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The Wadi Faynan Project, Southern Jordan: a Preliminary Report on Geomorphology and Landscape Archaeology

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The Wadi Faynan Project of the British Institute at Amman for Archaeology and History (BIAAH) has as its principal objective the provision of a detailed case study in the relationship between environmental change and human history in the arid zone, from prehistory to the present day. This report describes the preliminary findings of an initial campaign of fieldwork in geomorphology and landscape archaeology conducted by an inter-disciplinary team in 1996. A preliminary sequence of fluvial events has been established, represented by the Ghuwayr and Shayqar Beds dated to the Late Pleistocene, and the Faynan and Dana Beds dated to the Holocene. Methodologies have been trialed for recording, dating and interpreting the ancient field system assumed to be of Nabataean, Roman and Byzantine date; initial findings confirm its longevity of use and complexity of purpose. There are also indications that floodwater farming began in the Wadi Faynan in the Chalcolithic or Early Bronze Age.

Introduction (GWB)

The Wadi Faynan Project of the British Institute at Amman for Archaeology and History (BIAAH) has as its principal objective the provision of a detailed case study in the relationship between environmental change and human history in the arid zone, from prehistory to the present day. The project is addressing fundamental issues in the history of desert exploitation in Jordan, with wide relevance for arid-land studies in general. This report describes the preliminary findings of an initial campaign of fieldwork in geomorphology and landscape archaeology conducted by an inter-disciplinary team directed by Prof. G. Barker in April and May 1996.

Systems of land use in antiquity have frequently been identified as the primary culprits to be blamed for the legacy of the apparently exhausted, depleted and degraded desert environments seen today. However, contemporary ecological theory for arid and semi-arid lands (Beaumont 1989; Middleton and Pye 1994; Thomas and Middleton 1994) emphasizes that there are not necessarily the simple linear relationships today between changes in environment and land use of the kind implied by many archaeological theories about interactions between people and dryland environments in the past (for discussion, see Gilbertson 1996). In order to understand the relationship between people and deserts today – and in order to model such relationships in the future – we have to have a far better understanding of how people have interacted with dryland environments in the past. To do this, we need the integrated methodologies of geo-archaeology, in particular linking geomorphology and landscape archaeology (Barker *et al.* 1996).

