# 4 METHODOLOGY

## 4.1 Introduction

The theoretical and methodological background of this study is based mainly on the results of systematic surveys conducted by the ASI in the study area, additional excavations results, numismatic evidence, and historical sources. These sources and the accompanying methodology are outlined in greater detail below.

## 4.2 Survey archaeology: northern Negev

In recent decades, particularly since the 1950s, systematic archaeological surveys have been conducted throughout the Mediterranean and Near East (Barker and Llyod, 1991; Barker, 1996; Bintliff, and Sbonias, 2016; Alcock and Cherry, 2004; Witcher, 2008). In Israel, since the 1960s an impressive amount of survey data has been collected. Today, over 150 survey maps, each consisting of grid squares of 10 × 10 km (100 square km) have been published, containing thousands of archaeological sites, dating from prehistory to the Ottoman/early Mandate periods. The surveys conducted were site-based, meaning that only well-visible remains were registered (e.g., settlements, buildings, tombs, and large pottery concentration). The sites have been dated primarily based upon sherds found on the surface (Mayerson, 1996: 102). However, each team had its own definition as to what defines a site. In many surveys, however, the definition of what qualifies as a site or other methodological consideration was not published. Each site was registered with a site name and number, coordinates, dating, a general description, and a more specific description of the finds and remains discovered. Some of the sites added drawings of finds, illustrations (site maps), and photographs, which

were mostly taken by members of the survey team. All publications have been published online in bilingual (Hebrew/English) format. At the time of writing, 152 survey maps are available online, ten survey maps are in preparation for publication, surveys have been completed for five additional map areas, and a further 18 surveys are ongoing (Archaeological Survey of Israel n.d.).

Survey activities in the Negev were limited in the early phase of the ASI. With the Negev Emergency Survey, a response to the peace treaty with Egypt and the planned redeployment of the Israel Defense Forces in the Negev, these surveys received greater attention, and many areas in the Negev were systematically surveyed. The surveys in the northern Negev were conducted mostly from the 1970s onwards. For the northern Negev, 22 survey maps had been published by the year 2021 (see Figure 4.1), from which 12 have been chosen for analysis in this study.

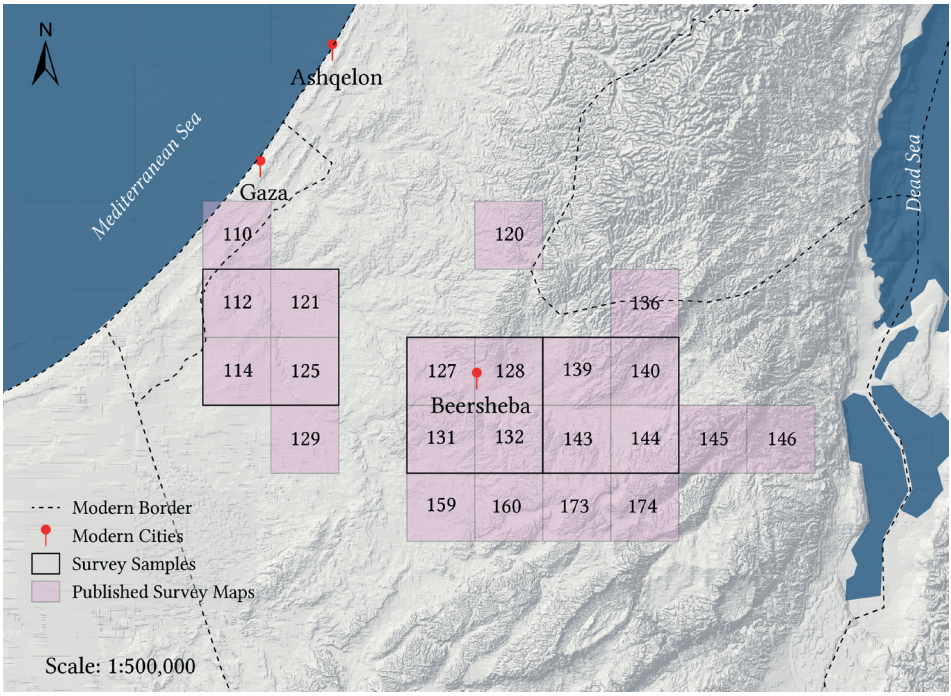


**Figure 4.1 ASI—Published survey maps of the Northern Negev.**

Published survey maps of the northern Negev, numbered as recorded in *Reshumot–Yalqut Ha-Pirsumim* (IDAM, 1964). Each square represents a 10 × 10 km area. All maps have been published online: The Archaeological Survey of Israel. [Online] Available at: http://www.antiquities.org.il/survey/new/default_en.aspx [Accessed 21 September 2021]. The survey samples identify the area analyzed for this research. The bold face squares are the basis for this work. Background: Hillshade from 12.5 m-resolution ALOS-PALSAR DEM.

The following archaeologists and researchers conducted the surveys in the areas analyzed in this work: Gat conducted the survey of Nirim (map 112) as well as the map of Patish (map 121) between the years 1999 and 2001 (Gat, 2012; 2014). Different teams surveyed Mivtahim (map 114). The first survey began in the late 1950s and was led by Gophna from Tel Aviv University (TAU); it was conducted before the founding of the ASI and its subsequent work on systematic surveys (Gal, 2017). During the late 1980s and early 1990s, Gazit surveyed the area (Gal, 2017). Lehmann, from Ben-Gurion University of the Negev (BGU), further surveyed the area between 2000 and 2008 (Gal, 2017). These three researchers surveyed different parts of the area (Gal, 2017). Gazit (1996) surveyed the Urim map from 1978–1985, and the results were published as a monograph and online. Maps 131 and 132 (Nahal Secher and Nachal Be'qa) were surveyed by Baumgarten (2014a; 2014b) and published online. These areas made up part of the Negev Emergency Survey, and the field work was conducted in the early 1980s. Thus, the maps were published many years after the research was completed. The survey maps of Be'er Sheva consist of a collection of the excavations and development surveys that were conducted during the last decades. The areas were never systematically surveyed, as the modern city of Be'er Sheva covers most of the area (Shemesh, 2018a; 2018b). Nahal Yattir (map 139) was surveyed in 1983–84 under the Negev Emergency Survey framework and published as a monograph (Govrin, 1991). The map of Qasif (map 140) was surveyed by Yehuda Govrin (2016) in the 1980s and published online. The map of Khirbat Aroer (map 143) was surveyed by Eldar-Nir (2015) in the early 1980s and published online in 2015. Finally, the map of Tel Malhata was surveyed in 1979 and the early 1980s by Beit-Arieh and students from TAU. The surveys were conducted in connection with the TAU excavation at Tel Ira (Beit-Arieh 2003: 8).

