THE PREHISTORIC ENGINEER-FARMERS OF CHIHUAHUA

ROBERT A. MCCABE¹

Some time in the Sixteenth Century one of the Spanish explorers traveling through Chihuahua in northern Mexico came upon a series of ruined buildings and terraces of stone. Then as now they stand deserted in the eastern foothills of the Sierra Madre Occidental. It may have been Alvar Nuñez Cabeza de Vaca,² or Iberia, who perhaps saw the ruins in the period between 1535 and 1565 and called them Casas Grandes or "large houses" and large they were indeed, for one measured 800 by 250 feet³ and was six stories high. Who performed the feats of primitive construction engineering, and why is not known.

To the gold-seeking Spaniard this desolation at the Casas Grandes was one more bloodless defeat. How much too late were the conquerors and who were the people they had hoped to subjugate?

The evidence, filtered through the minds of many historians and anthropologists, seems to indicate that the builders of the Casas Grandes in Chihuahua were of the same stock that built the Casas Grandes found in the Gila valley in Arizona and at Zuni in New Mexico. The three groups of gigantic adobes are similar in many respects. The one in Chihuahua appears to be the southernmost site for this kind of structure. The "town builders", as Wallace⁴ calls them, may have been the "Montezumas" who legends say emigrated southward from the fabled

¹Associate Professor of Forestry and Wildlife Management, University of Wisconsin.

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Bandelier's translation, however, has a frontispiece map suggesting that such had happened. The route shown indicates that Cabeza de Vaca's group passed through northern Chihuahua.


city of Aztalan to Anhauac in south Mexico. En route they supposedly stopped at three places: Zuni in New Mexico, in the Gila valley in Arizona, and at the Casas Grandes in Chihuahua. The Spanish historian Clavijero is quoted by Cozzens6 as stating of the Chihuahuan Casas Grandes that they were “similar in every respect to those of New Mexico.” There seems to be little doubt that the Casas Grandes in each case were built by people of the same culture.

The builders of the large houses are thought by some to be descendents of the cultured and skillful Toltecs, who were also predecessors of the fierce and war-loving Aztecs. In the end it may have been the Aztec who waged war on the town builder and eventually destroyed him.

One clue as to when the Casas Grandes fell is given by Wallace.7 In her collection is a water vase from the Chihuahua ruins dated 1864. It has an attached memorandum, part of which reads: “These Casas Grandes (great houses) were reduced to ruin by siege in 1070.” This is signed “William Pierson, American Consul 1873.” No further enlightenment regarding this date is given us by Susan E. Wallace who owns the vase and who presents the original information in her book The Land of the Pueblos.

THE TRINCHERAS

Virtually in the shadow of these house ruins that frustrate the antiquarian are other archeological features to intrigue the powers of deductive reasoning. These are numerous stone dams or walls found in the canyons and on mesas in the surrounding mountains. These dams or trincheras rather than the Casas Grandes seem to me to be the more interesting.

In the summer of 1948 I visited northwestern Chihuahua studying game animals and collecting vertebrate specimens for the University of Wisconsin.7 Other members of the party, Alden H. Miller, A. Starker Leopold, and Ward C. Russell, were also there for the same purpose representing the University of California. Floyd Johnson of Colonia Pacheco, our guide and packer, escorted us to our first camp seven air-line miles southwest of Colonia Pacheco on the Gavilan River.

Even in this remote and rugged mesa country the check dams were present on almost every slope. These trincheras are built

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7 Ibid., p. 235.
7 Supported by the University of Wisconsin College of Agriculture and a grant from the Wisconsin Alumni Research Foundation.
of volcanic stones usually about twice the size of a man's head. The stones are carefully arranged on and against one another so as to hold together without mortar or cementing materials. Principles of engineering were also employed: for example, the greater the height of the dam, the greater the flare at its base. The fact that so many still remain today is *prima facie* evidence that the sites were well chosen, and the construction more than adequate. There are perhaps other aspects of construction proficiency that could be noted by an eye trained in construction engineering.

![Diagram](image)

A diagrammatic view of the ruins area near the Galivan River camp.

We are used to thinking in terms of impounded water whenever dams are discussed. The *trinchera*, however, appears to have been used as a means of slowing run-off during the heavy rains of late summer, not so much a water conservation measure as a means of holding and building *soil* behind the check-dams. No *trinchera* that we saw impounded water.

