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(Before and) After the Flood: A multiproxy approach to past floodplain usage in the middle Wadi el-Hasa, Jordan

Daniel A. Contreras [a, *], Vincent Robin [a], Regina Gonda [a], Rachel Hodara [b], Marta Dal Corso [c], Cheryl Makarewicz [d]

[a] Institute for Ecosystem Research, Christian-Albrechts Universität zu Kiel, Olshausenstr. 75, D-24118 Kiel, Germany
[b] Scientific Consultant Services, Inc., 1347 Kapiolani Boulevard Suite #408, Honolulu, HI 96814, USA
[c] Graduate School Human Development in Landscapes, Christian-Albrechts Universität zu Kiel, Leibnizstraße 3, D-24118 Kiel, Germany
[d] Institute of Prehistoric and Protohistoric Archaeology, Christian-Albrechts Universität zu Kiel, Johanna-Mestorf-Straße 2-6, D-24118 Kiel, Germany

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ABSTRACT

Floodplains are an important feature of arid landscapes, enabling intensive agricultural activity by providing a locale with a consistent and largely predictable water source that is accessible without costly infrastructural modifications. Floodplain agriculture, although likely an important part of ancient agricultural systems in the Near East, is notoriously difficult to detect, as the dynamic environments in which floodplains are situated means that these geomorphic features are rarely preserved. However, recent survey in the Wadi el-Hasa, Jordan has revealed a preserved fragment of floodplain surface indicating past floodplain usage during the 7th–8th century cal AD. A multi-proxy analysis that incorporates geomorphic, geochemical, and paleobotanical analyses of this exposure has revealed a process of floodplain aggradation and incision modified by human activities and anthropogenic deposition. Analysis of the anthropogenic sediments suggests that the Wadi el-Hasa floodplain has not been adequately considered as a component of economic and subsistence activity during the early Islamic period.

1. Introduction

In arid environments, floodplains provide important locations of biotic productivity and offer the possibility of viable and intensifiable agriculture even without expensive infrastructural investments in irrigation (Doolittle, 2006). They are areas that are relatively reliably and predictably watered, albeit geomorphically unstable on various timescales. As a result, floodplains have significant potential as study sites for research into past land use and human development, but despite this considerable potential as archives of regional and local paleoenvironmental conditions and past human land use, the geomorphic instability of floodplains means that they are relatively rarely accessible for paleoenvironmental and archaeological investigation. Cycles of aggradation and incision can bury or erode ancient floodplain surfaces, making preserved archaeological sites and sediment stratigraphy in such settings scarce.

Nevertheless, recent survey in the middle Wadi el-Hasa in Jordan has documented a preserved fragment of floodplain surface containing archaeological evidence of a 7th–8th century cal AD occupation, providing a rare glimpse into past floodplain usage. The archaeological site documented there testifies to intensive use of this now largely-eroded landscape, shedding light on pre-modern floodplain land use in the southern Levant and providing valuable evidence of the potential importance of such little-preserved landscapes.

Using a multi-proxy investigation of this stratigraphic exposure that incorporates geomorphic, geochemical, and paleobotanical analyses, we investigate the anthropogenic and geomorphic processes operative in the floodplain during this period, and in particular examine the evidence for human exploitation of the Hasa floodplain.

2. A preserved floodplain fragment in the Wadi el-Hasa: HML-Exposure 2

The Wadi el-Hasa, located between the modern cities of Kerak and Tafileh, is a perennial watercourse that dissects the Jordan

* Corresponding author. Tel.: +49(0)431 880 5009.
E-mail addresses: danielalexandercontreras@gmail.com, dcontreras@ecology.uni-kiel.de (D.A. Contreras), vrobin@ecology.uni-kiel.de (V. Robin), regina.gonda@gmail.com (R. Gonda), rachel@scshawaii.com (R. Hodara), mdalcorso@gshdl.uni-kiel.de (M. Dal Corso), c.makarewicz@ufg.uni-kiel.de (C. Makarewicz).

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Plateau from east to west, draining eventually into the Dead Sea at as-Safi (see Fig. 1). Environmental conditions vary according to topography throughout the Wadi el-Hasa, with a semi-arid climate characterizing the plateau and upper slopes (ca. 1000 m a.s.l), and a desert climate characterizing the wadi bottom (ca. 400 m a.s.l). Modern-day precipitation levels within the Wadi el-Hasa are generally low, ranging from less than 100 mm to 200 mm per annum (Office of Arid Lands Studies, 2006), but flash floods during the winter months are not uncommon.

The south side of the middle and upper Hasa has been extensively archaeologically surveyed (Clark et al., 1985; MacDonald, 1988), revealing a settlement history dating back to the Middle Paleolithic (as early as approximately 300 kya; see Fig. 2 for a summary of regional chronology). Subsequent work has explored long-term settlement and environmental dynamics in the drainage (Hill, 2004, 2006, 2009), and investigations of individual sites continue. Recent archaeological research in the area has focused on excavation-based investigations of individual archaeological sites, particularly those dating to the early Neolithic (e.g., Makarewicz et al., 2006; Peterson, 2004), but there is also substantial evidence for occupation and use of the Hasa later in (pre)history. Nabataean, Roman, Byzantine, and Islamic villages, outposts, temples, and infrastructure are scattered throughout the Middle Hasa, and site density peaked in the Byzantine period (Hill, 2006; MacDonald, 1988).

These studies and other more geomorphically-focused investigations have recognized a long history of incision and aggradation in the drainage (Schuldenrein and Clark, 2001, 2003; Schuldenrein, 2007; Vita-Finzi, 1966; Winer and Rachel, 2010). One of the results of this geomorphology is a paucity of floodplain sites in the valley. The scarcity of these sites, however, reflects their destruction by erosion, or occasionally their burial, rather than research lacunae or (as occasional preserved sites suggest) settlement preference.

