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Mapping Julio-Claudian Rome:
A Study in Julio-Claudio Geography through GIS

Cassandra M. Finger

Submitted to the Classics Department
in partial fulfillment of
the requirement for the degree
Bachelor of Arts

Scott Bradbury and Barbara Kellum, Thesis Advisors

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*Barbara Kellum and Scott Brabury, for their advice and support,
Jon Caris, for being an all around GIS guru and sense,
My father for putting things in perspective,
And my mother, for, among other things, holding the umbrella*

Mapping Julio-Claudian Rome: A Study in Julio-Claudio Geography through GIS

Introduction

When I undertook this thesis, I decided at the outset that I wanted to present an analysis of the growth of the city of Rome during the Julio-Claudian period. However, rather than merely relying on textual evidence to come to a conclusion regarding architectural changes within the city during this period, I wanted to experiment with the possibility of incorporating a new and powerful type of technology: Geographic Information Systems (GIS). My hope was that by marrying textual research and investigation using a GIS I could present a more holistic analysis.

For centuries Western intellectuals have been captivated by the architecture and civic planning of Julio-Claudian Rome. The building projects which were undertaken during this period have been the subject of countless studies, papers, articles, and books. While scholarship about Rome began in the 16th and 17th centuries, the city itself became an appropriate topic for scholarship in the 18th and 19th centuries. The 20th century produced the bulk of credible research regarding the city's structures. Within the last twenty-five years, the building program of Augustan Rome has been studied extensively, but the impact of the building programs of Augustus' Julio-Claudian successors has received far less attention.¹ Augustus is famously purported to have said that he found Rome

¹ See most recently Lothar Haselberger and David G. Romano Mapping Augustan Rome JRA Suppl. 50 Portsmouth, RI 2002.

a city of mud and left it a city of marble², setting the precedent for a period of remarkable building projects within the city. While Tiberius has been criticized by modern historians for not contributing much to the topography of the city, and .was admittedly less ambitious in this regard than Augustus, he, did erect the Domus Tibertiana and the Temple of Augustus on the Palatine as well as several strategically placed arches and altars. Caligula commissioned entertainment complexes so frenetically there is only a record of two being completed: the Gaianum and the Circus Gai et Neronis, both on the opposite side of the Tiber. Claudius was also a great builder, finishing a number of Caligula's projects and undertaking a number of his own, including the Aqua Claudia. And while Nero is perhaps more famous for destruction of the city in the devastating fire of 64 C.E., he too was a prolific builder. His was the vast villa within the city that was the Domus Aurea, but he was also responsible for the Macellum Magnum and several additions to the aqueduct system.

Brief Overview of Geographic Information Systems (GIS)

Using Geographic Information Systems, hereafter referred to as GIS, I probed into the relationships between the buildings which have captivated scholars for centuries, creating a map of ancient Rome situated within precise real world coordinates. The Environmental Systems Research Institute, Inc. defines GIS as “a collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. ... A geographic information system (GIS)

² Suetonius Aug. 28.3

allows the researcher to link information (attributes) to location data, such as people to addresses, buildings to parcels, or streets within a network. [The researcher] can then layer that information to give the viewer a better understanding of how it all works together. It is possible to choose what layers to combine based on what questions need to be answered.”³ The benefit of GIS is this flexibility and dynamism. Unlike conventional mapping systems, a map produced through GIS software is not static and can be manipulated to suit the individual users' needs. This trait is part of the appeal of GIS software, and a main factor in my own decision to undertake a GIS project: other subsequent work can be added onto the foundation with relative ease.

The Mapping Process

I began mapping Julio-Claudian Rome with the goal of investigating and mapping the incidence and spread of fire during the time period between 14 AD and 64 AD. However, the paucity of reliable topographical information about fires in this period encouraged me to focus instead on an analytical approach which considered several variables. My first area of interest was the physical precedent each emperor set for the succeeding ruler. I will quantify this by measuring the distance between structures built by different emperors, as well as analyzing the physical grouping of buildings by different emperors. Second, I will show the chronological distribution of buildings throughout the city, thus illustrating whether or not the older buildings are tightly clustered together or newer buildings are interspersed among them. Finally, I will qualitatively look at how the city changed

³ <http://www.gis.com/whatisgis/index.html>

under Nero. I selected the period between 14 AD and 64 AD because I felt that that the era of the Julio-Claudians was historically significant in terms of Imperial precedent. Furthermore, it seemed appropriate for the project to span an entire dynasty.

The bulk of the first semester was occupied with gathering data for my base map. My hope was to use the data layers from Lothar Haselberger's published project, Mapping Augustan Rome. However, my communication with David Romano, the GIS expert on the project made it apparent that those files would not be available as they were intended for publication individually. Therefore, with the help of Jon Caris, the GIS Specialist at Smith, I scanned the paper map and used the scanned TIFF as the basemap. This posed some problems, however. Primary among those was the fact that this TIFF had no spatial reference, and a key focus of my project was to create a map of Imperial Rome within real-world coordinates. Additionally, any time a paper map is scanned there is a minimal amount of distortion due to folding, and the shrinking and swelling of the paper that occurs naturally due to humidity. Given this, my project will have some margin of error, which would have been substantially mitigated had the Haselberger files been obtained.

Now that the basemap had been scanned the next step was to georeference the map, a process which assigns a spatial reference to an image within ArcMap – the GIS program I used. However, in order to do this, I needed points with known coordinates or “control points” within the city of Rome. I therefore traveled to Rome with a Global Positioning System (GPS) unit to take

points of easily recognizable locations within the city. I collected control points all along the Tiber River, giving me more or less a line with which to anchor the scanned map, as well as control points in the Roman Forum, which I labeled for future reference. Once I returned to the Smith, the first task was to download the data I had collected and differentially correct it. Differential correction is the process by which the quality of GPS data is enhanced, either in real-time in the field, or, as is my own case, using postprocessing, that is, processing of the data after it has been collected. In order to do that I needed to find what is known as a base station – a satellite receiver that logs GPS data at regular intervals at a known location, thereby correcting any potential errors I may have collected with my field receiver. Data correction from a base station is complicated by the fact that the further a base station is from the control points, the less reliable the corrections are. Therefore, I contacted the Swiss Geodetic Society for advice and they pointed toward a serviceable base station.⁴

Once I had differentially corrected my data, it was time for me export the raw GPS data into a usable form, in this case, into an ESRI shapefile, a type of file that ArcMap recognizes as spatial data, whether in the form of points, lines or polygons. I then added these shapefiles to the ArcMap document containing the ungeoreferenced TIFF of Haselberger's map. I used the points contained in the shapefiles as my control points, thereby anchoring Haselberger's map in real space. My next step was to select a projection for my map. A map projection is a mathematical calculation whereby the three dimensional surface of the Earth is

⁴ More information on differential correction is available at <http://www.esri.com/news/arcuser/0103/differential1of2.html>.

transformed into the two dimensional surface of the map itself. There are many possible map projections to choose from and each has its advantages and disadvantages. Some preserve scale, others shape, and others area, but when preservation of one aspect of the map will distort others. The trick is to select a projection for the map one is working on that will result in the fewest distortions. I had already selected a projection for my data that was specific to the city of Rome – that is to say the distortion created by the projection was designed to be minimized over the city of Rome while greatly distorting the rest of the world – so it made sense to project the map into the same projection. However, this proved problematic as some of the more global data such as the Digital Elevation Model – a data layer containing the topographical information – of the area did not line up properly in this projection, probably due to the distortion caused by the projection. Therefore I had to unproject all the data and reproject them in WGS 1984, a more standard projection. Once I had the data in a projection that spread the distortion evenly throughout the surface of the earth, I could add in topographical data, which gave context to the geographic analysis I was going to perform.

