# Geoarchaeology and Site Formation Processes of a Fine-grained Alluvial Floodplain at La Playa Archaeology Site, Sonora, Mexico

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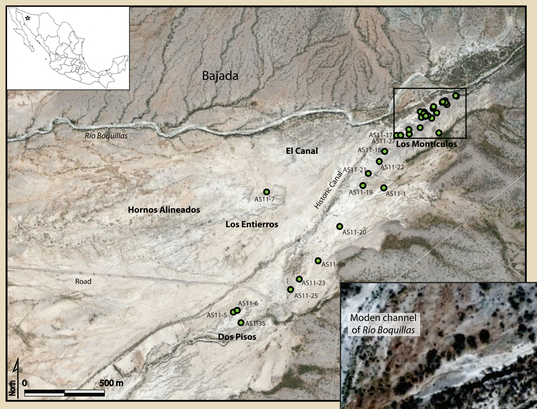
## Introduction

La Playa is a large (12 square km) site on the floodplain of the Río Boquillas in northern Sonora, Mexico. It contains material evidence of 13,000 years of human occupation, with a principal component in the Early Agricultural period (3150-1900 BP) (Carpenter et al. 2005). Interpretation of archaeological features and an extensive canal system (Figure 1) has been hampered by a limited understanding of the site's alluvial history due in part to extensive historic erosion and dissection of the floodplain, as well as local complexity in geomorphic features. The chronostratigraphy for part of the site has been documented (Copeland et al. 2012); however, the area of Los Montículos (Figure 2), has a much more complex depositional history.



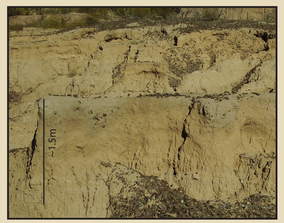




Figure 1: Profile AS11-3 in Los Montículos showing canal profiles. This is one of few locations in Los Montículos with *in situ* cultural deposits.

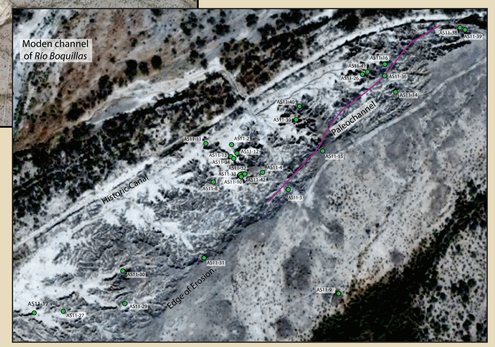



Figure 2: Map of La Playa showing study location, site area names, and profile locations and close-up of the Los Montículos area, the focus of this study.

## Research Objectives

- Correlate the stratigraphy of Los Montículos with that already determined for the rest of the site to document variation in geomorphic and anthropic formation processes
- Characterize the depositional environment before, during, and after the Early Agricultural period (3150-1900 BP).

## Methods

- Described sedimentological and soil morphologic characteristics in forty stratigraphic sections (Figure 2)
- Collected samples in vertical intervals from 5 profiles at 4 locations. Sand, silt, and clay content measured by pipette method (Janitzksy 1986a). Organic matter measured by Walkely-Black method (Janitzky 1986b). Calcium carbonate measured by Chittick apparatus (Machette 1986). (Figure 3)
- Radiocarbon dating of organic material (n=12) to determine timing of depositional events and allow temporal correlation among strata (Figure 6).

## Results

Three units were defined in Los Montículos and correlated with units previously defined in the rest of the site (Figures 3-6).

**Unit 10** is only visible locally and cannot be traced beyond Los Montículos.

**Unit 11** shows little variation in particle size across the site. It displays a floodplain pedofacies of multiple, weakly developed buried soils nearer to the channel, and fewer more strongly developed cumulic soils farther from the channel.

**Unit 12** represents a series of separate depositional events from overbank and channelized flow with much thicker deposits closer to the river in Los Montículos.