This scarcity notwithstanding, field survey associated with the el-Hemmeh Archaeological Project in 2010 revealed a small preserved floodplain site (HML-Exp 02) dating to the early Islamic period (ca. 8th century cal AD). Located approximately 2 km upstream of Tannur Dam, the site is buried in the sediments of a 3 m alluvial terrace, and has been exposed by the downcutting activity of a small side drainage. The site, defined in 2011 by careful cleaning of the exposure, is preserved over an ~17 m stretch of the exposure and consists of anthropogenic sediments as well as a series of small architectural features constructed of river cobbles (see Fig. 3). The extent and depth of the anthropogenic sediments (the architecture is less extensive than and clearly postdates the lower anthropogenic strata), coupled with their low artifact density, strongly suggests that these deposits are not domestic refuse.

The preservation of a floodplain fragment in the middle of the Wadi el-Hasa offers an unusual opportunity to investigate the ways in which inhabitants of this portion of the wadi system were utilizing the floodplain during a period of geomorphic stability. We describe here the results of a multi-proxy investigation of the stratigraphic sequence exposed at HML-Exp 02, focusing in particular on the ways in which contrasts between pre-occupation, occupation, and post-occupation deposits identified in the floodplain fragment can inform us about short-term geomorphic change in the valley, broader vegetation change within the catchment, and direct anthropogenic influence on the floodplain. Specifically, we investigate evidence of soil formation and past vegetative communities in these deposits, and examine anthropogenic influences, including the potential of cultivation activity.

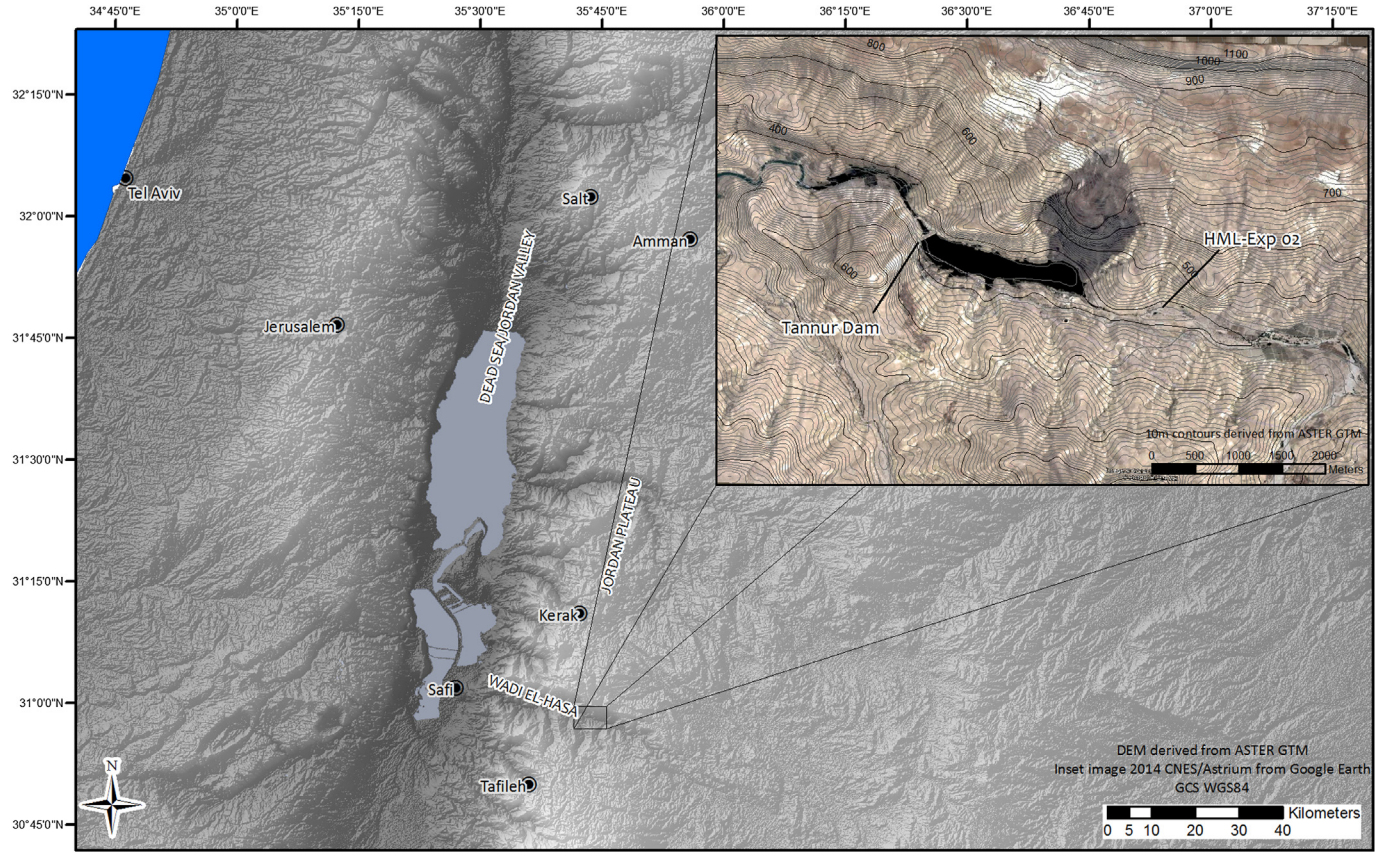

Fig. 1. Location and topography of the Wadi el-Hasa and the study site.