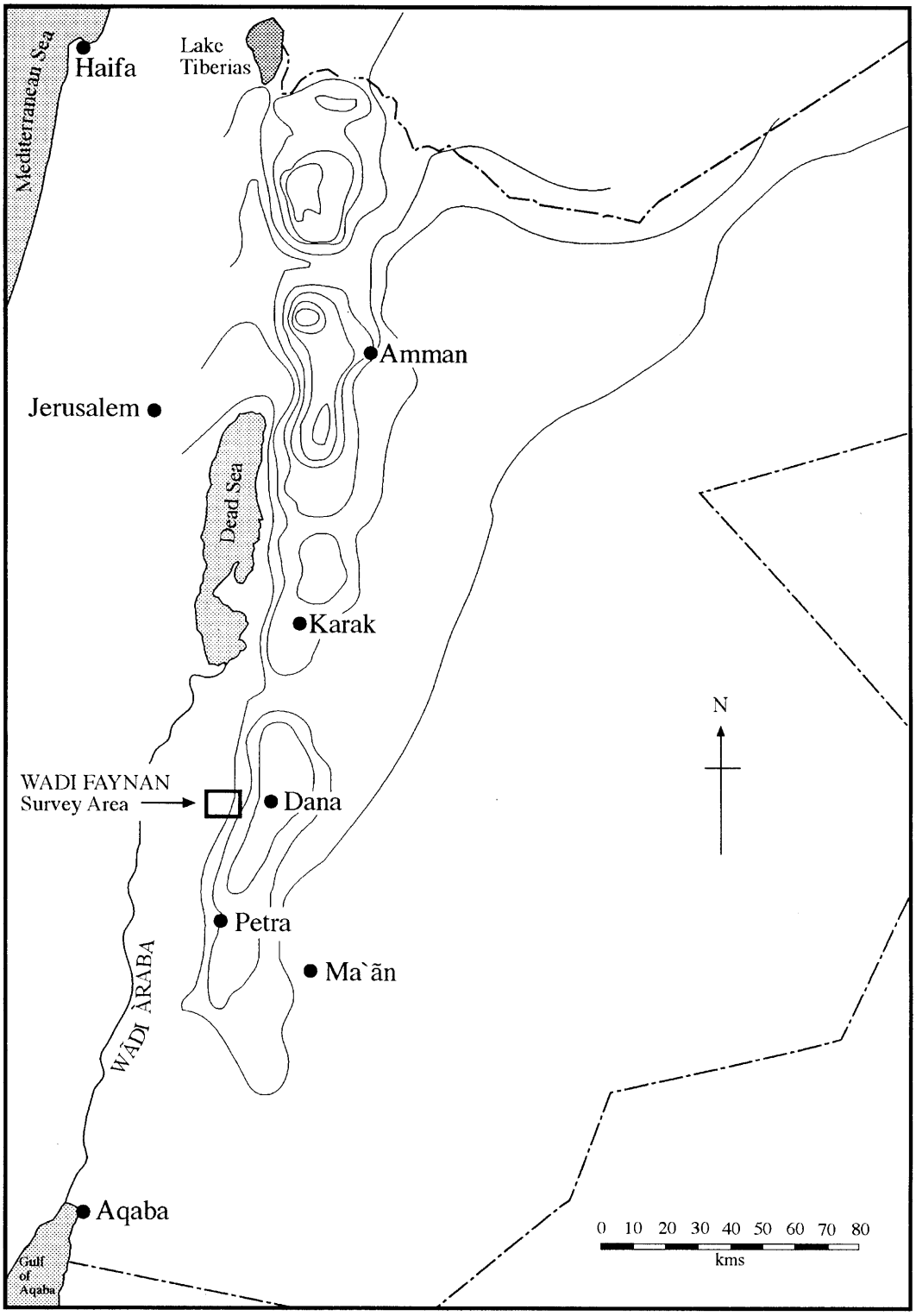

Figure 1. *The location of the Wadi Faynan within the region.*

The Wadi Faynan was selected by BIAAH as the case study for three principal reasons. First is the fact that it is a typical desertic region in terms of its climate, environment and landforms. The study area lies at the edge of a mountain front in south-western Jordan, immediately east of the trough of the Wadi Araba, which runs south from the Dead Sea to the Gulf of Aqaba (Fig. 1). The principal area of interest is the confluence of three wadis, the Ghuwayr (or Ghuweir on some maps of Faynan), Shayqar (or Sheger or Asheiar on some maps), and Dana, which merge to form the Faynan (Fig. 2). The Wadi Faynan is typically, but not always, a broad low basin 100–200 metres above sea level (Fig. 3), which opens onto the low plain of the Wadi Araba, but the terrain of the upper wadis immediately to the east and south-east is of notable relief, very rugged and inhospitable, rising dramatically to the fringe of the Jordanian upland plateau over 1100 metres above sea level (Fig. 4).

The Wadi Faynan has a dry desertic climate: Rabb'a (1994) records a mean monthly rainfall of 17 millimetres for January, falling to 0–0·1 millimetres from June through to September, rising to 17 millimetres in December, whereas rainfall on the plateau – only three to four hours walk from the Faynan confluence – is more than 200 millimetres a year. In the rugged mountain terrain, the steep, rock-strewn slopes of the ancient faulted bedrocks lead down to gravel-bed wadi floors in which powerful discharges occur at times of floods. To the west, these mountain slopes give way to long, low-angle aprons of colluvial and fluvial fans which merge to form the floor of the desert basin.

