Modeling Historic Structure Preservation Candidacy on Fort Ord

by

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Abstract

Site suitability modeling in geographic information systems has not been previously used to gauge the strength of historic structures as preservation candidates. The goal of this project was to develop an ArcGIS model and related methodology to serve as a screening process when evaluating a large number of potentially eligible structures. While an automated method cannot truly replace an evaluation by an expert, it can serve to make the process of evaluating a structure more efficient. This model can be used to streamline the evaluation process, and save time and resources by removing from consideration those structures that are obviously unsuitable, and ranking the remaining candidates based on various criteria. An expert can then make the final evaluations. As a case study by which to develop and test the modeled evaluation process, structures on the Main Garrison area of Fort Ord were evaluated using the model. Fort Ord is a former United States Army post north of Monterey, California. Closed in 1994, it contains a large number of structures dating from between 1940 and the late 1980s. Despite Fort Ord's significant role in US military history throughout much of the 20th Century, there are currently no plans to preserve any of the structures on the base. Confirming the validity of the proposed model workflow, Fort Ord buildings identified in an a priori assessment of building significance scored highly in the model. These results suggest the model workflow can become a useful addition to the cultural resource management toolkit. Additionally, this framework can also potentially be useful as historic communities evolve and develop, in determining which structures to preserve.

Chapter 1 Introduction

Located north of Monterey, California, Fort Ord is a former United States Army post. It is comprised of two developed areas, Main Garrison and East Garrison, as well a great deal of wilderness area between them. While much of this wilderness is now protected as part of the Fort Ord National Monument, the reuse plans include no provision for the preservation of any historic structures located on Main Garrison. While multiple reasons exist for this lack of concern, geographic information systems can help to move matters in the right direction, by providing a streamlined process for incorporating preservation into the plans.

The United States Army acquired the land that would become Fort Ord in 1917, for use in training exercises by the troops stationed at the Presidio of Monterey (Raugh 2004). The first structures were constructed in 1940, and it was first designated Camp Ord, then Fort Ord by 1941 (California Military Museum n.d.). Between 1940 and its closure in 1994, Fort Ord saw several waves of new construction (USACE 1941), and the continuous modification of existing structures to suit changing requirements (Musser 2013). Until the mid-1970s, Fort Ord served as a major basic training post, and was the only basic training base west of the Rockies at the time it ceased operating in that capacity. It was then the home of the 7th Infantry Division (Light) until 1994.

The goal of this project was to create a site selection model that assigns structures a ranking based on their eligibility for historic registration derived from criteria such as the age of the structure, its use, and if it is the last of a particular type of structure in an area. The final ranking was also affected by whether preserving a particular structure seems to be an effective use of limited resources as compared to other structures. There are both spatial and non-spatial elements to this ranking. The non-spatial criteria include aspects such as the type of structure, its history, and its current status and condition. Spatial criteria include elements such as a structure's accessibility to the public and proximity to other eligible structures. Figure 1 shows the area of interest at Fort Ord.

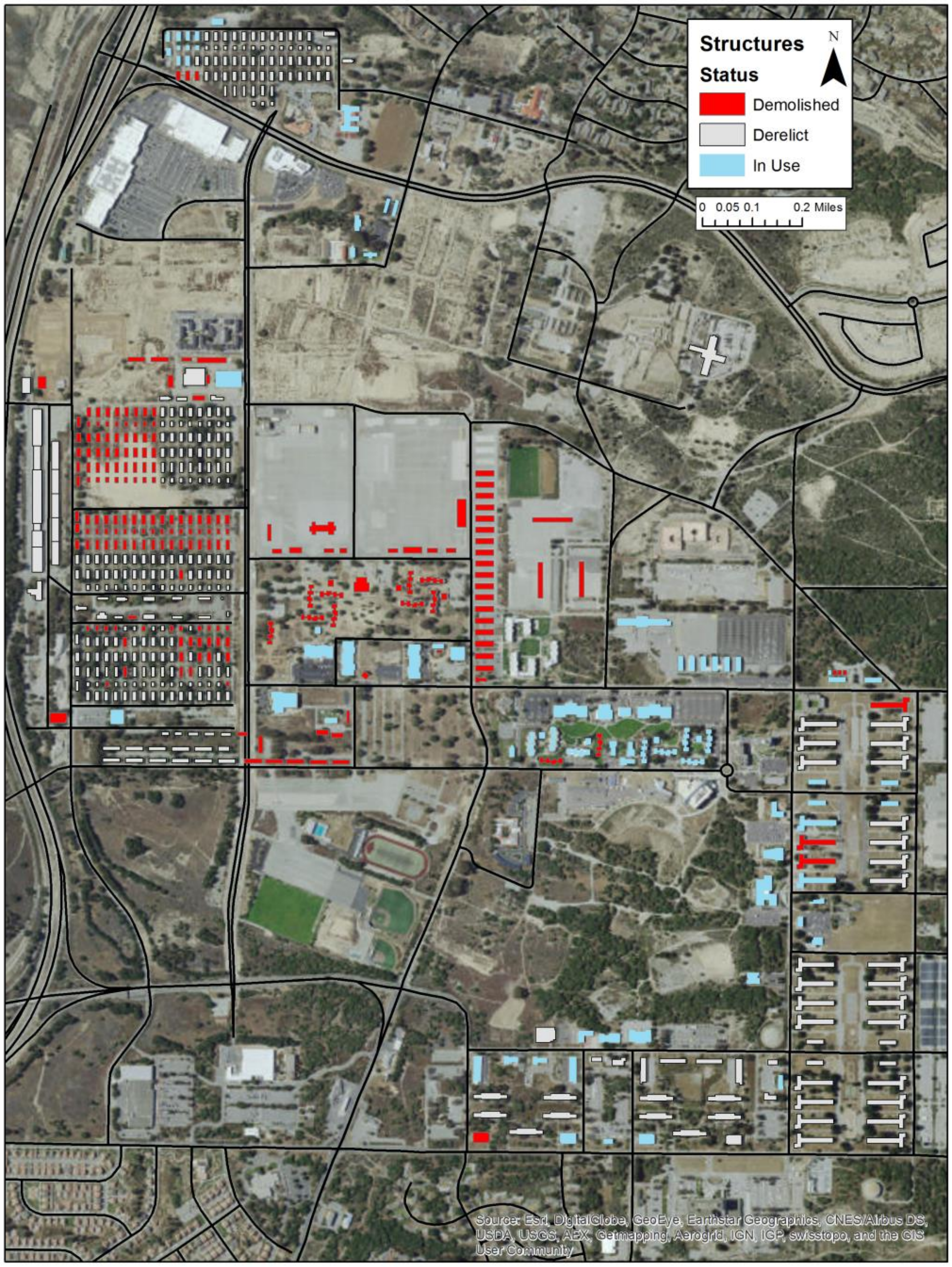

Figure 1. Map of Main Garrison showing structure status

1.1 Motivation

Historic structure reports are often employed when a structure that is potentially eligible for historic registration is going to be altered or demolished, as well as other times an assessment of a building's heritage value is needed (Hamamcioglu-Turan and Akbaylar 2011, Winter and Schulz 1990). The criteria employed by state and federal agencies to determine a structure's eligibility for historic registration is publicly available (California Register n.d., Staff of the National Register of Historic Places 2002). The main criterion is that the structure is historically significant. Additionally, buildings normally must be more than 50 years old, though exceptions can be made if the case warrants it.

While an automated process cannot replace a historic structures report written up by an expert, a GIS model offers a way to streamline the process when dealing with a large number of structures that may be eligible. Though an ultimate judgement on a structure's historical significance will need to be made by an expert, it is possible to model a selection based on those objective attributes of a structure that go into making it eligible. By weeding out those that are obviously ineligible or unlikely to be eligible, this model will then reduce the number of structures that need to be examined manually when dealing with a large group.

No examples of previous uses of GIS in this fashion have turned up in the research for this project. While traditional historic structure reports and site selection models are easily located, no examples of combining the two have been located at the time of this writing. As such, this project has gone in a direction not widely explored.

Additionally, this project has the potential to be beneficial on a more local scale. Fort Ord is a significant part of local history. Its roles, first as a basic training base and later as the home of the 7th Infantry Division (Light), mean that it has a connection to many major historical events between 1940 and 1994. Additionally, the barracks buildings contain a significant number of artworks created by the soldiers stationed there. Many of these murals contain information on the men in the various units, and the military operations they participated in.

Despite the history of this site, there does not appear to be much regard for it in the current reuse plans. While the East Garrison area of Fort Ord has had an historic structures report completed as part of a housing development project (Michael Brandman Associates 2004), and the Department of Defense conducted a report on some of the types of buildings across all their bases as part of a construction initiative in the 1980s, Main Garrison, which contains the majority of the structures, is intended to be entirely demolished, apart from those few structures that remain in use (EMC Planning Group Inc.; EDAW, Inc. 1997). Currently, the only structures that have been specifically designated as historic, as opposed to those that survive only because they remain in use, are a portion of the World War II cavalry stables preserved by a local non-profit.

1.2 Goals and Report Structure

The ultimate goal of his project was to create a model and methodology for the use of GIS in evaluating the strength as preservation candidates of individual structures within a large group. This process was employed with the structures located at the Main Garrison area of the former Fort Ord, California. While the details of individual structures are specific to Fort Ord, the resulting methodology has the potential to be adapted for other sites. This process is demonstrated in the following chapters, which cover research and previous work in this field (Chapter 2), score criteria, methodology and data requirements, as well as instructions on running the model (Chapter 3), the results of running the model and scoring the structures (Chapter 4), and the conclusions drawn from this project, as well as thoughts on further directions to work in (Chapter 5).

Chapter 2 Related Work

While no models have been found that specifically address historic preservation candidacy ranking, there is a variety of related literature that helped to inform the model, identify its criteria, and provide context to this specific study. This literature took the form of existing suitability studies, historic structures reports produced using traditional methods, and documents conveying the history of Fort Ord and its structures.

Additionally, despite not having been used to evaluate historic structures, GIS has been employed in other ways related to the preservation of historic structures. These uses primarily take the form of structure inventories. Examples include both web based applications and GIS databases. By increasing the ability to access data on historic structures, these projects provide planners and preservationists with new tools to organize the preservation and reuse of historic structures.

2.1 Site Suitability

Ultimately, the proposed screening process for historic structures takes the form of a site suitability analysis model, with structures serving as the sites. Currently, no articles or reports have been found that present a use of these models in the context of historic preservation. Site suitability analyses used in ways not related to preservation, however, still proved useful, particularly by informing the methodology of this project and the structure of the model ultimately created.

Many texts and journal articles discuss different types of site suitability analyses. In particular, those dealing with generating weighted suitability rankings are of interest. Multiple examples of this type of suitability analysis concern weighted overlays using raster data, in order to find a suitable location based on source overlays (Mitchell 2012). While this project instead dealt with the footprints of buildings rendered as polygons, some of the same logic applies.

This type of analysis has been employed for tasks such as planning urban development in India. In an article by Kumar and Shaikh (2013), five factors are assigned weight and employed in site suitability analysis for urban development. Raster datasets were used, containing data on slope, road proximity, land use/cover, land value, and geologic formations. By reclassifying these raster values into numerical rankings, from least to most suitable, suitability values are determined for each cell of the raster.

Kumar and Shaikh (2013) discuss the identification of suitable sites in hilly terrain, in particular. Their article demonstrates the use of multi-criteria analysis and GIS in determining site suitability for development in the city of Mussoorie, in India. Five criteria were employed in this analysis: slope, road proximity, land use/cover, land value, and geological formation. Once maps of these criteria were created, they were standardized using a comparison matrix. Weights were assigned by comparing the criteria to each other based on their importance. Specifically, the sum of the pairwise values was determined, each element was divided by the column total, and an average was calculated using the sum of the normalized scores and the number of criteria. These weights were then used to gauge site suitability.

This thesis project instead ranked existing features based on how they fulfill various suitability criteria. A similar goal was employed in a previous USC thesis project, *Community Gardens for Social Capital*, that models sites for community gardens in the city of Akron, Ohio (Oulton 2012). That project looked at land parcels in the city of Akron, and assigned rankings based on a variety of attributes, such as sun exposure, as well as factors such as the social capital of the surrounding neighborhood.

Oulton analyzed the suitability of land parcels based on both the physical characteristics of the site and social factors in the surrounding area. Land parcel and soil data were used for the physical variables, and a means of measuring social capital was designed for the project. Weighted rankings were assigned to the physical and social variables, and these were then added together and converted into a total score. Variables were ranked based on a 1 to 5 or 1 to 4 scale of suitability, with a maximum of 39 total points for physical variables, and the same for social variables (Oulton 2012). The resulting scores were then verified using in-person observation of the land parcels. This falls closer to the aim of this project, selecting from existing structures based on multiple criteria.

