%. One knapping station composed of two distinct cherts contained two reconstructible Cienega points that were broken and discarded during manufacture. There does not seem to be a significant difference in raw materials used in the production of San Pedro and Cienega points. At least one San Pedro projectile point was manufactured from a heat-treated chert.

The ground stone assemblage includes a phenomenal number of one- and two-sided cobble manos, slab and basin metates, basalt trays, bowls, and proto-palettes, pestles (including the peculiar "horned" type), reamers, rasps, and a large number of hammerstones. Raw materials are predominantly granitics, followed by schist, rhyolite, and basalts. Hammerstones, however, are virtually all manufactured from a dark green diorite.

Also of note, an arkosic schist quarry is situated atop a low hill where the Boquillas emerges onto the alluvial plain. Here, the bedrock was deeply incised, with tabular slabs removed with the aid of quartz cleavers. Although use of the quarry continued through the Trincheras period, characteristic schist implements, particularly the reamers and rasps used in shell ornament production, are common in Early Agricultural period components.

EAP Ceramics

Several sherds of a previously unidentified pottery type have been found in association with Cienega phase components (Morales 2006). This type, named La Playa Plain (formerly Lisa A), is a well-made, coiled-and-scraped, polished brown ware with a fine sand temper, and is readily distinguished from the Trincheras pottery tradition. One roasting feature containing sherds of La Playa Plain produced a radiocarbon date of 1,940 +/- 55 (4 to 129 CE). A single sherd was also found within an undated bell-shaped storage pit. La Playa Plain comprises approximately 2.5% of the ceramics collected from the site, although this is likely not a true representative sample, as the majority of our efforts have been concentrated in areas perceived to be associated with the Early Agricultural period. Still, it is present in significant numbers and in several contexts that suggest that this type may likely have been manufactured at La Playa, although the possibility that it is intrusive cannot be discounted.

Cienega Phase Pithouse

Large quantities of household cultural materials have been found eroding out to the surface all over the site, indicating that an agricultural village was established during the Early Agricultural period. Pithouses are very hard to find at the site because the very fine silt matrix inhibits the visibility of pits and pithouses. In 2011, a burned pithouse (Feature 550) was observed eroding out in a gully erosion wall at the center of the site. Approximately half of the house was gone, and the remaining half was excavated. This pithouse measures 3.5 meters long and has an entryway oriented to the west; 24 small postholes, 3–4 centimeters in diameter, were found surrounding the internal perimeter of the pithouse. The house did not have any evidence of a central hearth or storage pit inside. Several artifacts were found inside the house: four large Cienega points (between 7 and 9 centimeters long), a polishing bone tool, a polishing lithic tool, two lithic reamers, and one rock with a red pigment. A large range of burned organic materials (e.g., wood charcoal, wood artifacts, leaves, seeds, stems) was contained inside the house and the paleobotanical analysis is still in process. A ^{14}C date was obtained from charcoal placing the house in the Late Cienega period (AA93711, 1,900 +/- 30; OxCal 4.2; 28 CE/214 CE).

Bioarchaeology of the EAP Community at La Playa

The human remains recovered from La Playa over the past two decades represent the largest EAP skeletal sample in the region. The sample consists of 310 mortuary features, containing the remains of approximately

345 individuals. The distribution of radiocarbon dates from 54 of these burials (from bone collagen and associated charcoal) spans much of the occupation at the site, but the vast majority date to EAP phases: unnamed = 5, San Pedro = 10, Cienega = 32. Burials have been recovered up to 4 meters in depth at the site and across nearly 4 square kilometers of the site's extent (figure 9), but preservation varies greatly. Both natural and cultural processes (past and present) have disturbed numerous features, affecting the condition and preservation of the remains. We estimate that more than half of the sample is in poor condition—damaged, fragmented, and/or few elements preserved. The large spatial extent, considerable (temporal) occupation, and extensive erosion of the site indicate little pattern to the location, organization, or distribution of burials at La Playa. However, a number of burials appear to have been placed in direct association with each other, representing burial clusters or formal interment areas of up to four (or more) individuals.

