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Ancient Landscapes of the Ghor es-Sāfī: Surveys and Excavations 1997–2009

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The Ghor es-Sāfī is located at the southeastern end of the Dead Sea. At 400 m below sea level, it is the lowest place on the earth's surface. The ancient site is known from the Old Testament (Genesis 19) as *Zoar*, one of the 'cities of the plain' which was not destroyed by fire and brimstone. The area has good archaeological evidence for a substantial settlement of the Early Bronze Age, more limited Middle Bronze Age sites, and an extensive Iron Age occupation. It is attested in Roman documents, for example the Babatha Archive and the *Notitia Dignitatum*, as *Zoara*, an agriculturally rich district and the station of a cavalry unit. On the Byzantine mosaic map at Madaba, it is depicted as the walled city of *Zoora* surrounded by date palms and it is also known to have been the seat of a bishop who attended the Nicaean Councils. During Crusader and medieval Islamic periods, historical sources such as Yakut, Al-Maqdisi, and Foulcher of Chartres name it as *Segor* and/or *Zughar* and mention that it was a major center for sugar and indigo production as well as the most important market for these products.

Aerial view of Wadi al-Hasa in the Ghor es-Sāfī from the west; photo by Jane Taylor

Byzantine-period *Zoora* as depicted on the late 6th century A.D. mosaic map at Madaba; photo by Michele Piccirillo

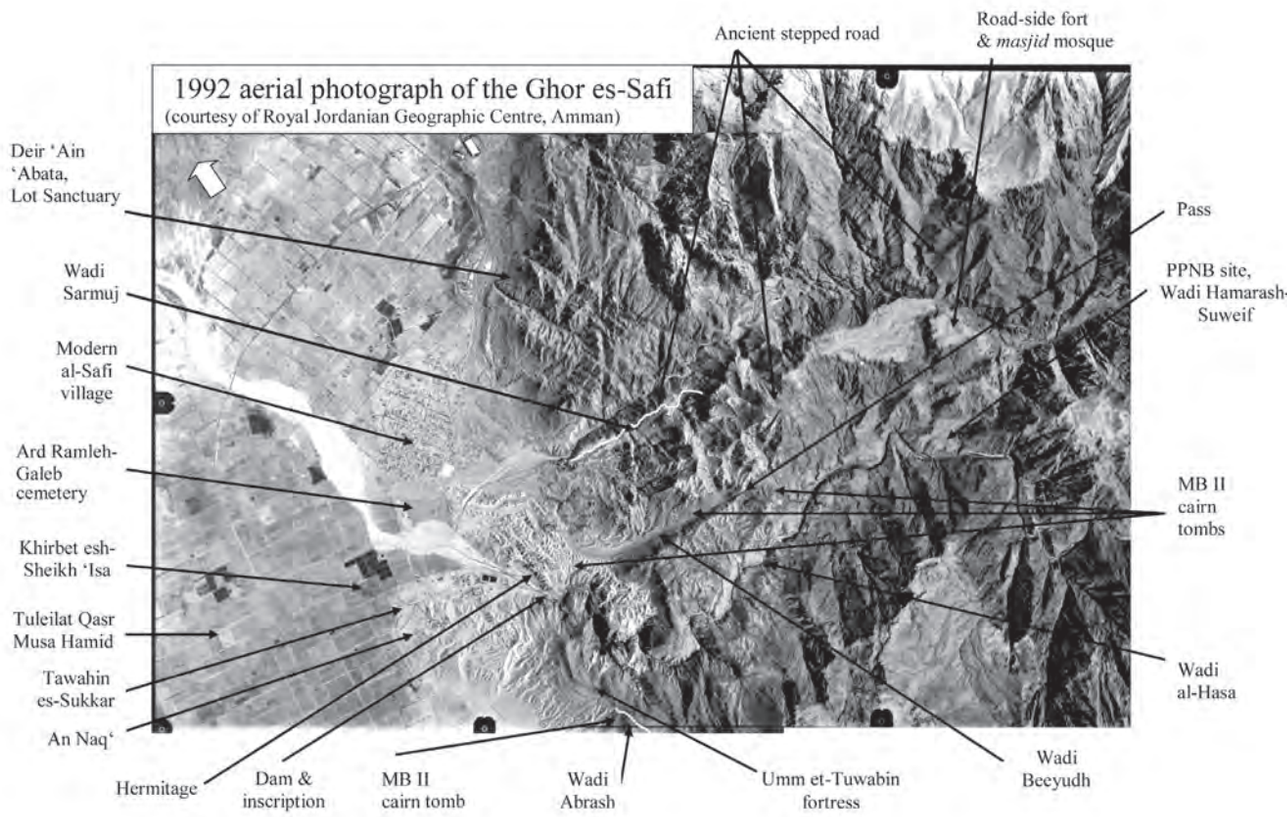
Early archaeological surveys of the Ghor es-Sāfī area by Albright and Kyle in 1924, Frank in 1934, Alt in 1935, King et al. in 1982, and MacDonald in 1986 identified remains associated with the Bronze and Iron Ages, and Roman, Byzantine, and Islamic periods. These scholars alluded to the site's biblical and historical associations identifying it as *Zoar*, *Zoora*, *Segor*, and *Zughar*.

