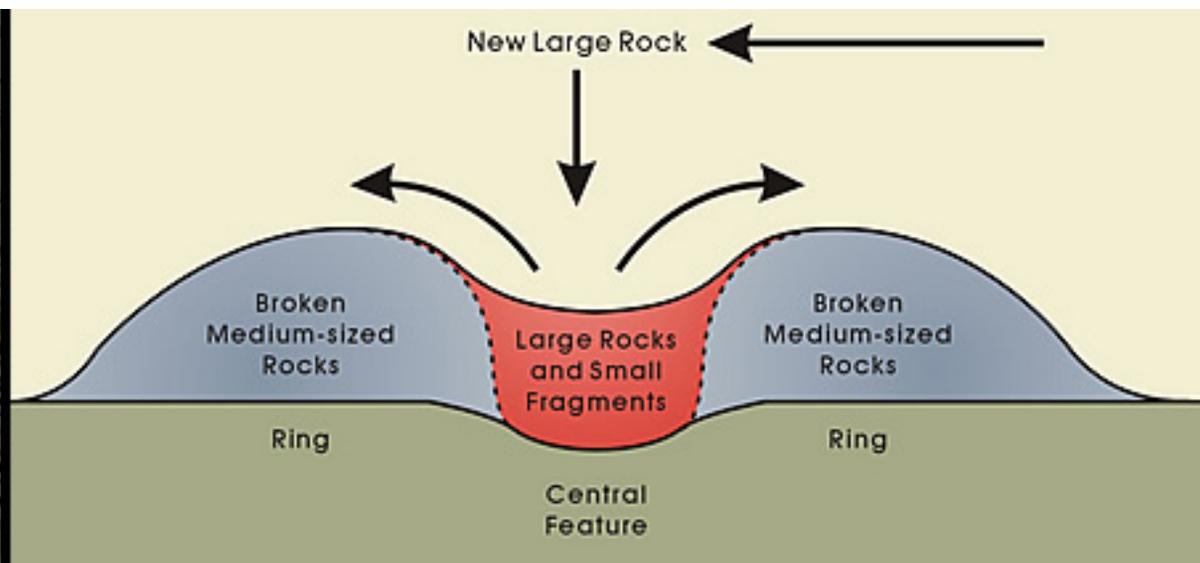
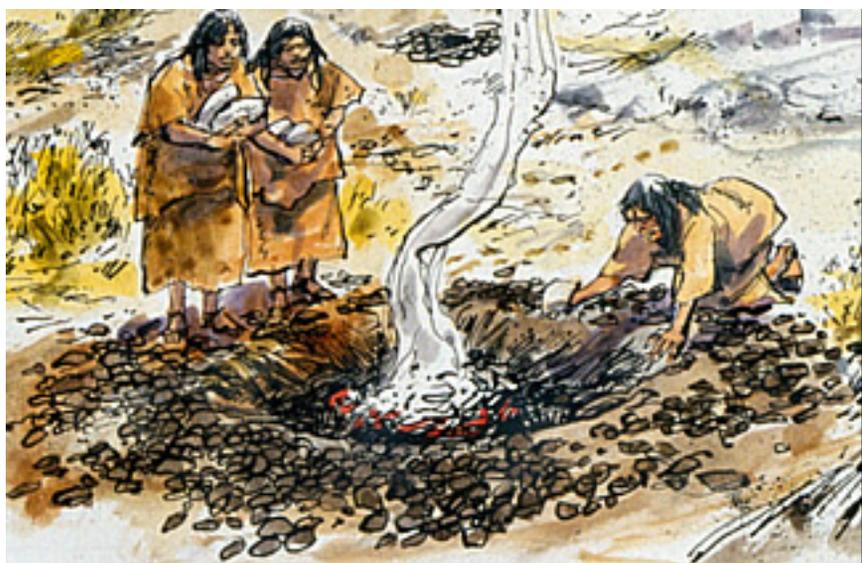


What is a Burned Rock Midden?



At left, artist's view of cooks laying large stones atop a fire within an oven pit. Once the fire has burned down and the rocks are red hot, they will be covered with layers of plants and earth, forming an earth oven capable of holding heat and steam for 24-48 hours. On right is a schematic cross-section (side view) of a burned rock midden. As earth ovens are built, opened, and later rebuilt in the central feature (or baking pit), the spent cooking stones—fist-size heat-fractured rocks—are cleaned out and tossed to the sides, forming a debris ring. Over time, this process can create large midden accumulations that are more than 20 meters (66 feet) across and up to 1.5 meters (5 feet) deep. Drawing on left by Charles Shaw for TBH; graphic on right, by the Center for Archaeological Research, University of Texas at San Antonio.

