ARCHAEOLOGY SOUTHWEST *magazine*

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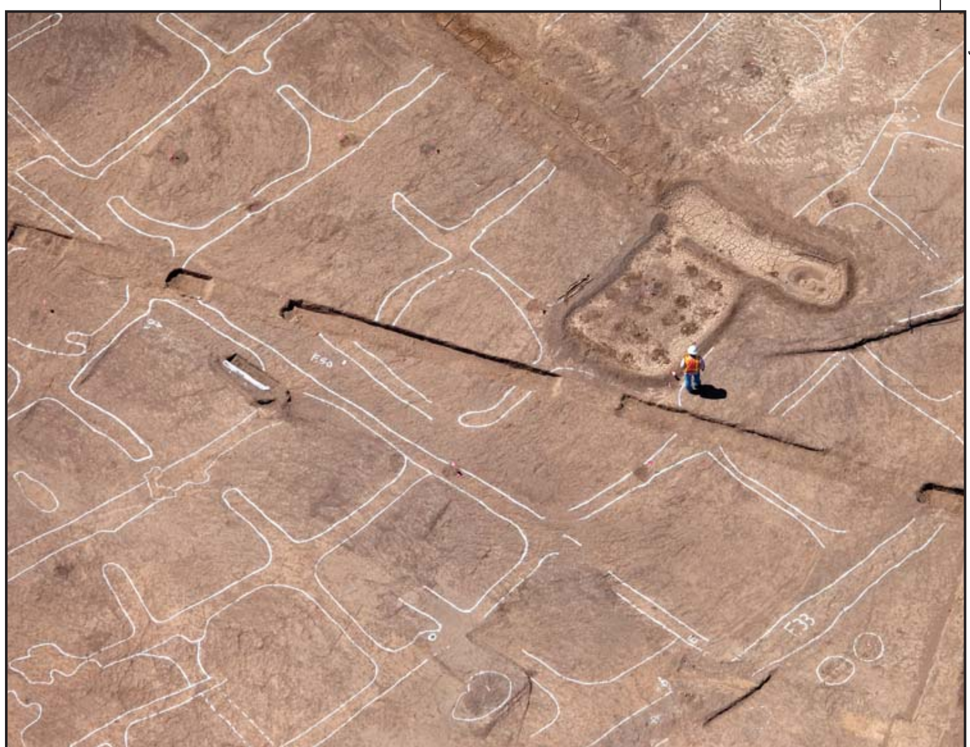
The Latest Research on the Earliest Farmers

Sarah A. Herr, Desert Archaeology, Inc.

IN *MAN MAKES HIMSELF,* archaeologist V. Gordon Childe described how the radical choice to domesticate plants and animals in the Near East, after millennia of foraging and hunting, led to economic and social changes that resulted in village life, cities, and nothing less than the foundation of Western civilization.

Linda Cordell (see pages 8–9) notes that the agricultural economies of the Greater Southwest were founded on maize, which originated in tropical Mesoamerica and was domesticated over thousands of years. To search for the origins of agriculture in the New World, researchers distinguished wild grasses from domesticates, recorded the dates of and places where maize was found, and attempted to find its points of origin and pathways of dispersal.



Henry D. Wallace

An archaeologist with Desert Archaeology, Inc., examines a re-created field area within the roughly 3,000-year-old expanse of irrigation canals and bordered fields currently under excavation at Las Capas in the Tucson Basin. More than fifteen acres of fields were once present. See pages 10–11 for more Las Capas photographs.

Early dates in well-preserved rockshelters at Bat Cave, Fresnal Shelter, and McEuen Cave suggested the presence of a highland corridor of maize agriculture along the Sierra Madres and into the Southwest until Bruce Huckell identified early farmers in the floodplain environments of the Sonoran Desert, most notably at the Milagro and Matty Canyon sites. Then, in the early 1990s, cultural resource management projects along the floodplain of the Santa Cruz River in the Tucson Basin began to expose extensive agricultural settlements as early as those of the highlands. Layers of flood events were peeled away to reveal earlier occupations.

In 1999, when the first *Archaeology Southwest* issue devoted to early agriculture was published, archaeologists could distinguish changes in architecture, craft technologies, and subsistence strategies well enough to define three archaeological phases for the Early Agricultural period: the San Pedro phase (1200–800 B.C.), the early Cienega phase (800–400 B.C.), and the late Cienega phase (400 B.C.–A.D. 50). On the Colorado Plateau, the period between about 1000 B.C. and A.D. 500 is broadly referred to as the Basketmaker II. Now, ten years after the first *Archaeology Southwest,* much progress has been made by archaeologists. Today, the earliest known maize and settlements in this region date to around 2100 B.C., and the earliest known canals are dated to approximately 1500 B.C.

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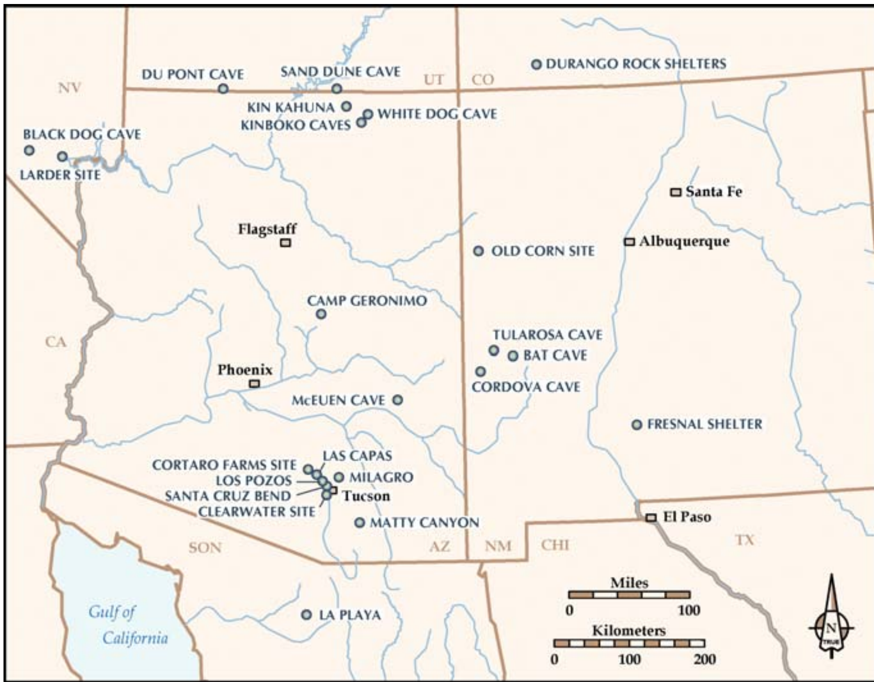


Map of archaeological sites mentioned in this issue.

After maize seemingly exploded out of Mesoamerica around 4,500 years ago, as described by John Roney and Robert Hard (see pages 4–5), it was found at virtually the same time in open and sheltered settings, and at large and small settlements from the Old Corn site near Zuni to La Playa, in Sonora, as discussed by John Carpenter, Elisa Villalpando, and Guadalupe Sánchez (see page 14). Michael W. Diehl notes that some sites have evidence of maize, squash, and beans, but all botanical assemblages are dominated by wild foods, in a mixed farming and foraging economy that lasted for millennia (see pages 12–13). As researchers have continued to study these patterns, the idea of a single way for maize to come from Mesoamerica to North America has been discarded.

Early studies tended to assign a strong role to environmental factors in explanations for the adoption of agriculture. As knowledge of the time depth, spatial extent, and variability of early farming sites has grown, more recent research has focused on people's ability to make an environment amenable to crop production. As demonstrated by Carla R. Van West (see pages 5–6) and David A. Gregory, Fred L. Nials, and J. Brett Hill (see pages 7–8), environmental information identifies the potential and the limits of the physical environment on agricultural production. Interdisciplinary research as wide-ranging as the study of cave formations, changes in ocean temperature, and sunspots helps us to understand how people evaluated soil types, groundwater availability, rainfall, temperature, exposure, and frost-free days when choosing where to settle.

But the physical landscape is malleable, and when people made the commitment to domesticate crops, they exercised control over the movement of water, earth, and fire at a scale previously unknown in the Southwest. Fire was used in the fields of Central America around 8,000 years ago. In the Early Agricultural period, canal systems, ditches, wells, dams, and terraces were probably developed locally to control the effects of seasonal water flow and imbue the soil with nutrient-rich sediments. The early farmers and foragers also lessened the effects of the seasons, digging hundreds of pits to stockpile food.

