An Inventory and Analysis of Spanish Colonial Construction-related Artifacts from Texas and Louisiana with French Colonial Comparative Material

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Abstract:

The purpose of this collaborative project between Dr. Roff, an architectural historian at The University of Texas at San Antonio, and the Center for Archeological Research, was to identify, assess, and publish information on construction-related artifacts gathered from archaeological investigations of presidio, villa, and mission sites that were established in colonial Spanish Texas. Funded by a UTSA GREAT Grant 2016 -2017, one of the objectives of this project was to create new research tools for the field of Spanish Colonial studies. The documentation project resulted in the development of the Spanish Colonial Construction Tools, Hardware and Materials research database and an ArcGIS Online web-based application with maps and links to photos of artifacts. The research database catalogs the artifacts of 31 colonial sites housed at ten curatorial facilities in Texas and Louisiana; whereas, the ArcGIS site connects the artifacts to the places where they were found with photographs and contextual information. This inventory of archaeological artifacts was developed as the first step in a long-term project to document construction tools and materials housed in archaeological collections in the United States and Mexico. This report serves as a record of the documentation process and as a guide to the research tools.

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Chapter 1: Introduction

An investigation of archival documents from the Spanish Colonial period for the settlement of the Texas region reveals very little about the craftsmen and their methods of design and construction for the numerous presidios, villas and missions built in this region from the late seventeenth to eighteenth centuries (Scheutz 1983). Archaeologists, historic preservation architects, and historians who specialize in the discovery, preservation, and historical reconstruction of Spanish Colonial culture need additional resources to evaluate this historical patrimony; there is a present need for scientific data and synthetic studies from which heritage professionals and scholars can make informed decisions and formulate new evidence-based theories. With this in mind, in the Spring of 2016, Dr. Shelley E. Roff, Associate Professor of The University of Texas at San Antonio (UTSA) College of Architecture, Construction and Urban Planning (CACP) proposed a project to collaborate with the UTSA Center for Archaeological Research (CAR) in order to create a new research tool for Spanish Colonial studies. Together, in the academic year 2016-2017, researchers created the Spanish Colonial Construction Tools, Hardware and Materials database, which then formed the basis for a series of ArcGIS Online maps and web applications. This project was funded by the UTSA Grants for Research Advancement and Transformation (GREAT) program, sponsored by the Office of the Vice President for Research.

The database and ArcGIS Online web-based applications are research and educational platforms through which credentialed professionals, academics, and students can investigate topics related to the construction process and related crafts of Spanish Texas. A primary objective of this project was to create an inventory of construction-related artifacts recovered from archaeological investigations of colonial sites in the Texas region. This documentation project was envisioned as the kind of resource that would provide a more accurate information base and lay the groundwork for new forms of research in a variety of disciplines. The inventory, archived in a relational database, is a powerful research tool because categorical searches and comparative analyses of the data can be made very quickly, once all the data is entered. The ArcGIS maps draw from this relational database and are designed to display interpretive, spatial analyses of the data. The use of these research tools is reserved for credentialed researchers and will be made available beginning in January 2019. An Esri Public Gallery, an online platform for displaying selected results of the research and delimited displays of the GIS maps, can be viewed by the public on the CAR and CACP websites. The Public Gallery, discussed further in Chapter 4, was created for educational purposes and is designed to protect sensitive archaeological information.

Although the format of this report will not be typical of archaeological reports, its publication as a special report was essential to draw the attention of the academic and professional community to this body of

research on Spanish Colonial artifacts retrieved in archeological investigations in Texas and Louisiana. The purpose of the following report is fourfold: to document the method of research followed by the GREAT Grant team, to present guidelines for the future user of the Spanish Colonial Construction Tools, Hardware and Materials database, to publish a preliminary analysis of the research database, and to describe the development of the ArcGIS Online maps and web applications. The report is organized into five chapters and one appendix. Chapter 2 documents how the research was organized and the method used to create the inventory of colonial-era artifacts. The methods used to gather and assess published reports on archaeological investigations pertinent to the research are also explained. Chapter 3 presents an overview of the contents of the database, guidelines for its use, and is followed by an analysis of the findings at each curatorial facility. The methods and purpose for creating the ArcGIS Online maps and web applications are outlined in Chapter 4. The final chapter summarizes results of the project and provides recommendations for future research with these newly created resources for Spanish Colonial archaeology, historic preservation, and architectural history. Appendix A is a comprehensive list of archaeological reports, books, and journal articles for the specific Spanish Colonial sites documented, and this bibliography is organized by the site name. This will hopefully be a useful guide for future research and planning projects at the listed colonial sites.

Historical and Geographical Scope of the Project

Our project for 2016-2017 was to document artifacts from presidio, villa, and mission sites that were established in the late seventeenth to eighteenth centuries in Texas. The immensity of Texas as a territory for potential research was daunting. An accounting of the exact number of Spanish Colonial sites in Texas is not currently possible. The Texas Archeological Site Atlas sponsored by the Texas Historical Commission (THC) records all archeological projects reported to them, and, although the atlas is a tremendous resource, it does not reflect all possible sites of colonial-era settlement. Archaeologists and historians have not yet identified the location of all sites referenced in primary sources, and many potential sites are not accessible because they are on private property. Also, concerning field schools, avocational, or even some professional work, the archeological reports on these sites are not always produced in a timely matter, and sometimes are not published. As a starting point, we composed a list of 61 major colonial sites derived from the Texas Archaeological Site Atlas. Some of these sites have not been excavated, and the only documented artifacts they had to offer were those collected on the surface of the site, thus not datable nor informative for our project. Consequently, we reduced the number of sites further to include only those that had professional excavations completed and that would have artifacts housed in a curatorial facility in Texas and northeastern Louisiana.

We also needed a way to limit the scope of the project that made sense historically and geographically. The decision was made to investigate only sites that had been excavated within Spanish Texas (Figure 1-1). This is the region occupied and governed by the Spanish between 1716 and 1821. Known to the Spaniards officially as the province of Nueva Filipinas, but more colloquially as Tejas, this territory encompassed the land from the Gulf Coast to the Red River (the northern border of present-day Texas and Oklahoma), although little exploration happened in the region north of the Camino Real de los Tejas in the eighteenth century, partly due to the fierce resistance of Native American tribes (Chipman 1992:1-21). The Red River's directional change in the landscape from eastward-flowing to its southward trajectory provided the eastern boundary of Spanish Texas with French Louisiana. To the south and west, the Tejas province was separated from the provinces of Nuevo Santander and Coahuila by the Nueces River.
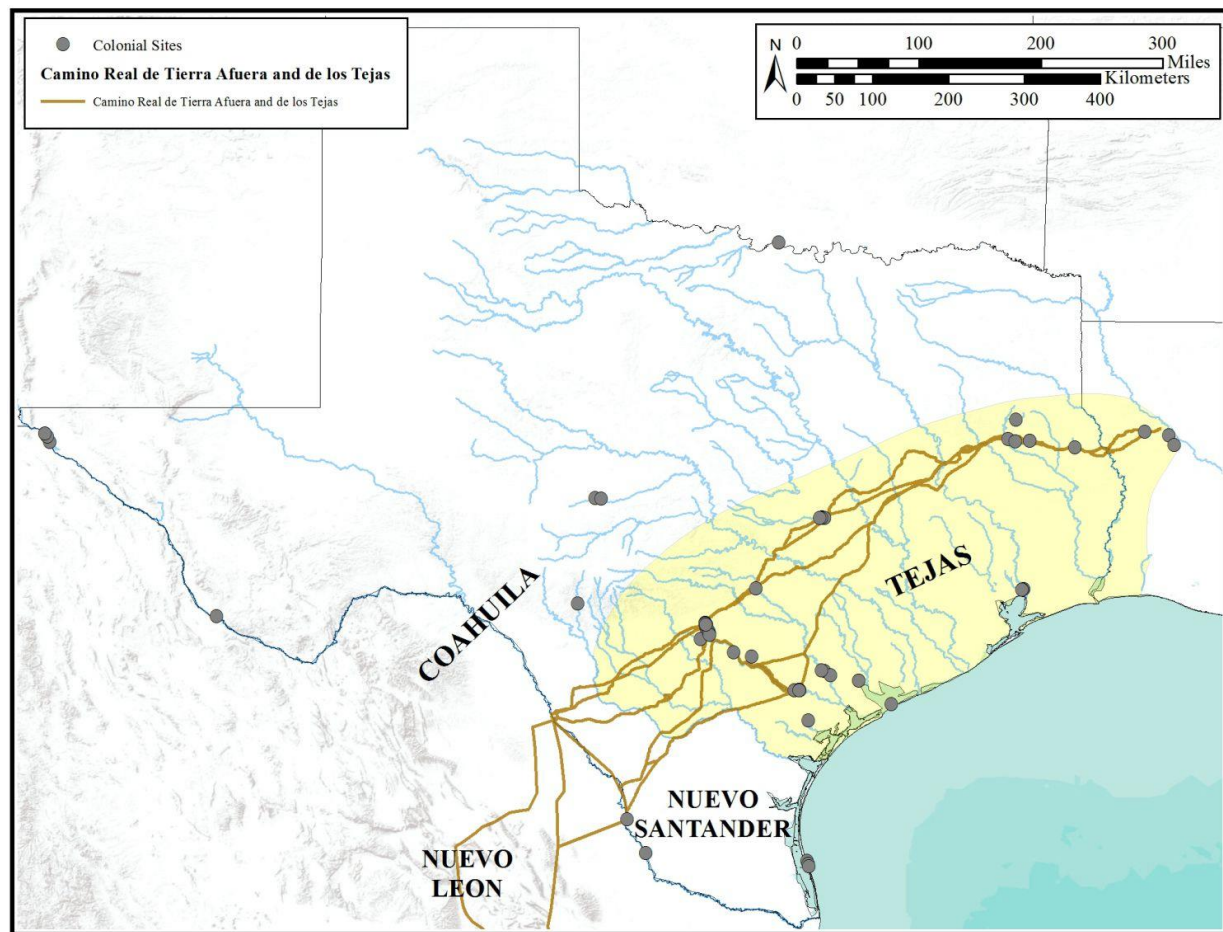
Figure 1-1. Map of Spanish Texas and its Colonial Sites that have had archaeological investigations.