The important discoveries of the Sanctuary of Lot at Deir ʻAin ʻAbata and the Nabataean cemetery at Khirbet Qazone made in the late 1980s and 1990s renewed archaeological interest in the Ghor es-Sāfī region. This was compounded by significant finds uncovered by illicit looting in the area, which spurred further field work.

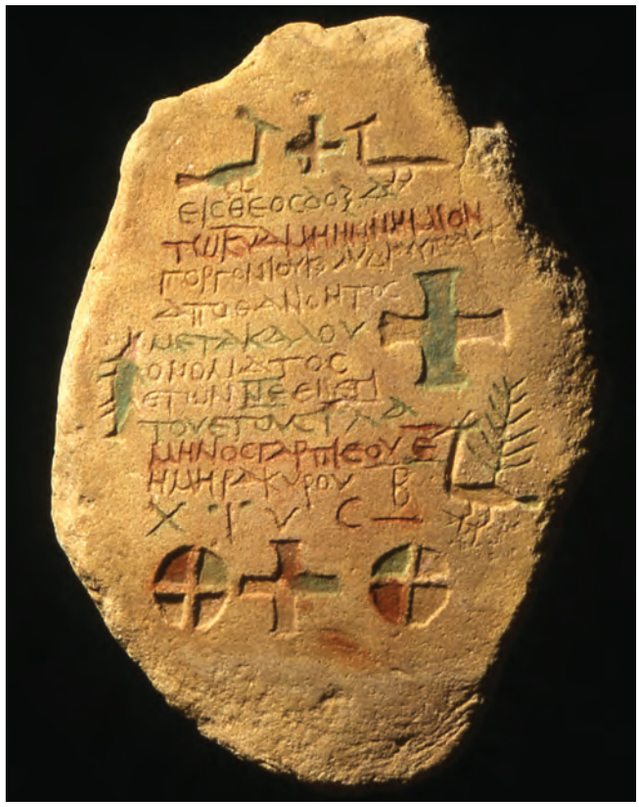
The Ghor es-Sāfī project

Over a period of twelve years beginning in 1997, the Ghor es-Sāfī project located and mapped dozens of archaeological sites in the region. The main components within the general area are the early Byzantine–medieval Islamic urban center of Khirbet esh-Sheikh ʻĪsā, the associated adjacent industrial complex of Masnaʻ es-Sukkar (commonly known as Tawāhīn es-Sukkar), and the Early Bronze Age and Byzantine cemeteries at An Naqʻ. Other parts include the sprawling Iron Age agricultural settlement of Tuleilat Qasr Mousa Hamid, the Nabataean fortress of Umm et-Tawabin with an associated dam below it, the early Christian hermitage at the Wadi al-Hasa, and the ancient road along the Wadi Sarmūj. Further east at the junction of the wadis Hamarash and Suweif is a substantial Pre-Pottery Neolithic B (PPNB) settlement.

