BROWN UNIVERSITY PETRA ARCHAEOLOGICAL PROJECT: THE 2010 PETRA AREA AND WĀDĪ SULAYSIL SURVEY

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Introduction

The Petra Area and Wādī Sulaysil Survey (or PAWS) undertook its initial season of fieldwork in the summer of 2010 as a major component of the Brown University Petra Archaeological Project (BUPAP). The PAWS research area is located some three to ten kilometers north of the Petra city-center, between the modern village communities of Umm Ṣayḥūn and Bayḍā, within which three zones were intensively surveyed: Areas a, b, and c (**Fig. 1**).[1] Given its close proximity to Petra, it is no surprise that previous travelers, explorers, and archaeologists have investigated this region, with the earliest accounts going back to the 19th century (Robinson and Smith 1841). However, the diachronic, systematic, and intensive design of the PAWS survey represents a novel approach to the documentation of this landscape that has yielded substantial and provocative results after only a single season of fieldwork.

In approximately a month long period between 28 June and 31 July 2010, the PAWS team systematically surveyed 133 hectares, in which material culture from all periods (from Paleolithic to the present) was counted and collected for some 334 Survey Units, and over 240 features — ranging from tombs to water management structures to agricultural installations — were recorded. The intention of this article is briefly to review previous research concerning the survey area, to discuss our methodological and theoretical concerns, and to summarize the preliminary results of the 2010 season.

The PAWS Survey Area and Previous Research

Our 2010 survey focused on a zone including Wādī Baqā‘,Wādī Sulaysil, and the immediate vicinity of the Islamic Bayḍā structures (the site of architectural mapping and excavation by BUPAP in this same season).[2] Again, this territory has long been known, if somewhat cursorily, to travelers and archaeologists. This brief synopsis summarizes accounts of the earliest western visitors and archaeologists who have conducted field research here in recent decades, framing what was known about the area previously and revealing some of the gaps that PAWS and its particular methodologies can fill.

The PAWS survey area is located in some of the most viable agricultural land near Petra and also is transected by several potential paths into the city. In terms of long-distance routes, there is a pass from Wādī ‘Arabah to the north of Wādī Sulaysil that allows access to the city center via Wādī Sulaysil; if approaching Petra from the north one must pass through the Bayḍā area, the site of the famed as-Sīq al-Bārid, or Little Petra, and numerous other Nabataean rock-cut tombs and complexes (see below). As for travel within the region, several wadis link the territory surveyed in 2010 with the city center itself, and any traffic between Bayḍā/Little Petra and Petra proper would pass through here. Without a doubt, this was an important part of Petra's hinterland during its Nabataean zenith, although our work proves its interest and importance is not limited to that time period alone.

Our earliest information goes back nearly as far as the first modern, Western descriptions of Petra. Burckhardt and many who followed in his footsteps entered via Wādī Mūsā and the Sīq (Burckhardt 1822: 422), usually traveling from ash-Shawbak. It is therefore possible that

1. Unless otherwise indicated, all maps created by Alex R. Knodell.

2. See Sinibaldi and Tuttle in this volume.

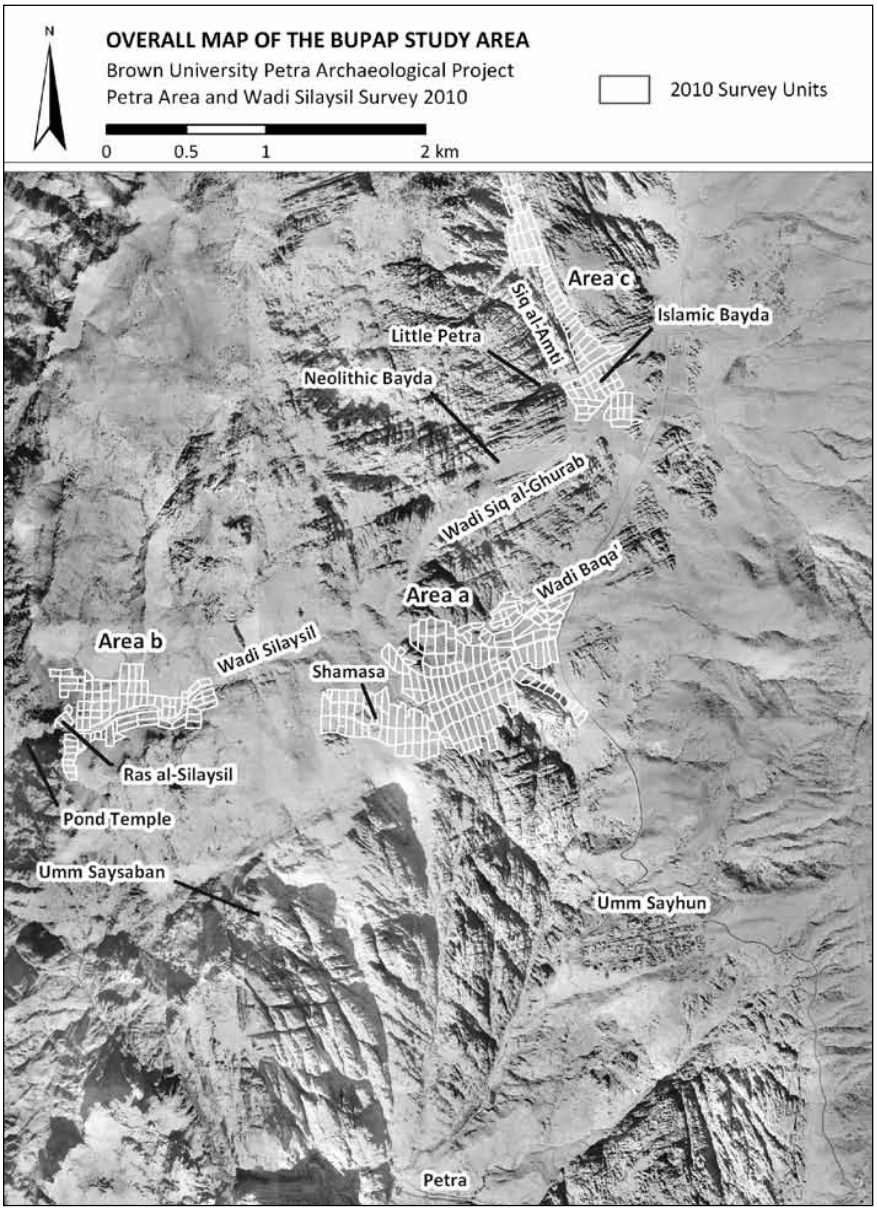
they traveled through the northern part of our survey area, passing near Bayḍā, but they do not discuss it. By contrast, the Biblical scholars Robinson and Smith (1841: 504-512) came up from the Wādī ʻArabah and appear to have ascended quite near the western extent of our work, north of Wādī Sulaysil. They gave only the name "Nemela" for the pass, where they described the porphyrite and sandstone (Precambrian and Cambrian) combination characteristic of the Wādī Sulaysil environs. They then descended into the wadi, still called Nemela according to their guides, and mentioned a narrow gorge that fits the description of the western end of Wādī Sulaysil, where it debouches dramatically and nearly vertically down to the area of the Pond Temple (Lindner 1995a). From here they followed the course of Wādī Sulaysil, mentioning the numerous terraces in the area, then continued into a "chasm" in a group of cliffs further east, called "as-Sīq", which is Wādī Sīq al-Ghurāb. They next came into an area called "*Suṭūḥ Bayḍā*ʻ", meaning "white plains", which seems to refer to most of the area around and south of Bayḍā. As Robinson and Smith moved south along the course of the modern road they described the now familiar topography and tombs in the distance, as well as the difficult nature of the farming undertaken by the Bedouin living in the area. Musil, in the early twentieth century, was the first writer to give the name "Sulaysil" to part of this region (1907: 333), and it has been referred to variously ever since (see Lindner 1995b for a summary).[3] The Baqāʻ area (roughly our Area a), lying between the previously mentioned areas and Petra proper, is not named in early accounts, nor located on modern maps. It is a toponym known colloquially and is used descriptively, meaning "open or empty place". A great deal of variability thus exists in how and for how long aspects of this landscape have been known or discussed by outside observers.

Certain parts of the survey area have been the subject of archaeological interest, again a fact not surprising given its very close proximity to Petra, and several significant sites have been excavated, surveyed or described in various manners (**Fig. 1**). However, the area as a whole had never been subjected to the kind of systematic, intensive survey espoused here, where the artifact (and from there densities of artifact types and their periodization across the landscape), rather than the site, is the minimal unit of analysis. By adopting such a non-site-based approach, we have already achieved results that complement previous investigations exceptionally well.

The vicinity of Bayḍā has received by far the most attention in the PAWS survey area, not least for the prehistoric periods. Two surveys in this region sought explicitly to document prehistoric sites (Gebel and Starck 1985; Kirkbride 1966), and a number of syntheses of the prehistory of the Petra area (and the Middle East more generally) include discussion of the well-known Natufian and PPNB site of Bayḍā (e.g., Gebel 1988). This site was put on the map through the excavations of Diana Kirkbride, which took place between 1957 and 1983, after she discovered it with local help in 1956 (Kirkbride 1960, 1961, 1962, 1966, 1967, 1968, 1984; Mortensen 1970). Since then several contemporary sites (e.g., Baʻja, Basṭā) have been noted or excavated in the wider region; these will not be discussed here as they lay outside of our immediate study area. More recently, Brian Byrd briefly renewed fieldwork at Bayḍā and has synthesized the results of Kirkbride's excavations for the Natufian and Neolithic periods (Byrd 1988, 1989, 2005).

