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GIS as a Modeling Tool for the Identification of Archaeological Sites and Paleo-Landscape Evaluation

Summary

GIS is a powerful tool in the assessment of landscapes for the locations of potentially valuable archaeological sites. A GIS approach allows predictive modeling of site location through examination of landscape variables conductive to human occupation. These include access to game and fresh water, exposure to the elements, ground surface slope, proximity to known trading pathways, and geographic location with respect to contemporaneous known sites. The GIS approach also allows for the assessment of geologic variables associated with site preservation. Through a combination of these techniques it is possible to delineate with a fair amount of accuracy the geographic locales within a study area with the best potential for recovery of archaeological remains. This can be a valuable technique for both public and private sector archaeology. The benefits of a GIS based approach to site designation are especially valuable for the Cultural Resource Management community for the rapid delineation and retrieval of archaeological remains from endangered areas due to development.

The Variables most commonly used to delineate probable site locations on a landscape are: Availability of local water resources, availability of shellfish and other stationary food resources, proximity to migration routes of terrestrial and sea mammals and birds, availability of high quality local lithic raw materials, soil drainage class, direction of exposure to winter sunlight, proximity to rivers and known overland travel routes, local slope, and proximity to known population centers. These factors contribute directly to the suitability for occupation of a site at any given point in time. The second stage of a GIS based analysis is to assess the landscape for intact deposits. This can be accomplished via modeling landscape features for the presence of surficial erosion patterns and modeling paleo-environments through the same region to assess for subsurface stability.

A weighted variable analysis of raster data is the most common tool used for analysis of paleo-landscapes. In this approach pixels are given a positive or negative value based on the site specific characteristics listed above. In this way all sites with a value greater than a certain threshold can be judged as viable for archaeological recovery.

A good GIS landscape analysis provides archaeologists with information about regional site patterning and preservation potential. This allows surveys to be
completed more quickly and with less cost to the consumer. Additionally GIS functions allow for high resolution mapping of archaeological sites and internal site stratigraphy. This allows finer resolution interpretation of past lifeways. However, due to the nature of archaeological deposits and the amazing potential of the human animal to be unpredictable there is no way to produce a perfect model of site distribution. A GIS based approach may be used to augment traditional archaeological methods but it will never replace them.

Annotated Bibliography:


In this paper the author further enhances the concept of the archaeological site as a numerically modeled phenomenon. Stress is placed on the non-random aspects of site location related to human needs and the availability of this data for site location predictability.


This recent Paper explores the viability of GIS based predictive modeling on Classical archaeology. The technique is successfully used to analyze and model site settlement patterns in Bronze Age Greece.


In this paper the application of GIS based site assessment is tested on the complicated archaeological record of the Netherlands. The technique is successfully applied in an environment very different from the American West where it was pioneered with moderate success.


In this landmark paper, the approach for using GIS to predicatively model archaeological site locations is laid out. Using LANDSAT imagery the authors
focus on how to identify likely site location based on landscape position and environmental factors which are immediately applicable to a GIS approach. This is an essential paper for understanding predictive landscape archaeology.


This article is an excellent overview of GIS as a cultural resource management tool. It outlines the potential uses for a GIS based analysis on various segments of archaeological work including Biblical archaeology.

Whitley, Thomas G. and Hicks, Lacy M. Using a Geographic Information Systems Approach to Extract Potential Prehistoric and Historic Period Travel Corridors Across a Section of Northern Georgia. Brockington and Associates.

In this CRM publication, the authors present an approach using GIS to predictively model routes of travel across paleo-landscapes. Although the paper is not peer reviewed it is an excellent example of how GIS can be used successfully to augment private sector archaeology.