After a series of initial surveys and geophysical tests carried out in the late 1990s, trial excavations were made in 2002 at the southwestern edges of Khirbet esh-Sheikh ʻĪsā exposing the southern extent of the city walls and a number of internal rooms. At the western and eastern perimeters there was good evidence for churches. A wider survey of the vicinity and surrounding slopes identified the limits and discerned the ancient agricultural field system. This surviving evidence on



1992 aerial view of the Ghor es-Sāfī annotated with sites and wadi locations



Byzantine period tombstone discovered in the Ghor es-Sāfī (and currently on display in the new museum there) made for Gorgonios (son) of Claudius, the vice-deacon, who died aged 55 years on 23 August 436; photo by Trevor Springett

the ground was then compared to 1961 aerial photographs taken before the area was developed and consequently disrupted. Limited excavations were also conducted of a few of the thousands of Early Bronze Age tombs at An Naq‘ and at the Iron Age settlement of Tuleilat Qasr Mousa Hamid.

The 2004 season saw the survey of the greater Ghor es-Sāfī environs and expansion of two excavation trenches opened during the 2002 season: the eastern pressing chamber at Masna‘ es-Sukkar (in the sugar factory complex) and at Khirbet esh-Sheikh ‘Īsā (the city center). The latter is a key area not only because it is the location of the main market but also because of its substantial, stratified deposits rich in material and environmental finds. New excavations were made in the Byzantine part of the cemetery at An Naq‘, where over five hundred important 4th–6th century Greek and Aramaic inscribed tombstones have been recovered in recent years. This cemetery has been badly looted by tomb robbers and it had never been officially excavated before so these excavations have been essential in identifying the origin of these tombstones.

The 2004 survey precisely located a newly identified dam with a Nabataean inscription, an ancient road leading to the eastern plateau, the fortress of Umm et-Tawabin, and the agricultural lands to the west near Tuleilat Qasr Mousa Hamid (thus confirming the Iron Age shoreline south of the Dead Sea).

Work also began on establishing a basis for mapping the entire area: every known site was revisited and basic coordinates taken using a GPS and a Total Station Theodolite. In addition to this, various aerial photographs were gathered including a set taken in 1992 by the Royal Jordanian Air Force, a complete set of 1:50,000 maps of the area, and selected 1:25,000 maps, Shuttle Radar Topographic Mapping (SRTM) data, and low resolution NASA satellite imagery. This information has been ‘geo-corrected’ to establish a Geographical Information Project using the newly established Jordanian coordinate system and it will serve as the main system of recording.

In 2006–2007 the survey continued with more field walking and verification. In order to understand the nature and extent of communication routes between the Ghor es-Sāfī and the interior, the routes running into the Ghor es-Sāfī from the wadis Sarmūj and Abrash were traced and recorded employing GIS/GPS. Following excavations, a detailed plan was made of the hermitage on the north bank of the Wadi al-Hasa. On the south bank, the ancient water canal and associated dam with the newly discovered Nabataean inscription next to a rock-cut niche were also recorded. Additional aerial photographs taken in 1953 and 2000, now available at the Royal Jordanian Geographic Centre in Amman, were incorporated into the GIS/GPS database of the Ghor es-Sāfī.

Further east along the Wadi al-Hasa at the intersection of the wadis Hamarash and Suweif, excavations at the PPNB settlement revealed ‘Basta-type’ buildings standing over 1.5 m high, flint tools, and many grinding stones attesting to early agricultural activities. Two more Neolithic sites were identified and recorded nearby.

