

5-2021

Spatial Assessment of Urban Growth in Cities of the Decapolis; and the implications for modern cities

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Spatial Assessment of Urban Growth in Cities of the Decapolis; and the implications for modern cities

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Geography

by

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May 2021
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Abstract

The Levant's Decapolis was a network of ten cities in Greco-Roman Israel, Jordan, and Syria that established a thriving economic community. The Decapolis was home to ancient and modern cities like Damascus (Dammásq) and Amman (Philadelphia). Despite the various origins of these cities, Roman administration and their city planners oversaw the implementation of idealized Roman city form throughout the region. Three Decapolis cities represent intriguing examples of the larger confederation. Philadelphia (Amman), Gerasa (Jerash), and Gadara (Umm Qais) represent cities of common original urban form which developed drastically diverse urban morphologies over time.

Spatial analyses of these cities required working from the modern urban plans to Roman-era morphologies. Project methodology involved the assessment of satellite and flyover imagery for both the modern city structure and the extant ancient city infrastructure and remains. Utilizing remote-sensing applications enabled in-depth analyses of land use and past urban structures. As the older city forms and infrastructure were identified, their reconstructions based on archaeological excavations and historical accounts were crucial. Preliminary results revealed important aspects about the urban form of each city over time. For example, Amman is now completely surrounded by its Roman ruins, radiating from the old Roman center into the large city today, little affected by topography. By the 20th century, Jerash had enlarged primarily to the east, however, more recently into a distinctive radial pattern. Umm Qais, however, has expanded eastward of its old center in an *organic* morphology following topography and watercourses. Urban morphometric analysis is vital for explaining and visualizing how Decapolis cities had

developed and created powerful links, intertrade routes, and economies – the thrust of this study.

Key words: Roman, Urban, Jordan, Development, Remote Sensing

Acknowledgements

At this time, I would like to thank the University of Arkansas and my committee for the resources and training provided in pursuing this research. First and foremost, my advisor, Dr. Tom Paradise should be thanked for his immense support in guiding my research interests and providing key starting context for the region. I would also like to thank Dr. Jason Tullis for instruction on the understanding, obtainment, and use of geospatial data, such as satellite imagery. Such instruction was crucial for simply displaying otherwise complex data. Finally, I would like to thank Dr. Rhodora Vennarucci for providing input and context for the ancient periods under examination. The Department of Geosciences was also instrumental in directing my study and providing the tools for geospatial evaluation of the study sites. Although travel to Jordan was interrupted by travel restrictions, I would also like to thank the Department of Middle Eastern Studies at the University of Arkansas for attempting to fund my study abroad. Additionally, I would like to thank the department for funding my graduate assistantship at the University of Arkansas.

Dedication

I dedicate this thesis to the memory of my late grandfather, Harley Dwayne Webb, who supported my interests with unconditional enthusiasm and love. I would also like to thank my parents, Joe Pierson and Sheila Burroughs, for their support during my research.

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Preface: RESEARCH RESTRICTIONS

Analyzing these three cities has been a difficult but intriguing task. A primary note must include that studying these ancient sites, in person, was not possible due to ongoing travel restrictions associated with the COVID-19 global pandemic. Plans had been made to visit each site to obtain a better knowledge of their character and development. Once conditions have resettled, it is my hope to visit these cities in Jordan. Moreover, if future research is pursued, multiple paths could be taken. More extensive research on these particular cities could glean more information with increased technical capabilities and context. It should also be noted that some areas of time and space for these cities are relatively unknown. As technology improves and archaeological excavations uncover more information, these cities could be re-examined to verify/criticize aspects of this approach. Another approach could include taking a similar methodological approach and apply it to other sites. The application of this approach to other regions within the Decapolis or in the Roman East immediately comes to mind. Portions of the Decapolis in Israel/Palestine or Syria could allow for a more general understanding of the ancient federation. Additionally, these cities would provide more data points for the understanding of modern city development throughout the Levant.

Chapter 1. INTRODUCTION

In the modern world, ours is increasingly an urban world. In 1950, less than one-third of the world's population lived in urban areas but that number is projected to increase to 68.4% by 2050 (UNDESA 2018). The stark contrasts between these two points in time contain a multitude of factors, conditions, and research questions. It raises the question of how did we get from here to there? Along this line of thinking, the question also remains on how has the urban population of the earth changed over the history of urbanization? Additionally, how are the relationships between ancient and modern cities manifested in both the physical, urban environment and the cultural heritages of said cities? Some answers to these questions can be answered by analyzing a small set of cities within the Kingdom of Jordan.

The Kingdom of Jordan contains an incredible number of heritage and cultural sites for both the Middle East region and the larger world. Several of these have reached the peak level of recognition in being granted the status of World Heritage Site by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Petra is one of the most well-known of these heritage sites and overshadows cultural gems throughout Jordan and the surrounding region. Some of these gems are the cities of the Decapolis. The Decapolis, or ten cities, was a league of mixed Greco-Roman and native Semitic cities within the Greater Levant (Syria, Lebanon, Israel/Palestine, and Jordan). The Decapolis somehow managed to operate on the periphery of major empires, like the Lagid (Ptolemaic), Seleucid, Roman, Nabataean, and Islamic empires, but also had interactions with key figures and events. Their importance largely stemmed from their position east of Judea and Syria which placed them among the far-reaching trade networks of the Nabataeans and beyond (Figures 1.1 and 1.2). These cities are also some of the most well-preserved examples of Roman urban form throughout the entire Mediterranean.

Elements of these urban forms were remarkably consistent throughout the Decapolis and yet each city offered unique variations on the Roman urban form. Their degree of preservation varied from city to city but usually, the Roman or even earlier structures survived due to some level of abandonment for several centuries. This abandonment began after the eighth century CE and lasted until modern settlements in the 16th to 19th centuries, often under expanding Ottoman rule.



Figure 1.1- Region of the Decapolis in 1st century CE relative to Kingdom of Herod Antipas and Roman Province of Judea. Cartography by T.R Paradise in Ruben and Taylor (2010).

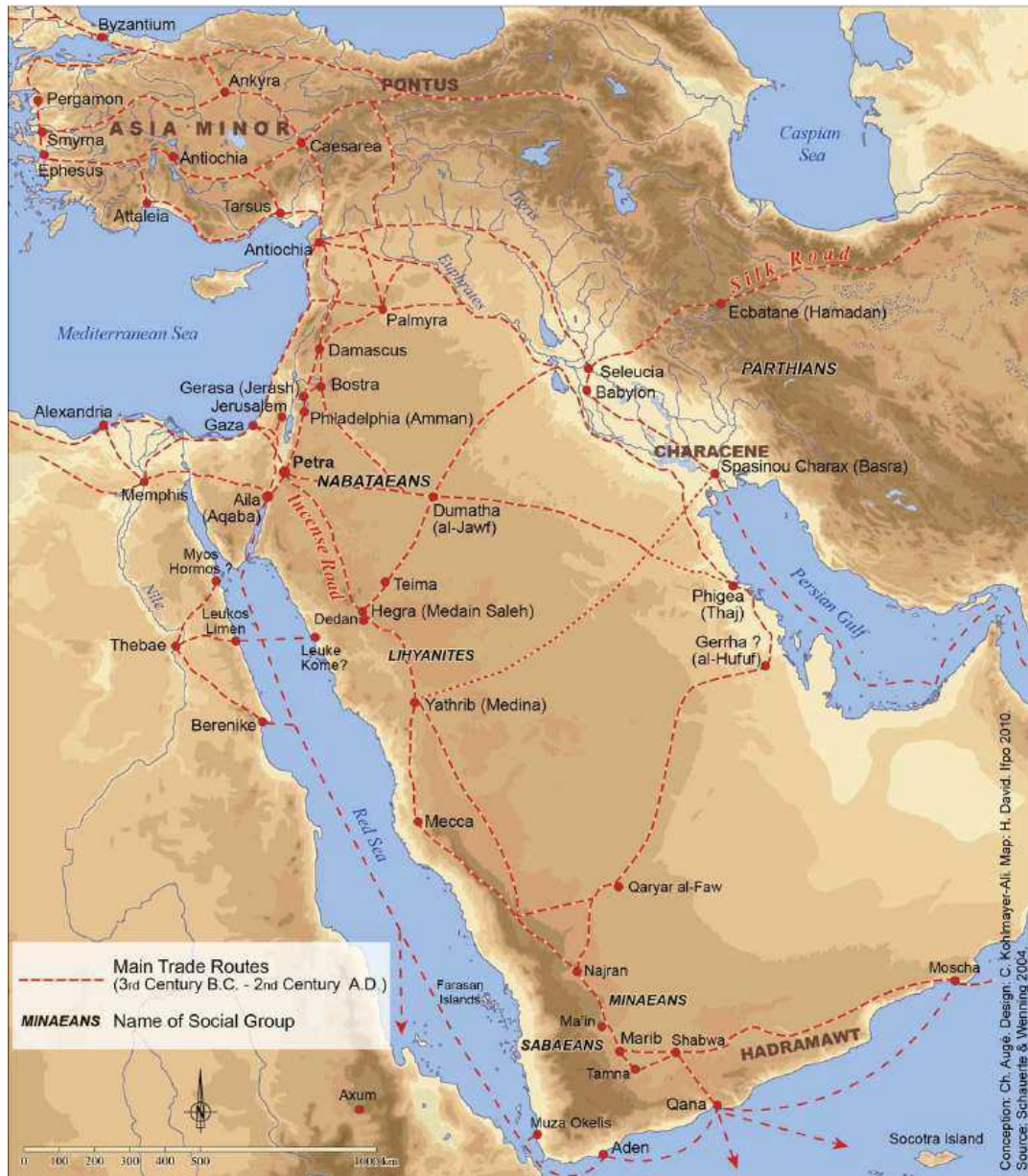


Figure 1.2- Nabataean Caravan and Maritime Routes from the 3rd century BCE to the 2nd century CE from Ababsa (2014, p.145). Note the proximity of Gerasa and Philadelphia between the Petra and the Mediterranean.

Urban analysis becomes far more interesting when the modern evolution and current states of these cities is taken into consideration. While the ancient cities maintained certain levels of similarity and symmetry, their modern counterparts have repopulated and expanded to incredibly various degrees. Besides the obvious importance to academic work and preservation,

the Decapolis cities also represent important economic and cultural drivers in the Kingdom. As a group, the Decapolis cities within Jordan fall behind only Petra in terms of visitor attendance. Spring, early summer, and autumn see the influx of thousands of tourists to the modern communities of the Decapolis. Thus, this research was aimed at understanding the urban development of these hybrid ancient-modern cities and the implications of urbanization on culture, economy, and urban form. Particularly, it was the combination of spatial analysis and urban history that provided unique insights into these areas and bridged two fields of study. The fields of history, urban morphology, and Geospatial Information Science are often separated and not used to their full capacity. This study attempted to use the strengths of each field to analyze the complex relationships of the Decapolis over a vast period of time. This combination allowed for a more comprehensive view on the myriad of influences of the ancient cities on the modern and vice versa.

Sites:

The Decapolis region was nestled between the Mediterranean Roman Empire to its west, the Roman province of Syria to its north, the Nabataean Kingdom to its south, and vast Transjordan/Arabian Desert to its east. The cities were clustered between the Jordan and Yarmouk Rivers and between Lake Tiberias and the Dead Sea. This region prospered in the early Roman Empire (1st-3rd Centuries CE) as the conduit for trade between the Roman Mediterranean and the Nabataean Kingdom to the Southeast (Silver, 2011, p.312). Even though every city of the Decapolis displays an important individual aspect of Roman city form, three sites are particularly important in their composition and urban development. These three sites are Gadara (Umm Qais), Gerasa (Jerash), and Philadelphia (Amman). The specified areas vary in modern settlement from a small town, small-medium city, and large metropolis, respectively.

Additionally, these three sites are easily accessible in terms of transportation and academics. As seen in Figure 1.3, the three cities lay within the northwest corner of Jordan in and around the Ajlun Highlands. In terms of travel today, Jerash/Gerasa lays within an hour drive of Amman/Philadelphia while Umm Qais/Gadara sits close to the border with Syria. However, Umm Qais remains within the range of an easy day trip from the Jordanian capital (Figure 1.4)

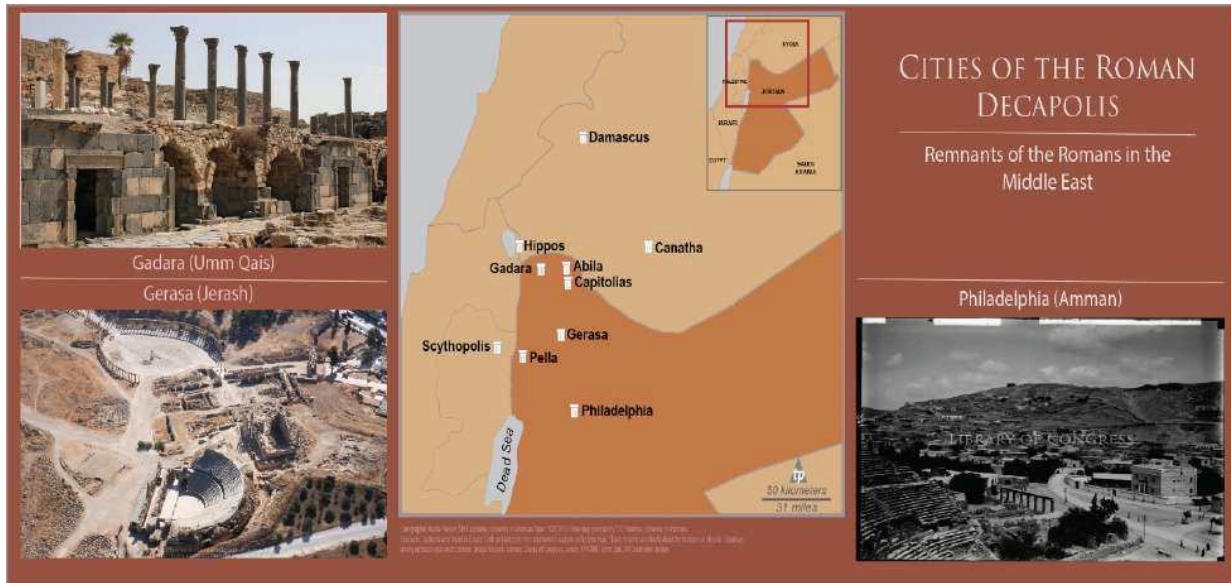


Figure 1.3- Cities of the Roman Decapolis with modern political boundaries. Original Cartographer- Tom Paradise. Images display key ruins from Gadara (Western Terrace), Gerasa (South Theater/Oval Plaza), and Philadelphia (Theater).



Figure 1.4- Decapolis Cities of this study among other Decapolis sites and modern urban areas. Elevation relative to sea level is noted along with modern political boundaries. Cartography by T. R. Paradise 2020.

Previous Research:

Historic references to the Decapolis began in Biblical accounts in the first century CE (Matt 4:25, Mark 5:20). Also writing in the 1st century CE, Pliny the Elder in his tome, *Natural Histories* (v.18-74) accounted for the commonly accepted members of the Decapolis to include Damascus, Philadelphia, Raphana, Scythopolis, Gadara, Hippos, Dios (Capitolias), Pella, Gerasa, and Canatha. Some of the earliest modern written sources were the works of engineer and archaeologist Gottlieb Schumacher in the 1880s. During this time, he traveled throughout Jordan and Palestine describing extensively the archaeological sites of the region. His work was beneficial for his representations and accounts of the structures of the sites and populations of nearby villages (Schumacher 1890). Schumacher represented the beginning of archaeological excavation in Northern Jordan that has been sustained by multiple teams, from a myriad of countries, to the present day.

However, the work between urban geographers, historians, and archaeologists has often been disconnected. As stated by Michael Smith, “*historical scholarship on social topics focuses increasingly on later and later periods, ignoring earlier epochs*” (2010). Through methods, addressed in subsequent sections, this research on the Decapolis attempted to bridge vital gaps between ancient and modern scholarship. Progressing forward technologically, satellite imagery has been an invaluable tool in analyzing urban forms. Satellite imagery and remote sensing have been utilized effectively in characterizing urban spaces in the metropolitan areas of modern ‘mega-cities’ (Alhaddad et al. 2012). Particularly, the number of sites analyzed mirror the plans for this proposed research. Satellite images, combined with spectral readings in remote sensing allowed for evaluations of urban aspects like “typology of urban ecosystems, urban to natural cover ratio, dominant habitat type, urban biodiversity, landscape context, and conservation

efforts” (Park et al. 2014). Remote sensing has also been used to systematically map the archaeological features of cities like Jerash (Stott et al., 2015). This was incredibly useful for understanding the ancient Decapolis cities.

Approach:

Analysis of this research culminated mainly into visual models based upon comparative cartography. Existing figures were digitized, referenced, compared, and contrasted with newly created maps and Geographic Information System (GIS) projects available internationally. This helped to detail the similarities and differences between the ancient Decapolis cities and their modern counterparts in Northern Jordan. Digitized images and collected imagery were contextualized with statistics and architectural discussions. It is through these data that the Decapolis of both the past and present were evaluated. This evaluation was derived from a series of methodological questions:

- *What are the dimensions (scale and shape) of the ancient vs. modern cities?*
- *How have the cities evolved in architecture and design (morphology)?*
- *How are the cities connected to each other and their surrounding hinterlands (i.e. roads, travel, utilities)?*
- *How was land used in the past and how is it used in the present?*
- *Who made/makes up the population of these cities?*

Analysis:

The main purpose of this study was to ascertain the differences and similarities of the Decapolis in the past and the present. Many such factors were related to the architectural prowess and environmental manipulation of various periods of human development. This was closely considered as events of the past can serve as indicators for various challenges and outcomes with

urbanization. Significance was enhanced for the Kingdom of Jordan for several reasons. Closer examination of the United Nations predictions for urbanized population revealed the often-obvious point that Jordan is almost entirely urbanized as a country at 91.4% of the population living in urban areas (UNDESA, 2018). Increased urbanization is accompanied by numerous problems. This study revealed the archaeological/architectural history of these cities but also indicated how and why certain challenges have developed in this corner of Jordan.

Chapter 2. LITERATURE REVIEW

Analyzing any city with thousands of years of habitation, history, and development was both difficult and interesting. Such analysis must be conducted among many different conceptual scales. The first scale that should be addressed was the factor of time and temporal considerations. Modern research in this area is dictated largely by what remains of the past. This comes in two forms: surviving literature from the time and archaeological interpretations. Additionally, cities are incredibly complex nexuses of human interaction with nature, the built environment, and their cultural armature. This aspect invokes varying scales of geographic consideration. Cities developed at very local levels but also interacted with powers far beyond them. These powers were often kingdoms and empires, but also include things like climatic conditions and natural disasters. These considerations led to the organization of this section.

Presentation of past literature was divided into two main time periods: Pre-Modern (before World War I) and Modern (after World War I). This division may seem quite unbalanced, and temporally arbitrary. However, literary works have an incredibly small survival rate for this region over time. Meanwhile, the modern period contains many more studies in far more specific areas of study. This division also marks the beginnings of the modern state of Jordan and great advances in the study of ancient cities. The pre-modern section will contain subsections based on various time periods from antiquity to the reintroduction of European scholars to the region. In terms of geographic scales, each city within the study area will be given its own section while general sources for the period will follow.

2a. Pre-Modern Works (Pre-WWI):

Ancient Literary Sources

The Decapolis, itself, was largely a product of the 2nd or 1st Centuries BCE. However, the individual member cities generally possessed far older histories. Archaeological works testify to the presence of human communities throughout these areas back to the Neolithic age (10,000-4500 BCE); such accounts were addressed in a later section.

Amman/Philadelphia: Focusing on literary sources, exclusively, the earliest mentions of Decapolis member cities lie in Rabbath-Ammon (modern Amman). Amman is unique among the Decapolis cities of Jordan in that a state existed around the fortified city. The kingdoms of Ammon and Moab can be seen among modern urban areas (Figure 1.4). The Ammonite state contributed to increased literary references to the area. While these references may not always refer to the city itself, they can at least attest to the existence and nature of this ancient citadel. First accounts of Rabbath-Ammon came in the 7th-6th centuries BCE in various books of the Old Testament within the Bible. Particularly, II Samuel described the relationships between the ancient kingdom of the Israelites and that of the neighboring Ammonites. Although written in the 7th or 6th centuries BCE, these books were dedicated to events some centuries before. These books provided interesting insights into the ancient city of Rabbath-Ammon. A notable example was the reported siege and conquest of the capital city by King David of Israel in the 10th century BCE. In the 2nd century BCE, the Book of Jeremiah accounted for various lists of Ammonite Kings of the 6th century BCE and prophesied Rabbath-Ammon's destruction. The first Greek references to Amman came from the Arcadian historian, Polybius, in the 2nd century BCE. Although it comes to us incomplete, *The Histories* of Polybius was a useful source of history for understanding the events of the Greeks and Romans around the Decapolis. Specifically, Rabbath-

Ammon was mentioned during the Fourth Syrian War (219-217BCE). Polybius recounted an invasion of Coele-Syria by Antiochus III of the Seleucid Empire. Rabbath-Ammon was mentioned as containing a strong Ptolemaic garrison and could indicate the status/position of the city (Polybius *Histories*, V, 71).

At this point, it is believed that the Ptolemies likely 're-founded' the city as Philadelphia. Returning to Biblical references, Philadelphia was invoked in the late 2nd century books of Maccabees I and II. The Ammonites were listed in opposition to the growing Hasmonean dynasty in Palestine and the Tobiad family were attested to possess lands east of the Jordan (Maccabees I, 5-6). These books also mentioned the conquest of numerous Decapolis cities by the Hasmoneans. Philadelphia was a noted exception to these conquests. The next literary reference to Philadelphia came in the Geography of Strabo. This late 1st century BCE work attempted to address the spatiality of the Mediterranean. Strabo was the first among a series of ancient geographers to provide lists of cities in various provinces, and he mentioned Philadelphia in one of these lists (Strabo, *Geography*, VIII:4.10). Strabo listed Philadelphia among the Decapolis but made little comment on the nature of the Decapolis federate structure. Given Strabo's fascination with other city leagues of the ancient world, his lack of comment here complicates the nature of the Decapolis. However, the presence of Philadelphia on this list attested to the standing of the city among the newly administered Roman province of Syria. Pliny the Elder followed in the 1st century CE in his *Natural History*. Pliny also listed cities of the Decapolis (Philadelphia included) but admitted to uncertainty over the exact composition of the city league (Pliny the Elder, *Natural History*, V:16). However, Pliny did use the specific term *civitas* which denoted their position among other communities in the Roman Empire. This reflected the status the Decapolis cities enjoyed during these periods.

The 2nd century CE saw another list by Claudius Ptolemy in his *Geography*. The list itself was more extensive but still included Philadelphia (Claudius Ptolemy, *Geography*, V:14). There were many concerns with Ptolemy's list, but it could indicate a growth of the Decapolis as a region. Amman was also featured prominently in the works of the Christian historian, Eusebius Pamphili, in the 4th century CE. Eusebius wrote extensively on biblical history and biblical sites. His role as Bishop of Caesarea Maritima placed him near the Decapolis cities in the province of Palestine. Eusebius' *Onomasticon* has entries for Amman, Ammon, and Philadelphia. Additionally, the city was identified as "a famous city of Arabia" (*Onomasticon*, Deuteronomy 2:19). Many of his entries for other settlements used Amman/Philadelphia as a reference point. This could indicate Amman/Philadelphia as an important city for the region. Such importance was supported by the employed terminology. Eusebius refers to Amman/Philadelphia as *polis episemos* (Klostermann, 1904, 22:15). He reserved this term for only a handful of contemporary cities in his writing and could indicate Amman/Philadelphia's high standing.

Jerash/Gerasa: Ancient Jerash was not as well represented in ancient literature as Amman. Lacking the biblical connections, it received its earliest known mention in Flavius Josephus' *The Jewish Wars* around 75 CE (Josephus, *The Jewish Wars*, I:4). In his works, Josephus also accounted for the rise of the Hasmoneans but extended beyond to include the arrival of Pompey the Great in 63 BCE. Gerasa was noted in his *Wars* as one of the Decapolis cities conquered by Alexander Jannaeus in the 1st century BCE. Gerasa was also among the lists of Pliny the Elder and Claudius Ptolemy (Pliny the Elder, *Natural History*, V:16/ Claudius Ptolemy, *Geography*, V:14). Gerasa was also noted in the *Onomasticon* by Eusebius where he commented on biblical sites near "a famous city of Arabia" (*Onomasticon*, Deuteronomy 7:1). It also served as a referential point in

Eusebius' description of the region and was used to trace the path of the ancient Jabbok (modern Yarmouk) river.

Umm Qais/Gadara: Gadara had quite the collection of literary references relative to other Decapolis cities. This was particularly interesting given the small size of the current settlement of Umm Qais. As with other cities, Polybius presented one of the earliest written accounts of the city. In the same section dealing with the Fourth Syrian War, Polybius accounted for Antiochus III's campaign in the region in the late 3rd century (Polybius, *Histories*, V, 66-70). Gadara was shown to stand against the Seleucid king. In context, this placed Gadara under the control of the Ptolemies during its early development. Additionally, Polybius emphasized the strength of Gadara's position and defenses as "one of the strongest in those parts" (Polybius, *Histories*, V, 71). The 1st century BCE showed a direct literary connection to the city of Gadara. This came in the form of the poet, Meleager of Gadara. Some of his surviving works directly referenced his home city and showed certain Semitic influences in his identity. This contradicted some notions that the city was completely dominated by Hellenism in this period. The Semitic-Hellenistic hybrid nature of the city was further supported by etymologic analysis for terms involved in the ancient city. These were addressed with discussions on epigraphic remains in a later section. Gadara also found itself among the geographical lists of Strabo and Pliny the Elder.

In the later 1st century CE, Josephus also described Gadara. Josephus' account was centered around Palestine and its neighboring provinces and spans the arrival of the Romans to the Jewish revolts of the 1st and 2nd centuries CE. Gadara is first mentioned along with the actions of the Judean king, Alexander Jannaeus (103-76 BCE), who put Gadara under siege in 96 BCE (Josephus, *Wars*, 4:2). Later, Josephus described how Pompey the Great rebuilt the city of Gadara at the behest of his freedman, Demetrius the Gadarene. After some continued unrest in

the region, Gadara seemed to have been made the center of an administrative unit by Aulus Gabinius, Proconsul of Syria around 57 BCE (Josephus, *Wars*, 8:5). The civil wars of Caesar/Pompey and Augustus/Antony had political repercussions in this region as well. Josephus recounted how Gadara eventually came under the control of King Herod of Judea after Augustus defeated Antony and Cleopatra (Josephus, *Wars*, I, 20:3). This arrangement was reversed following Herod's death around 4 BCE. At this point, Augustus split Gadara (along with Gaza and Hippos) from the divided Judean tetrarchies (Josephus, *Wars*, II, 6:3). They were then placed under the Roman province of Syria based in Antioch. The next reference to Gadara came roughly half a century later when the Jewish revolts began. It was identified as a city taken/attacked by the Jewish rebels. However, it was clear that the city was not terribly damaged as the future emperor, Vespasian, took back the city sometime later (Josephus, *Wars*, III, 7:1).

Claudius Ptolemy also listed Gadara on the cities within the Decapolis. However, he offered little information beyond its existence. It could be inferred that the other cities listed possessed close relations with Gadara but this is subject to question given various lists of the Decapolis. The final historical reference to Gadara for this period came from Eusebius. Like the other cities addressed here, Eusebius described many of the surrounding settlements and villages relative to Gadara. Gadara was of particular note by Eusebius for its proximity to hot spring baths (Eusebius, *Onomasticon*, Section C: The Gospels). Gadara also existed on a Latin pilgrim's guide of Palestine by a certain Theodosius in the late 5th or early 6th century CE (Lenzen and Knauf, 1984, p.34). Philadelphia and Gerasa were also listed within the province of Arabia (Lenzen and Knauf, 1984, p.34).

Jordan and General Historical Sources: Apart from city-specific references, other historical sources were necessary. These were useful for providing context in the more specific

works. The earliest such work is *The Histories* by Herodotus in the 5th century BCE. This notable book provided one of the earliest written sources for the region and offered insight into how Greek writers viewed the people and cultural practices of peoples in the region. Herodotus often offered more broad topics and was sometimes unreliable in his more exact details. Nevertheless, it was important to consider this work in building a historical understanding of the study region. The 1st century BCE offered another source in the works of Diodorus Siculus. It was best used in conjunction with Livy's *Ab Urbe Condita* as general sources of history surrounding the rise of the Roman Empire.

Islamic and Medieval Sources:

Amman/Philadelphia: Amman and other cities of the Decapolis continued to have important positions among the Roman and Byzantine Empires. However, literary references to Amman itself are scant. The 10th century CE saw one of the surviving Islamic references. In this case, the writer and poet, Al-Maqdisi, praised the citadel of Amman complete with an Umayyad Palace and Great Mosque (Rogan, 1986, p. 25). This account connected Amman to the Umayyad Caliphate based in Damascus. Close connections with the nobility in Damascus represented one of the most crucial factors for the Decapolis cities in this period. The medieval period also delivered a critical geographic source for Amman/Philadelphia and other ancient cities. The locations and relative positions of many cities were noted in the Tabula Peutingeriana, a 13th-century copy of a Roman *itinerarium*. The date of the original map was unclear but shows many cities and places in the Roman Empire. Philadelphia was identified on the map and was shown to be 62 miles from the city of Aereopolis in Moab. The next chronological reference found of Amman/Philadelphia came from a 1356 CE Mamluke declaration. This declaration identified Amman as the capital of the Belqa region and showed the continued prominence of the city (Rogan, 1986, p. 26).

Jerash/Gerasa: Strict literary sources on Jerash/Gerasa were equally hard to find in the later Roman to early Islamic periods (5th century- 8th century). However, the late 9th century contained a reference to the city from the Islamic geographer, Al-Ya'qubi. Al-Ya'qubi described Jerash as “a town in the Jordan province. The town is half Greek and half Arab” (Le Strange, 1890, p. 3). This represented one of the few sources to provide some demographic description of the city. The next literary reference may be found in the 12th century from Fulcher of Chartres. His account described a conflict between Baldwin II and the Atabeg of Damascus at Jerash. The city was described as abandoned but could indicate a smaller, more fortified settlement amidst the Roman ruins. The theme of decline was furthered in the 13th century when Yaqut al-Hamawi described the city as a “once-mighty city now a total ruin” (Le Strange, 1890, p. 462). The final reference for the period may be found in a 1596-7 Ottoman tax register. This document indicated that Jerash was referenced as a settlement and consisted of roughly a dozen families.

Umm Qais/Gadara: Gadara was referenced in the 7th century in many Arabic poetic works. This attested to a relationship between these two regions during and even before the Islamic conquests of the 7th century. Specifically, the Hudailian poet, Abu Du'aib, praised the quality of wine produced from Wadi Gadara (Mershen and Knauf, 1988, p. 131). Another poet in the 8th century, Al-Ahtal, also praised the wine produced near Gadara (Yaqut, Mershen and Knauf, 1988, p. 131). Ibn Hordadbeh listed Gadara and other Decapolis cities in the province of Jordan in the 9th century (Lenzen and Knauf, 1987, p. 25). Gadara was also represented on the Tabula Peutingeriana from the 13th century. The city was listed 16 miles from the city of Tiberias and seemed worthy enough of note to serve as a navigation point in the itinerary. The 14th-century writer, Ad-Dimasqi, described the village of Gadara near the hot springs of el-Hamme

(Le Strange, 1890, p. 54). Finally, Gadara/Umm Qais appeared in the Ottoman tax registers of 1596-7 along with tax assessments.

General: Like the earlier ancient period, the Medieval/Islamic period was best understood with some contemporary historical/geographic sources and context. The geographic understanding of the Islamic scholars was best outlined through the 9th-century *Kitāb ṣūrat al-Ard* ("Book on the Appearance of the Earth") by Al-Khwarizmi. The 12th century also offered some insight with Al-Idrisi's *The Recreation for Him Who Wishes to Travel Through the Countries*. These works are generally broader than those that mentioned the Decapolis cities, specifically. However, they offered useful insights into conditions and geographic knowledge at the time.

European (Re)discovery:

Amman/Philadelphia- The final time period in this section was the later Ottoman administration of northern Jordan. The 1800s saw European explorers and scholars make their way into the region. These travelers were of particular use for their journals and published writings. These works provided insight into the cities of the Decapolis at the time. This was especially useful given the lack of other historical accounts. Amman/Philadelphia was first 'rediscovered' by the Swiss traveler and geographer, Johann Ludwig Burckhardt, in 1812. Burckhardt described many sites east of the Jordan River, but his travels were quite brief (Boyer, 2016, p.282). James Silk Buckingham followed Burckhardt in 1816; he explored the area with economic interests in mind. He was then followed by British Naval Officers, Charles Irby and James Mangles, in 1818 (published 1822). Their experience as explorers provided more information even though, some of their calculations experienced error. Irby and Mangles were followed by zoologist Henry Baker Tristram who collected specimens and wrote extensively

about the Holy Land in 1864. Selah Merrill, an American archaeologist, traveled to the region twice (1875 and 1877). Charles Doughty documented some observations about life in the Jordan area while in a hajj caravan from Damascus in 1876. Soon after, in 1878, Laurence Oliphant surveyed the lands of northern Jordan with the design of developing a colonization plan. In 1881, a captain in the Royal Engineers, C.R. Conder, was commissioned by the Palestine Exploration Fund to survey and map the Moab region of Jordan. In 1884, Guy Le Strange explored the Balqa region and he even visited the Circassian settlement which had been recently established in Amman (Schumacher et al., 1889, p.306).

Jerash/Gerasa- Jerash/Gerasa had documented European visitors slightly earlier than Amman/Philadelphia. The German explorer, Ulrich Seetzen, visited Jerash in 1806 (published 1810). Although he operated on limited and flawed information, Seetzen managed to correctly identify Jerash as ancient Gerasa. He was then quickly followed by Burckhardt in 1812, who was able to roughly survey the probable extent of the Roman ruins. William John Bankes and Charles Barry visited the site numerous times from 1816-1819. From this fieldwork, they were able to construct a general plan for ancient Gerasa which was relatively accurate (Figure 2.1). Bankes had overlap and cooperation with other explorers like Buckingham, Irby, and Mangles. Various other explorers (M.E.G. Rey-1858, Warren- 1869, and Kiepert- 1870) also visited the site but produced sub-par maps (Figure 2.2). Gottlieb Schumacher visited Jerash in the 1880s and constructed a quite detailed map. His map (Figure 2.3) was also notable for representing the newly established Circassian settlement at the site. These historic plans and maps were compared and given context with contemporary Jerash in 2015 (Figure 2.4).

Plans of Jerash: Early 1800's

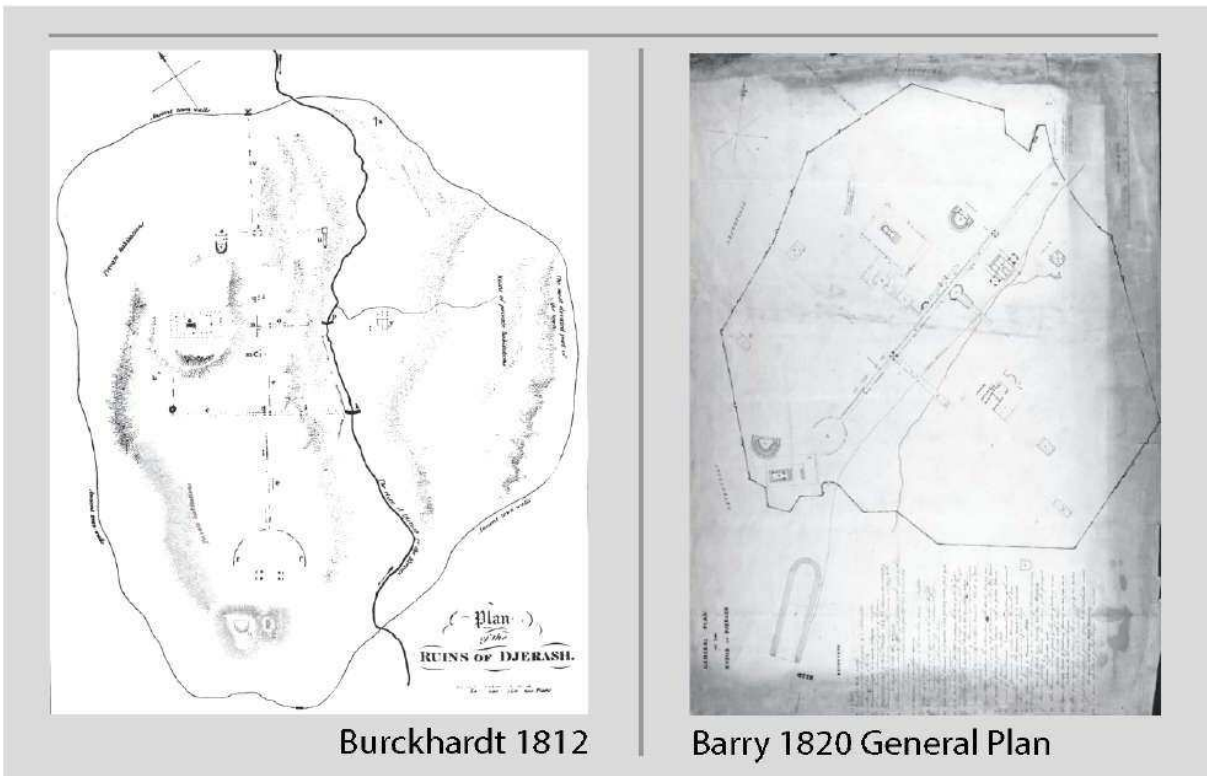
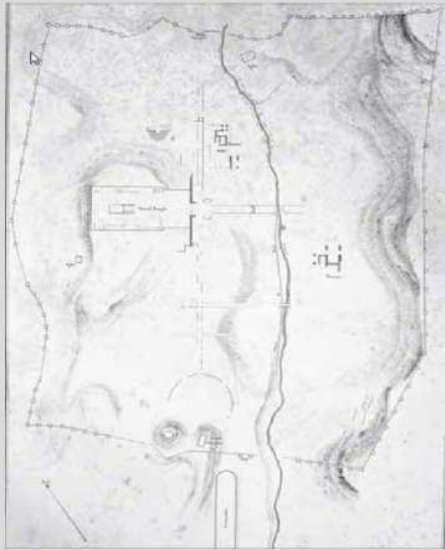
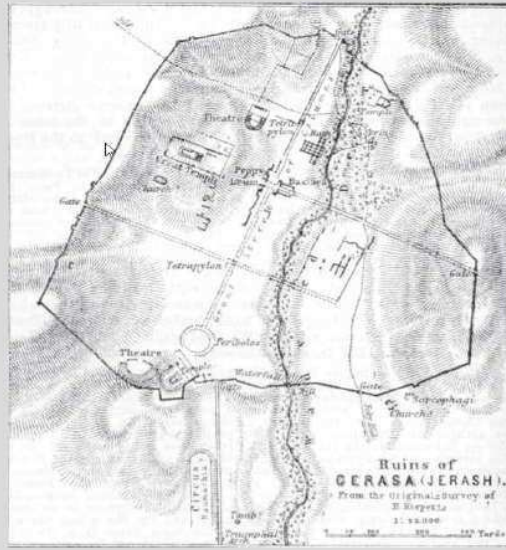


Figure 2.1- Plans of Jerash drawn from field surveys of Johann Ludwig Burckhardt in 1812(left) and Charles Barry in 1820 (right). From Boyer, 2016. Preserved by the Dorset HistoryCentre.

Plans of Jerash: Middle 1800's



Rey 1858



Kiepert 1870

Figure 2.2- Plans of Jerash drawn from field surveys of M.E.G. Rey in 1858 (left) and Kiepert in 1870 (right). From Boyer, 2016. Preserved by the Dorset History Centre.

Plans of Jerash: Late 19th-20th Century

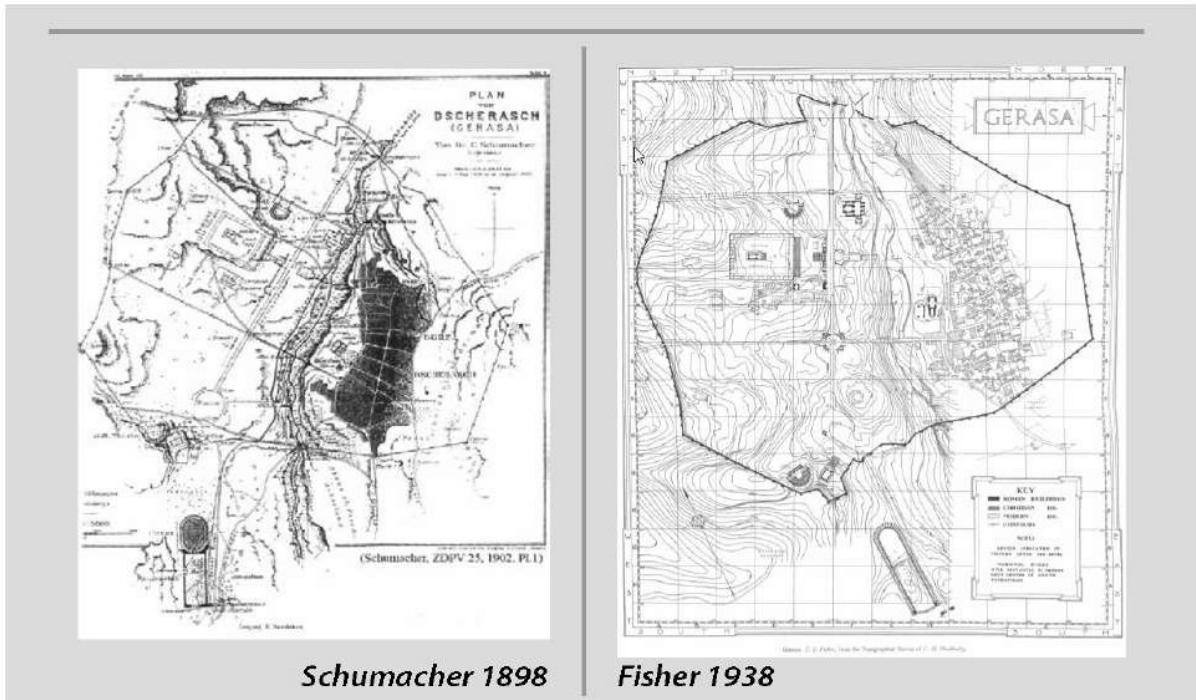


Figure 2.3- Plans of Jerash drawn from field surveys of Gottlieb Schumacher in 1898 (left) and C.S. Fisher in 1938 (right). From Boyer, 2016 and Kraeling, 1938. Preserved by the Dorset History Centre.

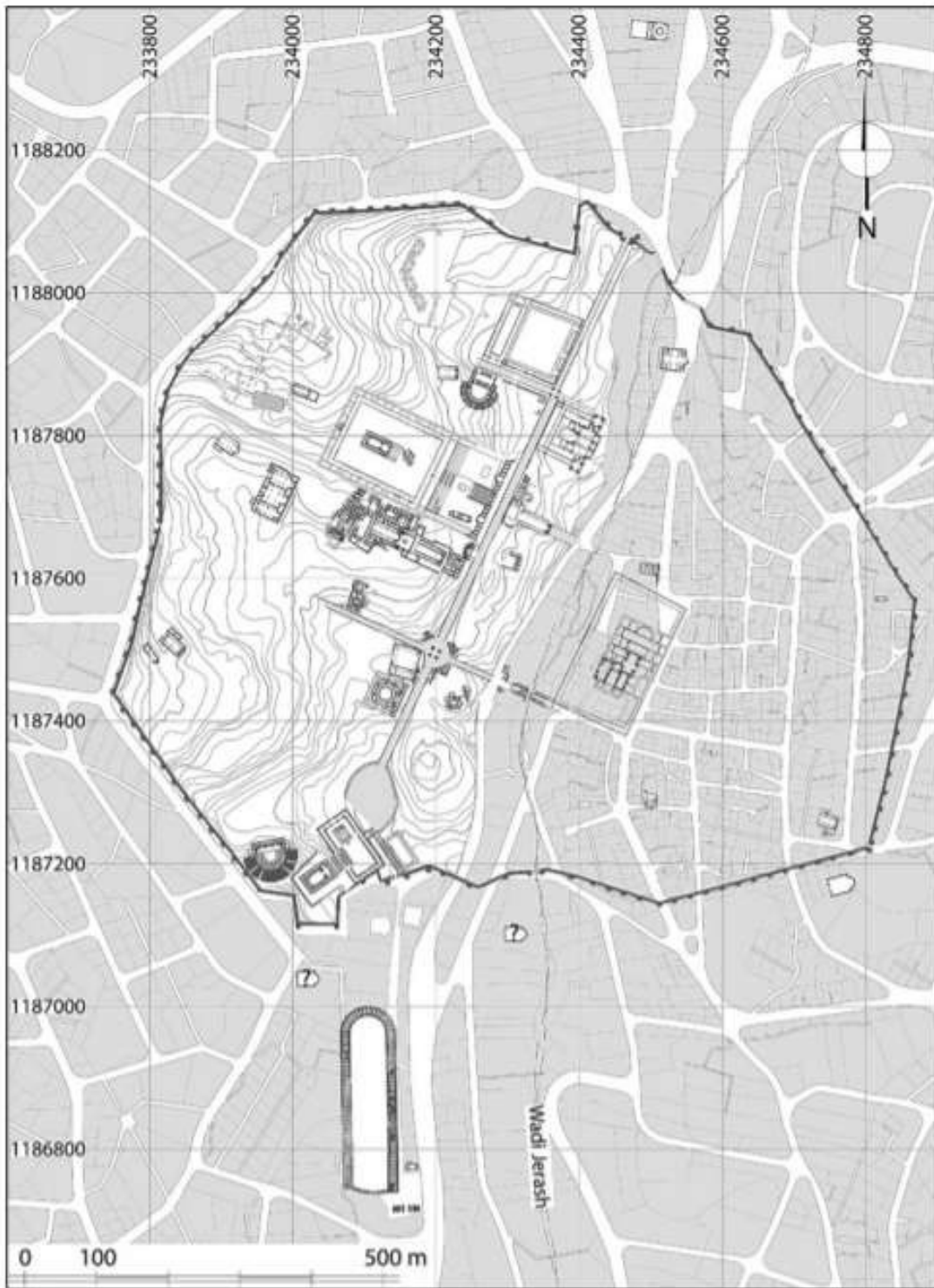


Figure 2.4- Plan of Jerash with reconstructed ancient structure footprints. The main road axes can be seen running north/south and east/west. These were flanked by colonnades. From Lichtenberger et al. (2015)

Umm Qais/Gadara- The final city in the study group was mostly documented by the same sources as the previous two. Seetzen also visited Umm Qais and identified six to seven families living among the area's caves. Bankes was noted to have visited the city. Buckingham included the city in the title of his written account (even though he misrepresents it as Gamala). He also noted roughly 200 inhabitants and large areas of agricultural cultivation. Irby and Mangles reaffirmed the use of caves as dwellings and stables. Tristram's visit in the 1860s indicated agricultural cultivation from populations of nearby settlements and only temporary habitation of Umm Qais. Merrill made note of the settlement in 1881. Finally, Schumacher also visited the site and constructed an intricate map as seen in Figure 2.5. It denoted the ancient ruins and the Ottoman era village which developed in an eastward direction.

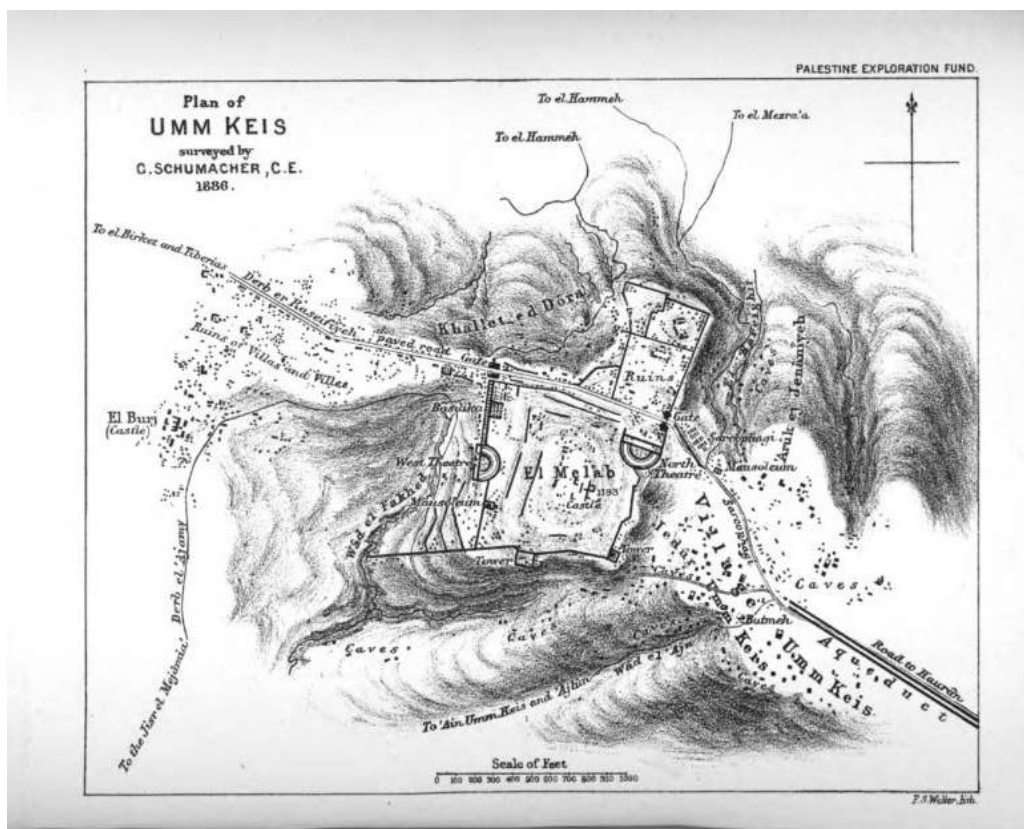


Figure 2.5- Plan of Umm Keis/Gadara by Gottlieb Schumacher (1890). Note the lower village on the right of the documented ruins.