After assigning a workable map projection to the raw data, it was time to add the data into the map. I began by digitizing the building footprints, which took three separate attempts to complete successfully. My first attempt consisted of drawing the building footprints in AutoCAD, which resulted in a layer file of visually stunning shapefiles that were unusable, since I could not assign an appropriate spatial reference to them. Next, I attempted to draw the buildings

using the Editor toolbar, an extension of ArcMap which allows users to manipulate existing layers within the map by adding data, as in my case, or removing it. However, I had elected to store my data in a personal geodatabase, “the common data storage and management framework for ArcGIS (the software package that encompasses ArcMap) and can be utilized wherever it is needed—on desktops, in servers (including the Web), or in mobile devices. It supports all the different types of data that can be used by ArcGIS.”⁵ Because I had stored my data in a geodatabase, I could not draw the shapes, or polygons, using the Editor toolbar. Finally, I exported the layers out of the personal geodatabase, drew the building footprints using the Editor toolbar and then imported the layer back into the geodatabase.

Once I had digitized the Augustan buildings, it was time to draw in the buildings attributed to other emperors, based on information gleaned from Platner and Ashby’s Topographical Dictionary of Ancient Rome, Richardson’s New Topographical Dictionary of Ancient Rome, and La Regina’s Lexicon Topographicum urbis Romae. After all the buildings were drawn and imported back into the geodatabase, I inserted three new data frames, so that I would have one data frame for each analysis I intended to perform, and then copied the base map, topography, and buildings into each data frame.

⁵ <http://www.esri.com/software/arcgis/geodatabase/index.html>

Data Frame 1: Chronology of Buildings

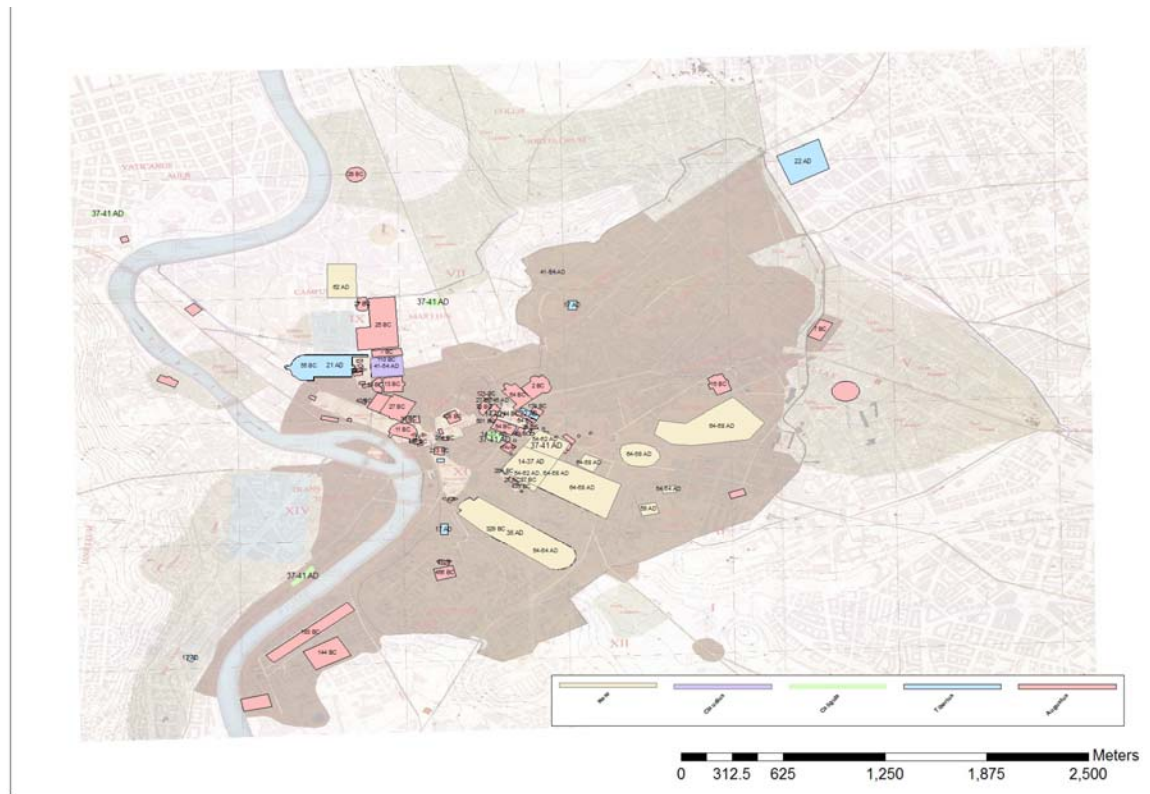


Figure 1: Data Frame 1

For the first data frame wanted to demonstrate how buildings were distributed by date, and “date modified” when applicable. That is to say, I wanted to show the location of the oldest imperial buildings, as well as the location and footprints of the buildings that had undergone significant renovations at the hands of subsequent emperors. My goal was to analyze the spatial relation between original foundations and later renovations. First I allotted a different color to each emperor and color-coded his buildings accordingly, making it easy to differentiate between the buildings of different reigns. I symbolized the buildings so that each emperor got his own color, readily illustrating where the Augustan vs. Neronian buildings were. Next, I labeled each emperor’s layer

based on the Approximate Date field in the Attribute Table, the database tied to the visuals of the map containing all information that is not spatial in nature, such as size, age, color, etc. Finally, in order that they be dynamic, I converted the labels into Annotation, then optimally positioned the annotation.