Despite discrepancies among site-based surveys and site definitions, these datasets are crucial for studying ancient settlement patterns (cf. Bintliff, 2000). Modern disturbances, including agriculture, urbanization, erosion, and other land use types, are threatening the archaeological material on and beneath the surface. Consequently, these datasets will gain even greater importance in the future when researchers must rely on survey data for regional settlement pattern analysis, because the physical remains are no longer preserved (Witcher, 2008).

### 4.2.1 Limitations of survey data

Surveys provide a systematic means of looking at the regional distribution of the archaeological record. Consequently, archaeological surveys provide valuable information that must be evaluated critically. Several limitations must be consid-

ered: the method of the survey (vehicular, pedestrian); resolution of the survey (coverage, sampling procedures); surveyor's expertise and biases; predetermined methods (what is registered, what defines a site, what are the types of information collected); season during which the survey took place (vegetation cover may vary seasonally); topographic features; general vegetation cover; and degree of development of previous human activities. Furthermore, and most importantly, the degree to which the surface material represents the archaeological site can vary greatly (Cherry, 1983: 398–99; Barker, 1991: 5; Gaffney, 2000), which can result in problems when estimating the size, chronology, and function of the archaeological site (Cherry, 1983: 379; Gill et al., 1997: 67; Bintliff, 2000: 200). The visibility varies widely in the northern Negev and between the study areas. Specifically, the vegetation in the Be'er Sheva–Arad basin is mainly spare, and topsoil finds are visible, whereas, in the southern Hebron hills, or the western study area, the visibility is lower because of denser vegetation.

Another limitation of the study is that the dating of the sites surveyed in the northern Negev is based primarily on pottery sherds. Chronological precision is limited in many instances, making it challenging to establish period-specific settlement maps (Magness, 2003: 7). Chronological precision is especially challenging to establish during the Late Roman–Early Byzantine, and the Late Byzantine to the beginning of the Early Islamic period. Many Byzantine period sites show continuity throughout the seventh century without a break, e.g., a destruction layer or significant shift in the material culture (Foss, 1995: 230).

A further limitation is that the survey data used in this study were collected and published by different teams; consequently, the dating and classification of the sites may vary. In the relevant surveys, the following periods were used for classification: Hellenistic, Hellenistic–Roman, Early Roman, Nabatean, Roman, Late Roman, Roman-Byzantine, Byzantine, Byzantine–Early Islamic, and Early Islamic. Therefore, in this study, it was essential to use excavations to compare the data, and only the combination of both datasets could provide a more detailed picture of the settlement patterns, allowing for a more precise analysis of the cultural landscape. To create settlement maps that were as accurate as possible, surveys and excavations were considered. In light of the new understanding of the ceramics sequences, published ceramics from the surveys and appropriate excavations were critically reviewed to ensure that chronological attributions were as precise as possible.

### 4.2.2 Theory, methods, and the problems of using legacy survey data

The data provided by the ASI can be defined as legacy survey data. Such data are archaeological information collected from the 1950s (some even earlier) onwards. Since the 1990s survey methodology has developed sharply (Witcher, 2008). However, legacy survey data are vital for comparative surveys and the exploration of inter-regional variability (Witcher, 2008). The problem when comparing such survey data from different maps is based on variations in their methodological approaches. The surveys were conducted during different periods (1950s–2000s). Some were published by the lead surveyor right away, but others were published decades later—some by people who did not participate in the survey.

Because different teams and lead surveyors conducted the surveys, the results and their interpretations vary. However, the lead surveyor: Baumgarten, Gat and Govrin, each surveyed two maps (Baumgarten, maps 131 and 132; Gat, maps 112 and 121; Govrin, maps 139 and 140), which somewhat reduces the variability in methods and interpretation in each study area. Nevertheless, in the eastern and western study area, three different surveyor teams were involved. The central study area has only two systematically surveyed maps, as the northern two maps are collections of all the field work conducted in the areas, which also includes sites that were excavated.

A further problematic point when comparing survey data is the lack of sufficient metadata, e.g., site definitions or the criteria of the survey strategy adopted by each survey team (cf. Witcher, 2008). In many cases, such metadata were not or were only very briefly described. As an example, Gat described some of the methodological considerations he used during the survey of Patish (Gat, 2014).[3] In the three study areas, this is the only survey that published any methodological considerations. Each team used different methods, and the lack of detail of the considerations limits the possibility of comparing the different regional datasets and analyzing inter-regional variability. As an example, in the western study

3 Methodology: "The survey was conducted by vehicle, mainly along the roads separating the cultivation plots and the channels of the streams. In those regions where there is limited vehicle access the survey was performed on foot. The aeolian soil (the different types of loess) facilitated identifying sites that are of a different shade, and where there are concentrations of stones, ash patches and pottery sherds. The survey was conducted in 2001 and the sites were revisited numerous times in different seasons. The artifacts gathered in the survey consisted mainly of ceramics and flint implements, architectural elements: such as a fragment of a marble chancel screen, bricks and bathhouse remains, stone pavers and wall liners, fieldstones and river pebbles next to the remains of public buildings, dwellings, industrial installations, cisterns and tombs." (Gat, 2014: D. Methodology)

maps 112, 114, and 121, between 41 and 53 Classical periods sites were registered. In map 125, however, 226 Classical sites have been indicated. This difference in such a small area cannot be explained as a real variation in the settlement intensity during the Classical period.

Similarly, Gazit registered 40 encampment sites dating to the Byzantine period; however, in the other three study areas, only three Byzantine campsites were discovered. These different survey results are mainly based on different site definitions rather than differences in human occupation. In other publications comparing the different survey maps, clear definitions for the described survey results were given (see Chapter 4.5—Settlement types).

## 4.3 GIS data

***Digital Elevation Model***

The digital elevation model (DEM) used in this study was ALOS-PALSAR[4]. The ALOS-PALSAR 12.5 m data is the highest-resolution of freely available data for this research area. The dataset was merged (Mosaic to New Raster tool in ArcGIS) with the Elevation Void Fill function and was applied to correct the DEM. Furthermore, the raster file was clipped to the extent of the northern Negev.

***Water sources***

In the early 20th century, Newcombe (1914; Zohar and Erickson-Gini, 2019: 6) mapped the southern Levant for the British military. The resulting map included routes as well as water sources. The water resources were digitized by Zohar and Erickson-Gini (2019), and their digitized shapefile of the water sources was used in this study (Figure 4.2). It is assumed that permanent water sources had not changed significantly from the Classical period to the early 20th century.