General- This time period also benefited from historical context and additional information. Prior to much of the European exploration into the Near East, study on the Greeks and Romans had become substantial. Christian leadership in Europe turned against studying the ancient Greeks and Romans in the early medieval period (Bowersock et al., 1999, p.15). The Renaissance saw a renewed interest in the subject. By the 19th century, European scholars had translated and contributed much to the study of the Greek and Roman world. This was seen in Bunbury (1879) where extensive translation and interpretation of ancient geographers was undertaken. William Smith's *Dictionary of Greek and Roman Geography* in 1854 was instrumental in understanding Greek and Roman accounts of people and places. Additionally, it facilitated the understanding of older European studies for the Greek and Roman Near East. This was followed in 1879 by Edward Bunbury's historical account of the Greeks and Romans. Here, he traced the development of ancient geographic thought. Such information was crucial in representing the existing knowledge in the ancient world concerning the Decapolis.

Schumacher's extensive travels in the 1880s extended beyond the immediate study area. This allowed for some connections between the study sites and other contemporary cities. In the early 20th century, other useful works were produced. William Libbey wrote about the more general area of the Jordan Valley and Petra in 1905. Gertrude Bell also provided a unique source about cities and environments in the Levant. Her book, *The Desert and the Sown*, documented many contemporary and older cities and provided some inclusion as a work of a female author. James Reid compiled an account of cities and settlements throughout the Roman Empire in 1913. This early work displayed an understanding of where the Decapolis was and how it was comprised (Reid, 1913, p.342).

2b. Modern Works (Post-WWI):

This modern works section was best related in a slightly different manner than the older sources mentioned previously. The time period was relatively recent, therefore, the sources for this section will be organized along thematic lines; archaeology, history, architecture, and geographic information science were then broken down into sources related to individual study sites or a general category.

Archaeological Works:

Amman/Philadelphia- The earliest archaeological works involved with Amman, aside from the surface-level surveys of the 19th-century explorers, came from Italian archaeologists. A series of excavations were undertaken by this Italian team in the 1930s (Parapetti, 2008, p. 159). Like much of the later archaeological work in Amman, excavations were centered on the citadel. The American Center of Oriental Research (ACOR) took over excavations in the 1960s and these were led by Professor Rudolph Dornemann in conjunction with the Department of Antiquities. In 1976, the Department of Antiquities conducted a survey for additional portions of the city (Muheisen, 1976). This was followed by The Madaba Plains Regional Project in 1984. This surveyed additional area surrounding the city. These surveys were documented and expanded upon in an archaeological survey of Greater Amman (Abu Dayyah, 1991). Similar surveys of Amman and its surroundings were undertaken by Huebner Ulrich in 1992. This particular study was fairly unique in its focus on pre-Hellenistic Amman. The features of Amman's citadel were examined along with a broad examination of Jordan in Myriam Ababsa's *Atlas of Jordan; History, Territories, and Society* in 2013. Additionally, Amman was examined in the archaeological works of David Kennedy. Both published in 2017, one explored the salvaging nature of the landscape in and around ancient Philadelphia. The other examined the relationship between the archaeological landscape and ancient Christianity.

Jerash/Gerasa- Jerash experienced relatively significant archaeological examination with the early European explorers. However, these were undertaken with little supervision. There were attempts to excavate after these but later attempts were halted due to unrest around the First World War. Following the creation of the Mandate of Transjordan under the British Empire, George Horsfield was placed in charge of the Jerash archaeological site (Kraeling, 1938, p.3). This began a phase of conservation that saw the beginnings of archaeological work at the site. While some excavation work was undertaken, the primary goals of this early stage were access and preservation. Full-scale excavation work began in the late 1920s to the mid-1930s as detailed by Carl H. Kraeling (Kraeling, 1938). Work began in the South Theater, North Theater, and Temple of Zeus in 1925. The main streets (*decumanus and cardo maximus*) were cleared in 1926. This period of excavation ended in 1928 and saw some initial work on uncovering and restoring parts of the Temple of Artemis. 1928-1934 saw continued excavations under a team from Yale University (J. W. Crowfoot, Mrs. Crowfoot, A.H.M. Jones, Mrs. Jones, Lieutenant-Commander Buchanan, J.B. Robertson, and Dorothy Crowfoot). This team undertook excavations of the church of St. Theodore in 1928. The 1929 campaign uncovered portions of the Cathedral, St. John the Baptist Church, Mortuary Church, Synagogue Church, and Bishop Genesius Church. The 1930s saw sporadic campaigns of excavations and archaeological work. This came to an end with the onset of the Second World War in 1939 (Kraeling, 1938, p.10). After the establishment of the independent Emirate of Transjordan, the newly formed government took charge of the site. Interest would continue for the site. Large-scale archaeological work was subsequently undertaken in the 1980s, 1990s, and 2000s (Khouri and Marvullo, 1985, p.19).

The Jerash International Project was implemented by the Department of Antiquities in 1982 and saw renewed archaeological work at the site (Khouri and Marvullo, 1985). This project

included teams from Jordan, Great Britain, the United States, Australia, France, Poland, Spain, and Italy. Some teams focused on the restoration of structures while others continued to excavate portions of the ancient city. Portions of this phase of excavation were elaborated on by Walmsley et al. in their study on the North Decumanus and North Tetrapylon in 1986. Several trenches were dug around the North Theater area and many conclusions were drawn about the dating of the street colonnades. Other aspects of the archaeological evaluation were summarized by Hugh Kennedy (1985) when he evaluated the urban change from Roman to Islamic Syria. He concluded that the region experienced a period of decline in the 6th century CE. In 2004, Ina Kehrberg published a study on pottery remains in Jerash from a recently uncovered tomb. Tracing different pottery archetypes and manufacturing methods, Kehrberg identified both local and imported Cypriot pottery throughout the Hellenistic period. This represented a higher definition of archaeology than the previous foci on the monumental structures in Jerash. Achim Lichtenberger (2008) later analyzed the colossal temples in Jerash where he examined the archaeological evidence surrounding the Temple of Zeus Olympios and the great Temple of Artemis. Such examination was directed toward addressing Hellenistic religious policy for Jerash. The changing nature of Jerash/Gerasa after the Roman ‘Golden Age’ was explored by Gideon Avni in 2011. This study contained a synthesis of archaeological work around Jerash and critiqued certain notions about its urban development.

Archaeological evidence, like church construction and monumental modification, was used to justify a more nuanced perspective on the post-Roman nature of the city. This was a critical response to Kennedy’s earlier models of urban development for the region.

Archaeological evidence attested to varying timelines of decline, growth, and sustainability in various cities in and around the Decapolis. The latest notable development in the archaeological

literature for Jerash came from the Danish Northwest Quarter Project. Headed by Achim Lichtenberger and Rubina Raja, many new conclusions have been developed about the nature of Jerash. These were spelled out in 2015 when Lichtenberger and Raja published their findings.

Elements of the classical city and the timeline of habitation were substantially altered. The authors followed this study in 2016 with specific consideration on the relationship between ancient Gerasa and its water supply. This explored the various cisterns, aqueducts, and other water management systems throughout the Greco-Roman city. Ting et al. (2019) continued to explore the ceramic remains of the city. This was undertaken to help tackle the challenge of dating ceramic manufacturing methods into the Islamic periods. Difficulty in identifying these patterns contributed to the notions of abandonment in certain Islamic periods. New findings have challenged the scale of abandonment after earthquakes in the 8th century. Lichtenberger and Raja (2015) continued to explore the water resources in Jerash and the interactions between Jerash and its hinterland.

Umm Qais/Gadara- Like Jerash, Umm Qais was identified in the early 19th century by European explorers. This led to surface level examinations of the ruins and these were reported by these explorers. The Department of Antiquities took control of the site and began excavations in the 1930s as well. The site did not see extensive excavations until the 1970s. This was facilitated through a partnership with the German Protestant Institute for Archaeology and some foreign excavation teams. These early works were useful for uncovering and identifying many of the structures of ancient Gadara. Archaeological work was suspended in the 1960s and early 1970s due to proximity to the 1967 War in Israel/Palestine. 1974 saw a renewal of interest in excavations by the Jordanian government and the German Protestant Institute (Brand, 2000). Adolf Hoffmann conducted an extensive survey of the area in 1999-2000 (Figure 2.6). Many of

these identifications were useful for later studies. A more comprehensive look at Greco-Roman Gadara by Claudia Bührig (2009) directly benefitted from Hoffmann's surveys. Also, in 2009, El-Gohary and Al-Naddaf analyzed brickwork in the Roman baths of Gadara. This represented a focus on a specific structure rather than the site as a whole. 2012 and 2013 saw continued studies of various strata in Gadara (Abdallah and Arafat et al.). The former analyzed the chemical characterization of glass objects which showed remarkable similarity throughout the Southern Levant. The latter used x-ray technology and spectroscopic measurements to analyze metal coins from Islamic Gadara. These recordings were aimed at identifying and dating some of these objects, but additional study was required. Similar methods were later used by Bührig (2013) to identify the building materials throughout Gadara. This study showed the prominence of local building materials but also indicated extensive marble imports to the city. Such imports indicate an increased level of prosperity.

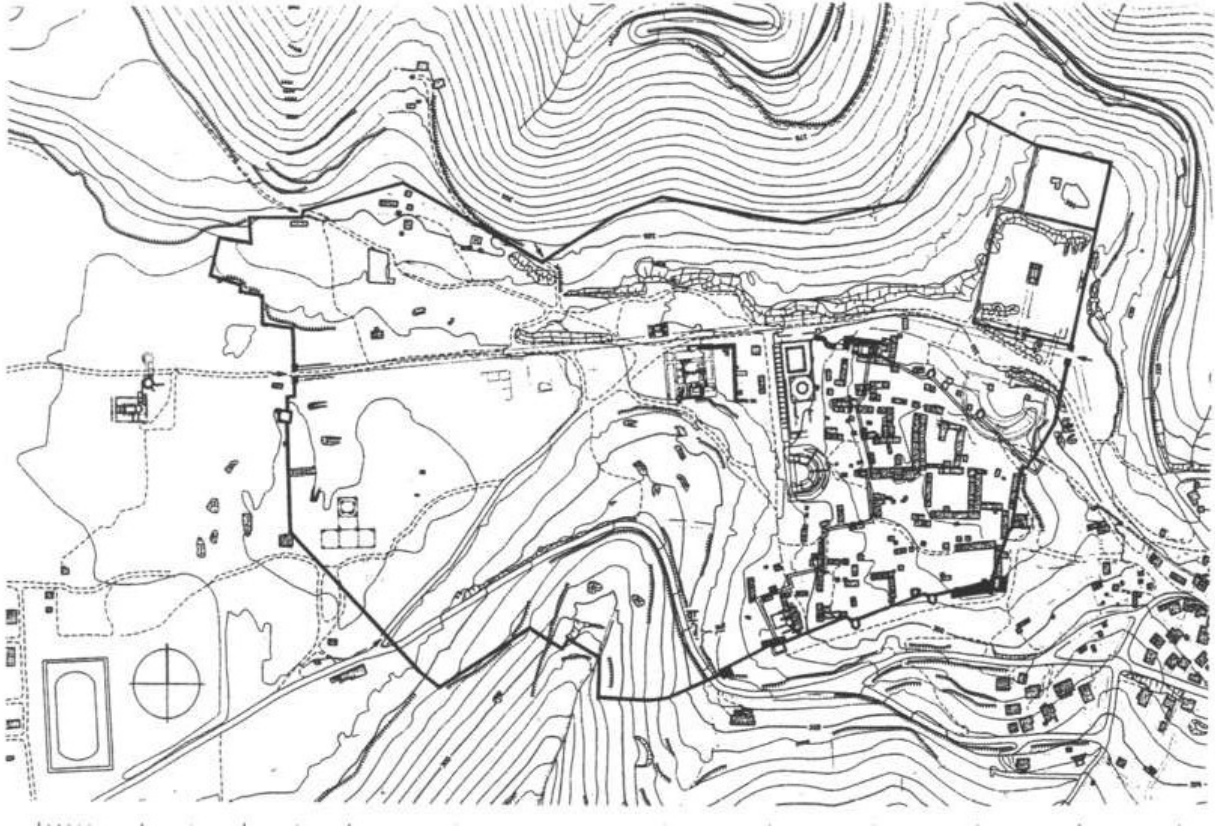


Figure 2.6- Map of Umm Qais/Gadara derived from archaeological surveys of A. Hoffmann in 1999-2000. The Ottoman village buildings are noted amid the ruins and topographic contours establish the slopes north and south of the city.

The water and environs of Gadara were then explored by Patrick Keilholz in 2014. Analysis of the cisterns of Gadara drew from previous excavations and was instrumental in estimating ancient populations given Gadara's lack of natural water sources. 2011 saw additional excavation seasons in Gadara. El Khouri and Omoush wrote about this season in 2015. This study provided insight and focus on the Abbasid occupation at Gadara (750-1050 CE). The Abbasid period was seen as a period of decline for the entire region. Pottery remains and better identification methods attest to more occupation in the later periods of Gadara. 2017 saw a series of interesting archaeological works for Gadara. Two studies addressed more details of the water supply systems of Gadara and the surrounding areas. Keilholz (2017) followed his previous work on cisterns with work on long aqueduct tunnels and distribution systems throughout the city through hydrological models. Interactions of these tunnels and the ancient city can be seen in Figure 2.7. Kempe and Al-Malabeh focus exclusively on the hundred-kilometer subterranean aqueduct, the Qanat Fir'aun. Over several years of archaeological excavation ending in 2016, Shiyab et al. verified some ancient building uses. However, they primarily discovered a new temple structure at the site. Soennecken et al. (2017) continued exploration of the wider Wadi al-Arab region and related several archaeological findings to Gadara. Almasri et al. (2017) took a more local stance. This was achieved by studying a statue of the goddess Tyche which was discovered in Gadara. The style and composition of this statue were compared with other Tyche statues from the Decapolis region. Alawneh and Almasri (2018) followed with a chemical analysis of Hellenistic mortar at the site.

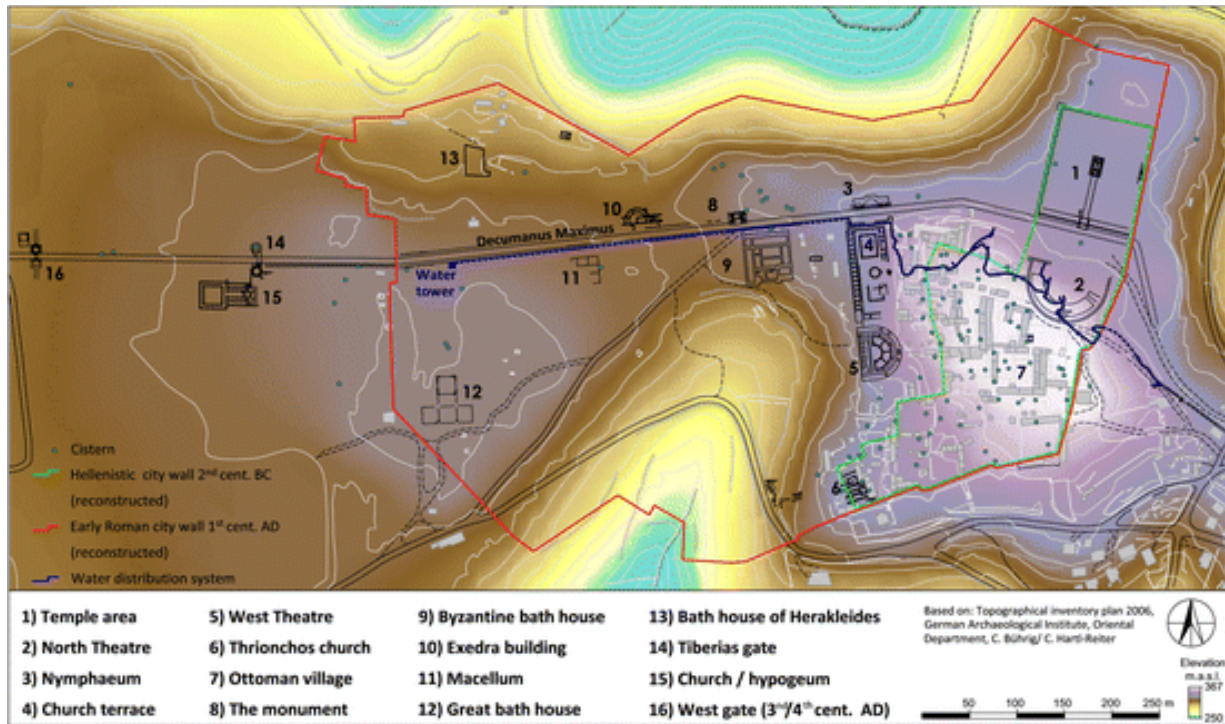


Figure 2.7- Map by P. Keilholz (2017) complete with elevation shading, contour lines, and building identifications. The Roman outline is maintained from Figure 2.6, but a Hellenistic outline is also provided.

General- Several other archaeological works supported those mentioned for specific study areas. In 1997, Basile examined the head of a Tyche statue recovered in Petra. This offered critical context for Almasri et al. (2017) in examining the Tyche statue at Gadara. These are most useful collectively but still, required greater connection to the history of the Decapolis. Two useful works connected archaeology with climatology for the study region of this research. Barker's 2002 study of desertification of Rome's frontiers and Kennedy's 2009 application of desertification theory to the Decapolis were informative works for understanding the conditions of this region in the Roman era. Da Costa (2010) provided additional information on the Decapolis economy throughout the Byzantine Period. She explored this through archaeological remains of ceramic lamps found in Pella from various trade destinations in the region. At this time, Keller and Tuttle (2010) provided a summarized account of archaeological projects

throughout Jordan in the two years preceding their writing. Tykot (2010) provided an archaeological investigation that traced the quarry of origin for Amman/Philadelphia and Umm Qais/Gadara marble sculptures. Such origins were important for a number of previously mentioned studies. Notably, it aided in the discussion on the Tyche statues of Almasri et al. (2017) and Basile (1997). Dirven (2011) provided a numismatic approach to understanding the region. This study investigated the interaction between coins and the imperial cult in the Roman Near East. More recently, Raja and Sindbaek (2018) provided a collection of archaeological projects. These were aimed at high-definition archaeology which sought more mundane explanations than the monumental foci of many archaeological works. Finally, Silver et al. (2019) explored the multidimensional analysis of the ancient city, Palmyra. The proximity and similarities of Palmyra make the study useful for providing additional context for the body of academic work surrounding the Decapolis.

Historical Works:

The multidisciplinary nature of this thesis and the many works cited make thematic divisions somewhat difficult. Archaeological works are inherently historical. However, this section is focused on works that may have derived information from excavation data but were not conducted by the authors. Historical sources are sought to consolidate information and provide human interpretation to archaeological and other sources.

Amman/Philadelphia- In 2009, Seteney addressed the historical context for Amman's earliest modern inhabitants, the Circassians. Seteney provided a historical account of Circassian identity, settlement, and self-representation throughout Jordan. Amman and Jerash were both notable cities given the Circassian origin of their modern cities. This aspect was not always considered when connecting the ancient and modern cities. Amman was further contextualized by

Hanania (2011). This work explored the social, economic, and political history of Amman from 1878 to 1958 representing the evolution of the city from its Circassian settlements to the capital of Jordan.

Jerash/Gerasa- One of the earliest modern historical works on Jerash was written by Julian Bowsher (1997) when she provided a historical expansion on the travels and accounts of 19th-century European explorers. Their travels and writings were provided context and sometimes offered corrections/critiques. It was useful to analyze these early accounts as they offered early insights into the Jerash area before the Circassian settlement was established. David Kennedy presented an extensive historical work in his *Gerasa and the Decapolis* in 2013. His book addressed several aspects of ancient Gerasa including the environs, inhabitants, and written records about the city.

Umm Qais/Gadara- Despite its small size, Umm Qais has a relatively early historical account. Mershen and Knauf (1988) traced the historical development of the city from its pre-Hellenistic origin to its modern form. The account was somewhat brief but addressed sources in written, archaeological, and other forms. Particularly, the focus centered on the etymological evolution of the city name and the inclusion of oral histories from the Ottoman-era villagers.

General- There was an additional body of historical works which were needed to provide context and trace the evolution of knowledge. Ernest Nash (1944) provided an additional account on Roman-era settlements. Bowersock et al. (1999) also provided a historical guide to the Mediterranean region in Late Antiquity. This was a useful bridge between the work of earlier classical periods and the medieval/Islamic periods. Also, Rami Daher (1999) wrote about the more contemporary aspects of history for the region. This account focused on political and cultural history within the Jordanian heritage industry. Boatwright et al. (2004) provided a more

centered historical account of the Romans with a focus on Rome itself. Histories of the Ottoman Empire and the Medieval Islamic world were critical resources for understanding the wider historical periods for the Decapolis (Quataert, 2005; Finkel, 2007; Lindsay, 2008). Moshe Gil (2006) contextualized the Roman agrarian economy in neighboring Palestine, addressing aspects like land ownership and cultivation practices. These were important considerations for areas like Gadara, which still contains large areas of arable land. Bethany Walker (2013) critiqued historical assumptions about settlement migration during the Mamluk period (15th-16th centuries). This discussion challenged some notions of decline for the Decapolis in this period. Skempis and Ziogas (2013) explored a more abstract area of spatial history when they explored the role of space in Greek and Roman literary epics. This was critical for outlining ancient understandings of space. The Decapolis also needed context in terms of cultural history. Tali Erickson-Gini provided such context in 2015 where their work centered around Nabataean religion. It was shown that the Semitic Nabataeans were influential throughout the Decapolis and shared a number of societal similarities. Jordan was also notable for the number of fortified structures in the country. These spanned from crusader castles to pre-historic mounds. Frederiksen et al. (2015) published a study on the fortifications of the ancient Mediterranean and the Near East. Several historians have used fortifications to estimate populations and make other conclusions about the region. Therefore, it seemed prudent to provide context for such structures.

Architectural/Urban Geographic Works:

Amman/Philadelphia- As the capital of Jordan, Amman has been subject to intense levels of urban development. Huge population explosions and growth in urban demands have contributed to Amman's large city structure. Consequently, there have been numerous urban studies for Amman. An early example of such works may be found in Eugene Rogan's work (1986) on the

nature of Amman's urban fabric. He was largely concerned with the physical expression of the Islamic city with Jordan's capital. Amman was notable in its lack of prototypical features of 'classic' Islamic cities. Rogan provided the historical and architectural background for this outcome. This was followed Kadhim's study (1993) which addressed the relationship between the Roman nymphaeum and the development of Amman. This work provided some consideration into how the ancient and modern cities can impact one another. Shawash (2003) explored Amman in a more comprehensive architectural manner. The city was surveyed for Emirate period architecture. The elements of such architecture were analyzed in their translation to the modern city. This was shortly followed in 2004 by Abu-Dayyeh and Nabil. They took a broader scale approach in tracking the plans for the urban development of Amman. These were critical in understanding the considerations the government showed for the city as it grew. Some of these considerations centered around the ruins of Amman while others prioritized more modernist ambitions. Understanding the complexities of Amman would be impossible without some local context.

Potter et al. (2007) later explored the urban geography of Amman. This was presented as an introduction to the site where topics ranged from topography and climate to social structure. Collectively, this served to ground observation in the context of Jordan's largest city. The social dynamics and urban development of Amman were further contextualized by Al-Husban and Al Shorman (2013). They focused on the socio-anthropological dynamics of Amman which were critical in understanding it as a modern city. Alnsour's study (2016) centered on calculating and managing the urban growth of the Amman metropolis. It was useful to understand the more active elements of urban planning for Amman and its growing population. Particularly, this (and other studies) were concerned with overwhelming urban sprawl for the city.

Jerash/Gerasa- Jerash and Amman have wide-ranging differences in urban form and representation in urban geographic literature. Amman was the subject of many contemporary urban studies and aims, while Jerash was a prime focus for archaeological considerations. Due to this, many urban studies focus on the old city (Gerasa). Consequently, attention was diverted from the new city (Jerash) which has surrounded and consumed the Roman ruins over time. Iain Browning (1982) provided a detailed outlook on the urban form of ancient Gerasa. Browning directed considerable energy to the complexity of the Roman city where its buildings were described in great detail and placed within the intricate framework of the ancient city plan. This was furthered a decade later when Watts and Watts (1992) studied the city. They explored the geometric properties of Gerasa's design. Both works highlighted the capabilities of ancient city planners and provide useful comparisons for modern city designs. Hammond (2006) later provided detailed descriptions of Gerasa's many ancient structures. Given the obstacles of visiting the site in person, these descriptions are useful in visualizing the Roman city. Like the other sites, Gerasa utilized infrastructure for the use and distribution of water. Blanke's survey of the central bathhouse in Gerasa (2015) accounted for both city infrastructure and architectural details. Finally, Boyer's work (2016) helped to clarify the varying imagining of the city, ancient and modern. He traced the different mapped plans of Jerash/Gerasa throughout the 19th and 20th centuries. The accuracy of the maps and what they chose to represent were useful for analysis of the site and the writers who developed the maps.

Umm Qais/Gadara- The compact size of Umm Qais as a modern village had limited its urban geographic/architectural literature. However, tourism remains an important industry for the town. As a consequence, Alobiedat's work (2016) addressed the relationship between the tourist industry and Umm Qais' built environment. Thus invoked, the relationship between heritage

tourism of ancient sites and modern built environments came into conflict. The other sites represented this relationship as well. It raised the question over the damage to ruins vs. the suffering of people -- a continuing problem for this region.

General Urban- The objective of studying the ancient and modern urban forms of the Decapolis also required informative general urban works. One of the most useful of these studies was the work of Kevin Lynch (1960). His book, *Image of the City* represented a key development in the methodology of urban studies. He framed cities into parts that could be examined individually and in concert. These characterized cities and continued to impact the way they are planned. Additionally, the Ekistics methodology of Konstantinos Doxiades (1968) paved the way for the multidisciplinary study of human settlements. This was adopted because of the complex nature of human settlements. It sought to combine architecture, engineering, urban planning, and sociology in the analysis of cities. Moving to the 1980's urban theory benefitted from the works of French philosopher, Michel de Certeau. He contributed two important works (1984 and 1988) for the objectives here. He espoused an emphasis on the practices of everyday life. Often urban planning and study can become overwhelmed with the monumental nature of cities. This happened in modern cities but could also be found in the study of the ancient. Lack of information for the average person could discourage scholars from seeking to explore how ancient cities functioned for their citizens. Certain aspects of archaeology have attempted to address this. Additionally, de Certeau wrote about the practice of history, itself when he emphasized the role humans play in the recording of history and invokes questions regarding historiography. Since large portions of this thesis rely on ancient historical accounts, theory on the practice of history was crucial.

This is further elaborated by Michel Foucault. He required critique on the human generation of knowledge through a genealogical method. This required suspicion of historical

generation in the past and present. In this sense, all historical references had to be considered with the human influence and bias in mind. Foucault's methodologies were further revised/added to in 2002 and 2012. These and other concepts for urban anthropology are synthesized by Setha Low (1996). Her work on the anthropology of cities was useful for consolidating approaches to studying cities. The concepts are most useful in identifying areas of methodology while combining anthropology, history, and psychology. Zarmakoupi elaborated on the Ekistics methods of Doxiadis through his Ancient Greek Cities Project in 2015. Bosker and Buringh (2017) took a more specific position by exploring the geographic origin of the European city system. This was important for its influences on earlier writers and the urban planning methods exported to Middle Eastern countries.

In addition to theory, general urban studies were required to analyze the Decapolis cities. The 1st Euro-Mediterranean Regional Conference, in 2007, provided a series of contextual works for traditional Mediterranean architecture. This was useful for both older architecture and future developments for cities in the region. Michael Smith sought to explore the connections between ancient cities and modern ones. His 2010 work asked if archaeological data could help modern cities address urban problems. This helped to guide the objectives in analysis on the ancient and modern Decapolis. Pratesi et al. focused on integrating geology and urban development through new remote sensing technologies. Their analysis of Florence over a period of decades was inspiring for quantifying urban change in rapidly changing cities (2016).

Ancient Urban- Ancient cities have their own intricacies and extensive bodies of work. Such work began in the Renaissance. In the modern period, the first such study comes in the 1960s. Frank Brown (1961) began this by elaborating on the style and elements of Roman architecture. The Decapolis was notable for the Roman nature of its cities. Therefore,

understanding the characteristics of Roman architecture was necessary. Liebeschuetz placed these architectural considerations within a larger temporal framework (2001) with his study on the decline and fall of the Roman city which provided a framework for evaluating cities over an extended period. Tomlinson and Tomlinson (2002) expanded this by considering a longer timeframe from archaic Greece to the Byzantine era. In 2004, Burrell explored the interactions between Greek cities and the Roman emperors. The Decapolis had various interactions with the emperors most notably when Hadrian wintered in Gerasa. Millar (2004) further connected Rome with the Greek world and that of the Near East. This urban history focused on government, society, and culture across the Roman Empire. Segal and Eisenberg (2007) explored the actual town planning practices in Hippos of the Decapolis. While the Roman East was often different from its western counterpart, the general landscape of Roman cities was necessary for further analysis. Palet and Orengo (2011) conducted such a study at a Roman-era city in Spain. Also, Senseney (2011) further explored classical architecture for the Greeks and Romans. Benoist offered another study on the city of Rome (2012). The city was explored in its relations to the wider empire. Greenhalgh continued certain themes of Tomlinson and Tomlinson when he commented on the later architecture of the Byzantines and early Islamic Empires throughout the East, North Africa, and Spain. Ulrich and Quenemoen (2013) provided additional informative perspectives on Roman architecture. Finally, Flohr (2020) constructed a study on the use of urban space and urban history of the Roman Empire.

Jordanian/Middle Eastern Urban- Cities in Jordan and the Middle East contain unique urban problems and properties. Due to this condition, prior research must be consulted on their urban forms, specifically. Fortunately, such literature exists going back to the 1960s for Jordan. Works from this decade were important due to their relative proximity to Jordan's independence.

Newcombe's work (1964) on urban planning throughout Jordan was critical to understanding the beginning of Jordan's rapid urbanization. Fisbach (2000) followed by discussing the relations between the government/society and the land in Jordan. Bener et al. (2010) addressed problems with increased urbanization in Jordan and other countries in the Middle East. Also, Darabesh (2010) incorporated urban concerns with the Decapolis. This centered on developing a tourist trail for the Decapolis within their urban contexts. Mishal (2011) explored the economic growth from Jordan and the nature of its developing economy. Rast et al. (2011) studied the everyday life and practices of ancient communities throughout the Levant. Mishal's analysis was complemented by Stafford in 2013. Khirfan et al. addressed the impacts of exporting urban planning from the West to areas in the Middle East. Urban problems regarding water security and climate change were explored by Greenwood (2014). O'Brien (2015) focused on a specific city, Beirut. While outside the study area, it represented a useful comparison city for urban change in the region. Odeh et al. (2017) later explored interactions between geology and urban planning in Jordan. These represented important considerations for urban development in the past and present. Finally, Ovadiah and Mucznik (2019) provided a study on religious expression in the Roman Decapolis. This constituted an important study in its approach to most of the Decapolis instead of a single city.

Geospatial/GIS Works:

Amman/Philadelphia- Geographic Information Science (GIS) is not necessarily a newer science. However, the rapidly developing technology of the field has greatly increased its scope and feasibility. Al Rawashdeh and Saleh (2006) provided one of the earlier GIS works for Amman. Their study focused on utilizing satellite imagery in tracking urban growth for Amman. Given Amman's massive growth, this study provided an instrumental framework for efficiently

quantifying such growth. 2013 saw GIS technology expand to explore the aquifers around Amman. Growing demand for water is one of the chief concerns for Middle Eastern urban development. Therefore, the ability of GIS to explore this relationship is critical.

Jerash/Gerasa- GIS work in Amman is largely concerned with the development of the modern city. The opposite was true in Jerash/Gerasa. Many survey techniques and geospatial applications have been dedicated to exploring the ancient city. Bayari (2005) provided a framework for implementing such technologies to explore Jerash/Gerasa. Hommori (2008) offered one of the relatively few foci on the modern urban situation. GIS was implemented to examine the hydrogeological resources of Jerash. This had applications for the ancient city but was also useful in planning for the modern city. In 2015, Hawambdeh et al. utilized geophysical examination to examine a specific site for Jerash. This was the Al-Berktain archaeological site north of Jerash. Geospatial work in Jerash/Gerasa culminated in the works of Stott et al. (2015). These works utilized remotely sensed data from the past and present to track the geographic development of Jerash. Finally, Holdridge et al. (2017) provided a fairly comprehensive application of GIS technology for examining the environs of Jerash.

Umm Qais/Gadara- Like the other cities, Umm Qais was examined through GIS for hydrogeologic purposes. The small size of the modern settlement did not necessitate an individual study. However, it was included in Awawdeh's (2010) analysis on the aquifers of the Yarmouk River basin. Abu Allaban and El-Khalili (2014) used GIS techniques to evaluate the impacts of pollution at the ruins in Umm Qais. Given Jordan's rapid urbanization, this study was critical to understanding the danger to cultural heritage sites. Al-Ruzouq et al. (2018) utilized geospatial methods to organize and manage Umm Qais/Gadara's high number of archaeological

remains. Finally, Alzoubi and Malkawi (2019) used GIS techniques to analyze the thermal properties of traditional and modern houses in Umm Qais.

General- There were some incredibly early geospatial works for this region. Due to its importance during the First World War, different European air forces conducted aerial surveys. The German air force conducted such surveys near the end of the war. These were later followed by the British in the 1930s under Sir Aurel Stein. Aerial imagery was also a cornerstone of Kennedy and Bewley (1948). Their survey of Jordan sought to explore the ancient sites from the air. Jane Taylor (2005) provided a similar survey. Such aerial imagery is useful for the identification of ancient sites and tracking urban development. Kennedy and Bewley (2014) summarized the accounts of aerial imagery. Collectively, these sources were key to displaying urban change and historical sites.

In 1921, Betten provided a translation and compilation of Roman itineraries. This was crucial in understanding Roman mapping practices. These were usually representations of distance, and not attempts at proper geographic representation. Hammond followed this, in 1981 with the creation of an atlas of the Greek and Roman world. Dilke (1985) also commented on Greek and Roman mapping. Talbert et al. provided additional insight in an atlas of classical history (1989). Talbert (2000) furthered this with a map-by-map directory of the Greek and Roman world. Talbert also explored the use of geographic information from small towns in the Roman Empire. These were often related to the medieval Peutinger map of the Roman Empire. Albu (2005) related key information on this map and the imperial geography of Rome. Tappy (2012) applied information from the Peutinger map to the Palestine region.

Geographic information systems were identified in their usefulness in archaeology. Given the extensive archaeological work in Jordan, Peterman (1992) attested to the usefulness of GIS.

Davies and Fall (2001) explored the applications of GIS in tracking precipitation and vegetation relationships. This would prove critical in later analysis on urban development using GIS. Al-Bilbisi and Tateishi (2004) used remote sensing to trace land cover changes throughout Jordan. This represented an increase in scope from city-based evaluations. Schmidt et al. (2006) explored the soils of the ancient Decapolis through GIS applications. GIS techniques were used in analyzing the morphology of megacities by Alhaddad et al. (2012). The higher resolution imagery could be used to quantify the massive amounts of data for larger cities. Park et al. (2014) conducted a useful case study on the urban form and landscape patterns of different cities. The GIS capabilities and comparative nature of the study provided useful frameworks. The American School of Oriental Research (ACOR) also utilized geospatial imagery for various purposes. As outlined by Danti et al. (2017), such imagery could be analyzed for monitoring the multitude of cultural heritage sites in Syria and Iraq. Continuing the applications of Al-Bilbisi and Tateishi, Jawarneh and Biradar (2017) compiled a decadal land cover database for the entirety of Jordan. This focus was expanded by Franceschini et al. and Obeidat et al. (2019). Collectively, they allowed for analysis on urban and landscape development throughout the country but were often at too coarse spatial resolutions for smaller cities (Figure 2.8 and Table 2.1).

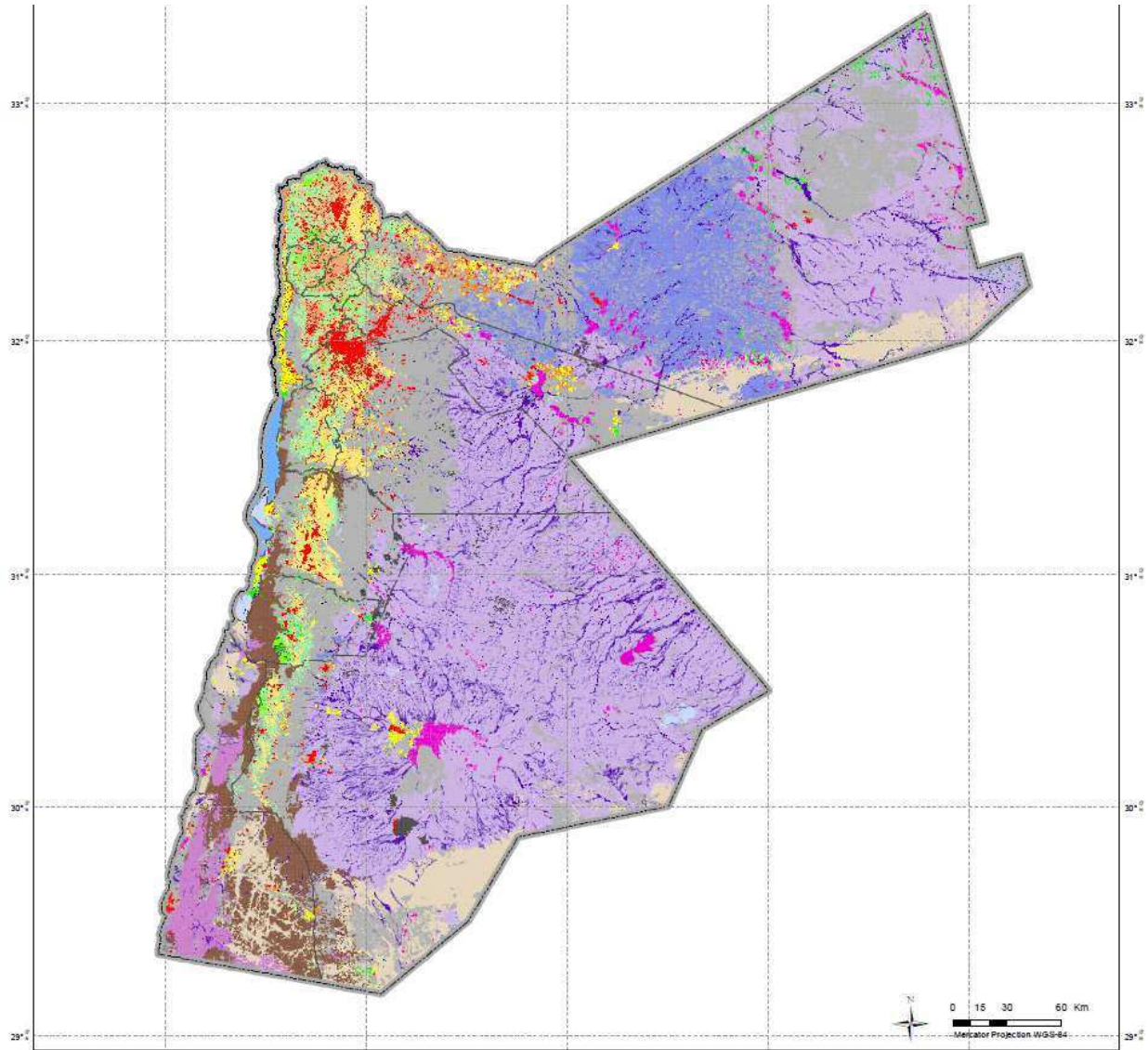


Figure 2.8- Land Cover in the Kingdom of Jordan from Franceshini et al. (2019). Urban areas are marked in red, greens and yellows represent agricultural practices, and the pinks/purples are chert, basalt, and bare soils.

Table 2.1- Land Cover Legend in the Kingdom of Jordan from Franceshini et al. (2019) for Figure 2.8.

LAND COVER CLASSES	
Irrigated	
Irrigated	
Rainfed herb.	
Rainfed	
Closed trees	
Open trees	
Woody	
Grasslands	
Build-up	
Bare soil	
Undiff. bare	
Bare rock	
Chert plain	
Basaltic plain	
Sandy areas	
Saline soil	
Extraction site	
Saline	
Natural	
Artificial	
Wetlands	
Wadi	
Mudflat	
TOTAL LAND	

Chapter 3. STUDY SITES

3a. Physical Landscapes

Jordan/Levant: Discussing the classical region of the Decapolis requires a broader discussion pertaining to the creation and evolution of the surrounding areas. The Decapolis is mostly contained within the Hashemite Kingdom of Jordan. Modern Jordan is a relatively small Middle Eastern nation covering roughly 89,342 square kilometers (CIA, 2021). Jordan borders five other countries with land boundaries representing approximately 1,744 kilometers. Jordan shares its longest border with the Kingdom of Saudi Arabia to the South (731 kilometers). The other boundaries include Syria (379 kilometers), Israel (307 kilometers), Iraq (179 kilometers), and the Palestinian West Bank (148 kilometers). Jordan is almost landlocked with only 26 kilometers of coastline. This coastline is represented by the Gulf of Aqaba from the Red Sea at the extreme southern extent of Jordan (CIA, 2021).

In terms of terrain, Jordan is characterized by a mostly arid desert plateau and a large north-south running geological rift. This rift, discussed in more detail below, represents the dominant topographical feature of Jordan and contains other features like the Jordan River Valley, the Dead Sea, and the Jordanian Highlands. The average elevation for Jordan, as a whole, reaches roughly 812 meters above sea level. The Dead Sea represents the lowest point at 431 meters below sea level and Jabal Umm ad Dami contains the highest elevation point at 1,854 meters above sea level (CIA, 2021).

The majority of Jordan's population is clustered in the west following the spine of mountains which connect Aqaba to the South, with Irbid and Umm Qais to the north. Primarily, these populations are centered around the capital, Amman, in the northwest (including the Decapolis region) and around the Gulf of Aqaba, in the southwest. Jordan is prone to several

natural hazards including drought, periodic earthquakes, and flash flooding (CIA, 2021). Earthquakes are of particular importance for urban populations, in general, and the historic development of Decapolis cities, in particular. The primary environmental concern for Jordan centers around the use/distribution of freshwater. With the limited water sources of the semi-arid/Mediterranean climate, the increased population has led to increased water scarcity and desertification of certain ecosystems (Lucke et al., 2005, p.70).

Geologically, Jordan occupies the northwestern edge of the Arabian Plate. Originally part of the neighboring African Plate, the Arabian Plate was detached roughly 25 million years ago due to rifting along the modern Red Sea. The Arabian, African, and Indian Plates have been forcing their way northward into the Eurasian Plate. These northern collisions continue to produce mountain ranges (such as the Zagros Mountains of Iran). The movement of these tectonic plates is critical in explaining the geologic nature of Jordan. The Dead Sea Transform (DST) fault system, or the Dead Sea Rift, joins faults in southeastern Turkey to the Red Sea Rift south of the Sinai Peninsula. This fault system is a result of increased movement by the Arabian Plate compared to the slower northern movement of the African Plate. Thus, these plates are pulling apart which contributes to the development of depressions. Significant examples of such depressions include the Gulf of Aqaba, the Dead Sea, and the Sea of Galilee. Such a geologic position grants Jordan an abundance of diverse features compared to the monotonous morphology of the interior of the Arabian Peninsula (Bender, 1975, p.13). Simultaneously, the presence of faults in the DST and those further to the north contribute to the hazard composition of Jordan in the form of earthquakes. Earthquakes are critical factors in the creation, development, and resilience of urban centers. The Decapolis had a particularly strong

relationship with earthquakes due to the longevity of habitation in the region and the rapid abandonment due to earthquake events in the 8th to 10th centuries CE (Ward, 2016).

As seen in Figure 3.1, Jordan can be divided into seven provinces: Southern Mountainous Desert, Mountain Ridge and Northern Highlands East of the Rift, Central Plateau, Northern Plateau Basalt, Northeastern Plateau, Wadi Al-Arabah-Jordan Rift, and Highlands West of the Rift (Bender, 1975, p.13). The Decapolis resides within the Wadi Al-Arabah-Jordan Rift, Highlands West of the Rift and the Mountain Ridge and Northern Highlands East of the Rift. Due to this condition, these provinces will be discussed in more detail than the remaining four geologic provinces. The Wadi Al-Arabah-Jordan Rift consists of a narrow depression that traverses Jordan from the Gulf of Aqaba, in the south, to Lake Tiberias, to the north. As a portion of the East African-Asia Minor Rift System, this rift rises up to two hundred and fifty meters above sea level in central Wadi Al-Arabah. As the rift continues northward, its floor falls to the lowest elevation on land, the Dead Sea (431 meters below sea level). The hypersaline lake surface exists at around four hundred meters below sea level and it extends over three hundred meters to its lakebed. Further north, the Jordan River Valley extends 105 kilometers to Lake Tiberias. The Highlands West of the Rift consist of structural upwarps (mainly Upper Cretaceous-lower Tertiary rock sequences) and drainage systems that drain eastward to the Jordan River Valley and westward to the Mediterranean Sea (Bender, 1975).

The Mountain Ridge and Northern Highlands East of the Rift contain a varied geologic character. Following the Rift, this province slopes gently toward the Central Plateau and steeply toward the Rift. Some of the highest points of elevation in the Kingdom are found in the south of the Mountain Ridge province in the Jibal ash-Sharah. The geologic nature of Jordan carries several consequences for the country, as a whole, and the Decapolis region in the north-west. The

presence of the Rift, Highlands, and Mountain Ridge produced conditions ideal for urban settlement. Bounded by the banks of the Jordan River, to the west, and desert plains, to the east, the highlands produce a discrete area of rich soils and abundant rainfall (Kennedy, 2007, 50). Just as these features made the area inhabitable, the surrounding landscapes provided a level of isolation which allowed the Decapolis to develop internally while drawing from broader cultures/civilizations both to the east and to the west.

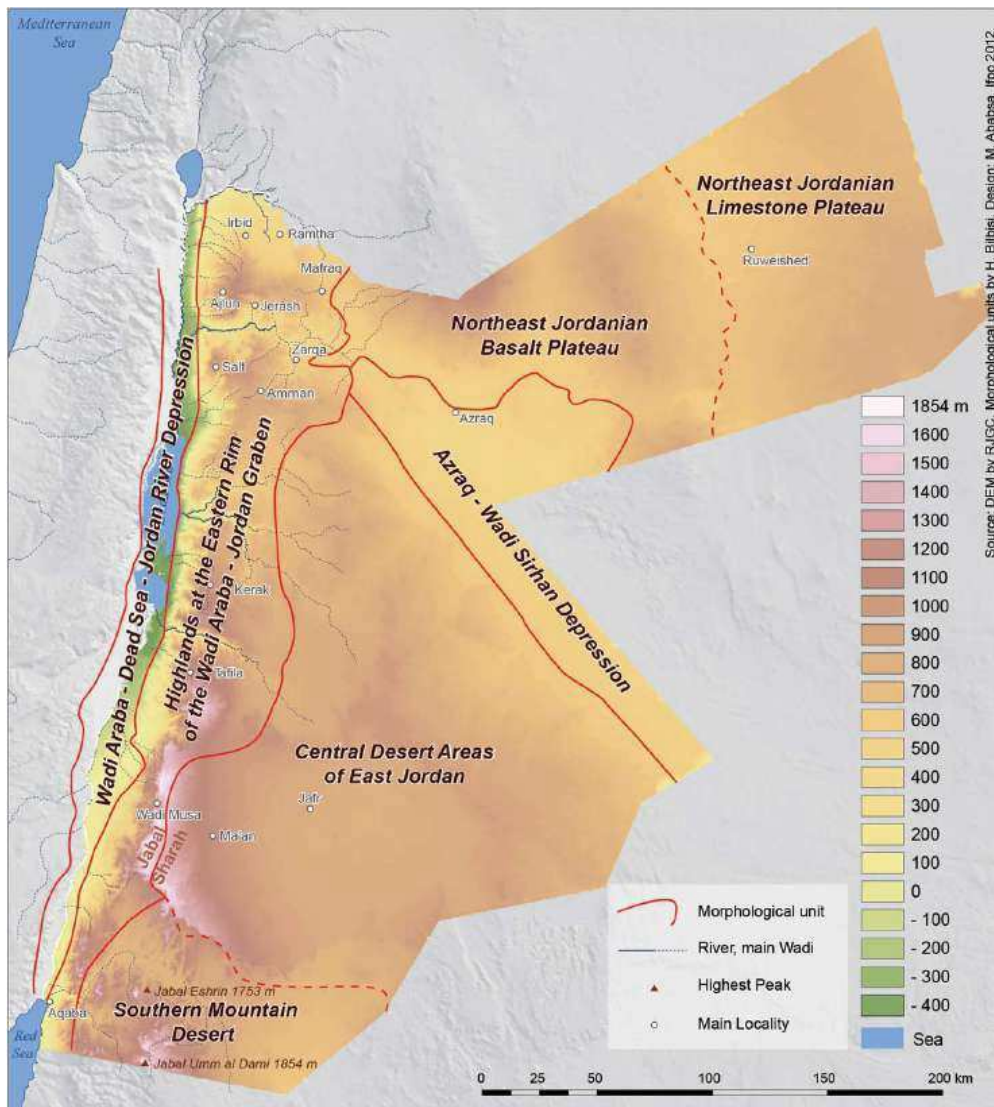


Figure 3.1- Geological Provinces of Modern Jordan with elevation in meters relative to sea level from Ababssa (2014: 45). Localities of Amman and Jerash mark Decapolis sites while Umm Qais lays northwest of Irbid.

