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Pierce, George Allen

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“The Territory Facing Jaffa”:
Cultural Landscapes of a Mediterranean Port and its Hinterland
(ca. 2000–539 B.C.E.)

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Near Eastern Languages and Cultures

by

George Allen Pierce Jr.

2015
This dissertation presents a synthesis of settlement patterns in the central coastal plain of modern Israel from the onset of the Middle Bronze Age to the end of the Iron Age (ca. 2000–539 B.C.E.). The ancient mound of Jaffa, situated on the southern Levantine coast south of the outlet of the Yarkon River, was the closest maritime outlet for Jerusalem and other highland centers in ancient times. Jaffa has the distinct status of being one of the few ports on the southern Levantine coast featuring an almost continual occupation history from the Middle Bronze Age through the modern era. Yet a lack of inclusion for Jaffa and other hinterland sites in archaeological and historical studies of the coastal plain is evident. In light of renewed excavations on the ancient mound of Jaffa, new analyses of the site’s and region’s material culture recovered from excavations conducted over the last sixty years necessitate the current examination of regional settlement patterns and systems to elucidate the potential economic and cultural connections
between the port and inland sites, both urban and rural in nature by providing a regional perspective for material culture recovered at Jaffa. Additionally, a reconstruction of the variety of local terrestrial, aquatic, and anthropogenic biomes of the Bronze and Iron Ages as represented in the archaeological record is presented.

It is argued here that the fundamental connections between all the sites in various periods can be interpreted through the framework of a maritime cultural landscape. Thus situated, Jaffa served as a gateway for the coastal plain and the highlands, connecting inland sites with materials from the coast and acting as a transit point for commodities produced inland that would be transshipped to other gateways in the eastern Mediterranean. Despite fluctuations in Jaffa’s prominence resulting from changes in political control, shared material culture with inland sites illustrates the strong connections that Jaffa forged with its hinterland as a unique central place within the settlement system of the coastal plain.
The dissertation of George Allen Pierce Jr. is approved.

Elizabeth F. Carter

Sarah P. Morris

Aaron Alexander Burke, Committee Chair

University of California, Los Angeles

2015
For Krystal Victoria and Victoria Diem,
erstwhile residents of Israel’s coastal plain,
and our newcomer, George Allen III,
who patiently endured the absence of a husband and father
while this work was completed
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Curriculum Vitae

Education
MA, Wheaton College 2005
Biblical Studies (Archaeology Concentration)

MSc, University of York 2004
Archaeological Information Systems
Thesis: “A GIS-Based Regional Survey of the Dothan Valley: The Early Bronze Age Sites”

BA, 1999 Clearwater Christian College
History (Major), Biblical Studies (Minor)

Publications


Conference Papers and Presentations


Maritime Cultural Landscapes of the Central Coastal Plain: An Examination of Jaffa and Its Hinterland. Invited lecture at Al-Quds University Dept. of Archaeology (Abu Dis, PALESTINE) April 2013.


The Late Bronze Age Bichrome Ware of Jaffa. Paper presented at the Annual Meeting of the American Schools of Oriental Research (Boston, MA) November 2008.


Fellowships, Grants, and Awards
US Dept. of State Educational and Cultural Affairs Fellowship, W.F. Albright Institute of Archaeological Research (September 2012–May 2013)
President’s Fellowship, UCLA (Academic Year 2012–13)
Dissertation Year Fellowship, UCLA (Academic Year 2012–13)
Annual Meeting Student Travel Grant, American Schools of Oriental Research (November 2011)
Mellon Foundation Pre-Dissertation Research Fellowship (Summer 2011)
Sara & Chaskel Roter Research Fellowship, UCLA Center for Jewish Studies (Summer 2010)
Near Eastern Languages & Cultures Departmental Travel Grant, UCLA (2008, 2009)
Platt Fellowship Grant, American Schools of Oriental Research (Summer 2009)
Graduate Research Mentorship, UCLA (Academic Year 2008–09)
Steinmetz Travel Grant, Cotsen Institute of Archaeology, UCLA (Summer 2008)
Graduate Summer Research Mentorship, UCLA (Summer 2007 and Summer 2008)
Lindstrom Travel Grant, American Schools of Oriental Research (November 2006)
EU Marie-Curie/ CHIRON Early Stage Research Fellowship, Ben-Gurion University of the Negev (April 2005–April 2006)

Teaching and Research Experience
Teaching Fellow, UCLA, ANNEA 10W “Jerusalem: The Holy City”
Teaching Fellow, UCLA, NR EAST 50A “First Civilizations”
Graduate Student Research Assistant, UCLA, Dr. Aaron A. Burke
Marie Curie/CHIRON Research Fellow, Ben-Gurion University of the Negev, Archaeology Division, Dr. Isaac Gilead
CAD Technician, University of York Castell Henllys Project, Dr. Harold Mytum
Publication Assistant, Southern French Alps Landscape Project, Dr. Kevin Walsh
Draftsman/ Research Assistant, Wheaton College Anthropology & Sociology Dept., Dr. Dean E. Arnold
Laboratory Research Assistant, Wheaton College Archaeology Laboratory, Dr. Daniel M. Master
Chapter 1: Regional Connections and the Question of Jaffa and its Hinterland

“No man is an island, entire of itself; every man is a piece of the continent, a part of the main.”
John Donne, Meditation XVII, *Devotions upon Emergent Occasions* (1959 [1624]: 108)

1.1 Introduction: Regional Archaeology and Connections

John Donne’s observation on the human condition of not existing in isolation but rather being connected to each other rings equally true for archaeological sites. Archaeological sites, for the most part, do not exist in isolation. No site is an island (even island sites); sites are situated within regions, however defined, and interact with their natural environment as well as other sites on numerous levels. The necessity of regional syntheses for archaeology cannot be overstated. Such studies help to determine relationships between people, land, and resources (Renfrew and Bahn 1999: 74). They also serve to increase awareness of regional diversity and complexity of adaptations as well as the rate of change (Trigger 1989: 286). Regional analysis can be a tool for study of settlement mechanisms (Finkelstein and Lederman 1997: 1), informing the archaeologist of non-habitation sites such as artifact scatters, field boundaries, and even isolated agricultural installations that give evidence of human interaction with the surrounding landscape. Even the “empty space” between sites attests to land use, or lack thereof, and contributes to the knowledge of a region as much as a major site (Smith and Parsons 1989: 179). These studies act a first step to provide means of comparison to other regions or periods (Kowalewski 2008: 248). Archaeological syntheses on a regional scale place sites with long occupational histories such as Rome, Athens, Jerusalem, or Acre within a broader context, elucidate their function within a settlement system and, when examined diachronically, can assess the changes in regional settlement patterns and systems as the site expanded or contracted over time.
For Levantine archaeology, regional syntheses are requisite to evaluate persistent broad questions of chronology, culture history, social and political organization and commercial associations. Such a regional focus for the Middle Bronze Age stimulates queries about the chronology of re-urbanization of Canaan in relation to established ceramic series (Cohen 2002) and interregional cultural connections vis-à-vis the Amorite koine visible in the archaeological record (Burke 2008: 160).¹ Late Bronze Age regional studies may consider the degree of Egyptian hegemony, local autonomy or frontier status of a region (Bunimovitz 1995) or its position within the “international” trade network of that period (Feldman 2006; Aruz, Benzel, and Evans 2008). Studies of the early Iron Age concerning Philistine migration, Israelite emergence, or Canaanite perseverance (Faust 2006; Shavit 2008; Faust and Katz 2011) as well as those of the later Iron Age confronting state formation and imperial control (Finkelstein 1999, 2003) require regional perspectives. The common thread throughout regional settlement studies and underscoring these overarching research topics in Levantine archaeology recalls Donne’s expression of connection and emphasizes the notion that rarely would a site exist in isolation.

Fundamentally, archaeology examines connections and identity, two facets of the human experience scalable from the individual level, how one sees oneself (identity) and how one exercises agency to interact with others (connections) to the regional and supra-regional levels with collective identities of a people group and connections realized through cultural, political,

¹ Within this study, a tripartite division of the Middle Bronze Age will be used (Ilan 1995: 297); thus, MB I = MB IIA in literature (ca. 1940/20–1750/30 B.C.E.), MB II = MB IIB (ca. 1750/30–1600 B.C.E.), and MB III = MB IIC (ca. 1600–1530/1470 B.C.E.), based on synchronisms in chronology between Egyptian sources and radiocarbon dates from the southern Levant (see Marcus 2003). Divisions of the Iron Age follow the Modified Conventional Chronology as outlined by Mazar (2005: 16; 2007: 122): Iron IA = ca. 1200–1150/1140 B.C.E., Iron IB = ca. 1150/1140–980 B.C.E., Iron IIA = ca. 980–840/830 B.C.E., Iron IIB = ca. 840/830–732/701 B.C.E., and Iron III ca. 732/701–539 B.C.E. For the purposes of this study, the Babylonian period, extending from the Babylonian destructions of Philistia and Judah in 605 and 586 B.C.E., respectively, to the onset of the Persian period in 539 B.C.E., will be considered Iron Age III. Thus, the chronological scope of this project extends from ca. 2000–539 B.C.E.
or economic bonds. The two concepts are neither mutually dependent nor exclusive. A region could be connected to another economically yet have no cohesive political or cultural identity between the regions, and the same situation could be extended to settlements within a region or groups or individuals within a site. In contrast to postmodern societies and the advancement of capital and manufacturing separated from the market that they serve, pre-Industrial Revolution societies were localized in that “personal interactions, economic production and exchange largely occurred within a set of relatively small spatial contexts” (Walsh 1995: 131). Thus, the connections between the inhabitants within a region and those of the region to other peoples in other regions are paramount, and studies using textual and archaeological evidence for these connections for Levantine ports of the Bronze and Iron Ages illuminate the types of connections these sites had with other sites and regions in the eastern Mediterranean.

1.2 Connections in the Levantine Littoral

Political, economic, and socio-cultural connections between commercial centers on the eastern Mediterranean littoral and their wider Vorland such as Egypt, Mesopotamia, Anatolia, Cyprus, and the Aegean are illustrated in the archaeological and textual records of the Bronze and Iron Ages. Studies of texts from Ugarit, imported pottery at Sidon and analyses of settlement patterns and ceramic petrography at Ashkelon illustrate the connections between port cities themselves as well as the connections to other eastern Mediterranean producers and consumers. In particular, the Late Bronze Age kingdom of Ugarit excelled in maritime commerce due to its geographic proximity to Cyprus, Anatolia, and inland routes to Mesopotamia, and ships from Ugarit reached Crete, Cyprus, Cilicia, the Levantine ports, and the eastern Delta (Vidal 2006: 270). Ugarit’s connections with other coastal sites along the Levantine seaboard such as Byblos, Beirut, Sidon,
Tyre, Akko, Ashdod, and Ashkelon through its port at Minet el-Beida are noted in Ugaritic letters and administrative document (Vidal 2006: 271–73; see also Yon 1994).

Vidal’s examination of connections between Ugarit and Ashdod illustrates the range of social and economic intercourse between the two cities (2006). Ashdod furnished raw material and finished products in wool (KTU 4.709; KTU 4.721:3; PRU VI 156), and jars of oil from royal stores delivered to the Ashdodite merchants, which might indicate reciprocity or hospitality on behalf of the palace (KTU 4.352:9).² It is interesting to note the presence of individuals from Ashdod at Ugarit and their status as being dependent on the sākinu, a royal official involved with trade, alluding to the integration of these Ashdodites into Ugaritic society as a merchant colony (KTU 4.96; KTU 4.635; Vidal 2006: 275).

The maritime and terrestrial connections of the Phoenician port cities of Tyre and Sidon are evident in various artifacts discovered at each site. In particular, Tyre’s relations with Cyprus in the tenth through eighth centuries B.C.E. are evinced by the Cypro-Geometric I, II, and III kraters, jugs, juglets, and bowls recovered from excavations at the al-Bass cemetery (Aubet and Núñez 2008). C. Doumet-Serhal provides a comprehensive overview of the kingdom of Sidon’s Middle Bronze Age and Late Bronze Age imports (2008). Ceramics from Mycenae, Crete, Cyprus, and Egypt attest to seagoing commerce with coastal sites like Sidon. Cylinder seals in a Syrian style including a presentation scene found at Ruweisé and a seal from the College Site with a Syro-Anatolian inspired guilloche dividing the field show the influence of these areas on glyptic produced by inland artisans (Doumet-Serhal 2008: 18–19). Ideational or creative connections between Sidon and Egypt are also evident in a locally made cosmetic box of

² In addition to the wool and textiles received from Ashdod as well as the grain from Aphek, Vidal posits that an additional raw material provided from the southern Levant was hippopotamus ivory (2006: 273). On the presence of hippopotami in the coastal rivers of the southern Levant, see the faunal discussion within the environmental reconstruction below.
hippopotamus ivory in the shape of a duck (Doumet-Serhal 2008: 40). Sidon’s relations with Cyprus and Euboea continued into the Iron Age as the Phoenician city-states grew in commercial power throughout the Mediterranean.

Three notable treatments illustrate Ashkelon’s economic and political connections with its hinterland and with the dominant economies of the Bronze and Iron Ages. L. E. Stager (2001) proposes an economic model centered on “port power” to explain Ashkelon’s place as an economic center for Early Bronze Age and Middle Bronze Age regional markets associated with the drainage networks of the southern Shephelah and coastal plain. Ashkelon’s merchants exploited the growing maritime trade by forging economic bonds with highland markets and transshipping the raw material or finished products to other eastern Mediterranean ports to reap considerable profits. In Stager’s estimation, the demand for Levantine products was great in Early Dynastic Egypt, and he posits that Ashkelon may have transshipped wine for the Dynasty 0 king buried in Tomb U-j at Abydos (Stager 2001: 631). The demand from Egypt during the Middle Bronze Age, especially during the Second Intermediate Period, for highland products such as resin, wine, oil, or timber, facilitated and encouraged the sea trade between Ashkelon and Avaris, modern Tell el-Dab’a, located in the Nile delta. The same demand by foreign markets for products from the interior of Canaan or the caravan trade from the eastern markets maintained Ashkelon’s economic advantage during the Iron Age, as illustrated by D. Master (2003; see discussion below).

Stager’s “port power” model for Ashkelon is partly supported by two additional analyses at the site and artifact levels. First, M. Allen (1997; 2008) conducted a survey to situate

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3 The specifics of this model as proffered by Stager (2001) and critiques will be addressed in the chapter dealing with theoretical frameworks.
Ashkelon in its regional context and test three settlement models in relation to trade and empire.\textsuperscript{4} Because of Ashkelon’s geographic position at the intersection of maritime and terrestrial trade routes, its “access resources” were critical to foreign powers (Allen 2008: 23). The results of Allen’s study indicate that the Bronze and Iron Age settlement patterns reflected the “access resources” model in which sites were oriented along trade routes that converged at Ashkelon whereas the later Classical and Islamic period settlement patterns conformed to an “organic” model in which smaller sites are arranged around central places and a larger degree of local autonomy is presumed. The value of Ashkelon and its region as a thoroughfare for goods rather than a “breadbasket” is evinced by the distribution, or lack thereof, of rural sites in Ashkelon’s hinterland (Allen 2008: 37). The regional analyses and economic and settlement paradigms proposed for Ashkelon such as “port power” or the “access resources” model can be tested against the regional settlement data and the archaeological record for a port such as Jaffa.

In addition to the regional analysis at the site level, D. Master (2003) has illustrated the political and economic connections between Ashkelon, its Assyrian overlords, Phoenician traders, and the inland centers of the southern coastal plain and Judean Shephelah using the petrographic evidence of the seventh century B.C.E. ceramic assemblage. While Ashkelon was politically subservient to the Late Assyrian regime, the ceramic corpus does not indicate strong economic integration with the empire. Rather, Ashkelon maintained its economic affiliations forged by its position at the economic nexus between the coastal plain, Shephelah, and Negev to the east and the Phoenician markets across the Mediterranean to the west.

Recognizing the potential for illustrating a port’s connection to its hinterland or centers further inland brings to light the absence of such a synthesis for Jaffa and its surrounding region.

\textsuperscript{4} Allen’s survey forms a portion of a geographically broader and chronologically more extensive treatment of settlement in the Ashkelon region in the recent work of Y. Huster (2015).
The history of scholarship for the region around Jaffa highlights the lacunae in current knowledge about the port and the coastal plain during the Bronze and Iron Ages. Presented below is a research design for the current project aimed at providing a much-needed synthesis of settlement history in the coastal plain and elucidating the nature of connections between Jaffa and contemporary sites farther afield.

1.3 The Problem of Jaffa in Its Regional Setting

The ancient mound of Jaffa (Gk. Joppa; Ar. Yafa), situated on the southern Levantine coast south of the outlet of the Yarkon River, was the closest maritime outlet for Jerusalem and other highland centers in ancient times. Jaffa has the distinct status of being one of the few ports on the southern Levantine coast featuring an almost continual occupation history from the Middle Bronze Age through the modern era. However, a survey of the literature about the archaeology of the coastal plain of the southern Levant, treated below, reveals two separate yet related problems. First, a lack of inclusion for Jaffa and other hinterland sites in archaeological and historical studies of the coastal plain is evident, likely due to the modern urban nature of Tel Aviv-Jaffa and the greater metropolitan area (Figure 1 and Figure 2). The dearth of accessible archaeological publications for research and salvage excavations and few references to Jaffa within ancient texts further complicate matters (Peilstöcker 2007: 149). Those studies that attempt to include Jaffa refer to outdated or faulty syntheses for Jaffa and its hinterland and often ignore data provided by salvage excavations (but see discussion of Faust and Safrai 2005 below). Second, many discussions about coastal sites and trade connections are sea-oriented, i.e., focused on the port and its connections to various overseas centers. Thus, investigations into imported pottery provide the “smoking gun” of maritime commerce (e.g., Doumet-Serhal 2008). With few exceptions, scant studies or frameworks exist for port-hinterland dynamics for eastern
Mediterranean littoral with a terrestrial focus. While the goods and materials, and their containers, imported to the region by maritime routes illustrate the thalassic affiliations of a coastal site, the presence of such objects at inland sites may illustrate just one of the possible arrays of connections between a port and its hinterland.

Figure 1: Overview of the central coastal plain of Israel showing modern cities and features (black labels), roads, and major archaeological sites (white labels). Note extensive urban sprawl of the greater Tel Aviv-Jaffa metropolitan area. Satellite image from Google Earth.
For the purpose of this study, the term “hinterland” is difficult to define concretely without referring directly to the research area. In modern economic terms, a hinterland is “the inland area from where a port produces the majority of its business” (Ferrari, Parola, and Gattorna 2011: 382). Concerning the hinterland of archaeological sites, the definition of such an area is flexible, since a center may have more than one hinterland and different types of hinterlands including political, social, economic, or religious. The spatial extent of an economic hinterland is dynamic, varying in respect to commodity and mode of transport, and transport in relation to the supply and demand of products at the port forms a logistical hinterland (Rodrigue and Notteboom 2006: 8–10). Since the types of cargo loaded at Bronze and Iron Age ports are considered bulk cargoes, distance from the port is one of the most important factor in the shape of a port’s economic hinterland (Rodrigue and Notteboom 2006: 5). Two additional types of hinterlands have been defined regarding port competition. A captive hinterland is a region in which a single port has a competitive advantage over other ports capable of handling the region's cargo. In contrast, a contestable hinterland has no single port with an advantage leading to port competition (Talley 2009: 143). For a contestable hinterland, ports may exert “gravitational forces” to attract goods from the hinterland, including “the presence of an international business environment” (Ferrari, Parola, and Gattorna 2011: 383). The presence of an international
business environment at Jaffa is manifest in the international character of the Akkadian letter from Takuhlina, a prefect of Ugarit, to Haya, an Egyptian vizier, found at Aphek in which Takuhlina sends his agent Adduya to collect 250 parīsu, or about fifteen metric tons, of wheat that the Ugaritians had given to an individual named Turšimati (Owen 1981a, b). I. Singer interprets the letter as a purchase of Canaanite or Egyptian wheat by Ugarit, probably from crops grown at the Egyptian estate of Aphek (1983: 34). The ramifications of the Egyptian administrative presence for Jaffa’s prominence over other regional maritime centers in a captive hinterland, especially in the Late Bronze Age, are clear. As other outlets such as Yavneh-Yam and Apollonia-Arsuf were established in the Iron Age, the region became a contestable hinterland for which the multiple ports may have competed.

Concerning the different categories of hinterlands in relationship to a settlement center, J. Schwartz (1991: 31) examines Lod in the Roman period, comparing Lod as a major religious and cultural center to a settlement near Emmaus in the hills that may have been in Lod’s religious hinterland while falling outside of its political or economic sphere. Schwartz attempts to define the relationship between center and hinterland stating that a settlement must reach a certain level of development in order to be considered a “center,” information must be available about the relationship between such a city and its hinterland, and that relationship must have importance for the history of the city (1991: 31). After rejecting a discussion of biblical Lod due to the lack of written information about its relationship with a potential hinterland, he clearly states that “we seek to write the history of Lod and not its hinterland. We shall, therefore, concentrate on how its relationship to its hinterland influenced its history and development and not vice versa” (Schwartz 1991: 31). The current study seeks the opposite approach in that it does not seek to write a history solely of Jaffa, and more attention is paid to the hinterland, the immediate region
commercially served by the port, than the port city at times. The lack of textual information is not prohibitive given the periodic silence from ancient texts about the central coastal plain.

In light of silent or inaccurate regional synthesis, new analyses of Jaffa’s material culture recovered from excavations conducted over the last sixty years necessitate the current study of Jaffa’s role focused on regional settlement patterns and systems and material culture to elucidate the potential economic and cultural connections between the port and inland sites, both urban and rural in nature. Situated within a maritime cultural landscape, Jaffa served as a gateway for the coastal plain and the highlands, connecting inland sites with materials from the coast and acting as a transit point for commodities produced inland that would be transshipped to other gateways in the eastern Mediterranean. Despite fluctuations in Jaffa’s prominence resulting from changes in political control, shared material culture with inland sites illustrates the strong connections that Jaffa forged with its hinterland as a central place within the settlement system of the coastal plain.

1.4 History of Scholarship

The aforementioned examples of Levantine ports with extensive commercial ties throughout the eastern Mediterranean provide the impetus for a synthetic, longue durée study examining the maritime and terrestrial connections of the port city of Jaffa and its regional context of the central coastal plain of modern Israel. The history of scholarship and a review of the literature about Jaffa, other urban centers, and the regional settlement systems of the central coastal plain illustrates the lacunae in knowledge, outdated information based on faulty treatments, and the scarcity of discussion about relationships between coastal and inland sites in regional syntheses treating Bronze and/or Iron Ages. Scholarship centered on the coastal plain falls into the three main categories of publications of research and salvage archaeological excavations, results of
full-coverage archaeological surveys, and synthetic works addressing a variety of concerns including demographics, the rural sector, political control, and issues of change and continuity. An additional sub-category of Jaffa-centric studies reflects the state of knowledge within current publications.

1.4.1 Research and Salvage Excavations

Major excavations conducted in the twentieth and twenty-first centuries have concentrated on larger, more visibly prominent sites in the region, and this aspect of the history of archaeological inquiry in the central coastal plain can be gleaned from encyclopedic articles. These field operations generated much data that contribute to the discussions of chronology and material culture dominating traditional “biblical” archaeology. Salvage excavations resulting from construction or demolition projects have been carried out in the region by the Department of Antiquities during the British Mandate and later under the auspices of the Israel Department of Antiquities and Museums (IDAM) and its successor, the Israel Antiquities Authority (IAA).

In general, four phases of exploration and significant research excavations can be distinguished, starting with the initial fieldwork on visible mounds in the early twentieth century based on the surveys and historical geographies produced by E. Robinson (1874), V. Guérin (1874–1875), C. R. Conder and H. H. Kitchener (1881–1883), and G. A. Smith (1896), amongst others. From the 1950s to 1970s, much of the archaeological efforts in the region concentrated on Jaffa and Tell Qasile, although Apollonia-Arsuf, whose Crusader remains had been documented in the nineteenth century, was also partially excavated as part of salvage operations. A renewed interest in the Yarkon River basin followed during the 1970s and 1980s after the

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5 It is interesting to note that while Robinson’s travel itinerary includes portions of the southern Sharon and the Ayalon River basin, Robinson himself did not visit Jaffa (Robinson 1874: 233). According to his travelogue, “Yâfa was closed” due to the plague and was reopened during his visit to Ramleh, but Robinson and his party continued eastward toward Jerusalem.
establishment of the Institute of Archaeology at Tel Aviv University. Lastly, the 1990s witnessed continued research excavations at Tel Gerisa, Apollonia-Arsuf, and Jaffa in addition to an increase in salvage excavations in the Tel Aviv-Jaffa metropolitan area.

Among the earliest archaeological efforts in the vicinity of Jaffa were the 1903 excavations by G.A. Barton to find the harbor of Solomon (Hanauer 1903a, 1903b). Due to the urban nature of Jaffa, excavations were not conducted until P.L.O. Guy’s 1948–50 fieldwork in the area demolished by the British during Operation Anchor in the 1930s, followed by J. Bowman, B.S.J. Isserlin, and K.R. Rowe of the University of Leeds in 1952 who continued in Guy’s stead after his passing (Isserlin 1950; Bowman, Isserlin, and Rowe 1955). Jacob Kaplan’s operations on the mound of Jaffa between 1955 and 1974 comprising ten excavation areas, together with later work by Haya Ritter-Kaplan, his wife, in 1978 and 1981, are fundamental to the present archaeological understanding of the site (Peilstöcker 2011a). Although his publications consist of preliminary reports and overviews, current archaeologists are indebted to his monumental efforts (Kaplan 1959, 1972; Kaplan and Ritter-Kaplan 1993a). Jaffa has witnessed numerous salvage excavations as urban renewal has gained momentum since 1992, in addition to limited work to facilitate tourism (Brand 1994; Levy 1999). Later research excavations were accomplished in 1997 and 1999 in Kaplan’s Area A by Z. Herzog of Tel Aviv University as part of a larger regional study in the central coastal plain that included excavations at Tel Michal and Tel Gerisa (Herzog 2008). Since 2007, the Jaffa Cultural Heritage Project (JCHP) under the direction of Aaron A. Burke and Martin Peilstöcker (see Burke and Peilstöcker 2011) has not only started the Kaplan Excavations Publication Initiative to fully publish the material from Kaplan’s excavations at Jaffa (Burke 2011b) but has also launched a program of

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6 M. Peilstöcker (2011a) has presented a comprehensive history of archaeological exploration in Jaffa with details of salvage excavations.
research excavations in Kaplan’s Area C near Qedumim Square (Burke, Peilstöcker, and Pierce 2014) and the Ramses Gate and Lion Temple portions of Area A with the goal to assess and clarify Kaplan’s stratigraphy (Burke et al. forthcoming), and initiated the Ioppa Maritima Project with S. Wachsmann to identify the location of the ancient harbor and conduct further archaeological research in Jaffa (Wachsmann 2014).

Archaeological explorations were conducted at other sites in the coastal plain during the British Mandate in the early twentieth century. Salvage excavations at Apollonia-Arsuf (Tel Arshaf) directed by I. Ben-Dor and P. Kahane in 1950 discovered pressing installations and evidence of glass manufacturing (Ben-Dor 1951; Kahane 1951). From 1982 to 2004, I. Roll led research excavations at Apollonia-Arsuf on behalf of Tel Aviv University recovering Iron Age pottery from pits in the Persian period levels (Roll and Ayalon 1989, 1993), and the current excavations are directed by O. Tal. Further south, J. Ory surveyed the area of Makmish in 1922 and proposed that the name of the site was Mekal, from which the name Tel Michal was derived. N. Avigad excavated the area of Makmish between 1958 and 1960, and fieldwork from 1977–80 was accomplished under the direction of Z. Herzog that included archaeological and geological surveys (Avigad 1993b; Herzog 1993b).

Four major sites along the Yarkon River, from its headwaters at Ras el-‘Ain (Heb. Rosh Ha-‘Ayin) to its outlet near the Tel Aviv harbor, greatly contribute to the history of the region in the Bronze and Iron Ages. Two sites on the Yarkon, Tel Gerisa, and Tell Qudadi were excavated by E. Sukenik with the assistance of S. Yeivin and N. Avigad between 1927 and 1950. Sukenik’s excavations at Tel Gerisa (Tell Jerishe), also called Napoleon Hill, revealed remains from the Early Bronze Age to the Iron Age, including a Middle Bronze Age glacis that was later re-excavated by S. Geva in 1976 (Geva 1982). Z. Herzog resumed work at the site intermittently.
from 1981–92 (Herzog 1993a). At Tell Qudadi (esh-Shuna), located at the mouth of the Yarkon River, in 1937–38 the excavators exposed, inter alia, a portion of a fortress dated to the eighth and seventh centuries B.C.E. currently being re-examined for publication by A. Fantalkin and O. Tal (2009; see also Avigad 1993a).

Contemporary with Guy’s explorations at Jaffa were the excavations by B. Mazar (Maisler) in 1948–50 at Tell Qasile, on the northern bank of the Yarkon nearly opposite of Tel Gerisa, under the auspices of the Israel Exploration Society (Maisler 1951). Further fieldwork on the mound from 1971–74 and 1982–89 directed by A. Mazar exposed a Philistine cult complex and offered a revised stratigraphy for the site based on his excavations (Mazar 1993). Additionally, several salvage operations were conducted on the lower slopes of Tell Qasile and in the vicinity as the Eretz-Israel Museum developed and revealed Middle Bronze Age features as well as additional Iron Age material.

In the 1920s, W. F. Albright surveyed the mound of Ras el-‘Ain at the headwaters of the Yarkon and found sherds ranging in date from the Middle Bronze Age to Iron Age I that led him to conclude that the site was ancient Aphek-Antipatris (Albright 1923). Early excavations included salvage work during 1935 and 1936 by J. Ory prior to construction of a proposed water supply for Jerusalem and operations on the southern slope of the mound by A. Eitan in 1961 (Eitan 1969, 1993). M. Kochavi of Tel Aviv University directed excavations at Aphek from 1972–85 as part of a regional project that included archaeological survey and fieldwork at ‘Izbet Sartah (Beck and Kochavi 1993; Finkelstein 1986, 1993).

Two additional sites of significance have only been excavated as a result of salvage work since their mounds have been either covered by modern development, not yet excavated, or both. Within the modern municipalities of Holon and Azor south of Tel Aviv-Jaffa, the construction of
Holon’s industrial area and growth of both towns has revealed a substantial burial complex dating from the Chalcolithic to the Iron Age and some graves from a Muslim cemetery (Perrot, Ben-Tor and Dothan 1993; Ben-Shlomo 2012). Fieldwork in the environs of Lod unearthed settlement remains dating from the Pottery Neolithic to the Iron Age with infrequent occupation in later periods (Kaplan 1993b). Salvage operations have intensified since 1990, including an extensive effort by E. Yannai and O. Marder in 2000 that revealed Iron Age wine presses (Yannai 2008b).

1.4.2 Surveys

Archaeological surveys conducted in the region recorded less-visible sites and present a fuller picture of the settlement pattern in the region. While primarily focused on topography, Conder and Kitchener (1881–1883) recorded the natural and cultural landscapes of Palestine, including notes on visible archaeological features that, for the sites in this study, mainly dated to the Roman-Byzantine and later periods. In addition to the nineteenth century topographic and toponymic surveys in the region, J. Kaplan’s survey of the southern bank of the Yarkon River, conducted prior to major regional excavations and preparatory to the expansion of Tel Aviv, illuminated the history of settlement in the area that stretched back to the Neolithic (Kaplan 1953). Kaplan described the natural topography, attempted to reconstruct ancient roads based on the location of sites, and reported ten sites near the Yarkon River between the Ayalon River and the sea. Kaplan dated three of these sites, Namal Tel Aviv (Havakkuk Street), Slaughterhouse Hill (Heb. Givat Bet HaMitbahayim), and el-Hikhar, to the latter part of MB II–III with Slaughterhouse Hill having additional material dated to the Iron Age (Kaplan 1953: 160). Although minimally published, Kaplan’s survey of the sites in Tel Aviv revealed glimpses of the
rich settlement history of the Yarkon basin and the periods in which site occupation intensified and abated.

Archaeological surveys of the Maps of Herzliyya (69), Kefar Sava (77), Rosh Ha-‘Ayin (78), and Lod (80) were conducted under the aegis of the Tel Aviv University Institute of Archaeology and the Archaeological Survey of Israel (ASI; Kochavi and Beit-Arieh 1994; Gophna and Beit-Arieh 1997; Gophna and Ayalon 1998; Beit-Arieh and Ayalon 2012). In conjunction with the excavations by Tel Aviv University at Tel Michal, R. Gophna conducted a survey of the coastal area around modern Herzliyya that included the ancient sites of Tel Michal and Apollonia-Arsuf. This effort was later supplemented by surveys conducted by E. Ayalon in the central and eastern portions of the survey area and preliminarily published in various articles and volumes (Gophna 1978; Gophna and Bunimovitz 1980; Gophna and Ayalon in Herzog 1980; Gophna and Ayalon 1989, 1998). Gophna also conducted surveys in the Tel Aviv-Jaffa metropolitan area as the Maps of Tel Aviv-Yafo (70) and Petah Tikva (71); these surveys have been published online by the Archaeological Survey of Israel (Gophna 2015a, b). The Institute of Archaeology at Tel Aviv University also conducted intensive surveys in the regions of Rosh Ha-‘Ayin and Lod under the direction of M. Kochavi and R. Gophna, respectively, with further surveys by I. Beit-Arieh (Kochavi and Beit-Arieh 1994; Gophna and Beit-Arieh 1997). In different stages, Beit-Arieh, Ayalon, and Kochavi oversaw the fieldwork around Kefar Sava, which is also published online (Beit-Arieh and Ayalon 2012). In 2008, L. Barda completed a survey of the area south of Jaffa around Holon, published online as the Map of Miqve Israel (72; Barda 2013). The results of these surveys are discussed with the overall patterns observed in this study below.

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7 The names of maps and the numbers in parentheses used by the Archaeological Survey of Israel correspond to paragraph numbers in the Registry of Monuments and Historical Sites, Reshumot–Yalqut Ha-Pirsumim No. 1091.
An additional venture that must be noted is the field survey conducted in several stages preceding the construction of the Cross-Israel Highway and its interchanges (the Yitzhak Rabin Highway, or Highway 6; Dagan 2011). This fieldwork resulted in the identification of one hundred and twenty-five sites, including settlements, agricultural installations, ancient roads, burial caves, and field boundaries and terraces, each of which were later excavated by the Israel Antiquities Authority in most cases with the remainder of the excavations carried out by teams from Israeli universities (Dagan 2011: 153). The overall extensive length of the intensive survey helps to offset the narrow, 100 to 150 meters wide corridor of the roadbed. Just as the completed areas revealed details about settlements in the various geographic zones the highway transects, northern and southern extensions of the Cross-Israel Highway currently necessitate further survey and excavations and will yield additional knowledge of settlement patterns in the alluvium of western Galilee and marginal areas of the Negev between Beer Sheva and Eilat.

1.4.3 Regional Studies

Syntheses examining a site’s regional context and function or the archaeology, settlement patterns, or socio-political organization of the region as a whole have attempted to clarify the settlement pattern or the roles of specific sites within the area.8 R. Gophna and J. Portugali (1988) published an analysis of the protohistoric settlement patterns from the Chalcolithic to the Middle Bronze Age in a study of the relationship between socio-cultural transformation and population increase. More recently, A. Faust and Y. Ashkenazy examined settlement patterns in the coastal plain during the EB II–III in light of environmental data for the period to explain the

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8 Published research with a specific focus on texts for discussions of historical geography (e.g., primarily concerned with Egyptian or Assyrian campaigns or the organization of the Solomonic districts as represented in 1 Kings) are discussed later in conjunction with the ancient texts that mention sites or the region. See also larger investigations of settlement patterns and populations for EB II–III (Broshi and Gophna 1984), MB II (Broshi and Gophna 1986), and Iron II (Broshi and Finkelstein 1992) that treat the Sharon plain and Philistia (the central and southern coastal plain) as either one unit or two sub-units within their discussion.
decrease in sites contrasted against population increase in other regions of Israel (2007, 2009). Gophna and P. Beck (1981) presented a regional synthesis focused on the Middle Bronze Age rural settlement pattern of the coastal plain and the associated ceramics as a complement to the ceramic studies of Beck at Aphek (Beck 1975, 2000). A thorough treatment of the pottery from twelve unwalled sites was accompanied by a list of thirty-eight additional unfortified sites discovered through survey and salvage operations. Gophna (1984) also examined Early Bronze Age and Middle Bronze Age fortified sites to ascertain whether Early Bronze Age or Middle Bronze Age defenses are determinants of site outlines and compared sites of each period in various regions that were not fortified in the other period (i.e., Early Bronze Age sites without Middle Bronze Age fortifications or Middle Bronze Age sites absent of Early Bronze Age defenses). His analysis showed that Middle Bronze Age sites with their ancient outline preserved were composed of freestanding earthen ramparts (see also Kaplan 1975: 1–8; Burke 2008).

Recent regional investigations of the central coastal plain during the Late Bronze Age and Iron I in terms of continuity and change in material culture and centered on the site of Aphek-Antipatris were accomplished by Y. Gadot (2003; 2008). Gadot’s initial study focuses on changes in material culture, or lack thereof, in relation to settlement patterns and political control of the region in an attempt to reconcile the “discontinuity between historical periodization and material culture” and to ascertain what socio-historical processes took place in the Late Bronze and early Iron Ages, how those changes can be explained, and how the changes fit within the political history paradigm (Gadot 2003: ii). For Gadot, the three most relevant issues are the effect of historical events on material culture, the rate of societal change, and how differences in the spatial distribution of material culture can be explained, embracing both a processual view that change is the result of social, economic, or political forces and the interpretive/post-
processual ideal that material culture must be situated within its social and symbolic context. Gadot’s dissertation utilizes the stratigraphy of Aphek-Antipatris and presents a ceramic typology of the relevant strata in relation to regional and supra-regional sites (see also Gadot 2009a), later examining stratigraphic sequence of other sites such as Tel Michal, Tel Qasile, Jaffa, Tel Gerisa, Azor, Lod, and ‘Izbet Sartah in addition to seventeen survey sites and the relative and absolute chronologies to present a picture of change in the region during this particular timeframe. He also reviews settlement patterns in the Early Bronze Age, Middle Bronze Age, and the Ottoman period to gain a long-term perspective on social change. Gadot’s efforts focus on the recursive relationship between humans and the environment and the crucial role of water management in areas prone to stagnation and swaps. The themes of continuity and change are well-illustrated through the regional typology of the Late Bronze Age and Iron Age assemblage at Aphek, the similarities between regional assemblages at Aphek and ‘Izbet Sartah, and the identification of non-local forms such as Egyptianized ceramics at Aphek or the Philistine corpus at Tell Qasile.

Gadot also published other studies concerning Aphek and its role in the Yarkon basin during the Late Bronze Age and Iron I. Concerning the latter period, Gadot discusses the sites in the region with Philistine material culture and the connections between Yarkon and Ayalon river basin sites and the Philistine pentapolis to the south as part of a frontier-homeland model (2006). He has also re-assessed the cultural identity and function of Building 1104 at Aphek, the so-called “Egyptian Governor’s Residence,” in light of the material culture from the structure and the Late Bronze Age Egyptian texts naming Aphek and Jaffa (Gadot 2010).

Lastly, A. Faust (2007) presents a study of settlement patterns that show decline in the coastal plain in the eighth century B.C.E., generally considered to be a prosperous time,
contrasted with a boom in settlements earlier in the tenth century. Basing the examination on planned and salvage excavations as well as previous survey results, Faust presents the settlement pattern of the Yarkon basin and the Sharon Plain in contrast to other parts of the coastal plain and areas further inland to better inform the understanding of the settlement process and its causes in the tenth centuries B.C.E.

1.4.4 Jaffa-specific Studies

Jaffa may be one of the most frequently mentioned sites in current scholarly literature on ancient Israel, yet it remains one of the most under-published archaeological sites. The principal excavator of Jaffa, J. Kaplan, published a synthetic overview of the history and archaeology of Tel Aviv-Jaffa from the Neolithic to Roman-Byzantine period (1959, 1972). Kaplan’s narrative summarized the survey of northern Tel Aviv that prompted the mayor to endorse planned excavations before urban expansion obscured them, his own excavations at Jaffa, and his excavations of various sites of wide-ranging periods in the coastal plain and Jezreel valley (Kaplan 1972: 66). Although lacking scientific details regarding the material culture for each period treated, Kaplan’s discussion of various periods, including his terminology, reveals the current archaeological opinions of his day.9 Despite its outdated concepts and less-than-critical integration of textual sources and archaeological material, Kaplan’s descriptions of smaller sites in Tel Aviv such as Sde Dov or General Hill Square on Slaughterhouse Hill remain useful hypotheses about the character and function of these sites. Overall, Kaplan’s synthesis and his

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9 A. Burke (pers. comm.) has also observed that the scale of Kaplan’s discussion varies from site to region to the entirety of Canaan within the course of a paragraph (see Kaplan 1972: 78). Note the discussion of the Late Bronze Age that begins with a paragraph describing the attributes and distribution of Cypro-Canaanite Bichrome Wheel-Made Ware, proceeds to the first sentence of the next paragraph dealing with the regional Bichrome exemplars, a sentence about a locus of vessels in burned debris (likely not Bichrome Ware), followed by a description of the MB II–III cemetery Kaplan excavated on Havakkuk Street near the Tel Aviv harbor.
preliminary chronology established a starting point for later stratigraphic discussions and overviews of Jaffa and its regional setting.

Given the sparse knowledge about Jaffa in the Iron Age, Persian, and Hellenistic periods, A. Fantalkin and O. Tal summarize archaeological investigations yielding first millennium B.C.E. remains and presents a regional analysis of settlement patterns and political control during that chronological span (2008: 228). Their meager evidence for an Iron IIA occupational phase comes from Area B, located under the floor of the Hammam restaurant adjoining the Jaffa Museum (see also Keimer 2011), red slipped, hand-burnished kraters from Area A 1970 excavations, late Iron I–Iron IIA fills from Z. Herzog’s excavations, and references in salvage excavation reports. Much attention is paid to Fantalkin’s excavations of wine presses in a small portion of the Ganor Compound that he dates to the ninth century B.C.E. (Fantalkin 2005; Fantalkin and Tal 2008: 230–36). Based on their reconstruction of Philistine and Late Assyrian control, Fantalkin and Tal conclude by stating that “Jaffa’s status as one of the most prominent cities of Palestine in ancient times is rather an artificial construction, at least when analyzed against first millennium B.C.E. realia” (2008: 264).

A. A. Burke (2011a) presents a synthetic settlement history of Jaffa from the Bronze Age to the Persian period. Stressing Jaffa’s role as a major commercial center for these periods, Burke details the geographic situation of Jaffa, specifically the terrestrial topography and deduced ancient hydrography, its location between the ports of Dor and Ashkelon, and its role as a node within a network of harbors on the Levantine coast facilitating trade between Egypt, Cyprus, and the Levant. The diachronic assessment of the material culture and relevant texts

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10 The dating of the glacis under the Hammam proved to be either confusing or elusive to Fantalkin and Tal who cite the discrepancies in dates given in Kaplan’s publications, posit an Iron IIA occupational area under the Hammam, and fail to mention the glacis in their later discussion of Jaffa in the Iron IIB–C.
shows Jaffa’s shifting role in the Middle Bronze Age and Late Bronze Age from a maritime outlet for Aphek to a cosmopolitan administrative center under Egyptian control replete with Near Eastern social elements such as maryannu and ‘apiru, and later in the Iron Age from a coastal site interacting with the Philistines during the late twelfth and eleventh centuries B.C.E. to its renewed status as a maritime gateway for the inland capital at Jerusalem during the United Monarchy, as a pawn in the contest between local kings and the Assyrian empire in the late eighth century B.C.E., and finally as a commercial center within the Sidonian economic sphere in the Persian period. After Burke discusses Jaffa’s place wider in the eastern Mediterranean trade networks of the Bronze and Iron Ages, he enumerates remaining questions concerning the date of Jaffa’s settlement in the Middle Bronze Age, its affinity to and integration with Phoenicia or whether it was simply “host to mariners from other regions,” and the evidence of interaction with the kingdoms of Israel and Judah (Burke 2011a: 74).

W. Zwickel integrates historical sources, including the topographic list of Thutmose III and Ramesside papyri, the annals of Sennacherib and the Hebrew Bible, survey results, and excavation data from regional sites to assess Jaffa in its regional context during the Late Bronze Age and Iron Age (2011). He stresses the importance of Jaffa’s location as the first Mediterranean port one encounters from the south without any hindrance from sand dunes (Zwickel 2011: 79). Concluding his overview, Zwickel notes that Jaffa’s character in the Iron Age remains in question and that assumptions about Jaffa “greatly influence our perception of Jaffa’s centrality in the settlement pattern of the coastal plain during different periods,” leading to a call for a renewed, intensive study of Jaffa’s Bronze and Iron Age materials (2011: 91).

Questions, whether acknowledged or implicit, persist about Jaffa, its hinterland, the settlement pattern and systems of the coastal plain, and the connections between the sites to each
other and to the wider Near Eastern world, revealing gaps in our knowledge and interpretations about Jaffa and its regional context. What were the sequence of founding and the nature of the connections between Jaffa and other Middle Bronze Age sites, especially the political center at Aphek? To what degree is the Amorite cultural koiné, visible elsewhere in the archaeological record of Canaan, present in the archaeology of Jaffa and its neighbors (Burke 2008: 160)? What connections did Jaffa have with the region during Egyptian hegemony and was Jaffa simply an Egyptian entrepôt surrounded by subjugated agricultural sites supporting the Egyptian administration? How did the extent of Philistine settlement in the region following the establishment of a port at Tell Qasile on the Yarkon River manifest itself in Philistine interaction with the indigenous centers like Jaffa? Finally, how did the Late Assyrian campaigns, deportations, and settlement policies impact settlement patterns in the region after the fall of Samaria? While these questions seek to illustrate the connections between Jaffa, other sites in the central coastal plain, and the wider ancient Near East, the reasons why these sites were or were not connected can be suggested through the frameworks of landscape and regional settlement studies augmented by applicable economic models.

1.5 Research Design and Methodology

Certain elements are missing from the studies summarized above that are necessary to place Jaffa in its broader geographic and archaeological contexts, determine the location and periods of ancient sites within the region, and elucidate the commercial and cultural connections between these sites. First, a current understanding of Jaffa’s material culture recovered by the Kaplan excavations, as analyzed by JCHP staff, now enables Jaffa to be included within a regional discussion and impedes the perpetuation of incorrect data and misinterpretations. For example, while the overall impact of Gadot’s analyses and reconstructions were not greatly affected by the
absence of Jaffa’s ceramics, his treatment of Jaffa depends on the preliminary encyclopedia entry on Jaffa (Kaplan and Ritter-Kaplan 1993a) as well as personal communications by Z. Herzog and A. Fantalkin. Additionally, the lack of publication of Jaffa’s finds prevented Gadot from using Jaffa’s ceramics as comparanda for the Aphek assemblage from Area X (Gadot 2009a: 188). Second, all currently known archaeological sites of any size or nature in the area around Jaffa remain to be plotted to accurately assess the region’s settlement pattern and systems. Further, a regional ceramic typology based on established typologies from published research excavations into which the ceramic corpus from Jaffa as well as exemplars from surveyed sites and salvage excavations can be integrated will help to periodize the sites and greatly illustrate connections in ceramic affiliation.11 Thus, the current project utilizes various data sources discussed below to establish a catalog of sites and critically surveys documentation from all excavated and surveyed sites from fully published excavation reports to raw data files. This study also examines the pottery from all available publications in addition to unpublished ceramics from Kaplan’s excavations at Jaffa to situate sites diachronically, economically, and culturally.

This project seeks to reconstruct regional settlement patterns and systems of the central coastal plain of modern Israel (Bronze Age Canaan) centered on the port city of Jaffa and its hinterland from the beginning of the Middle Bronze Age to the end of the Iron Age (ca. 2000–539 B.C.E.).12 Such a broad diachronic aspect provides a long term perspective needed to illustrate the changing role of sites and the ties between them under various political regimes and

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11 It is acknowledged that pottery is but one category of material culture that can elucidate the various relationships between the sites in this study. However, given the ubiquity of pottery and the lack of other published artifacts from survey sites, the use of ceramics is justified. Other artifact groups such as scarabs, lithics, or metal objects are discussed as necessary.

12 A brief discussion of regional Early Bronze Age (3500–2000 B.C.E.) activities will establish prior settlement history since landscape should be viewed as a palimpsest, a concept developed in the discussion of the theoretical framework.
in light of settlement expansion and contraction throughout the Bronze and Iron Ages. Although some of this ground is well-trod by the various studies treated above, certain nuances to the established interpretations as well as new proposals for site interactions based on more substantial analyses than Kaplan’s synthetic articles are revealed by incorporating undervalued survey and salvage excavation data and unpublished material from Jaffa’s material culture.

1.5.1 Area of Interest

Any attempt at understanding regional patterns of settlement, subsistence, and commerce must naturally define the coverage, or area of interest, and establish the boundaries of the data collection (Kowalewski 2008: 227). The physical setting of the current study area is part of a larger, diverse geography, linked to a storied past through place names and ancient thoroughfares used by local people, invading armies, and merchant traders. The topography of Israel allows for its division into distinct regions, including the Coastal Zone, the Central Mountains, the Jordan Rift, and the Transjordanian Highlands (Aharoni 1979: 21–42). Within these zones, certain regions are delineated based upon physical geography, such as the Central Mountains’ division into the Galilee, Mount Ephraim, and the Judean Hill Country or the segregation of the Coastal Plain into the Sharon and Philistia.

Whereas deeply cut perennial stream beds, hilly topography or inter-montane valleys can provide natural boundaries for regional analysis, the demarcation of an area that includes Jaffa and other coastal sites is not as straightforward since Jaffa sits at the junction of the Sharon plain to the north and Philistia to the south (Aharoni 1979: 24–25; Figure 3). Combined with the lack of hills in the coastal plain, delimiting a study area based on topographical features is not practical, although an eastern boundary of the foothills east of Aphek and western boundary of the Mediterranean Sea seems applicable. The use of wadis as northern and southern boundaries
appears to be an ecological solution, but the Naḥal Poleg to the north and Naḥal Soreq to the south do not suggest a border for Jaffa’s territory by posing a hindrance to travel or being some other sort of *de facto* border even though it is clearly recognized that borders are more porous and not as fixed as the lines on a map would indicate. A distance of thirty kilometers has also been proposed (Burke 2008: 125–39), and this number seems more likely since it would represent the distance of one day’s journey on foot between Jaffa and inland centers of comparable size. Thus, an assessment of commerce and travel in the region can only be accomplished if the inland centers of Aphek and Lod are included.

In a review article on regional settlement pattern studies, S. Kowalewski (2008: 250) emphasized that “measurements involving relationships between settlements and between settlements and other places—vertical and horizontal complexity, rank-size, boundaries, interaction, and networks—all require regional-scale data...regions are thus not tens of square kilometers in size, but hundreds or thousands.” Therefore, eight 10 km by 10 km grid squares named and numbered as paragraphs in the Registry of Monuments and Historical Sites and employed by the Archaeological Survey of Israel provide a basis for this investigation (*Figure 3*). Namely, the grid squares for this study are the Maps of Herzliyya (69), Tel Aviv-Yafo (70), Petah Tikva (71), Miqve Israel (72), Rishon le-Ẓiyyon (73), Kefar Sava (77), Rosh Ha-ʿAyin (78), and Lod (80). Although these squares are imposed on the landscape without regard for topography or hydrology, an analysis of the settlements within this selection should provide a clearer picture of settlement in the region and permit a delineation of Jaffa’s hinterland in relation to those of Aphek and Lod based on the settlement locations and choices of the region’s ancient inhabitants rather than a modern imposed area based on grid coordinates, arbitrary travel distances, or natural features that do not form territorial boundaries.
Figure 3: Overview of study area showing topography, watercourses, major archaeological sites, and Archaeological Survey of Israel grid numbers.

1.5.2 Data Sources

Sources of data for this project include the site records within the database of the IAA, published geographic, environmental, ceramic, and architectural data from research and salvage excavations and archaeological surveys, and to a lesser extent, texts from the Bronze and Iron
The IAA database records for eight hundred and fifty-three archaeological sites, every archaeological site within the eight aforementioned grids, were provided by M. Peilstöcker of the IAA to facilitate the present study, conducted as a regional sub-project of the JCHP. These records contain, *inter alia*, the site name, type, coordinates of the area defined as an archaeological site by the IAA (in essence, a protective boundary much larger than the actual site), a brief description of the site and its material, a list of temporal periods represented at the site and the types of artifacts or features present for each period, a list of excavation permits issued for the site with excavator’s name and institutional affiliation, and a bibliography of published reports (Figure 4).

The excavation permit numbers, excavator names, artifacts, and periods were carefully verified for each site due to spurious information present within the database records. Overall, the IAA database record resembles the description of sites in ASI publications with the additions of excavation history and fuller bibliographies. While not all records have excavation licenses or published reports, every site’s basic spatio-temporal information allows the overall boundaries of each site to be plotted within a virtual environment in the Geographic Information System (GIS) software and compared against site coordinates as related in published surveys and excavation

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13 Previous investigations of the coastal plain reviewed above, while furnishing hypotheses to consider about settlement patterns and systems, often provide additional information such as expanded illustrations of finds or more detailed architectural information than normally reported about surveyed sites.

14 For example, this boundary encompasses the mound of Jaffa as well as the urban area east of Jerusalem Blvd. (see Zone 3 on Ajami 2011: fig. 3.1).

15 Information for four license numbers published individually as Mazor (El ‘ad) Sites 96–99 (A-3070/1999), Mazor (El’ad) Sites 50 and 62 (A-3333/2000), and Mazor (El'ad) Site 66 (A-3263/2000) are listed under nineteen distinct sites in the IAA database: (Mazor 1644/0, Rosh Ha-‘Ayin 1644/2, Rosh Ha-‘Ayin 1644/3, Rosh Ha-‘Ayin 1644/4, Mazor (East) 1646/0, Mazor (East) 1718/0, Khirbet el Qasr 1792/0, Rosh Ha-‘Ayin 9181/0, Rosh Ha-‘Ayin 9182/0, Rosh Ha-‘Ayin 9183/0, Ḥorvat Zikhrin (Southwest) 9184/0, Rosh Ha-‘Ayin 9188/0, Nahshonim (South) 9207/0, Rosh Ha-‘Ayin 9211/0, Triangulation Point 152-S 9212/0, Rosh Ha-‘Ayin 9213/0, Rosh Ha-‘Ayin 9214/0, Rosh Ha-‘Ayin 9216/0, Triangulation Point 155-S 9462/0). Two additional unpublished excavations by D. Amit and I. Zilberbod (A-2772/1997) and I. Zilberbod (A-3653/2002) are also listed under nearly all of these sites. This duplication of information likely occurred as result of creating new records within the database by copying existing records and not editing the fields with accurate site information.
reports to ascertain the correlation between the IAA database and sites identified in archaeological surveys.

Culling the IAA sites registry for sites outside of the temporal limits of this project and supplementing the remainder with sites from the archaeological surveys not represented in the database resulted in a data set for this project comprising 195 sites ranging from MB I to Iron II, presented in the site catalog (see Figure 5 and Appendix A: A Catalog of Archaeological Sites.
of the Middle Bronze, Late Bronze, and Iron Ages in the Central Coastal Plain of the Southern Levant).

Figure 5: Overview of study area with all sites from all periods (Middle Bronze Age–Iron Age II) shown. Shaded zones represent modern built-up urban areas.

Excavation reports present the environmental analyses, ceramic profiles, architectural plans, relative chronology, and occasional synthetic overviews integral to the present study.

Following B. Trigger’s admonition that “the study of settlement patterns must...be aided by the study of artifacts” (1968: 74), a regional ceramic typology using established typologies at
published sites such as Aphek, ‘Izbet Sartah, Tel Michal, Tell Qasile, Tel Gerisa and others can not only situate a site’s ceramics within their regional and temporal context but also illustrate the connections between a site and other centers. A regional approach such as this is necessary to help elucidate the nuances in the ceramics from each temporal phase of this study (Dever 1992: 107–08). Published ceramic forms from surveys and salvage excavations are placed within the larger typology to both better date those sites, adding a finer resolution to the overall chronology to the settlement systems, and ultimately provide more region-specific parallels for Jaffa’s ceramic assemblage.

1.5.3 Textual Records

Ancient texts can provide an added depth for settlement pattern studies, but the information therein can be meager (Wilkinson and Barbanes 2000: 406). The relevant texts for the central coastal plain of Canaan include the Execration Texts dated to the Twelfth Dynasty of the Egyptian Middle Kingdom (Posener 1940), the Amarna Letters of the LB IIA/ Eighteenth Dynasty in the New Kingdom (Moran 1992), cuneiform tablets found in Canaan (Horowitz, Oshima, and Sanders 2006) and Late Bronze Age Egyptian papyri. In addition, the Hebrew Bible and Assyrian annals serve as sources for the Iron Age I and II. Various other written or inscribed sources such as ostraca, seals, and sealings help to create a fuller picture of the wide array of administrative and socio-cultural endeavors that occurred in the region.

While the great value that texts provide for relating the place names in topographical lists as well as intimating the relationships between sites is acknowledged, this project seeks to first establish the settlement history of the central coastal plain, evaluate all inscriptional evidence within its social and spatial context, and then approach historical texts with a better understanding of horizontal and vertical organization of the region. Differences between the
archaeological and textual records especially concerning the presence or absence of sites will be addressed only after the patterns have been discussed. Although it may seem like a processual tactic to separate the archaeology from texts, Lord Lytton’s observation about archaeology’s relationship to history and art as a handmaiden and conservator, respectively, tends to hold true when sites are added to a settlement pattern based on interpretation of a text and not on archaeological evidence (Bulwer-Lytton 1874: 193). By prioritizing texts, even discussing texts before archaeology still places archaeology in a subservient role to history.

1.5.4 Evaluation of Data Sources

A critical evaluation of the excavation and survey data reveals potential biases and pitfalls that are acknowledged here. The drawbacks to data from various sources including research and salvage excavations and archaeological surveys are not insurmountable, and the limitations of one data set are typically mitigated by another. By utilizing all relevant data from published research excavations, a predisposition toward larger, urban sites in the data set, with ‘Izbet Sartah being an exception, is evident based on the large amount of published data compared to the cursory or absent publications from salvage excavations. Data from archaeological surveys can greatly supplement the urban-focused results of planned research excavations in historical reconstructions and provide relative comparisons between regions (Faust and Safrai 2005: 140).

Y. Aharoni stated that “an archaeological survey can provide a picture of the whole area and the occupational changes that have taken place in it” (1979: 101). Regional projects should have elements of survey combined with excavations at the larger central sites (Portugali 1982). Yet inherent problems with survey data also warrant caution. For example, a potential bias may exist towards certain areas like river valleys for Mesopotamia in light of the construction of dams

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16 Environmental and climatic data will be evaluated in the discussion of the ancient ecology of the coastal plain during the Bronze and Iron Ages below.
on both the Tigris and Euphrates since the 1980s or for development and road construction similar to the survey conducted in advance of the Cross-Israel Highway (Wilkinson 2000: 222; Dagan 2011). In their article championing the use of salvage excavation data, A. Faust and Z. Safrai (2005: 151) note that when discrepancies in chronology arise between surveys and excavation results, it is likely that the surveys are mistaken. Two factors could be responsible for such discrepancies. First, the older periods of a site may not always be visible on the ground surface. Regarding the sites surveyed and excavated preparatory to the construction of the Cross-Israel Highway, in most cases excavations encountered the same periods represented in the material collected by surveyors (Dagan 2011: 154). Some prehistoric and late antiquity sites were not visible due to alluviation, and others were only discovered during the course of the highway’s construction.17 Often, later surveys of an already surveyed area find more features or sherd scatters previously unnoticed.18 The second cause in differences between surveys and excavation results is related to specialization in ceramic studies in which pottery readings for survey sites are performed by specialists in other periods. Additionally, surveys that incorporate older published material may miscommunicate outdated information or misattribute a site to a particular period not actually present in that site’s occupational history.19 Other limitations of

17 From the author’s experience, a Chalcolithic necropolis at Horvat Qarqar (South) near Qiryat Gat was not observed during two previous surveys and was only found as a result of bulldozers grading the hill containing the burial caves.
18 A supplementary survey was conducted by M. Haiman (1998) in the area between the quarries east of Migdal Aphek and the Green Line, the demarcation of the 1949 armistice. He reported that most of the sites and features dated to the Byzantine period with the exception of three sites with Iron II and Persian-Hellenistic period pottery previously surveyed by Kochavi and Beit-Arieh (1994; ASI 78 sites 142, 145, and 151). In addition to those sites, Haiman also noted the presence of five sherd clusters without visible architectural remains in the survey area with ceramics dated from Iron II to the Byzantine period (Haiman 1998: 46*).
19 For example, in his recently published survey of the Map of Tel Aviv-Yafo, Gophna (2015a) includes a site at the corner of Hen Boulevard and Frishman Street in Tel Aviv on a roster of Iron Age sites, citing an earlier article by Kaplan (1955b). However, the IAA database did not indicate an Iron Age settlement at that site. Further investigation of Kaplan’s article reveals that the Hen Boulevard site was dated to the Early and Late Islamic periods starting from the “VIIIe siècle de notre ère” and was not dated to the Iron Age or discussed in that section of the original article (see Kaplan 1955b: 99).
survey data include missing periods, more visible pottery for a particular period (e.g., Attic wares are easier to distinguish from local pottery than undecorated Middle Bronze Age and Late Bronze Age forms that exhibit continuity), site sizes that are estimates or approximations, the surveyor’s definition of “site,” and the number of collected sherds being small and insufficient for meaningful conclusions (Faust and Safrai 2005: 152). Additionally, sites can be buried by alluviation or lakes formed by river dams or “erased” by farming, development, or other mechanical activities, making estimates of site sizes difficult.

The value in surveys includes the location of sites together with a gross overview of occupational periods, recognition of transitory settlement evidence, and the discernment of long-term trends. Surveys and excavations have a recursive relationship whereby excavations provide foundational data for surveys that in turn stimulate research questions and regional contexts for particularistic excavations (Ford 2011: 6). Surveys also present the opportunity at single period sites to assess the distribution of artifacts to reveal site layout and functional areas, the taskscape at the microscale of the site (Ingold 1993; Wilkinson 2000: 227). Settlement patterns, trade routes, regional economies, and the environmental settings of the sites in the surveyed area may also be interpreted from survey data (Wilkinson 2000: 220–21). Surveys provide a geographic setting for the area’s sites that may be overlooked and present a broad picture, often at a coarse chronological resolution, of settlement history, examining sites that may not be either considered for a research excavation due to size or assumed importance, or be subject to salvage operations with respect to their location and planned development. The benefits and usefulness of the data generated by surveys outweighs the methodological problems associated with fieldwork of that nature.
Data from salvage excavations, or contract archaeology, also exhibit advantages and drawbacks. Faust and Safrai (2005) present three case studies using salvage excavation data, promote the use of this data as an indicator of the rural sector of past societies, and enumerate the positive and negative aspects of the data from “rescue” archaeology. Because salvage operations focus on archaeological remains discovered through monitoring of development activities, the distribution of sites is determined by development, not by previous survey or research agenda; thus, areas under development are better represented than others, and this is an advantage due to the geographic parameters of the present study (Faust and Safrai 2005: 141, n.4). Salvage excavation data also provide an “instability index” in which the continuity of sites from one period to another or lack thereof indicates changes in population or settlement crises and when combined with data from research excavations “give us the most reliable report of settlement history” (Faust and Safrai 2005: 142–43).

The problems associated with salvage work warrant attention. Such endeavors are dependent both on the area available for excavation and budget, and the publications are often partial or preliminary in nature illustrated with only a few photographs of significant loci. Additionally, later periods are better preserved, yet this is not only evident in the large amount of visible sites dated to the Byzantine period or later but expected due to the nature of the archaeological record and post-depositional processes. With the majority of salvage operations conducted in regions experiencing construction projects associated with growth or renewal, it is difficult to compare regions at different stages of modern development. Faust and Safrai (2005:

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While Faust and Safrai (2005) rightly champion the use of salvage excavation data, they fail to note that many of the sites published in the *New Encyclopedia of Archaeological Excavations in the Holy Land* (Stern 1993, 2008) were excavated as salvage operations and that previous syntheses of the settlement history of Jaffa as well as regional studies of various periods were already making full use of the available data (e.g., Kaplan 1972; Gophna and Beck 1981).
154) also raise the possibility that some sites might be overlooked since they are too small for planned excavations but too large for inclusion in development. While this is a possibility, it is more likely that these sites will be observed through survey.

Concerning the use of ancient texts as data sources, the initial period considered by this project, the Middle Bronze Age (ca. 2000–1650 B.C.E.) can be considered almost protohistoric given the lack of Canaanite sources for this region of the Near East. Although the Execration Texts are dated to the nineteenth and eighteenth centuries B.C.E., Ben-Tor argues that the texts actually reflect the Egyptian thinking in the Early Bronze Age, not the reality of settlement in the Middle Bronze Age (2006:81). However, the texts needed to be accurate to be effective; the reality of Egypt’s enemies in the early Middle Kingdom and older antagonists from the Old Kingdom (Early Bronze Age) appear jointly on the ritualized items. Many of the Late Bronze Age textual sources are presented from an elite or royal perspective and lack individuality or a focus on settlements in the region. Additionally, the Hebrew Bible and Assyrian sources are hardly unbiased in their ideological treatment of history. The bias of texts as well as the author, audience, purpose, occasion, and the archaeological context of each source should be addressed (Hoffmeier 2003). As a foil for these textual problems, it should be remembered that the goal of this project is, in Braudelian terms, a \textit{longue durée} perspective of settlement history and regional connections that is gained from the archaeological record and that the texts only play a supporting, albeit important, role in illuminating \textit{événements} of certain periods.

1.5.5 Evaluation of GIS Methods

The use of Geographical Information Systems (GIS) in archaeological investigations has become commonplace over the last two decades. No longer thought of as a “bandwagon” phenomenon, archaeologists and cultural resource managers employ this powerful tool for both predictive and
interpretive modeling, what Lock calls ‘landscape-as-now’ and ‘landscape-as-then’ studies, respectively (2003:164). Studies of the ‘landscape-as-then’ have been able to extract quantitative data and implement qualitative data when examining sites in a regional context. The utility of GIS for managing spatial data for regional studies and analyses of cultural landscapes, especially a project centered on Jaffa, has been discussed previously (Pierce 2010, 2011). For this study, GIS was employed to manage the point and polygon data for each survey grid square and perform spatial analyses such as nearest neighbor analysis, cost distance surfaces, and least-cost pathways in addition to hydrological modeling. Although the applicability, underlying algorithms, and potential pitfalls for each analysis are detailed by Wheatley and Gillings (2002) and Connolly and Lake (2006), a brief discussion about their utility for this study follows.21

Prior to any spatial analyses, locational data was plotted for each site consisting of easting and northing points (i.e., X and Y coordinates) listed in the Archaeological Survey of Israel publications and the boundaries of the polygon related in the IAA database that acts a protective boundary around the site against future development. When necessary, satellite imagery from Google Earth and physical visits to the sites helped to clarify point locations for sites within the larger protected area in the IAA database (see discussion on site size below and in Appendix A). Using the point data representing a site’s location, a nearest neighbor analysis was performed for each chronological period under consideration to determine to what degree the sites may be clustered. Although deemed “old-fashioned” (Conolly and Lake 2006: 164), nearest neighbor analysis retains its popularity in settlement pattern studies due to the ease in calculating the coefficient relating whether a set of points is clustered, regularly distributed, or randomly scattered.

21 I. Hodder and C. Orton provide a comprehensive treatment of many of these spatial analyses and underlying mathematical formulae prior to the advent of GIS (1976).
Certain problems exist with nearest neighbor analysis which may have a potential effect on the resulting coefficient (Pinder and Witherick 1972; Pinder, Shimada, and Gregory 1979). First, the definition of a boundary for the study area is problematic, leading to a boundary effect. A large study area may show that the points are clustered while a tighter, more controlled area may exclude points that should be considered (Hodder and Orton 1976: 38–40). This boundary effect may result in the separation of some points from their natural nearest neighbor outside of the study area. Studies using nearest neighbor analysis, especially those focused on sites located on pathways, rivers, or communication networks, have been based on incorrect formulae (Pinder and Witherick 1975; Pinder, Shimada, and Gregory 1979: 438). Additionally nearest neighbor analyses have a limitation in identifying multiscalor effects, i.e., clusters at different resolutions, in that clusters of artifacts or features may exist within a cluster of sites or the cluster of sites is part of a larger regional or intraregional pattern (Conolly and Lake 2006: 165). For the current study, it is assumed that a complete set of points is represented in the site catalog, and that the terrestrial trapezoidal area of interest is suitable for such an analysis. The boundary effect would act upon this analysis, assuming that sites in a neighboring survey grid exist but are not treated in this study, but is mitigated by the formulae employed by the GIS software (see Appendix B: Average Nearest Neighbor Analysis Reports for Settlement Patterns of the Middle Bronze, Late Bronze, and Iron Ages). It should be stressed that nearest neighbor analysis only indicates if sites are clustered, random or regularly spaced. It does not explain the underlying environmental or anthropogenic reasons for site spacing; this is the task of the scholar performing the inquiry (Earle 1976: 197).

The underlying topography for spatial analyses and hydrological modeling was derived from satellite data termed the Advanced Spaceborne Thermal Emission and Reflection
Radiometer (ASTER) Global Digital Elevation Model (GDEM).\textsuperscript{22} The ASTER GDEM is available in a 1 arc second (30 m) resolution providing a better resolution than the previously available topographic data of a 3 arc second (90 m) resolution generated by the Shuttle Radar Topography Mission (SRTM) with few patches of missing data and better representation of low-lying lands for which the SRTM data overestimates elevations (Hayakawa, Oguchi, and Lin 2008: L17404, pp. 3–4).\textsuperscript{23} While both data sets have been shown to be feasible for terrain modeling and analysis, the main drawback to using the digital elevation model from SRTM for this project lay in the SRTM data having voids, patches of missing data, and gross interpolation errors along the Yarkon River and some flat areas of the plain that were unacceptable for spatial analysis and unsightly for terrain modeling.

Using the ASTER digital elevation model, cost surfaces and least-cost pathways were derived for each period. Cost surface analysis can be defined as a mathematical model used to give a cost to each cell in a raster map, providing a way to measure the cost involved with traveling over different aspects of the terrain in question (Wheatley and Gillings 2002: 151). As people walk through the landscape, in the process of exploiting the resources within distance of their site, both energy and time are expended in a search for sustenance or in the process of going

\textsuperscript{22} The ASTER project was developed jointly by the Ministry of Economy, Trade, and Industry (METI) of Japan and the United States National Aeronautics and Space Administration (NASA). A second version of ASTER GDEM was made available in October 2011.