4 Advanced Land Observation Satellite-Phased Array type L-band Synthetic Aperture Radar, with a resolution of 12.5 m. [Online]. Available at: http://www.eorc.jaxa.jp/ALOS/en/about/palsar.htm; retrieved from: https://vertex.daac.asf.alaska.edu/#/ [Accessed: 20 October 2019]

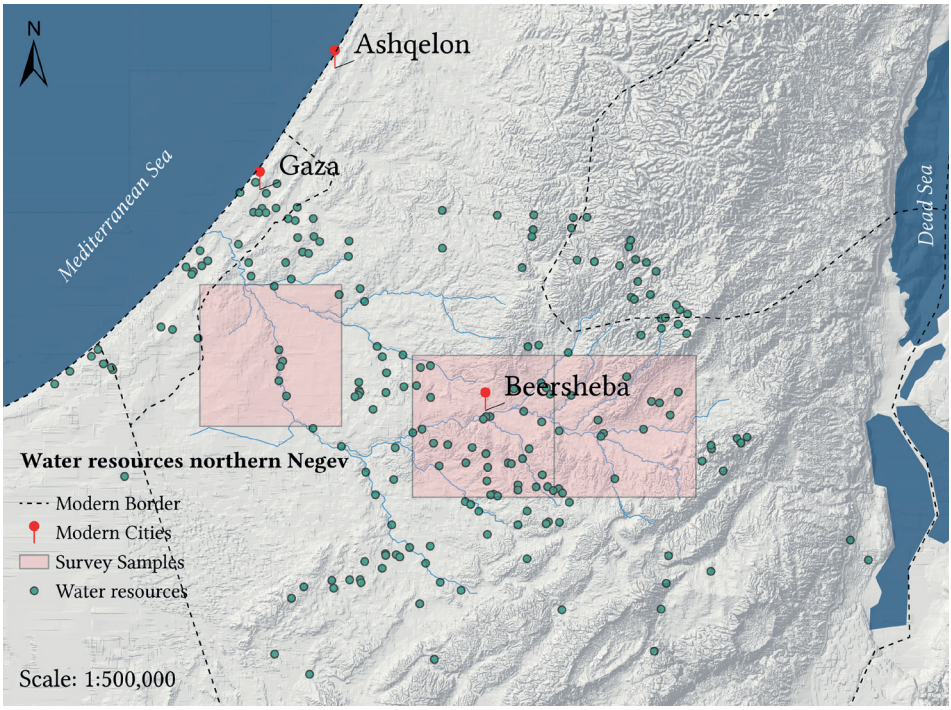


**Figure 4.2 Water resources northern Negev (after Newcombe, 1914).**
Water resources according to Newcombe (1914), digitized by Zohar and Erickson-Gini (2019). Northern Negev and the three study areas as well as the major wadis of the area. Modern cities of the area are marked in italics. Background: Hillshade from 12.5 m-resolution ALOS-PALSAR DEM.

### *Settlement data*

The GIS coordinates are taken mainly from the ASI map surveys, published surveys reports, excavations, and internal inspection reports. However, some sites—for which no recorded grid-coordinates were available—were recorded in the field with a handheld GPS, mainly in the city of Be'er Sheva and its surroundings. In several cases, published maps were used to determine the exact coordinates of certain features. For example, the following map of Be'er Sheva (Figure 4.3) shows the locations of 26 tombs discovered during inspections on Balfour Street (Abadi-Reiss and Eisenberg-Degen, 2013). The map was georeferenced with the help of the published coordinates, after which the exact location of each tomb could be determined.

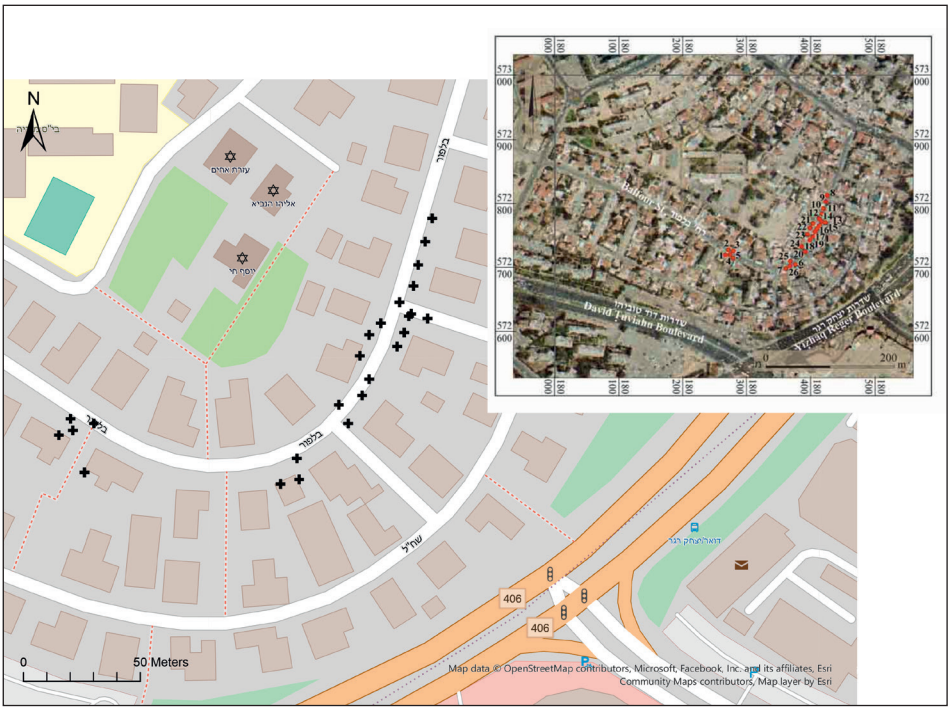


**Figure 4.3 Example of georeferenced map.**
Published map (right upper corner) (Abadi-Reiss and Eisenberg-Degen, 2013; Courtesy of the Israel Antiquities Authority) and exact location of tombs after the map has been georeferenced. Background: Open Street Map, map layer by ESRI.

### *Roads*

The road system presented in this study is based mainly on data drawn from the Digital Atlas of Roman and Medieval Civilizations (McCormick et al., 2018) at Harvard University,[5] which provides a digital version of the Roman roads identified in the *Barrington Atlas* (Talbert 2000). However, the large scale of these vector data file means that high-resolution digitization is problematic. Wherever possible, the roads have been corrected with the help of different maps and suggestions proposed by researchers (e.g., Roll, 2002; 2007; Tsoar and Yekutieli, 1992; Tsafrir et al., 1994; Gazit, 1996; Zohar and Erickson-Gini, 2019), as well as survey

5 The Digital Atlas of Roman and Medieval Civilizations. [Online] Available at: https://darmc.harvard.edu/data-availability [Accessed; 20 October 2019].

finds, such as parts of roads, milestones, etc. Furthermore, parts of some roads could be digitized with the help of satellite imagery, such as the Ma'aleh Deragot road. This road runs from Tel Malhata toward Jerusalem and is visible via satellite imagery from Digital Globe (ArcGIS World Imagery base map) provided by ESRI (Figure 4.4), and so could be corrected and digitized.