The creation of the landmass contained within modern Jordan resulted in the distribution of certain economic resources. The utilization of such resources was addressed in further detail in the description of modern Jordan. For now, the general distribution/presence of natural resources will be outlined. In terms of metallic minerals, Jordan contains notable amounts of copper, manganese, iron, chromium, nickel, uranium, and pyrite. Additionally, Jordan contains nonmetallic minerals such as phosphate and other gems/crystals. Compared to its oil state neighbors, Jordan contains much less actual and potential oil reserves. Compared to the massive reserves of Saudi Arabia (262.3 billion barrels in 2004), Jordan's reserves are negligible at best (NGS, 2008, p.84). The lack of such a valuable resource heightens the importance of other Jordanian resources, particularly, the cultural heritage/tourism resources. The final natural resource that requires discussion is that of water (Potter et al., 2007).

It would be impossible to discuss the nature of cities in Jordan, past and present, without discussing the climatic conditions, in which, the cities have/had existed. This discussion should also be prefaced with a distinction between climate and weather. Weather conditions represent the active meteorological conditions in an area at a specific time. Climate, on the other hand, represents a long-term average (usually around 30 years) of weather conditions that create general trends. The climate of Jordan, specifically, is an important topic for discussion for a multitude of reasons. One initial concern is the perception of Jordan's climate from unfamiliar audiences. Jordan and the Middle East, generally, are often mistaken as simply barren desert climates. In fact, the Middle East and North Africa represent extremely diverse climate regions ranging from the hot, arid deserts of the Arabian Peninsula to the humid subtropical areas of Afghanistan/Pakistan. Jordan's climate varies throughout its different regions. The south and east of the kingdom are primarily arid with relatively high temperatures (NGS, 2008). In the

northwest, the kingdom is semi-arid. The northwestern corner of Jordan, which contains the Decapolis, is very similar to other Mediterranean climates. In terms of rainfall, Jordan's climate ranges from over 700 millimeters/year to less than 50 millimeters/year depending upon the season (Mithin and Black, 2011, p.19). The rainy season, November to March, coincides with the Mediterranean cyclone and constitutes the vast majority of precipitation. Consequently, the dry season, April to October, remains almost completely devoid of precipitation. The precipitation coincides with a distinct temperature pattern. The Mediterranean climate of Jordan is characterized by temperatures that are warm (between 70- and 80-degrees Fahrenheit) in the dry summer and cool (40 to 50 degrees Fahrenheit) in the wet winter (NGS, 2008). The presence of this Mediterranean/Semi-Arid climate produces different land-use conditions. Even though deserts are a prominent feature in Jordan, roughly 11 percent of Jordan was designated as agricultural land in 2011 (CIA, 2021). Irrigation from water sources, such as the Jordan River, allows for more productive agricultural practices. Such uses for agriculture and cultivation are seen in Figure 3.2. Discussing the climate and land-use are important topics for understanding the past and present context of Jordan. Despite popular representations of many Middle Eastern countries, Jordan represents a complex array of climatic conditions. Climatic conditions are crucial in understanding the past development of major urban centers, as well as, predicting the conditions of modern urban expansion.

Jordan Landuse Zones Based on Soil Type

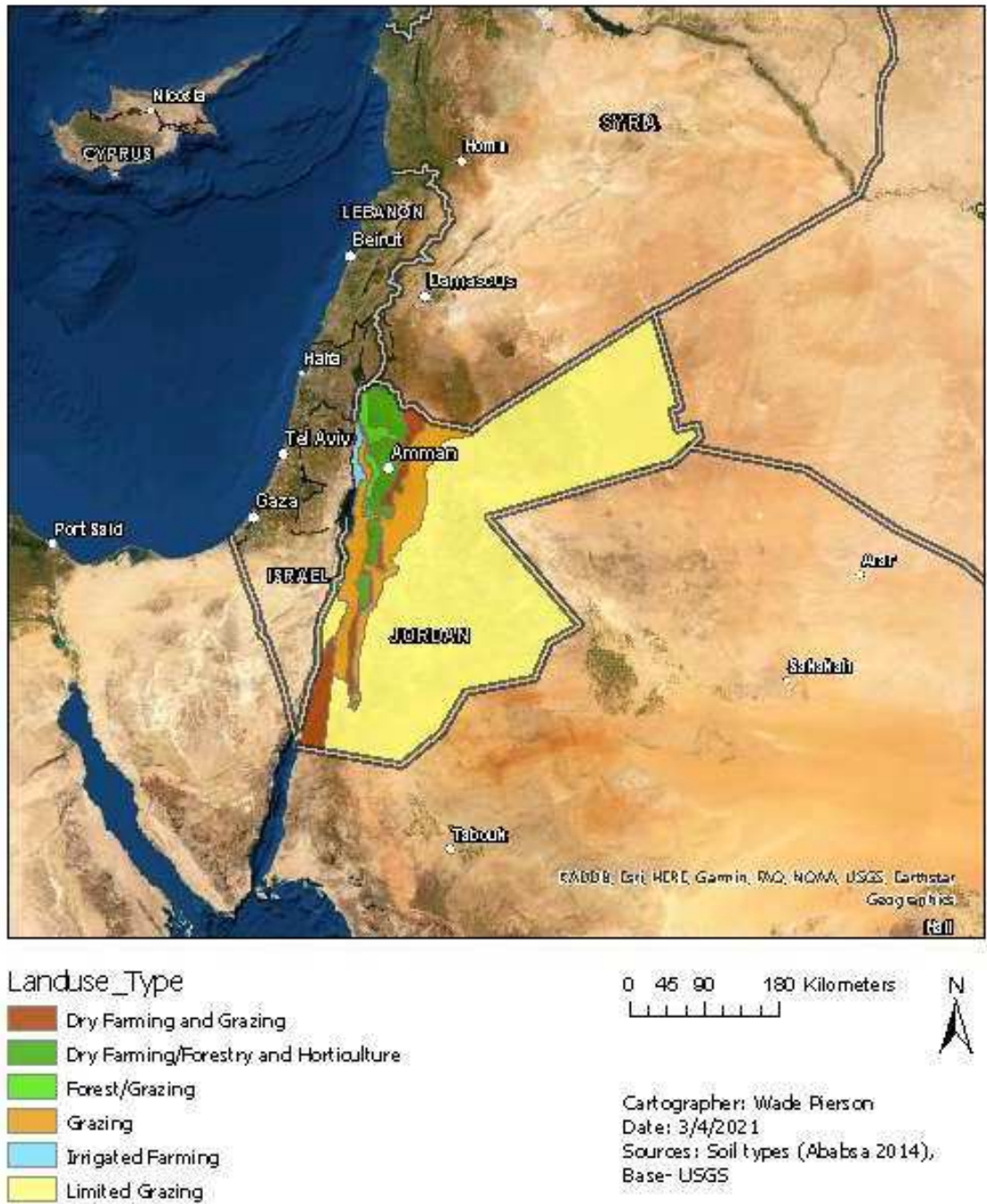


Figure 3.2- Land use facilitated by soil type in Jordan derived from Ababsa (2014). Amman, Jerash, and Umm Qais all lay within the Dry Farming/Forestry and Horticulture.

Amman/Philadelphia: Amman is situated within the northwest region of Jordan. This places the city within the Mountain Ridge and Northern Highlands East of the Rift geological province. Amman is built atop the 85-meter thick, Late Cretaceous Amman Silicified Limestone formation (Potter et al., 2007, p. 5). Its lithologies alternate between limestone, dolomitic chalky marls, white and brown cherts, chalk and silicified limestone. Amman has since expanded toward Zarqa which is somewhat thinner. The northern area of the city contains limestones with calcareous mudstones, siltstones, and marls. It lays just northeast of the Dead Sea and due east of the River Jordan. Much like the ancient city of Rome, Amman originally occupied seven hills, *jabals*. These hills surround the Wadi ‘Ras el Ain which flows into the Zarqa River basin. In addition to these hills, the city is made up of deep and narrow valleys. The upper and lower portions of these hills were initially settled but steeper sections have received more attention in recent years. Amman sits clearly within the Mediterranean climate zone of Jordan. As such, it has the typical climatic split of rainy winters and dry summers. The area is relatively wet from November to April and dry the remainder of the year. The summer temperatures average around 28 to 30 degrees Celsius while the winter averages between 12 and 21 degrees Celsius. Wet season rainfall is typically around 300 millimeters annually as seen in Figure 3.3. The western side of the city represents land more favorable for agriculture. Meanwhile, pre-desert and desert soils can be found just east of Amman (Potter et al., 2007).

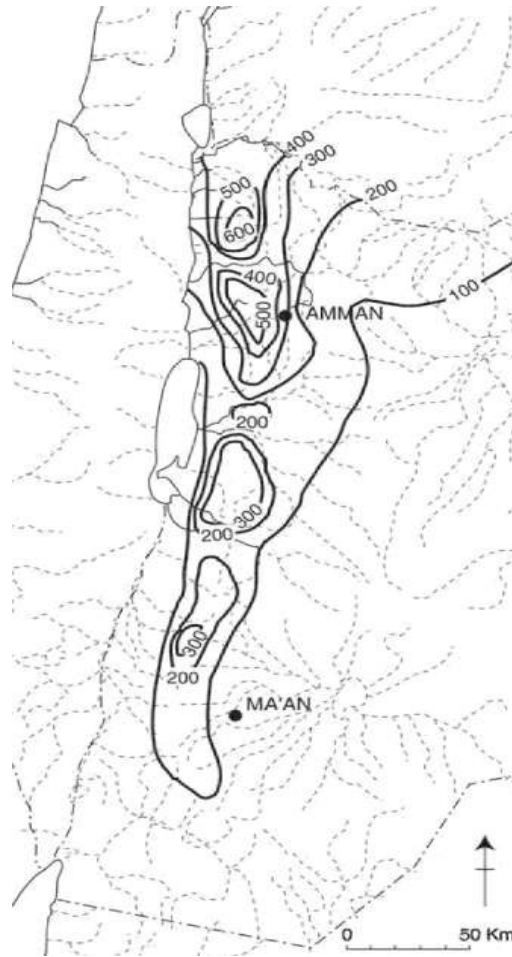


Figure 3.3- Average Annual Rainfall in millimeter isohyets. After Kennedy (2013).

Jerash/Gerasa: Jerash is located in the same general region as the majority of the Decapolis. Travel to the city is easy as it lays just 42 kilometers north of Jordan’s capital, Amman. Jerash belongs to the Highlands of the Ajlun region. This region is bounded on the north by the Yarmouk River, the west by the River Jordan, the south by the Madaba plains, and the east by the desert (Kennedy, 2013, p. 50). Jerash and its surrounding areas consist of hills and plain valleys which are usually between 600 to 1200 meters above sea level (Figure 3.4). On average these highlands are within 60 kilometers of the Mediterranean Sea which can be seen on a clear day (Kennedy, 2013, p. 46). After the land rises steeply from the Jordan River Valley, it

retreats southeast to the Azraq-Sirhan Depression. Locally, Jerash sits amid a relatively gentle sloping valley. This valley centers around the Chrysorhoas (modern Wadi Suf/Wadi Jerash), a tributary of the Jabbok (modern Zarqa) River (Kraeling, 1938, p. 11). The slopes, particularly the western side, are graced with descending terraces to the relatively flat valley floor. Soil composition is also important for the Ajlun Highlands region. The Jordan grants bountiful soils to its banks but the Terra Rossa soils of the Ajlun Highlands are also incredibly conducive to agricultural activities (Bender, 1974, p. 14). This, paired with abundant rainfall, make the region particularly attractive for human settlement. Jerash shares a climate similar to Amman. However, the northern highlands enjoy somewhat higher precipitation levels.



Figure 3.4- View of modern Jerash looking east from archaeological park. Photograph by T.R. Paradise (2015).

Umm Qais/Gadara: Umm Qais represents the northernmost city within the study area. The small city rests incredibly close to the borders with Syria and Israel. The Yarmouk River runs to the west and north of the town. Meanwhile, the Sea of Galilee (Lake Tiberias) lays near the base of Umm Qais' hills (Figure 3.5). The historical settlements sit upon a narrow ridge where the ruins extend over a length of 1.6 kilometers (Kennedy and Bewley, 2004, p.159). This ridge then steeply slopes into the Jordan and Yarmouk river valleys. Umm Qais is well north of Jerash but still within a day trip of Amman (120 kilometers). It is also only 15 miles from Irbid, a substantial city in the north of Jordan. It remains within the Ajlun Highlands region. Therefore, it possesses many of the physical properties of cities like Jerash. However, Umm Qais does reside near significant basalt formations. However, much of the Hellenistic settlement sits atop a limestone hill (Burhig, 2013, p.188). Umm Qais shares a similar climate to the cities of Amman and Jerash. Unlike those cities, Umm Qais does not have a natural water source. The site is located on xeric, rocky ridge outskirts within the Jordan and Yarmouk valleys (Keilholz, 2014, p. 27). The semi-arid climate of the region dictated the need for additional water resources for increased urbanization. This largely stemmed from the alternating wet/dry seasonal system which mitigates the use of water storage.



Figure 3.5- View of black column chapel at Umm Qais with Golan Heights and Sea of Galilee in the background. Photograph by T.R. Paradise (2014).

3b. Historical Landscapes

Jordan/Levant:

Prehistory to Bronze Age (-1200 BCE): Urban morphology represented research with applications in understanding the past and predicting the future. By understanding the patterns of urbanization buried underneath modern cities, urban geographers can better predict hazards, living conditions, and urban resilience. The emphasis on understanding the history of urban development necessitated a discussion on said history for the Decapolis and its surrounding areas. The history of this research region was long and storied. The breadth of urban morphological history in the Greater Levant stemmed from the region's proximity to/within the Fertile Crescent. This stretch of land curved from the upper Levant into Mesopotamia. The region represented a perfect nexus of conditions (rich soils, sufficient precipitation, and irrigable rivers) as the Euphrates and Orontes Rivers provided a hotbed for irrigated and rain-fed agricultural production (Porter, 2013, p.7). Often this period, roughly 9000 BCE, becomes

characterized by drawing contrasts between settled agricultural communities and nomadic pastoralists. These strict divisions produced exclusionary scholarship about the urban development of the region. By emphasizing the importance of communities, recent scholarship has attempted to include agro-pastoral settlements throughout the region.

Marginal zones on the outskirts of this region saw interactions between these various types of urban/community development, particularly in the Early Iron Age (1250-1000 BCE). The main regions of the Fertile Crescent and nearby Late Kingdom Egypt experienced their growth and expansion into the Levant in the Late Bronze Age (1550-1250 BCE). These powerful societies experienced sharp declines between the Late Bronze and Early Iron Ages. Throughout this period, settlements developed in both Lebanon's Beka'a Valley and West Central Jordan. The agro-pastoral societies in the Beka'a Valley have been associated with the emergence of the ancient Israelites. The contemporary development of similar settlements took place within Jordan between the Jordan Valley (West), the Arabian Desert (East), the Wadi al-Zarqa (North), and the Wadi al-Hasa (South) (Porter, 2013, p.9). Despite claims of regional-level organization in the forms of chiefdoms, kingdoms, or states, evidence of centralized administration was inconclusive. Instead, it seemed likely that settlements were created and disbanded irregularly. It seemed these settlements organized local infrastructure and often consolidated leadership as they changed over time. Paleoethnobotanical evidence from Khirbat al-Mudayna al-'Aliya (KMA) articulated the nature of these Iron Age settlements in terms of community management of crops, animal husbandry, and storage/construction (McGeough and Brown, 2016, p.34). Outside of the immediate region, the Late Bronze Age was characterized by palace-administered city-states. The first millennium BCE would see the return of large, territorial states. The Early Iron Age represents a period of transition in the broader history of urban development.

Classical (1199 BCE- 640 CE): The urban development of settlements in Jordan continued amid irregular processes and adapted to external influences as ancient empires began to develop once again. These processes occurred throughout the sites of what would become the Decapolis. As the Iron Age continued, several kingdoms developed in modern Jordan. The most prominent of these included Ammon, Moab, and Edom. Referenced in the Bible, these kingdoms would loosely control the region until, and sometimes after, major empires arrived. Invasions by the Neo-Babylonians and the Achaemenid Persian empire contributed to urban development throughout the region. Centralized authority and increased wealth were two undeniable influences on urban form throughout history. Control and mobilization of resources allowed larger, imperial powers to dictate the shape and nature of their urban centers. Infrastructure developments allowed empires to bend the environment more to their will than the subsistence agro-pastoralists of the Iron Age Levant (Porter, 2013).

The arrival of Alexander the Great in the 4th century would initiate pervasive changes for urban morphology in Jordan and the Greater Levant. Along with the external influences of imperial powers, Alexander characterized the urban morphology of cities across the burgeoning Hellenistic World and deep into Southwest Asia. A primary mode of this development was achieved through the resettling of veterans who served in Alexander's armies. Instead of trekking (4000km: Alexandria to Skopje) home to Greece and Macedonia, Alexander had his veterans settle new cities throughout his empire (often named after himself). Thus, Alexander's veterans inserted a foreign, Hellenized population amidst the diverse peoples of Southwest Asia. Inter-marriage and other social interactions began to mingle Hellenistic and local beliefs, culture, and society. The new urban centers were characterized by Hellenistic urban design. This is particularly evident in structures like temples. However, the Greek aspect of Hellenistic design is

often lost due to the oblitative nature of subsequent Roman urban planning. Before the Romans conquered the region, Alexander's generals and successors, the *Diadochi*, quarreled over the remains of his empire. The Macedonian Empire split mainly between Antigonid Macedon, Ptolemaic Egypt, and Seleucid Syria/Southwest Asia. The Seleucids, founded by Seleucus I Nicator, and the Ptolemies, founded by Ptolemy I Soter, warred almost constantly in the Levant (then called Coele-Syria). The constant Hellenistic warfare had deep repercussions for the region (Polybius, *Histories*). Death and destruction were certainly common results of these wars as the region even gained the moniker the Elephant Graveyard (from the number of war elephants killed in battle).

However, the constant competition for land and power led the Hellenistic powers to create as well. This primarily came in the form of Greek colonization/expansion. Colonies were often created as fortresses or armed camps to facilitate strategic goals during the many wars between the Ptolemies and Seleucids. Additionally, these colonies were often created on top of sites that had been variously inhabited as far back as Neolithic times (10,000-3,500 BCE). The Decapolis owed the majority of its creation to the establishment of these colonies. The sites of Amman and Jerash represent important examples of this colonization process and each were addressed in detail later in this section. The chaos of Hellenistic warfare also led to the rise of the Jewish Hasmonean dynasty in Israel/Palestine. Based out of Jerusalem, the Hasmoneans carved territory for themselves between the two successor kingdoms and even captured certain cities of the Decapolis. From the Early Second – Middle First century BCE, these powers would continue to vie for power in the Greater Levant and the effects of such wars can be seen in the fabric and development of cities within the Decapolis (Kraeling, 1938, p.28).

As the successors of Alexander the Great squabbled in the East, a new power was on the rise in the West. After expanding throughout the Italian Peninsula and destroying their rival, Carthage, the burgeoning Roman Republic looked eastward. The Romans had already proved troublesome to the ascendant Greeks when Pyrrhus I of Epirus invaded Italy (Early Third Century BCE). Pyrrhus won several battles against the Romans but saw his army dwindle to nothing as a result, giving us the term Pyrrhic Victory. By the Middle First century BCE, the Romans had expanded past Greece, into Asia Minor (Boatwright et al., 2004). The great Roman general, Pompey Magnus, then marched south defeating the Hellenistic powers and the Hasmoneans. Although direct Roman control was not immediately established, Roman influence represents the greatest impact on the development and prosperity of the Decapolis. The immediate results of Pompey's Eastern Campaigns included the ordering of the Decapolis into an autonomous federation of cities (Figure 3.6). The nature of this federation is debated but, at the least, it represented social and economic relations between the Greco-Roman cities.

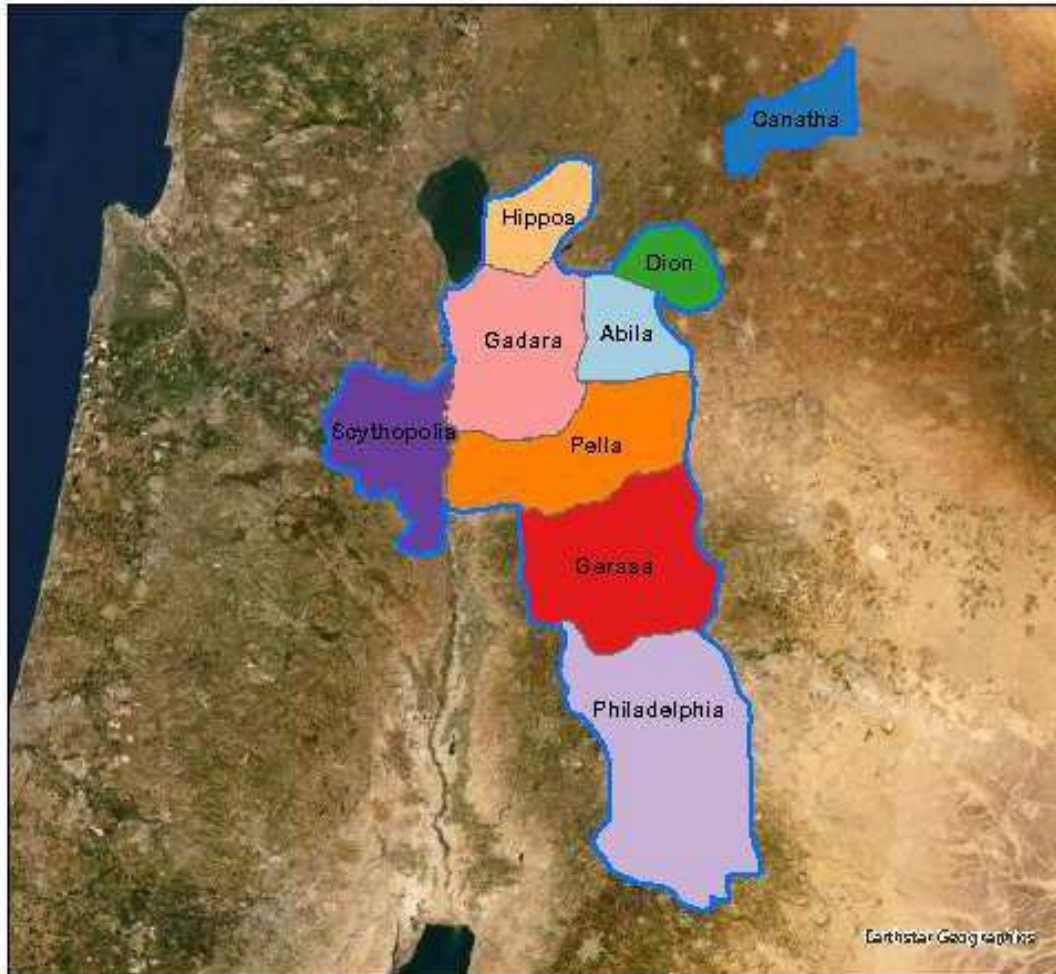
The Decapolis cities flourished under the Roman Republic/Empire as an important link in trade networks. Nabataean caravans from Petra often found their way to Mediterranean ports by passing through the Decapolis. As a result, the Decapolis gained massive wealth and incorporated certain aspects of Nabataean religion and culture. The Roman influence is also the most apparent in the urban morphology of the Decapolis. This mainly stems from the nature of the Roman urban design. By both adapting previous Greek designs and by constructing massive, obliterative public works, the Roman design left little evidence of older urban forms. Decapolis cities adopted a version of the Roman grid system radiating from at least one north-south running *cardo maximus* and an east-west running *decumanus maximus* street intersection (Watts and Watts, 1992).

From this period to the Third Century CE, the Decapolis would reach the peak of its prosperity and development. Somewhat ironically, the reign of the Emperor Trajan (98-117 CE) which saw the ‘Golden Age’ of the Decapolis coincided with the dissolution of autonomy in these cities. While the degree of this autonomy between the Roman Empire and the Decapolis can be debated, the region probably acted as a buffer between the Empire and the Semitic Nabataean Kingdom, centered in Petra, to the south (Khouri and Marvullo, 1985). Trajan’s eastern campaigns resulted in territorial gains for the Romans at the expense of the Parthian Empire in the East. Trajan also expanded Rome to its greatest extent through less violent means with the annexation of the Nabataean Kingdom in 106 CE. This annexation was accompanied by a provincial reorganization which saw some Decapolis cities remain in the province of Syria to the North while cities like Jerash were placed in the new province of Arabia. While this reshuffling fractured the contiguous territory of the Decapolis, many of its cities prospered even more due to their proximity to the new provincial capital at Bostra. Due to numerous struggles, the Roman Empire began to wane in power and wealth in the fourth century CE. The Decapolis experienced a decline as well. However, the region continued to somewhat prosper throughout the Byzantine Period (330 – 634 CE). While the Eastern Roman Empire, dubbed the Byzantine Empire by historians, lost much of the territory of classic Rome, the eastern provinces were far more prosperous (Kennedy, 1985).

Thus, the Eastern Empire still possessed the power and wealth to develop cities with monumental architecture. This can be seen in Justinian’s reconstruction of Antioch after the Sassanian conquest in the 6th Century CE. The Decapolis reflected this as well. Throughout this period, these cities continued to maintain their large open streets and monuments while adding several large churches as well (Kennedy, 2017, p. 233). Jordan continued to be administered in a

similar fashion to the earlier roman provincial system. The increased influence of Christianity did result in minor reorganizations around bishoprics and diocese. Eventually, the Decapolis became somewhat more divided between the Provinces of Arabia, Palestine I, and Palestine II. The Byzantine Empire would continue to exist for almost a millennium; Constantinople fell in 1453. However, the early 7th century CE saw increased territorial challenges for the empire. Further conflicts with the Sassanians, in the East, and the growing threat of the Rashidun Caliphate, to the south, led to the loss of Byzantine control in Jordan. Initial raids into the area, referred to as *Bilad Al-Sham* (Greater Syria), began under Caliph Abu Bakr in 629 CE. These then escalated into full-scale invasions in the 630s. Battles at Pella (Tabaqat Fahl) and Yarmouk in 635 and 636 CE resulted in the taking of south and central *Bilad Al-Sham* (Ababsa, 2014, p. 170).

Decapolis Region with City Territory and Area



City Name	Hinterland Area km
Philadelphia	1069.819
Gerasa	731.405
Pella	585.973
Gadara	599.078
Damascus	47.379
Scythopolis	436.149
Hippos	233.316
Abila	248.227
Dion	174.881
Canatha	205.645

0 10 20 40 Kilometers



Cartographer: Wade Pierson
 Date: 3/3/2021
 Source: Eisenberg 2016
 Note: Damascus has been omitted as the distance made it difficult to display the remaining Decapolis sites.

Figure 3.6- Thematic map of the Decapolis cities with projected hinterland/territory 1st century CE. Adapted from Eisenberg (2016) with satellite imagery from Earthstar Geographics.

Medieval/Islamic (641-1516 CE): Following the Islamic conquests, the Levant experienced some administrative evolution. Modern Jordan was split into two military districts (*junds*). Northwestern Jordan was incorporated into the *Jund Al-Urdun* centered around the city of Tiberias. The remainder of Jordan was technically administered by the *Jund* of Damascus. This subregion was effectively administered out of Amman. In 661 CE, Mu'awiyya bin Abi Sufyan pressed a claim at the Caliphate. He succeeded and established his capital in Damascus. His Umayyad dynasty would rule the Islamic world for roughly the next century. The proximity of Jordan and the Decapolis to the Umayyad capital had profound effects on urban form and prosperity. Additionally, the lands of Jordan were critical for its pilgrimage routes to Mecca and Medina. However, the Umayyad prosperity would not last. The mid-8th century saw a resistance movement to the Umayyad dynasty. Resistance was initially organized in the Sharah Mountains of Southern Jordan (Ababsa, 2014).

In 750 CE, the Abbasids overthrew the Umayyad Caliphate and moved their capital to Bagdad. Much of Jordan no longer benefitted from proximity to the caliphal capital and saw a period of decline. The area would continue in this state for the next quarter of a century. It would pass between the weakening Abbasids to the Egyptian Fatimid Caliphate in this period. Regional politics were upset in 1099 when Crusaders captured Jerusalem. The Fatimids were decisively defeated at Ascalon shortly after. The Crusaders pushed into Western Jordan in 1100 under the command of Tancred de Hauteville (Ababsa, 2014, p. 180). Territories of modern Jordan were divided into two territories for the Crusaders, the Territory of Suede and the Principality of Transjordan. The lands of Suede incorporated Northwest Jordan around Ajlun. Transjordan consisted of a narrow strip of territory stretching south to Aqaba and the Red Sea. During the period of Crusader states, the region experienced a great boom in the construction of fortresses.

These castral towns were critical to holding the territory against surrounding enemies. Prominent examples of these castles included Kerak and Shawbak. Records also indicate the presence of 60 knights in Transjordan and 40 in Suede (Ababsa, 2014, p. 181). The 1180's saw Transjordan come under the control of Renaud de Chatillon. From this position, he raided nearby Islamic lands. The area came back into Muslim hands when Saladin routed the Crusaders at Hattin in 1187 CE.

Saladin's Ayyubid Sultanate would continue to rule the area until 1263 CE. Some of the Crusader defensive structures (mainly Kerak and Shawbak) would serve important administrative functions. Controlled by Islamic forces once more, the region returned to its function of facilitating the Hajj. Later, Mamluks, former military slaves, took control of Egypt. By 1263, the Mamluk Sultanate took control of most modern Jordanian territories and extended to the Hejaz and Syria. The Mamluks promoted a program of communication through road construction and castle repairs. Administratively, Jordan was divided between the Province of Kerak to the south and the Province of Damascus to the north. Early Mamluk focus laid in defense. The eastern border was bolstered in fear of Mongol attack after the Mamluks had turned their invasions back at the Battle of Ain Jalut in 1260. The 14th century saw Mamluk focus for Jordan shift to a more economic and developmental agenda. Unrest and plague destabilized the region in the mid-14th century. Urban centers once again declined. Conditions would remain similar to this up and through the conquest of Ottoman Sultan Selim I in 1516.

Modern (1517 CE- Present): The early Ottoman administration continued previous efforts of facilitating travel along the Hajj routes in Jordan. Various Sultans and Walis (governors) undertook extensive building projects in the area. However, these were all motivated by the travel of pilgrims. Projects included fortifications, patrols, water infrastructure, and

shrines. Jordan was administered through the province of Damascus. It was further broken down into Liwa (sub-governorate) Ajlun and further into Nahiya regions. Despite the administrative nomenclature, the region was largely left alone by the Ottoman government which had a minimal presence in Transjordanian cities. As the center for sedentary populations in the area, Ajlun represented the richest and most populous liwa in Transjordan. It consisted of roughly 400 villages with a population of around 35,000 (Hutteroth and Abdulfattah, 1977). This time period reflected an increased influence of nomadic tribes in the region. Many areas of Jordan, particularly in the south and east, were only inhabited for parts of the year.

The 19th century saw the Ottoman government implement the Tanzimat reforms. These reforms established a far more formal administration of vilayets (provinces) and land codes. Particularly, reforms drastically changed notions of land ownership. The lands of Transjordan were reorganized multiple times but were ultimately placed in the Sanjaqs of Hawran and Ma'an within the Vilayet of Syria. Increased Ottoman administration and land reform paved the way for many new agricultural villages. This largely took place between Kerak and Amman. The Ottoman government had an additional hand in the re-urbanization of Transjordan. This came with refugee resettlement. A major portion of these refugees came from the Caucasus. In 1763, Russia began additional hostilities in the Caucasus. A major part of these wars was the taking of Circassia. The almost century-long conflict, the Russian-Circassian War (1763-1864), finally led to the mass expulsion and genocide of Muslim Circassians. The Ottoman Empire attempted to harbor between 800,000 to 1,500,000 Circassians. One method of handling these refugees was the settling of agricultural villages throughout Jordan. From 1878-1884, villages were settled at Amman, Wadi al-Sir, and Jerash. In the early 20th century, additional Circassian and Chechen villages were established at Na'ur, al-Zarqa', Sukhna, Ruseifa, and Suwaylih). Increased

urbanization and Ottoman presence led to the establishment of true administrative centers and additional infrastructure. This culminated in the construction of the Hejaz railway in 1900. This railway connected the region to the wider world and led to increased development for towns along its path. Eventually, the Ottomans had to defend Transjordan during the Great Arab Revolt (Falls, 1928).

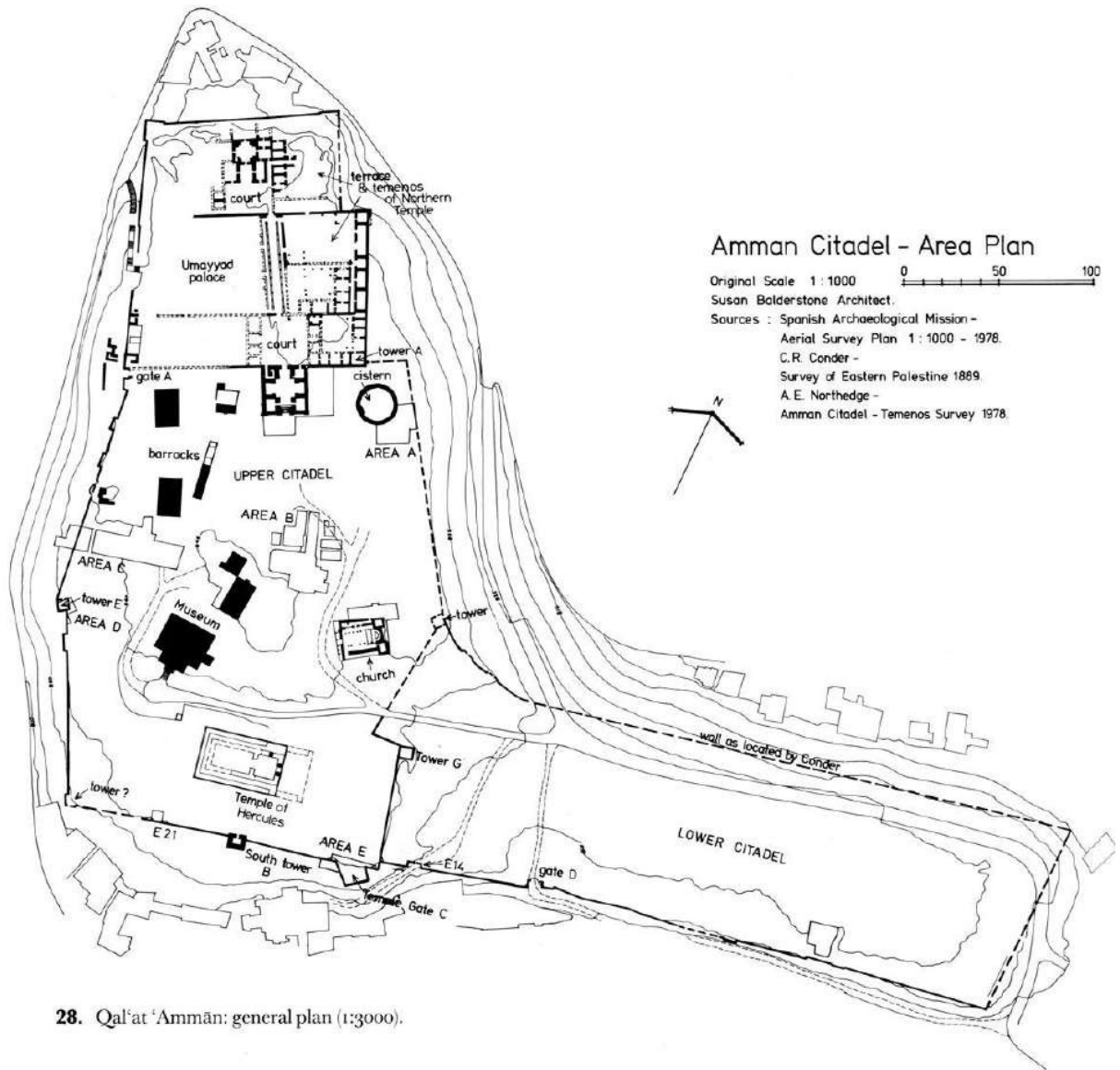
The Ottoman Empire joined the First World War in 1914 by attacking Russia on the Black Sea Coast. The Triple Entente sought to undermine the Ottoman Empire by supporting Arab rebels. This reached its peak when the British supported Sharif Husayn, custodian of Mecca and Medina. The rebels fought against the Ottomans throughout World War I based on promises of an independent Arabia (including the lands of Bilad Al-Sham). These promises were undermined by other European treaties (Sykes-Picot Agreement in 1916 and Balfour Declaration in 1917). Eventually, the British created the Emirate of Transjordan with Emir Abdullah at the helm. Abdullah was the son of Sharif Husayn and brother to the emir of Syria, Faysal. Sharif Husayn's family was uniquely poised to lead these new states due to its relation to the Prophet Muhammad through Fatima. In 1946, the Emirate was succeeded by the Hashemite Kingdom of Jordan. Although organized around the same government, this shift represented independence from the British Mandate. This remains Jordan's political organization to this day (Ababsa, 2014, p.220).

The Kingdom of Jordan saw the greatest expansion of urban growth and development since the Roman/Byzantine period. Increases in technology certainly played their role in this development. Increased job opportunities and city services led to extensive internal immigration to Jordanian urban centers. However, external immigration continued to be a major factor as well. The greatest influx of immigrants came in 1948. At this time, Israel asserted itself as an

independent state. This marked the *Nekba*, or catastrophe, where roughly 700,000 Palestinians were expelled from the Zionist state. Nearby Jordan became the primary destination for many such refugees. This and other waves of refugee settlement contributed to Jordan's rapid urbanization (Potter et al., 2007, p.4).

Amman/Philadelphia:

Prehistory to Bronze Age (-1200 BCE): The site of Amman and the majority of the Levant saw some of the earliest human settlements in the Neolithic and Chalcolithic periods (10300-3600 BCE). However, the pastoral nature of most settlements made it difficult to assess their morphology and development in these periods. There was a relative increase in the archaeological record for the Bronze Age (3600-1200 BCE). Finds indicated habitation at Amman (ancient Rabbath-Ammon) throughout this period (Taylor, 2005, p. 28). Evidence also indicated a continuation of habitation through grave excavations but further understanding was limited by later Greco-Roman construction. Kadhim and Rajjal argued that the urban settlement of the site has its origin around 1200 BCE (Kadhim and Rajjal, 1988, p. 318). However, there was also evidence of earlier urbanized settlement. Archaeological dating placed Amman's significant fortification walls within the Middle Bronze Age, 2000-1500 BCE (Hübner, 1992, p. 23). The lack of consistent record left the possibility that the site was settled and abandoned several times over. Nevertheless, by the beginning of the Iron Age in 1200 BCE, the citadel of Rabbath-Ammon was settled and fortified (Figure 3.7).



28. Qal'at 'Ammān: general plan (1:3000).

Figure 3.7- Citadel of Amman with key structures: Walls as identified by C.R. Conder, Temple of Hercules/Amman, Umayyad Palace and Mosque, and the Modern Museum (Northedge and Bennet, 1992).

Classical (1199 BCE- 640 CE): The Iron Age saw the rise of the Kingdom of Ammon. The Ammonites were a Semitic-speaking people whose lands, centered around Rabbath-Ammon, laid east of the Jordan River. Their kingdom was bordered to the south by the Kingdom of Moab and to the north by the Kingdom of Aram and Damascus. It was estimated that this period saw the construction of a shrine beneath the later Temple of Hercules/Amman (Taylor, 2005, p. 28). The Bible served as an important historical source for Rabbath-Ammon and the Ammonite Kingdom from the 10th century BCE on. There are many anecdotal references to Rabbath-Ammon (like the bedstead of Og). However, there were other, more practical references. Particularly, King David of Israel's conquest of the city was attested. It was in II Samuel that David directed his general, Joab, to first assault the city's water supply or 'City of the Waters' (II Samuel 12:27). This indicated some form of settlement outside the fortified citadel. This tactic was further corroborated as Antiochus III would employ the same maneuver in the Hellenistic age. It was also in this battle that David sends Uriah the Hittite to the front lines to ensure his death, allowing David to marry his widow, Bathsheba. David then sought to integrate his new Ammonite subjects by marrying his son, Solomon, to an Ammonite princess, Na'amah (I Kings 14:21, 31; II Chronicles 12:13). Division of Israel into southern Judah and northern Israel allowed the Ammonites to reestablish independence.

There were fewer references between the 9th and 7th centuries. However, Rabbath-Ammon retained some level of prominence as seen through extensive statuary production and elaborate inscriptions (Hübner, 1992, p. 24). This period also saw the Ammonites subjugated under the Assyrians as a vassal state. Later, the books of Jeremiah and Ezekiel would prophesize the destruction of Rabbath-Ammon by Nebuchadnezzar II of Babylon in the early 6th century BCE (Jeremiah 49:2, Ezekiel 21:2; 25:3-5). These prophecies did not come true but the

Babylonian Empire did invade and take control of the region. Around 577 BCE, Nebuchadnezzar II did incorporate the Ammonite state into the Babylonian provincial system. The city no longer operated as a capital but managed to function within this and the later Persian Achaemenid provincial systems. Rabbath-Ammon seemed to dwindle in importance in the Persian period but remains are hard to distinguish against the earlier periods. There are a few remaining notes on the area before the arrival of Alexander the Great. Notably, Tobiah the Ammonite was mentioned by the Persian governor of Judea, Nehemiah, in the 5th century BCE (Taylor, 2005, p. 34). The Tobiad family was attested to control vast areas and wealth from this period into the Hellenistic period.

Following the Battle of Issus in 333 BCE, Alexander the Great swung south through Syria to Egypt. Instead of pursuing his Persian adversary, Darius III, Alexander consolidated his growing empire by conquering Syria, Phoenicia, and Egypt. In late 332 BCE, Alexander took the fortress of Gaza and established control over Egypt. Although the lands of Jordan were not directly taken in the wars of Alexander, they came under the control of his short-lived empire and those of his *Diadochi*, or Successors. Initially, the region belonged to the large kingdom of Antigonos after Alexander's death. The Battle at Ipsus in 301 BCE resulted in this kingdom being carved up by other *Diadochi*. Lands of the Decapolis were taken by Ptolemy, Pharaoh of Egypt. Administratively, the region became known as Ammanitis and included much of northern Jordan. Unlike Gerasa and Gadara, Philadelphia/Amman owes its Hellenistic founding and development to the Ptolemies. Ptolemy II Philadelphus (285-246 BCE) re-founded Rabbath-Ammon into Philadelphia (Kennedy and Bewley, 2004, p.153).

This paved the way for the city's development and absorption of Greek culture. It is also at this time that the Tobiads reappear in the narrative. Zenon, an official of Ptolemy II, notes in

259 BCE an offering of livestock from a Tobiad with estates west of Amman (today 'Iraq al-Amir) (Taylor, 2005, p. 34). Other ancient sources (Josephus) indicated that the Tobiad family operated as tax collectors in Jerusalem but possibly also administered the areas around Amman (Ababsa, 2014, p. 135). The 3rd century BCE would later see an increased conflict between the Ptolemaic kingdom and the Seleucids of Syria. Over the course of five 'Syrian Wars', the lands of Palestine and Jordan would change hands numerous times. Particularly for Amman/Philadelphia, the Fourth Syrian War (219-217 BCE) saw the Seleucid King, Antiochus III, invade the Ptolemaic Levant (Kraeling, 1938, p. 30). After taking several cities in the north, Polybius recounted Antiochus III invading Amman/Philadelphia due to a strong Ptolemaic garrison (Polybius, V, 71). It was here that the siege method of denying the defenders access to water is repeated from the Biblical campaigns of David. Following the Battle of Panium in 200 BCE, the Seleucids established more permanent control over the region and began investing more in its urban development. It seems the area experienced some shifts during this period. During the reign of Antiochus IV Epiphanes (175-164 BCE), multiple candidates attempted to buy their way to the high priesthood of Jerusalem. Having been outbid, one Jason, fled to the land of the Ammonites. He was expelled in 169 BCE, but this is said to have been done by a Nabataean named Aretas (Ababsa, 2014, p. 135). Later, two Judean rulers, Judas Maccabeus and Alexander Jannaeus, conducted attacks in northern Jordan. The late 2nd and early 1st century BCE saw Philadelphia being ruled by local tyrants. Josephus identified Zeno Cotylas and his son Theodorus as tyrants and attested to their interactions with other Decapolis cities (Josephus, Wars, I; 2.4).

Like the greater region, Philadelphia came under Roman control in the mid-1st century BCE. Roman period Philadelphia experienced the most intensive urban development until the

20th century. At this time, the city was graced with a theater, odeon, and forum in the lower city. The citadel was enhanced with new temples, like the great temple of Hercules (Taylor, 2005, p. 26). The connection between the citadel and lower city was accomplished through the construction of a great stairway. The nature of the city was also gleaned from inscriptions. Tomb inscriptions from 69 CE detail a fallen soldier from Philadelphia. His tomb marked his home city but provided a Roman name. Additionally, his father's name seems to be a Latinized form of the Nabataean Rabel (Kennedy, 2013, p. 176). The intermingling of naming conventions and building styles pointed to Philadelphia and the Decapolis being hybridized cities. Mixes of Greek, Roman, and Semitic influences were present at each site. This was furthered in 106 CE when Trajan established the Province of Arabia. Philadelphia was incorporated into this new province along with the majority of former Nabataean lands. The city continued to prosper into this period as the temple of Hercules was dedicated during the reign of Marcus Aurelius and Lucius Verus. This can be dated through inscriptions of Geminius Marcianus, the Governor of Arabia from 162-166 CE (Taylor, 2005, p. 28). The theater was completed during the reign of Antoninus Pius (138-161 CE). The city was also present on the Tabula Peutingeriana map of the Roman world. This 13th-century copy of an ancient Roman map listed Philadelphia as a reference point some 62 miles from Aereopolis in Moab (Talbert et al., 1989). Philadelphia became a bishopric in the Byzantine Period (324- 640 CE) but little else was known about the city at this time.

Medieval/Islamic (641-1516 CE): Philadelphia coasted along with the Decapolis during the waning years of the Byzantine Empire and the early years after the Muslim Conquests. It seems that many major structures were maintained and repaired throughout this time. However, the coming of the Umayyad Dynasty in 661 CE led to increased prosperity for

Amman/Philadelphia. It is at this time the name Amman reappears for the city. While other cities waned in the Byzantine to Umayyad chaos, Amman prospered greatly. It was established as the capital of al-Balqa and functioned as an effective capital for most of Jordan while under the direct control of Damascus (Ababsa, 2014, p. 171). The Balqa region was notable for the period as the land of leisurely estates and hunting lodges for the Umayyad nobility. As seen in Table 3.1, this was reflected in Umayyad-era Amman through the construction of a palace, a mosque, and reinforcement of the Byzantine-era fortifications (Rogan, 1986, p. 25). The palace atop the citadel was quite ornate and the congregational mosque was applauded by the Arab historian, al-Maqdisi, in the 10th century CE (Ghawanmeh, 1983, p. 40-42). Abbasid withdrawal in the 8th century led to a regional decline which Amman certainly felt. It remained in this state of relative decline throughout the Fatimid, Buwayhid, Seljuq, and Ayyubid occupation. Amman steeply declined in the 13th century after a Mongol attack razed parts of the city (Ghawanmeh, 1983, p. 46-51). This proved to be a tipping point for Amman as an urban center. The Mamluk Sultanate of Egypt attempted some construction and it was declared the provincial capital of Balqa in 1356 (Rogan, 1986, p. 26). However, the city would not be rebuilt or substantially repopulated until the 19th century.

Modern (1517 CE- Present): The Ottoman Empire established control over the region by defeating the Mamluk Sultanate in 1516. Although Amman laid along the pilgrimage routes to Mecca, the Ottoman Empire did little to rebuild the ancient site. The region presented particular challenges to Ottoman authority. Nomadic tribes in the pre-desert and desert east of Jordan laid outside direct Ottoman control. The empire employed and negotiated with many of these tribes to secure the pilgrimage routes and keep other tribes occupied. However, everything changed when the Russian Empire conquered Circassia in the Caucasus region. The Russian-Circassian

War (1763-1864) and other hostilities led to the mass expulsion of Muslim Circassians and Chechens from the region. Sultan ‘Abd al-Hamid II provided refuge for the displaced Circassians and Chechens. Part of this resettlement included the founding of five new settlements in modern Jordan. Amman was one of these original settlements, receiving its first settlers in the 1870s and reaching 1000 people by 1893 (Hacker and Clarke, 1960, p. 8-12). These settlements also served Abd al-Hamid’s goals of securing the borders of his empire opposite the nomadic tribes of Jordan (Rogan, 1986, p. 26). Amman would continue to grow albeit slowly. 1905 marked an important milestone as the Hejaz Railway reached the city and a station was established in Amman. The city expanded substantially after Amir Abdullah b. al-Husayn made it his capital in 1921 (Taylor, 2005, p. 26). By 1946, Amman had become a substantial city of around 26,000 people. 1948 saw an enormous swell in population as Amman settled many Palestinian refugees. It is estimated that Amman settled around 240,000 refugees from 1948 to 1967 (Rogan, 1986, p. 28). The decades that followed only increased this number as Amman has continued to grow intensely. Jordan’s capital has since reached well over 1.7 million by 2004 and over 2 million by 2019 (Potter et al., 2007, p. 9; Jordanian Department of Statistics, 2019).