Because people chose to invest their time and labor in high-yielding plants like maize, successful harvests became essential for survival. Families occupied settlements near fields for longer periods and returned to them more often. The independence of single households was traded for access to watered fields created through the shared construction and maintenance of canals. These farmers built some of the earliest communal structures in the Southwest. With changes in food production came changes in the way that activities were divided among household members. As James Watson points out, sex-based differences in cavity rates of individuals in the southern Southwest and northwestern Mexico suggest that women were processing the harvested foods, a parallel that is found in agricultural, rather than foraging, societies around the world (see page 13). And Jonathan B. Mabry writes that as the relationship between

David A. Gregory

Changes in available water caused early farmers to dig wells, such as this eight-foot-deep feature from the site of Los Pozos, on the Santa Cruz River floodplain. The well could not be directly dated, but much of the surrounding settlement dates to the Late Cienega phase (400 B.C.–A.D. 50).

The Early Agriculture Advanced Seminar

To explore what is currently known of the first farmers in the Greater Southwest, an advanced seminar was held at the Colton House at the Museum of Northern Arizona on August 6 and 7, 2008, in conjunction with the Pecos Conference. This issue of *Archaeology Southwest* highlights some of the core themes of that discussion and our wish list for future research (see page 19).

people and their environment changed fundamentally, so too did their relationships with other people, their ancestors, and their cosmos (see pages 18–19).

Studies of the local and regional patterning of settlement in the early agricultural landscape show that the sudden appearance of maize around 4,000 years ago comes after a 1,500- to 2,000-year period when archaeological populations were virtually invisible across the Southwest. Phil Geib (see pages 15–16) points out that this leads to questions about who lived in this region immediately prior to the introduction of agriculture, and the identity of the first farmers. Did knowledge of farming diffuse northward from one community to another? Was farming brought northward by migrating populations moving into the area? Or was there both diffusion and migration?


Courtesy of Cline Library, NAU

This 1930s photograph portrays a Hopi farmer assessing his fields of melons (foreground) and maize at the start of the harvest. It serves as a reminder that to truly understand past places, we need to build a bridge between the information gained from archaeological samples and the living knowledge of today's Native American population. Jim Enote, the Executive Diretor of the A:shiwi A:wan Museum at Zuni Pueblo and a traditional farmer, helped those who attended the advanced seminar at the Museum of Northern Arizona in Flagstaff (see page 2) understand the dynamic relationship among seeds, land, and communities. His comments can be found at <www.cdarc.org/pages/what/resources/>.

The presence of contemporaneous sites with and without domesticated plants can be interpreted in two ways. A single group may have been farming in a floodplain as well as foraging for food in the uplands. Alternatively, two groups with different ways of obtaining food may have lived side by side. Broad patterns of clothing, baskets, rock art, and projectile points suggest variation in the cultural landscape in this period. At this time, all presumptions about cultural identities remain to be proved, but Laurie D. Webster (see pages 16–17) describes a method for differentiating cultures by identifying innate differences in technological training. She applies this method to perishables, but the premise is applicable to other artifacts as well.

This issue of *Archaeology Southwest* discusses our rapidly changing knowledge about the first farmers in the Southwest. Decades of documentation of the distribution of sites, artifacts, and subsistence resources have provided a strong regional baseline. Now, as recent large-scale projects on the Santa Cruz floodplain in the Tucson Basin and near Navajo Mountain expose significant numbers of structures, pits, and other features, we can examine the organization of households and communities, and begin to focus on the people behind the patterns. The choices of these individuals began the complex dynamic between societies and the environment that continues today, as governments and scientists now look at how to slow down or reverse the effects of human-wrought change.

Accelerator Mass Spectrometry (AMS) Dating

STUDIES OF CHANGE, such as the long transition to agriculture, depend upon being able to order objects (like pottery or projectile points) or contexts (such as a pithouse or a layer of trash) through time. The cultural layers within a site, or the geologic stratigraphy of a floodplain, help us to distinguish what is earlier from what is later, but do not necessarily provide absolute dates.

Independent dates relate an artifact or a context to our calendar. Many of these methods rely on geophysics, physics, chemistry, and statistical probability to estimate the age of a sample. The most common method used to date Early Agricultural and Basketmaker II materials is Accelerator Mass Spectrometry (AMS).

When they are alive, plants and animals absorb radioactive carbon-14 (^{14}C) from the earth's atmosphere. When they die, this absorbed carbon begins to decay at a known rate. AMS uses a particle accelerator to measure the amount of ^{14}C atoms remaining in a sample, and thus measure the passage of time since the death of the organism.

Laurie D. Webster (see pages 16–17) comments that she is fortunate to be able to date perishable artifacts directly using AMS because they are made of plant fibers. Other independent dating can be more tenuous. For example, the archaeologist must understand the relationship between the piece of maize in the hearth and the projectile point in the floor pit to be able to say that the AMS date from the maize helps to interpret the date of the point.

The Beginnings of Maize Agriculture

John Roney, Colinas Cultural Resource Consulting
Robert Hard, University of Texas, San Antonio

PREHISTORIANS BELIEVED for many years that agriculture in the New World began with maize. However, we now know that small-scale horticulture was widespread long before that. Squash, bottle gourd, and leren, a minor root crop, may have been grown in coastal Ecuador as early as 11,000 years ago. Domesticated squash was present in Oaxaca between 8,000 and 10,000 years ago, and bottle gourd was being grown in both North and South America at the same time (see page 5).

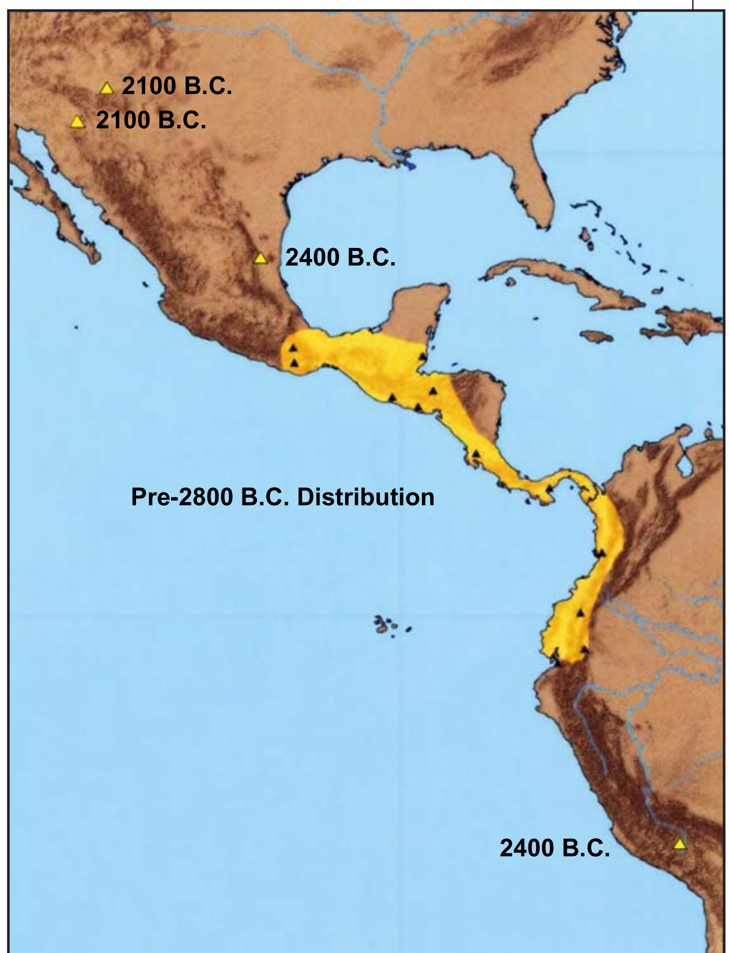
Evidence for the earliest horticultural societies is still somewhat controversial because it is primarily based on new microbotanical techniques. However, it seems likely that food production in Central America and adjacent regions before 7,000 years ago involved simple horticulture focusing on plants such as squashes and gourds, arrowroot, manioc, leren, yams, and maize, and perhaps tree crops such as palms and avocado.

We still do not know exactly when or where maize first appeared. Based on genetic and molecular studies, most researchers believe that a tropical grass, the *Balsas teosinte*, is ancestral to maize, and that it first appeared in the Balsas Basin of central Mexico about 9,200 years ago. By 7,000 years ago, some form of cultivated maize was widespread in Central America, as well as in adjacent areas of northern South America and southern Mexico. Semimobile foragers were experimenting with small-scale cultivation involving a mixture of root and seed crops; primitive maize was part of this mix.

Sometime prior to 6,250 years ago, further morphological changes in maize resulted in varieties that more closely resemble modern maize; presumably, these changes made the maize more productive. In the lowlands of Central America and adjacent regions at this time, slash-and-burn cultivation became more common, and the environmental and geographic range of maize expanded. In Mexico, maize that is 6,250 years old has been found in the highlands of Oaxaca, and maize that is 5,450 years old has been found in the semiarid Tehuacán Valley of Puebla. In southwestern Ecuador, maize with morphological changes indicative of greater productivity was dated to about 5,300 years ago.

