

THE WADI EL HASA SURVEY 1981

A Preliminary Report

by

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Introduction

The Wadi el Hasa archaeological survey was in the field for its second season between 20 April - 29 May, 1981.¹ The team members for the 1981 season were Burton MacDonald, Gary O. Rollefson and Duane W. Roller. Munawer Rwashdeh acted as representative of the Department of Antiquities of Jordan. Mujahed Muhaisen, a doctoral candidate in the Department of Prehistory at the University of Bordeaux and an employee of the Department of Antiquities of Jordan, joined the team for the fourth week of the infield season. Rollefson did the lithic analysis while James A. Sauer, Director of the American Center of Oriental Research (ACOR), Amman did the pottery analysis. The project was licenced by the Department of Antiquities of Jordan under the Directorship of Dr. Adnan Hadidi, and was an affiliated project of the American Schools of Oriental Research. Financing was provided by the social sciences and Humanities Research Council of Canada (Grant No. 410-80-0735-R1). A grant to develop a computer program for the storage and retrieval of the information gathered by the survey was received from the St. Francis Xavier University's Council for Research (Grant No. CC/80). Following the infield season the team members spent four weeks

in residence at ACOR working on a detailed report for the Department of Antiquities and a preliminary report for the *Annual of the Department of Antiquities of Jordan*.

During the 1979 or first season of infield work efforts were concentrated on the area along the south bank of the Wadi el Hasa from the western edge of the plateau where a steep descent begins towards the southeastern plain (Ghor) of the Dead Sea eastward to the ridge overlooking the Wadi La'ban. The 1981 season continued eastward from where the 1979 season had left off, that is, at the western slope of the Wadi La'ban. Work continued eastward as far as the ridge overlooking the Wadi el Ali. A total of 338 sites (Sites 215-552) were located (Fig. 1). During both the 1979 and 1981 seasons the area south of the Wadi el Hasa for a distance of 8-12 km. was surveyed. In each season of work approximately 110 sq. km. were covered (Plate XXVIII, No. 1).

Methodology

Before the infield work a study of previous archaeological work, explorations and surveys of the area was made. The work done in the 1930's by Glueck was

1. For a report on the first season of the survey see B. MacDonald, E.B. Banning and L.A. Pavlish, "The Wadi el Hasa Survey, 1979: A Preliminary Report" *ADAJ* XXIV (1980): 169-183, pls. CIII-CX. Brief reports on the 1979 phase of the survey have appeared in the *Bulletin of the Canadian Society for Archaeology Abroad* 19 (1980): 19-23, in the "Notes and News" segment of the *Biblical Archaeologist* 44 (1, 1981): 60-61, and in the *American Schools of Oriental Research Newsletter*, Number 3, December 1980, pp. 5-12. A report on Site 104 of the survey has appeared in *Liber Annuus* (Studii Biblici Franciscani), XXX (1980): 351-364, pls. 59-70, under the title "The Hermitage of John the Abbot at Hammam 'Afra, Southern Jordan".

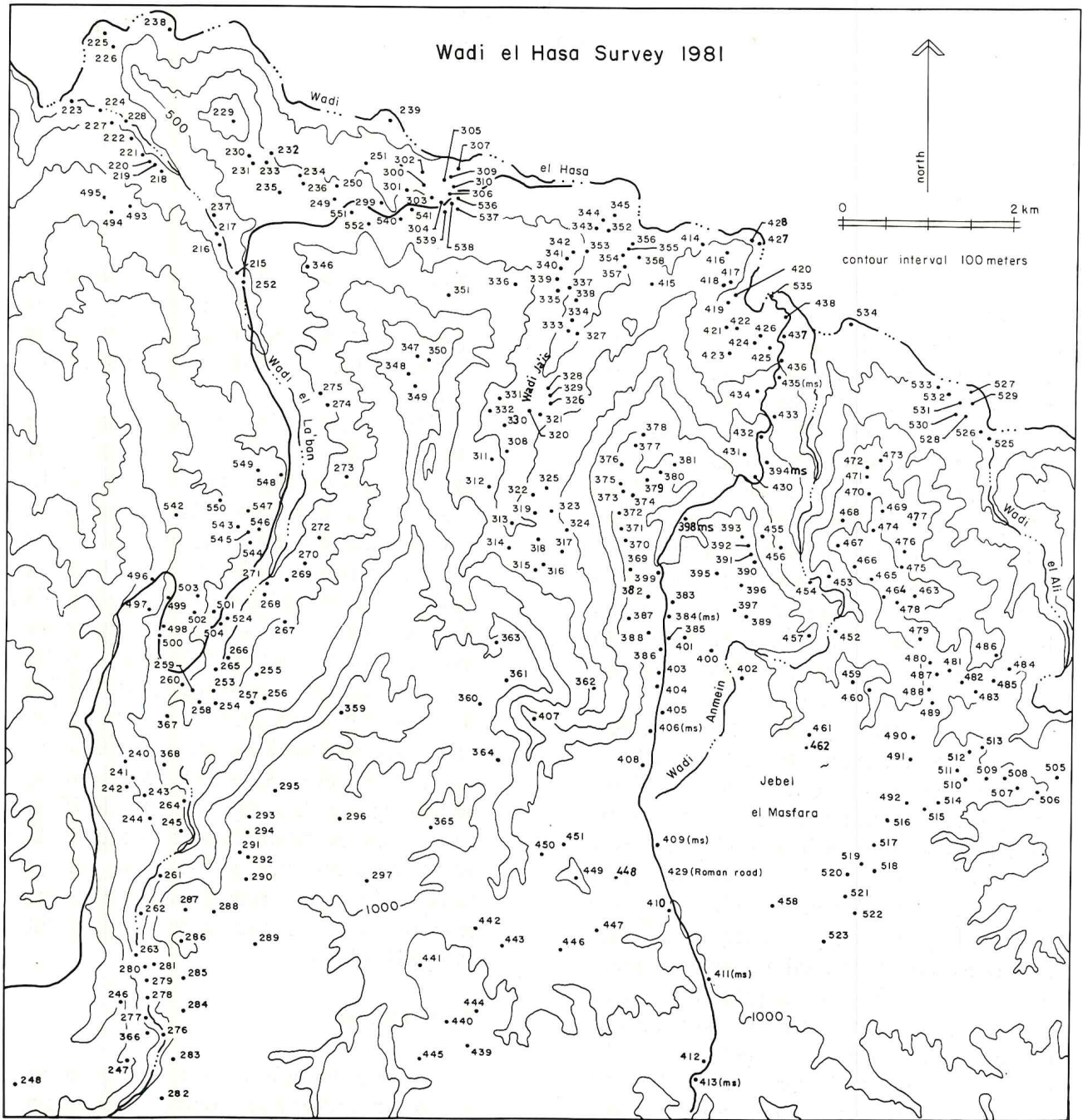


Figure 1: Map of the Sites of the 1981 Season (Site 298 is off the map to the southwest).

