BROWN UNIVERSITY PETRA ARCHAEOLOGICAL PROJECT: THE 2011 AND 2012 PETRA AREA AND WĀDĪ SILAYSIL SURVEY

Alex R. Knodell and Susan E. Alcock

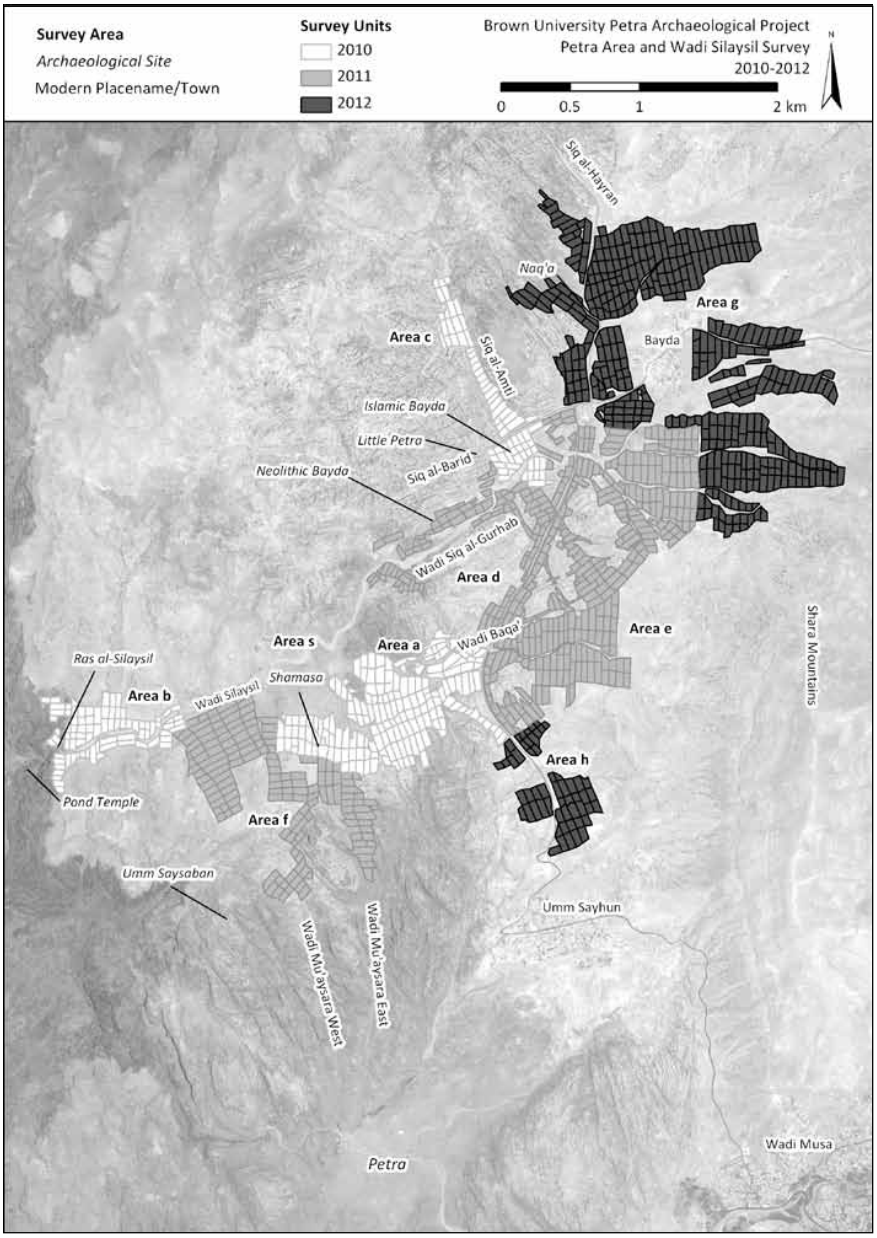
Introduction

The Petra Area and Wādī Silaysil Survey (PAWS) undertook its second and third seasons of fieldwork in 2011 and 2012 as a major component of the Brown University Petra Archaeological Project (BUPAP)[1]. The PAWS research area is located to the north of the Petra city center, between the modern village communities of Umm Ṣayḥūn and Bayḍa, within which three zones were intensively surveyed in 2011: Areas D, E and F. Two further areas were intensively surveyed in 2012: Areas G and H (**Fig. 1**)[2]. As noted in our 2010 report, this area is sufficiently close to Petra to have attracted the attention of previous travellers and archaeologists, going back to the 19th century (for a review, see Knodell and Alcock 2011). The PAWS survey, however, diverges from all prior work in the area owing to its systematic and intensive nature and its overtly diachronic focus, as well as its close integration with other aspects of BUPAP research. As we found in our first season (2010), this approach to the documentation of the landscape yields significant and substantial results (Alcock and Tuttle 2010, 2011, 2012; Knodell and Alcock 2011; Alcock and Knodell 2012). The following provides a brief description of our methods, then discusses the results of the 2011 and 2012 seasons.

The PAWS Survey Area and Methodology

A detailed description of the PAWS methodology has been given elsewhere (Knodell and Alcock 2011: 492-495), but will be reviewed briefly here. Our project works in the tradition of intensive, systematic and diachronic survey, as practiced in the Mediterranean basin and other parts of the world. While survey archaeology has long and successfully been conducted in Jordan (Banning 2001; MacDonald 2007), such work is not typically conducted with the degree of intensity undertaken by PAWS. In 2011 and 2012, as in 2010, our selected areas for investigation were divided into a number of survey units (or SUs), the boundaries of which were demarcated by GPS points taken at unit corners. The size and shape of survey units were defined based on team size and natural breaking points in the landscape (e.g. field boundaries or topographical features), as well as a desire to keep units small enough to maintain good spatial control of the data (usually 40 - 50 meters wide and 50 - 100 meters long). All terrain was covered as part of a survey unit unless its topographical character – such as steep slopes or bedrock outcrops – made this impossible. In most cases, however, such zones were subsequently explored by a separate team whose goal was the documentation of archaeological features within and between survey units. In each survey unit, four to six field walkers spaced 10 meters apart examined the ground surface, counted and collected all worked stone, counted all ceramics and collected diagnostic sherds, and counted and categorized all modern material within an individual

1. The Brown University Petra Archaeological Project is a multi-component research program co-directed by Susan E. Alcock and Christopher A. Tuttle; Alex R. Knodell is field director of the archaeological survey that is the subject of this article. For more information about the various aspects of BUPAP, see our project website, which contains descriptions of all of its components and lists of publications: http://proteus.brown.edu/bupap/Home.
2. Unless otherwise noted, all maps by Alex R. Knodell; background image: copyright 2011 DigitalGlobe Incorporated.



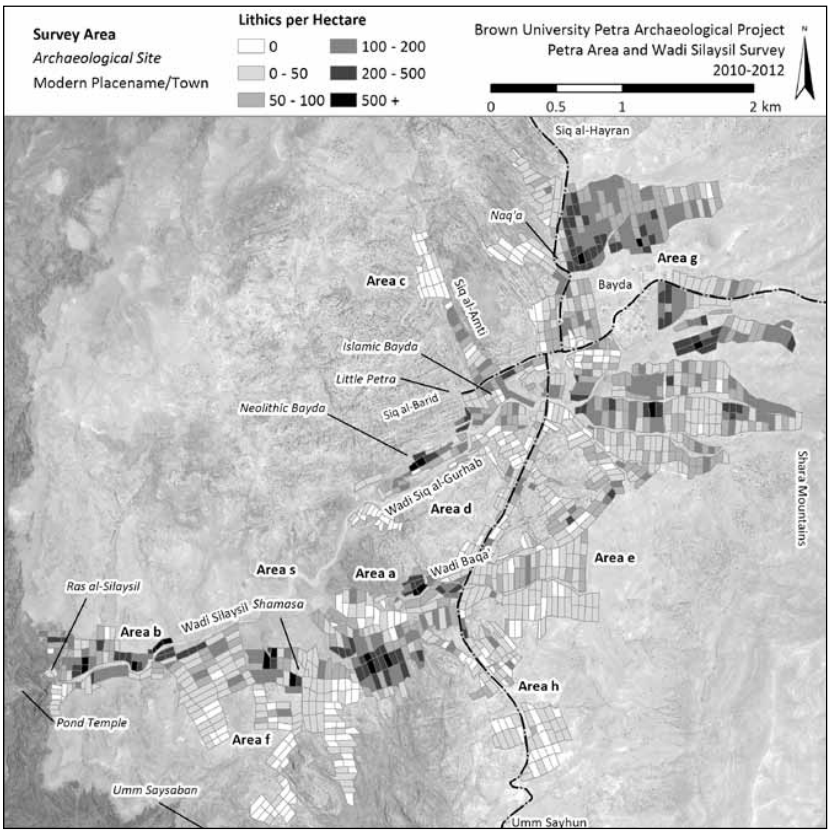
1. Overall map of areas surveyed in 2010, 2011 and 2012 with place names and known archaeological sites.

walker's two-meter wide transect across the survey unit[3].

