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GIS Aided Archaeological Research of El Camino Real de Los Tejas with Focus on the Landscape and River Crossings along El Camino Carretera.

Jeffrey M. Williams
Arthur Temple College of Forestry and Agriculture, jmwilliams@sfasu.edu

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GIS Aided Archaeological Research of

*El Camino Real de Los Tejas*

with Focus on the Landscape and River Crossings along

*El Camino Carretera.*

by

Jeffrey M. Williams

2007
GIS Aided Archaeological Research of *El Camino Real de Los Tejas* with Focus on the Landscape and River Crossings along *El Camino Carretera*.

By

JEFFREY M. WILLIAMS, Bachelor of Science

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ABSTRACT†

Many generations of indigenous pathways through the forests of eastern Texas have their origins obscured in antiquity. Utilized by early European explorers, these pathways became modified through heavy use and the expansions and improvements needed to accommodate easy passage of European horses and carts and finally the heavy wagons of Anglo-American settlers. The first road through Texas, *El Camino Real de Los Tejas*, utilized portions of these early trails.

*El Camino Carretera* (known as the cart road) is an early segment of *El Camino Real de los Tejas* that crossed the Sabine River at the boundary between Texas and Louisiana. Using historical documents as well as empirical archaeological surveys, existing segments of *El Camino Carretera* have been located, mapped, and documented. Additionally, a GIS geodatabase model has been developed for managing the archaeological data with physical landscape data in a spatially responsive medium allowing for an integrated study of the landscape forces influencing the selection of a preferred road location.

†Keywords: Archaeology, Geographic Information Systems, GIS, Geodatabase, Remote Sensing, Sabine County, *El Camino Real de Los Tejas*, *Camino Carretera*, and *Camino Chabinan*. 
PREFACE

Under the leadership of Dr. James E. Corbin, late Professor of Archaeology with Stephen F. Austin State University, a design was outlined to develop a regional archaeological landscape model managed by a Geographic Information System that would incorporate contextual information from both historical and archaeological research. The ultimate goal of this landscape model was to be a “tool” that could be used for the identification of potential landscape areas meeting the archaeological criteria for Spanish/Indian pathways through eastern Texas (Dr. Corbin’s 30 year archaeological research interest).

Due to Dr. Corbin’s untimely death in the fall of 2004 however, the scope of this research design narrowed to focus on a specific area of eastern Texas for documenting the development of an archaeological geodatabase data model encompassing the attributes associated with landscape parameters of identified Spanish roads. Additionally this research design has taken on the added responsibility of documenting the processes and procedures of locating, measuring, describing, and identifying existing Spanish road features.

Although studied and researched by many historians and archaeologists, Dr. Corbin was the only professional archaeologist to actively pursue and
document tangible physical locations of *El Camino Real de Los Tejas* through eastern Texas.

As developed, the archaeological landscape model presented here now includes physical parameters such as topography, hydrology, geology, and soils. The model also includes data complied by Dr. Corbin’s long standing archaeological and archival research in locating and documenting the actual locations of Spanish and French Colonial activities in East Texas.

Dr. James E. Corbin identifies a segment of the original *El Camino Real de Los Tejas* in Sabine County, Texas (March 26, 2004).
ACKNOWLEDGEMENTS

An attempt to recognize all of those who donated their time and expertise to this project would surely leave out an important contribution; therefore, I would like to express my deepest gratitude to all who aided in the encouragement of my research. First and foremost, I would like to acknowledge Dr. James E. Corbin, a premier East Texas Archaeologist, a mentor, and a friend whose spirit guided, supported, and inspired me through the difficult days of completing the field surveys without him. I would like to also acknowledge the support and research of Connie Hodges, an early Texas roads historian from Shelbyville, Texas. Connie’s research laid the foundation for locating existing segments of Spanish roads in Sabine County. Connie’s communications with local land owners, other early road historians, and the “old timers” who live along El Camino Real were an invaluable resource. I would like to thank the Arthur Temple College of Forestry and Agriculture for their generous support and specifically Dr. I-Kuai Hung, my thesis advisor and friend, who was indispensable in shaping the final product of this research. Dr. Daniel Unger and Dr. Michael Legg graciously provided encouragement and support. I would like to also thank Dr. Jerry Williams, the Graduate School representative and close friend of Jim’s, for his time and patience. To my family, I love you always.
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INTRODUCTION