About 4,500 years ago, there was a sudden expansion in the range of maize cultivation in both North and South America, which brought this cultigen into what is now the southwestern United States. In South America, the highland southern Peruvian site of Waynuna has yielded evidence for maize, arrowroot, and potato around 4,000 years ago. This site is some 900 miles outside the limits of the southern distribution of maize prior to 4,500 years ago.

A similar expansion in the range of maize occurred in North America. In Tamaulipas, both bottle gourd and squash were cultivated as early as 6,400 years ago, and maize was added around 4,400 years ago. As is now well known, maize reached the southwestern United States, about 1,200 miles north of central Mexico, only 300 to 400 years later.



Map of radiocarbon dates for early maize, illustrating the rapid movement of maize into South America and North America.

The spread of maize is remarkable not only because of the distances traveled, but also because of the range of habitats and environmental constraints transcended.

Given the tremendous importance of this early period of maize cultivation, it is amazing how little actual archaeological information is available from Mesoamerica. Ironically, our methodological advancements, allowing us to work with small particles, have surpassed our ability to work in the old-fashioned way, finding and excavating sites.

wikimedia.org

A bottle gourd growing on its vine, and bottle gourd artifacts that demonstrate how the thin, hard outer shell of the dried gourd made it ideal for scoops, ladles, and small containers.

Stephanie Mitchell

With the conspicuous exception of the Tucson Basin, in most regions we now know much more about early maize cupules, pollen, phytoliths, and starch than we do about early settlements and societies.

Several important points stand out in a review of early maize agriculture in Mesoamerica and beyond. First, all groups during this interval were small-scale societies that practiced either foraging or a mixture of foraging and horticulture. All documented subsistence systems relied heavily on hunting and gathering, and no architectural remains have been found. The agricultural village pattern typical of much of Mesoamerica did not emerge until around 4,000 years ago. Second, early horticulture involved a number of different species and combinations of species. Third, maize was usually added to pre-existing horticultural complexes, and the timing of its addition varied widely at different locations within its zone of distribution. Finally, maize was associated with squash and beans, as it is in the southwestern United States. It was also consumed by hunters, foragers, and full- and part-time farmers.

Who Were the Earliest Farmers in the New World?

WE HAVE KNOWN for several years now that domesticated squash was grown in Oaxaca, Mexico, between 8,000 and 10,000 years ago. Recently, David L. Erickson, of the Smithsonian's National Museum of Natural History, and colleagues have shown that bottle gourd was also widely cultivated in the New World at an equally early date. Bottle gourd is not a food plant; instead, it was raised to provide durable, lightweight containers, musical instruments, and fishing floats. It is an Old World plant, native to Africa but also widespread in Asia, where domesticated varieties were grown in China and Japan between 8,000 and 9,000 years ago. There are no known wild populations of bottle gourd in the New World. However, dated specimens demonstrate that this plant was cultivated in Florida, Mexico, and Peru between 8,000 and 10,000 years ago. Moreover, genetic studies show that the New World variety originated in Asia, rather than in Africa. The fact that it was so widespread as a cultigen prior to 8,000 years ago suggests that Paleoindian immigrants introduced this domesticated plant into the Americas.

The arrival of maize in the southwestern United States and northwestern Mexico was the culmination of a long and remarkable series of both biological and cultural processes whose story we are only beginning to understand.

Reconstructing Paleoenvironmental Conditions during the Early Agricultural Period

Carla R. Van West, SRI Foundation

NEW TECHNIQUES to reconstruct key aspects of past climate and their effects on local or regional landscapes in the Southwest continue to be developed. Within each time period, the available data vary in breadth and resolution. Archaeologists have access to several long, climatically sensitive, tree-ring chronologies with which to reconstruct annual variation in rainfall, temperature, streamflow, and the frequency of forest fires for the period between 2100 B.C. and A.D. 500. In addition, new data derived from speleothems, such as stalagmites, from caves in southern New Mexico and southern Arizona, can help to chart climate conditions in these desert settings for thousands of years. Environmental variations and trends at the scale of decades and centuries are available from a wider array of information sources, such as alluvial sediments, plant remains, animal bone, and shell.

Recently, paleoclimatologists have recovered fossilized shells from the Gulf of Mexico that have chemical signatures reflecting past seasonal rainfall, including the summer monsoon. Other sources of paleoenvironmental information include records of solar activity variation, fluctuations in the Pacific Ocean's temperature, ice core and ocean sediment core records, and histories of volcanic eruptions. We are just beginning to incorporate these newer

Richard V. N. Ahlstrom

Sarah A. Herr

Recent discoveries at the Larder site (top) and Camp Geronimo (bottom) remind us of how much more there is to learn about the Early Agricultural period in the Southwest. Even as we search for the first farming settlements that date to around 2100 B.C., we still do not know how domesticated seeds and agricultural knowledge spread to all the places of the Greater Southwest and northwestern Mexico by sometime between A.D. 50 and 500. The Larder site, situated at a reach boundary along Nevada's Las Vegas Wash, has been repeatedly farmed since its first occupation between 350 and 50 B.C. Camp Geronimo, on the banks of upper Tonto Creek, was occupied by maize and squash farmers at least five times between 800 B.C. and A.D. 500. Despite the presence of substantial Middle Archaic sites, no early farming sites have been found in the Phoenix Basin, an environment that later supported some of the largest populations in the Southwest.

sources of data into our long-term reconstructions, with encouraging results.

The recovery of 4,100-year-old maize from archaeological sites in both southern Arizona and west-central New Mexico has inspired researchers to reconstruct important aspects of paleoenvironments in these locales. What climate conditions, landforms, and biotic communities existed when these earliest farmers cultivated maize and native wild plants? Did environmental conditions just before the acceptance of maize by these Middle Archaic societies allow more frequent and successful harvests? In short, we want to know whether environmental conditions better suited to successful agriculture using simple farming techniques, such as high water table, floodwater, and runoff farming, were largely responsible for the incorporation of maize into hunting and gathering economies at this time, and how these environmental conditions influenced the rate of maize's spread across the Southwest.

In the Tucson Basin and the Zuni area (see page 7), archaeologists and their research collaborators have reconstructed past environmental conditions to better understand the Early Agricultural period. Despite differences in landforms, climate, and plant and animal communities, both localities, some 250 miles apart, experienced similar environmental changes. Researchers found that a major interval of erosion and channel cutting took place in rivers and streams in their respective areas about 4,500 years ago, perhaps in response to heavy rainfall and high-magnitude flooding associated with El Niño storms. The Santa Cruz River and the Carrizo Wash drainage began to fill for at least a millennium. During this interval of cooler and moister climate, with few large floods, fairly predictable rainfall, and aggrading alluvial sediments, maize was introduced into the subsistence economies of widely dispersed hunting and gathering groups in the Southwest.

The cultivation of maize and possibly other Southwestern crops was likely an opportunistic and discontinuous process for much of the Early Agricultural period. However, it is clear that maize became increasingly important in the diets and lifeways of early forager-farmers by the early centuries A.D. Environmental conditions certainly appear to have encouraged the acceptance of maize as an additional source of food, but other factors, including its potential productivity, its ability to be preserved and stored for long periods of time, and its ideological associations, were important as well.

Statistical Research, Inc.

View of the general setting of the Old Corn site.

The Old Corn Site

THE OLD CORN SITE, in west-central New Mexico near Zuni, excavated by Statistical Research, Inc. (SRI), contains an Archaic period food-processing and storage area, a Puebloan room block, and a historic campsite. It also contains several rockshelters, grinding slicks, and petroglyphs. However, what is most significant about the site is that very early maize, in the form of fifteen charred cobs, kernels, and glumes, was recovered from thirteen storage and thermal features.

Most of the maize samples dated to about 2200 to 1900 B.C. Archaeologists from SRI did not expect such early dates on well-preserved maize remains. Then, they realized that, by sheer chance, they had identified one of the earliest maize-bearing sites in the Southwest. It is unclear just where the maize was grown and by what method. The three most likely scenarios are that early Carrizo Valley maize was grown on the floodplain in overbank flood deposits, in slowly aggrading floodplain sediments irrigated from high water tables, or at the foot of alluvial fans watered by slope runoff and overbank floodwater. Future research at this site will reveal which techniques and locations were used to raise this important cultigen.