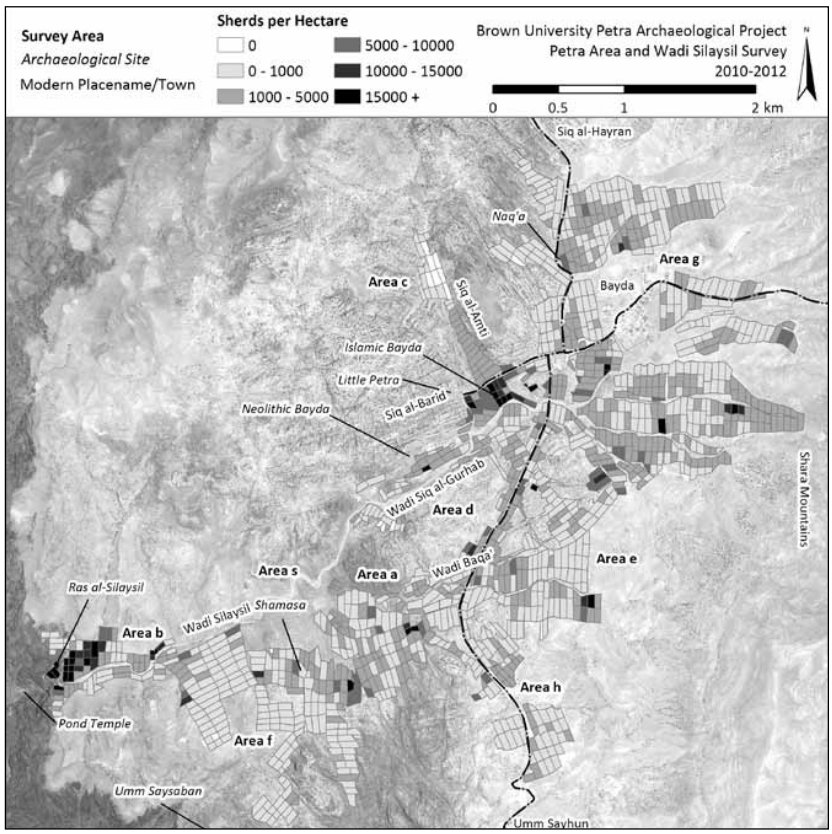
After collection, all artifacts were studied, and representative examples drawn and photographed. Such analysis allows the production of detailed distribution maps of artifacts (**Figs. 2, 3 and 4**), which were made using ESRI's ArcGIS. All artifactual, spatial and field data is managed in L-P Archaeology's ARK (Archaeological Recording Kit), an open source, standards compliant, web-delivered system, which will eventually be made publicly available online.

Lithic finds were studied by Gary Rollefson and Clive Vella. Ceramic analysis for the Bronze Age to Early Islamic periods was conducted by Tali Erickson-Gini; the Middle to Late Islamic pottery was studied by Micaela Sinibaldi. **Table. 1** provides a chronological chart of the periodization employed by the project; we should emphasize that we use terms such as

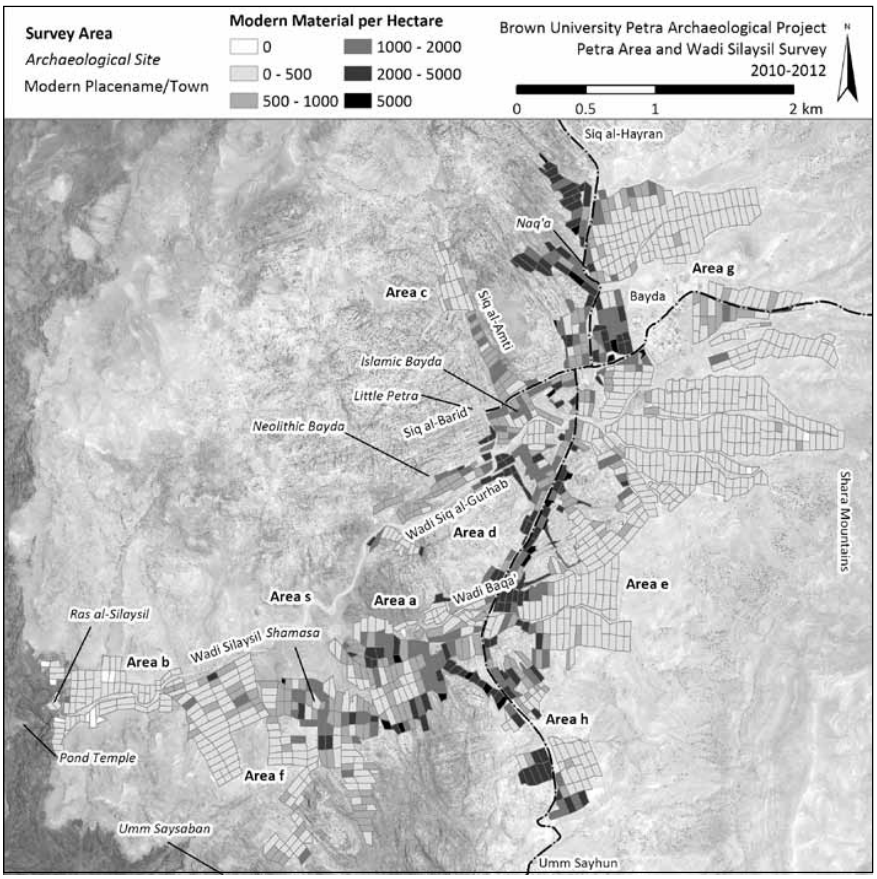
3. For a more detailed explanation of this process, including the nature of the paper-based and GIS documentation performed, the definition of what constituted a 'diagnostic' artifact and the calculation of artifact densities per survey unit, see Knodell and Alcock (2011).



2. Overall lithic density.



3. Overall ceramic density.



4. Overall modern density.

Hellenistic and Roman to make chronological, rather than cultural designations.

Not all discoveries, of course, were surface artifacts. Indeed, the landscape north of Petra has been modified to an astonishing extent through rock-cut interventions in the sandstone bedrock, creating cisterns and other water capture features, agricultural installations such as presses, ritual niches and baetyls, and many other elements. Moreover, numerous constructed retaining walls, for terracing or damming, are scattered across the region. Such things were often first observed, quickly noted and mapped by the survey team, and were then revisited by a 'Features' team, led by Christian Cloke and Cecelia Feldman, which at the very least drew, measured and photographed all archaeological features and in some cases undertook detailed architectural drawing or total station survey. Significantly more features were noted in 2011 and 2012 than in 2010. Cloke and Feldman have now evolved 11 broad functional classes and a more rigorous typology (with 24 categories) based on identifying characteristics to allow for consistent recording and greater transparency in identification and interpretation (see **Fig. 5** for a map of features found in 2010, 2011 and 2012). Dating the vast majority of these features remains a significant challenge, though associated surface assemblages provide some sense of general chronology.

It should be noted that the project continues to use the artifact or the feature as the minimal unit of analysis, and therefore continues not to define 'sites' in any strict sense. This decision is encouraged by our increasing sense that the patterned interaction of features and artifacts across the regional landscape is quite extensive and overlapping in time, making it very difficult to ascribe boundaries to sites in tight spatial terms.

Preliminary Results of the 2011 Season

Two of the areas selected for survey in 2011 (Areas D and F) were intended to link those investigated in 2010 (Areas A, B and C), while

Table 1: Chronological periodization employed by the Brown University Petra Archaeological Project.