Remote Sensing, Geographic Information Systems (GIS), and Global Positioning Systems (GPS), when combined, form the technological foundation of the geospatial sciences. Independently and combined, these technologies have been used extensively by archaeological researchers to identify, document, quantify, predict, and visualize human environmental utilization. In recent years the archaeological sciences have embraced these landscape level analysis tools as a means to visualize a hypothetical distribution of a phenomenon under study as it relates to certain limiting, enhancing, or dynamic landscape variables. When combined with remote sensing imagery and GPS derived locations, a GIS can manage archaeological data in a spatially responsive medium facilitating an integrated understanding of the landscape forces influencing the selection of preferred locations (Aronoff 2005:6-7; Gao 2002:447-453; Harris 2002:139-142; Wheatley and Gillings 2002:16-18).

Composed of physical disturbances, the archaeological record at the landscape level is at best an incomplete catalog of the interactions of human activity and the natural environment. Some of the interactions (i.e., disturbances) may represent actions or events of significance or importance while others may simply represent an unintentional byproduct of a human activity (e.g., erosion or...
surface buildup). When combined with traditional archaeological and historical research, a GIS provides a powerful tool that can enhance a researcher’s perspective of the relationship between the context of human events and the space in which the events occur. This in turn leads to a more complete understanding of the cultural behaviors, the sociological ideals, and the economies and human value structures creating the distribution (Ebert 1992:173-174; Harris 2002:134-140; Holliday 1992:101-112; Hodder 1995:164-168; Richards 1995:216-219; Schiffer 1987:126-132).

Defined as the region between the Trinity River and the Louisiana border, East Texas encompasses the pine forests of Texas. By the time of the earliest European incursions into East Texas in the late 17th century, many trails, pathways, or traces linked long established Caddo villages nestled deep in the piney woods of Texas. Utilizing these existing trails, the Spanish came to eastern Texas to curtail French interests in trade with the Indians by establishing a series of missions and presídios [forts] near Indian settlements. To facilitate communication with the frontier, the Spanish created roads that linked the missions and presídios by clearing and widening the existing trails. The network of roads that they opened became known collectively as El Camino Real, or The King’s Highway, linking the eastern most frontier missions with San Antonio to the south. The earliest road documented is El Camino Real de los Tejas established by Governor Alonso de Léon’s 1690 expedition to the Tejas Indians

Landscape influences that were inherent in the selection and development of these early roads can be studied by careful observation of road placement. The influence of landscape on the ordering of human space, specifically in the selection of one place over another, is of special interest to the archaeologist. Based on the assumption that humans are closely tied to the natural environment, landscape level archaeological analysis examines physical landscape variables on the premise that these environmental factors are significant in the selection of activity locations. At the landscape level, GIS in archaeological research is used to incorporate a combination of environmental variables with contextual information (e.g., historical, archival, genealogical, or ethnographical data) leading to the identification and interpretation of spatial patterns not easily observed in the archaeological record which in turn can lead to a more complete understanding of the relationship between humans and the environmental choices that were made (Allen et al. 1990:382-386: Carr 1991:221-224; Church et al. 2000:135-136; Savage 1990:22-32).

An early road segment of *El Camino Real de los Tejas* known as *El Camino Carretera* or the cart road has been located and surveyed, and used for determining the landscape variables associated with early Spanish road placement. *El Camino Carretera* crossed the Sabine River (now under Toledo
Bend Reservoir) in Sabine County, Texas and is the first road mentioned by the Spanish that links the eastern most Spanish missions of Nuestra Señora de los Dolores de los Ais, in present day San Augustine, Texas with the mission San Miguel de los Adaes near present day Robeline, Louisiana. Using historical documents, maps, and transcripts of oral interviews as well as the results of previous archaeological research into early Texas and Louisiana roads, a GIS geodatabase model design framework has been created for managing archaeological evidence with physical landscape data (i.e., topography, geology, hydrology, and soils). The developed GIS geodatabase model has been used as an integrated research oriented archaeological landscape visualization system for determining limiting and enhancing landscape factors identified for Spanish road placement. This set of landscape criteria has been used to develop a definition of what constitutes a Spanish road’s expression in the archaeological record, and has led to the discovery and identification of additional existing remnants of 17th and 18th century Spanish road features in eastern Texas.
OBJECTIVES