especially important for us.²

We systematically surveyed the area for study by foot and vehicle. The west and east slopes of the wadis in the area, namely, the Wadis La'ban, Ja'is and Anmein were walked by the team members. The ridges overlooking these wadis as well as the plateau areas between and to the south were covered in a similar fashion. Every visible indication of man's activities in the area from prehistoric times to A.D. 1918 was noted. These indications consisted of lithic and sherd scatters, places of burial, watchtowers, roads — and in association with the Roman Road, Site 429, milestones— aqueducts, mills, terraces, and major architectural sites. An effort was made at each site to collect artifacts, especially lithics and sherds. Sampling was purposive, total, or random depending on the site. The sites were described and sketched, where feasible, and their locations were plotted on 1:25,000 scale maps.³ All sites were given an inventory rating to aid the Department of Antiquities in selecting sites which have the greatest potential for excavation based on their archaeological importance, the urgency for excavation due to natural or human threat, their excavation practicability, and their touristic potential.

All information gathered during the two seasons is stored at the Registration Center of the Department of Antiquities in Amman and on computer tape at St. Francis Xavier University, Antigonish, Nova Scotia, Canada. This information is available for use by interested researchers. The collected lithics and sherds are stored at the Museum of the Department of Antiquities at Karak under the Directorship of Mr. Sami Rabadi.

The Prehistoric Materials of the 1981 Season

The 1981 survey season located 164

sites from which lithics samples were taken. Eight of these sites were predominantly ceramic in nature and the lithics samples were too small (ranging from one to four pieces in number) to indicate a prehistoric presence of any appreciable degree, or they contained only unidentifiable chips or flakes. For the remaining 156 sites, the preliminary analysis of the 5,796 stone tools and debitage entailed typological identification of tools and cores, identification of the probable age of each artifact, and the calculation of the relative frequencies of tools and cores for each site.

Since the chronological placement of lithic artifacts depends heavily on associated tool types, there was much uncertainty in the age determination of samples when diagnostic tool types were absent. Although some technological features can delineate between some of the major periods, many of the phases of stone tool production share virtually indistinguishable technologies. This is especially true for post-Pleistocene occupations in the survey area. Furthermore, detailed analyses of the lithic technology for the Chalcolithic and Early Bronze periods have not been published, if undertaken at all. This situation presents considerable problems when samples from these periods do not contain specific stone tools or associated diagnostic ceramic assemblages. In samples of moderate or large size, variations in the degree and quality of artifact patina was sometimes useful to establish a relative chronology within each sample, but this method of dating has many limitations for the accurate chronological placement of artifacts.

Because of all of these factors, a large proportion of most of the lithics samples is indeterminate as to the cultural periods they represent. Nevertheless, the reliance on blade production, microblade man-

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2. N. Glueck, *Explorations in Eastern Palestine, II. AASOR*, Vol. XV for 1934-1935. New Haven: American Schools of Oriental Research, 1935; *Explorations in Eastern Palestine, III. AASOR*, Vols. XVIII-XIX for 1937-1939. New Haven: American Schools of Oriental Research, 1939; R.E. Brunnow and A. von Domaszewski, *Die Provincia Arabia auf Grund Zweier in den Jahren 1897 und 1898 unternommenen Resisen und der Berichte fruherer Reisender*, 3 vols. Strassburg: Karl J. Trubner, 1904-9; A. Musil, *Arabia Petraea*. Kaiserliche Akademie der Wissenschaften, 2 vols. Wien: Alfred Holder, 1907-8; P. Thomsen "Die romischen Meilensteine der Provinzen Syria, Arabia, und Palaestine," *ZDPV* 40 (1917): 1-103.
 3. Map sheets at the 1:25,000 scale used to date are: 210/025 (Buteina), 210/035 (El' Aina), 225/025 (Qal' at El Hasa), and 225/035 (Muhai).

ufacture, the use of punch technique, overall artifact size and relative degree of patination were often sufficient to indicate that many of the otherwise undatable artifacts did not come from the Lower, Middle or early Upper Paleolithic periods and they were, therefore, classified as "Late" in date. This leaves a great deal of imprecision, of course, since the dates of these artifacts probably fall somewhere between ca. 20,000 to 2,000 B.C. (late Upper Paleolithic through Early Bronze), but at least the occupations they represent are distinguishable from the earlier half-million years of human presence in the survey area.

Chronology of the Lithic Materials⁴

Overall, the sites averaged more than 37 artifacts each (excluding indeterminate flakes, chips and debris). An average of three tools was found at each site, although the actual number of tools ranged from zero at 42 sites up to 29 at Site 506. More than five cores could be expected to be found at the "average site", with an absolute range of zero cores at 16 sites up to 35 at Sites 506 and 514. This leaves an average of slightly less than 29 flakes and blades for each site in the survey area.

The Lower Paleolithic (older than ca. 80,000 B.C.) was found at 17 sites.⁵ One handaxe from Site 337, on the western slopes of the lower Wadi Ja'is, is a crude amygdaloid which evidently dates to the Middle Acheulian and is as much as a half-million years old. Altogether, the Lower Paleolithic was found at roughly one-tenth of the sites, although the number of artifacts that could be assigned confidently to this very long period of human development was absolutely low (only 19 pieces). Another 22 artifacts from eight sites could have come from either the Lower Paleolithic or the Middle Paleolithic. Even if all of these artifacts were from the earlier cultural period, the combined total of 41 artifacts represents only 0.7% of the total artifact sample.