Bayḍā has also recently undergone a program of research with respect to its Nabataean remains. This work has focused primarily around rock outcrops among and near the remains of the Islamic period village, east of the better-known monuments of Little Petra in the as-Sīq al-Bārid. Since 2003, the Bayḍā Documentation Project, led by Patricia Bikai, has engaged in study of numerous features, including agricultural installations, cisterns, and sev-

3. That transliteration from Arabic to English can result in multiple spellings of the same words or places needs no explanation. However, we should be explicit in stating our spelling conventions, as well as pointing out the alternative spellings of place names that appear in the text and bibliography of this article. In consultation with Nancy Khalek (Brown University), who conducted a preliminary study of toponyms in the PAWS survey area, we have decided to transliterate place names in keeping with the system used by the *International Journal of Middle East Studies (IJMES)*. Thus, for example, we use "Bayda" where others have used "Beida" or "Beidha" and "Silaysil" where "Suleisel" or "Slaysil" also appear.



1. Overall map of areas surveyed in 2010 with place names and known archaeological sites.

eral substantial structures, most notably an extremely impressive colonnaded hall (Bikai *et al.* 2005a, 2005b, 2006, 2007, 2008). Also in this area is an important Nabataean inscription that links winemaking and ritual aspects of the landscape (Zayadine 1986). It remains to be seen how the Bayḍā Documentation Project and our own work will affect previous interpretations of this apparently very rich and dynamic area (e.g., Zayadine 1992).

There is a general trend, in the archaeology of the Petra region, to privilege investigation of prehistoric periods and of the Nabataean/Roman era at the expense of later epochs: this motivated to a great extent BUPAP's work at the in the area of Islamic Bayḍā. Yet there has been work on the material culture of modern times. For example, in the early 1980s Banning and Khöler-Rollefson (1983, 1992) undertook an ethnoarchaeological survey in the Bayḍā area that aimed to study the tangible remains of recent pastoral practices in the area (see also Russell 1993, 1995). Because of the diachronic goals of BUPAP, their results are of great interest, especially in terms of understanding modern land-use and its material signatures. At present, this research possesses limited spatial and methodological overlap with our own work, but we plan to develop such eth-

nographic and ethnoarchaeological dimensions in future seasons.

Although our 2010 survey territory remains relatively undisturbed, not least because of its location within the boundaries of the Petra Archaeological Park, some recent encroachments have been observed. Beginning in 1996, the Wādī Mūsā Water Supply and Wastewater Project began as a rescue operation in response to, and cooperation with, the installation of a pipeline running some 60 kilometers from the vicinity of Bayḍā in the north to the area of Jiththa in the southwest. The project, focused on a narrow strip of land that passes through our survey area along the course of the road between Bayḍā and Umm Ṣayḥūn, included an archaeological survey component that was heavily oriented towards the discovery of sites, 39 of which were documented between 1996 and 2000. All of these sites received basic description and some more attention in the form of drawing or limited excavation (ʻAmr *et al*. 1998; ʻAmr and al-Momani 2001), though the project directors pointed out that these "sites" are more appropriately described as "outstanding archaeological features" (ʻAmr and al-Momani 2001: 256). Some of these features fell within our survey area and were additionally documented by our project, with cross-references provided to previous work.

Of all pre-existing research to be mentioned, however, first and foremost must be the explorations by the Naturhistorische Gesellschaft Nürnberg (NHG), begun in the 1970s under the direction of Manfred Lindner. This team undertook several campaigns of exploration in the broader Petra region, focusing on remains from various periods (e.g., Lindner 1978, 1986, 1999). Thanks to them, for example, we know of the Early Bronze Age site of Umm Saysabān, the only Bronze Age site documented in our survey area (Lindner *et al*. 2001). They undertook basic description, mapping, and drawing at the Nabataean high place sanctuary and village at the far western end of Rās Sulaysil — which would become a major focus for our attention in Area b in 2010 (Lindner and Gunsam 1995b) — as well as at the "Pond Temple" located some 300 meters below, accessed by a now ruined and treacherous serpentine path (Lindner and Gunsam 1995a; Zayadine 1992). Finally, in our Area a, the "fortified suburb" now called Shammāsa was also studied by Lindner's team; here numerous water features, building remains, and a rock-cut shrine, possibly dedicated to Dushara, were recorded (Lindner and Gunsam 2001). Apart from the baseline of information provided, we would underscore that the NHG's research captured some important data subsequently lost, for example with the destruction of the high place sanctuary complex at Rās Sulaysil shortly after their 1989 visit to the site (Lindner and Gunsam 1995b: 271-273). Such actual and latent threats to the study region motivate, in part, our work.

In sum, previous research in the PAWS survey area has been largely site-based and oriented toward particular time periods. Based on this piecemeal documentation, we know a fair amount about certain places and certain epochs, but there remain major gaps in our understanding of the archaeological landscape, particularly with respect to patterns of long-term continuity and change. Our methodology was designed to fill these gaps and to recognize what has so far tended to be overlooked.

Methodology

The methods employed by PAWS are drawn from the practices of "intensive survey" and "landscape archaeology" as it is typically defined in the Mediterranean: core elements include a commitment to the collection of multi-period data, a regional scope, and interdisciplinary collaboration (cf. Cherry 1983: 287). These precepts were originally drawn from a later 20th century movement in world archaeology toward systematization, sophistication, and transparency in survey methods (e.g., Plog *et al*. 1978; Schiffer *et al*. 1978). Innovative methods for bringing these concerns together in an artifact-rich environment were especially evolved by British and American archaeologists working in the Mediterranean from the late 1970s onward (e.g., Wright *et al*. 1990; Cherry *et al*. 1991; Davis *et al*. 1997). Similar developments were ongoing in Jordanian survey archaeology over the same time period (for overviews see Banning 2001; MacDonald 2007), but surprisingly little cross-referencing has taken place between practitioners of survey method and theory in Jordan and the Mediterranean. Furthermore, the concept of off-site or non-site survey has not been widely

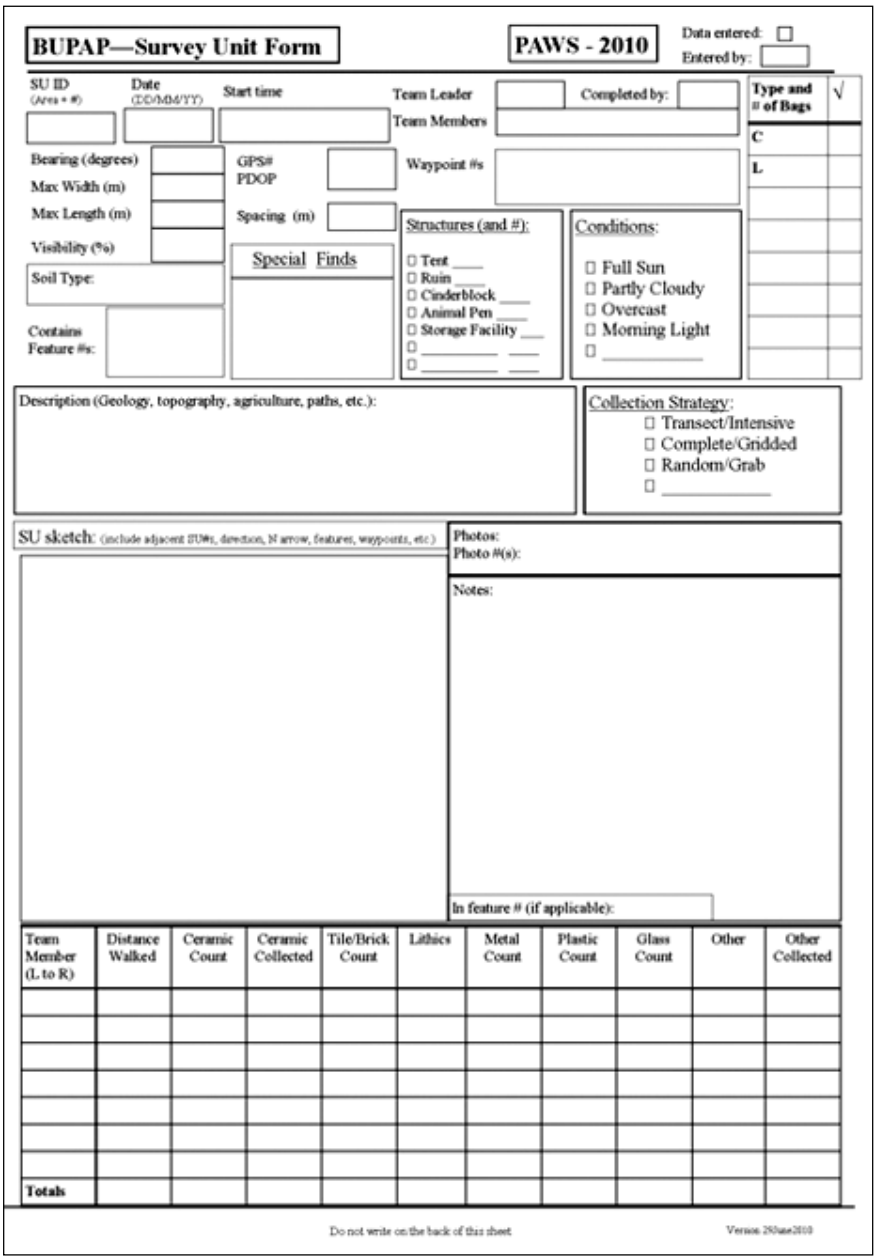
employed in Jordan (Banning 2001: 634), despite the fact that this is an approach particularly useful for documenting high densities of surface material continuously distributed in landscapes witnessing a variety of uses over time (Bintliff and Snodgrass 1988; Alcock *et al.* 1994). This seems to us very apposite to the archaeological landscape we have encountered north of Petra. Given that a principal concern of survey archaeology anywhere must be data comparability and utility for other researchers (Alcock and Cherry 2004), and given that methodological transparency is crucial to this, we describe our goals and methods in some detail here.