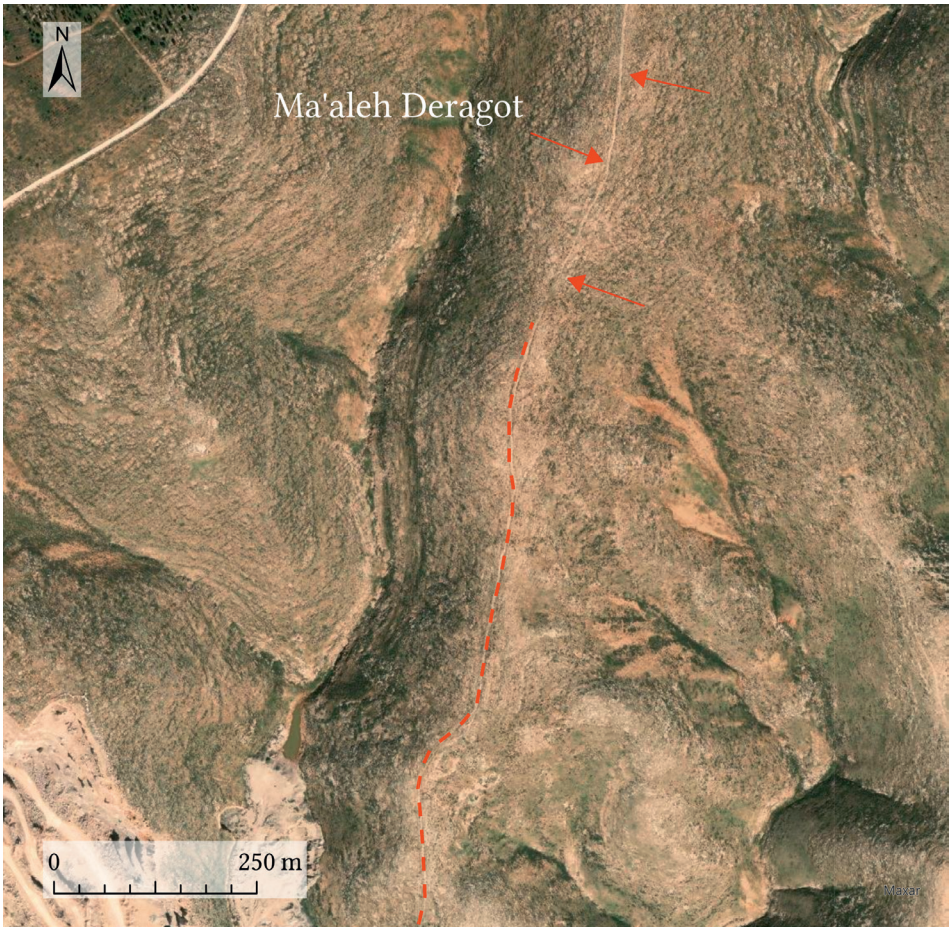


**Figure 4.4 Roman road, Ma'aleh Deragot.**
Satellite Imagery with the Roman road, Ma'aleh Deragot, clearly visible and partially digitized (in red). Background: Satellite Imagery ESRI—DigitalGlobe.

## 4.4 Database

The database was built by recording the information for each archaeological site (see Appendix 1—Database format and attributes). A general concept of the database needed to be built, to analyze the data with GIS software. Each archaeological site received a primary key (Site number, ID), which enabled the identification of each site individually as well as the ability to assign different attributes to each site, e.g., a farmhouse during the Late Roman period developed into a large farming village during Byzantine period, growing to include a church, winepress, and other attributes. This is still the same site (geographically speaking), but its attributes have changed. The same is true for a site that was abandoned and in a later phase resettled at the same location.

Each recorded site was given a name (either according to the ASI, geographic location, or map reference). Different definitions and categories were used to classify each archaeological site, e.g., site type (see Chapter 4.5 Settlement types). Wherever possible, the size of the settlement was calculated (see 4.6 Calculation of site size). Furthermore, the number of structures, area in hectares, periods of occupation, status as permanent or non-permanent site, a site description, and additional information were recorded.

## 4.5 Settlement types

Among the difficulties of comparing data from different surveys are the differences in site definitions, chronological definitions, and the details of the published data (see above 4.2—Survey archaeology: northern Negev). Therefore, it was necessary to specify clear definitions for the surveyed remains. For the purposes of this thesis, the surveyed sites were grouped into six general categories (settlements, installations, cult sites, burial sites, encampment sites and findspots. Each category has been further divided into types and subtypes (Table 4.1).

In the eastern Roman empire, there is archaeological evidence of a small farm-and-village-based economy. The economic prosperity of farms and villages began to take root in the Hellenistic period and continued through the Byzantine period and the Early Islamic period. During the Byzantine period, rural settlements covered all of Palestine, including previously unsettled regions (Hirschfeld, 1997). In the study area, agricultural settlements are mainly small to large single farms, groups of farms (three or more) categorized as small villages (hamlets), medium to large villages, and a few larger towns and cities.

**Table 4.1 Categories, types, and subtypes of archaeological remains.**

| Settlements | Installations | Cult Sites | Burials | Camps | Findspots |
|---|---|---|---|---|---|
| Urban/ Administrative: City, Town | Industrial: Kilns, Quarries | Temples, Shrines, Churches, Synagogues, Mosques | Tombs, Built tombs, Cemeteries | Encamp-ment sites | Pottery scatters, Coins, Additional archaeological finds |
| Rural/ Agricultural: Villages, Farms, Single Structures | Agricultural: Winepress, Olive press, etc. | Additional struc-tures that belong to cult sides such as: Miqves or baptismal fonts, etc. | | | |
| Military structures | Water: Cisterns, Wells, Pools, Aqueducts | | | | |

*Urban/Administrative Settlements—Cities and Towns:* During the Hellenistic period, a new type of urbanism was introduced in Palestine, and life changed significantly. In particular, new traditions (Greek-Hellenistic, then Roman) grew increasingly critical. These changes also affected how the locations were chosen for new settlements and how these settlements were planned and built. During the Classical period, the northern Negev was primarily an agricultural area with few large settlements. It served as a connection between the desert and the port cities of Gaza and Ashqelon. In the Late Roman period and throughout the Byzantine period, Be'er Sheva transformed into a large city and was designated the capital of northern Negev.

*Villages:* In this study, the term "village" was used for both smaller and larger rural settlements. Small villages are defined as more than four large structures (e.g., farmhouses). When possible, villages in the database were distinguished as small (four to nine structures) or large (villages containing ten or more structures). Several of the large Byzantine period villages had one or more churches; some also contained monasteries. An example of a large village can be seen at Khirbat Amra, a site that consists of several farmhouses, a large church, installations, etc. Some of these have central courtyards and are surrounded by rectangular rooms—the village dates to the Byzantine and Early Islamic periods, the area was settled from

during the Classical period, from the Hellenistic period onwards (cf. Tahal 1996; 2000).

