Reconstructing the Routes of the Aqueducts of Roman Sparta using GIS Least-Cost Path Analysis

This paper presents a comprehensive overview of the evidence for the Roman aqueducts of Sparta, followed by a Least-Cost Path analysis of their potential route. While it has long been known that there was at least one aqueduct supplying Imperial Sparta, little is known about its form, shape, length, date, route, or even if there were more than one. This paper compiles the relevant literary, epigraphic, and archaeological data for any Roman aqueducts in Sparta. Additionally, I provide some commentary on the water supply system of Roman Sparta. The evidence compiled suggests that there were two aqueducts supplying Sparta, built somewhere between Hadrian's reign and the middle of the 3rd century CE. Then, using the relevant data, I apply GIS Least-Cost Path analysis to determine the possible route of the Roman aqueducts. Least-Cost Path analysis has been utilized on a few occasions before for this purpose, yet rarely and in little depth have those analyses discussed their methodological framework. Thus, I lay out in detail my methodological approach to the problem and address the conceptual limitations. Finally, I present a series of plausible paths for the two aqueducts to take.

Abbreviated Bibliography

Atkinson, D.M., P. Deadman, D. Dudycha, and S. Traynor. 2005. "Multi-criteria evaluation and least cost path analysis for an arctic all-weather road." *Applied Geography* 25:287-307.

Breier, M., and M. Popovic. 2012. Tracing Byzantine Routes – Medieval Road Networks in the Historical Region of Macedonia and Their Reconstruction by Least-Cost Paths. In *Proceedings of the 16th International Conference on Cultural Heritage and New Technologies, Vienna 14 – 16 November 2011*.

Christesen, P., and N.W. Kramer. 2024. "The Settlement Organization of Sparta, from the Bronze Age to the Roman Period." *Classica et mediaevalia* 73:199-294.

Lolos, Y. 1997. "The Hadrianic Aqueduct of Corinth (With an Appendix on the Roman Aqueducts in Greece)." *Hesperia* 66 (2):271-314.

Orengo, H.A., and C.M.i. Alaix. 2011. Following Roman Waterways from a Computer Screen: GIS-based Approaches to the Analysis of Barcino's Aqueducts. In *Go Your Own Least Cost Path. Spatial technology and archaeological interpretation. Proceedings of the GIS session at the 15th Annual Meeting of the European Association of Archaeologists (EAA) 2009, 15-20 September, Riva del Garda, Italy*, edited by J.W.H. Verhagen, A.G. Posluschny and A. Danielisova. British Archaeological Reports, International Series. Oxford.

Robert, L., and J. Robert. 1976. "Bulletin épigraphique." *Revue des Études Grecques* 89 (426-427):415-595.

Ruggeri, F., M. Crapper, J.R. Snyder, and J. Crow. 2017. "A GIS-based assessment of the Byzantine water supply system of Constantinople." *Water Supply* 17 (6):1534-43.