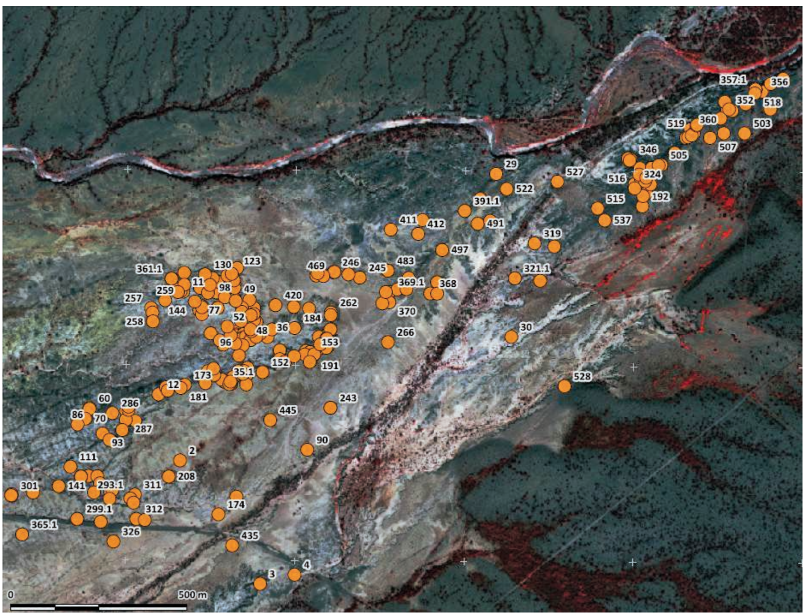

Figure 9. Satellite image of eastern portion of La Playa with burial locations plotted.

The sample consists of very few juveniles (*n* = 56; 16.23%), which may partly be the result of the poor preservation of fragile infant and child skeletal remains (T). However, many individuals lived well into senescence and the pattern of age distributions at death may reflect a relatively healthy population and low early mortality rates. The sample contains relatively even proportions of males (*n* = 132; 53.4%) and females (*n* = 117; 46.6%) among adolescents and adults across later age groups (figure 10).

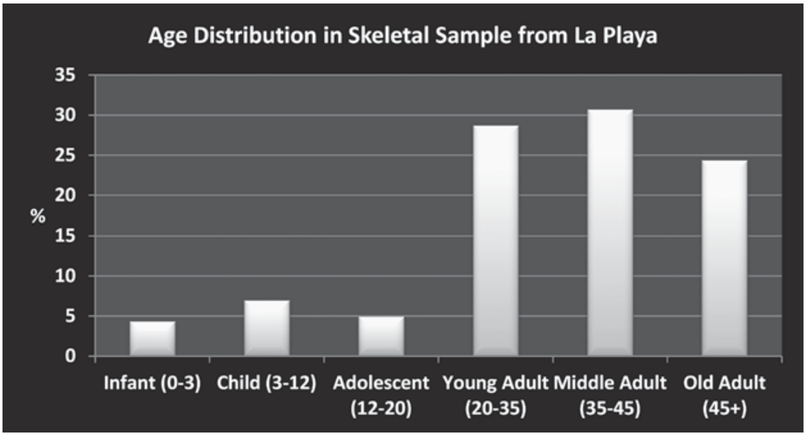

Figure 10. Age distribution of individuals in La Playa skeletal sample.