Artifacts from the Middle Paleolithic (ca. 80,000 - 35,000 B.C.) were found at 102 sites, nearly two-thirds of all those located during the survey. Although this is evidence of very extensive occupation during this time, the 750 artifacts assigned to this period constitute only 13% of the total artifact sample. Material which could have come from the later phases of the Middle Paleolithic or the earlier parts of the Upper Paleolithic were found at 38 sites (443 artifacts, 7.6% of the total sample). At least three of the sites (Sites 215 and 221, on the terraces of the lower Wadi La'ban, and Site 335 on the slopes of the lower Wadi Ja'is) have truly transitional Middle-Upper Paleolithic occupations, evidenced by the diagnostic Emireh point (Garrod 1938: 14).

The Upper Paleolithic (ca. 35,000 - 14,000 B.C.) was found at roughly one-third of the sites (n = 54). The 395 artifacts assigned to this period, which comprise only 6.8% of the sample, probably do not adequately reflect the real Upper Paleolithic presence in this part of Jordan. Very likely a large proportion of the numerous "Late" lithics come from the later stages of Upper Paleolithic development. The same may be true for the Upper Paleolithic-Epipaleolithic assignments, which total only 99 pieces (1.7%) and appear at only five sites in the survey area.

The Epipaleolithic period (ca. 14,000 - 8,000 B.C.) was not adequately represented among the sites. The absence of evidence of the use of microburin technique (Henry 1974), microburins, and retouched geometric microliths in any of the artifact samples precluded conclusive assignment of any of the collections to this important phase of cultural change in the Near East. The technological similarities between the Epipaleolithic and Early Neolithic periods are such that more than a thousand artifacts (nearly a fifth of the total samples) from 36 sites (nearly one-fourth of the lithics sites) could have come from either or both periods. Additionally, many of the "Late" artifacts could represent Epi-

4. Table 1 provides a summary of the results of the preliminary analysis of the lithic collections from the 1981 season.

5. Table 2 provides a breakdown of the periods represented among the sites.

paleolithic occupations.

The Early Neolithic (ca. 8,000 — 6,000 B.C.) evidence is easier to detect among the lithic samples, for diagnostic elements from this period were more abundant. Pressure-flaked lance points and arrowheads, as well as occasionally frequent burins on concave truncations, were found at seven sites, although many of the "Late" and Epipaleolithic-Early Neolithic assignments probably belong to this cultural period. Two of the Early Neolithic surface scatters appear to derive from *in situ* deposits: Site 257, on the slopes to the east of Khirbet edh-Dherih (Site 254) in the upper Wadi La'ban, and Site 326 on the eastern terrace in the central Wadi Ja'is. Site 329, near the latter site, which was classified to the Epipaleolithic-Early Neolithic and "Late" periods, also appears to be an essentially intact occupation and may be related to site 326. Site 318, on a terrace in the upper reaches of the Wadi Ja'is, might also contain undisturbed deposits from this period, although the lack of diagnostic elements in the collection resulted in a Epipaleolithic-Early Neolithic age ascription.⁶

Because two sites, viz. Sites 307 and 524, produced abundant and conclusive ceramic evidence, the lithics samples in association can be assigned to the Late Neolithic (ca. 6,000 - 4,250 B.C.). Both sites are *in situ* villages of at least a semi-permanent nature. Lithics were collected from only the lower portions of Site 307 which is located on a terrace complex just above the Wadi el Hasa, and although this restricted sample did not yield any evidence of equipment to grind seeds and grain, one unserrated sickle blade was found. The 568 sherds collected from Site 307 are predominantly from the Late Neolithic. Site 524, in the upper Wadi La'ban, produced a basalt grinding stone fragment in addition to a wide range of chipped stone material, and a road cut along the site has exposed up to two metres of stratified ash deposits. A total of 146 Late Neolithic sherds were collected at the site. One gazelle and several

sheep/goat bones were collected from the ash layer in the road cut (Pl. XXVIII, No. 2). The lithic material which might reflect Chalcolithic occupations (ca. 4,250 - 3,300 B.C.) was scanty. One small pressure-flaked arrowhead was found at Site 346, high above the Wadi el Hasa between the Wadi La'ban and the Wadi Ja'is, but the vast majority of the artifacts from this site was Middle Paleolithic and/or Middle-Upper Paleolithic in date. Site 308, which consists of stone enclosures, stone piles and possible terrace walls in the central Wadi Ja'is, produced 63 Late Chalcolithic sherds. This ceramic sample is associated with rarer chipped stone artifacts, many of which are of Middle Paleolithic origin; the remainder of the lithic artifacts are very nondescript and could represent any of the periods entailed in the "Late" classification.

Besides the above-mentioned sites Late Chalcolithic-Early Bronze I period (ca. 3,750 - 2,900 B.C.) sherds were found at three sites, viz. Sites 414, 422 and 462, and possibly at Site 453. Both Sites 414 and 422 are located on terraces along the south bank of the Wadi el Hasa while Site 462 is located on the NE end of Jebel el Masfara.

Artifacts ascribed to the "Late" periods of lithic manufacture turned up on 95 of the 156 sites (61%), making this category of artifacts almost as extensive as Middle Paleolithic distributions. In absolute terms, however, the number of "Late" artifacts is nearly doubled the figure for the Middle Paleolithic.

Distributional Comparisons of the Lithic Materials

Tables 1 and 2 also provide evidence which may indicate differential use of the land forms in the survey area through time. If one considers the landscape in terms of a dichotomy between the plateau on the one hand and all of the wadis on the other, the much higher relative frequencies of cores and tools from the plateau sites are sig-

6. A sample collected from Site 149, Khirbet Hammam, which was discovered during the 1979 season, contained a broken lance point with unifacial pressure-flaking retouch. This artifact is strong evidence that the *in situ* village site dates to the Early Neolithic.

