Impact of Erosion on Archaeological Site Formation

A study of CARRA, a Palaeolithic surface deposit in Guadalajara, Spain

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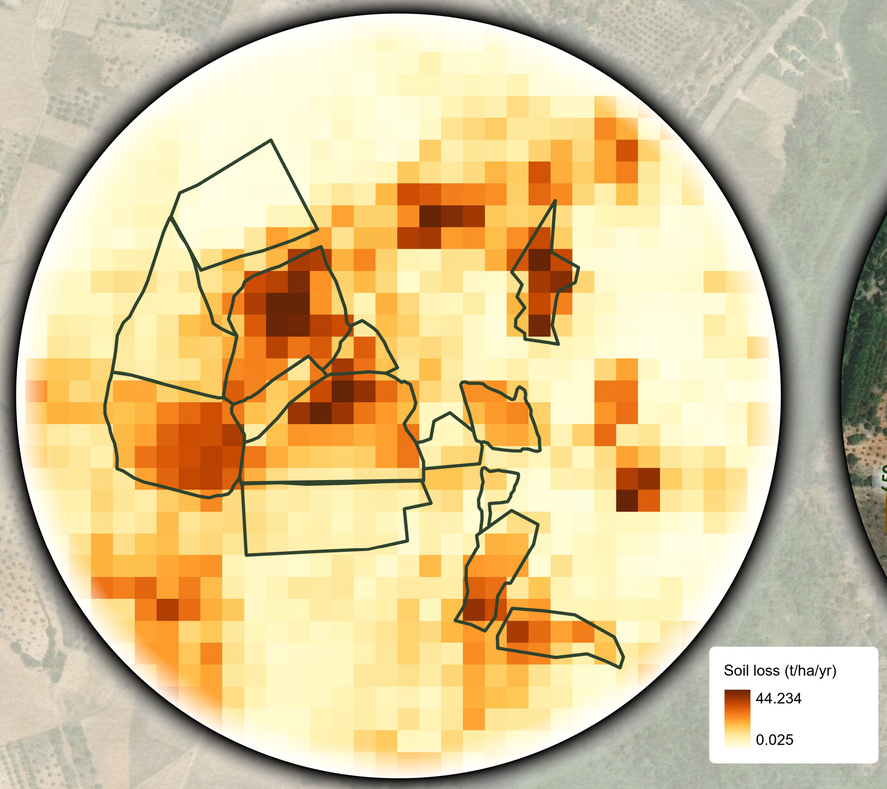
This project uses GIS tools and survey data from CARRA, a locality in the province of Guadalajara, Spain, to explore site formation processes and the risk presented by erosion for the conservation of open-air archeological sites in the region.

Evidence of human occupation in Central Spain spans the Early to Late Palaeolithic, but it appears to have been climatically unsuitable for long-term human settlement during cold events. Relatively few Palaeolithic sites are known dating from these climate phases, although survey results show that the Iberian Peninsula was not abandoned.

CARRA is an open-air site located in an area used for terraced agriculture. The fields are on an alluvial terrace on the bank of the Tagus River. Surveys were conducted on 13 fields between 2009, 2010, and 2022. A total of 547 stone tool artefacts were recorded.

The landscape was analyzed using the RUSLE (Revised Universal Soil Loss Equation) model, which measures soil loss due to fluvial erosion. Results from the RUSLE model provide the basis for testing whether lithic concentration at CARRA was formed by erosion processes, and whether erosion currently poses a conservation risk. The results of this research show that the artefact accumulation at CARRA is clustered and not randomly distributed.

The geographical location of the central Meseta could explain the scarcity of human occupation during the LGM (Last Glacial Maximum) in this region, which had an arid and cold continental climate. Despite this, recent studies have demonstrated the presence of a significant number of artefacts and potential archaeological sites in open-air contexts, some of which can be attributed to the Middle Paleolithic. The intensity of climate change in this region during the LGM and the current rate of erosion may have had a significant impact on the preservation of archaeological sites, thus creating a significant bias in our understanding of ancient demographic phenomena.