Mortuary Patterns

The vast majority of individuals at La Playa were interred as inhumation burials (*n* = 301; 87.2%), with significantly less as cremations (*n* = 44; 12.8%) (table 3). Although only seven cremations have been radiocarbon dated, these all fall within the later part of the cultural sequence at the site, including four dating to the Late Cienega phase and three to the post-EAP ceramic sequence. This would indicate that the practice of cremation came late to the site and was practiced to a very limited extent. It further matches patterns observed at contemporaneous sites in the region whereby a few cremations appear during the San Pedro phase (J. Vint, p.c. 2014; Watson and Byrd 2013), rise in frequency to about 13% during the Cienega phase, and then become a co-dominant mortuary practice at subsequent Formative period Hohokam sites in southern Arizona (Watson and Cerezo-Roman 2010).

The vast majority of burials at La Playa are represented by flexed primary inhumation (table 3); however, deviation from this pattern includes double primary inhumation, secondary inhumation (single and multiple), and both primary and secondary cremation (Carpenter et al. 2003a; Watson 2011). These additional forms of mortuary features have been documented at several contemporaneous sites and suggest that, although they do not conform to the apparent larger normative practice, a few forms are common enough to represent a regularized expression of mortuary variability between EAP communities (Watson 2011).

Table 3. *Attributes of Burial Treatment in La Playa Skeletal Sample*

Position	**%* (*n*)**	**Side**	**%* (*n*)**	**Orientation**	**%* (*n*)**	**Treatment**	**%† (*n*)**
Flexed	66.3 (126)	Right	28.2 (55)	North	16.9 (38)	Ochre	32.2 (97)
Semi-flexed	18.4 (35)	Left	27.2 (53)	East	16.0 (36)	Artifacts	12.0 (36)
Extended	15.3 (29)	Supine	35.4 (69)	South	19.6 (44)		
		Prone	6.2 (12)	West	47.6 (107)		
		Seated	1.0 (2)				
		Head-in	2.1 (4)				

**Percentage of individuals with attribute recorded in inhumations (n).*

Most primary inhumations were tightly flexed (66.3%), although semi-flexed and extended burials are not uncommon. Several authors have noted evidence for the use of cordage or textiles in binding the burials as part of the interment process at EAP sites, including La Playa (Carpenter et al. 2003a; Mabry 1998a, 2005, 2008; Thiel and Mabry 1997; Watson et al. 2006). Individuals were placed in equal proportions on either side (55.4%) or on the back (supine); however, seated and prone placements were also not unusual. The direction of body placement (or cranial orientation) varied dramatically but individuals were more commonly placed with the head oriented in a westerly direction.

Nonperishable associated funerary objects are limited within La Playa mortuary features, documented with approximately 12% of individuals. The variety of associated objects is also somewhat limited, but includes marine shell jewelry (beads and pendants), utilitarian ground stone (manos and metates), and projectile points. Other objects documented include stone pipes, bone tools, quartz crystals, and mineral pigment. The most common treatment afforded individuals interred at La Playa was the application of red ochre to all or parts of the body (32.2%). Most individuals were completely covered in red ochre suggesting use by the living as body decoration or application to the entire corpse as part of the mortuary ritual (Carpenter et al. 2005; Watson et al. 2006). Red ochre was also applied to burials at contemporaneous EAP sites but was more commonly limited to the mouth and pelvic area (Mabry 2008; Thiel and Mabry 1997). Mabry (2005) argues that the placement and application of ochre in mortuary contexts functioned to convey social identity and additionally symbolized the continuity of life and death.

Uncommon Mortuary Patterns

Three double primary inhumations have been documented at La Playa (Carpenter et al. 2003a): (1) an older adult female with an infant (6–9 months), (2) an adult male and 16- to 18-year-old female, and (3) two adult females (one old and one young). The latter two sets of these burials were covered in red ochre. Similar burials have been recorded at contemporaneous EAP sites (J. Vint, p.c. 2014; Thiel and Mabry 1997). There appears to be no regularized combination to these features beyond the otherwise normative characteristics of body placement and treatment. They are similar to single primary inhumations with the exception that there are two individuals buried in the grave.