A similar study by Kimbrough, Vallero, Shores, and Mitchell (2011) was employed in the city of Detroit. Based on a study previously conducted in Las Vegas, the aim was to select the most suitable location for air quality monitoring stations near a highway. A list of potential sites was drawn up, with locations then filtered out based on established criteria. This included criteria such as the average traffic on nearby roads, and climatic reports on the locations. Sites were also examined in person, which eliminated several sites that initially appeared promising. The decision process incorporated a number of different perspectives from different disciplines, utilizing both recorded data and in-person observation. Additionally, that report draws attention to factors other than purely physical or scientific constraints when selecting such a site. As Kimbrough et al. show, other agencies and stakeholders need to be incorporated into the decision process, which can add another layer of complexity.

Multiple criteria analysis has also been employed in industrial site selection. Rikalovic, Cosic, and Lazarevic (2014) discuss the use of GIS site suitability analysis in the Vojvodina region of Serbia. Due to the significant long-term nature of investment in a new industrial system, selected suitable locations is of major importance. Given a set of selection criteria, the goal is to find the site that bests suits that criteria. Due to the geographic nature of much of this data, GIS is particularly well suited to this task. Previous site selection is noted as being based almost entirely on technical or economic criteria. Site selection must now also satisfy a number of environmental, social, technical, and political criteria. When selecting industrial sites in Serbia, the criteria identified by the authors as the most significant include workforce availability, labor cost, availability of resources, and the efficiency and reputation of local authorities.

According to Rikalovic, Cosic, and Lazarevic, with the use of GIS, the selection process can be accomplished in a series of 10 steps. The use of GIS also facilitates the selection and evaluation of alternative sites. While their study generates a raster map showing the suitability of each cell, it also presents examples of the same map converted to vector data.

2.2 Historic Structures

Historic structures reports were one of the major sources used in this project. These reports, at their most basic, are intended to ascertain the historical significance and character of a structure. They perform this function by documenting the circumstances surrounding a structure's original construction, how it has been altered or modified, its current condition, and identifying an appropriate course of treatment. Originating in 19th Century France, historic structures reports have been in use in the United States since the 1930s (Slaton and O'Bright 1997).

The primary criterion for registration as a historic structure is historical or architectural significance. Additionally, structures less than 50 years old are normally ineligible, though exceptions can be made on a case-by-case basis (Staff of the National Register of Historic Places

2002). Additionally, certain types of structures are also normally ineligible, such as reconstructions, structures that have been moved, cemeteries, birthplaces, religious structures, and structures that are primarily commemorative. A variety of criteria can allow structures such as these to be eligible for historic registration, however. Religious structures can be eligible if they primarily derive their significance from architectural, artistic, or historical importance. Relocated structures can be eligible if they are the surviving structure associated with a person or event, or if they are primarily significant for their architecture. A grave of an important figure can be eligible if it is the only monument associated with that figure, and cemeteries can be eligible if they are associated with a historical event, if they have distinctive design features, or from their age. Reconstructed buildings are eligible if they are done as part of a restoration plan, and no authentic structures associated with the same historical events survive. Commemorative sites can be eligible if they have developed significance beyond their commemorative intent, and structures less than 50 years old are eligible if they are of exceptional importance (Staff of the National Register of Historic Places 2002).

The National Register of Historic places defines its criteria as significance in American history, archaeology, engineering, culture, and architecture present in districts, structures, buildings, sites, and objects that possess integrity of design, setting, workmanship, or association, and meet one of four other criteria. These criteria are association with a historical event, association with the lives of historical figures, embodiment of the characteristics of a particular time or designer, or the ability to yield valuable information about history or prehistory (Staff of the National Register of Historic Places 2002).

When authoring a report considering the designation of a historic structure, however, other factors are also significant. The condition of the structure is important, as is its prominence

(Hamamcioglu-Turan and Akbaylar 2011). Association with a particular historical context also contributes to a structure's significance (California Register n.d.).

In a 2011 study by Hamamcioglu-Turan and Akbaylar, a 19^{th} Century Ottoman church in Turkey is documented to demonstrate a variety of techniques in this field. The focus is on new image-based documentation methods, and the ways of combining these with more traditional techniques. Initially, the structures were used to create 2d and 3d elevations based on point clouds entered into AutoCAD software. Photographs of the structure were then rectified and used in mosaics with these elevations. These models, in combination with existing research, were used to document the structure. Data about elements or the structure are stored in tables, linked by structure ID numbers.

When determining if a structure is suitable for historic registration, its architecture is also significant. In addition to being a necessary step in documenting a structure, examining the architecture can help to determine the historic significance or viability as a preservation candidate of a building. Historic features and unique characteristics can contribute to the historic character of a structure, and examining the architecture can also indicate whether it has been modified or remodeled (Spiers 1982).

The use of GIS for cultural heritage dealing with French Colonial architecture in Hanoi, is described by Enriquez (2015) who sought to integrate web-GIS with cultural heritage. The author, notes that an inventory of cultural resources is the necessary first step to conservation, and inventory and conservation work can help to preserve at-risk sites.

Enriquez (2015) discusses the development of a web application for gathering and displaying data about historic colonial-era structures in Hanoi. The ultimate goal was to inventory the Art Deco architecture, in order to facilitate preservation in the face of rapid modernization initiatives. Additionally, a goal of the project was to provide a way to better engage the general public in the preservation process.

The data used in the Hanoi web application were geotagged photographs of French Colonial structures. This step then allowed an inventory that included both information on the architecture and a structure's coordinates to be created. With this data available, planners and preservationists can both view the locations and data on historic structures, as well as track how the urban environment has changed (Enriquez 2015).

GIS has also been employed in cataloguing historic structures in rural Spain. This study, by Cano, Garzón, and Sánchez-Soto (2013), took place in an area near the Almanzora River Valley, in the Andalusian region. This study aimed to document structures, classify them by type, and centralized documentation. Field and desk work were used to inventory the structures, and this data was then combined into a GIS. This GIS then allowed the centralized documentation to be used to formulate rehabilitation and reuse plans for the buildings.

The database discussed by Cano, Garzón, and Sánchez-Soto was created in response to the changing character of the European countryside in recent decades. Despite significant changes in the agricultural sector, resulting in the loss of many traditional rural structures, traditional architecture remains socially and culturally relevant. The area dealt with in this article was the Almanzora River Valley, in the Andalusian region of Spain. Buildings were classified based on the type of structure, such as kilns, mills, and types of houses. The author also notes that preservation of historic structures is costly, so those that have the potential for reuse are the most suitable for preservation.

The Spanish historic preservation database was created using seven steps in order to comprehensively inventory historic rural structures. The first step was to map the geographic locations of the traditional structures. These were identified using documentary sources and archives. Field data was then collected about each building, in the form of questionnaires concerning the characteristics of the building, the quality of the landscape, and the state of repair of various elements of the building. The data gathered in the first two steps was then entered into a computer database, and linked with photographs and other documents. The next step was to assess the socio-economic qualities of the surrounding landscape. This accounts for the characteristics of the landscape, historic and economic significance, and other factors. Identification files were then created from this data for each of the structures. These files were then used to create a centralized database of rural architecture, to facilitate the goals of preservation and reuse (Cano, Garzón and Sánchez-Soto 2013).

In the research for this thesis project, reports were also located that relate directly to the structures at Fort Ord. In the late 1980s, the Department of Defense embarked on a large construction initiative that necessitated the demolition of many World War II wooden temporary structures at bases throughout the US. The Department of Defense, working with state and federal preservation agencies, had a historic structures report and agreement drawn up that served as a report for all such structures, an act that removed the need for reports specific to each base (Department of Defense 1990; Garner 1993). Essentially, this is a generic report for all World War II temporary structures, allowing them to be demolished without a base-specific assessment. As such, these structures, which make up a large portion of the remaining buildings on Fort Ord, have no official requirement for a report, and no previous ones specific to Fort Ord have been located.

The East Garrison portion of Fort Ord has been the site of a housing development project for some time, with a temporary hiatus in construction between 2009 and 2013. As part of this project, historic surveys of the structures at East Garrison, most of which date to World War II, have been conducted. In these reports, a group of concrete dining halls constructed by the Works Progress Administration in 1940 were considered the best preservation candidates, and could possibly serve as a historic district (Michael Brandman Associates 2004; Urban Design Associates n.d.). There seem to be no plans for such a report for Main Garrison (EMC Planning Group Inc.; EDAW, Inc. 1997).

2.3 Fort Ord

The history of Fort Ord, and the buildings located on it, was of great significance to the aims of this project. A variety of primary and secondary sources exist detailing Fort Ord and its history. These range from maps and basic training yearbooks to history texts and documentaries.

The land on which Fort Ord was constructed was acquired by the United States Army in 1917, for use in cavalry exercises by the troops stationed at the Presidio of Monterey. It served in this capacity until 1940 (California Military Museum n.d.). The initial construction occurred at what is now East Garrison, near Salinas. This was designated Camp Ord (Donnenfield 1998). By 1941, construction had started at Main Garrison, near the coast, and the entire base was designated Fort Ord.

Fort Ord served as a basic training base from this point until the mid-1970s. Throughout this period, waves of new construction occurred at several points. The earliest buildings date to the beginning of World War II. These are wooden structures originally intended to be temporary (Garner 1993). Further new construction occurred in the early 1950s, late 1960s, mid-1970s, and throughout the 1980s (Musser 2013). Fort Ord was closed in 1994, as part of the Base Realignment and Closure Act, and much of the former land was incorporated into California State University, Monterey Bay, founded the same year (History of Fort Ord 1995).

Fort Ord can be divided into four major “waves” of construction. In general, these waves of new construction progressed for several years and occurred approximately once a decade. They usually corresponded to a period of conflict or a change in what the Army required of Fort Ord. Each period also marks a distinct change in the architecture of the building built during that time.

The first wave of construction started in 1940, and continued through World War II. The majority of these structures are two story wooden barracks, and were originally intended to be temporary, used for up to five years (Musser 2013). These structures were constructed using premade sections, and were completed very rapidly (USACE 1941). While more common at East Garrison, several permanent concrete structures were also built in Main Garrison at this time. These structures include Stilwell Hall, the former enlisted men’s club, and Martinez Hall, the former headquarters (Raugh 2004). While Martinez Hall remains in use as the Veterans Transition Center, Stilwell Hall, built in 1943, has been demolished.

The next major wave of construction occurred in the first part of the 1950s. This construction occurred mainly after the end of the Korean War, in 1953 and 1954. Unlike the bulk of the earlier construction, these structures were made of concrete, and intended to be permanent. The majority of these buildings are three story concrete barracks that include attached kitchen and dining hall facilities. Originally arranged with a single large bunk hall on each floor, they were later divided up into smaller rooms (Musser 2013). The stockade was also constructed at this time.

The third major construction phase occurred in the late 1960s. These are three story concrete barracks of a different design to those built during the 1950s. Whereas the earlier structures incorporated the kitchen and dining facilities into a single building, the 1960s structures once again separate these facilities into different buildings, with dining halls serving a group of barracks. Unlike the earlier barracks, these were designed from the start as containing separate 8-man rooms, rather than the large bunk halls of the earlier barracks. The main hospital, currently used as an office building by the Department of Defense, was also built at this time (Musser 2013).

The final group of buildings was constructed starting in the mid-1970s, and expanded until new construction ended in the late 1980s. The barracks are three story concrete structures, surrounded by single story concrete buildings containing facilities such as dining halls and offices. Additionally, these barracks continued the trend from the 1960s, of switching from large bunk halls to smaller rooms housing fewer men. This group of barracks were also the only ones built after Fort Ord was no longer a basic training base. These facilities were periodically expanded, by the addition of structures such as gyms, until the end of the 1980s (Musser 2013). Notably, California State University, Monterey Bay refurbished and used many of these buildings when it first opened in 1995.

2.4 Similar BRAC Bases

Base Realignment and Closure (BRAC) is a process by which US military installations are closed in order to increase Department of Defense efficiency. BRAC Commissions drew up reports at five points between 1988 and 2005, recommending which bases should be closed (Office of the Under Secretary of Defense for Acquisition, Technology and Logistics n.d.). Fort Ord was closed at the recommendation of the 1991 BRAC report.

Other bases closed as part of BRAC share similar characteristics to Fort Ord. Bases identified as being of similar vintage and containing similar architecture to Fort Ord include Fort Chaffee, Fort Greely, and Fort Rucker. Of these, Fort Chaffee is of particular note. Opened in

1941, Fort Chaffee was closed on the recommendation of the 1995 BRAC Commission (Fort Chaffee Redevelopment Authority 2009). A group of the wooden structures on Fort Chaffee have been designated a historic district. Certain structures, such as the barbershop, are reused as museums, and others, such as the chapel, are available for other functions. Tax credits are also available to encourage restoration and reuse of buildings in the historic district (Fort Chaffee Redevelopment Authority 2009).

2.5 Likely Candidates

Based on all of the preliminary research and field work, certain structures and areas can be identified a priori as likely candidates for preservation. They are identified here so that the results of the model developed in this research can be assessed against such determinations for preservation that might be made in the absence of GIS.