A typical **burned rock midden** is a low, donut-shaped mound of heat-fractured rocks and other cooking debris that accumulated over time from many plant-baking episodes that took place in a baking pit in the center of the midden.

Thousands of years ago, prehistoric peoples learned that heated rocks can be used very effectively to bake certain plant foods, such as bulbs or fibrous plant "hearts," which must be cooked at least overnight and sometimes for several days before they are edible. Open fires, with or without rocks, lose their heat relatively quickly once the fuel is consumed. In contrast, rocks heated within a pit and covered by layers of plants and insulating earth, can hold heat for up to 48 hours. The larger and more numerous the rocks, the more slowly they will dissipate heat and the longer they will stay hot enough to cook the food. This technology is called **earth oven cooking** or **pit baking** and it was known throughout most of the ancient world.

Burned rock middens are common across central and southwestern Texas and were first recognized as cooking features by archeologists in the early part of the twentieth century. The first systematic investigation of these rock middens was begun by James E. Pearce at the University of Texas



James Pearce of the University of Texas was the first archeologist to study burned rock middens in Texas. Around 1917, he began sending out questionnaires to teachers asking for information on "Indian mounds" and other archeological features. Photo from TARL Archives.



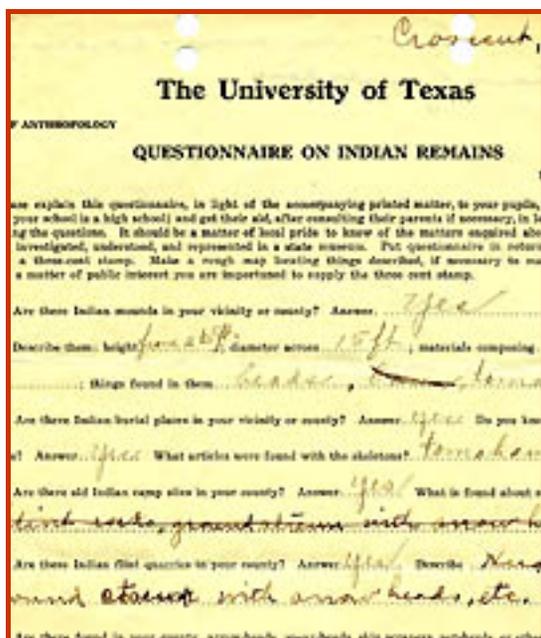
Lots of rock. As shown in this example, a close-up of site 41BR65 at Camp Bowie, burned rock middens are made up of quantities of stones, broken up from heating and no longer as useful for cooking. Dense accumulations such as the midden pictured here represent mainly

[Click images to enlarge](#)

around 1917. Pearce called these features "kitchen middens" and thought they were the result of numerous fires built within circles of stone to keep the fire contained for cooking and warmth. Others, he believed, could be attributed to "stone boiling," a procedure in which heated stones were placed into a vessel containing water and food in order to cook the food.

[The stones pictured here represent mainly cooking debris discarded from central baking pits. Click to see larger view. Photo from TARL Archives.](#)

Later archeologists proposed various alternative ideas or models of how middens formed. The first of these,—the **intersecting hearth** model,—was described by J. Charles Kelley and Thomas Campbell in 1942. They believed that piles of burned rock gradually accumulated as numerous small cooking hearths were built in the same general area; over time, the broken rocks from all of the hearths formed a burned rock midden. In contrast, in the late 1960s William Sorrow proposed a **communal dump** model. In this scenario, burned rock middens are the result of prehistoric people dumping used rock in a central discard heap—the actual cooking taking place in hearths scattered across the larger campsite. Over time, as people returned to the same campsite was reused and enough burned rock was discarded in the same place, a mound would be formed.



Anatomy of a Midden: The Central Feature or Earth Oven Model

Today, the prevailing notion is the **central feature** or **earth oven model** proposed by TBH editor Steve Black and his colleagues at the Texas Archeological Research Laboratory in the mid-1990s. This explanation partially builds on several of the earlier ideas in Central Texas, as well as ethnohistoric accounts of the use of similar features by native peoples throughout the Southwestern United States. Pearce correctly realized that the cooking was taking place in the central area of the middens, but he didn't understand hot rock cooking. Sorrow was right about middens representing mainly dumps, but he failed to recognize that the source of the rock was from within the midden itself.

