

The small size of the stones and the narrowness of the walls indicates that this was a temporary structure that could represent the Yarmoukian version of Bedouin tents of much later times.

The sixth Millennium Street (FIG. 5)

The 1993 season produced one of the most impressive features uncovered anywhere in the Levant. Two stone walls in the South Field ran in an E-W direction, parallel to and about 15 m north of the Great Wall (Rollefson, Kafafi and Simmons 1993: Fig. 3); the Great Wall was built originally during the PPNC period but used well into the Yarmoukian as well. Between the two walls was a series of at least 13 steps 2.5 m wide that climbed the hill at intervals of 35-65 cm. The southern boundary of this walled street was repaired badly at one time and eventually destroyed during the Yarmoukian period, but the northern wall preserved two 75 cm wide gateways that opened from the street into courtyards. A single course of small stones acted as a "curb" at the gateways. The eastern end of the street was destroyed by bulldozers, but the street could be traced uphill for more than 9 m toward the west, where it was also destroyed by later Yarmoukian construction.

The street was certainly in use during the Yarmoukian period, as is shown by potsherds mixed into *huwwār* surfacing of the steps. But it remains unclear when the street was originally constructed: at the eastern end of the street, the dirt between the stone steps produced no pottery, suggesting that it may have been constructed in the PPNC at about the same time as the Great Wall. But this small area barren of ceramic evidence is insufficient in sampling terms to be conclusive, and the only way to make a convincing determination would be to excavate (and in the process destroy) the feature, which we do not wish to do. It is safe to conclude, on the other hand, that the walled street represents one of the earliest efforts at community planning, dating to around the middle of the sixth millennium.

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Neolithic 'Ayn Ghazāl in its Landscape

Introduction

'Ayn Ghazāl was a permanent farming settlement for more than 2,000 years, a dynamic and vital center that witnessed one of the largest populations of its time anywhere in the world. Nine seasons of archaeological excavations conducted from 1982 through 1995 have sampled only about one per cent of the surface area of this town that had grown to more than 15 ha before its eventual decline and ultimate abandonment, research that has provided a considerable amount of detail concerning the changes in technology, architecture, subsistence economy, and social organization.

One of the principal aims of prehistoric archaeology is to understand social systems in terms of their interaction with the near and distant reaches of its surrounding environment, including assessments of how the environment constrained certain options for human development, as well as how society affected its surroundings. Put in other terms, what resources were available to human groups, how were these resources extracted and utilized, and how did these systems of procurement and use influence the viability of future social systems in a particular settlement, locality, or region?

Direct archaeological evidence can provide major insights to these questions, and much has been learned already about the 'Ayn Ghazāl area through analyses of faunal and botanical remains, geological processes, and changes in the patterns of recovered evidence. Even so, eventually all of the site-specific information must finally be placed in the context of the landscape around 'Ayn Ghazāl in order to understand why 'Ayn Ghazāl flourished so well for so long, but then declined in its fortunes to the point that it became a virtual ghost town, visited only seasonally by pastoral nomads for a couple of months of the annual round.

But it has been perhaps 8,000 years or more in calibrated radiocarbon time since 'Ayn Ghazāl went through its death throes, and in the past 80 centuries continued overexploitation and unconcern for the countryside has devastated whatever regional evidence could have been recovered for a detailed reconstruction of 'Ayn Ghazāl's surroundings. This problem has been particularly exacerbated within the past three decades as a result of urban

expansion between 'Ammān and az-Zarqā', resulting in wholesale replacement of hilltops, slopes, and valleys with new constructions and modifications.

But one can approach a general estimate of ancient land-use patterns, even in the urban sprawl around 'Ayn Ghazāl, by comparing archaeological evidence with references that reflect differences between modern conditions and those that pertained in the past. Two aspects of this avenue of investigation include detailed topographical maps and aerial photographs.

Occupational Stability versus Abandonment

'Ayn Ghazāl is only one of a number of sites on the Jordanian Plateau that demonstrates such extensive continuity through time, including Wādī Shu'ayb and— to a lesser temporal extent— Baṣṭa, which until now has produced the only well-documented sequence for the elusive Late PPNB period (ca. 8,500-8,000 bp, uncalibrated). In contrast, Neolithic settlements in the Jordan Rift (including Bayḍa) and westwards show either a much shorter span of occupation (e.g. Beisamoun) or contain sequences that reveal substantial interruptions in their settlement history (e.g., Jericho and Abou Gosh). In short, west of the Jordanian Plateau, every known farming village was abandoned by the middle of the ninth millennium bp, while those in the Jordanian highlands were either newly founded (Baṣṭa) or grew substantially in size after this time ('Ayn Ghazāl, Wādī Shu'ayb, aṣ-Ṣifiyya).

It remains a major problem to account for this contrast of site abandonment on the one hand and continuity of settlement on the other; associated with the latter aspect, the phenomenon of "site gigantism" also requires an assessment of the mechanisms underlying the apparent relocation of populations to the Jordanian Plateau. Information for most of the Jordanian sites remains unpublished or at an early stage of analysis, but a possible explanation is suggested by a general examination of the landscape surrounding the settlement at 'Ayn Ghazāl.