TABLE 1 Distribution lithics of sites and artifacts by general location, from the 1981 Wadi el Hasa Survey season.

<i>Location</i>	<i>No. Sites</i>	<i>Total Artifacts</i>	<i>Average</i>	<i>Average Tools</i>	<i>% Tools</i>	<i>Average Cores</i>	<i>% Cores</i>
Wadi el Hasa	35	1157	33.0	1.7	5.2	3.0	9.1
Wadi La'ban	24	779	32.4	2.8	8.7	4.2	2.8
Wadi Ja'is	20	782	39.1	1.4	3.6	3.2	8.0
All Wadi Sites	79	2718	34.4	2.0	5.7	3.4	9.9
All Plateau Sites	77	3078	40.0	4.0	10.1	7.6	18.9
All Sites	156	5796	37.2	3.0	8.0	5.4	14.7

TABLE 2 Absolute and relative frequencies of sites containing artifacts from specific cultural periods by general location.

<i>Location</i>	<i>(n/%)</i>											
	<i>LP</i>	<i>L-MP</i>	<i>MP</i>	<i>M-UP</i>	<i>UP</i>	<i>UP-Epi</i>	<i>Epi-EN</i>	<i>EN</i>	<i>LN</i>	<i>Ch</i>	<i>EB</i>	<i>Late</i>
Wadi el Hasa	5 14.3	3 8.6	23 65.7	12 34.3	14 40.0	2 5.7	0 0.0	1 2.8	1 2.8	1 2.8	1 2.8	25 71.4
Wadi La'ban	5 20.8	1 4.2	14 58.3	3 12.5	10 41.7	1 4.2	2 8.3	5 20.8	1 4.2	0 0.0	0 0.0	19 79.2
Wadi Ja'is	1 5.0	0 0.0	14 70.0	10 50.0	3 15.0	0 0.0	3 15.0	1 5.0	0 0.0	1 5.0	0 0.0	10 50.0
All Wadi Sites	11 13.9	4 5.1	51 64.6	26 32.9	27 3.8	3 6.3	5 6.3	7 8.9	2 2.5	2 2.5	1 1.3	54 68.4
All Plateau Sites	6 7.8	4 5.2	51 66.2	12 15.6	27 35.1	2 2.6	31 40.3	12 15.6	0 0.0	0 0.0	0 0.0	41 52.6
All Sites	17 10.9	8 5.1	102 65.4	38 24.4	54 34.6	5 3.2	36 23.1	19 12.2	2 1.3	2 1.3	1 0.6	95 60.9

nificantly different than the same ratios for the wadi sites in Chi-Square comparisons.

For both tools and cores, the percentages of these artifacts are nearly double those of the combined wadi collections. In general, the plateau sites are probably the loci of somewhat more permanent occupations and represent a wider variety of tasks than is the case for the wadi sites, at least for the

Lower, Middle and Upper Paleolithic periods. There are several notable exceptions to this generalization, however, for large *in situ* Early Neolithic, Late Neolithic and Epipaleolithic-Early Neolithic sites, discussed above, occur in the Wadi el Hasa, Wadi La'ban and Wadi Ja'is (Pl. XXIX, No. 3).

Several noteworthy features also emerge when one considers the relative dis-

tributions of sites on the plateau versus the wadis in each major cultural period. Nearly two-thirds of the Lower Paleolithic sites lie in the wadis while only one-third occur on the plateau. This difference is not statistically significant, but this may be related to the absolutely small number of Lower Paleolithic sites on the plateau.

The reverse of this situation is descriptive of the Early Neolithic sites, with two-thirds of them located on the plateau. Once again, however, this disparity is not significant in a statistical sense. On the other hand, the roughly similar distribution of Epipaleolithic-Early Neolithic sites (one-seventh in the wadis, six-sevenths on the plateau) is statistically different beyond the .0001 level of significance.

The distribution of sites from the Lower-Middle Paleolithic, the Middle Paleolithic and the Upper Paleolithic periods parallel each other in that roughly half of them is located in the wadis and half on the plateau. For the Middle-Upper Paleolithic, however, two-thirds of the sites are in the wadis and one-third on the plateau, a difference significant at beyond the .02 level. For this same period of time, sites are significantly more numerous in the Wadi el Hasa and Wadi Ja'is compared to the plateau, but Middle-Upper Paleolithic sites in the Wadi La'ban are of comparable relative frequency.

Some of the significance of the differences in the distributions of sites according to period become obscured when the plateau sites are compared with sites from the individual wadis.⁷ Much of this obfuscation is due to the small numbers of sites from certain periods in the wadis, where statistical tests of significance cannot be applied. For example, Epipaleolithic sites are relatively rare in the Wadi La'ban and Wadi Ja'is and absent in the Wadi el Hasa, while they occur in 40% of the plateau sites. One cannot demonstrate the significance of this disparity, beyond appealing to logic, with samples totalling two cases for the Wadi La'ban and three for the Wadi Ja'is.

There is some considerable variation in the exploitation of individual wadis as evidenced by comparing the relative frequencies of cores and tools. The percentage of tools from sites in the Wadi La'ban is significantly higher than in both the Wadi Ja'is and the Wadi el Hasa, although sites from the latter wadis are not significantly different from each other. The same relationship holds for core percentages. In terms of these percentages, the Wadi La'ban sites behave somewhat like the plateau sites: for the tool percentages, the plateau sites are significantly higher than the Wadi el Hasa and Wadi Ja'is sites, but not compared to the sites in the Wadi La'ban. The plateau core percentages are also higher than those in the Wadi el Hasa and the Wadi Ja'is, but the same is also true for the Wadi La'ban.

One can also detect some variability within some of the wadis in terms of core and tool relative frequencies. For example, the 35 sites which overlook the Wadi el Hasa group into clusters of 25 sites in the vicinity of Jebel eth-Tannur, a cluster of five sites near the confluence with the Wadi Anmein, and a third cluster of five sites near the Wadi el Ali debouchement. While none of these clusters differs in terms of the tool ratios, the very low core percentages in the central cluster differs significantly from the easternmost cluster beyond the .02 level. This suggests that the central cluster of sites, at least, represents very brief, unsubstantial occupations.