\textsuperscript{23} The differences between the two products stem from the methods used to collect topographic information. While ASTER uses a pair of satellites to photograph the earth’s surface and control points from differentially-corrected GPS and is still collecting data, the SRTM used reflective radar over an eleven-day period in 2000. Low reflectivity and cloud cover mutually affect both products. SRTM and ASTER also have problems with vertical elevation in their raw forms and the interpolations required to process the data from the satellite and the space shuttle. In both cases, neither the radar beams nor the imaging from the satellites differentiate between urban high-rise buildings and natural features on their own, and the ASTER and SRTM products are processed to account for urban areas using ground control points. For the study area, both are sufficient, although an exaggeration in elevation certainly highlights the low-lying areas, and the built-up environment in this area does not present too much of a problem since most buildings are not taller than three to four stories (see Nikolakopoulos, Kamaratakis, and Chrysoulakis 2006 and Huggel et al 2008 for studies comparing SRTM and ASTER data prior to the release of ASTER GDEM version 2).
to work in a field. Within GIS, cost surfaces can be classed according to time needed to travel a certain distance or the energy expended in achieving that destination. Both cost surface analysis and line-of-sight analysis, or viewshed, can be considered means for investigating cognition since both methods examine the landscape from a humanized viewpoint and perception, rather than simply calculating environmental factors such as soil type areas or vegetation cover.

Cost surfaces are generated by using algorithms to determine these expenditures of time or energy (van Leusen 2002). Individual authors have suggested their own algorithms or proposed adoption of formulae used by raster-based GIS software programs, and these options have been aptly discussed by M. van Leusen (1999; 2002), although mainly these algorithms fall into two categories, isotropic and anisotropic. Isotropic cost surfaces represent the cost of travel as being equal in all directions, suitable for a return-to-base study (Wheatley and Gillings 2002: 152). Anisotropic cost surfaces include the previous two elements in consideration, base point(s) and friction, along with the effect of slope and direction of travel.24

Cost surfaces have been traditionally developed on slope or other topographic features, but critics adopting a post-processual stance have advocated the inclusion of the human elements of cognition and perception into cost surfaces. Areas that are “taboo” would act as a repellent and have a higher cost than significant places in the landscape such as ritual centers (Wheatley and Gillings 2002: 151). While CSA has proven to be a valuable technique for measuring human efforts, improvements on this process and on generated least-cost paths are encouraged.

Least-cost pathways are derived using the result of a cost surface analysis and can determine a route between a point on the cost surface and any other given point in the terrain (Wheatley and Gillings 2002: 157). With two given points, a least-cost path is generated using a

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24 Anisotropic cost is a ratio between a base slope and the slope of ascent (Bell and Lock 2000: 90; Bell, Wilson, and Wickham 2002: 175), with additional factors such as the mass and velocity of the traveler added.
cost surface related to the end point, which is “drained” from the starting point. Various technical factors complicate this procedure for archaeological use. These include the cell size used in the raster grid, the algorithm employed to ascertain the cost surface resulting in incorrect costs for cells, and the manner in which a computer seeks to find the lowest cost cell, rather than modeling a more realistic route. Much like cost surface analysis, the humanized element of least-cost pathways is an area which begs for more implementation. Given the history of a landscape, a local person’s knowledge of it, and the alternative method of ascending or descending slopes, least-cost pathways provide the opportunity to “combine resource and social networks” (van Leusen 2002).

A mainstay of GIS usage within archaeology involves not only the spatial analysis and creation of data, but also the opportunity to answer archaeological questions and propose new theories or potential problems worthy of field investigation (Zubrow 1990: 67). While nearest neighbor analysis examines site patterns, factors affecting settlement location and connections to other settlements require fieldwork and an examination of the material culture. The least-cost paths generated from an anisotropic cost surface based on slope and calorie expenditure provide a heuristic device for studying movement between sites within this region and offer suggestions for future landscape survey endeavors to investigate travel corridors. While not without inaccuracies, they provide a basis for further study of movement within this region, integrating physiology, cognition, and perception. Tracks between sites may suggest partially how sites are connected geographically, material culture at each site provides additional evidence for reconstructing the settlement systems of the central coastal plain during the Bronze and Iron Ages. Therefore, while this study is helpful in understanding site clustering or pathways in the
region, the results of the GIS analyses are hypotheses open to revision and starting points for further analysis.

**1.6 Conclusion**

The initiative to publish Kaplan’s excavations at Jaffa, combined with survey and excavation data from research and salvage operations, provide the means to propose the economic and cultural connections between Jaffa and contemporary sites in the central coastal plain as well as possibly determine how Jaffa functioned within the regional settlement system. It also provides the opportunity to assess what drove settlement in the region, the continuity and change in settlement systems, and how cultural landscapes may be reflected in the settlement pattern and material culture. The lack of attention to Jaffa or misconceptions about the archaeology of the region evident in previous studies together remaining questions illustrate the need for the current study that attempts to synthesize various data and present a coherent, albeit fragmentary, picture of the settlement history of the central coastal plain.

The spatio-temporal data of Cartesian coordinates and ceramic evidence from 195 sites in the central coastal plain, ranging in date from Middle Bronze Age to Iron Age II, illustrate what connections Jaffa had, to which sites the port was strongly tied, and when these relationships flourished. How and why these connections were maintained can be answered by viewing Jaffa as a maritime commercial center within the flexible framework of a maritime cultural landscape that incorporates both marine and terrestrial components to provide a holistic view of settlement patterns with a degree of maritimity (Westerdahl 1992; see below). As a maritime gateway, Jaffa connected inland sites with materials from the coast and acted as a transit point for commodities produced inland that would be transshipped to other gateways in the eastern Mediterranean. Although Jaffa’s prominence fluctuated with changes in political control, common material
culture shared with inland sites during the Bronze and Iron Ages formed the strong connections between Jaffa and its hinterland, and Jaffa’s role as a unique central place within the settlement system assured its position as the key element in the maritime cultural landscape of the central coastal plain.
Chapter 2: Theoretical Underpinnings and Approaches to Regional Studies

2.1 Introduction: A Multiplicity of Methods

Regional analyses draw upon several theoretical and methodological approaches and may incorporate various social, cultural, political or economic models as ways of explaining both the pattern and system of regional settlement or testing the models. The focus of this study on cultural or historic landscapes of the central coast requires a brief foray into concepts of regional settlement pattern studies as a way to elucidate the extent and components of the settlement patterns in the central coastal plain. Since a discussion of landscapes provides a cognitive aspect to this assessment of Jaffa and its regional setting, this study is grounded complementarily in landscape archaeology with its accompanying focus on space and place and the extent to which people in the ancient Near East recognized regional distinction and variation. Engaging the malleable concept of landscape raises questions about ancient cognition and perception that warrant consideration prior to testing models of political or economic organization. It is as important to consider what the inhabitants of the region perceived about themselves, their habitation, or even the physical landscape within their region, and if or how that perception affected the organization of their locale, as it is necessary to seek the archaeological signature of such patterning. By relying on models of settlement to explain how the systems may have functioned and the aforementioned cognitive elements answering why the settlements were connected, elements of material culture, textual evidence, and natural environs can construct a plausible picture of the cultural landscapes of the central coastal plain.

2.2 Regional Settlement Patterns and Systems

Although the importance of regional studies for archaeology and history has been related above, it is necessary to define what is meant by both “settlement pattern” and “system” and consider
the goals and scales of regional settlement archaeology. The study of regional settlement patterns is rooted in archaeological inquiries in the late nineteenth century that blossomed and grew in the early twentieth century along two parallel courses (Parsons 1972: 127, 136). The first approach is ecological and primarily concerned with size and distribution of sites, assuming that the settlement pattern is result of the interaction between environment and technology responsible for features in the landscape such as habitation sites, monuments, and tombs. The second utilizes settlement patterns, especially intra-site patterning, to reconstruct various social, political, or religious organizations of a locale (Trigger 1968: 54). While the former has developed in the Old World, primarily in Great Britain, the latter has mainly been employed by New World anthropologists and archaeologists in the American Southwest and South America. This behavioral approach to regional settlement studies colors the definition proffered for settlement archaeology as “the study of social relationships using archaeological data” in which various aspects of social relationships are considered “functioning systems of economic, political, and affective relationships” rather than simply traits of a culture (Trigger 1967: 151). Yet this dichotomy should not stand as a sharp divide since seminal regional projects in the Near East have concentrated both on the development of agriculture and other interactions between humans and the environment and the organization of society (Adams 1965, 1981; Wright 1969; Adams and Nissen 1972), and systematic regional surveys guided by questions derived from settlement archaeology have been carried out in the southern Levant since the 1980s (Rosen 2003: 176).

25 J. Parsons (1972: 128) notes that R. Braidwood’s survey of the Amuq Valley developed independently of any influence by cultural ecological theory. Indeed, Braidwood’s stated purpose was “the complete reconnaissance of a certain area to discover what, if anything, within that area is of archaeological interest” (Braidwood 1937: 1). Absent the theoretical orientation of Willey (1953) or Steward (1972) also present in Adams’ surveys of Mesopotamia, Braidwood’s work, while pioneering, represents a regional site catalog (Stanish 2003: 163).

26 S. Rosen (2003: 178–79) suggests that settlement archaeology independent of culture history in the Levant developed at a slower pace than Mesopotamia, Greece, or the New World due to the presence of a powerful “mythological narrative,” local archaeologists with overarching agendas contrasting those of foreign expeditions,
2.2.1 Defining Settlement “Patterns” and “Systems”

Definitions for settlement “pattern” and “system” emphasize the relationships between people and the site and the sites within a pattern to each other, somewhat transcending the social vs. ecological divide. Settlement patterns are “the regularities formed by the distributions of multiple places where people lived or carried out activities, including regularities in the relations of these places and activities to each other and to other features of the environment” (Kowalewski 2008: 226–27). Such places may be locations of habitation or have a specialized function such as an agricultural installation, field watchtower, burial cave or fortress and are termed by this project as “sites.” Settlement systems are the natural or cultural processes behind the patterns, or how these factors interact with each other to produce the resulting settlement pattern (Kowalewski 2008: 226). Simply, the system is the “set of ‘rules’ that generated the pattern” (Flannery 1976: 162). Since patterns reflect environment, technology, and various institutions of social interaction and control, the resulting pattern may be a compromise between competing determinants and be unique to a particular region or cultural group (Willey 1953: 1; Trigger 1968: 53). With increasing cultural complexity, a tendency exists for aggregation of settlements into an urban environment that provides a range of specialized facilities such as cultic centers, warehouses, palaces or administrative buildings, artisan workshops, and defensive works, yet the pattern of such complex societies may differ between groups. For example, the pattern in a river-oriented locale such as Egypt will not be the same as the pattern in the riverine environment of Mesopotamia (Trigger 1968: 72–74). Regardless of the form(s) or complexity of the settlement systems, “identification of successive spatial systems is, in effect, necessary to write the history of a regional society” (Leveau 1999: 187).

and the integration of prehistoric archaeologists with developed theoretical frameworks with historical archaeologists within the same academic departments.
2.2.2 Three Scales of Regional Inquiry

The analysis area of a settlement pattern study is scalable on three levels: microscale (individual structures), mesoscale (intra-settlement patterns), and macroscale (regional settlement distributions), or simply, habitation, community, and society (Trigger 1968: 55, 73). On a microscale, buildings can reflect the technical skill of construction as well as various facets of individuals and their social organization and hierarchy such as wealth, rank, family structure, social and political institutions, craft specialization, cult ideology and praxis, and personal preferences for style and fashion. The layout and contents of an individual structure may indicate the function of the building or the class of its denizen (Trigger 1967: 152, 1968: 57–60). Further, a dwelling may reveal familial organization such as those at Ugarit (see Schloen 2001). The subsistence regime of the household determines a structure’s portability (i.e., whether a family lives in a portable construction like a tent or in a permanent habitation), and buildings are constructed using the materials of the environment to mitigate the same environment’s effects (Trigger 1968: 56–57).

Considerations of the mesoscale involve the community layout (Trigger 1968: 60–66). The location, size, and stability of a community are limited by environment and subsistence technology, which includes not only production of food but also storage, processing, and transportation in some cases. Settlements also require a source of fresh water and a level of security. Specialized site functions such as fortress, garrisons, watchtowers, or outposts suggest the complexity of political organization together the communal need for control or defense. Assuming that a settlement is composed of one or more communities, the community pattern may correspond to social, ethnic, or occupational groups. In primitive societies and certain complex societies organized by real or fictive kinship, the physical plan of the settlement reflects
such familial or kinship relations. Intra-site patterns within settlements in complex societies may also exhibit configurations of buildings determined by religious or ethnic affiliation or cosmologic ideology, while the location of such sites may be determined less by subsistence strategies than commercial interests (Trigger 1968: 63). Concerning site function and specialization, B. Trigger notes that an investigation of commerce and production at the site level, that should include a determination of imported versus locally produced goods together with locations of workshops in relation to habitation, is necessary for estimations of site size and social complexity (1968: 64). The presence or absence of trade goods should reveal the integration of the community into the economy or indicate a settlement’s self-reliance (Trigger 1967: 152).

Zonal or regional settlement patterns on a macroscale are influenced by the same considerations affecting the mesoscale (Trigger 1968: 66–70). In particular, the area’s ecology and the ability of a population to exploit natural resources such as soil types, water sources, or fauna as well as the ability to mitigate harsher environs greatly determines the density and distribution of settlements (Trigger 1967: 152). Economic factors such as trade including resource exploitation or craft production, political organization, warfare and security concerns, and religious ideologies all factor into the regional settlement pattern. Spaces between settled areas, a “no man’s land” of sorts, should be noted and settlement boundaries analyzed for indicators of competing groups such as fortifications or other visible signs of aggression or defense. Trigger (1968: 70) also states that migration and population change due to disease or economic reasons are additional dynamic factors that shape the overall regional pattern.
2.2.3 Research Design for a Regional Settlement Analysis

The call for more study about site catchments, territory shape based on resource distribution, zones of settlement, relationships between population growth and settlement density, central place locations, and especially, the regularities of spatial patterning of settlements encourages regional projects like the current study (Bintliff 2002: 32). Several scholars have outlined research design, or at least objective, for settlement studies. Parsons lists four goals for settlement system analysis, namely, a methodologically sound and meaningful site classification; estimation of population for different time periods; a sound chronology within which the settlement configurations can be structured; and an understanding of the production potential for the area (Parsons 1972: 142). In addition to the objectives (what the data are and how they apply to questions), coverage (area of study) and intensity (resolution) of the regional study, one should also specify the data manipulations and analytical techniques for the research questions (Kowalewski 2008: 227–28, 255), and these elements of the research design have been discussed above. Additionally, S. Kowalewski (2008: 254) proposes ten characteristics of a settlement pattern that should shape research design and discussion, including: place, scale, complexity, integration, boundedness, efficiency or economy, variation, embedding as a component within a larger system, duration, and previous and succeeding patterns. Thus, a fundamental component for settlement pattern analysis is comparison between chronological periods in the same region, giving the study a temporal depth required to assess a particular period.

A critical component of regional analysis is determining the location and function of various site types and how each site relates to other sites within the settlement pattern (Kowalewski 2008: 256). At the mesoscale, the task of defining the settlement, or “community,”
including a discussion of site size and boundaries should be a priority. Questions about the types of activities and their locations and what types of residential groups occupied each site should also inform the study (Parsons 1972: 138). Much like analyses of the mesoscale that must first consider the definition of a site or community, macroscale studies of regions, or “zones,” should place primacy on defining the area of interest and should strive to be more than tentative or descriptive in character (Parsons 1972: 140–41). Concerning the boundaries of the area of interest, Kowalewski (2008: 226) notes that “whether physiographic or behavioral, regions are open systems and their boundaries are more or less permeable or fuzzy, but they make sense as a whole internally and their boundaries make sense physiographically or behaviorally.”

To properly reconstruct successive settlement systems diachronically, a reconstruction of the paleoenvironment, and in some cases ancient topography, is required in addition to rigorous sampling and analysis of the collected artifacts (Vita-Finzi 1978: 7; Lock 2003: 164). Moreover, geology and geography are essential for comprehending certain site dynamics (Drewett 2004: 39). Adjacent regions may also need to be taken into account to fully understand the pressures acting upon the study area (Parsons 1972: 135). One must also reflect on not only the individual factors affecting settlement, but also their interaction and the resulting “principle of hierarchical resolution of conflicting tendencies” in which a hindrance to settlement such as poor defensibility or lack of agricultural hinterland is outweighed by the importance of a location for trade, production, or political control, although some settlements founded for a particular reason ultimately fail because of ecological factors (Trigger 1968: 72). In sum, “the essence of the settlement pattern research design is that the basic goal is to find the distribution of people (which may not be all that easy); then one attaches additional information of various kinds to that framework” (Kowalewski 2008: 252).
2.2.4 Drawbacks to Regional Settlement Studies

J. Parsons (1972: 142–43) enumerates five potential pitfalls for settlement pattern analysis. First, site function is difficult to infer from general functional aspects observed in survey or excavation data. The lack of information about site function also makes population estimates challenging because the extent, function, or seasonality of the site all affect demographic calculations, which in turn, influence settlement system analysis. Second, subjectivity in data acquisition also affects population estimates and calculations of site size. Third, sampling strategies affect the amount and types of data collected. Fourth, gross chronological control hinders nuanced analyses of settlement patterns on a finer scale (one to two generations of inhabitants). Fifth, an ignorance of the paleoenvironment and modern land use prevent an accurate estimation of agricultural production, subsistence, and trade.

The importance placed on the paleoenvironment and its role in shaping the pattern of regional settlement would seem to accord well with a cultural ecological view of landscape and principles of landscape archaeology. As F. Hassan (2006: 318) observes, “the landscape is a habitat, the localized environment in which organisms (in this case people) live, where people obtain food and shelter, seek mates, and satisfy their needs, desires, and pleasures.” Landscape archaeology offers multiple perspectives by utilizing theory and methods from diverse data sets and various disciplines with “the potential for holistic study of places,” but Kowalewski (2008: 251) argues against a landscape approach to settlement pattern research based on landscape archaeology’s multi-disciplinary nature. The application of the term landscape to studies highlighting various aspects of the natural or cultural environment and the array of different approaches, possibly indicating a lack of clear theoretical grounding, has also drawn critique (Anshuetz, Wilshusen, and Scheick 2001: 157–58). “Many archaeologists hoped that ‘landscape’
would become an organizing theory, but the last decade has shown it to be at best a fashionable
umbrella, an empty shell containing everything yet nothing in particular, and a license for
indiscipline. In practice, landscape archaeology is a junk drawer, a disorderly place where we
store things that are sometimes needed and useful” (Kowalewski 2008: 253). Thus, the potential
of a multi-faceted approach incorporating multiple strands of data, theory, and methods may
become a hindrance due to its lack of cohesion. However, a more nuanced definition of
*landscape* with regards to the current project and the potential contributions of a landscape
approach greatly mitigate the negativity shown by Kowalewski and others critiquing the
nebulous use of the term over the last two decades.

2.3 Aspects of Landscape Archaeology

J. Cherry (2003: 158) noted that *landscape* is a “capacious mansion with many rooms” when
highlighting the difference in thought between processual Mediterranean regional surveys
focused on quantitative and scientific results for social and ecological questions and postmodern
studies centered on phenomenological approaches to landscapes that are constantly changing
through time according to the individual’s perception and perspective. Such a sizeable demesne
is required since “landscapes refuse to be disciplined; they make a mockery of the oppositions
that we create between time (history) and space (geography) or between nature (science) and
culture (anthropology)” (Bender 2002: S106). This imprecision and refusal to be categorized
rises from the concept that landscape sits at the “intersection of the physical earth and human
culture” (Smith 2001: 365) The eclectic application of *landscape* ranges from the physical
landform itself to land-use categories that emphasize its passivity as a thing to be acted upon by
humans to definitions derived from the human experience existing and moving within the
landscape, such as historical landscapes, landscapes of settlement, or phenomenological landscapes (Bender 2002: S103; Johnson 2005: 116).

Such a variety of uses requires a fundamental landscape paradigm as proposed by Anshuetz, Wilshusen, and Scheick (2001: 160–61): “1) Landscapes are not synonymous with natural environments and are synthetic with cultural systems organizing peoples’ interactions with their environment;27 2) landscapes are worlds of cultural product; 3) landscapes are the arena for a community’s activities; and 4) landscapes are dynamic constructions, with each community and each generation imposing its own cognitive map on an anthropogenic world of interconnected morphology, arrangement, and coherent meaning.” Thus, in a general definition, landscape archaeology attempts to describe, interpret, and understand the development of the cultural features that occur on the surface of the earth. Although the importance of landscape archaeology may seem obvious, “landscapes provide evidence for long-term changes and settlement economic patterning and features that relate to social or religious changes. In addition, the landscape provides a fundamental context for features such as religious monuments or many inscriptions, monumental or informal” (Wilkinson 2003: 4). Both socio-historical structures including class, inheritance, trade, laws, and administrative units and physical structures such as climate, topography, and geology comprise the landscape (Crumley and Marquardt 1990: 74). Because landscape archaeology addresses both the cultural and physical record over large geographical areas, landscape archaeology has potential to be truly unifying. Specifically, the cultural landscapes that the present study seeks to illuminate are the patterns and organization of habitation sites and non-habitation sites, or those with specialized function, their relation to each

27 It should be noted that discussions of landscape taphonomy and methods of “landscape analysis” such as coring (Chapman 2006: 12–13), while greatly useful in reconstructing the ancient natural environment, are not required for a study such as the current project to be broadly considered “landscape archaeology.”
other, and the land use between these sites for each successive chronological period from ca. 2000 to 539 B.C.E. Since the development of different landscapes is contingent upon both local ecology and social or cultural factors (Wilkinson 2003: 3), it is precisely this multi-faceted approach to how humans interact with their environment, taking contributions from settlement archaeology, distribution, and environmental studies coupled with inferences about perception, movement, and agency that best compliments a diachronic regional study of settlement systems that seeks to assess the imprints of various people groups and cultural habits within the research area.

2.3.1 Landscape as Palimpsest

Since the research area of the present studies was almost continually inhabited by successive groups for the temporal span under consideration, landscape as palimpsest is a fundamental concept for the area of interest. O.G.S. Crawford (1953: 51) developed the analogy with a palimpsest:

a document that has been written on and erased over and over again; and it is the business of the field archaeologist to decipher it….whereas the vellum document was seldom wiped clean more than once or twice, the land has been subjected to continual change throughout the ages.

Landscape as palimpsest can be conceived as the “progressive superposition of one landscape on another and sometimes the selective removal of parts of the earlier landscapes by later landscapes” (Wilkinson 2003: 7). While the temporal differences are often critical for understanding the socio-cultural, political, economic or environmental forces impacting the landscape in successive periods, the continuity within the landscape is partially represented by the notion of persistent places that are “repeatedly used during long-term occupation of the
region” even though the use may be episodic. The signature landscape resulting from the settlement patterns and land use of one period may continue in later periods or may be changed entirely depending on the organization and exploitation strategy used by later inhabitants. For example, whereas the Bronze Age in the southern Levant was marked by a landscape of tells, the signature landscape for the Iron Age was one of dispersal and growth in the rural sector (Wilkinson 2003: 130). This rural expansion comprised episodic settlement between 1000 and 600 B.C.E. into what would have been considered “marginal” land during the Bronze Age. Assyrian royal initiatives such as the resettlement of conquered peoples and/or more stable environmental conditions served as catalysts for this shift in settlement patterns (Wilkinson 2003: 132). Additionally, an economic impetus such as the Phoenician demand for the by-products of cash crops like grapes and olives encourage settlement especially in coastal areas (Lehmann 2001: 94). These farms likely engaged in all four sectors of the agricultural economy, namely, wine and viticulture, olives and oil extraction, cereals, and animal husbandry (Dar 1986: 253). Olives were probably grown in the closest zone of cultivation to the main building(s) while cereals were grown further away based on the location of threshing surfaces on or near second and third quality soils (Wilkinson 2003: 139). Iron Age farmstead features include rural trackways, field towers, wine and oil presses, cisterns (usually rock-hewn), and agricultural terraces and field boundary walls, all of which were antecedents of the “Roman landscape mosaic” into which all the elements coalesced (Dar 1986; Wilkinson 2003: 135–37) The multi-period, although likely not continual, utilization of the farmstead land, associated structures and installations from the Iron Age through the Roman-Byzantine era attest to the temporal durability of such feature types as well as the continuity of farming practices in antiquity (Finkelstein 1978, 1981; Dar 1986). Thus, each successive land tenant had to contend with not only the physical
landscape as palimpsest with the persistence of features and installations hewn into the landscape but also with the cognitive elements within a dynamic landscape that is brimming with memory and meaning. Considerations of such mental facets as space and place within the landscape as well as cognition and perception provide added components for a construction of the cultural landscapes for the central coastal plain of the southern Levant.

2.3.2 Space and Place

The twin concepts of space and place seem self-explanatory, yet some measure of definition in relation to landscapes is needed. Space carries the connotation of Cartesian $x$ and $y$ coordinates corresponding to longitude and latitude on a grid or map, expressing a point of existence capable of measurement using Euclidean means. Mathematical models of spatial organization could be created to explain societies using large amounts of quantitative data, Cartesian coordinates, and Euclidean geometry in space. Space became simply the areas between places (Chapman 2006:130). Space in this way is more of an abstract notion, imposing a distance between the investigator and the subject for the person consulting a map. This concept dates back to mapmakers in antiquity and continued through the Renaissance when landscape painters gave distance to the subject and the viewer was removed from the landscape and viewed it from afar (Lock 2003: 175). Yet landscape paintings at least retained a horizontal viewing plane. With maps, and now aerial and satellite photographs, the view plane becomes vertical, giving the top-down view of the world common to those viewing such media. While scaled maps do a great service by reducing the world, or a part of it, to something more comprehensible and portable, it is perhaps too easy to lose sight of the reality of the horizontal plane in which humans exist. The goal of making generalizations, while desirable, can have the drawback treating space and landscape as if it were the same universally, having the same properties diachronically as a
container for action (Tilley 1994: 9; Wheatley and Gillings 2002: 8). This is a critique leveled at the processual concept of landscape as such spatial analyses of past human activities utilized the concept of neutral space (Tilley 1994: 9).

Conversely, a post-processual stance views space as a medium for the action, and space associated with different periods is considered to be distinct from the foregoing or subsequent periods. This concept of space as a medium leads to the perception of a sense of place engendered with cultural significance and meaning (Tilley 1994, 11, 18–19). As each preceding period leaves a “shadow” on the landscape, those peoples inhabiting the landscape in each subsequent period react to these human alterations to the landscape in different ways than their predecessors, perceiving monuments, paths or locales differently (Gaffney and van Leusen 1995: 377). People imbue nature with their culture through praxis (Crumley and Marquardt 1990: 73), actively creating places through association with memories, stories, or activities (Chapman 2006: 130). Landscape, then, becomes both the medium and outcome of these activities (Savage 1990: 339; Tilley 1994: 10). Therefore, places can mean different things to different peoples throughout time, and this particular relationship is generally understood to be centered on one’s locale, a significant space located in the cultural or natural landscape (Tilley 1994: 18).

While other subjective elements such as ritual, memory, or power are also of fundamental importance in creating a sense of place, purely environmental aspects such as water, topography, fauna, or other natural features become part of the mentally constructed landscape (Wilkinson 2003: 5). S. Savage (1990: 338) asserts that certain environmental information, such as water sources or raw materials, is coded into the natural world while social information is coded into people through ritual and tradition and then projected onto the environment. Site locations close to good resources and in a socially advantageous position are a good illustration of this concept.
B. Bender (2002: S104) observes that humans do not act upon the landscapes; rather, humans interact with the landscape, and “what is done affects what can be done.” Further, “a place inflected with memory serves to draw people towards it or to keep them away, permits the assertion or denial of knowledge claims, becomes a nexus of contested meaning” (Bender 2002: S104). The complexity of this relationship is apparent when considering the effect of cognition and perception while moving through the landscape. Since the body is the “mediation point” between thought and the world, a concept of cognition and perception about the physical is required to better understand human movement through the natural world.

2.3.3 Cognition and Perception

While the introduction of cognition and perception is open to criticism stemming from concerns about epistemology and the possibility of multiple or inaccurate truths, with careful application of various textual sources, one may arrive at a better understanding of past peoples’ impressions of the surrounding landscape and the natural world. Determination of a group or individual’s cognition and perception of the landscape without such textual resources may be more difficult, and cognitive psychology can give archaeologists insight into how humans perceive their surroundings. Cognition is simply the acquisition, organization, and use of knowledge (Neisser 1976: 1). Perception involves having pre-existing knowledge, or schemata, of an ideal which direct one’s activities and interactions with objects in the real world. These experiences in turn help to develop and change one’s schemata. This cognitive process is exemplified by E. B. W. Zubrow’s (1994) study comparing the culturally ideal Iroquois settlement patterns to real village locations using GIS.

Movement through the landscape is greatly aided by the traveler’s schemata, cognitive map, and perception. U. Neisser’s study (1976) of cognitive psychology illuminates the concept
of cognitive maps. C. Renfrew (1994: 10) used this term to describe one’s accumulated knowledge and experience, a worldview used to determine future activities. Neisser (1976: 108) explains that as movement occurs, perception, mostly visual information, constantly changes within the mind, and that locomotion is fundamental to spatial orientation. In the act of moving, one is aware of the surrounding landscape, the end destination, and one’s self (Neisser 1976: 117). It is the awareness of self in the landscape, called *propriospecific information*, and destination that allow one to know his whereabouts (Neisser 1976: 116). The relative position of the destination is known, even if it cannot be seen, due to schemata, knowledge of information without that information being available to the eye (Neisser 1976: 110). These schemata are embedded in cognitive maps that are ever-changing due to perception. Due to cognitive maps, actual journeys can be reproduced more easily than recounted because, as Neisser writes, “travel is different from travelogue” (Neisser 1976: 118). Finally, Neisser (1976: 123) stresses the ubiquity of cognitive maps and relates components of those maps including landmarks, paths, nodes, and edges. People navigate by landmarks, things able to be seen, along paths, choosing the correct route whilst at a node, a connection or intersection of paths. Edges provide boundaries to territories or visibility. The cognitive map can be disengaged from its original use, movement, and employed for informative uses (Neisser 1976: 125). Because landscapes act as a “primary medium of socialization,” knowledge about the landscape and having a cognitive map of “where to go” empowers the agent moving through a landscape (Tilley 1996: 162).

2.3.4 *Regional Distinction in the Ancient World*

Although a cognitive map of the landscape empowers an individual, landscape is experienced through “pre-existing external social realities” that may be informed by knowledge controlled by repressive power structures (Tilley 1996: 162). However, questions arise about the
existence or extent of cognitive maps or knowledge about other regions outside a person’s realm of interaction. How much did the common individual know about the realities of neighboring regions or far-flung areas absent of what the dominant cult or political institution relayed? For example, D. Jeffreys argues that the ancient Egyptians’ awareness of the deserts or oases outside the Nile Valley may have been “hazy” at times, and the cultural and ethnic terms for foreigners were combined with stereotypical representations in artistic convention so that the common person who did not serve in the army, or travel as an artisan, and was immobile due to agricultural concerns, only knew what those who created the art projected. Local cult affiliations resulted in locally shared experience and values. Even planned, imposed capitals at Amarna and Pi-Ramesse were built near older established settlements and acted as “para-sites,” defined by Jeffreys (2010: 105) as a royal development or extension that intruded upon an existing community with its own socio-economic equilibrium. Such cities then co-opted established power to project their own authority. Concerning artistic illustrations of landscape, stereotyped representations pervade Egyptian art; images of terrain were often used for hunting scenes or Hathor’s nascence. The Mediterranean coastline was rarely visualized, and Jeffreys (2010:116) posits that it may not have been part of the Egyptian mentalité due to the gradual change from the Deltaic farmland to swamps to lagoons to open water.

Jeffreys’ study of Egyptian regionalism raises the questions about how landscape can affect uniformity between regions and how regional diversity can be detected within a larger area. A core-and-periphery model must account for changing cores within the region diachronically. The examination of central places with lower tier centers may prove useful, but inference must be made about what constitutes a second or third tier center within the settlement hierarchy. The Egyptian nome system, divided by topographic features, serves as a starting point
for regional variation in ancient Egypt (Jeffreys 2010: 107–08). Palace-centered polities in cities such as Ashkelon, Aphek, Megiddo, or Kabri would serve the same for Middle Bronze Age Canaan, but an archaeological signature of regional variation within material culture may still be lacking. The present study relies on craftwork, namely pottery, but the problem of sufficient diversity on a non-microscopic level, i.e., form or decoration, in non-imported pottery still looms.

2.5 Models of Settlement

The archaeologically visible settlement patterns imposed on the landscape of the central coastal plain of Israel reflect conscious choices made by their inhabitants regarding availability of natural resources, safety, and proximity to pathways. Embedded within the patterns are hierarchies of sites requiring explanation regarding how the settlement system may have functioned. Several descriptive models have been used to explain the hierarchy of sites within the pattern from economic or social perspectives such as locational models that analyze the natural resources around a settlement in regard to least-cost, site-territory analysis to determine a site’s potential given an economic range of catchment, or network analyses that assess centrality and accessibility of a site. With some modifications, Central Place Theory (CPT) is the most widely applied theoretical framework used to explain settlement patterns in the southern Levant (e.g., Levy 1995: 229; Dever 1987: 150), and the usefulness of this theory for this study is considered here together with models proposed as alternatives or adaptations of CPT.

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29 A. T. Smith (2001: 370) observes that “a deep-seated problem lies in mistaking the mosaic of regional ceramic provinces as reflections of anything other than the way archaeologists in the present typologize.” For example, cities used as administrative centers with imposed control like Jaffa may present a skewed perspective when compared to another regional center like Tel Gerisa, but the problem of the pervasive nature of Egyptian material culture regardless of actual Egyptian presence at sites leaves the record wanting for sites that are dated to the Late Bronze Age but without Egyptian material to accurately judge the regional flavor.
2.5.1 *Central Place Theory*

W. Christaller (1966) sought to explain variations in size, number, and distribution of towns and based his theory on the premises that settlement performed economic functions, a natural tendency toward centralization existed, and the existence of towns depended upon the supply or marketing of goods. Central places were the sites where goods and services required by a region’s inhabitants would be concentrated for most efficient access, and the complementary region around the central place was its hinterland (Christaller 1966: 16–17). The number, size, and distribution of central places were determined by the distance people would travel to acquire the good or service, called the range of a good (Wagstaff 1986: 119). Many factors affect the range of the good including its price at a particular central place, the cost of traveling and getting the item, the number of people demanding the good or service, and the number of central places. In theory, central places offering the same goods and services should be equidistant. Christaller sought to rank goods and service, creating a hierarchy of places whose optimal pattern is hexagonal for each lower tier site to be serviced by a higher tier site. Higher order sites performed the same services and provided the same goods as lower order sites and had additional goods or services that would have insufficient demand at lower centers (Haselgrove 1986: 5). To test the theory of centralized goods and services, Christaller used an index based on the number of telephone connections to establish the lower order central places and the higher tiers were distinguished based on administrative functions since he presumed that communities needed to separate themselves (1966: 147–50; Wagstaff 1986: 120). He also realized that the system could change based on a change in the consumption of a good, a change in the supply or price of an item, or through technical progress that would increase the range of central goods and weaken lower tier centers (Christaller 1966: 85–101).
Leaving aside the inexplicable use of telephone connections as an index of central goods consumption, several critiques of CPT and cautions about its use have been voiced. Foremost, Christaller’s model is connected with settlement patterns resulting from economics of the feudal Middle Ages in southern Germany; thus, the model may not be applicable to prehistoric or ancient non-capitalist societies (Haselgrove 1986: 3; Wagstaff 1986: 121). According to Haselgrove, one of the problems in applying CPT to archaeological settlement patterns is the lack of data from small-scale excavations over a long period of time that would present a fuller picture of the overall pattern (1986: 5–6). While CPT can help to explain a pattern of settlements, it does not explain the behavior that created the pattern. For example, did the pattern develop from a central place with lower tier centers appearing later or did the system start with smaller sites with one center emerging as the central place to sell or obtain goods and services in a region? Wagstaff observes that “Christaller offered no sustained explanation for the existence of a central place system in the first place” (1986: 121).

Despite these critiques, a generalized version of CPT has become rooted in archaeology, especially in application to non-industrialized societies where spatial organization might be equated with social organization. Increased attention has been placed on factors that promote centralization and site specialization. Additionally, studies of Iron Age Britain have identified five points necessary to interpreting a site as a central place, including: the existence of a defined territory, that the site was the most complex form in the hierarchy of site types, management of surplus for the needs of the resident community, service as a focal point for redistribution, and control over storage facilities (Haselgrove 1986: 8). To assess interaction and functional relationships between sites, archaeology is dependent on artifact distribution although different
processes may generate the same spatial results. It is necessary to remember that the processes of exchange and interaction behind the pattern are of ultimate interest.

2.5.2 Gateways and Transit Points

Together with the generalization of CPT absent its classic formal and spatial qualities, alternate concepts of economic organization developed such as gateways and dendritic systems. K. Hirth’s study of Early Formative sites in the Central Mexican highlands found that influential sites within an economy participating in trade are often located at strategic points to control the flow of goods into and out of distinct natural or cultural regions (1978). These “gateway” sites are established and develop based on increase in trade or the settling of a fringe area and link their region to external trade routes and often develop in positions that have the potential to control the flow of goods and people (Hirth 1978: 37; Burghardt 1971: 282). Unlike the concentric zones of traditional central places, hinterlands of gateways look like elongated fans with individual sites linked via a linear or dendritic network (Hirth 1978: 37). In contrast to central place systems where centers of equal rank interact with others in the vertical hierarchy and maintain strong horizontal connections with other centers of equal rank, the markets within the individual sites in the dendritic network are oriented toward the gateway (Hirth 1978: 38).

Central places and gateways can be defined mainly on the mental constructs that the labels imply. Central places are ideally located in the center of their zone of influence and gateways are located at one end of their associated territory (Burghardt 1971: 269–70). The ideal central place and lower tier centers are arranged in a circular or hexagonal shape whereas gateway communities have elongated territories extending away from a core. Gateways usually involve an aspect of long-distance trade in contrast to central places that principally have local connections. Critiquing the idealized central place, A. Burghardt (1971: 285) notes that central
places in reality are located near the periphery of their associated territory, noting the situations of islands where the central place is typically a port and of mountain valleys that have the central place situated near the valley entrance and connecting it to external centers. Located at a “site of considerable transportational significance,” either a bulk-breaking point where bulk cargo would be offloaded from a vessel or a transport node, gateways are located typically close to the boundaries between different modes or intensities of production (Burghardt 1971: 272).

Burghardt described two states of gateway development in relation to central places and economic growth or decline of the gateway’s tributary area (1971: 272–273). In a dynamic situation, gateways develop from an initial stage as the city benefits from the influx of wealth and effort in a tributary area. The ability for central places to develop in the tributary area depends on the size of that area and the potential for development of intermediary centers between the loci of production and the gateway. In larger productive areas, as central places rise and develop, the gateway city will lose portions of its hinterland and will be effectively reduced to a large central place while retaining its transport nodality. If enough competition from other sites is felt, the growth of the gateway decreases, and it can become stagnant economically with an accompanying decline in population. In such cases, the gateway site may revert to being a typical central place for its region rather than a connector between two different zones. The continued growth of central places in the gateway’s original tributary area eventually results in “an approximation of the classical central place distribution and hierarchy of centers” (Burghardt 1971: 273). Within a static economy or settlement trajectory, the gateway city remains dominant in the region. However, with economic decline, the gateway would increase in dominance, and other central places should suffer given the connections to commercial endeavors external to the region.
Certain transit points that can also be considered maritime gateways facilitated access from the coastal plain to the eastern Mediterranean world and vice versa, similar to sites such as Tell el-Dabʿa in the Nile Delta that functioned as such a maritime gateway for Egypt (Hirth 1978; Marcus 2006). Generally, gateways are seen as settlements in the margins away from the geographical center of a region, usually at the interface of two differing zones, either culturally or naturally delimited. As maritime gateways typically located at the interface of earth and water, points located on navigable rivers or wetlands such as Tell el-Dabʿa functioned as “conduits” and “hubs” of exchange between seafarers and their terrestrial counterparts (Marcus 2006: 187). While not all transit points are gateways, maritime gateways are likely transit points for cargo. Such locales function as nodes within the larger commercial networks utilizing land-based transportation so that maritime gateways such as Jaffa connected the eastern Mediterranean basin to palatial centers like Aphek and later Jerusalem. In addition to the evidence at ‘Ezbet Rushdi for Minoan trade during the reign of Amenemhat II and Cypriot and Minoan ceramics from Tell el-Dabʿa dated to Amenemhat III, the large number of Canaanite jars found at Tell el-Dabʿa give an indication of the intensity of maritime traffic at the site. Estimates of eight thousand jars per annum have been proffered for these storage vessels, prompting Marcus (2006: 188) to surmise that fifty-three to one hundred and sixty ships per year, or roughly one per day if only sailing between Spring and Autumn, docked at Tell el-Dabʿa, although it is more likely that commercial ships sailed in flotillas similar to the group of nine ships depicted in the tomb of Kenamun (Davies and Faulkner 1947). While Avaris, and subsequently Egypt, clearly benefited from trade with the eastern Mediterranean that passed through this maritime gateway, communication with Cyprus and various Levantine centers was accomplished faster by maritime transport than by overland methods. Marcus calculates that sailing time from a Deltaic center to Gaza would take
thirty-three hours or less and a trip from Cyprus to the Nile Delta could be accomplished in thirty-one to sixty-two hours given three to six knot winds (2006: 188). These junkets are markedly faster than the eight to twelve days needed for an individual or a donkey caravan moving twenty to thirty kilometers a day. Burke also calculates that a voyage from the Delta to Byblos would have taken between sixty-three and two hundred and sixty-nine hours, or an average of eleven days (2011: 66). The importance of a maritime gateway such as Tell el-Dab’a lay in maritime commerce “as a means of economic, and ultimately political power’’ (Marcus 2006: 189). The situation of foreign merchants and traders taking economic control of Avaris and controlling the flow of goods up the Nile to Thebes, and eventually taking political control of Lower Egypt, would well illustrate the “Port Power’’ model proposed by L. Stager (2001).

2.5.3 The “Port Power’’ Model

Dendritic models place emphasis on highest order sites, or attachment points, and lower order settlements to map communication or commercial lines (Haselgrove 1986: 7). Based on the model developed by B. Bronson (1977) and S. Hall (1985) for southeast Asia, Stager proposed such a model for coastal Levantine sites in the Bronze and Iron Ages in which merchants leveraged “Port Power’’ to connect hinterland resources to wider economic markets such as dynastic Egypt, reaping the profits of this trade (Stager 2001). Stager’s model makes two assumptions about coastal commercial sites and the control wielded by the merchants. First, the site was tied to inland polities via east-west networks of drainage or transport systems (Stager 2001: 625). Second, power was exercised via economic measures external to the political or military power of the state (Stager 2001: 628–29). Power exerted by the state as punitive measures against hinterland polities could actually be counterproductive and costly in Stager’s opinion (2001: 629). Within the dendritic settlement pattern four tiers of hierarchy exist (Stager
2001: 625). The lowest tier sites would have been “village clusters” or “communities of exchange” in the highlands that brought resources to regional markets in the highlands. Regional markets, such as Shechem, Jerusalem, and Hebron in the Middle Bronze Age, transported goods to “intermediate markets” located in the lower hills or coastal plain that were then were linked to coastal commercial centers. Goods sent along this trade network could have ranged from pastoral and agricultural products to salt and bitumen from the Dead Sea and copper from Sinai or the Wadi Feinan in modern Jordan. Within this dendritic system, power was asymmetrical with the larger balance of power always tipped in the direction of the port; thus, the regional markets that held some power over the hinterland were in turn controlled by the intermediate markets dominated by the port (Stager 2001: 629). For Stager, control of the entire system was affected through economic coercion and control of information that ultimately rested in the hands of the merchants, some of whom may have been “foreigners” living in a colony at the port. (Stager 2001: 629)

In an adaptation of the dendritic model for settlement and trade, S. Cohen presents a four-phase development of ceramics in the MB I for the Levant (2002). These phases are based on work by P. Gerstenblith’s seriation of MB I pottery from Megiddo (1983) and P. Beck’s work at Aphek (1985). Using the ceramic chronology as presented at Aphek to date MB I sites, Cohen suggests that the developmental pattern is indicative of dendritic economic networks. Larger, fortified sites are trade centers for smaller less powerful sites further east up the wadi basins, forming an imbalance of power and trade as described in the “Port Power” model. Cohen (2002) suggests that initial settlement was made on the coast and settlements began to be established on routes into the highlands possibly to obtain natural resources there. Luxury items and imported pottery appear in higher concentrations closer to the coastal trade centers such as Akko,
Ashkelon, and Dor, in addition to “gateway” cities to inland settlements such as Megiddo and Gezer (Cohen 2002: 129–30). Cohen (2002: 131) attributes this dendritic exchange system and “cultural renaissance” of the MB I to contact with Middle Kingdom Egypt and the powerful trade cities such as Byblos.

Stager’s model of “Port Power” makes the best use of the data for the settlement patterns of the Early Bronze Age combined with the status of Ashkelon as a major port on the southern Levantine coast that was engaged in maritime trade with early dynastic Egypt. While Stager feels that the model is also applicable to the Middle Bronze Age (Cohen 2002) and to Phoenician trade networks in the Mediterranean, especially the colonies in Spain, he admits that the model can be subject to re-interpretation or even discard if anomalies cannot be incorporated. Critiques of the “Port Power” model include the observation that Stager’s assumption that coastal sites were integrated to interior regions by east-west wadi systems is hardly applicable for Ashkelon since the site is not situated on a drainage system. Also, the wadi networks were not always the transportation corridors like the rivers of Southeast Asia in Hall’s original study. Although Stager mentions “harbor princes” twice, the concept of economic power outweighing that of the state seems to disregard the palace-controlled trade prevalent in the ancient Near East. If Egypt’s trade was monopolized by the crown, something Stager admits (2001: 629), would the city-states in the southern Levant, secondary states that rose from contact with a pristine state like Egypt, be any different (see Esse 1989)? Stager’s description of “shipping and trader barons” and merchants “in their counting houses” (2001: 633) holding mercantile sway over inland polities ripe with natural resources destined for foreign markets evokes images of the Hudson’s Bay Company trading with natives Americans for furs or the East India Company establishing
footholds at Indian ports to trade for spices and tea. Finally, in Stager’s iteration of “Port Power,” the balance of economic power is at the port so that the port is the core and the inland coastal plain is the periphery. In some cases such as Middle Bronze Age Aphek or Kabri, however, the coast is the periphery and the inland is the core.

Such critiques serve to modify the “Port Power” model and increase its potential use along with other models applicable for the macroscale level of investigation for testing by the present study of settlement patterns in the central coastal plain. In his analysis of Ashkelon and its regional context, M. Allen presents three settlement pattern models for the hinterland of Ashkelon (1997; 2008: 23). First, in the “organic” model agricultural production and population growth are within a feedback loop determined largely by ecological variables. This model borrows from CPT and posits a settlement pattern oriented toward a central place or a hierarchy of such. A second model, the “uniform” model, acknowledges the influence of external political and economic factors in that rural intensification would be needed during periods of external control to support the administrative and martial activity in the area. The resulting pattern would comprise small uniform sites with regularly spaced regional centers built as collection and storage facilities that would send products from the rural periphery to an external core. In contrast to the local autonomy assumed in the “organic” model, the “uniform” model presupposes a dominant external power exerting pressure to change the settlement pattern of a region. The third model, dubbed “access resources” by Allen, is applicable to commercial centers on a nexus between the sea and land, that attract trade and the interest of foreign powers due to the inland links of the site. A settlement pattern for the “access resources” model would be

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30 It should be noted that mercantile efforts of the European powers during the age of colonialism were meant to establish ports or trading posts under a company’s control and thus, may not be directly analogous to Levantine merchants controlling Early Bronze Age or Middle Bronze Age Levantine trade, but the application of “Port Power” to the Phoenician expansion in the western Mediterranean may hold true.
linear, or dendritic, with sites positioned along trade routes, connecting inland centers to a coastal outlet and few rural sites and illustrating Stager’s “Port Power” model.

2.5.4 Site Typologies and Hierarchies

Analysis of settlement patterns should begin with the formulation of a site typology, that is, “a classification that reflects the difference in size, function, features, and other attributes of sites dating to the same period” (Flannery 1976: 163). Significant information about settlement systems often derives from regional survey and may produce relatively objective site types such as regional and secondary centers, villages, hamlets, farmsteads, campsites, or other categories with implicit administrative hierarchies. Often, site typologies as determined by investigators result in a site-size driven scale to avoid interpretation of site function. For example, the EB II–III sites examined by Broshi and Gophna (1984: 42) are divided into a five tier hierarchy of 0.1–0.3 ha, 0.4–1.0 ha, 1.1–4.9 ha, 5.0–9.9 ha, and sites 10 ha or larger (see also Broshi and Gophna 1986:74; Broshi and Finkelstein 1992: 48).

However, the site-size approach is difficult to implement since the areas reported for many surveyed sites, if at all, are often estimates.31 Further, while the surface pottery may indicate the majority of periods of occupation, the extent and nature of activities at a surveyed site are not always evident without excavation. Given the fragmentary nature of most salvage operations, estimates of site size are often lacking in preliminary reports. Salvage excavations area also conducted in places that are completely altered by construction; often, there are no traces of archaeological materials left once a construction project is completed. Additionally, the boundaries as listed in the IAA database, and listed in Appendix A, only provide the maximal

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31 More recent survey work conducted at previously surveyed Middle Bronze Age sites in the western Galilee employed GPS equipment to record the extent of artifact scatters, visible architectural remains, or presently buried features affecting the shape of the site (e.g., terraces or fortifications), resulting in the correction of past site size estimates (Yasur-Landau, Cline, and Pierce 2008: 63).
extents of the protective boundaries around a site and do not reflect the site’s actual size. Settlement typology based on size alone not only neglects the function of site and its associated artifacts but is problematic for this project due to its reliance on data from surveys, rescue archaeology, and a sites and monuments registry that delineates a protective margin around a site without noting the site’s actual location or size.

In tandem with ranking sites by their estimated area, several studies of Bronze and Iron Age settlement patterns have created site typologies and resulting hierarchies to propose settlement models for both the region and the entire extent of the land of Canaan. The settlement typology derived by M. Broshi and R. Gophna based on fortifications resulted in four types: rampart settlements built over EB II–III cities; rampart sites built on virgin soil or previously unfortified sites; fortified centers without ramparts (free-standing walls); and unfortified sites (1986: 88). Overall, this typology is both acceptable and applicable because this it distills Middle Bronze Age sites to the key components that define such sites, namely: the presence or absence of fortifications, the type of fortifications, and the relation of the urban fortified centers to earlier settlements.

Regarding the smaller sites without constructed defenses, Gophna and P. Beck classify the Middle Bronze Age rural (i.e., unfortified) sites of their regional study based on site size, location, and material culture (1981: 75–76). As a result of their analysis, they proposed seven territorial sub-divisions of the coastal plain and their respective rural sites and urban centers and elucidated the differences between the Early and Middle Bronze Age urbanization processes and resulting settlement patterns, noting that the Middle Bronze Age system endured through the Late Bronze Age and later Iron Age (Gophna and Beck 1981: 77–78). The areas of the southern Sharon between Naḥal Poleg and the Yarkon basin and the lower drainage system of Naḥal
Ayalon southeast of Jaffa are of interest for the current study. The rural settlement comprised eight categories determined by Gophna and Beck based on their size, location, and nature of their material remains, namely: villages of one acre or more, hamlets of less than one acre, farmsteads composed of sporadic buildings, campsites, cult sites, “sea-oriented” sites, cemeteries, and undefined sites (1981: 75–76). Their analysis indicates that the Middle Bronze Age rural population had no preference for topography and settled on hills, plains, or in valleys near arable land and perennial water sources. In relation to the fortified and stratified urban centers, the rural settlements may belong to a pre-urban phase of MB I, and/or serve as satellites or larger sites, but some inter-site relationships were indeterminate. Gophna and Beck (1981: 77) view this territorial sub-division of the coastal plain and the rural components of an urban system as evidence of a system attested in the Late Bronze Age textual records, citing additional support from the Middle Kingdom Egyptian Execration Texts.

The site typology of Broshi and Gophna (1986) discussed above is complimented by the hierarchies for Middle Bronze Age sites outlined by D. Ilan (1995: 305). For the MB I, Ilan proposes a four-tier system of regional centers and gateways; sub-regional centers and/or loci of specialist production or service; villages; and farmsteads in which political and commercial interests are prime and built on the foundation of village and farm production (1995: 305–06). The MB II–III typology evinces a more complex hierarchy consisting of:

1) First order gateway (e.g., Hazor);
2) Second order gateway (e.g., Ashkelon, Kabri, Pella);
3) Third order gateway (e.g., Dan, Jericho, Dor, Jaffa);
4) Regional center (e.g., Megiddo, Beth Shean, Shechem, Gezer);
5) Sub-regional centers;
6) Villages; and

7) Farmsteads or hamlets.

Within this system, fortified sites would most likely be ranked as sub-regional centers or higher based on the assumption that such centers, providing a number of services to lower-order sites, would have evidence of defensive works. Clearly, this hierarchy favors commercial power as the gateway sites rank higher than regional centers (e.g., Jaffa ranks higher than Megiddo or Shechem), and within the current study only a few of the sites such as Jaffa and Aphek can be confidently placed in categories other than village or sub-regional center.

Ancient textual sources of site typologies and hierarchies express the organization and types of settlements that were most important within their cultural sphere. Burke presents a comprehensive array of settlement typologies and hierarchies based on archaeological and textual sources from the Syrian Jazira in the third millennium, Early and Middle Bronze Age Ebla, Old Babylonian Mari and Mesopotamia, Late Bronze Age Alalakh, Arrahpe, and Ugarit in addition to information on the Middle and Late Bronze Ages southern Levant (2008: 103–22). The array of site types within the Old Babylonian terminology and Ugaritic administrative texts evinces the awareness of distinctive settlement hierarchies within ancient cognition ranging from fortified town and its various components to unfortified towns, villages, and specialized sites such as watchtowers or agricultural estates (Burke 2008: 110, Table 16).

Terminology for settlements in the Amarna letters also reveal ancient concepts of site hierarchies. In EA 137, Rib-Hadda of Byblos appealed for help from the Egyptian king, asking either to be restored to the throne of Byblos or to be allowed to settle in what the letter denotes as ālāni pu-ru-zi (Na’aman 2005: 282; see also Moran 1992: 218–21). The noun pu-ru-zi, likely a Canaanite loanword since it is absent in other cuneiform texts, distinguishes this type of
settlement from the general term ālu, or “city,” that could be used to refer to the spectrum of Bronze and Iron Age site types (see CAD A/1: 379–88). Na’aman posits that pu-ru-zi is related to the Hebrew root prz employed in several biblical passages and translated as “unwalled villages” (‘ry/kpr hprzy; Na’aman 2005: 283). The category of “unwalled villages” likely included villages, hamlets, agricultural estates, and farmsteads and were located on the periphery of the territories of fortified cities. In both EA 137 and the Hebrew Bible, the noun pu-ru-zi/prz in its various conjugations should be understood as “rural unwalled village(s)” (Na’aman 2005: 283).

F. Frick’s work on the concept and meaning of ‘îr, commonly translated as “city” in the Hebrew Bible, also details the nouns used to describe other settlement types in the Hebrew Bible (Frick 1977: 42–61). The term ‘îr (pl. ‘ārîm) is used 1,090 times in the Hebrew Bible, and Frick observes that “the city as a walled place of refuge is…a very predominant way of understanding the city in the OT” (1977: 32). His examination of the semantic range of ‘îr results in the following meanings:

“(1) a fortified structure for defensive purposes; (2) a walled, permanent settlement; (3) a quarter within such a settlement, especially the citadel containing the temple or temples and the administrative quarters; and (4) in a more comprehensive political and economic sense, the city includes the citadel, the fixed settlement, and is the center of and marketplace for the surrounding secondary settlements of a less permanent nature” (Frick 1977: 39).

In his discussion of ‘îr and its connotation as a citadel, he notes other terms associated with “citadel” used in the Hebrew Bible (1977: 42–54). For example, qiryâ, a component used in

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pre-Israelite place-names such as Kiriath-Arba, Kiriath-Sepher, or Kiriath Jearim and in Moab (Kiritahaim), may not have been used by Israelites yet serves as a poetic parallel to ‘îr. In addition to its normal usage meaning “gate,” ša’ar may also be used in a synecdoche pattern in which a part of something stands for the whole. Thus, “gate” was used to refer to the whole city in Deuteronomistic passages (see Frick 1977: 44–45). Māqôm, a generic term for place of human abode, is used parallel to ‘îr (Gen 18:24, 26; Deut 21:19; Amos 4:6). Additionally, the Hebrew Bible uses multiple terms to denote features of a city’s defenses such as migdîl, bîrâ, and șerîaḥ. The most common, migdîl, or “tower,” is used to connote a stand-alone structure, usually to form a line of defense, or a nucleated settlement around a fortified tower (see Burke 2007 for a detailed discussion of Bronze Age defensive towers). Frick posits that cities germinated from a migdîl and its associated settlement (1977: 47). Types of cities denoted in the Hebrew Bible include store cities, chariot cities, cities of defense, royal cities, cities of refuge, and Levitical cities (Frick 1977: 136–42).

While the semantic range of ‘îr encapsulates any place of human dwelling with some defensive works, the biblical authors used several terms for unwalled and/or impermanent habitation sites from which the lower tiers of an Iron Age settlement hierarchy, based on the Hebrew Bible, can be derived. The noun hâśêr (pl. hâśêrim), possibly derived from a root meaning either “to encompass, surround” or “to be present, settle, or dwell,” refers to unwalled villages, and Lev 25:31 states their apposition to walled cities: “But the houses of the villages which have no wall around them shall be reckoned with the fields of the country…” (Frick 1977: 55–56). The settlement narratives in Joshua also communicate the relationship between walled and unwalled secondary settlements with the phrases “cities and their villages” (see Josh 19:6–23). A similar phrase, “the city and its daughters,” seems to be used in contexts of conquest (e.g.,
Other infrequent terms used to denote smaller or impermanent settlements include: ḥawwōt yāʾîr, small villages in Gilead conquered by the tribe of Manasseh (Num 32:41); nāweh (cf. Akkadian nawûm), likely pastoral encampments and associated animal enclosures; and kāpār, possibly a loanword from Akkadian or Aramaic, contrasted with fortified cities and translated as “country villages” (1 Sam 6:18 RSV; Frick 1977: 55–61). Utilizing these terms, a simple three-tier settlement hierarchy for biblical Israel and Judah may be proposed:

1) City (ʿîr and its associated synonyms discussed above): any fortified dwelling place ranging from a densely built environment to a singular watchtower;
2) Village (ḥāṣēr, kāpār, ḥawwōt): an unwalled, possibly semi-permanent, settlement;
3) Impermanent encampment or enclosure (nāweh).

The typology and hierarchy used in the current study and illustrated on the maps accompanying the discussion of settlement patterns from the EB IV to Iron III below combines the fortified and unfortified dichotomy elucidated by Broshi and Gophna (1986), and perceived by the ancient inhabitants of the coastal plain, with the hierarchy developed by Ilan (1995: 305) and certain categories of unfortified, rural sites. Although ancient sources communicate great insight and cultural details necessary for analyzing ancient settlement systems, ultimately, excavation remains the most useful method for determining site function. The site hierarchy and typology for the current study attempts to take both information sources into consideration and consists of six categories:

1) Gateways;
2) Regional centers;
3) Sub-regional centers;
4) Villages;

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33 Gateways for the present research area would fall under “third order gateways” in Ilan’s hierarchy (1995: 305).
5) Farmsteads or hamlets; and

6) Specialized sites (i.e., cave dwellings, cultic sites, campsites, agricultural installations, anchorages, and burials/cemeteries).

An additional seventh category of site with pottery only (e.g., a surveyed pottery scatter or pottery found during excavation without associated features) is employed to account for sites without visible architecture or other features. This typology recognizes the social complexity and political authority needed to construct fortifications and the dichotomy between the fortified urban centers and rural unfortified sites; thus, map elements distinguish between fortified and unvaulted sites while relative site sizes, often linked with the site’s place in the hierarchy are shown through graduated symbols. It should also be noted that the first three site types in this hierarchy may be fortified at some point in their settlement history, but their type and place in the hierarchy is not dependent on the existence of defensive works during a particular period. Also, it is acknowledged that some sites will also include intramural burials or a cemetery situated nearby, but individual burial sites or cemeteries tend to be discovered in isolation without a definite associated settlement and deserve a separate category apart from habitation sites.

2.6 Conclusion

Trigger’s observation that “What is important is that Settlement Archaeology forces us to think through problems from a new angle - that of social relations” (1967: 158) influences this project in its consideration of the connectivity of these sites to each other and the region’s situation in the wider Mediterranean world. By examining not only Jaffa but also its hinterland in terms of maritime and terrestrial cultural connectivity, it is useful to conceptualize Jaffa situated within a maritime cultural landscape as a transit point, a node for unloading and loading goods, or as the final destination of a ship’s cargo. Eastern Mediterranean ports in the Bronze and Iron Ages
should be considered links in a logistics chain stretching from a point of origin somewhere in the eastern Mediterranean basin, through the port, along a network of roadways, ultimately arriving at a consumer site.

Since studies of the landscape should consider the physical environment as well as cultural influences on the landscape and the effects of those processes (Wilkinson 2003: 10), this project integrates seemingly divergent approaches to the cultural landscape adopting both a processual stance focused on settlement patterns, land use, environment, and subsistence as well as the post-processual viewpoint that includes subjective elements such as cognition and perception. Ultimately, the consequences of human actions result in spatial patterns of settlement, and landscape can reflect the organization of society or communicate cultural values (Johnson 2005: 118; Federov 2013: 208). In contrast to Kowalewski’s critique of landscape methodologies above, the strength of the landscape approach lies in its diverse nature and in the fact that it is not a unified field. This is not to say that criticisms about disorganization are invalid since structure is required, but the many facets of landscape archaeology encourage diversity within theories, methods, and interpretations of the available data sets.

The end product of either a diverse landscape approach or a more rigid settlement systems paradigm should include a holistic view of the landscape that includes all aspects of environment and culture to reconstruct the past landscape. The threads of landscape as space and place, cognition and perception of landscape, and the economies of settlement and human activities that were subject to climate and ecology yet transformed the landscape can be woven together. While a complete picture of the Bronze and Iron Age Canaanite coast may never be ascertained, several components of the cultural landscape can be discovered, and this work is simply one of many interpretations that could be justified.
3.1 Introduction: The Importance of Reconstructing Past Environments

Karl W. Butzer describes the archaeological record as “a proxy for human biological and cultural evolution that identifies behavioral patterns encoded in artifacts and embedded in sediments” (2008: 403). To properly reconstruct successive settlement systems diachronically, an appreciation for the paleoenvironment and ancient topography is required to situate a site within its physical landscape, past climate regime, and larger geomorphologic system and draw attention to the organizational grain of an environment as a human habitat (Vita-Finzi 1978: 7; Butzer 2008: 404). Moreover, geology and geography are essential for comprehending certain site dynamics (Drewett 2004: 39).

While the modern environment belies much about the ancient conditions and is the latest stage of an environment’s history, emphasis should be placed on past environmental contexts because the historical landscape is central to a regional history (Felten, Muller and Ochs 2013). Such efforts are necessary given the shifts in global climate, changes in local topography and hydrology, presence of intrusive vegetation, and decrease or disappearance of faunal ranges. Further, this endeavor requires a multi-disciplinary approach since “sites form and are transformed within a four-dimensional matrix, as a result of interactive agencies unbeholden to disciplinary boundaries” (Butzer 2008: 404). An approach to the relationship between humans and the environment can address three aspects: the natural environment that serves as a living and working space for humans and constrains them, the exploitation of the environment for sustenance or raw materials for industry, and the impact of human operations within the environment including terracing, deforestation, and erosion (Trément 1999: 195). The following synthesis of several lines of paleoclimatic and environmental research attempts to present a
general picture of the geology, soils, hydrology, climate, flora, and fauna of the central coastal plain and address the physical characteristics of the physical location and migration of harbors within the region due to natural or cultural causes.

3.2 Biogeography of the Central Coastal Plain

Reconstructing paleoclimates and past landscapes can be accomplished through a variety of scientific avenues. Site catchment analysis, soil quality or potential, archaeobotany, pollen and mollusk studies, geomorphology, and archaeozoology contribute to an overall perception of the paleoenvironment (Walsh 1999: 1–3). Soil types are valuable in the study of diachronic changes in settlement patterns to elucidate changes in exploitation strategies. Study of sediment and soil can also illuminate landscape changes and give insights into ancient water regimes, locations of agricultural and horticultural activities, and distribution of dwellings (Ackermann 2007: 101–03).

Pollen studies are significant for paleoecological research because pollen is representative of a region’s vegetation and the pollen rain, the pollen carried by air, settles in terrestrial and lacustrine sediments. Such deposits can be used to infer regional vegetation and climate, assuming that the pollen-vegetation and vegetation-climate relationships operated in the past in the same manner as the present (Kneller 2009: 816).^34^ Wood remains from archaeological sites also reveal various aspects of the ancient environment and human activities (Lev-Yadun 2007; Weiss and Kislev 2007). The long history of wood use combined with the fact that wood must be transported to a site for a reason means that such remains may signify intentional human activity more than other plant remains; simply, “specific types of wood were deliberately brought into archaeological sites because of their suitability for certain uses” (Lev-Yadun 2007: 142). Dry and

^34^ The use of pollen studies should consider additional factors such as the tendency for pollen to be moved through archaeological layers via wind or gravity and the fact that wind can move arboreal pollen farther than herbaceous pollen (Grossmann 2001: 10).
charred wood samples are useful not only for dendrochronology but also species identification that might expose ecological differences at a species level, indications of past climate, and human impact on the environment as well as local and international trade and craft technology (Lev-Yadun 2007: 142–43, 153). Likewise, archaeobotanical samples, including dry or charred finds, impressions of plants on clay, plaster, and bricks, or remains that only appear as phytoliths, contribute to reconstructions of environment and climate, economy, and ancient lifestyle (Weiss and Kislev 2007: 167–70). Weeds are also important for archaeobotany since certain weeds only grow in specific soil types or under certain conditions (Chernoff and Paley 1998: 398). While the temptation exists to interpolate the specific information provided by specialist studies for a wider area than originally intended or to employ extra-regional data by analogy, it must be noted that certain taphonomic processes are particular to the Mediterranean region, and the integration of data at different temporal and spatial scales can only represent cumulative processes and effects and offer generalizations (Walsh 1999: 5–7). Careful synthesis of all the information can present a fuller picture of a region’s past landscape and climate as well as the social, political, and economic strategies employed by its inhabitants.

3.2.1 Physical Geography

A region is “determined by a complex of climatic, physiographic, biological, economic, social, and cultural characteristics” (Forman and Godron 1986: 13). Using this definition, the southern Levant can be divided into four main zones with several distinct regions, namely: the coastal zone, the central hills, the Jordan Rift valley, and the Transjordanian highlands. The coastal plain of Israel extending from the Rosh ha-Niqra ridge southward and interrupted by the Carmel Ridge is twenty-one percent of the land of modern Israel (Kallner and Rosenau 1939: 61). In ancient times, the coast served as a focal area of the land bridge between Egypt and Mesopotamia,
providing a gateway to the Mediterranean (Raban 1985: 11). Physically, the southern coast from Rafah to Mt. Carmel consists of a low escarpment (10 m to 50 m high) that is interrupted by former river estuaries filled by beach, swamp, and alluvial deposits (Raban 1983: 216). Stating that the coast below Carmel is “without promontory or recess,” G. A. Smith noted the possibility of anchorages at ‘Atlit, Dor, Jaffa, and Ashkelon. Concerning other places, he stated: “the rest is merely a shelf for the casting of wreckage and roosting of seabirds” (Smith 1896: 128). Along this seemingly feature-less coastline, Jaffa was hailed as “a true cape, it projects into the sea, a landmark visible from a far distance...” (Tolkowsky 1924: 1).

This study centers on the hinterland of Jaffa in the Sharon plain with its major watercourse, the Yarkon River, and its tributaries. South of Mt. Carmel, the Plain of Sharon extends from Naḥal Tannanim (Crocodile River) to the Naḥal Soreq (Nahr Rubin), widening from approximately 13 to 20 kilometers. The name Sharon might derive from the Semitic root yšr, meaning “smooth” or “straight,” possibly cognate with the Akkadian išarum (Brown et al. 1952: 448; Smith 1896: 52). According to Aharoni, the name Sharon also had the connotation of a “forested region,” referring to the oak forests growing on the red soil (1979: 24; see Isa 33:9, 35:2). The unsuitability of the non-alluvial soil for agriculture led to the use of the region for grazing flocks as attested in the Hebrew Bible (1 Chr 7:21, 27:29; Isa 65:10; Rainey and Notley 2006: 75). In an Amarna Letter, Rusmany the king of Šaruna affirmed his loyalty to the Egyptian king (EA 241; Moran 1992: 296). Petrographic analysis of the clay of the tablet designated EA 241 indicated that the missive originated from the southern Bashan or the Yarmuk valley (Goren, Finkelstein, and Na’aman 2004: 220–21). The designation of the coastal plain south of Carmel and north of the Nahal Soreq as “the plain of Sharon” in the Hebrew Bible seems to be a later development in comparison to earlier attestations that refer to a town or city-state located elsewhere.

35 Of the six times “Sharon” is found in the Hebrew Bible, five instances seem to refer to the coastal plain, while one refers to a particular town in the Bashan area of Transjordan (1 Chr 5:16). In contrast to the majority of the references in the Hebrew Bible, earlier attestations of this place name also seem to indicate a specific town. The Middle Kingdom Execration Texts invoke a town written as š(u)-a(?)-nu and reconstructed as Šarānu (Posener 1940: 80, E 30). Later, the town of Ša-rû-na, translated as Sharon, appears in a list of maryannu from Djahi sent to Egypt as emissaries dated to the reign of Thutmose III or his co-regency with Amenhotep II (Papyrus St. Petersburg 1116A.75 and 185; Rainey and Notley 2006: 75). In an Amarna Letter, Rusmany the king of Šaruna affirmed his loyalty to the Egyptian king (EA 241; Moran 1992: 296). Petrographic analysis of the clay of the tablet designated EA 241 indicated that the missive originated from the southern Bashan or the Yarmuk valley (Goren, Finkelstein, and Na’aman 2004: 220–21). The designation of the coastal plain south of Carmel and north of the Nahal Soreq as “the plain of Sharon” in the Hebrew Bible seems to be a later development in comparison to earlier attestations that refer to a town or city-state located elsewhere.
Along the coast, the Sharon escarpment, the nearly continuous cliff of 10–50 m high extending from Mt. Carmel to Rafah, attained its present form after the Early Bronze Age (Bakler 1989: 201). The Nahr el-ʻAuja, the modern Yarkon River, rises at Ras el-ʻAin near biblical Aphek (Herodian Antipatris), and the main commercial trunk route used in antiquity shifted slightly east to avoid fording the river but ran close enough to take advantage of the available fresh water produced by the spring (Dorsey 1991: 61). Sufficient groundwater exists at moderate depths, but a lack of proper drainage in ancient times resulted in large areas that were swampy (Kallner and Rosenau 1939: 63). North of the Yarkon, cemented calcareous sandstone ridges, locally called kurkar, prevent adequate drainage of wadis contributing to the development of wetlands east of these ridges.