Stream Reach Boundaries: Persistent Places on the Landscape of Early Southwestern Farmers

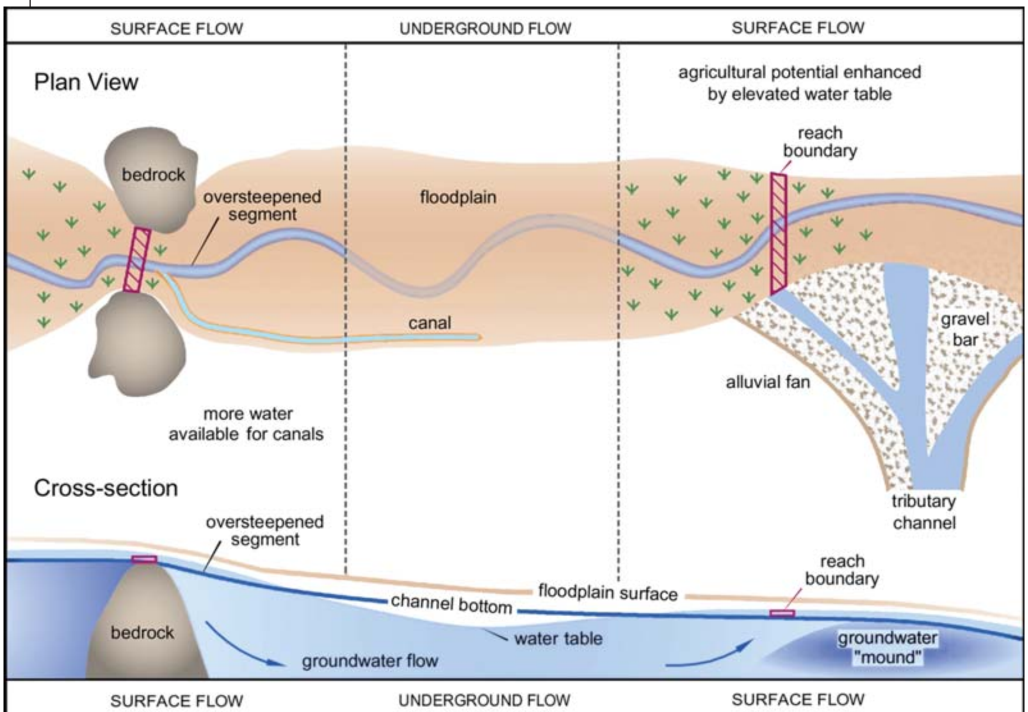
David A. Gregory, Fred L. Nials, and J. Brett Hill
Center for Desert Archaeology

EARLY AGRICULTURAL PERIOD FARMERS decided where to settle and plant their fields based partly on access to water. During this time, the largest settlements were located along the major streams and their principal tributaries, where water was more abundant and reliable than anywhere else on the landscape. We have called these places *stream reach boundaries*, since they constitute natural subdivisions of streams into a series of reaches, or stretches of the floodplain that are relatively uniform.

Reach boundaries are of two main types: those created by the presence of bedrock or relatively impermeable sediments in, beneath, or next to the stream channel, and those created by tributary confluences with main streams. They have been constant features of the Southwestern landscape for at least 8,000 years. Identifying reach boundaries on today's maps can help predict and explain the settlement choices of farmers 4,000 to 4,500 years ago.

Reach boundaries resulting from outcrops of bedrock or impermeable sediments create a barrier to groundwater flow, causing the water table to rise upstream from the barrier. If the rise is sufficient, *cienegas* (wetlands) and springs form, and the aquifer discharges into the surface channel, resulting in either a new segment of surface flow or increased perennial flow. Surface flow may be continuous along the entire length of a reach, or may eventually sink into valley-bottom sediments before arriving at the next reach boundary. High water tables at these boundaries result in increased vegetation, enhancing sediment deposition and leading to a wider, lower-gradient floodplain. This in turn allows floodwaters to spread over a larger area and reduce the potential for flooding of settlements and fields. A short, oversteepened segment typically occurs immediately below a reach boundary. This segment is characterized by straighter, deeper, and more constricted channels. Excess sediment may be deposited downstream from the steeper segment, and the channel may shift positions more frequently, causing the active floodplain to be wider below the boundary.

The stream reach concept helps to explain why confluences of tributaries and main stem channels were particularly attractive places for farming. Tributaries have steeper gradients than main streams. They transport proportionally larger amounts of coarser sediment, much of which is ultimately deposited on the main stream floodplain at and near the confluence. These deposits locally elevate and narrow the floodplain surface on the main stream, resulting in a flatter gradient above and an oversteepened segment immediately below the confluence. Groundwater from large tributaries may also cause the water table in the main stream to rise. In addition, during the Southwest's summer monsoon months, tributary floods do not necessarily occur at the same time as main stream floods. Farmers at or below the confluence would have made use of a prolonged runoff period. The combination of additional groundwater and increased sediment deposition on the main stream floodplain at tributary confluences duplicates the effects of bedrock boundaries elsewhere.



Plan and cross-section view that illustrates the effects of a reach boundary on stream behavior, making such locations ideal places for early farming.

Reach boundaries provided early Southwestern farmers with reliable water, arable land, and abundant plants to eat and to use in the construction of small houses. In addition, oversteepened gradients and wider floodplains below reach boundaries make boundaries themselves ideal places to divert water into canals to water fields. Some of the largest sites in the Tucson Basin were situated near reach boundaries, indicating that early farmers made good use of all these advantages.

Over the last three years, we have identified more than 300 reach boundaries in the upper watershed of the Gila River, as well as the Mimbres River. In addition, we have measured more than 1,500 miles of floodplain. We have found that the sites of early farmers were much more likely to be associated with reach boundaries than with any other locations. The same pattern was found to be true for late prehistoric and protohistoric sites (A.D. 1200–1600).

Stream reach boundaries have been important to the settlers of the Southwest for more than 8,000 years. It is not surprising, then, that along the Santa Cruz River, the Spanish missions of San Xavier del Bac and San Agustín, as well as the Tucson Presidio, are located in proximity to these geological features.

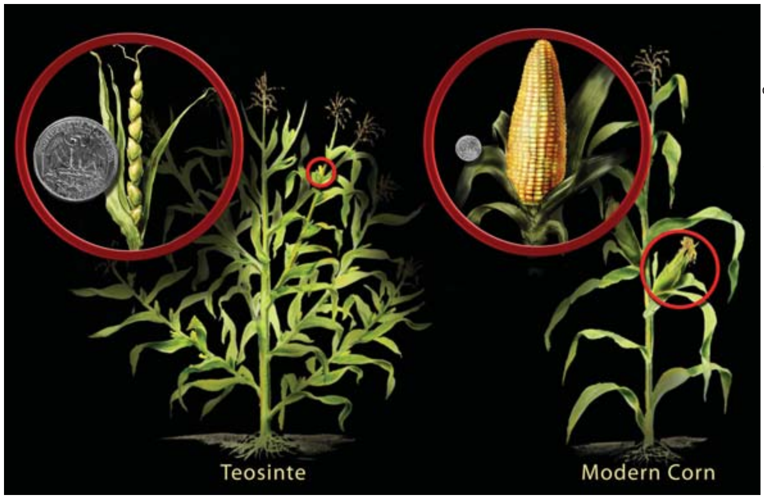
Thoughts about Maize

Linda Cordell, School for Advanced Research

MAIZE WAS THE MAINSTAY of the Hohokam, Ancestral Puebloan, and Mogollon economies. Today, maize is central to beliefs, prayers, and rituals of their descendants, especially the O'odham and Pueblo Indians. Despite its importance to indigenous Southwestern cultures, maize originated far to the south, in central Mexico. Understanding when, how, and ultimately why maize came to the Southwest is of great interest to archaeologists.

New information shows that maize was grown earlier and in more diverse topographic settings throughout the Southwest than expected. Around 2100 B.C., maize was used by the people of the Arizona deserts, the Mogollon Highlands, and the Colorado Plateau. The locations of Early Agricultural sites have been difficult to predict. Archaeologists first found early corncobs in dry, upland caves. Then, excavations on the Santa Cruz River (see pages 18–19) led us to expect early maize sites to be deeply buried in the desert floodplains. The corncobs (dating to 2200–1900 B.C.) found in relatively shallow features in the mountains near modern Zuni (see pages 5–6) were a complete surprise to archaeologists. It now appears that maize was widespread throughout the Southwest by about 2100 B.C.

Maize is genetically variable and morphologically plastic, as botanist Gary Nabhan reminds us in *Enduring Seeds*. The extraordinary number (about 300) of landraces, or varieties of maize, grown today is the result of human efforts to grow maize in diverse soil conditions, climates, and topographic settings. The adaptability of maize is reflected by the fact that it grows at sea level in the Caribbean, at 12,000 feet above sea level in the Andes, in moist areas in the American Midwest, and in sand dunes at the Hopi Mesas. Furthermore, the form of the corn (kernel color, cob shape, average number of rows, and so on) is only indirectly related to the genetics of the plant. For example, Hopi Blue flour corn and Tarahumara Blue flint corn are morphologically similar and diverged from the same ancestral stock not very long ago. Yet they differ in cob placement, days to maturity, ear weight, and other characteristics that allow the plants to survive in similar semiarid environments.