Within Spanish Texas, we further delimited the project to sites specifically established along the Camino Real de los Tejas, a road sanctioned by the King of Spain as a protected route for military, missionary and economic expansion into this frontier of New Spain. This road was the northeastern extension of the Camino Real de Tierra Afuera del Oriente, whose royal protection and oversight was established in the seventeenth

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century to connect Mexico City with its northeastern-most frontier (Sanchez 2016:9-10) (Figure 1-2). The distinction between the end of the Camino de Tierra Afuera and the beginning of the Camino de los Tejas, has been a contested question of political boundaries at different points in its history. However, most eighteenth-century historical sources described the Tejas branch of the camino, and its deviations, as the road crossing the Medina River, or departing from the nearby settlement of San Antonio (de la Teja 1995:3-4; Sanchez 2016:8). The Medina River is one of two tributaries that feeds into the San Antonio River, thus explaining a possible conflation of the two locations as a western boundary of this frontier. In addition, this road was not a single path across the territory, but rather was a corridor of several main and secondary trails, many established along earlier Native American pathways, and others diverted to allow easier wagon passage and to connect new settlements to each other. These trails collectively all led to the Spanish outpost of Los Adaes, and the Tejas people, near the border with French Louisiana. This camino included a primary lower branch that connected San Antonio to the Presidio Nuestra Señora de Loreto de la Bahia (in Goliad) and continued northeast, once again, towards Los Adaes.
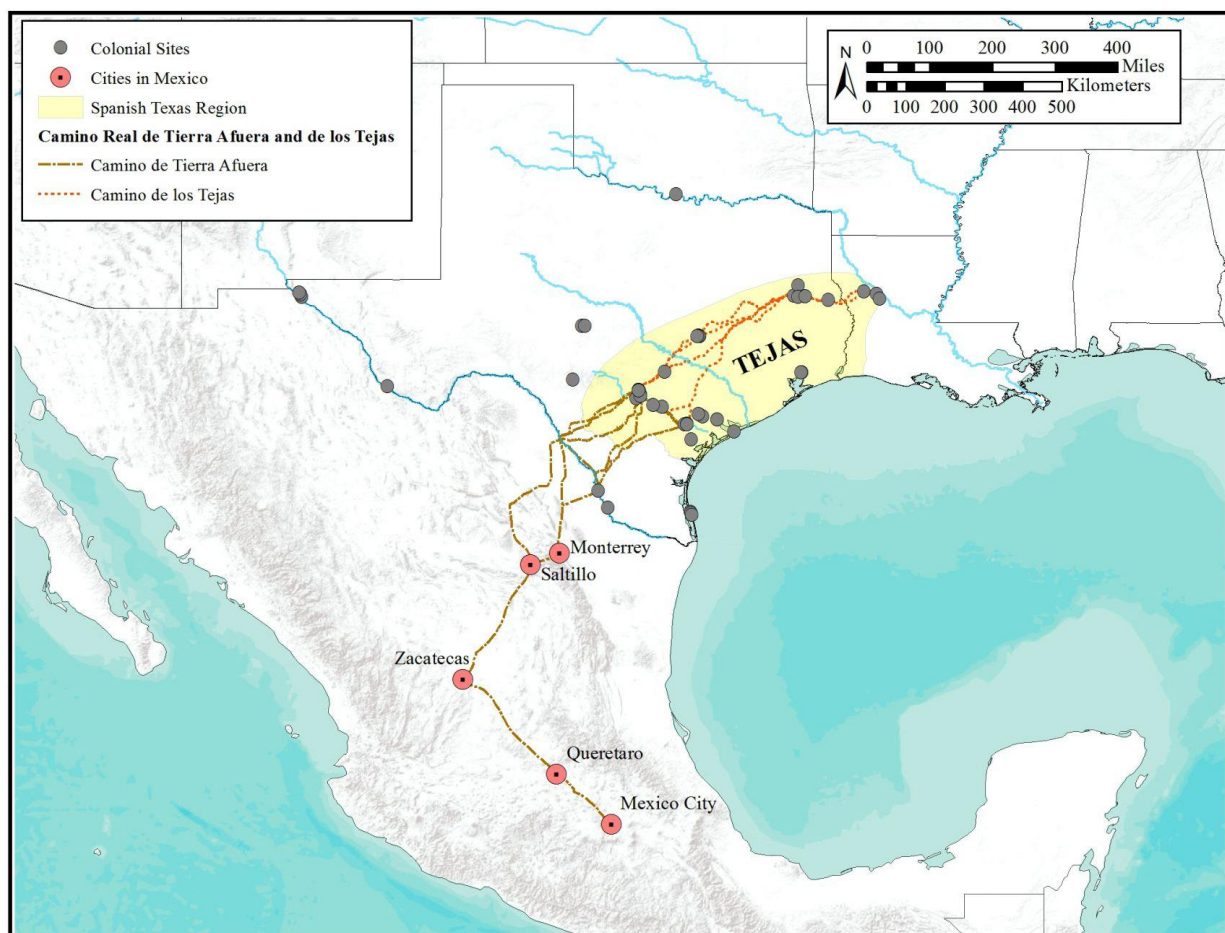
Figure 1-2. The Camino Real de Tierra Afuera connecting Mexico City to the Province of Tejas.

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The official establishment of this Camino Real de los Tejas in the late seventeenth century was one of several measures taken to protect the Viceroyalty of New Spain's northern borderlands from recent French intrusions. The greatest concern at the time was the news in 1684 of a French fort established by Robert Cavallier, Sieur de la Salle, near Matagorda Bay (Hadley 1997:312-313). The Spanish responded quickly with plans to destroy this fort and to create a defensive front for the region between the Medina-San Antonio Rivers and the official eastern border with French Louisiana. The road was an essential component for the settlement process and a means to connect newly established presidio and mission sites in the Texas frontier to the supplies and personnel of their counterparts in Mexico.

This network of roads is a key factor in the study of the construction of the Spanish Colonial settlements. The Texas region was initially a true wilderness for European settlers, one devoid of the skilled craftsmen and the forged and cast iron tools needed for European methods of construction. In the eighteenth century, the first settlements were constructed with tools brought into the region as colony kits, either by ship or overland along the Camino Real, by colonial-era explorers, Spanish missionaries, and the military (Bruseth 2014:67-92; Simmons 1980:18-19). The roads themselves are a vehicle by which we may, in the future, be able track the origin and movement of craftsmen and their tools. Although the focus of this project was on Spanish Colonial sites and artifacts, the overlap of Spanish and French settlement at some colonial sites and the interactive trade between the two cultures in northeastern New Spain required that the research be expanded to include some sites with French Colonial and French Creole artifacts.

In the end, some colonial sites were included that were not in the original scope of research along the Camino Real de los Tejas. It seemed appropriate to include the seventeenth-century French Fort St. Louis and the first Spanish Presidio La Bahia, which occupied the same site near the Gulf Coast (Gilmore 1986; Bruseth 2004). These sites represented important historical events that motivated the Spanish Crown to sanction the road to Tejas and fund the settlement of Spanish Texas. During the process of documentation at each curatorial facility, artifacts from sites not on the list were found located next to those that were, and it seemed expedient to document those sites while at the curatorial facility. The Spanish Fort Sites on the Red River is one example at TARL.

It was also decided it would be informative to document tools found outside the time frame of Spanish Texas (1716-1821) as comparative material, reasoning that the design of European tools had changed little between the Ancient Roman period and the Industrial Revolution of the nineteenth century. This was substantiated by a reference tool Dr. Roff developed for the project, a digital encyclopedia of historical construction and surveying tools used in Europe and the United States. Dr. Roff found that earlier artifacts from sixteenth and seventeenth century shipwrecks along the Gulf Coast provided valuable insight into the

shape and size of construction tools brought from Europe for colonial settlement. In addition, artifacts from the late eighteenth- to nineteenth-century Magnolia and Oakland Plantations, French Creole sites at the Cane River Creole National Historic Park, provided a large array of forged and cast iron carpentry tools, which provided physical examples of similar tools historically used in Spanish Texas. The documentation process at the San Antonio Mission National Park and at CAR, which together house the San Antonio Missions artifact collection, was also broadened to include artifacts whose provenience came from a mixed context and from the nineteenth century.

Nevertheless, the Camino Real de los Tejas as a path of settlement gave a focus to the research. By the end of the grant period, Dr. Roff documented tools, architectural hardware and construction materials at ten curatorial facilities, which resulted in covering thirty-one of the original sixty-one possible Spanish Colonial sites and three additional French Colonial and Creole sites. These sites represent presidios, villas, missions, ranches, churches, and shipwrecks. The following chapters will delve further into the documentation of the artifacts found at these sites, their current state of preservation, and their value for future research.

Chapter 2: Research Design and Documentation Methods

Research Design

The first step in organizing the research was to determine where the artifacts of excavated Spanish Colonial sites in Texas were housed. Dr. Roff determined that documentation ten archaeology labs and museums would result in a significant enough number of Spanish Colonial sites to provide a substantive sample of tools and hardware across the region. The decision was made to make the furthest Spanish settlement, Los Adaes, which falls within present-day Louisiana, the initiation point of the project and then to work westward across Texas, documenting as many sites as the grant funds and time period would permit. The artifacts from the Los Adaes archeological investigations are housed at the Williamson Museum at Northwestern State University in Louisiana. Since Dr. Roff began the documentation project in northwestern Louisiana, it made sense to investigate other nearby facilities that housed Spanish, French, and Creole artifacts, which provided substantive comparative material for the project.

The project was organized into three phases of research: 1) documentation of artifacts at selected curatorial facilities across Texas and Louisiana, 2) literature review and documentation of artifacts at CAR, and 3) the creation of the GIS maps and Esri Online applications. Although these were three distinct projects, their time frames overlapped. Beginning with the first phase of the project in September 2016, Dr. Roff photographed and documented artifacts at four curatorial facilities in East Texas and Louisiana: the Archaeology Laboratory at Stephen F. Austin State University, the Williamson Museum at Northwestern State University, the Cane River Creole National Historic Park, and The Cabildo - Louisiana State Museum. With this documentation, she created in Excel the initial Spanish Colonial Construction Tools and Hardware database.

The second phase of the project, initiated in March 2017, marked the beginning of CAR's collaboration with Dr. Roff to conduct an intensive search of the artifact collection curated at CAR. Staff at CAR includes individuals who have worked or visited colonial sites within the Southwestern United States and Central America, including work on all five colonial mission sites in San Antonio and their associated acequias. The CAR is one of five curatorial repositories in Texas authorized to hold both Private, State and Federal collections. The majority of CAR's holdings are drawn from the San Antonio and South Texas Region. At this time, the CAR staff completed an extensive literature review of published material on excavated colonial sites in Texas, including the gray literature. CAR staff searched and documented the entirety of all colonial-era artifacts currently curated in the CAR repository. Although construction materials were not part of the original scope of this project, a decision was made to document construction materials that had

been collected in archaeological investigations at the five San Antonio Missions. The purpose of the construction materials inventory was to provide future researchers with an understanding of the types of colonial-era materials that have been found below the surface and where to find samples that might be used for various forms of analysis.

During the second phase, Dr. Roff photographed and documented artifacts at CAR and at five additional curatorial facilities: the Texas Archeological Research Laboratory (TARL), San Antonio Missions National Park, the Corpus Christi Museum of Science and History, the Texas Maritime Museum, and The Bullock State History Museum. The CAR staff also photographed an additional forty-two artifacts, and entered all second phase project documentation into the database, which included the location and provenience of these artifacts. The final version of the database, the Spanish Colonial Construction Tools, Hardware, and Materials database is housed at CAR and plans are to make it available to credentialed researchers in December 2018.

Parts of this database were used in the development of ArcGIS Online maps and web applications for the third phase of the project. In terms of the research design, the ArcGIS maps developed by CAR staff are tools that expand the analytical capabilities of the database, allowing spatial analyses of the chronology and distribution of metal tool and hardware types. The Esri Public Gallery was envisioned as a means of presenting non-sensitive archaeological and artifact information to the public, in order to build a greater appreciation of the architecture of Spanish Texas and to create a resource for secondary education on Spanish Colonial building crafts.

Literature Review

The CAR staff began the literature review by consulting all in-house archaeologists and staff with experience in colonial archaeology in Texas. The CAR library collection of archaeological reports, books, and journal articles with documented colonial-era occupations were also reviewed. The first step in the process was identifying colonial sites within Texas such as presidios, missions, ranches, and other types of sites. The CAR library includes over 2,500 different technical reports, books, thesis, or dissertations that cover archaeology or related topics from the United States and Central America. In order to record and organize the results, an Excel file was created that included fields for site trinomial, site name, timespan (when known), settlement type, county, where artifacts from site are housed, articles/reports associated with the site, and other comments.

The project relied primarily on the THC's Texas Archeological Site Atlas as a search tool for the next phase. Using the Site Atlas, staff searched specific sites in order to look for associated references. Search results included report abstracts and archeological site forms that sometimes contained additional sources

of information. Once all the colonial sites known to the staff were searched, a "colonial" and other keywords search was used in the Site Atlas to find any additional colonial-era sites or references. All publications were added to the Excel file for future review. When available, staff recorded the location(s) where artifacts from the colonial sites were curated during the Site Atlas search.

CAR staff searched the Texas Beyond History (TBH) website for reference material associated with colonial site investigations. The TBH website is a public education service of TARL, hosted by the University of Texas at Austin, and in partnership with the Department of Anthropology at Texas State University. Several additional new sources were identified in the Print Sources section of the Credits and Sources page of the TBH website. Various web browsers were also used to search for additional publications.