Period	**Date Ranges**[4]
Lower Paleolithic	1 m.a.-250 k.a.
Middle Paleolithic	250-50 k.a.
Upper Paleolithic	45-19 k.a.
Early/Mid Epipaleolithic	21,000-15,300 BC
Natufian	15,700-10,000 BC
PPNA	10,000-9,000 BC
PPNB	9,000-6,900 BC
PPNC	6,900-6,350 BC
Late (Ceramic) Neolithic	6,350-5,500 BC
Chalcolithic	5,500-4,300 BC
Early Bronze Age	4,300-2,500 BC
Middle Bronze Age	2500-1550 BC
Late Bronze Age	1550-1200 BC
Iron Age I	1200-1000 BC
Iron Age II	1000-500 BC
Iron Age IIa	1000-900
Iron Age IIb-c	900-586
Iron Age III	586-539
Babylonian/Persian	539-300 BC
Early Hellenistic	300-200 BC
Late Hellenistic	200-50 BC
Early Roman	50 BC-100 AD
Middle Roman	100-250 AD
Late Roman	250-450 AD
Byzantine	450-650 AD
Early Islamic	650-1000 AD
Middle Islamic	1000-1400 AD
Late Islamic	1400-1800 AD
Modern	1800-present AD

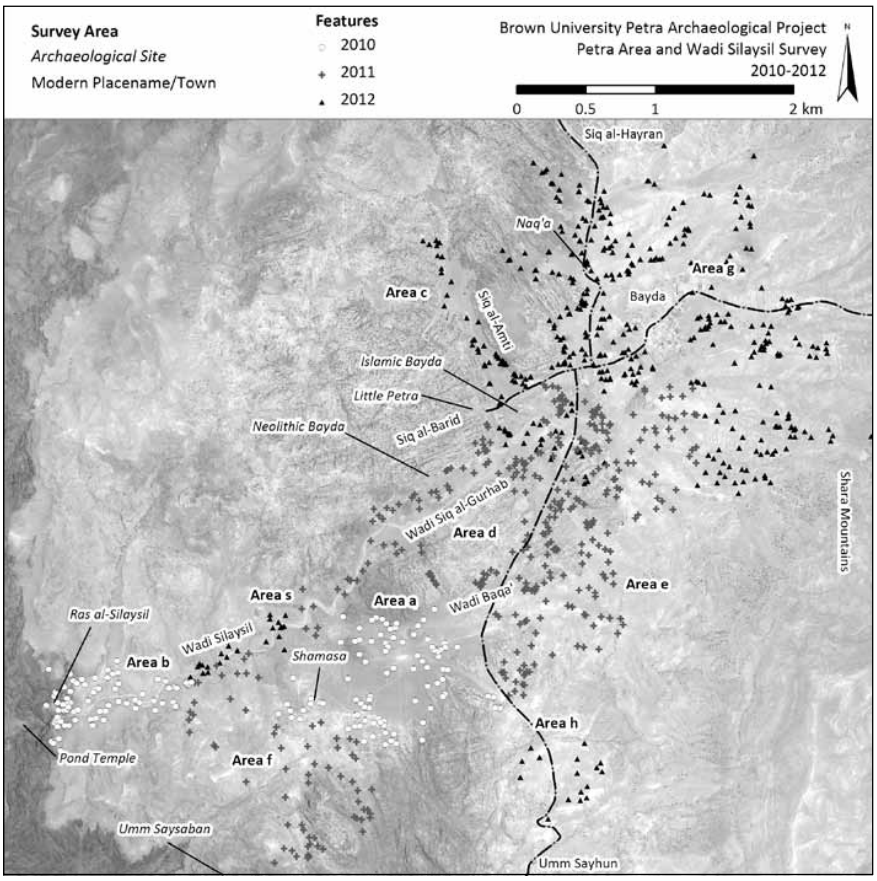
Area E expanded our coverage to the east side of the modern north - south road between Umm Sayhun and Bayda, which very roughly follows the eastern boundary of the Petra Archaeological Park (**Fig. 1**). This general area, as noted before, lies within a few kilometers of the Petra city center, embraces some of the most viable agricultural land available to the north and is transected by several potential routes in and out of the city. Sites in the region previously studied, by ourselves and others, include Shamasa (located in Area A), Rās as-Silaysil (Area B), Little Petra (Area C), Nabataean and Islamic Bayda (Areas C and D), Neolithic Bayḍa (Area D) and Umm Saysabān (to the south of Area F; for the locations of these places see **Fig. 1**). A summary of previous work in the BUPAP study area is given in the report of our first season (Knodell and Alcock 2011; see also, e.g., Bikai *et al*. 2007, 2008; Byrd 2005; Kirkbride 1966; Lindner and Gunsam 1995, 2002; Lindner *et al*. 2001; Sinibaldi and Tuttle 2011).

As seen in **Figs. 2 - 4**, lithic, ceramic and modern materials were found (as in 2010) throughout the areas walked in 2011. Modern densities (garbage, essentially, with metal, plastic, glass and 'other' recorded separately) were highest along the roads and in areas that are popular picnic and camping spots for both tourists and the local population. Distributions of modern material in the more remote Area F and the eastern parts of Area E were for the most part much lighter. Ceramic and lithic finds were almost continuously scattered across the landscape examined, with distinct periodic 'hot spots'.

Area D

The 107 survey units of Area D connected Areas A and C from 2010, extending west from

4. All dates are approximate. The chronology of many periods obviously remains to a degree in fluxand not all periods listed here are present in our survey area.It is also the case that further ceramic analysis, notably in terms of fabric classifications, will modify our present reading of the material. The following offers some explanation for the periodization adopted by BUPAP. Prehistoric dates (Lower Paleolithic to Early Bronze Age) are after Levy (1995: xv-xvi) and Weninger *et al*. (2007), and adapted slightly to reflect the specific situation in southern Jordan. For Iron Age dates see Herr (1997) and Bienkowski (2001). For Hellenistic to Byzantine, see Erickson-Gini (2010) and Erickson-Gini and Israel (2013). For an alternative chronological schema that covers the Nabataean period – here Hellenistic to Roman, see Schmid (2000); our reasons for not using this more standard chronology will be explained in detail in forthcoming publications that deal with the ceramics in greater detail. For reasons of practicality, very broad subdivisions within the Islamic periods are indicated with the chronology proposed by Whitcomb (1992), though amended slightly with regard to the end date of the Byzantine and the start of the Early Islamic periods. We emphasize that all periodizations are intended to indicate material culture transitions in a broader historical framework, rather than cultural or religious identities (for example, Edomite, Nabataean, or Islamic).



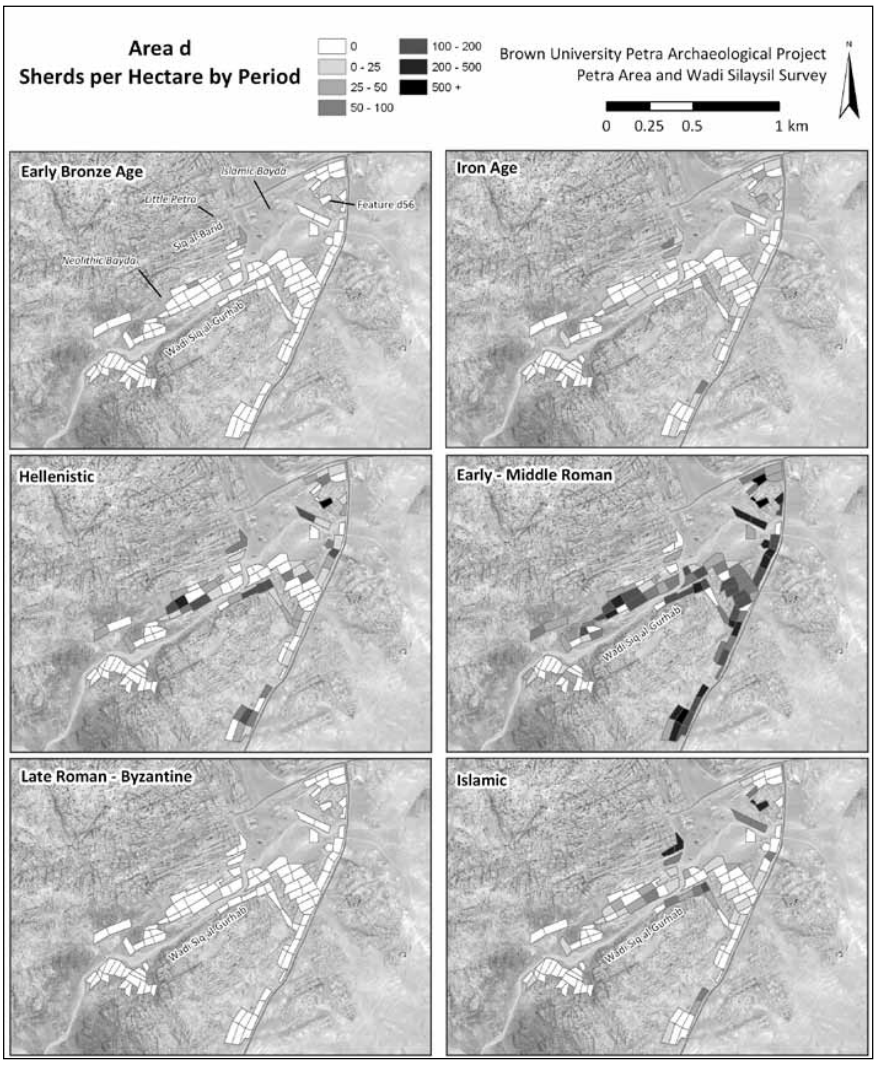
5. Distribution of features across the survey area.

the modern road and the vicinity of Nabataean and Islamic remains at Bayḍa, through Wādī Sīq al-Gurhab and past Neolithic Bayḍa (**Fig. 1**). Amongst the lithics, Late Prehistoric (Late Neolithic, Chalcolithic and Early Bronze Age) material dominates the assemblages, but Middle Paleolithic and Epipaleolithic / Pre-Pottery Neolithic finds were also recorded.