Table 3.1- Notable Umayyad-period constructions in Northwest Jordan and possible construction dates from Kennedy (2013).

Place	Date	Features
(Philadelphia-Amman)		Gubernatorial Palace)
Qasr Mshatta	743	'Winter Palace' of Caliph Walid II; 144 x 144 m
Qasr et-Tuba	743-4	Desert palace, 145 x 70 m. Incomplete
Qasr Mushash	(4th-7th cent.) Umayy	18 structures over 4 sq km area; qasr (26 x 26 m), bath suite, buried buildings, reservoir, cisterns, gardens?
Qasr el-Kharaneh	c. 710	Fortress (?)/ audience residence, c. 25 x 25 m, two storeys
Qasr Amra	c. 705-15	Audience chamber and elaborately decorated bath suite
Azraq Shishan	Umayyad	Irrigated garden (and mansion?), huge reinforced reservoir and encircling wall for oasis pools
Qasr Ain es-Sil	Umayyad	Mansion, c. 17 m sq, two storeys with bath suite, oil press and ovens; farm; hydraulic works; wall 2.5 km+
Qasr el-Hallabat	(Nab, Roman) Umayyad	Mansion, 38 m sq, two storeys, mosaics, frescoes, mosque, houses, reservoir, cisterns, irrigated garden; bath suite 3 km away
Umm el-Walid	(Nab, Rom) Umayyad	Roman village developed in Umayyad period: East Qasr = 71 x 71 m; two other <i>qasr</i> ; two large dams and farm with wine press nearby
El-Fedein	(Late Roman) Umayyad	Large house; bath suite (?); mansion
Qastal	Umayyad	Qasr, 68 x 70; early mosque; bath suite (?) with mosaics; reservoirs, cisterns; large dam
Khan es-Zebib	Umayyad?	Qasr 44 x 49 m; caravanserai
('Qubbash')	Umayyad	Named in ancient sources as a royal estate in the Balqa

Jerash/Gerasa:

Prehistory to Bronze Age (-1200 BCE): Jerash lays in a very hospitable locale for human settlement. The combination of climate, position, and natural resources contributed to very early inhabitation. The original tell (hill) and surrounding area were certainly inhabited by agro-pastoral communities as early as the Neolithic period (10,000-4500 BCE). Archaeological evidence supports this as Neolithic tools have been found in the northwest of Jerash (Lichtenberger and Raja, 2015, p. 486). Bronze and Iron age pottery have been found throughout the site but particularly on the original tell west of the Wadi Jerash (Taylor, 2005, p. 52). The site had a sparse settlement from the Early Bronze age (3600-2000 BCE) to the Early Iron age (1200 BCE).

Classical (1199 BCE- 640 CE): In this period, or possibly earlier, Semitic-speaking peoples established more substantial settlements. These were most likely cousins to Amorites, Ammonites, or possibly Nabataeans (Kraeling, 1938, p. 27). Garshu, the original name of Jerash, indicated this relationship due to its Semitic origin and the proximity of these other groups. The settlement was more permanent but still only covered an area of approximately eight hectares (Kennedy, 2013, p. 77). The arrival of the Greeks and Macedonians in the 4th century BCE was an important turning point for Jerash as an urban center. There were traditions about the city's Hellenistic founding by Alexander the Great or even his general, Perdikkas. However, these traditions are based on attempts to rectify Gerasa's Semitic name with Greek etymology (Kraeling, 1938, p. 28). Nevertheless, Jerash/Gerasa came under the control of Antigonos before being ceded to Ptolemy after the Battle of Ipsus. It seemed that Jerash/Gerasa was not rebuilt as the Ptolemies had done in Philadelphia. Instead, urban development at Jerash/Gerasa can be traced to the early 2nd century BCE under Seleucid control. The Fourth Syrian War saw

Jerash/Gerasa conquered by Antiochus III. It is possible that Jerash/Gerasa was re-founded as a Hellenistic city at this time. Many scholars place this rebuilding in the reign of Antiochus IV (175-164 BCE) although evidence for the Hellenistic city was covered/destroyed by the later Roman settlement (Taylor, 2005, p. 52).

A key factor in understanding ancient Jerash/Gerasa lies in tracing the evolution of its name. It was renamed “Antioch on the Chrysorhoas, also known as Gerasa” (Kennedy and Bewley, 2004, p. 155). Antioch clearly denotes a Seleucid influence as they established dozens of similarly named cities throughout the east. The interesting note about the name is that adaptation of the Semitic name, Gerasa, is kept within the official name. Pottery and architectural remains indicate the Hellenistic settlement resided between the Temple of Zeus and Camp Hill near the center of Jerash (Kraeiling, 1938, p. 30). Josephus explored the relationship of Gerasa to surrounding cities, like Philadelphia. In the late 2nd century to early 1st century BCE, Gerasa was occupied by the tyrants of Philadelphia (Josephus, *Wars*, I, 4.8). It seemed that Gerasa served as a sanctuary through the Temple of Zeus. This status made it a desirable location for the tyrants to keep their treasures. This ultimately led to the capture of Gerasa by the Hasmonean ruler, Alexander Jannaeus. Gerasa’s role as a sanctuary was further supported by indicators of Jewish communities among the mixed Semitic/Greek city (Lichtenberger and Raja, 2015, p. 486). The capture of Gerasa by the Judean ruler was soon followed by the arrival of the Roman general Pompey in 63 BCE.

The Roman rearrangement of the East and eventual integration led to increased prosperity for the Decapolis and Gerasa. Development in Gerasa was somewhat interrupted when the city was attacked during the First Jewish-Roman War in 66 CE. Josephus recounts that the city was taken by the Jewish rebels that struck many other cities in the region (Josephus, *Wars*, II, 18.1).

Between 66 and 73 CE, the war between Jewish rebels and the Romans raged. The Romans were initially overwhelmed which led to the occupation of Gerasa. It seemed that Gerasa continued to operate as a sanctuary city. Archaeological evidence attests to the later presence of Jewish communities (Synagogue Church). Additionally, Josephus recounted the retaliatory violence of various cities to Jewish inhabitants following the restoration of Roman control. He singled out Gerasa as a city where little to no harm befell the Jewish community and external Jewish travelers were escorted through the city's territory (Josephus, *Wars*, II, 18.5). Gerasa was retaken after the Emperor Nero dispatched Vespasian to Judea. Specifically, Gerasa was stormed by a detachment under the command of one Lucius Annius (Josephus, *Wars*, IV, 9.1). These hostilities apparently included plundering and razing but more likely indicated damage to smaller settlements around the city (Kraeling, 1938, p 45). The extensive development of the city in the coming period provided some doubt on Josephus' accounts of destruction. Inscriptions from Gerasa indicate that Vespasian later established a garrison at the city, the *Ala Thracum Augusta* (Kraeling, 1938, p. 45).

Following the First Jewish War, Gerasa experienced a period of incredible urban development. The city was mentioned, along with the greater Decapolis, by writers like Pliny the Elder and Ptolemy. As seen in Table 3.2, the Roman city plan was first implemented in the later 1st century. Initial planning was accomplished through the construction of key structures; the Oval Plaza, the *Cardo Maximus*, and the ring of fortified walls (Browning, 1982, p. 36). The majority of Gerasa would come later but these key structures dictated the large-scale Roman plan. Gerasa also experienced increased connectivity in this period through road construction to Caesarea Maritima in Palestine (Kennedy, 2013, p. 84). Further development would accompany Trajan's restructuring of the region in 106 CE. Like Philadelphia, Gerasa was placed in the

newly formed Province of Arabia. The new provincial capital, Bostra, was much closer than the former provincial capital of Antioch in Syria.

The proximity to Bostra led to increased prosperity for Gerasa, especially once they were connected by new Roman roads in the early 2nd century CE (Kennedy, 2013, p. 84). Trajan and Hadrian would helm the Empire during Gerasa's greatest prosperity. Gerasa's large Southern Theater was dedicated to Trajan which pointed to its construction between 98 and 117 CE (Kraeling, 1938, p. 48). Trajan affected Gerasa primarily through his broad policy decisions. His successor, Hadrian, had a far more personal impact on the city. In the winter of 129/130 CE, the Emperor was conducting a tour of the Empire and decided to have a prolonged stay at Gerasa. Hadrian's visit was documented by inscriptions throughout Gerasa (Kraeling, 1938, p. 49). Gerasa may well have benefitted from Hadrian's personal patronage after his stay. Nevertheless, the city experienced its golden age in the 2nd and 3rd centuries CE which saw construction of structures like the Temple of Artemis (Figure 3.8). Following Hadrian's visit, Gerasa erected numerous dedications to the Emperor. The most prominent dedication was the Triumphal arch south of the ancient city. Some even estimate that Gerasa may have planned a new city quarter to encompass the Arch of Hadrian and Hippodrome (Kraeling, 1938, p. 50).

From the 3rd century CE on, periods of unrest within the Roman Empire led to various levels of development for Gerasa. The eastern provinces were spared some of the worst unrest that the west experienced. However, trade declines were notable and civic projects were greatly reduced. The Severan dynasty saw some attempts at urban development by raising the city to colonial status and constructing the East Baths in the residential half of the city (Browning, 1982, p. 51). While the end of the Roman period saw reduced development, the Byzantine period (5th-7th centuries) saw Gerasa develop along a more religious route. Gerasa benefitted from the rise of

Christianity and its proximity to the Holy Land. There have been upwards of seventeen churches uncovered within Gerasa from this time (Kennedy, 2017, p. 233). Meanwhile, it had the third-most attested bishops from the period behind only Bostra and Madaba. These churches were quite extensive but utilized previous building materials of the Roman period instead of newly acquired materials. Table 3.3 provides a timeline for when these churches were constructed and a portion of the reused building locations from Roman structures.

Table 3.2- Timeline of construction for Gerasa’s key Greek/Roman structures from Kennedy (2013).

Structure	Date
Temple of Zeus	first phase AD 22-8
City Plan	by AD 75/6
South Theatre	dedicated AD 90/1
Oval Piazza	1st cent. AD
Cardo	conceived 2nd half 1st cent. AD
Cardo	Ionic colonnades – late 1st/early 2nd cent. AD ?
North Gate	AD 115
Arch	AD 129-30
South Gate	AD 129-30
City Wall	early 2nd cent. AD
Hippodrome	mid-2nd cent. AD
South Tetrakionion	mid-2nd cent. AD?
North Tetrapylon	c. AD 165
Macellum	2nd half of 2nd cent. AD
Temple of Artemis	monumentalized AD 150-80
Temple of Zeus	monumentalized 161-6
North Theatre	AD 162-6 of c. 800 seats
South Decumanus	colonnaded and paved c. AD 170
West Baths	c. AD 150-200
Nymphaeum	AD 191
Cardo	Corinthian capitals and widened – 2nd cent. AD
East Baths	2nd cent. AD?
North Theatre	extended AD 222-35 to c. 1600 seats
Baths of Paccus	AD 454-5; restored AD 584

Table 3.3- Timeline for the construction of Byzantine churches in Gerasa, 4th-7th centuries CE, from Kennedy (2013).

Structure	Date
Cathedral	2nd half of 4th cent.? (AD 365?)
(Shrine of St Mary	2nd quarter of 5th cent. or later)
Apostles, Prophets and Martyrs	AD 464/5
St Theodore	AD 494-6
Procopius Church	AD 526-7
Complex:	
St George	AD 529-30
St John the Baptist	AD 531
SS Cosmas and Damian	AD 533
Synagogue Church	AD 530-1
SS Peter and Paul	AD 540
(Southwest Chapel	2nd quarter of 6th cent.)
Bishop Isaiah Church	AD 558
Mortuary Church	AD 565
Propylaea and Diakonia	AD 565
Church of Bishop Marianos	AD 570
Church on the Intermediate Terrace	6th cent.
St Genesisius	AD 611
Churches on the Terrace of Temple of Zeus	Undated
Octagonal Church	Undated
Elias	Undated



Figure 3.8- Monumental front colonnade of Temple of Artemis at Jerash. Photograph by T.R. Paradise (2015).

Medieval/Islamic (641-1516 CE): Despite earlier claims of precipitous decline after the Islamic conquests, Gerasa continued as an area of urban activity. Evidently, the city was prosperous enough to mint coins in the name of the Caliph Abd al-Malik bin Marwan from 685-705 CE (Taylor, 2005, p. 54). The scale of monumentality certainly decreased but the city saw several adaptive works. A primary example of this was the modification of the macellum for manufacturing purposes (Hammond, 2006, p. 94). The Umayyad dynasty saw some continued development for Gerasa, now Jerash. A congregational mosque was constructed in the early 8th century atop an earlier Byzantine bathhouse. The 2,200 square meter structure was constructed/inhabited over the course of centuries with distinct phases (Barns, 2016, p. 787). The earliest construction was notable for expert masonry and integration within Jerash's ancient city plan. The building sat at the corner of the *Cardo* and southern *decumanus* at the circular plaza. The later periods of Islamic occupation were notable for the sustained repurposing of plazas for shops and housing (Kraeling, 1938, p. 157-8). Earthquakes in 749 CE heavily damaged Jerash. Around the same time, the Abbasids took control of the Islamic caliphate and moved the capital to Baghdad. These two events marked a serious decline for Jerash. In the 12th century, Jerash was the site of conflict during the Crusades. Baldwin II, king of Jerusalem, besieged a castrum built by the Atabeg of Damascus (Fulcher of Chartres, 3; 10.1-5). Jerash was described as deserted but the account could indicate a portion of the city was fortified and settled (Lichtenberger and Raja, 2015, p. 69). The 13th-century Arab geographer, Yaqut al-Hamawi, indicated that Jerash was sparsely settled but noted the importance of water mills for local cultivation (Le Strange, 1890, p. 462). It was from this period that Jerash seems to be the site of transhumance practices. The area was easily cultivated but it seemed this was done by communities of other villages. Like in Gadara and Philadelphia, areas like caves and ruins were inhabited for harvest seasons only.

Modern (1517 CE- Present): Little can be gleaned about Jerash from the 13th to the 16th century. This period saw the rise of the Ottoman Empire and the establishment of their control in the region. Jerash was administered through the Liwa (sub-governorate) of Ajlun. Additionally, it was part of the Bani Alwan Nahiya (district) (Ababsa, 2014, p. 189). Jerash remained close to the pilgrimage routes to Mecca but was far enough removed to receive little Ottoman attention. Ottoman census records in 1596/7 indicate a village of around a dozen families at Jerash (Hutteroth and Abdulfattah, 1977, p. 164). These records differentiate between permanent villages and *hali* or “empty villages” (Mershen and Knauf, 1988, p. 134). Empty villages were still taxed which indicated cultivation by neighboring communities. Jerash is thus identified as a more permanent settlement, albeit a small one. By the time European explorers began surveying the region in the 1800s, they found Jerash to be inhabited seasonally under temporary structures. Ulrich Seetzen noted, in his 1806 visit, that the nearest sizable village was Suf (roughly 7.5 km north of Jerash) and the presence of agricultural activity at Jerash (Seetzen, 1810, p. 34). Seetzen managed to identify the site as ancient Gerasa and noted many of the monumental structures. However, his guides were uneasy about him staying for a longer period and he continued on to a nearby village. Johann Ludwig Burckhardt would find Jerash in a similar state in 1812, noting its irrigated land and olive groves. James Silk Buckingham commented on the cultivation of corn crops in the ruins of the ancient hippodrome south of ancient Gerasa in 1816 (Buckingham, 1816, p. 344).

In the 1850s, George Hall elaborated on the semi-nomadic relationship at Jerash when he identified the Aduan tribe as conducting the harvest (Hall, 1852, p. 48). Like Amman, Jerash changed dramatically in the 1870s due to the establishment of a Circassian settlement. This settlement marked the origin of the present urban center of Jerash. Although initially small, the

Circassian settlement soon grew to occupy the eastern majority of ancient Gerasa. This was clearly displayed in Gottlieb Schumacher's map of Jerash from 1898-1900 (Schumacher, 1902, Pl.1). During the British Mandate of Transjordan (1918-1945), Jerash experienced a period of archaeological focus. In 1925, George Horsfield was placed in charge of the Jerash archaeological site under the authority of the British School of Archaeology in Jerusalem (Kraeling, 1938, p.3). The early phases of excavation were limited to surface examinations and clearing of access roads. From 1928 to 1934, Yale University conducted several campaigns of excavations. These campaigns uncovered several churches, temples, and other monumental structures throughout Jerash (Kraeling, 1938, p.4-7). Since the independence of Jordan in 1946, Jerash has continued to develop. It has since grown to over 50,000 people (Department of Statistics, 2019). Jerash has developed well due to two main factors. Primarily, the small city has benefitted from its proximity to Amman (approximately one hour's drive). Additionally, Jerash has prospered due to the cultural tourism of the archaeological site. Impacts of such development will be explored in an architectural section below.

Umm Qais/Gadara:

Prehistory to Bronze Age (-1200 BCE): Gadara's position atop a high ridge and proximity to fertile farmlands made it a prime site for human settlement. However, there is little evidence for human occupation in the Neolithic and Chalcolithic periods. Some of the earliest evidence for settlement comes in the Late Bronze Age. This evidence was uncovered in 1983 by the Danish Umm Qais Project and indicates settlement in the 14th or 13th century BCE (Mershen and Knauf, 1988, p.129). Further surveys have verified inhabitation in and around Gadara from this period to the 4th century BCE (Bührig, 2013, p.187). The general character and development of these settlements paralleled those of the other Decapolis cities in this region. Tracing the

extent of Gadara's Bronze Age settlement was difficult but likely hugged the hill which the later Hellenistic settlement developed. Additionally, Gadara can be analyzed through the etymological development of its name. Greek adaptation attached an '-a' to many names that it attempted to interpret. Therefore, Gadar (Arabic- gadr/Hebrew- gader) was the Semitic name meaning 'wall' or more specifically 'terrace wall' (Mershen and Knauf, 1988, p.129). This name is attached to this period mainly due to the lack of staying power of later city names (Antioch and Seleucia).

Classical (1199 BCE- 640 CE): Up to the 4th century BCE, the history of Gadara must be assumed to correlate to the history of the greater region. There was little archaeological or literary evidence for the city before the coming of Alexander the Great and his successors. The city was first directly mentioned by the Greek historian, Polybius, in the 3rd century BCE. He commented on Gadara being considered one of the most strategically poised areas in the region (Polybius, V, 71,3). He also detailed the capture of Gadara during the campaigns of Antiochus III in the Fourth Syrian War (219-217 BCE). This account was informative for numerous aspects of ancient Gadara. Its capture by the Seleucid king, Antiochus III, dictated Gadara being a Ptolemaic outpost. From Polybius' wording, Gadara was described as a 'Polis', or city. Use of this term carried the meaning that Gadara was not simply a fort or outpost. However, the lack of an official 'Greek' name most likely denoted a lack of regional importance for Gadara. The Seleucid period, from the late 3rd century to the early 1st century BCE, marked the development of Gadara into a substantial urban center. It was certainly more officially recognized as the names Antioch and Seleucia are attested throughout the area (Mershen and Knauf, 1988, p.130). These names account for Seleucid influence and possibly patronage. Although, these names never found their way into common use. The use of different naming conventions was critical to understanding the past culture of Gadara and was explored in a later section. Nevertheless,

indications of name use led to more discussion on Gadara's history. Gadara was used by the Cynic poet, Meleager of Gadara, when describing his home city. In this same period, Gadara was graced with a large temple district in the northeast corner. The 92x106m temple was constructed on top of an artificially leveled area and dedicated to Zeus Olympios (Bührig, 2009, p.369). This area was also enclosed with fortified walls. However, this Hellenistic settlement was restricted to an acropolis and was only roughly six hectares, 1/5th the size of the eventual Roman city (Hoffmann, 1999, p.221-224). Gadara is fairly unique among the Decapolis. The lack of natural waterways in the city necessitated the building of aqueducts and cisterns to support its population. Josephus also told of a ten-month siege of Gadara by the Judean ruler, Alexander Jannaeus, in the 1st century BCE (Josephus, *Wars*, XIII, 13.3). The duration of the siege and water infrastructure discovered at the site have allowed an estimation of the city's population. Patrick Keilholz produced a model to include these variables and estimated the Hellenistic city population to be 2,050 (Keilholz, 2014, p.35).

Pompey the Great would retake Gadara from the Hasmoneans in 63 BCE. The other Decapolis cities were also 'liberated' at this time and placed under the protection of the Roman province of Syria. However, Gadara was special among its contemporaries in that the city was directly connected to Pompey. The Roman general provided means to rebuild the city after war had damaged it. Josephus explained that this occurred at the behest of Pompey's freedman, Demetrius the Gadarene (Josephus, *Wars*, I, 7.7). The scale of Pompey's rebuilding and restructuring for the Decapolis was attested in Gadara by the use of a new calendar. Inscriptions and other remains mark 63 BCE as the first year. It was likely that Gadara was augmented with a 13km subterranean aqueduct during Pompey's rebuilding efforts (Keilholz, 2017, p.151).

During the Roman period, Gadara developed along the main *decumanus*. This east-west road formed the backbone of the city and many monumental structures were constructed along its course (Bührig, 2009, p.370). The colonnaded street was the center of urban activity and was flanked by temples, baths, a nymphaeum (elaborate fountain), shops, tombs, gates/monumental arches, and two theaters (Kennedy and Bewley, 2004, p.159). Most of these projects were initiated at this time but took quite a while to complete. Gadara continued to develop as the Decapolis prospered through the 2nd century CE. Unlike the other Decapolis cities of Gerasa and Philadelphia, Gadara was not placed within the Province of Arabia after Trajan's reforms in 106 CE. Instead, Gadara was placed in the Province of Palestina whose capital, Caesarea Maritima, was located on the Mediterranean coast (Ababsa, 2014). Around the middle of the 2nd century, Gadara was connected to the Province of Arabia's capital, Bostra, through a Roman highway system. This system was critical for Roman administration which included the constant arrival/welcoming of Roman governor appointees. Certain historians have postulated that Gadara's many Monumental arches point to Gadara's additional importance. It was inferred that governors were welcomed in Gadara on their way to Bostra (Kennedy, 2013, p.84). Gadara's prominence was also attested by extensive constructions in and around the city. The most impressive structure was the Qanat Fir'aun aqueduct. Regionally, this aqueduct ran 153 kilometers, supplied multiple Decapolis cities, and represented the longest tunnel construction of the Roman Empire (Keilholz, 2017, p.154). Such construction would only have been possible given extensive wealth and building prowess. By the 3rd century CE, Gadara reached its maximum extent and likely the peak of its urban development. The city developed westward along the 1.7-kilometers-long *decumanus maximus* which was punctuated by a monumental gate (Bührig, 2009, p.373).

Gadara came under the administration of the Byzantine, or Eastern Roman, Empire. Although the Roman Empire experienced its share of hardships leading to this period, Gadara still occupied an important position along the trade routes from Arabia to the Mediterranean. The city utilized this position to continue significant urban development projects. Development occurred in two, relatively distinct phases: 4th to mid-5th century CE and mid-5th to 7th century CE. The first period saw continued development throughout Gadara. Projects of this period included an extensive bath complex and a five-aisled basilica church (Bührig, 2013, p.373). This early period can be seen more as a continuation/transformation of the previous ‘Golden Age’ of Gadara. The building efforts were still extensive and integrated within the larger city structure/design. The defining variable for this period was the increased influence of Christianity. The religion had become prominent in the city sometime earlier but widespread acceptance/support throughout the Empire had a different effect. By the 4th century, Gadara became a diocese and required physical expression of its importance to the Christian community. Hellenistic temples fell out of use and began to be repurposed for church construction. The later period of Byzantine Gadara was heavily characterized by rebuilding and repurposing. Outward expansion was reduced. The North Theater was repurposed into an amphitheater (a circular theater) and numerous additional churches were constructed (Bührig, 2013, p.374). Continued prosperity was also attested by extensive rebuilding efforts. The area experienced several earthquakes during this later period and they caused significant damage. However, many structures were repaired and remained in use.

Medieval/Islamic (641-1516 CE): The transition to Islamic control in Gadara is notable for its seeming harmlessness. The lack of violence upon the city is remarkable given its proximity to the Battle of Yarmouk of 636 CE. The great clash between the Byzantine Empire

and the Rashidun Caliphate occurred only roughly 20 kilometers from Gadara. However, the lack of extensive damage was consistent with other cities in the region during this transition. The area around Gadara, modern Wadi ‘Arab, was widely known for its cultivation of wine. Writers of the Arabian Peninsula praised such wine and even knew the area as Wadi Gadar (Lenzen and Knauf, 1987, p.36). The fame of Gadarene wine would continue well into the Islamic period. Gadara did experience some decline after this period. As of yet, no significant building projects tied to this period have been discovered. Further damage from the destructive 749 CE earthquake was not repaired and the settlement became incredibly reduced (Bührig, 2013, p.375). Additionally, Gadara developed into two different villages by the 14th century. The name, Gadara, continued to be used but became attached to a settlement to the north. This was the site of the hot springs for which Gadara had been famous since antiquity. Eventually, the northern settlement became known as Hammat Gadar while the original site became Umm Qais (Mershen and Knauf, 1988, p.132). This new name meant something like “toll station” in Arabic. Although, this name is difficult to trace etymologically.

Modern (1517 CE- Present): It seemed that the original site of Gadara, now called Umm Qais, was reoccupied after the Ottoman conquest of the Mamluk Sultanate. This reoccupation could have come between this period and the last literary account of Gadara in 1347. However, there is a lack of information for this time. Ottoman tax records provide key insights into this period. In 1596, the tax register listed Umm Qais as a village and provided an indication of its economic activities (Hutteroth and Abdulfattah, 1977, p.168). Curiously, Hammat Gadar was listed as an empty village. This area was still taxed but this usually implied ownership of the land by neighboring villagers and/or seasonal occupation. Seasonal occupation became an important consideration for Umm Qais into the modern period. European explorers of the 19th century

described various levels of inhabitation for Gadara. Ulrich Seetzen, Irby and Mangles, and James Buckingham all described a small village of people who lived primarily in ancient tombs.

Seetzen listed six or seven families as the population for Umm Qais in 1806 (Seetzen, 1806, p.28). Writing fifteen years later, Buckingham estimates 200 people (Buckingham, 1821, p.439). On an earlier visit, Buckingham found the settlement completely abandoned.

The fluctuating population of Umm Qais indicated that the site was occupied when conditions facilitated agricultural practices and abandoned when they did not. Ottoman land reform in the mid-19th century facilitated the establishment of a permanent village at Umm Qais. Certain families were able to profit from the new land ownership policies and constructed large houses complete with courtyards (Mershen and Knauf, 1988, p.141). Wealthy families expanded these housing complexes over the course of generations into the 20th century. This village continued to exist until the 1970s. After the 1967 war ended, archaeologists attempted to excavate the Greco-Roman ruins. The government facilitated this by buying the land (450 dunams/45 hectares) on the hill and essentially forcing its residents to the newer village east of the ruins (Brand, 2000, p.28). The Ottoman village has since become a heritage site of its own. Umm Qais has experienced some growth over the past few decades and is now a small town of a few thousand people (Department of Statistics, 2019).

Chapter 4. METHODOLOGY

Analysis for the development of the Decapolis cities (Amman, Jerash, and Umm Qais) required multiple scalar considerations. The most apparent of these scalar considerations was the temporal longevity of these ancient cities. All three sites showed some signs of inhabitation back to the Neolithic age and early urban settlements are attested in the Bronze and Iron ages. Thousands of years of inhabitation, landscape modification, and urban development provided a dense conceptual image. Additionally, cities must be evaluated at different spatial scales. The basic level of analysis for cities includes the local scale. Usually only a number of hectares or square kilometers, this scale was largely concerned with what/who was physically present at a particular site. Individual structures and environmental modifications served as study subjects and can confer several implications. However, cities do not exist in a vacuum. The urban core has always remained dependent on a surrounding area. This area, the hinterland, was responsible for housing smaller settlements, agricultural activities, and other larger concerns.

A geospatial analysis of these cities also required wider scales of consideration. Aside from the immediate vicinity, these cities have existed and/or do exist amid other landscapes and human organizations. Various levels of government and administration were involved at this scale. Whether it was the Roman Empire or the Kingdom of Jordan, decisions at these levels can have impacts on urban development. As a nexus for human/environment interaction, cities are also inherently complex subjects. Cities consist of occupied space, structures, landscape modification, population, and many other characteristics. Therefore, these aspects had to be considered throughout the various scales of analysis.

General Methodological approach:

Now that some key considerations have been presented, the methods utilized in this study can be presented to address them. The methodological steps (Figure 4.1) were created to compare and contrast the modern Decapolis cities and their ancient counterparts. Spatial analysis was facilitated by an initial division of consideration. This division attempted to address the large temporal variance in the study locations by dividing sources into past and modern sources of geographic information. As the name implies, the past sources were aimed at representing past versions of the Decapolis cities. A key portion of past sources was compiled from accounts from historical sources. Much of what is known about the ancient world was derived from historical accounts that have survived. The writings of ancient authors were crucial to tracing the existence and character of settlements. It was not always productive to take these accounts at face value. Writers were known to make mistakes and interject personal belief over actual fact. However, this could also be used to evaluate the perspective of the writer. Such perspective could often say more than the original narrative. Additionally, the preservation and presentation of ancient authors provided more opportunities for analysis.

Historical accounts were best utilized in conjunction with archaeological excavations and verification. Separately, historical accounts generally risked providing period-based context without all of the facts. Conversely, excavations could provide more concrete facts but could also lack context. Therefore, the best attempt at exploring the urban development of the ancient Decapolis combined these two sources. This was largely seen in the production and comparison of historical maps. While these could often contain spatial miscalculations or other human errors, historic maps still combined the historical account with a geographic consideration. This triumvirate of sources was implemented in this study through a series of factors/questions. Such

factors included dimensionality, urban morphology, interconnections, environmental utilization, and demographics; these factors provided a more realized image for each study site.

The modern components of this methodological approach were generally regarded as those that were produced around the beginning of the 20th century. This division was largely due to the establishment of contemporary cities at the Decapolis at this time. Physical documentation was far more consistent at this point as well. Historical maps and accounts continued to be used in the early portions of this period. However, as technology developed, more sophisticated sources emerged. The innovation of the photograph was the core development for modern methods on this subject. Capture of images on film took a substantial amount of user error/input away and was more replicable. Basic photographs are useful for certain applications in this study but became invaluable in conjunction with aerospace technology. Placing cameras within aircraft allowed for accurate representations of larger ground areas. The study region experienced early exposure to this combination of technology. The *Deutsche Luftstreitkräfte*, or German Airforce, conducted the earliest aerial surveys toward the end of the First World War (1918). Imagery continued to improve throughout the 20th century. This resulted in modern satellite imaging platforms with high spectral and spatial resolutions. Collectively, remotely sensed imagery and GIS applications are the cornerstones for modern analysis. These were then supplemented with other modern maps. The Decapolis cities were also given further context due to consistent record keeping and sharing of information. Population, demographic, and construction records were used to further contextualize urban development. These records included censuses, statistical newsletters, and other government reports.

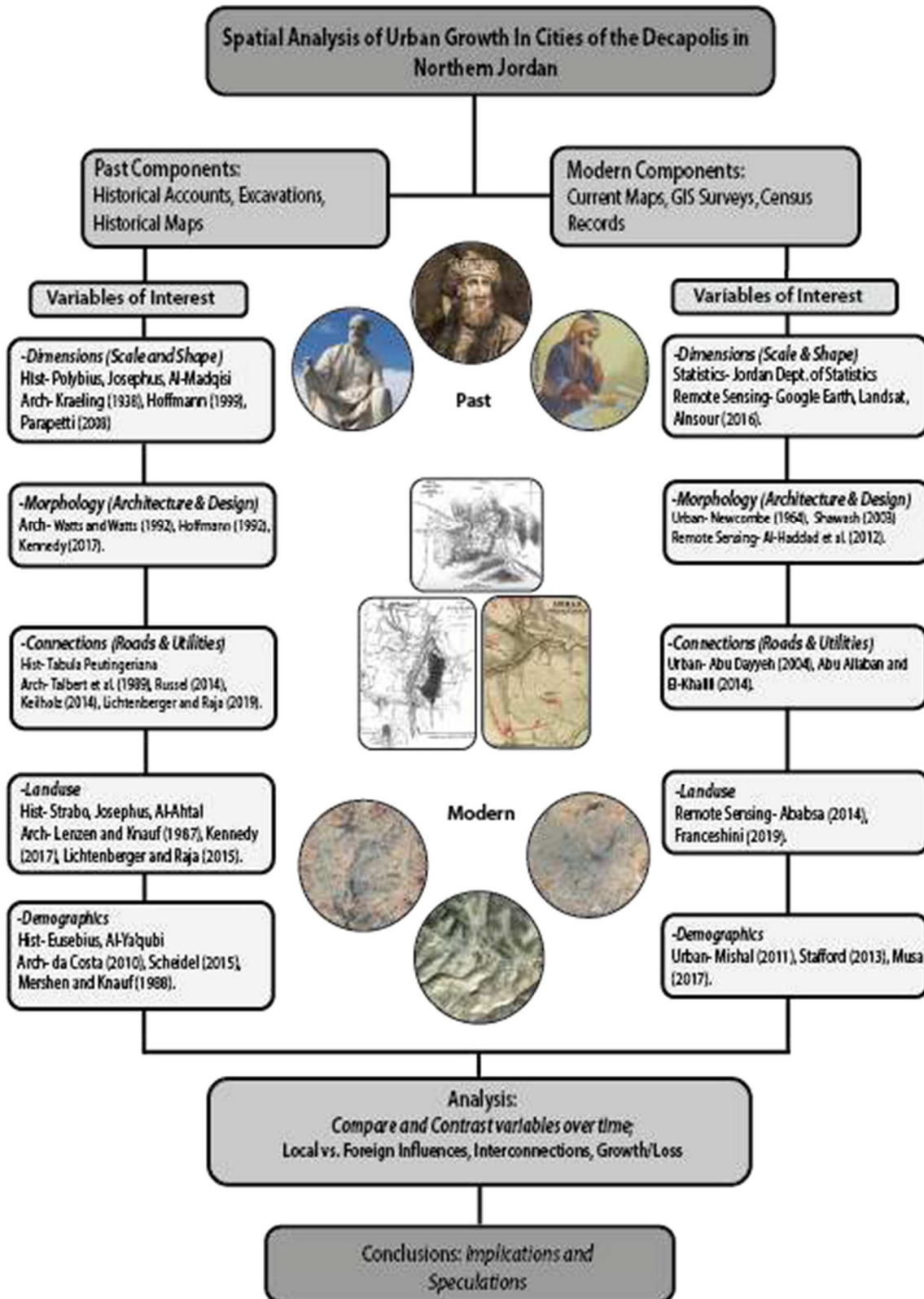


Figure 4.1- Methodological flowchart for analysis on the Decapolis cities of Amman/Philadelphia, Jerash/Gerasa, and Umm Qais/Gadara using historical accounts and modern remote sensing techniques.

4a. Past:

- *What were the dimensions (scale and shape) of the ancient/medieval cities?*

The most basic analysis of urban development required an understanding of physical area over time. This question was initially pursued through historical accounts. Information from these sources is primarily qualitative. Measurements were scarce and often unreliable. However, simple identification of sites and comments on their nature were useful for initial scalar impressions. The earliest source that included any of the study sites was the Old Testament of the Christian Bible. Selections of the Bible (particularly II Samuel) described important details about the ancient city of Rabbath-Ammon. The primary detail that can be derived was the presence of a settlement outside of the city's citadel. Later, historians like Polybius, Josephus, Pliny the Elder, Ptolemy, and Eusebius contributed additional details about the other study sites. Medieval accounts from Arab historians/poets (Al-Maqdisi, Al-Ya'qubi, Yaqut Al-Hamawi, Al-Ahtal, Hordadbeh, and Ad-Dimasqi) and some European contemporaries (Fulcher of Chartres and William of Tyre) commented on the nature of the Decapolis cities.

Archaeological excavations have been performed, at varying scales, for the three cities in this study. In the 1930s, Carl H. Kraeling's excavations of Jerash represent the most extensive of such efforts (Kraeling, 1938) while Italian excavations were performed in the citadel of Amman (Parapetti, 2008). Finally, excavations at Umm Qais were intermittent from the 1960s to the 1990s. The eventual operations of the German Protestant Institute provided important information on the scale of urban development at the site (Hoffmann, 1999). Excavations and context from historical sources were used to calculate the urban areas for these cities. It is difficult to trace some aspects of ancient structures. Therefore, the urban area was often restricted to areas contained within ancient circuit walls.

- ***What was the character of Decapolis city architecture and design?***

Historical accounts were less useful in addressing the character of the Decapolis cities' design. Specific structures were not usually directly referenced or described and ancient writers did not likely visit these sites. This greatly reduced the input of historical accounts. However, a synthesis of ancient and modern sources could shed light on this topic. Epigraphic evidence (inscriptions and carvings) was particularly useful in dating particular structures and indicating additional features of ancient city design. Inscriptions were consolidated from various archaeological reports (Kraeling 1938, Watts and Watts 1992, Lichtenberger 2008, Kennedy 2013, and Kennedy 2017). Epigraphic and archaeological data were employed to identify the architectural designs and landscape modifications for the Decapolis cities.

- ***How were the Decapolis cities connected to their surrounding regions/polities?***

Connection to surrounding regions was primarily explored through the implementation of infrastructure. The transportation of people, trade goods, and resources were important indications of how these ancient cities interacted with the surrounding world. The primary method of travel in the ancient world was on foot or via horse/cart. Navigable rivers would have presented another option but the semi-arid landscape of the study site did not facilitate such travel. Therefore, the initial transport of urban essentials would have to come from roads and paths. The Romans were particularly renowned for their extensive construction of roads throughout their empire (Russel, 2014). Fortunately, the Roman roads were a testament to Roman engineering as many survive to this day. Other physically indeterminate roads were attested in the surviving maps of the Roman Empire (Talbert et al., 1989). Information on travel to and from the Roman-era Decapolis was readily available through the ORBIS model developed by Stanford University (Schiedel, 2015). While each site was not explicitly present on the

network, Philadelphia and other neighboring sites were used to calculate travel times/costs for the ancient inhabitants. Connections were explored within the region and to important regional centers of the Roman world. Overland routes were calculated between cities of the Decapolis with a focus on travel speeds of commoners (usually on foot). Connections to the larger Roman world incorporated nautical travel through traditional sea routes in the Mediterranean.

Ancient infrastructure also included environmental modification of water resources. The semi-arid to hyper-arid climate of the Levant makes water management a critical urban concern. The inhabitants of the Decapolis cities addressed this concern in two main approaches. The first was to construct water storage spaces, or cisterns, to collect water during the wet winter seasons. This water could then be retained and used at a later date. Cisterns have been uncovered in vast numbers at every Decapolis city which indicates their widespread use and importance. The archaeological identification of cisterns became increasingly useful when combined with historical accounts. The siege of Gadara by Alexander Jannaeus in 83 BCE was attested to have lasted ten months by Josephus (Josephus, *Antiquities*, XIII, 13.3). Philadelphia/Amman displays some similar connections through both historical accounts and archaeological investigations. The ‘city of the waters’ was mentioned in II Samuel (II Samuel 2:27). Polybius elaborated on this element when commenting on the siege by Antiochus III. In this instance, the siege was intense but unsuccessful until an opening in the walls was revealed as the avenue for the citadel to access water (Polybius, I, 5.71). Finally, indications of water storage capacity and infrastructure development from Jerash were provided by tracing the construction of aqueducts and cisterns throughout the city (Lichtenberger and Raja, 2019).

- ***How was land used in and around the Decapolis cities?***

The terms ‘land use’ and ‘land cover’ are often used interchangeably. Although they

address similar topics, they are two distinct areas of study. Land use is concerned with “man’s activities on land which are directly related to the land” and Land cover focuses on “vegetational and artificial constructions covering the land surface” (Anderson et al.,1976, p.8). Given these definitions, Land use was addressed by historical sources or ground surveys and Land cover was analyzed with satellite imagery.

Ancient sources did not often provide exact information on the use of land in the Decapolis cities. However, they did offer useful clues. Historians and ancient writers commented on special land uses and functions. Within this region, cities were noted for their proximity and use of the surrounding landscapes. Sections of Strabo, Josephus, and the Arab poets were used extensively in this fashion. Archaeological evidence was far more useful in this subject. Excavation reports from older digs, like Kraeling (1938), were utilized. Additionally, there have been extensive ongoing projects in the area. Prominent examples of such projects include the Danish-German Northwest Quarter Project in Jerash which began in 2010. Such projects were instrumental for identifying land uses over time. Evidence that has been uncovered includes everything from coinage to local manufacturing facilities (Lichtenberger and Raja, 2015). In the modern period, somewhat regular Land cover maps were utilized to display the environment around these cities but did not necessarily represent how the land was used for individual functions or activities.

- ***What were the demographic conditions of the Decapolis cities?***

This subject was addressed in a similar fashion to the previous examples. However, it was somewhat unique in that it was primarily focused on the people of the Decapolis cities. It would be simple to reduce these ancient cities to a collection of ruins and historical accounts. However, they were populated by people who existed in an important relationship with their

cities. Cities are great examples of areas where the built environment influences its residents, and that population influences the built environment. Therefore, it was essential to attempt an understanding of the ancient Decapolis inhabitants to better inform how and why the cities developed. This was a challenging task given the scarcity of records reaching into the past. It was not hopeless though. There are occasional records that have population and demographic indicators and one such record existed in the form of an Ottoman tax register from 1596 CE (Mershen and Knauf, 1988, p. 134). Epigraphic and archaeological data were also used as indicators of cultural, economic, and linguistic character within these cities. Altogether, these aspects helped to explain who these cities were.

4b. Modern:

- *What are the dimensions (scale and shape) of the modern cities?*

Dimensionality of the modern Decapolis cities can be studied at a far greater frequency and at a higher definition. Dimensionality was concerned with measuring the scale and shape of urban areas. From a top-down perspective, this was focused two-dimensional areal extent of the Decapolis sites. However, cities also developed along a vertical axis and dimensionality incorporated this aspect as well. This provided the preliminary basis for urban analysis by showing where cities had grown and shifted. The analysis of these ancient sites was somewhat limited by assumptions and lack of consistent information. However, their modern counterparts have been measured and recorded through photography, remote sensing, and satellite imaging. The most recent dataset was obtained through Google Earth Pro. Here, a base image (2019-2020) was recorded for comparison to older periods. Working backward, scenes of the Decapolis sites were obtained from various platforms for different periods of time. Landsat 5 imagery was selected from June of 1989 via the United States Geological Survey (Figure 4.2). The target year had been 1990 as a midway point between current imagery and other sources. However, scenes from 1990 were compromised by cloud cover for certain sites; scenes from 1989 were substituted. The Landsat 5 Satellite was equipped with seven spectral bands amid the Thematic Mapper sensor (Al-Bilbisi and Tateishi, 2004). Excluding the sixth band, the remaining bands produce images at 30-meter resolution. The sixth band (infrared) records at a 120-meter resolution. The study area was passed by the satellite at path 174 that year. Amman and Jerash were captured on the scene in row 38 while Umm Qais was captured in row 37 to the north. Landsat data was selected in this manner because of the fixed nature of previous data. This data

was more than simply an image of the area frozen in a period of time. It provided indicators of additional aspects like environmental characteristics.

Imagery in this study for the year 1970 was obtained from the CORONA satellite missions which operated from 1960-1972 (Figure 4.3). CORONA was notable as the United States' first photographic spy satellite and managed to capture imagery of the Earth's surface at a high spatial resolution (1.8 meters). Scenes from the CORONA satellite do lack some of the spectral resolution benefits of platforms like Landsat. However, the high spatial resolution does allow for important analysis of urban growth at this crucial juncture. Scenes of Jordan and the Decapolis were obtained through the Center for Advanced Spatial Technologies (CAST) at the University of Arkansas and the United States Geological Survey (USGS). The study sites were included in the 1110-2300 Fore scenes from June 8, 1970.

The last imagery data for the modern period come from aerial imaging platforms. While early photographs were taken by the German Air Force in 1918, comprehensive aerial photography of the study sites was not accomplished until 1939. At this point, Jordan (the Emirate of Transjordan) was under the British Mandate of Palestine and Transjordan. Throughout 1938 and 1939, Sir Marc Aurel Stein cooperated with the Royal Air Force to conduct archaeological surveys from the air. These aerial missions recorded many of the important archaeological sites in Jordan and provide crucial data for the size and shape of the Decapolis cities of Jerash and Umm Qais. Amman was not included in this collection and had to be analyzed from different sources. The Sir Aurel Stein Archive was made available by the British Academy and the Aerial Photographic Archive for Archaeology in the Middle East (APAAME).

Decapolis Landsat 5 Imagery



Cartographer: Wade Pierson
Date: 3/3/2021
Source: United States Geological Survey
Earth Explorer, June 24 1989

0 10 20 40 Kilometers



Figure 4.2- Landsat 5 satellite imagery clipped to the extent of the Decapolis territory (Figure 3.4) with surrounding areas displayed through Earthstar Geographics 2020 satellite imagery.

- ***What is the character of modern Decapolis city architecture and design?***

The modern period has many advantages in the analysis of architecture and design. Particularly, the construction dates for structures are fairly well known, cities are planned by governing bodies, and architecture can be traced through existing structures. The Jordanian censuses of 1994, 2004, and 2015 contain informative categories regarding the construction of structures throughout its governorates. These censuses were searched and data regarding population, housing units, and construction dates were obtained. Additionally, the area of urban studies has developed throughout the modern period. As such, studies have documented the broad urban planning policies and practices of Jordan (Newcombe, 1964). Different architectural trends and developments are also tracked and analyzed. Architectural elements of Jordan from the establishment of the Emirate to the modern developments of growing cities have been documented (Rogan, 1986/Shawash, 2003).

- ***How are Decapolis cities connected to their surrounding areas now/recently?***

Like most aspects of the modern period, the connections of modern cities were more consistently documented and accessible. Satellite technology has been an incredible development for this subject. Google Maps/Earth and ArcGIS have the capability to easily calculate the distance and travel time between almost any points. These applications were used to analyze the interconnections between the study sites and surrounding areas. There have also been extensive studies on the planned development of infrastructure for many of these cities (Abu-Dayyeh, 2004). Planned transportation and water infrastructure provided key insights into the internal and external interactions of the modern Decapolis cities.

- *How is land used in/around the Decapolis cities now/recently?*

Simplified land cover analysis can be conducted from basic satellite images which contribute greatly to the modern period methods. Google Earth images and other satellite imagery can be generally classified between urban and rural areas. This is enhanced by spectral reflectance for multi-spectral satellite imagery. Land cover was primarily explored in this supervised classification. This generalized classification was placed within the context of other remote sensing land cover studies. Landsat 5 images were also used in the construction of land cover maps by the Royal Jordanian Geographic Center (Ababsa, 2014). This 2006 study provided key information about the geological, agricultural, and urban characteristics of the country. A similar study was undertaken recently in 2019 when the United Nation's Food and Agriculture Organization (FAO) compiled a Land Cover Atlas of Jordan to facilitate sustainability and development (Franceschini et al., 2019). This was a largely improved analysis due to the higher resolution of its base data. The FAO land cover atlas used Sentinel-2 imagery which has a spectral resolution of 10 meters. These works were critical in providing context for the locally scaled analysis pursued in the study on the Decapolis cities.

The integration of land cover analysis through remote sensing was a critical component to this study. Particular activities in the land surrounding the study sites were difficult to determine in periods with little historical references. However, quantified classes of land cover were useful in providing baselines for what activities could have been supported. Certain factors, like climate change, certainly influenced the lands around these cities. Nevertheless, classifications of land cover substantiated earlier accounts of activities. For instance, land classified as supporting orchards/vineyards substantiates earlier claims to wine production.

- ***What are the demographic conditions of the modern Decapolis cities?***

Demographics are a more widely known entity in the modern period. Direct information about particular cities in the past was infrequent. This leads to generalizations about populations and often relies upon certain assumptions. Modern demographics are much more standardized. The primary sources for this subject were the census reports and other data from the Jordanian Department of Statistics. Censuses were performed for 1994, 2004, and 2015. These contained reports on the population, economy, and ethnic compositions of the Kingdom of Jordan. Additionally, the censuses were augmented with individual statistical reports for 2019 and other special considerations. Tourism was also explored through statistical newsletters from the Jordanian Ministry of Tourism and Antiquities.