Over 100 different site-specific reports, articles, and books were referenced during the project. These publications covered over fifty sites, including presidios, villas, missions, and ranches. After completing a bibliography of the research material, the publications were collected, either from CAR's library, online PDFs, or through interlibrary loans from the UTSA library. Reports were then referenced for colonial artifacts, specifically for any tools or hardware associated with construction. This bibliography is published at the end of this report as Appendix A. The reports that were tied to specific CAR-located artifacts in the database were later recorded in the Publications column of the Spanish Colonial Tools, Hardware, and Construction Materials database.

Documentation Methods: Phase 1

Methods of recording and storing artifacts differed at each curatorial facility visited during this investigation. In each case, the director of the archaeology lab or the curatorial staff assisted with finding the metal artifacts of interest within their specific collection. The documentation of the East Texas and Louisiana facilities were the first to be conducted, and it was at these facilities that a method for artifact documentation was established. The practice was to photograph the identifying data and each artifact together sequentially, as a means of keeping a logical sequence of information that would be archived in curatorial facility folders on the computer. The documentation photographs were taken using a Canon EOS 5D Mark II digital camera, along with a Canon EF 100 mm macro lens, an EF 50 mm lens, and, for very large objects, a Zoom EF 16-35 mm lens. The first photograph of the series taken for each artifact consisted of the artifact's tag with its identifying data. This was followed by one photograph taken directly above with a 10 cm scale included within the frame, so that scaled measurements could be read if needed in the future. Additional photographs were taken to document different sides of the object and to allow a better three-dimensional understanding of the object (Figure 2-1).

Figure 2-1. An example of a series of photograph used to document a pintle, housed at CAR.

Not all metal artifacts available at each curatorial facility were documented. A selection was made that represented the most interesting finds and the breadth of type of artifact found at the institution. For example, all curatorial facilities had nails from almost every colonial site. Yet, it was only expedient to document a few types of nails found, rather than the quantity available. The same approach was applied at facilities visited later in the project and for the collection of construction materials examined for the case study. After visiting the first four facilities in East Texas and Louisiana, Dr. Roff created an Excel file, entitled the Colonial Tools and Hardware database, to provide CACP graduate assistants a location to enter and store the data and photographs in an organized manner.

Documentation Methods: Phase 2

When work began at the CAR in March 2017, Dr. Roff provided a digital copy of the Colonial Tools and Hardware database and a printed notebook of the encyclopedia of tools for the CAR staff to use as reference documents. Both resources provided photographs, drawings, and diagrams of tools used historically in the design and construction of architecture and land survey. These resources were particularly useful for attempting to identify corroded pieces of unidentified metal. Both the CAR's collection and those at other curatorial facilities had a large number of unidentified metal artifacts with which to contend. The reference documents allowed the staff to consult and crosscheck artifacts with substantial examples of colonial-era tools and hardware depicted in the database and notebook.

Lab Inventory

The next phase of the project at the CAR was to search the institution's records and artifact collection for construction tools, hardware, and materials related to Spanish Colonial architecture. To accomplish this, staff first searched through CAR's accessions for the National Park Service's (NPS) San Antonio Missions and the Rancho de las Cabras sites. The CAR shares a database with the United States Department of the Interior that includes information on what artifacts are housed at the CAR. This database is called the Interior Collections Management System (ICMS). Columns within the database include Accession #, CAR Accession, Catalog #, State Site #, Site Name, Within Site, CAR Superclass, CAR Class, Object (NOM), Description, Item Count, Measurements, Row, Shelf, Box, and Bag. Each accession collection was searched for artifacts specifically mentioned in the literature that were identified as Spanish Colonial. Staff members noted their exact location within CAR, so in the future, the artifacts could be easily found and retrieved. Next, the collections were searched for keywords such as metal, tools, colonial, etc. When artifacts that matched the search terms were found in the database, but the term colonial was not directly associated with the item, the relevant research material for that accession was referenced to identify if the artifact's provenience was associated with the colonial era, a pre- or post-colonial era, or within a mixed context. As the project continued, it became clear that a dearth of artifacts could be conclusively determined to be Spanish Colonial tools or architectural hardware. This led researchers to include items that were in a mixed context or ones whose time span was as late as the terminal nineteenth century.

Documentation Process

Once an Excel file was composed of the CAR artifacts, Dr. Roff reviewed and selected the artifacts most relevant to the project, including many unidentified artifacts for study. The documentation methods proceeded as earlier described, except for a selection of forty-two artifacts that were photographed and documented using a static camera rig by the CAR staff. In this case, a Canon EOS Rebel XSi camera and a Canon EF-S 60mm macro lens was used with a shutter release to avoid movement from trigger squeeze.

After the selected NPS artifacts were photographed, artifacts from other collections at the CAR were searched for possible tools and hardware. The staff searched accessions from known colonial-era sites housed at the CAR for any relevant artifacts and recorded selected artifacts in the database.

During the investigation at CAR, Dr. Roff continued her documentation project at the five remaining facilities. By May 2017, the database had grown to 247 artifacts, too large for Excel to handle analytical searches when using the sorting tool. The issue was the great number of images stored in the database. The information and images were transfer the database to a different software, Access. With this software's expanded capabilities, researchers were able to place links to the images of artifacts in each row (instead of storing each one in a database cell), not only enabling the sorting function with image reference, but also allowing the creation of dropdown menus for words that are entered repetitively. This feature was used to categorize tools used for carpentry, stone masonry, brick masonry, etc., and to identify materials, such as iron, copper, limestone, and brick. The database's format was reorganized to be more closely aligned with CAR's NPS Excel database. Within the new Access database, now entitled the Spanish Colonial Tools, Hardware, and Construction Materials database, researchers began entering the second phase documentation data.

The documentation process ended in early July 2017, in order to allow time for a final phase of data entry before the end of the grant period. The documentation of specifically colonial-era metal artifacts, which include tools and hardware, is complete at all facilities except the San Antonio Missions National Park and The Cabildo. The artifact collection at the San Antonio Missions National Park was too extensive to finish in one year, and the investigation will be continued by Dr. Roff. At The Cabildo, she was only allowed to photograph the artifacts that were on display to the public. It is hoped that a future grant will facilitate research on French Colonial and Creole metal artifacts in Louisiana.

Chapter 3: Description and Analysis of the Database

This chapter provides a guide to the database to answer a future user's questions about its scope, design, nomenclature, utility, and limitations. This guide is followed by an analysis of the findings at each curatorial facility, which includes an assessment of the current condition of their metal artifacts and construction materials, where relevant. As the project grows beyond the time frame of this GREAT Grant, the numbers and percentages presented in this chapter will necessarily change. The database makes possible a great number of potential analyses of the material documented; thus recommendations for future research, beyond this chapter's analysis, are offered in Chapter 5.

Guide to the Spanish Colonial Construction Tools, Hardware, and Materials Database

The database is organized into four tables: Database, Site Name Index, Curatorial Facilities Index, and Glossary (Figure 3-1). In the Database table, the column headings, Site Name, Location-Current, and Artifact are headings that are shared with one of the other three tables. These three relationships between the tables were identified and linked for future functions of the database.

Figure 3-1. Image of the Spanish Colonial Construction Tools, Hardware, and Materials Database with the Database table open.

The Database Table

The Database is currently composed of eighteen columns, and the purpose of each will be described briefly here. The first column contains an ID number, which Access automatically generates. Columns two through six follow the ICMS column names, which include NPS Accession #, Institution Accession #, Catalog #, State Site, and Site Name. These are common archaeology classifications; however, they will be explained here for the non-specialist user of the database. The names of the other columns were newly created for this project.

ID: The ID number in the first column notates the row in which each individual artifact is documented. Note that the ID numbers for artifacts (and entries in the other tables) at times skip a number in sequence. This is due to the occasional removal of artifacts and index entries, as they were discovered to be inappropriate for the parameters of the database. In the end, forty-seven artifacts were deemed inappropriate for the database and were removed. It was important to not re-number the database each time this situation was encountered. Keeping a single ID number throughout the time frame of the project allowed the consistent identification of the project artifact through the many transitions, case studies, and analyses that occurred, as well as the development of the ArcGIS. Two curatorial facilities were removed from the database, the Texas Maritime Museum and The Bullock Museum of Texas State History, because the artifacts documented there were on loan from the Corpus Christi Museum of Science and History. It was more appropriate for this institution to remain the "Location-Current" for these artifacts.

NPS Acc #: The identifying accession number for a group of artifacts, according to the guidelines of the National Parks Service.

Institution Acc #: The identifying accession number given for a group of artifacts, usually, once they have been catalogued by the archaeologists after the investigation. Sometimes this number is given by the curatorial facility instead.

Catalog #: The meaning of the catalog number varied between facilities; for some it was an artifact identification number, but for others it indicated a specific excavation and artifact identification number would be a subset of the catalog number.

Site Provenience: The coordinates within the archaeological investigation from which the artifact was taken. This information was recorded only when it was provided on the artifact's identifying tag, or at times, supplemented from an archaeology report.

State Site: The Smithsonian trinomial, which is a unique identifier assigned to archaeological sites in many

states in the United States. They are composed of one or two digits coding for the state, typically two letters coding for the county or county-equivalent within the state, and one or more sequential digits representing the order in which the site was listed in that county.

Site Names: Abbreviated names of historical sites; see the Site Name Index for their full name.

Location-Current: The curatorial facility where the artifact is currently housed. These are abbreviated names; see the Curatorial Facilities Index for their full name.

Artifact Location: This is where the artifact can be found within the curatorial facility's repository.

Category: Categories of tools, hardware, and construction materials are included here to enable sorting according to these categories. Some category sub-sets were defined as separate categories because they are commonly found at Spanish Colonial sites. For example, "blacksmithing" is considered a subset of "metalsmithing," just as "carpentry" belongs within the more general category of "woodworking"; yet they are all listed as categories. The "hardware" category warrants further explanation. This category was thought of as being similar to, but perhaps a little more broad than, the modern-day category of architectural hardware. It includes metal artifacts used in the construction of the building or related to its function as a building, such as metal products used to create walls, doors, architectural ornamentation, cabinetry, furniture, etc. The "tool" category was created specifically for chains because, although some could be categorized as" hardware" or "surveying/measurement," most could have been used as a tool for a variety of purposes.

Artifact: The tool, hardware, or construction material documented. An attempt was made to identify or correct the identification of metal tools and hardware, where possible. "Unidentified" ones may possibly be identified in the future.

Type: If the tool, hardware, or construction material had several types, the type was identified here, when known.

Material: The general or most common material of the artifact. An attempt was made to identify the material of as many artifacts as possible.

Date of Origin: This is the century from which the object has been identified. If a specific date is known, this was recorded in the Artifact Notes column.

Culture: The culture to which the artifact can most appropriately be attributed. The "colonial" designation, for example in Spanish Colonial, means that the artifact was either made or found in the Americas or it was

intentionally brought to the Americas to establish a colony, for example in a colony kit. Otherwise, the Culture designates the region in Europe it is from, for example, Spain.

Artifact Notes: Dates on the artifact identifying tag were recorded in this column, as well as any other data that could be learned at the curatorial facility.

Images: Only two to three images per artifact could be recorded in this database due to the size limit of 2G for the current Access software used.

GIS: This column indicates "Yes" if the artifact's photograph was chosen to be used in the Esri Story Map published on CAR's website in 2017.

Publication: An attempt was made to tie each artifact to its respective archaeology report. Where the publication is recorded, only one publication was provided per artifact row, due to space limitations. The digitized reports were indicated by their internet address; otherwise, their citation was recorded. Not all publications linked to artifacts could be ascertained by the end of the project time frame. All archaeology reports linked to the CAR artifacts are fully represented. The task of completing the Publications column with reports, which can be found at other facilities and libraries, is left to future researchers who may wish to use and amplify this database. Sharing this research will increase the database's usefulness as a professional research tool.