In 2010 the PAWS survey worked in three zones: the Wādī Baqā‘ (Area a), the Wādī Sulaysil (Area b), and in the vicinity of the Islamic Bayḍā structures (Area c). Each of these was divided into a number of survey units (or SUs), the boundaries of which were defined by GPS points taken at unit corners. Boundaries were determined based on team size and natural breaking points in the landscape (e.g., field borders or topographical features), as well as a desire to keep units small enough to maintain good spatial control of the data. Unit size thus varied from approximately 40 to 60 meters wide by 50 to 150 meters long. For each of the three Areas, it was decided that as much territory as possible would be explored intensively, excluding extreme topography that is better dealt with through more extensive methods (e.g., selective inspection or remote sensing). In each SU four to six field walkers spaced 10 meters apart carefully inspected the ground surface, documenting all artifacts within a two meter wide transect for each walker. For projecting distributions of artifacts across the landscape, we thus possess a 20 percent sample of ground inspected per SU, from which densities of sherds, lithics, and modern material per hectare can be generated[4]. The choice of a tight, 10 meter spacing also went a long way to ensure that all features in each SU could be noted, recorded, mapped, photographed, and drawn. Information was recorded on paper forms for each unit (**Fig. 2**), and later digitized and transferred to our electronic database.

As for our artifact collection strategy, each field walker, within their two meter wide transect, collected all chipped stone, counted all ceramic material and collected diagnostic sherds, and counted and briefly described all modern material. This strategy was obviously governed by practical concerns. For example, while collecting all ceramics might be ideal in some circumstances (it goes without saying that what is diagnostic for a field walker may differ from what is diagnostic for the ceramic specialist), the high densities in some areas would make total collection nearly impossible and certainly impractical. It was thus decided that, as in many Mediterranean surveys, a consistent method of counting all and collecting only diagnostic and potentially diagnostic sherds would be the best way forward. Such a protocol also works to avoid chronological biases, which is a governing principle of the Brown University Petra Archaeological Project as a whole. The nearby survey undertaken by the Finnish Jabal Harun Project employed a similar field walking and collection strategy (e.g. Frösen *et al.* 1999), which will eventually aid in data comparability across the immediate region.

While the three zones surveyed in 2010 contain previously known archaeological settlements (notably Shammāsa in Area a, Rās Sulaysil in Area b, and the Nabataean and Islamic communities in Area c), our goal was not to identify “sites”, *per se*. Site definition is a notoriously tricky issue, better handled after data processing, when chronological and spatial relationships among artifacts and archaeological features across the landscape can be better understood. Thus, what other projects may have called sites — for example, a cistern or a tomb — are termed by us “features” until their full landscape and chronological context is better

4. The calculation of artifact densities per survey unit is carried out as follows. For each survey unit, field walkers covered two meter wide transects. Thus, the total area of the ground surface for which artifacts are counted is the sum of the walkers’ transects multiplied by two (20 percent of the Survey Unit). Artifact counts for the Survey Unit are then divided by this product (the sum of walker transects times two) to render the average number of artifacts per square meter. This number is then multiplied by 10,000 to determine the number of artifacts per hectare (100x100 meters). Such a calculation provides an immediate and comparable sense of distributions across the landscape, though we acknowledge that, especially for lithic artifacts, it may appear to exaggerate the amounts of material observed. For actual lithic numbers, by Area, see **Table 1**.



BUPAP—Survey Unit Form **PAWS - 2010** Data entered: ☐ Entered by:

SU ID (Area + #) | Date (DD/MM/YY) | Start time | Team Leader | Completed by: | Team Members

Type and # of Bags | √ | C | L

Bearing (degrees) | Max Width (m) | Max Length (m) | Visibility (%) | GPS# | PDOP | Spacing (m) | Waypoint #s

Soil Type: | Contains Feature #s:

Special Finds

Structures (and #): ☐ Tent ___ ☐ Ruin ___ ☐ Cinderblock ___ ☐ Animal Pen ___ ☐ Storage Facility ___ ☐ _____ ___ ☐ _____ ___

Conditions: ☐ Full Sun ☐ Partly Cloudy ☐ Overcast ☐ Morning Light ☐ _____

Description (Geology, topography, agriculture, paths, etc.):

Collection Strategy: ☐ Transect/Intensive ☐ Complete/Gridded ☐ Random/Grab ☐ _____

SU sketch: (include adjacent SUs, direction, N arrow, features, waypoints, etc.)

Photos: Photo #(s):

Notes:

In feature # (if applicable):

Team Member (L to R)	Distance Walked	Ceramic Count	Ceramic Collected	Tile/Brick Count	Lithics	Metal Count	Plastic Count	Glass Count	Other	Other Collected
Totals										

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2. PAWS Survey Unit field form.

understood.

All features were assigned individual numbers and at the very least described, mapped, sketched, measured, and photographed. Others were selected for more detailed treatment through architectural drawing or total station survey. Analysis of certain features in the survey area (such as quarries) is also being undertaken in tandem with study in the city center to better understand architectural and economic relationships between and within the center and its hinterland. The digitization of all these data and incorporation into the project Geographic Information System (GIS) allows us to make comprehensive plans of features within the survey area (as a whole and in parts) that can be compared with artifact densities across the same landscape (see below).

GIS and remote sensing play a major role in our survey design, execution, data processing, and interpretation. After selecting the general area for study, a QuickBird satellite image of 0.6-meter ground to pixel resolution was purchased from DigitalGlobe Incorporated. In tan-

dem with ArcGIS and known GPS coordinates, this imagery was used to identify areas of interest, as well as the previously known sites within the survey area. Features such as terrace walls were readily identifiable, and the high-resolution satellite imagery, in combination with ground truthing, has been a great aid in mapping them. A digital elevation model of 30-meter ground to pixel resolution was obtained from ASTER, which has been used to model various aspects of the landscape, such as viewsheds and potential routes of movement (Because of the extreme and often abrupt topography of the area, obtaining higher quality elevation data became a top priority for the 2011 season). Handheld personal digital assistants (PDAs) were used in the field with ArcPad mobile GIS software and Garmin GPS receivers, which typically registered accuracy of two to five meters; this allowed for on-the-spot generation of shapefiles to denote the boundaries of survey units and locations of features. GIS was also used to perform various data-processing tasks, including the display of artifact densities and period distributions for each survey unit and the generation of models based on elevation data; of course, it also serves as a generally useful interpretive tool for viewing multiple types of data simultaneously.

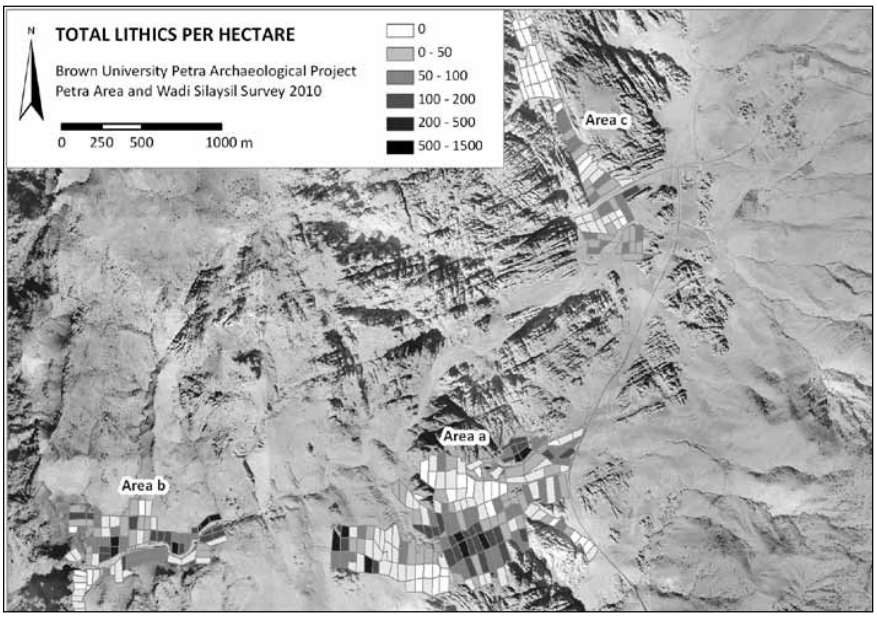
Not everything could be achieved in our initial season. In particular, we acknowledge the need for more structured and detailed input from geologists and hydrologists, to understand what is clearly a fragile and dynamic landscape. Moreover, we hope to develop an ethnographic component to our work, a dimension we feel to be necessary to any survey committed to understanding all aspects of the landscape and its use through time. Not only do the current inhabitants of the area understand and know the current state and recent past of this region better than visiting archaeologists, but they also have a great stake in how this area develops and is presented as an archaeological and human landscape.