One burial at La Playa consisted of a primary inhumation burial of an adult male covered by the secondary deposit of another, partially disarticulated male, with a large deer antler placed over the two bodies. The partial articulation of several elements of the secondarily deposited individual indicates that he would have been exhumed from the original interment and deposited with the remains of the more recently deceased individual. Multiple secondary inhumations have also been documented at several other EAP sites (Huckell 1995; Mabry 2005; McClelland 2010; Thiel and Mabry 1997), and share many of the same characteristics common to the normative single primary inhumations, including treatment with ochre and some associated funerary objects.

The cremations recovered from La Playa also demonstrate a considerable amount of diversity, including both primary and secondary contexts. Ten of the 12 primary cremations were remains recovered from formal crematoria—oval or square pits defined by a thick burned-earth rind (Carpenter et al. 2003a, 2005). Cremations have been documented at half a dozen other EAP sites (Dongoske 1993; Hesse and Lascaux 2005; McClelland 2010; Minturn et al. 1998; Thiel and Mabry 1997).

Six burials at La Playa are recognized as deviant burials, in that they don’t conform to normative burial practices. These individuals were placed vertically, head first, in deep pits or forced into pits, which resulted in dislocated joints and postmortem fractures. None of these individuals had any signs of burial treatment (i.e., ochre staining or associated objects) suggesting a very different process and significance in placement of the body. Elsewhere, these cases have been referred to as "body disposals" (Watson et al. 2010, 2012). This concept is exemplified by the four individuals from La Playa that were placed in a pit with the head on the floor, the upper body lying up the wall, and the legs precariously splayed above the body. The position of these burials suggests that the individuals had been dumped into a pit without regard for placement and filled quickly. A similar example was documented at the early EAP site of Las Capas (Mabry 2008). All of these deviant burials are of males, mostly young adults, and often display signs of perimortem trauma.

Health, Disease, and Pathology

Skeletal pathology is relatively infrequent in the La Playa skeletal sample (table 4). Evidence for anemic reactions (cranial porosity) are rare and, when present, are mild to moderate in form. The vast majority of evidence for infection (affecting 13% of individuals in the sample) is nonspecific bone lesions such as discrete periosteal lesions on long bones. These are commonly the result of localized traumas, subperiosteal hematomas, and new bone formation. A few individuals show signs of more serious systemic infections including osteomyelitis and reactive bone lesions on ribs, vertebrae, and hip bones. Five adult individuals show signs of lung infection on the inner aspect of several ribs, and one adult female displays severe infection and bone destruction of left hip, most likely from tuberculosis.

Table 4. *Frequency of Skeletal Lesions in La Playa Skeletal Sample*

Pathology	*n*	%
Cranial Porosity	21	9.7
Non-Specific Infection	29	13.4
Infectious Disease	10	4.7
Degenerative Disease	71	32.7
Oral Pathology	97	44.9
Trauma	50	23.1

Skeletal lesions related to degenerative disease and functional stress, although more common (33%), were relatively mild and largely took the form of lipping on the body of lumbar vertebrae—indicative of a workload stress on the lower back. On the whole, individuals in the sample exhibited limited amounts of functional stress as they aged, indicating a life relatively free of degenerative disease (Watson et al. 2006).

Information on oral health is available for a large number of the La Playa individuals because teeth often preserve better than bone. Oral pathology, including caries and tooth loss, affects almost half (45%) of the individuals in the sample. This frequency is considered relatively high when compared to other populations that practiced a mixed-subsistence economy (Turner 1979). These data indicate that the diet was relatively reliant on cariogenic carbohydrates (Watson 2008a), a pattern traditionally attributed to agricultural dependence around the world. However, in the Sonoran Desert there are a number of local plant species that would have been consumed that are equally cariogenic, such as cactus (pads and fruit), mesquite beans, and agave (Watson 2008a). This supports the supposition that these early farmers continued to practice a mixed-subsistence economy.