Data Frame 2: The Augustan Influence

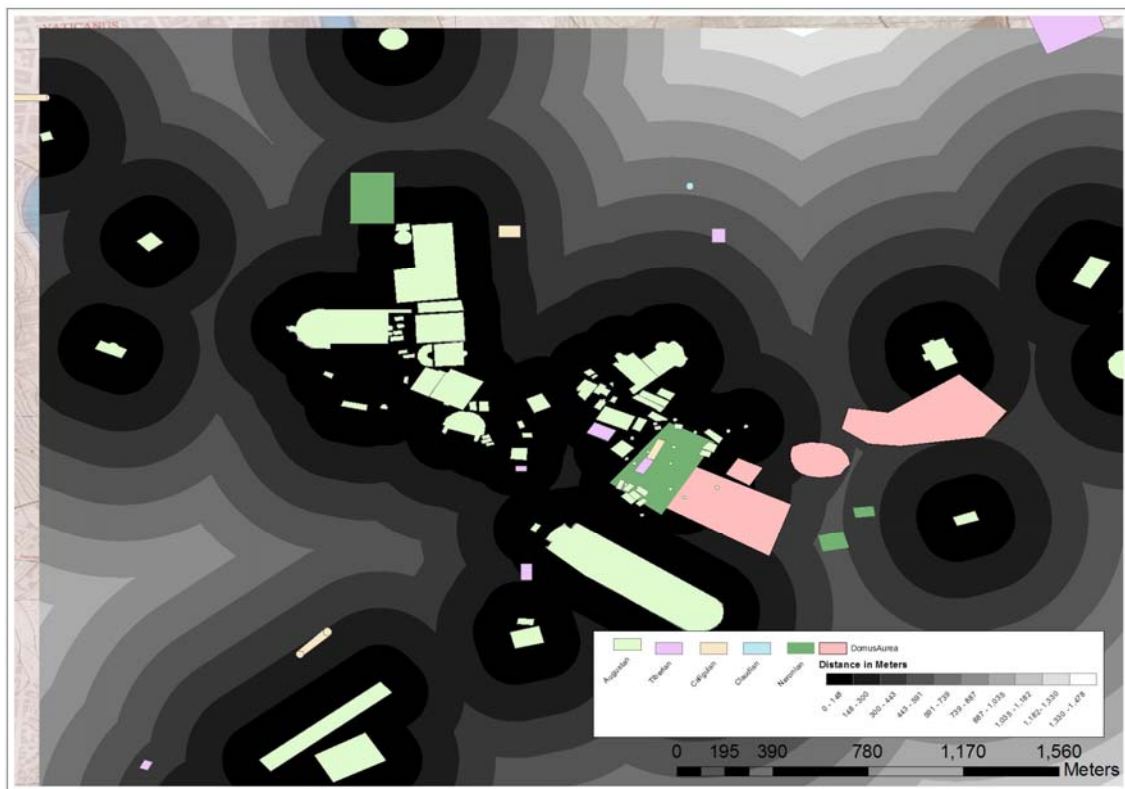


Figure 2: Data Frame 2

For the first data frame I wanted to demonstrate the influence that Augustus had on succeeding emperors from an architectural standpoint. In order to achieve this, I converted the Augustan buildings layer from a feature to a raster – essentially converting the geometric shapes into something more like pixels.⁶ After converting the layer to a raster, I performed a raster analysis called Euclidian Distance, which identifies the distance from each cell to the closest

⁶ For more information on rasters, go to http://www.gis.com/implementing_gis/data/raster.html

source cell. Put simply, this operation finds distances in straight lines. The result is concentric rings of a given distance apart, which varies depending upon the cell size specified. For this analysis I specified a ½ meter grid cell. I then used the Raster Calculator to convert the output of the Euclidian Distance from decimal degrees into meters.

Data Frame 3: The Great Fire of 64

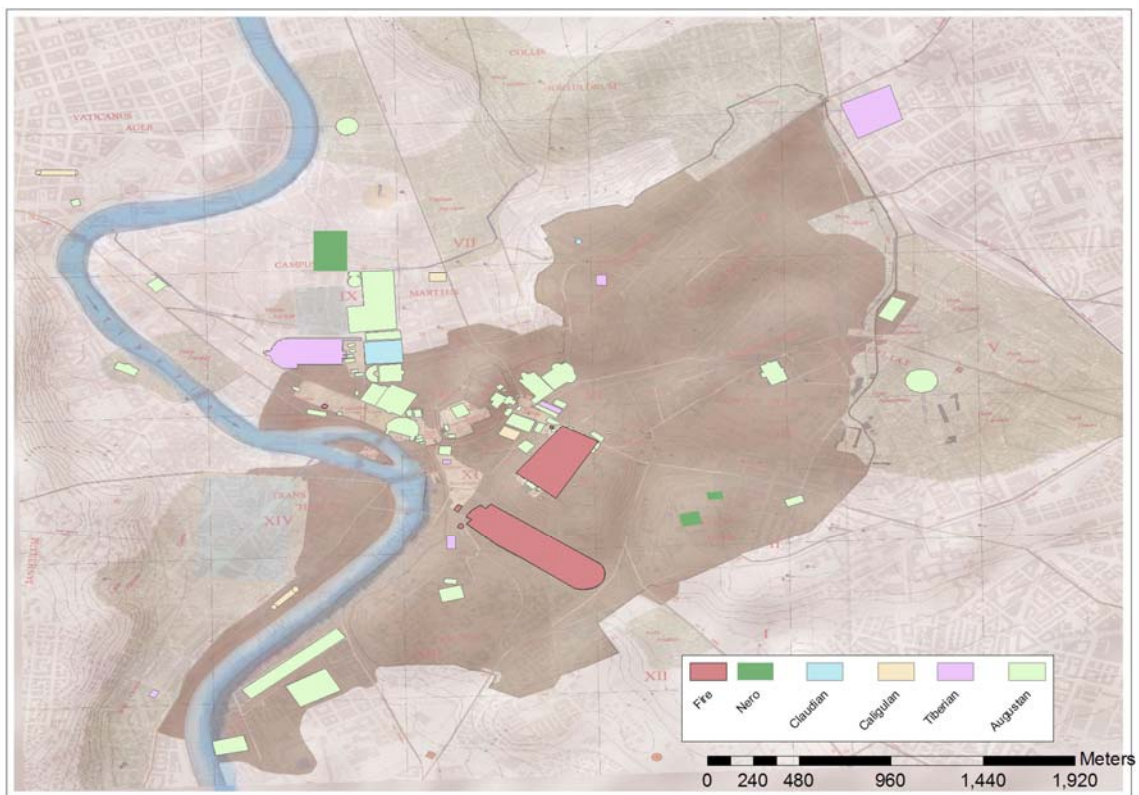


Figure 3: Data Frame 3

For the third data frame, I wanted to illustrate the extent of the damage of the Great Fire of 64. In order to do this I first assigned a distinct color to each emperor's building projects, with the exception of Nero. For Nero's building projects I assigned two distinct colors: one color for those buildings built prior to 64 that were unaffected by the fire and one color for those buildings that were affected by the fire, based on textual references. The result is a map which

demonstrates not only the buildings destroyed by the fire, as described by ancient historians, but also the extent of the damage in terms of meters.

