

Comments on the Indians' Water Supply at Gran Quivira National Monument

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FOR WELL OVER A HUNDRED YEARS, the Indians' source of water at the ruins now known as Gran Quivira National Monument has been the subject of considerable speculation. From 1835 to the present time, explorers and archaeologists have described various water supply and irrigation systems which they believed these Indians possessed.

Gran Quivira National Monument is a pueblo and Spanish mission ruin, located atop a limestone ridge about twenty-five miles southeast of Mountainair, New Mexico, and situated on the eastern edge of the Chupadera Mesa. No permanent water exists anywhere in the vicinity, although several low areas within a few miles of the ruins form temporary ponds or lakes after periods of heavy precipitation. Undoubtedly it is this utter aridity of the landscape which, stirring the casual observer's imagination, has been the reason for the many theories advanced to explain how the Indians obtained enough water to sustain their large village and the mission establishment.

Most of these theories have been based on the existence of four, possibly five, "ditch-like" depressions, and an equal number of shallow saucer-shaped depressions, which can be seen on the crest of the ridge, short distances east and west of the ruins (see Figs. 1 and 2). Many persons have contended that these features represent irrigation ditches and reservoirs, which provided water not only for the domestic use of the villagers but also for the irrigation of some of their farming fields. It is the purpose of this paper to show that these so-called "ditches" were not used for irrigation at all, but were, quite possibly, nothing more than Indian trails.

HISTORICAL REFERENCES

The earliest known references to the water source at Gran Quivira were written during the occupancy of the village. A Spanish document dated 1663 states that "The scant water supply is in a few wells a quarter of a league from the place . . . Hence it is expensive to obtain water, and necessitates great labor by the Indians; they exhaust the wells, and then the people lack water . . ." (Hackett 1937: 142). Another document, dated 1661, says: ". . . the deepest well is about ten *estados* deep and no more, and there are wells which are only from four to five *estados*; the whole number of the wells is thirty-two . . ." (*ibid.*: 162). No mention whatever is made of reservoirs or irrigation ditches.

In 1835, about 160 years after abandonment of the area, Gran Quivira was visited by a trapper named Benjamin David Wilson. He later wrote: ". . . I

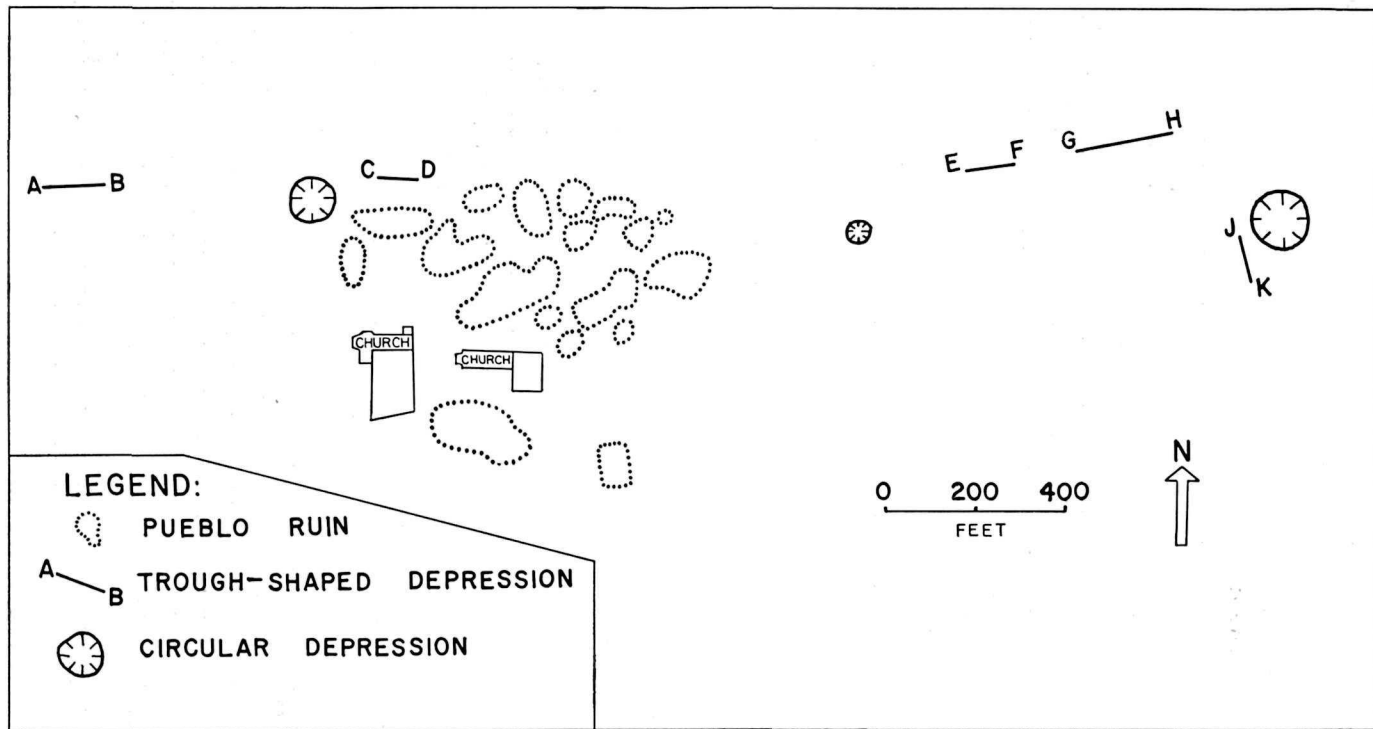


Fig. 1. Map of Gran Quivira, showing locations of troughs and circular depressions. One or two additional circular depressions are located several hundred yards east of Trough J—K. In order to avoid confusion, recognized kiva depressions in ruin are not mapped.