Dental attrition within the sample is relatively heavy, but also extremely variable. A quantitative assessment of attrition revealed that the angle of wear on molar occlusal surfaces increased (greater slope/angle) from the San Pedro to Cienega phase (Watson 2008b). Steeper wear angles have been shown to be consistent with consumption of a highly processed agricultural diet (Smith 1984). This suggests that although the overall contributions of plant resources to the diet of these early farmers did not change much for almost 2,000 years, mechanical processing of these resources may have intensified during the Cienega phase.

Adult statures varied quite a bit, ranging from 155 to 172 centimeters for males (5’1” to 5’6”), and from 142 to 165 centimeters for females (4’7” to 5’4”); however, the modes for both sexes were relatively high indicating a fairly tall population overall. These stature estimates indicate that nutrition and health were adequate, at least during development. Overall, the skeletal evidence indicates that the early farmers of the Sonoran Desert were relatively healthy. The limited presence of infectious disease and nutritional deficiencies likely suggests that population densities were moderate and food security was relatively good.

Trauma, Violence, and Conflict

Traumatic bone lesions (healed and perimortem) are common observations in the La Playa skeletal sample (table 4). Fractures are the most common traumatic injury and have been observed on crania (both male and female), mandibles, arm and leg bones, patellae, ribs, vertebrae, wrist bones, and fingers and toes (Watson et al. 2010). Other examples of traumatic lesions include an adult female with a healed amputated right forearm, an adult male with a projectile point embedded in the back of the head, and an adult female with a dislocated femoral head with associated osteoarthritic growth.

Trauma to the skeleton does not necessarily equal violence, especially among part-time foragers where accidents are common. Although traumatic lesions are present in 23% of the sample, positive evidence for violence is confirmed for only about 5% (Watson et al. 2012). This is low compared to later agricultural groups in the region (LeBlanc 1999; Rice and LeBlanc 2001) but still indicative of a moderate level of interpersonal violence in early farming communities. In addition to blunt-force fractures and embedded projectile points, "body disposals" are also indicative of violent acts.

Similar patterns of traumatic lesions are observed at other EAP sites in southern Arizona—averaging about 20% (Watson and Byrd, 2013). These traumatic injuries also included clear evidence for violence, suggesting some level of violence was common among these groups. The majority of causes proposed for violence in the region, which broadly include both internal (social) and external (environmental) explanations, center on studies in the northern Southwest and among later agricultural groups and have limited applicability to the early farmers of the Sonoran Desert.

Significant evidence for violence during this period, however, indicates that perhaps intercommunity conflict was pervasive, and several researchers have demonstrated that horticultural groups have higher rates of warfare compared to hunting and gathering communities (Knauft 1990; Nolan 2003; Otterbein 1970; Richerson et al. 2001). Nolan (2003) further notes that more acts of violence occur in horticulturalists that have above-average population densities, linking violence to environmental and resource stress. Others have noted that the number of violent acts also increases with increasing quantities of unrelated people living in a given location (Richerson et al. 2001). Though there is little evidence of competition for resources amongst the EAP communities, there is clear evidence for increases in population densities over the course of this period.

Human Mobility

Mobility strategies should figure prominently in the adoption of agriculture, as adaptive strategies entail considerable variation in how groups respond to the use of cultivated foods (Stokes and Roth 1999). They depend on resource availability and seasonality, and groups may use different strategies throughout the year, or even at the same time to facilitate the exploitation of important resources (Kelly 1983: 296).

Archaeological data indicate that EAP groups in the Sonoran Desert employed a mixed-subsistence economy. Yet continuity in village location and structure and irrigation systems at numerous floodplain sites—which only increase in size and complexity through time—imply that settlement was essentially permanent. Given the continued exploitation of wild foods and investment in distant material resources, it is likely that these early farmers practiced a form of logistical mobility. Ethnographic data from the American Southwest demonstrate that agricultural groups regularly integrated logistic mobility and a gendered division of labor (Stokes and Roth 1999).