The geographical extent of the current study encompasses part of the tribal territory allotted to the Israelite tribe of Dan as reported in Josh 19:40–48 (Bartusch 2003: 81–97). The five districts noted with the text center primarily along the courses of the Nahal Soreq and Nahal Ayalon. Much ink has been spilled about the town lists and in identifying cities listed in the Hebrew Bible with known archaeological sites (e.g., Kallai-Kleinmann 1958, 1961; Mazar 1960; Svensson 1994; Galil 2000). However, in light of the troubles with lowland Canaanites recorded in Judg 1:34–35, the Danite allotment and settlement were idealistic constructions, probably based on later administrative districts (Kallai-Kleinmann 1961: 226). Rainey and Notley, following the inscription of Eshmunazor and the Onomasticon of Eusebius (162: 5–6), place the southern border of the Sharon in the Valley of Soreq, which functioned as the southern boundary of the Danite inheritance described in Joshua 19 and the southern boundary of the present study (2006: 37). The Nahal Ayalon formed a boundary for the Danite inheritance which did not
include Jaffa but did include “the territory facing Jaffa,” the port’s economic hinterland in the Ayalon and Yarkon basins (Josh. 19:46).

3.2.2 Geology

Discussions about paleoenvironments, including climate, divide the coastal zone of Israel into two portions. The northern part extends from the Carmel range to the Rosh Ha-Niqra ridge on the Lebanese border while the southern part, including the Sharon plain, runs from the southern slope of Mt. Carmel into the northern Sinai. The main component of Israel’s coastal plain below Carmel is Nile sediment composed of silt and clay particles and quartz sand with feldspar carried from Ethiopia via the Blue Nile and deposited by water current and wind from the Delta to the Akko promontory (Nir 2001: 11; Ronen et al. 2005: 187–88). Ten sedimentary cycles are evident stretching from the Middle Paleolithic to recent sand deposits, the latest of which vary in thickness up to two meters (Ronen 1983: 125-26). While the coastal plain is composed of alternating layers of sediment from marine and terrestrial origins based on ingression and regression, its eastern boundary is defined by older geologic formations of the hill country that meet younger formations of the coastal plain (Issar 1968: 16–17). On the eastern edge of the study area, a strip of limestone hills, spurs extending from the hill country of Samaria, with accumulated rendzina and terra rossa soils in the intermontane valleys and wadi channels provided good conditions for settlement despite the lack of natural water sources.

36 In addition to sediment from the Nile, drainage networks dispersed sediments at their interface with the sea which also contributed to silting (Stanley, Mart, and Nir 1997: 531; Sandler and Herut 2000: 352). The navigability of rivers along the Levantine coast was affected by this silting of the lower courses and blockage by wave-built sand bars (Raban 1985: 18).

37 The four main geologic formations of the central coastal plain include: the Yafo formation of marine deposits of shale and clay dating to the Miocene and early Pleistocene; the Pleshet formation comprises calcareous and sandy limestone (kurkar) dated to the Upper Pliocene to Holocene; the Rehovoth formation of hamra loams, clays, and silt of terrestrial and limnic facies dated from Pleistocene to recent periods overlying the Pleshet formation; and the Ahuzam formation of gravels in the eastern portion of the coastal plain overlying the Pleshet formation (Issar 1968).
Pleistocene coastal landscapes are represented by carbonate-cemented quartz sandstone called *kurkar*, and reddish sandy loams named *hamra* (Goldberg 1995: 49). *Kurkar* occurs in ridges parallel to the coast with older formations eastward, and these ridges are instances of former shorelines. Archaeological sites were often founded on these *kurkar* ridges (Avnimelech 1950–1951: 77). These shore-parallel ridges decrease in number from seven in the south to two in the north (Ronen et al. 2005: 188). Ridges are closer together in the north and lower in elevation in the south (Goldberg 1995: 49). In the southern part of the coastal plain from Gaza to Tel Aviv, designated by modern earth scientists as Pleshet (referring to ancient Philistia) or the Judea coast, up to seven *kurkar* ridges can be distinguished, while the Sharon plain from Tel Aviv to Caesarea has three to four ridges covered with red loam (Ronen 1983: 122). In the area of the central coastal plain, the terrestrial *kurkar* ridges are paralleled by three to four more offshore ridges on the continental shelf constituting an active part of the seascape (Neev, Bakler, and Emery 1987: 3). Poorly drained channels between ridges into which *hamra* is deposited are called *marzeva*. While the *kurkar* ridges prevented water from draining to the sea creating marshy areas between the ridges, they also blocked sand from encroaching inland except for areas where rivers eroded gaps into the *kurkar* ridges, such as the Nahal Gelilot near Tel Michal (Grossmann 2001: 4). Low hills of red *hamra* inland from the *kurkar* ridges are separated from the hills of Samaria farther east by an alluvial trough valley as wide as six kilometers that runs southward to the Yarkon River basin. The weathering of *kurkar* provides additional sediments, resulting in coarse sediment near the shore and finer sediment lain towards deeper water as well as fluvial deposits where seasonal watercourses empty into the sea. An implied west-northwest trending tectonic fault called the Yafo–Lod (Ramle) line is indicated by the terminations of parallel offshore and terrestrial *kurkar* ridges north of the Yafo promontory and the east-

Within the research area of this project, four main soil associations with several sub-associations can be distinguished. From west to east, the main soil associations are terra rossa (A), hamra (E), grumusols (H), and sand (V; see Figure 6). Soil associations are soil units found within the same soil landscape and are formed from the same primary material (Dan 1988: 95). Rather than areas of homogeneous soil, one soil type is typically found in association with a variety of other soils due to differences in topography and parent material. Terra rossa soil largely occurs with outcrops of its parent material limestone and dolomite in the central and northern hills of Israel, forming when rainwater leaches carbon and silicates from the parent rock leaving soil abundant in iron hydroxides (Dan 1988: 107, 114). This soil only occurs along the eastern edge of the study area in the low hills bounding the coastal plain. In addition to cultivars, terra rossa is dominated by the Quercus calliprinos (Kermes oak)–Pistacia palaestina (terebinth) arboreal association. Hamra soils originate from coastal sand and calcareous sandstone in addition to alluvial sediments and are typical for the central coastal plain (Dan 1988: 117–18).
This soil association includes *pararendzina* soil formed from the *kurkar* ridges of the coastal plain (Dan et al. 1972: 44–45). *Hamra* has relatively same distribution as *kurkar* formations, and although *hamra* is a paleosol (fossil soil), its formation remains in question. While lighter clays exhibit aeolian deposition, it is unclear if *hamra* formation was related to past climate changes, fluctuation in sea level, or the underlying chemical composition of the sandstone substrate.
Grumusols composed of fine-textured aeolian or alluvial sediment occupy the floodplains of the drainage network (Dan 1988: 119). Most of the primary vegetation in the areas of this soil association has been replaced by segetal association of *Prosopis farcata* (Syrian mesquite)–*Scolymus maculates* (Spotted golden thistle).

The sand of the coastal plain consists of unconsolidated dune sand originating in the Nile Delta and transported by water and wind currents for the last million years (Dan 1988: 125; Ronen et al. 2005: 188). In addition to the Nile sands, the cliff above the beach on the Sharon shore also contributes 200,000 m$^3$ of sand to the beach and continental shelf (Ronen et al. 2005: 189). “Hadera” dune sands appear two to three geologic layers above earlier “Tel Aviv” kurkar beds, deposited seven to five thousand years ago, and Early Bronze Age continental aquatic deposits, originating from the Nile Delta (Horowitz 1979; Neev, Bakler, and Emery 1987: 23). At the onset of the Middle Bronze Age, people began to settle on the kurkar formations along the coast, and the sea level was one to two meters lower than present (Sivan, Eliyahu, and Raban 2004: 1046). It was also at this time that aeolian sands began to be deposited along the coast. The youngest sand deposits are post-Roman period in date given their coverage of Late Roman and Byzantine sites and the presence of Early Islamic and Crusader period burials in the stabilized dunes, although in some areas near Apollonia that were forested during the Crusader period, the ingression of sand must have occurred after the Middle Ages (Neev, Bakler, and Emery 1987: 23). Vegetation for the shifting coastal dunes includes *Ammophiletum arenarium* (marram grass), and the stable sand dunes and fields are dominated by *Artemisia monosperma*.

The late Avner Raban emphasized that any study of ancient ports should reflect upon the location and nature of the ancient coast line (1990–1993: 99). The three kurkar ridges parallel to

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38 The kurkar ridges also pose an enigma regarding their formation environment and which sandstones are continental or marine in origin and if the stone and soil resulted from marine transgression or regression or both.
the coast are not merely solidified sand dunes, but representations of ancient shore lines; thus the
gеology of the coastal plain records the various ingressions and regressions of the sea in the
prehistoric era record (Issar 1968: 23). Complementing the geologic evidence, Neolithic,
Chalcolithic, and Early Bronze Age sites are found submerged off the coast, situated in the
troughs between kurkar ridges. The commencement of maritime trade along the Levantine
coast, probably in the late fourth millennium, coincided with a rise in sea level, which flooded
stream channels and created deep coastal estuaries that allowed ships to sail to transit points
upriver (Raban 1990–1993: 99). Access to such riverine ports after the sea level dropped would
be dependent on the depth of the surviving river channel and the draft of the vessel. It must also
be noted that a rise in sea level affected coastal roads and agricultural potential and created
swamps due to poor drainage (Grossmann 2001: 11).

The presumed sea level at the start of the Middle Bronze Age was almost 3 m lower than
present (Wreschner 1977: 280*–81*), but Raban observed that this may be an over-estimation
(1983: 229). Given the distribution of Middle and Late Bronze Age anchors off the Carmel coast,
a reconstruction of the shoreline 60–80 m west of the present line and a sea level 1–1.5 m lower
(14–15 m below mean sea level) than at present can be proposed. This corresponds with the
location of a Middle Bronze Age cemetery at ‘Atlit that also marked the shoreline (Galili,
appears to be near the modern level given the location of sites from that period located close to
the present shoreline.

39 These pre- and protohistoric sites located off the coast of Israel, many of which were exposed during a winter
storm of 1968 that removed much coastal sand, survived marine transgression and are subject to less wave energy in
part due to the depth of sediments covering each site and the depth of water (Flemming 1983: 146–50).
In addition to eustatic changes, local fluctuations in sea level along Israel’s coast may be isostatic changes caused by tectonic movements (Neev, Bakler, and Emery 1987: ix). The seemingly-featureless coastline, resulting from tectonic activity or marine abrasion, greatly influenced the pattern of settlement in the region, and following the Early Bronze Age, the coastline was relatively stabilized. Earthquakes in the area resulted in movement that had “a creeping nature rather than catastrophic faulting,” and the gradual changes that occurred such as the uplift of land and subsidence of offshore deposits were not recorded in textual sources (Neev, Bakler, and Emery 1987: xii). Based on the location of certain dark clay deposits, that may have originated from swamps, overlying EB IA material, H. Ritter-Kaplan posited that the northern bank of the Yarkon was uplifted after the EB IA and that disparate deposition of the black clays in relation to Early Bronze Age material on either side of the river likely shows that the Yarkon basin represented a tectonic fault line perpendicular to the coastal fault (1979a: 240–41).

Geologically, the Early Bronze Age to Middle Bronze Age transition was marked by three changes in the coastal belt. First, the present coastline and cliffs resulted from vertical tectonic movement in this period. Second, the sea ingressed eastward, possibly due to seabed subsidence rather than a eustatic rise in sea level. Finally, the continental block east of the coast was uplifted rejuvenating the erosional processes of the late Pleistocene drainage network (Neev, Bakler, and Emery 1987: 111–12). The oscillatory tectonic movements created conditions favorable for swamps and sand dunes.

By the MB II, the coastline had changed from flat lagoons and marshes to an uplifted cliff with a narrow beach characteristic of the shore north of Tel Aviv in the region of Tel Michal and Apollonia-Arsuf (Neev, Bakler, and Emery 1987: 96). The first of three generations of sand dunes were deposited along the coast during the Middle and Late Bronze Ages with a long hiatus.
of dune formation until the Late Roman period (Raban 1983: 230; Neev, Bakler, and Emery 1987: 112). The Middle to Late Bronze Age transition witnessed a greater tectonic event than the previous Early to Middle Bronze Age transition with evidence of collapse and subsidence along the shore at Tel Michal, Yavneh Yam, and Tel Haraz further south, likely the result of the earthquakes and tsunami triggered by the eruption of Santorini (ca. 1628 B.C.E.; see discussion of natural disasters below). Bakler attributes the subsidence of large masses of material from the coastal cliff at Tel Michal at the end of the MB II and LB I to tectonic activity (1989: 202). All fortification walls at Tel Michal during the Middle and Late Bronze Age were built diagonal to the coastline trending north-northeast. The MB II enclosure at Tel Michal was partly built on late Pleistocene deposited kurkar and on an artificial earth ramp, but a catastrophic event prior to the LB I caused the collapse of the western portion of the platform (Neev, Bakler, and Emery 1987: 56). This situation may be analogous to the fate of the fortifications at Yavneh Yam, which also date to the MB III–LB I and suffered marine abrasion (Neev, Bakler, and Emery 1987: 67).40 The Late Bronze Age inhabitants at Tel Michal built an enclosure and extended the earth platform further to the east, yet those fortifications were also subject to collapse and reconstruction in the LB II with further eastward expansion of the man-made earthen ramp upon with the enclosure walls were built. Tectonic activity, possibly correlated to a long tectonic phase in the Aegean and western Anatolia that included the Thera eruption, may have caused the destruction of the Middle Bronze Age and Late Bronze Age fortifications at coastal sites such as Tel Michal and Yavneh Yam (Neev, Bakler, and Emery 1987: 56). However, it must be noted that Burke disagrees with Herzog’s invocation of tectonic activity for the demise of the Middle

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40 Burke disagrees with the terminology employed by Herzog, namely, “platform” and “ramparts,” in relation to the MB settlement at Tel Michal, noting that “there is insufficient reason for the identification of a platform, rampart, or glacis at the site” (2008: 296–98).
Bronze Age settlement at Tel Michal given the quantities of brick debris and ash evident in the construction of LB I ramparts (2008: 298). Further, he dismisses the claims that tectonic activity caused a change in the coastline that destroyed half of the enclosure at Yavneh-Yam since no evidence exists indicating that the enclosure was actually rectilinear, contrary to the opinion of J. Kaplan, the enclosure’s excavator (Burke 2008: 78).

Another minor phase of tectonic activity may have occurred during the Late Bronze Age to Iron Age transition, possibly causing the abandonment of coastal centers like Tel Michal. Other breaks in the occupational sequence may also be the result of natural processes. Despite the catastrophic events associated with tectonic movements or subsidence, the rebuilding of such sites as Apollonia, Tel Michal, and Yavneh Yam in the same location after an earthquake was likely justified by the site’s strategic or economic importance (Neev, Bakler, and Emery 1987: 113).

In a summary of the past environment of the coastal plain, P. Goldberg proposes that the earliest inhabitants would have “observed a sandy landscape which was periodically stabilized by vegetation probably during periods of wetter climate...they would have also noted the rising and lowering of sea level in response to retreat and advance of the ice sheets in the northern latitudes” (1995: 50). The importance of this geologic information for this study lies not only in the reconstructions of marine ingression and regression and the soil types and potential agricultural yield but also in a better understanding of the basic components from which the inhabitants of the coastal plain would fashion their buildings and ceramic vessels. For example, the location of Tell Qasile on a kurkar ridge in the coastal plain along the Yarkon riverbed and the underlying geology illustrate how available raw materials affect the production of both building materials and structural integrity of buildings at the site. The inclusion of coastal sand as
well as the lack of clay to mix into a mudbrick matrix resulted in weaker bricks that could not withstand structural stress and eventually led to collapsed walls (Rosen 1985: 133). Thus, the geology of the coastal plain together with its hydrology formed the base landscape with which humans interacted over the millennia of occupational history in the region. While humans were able to use the geologic raw materials to their best advantage, they were still constrained by their geologic surroundings and its physical properties ranging from the topography and soil makeup to the chemical composition of the clays used for craft production.

3.2.3 Surface Hydrology

An examination of the surface hydrology of the central coastal plain, both seasonal and permanent, reveals the importance of such water features and the resources that they presented to the ancient inhabitants of the region. A central hydrological feature to the study area is the drainage system that includes the permanent Yarkon (Nahr el-’Auja) and the seasonal Ayalon (Wadi Musrara) rivers in addition to other wadis that drain into the Yarkon basin such as the Naḥal Qana, Naḥal Rabba, Naḥal Shillo, and Naḥal Mazor. The springs at Rosh Ha-‘Ayin (Aphek-Antipatris) are the second most stable water source in Israel after the Jordan River, producing as much as 220,000,000 m³ per year (Avitsur 1957: 24). Tolkowsky noted two springs on the northeastern side of Jaffa that provided drinking water but lay outside the Bronze and Iron Age fortifications (1924: 2). Due to the high water table, many sites in lower areas such as the trough between the hamra hillocks and the fringe of the hill country obtained fresh water from wells and cisterns (Beit-Arieh and Ayalon 2012). The map sheets produced by the Survey of Western Palestine that correspond to this study’s area of interest reveal numerous wells dotting the central coastal plain from the lower hills west toward the coast (Conder and Kitchener 1881–1883: Sheets X, XI, XIII, and XIV).
M. Avnimelech sought to understand the ancient streambed of the Yarkon in relation to the settlement along its length including Tell Qudadi, Slaughterhouse Hill, Tell Qasile, and Tel Gerisa and other wadis that adjoin the Yarkon (1950–1951). The topography of the Yarkon basin and distribution of alluvium indicate numerous past river meanders and instances of avulsion. Fluvial processes such as erosion and alluvial deposition are affected by seasonal changes in climate that increase or decrease the river flow. Yannai’s excavations of Yehud showed that the Yarkon flowed at a lower level in the channel and did not inundate the EB IV and Middle Bronze Age tombs at the site in contrast to the Byzantine period in which thick layers of alluvium were deposited (Yannai 2004). The width of the current river (40–60 m near Tell Qasile) compared to the width of the flood plain (400–600 m) indicates extensive changes in the river’s course (Avnimelech 1950-51: 79). The length of the Yarkon also varied with sea levels. The geomorphology of the valley is further complicated by the presence of tributaries and the confluence of the Yarkon and Ayalon near Tel Gerisa. Cores taken on the northern bank of the Yarkon and at water level of the Ayalon adjacent to Tel Gerisa contained alluvial sequences of mud and sand with little organic material for dating and one Persian period ceramic sherd at -2 m depth in the Gerisa core (Gifford and Rapp 1989: 206). Coring from the Geological Survey of Israel showed that the bedrock channel of the Yarkon contained about 30 m of alluvial fill and was likely deep enough in antiquity to allow passage of vessels inland as far as Tell Qasile or Tel Gerisa, depending on the vessel’s draft. Natural dams at el-Haddar (the Herzliyya Bridge) and Tel Gerisa indicated that both the Yarkon and the Ayalon have only been in these courses in relatively “recent times” (Avnimelech 1950–1951: 80–81).41 Previously, the Yarkon ran half a kilometer to the south, flowing toward the northwest toward the Sheikh Muwannis kurkar ridge

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41 The course of the Yarkon and Ayalon as shown in fig. 1 of Avnimelech’s study matches historical maps of the area including the Survey of Western Palestine (Conder and Kitchener 1881–1883: Sheet XIII).
and skirting Tell Qasile to the southeast before turning northwest again and flowing across the area that is now the Sde Dov airfield and emptying into the sea north of the present Reading power station. The Ayalon formerly ran between Tell Gerisa and the Jerishe village northeast toward the Yarkon rather than northwest in its current channel (Figure 7). However, Avnimelech did not proffer a date for the proposed previous courses of the Yarkon and Ayalon rivers in his investigation.

Figure 7: Detail of alternative courses of the Yarkon River and Nahal Ayalon (after Avnimelech 1950–1951, fig. 1). Arrows indicate proposed ancient channels and estuary of the Nahal Ayalon near Jaffa.
Concerning the ancient course of the Ayalon, it appears that it diverted at some point from flowing into the sea just north of Jaffa’s promontory to following the eastern side of a ridge extending from immediately north of the current Hwy 44 (Derech Ben Tsvi) and west of the Hwy 20 (the Ayalon Highway) to a point north of HaRakevet Street and west of HaMasger Street (Figure 8). Rainey and Notley state that the Naḥal Ayalon formerly emptied into the sea near Jaffa, but “prior to human habitation it was deflected northward by the intrusion of sand and had to flow behind a sandstone ridge until it joined the Nahr el-‘Auja” (2006: 37). According to Raban, a layer of river pebbles found in a core drilled off Jaffa’s headland, which was not dated, “proves the theory of the existence of an ancient outlet of the N[ahal] Ayalon at this part of the shore” (1985: 27). He further suggested the possibility that the change in the wadi’s course was “an artificial enterprise” and posited that it may have occurred in the second millennium B.C.E. as
a way to improve the estuarine harbor at Jaffa, citing engineering parallels in the Nile Valley and Minoan Crete (1990–1993: 100). By utilizing the natural depression east of the site formed by the former outflow of the Ayalon and undoubtedly deepened by an ingression of the sea, such efforts would have yielded an inland harbor on the leeward side of the mound with an area of thirty to forty hectares. The date and feasibility of the proposed harbor in addition to other harbor locations along the coast of the study area are discussed below.

Regarding the change in the Ayalon’s course in relation to human habitation, archaeological sites situated near the proposed channel of the Ayalon that would have emptied into the sea just north of Jaffa would indicate the period(s) in which the wadi ran toward Jaffa and indicate the probable period in which the watercourse shifted and followed its present course. A cursory examination of the known archaeological sites from the Neolithic to the Roman period within the associated survey grids, MR 70 and 71, revealed no archaeological sites found near the Ayalon’s proposed course that can be dated prior to the Hellenistic period. Several EB I sites have been excavated on the kurkar ridge that runs parallel to the known channel of the Ayalon after its turn northward toward the Yarkon. While these site locations are topographically advantageous, their proximity to the Ayalon cannot be overlooked. The location of these sites along the Ayalon’s present course, combined with the absence of sites along the proposed course seems to imply that the Ayalon shifted northward prior to the onset of the Early Bronze Age.

In conjunction with the drainage systems of seasonal wadis and the stable output of the Yarkon, freshwater and brackish marshes featured prominently within the physical landscape of
the coastal plain. Freshwater mineralized marshes originated from groundwater, streams, and surface run-off, while the brackish marshes formed only near river estuaries with the influx and mixing of salt water and freshwater. Factors of wetland formation include rise in sea level, change in climate and increased precipitation, erosion, sedimentation or formation of natural levees or breakwaters, and deliberate or natural diversion of drainage networks (Eger 2011: 56). Until two to three thousand years ago, most of the coastline of Israel that is now covered with sand consisted of marshland because the *kurkar* ridges near the coast would act as dams to prevent water discharge, resulting in vernal ponds and the loss of potential agricultural land (Sivan, Eliyahu, and Raban 2004: 1046). Several accounts have observed that rainwater would collect and remain on the ground for up to nine months in the low *marzeva* zone behind the first *kurkar* ridge east of the sea (Gophna 1978: 136).

Coring along the coastline near Dor showed that coastal marshes dried up prior to the beginning of the Pre-Pottery Neolithic (ca. 8100 BP) as a result of climate change, yet marshes east of the coast still survived into historical periods (Sivan, Eliyahu, and Raban 2004: 1045). A. Eger notes that during the Late Roman and Early Islamic periods, ca. the sixth to eighth centuries C.E., many wetlands in the Near East became permanent marshes throughout the year, expanded beyond their previous limits, and appear to have formed concurrently (2011: 55). While wetlands in the area east of Tel Michal were drained in the Byzantine period, the valley bottoms along the coast were below the water table and were swampy as late as the early twentieth century (Karmon 1959; Grossmann 2001: 13). Geomorphologic studies indicate the existence of swampy

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42 In this discussion, swamps are distinguished from marshes by types of vegetation; whereas marshes are predominantly reeds, rushes, and grasses, swamps are dominated by trees and bogs containing accumulations of peat.  
43 Vernal pools are temporary marshes formed in shallow depressions that are often dry in the summer and autumn months, reaching their maximum depth during the spring months.
ground east of the Exhibition Grounds site in Tel Aviv and some subsidence of the site toward the low-lying area (Golan 2009). Marshy soil with meager Early Bronze Age sherds overlying the Chalcolithic remains was noted at the site by Kaplan (anon. 1971b: 26). Tolkowsky claimed that prior to the orange groves, marshes in the area east of Jaffa served as a natural barrier against enemies (1924: 2).

Such water features were recorded by modern geographers of the Holy Land. Jacotin and the French surveyors during Napoleon’s campaign in Palestine labeled the water-filled depression east of Jaffa as a *flaque d’eau* (Shacham 2011: figs. 13.1, 13.4), which was later categorized as an *etang* on an early nineteenth century map by Denain and Delamare (Shacham 2011: fig. 13.2). The local name for this feature was “el Bassat,” meaning “the swamp” (Hanauer 1903a: 260; see discussion below). Other pools in the area were named after individuals or given names such as Birket el-Butt (Pool of the Ducks) or Burak Leil (Pools of the Night) as recorded by the Survey of Western Palestine (Palmer 1881; Conder and Kitchener 1881–1883: Sheets XI and XIII). Other marshes that formed during the winter months were indicated on the maps but not named (Figure 9). The danger of standing water lay in instances of malaria that were a concern for travelers and modern residents of Jaffa. Hanauer notes an outbreak in summer 1893 of “malignant fever” attributed to malaria and the efforts to dig a channel to drain off standing water in the depression known as “el-Bassa” (1903a: 259; see discussion on Jaffa’s harbor below).
3.2.4 Climate

Recently, a consensus has grown among scholars that climatic and environmental changes were often the root of a chain reaction leading to economic recession, resource depletion, overpopulation, conflict and invasions and were, therefore, ultimately responsible for the decline and collapse of the ancient Near Eastern civilizations (Issar and Zohar 2007: 35). Weiss and
Bradley propose that societal collapses throughout time resulted from climatic events and “new conditions that were unfamiliar…and persisted for decades to centuries” (2001: 609). These highly disruptive climatic shifts led to societal collapse as an adaptive response to intractable strain. Citing studies linking collapse from both the Old and New Worlds in prehistoric to historic eras, Weiss and Bradley view climate as “the primary agent in repeated societal collapse” (2001: 610). Such primacy for climatic events as the cause for societal collapse downplays social, economic, or political factors that likely combined with environmental stress, resulting in collapse episodes. Response to long-term environmental stress included reduction of social complexity, abandonment of urban centers, and reorganization of production and supply systems (de Menocal 2001: 672).

Determining the effects of climatic shifts on settlement patterns in the coastal plain necessitates a reconstruction of the ancient climate of the eastern Mediterranean basin that can be accomplished in a number of ways, including oxygen isotope analysis, ice and sediment cores, lithology, and palynology (Bradley 1999: 5). Despite latent uncertainties when analyzing these proxies and relating them to natural processes or climatic events (Abrantes et al. 2012: 4, 17), the approaches treated here from the best information to propose the environmental and climatic conditions faced by the inhabitants of the coastal plain in the Bronze and Iron Ages. Studying the ratio of stable oxygen isotopes ($^{18}$O/$^{16}$O or $\delta^{18}$O) in what is essentially “fossil water” contained in ice cores, marine life, or cave speleothems can reveal a history of the temperature at which condensation occurs, and when combined with eustatic changes in sea level, the $\delta^{18}$O may elucidate climatic cooling and warming trends (Bradley 1999: 127–30). The $\delta^{18}$O in samples from Lake Van, the Sea of Galilee, the eastern Mediterranean, and speleothems from caves in upper Galilee and the Soreq Cave have been compared to isotopic composition of standard mean
ocean water for paleoclimatic reconstructions because the ratio is influenced by ambient
temperatures and climate regimes and not anthropogenic activities (Issar 2003: 6 and references
there). Sea levels are also indicative of climate trends as ingressions of the sea occurred during
warm periods when glaciers would melt and cause the sea level to rise, while regressions were
the result of glaciers freezing water during colder periods. Low sea levels such as those from
4.5–4.0 thousand years BP (kya) suggest colder climate in higher latitudes when polar glaciers
expanded, and high sea levels from 4.0–3.5 kya and 3–2.5 kya reflect warmer climate periods
when glaciers melted (Issar 2003: 11). It must be noted that the fluctuation in sea level is inverse
for the Mediterranean Sea compared to the Dead Sea. Thus, while high levels of the
Mediterranean indicate warm climate, corresponding lower levels of the Dead Sea point to
evaporation, and higher levels of the Dead Sea show cooler and more humid periods (e.g., high
lake levels at 4.5 and 3 kya).

Using the $\delta^{18}O$ from various sources in conjunction with marine and terrestrial coring,
climatic shifts from the Middle Bronze Age to the Iron Age can be proffered. At the beginning of
the Middle Bronze Age, a warmer, drier climate prevailed based on increased $^{18}O$ composition in
Sea of Galilee and higher Mediterranean Sea levels versus a lower Dead Sea (Issar 2003: 21).
Stable isotope analysis of speleothems in the Soreq Cave provides substantiation for a drier
climate after 2000 B.C.E. (Bar-Matthews, Ayalon, and Kaufman 1997). The climate was not as
warm and dry as the preceding EB IV but was a continuation of the warm phase with some
drilled off the Israeli coast could be the result of a higher rate of dust storms in northern Egypt,

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44 Paleoclimatology studies render $^{14}C$-calibrated dates in thousands of years before present, rather than traditional
dates (e.g., 4.2 kyr cal BP vs. ca. 2200 B.C.E.). Due to varying abbreviations, all of which imply the same thing, the
prevailing “kya,” thousands of year ago, will be used here with the implied understanding that all dates given as
such are calibrated radiocarbon dates.
the Sinai, and the Negev during the Middle Bronze Age. The deposition of sand and silts in Nahal Lachish indicate fluctuation between rainfall and drought (Rosen 1986: 56–57). Later, around 3.4 kya, the presence of lighter oxygen isotopes ($^{16}$O) represent an influx of melted glacial water indicating a warm period corresponding to the Late Bronze Age (Issar 2003: 11). A study of oxygen isotopic composition ($\delta^{18}$O) in the shells of Glycimeris violacescens showed fluctuations in aridity between 4–2.6 kya, due to the ratio of evaporation to precipitation (Kaufman and Magaritz 1980). The $\delta^{18}$O curve plotted against $^{14}$C indicated a more humid climate ca. 2000 B.C.E. immediately followed by a more arid trend that increasingly became more humid until ca. 1000 B.C.E. after which the climate became even more arid before achieving the balance of the present (Kaufman and Magaritz 1980: fig. 2).

While climate has previously been proposed as a culprit for societal collapse and change at the end of the Late Bronze Age together with the role of the Sea Peoples as a catalyst in that collapse or as a result of larger environmental factors, a core from Larnaca Salt Lake near Hala Sultan Tekke on Cyprus with correlation from an additional core taken at Tell Tweini (Bronze Age Gibala), Syria, provides sufficient data for an evaluation of climate fluctuations with respect to the Late Bronze Age–Iron I transition (Kaniewski et al. 2013: 2).45 Sediments from the lake bed core show that the Larnaca Salt Lake was connected to the sea prior to 1450 B.C.E., and in the following century (1450–1350 B.C.E.), a shift from a sheltered marine embayment to a lagoon environment occurred. The resulting ecological imbalance is evidenced in decrease of the characteristic Mediterranean woodland ecotope within the pollen record and a gradual transition to plants associated with a dry steppe, occurring in two steps at 1450 B.C.E. and 1200 B.C.E.

45 The base of core B22 at Larnaca Salt Lake can be radiocarbon dated to 1633–1501 cal B.C.E., the middle core to 1497–1377 cal B.C.E., and the upper part of the core dates to 1165–1265 C.E. (Kaniewski et al. 2013: 3; all dates in 2σ range).
A hydrological anomaly and decline in agricultural activity is indicated at both Larnaca Salt Lake and the Tell Tweini core between 1200–850 B.C.E., and evidence for a drier environment across the Near East is provided by increased δ^{18}O at Ashdod and the Soreq Cave indicating less rainfall, decreased precipitation at Tell Breda and Ras el-‘Ain in Syria, reduced Nile floods, minimal riverine discharge of the Tigris and Euphrates, and a “dry event” in coastal Syria (Kaniewski et al. 2010; see Kaniewski et al. 2013: 6 and references there). Plotting radiocarbon dates obtained from climatic and archaeological events revealed that the climatic crisis, reduced crop yields, and emergence of the Sea People all occurred ca. 1215–1190 B.C.E. (1σ range), indicating that “the [Late Bronze Age] crisis was a complex but single event where political struggle, socioeconomic decline, climatically-induced food-shortage, famines and flows of immigrants definitely intermingled” (Kaniewski et al. 2013: 9).

This analysis confirms the earlier opinion of W. Burroughs, who connects the arrival of the Sea Peoples in the Levant with a globally disturbed climate (2005: 257). Around the time of their emergence, colder, wetter conditions prevailed across Europe in which sea temperatures in the North Atlantic were colder and glaciers expanded in the Alps. The eastern Mediterranean also cooled quickly with colder winters and more incident of drought. In his opinion, the Sea Peoples were displaced by crop failures and famine as a result of climactic change (Burroughs 2005: 258).

Radiocarbon dating of buried shoreline and beach deposits combined with water level indicators in the Dead Sea act as a proxy for rainfall data in the southern Levant (Enzel et al. 2003: 264). Lithology of three cores taken at Ein Gedi, Ein Feshka, and Ze’elim on the shoreline

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46 Mediterranean woodland species consist of *Olea*, *Pistacia*, evergreen *Quercus*, *Juniperus*, *Rhamnus*, *Cistus*, *Cedrus*, *Pinus*, and members of the Ericaceae family. Dry steppe taxa include *Scabiosa*, *Ephedra*, Chenopodiaceae, *Artemisia*, Asteraceae, and *Helianthemum* (Kaniewski et al. 2013: fig. 2).
of the Dead Sea illustrate the conditions of the lake which reflect Mediterranean climate (Migowski et al. 2006: 422). The most dramatic drop in the Dead Sea water level, approximately forty-five meters, started during the Early Bronze Age to Middle Bronze Age transition, ca. 2200 B.C.E., and ended during the Late Bronze Age, ca.1400 B.C.E. Gypsum laminae indicate a brief shift toward a more arid climate around 4.2 kya that lasted approximately three hundred years, corresponding to the EB IV, after which wetter conditions prevailed (Migowski et al. 2006: 426–27). Further, climate deterioration around 3.5 kya, approximately the start of the Late Bronze Age, is marked by a sand deposit that establishes the lake level at -417 m below mean sea level. Associated clastic layers in the Ein Gedi and Ein Feshka cores indicate a drop in sea level of thirty-five meters in less than two hundred years (Migowski et al. 2006: 426). The dry period starting at 4.2 kya appears to be an “abrupt arid event,” while true climate deterioration starts around 3.5 kya. At 3.4 kya, the trend reverses toward increased precipitation and cooler weather indicated by higher Dead Sea levels, and this continued until approximately 3.2 kya. Fluctuations in rainfall are also indicated throughout the Iron Age including a warmer period from 3.2–2.9 kya followed by a cooler, wetter climate around 2.8–2.7 kya (Enzel et al. 2003: fig. 2A; Issar 2003: 24). Concerning the results of these analyses, Enzel et al. (2003: 268) suggest that most abrupt cultural shifts correspond to prolonged periods of either rainfall or drought evidenced in shifting levels of the Dead Sea.

The most significant changes on fluvial systems, sediment dynamics, and vegetation in the Levant during the Late Holocene were felt from the second millennium B.C.E. forward (Hooke 2006: 330; Dusar et al. 2011: 152–53). Both climatic change and human activities have contributed to variations in plant cover visible in the pollen record within the last four thousand
years. Pollen studies not only corroborate paleoclimatic reconstructions from stable isotope analysis and coring but also reveal the impact of cultural or commercial endeavors on vegetation.

At the Tel Aviv Exhibition Grounds (site 53) on the northern bank of the Yarkon, H. Ritter-Kaplan excavated “pre-Chalcolithic,” Chalcolithic, “pre-Urban,” Early Bronze Age, MB I and post-MB I strata (Horowitz 1979: 253; Ritter-Kaplan 1979a). Palynological analyses of samples taken from each stratum reveal low amounts of arboreal pollen prior to the Chalcolithic period in addition to lower amounts of oak pollen in the MB I and succeeding phases (Horowitz 1979: table 6.21). Ritter-Kaplan observed that within the sediment stratigraphy a black, clayey layer containing EB I–III artifacts with an abundance of oak pollen was covered by a gray sandy layer devoid of pollen that also overlaid a layer of EB IV material (1979a). Samples from the Middle Bronze Age strata indicated a dramatic increase in cypress pollen, which Horowitz interprets as an indication that the Middle Bronze Age inhabitants of the Yarkon basin were cultivating cypress for timber since cypress grows relatively straight (1979: 254).

Pollen analyzed from two bore holes in Haifa Bay showed an increase in arboreal pollen of oak and olive from 2400–2300 B.C.E., from ca. 2100–1100 B.C.E., and an increase from ca. 700–600 B.C.E. These periods are separated by drops in vegetation and arboreal pollen ca. 2250 B.C.E. and 950 B.C.E. (Horowitz 1979: 214, fig. 6.18). The peaks suggest that more vegetation was present, while the lows indicate a drier climate according to Horowitz who suggests an increase in precipitation during the peak periods (1979: 214). The increase in oak and especially olive may indicate an intensification of cultivation from the Middle Bronze Age to the Iron IA and the seventh century B.C.E.

47 This stratigraphic sequence indicated that the climate in the Yarkon basin was more humid during the Chalcolithic and EB resulting in a higher groundwater table that flooded the dwellings. The drier climate following the EB effected a lowering of the groundwater table and a migration of the site toward the water (Horowitz 1979: 254).
Pollen cores obtained from the Sea of Galilee indicate a reduction in oak cover and increase in olive pollen during the EB II–III with a slight decline in olive during the EB IV. Abatement of oak woodlands continued during the second millennium B.C.E. with a substantial decline in oak since 1000 B.C.E. and “a dramatic increase in olives in the eighth and seventh centuries B.C.E. and fourth and fifth centuries C.E.” (Wilkinson 2003: 144). The increase in olive pollen is corroborated by a core from Lake Hula. In the intervening centuries between the Iron Age and the Byzantine period, the well-known Mediterranean landscape of evergreen oak, pine, and scrub maquis replaced the diminishing olives (Wilkinson 2003: 145). The decline in oak is a direct result of increased settlement in the hill country that led to more soil erosion during high-rainfall events due to tree clearance (Wilkinson 2003: 148).48

Analyses of pollen from cores along the western shore of the Dead Sea also contribute to the overall picture of paleoclimate and vegetation. Olive pollen seems to correspond with the rise and decline of the Middle Bronze Age polities, increasing at the beginning of the period and declining toward the transition to the Late Bronze Age (Neumann et al. 2010: 749). Overall, a continued decrease in olive pollen occurred during the Late Bronze Age but levels of Mt. Tabor oak remained stable (Litt et al 2012: 100). As discussed above, the lake level dropped below -417 m below mean sea level ca. 3.4 kya, and it is likely that the southern basin of the Dead Sea was dry. In the Late Bronze Age to Iron I transition, a dramatic drop occurred in all Mediterranean woodland species with Kermes oak, Mt. Tabor oak, and terebinth falling below 1% of the total sample. During this period, while tree pollen was low, herb values were at a maximum. This decline in arboreal pollen should not be considered anthropogenic since olive also decreases. Rather, such results suggest extensive drought (Litt et al. 2012: 100–01).

48 Encouragement for such forest clearing activities by the Israelite tribes of Ephraim and Manasseh attempting to settle in the hill country is ascribed to Joshua in the Hebrew Bible (Josh 17:14–18).
increase in olive pollen occurred in the Iron Age although episodes of higher Chenopodiaceae and lower olive values indicate a decrease in rainfall, and might be linked to abandonment of settlements during the tenth and eighth centuries B.C.E. (Neumann et al. 2010: 760). Around 2.6 kya, evergreen and deciduous oak as well as olive values increase and grapes appear in the pollen record, signaling a moister period (Litt et al. 2012: 102). The rise in lake level at end of Iron Age indicates more precipitation, but some sand layers in the Ze’elim core attest to arid periods during the Iron Age (Neumann et al. 2010: 760–61).

While stable isotope analysis, core sampling, and palynology provide broad perspectives on climate and vegetation, natural disasters produced episodic shifts in climate to which the ancient inhabitants of the coastal plain needed to adapt. The drier climate around 4.2 kya during which European glaciers retreated, the tree line in Sweden rose, and a sub-Boreal climate prevailed across Europe also brought about droughts and agricultural disaster in western Asia, North Africa, and eastern Europe (Burroughs 2005: 251). Cooling events in the north Atlantic have been linked to the decrease in rainfall in the Near East at the end of the EB III. Volcanic activity at 2354 B.C.E., 1627 B.C.E., and 1159 B.C.E. is also recorded in ice cores. The late third millennium event is associated with the eruption of the volcano Hekla in Iceland, and the 1159 B.C.E. event can be seen in tree-ring series from Ireland to Anatolia (Burroughs 2005: 252). The volcanic event that occurred ca. 1627 B.C.E., the eruption of Thera (Santorini) in the Aegean greatly affected the peoples living in the eastern Mediterranean at the end of the Middle Bronze Age. 49

49 An olive branch from a tree buried during the Santorini eruption and preserved in the tephra provides a narrower date for the volcanic event (Friedrich et al. 2006: 548). Using seventy-two growth rings supplemented by four 14C dates for sections of the growth rings, the determined calibrated date of the eruption falls between 1627–1600 B.C.E. (2σ, 95.4% confidence; 1621-1605 1σ, 68% confidence). This date is confirmed by 14C analysis of short-lived seeds or groups of seeds from containers buried in the volcanic debris at Akrotiri that yielded a date of 1660–1613 B.C.E. (2σ range), with the most likely sub-range of 1639–1616 B.C.E. (1σ range; Manning et al. 2006: 567–68).
Given the known historical parallels for the climate fluctuations caused by disruptive events like a volcanic eruption, probable effects of the eruption of Thera on the climate and population of the ancient world can be suggested. Immediate effects included a volcanic plume an estimated 36 km high, tephra (the ash and pumice ejected from a volcano) accumulation of three centimeters per minute, and a caldera collapse of 18–39 km$^3$ of material that contributed to tsunami generation (McCoy and Heiken 2000: 1234). Models incorporating data from historic eruptions accompanied by tsunami suggest maximum wave amplitudes of 26 m and inland inundation of 200 m for the Cretan coastline (Goodman-Tchernov et al. 2009: 943). The estimated time elapsed from the eruption to the tsunami reaching the Levantine coast was approximately 90 minutes (Goodman-Tchernov et al. 2009: 943, fig. 1).

Four cores taken in the harbor of Caesarea, dated by ceramics, radiocarbon, and optical stimulated luminescence, contained material deposited by a tsunami that resulted from the eruption of the Thera volcano dated to ca. 1628 B.C.E. (Goodman-Tchernov et al. 2009). Three tsunamiigenic horizons were identified corresponding to the 551 C.E. earthquake, an event at 115

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50 P. LaMoreaux (1995) posits destruction and climatic chaos on a global scale from a series of volcanic eruptions of Thera lasting from 1628 to 1450 B.C.E. The effects of the Theran eruptions, according to LaMoreaux, are reminiscent of biblical plagues. He then connects the volcanic eruptions to catastrophes of biblical proportions: the destruction of the Minoan fleet at Crete, massive loss of life from ejecta, a tsunami killing thousands along the eastern Mediterranean littoral, darkness, lightning and earthquakes in Asia Minor, Africa and as far away as Scandinavia, major fire damage from Sinai to the Nile Delta, low-lying gases killing those attempting to escape Thera, and climatic changes affecting California, the British Isles, Germany and China (LaMoreaux 1995: 174).

In a critical response, D. Pyle (1997: 59) accuses LaMoreaux of confusing the dates of the single massive eruption with the reality of several distinct eruptions across time. Pyle further rejects speculation about the amount of sulfur ejected into the air, noting that the direct release of sulfur was half the amount discharged by Mt. Pinatubo in 1991 and that the GISP2 ice core in Greenland indicates that Santorini-scale sulfur additions to the atmosphere occur at a rate of eighteen per thousand years (1997: 60). Concerning the magnitude of the eruption he relates that the erupted volume of dense magma was 27 km$^3$ with a peak column height of 36 km and a sulfur emission of 5–8 megatons of sulfur dioxide (Pyle 1997: table 1 and references there). Following observations of recorded eruptions, the first two winters after the eruption would have been warmer in the high-latitude portions of North America and Europe while summers would have been cooler for two to three years (Pyle 1997: 60). No mention was made however of climate changes in the Mediterranean area. While wielding comparative volcanology to correct the sensational and at times hyperbolic statements of LaMoreaux, Pyle casts far too narrow of a view of the effects of the Santorini eruption on Mediterranean climates and cultures. For instance, Pyle’s dismissal of large-scale global effects ignores recorded evidence of cooling and agricultural failures after historic eruptions such as the Laki, Iceland event in 1783–84.
C.E., and the third event dated to 3630–3410 cal BP (Goodman-Tchernov et al. 2009: 945).\textsuperscript{51} In contrast to the two later events that affected the constructed site and deposited material culture within the tsunamigenic deposits, the third event lacked artifacts since the site of Caesarea was not inhabited during the Late Bronze Age. A tsunami wave height of seven meters can be estimated from occurrence of pumice at five meters above sea level in a coastal terrace near Tel Aviv and the assumption of sea levels being two meters lower than present (Yokoyama 1978; McCoy and Heiken 2000: 1249).\textsuperscript{52} Researchers using chemical analysis were able to “fingerprint” tephra recovered from excavations at Tel Gerisa and determined that the source was Santorini (Huber, Bichler, and Musilek 2003). The pumice found along Levantine coastline likely originated with pumice rafts, not tsunami, and were deposited 85–350 days after the eruption event (McCoy and Heiken 2000: 1247-48).

Longer term effects of volcanic eruptions included airborne particles from volcanic eruptions that remained suspended in the atmosphere attached to air, dust, and water vapor that affected the chemical, radiative, and dynamical properties of the atmosphere (Stothers 2009: 976).\textsuperscript{53} The stratospheric aerosol veil resulting from a volcanic eruption effects a cooling in climate in the hemisphere of origin beginning one month after the eruption and lasting for three to six months (Stothers 2009: 978). Prolonged cooling for one to five years with an appreciable temperature drop in the first post-eruption winter is accompanied by increased cloudiness and

\textsuperscript{51} Tsunamigenic indicators include “erosional lower contacts, fining-upward particle-size distribution, imbrications of inclusions, individual or groups of mollusks, mixed wear and poor sorting of mollusks, distinctive microfossil assemblage, rip-up clasts, household artifacts and high-value anthropogenic cultural material misplaced in marine context, rafted organics or pumice, unidirectional tilting of marine installations, and well-rounded beach zone pebbles in deeper contexts” (Goodman-Tchernov et al. 2009: 944–45).

\textsuperscript{52} The estimated tsunami height for the central coastal plain should be noted with caution since measuring tsunami wave height by run-up, the material deposited debris inland, is problematic due to the number of factors involved with slope and topography both off and onshore as well as wave dynamics (McCoy and Heiken 2000: 1232–33).

\textsuperscript{53} The tropospheric haze following an eruptive event is caused by sulfuric gas in the atmosphere which produces a temporary climate cooling. Such hazes were noted by Pliny the Younger following the eruption of Vesuvius and by Benjamin Franklin after the Laki, Iceland event in the late eighteenth century.
precipitation. Eruptive events such as Mt. Etna in 44 B.C.E. greatly impacted the climate with increased cold and rain, extensive crop damage, famine, and disease outbreaks. Atmospheric temperature decreased in the northern hemisphere by 0.5°C due to the Thera eruption (McCoy and Heiken 2000: 1228). For large eruptions such as the eruption of Thera, climatically significant aerosols may have remained suspended for over six years (Stothers 2009: 978).  

Employing the results of all these methods permits a synthetic overview of climate for the Levant from the EB IV to the Iron Age. Towards the end of the third millennium, data indicate that global warming resulted in lake levels dropping, rivers becoming seasonal, and expanding deserts. Aridification of the Near East resulted from lower rainfall related to cooling of subpolar and subtropical surface waters of the North Atlantic (de Menocal 2001: 670). This major crisis, lasting about a century from 2200–2100 B.C.E., included a drop in Dead Sea level of nearly one hundred meters and the drying up of the southern basin, a rise of oceanic levels of one and a half meters, a drop in olive pollen and rise in oak and pistachio pollen in cores from the Sea of Galilee (Issar and Zohar 2007: 135). The Late Bronze Age is marked by a rise in lake levels and decrease in the Mediterranean Sea level but continued with a reverse trend, suggesting that the Late Bronze Age had climate fluctuations between warm and dry periods and cooler and more humid periods (Issar 2003: 22). Following the climatic disruption associated with the eruption of Thera, a warm dry phase starting ca. 1600 B.C.E. crested during the fifteenth century B.C.E. and was succeeded by a more humid phase around 1300 B.C.E. This warming of climate at the beginning of the Late Bronze Age meant a higher Nile with greater inundation and prosperity for Egypt and drought in the Levant. The beginning of the twelfth century B.C.E. witnessed the start

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54 According to the Volcanic Explosivity Index scale that ranks eruptions in terms of volume and height of ejected material and eruption duration from 1 to 8 (8 being the highest), the Etna explosion is ranked at 3 and Vesuvius at 4, while Thera is ranked at 7, equal to the 1815 eruption of Tambora in Indonesia.
of a drier period that precipitated crop failures and immigrant movements in the eastern Mediterranean basin (Kaniewski et al. 2013). Following a cool humid period around 1000 B.C.E., a warm and dry period developed with a nadir at 850 B.C.E. and increasing favorable conditions that peaked between the third century B.C.E. and the third century C.E. (Issar and Zohar 2007: 193).

Societies in Egypt, Mesopotamia, Anatolia, and the Levant invented strategies to mitigate and adapt to new climatic regimes. For the lowland areas of Canaan, the shift in climate seems to have precipitated a ruralization and nomadization within society that included abandonment of permanent settlements and diversified subsistence strategies that may favor pastoralism (Dever 1995: 289–93). Droughts in western Asia around 8200, 5200 and 4200 kya spurred changes in settlement patterns and subsistence strategies that subsequently shifted back to previous patterns after the climate ameliorated (Gornitz 2009: 7). Issar regards the re-urbanization of Canaan as “more a consequence of environmental adaptation than of favorable climatic conditions” and views the evolution of fortified centers as linked to the skills needed to excavate and maintain water systems to ensure a water supply during times of warfare or low precipitation (2003: 22). Yet periods of either high or low precipitation could induce stress within the ecosystem. Wet climate events combined with a lack of drainage created swamps and marshes that were deleterious to health and promoted insect-borne diseases such as malaria that would worsen living conditions and lead to a decline in population. Clearly, anthropogenic changes coupled with drier climate resulted in increased stress on vegetation.

An implied relationship exists between “rapid alterations in settlement patterns, growth or abandonment of cities, with cultural discontinuities on the one hand and climate fluctuations on the other,” although the role of climate in adding strain to instable systems should be recognized
and properly understood (Gornitz 2009: 7). That is, socio-cultural change is rarely mono-causal or climate exclusive. Although temporal correlations between cultural and climatic events may exist, such correlations do not prove causation concretely (Gornitz 2009: 9). In systems already destabilized by socio-economic or political factors or environmental degradation, climatic shift(s) may have served as a catalyst for change or collapse.

3.2.5 Terrestrial, Aquatic, and Anthropogenic Biomes

The landmasses of the world are classified according to several characteristics such as soil types, geology, and climate, all of which impose limits on the types of plant and animal species capable of living in a region (Putnam 1984: 169). Major biomes, groups of plants and animals classified by the region’s vegetation, include forest, grassland, woodland, shrubland, semi-desert shrub, and true desert, and several schema exist that create special categories or subcategories for these overarching biomes. The area of interest for this study falls into an ecoregion known as the Eastern Mediterranean conifer-sclerophyllous-broadleaf forest, incorporating most of the eastern Mediterranean littoral stretching from the Gaza Strip to southern coastal Turkey. Most of the plants in this ecoregion have sclerophyllous (hard, tough evergreen) leaves with *Quercus*, *Juniperus*, and *Pinus* species being dominant (Lomolino et al. 2010: 144–45). Shrublands, called *maquis*, are also typical of the Mediterranean climate. Aquatic biomes for the region are generally divided into freshwater (lotic and lentic habitats) and marine (littoral and neritic) communities (Lomolino et al. 2010: 153–56).

In addition to terrestrial and aquatic biomes, the interaction between humans and the landscape has prompted the recognition of dynamic social-ecological systems and the

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55 Lotic habitats are those associated with running water such as streams, rivers, or springs; standing water habitats such as lakes, ponds, or wetlands are considered lentic. For marine biomes, the littoral zone is located at the intersection of land and sea in the intertidal area, and the neritic, or sublittoral, zone extends out into the sea to a depth of 200 m, the depth of the temperate shelves (Lomolino et al. 2010: 154).
classification of anthropogenic biomes (Ellis and Ramankutty 2008). Just as global patterns of vegetation define the overarching biomes, patterns of human land use and the impact of humans on the landscape serve to categorize the anthropogenic biomes in terms of urbanization, settlement, agriculture, pastoralism, and wildlands (Alessa and Chapin 2008: 530). These categories evince the “inextricable intermingling of human and natural systems almost everywhere on Earth’s terrestrial surface” (Ellis and Ramankutty 2008: 445).

The introduction of new flora to the southern Levant since the Middle Ages and cycles of deforestation and re-growth have altered the ecology of the coastal plain. The establishment of citrus and the expansion of citrus groves to fill market demand, combined with a growing urban population in the nineteenth and early twentieth centuries, impacted the traditional agriculture and horticulture practiced in the region. Large parts of the plain between Jaffa and Lod were cultivated with wheat, with citrus encroaching, and olives grown in the area around Ramle and Lod (Kallner and Rosenau 1939: 66). Remnants of Mt. Tabor oak (Quercus ithaburensis) survive in non-cultivated areas north of the Yarkon River, while south of the Yarkon, Christ’s Thorn jujube (Ziziphus spina christi) has prevailed since the early Iron Age near sites like Tel Gerisa (Liphschitz, Lev-Yadun, and Gophna 1987: 44). With reference to the lower hills along the eastern portion of the study area, Kochavi and Beit-Arieh stated that “the indigenous flora has been entirely destroyed, erasing possible evidence on species that existed in the past” (1994: 9*; see also Gophna, Liphschitz, and Lev-Yadun 1986: 71). However, available evidence from ancient texts and samples of flora and fauna collected from controlled excavations in the coastal plain serve as a basis for reconstructing the local terrestrial, aquatic, and anthropogenic biomes exploited by the region’s inhabitants from the Early Bronze Age through the Iron Age, namely: croplands, rangeland, settlements, wildlands (trees, some grasses, no agriculture), freshwater
(lotic and lentic), and marine (littoral and neritic). An additional “non-local” category of biota may also be considered given the evidence in the region of overland commerce and importation via thalassic means.

3.2.5.1 Croplands

Following the categories and definitions of Ellis and Ramankutty (2008: 442, table 1), croplands within the central coastal plain are a “residential rainfed mosaic,” that is, “a mix of trees [for horticulture] and rainfed cropland with substantial human populations.” Ancient texts directly and indirectly mention the actual flora of the region when alluding to the fertile or the forested nature of the Sharon. Preserved within the corpus of Amarna letters is a message from Addadanu, a Canaanite vassal of the Egyptian pharaoh, who reports that he has faithfully guarded the šunuti, or granary, of the Egyptian king in Jaffa, implying cereal cultivation in the vicinity of the administrative center (EA 294; Moran 1992: 336–37). In a Ramesside composition, the satirical Egyptian scribe Hori noted that his antagonist, the ridiculed scribe Amenemope, would find “the field verdant in its season” at Jaffa in the papyrus entitled “The Craft of the Scribe” (P. Anastasi I; COS 3.2). From the same period, an Akkadian letter found at Aphek details the request of Takuhlinu, a minister of Ugarit, to his Egyptian counterpart, Haya, for restitution of fifteen metric tons of wheat, probably grown at the Egyptian estate at Aphek, that originally exchanged hands in the port city of Jaffa and would be shipped to Ugarit to ease the food shortage in the Hittite kingdom (Owen 1981a; Singer 1983). Although deriving from a source later than the temporal scope of this study, the inscription on the coffin lid of the Sidonian king Eshmunazar recounts that the “Lord of Kings gave us Dor and Joppa, the majestic corn lands that are in the Plain of Sharon, in accordance with the mighty deeds that I performed…” (COS 2.57). Thus, in exchange for loyal vassalage, the Persian “Lord of Kings,” likely Xerxes or Artaxerxes, placed
two port cities and their agricultural hinterlands under Sidonian control. These ancient texts provide a basic understanding of the region’s flora that can be greatly supplemented by the botanical material from excavated sites in the region.

Edible plants found in the archaeological record demonstrate the variety of plants grown for consumption by humans and animals. Olives, grapes, and vetch were recovered from the Bronze and Iron Age strata of Tel Michal (Liphschitz and Waisel 1989: 219). Within the debris of the burned Late Bronze Age gateway at Jaffa, excavators found charred cereal grains, olive pits, grape pips, and chickpeas, all of which show the variety of produce stored in the structure of a monumental gate (Burke et al. forthcoming). The excavations at Aphek yielded barley and two varieties of wheat, pulses such as lentil, fava beans, bitter vetch, and fruit including grapes, figs, olives, and pomegranates (Kislev and Mahler-Slasky 2009: 499). Other harvested plants included flax for linen, seed, or oil production and cumin. Examination of the grains at Aphek and their deposition, including the isolation of weeds, revealed that the site utilized the surrounding fertile soils and produced its own grains (Kislev and Mahler-Slasky 2009: 500–502). The material examined by specialists contained waste products of the threshing, sieving, and separation processes. Crop rotation, which involved sowing pulses in a field after a few years of cereal production in the same field, was evident in the seed assemblage by the presence of a few pulses within larger concentrations of barley or wheat. The grape pips and skins recovered from Aphek intimate that white wine, rather than red, was being produced at the site by the resident Egyptians (Kislev and Mahler-Slasky 2009: 510–13).

A variety of plant remains were recovered from Temple 131 and Building 225 at Tell Qasile as well as Building O of Maisler’s excavations, all of which are stratigraphically assigned to Stratum X (Iron IB; late eleventh to early tenth centuries B.C.E.). Edible plants included cereals
such as wheat and barley with seeds of the weed darnel (*Lolium temulentum*) and legumes including horse bean (*Vicia faba*), grass pea, dwarf chickling, purple broad vetch, lentils, flax, grapes, figs, *Prunus* sp., and weeds such as “prickly caterpillar” (*Scorpiurus muricatus*), sun spurge, and members of the Boraginaceae family. The flax seeds show signs of cultivation in shape and were found without any contaminants (weed seeds or other crops), indicating the level of careful processing for this crop.

Additionally, installations and material culture at various sites also bear witness of the region’s agricultural productivity. Denticulated flint sickle blades for cutting dry cereal stalks abound in the Late Bronze Age strata at Tel Michal (Lamdan 1989: 318). Settlers at Tell Qasile used the river for irrigation for crops, and agricultural installations such as silos and presses for oil and wine attest to the yield of the river basin (Maisler 1950–1951: 62; Ayalon 1994). The earliest occupational layer, Stratum XII (late twelfth century C.E.) was found to be “rich in stone mills” for grinding grain as well as flint sickle blades (Maisler 1950–1951: 75). Winepresses dated to the Iron II at Jaffa and Tel Michal, as well as those at numerous other Iron Age farmsteads in the low hills bordering the coastal plain to the east, also attest to regional viticulture and wine production for local consumption or export (Herzog 1989; Fantalkin 2005).

### 3.2.5.2 Rangeland and Settlements

The anthropogenic biome categories of rangeland, land dedicated for livestock grazing with minimal crops and forests, and settlement, defined as a mixture of “rural and urban populations, including suburbs and villages” (Ellis and Ramankutty 2008: 442, table 1) can be considered together for the ancient Near East since domesticated animals were sheltered within houses and

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56 Of the grinding stones recovered during B. Mazar’s excavations, an upper grinding stone of a saddle quern with a carved groove the length of its upper (curved) side and dated to the eleventh or tenth century B.C.E. finds parallels with grooved upper grinding stones from Tell Halaf, possibly indicating influence from Mesopotamia (Avshalom-Gorni, Frankel, and Getzov 2004: 264).
courtyards in villages and cities. Comparable to the flora of the Sharon, both ancient texts and zooarchaeological assemblages reveal the species that required rangeland for grazing in the coastal plain during the Middle Bronze Age through Iron II and suggest the importance of certain species for the local economies and illustrate connections between inland sites and their coastal neighbors. Inferences about the fauna of the coastal plain can be made from New Kingdom Egyptian papyri and biblical references to activities in the Sharon. Egyptian sources allude to the presence of equines at the city of Jaffa. Chariot horses are explicitly mentioned in “The Capture of Jaffa” (P. Harris 500; Simpson 2003: 72–74) when the Egyptian general Djehuty request that the animals be given fodder lest a mercenary overpower them. In a later text, “The Craft of the Scribe” (P. Anastasi I; COS 3.2), the scribe Hori follows a depiction of Jaffa and his fellow scribe Amenemope’s fictive, unfortunate affairs there with a fanciful description about repairs to Amenemope’s chariot. Since these conjured repairs were likely set in Jaffa, the presence of horses to pull the chariot is understood within the context of the sardonic letter. Biblical references to the Sharon, while acknowledging its wooded areas, also view the region as pasture for herds and a “fold for flocks” (Isa 65:10). According to the Chronicler, the herds of King David were under the care of Shitrai the Sharonite (1 Chr 27:29). Although both of these texts may be dated later than the biblical period, it may be assumed that grazing livestock in the

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57 The adoption of such a definition for this study does not indicate an acceptance of a rural / urban divide with modern connotations of agriculturalism versus industrialism, respectively. Rather, “rural” and “urban” in the present study should be conceptualized in ancient terms as unwalled settlements (villages) as opposed to walled settlements (towns or cities; see discussion in Frick 1977 and below).

58 The Chronicler also mentions the “sons of Ephraim” including Zabad, Shuthelah, Ezer, and Elead that were killed by the men of Gath “because they came down to take away their cattle” (1 Chr 7:21). The use of pronominal verbal suffixes are seemingly ambiguous and leave the reader at first glance only knowing that one party came to take another party’s herd(s) and that the Ephraimites were killed by Gittites. Given the action of coming “down,” it appears that the Ephraimites conducted a seemingly unsuccessful razzia on the Gittite herds grazing in the southern part of the Sharon plain.
Sharon, given the difficulty in farming the *hamra* soil, was common throughout the Bronze and Iron Ages.

While the ancient textual evidence may attest to the flocks and herds grazing in the Sharon, imply the presence of chariot horses, and remain silent on other animals, faunal remains recovered from archaeological excavations present a fuller picture of domesticated species exploited by the coastal plain’s residents. The domesticates are dominated by sheep/goat, cattle, pig and equids, as expected for the ancient Near East, and the proportion of each species within the assemblage for each site changes diachronically, revealing changing patterns in exploitation within the local economies.

Together with cattle, sheep and goat were the main source of animal protein for Middle Bronze Age and Late Bronze Age denizens of Tel Michal, supplemented by hunted animals. The high percentage of domesticated animal remains from the founding of the site suggests established animal husbandry rather than exploitation of marine resources or hunting. In loci dated to the Middle Bronze Age, a large number of pig remains were present while domesticated dog (*Canis familiaris*) was absent. During the Late Bronze Age, the overall number of domesticates, including pigs, is reduced with more cervids represented in the assemblage as well as dogs and a single donkey (Hellwing and Feig 1989: 244). Sheep and goat increased during the Iron Age while the number of cattle dropped, and numbers of cervids remained comparatively high.

Four of the tombs at Tell Qasile (West) dated to the MB II contained the bones of one caprovine per tomb (Sade 2006: 135). The faunal remains from the settlement reveal dependence on sheep and goat and suggest that the residents of the site also herded cattle given the high percentage of cattle bones within the overall sample (≈37%). Donkeys also formed a significant
part of the remains from the settlement (~30%; Sade 2006: 137). Additionally, the remains of at least one pig and one horse were present.

The domesticated livestock remains from MB I and II contexts at Aphek are dominated by sheep/goat, followed by cattle (Hellwing 2000: 296). While pigs comprise a smaller portion of the MB I–II assemblage (>10%), the ratio of young to adult bones indicates that piglets were slaughtered for meat. Forelimbs of caprovines were more represented than the hind limbs, possibly showing a preference for the meat of the forelimbs while the opposite held true for cattle, except at Tel Michal where the distribution of forelimb vs. hind limb was similar (Hellwing 2000: 310). The same phenomenon occurs at Tel Dan, Tell Qiri, Lachish, and Tel Michal, possibly indicating social stratification or a ritual or cultic aspect to butchery or feasting (Hellwing and Feig 1989: 238). The prevalence of sheep and goat continued in the LB II and transitional LB II–Iron I contexts at Aphek (Horwitz 2009: 536). However, during the Iron IB, cattle bones increase in frequency with a drop in caprovines and pigs (Horwitz 2009: 536). Thus, while pig was once considered a diagnostic marker of Philistine foodways, the faunal remains from Aphek, considered to be inhabited by Philistines during this period, strongly suggest the opposite. In the Iron IIA, the pattern resembles that of the LB II with a preference for sheep/goat and pigs were present again, yet later Iron IIA contexts reveal an absence of pigs with the same high frequency of sheep and goat.

Although the data of the faunal assemblage from Tel Gerisa remains largely unpublished, the limited information confirms the overall pattern of animal exploitation observed at other sites. Tel Gerisa had high frequency of cattle in LB II that continued into early Iron I while later Iron I contexts were dominated by sheep and goat (Horwitz 2009: 536). The terminal LB II–Iron I at Tel Gerisa is marked by a large increase in sheep and goat and decrease in cattle and pig.
Additionally, a substantial number of equid bones were found at Tel Gerisa (Sade 2000 cited in Horwitz 2009: 529).

Comparable to other sites in the region, the faunal sample for mostly Late Bronze Age and Iron Age contexts at Jaffa consists of sheep/goat, cattle, and pig, with possible indications of dog butchery as well (Burke et al. 2011). Donkey remains attest to their value for transport and further indicate the role of Jaffa as a maritime gateway for caravans from the east. Further analysis should reveal the frequencies of caprovines and cattle and indicate the intensity of animal husbandry and the exploitation regime.

The pattern of faunal remains at ‘Izbet Sartah shows a dependency on animal husbandry with limited supplement by hunting with 97% of the assemblage originating from domesticated animals (Hellwing and Adjeman 1986: 150–51). Overall, caprovines were the dominant domesticated group, with sheep preferred over goat, and cattle were the second-highest represented. Bones of dogs or donkeys were rare as were hunted deer or gazelle. Notably absent in secure strata are pig bones with only five identifiable bones present in mixed contexts, and these bones may be the result of the Byzantine period occupation of the site (Hellwing and Adjeman 1986: 146).

Mammals represented at Tell Qasile include cattle, sheep, goat, pig, donkey, fallow deer, hippopotamus, and camel. Sheep and goat provided most of the meat for consumption with twice as many sheep than goats being slaughtered according to the metapodia (Davis 1985: 148). A high number of older individuals (> 3 years) within the sheep and goats remains indicate that the animals were likely kept for secondary products.

Regarding the economies of the sites in the study region, it is clear that domesticated cattle, sheep, and goat provided the bulk of animal protein via meat or milk within the diet of the
Bronze and Iron Age peoples. Domesticated mammals comprise 94% of the faunal assemblage from Middle Bronze Age Aphek, strongly suggesting the dependence of the site’s inhabitants on animal husbandry for protein (Hellwing 2000: 295). The young age of the pig bones from Tel Michal and Aphek show that pigs were being raised for consumption in contrast to the sheep, goats, and cattle that were slaughtered in adulthood signaling a maintenance of these animals for secondary products such as milk, wool, and hair, and in the cases of cattle, traction. In contrast, during the Late Bronze Age at Aphek, the high proportion of young animals slaughtered before 3.5 years old in the Egyptian residency indicates a meat-oriented management strategy in contrast to other sites with secondary products strategy (Horwitz 2009: 529). The greater number of sheep represented over goat for Middle Bronze Age to Iron I at Aphek and the Iron I layers at ‘Izbet Sartah and Tell Qasile suggest a strategy of wool production (Hellwing and Adjeman 1986: 143–44; Horwitz 2009: 544). Coupled with a correlation with a large percentage of cattle bones, they indicate a relatively sedentary mode of living as well as an ecological niche where the hardiness of goats was not required. Overall, the patterns of exploitation for terrestrial fauna suggest a population with intensive agricultural production that increased from the Middle Bronze Age to the Late Bronze Age, as indicated by the high percentage of cattle, as well as a demand for wool, given the higher numbers of sheep than goat (Kolska-Horwitz and Milevski 2001: 299–300).

3.2.5.3 Wildlands

Wildlands are here defined as unmanaged, non-cultivated areas of tree cover and grassland that may have been used occasionally for grazing but were primarily exploited as a source of timber. The primary vegetation of the coastal plain in the protohistoric periods was eastern Mediterranean forest comprising Kermes oak (Quercus calliprinos), terebinth (Pistacia...
palaestina), olive (Olea europaea), and buckthorn (Rhamnus palaestina; Liphschitz, Lev-Yadun, and Gophna 1987: 44). The forest density of the coastal plain was higher in antiquity, although it was likely less dense near the coast due to the salty spray. In the Hebrew Bible, two references in prophesy attributed to Isaiah allude to the Sharon as a forested area either through proclaiming the opposite, noting the destruction of forested areas such as the Lebanon, Bashan, and Carmel (Isa 33:9), or as reference to its excellent fertility like Lebanon and Carmel (Isa 35:2). In both verses, the region is grouped with other regions recognized as forested during the late Iron Age. During the Roman period, Strabo recorded a large forest between Strato’s Tower and Jaffa (Geo. 16.2.27).