Aldo Leopold had described these structures to me in great detail and no doubt colored my thinking on their source and function. He visited the Gavilan area on a hunting trip in the winter of 1938. His superb description of the dams and the ecology of this region appear in an essay, “The Song of the
Gavilan”.⁸ Other writers, Carl Lumholtz,⁹ Henry A. Carey¹⁰ and W. J. McGee,¹¹ have also observed these structures and recorded their presence. Lumholtz, in his two volume work Unknown Mexico, gives a rough descriptive outline of where these trincheras occur in northwest Mexico. It appears that our Gavilan camp was in the center of the trincheras country.

One could not travel long in the Gavilan watershed without encountering these landmarks. They were built on all types of slope. Those in narrow steep-sided ravines were necessarily narrow and taller (3 to 4 feet) than those found in places of low gradient where the dams were often very long but only 1 to 2 feet high. There was a remnant of a dam about a mile down the river from our camp where only the anchor ends of the structure remained. It may well have been part of an impounding wall that cut across the main river channel. It was the only one to suggest that such dams may have been employed to hold water.

Frequently the dams were constructed in a series one behind the other, creating between them a terrace effect reminiscent of the ancient Inca terraces. In one instance on a large mesa above our camp I found a series of four dams protruding above the turf to the height of one stone. Behind these dams was a pear-shaped meadow of about 10–15 acres surrounded by tall yellow pines. Another series on the same mesa in a somewhat narrow draw had spacing between the dams of 8, 16, and 34 feet. This doubling of the spacing was hardly accidental.

In several instances a large heap of stones of the size used in dam building was found at the base of a ravine in the side of a mesa. It is possible, because of the steep slopes, that some time in the past one of the dams washed out. One needs only to be caught in the torrential downpours that drench this country during the rainy season to be convinced that such is likely. Once dislodged the building stones could roll down the ravine like so much talus. I found no such stones that could have been considered natural talus.

This heap of like-sized stones might also be the remains of a lookout hut built on the mesa edge and washed into the ravine by the slow erosion of the mesa rim. Several ruins of possible dwellings or shelters were found at vantage points on mesa tops and

¹¹Lumholtz (ibid., p. 22, vol. 1) states that W. J. McGee saw them on his expedition of 1895. The reference was not explicit and I was unable to locate it for a direct quotation.
in each case had a commanding view of the surrounding country. An excellent picture of such a ruin is presented by Sayles.\textsuperscript{12} One ruin in particular overlooked the Gavilan valley. The original building had been built on a small bench just below the rim of the tallest mesa. The stone walls had long since fallen apart but enough remained to show that the single room was about 12 feet by 12 feet. The roof was probably thatched. Ralph L. Beals\textsuperscript{13} in his studies on comparative ethnology of northern Mexico indicates that thatched roofs were used by the early inhabitants of this region. It so happens that in the Gavilan area there grows a tall bunch grass of the genus \textit{Muhlenbergia} that appears to be suitable for thatching.

\textbf{THE "RUINS"}

The \textit{trincheras} and the lookout hut were not, however, the only evidences of prehistoric peoples in the Gavilan River area. Floyd Johnson pointed out an area near our camp that he called the


“ruins”. Only a discerning eye would have spotted any ruins at this place. I had hunted quail over the site many times without having noticed anything peculiar. Once scrutinized, many man-made features became evident. The site was a flat place or small bench on an escarpment 50 feet above the river. The area encompassed about two acres and was irregular in shape. The sheer walls of the escarpment on the south and southeast quarter dropped directly into the river, which flows around the promon-

One of the stones bearing hieroglyphics found in the ruins along the Gavilan River. This stone measured fifteen by twenty inches.
tory. To the southwest and west the bench fell away more gradually to a flat or meadow along the river's edge. To the north the land rose gently and widened to become part of a mesa slope on which were eleven long dams (each about 150 ft.). On the west the bench was bounded by a narrow deep-cut ravine. In this ravine, which dropped sharply as it neared the river, were six check-dams, but most were in poor condition probably due to the flash floods of many years. During one downpour I saw this ravine spew its brown torrent into the middle of the river when normally the drainage only moistened the stone walls of the cliff.

In the center and above the top terrace was a circle about fifteen feet in diameter of large rectangular stones. These were set on end and although irregular in height, they formed what I called a "council ring", (estufas) and this it may well have been. The stones appeared to have been quarried, which operation must have involved great difficulties. It would have required the labor of at least five men to move even the smallest for any distance. There was no quarrying site within a radius of at least a mile. The stone ring occupied a commanding position, overlooking the entire bench. The ring today is almost obscured by grass and live oaks. For a culture as primitive as this one appears to have been, and lacking in the use of beasts of burden, this ring of stones is all the more interesting.