The second reason for the selection of the region was that the wadi has long been known for a remarkable suite of archaeological remains (Glueck 1935; Lagrange 1898; Musil 1907), indicating a variety of levels of intensity of human exploitation from prehistoric to recent times. The evidence included a suite of settlement and burial sites from the neolithic (Najjar *et al.* 1990) to the Islamic periods (King 1989). The complex is dominated by the major site of Khirbat Faynan ('the Ruin of Faynan') on a hill overlooking the wadi confluence. The whole hill is covered by a dense tumble of sandstone masonry, amidst which can be discerned a large central rectangular structure surrounded by a complex of subsidiary buildings, streets and lanes, and with two churches and other structures on a terraced platform to the northeast. Khirbat Faynan has yielded surface artefactual evidence for occupation in (at least) the Nabataean, Roman and Byzantine periods, and is assumed to be associated with other major monuments in the vicinity of the confluence, including an aqueduct, a major reservoir and a water mill, all assumed to be of Roman data, and cemeteries (Fig. 2).

As he travelled down the Wadi Faynan following his visit to Khirbat Faynan, Glueck noted "large stretches of formerly cultivated fields . . . strewn with Nabataean sherds" (1935, 35). These fields were marked out by boulder walls and stretched for several kilometres down-wadi along the south side of the wadi floor from the confluence. Several commentators noted that the surface pottery included much Roman and Byzantine as well as Nabataean material, suggesting a long history of ancient cultivation, presumed to be primarily in support of the population of Khirbat Faynan. The area is also extremely rich in minerals, and extensive research in recent years, especially by the Bochum Mining Museum, has demonstrated a rich prehistory and history of mineral extraction and exploitation (Adams 1991; Hauptmann 1989 and 1992; Hauptmann *et al.* 1992). Khirbat Faynan is assumed to have been the principal focus of this activity in the Nabataean, Roman and Byzantine periods, and the site is commonly identified with references to the copper mines of *Phaino*, to which Christians of Palestine and Egypt were transported in the third and fourth centuries A.D. Given the wealth of archaeological evidence, therefore, the Wadi Faynan seemed ideal for an inter-disciplinary investigation of a desert landscape and of the long-term exploitation of its plant, animal and mineral resources.

The third reason for the study is that the remarkable archaeological landscapes of the Wadi Faynan are increasingly threatened by modern development: the lower part of the Wadi Faynan has been turned over to intensive vegetable production irrigated by water piped down from a major spring in the Wadi Ghuwayr and year by year the system is extending further up-wadi. Cemetery sites are also being pillaged by grave-robbers, the context for an on-going rescue excavation by a BIAAH team.

It must be emphasized that this is not a case study in environmental determinism: the Wadi Faynan offered particular opportunities and set particular constraints for human settlement, but how human societies have responded to these has depended especially on their social institutions. Also, in no sense can the wadi system be understood as a closed cultural system: the exploitation of mineral resources and trade in metal have of course inextricably linked the area with the outside world, whilst in terms of agriculture, for example, the Bedouin pastoralists who currently winter their flocks in the wadi take them up to their villages on the plateau edge in the summer, whilst the market gardening