The arboreal remains at various sites in the coastal plain comprise few taxa and illustrate the prevalence of, and likely preference for, certain species. The wood remains from Aphek are dominated by olive and oak species, especially Kermes oak, which is predominant at other sites in the region and confirms the Quercus calliprinos-Pistacia palaestina association (Liphschitz 2000: 318). The dendroarchaeological samples from Middle Bronze Age strata at Aphek include five species of trees, namely: Mt. Tabor oak, Kermes oak, terebinth, olive, and cypress (Cupressus sempervirens; Liphschitz 2000: 317). Late Bronze Age–Iron IIA strata in Area X yielded almost the same species with the absence of cypress (Liphschitz 2009: 493). At Tel Michal, olive, Pistacia sp., Kermes oak, Mt. Tabor oak, and “broom brush” (Retama roetam) were found within occupational strata (Liphschitz and Waisel 1989: 222). Aleppo pine (Pinus halapensis), jujube, and “broom brush,” in addition to cypress and oleander grown near the river banks, constituted the wood remains at Tel Gerisa (Liphschitz 1986–1987: 102). Timber remains at ‘Izbet Sartah show an exclusive use of Kermes oak and Aleppo pine (Liphschitz, Lev-Yadun, and Gophna 1987: 48).
The main impact of human activities on coastal vegetation was the clearance of area into which invasive species were able to thrive with little competition from the dominant plants (Gophna, Liphschitz and Lev-Yadun 1986: 81). The ephemeral nature of EB IV settlements and lower population density allowed the forests to recover from Early Bronze Age exploitation before the major Middle Bronze Age sites in the area were established and visible degradation of the vegetation occurred around Aphek, Tel Gerisa, and Jaffa. When a lack of settlement occurred in the central area of the coastal plain, the land probably reverted to forest dominated by Mt. Tabor oak and provided pasture for any herds kept by the hill country farmers. Undoubtedly, the alluvium continued to be fertile for crops, prompting the reference to the “majestic corn lands” on the coffin lid of Eshmunazor (COS 2.57). In later periods, Mt. Tabor oak forested the area between Lod and the southern slope of Carmel (Liphschitz and Waisel 1985: 139). Although the Kermes oak likely dominated the ancient arboreal landscape, the Mt. Tabor oak quickly replaced it when the land was cleared and left vacant following the Roman-Byzantine period. Thus, when medieval and modern travelers observed the oak forest of the Sharon, they saw stands of Mt. Tabor oak in association with the jujube established in the absence of Kermes oak and terebinth (Liphschitz 1986–1987: 101).

The non-domesticated faunal remains exhibit the diversity of wild animals encountered by the inhabitants of the coastal plain. Hunted animals, such as deer and gazelle, only form a small portion of the overall assemblage at most of the sites in the region. At Tel Michal, hunted deer comprise only 7% of Middle Bronze Age faunal remains (Hellwing and Feig 1989: 243). Hunting also played a minor role in subsistence at Aphek with undomesticated species constituting only 6% of the overall Middle Bronze Age sample (Hellwing 2000: 295). A

59 Forested areas, including one east of Jaffa, are represented on the Survey of Western Palestine maps of the coastal plain (Conder and Kitchener 1881–1883: Sheets X and XIII).
decrease in the percentage of wild taxa within the entire sample is also observable from LB II (9.2%) to Iron II (1.3%; Horwitz 2009: 542). Remains from gazelle and deer at Aphek attest to both open savannah-like grasslands, favored by gazelle, and forested areas, frequented by deer, in proximity to the site (Hellwing 2000: 304). Although hunting may have provided a small portion of the animal protein within the diet, cervid hunting as a sport by Egyptians living in Late Bronze Age Canaan is attested by the four sets of antlers, likely displayed as trophies, found within the debris of the destroyed gate at Jaffa (Burke et al. forthcoming).

Carnivorous predators are also represented in the faunal assemblages from coastal sites. Four lion bones consisting of a partial canine, a proximal radius, and two phalanges were present in LB II and Iron I deposits in Area X at Aphek (Horwitz 2009: 543). Two lion metacarpi and lower paw elements were also found in the faunal assemblage from Tel Gerisa. The presence of bones from feet and lower extremities at both sites is likely the result of the “schlepp effect” of skinning the animal at a kill site and carrying the skin and bones that remain back to a settlement for either quotidian or cultic functions (E. Maher, pers. comm., 11/22/2013). More notably, Kaplan’s excavations west of the gate area at Jaffa recovered a lion skull and mandible from an LB II context considered by the excavator to be a temple (Kaplan 1972: 84). Close observation revealed a chop mark near the base of the skull, indicating intentional peri-mortem decapitation, and cut marks on the skull and jaw that suggested intentional de-fleshing. The purpose of these activities in connection to the artifact is unclear, and several uses for the skull can be proposed including a hunting trophy of an Egyptian official, ritual headgear for religious ceremonies, or a votive offering placed in a cultic setting.60 In addition to the lion remains, a lower mandible of a

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60 The possibility of these lion remains resulting from a local hunt is interesting to consider in context of the large scarab of Amenhotep III found within the matrix of mudbricks used in the Stratum IVA gate at Jaffa that commemorates the king’s success in hunting 102 lions (Sweeney 2003: 54–56). Perhaps Amenhotep III’s subordinates also engaged in hunting dangerous prey.
medium-sized carnivore, possibly a hyena, was also discovered among the faunal remains from Kaplan’s “Lion Temple” excavations (Burke et al. 2011).

3.2.5.4 Freshwater Biomes

Both lotic and lentic biomes are locally represented in the central coastal plain although identification of floral and faunal biota from these habitats is meager. Although these water features would be obstacles to travel and transportation, marshes provided additional floral and faunal resources on a seasonal basis. In areas near the Ayalon and Yarkon rivers, the river banks were dominated by willow, poplar, and tamarisk with some open grazing areas in flood-prone spots (Gophna, Liphschitz, and Lev-Yadun 1986: 79). Smoother flint sickle blades found at Tel Michal suggest that reeds from wetlands were being harvested as well (Lamdan 1989: 318). Remains of aquatic creatures found at excavated sites indicate exploitation of both fresh and saltwater species. Two species of land snails from the vicinity of Aphek, freshwater mollusks, snail, and crab from the Yarkon River represent taxa from the immediate environs of the site (Mienis 2009). Since most of the coastal fresh water marshes were seasonal and not deep enough to support fish, the marshes were exploited for waterfowl drawn to the amphibians inhabiting these features or for reeds or other hydrophytes. Without the presence of fish, amphibians and insects would have thrived and multiplied. The presence of such marshes in the coastal plain would have been a source of malaria and other insect-borne diseases.

Certain undomesticated species, notably the hippopotamus (*Hippopotamus amphibius*), flourished in the lotic habitats of the central coastal plain since the Neolithic period. Hippos, together with elephants and boars, were exploited for ivory because hippo ivory retains whiteness and does not turn yellow as quickly. Additionally, hippos provide meat, fat, marrow, and hide. Horwitz and Tchernov (1990) discuss the temporal and geographic distribution of
hippo remains and factors that affect their visibility in the archaeological record, noting that one may determine local exploitation, i.e., hunting, in contrast to ivory-working by presence of skeletal elements. Thus, the presence of hippo bones indicates proximity of the animal to a site while isolated teeth allude to the existence of trade networks for the portable raw material (Horwitz and Tchernov 1990: 74; Figure 10).

Figure 10: Upper and lower right hippo canines from Tell Qasile, L.3451, Stratum IX (after Horwitz and Tchernov 1990: fig. 1).

Hippopotami in the Yarkon are archaeologically attested, and the inhabitants of the Yarkon River basin exploited, and likely feared, this source of hide, bone, ivory, and meat.61 Caprovine, wild cattle, and hippopotamus bone were found in a settlement context attributed to the Pottery Neolithic B Wadi Rabah culture (Dayan and Lupu 2011). A “boomerang-shaped article of hippopotamus tooth” dated to the Chalcolithic was found at Givat Oranim (Naḥal Bareqet) during salvage operations (Oren and Sheftelowitz 1999: 49*). Hippo remains were also

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61 It has been suggested that hippopotami probably also lived in the Orontes and Sinn rivers (Riis 1970: 33).
found in an EB II context from Area B at Aphek (Hellwing 2000: 306). Although the oldest of these finds predates this study’s temporal focus by more than three thousand years, hippopotamus bones and ivory were present in Iron Age levels at Tell Qasile (Haas 1953) and at Tel Gerisa (Horwitz and Tchernov 1990: fig. 4). Body part selection accounts for the presence of meat-bearing limb bones at archaeological sites and the absence of other skeletal elements with little meat value (Horwitz and Tchernov 1990: 73). Further, ethnographic studies show that meat removal from hippo bones results in “deep, broad, straight-walled hack marks” that correlate well with cut marks found on a hippo metacarpals from Tell Qasile (Horwitz and Tchernov 1990: 73; Figure 11).

Figure 11: Hippo metatarsals from Tell Qasile, L.328, Str. XI (left) and L.288, Str. XII (right). Note deep butchery cuts indicated by arrows (after Horwitz and Tchernov 1990: fig. 5).
Based on the presence of molars and skeletal fragments found together with ivory tusks, it is likely that hippopotami inhabited the Yarkon River wetlands until the end of the Iron Age, and the latest tooth fragments were found in a late Iron Age or early Persian period context at Tell Qasile (Haas 1953: 32). Haas argued that the presence of African animals such as the hippopotamus, the soft-shelled turtle (*Trionyx triunguis*), and the Nile crocodile attested at prehistoric and historic archaeological sites suggests swamp-like conditions in which papyrus, water lilies, and other swamp flora prevailed (1953: 34). Stands of papyrus were noted in the Huleh basin, the north shore of the Sea of Galilee and along the coastal plain well into the twentieth century. A fluctuating biotope that restricted the population combined with the increase in settlement density in the coastal region led to an increased predation of hippopotami and their disappearance from the archaeological record after the Iron Age (Horwitz and Tchernov 1990: 72).

3.2.5.5 Marine biomes

Like the freshwater biome, the marine biome comprising littoral and neritic zones is meagerly attested within the archaeological record, but the surviving faunal remains attest to the exploitation of this biome and the connections inland sites maintained with coastal communities. Concerning specific flora, no marine plants have been documented in the archaeological literature to date. The Hebrew Bible mentions the flower, כבצלת השור, mistranslated as the “rose” of Sharon (Song 2:1). This may actually refer to the sea daffodil (*Pancratium maritimum*), a flowering plant common to the sandy littoral of the coastal plain. The few fish and turtle remains from Tel Michal may indicate less dependence on marine exploitation than terrestrial fauna (Hellwing and Feig 1989: 242, 246). Saltwater fish remains from Aphek such as meagre and grouper illustrate connections with coastal fishermen since both fish species require boat-
based fishing. The terrestrial and aquatic invertebrate assemblage also shows definite ties with coastal sites or exploitation of the coastal environment approximately fifteen kilometers away (Mienis 2009: 568). Saltwater mollusks, snails including murex (*Bolinus brandaris* and *Hexaplex trunculus*), and cuttlefish were transported from the Mediterranean (Mienis 2009: 565).\(^{62}\) Although archaeomalacological remains found in Late Bronze Age and Iron Age levels at Aphek likely centered primarily on ornamentation (Mienis 2009: 567), consumption of freshwater and saltwater fish and squid, including Nilotic varieties (see below), illustrates the maritime connections between inland centers such as Aphek and coastal gateways through which imported foodstuffs passed.

### 3.2.5.6 Non-local Biota

In addition to the biota local to the coastal plain, analyses of wood and faunal remains confirm the import of timber and foodstuffs from other regions of the eastern Mediterranean, most notably Lebanon and Egypt. The arboreal remains from all these sites illustrate the exploitation of the local oak forests and dominance of the Kermes oak in addition to the need or desire to import cedars from Lebanon for certain construction efforts. Timber samples taken from Mazar’s excavations at Tell Qasile show that both cedar of Lebanon and Mt. Tabor oak were used as construction materials.\(^{63}\) Most notably, recent excavations at Jaffa uncovered nearly two dozen timbers, likely cedar of Lebanon, used in the construction of the roof and superstructure of the monumental gateway (Burke et al. forthcoming). Additionally, four samples of imported *Cedrus libani*, three of which originated in the Egyptian residence, were recovered at Aphek (Liphschitz

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\(^{62}\) The cuttlefish or common squid, considered a delicacy, was probably an occasional supplement to the normal diet. Cuttlebones have also been used in metallurgy as casting moulds, although the specimen from Aphek was not a large fragment and likely did not exhibit any tool marks.

\(^{63}\) Two samples of cedar, one of which may have been a pillar, were retrieved from Temple 131. The oak fragment was found in Building 225 adjacent to the temple (Liphschitz and Waisel 1985: 139).
It should also be noted that fruit from other regions such as dates, almonds, carob, and hawthorn that grow in the Jordan Valley and central hills are absent in Bronze and Iron Age levels at archaeological sites in the coastal plain, possibly indicating a lack of connections with those regions.

Camel bones found in Iron Age contexts at coastal gateways may indicate involvement in the east-west commercial networks as outlets for commodities from more arid environments, although the possibility of the camels being raised in the coastal plain and used for local transportation in the Iron Age and later cannot be excluded. For example, at least one camel is attested during the Iron Age at Tel Michal, suggesting the presence of domesticated camels, possibly from caravans, at the site. Also interesting is the large amount of camel bones found in the Stratum II pits at ‘Izbet Sartah, although these remains may have been deposited during Stratum I or later during the Byzantine period (Hellwing and Adjeman 1986: 147).

Fish constituted part of the diet at Aphek that included freshwater species from the Yarkon, marine fish caught by coastal fishermen, and Nilotic species probably obtained through the maritime links with the Nile valley. Meagre, grouper, gilthead seabream, and Nile perch were found in the area of the Late Bronze Age Palace VI (Lernau 2009: 569). From the Iron Age levels, the fish remains included meagre, white grouper, blue-spotted sea bream, Nile catfish, Nile perch, and mullet (Lernau 2009: 569, 572). Nile perch (Lates cf. niloticus) was also found at Tel Gerisa and Tell Qasile (Lernau 2009: 572) and Jaffa (E. Maher, pers. comm.). The presence of Nile perch bones at over forty Levantine sites as well as archaeological sites in Turkey and Cyprus likely indicate a thriving trade in Nile perch during the Late Bronze Age. Although H. Lernau (1986–1987) posited that southern Levantine littoral rivers were deep enough from the Late Bronze Age onward to support populations of Nile perch, the presence of three skeletal
elements from Late Bronze Age and Iron Age Aphek probably indicates commercial or cultural connections with Egypt via the coastal sites (Lernau 2009: 573).

Taken together, the terrestrial, aquatic, and anthropogenic biomes of the central coastal plain in the Bronze and Iron Ages were rich in plant and animal resources which the inhabitants of the region exploited with little overall impact on the environment. For example, in their discussion of Middle Bronze Age land use and requirements, Gophna, Liphschitz, and Lev-Yadun propose a mixed economy of herding and farming (1986: 76–77). Following agricultural studies of the Roman era and assuming a per capita requirement of 1 ha under cultivation, they note that the soils were less extensively exploited than in the Roman period, the cereals were more resistant to pathogens, and fewer, less aggressive weeds persisted than in later periods. Concerning pastoral requirements, they estimate that herding provided only twenty-five percent of the diet and would have required 0.3 ha for caprovine grazing. Together with wood requirements for fuel, pasture and farmland would have accounted for twenty to twenty-five percent of the available land of the coastal plain affected by human activities during the Middle Bronze Age (Gophna, Liphschitz, and Lev-Yadun 1986: 78, 80). Floral and faunal samples reveal that many sites were situated not only at strategic geographic points for commerce but were also located at ecotones, the nexus or transitional area between local biomes. While not all of the local biomes were as robustly exploited as others or as equally represented in the archaeological record, and some timber and seafood were imported as raw materials and foodstuffs, the preserved plant and animal remains provide a sense of the region’s biota and illustrate the agro-pastoral economies of the coastal plain through the lens of regional biomes.
3.3 Harbor Location and Port Migration

The previous review of past sea levels, tectonic activities, climatic shifts, and coastal geomorphology permits a more informed discussion about harbor locations for the central coastal plain. While longshore commercial activity commenced as early as the fourth millennium B.C.E. (Wachsmann 1998: 41), the main hindrance for harbors on the Mediterranean coast south of Carmel is the shallow water and shifting sands along the sea floor (Raban 1985: 11). In addition to silting from Nilotic sands and discharge from Levantine rivers, changes in sea level and tectonic action have served to obscure and even obliterate ancient harbors that existed along this seaboard. As G. A. Smith noted, “While the cruelty of many another wild coast is known by the wrecks of ships, the Syrian shore south of Carmel is strewn with the fiercer wreckage of harbours” (1896: 131).

N. Marriner and C. Morhange present a typology of “wrecked” harbors in the Mediterranean basin based on earth science techniques accounting for distance to present coastline, position to present relative sea level, geomorphology, and taphonomy, or “how these ancient ports came to be fossilized in the sedimentary record” (2007: 146). Relevant for this study are buried harbor types including urban, landlocked, and lagoonal harbors (Marriner and Morhange 2007: 152–59). Reduction in sea-level rise coupled with coastal progradation resulting from high sediment supply due to anthropogenic modification of watersheds (deforestation and agriculture) elucidates why harbors have been lost over time. Urban harbors like Beirut still have an active port, but the ancient harbor is beneath a modern city (Marriner and Morhange 2007: 152). Bronze Age Beirut had the same type of pocket beach and protected embayment as Tyre and Sidon likely favored by Bronze Age mariners (Marriner, Morhange, and Saghieh-Beydoun 2008: 2507). As seafarers sailed between larger commercial polities, natural anchorages would
have been favored; thus settlements near such proto-harbors like Tyre, Sidon, Beirut, and probably Jaffa, would have flourished. The in-filling of urban harbors like Beirut results from fluvial deposits, erosion from building materials, urban runoff, and waste disposal. In addition to the aforementioned ports, the preeminent Phoenician cities of Tyre and Sidon also have buried harbors with basins still in modern use. Lagoonal harbors offer natural protection as safe havens for ships. However, such low energy embayments gradually fill with sediment deposited by nature and humans. Although lagoons offered limited draft depth, the shallow draft of the Bronze and Iron Age vessels was well-suited for these anchorages (Marriner and Morhange 2007: 159).

Underwater surveys conducted at Tel Michal (Grossmann 2001) and Apollonia-Arsuf (Galili, Dahari, and Sharvit 1992) also relate the locations of submerged kurkar formations and present the locations of natural anchorages along the central coastal plain employed by mariners before the advent of man-made harbors in the Iron Age. One possible harbor at Tel Michal, now buried by sediment underwater, was created by an abraded crescentic kurkar ridge in the surf zone below the cliff that served as a natural breakwater (Error! Reference source not found.). A channel 30–40 m wide and up to 2 m deep was recorded between the ridge and the beach, and it is likely that ancient mariners entered the cove from the south. Along the inside arc of the ridge opposite the tell, four large ashlar blocks were found in an underwater survey together with other unworked or roughly worked stones and the handle of a Late Bronze Age cooking pot and fragment of a Late Bronze Age bowl (Grossmann 2001: 34–36).64

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64 While Herzog claims that this indicates a built harbor with a pier, Grossmann rejects such an interpretation based on chronology and dating of other artificial harbors to the Phoenician period. Regardless of interpretation, the fact remains that some anthropogenic structure together with Late Bronze Age ceramics is submerged east of the kurkar ridge just offshore from Tel Michal.
An alternative anchorage was discovered as coring performed near the Naḥal Gelilot revealed gravels and silt deposited when a body of water ran along the southern side of the upper tell at Tel Michal (Gifford and Rapp 1989: fig. 17.1). This core gives evidence for flooding of the wadi channel by rising sea levels during the Holocene, dated to 5200 B.C.E. A water depth of one to two meters would have existed near the channel mouth, likely indicating the Middle
Bronze Age anchorage for Tel Michal (Gifford and Rapp 1989: 206). E. Grossmann suggests that the Bronze Age inhabitants of Tel Michal diverted the wadi to create a harbor in the estuary that would be silt-free as a result of the running water (2001: 34). She also speculates that in drier months, a channel was cut to reach the relatively high water table, and the ground water would have kept the embayment clear of silt transported by longshore currents in the Mediterranean (Grossmann 2001: 37). The soil and sand excavated from this effort to create and maintain such an anchorage may have been used to level, fill, and create the embankments for Tel Michal’s Middle and Late Bronze Age embankments. Beirut’s ancient harbor consisting of a talweg between the hills of Ashrafieh and Ras Beirut is comparable to the proposed harbor at Tel Michal on the Nahal Gelilot, which ran between two of the five mounds at the site. The exception is that Beirut’s ancient settlement started in the area between the hills, while Tel Michal was founded on the upper mound north of the Nahal Gelilot channel (Marriner, Morhange, and Saghiieh-Beydoun 2008: 2496).

Similar to the first proposed anchorage for Tel Michal, a submerged kurkar ridge slightly south of Apollonia-Arsuf provided a sheltered anchorage between offshore hazards and the coast (Figure 13). An underwater survey recovered a triangular anchor dated to the MB I, a rectangular anchor with a single perforation dated to the Late Bronze Age, and two three-holed stone anchors from the Iron Age or Persian period (Galili, Dahari, and Sharvit 1992, 1993: 63–65). Although no terrestrial settlement is known from the Middle or Late Bronze Ages, these finds indicate that the shelter was used long before a site developed.

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65 R. Miller suggests that specialized engineers would have been hired by cities to dig water systems that reached the aquifer and utilized the excavated material to build city defenses (1980: 339). The same use of excavated material from the wadi channel to build the embankments or platforms at Tel Michal seems likely.
Figure 13: The anchorage at Apollonia-Arsuf with submerged kurkar formation, architecture, and anchors (after Galili, Dahari, and Sharvit 1992: fig. 1).

The economic and political drawbacks associated with the lack of a suitable harbor at Jaffa became evident in the modern era as Europeans regained interest in the Holy Land as a result of Napoleon’s campaigns. The French surveyors recognized the problems of accessing Jaffa’s harbor and produced a bathymetric map with depth soundings showing the best approaches for ships at the turn of the eighteenth and nineteenth centuries (Shacham 2011: fig 13.10; Figure 14). Echoing the statements of many visitors to the Holy Land, Baedeker’s guidebook states plainly that Jaffa “possesses no good harbour” (1876: 6) as large ships had to anchor east of a chain of rocks and goods and passengers were ferried in longboats through the rocks to the quayside in the port. Inclement weather wreaked havoc on such activities as G. A. Smith stated that the reefs at Jaffa “are more dangerous in foul weather than they are useful in fair” (1896: 130–31). During winter, the majority of the boats from Jaffa moored within the mouth of the Yarkon, and smaller boats were beached (Hanauer 1903a: 261; Avitsur 1965: 30).
Hanauer noted artificial cuttings in the offshore rocks at Jaffa, indicating an attempt sometime in the history of the port to utilize the rocks to build a better harbor (1903a: 261). Various schemes in the early twentieth century proposed dredging the harbor to accommodate larger steamships, building breakwaters, and connecting the quays via tracks to railroads, including plans from an Italian syndicate to fund an operation planned not to exceed $7,000,000 to improve the harbor (anon. 1922: 25).  

As early as the 1830s the question arose about constructing an inland harbor utilizing the “Jaffa marsh,” a site that was acclaimed as “Solomon’s Port” based on the artifacts recovered from the marshy area that resembled anchors and chains (Avitsur 1965: 32; see also Hanauer 1903a). This feature is recorded by Jacotin and the French surveyors during Napoleon’s campaign in Palestine labeled the water-filled depression east of Jaffa as a *flaque d’eau* (see [Figure 14: Bathymetric-shaded map of Jaffa’s harbor using French depth soundings from 1799](#)).

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66 According to a brief column in *Steam Shovel and Dredge*, “commensurate with harbor improvement, the city of Jaffa itself is making plans to come out of its lethargy and reap rich rewards,” which included proposed waterfront construction of warehouses, restaurants, hotels, and private residences (anon. 1922: 25).

67 A note on the French map states that “Sounding of the port of Jaffa in the lowest sea which occurs in the evening. The highest sea is two feet below the lowest level.” The measurements are related in *pieds du roi* (≈32.48 cm) and *toises* (consisting of 6 *pieds*, or ≈1.949 m).
Shacham 2011: figs. 13.1, 13.4), an unnamed feature on the SWP map (Conder and Kitchener 1881–1883: Sheet XIII), and a Niederung identified as “el-Bassat es-Saghire” on Sandel’s map of 1878–1879 (see Shacham 2011: fig. 13.19). In two short articles about this depression, J. Hanauer presented information for this swamplike area earning the appellation of “Solomon’s Harbor” (1903a; 1903b). Hanauer related that landowners digging a well in the sunken area encountered wall fragments claimed to be a “massive sea wall” and excavated to a depth of eleven meters without encountering sand (1903a: 260). Additionally, “old people had related that they had heard of boat anchors having been dug up in the ‘Bassah’” (Hanauer 1903a: 260). However, the “anchor” that was found was not a stone anchor but “a piece of iron, looking like a fragment of a ship’s anchor” to its discoverers (Tolkowsky 1924: 27). The loamy soil encountered by the landowners originated from water-laid deposits, likely from sediment in the area being carried by rainwater during the winter months (Tolkowsky 1924: 26). The “sea wall” composed of ashlar masonry in the western portion of the depression was also encountered during excavations by the American School of Oriental Research in Jerusalem (now the W. F. Albright Institute of Archaeological Research), then directed by George A. Barton. He claimed that the “existence of an ancient inner harbor at Jaffa, used in the Maccabean period and in the time of Saladin, and perhaps also in the time of Solomon, was rendered probable” by his excavations (Moore and Barton 1903: 41). While Barton may have been mistaken regarding the temporal scope in which the inner harbor functioned, he likely listed those periods in his report and in a letter to Hanauer based on the finds that he encountered and the local tradition linking the inland depression with the “Harbor of Solomon” (Hanauer 1903a: 258, 1903b: 355–56). Thus, the ashlar wall in el-Bassa probably dates to the Hellenistic or Crusader periods and was
not a Solomonic quayside or any type of port architecture (but see Raban 1994: 101). Barton also stated in a letter to Hanauer that “seismic disturbances have changed the level at various times” (1903b: 355–56). In his assessment of the depression, Hanauer asserted that el-Bassat was “an inland lagoon or swamp perhaps connected with the sea by a narrow channel, up which small vessels may have passed to find shelter in stormy weather” (Hanauer 1903a: 260-61).

Sediment and pebbles retrieved from coring show that the Naḥal Ayalon emptied into the Mediterranean Sea just north of Jaffa at some point in the past (see discussion above). The deep indentation to the southeast of the ancient mound, known as el-Bassat, resulted from this stream flow. Either human effort or the natural development of a kurkar ridge further east, the second inland kurkar ridge, changed the course of the seasonal Naḥal Ayalon, which simply followed topography and shifted its course northward and joined with the Yarkon near the site of Tel Gerisa. Like efforts attested at other coastal sites, such as Achziv and Tel Michal, inhabitants of Jaffa may have transformed the landscape to permit vessels to sail into the lagoon formed by the old Ayalon outlet on the lee side of the mound (Raban 1985: 20). These efforts, in conjunction with a rise in sea levels, flooded the channel and depression of the Ayalon’s previous course and provided a natural harbor guarded by a promontory; thus, Jaffa would have been a “beautiful place” for mariners in the Bronze and Iron Ages.

In addition to the previous excavations and publications from the early twentieth century and mid-century or later coring, the previous course of the Ayalon has been the subject of current investigations by the Ioppa Maritima Project, a maritime component of the Jaffa Cultural

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68 Raban posited that given the parallels for anthropogenic inner harbor basins in the Phoenician colonies of Utica and Carthage, the Phoenicians could have excavated “al-Bassat” during the reign of Solomon (1985: 27). Conclusive dating of the masonry, dependent on the associated finds discovered in Barton’s operations, may not be possible since further investigation of the early archives of the American School in Jerusalem (now the W.F. Albright Institute of Archaeological Research), currently held by the Archaeological Institute of America, revealed no records from Barton regarding his fieldwork in Jaffa (A. Burke, pers. comm.).
Heritage Project, initiated by A. Burke and S. Wachsmann to determine the location of Jaffa’s Bronze and Iron Age harbor and explore underwater areas adjacent to the current mound for ancient shipwrecks. Recent coring in the area of the Bloomfield Stadium and adjacent Groenigen Park was accomplished in fall 2014 with an underwater survey following. Although the results of the coring are being prepared for publication (see Wachsmann 2014), GIS analyses using hydrological modeling tools employing both SRTM and ASTER digital elevation data have suggested the possible ancient course of the Ayalon and the maximal extent of the depression that served as Jaffa’s ancient harbor. In light of the differences between the topographic data sets (see 1.5.5 Evaluation of GIS Methods), probable courses for the Ayalon were calculated from both the SRTM and ASTER data. The SRTM data produces a flow that empties into the Mediterranean approximately 350 m directly northeast of Jaffa’s tell whereas the ASTER data produces a flow into the sea about 800 m northeast of the mound. Along with a hypothetical flow direction, a possible maximal extent for the lagoon formed by the outflow of the Ayalon, which likely served as Jaffa’s ancient harbor, was also determined using hydrological analysis and elevation data (Figure 15). While the actual extent and location of Jaffa’s harbor may not have ever been as large as the area indicated by the GIS software, the results of this modeling provides an insight into what may have been the “sea of Joppa” mentioned in the Hebrew Bible and a foundation for future desktop and field investigations.

69 I would like to thank A.A. Burke for inviting my contribution to an article about the Ioppa Maritima Project and the search for Jaffa’s ancient harbor currently in preparation and K. Kowalski for the debate about the differences in underlying topographic data and the results of hydrological modeling. Maps of the proposed course of the Ayalon derived from our GIS analyses will be published in the aforementioned article.

70 These results do not prove the viability of one dataset over the other; rather, they provide two testable hypotheses regarding the Ayalon’s ancient course. The position of the SRTM-derived stream aligns with a canal dug to drain el-Bassa in the late nineteenth century and indicated on Hanauer’s map (1903a). It is conceivable that the GIS may have identified the resulting lower topography of that canal (now bridged by a walkway where it joined the seashore) and illustrates the caution warranted when executing spatial modeling and reconstructing ancient environments using modern topography from an urban environment.
Figure 15: GIS-derived ancient course of the Naḥal Ayalon (dashed blue line) and proposed maximal extent of the basin (dashed red line). 1 m contours over historical SPOT satellite image.

Although Jaffa would have been the closest port for Jerusalem, some scholars have argued that the timbers for the monumental construction efforts in Jerusalem would have been floated in rafts from Lebanon to the Yarkon estuary and transported from Tell Qasile to the Davidic capital (2 Chr 2:16 [Heb. 2:15]; Maisler 1950–1951: 63; Aharoni 1979: 18), and this scenario would have been repeated for the construction of the second temple in the post-Exilic period (Ezra 3:7). Raban argued against this interpretation of the “sea of Joppa” based on geographic distance from the site, ethnic and political fragmentation, and the difficulty in accessing the river due to the shallow sandbar across the estuary in addition to the lack of archaeological features such as retaining walls or quays along the river bank (1994: 112). The lagoonal harbor at Jaffa, if accessible during these periods, would have presented a closer route for terrestrial transportation of the timbers by offloading them in the lagoon and then taking them overland via the Naḥal Ayalon to Jerusalem. Therefore, Jaffa may have comprised two urban nuclei with a citadel or upper city on the present mound and a lower city near the harbor like
Sidon and Beirut (Marriner, Morhange, and Saghieh-Beydoun 2008: 2501), and this possibility is currently being explored as part of the Ioppa Maritima project.

A “migration” of ports can be observed in two instances within the chronological framework of this study. First, for the anchorage at Tel Michal, creating and maintaining a lagoonal harbor from the channel of the Naḥal Gelilot could have been accomplished in the Middle and Late Bronze Ages, yet the anchorage was not able to handle all the maritime traffic in late antiquity (Grossmann 2001: 18). The rate of sediment deposition from the Nile and rainwater runoff and the political organization required to keep the channels cleared of silt presented challenges to the ancient inhabitants of coastal sites as well as shifts in settlement patterns. Although secondary in importance to Caesarea and Jaffa, the center of maritime activities migrated to Apollonia, where more of the population in this area of the Sharon plain had settled during the Hellenistic period given its location on terrestrial trading routes. While the shift between Tel Michal and Apollonia as maritime centers was primarily based on Apollonia eclipsing Michal economically, probably from the intentional efforts of the Hellenistic period authorities (Gophna and Ayalon 1989: 23), the port migration at Jaffa from a lagoonal harbor situated in the ancient outlet of the Naḥal Ayalon to an anchorage for small boats on the leeward side of the chain of rocks offshore from the mound appears to be more natural in cause than cultural.

Second, if the flaque d’eau east of Jaffa did indeed serve as a lagoonal harbor, Tell Mashuk, a potential candidate for Paleo-Tyre on the littoral opposite Tyre, may serve as an analogy for Jaffa (Marriner, Morhange, and Carayon 2008: 1306–07). Geoarchaeological studies of the sediments near Tell Mashuk indicate that the coastal environment was flooded six thousand years ago, and the lagoon possibly served as a Bronze Age anchorage. Concerning the
silting of the lagoon and eventual blockage or in-filling, “in the absence of a fluvial flushing system, any inlet would gradually have been blocked by beach ridge accumulation” (Marriner, Morrange, and Carayon 2008: 1307). Once the bar was formed and cut the lagoon off from the open sea, the area became marshland in the Roman period and remained so until the nineteenth century. A parallel course of natural events should be considered from Jaffa and the “Harbor of Solomon” in which the basin adjacent to the city was a lagoon that functioned during the Bronze and Iron Ages with eventual beach ridge formation that separated the lagoon from the sea during the Classical period, and the lake resulting from winter rains persisted until the early decades of the twentieth century.71 However, the lagoon formed by the previous outflow of the Ayalon may have been protected from sedimentation in some manner by offshore ridges or reefs, much like the northern harbor of Tyre in antiquity (Marriner et al. 2005: 1319). Over time the depression may have filled in by sedimentation from pluvial sources “melting” mudbrick constructions as well as by the use of the harbor as a dump as evidenced by the wood, leather, ceramics, and macrofauna recovered from cores of Tyre’s northern harbor (Marriner et al. 2005: 1324). Once the lagoon was separated from the sea, the only option for smaller craft seeking a harbor would be along the northeastern part of the promontory, partially protected from waves by the chain of rocks still visible today. Larger vessels developed later would be consigned to anchor in the deeper waters west of the rocks and have their goods and passengers ferried ashore.

71 Following Pliny’s description (V, xiv, 69) of the adoration of the goddess Ceto (likely Derceto or Atargatis) at Jaffa, Tolkowsky suggested that the depression east of the city, considered by some to be the “Solomonic harbor” was a pool sacred to the goddess (1924: 27). That the Romans would venerate a goddess at a pool of water accords with votive offerings of the Roman period found deposited in springs and pools across the extent of the former Roman empire and would only further contribute to the history of the depression east of Jaffa’s ancient mound.
3.4 Conclusion

As agents within the physical landscape of the central coastal plain, the inhabitants of the Sharon adapted to the climate, soils, and hydrology of the region while prudently exploiting its timber resources, grazing lands, and proximity to maritime resources and leaving traces within the archaeological and textual records of their cultural-ecological system that interacted with natural elements and anthropic changes to them (Nir 1986: 133). To grasp the challenges the landscape and climate posed, several strands of scientific evidence including isotope analysis, pollen studies, lithology, and coring samples can be integrated with archaeobotany and zooarchaeological techniques to present a picture, albeit in broad strokes, of the paleoenvironment of the southern Levant. The geologic history of the Sharon reveals various prehistoric fluctuations in sea level together with fluvial and aeolian sediment deposition. The calcified sandstone ridges act as reminders of previous sea levels and as barriers to drainage, creating marshes and wetlands across the coastal plain in wetter periods. While the red loam hamra soil was moderately fertile and provided pasture for herds, the alluvial soils provided well-watered ground for not only growing the staples of ancient Near Eastern diet, cereals, grapes, and olives, but also afforded opportunities to cultivate pulses, legumes, fruits, and flax. Throughout the chronological span considered by this study, the prevailing exploitation pattern of domesticated animals focused on raising sheep and cattle and keeping them into maturity for their secondary products such as wool, milk, blood, and labor. Although hunting only played a minor role in food strategies, the presence of deer suggest a wooded terrain, while gazelle and lions demonstrate the existence of grasslands. In addition to several varieties of fresh water fish and crab, the Yarkon also hosted a hippopotamus population hunted for ivory, meat, and hide well into the Iron Age.
The daily activities of the Sharonites all took place within a climatic regime that fluctuated between warm, dry periods and cooler, moister periods that trended throughout the Bronze and Iron Ages. Following a warm and dry period at the end of the Early Bronze Age, the Middle Bronze Age was less warm but still dry until ca. 1800 B.C.E. when instances of wetter events are recorded. Despite such events, including the disruption caused by the eruption of Thera ca. 1628 B.C.E., the weather continued to be warm and dry, reaching a climax around 1500 B.C.E. when the level of the Dead Sea dropped to -417 m below mean sea level. Cooler and wetter conditions prevailed between 1400–1200 B.C.E. until an “abrupt arid event” coincided with the exploits of the Sea Peoples around the eastern Mediterranean basin and hastened the end of the Bronze Age. Fluctuations in precipitation are noted during the warm period between 1200–900 B.C.E. until a shift to cooler, wetter weather in the eighth century B.C.E. that corresponded with a rise in olive pollen in the Sea of Galilee and the Dead Sea, resulting from the boom in olive oil production witnessed after the Assyrian campaigns in the region (Gitin 1995; Schloen 2001: 141–47). With these environmental and climatic reconstructions established, one may situate the settlement patterns of the Sharon from the Middle Bronze Age to the Iron II within their natural landscapes and posit a determination of their cultural landscapes, specifically, the intra- and supraregional connections the inhabitants of those sites cultivated.
Chapter 4: Settlement Patterns in the Central Coastal Plain

4.1 Introduction

The reconstruction of the paleoenvironment and climate of the central coastal plain not only highlights the conditions of the physical landscape of the region and the climatic regime for each period. The reconstruction also suggests how the environmental contexts influenced the overall settlement pattern in each period and impacted how the sites were connected both to each other and to other regions. Archaeological surveys provide data for a general examination of regional settlement patterns on a broad scale, and the information from these surveys combined with salvage and research excavations not only form the empirical basis for determining the patterns of settlement but also provide the justification for probabilistic statements about diachronic settlement patterns and systems of interactions and connectedness. Analyses of the surveyed areas represented in this study present the overall fluctuations in settlement density that appear to be normative for the southern Levant in the Bronze and Iron Ages, namely: scant settlement in pre- and protohistoric periods, the re-urbanization of Canaan in the Middle Bronze Age following a centuries-long crisis and the establishment of urban centers and non-urban villages and hamlets, a decrease in numbers of settlements in the Late Bronze Age, followed by an increase in settlement during the Iron I and fluctuations in overall numbers of sites in the Iron II, and an explosion of settlement during the Iron III in the low hills along the eastern edge of the study area. Despite the partial nature of some of the data from surveys and excavations, the available data about the material culture at each site supply enough information to map the settlement patterns from the Bronze and Iron Ages in the central coastal plain.
4.2 Settlement Patterns of the Central Coastal Plain

Armed with a tentative site typology and hierarchy, the utilization of archaeological survey, salvage and research excavation data permits the current study to reconstruct the settlement patterns using the most complete data set available, and an evaluation of previous conclusions made by the regional surveyors can be made. Attempts to determine site function are based on published material and should be considered tentative until further publications come to light. While the empirical data detailing geographic location and basic chronological information are often readily available, particulars about material culture, architectural plans, and published ceramic profiles are often lacking, making a determination of chronology, site function, and probabilistic statements about site interconnections difficult. It should be noted from most periods that not all sites existed concurrently. Maps often give a static picture or impression whereas the satellite sites of an urban center likely “switch on and off like traffic lights” as they alternated between periods of occupation and abandonment (Wilkinson 2003: 126). Burke notes that “the underlying settlement pattern throughout much of the Levant during the Middle Bronze Age consisted of archetypal settlements integrated within a hierarchical pattern arrayed around major political centers” (2008: 104). This statement rings true for the study area not only during the Middle Bronze Age but for the Late Bronze Age and most of the Iron Age as well. The following discussion of settlement patterns will present a synthetic overview of Early Bronze Age settlements within the area under consideration in the coastal plain as a backdrop for a more detailed examination of the site distribution in the region from the Middle Bronze Age to the end of the Iron Age. The data will be treated in a diachronic progression with analyses and interpretation of demographic trends, regional economies, and political complexities in the subsequent chapter.
4.2.1 Early Bronze Age I–III (ca. 3400–2200 B.C.E.)

Although outside of the chronological scope of this study, the Early Bronze Age was a formative period in the settlement history of Palestine in which the first phase of urbanization and the formation of territorial states occurred. The Early Bronze Age settlement pattern takes advantage of elements needed for the establishment of permanent (i.e., non-mobile or transient) sites with
an agro-pastoral economy, namely: close proximity to a permanent source of water and land cleared or ready for agriculture (Gophna 1995: 269). Based on shared aspects of material culture, sites within the area of interest for this study such as those at Bodenheimer Street and Hamasger Street in Tel Aviv are considered part of the north-central EB IA settlement area. Overall, 9 sites within the area of Tel Aviv (MR 70 and 71) were founded on Late Chalcolithic remains, evincing a continuity in the patterns of settlement (Gophna 2015b). Most of the EB IA sites in the study area were meager settlements or small burial sites (e.g., Azor [site 140]), yet during this period, sites were established that would be persistent through the Bronze Age such as Tel Gerisa (site 64) and Aphek (site 80; Figure 16).72

Growing archaeological evidence from EB IB sites in southern Canaan points to an Egyptian presence in Canaan coinciding with the late Predynastic Naqada IIC/D2 through the Protodynastic period and Dynasty 0 to Narmer or Hor-Aha of the First Dynasty. Although the exact nature of this Egyptian presence is debated with terms such as “colonies,” “trade diaspora,” or even “occupation,” a clear core-periphery relationship was established between Egypt and Canaan in which Egyptians were settled in Canaan at “outposts” such as Tell es-Sakan, En Basor, Lod, and in the area of modern Hamasger Street in Tel Aviv (Sowada 2009: 245–46; anon. 2015) and likely utilized the burial grounds at Azor (site 140; Ben-Tor 1993: 127). Kaplan’s excavations at Jaffa (site 46) also unearthed fragments of EB IB vessels adding that site to the array of settlement in that period. After the withdrawal of an Egyptian presence, perhaps the cause for the socio-spatial settlement crisis at the end of the EB IB, the impact of interaction with the Egyptians on Canaan was the political and economic organization and urban complexity that characterized the development of secondary states in Canaan. The “asymmetrical contact”

72 Sites appearing in Appendix A, the site catalog for this study, will be noted following the site name. Further details about the nature of the site and finds are located there.
with Egypt led to a state formation in Canaan that was “reactive, not creative, in its genesis (Esse 1989: 90–92). To this, Mazar would add an increase in population and progress in agricultural techniques leading to a surplus and trade as additional contributing factors leading to urbanization and secondary state formation (1990: 111).

The urbanization process in the Early Bronze Age, moving from unwalled settlements to compact, fortified sites, can be understood through a “socio-spatial settlement crisis” at the EB I–II transition, and urbanization may be the result of contact with a pristine civilization as Egyptians interacted with and settled among the EB peoples of Canaan or the outcome of developments in the northern Levant that diffused southward (Gophna 1995: 275; see also Kempinski and Gilead 1991 and Amiran 1970b). Within that process, the EB II fortified system emerged via either the “shrinking settlements” model, where by the construction of fortification walls limited the area of sites that had originally spread farther afield and limited the population of a site, or the “abandoned settlements” model in which places like Lod (Site 188) and Palmahim were left abandoned at the end of the EB I (Gophna 1995: 273).

EB II settlement patterns are distinguished by fortifications, public architecture, nascent urban planning, and social stratification reflected in the material culture of unwalled settlements versus urban centers (Ben-Tor 1992: 96). Smaller settlements were located near fortified centers, some being seasonal or specialized such as miners’ villages near copper sources. EB II–III settlements consisting of large fortified sites (>10 ha), medium habitation sites (average 5 ha), and small sites (<1 ha) and an estimated overall population of 150,000 (Broshi and Gophna 1984: 41–53). Over half of the EB II–III sites were located in the hill country with the coastal areas left relatively vacant (Faust and Ashkenazy 2009: 28–30). Climatic data indicate an increase in precipitation during the EB II–III that exacerbated existing drainage problems and
increased the area of coastal swamps. The human response centered on abandonment of the region of the coastal plain for other urban centers and the decline of Egyptian presence in the Early Bronze Age Levant that was coupled with an increase in maritime activity as an alternative to overland routes (Faust and Ashkenazy 2007: 42, 2009: 35–36). After a period when the four fortified towns of Aphek (site 80), Dalit, Gezer, and Gimzo controlled the coastal plain, another settlement crisis occurred in Canaan that marked the end of the EB II. Sites like Aphek were abandoned at a gradual rate.

While a decrease in sites between the EB II and EB III is observed, for the fortified sites that continued, the EB III marks the height of urban development for the Early Bronze Age as attested by architecture and artifacts illuminating the far-flung trade relations between Palestine and other regions of the Near East (Ben-Tor 1992: 97). During the EB III, many sites experienced several phases of building and destruction. The final collapse of EB III urban culture occurred abruptly ca. 2200 B.C.E. as sites across the Near East were abandoned or destroyed. Some scholars have interpreted the Sixth Dynasty Egyptian autobiography of Weni the Elder, who participated in at least six raids against Asiatics for Kings Pepi I and Merenre (Simpson 2003: 404–05), as evidence of Egyptian campaigns in the southern Levant during the Early Bronze Age (Mazar 1990: 141; Ben-Tor 1992: 124–25). The collapse at the end of the EB III was too widespread to have been caused by Egyptian martial expeditions against the “Sand-dwellers,” and the shift to a warmer and drier climate starting ca. 2200 B.C.E. as evinced by proxy data of cave speleothems, Dead Sea lithology, and ice cores (see discussion above, 3.2.4 Climate) had a greater effect on peoples of the Near East in that the abandonment of cities in Canaan and Syria coincided with the demise of Egypt’s Old Kingdom and the downfall of the Akkadian Empire in Mesopotamia.
4.2.2 Early Bronze Age IV (ca. 2200–1940/20 B.C.E.)

To appreciate the contrast between the re-urbanization of Canaan during the Middle Bronze Age and the final phase of the Early Bronze Age, one may note the dearth of settlements in the region during the EB IV. The EB IV is represented by 22 total sites, of which 2 have traces of habitation (Figure 17). Structural remains and fragments of an oven or furnace were found at Aphek (Site 80) during salvage work in 2002 according to the IAA database, complementing the EB IV sherds found during research excavations in the 1970s and 1980s at the site (Beck and Kochavi 1993: 66). At Khirbet Bet Kufa (NW; see Site 178, Beit Nehemiah), excavators found curved wall fragments composed of small and medium fieldstones, portions of a pavement, and pit together with ceramics, flints, and stone tools (Yekutieli, Faran, and ben Yishai 2000: 134*). Only isolated sherds of this period were found at Tel Hadid (Site 186) and Jaljulye (1; Site 24) suggesting some human presence at those sites (Herzog 1993a: 480).

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73 Although Pinhas Street in Tel Aviv (Site 63) is described in the IAA database generically as having “settlement remains,” a recent publication by Gophna (2015b) only notes the presence of hewn tombs dating to the EB IV.
The remaining sites (n=17), in the eastern and western portion of the region, are burial sites or cemeteries consisting of shaft tombs or caves for internment, with the exception of Mazor (E; Site 105), where a cairn dating to the EB IV presumed to be marking a burial was recorded in the IAA database. The burial sites in the western portion of the study area are located in the Yarkon River basin downstream from its confluence with the Nahal Ayalon and along a kurkar ridge that runs parallel to the coast approximately two kilometers inland, a pattern
observed by Gophna (1992: 134). It is difficult to suggest any connection between the sites in the region except for the possibility of the burial sites in the Yarkon River and Nahal Ayalon basins having some sort of connection with settlements that have been covered by alluvium, sites that were obscured by later periods in stratified mounds, or impermanent settlements near the Yarkon River in the area of modern Tel Aviv (Gophna 1992: 128). Based on form and stylistic parallels, the ceramic vessels from the Holon tombs can be confidently assigned to Dever’s “Family S” (1980: 48). However, in light of Dever’s statement that “Family S” pottery in coastal areas typically originate in domestic material, the fact that the vessels from Holon were recovered from burial contexts may indicate a relationship with the few rural hamlets or villages with the region at the time that may have produced pottery deposited in the tomb at Holon.

The distribution and function of the EB IV sites in the region can be explained through a model of EB IV society that engages both sedentary yet rural elements and more nomadic constituents largely dependent on pastoralism (Dever 1995: 294–95). The preponderance of internment sites in contrast to permanent habitation evinces a non-nucleated population, likely engaged in a primarily pastoral economy that pastured their herds in the Sharon and the low foothills during a period of food system abatement (Dever 1980: 45; LaBianca 1992: 19–20). Assuming that the sites at Aphek and Khirbet Beit Kufa (NW) were permanent habitations, sedentary groups probably lived in these rural agricultural villages and were able to mitigate the warm, dry climate by their proximity to a permanent water source.

74 The number of sites precludes an examination of ceramics from every EB IV site shown on the map. Additionally, the EB IV is outside of the stated chronological scope of this study. 75 Dever notes that several storage jars with vestigial knob handles, three mugs with functional handles, and two single spout lamps from the tombs at Holon had parallels at Jericho and Jebel Qa’aqir (1970: 23, 28–29).
4.2.3 *The Middle Bronze Age (ca. 1940/20–1530/1470 B.C.E.)*

The beginning of the Middle Bronze Age in Canaan is marked by the re-urbanization of the region with the establishment of palatial and fortified centers, monumental architecture, wheel-made ceramics, and international trade (Ilan 1995: 297). The re-urbanization of Canaan at the beginning of the Middle Bronze Age was a process whose whole that was greater than the sum of its various parts. The process of settlement in the Middle Bronze Age differed from the EB II–III with respect to the shorter period of urbanization in the MB I in which urban sites were established more quickly in comparison to the earlier era with a larger number of rural settlements, a greater diversity in size, function, and distribution of sites, and expansion into previously unexploited niches. Scholars attempting to explain the impetus that transformed Canaan from a largely rural population with ephemeral archaeological remains in the EB IV into an urban society with settlement hierarchies and extensive trade networks in the MB I have interpreted the archaeological data associated with the nascent Middle Bronze Age in various ways. While contrasts between the EB IV and MB I support theories of external forces such as population movements (Kaplan 1971; Dever 1976) or trade and communication (Gerstenblith 1983), certain continuities in metallurgy and ceramic production underscore internal developments. Tubb (1983) argues for a cultural continuity between the EB IV and the MB I as an internal development with little contact from Mesopotamia or northern Syria. In all likelihood, the Middle Bronze Age material culture was the result of multiple internal and external factors (Ilan 1995, 1996a).
In total, 73 Middle Bronze Age sites have been excavated or surveyed in the region (Figure 18). Of these, 39 can be assigned with confidence to the MB I, 30 sites to the MB II–III, and 17 sites are indeterminate. Notably, 7 sites have continuity between the EB IV and MB I, namely: Tel Aviv Pinkas Street (site 63), Tell Qasile (site 56), Tel Gerisa (site 64), Tel Aviv

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76 Sites that could not confidently assigned to either on the basis of incomplete or imprecise information will not be included in the present discussion but are included on the map of MB II sites.
Ramat Ha-Hayyal (site 48), Jaljuliya (W; site 27) Aphek (site 80), and Tel Yehud (site 136), although it is very likely that a temporal gap exists between the use of these sites in the EB IV and their establishment in the MB I. Additionally, the character of some sites changed as evinced at Pinkas Street in Tel Aviv, Tell Qasile, and Tel Yehud which served as a burial sites in the EB IV but had evidence of habitation in MB I and Sde Dov (site 39) where EB IV burials were also found in vicinity of the features and artifacts thought to be a campsite. Reuse of EB IV burial caves by the MB I population was also evident at Tel Aviv, Qirya Quarter (site 68), Jaljuliya (W; site 27), and Tel Yehud (Kaplan and Kaplan 1993b: 1454). The MB I sites are distributed mainly along three axes following topography and hydrographic features in the Yarkon River basin with a few outlying sites, oriented with a kurkar ridge in the southwestern portion of the research area, and aligned north-south along the fringes of the eastern hills (Figure 19). Site distribution follows a pattern already begun in in pre- and protohistoric periods in that settlements were founded along channels of the watercourses and along the kurkar ridge inland from the sea near sources of water.77

77 It is presumed that the sites clustered around Rishon le- Ziyyon were near a water source although their present landscape setting has been completely altered by sand dune formation that commenced in the Byzantine period.
Of the 39 MB I (ca. 1940/20–1750/30 B.C.E.) sites, at least 4 (Jaffa, Tel Gerisa, Aphek, and Tel Qana [site 10]) were fortified centers, with extant monumental architecture at Aphek (Kochavi, Beck, and Yadin 2000). The zenith of Aphek’s settlement history occurs in the Middle Bronze Age with several sub-phases of palatial architecture and associated pottery that provides a ceramic typology for the region. Excavations directed by M. Kochavi encountered six phases of Middle Bronze Age development evident across the site: three MB I phases, one transitional
MB I–II and two MB II (Beck and Kochavi 1993: 66–68). The first phase is characterized by poorly constructed pre-palace architecture and some installations. The ceramic assemblage composed of storage jars and bowl with white slip and painted or plastic decorations, but red slipped surface treatments are completely absent. The second phase is marked by construction of Palace I on the acropolis and the city wall. Ory (1938) exposed a portion of this 4 m wide mudbrick wall as well as six tombs dated to the MB I (phase 3). Next to the MB I wall, smaller houses with scanty finds were built directly over Early Bronze Age remains. In phase 3, Palace II succeeded Palace I and was built to the west of the latter. Features of Palace II included an abutting watchtower, 1.2 m thick exterior walls, a plastered courtyard, and intramural infant jar burials. Red slipped and highly burnished pottery is indicative of this phase. Phase 4 is a post-Palace II phase in which the palace was abandoned and replaced by a residential quarter and burials, including infants in jars. The pottery of this phase starts to show MB II characteristics.

At Tel Gerisa, excavations by Z. Herzog found that in the early MB I, a mudbrick city wall 1.7 m wide was built over an earlier unfortified phase of occupation, and a glacis of hamra soil mixed with small stones and covered by crushed kurkar abutted the city wall (Herzog 1989–90: 51). This phase suffered conflagration and was replaced by another brick city wall, 2.2 m wide, also with an attached glacis consisting of thirteen layers of mudbricks overlaid with crushed kurkar (Herzog 1989–90: 51; see Burke 2008: 260). A portion of the city wall of this phase consisted of two parallel walls that were part of a tower. Ceramic vessels found in association with this phase include carinated bowls with gutter rims, bowls with a painted red cross in the interior surface, and finely combed storage jars, all of which date to the late MB I. The defensive works at Tel Qana were less elaborate, consisting of an earthen rampart (Burke 2008: 303). At Jaffa, Kaplan dated two mudbrick walls in Area A to the seventeenth century
B.C.E. (MB II; Level VII) but claimed that the southern wall was built on an earlier rampart of beaten earth and kurkar that he assigned to an MB I level. Recent examination of the pottery from Kaplan excavation areas Y and J reveals a MB I occupation level, likely established in the third phase of MB I settlement (Burke 2011a: 66–67; see also Cohen 2002).

Architecture and artifacts have been found at 17 sites without fortifications, namely: Tel Aviv-Herzliyya Road (site 9), Tell edh-Dhahab (site 31) Nahal Yarkon (S; site 38); Tel Aviv, Exhibition Gardens (site 52), Tel Qasile (site 56) Tell Abu Zeitun (site 58), Pinkas Street in Tel Aviv (site 63), Triangulation Point 793-X (site 72), Petah Tikva, Kefar Avraham (site 88), Khirbet Sha’irah (site 97), Mazor (NW; site 103), Rishon le-Žiyyon Industrial Area (site 125), Rishon Le-Zion dunes (site 128), Gan Soreq North 2 (site 132), Gan Soreq (site 134), Tel Yehud (site 136), and Lod (site 188). These sites do not extend over 0.6 ha in area and consist of fragmentary architecture with or without associated living surfaces, hearths and ash, pits, pottery, flint tools, and ground stone artifacts. Surveys at Abu Rabah (site 13), Rishon le-Žiyyon 5 (site 126), and Gan Soreq (site 131) found only pottery scatters that may be indicative of habitation at those sites.

Additional MB I site types include burial grounds, an anchorage, and pottery scatters, one of which has been interpreted as a campsite. Twelve sites without any traces of habitation consist of individual burials or cemeteries: Kefar Shemaryahu (site 3), Gelilot (site 8), Jaljuliya (W; site 27), Ramat HaHayyal (48), Hadar Yosef (site 53), esh-Sheikh Munis (site 54), and the Qirya Quarter (site 68) in Tel Aviv, Kinneret Street in Bene Beraq (site 60), Tri. Point 609-H near Holon (site 123), Gan Soreq (W) 1 (site 129), and Yehud (site 139). Some of these cemeteries are likely associated with habitation sites nearby although some seem isolated and may have served a mobile group or a site that is yet to be discovered. The largest cemetery of the period
was discovered in Rishon le- Ziyyon, and it consisted of 218 pit burials, 28 shaft tombs, and at least 3 jar burials dated to the MB I–II, and the excavator posits that over 1,000 burials were extended over 10 ha (Levy 2008). In addition to the cemetery, the site also had structural remains and pits dated to the MB I (Arbel 2009). Although the terrestrial site of Apollonia-Arsuf (site 1) has not yielded any Middle Bronze Age material culture, the area off the coast was used as an anchorage in the Bronze and Iron Ages (Tel Arshaf, Underwater area, site 2) based on the presence of a Byblian anchor dated to the MB I and others (Galili, Dahari, and Sharvit 1992, 1993: 63–65).

An increase in settlement occurred throughout Canaan during the MB II–III (ca. 1750/30–1530/1470 B.C.E.), considered the floruit of Bronze Age settlement in the southern Levant (Mazar 1990: 197). In the study region, 13 sites evince continuity between MB I and II, and 17 new sites were founded, resulting in a total of 30 sites that can be confidently assigned to the MB II–III (Figure 20). An additional 17 sites currently dated to a general “Middle Bronze Age” might be dated to the MB II–III, resulting in an increase of sites over the MB I.78 The site locations follow the same general pattern as the preceding period with settlements grouped in the floodplains of the watercourses and along the kurkar ridge inland from the coast. A few sites lay farther afield from the wadi basins, and some sites were established on the coast north of the Yarkon River and in the eastern foothills bordering the coastal plain.

78 These sites appear on Figure 20 together with sites positively dated to the MB II.
During this period, 5 sites were fortified with Tel Gerisa, Jaffa, and Tel Qana continuing from the MB I, and Tel Michal (site 4) being newly-founded. The fortification wall at Aphek fell out of use during this period (Burke 2008: 236), but Palace III was built on the acropolis over

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79 Although the excavator asserts that Tel Michal (site 4), founded in the MB III, was fortified with a sand and hamra glacis (Herzog 1993b: 1036), Burke disagrees with the identification of this feature and its function as a defensive work (2008: 297–98).
the ruins of Palace I with massive stone foundations to prevent subsidence. Later, Palace III underwent changes and repairs but was destroyed in the mid-sixteenth century B.C.E. Tombs and structural remains in several other areas can also be confidently assigned to the MB II (Beck and Kochavi 1993: 67).

The earliest remains Kaplan encountered at Jaffa were Middle Bronze Age burials dated to the MB II–III in Area Y, adjacent to St. Peter’s Church. An infant jar burial was accompanied by a red burnished juglet and a scarab. Additional burials in the area date from the same period but were disturbed by the construction of features that Kaplan interpreted to be kilns, also dated to the Middle Bronze Age, despite the lack of ash deposits, wasters, or other kiln-related debris (see Kletter and Gorzalczyński 2001). Kaplan also dated two mudbrick walls in Area A to the seventeenth century B.C.E. (MB II; Level VII) but claimed that the southern wall was built on an earlier rampart of beaten earth and kurkar that he assigned to Level VIII. Sections of a rampart of similar construction that Kaplan dated to the eighteenth century B.C.E. (MB II) were found in Area B under a glacis dated to the eighth century B.C.E.

At least 13 sites can be identified as smaller unwalled settlements less than 1 ha in size. Included in this group are Tel Aviv, Slaughterhouse Hill (site 41), Petah Tikva, Abu ‘Eid (site 51), Tell Qasile (W; site 55), Tel Qasile (site 56), Tell Abu Zeitun (site 58), Tel Aviv, Pineles Street (site 61), Khirbet Sha‘irah (site 97), Mazor (NW; site 103), Petah Tikva, Kefar Avraham (site 88), Horvat Bene Beraq (site 135), Tel Yehud (site 136), Bet Dagan, Volcani Institute (site 142), and Lod (site 188). The site of Slaughterhouse Hill in Tel Aviv continued in use at the end of the Middle Bronze Age, but its function changed from a habitation site to a cemetery in the late MB III or early LB I (Kaplan and Ritter-Kaplan 1993b: 1454). In sum, 6 sites consisted of burials only, whether a single burial or a cemetery, although burials and industrial installations
were also encountered at habitation sites. The large cemetery at Rishon le- Ziyyon (site 127) continued into this period, and burials were also found at Tel Aviv, Afeqa (site 11), Tel Aviv, Havakkuk Street (site 43), Tel Aviv, Ramat Aviv (site 57), Azor (site 140), and Beit ‘Arif (site 174). At Ḥorvat Hani (W; site 148), evidence of habitation inside a cave was uncovered during excavation (Lass 2003). Finally, at a few sites only pottery was found without any associated architecture including Herfeliyat (site 5), Uweid (site 6), El Qibli (site 7), and surveyors suggest that these sites were camps in the hinterland of Tel Michal (Gophna and Ayalon 1998: 11*).

4.2.4 Late Bronze Age I–II (ca. 1530/1470–1300 B.C.E.)

Intensive examinations of the effects of New Kingdom Egyptian imperialism over the last two decades necessitate a reconsideration of the question of Late Bronze Age settlement patterns in the southern Levant that take into account nuances made possible by a clearer understanding of settlement types and historical developments during the Late Bronze Age. S. Bunimovitz asserts that the settlement pattern is the “material manifestation of the entire mode of production and…of the social and political organization” (1995: 324). Understanding the changes between Middle Bronze Age and Late Bronze Age patterns is essential in perceiving the connections created and maintained between sites during this period given the decrease in settlement observed throughout Canaan (Gonen 1984: 63; Mazar 1990: 293–94).
Close examination of the settlement pattern for the LB I–II shows both continuity and change between the Middle Bronze Age and Late Bronze Age patterns (Figure 21). Sites dated to the Late Bronze Age are located primarily along the coast or along the flood plain of wadis with only a few sites located farther afield. LB I and/or II material was found at a total of 18 sites, an overall decrease from the preceding period, but destruction levels dated to the MB III–LB I transition and a temporal gap in occupation is evident at many sites. However, some walled
centers show continuity with the MB II–III including Jaffa, Tel Michal, and Tel Qana, although it is debated whether Tel Michal was enclosed by fortifications or if the ramparts at Tel Qana were still in use. Herzog proposes that the Middle Bronze Age settlement at Tel Michal was destroyed by tectonic activity along the coast and that such tectonic shifts were mitigated by the Late Bronze Age inhabitants of Tel Michal who reshaped the hill by adding a large fill of sand (30 m wide by 10 m high) eastward (1993b: 1037). These denizens also constructed a fortress on the northern part of the high mound that was accompanied by buildings to the south. After the LB I settlement was destroyed, efforts were made to enlarge and strengthen the rampart, and this settlement continued until its abandonment in the fourteenth or thirteenth century B.C.E.

Following the campaigns of Thutmose III in Canaan in the mid-fifteenth century, Jaffa became a fortified Egyptian administrative center. The presence of Egyptians and an Egyptian garrison at Jaffa is soundly attested not only through monumental architectural features but also through the copious amounts of Egyptianized ceramics and imported vessels from Egypt recovered from layers dating from the LB IB to early Iron IA (ca.1460–1150/1140 B.C.E.; see Burke and Lords 2010; Burke and Mandell 2011; and K. Pierce 2013). The earliest Late Bronze Age material (Level VI) appeared as mudbrick walls on stone foundations to the north and south of a monumental gateway dated to the LB II. Ceramics from Level VI south of the gate consisted of imported Cypriot Monochrome and Base Ring wares. To the north of the gate, a pit dated to the LB I contained the likely remains of an infant jar burial that contained a carinated bowl, gray burnished juglet, clay rattle, and a handleless goblet rendered with a bichrome horizontal paint scheme. Pits in Area Y contained LB I material. A monumental gateway consisting of a passageway cut through preceding occupational layers and was flanked by mudbrick towers to the north and south of the passageway. Kaplan only distinguished two phases of gate in this area:
an earlier construction phase of red orange bricks made of hamra (Level IVB) to which sandstone blocks bearing the names of Ramses II were attached as a façade and a later phase of gray bricks built directly over the preceding gate. Throughout Kaplan’s publications, it is clear that he assumed that the Ramses Gate was constructed during the pharaoh’s reign (Kaplan and Kaplan 1993: 656), and Herzog (2008: 1791) also states that the gate was built in the LB IIB. Recent excavations by the JCHP have detailed several phases of construction and repair to the gate starting in the LB IIA and continuing through its destruction in the LB IIB. Excavations have also recovered numerous cedar beams that framed and supported the gate’s superstructure, antlers from deer taken as trophies and hung in the gateway, and countless botanical samples of seeds that will shed light on the agricultural yield in the area around Jaffa (Burke et al. forthcoming).

While the number of LB I–II fortified sites remained relatively equal to the preceding period, the overall number of unwalled settlements decreased from 18 sites in the MB II–III to 7 sites in the Late Bronze Age with the acknowledgment of a likely temporal gap in settlement during the transition between the Middle and Late Bronze Ages. Based on extant archaeology and the inclusion in the topographic list of sites conquered by Thutmose III, 4 sites may be considered larger unwalled towns: Aphek (site 80), Tel Gerisa (site 64), Ono (site 138), and Lod (site 188).

Concerning Lod and Ono, Late Bronze Age material at Lod is meager. The Late Bronze Age site, possibly mentioned as no. 64 on Thutmose III’s topographic list, is represented by pottery in refuse pits and a Cypriot WS bowl fragment (Schwartz 1991: 39; Elisha 2009). The site of Ono or Kefar Ana presents a special difficulty in which the textual record is met currently with silence from the archaeological record. Literary references to the site include the
topographic list of Thutmose III in which Ono as Site 65 follows Lod (Simons 1937: 112), the Hebrew Bible (Ezra 2:33; Neh 6:2, 7:37, 11:35; 1 Chr 8:12), and the Talmud (Shearer 1992: 25). The earliest archaeological investigation at the site began as an inspection and trial excavation supervised by J. Kaplan who unearthed Roman and Early Islamic period artifacts. It is likely that the Late Bronze Age site is located not at Kefar Ana but at Kafr Junah, approximately seven hundred meters to the northeast of Kefar Ana.

Although the initial portion of the LB I is represented by few finds at Aphek, the site during the remainder of the Late Bronze Age is characterized by Egyptian influence and control in the wake of the campaign of Amenhotep II. Following the destruction of Palace III at the end of the Middle Bronze Age, two successive monumental buildings were constructed (Palace IV and Palace V) whose plans cannot be reconstructed due to the building activities of Palace VI, deemed the “Egyptian Governor's Residence.” This public structure had two entrances: one to a ground level of halls and storerooms, and the second to a staircase leading to an upper story. Parallels for this building were excavated at Beth-Shean, Tell el-Far‘ah (S), Tel Sera‘, Tel Mor, and Deir el-Balah. Palace VI suffered destruction resulting in a 2 m thick debris layer. Within the destruction debris, Canaanite storage jars, collared-rim pithoi, Egyptian bowls and a considerable amount of Egyptian, Hittite, and Akkadian texts (Beck and Kochavi 1993: 68). In addition to a LB II pit containing three Cypriot Base Ring II *bilbils* that Eitan (1969) excavated and several graves, two wine presses contemporary with Palace VI were found in Area A.

At Tel Gerisa, small LB I structures were built against the MB II wall that later went out of use. Cypro-Canaanite Wheel-Made Bichrome Ware with geometric and zoomorphic motifs

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80 Texts found in Palace VI at Aphek include an Egyptian blessing on a faience ring, a faience dedicatory plaque of a temple to Isis, the bulla of a Hittite price, trilingual and bilingual lexica, administrative lists in cuneiform, and the letter written Akkadian from Takuhlina, a prefect of Ugarit, to Haya, an Egyptian vizier (Rainey 1975, 1976; Owen 1981a, b; Singer 1977, 1983).
was found in this phase (Herzog 1983: 122). While LB II structures were not excavated on the southern acropolis of the mound, a large courtyard composed of pebbles and crushed lime was discovered in the center of the site (Herzog’s Area C). Associated with this courtyard were scarabs, a Cypriot zoomorphic vessel, and an “Eye of Horus” pendant. In addition to the courtyard, a large structure with kurkar flagstone paving, a residential wing, and plastered floors likely served as the administrative center of the site during the LB II. Finds from this area include two Cypro-Mitannian cylinder seals, twelve scarabs, Cypriot White Slip II ceramics, and Egyptian-style pottery including ovoid jars and bowls (Herzog and Tsuk 1993: 62).