Preliminary Results of the 2010 Season

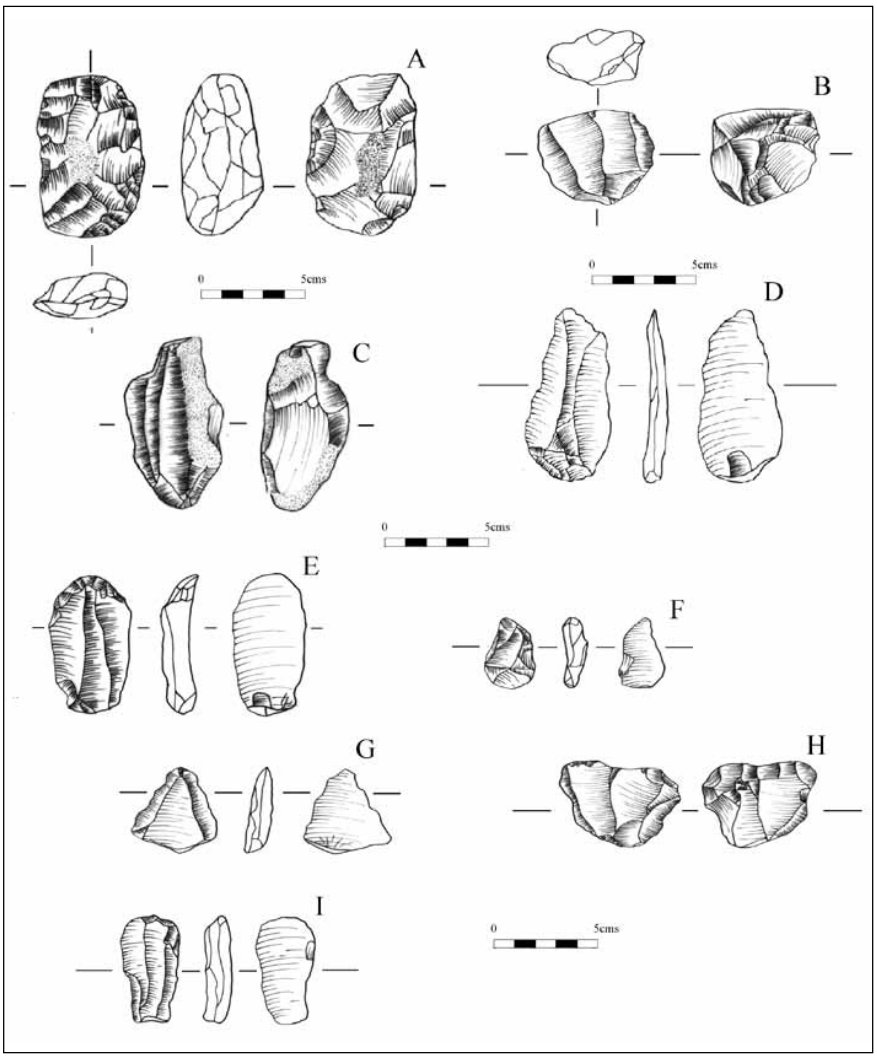
What follows is a summary of our preliminary results for the 2010 season. Following a brief general outline, we provide diachronic synopses of Areas a (Wādī Baqā‘), b (Wādī Sulaysil), and c (the vicinity of Islamic Bayḍā) before moving to general patterns, observations, and directions for further research.

Lithics were found in many parts of the survey area, albeit with some specific clusters identified. Gary Rollefson (Whitman College) did preliminary work on these finds during the 2010 field season, augmented by more detailed study (with Clive Vella of Brown University) in May 2011. The 2010 season recovered material dating as early as the Lower Paleolithic, as well as all subsequent major periods of prehistory (**Fig. 4, Table 1**). Overall, Paleolithic artifacts from the duration of the Pleistocene period account for more than 15% of the unit collections. Despite the proximity of Area c to the prehistoric site of Bayḍā, Epipaleolithic and Pre-Pottery Neolithic finds were relatively rarer than might have been anticipated, essentially equal to the Paleolithic periods. The samples as a whole were dominated (almost 60%) by Chalcolithic/Early Bronze lithics; while this might be taken to indicate a greater level of activity during these later periods, it must be recalled that these artifacts are simply the highest in the stratigraphic record, and that earlier artifacts remain covered (or removed) by thousands of years of erosion and redeposition. Moreover, there seems to have been a significant change in production in the Chalcolithic/Early Bronze Age, where stone tools were likely produced on an *ad hoc* basis, then cast aside, resulting in greater numbers and wider distributions than we have for other periods. Areas a and b reflect absolute counts and densities much higher than in Area c, which may reflect in part the especially heavy overburden of later periods around Bayḍā, in part the sandy deposits which presently cover a section of the Sīq al-Amṭī (**Figs. 3 and 4**).

Ceramic analysis was undertaken by Tali Erickson-Gini (Independent Scholar) and Micaela Sinibaldi (Cardiff University). With their combined specialties ranging from the Hellenistic to the Late Islamic periods, they were able to date the vast majority of diagnostic material collected (though they stress that some yet unidentifiable material may be recognizable to specialists in earlier periods). Ceramic finds, as Figure 5 illustrates, were widely dispersed throughout the survey area. Only a handful of tracts had no material, and some yielded densities (calculated in the manner explained earlier) as high as 140,000



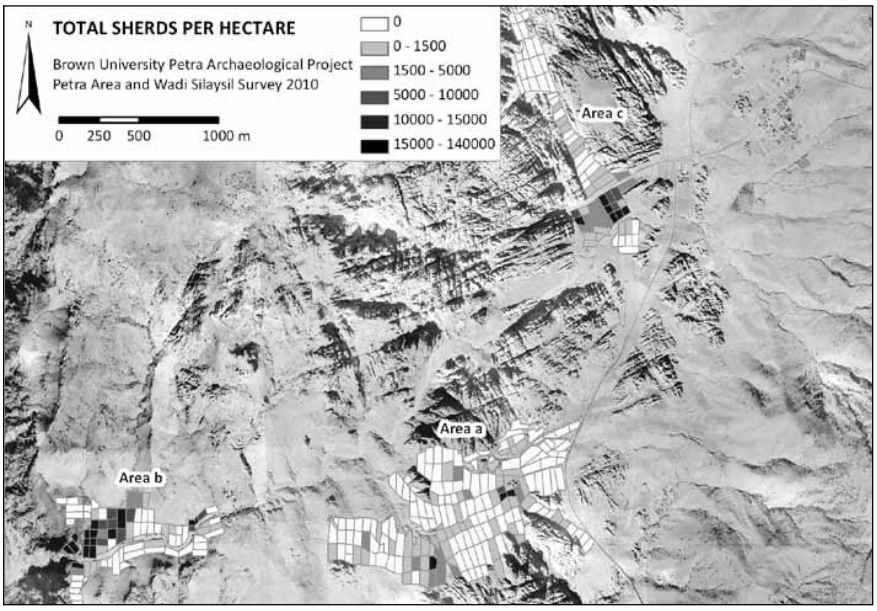
3. Total lithic density in Areas a, b, and c.



4. Select lithic illustrations: A – PPN axe/adze (Survey Unit c50); B – Ch/EB blade core (c25); C – Ch/EB blade core (a135); D – MP Levallois blade (b37); E – UP end-scraper (b19); F – LN canted dihedral burin (a102); G – MP Levallois point (b41); H – MP Levallois point core (b10); I – LN burin on concave truncation (b45) (Illustration by Clive Vella).

Table 1: Distribution of chipped stone artifacts by temporal periods in the different PAWS survey areas in 2010 (Table by Gary O. Rollefson and Clive Vella).

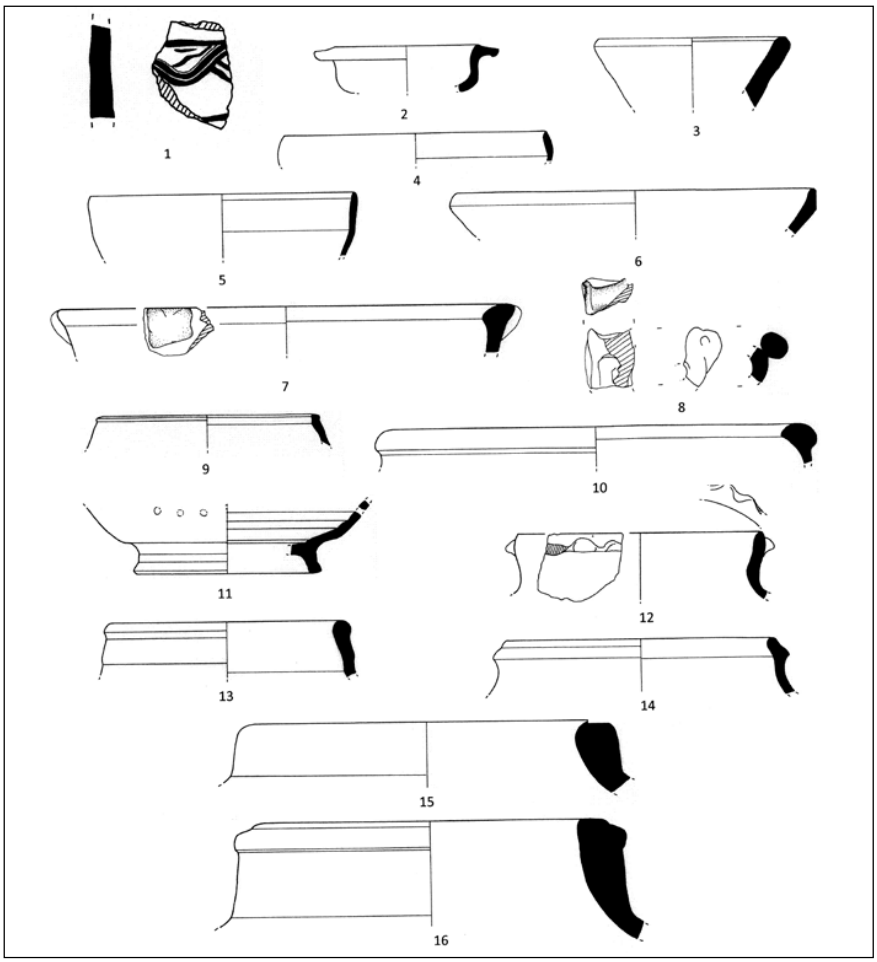
	Area A		Area B		Area C		All Areas	
	n	%	n	%	n	%	n	%
Lower Paleolithic	1	0.6	2	1.7	1	1.6	4	1.2
Lower/Middle	1	0.6	7	6.0	7	11.3	15	4.5
Middle Paleolithic	12	7.6	12	10.3	3	4.8	27	8.0
Middle/Upper	0	0.0	5	4.3	1	1.6	6	1.8
Upper Paleolithic	0	0.0	3	2.6	0	0.0	3	0.9
Upper/Epi	0	0.0	0	0.0	0	0.0	0	0.0
Epipaleolithic	10	6.4	4	3.4	0	0.0	14	4.2
Epi/Pre-Pottery Neo	10	6.4	8	6.8	1	1.6	19	5.7
PPNA	0	0.0	0	0.0	0	0.0	0	0.0
PPNB	4	2.5	2	1.7	0	0.0	6	1.8
PPN	8	5.1	8	6.8	1	1.6	17	5.1
Late Neolithic	5	3.2	3	2.6	1	1.6	9	2.7
LN/Chalcolithic	7	4.5	3	2.6	0	0.0	10	3.0
Chalco/Early Bronze	98	62.4	59	50.4	44	71.0	201	59.8
Late	1	0.6	1	0.9	3	4.8	5	1.5
Subtotal	157	100.0	117	100.0	62	100.0	336	100.0
Unidentified	6	(3.7)	17	(5.2)	4	(6.1)	27	(7.4)
Total	163		134		66		363	