The project outlined in this document focuses on evaluating a specific landscape area originally identified by Dr. James E. Corbin as being critical to the understanding of early Spanish Colonial travel and trade in eastern Texas (Figure 1). To facilitate locating existing Spanish road segments as well as the extraction of physical landscape variables, emphasis was placed on the development of a GIS managed archaeological landscape visualization model. The creation and implementation of this GIS required that an integrated archaeological geodatabase design framework be created and tested.

The research outlined in this document compliments and adds to the general historical knowledge of the East Texas region by locating and describing an existing but not recognized segment of *El Camino Real de Los Tejas*. Additionally, this research adds to archaeological GIS theory by documenting the development and use of a geodatabase design framework that incorporates a set of landscape criteria for road placement to aid in the discovery and identification of additional existing remnants of 17th and 18th century Spanish road features in East Texas.
The fundamental objectives of this research were to:

1) Identify potential Spanish road locations through historic research.
2) Locate and survey existing Spanish road segments.
3) Define a Spanish road based on physical attributes of existing segments; thereby developing a set of landscape criteria for Spanish road placement.
4) Design and create a geodatabase data model incorporating physical landscape data with Spanish road variables through an iterative process of archaeological landscape visualization and spatial analysis.
5) Identify supplementary areas for field surveys to locate additional road segments.
6) Document the processes, procedures, and results of designing and implementing a GIS archaeological landscape visualization model.

The Texas Historical Commission’s Department of Antiquities Protection published a report in 1993 titled “Archaeology in the Eastern Planning Region, Texas: A Planning Document” that outlines the need for improvement of the overall understanding of the archaeological record of East Texas. To accomplish this task, the report recommends to “concentrate survey efforts in areas subject to development pressures within the region and in counties with high numbers of sites with unknown research potentials,” and to “require the study of geomorphological data as a standard aspect of regional or areal studies.” They
also include, as an important management goal, the development of an accessible computer database including the creation of a regional GIS (Perttula 1993:27-29).

While the need for a comprehensive archaeological database for the East Texas region is recognized by the Texas archaeological community, the need for specialized and specifically focused studies is also recognized as important to a cultural understanding of the area. The volumes of primary sources available to the researcher pertaining to Spanish activities in the East Texas region indicate that formal and informal systems of communication were utilizing clearly defined road networks (Figure 2).

Figure 2. 1807 map of road going through Nacogdoches to Natchitoches on the Red River. By Anthony Nau, Zebulon Pike’s cartographer. East Texas Research Center.
Military, government, and commerce documents mention activities referencing placenames that often described physical features on the landscape. Many early documents only record landscape references of special note such as difficult stream crossings, but generally leave the written record bare of the landscape descriptions sought after by modern researchers.

Nevertheless, travel over *El Camino Real de Los Tejas* is well documented. The road was the main life link of support for the early Spanish colonies, and the importance of the first road through East Texas can not be overstated in the terms of the heritage of the Texas people. The road united the cultural history of the Caddo nation with the Spanish and the French, and it ultimately integrated the cultural heritage of the Anglo- and African American immigrants who utilized the road as a pathway to the land that was to become Texas.