*Farmhouses:* Farmhouses can be found throughout the three study areas and are the most common structure category. Three main types of farmhouses can be found in the northern Negev, the most common of which is a simple, small dwelling, consisting of one to three rooms, measuring in total some 50 to 100 square m. A second type consists of watchtowers, which were used as seasonal dwellings, mostly in the area surrounding towns and villages. They did not serve as family residences (Haiman and Fabian, 2009: 46). The third type includes large, mostly rectangular structures consisting of several rooms grouped around an inner courtyard. The largest such farming estates were built as manor houses, usually containing a closed compound, and ranging in size between 200 and 500 square m. Many farmhouses are accompanied by additional agricultural structures, such as animal pens, installations, and cisterns. Farmhouses could not always be categorized based on their description in the survey text. In most cases, buildings were categorized as "structures." Only if it was deemed likely that the building served as a farmhouse (e.g., if there were agricultural structures connected to the building, based on a published map or other indications) were the sites then categorized as such.

*Structures:* The category "structures" includes all sites that do not fit into any other category or where no further surface finds indicating a specific usage of the structure have been found. Examples are dwellings in an urban environment, temporary dwellings, small farms, and structures of unknown purpose.

*Installations:* Installations are defined as structures in which there is archaeological evidence of a specific activity. Most installations are either agricultural (e.g., winepress, oil press, (donkey) mill, fish farming pools) or industrial (e.g., pottery kilns, quarries). Many installations surround towns, villages, and large farmhouses.

*Military Structures:* Several military structures were discovered in the study areas. These were mainly fortified structures, for example, farmhouses with fortification towers, fortresses, military camps, and associated structures. Such structures have been found in all three study areas, dating from the Hellenistic to the Early Islamic period.

*Cult Sites:* This category includes all cult sites: temples, shrines, churches, monasteries, synagogues, and mosques as well as related structures such as miqve, bap-

tismal fonts, etc. Within the study areas, a Hellenistic temple, churches (n = 27), monasteries (n = 11), synagogues (n = 2), and two mosques (n = 2) were found. The Hellenistic temple was discovered at Tel Sheva (Aharoni, 1973: 34; Derfler, 1981: 97), Churches and monasteries appear from the fifth century CE in the study area and were abandoned the latest around the eight century CE. A Byzantine period synagogue has been found at Ma'on (Levy, 1960: 265; Grabar, 1962: 117; Barag, 1993: 944–946), and indications for a synagogue in Be'er Sheva have also been discovered (Figueras, 1980: 154; 2013: 9). Early mosques dating to the Early Islamic period have been discovered within the eastern study area. Further, north of Be'er Sheva, just outside the study area and close to the Bedouin town of Rahat, a small open-air mosque was discovered that dates possible to the eighth century CE (Seligman and Zur, 2021: 25–41).

*Burial Sites:* There were several cemeteries and burial sites in the study areas, mainly close to wadis, where winter rains and erosion had exposed the burials. However, most burial sites have been discovered during test trenches, inspections, and excavations (e.g., Be'er Sheva, Tel Sheva, Tel Malhata). At Tel Malhata in particular, a large cemetery has been excavated in recent years (Talis et al., 2017). The majority of the tombs found in the northern Negev are cist tombs built from dressed limestone slabs. These tombs date from the Late Roman to the Early Islamic period. As the Byzantine burial tradition continued into the Early Islamic period, it is not always possible to date a burial precisely to one of these periods. Other burials found in the study area include pit graves and burial caves.

## 4.6 Calculation of site size

Wherever possible, the size of the settlement was calculated. However, this was not possible in all cases, and there are several sites for which the exact size is unknown. If no size was indicated in the publication or survey file, it was estimated (if possible) based on the described findings or attached site plans and photos. It is assumed that measurements of site size and its perimeters always represent the site during its maximal extent of growth.

Five site size categories were defined: unknown, small sites up to 1 ha, larger sites between 1.1–3.0 ha, large sites between 3.1 and 10.0 ha, and sites larger than 10.1 ha. It was not possible, based on the given data, to define a more precise category. Most sites were in the 0.0–1.0 ha category, which contains all sites from a few square m to 1 hectare. These include mostly farmsteads, installations, small villages (hamlets), isolated structures, cisterns, aqueducts, and agricultural terraces.

In the larger category (< 10 ha), many sites are non-permanent, such as campsites and findspots. These were used over a long period and consequently show large pottery scatters. It is impossible to establish the exact size of non-permanent sites for a specific period, as those sites were in use over a long time. During the Late Roman to Early Islamic period, several urban centers were also recorded for the study areas, and to calculate the actual the size of these sites several different methods were used (see below).

### 4.6.1 Different methods of calculating site size

***Calculating site size according to the approximate radius of field scatters***

It is important to note that, in most cases, a general radius of the scatter of archaeological remains was given in the survey description with little additional detail. To establish the size of the archaeological site itself (e.g., the set of buildings, villages), it is necessary to consider the approximate radius of significant field scatters surrounding the sites (Wilkinson, 1989: 44; Bintliff, 2000: 209). For the calculation of site size according to field scatter radius, the following calculations, suggested by Wilkinson (1989), were used (Table 4.2).

**Table 4.2 Calculating site size from the radius of field scatters.**
The approximate radius of significant field scatters surrounding archaeological sites in the Middle East (from Wilkinson, 1989: 44).

| Settlement size | Radius of scatter (km) |
|---|---|
| Hamlets and farmsteads < 1.5 ha | 0.2–0.4 |
| Villages 2–9 ha | 0.6–1.0 |
| Small town* 10–29 ha | 1.3 |
| Large town/city > 40 ha | 2.2–6.0 |

* One example only: site 48 in the North Jazira

***Calculating site size according to aerial/satellite imagery***

In certain cases, free, available, aerial and satellite images (Digital Globe pictures—ArcGIS World Imagery base map, and in some cases drone aerial pictures) were used to calculate the approximate size of a site. In most cases in the north-

ern Negev, large archaeological sites have good visibility, especially as the vegetation is not dense. Therefore, calculating the size based on the settlements borders was possible. However, these calculations always represent the maximum possible size of the settlement. If areas within the settlement remained unsettled, in most cases this was not possible to establish. Also, only the maximum extent of the settlement could with this method be calculated, not site size based on specific periods. The method was also used to confirm the site size calculation based on approximate radius of field scatters. In all cases the analysis of the imagery confirmed the estimated site size calculated.

***Calculating site size according to kernel density estimation***

For most sites, the above-mentioned methods to establish site sizes were sufficient, but for the Roman-Byzantine settlement of Be'er Sheva, these methods were not possible. Modern Be'er Sheva covers the ancient settlement, making it impossible to analyze the site based on the field scatters or visible remains. Therefore, the kernel density tool (KDE) in ArcGIS Pro was used to calculate its size. The kernel density tool calculates the density of features in a neighborhood around each cell in a raster (ESRI, 2020a). Kernel density is highest at the position of a calculated central point and decreases gradually with increasing distance from that point. Using the KDE, the location of the ancient settlement and its size could be calculated (see below: Chapter 6.6.1—Be'er Sheva in the Byzantine period).