Building T-2798, Martinez Hall, is a World War II era permanent structure and the only remaining such structure on Main Garrison. It also contains artwork, has not been modified, and has remained in use, so it is in good condition. The combination of these characteristics seem to suggest that it would make a good preservation candidate.

Two areas of structures are also likely to be key preservation targets. The northern group of World War II temporary structures are in the oldest age group, are mostly fairly intact, and have not been modified. The 1950s barracks in the East zone are of concrete construction making them less susceptible to damage, the majority of them are unmodified, and many contain artwork.

This document now turns in the next chapter to a description of the development of the model and workflow used to assess the buildings on Fort Ord. The resulting scores are compared to these a priori assessments in Chapter 4 to determine the validity of this process.

Chapter 3 Data and Methods

The goal of this project was to create a screening process for use when evaluating structures as historic preservation candidates. This includes considerations beyond simply whether it met the eligibility criteria to be listed as a historic structure. The groups and organizations preserving historic structures possess finite resources, preserving certain structures over others makes better use of those resources. Ultimately, the final call on whether or not a structure is historically significant and worth preserving must be made by an expert. This model and related methodology merely serves to estimate a structure's suitability, so that effort by experts can be more efficiently allocated toward the best candidates.

The model was created in the context of Fort Ord, California. As such, many details of the models and methods used are specific to that site. With modifications, however, this methodology should also be applicable to other groups of structures. As is shown later, the individual scoring operations can have their codes modified in order to add new parameters or remove irrelevant ones.

This chapter contains several main sections. The first of these presents the criteria used to assess preservation significance. Then the study area and types of data used are discussed. Finally, the model is described, both how it functions and how to run it.

3.1 Criteria

Research has indicated several evaluation criteria to be used when ranking the structures on Fort Ord for their suitability as preservation candidates. Some of these concern attribute data, and others relate to spatial characteristics of the buildings. The year of construction is important, as it can be used to determine both the age of the structure (Staff of the National Register of Historic Places 2002), and estimate its association with a particular historical event or context

(California Register n.d.). The condition of the structure will influence its score, as will whether or not it has been modified (Hamamcioglu-Turan and Akbaylar 2011).The function of the structure will be incorporated, to screen out garages and similar structures. The presence of artwork in the building will also increase its ranking as a candidate.

Several criteria will also be ranked using spatial characteristics, rather than attribute data, or by a combination of the two. The prominence of a structure is important when gauging its quality as a preservation candidate (Hamamcioglu-Turan and Akbaylar 2011). Clusters of highly ranked structures may also be suitable as a historic district, similar to what was proposed for East Garrison (Michael Brandman Associates 2004). Alternatively, structures that are the last of a particular type in a given area can be considered at-risk (Enriquez 2015), and therefore of greater urgency. One of the primary goals of historic preservation is education (Huyck 1990), so structures that are more accessible would logically make better candidates. These criteria are summarized in the following table.

Table 1 Criteria and data sources

Criteria	Description	Source
Year	Used to determine both age (>50 years), and association with a historical event.	GIS Dataset/Previous research
Condition	The condition of the structure, ranked as either no/cosmetic damage, non-structural damage, and structural damage.	Field work
Modification	Whether the structure has been modified. Ranked as either no modification, light modifications that do not change the overall layout, or significant modification.	Field work
Function	What the function of the structure was.	Historic Maps, other documents
Artwork	Whether the structure contains artwork.	Field work
Prominence	How prominent a structure is, defined as the area over which it is visible.	Elevation data, ArcGIS analysis
Clustering	Groups of high scoring structures.	Hot spot analysis
At-Risk	How common or uncommon a structure is.	Frequency tool
Accessibility	A structure’s proximity to the nearest road.	Near tool

3.2 Data

With this project, the intention was to create a generic model that could be applied to the examination of structures on different sites. Certain details, however, are important to a particular site, but may not necessarily be applicable to another. As such, the model cannot be applied directly to another site without modification. The generally methodology, however, should be applicable to other sites, with modifications to the exact steps and the starting datasets to fit the unique background of the site being examined.

Three initial datasets were employed. These are the structures themselves, the road network, and elevation data for the surrounding landscape. Additionally, various other data layers need to be created as part of the analysis process. While many of the attributes contained in these layers are applicable to many different sites, others seeking to employ this method will need to tailor their datasets to those criteria that they consider significant.

3.2.1. Structures

The most prominent dataset, and in many ways the most important, is the data representing the structures themselves. This is a polygon feature class containing the footprints of the structures, and various attributes related to them. Main Garrison contains approximately 415 surviving structures. The polygons in this layer were created using a combination of historic maps, aerial imagery, and a shapefile obtained from the California State University, Monterey Bay planning office. This dataset includes all of the structures present on Main Garrison in 1994, including those since demolished. While this shapefile was useful in positioning structures, as well as providing some attribute data, the digitization is fairly inaccurate, making the polygons unsuitable to use in this project.

The attributes for each structure were derived from a variety of documentary sources, as well as previous field work undertaken by the author. This field work consisted of taking interior and exterior photographs of the structures between 2009 and 2015. First hand examination of the structures was used to determine information on attributes such as condition and the presence of artwork.

Table 2 Structure Attributes

Attribute	**Source**	**Type (example)**
bldgNumber (building number)	Historic Maps	String (T-1921)
Status	Field work	String (derelict)
yearBuilt (year of construction)	GIS Dataset/Previous research	Integer (1940)
Condition	Field work	Integer (2)
Function	Historic Maps, other documents	String (barracks)
Modified	Field work	Integer (0)
Floors (unused)	Field work	Integer (2)
Artwork (presence of artwork)	Field work	String (Yes)
Type (of structure)	GIS Data, other documents	String (WW2Temp)

3.2.2. Zones

For certain portions of the analysis, it was necessary to divide the study area into various zones. The primary use of these zones was in gauging how common or rare a given type of structure is in a particular area. With one exception, these zones are based on construction periods. Zones consist of region where the majority of structures were built during the same time frame. In one case, a zone was divided into two because there was a large gap between two groups of buildings constructed during the same period. This gap caused the areas of primarily World War II temporary buildings to be split in two, where demolition had created a natural break.

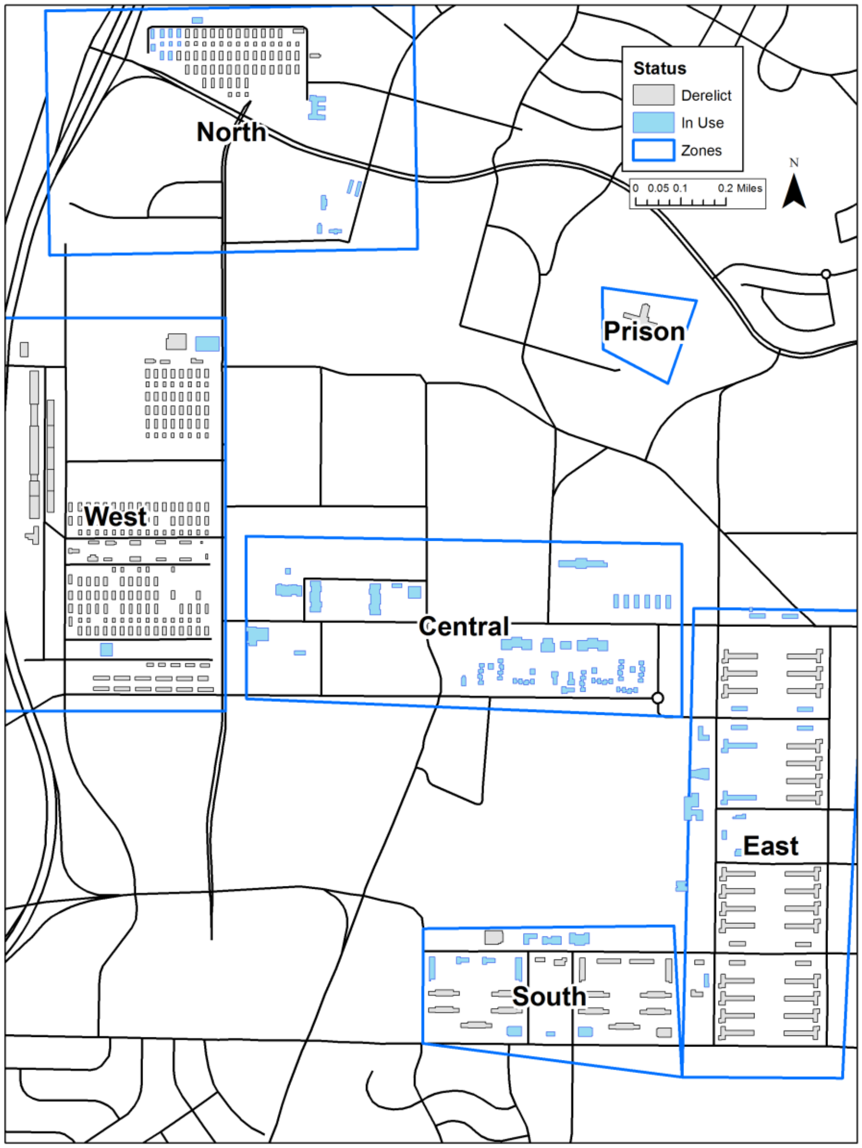

Figure 2 Map of the Zones. North and West are primarily WWII temporary structures, East and Prison are primarily 1950s structures, South is primarily 1960s structures, and Central consists mainly of structures from the 1970s or later.

3.2.3. Roads

A transportation dataset was also included to assess accessibility. Obtained from Monterey County's GIS data website, this dataset contains all of the active roads in Monterey County. This shapefile represents roads as a simple line feature, allowing use of the Near tool to judge how close the center point of each building is to the centerline of the nearest road. As the only factor being examined using this data was the proximity of a structure to an active road, simple lines were adequate. If types of road or traffic levels were also included in the analysis, a more detailed dataset would be necessary.

Figure 3 Road centerlines

3.2.4. Elevation Data

The final necessary initial dataset was elevation data. This came in raster form, and was obtained from the USGS National Map website, as part of the National Elevation Dataset. This data was used in gauging the prominence of a structure, based on its visibility. The resolution of this data is 1/9 arc second, noted as being approximately 3-meter resolution, and it contains the elevations of the structures and other surface features, rather than just the landscape. This allowed the visibility analysis to account for possible view obstruction as the result of neighboring structures. The dataset was in decimal degree units, using the 1983 North American Datum. Figure 4 presents a hillshade based on this elevation data.

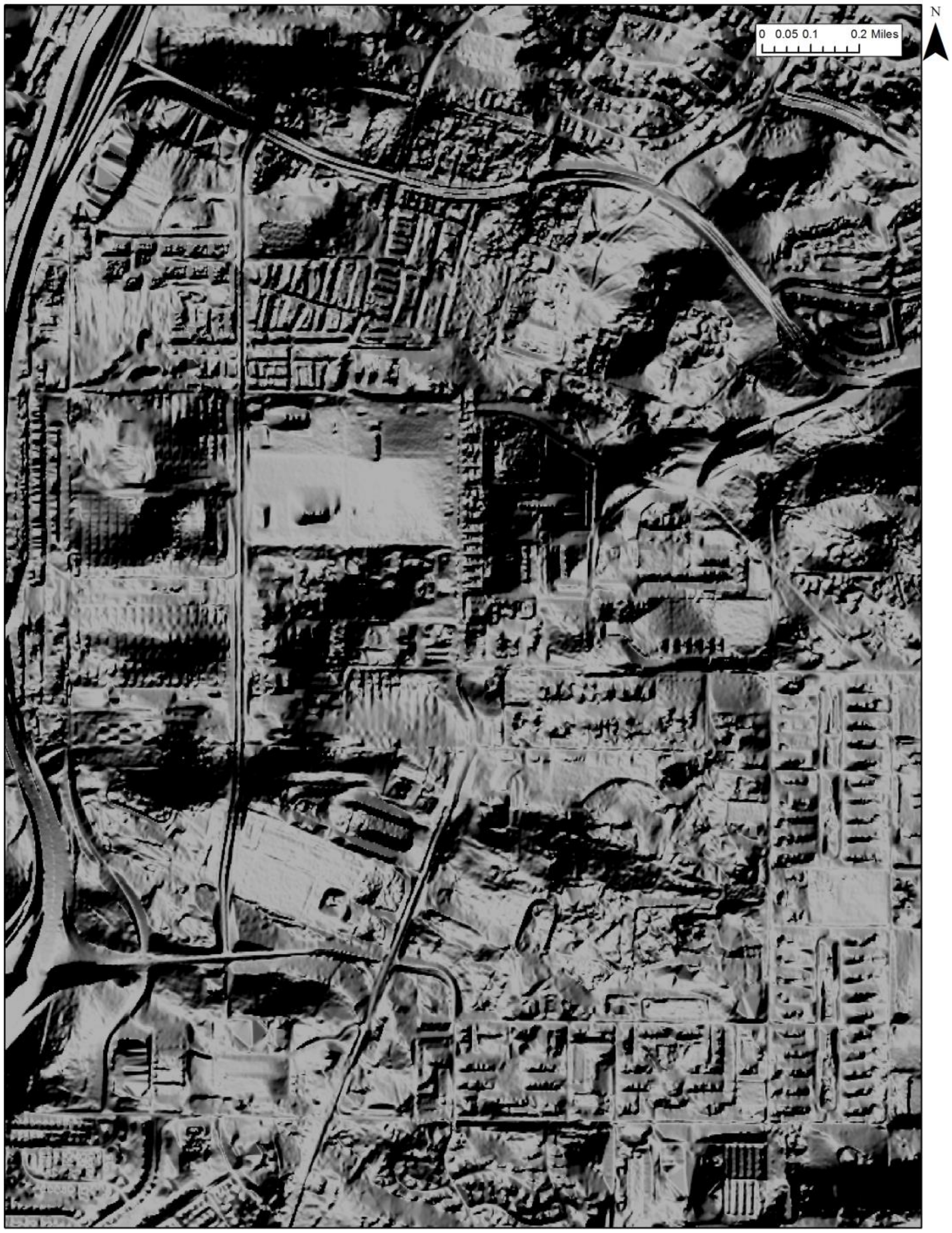

Figure 4 Hillshade from elevation data, with structure elevations visible.