Data Frame 4: The Domus Aurea

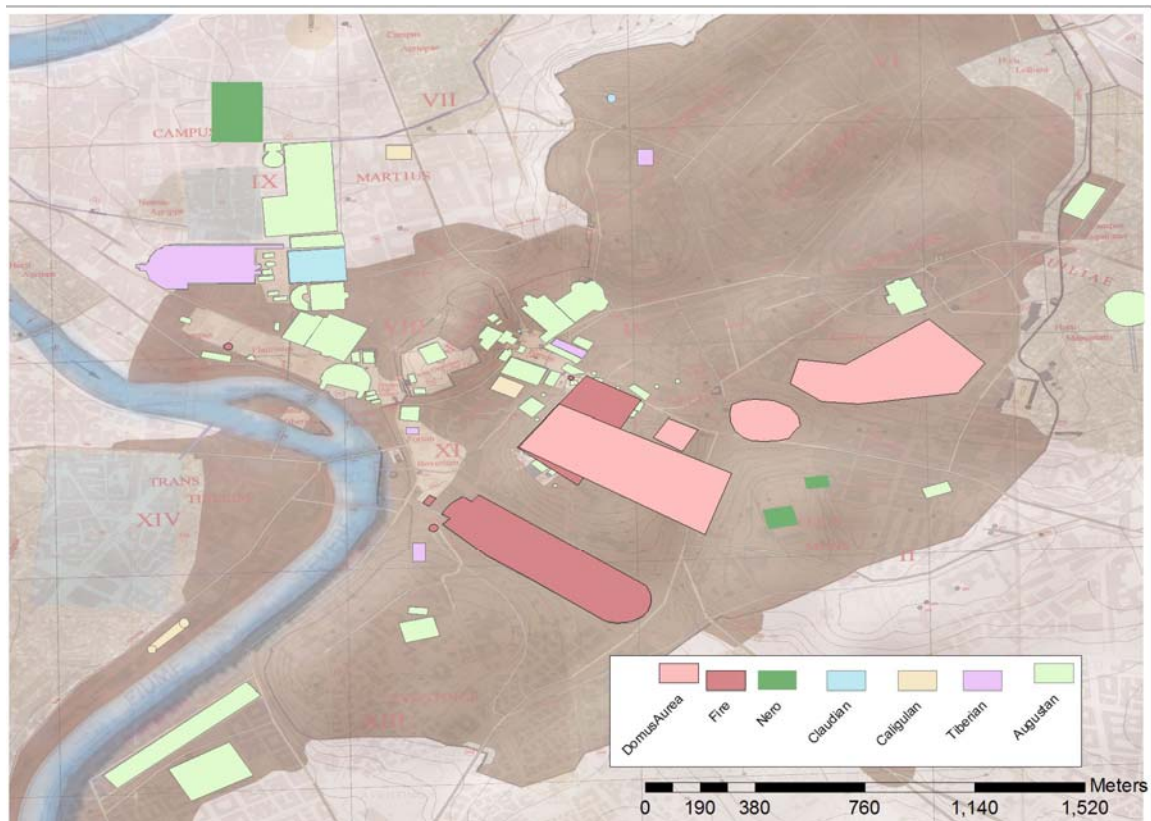


Figure 4: Data Frame 4

For the final data my goal was to analyze? Nero's rebuilding efforts after the fire. The focal point of this map was going to be the Domus Aurea. In order to illustrate that, I first added the layers of previous buildings, including the layer of pre-fire Neronian buildings. Next, I drew in an approximation of the extent of the Domus Aurea using the Editor tool. I then overlaid the Domus Aurea layer over the preceding layers. This juxtaposition of layers showed how the area of the Domus Aurea may have related to the surrounding city.

Analysis

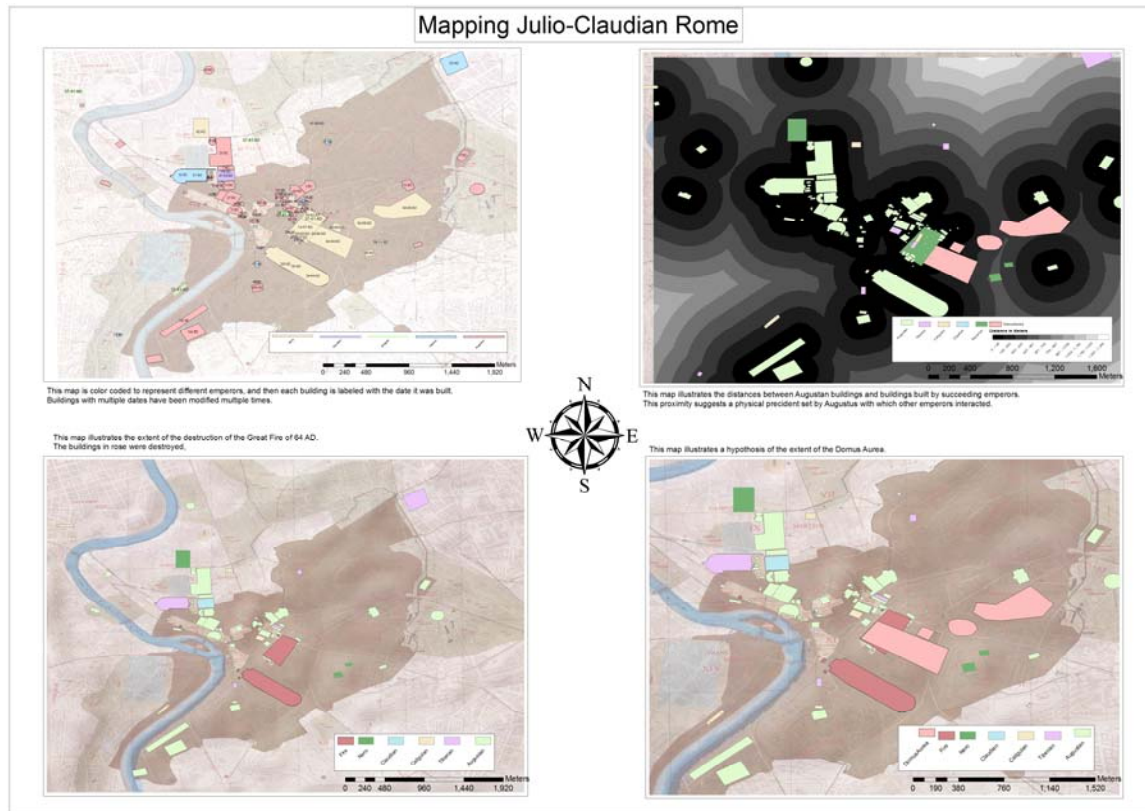


Figure 5: Map

When analyzing the map, fig. 5, it makes logical sense to begin with the first data frame, dealing with Augustan influence, both from a chronological and a spatial literacy standpoint. The first data frame shows the distribution of buildings throughout the city by date. One would assume that the oldest buildings in the city would be clustered in the center, near the Forum and the Campus Martius, but that is not necessarily the case. While it is true that there are indeed some buildings there dating to the 5th century BC, and some buildings did not have definite dates, but rather vague gestures such as since the time of Romulus or Evander,⁷ most of these buildings date to the mid- to late Republic or Augustan

⁷ Platner and Ashby

period. In fact, from this map it appears that there is not a real concentration of significantly older buildings. Instead, they are mixed in with the newer buildings. This suggests two things about the urban development of Rome during the Julio-Claudian period. The first is that Augustus' boast that he found the city in mud and left it in marble⁸ is a reasonably accurate one, for the majority of the buildings in the city were built by him. The second is that the Julio-Claudians built with a keen sense of architectural history, as they placed their more modern buildings within a context of older ones. This was suggested by the previous data frame, but the lack of a coherent pattern to the distribution of building dates confirms this.