discovered on the eastern side [of the ruins] what satisfied me were the remnants of a concrete aqueduct. Camped there that night, next morning endeavored to trace the aqueduct, which led easterly to a mountain range." Wilson states that he spent the whole day in tracing it, and was rewarded by finding water at its eastern end (Woodward 1934: 95-96).

By way of illustrating the reliability of this account, however, it should be pointed out that at the time of his visit, Wilson and his party were undergoing "terrific sufferings." They had been "... six days without food, and five without water ... Every joint in our bodies ached, our eyes sunk in our heads as if we had been dead a week, and the bones seemed to be pushing through the skin" (*ibid.*: 95-96). With Wilson in such a state at the time of his visit, and furthermore not writing his account until forty-two years later, his description probably should not be accepted as being wholly accurate.

Another description of Gran Quivira was published even earlier than Wilson's. In 1844, Josiah Gregg also wrote of a concrete aqueduct (Gregg 1933 ed.: 105). However, Gregg's description of the ruins is so inaccurate in other respects that it seems likely that he never actually was there, but merely relied on stories told by other travellers.

Perhaps the most meticulous of the early visitors was Major James Henry Carleton, who stopped at Gran Quivira with a squadron of soldiers in 1853, and carefully measured and described the ruins. He states: "Towards the east we saw a well defined road, which kept the ridge for a few hundred yards, and



Fig. 2. The author examining one of the troughs (E—F in Fig. 1), looking generally east. Loose rock in foreground indicates location of test trench.

then turned off toward the southeast, where all further vestiges of it are lost in the sand. Where it is most plainly marked along the summit of the ridge, some large cedar trees are growing directly in the middle of it" (Carleton 1855: 308). Carleton also discussed the possibility of irrigation ditches, and states: "There is . . . no mark whatever of irrigating ditches . . . We saw no indications that there had ever been . . . an aqueduct . . ." (*ibid.*: 308-309).

In 1892, Bandelier described what he believed to be the remains of an ancient irrigation system at Gran Quivira (Bandelier 1892: 286-288). This theory has been repeated and reworded by various archæologists since that time. Perhaps it was best stated by Toulouse in 1945, in an article in which are described

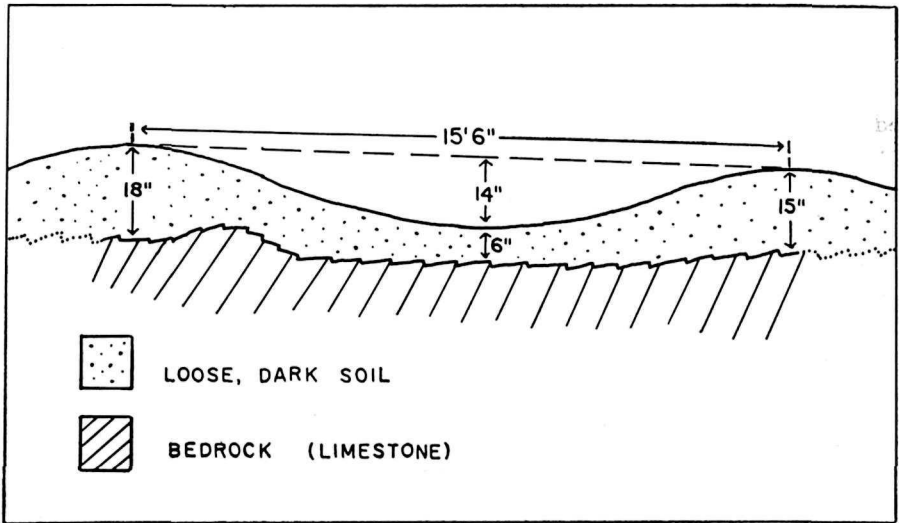


Fig. 3. Cross-section of Trough E—F, as revealed by test trench. (Not to scale.)

four separate types of structures which Toulouse believed were part of an ancient irrigation system. These structures were listed as ditches, reservoirs, terraces, and artificial drainage basins (Toulouse 1945: 370-371).

TEST TRENCH

The "ditches" (hereinafter called troughs) have received the most attention from writers. In May, 1958, a test trench was dug through one of the troughs to determine if there had ever been water flowage through it. A cross-section of the trough, as revealed by the trench, is shown in Fig. 3. The upper soil layer consists of loose, dark earth, ranging in depth from 6 to 18 inches. Below this loose soil layer is the limestone bedrock. The trough is located entirely in the soil layer. There is no indication that the trough was in any way intended for the flowage of water. The trough has no clay or rock lining, nor is there any soil stratification as evidence of past water flowage. The surface of the bedrock is very irregular, with many small cracks, and had not been previously

disturbed. This situation—loose soil, underlain within a few inches of the surface by bedrock—has been encountered in other diggings on the Monument, and seems to be the normal soil profile of the area.