3.3 Model Overview

This section provides an overview of the functions of the model. Details on the running of the model are included in the following section. The model consists of three sub-models. These are the viewshed model, the results merging model, and the scoring model.

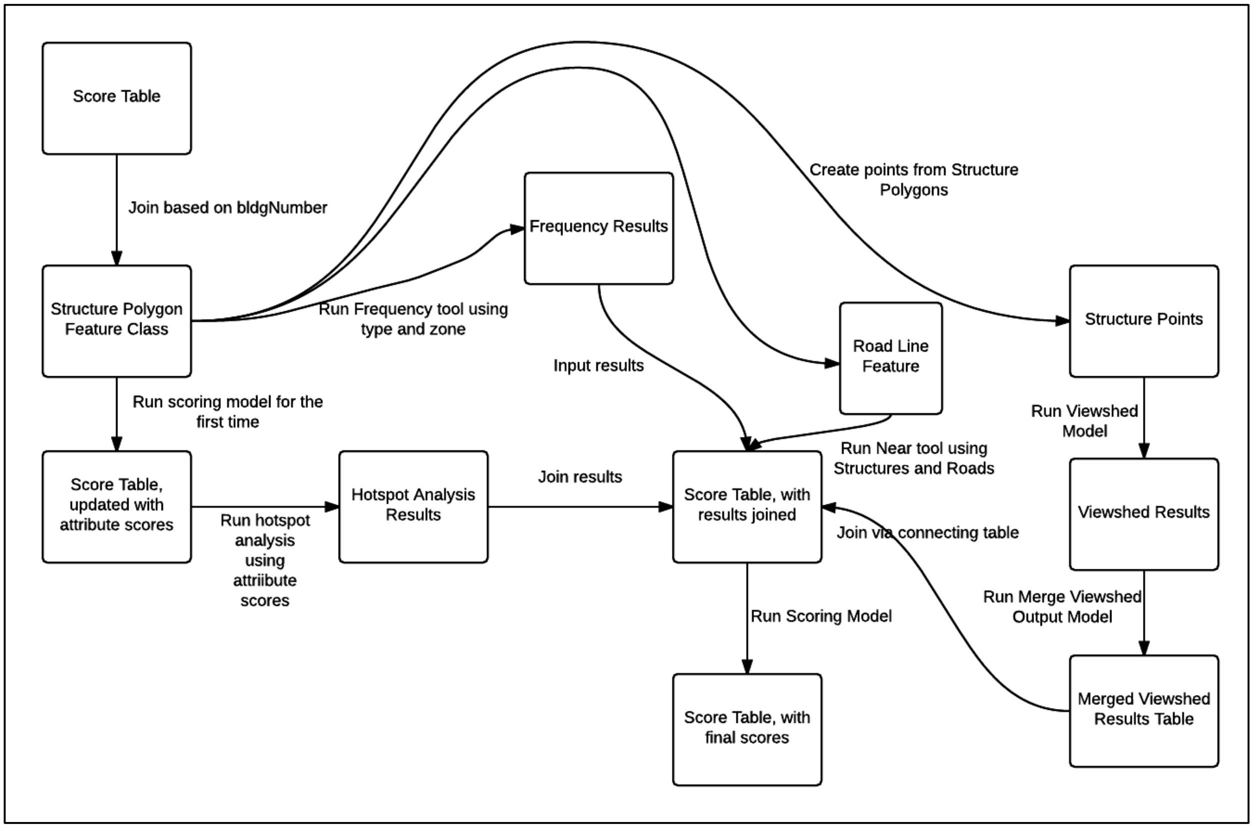

Figure 5 Diagram of the Model(s)

3.3.1. Viewshed Sub-Model

The first model section is used to calculate the viewshed data for visibility scoring. This model takes a layer containing the center points of the structure polygons and the elevation data as its inputs. An iterator runs through each structure point consecutively, the viewshed operation is run, and the results are saved as a series of consecutively numbered tables. The results of the viewshed model is a folder containing a series of tables, numbered from 0 to one less than the number of features. These tables contain the count of cells in the entire study area from which the feature is visible.

3.3.2. Merging Sub-Model

This model is designed to be run following the viewshed model. The resulting merged table includes the values from all of the viewshed output tables, entered into individual rows associated with the relevant structure object IDs. Since the tables output by the viewshed model do not record the original structure IDs, it is important to note that this table requires an intermediate table that links the original and new object IDs by their position in the processing flow. This is discussed in greater detail in the section below about running the model.

3.3.3. Scoring Sub-Model

This model assigns scores based on a variety of criteria. It uses the results of the previous models, as well as a variety of other forms of preliminary data, coming from the structure attributes, joined features, and manually entered information. This is accomplished through a series of Field Calculator operations. Each Field Calculator operations scores for a particular criterion. These values are then entered into a Score table, along with totals of the attribute, spatial, and total scores.

When running this sub-model for each criterion, the point values, as well as other variables that differ by criteria, are set by the user, though default values are provided. The specific values assigned to these variables used for the Fort Ord case study are included in the explanation of each step below. Additionally, the VB code used in the field calculator for each criterion score are included in Appendix A. The following sections outline the individual components of this scoring model.

3.3.3.1. Year Scoring

The first calculate field operation assigns scores based on the year a building was constructed. The year of construction for each structure polygon is compared to a set of three brackets of years, and assigned points based on which range the date falls into. Three floating point variables (yearPointsA, yearPointsB, yearPointsC) indicate the point values assigned, and the integer variables (year1Start, year1End, etc.) determine the start and end years of each of the three ranges.

Table 3 Year scoring parameters

Parameter	Explanation	Default Value
yearPointsA	Oldest year range points awarded	10
yearPointsB	Mid-year range points awarded	5
yearPointsC	Younger year range points awarded	2.5
year1Start	Start year for the earliest bracket	1940
year1End	End year for the earliest bracket	1945
year2Start	Start year for the mid bracket	1946
year2End	End year for the mid bracket	1970

3.3.3.2. Condition Scoring

The second calculate field operation scores based on a structure's condition. There are three floating point variables for this score. These represent the maximum (conditionFullPoints), middle (conditionMidPoints), and minimum (conditionLowPoints) awarded based on condition.

Table 4 Condition scoring parameters

Parameter	Explanation	Default Value
conditionFullPoints	Points awarded to highest condition rating	10
conditionMidPoints	Points awarded to mid condition rating	5
conditionLowPoints	Points awarded to lowest condition rating	2

3.3.3.3. Artwork Scoring

The third portion of this model scores based on the presence of artwork in a structure. This step has only one variable, a floating point value for the number of points awarded if there is artwork present in a structure. If a structure contains artwork it is awarded full points, otherwise it is awarded none. The only values for the artwork attribute are a yes/no for the presence of artwork.

Table 5 Artwork scoring parameters

Parameter	**Explanation**	**Default Value**
artPoints	Points awarded for the presence of artwork	10

3.3.3.4. Function Scoring

The fourth field calculator operation assigns scores based on the function of the structure in question. The variables for this are all of the floating point type, and are given for each building function (barracksPoints, hqPoints, etc.), as well as a value (minPoints) that serves as a minimum number of points awarded if the function of the structure does not match one of the other categories. The attribute values for the function category are a text description of the function of the structure.

Table 6 Function scoring parameters

Parameter	Explanation	Default Value
barracksPoints	Points awarded to barracks	10
hqPoints	Points awarded to HQs	10
chapelPoints	Points awarded to chapels	10
uniquePoints	Points awarded to unique/other	10
officePoints	Points awarded to office/admin	6
pxPoints	Points awarded to PXs	6
diningPoints	Points awarded to dining facilities	6
recPoints	Points awarded to recreation/gymnasium/theater structures	6
minPoints	Minimum points possible	2

3.3.3.5. Modification Scoring

The final of the non-spatial attribute scores is calculated based on to what degree a structure has been modified since 1994. This makes use of three floating point variables (noModPoints, minorModPoints, majorModPoints), each corresponding to a particular degree of modification.

Table 7 Modification scoring parameters

Parameter	Explanation	Default Value
noModPoints	Points if no modifications	10
minorModPoints	Points if minor modifications	5
majorModPoints	Points if major modifications	0

3.3.3.6. Accessibility Scoring

The first spatial score is based on accessibility measured as the distance between a structure and the nearest road. All of the parameters for this operation are floating point values. These values are based on the average distance, in meters, from a road for all features in the dataset. Two variables (roadOverDistance, roadUnderDistance) are used to multiply the average (distAverage) to set the breakpoints between the near, average, and far ranges. While the average distance is used by default, this base value can be set to any value that the user chooses.

Table 8 Accessibility scoring parameters

Parameter	Explanation	Default Value
roadMaxPoints	Points awarded for shorter than average distance to road.	10
roadMidPoints	Points awarded for average distance to road.	5
roadOverDistance	How many times the average is considered a far distance.	1.5
roadUnderDistance	How many times the average is considered a short distance.	0.5
distAverage	Average distance to road.	52.057

3.3.3.7. Cluster Scoring

The next step assigns scores based on identification of hot spots of high attribute scores generated using the Getis-Ord Gi* method. Prior to this step, the hot spot analysis tool needs to have been run separately using the total of the attribute scores, and the results joined to the score table. Scores are based on whether a structure is given a 90, 95, or 99% confidence rating of being a hot spot. The three parameters are floating point values that correspond with the point values awarded for each confidence interval.

Table 9 Clustering scoring parameters

Parameter	Explanation	Default Value
90ConfPoints	Points for hot spots with 90% confidence	2.5
95ConfPoints	Points for hot spots with 95% confidence	5
99ConfPoints	Points for hot spots with 99% confidence	10

3.3.3.8. At-Risk Scoring

This step scores structures based on whether they are judged as being at-risk. Structures that are the last of their type in predetermined zones are considered moderately at risk, those that are unique in the entire study area are considered at greater risk. Two floating point parameters (upperAtRiskPoints, midAtRiskPoints) are the point values awarded for both of these conditions. The remaining integer parameters represent structure types in each zone (northWW2Temp, etc.) and are given values from 0, 1, or 2. Zero signifies a type that is either common in a zone or not present, 1 indicates it is unique in that zone but not overall, and 2 signifies it is unique in the study area. These values are entered by the user based on the results of the frequency tool, conducted separately.

Table 10 At-Risk scoring parameters. Identical values not listed individually.

Parameter	Explanation	Default Value
upperAtRiskPoints	Points for more at-risk structures	10
midAtRiskPoints	Points for slightly at-risk structures	5
northWW2Perm	Value for WWII permanent structures in the North zone	2
west80s90s	Value for 1980s and 1990s structures in the West zone	1
eastWW2Temp	Value for WWII temporary structures in the East zone	1
east1960s	Value for 1960s structures in the East zone	1
east1970s	Value for 1970s structures in the East zone	1
centralWW2Temp	Value for WWII temporary structures in the Central zone	1
prison1950sOther	Value for 1950s non-barracks in the Prison zone	1
All other parameters	Value for all other types and zones	0

3.3.3.9. Prominence Scoring

The final spatial score is based on the prominence of a structure. In this context, prominence is measured as the area over which a structure is visible. The Viewshed and Merge Models need to have been run already, and the results joined. A value, the average by default (promAvgValue), is used to judge how prominent a structure is. If the visible cell count for a structure is greater than this value multiplied by promUpperFactor, it will be awarded full points (promUpperPoints). If it is less than that, but greater than the average multiplied by promMidFactor, it will be awarded partial points (promMidPoints). Otherwise, the structure will be awarded no points.