Ceramic densities were highest in the areas around Islamic Bayḍa, which also has significant remains from earlier periods, and at points in Wādī Sīq al-Gurhab. Area D, in survey units near Little Petra and Neolithic Bayḍa, yielded some of the project's first recorded Early Bronze Age pottery; Iron Age II and Hellenistic materials were observed there as well (**Fig. 6**)[5]. The vast majority of the ceramic evidence collected here, however, as elsewhere in the survey region, is dated to the Early and Middle Roman periods. Very few imported wares were noted for this time period. The pattern of a remarkable dearth of Late Roman and Byzantine ceramics continued from our previous season, but – unsurprisingly given its proximity to Islamic Bayḍa – Area D produced a large number of handmade vessel sherds of Middle and Late Islamic date.

We recorded a wide range of features (96 in number) in Area D, including quarries, presses, cisterns and other water features, tombs and rock reliefs. Many but by no means all of these interventions are in the vicinity of early Bayḍa and the complex rock-cut landscape previously observed there (Bikai *et al.* 2007, 2008). The near ubiquity of such features across the landscape was particularly significant, indicating the

5. Figs. 6, 7, 9, 11 and 13 present ceramic densities of each survey unit by period. Toponyms and specific locations are indicated only in the upper left tile; these do not necessarily correspond to the particular period map in which they are rendered. Some collapsing of chronological categories is necessary to indicate general trends in the ceramic data. In the diachronic period density maps we use the following terms to encompass the following more specific periods: Iron Age material is predominantly Iron IIb and c, though more nuance may yet emerge from this following further study; Hellenistic includes sherds that were designated as both Hellenistic and Hellenistic / Roman (not a large category); the majority of sherds included in the Islamic category are dated generally to the Middle to Late Islamic periods.



6. Area D, ceramics by period.

extent to which this area as a whole was modified, well beyond the previously studied locations at Little Petra, Neolithic Bayḍa and the Nabataean Hall immediately east of the Islamic Village. Extensive and elaborate complexes are located in the northeastern part of Area D, south and south-west of the Nabataean Hallat Bayda (Bikai *et al*. 2008), and in the vicinity of Neolithic Bayḍa. There was often a direct correlation between high ceramic densities and the presence of complex features.

Area E

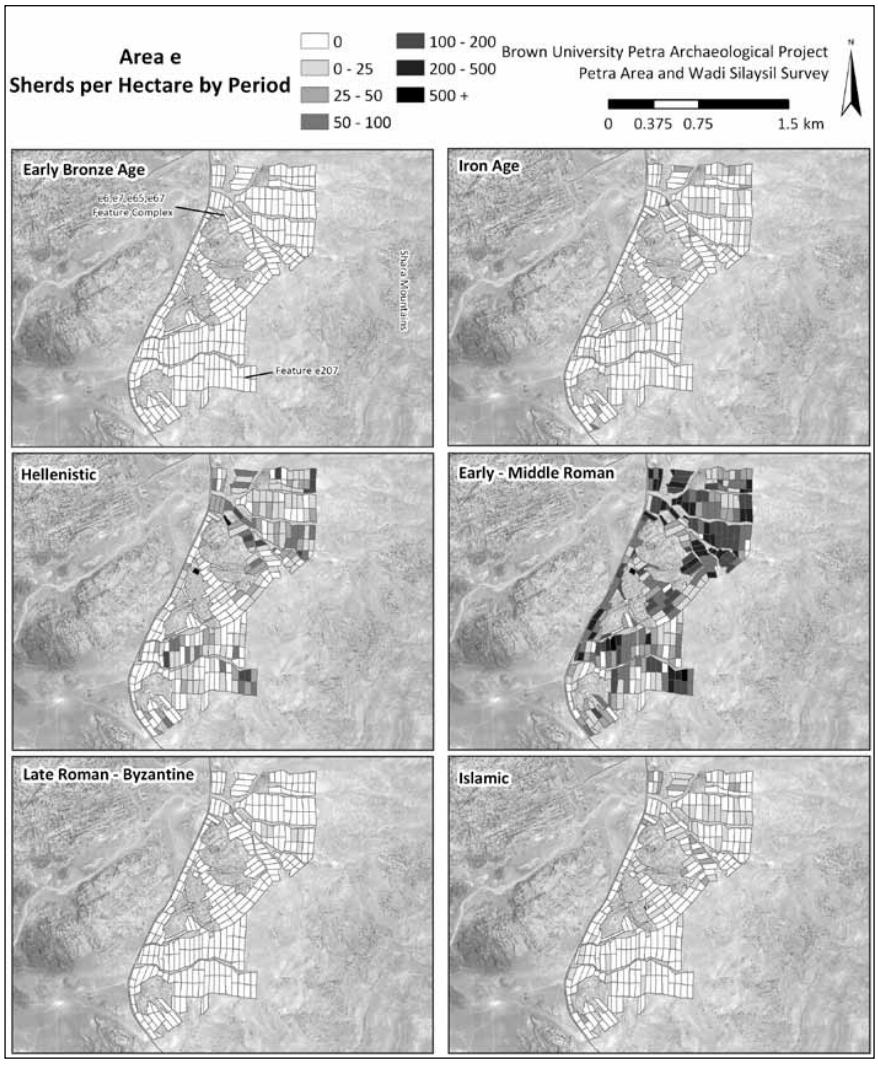
The 285 survey units of Area E, lying on the east side of the Umm Sayhun - Bayḍa road, are comprised of small fields among the sandstone rock formations along the road, with many series of terraced fields further east and moving up the slopes of the Sharāh mountains.

Lithic finds were particularly abundant in Area E (**Fig. 2**) with a higher percentage of survey units yielding such artifacts than in Areas D or F; these provided the best array of tool types for multiple periods from the Lower Paleolithic to later prehistoric times. Several Lower Paleolithic bifaces (hand axes), for example, were recovered. It can be hazarded that this territory, east of the Umm Ṣayḥūn - Bayḍa road and climbing toward the Sharāh mountains, may have been more intensively exploited in deep prehistory than other areas explored in 2011; possible reasons for this should be further explored. At this point, we would connect the activities of pre-modern humans in this area with the presence of water and lithic raw material resources on the slopes of the Sharāh mountains.

The topography also provides a vantage point for observing prey animals moving through the landscape below, while still being relatively easy to access. Moreover, the Namala pass to the north-west, which leads down to the Wādī ʻArabah, would have been an important migratory route for both humans and animals.

Ceramic densities were fairly consistent across this terrain, though with some significant concentrations, for example, in direct relation to Feature E207 at the very edge of the south-eastern extent of Area E (**Fig. 7**). No Early Bronze Age pottery was found on the east side of the road in 2011 (and it should be noted that we have found no Middle or Late Bronze Age ceramics anywhere in the study region), but Iron II finds were recorded, as were Hellenistic sherds. A concentration of the latter, together with Early Roman material of higher quality than that of surrounding units, was discovered at Feature E207: the remains of a large structure on a high outcrop commanding an impressive view over the BUPAP survey territory and beyond. Overall in Area E, Early and Middle Roman material continues to appear in the densest concentrations, with the now familiar subsequent drop off in Late Roman and Byzantine times. Islamic period material was also found, especially in the more northerly part of the Area.