The analysis of skeletal geometric morphology from EAP samples has led several authors to suggest that mobility may have differed between males and females during this period (Byrd 2014; Ogilvie 2005; Watson and Stoll 2013). Ogilvie (2005) demonstrated that although femoral cross-sectional geometry was dramatically different between samples of foragers from the Lower Pecos (TX) and agriculturalists from Pottery Mound (NM), it was similar between sexes within each sample indicating similar mobility strategies were employed by males and females. However, intermediate values observed among a sample of EAP forager-farmers from Matty Canyon (AZ) demonstrated a significant difference between males and females, which led her to suggest that they engaged in a gendered logistic mobility strategy.

More recent analyses by Watson and Stoll (2013) similarly identify a significant degree of sexual dimorphism in femur midshaft dimensions in EAP samples (including numerous samples from La Playa), and suggest that males participated in more frequent foraging activities than females. They also recognize that the rugged terrain of the Sonoran Desert would have likely played a significant role in the degree of sexual dimorphism in femoral geometry observed in EAP samples. Frequent forays over rugged terrain to forage local resources could easily produce the femoral shape observed among males in the samples. However, given the evidence for foraging distant material resources among EAP groups (such as marine shells and obsidian), they consider that the combination of distance and elevation would have had a measurable effect on femoral dimensions and robusticity (Watson and Stoll 2013). These conclusions differ from other biomechanical studies of mobility among foraging groups in that traveling long distances is not obligatory for significant femoral bending forces in the Sonoran Desert.

The conclusions of these studies are important because they suggest that EAP groups practiced a form of gendered logistic mobility strategy. While both men and women would have contributed to the domestic and agricultural investments in the villages located on the floodplain, men likely made regular foraging excursions across rugged terrain to exploit subsistence and material resources, and possibly foraged across significant distances.

Supporting evidence for differential mobility within EAP groups may also come from biological relationships between these communities. A recent study of biological distance based on cranial measurements identified significant phenotypic variability among males within and between EAP sites, whereas females exhibit greater phenotypic similarity within sites (Byrd 2014). Byrd (2014) suggests that these patterns could result from, and reflect, the practice of male exogamy and matrilocal residence between EAP communities.

Conclusions

We believe that the unique occupational history and abundant archaeological features of La Playa allow our interdisciplinary and multi-themed research to address the environmental history of the Boquillas Valley in the Sonoran Desert region and the *longue durée* of human adaptation in the Sonoran Desert, and truly enable us to raise time to the level of explanation. The first groups to enter the Boquillas Valley were small bands of Clovis hunters who hunted the megafauna that grazed upon the lush grasslands. The climatic changes that occurred with the end of the Pleistocene apparently prompted a moderately abrupt shift from an emphasis upon hunting to a mixed-subsistence hunting and gathering strategy that maximized the exploitation of available plant resources characteristic of the Archaic period (Sánchez and Carpenter 2012: 143).

We have also proposed (Carpenter et al. 2001, 2002, 2005, 2008) the likelihood that the Sonoran Desert was largely abandoned as a result of increased temperatures and decreased precipitation during the Altithermal. Limited artifacts and ^{14}C dates associated with this period may likely reflect brief incursions into the Sonoran Desert during cyclical periods of ameliorative climatic conditions. When the Altithermal period ended, the Sonoran Desert apparently experienced a return of more amenable climatic conditions, and was rapidly recolonized by incipient maize cultivators who had adopted maize near the end of the Altithermal or the initial stages of the Late Holocene. These people were probable Sonoran Uto-Aztecan-speaking groups who were the first *norteños* to adopt maize and who quickly dispersed from their presumed heartland (e.g., Miller 1983), recolonizing the Sonoran Desert region and contributing to the great linguistic diversification of this language family at this time. These incipient agriculturalists of the Sonoran Desert apparently selected alluvial settings characterized by low-energy streams with seasonal overbank flooding.