The drop-down menus provided for some, but not all, columns are the key feature of the database for conducting an analysis of the data. They can be used to sort the descriptive terms alphabetically or to sort according to one or a selection of terms provided. Simply select "Sort A to Z" or de-select "Select All" and then select one or more terms to sort by. The descriptive terms provided encompass all the possible entries in that column, which is why some terms include two or more terms together for the cases when the artifact warranted this attribution. These menus also help with data entry to maintain the consistency of terms used to describe artifacts and to avoid spelling errors that might cause issues with the term searches. Throughout the database, the cells that are left blank indicate that the information does not exist or could not be verified or identified.

The Additional Tables

The Site Name Index table defines the abbreviated site name with the full official site name, which were derived from the National Register of Historic Places website (see References Cited at the end of this report). For each location, the Site Name Index table provides the range of time that the site was inhabited as a colonial-era settlement and other relevant notes about the site. The Curatorial Facilities Index table

further defines the abbreviated names given in the respective database column with the official full names of the facilities. The Glossary table defines all of the tools, hardware, and construction materials that are found in the Artifact column of the database. These definitions came from various dictionaries and internet resources and were often modified to better describe the particular function of the artifact at hand.

An Analysis of the Findings at the Curatorial Facilities

The findings from the curatorial facilities, which included archeology labs, museums, and National Parks Service facilities, are analyzed individually by center. Texas Parks and Wildlife was originally included in the scope of research; however, the colonial-era collections they once held for Mission San José y San Miguel de Aguayo are now housed at CAR and the San Antonio Missions National Park. The artifacts from Mission Espíritu Santo de Zuñiga and Rosario were moved to TARL, and a few artifacts remain on display at the Goliad State Park and Historic Site. Although documentation occurred at ten curatorial facilities, only eight are represented in the database, since the artifacts documented at the Texas Maritime Museum and The Bullock Texas State History Museum were on loan from the Corpus Christi Museum of Science and History. Table 3-1 lists these eight facilities with their abbreviated names created for the database column entitled Location-Current.

Table 3-1. Abbreviated Names Used in the Database for Each Curatorial Facility

Location-Current	Curatorial Facility
UTSA CAR	Center for Archaeological Research, University of Texas at San Antonio
UT TARL	Texas Archaeological Research Laboratory, University of Texas
NPS SA Missions	San Antonio Missions National Park
CCMSH	Corpus Christi Museum of Science and History
Cane River	Cane River Creole National Historical Park
SFASU Arch Lab	Archaeology Lab, Stephen F. Austin State University
NSU Williamson	Williamson Museum, Northwestern State University
The Cabildo	The Cabildo – Louisiana State Museum

At writing of this report, 548 artifacts at the eight curatorial facilities have been documented (Table 3-2). These facilities provided access to 31 colonial-era sites (Figure 3-2). On average, each colonial site studied revealed approximately four identifiable tools, eight pieces of metal hardware, and 2.4 unidentified metal objects (this calculation excludes The Cabildo artifacts for which their sites cannot be known at this time, although many may come from the city of New Orleans). The artifacts placed in the "unidentified" category were documented because their form indicated a possible function that might be identified in the future when there is a larger cross section of artifacts for comparison. For example, iron fragments may be later identified as part of a metal rasp (Figure 3-3). The unidentified artifacts are not included in the tables developed for each curatorial facility below (starting with Table 3-3) but can be studied in the database. We

assessed construction materials at CAR, but not at other curatorial facilities, due the time available during the grant period. CAR's collection was one we could easily access and from which we could develop an accurate statistic; at CAR we found approximately 16 construction material samples per site to document.
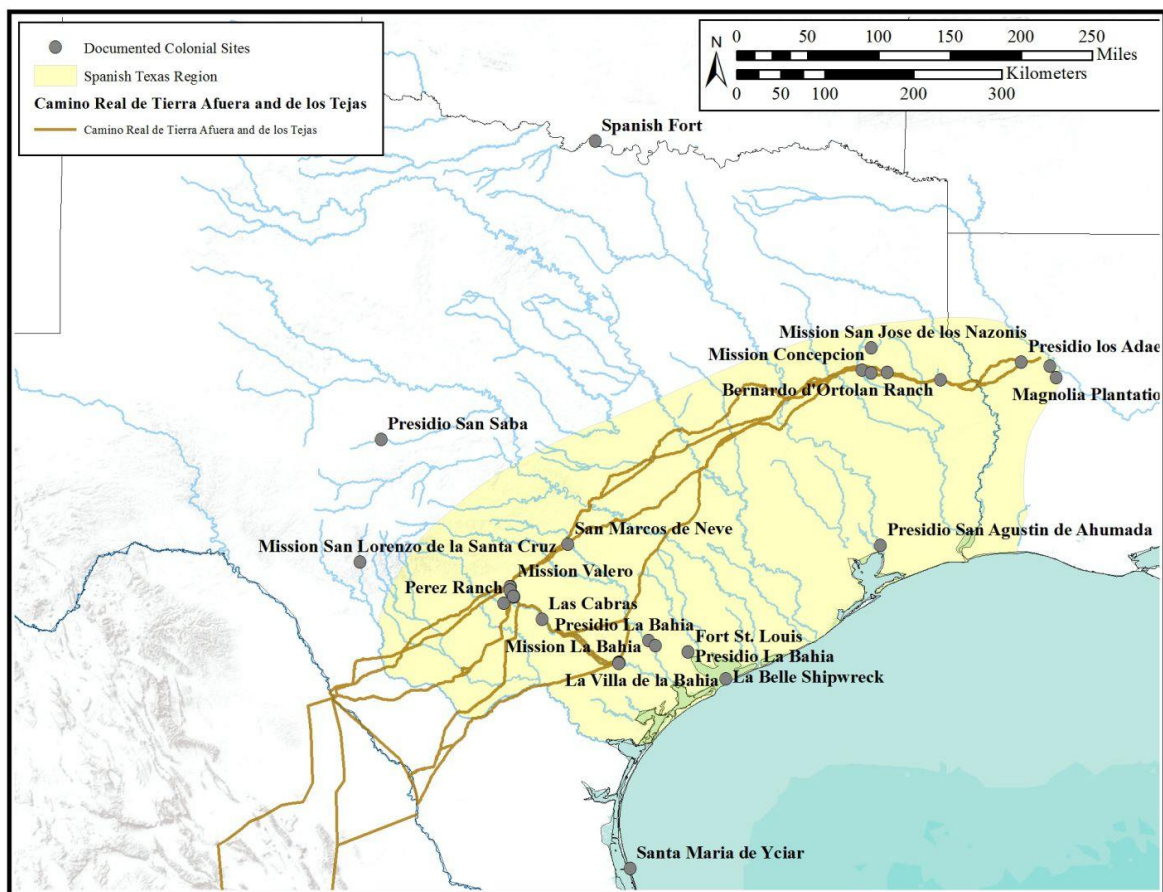
Figure 3-2. Map showing the 31 colonial-era sites documented in this project.

The number of artifacts documented overall during this project were too numerous to provide herein as a catalogue with individual descriptions and photographs. The reader is referred to the database and to the referenced archaeology reports. Also, the Story Map in the Esri Public Gallery provides a few examples of artifacts from each documented colonial site. Table 3-2 presents an overview of the findings at each curatorial facility. This table is followed by a description of the findings at each facility and a photograph of one representative artifact.

Figure 3-3. Unidentified artifact documented at CAR.

Table 3-2. Sites Studied and Documented Artifacts
from Curatorial Facilities with Colonial-era Collections

Location-Current	Sites Studied	Tools	Hardware	Materials	Unidentified	Total
UTSA CAR	10	48	41	158	18	265
UT TARL	7	34	14	3	26	77
NPS SA Missions	4	12	18	13	19	62
CCMSH	2	37	1	0	1	39
Cane River	1	26	6	0	6	38
SFASU Arch Lab	6	13	9	1	3	26
NSU Williamson	1	11	9	0	1	21
The Cabildo	Unknown	17	3	0	0	20
TOTAL	**32***	**198**	**101**	**175**	**74**	**548**

*The total sites studied is calculated counting The Cabildo as having one site, since the provenance of their artifacts are not known at this time.

Center for Archaeological Research (CAR), The University of Texas at San Antonio

Sites documented at the CAR represented within the database include the five San Antonio Missions: Mission Valero, Mission Concepción de Acuña, Mission San José y San Miguel, Mission San Francisco del la Espada, and Mission San Juan Capistrano; as well as other local sites: Olivas Site 1, Rancho de las

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Cabras, the Perez Ranch, and San Fernando Cathedral. The CAR has a few artifacts from Mission Espíritu Santo de Zúñiga Goliad; however, most of the CAR-curated artifacts from this site are housed at TARL today. The CAR staff investigated more than 150 NPS accessions within an associated artifact count of over 55,000. Additional non-NPS accessions were searched for relevant artifacts, of which 107 were identified as having material relevant to the study. A representative artifact is shown in Figure 3-4. Table 3-3 provides a comprehensive list of the number and type of tools, hardware and construction materials documented at CAR. Although this is a complete list of colonial-era tools and hardware found at CAR, the construction materials list is not complete, as discussed at the end of Chapter 3. The quantities of construction materials usually reflect bags of artifact samples, rather than single objects.

Figure 3-4. An eighteenth-century prick punch, type used with a ball-peen hammer, documented at CAR.

Table 3-3. Colonial-era Artifacts Documented at CAR

TOOLS		
Artifact	**Material**	**Quantity**
Abrader	Sandstone	1
Axe Head	Iron	2
Bar	Iron	1
Bolt	Iron	1
Chain	Metal	1
Chisel	Iron	6
Clamp	Metal	1
Clevis	Iron	1
Compass Lead	Lead	1
Drill Bit	Iron	1
Fasteners	Iron	1
Ferrule	Iron	1
File	Iron	2
Hammer Head	Iron	1
Hook	Iron	3
Nails	Iron	5
Nut	Iron	2
Pin	Metal	1
Punch	Iron	1
Rasp	Iron, Metal	2
Screw	Iron	1
Spike	Iron	1
Washer	Iron, Lead, Metal	10
TOTAL		**48**

HARDWARE		
Artifact	**Material**	**Quantity**
Brace	Metal	1
Bracket	Iron	3
Handle	Iron	1
Hinge	Iron	14
Latch	Iron	1
Nail Cover	Copper	1
Ornament	Iron	1
Pintle	Iron	1
Pipe	Metal/Copper/Lead/Iron	9
Pull Plate	Iron	1
Tube	Copper	2
Wire	Iron/copper	6
TOTAL		**41**

MATERIALS		
Artifact	**Material**	**Quantity of Samples**
Brick	Clay, Adobe	115
Brick/Tile	Clay	6
Caliche	Calcium carbonate	2
Limestone	Limestone	1
Mortar	Unidentified	2
Mortar/Plaster	Unidentified	11
Plaster	Unidentified	3
Soil	Unidentified	8
Stone	Unidentified	1
Tile	Clay, Sandstone, Stone	8
TOTAL		**158**

Texas Archaeological Research Laboratory (TARL), The University of Texas at Austin

The seven sites documented at TARL were Presidio Loreto de la Bahía, Presidio La Bahía/Fort St. Louis, Mission Espíritu Santo de Zúñiga, La Villa de la Bahia, Mission San Lorenzo, Presidio San Luis de las ,Amarillas (San Sabá), and the Spanish Fort Sites. The largest collection of artifacts, 58 out of 77, came from Mission Espíritu Santo de Zúñiga. A representative artifact is shown in Figure 3-5. The findings for tools, hardware, and construction materials are assessed in Table 3-4. This represents a complete list of colonial-era tools and hardware found at TARL, however, no attempt was made to fully document the construction materials collection.

Figure 3-5. An eighteenth-century splitting maul documented at TARL.