Table 11 Prominence scoring parameters

Parameter	Explanation	Default Value
promMidPoints	Points for slightly more prominent structures	5
promUpperPoints	Points for significantly more prominent structures	10
promAvgValue	Average visible area	1487116.458
promMidFactor	Number of times average to be considered slightly more prominent	1.5
promUpperFactor	Number of times average to be considered significantly more prominent	2

3.4 Model Workflow

This section outlines the workflow used to go from structure polygons with attributes to final scores. The model steps need to be run in a certain order, and certain additional actions need to be taken outside of the model to facilitate later steps. These are shown in Figure 6. At the outset, it is necessary to join the score table to the structure polygons. All further datasets generated also ultimately need to be joined to the score table.

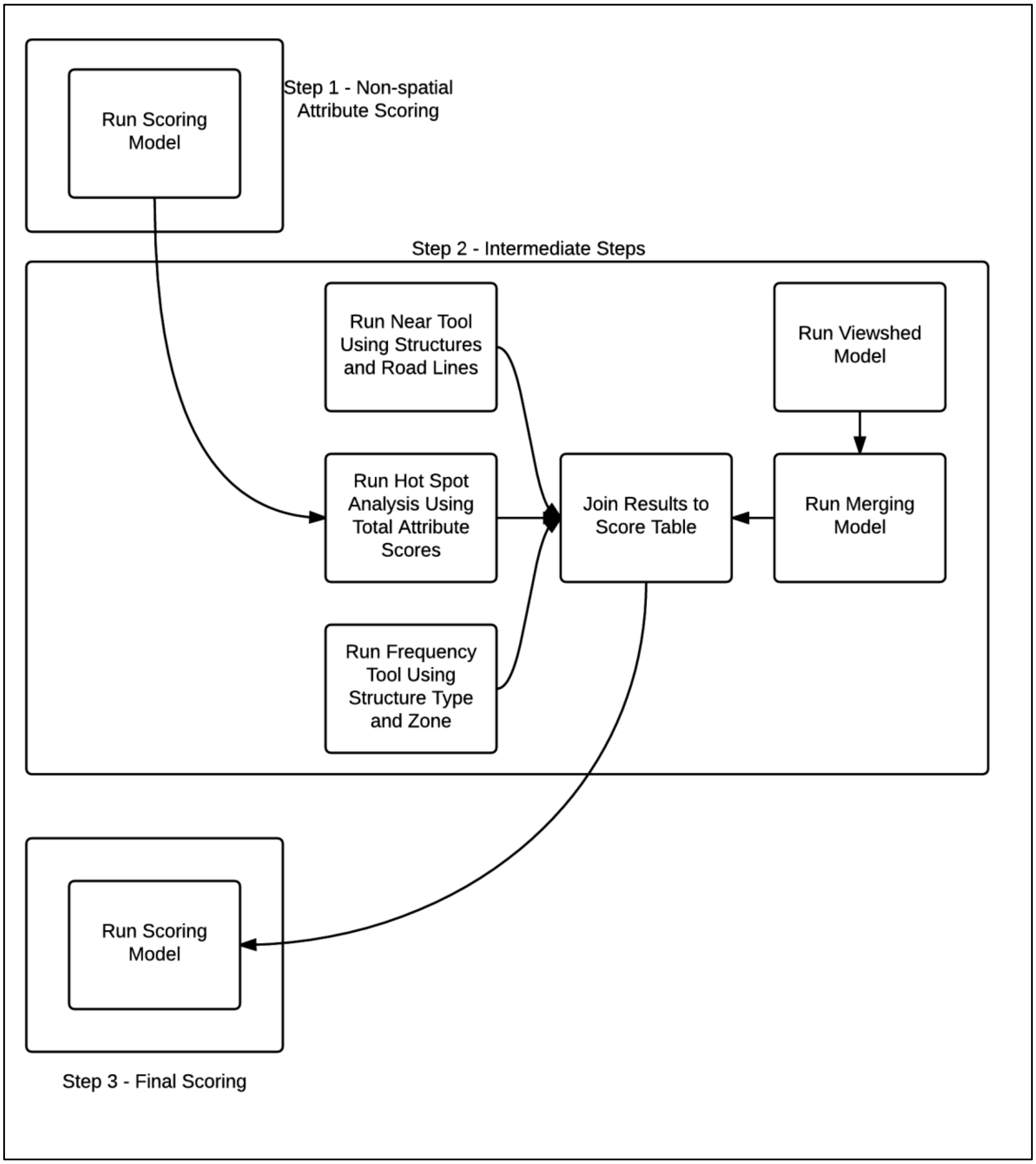

Figure 6 Workflow for running the model

The first step is to run the scoring model once. At this point, it will not be able to calculate the spatial scores, but the attribute score calculations are necessary for later steps. Following these attribute score calculations, the sum will be calculated as an overall attribute score. Other operations are required before the model can be run a second time to calculate the spatial and total overall scores. Some of these steps are performed outside of a model, the others requiring running the viewshed and merge models.

The first intermediate operation is to run the near tool using the structure polygons and road lines. This appends the distance from each structure to the nearest road to the attribute table. A hot spot analysis is also required before calculating the spatial scores, using the attribute score totals for the structures. The confidence levels for hot spots that result are necessary for the one of the spatial scoring steps. The frequency tool needs to be run, using the structure type and zone. This will output a table listing the number of each structure type per zone. These values will later effect variables entered during the spatial scoring.

The next step is to run the viewshed model. Following this tool, the merge model should be run. This tool merges the individual viewshed results into a single table with object IDs. These IDs are assigned based on the order in which the tables are entered into the merge tool input window. Due to the way the software orders these input tables, they will not necessarily be consecutive. In order to correct for this, it is necessary to join the visibility count results to the score table using a connecting table, that links the post-merge object IDs with those of the original structures. Essentially, the original object IDs are joined to the score table, and a second column contains the number of that structures object ID in the merged table, and is joined based on it.

Once these two tools have been run, and the results of the other preliminary work have been joined to the score table, the Scoring Model can be run again, to generate the spatial scores. These scores will be automatically filled in the score table. The remaining operations in the model calculate the sum of the spatial scores, the sum of the total attribute and spatial scores, and enter these values in the score table.

Chapter 4 Results

This chapter discusses the results returned by the model when it was applied to the Fort Ord structure data. Following a brief overview of the overall scores, they are broken down by individual criteria. The top scoring structures are also examined individually, to assess whether the scoring model has accurately scored them. Finally, the results are compared to the expected results listed in Chapter 2.

The model returned a range of scores. These are shown in Figure 7. This map, as well as the maps of non-spatial and spatial scores, are classified in three classes using the natural breaks method. The lowest scoring structures have 19 points, and the highest scoring structure has 76 points. A visual examination of the mapped results appears to show some trends in the total scores. More highly scored structures are in the northern section, and along the south and eastern edges. The western and central sections tend to exhibit lower scores. The breakdown of the individual scores was also reviewed, and the top scoring structures were examined to attempt to judge the accuracy of the results.

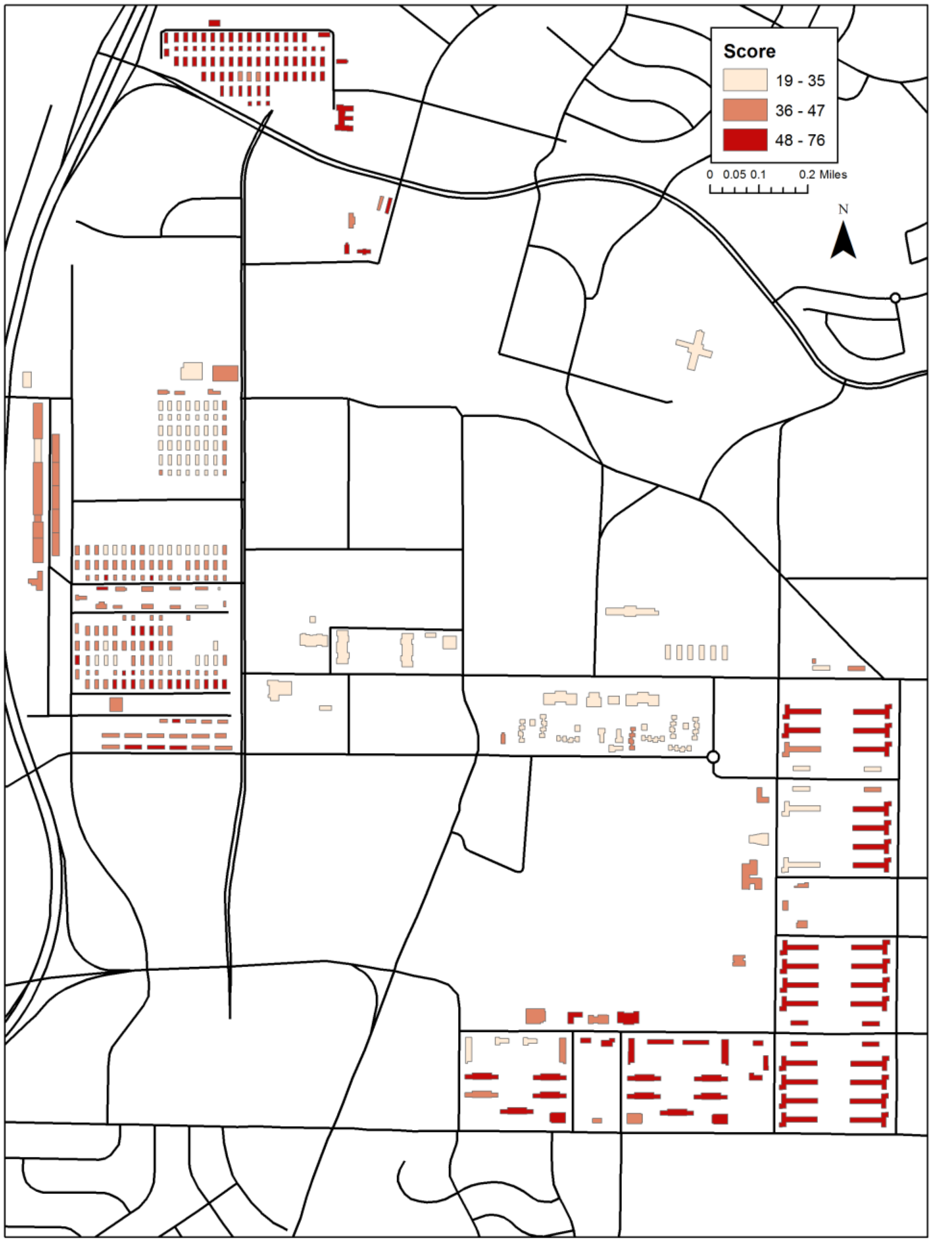

Figure 7 Map of overall scores

4.1 Non-Spatial Attribute Scores

As described in the previous chapter, each of the five attribute criteria was assigned a score, and a total attribute score was calculated from these individual scores. These structures were then used for some of the spatial scoring, as well as providing their own information about the suitability of the structures in different zones.

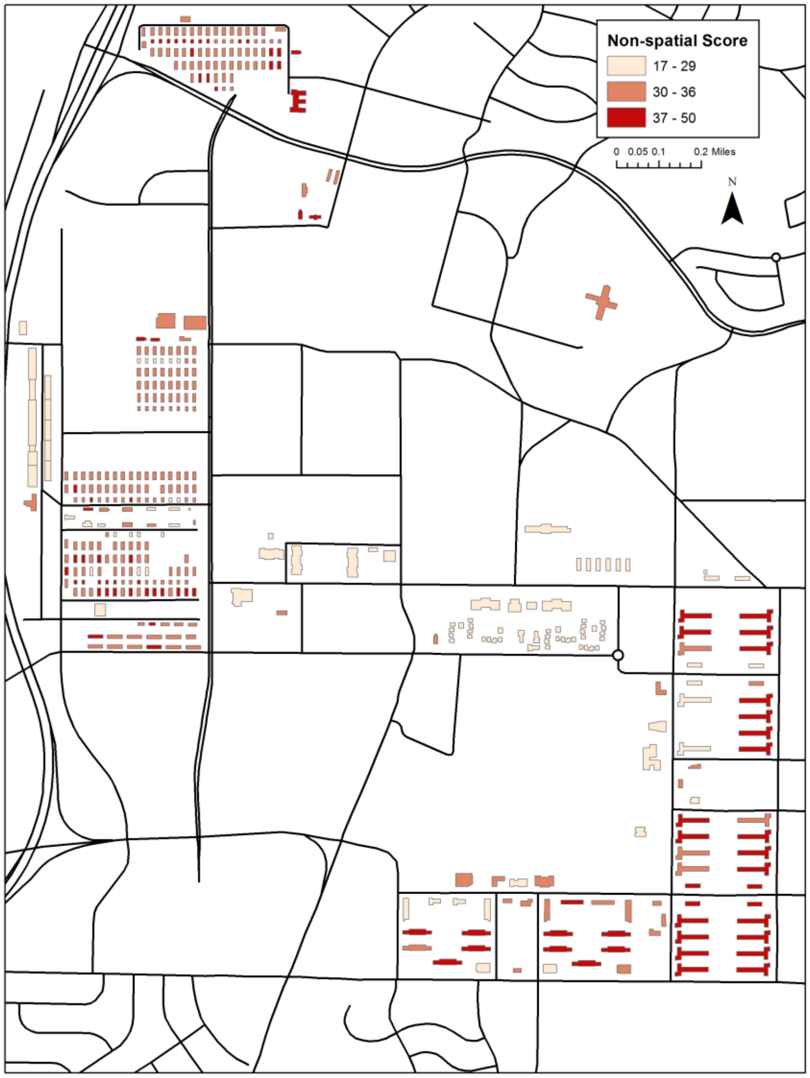

Figure 8 Total non-spatial attribute scores

4.1.1. Year

The first score was based on the year a structure was constructed. As expected, these mapped fairly directly to the zones, because the zones were largely based on construction period. World War II era structures scored the highest, 1950s and Vietnam era structures scored in the middle, and later structures scored the lowest.