209 features were discovered in Area E, characterized by agricultural and hydraulic installations in the sandstone bedrock at its western edge and by numerous terrace walls further to the east (in some cases running over 200 meters in length). There are some highly imbricated rock-cut complexes in Area E (as indeed



7. Area E, ceramics by period.

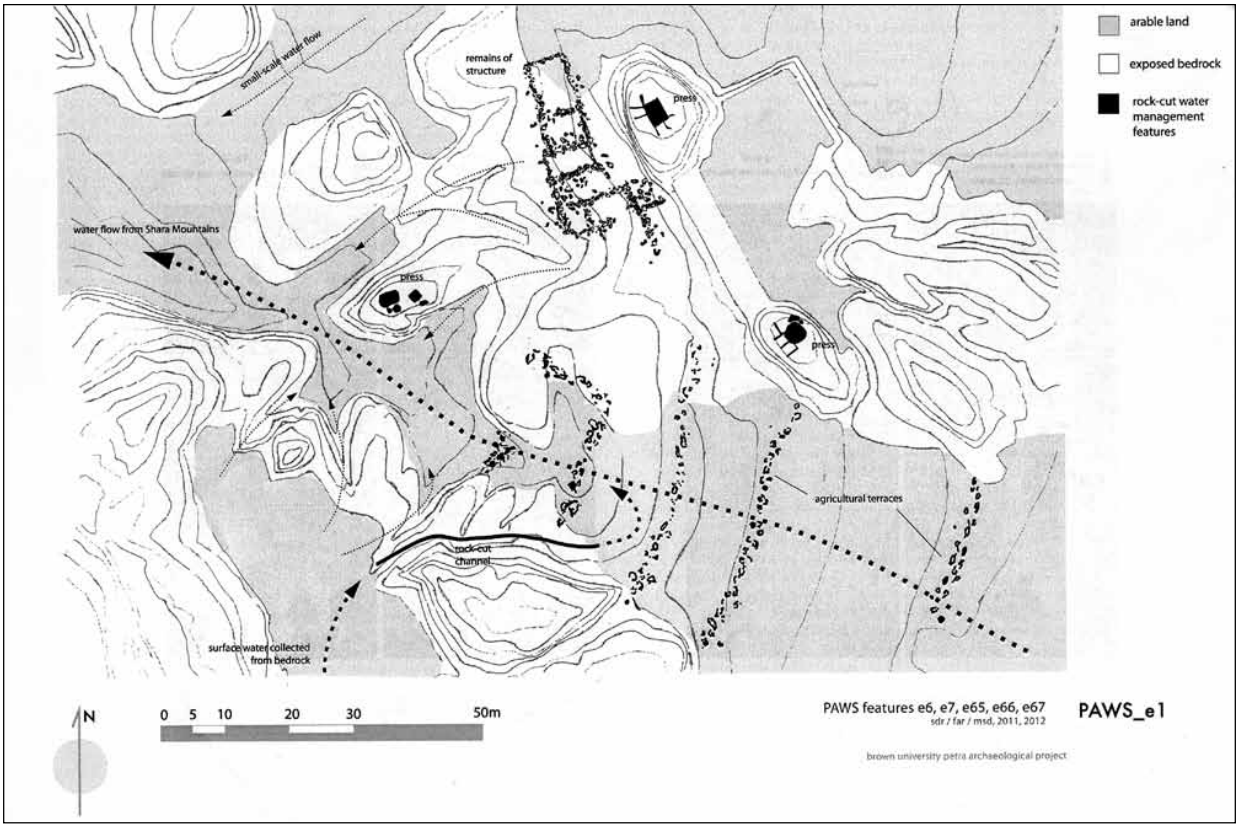
elsewhere in the survey region), where features originally identified separately were found to work as systems of water capture and management, sometimes in tandem with agricultural installations. This high degree of connectivity must be true as well for the patterning of walls, here and elsewhere in the study region. One such complex of particular interest consists of a variety of features (E6, E7, E65, E66 and E67) found at different times throughout the season and includes the remains of a terrace system, substantial buildings, presses and an elaborate system of water channels (**Fig. 8**). Moreover, this complex is located close to several baetyls, niches and other ritual features, to which it was no doubt connected.

Finally, the results of the PAWS survey, especially for Area E, were shared with the UNESCO sponsored Risk Mapping Project in Petra, which concerned itself with definition of the boundary and potential buffer zone for the Petra Archaeological Park. Discussing their specific case study (the Park's eastern boundary between Umm Ṣayḥūn and Bayḍa), the report noted that while this area had been identified as highly suitable for development in the most recent Strategic Master Plan, "this appeared contrary to the richness of the archaeological remains confirmed by recent archaeological surveys," citing the work of BUPAP (Paolini *et al*. 2012: 66).

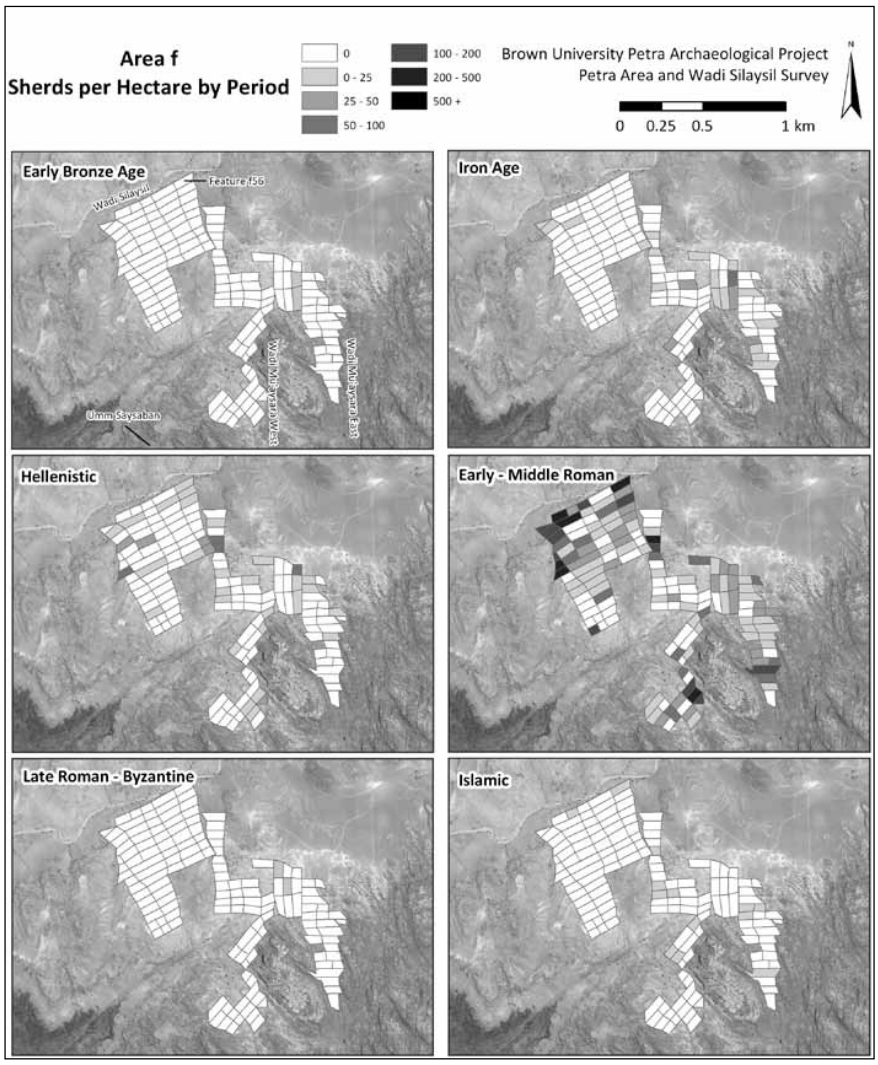
Area F

Area F, consisting of 144 survey units between Wādī Silaysil and Wadi Mu'aysara East and Wadi Mu'aysara West, joins Areas A and B (walked in 2010). As with Area D, Area F was less productive in terms of lithic material than Area E, but finds of Middle Paleolithic date were made, as well as of Epipaleolithic and Pre-Pottery Neolithic material. Area F yielded, for the first time, definite Pre-Pottery Neolithic B and Late (Pottery) Neolithic arrowheads.

Ceramic counts were comparatively low here, with only a few exceptions (**Fig. 9**). Two survey units produced Early Bronze Age material; it should be noted that the contemporary site



8. Area plan of Features E6, E7, E65, E66 and E67 (map by Sarah F. Rhoads, Felipe A. Rojas and Michal S. Dziedziniewicz).



9. Area F, ceramics by period.

of Umm Saysaban lies above and to the southwest of Area F. Later periods follow roughly the same pattern as detected elsewhere: some Iron II and Hellenistic activity, a peak in the Early and Middle Roman era, a sharp drop off in the Late Roman and Byzantine periods, and renewed traces of activity in Islamic times.

72 features were identified in Area F, chiefly associated with agricultural and hydraulic modifications of the landscape, such as terraces and dams. The most notable feature discovered was Feature F56, a hill-top construction reminiscent of Feature E207, with an admirable view in several directions. The numerous associated ceramics indicated a heavy Early to Middle Roman presence; the area around is marked by quarries, terrace walls and dams testifying to extensive landscape manipulation and water management strategies.

Extensive Survey

The methodology of intensive survey employed by BUPAP is not, of course, feasible across the entire landscape we seek to investigate. Bedrock outcrops, high massifs or very steep slopes cannot be walked in this fashion, but are equally necessary for understanding long-term human activity in and use of the region. To that end, specific zones were more extensively explored by small teams looking carefully for the presence of features. In 2011, three such zones were targeted in this fashion. One lay in Area E, in the near vicinity of the 'Seven Wonders' *bedouin* camp; another augmented our picture of activity in the vicinity of the Wadi Baqa' dams in Area A; finally, Area S was designated for features found in a zone west of Area D, along Wadi Siq al-Gurhab and Wadi

Silaysil. Thirteen features were found here, including a roughly two meter-tall carved relief (Feature S13; **Fig. 10**) emulating a tomb façade, with molded cornice and the incised outline of a door. This feature is interestingly positioned, overlooking an extensive series of dams and walls (Feature S9).