Of note in the first dataframe is the pattern of Claudius' building program. It becomes apparent, when analyzing the first dataframe that Claudius built no new construction in Rome, rather improving upon pre-existing structures. The answer for this can be found in the financial situation of the Empire under Claudius. Under Caligula, the cost of maintaining the Principate rose,⁹ and in order to offset this, Claudius had to be a much shrewder fiscal manager. Instead of building new buildings, Claudius concentrated on infrastructure – not included on this map, like two new aqueducts, and ensuring that there was a steady supply of grain for the city. Additionally, Claudius undertook the massive building project at Ostia, which is outside the scope of this map. Therefore, it must be concluded that Claudius was more focused on the functional building projects, rather than the glamorous ones.

⁸ Suetonius Aug.28.3

⁹ Levick. P. 130

The second dataframe shows that Augustus' architectural influence was felt long after his death in 14 AD. Indeed each succeeding Julio-Claudian emperor seems to be reacting against or responding to Augustus, to judge from the positioning of their building projects. The vast majority of the buildings were built within 150 meters of an Augustan edifice, which suggests a desire on the part of succeeding Julio-Claudians to ally themselves psychologically with Augustus by positioning their monuments and building projects in close proximity to his own. There are, however, some outlying buildings which were constructed farther from an Augustan structure. Of the buildings attributed to Tiberius, the farthest outlying are the Castra Praetoria, Temple of Flora, and the Temple of Fors Fortuna. While the Castra has overriding reasons for being located so far outside the city and consequently from an Augustan structure, it is interesting to note that the majority of Tiberius' building projects were constructed at least 443 meters away from any Augustan building. It would appear that Tiberius was attempting to differentiate himself from his predecessor and step-father, possibly lending credence to the theory that the relationship between the two was tenuous and that Tiberius was not Augustus' ideal successor. At any rate, Tiberius is the emperor who most consistently built the farthest from Augustan structures, probably in a reaction against him.

Despite this fact, it is the Temple to the Divine Augustus, perhaps the structure with the least physical distance between it and an Augustan structure, which embodies the most dichotomous aspects of Tiberius' personality, as it has been perceived by historians. A military man by training, Tiberius was very

concerned with duty, which explains his divorce from Vipsania Argippina in favor of Julia at Augustus' behest.¹⁰ Into his adult life, Tiberius had a fraught relationship with his stepfather, as it has been stated, becoming Augustus' successor only as a last resort – a fact Augustus made clear in his will. And yet, once Augustus is deified, Tiberius erects a temple and library complex between the Palatine and Capitoline Hills, near the Basilica Iulia. Why would a man, who was so frugal with the imperial treasury, spend such a large amount of money on a man he, in all likelihood, didn't even like that much? The Roman notion of pietas dictated the building be built, both because Augustus was Tiberius' adopted father and because Augustus had just been voted divinity and Tiberius was the head of Roman religion as the Princeps. Therefore, the temple was built, with close visual associations to other Augustan buildings, out of a sense of duty.

Nero too appears to be using his buildings as an oppositional statement to Augustus' influence. Three of his buildings are farther than 150 meters from an Augustan structure, one of which is included among those that make up the Domus Aurea complex, specifically the Macellum Magnum, the Temple of the Divine Claudius, and the Stagnum Neronis. But it is hardly likely that Nero's building patterns can be explained in the same manner as Tiberius, where the distance is likely a result of direct conflict between the two men and a desire on Tiberius' part to establish himself as his own man. Rather, it is more likely that Nero was attempting to suggest that he was ushering in a new era, and therefore distanced himself both physically and psychologically from Augustus. If this is the case, then his choice to position parts of his Golden House farther away from

¹⁰ Seager, Robin. Tiberius. P. 11

Augustan buildings suggests that he really was trying to make a distinction between Augustus and himself in the visual vernacular of the city.

Caligula built two structures further than 150 meters from an Augustan building: the Temple of Isis and the Gaianum. Given that the Gaianum was used for horse races, it is reasonable to assume that its location was selected out of convenience and want of space rather than an attempt on Caligula's part to differentiate himself from Augustus. The Temple of Isis is somewhat more difficult to explain, although its distance, too, has a plausible explanation. Caligula was constructing a temple to a foreign deity, and while Rome's religious atmosphere was notoriously porous and receptive to foreign cults, it may have seemed slightly suspect for Augustus' great-grandson to erect a temple to an Egyptian goddess only 90 years after he defeated Cleopatra at Actium. Perhaps someone with a sense of propriety convinced Caligula to situate his temple to Isis slightly apart from the rest of the Campus Martius. At any rate, it is doubtful that by these two buildings Caligula meant to take a decisive visual stance in opposition to Augustus. This theory is supported by the fact that other forays into construction that have a traceable footprint are within 150 meters of an Augustan building. It is therefore reasonable to assume that, from a visual perspective at least, Caligula wished to be connected with Augustus due to the proximity of his buildings to that of Augustan buildings.

As previously stated, Claudius did not undertake the construction of any new buildings, electing instead to improve existing structures. However, all of the buildings Claudius improved are within 150 meters of an Augustan building. This

suggests that he wished to align himself very closely to Augustus. In doing this, perhaps Claudius was attempting to lend legitimacy to his reign, begun under ignominious circumstances. Claudius was not the strongest candidate for Princeps at the time of Caligula's assassination, given his physical ailments and lack of political experience. By aligning himself with Augustus, Claudius strengthened his claim to the title of Princeps. He did this not only through his buildings, but through stationary, coins, and festivals as well.¹¹ Given this, it is reasonable to assume that Claudius grouped his buildings so close to Augustus' buildings to bolster his claims to the title of Princeps at a time when multiple candidates had been vying for the position.