Immediately below the bottom terrace and opposite the council ring was a large irregular-shaped boulder 68 inches across the base and 32 inches high, one side of which was covered with hieroglyphics. Viewing this stone for the first time gave me the strange feeling that I was trespassing, even in this wild back country. I dug carefully at its base to uncover more of the writing, as it was obscured by about six inches of silt. Three other stones were also found bearing inscriptions. These were smaller (about 15 x 20 inches) and appeared to have been part of a wall. In several instances the inscription was incomplete, indicating that the missing part was probably on an adjacent stone. The three stones were scattered and apparently not matched. There was no discernible attempt to portray any figures, animate or inanimate. Some of the inscriptions are similar to those found on Mesa Verde in pueblos in Colorado.\(^\text{14}\)

Slightly to the west and 50 feet below the terraces out on the bench proper were three mounds. The upper two were groups of stones so arranged that they appeared to be the remains of one large or two small dwellings. They were almost overgrown with

\(^{14}\) Fig. 3, page 473, J. Walter Fewkes, "A prehistoric Mesa Verde pueblo and its people"; Annual Report Smithsonian Institution, Wash., D.C., 1915.
The hieroglyphics found on a large boulder did not appear to contain any figure writing. Only simple designs covered the stone on one face.

The pottery fragments (left) and part of a mano found in the ruins on the Gavilan River indicated a maize agriculture had once existed in this area.
grass. The larger building seemed to have had a very small ante-
room adjoining. This floor plan was noted on several other occa-
sions along the Gavilan and is shown graphically in Richard J.
Hinton’s *Hand-book to Arizona*.\textsuperscript{13} Fragments of pottery and a
broken *mano* were found near these ruins. Lower on the bench
near the southwest corner of the area was the third mound with
its decadent walls. Here, too, pottery fragments were found. The
interesting feature about this latter site was that the side to the
west, which slopes rapidly toward the flat meadow adjacent to
the river, was supported by a series of short, almost over-lapping
stone dams. I failed to record the number of dams involved, but
as I now recall, they were so close together as to give the
appearance of a cobblestoned hill.

This was a clear-cut example of employing the check-dam
technique to protect a slope that would have otherwise eroded.
It is inspiring to see the effectiveness of this primitive construc-
tion. These little check-dams and terraces have so efficiently held
the soil and sod that they can be found only by hunting for them
among the yellow gamma grass now covering the slope. These
miniature support-dams were also found on the bench in several
places along its edge.

**The Fort**

One morning while collecting birds on one of the larger mesas
I chanced upon what was the most imposing of all the ruins
encountered in the Gavilan River area. I called it the "fort". It
was situated on the corner of a mesa rim where two canyons met
at right angles to each other. Both were deep and steep-sided.
The larger one, when I saw it in the wet season, had a roaring
stream in the bottom. So steep were the sides of this canyon that
even a zigzag ascent among the live oaks would have been dan-
gerous. The structure, which was in an excellent state of preser-
vation, was an angular wall shaped like a boomerang. The highest
part (7 feet) of this wall was in the center or elbow of the
boomerang. I paced the total length and found it to be 280 feet
long. There was also an auxiliary wall below the elbow which
was five feet tall and about 1520 feet long. It was impossible to
photograph this lower wall in perspective because it was down-
slope about 35 feet and partly covered with brush. On the flat
above the main wall was the stone remnant of what appeared to
have been a building. It was not unlike those found in the ruins
above our camp.

\textsuperscript{13} p. 431, Richard J. Hinton. *The hand-book to Arizona*, San Francisco, Payot,
Despite my calling this site a fort, it was probably not used as such. The wall did not stand above the ground level, but appeared as a stone facing for the top edge of a steep-sided mesa. There was no protection from the mesa side, which would have been most vulnerable to attack. These facts preclude any protection from this mortarless masonry. What then was this structure? My guess is that it was built by a family who took pride in their building craft, and who used their skill to protect the mesa rim on which the dwelling perched. The building was probably built on this site because it was near several meadows and because of its commanding view. Today water and fuel would be as easy to procure had the dwelling been built a short distance from the canyon rim where no earth-supporting walls would be needed. It may have been otherwise in the days of the builder.