For the Wadi Ja'is, nine sites form a local cluster in the lower reaches where it joins the Wadi el Hasa, while a cluster of 11 sites occurs in the larger areas of the middle and upper reaches of the drainage. These two clusters are similar in their core and tool ratios, although the number of tools from the lower cluster is too small ($n = 4$) for tests of significance. Nevertheless, this small number of tools, compared with the 24 from the upper Wadi Ja'is, suggests a more limited focus of activity for the lower sites.

The Wadi La'ban sites cluster into three

7. No lithic sites were recorded for the relatively small Wadi Anmein, although it must be admitted that the survey of this wadi was conducted while the lithics specialist was unavoidably out of the country.

regional groups,⁸ with 10 sites in the lower reaches of the wadi, seven in the middle part of the valley, and seven more in the upper sections of the drainage. Of these 24 sites' total artifact sample, 55.0% of the cores and 33.8% of the tools come from a single site: the Late Neolithic village at Site 524. Since this site could severely distort the patterns of variability among the sample from the Wadi La'ban, only the other 23 sites were compared. No significant differences were noted among the core ratios for the three clusters, but a steadily decreasing percentage of tools occurs from the uppermost cluster (not far below the plateau) to the lowermost cluster in the north. The 13% figure for tools from the uppermost cluster is significantly different from the 6.5% value from the lowest one. This is an indication that sites in the lower portions of the wadi were more specific in nature (as was the case in the Wadi Ja'is), and that the sites from higher up the wadi witnessed a variety of activities similar in nature to the general pattern of the plateau sites.

Whereas the sites in the wadis clustered into two or three major groups for each physiographic feature, the situation on the plateau is more complex, and the resulting differences among the highland site clusters become more difficult to interpret on the basis of the present evidence. The 77 sites on the plateau fall into six clusters as follows: the Rujm Muhawish "cluster" consists of the isolated Site 248, a predominantly Early Neolithic site in the far southwest corner of this season's survey area. The "western Plateau" cluster is made up of eight sites along the Jebel Abu Usba' ridge; the "Central Plateau" group consists of 26 sites around Jebel en-Namin; the "South-Central Plateau" cluster is

comprised of a loose association of seven sites in the highlands between Jebel Abu Usba' and Jebel el Masfara; seven sites to the northeast of Jebel el Masfara make up the "Northeast Plateau" group, between Wadi Anmein and Wadi el 'Ali; and the final cluster is the "Southeast Plateau" group, formed by 28 sites between the Jebel el Masfara and Wadi el 'Ali.⁹

Comparisons of the relative frequencies of tools among these clusters show that the Southeast Plateau sites differ significantly from *all* of the other clusters even though the other clusters are statistically similar to each other in this aspect. One reason for this stark differentiation is undoubtedly due to the seven dense Early Neolithic sites (and 13 other sites ascribed to the Epipaleolithic-Early Neolithic) in the Southeast Plateau Group. For reasons unknown on the basis of the present evidence, this part of the uplands seems to have been particularly favoured by social groups during this period: 58% of the Early Neolithic sites on the plateau are found in this southeastern group, leaving only five others to be distributed among the other five clusters. Of the Epipaleolithic-Early Neolithic sites, 42% of these are also found in this large cluster.

Core percentages are complexly distributed: in terms of this artifact ratio, only the Northeast Plateau and the Central Plateau clusters are statistically similar, but all of the other individual comparisons are significantly different. One reason for the similarities between the Northeast and Central Plateau groups of sites may relate to the relatively extensive Middle Paleolithic occupations in each cluster, while the extreme diversity among the other clusters of sites is undoubtedly connected to corresponding

8. The cultural and geological processes that have been operative here may belie the apparent three-fold clustering of sites in the Wadi La'ban, and the other wadis may have suffered similar effects, although probably to lesser degrees. The Wadi La'ban is characterized by extensive terraces, especially on its western margins, which have trapped eroding sediments from the adjacent steep slopes. Much of this wadi, therefore, probably contains numerous *in situ* sites from many major periods that were not evident to the survey staff. On all of these terraces, sporadic, isolated chipped stone artifacts had been exposed on the surface as the result of cultivation, yet these artifact densities were so low that it was not possible to detect a concentration that indicated a "site" of prehistoric human occupation/habitation.

9. As was the case in Note 7, the survey of Jebel en-Namin concentrated on the Roman road sector while the lithics specialist was in the United States. The large number of sites along this restricted portion of the plateau suggests that the Jebel en-Namin was even more densely occupied in prehistoric periods.

diversity in the periods of occupation represented on those sites.

Concluding Remarks on the Lithic Materials

In summary, the lithic materials from the 1981 Wadi el Hasa survey span as much as a half-million years of human cultural development. The analysis for this preliminary report has been of necessity brief and rather superficial, but nevertheless some significant clues have emerged that point to substantial differences in the way human societies exploited the macro- and microenvironments in the area adjacent to the southern banks of the Wadi el Hasa. Some of these differences must reflect changes in available resources according to responses to changing climatic conditions, while others probably indicate shifts in socio-economic structures and efficiency in resource extraction and processing.

Resolving the questions that these differences raise concerning the prehistoric use of the area will require information from sources beyond the artifact collections *per se*, such as geological assessments of the changes of soil configurations, data relating to stability and change of paleoclimates, more intensive investigations of present and past plant communities in the area, and more extensive use of geographical methods of relating weather, water and food factors to site locations.

But the lithic artifacts themselves still contain much untapped information that is vital to understand changing patterns of human exploitation of the local region. More thorough examination of the collections in terms of the technology employed in lithic manufacture might refine the identification of periods of cultural development now subsumed under the "Late" classification as well as perhaps reduce the numbers of the stifling "indeterminate" batch of artifacts. Beyond this, the collections from the Wadi el Hasa Survey project also provide a valuable resource to begin a concerted effort to establish sub-phases within much of the prehistoric record for Jordan; at the present time, such temporal distinctions are known only for

Palestine and parts of Lebanon, but the implications of these distinctions for the different environmental regimes of highland Jordan remain to be investigated and determined.