4.1.2. Condition

Condition scores, as shown in Figure 9, also followed zone boundaries. One zone, in particular, has the highest concentration of low scoring structures, and another has almost entirely high scoring structures. The West zone, the southernmost of the two primarily World War II era zones, has the highest concentration of very low scores. This area is comprised largely of wooden structures, so they would be more susceptible to natural decay than concrete structures. Additionally, fire department training and partial demolition have damaged many of the structures in this area. The Central zone, which is part of the area used by California State University, Monterey Bay, contains only structures in the highest condition rank. The structures have remained in use, and largely remodeled, meaning they are in the highest condition rank. Areas comprised mostly of concrete structures scored higher overall in condition, likely because they are less susceptible to natural decay than wooden structures.

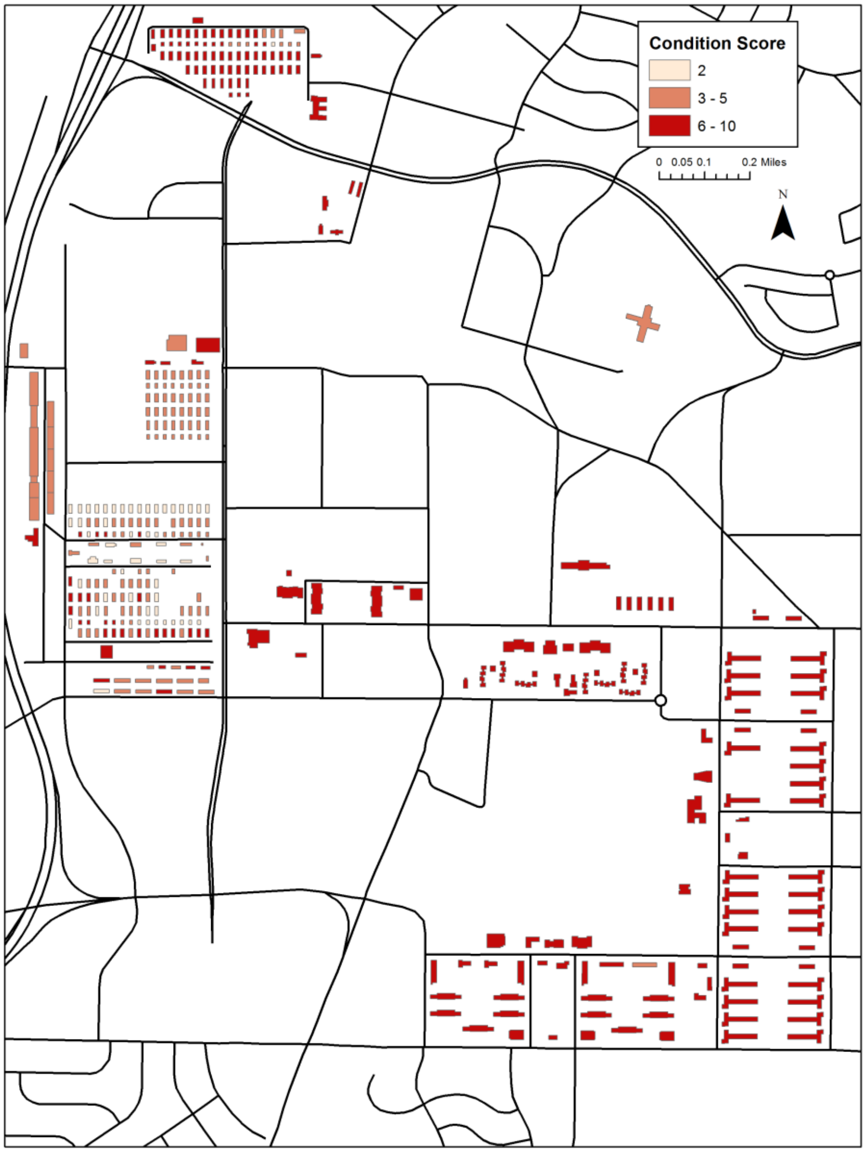

Figure 9 Condition scores

4.1.3. Artwork

The artwork scoring was binary, with structures either receiving full points for having artwork or no points for not having artwork. Artwork is found predominately, but not exclusively, in barracks buildings. The Central zone contains no such structures, because the buildings have all been remodeled for use by the university. There is a higher concentration of structures with artwork amongst the concrete buildings, though this seems likely to be the result of these areas having a smaller number of larger structures, rather than the numerous smaller buildings in the wooden areas.

4.1.4. Function

Overall, function scores are not particularly concentrated in one zone or another. For the most part, structures serving a variety of different functions are scattered throughout the zones. The only notable variation from this is in some areas of the concrete barracks, where facilities such as dining have been combined into the barracks buildings, meaning more of the structures receive the higher barracks function score.

4.1.5. Modification

Modification scores were awarded based on whether or not a structure has been modified since the base closed in 1994. As the majority of the structures have been abandoned since then, they receive full points. The notable exceptions to this are the Central zone, and part of the East zone. California State University, Monterey Bay occupies all or part of both of these zones. Structures that remain in use by the university have all been modified to varying degrees.

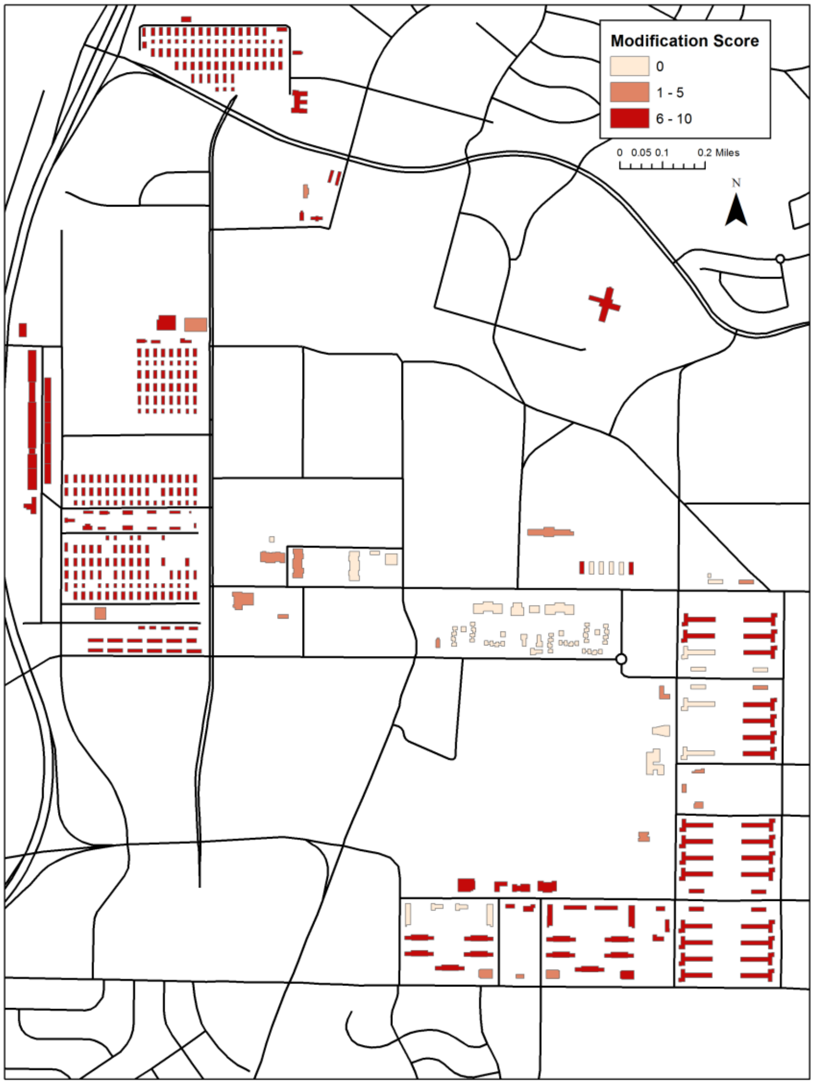

Figure 10 Modification scores

4.2 Spatial Scores

The spatial scores were calculated out of a maximum of 40 points. Four criteria, with a possible 10 points for each, were used to arrive at these scores. The highest scoring structure received a spatial score of 30, and the lowest a spatial score of 0. As Figure 11 shows, structures with higher spatial scores are clustered primarily along the northern and southern edges of the study area. Higher concentrations of lower scores appear toward the center of the study area.

Figure 11 Overall spatial scores

4.2.1. *Accessibility*

Accessibility scores were assigned based on a structure's proximity to a road. The accessibility scores do not correlate with the zones, as with some of the other scores. Rather, the scores tend to be highest along the edges of a group of structures, and decrease toward the center, as the distance from a road increases.

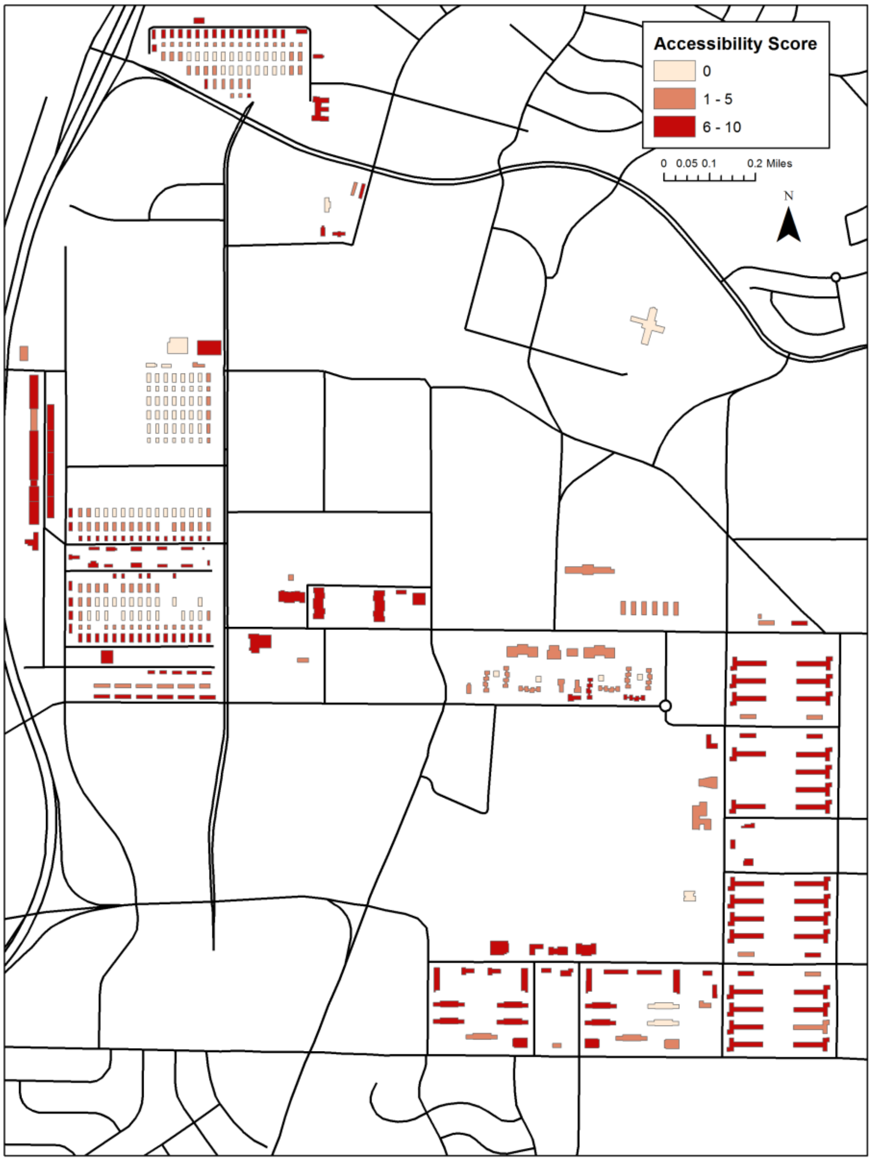

Figure 12 Accessibility scores

4.2.2. Clustering

Clustering was measured in order to score structures based on whether they might be suitable for use as a historic district. The confidence intervals returned by running hot spot analysis on the total attribute scores were used for this analysis. Two major areas of clustering are visible in the results. These are in the northern end of the study area, and in the southeast corner. This indicates that these are areas where many of the structures in close proximity to each other possess high attribute scores.