On another occasion, while attempting to photograph some wild flowers near our camp site, I climbed a fallen tree in order to get an overhead view of the blossoms. From a height of about 6 feet I noticed through the reflex lens of my camera that stones near the flowers were arranged in a crude circle about 50 feet in diameter, with other rows of stones radiating from the center to
the periphery. These stones were about the size of loaves of bread, partly buried and grown over in places with grass. This wagon wheel design was not easily discernible when walking near it, for I must have passed by or over it 25 times before seeing it in this fresh perspective.

**EARLY CHIHUAHUAN AGRICULTURE**

Studying and hunting game animals of this rugged back country left me little time for reflection on the archaic masonry that was seldom out of sight. This much, however, seems obvious: The dams were in some way associated with the pursuit of agriculture. The presence of pottery fragments in the ruins implies that the culture was archeologically recent and probably a corn-bean-squash agriculture.

Were these dams the precursor of modern soil conservation practices and built to check soil erosion? Perhaps, but only as a secondary measure. The real reason, as stated earlier and also as expressed by others, was to catch and hold silt. Most of the country, including fairly level mesa tops, is extremely rocky and unsuited generally even to hand agriculture; the formation of soil from the flaky volcanic rock is reasonably fast and a check-dam along a run-off course would soon collect enough soil to support vegetation. Thus behind each *trinchera* arose a potential field. As the silt accumulated, a new tier of stones could be added to the dam. The water basin, or more properly soil basin, thus formed would mean additional land for the enlarging field.

Seemingly in opposition to this hypothesis is the fact that many of the dams were in places where there was little chance to catch or hold enough soil to make dam-building a worthwhile operation. Likewise there *now* exist slopes that would make very good fields if dammed, located near these almost negligible fields behind well-built dams. Those areas behind dams built on steep slopes and in narrow canyons are subject to periodic washing or side cutting during the rainy season. Thus it seems unlikely these were meant to be fields. It is difficult to guess what other function this type of dam may have served.

If the deductions made thus far are correct, then the preconquest farmer of Chihuahua probably practiced soil conservation *before* he farmed much of his land. This has an ironic twist, since we came from a rich and “enlightened” land to the north where a small group of soil conservationists are trying to help an unwilling country prevent its soil, and indirectly its wealth, from flowing seaward.
Agriculture in many parts of Mexico is still very primitive. Before the advent of the horse, which the Spaniards introduced, we can only surmise that the land was tilled by hand with crude wooden implements. Were the campesinos (farmers) many or few in the region of the abundant trincheras? The comparatively meager evidence of permanent dwellings and the likelihood that the fertility in the thin volcanic soil would be dissipated after a few years of corn and bean agriculture indicate the farmers may have been few in number or partially nomadic in nature.

A simple fallow rotation of many small fields, up and down a watershed could have insured better fertility and account for the

The check-dams or trincheras found in many places in northern Chihuahua were well built structures. The meadows behind these dams were usually grown to several species of bunch grass. (Photo by Aldo Leopold)
tremendous number of check-dams throughout northwestern Chihuahua.

The scarcity of dwellings, however, could mean the farmers spent only the growing season near their fields and returned to a central point after the harvest. This would also explain the ruins of fair-sized villages found in this region which may in some way be associated with the Casas Grandes.

No culture is as difficult to trace or to deal with as that of nomadic or war-scattered peoples. Could our engineer-farmers have been such a group? If so, it matters little, for whatever their nature, they reveal a history and teach their lessons with piles of little stones on the sides of remote mountains.

**DEER AND THE TRINCHERA FARMER**

Whether the farmers were few or many, they probably had one problem in common if present and pristine conditions are comparable, namely how were their many small fields protected from the depredations of deer. Today the whitetail deer on the Gavilan can be considered numerous, but were they present in years past or at the time of the trinchera builder? The situation
during a hunting trip by Aldo Leopold in 1938 was generally the same as we found it in 1948.

Carl Lumholtz\(^5\) who traveled extensively in all parts of Mexico, has this to say of the Gavilan watershed in 1891: "Never have I been at any place where deer were so plentiful." It seems highly unlikely that deer were absent in preconquest times, although Obregon's History of 16th Century Explorations in Western America\(^7\) records how the expedition of Francisco de Iberra passed through this region in 1565–66 and almost starved to death, subsisting on bitter acorns, horse flesh and in desperation on shoes, hides and dirty leather straps. However, a noisy, marching army of men untrained in mountain hunting would likely not see a deer where deer might be relatively abundant. In this same narrative of Iberra's suffering, Obregon mentions Indians who live on "all sorts of game and wild reptiles"; deer per se, are not mentioned.