Table 3-4. Colonial-era Artifacts Documented at TARL

TOOLS		
Artifact	**Material**	**Quantity**
Axe Head	Iron	2
Bolt	Iron	1
Chain	Iron	7
Chisel	Iron, Copper	3
Compass	Metal, Slate	2
End Scrapers	Stone	1
Gouge	Iron	2
Grindstone/Whetstone	Stone	1
Hatchet Head	Iron	1
Hook	Iron	1
Hook/Latch	Iron	1
Maul	Iron	1
Nails	Iron	3
Punch	Iron	1
Rasp	Iron	1
Saw Blade	Iron	1
Screw	Iron	1
Sun Dial	Stone	1
Tomahawk Eye	Iron	2
TOTAL		**34**

HARDWARE		
Artifact	Material	Quantity
Chain	Iron	1
Hanger	Iron	2
Hinge	Iron	3
Hook or Chain	Iron	1
Key	Iron	1
Keyhole	Iron	1
Latch	Iron	1
Padlock	Iron	3
Wire	Iron	1
TOTAL		**14**

MATERIALS		
Artifact	**Materials**	**Quantity of Samples**
Brick	Clay	1
Plaster	Unidentified	1
Roof Cap Fragment	Adobe	1
TOTAL		**3**

San Antonio Missions National Historical Park

This curatorial facility houses artifacts from four of the five San Antonio Missions: Mission Concepción de Acuña, Mission San José y San Miguel, Mission San Francisco de la Espada, and Mission San Juan Capistrano, as well as components associated with these missions including acequias, labors, and Rancho de las Cabras. A representative artifact is shown in Figure 3-6. Other artifacts from these sites are stored at the CAR. The CAR is the official curatorial facility for the San Antonio Missions National Historical Park. The park headquarters' cold storage facility houses objects that were acquired through acquisition, donation, etc., as well as archaeological collections that are being processed prior to being sent to the CAR.

The Mission San Antonio de Valero artifacts are housed exclusively at the CAR and are the property of the Texas General Land Office.

Figure 3-6. An eighteenth-century pair of tongs documented at the San Antonio Missions National Park.

Table 3-5. Colonial-era Artifacts Documented at the
San Antonio Missions National Historical Park

TOOLS		
Artifact	**Material**	**Quantity**
Axe Head	Iron	1
Bolt	Metal	1
Chain	Iron	1
Chisel	Iron	1
Nails	Iron, Metal	5
Spike	Metal	1
Staple	Iron	1
Tongs	Iron	1
TOTAL		**12**

HARDWARE		
Artifact	**Material**	**Quantity**
Bell	Iron	1
Carabiner/Wire	Iron	1
Door Clapper	Iron	1
Door Handle	Iron	1
Hasp	Iron	1
Hinge	Iron	2
Hinge/Hook	Iron	1
Key	Iron	4
Latch	Iron	1
Lock plate	Iron	1
Nail cover	Copper	2
Wire	Iron/Plaster	2
TOTAL		**18**

MATERIALS		
Artifact	**Material**	**Quantity of Samples**
Brick	Clay	1
Plaster	Unidentified	3
Tile	Clay, Plaster, Stone	9
TOTAL		**13**

Corpus Christi Museum of Science and History

The CCMSH is a Texas Historical Commission Certified Archaeological Repository. They house the artifacts from two colonial-era shipwrecks along the Gulf Coast, the sixteenth-century Santa María de Yciar and the seventeenth-century *La Belle*. The majority of the artifacts listed in Table 3-7 came from *the La Belle* and were tools used for carpentry and woodworking. A representative artifact is shown in Figure 3-7. One of the wood boxes recovered from the *La Belle* by the TAMU archaeology team in 1997 contained a large collection of tools that are assumed to belong to a carpenter or cooper on board the ship, and many are thought to be used mostly for barrel-making (Bruseth et al. 2017:656-657). Not all of these tools were documented for the database. Dr. Roff selected those that could be used in for cabinetmaking and construction.

Table 3-6. Colonial-era Artifacts Documented at the
Corpus Christi Museum of Science and History

TOOLS		
Artifact	**Material**	**Quantity**
Adze	Iron	2
Auger	Wood, Iron	1
Auger bit	Iron	1
Axe Head	Iron	1
Broom	Wood	1
Chisel	Iron	2
Compass	Brass	1
Compass-divider	Brass	2
Cross Staff Aperture Disks	Metal	1
Cross Staff Vane Fittings	Metal	1
Dividers	Brass, Iron	5
Draw Knife	Wood, Iron	1
Gimlet	Iron	1
Gouge	Iron	1
Hammer Head	Iron	4
Hatchet Head	Iron	1
Inkwell	Brass	1
Ladle	Iron	1
Pen Knife	Iron	1
Pencil	Lead	1
Pencil/brush holder	Brass	1
Plumb Bob	Iron	1
Ruler	Wood	1
Sharpening Stone	Stone	1
Sharpening Tool	Stone	1
Square	Iron	1
Stylus	Wood	1
TOTAL		**37**
HARDWARE		
Artifact	**Material**	**Quantity**
Padlock	Metal	1

Figure 3-7. A seventeenth-century carpenter's square documented at CCMSH.

Cane River Creole National Historical Park

The artifacts recovered at the Cane River facility were from the Magnolia and Oakland Plantations, a collection rich in French Creole tools from the late eighteenth to the mid-nineteenth century. These tools were surface recoveries mostly from the extant buildings. No archaeological investigations have been done to-date. A representative artifact is shown in Figure 3-8. It would be possible to document construction materials at this facility in the future.

Figure 3-8. An eighteenth-nineteenth-century screw-threader documented at Cane River Creole National Historic Park.

Table 3-7. Colonial-era Artifacts Documented at the
Cane River Creole National Historical Park

TOOLS		
Artifact	**Material**	**Quantity**
Anvil	Iron	1
Auger Bit	Metal	1
Axe Head	Steel	3
Base (for anvil)	Wood, Iron	1
Chisel	Iron, Metal	2
Hook	Metal	1
Hook/Latch	Iron	2
Maul	Iron	1
Pulley	Iron	1
Saw Blade	Iron	2
Screw Threader	Iron	1
Shovel	Iron	1
Spike	Iron	1
Square	Wood, Metal	1
Stand (for compass)	Wood	1
Staple	Iron	1
Tongs	Iron	1
Wedge	Iron	1
TOTAL		**12**
HARDWARE		
Artifact	**Material**	**Quantity**
Hinge	Iron	1
Latch	Iron	3
Pintle	Iron	1
Pintle/Hinge	Iron	1
TOTAL		**6**

Archaeology Lab, Stephen F. Austin State University

The Spanish Colonial sites that had metal artifacts available for investigation at SFASU were Mission Concepción de los Hainais, Bernardo D'Ortolan Ranch, Guadalupe del Pilar Church, Mission San José de los Nazonis, Morris Jackson site, and Mission Dolores de los Ais. A representative artifact is shown in Figure 3-9 (Table 3-8). Mission Dolores is a THC historical site, and the only Spanish Colonial mission under their guardianship; thus, the artifacts from this site belong to the THC. The one brick documented under construction materials is just a sample, and further investigation of construction materials is possible at this curatorial facility.

Figure 3-9. An eighteenth-century eye-hole hinge documented at the SFASU Archaeology Lab.

Table 3-8. Colonial-era Artifacts
Documented at the Archaeology Lab, SFASU

TOOLS		
Artifact	**Material**	**Quantity**
Axe	Iron	1
Bolt	Iron	1
Chain	Iron	1
Drill bit	Iron	1
Nails	Iron	8
Tin can/bucket fragment	Iron	1
TOTAL		**13**
HARDWARE		
Artifact	**Material**	**Quantity**
Hinge	Iron	3
Hook/Latch	Iron	1
Latch	Iron	1
Pintle	Iron	1
Plate	Iron	1
Pull Plate	Iron	1
Wire	Iron	1
TOTAL		**9**
MATERIALS		
Artifact	**Material**	**Quantity of Samples**
Brick	Clay	1

Williamson Museum, Northwestern State University

The artifacts documented at the Williamson Museum were from several seasons of investigations at Presidio Pilar de los Adaes (1965-1980s). Most of the tools are ones used in carpentry. A representative artifact is shown in Figure 3-10. When this site was documented in the early stage of the grant project, Dr. Roff was not recording construction materials, thus there are none for Table 3-9. However, with a future grant project, the Williamson Museum would be a lucrative repository to further investigate.

Figure 3-10. An eighteenth-century saw blade documented at the Williamson Museum, NSU.

Table 3-9. Colonial-era Artifacts
Documented at the Williamson Museum, NSU

TOOLS		
Artifact	Material	Quantity
Bolt	Iron	1
Hoe	Iron	1
Maul	Iron	1
Nails	Iron, Copper	5
Punch/Drift Pin	Iron	1
Saw Blade	Iron	1
Spike	Iron	1
TOTAL		**11**
HARDWARE		
Artifact	**Material**	**Quantity**
Hinge	Iron	4
Key	Iron	1
Lock Plate	Iron	1
Padlock	Iron	1
Padlock Hasp	Iron	1
Shears	Iron	1
TOTAL		**9**

The Cabildo – Louisiana State Museum

The Cabildo's collection houses a collection of tools from French Colonial sites dating from the eighteenth to the nineteenth century. The tools are in excellent condition, and most retain their wood handles. A representative artifact is shown in Figure 3-11 (Table 3-10). Dr. Roff did not pursue identification of the sites, nor the provenience, for the 20 artifacts from museum, because, although they were easily classified tools, no further information was available from the museum.

Figure 3-11. An eighteenth-century wood mallet, type used to pound a chisel, documented at The Cabildo.

Table 3-10. Colonial-era Artifacts
Documented at the The Cabildo

TOOLS		
Artifact	**Material**	**Quantity**
Anvil	Iron	1
Bolt	Iron	1
Brace	Wood	1
Carving Tools	Wood/Metal	1
Chisel	Wood/Metal	1
Drawing	Paper	1
Level	Wood/Brass	1
Mallet	Wood	2
Plane	Wood/Metal	2
Saw Blade	Wood/Metal	1
Spike	Iron	1
Tongs	Iron	2
Traveler	Iron	1
TOTAL		**16**
HARDWARE		
Artifact	**Material**	**Quantity**
Hinge	Iron	2
Latch	Iron	1
TOTAL		**3**

An Analysis of Cultural Provenance

At the conclusion of the project, researchers were interested in knowing what percentage of tools and hardware in the database collection could be identified as Spanish, French or originating from other cultures. An analysis of the database shows that, of the artifacts that could be culturally identified, there were 274 Spanish Colonial, 53 French Colonial, 38 French Creole, and 1 English artifact. However, these numbers are not necessarily meaningful. The documentation of a greater number of colonial-era sites across the Texas-Louisiana region is needed in order to produce a meaningful statistic. Also, with the artifacts documented during the project, it was not possible to determine if a tool was truly of French or Spanish origin unless it had an identifying mark or feature, and this was not encountered with the artifacts studied. Researchers could determine the cultural identification of the artifact by its location, when in a limited, single use context. In the case of a mixed-use context, researchers relied on the provenience and verification from the site's archaeology report. The cultural provenance of 185 artifacts in the database could not be determined, and are labeled so, because the attribution for these was not clear. They are not "unidentified," but they might possibly be identified by other means in the future.

A Case Study of the Construction Materials at the San Antonio Missions

Although the documentation of construction materials was not within the original scope of research, Dr. Roff decided it would be a useful endeavor to create a limited case study on construction materials. This was possible because she had documented a few construction materials in the course of her work at CAR,

SFASU, TARL, and the San Antonio Missions National Park. The decision was made to focus the case study on two local facilities, the CAR and the San Antonio Missions National Park, where these materials were readily accessible to the GREAT Grant research team. Due to the nature of these collections, this necessarily meant the focus would be on the sites in common between these two centers, the five San Antonio missions, although the materials of a few additional San Antonio colonial sites have been included. A representative artifact is shown in Figure 3-12.