In addition to sites discussed above, 4 additional sites evince habitation on a smaller scale, and these sites include Mazor (NW; site 103), Sanhedrin Street in Holon (site 122), Gan Soreq West 1 (site 130), and Ḥorvat Bene Beraq (site 135). Burial sites comprise a rock-hewn tomb chamber near Tel Gerisa (Ramat Gan, Shekhunat Ha-Gafen, site 65) that contained a funerary deposit of two scarabs, a steatite seal, weights, scale pans, a ring with lead solder as well as Cypriot White Slip II, Cypriot Base Ring, and Canaanite vessels. A burial cave at Azor (site 140) partly used in the MB II and in continual use throughout the Late Bronze Age contained several layers of human and equine burials side by side as well as twenty-one scarabs (Dothan 1993: 127). Other tombs dating to the end of the LB II and containing Cypriot pottery were discovered during excavations, but Iron I activities had greatly disturbed the graves. Pottery disassociated from architecture or pottery scatters were observed at el-Hiltamiya (site 12), Triangulation Point 112-S (N; site 79), Bene Beraq, el-Waqf (site 66), Tel Yehud (site 136), and Tel Hadid (site 186). Mariners continued to use the anchorage at Tel Arshaf as evinced by fifteen anchors dated to the Late Bronze Age recovered from underwater explorations (Galili, Dahari, and Sharvit 1993: 64).
4.2.5 Late Bronze Age III/Iron Age I (ca. 1300–980 B.C.E.)

The end of the Late Bronze Age and beginning of the Iron Age heralded massive changes in the social and political structures of the eastern Mediterranean. The collapse of palace economies and breakup of imperial authority, the migration of the Sea Peoples, and the settlement of the Israelites in the hill country of the southern Levant impacted settlement patterns and the established connections between sites in the region, effectively creating new connections as three groups with differing cultural identities strived to make their home in the Sharon. Traditionally, the archaeological phase starting ca. 1200 B.C.E. has been treated as the Iron Age based on Egyptian chronology and the end of the 19th Dynasty and start of the 20th Dynasty as well as difference in material culture associated with the emergence of Israelite groups and the disruption caused by the Philistines and their associated settlement in the southern coastal plain (Mazar 1992: 259). However, since Egyptian control of various Canaanite sites continued until the last quarter of the twelfth century (Megiddo VIIa and Lachish VI), some scholars prefer to label this period as LB III (Ussishkin 2004: 75; Gadot 2009: 586).81

Within the IAA database, this period is designated “LB II–Iron I” for excavators to use when assigning chronological dates to their finds. In the absence of detailed excavation reports, assuming a site does not show evidence for a change in material culture around 1200 B.C.E. presents a problem when presenting a historical overview of settlement in the Sharon plain since other sites founded during this period do not have connections with previous Canaanite or

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81 D. Ussishkin would prefer date the LB III from 1300–1130 B.C.E. based on the stratigraphy of Lachish in which Stratum VII and Fosse Temple III correspond to the Egyptian 19th Dynasty and Stratum VI equates to the 20th Dynasty, extending to the reign of Ramses VI (2004: 75). He views this period as a cultural highlight for both Lachish and Megiddo (Stratum VII), and the destruction of those levels marks the end of the LB. In contrast, Mazar prefers to retain the traditional division based on the absence of international trade after the thirteenth century, the destruction of Hazor, and the presence of Iron Age groups such as the Philistines and Israelites (1990: 290).
Egyptian establishments and are truly Iron Age in character.\textsuperscript{82} For example, without published material culture for sites like Lod, it is difficult to verify the database entries of pottery from the “LB II–Iron I” for this period in light of publications that discuss Late Bronze Age material dated to the fourteenth century B.C.E. with a succeeding feature dated to the Iron II (ninth century B.C.E.; Yannai and Marder 2000: 64\textsuperscript{*}).\textsuperscript{83} For other sites like Aphek and Jaffa, the continuation of Egyptian control and the lack of distinctive break in material culture, justifies the use of LB III since both sites have later Iron IB occupations. The resulting map of settlement pattern of this period combines LB III and Iron I sites since some of these site are contemporaneous (\textbf{Figure 22}), and an attempt is made to distinguish between LB III and Iron I at several sites in the discussion below.

\textsuperscript{82} Another problem that arose during this study was the use of the period “LB II–Iron I” in the IAA database records as a general term for Iron Age material culture. A careful examination of published surveys and excavation reports revealed several sites for which this period is not attested.

\textsuperscript{83} However, a tantalizing piece of evidence for Lod’s existence in the terminal LB or early Iron I is a child burial in a collared-rim jar in the Newe Yeraq quarter of Lod (Rosenberger and Shavit 1993: 56).
In contrast to the decline in the overall number of sites during the LB I–II, the LB III/Iron I witnessed an increase from 18 to 25 total sites with 8 sites persisting from the Late Bronze Age into the LB III/Iron I. The urban centers such as Jaffa, Aphek, and Gerisa have some evidence of gaps in occupation between the end of Egyptian hegemony and the Iron IB. Two fortified centers existed at Jaffa and Tell Qasile at different times as the former had a monumental gate during the LB III and the latter was fortified after its establishment as a
Philistine center in the late twelfth to early eleventh centuries B.C.E. Jaffa’s city gate, excavated by Kaplan and dated to the LB III, was the last in a series of gates and repairs that existed in the area known as the “Ramses Gate.” Like its predecessor in the LB II, this gate also suffered conflagration, and Kaplan found a bronze gate hinge near the left jamb. While no early Sea Peoples Monochrome (Mycenaean IIIC1B) pottery was found at Jaffa, later Iron IB material at Jaffa consists of Philistine pottery consisting of Philistine bichrome, “degenerate monochrome” and Philistine Red Slip contemporary with Tell Qasile Stratum XI recovered from a fragmentary floor, pits, and ash layers south and west of the gate in both the Ramses Gate and Lion Temple sectors of Area A. Herzog also found sections of walls and floors north of the gate and pits south of the gate containing material dated to the eleventh and eighth centuries B.C.E. (Iron IB and IIB; Herzog 2008: 1792).

At Tell Qasile, the earliest Iron Age remains encountered in excavations by B. Mazar (Maisler) belong to large structures constructed of mudbricks and kurkar stones and a pavement consisting of large stone slabs (Stratum XII; late twelfth to early eleventh centuries B.C.E.). These buildings suffered conflagration and intrusion by later building activities. The next phase of architecture, Stratum XI, was built on a different plan than Stratum XII and consists of a building built of kurkar stones with furnaces and adjacent crucibles for smelting copper inside and a 5.5 m thick fortification wall and a 6 m thick glacis on the west side of the mound (Maisler 1950–1951: 75, 125). Both strata had plain wares associated with the Canaanite ceramic tradition and decorated pottery in the Philistine bichrome and “degenerate monochrome” motifs. A. Mazar’s excavations found a single room temple with benches and a raised dais with cultic vessels (Temple 319). An anthropomorphic jug, a scaraboid with a chariot scene, and an ivory knife handle with Cypriot parallels were found in the courtyard. An enclosure wall separated the
temple complex from buildings to the south, and repairs made to the wall in subsequent strata indicate the continuity of architecture in the temple precinct. To the southeast of the temple, a large building with plastered benches along its interior and a raised central hearth with parallels in the Aegean, Anatolia, Cyprus, and at Tel Miqne-Ekron. The construction of another temple in Str. XI (Temple 200) directly above the brick temple of Str. XII with slight enlargement also evinces continuity in the use of sacred space.

Unwalled settlements (n=12) form a “rural” component to the settlement system. These sites include Tel Qana (site 10), Jaljuliya (1; site 24), Trig. Point 197-E (site 28), Tel Gerisa (site 64), Trig. Point 101-S (site 76), Rosh Ha–’Ayin (site 77), Trig. Point 112-S (N; site 79), Aphek (site 80), ’Izbet Sartah (site 81), Rosh Ha–’Ayin (site 87), Horvat Bene Beraq (site 135), and Azor (site 140). Some rural continuation is also evident at Horvat Bene Beraq while other sites developed into habitation sites like Trig. Point 112-S and Azor, which also acted as a cemetery site during the Iron I (anon. 1967a; Ben Shlomo 2008, 2012). At Tel Gerisa, several phases of Iron I occupation on the northern portion of the site were excavated. The earliest phase consisted of fragmentary walls and floors that Herzog (1982: 31) dated to the twelfth century B.C.E. Later activity in the area is represented by mudbrick walls and stone foundations with associated Philistine bichrome pottery. Pits containing sherds of Philistine ceramics and collared-rim pithoi were dug into these layers. The site’s water system, partially excavated by Sukenik, consisted of a 6 m wide shaft with at least 22 rock-cut steps leading down to the water table into which a rectangular stone interior casing was built. Pottery from the space between the inner stone casing and the hewn shaft dated from MB I to Iron I, indicating that the well was constructed during the early Iron Age into a system that was likely first hewn in the Middle Bronze Age (Herzog and Tsuk 1993: 62). On the southern acropolis, three phases of Iron I occupation were revealed.
Finds from this area attest to agricultural activities supplemented by fishing, evinced by lead sinkers (Herzog 1988–89: 61). In the latest phase, the layout of the buildings with a courtyard with pillar bases and two flanking rooms as well as the pottery assemblage parallels Stratum X at Tell Qasile. This phase was destroyed by fire, which Herzog (1982: 31) suggests may have been result of an earthquake.

At Aphek, a residential quarter built astride the ruins of Palace VI marks the beginning of the Iron Age. Fishing equipment and a turtle shell found in the eastern portion indicate wetland exploitation. The two succeeding strata in Area X yielded much Philistine pottery, “Aishdoda” figurines, and a tablet in an undeciphered script. Devoid of architecture, these strata are characterized by pits (Str. X-10) and ash layers (Str. X-9). In Stratum X-8, remains of a four room house were discovered with round column bases for support pillars and plastered silos similar to those excavated at ‘Izbet Sartah (see below). The pottery in the silos dates these features to ca. 1000 B.C.E.

Founded in the Iron I, ‘Izbet Sartah and other nearby villages comprise a different settlement pattern than the preceding periods in that these sites were founded in the low hills bordering the coastal plain east of Aphek, an area not previously exploited for habitation and subsistence strategies. Stratum III at ‘Izbet Sartah, dated to the late thirteenth through early twelfth century B.C.E., consists of an elliptical-shaped settlement shaped by an outer enclosure wall with adjoining casemate rooms surrounding a central courtyard with several stone-lined silos. According to Finkelstein (1993: 653), the earliest pottery at the site includes Late Bronze Age forms and decorations and a Mycenaean stirrup jar, and the remainder of the Stratum III assemblage was plain storage jar rims, red slipped bowls, and three complete collared-rim pithoi. The site was abandoned at the beginning of the eleventh century B.C.E. In the late eleventh
century B.C.E., the site was reoccupied (Stratum II), and the layout was dominated by a large four-room house (16 m x 12 m) with smaller, non-adjoining houses built on the edge of the hill on which the settlement was founded. Stone-line silos dug into the Stratum III remains mark the area around the central building. This occupational phase only lasted one to two decades before being abandoned again (Finkelstein 1993: 653). Examining the available ceramics, it is clear that in the LB III/ Iron IA, the extant sites south and west of Aphek such as Jaffa and Tel Qana seem to continue with local ceramic traditions and have no connections to the newly founded habitation sites that included ‘Izbet Sartah in the foothills east of Aphek. Due to their pottery assemblages with hill country affinities, spatial organization of ‘Izbet Sartah, overall settlement pattern in low hills, and lack of Philistine ceramics, the sites east of Aphek can all be considered part of the Israelite settlement in the early twelfth century B.C.E. (Finkelstein 1986: 204–05).

Ceramic findspots without visible architectural remains are found at 8 sites: Nahal Qana (3; site 26), Bene Beraq, el-Waqf (site 66), Khirbet Kafr Hatta (site 73), Qurnat Haramiya (W; site 85), Rosh Ha-‘Ayin (site 86), Petah Tikva, Kefar Avraham (site 88), Bet Dagan (site 141), and Trig. Point 444-H (site 156). Two sites that cannot be confidently dated to the LB III/Iron I (Me‘arot Bareqet [Site 163] and Ramat Gan, Derekh Ha-Tayassim and Derekh Lod Junction [Site 71]) complete the settlement pattern for the LB III/Iron I. Additionally, one burial site is dated to this period (Ramat Gan, Ramat HaShiqma [site 70]), although other sites may have had burials.

4.2.6 Iron Age II (ca. 980–701 B.C.E.)

The Iron II witnessed state formation within Israel, the division of the kingdom into the territories of Israel to the north and Judah in the south and the constant political and economic pressures placed on those kingdoms from external sources such as the Aram-Damascus, Assyria,
Egypt, and Babylonia in addition to the dominant Phoenician maritime presence. This region likely played host to these seafarers when the timbers for the construction projects of the United Monarchy in Jerusalem were floated to the “sea of Joppa” (see discussion above). Later the coastal plain felt the wrath of Assyria as Sennacherib destroyed the cities belonging to, or allied with, Sidqa of Ashkelon as he joined Hezekiah of Judah in rebellion. Following annexation into the Assyrian provincial system, the region continued with its agro-pastoral preoccupations with a settlement pattern that differs from preceding periods.
For the entire Iron Age II (ca. 980–539 B.C.E.), 142 sites can be identified in the study area. Of those, 12 sites can be confidently dated to the Iron IIA (ca. 980–840/830 B.C.E.), 17 sites to the Iron IIB, 18 sites from the Iron III and 106 sites that cannot be precisely dated.84

Continuity between the Iron IB and Iron IIA is evinced at 8 sites, namely: Jaffa, Tell Qasile, Tel

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84 While the last category of 107 sites cannot be concretely dated to the Iron IIC–III due to incomplete information or lack of published illustrations, the sites tend to follow the observed pattern of Iron IIC–III settlement and will be included with the Iron IIC map and discussion.
Gerisa, Petah Tikva Kefar Avraham (site 88), Tel Qana, Aphek, ‘Izbet Sartah, and Rosh Ha-
Ayin (site 87). While the location of the sites primarily on alluvial soil along the watercourses
of the Yarkon and Ayalon also evinces continuity in the settlement pattern from the preceding
Iron I back to the Middle Bronze Age and further, a marked decrease in settlement numbers
occurred from Iron I into Iron IIA (Figure 23). Although the number of unwalled sites remained
constant (12 sites in each period), the number of fortified sites and pottery scatters declined
sharply. While Tel Michal (site 4) experienced a renewed settlement for a portion of this period
along with installations and architecture thought to have a cultic function, other settlements
appear to diminish over time at Tel Gerisa, Jaffa, Aphek, and ‘Izbet Sartah. Jaffa has a dearth of
Iron IIA material from the tell; however, five installations consisting of pits with plastered
interiors and surfaces sloping toward oval depressions and serving as collecting vats for
winepresses were excavated in Area F of the Ganor Compound (Fantalkin 2005). These
installations were dated by the excavator to tenth–ninth centuries B.C.E. based on red-slipped,
hand-burnished pottery recovered from the fill soil within them (Fantalkin 2005: 7). At Tel
Gerisa, two phases of settlement dating to the tenth century B.C.E. marked the end of the
settlement history of the site until the Early Islamic period. Two four room houses excavated in
Stratum A-8 at Aphek suffered a fiery destruction near the end of the tenth century B.C.E. The
final Iron Age settlement at ‘Izbet Sartah is dated to the beginning of the tenth century B.C.E. The
large four-room house was repaired with several modifications to its layout including partitions
between columns and additions of rooms other installations, but the site was later abandoned
until the Byzantine period. Only one pottery find spot is recorded at Slaughterhouse Hill in Tel
Aviv (site 41).
The Iron IIB (ca. 840/830–701 B.C.E.) witnessed a slight growth in settlement with 17 sites overall including a fortified site at Jaffa, 14 unwalled settlements, and 2 sites with pottery and no visible or associated architecture (Slaughterhouse Hill in Tel Aviv [site 41] and Kefar Shemaryahu [site 3]; Figure 24). Regarding continuity, 6 sites shows signs of use in both the Iron IIA and IIB although this does not imply continuous settlement since some sites have temporal gaps in their occupation history. The extant sites follow the same pattern of being
located near the watercourses with a few located on the coast and along the eastern hills. At Jaffa, a stone-lined glacis dated to this period was uncovered during excavations under the floors of the Hammam building adjacent to the Jaffa Museum (Kaplan and Ritter-Kaplan 1993: 658; Keimer 2011: 251). This glacis was constructed of a layer of stones overlying a sandy layer beneath which courses of mudbricks were laid. In the eastern portion of Area A, a fragment of a stone wall adjoining a sloping stone floor were also dated to the eighth century B.C.E. Salvage excavations around Clock Tower Square at the foot of the northeastern slope of the tell found Iron Age floors and pottery, but a large exposure of these remains was not possible due to safety precautions (Peilstöcker 2009). It is difficult to assess the status of defensive works for other settlements in the region during the Iron IIB given the fragmentary nature of the Iron II architecture excavated or observed at each site.

4.2.7 Iron Age III (ca. 701–539 B.C.E.)

The settlement pattern in the aftermath of the Assyrian campaign presents a completely different picture from all the preceding patterns since the Middle Bronze Age (Figure 25). When combined with sites that cannot be precisely assigned to the Iron III, a total of 124 sites appear to be founded during this period. Only 4 sites persist from the Iron IIB: Jaffa, Azor, Lod and Tel Hadid. The expected locations for settlements in this region appear altered given the distribution of sites. The sites along the eastern portion of the study area are grouped in the available spaces in the low hills. In addition to the basin of the Yarkon River, the hills appear to be the preferred location for settlement and subsistence activities. Instead, few cities are located along the coast, with Apollonia-Arsuf and Jaffa serving as ports, and most of the new sites are founded along the low hills that border the coastal plain.
In total, 85 habitation sites ranging in size from single farmstead to large village or town were established. Within the region, 9 fortified centers or towers were constructed including the coastal fort at Tell Qudadi (site 40) at the mouth of the Yarkon River, and a fort near Rishon le-Ziyyon (site 127) that probably guarded the coastal route southward. The other 7 fortified farmhouses or towers were likely built along strategic draws in the eastern hills between Nahal Beit ‘Arif and Nahal Shillo and north of the Nahal Shillo. Unwalled settlements (n=33) are...
distributed in the hills and along the coast including Jaffa (site 46), Apollonia-Arsuf (site 1), Tell Qasile (site 56), Tel Yaʿoz (site 133), Azor (site 140), Tel Hadid (site 186), Lod (site 188). In Area A on the tell of Jaffa, pottery from ash and debris layers dates from the eighth to sixth centuries B.C.E. and shows affinities with both northern Israelite and Phoenician forms and southern Judahite forms as well. At the Postal Compound, a carinated bowl rim dated to the seventh century B.C.E. and imitative of an Assyrian form was found in soil covering some kurkar rubble that may be collapse from a nearby, unexcavated building (Rauchberger 2010).

Excavations in the Flea Market on Rabbi Hanina Street exposed a structure built of fieldstones bonded with plaster with an interior coating of plaster, likely used for a water reservoir or industrial installation (Arbel 2008). Sherds from the installation date to the late Iron Age or transition to the Persian period. Thus, Jaffa may have been one of the cities conquered by Sennacherib at the close of the eighth century, but its existence in the seventh and sixth centuries is evinced by pottery and architecture on the mound and in the area of the lower town (pace Zwickel 2011: 90).

With respect to small settlements, 52 individual farmsteads and 8 rock-hewn installations such as wine and oil presses were built in the hills for processing grapes and olives. The establishment of these farmsteads began an institution of farming and hewing or building associated features that continued into the Byzantine period as most of these sites evince intermittent occupation during the Persian, Hellenistic, Roman, and Byzantine periods (Finkelstein 1981). An additional 19 findspots of Iron II pottery, mostly located in the low hills along the eastern border of the coastal plain, have also been recorded.

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85 A farmstead is defined as a single building usually with a stone enclosure wall with nearby rock-hewn installations for pressing and collecting oil or wine, agricultural terraces, and field enclosures. A watchtower may be associated with a farmstead
4.3 Conclusion

By accessing data from sites that represent various sectors and specializations within ancient society, a history of settlement in the central coastal plain using data from salvage and research excavations can provide “the most reliable report of settlement history” (Faust and Safrai 2005: 142–43). The general trend of settlement in the southern Levant related in the introduction to this chapter is reflected in the settlement density for each period displayed in Table 1 and Figure 26.

<table>
<thead>
<tr>
<th>Period</th>
<th>Walled Sites</th>
<th>Unwalled Sites</th>
<th>Other$^{86}$</th>
<th>Pottery Only</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Bronze IV</td>
<td>2</td>
<td>17</td>
<td>3</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Middle Bronze Age$^{87}$</td>
<td>3</td>
<td>7</td>
<td>7</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Middle Bronze I</td>
<td>4</td>
<td>17</td>
<td>14</td>
<td>4</td>
<td>39</td>
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<td>Middle Bronze II–III</td>
<td>5</td>
<td>13</td>
<td>11</td>
<td>1</td>
<td>30</td>
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<tr>
<td>Late Bronze I &amp; II</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>Late Bronze III/Iron Age I</td>
<td>2</td>
<td>12</td>
<td>3</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Iron Age IIA</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Iron Age IIB</td>
<td>1</td>
<td>14</td>
<td>2</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Iron Age III</td>
<td>3</td>
<td>15</td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Iron Age$^{88}$</td>
<td>6</td>
<td>70</td>
<td>11</td>
<td>19</td>
<td>106</td>
</tr>
</tbody>
</table>

Table 1: Settlement densities in the central coastal plain based upon the number of recorded sites

$^{86}$ For the purposes of this table, this category consists of cave dwellings, cultic sites, campsites, agricultural installations, anchorages, and burials/cemeteries.

$^{87}$ This designation represents sites that could not be confidently dated to either the MB I or MB II–III.

$^{88}$ Sites in this category could not be precisely dated to the Iron II or Iron III.
Analyses and interpretations of the settlement systems employing the site typology and hierarchy for the region detailed previously (see 2.5.4 Site Typologies and Hierarchies), examine site location strategies, cautiously determine demographic trends, and prudently discuss the types of connections between sites, especially the commercial ties between the region and the wider eastern Mediterranean world effected through maritime gateways on the coast, can now be considered.
Chapter 5: Analysis and Interpretation of Settlement Systems in the Central Coastal Plain

5.1 Introduction

The preceding discussion of settlement patterns from the Middle Bronze Age to Iron Age III affords the opportunity to examine the settlement systems in terms of distribution, demographic trends, settlement hierarchies, and political complexity. The concept of connections can also be addressed regarding the regional economies and the types of connections between sites within the region effected by its inhabitants and connections between the central coastal plain and other regions or area of the eastern Mediterranean. While this treatment is not designed to be exhaustive, it seeks to address these facets of the settlement history of the central coastal plain armed with data available from research excavations, salvage work, and archaeological surveys with the hope of prompting new avenues of research into the settlement patterns of the coastal plain. One new approach to interpreting the regional settlement system is that of the maritime cultural landscape, first proposed by C. Westerdahl (1992), and adapted here as a connective framework for the central coastal plain.

5.2 Site Location and Cluster Analyses

Nearest neighbor analysis examines a set of points for deviation from random, i.e., all individual points have an equal probability of occurring at any point of a surface (Earle 1976: 197). Deviation from random can appear as points being either regularly spaced or more clustered than expected. Clustered distribution can be a result of “mutual attraction of individuals toward a strategic (necessary and localized) resource, or the nature of the generative process where new individuals from one or more parent individuals already located in space” (Earle 1976: 197). Conversely, regular distribution indicates a mutual antagonism between points. While a nearest neighbor analysis shows to what degree points are clustered, regularly spaced or random, the
settlement system, or the “rules” for the pattern, should also be determined (Flannery 1976: 162). Nearest neighbor analysis was performed using GIS software for each settlement pattern presented above from the Middle Bronze Age to Iron Age III, and the reports generated by the software are included with this study in Appendix B: Average Nearest Neighbor Analysis Reports for Settlement Patterns of the Middle Bronze, Late Bronze, and Iron Ages.

Nearest neighbor analysis for MB I determined that the sites were clustered while the MB II overall pattern does not appear to be significantly different than a random distribution; that is, the sites are not trending toward clustered or dispersed distribution. However, this result can be further clarified by noting the locations of the sites. In the MB I, there is a cluster of settlements near the confluence of the Naḥal Ayalon and the Yarkon River, suggesting that the smaller sites at Tell Qasile, Ramat Aviv and Pinkhas Street, in addition to the burial sites nearby, were spawned from a parent site, most likely Tel Gerisa. The cluster of sites in the Rishon le-Ẓiyyon sand dunes may have been clustered around a strategic resource, but the nature of the current landscape prevents any further speculation about what that resource may have been.

Although “randomly” distributed, the MB II sites are constrained in their choice of location. Like MB I sites, the sites are mostly all near a water source and with the exception of those sites in the sand dunes that obscure the ancient soil, the MB II sites are located either on alluvial soil or at the nexus between two or more soil associations. By locating a site within distance of two or more soil types, the benefits of the different drainage capabilities by different soils would present a better potential for agricultural variability (Webley 1972: 170; Pierce 2005: 17). Thus, contrary to the implied notion of “random,” the inhabitants of a site carefully calculated the location of a new site. The locational “rules” for the settlement systems in effect for the Middle Bronze Age, and likely for the previous periods of permanent settlement, dictate
that sites should be close to a water source and on either alluvial soil or a combination of soil types. Regarding the proximity of sites to the watercourses, while many sites are located close to the Yarkon River, a gap exists between sites situated along the Nahal Ayalon and the wadi channel itself. This gap may be explained in terms of soil distribution as the sites that are located along the Ayalon’s course are situated along the edge of the alluvial soil carried and irrigated by the seasonal stream, likely to maximize agricultural land since the hamra soils of the coastal plain were not exploited for agriculture until later antiquity.

Like the preceding Middle Bronze Age, nearest neighbor analysis for the Late Bronze Age sites indicates a distribution that is not statistically significantly different than random. This “randomness” is actually constrained by drainage networks and soil distribution, and the Late Bronze Age sites were situated on alluvial soil or at a juncture of two or more soil types. However, for the LB III/Iron I, according to nearest neighbor analysis, the distribution indicates a less than 5% likelihood that the clustered pattern of the LB III/Iron I sites could be the result of random chance. The people of the site cluster in the low hills east of Aphek that includes ‘Izbet Sartah are likely sharing the resources of that area and are not able to establish sites in the coastal plain. The placement of sites in the plain near a water source and on alluvial soil or near a variety of soils for best agricultural exploitation continued, following the system already in place since the development of agriculture.

While the sparse settlement patterns of the Iron IIA and IIB exhibited a “random” distribution that adhered to the settlement system “rules” for site location, the establishment of new sites in previously unattended or sparsely settled land during the Iron III marks a departure from the predominant Bronze and early Iron Age pattern of an urban center with satellite villages and a concentration of population at specific points. Rather, the pattern observed in the Iron III
reflects the patterns of Iron Age Syrian Jazira and Mesopotamia that differed from those of the Late Bronze Age (Wilkinson and Barbanes 2000). While Late Bronze Age patterns were nucleated around a singular urban center such as a city-state, the Iron Age settlement pattern was more hierarchical with capital cities within the Assyrian administrative regime and more dispersed rural settlements (Wilkinson and Barbanes 2000: 397). No longer was the landscape a “landscape of tells.” While the Late Assyrian Empire was not the sole cause of such a change, it certainly catalyzed forces that were already in progress. The wide distribution of Late Assyrian pottery in the Syrian Jazira indicates a more dispersed and rural settlement pattern, which Wilkinson and Barbanes attribute not only to Assyrian imperial resettlement policies but also the sedentarization of nomadic populations (2000: 420). For the southern Levant, it appears that while resettlement policies were in effect and can be seen in the cuneiform documents from Tell Hadid that bear the Mesopotamian names of people resettled in the area after the Assyrian conquest, the growth of horticulture and export of oil and wine observed in the Shephelah also occurred along the lower hills bordering the Sharon. It is likely that connections between these farmsteads existed based on shared occupation and a connection between these rural elements and coastal centers like Jaffa and Apollonia-Arsuf was necessary if the finished product required pelagic transportation. Stager’s theory of “Port Power” would be applicable to a scenario in which the farmers, or their intermediaries, would bring oil or wine produced in the hills to Jaffa for transshipment to other cities in along the Mediterranean littoral. The absence of settlements between the production centers and ports does not necessarily imply the absence of connections and networks between the two classes of sites.
5.3 Demographic Trends

Demographic trends in population can aid researchers in understanding the social or political organization of a region or assess the impact of the population on the landscape (see Gophna, Liphschitz and Lev-Yadun 1986; Zorn 1994: 31). Several methods employ archaeological data to estimate past populations, including site area, number and size of dwellings, artifacts such as cooking pots, food remains and mortuary data (Hassan 1981: 66–83). Inscriptions and textual references have also been used, though critiques of ancient authors’ population figures have shown that these numbers are not trustworthy in all cases (Duncan-Jones 1963; Broshi 1979: 6). Since all estimates have a potential source of error, they must be treated as hypotheses open for testing (Hassan 1981: 4).

One of the more basic and widely applied methods of estimating population involves multiplying a coefficient by the size of a site. The coefficient is usually related in persons per hectare or square kilometer and based on ethnographic analogy. This method has been employed in previous estimates of the population of Palestine during the EB II–III, MB II, Iron II, and Byzantine periods (Broshi 1979; Broshi and Gophna 1984; Broshi and Gophna 1986; Broshi and Finkelstein 1992) as well as for third millennium Sumer (Braidwood and Reed 1957) and for larger portions of the Eastern Mediterranean (Angel 1972). However, since the area of a site is not always exactly known, especially in the case of surface surveys, multiplying a site size by a coefficient is “seldom more than a guess” and lacks accuracy (Schacht 1981: 128). Additionally, for the sites listed in the IAA database, the area recorded on the site’s file is not the actual area of the site but a protective boundary when future development is considered. The drawback to using this boundary as an estimate of site size lies in the fact that many of the boundaries establish a 1 km² or larger zone around a site that would never have been that large in antiquity. The lack of
reliable estimated site size for the sites in the study prevent a calculation of population for each period, but general trends can be gleaned from previous scholarly attempts.

M. Broshi and R. Gophna discuss the settlement patterns and estimated the population for the area of Palestine during the Middle Bronze Age, estimating that at the time only eighty percent of the Middle Bronze Age sites were known (1986). While acknowledging the historical record, the population of nomadic groups could not be determined but would have a negligible impact on the study. Following the works of Marfoe (1980), Shiloh (1980), and ethnographic parallels, they employed a coefficient of 250 persons per hectare as an estimate for calculating urban population (also Broshi and Gophna 1984: 42). Their calculations account for the total area of sites ranging from small, dispersed villages of 0.1 ha to very large urban centers of 10 or more hectares, excluding cemeteries and the area of walls and ramparts surrounding fortified cities with the resulting figures of 100,000 for the total MB I population of Canaan and 140,000 for MB II. Despite the changes in the nature and distribution of Middle Bronze Age settlements in comparison to EB II–III sites, the overall population estimate was slightly lower than the EB II–III (compare to 150,000; Broshi and Gophna 1984), suggesting that the continuity in agrotechnology and advances in metallurgy did not promote a population larger than the EB II–III (Broshi and Gophna 1986: 87).

In the third article in the series on population and settlement, Broshi and Finkelstein (1992) examined the region of Palestine during the Iron IIB, specifically the eighth century with estimations of population based on a density coefficient of 250 persons per built-up hectare based on previous archaeological and ethnographic work. Broshi and Finkelstein delimit four sub-divisions of the region designated “Central and Southern Coastal Plain,” listing Tel Qasile and fifteen small (less than one hectare) sites in the southern Sharon (1992: 53). The proposed
population in the southern Sharon for the eighth century B.C.E. is 3,750 persons total for a built-up area of fifteen hectares total. While this number is a well-informed estimate, it serves as an illustration of the sparse settlement pattern during the eighth century compared to other periods.

R. Gophna and J. Portugali (1988) published an analysis of the protohistoric settlement patterns from the Chalcolithic to the Middle Bronze Age in a study of the relationship between socio-cultural transformation and population increase. The relevant results of their study show that following the collapse of EB II–III settlement system and dispersal to smaller sites in the EB IV, a smaller, pre-urban phase of MB I preceded the growth in settlement number, built-up area, and estimated population in the second phase of MB I with new centers evenly distributed on the coast between Dor and Tell el-‘Ajjul (Gophna and Portugali 1988: 15–17). This renewed urbanization culminated in the MB II with an estimated population for the entire coastal plain from Mt. Carmel to the Negev of 37,000 inhabitants and the sites mostly concentrated in the center of the area (Gophna and Portugali 1988: 18), likely as a result of the gravitational pull of Aphek. Discussing the MB I to MB II urban transformation, Gophna and Portugali note a dramatic increase in calculated population from the EB IV and suggest that the increase was the result of the transformation from a “semi-sedentary ‘tribal’ society to an urban society” (1988: 20–21; Broshi and Gophna 1986: 87). It is interesting to note that the rate of Middle Bronze Age urbanization in the coastal plain is unique in Canaan with the possible exception of the upper Jordan Valley (Gophna and Portugali 1988: 21).

Demographic trends for the coastal plain during the periods under consideration can be estimated using the coefficients discussed above together with the work on urban population density in the Late Bronze Age presented by D. Schloen (2001: 168–69; Table 1). These figures were derived by approximating the settled area of walled and unwalled sites and using a
coefficient for each type of site to determine an estimated population range. It should be noted that these estimates do not account for any nomadic sector of the population or for sites where only pottery was collected (i.e., sherd scatters). Although demographic studies cannot be normative without the aid of censuses or other texts relating persons in households, the difference between walled and unwalled sites and the overall trends through time facilitate an understanding of ancient settlement in the study area.

<table>
<thead>
<tr>
<th>Period</th>
<th>Unwalled sites</th>
<th>Walled sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Built area (ha.)</td>
<td>Population estimate (200–250/ha)</td>
</tr>
<tr>
<td>EB IV</td>
<td>1</td>
<td>200–250</td>
</tr>
<tr>
<td>MB I</td>
<td>5</td>
<td>1,000–1,250</td>
</tr>
<tr>
<td>MB II</td>
<td>5</td>
<td>1,000–1,250</td>
</tr>
<tr>
<td>LB I and II</td>
<td>13.5</td>
<td>2,700–3,375</td>
</tr>
<tr>
<td>LB III/Iron</td>
<td>16.5</td>
<td>3,300–4,125</td>
</tr>
<tr>
<td>I</td>
<td>19</td>
<td>3,800–4,750</td>
</tr>
<tr>
<td>Iron IIA</td>
<td>13</td>
<td>2,600–3,250</td>
</tr>
<tr>
<td>Iron IIB</td>
<td>26.8</td>
<td>5,360–6,700</td>
</tr>
</tbody>
</table>

Table 2: Estimates of built areas and population of the coastal plain, Early Bronze Age IV–Iron Age III

5.4 Regional Economies

Elements of the agro-pastoral subsistence strategies employed by the denizens of the central coastal plain during the Bronze and Iron Ages has been discussed above with regards to exploitation of the particular biomes of the region. The network of pathways illustrated by the Survey of Western Palestine and indicate that travel by foot, quadruped, or wheeled vehicle
within the region could easily be accomplished to maintain economic ties between all sites ranging from farmsteads to maritime gateways (Figure 27).89

Figure 27: Trackways recorded by the Survey of Western Palestine in the central coastal plain shown with archaeological sites dated to the Iron IIB (ca. 840/830–701 B.C.E.)

89 The roads and paths illustrated in the Survey of Western Palestine (Conder and Litchener 1881–1883) closely parallel the Iron Age branches of the coastal highway discussed by Dorsey (1991: 61–65) and GIS-derived least-cost pathways generated for this study.
In addition to the local economy, certain sites and industries participated in larger economic exchanges between regions. Clearly, small portable items such as scarabs at Middle Bronze Age sites showing links between the coastal area near Jaffa and Egypt during the Middle Kingdom and Hyksos period (Gophna 2015a). The region’s role in Middle Bronze Age commercial activities may be further elucidated by examining storage jars and other vessels in the family of Red, White, and Blue (RWB) Ware. R. Amiran (1970a: 103) relates the two types of storage jar decoration in the MB II-III as wavy or straight incisions around the shoulder of the jar and “black or bluish-gray and red alternating wavy and straight lines painted over a white slip.”

Maier’s study of RWB shows that open forms such as kraters and carinated bowls, jars, and a fragmentary cup-and-saucer krater were decorated with alternating wavy and straight horizontal lines rendered in red and blue paint (Maeir 2002: 229; 2007: 286). RWB is found as early as MB I–II (late Twelfth to early Fifteenth Dynasties, ca. 1825–1600 B.C.E.; Stager et al. 2008: 217).

RWB is primarily found at sites in the central coastal plain of Canaan at Tel Gerisa (site 64; Geva 1982: 24, fig. 24:11), Tel Michal (site 4; Negbi 1989: 58, fig. 5.9.9), and Tell Qasile (W; site 55; Kletter 2006: 108, fig. 33: 5, 6). RWB is also present in the pottery retained from Kaplan’s excavations in Areas J and Y at Jaffa. The same open forms and store jars attested throughout the coastal plain are extant at Jaffa.

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90 The white background was only painted in the area decorated with red and blue paint. Potters needed to use a white base due to high salt content in plastic clays thrown on a wheel that would cause the paints to deteriorate at a rapid rate. Potters would use a thick, white undercoat when applying paint (Maeir 2002: 232; see also Franken and London 1995). While red and white are colors that may be easily obtained by craftsmen, Maeir (2002: 232–33) suggests that the blue paint is made from cobalt that would have been imported from Egypt. Cobalt would be lesser-known component of trade between Egypt and the southern Levant. Maeir (2002: 233) exercises caution against assuming that blue paint is indicative of cobalt since the blue color can also be obtained from a mixture of huntite and azurite. The prevalent wavy line is interpreted by Maeir (2002: 234) as a common element connecting Chocolate-on-White Ware to RWB and other antecedents. Ilan (1996b: 228) even suggests that the wavy line motif is related to liquid inside the vessels.

91 One interesting artifact in the RWB style is a zoomorphic vessel. Though fragmentary and faded, it is clear that the animal is a quadruped with a thick tail (possibly bovine) and is white slipped with red and blue painted decoration applied in a semi-herringbone pattern. The lack of parallels makes this item unique in the corpus of Middle Bronze Age vessels and RWB.
Both RWB and its predecessor, Levantine Painted Ware (LPW), evince the importance of maritime connections within the Middle Bronze Age commercial landscape of the central coastal plain. If the origins of LPW should be located on the Lebanese coast between Byblos and Sidon, it is easy to surmise that LPW would be traded to local coastal merchants during a pause on the Byblos Run in the early MB I. In addition to two widely illustrated LPW jugs, Tomb 4 at Aphek also yielded a plain cup of the same type from Byblos contemporary with the Montet Jar (Ory 1938: 118, No.88). It is most likely that this cup arrived at Aphek via a maritime trade route between Byblos and Jaffa. The LPW jars and juglets carried in the maritime trade that resumed along the Levantine coast in the MB I also inspired potters along terrestrial and nautical routes. M. Artzy (1995: 33–34, n.20) argues for a common ceramic tradition for Syrian and Canaanite painted wares with recognition of regional variation, and the vehicle that fostered that commonality was probably commerce.

Stager (2002: 361) notes that 40% of Canaanite pottery at Tell el-Dab’a in the Nile delta came from coastal sites between Akko and Ashkelon. Of this, 4% originated from an area north of Ashdod as indicated by the presence of hamra soil and coastal sand observed in petrographic analysis (Cohen-Weinberger and Goren 2004: 77–78). While Stager suggests Yavneh-Yam (2002: 361), and Cohen-Weinberger and Goren posit a general area between Tel Michal and Yavneh-Yam (2004: 78), there is no reason why Jaffa should not be considered for this location. Kaplan excavated two kilns at Slaughterhouse Hill in Tel Aviv (site 41; Kaplan 1972: 77). Geva mentions a kiln at Tel Gerisa, originally labeled a “Workshop Oven” by the original excavator (1982: 10; also Herzog 1993: 480). In addition to these, three kilns have been excavated at Aphek, two at Tel Michal, two at Ramat Aviv (site 57), two at Tell Qasile (W), and one at Ben Nun Street in Tel Aviv (Kletter and Gorzalczyzny 2001). This plethora of pottery kilns from
Middle Bronze Age contexts was interpreted by Kaplan as an indicator of the large population density but it could also be the indicative of ceramic production for export. While it is not certain that all these kilns were producing more than what could be consumed locally, the presence of such markets and industries that emerged as Jaffa developed as a node on a well-established trade route fits Stager’s theory of “Port Power” (Stager 2002: 356–62). Thus, a picture of Middle Bronze Age maritime trade involving a port like Jaffa, coupled with local industry in Jaffa’s hinterland, emerges to supplement Stager’s description of the Byblos Run. Ships laden with timber and other commodities sailed from Byblos toward Egypt, stopping and engaging in cabotage at various ports and exchanging items and ideas. Some items were traded and remained in southern Canaan, like the Byblian cup at Aphek, while other commodities such as oil, wine, or resin were packaged in Canaanite pottery destined to be sent to Egypt. Evidence of maritime and terrestrial trade is most evident for the Late Bronze Age by Cypriot, Mycenaean, and Egyptian imports clearly being distinguished against pottery made in the Canaanite tradition. While imported wares are expected at coastal sites, Cypriot White Slip fragments at inland sites such as Tel Qana (Gophna and Ayalon 1998: 47, fig. 97.5:6), Bene Beraq el Waqf (Kletter 2000: 38*), and Lod (Elisha 2009) as well as Base Ring vessels in tombs at Shekhunat HaGafen in Ramat Gan (Ory 1944) and Shoham (Gophna and Feldstein 1998: 73) and Mycenaean wares also at Shoham attest to the maritime and terrestrial networks required to obtain such goods. Connections to Cyprus, evinced by the Cypriot origin of three Bichrome Wheelmade sherds from Tel Michal determined by NAA (Vitali, Rapp, and Negbi 1989) and possibly other sherds from Jaffa, Aphek, and Tel Gerisa, are further strengthened by noting the other Cypriot wares, such as Monochrome and White Slip I, found in association with these Bichrome pieces. Despite the less than ideal stratigraphic and spatial contexts, these sherds
illustrate the production and trade in ceramic containers, their contents, and the inspiration for local imitations of such vessels between Levantine and Cypriot potters and coastal commercial centers like Jaffa and Tel Michal as well as the potential transit point at Tel Gerisa.

5.5 Political Complexity

The overview of settlement patterns and development of a site typology and hierarchy permit a synthesis of the political complexities of the central coastal plain during the periods under investigation. Although much of the published data in preliminary reports cannot serve to further periodize the MB I establishment of these sites (Cohen 2002) nor greatly clarify their functions, a general hierarchy can be detected. For the MB I, the highest tier comprises the fortified palatial site of Aphek as the regional center with the other fortified coastal centers, Tel Gerisa and Jaffa, likely acting as maritime gateways for commerce and sub-regional administrative centers (Ilan 1995: 305). Tel Gerisa may have enjoyed gateway status as the first port for Aphek prior to the founding of Jaffa (Yosef 1986–1987: 84; Kempinski 1992: 170). In this way, the core was located at an inland power center while the port(s) were part of the periphery. Aphek’s importance can be seen in its inclusion with other “dangerous” foreign lands and rulers in the Egyptian Execration Texts where it appears as ‘Apqum ruled by a prince called Ynk’lu (Yanakilu; see Posener 1940: 65). During the MB II, Jaffa continued to function as a gateway for the dominant regional site of Aphek with the settlements at Tel Gerisa and Tel Qana serving as sub-regional centers. Tel Michal, founded during this period, did not likely offer competition to Jaffa for hinterland resources and remained a lower-order gateway.

92 While the scholarly consensus is that the Execration texts reflect Egyptian attitudes toward perceived threats from the past, present, and future, Ben-Tor argues that the place names listed in the Berlin and Brussels groups were inherited from Old Kingdom execution formulas and may reflect an EB II–III settlement reality (2006: 81). This view is likely incorrect since accurate names for people and places were needed to make the magic effectual.
Change in the settlement pattern from the MB II to the Late Bronze Age is evident from the decrease in habitation sites throughout the coastal plain and Canaan at large. The reason for these changes is unclear, and scholars suggest that the decrease in settlement number may be the result of the Egyptian campaigns to expel the Hyksos from Egypt and subdue Canaan (Bunimovitz 1995: 320, 322). However, as B. Blouet wrote in his article on the impact of conflict on rural settlements on Malta:

“the measurement of the impact of conflict upon the settlement system of a region is no easy task, because the patterns are shaped by many pressures, for example agricultural practice, population density, and systems of tenure; moreover, unless armed combat annihilates villages entirely, other factors may reassert themselves and eventually obscure or modify the marks of warfare” (Blouet 1978: 368).

Also, there is no consensus on warfare’s impact on a settlement pattern since the length and intensity of the campaign and the resiliency of the local population under stress would influence the result. Finally, a distinction must be made between the effects of conflict, like destruction debris, and a response to conflict. It is most likely that the rural population avoided invading armies and returned to their homes after danger passed. Blouet states, “Human populations are remarkably resilient. Their institutions are capable of withstanding warfare, famine, disease and other catastrophes. It is only when populations go into numerical decline that settlement patterns begin to contract or collapse” (1978: 379). The disappearance of a village from a settlement pattern was not the result of decisions to abandon but was due to a slow population loss over time. In this way, the loss of rural sites between the MB II–III and Late Bronze Age is a difference not between urban and rural but between sedentary and non-sedentary in which the non-sedentary portion of the population has left little trace of their whereabouts (Bunimovitz
It is probable that after a period of willful nomadism, they either settled in the urban centers under Egyptian hegemony or became part of the population in the shifting frontier (Bunimovitz 1995: 327–28).

Great changes in site function for the urban centers occurred at the beginning of the Late Bronze Age established the site hierarchy for the rest of the period of Egyptian hegemony in the region. Meager LB I finds from Aphek suggest that the site lost its power prior to the campaigns of Thutmose III in Canaan who likely established a *htm* fortress at Jaffa. Thutmose III established *htm* fortresses at key harbors on the Levantine coast that served the same function as the *htm* forts on routes entering Egypt that helped to “seal” the terrestrial borders of Egypt by monitoring or stopping maritime traffic at the port (Morris 2005: 138–39). The function of such bases as storehouses for Egyptian forces serving in Canaan is also clear in the Amarna letters as the granary of the king is referenced by Adda-danu, the local vassal in charge of guarding the “cities of the king” (EA 294; Moran 1992: 336–37). With an administrative center established at Jaffa, the center of power shifted from its Middle Bronze Age roots at Aphek to the coast, reversing the inland core / coastal periphery situation of the Middle Bronze Age. The subordinate status of Aphek to Jaffa is implied by the presence at Aphek of the letter from the minister of Ugarit, Takuḫlinu, to his Egyptian counterpart Haya concerning a consignment of wheat deposited at Jaffa and bound for Ugarit or the Hittite empire (Singer 1983). Although the reasons why the letter was deposited at Aphek are still unclear, the role of the inland site and its connection to the administrative harbor town of Jaffa can be surmised based on the re-interpretation of Palace VI, the “Governor’s Residency,” at Aphek as an agricultural estate of the

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93 “A *htm*-fortress should be regarded as a military base that functioned as a seal or a gateway, allowing access to a restricted area to be carefully monitored and, if need be, prevented. This term is most frequently utilized with respect to border fortresses” (Morris 2005: 809). The determinative sign for the word *htm* is a cylinder seal on a necklace; hence, the intent and purpose of the forts is clear.
Egyptian king (Gadot 2010). Gadot notes the layout of the building, its similarity to a structure excavated at Tel Gerisa, and its demise by conflagration that sealed an array of finds below the destruction debris. Gadot’s careful analysis of the finds in their context and effort to distinguish between assemblages that would have sat on the second story floor versus the ground floor revealed storage areas for agricultural surplus on the ground floor with a scribal chamber on the second based on the findspots of cuneiform texts and their petrographic composition of local clay (Goren et al. 2006; Gadot 2010: 54–56). Analysis of other areas indicates controlled production of wine as well as other activities such as spinning and possibly the cultivation and processing of papyrus for administrative documents (Gadot 2010: 56–58). The sum of the evidence indicates that Tel Gerisa and Aphek served as Egyptian estates and that the Yarkon and Ayalon basins were annexed by Egypt during the eighteenth dynasty, continuing to function as agricultural estates under Egyptian control until shortly after the death of Ramses II when Gadot dates the destructions of the Level IVB gate at Jaffa, Building 1104 at Aphek, and likely Tel Gerisa’s building as well (2010: 62). In Gadot’s reconstruction, Merneptah, the “Subduer of Gezer,” campaigned against the rebellious Canaanite polities in his fifth regnal year after which an administrative center was established at Gezer and a new gate was built at Jaffa (Level IVA) while the estates at Aphek and Tel Gerisa were left to lay in ruin.

M. Jasmin also examined the city-states of Canaan during the LB II to clarify the political organization of Canaan and demonstrate the different organizations of those city-states (2006: 161). Within his study, he uses “repartition circles” with 6.5 km and 10 km radii to create buffers around large sites as an approximation of the site’s political sway. His source for a city’s importance is not only size but also references in the Amarna Letters. For Jaffa, he is unwilling to place the port under the control of Gezer as Finkelstein (1996: 234, 255) and Bunimovitz
(1995: 328) have done based on their studies of LB II settlement patterns.\textsuperscript{94} Jasmin posits that Jaffa enjoyed a special status as an Egyptian administrative center and interprets the term “city gate” as a term referring to the port city rather than assuming it to be a reference to the literal city gate (2006: 172). The absence of smaller satellite sites within Jaffa’s repartition circle indicates that Jaffa was a political center rather than the center of an agricultural kingdom. He correctly notes that a difference existed between Jaffa as an administrative center, which is established in the Amarna Letters, and as a city-state exerting control over satellite sites and competing with other city states (Jasmin 2006: 172). He observes that LB II Canaan is a “dual-functioning system” of administrative and political centers and city-states with a three-tiered settlement hierarchy of the main center of the city-state, regional centers, and villages or hamlets in the periphery of larger sites (Jasmin 2006: 177).

The connections between the some of the sites change diachronically as sites were abandoned or destroyed at the end of Egyptian occupation and other sites were founded or had renewed occupation later in the twelfth century B.C.E. Thus, the Level IVA gateway at Jaffa likely belongs to the LB III based on the continuation of Late Bronze Age material culture found in the remains of the gate and the lack of early Iron I ceramics indicative of Israelite or Philistine settlement (Kaplan 1972: 81–82; Burke et al. forthcoming). Likewise, Aphek Stratum X11, which consisted of private buildings interpreted as fishermen’s dwellings, is assigned to the LB III by its excavators (Kochavi 2009: 599). This occupation follows the conflagration that destroyed Palace VI, the so-called “Governor’s Residency,” but does not have cultural affinities

\textsuperscript{94} Jaffa may have been administered from Ashdod since the clay used to make EA 294 and 296, both of which refer to \textit{Yapu}, came from a source between Ashdod and Caesarea (Goren, Finkelstein, and Na’aman 2004: 293), and the geographic details in the letters accords with an administrator located between Gaza and Jaffa as Yahtiru stated in EA 296 that he was guarding both the “city gate of Azzatu [Gaza] and the city gate of Yapu [Jaffa]” (Moran 1992: 338–39).

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to the Egyptian or Canaanites previously living at Aphek. Kochavi sees this as an indication that
the new inhabitants were Sea Peoples settling in the area, but the lack of material culture makes
this interpretation problematic (2009: 599).

New settlements in the Iron IB (post-1130 B.C.E.), especially that of Tell Qasile on the
Yarkon River served to re-define the power center and the connections between sites in the
region. While palatial Aphek served as a regional center in the Middle Bronze Age, Jaffa became
the center during the Late Bronze Age after the establishment of the Egyptian administrative
center. After the decline of Egyptian authority, it appears that the status of regional center is
attained by Tell Qasile, confirmed by a lack of substantial Iron IB architecture at the former sites.
With the establishment of the Philistine enclave on the Yarkon, Tel Gerisa was re-settled with
material culture indicative of the Philistines. Sites such as Aphek, Azor, and Ḥorvat Bene Beraq
also fall within the Philistine sphere of influence. Jaffa also yielded Philistine ceramics in Level
IIIB on the mound that included Philistine Bichrome, degenerated Monochrome, and Philistine
Red-Slipped Ware, all of which have excellent parallels with Tell Qasile Str. XI and X.
Excavations at the Armenian Monastery at Jaffa also found Philistine ceramics in association
with a cooking pot on a floor, possibly indicating that the Iron IB settlement at Jaffa occupied the
windward side of the mound (M. Peilstöcker, pers. comm.). These remains at the Armenian
Monastery and two possible cooking jug fragments, indicative of Philistine food preparation,
found in the retained ceramics from Kaplan’s excavations in the “Lion Temple” portion of Area
A indicate that Philistines lived at Jaffa and not that the inhabitants of Jaffa merely traded with
those living at Tell Qasile. Thus, three groups of people with different cultural identities shared
the central coastal plain in the late Iron I: the Philistines who established Tell Qasile and likely
lived at Tel Gerisa, Jaffa, Ḥorvat Bene Beraq, and Aphek while burying their dead at Azor; the
Israelites clustered in the low hills east of Aphek; and the lowland Canaanites who continued in their mode of life after Egyptian occupation and interacted with both newcomer groups.

For the early Iron Age I, Gadot argues that it is likely that Gezer dominated the sparsely-settled region, but the area was “neglected socially and politically” (2006: 22–23). Despite the presence of Tell Qasile and the unexcavated site connected to the Azor cemetery, the lack of a dominant political center to organize efforts to control excess water ensured that the region was a frontier for some other homeland. The organic material in the ash layers at Aphek attest to its agricultural productivity during this period, and Gadot suggests that the large bronze needles found at the site were used to sew grain sacks (2006: 26). In Gadot’s opinion, Aphek likely functioned as an estate or farmstead instead of a village, a situation paralleled at other nearby Iron I sites such as Tel Gerisa and ‘Izbet Sartah. He contends that ‘Izbet Sartah and Aphek were linked economically, regardless of cultural identity and that the silos at ‘Izbet Sartah stored agricultural surplus that would be transferred to Aphek and then to Tell Qasile or Gezer before being shipped south to support Philistine elite at Ashkelon since the pottery at Tell Qasile shows some affinity with the larger coastal port city (Gadot 2006: 31–32).

During the Iron IIA, Jaffa continued to act as the gateway for the region, but it is difficult to distinguish a regional center in the sparse settlement pattern. Jaffa’s role in the Iron Age appears to be eclipsed by other centers including Tell Qasile during the Iron I, and Zwickel asserts that Tel Gerisa was the main harbor town in the Iron II rather than Jaffa (2011: 89). The location of sites along the Yarkon basin drives A. Faust’s hypothesis about the tenth century settlement of the coastal plain (2007). For Faust, the biblical texts referring to the Sharon (1 Kgs 4:10, 5:16-21 [2 Chr 2:15]; 1 Chr 27:29) reflect the archaeological reality of settlements during the tenth century as an initiative of the United Monarchy to gain a corridor from Jerusalem to the
Mediterranean via the Yarkon basin. After the end of the United Monarchy and following the actions by Sheshonq I, the region returned to being a fringe area indicated by a lack of both urban and rural settlement in the eighth century B.C.E. Faust concludes:

“…it is likely that the lack of a strong central administration with an interest in the region, coupled with the problematic ecological conditions and the prevailing cultural attitudes among the Israelite population toward the sea, prevented a resettlement of the region. After all, the Kingdom of Israel could use the port of Dor, and it is likely that Judah was too weak to resettle the region” (2007: 76).

In contrast to Faust, Fantalkin and Tal’s discussion of the region during the Iron IB/IIA centers on Iron Age chronology, denying any control of the United Monarchy (and the existence of such an entity) over the coastal plain yet citing the late date of biblical authorship as evidence (Fantalkin and Tal 2008: 236–39 contra Faust 2007). In the course of discussing political control in the ninth and eighth centuries B.C.E. prior to the reference concerning Jaffa and other nearby sites being controlled by Sidqa of Ashkelon in the account of Sennacherib’s campaign, Fantalkin and Tal conjure a political game of “hot potato” among Philistine cities with regards to control of Jaffa, starting with Qasile, then Ekron in the first half of the tenth century B.C.E., then Gath until its destruction by Haza’el, then Ashdod until its conquest by Sargon II in 711 B.C.E., then Ashkelon until 701 B.C.E., after which Jaffa may have passed to Padi of Ekron to provide a maritime gateway for Ekron as a reward for loyalty to the Late Assyrian empire (2008: 241–42). With emphasis on their publication efforts for Tell Qudadi (Fantalkin and Tal 2009), the authors argue that a shift in settlement pattern resulted from Assyrian campaigns and that the inland cities of the Ashkelonian coalition were ultimately transferred to the province of Samaria while
Jaffa and its immediate environs became part of the province of Dor (Fantalkin and Tal 2008: 246; Na’aman 2009: 355).

Despite the political twists and turns in the Iron II–III, the settlement data indicate that Jaffa served as the prime gateway for maritime commerce. While eighth century B.C.E. settlements are rare in the area, the area was not devoid of settlement as archaeologically attested at Tel Hadid, Tel Michal, Tell Abu Zeitun, and Tell el-Hashash among others as well as the annals of Sennacherib that records the conquest of Bet Dagon, Jaffa, Bene Beraq, and Azor (COS 2.119B). The setting of the book of Jonah also acknowledges the existence of Jaffa as a maritime gate for ships bound for Tarshish (Jon 1:3). After the Assyrian campaigns, the shift in settlement patterns to small farmsteads filling the low hills, and the establishment of Yavneh-Yam and Apollonia-Arsuf, which added competition for hinterland products, Jaffa may not have been as prominent, but its place at the top of the site hierarchy was insured by its harbor and the maritime connections it enjoyed.

5.6 Maritime Cultural Landscapes

One may assume that for the research area of the central coastal plain of modern Israel, local boundaries and awareness of other immediate regions such as the northern Sharon, the lower hills of the Judean Shephelah, the hill country, or the larger valleys such as the Jezreel, was likely experiential knowledge gained through trade, travel, and public works commissioned by political or cultic centers. Perhaps the visible boundaries to the region such as the sea to the west and hill country to the east made variations in topography on the northern and southern horizons more prominent such as those described above for the Nile Delta by Jeffreys (2010: 102–03). In contrast to the Egyptian experience based primarily on the Nilotic landscape, the Mediterranean
likely loomed large within the perceptions and knowledge of the landscape for the inhabitants of the central coastal plain of Israel.

The economic models discussed previously, while suitable for examining regional economies, are inadequate to deal with the interface between coastal sites and those further inland. The central place model, with modifications, works well for understanding the role of regional centers, markets, and services offered within the various levels of a local economy, but it has been argued here that the dynamics of a port acting as a gateway and transit point present a special exception to the spatial pattern of classic CPT. Likewise, the dendritic networks and “Port Power” proposed by Stager (2001) account for the settlement patterns along natural channels reaching into the interior of a landscape and the reality of a merchant class at a port. However, the model is still terrestrially-focused and lacks elements of maritimity. Thus, a different consideration of both land and sea aspects of the maritime cultural landscape (MCL) of the region will demonstrate how connections were effected and maintained between coastal and inland sites within the region and between the region and the wider eastern Mediterranean world via the main regional port at Jaffa.

Emerging from Scandinavian nautical archaeology and coined by C. Westerdahl, maritime cultural landscape (MCL) is the best English sense of the Swedish term *sjöbruk*, its mariculture manifestations, and “the whole network of sailing routes, old as well as new, with ports and harbours along the coast, and its related constructions and remains of human activity, underwater as well as terrestrial” (Westerdahl 1992: 5-6; see also Westerdahl 2011c). Fundamentally, the concept of a MCL seeks to determine the relationship between a maritime environment and the functional and social strategies that people develop within that environment (Rönnby 2007: 66). The notion of a MCL was proposed as a parallel to agrarian cultural
landscapes in which inland features such as field systems, roads, terraces, and settlements were more visible and “monumental” than coastal or submerged features (Westerdahl 2011b: 338). Expanding this, B. Ford (2011: 4) states that “MCLs combine physical aspects of landscape and seascape to analyze the culture of maritime peoples within a spatial context, while retaining the recursive culture-nature relationship of landscape study.”

Ford (2011: 1–2) seeks to draw on the multivariate nature of landscape archaeology to approach maritime archaeology holistically since culture, time, and space are inseparable from landscape. Westerdahl (2011b: 339) lists possible landscape subdivisions for a MCL, including: the economic landscape that includes grazing areas and land-based resources; the resource landscape from which maritime ventures would access raw materials for ships and goods; the transport landscape, which should include not only shipwrecks but also roads and trackways on land used to convey goods; the territorial landscape of defense and aggression; the cognitive landscape, referring to experiential knowledge used in locomotion such as passages, routes, and indicated by place names; and the ritual landscape that is imbued with symbols and often personified, gendered, and/or deified. In sum, “all the range of people’s relationship to the seaboard, their maritime or maritime environment(s), should reasonably be implied in definition of a maritime cultural landscape” (Westerdahl 2011b: 336). It must be noted that not every coastal settlement is part of a MCL solely due to its physical location. For example, dwelling in proximity to navigable waters enables various means of communication but does not predicate that the waterborne option is always exercised (Rönnby 2007: 72). Westerdahl (1998) emphasizes that a culture’s maritimity is conditional, being dependent on the population’s “maritime preoccupations.” However, the transport aspect of a maritime culture should linked to
the boat and its crew, expanding the MCL to include inland sites that obtained goods or services by nautical means at some point.\textsuperscript{95}

Westerdahl (1992: 6) proposes a holistic approach to MCL by stressing the importance of studying terrestrial landscape components both natural and cultural, noting that “features on nearby land [are] as important as depth curves underwater,” arguing that the MCL should be complementary to its terrestrial companion rather than a subsidiary extension. Prominent coastal settlements usually had good inland connections via watercourses, and this can be expanded to include a good network of terrestrial pathways between settlements (Rönnby 2007: 76). In a self-critical essay examining maritime archaeology and cultural heritage management in Norway, D. Tuddenham (2010: 6) questions the concept of a divide between sea and land, asking if the promotion of a maritime cultural landscape maintains a non-existent gap, and Westerdahl (2011b: 333) responded by rejecting a division between “maritime” and “terrestrial” since people in coastal regions have a level of economic dimorphism in which both maritime and agrarian activities are performed in one community similar to groups who engage in both agriculture and transhumant pastoralism (Gottwald 1979: 465–66).

5.6.1 Aspects of a Maritime Cultural Landscape

Salient features of a MCL include transit points, chronology, continuity of centers of maritime culture, metrical aspects, and sea routes (Westerdahl 1992: 6–7). Transit points are defined “connections with waterways inland and the points where vessel or transportation methods change,” and it is at this point that inland polities connect with the larger world (Westerdahl 1992: 6). These sites are typically located at estuaries where the river current decreases and

\textsuperscript{95} Rather than a list of “empirical qualities,” maritimity is a category of understanding (Tuddenham 2010: 89). Maritimity is the identification and sorting between the poles of Land and Sea, analogous to metaphysical sorting between Nature and Culture, with the result being “quasi-objects” that belong to both categories in varying degrees.
mixes with seawater and re-loading and market areas sprang up in conjunction with local road networks, but it must be noted that culture and tradition play important roles in addition to natural topography in establishing such centers. In Westerdahl’s estimation transit points attract power and control as well as myth and ritual (2006: 61). Such transit points that required loading and unloading boats and the action of porting a boat had specific designations in Ur III southern Babylonia. For example, the term Má.bala.ak describes transferring the boat over various obstacles blocking the stream or porting a boat from a canal to the main river channel (Steinkeller 2001: 35–36). In his discussion of the Umma countryside, P. Steinkeller (2007: 194) notes a “special phenomenon...of a more dispersed mode of habitation.” Texts record numbers of individuals living apart from nucleated settlements, which Steinkeller relates as isolated farmhouses. Of these, 116 men were living “at the inlet of the Gishgigal canal,” and 119 men were residing “at the outlet of the Umma canal” (see Steinkeller 2001: 52, n.120 for details about the canal’s course and outlet south of Umma). It is more likely given the prominence of riverine traffic that these settlements and possibly others near the inlets and outlets of canals were transit points at which goods were transferred from terrestrial transportation to boats or relayed from one boat to another or the entire boat would be unloaded, moved to another waterway, and re-loaded. This type of activity was likely the primary activity for the settlement of “Ká.íd.da Umma” (“the inlet of the Umma canal”) at the confluence of the Tigris and the Umma canal (Steinkeller 2001: 51–53).

The other features of a MCL also greatly contribute to the description and analysis of the mariculture within a specific region. Terrestrial dating methods also aid maritime endeavors, and

96 The sum of the logographic values of the signs clearly convey the meaning of the word. Thus, Má (Akk. eleppu) = “boat” (Labat 1995: 93, Sign 122); Bala (Akk. ebēru) = “to cross” (Labat 1995: 45, Sign 9); and Ak (Akk. epēšu) = “to do” (Labat 1995: 83, Sign 97).
although Westerdahl (1992: 7) references geologic dating methods in conjunction with radiocarbon to develop a timeline of mariculture, traditional stratigraphy and ceramic seriation can equally contribute to establishing the sequence of port and harbor establishment as well as port migration. Metrical aspects include the distances between transit points, which are usually set at intervals such as the Phoenician harbors in the Mediterranean or major ports on the Levantine littoral (Harden 1971: 32–33; Burke 2011: 65–66). In his discussion of Phoenician settlement geography and drawing on the work of P. Cintas, D. Harden lists the attributes of Phoenician harbors, which include a sheltered anchorage preferably with a beach, a source of fresh water, and a limestone outcrop for tombs and quarries (1971: 32; Aubet 1987: 151–55). Further, he notes that such places were usually established at forty kilometer intervals “for it was the sailors’ habit to travel by day and stop each night en route” (Harden 1971: 33). Finally, sea routes as far as they can be determined are often a neglected or subsumed within metrical discussions but should contribute to the overall economic network and MCL into which a site is integrated. It is likely that two route systems existed along the Levantine littoral during the Bronze and Iron Ages. The first likely hugged the coast and was utilized by local sailors engaging in cabotage, and the second lie further away from shore but relied on anchorages at night or in inclement weather (Westerdahl 1998; Burke 2011: 66).

Westerdahl further characterizes the MCL in terms of zones of transport geography that are defined by the method of transportation for goods as well as natural conditions, the development of roadways, in addition to other social, economic, political, or cultural factors (1992: 11–13; 1998). A natural obstacle often marks the transition between transport zones, and in some regions, the borders between transport zones likely correspond to cultural boundaries (Westerdahl 1998). Westerdahl describes seven different transport zones, two of which are
applicable for the central coastal plain (1998; 2006). An inland zone with land-based means of transportation can be added to the two general zones corresponding to a *waterfront or coastal zone* in which larger ships are predominate and a *riverine zone* in which smaller boats are employed. Further, these zones can be outlined by the transit points at which goods would be off-loaded or transferred to another means of transport. Alternate configurations of such a system are evident in the eastern Mediterranean basin where only two zones may exist, such as a coastal zone directly transitioning to an inland zone in the absence of navigable rivers in the southern Levant, or all three may exist and the riverine and inland zones may be utilized concomitantly as in Egypt.

In a reflection on MCLs, Westerdahl (2011b) makes additional observations, seeking to make the concept of a MCL more inclusive as a result of several research trajectories since the first iteration of the concept. Part of the reality and subsequent folklore of a MCL includes the “anatomy of a disaster...inherent in any respectable maritime landscape” (Flatman 2011: 320; Westerdahl 2011b: 332). Waiting for a favorable wind provides the impetus for exchange between a ship’s crew and the inhabitants of a port. Lying at anchor in a harbor could prove catastrophic if anchors cannot be shifted, resulting in lost anchors or even wrecks at an anchorage (Rönnby 2007: 76). Disasters such as shipwrecks lead to local memory of the event that later transforms to folklore and possibly myth.97

5.6.2 Sources of a Maritime Cultural Landscape

Sources of MCL include shipwrecks, constructed remains on land, tradition of place function, natural topography, and most importantly, place names (Westerdahl 1992: 7–11). Shipwrecks

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97 Although no recorded myth developed from the incident, one such disaster involving storm damage to ships and subsequent salvage operation is recounted in a letter from the king of Tyre addressing the king of Ugarit (RS 18.031; COS 3.45H).
remain a pre-eminent feature of maritime archaeology and serve as a primary component for most MCLs despite acknowledged problems such as their status as “time capsules,” salvage and stripping of wrecks, and drift of remains along the sea floor (Westerdahl 1992: 7). Constructed land remains form another source, and these remains include not only quays but also seasonal habitation sites, built navigational aids, commercial buildings, fortifications, modified physical landscapes, tombs and cemeteries, ballast sites, and immaterial items such as regulations (Ford 2011: 5). Westerdahl voices concern about “the ship archaeologist’s unwillingness to grasp the essentials of land-based settlement archaeology,” effectively ignoring maritime aspects of coastal settlements and losing potential data about ships and boats (1992: 8). Conversely, archaeologists studying settlement systems and coastal zones should have an awareness of facets of mariculture that may be present at a particular site. Incorporating terrestrial components to a wider MCL also involves recognizing the tradition of usage of a particular site or feature, archaeologically determined through the lens of the longue durée, as well as situating them within the natural environment and topography. In this manner the natural havens with long site use can be contrasted with shorter-lived anchorages or even constructed ports that fell out of use with environmental or cultural transformations.

Of all the sources of a MCL, Westerdahl gives primacy to place names including the names of elements that reflect certain features such as blockages, sailing routes, ship and boat types, as well as inland names that reflect transportation routes or settlement situation (1992: 9–11). He notes that “a natural way of discovering the MCL is by way of the cognitive perspective of local tradition,” and this is reflected in place names (Westerdahl 1992: 5, 9). Places names are “culture laid directly onto a space to form a landscape” (Ford 2011: 5), forming what Wilkinson (2003: 10) described as a “complex non-Cartesian web of reference points on the landscape.”
While Semitic Bronze and Iron Age place names in the Levant may not be as numerous and specific as the North Germanic examples cited by Westerdahl, Burke (2011: 66) has detailed the major port names and their possible etymologies for the southern Levant and the Phoenician coast. Additionally, a sense of cognition about sea travel may be accomplished by close reading of the available texts, even if specific place names of anchorages, blockages, shoals, or landmarks are relatively unknown.

Place names, both taboo and noa (i.e., freed from taboo), help to elucidate human cognition concerning the dichotomy between sea and land as well as liminal spaces such as the shore. Westerdahl emphasizes this binary dynamic that is “viewed as antagonistic...but complementary as well” (2011: 292). While the Scandinavian sources for his study were oral narratives and folklore, he also posits that the “binary hypothesis” can be determined archaeologically for ancient societies. For Westerdahl, this dualism of land and sea extends to the genders associated with each, male and female respectively, so that while boats are constructed from land/masculine materials, they are transferred to the wet/feminine element, noting that “female associations are almost always found in the offerings to the boat and its tutelary deity, almost invariably a goddess” (2011: 293). This association of sea with the female gender harkens to the cosmologies of Mesopotamia in which the defeated and divided Tiamat becomes the sea and the atmospheric waters. In Ugaritic, the sea is personified within the male deity, Yamm, yet a popular etymology of the name Aṭirat(u), or Asherah, may be related to the full title rḥt aṯrṯ ṣm, “Great Lady who walks on the Sea,” used in the Baal Cycle (e.g., KTU 1.3.v.40; Wyatt 1999: 99–100). She is designated as “Great Lady, Aṭiratu of the Sea” later in the Baal Cycle.