Nicole Rager Fuller, National Science Foundation

Indigenous peoples living in the lowland areas of southwestern Mexico may have cultivated corn or maize more than 8,700 years ago, according to new research. Molecular biologists recently identified a large, wild grass called Balsas teosinte *as the ancestor of maize. The suppression of branching from the stalk resulted in a lower number of ears per plant but allowed each ear to grow larger. The hard case around the kernel disappeared over time. Today, maize has just a few ears of corn growing on one unbranched stalk.*

Botanist Hugh Iltis calls maize a "super domesticate." All of the key properties of maize that differentiate it from its still-extant wild progenitor, teosinte, can be easily interpreted as the result of active human selection. Before mechanized agriculture, maize plants required individual planting and care. Variations, mutations useful for humans, would have been noticed and exploited by early hunter-gatherers. Although botanical research shows that the mutation that enabled people to domesticate teosinte was exceptionally rare, the effects of the mutation would have been visible and valuable to farmers. Similarly, modern Southwestern landraces of corn, such as Hopi Blue and O'odham sixty-day maize, are morphologically adapted to withstand arid conditions. We do not know how long it took to breed their drought-resistant characteristics. Their development required human knowledge and attention. These were not accidents.

Las Capas

Sarah A. Herr, Desert Archaeology, Inc.

TENS OF THOUSANDS of artifacts and thousands of features were found during the 1998 and 1999 excavations of approximately two acres of the Las Capas site, by Desert Archaeology, Inc., and SWCA Environmental Consultants, respectively. These projects greatly expanded our knowledge of the early and late San Pedro phases, when the first farmers spread across the Southwest.

Beginning last summer, Desert Archaeology project director James M. Vint, and a thirty-person crew, returned to Las Capas to investigate 120 acres. To date, the work has focused on reconstructing the landscapes of the period between 750 and 1000 B.C. Located at a reach boundary (see pages 7–8) where two large tributaries meet the Santa Cruz River, the environment was well suited to agriculture.

Residents built large oval houses and smaller circular houses along slight rises in the floodplain. Their storage and roasting pits surrounded their residences, and they looked out on canal-watered fields that sloped down to the river.

Sealed by later floods that eventually caused the abandonment of the settlement, the field and canal systems are remarkably well preserved. Linear earthen borders contained the water offered when canals were opened into the fields. Also preserved were the individual holes where farmers planted their seeds in the spring, and perhaps picked the plants at the end of the harvest.

As work continues through the summer, more layers of Las Capas will be removed to show how even earlier farmers, of the twenty generations that occupied the site, made use of this fertile area.

Henry D. Wallace

The current excavations at Las Capas are within the boundaries of the Pima County Regional Wastewater Reclamation Facility.

The photograph at the right reveals an extensive well-preserved Early Agricultural period landscape with agricultural fields, canals, and habitation areas. The most extensive areas of fields are located in the right center of the photograph. The soil colors of fields are clearly distinguishable from the raised earthern berms that helped contain the water released from the canal. The area to the left is closer to the Santa Cruz River. Canals are present in this area, though the detailed preservation of individual cells does not continue. Field features have been highlighted with white paint to improve their visibility for aerial photography.

In the photograph above, field crews begin work on pithouses in the early morning light. Layers of houses underlie, co-occur with, and postdate the surrounding fields. The image is a detail of the area at the far right of the photograph to the right.

Las Capas Photo Gallery

Gene Espinosa

Gene Espinosa

Above left: Ceramic containers had not yet been invented in the Early Agricultural period, so storage and cooking often took place in pits. Before the project is over, the Las Capas crew will have sampled and recorded thousands of pits. Above right: An archaeologist monitors one of three backhoes outfitted by Innovative Excavating, Inc., with a special stripping blade used to reveal the ancient fields and habitation areas.

Henry D. Wallace

Early Agricultural Period Food Provisioning and Foraging

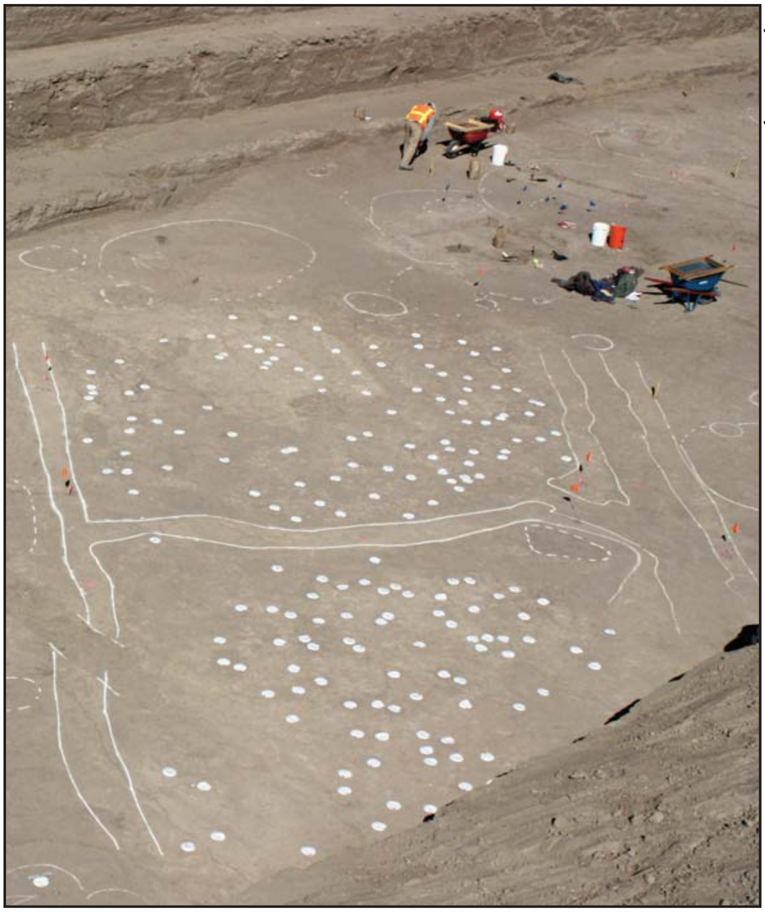
Michael W. Diehl, Desert Archaeology, Inc.

EARLY MAIZE was a short-cobbed, popcorn variety that was unimpressive when compared with modern corn; it was only an inch or two long. Compared to modern maize, it yielded smaller amounts of grain for the effort invested to grow it. However, it was somewhat more productive than wild grains, such as goosefoot and amaranth, which grew as abundantly in the Southwest prehistorically as they do today.

Despite the obvious desirability of maize compared with wild plants, the introduction of crops did not cause people to stop foraging for wild food. The continued dominance of wild foods in the diet is apparent when we compare food choices made by early agriculturalists with those made by people during the Early Ceramic (around A.D. 200) and Hohokam (around A.D. 1000) periods.

In 2000 B.C., maize was a relatively new resource in the Southwest. In southern Arizona, very little is known about the other foods that were eaten by these early farmers. However, information from several very early sites indicates that seven types of plants were consumed, one of which was a crop: maize, saguaro cactus fruit, wild grass seeds, mesquite pods, false purslane, and two kinds of prolific weeds, goosefoot and amaranth.

In 1000 B.C., maize was an established resource in the American Southwest. Irrigation canals in southern Arizona had been in use for at least 500 years. Maize was important because it provided a large amount of food in one easily accessible place. New crops may have been planted by this date, because a possible common bean was found at Las Capas. Despite efforts to intensify maize production, wild foods continued to be a large part of the diet. Based on samples from the Las Capas and Cortaro Farms sites, the residents ate more than twenty kinds of plants, most of which were wild grasses, weeds, and cactus fruit, along with maize. This pattern of intensive use of a broad range of resources continued until the first century A.D.



Gaylen Tinsley

At Las Capas, thousands of individual planting holes have been preserved. These holes, marked with paper plates, provide insights into planting techniques, the spacing of plants, and the potential yields of ancient irrigated fields.

By A.D. 200, a revolution in the economy of Southwestern peoples had occurred. Unlike their ancestors, people living in southern Arizona at this time fired true ceramic containers, shaping them primarily into seed-storage jars. The range of crops planted at that time included maize, beans, and squash for food and cotton for fiber. Something about the new economy brought about a decline in the use of many wild plants. Goosefoot, amaranth, mesquite pods, and cactus fruit were still commonly used, but wild grasses and weedy plants were used less frequently. The residents of southern Arizona during this time were eating about ten kinds of plants, of which two to four were crops. People were heavily dependent on farming. They used wild plants to add flavor or texture to other foods, or ate them in times of famine.