Other BUPAP Activities

The PAWS survey was only one of several activities conducted during the BUPAP 2011 season; while these are to be published in full elsewhere, they will be briefly noted here. Excavation continued at Islamic Bayḍa with three trenches under the direction of Christopher Tuttle and Micaela Sinibaldi (assisted by Katherine Harrington and Clive Vella). Work in the two trenches already opened in 2010 (see Sinibaldi and Tuttle 2011) resumed and a third trench was opened. During this season new structures with a domestic function were excavated and new observations on building techniques were made. Geophysical survey of select locations at Islamic Bayḍa was also undertaken by Thomas M. Urban. A program of laboratory analysis – including phytolith study (sampling for which was undertaken in 2011), dendrochronological analysis and radiocarbon dating – is planned for Islamic Bayḍa, which will be included in the full publication, currently in progress.

10. Feature S13, carved 'tomb' relief (photo by Christian F. Cloke).

The season also saw the inception of the Petra Routes Project (PRP) as a subcomponent of BUPAP. The goal of the PRP team (coordinated by Michelle Berenfeld and Felipe Rojas) is to document known route ways in and out of the Petra city center, at both a regional and a local scale. In particular, they started the meticulous recording of features (including the remains of roads) in Wadi Mu'aysara East and Wadi Mu'aysara West, which link Petra to the PAWS survey territory to the north and to settlements such as Shamasa and Ras al-Silaysil (Fig. 1; Rojas and Berenfeld 2012).

We continued a program of geophysical prospection, undertaken by Thomas M. Urban, who employed both magnetometry and ground penetrating radar (GPR) in the 2011 season. Urban's work in the city center in the Upper Market (a continuation of BUPAP's Petra Upper Market Archaeology [PUMA] endeavor), confirmed – through detailed gridded GPR survey – the presence of a well-defined anomaly of substantial size first observed through electromagnetic induction survey and magnetometry in 2010 (Urban *et al*. 2012). Additional geophysical testing in the Petra city center was done at the Temple of the Winged Lions, at the Turkmanniyya Tomb and at the Petra Church; preliminary results from the latter two sites were provided to both the Petra Archaeological Park and UNESCO representatives concerned with the conservation and preservation of these two major monuments. Urban also carried out geophysical profiles at the settlement of Shamasa (surveyed and documented in our 2010 season) and near Bayḍa, both in the Siq al-Amti (surveyed as part of Area C in 2010) and in a 2011 survey unit (PAWS D71) with extremely high ceramic densities lying in front of a two-storey Nabataean tomb (Feature D56).

Finally, the BUPAP project also collaborated with a team from Cornell University's Wiener Laboratory for Aegean and Near Eastern Dendrochronology, led by Sturt Manning, who has started a program of dendrochronological sampling in southern Jordan. We would also like to thank Dr Fuad Hourani of the University of Jordan for briefly visiting the project and advising us on how to approach the geomorphological history of what is clearly a highly dynamic region.

Preliminary Results of the 2012 Season

Continuing with the methods from 2011, we conducted intensive regional survey in the area north of the Petra city center, this time in two areas: Area G extended the survey area north of previously surveyed territory, focusing on the vicinity of the modern village of Bayḍa; Area H extended the eastern part of the survey area to the south, in order to close the gap between our survey area and the village of Umm Sayhun. This represents the completion of the first phase of work by the Petra Area and Wadi Silaysil Survey, which has now covered a coherent area of *ca* 6 sq. km (or *ca* 600 ha.) in a natural valley bounded to the north by the Namala pass, in the east by the Sharāh mountains, in the south by Umm Sayhun and the mountains separating Petra and its northern hinterland, in the west by the precipitous drop to the Wadi Araba' at the end of Wadi Silaysil and in the north-west by the rugged landscape north of Wadi Silaysil and Wadi Siq al-Gurhab (**Fig. 1**).

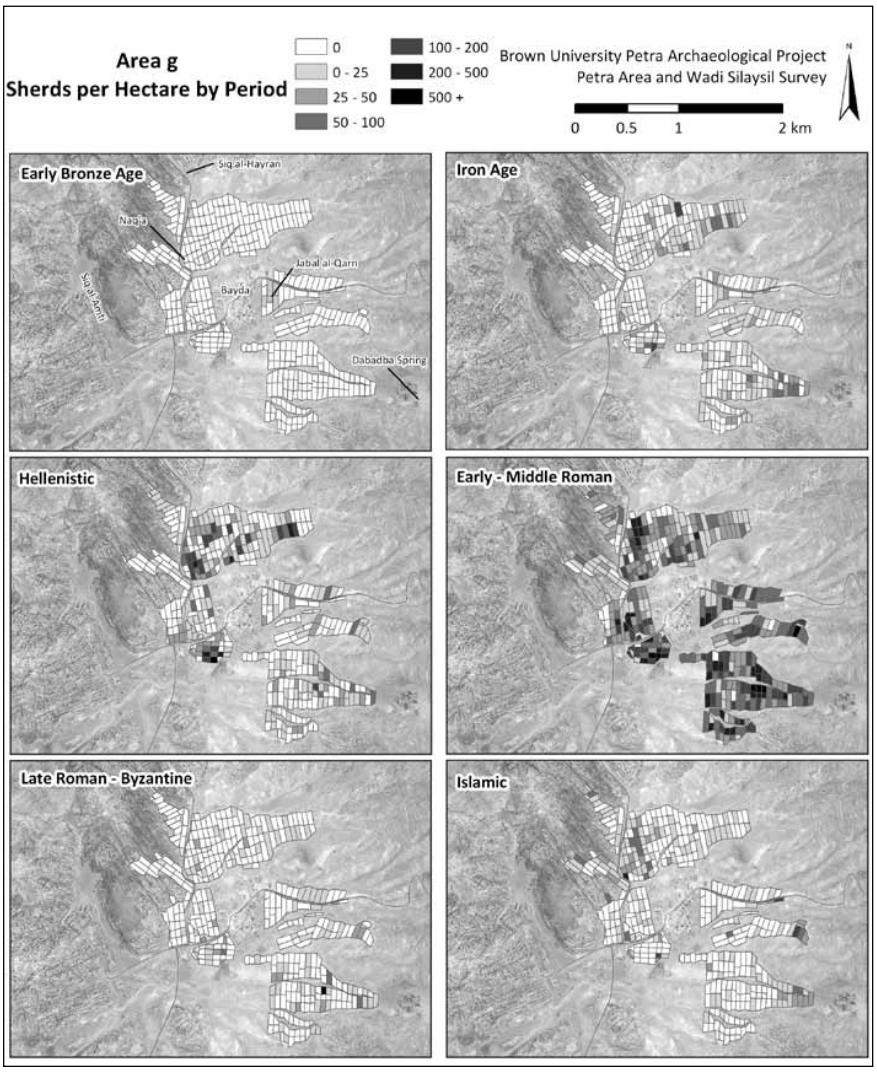
Area G

Area G, the largest yet surveyed, consists of 396 survey units surrounding the modern village of Bayḍa and abutting Area E to the south. Area G extends to the beginning of the Namala pass in the north and to a variety of steep cliffs and ridges in the west. On the east it extends up the slopes of the Sharāh mountains toward the Dabadba spring. A previously known site in this area is the Early Modern village of Naq'a.

Lithic finds in Area G were exceptionally widespread (**Fig. 2**). Lower and Middle Paleolithic periods were well represented, as in Area E, and some 17 hand axes were recovered, along with over 60 pieces produced using the Levallois technique. The pattern of lithic distribution differed from that recorded in other areas in that there was a distinct lack of Epipaleolithic and Pre-Pottery Neolithic material. Less than 0.5 % of the total assemblage from Area G can be dated to these periods. By far the most well represented period was the Late Prehistoric period, again broadly defined as encompassing the Late Neolithic to Early Bronze Age. The dominance of this type of material is in general accordance with the rest of the PAWS survey area (Knodell and Alcock 2011; see also descriptions of Areas D, E and F above).