## 4.7 Chronological considerations

This research followed the chronology for Israel proposed by Stern (2008: 2126–29). The Classical period in the Negev is generally dated from the late fourth century BCE, beginning with Ptolemaic rule, through the Early Islamic periods (tenth/eleventh centuries CE). The general chronology and sequence of events are summarized in Table 4.3.

These social, political, and economic perturbations can be traced archaeologically and are presumably reflected in the settlement systems.

**Table 4.3 Classical chronology and sequence of events (after Stern, 2008).**

| PERIOD | CHRONOLOGY | EVENTS |
|---|---|---|
| **Early Hellenistic** | 332–167 BCE | • ***Ptolemaic Kingdom***<br>○ Ptolemaic rule, established after the death of Alexander the Great<br>○ Palestine was part of the Ptolemaic Kingdom through the late fourth and most of the third centuries BCE<br>○ Beginning of the incense trade to Gaza by the Nabateans<br>• ***Seleucid Kingdom***<br>○ Stronger Hellenization of Palestine<br>○ Jewish revolt against the Hellenistic ruler |
| **Late Hellenistic** | 167–37 BCE | • ***Hasmonaean Kingdom***<br>○ 167–147 BCE, Maccabean revolt and years of struggle<br>○ By 142 BCE, the Hasmoneans had seized power in Judea as well as larger parts of the country<br>○ ~ 100 BCE, conquest of Gaza by Alexander Jannaeus; blocking of the Nabatean trade route until the Roman conquest<br>○ 64 BCE, Roman conquest of Palestine; northern Negev divided between the Nabateans, Jews, and Greek coastal cities (e.g., Gaza, Raphia) |
| **Early Roman** | 37 BCE–132 CE | • ***Herodian period***<br>○ 37 BCE, end of Hasmonaean Kingdom; Herod client-king of Rome<br>○ 4 BCE marks the division of Herod's Kingdom between his sons<br>○ 66–70 CE, First Jewish Revolt; end of the Herodian period<br>○ 106 CE, Nabatean Kingdom annexed by the Roman army<br>○ 132–135 CE, Bar Kokhba revolt |
| **Late Roman** | 132–324 CE | ○ 284 CE, reform by Diocletian; splitting of provinces into smaller units; division of army into field forces and frontier guards<br>○ Creation of *Limes Palestina*, a line of several forts in the northern Negev |
| **Early Byzantine** | 324–491 CE | ○ 324 CE, Emperor Constantine takes control of the eastern Roman Empire<br>○ Late fourth century CE, territory officially becomes Christian<br>○ ~ 358 CE, division into two provinces (north and south) along the *Limes Palestina*<br>○ 363 CE, earthquake<br>○ ~ 400 CE, reorganization of Palestine and division into three separate provinces: *Palaestina Prima, Palaestina Secunda,* and *Palaestina Tertia* (the northern parts of the study area are located in what was the *Palaestina Prima;* the southern parts in *Palaestina Tertia*) |

**Table 4.3** ***(continued)***

| PERIOD | CHRONOLOGY | EVENTS |
|---|---|---|
| **Late Byzantine** | 491–640 CE | ○ 541–542 CE, Justinianic plague<br>○ Peak of desert urbanism and population, Elusa becomes district city of the region<br>○ 614 CE, Persian raids; military confrontation between the Byzantine and Persian empires which weakened both powers<br>○ 634–640 CE, Arab conquest<br>○ During the Late Byzantine period, several earthquakes took place in the northern Negev (551 CE; 633 CE) |
| **Early Islamic** | 640–750 CE (–1099 CE) | • ***Umayyad caliphate ca. 661–750 CE***<br>○ Consolidation of the Umayyad caliphate, capital: Damascus<br>○ Reorganization of Palestine; most of *Palaestina Prima* and *Palaestina Tertia* (i.e., most of the northern Negev) became part of Jund Filastin<br>○ Shift away from urbanism<br>○ 695 CE, 'Abd al-Malik's reforms (Language: Arabic; new Islamic coinage; administrative reforms)<br>○ 712–715 CE, foundation of the City of Ramle as new capital of Jund Filastin<br>○ Crystallization of Islam and slow displacement of Christianity<br>• Abbasid dynasty ca. 750–969 CE<br>• Fatimid dynasty ca. 969–1099 CE |

## 4.8 Coins

To analyze the general trends in the dating of the settlements in the study area, next to ceramic finds, approximately 750 coins, found at various excavations within the study areas, were included in a database (see Appendix 2—Coin finds from excavations). The coins were retrieved from different archaeological excavations, and about 60% of the coins were registered in the IAA database. Additionally, publications of relevant material (excavation reports), which the IAA did not record, were added to the database. The coins selected for inclusion in the database were discovered in larger towns and villages and in the city of Be'er Sheva. In total, 18 archaeological settlements were analyzed. Most coins were found in Be'er Sheva (n = 339) from 31 different excavations (Figure 4.5).

The coins were categorized according to archaeological periods and dating (see above, Chapter 4.7—Chronological considerations). They were divided into categories of generally 50 years with some exceptions (e.g., 50 to 70, 300 to 324 CE, 600 to 638 CE) that resulted from historical events. After the Arab conquest, By-

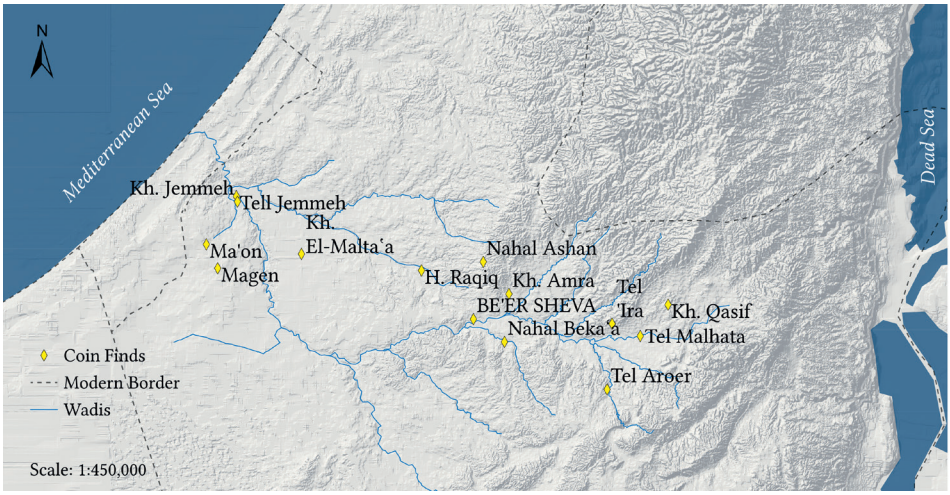


**Figure 4.5 Coins from excavations in the northern Negev.**
Coins were collected from archaeological excavations, mainly from cities, towns, and villages. About 750 coins, dating from the fourth century BCE to the ninth/tenth century CE, were analyzed. Background: Hillshade created from the 12.5 m-resolution ALOS-PALSAR DEM. For list of excavations see Appendix 2—Coin finds from excavations.

zantine coins continued to be used, and Arab-Byzantine (pre-reform Islamic) coins were introduced in the area. In 696/697 CE, 'Abd al-Malik's reforms were enacted, and the discontinuation of Byzantine coins in Palestine was taken into consideration (Gitler and Weisburd, 2005: 540). After the reform, three standard denominations were introduced: gold (*dinar*), silver (*dirham*), and copper (*fals*) (Avni, 2014: 35). The coinage for the seventh and eighth century CE was clearly dated and categorized, but this is not the case with coins from the ninth and tenth centuries CE. As copper coins ceased to be used, the number of coin finds dropped significantly (Avni, 2014: 35).