By A.D. 1000, very large irrigation canals were widely used to produce predictably high yields from farms. In addition, some few centuries before, maize had undergone a genetic mutation that transformed the tiny-cobbed low-yield popcorn into the large-cobbed high-yield corn we see today. Prehistoric farm fields yielded five to ten times as much grain for the effort. Maize was the primary staple, along with beans and squash. Changes in the size and shape of maize-grinding tools in the interval from A.D.

600 to 1000 were driven by the need to process more maize into meal. People were also learning to cultivate agave. During this time, thirteen types of plants were commonly eaten, of which five were crops. Wild grasses were rarely used, and the primary wild plants consumed were mesquite pods, saguaro cactus, tansy mustard (for flavoring), and goosefoot.

Food production by early agriculturalists contrasts with the crop-oriented subsistence practices of the Hohokam. From about 2100 B.C. to A.D. 50, maize was one important resource among many. The adoption of maize, and the slow development of an agricultural economy, fundamentally changed the organization of households, social customs, and the way people related to their world.

Life and Death among the Earliest Farmers

James Watson, Arizona State Museum

CHANGES IN DIET and the development of permanent settlements greatly affected the health of the region's earliest farmers. The study of 368 human burials, 267 of them from La Playa (see page 14), indicates that, overall, early agriculturalists in the Southwest were in good health, showing little evidence of infectious or degenerative diseases.

The majority of adults lived beyond the age of thirty-five, and about one in three survived past age forty-five. For the time, this was a relatively long-lived population.

However, their oral health was generally poor. Almost sixty percent of the individuals examined had evidence of cavities; the prevalence of cavities indicates the abundance of sugars and starches in their diet. This incidence of cavities is relatively high compared with other populations that practiced a similar subsistence economy. In addition, about forty-five percent of the individuals examined had lost at least one tooth. This, too, is a high percentage and is commonly associated with a greater reliance on agriculture.

In addition, women lost their teeth more often than men. This pattern has been seen in prehistoric populations worldwide, but it is more commonly associated with sedentary agricultural groups. It is often the result of the sexual division of labor; as women prepared food throughout the day, they tended to eat more processed food than men did.

The high amount of sugars and starches in the diet was partially due to the cultivation of corn, but in the Sonoran Desert, a number of wild plants would have been equally, or even more detrimental to dental health. These include cactus (pads and fruit), mesquite beans, and agave. Interestingly, the frequency of dental problems did not vary significantly between the San Pedro (1200–800 B.C.) and the Cienega (800 B.C.–A.D. 50) phases, indicating that the kinds of plants being eaten remained about the same throughout the Early Agricultural period (see page 12).

Detail of the erosion that has exposed a wide array of human burials and other features at the site of La Playa in northern Sonora.

La Playa: An Early Agricultural Period Landscape

John Carpenter, Elisa Villalpando, and Guadalupe Sánchez
Instituto Nacional de Antropología e Historia

LA PLAYA is the largest Early Agricultural period site in the area of northwestern Mexico and the southwestern United States. In 1995, archaeologists from the Instituto Nacional de Antropología e Historia began to recover and document the artifacts and features that were threatened by erosion of the Río Boquillas alluvial floodplain. More than a decade later, work at the site has grown into a multidisciplinary research project, involving archaeologists and students from both Mexico and the United States. This research considers environmental variables, bioarchaeological evidence, and changes in human settlement patterns to reconstruct how Early Agricultural period peoples moved from a foraging to an agricultural economy.

The Altithermal period (roughly 5500–3500 B.C.) was initially defined by geologist Ernst Antevs as a shift to higher temperatures and reduced precipitation. The rarity of Pinto/San José projectile points at La Playa suggests that this area, and much of the lowland desert borderlands, was abandoned during at least a portion of this time. Increased use of the Boquillas Valley coincided with a return to better climatic conditions after 3500 B.C.

The artifacts and features of La Playa are similar to those found at San Pedro (1200–800 B.C.) and Cienega phase (800 B.C.–A.D. 50) sites in southeastern Arizona. Early Agricultural period projectile points, including Empire, San Pedro, and Cienega styles, make up the majority of the identified assemblage. La Playa appears to have reached its maximum occupation sometime during the Late Cienega phase.

The 267 human burials recovered date to the Early Agricultural period, providing by far the largest burial sample for this time (see page 13). The physical characteristics of these burials suggest genetic connections with populations in southeastern Arizona.

We have also investigated more than 250 prehistoric archaeological features. These include human and animal cremations, dog burials, a variety of pits, flaked stone scatters, ground stone caches, two structures located on the slopes of the Cerro Boquillas, a probable pithouse, geoglyph figures, petroglyphs, about eighty-six acres of probable linear-bordered agricultural fields, irrigation canals, and a quarry for an arkosic schist used mainly to make reamers and rasps used in manufacturing shell ornaments.

The most common feature at La Playa was the *horno,* a subterranean oven. More than 1,300 *hornos*, ranging from about two to sixty-six feet in diameter, have been documented. While the majority appear to have been used by households, the largest *hornos* may indicate communal feasting. One *horno* contained the remains of at least ten redtail hawks.

Aerial overview of the location of the site of La Playa, which is being exposed by the extensive erosion of the Río Boquillas floodplain in northern Sonora.

Although maize was important to the residents of La Playa, wild plants, such as amaranth, chenopodium, mesquite, and cactus, continued to be used. Evidence was also found for the hunting and consumption of deer, antelope, rabbit, hare, tortoise, and desert bighorn. Fish and crab were transported to the site from the Sea of Cortez, about sixty-two miles away.

The most important craft undertaken at La Playa was the production of shell ornaments. Fifty-nine marine shell species have been identified, though *Glycymeris* is by far the most common shell recovered.

The excavations at La Playa demonstrate the importance of the alluvial valleys of the Sonoran Desert to our understanding of the development of agriculture in northwestern Mexico and the southwestern United States.

Continuity and Change in the Four Corners Region during the Agricultural Transition

Phil Geib, University of New Mexico

DID PEOPLE CONTINUOUSLY occupy the Colorado Plateau as they made the transition from hunting and gathering to farming? Were the earliest farmers in the Southwest previously foragers in the same region? A recent excavation project for the Navajo Mountain Road (N16) in northeastern Arizona and southeastern Utah provides some intriguing insights into these questions.

AMS dates (see page 3) from this project show that people abandoned the project area at least twice. The 154 radiocarbon dates for the N16 study area range from almost 8000 B.C. to A.D. 700. The dates indicate a major break in occupation between 4500 B.C. and 2200 B.C., and a short gap just prior to 400 B.C. This short gap is followed by significant changes in the subsistence economy and material culture. Most notably, sites from the N16 project area that date after this gap show a strong presence of maize. This raises questions about whether the people who returned to the area were the direct genetic descendants of the earlier residents, or if a new population moved into the vacated area.

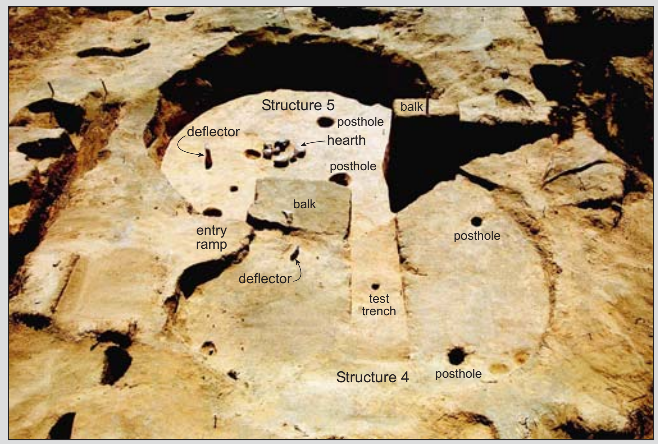
Although several N16 sites dated to about 1000 to 400 B.C., a time when maize was grown on the southern and eastern Colorado Plateau, no corn or squash was found at the N16 sites from this period. In contrast, nearly all preceramic sites dated after 400 B.C. contained maize, sometimes in great abundance. This pattern does not seem to be due to site setting or to preservation factors. Therefore, I have classified all sites on the earlier side of the date gap as Late Archaic because they appear to be the remains of a foraging lifestyle. The sites on the later side of the date gap are classified as Basketmaker II.

Support for this argument comes from the material culture. Besides a lack of domesticated plants, perishable artifacts from cave sites, projectile points, and other remains from Late Archaic sites are unlike those of typical Basketmaker II sites. Thus, there appears to have been a change in how people adapted to the natural and cultural environment after 400 B.C.