5. Total ceramic density in Areas a, b, and c.

sherds per hectare. The majority of ceramic finds ranged in date from the Iron Age II (700 – 500 BC) to the Middle and Late Islamic periods (1000-1800AD). High densities of Roman (50 BC – 450 AD) and Islamic era ceramics were especially noted, with other periods (Hellenistic [300 – 50 BC] and Byzantine [450 – 650AD]) also present. We should note that the terms Hellenistic and Roman are used here not to assign cultural designations, but to frame our ceramic chronologies in a way that allows broader inter-regional comparison. The social and cultural activity we are witnessing for the last centuries BC and early centuries AD is, of course, Nabataean in character, even well after the Roman annexation in the early second century (cf. 'Amr 2004). At Tali Erickson-Gini's suggestion, we illustrate select examples of Iron II and Hellenistic survey material, periods less well represented in publications from this region than the better-known Roman era ceramics (**Figs. 6 and 7**).

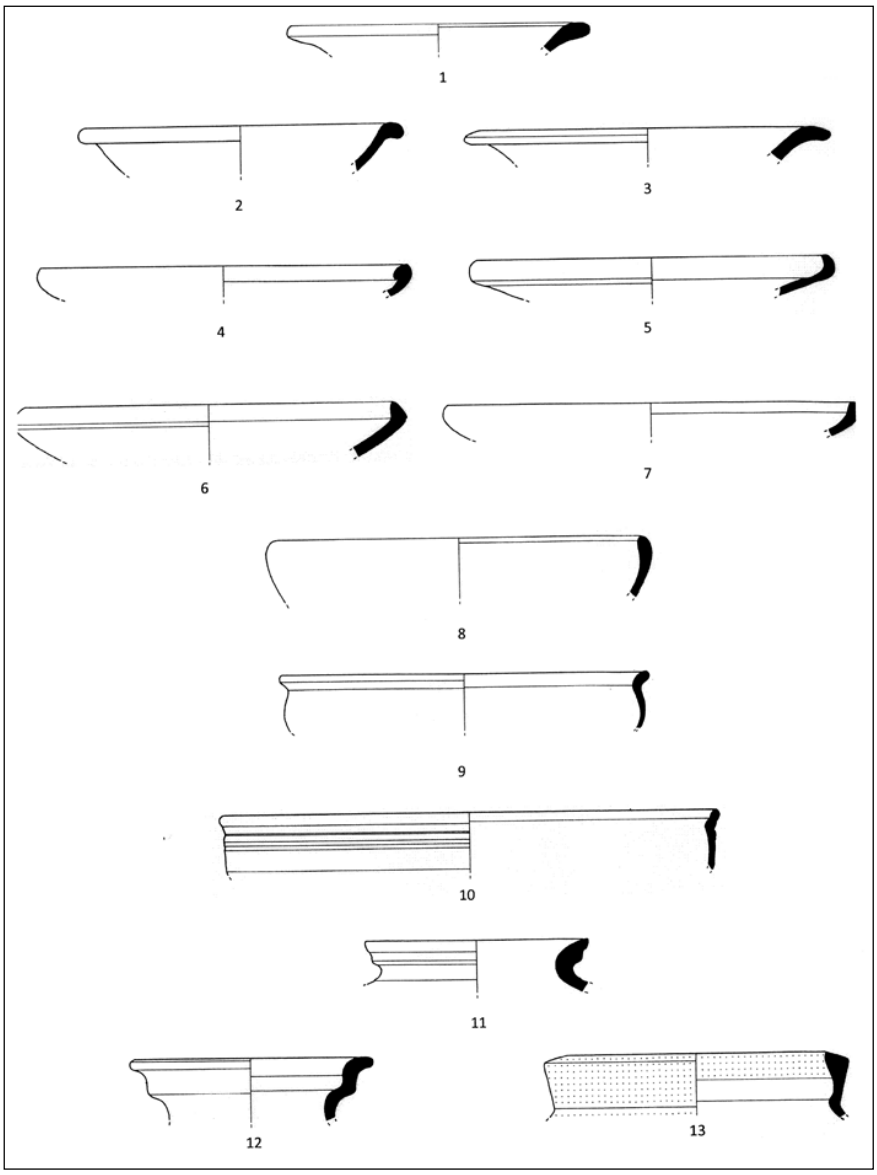
The third major category of finds to report



6. Iron Age II ceramics (selection by Tali Erickson-Gini; Illustration by Munjad Qasem).

(Appendix: Ceramic Finds from the PAWS 2010 Season (by Tali Erickson-Gini)
The Iron II Finds (**Fig. 6**)

1. *Sherd with raised line decoration – SU a 29.1. Yellowish red ware (5YR5/8). Coarse fabric with numerous light gray inclusions. Light brown slip on exterior (7.5YR6/4). Raised wavy-line decoration.*
2. *Bowl – SU a 106.1. Strong brown ware (7.5YR5/8). Light gray core and minute light gray inclusions.*
3. *Bowl – SU a 149.2. Yellowish red ware. Thick gray core and numerous medium to large light gray inclusions.*
4. *Painted ware bowl – SU a 178.1. Reddish yellow ware (5YR6/8). Minute light gray and white inclusions. Thin black and thicker red lines on interior.*
5. *Painted ware bowl – SU a 172.1. Reddish yellow ware (5YR6/6). Bands of dark reddish brown on exterior (5YR3/2).*
6. *Bowl – SU a 72.1. Yellowish red ware (5YR5/8). Light gray core and minute light gray inclusions.*
7. *Bowl with knob handle – SU a 65.1. Yellowish red ware (5YR5/8). Brownish-gray core and minute light gray inclusions.*
8. *Knob handle – SU a 86.1. Reddish yellow ware 5YR6/8. Light grayish brown core. Dark red paint (2.5YR4/8).*
9. *Krater – SU b 52.3. Red ware (2.5YR6/8). Weak red slip on interior (2.5YR6/4) with red painted decoration on interior rim and a dark red band on exterior (2.5YR4/4).*
10. *Krater – SU a 47.2. Reddish yellow ware (5YR7/6). Minute light gray inclusions.*
11. *Perforated vessel base – SU a 127.1. Yellowish red ware (5RY6/8). Gray core and gray inclusions. White accretions on both sides. Row of perforations on lower body and above the base.*
12. *Jug or cooking pot – SU a 43.1. Reddish yellow ware (7.5 YR7/6). Light gray core. Coarse finish and traces of brown slip on exterior (7.5YR4/3). Thumb impressed decoration along the rim.*
13. *Cooking pot – SU a. 46.3. Yellowish red ware (5YR 5/8). Numerous light and dark gray inclusions.*
14. *Cooking pot – SU a 25.1. Reddish yellow ware (5YR6/8). Light gray core and minute light gray inclusions. White accretions on both sides.*
15. *Storage jar – SU a 149.1. Yellowish red ware (5YR5/6). Thick gray core and numerous medium to large light gray inclusions and number of large red inclusions.*
16. *Large jar or jug – SU a 70.1. Yellowish red ware (5YR5/8). Thick light gray core and medium to large light gray inclusions. Band of red paint on rim.*



7. Hellenistic period ceramics (selection by Tali Erickson-Gini; Illustration by Munjad Qasem).

The Hellenistic Finds (**Fig. 7**)

1. Bowl – SU b 71.3. Reddish yellow ware (5YR7/6). Small white and light gray inclusions. Traces of red wash on the exterior (2.5YR5/8) and worn dark reddish gray wash on the interior (5YR4/2).
2. Bowl – SU a 45.1. Pink ware (5YR7/4). Minute dark gray inclusions. Traces of dark slip on exterior.
3. Bowl – SU b 51. 3. Reddish yellow ware (5YR7/8). Light gray inclusions. Light gray slip on exterior (10YR7/2).
4. Bowl – SU b 51.2. Reddish yellow ware (5YR6/6). Dark reddish brown band on exterior rim (5YR3/2).
5. Bowl – SU b 71.4. Dark reddish brown ware (5YR3/2). Medium to large white inclusions.
6. Bowl – SU b 51. 1. Reddish yellow ware (5YR6/8). Minute dark gray inclusions. Red slip on exterior (2.5YR5/8). Dark reddish brown slip on exterior rim.
7. Bowl – SU b 1.1. Reddish yellow ware (5YR7/8).
8. Bowl – SU b 13.2. Reddish yellow ware (5YR6/8). Minute dark gray inclusions. Faded reddish brown slip on exterior (5YR4/4).
9. Bowl – SU b 36.1. Light reddish brown ware (%YR6/4). Gray slip on exterior (5YR5/1).
10. Bowl – SU b 21.4. Reddish yellow ware (7.5YR6/6). Light gray core and minute gray inclusions. Brown slip on exterior (7.5YR4/3).
11. Jar – SU b 36.2. Yellowish red ware (5YR5/8). Large light gray inclusions. Red slip on exterior (2.5YR6/8).
12. Jar – SU b 49.1. Reddish yellow ware (5YR6/8). Medium dark gray and white inclusions. Brown slip (7.5YR4/2).
13. Cooking pot SU b 71.2. Yellowish red ware (5YR5/8). Light gray core. Yellowish red slip on interior (5YR5/6) and very dark gray slip on exterior (7.5YR3/1). Dark brown wash on interior rim (7.5YR3/4).