In 1911 the Texas chapter of the Daughters of the American Revolution (DAR) adopted a resolution calling for formal identification and marking of the historic route of *El Camino Real*. Mrs. Lipscomb Norvelle, Chairwoman of the Western Division of National Old Trails Roads of the DAR, wrote that “closely identified with the glorious history of Texas are the deeds and achievements of the communities peopling the route of its most historic landmark, the King’s Highway” (Norvelle 1945:167-170). Under the guidance of Mrs. Norvelle, the DAR continued to promote the need for identifying and marking the road.
Public interest grew, and in 1915 the Texas State Legislature appropriated $5,000.00 to survey and mark the original route. A professional railroad right-of-way surveyor, Major V. N. Zively, C. E. was commissioned to physically survey the route utilizing land ownership records, diaries, and archival documents. Completing the work in 1916, Zively reported that in East Texas the road “was very definitely located by the field notes of land surveys,” and that in many cases the surveys were “bounded on one side by the old road” (Figure 3) (Zively 1916:2).

Figure 3. 1863 ownership map of Sabine County, Texas showing El Camino Real de Los Tejas as the northern boundary of the James Mason property. East Texas Research Center.
The DAR raised private funds that were supplemented by later Legislative appropriations to mark the route surveyed by Zively by erecting large granite markers every five miles along the 540 miles of original road in Texas. In 1918 the DAR presented the historic trail, marked by 123 granite stones, to the State of Texas. Major Zivley’s field notes and maps were bound in book form and distributed to counties along the surveyed route. As interest grew, many celebrations honoring events and persons associated with the early Texas road became commonplace in communities along the surveyed route. In 1924 the Texas State Highway Department took control of highway construction across Texas, and in 1929 the Texas Legislature formally adopted Zivley’s route and directed the Department to maintain and preserve the road along the original route (Norvelle 1945:322-362).

Generally acknowledged as closely paralleling Zively’s original route, State Highway 21 between the Sabine River and San Antonio commemorates the early Texas road (Figure 4). Completely paved by 1949, Highway 21 has been widened, leveled, and straightened over the years obliterating many of the physical road features identified by Zivley. Nevertheless, interest in El Camino Real has never waned, as many communities along the route continue to celebrate their heritage with events honoring the early road.
In 1991, to commemorate the 300th anniversary of the road, the Texas Legislature authorized the Old San Antonio Road Preservation Commission to draft a comprehensive preservation plan for the early road. The Legislature also directed the Texas Department of Transportation (TxDOT) to prepare a report on the disposition of the historic trail. The report resulted in a published document of current research into *El Camino Real* with recommendations for identifying and protecting existing cultural features of the early road (McGraw *et al.* 1991:3-4).
Introduced in Congress in 1998, legislation known as *El Camino Real de los Tejas* National Historic Trails Act resulted in the U.S. Department of Interior’s National Park Service (NPS) conducting a feasibility study of designating *El Camino Real de los Tejas* a National Historic Trail. The NPS concluded that the early Texas road meets the criteria for inclusion in the National Historic Trails system and that it “is nationally significant because of its use for exploration, conquest, missionary supply, settlement, cultural exchange, and military campaigns” (NPS 1998:3-27).

A comprehensive feasibility study, developed by the NPS under the National Historic Trails Act, set “specific objectives and practices to be observed in the management of the trail, including the identification of all significant natural, historical, and cultural resources to be preserved,” and that “a protection plan for any high potential historic sites or high potential route segments” be developed. In the feasibility study, the NPS also recommended various means of public participation in experiencing *El Camino Real de los Tejas* through interpretive trails and programs at existing segments of the road (NPS 1998:68-72).

In October of 2004, after passing in both the Senate and House of Representatives, President George W. Bush signed into law the bill designating *El Camino Real de los Tejas* as a National Historic Trail under the administration of the NPS. Under the law, publicly owned lands along *El Camino Real de los Tejas* come within the jurisdiction of the NPS while privately owned lands can
only become certified as part of the trail system through voluntary consent. The law also encourages the formation of local associations or partnerships for the promotion of economic development and support of heritage tourism along El Camino Real de los Tejas (Public Law 108 - 342 October 18, 2004).