In summary, I believe that two different populations lived sequentially in the study area. The nonagricultural sites dating to before 400 B.C. represent foragers, not the

Kin Kahuna

KIN KAHUNA is one of more than a dozen Basketmaker II settlements excavated by Navajo Nation archaeologists on the Rainbow Plateau of northeastern Arizona and southeastern Utah. Excavations have revealed seven pithouses, twenty-six storage pits, thirty-two other pits, seventeen hearths, extensive trash deposits, and human burials. Six houses were completely excavated. A seventh, which lay mostly outside the project area, was sectioned only along its northern edge. The small houses (floor areas of about 200 square feet) seem barely sufficient for single families. All had central hearths that generally consisted of no more than fires built directly on the floor.



Navajo Nation Archaeology Department

Two of the round pit structures excavated by the Navajo Nation Archaeology Division prior to construction along Navajo Mountain Road (N16) in northeastern Arizona and southeastern Utah.

The maize recovered at the site dated from about 400 B.C. to A.D. 400. Of the four dated houses, two may have been contemporaneous, but the other two were occupied at different times. This suggests that the site never was home to more than two nuclear families at once.

One obvious reason for the long use of this location was the prime agricultural land that lay immediately north of the site at the confluence of two small drainages. The importance of maize for the occupants of Kin Kahuna seemed clear during excavation, because workers found corn kernels and cupules (sometimes cobs) in most features, either while digging or in sediment screening.

hunting-gathering camps of preceramic farmers. The archaeological patterns do not suggest that local foragers evolved into farmer-foragers, but they do support the idea that farming groups migrated into the area.

The N16 excavations took place in a modest-sized area that may not be representative of the entire region. Directly dated burials and artifacts demonstrate that Basketmaker people who used domesticates were present southeast of the N16 project area a few hundred years earlier. Therefore, Basketmaker occupation of the study area might represent little more than the expansion of farmer-foragers from a longer-occupied adjacent area. However, our results do suggest that the replacement of foragers by farmers across the Colorado Plateau may have been a complex process that did not follow the same time frame or sequence in all areas.

A Perishables Perspective on Social Boundaries during the Early Agricultural and Basketmaker II Periods

Laurie D. Webster, University of Arizona

PERISHABLE ARTIFACTS provide a unique perspective on social and cultural boundaries in the Southwest during the Early Agricultural and Basketmaker II periods. Thousands of perishable artifacts have survived because people made extensive use of rockshelters as temporary camps, storage sites, and burial places. This was not the case in all regions, however. Little is known about perishable traditions in the Sonoran Desert during the Early Agricultural period because most identified sites are in open settings rather than in caves.

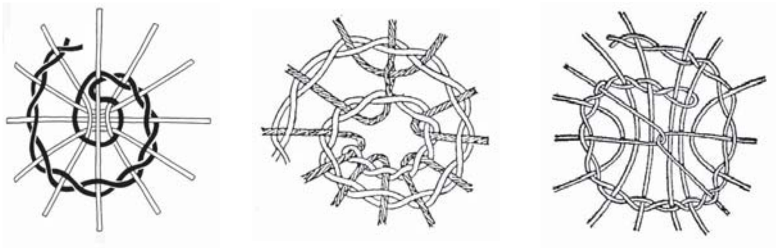
The perishables record improves east of the Tucson Basin. Many of the caves recorded by archaeologists C. Burton and Hattie Cosgrove in the Upper Gila contained a "Basketmaker" (probably Early Agricultural) component; Tularosa and Cordova caves produced numerous "Pre-Pottery" perishables. Our best information from the southern Southwest comes from McEuen Cave near Safford, where a diverse assemblage of perishable artifacts was recovered. Three artifacts from the cave produced calibrated accelerator mass spectrometry (AMS) ages between approximately 800 and 180 B.C.

Basketmaker II twined bag with painted design from White Dog Cave, northeastern Arizona. Twined bags offer various attributes, including starts, rim finishes, and methods of adding new warps, for comparing technological style across regions. (From Guernsey and Kidder 1921; see <www.cdarc.org/pages/what/resources> for citation.)

Most Basketmaker II perishables come from the Colorado Plateau. White Dog Cave, the type site for the early Basketmaker II occupation, yielded decorated coiled baskets, twined and looped bags, twined and plain-weave sandals, fur blankets, atlatls, and other items, all believed to date from 500 B.C. to A.D. 1. Sand Dune Cave and probably Kinboko Cave 1 also produced early perishables. Other Basketmaker II perishable assemblages, including those from Du Pont Cave and the Durango rockshelters, appear to date to the early centuries A.D. Recent excavations at Black Dog Cave, near Las Vegas, confirm the presence of a late Basketmaker II perishable tradition as far west as southern Nevada.

Patterned ways of making things are taught and passed down through families and other learning networks. Hard-to-see attributes of artifact manufacture, which require first-hand knowledge to produce and are difficult to imitate from afar, are particularly valuable for investigating population movements and shared social histories. For example, the hidden warp splices of twined bags appear to show regional patterning. Future studies of Early Agricultural and Basketmaker II perishables that focus on these attributes will enable archaeologists to better compare the variability of assemblages and, potentially, social groups, among sites and across regions.

The biggest handicap we face in interpreting these collections is a lack of knowledge about their chronology; unfortunately, only a handful of artifacts have been directly dated. As archaeologists refine the dates for the Basketmaker II period, it becomes even more important to obtain absolute dates for these objects so contemporaneous assemblages can be compared. Fortunately, perishable artifacts are well suited for direct AMS dating (see page 3).

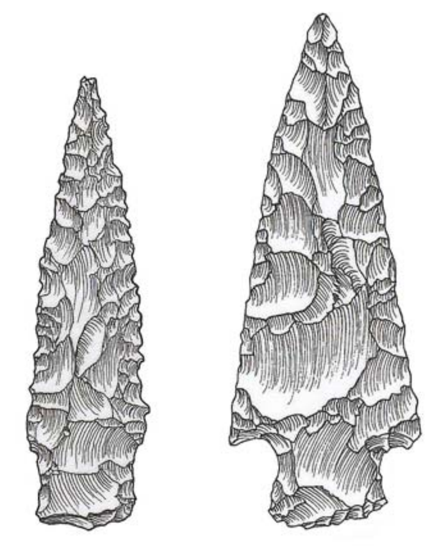


Craft items that look alike to the casual observer may differ in the details of their construction. Because young craftspeople learned construction methods from their elders, archaeologists can use these details to differentiate social groups. The figure on the left shows one method of starting a base for a twined bag, whereas the two other figures are variations on this method. (At left, Guernsey and Kidder 1921; middle, Morris and Burgh 1954; right, Cosgrove 1947. See <www.cdarc.org/pages/what/resources> for citations.)

Although it is not yet possible to make fine-grained comparisons between perishable assemblages, some broad patterns and boundaries can be identified. The roots of Early Agricultural and Basketmaker perishable assemblages lie in a Late Archaic hunting and gathering lifeway that extended from the eastern Great Basin to Oklahoma and western Texas. Common features of this tradition include the use of caves for burial purposes, temporary camps, and storage facilities; the interment of the dead in containers (inhumations or cremations in coiled baskets or flexible fiber bags); and a suite of objects such as twined rabbit-fur robes, plain-weave sandals, nets, coiled baskets, twined and looped bags, wooden fending sticks, and atlatls. This pattern became more localized in different parts of the Southwest between 1000 and 500 B.C., stimulated by diffusion from the eastern Great Basin and Mexico.

Not surprisingly, different regional traditions emphasized different perishable technologies. For example, the perishable traditions of southern Arizona appear to represent a mixture of eastern Great Basin and northern Mexican technologies, whereas those of the Mogollon Highlands share many similarities with the Colorado Plateau but also display influences from Mexico. Marked differences in sandal styles, basket technologies, and atlatls characterize the Mogollon Highlands and Trans-Pecos regions.

The origins of Basketmaker II culture on the Colorado Plateau are still debated. Influences have been proposed from many regions: the northern Plateau, the Great Basin, California, the Southern Basin and Range, and northern Mexico. Perishable patterns can contribute greatly to this discussion. Western Basketmaker II perishables appear to have their closest relationships with Great Basin, California, and northern Plateau coiling and twining traditions. In contrast, Eastern Basketmaker II perishables combine these coiling and twining industries with a Mexican twill-plaiting tradition. Future studies of technological style using well-dated perishable collections will help refine our understanding of Basketmaker II origins and diversity.



R. Jane Slíva

Projectile points are a major source of chronological information. An Empire point (left) dates between 1200 and 800 B.C., and a San Pedro point (right) dates between 1200 B.C. and A.D. 50. These point styles were in use in the southern Southwest when maize was increasing in importance. Points can also provide insights into cultural identity, an approach that is just starting to be taken for the Early Agricultural period. For more information about point chronology and style, see <www.cdarc.org/pages/what/resources/>.