98 Although the term “liminal” derives from the Latin limen, meaning “threshold,” the Greek cognate λίμην indicates maritime aspects such as “harbor,” or metaphorically “haven,” as well as other natural features such as a marshland or estuary (Liddell and Scott 1940; Westerdahl 1992: 292).
(KTU 1.6.i.43ff.), and the Kirta Epic relates the progress of the king and his besieging force to
the temple of “Aṭīratu of Tyre, and to the goddess of Sidon,” both coastal centers of maritime
activities (KTU 1.14.iv.35–39). Her designation as “Aṭīratu of the Sea” and her divine helper the
Fisherman (dgy aṭr) are attested in the Baal Cycle (KTU 1.3.vi.10).

The boat or ship is the paramount liminal agent that crosses the borders of the cognitive
elements of sea and land. By extension, the sailors should also be recognized as liminal agents
that traverse the sea-land dichotomy as well as cultural brokers that interact with those dwelling
on land. Another aspect of the relationship between sea and land observed by Westerdahl is the
use of land animals, specifically elk and horses, in conjunction with ships’ stems and their
artistic representations. These figureheads may have had an apotropaic function of protection at
sea by combining the strength of the land/male animal with that of the sea/female ship
(Westerdahl 2011a: 296). The phenomenon of a carved horse head mounted as a stem figure on a
ship was not restricted to northern Europe since Phoenician ships are represented with such
elements in Assyrian reliefs on the palace gates of Shalmaneser III (Figure 28) and Sargon II’s
reliefs at Khorsabad (Markoe 2000: 41, fig. 5Figure 28: The upper register of the bronze gate
bands from Balawat shows transportation of tribute by Phoenicians in hippos type boats with
horse figureheads at prow and stern. Photograph © Trustees of the British Museum.). E. Linder
argues that the appearance of horse protomes on Phoenician ships, which led to their designation
as hippoi boats, is a development of their association with the Assyrian empire and that that
horse head represented the power of Assyria, symbolizing dominance over the waterways (1986:
287). Regarding a possible Phoenician origin or development of the horse-headed protome,
according to Linder, “one can hardly find any trend in Phoenician art and cult which would lead
to an original horse representation of their sea power or trade” (1986: 287).
5.6.3 The Maritime Cultural Landscape of Jaffa and Its Hinterland

As the likely etymology of the ancient name *Yapu*, meaning “fair,” would imply, Jaffa’s situation on the coast provided “a beautiful place” for mariners to unload goods and possibly reload their ships with products destined for other harbor towns.99 The port of Jaffa facilitated the transfer of cargo and/or passengers between the sea and the land, providing a service rather than a physical product, although products may have come from nearby agricultural lands or craft workshops within the city (Cullinane and Talley 2006: 1; Talley 2006: 44). Alternatively, Jaffa may have functioned as “an intermodal node in the transportation network, where cargo and/or passengers change modes of transportation,” and the final destination was farther afield (Talley 2006: 44). In

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99 The meaning of *Yapu* as “fair” or “a fair place” was suggested by S. Wachsmann (A.A. Burke, pers. comm. 9/5/2015).
modern terms of transport corridors and logistics hubs, Jaffa functioned as load center, sitting at the interface between land and sea and between the region and overseas markets. Second-tier sites that possibly served as gathering points for raw materials before final transport to Jaffa operated as regional load centers, and the coastal highway, together with east-west routes extending from the coast inland function as freight corridors (Rodrigue and Notteboom 2006). Yet the economic aspects of Jaffa’s function within a MCL should not outweigh its role as a center of exchange for knowledge, ideas, and technology. The names and locations of other ports were doubtlessly shared between ships’ crews lying in harbor in addition to good anchorages, places of wrecks and founder, myths of the sea and weather and their associated deities, and perceptions of other regions.100

Another component of the MCL of the Sharon is the tradition of usage of a particular site or feature, archaeologically determined through the lens of the longue durée. The tradition of using havens as opposed to building harbors finds its expression in the anchorage at Apollonia-Arsuf as evinced by the Middle Bronze Age, Late Bronze Age, and Iron Age anchors recovered from the natural anchorage that attest to the knowledge and continued use of this site long before the terrestrial settlement was founded. The Byblian anchor indicates not only the presence of a Middle Bronze Age anchorage at the site and the possibility of mercantile trade along the Canaanite coast but also a shared technology of anchor production given its typological similarities to other anchors within the statistical range of the “Byblian” group as defined by Galili, Sharvit, and Artzy (1994: 101).101 That the majority of Byblian anchors in the eastern

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100 The sharing of information, both natural and mythical, likely inspired and perpetuated the association of Andromeda with Jaffa.
101 The correlation between this anchor’s attributes and those of the Byblian group suggests production choices that are patterned rather than expedient, purposefully imitative through generational emulation, and functional, indicating a shared cultural dynamic (Deetz 1968: 39).
Mediterranean have been found along the Syro-northern Israeli coast coupled with the fact that no Byblian anchors have been found in land excavations in Israel raises questions about the origins of the ships using these anchors and their organization as a fleet or as single merchantmen as well as their absence south of Apollonia-Arsuf (Galili, Sharvit, and Artzy 1994: 106).

It is important to note that within a MCL, a primary emphasis on the sea, versus a terrestrial focus, may hold true for coastal settlements, but for inland centers in a port’s hinterland, the sea, even if within view, may be just one of components that constitute a cultural landscape. An example of this consciousness is the nautical-themed southern panel of the north carpet of the Lod mosaic with meticulous depictions of ships in various states of rigging and detailed renderings of various aquatic taxa (Avissar 1998; see also Haddad and Avissar 2003 and Friedman 2004). In his discussion of maritime culture being attached to boats and the crew, Westerdahl’s purpose was to include river and lake exploitation within a MCL framework, yet the idea of a maritime culture capable of going inland should include not only ships and sailors but also the products transported by ship regardless of their final destination. Thus, imported ceramics and their original contents, or other finished prestige items, offloaded at a port on the coastal plain and then traded or delivered to hinterland center carry with them this attachment to the sea. It is this aspect of a MCL that is most visible at inland sites through the recovery of Cypriot, Mycenaean, and Egyptian ceramics that required waterborne transportation and offloading at a transit point before reaching their intended consumer. Similarly, the elite individual consuming cuttlefish and various saltwater fish taxa must have maintained connections with coastal fisherman to supply such culinary delights. Although the inhabitants of
inland sites may not have constructed their cultural landscapes with a maritime primacy, the role of the sea and seafaring in their political and economic lives was undeniable.

5.7 Conclusion

The regional settlement history presented here attempts to synthesize the available excavation and survey data to present a picture of settlement in the central coastal plain from the Middle Bronze Age to Iron III based on current archaeological knowledge. The derived settlement typologies and hierarchies, while basic in construction, provide an avenue for further refinement as fuller treatments of excavated sites are published. Comparing the site typology derived from archaeology to those detailed in ancient sources for the various periods under consideration also warrants further attention. One missing element from the pattern are maritime enclaves/niches described by Westerdahl (1998) as “areas outside of the towns with permanent settlements, where a large majority (up to 80 %) of the inhabitants are engaged in maritime activities and where maritime cultural experience and tradition have been accumulated from generation to generation.” Although they might not be as visible or included with an overview of the site, ports like Jaffa, Tel Michal, or Apollonia-Arsuf should have smaller adjacent sites. The present urban nature of the environment around these sites requires waiting for salvage operations to discover them.

The settlement patterns from the Middle Bronze Age through Iron IIB seem to follow the system “rules” as constrained by natural topography, soils, and hydrology and thus form more dendritic networks, especially during the Iron I–IIA as sites were revived or established near alluvial drainage networks. In contrast to Early Bronze Age sites that were built on spurs or hills, Middle Bronze Age sites are most found in valleys, indicating a preference for flatter ground of the plains. Gophna (1984: 31) posits that the freestanding rampart sites were “an indicator of the
changed cultural landscape of Palestine in the first half of the second...millennium B.C.E.,” with a shift toward maritime commerce and the establishment of port cities on the coast. The location of the regional center shifted with changes in political administration. Under the palatial system of the Middle Bronze Age, Aphek served as the center with the coast as a periphery. Jaffa’s role as Egyptian administrative center in the Late Bronze Age shifted the center from inland to the coast where it likely remained until the establishment of Tell Qasile by the Philistines in the second half of the twelfth century B.C.E. Following the destructions of the early tenth century attested at Tell Qasile, Tel Gerisa, and other sites, it is likely that Jaffa regained importance as an outlet to the sea for the Judean monarchy. Even during periods of decline like the eighth century B.C.E., Jaffa was still able to be fortified (Keimer 2011) and served as a magnet for maritime and terrestrial commerce. After the Assyrian campaigns and population resettlements, the port’s draw as a means of export probably bridged the literal gap in the settlement pattern between the coastal sites and the numerous farmsteads operating in the low hills and wadi valleys to the east. The question arises in regards to what kept the sites as part of a functioning settlement system during each period from the Middle Bronze Age to Iron III. The notion of a maritime cultural landscape as one potential method of establishing and maintaining connections between coastal and inland sites and its various components that are potentially recognizable on the Mediterranean littoral deserves future attention.
Chapter 6: Conclusions

L. Foxhall asserts that “Mediterranean landscapes are human artefacts in which the complex cultural histories are firmly embedded. These landscapes should be interpreted as manifestations of historically specific identities shaped by different human societies over many millennia according to deep-seated cultural principles” (2003: 75). This study sought to offer a synthesis of the settlement history of Jaffa and the central coastal plain from ca. 2000–539 B.C.E. in relation to the regional settlement patterns compiled and presented here and provides a discussion of the relational dimension of economic landscapes, using material culture to illuminate the “interactive links that connect land elements…through the movement of people” and through the movement of the goods they exchanged (Hollenbeck 2010: 192).

Identifying the need for a new regional synthesis in light of current archaeological knowledge led to the integration of archaeological surveys, and data from both research and salvage excavation records to determine the intraregional and supraregional connections that developed between sites in antiquity. Multiple strands of scientific evidence were used to reconstruct the paleoenvironment that served to constrain the inhabitants of the coastal plain yet was subject to their agency. The settlement patterns of the central coastal plain exhibited a certain amount of continuity in location and changes in clustering and dispersal throughout the periods addressed by this study, yet the sea and the potential of maritime commerce remained constant. This is especially true for sites like Jaffa, Sde Dov, Tell Qudadi, Tel Michal, and Apollonia-Arsuf which sat directly at the intersection of terrestrial and littoral maritime biomes as well as other sites that were located in cropland or rangeland biomes with two or more soil associations that bordered lotic or lentic freshwater biomes. By locating sites at the intersection
of these biomes, the inhabitants of each site were optimally located to exploit the surrounding environment.

By examining the port city and its hinterland in terms of maritime and terrestrial connectivity, it is useful to conceptualize Jaffa as a gateway and transit point, a node for unloading and loading goods imported for inland centers or exported to foreign markets, or as the final destination of a ship’s cargo. As an “exchange gateway,” exchanges of products occurred in both directions, and Jaffa’s hinterland functioned as its terrestrial core area from which goods or raw materials would be procured for maritime commerce. Thus, Jaffa faced a relatively static settlement trajectory from its advent during the Middle Bronze Age until the Assyrian conquest in 701 B.C.E. The economic or political oppression resulting from changes in Jaffa’s political status (e.g., MB II port for Aphek, LB administrative center,) felt by the region’s inhabitants would have prevented development of other gateways and central places and increased Jaffa’s prominence in the economic landscape by virtue of its position as a gateway to the eastern Mediterranean.

The intense settlement throughout the region following the Assyrian campaigns and subsequent development of farmsteads in the hinterland signal a change in settlement patterns from somewhat “static” in the Bronze and early Iron Ages to “dynamic” in the Iron III and subsequent periods. Jaffa although maintaining a primacy in the region due to the port’s role as a transit point, likely competed with terrestrial trade routes and inland centers, eventually having a reduced service area and probably functioning as a classic central place like the others in the hierarchy. However, the port of Jaffa’s position of primacy as a transport node allowed the site to reap the benefits of maritime trade. While the terrestrial and thalassic connections enjoyed by Jaffa and the sites in its hinterland can be understood within the economic framework of a port
and its tributary area in a maritime cultural landscape, this is only one approach to understanding
the matrix of connections and networks that existed between individuals, sites, and the “territory
facing Jaffa” in the past.
Appendix A: A Catalog of Archaeological Sites of the Middle Bronze, Late Bronze, and Iron Ages in the Central Coastal Plain of the Southern Levant

A.1 Site Selection

This catalog consists of 195 sites within the 800 km² study area that date between the beginning of the Middle Bronze Age to the end of the Iron Age (ca. 2000–539 B.C.E.; see also 1.5 Research Design and Methodology and Table 3). These sites range from large stratified habitation sites to artifact scatters and are subdivided according to their numbered paragraphs in the Registry of Monuments and Historical Sites as employed by the Archaeological Survey of Israel (ASI) which are treated here in order from west to east and south to north (see Figure 3). Within these subdivisions the sites are listed in descending order from north to south and from west to east, following the conventions of the ASI. Most of the information obtained from the Israel Antiquities Authority (IAA) was compiled and exported from the database in late 2008 with the exception of the Map of Petah Tikva (MR 71) which was exported in 2012. To present as complete a list as possible, every effort was made to supplement the catalog with site reports published by the IAA in Hadashot Arkheologiyot–Excavations and Surveys in Israel and 'Atiqot that were not represented in the 2008 records and with ASI maps published electronically since 2012. Of course, the nature of archaeological discovery and the potential for new sites or additional data for known sites necessitates a future update for a catalog such as this. Thus, this

102 Table 3 lists all sites in the site catalog alphabetically together with their number within this catalog, IAA database record numbers, ASI numbers, boundary areas according to the IAA database, estimated areas given in the publications of the ASI grids, and all archaeological periods for the sites within the catalog to illustrate the continuity and changes within a site’s history from prehistoric eras to the modern era. These designations follow the abbreviations used by the NEAEHL: PA–Paleolithic periods; NE–Neolithic period; CH–Chalcolithic period; EB–Early Bronze Age; MB–Middle Bronze Age; LB–Late Bronze Age; IR–Iron Age; PE–Persian period; HL–Hellenistic period; RO–Roman period; BY–Byzantine period; EI–Early Islamic period; CR–Crusader and Ayyubid periods; LI–Late Islamic period; and OT–Ottoman period.
catalog serves as a starting point in a diachronic study of settlement patterns and systems that should be “eternal” (Kowalewski 2008: 229).

A.2 Site Data

The following information is given for each catalog entry:

1. Site name. The site names presented in this catalog follow these conventions. Ancient place names for confidently identified sites have been used in favor of the tell name (e.g., Aphek for Tel Afeq or Qal’at Ras el ‘Ein), but in cases of suggested or contested identification, the site name as listed in the IAA database has been retained (e.g., ‘Izbet Sartah instead of Ebenezer or Tel Gerisa rather than Gath-Rimmon). In an effort to standardize site names given the multiple ways of transliterating certain site names from Hebrew to English, priority was given to spellings for such sites that appear in the New Encyclopedia of Archaeological Excavations in the Holy Land (NEAEHL; Stern 1993, 2008). Site names not represented in those volumes employ spellings from HA–ESI, and English names used by excavators are preferred over Hebrew transliterated names (e.g., Slaughterhouse Hill for Giv’at Bet Ha-Mitbahayim). For sites in the IAA database with no English publications, the transliteration herein adheres to the rules set forth by the Academy of the Hebrew Language in Jerusalem. In all cases, the bibliographic entries for each site retain the spellings as given in the publication (e.g., Tel Qasila in Ayalon 1993 rather than Tell Qasile; Tell Jerishe in Geva 1982 for Tel Gerisa). Numeric designations for multiple sites bearing the same name or for sites distinguished by a cardinal direction are given in parentheses after the site name. When the accepted or common name for the site differs with that used by the ASI or another survey, the alternate name appears in brackets following the site name (e.g., Apollonia-Arsuf [Tel Arshaf]). Arabic places
names recorded by the Survey of Western Palestine or on British Mandate maps, where known, also appear in brackets following the site name listed in the IAA database.

2. **Site number(s).** Site numbers as noted in the IAA database and available ASI publication as well as other surveys, such as the survey of Middle Bronze Age sites by Gophna and Beck (1981), are listed with the IAA number first, followed by other numbers. This provides an ease of reference for future studies and aids in differentiating sites with the same name.

3. **Boundary and point coordinates.** Boundary coordinates for the area are listed as the southwestern and northeastern points of a rectangle determined by the IAA. The coordinates are listed in Israel Transverse Mercator values, also called the New Israel Grid.\(^{103}\) The total protected area established by the IAA is given for each site. The site boundaries given by the IAA should not be interpreted as the site size since there boundaries merely indicate the protected area around the site that would require further excavation or inspection prior to development (see Ajami 2011). Where applicable, point coordinates for sites listed by the ASI are also given as a way to provide contrast to the wider protective boundaries of the IAA. Where possible, an estimate of the site size related by excavators or surveyors is listed, although it should be noted that size and outline of many of the sites listed here have been obscured or obliterated by modern development.

4. **Periods.** All periods listed in the “Scientific Data” portion of the IAA data record, the sites descriptions in the relevant ASI publication, or the periodization used by other published surveys have been listed for the sites presented in this catalog. This has been

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\(^{103}\) Coordinates for sites from older publications using the Old Israel Grid (the Palestine Grid of 1923) have been converted to New Israel Grid.
done to show the continuity or gaps in settlement histories of each site and to emphasize those single period sites within the study area. The dates related for each site follow the information listed in the IAA database in which the level of resolution for each site is variable with a site having Middle Bronze Age, MB II, and MB IIB entries in the period column. Finer resolution for sub-periodization in the Bronze and Iron Ages was possible only through reading the published site reports or survey articles and examining published ceramic parallels.

5. Description. A brief encyclopedic description of each site relates the types of features and material culture present at the site, together with limited interpretations of site or feature function. For stratified sites, effort was made to present the general information for each stratum without extraneous information about artifacts or assemblages that would detract from the overall picture and can be found in the listed references.

6. References. Every effort has been made to provide succinct references for each site relevant to the temporal scope of this volume. Each list is intended to be thorough but not exhaustive since publications focused on periods outside the scope of this project were excluded as were secondary articles.¹⁰⁴ For many sites, the final report published as a monograph or a lengthier journal article supersedes numerous preliminary reports; thus, the preliminary reports for these sites are not given unless a specific detail is cited. In some cases, preliminary reports and/or the encyclopedia entry are the only sources of information for a site awaiting full publication (e.g., Tel Gerisa), making the citation of numerous preliminary reports necessary.

¹⁰⁴ These references may be gleaned from the NEAEHL bibliographies or from final reports.
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Table 3: Table of All Sites in the Study Region dating from the Middle Bronze Age to Iron Age III (for period abbreviations, see n. 100).
| Catalog No. | Site Name | JAA Record No. | MR Grid | ASI No. | IAA Boundary Area (ha) | ASI Estimated Area (ha) | PA | NE | CH | EB | MB | LB | IR | PE | HL | RO | BY | EI | CR | LI | OT |
|------------|----------|----------------|---------|---------|------------------------|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 7          | el-Qibli | 69             | 71      |         |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 179        | Esh Sheikh Abu | 80 | 158      |         |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 132        | Gan Soreq (North) 2 | 72 | 46       | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 130        | Gan Soreq (West) 1 | 72 | 36       | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 131        | Gan Soreq [Gan Soreq (Northwest) 1; Gan Soreq (North) 1] | 839/0 | 72 | 38, 36 | 39                        | •                      |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 134        | Gan Soreq [Nahal Soreq 2] | 790/0 | 72 | 42, 10 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 8          | Geillot [Tel Aviv–Herzliyya Road] | 986/0 | 69 | 74, 2.25 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 24         | Gilgal [Jaljulye (1)] | 1649/0 | 77 | 82, 100 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 69         | Givataim (3) | 71 | 71       | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 5          | Herfelh yat | 69 | 57, 0.4  | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 122        | Holon, Sanhedrin St. [Holon 4] | 843/0 | 72 | 13, 6 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 120        | Holon, Tel Gibborim | 876/0 | 72 | 24       | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 33         | Horshim (East) [Oranit (1)] | 40404/0 | 77 | 139, 110 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 36         | Horshim (SE) [Oranit (8)] | 40406/0 | 77 | 183, 52.25 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 145        | Horvat ‘Al (Northwest) [Khirbet Deir ‘Ala (West)] | 13243/0 | 80 | 13, 1 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 146        | Horvat ‘Al [Khirbet Deir ‘Ala] | 80 | 14, 2 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 143        | Horvat ‘Ammar | 80 | 7        | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 135        | Horvat Bene Beraq | 1039/0 | 73 | 110       | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 166        | Horvat Burnat [Khirbet Burnat (Northwest)] | 1711/0 | 80 | 65, 10 | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 148        | Horvat Hani (West) | 80 | 5        | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 29         | Horvat Harish | 1798/0 | 77 | 104, 100 | 3        | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 111        | Horvat Leved [Khirbet Umm el Labad] | 1882/0 | 78 | 272, 100 | 0.5        | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 91         | Horvat Migdal Aphek [Majdal Yaba] | 78 | 136      | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 14         | Horvat Naseh | 1979/0 | 77 | 100      | •        |                        |                        |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Catalog No. | Site Name [Notes] | MR Grid | ASI Record No. | IAA Record No. | IAA Boundary Area (ha) | ASI Estimated Area (ha) | PA | NE | CH | EB | MB | LB | IR | PE | HL | RO | BY | EI | CR | LI | OT |
|-------------|------------------|---------|---------------|----------------|-----------------------|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 119         | Horvat Pundaq [Khirbet Bir Bunduk] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 191         | Horvat Shamlem [Deir Abu Salama] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 172         | Horvat Tinshemet [Khirbet 'Ali Malikina; Khirbet esh Shamiya] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 30          | Horvat Zakkur [Khirbet ez-Zakur] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 81          | Izbet Sartah | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 46          | Jaffa, Underwater area | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 27          | Jalaliya (West) [Nahal Qana 4A] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 20          | Jami el-Umari | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 34          | Kafr Bara (1) | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 37          | Kafr Bara (20) | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 75          | Kafr Qasim [ASI 26] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 74          | Kafr Qasim [ASI 6] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 3           | Kefar Shemaryahu [el-Harisiya] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 175         | Khirbet Abu el Fahm (Southwest) | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 184         | Khirbet Budrus (West) | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |
| 151         | Khirbet Burj el Haniya [H. Hani (South)] | 80 | 214 | 1791/0 | 78 | 294 | 200 | 2 | 6 | 100 |

Table 3 (cont.; for period abbreviations, see n. 100)
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Table 3 (cont.; for period abbreviations, see n. 100)
A.3 Site Catalog

A.3.1 Map of Herzliyya (MR 69)

1. APOLLONIA-ARSUF [TEL ARSHAF]

Site no(s): 988/0 (IAA); 69.11 (ASI)

Boundary coordinates (IAA): 181700, 677500 SW 182500, 678300 NE

Point coordinates (ASI): 181800-182100, 677700-678100

Area: 64 ha (IAA boundaries); 12 ha (ASI boundaries)

Period(s): Pre-pottery Neolithic, Chalcolithic, EB I, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Crusader, Late Islamic, Ottoman

Description: Stratified tell directly on seaside with anchorage (see Tel Arshaf underwater area), originally known as Arshof in the Persian period. Excavations revealed settlement with occupation from Persian period through the end of the Crusader period. Fragments of pottery from the prehistoric periods (Pre-pottery Neolithic, Chalcolithic, and Early Bronze Age) were found scattered on the ground surface.

Iron Age artifacts include a green faience shabti fragment found near the Crusader city wall and pottery recovered from Area D, a pit in Area H, and a systematic surface survey of the site (Tal 1999: 291). The meager ceramic corpus consists of both “northern” and “southern” forms of bowls (red slipped and wheel-burnished), cooking pots, storage jars, and holemouth jars. Tal dates the assemblage to the eighth and seventh centuries B.C.E. (Iron IIB; Tal 1999: 291).

With a preserved height of 7 cm, the shabti fragment suggests possible commercial connections between Apollonia-Arsuf, or another nearby settlement, at the end of the Iron Age and Egypt (Giveon 1970). The statue is broken at waist level and damaged on the upper right
portion. The molded tools held by the shabti consist of an ax and a hoe with an indication of a rope for sack. The inscription was engraved on the statue before glazing, in a single column, in the center of the body, between two vertical lines. Only five signs survive, with the lowest is damaged, but the beginning of the formula for Late Period shabtis “Enlighten Osiris...” is readable. Giveon considered the shabti of mass production and poor quality, and he suggested that it may have been robbed from a tomb or was in the possession of an Egyptian soldier or officer stationed in the area (1970: 7). It is more likely that this statute is linked to trade with Egypt facilitated by the Phoenicians who may have used the anchorage at Apollonia-Arsuf on their voyages between Egypt and the Phoenician coast.


(See also http://www.tau.ac.il/humanities/archaeology/projects/proj_apollonia.html and publication list there)

2. TEL ARSHAF, UNDERWATER AREA

Site no(s.): 4420/0, 26762/0 (IAA); 69.10 (ASI)

Boundary coordinates (IAA): 181000, 676900 SW 182000, 678350 NE

Point coordinates (ASI): 181700-181800, 677700-678000

Area: 187 ha (combined IAA boundaries); 1 ha (ASI boundaries)

Period(s): MB I, LB, Iron II?, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Crusader

Description: Remains of an anchorage composed of sandstone reefs south of Tel Arshaf (see below), including sections of buildings that collapsed into the sea, extending up to 100 m west
and south of the tel. While the submerged structures date to the Byzantine and Crusader periods and are likely associated with the settlement at Apollonia-Arsuf, other stone, ceramic, and metal finds from the Middle Bronze Age, Late Bronze Age, Iron Age, Persian and Roman periods attest to a longer history of site use (Grossmann 1993). Notably, a triangular anchor dated to the MB I, a rectangular anchor with a single perforation dated to the Late Bronze Age, and two three-holed stone anchors from the Iron II or Persian were recovered during an underwater survey (Galili, Dahari, and Sharvit 1992, 1993: 63–65). Statistical analysis of the Middle Bronze Age anchor’s frontal triangularity and hole position revealed that it should be classified within the “Byblian” group defined by Galili, Sharvit, and Artzy (1994).105


3. Kefar Shemaryahu [El-Harisiya]

Site no(s).: 1047/0 (IAA); 69.20, 69.21, 69.22, and 69.23 (ASI)

Boundary coordinates (IAA): 182850, 676250 SW 183850, 677350 NE

Point coordinates (ASI): 183300, 677300 (ASI 20); 183300, 677100 (ASI 21)

Area: 110 ha (IAA; inclusive of all Kefar Shemaryahu sites listed here); 45 m² (area of structure at ASI 69.21)

Period(s): MB I, Iron II, Roman, Byzantine, Early Islamic, Late Islamic

105 H. Frost (1970: 381) described the Byblian anchor as “a triangular slab of stone with an apical piercing, sometimes surmounted with a shallow groove.” In their study of Byblian anchors off the Carmel coast of Israel, Galili, Sharvit, and Artzy offered a refined list of attributes that included measurements of front triangularity; hole position indices; indices of profile triangularity, rectangularity, and flatness; material type (limestone); and presence of a rope groove (1994: 105).
Remains of an isolated tripartite structure interpreted by J. Kaplan (1971: 305) as a cultic building given architectural similarities to the Phase C Nahariyya Temple. The building, with a preserved height of a single course of stone, was discovered by a bulldozer during construction of a municipal pool that was never built. Kaplan’s plans of the structure at the time of its excavation label it as “the Israelite Building,” an assignation likely based on an Iron IIB cooking pot rim fragment and a possible krater rim found during his fieldwork.106

Salvage excavations around this area uncovered Middle Bronze Age burials and pottery (Eliaz 1999; Mettens 1999; Ayash and Birman 2006). Although much of the pottery found during excavations was recovered from later Byzantine contexts, an undisturbed burial pit cut into hamra contained two large storage jars, two handleless jars and a red slipped and burnished dipper juglet dated to the MB I (van den Brink 2000).


4. TEL MICHAL [MAKMISH]

Site no(s).: 987/0 (IAA); 69.44, 69.55 (ASI)

Boundary coordinates (IAA): 180800, 673800 SW 182200, 675200 NE

Point coordinates (ASI): 181100, 674200 (ASI 44); 180900, 673900 (ASI 55)

Area: 196 ha (IAA boundaries)

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106 This conclusion was reached by the author after viewing plans and ceramic profile drawings from Kaplan’s excavations in the possession of E. Marcus, who is examining the pottery as part of a larger project focused on the Sharon plain during the MB. The remainder of the pottery, estimated at sixty to seventy sherds total, is dated to the MB II with parallels no earlier than the Palace II phase at Aphek (E. Marcus, pers. comm.).
**Period(s):** Lower Paleolithic, Pre-pottery Neolithic, MB II–III, LB, Iron II, Persian, Hellenistic, Roman, Early Islamic

**Description:** Stratified tell site on Herzliyya coast consisting of five hills on which an acropolis and lower town are situated. Excavations found chipped stone tools from the Paleolithic and Neolithic periods not in situ and the remains of settlement various periods since the Middle Bronze Age. The nearby site of Makmish, excavated by Avigad (1993b), is likely part of the Iron Age settlement at Tel Michal and is included within the IAA boundaries for the larger site.

The main settlement at Tel Michal, founded near the close of the MB II, consisted of a raised platform with an enclosure wall that likely had surmounting structures and glacis of alternating layers of *hamra* soil and sand. Its commercial connections are represented by imported Cypriot pottery, Hyksos scarabs, and Egyptian alabaster vessels. The remains of pottery kilns dating to the MB II–III were found in later excavations northwest of the site in addition to Persian period structures.\(^{107}\) An unfinished triangular limestone anchor with a partially bored apical socket was found in re-use within a poorly-preserved wall dated to the MB II (Sharvit 2006). Since the anchor was never finished, it may have served a votive or symbolic function similar to those discovered in foundations at Kition and Ugarit. The IAA boundaries also include a surface scatter of Iron Age pottery on the coast south of the tell (Gophna and Ayalon 1998: 34, 33*).

Herzog proposes that the Middle Bronze Age settlement was destroyed by tectonic activity along the coast and that such tectonic shifts were mitigated by the Late Bronze Age inhabitants who reshaped the hill by adding a large fill (30 m wide by 10 m high) eastward

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\(^{107}\) The IAA lists two MB III kilns excavated by Gorzalczany and Rand (A-2446/1996) as part of the site record for Herzliyya Gimmel (IAA 1018/0), which is clearly a duplicate since that site is situated south of Tel Michal. Salvage excavations there recovered material culture from the Persian through Byzantine periods, see Gophna and Ayalon 1998: 27* and 31*. 
These denizens also constructed a fortress on the northern part of the high mound that was accompanied by buildings to the south. Maritime connections are evinced by Late Cypriot wares and a group of kraters with bichrome decoration that differ from local dichromatic wares in form and decoration and were manufactured along the coast of Canaan or Syria. After the LB I settlement was destroyed, efforts were made to enlarge and strengthen the rampart, and this settlement continued until its abandonment in the fourteenth or thirteenth century B.C.E.

Tel Michal witnessed renewed settlement in the tenth century B.C.E., which expanded from the central high mound to the surrounding hillocks. At Makmish, the remains of a square building (10 m x 10 m) were exposed, and the lack of support for a roof led the excavator to interpret the construction as an enclosure wall. In the center of the enclosed area was a stone platform with ash deposits at the four corners, and nearby, several slabs of flat stone interpreted as “tables” were found. Pottery from the tenth century B.C.E. was recovered from the complex. In light of the archaeological finds, the excavator suggests that the area was used to cook meals and light fires, similar to the high places described in 1 Samuel 9 (Avigad 1993b: 933). Other rectangular structures with benches along the walls were found on the southeastern hill, prompting Herzog (1993b: 1038) to suggest that these areas together with Makmish were “family cultic rooms or bamot.” Evidence of the site economy is furnished by a complex of wine presses also dated to the tenth century B.C.E. Following a gap of a century and a half, renewed settlement activities at Tel Michal occurred on the southeastern hill with pottery vessels found buried on the eastern hill and eighth century B.C.E. sherds present on the high mound. The site was again abandoned at the end of the eighth century and was devoid of discernible occupation.

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108 A large fragment of a krater of this type was found by Kaplan at Jaffa (MHA 2294), and another, almost complete, example of this krater from Tell el-Ifshar has been observed by the author in the IAA storage facility at Beth Shemesh in 2012.
until the Persian period when it experienced the largest occupation and industrial activity and the cultic site at Makmish was again active. The site was occupied until the Early Islamic period when Apollonia-Arsuf rose to prominence and eclipsed Tel Michal in importance.


5. **HERFELIYAT**

**Site no(s).:** 69.57 (ASI)

**Boundary coordinates (IAA):** NA

**Point coordinates (ASI):** 181600, 673700

**Area:** .4 ha

**Period(s):** MB II, Iron II?, Persian

**Description:** Pottery scatter on eastern slope of coastal ridge; likely the remains of a campsite.

**References:** Gophna and Ayalon 1998: 34, 33*

6. **‘UWEID**

**Site no(s).:** 69.60 (ASI)

**Boundary coordinates (IAA):** NA

**Point coordinates (ASI):** 181100, 673500

**Area:** NA

**Period(s):** EB I, MB
**Description:** Pottery scatter on *hamra* soil in a coastal dune area classified by the surveyors as a campsite.

**References:** Gophna and Ayalon 1998: 35, 33*

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**7. EL-QIBLI**

**Site no(s).:** 69.71 (ASI)

**Boundary coordinates (IAA):** NA

**Point coordinates (ASI):** 180800, 672900

**Area:** 400 m²

**Period(s):** Chalcolithic, EB I, MB, Ottoman

**Description:** Remains of stone circles (possible habitations?) on a *hamra* outcrop with scatters of ground and chipped stone implements and pottery. The surveyors interpreted this location as a campsite.

**References:** Gophna 1978; Gophna and Ayalon 1998: 36–38, 35*

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**8. GELILOT [TEL AVIV–HERZLIYYA ROAD; COUNTRY CLUB JUNCTION]**

**Site no(s).:** 986/0 (IAA); 69.74 (ASI); Gophna and Beck 1981, Site 21

**Boundary coordinates (IAA):** 181750, 672700 SW 181600, 672550 NE

**Point coordinates (ASI):** 181900, 672700

**Area:** 2.25 ha (IAA boundaries)

**Period(s):** MB I

**Description:** Cemetery comprising ten tombs with ceramic vessels and copper weapons located on a slope of a *kurkar* ridge E of the coastal road.
References: anon. 1978a; Gophna and Beck 1981: 71; Gophna and Ayalon 1998: 38–39, 36*

9. TEL AVIV–HERZLIYYA ROAD [SOUTH OF COUNTRY CLUB JUNCTION]

Site no(s).: 69.75 (ASI); Gophna and Beck 1981, Site 22

Boundary coordinates (IAA): NA

Point coordinates (ASI): 181800, 672600

Area: NA

Period(s): MB I

Description: Settlement remains consisting of scattered pottery and hearths on N slope of hamra hill E of the coastal road.

References: Gophna and Beck 1981: 71; Gophna and Ayalon 1998: 39, 36*

10. TEL QANA [TELL EL MUKHMAR]

Site no(s).: 1273/0 (IAA); 69.97 (ASI)

Boundary coordinates (IAA): 189500, 670600 SW 189900, 670900 NE

Point coordinates (ASI): 189700, 670700

Area: 12 ha (IAA boundaries); 2.5 ha; lower tell of ca. 1 ha (ASI estimate)

Period(s): EB, MB II, LB, Iron I, Iron II, Persian, Hellenistic, Roman, Byzantine

Description: Stratified tell site along the Nahal Qana, whose Arabic name, Tell el Mukhmar, was translated as “the mound of the wine-bibber” (Palmer 1881: 219). It is possible that the presence of later wine presses and viticulture surrounding the tell gave rise to the Arabic place name.
Surveys of the site noted an acropolis, lower city (W and S of acropolis), and visible remains of a city wall constructed with large stones. Neri’s survey to identify source materials of crushing and grinding stones collected eighty millstones, of which forty percent were basalt, thirty-five percent limestone, and twenty-five percent were beach rock (concreted shells and sandstone). Additionally, a basalt grinding bowl, potter’s wheel, and a limestone grinding tool were discovered (Neri 1997). According to the IAA database record, van den Brink’s excavations in 2007 revealed “an MB [II] living surface encountered in various probes; a single, primary warrior burial in extended, supine position with pottery and metal funerary gifts dating from the LB II, and two wine presses probably dating from the Iron Age II.”


11. Tel Aviv, Afeqa [Ramat Aviv Gimmel]

Site no(s).: 984/0 (IAA); 69.91 (ASI)

Boundary coordinates (IAA): 181100, 670000 SW 181400, 670100 NE

Point coordinates (ASI): 181100, 670100

Area: 3 ha (IAA boundaries)

Period(s): MB II–III, Hellenistic, Roman

Description: Remains of a structure and rock-hewn installations at Rishpon Street 4. Excavations of four burial caves, mostly dated to the Hellenistic period, revealed an oval cave, the ceiling of which was destroyed by bulldozer operations. The cave contained the remains of two individuals and a pile of infant bones together with grave goods. The burials area dated to the MB II–III based on a scarab found in the cave (Kaplan 1978b: 417). Publications
concentrated on a burial cave and pit from the Hellenistic period, later used as habitation during the early Roman period.

References: anon. 1977b; Kaplan 1978b; Kaplan and Ritter-Kaplan 1989; Gophna and Ayalon 1998: 42, 38*-39*

12. EL-HILTAMIYA [FERRIKHIYEH]

Site no(s).: 1272/0 (IAA); 69.98 (ASI)

Boundary coordinates (IAA): 189300, 669900 SW 189600, 670300 NE

Point coordinates (ASI): 189400, 670100

Area: 12 ha (IAA boundaries); 1 ha (ASI estimate)

Period(s): MB or LB, Iron II?, Late Islamic, Ottoman

Description: Remains of deserted village and flour mill, described in the Survey of Western Palestine as “a few mud huts near the river” (Conder and Kitchener 1881-1883, II: 251). The majority of the finds date to the Late Islamic period. A single sherd of Middle Bronze Age or Late Bronze Age date (not illustrated) was found at the site along with Iron Age and Ottoman pottery. The IAA database indicates a settlement or ruin and accompanying pottery scatter dated to the Late Bronze Age.

References: Conder and Kitchener 1881–1883, II: 251; Gophna and Ayalon 1998: 51–52, 40*

13. ABU RABAH

Site no(s).: 9512/0 (IAA)

Boundary coordinates (IAA): 189200, 669900 SW 189300, 670200 NE

Point coordinates (ASI): NA
**Area:** 3 ha (IAA boundaries)

**Period(s):** MB I

**Description:** Scatter of pottery sherds. This site could possibly be included in the ASI description of El Hiltamiya (see above) as a low mound of 1 ha west of the site with scatters of pottery, grinding stones, and building stones.

**References:** NA

A.3.2 *Map of Kefar Sava (MR 77)*

14. ḤORVAT NASHE

**Site no(s).:** 1979/0 (IAA)

**Boundary coordinates (IAA):** 200000, 680000 SW 201000, 681000 NE

**Point coordinates (ASI):** NA

**Area:** 100 ha (IAA boundaries)

**Periods:** MB II, Iron II, Persian, Roman, and Byzantine

**Description:** Remains of a structure and associated architectural elements, cisterns, stone-lined pit, and tabun. Recent survey work also recorded more presses, cisterns, tombs, burial caves, stone clearance heaps, and a kiln in the vicinity (Shmueli, ‘Azab, and Yihya 2008). Salvage excavations revealed a Middle Bronze Age level with evidence of metal production as well as bronze daggers and a limestone pommel that may have been grave goods. Utilitarian pottery from the Iron Age suggests that the site was inhabited, but no architectural remains from that period were excavated (Mettens 2004).

**References:** Mettens 2004; Shmueli, ‘Azab, and Yihya 2008
15. **Khirbet Kara (1)**

**Site no(s).**: 77.28 (ASI)

**Boundary coordinates (IAA)**: NA

**Point coordinates (ASI)**: 199684, 678896

**Area**: 1 ha (ASI estimate)

**Periods**: Paleolithic, Iron II, Persian, Hellenistic, Roman, and Byzantine

**Description**: Remains of a hilltop settlement with foundations of structures consisting of fieldstones with lintels and doorjambs preserved, likely dating to late antiquity. Rock-hewn cisterns with capstones, oil presses, cist burials, and arcosolia tombs were located nearby. An adjacent cave below the site yielded evidence of early flint production.

**References**: Beit-Arieh and Ayalon 2012

16. **Khirbet Kara (4)**

**Site no(s).**: 77.27 (ASI)

**Boundary coordinates (IAA)**: NA

**Point coordinates (ASI)**: 198884, 678596

**Area**: NA

**Periods**: Iron II

**Description**: Remains of two circular buildings, one of which is covered by a stone clearance heap. An adjacent wall north of the structures is preserved for a length of 20 m.

**References**: Beit-Arieh and Ayalon 2012
17. QALQILYE (1)

Site no(s).: 77.36 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 197585, 677096

Area: >100 m² (ASI measurement estimate)

Periods: Iron II, Persian, Roman, and Byzantine

Description: Sherd scatter across surface with concentration of Roman and Byzantine ceramic
and glass fragments

References: Beit-Arieh and Ayalon 2012

18. KHIRBET SUFIN (1)

Site no(s).: 77.37 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 198435, 676996

Area: 4 ha (ASI estimate)

Periods: Paleolithic, EB I, Iron II, Persian, Hellenistic, Roman, Early Islamic, Crusader, Late
Islam, and Ottoman

Description: Remains of a settlement with extant wall fragments, tessellated pavement, cisterns,
and a partially hewn pool. Other artifacts include Levallois-Mousterian flint tools, pottery sherds
from Early Bronze Age to Roman periods in the northern portion of the site and ceramics and
glass from late antiquity and the Middle Ages extending across the area.

References: Beit-Arieh and Ayalon 2012
19. QALQILYE (2)

Site no(s).: 77.49 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 199085, 676496

Area: 0.5 ha (ASI estimate)

Periods: Iron II

Description: Stone clearance heaps, likely marking the location of buildings, rock-hewn cistern, and sherd scatter on a hill side.

References: Beit-Arieh and Ayalon 2012

20. JAMI EL-'UMARI

Site no(s).: 77.69 (ASI)

Boundary coordinates (IAA): 197300, 673200 SW 197950, 674200 NE

Point coordinates (ASI): 197885, 674196

Area: NA

Periods: Iron II, Persian, Roman, Byzantine, Late Islamic and Ottoman

Description: Sheikh’s tomb with rock-hewn cisterns adjacent. Nearby a rock-cut tomb with courtyard and five loculi, likely dating to late antiquity, was discovered in addition to various hewn installations such as wine and oil presses, cist graves, and arcosolia tombs. The surface pottery dated from Iron II to the Ottoman period.

References: Beit-Arieh and Ayalon 2012

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109 This site falls within the boundaries delimited by the IAA for Yarhiv (7690/0), but the association of the two sites is unclear.
21. **Yarhiv [Matan (4)]**

**Site no(s).**: 7690/0 (IAA); 77.85 (ASI)

**Boundary coordinates (IAA)**: 197300, 673200 SW 197950, 674200 NE

**Point coordinates (ASI)**: 197585, 673296

**Area**: 65 ha (IAA boundaries)

**Periods**: Middle Paleolithic, Chalcolithic, EB I, Iron II, and Byzantine

**Description**: Remains of a structure and various rock-hewn installations including wine presses, cisterns, tombs and quarries dated to the Byzantine period. Pottery and flint implements from earlier periods were collected from the site during survey.

**References**: Gudovitch 1999a; Beit-Arieh and Ayalon 2012

22. **Matan (2)**

**Site no(s).**: 77.70 (ASI)

**Boundary coordinates (IAA)**: 197300, 673200 SW 197950, 674200 NE

**Point coordinates (ASI)**: 197785, 674096

**Area**: NA

**Periods**: Iron II?, Persian, Roman, and Byzantine

**Description**: Rock-hewn arcosolia tombs dating to late antiquity and a large cave south of the tombs. Ceramic finds from Iron Age to Byzantine periods.

**References**: Beit-Arieh and Ayalon 2012

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110 This site falls within the boundaries delimited by the IAA for Yarhiv (7690/0).
23. MATAN (5)

Site no(s).: 77.86 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 198385, 673896

Area: >18 m² (ASI estimate)

Periods: Iron II and Byzantine

Description: Remains of a structure (3 x 6 m) with large fieldstone foundations preserved to a height of two courses with a winepress, rock-cuttings, and hewn installations nearby.

References: Beit-Arieh and Ayalon 2012

24. JALJULYE (1)

Site no(s).: 1649/0 (IAA); 77.82 (ASI)

Boundary coordinates (IAA): 195000, 673000 SW 196000, 674000 NE

Point coordinates (ASI): 195485, 673496

Area: 100 ha (IAA boundaries)

Periods: Chalcolithic, EB IV, MB, Iron I, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Crusader, Late Islamic, and Ottoman

Description: Remains of a village overlying a tell of unknown size. The best preserved structures are a khan and a mosque, both dating to the Late Islamic period (Peterson 1997). Other contemporary buildings and surfaces were excavated during salvage operations (Mettens 2002a, 2002b). Collected material culture includes pottery from the Chalcolithic through Ottoman period and a Roman era coin.
25. **MAGDIEL, GIL AMAL NEIGHBORHOOD [BYAR ‘ADAS]**

**Site no(s).:** 1435/0 (IAA); 77.75 (ASI)

**Boundary coordinates (IAA):** 192600, 673650 SW 192900, 674000 NE

**Point coordinates (ASI):** 192785, 673895

**Area:** 7.5 ha (IAA boundaries); 4 (ASI estimate)

**Periods:** Epipaleolithic, Pre-Pottery Neolithic, MB II, Persian, Roman, Byzantine, Early Islamic, and Ottoman

**Description:** Ruins of a settlement with modern building fragments and architectural details and meager remains from late antiquity were excavated in the northern portion of the site. Artifacts from the site include chipped stone tools, pottery from the MB II through the Ottoman period, as well as Roman and Early Islamic coins.

**References:** Gophna and Beck 1981: 71; Beit-Arieh and Ayalon 2012

26. **NAHAL QANA (3)**

**Site no(s).:** 77.94 (ASI)

**Boundary coordinates (IAA):** NA

**Point coordinates (ASI):** 191985, 672795

**Area:** 1 ha (ASI estimate)

**Periods:** Epipaleolithic, Pre-Pottery Neolithic, EB, Iron I, Persian, Roman, Byzantine, Early Islamic, and Ottoman
**Description:** Scatter of flint tools and pottery sherds, as well as Byzantine and Early Islamic coins. The surveyors posit that the finds were part of a soil fill brought to their current location from another site.

**References:** Beit-Arie and Ayalon 2012

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**27. Jaljuliya (West) [Nahal Qana 4a]**

**Site no(s).:** 14929/0 (IAA); 77.200 (ASI)

**Boundary coordinates (IAA):** 194000, 672100 SW 194200, 672300 NE

**Point coordinates (ASI):** 193950, 672000

**Area:** 4 ha (IAA boundaries)

**Periods:** MB I

**Description:** Burials of two individuals, one child aged nine to ten years and one adult between the ages of twenty-five and forty (Avivi 2005). Pottery and weapons associated with the adult burial dated to the early MB I.

**References:** Avivi 2005

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**28. Triangulation Point 197E [Dhahar Zakur]**

**Site no(s).:** 14037/0 (IAA); 77.110 (ASI)

**Boundary coordinates (IAA):** 198300, 672100 SW 198600, 672500 NE

**Point coordinates (ASI):** 198385, 672196

**Area:** 12 ha (IAA boundaries); 2 ha (ASI estimate)

**Periods:** Iron I
Description: Remains of a settlement that include stone piles, a crushing basin and stone from an oil press, two cisterns, and pottery from Iron I. The boundary area of this site are completely within the IAA-determined site boundaries of Ḥorvat Zakkur (1886/0; see below).

References: Beit-Arieh and Ayalon 2012

29. Ḥorvat Harish

Site no(s).: 1798/0 (IAA); 77.104 (ASI)

Boundary coordinates (IAA): 197000, 672000 SW 198000, 673000 NE

Point coordinates (ASI): 197385, 67209

Area: 100 ha (IAA boundaries); 3 ha (ASI estimate)

Periods: Iron II, Roman, Byzantine, Early Islamic, and Ottoman

Description: Remains of foundations, cisterns, a rock-hewn reservoir and burial cave in addition to pottery from Iron II to the Ottoman period. Salvage excavations revealed a quarry devoid of artifacts.

References: Birman 2004; Beit-Arieh and Ayalon 2012

30. Ḥorvat Zakkur [Khirbet ez-Zakur]

Site no(s).: 1886/0 (IAA); 77.111 (ASI)

Boundary coordinates (IAA): 198000, 672000 SW 199000, 673000 NE

Point coordinates (ASI): 198885, 672096

Area: 100 ha (IAA boundaries); 2 ha (ASI estimate)

Periods: Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic and Ottoman
**Description:** Remains of structures, including wall and foundation fragments and colored tesserae, rock-cuttings, wine and oil presses, crushing surfaces, plastered cisterns, quarries, and burial caves. Many features that have been excavated are dated to the Byzantine period. Surface pottery ranges in date from EB I to Ottoman period.

**References:** Kochavi 1972: 228; Torge 2003; Haiman and Barda 2006; Beit-Arieh and Ayalon 2012

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**31. TELL EDH-DHAHAB**

**Site no(s).:** 7377/0 (IAA); 77.116 (ASI)

**Boundary coordinates (IAA):** 193550, 671620 SW 193680, 671780 NE

**Point coordinates (ASI):** 193585, 671695

**Area:** 21.58 ha (IAA boundaries); 1 ha (ASI estimate)

**Periods:** EB, MB I, Iron II, Persian, Hellenistic, and Roman

**Description:** Remains of settlement from the Early Bronze Age to Hellenistic period including surface scatter of flint tools and pottery. An unwalled settlement of about one-half acre was dated to MB I by Gophna and Beck (1981: 71). A Roman milestone was observed at the site.

**References:** Gophna and Beck 1981: 71, Site 20; Beit-Arieh and Ayalon 2012

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**32. ORANIT (6)**

**Site no(s).:** 77.145 (ASI)

**Boundary coordinates (IAA):** NA

**Point coordinates (ASI):** 199385, 671096

**Area:** 600 m² (ASI measurement)
Periods: Iron II and Persian

Description: Remains of a square enclosure, whose northern wall consists of a double row of large fieldstones. Architectural remains and plastered cistern were noted within the enclosure walls.

References: Beit-Arieh and Ayalon 2012

33. HORSHIM (EAST) [ORANIT (1)]

Site no(s).: 40404/0 (IAA); 77.139 (ASI)

Boundary coordinates (IAA): 198000, 670900 SW 199000, 672000 NE

Point coordinates (ASI): 198785, 671096

Area: 110 ha (IAA boundaries)

Periods: Iron II, Persian, and Byzantine

Description: Remains of square towers and adjacent installations including presses, agricultural terraces, cisterns, and a lime kiln. Surface pottery dates from Iron II to Byzantine.

References: Beit-Arieh and Ayalon 2012

34. KAFR BARA (1)

Site no(s).: 77.158 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 197585, 670796

Area: 1.5 ha (ASI measurement estimate)

Periods: EB, Iron II, Roman, Byzantine, Early Islamic, Crusader, Late Islamic, and Ottoman
Description: Stratified tell presently cultivated with outline of northern city wall visible, foundations of structures, cisterns, wine and oil presses, crushing basin, burial caves, and arcosolia tombs. Pottery ranges in date from the Early Bronze Age to Ottoman period, and tesserae were collected.

References: Beit-Arieh and Ayalon 2012

35. ORANIT (7)
Site no(s).: 77.182 (ASI)
Boundary coordinates (IAA): NA
Point coordinates (ASI): 198585, 670696
Area: NA
Periods: Iron II, Persian, Hellenistic, Roman
Description: Remains of a square building (6 x 6 m) and a column fragment near the top of a hill with Persian through Roman period pottery nearby, and the ruins of a trapezoidal structure (4.1 x 7 m), winepress, and stone clearance pile southeast of the hill from which Iron Age pottery was collected.
References: Beit-Arieh and Ayalon 2012

36. HORSHIM (SOUTHEAST) [ORANIT (8)]
Site no(s).: 40406/0 (IAA); 77.183 (ASI)
Boundary coordinates (IAA): 198500, 669950 SW 199050, 670900 NE
Point coordinates (ASI): 198885, 670696
Area: 52.25 ha (IAA boundaries)
**Periods:** Iron II, Persian, and Hellenistic

**Description:** Remains of two groups of buildings delimited by enclosure walls and associated agricultural installations nearby including two winepresses, crushing stone of an oil press, agricultural terraces, tomb, and burial cave.

**References:** Finkelstein 1981: 331–32; Beit-Arieh and Ayalon 2012

37. **KAFR BARA (20)**

**Site no(s).:** 77.168 (ASI)

**Boundary coordinates (IAA):** NA

**Point coordinates (ASI):** 197685, 670496

**Area:** NA

**Periods:** Iron II and Persian

**Description:** Rock-hewn installations including two winepresses, cistern with capstone and trough, circular burial cave with six loculi; arcosolia tombs, and a quarry. Pottery collected during survey dated to Iron II or Persian period.

**References:** Beit-Arieh and Ayalon 2012

38. **NAHAL YARKON (SOUTH)**

**Site no(s).:** 40403/0 (IAA); 77.147 (ASI)

**Boundary coordinates (IAA):** 190200, 669950 SW 190500, 670150 NE

**Point coordinates (ASI):** 190285, 669995

**Area:** 6 ha (IAA boundaries); 0.5 ha (ASI estimate)

**Periods:** MB I
Description: Ash pits, rubble, and pottery near the Yarkon River. Gophna and Beck (1981: 74) estimate the site size as one-half acre.

References: Gophna and Beck 1981: 74, Site 29; Beit-Arieh and Ayalon 2012

A.3.3 *Map of Tel Aviv-Yafo (MR 70)*

39. **TEL AVIV, SDE DOV**

Site no(s).: 913/0 (IAA); 70.3 (ASI)

Boundary coordinates (IAA): 179000, 668000 SW 179900, 669800 NE

Point coordinates (ASI): 179465, 668724

Area: 81 ha (IAA boundaries)

Periods: EB I, EB IV, MB I

Description: An elliptical depression (20 x 9 m) dug into the *kurkar* sandstone filled with strata of sand and clay soil, likely indications of seasonal abandonment, between which traces of occupation including ash, pottery, and animal bones were recovered. Remains of ovens and hearths as well as carbonized cereal kernels were also discovered in a higher level. Near the elliptical feature, excavators found a burial cave containing human bones and bronze vessels dating to the EB IV as well as pottery and flint objects from the EB I.

References: anon. 1971a: 24; Kaplan 1972: 75–76; Gophna and Beck 1981: 73; Kaplan and Ritter-Kaplan 1993b; Gophna 2015a

40. **TEL AVIV, ESH-SHUNA [TELL QUDADI]**

Site no(s).: 912/0 (IAA); 70.5 (ASI)

Boundary coordinates (IAA): 179000, 667700 SW 179300, 668000 NE
**Point coordinates (ASI):** 179035, 667974

**Area:** 9 ha (IAA boundaries)

**Periods:** Chalcolithic, EB, MB, Iron II, Persian, and Byzantine

**Description:** Remains of a large structure, interpreted as a fortress, consisting of foundation and some walls built of roughhewn *kurkar* stones with an inset-offset wall of a later phase built parallel to the earlier phase. While Avigad (1993: 882) dated the fortress to the ninth century B.C.E., Fantalkin and Tal re-dated the construction to the eighth century B.C.E. (2009: 197). Another ashlar and fieldstone wall of the pier-and-rubble method north of the fortress was dated to the Persian period. Persian and Byzantine period pottery was found at the site.

**References:** Avigad 1993a; Fantalkin and Tal 2009; Gophna and Paz 2011; Gophna 2015a

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41. **Tel Aviv, Slaughterhouse Hill [Giv‘at Beth Ha-Mitbahayim]**

**Site no(s).:** 910/0, 25935/0 (IAA); 70.11 (ASI)

**Boundary coordinates (IAA):** 179250, 666700 SW 179700, 667000 NE

**Point coordinates (ASI):** 179555, 666764

**Area:** 13.5 ha (combined IAA boundaries)

**Periods:** Chalcolithic, EB I, EB IV, MB II, Iron IIA, Persian, Hellenistic, Roman, and Byzantine

**Description:** Remains of an unwalled settlement dated to MB II including a pottery kiln and a burial cave. Additional finds included clay and stone loom weights and ceramic figurines (Kaplan 1951: 31). Filled with debris and potsherds, circular installations hewn into the *kurkar* bedrock were interpreted as granaries dated to the Middle Bronze Age (anon. 1965: 9).

Excavations of a collapsed cave roof resulted in the discovery of a pottery kiln in the upper
layers of soil (Kaplan 1957: 29). The lower portion of the kiln, including vessels for firing, and part of its chimney were well preserved. Later fieldwork at Hill Square encountered pits containing ash, animal bones, and pottery dated to the MB II–III (anon. 1971b: 26). On Shimeon Ha-Tarsi Street nearby, a cemetery dated to MB III–LB I was discovered but was destroyed prior to salvage efforts (Kaplan and Ritter-Kaplan 1993b: 1454). Excavations on Yehoshu’a ben-Nun Street exposed a portion of another kiln with piers constructed of mudbricks that was partially hewn into the kurkar bedrock (Sari 2000). Pottery inside the kiln dated to the MB I.

Iron Age material seems to be limited to ceramics. Reports from the mid-1960s mention tenth century remains, but give no further information as to the types of features or material culture found at the site (anon. 1965; Kaplan 1966: 283). Pottery found at the site was dated to the “First Temple period,” later narrowed to the eighth century B.C.E. (Kaplan 1951: 31; Kaplan and Ritter-Kaplan 1993b: 1454). The Kaplans suggested that the eighth century B.C.E. finds at Slaughterhouse Hill, Hill Square, and nearby Yehoshu’a ben-Nun and John Hyrcanus Streets belonged to forward camps of Hezekiah’s allies during Sennacherib’s 701 B.C.E. campaign, but Fantalkin and Tal argue that the smaller settlements in the Tel Aviv region were simply part of Jaffa’s agricultural hinterland (2009: 243).


42. TEL AVIV, GAN HA-NEVI’IM

Site no(s).: 27329/0 (IAA); 70.12 (ASI)

Boundary coordinates (IAA): 179030, 666650 SW 179220, 666900 NE

111 Further examination of the stratigraphy beneath the collapse revealed that the cave was used for habitation in the Chalcolithic and EB, and the roof of the cave collapsed sometime between the EB and MB II (Kaplan 1957: 30).
Point coordinates (ASI): 179075, 666744

Area: 4.75 ha (IAA boundaries)

Periods: MB and Roman

Description: Tombs and hewn burial cave from the Middle Bronze Age and Roman periods.

Kaplan (1955a: 7) notes a single Middle Bronze Age grave at the site

References: Kaplan 1953: 159, 1955a: 7; Gophna 2015a

43. TEL AVIV, HAVAKKUK STREET [GIVAT NAHSHON]

Site no(s).: 880/0 (IAA); 70.7 (ASI)

Boundary coordinates: 179000, 667700 SW 179300, 668000 NE

Point coordinates: 178575, 666874 (ASI)

Area: 1 ha (IAA boundaries)

Periods: MB II–III, Roman

Description: Cemetery consisting of eighteen shaft tombs dated to the late MB II–III. Thirteen graves had a singular burial cavity, three had two burial chambers, and two contained three niches. Due to the acidity of the soil, only the bones in two tombs remained, but Kaplan estimated that twenty-five individuals were buried in the cemetery (1955: 2). Funerary deposits were recovered from every tomb, and the typical ceramic assemblage comprised two or three storage jars (usually located near the deceased’s feet), a dipper juglet near the jars, piriform or cylindrical juglets near the head, and three to four simple or carinated bowls. Other grave goods include bronze toggle pins, two bronze swords and a bronze axe, a pair of gold earrings, various fragments of metal bracelets, amethyst and carnelian beads, and twenty-four scarabs. Leibovitch suggested that one of the scarabs bore the name  m3 ‘t-k3-r’, the prenomen of Queen Hatshepsut.
Overall, the form and decoration of the scarabs suggest a date at the end of the Hyksos period and beginning of Dynasty 18 (Leibovitch 1955: 18).

References: Kaplan 1955a; Leibovitch 1955; Gophna and Beck 1981: 74; Gophna 2015a

44. PORT OF JAFFA, UNDERWATER AREA

Site no(s).: 26148/0, 4422/0, 27405/0

Boundary coordinates: 175700, 660200 SW 176200, 663300 NE112

Area: 243 ha (combined IAA boundaries)

Periods: LB, LB II–Iron I, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Crusader, Late Islamic, and Ottoman

Description: The IAA database notes the “remains of an ancient anchorage, and remains of ships and cargo” including anchors, pottery and metal vessels of various periods since the Late Bronze Age. However, the archaeological features area all terrestrial elements such as structural remains, graves, etc., and the license numbers echo those of Jaffa (Site 46 below). Underwater survey south of the modern port recovered abraded finds from “rocky expanses” that dated from the Persian and Roman periods (Sharvit and Galili 2002: 54*). An abrasion platform with evidence of quarrying was also discovered but was not datable. Within the port and near the breakwater, the surveyors recovered pottery from the Byzantine through Ottoman periods and glass bracelet pieces and pipe fragments from the Ottoman period in addition to three small perforated stone anchors that were not able to be dated (Sharvit and Galili 2002: 54*–55*).

References: Sharvit and Galili 2002

112 The boundary coordinates comprise three areas that partially overlap with those of terrestrial Jaffa.
45. JAFFA, UNDERWATER AREA

Site no(s).: 38088/0

Boundary coordinates: 176500, 662900 SW 176800, 662980 NE\textsuperscript{113}

Area: 2.4 ha (IAA boundaries)

Periods: LB, Persian, Hellenistic, Roman, Crusader, and Ottoman

Description: The IAA database describes the area as having “remains of wrecks and cargoes: anchors, ceramic and metal vessels” from various periods, but all associated license numbers refer to terrestrial salvage operations. To date, no remains of shipwrecks or their cargoes off the coast north of Jaffa have been published although some material culture has been recovered from the port and underwater area south of the modern harbor (see below).

References: NA

46. JAFFA

Site no(s).: 823/0, 823/1, 25945/0 (IAA); 70.25 (ASI)

Boundary coordinates (IAA): 176000, 661500 SW 177500, 662900 NE

Point coordinates (ASI): 176775, 662384

Area: 201 ha (combined IAA boundaries)

Periods: EB, MB II, LB, Iron I, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Crusader, Late Islamic, and Ottoman

Description: Stratified habitation site and port consisting of an upper mound with settlement remains from the Iron Age forward on the southern and eastern lower slopes. Excavations of the tell discovered pottery from the Early Bronze Age to Ottoman periods and architecture and

\textsuperscript{113} The boundary coordinates lie to the north of Jaffa off the coast and indicate a physical separation from other Port of Jaffa, Underwater Area sites.
burials from the Middle Bronze Age to Ottoman periods, including a monumental gateway to a
citadel dated to the Late Bronze Age Egyptian occupation of the site. Operations in the lower
city found Middle Bronze Age and Late Bronze Age tombs, fragmentary Iron Age architecture
and installations, in addition to architecture, graves and pottery from almost every period
succeeding the Iron Age.

_Upper Mound_-Continuing excavations in an area on the ancient mound already dug by P.L.O.
Guy from 1948 to 1950, the University of Leeds expedition reported finding Iron Age ashlar
blocks in reuse as well as “one or two minute fragments of burnished ware in the Iron Age
tradition, and a Cypriote ‘milk bowl’ sherd from the Bronze Age” (Bowman, Isserlin, and Rowe

In 1955, Jacob Kaplan began excavations on behalf of the Museum of Antiquities of Tel
Aviv-Jaffa in an area cleared of old Ottoman period houses that he designated Area A. Kaplan
continued excavations at Jaffa in Area A and other areas (B, D, G, F, H, J, X, and Y)
intermittently until 1974 (Kaplan 1972; Kaplan and Kaplan 1993a). Z. Herzog of Tel Aviv
University also conducted excavations in Kaplan’s Area A in 1997 and 1999 and largely
confirmed Kaplan’s observations (Herzog 2008). Since 2007, the Jaffa Cultural Heritage Project
under the direction of A. Burke and M. Peilstöcker has sought to reevaluate Kaplan’s
excavations as part of a larger project within Jaffa that also includes the scientific publication of
Kaplan’s excavated material. Following two seasons in the Jaffa Visitor’s Center (Kaplan’s Area
C; Burke, Peilstöcker, and Pierce 2014), fieldwork commenced in the Ramses Gate portion of
Area A to clarify Kaplan’s stratigraphy.

The earliest remains Kaplan encountered were Middle Bronze Age burials dated to the
MB II–III in Area Y, adjacent to St. Peter’s Church. An infant jar burial was accompanied by a
red burnished juglet and a scarab. Additional burials in the area date from the same period but were disturbed by the construction of features that Kaplan interpreted to be kilns, also dated to the Middle Bronze Age (see Kletter and Gorzalczany 2001). Kaplan also dated two mudbrick walls in Area A to the seventeenth century B.C.E. (MB II; Level VII) but claimed that the southern wall was built on an earlier rampart of beaten earth and kurkar that he assigned to Level VIII. Sections of a rampart of similar construction that Kaplan dated to the eighteenth century B.C.E. (MB II) were found in Area B under a glacis dated to the eighth century B.C.E. (see discussion below).

The earliest Late Bronze Age material (Level VI) appeared as mudbrick walls on stone foundations to the north and south of a monumental gateway dated to the reign of Ramses II. Ceramics from Level VI south of the gate consisted of imported Cypriot Monochrome and Base Ring wares. To the north of the gate, a pit dated to the LB I contained the likely remains of an infant jar burial that contained a carinated bowl, gray burnished juglet, clay rattle, and a handleless goblet rendered with a bichrome horizontal paint scheme. Pits in Area Y contained LB I material. A monumental gateway consisting of a passageway cut through preceding occupational layers and was flanked by mudbrick towers to the north and south of the passageway. Kaplan only distinguished two phases of gate in this area: an earlier construction phase of red orange bricks made of hamra (Level IVB) to which sandstone blocks bearing the names of Ramses II were attached as a façade and a later phase of gray bricks built directly over the preceding gate. Throughout Kaplan’s publications, it is clear that he assumed that the Ramses Gate was constructed during the pharaoh’s reign (Kaplan and Kaplan 1993: 656), and Herzog (2008: 1791) also states that the gate was built in the LB IIB. Recent excavations by the JCHP have detailed several phases of construction and repair to the gate starting in the LB IIA and
continuing through its destruction in the LB IIB. Excavations have also recovered numerous cedar beams that framed and supported the gate’s superstructure, antlers from deer taken as trophies and hung in the gateway, and countless botanical samples of seeds that will shed light on the agricultural yield in the area around Jaffa (Burke et al. forthcoming) Kaplan attributed a succeeding gateway to Level IVA, which he also dated to the late thirteenth century BC. This layer included two walls made of gray mudbrick flanking the citadel entrance and a passageway paved with stones and pebbles (Kaplan and Kaplan 1993a: 656). The sequence of construction elucidated by the JCHP excavations confirms this and shows that the gate was built directly on a sandy fill deliberately laid on a leveling course of mudbrick-like material of detritus raked to level the area, a technique reminiscent of other Egyptian constructions eschewing stone foundations for mudbrick structures. The presence of Egyptians and an Egyptian garrison at Jaffa is soundly attested not only through monumental architectural features such as the Ramses Gate façade but also through the copious amounts of Egyptianized ceramics and imported vessels from Egypt recovered from layers dating from the LB IB to early Iron IA (ca.1460–1150/1140 B.C.E.; see Burke and Lords 2010 and Burke and Mandell 2011). The Level IVA gate also suffered conflagration, and Kaplan found a bronze gate hinge near the left jamb. In addition to the monumental gateway, excavators encountered a building west of the gate with a plaster floor on which rested the skull of a lion with a scarab nearby bearing the name of Queen Tiy, the wife of Amenhotep III. The so-called “Lion Temple” was dated by Kaplan to the end of the thirteenth and beginning of the twelfth centuries B.C.E. (LB III / Iron IA), but Herzog asserts that the building should date to the LB IIA based on the scarab of Queen Tiy and the superposition of mudbricks similar to the Level IVA gate (2008: 1791).114

114 As a complement to the Queen Tiy scarab, Herzog’s excavations found a commemorative scarab of Amenhotep III in the gateway that recounts the king’s successful hunt of 102 lions (Sweeney 2003).
Iron I (Level IIIB) material at Jaffa consists of Philistine pottery recovered from a fragmentary floor, pits, and ash layers south and west of the gate in both the Ramses Gate and Lion Temple sectors of Area A. Herzog also found sections of walls and floors north of the gate and pits south of the gate containing material dated to the eleventh and eighth centuries B.C.E. (Iron IB and IIB). In the eastern portion of Area A, a fragment of a stone wall adjoining a sloping stone floor were also dated to the eighth century B.C.E. (Level IIIA). A stone-lined glacis also dated to this period was uncovered during excavations under the floors of the Hammam building adjacent to the Jaffa Museum (Keimer 2011). This glacis was constructed of a layer of stones overlying a sandy layer beneath which courses of mudbricks were laid. In the Lion Temple area, the Iron II consists of layers of debris and ash without any architectural elements. Two cattle burials from were found in these layers, raising questions of cultic activity at the site during the Iron II. Pottery from these layers dates from the eighth to sixth centuries B.C.E. and shows affinities with both northern Israelite and Phoenician forms and southern Judahite forms as well. In other excavations on the northern slope of the ancient mound, M. Peilstöcker found domestic Iron Age pottery in a layer of dark brownish-gray soil under the bottom of a pit in the courtyard of a structure dated to the Ottoman period (Peilstöcker 2005). The amount of Iron Age pottery from the layer beneath the pit is suggestive of occupational debris rather than sherds that have washed down the slope of the mound.