The disruption of many PPNB sites and the rapid growth or founding of others coincide with a dramatic decline in variability in the 'Ayn Ghazāl faunal record (Köhler-Rollefson *et al.* 1988). It is an inescapable conclusion that this decrease in the species inventory is asso-

ciated with a severe alteration in the local environmental and ecological conditions around 'Ayn Ghazāl, a situation that is clearly supported by the disappearance of forest or woodland associated species and the decline of small carnivores, birds, and microfaunal evidence (cf. Köhler-Rollefson *et al.* 1993).

The faunal situation at 'Ayn Ghazāl in the mid-ninth millennium bp might be taken to reflect the consequence of decreased rainfall, an interpretation that was popular from the 1950s to the early 1980s. But it is now clear that the "Climatic Hypothesis" to explain the fate of Neolithic settlements west of the Jordanian Plateau is no longer tenable (Köhler-Rollefson and Rollefson 1990). Instead, our research at 'Ayn Ghazāl indicates that the environmental degradation around mid-ninth millennium farming villages was the result of cultural overexploitation and mismanagement of resources over a number of centuries in an area that is notoriously delicate and marginal. Briefly, the effects on the local countryside of intensive browsing/grazing by ovicaprids in addition to local deforestation for construction, lime plaster manufacture, and domestic fuel needs—and the consequent exposure of otherwise protected agricultural soils to water and rain erosion—had the same effect on the viability of Jericho or Beisamoun as a decrease of 50 - 100 mm of annual rainfall.

It can be suggested, therefore, that the opposing fates of the sites on and off the Jordanian Plateau are related to the contrasting local landscapes; to the ecotonal variety surrounding farming settlements in terms of inherent adaptability potentials in case of environmental degradation. In this regard, the rich ecotone at 'Ayn Ghazāl (including Mediterranean woodland and *maquis*, river galleria, steppe, and desert) offered considerable flexibility to generations of 'Ayn Ghazāl residents that may not have been available to the more environmentally circumscribed villages to the west.

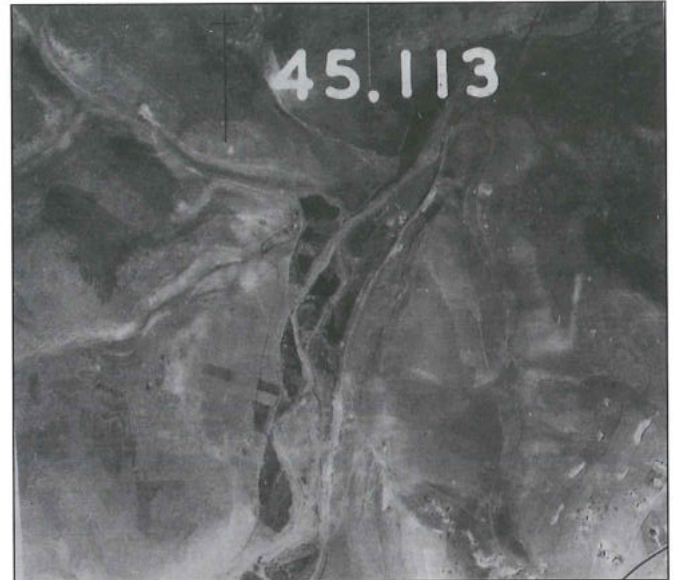
Neolithic Land Use at 'Ayn Ghazāl

The general pattern of resource utilization mentioned above ignores the fundamental question of how the Neolithic people of 'Ayn Ghazāl lived off the land. Where, exactly, did they live, where did they plant their crops, and where did they take their flocks? The plethora of multi-story dwellings, highways, and military reservations established in the past few decades make it difficult to resolve these problems by undertaking surveys in the area around 'Ayn Ghazāl (Simmons and Kafafi 1992). Even an attempt to reconstruct the original area of the Neolithic site boundaries of 'Ayn Ghazāl has proved difficult in view of the radical changes affected by public and commercial destruction/construction since the 1970s.

Former Size of Neolithic 'Ayn Ghazāl

The 'Amman area was sparsely populated, in a relative sense, until the surge of refugees into Jordan after 1948.

At some 14 km to the north-east of the center of 'Amman, the 'Ayn Ghazāl area was little affected by the immediate events of the war, as can be seen from the aerial photograph taken in 1953. The photo (originally 1:25,000 scale, but enlarged to 1:10,000) reflects the general landscape dissected by the Wādī az-Zarqā' and its tributaries, the presence of small black rectangles indicating Bedouin tents, and faint traces that represent dirt paths and roads, as well as the Hījāz railway in the eastern edge of the photo (FIG.1). The illustration also dimly shows the active zone of the az-Zarqā' river in addition to an area of perhaps seasonal or semi-periodic inundation of the lower terraces. The distribution of plantations indicates limits of expected river-fed irrigation of agricultural plots.