The total number of coins of each dating was divided by the total coins discovered from each study area and multiplied by 100 to obtain the percentage of coins that appear. The same was done for the total coin finds to detect general patterns (Figure 4.6). However, even after standardizing the results, several problems persisted with using coin finds for dating. According to Walmsley (1999), Byzantine coins were still widely in circulation one or two centuries after their production. However, he concludes that "numismatic evidence from controlled excavations can expand our understanding of socio-economic conditions in the late antique East" (Walmsley, 1999).

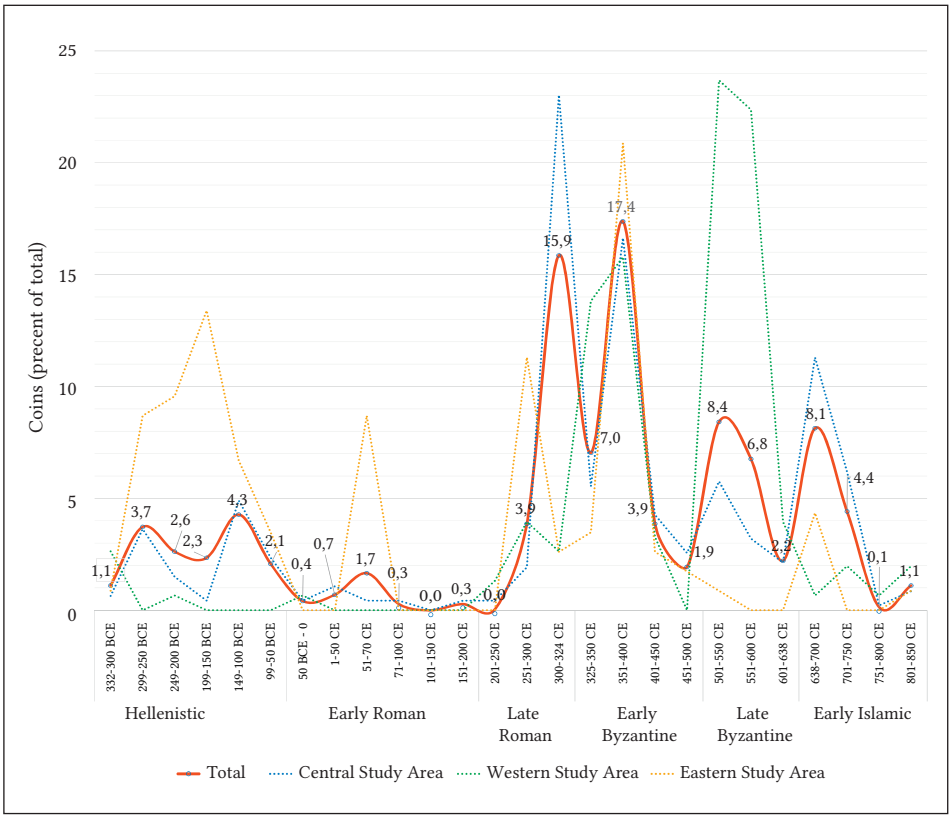


**Figure 4.6 Coin finds from the study areas according to dating.**
To compare the chart figure from the different study areas, the percentage of coins was calculated based on the total amount of coins from each study area. Coin data from the IAA internal database (*Menorah*) see Appendix 2.

Furthermore, there were problems based on the data used to compile the database: the coins had been categorized in groups of about 20–50 years. Thus, the coin dating might fit more than one group, e.g., a coin dated from 114–96 BCE. Therefore, the data could only be used to indicate settlements in the northern Negev and analyze general trends. However, coins are an essential tool to support arguments based on settlement patterns and ceramic dating. For the eastern study area, coin finds from only a few sites were recorded: over 90% came from Tel Aroer, Tel Ira, and Tel Malhata. Therefore, the sample was too small to analyze general trends for the whole study area (see Chapter 7.8—Coin finds from the eastern study area).

The coin finds show a moderate activity in the Hellenistic period, with a strong decline during the first century BCE. There is a small rise in the mid-first century CE, during the Early Roman period, but it flattened after the Jewish Revolt. Almost no coins date between 100 CE and 250 CE, which changes strongly after 250 CE. Most coins date to the late third and early fourth century CE, and there is a substantial decrease in coins in the fifth century CE, with almost no coins dating between 430 CE and 490 CE. Safrai (1998) explains the drop in coins in the fifth century CE (408–491 CE) due to a decline in demographic and economic vitality in the region. Gitler and Weisburd (2005: 552) analyze the coin finds from villages and towns from Palestine and argue that the decline in the fifth century appears because, during the fourth century, an unusually high level of coinage production took place—during the fifth to seventh century, coinage production returned to standard levels. Roughly 67% of all coin finds date between 300 and 638 CE, meaning from the last part of the Late Roman period to the beginning of the Early Islamic periods. The coin finds from each study area and general trends are discussed separately in each study area chapter separately (see: Chapters 5 to 7).

## 4.9 Settlement analysis: survey samples

The analysis of the northern Negev settlements was based mainly on the survey data of the ASI and the interpretation of the settlement patterns reflected in this data. Surveys, excavations, and inspections over the last seven decades have documented the location and chronology of over 1,800 permanent sites and many non-permanent sites—such as campsites and findspots—dating to the Hellenistic, Roman, Byzantine, and Early Islamic periods. Roughly 10% of the sites have been excavated. The regional changes in settlement data over time are reflected in the data from the different surveys.

Before beginning the settlement analysis, the problems and limitations of using (legacy) survey data had to be acknowledged (see Chapter 4.2.1—Limitations of survey data). Careful consideration had to be given to the classification of sites (see Chapter 4.5—Settlement types), their division into site size categories (see 4.6—Calculation of site size), and the use of excavation data to consider chronological sequences of the surveyed sites. After the classification and site size of each site had been established, the examination of the spatial and temporal changes in settlement patterns and site hierarchies were done. The changes in settlement patterns and site hierarchies are presented through distribution maps (according to archaeological period) and statistics. The different distribution maps for each study area are compared and analyzed.