Consequently, continuing analyses of the chipped stone tools and debitage from the 1981 survey collections will continue through the coming year (as well as the material from the 1979 season). These analyses will include metric measurements, detailed technological investigation, and more refined typological examination (Cf. Rollefson 1981; Rollefson n.d.; Rollefson and Sauer n.d.). By these means, not only will our assessment of the prehistoric uses of the survey area be enhanced, but a sound foundation for our understanding of much of Jordan's prehistory might be established.

The Materials from the Historic Periods

Pottery sherds ($n = 13,662$) were collected from 148 of the 338 sites surveyed. The number of sherds ranges from 1226 collected at Site 406, Rujm Faridiyyeh, to three sherds collected at Site 375, a group of five tower/tombs. However, generally speaking, sites which yielded only four or five sherds are not included in the 148 sites mentioned above. When no more sherds than this number could be found at a site they were generally not saved and, therefore, they were not counted. However, their presence at the site was mentioned in the data collection sheets.

The sherds collected at each site were used as a basis for assigning the site to a particular period or periods. Caution, however, must be taken about putting too much reliance for dating purposes on a very small number of sherds at a particular site.

As for the lithic materials the materials from the historic periods will be treated chronologically.

Besides the Early Bronze I sherds found in association with the above-mentioned, Late Chalcolithic-Early Bronze I sites several Early Bronze I period (ca. 3,300 - 2,900 B.C.) sites were surveyed, viz. Sites 260, 328, 360, 361, 366, 367 and two possibly or probably contemporaneous sites, viz. Sites 369 and 390.

Site 260 is a sherd and lithic scatter on a modern, man-made terrace which is used today as a parking lot for picnickers and visitors to 'Ayn Dhir el La'ban in the upper segments of the Wadi La'ban. The pottery is predominantly from the Early Bronze I period and pottery from this period was found in an ash layer in a modern road-cut.

Moreover, Early Bronze pottery was found at two sites, viz. Site 405 where the pottery was read as Early Bronze-Iron Age body sherds and at Site 287. There were also several other sites at which the pottery reading was Early Bronze (?), possible, or probable. At two other sites, viz. Site 476 and 536 the pottery was read as either Early Bronze or Ottoman/Modern. At this stage in the study of the pottery there is none which can be definitely associated with Early Bronze II-IV.

Although stone tools and debitage constituted important components of Early Bronze Age remains and even later periods (McConaughy 1979; Rollefson and Funkhouser n.d.), diagnostic typological evidence was not found in the 1981 season. Many "Late" lithic artifacts could come from Early Bronze Age contexts.

The Middle Bronze period (ca. 1950 - 1550 B.C.) is unrepresented in the survey area except for the presence of one possible Middle Bronze sherd found at Site 362. There were no sherds collected which we can presently date to the Late Bronze period (ca. 1550 - 1200 B.C.).

There are four sites, viz. Sites 270, 283, 284 and 362 at which Iron IA period (ca. 1200 - 1000 B.C.) pottery was collected. Site 270, on the east side of the Wadi La'ban, yielded 19 sherds from this period. It consists of a modern house, possibly rebuilt from ancient remains, approximately 30 m. square, built of ashlar blocks. Foundation walls extending beyond the area of the modern house are visible. The site commands an excellent view of the central segment of the Wadi Laban (Pl. XXIX, No. 4).

An extremely interesting site which yielded 72 Iron Age sherds plus seven sherds probably from the same period is Site 362, Khirbet al-Faridiyyeh. The site has predominant Mamluk/Ottoman pottery and is

either a very large farm or village. It is located on a terrace on the west side of the upper Wadi Ja'is opposite 'Ain al-Faridiyyeh. Modern paddocks have been constructed which evidently used the stone of earlier structures. Fifty-nine Iron Age body sherds, 11 Iron I-IIA, one fragment on an Iron IA "collared-rim" jar, and one possible Middle Bronze or Iron I sherds were collected at the site, mostly from the east slope.

Site 367, Ed-Dair, is a major Iron I-II site on the west slopes of the Wadi La'ban just to the southwest of Site 260. At the north side of the site there appears to be a tower and a major building measuring approximately 25 x 10 m. and is apparently divided into three rooms. The larger building is constructed of well-laid, roughly-hewn-blocks, and is located immediately to the south of the tower. There may be another similar building to the west, and to the east there is a series of terraces.

An important site from the Iron IIA-B period (ca. 918 - 605 B.C.) is Site 311, Rujm Ja'is. The 209 sherds collected at this site all date to the same period. The site is probably to be identified with Glueck's Rujm Ja'ez or his Site 217 (Glueck 1935:102), one of his Edomite fortresses or border sites (Glueck 1935:105-106). It is located on a terrace on the west side of the Wadi Ja'is, central segment. A spring is located below the site. The site commands an excellent view of the Wadi Ja'is, the Wadi el Hasa to the north and El 'Aina across the Wadi el Hasa to the northeast. There are many foundation walls still visible in the midst of a great deal of stonefall. There appears to be a tower measuring ca. 9 x 9 m. at the eastern extremity of the site. There also appear to have been several other structures at this very ruined but impressive site, and it could very well have been a fort-site. There is also evidence of ancient agriculture in the area.

This site ought to be considered in conjunction with Site 248, Rujm Muhawish, which also appears to be a large fortress from the Iron II period. It is located on one of the highest points (1198 m.) in the plateau area west of the Wadi La'ban. The structure consists of a polygonal building

with towers at the corners and long, narrow structures, measuring 4-5 m., running between the towers. None of the structures are preserved to more than one meter above the present ground level. The site commands an excellent view in all directions.

Three predominantly Iron II sites, viz. Sites 282 (Khirbet al-Draj), 283 (Khirbet al-Mdhaywit¹⁰), and 284 (Khirbet Abu 'Usba') are located to the east and northeast of Site 248 on the east side of the upper Wadi La'ban. All these sites were probably villages.