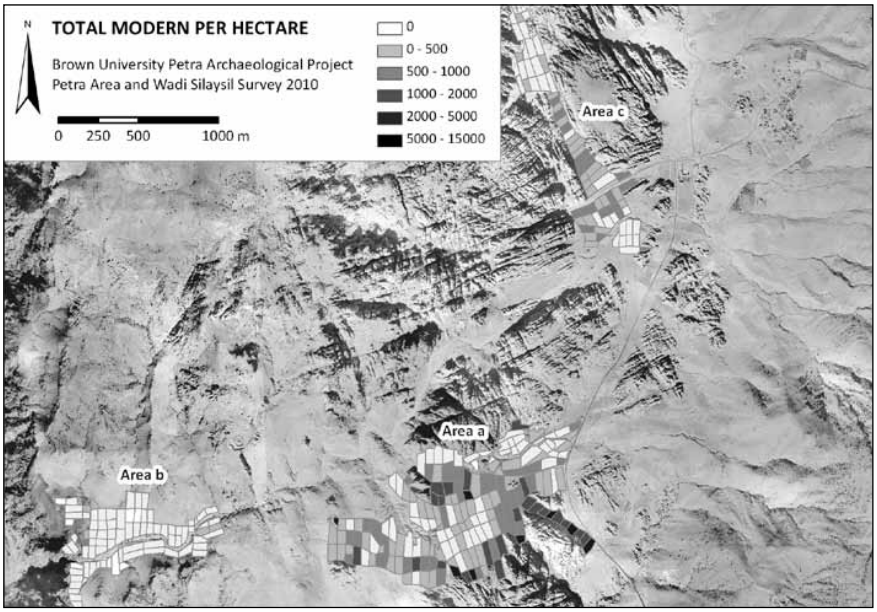
is modern detritus (**Fig. 8**). A great deal of this can be traced directly to local occupants, who graze their animals, live, and picnic in this area. But much is clearly related to growing, and not always regulated, tourism in the region. This phenomenon is only likely to develop and expand as significant Jordanian and NGO energy is devoted to encouraging people to spend more time in the Petra region, in hopes of generating additional local revenue streams. While this is an admirable goal, the potential negative impact on the area is no minor danger, and we plan to continue documenting changes in the region, as well as alerting local archaeological authorities to specific threats. The "garbage map" of the PAWS 2010 season, for example, has already been shared with groups working on archaeological conservation and management issues for the Petra Archaeological Park.

Area a

Located in and around an area called Baqā' or Wādī Baqā', Area a was divided into 180 survey units, 163 of which produced lithic material from the Lower Paleolithic to the present. The Middle Paleolithic is well represented, including several Levallois blades, points, and flakes. Epipaleolithic through Pre-Pottery Neolithic artifacts are also relatively abundant, although the fragmentary nature of many of these pieces made it impossible to distinguish between almost half of the Epipaleolithic to Pre-Pottery Neolithic B samples; tools were rare. Chalcolithic/Early Bronze Age lithics were frequent, possibly associated with the Area's close proximity to the Early Bronze Age site of Umm Saysabān (Lindner *et al*. 2001). What is surprising is the seemingly continuous scatter throughout the sector, there being only a handful of survey units with no identified lithic material (**Fig. 3**). In general, these results compare in date and description to material found in the nearby Finnish Jabal Harun Project's survey (Frösén *et al*. 1999, 2000).

The heaviest concentrations of chipped stone were just north of Wādī Baqā', which also happens to be the part of Area a closest to Bayḍā. All aspects of the *chaîne opératoire* for stone tool production are represented here, including cores, debitage and finished implements. Based on the character of cortex on artifacts, raw material was clearly collected from wadis, quite likely this one, next to which production seems to have taken place. This fits well with Kirkbride's interpretation that wadi pebbles formed the chief supply of flint in the area, with the other possible source being the tabular flint from limestone strata of Jibāl ash-Sharāh (1965: 37-39).

Given the ubiquity of late prehistoric lithics and the close proximity to Umm Saysabān, it is surprising that no pottery from the Early Bronze Age was found in Area a. However, it is possible that some of the small amount of uniden-

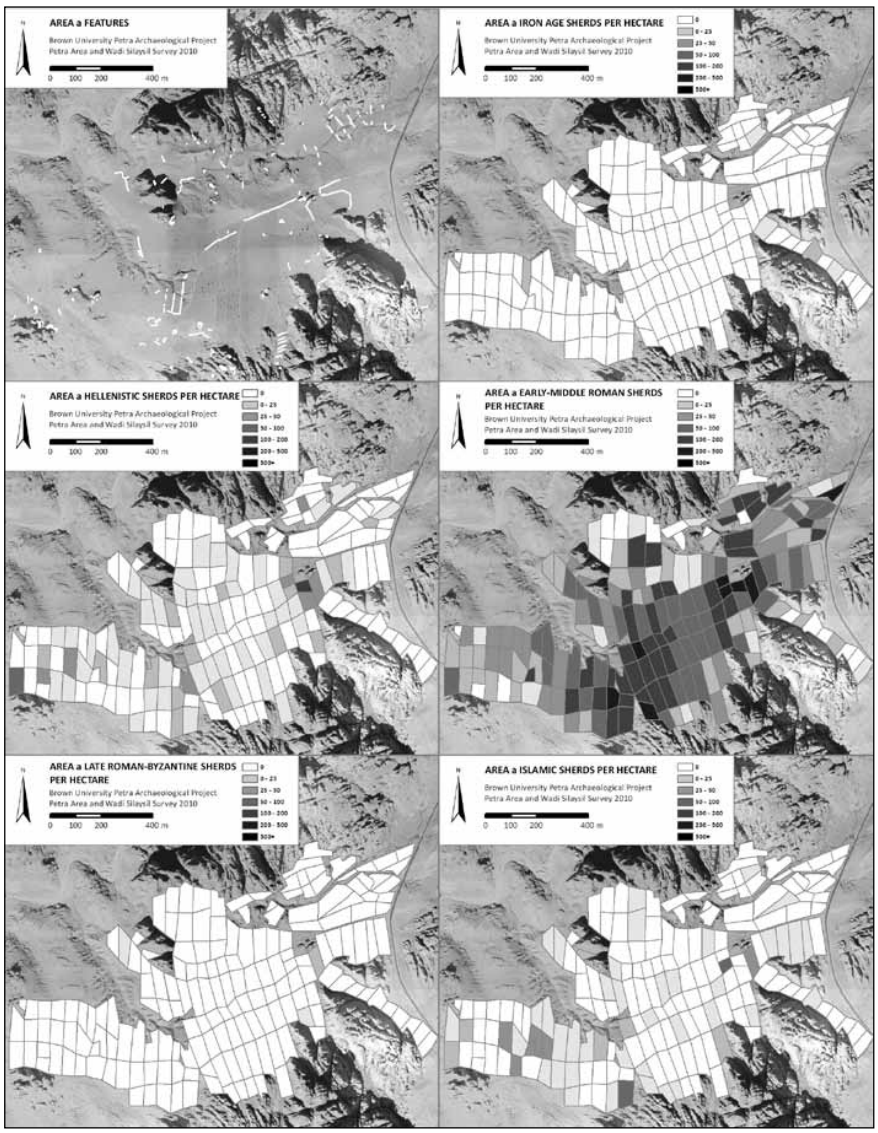


8. Total density of modern materials in Areas a, b, and c.

tified material may date to the Bronze Age or earlier periods. The earliest identified ceramic material belongs to the Iron II period (700 – 500 BC) (**Fig. 9**). This is a period that has received relatively little attention in the immediate vicinity of Petra, though there are significant sites in the region at Ba'ja, Khirbat al-Mu'allaq, Jabal aṣ-Ṣuffāḥa, and Umm al-Biyāra at Petra itself (Lindner and Farajat 1987; Lindner *et al*. 1996; Lindner *et al*. 1998; Bienkowski in press). In Area a, the largest concentrations of these sherds are found near the modern road between Umm Ṣayḥūn and Bayḍā, and near the fortified Rock of Shammāsa. No architectural remains can be securely dated to this period.

Following the Iron Age II, Edomite period, there is an apparent gap in identified material until the Hellenistic period, approximately the third century BC, though the very presence of material this early is noteworthy. The largest concentrations of Hellenistic ceramics are found near major features, such as those at and around Shammāsa. It is noteworthy that these appear to always co-occur with large amounts of later (Roman period) ceramics, implying a continuity of use of space over time.

Sherds identified as Roman (50 BC – 450AD, though especially Early and Middle Roman [50 BC – 250AD]) were by far the most common throughout Area a. As is true for Areas b and c, Area a is nearly completely devoid of Byzantine ceramics. Islamic period ceramics are



9. Area a features and ceramic densities, by period.

scattered throughout, but in no great concentrations – except at Shammāsa, an observation that fits Lindner and Gunsam's interpretation that Shammāsa served as a fortified outpost in this period (2002).