PRESENT EVIDENCE

Perhaps the best indication that the features in question were not irrigation ditches and reservoirs is merely present observation. As already stated, the troughs do not seem to have been constructed for irrigation. They are so broad and shallow that much water would have been lost through evaporation—with additional great loss resulting from the porosity of the soil in which they are laid.

The “reservoirs” are much the same—very broad, shallow, circular depressions in the soil. Never has more than a few inches of standing water been observed in them, and this only for a few hours after a very heavy rain. All of these depressions are on the top of the ridge, with little or no drainage into them. They retain moisture in the soil fairly well, but not standing water.

In addition to ditches and reservoirs, Toulouse also mentions terraces and artificial drainage basins (*ibid.*: 370-371). There are apparent terraces near the ruins, and it is possible that the Indians built some of these to take advantage of whatever meager drainage the area afforded. However, irrigation of these terraces, which has been suggested, was not at all necessary. It has recently been shown that Indian corn can be grown successfully on these terraces without irrigation, even with today's sub-normal rainfall (Howard 1958).

Perhaps all of this might be summarized by stating that if, at the time this village was occupied, the rainfall was no greater than it is today, the “reservoirs” could not have collected enough water for irrigation. And if the rainfall *was* greater 300 years ago, irrigation would not have been necessary.

CONCLUSIONS

For what, then, might these depressions have been used, if not for irrigation? I feel that Major Carleton was right—that the troughs are very likely nothing more than trails. Where did the trails go? It probably never will be possible to determine this without question, because only a few short sections of them are still visible. However, there are several possibilities.

Sections A—B and C—D (Fig. 1) are aligned in a general east-west direction, and could be remnants of the trail to the Indians' wells. As mentioned previously, the Spanish documents state that the Indians' water supply lay in thirty-two wells, a quarter of a league distant, and from four to ten *estados* deep. Computing a Spanish league as 2.65 miles (Webster's Collegiate Dictionary 1942: 570), and an *estado* as about 5½ feet (Schroeder, personal communication, 1959), this means that the wells were about three quarters of a mile from the village, and from twenty to fifty feet deep. This fits in exactly with present conditions. An intermittent lake basin presently exists about three quarters of a mile west of the large church ruin, and there is standing water in this lake during periods of heavy precipitation. After the lake dries up, water usually can be obtained within ten or twenty feet of the surface, and even during dry periods is seldom deeper than fifty feet. Ranchers have reported

finding potsherds in this basin as deep as twenty feet below ground level. If this is the location of the reported Indians' wells, as seems likely, it is logical that repeated trips between the wells and the village would have worn a deep trail or depression in the soil.

Sections E—F and G—H (Fig. 1) extend generally eastward and slightly north from the ruins. This might be a trail to Pueblo Blanco, a ruin about fifteen miles northeast of Gran Quivira, and one of the few sites in the area known to have been occupied in the historic or mission period. It also might be a trail to the Gallinas Mountains, about fifteen miles to the east, where it is believed the Indians obtained the many huge timbers used in construction of the large church.

Section J—K (Fig. 1) is the most indistinct, and very possibly does not represent a trail at all. However, it is known that for many years Gran Quivira was a trading center for a number of other Indian groups living to the south and southeast, including the Apaches, who at that time were located in southeastern New Mexico. It is possible, therefore, that the large number of peaceful trading parties who visited Gran Quivira used a particular route or trail.

As for the "reservoirs," I have already mentioned that these depressions do retain soil moisture, but little or no standing water. This fact suggests two possibilities. Considered in connection with the Spanish statement that the Indians' "lack of water is so acute that they are accustomed to preserve their urine to moisten the earth to make walls" (Hackett, *op. cit.*: 142), the depressions could be adobe pits. Again, they might be small farming plots, constructed in such a way as to conserve moisture. This second possibility is pointed up rather strongly by the recent discovery of a large number of similar depressions at nearby Pueblo Blanco, which is equally lacking a presently visible surface or spring water supply. Perhaps twenty-five or more of these depressions—which certainly could not all be adobe pits—completely surround Pueblo Blanco. It would be interesting to check the occurrence of such features at other sites.

I would be remiss if I ended this article without a few words of acknowledgement. To Mr. Channing Howell, Superintendent of Gran Quivira National Monument, thanks for taking the photograph used as Fig. 2, for first pointing out to me many of the troughs and other depressions, and for assisting in many other ways. Thanks also to Mr. Jack Kite, Gran Quivira, who supplied much of the labor for the test trench, helped in locating some of the depressions, and gave much information about the area, including the past finding of pottery in the lake basin. And thanks to Mr. Albert T. Schroeder, of the National Park Service in Santa Fe, who, without knowing my ideas on the subject, suggested that the depressions at Pueblo Blanco might be farming plots.

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