In summary, both the Iron I and Iron II periods are extremely well represented in the area. However, they are generally speaking present on the western side of the territory. Sites from these periods on the eastern segment of the survey area are represented by several sherds at the most.

No pottery or other occupational remains were found which dated definitely to the Persian period (539 - 332 B.C.). However, this is not unusual for this part of southern Jordan.

A small amount of Hellenistic period (332 - 63 B.C.) pottery was found in the area. This pottery consists of a maximum of 70 sherds scattered through 10 possible sites. However, only five of these sherds are indubitably Hellenistic. None of the 10 sites can be said to be distinctly Hellenistic in any way and most have other periods dominating. The only one which is in any way unusual is Site 419, a large rectangular olive press in an agricultural area along the Wadi el Hasa, where seven Hellenistic/Early Roman sherds were collected. However, associated Site 420 has a predominance of Nabataean pottery and has neither Hellenistic or Early Roman pottery present (Pl. XXX, No. 5).

As the area of the survey lies within ancient Nabataea, it was not unexpected that Nabataean pottery was the most common found and that Nabataean sites were the most numerous. Of the 148 pottery-yielding sites 80 had some Nabataean pottery and that pottery was dominant at 40 of

these sites. Besides these 80 sites the reading from 20 other sites was Nabataean/Late Roman and from one site, viz. Site 313, the reading was Hellenistic/Early Nabataean/Byzantine.

The major Nabataean population center found in the 1981 season was in the Wadi La'ban. At its mouth is the prominent site of Khirbet eth-Tannur, Site 229, rising on a summit nearly 400m. above the wadi bed. This major Nabataean sanctuary was excavated in 1937 and has been thoroughly published (Glueck 1965; 1978). The 1981 visit did not add to the earlier findings.

Ten kilometers up the Wadi La'ban, however, is another major Nabataean center, only briefly mentioned by previous explorers (Glueck 1965: 48). This is Site 253, Qasr edh-Dherih, which seems to be a smaller version of the temple at Khirbet eth-Tannur. Qasr edh-Dherih is a temple with a cella within a walled courtyard in a typical Hellenistic-Oriental pattern, standing on a prominent bluff overlooking the Wadi La'ban at 'Ayn Dhir el La'ban. There seems to be a large agora or forum to the south of the temple and various related structures to the east; the entire complex is enclosed by terrace walls, especially on the western and northern sides where the wadi curves around the base of the bluff. A number of decorated architectural fragments was visible at the site, some of which are in a delicate vine-and-tendrill style invoking comparisons with Roman art of the early Julio-Claudian period (Glueck 1939: Fig 26, p. 47; Schmidt-Colinet 1980: 189-230) (Pl. XXX, No. 6).

Qasr edh-Dherih seems to have been the civic center of a major Nabataean settlement whose ruins are known today as Khirbet edh-Dherih, Site 254 (Glueck 1939: 46-48). It was a sizeable settlement, covering several thousand square meters, curving in an arc south and east of the Qasr. Little detail is visible today, however, because of erosion.

Another major Nabataean site lies about 1500 m. south of Khirbet Edh-

10. This site is identified as Rujm Muhawish on the 1:25,000 scale maps. However, the locals refer to Site 248 by the same name.

Dherih. This is Khirbet al-Baqarah, Site 368 (Glueck 1935: 107). Although the ruins themselves are scanty and not impressive, the pottery found was exclusively Nabataean.

Farther south 350 m., above 'Ain Zara, is a recently abandoned village, Site 366, lying on the cliff slopes on the west side of the Wadi La'ban. This site also yielded a high concentration of Nabataean pottery - 206 sherds.

Nabataean occupation along the Wadi el Hasa itself is not well documented, except for Khirbet eth-Tannur. There was probably a number of farmsteads, but erosion and flooding have wiped away most of the evidence. Agricultural terraces which may represent such a farmstead were found east of Jebel eth-Tannur at Site 239. Another major Nabataean farmstead, Site 420, lay in a lush basin along the south bank of the Wadi el Hasa, approximately five kilometers east of Site 239. There are foundations of a large structure which may have been the farmhouse itself (Glueck 1935: 106).

The Wadi Ja'is, a major tributary, enters the Wadi el Hasa seven kilometers to the east of the Wadi La'ban. Although never as precipitous as the Wadi La'ban, the Wadi Ja'is has a flat valley well suited to agriculture. It was another Nabataean population center: the major Nabataean site was Khirbet Ja'is, Site 321 (Glueck 1935: 102), a settlement on the east slopes of the Wadi about three kilometers above its mouth. There seems to have been no other Nabataean village in the wadi although there were a number of Nabataean sherd scatters, e.g. Site 326.

There was probably Nabataean occupation on the plateaus between these wadis. The standard type of site on the plateaus, especially their northern reaches, where promontories stand high above precipitous cliffs, is a small watchtower, either square or round, about four meters in maximum dimension, and frequently reused as a tomb. In addition, there are many other tombs, built in a similar fashion to the wat-

chtowers, and often indistinguishable from them. Both towers and tombs are constructed of ashlar masonry and rarely have survived beyond one or two courses. Surface pottery was inevitably too scanty to be used for dating purposes, although it often included Nabataean pieces.

The advent of Roman control in A.D. 106 meant little change for the inhabitants of the area. Most of the major Nabataean sites continued to be occupied, and there seem to have been no major new sites except those associated with the construction of the Via Nova, built by Trajan in A.D. 111 - 114.

Over eight miles of the Via Nova were explored during the 1981 season, from the bridge, Site 535, across the Wadi el Hasa to the northern flanks of Jebel el-'Idham, or from south of Mile 63 to Mile 55 from Petra. At each mile, Sites 435, 394, 398, 384, 406, 409, 411 and 413, up to 10 milestones were still visible, although their condition had deteriorated dramatically since they were examined by Thomsen in the early years of this century. The inscriptions recorded by Thomsen were in most cases faint or completely obliterated (Thomsen 1917: 1-103)¹¹ (Pl. XXXI, No. 7).