A section of the ancient road leading to the Ghor es-Sāfī; photo by Georgios A. Papaioannou

Eastern Sugar Pressing Chamber in the Masna‘ es-Sukkar; photo by Konstantinos D. Politis

Immediately north of Wadi al-Hasa lies Wadi Sarmūj, in which the ancient road leading up to the Kerak plateau was identified and mapped. Although it was originally a Roman stepped ‘Imperial’ road, three open-air *masjid* mosques along the route indicated that it was also used during medieval Islamic periods. Copper mining was also evident here. The smaller Wadi Beeyuth in between wadis Sarmūj and Hasa was also investigated. South of Wadi al-Hasa beyond the Nabataean fortress of Umm et-Tawabin, a track was identified in Wadi Abrash with evidence of pack animals still using it. In all these wadis on the Late Pleistocene terraces, Middle Bronze Age II cairn tombs similar to those at Deir ‘Ain ‘Abata were identified and mapped.

On the Ghor es-Sāfī floor, surveying was extended around Khirbet esh-Sheik ‘Isa and Tuleilat Qasr Mousa Hamid in order to identify more clearly the extent of these two settlement sites. The former medieval Islamic city is much more extensive than the current officially claimed antiquities property and it is obvious that additional lands need to be acquired. The latter site also proved to be a more extensive Iron Age II agriculturally based (primarily wheat and barley) settlement with evidence of Roman occupation in the upper levels. Finally, in the Ard Ramleh-Galeb on the north bank of the mouth of the Wadi al-Hasa, a previously unknown Nabataean cemetery site was identified but was not surveyed because it is on private property.

During 2008 and 2009 fieldwork in the Ghor es-Sāfī continued. At Khirbet esh-Sheik ‘Isa the excavation trenches were expanded reaching a depth of over 2.5 m where an Abbasid-period paved street and mosaic floor were revealed. In situ finds included pottery associated with the sugar and indigo industries known from medieval historical sources to have flourished there. At Wadi Hamarash-Suweif, more well-preserved PPNB buildings were exposed in the excavations and included a very large rectangular one, aligned with streets, and containing possible cultic objects which may have served a ceremonial function. The survey identified a third ancient stepped road, at Wadi Kuniya just north of the Ghor es-Sāfī, leading up to the Kerak plateau.

The whole region is undergoing constant development which unfortunately threatens the ancient landscape.

Origins of the Sugar Industry

Particular emphasis needs to be given to the sugar industry in the Ghor es-Sāfī where large-scale production in the region first began. During the 7th to 9th centuries, Arab scholars advanced their study and development of ancient Greek science, particularly in chemistry, in part resulting in the development of a chemical industry. Combined with knowledge of processing sugar cane acquired from India via Persia, they perfected its mass production. Consequently, the wide-spread cultivation of sugar cane was introduced and gradually established in Egypt, Syria, Palestine, and Jordan.

The Masna‘ es-Sukkar, or sugar factory, in the Ghor es-Sāfī is important because it has three presses, making it the largest known in Jordan and Palestine. Sugar cane was crushed in water-powered installations and the product was then pressed to extract the juice. The extract was boiled for evaporation and subsequently poured into conical-shaped perforated pottery jars and the molasses dripped into the jars below. Large-scale production of sugar required a great number of these custom-made pots as well as *dusut*, unusually large metal bowls needed for the boiling process. These specialized vessel types contributed to the productivity of the sugar industry.

Analysis of the pottery and other finds suggests that the Masna‘ es-Sukkar in the Ghor es-Sāfī may have functioned as early as the 8th century and was certainly fully operational during the 12th–14th centuries in the Crusader and Ayyubid-Mamluk periods. The late 15th century burials found within the crushing chamber testify that operations had ceased by then.

The adjacent site of Khirbet esh-Sheik ‘Isa was medieval Zughar, the major market center in the southern Bilad esh-Sham (Levant) where the sugar product was traded and exported via an east-west road network to the port of Gaza through which there was access to the European markets. Because sugar was so closely associated to Zughar, it is likely that its name became the name of the product.