Based on associated finds, building methods, and historical circumstances, it is our preliminary conjecture that most of the 120 features recorded in Area a date to the Roman period. A large number of features seem to be directly related to water management and agricultural practices in this difficult environment. Thirty-two dams or other water control elements were documented in Area a alone, including the elaborate system in Wādī Baqā' itself (This system formed the subject of a more detailed study by Emanuela Bocancea and Timothy Sandiford of Brown University). Six cisterns, some but not all previously known, were also mapped and drawn. Numerous terrace walls and field boundaries were also recorded. While such features are notoriously difficult to date, we currently posit that many of these were part of a program of land management beginning in the early first century AD. This is the interpretation of the terrace systems on Jabal Harūn (Frösén *et al.* 1999), a date which would also work with the majority of our ceramic evidence. In addition to agricultural and water management features, five tombs, eight quarries, four structures, and 17 rock-cut features of various types, including water channels, niches, and shrines, were thoroughly documented; detailed treatment of these will follow in other publications.

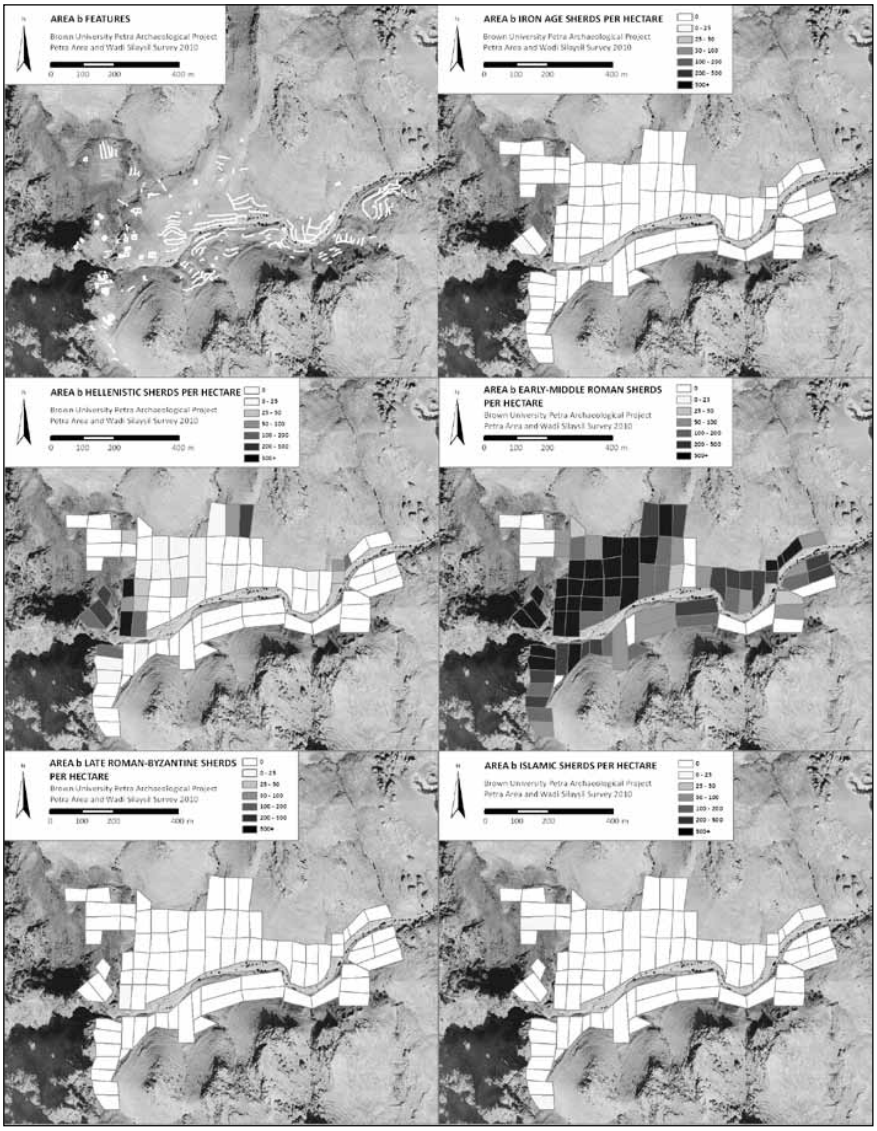
Area b

The remains of the Nabataean village of Rās Sulaysil and its immediate surroundings were the primary focus of our investigations in Area b, located at the western end of Wādī Sulaysil. In the 1980s Gebel (1988: 76) surveyed a site called "Wadi Sleisil", which he dated to the Natufian period. He gives a description of surface finds — a scatter of stone tools on the north side of the wadi — which we relocated during the course of our work. Aside from this location, lithic material was found throughout Area b, with high density areas on the north side especially (**Fig. 3**).

Although Area b covers only about a half of the surface extent of Area a, the lithics in the surface collections (found in 134 survey units in Area b compared to 163 in Area a) indicate that this survey sector was more heavily "populated" by chipped stone artifacts. Lower and Middle Paleolithic presence was three times as intensive; for the Middle Paleolithic, the samples reflect a heavy reliance on the use of Levallois techniques for the production of blades, flakes, and especially Levallois points that were used as hunting and butchering tools. Middle/Upper and Upper Paleolithic artifacts reach almost 7%, which is the highest level for the entire survey region in 2010. Epipaleolithic to Pre-Pottery Neolithic blades, flakes, and cores were found in 20% of the survey units, a possible indication that the Wādī Sulaysil incises a varied terrain in Area b, which would allow for a broader array of exploitable resources. Finally, the Late Prehistoric period (Late Neolithic through Early Bronze) retains its numerical superiority, but we stress again that this may well be as much a reflection of natural processes as of any cultural florescence.

For ceramic finds (**Fig. 10**), very little Iron Age material was found in Area b, but most was located at the strategic high point at the end of the wadi on the north side. The site of a Nabataean high place sanctuary (and perhaps lookout), this area overlooks the extent of Wādī Sulaysil to the east, as well as the Wādī 'Arabah and an important route to Petra to the west.

The Nabataean remains in the area have long been known — discussed first by Kirkbride (1961), described as a caravanserai by Zayadine (1992) and investigated by Lindner's team (Lindner and Gunsam 1995b). Documentation of the high place sanctuary and associated finds, as well as a basic description of the environs, thus exists — fortunately because, as mentioned, the sanctuary suffered a massive, intentional destruction sometime between the NHG team's visits in 1989 and 1990 (Lindner and Gunsam 1995b: 271). For our part, we are able to provide more topographical and chronological data for this landscape and all of its numerous archaeological features. While Lindner and Gunsam (1995b: 273) dated the pottery associated with the sanctuary at earliest to the first century AD, our survey collection recovered a significant amount of earlier, Hellenistic pottery, especially associated with the structures at the sanctuary (**Fig. 10**). Based on these new finds, it seems that

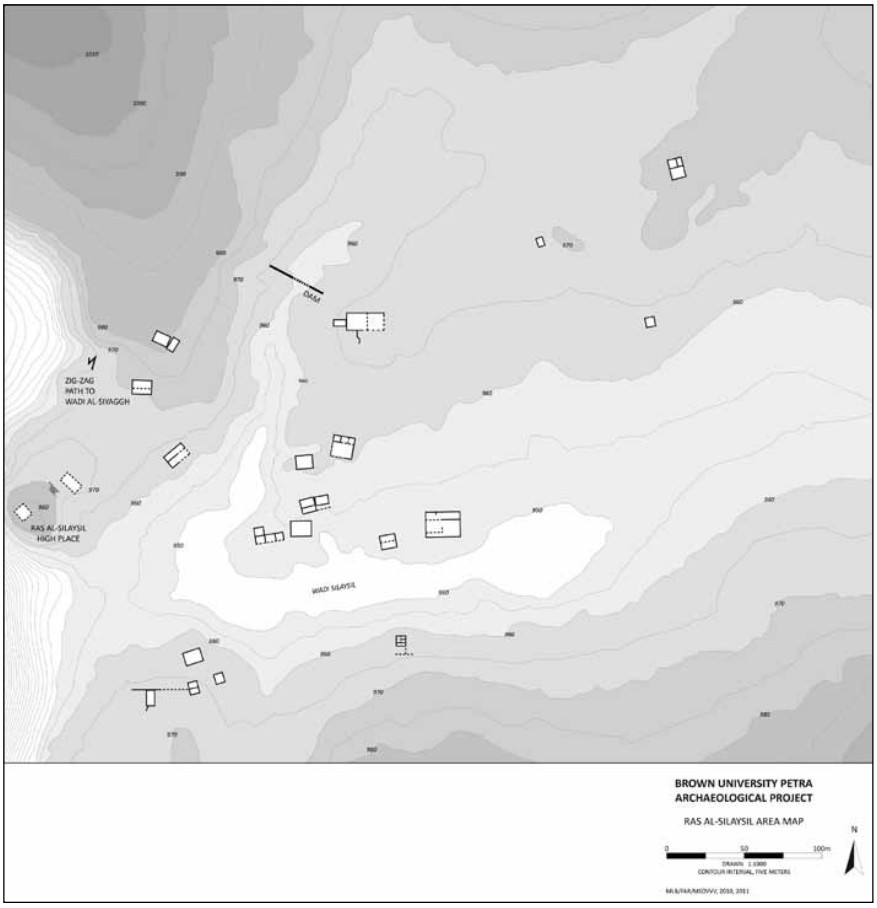


10. Area b features and ceramic densities, by period.

Nabataean activity in the area should be pushed back to at least the third-second centuries BC. The ritual interpretation of the site – tied up intriguingly with its spatial and visual relationship with Jabal Hārūn, the Pond Temple below, as well as other landmarks – requires more detailed attention (Lindner and Gunsam 1995a).