Approximately 4,000 years ago, people colonized the alluvial plains along the Boquillas in the Magdalena river system in northern Sonora as well as along the Santa Cruz River in the Tucson Basin (e.g., Las Capas, Los Pozos, Santa Cruz Bend, Clearwater, and Cortaro Farms) (Herr 2009: 2), inhabiting relatively permanent settlements and eventually transforming these riverine environments into agricultural systems composed of fields, canals, and artificial reservoirs. Although *Zea mays* was the principal crop cultivated in the fields, amaranths, quelites, and many other opportunistic plants were incorporated within the subsistence system; maize contributed an additional foodstuff to the diet but the La Playa community continued to base their diet on a mixed economy combining wild resources with their cultigen(s) for at least two millennia.

The few cases of anemia and other diseases observed in the bioarchaeological data appear to indicate that people at La Playa enjoyed relatively good health. The La Playa population reached its peak during the Cienega phase. Immense roasting pits and roasting pits containing at least 20 rabbits perhaps indicate that ritual feasting was a mechanism promoting social cohesion of the population.

Unquestionably, the vast quantities of marine shell from the Sea of Cortéz, located approximately 120 kilometers to the west, comprise the most significant non-local resource encountered at the site. Whether shell was procured directly by the occupants of the site via travel to the coast or, alternatively, was acquired through trade with coastal fisher-foragers (ancestral Comca'ac) has not been established. However, Trincheras period sites like Playa Noriega, a Comca'ac site near Bahía Kino with significant quantities of Trincheras Purple-on-red, suggest significant interaction between the Trincheras tradition folk and the ancestral Comca'ac, and there is presently no reason to believe this pattern could not have been established during the preceramic period. In addition to the abundant marine shell utilized in the production of ornaments, as was noted in the discussion of the faunal remains, foodstuffs were also obtained from the Sea of Cortéz.

Mineral resources were obtained from a variety of far-ranging regions. Virtually all of the obsidian at La Playa comes from the Antelope Wells source on the New Mexico/Chihuahua border, some 350 kilometers to the east. Spectrographic analysis indicates that a high-quality red argillite is derived from the Tonto Basin, approximately 400 kilometers to the north, in central Arizona (James Gundersen, p.c. 1999). Turquoise from an as yet unidentified source is also present. Hematite, frequently utilized in burials, is often present as residue on numerous pestles and palettes, and may come from known deposits near Magdalena (Fay 1958), approximately 50 kilometers to the northeast; however, McLaurin et al. (2007) reported the occurrence of hematitic sandstone in the Boquillas Hills.

A composite stone pipe (figure 11) manufactured of scoria sourced to the Pinacate region of extreme northwestern Sonora, and with a stemmed mouthpiece of vermetid shell from the Sea of Cortéz, was included as a grave offering with the burial of an adult male 45+ years of age (Feature 324). Radiocarbon dating of bone collagen (AA53244, 2,556 +/- 54) assigned this burial feature to the early Cienega phase (1 sigma between 690 and 550 BCE, or between 840 and 510 BCE at 2 sigma confidence interval).

The sources for the crypto-crystalline raw materials, including a wide variety of cherts, chalcedony, and petrified wood, are as yet unknown. Small nodules of chert are only rarely encountered among Río Boquillas cobbles, which are composed almost entirely of igneous parent material from the surrounding mountains.