For more than 300 years, crossing more than 500 miles of Texas, El Camino Real de los Tejas continues to be an important component of Texas history. First serving as a corridor of communications between Caddoan villages, then serving Spanish and French colonial interests, and finally as the main corridor for American colonization of Texas, this early road is a monument to a shared cultural heritage.
LITERATURE REVIEW

The complex nature of designing a geodatabase that combines archaeological, historical, and physiographical data in GIS managed landscape visualization system, requires that three broad areas of applicable literature be investigated. The first subject reviewed was the physical setting of the research area. Readings included physiographic and cultural references of the region with a specific emphasis on the physical landscape attributes that affect formation processes of the archaeological record (e.g., geology, hydrology, soils, slope and topographic relief).

The second area of literature reviewed were documents pertaining to the archaeology and history in which the research subject occurs. Utilizing the extensive collection of the East Texas Research Center (ETRC), a State of Texas historic document archive housed at Stephen F. Austin State University, as well as Dr. Corbin’s comprehensive personal collection of reference material, a detailed analysis of Spanish colonial activity pertaining to roads through East Texas has been outlined.

The third area of literature examined was the applied use of geospatial technologies in archaeology with a focus on GIS and archaeological theory. Along with current trends of spatial data capture, data management, and data
integration, the literature reviewed included the development and use of geodatabase designs utilizing “state-of-the-science” technology.

**Landscape Setting**

The selected research area is wholly within north-central Sabine County, Texas. It includes a portion of western Toledo Bend Reservoir and the flooded Sabine River valley (Figure 5). Located in the gently rolling hills of East Texas, Sabine County lies within the Gulf Coastal Plain Physiographic Province of North America. This province is characterized by low topographic relief, extensive marshy tracts, altitudes below 152 meters (500 feet), and sedimentary geologic formations.

Within Texas, the Gulf Coastal Plain Physiographic Province is divided into geographic regions based on physiographic and moisture conditions. The East Texas Timber Belt is a geographic region that supports abundant pine and oak woodlands and is characterized by a gently rolling to level sandy terrain, annual rainfall in excess of 102 centimeters (40 inches), and an average growing season of over 240 days (Bray, 1904:11-16). The Pine Woods subdivision of the East Texas Timber Belt is the dissected sandy forest lands with rolling relief whose western boundary is approximately the 109 centimeters (43 inches) rainfall line (Chambers 1948:8-10).
The geologic character of Sabine County is dominated by formations representing tremendous sedimentary deposition during the Tertiary Period of the Cenozoic Era (Fisher, 1965:24-31). Across the county (Figure 6), indurated sandstone formations contact each other to form low escarpments or cuestas that are landward facing and that dip toward the Gulf of Mexico at a steeper angle than the present land surface. Between the cuestas and their backslopes are found rolling hills that range from 30 to 183 meters (98 to 600 feet) in relief with inter-ridge drainages being deflected slightly eastward at the base of the cuesta’s front. The backslopes of the cuestas consist of rolling hills and prairies (Fisher, 1965:24).

The geologic formations of the region are composed of light-colored tuffaceous clays with interbedded fine to medium grained light-colored quartz sandstone lenses with abundant fossil wood. Outcrops of the Weches Formation, a glauconitic marl exposed by erosion, and thin lenses of small rounded gravels, as well as great quantities of silicified wood are found throughout the region (Fisher 1965:31; Sellards et al. 1932:780-787).

Floodplains of the streams and rivers that cut through the cuestas are typically 1.5 to 16 kilometers (1 to 10 miles) wide and generally occur 30 to 46 meters (98 to 151 feet) below the normal elevation of the land (Fenneman 1938:11-13). The Sabine River (now impounded by Toledo Bend Reservoir) once provided the eastern boundary line for Sabine County. Abundant perennial
springs feed the many streams that drain the county. Dissected by numerous streams, Sabine County has an elevation that ranges from approximately 50 meters (164 feet) in the south to 160 meters (590 feet) in the north near Matlock Hills. The northern portion of the county drains to the east into Toledo Bend Reservoir. Flooded in the mid-1960s with the completion of the dam near the site of old Bevil’s Ferry in Newton County, the 185,000-acre impoundment of Toledo Bend Reservoir drowned the Sabine River valley and its early Spanish crossings as well as the earliest Anglo-American river port towns (Bureau of Economic Geology (BEG) 1992; 1977).