1. Aerial photo of the 'Ayn Ghazāl area taken in 1953.

FIG. 2, an aerial photo taken in 1990 (1:10,000 scale), shows the effects of population growth since 1953. The az-Zarqā' River Valley has been completely altered, and former floodbank plantations no longer exist. Much of the river valley has been reformed to reduce the earlier dramatic sinusoidal flow of the az-Zarqā' River to a lazier S-shaped plan. The high and broad terrace to the east above the Wādī az-Zarqā' is covered with recent residential developments.

Despite the contrasts in the two photos, one aspect remains little changed. The area between the west bank and the Hījāz railway on the east bank is constant, and one can estimate how much of the Neolithic settlement at 'Ayn Ghazāl was destroyed by recent twentieth century construction activity. A strip 40-50 m wide along the present course of the highway was bulldozed (ca.2.6 ha in total), and at the northern end of the site an area of perhaps a hectare was removed for the highway interchange. At its greatest extent, then, 'Ayn Ghazāl probably extended well over 15 ha (cf. earlier size estimate of 12 ha in Rollefson and Köhler-Rollefson 1989).



2. Aerial photo of the 'Ayn Ghazāl area taken in 1990.

Neolithic Farm and Pasture Land

The 1953 aerial photo is not of much help in locating potential acreage available to the Neolithic farmers of 'Ayn Ghazāl, but maps of varying scales show the most likely areas. The topography to the west of the settlement is wildly undulating and relatively deeply scored by wadis, and from the general steepness of the terrain it is unlikely that much of this area contributed greatly to cereal and pulse production; on the other hand, one should not overlook the potential of garden plots in the wadi bottoms that may have provided root crops for nutritional and seasonal variety. It is more probable that the hillsides and hilltops were used for hunting and herding. In the former case differences in elevation and plant cover would have provided the most diverse selection of prey, and in the latter case, the animals would have been kept well away from the fields during the growing season.

To the east of 'Ayn Ghazāl, there is a broad and gently falling plateau with a slope of approximately 4% or less, from the area just south of the Märka Airport to the cliffs beyond the northern end of 'Ayn Ghazāl. Where the terrain becomes broken in the northern reaches of this sector, there are still sizable terraces that would have been suitable for extensive agriculture, including one shelf just above and east of the East Field and another about a kilometer to the north-east of the site. Within a 2 km radius of the center of 'Ayn Ghazāl, we calculate that there would have been more than 500 ha of available farmland, well

within reasonable limits of travel time and transport distance to and from the fields, as well as the food requirements of the large population inhabiting 'Ayn Ghazāl at its peak (Köhler-Rollefson and Rollefson 1990: 7-9).

Within the river valley, the 1953 photograph shows broad flood plain plantations that were undoubtedly also important in Neolithic times. Better watered than the plateaus, fields of legumes and grain on these low terraces (10-15 ha in area just along the Neolithic village itself) would have provided some measure of food security during occasional short-term droughts in the 'Ayn Ghazāl vicinity.

Degradation of the Neolithic Landscape

The desert-like appearance conveyed by FIG. 1, a view repeatedly portrayed in 19th and early 20th century photographs from the southern Levant (e.g. Ramadan 1981), is certainly the consequence of persistent overexploitation of the landscape. We have detailed elsewhere (Köhler-Rollefson and Rollefson 1990) that this human devastation of the environment began with the founding of the Neolithic settlement at 'Ayn Ghazāl, a process of overgrazing, devegetation, and prolonged cultivation of fields that began to reduce the sustainable population level at 'Ayn Ghazāl by the beginning of the sixth millennium and eventually led to the abandonment of the settlement as a permanent farming community (Rollefson and Köhler-Rollefson 1993; Kafafi and Rollefson 1995).

Although a luxuriant ecotone at the beginning, the rapid population growth of the village came at the expense of increasing demands of food, fuel, and architecture. Land was cleared for new fields of wheat, barley, and legumes, opening the way to eventual erosion of the arable soil by wind and water. Depletion of wood stands for buildings and fires destroyed the natural habitats of wild animals that the earlier inhabitants hunted with such great success; hunting became less and less productive in the near reaches of 'Ayn Ghazāl, and in compensation more numbers and varieties of animals were domesticated and herded to make up for the shortfall of meat in the diet. The growing number of animals browsing and grazing in the vicinity of 'Ayn Ghazāl accelerated devegetation of the landscape, including the post-harvest stubble that otherwise would have protected the field soils from deflation and sheet wash. Water remained sufficient in the river and at the spring of 'Ayn Ghazāl (witness the small but short-lived Early Bronze site a half-kilometer south of the Neolithic settlement [Petocz 1986] and the Byzantine farmstead at 'Ayn Ghazāl itself [Rollefson, Kafafi and Simmons 1993]), but by the fifth millennium the landscape around the spring and river could support only small Neolithic shepherd groups on a temporary basis.

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