Analysis:

The multiple aspects of spatial analysis for the Decapolis cities were synthesized mainly through the use of comparative cartography. Maps were created from the various subjects within the methodological approach. Geographic Information Systems were employed for maps with geo-referenced data. Most data were displayed in ESRI's ArcGIS Pro which allows for further geographic calculations. However, other maps were created and displayed in Adobe Illustrator to create side-by-side comparison maps. This approach was also taken for comparing and contrasting imagery for various locations. Through the specified methodological considerations, this study attempted to analyze growth/loss, foreign influence, economic development, and other aspects of the modern Decapolis cities.

Chapter 5. RESULTS AND ANALYSIS

5a. Dimensionality: Scale and Shape

The shape and scale of the Decapolis cities were analyzed primarily through Geographic Information Systems (GIS). Urban build-up overtime was visualized as ‘polygons’ (distinct areas defined by discrete boundaries) on ArcGIS Pro 2.6.1 software. This was accomplished through different means for the various dates in this study. The Hellenistic and Roman built-up areas were digitized from archaeological reports (Kraeling, 1938/Keilholz 2014). Once ancient urban areas were identified by these archaeological works, base images were loaded into ArcGIS Pro. For dimensionality, the WGS 1984 Equal Earth Projection and WGS 1984 Web Mercator (auxiliary sphere) were selected as coordinate system projections at the base-map level. The Web Mercator projection closely resembled the collected imagery data. This enabled the retention of the overall shape of build-up areas from computer analysis to the real-world areas and shapes. The Equal Earth Projection ensured the correct calculation of built-up areas. The base maps were further established by selecting ESRI’s World Imagery Hybrid layer. This layer contained base satellite imagery from 2019. There was some variation in this imagery -- scenes for the study sites were provided through Maxar at 0.31- and 0.5-meter resolutions. Image resolution for Jerash and Amman were covered by 0.5-meter images from 2019 while Umm Qais had slightly better, finer imagery (0.31-meters) from 2017.

Once the base maps had been established, older imagery was imported for comparison. Imagery from Landsat and the CORONA satellite missions were obtained in GeoTIFF formats which allowed for automatic georectification within ArcGIS Pro. From this point, the imagery was georeferenced in order to make it useful. Images from 1939 and earlier were transformed via a first-order polynomial (affine) function with at least three control points. Most of these control

points were selected based on surviving ancient/old structures and landmarks. Images were then digitized into ArcGIS Pro polygon shapefiles and stored in a geodatabase to facilitate efficient use and accessibility.

Visual interpretation was used to identify areas of urban build-up. The *dissolve function*, which aggregates multiple polygons into a single interactive object, was used to compile disparate polygons into a single dataset. *Calculate geometry* was then used to calculate the area of the enclosed polygons in hectares. This function added spatial or geometric information to the attribute fields of a GIS object such as length, area, or coordinates. The hectare unit (10,000 m² or 2.471 acres) was chosen as an appropriate spatial unit which kept the smaller settlement sizes from becoming fractions and complicating calculations. Polygons were then compiled and given text fields that identified the time period to prevent confusion or miscalculations. Changes in the city dimensions over time were then analyzed by compiling the build-up area polygons and were displayed with a greyscale color ramp. This display method was chosen to facilitate percipient interpretation of urban change. These polygons addressed the horizontal dimensions of the Decapolis cities. However, cities also developed on the vertical plane. The horizontal dimensions were given vertical contexts by employing a Digital Elevation Model (DEM) of Jordan from the Jordan University of Science and Technology, Department of Civil Engineering. Each city will now be discussed regarding these maps.

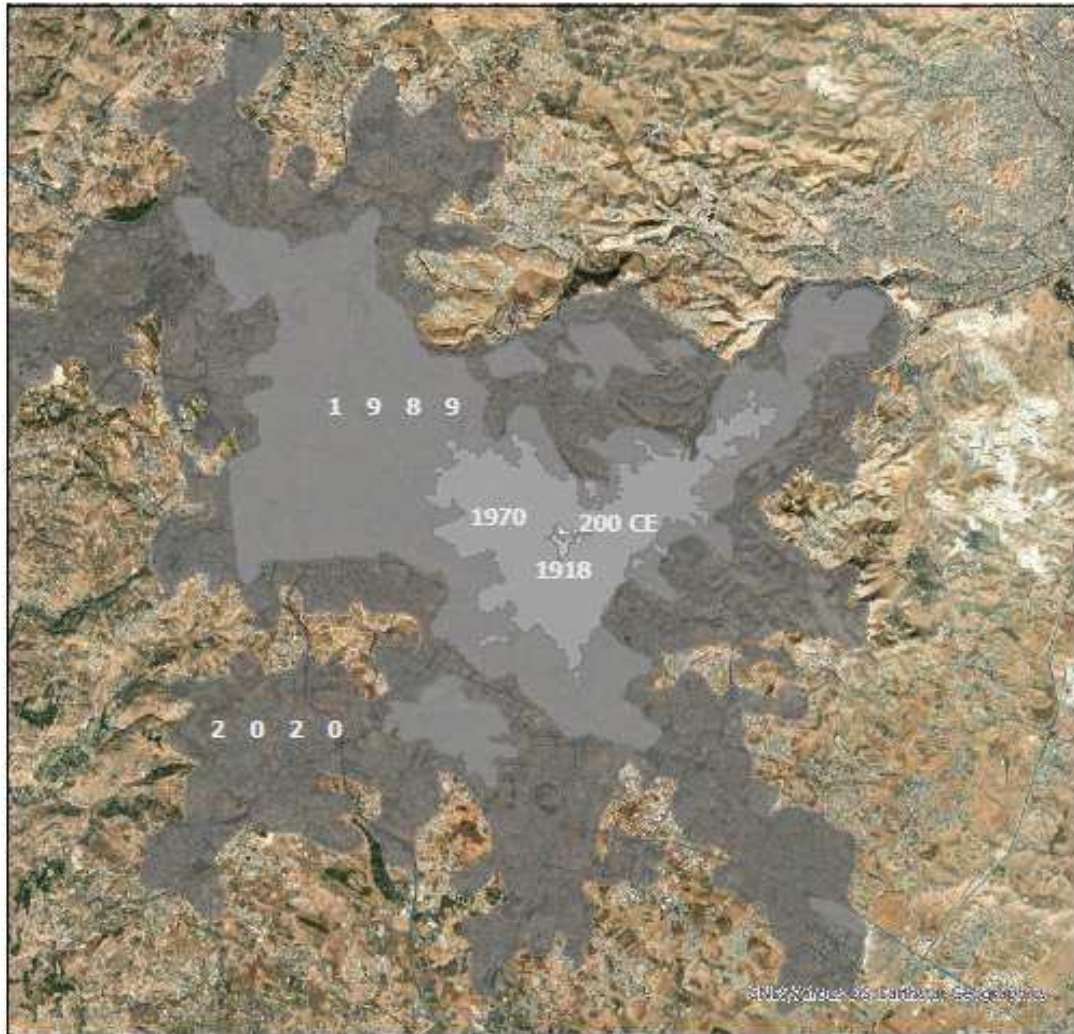
Amman/Philadelphia- The city of Amman exhibited the most substantial growth of the study sites (Figure 5.1). The Roman period city was estimated at only 12.9 hectares while Emirate period Amman (1918-1946) was only somewhat larger at 28 hectares. Amman experienced periods of explosive and spasmodic growth between this period and 1970 with an increased urban area of 2,784.5 hectares. At this point, the growth would continue to accelerate.

The urban area reached 11,825.2 hectares by 1989. By 2020, Amman had expanded to a sprawling 33,377 hectares that we see today.

In this study it was found that Amman has also exhibited substantial development, vertically. The citadel and the area around the ‘downtown’ wadi (seasonal stream) served as the main urban area for the ancient city. There have not been enough data to verify urban forms beyond this area. Therefore, the same areas were used for the Hellenistic and Roman elevations. Urban area polygons were used as ‘clipping extents’ for the DEM and this allowed for certain characteristics of the DEM to be calculated. Displaying specific sections of the DEM reduced processing demand and provided localized context for each site. The spatial characteristics of the DEM included minimum elevation, maximum elevation, average (mean) elevation, and standard deviation of elevation levels (Table 5.1). The initial urban settlement ranged between 747 and 834 meters above mean sea level (AMSL). The Emirate period (1918-1946) saw the settlement largely develop along the ‘downtown wadi’ with a reduced maximum elevation of 806 meters AMSL. In 1970, the minimum elevation fell to 702 meters AMSL and the maximum rose to 947 meters AMSL. These trends continued into 1989 and 2020 with minimums of 651 and 625 meters AMSL. The maximum relief also rose to 1095 and 1100 meters AMSL.

Roman Philadelphia to the Capital of Jordan

Scale of Urban Development at Amman



Cartographer: Wade Pierson Date: 3/1/2021
 Amman at 1:200,000 Scale
 Sources: Roman- Mahadin and Kadhim (1994),
 1918- Falls (1928), 1970- CORONA,
 1989- Landsat 5, 2020- Google Earth

Time Period	Period Name	Area Hectares
200 CE	Greco-Roman	12.914364
1918	British Mandate	27.997432
1970	Early Kingdom of Jordan	2784.463417
1989	Mid-Kingdom of Jordan	11825.237743
2020	Modern Kingdom of Jordan	33377.391635

Figure 5.1- Growth of Urban Build-up in Amman from 200 CE- 2020 laid over satellite imagery in ArcGIS Pro.

Table 5.1- Elevation above mean sea level for build-up polygons of previous figure.

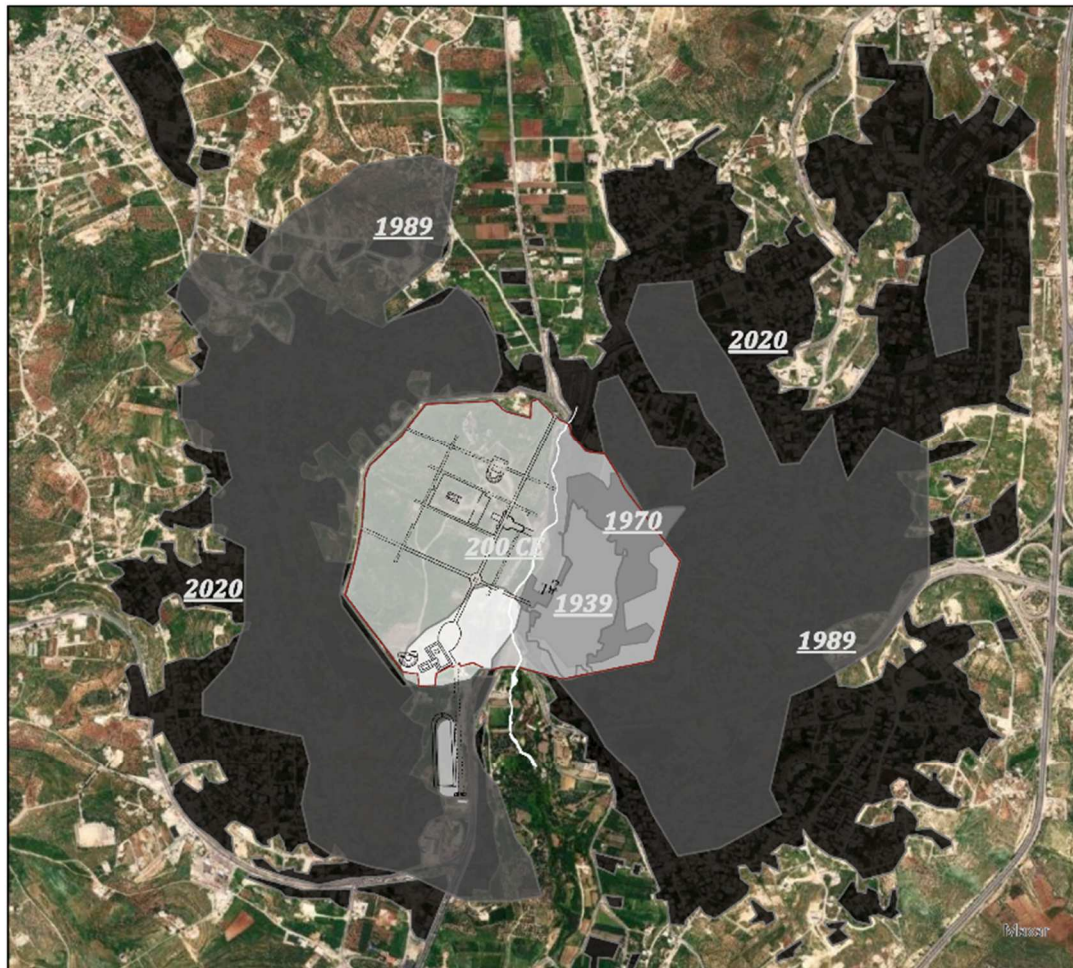
Period	Minimum	Maximum	Mean	Std. Dev
Hellenistic (300-64 BCE)	747	834	801.389	32.7
Roman (63 BCE- 632 CE)	747	834	801.389	32.7
Emirate (1939)	747	806	769.189	10.788
Early Kingdom (1970)	702	947	832.782	52.83
Mid-Kingdom (1989)	651	1095	902.764	90.981
Modern Kingdom (2020)	625	1100	892.992	86.778

Jerash/Gerasa- In this study, Jerash also exhibited periods of growth but at lower levels than Amman (Figure 5.2). Hellenistic Gerasa was the smallest settlement at 9 hectares. Roman Gerasa peaked at around 88 hectares. The settlement retracted by 1939 to only 11 hectares. From 1939 to 1970, Jerash almost doubled to 21 hectares. Urban area for 1989 represented a steep increase to 317 hectares. Finally, modern Jerash has grown to 507 hectares.

Jerash’s average elevation (596.63 meters AMSL) is significantly lower than Amman’s and the variation in elevation (Table 5.2). Hellenistic Gerasa was built between 562-587 meters AMSL while the Roman-era city was built higher up the surrounding hills to 629 meters AMSL and downslope to 548 meters AMSL. In 1939, Emirate Jerash was built between 567-594 meters AMSL – a more compressed built-up ear than during its Roman days. In 1970, the city limits extended between 564-616 meters AMSL, increasing once again in 1989 from 540 to 736m.

Roman City to Archaeological City

Scale of Urban Development in Gerasa/Jerash



Period Name	Time Period	Area Hectares
Modern Kingdom of Jordan	2020	507
Mid-Kingdom of Jordan	1989	317
Early Kingdom of Jordan	1970	21
Emirate of Jordan	1939	11
Roman/Byzantine	200 CE	88
Hellenistic	200-64 BCE	9

0 0.25 0.5 1 Kilometers N

- Jerash 2020
- Jerash 1989
- Jerash 1970
- Jerash 1939
- Roman Gerasa
- Hellenistic Gerasa

Cartographer: Wade Pierson
 Date: 2/10/2021
 Sources: Hellenistic- Kraeling 1938,
 Roman- Browning 1982,
 1939- UCLA RAF, 1970- CORONA,
 1989- Landsat 4, 2015- Stott et al.

Figure 5.2- Growth of Urban Build-up in Jerash from 200 BCE- 2020 overlaid on satellite imagery in ArcGIS Pro.

Table 5.2- Elevation above mean sea level for build-up polygons of previous figure.

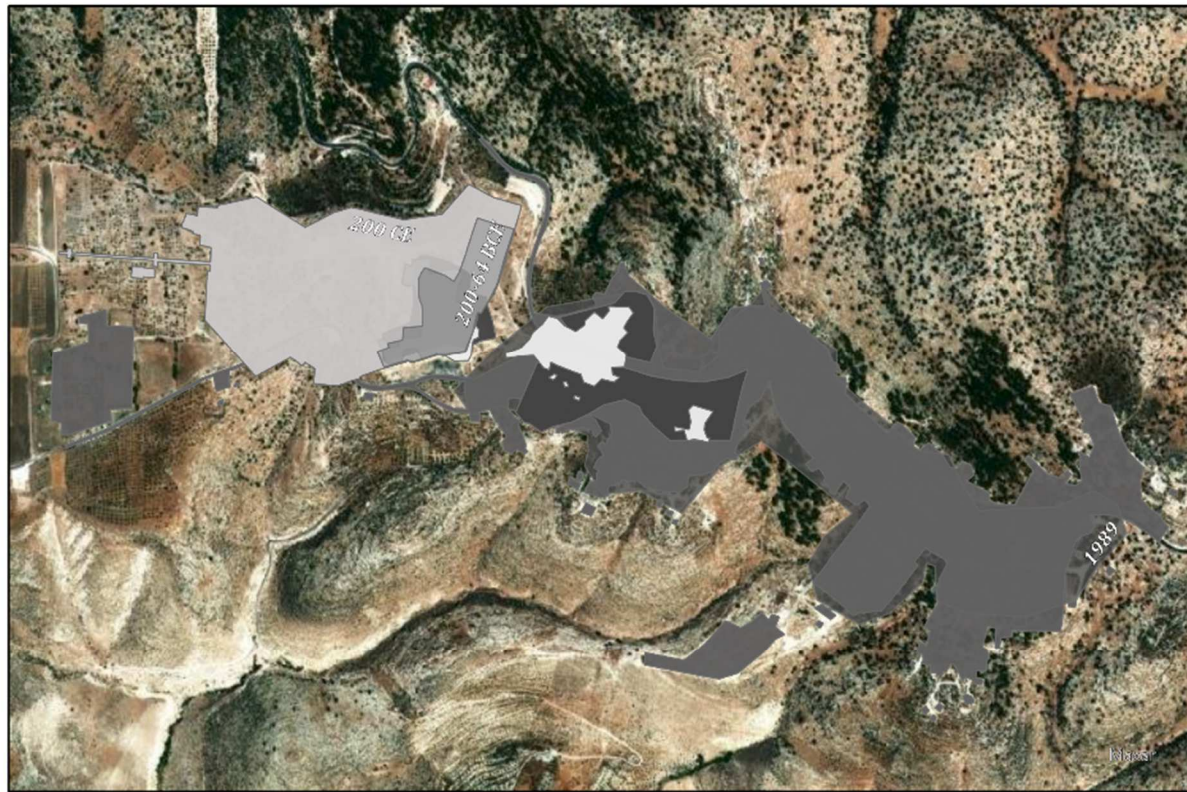
<i>Period</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Dev</i>
Hellenistic (300-64 BCE)	562	587	572.636	7.711
Roman (63 BCE- 632 CE)	548	629	587.252	17.455
Emirate (1939)	567	594	579.059	7.232
Early Kingdom (1970)	564	616	585.6	13.454
Mid-Kingdom (1989)	540	736	623.189	40.219
Modern Kingdom (2020)	521	789	632.064	53.403

Umm Qais/Gadara- The expansion of the urban build-up at Umm Qais/Gadara had to be determined at a local scale (Figure 5.3). The Greek and Roman areas were comparable to the other study sites at 5.15 and 29.5 hectares, respectively. By 1939, the urban build-up had only grown to 7.38 hectares, and by 1970 to 14.84 hectares. There was a substantial increase between 1970 and 1989 as ‘urbanized’ Umm Qais had reached 57.03 hectares. The current maximum area of urban build-up was 69.11 hectares in 2020.

The average elevation of Umm Qais was only 349.36 meters AMSL. Elevation data for Umm Qais had some interesting developments (Table 5.3). The maximum elevation remains at 361 meters AMSL from the Hellenistic to the Emirate periods. The Hellenistic elevation was lowest at 344 meters AMSL. While Roman Gadara increased the elevation of the city limits to 301-meter AMSL. The Emirate period’s minimum elevation surpassed the Hellenistic minimum elevation of 343 meters AMSL. In 1970, the city extents increased in elevation from 336 meters AMSL to 366 meters AMSL. The elevation extents in 1989 reached from 324 to 375 meters AMSL. The modern period city extents extend to a minimum of 286 meters AMSL to a maximum of 391 meters AMSL.

Roman Metropolis to Modern Village

Scale of Urban Development at Gadara/Umm Qais



0 0.25 0.5 1 Kilometers



Time Period	Period Name	Area Hectares
2020	Modern Kingdom of Jordan	97.762563
1970	Early Kingdom of Jordan	20.996386
1939	Emirate of Jordan	10.43465
63 BCE-636 CE	Roman/Byzantine	41.762645
200-64 BCE	Hellenistic	7.285971

Time Period

- 2020 Umm Qais
- Umm Qais 1989
- 1970 Umm Qais
- 1939 Umm Qais
- Roman Gadara
- Hellenistic Gadara

Cartographer: Wade Pierson
 Date: 2/10/2021
 Sources: Keilholz (2017), Buhrig (2009),
 Stein (1939), CORONA (1970),
 Google Earth (2020).

Figure 5.3- Growth of Urban Build-up in Umm Qais from 200 BCE- 2020 overlaid on satellite imagery in ArcGIS Pro.

Table 5.3- Elevation above mean sea level for build-up polygons of previous figure.

<i>Period</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Dev</i>
Hellenistic (300-64 BCE)	344	361	352.778	7.379
Roman (63 BCE- 632 CE)	301	361	336.4	12.786
Emirate (1939)	343	361	352.889	6.294
Early Kingdom (1970)	336	366	353	8.557
Mid-Kingdom (1989)	324	375	353.291	11.486
Modern Kingdom (2020)	286	391	347.815	19.458

5b. Morphology: Character of Architecture and Design-

Amman/Philadelphia- Archaeological records have been the most useful source for ancient and medieval architecture/design for Amman. Roman architecture was the most prevalent style and period throughout Amman’s ruins. The Roman Theater serves as an important example of Roman architecture in the downtown area. The semi-circular theater measured 74 meters in diameter and could seat approximately 6,000 people (Kennedy and Bewley, 2004, p. 153). The large theater was carved into the nearby hillside and was then reinforced with limestone and mortar (Hadidi, 1974, p.87). A forum was constructed to the north of the large theater and was framed by a colonnade and a smaller theater, or *odeon* (Figure 5.4). The Odeon only measures half the size of the grand theater at 36 meters in diameter and seated between 500 and 1,200 people (Taylor, 2005, p.30). Epigraphic evidence indicates the large theater was constructed during the reign of Antoninus Pius in the mid-2nd century CE (Taylor, 2005, p.30). The forum was connected to the *Decumanus Maximus* which ran east and west below the Citadel of Amman. Column capitals along the colonnaded roadway also supported

dating to the mid-2nd century CE since their particular Corinthian order resembled other constructions of the Antonine style (Hadidi, 1974, p.85). The nymphaeum, or public water fountain, lays just west of the theaters and forum. The nymphaeum was constructed as half of an octagon and reached 68 meters in length along its back wall. The first floor contained the fountain while the second floor rose 12 meters through the use of apses. These apses likely terminated in semi-domes and the structure was likely fronted with a colonnade. Most accounts also allocate the nymphaeum to the later 2nd century CE along with other major parts of the Lower City. The nymphaeum also sat just northeast of the crossing of Philadelphia's two main roads, the *Cardo* and *Decumanus Maximus* (Waheeb and Zu'bi, 1995).



Figure 5.4- East-looking View from the Amman Theater in the early 1900s (Library of Congress Collection).

The final ancient structure which contributes to the character of Amman/Philadelphia is the Great Temple of Amman (or Hercules) which has been dated via inscription. In this case, the inscription mentions the Roman governor of Arabia, Geminius Marcianus. Marcianus was governor from 162-166 CE (Taylor, 2005, p.28). The inscription also dedicated the temple to the co-emperors Marcus Aurelius and Lucius Verus. The stairway that linked the Citadel and the agora connected to the surrounding courtyard, or temenos, of the Temple. The Temple of Amman sits on a 43m by 27m podium with a six-columned façade (Figures 5.5, 5.6). Each column measures 13.5 meters in length making this one of the larger temples found across the Roman Empire (Kanellopoulos, 1994).

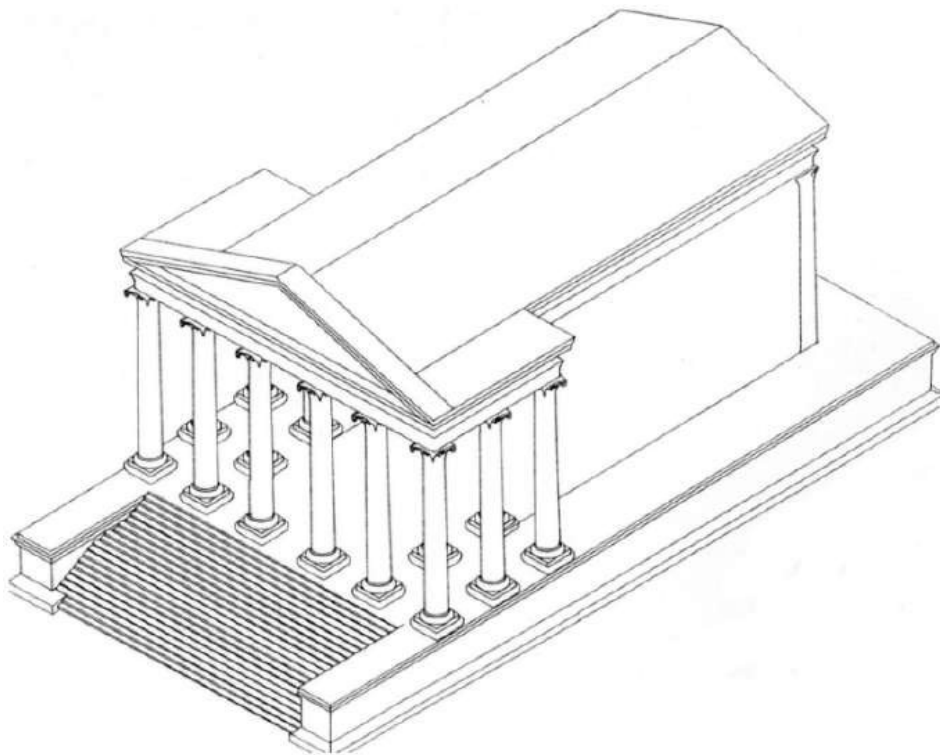


Figure 5.5- Reconstruction of the Temple of Hercules Naos and Façade in Amman, Jordan. Illustration by Chrysanthos Kanellopoulos (1994).



Figure 5.6- Partially restored Temple of Hercules/Great Temple of Amman Podium and Columns, ACOR Photo Archive, Gaetano Palumbo (1995).

There were remarkably few structures that could be reliably identified to the Byzantine Period of Amman/Philadelphia (324- 636 CE) (Parapetti, 2008, p.160). However, Amman's Citadel or Qala'a does contain the Church of St. Elianos which is located directly to the northeast of the Temple of Amman. This church was most likely constructed in the 5th-6th centuries CE (Taylor, 2005, p.28). The basilica shape, with a central nave and two aisles, was created using columns from the Temple of Hercules/Great Temple of Amman. Later, an Umayyad palace complex was constructed on the Amman Citadel. The structure resembled an irregular trapezoid and sits on the north corner of the Citadel. The palace consisted of three structural groupings and is located north of the Great Temple. First, the southernmost section of the complex consists of a large vestibule or reception hall (Figure 5.7). This hall is the most well-preserved structure of the complex and has recently been restored with a wooden dome (Taylor, 2005, p.29). This area

served as an entrance to the complex and remained within close proximity to the mosque and cistern. Next, the palace complex centers around a porticoed courtyard which served as both guest quarters and administrative offices (Almagro and Olavarri, 1982, p.317). The northernmost section seems to have been the actual gubernatorial residence of the complex. Much of the palace's plan resembled the Greek cross with a central square area and four equal-sized arms. Meanwhile, several structures of the complex resembled more Sassanian (Persian) influences. The most apparent example of these influences is an *Iwan*, or vaulted rectangular hall, in the residential section of the complex (Almagro and Olavarri, 1982, p.312).

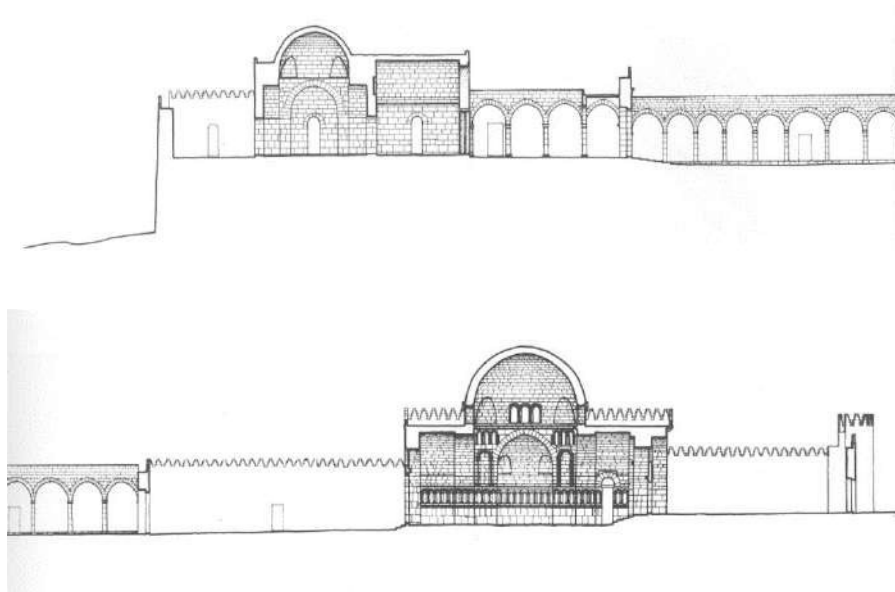


Figure 5.7- Reconstruction Section of the Umayyad Palace of Amman, Governor's Residence (top), Vestibule (bottom), Almagro and Olavarri (1982).

Directly across from the palace complex, the Umayyad Period (756–1031 CE) also saw the construction of a proper congregational mosque (Figure 5.8). The mosque sits atop a nearly perfect square plan and faces the palace complex at a slight angle. The sides of the mosque measure 33.6 meters producing an area of 1,128 square meters (Almagro and Jimenez, 2000, p.459). The square plan was later in-filled to create a hypostyle hall for use as a prayer room. The base/floor of the mosque derives from Roman/Byzantine construction practices. This also

places the mosque within the early period of Islamic architecture as some of the oldest mosques used this type of floor plan. Sassanian influences can be seen in the column design within the prayer hall (Almagro and Jimenez, 2000, p.471).

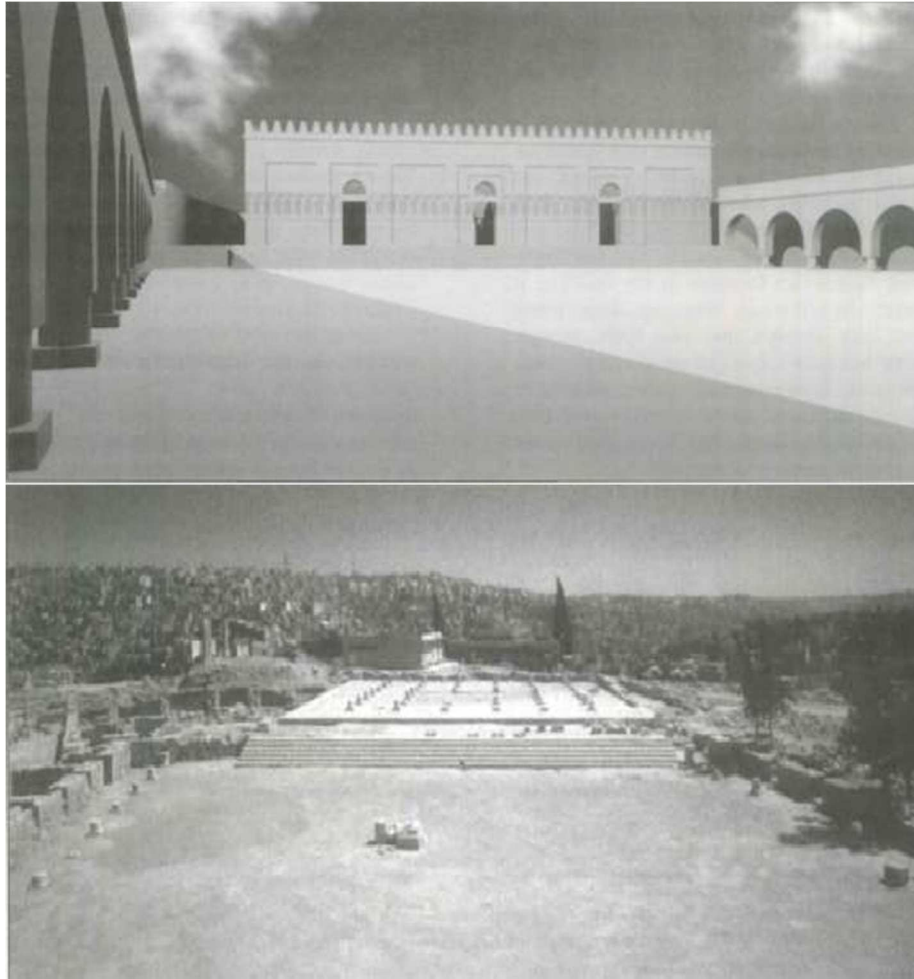


Figure 5.8- Umayyad Mosque of Amman, Reconstructed view of the Prayer Hall and Courtyard (top) and Modern view of foundation and hypostyle hall (bottom), Almagro and Jimenez (2000).

There is little archaeological evidence or architectural records for Amman until the late 19th century. Circassian settlers brought their foreign architectural style to Amman from the Caucasus Mountains region. Greater availability of timber, as a building material, made the Circassians far more advanced in woodworking than their new, Arab neighbors (Shawash, 2003, p.37). This constituted one of the greatest differences in Circassian and local architecture. Circassian structures were far more likely to employ wooden beams and other wood-based building techniques. They also utilized mud-brick (adobe) as a wall-building material. Circassian houses presented a new architectural style compared to the Arab rural house (Figure 5.9). These houses were designed with a gallery or loggia, that opened onto a porch -- a departure from the central courtyard-based structures of other vernacular settlements. Additional features of Circassian architecture can be gleaned from historical references. In 1893, Robinson Lees noted two main streets at the settlement and Circassian homes surrounded by yards enclosed with walls of stone. Others recorded other familiar European features of the Circassian architecture. Notably, one Dr. Bliss remarked about the appearances of chimneys, porches, and balconies in most every house in Circassian Amman (Ababsa, 2014, p.37). The porch/balcony would remain one of the most prevalent Circassian architectural features in Amman. Increased influences from Europe can be seen in the Raghadan Palace in 1926 and the White Palace of 1942. Meanwhile, the evolution from classical structures, like the Husseini Mosque, to the grand King Abdullah Mosque marked important transitions for the architecture of Amman (Rogan, 1986, p.37).

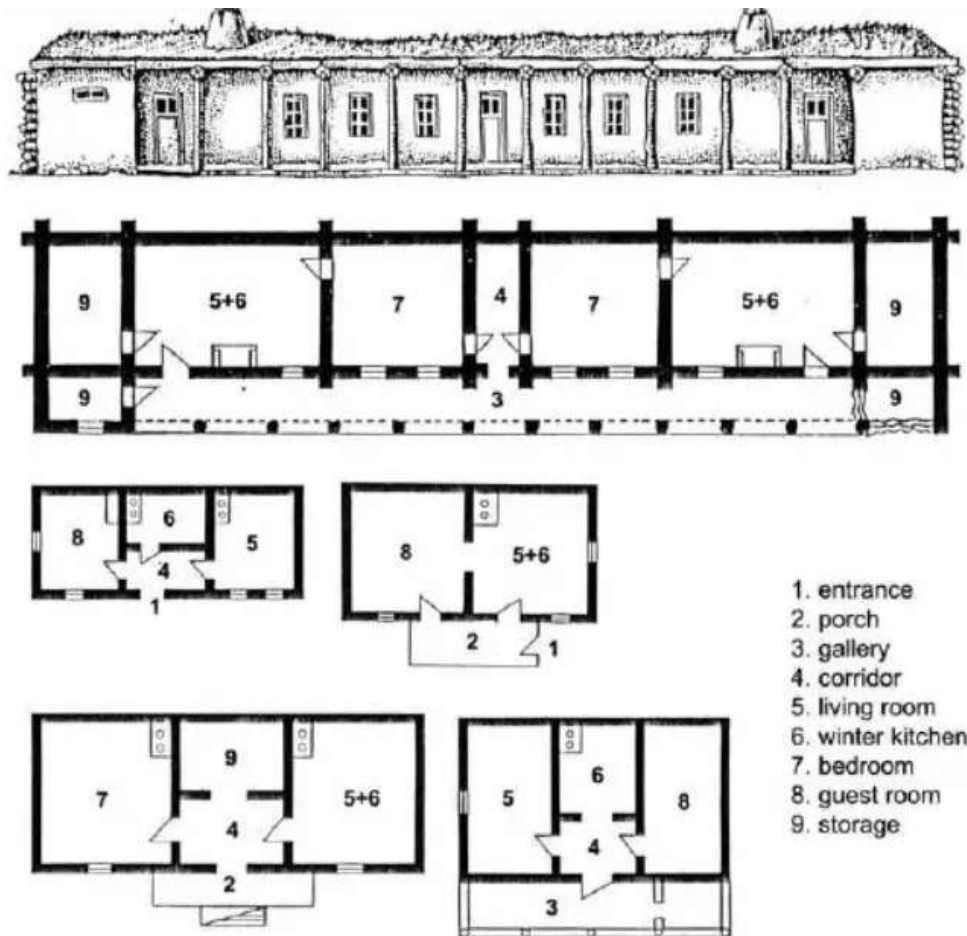


Figure 5.9- Plan of Archetypal Circassian Gallery House, Shawash (2003). Note the large porch areas and wood beams.

Jerash/Gerasa- Ancient Jerash was incredibly well-preserved along the western side of the Wadi Jerash. Apart from a few identifying features, Jerash/Gerasa's morphology was sparsely represented in historical accounts. It has been noted that part of the reason that Jerash's western city was so well preserved was due to increased sediment build-up along the wadi channel banks. Archaeologically, there were many structures in Jerash/Gerasa which exhibited remarkable architectural features. Roman architectural design dominated these ruins as observed in the Temple of Artemis, Southern Theater, Oval Plaza, and the overall city plan. Portions of the Temple of Artemis were excavated as early as 1928 (Kraeling, 1938, p.4); the massive temple

complex encompassed 34,000 square meters (Kraeling, 1938, p.125); The incredible size and splendor of the temple complex made it one of the most important religious structures in the Roman Empire. Inscriptions date the structure to the latter part of the 1st century CE or early 2nd century CE (Ovadia and Mucznik, 2019, p.521). The temple complex also extended to the eastern, residential area of the city. Architecturally, the complex was be divided into five sections: the propylaea east of the cardo, the propylaea west of the cardo, the forecourt, the inner court (temenos), and the hexastyle peripteral temple (Ovadia and Mucznik, 2019, p.523). The main temple, which housed the cult statue of the goddess, can be seen as a reconstruction in Figure 5.10. Current conditions have left the temple with only some free-standing columns and part of the inner shrine (Figure 5.11). Many architectural elements, like Vitruvian Corinthian columns, reflect rather standardized architectural elements. Standardized architectural elements in other cities of the Decapolis indicated that these other cities played a smaller role as influential artistic centers (Peleg-Barkat, 2013, p.433).

Like Amman, Jerash contained two Roman theaters which were important elements in the architectural character of the city (Figure 5.12). Jerash's larger theater, the Southern Theater, was constructed earlier than those in Amman during the late 1st century CE (Kennedy and Bewley, 2004, p.155). The South Theater was roughly comparable to the Theater in Amman and seating between 3,000 and 6,000 spectators (Taylor, 2005, p.52). The South Theater sits adjacent to the Temple of Zeus Olympios and the Oval Plaza at the southern edge of the city. The city is also complemented by a North Theater (or Odeon) adjacent to the Temple of Artemis.

One of the most unique architectural features of ancient Jerash was the Oval Plaza which linked the Hippodrome and Southern Gate, with the South Theater, the Temple of Zeus, and the *Cardo Maximus*. This oval plaza or forum was quite the departure from classical Roman

architecture. Instead of an orderly symmetry, this plaza resembles that of a pear (Figure 5.13). The base sits at an angle with the Temple of Zeus and two uneven parabolic arms meet at the *Cardo*. Ionic columns and an architrave frame the edge of the plaza. The plaza construction has been dated to the 1st century CE (Peleg-Barkat, 2013, p.432), however, the irregular shape and alignment with the older Temple of Zeus indicate an underlying, earlier structure.

A broader Roman city plan represents the final influential element for the character of Jerash/Gerasa. Since sprawling modern city has not overrun the monumental quarter of the city, the ancient plan is isolated and apparent. In fact, the ‘archaeological city’ of Jerash/Gerasa was inscribed by UNESCO as a World Heritage site in 2004 further ensuring its future preservation. The basic organized plan can be observed around the *Cardo Maximus* and the two *Decumani* (North and South). The wadi also provided a natural division for a western civic west and eastern residential section of the city. Moreover, the Northern *Decumanus* and Oval Plaza formed a regulating square that dictates the layout of the civic area (Watts and Watts, 1992, p.309). The city plan appeared to have been implemented and integrated by the late 2nd century CE (Kennedy and Bewley, 2004, p.155).



Figure 5.10- Reconstructed illustration of the central temple structure in the Temple of Artemis complex at Jerash. Illustration by Josep Ramon Casals/National Geographic.



Figure 5.11- Standing columns of Temple of Artemis at Jerash, Khouri and Marvullo (1985).



Figure 5.12- Reconstructed illustrations of the South Theater orchestra and cavea (left) and view of excavated/restored South Theater (right) today. Illustration by Josep Ramon Casals/National Geographic.



Figure 5.13- View of Oval Plaza looking North in 1939 (top left), in 1998 (top right), and reconstructed illustration of Roman-era Plaza looking south (bottom). Top photos from Aerial Photographic Archive for Archaeology in the Middle East (APAAME). Reconstructed illustration by Josep Ramon Casals/National Geographic.

Jerash also experienced resettlement at the hands of Circassian refugees in the late 19th century. Much less has been written about the architectural development of modern Jerash, however, Circassian elements are as pervasive in Jerash as they were in Amman. Notably, the settlers constructed a mosque atop ruins of the Eastern Baths shortly after their arrival (Figure 5.14). Most evident by its minaret, the structure resembles elements of Caucasus architecture. Additionally, contrasting images of the archaeological park and the surrounding modern settlement show a dramatic increase in multi-story architecture. Also, the city has experienced suburban sprawl around the western border of the ancient city (Watts, 1997, p.449).



Figure 5.14- View of Circassian Mosque at Jerash 20th century. The rising minaret was built on top of an ancient Roman Bath structure. Image by Watts (1997).

Umm Qais/Gadara- Gadara's architecture, like that of Gerasa, is not broadly evident in written historical records. The city was famous for a multitude of scholars from the Greco-Roman Period, but little has been found written of the physical city. The archaeological record at Gadara provided invaluable information for understanding the ancient city. An East-West axis dominated the city plan where civic structures and commercial shops lined the colonnaded street (Bührig, 2013, p.188). The earliest structure that contributed to the morphology of Gadara was a Hellenistic Temple precinct at the northern edge of the settlement. Constructed primarily of local limestone, this structure dates to the 1st century BCE (Bührig, 2009, p.369). The temple measured 92 by 106-meter and connected to the original city entrance to the east. Zeus Olympios likely served as the temple's patron (note the connection to Gerasa in this particular version of the deity) and had been rebuilt numerous times but still retained largely Hellenistic features.

Gadara rounds out the three study sites by also possessing multiple theaters. The larger, northern theater has not been well preserved. The 85-meter wide cavea (semicircular seating area) can be seen in the hillside but much of the building material has been scavenged. The western theater is far more preserved and noteworthy (Figure 5.15). This theater had a diameter of 52 meters and sat around 3,000 spectators. Like much of later Gadara, the smaller theater was constructed of various materials. Instead of the traditional limestone, the Western Theater and the nearby chapel were constructed and faced with the local black basalt (Bührig, 2013, p.188). Basalt represents a rare and difficult material to carve and dress, seldomly used in a structure of this size or nature. Building materials used in this theater and across Gadara indicated increased importation of marbles and granites; these exotic and difficult materials lend more credence to the increased trade relations of Gadara and the Decapolis.



Figure 5.15- Western Theater of Gadara/Umm Qais modern conditions, from Haupt and Binder/*Art Destinations Jordan*. Note the dark basalt used for the scaenae frons and cavea. Photograph by T. R. Paradise (2007).

Unlike Jerash and Amman, Umm Qais was never fully abandoned by its residents. European explorers, like Ulrich Seetzen, observed many the inhabitants residing in caves and tombs during the early 19th century (Seetzen, 1810, p.368). This led to the establishment of an Ottoman-era village adjacent to the Northern Theater and Hellenistic Temple. The residential structures on the hill, amid the ruins, represented a particular class structure. These houses developed over many generations and their courtyard complexes reflected merchant activities (Mershen and Knauf, 1987, p.141). Many villagers were uprooted when excavations were provisioned for the ancient area of Umm Qais. During the 1970s and 1980s, Garasa/Umm Qais saw a ‘compensation effort’ from the Housing and Urban Development Corporation (Brand, 2000, p.29). Agency efforts attempted to construct new houses for the displaced residents but took little of their needs into account. Modern construction methods and materials led to a

distinct change in architecture. The government plans for the new town were reflected in organized rows and lots compared to the narrow and organic old village (Figure 5.16).

UNESCO inscribed Gadara/Umm Qais as a World Heritage site in 2001.

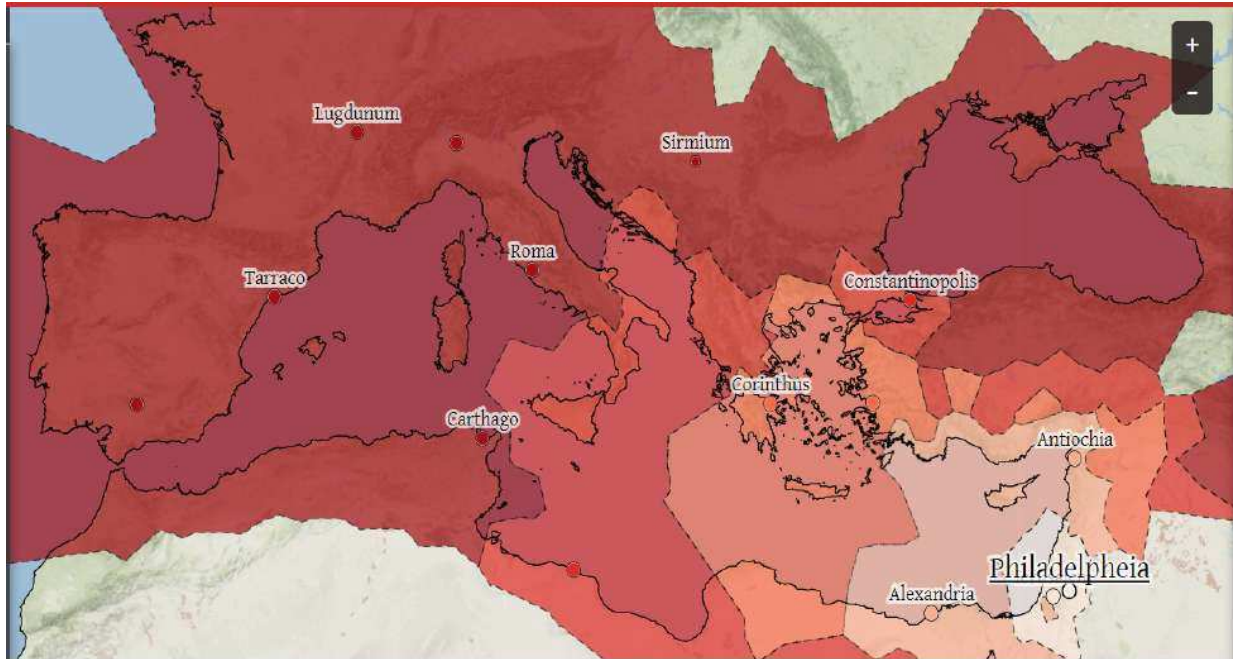


Figure 5.16- Google Earth Imagery of Umm Qais in 2020. Note the ruins at the left-center of the image while the modern town is ordered along the right-center of the image.

5c. Connections: Roads, Travel, and Utilities

The Stanford University ORBIS model provided key data about travel and infrastructure in Roman Philadelphia. This website facilitated a number of geographic estimations and associations then and now. Such estimations as travel times from Gerasa, Gadara, and Philadelphia can be easily projected using various transportation methods (i.e. foot, carriage). It was gauged that the majority of the Decapolis and Palestine lay within a week's travel by foot from Philadelphia (Figure 5.17). Since Antioch on the Orontes (modern Antakya) two important and influential urban centers of the Roman Empire, it was ascertained that both of cities were located within two weeks of travel when utilizing a sea route. While the Roman roads were well-built and quite extensive, they could not compete with the increased connectivity of the Mediterranean Sea routes. However, they were critical in facilitating trade to said sea routes.

Using ORBIS, the travel times could also be analyzed for a more local/regional distances. Within the Decapolis, it was possible to travel (118 km) from Philadelphia (Amman) to Kapitoliias (modern Beit Ras) in four days (Figure 5.18). Current infrastructure has cut that time to 18 hours if foot remained the primary method of travel (Figure 5.19), however, more efficient road networks manage to reduce the travel distance to 85 km. ORBIS was also used to calculate travel from Scythopolis to Bostra. Scythopolis was another important Decapolis city and Bostra became the provincial capital for many Decapolis cities after the reforms of Trajan. The 109-kilometer journey took an average Roman traveler 3.7 days to walk (Figure 5.20). However, using Google Maps, a similar course was plotted to include Gadara (Figure 5.21) -- the modern trip would take 25 hours and a slightly longer distance at 124 kilometers. ORBIS was a valuable tool since travel estimates and interactions for each study site could be established between these two paths.