*Lower City*—The settlement was located mainly on mound and adjacent slopes during the Bronze Age as attested by ceramics and fragments of fortifications and monumental buildings found on the upper tell (Arbel and Peilstöcker 2009: 35–36). Excavations have encountered no settlement remains from the Bronze Age south and east of the ancient mound. Operations at 38 Yefet Street south of the tell found an MB II infant jar burial with additional graves goods consisting of a
carinated bowl and a juglet (Avner-Levy 1998: 55). Work at the corner of Yefet and Louis Pasteur Streets uncovered fifteen additional graves of various types (pit, cist, kokhim, and a storage jar burial) dated to the MB II, Late Bronze Age, Persian and Hellenistic periods with other burials being destroyed by mechanical equipment (Ayash and Bushnino 1999: 97*).\(^{115}\) Two pit graves, one partly lined with stones, dated to the LB I were exposed at the Ganor Compound (Peilstöcker 2011b). In each grave one or two deceased were buried, along with funerary offerings that included locally-produced juglets, Cypriot Base Ring juglets (bilbils) and a Syrian imitation of a Cypriot Red Lustrous Wheelmade bottle (Yannai, Gorzalczany, and Peilstöcker 2003). Indications of three rock-hewn tombs, two caves and a discernible shaft that likely led to another tomb, were observed during the excavations of the French Hospital at the foot of the southeastern slope of the ancient tell (Re’em 2010). One burial cave that had collapsed but was not excavated contained fragments of jars, juglets, and Cypriot White Slip bowls (Re’em 2010: fig. 4:1).

The early stages of the Iron Age the area east of tell represented only a few potsherds. Five installations consisting of pits with plastered interiors and surfaces sloping toward oval depressions and serving as collecting vats for winepresses were excavated in Area F of the Ganor Compound (Fantalkin 2005). These installations were dated by the excavator to tenth–ninth centuries B.C.E. (Iron IIA) based on red-slipped, hand-burnished pottery recovered from the fill soil within them (Fantalkin 2005: 7).\(^{116}\) Presses of this type were also found at Tell Qasile and Tel Michal (Ayalon 1993, 1994; Herzog 1989: 73–75), and the similarities in presses in the

\(^{115}\) Another grave that may have been part of the larger cemetery was destroyed prior to the installation of telephone lines in Yehuda Ha-Yamit Street (Kapitaikin 1999: 98*).

\(^{116}\) M. Peilstöcker, who directed excavations in other areas at the Ganor Compound, disagrees with this dating based on his own excavations that revealed the same type of winepresses that contained later sherds in the fill soil (Peilstöcker, pers. comm.). Faust also disagrees with Fantalkin’s dating of the ceramics to the ninth century B.C.E. following the low chronology (Fantalkin 2005: 17–18), and Faust argues that the assemblage better fits a tenth century date (2007: 69, n. 9).
coastal region may indicate similar adaptation to the local geology. Salvage excavations around Clock Tower Square at the foot of the northeastern slope of the tell found Iron Age floors and pottery, but a large exposure of these remains was not possible due to safety precautions (Peilstöcker 2009). At the Postal Compound, a carinated bowl rim dated to the seventh century B.C.E. and imitative of an Assyrian form was found in soil covering some kurkar rubble that may be collapse from a nearby, unexcavated building (Rauchberger 2010). Excavations in the Flea Market on Rabbi Hanina Street exposed a structure built of fieldstones bonded with plaster with an interior coating of plaster, likely used for a water reservoir or industrial installation (Arbel 2008). Sherds from the installation date to the late Iron Age or transition to the Persian period. A concentration of pottery was found on the floor level of bedrock in Rabbi Pinchas Street, approximately fifteen meters north of the installation, but not in association with any architecture. Remains of buildings and floors of the period were encountered at the Ganor Compound. These building remains may belong to small farms that existed at the edge of town (Arbel and Peilstöcker 2009). Work in several areas stretching along the length of Jerusalem Boulevard uncovered Iron Age and Persian period ceramic fragments beneath a layer of sandy soil underlying a Byzantine period road; no associated features were discovered (Jakoel 2011). Finds dating to the Iron Age were also found in a mixed context of a Hellenistic period cemetery and during fieldwork on Koifmann Street that mainly found Late Ottoman structures (Jakoel 2012a; Jakoel and Marcus 2011). In excavations around the Sabil Suleiman and in Mifraz Shlomo and Roslan Streets, Iron Age pottery was found in a dense clay layer (Arbel, Hater, and Yechielov 2012). Ash lenses were also distinguished together with the Iron Age pottery in the area around the water fountain as well as fragmentary remains of a wall. The discovery of Iron Age remains in the lower city is unique given the paucity of Iron Age material on the tell.
References: Bowman, Isserlin, and Rowe 1955; Kaplan and Ritter-Kaplan 1993a (additional preliminary reports for Kaplan’s excavations at Jaffa area listed in Burke 2011c); Avner-Levy 1998; Fantalkin 2005; Peilstöcker 2005, 2009; Arbel 2008; Arbel and Peilstöcker 2009; Rauchberger 2010; Re’em 2010; Jakoel 2011, 2012a; Jakoel and Marcus 2011; Peilstöcker and Burke 2011; Arbel, Hater, and Yechielov 2012; Burke, Peilstöcker, and Pierce 2014; Gophna 2015a; Burke et al. forth.

A.3.4 Map of Petah Tikva (MR 71)

47. TEL AVIV, HA-GUSH HA-GADOL (UNOFFICIAL NAME)

Site no(s).: 25934/0

Boundary coordinates: 179600, 669200 SW 180000, 669800 NE

Area: 24 ha (IAA boundaries)

Periods: MB, LB, Iron, Persian, Hellenistic, Roman, and Byzantine

Description: Scattered pottery ranging in date from the Middle Bronze Age to Byzantine period. This may not represent an actual site, but a general designation for the northern Tel Aviv area.

References: NA

48. TEL AVIV, RAMAT HA-HAYYAL [SHEKHUNAT ‘OLE SHANGHAI]

Site no(s).: 1044/0, 1044/3, 28433/0 (IAA); 71.1 (ASI)

Boundary coordinates (IAA): 184200, 668090 SW 185100, 669450 NE

Point coordinates (ASI): 184585, 669265

Area: 122.4 ha (overall IAA boundaries)

Periods: EB IV, MB I, Hellenistic, Roman, Byzantine, Early Islamic, Crusader, and Ottoman
**Description:** Remains of structures, installations, artifacts, and evidence of quarrying ranging from the Hellenistic to Ottoman periods. Two EB IV tombs have been discovered at the site in addition to an individual MB I grave reported by Kaplan and Ritter-Kaplan (1993b; Yankelevitz 1999). An Iron II krater fragment was recovered from a mixed context within a partially-quarried cave (Buchennino 2010).

**References:** Kaplan and Ritter-Kaplan 1993b; Yankelevitz 1999; Buchennino 2010; Gophna 2015b

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49. **TEL AVIV, EL HADDAR**

**Site no(s).:** 1045/0 (IAA); 71.13 (ASI)

**Boundary coordinates (IAA):** 183000, 668000 SW 184000, 669000 NE

**Point coordinates (ASI):** 183585, 668095

**Area:** 10 ha (IAA boundaries)

**Periods:** Iron Age, Roman, Byzantine, Early Islamic, and Ottoman

**Description:** Some architectural remains related to the mills, dams, and walls near the river bank. Scatters of flint tools and pottery from the Iron Age, Roman, Byzantine, and Early Islamic periods. Coins from the Ottoman Period were found near a wall.

**References:** Elisha 1996; Buchennino 2006b; Gophna 2015b

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50. **NAHAL YARKON (3)**

**Site no(s).:** 9510/0 (IAA); 71.21 (ASI)

**Boundary coordinates (IAA):** 186800, 668600 SW 187100, 668900 NE

**Point coordinates (ASI):** 186915, 668875
Area: 9 ha (IAA boundaries)

Periods: MB, Iron II, Persian, Hellenistic, and Late Roman

Description: Dense sherd scatter on west bank of Yarkon River. Ceramics, flint tools and basalt fragments were found.

References: Gophna 2015b

51. Petah Tikva, Abu ‘Eid [Sgulla-Yarkonim Station (West)]

Site no(s).: 1271/0 (IAA); 71.22 (ASI); Gophna and Beck 1981, Site 28

Boundary coordinates (IAA): 189050, 668570 SW 189310, 668690 NE

Point coordinates (ASI): 189185, 668665

Area: 3.12 ha (IAA boundaries)

Periods: MB II and Persian

Description: Remains of an unwalled settlement of about one acre dated to MB II as well as scattered pottery from Persian period.

References: Gophna and Beck 1981: 74; Broshi and Gophna 1986: 84, Table 9; Gophna and Portugali 1988: 26; Gophna 2015b

52. Tel Aviv, Exhibition Gardens [Ganei Ha-Ta‘arukha]

Site no(s).: 6086/0 (IAA); 71.8, 71.27 (ASI); Gophna and Beck 1981, Site 24

Boundary coordinates (IAA): 181400, 667700 SW 182000, 668650 NE

Point coordinates (ASI): 182485, 668355 (71.8); 181285, 667714 (71.27)

Area: 57 ha (IAA boundaries)

Periods: Chalcolithic, EB, MB I, Hellenistic and Ottoman
**Description:** Remains of an oval structure and channel dated to the Chalcolithic period and a MB I cemetery. In the 1971 excavations, four tombs, one of which was badly damaged, were excavated that contained human remains and pottery dated to MB I. Near a skull in one of the tombs was a Tell el-Yehudiyyeh juglet with a depiction of a ship rendered in the characteristic style of that ware. The preliminary report equates the ceramics from this cemetery with those recovered from Sde Dov (anon. 1971: 26). Other scant remains dated to the MB I overlaid Chalcolithic material and were likely related to the tombs. Early Bronze Age sherds were found in fills covering the Chalcolithic stratum. Kaplan and Ritter-Kaplan (1993b: 1454) stated that seven graves were cleared at the Exhibition Gardens; details of when the other three tombs were excavated or their contents is lacking.

Later salvage excavations conducted a geomorphologic study that discovered a swamp adjacent to the site and identified that a portion of the site subsided toward a wadi channel (S. Golan 2009). Complete vessels dated to the MB I were found, and petrographic analysis indicated that they were manufactured locally. Other artifacts include animal bones, shells, stone vessels, and a bronze chisel.

**References:** anon. 1971b; Gophna and Beck 1981: 73; Kaplan and Ritter-Kaplan 1993b; S. Golan 2009; Gophna 2015b

### 53. TEL AVIV, HADAR YOSEF

**Site no(s).:** 1046/0 (IAA); 71.9 (ASI); Gophna and Beck 1981, Site 3

**Boundary coordinates (IAA):** 183000, 668100 SW 183200, 668400 NE

**Point coordinates (ASI):** 182705, 668315

**Area:** 7.54 ha (IAA boundaries)
**Periods:** MB I, Roman, and Byzantine

**Description:** Cemetery demolished by drainage project in 1958 containing MB I burials; no information about the grave types or burial customs is available. Kaplan and Ritter-Kaplan (1993b: 1454) only mention individual graves in the Hadar Yosef area but give no further detail. The whole vessels recovered during salvage excavations date to Pre-Palace Phase at Aphek.

**References:** Gophna and Ayalon 1980: 149; Gophna and Beck 1981: 48–50, fig. 3; Kaplan and Ritter-Kaplan 1993b: 1454; Gophna 2015b

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**54. TEL AVIV, ESH SHEIKH MUNIS**

**Site no(s).:** 4198/0 (IAA); 71.7 (ASI)

**Boundary coordinates (IAA):** 181400, 668100 SW 181700, 668300 NE

**Point coordinates (ASI):** 181505, 668215

**Area:** 60 ha (IAA boundaries)

**Periods:** MB I, Byzantine, Crusader, Late Islamic, and Ottoman

**Description:** Remains of a settlement dated to the Crusader period with tombs dated to the Byzantine period. In the winter of 1986, a grave was discovered, as a result of erosion, on the eastern slopes of a hill that was previously the Arab village of Sheikh Munis (now Tel Aviv University). From the tomb, a jar handle dating to the MB I and a dagger with a cast bronze blade with five reinforcing ridges were recovered (Yosef 1986–1987). A few graves from this period were damaged in previous construction efforts.

**References:** Yosef 1986–1987; Dayan, Ajami, and Nagar 2012; Gophna 2015b
55. TELL QASILE (WEST) [RAMAT AVIV (1)]

Site no(s).: 25354/0 (IAA); 71.23 (ASI)

Boundary coordinates: 180200, 667500 SW 180600, 668600 NE

Point coordinates (ASI): 180795, 667934

Area: 44 ha (IAA boundaries)

Periods: MB II, Persian, Hellenistic, and Ottoman

Description: Settlement remains including mudbrick rubble and items associated with food production such as animal bones, cooking pots, and basalt grinding stones. The ceramic assemblage is dated by parallels at Aphek to a late phase of the MB I (Kletter and Ayash 2000: 35*). Ten pit graves containing one to three individuals, animal bones, and pottery dated to MB II. An oval cavity hewn into the kurkar bedrock contained the remains of seven adults deposited in secondary burial (Kletter and Ayash 2000: 36*). In addition to the graves, two pottery kilns were found comprising an oblong installation with a fuel chamber and earthen pillars to support the floor of the fire box. Sherds from the ash and debris at the bottom of the kiln date to the MB II.

A. Glick (2008) supervised a salvage excavation of several rock-hewn installations and pit graves. A damaged pit grave with few non-diagnostic sherds had a comparable outline to Middle Bronze Age tombs excavated in the vicinity. Glick (2009b) also excavated remains of a rock shelter that protected a semicircular depression that may have functioned as a tabun. Two bowls and a dipper juglet dated to the MB II were found just above a bedrock surface associated with the so-called tabun. An adjacent rock cutting, possibly a grave, also contained MB II potsherds but was only partly excavated. Across the excavated area, the MB II ceramic assemblage, which includes bowls, a goblet, a krater, cooking pots, and jars, evinces a more
extensive occupation of the site during that period than previously thought. Middle Bronze Age sherds together with Hellenistic and Ottoman pottery were found in depressions cut into kurkar at the site (Glick 2009a, 2009b).

Later features include portions of an agricultural settlement of the Hellenistic period, Roman-Byzantine agricultural installations, and Ottoman refuse pits. A burial attributed to the Persian period was also excavated.

References: Kaplan 1959: 45; Kletter and Ayash 2000; Cohen-Weinberger 2006; Kletter 2006; Nagar 2006; Sade 2006; Glick 2008, 2009a, 2009b; Gophna 2015b

56. TELL QASILE

Site no(s.): 946/0 (IAA); 71.24 and 71.26 (ASI)\(^{117}\)

Boundary coordinates (IAA): 180600, 667500 SW 180900, 667800 NE

Point coordinates (ASI): 180755, 667664

Area: 9 ha (IAA boundaries)

Periods: Pottery Neolithic, EB IV, MB I–II, Iron I, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Crusader, and Late Islamic

Description: Stratified tell on the northern bank of the Yarkon River. With the exception of ephemeral settlement remains dated to the EB IV, research and salvage excavations have revealed architecture and material culture on the mound dating from the Iron Age IB to the Late Islamic period with few occupational gaps. Prior to excavations, two Hebrew ostraca, both

\(^{117}\) Although Gophna (2015b) lists Tell Qasile and an adjacent site named “Eretz Israel Museum Tel Aviv” as separate entries in the Map of Petah Tikva (Sites 71.24 and 71.26, respectively), the latter site is composed of industrial installations and burials ranging from the EB IV to the Ottoman period on the peripher of Tell Qasile, which likely functioned as an industrial zone for the settlement at Tell Qasile. As such, both sites are treated together in this catalog.
administrative in nature, were found on the tell’s surface; the first was discovered by the Kaplans and the second by R. Hoff (Maisler 1950–1951: 208–11).

To the east of Tell Qasile, E. Ayalon (1985: 107) excavated a pottery kiln with MB I ceramics and a deposit of pottery that may have been kiln wasters. It is possible that this is an industrial site related to Tel Gerisa. At the foot of the western slope, a cavity hewn into kurkar, likely a portion of a pit burial, contained a storage jar with a dipper juglet inside (Ayalon and Harpazi Ofer 2004). Part of another storage jar and a bowl were found nearby. Additionally, a few MB I sherds were found on bedrock during excavations on the as well as a few MB II burials to the east and west of the site (Mazar 1980: 9).

In Area A, excavated in 1949 by B. Maisler (Mazar), the earliest Iron Age remains encountered in excavations belong to large structures constructed of mudbricks and kurkar stones and a pavement consisting of large stone slabs (Stratum XII; late twelfth to early eleventh centuries B.C.E.). These buildings suffered conflagration and intrusion by later building activities. The next phase of architecture, Stratum XI, was built on a different plan than Str. XII and consists of a building built of kurkar stones with furnaces and adjacent crucibles for smelting copper inside and a 5.5 m thick fortification wall and a 6 m thick glacis on the west side of the mound (Maisler 1950–1951: 75, 125). Both strata had plain wares associated with the Canaanite ceramic tradition and decorated pottery in the Philistine bichrome and “degenerate monochrome” motifs.

The architecture of Stratum X (late eleventh to early tenth centuries B.C.E.) was better preserved and a residential quarter could be discerned in the southern portion of the tell. A northern insula consisted of two rows of houses surrounded on three sides by streets and accessible only from the street (Buildings K, J, and W). The houses comprised a corner courtyard
bordered by two adjoining rooms on the long and narrow sides of the courtyard. Pavements and rows of columns in the courtyard suggest that the area was roofed. Rooms within this insula’s buildings functioned as workshops, storage rooms, and dwellings. Further analysis revealed that these buildings were modified to become “four room houses” in Str. X (Mazar 1980: 74). Separated by a street, the southern insula was formed by two houses (Buildings Q and R) and a building on the western end of the insula with a double row of columns (Building Z), intimating that it was likely used as a storehouse (Mazar 1980: 75). In contrast to Str. XI, which likely ended as a result of an earthquake, Str. X was destroyed by fire. In addition to red-slipped pottery, iron implements are present for the first time in this stratum.

Following the destruction of Str. X, new buildings of Stratum IX appeared. The fortifications of Str. XII–X fell out of use, and a row of adjoining houses was built in its place. Collapse from the buildings of the northern insula was cleared away, and the inhabitants of the southern insula structures, re-styled as four room houses, dug silos in the area to the north. East of the remains of the northern insula, a large building consisting of two wings has been interpreted as an official’s residence based on the large mudbrick benches in the northern wing that may have functioned as a reception hall with a residence while the southern wing comprising four narrow rooms served as a storehouse (Building L; Maisler 1950–1951: 197–201; Mazar 1980: 75). All of these buildings continued in use intro Str. VIII but were replaced in Str. VII, although remains from this layer were mostly destroyed by the Persian period building activities in Str. VI. While the original excavators dated Str. IX to the tenth century B.C.E. (Iron IIA) and Str. VIII and VII to the ninth and eighth centuries B.C.E., respectively, closer examination of the stratigraphy and ceramics by A. Mazar (1980: 10–11) resulted in a correction to the stratigraphy of the early excavations after recognizing that Str. XII–XI were incorrectly
dated. Based on the continuity of architecture in Area C (see below) and a better recognition of
tenth century ceramic forms, Mazar proposed that Str. IX dated to the first half of the tenth
century and Str. VIII to the second half of the tenth century. According to his reconstruction, Tell
Qasile suffered destruction at the end of Str. VIII and was not occupied again until the seventh
century B.C.E., eliminating Str. VII and an eighth century B.C.E. occupation altogether. This
revised chronology of Tell Qasile raises questions about the paleographically dated ostraca and
their presence at a presumably abandoned site. The remaining strata (Str. VI–I) retained their
assigned dates from the Persian period to the Early Islamic.

A. Mazar’s excavations of Area C provided stratigraphic clarification for B. Mazar’s
earlier operations and illustrate the continuity of function and architectural layout in sacred
space. Two phases of Str. XII could be distinguished. Str. XIIIB consisted of fragmentary floors
and walls situated directly on bedrock but whether the area was established as a cultic space is
unclear (Mazar 1980). In the latest phase, Str. XIIA, Mazar discovered a single room temple with
benches and a raised dais with cultic vessels (Temple 319). Layers of burnt organic material in a
courtyard to the northeast point to sacrifices or other rites. An anthropomorphic jug, a scaraboid
with a chariot scene, and an ivory knife handle with Cypriot parallels were found in the
courtyard. To the north, a narrow room likely served in an ancillary function to the temple. An
enclosure wall separated the temple complex from buildings to the south, and repairs made to the
wall in subsequent strata indicate the continuity of architecture in the temple precinct. To the
southeast of the temple, a large building with plastered benches along its interior and a raised
central hearth with parallels in the Aegean, Anatolia, Cyprus, and at Tel Miqne-Ekron. Mazar
posits that this building served an administrative function (1993: 1208). The construction of
another temple in Str. XI (Temple 200) directly above the brick temple of Str. XII with slight
enlargement evinces continuity in the use of sacred space. While the main area of the temple was lined with benches, a partitioned area in the southwestern corner contained numerous cultic vessels and votive items including a triton conch shell likely used as a trumpet (Mazar 1980: 118). The courtyard space was also preserved in Str. XI, and excavators encountered a favissa in the northern portion that contained an anthropomorphic libation vessel, a lion-shaped rhyton, zoomorphic masks, pottery executed with “Philistine Red Slip” decoration, and faunal remains. West of Temple 200, a second cultic structure (Temple 300) adjoined the temple and also had plastered benches along the walls and a raised platform against which three cylindrical cult stands were leaning. Remains of three bowls, two of which were decorated with modeled bird heads, and several globular juglets were recovered from the structure. Str. X also shows continuity with preceding strata in the layout of cultic and residential structures. The buildings south of the temple complex in Area C are on the same alignment with Str. X buildings in Area A, indicating the intentional urban planning of streets and insulae at the site. The Str. X temple, Temple 131, was constructed along the same pattern as its predecessor, Temple 200, with enlargements and added features such as an antechamber lined with benches on the eastern side. The floors were raised, and two column bases held cedar pillars that supported the roof. Against a partition wall in the western portion of the main room, a stepped brick platform was built. The area behind the partition wall served as storage. The courtyard also continued in use with the addition of a square stone foundation north of the temple entrance that may have served as an altar. The conflagration that destroyed Str. X sealed numerous cultic objects and vessels in Temple 131 including an ax-adze that may indicate the importance of the tool for a Sea Peoples group inhabiting Tell Qasile (Mazar 1985: 4). After the destruction of Str. X, the temple and its courtyard, with modifications were rebuilt and continued in use in Str. IX and VIII (Temple
The residential quarter to the south witnessed changes in architectural layout similar to those in Area A with a different alignment of buildings and construction of new structures over long-established streets (Building 169). The site was abandoned following the destruction of Str. VIII, attributed by Mazar to the campaign of Sheshonq I. Limited remains attributed to Mazar’s “Str. VII” date to the late seventh century based on Judean and coastal ceramic forms.

During the construction of the “Man and His Work” and Science Pavilions at the Eretz-Israel Museum, H. Ritter-Kaplan conducted two salvage excavations at the base of the northern slope of Tell Qasile, resulting in the discovery of a trench hewn into kurkar bedrock and deposits to the south indicative of a glacis that she interpreted as part of a defensive system (Ritter-Kaplan 1978: 416; 1985). The trench measured approximately 2 m wide at the top, narrowing to 0.4 m wide at the bottom, and 1.5 m deep. Ceramics from the trench dated exclusively to the Iron Age (tenth century B.C.E.; Ritter-Kaplan 1985: 196). This hewn trench extended eastward through Ritter-Kaplan’s Areas II and III and sloped toward a ravine that drained into the Yarkon. A. Mazar (1972: 18) suggested that this channel carried water to fields north of the site. Additionally, a series of deposits were noted sloping upward from the edge of the trench. The soil layers, consisting of dark soil and containing tenth century B.C.E. pottery, were covered by stones mixed with clay near the trench and stones mixed with crushed kurkar and rubble farther upslope, leading Ritter-Kaplan to interpret this as a glacis (1985: 197). She further posited that the damage to the temple precinct of Strata XII-VII excavated by A. Mazar was partially caused by the removal of material to create the sloped feature.

Further salvage operations around the slopes of the site have exposed numerous pits and pressing installations dated to the Iron IIA. Portions of three pits that likely functioned as part of a complex of wine presses were discovered southwest of the site (Ayalon 1993). Pottery within
the pits dated to the Iron Age, Hellenistic, and Roman periods, and collecting pits of this type were excavated in the tenth century B.C.E. stratum on the mound. Later excavations revealed a total of seven winepresses approximately 100 m from the tell thought to be operated by family groups (Ayalon 1994: 10*). The presses comprise a round or elliptical combined treading floor and collecting vat with no connecting pipe. Three other locations around the base of the tell have similar installations. The excavator suggests that the quantity of presses combined with the numerous amphorae and the geographic location of the site, indicate that wine was produced for export (Ayalon 1994: 11*). At the bottom of the northwestern slope, a round pit with a sloping floor and shallow depression at the lower end served as part of a pressing installation and later, a refuse pit (Ayalon and Harpazi Ofer 2001: 44*). A ceramic assemblage consisting of jars, bowls, and kraters above the sloping plastered floor dates to tenth century B.C.E.

More recently, to the west of the mound, three additional pits evince the storage and refuse needs of the inhabitants of Tell Qasile (Ayalon 2007). The first pit contained pottery from the eleventh and tenth centuries B.C.E., a beachrock grinding stone, and fragments of mudbricks. Shallow remains of an adjacent pit yielded two red-slipped bowls. A larger pit in a second location was hewn into kurkar and also contained eleventh and tenth century B.C.E. ceramics in addition to a ceramic weight and a possible conical plug for a potter's kiln. Additional finds include the broken base of an Iron Age storage jar re-used as a crucible that was recovered from a Roman pool (Ayalon and Bashkin-Yosef 2008: fig. 3:11).

57. TEL AVIV, RAMAT AVIV [RAMAT AVIV (2)]

Site no(s).: 15904/0 (IAA); 71.25 (ASI)

Boundary coordinates (IAA): 180000, 667510 SW 180250, 667780 NE

Point coordinates (ASI): 180385,667594

Area: 6.75 ha (IAA boundaries)

Periods: MB, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Late Islamic, and Ottoman

Description: Remains of architecture and pits from late antiquity interspersed with ceramics from various periods. A. Gorzalczany (2002, 2003) excavated the remains of a hewn burial cave that yielded only non-diagnostic bones and pottery (L.706). This may be related to the Middle Bronze Age cemetery at the nearby site of Tell Qasile (West; Gorzalczany 2003: 273). Some Middle Bronze Age pottery was found in a mixed context and likely came from fill soil originating at a nearby site (Ajami 2002). Geological anomalies and a vat and quarries dated to the Roman era provided impetus for a geological study of the area (van den Brink and Ackermann 2010). Numerous pits, some containing charred bones and stones, have been excavated at the site, indicating the likelihood of the site being an industrial area on the periphery of a larger settlement (Barkan and Jakoel 2012).

References: Gorzalczany 2002, 2003; Barkan and Jakoel 2012; Dagot 2007; van den Brink and Ackermann 2010; Gophna 2015b

58. TELL ABU ZEITUN

Site no(s).: 1075/0 (IAA); 71.30 (ASI)

Boundary coordinates: 184600, 667000 SW 184850, 667500 NE

Point coordinates (ASI): 184785, 667495
Area: 12.5 ha (IAA boundaries)

Periods: MB I–II, Iron IIB, and Persian

Description: Stratified tell with architectural remains from the Iron Age and Persian period and burials dated to the Early Islamic period. Excavations by J. Kaplan revealed two strata of Persian period architecture and a single layer dated to the Iron II. Finds from the Persian period included Attic ware and an ostracon inscribed with the name *hswb*, a name attested in the Hebrew Bible in post-exilic contexts (Kaplan 1993a). Later trial excavations by H. Katz, although lacking in architectural discoveries, confirmed Kaplan’s findings by recovering ceramics from the ninth to seventh centuries B.C.E. and an assemblage dated to the fifth and fourth centuries of the same era. More recently, a trial trench at the foot of the tell encountered three layers with ceramics dated to the MB I–II, and the lowest stratum contained fired tabun material (D. Golan 2008b).

References: Kaplan 1958, 1993a; Katz 2007; D. Golan 2008b; Gophna 2015b

59. NAHAL YARKON (2)

Site no(s).: 71.32 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 189135, 667295

Area: 3.12 ha (IAA boundaries)

Periods: MB, Hellenistic, Late Roman, and Byzantine

Description: Remains of an unwalled settlement on the eastern bank of the Yarkon River. Surface finds included fragments of basalt vessels, grinding stones, tesserae, and pottery. Most finds dated to the Late Roman period with a few sherds from the MB.

References: Gophna 2015b
60. BENE BERAQ, KINNERET STREET

Site no(s.): 1042/0 (IAA); 71.29 (ASI)

Boundary coordinates (IAA): 183300, 666500 SW 183700, 667200 NE

Point coordinates (ASI): 183645, 667115

Area: 28 ha (IAA boundaries)

Periods: MB II–III, Iron II, Hellenistic, and Roman

Description: Salvage excavations discovered a tomb south of the Yarkon dated to the “Hyksos” period (MB II–III; Kaplan 1978a: 416–17). Constructed with two chambers, the northern chamber contained the remains of a young male with his head to the east and face turned south. Funerary deposits consisted of a juglet near the head and a jar near the feet as well as four storage jars on the floor of the southern chamber. More recent operations revealed a winepress dated to the Roman period with Iron Age, Hellenistic, and Roman period pottery in the fill (Glick 2010).

References: anon. 1977a; Kaplan 1978a; Glick 2010; Gophna 2015b

61. TEL AVIV, PINELES STREET [TEL AVIV, EL KHIKR]

Site no(s.): 25936/0 (IAA); 71.33 (ASI); Gophna and Beck 1981, Site 27

Boundary coordinates (IAA): 180100, 666800 SW 180700, 667100 NE

Point coordinates (ASI): 180255, 666944

Area: 18 ha (IAA boundaries)

Periods: MB II

Description: Remains of an unwalled MB II settlement and associated pottery scatter.
References: Kaplan 1953: 160; Gophna and Beck 1981: 73; Gophna 2015b

62. **Tell el-Hashash**

*Site no(s.):* 942/0 (IAA); 71.35 (ASI)

*Boundary coordinates (IAA):* 180800, 666600 SW 181100, 667000 NE

*Point coordinates (ASI):* 180885, 666694

*Area:* 12 ha (IAA boundaries)

*Periods:* Chalcolithic, EB, MB, LB, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Ottoman

*Description:* Records on file with the IAA list Middle Bronze Age and Late Bronze Age pottery, and during their study of the finds from the site, Tal and Taxel (2010: 96) noted Iron II pottery from the ninth and eighth centuries B.C.E. Database entry lists Iron Age pottery for Tell el-Hashash (*contra* Tal and Taxel 2010: 124, n.3), but publications for Tell el-Hashash by J. Kaplan and H. Ritter-Kaplan do not mention these finds. Excavations 100 m away on Yehuda HaMaccabi Street also found, *inter alia*, some “Hyksos” pottery (Tal and Taxel 2010: 101).

*References:* anon. 1966b, 1981; Ritter-Kaplan 1983, 1984; Tal and Taxel 2010; Gophna 2015b

63. **Tel Aviv, Pinkas Street [Tel Aviv, Shikun Tzameret and Tel Aviv, Pinkas Street]**

*Site no(s.):* 943/0, 25941/0, 25942/0 (IAA); 71.37 and 71.38 (ASI)

*Boundary coordinates (IAA):* 180500, 666200 SW 180900, 666500 NE

*Point coordinates (ASI):* 180665, 666574 (71.37); 180685, 666394 (71.38)

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118 These coordinates represent a polygon enclosing all three sites listed as Tel Aviv, Pinkas Street in the IAA database.
Area: 12 ha (IAA boundaries)

Periods: Chalcolithic, EB IV, MB I, Early Islamic, Late Islamic, and Ottoman

Description: Remains of settlements from Chalcolithic and MB I with nearby hewn tombs from EB IV and eight MB burials. Additional burial caves dated to the Chalcolithic and MB were discovered north of Pinkas Street (Shikun Tzameret; Kaplan 1961: 10).

References: Kaplan 1961: 10; Kaplan 1972: 74; Gophna 2015b

64. TEL GERISA [TELL JERISHE]

Site no(s).: 982/0 (IAA); 71.44 (ASI)

Boundary coordinates (IAA): 181340, 666180 SW 182360, 667120 NE

Point coordinates (ASI): 181585, 666444

Area: 95.88 ha (IAA boundaries); 4 ha (excavator’s estimate)


Description: Stratified tell site with architectural remains and material culture spanning the Bronze and Iron Ages with some traces of occupation during the Early Islamic period. Established on the southern bank of the Yarkon River, the mound is situated on the third kurkar ridge that runs parallel to the coast, near a small cataract that powered flour mills in the modern era.

Excavations by E. L. Sukenik revealed occupation on the mound from the end of the Early Bronze Age to the tenth century B.C.E. The Early Bronze Age settlement consisted of some walls and pottery on the western and southern part of the site (Sukenik 1935: 208). Some fragmentary structures including a room with pieces of slag on the floor and several infant jar burials make up the Middle Bronze Age remains apart from the glacis built of alternating layers
of beaten earth and crushed *kurkar* (Sukenik 1938, 1944). The glacis was built on the natural *kurkar* slope by first covering the slope with soil then adding a layer of mudbricks for stability and then alternating layers of sand and soil up to 3 m thick (Geva 1982: 14–18). A wall 3 m wide and up to 3 m high formed the upper limit of the glacis and was not visible outside the site; the fortification wall that would have surmounted the glacis was not extant. Sukenik dated the fortifications at the site to the Hyksos period (MB II–III) and stated that the glacis remained in use until the end of the Late Bronze Age. Structural remains from the Late Bronze Age were encountered across the tell, and in addition to imported Cypriot and Mycenaean ceramics, Sukenik found a “heart scarab” inscribed with the thirtieth chapter of the Book of the Dead, a Babylonian cylinder seal, Astarte figurines, and bronze weapons (Sukenik 1935: 209; 1944: 199). At the southern part of the site, the Iron Age material, which included Philistine ceramics, witnessed conflagration in the tenth century B.C.E.

Later excavations in the 1980s and early 1990s led by Z. Herzog partially confirmed Sukenik’s findings and discovered new material that presents a fuller picture of the site’s occupational history. Following the unfortified EB II or III settlement, three phases of development could be distinguished in relation to the city’s defenses during the Middle Bronze Age (Herzog 1993a: 482). In the early MB I, a mudbrick city wall 1.7 m wide was built over an earlier unfortified phase of occupation, and a glacis of *hamra* soil mixed with small stones and covered by crushed *kurkar* abutted the city wall (Herzog 1989–90: 51). This phase was replaced by another brick city wall, 2.2 m wide, also with an attached glacis consisting of thirteen layers of mudbricks overlaid with crushed *kurkar*, and this late MB I fortification system corresponds to the glacis excavated by Sukenik (Herzog 1989–90: 51; Burke 2008: 260). A portion of the city

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119 In the preliminary report of the 1988 season, Herzog (1989–90: 51) dates the EB pottery found to the EB II, while in the later synthetic article, he attributes the EB ceramics to EB III.
wall of this phase consisted of two parallel walls that were part of a tower. Ceramic vessels found in association with this phase include carinated bowls with gutter rims, bowls with a painted red cross in the interior surface, and finely combed storage jars, all of which date to the late MB I. The third phase of fortifications witnessed the construction of a 3 m wide wall over the previous walls, and this wall continued in use into the Late Bronze Age. A large building abutted this wall whose floors sloped toward the fortification wall as a result of the previous fortifications over which they were laid. In addition to the ceramics from these floors, vessels dated to the MB II were also found in a pit that intruded into earlier MB I levels. The pottery items were found above a bronze figurine of a deity in a smiting pose (Herzog 1984: 56). Smaller LB I structures were built against the MB II wall, and Cypro-Canaanite Wheel-Made Bichrome Ware with geometric and zoomorphic motifs was found in this phase (Herzog 1983: 122). While LB II and Iron I structures were not excavated on the southern acropolis of the mound, a large courtyard composed of pebbles and crushed lime was discovered in the center of the site (Herzog’s Area C). Associated with this courtyard were scarabs, a Cypriot zoomorphic vessel, and an “Eye of Horus” pendant. In addition to the courtyard, a large structure with kurkar flagstone paving, a residential wing, and plastered floors likely served as the administrative center of the site during the LB II. Finds from this area include two Cypro-Mitannian cylinder seals, twelve scarabs, Cypriot White Slip II ceramics, and Egyptian-style pottery including ovoid jars and bowls (Herzog and Tsuk 1993: 62).

Several phases of Iron I occupation on the northern portion of the site were also excavated. The earliest phase consisted of fragmentary walls and floors that Herzog (1982: 31) dated to the twelfth century B.C.E. Later activity in the area is represented by mudbrick walls and stone foundations with associated Philistine bichrome pottery. Pits containing sherds of Philistine
ceramics and collared-rim pithoi were dug into these layers. The site’s water system, partially excavated by Sukenik, consisted of a 6 m wide shaft with at least 22 rock-cut steps leading down to the water table into which a rectangular stone interior casing was built. Pottery from the space between the inner stone casing and the hewn shaft dated from MB I to Iron I, indicating that the well was constructed during the early Iron Age into a system that was likely first hewn in the Middle Bronze Age (Herzog and Tsuk 1993: 62). On the southern acropolis, three phases of Iron I occupation were revealed. Finds from this area attest to agricultural activities supplemented by fishing, evinced by lead sinkers (Herzog 1988–89: 61). Other special finds include a clay figure of a female, a pair of bronze cymbals, and a pyramidal seal. In the latest phase, the layout of the buildings with a courtyard with pillar bases and two flanking rooms as well as the pottery assemblage parallels Str. X at Tell Qasile. This phase was destroyed by fire, which Herzog (1982: 31) suggests may have been result of an earthquake. Following this destruction, two phases of settlement dating to the tenth century B.C.E. marked the end of the settlement history of the site until the Early Islamic period.

More recently, an ivory scaraboid with an incised rendering of a lion was found at Tel Gerisa (Jakoel and Barkan 2010). The object is dated to the MB II and gives further evidence for contact between Middle Kingdom Egypt and the Canaanite coast.


65. RAMAT GAN, SHEKHUNAT HA-GAFEN

Site no(s).: 14786/0 (IAA); 71.46 (ASI)
**Boundary coordinates (IAA):** 182400, 666150 SW 182600, 666350 NE

**Point coordinates (ASI):** 182285, 666295

**Area:** 4 ha (IAA boundaries)

**Periods:** LB

**Description:** Rock-hewn tomb chamber in *kurkar* near Tel Gerisa measuring 2.55 m x 3 m x 1.36 m high. Since the bones were decayed, Ory (1944: 56) estimated that one or two persons were interred but could not speculate about their position. The funerary deposit consisted of two scarabs, a steatite seal, weights, scale pans, a ring with lead solder as well as Cypriot White Slip II, Cypriot Base Ring, and Canaanite vessels. Carbonized food was found in a Canaanite storage jar, but the chemical analysis did not reveal the composition. Based on the objects deposited in the tomb, Ory proposed that the deceased was a merchant or goldsmith (1944: 56).

**References:** Ory 1944; Gophna 2015b

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**66. BENE BERAQ, EL-WAQF**

**Site no(s).:** 1041/0 (IAA); 71.51 (ASI)

**Boundary coordinates (IAA):** 183300, 665750 SW 183750, 666150 NE

**Point coordinates (ASI):** 183285, 666095

**Area:** 18 ha (IAA boundaries)

**Periods:** LB, Iron I, Hellenistic, Roman, Byzantine, Early Islamic, and Ottoman

**Description:** Structural remains, possibly of a fortress, dated to the Hellenistic period and pottery from the Late Bronze Age, Iron I, Roman and later periods. Late Bronze Age and Iron I

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120 The database record indicates tombs from the MB and LB; this is repeated in the ASI entry (Gophna 2015b). However, all entries by period are associated with R. Kletter’s excavations at Bene Beraq, el Waqf 1041/0, and the publications section lists preliminary articles for Bene Beraq, el Waqf and Byzantine remains found elsewhere in Ramat Gan (Shacham and Ayalon 1990).
sherds consist of a Cypriot White Slip bowl fragment with painted decoration and a rim sherd of cooking pot, respectively.

References: Kletter 2000; Gophna 2015b

67. RAMAT GAN

Site no(s).: 1013/0

Boundary coordinates: 182000, 665000 SW 184000, 667000 NE

Area: 400 ha (IAA boundaries)

Periods: Chalcolithic, EB, MB, Iron Age, and Early Islamic

Description: The database record lists a site from the Chalcolithic period, burials from the Early Bronze Age and the Middle Bronze Age, and settlement remains from the Iron Age through the Early Islamic period and some Ottoman structural fragments. The boundaries for this “site” as listed by the IAA database encompasses other sites within its boundaries (Bene Beraq- el Waqf 1041/0, Shekhunat Ha-Gafen 14786/0, and portions of Tel Gerisa and Bene Beraq Kinneret Street).

References: NA

68. TEL AVIV, QIRYA QUARTER [SARONA]

Site no(s).: 938/0, 24496/0 (IAA); 71.66 (ASI)

Boundary coordinates (IAA): 179520, 664100 SW 180600, 665100 NE

Point coordinates (ASI): 180005, 664144

Area: 98.08 ha (IAA boundaries)

Periods: EB I–II, EB IV, MB I, Hellenistic, Late Roman, Late Islamic, and Ottoman
Description: Remains of burial cave with signs of repeated use and evidence of primary and secondary burials with deposits; dated by ceramics to the EB IA and EB II (Ritter-Kaplan 1979b: 241). Another burial cave contained only sherds datable to the EB IV but no human remains (anon. 1971b: 26).

The area’s use as a cemetery during the EB IA, II, and IV as well as MB I has been confirmed by more recent salvage excavations that have discovered almost 160 caves and pits hewn into the kurkar bedrock that served as tombs (Braun and van den Brink 2005; Avissar 2006; Barkan 2008). While many of the caves excavated by E. Braun and E. C. M. van den Brink were used in the EB I–II, more than fifty cavities, some with associated shaft entrances, served as tombs during the EB IV (2005). Concerning Middle Bronze Age burial caves, two scarabs of the twelfth Dynasty were found in a small cave, and another tomb was dated to the Middle Bronze Age by the socketed spearheads within it (Braun and van den Brink 2005). The cave excavated by D. Barkan (2008) was used primarily at the end of the EB I and beginning of the EB II, yet sherds in the upper level of the cave, including a storage jar, indicate that the cave was reused in the MB I.

References: anon. 1971b; Ritter-Kaplan 1979b; Kaplan and Ritter-Kaplan 1993b; Braun and van den Brink 2005; Avissar 2006; Barkan 2008; Gophna 2015b

69. GIVATAIM (3)

Site no(s).: 71.71 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 182185, 663695

Area: NA
Periods: Iron Age, Byzantine, Early Islamic, Crusader, and Ottoman

Description: Structural remains from the Iron Age and Early Islamic period. Ceramic finds date to the Byzantine period and later.

References: Gophna 2015b

70. RAMAT GAN, RAMAT HASHIQMA

Site no(s).: 14785/0 (IAA); 71.77 (ASI)

Boundary coordinates (IAA): 182550, 661650 SW 183100, 662200 NE

Point coordinates (ASI): 182605, 661975

Area: 30.25 ha (IAA boundaries)

Periods: Iron I, Byzantine, and Early Islamic

Description: Burials from the Iron I and Early Islamic period. Finds include remains of quarrying, skull fragments, and pottery dating to Byzantine and Early Islamic periods.

References: Gophna 2015b

71. RAMAT GAN, DEREKH HA-TAYASSIM AND DEREKH LOD JUNCTION [SHEKHUNAT NIR AVIV]

Site no(s).: 4258/0 (IAA); 71.78 (ASI)

Boundary coordinates (IAA): 182150, 661250 SW 182850, 661800 NE

Point coordinates (ASI): 182365, 661595

Area: 38.5 ha (IAA boundaries)

Periods: EB, LB II–Iron Age I, Roman, Byzantine, and Early Islamic
Description: Collapsed burial cave with bones and ceramics dated to the EB I (Kaplan and Ritter-Kaplan 1993b: 1453). Later excavations revealed remains of a settlement with an oil pressing installation and plant remains. The IAA database lists settlement remains from the LB II–Iron I, but no reference or excavation permit is listed for the Iron I material.

References: Kaplan and Ritter-Kaplan 1993b; Gophna 2015b

72. TRIANGULATION POINT 793-X [TEL IHMEIDÂN]121

Site no(s).: 1110/0, 1152/0 (IAA); 71.84 (ASI); Gophna and Beck 1981, Site 5

Boundary coordinates: 185500, 660900 SW 185600, 661000 NE

Point coordinates (ASI): 185636, 660945

Area: 1 ha (IAA boundaries)

Periods: MB I

Description: Remains of graves and artifacts attesting to settlement. Surface scatter of pottery dated to MB I as well as flint tools and flakes and fragments of basalt vessels.

References: Gophna and Beck 1981: 50–52, fig. 4; Gophna 2015b

A.3.5 Map of Rosh Ha-ʿAyin (MR 78)

73. KHIRBET KAHR HATTA [EN NEBI HATTA]

Site no(s).: 1723/0 (IAA); 78.3 (ASI)

Boundary coordinates (IAA): 196000, 669900 SW 197000, 670000 NE

Point coordinates (ASI): 196400, 669900

Area: 10 ha (IAA boundaries)

121 The IAA database entry for a site named Tel Ihmeidan (Site 1152/0) only records tombs and surface pottery with no date assigned. Trig. Point 793-X is directly adjacent to Tel Ihmeidan, and their protective boundaries overlap.
Period(s): Chalcolithic, MB, LB II–Iron I, Byzantine, and Early Islamic

Description: Ruins of an Arab village and sheikh’s tomb as well as a cave, cisterns, plastered pools, various installations, and construction material in addition to pottery from various periods.


74. KAFR QASIM

Site no(s).: 78.6 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 196750, 669520

Area: ca. 8 m² (ASI measurements)

Period(s): Iron II

Description: Rock-cut winepress west of Kafr Qasim consisting of a rectangular treading area and elliptical vat.

References: Kochavi and Beit-Arieh 1994: 20, 22*

75. KAFR QASIM

Site no(s).: 78.26 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 199200, 669500

Area: NA

Period(s): Iron II, Byzantine, and Early Islamic

Description: Winepress with two treading surfaces and double collecting vat.
References: Kochavi and Beit-Arieh 1994: 27, 25*

76. TRIANGULATION POINT 101-S [KAFRING]

Site no(s.): 1795, 25073, 25074 (IAA); 78.15 (ASI)

Boundary coordinates (IAA): 196900, 669200 SW 197200, 669400 NE (overall)

Point coordinates (ASI): 197100, 669300

Area: 6 ha (combined IAA boundaries); 1 ha (ASI estimate)

Period(s): EB, Iron I, Iron II, Persian, Hellenistic, Roman, and Byzantine

Description: Remains of settlement including tombs, rock-cut installations, such as winepresses and cisterns, and fortifications extant in two locations. Probes by Y. Porath revealed wall segments and Iron Age pottery, including collared-rim pithoi, hand burnished pottery, and a Philistine sherd (Kochavi and Beit-Arieh 1994: 24*). Three separate IAA database entries overlap one ASI site.

References: anon. 1973, 1975; Kochavi and Beit-Arieh 1994: 25, 24*

77. ROSH HA-'AYIN [KAFRING]

Site no(s.): 9043/0 (IAA); 78.43 (ASI)

Boundary coordinates (IAA): 197500, 668700 SW 197700, 668900 NE

Point coordinates (ASI): 197550, 668750

Area: 4 ha (IAA boundaries); 1.5 ha (ASI)

Period(s): Iron I, Iron II, Persian, Hellenistic

Description: Stratified tell with fortifications, rock-cut installations, and terraced walls; fragmentary walls north and south of the site.
References: Kochavi and Beit-Arieh 1994: 33, 28*

78. ROSH HA-‘AYIN [NAHAL YARKON]

Site no(s).: 9029/0 (IAA); 78.32 (ASI)

Boundary coordinates (IAA): 193700, 668200 SW 193900, 668300 NE

Point coordinates (ASI): 193800, 668300

Area: 2 ha (IAA boundaries)

Period(s): MB, Iron II, Persian, Roman, and Byzantine

Description: Remains of structures northeast of Yarkon headwaters and 200 m north of Tel Aphek consisting of two walls, 60 m long, composed of hewn limestone. These walls were discovered when a bulldozer removed some large stones from a wall. This area was designated Area F during the 1973 excavations at Aphek-Antipatris by Tel Aviv University, and trial excavations revealed a substantial building dated to the Persian period by the associated pottery (Kochavi 1975: 37). Further investigations by the IAA also revealed a Persian period building.

References: Kochavi 1975; Kochavi and Beit-Arieh 1994: 30, 27*

79. TRIANGULATION POINT 112-S (NORTH)

Site no(s).: 25077/0 (IAA)

Boundary coordinates (IAA): 196700, 668000 SW 196900, 668050 NE

Point coordinates (ASI): NA

Area: 1 ha (IAA boundaries)

Period(s): LB, Iron I, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Crusader
**Description:** Iron I settlement remains including walls and silos on a hill southwest of ‘Izbet Sartah (see below). Surface pottery dated to Late Bronze Age, Iron I and early Iron II.

**References:** NA

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**80. APHEK-ANTIPATRIS [QAL‘AT RAS EL ‘EIN]**

**Site no(s).:** 1508/0 (IAA); 78.63 (ASI)

**Boundary coordinates (IAA):** 193400, 667600 SW 194000, 668300 NE

**Point coordinates (ASI):** 193600, 668000

**Area:** 42 ha (IAA boundaries); 12 ha (ASI)

**Period(s):** Chalcolithic, EB I, EB IV, MB I–II, LB I–II, Iron I, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Ottoman

**Description:** Large stratified tell located at the headwaters of the Yarkon River with extensive remains of an Ottoman fortress on the top of the mound. The site’s occupation spanned from the Chalcolithic to the Ottoman period with periodic gaps. W. F. Albright confirmed the identification of Ras el-‘Ain as Aphek of the Sharon (1923). Salvage operations were conducted at the site by Ory (1936, 1937) and Eitan (1969). M. Kochavi directed extensive research excavations on behalf of the Institute of Archaeology at Tel Aviv University (TAU) from 1972 to 1985, and minor salvage projects have been conducted since.

Evidence for prehistoric occupation includes Chalcolithic sherds recovered from a pit, EB IB and EB II architecture encountered by Ory and the TAU excavations, and some EB IV sherds. Connections with Egypt make themselves manifest in the imported pottery in the EB IB assemblage. The decline of Aphek at the end of the Early Bronze Age II follows a general pattern observed across the coastal plain of abandonment of low-lying sites and a preference for
the hill country. According to the IAA database, excavations directed by Kochavi and Tepper that uncovered part of the Roman cardo of Antipatris in 2002 also encountered parts of a structure and furnace or oven of unknown function from the EB IV. This compliments EB IV pottery found during the TAU excavations.

The zenith of Aphek’s settlement history occurs in the Middle Bronze Age with several subphases of palatial architecture and associated pottery that provides a typology for the region. Early excavators found Middle Bronze Age architecture, graves, and artifacts. In Ory’s excavations, Test Pit 15 yielded a scarab dated to the Thirteenth Dynasty (Ory 1936: 112). Eitan’s excavations at the foot of the southeastern slope discovered a Middle Bronze Age burial and a type of rubble surface with ceramics predominantly from the Middle Bronze Age with some Iron II sherds. Kochavi’s operations discerned six phases of Middle Bronze Age development evident across the site: three MB I phases, one transitional MB I–II and two MB II (Beck and Kochavi 1993: 66–68). The first phase is characterized by poorly constructed pre-palace architecture and some installations. The ceramic assemblage composed of storage jars and bowl with white slip and painted or plastic decorations, and surface treatments with red slip are completely absent. The second phase is marked by construction of Palace I on the acropolis and the city wall. Ory exposed a portion of this 4 m wide mudbrick wall as well as six tombs dated to the MB I (phase 3, below). Another wall built over the graves was dated to the MB II based on associated pottery. Next to the MB I wall, smaller houses with scanty fids were built directly over Early Bronze Age remains. In phase 3, Palace II succeeded Palace I and was built to the west of the latter. Features of Palace II included an abutting watchtower, 1.2 m thick exterior walls, a plastered courtyard, and intramural infant jar burials. Red slipped and highly burnished pottery is indicative of this phase. Phase 4 is a post-Palace II phase in which the palace was
abandoned and replaced by a residential quarter and burials, including infants in jars. The pottery of this phase starts to show MB II characteristics. In the MB II (Phase 5), Palace III was built on the acropolis over the ruins of Palace I with massive stone foundations to prevent subsidence. During Phase 6, Palace III underwent changes and repairs but was destroyed in the mid-sixteenth century B.C.E. Tombs and structural remains in several other areas can also be confidently assigned to the final phase of the MB II.

Aphek during the Late Bronze Age is characterized by Egyptian influence and control following the campaign of Amenhotep II. Following the destruction of Palace III, Palace IV was built with the same general layout, although some areas above Palace III were not rebuilt. Palace V, with its stone-paved courtyard and drainage channels, succeeded Palace IV and was built on a different orientation, possibly as an influence from the Egyptian conquest. The plan of Palace V cannot be reconstructed due to the building activities of Palace VI, deemed the “Egyptian Governor's Residence.” This public structure had two entrances: one to a ground level of halls and storerooms, and the second to a staircase leading to an upper story. Parallels for this building were excavated at Beth-Shean, Tell el-Far‘ah (S), Tel Sera’, Tel Mor, and Deir el-Balah. Palace VI suffered destruction resulting in a 2 m thick debris layer. Within the destruction debris, Canaanite storage jars, collared-rim pithoi, Egyptian bowls and a considerable amount of texts (Beck and Kochavi 1993: 68). In addition to a LB II pit containing three Cypriot Base Ring II bilbils that Eitan excavated and several graves, two wine presses contemporary with Palace VI were found in Area A.

A residential quarter built astride the ruins of Palace VI marks the beginning of the Iron Age. Fishing equipment and a turtle shell found in the eastern portion indicate wetland exploitation. The two succeeding strata in Area X yielded much Philistine pottery, “Ashdoda”
figurines, and a tablet in an undeciphered script. Devoid of architecture, these strata are characterized by pits (Str. X-10) and ash layers (Str. X-9). In Stratum X-8, remains of a four room house were discovered with round column bases for support pillars and plastered silos similar to those excavated at ‘Izbet Sartah. The pottery in the silos dates these features to ca. 1000 B.C.E. Two additional four room houses excavated in Str. A-8 evinced a fiery destruction near the end of the tenth century B.C.E. Few Iron IIA remains were found on the acropolis of the mound (ninth century B.C.E.; Str. X-7 and X-6), and sherds were found in other excavation areas.


81. ‘IZBET SARTAH

Site no(s).: 1722/0 (IAA); 78.66 (ASI)

Boundary coordinates (IAA): 196700, 667900 SW 196900, 668000 NE

Point coordinates (ASI): 196750, 667950

Area: 2 ha (IAA boundaries)

Period(s): Iron I–Iron IIA

Description: Remains of an Iron Age settlement with three strata (two Iron I strata and a final Iron IIA stratum) excavated in 1976–78 by M. Kochavi and I. Finkelstein and identified as biblical Eben-ezer (1 Sam 4). Traces of Byzantine agricultural and field clearing activities were apparent.
Stratum III, dated to the late thirteenth through early twelfth century B.C.E., consists of an elliptical-shaped settlement shaped by an outer enclosure wall with adjoining casemate rooms surrounding a central courtyard with several stone-lined silos. According to Finkelstein (1993: 653), the earliest pottery at the site includes Late Bronze Age forms and decorations and a Mycenaean stirrup jar, and the remainder of the Stratum III assemblage was plain storage jar rims, red slipped bowls, and three complete collared-rim pithoi. The site was abandoned at the beginning of the eleventh century B.C.E.

In the late eleventh century B.C.E., the site was reoccupied (Stratum II), and the layout was dominated by a large four-room house (16 m x 12 m) with smaller, non-adjoining houses built on the edge of the hill on which the settlement was founded. Stone-line silos dug into the Stratum III remains mark the area around the central building. This occupational phase only lasted one to two before being abandoned again (Finkelstein 1993: 653).

The final Iron Age settlement, Stratum I, is dated to the beginning of the tenth century B.C.E. The large four-room house was repaired with several modifications to its layout including partitions between columns and additions of rooms other installations. The ceramic assemblage is relatively the same as Stratum II, with the differentiation accomplished by statistical analysis of the quantity of types. Finkelstein (1993: 653) surmises that this phase represents westward expansion by David and that once the Yarkon River basin was available for settlement, the site was again abandoned.

82. SHAQIF ESH SHEIKH

Site no(s).: 78.79 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 199740, 667500

Area: NA

Period(s): Iron II and Byzantine

Description: Remains of a large rectangular building, interpreted as a fortress, with one interior partition wall and two interior pillars still standing and several fallen columns nearby. The remains of several stone features and adjacent piles of stones, interpreted by the surveyors as the remains of other structures, may have served as ancillary buildings to the large rectangular “fortress.”

References: Kochavi and Beit-Arieh 1994: 46–48, 35*-36*

83. KHIRBET TAHA

Site no(s).: 78.68 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 196900, 667200

Area: NA

Period(s): Iron II, Persian, and Hellenistic

Description: Small tell with visible wall tops and sherd scatter with rock-cut installations below the summit. Nearby, an oil press with circular crushing surface and square central hole was found in a wadi to SE of site.

References: Finkelstein 1981: 344–45, fig. 9; Kochavi and Beit-Arieh 1994: 43, 33*
84. NAHAL RABBA

Site no(s).: 78.87 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 196600, 666900

Area: 4.5 ha (ASI estimate)

Period(s): Iron II, Persian, Hellenistic

Description: Remains of settlement with several structures south of Naḥal Rabba with fieldstone walls preserved at a height of one to two courses. Two pillars survive in situ in one of the buildings with a large hewn stone nearby, possibly a lintel or additional pillar. Cistern, quarries, and rock-cut winepress adjacent to site.

References: Finkelstein 1981: 344–45, fig. 9; Kochavi and Beit-Arieh 1994: 50–52, 37*–38*

85. QURNAT HARAMIYA (WEST)

Site no(s).: 9056/0 (IAA); 78.89 (ASI)

Boundary coordinates (IAA): 196100, 666300 SW 196400, 666700 NE

Point coordinates (ASI): 196250, 666500

Area: 12 ha (IAA boundaries); 4 ha (ASI estimate)

Period(s): Iron I, Iron II, Persian, Hellenistic, and Roman

Description: Remains of settlement consisting of the remains of several structures, including a modern sheikh’s tomb, rock-cut wine and oil presses, cisterns, and cupmarks. Burial caves, hewn tombs, and a shaft tomb are also located in the vicinity of the settlement. Pottery collected from the surface during a survey dated from the Iron Age to the Herodian period.

86. Rosh Ha-'Ayin [Nahal Shillo]

Site no(s).: 9062/0 (IAA); 78.128 (ASI)

Boundary coordinates (IAA): 195700, 665200 SW 195900, 665350 NE

Point coordinates (ASI): 199400, 666300

Area: 3 ha (IAA boundaries); .23 ha (ASI estimate)

Period(s): Iron I, Iron II, and Hellenistic

Description: Remains of an enclosure west of Ḥorvat Migdal Aphek (see above) consisting of a double row of stones with gravel fill and rock-hewn installations west of enclosure.

References: Kochavi and Beit-Arieh 1994: 65, 45*

87. Rosh Ha-'Ayin

Site no(s).: 9057/0 (IAA)

Boundary coordinates (IAA): 196100, 666000 SW 196600, 666300 NE

Point coordinates (ASI): NA

Area: 15 ha (IAA boundaries)

Period(s): Iron I, Iron IIA, Persian, Byzantine, and Medieval

Description: Settlement with remains of buildings and agricultural installations. A heavily damaged cave nearby was associated with an oil press. Excavations by Torge and Avner found the head of an “Ashdoda” figurine (Gadot 2006: 29).

References: Avner-Levy and Torge 1999; Eliaz 2002
88. PETAH TIKVA–KEFAR AVRAHAM [FEJJA]

Site no(s).: 1383/0 (IAA); 78.84, 78.85 (ASI)

Boundary coordinates (IAA): 190840, 665800 SW 191350, 666600 NE

Point coordinates (ASI): 191050, 666000

Area: 40.8 ha (IAA boundaries)

Period(s): MB I–II, LB II–Iron I, Iron IIA, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Late Islamic

Description: Settlement mound near derelict Arab village of Fejja in present Newe Kibbush neighborhood. In addition to a MB I–II unwalled settlement, excavations have revealed artifacts from the LB II–Iron I, Iron II, Persian, Byzantine, and Islamic periods.


89. QASR ES SITT

Site no(s).: 7823/0 (IAA); 78.102 (ASI)

Boundary coordinates (IAA): 197350, 665980 SW 197650, 666100 NE

Point coordinates (ASI): 197500, 666000

Area: 3.6 ha (IAA boundaries)

Period(s): Iron II, Persian, Hellenistic, and Byzantine

Description: Remains of a structure composed of medium and large fieldstones with a courtyard, bounded by a wall. The building foundations have two courses of stones preserved,
while only one course of stone remains for the bounding wall. Several building phases can be
distinguished in addition to a stone likely from a press in secondary use in a wall. A rock-cut
cistern and installation are located to the northeast. Other features include stone fences and
agricultural terraces on the slope of the hill and rock-hewn installations at the base of the eastern
slope.

Finkelstein 1981: 332, 336–37, fig. 5; Kochavi and Beit-Arieh 1994: 57–58, 40*–41*

90. Rosh Ha-‘Ayin [Wadi el Bureid]

Site no(s).: 9076/0 (IAA); 78.145 (ASI)

Boundary coordinates (IAA): 198200, 665700 SW 198500, 666000 NE

Point coordinates (ASI): 198300, 665800

Area: 9 ha (IAA boundaries); .2 ha (ASI)

Period(s): Iron II, Persian, and Hellenistic

Description: Complex of structures, each with several rooms and a courtyard, likely a farmstead.
Lime kiln and agricultural terraces were located nearby.

References: Finkelstein 1981: 332, 338–39, fig. 6; Kochavi and Beit-Arieh 1994: 72, 48*–49*

91. Horvat Migdal Afeq [Majdal Yaba]

Site no(s).: 78.136 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 196000, 665300

Area: NA
Period(s): Iron II, Persian, Byzantine, and Early Islamic (from western slope of the hill)

Description: Late structures built on medieval remains, most notably the Crusader castle of Mirabel, surmounting a hill north of Naḥal Shillo. On the western slope, three terraces, rock-hewn tombs, cisterns, presses, and other installations cut into bedrock attest to a larger site history.

References: Guérin 1874–1875, II: 131–33; Conder and Kitchener 1881–1883, II: 286, 360–61; Albright 1923; Kochavi and Beit-Arieh 1994: 69–70, 47*

92. Rosh Ha-‘Ayin [Naḥal Shillo]

Site no(s).: 9074/0 (IAA); 78.142 (ASI)

Boundary coordinates (IAA): 197900, 665200 SW 198000, 665400 NE

Point coordinates (ASI): 197940, 665300

Area: 2 ha (IAA boundaries)

Period(s): Iron II, Persian, and Hellenistic

Description: Remains of a farmstead built with medium and large fieldstones with one corner of the structure preserved. To the east, a rock-cut cistern was found with a rectangular opening and lower circular shape.

References: Finkelstein 1981: 332, 342–43, fig. 8; Kochavi and Beit-Arieh 1994: 71, 48*

93. Wadi el Bureid (South) [Naḥal Shillo]

Site no(s).: 9080/0 (IAA); 78.151 (ASI)

Boundary coordinates (IAA): 198700, 665200 SW 198900, 665500 NE

Point coordinates (ASI): 198850, 665250
Area: 6 ha (IAA boundaries)

Period(s): Iron II, Persian, and Hellenistic

Description: Remains of two structures adjoining a courtyard, likely a farmstead, with nearby rock-hewn lime kiln.

References: Finkelstein 1981: 338–39, fig. 6, 346; Kochavi and Beit-Arieh 1994: 74, 50*

94. Rosh Ha-‘Ayin [Nahal Shillo]

Site no(s).

Boundary coordinates (IAA): 196900 665000 SW 197000, 665100 NE

Point coordinates (ASI): 196900, 665000

Area: 1 ha (IAA boundaries); 75 m² (structure only)

Period(s): Iron II, Persian, and Hellenistic

Description: Rectangular building with an exterior wall consisting of a double row of medium fieldstones and interior walls. Later rock-cut lime kiln suggests later re-use of ruined building for plaster production.

References: Finkelstein 1981: 332, 336–37, fig. 5; Kochavi and Beit-Arieh 1994: 66, 45*

95. Bir el-Sihrij [Khallat es Sihrij]

Site no(s).

Boundary coordinates (IAA): 197400, 664700 SW 197700, 665100 NE

Point coordinates (ASI): 197600, 664900

Area: 12 ha (IAA boundaries)

Period(s): Iron II, Persian, and Hellenistic
Description: Large structure (3,000 m²) comprised of multiple rooms flanking a courtyard with adjacent agricultural terrace walls. Several walls of the building were made with a double row of fieldstones with fill between. According to the surveyors, the rock-cut cistern in the courtyard was fed by rainfall.

References: Finkelstein 1981: 332–33, 335, 342–43, figs. 3, 8; Kochavi and Beit-Arieh 1994: 81, 54*

96. ROSH HA-‘AYIN [NAHAL SHILLO]

Site no(s).: 9155/0 (IAA); 78.180 (ASI)

Boundary coordinates (IAA): 197400, 664500 SW 197600, 664700 NE

Point coordinates (ASI): 197500, 664600

Area: 4 ha (IAA boundaries)

Period(s): Iron II, Persian, and Hellenistic

Description: Large complex consisting of a bi-level courtyard (approx. 800 m²) framed on three sides by large fieldstone walls and adjoined by a rectangular room (36 m²).

References: Kochavi and Beit-Arieh 1994: 82, 54*–55*

97. KHIRBET SHA‘IRA [PETAH TIKVA–SHA‘ARIYA]

Site no(s).: 1328/0 (IAA); 78.161 (ASI)

Boundary coordinates (IAA): 190000, 664000 SW 191000, 665000 NE

Point coordinates (ASI): 190800, 663700–191000, 664000

Area: 100 ha (IAA boundaries); 6 ha (ASI estimate)

Period(s): MB I–II, Roman, Byzantine, and Early Islamic
Description: While the ASI found remains of a Roman, Byzantine and Early Islamic settlement and installations, excavations by M. Peilstöcker in 1997 revealed architectural remains dated to the late MB I with continuation into MB II.

References: Peilstöcker 2000a, 2004; Kochavi and Beit-Arieh 1994: 78, 52*

98. KHIRBET DAVOV AH [NAḤAL SHILLO]

Site no(s).: 9164/0 (IAA); 78.189 (ASI)

Boundary coordinates (IAA): 198500, 664200 SW 198800, 664500 NE

Point coordinates (ASI): 198700, 664400

Area: 9 ha (IAA boundaries); 484 m² (structural dimensions)

Period(s): Iron II, Persian, and Byzantine

Description: East-facing square fortress (22 x 22 m) with courtyard, entrance lintel in situ, and revetment wall on southwest corner.

References: Kochavi and Beit-Arieh 1994: 83–84, 56*

99. NAḤAL SHILLO

Site no(s).: 78.218 (ASI)

Boundary coordinates (IAA): NA

Point coordinates (ASI): 197200, 663800

Area: 308 m² (maximal structure dimensions)

Period(s): Iron II and Byzantine
**Description:** Remains of a rectangular structure (4.85 x 6.3 m) with walls consisting of “large, partly drafted stones” with part of a stone basin incorporated into the building built over an earlier (Iron Age?) structure (16.4 x 18.8 m) made of a double row of fieldstones with fill.

**References:** Kochavi and Beit-Arieh 1994: 93, 62

100. **ROSH HA-AYIN**

**Site no(s).:** 9185/0 (IAA)

**Boundary coordinates (IAA):** 198100, 663700 SW 198300, 663900 NE

**Point coordinates (ASI):** NA

**Area:** 4 ha (IAA boundaries)

**Period(s):** Iron II? and Byzantine

**Description:** Remains of a settlement with associated tombs and surface scatter of pottery.

**References:** NA

101. **NAHSHONIM**

**Site no(s).:** 1647/0 (IAA); 78.210 (ASI)

**Boundary coordinates (IAA):** 195700, 663300 SW 195800, 663400 NE

**Point coordinates (ASI):** 195700, 663300

**Area:** 1 ha (IAA boundaries)

**Period(s):** Iron II and Persian

**Description:** Tomb consisting of a natural cave with hewn modifications including entrance steps and a partition wall; excavated by Z. Yeivin and M. Hershkovitz in 1961. In contrast to
Kochavi and Beit-Arieh (1994: 60*) who date the burial cave to the Iron Age, the IAA database attributes the tomb to the Persian period.

References: anon. 1961a; Kochavi and Beit-Arieh 1994: 90, 60*

102. Rosh Ha-‘Ayin [Naḥal Shillo]

Site no(s).: 9213/0 (IAA); 78.235 (ASI)

Boundary coordinates (IAA): 196800, 662400 SW 196900, 662500 NE

Point coordinates (ASI): 196900, 662500

Area: 1 ha (IAA boundaries)

Period(s): EB IV, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Late Islamic

Description: Rectangular structure with large courtyard, ancillary structures, and nearby cistern. Small structure to the northeast may have functioned as a watchbooth.


103. Mazor (Northwest) [Naḥal Mazor]

Site no(s).: 1576/0 (IAA); 78.226 (ASI)

Boundary coordinates (IAA): 194400, 662200 SW 195200, 662600 NE

Point coordinates (ASI): 194990, 662400

Area: 32 ha (IAA boundaries); .6 ha (ASI estimate)

Period(s): Chalcolithic, MB I–II, LB II, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic (Umayyad) and Ottoman
**Description:** Remains of settlement on hill with caves and rock-hewn pool on lower slopes. Structures, living surfaces, and presses from Bronze and Iron Ages found by surveyors. Gophna and Beck (1981: 50) discuss the ceramic assemblage from MB I–II. Kochavi and Beit-Arieh (1994: 63*) note the presence of imported Cypriot pottery and a figurine mould, and IAA database lists Iron Age II pottery and a scarab found on bedrock.

**References:** Gophna and Beck 1981: 50, fig. 4:1-5; Kochavi and Beit-Arieh 1994: 95–96, 63*

104. **Rosh Ha-‘Ayun [Nahal Mazor]**

**Site no(s).**.: 9214/0 (IAA); 78.236 (ASI)

**Boundary coordinates (IAA):** 196500, 662300 SW 196600, 662400 NE

**Point coordinates (ASI):** 196600, 662400

**Area:** 1 ha (IAA boundaries)

**Period(s):** Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Late Islamic

**Description:** Remains of several structures surrounding a courtyard with rock-hewn cisterns, human-modified natural caves, and a winepress in the vicinity. To the west were found the remains of a small structure (3 x 3 m) that may have functioned as a watchbooth.