Figure 3-12. A colonial-era brick sample documented at CAR.

One objective of the case study was to determine if there were substantive quantities recovered of each type of material used in construction, enough to allow a future researcher to perform tests on the chemical composition and material properties, without diminishing the supply. With the data collected so far, future researchers would be able to conduct these tests at the CAR facility. A researcher would need to contact the CAR and the owners of the artifacts for permission, which in the case of Mission San Antonio de Valero would be the Texas General Land Office and the other San Antonio Missions would be the National Parks Service. Although there is an abundance of material for these types of studies, dating the materials exclusively to the colonial period is an issue that will be discussed below.

The CAR staff conducted a search for colonial-era construction materials within the CAR's NPS accessions, and subsequently entered the data into the Access database. The search was then extended to non-NPS colonial materials and those from excavations of other sites in the San Antonio region. Only items that were catalogued as specifically being from the colonial period were documented. For example, there may be more bricks that are from the colonial period but were never tagged to that level of detail. The result was the recovery of 158 samples of materials of verified colonial origin from the CAR that were documented in the database. It was decided not to photograph all of these artifacts, which were often large samples of materials in bags. Only 30 samples of construction materials from Mission Valero were photographed for the ArcGIS case study map that will be described in Chapter 4. A similar process occurred at the San Antonio Missions National Park. Between the two curatorial facilities, 171 construction materials have been documented and recorded in the database so far. A sample of the data on materials found in the Spanish Colonial Construction Tools, Hardware, and Materials database is provided in Table 3-11.

Table 3-11. Colonial-era Construction Materials
Recovered in Archeological Investigations in the San Antonio Region

Site Name	Artifact	Quantity of Samples
Mission San Antonio de Valero	Brick	5
	Brick/Tile	6
	Caliche	2
	Limestone	1
	Mortar	2
	Mortar/Plaster	1
	Plaster	3
	Soil	8
	Stone	1
	Tile	1
Mission Concepcion de Acuña	Brick	49
	Tile	7
	Plaster	1
Mission San Francisco de la Espada	Brick	24
	Tile	4
	Mortar/Plaster	4
Mission San José y San Miguel	Brick	20
	Plaster	2
	Tile	4
	Unidentified	1
Mission San Juan	Brick	16
	Mortar/Plaster	6
Rancho de la Cabras	Brick	2
San Fernando Cathedral	Tile	1
TOTAL		**171**

Approximately 81 percent of the construction materials found were brick and tile. A little more than 10 percent were mortar and plaster samples, and the rest were stone, soil, and caliche samples. It was not determined if any of the samples of glass came from windows, as opposed to bottles and other domestic forms of glass, therefore, they were not included in this inventory. Also, the CAR does hold wood planks from San Fernando cathedral, but further study will be required to determine whether these items are from the colonial period. Upon visual inspection, it was thought that they are not. A large portion of these materials, 33 percent, came from archeological investigations at Mission Concepción de Acuña, and the rest were distributed fairly evenly in number among the other missions.

The objective with this case study was to document the archaeological recovery of construction materials for the San Antonio missions, as a basis for future research. The documentation of materials at both repositories can be continued in the future with the items that were not catalogued as colonial (no time period recorded) or were derived from a mixed context. An investigation of the archaeology reports and field notes for each site may help to further determine whether the unidentified materials were derived from a purely colonial context or not. For the NPS artifacts, two steps would be required. This includes finding the units and levels that are colonial-era and then checking the NPS database for any brick with those proveniences. Outside of the NPS collections, the CAR database records the categories of artifacts that are present within each site, but it is lacking specific information such as provenience, count, or weight, making it a more difficult undertaking.

Chapter 4: The ArcGIS and the Esri Pubic Gallery

Phase 3 of research sought to connect the construction tools, hardware, and materials studied with the places in which they were found. This phase was undertaken to enable a contextual study of the materials and to be able to present and make available the collected data in an easily-accessible online framework. In order to achieve this, two ArcGIS geodatabases were created: one stored the sites that were studied and connected them with their selected artifacts, while the other placed the objects studied from Mission Valero within their specific site proveniences. These two geodatabases formed the backbone from which ArcGIS Online maps and web applications were developed to visualize the data. Finally, these maps and web applications formed the essential components of an Esri Public Gallery, which provides a visual accompaniment to the current report. The Esri Public Gallery can be found through a link provided on both the CAR and the CACP websites. This link is also provided in the References Cited section at the end of this report. This chapter documents the process by which the GIS data was created and structured in an effort to help future researchers working with this data.

Constructing the Tools and Hardware Geodatabase

The primary purpose of the geodatabase was to form a centralized location for the spatial data connected to the colonial sites considered within this research and the findspots of the tools and hardware that were studied as part of this project. The file geodatabase (ColonialTools.gdb) contains three point feature classes: AllColonialSites, StudiedSites, and Tools.

- AllColonialSites (point): This point feature class contains the location of all Spanish and French colonial sites listed in the bibliography as well as additional important sites.

- StudiedSites (point): This point feature class contains all sites from which materials were studied as part of this research.

- Tools (point): This point feature class contains select tools and hardware from each site studied, tied to the longitude and latitude of their respective sites.

These three feature classes show the spatial location of a select set of studied objects from the Spanish Colonial Construction Tools, Hardware, and Materials Database, highlight the sites considered in this research, and identify those sites that could be part of future work on colonial tools and hardware within Texas. The AllColonialSites and StudiedSites feature classes were divided to make map creation easier while the Tools feature class was divided from the others so that it could be linked to the information gathered within the Spanish Colonial Construction Tools, Hardware, and Materials Database.

The AllColonialSites feature class was created by collecting the longitude and latitude of sites listed in the bibliography through the data provided by the Texas Sites Atlas. Attributes were added that relate to the founding date and abandonment date of each site to allow for the dynamic visualization of the chronological development of French and Spanish colonial activity in Texas and Louisiana. Sites were given categories (mission, presidio, acequia, shipwreck, etc.) to enable the differentiation of sites by their typology. Further details were added to the StudiedSites feature class. Each site contained the same information along with a brief historical account to provide public viewers with an understanding of the purpose, importance, and history of each colonial site that was studied. Photographs of these sites were added as attachments to the feature class. Finally, the Tools feature class contained individual records for a select number of tools and hardware pieces that were each assigned a single location for its respective site. The number of artifacts displayed at each colonial site was limited to a maximum of three, emphasizing those tools that were either the most informative or illustrative of the variety studied. The findspot had to be limited to the site-level since more detailed provenience information did not exist for all objects. The data from the Spanish Colonial Construction Tools, Hardware, and Materials database were joined with the tools feature class through a common ID number, allowing all data collected for the Access database to be queried and to serve as categories for symbology within GIS maps. Additionally, photographs of the tools and hardware from the Access database were added to the geodatabase feature class as attachments.

After this geodatabase was completed, it was used to create figures for this report and was uploaded to ArcGIS Online. From here, the data could be used in a series of ArcGIS Online Web Maps in order to better convey the scope of the research to the public. Through these maps, the general public is provided with only a selection of the artifact data studied as part of this research. One exception to these limits is found in the Mission Valero case study, which is explained in the following section.

The Mission Valero Case Study

Mission Valero was chosen as a case study to demonstrate the breadth of artifact findings at one site and the benefits of contextualizing artifacts within a site, in their exact find locations. In this case, knowing what artifacts were associated with specific structures within the mission complex can help articulate how they may have been used and by whom. Additionally, Mission Valero was selected because of the integrity of its excavation records, almost all of which are located within the accessions stored at the CAR. The combination of publications and these accession records allowed 77 out of 93 studied artifacts to be placed within a specific excavation unit, a level of contextual information not easily available for other studied sites. Due to the sensitive nature of site location and artifact provenience, Mission Valero's protected status as part of a World Heritage Site and the National Parks Service makes it one of the few archaeological sites for which this level of excavation mapping would be permitted for public view.

In order to create the necessary GIS data to contextualize the finds for Mission Valero, maps of the excavations associated with the studied materials were scanned, georeferenced, and digitized. These excavations were Greer 1966 (1967), Sorrow 1970 (1972), Adams and Hester 1973 (1973), Eaton 1977 (1980), and Tomka, Fox, Figueroa, and Thompson 1992 (2008). Once the excavation extents and units were digitized, the studied artifacts could be placed within their respective units and assigned to the appropriate level and depth below the ground. All of this data was stored within a file geodatabase created for the Mission Valero case study, which is named ValeroCaseStudy.gdb. It houses the artifact data for tools, hardware, and materials that were studied from Mission Valero, along with the corresponding excavation extents from which they were discovered. In addition, the geodatabase contains contextual data on the former structural footprint of the mission and its acequia. The following provides a description of each feature class within the geodatabase and the kind of data contained within:

- AlamoAcequia (line): This line feature class was adapted from data collected by Pape-Dawson Engineers Inc. through an architectural survey of Mission Valero and the surrounding buildings. It records the visible portion of the acequia associated with Mission Valero.

- Artifact (point): This point feature class provides a spatial location for the Mission Valero artifacts that could be placed within their specific context. The points for these artifacts do not represent the precise coordinates of where these objects were found during excavation. They represent approximate locations within the specific unit in which they were discovered, separated spatially from other objects found within the same unit so that their symbols do not overlap. Elevation data is only provided within the Level field, since each excavation from which these artifacts came employed different datums and methods of recording depth. The Level field records either the artifact's depth within a unit or the level from which it came, depending on the recording system of each excavation. This feature class was joined with the data collected as part of the Spanish Colonial Construction Tools, Hardware, and Materials Database to allow for greater ability to query and symbologize the data. Images of the artifact were attached to these points to allow visualization of the artifact within GIS.

- Artifact_poly (polygon): This polygon feature class associates the spatial data recorded for each studied artifact with an individual excavation unit. This is simply a different spatial and visual method of recording and displaying the same information from the Artifact feature class. The Artifact_poly feature class was joined with the data collected as part of the Spanish Colonial Construction Tools, Hardware, and Materials Database to allow for greater ability to query and symbologize the data. Images of the artifact were attached to these polygons to allow visualization

of the artifact within GIS.

- ExcavationExtent (polygon): This polygon feature class records the spatial extent of the five excavations conducted at Mission Valero that are associated with artifacts studied as part of this research. These extents were digitized from maps printed in published reports for each excavation. The attribute table contains information on the name of the excavator, the year of excavation, when the report or documentation on the excavation was published, what each extent was named within the individual excavation, and the source used to digitize the data.

- ExcavationUnit (polygon): This polygon feature class records the spatial extent of the individual units, squares, trenches, test pits, and probes recorded as the units of investigation for five excavations conducted at Mission Valero. These extents were digitized from maps printed in published reports for each excavation. Their digitization made it possible to place the studied objects within a more precise location at Mission Valero. The attribute table contains information on the name of the unit type, the number given to the unit, the excavator, the year of excavation, when the report or documentation on the excavation was published, and the source used to digitize the data.

- Structure (polygon): This polygon feature class was digitized from a reconstruction of the extent of Mission Valero in 1836. This feature class is meant to give viewers a sense of the entire complex of Mission Valero at the times in which the objects under study were used.

Once all of the data was collected and digitized, the file geodatabase was uploaded to ArcGIS Online to create an online Web Application. This application allows the user to explore where certain tools, hardware, and construction materials were found within Mission Valero. Such a reconstruction of the context of each of these finds is the first step in their future analysis.