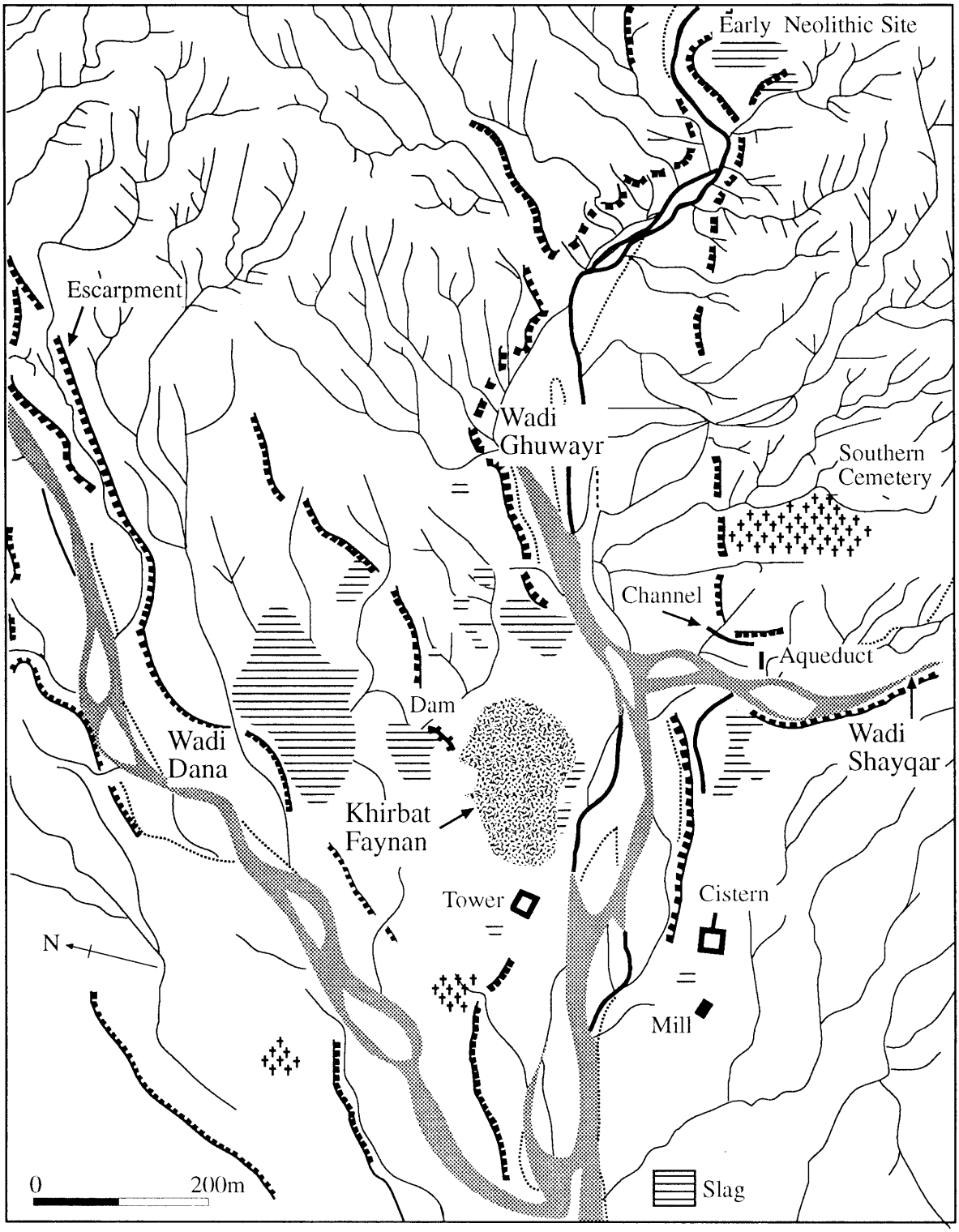

Figure 2. *Detailed map of the Dana/Ghuwayr/Shayqar confluence, showing the principal archaeological sites and features.*

Figure 3. *View west from Khirbat Faynan down the Wadi Faynan towards the Wadi Araba. (Photograph: G. Barker).*

Figure 4. *Looking east up the Wadi Ghuwayr towards the plateau escarpment; the neolithic settlement ('Wadi Ghuwayr 1') is situated on the spur at the centre of the photograph. The two plastic pipes in the foreground are taking water from the Wadi Ghuwayr spring (behind the spur) to irrigrate fields in the lower wadi. (Photograph: G. Barker).*

now expanding in the lower wadi is a cash economy developed to meet the expanding urban market of Amman. Nevertheless, the wadi forms a very attractive focus for an integrated study in landscape archaeology, precisely to be able to understand the variety of ways in which its cultural ecology has adapted to environmental change on the one hand and to the outside world on the other.