Why the EAP population shifted from primary inhumation burials to

Figure 11. Composite stone pipe.

primary and secondary cremation burials during the terminal Cienega phase is unknown; however, continuity in material culture is otherwise indicative of continuity of occupation by the same peoples during the subsequent Trincheras period. Contra Haury (1950: 547) and Johnson (1960, 1963: 182–185), we do not view the Trincheras tradition as a "desert branch" variant of the Hohokam, but consider it as a distinct tradition. While acknowledging similarities with the ceramic traditions of the Papagueria and Tucson Basin (cf. Ezell 1954, 1955), we perceive a greater affiliation with other traditions in Sonora, and include the Trincheras ceramic tradition in what McGuire and Villalpando (1993) define as "Desierto Brownware," characterized by relatively thin-walled vessels with pronounced scrape marks produced by coil-and-scrape manufacture. Among the archaeological traditions we group under this designation are the ancestral Comca'ac (Bowen 1976: 113–114), the Huatabampo tradition of southern Sonora and northern Sinaloa (Álvarez 1981, 1982, 1985, 1990; Carpenter 1996, 1997; Ekholm 1942), the Río Sonora (Pailes 1972, 1976), and Serrana (Carpenter 2014; Carpenter and Vicente 2009) archaeological traditions. ✜

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A Record of Collaboration and Students

From those modest beginnings, the Proyecto Arqueologico La Playa evolved into a truly transnational interdisciplinary and multi-thematic research project, involving several professional colleagues, principally from the Instituto Nacional de Antropología e Historia (INAH), the University of Arizona, and the Universidad Autónoma de México (UNAM), as well as a number of undergraduate and graduate students

from universities in Mexico, the United States, and the United Kingdom. Those colleagues who have collaborated with the La Playa project include Jim Holmlund, GEOMAP (cartography); Art Rohn and Ethne Barnes, Wichita State University (bioarchaeology); Jim Mead, Northern Arizona University (paleontology); Brett T. McLaurin, Department of Geography and Geosciences, Bloomsburg University of Pennsylvania (geology); Jay Quade, Department of Geosciences, University of Arizona (geology); Vance Holliday School of Anthropology and Department of Geosciences, University of Arizona (geology); Sergey Sedov, Instituto de Geologia, UNAM, Mexico City (edaphology); Elizabeth Solleiro, Instituto de Geologia, UNAM, Mexico City (edaphology); Mike Brack, Desert Archaeology, Inc. (cartography); Penny Minturn and Lorrie Lincoln-Babb, Arizona State University (bioarchaeology); Robert J. Hard, Department of Anthropology, University of Texas–San Antonio (stable isotopes); Jennifer Leonard, Estación Biológica Doñana, Sevilla, España (DNA).

To date, the project has produced nine undergraduate *licenciatura* theses from the Universidad de las Américas-Puebla (UDLAP), Escuela Nacional de Antropología e Historia (ENAH), and University of Arizona (UA): Coral Montero (UDLAP 2004 funerary patterns); Sarahi Ochoa (UDLAP 2004 lithics); Andree Bojalil (UDLAP 2004 historical archaeology); Veronica Velazquez (UDLAP 2004 historical archaeology); Natalia Martinez (UDLAP 2005 paleoethnobotany); Cristina Garcia (ENAH 2005 lithics); Patricia Martínez (UDLAP 2006 zooarchaeology); Juan Jorge Morales (UDLAP 2006 ceramics); Audrey Copeland (UA 2011 stratigraphy and geochronology).

Also produced were seven master's theses from the University of Arizona (UA), University of York (UY), Universidad Nacional Autónoma de Mexico (UNAM), University of Texas–San Antonio (UTSA), and University of Pennsylvania (UP) and one Ph.D. dissertation from the University of Nevada–Las Vegas (UNLV): Guadalupe Sanchez (UA 1998 paleoethnobotany); Patricia Martínez (UY 2008 zooarchaeology [canids]); Aileen C. Elliot (UP 2011 geology); Tamara Cruz-y-Cruz (UNAM 2011 soils); Rachel Byrd (UA 2012 bioarchaeology); Amy Schott (UA 2012 geoarchaeology); Ashley Jones (UTSA 2014 stable carbon and nitrogen isotopes); James Watson (UNLV 2005 bioarchaeology). There are an additional four graduate theses currently in process.