Esri Web Applications and Public Gallery

An important component of this research project was creating a public-facing platform that could provide greater information about the nature of Spanish Colonial Texas and the tools, hardware, and materials used in construction that formed the backbone of this colonial experience. ArcGIS Online provides a number of different web maps, applications, and templates that employ the data collected within the two previously described geodatabases to create different modes of visualization. While the ultimate goal of publishing this geographic information was to better inform the public, due to the sensitive nature of archaeological site location information, the desire for the public to have complete and free access had to be balanced with the ethical obligation to protect archaeological sites from potential future harm and looting. For the case

study of Mission Valero, this concern is somewhat moot, since the site is well protected and under regular surveillance. For the other site locations, however, an effort was made to ensure that sites could not be precisely located, and only observed on the macro level. This restricted the types of Esri web maps and applications that could be used for display, since many of these do not allow either a restriction on the ability to zoom in maps or cause layers to disappear after maps have zoomed past a certain point. The following Esri Web Applications were created as a way for the public to visualize and contextualize the tools and colonial sites discussed as part of this report.

Spanish Colonial Construction Tools and Hardware – Home Page

Three Web Applications (see below) and Story Maps were collected in one single Public Gallery that provides a description of the overall research project and provides a link to each map (Figure 4-1). This home page is linked to the both the CAR and the CACP websites.
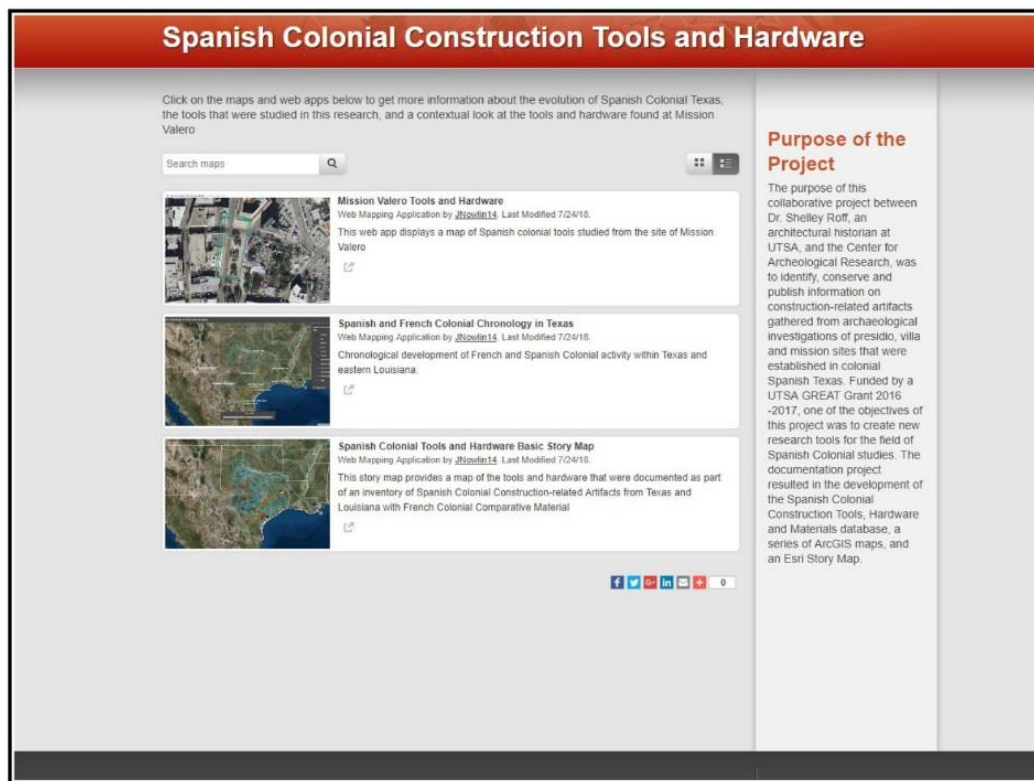
Figure 4-1. Image of the Spanish Colonial Tools and Hardware - Home Page.

Mission Valero Tools, Hardware and Materials

The first web application, Mission Valero Tools, Hardware and Materials, provides a map of the extent of the Mission Valero complex with the construction tools, hardware, and materials studied from the site placed in their actual findspots (Figure 4-2). It shows the extent of the excavations that brought these objects

to light, dating to between 1966 and 1992. It uses the data gathered within the ValeroCaseStudy.gdb file geodatabase. The application provides a Legend on the right-hand side that explains the symbols used for each category of data and a Layer List that allows any of these layers to be turned on and off. The purpose of this application is to allow users to contextualize the 77 items studied from Mission Valero within the overall complex and to assist researchers who may want to learn more about these objects by indicating the stratigraphic unit in which they were discovered, the publication where they originally documented, and providing documentary photos of the objects themselves.
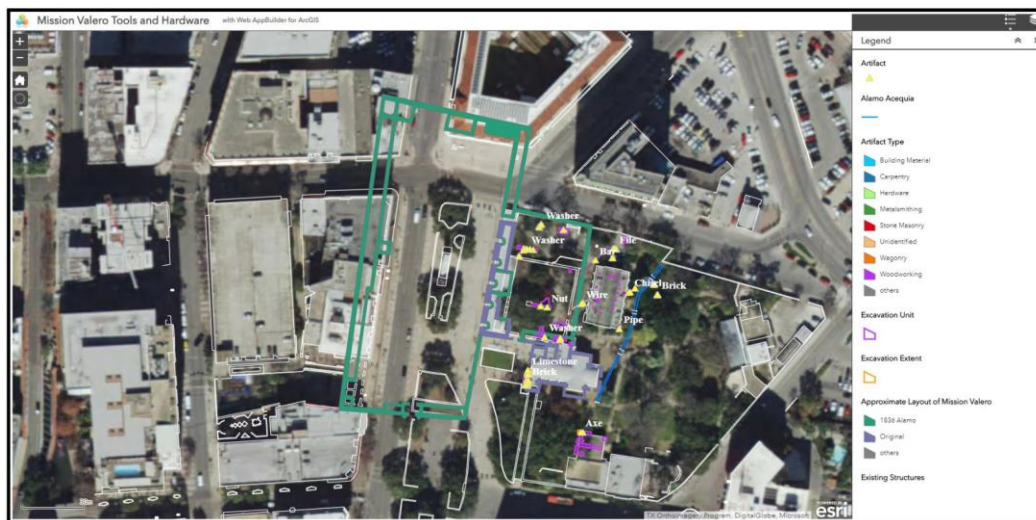
Figure 4-2. Image of the Mission Valero Tools and Hardware Web Application.

Spanish and French Colonial Chronology in Texas

The second application is a Time Aware Web Application that visualizes the expansion and eventual contraction of sites within Spanish Colonial Texas (Figure 4-3). By using the DateEstablished and DateAbandoned fields from the AllColonialSites feature class in the ColonialTools.gdb, the application displays colonial sites when they were first founded and removes them from the map after they have been abandoned. A time slider at the bottom of the map shows what time period is being displayed. When the play button is pressed, time advances at the prescribed interval (the default for the map is currently at one-year intervals from 1680 until 1901). Each of the sites displayed on the map is labelled with its name, and each point is colored based on the site type. A legend describing these categories is available in the upper right-hand corner. Since this is an interactive map, users can zoom in on each of the sites to get a better sense of where these colonial sites are located and how they relate to nearby water features and particularly to the Camino Real. Zooming beyond the county level makes the sites disappear for their own protection. It is hoped that such a dynamic map will help viewers understand how and where Spanish Colonial Texas developed, and what sites are critical to telling such a story.
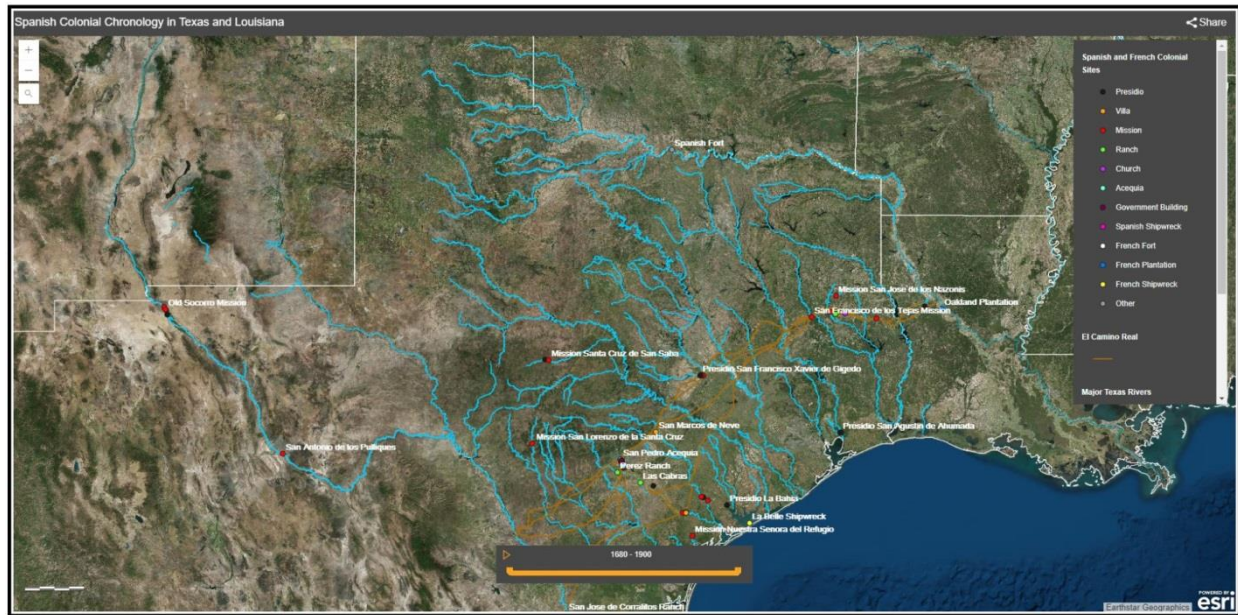
Figure 4-3. Image of the Spanish and French Colonial Chronology in Texas Time Aware Web Application.

Spanish Colonial Tools and Hardware Basic Story Map

The Spanish Colonial Tools and Hardware Basic Story Map provides a map of a selection of tools and hardware studied as part of this research project (Figure 4-4). Each object has been placed at the center point of the site at which it was found. However, as with the previous map, this location data disappears when zoomed in beyond the county level. Each site location is colored based on the site type in which the object was found, and the site type is described in the legend in the upper left-hand corner of the map. To pull up the attribute information connected with each object, the user clicks on one of the points. It displays the data collected as part of the project along with the thumbnail photo of the object itself. Further images can be viewed by clicking on links within the pop-up. This map provides a limited sample of the objects studied as part of the research project and allows them to be contextualized within the landscape of Spanish Colonial Texas.

Figure 4-4. Image of the Spanish Colonial Tools and Hardware Basic Story Map.

