Water in the Desert: Using Archaeology to Reconstruct Ecology

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Research Questions:
- Can changes in human activity patterns provide evidence of ecological change?
- Are these changes apparent in the archaeological record?
- Which human activities are the best indicators of ecological conditions?
- Can archaeological evidence be used to locate landscape features that have since vanished?

Methods:
- Coordinates for Prehistoric and New Kingdom sites were separated from the dataset and mapped in ArcMap. It became apparent that sites occurred in two clusters: a line proceeding west from Kharga and a ring north of the oasis. The following analysis was based on this observation.
- Each map was overlaid on topographic data from an ESRI basemap.
- In both periods, the lowest elevation among the sites of the northern ring was used as an indicator of highest possible lake level, and a hypothetical lake was drawn below this elevation.
- Based on survey data, routes were drawn between the oasis and sites in the western cluster.
- Mapped data for both periods were overlaid on a modern Digital Elevation Model of the area and mapped in ArcScene.

Conclusions:
- Features such as lakes can be plausibly reconstructed based on the spatial distribution of archaeological sites.
- The constriction of the lake between the Prehistoric and New Kingdom periods indicates that the landscape was drying.
- The close correlation of Prehistoric and New Kingdom routes indicates that the Prehistoric landscape was already arid enough to require travel from well to well. This could mean that the drying of Kharga Oasis began much earlier than previously thought.

This analysis was performed with archaeological survey data provided by the North Kharga Oasis Survey (NKOS), operating in Kharga, New Valley Province, Egypt. Coordinates for cultural material and geological features in the survey area were collected by handheld GPS over the course of several field seasons, and the dataset includes cultural material from the Paleolithic until modern times.

Geological and archaeological evidence indicate that the area surrounding Kharga Oasis, now a hyper-arid section of the Libyan Desert, was once considerably greener. Petroglyphs and physical remains of aquatic animals point to the existence of a large lake in the area, but erosional processes and infilling of sand make it difficult to determine the boundaries of this feature.

The GIS analysis seeks to locate the lake by mapping the sites that ringed it, and to track ecological change by examining the distribution of sites and roads. In order to view patterns more clearly, sites were separated by period. Presented here are two archaeologically distinct periods: the Prehistoric (before 3400 BC) and the New Kingdom (c. 1550-1070 BC).

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