**References:** Finkelstein 1981: 332, 340–41, fig 7; Kochavi and Beit-Arieh 1994: 98, 65*

105. **Mazor (East)**

**Site no(s).**.: 1646/0 (IAA); 78.235, 78.238 (ASI)

**Boundary coordinates (IAA):** 195620, 661500 SW 197130, 663250 NE

**Point coordinates (ASI):** NA

**Area:** 264.25 ha (IAA boundaries)
**Period(s):** Chalcolithic, EB IV, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic (Umayyad), and Late Islamic

**Description:** Remains of buildings, surfaces, field walls, cisterns, tombs, roads, and artifacts from various periods. While the record summary details the settlements of the Persian and Byzantine periods, the database also lists a structure, field walls, press, and possible watchbooth dated to Iron II. Site extends over most of the Mazor area with numerous sites and excavations within the larger overall boundary.


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106. **MEZUDAT MAZOR**

**Site no(s).:** 1645/0 (IAA)

**Boundary coordinates (IAA):** 195200, 662200 SW 195500, 662350 NE

**Point coordinates (ASI):** NA

**Area:** 4.5 ha (IAA boundaries)

**Period(s):** Epipaleolithic, Chalcolithic, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic (Umayyad), Late Islamic (Ayyubid–Late Islamic), and Ottoman

**Description:** Remains of settlement activity, burials, installations, roads, and artifacts from various periods, including an Iron Age II living surface and ceramics.

**References:** Gudovitch 1998; Amit 1998
107. **Rosh Ha-‘Ayin [Nahal Shillo]**

*Site no(s.):* 9219/0 (IAA); 78.243 (ASI)

**Boundary coordinates (IAA):** 197700, 662200 SW 197900, 662400 NE

**Point coordinates (ASI):** 197800, 662200

**Area:** 4 ha (IAA boundaries); 900 m² (structural dimensions)

**Period(s):** Iron II, Persian, Hellenistic, Roman, and Byzantine

**Description:** Large, square structural remains (30 x 30 m) partially damaged by a nearby Roman road. Two rock-hewn cisterns were located within building, and a small structure (approx. 3 x 3 m) was found to the northeast. Buildings have been interpreted as a fortress and watchbooth, respectively.

**References:** Finkelstein 1981: 333, 335, 340–41; Kochavi and Beit-Arieh 1994: 100, 67*

108. **Nahal Shillo**

*Site no(s.):* 78.271 (ASI)

**Boundary coordinates (IAA):** NA

**Point coordinates (ASI):** 198780, 661940

**Area:** NA

**Period(s):** Iron II, Persian, and Byzantine

**Description:** Remains of several rectangular structures and rock-hewn pressing installations and collection vat nearby. Notable are two structures (4 x 5 m; 11 x 17 m) with Iron II and Persian period ceramics.

**References:** Kochavi and Beit-Arieh 1994: 108–09, 72*
109. **TRIANGULATION POINT 155-S (EAST) [NAHAL MAZOR]**

**Site no(s).**: 9462/0 (IAA); 78.268 (ASI)

**Boundary coordinates (IAA)**: 197050, 661750 SW 197400, 662000 NE

**Point coordinates (ASI)**: NA

**Area**: 8.75 ha (IAA boundaries); 300 m² (structural area)

**Period(s)**: Iron II, Persian, Hellenistic, Roman, Byzantine, and Late Islamic

**Description**: Remains of rectangular complex (15 x 20 m) consisting of a double row of medium and large fieldstones, other wall fragments, cisterns, field walls, and burials mostly post-dating the Hellenistic period. Earlier remains include natural caves used for burials and shaft tombs. IAA database lists a structure, field walls, press, and possible watchbooth all dated to Iron II.


110. **MAZOR**

**Site no(s).**: 1644/0 (IAA)

**Boundary coordinates (IAA)**: 194900, 661400 SW 196000, 662200 NE

**Point coordinates (ASI)**: NA

**Area**: 88 ha (IAA boundaries)

**Period(s)**: Chalcolithic, MB, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic (Umayyad), Late Islamic, and Ottoman

**Description**: Structures, plastered pools, presses, cisterns, living surfaces, and burials from various periods from the Hellenistic period forward, including a Hellenistic farmhouse (Amit and Zilberbod 1998a) and a mausoleum dated to 300 C.E. (Kaplan 1985). Excavations in the northwest portion of the site (Area S8) revealed burial caves from the Chalcolithic period and
Middle Bronze Age. The Middle Bronze Age material originated from the shaft of a grave and consists of a bronze dagger found in the shaft and fragments of a red slipped krater discovered in the shaft’s opening.

References: Kaplan 1985; Amit and Zilberbod 1998a; Milevski 1999, 2001

111. ḤORVAT LEVED [KHIRBET UMM EL LABAD]

Site no(s).: 1882/0 (IAA); 78.272 (ASI)

Boundary coordinates (IAA): 182200, 678950 SW 181500, 678350 NE

Point coordinates (ASI): 198200, 661770

Area: 100 ha (IAA boundaries); .5 ha (ASI estimate)

Period(s): Iron II, Persian, Hellenistic, Roman, Byzantine, Late Islamic, and Ottoman

Description: Remains of settlement with fieldstone constructions, crushing surfaces, and four rock-hewn, bell-shaped cisterns nearby. The IAA site boundaries extend over most of the Nahal Mazor area with three distinguishable sites within the larger overall boundary.

References: Conder and Kitchener 1881–1888, II: 378; Kochavi and Beit-Arieh 1994: 109, 72*

112. ROSH HA-‘AYIN

Site no(s).: 9468/0 (IAA)

Boundary coordinates (IAA): 198600, 661600 SW 198700, 661700 NE

Point coordinates (ASI): NA

Area: 1 ha (IAA boundaries)

Period(s): Iron II, Persian, Hellenistic, Roman, Byzantine, Late Islamic, and Ottoman

Description: Remains of fortified structure(s), cistern and pottery from various periods.
113. MAZOR (WEST)

Site no(s).: 9448/0 (IAA)

Boundary coordinates (IAA): 194500, 661400 SW 194900, 662200 NE

Point coordinates (ASI): NA

Area: 32 ha (IAA boundaries)

Period(s): Chalcolithic, MB, Persian, Hellenistic, Byzantine, and Modern

Description: Burial caves dated to the Chalcolithic period and Middle Bronze Age, plastered pools, traces of quarrying activities, and artifacts from various periods as well as a modern Muslim cemetery. The burial cave dated to the Middle Bronze Age (Cave B4) contained the remains of five individuals and approximately fifty intact or restorable vessels including storage jars, bowls, jugs, and juglets (Milevski 2007). An imported juglet from Cyprus attests to the site’s connections with maritime commerce.

References: Milevski 2007

114. MAZOR (EAST), SOUTH

Site no(s).: 27633/0 (IAA)

Boundary coordinates (IAA): 196000, 661450 SW 197000, 661500 NE

Point coordinates (ASI): NA

Area: 5 ha (IAA boundaries)

Period(s): Chalcolithic, Iron II, Persian, Hellenistic, and Byzantine
Description: Settlement remains from Persian and Byzantine period as well as tombs, agricultural installations, enclosure walls, and surface pottery from various other periods.

References: NA

115. ROSH HA-‘AYIN [NAHAL MAZOR]

Site no(s.): 9461/0 (IAA); 78.267 (ASI)

Boundary coordinates (IAA): 196100, 661100 SW 196200, 661200 NE

Point coordinates (ASI): 196200, 661110

Area: 1 ha (IAA boundaries)

Period(s): Iron II and Persian

Description: Remains of rectangular structure (4 x 16 m) with three consecutive rooms connected by passageways. Wall fragments were found to the west.

References: Kochavi and Beit-Arieh 1994: 107, 71*

116. ROSH HA-‘AYIN [NAHAL MAZOR]

Site no(s.): 9472/0 (IAA); 78.273 (ASI)

Boundary coordinates (IAA): 198300, 661000 SW 198500, 661200 NE

Point coordinates (ASI): 198400, 661100

Area: 4 ha (IAA boundaries)

Period(s): Iron II, Roman, Byzantine, and Early Islamic

Description: Remains of structures including a square fort (6.3 x 6.7 m) built of a double row of stones and two courses high with nearby wall fragments, cisterns, and surface scatter of artifacts.

References: Kochavi and Beit-Arieh 1994: 109, 72*–73*
117. **Khurbet el Qasr**\(^{122}\)

**Site no(s).**: 1792/0 (IAA); 78.290 (ASI)

**Boundary coordinates (IAA)**: 197000, 661000 SW 198000, 662000 NE

**Point coordinates (ASI)**: 197200, 660950

**Area**: 100 ha (IAA boundaries)

**Period(s)**: Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Late Islamic and Ottoman

**Description**: Remains of rectangular fort (8.2 x 9.2 m) built of large fieldstones and surviving to a height of six courses. Rectangular building foundations (8.25 x 25 m), also built of large fieldstones, lie adjacent as well as stone boundary walls, a rock-cut cistern, and ruins of a circular structure (7 m in diameter). In addition to wall fragments, installations, and burials dated to various periods, the IAA database record lists a structure, field walls, press, and possible watchbooth all dated to Iron II.

**References**: Kochavi and Beit-Arieh 1994: 113–14, 75*

118. **Qula**

**Site no(s).**: 1643/0 (IAA); 78.285 (ASI)

**Boundary coordinates (IAA)**: 197000, 660000 SW 198000, 661000 NE

**Point coordinates (ASI)**: 197100, 660200

**Area**: 100 ha (IAA boundaries)

\(^{122}\) Although the point information for the site lies south of the IAA boundaries, the site name and description suggest that the two records should be considered together.
Period(s): Chalcolithic, EB I, EB IV, MB, Iron III, Hellenistic, Roman, Byzantine, Crusader, and Ottoman

Description: Remains of village with Crusader stronghold, khan, and fosse. A survey and excavations prior to the construction of the Cross-Israel Highway revealed burial complexes from the Chalcolithic, EB IV, Hellenistic, Roman, and Byzantine periods as well as a press dated to the Byzantine period and a lime kiln of unknown date. Dagan (2011: 15*) asserts that at least one of the burial caves was re-used during the Middle Bronze Age.


119. ḤORVAT PUNDAQ [KHIRBET BIR BUNDUK]

Site no(s).: 1791/0 (IAA); 78.294 (ASI)

Boundary coordinates (IAA): 197000, 660000 SW 198000, 661000 NE

Point coordinates (ASI): 197100, 660200

Area: 100 ha (IAA boundaries)

Period(s): Iron II and Persian

Description: Remains of rectangular fortress (35 x 40 m) with at least one corner tower. The IAA boundaries and database record includes Khirbet el Qasr (see above) and lists other archaeological elements with this site such as structures, cisterns, and presses in addition to scattered artifacts. The boundaries of the recent excavation by Y. Elisha include this site as well as Triangulation Point 158-S 1717/0, Rosh Ha-‘Ayin 9483/0, and Birkat el Rabah 26107/0.

References: Kochavi and Beit-Arieh 1994: 115, 76*; Elisha 2010
A.3.6 Map of Miqve Israel (MR 72)

120. HOLON, TEL GIBBORIM

Site no(s).: 876/0, 25373/0 [Holon, Tel Gibborim (North)]

Boundary coordinates: 178000, 659900 SW 178400, 660500 NE

Area: 24 ha (IAA boundaries)

Periods: EB IV, MB I?

Description: IAA database records shaft tombs from the Middle Bronze Age. Dever (1970: 23, 28–29) notes several unpublished ceramic forms from Holon that date stylistically to EB IV and exhibit lingering features from the Early Bronze Age and some aspects that anticipate further development in MB I. These forms include storage jars with vestigial lug handles that have devolved into knobs, “mugs” or “beakers” with functional handles, and one-spouted lamps.

References: Dever 1970

121. BAT YAM, RAMAT HA-NESI [BAT YAM 5]

Site no(s).: 24520/0 (IAA); 72.7 (ASI)

Boundary coordinates (IAA): 176780, 657300 SW 177000, 657540 NE

Point coordinates (ASI): 176300, 657540

Area: 5.28 ha (IAA boundaries)

Periods: EB IV, MB, and Hellenistic

Description: Remains of a farmstead as well as EB IV and Hellenistic tombs. The IAA database lists MB tombs under the cultural information for this site, but this may be an error in terminology (i.e., entering MB in the database referring to EB IV-MB I rather than the traditional MB II).
References: Barda 2013

122. HOLON, SANHEDRIN STREET [HOLON 4]

Site no(s).: 843/0 (IAA); 72.13 (ASI)

Boundary coordinates: 177700, 656600 SW 178000, 656800 NE

Point coordinates (ASI): 177826, 656755

Area: 6 ha (IAA boundaries)

Periods: EB, MB, LB II, Persian, Hellenistic, Roman, and Byzantine

Description: Small tell named “School Hill” with settlement remains, pottery, and flint tools dating from the Early Bronze Age to Byzantine periods. Architectural remains of two mudbrick buildings separated by a courtyard and oven, all dated to LB II by Cypriot ceramics were unearthed at the site

References: Barda 2013

123. TRIANGULATION POINT 609-H [HOLON 3; RISHON LE-ŻIYON (WEST)]

Site no(s).: 821/0 (IAA); 72.11 and 72.12 (ASI); Gophna and Beck 1981, Site 7

Boundary coordinates: 176500, 656600 SW 176600, 656700 NE

Point coordinates (ASI): 176564, 656648 (72.11); 176300, 656400 (72.12)

Area: 1 ha (IAA boundaries)

Periods: Epipaleolithic, Chalcolithic, EB I, MB I, Persian, and Hellenistic

Description: Remains of a corner of a structure composed three courses of mudbricks resting on kurkar fieldstone foundations three courses high (50 cm) and 1.8 m wide abutted by mudbrick collapse overlying a layer of ash, debris including animal bones, burnt brick, and pottery dated to
MB I. Nearby, R. Gophna excavated a cemetery also dated to the MB I, and later fieldwork in the vicinity also exposed MB I tombs (anon. 1982b). Later finds include an inscribed storage jar with Phoenician letters, dated to the fifth and fourth centuries B.C.E. (anon. 1964b) and Hellenistic pottery near the Middle Bronze Age burials. The IAA database also list Persian period burials in the vicinity.


124. RISHON LE-ŻIYYON DUNES [HOLON 6; HOLON 7]

Site no(s).: 842/0 (IAA); 72.18 and 72.23 (ASI)

Boundary coordinates: 177600, 654700 SW 177860, 655060 NE

Point coordinates (ASI): 177830, 655160 (72.18); 177390, 654906 (72.23)

Area: 9.36 ha (IAA boundaries)

Periods: MB I, MB II, LB I, Iron II, Persian, Roman, and Byzantine

Description: Remains of kurkar stones, mudbricks, and surface pottery dated to MB II and LB I according to the IAA database record. To the south, a scatter of MB I, Iron Age, and later sherds, bones, flint, and basalt may either be ex situ or from a related settlement.

References: Barda 2013

125. RISHON LE-ŻIYYON, INDUSTRIAL AREA [HOLON 9]

Site no(s).: 72.25 (ASI); Gophna and Beck 1981, Site 9

Boundary coordinates: NA

Point coordinates: 178700, 654500

Area: .1 ha (excavator’s estimate)
Periods: MB II and LB

Description: Foundations of several structures made of kurkar fieldstones in addition to surface finds of Middle Bronze Age pottery and basalt grindstones.

References: Gophna and Beck 1981: 63

126. RISHON LE-ŽIYYON SAND DUNES 5

Site no(s).: 72.21 (ASI)

Boundary coordinates: NA

Point coordinates (ASI): 175514, 654371

Area: approximately 2 ha

Periods: MB I, Iron II, Hellenistic, Roman, and Byzantine

Description: Remains of a settlement with worked stones and scattered pottery dating from various periods with Hellenistic being predominant.

References: Barda 2013

127. RISHON LE-ŽIYYON [RISHON LE-ŽIYYON SAND DUNES 7]

Site no(s).: 840/0, 27816/0, 28116/0; 72.26 (ASI)

Boundary coordinates (IAA): 177080, 652500 SW 178300, 654000 NE123

Point coordinates (ASI): 177879, 653665

Area: 183 ha (IAA boundaries); 10 ha (estimated cemetery size; Levy 2005)

Periods: Neolithic, MB I–II, Iron II, Persian, Hellenistic, Roman, Byzantine, and Early Islamic

123 The overall boundary includes adjacent areas of Rishon le-Žiyyon Sand Dunes (West; 27816/0), and Rishon le-Žiyyon Sand Dunes (South; 28116/0).
Description: Remains of large cemetery consisting of 218 pit burials, twenty-eight shaft tombs, and at least three jar burials dated to the MB I–II, structural remains and pits dated to the MB I (Arbel 2009), a mudbrick fortress dated to the eighth century B.C.E., Iron II wine presses that may have been associated with the fortress (Segal 2000; Arbel 2009), and surface scatters of flint implements and pottery. The MB I–II cemetery may have served the communities farther to the north, Rishon le- Ziyyon Sand Dunes (842/0) and Rishon le- Ziyyon Industrial Area (Gophna and Beck 1981, Site 9), and the Middle Bronze Age settlement at Rishon le- Ziyyon Sand Dunes (see below, 15989/0; Gophna and Beck 1981, Site 8). Excavations in the area also revealed later artifacts and installations such as a Roman period sarcophagus (Gorzalczany 2001), a Byzantine period winepress (Shavit 1993), and Early Islamic pottery (Ayash 1999).


128. Rishon le- Ziyyon Dunes [Rishon le- Ziyyon Sand Dunes 9]

Site no(s).: 15989/0 (IAA); 72.28 (ASI); Gophna and Beck 1981, Site 8

Boundary coordinates (IAA): 178200, 652500 SW 178700, 653300 NE

Point coordinates (ASI): 178320, 653100

Area: 40 ha (IAA boundaries)

Periods: MB I, Persian, and Hellenistic

Description: Remains of foundations of a building with associated MB I pottery. Later excavations in the vicinity exposed Persian pits and Hellenistic walls with associated pottery possibly related to later strata of the nearby Iron II fortress (Peilstöcker 1999, 2000c).

124 The excavator estimates that the cemetery contains one thousand burials and extended over an area of 10 ha (Levy 2005: xi)
References: Gophna and Beck 1981: 63; Peilstöcker 1999, 2000c; Barda 2013

129. ELEVATION POINT 24 M [RISHON LE-ŻIYYON SAND DUNES 16]

Site no(s): 26110/0 (IAA); 72.35 (ASI)

Boundary coordinates: 176600, 650900 SW 177150, 651350 NE

Point coordinates (ASI): 176923, 651209

Area: 24.75 ha (IAA boundaries)

Periods: MB, Iron?, Hellenistic, and Late Roman

Description: Surface scatter of flint tools and pottery from the Middle Bronze Age, Hellenistic, and Late Roman periods. The IAA database includes fragments of flint tools and pottery from the Iron Age as well without further specifying which subdivision of the Iron Age.

References: Haiman 1999; Barda 2013

130. GAN SOREQ (WEST) 1

Site no(s): 72.36 (ASI)

Boundary coordinates: NA

Point coordinates (ASI): 177280, 651150

Area: 24 ha (IAA boundaries)

Periods: MB I, LB, Iron II?, Persian, Hellenistic, and Roman

Description: Rock-hewn tombs dating to MB I. To the northeast, salvage excavations revealed habitation levels including mudbrick detritus, flint, basalt grinding stones, and pits dated to the MB I with nearby settlement remains from the Iron Age through the Roman period. ‘Ad notes that this site is on the lower slope of a Middle and Late Bronze Age site (2008).
References: ‘Ad 2008; Barda 2013

131. GAN SOREQ [GAN SOREQ (NORTHWEST) 1; GAN SOREQ (NORTH) 1]

Site no(s).: 839/0 (IAA); 72.38, 72.39 (ASI)

Boundary coordinates (IAA): 177400, 650700 SW 178000, 651300 NE

Point coordinates (ASI): 177861, 651022 (72.38); 178397, 651307 (72.39)

Area: 36 ha (IAA boundaries)

Periods: Lower and Middle Paleolithic, MB, Iron II, Persian, Hellenistic, Roman, and Early Islamic

Description: Architectural remains dated to the Iron II, ruins of courtyard structure, other buildings and two wine presses dated to the Hellenistic period, Roman period burials, and pottery from the Middle Bronze Age through the Early Islamic period. Nearby, flint implements dated to the Lower and Middle Paleolithic were scattered on the ground surface.


132. GAN SOREQ (NORTH) 2

Site no(s).: 72.46 (ASI)

Boundary coordinates: NA

Point coordinates (ASI): 177318, 650860

Area: 24 ha (IAA boundaries)

Periods: MB I and Roman
Description: Fired mudbricks with associated MB vessels in a hamra quarry with scattered pottery and flint tools also visible on ground surface. Possible remains of a settlement that included Gan Soreq (West) 1 and other sites in the vicinity.

References: Barda 2013

133. Tel Ya‘oz

Site no(s).: 759/0 (IAA); 72.41 (ASI)

Boundary coordinates (IAA): 174000, 650000 SW 175000, 651000 NE

Point coordinates (ASI): 174072, 650620

Area: 10 ha (IAA boundaries)

Periods: Iron II, Persian, and Hellenistic

Description: Remains of structures consisting of foundations made of dressed kurkar blocks and hamra mortar and built using kurkar ashlar piers with fieldstones between the piers (pier and rubble construction). Collapsed mudbricks indicate the building material of at least part of the superstructures. The buildings and the majority of the finds, which include ceramic and stone vessels, bronze fibulae, painted plaster architectural details, an anthropomorphic ceramic rhyton, and a Greco-Persian style stamp seal date to the Persian and Hellenistic periods.

An Iron II presence at this site is suggested by Iron Age sherds collected with distinctive Persian and Hellenistic pottery during a survey by M. Dothan and complemented by a complete Iron II bowl was found in the material generated from a foundation trench for a nearby Hellenistic wall (Dothan 1952: 111; Fischer, Roll, and Tal 2008: 129).

References: Dothan 1952; Fischer, Roll, and Tal 2008
134. GAN SOREQ [NAHAL SOREQ 2]

Site no(s).: 790/0 (IAA); 72.42 (ASI)

Boundary coordinates (IAA): 175400, 650100 SW 175500, 650200 NE
Point coordinates (ASI): 175436, 650151

Area: 10 ha (IAA boundaries)

Periods: MB I, Iron II?, Persian, Hellenistic, and Roman

Description: Rock-hewn tombs dating to MB I. To the northeast, habitation levels including mudbrick detritus, flint, basalt grinding stones, and pits dated to the MB I with nearby settlement remains from the Iron Age through the Roman period.

References: Barda 2013

A.3.7 Map of Rishon le- Ziyyon (ASI 73)

135. ḤORVAT BENE BERAQ

Site no(s).: 1039/0, 1040/0, 25371/0 (IAA); 71.81 (ASI)

Boundary coordinates: 183000, 660000 SW 184100, 661000 NE (overall)

Area: 110 ha (combined IAA boundaries)

Periods: MB II, LB II, Iron I, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Ottoman

Description: A series of sondages excavated by Finkelstein revealed the vast settlement history of the site ranging from MB II to Late Islamic with the earlier periods either sealed by later floors or cut by intrusive pits. More recent excavations exposed wall fragments with Iron Age sherds in association (Shadman 2010).

References: anon. 1976, 1978b; Finkelstein 1990; Shadman 2010; Gophna 2015b
136. **TEL YEHUD**

**Site no(s):** 1269/0 (IAA)

**Boundary coordinates (IAA):** 189400, 659600 SW 190020, 660450 NE

**Area:** 52.7 ha (IAA boundaries)

**Period(s):** Chalcolithic, EB IV, MB I–II, LB, Persian, Byzantine, Early Islamic, Ayyubid, Late Islamic, and Ottoman

**Description:** Remains of settlement with fieldstone arches and other architectural elements, pottery, and burials from several periods. Fieldwork by E. Yannai (2004) recovered whole vessels dated to the Post-Palace phase of Aphek, the transitional MB I–II, that were likely grave goods although the plans of the tombs could not be reconstructed. A burial of an adult male and three child burials, only one of which was contained within a storage jar, could also be dated to the Middle Bronze Age based on ceramic grave goods and were likely part of the same burial complex (Segal and Eshed 2011). Recent salvage operations uncovered three Middle Bronze Age burials, one of which included a bronze dagger together with handle rivets and pommel (Arbel 2013). A pottery scatter southeast of town dated to MB II (Gophna and Beck 1981: 74). Rescue excavations at various areas of the site indicate a large settlement from the Early Islamic, Late Islamic and Ottoman periods that overlies and in some cases disturbs earlier phases.

**References:** Gophna and Beck 1981: 74 (Site 31); van den Brink and Shmueli 1997; Gudovitch 1999b; Yannai 2004; Segal and Eshed 2011; Arbel 2013

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137. **NEWE EFRAYIM**

**Site no(s):** 1221/0, 25113/0
**Boundary coordinates:** 187800, 659600 SW 188400, 660200 NE

**Area:** 36 ha (IAA boundaries)

**Periods:** Iron II, Persian, Hellenistic, Byzantine, Early Islamic, and Late Islamic

**Description:** Remains of two ovens, wall foundations, two winepresses, an industrial installation, and a pillar dated to later antiquity (Birman 2007; Sion 2007). Excavations by B.S.J. Isserlin revealed remains and artifacts dating from the Iron Age through Early Islamic period.

**References:** Birman 2007; Sion 2007

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**138. Ono**

**Site no(s).:** 1185/0

**Boundary coordinates:** 187300, 658600 SW 188000, 659500 NE

**Area:** 63 ha (IAA boundaries)

**Periods:** Chalcolithic, EB, LB?, Persian, Roman, Byzantine, Early and Late Islamic, and Ottoman

**Description:** The site of Ono or Kefar Ana presents a special difficulty in which the textual record is met currently with silence from the archaeological record. Literary references to the site include the topographic list of Thutmose III in which Ono (Site 65) follows Lod (Simons 1937: 112), the Hebrew Bible (Ezra 2:33; Neh 6:2, 7:37, 11:35; 1 Chr 8:12), and the Talmud (Shearer 1992: 25). The earliest archaeological investigation at the site began as an inspection and trial excavation supervised by J. Kaplan prior to expansion of the “Or Yehuda” bakery. Kaplan’s efforts exposed three to four meters of Islamic and Ottoman debris and only encountered earlier Roman-Byzantine period settlement at the top of the mound (anon. 1962b: 15). Test trenches dug at the foot of the slope found virgin soil under the Islamic layer. More recent excavations around
the perimeter of the site have also unearthed artifacts from the Chalcolithic, Early Bronze Age, and Persian periods in addition to Byzantine and Early Islamic burials, Crusader coins, and late Ottoman architectural elements (Barkan and Jakoel 2010; Kogan-Zehavi 2011; Sion and Rapuano 2010). It is likely that the Late Bronze Age site is located not at Kefar Ana but at Kafr Junah, approximately seven hundred meters to the northeast of Kefar Ana.

References: anon. 1962b; Shearer 1992; Sion and Rapuano 2010; Kogan-Zehavi 2011

139. Yehud

Site no(s).: 1270/0 (IAA)

Boundary coordinates (IAA): 189650, 658850 SW 190100, 659250 NE

Area: 18 ha (IAA boundaries)

Periods: Chalcolithic, MB, LB, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Ottoman

Description: The IAA database description includes Iron Age pottery kiln, and surface pottery ranging from Chalcolithic to Byzantine periods. Recent excavations in the Ashkenazi market of Yehud revealed a Late Roman-Byzantine industrial complex and yielded some Iron Age II sherds (Jakoel 2012b).

Salvage efforts during a parking lot construction resulted in the excavation of four partial Late Bronze Age tombs that had been severely damaged by machinery (Govrin 2009). The first grave discovered was sealed by a .5 cm thick layer of plaster. The tomb contained a partial human female skeleton in supine position (truncated by heavy machinery), animal bones, a basalt pestle and three-legged mortar, a conical jar, and 2 bowls that contained animal bones, likely sheep ribs. The body was interred on the south side of the tomb with basalt implements and some
pieces of copper nearby, and three additional bowls, also holding faunal remains were located on the north side (Govrin 2009: 3). Another two poorly preserved graves were discovered in the vicinity after suffering damage from a bulldozer (Govrin 2009: 5). Additionally, test excavations found a pit containing a storage jar with an inverted juglet and disarticulated bones of an infant jar burial dated to the Late Bronze Age (Govrin 2009: 9). Govrin also mentions another grave from which the IAA inspectors recovered only a copper dagger (2009: 10).

References: Govrin 2009; Jakoel 2012b

140. AZOR

Site no(s): 974/0, 975/0, 976/0, and 979/0

Boundary coordinates (IAA): 181000, 657560 SW 182000, 659600 NE (composite)

Point coordinates: 181600, 659230

Area: 182 ha (combined IAA boundaries)

Periods: Chalcolithic, EB, MB II, LB II–Iron I, Iron II, Byzantine, Crusader, Late Islamic, and Ottoman

Description: The overall area includes the industrial area of Holon; small tell but large burial fields from Chalcolithic to the modern era.

Tel – Operations by Gophna and Busheri at the edge of the mound reported a settlement dated to the Late Bronze Age–Iron I transition. Excavations by Dagot (2002) revealed a fieldstone pavement and an adjacent installation dated by the Port St. Symeon Ware and imported glazed vessels on the floor and in the fill around the installation to the Crusader period, below which was a hamra fill with Iron II sherds. Van den Brink (2005) excavated two areas near the cinema
in Azor, and Stratum 2 in Area B was composed of a fill with sherds dated exclusively to the Iron Age.

*Cemetery*—In addition to the Chalcolithic and EB I burials excavated by J. Perrot and A. Ben-Tor, respectively (see Perrot 1961 and Ben-Tor 1975), M. Dothan excavated Middle Bronze Age, LB IIB, and Iron I–II burials in his excavations of the necropolis at Azor (designated Areas B, C, and D; Dothan 1958, 1960, 1961b, 1989, 1993). Later salvage operations uncovered more Iron Age tombs (Pipano 1984) and a MB II burial in proximity to Dothan’s previous work (Gorzalczany, Ben-Tor, and Rand 2003). An additional nine tombs dating to the terminal Late Bronze Age and Iron I and thirteen unexcavated tombs likely dating to the modern period (Buchennino 2006a; Buchennino and Yannai 2010); four different types of graves: pit graves, rim-to-rim double pithos burial, tombs built of unfired mud bricks, and cist graves lined with *kurkar*.

Dothan (1961a) also published a storage jar dated to 7th–6th centuries B.C.E., reportedly looted from a burial prior to his 1960 season. This storage jar has a short, rounded rim, sharply carinated shoulder, two loop handles, and pointed bottom (Type JR4, see Ben-Shlomo 2012: 129-31, Fig. 5.9:8) is parallel to “sausage”-shaped jars. The jar was inscribed *lšlmy*, which could be interpreted as either the Aramaic name Shalmai or the Hebrew name Shelemiah(u) attested in biblical and extra-biblical sources.

141. BET DAGAN

Site no(s).: 1072/0

**Boundary coordinates:** 183800, 656600 SW 184200, 656900 NE

**Area:** 12 ha (IAA boundaries)

**Periods:** EB IV, Iron I, Iron II, Persian, Byzantine, Early Islamic, Late Islamic, and Ottoman

**Description:** Remains of a structure, wells, architectural elements, EB IV and Late Islamic burials, and scattered ceramics. A site survey found Iron I pottery and the head of a zoomorphic figurine that may have been part of a *kernos*. Peilstöcker and Kapitaikin (2000) encountered an occupational level dated to the Iron I and II.

**References:** anon. 1966; Peilstöcker and Kapitaikin 2000; Yannai 2008a

142. BET DAGAN, VOLCANI INSTITUTE

Site no(s).: 1010/0 (IAA); Gophna and Beck 1981, Site 32

**Boundary coordinates:** 182600, 655460 SW 182960, 655820 NE

**Point coordinates:** 182700, 655900

**Area:** 12.76 ha (IAA boundaries)

**Periods:** MB II

**Description:** Remains of an unwalled settlement and cemetery dated to MB II. Database summary only describes “remains from the Bronze Age.”

**References:** Gophna and Beck 1981: 74
A.3.8 Map of Lod (ASI 80)

143. Ḥorvat ‘Amar

Site no(s).: 80.7 (ASI)

Point coordinates (ASI): 196700, 659900

Area: NA

Periods: Iron II, Persian, and Byzantine

Description: Fragmentary remains of a structure with entrances to burial caves nearby.

References: Guérin 1874–1875, II: 83; Conder and Kitchener 1881–1883, II: 328; Gophna and Beit-Arie 1997: 20, 26*; Mendel 2000

144. Naḥal Mazor [Ḥorvat Pundaq (South)]

Site no(s).: 14941/0 (IAA); 80.10 (ASI)

Boundary coordinates (IAA): 197060, 659890 SW 197080, 659910 NE

Point coordinates (ASI): 197070, 659900

Area: .04 ha (IAA boundaries)

Periods: Iron II, Persian, Byzantine, Late Islamic, and Ottoman

Description: Remains of settlement including foundations of structures, rock-hewn cisterns, winepress, lime kiln, and agricultural terraces. Ceramic finds date from the Iron Age forward, and Late Islamic-Ottoman periods burials were excavated in the vicinity.

References: Gophna and Beit-Arie 1997: 21–22, 27*

145. Ḥorvat ‘Al (Northwest) [Khirbet Deir ‘Ala (West)]

Site no(s).: 13243/0 (IAA); 80.13 (ASI)
Boundary coordinates (IAA): 199000, 659700 SW 199100, 659800 NE

Point coordinates (ASI): 199000, 659700

Area: 1 ha (IAA boundaries)

Periods: Iron II, Roman, and Byzantine

Description: Fieldstone foundations and scatter of Iron II pottery.

References: Gophna and Beit-Arieh 1997: 22, 27*

146. Ḥorvat ‘al [Khurbet Deir ‘alla]

Site no(s).: 80.14 (ASI)

Point coordinates (ASI): 199500, 659500

Area: 2 ha (ASI estimate)

Periods: Iron II, Roman, and Byzantine

Description: Remains of a settlement with discernible structures and streets in addition to rock-hewn cisterns, pools, tombs, and weights for oil presses. A lime kiln and cistern were recorded nearby.

References: Guérin 1874–1875, II: 120; Conder and Kitchener 1881–1883, II: 310; Gophna and Beit-Arieh 1997: 23, 27*

147. Triangulation Point 634-H [Ḥorvat ‘al (East)]

Site no(s).: 13241/0 (IAA); 80.15 (ASI)

Boundary coordinates (IAA): 199700, 659400 SW 199800, 659600 NE

Point coordinates (ASI): 199800, 659500

Area: 2 ha (IAA boundaries)
Periods: Iron II, Persian, Roman, and Byzantine

Description: Remains of foundations made of fieldstones with adjacent rock-hewn winepress, cisterns, cupmarks, and lime kiln. Pottery collected from the site dates from Iron II to Byzantine period.

References: Gophna and Beit-Arieh 1997: 23, 28*

148. ḤORVAT HANI (WEST)

Site no(s).: 80.5 (ASI)

Point coordinates (ASI): 196350, 659450

Area: NA

Periods: Chalcolithic, EB I, MB II, Iron II, Byzantine, Early Islamic, and Ottoman

Description: Remains of structures dated to the Byzantine period with associated installations such as a winepress, enclosure walls, rock-hewn cisterns and pools, stone clearance piles, and nearby lime kiln. A natural cave with some modifications and built installations contained burials from the Chalcolithic and EB I. E.H.E. Lass (2003: 34) reports that the MB II and Iron II pottery from his excavations at Ḥorvat Hani (West) was recovered from accumulated debris overlying EB I material in the burial cave at that site and on the surface adjacent to the cave, disassociated from stratified material. He posits that the site was a satellite of Lod in the Middle Bronze Age and of the fort or tower at Ḥorvat ‘Ammar during the Iron Age (Lass 2003: 6).

References: Gophna and Beit-Arieh 1997: 20, 25*–26*; Lass 2003; Dagan 2011: 16*

149. TRIANGULATION POINT 449-H [ḤORVAT HANI]

Site no(s).: 13289/0 (IAA); 80.9 (ASI)
Boundary coordinates (IAA): 197000, 659400 SW 197100, 659500 NE

Point coordinates (ASI): 197000,659400

Area: 1 ha (IAA boundaries); .2 ha (ASI estimate)

Periods: Iron II, Persian, Byzantine, Late Islamic, and Ottoman

Description: Remains of building foundations composed of large fieldstones and ashlar masonry, hewn wine and oil presses, reservoir, cisterns, and an arcosolia tomb. Salvage excavations revealed Late Islamic period graves. Surface pottery dated from Iron II to Byzantine periods.

References: Conder and Kitchener 1881–1883, II: 307; Gophna and Beit-Arieh 1997: 21, 26*

150. TRIANGULATION POINT 27-J (SOUTH) [Horvat ‘Al (West)]

Site no(s).: 13234/0 (IAA); 80.12 (ASI)

Boundary coordinates (IAA): 198700, 659400 SW 198800, 659500 NE

Point coordinates (ASI): 198800, 659400

Area: 1 ha (IAA boundaries)

Periods: Iron II

Description: Remains of structure composed of large fieldstones with rock-hewn cistern and trough to the east.

References: Gophna and Beit-Arieh 1997: 22, 27*

151. Khirbet Burj el Haniya [Horvat Hani (South)]

Site no(s).: 13270/0 (IAA); 80.8 (ASI)

Boundary coordinates (IAA): 196900, 659100 SW 197000, 659300 NE
Point coordinates (ASI): 196900, 659200

Area: 2 ha (IAA boundaries); 900 m² (ASI structure measurement)

Periods: Iron II, Persian, and Hellenistic

Description: Remains of square structure (30x30 m) with no distinguishable interior plan. Lime kiln and rock-hewn crushing basin of an oil press were found in the northeastern corner of the building.

References: Gophna and Beit-Arieh 1997: 21, 26*

152. Barqeqet (East)

Site no(s).: 80.25 (ASI)

Point coordinates (ASI): 195500, 658900

Area: .3 ha (ASI estimate)

Periods: Iron II

Description: Structural remains constructed of large fieldstones and heaps of cleared stones.

References: Gophna and Beit-Arieh 1997: 25–26, 30*

153. Khirbet el Bira [Khirbet el Bira (North)]

Site no(s).: 1714/0 (IAA); 80.36 (ASI)

Boundary coordinates (IAA): 196800, 658800 SW 196900, 658900 NE

Point coordinates (ASI): 196800, 658850

Area: 1 ha (IAA boundaries); 304 m² (ASI structural measurement)

Periods: Iron III, Roman, and Byzantine
**Description:** Remains of structure (16 x 19 m) with discernible interior courtyard and rooms with monolithic columns extant, one being in secondary use. A rock-hewn winepress was found to the south.


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154. **RAS ES SUMMAQ**

**Site no(s).:** 80.27 (ASI)

**Point coordinates (ASI):** 195700, 658800

**Area:** .5 ha (ASI estimate)

**Periods:** Iron II, Persian, Hellenistic

**Description:** Remains of buildings on natural terraces with adjacent rock-cut cisterns. ASI reports single sherd of Iron II pottery present, but two sherds are illustrated.

**References:** Gophna and Beit-Arieh 1997: 26, 30*

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155. **TIRAT YEHUDA [KHIRBET EL BIRA (WEST)]**

**Site no(s).:** 1715/0 (IAA); 80.29 (ASI)

**Boundary coordinates (IAA):** 196000, 658600 SW 196200, 658800 NE

**Point coordinates (ASI):** 196200, 655850

**Area:** 4 ha (IAA boundaries)

**Periods:** Iron II, Persian, and Hellenistic

**References**: anon. 1961b; Yeivin and Edelstein 1970; Finkelstein 1981: 335; Gophna and Beit-Arieh 1997: 27, 30*–31*

**156. TRIANGULATION POINT 444-H**

**Site no(s).**: 13256/0 (IAA)

**Boundary coordinates (IAA)**: 195400, 658400 SW 195600, 658800 NE

**Area**: 8 ha (IAA boundaries)

**Periods**: Iron I?, Persian, and Hellenistic

**Description**: Remains of structure(s) with fieldstone foundations and scatters of pottery.

**References**: NA

**157. KHIRBET EL BIRA (NORTH)**

**Site no(s).**: 80.35 (ASI)

**Boundary coordinates (IAA)**: NA

**Point coordinates (ASI)**: 196900, 658600

**Area**: NA

**Periods**: Iron III, Persian, and Byzantine

**Description**: Rock-cut wine presses and cisterns, stone piles, and stone enclosure fences.

**References**: Gophna and Beit-Arieh 1997: 30, 33*
158. **Triangulation Point 18-J (South) [El Muhaddad (West)]**

*Site no(s.):* 13239/0 (IAA); 80.48 (ASI)

**Boundary coordinates (IAA):** 199300, 658500 SW 199400, 658600 NE

**Point coordinates (ASI):** 199400, 658600

**Area:** 1 ha (IAA boundaries)

**Periods:** Iron II

**Description:** Remains of structure, with one discernible room and a possible courtyard, built of large fieldstones and preserved to a height of 2–3 courses. A rock-cut cistern was discovered near the eastern wall.

**References:** Gophna and Beit-Arieh 1997: 35*

159. **Bareqet**

*Site no(s.):* 14947/0 (IAA)

**Boundary coordinates (IAA):** 196940, 658540 SW 196960, 658560 NE

**Area:** 400 m² (IAA boundaries)

**Periods:** Iron II, Roman, and Byzantine

**Description:** IAA database lists a settlement from the Iron Age, Roman, and Byzantine periods including agricultural terraces, burial caves, hewn presses, four cupmarks, a ruined pool, cistern, and remains of rock cuttings. Not to be confused with Bareqet (Site 151 below).

**References:** NA

160. **Bareqet [et Tira]**

*Site no(s.):* 80.19 (ASI)
Point coordinates (ASI): 194700, 658400

Area: NA

Periods: EB, Iron II, Hellenistic, Roman, and Byzantine

Description: Ruins of a deserted village and other structural remains, hewn wine presses, tessellated pavements, and a plastered pit in addition to scattered ashlars, basalt vessels, Early Bronze Age flint tools, and pottery.

References: Guérin 1874–1875, II: 391; Conder and Kitchener 1881–1883, II: 378; anon. 1967b; Gophna and Beit-Arieh 1997: 24, 28*–29*

161. Khirbet el Bira

Site no(s).: 80.33 (ASI)

Point coordinates (ASI): 196800, 658300

Area: NA

Periods: Iron III, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Ottoman

Description: Remains of buildings with fieldstone foundations, cisterns, rock-hewn installations, lime kiln, burial cave, reservoir, and quarries. Trial excavations by Sheftelowitz and Oren (1996) uncovered the remains of a structure (9 x 11 m) with a courtyard (8 x 10 m) and cisterns dated to the Iron IIB, Persian and Byzantine periods, in addition to a winepress, two rock-hewn tombs, and ten quarries dated from the Roman and Byzantine periods that were reused in the Ottoman period.

162. **Khirbet el Bira (West)**

**Site no(s).**: 80.30 (ASI)

**Point coordinates (ASI):** 196250, 658300

**Area:** NA

**Periods:** Iron III

**Description:** Rock-hewn winepress with treading floor, pile of cleared stones enclosed by stone fence, and haphazard dispersion of large building stones.

**References:** Gophna and Beit-Arieh 1997: 27, 31*

163. **Me‘arot Bareqet**

**Site no(s).**: 14948/0 (IAA)

**Boundary coordinates (IAA):** 196890, 658240 SW 196910, 658260 NE

**Area:** 400 m² (IAA boundaries)

**Periods:** Iron I, Persian, Hellenistic, Roman, Byzantine, Early Islamic, and Ottoman

**Description:** IAA database lists a settlement from the Iron Age through the Ottoman period including agricultural terraces, burial caves, hewn presses, a plastered pool, cistern, and remains of rock cuttings.

**References:** NA

164. **Nahal Beit ‘Arif**

**Site no(s).**: 80.42 (ASI)

**Point coordinates (ASI):** 198000, 658000
Area: 286 m² (ASI structural measurement)

Periods: Iron II, Persian, Early Roman, and Byzantine

Description: Rectangular area (22 x 13 m) enclosed by stone fence with rock-hewn installations within, dated by surveyors to the Persian and Byzantine periods. Later excavations by E. Ayalon revealed small square rooms (2.5 x 2.5 m) with finds dated to the Iron II, Persian, and Early Roman periods.

References: anon. 1982a; Gophna and Beit-Arieh 1997: 32, 34*

165. TRIANGULATION POINT 189-Z (NORTHEAST) [BAREQET]

Site no(s).: 13128/0 (IAA); 80.60 (ASI)

Boundary coordinates (IAA): 195300, 657800 SW 195400, 657900 NE

Point coordinates (ASI): 195300, 657900

Area: 1 ha (IAA boundaries)

Periods: Iron II, Persian, Hellenistic, and Roman

Description: Rock-hewn cave on hilltop with agricultural terraces, hewn cisterns, winepress, and cupmarks nearby.

References: Gophna and Beit-Arieh 1997: 39–40, 38*

166. HORVAT BURNAT [KHIRBET BURNAT (NORTHWEST)]

Site no(s).: 1710/0, 1711/0, 13214/0 (IAA); 80.65 (ASI)

Boundary coordinates (IAA): 196000, 657000 SW 197000, 658000 NE

Point coordinates (ASI): 196100, 657750

Area: 10 ha (IAA boundaries)
Periods: EB, LB, Iron II, Persian, Hellenistic, Roman, Byzantine, and Early Islamic

Description: Small tell with remains of structures and city wall from the Early Bronze Age, an Iron Age oil press, and terrace walls, floors, building walls, alleys, and finds from later periods. Site boundaries also encompass Triangulation Point 200-Z (East; IAA 13214/0), at which the IAA records undefined feature and a scatter of pottery dated to the Iron Age. It is likely that this should be equated with the press and ceramics found by Torge and Gendelman (2008).


167. TRIANGULATION POINT 2-J (SOUTH) [KHIRBET MUSHT FEIYADA]

Site no(s).: 13287/0 (IAA); 80.71 (ASI)

Boundary coordinates (IAA): 197400, 657500 SW 197500, 657600 NE

Point coordinates (ASI): 197500, 657500

Area: 1 ha (IAA boundaries)

Periods: Iron II, Persian, and Hellenistic

Description: Remains of structures on three natural terraces, including a building interpreted as a four-room house on the highest, a pile of stones from a collapsed building on the middle terrace, and on the lowest, remains of a circular structure (9 m diameter) with two extant courses, which has been interpreted as a tower. A rock-hewn winepress and cistern are nearby.

References: Gophna and Beit-Arieh 1997: 45–46, 41*

168. TRIANGULATION POINT 807-X (SOUTH) [KHIRBET BURNAT (SOUTHWEST)]

Site no(s).: 13188/0 (IAA); 80.66 (ASI)

Boundary coordinates (IAA): 196100, 657200 SW 196200, 657300 NE
Point coordinates (ASI): 196100, 657300

Area: 1 ha (IAA boundaries)

Periods: Iron II, Persian, Hellenistic, and Roman

Description: Remains of structures with rock-hewn and fieldstone foundations with a plastered cistern in one of the buildings. Additional structures and rock-hewn installations were observed on an adjacent rock terrace.

References: Gophna and Beit-Arieh 1997: 42–43, 39*

169. SHOHAM [KHIRBET ABU HAMID]

Site no(s).: 12 (ASI)

Point coordinates (ASI): 195000, 657100

Area: 1 ha (ASI estimate)

Periods: Chalcolithic, EB I, EB II, Iron II, Persian, Roman, Byzantine, and Early Islamic

Description: Remains of a settlement with predominant EB I and Persian features as well as finds from various other periods.


170. TRIANGULATION POINT 200-Z (SOUTH) [EL KHIRBA]

Site no(s).: 13259/0 (IAA); 80.80 (ASI)

Boundary coordinates (IAA): 195500, 656800 SW 195600, 656900 NE

Point coordinates (ASI): 195500, 656900

Area: 1 ha (IAA boundaries)
Periods: Chalcolithic, EB, Iron II, Persian, Roman, Byzantine, and Early Islamic

Description: Settlement ruins with structural remains, pavement fragments, rock-hewn winepresses and cisterns, and arcosolia tombs dated from Roman to Early Islamic periods. Ceramics and small finds range from Chalcolithic to Persian period.

References: Gophna and Beit-Arieh 1997: 48–49, 43*

171. NAḤAL BEIT ‘ARIF

Site no(s).: 13209/0 (IAA); 80.88 (ASI)

Boundary coordinates (IAA): 197100, 656900 SW 197200, 657000 NE

Point coordinates (ASI): 197200, 656900

Area: 1 ha (IAA boundaries)

Periods: Iron II, Byzantine, and Early Islamic

Description: Remains of a tower composed of large stones, dated to the Byzantine period, and a nearby cistern.

References: Gophna and Beit-Arieh 1997: 52, 45*

172. ḤORVAT TINSHEMET [KHIRBET ‘ALI MALIKINA; KHIRBET ESH SHAMIYA]

Site no(s).: 1709/0, 14961/0 (IAA); 80.84 (ASI)

Boundary coordinates (IAA): 196000, 656000 SW 197000, 657000 NE

Point coordinates (ASI): 196600, 656350

Area: 10 ha (IAA boundaries)

Periods: EB I, Iron II, Persian, Hellenistic, Roman, Byzantine, Late Islamic, and Ottoman
**Description:** Settlement remains that include foundations of structures, rock-hewn cisterns, ashlar quarry-\textit{cum-}reservoir, winepress, and karstic caves used for burial. Traces of Early Bronze Age flint productions were found in salvage excavations.

**References:** Guérin 1874–1875, II: 76; Conder and Kitchener 1881–1883, II: 328; Gophna and Beit-Arieh 1997: 50–51, 44

173. **SHOHAM**

**Site no(s).:** 13130/0 (IAA)

**Boundary coordinates (IAA):** 195300, 655400 SW 195800, 655800 NE

**Area:** 20 ha (IAA boundaries)

**Periods:** Iron II, Hellenistic, Roman, Byzantine, Early Islamic

**Description:** Remains of a structure walls, architectural elements, presses, cistern, plastered cave (used as a \textit{mikveh}), scattered artifacts, and a burial dating to the Iron Age II.

**References:** Dahari and ‘Ad 2000

174. **BEIT ‘ARIF [NAHAL BET ‘ARIF]**

**Site no(s).:** 14737 (IAA); 80.91 (ASI)

**Boundary coordinates (IAA):** 193500, 655400 SW 193800, 655700 NE

**Point coordinates (ASI):** 193600, 655500

**Area:** 9 ha (IAA boundaries)

**Periods:** Chalcolithic, EB I, MB II, and Byzantine

**Description:** Burial cave with fragments of Chalcolithic ossuaries and a secondary MB II burial. Arcosolia tombs and rock-hewn winepress nearby.
References: Gophna and Beit-Arieh 1997: 53, 46*

175. **Khirbet Abu El Fahm (Southwest)**

Site no(s).: 80.120 (ASI)

Point coordinates (ASI): 199500, 655400

Area: NA

Periods: Iron II

Description: Remains of structure with walls constructed of large fieldstones and a lime kiln that was added later.

References: Gophna and Beit-Arieh 1997: 62, 51*

176. **Naḥal Bet ‘Arif**

Site no(s).: 80.109 (ASI)

Point coordinates (ASI): 196750, 655050

Area: 3 ha (ASI estimate)

Periods: Iron II, Persian, Roman, Byzantine, Late Islamic, and Ottoman

Description: Remnants of a settlement including structural remains, rock-hewn installations, plastered reservoir, tombs, and agricultural terraces.

References: Gophna and Beit-Arieh 1997: 58–59, 49*

177. **Shoham (South) [Naḥal Bet ‘Arif]**

Site no(s).: 16300/0 (IAA); 80.125 (ASI)

Boundary coordinates (IAA): 194350, 654900 SW 194570, 655000 NE
Point coordinates (ASI): 194400, 654900

Area: 2.2 ha (IAA boundaries)

Periods: Chalcolithic, EB I, MB II, LB, Iron II, Byzantine, and Early Islamic

Description: Complex of natural caves, four of which were excavated. Two caves, one L-shaped (16.5 x 18 m) and the other bell-shaped, revealed burials from the Chalcolithic period after which the caves were used for dwellings in the EB I, Middle Bronze Age, Iron II, and later periods. The bell-shaped cave was also used for burials in the Late Bronze Age.

References: Gophna and Beit-Arieh 1997: 63–64, 52*–53*; Gophna and Feldstein 1998

178. BEIT NEHEMIAH [KHIRBET BEIT KUFA (NORTHWEST); KHIRBET BEIT KUFA (NORTH)]

Site no(s.): 13138/0 (IAA); 80.146, 80.147 (ASI)

Boundary coordinates (IAA): 196300, 653600 SW 196600, 654400 NE

Point coordinates (ASI): 196310, 653700; 196500, 653600

Area: 24 ha (IAA boundaries)

Periods: MB I, Iron II, Persian, Hellenistic, Byzantine, Crusader, and Late Islamic

Description: Rock-hewn cisterns, arcosolia tomb, and scattered pottery on hillside with circular structures attributed to MB I nearby. Salvage excavations by Abu Fana (2004) revealed terrace walls dated to the Byzantine period that formed a square enclosure. Site boundaries overlap with those of Triangulation Point 208-Z (North; IAA 13124/0).

References: Gophna and Beit-Arieh 1997: 69, 57*; Yekutieli, Faran, and Ben Yishai 2000; Abu Fana 2004; Dagan 2011: 16*
179. **ESH SHEIKH ABU ISMA‘IL**

Site no(s).: 80.158 (ASI)

**Point coordinates (ASI):** 199000, 653600

**Area:** NA

**Periods:** Iron II

**Description:** Sheikh’s tomb on a hill, east of which was found a rock-cut winepress consisting of a treading surface and collection vat with a cistern nearby.

**References:** Gophna and Beit-Arieh 1997: 73, 60*

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180. **BEIT KUFAH**

Site no(s).: 80.145 (ASI)

**Point coordinates (ASI):** 196550, 653400

**Area:** NA

**Periods:** Iron II, Roman, Byzantine, Early Islamic, and Ottoman

**Description:** Remains of a Byzantine period settlement with tessellated pavement and nearby cistern. A survey in the area collected Iron II and later ceramics.

**References:** Guérin 1874–1875, II: 68; Conder and Kitchener 1881–1883, II: 306; Gophna and Beit-Arieh 1997: 68, 57*

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181. **ELEVATION POINT 207 M**

Site no(s).: 33862/0 (IAA)

**Boundary coordinates (IAA):** 198800, 653040 SW 199150, 653330 NE

**Area:** 10.15 ha (IAA boundaries)
Periods: Iron II

Description: Remains of a possible watchtower, burial cave, cistern, and rock cuttings. Surface pottery dates to the Iron Age.

References: NA

182. NAHAL NATUF

Site no(s).: 80.144 (ASI)

Point coordinates (ASI): 196300, 653100

Area: NA

Periods: Iron II, Roman, and Byzantine

Description: Fieldstone dam across a tributary of Nahal Natuf dated to the Byzantine period. A survey of the area revealed steps leading from the dam to a rock-hewn winepress, cistern, and adjacent burial cave. Pottery from this area dated to the Iron Age II and later periods.

References: Gophna and Beit-Arieh 1997: 68, 57*

183. ELEVATION POINT 201 M

Site no(s).: 34281/0 (IAA)

Boundary coordinates (IAA): 198330, 652930 SW 198510, 653020 NE

Area: 1.62 ha (IAA boundaries)

Periods: Iron II and Byzantine

Description: Rock-hewn winepress and surface scatter of pottery.

References: NA
184. **Khirbet Budrus (West)**

*Site no(s.):* 13284/0 (IAA); 80.179 (ASI)

**Boundary coordinates (IAA):** 197800, 652800 SW 197900, 652900 NE

**Point coordinates (ASI):** 197900, 652800

**Area:** 1 ha (IAA boundaries)

**Periods:** Iron II and Byzantine

**Description:** Remains of fieldstone foundations, three rock-hewn cisterns with conduits, and scattered sherds.

**References:** Gophna and Beit-Arieh 1997: 85–86, 65*

185. **Abu el Hubban**

*Site no(s.):* 1706/0 (IAA); 80.176 (ASI)

**Boundary coordinates (IAA):** 196400, 652700 SW 196500, 652800 NE

**Point coordinates (ASI):** 196400, 652700

**Area:** 1 ha (IAA boundaries)

**Periods:** PPNB, Iron II, Hellenistic, and Byzantine

**Description:** Remains of Hellenistic field boundary or enclosure walls, Byzantine farm with press and cistern, caves with evidence of rock-cuttings, and surface scatter of Neolithic flint tools and Iron II pottery.

**References:** Gophna and Beit-Arieh 1997: 81–85, 65*

186. **Tel Hadid [El Haditha]**

*Site no(s.):* 1640/0, 16245/0 (IAA); 80.166, 80.168, 80.170, 80.173 (ASI)
**Boundary coordinates (IAA):** 195000, 652000 SW 196000, 653500 NE

**Point coordinates (ASI):** 195500, 652400

**Area:** 150 ha (IAA boundaries); 4 ha (ASI estimate)

**Periods:** EB IV, MB, LB, Iron I, Iron II, Hellenistic, Roman, Byzantine, Early Islamic, Late Islamic, and Ottoman

**Description:** Stratified tell with structural remains, a tessellated pavement with a stylized city labeled “Egypt,” rock-hewn wine and oil presses, cisterns, quarries, burial caves, and arcosolia tombs. Pottery scattered on the ground surface ranged in date from the Middle Bronze Age to the Ottoman period.

Two Neo-Assyrian cuneiform documents were recovered from Iron II buildings (Na‘aman and Zadok 2000), and H. Torge excavated a portion of another residential building built of large fieldstones (Torge 2010). A jar handle with a two-winged LMLK stamp impression was found as well as a worn fragment of a broken figurine. Near the Iron II structures, three wine presses also dating to Iron Age were uncovered, and twenty-five oil presses were found in the area northwest of the tell (Beit-Arie 2008). Additionally, a burial cave used during the eighth century B.C.E. and the Roman period was excavated north of Tel Hadid (Yannai 2012).

The boundaries determined by the IAA (listed above) represent maximal extent of the site of Tel Hadid, which has since been divided into smaller individual “sites” with their boundaries falling within or adjacent to the overall dimensions of Tel Hadid. These smaller parcels, many of which are located on the lower slopes of the tell, are the result of various salvage operations required by the construction of the Trans-Israel Highway (IAA 16245/0) or infrastructure installation and include the lower city of Tel Hadid (IAA 14966/0) and several other areas,
designated either Hadid or el Haditha in the database (IAA 13220/0, 13221/0, 14967/0, and 14980/0). The finds from these satellite sites echo the settlement history of Tel Hadid.


187. NAHAL NATUF

Site no(s).: 80.188 (ASI)

Point coordinates (ASI): 194800, 651900

Area: 5 ha (ASI estimate)

Periods: PPNB, Iron II, Roman, Byzantine, and Ottoman

Description: The initial survey revealed a prehistoric site with evidence of a chipped stone atelier. A later survey by Dagan discovered remains of settlement with building elements, wine presses, burial caves and tombs, cisterns, and rock-cuttings in addition to scatters of pottery from Iron II and later periods. Given its proximity to Tel Hadid, this site was likely a satellite in the historical era.

References: Gophna and Beit-Arieh 1997: 90, 69*

188. LOD [LYDDA]

Site no(s).: 1324/0 (IAA); 80.184 (ASI)

Boundary coordinates (IAA): 190450, 651550 SW 191100, 652800 NE

Point coordinates (ASI): 190500, 651500
Area: 81.25 ha (IAA boundaries)

Periods: Pottery Neolithic, Chalcolithic, EB I–II, MB I–II, LB, Iron II, Persian, Hellenistic, Roman, Byzantine, Early Islamic, Crusader, Late Islamic, and Ottoman

Description: Stratified tell with occupational layers dating from the Pottery Neolithic to the Ottoman period partly covered by the modern city.

Although the earliest occupational strata are located on the banks of the ‘Ayalon River, the smaller, unwalled Middle and Late Bronze Age settlements were located about 500 meters south. Lod’s MB I–II remains consist of several pits and a tabun with some associated pottery, (Yannai and Marder 2000: 64*), tombs (excavated by Peilstöcker), a hearth (Arbel 2004), enclosure walls and crucibles of a metal workshop, slag and pottery overlying a Neolithic wall fragment (Segal 2012), mudbrick walls and associated living surfaces and flint tools (Golani 2012). The Late Bronze Age site, possibly mentioned as no. 64 on Thutmose III’s topographic list, is represented by pottery in refuse pits and a Cypriot WS bowl fragment (Schwartz 1991: 39; Elisha 2009).

Excavations also uncovered a wine press comprising four vats with sedimentation pits and dated to the ninth century B.C.E. by associated pottery (Yannai and Marder 2000; Yannai 2008: 1915). Although recovered from a mixed context, an Iron Age krater and a fragment of a drum from a figurine were found during operations in Abba Hillel Silver Street (Golan 2000). Iron Age sherds have been collected in several other excavations, also from mixed contexts (van den Brink 1999; Shmueli 2000; Arbel 2004).

References: Schwartz 1991; Kaplan 1993c; van den Brink 1999; Golan 2000; Shmueli 2000; Yannai and Marder 2000; Arbel 2004; Yannai 2008b; Elisha 2009; Golani 2012; Segal 2012
189. Modi'im Junction

Site no(s).: 80.186 (ASI)

Point coordinates (ASI): 194210, 651090

Area: NA

Periods: Iron II, Roman, and Byzantine

Description: Rock-hewn installations including wine presses with troughs leading to cisterns, arcosolia tombs, and burial caves.

References: Gophna and Beit-Arieh 1997: 90, 69*

190. Khirbet Edh Dhuheiriya (North)

Site no(s).: 80.206 (ASI)

Point coordinates (ASI): 193900, 650900

Area: NA

Periods: Iron II, Roman, Byzantine, and Late Islamic

Description: Rock-hewn vats, cisterns, three tombs, and rock-cuttings. It is likely that this site is a satellite of agricultural installations from the main settlement at Khirbet edh Dhuheiriya (see below).

References: Gophna and Beit-Arieh 1997: 94, 72*

191. Horvat Shalem [Deir Abu Salama]

Site no(s).: 80.214 (ASI)

Point coordinates (ASI): 196100, 650800

Area: 1 ha (ASI estimate)
**Periods:** EB I, EB II, Iron II, Persian, Hellenistic, Byzantine, Late Islamic, and Ottoman

**Description:** Remains of a settlement with rock-hewn winepress and pits in the center of the site. This site was probably a satellite site of either the site of *Khirbet edh Dhuheiriya* or the larger settlement at *Tel Hadid*.

**References:** Conder and Kitchener 1881–1883, II: 310; Gophna and Beit-Arieh 1997: 96–97, 74*

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**192. BEN SHEMEN**

**Site no(s).:** 14949/0 (IAA)

**Boundary coordinates (IAA):** 193750, 650700 SW 193850, 650800 NE

**Area:** 1 ha (IAA boundaries)

**Periods:** Iron IIB, Hellenistic, Byzantine, and Late Islamic

**Description:** Settlement remains with associated hewn cistern, basin, rock-cuttings, and scattered ceramics from Iron II and later periods; possibly a satellite settlement of *Khirbet edh Dhuheiriya*. Excavations conducted along the route of the Cross-Israel Highway revealed a pit with fragments of bowls, kraters, lamps and cups dated to the eighth century B.C.E. (Yekutieli et al. 2000: 62*).

**References:** Yekutieli et al. 2000; Dagan 2011: 17*–19*

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**193. BEN SHEMEN (SOUTH)**

**Site no(s).:** 25096/0 (IAA)

**Boundary coordinates (IAA):** 194400, 650400 SW 194700,650700 NE

**Area:** 9 ha (IAA boundaries)
Periods: MB and Iron I?

Description: Building remains and scatters of pottery and lithics from the Middle Bronze Age and Iron Ages; possible satellite of Khirbet edh Dhuheiriya (13114/0).

References: NA

194. Khirbet edh Dhuheiriya

Site no(s).: 15000/0 (IAA)

Boundary coordinates (IAA): 193790, 650390 SW 193810, 650410 NE

Area: 400 m² (IAA boundaries)

Periods: Iron II, Persian, Hellenistic, Byzantine, Early Islamic, and Ottoman

Description: Remains of a settlement with foundations of structures, hewn cisterns, rock-cuttings, burial caves, and pottery dated from Iron II to the Ottoman period. This is likely a satellite of Khirbet edh Dhuheiriya (13114/0).

References: NA

195. Khirbet edh Dhuheiriya [Khirbet el-Thahiriya]

Site no(s).: 13114/0(IAA); 80.204 (ASI)

Boundary coordinates (IAA): 194000, 650200 SW 194150, 650600 NE

Point coordinates (ASI): 193990, 650400

Area: 6 ha (IAA boundaries); .6 ha (ASI estimate)

Periods: Chalcolithic, Iron II, Persian, Hellenistic, Byzantine, Early Islamic, and Ottoman

Description: Ruins of Arab village with structures, bell-shaped cisterns, and hewn installations. Burial caves in the area formed a Chalcolithic necropolis. Surface finds included pottery dating
from Iron II to the Ottoman period. Later excavations at Sites 90 and 91 on the Cross-Israel Highway survey discovered a fragment of a figurine thought to be an equid with a saddle at Site 90 and worn sherds of bowls, kraters, jars, a decanter and a lamp dated to end of the Iron Age or beginning of the Persian period (Birman 2001: 68*).

**References:** Conder and Kitchener 1881–1883, II: 265; Haiman and Dagan 1996; Birman 2001; Dagan 2011: 19*
Appendix B: Average Nearest Neighbor Analysis Reports for Settlement Patterns of the Middle Bronze, Late Bronze, and Iron Ages

B.1 Results of Analyses

This appendix contains the reports generated by the GIS software (ArcGIS 10.2) as a result of performing the Average Nearest Neighbor Analysis for the settlement patterns for each archaeological period within the area of study. Formulae used to calculate this analysis have been discussed by Hodder and Orton (1976, 38-40; see also the discussion in 1.5.5 Evaluation of GIS Methods). For these analyses, the entire land area of the region under consideration was used as the bounding area rather than employing a rectangle that would enclose only the sites for a particular period. The results of the analysis produce a randomness observation based on distribution of sites; thus, the z-score equals 1, then sites are considered to be randomly distributed. A z-score greater than 1.65 represents a regular distribution (in which a z-score of 2.1491 equals uniform distribution. Conversely, a z-score less than 1.65) indicates clustering. As noted previously, nearest neighbor analysis merely indicates if sites are clustered, random or regularly spaced. It does not explain the underlying natural or cultural reasons for site location.
Average Nearest Neighbor Summary - MB I

Given the z-score of -3.07, there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Average Nearest Neighbor Summary

- **Observed Mean Distance**: 1567.1080 meters
- **Expected Mean Distance**: 2117.7168 meters
- **Nearest Neighbor Ratio**: 0.739999
  - **z-score**: -3.066182
  - **p-value**: 0.002168

Dataset Information

- **Input Feature Class**: Middle Bronze I
- **Distance Method**: Study EUCLIDEAN
  - **Area**: 681,678,131.645448 sq. meters
Given the z-score of -0.50, the pattern does not appear to be significantly different than random.

**Average Nearest Neighbor Summary**

- **Observed Mean Distance:** 1795.9155 meters
- **Expected Mean Distance:** 1864.9262 meters
- **Nearest Neighbor Ratio:** 0.962995
- **z-score:** -0.495546
- **p-value:** 0.620215

**Dataset Information**

- **Input Feature Class:** Middle Bronze II-III
- **Distance Method:** EUCLIDEAN
- **Study Area:** 681,678,131.645448 sq. meters
Average Nearest Neighbor Summary - LB I-II

Given the z-score of -0.39, the pattern does not appear to be significantly different than random.

Average Nearest Neighbor Summary

Observed Mean Distance: 2929.6019 Meters
Expected Mean Distance: 3076.9712 Meters
Nearest Neighbor Ratio: 0.952106
      z-score: -0.388733
      p-value: 0.697474

Dataset Information

Input Feature Class: Late Bronze I-II
Distance Method: EUCLIDEAN
Study Area: 681,678,131.645448 sq. meters
Average Nearest Neighbor Summary - LB III/Iron I

Nearest Neighbor Ratio: 0.709371
z-score: -2.779964
p-value: 0.005436

Significance Level (p-value)
0.01  < -2.58
0.05  -2.58 - -1.96
0.10  -1.96 - -1.65
     -1.65 - 1.65
0.10  1.65 - 1.96
0.05  1.96 - 2.58
0.01  > 2.58

Given the z-score of -2.78, there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Average Nearest Neighbor Summary

Observed Mean Distance: 1852.0955 meters
Expected Mean Distance: 2610.8966 meters
Nearest Neighbor Ratio: 0.709371
z-score: -2.779964
p-value: 0.005436

Dataset Information

Input Feature Class: LB III/Iron Age I
Distance Method: EUCLIDEAN
Study Area: 681,678,131.645448 sq. meters
Average Nearest Neighbor Summary - Iron IIA

Nearest Neighbor Ratio: 1.084270
z-score: 0.558463
p-value: 0.576528

Given the z-score of 0.56, the pattern does not appear to be significantly different than random.

Average Nearest Neighbor Summary

Observed Mean Distance: 4086.0767 meters
Expected Mean Distance: 3768.5047 meters
Nearest Neighbor Ratio: 1.084270
z-score: 0.558463
p-value: 0.576528

Dataset Information

Input Feature Class: Iron Age IIA
Distance Method: EUCLIDEAN
Study Area: 681,678,131.645448 sq. meters
Given the z-score of -0.67, the pattern does not appear to be significantly different than random.

Average Nearest Neighbor Summary

Observed Mean Distance: 2473.3370 meters
Expected Mean Distance: 2664.7352 meters
Nearest Neighbor Ratio: 0.928174
z-score: -0.673163
p-value: 0.500843

Dataset Information

Input Feature Class: Iron IIB
Distance Method: EUCLIDEAN
Study Area: 681,678,131.645448 sq. meters
Given the z-score of -4.39, there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Average Nearest Neighbor Summary

Observed Mean Distance: 939.4317 meters
Expected Mean Distance: 1186.7712 meters
Nearest Neighbor Ratio: 0.791586
z-score: -4.385813
p-value: 0.000012

Dataset Information

Input Feature Class: Iron IIC-III
Distance Method: EUCLIDEAN
Study Area: 681,678,131.645448 sq. meters
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