### 4.9.1 Survey samples

In this research, three different geographical areas of the northern Negev were analyzed. Each study area had been divided into four 10 × 10 km survey areas (Figure 4.7). The total size of the study areas was 1194,87 km², and each study area had a size of:

1) Western study area, centered on Nahal Besor, close to Gaza (394.87 sq km)
2) Central study area, centered on the city of Be'er Sheva (400 sq km)
3) Eastern study area (400 sq km)

The three study areas were systematically surveyed by teams from the ASI or its Negev Emergency Survey branch. The analysis presented here capitalizes on the rich datasets compiled during their systematic surveys. In total, the three study areas were compiled from ten systematically conducted surveys and two compilations of development survey data and excavations (Be'er Sheva East and Be'er Sheva West; 127, 128). Survey maps 127 and 128 were not systematically surveyed

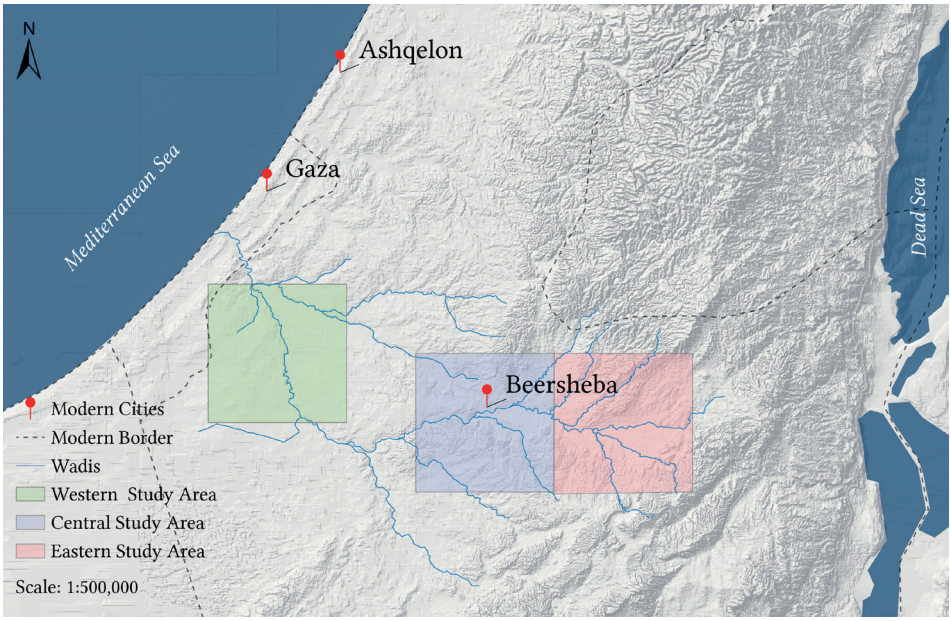


**Figure 4.7 Detailed map of the northern Negev and the three study areas.**
Each study area comprised of 400 km² (total 1200 sq km). A small part of the western study area is located within the Gaza Strip, in total 5.13 sq km, which most likely have not been surveyed (see below). Background: Hillshade created from the 12.5 m-resolution ALOS-PALSAR DEM.

(Shemesh, 2018a; 2018b). The modern city of Be'er Sheva, founded in the first years of the 20th century, comprises a large part of these survey maps, and therefore a regular, systematic survey was not possible.

Since the early 1960s, many development surveys, inspections, and excavations have been conducted, and numerous Classical archaeological sites have been discovered and registered. The published "survey maps" of Be'er Sheva from the ASI are a compilation of all surveys and excavations conducted in the area. In addition to these data, archaeological sites found during inspections and the excavations that took place after surveys were added to the database. With the help of GIS, most of the added archaeological remains were cist tombs dating from the Late Roman through the Early Islamic periods. Most of these tombs were not excavated, and only the GPS locations of each were recorded. Therefore, exact dating is not possible, although most tombs are connected to the Late Roman-Byzantine city of Be'er Sheva. The data were collected in May, July, and August 2019 with a handheld GPS during surveys in the city of Be'er Sheva and its surroundings. The antiquities were identified with the help of Sonntag (former Be'er Sheva and northern Negev District Archaeologist, IAA).

To ensure data comparability for the comparative analysis of site datasets from the different regions, the dataset from the central study area was used, counting the city of Be'er Sheva as one site (Table 4.4). The archaeological sites recorded from inspections and excavations are useful for another purpose: to establish the size of the Late Roman-Byzantine city of Be'er Sheva. That is, for comparing the Classical period site density of the three study areas. In the case of Be'er Sheva (maps 127 and 128), the density without the added archaeological sites from inspections should be considered.

These systematic archaeological surveys formed the basis of this research with the addition of development surveys, test trenches, and inspections, which were added to the survey data. Excavations also constituted a data baseline for comparing the survey data. Most of the excavations were salvage projects conducted by the IAA, although some of the larger sites were excavated by members of academic institutions. A large number of salvage excavations carried out by the IAA, mainly since the early 1990s, were a significant source of information. First of all, they are located throughout the study areas, and their distribution is random. This means that salvage excavations took place where a construction project was developed and that the results present an unbiased picture of the settlement patterns of the northern Negev (Avni, 2014: 20). Within and surrounding the city of Be'er Sheva, a large number of salvage excavations took place, allowing us to understand better the history of the ancient settlement and the northern Negev.

Most of what is known about the ancient settlement of Be'er Sheva is derived from salvage excavations. All results (at least preliminary) from salvage excava-

**Table 4.4 Overview of the study areas.**

For an overview of the single survey maps see Appendix 3—Survey maps: Summary of classical sites.

| Survey Area | Maps | Area | Classical Period Sites | Density of Classical Sites |
|---|---|---|---|---|
| *Western Study Area* | 112, 114<br>121, 125 | 394.87 sq km[1] | 415 | 1.05 |
| *Central Study Area* | 127*, 128*<br>131, 132 | 400 sq km | 951<br>(497)[2] | 2.38<br>(1.24) |
| *Eastern Study Area* | 139, 140<br>143, 144 | 400 sq km | 438 | 1.10 |

1 Parts of maps 112 and 114 (Gat, 2012; Gal, 2017) are located within the Gaza strip. It is unclear if these areas were surveyed. However, the surveys took place at least partially before the disengagement of Israel in 2005, so theoretically it would have been possible. Area within the Gaza strip in map 112: 3.46 sq km; Area in map 114: 1.67 sq km. No archaeological sites were mapped in these areas.
2 Counting Be'er Sheva only as one site, including all burial sites.

tions conducted by the IAA are published online in bilingual format (Hebrew/English).[6] The discoveries of the IAA are all available in the data bank and archives. Given the large amount of available archaeological data and based on a quantitative analysis of the accumulated archaeological material, a comprehensive picture of the settlement patterns in the northern Negev during different archaeological periods can be reconstructed.

6 Hadashot Arkheologiyot—Excavations and Surveys in Israel. [Online]. Available at: https://www.hadashot-esi.org.il/default_eng.aspx.