In summation, the first data frame shows that each succeeding Princeps' unique relationship to Augustus was borne out in his building locations. Tiberius was obviously eager to break with his step-father, with whom he shared a difficult personal relationship. But more than that, any man who immediately succeeded the great Augustus would have needed to establish himself as Princeps in his own right, not merely riding on Augustus' coattails. Therefore, Tiberius' buildings are the most consistently far away from those of Augustus. Caligula's loyalties were capricious, and his feelings toward Augustus were no exception. He seems to have physically allied himself with Augustus when it suited his purposes, building further away when it didn't. Claudius most consistently builds near Augustan buildings, probably because of all the Julio-Claudian Princeps up to that point, he had the most dubious claim to the position. By positioning his buildings near Augustan structures he visually reminded the Roman citizens that

¹¹ Levick, Barbara. Claudius, p. 45

he was indeed linked to the Julian dynasty, if only tenuously by marriage. Nero's physical distancing from Augustus suggests that he was attempting to concretely demonstrate to the Roman populace that he was a new and different sort of Princeps.

The third data frame illustrates the extent of the Great Fire in 64, according to ancient sources such as Tacitus and Cassius Dio. The burned structures are symbolized in red, making them easier to see against the map itself. What is immediately noteworthy is that only six buildings are mentioned by name as having been destroyed, and therefore only six buildings are shown as having been destroyed on the map. While this sounds like a paltry number, belying the title "Great Fire", the extent of the damage must also be considered. The fire at one point spread from the Circus Maximus to the Amphitheater of Statilus Taurus, a distance of about 1.5 kilometers. In order for it to spread to such an extent it had to follow the Tiber, and surely there were insignificant buildings along the river that were destroyed in its wake. Also, this map does not show any dwellings that may have been in the path of the fire, as it focuses on major monuments and the large *domi* clustered around the Palatine. Furthermore, in considering the Palatine, it is important to note that the entire Domus Transitoria was destroyed. Therefore, while the third data frame seems initially to downplay the architectural significance of the Great Fire, it on the contrary supports it by illustrating the extreme extent of the damage.

The fourth and final data frame illustrates a possible building footprint of the Domus Aurea. By overlaying the Domus Aurea footprint – which I based on

Dio Cassius and Tacitus with the buildings destroyed in the Great Fire, I hoped to test whether or not the Domus Aurea was indeed built out of the ashes of the Great Fire, as Tacitus asserts. What I discovered, however, when I did my map analysis was somewhat surprising. The only overlap between the Great Fire and the Domus Aurea was the footprint of the Domus Transitoria. Therefore, in essence, Nero built on the ruins of his own home. Based on my base map, there were no pre-existing buildings on the site where I posit that Nero built the rest of the Domus Aurea complex, although Haselberger's map is not the most complete rendering. Moreover, in terms of Tacitus' assertions, is that based on the Great Fire portion of the map (data frame 3) the fire did not reach that area and perhaps was even spreading in the opposite direction. This is of course all speculation. What is concrete is that the only overlap between fire damage and the Domus Aurea was the Domus Transitoria.

Conclusion

It is not enough to merely create a map that is visually appealing; one must create a map that presents a cogent analytical argument. The map that I present asks a series of questions regarding the architectural progress of the city. Each builds on the other, creating an understanding of Julio-Claudian Rome that was not possible before. The analysis begins with the dispersal of early Republican buildings throughout the city, and the Augustan influence, then moves to the Great Fire and the Domus Aurea. This progression follows the evolution of the city itself, and was logical for a map analyzing the growth and change undertaken in the physical aspect of the city between 14 AD and 68 AD.

Using a Geographic Information System, I was able to place the monuments of Julio-Claudian Rome within the spatial context of Modern Rome. This is important because it allows for further research, like topographical analysis and research on the relationship between modern buildings and ancient ones. It is also easier to plot later historical layers, such as Flavian buildings, onto the map I have created with a true to life spatial reference. I wanted this map not to be an end but a beginning, and for that to be possible, making it geographically accurate in a real world context was essential. I also stored my data in the most universally accepted format for GIS work, to encourage portability and ease of translation from one application to another.

I feel that this process and the end product have successfully shown that cutting edge technology can be harmoniously married with Classical studies, with desirable results. This mapping project demonstrates that questions that arise in the course of studying Classics that pertain to the physical world can be addressed using Geographic Information Systems. This includes, but is not limited to, the obvious, such as questions about geography and architecture – mapping out the route that Alexander the Great took, or the drinking houses in Pompeii. But GIS can also be used to for anthropological questions such as the origin and importation of certain mythological characters such as Bacchus. Even certain literary issues can be brought to light, such as the recreation of the battle lines in the *Iliad*. Given this, and my map, I feel a case must be made for further inclusion of technology in the Classics education.