The two most important new insights are: (1) the realization that most middens formed around a central feature or baking pit; and (2) a pragmatic understanding of earth oven cooking, the only plausible process that could result in so many mounds of spent cooking stones. While many kinds of plant and animal foods can be baked in earth ovens, it is a labor-intensive and resource-

This "Questionnaire on Indian Remains" was filled out and returned to Pearce in 1919 by a public school teacher in Cross Cut, a small town in northwestern Brown County. Pearce sent out 10,000 questionnaires to schools across the state in late 1918 and early 1919. The first question reads: Are there Indian mounds in your vicinity or county? TARL Archives.



Experimental Earth Oven 1. The last rock is added to an oak fire built within a pit. After heating for at least an hour, the rocks will be rearranged to form the bed or heating element of the oven.

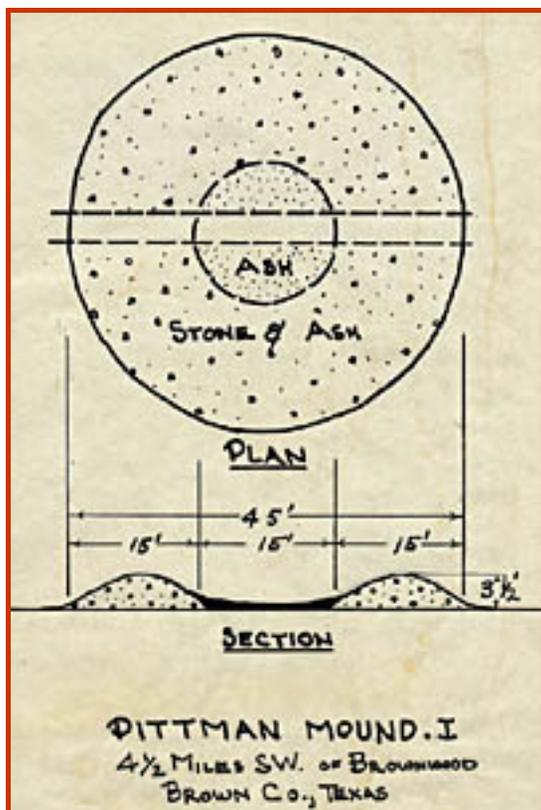
intensive cooking method that is mainly used to cook certain kinds of plants.

Before considering what, exactly, was being cooked in earth ovens, it is helpful to understand how they work. For a small earth oven, the first step is digging a pit, usually a shallow pit a foot or so deep and 1-1.5 meters (3-5 feet) across. Within this pit—called an **oven pit** or **baking pit**—a blazing wood fire is built, upon which large rocks are heaped. As the fire burns down, the rocks become very hot—sometimes even glowing hot. Using a long fire pole, the cook arranges the hot rocks into a circular bed with a flat or concave upper surface. This hot rock bed will function as a **heating element** or **thermal storage device** that holds and slowly releases heat.

As soon as the heating element is ready, it is quickly covered with a thick layer of green plant material such as wet grass or prickly pear pads. This lower layer of **packing material** serves two purposes: it keeps the food from direct contact with the rocks and coals and, most importantly, it releases steam. The **food layer** is added next and covered with an upper layer of packing material that adds more moisture and keeps the food clean. The final addition is an **earthen cap**—a thick layer of earth holds the steamy heat within the oven.

A properly constructed earth oven will stay hot for many hours—up to 48 hours in some cases. The cooking time varies depending on what and how much is being cooked. After the desired cooking time is up, the earthen cap, upper packing material, and the food layers are removed, leaving the bottom layers undisturbed. Days, weeks, or even years later, prehistoric cooks often returned to reuse an existing oven pit—reusing an old pit is much easier than digging a new one. Before they could build a new oven, they first had to clean out the pit and dismantle the old heating element. As they did this, they sorted through the rocks at the bottom of the pit. Any large rocks that remain more or less intact were put to one side to be reused. The many fist-sized fragments broken by **thermal cycling** (heating and cooling) were tossed out of the pit, forming a debris ring or mound around the pit. The more the pit was used, the larger the ring or "midden" of broken rock became.

The below drawings show how the process works, step-by-step.



Schematic drawing of a burned rock midden near Brownwood that Pearce excavated in 1919 or 1920. Pearce clearly understood the internal structure of this midden, but he did not grasp how the process—earth oven cooking—worked. TARL Archives.



Experimental Earth Oven 2. The final layer, an earthen cap, is added atop the upper packing layer of green grass, below which is the food layer. The earthen cap was about 6 to 10 inches thick and effectively sealed the oven, holding in the steamy heat for two days.



Experimental Earth Oven 3. After two days of baking, the oven is opened exposing a large sotol "head" (the food layer). As it turned out, the neophyte earth oven chefs had used too much fuel and hot rocks relative to the food load and charred much of the food. The same thing occasionally happened to prehistoric cooks, resulting in the charred food remains that archeologists sometimes find.