An incomplete and unpublished soil survey for Sabine County exists; however, only a very small portion of northern Sabine County has been mapped. Communications with the county Natural Resource Conservation Service (NRCS) office yielded a limited amount of information on the soils within the area.

Soils along the lower elevation drainages are mainly composed of level sandy loam surfaces that are frequently flooded over loamy subsoil. Along the eastern slopes of the county, the soil has a thin layer of fine sand over red and gray clay. These soils occur at the head of drainages with steeply sloping to moderate side slopes. The south and west portion of the county have soils that are composed of thin fine sand lenses over red clay on gently sloping convex ridges (NRCS, personal communication 2004).
Rainfall in Sabine County averages 123.11 centimeters (48.47 inches) per year, with approximately 52 percent of the total annual precipitation generally occurring from April through September. This is the growing season for most crops in East Texas. In winter, the average temperature is 10.56° C (51° F) and the average daily minimum temperature is 3.89° C (39° F). In summer the average temperature is 27.2° C (81° F) and the average daily maximum temperature is 33.9° C (93° F) (NRCS, personal communication 2004).

Sabine County is within the Austoriparian Biotic Province of Texas. This province is characterized by pine and pine-oak forests on the uplands, and by the abundant oak, elm, and ash hardwoods in the lowlands (Blair 1950:98-99). Pure stands of long-leaf pine once dominated the rolling and deep sandy uplands with mixtures of loblolly and shortleaf pine, red oak, postoak, blackjack oak, and sweetgum dominating the woodlands between the long-leaf area and the coastal prairies to the south (Cruikshank and Eldredge 1939:7-8).

As defined by Tharp (1939), the research area lies completely within the Pine Forest Vegetation Region of Texas. The Pine Forest Region is composed of many diverse habitats consisting of pine and pine/hardwood uplands, hardwood dominated bottomlands, natural grasslands and prairies, and low wet areas consisting of swamps, marshes, and bogs (Tharp 1939:2-4). Grasslands in Sabine County consist of pasturelands (improved and unimproved), old fields, and right-of-ways. Managed pastureland, which is the most common type of
grassland in the area, is typically dominated by improved varieties of common grasses.

Cultural History of the Region

Archaeological evidence gathered in the region, shows a long and prosperous habitation by a varieties of people over time. During the Archaic and earlier periods (ca. 8,000 BCE), the migratory bison hunters of the plains would have found abundant resources in the rolling forested prairies of East Texas. The seasonal food gathering activities of these people gradually gave way to semi-permanent food producing activities of the Woodlands Period (ca. 3,000 BCE), due in part to the rich natural environment. By the time the first Europeans began to explore the East Texas in the late 1600’s, the cultures they encountered had established an adaptive system that allowed for flourishing populations (Ewers 1969:103-104). First the Spanish and then the French documented and recounted stories of the natural bounty of East Texas and the peoples who lived here. Yet, the large flourishing populations of native peoples had largely disappeared by the time that permanent European settlements were being established (Castañeda 1939:46-98).

Prior to the coming of the Europeans, the gently rolling oak and pine forests of eastern Texas were home to a linguistically related people known as
the Caddo. These were the southwestern group of a much larger cultural tradition extending south from Oklahoma, southwest from Arkansas, and west from Louisiana. By the time European explorers encountered the Caddo, they had been living along the rivers and waterways of East Texas for over a thousand years.

The Caddo were an agriculturally advanced people who grew surpluses of corn and who had ceremonial centers characterized by large populations and flat topped earthen temple and burial mounds. At the time of European contact and although living as different tribes in different areas, the Caddo were organized into three separate confederacies with the Hasinai, or Texas (Tejas) as the Spanish were to call them, being composed of eight tribes living in scattered hamlets (Newcomb 1995:282-284 [1961]; Swanton 1996:7-10 [1942], 1984:315-317 [1952]).