Distance from Philadelpheia

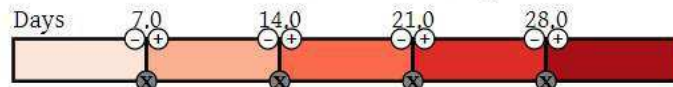


Figure 5.17- ORBIS Stanford Model Predictions of Travel Time Between areas of the Mediterranean and Philadelpheia of the Decapolis. Here, travel time incorporated both land travel (local) and sea routes (areas further away). Accessed 3/5/2021 <https://orbis.stanford.edu/>.

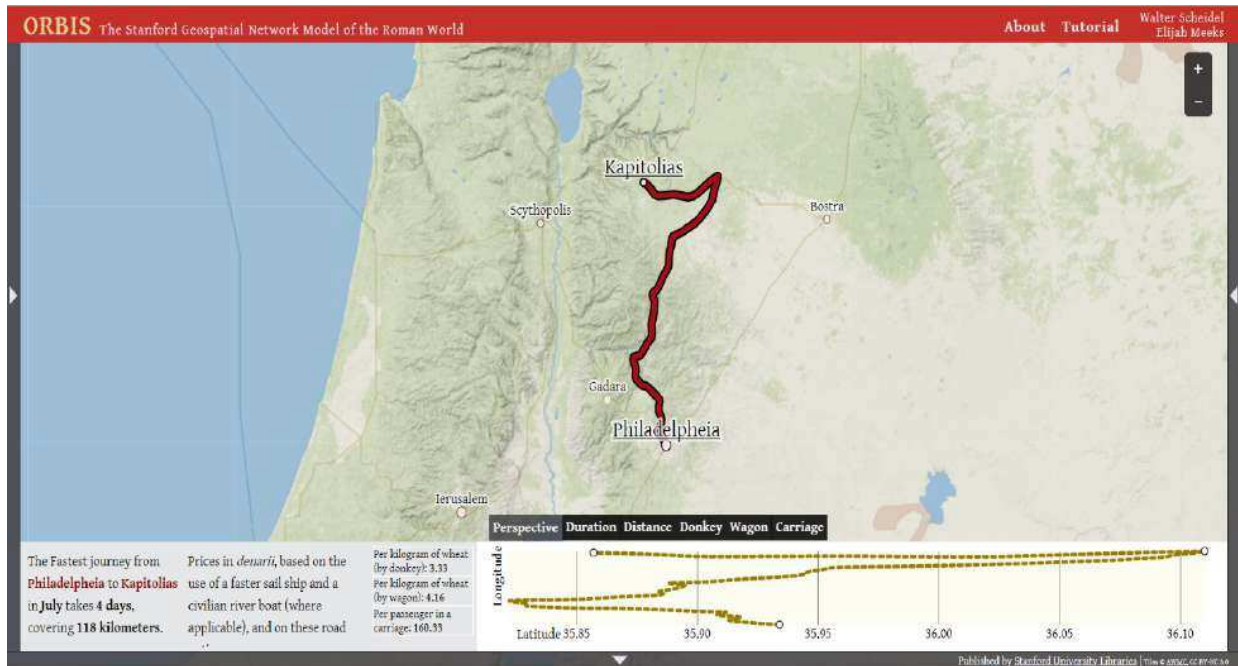


Figure 5.18- ORBIS Stanford Model Prediction of Travel time between Philadelphia and Kapitlias using Roman roads (on foot). Accessed 3/5/2021 <https://orbis.stanford.edu/>.

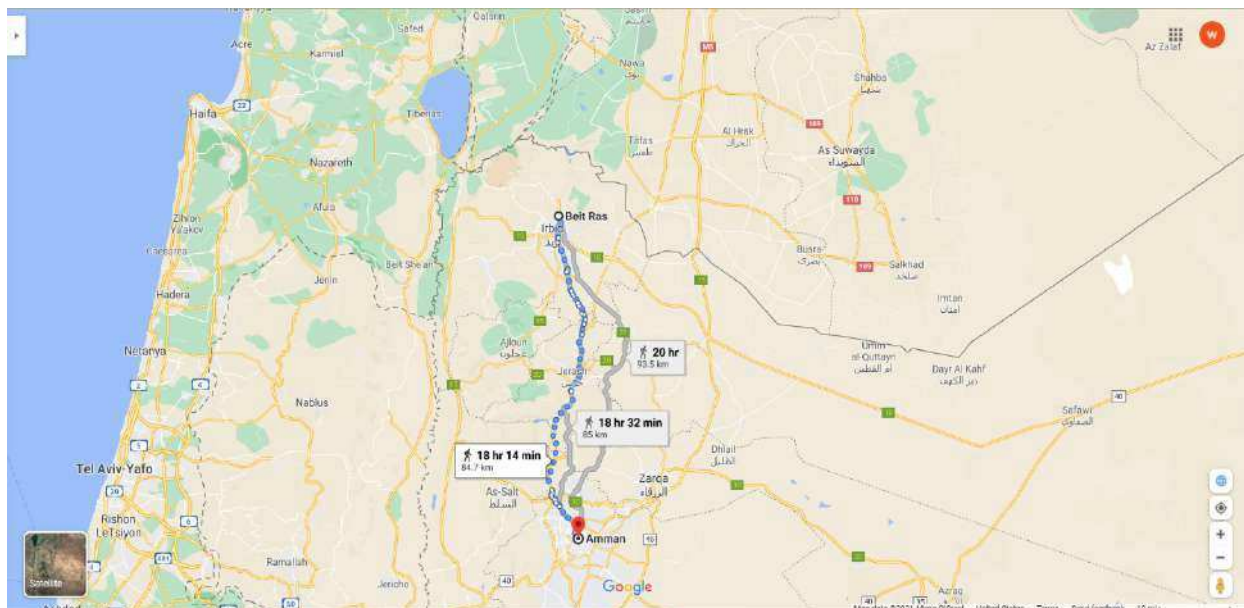


Figure 5.19- Google Maps 'Prediction of Travel' time between Amman (Philadelphia) and Beit Ras (Kapitlias) on foot using modern infrastructure. Accessed 3/5/2021.

Amman/Philadelphia - Finally, connections can be explored through the provision of utilities, like water. Due to the semi-arid climate in central Jordan, water was and is a precious resource for the Decapolis cities. Both Amman and Jerash are bisected by streams. These wadi, or seasonal streams or arroyos, only become large streams during the wet winters. Historic accounts were useful in identifying some of the hydrologic infrastructure across the region. Amman's permanent cisterns (Arabic: *bir*, *sharij*) and other water storage structures were mentioned in many sources including II Samuel in the Old Testament. Polybius recounted similar information when detailing Antiochus III's capture of Philadelphia (Polybius, V, 71). Both accounts reflected water storage/access outside of Amman's fortified Citadel or Qala'a. In 1889, C.R. Conder corroborated these accounts by identifying a large cistern outside the walls of the Citadel (Parapetti, 2008, p.162). Since then, a number of cisterns have been excavated within the Citadel walls as well.

The archaeological record was more enlightening on the scale of hydrologic infrastructure within the Decapolis. Amman contained several important storage facilities of such ancient/medieval infrastructure. The Nymphaeum, mentioned above, served as a magnificent, aesthetic, and practical device for the distribution of water on a broad scale. Conder's cistern was excavated by the Italian archaeological teams in the 1930s. Thick plaster lining indicates the reservoir could have originally been constructed as a hypogeal tomb (Parapetti, 2008, p.163). Umayyad Period Amman also contained impressive water features. Adjacent to the Vestibule of the Palace complex on the Citadel, a bath complex was constructed. While initial structures may have been much older, the Umayyad Period saw the finalization of the complex. The baths were integrated into the Umayyad upper city with connections to the palace, square, and mosque (Figure 5.22). The source of the bathhouse water remained uncertain, but the baths were also

sited adjacent to a massive cistern. This circular cistern measured 17.5 meters in diameter, had 2.5-meter-thick walls, and could hold up to 1370 cubic meters of water (Arce, 2015, p.3).

The modern city of Amman has initiated a multitude of water infrastructure projects in the attempt to supply its ever-expanding population. Roughly half of Amman's water is pumped from the low-lying Jordan Valley into the hills of Amman (Potter et al., 2007, p.21). Amman's remaining water supply is channeled from Al-Mafraq to the north as well the Azraq aquifer to the east, and Qatrana, Swaqa, and Wala to the south. These enormous water demands on Amman's water have far-reaching effects since many of these sources serve areas far outside the city and are especially sensitive to fluctuations attributed to increasing climate change. In recent years more ambitious projects have also been designed and implemented. For example, the Disi Project was commissioned by the Jordanian Government to construct 325 kilometers of pipeline to connect Amman to the Disi Aquifer near the southeast border with Saudi Arabia (Ababsa, 2014, p.428). Inaugurated in 2013, the project provides an annual average of 100 cubic megameters of drinking water to the capital city.

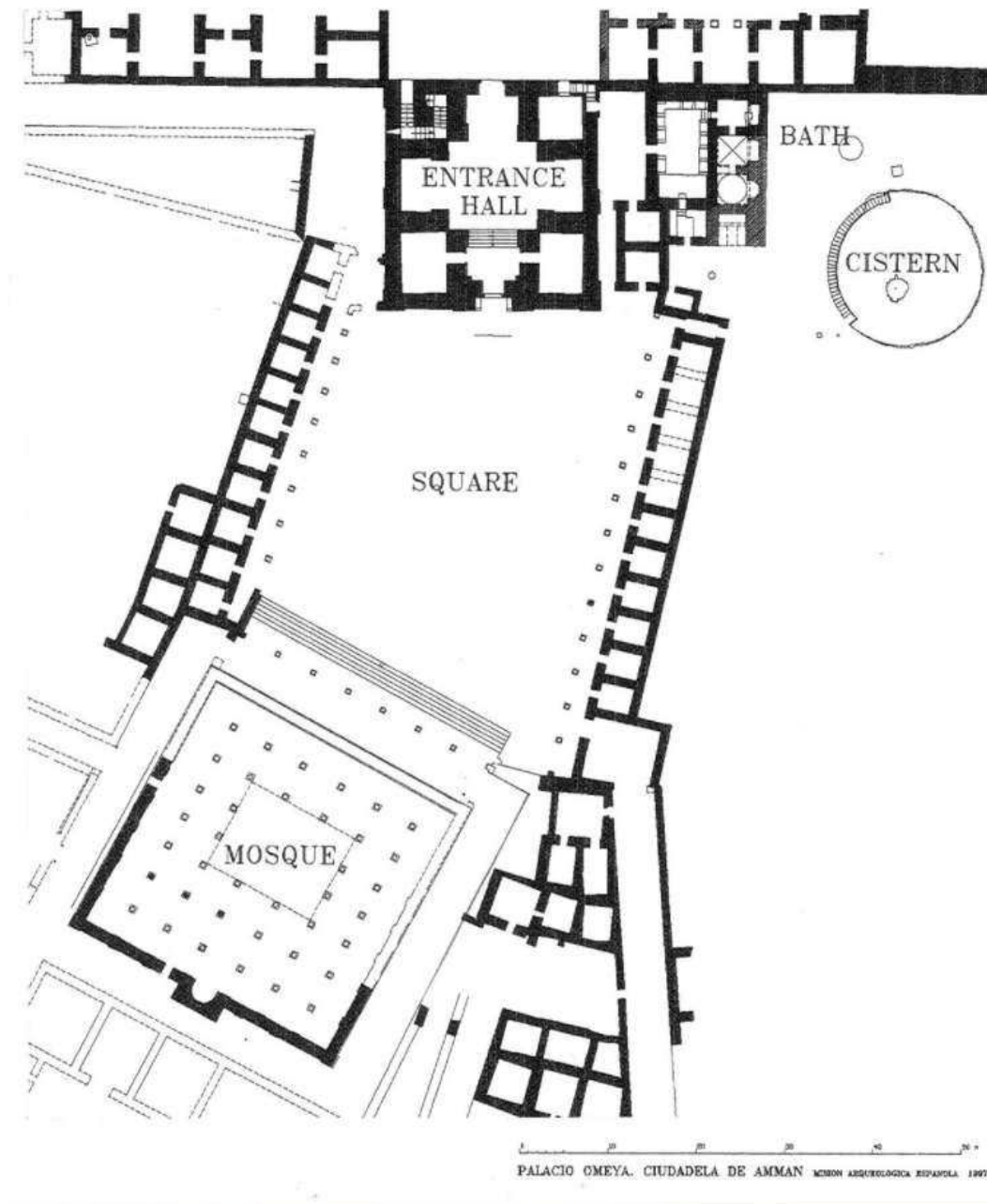


Figure 5.22- Plan of Umayyad Palace complex within Amman’s Citadel (Arce, 2015). The entrance at the top is the vestibule that leads to the Governor’s Palace while the bottom leads across the citadel hilltop in Amman.

Jerash/Gerasa- Like Amman, a seasonal stream bisects portions of Jerash. The Wadi Jerash (ancient Chrysorroas/Gold River) divided Jerash/Gerasa into halves separated by steep channel banks. Aside from the stream, ancient Gerasa water was supplied through numerous

sources (Figure 5.23); the lower portions of the city were supplied by springs, the stream, and a series of cisterns (Lichtenberger and Raja, 2015, p.10). Meanwhile, extensive water distribution infrastructure radiated from the city. The western and northwest portions of the city were supplied by rock-cut aqueducts which channeled water to reservoirs and cisterns, which redistributed the water to the residents. Some of these structures stretched for several kilometers to other sources of water (Stott et al., 2015, p.5). Near the source of the wadi, there is also a unique double cistern (Arabic: *birketein*), which had an accompanying small theater. This structure served religious and water storage functions. Gerasa also boasted an elaborate nymphaeum centrally located along its *Cardo*. The scale of the nymphaeum further indicated an extensive water management, storage, and distribution system.

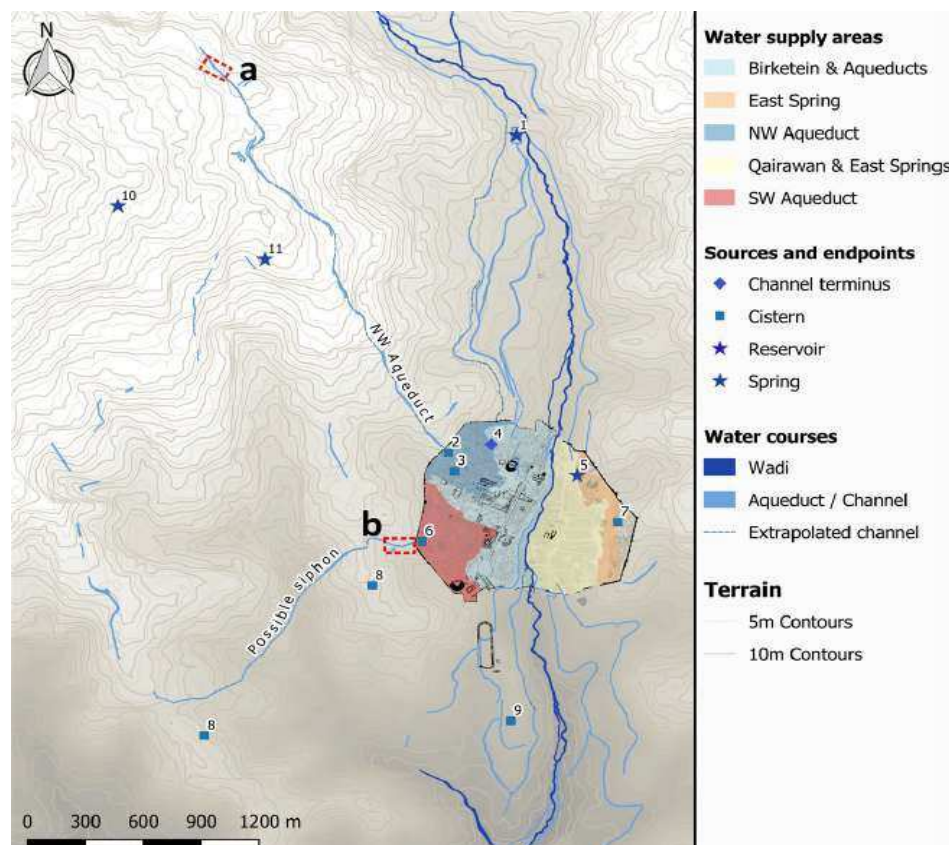


Figure 5.23- Aqueducts and Cisterns of Jerash (Stott et al., 2015). Areas are identified where a particular water source supplies the majority of water and contours are provided to explain the mechanics of possible aqueducts.

Umm Qais/Gadara- Travel to and through ancient Gadara was an important facet of this Decapolis city. Literary accounts shared some information on this subject. Polybius recounted several scholars who hailed from Gadara and had since found new homes in the major centers of the Roman world. Gadara seemed close to areas outside the Decapolis, however, the steep depression of the Jordan Valley hampered travel times. There are also elements of the city plan which reflected the importance of travel in and through Gadara. As mentioned previously, this city ran on a primary east-west axis common in many planned Roman cities. The westernmost portions of the city were demarcated by monumental arches/gates (Kennedy and Bewley, 2004, p.159). Travel and trade were further elevated by Gadara's strategic position on the route between Caesarea Maritima (coastal Israel) and Bostra (southwest Syria). Sophisticated Roman engineering allowed these cities to be connected in the most efficient manner for the period. The route from Caesarea to Bostra was further attested as the first leg of the journey -- Caesarea to Scythopolis – which has been dated as one of the earliest roads in the region in 69 CE (Kennedy, 2013, p.150). The roads to Gadara, Pella, and Bostra followed their Palestinian counterparts. Therefore, it stands to reason that Gadara served as the entry point for travelers and governing officials departing to or arriving from the Province of Arabia to the east and south.

Umm Qais/Gadara also contained some of the most extensive ancient hydrologic infrastructure in the Decapolis. Over 80 cisterns have been documented within the ancient area of Gadara (Keilholz, 2014, p.27). The prevalence of cisterns was not surprising as Gadara lacked a natural waterway like those of Philadelphia and Gerasa. Instead, Gadara was perched atop a plain overlooking the Jordan Valley. Plentiful cisterns were an attempt to mitigate Gadara's lack of streams or springs (Figure 5.24). These storage structures varied in shape and size and also played a role in the demographic attributes of Gadara and were discussed in a later section.

Although these cisterns could store significant volumes of water, the burgeoning Roman city of Gadara required more as its population grew. Engineers accommodated these needs by constructing multiple artificial tunnels which conducted water from surrounding areas. The first aqueduct was known as the Qanat Turab and ran 30 kilometers from the hills east of Gadara. The construction methods hint that this structure could have been built as early as the 1st century BCE. Using modern discharge rates from the source of the aqueduct, Ain Turab, it is possible that the aqueduct carried up to 3.6 liters per second (Keilholz, 2017, p.150). This was certainly an important example of Roman water infrastructure and highlights the connections between Gadara and its hinterland.

However, the Qanat Turab was dwarfed by the 2nd century CE Qanat Fir'aun which collected water from southern Syria and conducted it south 153 kilometers to the lands of the Decapolis. The Qanat Turab served as a marker for the prosperity of the Decapolis as it represented the largest such structure throughout the entire Roman Empire. The modern village of Umm Qais largely relies on three springs for their freshwater including Ain Qais (Keilholz, 2017, p.150-154). Water in Gadara was heavily managed through the use of control towers and reservoirs which directed water to specified areas to be collected. Two such areas contributed to Gadara's external connections and city: the Bath Complex and particularly the Nymphaeum which represents the third such structure within these study sites and could have implications for the Decapolis as a whole.

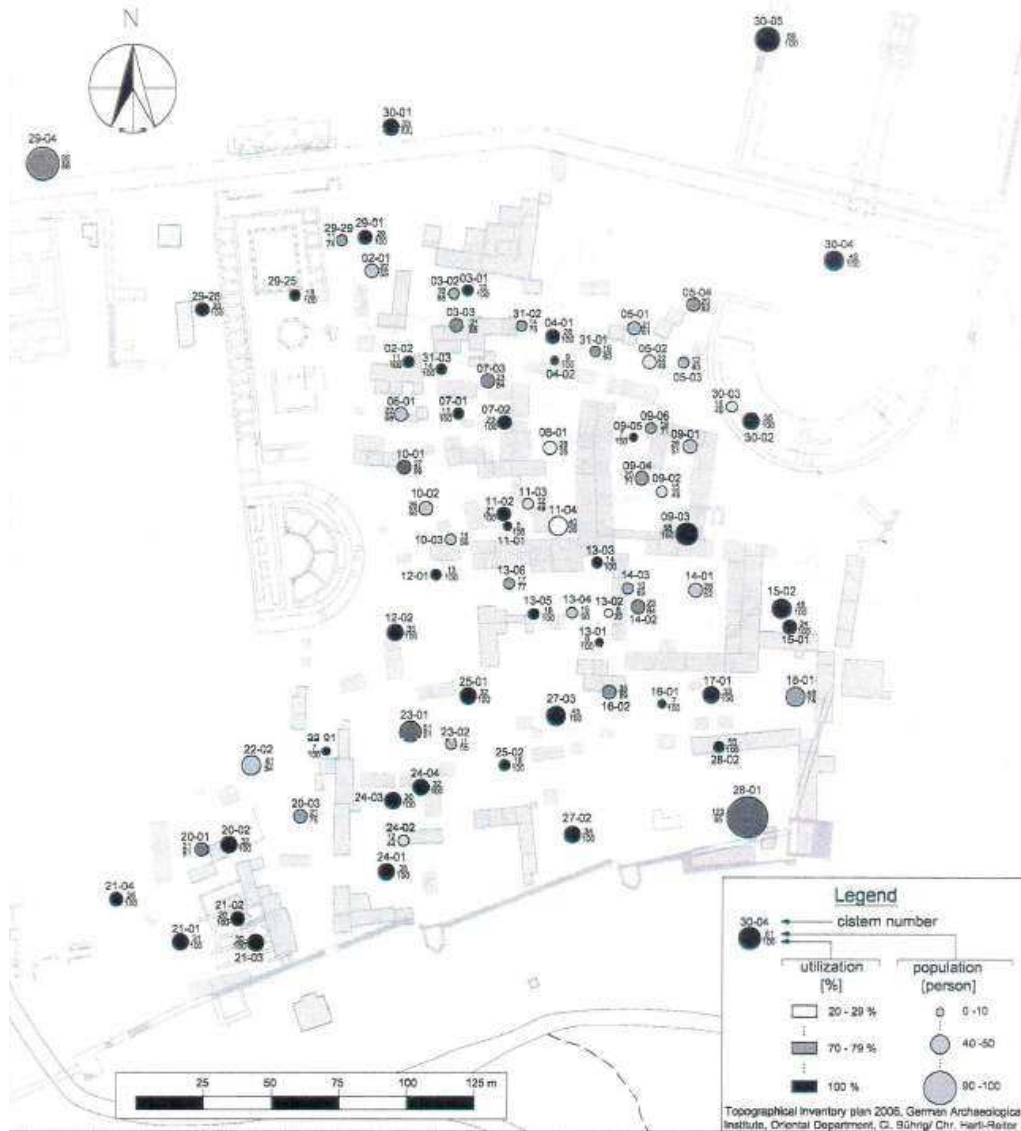


Figure 5.24- Cisterns of Gadara and estimated population supported by water rates (Keilholz, 2017). Those surveyed here were used to estimate the population of the Hellenistic settlement.

5d. Landuse

Amman/Philadelphia- It seemed appropriate to discuss land use and cover from the modern period back to the ancient due to the types of data currently available. Aside from human modification, there are three main criteria: elevation, soil type, and climate. Elevation and relief had been addressed but to summarize, Amman is sited between 625 and 1100 meters above sea level. The city sits at the edge of a series of highlands that greatly contrast the low Jordan Valley

to its West. Amman is situated atop a broad distribution of red Mediterranean soils (terra rossa soils). These soils were particularly conducive to agriculture relative to the surrounding arid soils of Jordan. Amman's soil types placed it within the dry farming, forestry, and horticulture land use classifications (Figure 3.2). Although it was situated closest to the desert soils of the *Chert Desert* in Southeast Jordan, Amman still clearly possesses the capabilities to foster agriculture. This was further supported by annual rainfall between 300-400 mm in Amman (Kennedy, 2013, p.52). Looking at modern land cover (2019), the Amman Governorate was dominated by the presence of bare soil (Figure 5.25 and Table 5.4). As a city, Amman was based in the western section of the governorate. The presence of the metropolis in the eastern desert districts was minimal. Therefore, a more accurate picture of Amman's land use can be derived by excluding the eastern desert districts. New estimations revealed that the urban build-up constituted the highest area at 317.42 square kilometers. Bare soil still contributed a considerable area of 238.01 square kilometers. Other large areas were divided between grasslands, rainfed herbaceous crops, and rainfed orchards (124.55, 86.75, and 71.53 sq km respectively).

Geologic and climatologic surveys have allowed the modern study site land cover conditions to be examined with great reliability. Additionally, many of these conditions provided important baselines which could be applied back in time. The elevations remained constant and broad soil patterns remained relatively stable. Climate does change over time however general characteristics would remain similar. Previous land cover maps have articulated the increased urbanization of the area around Amman at the cost of agricultural and natural landscapes between 1987 and 2001 (Al-Bilbisi and Tateishi, 2004, p.14). Land use conditions before the Emirate largely relied on historical accounts. For Amman in 1903, remarks from the Islamic scholar, Jamal al-Din al-Qasimi discussed the developing commerce of the city (Rogan, 2019,

p.91). Increased commercial activity seems to have developed from the construction of the Hejaz Railway in the early 20th century.

Commercialization had occurred, to some degree, before the Circassian settlement in 1878. Bedouin and merchants from Salt (west of Amman) used the Amman rest point on the Mecca pilgrimage route as a marketplace to sell their wares (Hamarneh, 2019, p.62). In 1893, Robinson Lees noted extensive areas of Circassian commerce with a street dedicated to their shops (Hacker, 1960, p.17). Prior to this, varying stages of land use were analyzed through a more agricultural lens. Oliphant (1881) described some of the land use for the early Circassian settlement by describing their vegetable gardens and livestock herds. Remarks on land use were the basis for many understandings of the population at Amman since its decline during the Abbasid Period (750-1517 CE). Sir Henry Layard noted parcels growing corn and barley as he passed the city in 1840 (Hamarneh, 2019, p.58). Other accounts have commented on the agricultural practices which attested to the agricultural prowess of the Amman area. Agricultural conditions were likely more developed during the Roman Period as the larger Roman city would have required additional food supplies. Such agricultural conditions are threatened nowadays as urban sprawl has pushed the city sprawl into the fertile lands to the west.

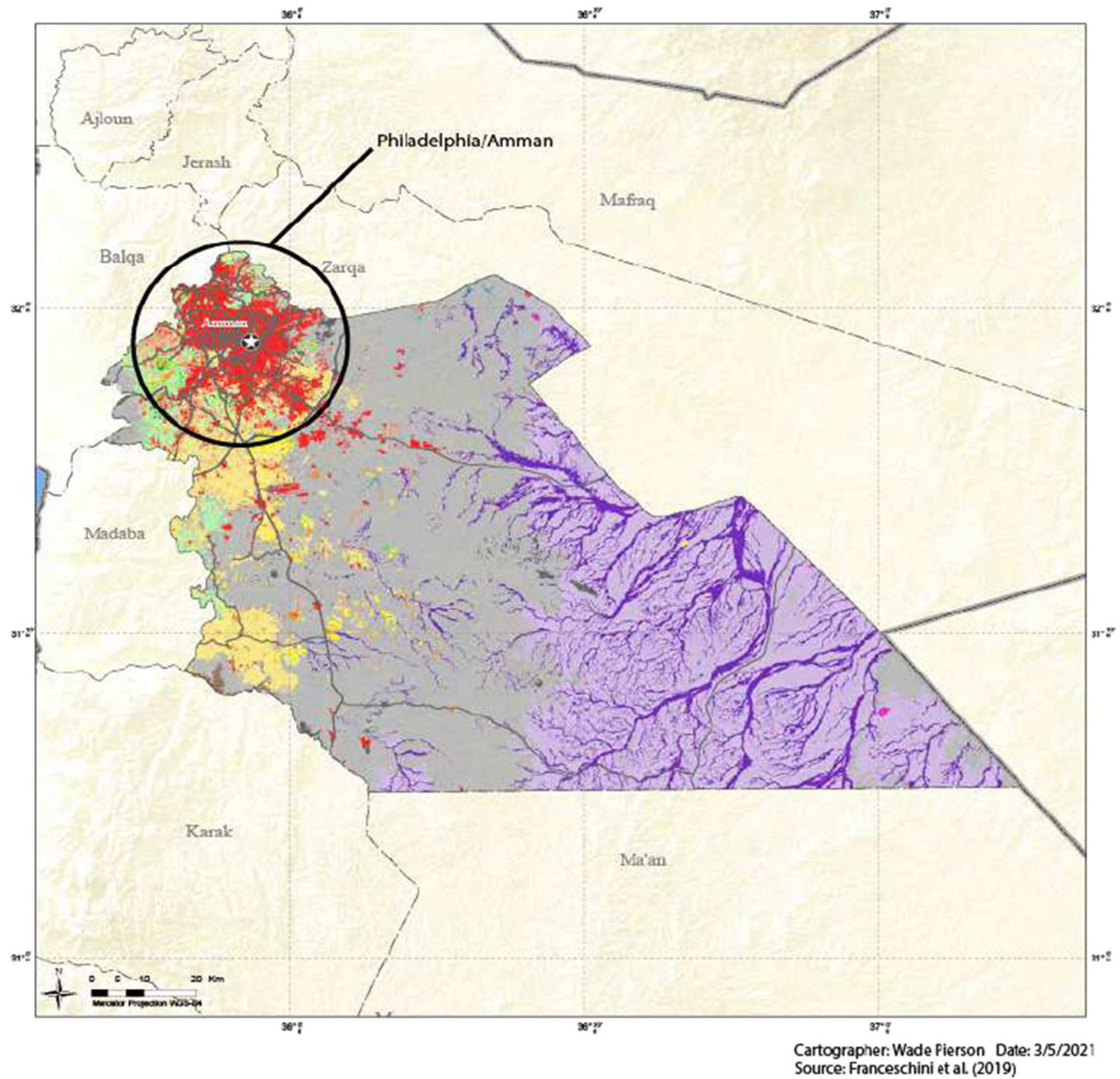


Figure 5.25- Land Cover of the Amman Governorate using Sentinel-2 Imagery (Franceschini et al., 2019). The Greater Amman Municipality is circled in the image.

Table 5.4- Land Cover Legend of the Amman Governorate (Franceschini et al., 2019).

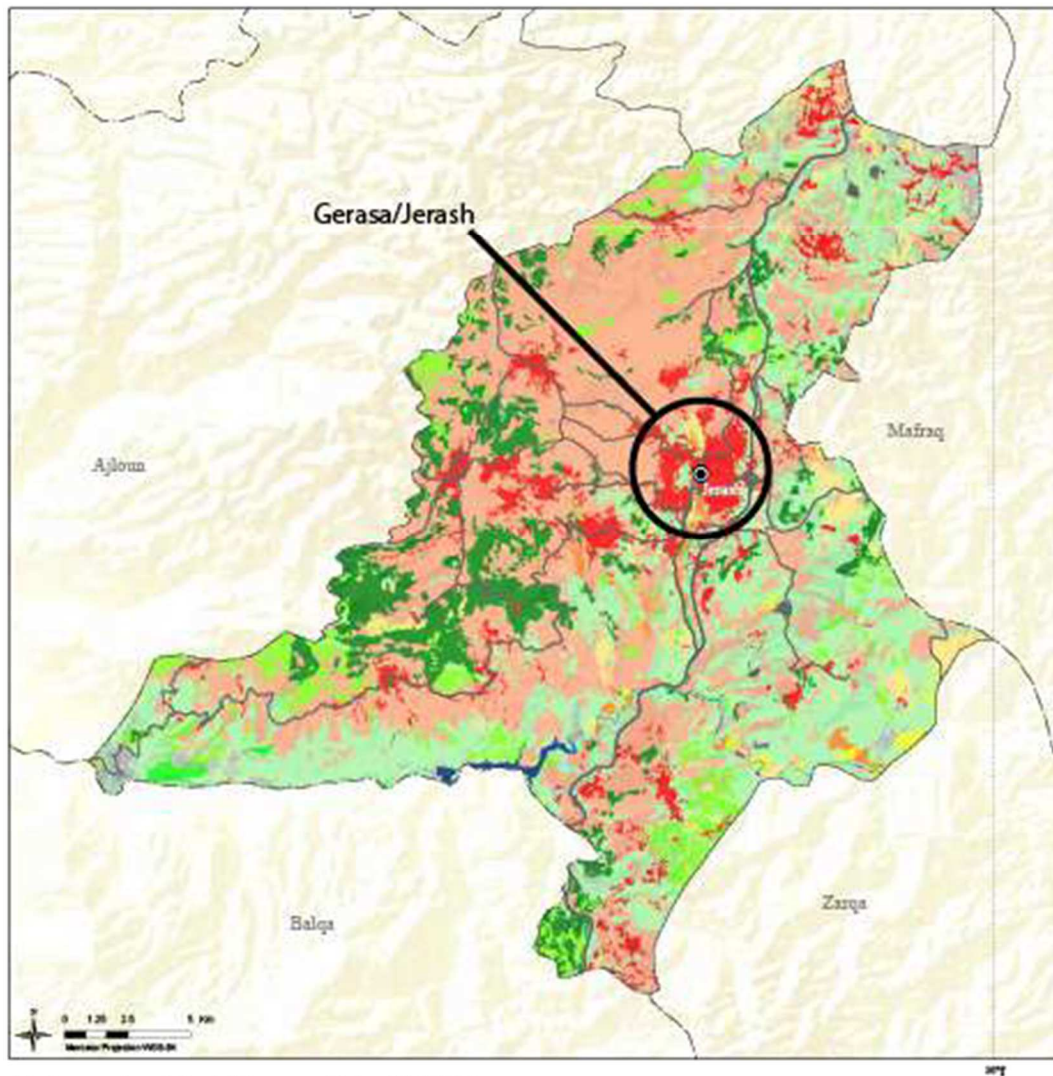
LAND COVER CLASSES	DISTRICTS										TOTAL km ²	TOTAL %
	Al- Jami'ah'	Al- Jizah	Al- Muaqqar	Al- Quaisma	Marka	Na'oor	Qasabet Amman	Sahab	Wadi Essier			
Irrigated orchards	0.01	19.09	4.36	0.44	0.34	0.60	0	0.9	3.04	27.96	0.4	
Irrigated herbaceous	0	47.85	6.50	0.02	0.34	1.04	0	0.37	1.55	57.66	0.8	
Rainfed herbaceous crop	3.94	308.05	16.17	29.40	4.48	42.55	0.18	20.66	6.20	431.64	5.7	
Rainfed orchards	10.25	22.05	2.70	4.24	1.37	27.76	0.04	1.66	27.87	97.93	1.3	
Closed trees	2.21	0.02	0	1.86	0.52	4.03	0.40	0	1.26	10.30	0.1	
Open trees	0.86	0.32	0	0.40	2.53	1.20	0	0	6.69	12	0.2	
Woody vegetation	0.29	0.54	0	0	0	0.43	0	0	1.56	2.82	0	
Grasslands	25.36	48.63	0.27	6.39	4.55	45.58	1.14	0	41.53	173.46	2.3	
Build-up	71.26	45.28	37.29	66.94	71.35	26.97	43.13	23.73	37.77	423.72	5.6	
Bare soil	6.79	2,207.68	542.96	9.38	170.12	34.01	0.49	372.20	17.22	3,360.85	44.3	
Undifferentiated bare	0	10.90	0	0	0	0.49	0	0	0	11.39	0.1	
Bare rock granite	0	0	0	0	0	0	0	0	0	0	0	
Chert plain	0	2,103.98	88.90	0	0	0	0	29.61	0	2,222.50	29.3	
Basaltic plain	0	0	0	0	0.13	0	0	0.11	0	0.24	0	
Sandy areas	0	0	0	0	0	0	0	0	0	0	0	
Saline soil	0	0	0	0	0	0	0	0	0	0	0	
Extraction site	0	22.73	0.06	1.06	6.96	0	0	0.17	0	30.98	0.4	
Saline waterbody	0	0	0	0	0	0	0	0	0	0	0	
Natural waterbody	0	0.17	0.05	0	0	0	0	0	0	0.22	0	
Artificial waterbody	0.01	2.01	0.06	0.11	0.01	0.03	0	0.03	0.09	2.33	0	
Wetlands	0	2.19	1.43	0	0.01	0	0	2.40	0	6.03	0.1	
Wadi	0	631.93	50.91	0	0	0	0	31.21	0	714.04	9.4	
Mudflat	0	4.50	0	0	0	0	0	0.99	0	5.49	0.1	
TOTAL LAND	120.97	5,477.92	751.66	120.23	262.72	184.69	45.37	483.22	144.79	7,591.57	100	

Jerash/Gerasa- Jerash lays only some 40 kilometers from Amman. As such, many of its underlying land-use and land cover factors are quite similar. Jerash lays within the same layer of Terra Rossa soils as Amman. Similar precipitation and soil type also place Jerash in the 'dry farming/forestry and horticulture' land use zone (Figure 3.2). While variable, average rainfall for Jerash slightly exceeded that of Amman at closer to 400 mm/year (Kennedy, 2013, p.52). In terms of elevation, Jerash sat somewhat lower at 521-789 meters ASML. Unlike Amman, Jerash was contained within the one district of the Jerash Governorate. The city did not dominate these statistics as Amman did. However, regional land cover still provided interesting insights into the interactions of land, people, and built environment. The largest single class came in the form of rainfed orchards at 161.7 km². Grasslands ranked second in area at 120.5 km². Urban build-up ranked in the middle at 31.66 km². It ranked slightly above open trees (26.96 km²) and below closed trees (38.14 km²).

Jerash was also noteworthy for the role of archaeology and tourism in its land use. As mentioned before, excavations took place fairly early in Jerash. Between some of these excavations, the Circassian settlement was established. Modern Jerash has developed within the Roman-era walls. Competing interests led to the unwritten understanding that the east bank of the Jerash Wadi belonged to the modern city while the west belonged to archaeological interests (Watts, 1997, p.448). Plans emerged in the 1970s to capitalize on tourism after the loss of the West Bank in Palestine. Jerash seemed a prime location as it had significant tourist attraction with 475,526 visitors in 2019 (Figure 5.26 and Table 5.5). However, sprawl defied these plans and surrounded the ancient city leaving an island of the archaeological park in the center of the city. It remained one of the foci of the Jordanian Government in terms of generating revenue.

Written accounts and other evidence for the land use of Circassian Jerash are scant. However, it can be assumed the Circassian settlers replicated certain actions and techniques found in Amman. A primary facet of this would be the increased use of lumber as a building material (Shawash, 2003, p.38). Unlike the Caucasus, northern Jordan was not an area of plentiful forests. Therefore, it stood to reason that Circassian building methods had some impact on the local forested land use as previously explained. Archaeological evidence conveyed some notions about land use in ancient Gerasa. Applications of water infrastructure and urban features have already been explored as they relate to the use of the land. However, there are other features of note in the ancient city. Inscriptions from the Temple of Artemis in the Severan Period (193-235 CE) told of a dedication by the “gardeners of the Upper Valley” (Lichtenberger and Raja, 2016, p.110). The topography pointed to these gardeners residing to the north of Gerasa, possibly near Birketein. However, their dedication to Artemis pointed to both organization and particular wealth. These wealthy citizens identified a certain suburban community for the ancient city of Gerasa and significant agricultural activities. Additionally, Jerash has become characterized as a cultural heritage tourism attraction. Hundreds of thousands of tourists flock to Jerash to marvel at its ruins (over 400,000 in 2019, Figure 5.27). In terms of tourism, Jerash was only surpassed by the more internationally-known site of Petra to the south. As such, curating the archaeological areas of Jerash have become major urban force in the city.

Landuse in the Jerash Governorate, Jordan



Cartographer: Wade Pierson Date: 3/5/2021
Source: Franceschini et al. (2019)

Figure 5.26- Land Cover of the Jerash Governorate using Sentinel-2 Imagery (Franceschini et al., 2019). The Jerash Municipality is circled in the image.

Table 5.5- Land Cover Legend of the Jerash Governorate (Franceschini et al., 2019).

LAND COVER CLASSES	Qasabet Jarash	TOTAL km²	TOTAL %
Irrigated orchards	3.02	3.02	0.7
Irrigated herbaceous crop	1.80	1.80	0.4
Rainfed herbaceous crop	11.92	11.92	2.9
Rainfed orchards	161.70	161.70	39.4
Closed trees	38.14	38.14	9.3
Open trees	26.96	26.96	6.6
Woody vegetation	1.81	1.81	0.4
Grasslands	120.50	120.50	29.4
Build-up	31.64	31.64	7.7
Bare soil	10.16	10.16	2.5
Undifferentiated bare	0	0	0
Bare rock granite	0	0	0
Chert plain	0	0	0
Basaltic plain	0	0	0
Sandy areas	0	0	0
Saline soil	0	0	0
Extraction site	0.76	0.76	0.2
Saline waterbody	0	0	0
Natural waterbody	0.65	0.65	0.2
Artificial waterbody	1.28	1.28	0.3
Wetlands	0	0	0
Wadi	0.02	0.02	0
Mudflat	0	0	0
TOTAL LAND	410.37	410.37	100

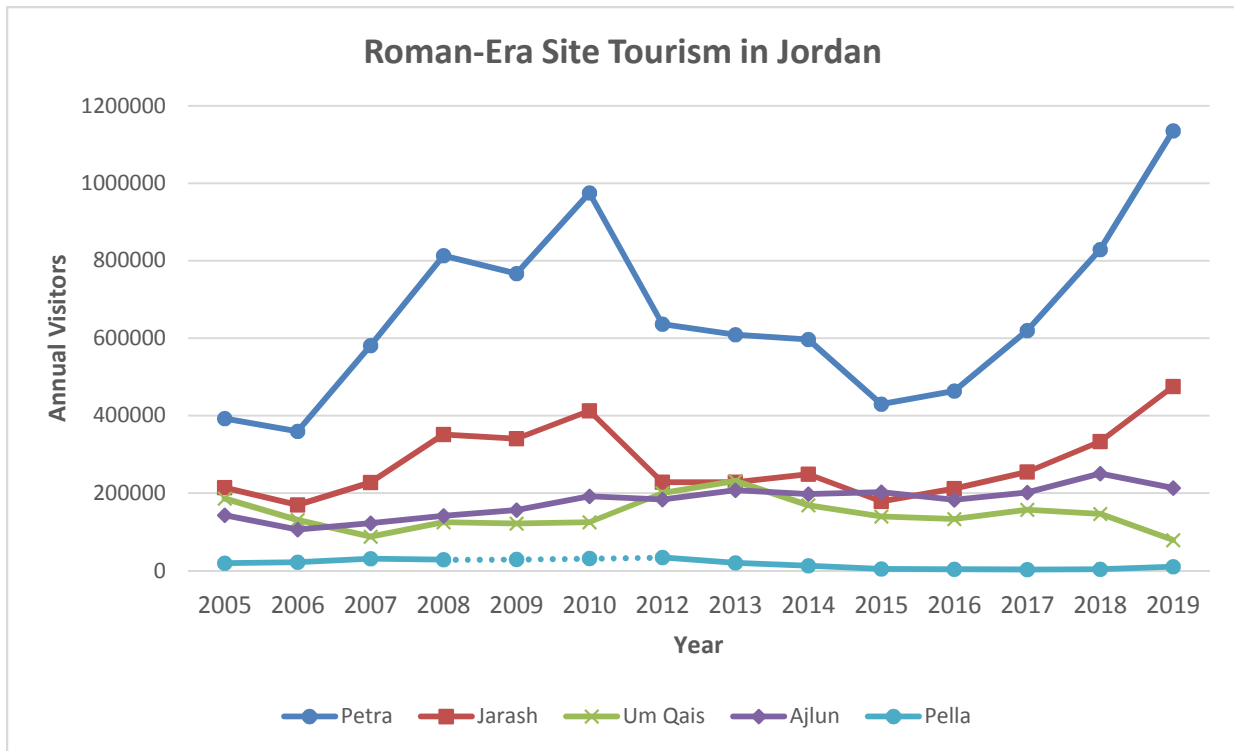


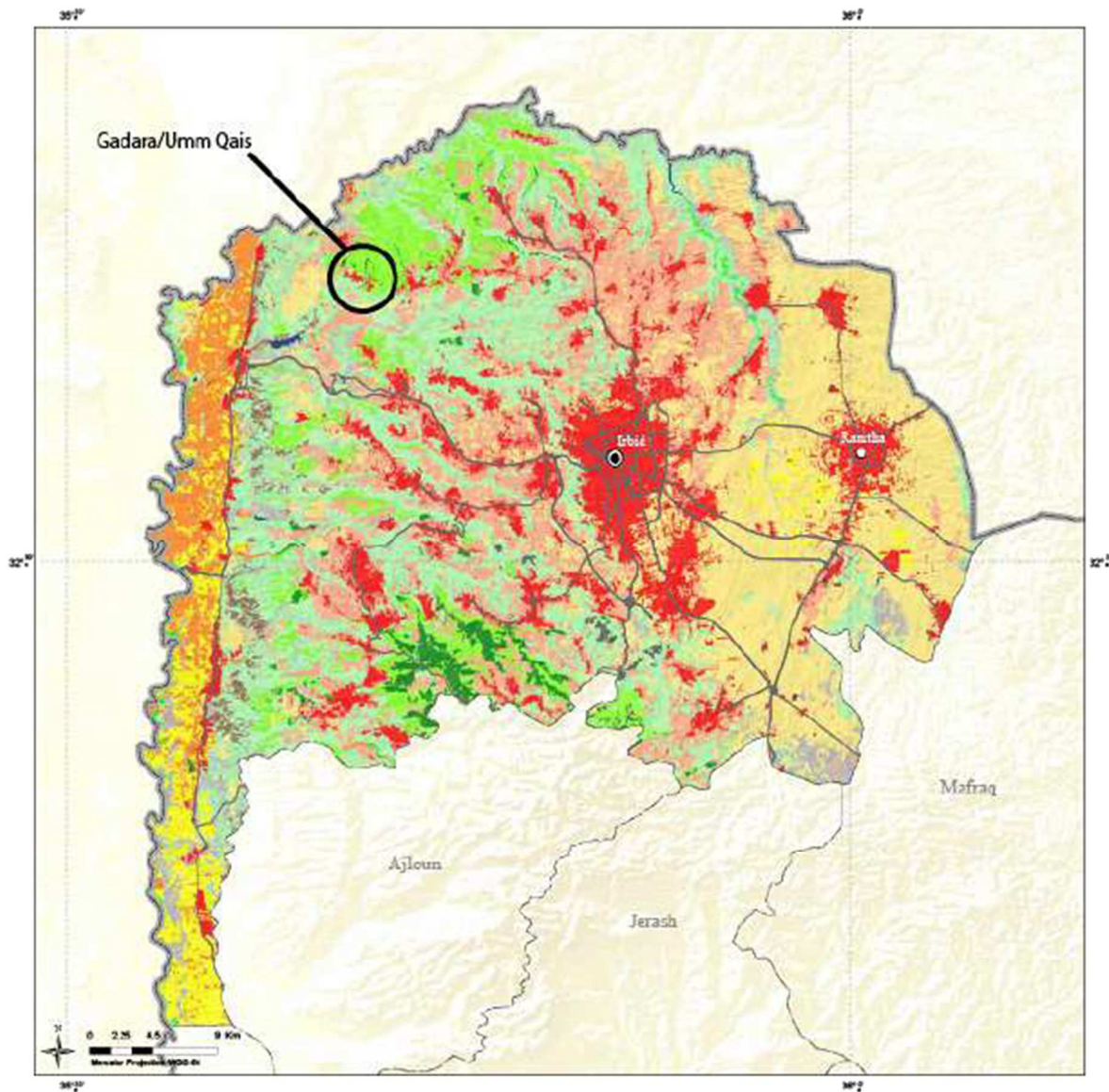
Figure 5.27- Annual visitors to Jordan’s most popular cultural heritage tourism sites (Ministry of Tourism and Antiquities- 2005-2019).

Umm Qais/Gadara- Umm Qais is the northernmost of the sites in this study and was located just south of the borders with Syria and Israel. Umm Qais was also the lowest of the sites at 286-391 meters ASML and also experienced the most rainfall with over 400 mm/year (Kennedy, 2013, p.52). The city sat on a perch of Terra Rossa soils surrounded by rich Jordan Valley soils and Yellow Mediterranean soils (Kennedy, 2013, p.54). Umm Qais and its surrounding area were split between ‘dry farming/forestry and horticulture’ and ‘forest/grazing land cover classifications (Figure 5.28 and Table 5.6). Umm Qais could be analyzed amid the Bani Kenanah District of the Irbid Governorate. Umm Qais was relatively small but the district gave general indications of the land interactions of the city. The largest land cover class was grasslands at 85.77 km² (Table 5.6). This was followed by rainfed orchards at 76.28 km². Open trees ranked third at 45.15 km². Urban build-up generated a surprising 20.74 km² in this area.

Tracing back land use for Umm Qais did not involve a complex development due to the relatively light urban development of the city. However, the increased attention of cultural tourism has had an impact on land use. Initially prioritized for excavations, the ancient acropolis recently became more of a tourist attraction. Umm Qais ranked as one of the most visited sites in Jordan with a peak of 231,493 visitors in 2013 (Figure 5.27). Attempts to profit from this tourism led to government and corporate attempts to renovate the old Ottoman village into a resort in the 1980s and 1990s (Brand, 2000, p.30). This became an issue due to the resettlement of several inhabitants from the area in the 1970s; tourist revenue also partially changed the function of the site.