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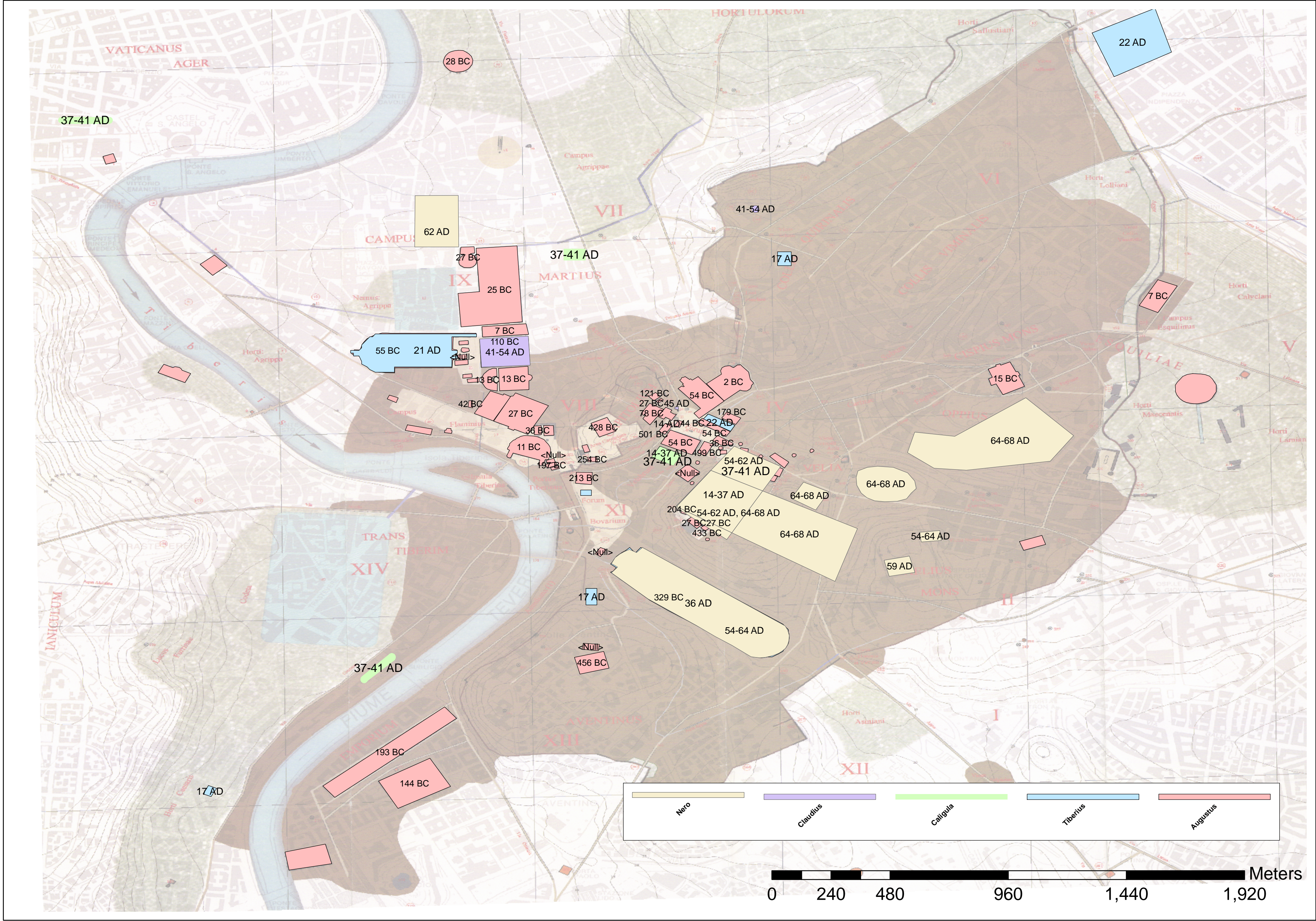
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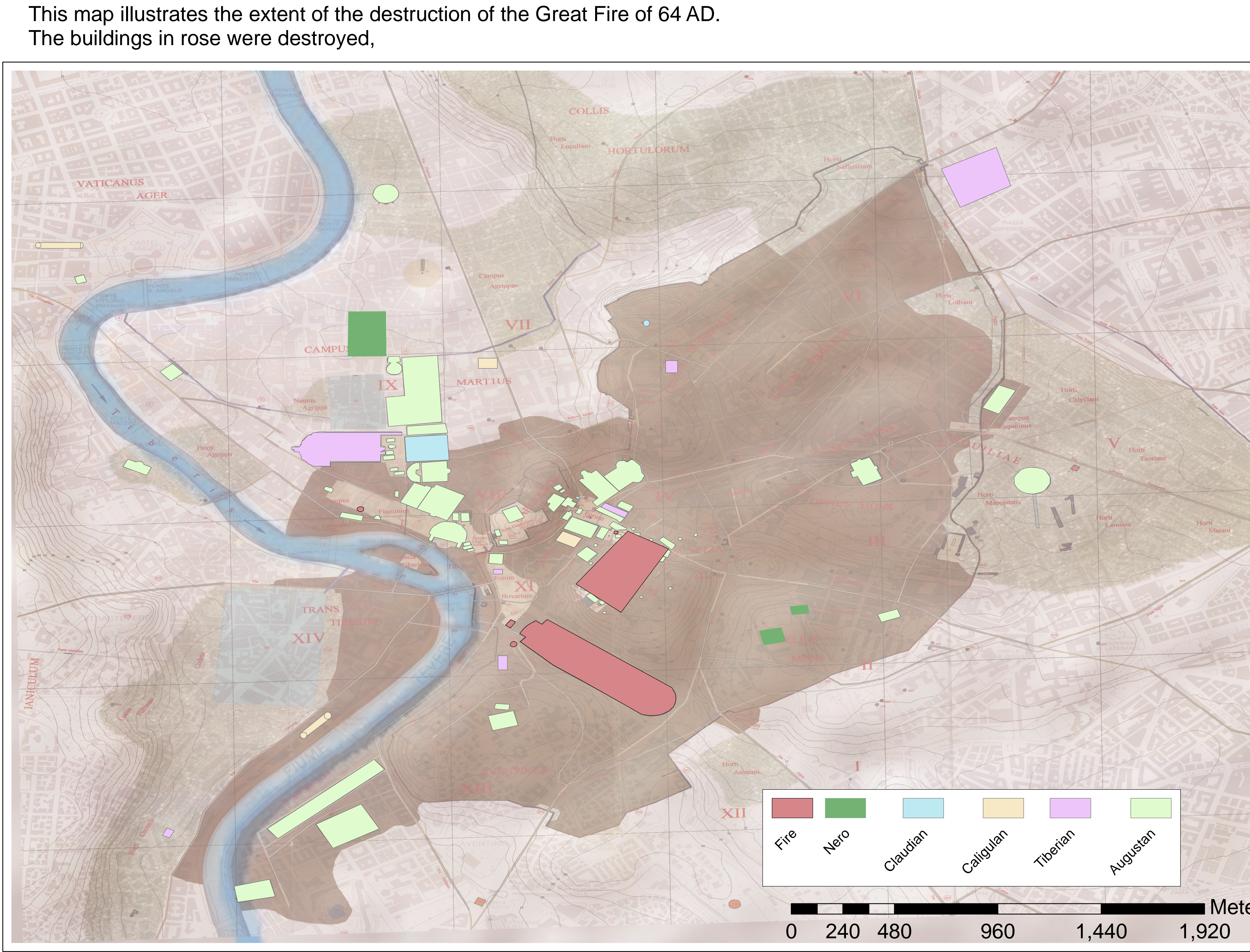
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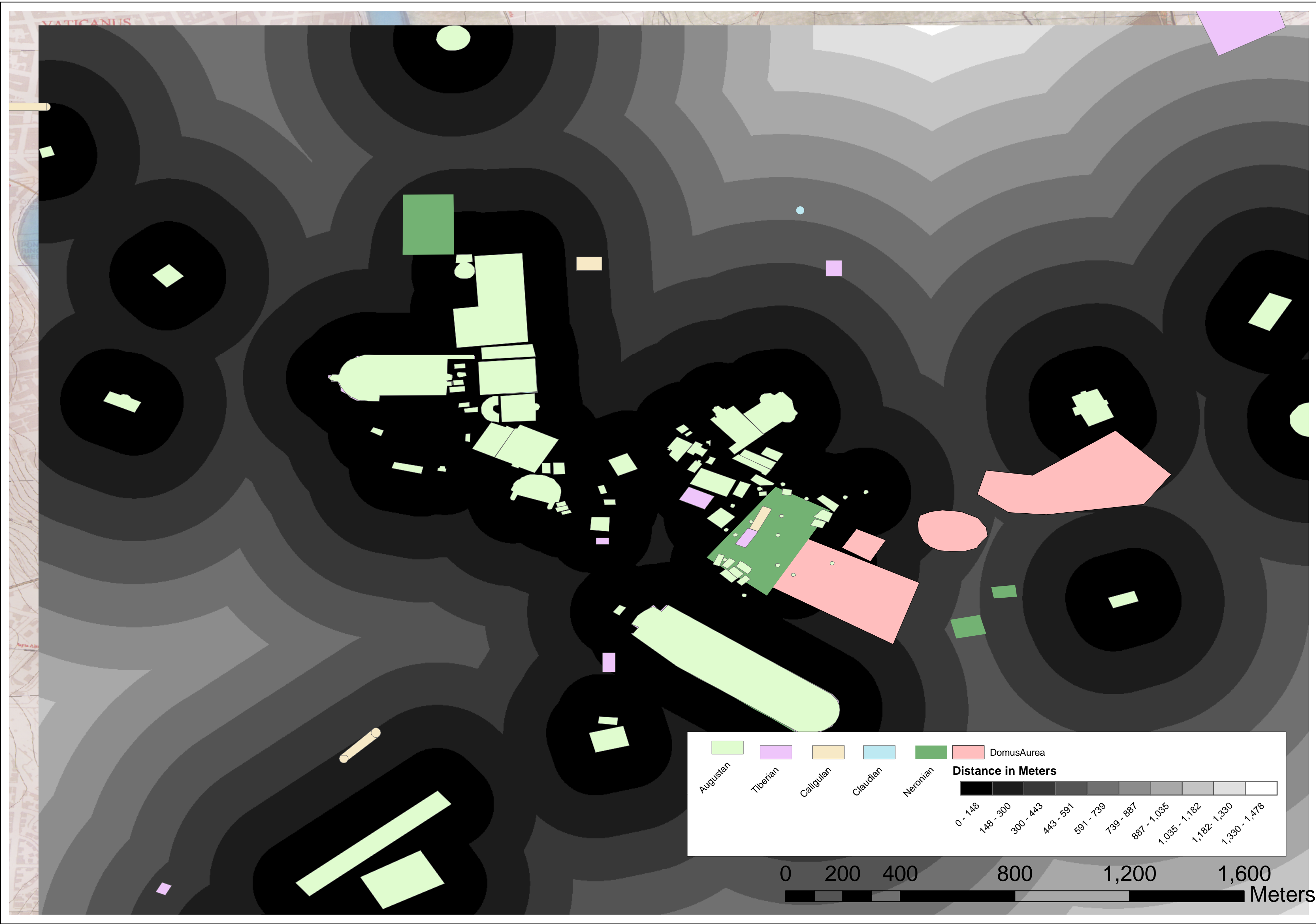
Mapping Julio-Claudian Rome