Ceramics ranging in date from the Early Bronze Age to the modern period were found throughout Area G (**Fig. 11**). Early Bronze Age ceramics were found mainly in the vicinity of Jabal al-Qarn, an apparent Early Bronze Age settlement discovered by the PAWS survey on a hilltop immediately east of the modern village of Bayḍa. This is an exceptionally significant discovery, which was documented using a range of methods (Vella *et al*. 2012). Later remains near the site had been known to archaeologists and identified as belonging to the Nabataean / Roman periods, based the presence of pottery and some wall foundations ('Amr *et al*. 1998; 'Amr and al-Momani 2001). The presence of Early Bronze Age material, however, was not recognized until now, an identification stemming from the similarity of wall remains and pottery to those found at Umm Saysaban, the only other known Early Bronze Age site in the study area and its immediate surroundings (Lindner *et al*. 2001; Hübner 2013). The collection of some 200 Late Prehistoric lithics in the survey units covering the site (G252 - G260) was also illuminating.

Iron Age (almost entirely Iron II) ceramics were well represented in Area G, more so than study thus far suggests has been the case in Areas A - F. Densities were highest in the easternmost stretches of Area G, as one moves up the slopes of the Sharāh mountains. This pattern is not surprising, given the proximity to water sources and the increased visibility (often sought in the Iron Age) that these locations afford. Hellenistic period material in general tends to represent continued occupation in areas that were of interest during the Iron Age, with some exceptions. An example of a place that becomes prominent in Hellenistic times, without an Iron Age predecessor, is the Early Modern village of Naq'a. As seen in all other parts of the survey area, further intensification occurs in the Early - Middle Roman period, where nearly the entire landscape is populated with sherds of these periods, with varying degrees of density. Places arguably of most intense activity, represented by the highest density of material, are often those that had been occupied in previous periods, although again this is not always the case; certain locations with only limited earlier activity also experience marked growth, at least in terms of sherd



11. Area G, ceramics by period.

densities, in the Early - Middle Roman period. There is no question that this represents either a major shift in population or in land-use during these periods, which would have transformed the entire landscape. As in other parts of the survey area, there is a marked decline in Late Roman - Byzantine material. While this material is nearly absent in Areas A - F, however, it is much more widely distributed in Area G, though never (with the exception of one survey unit) in high densities. Finally, the Middle - Late Islamic period is nearly indistinguishable in its pattern from that of the Iron Age, again with areas of greatest interest on the slopes of the Sharāh Mountains. One surprise for this period, however, was the relatively small amount of material found at Naq'a.

Some 343 individual features or feature groups were recorded in Area G (**Fig. 5**). These consisted of a variety of types, as described for the 2011 survey areas discussed above. In the parts of Area G located on the slopes of the Sharāh mountains, terrace walls were near ubiquitous, reflecting a primary concern with water and agricultural management in this area. The presence of several deep *wadis* and the well-known Dabadba spring just east of the southern extent of Area G provides a clear explanation for this patterning. Of particular interest were several fragments of water pipe found in Area G running east - west, and in Area H running north-east – south-west, toward Petra; a few traces of water pipe were also found near features in Area E. More targeted examination may allow us to trace the path of this aqueduct in greater detail, though the material distribu-

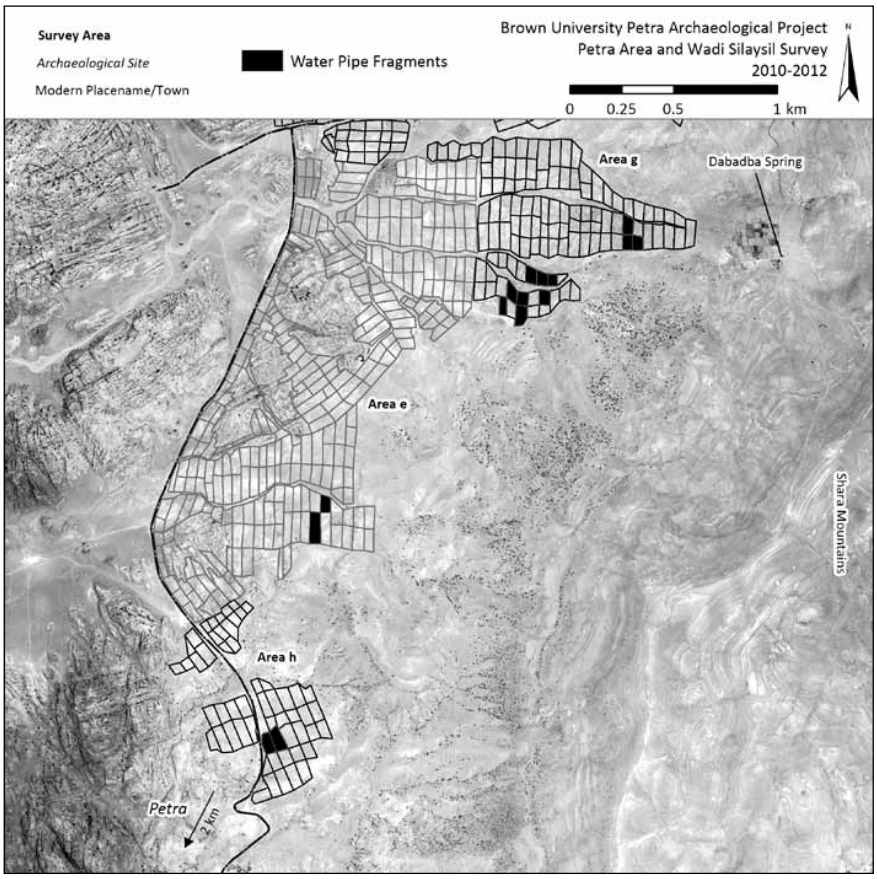
tion is already telling, with fragments in survey units spanning several hundred meters and demonstrating clear directional patterning (**Fig. 12**; 23 water pipes were collected in Area G, five in Area H).

Other aspects of the agricultural landscape include presses and cisterns. Several buildings and building complexes were also found amongst these wall systems, often at locations affording exceptional visibility over the surrounding terrain; this suggests to us that there is often a direct relationship between the such structures and field systems. The overwhelming presence of Early - Middle Roman ceramics in the area may indicate that the majority of features date to this period as well. That said, many of these features were likely used over extended periods of time, and several exhibit numerous episodes of repair, in some cases dating even to the modern period. Various inscriptions (mostly modern, though several ancient) were also recorded, as well as several examples of rock art (ancient and modern).

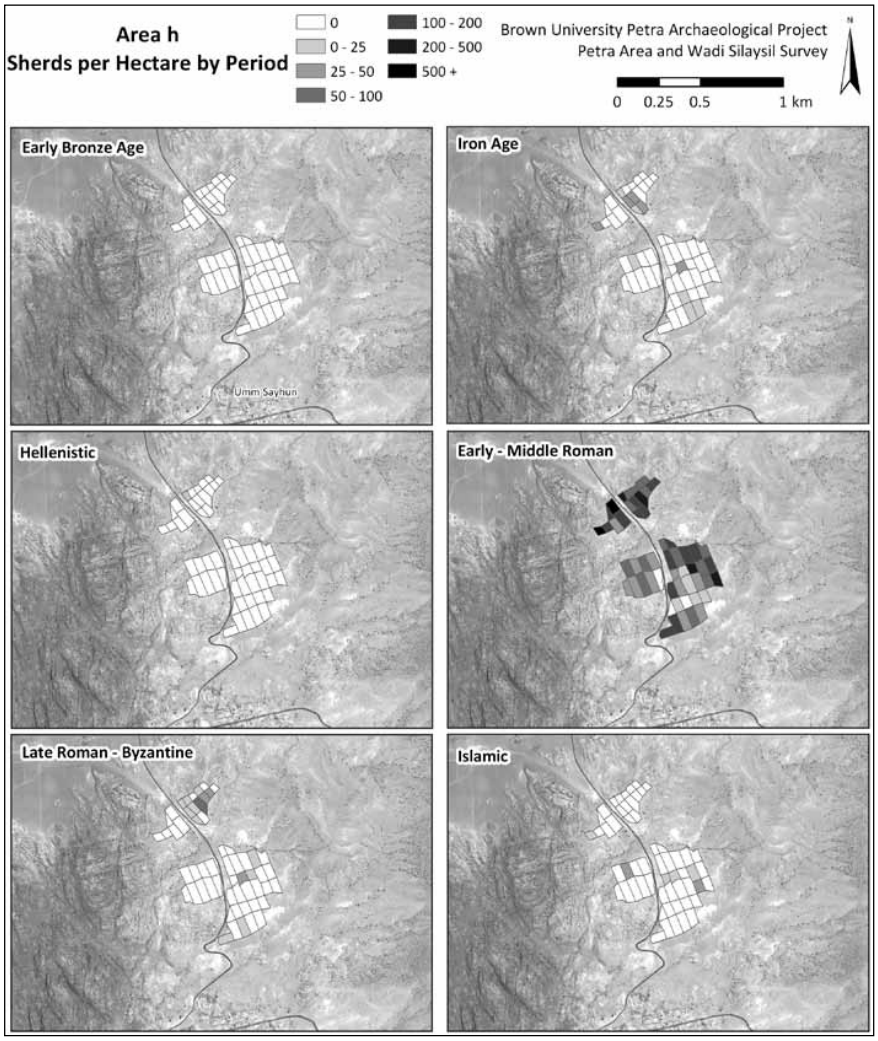
Area H

Area H consists of 56 survey units, located between the rest of the survey area and the modern village of Umm Sayhun. This area effectively closes the gap between Areas A and E, surveyed in 2010 and 2011, and the modern village, which forms the southern boundary of the eastern part of the overall study zone.