The sugar industry reached its peak in the Jordan Valley during the Mamluk Period (12th–15th centuries) and proved to be a highly profitable trade. Sugar factories and plantations were declared royal property and the sultan appointed a special supervisor of the Jordan Valley called *astadar al-aghwar* to collect the sugar products and manage their finances. Some of these factories were even put under the *na’ib* of Damascus (the delegate of the sultan) who went to the Jordan Valley

during the sugar cane harvest for inspections and to promote irrigation projects for the plantations.

The sugar industry represented the apogee of medieval Arab science and technology at the time and its international impact cannot be overstated. The already high demand for sugar in Europe grew further, prompting the development of the industry there. Eventually those factories superseded the Arab ones, dominating sugar production during the subsequent centuries. Sugar became a major world commodity and ultimately, sugar production and its industrial by-products were key to the foundation of the 'Industrial Revolution' in 18th century Europe.

The Lowest Place on the Earth

An overall objective of the Ghor es-Sāfī project is to distinguish the relationship of humans over millennia within the unique environment of the Rift Valley at its lowest place on land by the Dead Sea. The dramatically fluctuating landscapes of the area clearly affected people's ability to live in the terrain and determined their relative success in doing so. It is evident that the most vital feature was the perennial waters of the Wadi al-Hasa. Unfortunately though, these well-watered, soil-rich lands remain ideal for agriculture activities which often obliterate evidence of previous occupation.

Thematic presentations in the new Museum at the Lowest Place on Earth located in the Ghor es-Sāfī highlight the human use of this unique part of the world over some ten thousand years through the exhibition of finds from archaeological work in the region. 'The First People' focuses on prehistory, particularly the Neolithic-period stone tools related to the earliest agriculture. 'The First Cities' displays the oldest wheel-made pottery, stone vessels, early metal work, and jewellery from Early and Middle Bronze Age tombs at Bab edh-Dhra', An Naq' and Deir 'Ain 'Abata. 'The Story of Lot' illustrates one of the most dramatic episodes in the Old Testament book of Genesis and its association with Deir 'Ain 'Abata. 'A Monk's Life' describes daily life in an early Christian-Byzantine monastery. 'Nabataeans on the Dead Sea Shores' shows what ordinary Nabataean Arabs looked like, how they were dressed, and some of the artifacts from Khirbet Qazone. 'Hellenism and Islam' is a special exhibition which explains the influence and one thousand year continuity of Hellenic culture through the ages. 'The Story of Sugar' describes the origins of the sugar industry in the Ghor es-Sāfī region. 'On-going Excavations' highlights the finds from the latest archaeological work in the region. 'Mosaic-Making and Conservation' details the technology of an important ancient art and presents a unique way to preserve one mosaic. 'Rescued Antiquities' displays the most significant finds salvaged from looted sites, most important of which are the 4th–6th century inscribed tombstones. Another special exhibit is on 'Ancient Technologies' including pottery making, metallurgy, and stone working. Finally, the thematic flow of the museum exhibition ends with ethnographic collections from the modern peoples living on the southeastern Dead Sea shores.

The design and interpretation of the Museum at the Lowest Place on Earth was prepared by the Hellenic Society for Near Eastern Studies under the auspices of the Ministry of Tourism and Antiquities of Jordan. The Ghor es-Sāfī project is sponsored by the Hellenic Society for Near Eastern Studies in collaboration with the Department of Antiquities of Jordan and supported by Aramex LLC. The Palestine Exploration Fund (London) and ACOR supported post-excavation studies on all the finds with the objective of publishing the results in a monograph.

Aerial view of the Museum at the Lowest Place on Earth; photo courtesy of APAAME_20091022_DLK-0305 (for more aerial images of Jordan, see the Aerial Photographic Archive for Archaeology in the Middle East available at www.classics.uwa.edu.au/research/cah/aerial-archaeology)