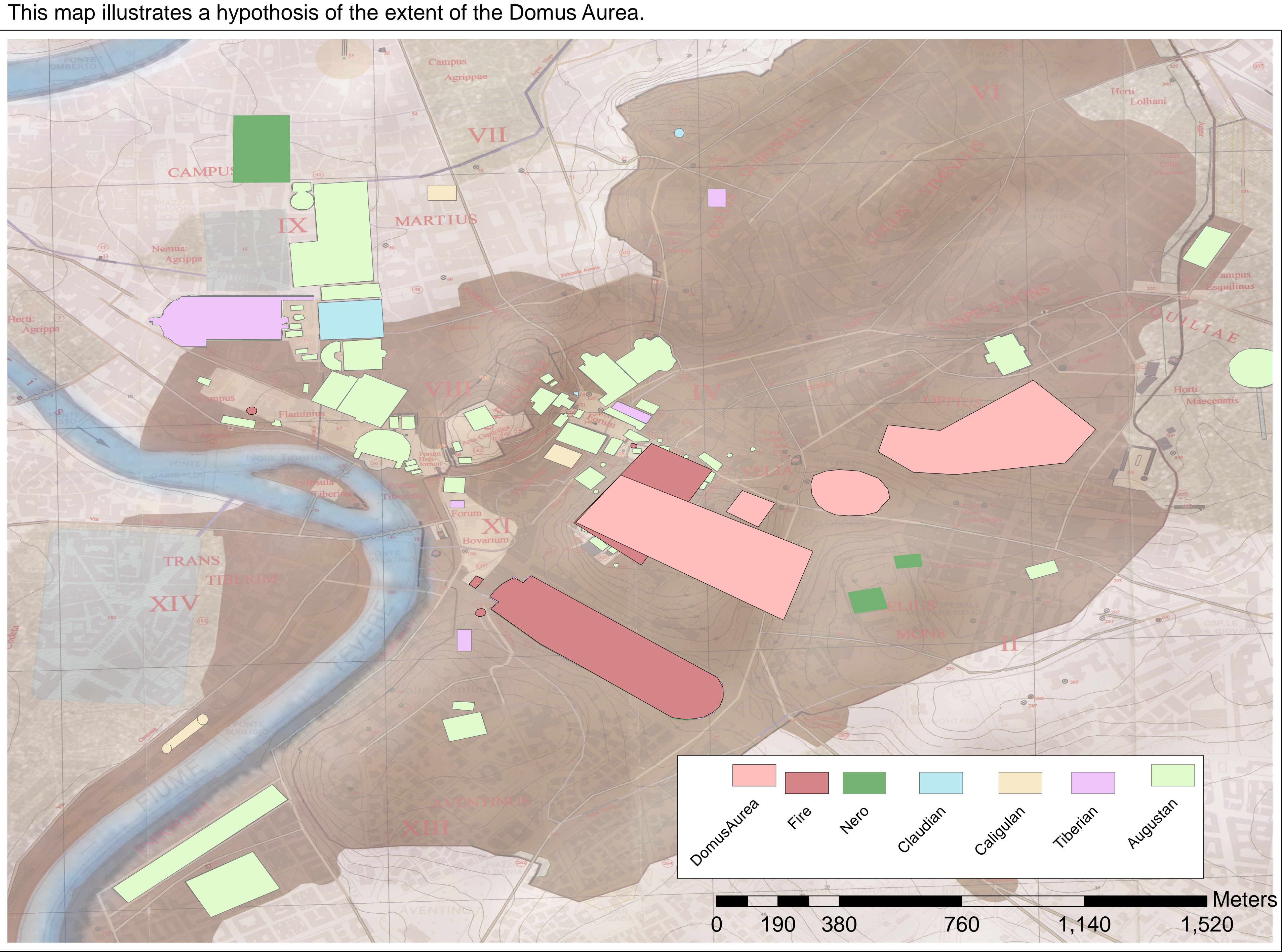
This map is color coded to represent different emperors, and then each building is labeled with the date it was built. Buildings with multiple dates have been modified multiple times.



This map illustrates the extent of the destruction of the Great Fire of 64 AD. The buildings in rose were destroyed,



This map illustrates the distances between Augustan buildings and buildings built by succeeding emperors. This proximity suggests a physical precedent set by Augustus with which other emperors interacted.



This map illustrates a hypothesis of the extent of the Domus Aurea.