Lithic finds in Area H were in general less numerous than in the other survey areas, following the trend seen to the north of it in the southern part of Area E, with relatively low densities of finds, mainly of Late Prehistoric date (**Fig. 2**). Ceramic finds were also not particularly abundant (**Fig. 13**), with no Bronze Age material, a handful of Iron II material, no Hellenistic material and very few Late Roman - Byzantine and Middle - Late Islamic sherds. Once again, Early - Middle Roman is the best-represented period, with densities comparable to other parts of the survey areas, often concentrated around particular features, mainly structures. While area H ceramics were not as numerous as in other areas,



12. Map of aqueduct water pipe remains found in Areas G and E.



13. Area H, ceramics by period.

there were some particularly fine examples of Early Roman pottery and lamp fragments. The close proximity of Area H to the Petra city center makes the relatively low densities surprising, though this may be balanced by the apparent increase in finely made ceramics.

A total of 24 features were recorded in Area H, again somewhat surprising given its close proximity to the city center of Petra. This relatively low density may have to do with its rather rugged and abrupt topography. It is worth noting, however, that several significant features, such as cisterns, quarries and other rock cuttings are located between Area H and Petra proper, though located outside of the PAWS survey area.

Extensive Survey

In addition to the intensive pedestrian survey, which consisted of a combination of fieldwalking, artifact collection and feature recording in Areas G and H, additional 'extensive' survey work was again undertaken in zones not suitable for side-by-side fieldwalking (see above description for the 2011 season). In 2012 we continued this type of work in Wadi Silaysil (Area S), as well as in some of the massifs in the center of the survey area, which were added to the Area D and E feature series, depending on their location (Area D west of the Umm Sayhun - Bayḍa road; Area E east of the road). Limited exploration was also undertaken farther up the slopes of the Sharāh mountains in order to better contextualize the surveyed areas below (see **Fig. 5** for the overall distribution of features throughout the survey area).

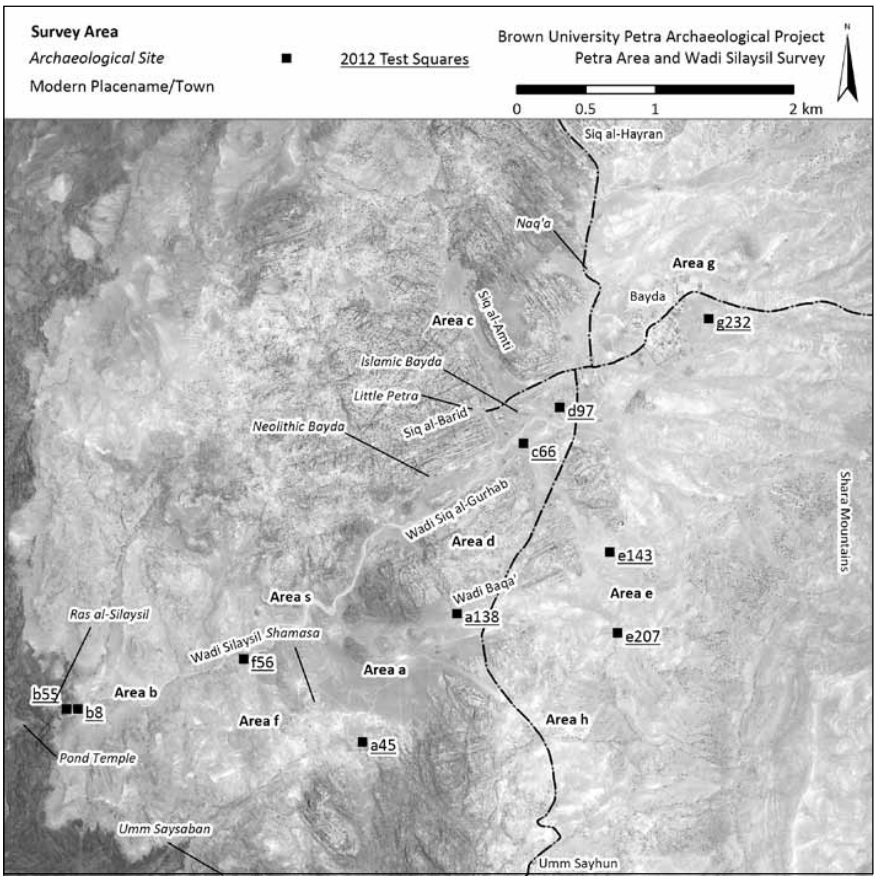
Test Squares

The final component of PAWS, added for the first time in 2012, was limited test excavations

at ten features found throughout the course of the survey (**Fig. 14**). This work was organized and overseen by Clive Vella and Emanuela Bocancea. The motivation behind this program of test excavations was both to verify the testimony of the surface record and to improve our understanding of ceramic chronologies. We also hoped to evaluate the 'archaeological potential' of these locations, in order to determine whether further excavation at these sites would substantially improve our understanding of them, both in their own right and in terms of their relationship to the wider landscape. Locations selected for test excavations included: a terrace / dam in Wadi Baqa' (Feature A138), the so-called Dushara Shrine at Shamasa (Feature A45), structures at the village site of Ras al-Silaysil (Features B8 and B55), an ashlar-constructed limestone platform near Islamic Bayḍa (Feature C66), a baetyl near a two-story tomb (BD835 in Brünnow and Domaszewski [2004: 401]), also near Bayḍa (Feature D97), a unique round building in Area E (Feature E143), two stone-built, hilltop structures that appear to have functioned as look-out posts (Features E207 and F56), and finally the newly discovered Early Bronze Age site at Jabal al-Qarn (Feature G232). Highlights included instances of finely constructed flagstone floors and numerous ceramic finds, some of which have been taken for Optically Stimulated Luminescence (OSL) dating.

Other BUPAP Activities

A variety of related, but independent activities continued in 2012 as other components of the Brown University Petra Archaeological Project. Geophysical prospection under the direction of Thomas Urban continued in a variety of locations, including Jabal al-Qarn (Vella *et al*. 2012) and in the Wadi Baqa' terrace / dam system (Urban *et al*. 2013) as part of a detailed study of this system undertaken by Bocancea, Tuttle, Urban and Vella. This study includes limited excavation (described above) as well as OSL dating and a study of various soil parameters through its entire extent, from the slopes of the Sharāh mountains down to the intersection of Wadi Baqa' with Wadi Silaysil. Geophysical work was also carried on at the site of Islamic Bayḍa.



14. Test square locations.

The Petra Routes Project also continued its work under the direction of Michelle Berenfeld and Felipe Rojas, in collaboration with a team of architects aiming to develop innovative ways of documenting the challenging and dynamic landscapes found in Wadi Mu'aysara East and Wadi Mu'aysara West. Innovative artistic representations were produced to complement the extensive feature mapping and documentation carried out throughout these *wadis*. The Petra Routes Project team also provided invaluable assistance in producing drawings of particular features for the PAWS team (e.g. **Fig. 8**).

Conclusions

The 2010 - 2012 field seasons of the PAWS survey represent a first stage of work in the hinterland of Petra, after which the project will take a break from fieldwork for a study season and comprehensive publication of what has been accomplished up to this point. The overview of methods and results from 2010 (Knodell and Alcock 2011) and from 2011 and 2012 presented here are only brief overviews of the data produced and forthcoming interpretations. The amount and range of work undertaken will necessarily involve specialized studies on all components of the project, summarized here for the sake of our colleagues and collaborators who have an interest in BUPAP. Moreover, we plan to make all 'raw data' produced by the project available online, in an interactive format that will be of use to other scholars. The data for the study area are already extraordinarily rich and varied, from the wide temporal range of the lithic and ceramic evidence recovered, to the plethora of features observed, both built and rock-cut. The PAWS survey, together with the multiple other components of the Brown University Petra Archaeological Project, is on its way to providing an unparalleled close examination of the hinterland of Petra.

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Alex R. Knodell
Getty Research Institute
1200 Getty Center Drive
Los Angeles, CA 90049-1745
United States of America
Susan E. Alcock
Joukowsky Institute for Archaeology and the Ancient World
Brown University
Box 1837/60 George Street
Providence, RI 02912, United States of America

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