Moving back in time, land use was mostly agricultural. European explorers noted the cultivation of the land while the cultivators repurposed ruins and tombs into domiciles. The agrarian history of Gadara/Umm Qais was quite noteworthy. Evidently, Gadara was renowned for its wine production to the point where Arab writers in the 7th century were familiar with the city (Mershen and Knauf, 1988, p.131). Aside from the urban features of Gadara, little more could currently be gleaned about land use in ancient Gadara.

Landuse Irbid Governorate, Jordan



Cartographer: Wade Pierson Date: 3/5/2021
Source: Franceschini et al. (2019)

Figure 5.28- Land Cover of the Irbid Governorate using Sentinel-2 Imagery (Franceschini et al., 2019). The town of Umm Qais is circled in the image. Umm Qais lays in the Banu Kenanah Subdistrict.

Table 5.6- Land Cover Legend of the Irbid Governorate (Franceschini et al., 2019).

LAND COVER CLASSES	DISTRICTS										TOTAL km ²	TOTAL %
	Al-Aghwar Ash- Shamaliya	Al- Koorah	Al-Mazar Ash- Shamali	Al- Wastiyya h	Ar- Ramtha	At- Taybeh	Bani Kenanah	Bani Obeid	Qasabe t Irbid			
Irrigated orchards	61	0.45	0	0.12	0.20	0.29	0.60	0.35	0	63	4.0	
Irrigated herbaceous	61.47	0.02	0	0	8.02	0	0.07	0.67	0.65	70.90	4.5	
Rainfed herbaceous	11.21	5.11	5.42	1.43	173.40	6.27	15.90	91.28	40.66	350.68	22.4	
Rainfed orchards	2.52	39.99	25.35	15.73	16.66	14.34	76.28	22.27	68.42	281.56	18	
Closed trees	0.23	12.25	9.06	0.03	0.18	0.17	2.51	1.23	0.30	25.97	1.7	
Open trees	1.39	24.23	10.05	3.91	0	6.79	45.15	4.54	1.12	97.19	6.2	
Woody vegetation	5.89	0.29	0	0.04	1.81	0.09	1.20	0	0.39	9.71	0.6	
Grasslands	55.05	68.75	24.22	15.75	28.43	25.74	85.77	28.12	54.14	385.97	24.6	
Build-up	13.92	20.48	10.60	6.50	31.61	6.47	20.74	28.91	67.63	206.85	13.2	
Bare soil	19.84	4.71	0.43	2.04	10.43	1.44	2	10.36	2.34	53.59	3.4	
Undifferentiated bare rocks	8.83	2.45	0	0.10	0	1.96	0	0	0	13.35	0.9	
Bare rock granite	0	0	0	0	0	0	0	0	0	0	0	
Chert plain	0	0	0	0	0	0	0	0	0	0	0	
Basaltic plain	0	0	0	0	0	0	0	0	0	0	0	
Sandy areas	0	0	0	0	0	0	0	0	0	0	0	
Saline soil	0	0	0	0	0	0	0	0	0	0	0	
Extraction site	0	0	1.19	9	9	9	9	0.89	0.45	2.53	0.2	
Saline waterbody	0	0	0	0	0	0	0	0	0	0	0	
Natural waterbody	2.03	0	0	0	0	0	0.11	0	0	2.14	0.1	
Artificial waterbody	0.92	0.01	0	0.21	0.85	0	0.29	0.04	0.01	2.32	0.1	
Wetlands	0.03	0	0	0	0.18	0	0	0	0	0.21	0	
Wadi	0	0	0	0	0	0	0	0	0	0	0	
Mudflat	0	0	0	0	0	0	0	0	0	0	0	
TOTAL LAND	244.33	178.76	86.31	45.85	271.77	63.57	250.61	188.66	236.11	1,565.97	100	

5e. Demographics

Aside from their architectural and archaeological treasures and structures, these three cities also represent evolving communities of people. As such, analysis of urban spaces needed to include discussion on residents who lived during the various periods of the Decapolis. The historical record had several important contributions on this subject. Demographic analysis of these cities was primarily divided into population, economic, and cultural sub-categories.

Amman/Philadelphia- In terms of population, Amman has experienced the most drastic fluctuations. The Pre-Hellenistic population of Amman was approximately 3,000 (Figure 5.29) (Kennedy, 2017, p.239). Increases in Roman city design facilitated the population increase to around 5,000 although this number could have reached as high as 8,000 or 10,000. Complexities in estimating past populations will be explored in a later section. Population numbers for the periods after the Romans are incredibly hard to find. This is exacerbated by the general abandonment of Amman after the 8th or 9th centuries CE (Kennedy, 2017, p.137).

By 1893, Circassian settlers had brought Amman's population back to at least 1,000 residents. Populations for the Circassian settlements was largely dependent on historical writings. Consistent records were not kept by the Ottomans for this region. Therefore, one must rely on European explorers once more. Laurence Oliphant recounted an early sighting of this colony and reported an initial population of 500 (1881, p. 162). The latter number of 1,000 residents also came from the writings of a European traveler, Robinson Lees (Hacker, 1960, p.17). The Roman-era numbers were matched again only in 1918 (Alnsour, 2016). The 1940s saw the establishment of the Emirate of Transjordan, the declaration of Amman as the capital city, and other factors for growth. As such, the population grew between 26,000 to 45,000 in this period (Rogan, 1986, p.26). By the 1990s, Amman reached over a million inhabitants at

1,576,238 people. This was also the point where public censuses were taken regularly and bolstered the population estimates. Amman grew to 1,824,177 by 2004 and to a massive 3,895,991 people by 2015. The most recent statistics from the Kingdom of Jordan estimate the population of Amman at 4,440,978 residents for 2019.

Culturally speaking, Amman has also experienced significant shifts. Most historic ethnic/cultural compositions of the city required analysis through archaeological evidence. The earliest people at Amman were certainly a Semitic people: the Ammonites. Some elements of this early culture can be seen in the production and distribution of their statuary (Hübner, 1992, p.26). The next documented evidence for Amman's cultural character came in the 3rd century BCE when Ptolemy II Philadelphus rebuilt Amman as Philadelphia. The adoption of the name Philadelphia indicated a heavier Greek presence. However, the ease at which Amman became the name later on pointed to the Semitic influences remaining quite strong and possible links to the Egyptian god Amon Ra. It seemed likely that, in the Roman period, cultural blending occurred in Amman. As Roman designs took over the city streets, so it seems their culture, religion, and language seeped into local traditions. Epigraphic evidence pointed to this phenomenon. Dated to 69 CE, a particular inscription on a tomb identified the resting place of a Roman soldier from Philadelphia (Kennedy, 2013, p.176). This soldier possessed a Roman name, but the name of his father represents a Romanized form of a Semitic name.

Less was known about the ethnic/cultural makeup of Umayyad Amman. The construction of the Governor's Palace and Umayyad mosque atop the Citadel indicated religious shifts, however, it was unknown if the ethnic composition of the city also changed. Although, the name Amman was revived once the influence of the Romans was abandoned and/or removed. Following deterioration and instability, the permanent settlement at Amman was almost

completely abandoned. Circassian settlers initiated the next major cultural shift in the late 19th century upon their arrival. These settlers came from the Caucasus – the land between the Ottoman and Russian Empires. Although Muslim, these settlers possessed significantly different identities and cultures and settlements quickly integrated nearby Arab populations as they grew.

The next major shift came with the independence of Israel in 1948. Millions of Palestinian refugees flooded into Jordan. Amman, itself, absorbed an approximate 240,000 refugees from 1948 to 1967 (Rogan, 1986, p.28). Palestinians were from relatively similar cultures and societies as the native Arab populations of Jordan (i.e., Bedouin) or the early Transjordan residents. However, their mass in-migration led to internal divisions and discussions about the very nature of being Jordanian. Amman continued to absorb waves of refugees and immigrants. This intermixing of cultures and the need to quickly accommodate a quickly growing massive population led to a lack of physical representation of culture and environment (Rogan, 1986, p.28).

In tandem with the population numbers, the Jordanian censuses provided some information on the demographic makeup of modern Amman. The 2015 census contained three sections of interest: gender, urbanization, and nationality. Amman's size was also attested to by a nearly 98%/2% urban/rural divide (DOS, 2015). Nationality statistics were less useful than might be expected. Specific nationalities and ethnic groups were not explored but there was a general indication that roughly 1/3rd (36.2%) of Amman was of foreign nationality (DOS, 2015).

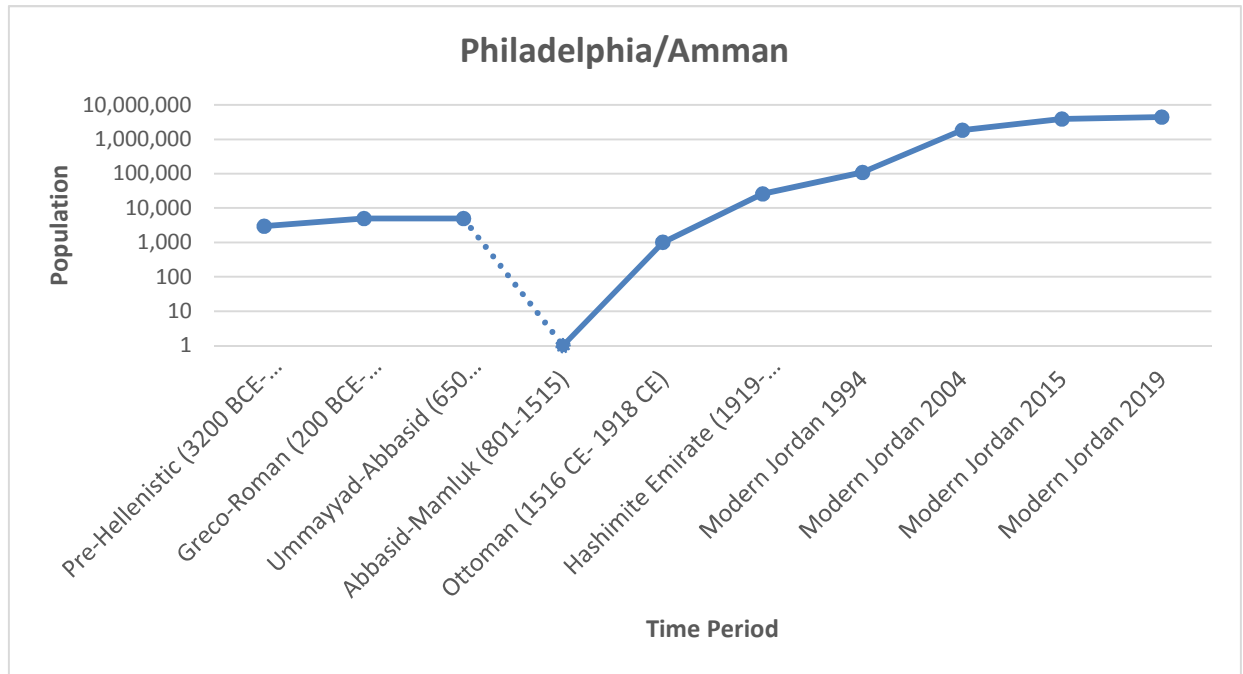


Figure 5.29- Population of Amman over time (Kennedy, 2017. Hacker, 1960. Alnsour, 2016, DOS 1994-2019).

Jerash/Gerasa- Numbers for Pre-Hellenistic Jerash were also generated from archeological estimates. Generally, the main indication was that the population was simply less than that of Roman Gerasa. Estimates placed this number around 3,000 (Figure 5.30). While the Roman period had a decidedly larger population, this number was still difficult to ascertain. Estimates are generated from contemporary cities, Roman army deployments, and architectural evidence (Kennedy, 2013, p.101). Such predictions placed the population between 8,000 and 20,000 from the 3rd century BCE to the 7th century CE. Other estimates have attempted to narrow this down to about 10,000 inhabitants. Architectural evidence suggested continued development at Jerash in the Umayyad period but possibly a reduced population (Figure 5.30). Like Amman, Jerash was largely abandoned by the 19th century. Between settlement by the Circassians in the 1870s and 1918, the Circassian village was roughly equivalent to that of Amman at 1,000 people. Connections to other Circassian villages and increased relations with the Bedouin tribes led to

the settlement doubling throughout the Emirate period. Jerash would experience explosive growth in the modern period. By 1994, Jerash was ten times the size of its Emirate population at 21,278 people. Ten years later, in 2004, the city had reached 31,652 people. Between 2015 and 2019, Jerash increased from 50,745 to 56,104 inhabitants.

Culturally, Jerash was characterized by its hybridity. The name of the city, originally Garshu, is clearly of Semitic origin which is attested in Nabataean inscriptions (Lichtenberger and Raja, 2016, p.63). Semitic origins of its name and close ties to the Nabataeans point toward a similar language and culture to the nearby Nabataeans. Once Hellenistic rule was established, the city name changes to ‘Antioch on the Chrysorrhoeas, the former Gerasa’ (Lichtenberger and Raja, 2016, p.6). Antioch denoted Seleucid influence while Chrysorrhoeas (golden river) attested to positive Greek views on the city. However, the inclusion of the Hellenized version of the Semitic name and the Semitic name’s quick revival were some of the indicators that the population was thoroughly Semitic even under Greek and Roman rule. Literary accounts provided some additional detail about Greco-Roman Gerasa. Josephus recounted amicable treatment of Jewish communities in Gerasa during the First Jewish Revolt in 66 CE. He explained that those in the city were left unharmed and that travelers were safely conducted through the city’s territory (Josephus, *Wars*, II,18.5). Archaeological evidence of limestone vessels, unique to Judaea, Samaria, and Galilee, have also been found in Gerasa (Lichtenberger and Raja, 2015, p.494). There were also architectural remains of synagogues in Gerasa until the 4th century CE (Lichtenberger and Raja, 2015, p.495).

Aside from the shift to Christianity, little can be gleaned about the culture of Jerash/Gerasa throughout the Byzantine period. However, there was substantial evidence about the culture of Jerash in the Umayyad and Abbasid periods. Excavations in the Northwest corner

of Jerash by the German-Danish Northwest Quarter Project uncovered numerous ceramic and architectural remains which showed trends among the developing populace. It was also very fortunate that the cultural makeup of Jerash was documented in a literary source. The Arab geographer, Al-Ya'qubi documented around 891 CE that Jerash was inhabited by a mix of Greeks and Arabs (Le Strange, 1890, p.462). While this was not the most detailed information, it points to a mixed population deemed worthy of mentioning by a contemporary geographer. After this period, Jerash eventually declined and a permanent population was almost completely lost.

In the 19th century, Jerash was resettled by Circassian migrants fleeing conflict in the Caucasus. These Circassians made up the majority of Jerash's population until the modern period. Explosive growth in Jerash partially stemmed from its proximity to the new capital of Amman. However, it also expanded greatly due to the influx of Palestinian refugees in the 1940s-1960s. Two refugee camps were established around Jerash in 1967-1968: the Souf and Gaza Camps. The Souf Camp sits to the north of Jerash, started with 1,650 prefabricated structures, and now contains 19,000 registered refugees (UNRWA). The Gaza Camp was established south of Jerash, started with 1,500 structures, and houses 29,000 refugees (UNRWA). Other modern indicators for the demographics of Jerash are somewhat generalized. Reports are limited to Governorate statistics, however, since Jerash is the largest city in its Governorate of the same name, these statistics should be sufficient general indicators of Jerash as a city (DOS, 2015). The vast majority of Jerash's population is currently characterized as urban at 77%. While 29.2% of Jerash is made up of foreigners while 70.8% are identified as Jordanian.

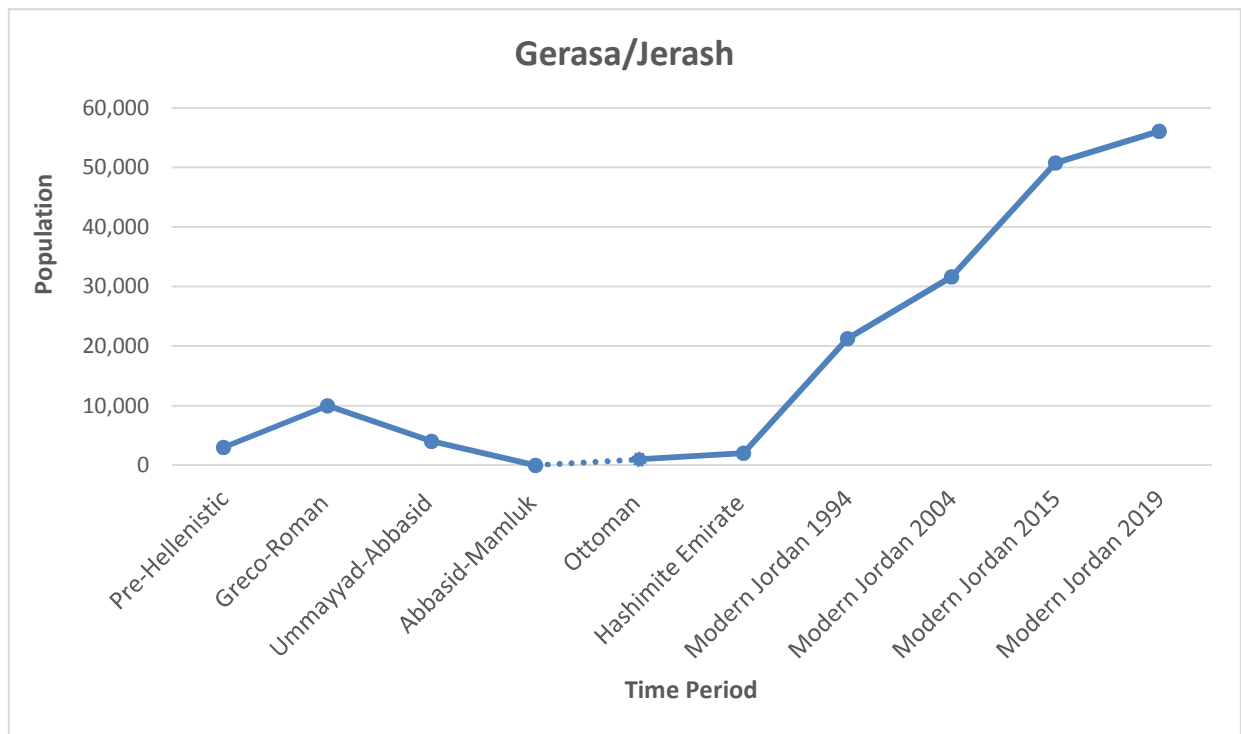


Figure 5.30- Population of Jerash over time (Kennedy, 2013. Hacker, 1960. Alnsour, 2016, DOS 1994-2019).

Umm Qais/Gadara- The third city of this study exhibited the smallest population variation. Pre-Hellenistic Gadara was difficult to estimate in terms of population. The population was certainly smaller than the later Roman settlement but how much smaller was debatable. The urban area was found to be approximately six hectares (Bührig, 2009, p.371). Applying the Roman era density of 150-200 inhabitants per hectare estimates the population at 1,050 (Figure 5.31). Gadara was unique, among the Decapolis, in its lack of an ephemeral stream. A lack of intermittent natural water sources and historical events allowed for far better estimates of Gadara's population. During the Hellenistic period, Josephus explained that Gadara was besieged for 10 months. Studies have shown that the water infrastructure of Gadara had the capability to support 2,050 people for the length of this siege (Keilholz, 2014, p.35). Increased water infrastructure during the Roman Period also allowed for more exact estimates. Cisterns and aqueducts provided as much as 1000 liters per inhabitant per day. Taking into account ancient

city densities, it was likely that Roman Gadara supported between 7,000 and 9,000 people (Keilholz, 2017, p.155). Unfortunately, there were no substantial information for the Byzantine and Umayyad Periods in Gadara. However, many of the complex Roman structures continued to be maintained in this period. There was most likely some level of decline during these periods however, the population probably remained somewhat the same.

Little data was available from the 9th to 16th centuries for the city, now known as Umm Qais. Ottoman tax registers indicated 39 households in the village which correlated to approximately 200 people (Mershen and Knauf, 1988, p.137). Umm Qais was not listed in Emirate records for the early 20th century although it was assumed that the population continued to rise from the establishment of more elaborate structures on the Ottoman village site. The first modern record of Umm Qais' population was found in 1994 where the village was listed at 3,426 residents. Umm Qais disappeared from the 2004 Jordanian Census and no data was found for this period. However, the 2015 Census listed Umm Qais with 6,124 inhabitants. Therefore, it is assumed once again that a growing trend occurred between 1994 and 2015. The village had increased again in 2019 to 6,770 residents.

Culturally, Umm Qais/Gadara contained several differences from the other study sites. Unlike Amman, ancient Gadara was not substantially and permanently settled until the arrival of Hellenistic forces. It appeared that the Greeks quickly established the city as a strategic fortress. However, Greek dominance was unlikely as the name Gadara, derived from the Semitic *Gadr*, was not replaced until the modern period. There was evidence of Seleucid influence as the names Seleucia and Antioch were found in reference to Gadara (Mershen and Knauf, 1988, p.130). However, these names were not found in common use in inscriptions or coinage. Semitic dominance was also supported by literary sources. Gadara was famous for the number of notable

resident scholars relative to its size and position. One of the most famous scholars was the poet, Meleager of Gadara in the early 1st century BCE. In one of his epigrams, the Gadarene poet praised his birthplace and opened with the Semitic greeting, '*Salam*' (Mershen and Knauf, 1988, p.130).

Moving to the modern period, the culture of Umm Qais/Gadara can mainly be traced in the evolution of its name. The name, Gadara, eventually became more associated with the nearby hot springs, Hammat Gadar, than with the original Decapolis city. Meanwhile, the name Umm Qais, derived from the Arabic word, *maks*, meaning tax (Mershen and Knauf, 1988, p.132). However, it seems that the evolution to Umm Qais was a long and confused process. Nevertheless, the name was clearly influenced by Arab inhabitants. Umm Qais also never experienced a massive influx of migrants. The Ottoman village meant Umm Qais was not selected as a site for Circassian colonization and small population numbers left little room for other migrant groups. This was supported by the 2015 census which lists the Bani Kananah district, which contains Umm Qais, at 85.5% Jordanian (DOS, 2015). Statistics were generalized for the small settlement of Umm Qais by the encompassing district. However, the region was largely similar in nature to Umm Qais. Finally, Umm Qais was part of a more rural area with 28.3% of its population coming from rural areas.

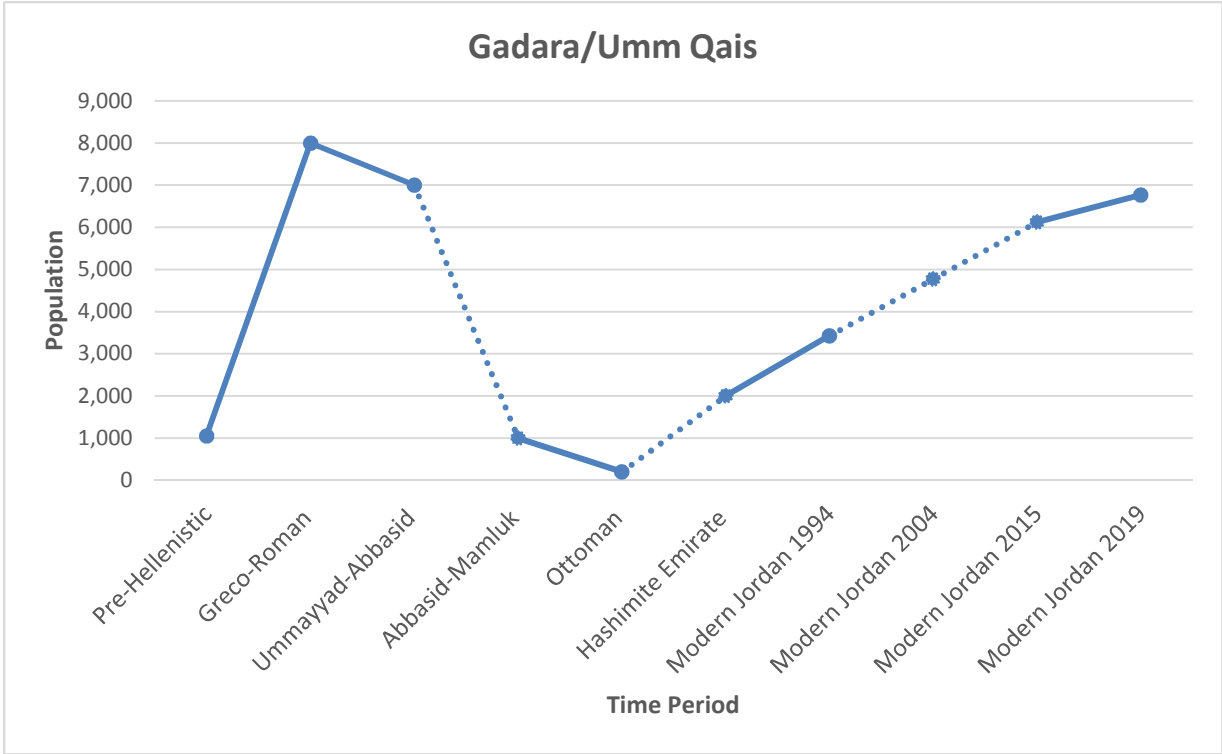


Figure 5.31- Population of Umm Qais over time (Keilholz, 2017. Mershen and Knauf, 1988. DOS 1994-2019).

Chapter 6. DISCUSSION

Thus far, data have been compiled from multiple sources in an attempt to understand the spatial development of the selected cities from the Decapolis. Similarities and overlap should be noted for the multidisciplinary approach in the previous section. The spatial analysis, pursued within this study, required compartmentalization to convey certain aspects of these cities. This section was dedicated to connecting and discussing the interplay between the methodological divisions from the previous section. Instead of a thematic framework, cities were discussed individually. A comprehensive view of each city's spatiality should be facilitated by this approach and further connections were discussed in the final section.

6a. Amman/Philadelphia

The sheer size of modern Amman often resulted in numerous problems and complexities when studying its urban space. This was exacerbated by the spasmodic growth periods where the city grew at an incredible magnitude. Given these considerations, it seemed appropriate to address some of the intricacies of urban space development in Amman. The previous section addressed the scale of urban build-up at varying points in time. However, such development required more spatial context for analysis. The urban build-up can be traced in relation to the surrounding topography and other periods (Figure 6.1). Roman Philadelphia was restricted to the Citadel and surrounding valley. It should be noted that the Roman-era extent was difficult to determine with certainty. Amman rapidly urbanized in the 20th century and much of the ancient city was covered by dense modern development. Excavations were largely limited to the Citadel and a few key structures of the lowland area. In 1918, Amman was restricted to the lowland areas around the Wadi. The lower elevation of Amman's urban build-up, in 1918, was further supported by elevation calculations. An average elevation of 769.189 meters AMSL ranked as

the lowest for Amman's urban history. The average elevation was a key measurement for Amman as the area was divided into many hills and low valleys. Initial settlement occurred at both the lowlands and the tops of hills. This can be seen in the Roman and 1918 variations of Amman. However, as the city developed, the average elevation rose. This occurred due to increased settlement in the western highlands but also because of increased construction on the steep mid-hill slopes of Amman (Potter, 2007, p.5). Such development led to buildings essentially stacking upon one another.

Interactions between population, environment, and urban build-up were incredibly important in understanding the development of Amman. The base numbers for Amman's population had been explored. Further context was established through urban density estimates. Densities were estimated with census data and the build-up maps. The results can be seen in Table 6.1. Roman Philadelphia had an unusually high density at 387 persons per hectare. Although, this estimate could be inflated as the total extent of the Roman city was unknown. In the modern period, densities can be seen rising from 36 persons per hectare to 133 persons per hectare between 1918 and 2020 (Table 6.1). In terms of environment, Amman sits between two distinct environmental zones. Elevation, soil, and climate contribute to bare lands and deserts at the eastern edge of Amman (Figure 5.25). Meanwhile, north and west of Amman are homes to cooler micro-regions full of grasslands and orchards. 1970 and 1989 showed extensive developments of Amman to the west while the east only received marginal development (Figures 5.25, 6.1). By 2020, this picture became obscured as arms of development reached toward the southeast, south, and southwest while continuing to the northwest.

Philadelphia to Amman: Urban Development

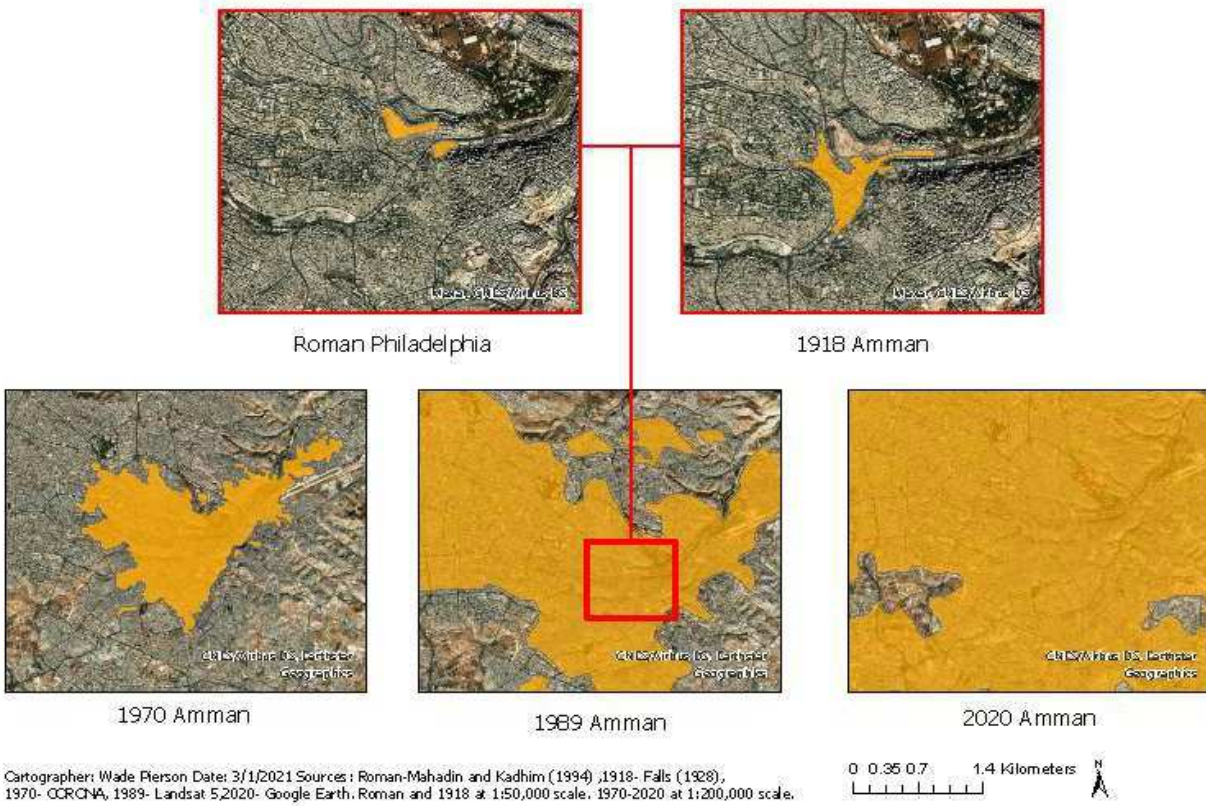


Figure 6.1- Urban Build-up of Amman from the Roman Period to 2020. Polygons built on archaeological excavations and satellite imagery.

Table 6.1- Urban Population Densities (Resident/Hectare) for the Decapolis cities of Jerash, Umm Qais, and Amman. Generated from population data (Figures 5.29-5.31) and area (Figures 6.1, 6.3, and 6.7).

<i>Period</i>	<i>Gerasa/Jerash</i>	<i>Gadara/Umm Qais</i>	<i>Philadelphia/Amman</i>
Pre-Hellenistic (3200 BCE- 300 BCE)	375	175	232
Greco-Roman (200 BCE- 600 CE))	118	233	387
Ottoman (1516 CE- 1918 CE)	N/A	N/A	36
Hashemite Emirate (1919- 1946)	181.81	33.33	104
Modern Jordan 1994	67	N/A	64.313
Modern Jordan 2004	N/A	60	106
Modern Jordan 2019	111	98	133

At this point, the urban development of Amman can be characterized along the three classical models for urban structure: Burgess Concentric Zone, Hoytian Sector, and Multiple Nuclei Models (Burgess, 2008/Hoyt, 1939/Harris and Ullman, 1945). Modern Amman was too large and complex to explain with any one model. However, general trends can be acknowledged. Amman was often conceptualized as two different cities. This often referred to a wealthier, more developed west and a poorer, less developed east. Tracking urban development indicated the presence of two main models of urban structure. Hoytian sector distributions were observed in larger/wealthier plots of land in the north and west of Amman (Potter et al., 2007, p.17). Likewise, sectors of industrial activity and denser housing can be seen in the northeast (towards Zarqa) and to the southeast. The remainder of the city had developed in a more concentric fashion around the old city (Ancient Philadelphia/1918 Amman). Lower grades of housing can be seen radiating outward from the original city which included the areas of former Palestinian Refugee camps (Potter et al., 2007, p.16).

By combining elements of morphology and networks, there were important similarities between the selected Decapolis cities. Structures that exemplified these similarities will be discussed in further detail. Additionally, features, unique to each city, were explored. The first structure that appears in each city is the Roman Theater. A key feature of Amman's theater was that it allowed for characteristic evaluation of Amman through time. Generally, the role of the theater, in the Roman city plan, can be seen as it frames the public forum with the Odeon. Complemented by colonnades and roads, these structures enclosed the forum and isolated it from the surrounding city. It can also be assumed that the population of ancient Philadelphia was sufficient to fill the majority of the 6,000-person-theater near the time of its construction (Kennedy and Bewley, 2004, p.153). The theater also operated as a useful tool in examining the development of modern Amman. One hundred years of change was documented in photographs from the Theater in 1920 and 2020 (Figure 6.2). Looking to the north or the south, one can see the replacement of wooded areas and bare hillsides with multi-story buildings and dense urban blocks.



Figure 6.2- Views of Amman’s theater looking south in the early 1900s (top) and in 2020(bottom). The top image is preserved in the Matson Collection at the Library of Congress while the current image was obtained in Google Earth; accessed 12/10/2020.



Public water fountains and basins, or *nymphaea* also featured prominently in the selected Decapolis cities. As sophisticated public water features, *Nymphaea* were important indicators of prosperity, engineering abilities, and public concerns of the Roman cities which housed them. These served the primary function of distributing water which the city populace could collect and bring home. However, they also operated as places of leisure and social interaction. The Amman *Nymphaeum* exemplified these features as it was constructed in a central part of ancient Philadelphia with its back to the central Wadi. The *Nymphaeum* of Amman was located in the southwest section of the ancient city. It was sited some 200 meters west of the theater and just south of the *Decumanus*. Like the theater, the *Nymphaeum* was likely constructed during the later 2nd century CE along with a large-scale Roman remodel of Philadelphia (Waheeb and Zu'bi, 1995, p.238). The structure was truly monumental in nature standing at over 12 meters tall in its three semi-domed apses. The half-octagonal shape also extended 68 meters with some 20 niches complete with statuary (Waheeb and Zu'bi, 1995, p.232). An *exedra*, a colonnaded social space, likely connected the *Nymphaeum* with the nearby colonnaded streets of ancient Philadelphia (Kadhim, 1993, p.283).

While most columns did not survive, archaeological remains indicate these colonnades were of the Corinthian order consistent with other structures of the period. Here, citizens could relax and interact with one another before or after their water collection sheltered from the elements. In terms of materials, significant portions of the *Nymphaeum* were constructed from various exotic marbles (Waheeb and Zu'bi, 1995, p.234). Additionally, a 26x15x3 meter water basin was discovered in the courtyard of the *Nymphaeum*. Although consistent with the Roman building methods of the site, this basin was centered in the northern section of the *Nymphaeum* which violated Roman standards of symmetrical design (Waheeb and Zu'bi, 1995, p.232). The

asymmetry of this basin and the existence of numerous other features conveyed some doubt on the designation of this structure as a Nymphaeum. The unique aspects of this structure indicate an independent monument for the city but the overall function would remain generally the same.

The Temple of Amman is also an important structure to discuss relative to the othersites. The Temple of Amman was constructed at approximately the same time as the large-scale remodel of Philadelphia in the mid-2nd century CE. It is notable for the immensity of its size as articulated by the remains of a 12-meter-tall statue of Hercules (Taylor, 2005, p.28). There are certain assertions that the Temple sits above previous altars and sacred spaces of the Iron Age. The limited real estate of the Citadel made this a possibility. With this possibility, the chancealso exists that Hercules could be an *interpretation Graeca*, a Greek interpretation, of a localgod. This would fit with similar trends of a Temple of Hercules at Gadara and further ties the two cities. Additionally, the lack of evidence for a Temple of Zeus Olympios draws some distinction between Amman/Philadelphia and the other two study sites.

Moving to unique features, Amman is noteworthy for its Umayyad Palace Complex. Architecturally, the palace represented a blend of Roman/Byzantine designs and Eastern (Sassanian) elements. Of the selected Decapolis cities, the palace complex represented the most extensive architectural project of the Umayyad Period. In many cases, its scale would not be surpassed until the modern era. To a lesser extent, Ancient Philadelphia's city plan was somewhat unique among the study sites. Archaeological investigations indicate that the city had both a *Cardo* and *Decumanus Maximus*. However, the remains of these areas have been lost to modern development. Additionally, the main streets operate in a somewhat different function than other cities. The Citadel sits largely isolated from the lower city save for a processional stairway. Both the Theater forum and Nymphaeum lay east of the intersection between the two

colonnaded streets. More of an ancient city could have existed where the two main streets intersected but this has yet to be verified. Even so, the preserved structures and the acropolis certainly made up a good portion of an ancient settlement. Also, the hilly relief of Amman would have restricted the formal layout of a Roman gridiron street orientation. However, the somewhat flatter landscape of Jerash's Roman-era city made it in ideal location for the implementation of Roman gridiron street forms.

6b. Jerash/Gerasa

In many respects, Jerash represents the middle ground between the other two study sites. While closer to Amman, Jerash lays between the capital and the small town of Umm Qais. The majority of the ancient city was well preserved but not completely devoid of development. One of the few problems with studying Jerash was the lack of attention the modern settlement has received in comparison to its adjacent ruins. It was the relationship between the ancient ruins and the modern city that made Jerash a particularly interesting study site. For instance, this relationship was explored through the expanding settlement and elevation. The Wadi Suf (or Wadi Jerash) cut through the center of Jerash from the north. The wadi and its surrounding land represented the lowest elevations in and around Jerash. The channel banks of the wadi rise to either side of the stream which reach some of the highest points in the area. The west bank rises to a higher elevation than the flanking eastern banks.

This all becomes important when analyzed in tandem with the urban area over time. The original Hellenistic settlement largely sat upon the area known as the 'Camp Hill' at Modern Jerash. This area sits between the Temple of Zeus and the modern Museum at Jerash. Small in area, this settlement also lacked relative elevation disparities with a maximum of 587 and a minimum of 562 meters above mean sea level. By the Roman Period, the settlement climbed the

slopes of the west which is where the monumental structures were located. This city contained substantially higher elevations and looked down over other portions of the area. Circassian resettlement of Jerash was initially based around the wadi. This area was ideal for settlement as it facilitated agriculture and provided fresh water. However, this area was also notably lower and more consistent in elevation. As the city grew, it expanded around the ancient ruins (Figure 6.3). Initial developments in 1970 continued to take advantage of lower, more level ground. By 1989, modern Jerash had expanded into surrounding highlands and the current city had recently expanded into much higher land further east of the city.

Gerasa to Jerash: Urban Development

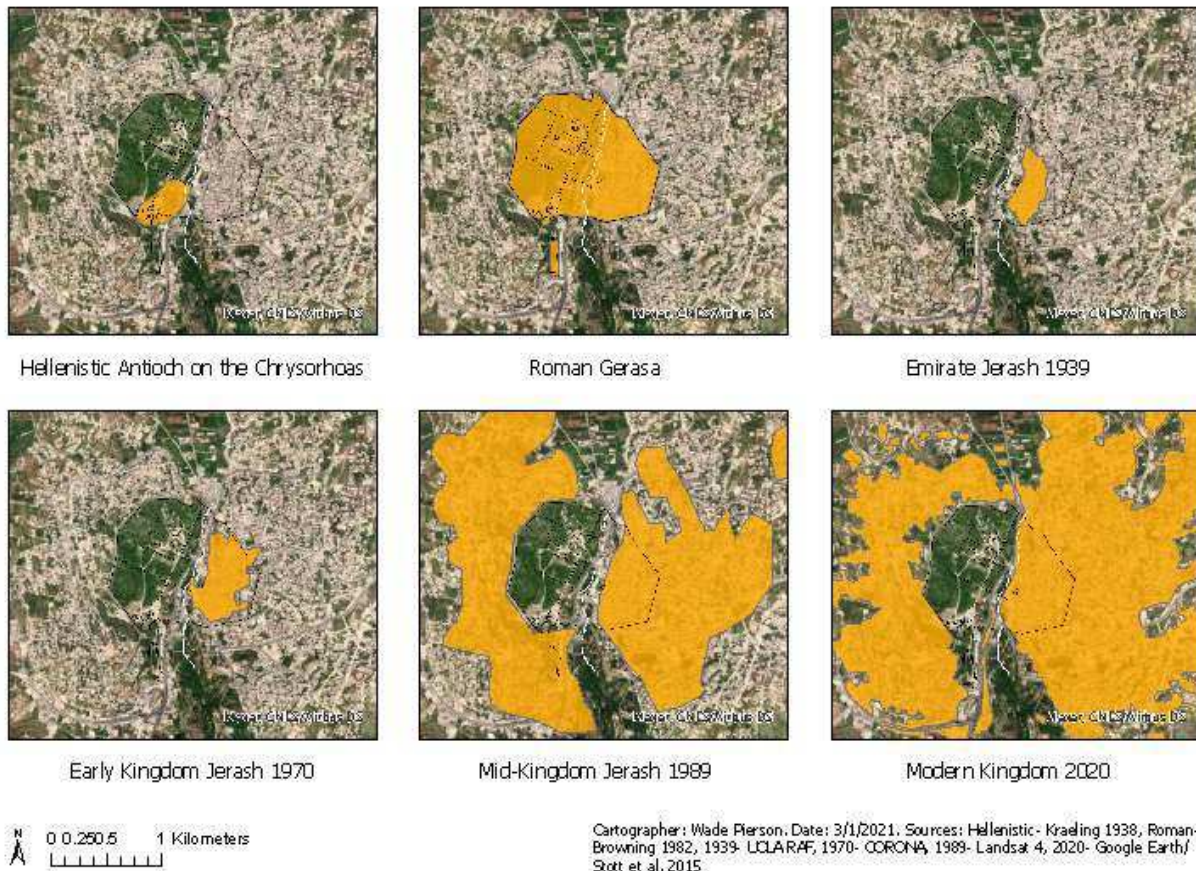


Figure 6.3- Urban Build-up of Jerash from the Roman Period to 2020. Polygons built on archaeological excavations and satellite imagery

This 'middle ground' nature of Jerash was reinforced when analyzing the density of its historical populations. While the Hellenistic settlement appeared incredibly dense at 375 persons per hectare, this could vary greatly as the exact area of this period was unknown. In the Roman period, Gerasa grew substantially in both size and population. Estimates placed density, for this period, at 118 persons per hectare (Table 6.1). Data was unavailable until the late Ottoman period/Emirate period when Circassians resettled Jerash. Numbers were difficult to verify but photographic evidence of the settlement allowed for some approximation. This period exhibited densities of approximately 181 persons per hectare. Expansion by 1994 led to decreased density of around 67 persons per hectare. This likely stemmed from increased suburban development at Jerash. Nowadays, this density has increased to 111 persons per hectare, between that of modern Amman and modern Umm Qais.

In modern Jerash, there seemed to be little indication that development had occurred along a preferred environmental path as in Amman. Jerash is surrounded by land suitable for orchards and grasslands but it is still a relatively small area. Therefore, it seemed that human factors were more likely to direct Jerash's development. Historically, development was contained within the walled areas of ancient Gerasa until massive development in the 1980s (Figure 6.3). As mentioned, the early modern settlements at Jerash could have been restricted by the need to stay close to the wadi as their water source. The ancient ruins were surrounded by urban development while expansion occurred along transportation routes in the east. Current developments in Jerash appeared to be fueling this trend. The city continued to grow into the west with suburban sprawl, and to the east along the Jerash-Khraisha Interchange highway system.

Development along both sides of the wadi channel was explored and analyzed through historical imagery. Urban development for western Jerash can be displayed by orienting around the circular plaza of the south *decumanus* (Figures 6.4 and 6.5). Early images showed an undeveloped landscape in 1939. While relatively sparse settlement can be seen in 1998, with continued growth by 2005. However, images from 2015 showed extensive development and urbanized infill for this area of Jerash.



Figure 6.4- Historic Aerial Imagery of Jerash’s western side from 1939. The Circular Plaza is marked by a white arrow to help illustrate the change in urban area outside of the ancient city walls. Imagery from APAAME.



Jerash Western Development- 1998 APAAME



Jerash Western Development- 2005 APAAME



Jerash Western Development- 2015 APAAME

Figure 6.5- Historic Aerial Imagery of Jerash's western side from 1998, 2005, and 2015. The Circular Plaza is marked by a white arrow to help illustrate the change in urban area outside of the ancient city walls. Imagery from APAAME.

In terms of urban morphology, Jerash displayed a complex urban image. The urban core of the Circassian settlement initially expanded within the Roman walls in a compact manner. Since then, the city began to radiate outward in what would seem to be a model of concentric expansion (Burgess, 2008). More recent urban development pointed to some forms of Hoytian Sectors as Jerash grew toward its transportation arteries and as more suburban and exurban housing grew surrounding the archaeological park (Hoyt, 1939). Additionally, services and amenities for the tourist industry have developed in a southward sector flanking the hippodrome.

Moving to morphological characteristics, Jerash shared a number of similar structures to the other Decapolis cities. Notably, Jerash contained two Roman theaters. The Southern Theater was the larger of the two in Jerash and was roughly contemporary to Amman's Roman Theater in date of construction though slightly smaller and currently missing its *summa cavea* (or upper deck of seats). Jerash's southern theater was well preserved in some ways while damaged in others. The upper seating sections (*cavea*) were restored after centuries of abandonment. In terms of function, Jerash's southern theater played a different role than Amman's. It did not form a central plaza in concert with a smaller theater. Instead, it ran adjacent to the Temple of Zeus which had to be used to access certain seating areas of the *cavea* (Kraeling, 1938, p.19). The Odeon at the northern end of ancient Gerasa expressed a similar function. This theater was smaller than its southern counterpart but still formed an important component of the ancient city. Instead of the Temple of Zeus, the northern theater stood just adjacent to the magnificent Temple of Artemis. Jerash is also notable for a small theater north of the city proper at Birketein where the double cistern and small theater most likely provided a religious function while also representing a slice of suburban/rural development from the city.

Jerash is also home to a monumental nymphaeum. Originally cleared in 1925, the Nymphaeum sat directly below the Temple of Artemis complex (Kraeling, 1938, p.5). The structure was placed across the *cardo* and adjacent to the sacred approach street which led from the sanctuary to the eastern, residential quarter of the city. Such positioning placed the Nymphaeum in the heart of urban social life within ancient Gerasa. The Jerash Nymphaeum was substantially smaller than its counterpart in Amman with only a 22-meter-long façade occupying a single domed apse (Kraeling, 1938, p.21). The modest size of Jerash's Nymphaeum was offset by incredibly elaborate ornamentation and a moving architectural style (Figure 6.6, Browning, 1982, p.143). The façade had characteristic niches for statues and even had plumbing to direct water from these niches to a central basin. The structure was constructed primarily of limestone with marble facing on the lower levels and ornate plaster decoration at its upper levels (Kraeling, 1938, p.21). The Nymphaeum in Jerash can be dated by the accommodations of surrounding porticos to 191 CE (Kraeling, 1938, p.54). Continued use of the Nymphaeum after the Roman period was somewhat unclear. There was substantial evidence of continued water supply and bath complex use in the Byzantine period from the 4th to the 7th centuries CE (Lichtenberger and Raja, 2019, p.15). However, earthquakes in 749 CE severely damaged the centralized water supply of the city and individual cisterns replaced the elaborate plumbing infrastructure as Gerasa's water system. Lack of conducted water sources meant the Nymphaeum had to have fallen out of use by this time, if not earlier.



Figure 6.6- Closeup of Jerash Nymphaeum showing intricate detail of the façade. Photograph by T.R. Paradise (2007).

The city plan of ancient Gerasa was arguably the most striking feature of the archaeological site. In many ways, it was the most intact and traditionally Roman city plan within the selected Decapolis cities. The entire city was oriented along a mainly north-south running *Cardo Maximus*. This connected the extra-urban Roman roads to the city through a north and south gate. Further divisions of the city were laid out between two east-west running streets (*Decumanus*). Monumental structures were organized around these three colonnaded streets in very traditional fashions. However, the Gerasa city plan was also fairly unique. The colonnaded streets do not run directly north/south and east/west. Instead, they are tilted with the *Cardo* running slightly to the north-east. Despite the initial lack of strict geometry, the city was

engineered to establish its plan as the universalizing geometric reality of its percipients. Once inside the city, everything was controlled and organized to present the *Cardo* as the true northern axis. This was aided by constructions of porticos and tetrapylons which directed the eye-line. The eye-line dynamic was the greatest accomplishment of the Gerasan city plan as this process extends well outside of the city core to Hadrian's Arch to the south. From here, the plan was organized around regulating squares to direct sight past the hippodrome, through the Oval Plaza, and up to the Temple of Artemis (Watts and Watts, 1992, p.313).