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Early Farming Societies in the Desert Southwest

Jonathan B. Mabry, Tucson Historic Preservation Office

THE ADOPTION OF AGRICULTURE has been studied extensively by anthropologists. Those studies help reveal many similarities in the social, economic, and ideological changes that occurred in early farming societies around the world. These global patterns provide insights into the archaeological patterns of early farmers of the desert Southwest.

Food production and the creation of surpluses led to significant social changes over time. Only a portion of the changes identified in the worldwide studies are considered here. These include the roles and types of households, concepts of private and common property, mechanisms to promote community solidarity, and ways to legitimize transfers of household property to subsequent generations.

The greatest pace and breadth of changes can be seen in the archaeological patterns of early agricultural sites with evidence of canals, such as those in the middle Santa Cruz Valley. These include Las Capas (see pages 9–11), which may have been larger and more sedentary due to the locally reliable surface flow of the Santa Cruz River in this location, as well as the cooperative requirements of agriculture intensification through irrigation. For these reasons, the focus here is on early irrigation communities in the Tucson Basin.

The emergence of the household as the basic social and economic unit, and the shift from public storage and unrestricted sharing of food to nuclear family households with private food storage and consumption, was common around the world. In the desert Southwest, these changes occurred in irrigation communities that developed during the San Pedro phase (1200–800 B.C.). During the 1998 sample of the early San Pedro phase (1200–1000 B.C.) at the Las Capas site, houses were relatively large, indoor pits were small and few, and food was primarily stored in outdoor pits. In contrast, during the late San Pedro phase (1000–800 B.C), houses were smaller and had large indoor storage pits.

©Adriel Heisey

The site structures of some Cienega phase (800 B.C.–A.D. 50) sites in southern Arizona may reflect changes in the social structures of Early Agricultural period communities. This aerial photograph shows a recent excavation at the Clearwater site, near downtown Tucson, that uncovered a Cienega phase settlement. In the lower right is a circle of pithouses that may represent a courtyard house group of an extended family, and in the upper left is the foundation of a much larger pit structure that may have been a communal-ceremonial building that integrated multiple families. Similar "big houses," possible circular house groups, and a possible plaza have been found at other Cienega phase sites in the region.

The shift to household storage of food surpluses likely reflects the development of the concept of private property, as differentiated from common property and open-access resources.

Throughout the world, the practice of irrigation is also associated with well-developed concepts of property, because investments of labor improving long-term agricultural productivity must be protected by rules of ownership and inheritance. In locally managed irrigation systems, the water and the main segments of delivery systems are usually the common property of cooperating irrigators, but the fields that are watered and the harvests of those fields are invariably private property.

The next common stage of development in household organization in early farming societies is a shift from nuclear family to extended family households. Archaeologically, this may be indicated by the rings of houses around shared courtyards, tentatively identified at some Cienega phase (800 B.C.–A.D. 50) sites, such as the Santa Cruz Bend and Clearwater sites. In systems of irrigated agriculture, extended family units are advantageous when land is abundant and the labor supply is limited.

Broken figurines recovered from the 1998 excavations at Las Capas may represent veneration of family ancestors to legitimate descent and inheritance. (Length of longest figurine is 2.2 inches.)

In cultures in which households own property and death involves the transfer of that property, claims on the ancestors are often used to establish descent and inheritance. Households express ties to their ancestors by placing deceased family members beneath or close to their houses, or in nearby family plots, where they become symbols of the continuities of household lineages. Possible signs of ancestor veneration in early farming communities in the desert Southwest include placement of burials in habitation areas, such as in abandoned houses. Also, crosscultural comparisons suggest that household rituals involving figurines may represent veneration of family ancestors and remembrance of genealogies.

There was inherent tension between the household and the community in early agricultural societies. While each household needed to control its own fields and the food it produced, there was also a need for labor pooling and cooperation to clear fields, to build and maintain canals, and to protect resources. "Big houses" found at several early farming sites in the Tucson Basin may have been facilities for group meetings and ceremonies, designed to promote the social integration of the community. Group ceremonies and household rituals reflect a new division between public and private life.

In the desert Southwest, changes related to the adoption of agriculture occurred slowly. There was also significant variability in the degrees of permanence of settlements during the more than two millennia from the arrival of maize in the area to the development of ceramic production. The consideration of worldwide patterns when assessing new evidence should continue to be a productive approach as this exciting research continues.

Research Wish List

Linda Cordell, School for Advanced Research

As a discussant at the Pecos Conference, I was asked to develop a wish list of research topics for the coming decade. The list includes laboratory research, archaeological fieldwork, and consideration of new conceptual tools.

We need to be sure that our radiocarbon dates for the appearance of maize throughout the Southwest are accurate, so that we can match the timing with appropriate reconstructions of the past environment (see pages 5–6).

We need to further develop techniques to predict the locations of early maize farming sites in the Southwest. This should involve field-testing the ability of the stream reach and reach boundary model (see pages 7–8). We should also excavate broad horizontal exposures at these sites, especially those found in unexpected locations. Such exposures will provide information on the relationships among early foragers, farmers, and the environment.

We should explore concepts that can unify studies as diverse as those that focus on specific plants and those that address the spread of agriculture through a region. Smithsonian Institution archaeologist Bruce D. Smith suggests that the concept of niche construction, from general ecology, provides a potential link between these two scales of analysis. It refers to ways in which animals enhance their environments, sometimes with unintended consequences. A simple example is the beaver, whose tree-cutting, dam-building, and pond-making generate new landscapes for many species. Early farmers manipulated soil, seeds, and water in ways that likely changed the natural landscape of the Southwest.

Finally, the concept of niche construction might also be applied to hunter-gatherers before they adopted maize. These foragers consumed many different wild plants and managed a variety of plants and their habitats with skill. They may have enhanced plant diversity by encouraging some weeds and perhaps actively seeking new seeds. Like the modern Great Basin Shoshone, Middle Archaic hunter-gatherers may have excavated canals to water their wild plants. Supplemental watering would have increased yields but could have damaged soils, requiring movement and relocation of fields. This, in turn, may have led to what William Doolittle and Jonathan Mabry have called "mosaic environmental landscapes," where ancient Southwestern people later cultivated maize.

Back Sight

TEN YEARS AGO, in the premier issue of *Archaeology Southwest*, we presented both old and very new evidence related to early agriculture. A decade of archaeological work has brought many more discoveries about the lifeways of the first farmers, especially in the southern Southwest.

David Wilcox, of the Museum of Northern Arizona, proposed that an advanced seminar on early agriculture in the American Southwest and Mexican Northwest be held in conjunction with the 2008 Pecos Conference in Flagstaff. The seminar was organized by Sarah Herr, who agreed to be the guest editor for this issue of *Archaeology Southwest*, which presents some of the seminar's findings.

Henry D. Wallace

Fields at the site of Las Capas that were state-of-the-art technology 3,000 years ago are juxtaposed with the twenty-first-century Pima County Regional Wastewater Reclamation Facility.

Sharing the highlights of current research with both professionals and the public has become an increasingly important role for *Archaeology Southwest*. Big topics, such as the spread of agriculture, early irrigation systems, the transition to village life, and the role of humans in transforming their environment, are an especially good fit with the Center's mission. The knowledge gained from studying the archaeological record helps us to make the case for why it is important to "preserve the places of our shared past," the Center's core mission.

We changed the name of this publication—it was formerly *Archaeology in Tucson*—to acknowledge the Center's expanded geographic focus. The forty issues of *Archaeology Southwest* have been split fairly evenly between those that focus on the archaeology of a specific area, such as Chaco Canyon or the Phoenix Basin, and those that address a broad topic, such as warfare in the Southwest or threats to the past. We are pleased to embark on our second decade of *Archaeology Southwest* by returning to our very first topic, early agriculture. With so much new information to report, our longer, full-color format does greater justice to the topic.

This publication is one of the benefits that members of the Center receive. It is also distributed to tribes across the Southwest as well as to many libraries. In addition, issues are used in classes at universities throughout the country. In 2008, the Arizona Governor's Archaeological Advisory Committee recognized *Archaeology Southwest* with its Award in Public Archaeology. Our goal is to continue to increase the number of people we reach via this print medium and to offer additional content through our website. Despite the current economic gloom, we enter our second decade of this publication with a strong sense of optimism.

William H. Doelle

William H. Doelle, President & CEO
Center for Desert Archaeology

back sight (băk sīt) n. **1.** a reading used by surveyors to check the accuracy of their work. **2.** an opportunity to reflect on and evaluate the Center for Desert Archaeology's mission.

Center for Desert Archaeology
Archaeology Southwest
300 E. University Blvd., Suite 230
Tucson, AZ 85705

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