Chapter 5: Conclusions and Recommendations

The artifacts documented in this project are the physical remains of a portion of the history of Texas. The metal hardware and construction materials recovered from archeological investigations of Spanish Colonial sites are one of value for the potential reconstruction and analysis of construction-related craft processes and the resulting architectural fabric that formed the physical infrastructure of Spanish Texas. Construction tools are potentially key pie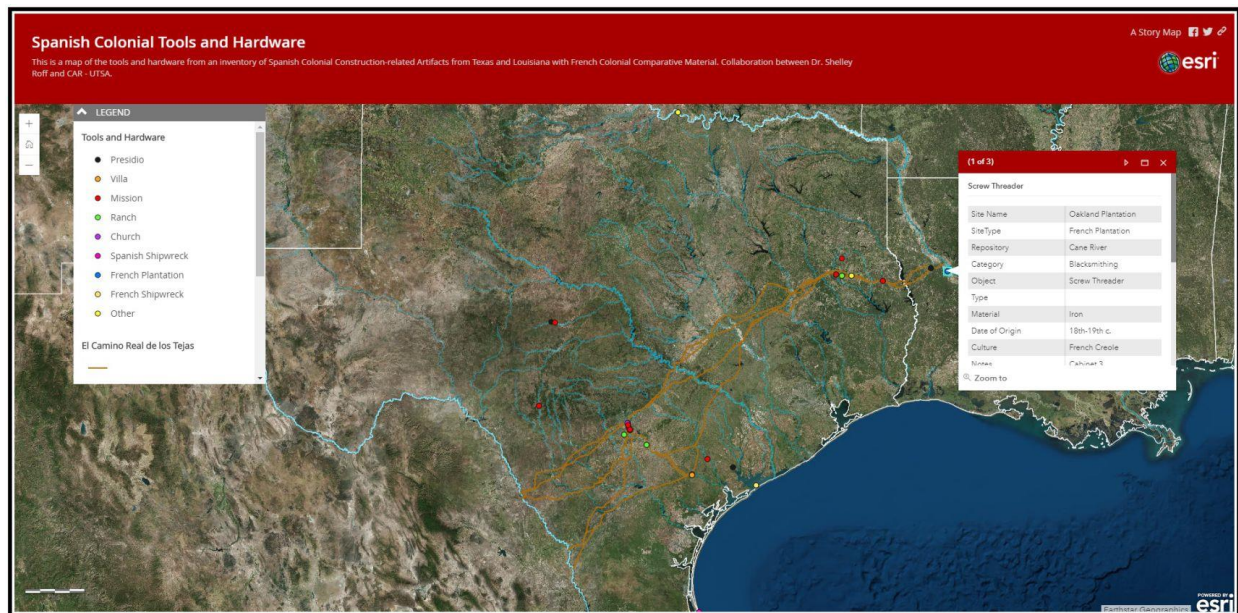ces of evidence needed to reconstruct the settlement process and they can be used to investigate the adaptive measures taken in the development of this particular frontier setting. The size and characteristics of tools and measurement devices can explain how property boundaries and building plans were physically laid out and how scale and proportions were used in construction. The primary cultural resources for this project were metal artifacts recovered from archaeological contexts. These artifacts are in varying stages of oxidation and deterioration, and this concluding chapter focuses specifically on the condition and integrity of these artifacts and the existing options for stabilizing and conserving them in order to enhance their longevity and utility for future research purposes.

The State of Metal Tools and Hardware in the Spanish Texas Region

During the documentation process, it became evident that the quantity of metal artifacts found at colonial-era sites was considerably smaller than that of ceramics, but substantially greater than that of wood. One could state correctly that the rates of perishability of these three materials buried in soil is parallel to the quantities found. Yet, there was variation in the physical contexts in which these artifacts were recovered. An immediate difference can be found in the shipwrecks, of which boxes, crates, tool handles, and other objects of wood survived in much better condition in seawater than the metal objects—the obverse of most terrestrial environments. Historical and environmental factors that might have contributed to the artifacts' persistence or loss to the archaeological record must also be taken into account. Relative to the total number of artifacts housed in curatorial facilities, the researchers of this project identified five factors that might have shaped the numbers of identifiable metal artifacts found at colonial-era sites.

A primary reason for a low number of recovered metal tools and hardware may have much to do with the relative scarcity of metal items that the missions and presidios had in their own time. As discussed in the introduction to this report, Texas at the time of the Spanish settlement was a frontier region, and all unrefined metal and metal objects were imported to the site from long distances. The Province of Tejas, unlike Nueva México, was not productive for the mining of metals of any kind, despite numerous explorations and failed attempts in the region (de la Teja 1995:4). A report by Fray Gasper José de Solis in the 1760s mentioned that Mission Dolores de los Ais seriously lacked basic supplies "because of the fact that the aid sent to them from the outside and given by the King, Our Lord (whom God may Preserve), does

not usually come on time" (Gilmore 1980:234). The reports of a serious deficit of iron and steel at many sites in Tejas are documented repeatedly, from the eighteenth into the early nineteenth century (Taylor 1957, 62; Simmons 1980:33).

In the case of the earliest settlements, the Spanish government only provided a minimum of supplies needed, in order to get a colony started; and then the settlers were expected to develop their own means to flourish. Both missions and presidios were considered by the Spanish government and by the religious orders to be temporary installations; the intent was for them to eventually grow into civilian towns, where they would become a source of royal revenue, rather than a drain on resources (Moorehead 1975, 222-223). There may been even greater emphasis on this objective by the eighteenth century, since for the previous 200 years the Spanish Empire had been in a serious economic decline, a situation that manifested in a gradual decline of material goods flowing from the cities of Spain to the Americas (Carlson 1994, iii).

One might ask why it was so difficult to get supplies, and in particular metals, to the missions and settlements in Tejas. The geographic location of Tejas was one important factor. There were no good natural ports from which to develop trade, and the many rivers traversing the Tejas region were not navigable from the Gulf Coast. Also, the great distances of overland trails between central Mexican provinces and Nueva México made a trade network virtually prohibitive. Most blacksmithing in eighteenth century Spanish Texas was dependent on refined metals such as iron, copper, bronze, and tin brought overland on mule trains, which were vulnerable to attack (Simmons 1980; 17-18). Another reason may lie with trade sanctions imposed by the Crown of Spain on the colonies. The Crown had established a policy which forbade the colonial production of iron, in order to protect their own industry in Vizcaya. Exported Spanish iron was sent to the Mexican port of Vera Cruz, and from there would be taken overland to the provinces. It would have been possible for locals to exploit the iron-rich provinces in central Mexico and Nueva México, even despite the Spanish law; yet iron and steel were not developed and remained a scarce commodity throughout the colonial period. A possible reason may have been the focus on silver mining, which had detracted from any expenditures to mine and smelt other less lucrative metals (ibid.).

A second reason why the ratio of metal tools and hardware in comparison to other artifacts is disproportionate might be due to fact that metal was a precious commodity in New Spain, even in a time of good economic conditions. Refined metal products were labor-intensive to produce. With so few tools and metal hardware being transported into Spanish Texas, and making it to the intended site, it would make sense that what metal objects the colonists had would be carefully guarded and maintained, and these objects would be passed down for generations, perhaps at times being traded or relocated to other sites. Tools that were broken could be adapted for other uses (Figure 5-1), and at times, so repurposed to another

end that they become unrecognizable as to their original use when observed today.

Third, as noted in archaeological reports, iron and steel tends to deteriorate at a rapid rate in comparison to other less perishable artifacts like inert ceramics or glass (Gerow 1997:263; Lockhart et al. 2002:213). This process is due to the oxidation and reduction processes affecting metal surfaces. The rate of corrosion can be affected by the acidity of the soil, the amount of soil moisture, and the oxygen concentration within the soil (Colorado Geological Survey 2017). Iron and iron-alloyed artifacts are the most at-risk, and copper alloyed artifacts with a significant amount of zinc also oxidize rapidly. The collections at the CAR had very large amounts of material recorded as unidentified metal or unidentified scrap, and there were similar findings at other curatorial facilities. These terms were apt in most cases. Although some of the material may have been a tool or piece of hardware at one time, much of it is now deeply oxidized and fragmentary. Considering that the majority of the corpus of metal examined were fragmentary and unidentifiable as to original use, it is exceptional that the project's researchers could identify the great number of tools that they did.

Figure 5-1. Iron object repurposed as a chisel.

A fourth factor is that the conservation of identifiable metal artifacts from twentieth-century archeological investigations in Texas has varied greatly between curatorial facilities as a direct result of funding. None of the artifacts documented at the CAR in this study have received conservation methods. The GREAT Grant team had discussed early on in the project the possibility of developing conservation methods for the

artifacts held at the CAR, but after reviewing the CAR's metal artifact inventory, it was decided that this project should be deferred to a future time when there were greater funds available. The San Antonio Missions National Park hold a valuable number of important and/or rare artifacts from the same mission sites, yet they also lack dedicated funds for their conservation. The Cane River Creole National Historic Park, also a NPS facility, has not had funds for the conservation of its extensive metal artifact collection. Its artifacts, however, have an advantage over those at the CAR and the San Antonio Missions National Park in that most of them were not exposed to the corrosive effects of being buried in soil. All of the artifacts at The Cabildo museum also appear to be in good condition, and this may be due to the fact that many appear to have been donated to the museum from private collections, not from archaeological investigation. It is not evident from visual observation that any of them have been treated with conservation methods. At TARL, a metal artifact collection that is composed almost solely from archaeological sites has only three out of 68 documented metal artifacts conserved.

However, other facilities have made a concerted effort or have had public funds to preserve the most valuable artifacts. The most impressive case was of the metal artifacts recovered from the *La Belle* and the Santa Maria de Yciar shipwrecks. All (100 percent) of these shipwreck metal artifacts were treated at Texas A&M University's Conservation Research Laboratory (CRL), of which 33 of these artifacts were a part of this project's study. The metal and wood components of the *La Belle* artifacts were conserved with various methods described the chapter on the conservation of the *La Belle* artifacts in the recent publication, *La Belle: The Archaeology of a Seventeenth-Century Ship of New World Colonization* (Bruseth, et al. 2017:60-80). The excavation and conservation of the *La Belle* and its contents were enacted with Texas state-appropriated funds, as well a great number of other public and private donations. Another substantive effort can be seen with the 21 metal artifacts documented at the Williamson Museum at NSU, of which almost all were conserved. These artifacts were treated by Jay C. Blaine of Dallas, Texas, who donated his excellent services. Also, At least half of the 24 metal artifacts documented at the Archaeology Lab at SFASU had been cleaned and conserved under Jay Blaine's direction. Yet, in summary, the vast majority of metal artifacts in this present study, approximately 81 percent (283 out of 351), have had no stabilization or conservation at all, and there has been no funding has been sought after for this purpose in the state of Texas, except for the two shipwrecks.

A fifth point of consideration for the lower numbers of surviving metal artifacts has to do with the relative volume of archaeological excavation in contrast to the size of each Spanish Colonial site studied. For example, as more investigation takes place at these sites the potential for additional metal artifacts will increase. Excavations are often limited to specific areas of a site that will be affected by new construction and occur when the city, state, or federal government complies with mandated archaeological work in order

to save the material unearthed. Of course, this issue affects what can be known about artifacts of any material, yet the dearth of un-conserved metal at the curatorial centers visited indicates that the majority metal artifacts have not been thoroughly analyzed, stabilized, or conserved as a direct result of the lack of funds available for such undertakings.

Recommendations for Future Research

The project's researchers chose not to include in an analysis of the artifacts themselves nor other potential forms of analyses with the database in this report, but to leave these endeavors for future publications. It is hoped that future researchers will use this database not only for its content but also as a finding aid from which to begin further searches for artifacts and construction materials. The database has the potential to be the platform around which specialized studies of specific categories of metal artifacts or construction materials can be created. The database allows one to search for contemporary analogs of artifacts, those that are morphologically similar, where and when analogs can be found, and specific variations in types of artifacts and materials. The Great Grant team is planning a future collaboration in which to complete the documentation of sites in West Texas, Florida, Mexico, and additional sixteenth- to eighteenth-century European shipwrecks near American coastlines.

It is the team's recommendation that metal stabilization and conservation become a standard part of curatorial practice for cultural materials recovered from Texas archaeological sites. The requirements should be mandated at the federal level for applicability to all undertakings under federal oversight and incorporated into the Texas Antiquities Code by adoption. Only when there is a clear mandate and process in place will specific funding be available for cataloguing and archiving metal artifacts recovered in future excavation work. Not all recovered metal merits conservation. A hierarchy of criteria needs to be established for the type of artifacts that do merit conservation, and guidelines should be developed for a guaranteed uniformity of process across curatorial facilities. In the meantime, for the large number of historically significant metal artifacts that remain un-conserved in current facilities, public and private funding should be pursued to stabilize these artifacts for future generations of research. This may be done individually by the curatorial facilities or UTSA researchers may pursue a means of uniting the curatorial facilities of Texas in a joint application for greater funds.

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41BX255 Olivas Site 1

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41NA344 Mission Nuestra Señora de la Purisima Concepción de los Hasinai

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41RE1 Mission San Lorenzo de la Santa Cruz

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