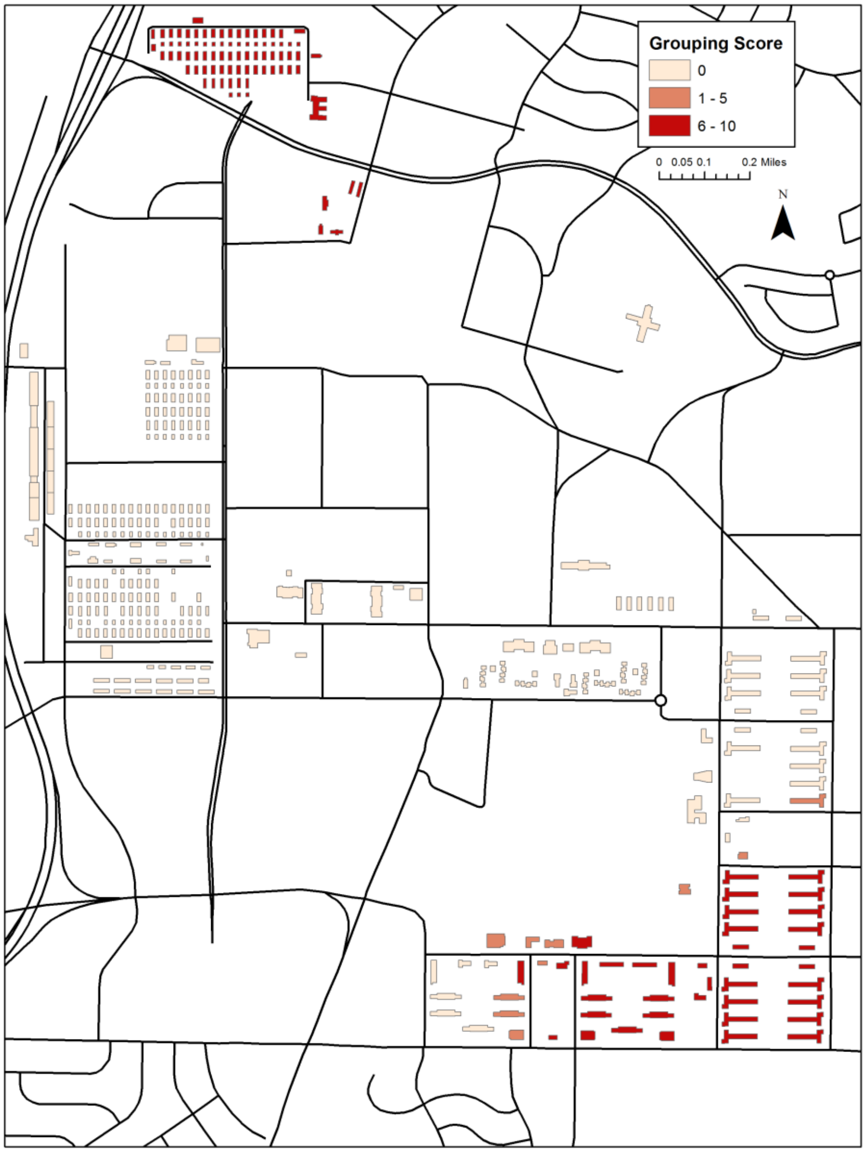

Figure 13 Clustering scores

4.2.3. At-Risk

The majority of structures received appeared frequently throughout Main Garrison, and received no points in this category. Only one structure was awarded the highest score in this category. Building T-2798, indicated in Figure 14 by the arrow, is the only World War II era permanent structure remaining in the study area, so was awarded the full points. Six other structures were awarded partial points, as they were the only structure of a particular type in their zone, but were not unique overall.

Figure 14 At-risk scores

4.2.4. Prominence

Prominence scores were assigned based on the area over which as structure is visible. As such, these scores have a fairly direct correspondence to the geography and surrounding environment for each structure. The Northern zone, which is positioned largely on a hill, has a large number of highly prominent structures due to this elevation. The Central zone has several moderately prominent structures, likely because it contains many open areas and low buildings.

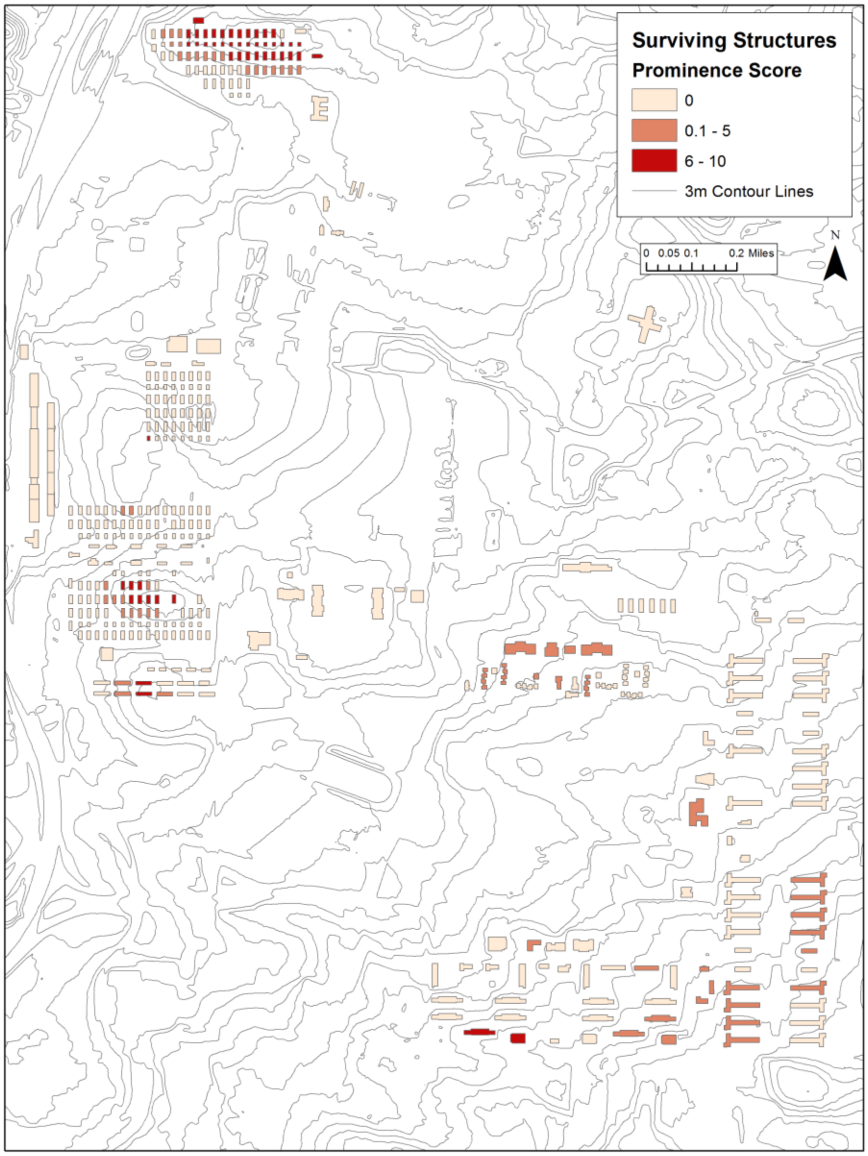

Figure 15 Prominence scores

4.3 Top Scoring Structures

This section examines some of the highest scoring structures individually in greater detail. Starting with the highest scoring structure, four top scoring structures are examined. Each structure comes from a different building type. The details of the structures are provided, as well as a sample of photographs illustrating the structures current status and condition. Tables 12 and 13 show the non-spatial and spatial scores for these four structures.

Table 12 Non-spatial attribute scores

Building Number	**Year Score**	**Condition Score**	**Function Score**	**Artwork Score**	**Modification Score**	**Total Attribute Score**
2798	10	10	6	10	10	46
4566	5	10	10	10	10	45
T-2906	10	10	6	0	10	36
4469	5	10	10	10	10	45

Table 13 Spatial scores

Building Number	**Accessibility Score**	**At-Risk Score**	**Group Score**	**Prominence Score**	**Total Spatial Score**
2798	10	10	10	0	30
4566	10	0	10	5	25
T-2906	10	0	10	10	30
4469	5	0	0	10	15

4.3.1. Building 2798

The highest scoring structure was building 2798, Martinez Hall. It was awarded 76 points. This structure is a World War II permanent structure, the only remaining structure of this type on Main Garrison. This building received a full score in all categories except for function and prominence. It received 6 points for its function, in the office/admin category, and 0 points in prominence. Martinez Hall was constructed in 1943, so it is associated with the historical context of World War II. It is of a type currently unique on Main Garrison, has not been modified significantly, and, though not shown here, contains artwork. It is also still in use, so it has remained in good condition. Overall, the scoring of this structure as a strong candidate for historic preservation seems accurate.

Figure 16 Building 2798, Martinez Hall

4.3.2. Building 4566

Building 4566 is one of several buildings of its type that all scored 70 points. As the details of these structures are all generally similar, only the first will be discussed individually. Building 4566 is a 1950s concrete barracks building. The age of this structure is in the range that meets National Register criteria, being greater than 50 years, but it was not built during a specific event. These structures are numerous, and received no points for being at risk. Building 4566, like many similar barracks buildings contains artwork. The concrete construction has made such structures less susceptible to decay, and most have not been modified. Additionally, the proximity of these structures to each other gives them potential as a historic district. While individual details of this structure and others like it may not appear to make it as worthwhile a candidate as World War II structures are, when the characteristics are taken together, particularly across multiple buildings, these structures could still provide valuable preservation candidates.

Figure 17 Building 4566 exterior 1

Figure 18 Building 4566 exterior 2

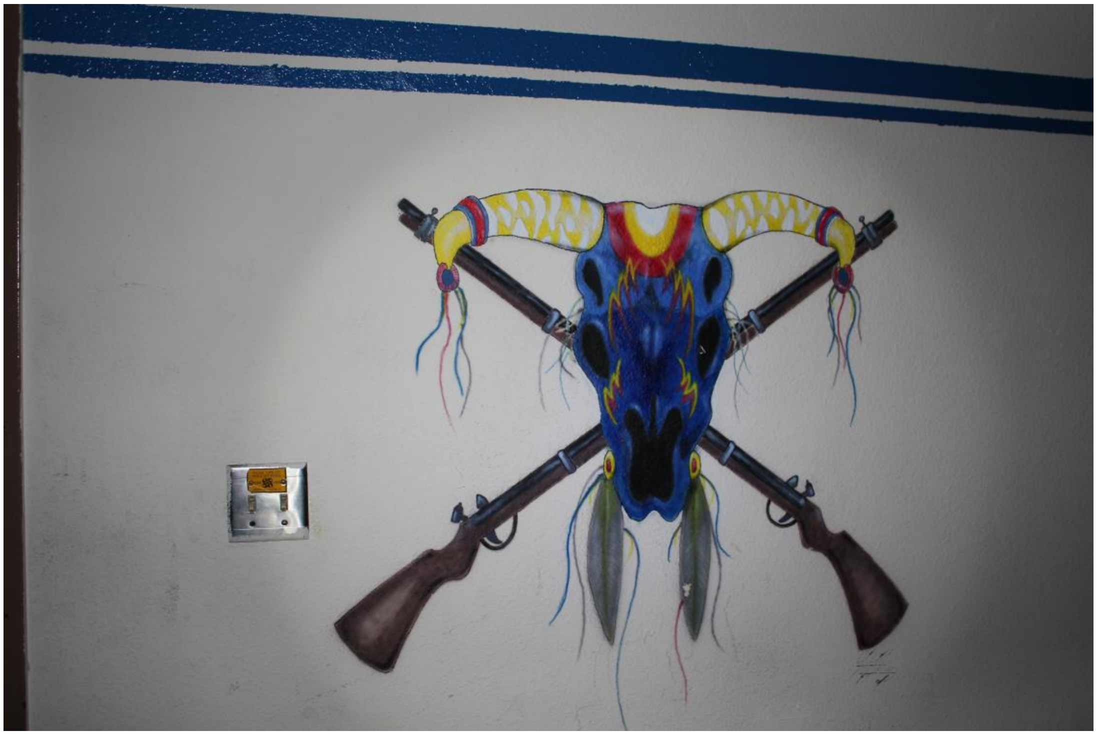

Figure 19 Building 4566 interior artwork 1

Figure 20 Building 4566 interior artwork 2

Figure 21 Building 4566 interior artwork 3

4.3.3. Building T-2906

Building T-2906 is one of several wooden World War II era temporary structures in the North zone that scored 66 points. These structures are all office/admin buildings built in 1940 and 1941. This structure, like the others of the same type and score, was constructed during World War II, giving it association with a historical event. These structures do not contain artwork. While of importance individually, structures of this type are not particularly distinguished one from another. It is as a group that these structures gain greater significance, by illustrating a particular period. In this case, it is the construction during the buildup to World War II.