Archaeological investigations in East Texas have demonstrated that long before the Caddo there was widespread diffusion of cultural practices not native to East Texas (Fox, 1983:8-30). Most notably is that artifacts recovered from the period immediately preceding the emergence of the Caddo show a distinct tradition of southeastern woodland artifact styles including anthropomorphic and effigy ceramic vessels and the building of large earthen temple and burial mounds indicating that the Caddo of East Texas were a western extension of the
mound builders of the Mississippian culture (Figure 7) (Shum and Krieger 1954:144-149).

The Mississippian culture conducted extensive trade with Mesoamerica through an overland trade route known as the Gilmore Corridor (named for the spatial distribution of Mesoamerican trade goods found in excavated archaeological sites). The mound building Caddo of East Texas were centered where the route enters the forested region of the southeastern United States (Forbis 1975:94-95; Gorenstein 1975:7-9).

Figure 7. Historic range of Caddo settlement (Williams 2007).
Archaeological excavations of the Caddo Mounds at the George C. Davis site (Caddo Mounds State Park west of Alto) and excavations at the Washington Square mound site (T.J. Rusk Elementary School campus in Nacogdoches) indicate that these population centers, along with small dispersed extended family hamlets and the far away trade centers, were connected by a network of pathways or trails. From the volume of Mesoamerican trade goods recovered from mound sites of the Mississippian culture, a great many traders must have traveled these trails over countless years visiting each population center with high quality goods and new ideas and technologies from far distant cultures (Forbis 1975:94-95; Smith 1995:7-8).

As Europeans begin exploring these early indigenous trails they often documented their journeys. First the Spanish and then the French meticulously recorded their early explorations along these routes; some writing official reports, some drawing maps, some keeping diaries, and others writing memoirs. From these early accounts we can learn much of the landscape being crossed, the peoples and habitations encountered, as well as the religious and political motivating forces of the various explorers’ patrons. Begun as routes of conquest, these early trails quickly became paths of conversion and later of commerce resulting in a series of permanent roads with missions, presidios, and ranchos established to protect this vital link of communications (Figure 8).
Figure 8. Cultural Timeline of East Texas
The main road linking the northern province of Texas with its support and supply from the interior of New Spain was called *El Camino Real* (The King’s Highway or The Royal Road). The first written documentation of a road in East Texas comes from the accounts of De Soto’s expedition in the mid-summer of 1542. Although briefly noted in the accounts, it is apparent that the mention of a road is significant, where peopled areas producing abundant maize (corn) were connected by trails that were developed enough that the Spanish considered them roads. These accounts would indicate that the arteries linking the settlements in the province of the Caddo were more than likely wide enough to accommodate a large army of horsemen, solders, livestock, and camp followers (Robertson 1993:146-147 [1933]; Swanton 1985:262 [1939]).

By the mid-17th century all of the major European powers were gaining territory in the new world. Spain, whose industries and economy were drained from repeated warfare, was struggling to hold onto its frontier territories and was only able to maintain its power by the annual gold and silver tributes from its colonies in New Spain. Fearing the loss of commerce from French raiders in the West Indies, Spain embarked on an aggressive policy of colonizing and expanding the hold on its territories (Dunn 1971:17-19 [1917]).

In July of 1684, French explorer Réné Robert Cavelier Sieur de la Salle received a commission from King Louis XIV to build a fort at the mouth of the Mississippi River. Setting sail with 280 solders, settlers, and servants in four
vessels including the frigate *La Belle* (found and excavated in Matagorda Bay by the Texas Historical Commission between 1996 and 1997), la Salle, through a series of miscalculations and unfortunate events, overshot the mouth of the Mississippi River to land on the coast of Texas and became stranded near Matagorda Bay in February of 1685 (Castañeda 1976a:285-287 [1936]; Morfi 1935:124-125).

An English translation of the journal of Henri Joutel, la Salle’s trusted lieutenant, gives perhaps the best first hand account of travel through East Texas. Joutel was left in charge of Fort St. Louis (found and excavated by the Texas Historical Commission between 1999 and 2002) while la Salle was exploring to the northeast in search of the “great river.” Joutel described in detail the hardships of life at the fort, and after the murder of la Salle he describes the journey through the lands of the Caddo while in search of a French trading post on the Red River (Joutel 1968:39-63).