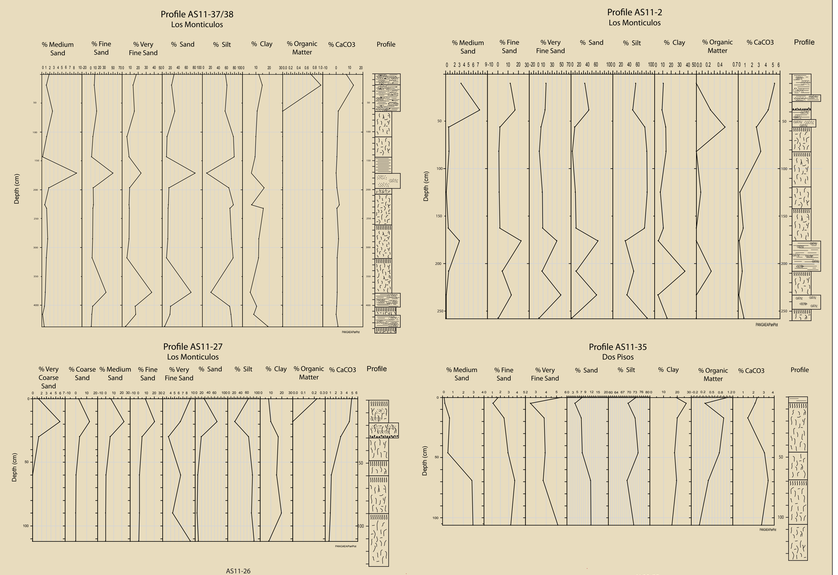



Figure 3 (above): Lab results of particle size distribution, organic matter content, and calcium carbonate content for 4 profiles at various distances across the site.

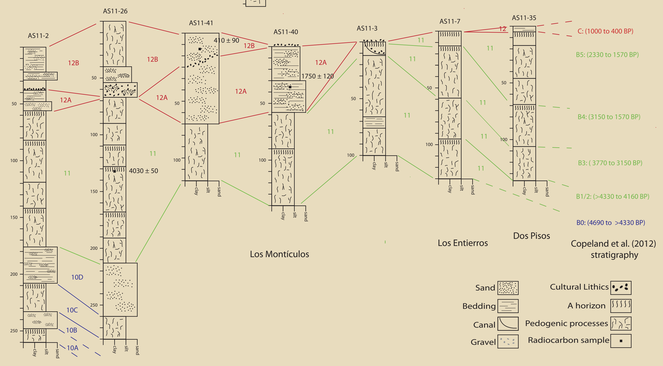



Figure 4 (right): Schematic stratigraphic diagram of seven profiles across the site, showing stratigraphic correlation among units defined in Los Montículos and their correlation with units defined by Copeland et al. (2012).

## Conclusions

Units 10 and 11 contain very fine grained deposits typical of low energy overbank deposition. Units with dominantly silts and clays represent deposition of suspended load onto the floodplain (Gerrard 1987). Unit 10B and 10D contain fine and very fine sand, also typical of overbank deposition (Gerrard 1987). Overbank deposition can become the dominant process of floodplain formation when the river channel remains stable (Ritter et al. 1973), which is the case of the Rio Boquillas.

The lack of sandy and gravelly deposits in Unit 11 suggests very low frequency of high intensity floods c. 4000-1600 cal BP. This, along with slow accumulation rates, made the floodplain an attractive location for farmers in the Early Agricultural period (3150-1900 cal BP). The extensive canal network may have enhanced slow deposition of fine-grained sediments.

A shift to higher energy sandier deposits in Unit 12 occurred after the Early Agricultural period, which resulted in erosion and redeposition of sediments and cultural materials. The proximity to the river resulted in more frequent episodes of erosion and deposition in Los Montículos. A majority of the archaeology there is now in an eroded lag deposit, and stratigraphic units present in other areas of the site are missing from Los Montículos.

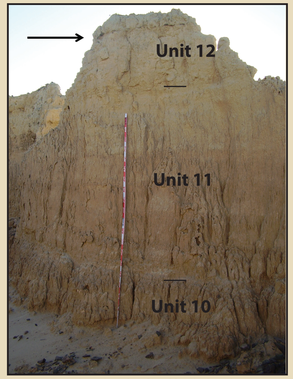
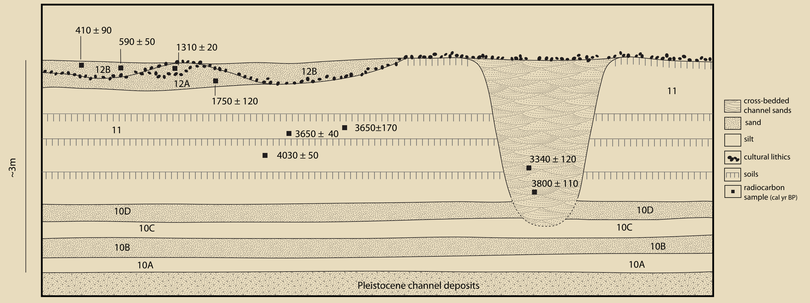



Figure 5: Typical stratigraphy of Los Montículos showing Units 10, 11, and 12 with a buried lag of redeposited cultural material at arrow. Near profile AS11-39. Scale is 2 m.

Figure 6: Generalized stratigraphy of Los Montículos showing Units 10, 11, and 12 and relative positions of radiocarbon dates. Channel shown is the paleochannel through the Los Montículos area (Figure 1) which is likely a crevasse splay or channel avulsion.

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