Figure 22 Building T-2906 exterior 1

Figure 23 Building T-2906 exterior 2

Figure 24 Building T-2906 interior 1

Figure 25 Building T-2906 interior 2

4.3.4. Building 4469

Building 4469 is the highest scoring of the structures built in the late 1960s and early 1970s. It was constructed in 1970, and was awarded 60 points. This structure scored 10 points in all but four categories. These were construction year (5), road distance (5), at-risk (0), and prominence (0). This structure is in good condition, has not been modified, and contains artwork. What makes this structure particularly notable, however, is its function. It served as the headquarters for the 7th Infantry Division (Light).

Figure 26 Building 4469 exterior 1

Figure 27 Building 4469 exterior 2

Figure 28 Building 4469 artwork 1

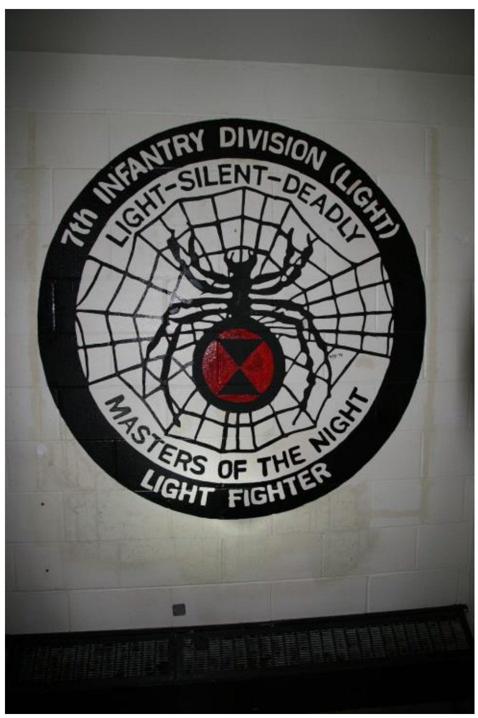

Figure 29 Building 4469 artwork 2

Figure 30 Building 4469 artwork 3

Figure 31 Building 4469 artwork 4

4.4 Comparison to Expectations

Prior to running the model, an a priori assessment of which structures or groups of structures appear to be of historical importance was undertaken. This assessment is discussed above in Chapter 2. Generally, the results of this assessment are reflected in the results of the model, though there are differences.

The only individual structure that was estimated manually as being significant specifically, as opposed to types or time periods that would likely include significant structures, was Martinez Hall. The results of the model are in agreement with this a priori assessment. Martinez Hall was the highest scoring structure by a margin of 6 points, and many of the criteria contributing to this greater score were the same as those that suggested its significance beforehand.

Two groups of structures were assessed a priori as likely containing strong preservation candidates. These were the World War II temporary buildings in the North zone, and the 1950s barracks in the East zone. The temporary structures seem to be good candidates due to their association with World War II, and the 1950s structures contain significant soldier artwork, as well as remaining in good condition due to their construction.

One structure that was rated highly in the model, but not accounted for in the earlier assessment, is the structure from 1970, building 4469, discussed in the previous section. Upon examining this structure in detail, however, its lack of inclusion seems more to be an oversight in the a priori assessment than an issue with the model. This structure, and others like it, appear to be no worse a candidate for preservation than comparable 1950s structures, with variations in score arising mostly from spatial factors. This discovery of an additional building that might be appropriate for preservation points to the usefulness of the model.

The overall effectiveness of the model is examined in greater detail in the following chapter.

Chapter 5 Conclusions

This chapter discusses the effectiveness of this model, its shortcomings, and possible directions to take further research.

5.1 Model Success

There are several factors that must be taken into consideration when assessing how successful or unsuccessful the model is. The first of these is demonstrated by the individual examinations done in the previous chapters: the results returned by the model must be compared with a priori assessments in order to identify any anomalies, where a score is obviously mismatched with a structure. The second is examining the scores to check if any steps of the model appear to not be working as intended generally.

Based on the review of previously conducted research, this model has employed GIS in a way not previously explored. No previous examples have been located of utilizing these types of site suitability analysis methods for historic structure evaluation. Because what criteria make a structure a worthwhile preservation candidate or not is somewhat subjective, the model also allows a certain amount of user customization to the point values and other parameters. This also allows different weights to assigned to different criteria, by varying the number of points assigned.

The model outlined here will be most successful when employed on the site for which it was designed, Fort Ord. However, it could be applied to other US Army bases or other military sites with minimal modification. More significant modifications would be necessary before applying it to dramatically different contexts. Thus, it also establishes a working framework that can be adapted and applied to other sites.

5.2 Model Effectiveness

Generally, the model worked as intended. When dealing with the attribute based scores, the model accurately assigns them based on the values entered. The accuracy of these scores, of course, are also dependent on the accuracy of the initial structure data. Importantly, the weighting of different criteria is a subjective matter, so the user is able to adjust the points for each category if they so choose.

Provided that the initial data is of the correct quality and the user editable values are correctly entered, the model should accomplish its intended task as demonstrated by the examination of the scoring results in the previous section. The model does seem to result in a useful indicator of which structures appear to be good candidates for preservation.

5.3 Shortcomings

Notable shortcomings became apparent when examining the results of some of the spatial scoring components. Some of these, such as the prominence measurement, may not necessarily measure a required characteristic as completely as might be hoped.

Prominence can be reasonably expected to include factors in addition to simply a structure's visibility. As the model currently sits, however, prominence is measured purely as the visible area of a structure based on the surrounding elevations. As a result, structures that may be more prominent for reasons other than visibility, such as by being the center of a group, are not scored accordingly.

Similarly, accessibility is scored using a fairly simplistic measure. The model assigns scores based solely on the distance the center point of a given structure is from the nearest road. This fails to account for other factors that may affect accessibility, such as the size and average level of traffic on the road, as well as factors such as steps or stairs between the building and the road.

While these shortcomings do affect the results of the current model, development of additional spatial analysis components that can include more complex measures are certainly possible.

5.4 Possible Future Directions

There are various directions that future research could take to build on this model. As mentioned in the previous section, there are several areas where the scoring could be made more complete. By incorporating factors such as the traffic level on roads, or measuring prominence by more than simple visible area, the spatial scoring could be made more accurate, and generally more useful. Similarly, scoring for the presence of artwork is currently binary. By accounting for various factors relating to the artwork, such as its age in relation to the building, this measure could be made more complete.

Additionally, the model could also potentially benefit from a greater degree of user customization in the non-spatial scoring. In its current form, the model allows basic customization of parameters such as the point values awarded for different attribute values. Where the criteria themselves are editable, it mainly consists of options such as editing the start and end years for different ranges, rather than, say, adding more ranges. By increasing the ability for the user to edit these parameters, it would improve the model's ability to better account for the subjectivity inherent in this sort of analysis.

Increasing the degree of user customization possible without code editing would also serve to make it simpler to apply this model to other sites. As with the year ranges mentioned previously, criteria such as a building's function are only editable to the extent of the points awarded for each function. Adding or replacing functions requires editing the code for that model step. As such, it would require a fair amount of user effort and expertise in order to modify this model for other sites and contexts.

While the model is effective in its current form for the specific purpose of identifying candidates for historic preservation on Fort Ord, it definitely has room for improvement. By increasing the completeness of the spatial scoring operations, the result could be made more accurate and, therefore, more useful. Additionally, the model could be made more flexible based on the needs of the user. This would then allow a greater usefulness over a wider variety of sites.

5.5 Value of this Research Effort

The value of this research lies in its use of GIS to streamline the process of historic structure evaluation. The success of this model has demonstrated that it is possible to make use of GIS tools in order to estimate the quality of a structure as a historic preservation candidate. More important than the model itself, which is limited to Fort Ord and similar sites, is the logic and framework surrounding it. With minor modifications, this framework can be applied to a variety of different types of sites, providing another tool for cultural resource management.

Additionally, this framework can potentially be applied to historical communities in other ways. As these communities develop, models such as this can be used to help guide planners on which structures are worth saving to preserve the character and history of a community.

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Appendix A: Field Calculator Code

Year Scoring:

```
dim n
if [intactStructures.yearBuiltLong] >= %year1Start% and [intactStructures.yearBuiltLong] <=
%year1End% then
  n = %yearPointsA%
elseif [intactStructures.yearBuiltLong] >= %year2Start% and [intactStructures.yearBuiltLong]
<= %year2End% then
  n = %yearPointsB%
else
n = %yearPointsC%
end if
```

Condition Scoring:

```
dim x
if [intactStructures.Condition] = 2 then
  x = %conditionMidPoints%
elseif [intactStructures.Condition] = 3 then
  x = %conditionFullPoints%
elseif [intactStructures.Condition] = 1 then
  x = %conditionLowPoints%
end if
```

Artwork Scoring:

```
dim y
if [intactStructures.Artwork]=1 then
  y=%artPoints%
else
  y=0
end if
```

Function Scoring:

```
dim k
if [intactStructures.Function]="barracks" then
  k=%barracksPoints%
elseif [intactStructures.Function]="hq" then
  k=%hqPoints%
elseif [intactStructures.Function]="chapel" then
  k=%chapelPoints%
elseif [intactStructures.Function]="unique" then
  k=%uniquePoints%
elseif [intactStructures.Function]="office" then
  k=%officePoints%
elseif [intactStructures.Function]="px" then
  k=%pxPoints%
elseif [intactStructures.Function]="dining" then
  k=%diningPoints%
elseif [intactStructures.Function]="rec" then
  k=%recPoints%
else
  k=%minPoints%
end if
```

Modification Scoring:

```
dim g
if [intactStructures.Modified]=0 then
  g=%noModPoints%
elseif [intactStructures.Modified]=1 then
  g=%minorModPoints%
else
  g=%majorModPoints%
end if
```

Road Distance Scoring:

```
dim l
if [intactStructures.NEAR_DIST] <= (%distAverage% * %roadUnderDistance%) then
  l=%roadMaxPoints%
elseif [intactStructures.NEAR_DIST] >= ( %distAverage% * %roadOverDistance%) then
  l=0
else
  l=%roadMidPoints%
end if
```

Group Scoring:

```
dim f
if [intactStructures_HotSpotsTest3.Gi_Bin] = 3 then
  f=%99ConfPoints%
 elseif [intactStructures_HotSpotsTest3.Gi_Bin]=2 then
  f=%95ConfPoints%
elseif [intactStructures_HotSpotsTest3.Gi_Bin]=1 then
  f=%90ConfPoints%
else
  f=0
end if
```

At-Risk Scoring:

```
dim q
if [intactStructures.zone]="North" and [intactStructures.buildingType]="WW2Temp" and
%northWW2Temp%=2 then
  q=%upperAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="WW2Temp" and
%northWW2Temp%=1 then
  q=%midAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="WW2Perm" and
%northWW2Perm%=2 then
  q=%upperAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="WW2Perm" and
%northWW2Perm%=1 then
  q=%midAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1950sBarracks" and
%north1950sBarracks%=2 then
  q=%upperAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1950sBarracks" and
%north1950sBarracks%=1 then
  q=%midAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1950sOther" and
%north1950sOther%=2 then
  q=%upperAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1950sOther" and
%north1950sOther%=1 then
  q=%midAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1960sConcrete" and
%north1960s%=2 then
  q=%upperAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1960sConcrete" and
%north1960s%=1 then
```

```
  q=%midAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1970sConcrete" and
%north1970s%=2 then
  q=%upperAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1970sConcrete" and
%north1970s%=1 then
  q=%midAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1980sConcrete" and
%north80s90s%=2 then
  q=%upperAtRiskPoints%
elseif [intactStructures.zone]="North" and [intactStructures.buildingType]="1980sConcrete" and
%north80s90s%=1 then
  q=%midAtRiskPoints%
elseif [intactStructures.zone]="West" and [intactStructures.buildingType]="WW2Temp" and
%westWW2Temp%=2 then
  q=%upperAtRiskPoints%

<Repeated for all zones>

else
  q=0
end if
```

Prominence Scoring:

```
dim t
if [visMerge.SUM]>=(%promAvgValue% *%promMidFactor%) and
[visMerge.SUM]<(%promAvgValue% *%promUpperFactor%) then
  t=%promMidPoints%
elseif [visMerge.SUM]>=(%promAvgValue% *%promUpperFactor%) then
  t=%promUpperPoints%
else
  t=0
end if
```