The BIAAH conducted reconnaissance survey in the Wadi Faynan in the spring of 1995 (Barnes *et al.* 1995): three transects of terrain across the main wadi below its confluence were investigated by intensive 'field-walking'. This fieldwork demonstrated the likelihood of considerable time depth in the settlement record: the team located numerous lithic scatters likely to be of palaeolithic, epipalaeolithic and neolithic date, a number of concentrations of pottery and lithic material of chalcolithic and early bronze age date, possibly associated with burial cairns, and a variety of Nabataean, Roman and Byzantine structures. Furthermore, they also noted that the field system in the transects was carpeted with Nabataean, Roman and Byzantine pottery, *prima facie* evidence for a period of use of similar antiquity. Further information has been obtained by the BIAAH from rescue excavations undertaken in a major cemetery south-east of Khirbat Faynan, and from survey around Dana at the head of the wadi system for the Royal Society for the Conservation of Nature (Finlayson and Baird 1995). The purpose of the fieldwork described in this report, however, was to begin the process of developing an integrated geo-archaeological framework for the Wadi Faynan Project, by using the techniques of geomorphology to investigate landscape evolution and those of landscape archaeology to investigate the nature and function of the field system that forms the primary evidence for past land use. The team worked in the Wadi Faynan in April and May 1996, alongside a team directed by Dr Karen Wright (University College, London) conducting an initial investigation of a settlement site of early bronze age date located by the 1995 BIAAH survey within the field system (now designated as site WF100 in the survey record), though this work is not reported on in detail here.

The geomorphic development of the archaeological landscape (DDG, COH, SJM)

The study area is immediately to the east of one of the fundamental discontinuities of the Earth's crust, the Wadi Araba and Dead Sea Transform Fault System. The latter forms part of the boundary between the African and Arabian tectonic plates, which since the Miocene has accumulated approximately 105 kilometres of left-lateral movement (Quennell 1984). A detailed and referenced account of the geology of the region is provided by Rabb'a (1994).

This initial report sets out our present understanding of the geomorphological development of the desertic area defined by the confluence of the Wadis Dana, Ghuwayr and Shayqar. The Late Quaternary deposits in the immediate study area have been described, mapped and interpreted by Rabb'a (1994), who recorded the presence of Late Pleistocene fluviatile gravels and alluvial fans; Late Pleistocene to Holocene alluvial fans; and Holocene aeolian sands and dunes, and alluvium and wadi sediments.

It is clear from previous work (for example: Marco *et al.* 1994; Quennell 1984) and from our own unpublished work that the Late Quaternary in this region witnessed major climatic, tectonic and related environmental changes. At times in the Late Pleistocene, the wadis in the present study area were characterized by the presence of powerful, aggrading rivers, which led to the development of large alluvial fans and boulder-rich terrace deposits. Subsequently, these alluvial fans were subject to substantial vertical and lateral erosion. These processes produced those major elements of the present basic topography comprised of surficial deposits. The 1996 fieldwork has further subdivided these Pleistocene deposits (Fig. 5). Several substantial bodies of ancient – presumed Pleistocene – bodies of fluviatile sands and gravels have been provisionally recognized in the survey area, though we need further information before they can be described and interpreted in more detail.

In the area of the ancient field system and the associated complex of archaeological remains, we have mapped and named a particularly complex set of these alluvial, fluvial and fanglomerates as the Ghuwayr Beds. These reach up to forty metres above the present wadi floor in the study area, and can be equated with the Pleistocene PLG2 fluviatile deposits identified by Rabb'a (1994). An early (Pre-Pottery B) neolithic settlement being excavated by Mohammad Najjar of the Jordanian Department of Antiquities, dated to the later eighth and seventh millennia B.C., is located on the surface of an eastern extension of these deposits in the Wadi Ghuwayr (site 'Wadi Ghuwayr 1'). More generally, within the immediate study area, neither flint artefacts likely to be later than palaeolithic in date, nor traces of field systems, have been found resting on surfaces developed on the Ghuwayr Beds. Unrolled artefacts of