Turning to the built environment, Michelle Berenfeld (Pitzer College) and Felipe Rojas (Brown University) undertook a detailed architectural drawing and topographic survey, producing drawings of all 21 structures in the area, as well as an overall plan (**Fig. 11**). From this, four distinct clusters of buildings can be noted. Those outliers observed are located in strategic places, such as above the confluences of wadis; they thus possessed lines of clear visual communication with the building clusters to the west, as well as with places that those clusters could not observe.

Water management and cultivation were as important here as in Area a. An additional 12 dams were recorded and the investment in agriculture is made obvious by the numerous terraces found throughout the area. Again, while these are difficult to date, similar terraces located slightly farther up Wādī Sulaysil have recently yielded radiocarbon dates of around 100 AD, which matches the bulk of our ceramic evidence (Beckers in press). All in all, the area of Rās Sulaysil emerges as a most intriguing zone: part of an inter-visible system of fortifiable and otherwise significant locations (including



11. Map of Rās Sulaysil structures and topography (map by Michelle L. Berenfeld, Felipe A. Rojas and Michal S. Dziedziniewicz).

Shammāsa, Jabal Hārūn, and Petra itself), apparently intensely cultivated and charged with ritual significance.

The floruit of the Sulaysil community appears relatively short-lived, with the bulk of ceramic finds dating to the Early to Middle Roman period (50 BC – 250 AD). Material that could definitively be identified as Byzantine was nearly completely absent, consisting of only a few sherds in a single survey unit, and only slightly more Islamic pottery was collected. Finally, Area b had by far the least modern garbage of any of the areas we surveyed. This must certainly be a direct result of its difficult access from the main road and the fact that modern land-use is thus far limited to goat herding and some apparent small-scale farming activity.

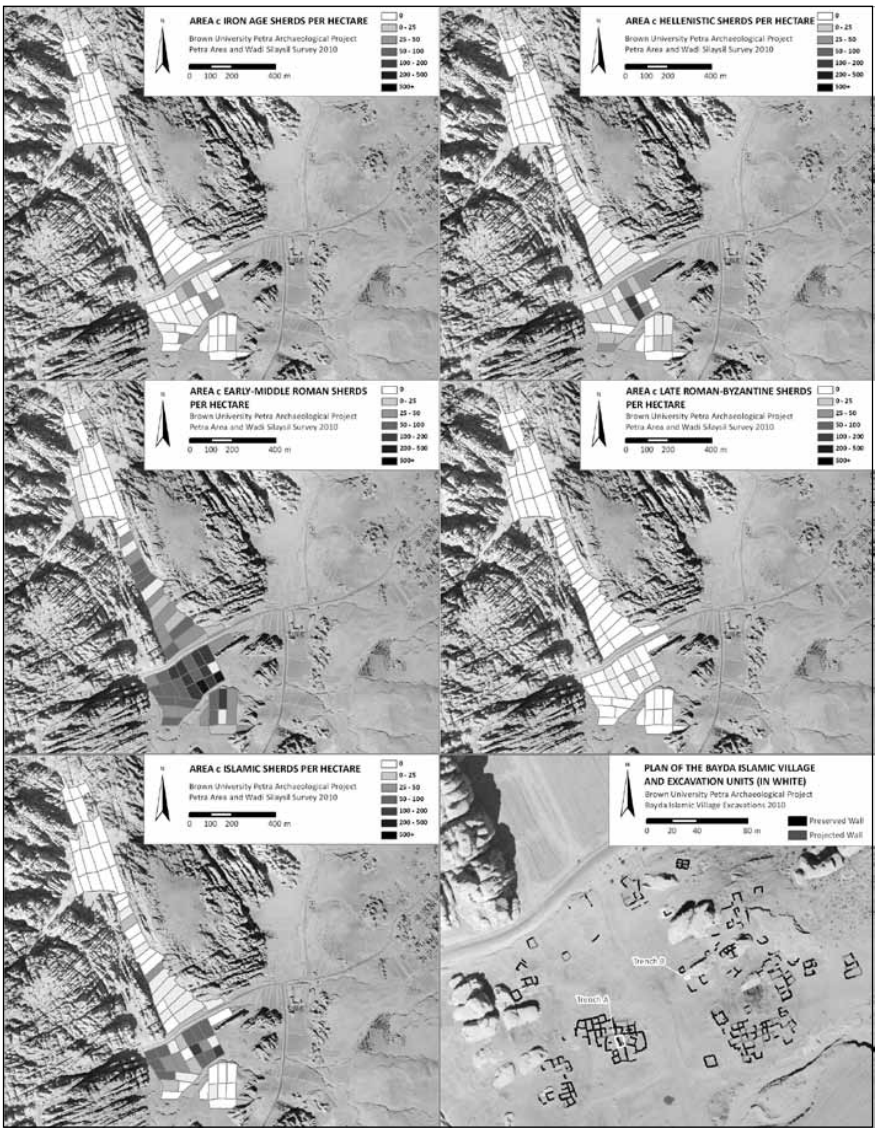
Area c

Centered around the Islamic Bayḍā structures, Area c is divided into 70 survey units covering the extent of the village and the Sīq al-Amṭī, as well as areas to the west and south. While ceramic, lithic, and modern finds were located throughout, it should be noted that the very low densities encountered in the northern part of Sīq al-Amṭī may be the result of a deep sand cover, not present elsewhere in the areas surveyed by PAWS in 2010. Several features, including quarries and petroglyphs, were located in this area but very few surface finds.

The numbers and distribution of chipped stone artifacts from Area c clearly reflect, at least in part, the geomorphological character of the Sīq al-Amṭī. Survey units that produced lithics numbered 65 (**Fig. 3**). Fully three-fourths of the recovered artifacts from Area c were from the later prehistoric periods (Chalco/EB and "Late"), although Lower, Middle, and Upper Paleolithic finds still accounted for around 20% of the Area c samples (**Table 1**). What is significant is the near absence of Epipaleolithic to Pre-Pottery Neolithic periods — a result which could be a consequence of better water resources, vegetational cover, and cultivable territory immediately around Prehistoric Bayḍā, a short

distance to the southwest.

Moving onto ceramics from historical periods (**Fig. 12**), there is a surprising diversity of periods represented in the area of Islamic Bayḍā, beginning with Iron II pottery, found in more abundance here than anywhere else thus far surveyed. Hellenistic sherds are also notably present, suggesting activity contemporary with the surrounding Nabataean complexes and features under study by the Bayḍā Documentation Project (Bikai *et al*. 2007). The Roman and Islamic periods were, however, best represented; this is not surprising, given the multi-period remains already documented by the Bikai team as well as the results of the current BUPAP mapping and excavation efforts at Islamic Bayḍā. The abundance of Roman period sherds, which are in some cases more numerous than those from the Islamic period, may allude to more complex architectural phasing in the village itself than previously thought. Whether these are strictly surface remains or not will hopefully be revealed by BUPAP's concurrent excavations amongst the Islamic period structures. Byzantine remains are again quite scant, and exist only in the vicinity of a structure identified as a former church. Since features in this area had previously been recorded by the Bayḍā Documentation Project, the BUPAP teams (for both PAWS and the excavation at Islamic Bayḍā) sought only to fill certain gaps (Bikai *et al*. 2007, 2008). Timothy Sandiford and Ian Straughn (Brown University) with Mi-



12. Area c ceramic densities, by period, and a preliminary Total Station survey plan of Islamic Bayḍā.

caela Sinibaldi (Cardiff University) undertook, for example, a preliminary mapping of the extant architectural remains at Islamic Bayḍā (**Fig. 12**; this work will be further discussed in reports on BUPAP's results from the excavations).

North of the village, in the Sīq al-Amṭī, ceramic distributions are predominantly of Roman and Medieval date. However, the overall densities are lower than one would expect for a caravanserai, as Zayadine (1992) and many others would like to see here. Architectural elements suggestive of ritual activity, as well as wine-presses suggesting the presence of vineyards, have been identified here by Bikai (Bikai *et al.* 2007: 369), an interpretation that seems to fit the area's Nabataean usage more readily. Further analysis of ceramic data based on the distribution of forms may clarify this issue.

Conclusions and Future Directions

In sum, the PAWS survey, after one season of fieldwork, has produced both novel and promising results. In many ways, our landscape approach complements research previously conducted in the area, providing necessary background to known sites. However, the intensive methodology advocated here has also revealed significant amounts of material from formerly little-known periods in the region (e.g. late prehistoric), and exposed more complicated, diachronic histories at sites generally described as belonging to a single period (e.g., Islamic Bayḍā or the Nabataean village at Rās Sulaysil). Despite these already significant results, we stress that the interpretations presented above remain preliminary in nature. Much work remains to be done with respect to primary fieldwork (for example, filling gaps between areas surveyed in 2010), as well as feature, artifact, and data analysis, which we look forward to reporting in the coming years.

In 2011, fieldwork will continue with a slightly larger team, allowing for greater expediency in the recording of survey units and features. Intensive field walking will have two primary goals: (1) to cover the areas separating Areas a, b, and c as comprehensively as possible and (2) to expand east of the road that runs between Umm Sayhūn and Bayḍā. Additionally, we hope to expand the ethnographic and geological components of the project, for which groundwork was laid in 2010. Architectural and spatial analysis of features will continue, as will topographic studies of routes of movement within the survey area, and between it and the city center of Petra.

A preliminary report cannot do justice to the efforts of all who contributed to the 2010 season of PAWS. Indeed, this article has had the daunting task of distilling multiple detailed field reports prepared by various project members, sometimes reducing several thoughtful pages into only a sentence or two. We hope, however, to have presented a coherent account of our first season of work that gives due credit to previous researchers in our project area, explains the background and motivations of the Petra Area and Wādī Sūlaysil Survey, and provides some initial interpretations in presenting the data thus far collected.

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