The roadway crossed the Wadi el Hasa on an arched bridge, Site 535, of which only a small portion of the northernmost arch remains. (Pl. XXXI, No. 8). From the wadi the road climbs in graceful turns and loops to the summit of the plateau, Jebel el Masfara, reaching the summit, a rise of approximately 470 m., in six kilometers. The grade varies between 6% and 10%, and the engineering work is remarkably limited, with few embankments or cuttings. At times bedrock was chiselled away to form the road surface itself, and in two places gentle steps were constructed (Pl. XXXII, No. 9).

The roadway was made of hard and durable field stones, with raised curbs on either side. The width of the roadway is three m., although on the plateau the width was doubled at some time after the original

11. Thomsen recorded inscriptions along this stretch of road dating from A.D. 111 (at Mile 58, Site 406, and Mile 59, Site 384) to A.D. 305-306 (at Mile 63, north of Site 535). On this see Thomsen 1917: 1-103, especially 52-53 (mile-stones 134-142).

construction. It is not known how long the road remained in use: the last milestone inscription near the Wadi el Hasa is Tetrarchic in date,¹² but in the Madaba region are two Constantinian inscriptions.¹³

A number of structures was surveyed along the road and are to be associated with it. The most important is known today as Rujm Faridiyyeh, Site 406, at Mile 58 (Glueck 1965: Pl. 89). Although the structure cannot be dated precisely, it seems to have been a fort or garrison. It is located near a spring, 'Ain Faridiyyeh, and is oriented with its east face parallel to the roadway. The structure is 45 m. on a side and has a doorway south of center on the east side. The east wall is preserved to six courses of well-laid pseudo-isodomic masonry. The interior seems to have rooms on three sides (Pl. XXXII, No. 10). About three kilometers to the southwest, in the center of Jebel 'Abu Usba', is a similar structure, Site 296, which commands a view to the north, especially towards the Dat Ras area, which is not visible from Rujm Faridiyyeh (Pl. XXXIII, No. 11).

Some of the nondescript towers near the Via Nova, especially those on the slopes north of the plateau proper, may be associated with the road. Of special note are Site 432, a fort or way-station lying in a saddle between Mile 60 (Site 394) and Mile 61 (Site 435), and Site 386, approximately one kilometer north of Rujm Faridiyyeh, which may have been an outpost of the large fortress, as it controls an area hidden from Rujm Faridiyyeh.

Late Roman-Byzantine period (A.D. 135-640) sherds were found at five sites, viz. Sites 273, 288, 374, 441, 501, and at one possible site, viz. Site 484. These sites do not fall into any one category and a study of their location within the survey area leads to no significant conclusion(s).

The number of Byzantine period (A.D. 324 - 640) sites in the area was surprisingly low ($n = 11$). The Byzantine sites surveyed this season are small, generally speaking, and for the most part they are

located in the western portion of the survey area. At least two, viz. Sites 223 and 313, of the Byzantine sites appear to be tower sites, and they are located at the confluence of the Wadi el Hasa and the Wadi La'ban, and the Wadi Ja'is and the Wadi Zabda respectively. The positioning of these two sites is similar to that of Site 169, Mu'afa, surveyed in the 1979 season and located at the confluence of the Wadi 'Afra and the Wadi el Hasa (MacDonald, Banning, and Pavlish 1980: 179).

Early Islamic period (A.D. 630 - 1174) habitation in the area appears to be virtually nonexistent on the basis of the sherds gathered. Only one Fatimid-Mamluk sherd was found during the entire season and that was a small, purple-glazed body sherd found at Site 452 which is located on the east bank of the upper Wadi Anmein. Nothing else from this period was noted.

Pottery sherds which were read as Mamluk/Ottoman were found at only one site, viz. Site 362, and it was the predominant pottery at that site. Twenty-four Ottoman/Modern sherds were found at the same site which has been described above in the section on the Iron I-II periods.

Pottery from four sites, viz. Sites 226, 245, 247 and 255, and from two other possibly/probably contemporaneous sites, viz. Sites 225 and 254 was read or assigned to the Ottoman period (A.D. 1516 - 1918). All these sites are located in the western portion of the survey area and in close relation to the Wadi La'ban.

Pottery from 50 sites was read as Ottoman/Modern period (A.D. 1516 to the present) material, from one site, viz. Site 282, as possible Ottoman/Modern or Early Bronze. Ottoman/Modern pottery was dominant at 15 of the above-mentioned 50 sites (Pl. XXXIII, No. 12). Nothing of significance can be concluded about these sites. This pottery is associated with villages, e.g. Sites 283, and 284, tower/tombs, e.g. Sites, 273, 360, 441, 483, 484, stone enclosures, e.g. Sites 549, 548, and sherd

12. At Mile 58, Site 406, is an inscription of A.D. 305-306. See Thomsen 1917: no. 134b.

13. At Mile 8 from Madaba and Mile 13 from Madaba are inscriptions of A.D. 334-335. See Thomsen 1917: nos. 116a and 119b1.

scatters, e.g. Sites 503, 500 and 499. Moreover, these sites were found throughout the survey area and are not concentrated in one specific geographical sector. These sites are generally small in size and with the exception of several sites, e.g. Sites 496 and 499, the number of associated sherds is small as well.

On any survey there are always a number of sites which cannot be dated. Many of the tombs surveyed had no associated pottery. Thus it is difficult to say to which period(s) they ought to be assigned. The seven mill sites, viz. Sites 258, 265, 276, 277, 278, 279 and 281, in the Wadi La'ban and the one mill site, viz. Site 427, in the Wadi el Hasa had no associated pottery (Pl. XXXIV, No. 13). Thus investigation of their construction is necessary before they can be assigned to a definite period. Furthermore, aqueduct sites, e.g. Sites 238 and 262 and cave sites, e.g. Sites 263 and 264 cause the same problems as far as dating is concerned (Pl. XXXIV, No. 14).

Further study is necessary on the pottery sherds collected in the 1981 season. Also a more detailed study of the asso-

ciation between pottery and site will lead to more definite conclusions regarding the occupational history of the territory surveyed.

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