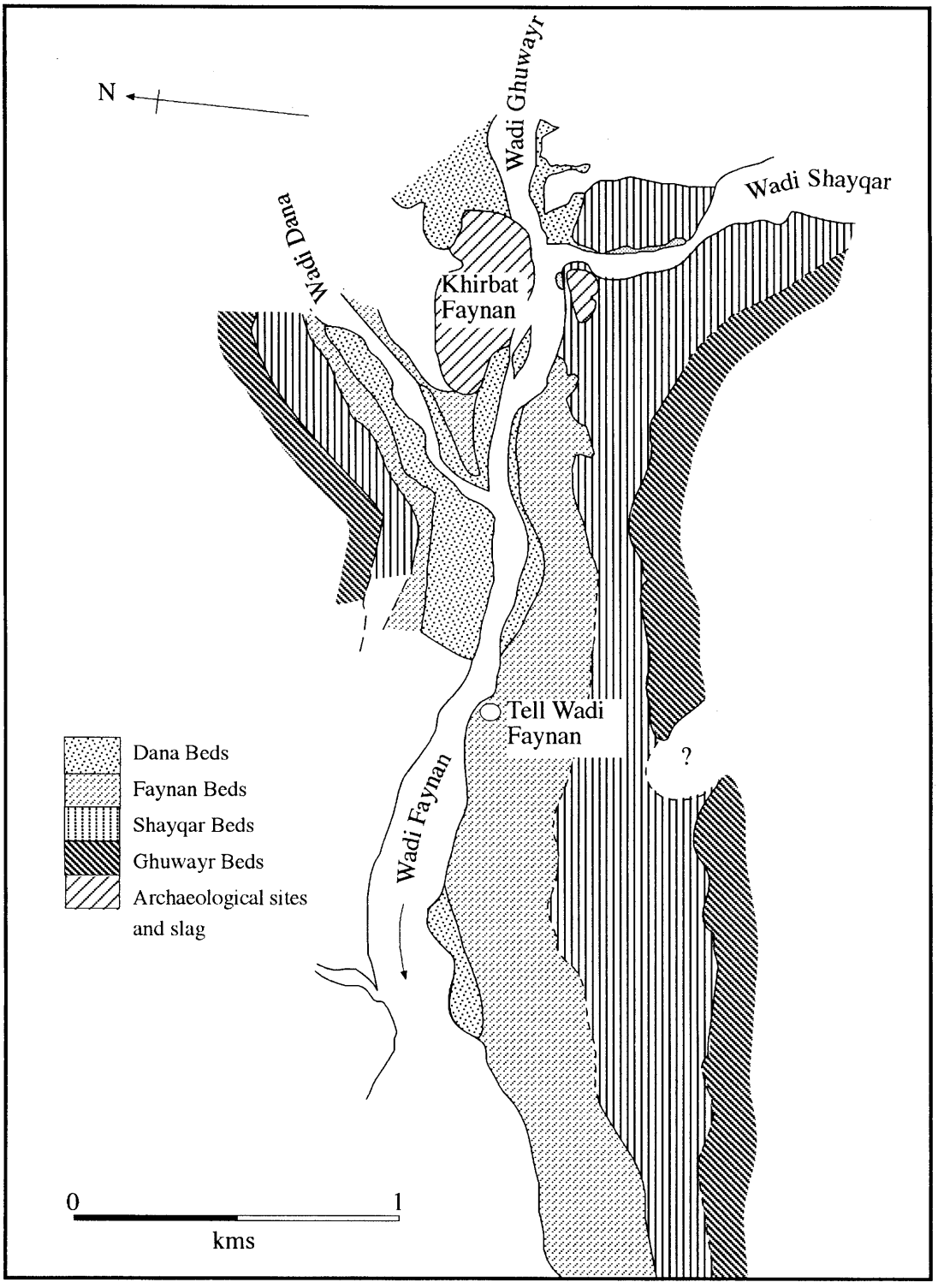

Figure 5. *Simplified geomorphological map of the study area.*