Pastoralists and GIS:
Predictive Modeling and Campsite Location in Beidha, Southern Jordan
Outline

• Predictive Modeling: Why?
• Why Beidha?
• The Model.
• The Next Steps for Predictive Modeling.
• Beidha Revisited (Site Formation Processes).
• Conclusions
Goats and sheep were fully domesticated by 9000 kya. Nomadic pastoralism was therefore a major social and economic strategy by at least the PPN whose participants were dynamically involved with their more settled neighbors.

Why then do we know so little about these ancient pastoralists?

Due to the nature of pastoralism, campsites are generally temporary and ephemeral. Therefore, the survey strategies employed to find more permanent agricultural sites are not effective.

Survey methodologies utilized in the research of hunter-gatherer site are more useful, but even these do not take the interdependence of pastoralists and their herd animals into account.
Predictive Modeling and Near Eastern Nomadic Pastoralism

- Predictive models have been used successfully in other types of archaeology for several decades, but have never been employed in the archaeology of nomadic pastoralists.
- Modern GIS combines advanced terrain simulation and robust geo-statistical abilities with high powered computing to provide a platform for types of predictive modeling heretofore thought functionally impossible.
- Multivariate analysis of ecological, cultural, and geographic variables of nomadic campsite location can be cross-tabulated with known campsites to create a unique model.
Predictive Modeling and Near Eastern Nomadic Pastoralism

• These models can be tuned both in geographic and cultural scope, and provide multiple types of information useful to archaeologists.
• Not only can they tell us where sites are located, they can tell us exactly why these types of site are located where they are.
Pastoralism in Beidha

- Why Beidha?
Pastoralism in Beidha

- Why Beidha?
- Surveyed specifically for recent pastoral campsites in 1982 by Banning and Köhler-Rollefson and again in 1989-1993 by Simms and Russell, and other travel 19th and early 20th century travellers visited the area and wrote about the pastoralists they encountered.
- Extensive ethnological and ethnoarchaeological data for the modern Bedouin of the region.
- Small in total area, but comprised of diverse ecological and geographic zones.
- Presents a “living laboratory” that has been studied ethnoarchaeologically for over two decades.
Lowland Alluvial Zones

Upland Forested Wadis
Modeling Parameters

• What seems useful?
  • The fallacy of water and pasture…
  • Purely ecological factors?
  • Purely cultural factors?
  • The right mix.

• Trial and error is the only way.

• What I used for the Beidha Model:
  • Distance to Wadi bottoms as a proxy for water.
  • Distance to ridge tops as a proxy for pasture and seasonality.
  • Slope as a measure of water avoidance and ease of camping.
  • Aspect as measure of wind and sun avoidance-seeking.

• Parameters tested and not used.
  • Substrate type; Distance to shadows (Summer and Winter); Viewshed area and direction; Distance to the roads; Distance to the various geobotanical zones.
The Future of Predictive Modeling

- More sophisticated environmental models.
- Larger scale, more realistic digital elevation models.
- More accurate environmental simulation using remotely sensed data and irradiation simulation.
Intensity of Solar Radiation

Overall Ground Reflectance
The Future of Predictive Modeling

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• More appropriate model building tools.
  • Dempster Schafer Theory and Plugin for GRASS GIS
The Future of Predictive Modeling

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- Paleoenvironmental reconstruction.
  - The Mediterranean Landscape Dynamics project at ASU.
  - Paleoclimatic data and reconstruction.
  - Geomorphic landscape reconstruction and erosion/deposition modeling.
USPED-based landscape evolution in GRASS GIS

(6 timesteps, landcover, rainfall, and soil type held constant)
Beidha Revisited

• In 2004 I was able to briefly revisit Beidha with Dr. Banning, and we reconnoitred some of the sites he recorded in 1982.

• Simms and Russell investigated the effects of 1, 2, and 4 years worth of site formation at some of their ethnoarchaeologically recorded campsites.

• Because the sites were recorded in depth more than 20 years ago, the Banning and Köhler-Rollefson sites are prime candidates for site formation studies.

• In combination with the short term effects of site formation garnered from the Simms and Russell study, reanalysis of the Banning and Köhler-Rollefson sites would provide ancillary information on the long term effects of site formation.
Site formation processes affecting the preservation of compacted goat-dung floors at two sites.
Eroding Hearth

Surface Scatter

Rock Ring
Conclusions

• Predictive modeling is a tool that can and should be used to address the challenges presented to archaeologists interested in nomadic peoples.
• Caveat emptor however: You only get what you put into the model.
• Therefore, complex multivariate models of site location built from archaeological, ethnoarchaeological, and ecological data and applied to robust terrain and environmental models should be pursued above other types of modeling.
• These models not only aid in site location, but also give us the means to test why sites are where they are, and can open up new avenues of research.
Conclusions

• Most importantly, however, it should be stated that predictive models are only the first step.

• In order to bring the archaeology of Near Eastern nomadic pastoralists to the same level as their agriculturalist neighbours, we must pursue other important research topics, such as site formation studies.

• Hopefully, the model presented here represents a good first step, and will help bring the archaeology of nomadic pastoralists into the 21st century.
References:


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