

# Water and Soil Conservation by Prehistoric Indian Cultures in the Sierra Madre Occidental of Mexico

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## *Abstract*

Prehistoric indian cultures, probably Toltecs, constructed crude check-dams known as *trincheras* through-out the Sierra Madre Occidental of Mexico some 900 to 1100 years ago. The *trincheras* served as soil and water conservation structures and helped support a much denser population in this semi-arid region then at present.

## **Introduction**

Anthropological research substantiates the conclusion that the arid and semi-arid regions of the Sierra Madre Occidental of Mexico supported larger populations a thousand years ago than today (2). Unique water and soil conservation structures may well have been responsible for these denser prehistoric indian populations.

## **Trinchera distribution and characteristics**

*Trincheras*, crude stone check-dams, were constructed throughout the Sierra Madre Occidental of Mexico in the present day Mexican states of Chihuahua and Sonora, by prehistoric indian cultures, most probably Toltecs, between 900 and 1100 years ago (3). Figure 1 shows the limits of distribution of *trincheras* within the Sierra Madre Occidental. These structures were placed across stream channels and arroyos to obstruct and control the normal flow of water.

*Trincheras* were constructed from locally abundant angular fragments of Tertiary ago volcanic rocks. The fragments, about the size of a basketball, were piled in layers one upon another until an average height of 3 or 4 feet was attained. The rocks were then back-filled with material from the upstream side of the *trinchera* wall. The widths of *trincheras* were determined by the widths of the stream channels or arroyos they occupied. Average widths are less than thirty feet. Although most *trincheras* are either straight or slightly curved in shape, a great variety of other designs can be found. Figure 2 shows a typical cross sectional plan of a *trinchera* in the Sierra Madre Occidental as well as several common shapes.

Basic engineering principles appear to have been employed in the placement of *trincheras*. A "head-to-toe" positioning of checkdams is common, i.e., the "head" or top of the lower *trinchera* is at the same elevation as the "toe" or base of the next higher *trinchera*. In addition to "head-to-toe" placement many *trincheras* were secured against bedrock along the side channels of their stream courses or arroyos. The fact that *trincheras* still remain in nearly undisturbed condition throughout the Sierra Madre Occidental testifies to their proper placement and sound construction.



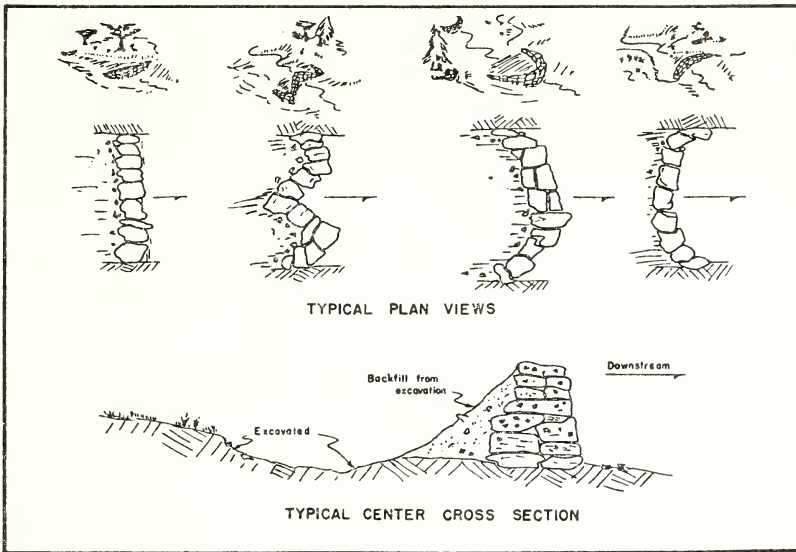


Figure 2.

perennial streams. Since this semi-arid region of the Sierra Madre Occidental annually suffers from a prolonged April to mid-July drought, trincheras may have been intended to regulate stream flow, thereby allowing increased moisture to be available for crops and other uses over longer periods of time.

Agricultural plots were also limited throughout this area. As trincheras held back sediments on their upstream sides, small, level soil plots were developed behind each trinchera. The soil in these trinchera plots today is at the level of the top of the trincheras, in many instances 3 or 4 feet deep. Because trincheras were back-filled, sedimentation rates would have been accelerated. Beans and squash, along with corn the basic food crops of the agriculturally oriented inhabitants of the region, could readily have been grown in the rapidly accumulated soils developed from the swiftly weathered volcanic rocks of the area.

As a season progressed, water which had permeated the soil behind the trinchera, would rise by capillary action to the level of the crop's root system. This made a crude but rather effective kind of irrigation.

### Conclusions

It can be asumed from present conditions that water and soil were major environmental obstacles to settlement in the Sierra Madre Occidental of Mexico. Trincheras serving as soil conservation structures, water conservation structures, or both, aided the prehistoric Indian cultures of the Sierra Madre Occidental in supporting a denser settlement of population than occurs at present. Further research into

trincheras and other structures created to alter the physical environment in arid and semi-arid regions, perhaps could afford us with a better understanding of early population distribution patterns in these areas.

#### Literature Cited

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