This stood as a testament to the Roman city planners as the Gerasa city plan directed urban development for centuries. While the modern city developed along the less directed residential east of Gerasa, the Roman planning extended to the Umayyad period. Construction of a congregational mosque southwest of the Circular Plaza represented a continuation of Roman planning and building strategies. The mosque was constructed sometime around 710 CE and was occupied, in some form, until the 10th century CE (Barns, 2016, p.787). Modern settlement was initially dictated by the Roman city as it was contained within the Roman walls. However, the sprawling development of the last few decades has been organized around the recognized archaeological park which preserves partial effects of the Roman city plan (Watts, 1997, p.449).

There were also several features unique to ancient Gerasa among the selected Decapolis cities. Prime examples of unique structures included the Oval Plaza and Temple of Zeus near the Southern Gate. Certain elements of these structures have been mentioned. To summarize, the Oval Plaza was an interesting structure that most likely acted as a forum or public/commercial space for ancient Gerasa. The Plaza was notable for its irregular shape. Although called oval, the Plaza is only roughly oval or elliptical -- it more closely resembles a pear. The base of the Plaza was dictated by the Temple of Zeus where the approach descended to the plaza at a slight angle.

This base was met by a set of columns at the left and right. The left colonnade was somewhat shorter and curves at a shallower angle. The South Theater was accessed by traversing this colonnade. The right side of the base has a longer, more angled colonnade. These colonnades were Ionic in order and support an architrave between their spans. The two sides met to create the *Cardo*. The Temple of Zeus Olympios was designed to relate to the Oval Plaza as well. The entry to the Temple made up the beginning of the Plaza. From the leveled plaza, the Temple was reached through a large stairway that led to the temenos, or outer courtyard. Inside this colonnaded courtyard, there was an altar that is still visible today. The actual Temple of Zeus Olympios was sited farther up the hill connected by a staircase. The earliest structures of the Temple were constructed during the 1st century BCE in the form of a naos, or rectangular inner temple chamber (Lichtenberger, 2008, p.136). The courtyard was likely constructed 27-28 CE and the large prostyle peripteros temple came much later in 163 or 164 CE (Lichtenberger, 2008, p.136). Dating is key for this temple and the Oval Plaza as they have their origins in the Greek and early Roman period (1st century BCE- 1st century CE). This could explain their unusual features. Zeus Olympios also confirmed Seleucid influence as this version of the god was heavily promoted throughout Seleucid colonies (Lichtenberger, 2008, p.146).

6c. Umm Qais/Gadara

Almost the complete opposite of Amman, Umm Qais was relatively difficult to analyze due to its small size. Only well into the modern period did Umm Qais exceed the size of Roman Gadara. Since then, the city has only reached 69.11 hectares with 6,770 residents. At such a small size, it was difficult to identify larger practices and generalizations but easier to document the exact development of the city. In terms of elevation, Umm Qais and Gadara have quite differentiated circumstances. Both areas are relatively similar when examined at the regional

scale. However, modern expansions were developed upslope to 789 meters AMSL by settling the hills east of Gadara. The ancient city was also notable for being relatively flat however smaller in extent. The original Hellenistic settlement only contained a 25-meter difference between its minimum and maximum elevations. Variability increased substantially into the modern period. However, general trends showed Umm Qais developed along the upper reaches of the hills with wooded areas/orchards along the slopes.

As noted in the discussion on elevation, the area of Umm Qais has expanded to the east since the Roman Period (Figure 6.7). This seemed to be a major shift as the Roman city deliberately avoided or could not develop in this direction (Bührig, 2009, p.371). This carries some notions of land use as the western plain of Gadara was left unsettled. Extensive agricultural practices could be seen in the area and it could be estimated that the area was preserved for this use. Also, the small area limited the effects of preferred climatic conditions like those in Amman. Areas in Umm Qais were relatively homogenous and were surrounded by somewhat milder temperatures and higher rainfall than those of the Jordanian capital. The scale of development at Umm Qais made it difficult to assign it to a classical model of urban structure. However, some indicators point to a *multiple-nuclei* model. Early modern Umm Qais (1970) developed at two points. The upper Ottoman village and the lower, local village developed among different scales and fashions. The upper village developed in relation to the grain trade while the lower village formed a nucleus of 'peasantry development' (Harris and Ullman, 1945). The modern village has since developed a singular straight sector; the archaeological site had grown as a singular business area, with agriculture surrounding the area. Thus, urban design of Umm Qais would place it between the Hoytian Sector and Multiple Nuclei Models.

Gadara to Umm Qais: Urban Development

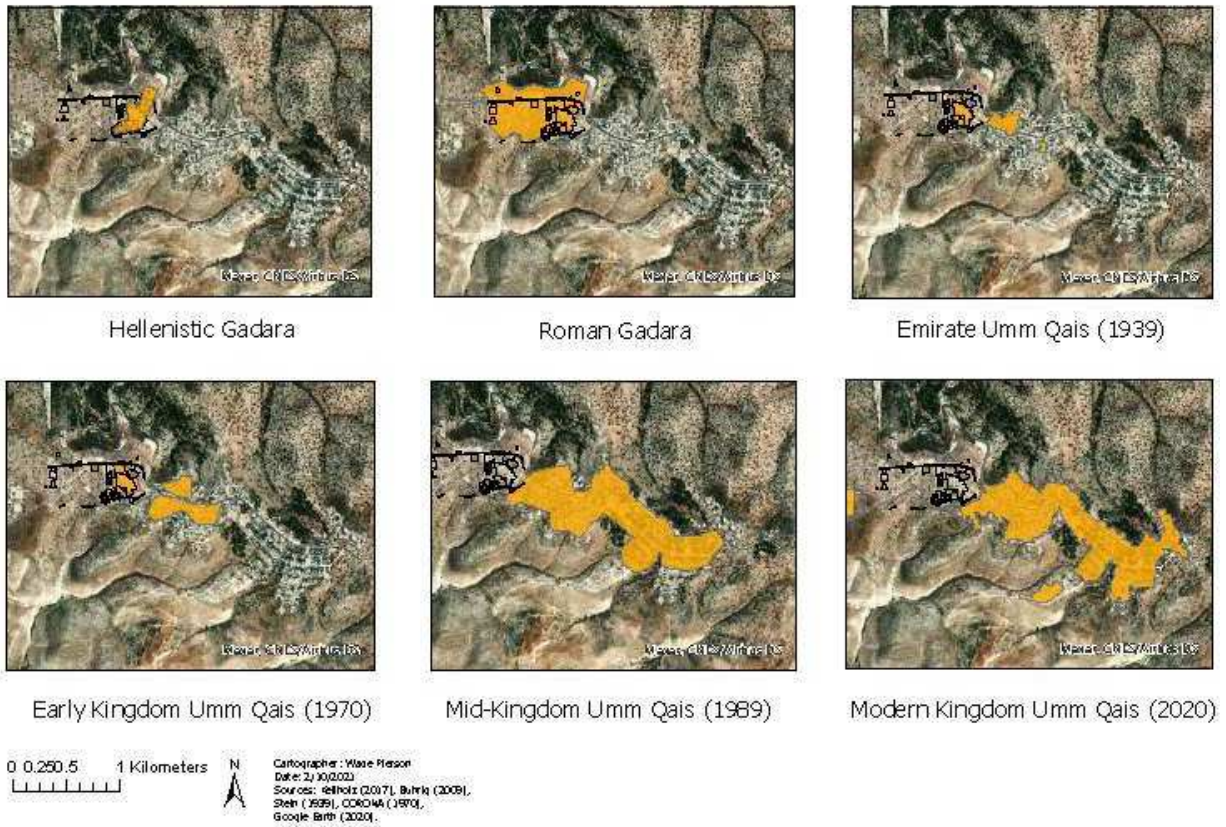


Figure 6.7- Urban Build-up of Umm Qais from the Roman Period to 2020. Polygons built on archaeological excavations and satellite imagery.

Umm Qais/Gadara was also explored and analyzed using the combination of demographics and dimensionality. Primarily, this was accomplished through population density estimations. The Hellenistic settlement of Gadara only contained around 1,000 residents. However, the original fortified position was also incredibly small at 6 hectares, or a density of 175 persons per hectare. Construction and development accelerated during the Roman period with densities between 233 and 200 persons per hectare. The prosperity Gadara experienced as part of the Decapolis signaled its greatest period of urbanization. Severe reductions in the 9th to 16th centuries led to an incredibly small 33.3 persons per hectare. The original Ottoman village also exhibited periods of development and urbanization. By 1994, the density doubled to 60.1 persons per hectare. However, this was also problematic as it was partially due to the government resettling of Umm Qais. The Ottoman-era settlement was completely uprooted in the 1970s and more urbanized projects were constructed to house the newly displaced population. Nevertheless, with a modern population of 6,770 people, Umm Qais had continued to grow in density at 97.97 persons per hectare. The essential removal of the Ottoman village and the preservation of the western plain can be seen through photographs between 1938, 1998, and 2017 (Figures 6.8 and 6.9).



Figure 6.8- Historic Aerial Imagery from the ruins of ancient Gadara in 1938. The image shows intact structures at the ruins and little other development while the latter two show larger buildings lower on the hill. Imagery from APAAME.



Figure 6.9- Historic Aerial Imagery from the ruins of ancient Gadara in 1998 (Above) and 2017 (Below). Note these images show larger buildings lower on the hill. Imagery from APAAME.



Umm Qais also contained many structures that enhance the common aspects between the Decapolis cities. As with the other sites, ancient Gadara contained two theaters. Eastern portions of Gadara made up the Hellenistic settlement and an extending terrace. By the Roman period, this terrace was graced with a Temple to Zeus Olympios with a theater directly across from a small forum (Bührig, 2009, p.369). This Northern Theater was the larger of the two at Gadara. At 85 meters in diameter, the Northern Theater was roughly comparable to the theaters of Amman and Jerash. However, further evaluations were limited by the lack of preservation for this structure. Most materials had been scavenged and the structure was mostly identifiable by its general shape in the landscape. The Western Theater represented a far more intriguing structure. It could be identified as an Odeon due to its smaller size but, at 52 meters in diameter, was still a considerable public feature. This theater was fairly well preserved and was notable for its basalt construction. Other theaters of the period were constructed with limestone, marble, or other local stones. These varied in color but paled in comparison to the distinct dark grey/black of the Western Theater's basalt blocks (Bührig, 2013, p.188). The theater was also fitted with imported marbles for the bases and Corinthian capitals of its columns. Indeed, the style of dark basalt and imported marbles characterized Gadarene construction practices during the Roman Period.

The Nymphaeum of Gadara contains similarities to the other study sites and a continuation of the building practices of the city. The Nymphaeum at Gadara was the smallest of the three sites at only 15 meters in its façade. However, it contained similar features to those of Amman and Jerash. These included a central apse and niches for marble sculptures. However, this Nymphaeum also represents the Gadarene style of the Roman period by interlacing marbles and limestones with local basalt (Bührig, 2013, p.188). Gadara also offered a distinct view of the Nymphaeum within the city plan. This structure was easily accessed as it was laid directly

adjacent to the main artery of Gadara, the *Decumanus*. However, it could also be seen that the Nymphaeum was representative of luxury and not necessarily of function. Gadara's extensive water management system displayed this reality as water control devices (culverts and cisterns) were designed to only supply the Nymphaeum once virtually all other areas were supplied (Keilholz, 2017, p.165). It was not clear if this was the case with other Nymphaea as they had the benefit of nearby permanent streams. However, the opulent design of all three structures could indicate their status as a place of luxury.

Aside from the peculiarities already mentioned, Umm Qais/Gadara had unique urban design. The ancient city initially developed on an acropolis hill that was bounded to the east. Areas to the west were relatively flat and open with steep slopes to the north and south. These topographic restraints led Gadara to develop along a singular, east-west axis. This was a slight departure from Roman designs as it lacked a north-south *Cardo* to accompany the city's *Decumanus*. Nevertheless, the city was certainly dominated by Roman design and planning after this wrinkle. The organization and architectural style of the city kept within the tradition of the other Decapolis cities except for its building materials, as mentioned above. Additionally, Umm Qais was notable for its Ottoman-era village. The city avoided complete abandonment for significant periods of time. This could be attributed to the better climatic conditions of Umm Qais or the security the area offered against Bedouin-Fellaheen conflicts. Either way, Umm Qais developed a charming village with Ottoman-inspired architecture instead of that of the Circassians as in Amman and Jerash.

Chapter 7. CONCLUSIONS and IMPLICATIONS

Urban development in Jordan has been an incredibly dynamic and accelerated process. Even though the area has a long history of urbanized settlement, recent interactions with the broader world have had dramatic impacts on the country's land use and development. These changes especially affect its cities as they attempt to wrestle with modern demands and ancient traditions. This being the case, the sites of Amman (Philadelphia), Jerash (Gerasa), and Umm Qais (Gadara) were selected for this study to show and analyze how and why cities have evolved over two millennia in Jordan. The cities chosen for this research were important members of the Roman-era Decapolis -- a federation of ten cities between Roman Syria and Palestine. During the classical period, all three cities exhibited similar urban development, extent, and character. However, how they developed spatially over the past 2,000 years was the focus of this study.

More similarities emerged between these three cities following the decline of the Roman Empire; they survived and thrived from the 3rd to the 7th centuries CE during some of the most catastrophic periods of the Roman/Byzantine Empires. Even the Arab conquests of the 7th century did not lead to their immediate decline. However, ecological disaster and political instability eventually led to large-scale abandonment of permanent settlements across Jordan. Urban growth was resuscitated in the 19th and 20th centuries when the Decapolis cities saw a relative rebirth due to external influences. This then led to varying levels of expansion further analyzed in this study.

The height of Decapolis economies coincided with Roman expansion across the Mediterranean stemming from the role the Decapolis played in facilitating trade between Rome and the East. Primarily, these cities achieved increased prosperity through cultural and economic adjacency with the wealthy Nabataean Kingdom of Petra fame. Although they displayed key

Roman characteristics, these cities remained an amalgam of Greek, Roman, and native Semitic peoples. This integration extended to the cities' names themselves: Amman (Rabbath-Ammon), Jerash (Gerasa/Garshu), and Gadara (Gadr) were all Semitic origin. However, Amman was renamed Philadelphia after a Ptolemaic ruler from Egypt and Jerash and Gadara received Seleucid dynasty names (Antioch and Seleucia).

Urban architecture also embodied the blending of Roman and eastern designs and influences. Roman-era Decapolis cities were notable for similarities in their built form. The three cities of this study had characteristic Roman city plans articulated through monumental colonnaded streets, theaters, aqueducts, nymphaea, and temples. Each city also offered unique variations of Roman principles in law, language, religion, and infrastructure. For example, Amman's Citadel represented a model of Decapoline urban evolution and continuity from its Iron Age fortification, to a grand Hellenistic temple, a Byzantine Basilica, and an imposing Umayyad Palace melded into the broader urban landscape we see today.

The modern settlements of today found their origins in the 19th century. Umm Qais was largely a product of the Tanzimat land reforms of the Ottoman Empire which led to the development of a small Ottoman village amid its Roman ruins. Since their slow abandonment over the last centuries, Jerash and Amman were only seasonally populated until Circassian immigrants established colonies under Ottoman administration. Modern developments, however, can be traced with more accuracy through new technologies. Through the use of aerial photography (and remote sensing) better estimations of urban extent were analyzed over the past century. This study implemented a number of photographic technologies (i.e., photogrammetry, multispectral imaging) for urban extent and land use changes.

Specifically, Amman experienced massive growth in size, population, and ecological variability. Its population has spiraled from 8,000-10,000 residents during the Roman era to more than 4 million by 2019. This growth was accompanied by an increase in the urban space to 33,000 hectares (333 km²) today. Multi-spectral imagery in conjunction with zoning codes shows that Amman developed high-end residential sectors to the north and west, and industrial and low-end housing to the northeast and southeast. Meanwhile, other residential development occurred in broader concentric zones over time.

On the other extreme, Umm Qais developed the least in terms of extent, variability, and population. Ancient Gadara grew along an east-west axis to nearly 30 hectares. With over one hundred years of modern development, the Decapoline city of Gadara -- Umm Qais today -- doubled its area to 69 hectares. Moreover, Umm Qais' growth was somewhat disconnected from its Hellenistic core to the west, unlike the radial expansion found in Amman. As the Jordanian government facilitated archaeological excavations of the ancient city, it led to the resettlement of the Ottoman-era village into a new, European-influenced settlements to the east. In terms of population, Umm Qais (6,770) has not exceeded the population of Roman Gadara (7,000-9,000) even with modern advances in technology and increased urbanization across Jordan. The Ottoman village atop the hill and a lower village represented a model for multiple nuclei urbanization, however, the small scale of Umm Qais may undergo new changes it continues to grow.

Jerash represented a median between the two poles of Amman and Umm Qais. The Roman city of Gerasa occupied roughly 80 hectares but has since expanded to 500 hectares in 2020. The population experienced similar trends as the Roman population of 10,000 2,000 years ago has grown to roughly 56,000 residents today. In this study, Jerash also represented a notable

balance between the preservation of ancient urban areas and modern urban growth and development. Forcible resettlement from the ruins was kept to a minimum, unlike Umm Qais, and the growing city has not consumed much of the original city, as was the case with Amman. The ancient Roman-era city of Jerash has been effectively preserved, but contemporary growth slowly ingesting its fringe (Figure 7.1). In terms of urban structure models, Jerash exhibited many trends related to the tourist industry, suburban expansion, and transportation convenience. While new evidence over the last decade reveals the gradual development of concentric zones around the burgeoning archaeological park-old city central area.

Collectively, the selected Decapolis cities in this study revealed an incredibly intricate picture of urban development and progression. Over time these cities have persisted on the periphery of major geopolitical actors and physical conditions. However, they have also overlapped with direct connections to these larger influences such as Hadrian's visit to Jerash, or the exponential growth of Amman due to the Palestinian refugee crisis. This research revealed the ability of these cities to integrate landscape, water resources, past tradition and technologies, land use, and political upheaval and migration to create thriving economies, societies, and legacies. Ecological and human influences led to three distinct levels of urbanization. Each city started with relatively similar urban positions within the Decapolis-era politics, economies, infrastructure, and population. However, human influences, like Emir Abdullah's decision to make Amman his capital in 1928, contributed to dramatically varying levels of urban growth and development.



Figure 7.1- Reconstructed illustration of ancient Gerasa (top) vs. 2015 imagery of Jerash (bottom). Reconstruction from Josep Ramon Casals/National Geographic and aerial imagery from APAAME.

Despite serious differences in population changes and scales of the built environments, the Decapoline cities of Philadelphia/Amman, Gerasa/Jerash, and Gadara/Umm Qais displayed the prevalence of both Roman influence and local hybridity. Each site provided particularly useful insight into the ancient influence and local adaptability due to the relatively equal starting points in terms of urban development. Much of the histories surrounding the three locations are deeply interwoven and paralleled. All three cities possessed intermittent Bronze Age (3000-1200 BCE) and Iron Age (1200-550 BCE) settlement but established more permanent and architecturally distinct forms in the Greco-Roman period (332 BCE-600 CE). These urban forms were complete with typical Roman structures (nymphaea, theaters, temples) and a gridded Roman street system. However, certain structures (e.g., Oval Plaza in Jerash) and epigraphic evidence (tomb inscriptions) pointed to local traditions and adaptations of traditional, foreign urban forms. These classical urban forms facilitated larger, more complex cities through resource management (aqueducts, roads, etc.) and improved building materials/practices. All three cities reached comparable levels of prosperity in the later Roman and early Byzantine periods (200-400 CE). However, these forms were not entirely sustainable in the face of ecological disaster and political instability.

The classical cities of the Decapolis continued to influence modern urban form through two main avenues: material/physical and historic/cultural. The material influence was the most readily apparent as modern settlements in the Decapoline cities were built atop and from the ancient ruins of the Romans. This meant modern settlements were direct manifestations of the Roman cities as foundations were reused and the Roman city plans were unconsciously followed centuries after their designers ceased to manage them. The material component was still a major factor in two of the study sites: Jerash and Umm Qais. These cities have remained small enough

that the overall character of each city was still affected to a noticeable degree. Jerash was the most obvious as the modern city surrounded the well-preserved half of the ancient city. Amman had developed to such large populations and areas that the physical/material influence of the ancient city was restricted to the Citadel in the central city. However, the more human elements of influence were seen across the cities to various extents. Aims at preservation, excavation, and tourism attraction were prioritized around the ancient ruins for the Decapoline cities. Amman saw attempts to incorporate the Citadel into a master plan for a 'modern' downtown district for the capital (Abu-Dayyeh, 2004). These attempts were successful in some ways but Amman continued to develop in rapid waves. While Amman developed over its ruins quite destructively, Umm Qais, as a modern settlement, suffered at the expense of its ancient ruins (Brand, 2000). Meanwhile, Jerash developed in a middle path where preservation was achieved in the western portion of the ancient city while the modern, eastern settlement was allowed to develop. Further, Jerash has since boomed from proximity to Amman and the tourist industry. As the world continues to urbanize, more and more ancient ruins will become at risk of serious damage from urban development. Likewise, as interests in scholarship grow, modern settlements, which are equally valuable, could be at risk as well. Therefore, it is crucial to consider the development of the Decapoline cities in how they have accommodated and adapted throughout their extensive histories.

The bridging of technologies (like satellite imagery and geospatial information science/GIS) and historical/urban study presented a well-informed path for studying the ancient cities of the Decapolis. It allowed for quantified analysis for how the populations of these cities changed while addressing their changing cultural practices and identities. It showed how Amman often retained a position of authority while sites like Jerash were more suitable for major cities.

The relationship between preservation and modern development was also heavily explored. These techniques both highlighted/celebrated the marvels of ancient structures and addressed the human concerns/effects of pursuing such ancient relics. This relationship was seen through the detrimental effects of Amman's development and Jerash's focus on balance between development and preservation. The situation at Umm Qais was also critical. The primacy of ancient ruins for scholars and tourists resulted in neglect for the Ottoman-era village. Therefore, technological advances in analyzing Umm Qais' modern shifts were contextualized with personal accounts and urban histories. Cities are complex. Attempts to analyze singular features and traits misrepresent the city as a whole. Spatial analysis using both geographic technologies and the histories of urban fabric help provide a comprehensive and nuanced view of cities. While certain areas are less represented in data, this study attempted to provide an illustrative and powerful tapestry for how and why the Decapoline cities evolved from classical metropolises to their modern, varied forms.

Chapter 8. REFERENCES

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Chapter 9. APPENDIX

Appendix A: *Jordan Department of Statistics Reports*

Table 3.4- Population of Jordan Estimation Report 2019

عدد سكان المملكة المقدر حسب البلدية والجنس في نهاية ٢٠١٩						
Estimated Population of the Kingdom by Municipality and Sex, at End-year 2019						
Governorate	Municipality	السكان	الامات	الذكور	البلدية	المحافظة
		Population	Female	Male		
Amman Governorate	Amanet Amman Alkubrah	3816980	1780231	2036749	أمانة عمان الكبرى	محافظة العاصمة
	Na'oor	77670	37197	40473	ناعور	
	Um Elbasatien	21580	10040	11540	أم البساتين	
	Hosba'n	23047	11030	12017	حسبان	
	Marj Al-hamam	135407	64501	70906	مرج الحمام	
	Sahab	142554	56835	85719	سحاب	
	Jizah	87021	33201	53820	الجزيرة	
	Amireah	10083	4406	5677	العاصرية	
	Muaqqar	93280	42990	50290	الموقر	
	Um Al-Rasas	15361	7192	8169	أم الرصاص	
	Beduen(Mukhayyam Talbiyyeh)	17995	8021	9974	بدون (مخيم الطابية)	
	Total*	4440978	2055644	2385334	المجموع	
Balqa Governorate	Salt Kubrah	150562	71853	78709	السلط الكبرى	محافظة البلقاء
	Alshoueh Alwasta	53832	23739	30093	الشونة الوسطى	
	Dair Alla	56437	24781	31656	ديرعلا	
	Ain Albasha	119294	56546	62748	عين الباشا	
	Al-Ardha	17618	8147	9471	العارضة	
	M'addi	24793	9279	15514	معدى	
	Swaimeh	4448	2191	2257	سويمه	
	Fuhais	20912	9765	11147	الفحيص	
	Mahes	19628	9355	10273	ماحص	
	Beduen (Mukhayyam Baq'ah)	76076	36044	40032	بدون (مخيم البقعة)	
Total	543600	251700	291900	المجموع		
Zarqa Governorate	Zarqa	714153	340757	373396	الزرقاء	محافظة الزرقاء
	Russeifa	434110	202919	231191	الرصيفة	
	Bierain	27458	12675	14783	بيرين	
	Dhlail	56307	24997	31310	الذليل	
	El-Hallabat	14942	6266	8676	الحلابات	
	Hashemiyah	89072	42745	46327	الهاشمية	
	Azraq	18852	8361	10491	الازرق	
	Hetten,Mrayjeeb Al-fhoud, AL-mkhayzen Al-gharbeih)	143828	68636	75192	بدون (مخيم حطين، مريجيب القهود، المخزون الغربية)	
Total*	1498722	707356	791366	المجموع*		
Madaba Governorate	Madaba Alkubrah	165477	77698	87779	مادبا الكبرى	محافظة مادبا
	Leb & Mlaih	24053	11673	12380	لب وملح	
	Dieban Jadeda	15660	7219	8441	ديبان الجديدة	
	Jabal bne Hamedah	4010	2010	2000	جبل بني حامدة	
Total	209200	98600	110600	المجموع		

* There is difference in the Total: population of Amman and Zarqa Governorate due to including of alocality from Zarqa Governorate (Abu Saiah Locality).

* يوجد اختلاف في مجموع السكان المحافظتي العاصمة والزرقاء وذلك بسبب إضافة تجمع سكني من محافظة الزرقاء الى محافظة العاصمة (تجمع أبو صياح).

Table 3.4- Continued

عدد سكان محافظة جرش المقدر حسب البلدية والجنس في نهاية ٢٠١٩						
Estimated Population of the Jarash Governorate by Municipality and Sex, at End-year 2019						
Municipality	locality	السكان	الامات	الذكور	التجمع	البلدية
		Population	Female	Male		
Jarash Akubrah	Soof	16335	7968	8367	سوف	جرش الكوبرا
	Dair Elliyyat	3178	1549	1629	دير الليات	
	Meqebleh	2116	1020	1096	مقبة	
	Kfair	2723	1304	1419	الكفير	
	Zaqreet	1106	501	605	زقريت	
	Eybarat	5942	2790	3152	الجبارات	
	Asfoor	1521	684	837	عصفور	
	Rashaydeh	2676	1254	1422	الرشيدة	
	Um Rameh	114	50	64	ام رامح	
	Enabeh	308	145	163	عنبيه	
	Jabba	471	217	254	جبا	
	Nabi Hood	1969	931	1038	النبي هود	
	Um Qontarah	764	387	377	ام قنطرة	
	Abarah	222	103	119	العجارة	
	Qraia'	360	173	187	قرايا	
	Ryashi	697	333	364	الرياشي	
	Hazeah	133	59	74	الحازية	
	Amamah	667	190	477	عمامة	
	Shak Mfarrej	439	195	244	الشيخ مفرج	
	Jarash	56104	26467	29637	جرش	
Mansheiat Hashem	11542	5549	5993	منشية هاشم		
Total		109387	51869	57518	المجموع	
Alm'arad	Sakeb	12810	5986	6824	سكيب	المزارع
	Ketteh	8756	4189	4567	الكثة	
	Raimoon	8601	4087	4514	ريمون	
	Nahleh	4356	2119	2237	نحلة	
	Hadadeh	3275	1500	1775	الحدادة	
	Hasainiyyat	1234	604	630	الحسينيات	
	Najdeh	320	154	166	نجدة	
	Jamla	1483	707	776	جملا	
Total		40835	19346	21489	المجموع	
Bab Amman	Mastabah	5401	2598	2803	المصطبة	باب عمان
	Mers'e	5047	2370	2677	مرصع	
	Jebbah	5128	2434	2694	جبة	
	Tal'er Erroz	1771	831	940	تلعة الرز	
	Rahmaniyyeh	760	364	396	الرحمانية	
	Raieh	583	273	310	الراية	
Total		18690	8870	9820	المجموع	

Table 3.4- Continued

عدد سكان محافظة اربد المقدّر حسب البلدية والجنس في نهاية ٢٠١٩ Estimated Population of the Irbid Governorate by Municipality and Sex, at End-year 2019						
Municipality	locality	المسكن	الاناث	الذكور	التجمع	البلدية
		Population	Female	Male		
sahel Horan	Tourah	36634	17707	18927		طيرة
	Shajarah	30848	14675	16173		الشجرة
	Emrawah	7914	3934	3980		عمراوة
	Dnasebeh	4199	2129	2070		الذنية
Total		79595	38445	41150	المجموع	
Khaled Abn Alwaleed	Malika	12941	6369	6572		ملكيا
	Um Qais	6770	3279	3491		دقيس
	Mansoomh	6083	3049	3034		المنصورة
	Mikhaibeh El-Teha	4021	2006	2015		المخبية التحتا
	Hemah Aurdinyah(Mikhal	3099	1538	1561		لحمة الارمنية (المخبية العليا)
Total		32914	16241	16673	المجموع	
yarmook Ja dedah	Kharja	9802	4835	4967		خرجا
	Hariema	7009	3406	3603		حريما
	Abu El-Loqas	1981	1015	966		ابو القوقس
	yarmook	910	443	467		يarmook
	Khrayybeh	2368	1173	1195		الخريبة
	Qasfah	1530	711	819		القصفه
	Saileh	1530	756	774		السيلة
	Zaweh	2017	974	1043		الزوية
Total		27147	13313	13834	المجموع	
Alkfara	Kofor Soom	12547	6152	6395		كفور سوم
	Hartha	7476	3723	3753		حرثا
	Yebia	8217	4223	3994		يبيا
	Rfaid	3285	1619	1666		الرفيد
	Aqraba	4492	2155	2337		عقربا
	Hebras	6375	3134	3241		حبراص
	Bareshta	866	392	474		برشتا
Total		43258	21398	21860	المجموع	
Alshoaleh	Saham	10632	5371	5261		سحم
	Samar	6179	3091	3088		سامر
	Esheh	182	78	104		الشة
Total		16993	8540	8453	المجموع	
Aksru	Sama El-Roosan	5207	2408	2799		سما الروسان
	hatem	10422	5230	5192		حاتم
	Azriet	1893	871	1022		عزريت
	Mizaireeb	3181	1570	1611		المزيريب
	Ebder	4695	2259	2436		عبدر
Total		25398	12338	13060	المجموع	

Table 4.5- Jordan 1994 Census Population by Locality in the Amman Governorate

1/28/2021

www.dos.gov.jo/dos_home_e/main/population/census1994/census.htm

**Population (by Sex), Number of Households, Housing Units and Buildings by Locality as of 10/12/1994
Selections: Amman Governorate**

Locality Name	Population			No. of Households	No. of Housing Units	No. of Buildings
	Total	Female	Male			
Abdaliyyeh	3,168	1,434	1,734	498	693	594
Abu Alanda	24,208	10,840	13,368	3,901	4,825	2,673
Abu El-Meleh	255	132	123	38	53	46
Abu Essoos	203	101	102	33	42	35
Abu Hlaileefah	217	111	106	35	52	61
Abu Lessen	171	71	100	38	44	48
Abu Naqlah	571	264	307	86	103	87
Abu Sayah	567	282	285	75	106	123
Adasiyyeh	1,222	579	643	183	220	199
Ajajreh	188	87	101	33	47	37
Almaniyyeh	302	146	156	44	54	46
Amman	969,598	464,049	505,549	168,902	202,187	73,911
Amreh	582	277	305	100	125	118
Arainbeh Gharbiyyeh	782	367	415	118	129	148
Arainbeh Sharqiyyeh	479	236	243	79	116	126
Badou Jizeh	252	120	132	45	45	45
Bahath	59	21	38	21	30	30
Baidha	455	203	252	95	173	169
Bal'as	146	59	87	31	58	38
Basset Na'oor	597	278	319	100	142	140
Basset Wadi Essier	2,825	1,398	1,427	405	522	444
Belal	536	267	269	81	115	87
Bhaira	323	137	186	59	91	90
Binayat	4,458	2,412	2,046	623	867	588
Dab'ah	264	123	141	40	67	65
Dabbeh	205	99	106	30	39	39
Dabooq	1,774	886	888	305	439	335
Dair	1,221	591	630	183	224	188
Dhaibeh Gharbiyyeh	2,045	1,001	1,044	286	357	423
Dhaibeh Sharqiyyeh	1,504	726	778	225	285	295
Dhair	578	284	294	93	153	113
Dra'	1,541	734	807	241	309	214
Edlayla (Dalielet Mtairat)	407	208	199	69	99	100
El-A'al	1,989	1,006	983	273	330	302
Elayyan	187	100	87	27	37	38
Emaish	434	196	238	75	126	90

Table 4.5- Continued

Eraq El-Amir	1,485	719	766	221	277	246
Eskan Abu Nsair	18,879	9,176	9,703	3,289	3,649	1,535
Ethbayan	629	276	353	135	197	159
Ewailiyyeh	222	108	114	36	60	37
Fahs	106	55	51	15	32	33
Falej	54	25	29	9	17	18
Feisaliyyeh	3,169	1,534	1,635	512	657	603
Ghazaleh	148	60	88	23	28	28
Ghbayyeh	150	76	74	34	60	55
Ghroos	1,223	612	611	179	228	176
Hamdeih	324	168	156	40	50	60
Hammam - Tallaq	337	125	212	101	173	146
Hatmeia	500	235	265	67	91	93
Hdaib	140	72	68	22	33	31
Hoadh Hammam-Shmoot	658	308	350	126	158	162
Howwarah	340	143	197	82	147	142
Huseiniyyeh	272	146	126	40	46	32
Jawa	8,492	4,138	4,354	1,192	1,499	1,060
Jbaiha	37,421	18,622	18,799	6,953	9,812	3,015
Jizeh	3,513	1,433	2,080	485	596	435
Jlool	474	186	288	107	147	129
Jmayyel	311	155	156	47	70	76
Jwaydeh	16,780	7,750	9,030	2,380	3,066	1,493
Ka'afour	11	0	11	9	20	22
Khabbab	111	28	83	39	43	49
Khadhra-Barazin	519	200	319	123	172	142
Khan Ezzbeeb	20	0	20	7	8	6
Khannan	81	41	40	11	24	26
Khashafiyet Dabaybeh	2,525	1,227	1,298	383	460	418
Khashafiyet Shawabkah	511	256	255	73	102	99
Khashef	174	85	89	28	46	33
Khelda & Tla' El-Ali	35,953	17,975	17,978	7,149	10,648	3,107
Khirbet Sarah	921	415	506	129	175	95
Khrayyem	44	25	19	11	21	20
Libban	1,266	568	698	241	403	340
Madhouna	244	80	164	61	81	85
Maghayer Mhanna	1,109	526	583	145	184	180
Maisarah	774	380	394	121	155	110
Manakher	279	127	152	45	57	63
Manarah	188	90	98	30	47	43
Manja	526	264	262	89	103	101

Table 4.5- Continued

1/28/2021

www.dos.gov.jo/dos_home_e/main/population/census1994/census.htm

Mokhayyam Ghazzeh	13,267	6,768	6,499	1,976	2,261	2,273
Mshairfeh Gharbiyyeh	1,094	525	569	156	241	234
Mukhayyam Soof	9,494	4,715	4,779	1,451	1,621	1,480
Nabi Hood	625	305	320	99	136	112
Nahleh	2,614	1,281	1,333	382	460	330
Najdeh	187	90	97	29	42	42
Qafqafa	3,463	1,355	2,108	406	553	490
Qraia'	210	107	103	38	40	40
Rahmaniyyeh	584	277	307	88	111	118
Raimoon	4,785	2,311	2,474	691	810	607
Rashaydeh	1,128	540	588	157	211	194
Rayeh-Manatt	250	126	124	41	65	64
Ryashi	332	142	190	58	104	83
Sakeb	8,237	3,965	4,272	1,151	1,473	1,072
Soof	10,182	4,961	5,221	1,587	2,095	1,528
Tal'et Errozz	707	339	368	119	152	146
Thoghret Asfoor	121	63	58	19	41	45
Um Ezzaitoon	370	179	191	60	71	72
Um Qontarah	391	169	222	51	75	67
Zaqreet	431	190	241	91	164	159

Source: General Census of Population and Housing of Jordan 1994

Table 4.6- Jordan 1994 Census Population by Locality in the Jerash Governorate

1/28/2021

www.dos.gov.jo/dos_home_e/main/population/census1994/census.htm

**Population (by Sex), Number of Households, Housing Units and Buildings by Locality as of 10/12/1994
Selections: Jarash Governorate**

Locality Name	Population			No. of Households	No. of Housing Units	No. of Buildings
	Total	Female	Male			
Abbarah	341	156	185	57	89	89
Alaymoon	600	290	310	81	105	98
Amameh	102	38	64	25	52	44
Asfoor	500	229	271	84	108	105
Baliela	4,096	2,018	2,078	600	764	603
Borma	3,725	1,773	1,952	577	742	574
Dair Elliyyat	1,839	924	915	268	327	297
Dhahr Essero	2,570	1,219	1,351	391	476	369
Dibbeen	43	19	24	9	59	63
Ejjbarat	1,163	563	600	164	206	156
Enabeh	79	40	39	13	25	22
Fawara	388	187	201	59	83	78
Fayha-Mesherfeh E1-Westa	408	172	236	74	117	146
Haddadeh	1,529	750	779	218	294	223
Hamta	385	178	207	53	73	63
Hasainiyyat	274	142	132	38	71	70
Jamlah	467	237	230	69	108	94
Jarash	21,278	9,844	11,434	3,517	4,247	2,564
Jazyeh	211	96	115	33	48	46
Jazzazeh	1,020	487	533	143	176	150
Jebba	395	183	212	61	87	86
Jebbeh	2,422	1,162	1,260	369	438	376
Jnaideyyeh-Mshairfeh Sharqiyyeh	564	269	295	84	130	133
Ketteh	4,426	2,145	2,281	656	825	627
Kfair	1,279	637	642	216	273	244
Kherbt Eshawahed	416	188	228	72	85	78
Khshaibeh	934	466	468	146	179	165
Kofor Khall	4,646	2,274	2,372	752	958	810
Majarr	1,055	482	573	151	224	225
Majdal	579	240	339	99	144	128
Mansheiat Hashem	741	368	373	86	119	110
Marameh	162	79	83	27	55	52
Mashtal Faisal	180	71	109	37	53	49
Mastabah	2,353	1,144	1,209	367	459	390
Meqebleh	1,258	630	628	194	261	207
Mersi'e	2,290	1,074	1,216	352	454	369

www.dos.gov.jo/dos_home_e/main/population/census1994/census.htm

Table 4.6- Continued

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www.dos.gov.jo/dos_home_e/main/population/census1994/census.htm

Mokhayyam Ghazzeh	13,267	6,768	6,499	1,976	2,261	2,273
Mshairfeh Gharbiyyeh	1,094	525	569	156	241	234
Mukhayyam Soof	9,494	4,715	4,779	1,451	1,621	1,480
Nabi Hood	625	305	320	99	136	112
Nahleh	2,614	1,281	1,333	382	460	330
Najdeh	187	90	97	29	42	42
Qafqafa	3,463	1,355	2,108	406	553	490
Qraia'	210	107	103	38	40	40
Rahmaniyyeh	584	277	307	88	111	118
Raimoon	4,785	2,311	2,474	691	810	607
Rashaydeh	1,128	540	588	157	211	194
Rayeh-Manatt	250	126	124	41	65	64
Ryashi	332	142	190	58	104	83
Sakeb	8,237	3,965	4,272	1,151	1,473	1,072
Soof	10,182	4,961	5,221	1,587	2,095	1,528
Tal'et Errozz	707	339	368	119	152	146
Thoghret Asfoor	121	63	58	19	41	45
Um Ezzaitoon	370	179	191	60	71	72
Um Qontarah	391	169	222	51	75	67
Zaqreet	431	190	241	91	164	159

Source: General Census of Population and Housing of Jordan 1994

Table 4.7- Jordan 1994 Census Population by Locality in the Irbid Governorate

1/28/2021

www.dos.gov.jo/dos_home_e/main/population/census1994/census.htm

**Population (by Sex), Number of Households, Housing Units and Buildings by Locality as of 10/12/1994
Selections: Irbid Governorate**

Locality Name	Population			No. of Households	No. of Housing Units	No. of Buildings
	Total	Female	Male			
Abser Abu Ali	271	121	150	43	56	56
Abu El-Loqas	994	505	489	147	197	174
Abu El-Qain	376	184	192	52	71	62
Abu Falah	49	21	28	7	10	10
Abu Saydo	2,087	945	1,142	326	401	375
Abu-Habeel	870	380	490	135	151	134
Adasiyyeh	2,035	992	1,043	320	430	421
Aidoon	14,661	7,047	7,614	2,420	3,213	1,964
Al'al	3,549	1,726	1,823	596	679	602
Aqraba	2,008	991	1,017	291	341	311
As'ara	733	369	364	103	108	122
Ashrafiyyeh	6,355	3,127	3,228	930	1,214	882
Azriet	658	324	334	100	125	118
Ba'leh	27	10	17	4	32	32
Bait Iedes	3,768	1,862	1,906	531	696	571
Bait Ras	11,475	5,500	5,975	1,726	2,219	1,508
Bait Yafa	6,214	2,975	3,239	929	1,112	916
Balouneh	4,455	1,895	2,560	721	857	771
Baqoorah	652	297	355	132	207	214
Bareshta	201	96	105	29	40	36
Boshra	8,539	4,211	4,328	1,298	1,556	1,169
Bwaidhah	3,931	1,957	1,974	564	684	647
Dair Abi Sa'id	8,303	4,064	4,239	1,243	1,607	1,201
Dair Ess'eneh	4,170	2,039	2,131	585	700	585
Dair Yoosef	4,965	2,392	2,573	822	1,038	766
Dar El-Basha	698	349	349	127	159	154
Dnaibeh	1,762	865	897	249	293	262
Doaqarah	3,606	1,809	1,797	544	696	616
Ebder	1,650	816	834	233	284	264
Emrawah	2,955	1,419	1,536	379	469	412
Enbeh	5,336	2,596	2,740	741	881	738
Esheh	80	42	38	14	18	22
Feddein	587	304	283	91	97	81
Fo'arah	2,731	1,361	1,370	390	487	433
Habka	1,775	877	898	278	326	325
Hajeja	30	13	17	3	10	10
Hakama	5,645	2,766	2,879	922	1,131	772

Table 4.7- Continued

Ham	823	398	425	134	175	138
Hariema	2,804	1,352	1,452	441	542	448
Hartha	3,890	1,913	1,977	609	749	631
Hatem	4,422	2,134	2,288	688	801	702
Hebras	2,709	1,314	1,395	416	517	474
Hoafa El-Mazar	1,075	514	561	153	197	197
Hoafa El-Wastiyyeh	2,843	1,408	1,435	461	558	472
Hoor	1,602	775	827	239	306	263
Hoson	16,302	7,911	8,391	2,771	3,412	2,560
Howwarah	9,757	4,770	4,987	1,601	1,947	1,557
Ibrahimia - Sarras	329	146	183	58	107	115
Irbid	208,329	100,647	107,682	34,804	42,398	20,223
Iskayeen	12	5	7	5	13	13
Jamhah	1,643	772	871	251	300	262
Jdaitta	9,629	4,691	4,938	1,443	1,890	1,502
Jeffien	2,626	1,293	1,333	378	485	390
Jenien Essafa	2,926	1,484	1,442	444	587	449
Jeser Shaikh Hussein	6,151	2,900	3,251	938	1,149	1,000
Jijjien	2,165	1,010	1,155	340	401	364
Johfiyyeh	1,935	912	1,023	288	345	304
Karkamah	93	45	48	9	25	26
Kela'a El-Sowafi	20	8	12	7	25	25
Ketem	4,222	2,029	2,193	640	811	657
Kharaj	1,741	819	922	266	328	297
Kharja	4,387	2,064	2,323	673	865	716
Kharjeh	224	106	118	33	61	64
Kherbet El-Hawi	30	14	16	9	20	21
Kherbet Mershed	213	105	108	34	55	70
Khrayybeh	1,029	475	554	163	245	211
Kofor Abiel	5,053	2,508	2,545	777	1,089	871
Kofor An	2,059	929	1,130	323	399	353
Kofor Asad	6,545	3,179	3,366	1,000	1,235	954
Kofor Awan	5,746	2,734	3,012	892	1,183	984
Kofor El-Ma'	7,495	3,698	3,797	1,113	1,392	1,156
Kofor Jayez	2,682	1,262	1,420	416	504	465
Kofor Kiefia	529	259	270	77	123	109
Kofor Rahta	987	460	527	143	179	159
Kofor Rakeb	3,535	1,739	1,796	502	646	533
Kofor Soom	5,706	2,805	2,901	803	931	844
Kofor Yooba	8,581	4,129	4,452	1,290	1,622	1,265

Table 4.7- Continued

Krayymeh	14,231	6,566	7,665	2,168	2,621	2,271
Makhraba	1,141	555	586	176	235	219
Malka	5,470	2,675	2,795	852	1,089	961
Manshiyyeh	5,480	2,624	2,856	888	1,081	824
Mansoorah	1,915	952	963	295	367	330
Maro	2,399	1,169	1,230	356	416	357
Marzeh	789	383	406	106	127	116
Mashari'e	14,933	7,043	7,890	2,274	2,691	2,095
Mazar Shamaliyyeh	10,475	5,089	5,386	1,458	1,784	1,434
Mendah	728	352	376	133	147	144
Merehba	1,213	586	627	174	235	193
Mghayyer	7,013	3,404	3,609	1,062	1,321	1,090
Mkhaibeh El-Foaqa	1,372	688	684	232	259	234
Mkhaibeh El-Tehta	2,031	953	1,078	305	374	344
Mukhayyam El-Hoson	14,463	7,219	7,244	2,139	2,273	2,400
Mzairaab	921	452	469	139	176	161
Natfeh	1,329	650	679	198	264	223
Nhair	23	12	11	3	8	10
No'ayymeh	9,993	4,896	5,097	1,557	2,147	1,643
Qarn	568	275	293	68	107	108
Qasfah	568	278	290	93	130	114
Qmaim	4,078	1,971	2,107	636	781	627
Qom	986	457	529	151	168	171
Rahwah	54	34	20	9	16	17
Ramtha	50,022	23,917	26,105	7,396	9,261	6,856
Rfa'iyyeh	187	100	87	31	37	37
Rfaid	1,823	888	935	295	358	344
Rhaba	5,731	2,750	2,981	794	1,023	812
Rkhayyem	42	19	23	11	11	12
Roqqah	220	113	107	29	40	40
Saham	4,949	2,418	2,531	799	947	785
Saidoor	1,100	542	558	173	206	181
Sail El- Hemmeh	281	150	131	42	49	40
Saileh	571	274	297	95	143	119
Sal	5,502	2,690	2,812	884	1,062	850
Sama El-Roosan	1,966	931	1,035	346	412	398
Samad	904	438	466	125	158	148
Samar	2,406	1,205	1,201	388	491	372
Samma	7,122	3,481	3,641	1,008	1,169	1,002
Sammo'	4,889	2,340	2,549	690	869	682

Table 4.7- Continued

Samt	1,395	685	710	189	242	212
Sarieh	15,957	7,780	8,177	2,380	2,868	2,066
Sbierih	24	6	18	7	8	10
Seefen	150	67	83	23	28	24
Shajarah	8,970	4,339	4,631	1,274	1,642	1,329
Shatana	165	68	97	42	150	143
Shooneh Shamaliyyeh	12,664	5,993	6,671	2,062	2,355	1,734
Slaikhat	594	304	290	86	104	88
Sokhneh	254	142	112	40	44	41
Soom	3,795	1,818	1,977	585	694	598
Sowwan	8	5	3	3	5	5
Tabaqat Fahl	592	286	306	96	110	100
Tantoor	45	20	25	6	10	10
Tayybeh	10,065	4,860	5,205	1,614	1,934	1,518
Tebneh	4,172	2,066	2,106	616	805	632
Teqbel	360	172	188	69	100	111
Torrah	11,664	5,686	5,978	1,642	2,007	1,603
Um El-Jadayel	655	311	344	104	123	130
Um Qais	3,426	1,684	1,742	542	705	578
Wadi El - Yabes	5,371	2,545	2,826	876	1,154	983
Waqqas	4,530	2,152	2,378	663	754	640
Wasfeya	225	96	129	36	49	54
Yarmook	449	235	214	69	93	88
Yebla	2,968	1,464	1,504	436	510	478
Z'atara	692	302	390	115	178	165
Zabdah El- Wastiyyeh	350	173	177	51	67	72
Zabdet Farkooh	1,765	858	907	251	311	202
Zahar	3,311	1,642	1,669	504	607	536
Zmal	2,611	1,238	1,373	379	467	400
Zmaliyyeh	1,035	454	581	152	192	189
Zoobyia	2,434	1,177	1,257	360	477	428

Source: General Census of Population and Housing of Jordan 1994