1 A pit approximately 1 to 1.5 meters in diameter and 30 centimeters in depth is dug. Fuel wood is then loaded and fired.



2 While the fire is still burning, large rocks are placed in the fire. The fire is allowed to burn down until a bed of coals is remaining. At this point, the rocks are sufficiently hot to cook.



3 A layer of packing material (such as grass) is placed over the hot rocks to insulate and protect the food. An additional layer of packing material is placed over the top of the food.



4 Earth removed from the initial pit construction is used as a cap to seal the oven for cooking. Hence the name "earth oven". Borrow pits develop when additional materials are needed. Once sealed, the food is allowed to cook for 24-72 hours (depending on the type of food).



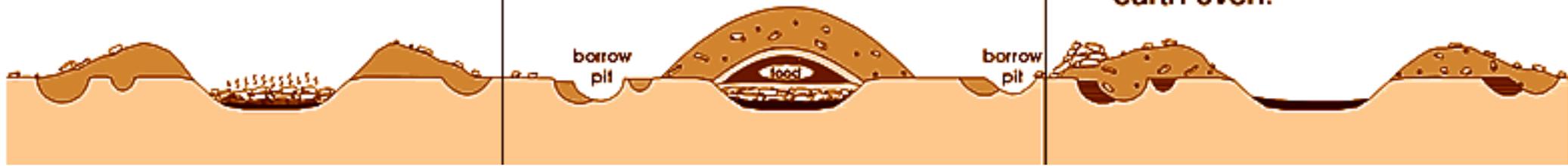
5 After sufficient time for cooking has elapsed, the oven is opened and cooked food is removed. The oven is then cleaned of its contents which include ash, charcoal, and broken rocks. Rocks not fire broken will be set aside for future use, and the broken ones will be discarded.



6 The cycle continues with another firing using both reused stones and new ones.

7 An earthen cap is again constructed over the central area. The cap now begins to incorporate some of the spent rock from the first firing. New borrow pits continue to develop as earth is needed.

8 As the process continues, refuse from earlier firings becomes ever more integrated into the matrix of the earthen caps as well as filling in the borrow holes. Artifacts lying about the surface will also be incorporated into the amassing spoil heap via the borrowing of earth for capping material. This may, and often will, include artifacts that are behaviorally unrelated to cooking in the earth oven.



What Was Being Cooked?

Archeologists long debated what was being cooked at burned rock midden sites. Some of the suggestions have been based on charred plant and animal remains found within middens and some have been based on other factors, such as the distribution of certain plants. One notion that became popular in the 1970s is that middens were places where large quantities of **acorns** were processed to remove the tannins (acids) and to render the acorns edible. Another proposed idea is that the main food item was **meat from large animals** such as deer and bison. Both of these ideas are problematic because there is no good reason to think that either acorn processing or meat baking would require large quantities of heated rocks. Some California tribes used stone boiling in acorn processing, but they used types of rocks that could be repeatedly heated without breaking. Meat can be cooked in earth ovens, but most meat can be easily cooked over an open fire.

Today, there is convincing evidence that the main thing being cooked was plant food, especially that obtained from **certain kinds of starch- and**

inulin-rich plants including soto, agave lechuguilla, and members of the lily family, such as wild onions. Charred fragments of such plants have now been found at numerous burned rock middens.

In the Camp Bowie area, the most likely candidates are **geophytes**, herbaceous plants with underground storage organs (bulbs), such as wild onions, that require long-term baking to make the plant digestible. There are several different kinds of geophytes with various types of storage organs (bulbs, tubers, etc.). Good descriptions of the different kinds of bulbs can be found on the website for the **Flower Bulb Research Program**.



*Lily family bulbs such as, from left to right, wild hyacinth (eastern camas), wild onion, and wild garlic, were probably the main plants gathered and baked in the burned rock middens at Camp Bowie. **Click to see full image.***
Photo by Doug Boyd.

While it is quite likely that various kinds of foods were prepared at burned rock midden sites, many preparation techniques probably contributed little or nothing to the accumulation of burned rocks. The one thing we know for certain is that it took lots of time, labor, and material (stones, fuel wood, packing plants, and earth) to construct earth ovens as well as time and labor to gather and prepare the large amounts of food, of whatever type, that were cooked in them.



In southwest and far west Texas, lechuguilla, the smallest species of the agave family, was one of the main plants baked in earth ovens. The plants shown here are drought stricken and unsuited for baking. In wet years, lechuguilla plants are greener and filled out; when properly baked for several days, lechuguilla hearts are quite sweet and readily digestible. Photo by Phil Dering.