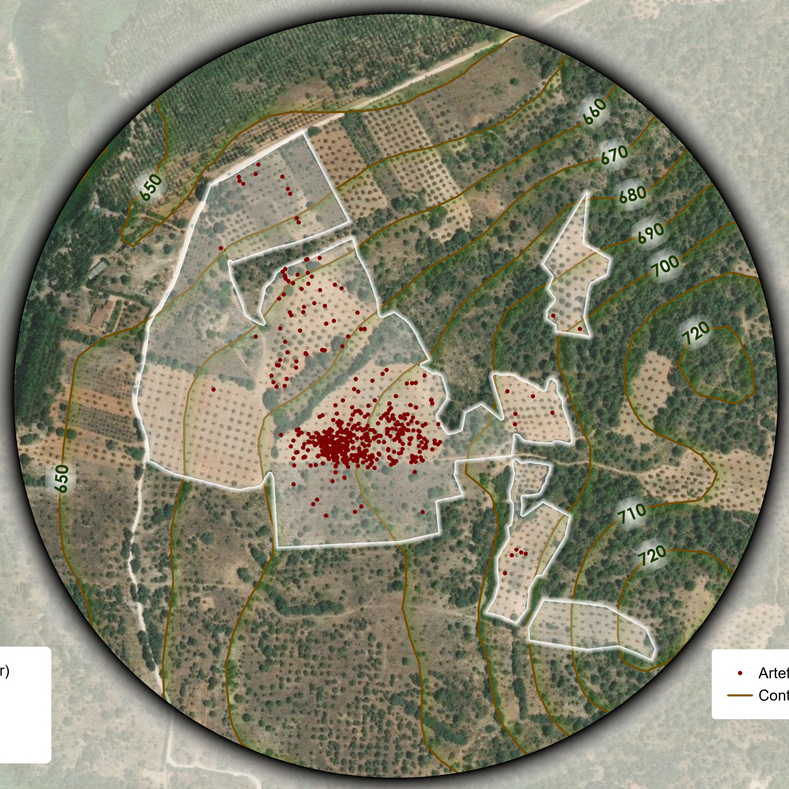


Soil loss (t/ha/yr)
44.234
0.025

Average annual soil loss (tonnes/ hectare/ year)
25m resolution

RUSLE is an erosion model that considers:

R - Rainfall-runoff erosivity
K - Soil erodibility
LS - Slope length and steepness
C - Land cover
P - Conservation practices

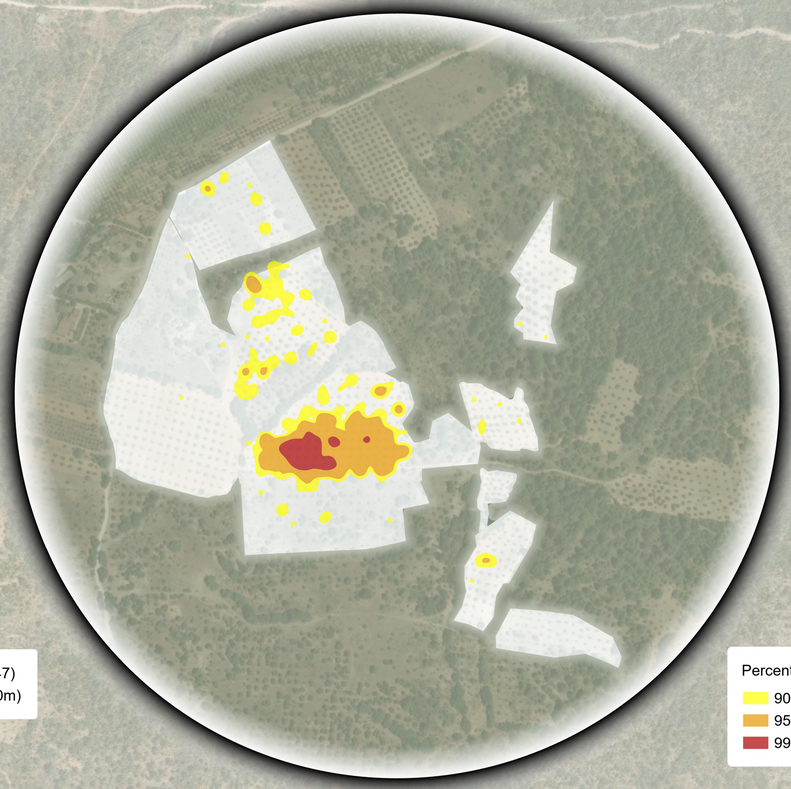


• Artefact (547)
— Contour (10m)

Location of artefacts in CARRA

CARRA1 #668 — Flint blade
CARRA1 #775 — Flint nucleus
CARRA1 #724 — Denticulate flint
CARRA1 #673 — Flint blade

Examples of artefacts from CARRA



Percentile
90th
95th
99th

Concentration of artefacts in CARRA

Province of Guadalajara (1:2,000,000)

N

0 0.25 0.5 Km

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