Supporting the thesis that deer were present is the account by Cabeza de Vaca,\(^8\) who with several white men and a large group of Indians passed through this same region\(^9\) about 1538. He writes that on one occasion a small group of Indians armed with bows and arrows went into the hills and returned at nightfall with over 20 deer. Another method of taking deer mentioned by Beals\(^20\) was to poison water holes used by deer. Cabeza de Vaca, was an educated white man who traveled and lived like an Indian. His narrative indicates that he was deer conscious principally because of the food value. Frequent mention is made of deer in the late stages of his journey when he crossed Sonora (and Chihuahua?).

A final word on the occurrence of deer in this area during the Sixteenth Century comes from Bandelier's translation of Cabeza de Vaca's narrative:

\(^5\) Ibid., p. 58.
\(^6\) George Peter Hammond and Agapito Rey (translation), Obregon's History of 16th Century Explorations in Western America. Wetzel Publishing Co., Los Angeles, California, 1928.
\(^7\) Ibid., p. 143.
\(^8\) Hubert H. Bancroft's History of Arizona and New Mexico (San Francisco, 1889) and Bandelier, 1905, op. cit., indicate that Cabeza de Vaca passed in a westerly direction very close to the Gavilan River. Cleve Hallenbeck's Alvar Nuñez Cabeza de Vaca: The Journey and Route of the First European to cross the Continent of North America 1534–1541 (The Arthur H. Clark Co., Glendale, Calif., 1940, pp. 326) reviews the various routes that historians say Nuñez was supposed to have taken. I conclude from his route map opposite page 308 that the route proposed by Sauer (Ibid., 1932) and Hallenbeck collectively best fitted the early accounts as presented. This however does not affect the text hypothesis since the route of Sauer and Hallenbeck passes northwest of the hairpin turn in the Bavispe River at a point about 80 air-line miles from the Gavilan watershed. The country topographically, botanically and game wise is generally comparable.
\(^9\) Ibid., p. 108.
In the village where they had given us the emeralds, they also gave Dorantes [one of the party] over six hundred hearts of deer, opened, of which they kept always a great store for eating. For this reason we gave to their settlement the name of ‘village of the hearts’.

Thus in this early period of recorded history it would seem that the native populus kept the deer thinned down to a point where “trinchera-fields”, if they existed, were not molested. While not wholly comparable, even today where the itinerant lumber camp stays for a short period the deer are extirpated from the surrounding area. This observation I recorded from Floyd Johnson, our guide.

In no case in the several early accounts of this area by Spanish explorers is mention made of the trinchera or check-dam.

The evidence, meager as it is, seems to indicate that deer and trinchera fields occurred together but that the campesinos de la trincheras were not wholly dependent on agriculture. The bow and arrow, spear, or similar weapon may have been used to help provide the bulk of the edible protein and in so doing would have eliminated the problem of deer depredation. If the trees of our forests today were as important to all Americans as the corn behind the trinchera was to its planter we would waste no time in dealing with our present overpopulations of deer.

The western slope of the Sierra Madre in northern Mexico still retains much of its wild and primitive appeal for the naturalist. A. S. Leopold records this eloquently in his “Adios Gavilan”.

We cannot be complacent and assume that a wilderness will remain forever wild and untouched. Even as this is written, battered lumber trucks rumble over widened donkey trails bringing saws and sawyers to this virgin wilderness.

The proverbial handwriting on the wall came to our camp with the rains. The lumbering operations just beginning in the headwaters of the Gavilan River changed our stream, where rainbow trout could be seen in the bottom of four-foot pools, into an ugly brown torrent that rose three feet in a matter of minutes. Such ushering of soil to the sea is rivaled only by some of the most abused watersheds north of the border.

I cannot here discuss the “merits” of logging this region, but even a layman could see that this very young soil going downstream was the result of the ax and saw. The loss of topsoil is blood letting for this already soil-poor area. The loss of game and the changes in flora and fauna will doubtless follow. The

erosion which now threatens to scar these hills will inevitably wash away the last vestiges of check-dams and stone ruins.

The teeth of the cow are not unlike the teeth of a saw in destroying wilderness. The old dung and a host of weeds near our camp gave mute witness to the fact that the cow and herdsman had at least reconnoitered the Gavilan valley. What will come after lumbering, after grazing to a land that can afford neither?

I am sorry in the knowledge that the tall pines and the mesas must part company and that in turn the hills may wither, the clear streams become dry creek beds, and the trinchera stones slide downhill. But I am sorrier still for those who have had no opportunity to see this magnificent wilderness in the period between the Spaniards and the sawyers.