Joutel described each village encountered as they moved farther northeast. Passing from one village to the next, the survivors of la Salle’s expedition were led across roads by Indian guides who would go ahead to give the elders of each village advance notice of their coming. Finally reaching a French trading post on the Red River after a six month journey (Figure 9), Joutel and the remainder of la Salle’s ill fated colony would eventually make their way back to Canada and France (Joutel 1968:173-175).
After learning of the French plans to establish a foothold on the coast of Texas, the Spanish crown immediately ordered the Viceroy of New Spain to undertake two expeditions to locate the French settlement. Both failed, and it was not until 1689 that Alonso de Léon’s expedition discovered the ruins of Fort St. Louis. Returning to the Viceroy with two surviving Frenchmen who had been living with the Caddo, de Léon proved in fact that the French were moving into Texas to establish trade with the Indians (Castañeda 1976a:352-353).

Figure 9. Close up of an early 18th century French map showing Indian settlements along road systems. *East Texas Research Center.*
According to Dr. James Bruseth, Deputy State Historic Preservation Officer and Director of the Archaeology Division of the Texas Historical Commission, artifacts recovered from the excavations of the French frigate *La Belle* have been claimed by France as French property under Maritime Law. The claim resulted in an international treaty brokered by the U. S. Department of State between France and the State of Texas whereby the artifacts are recognized as French national treasures residing in Texas in perpetuity. In 2004, the remains of a French sailor, found during the *La Belle*’s excavation, were buried in the Texas State Cemetery in Austin. The State funeral was attended by the French Ambassador to the United States and presided over by a priest of French decent. A granite marker placed in the cemetery chronicles the sailor’s journey. Descendants of the two surviving Frenchmen from la Salle’s failed expedition, who were captured and questioned by de Léon in 1689, live in northern New Mexico (Jim Bruseth, personal communication 2007).

At almost the same time as de León’s return, the Viceroy received news that France and Spain were at war once again. Quickly giving permission for another expedition to the Tejas, the Viceroy appointed de Léon as leader with Father Massanet as head of the missionaries. In March of 1690 de Léon’s fifth *entrada* was begun with one hundred and ten solders and five missionaries (Morfi 1935:152-153; Dunn 1971:110-123 [1917]).
Arriving at the Tejas village on the Neches River on May 22 of 1690, Father Massanet built and consecrated a mission on the first of June that he named *San Francisco de los Tejas* (Figure 10). In a letter to Don Carlos de Siguenza, Father Massanet wrote that at the San Marcos River they met “an Indian who was thoroughly acquainted with the road into the country of the Tejas, and he showed us the way until we met with the governor of the Tejas.” He also mentioned sending an Indian messenger to the governor [chief] of the Tejas “telling him to light fires along the road by which they should come, and that we would answer by the same signal” (Casis 1991:375).

Figure 10. Portion of the Weches USGS 1:24,000 topographic quadrangle map showing the Mission Tejas area (Williams 2007).
In his report to the Viceroy, de Léon suggested the need for Spanish settlements and at least four *presidios* to secure the allegiance of the Tejas. In September of 1690 Father Massanet reported to the Viceroy the conditions of the conversions of the Indians and how best to proceed in extending the missionary work (Castañeda 1976a:359 [1936]). The King of Spain had received a detailed account of these events and consequently ordered another expedition for conversion of the Tejas. The Viceroy appointed D. Domingo Terán de los Ríos and sent him to the Tejas with fifty soldiers, fourteen Franciscan missionary fathers, and seven lay brothers (Morfi 1935:153-155).

Arriving among the Tejas in the late summer 1691, Terán quickly exhausted his supplies and was forced to return to Mexico leaving the missionaries behind. Not until the winter of 1692 did the Viceroy show any interest in the missions among the Tejas when he ordered Captain Diego Ramón to propose the best means of communicating with the missions. Ramón suggested that “a party of twenty men from Monclova could take the missionaries the desired supplies, since the road was now well known” (Castañeda 1976a:372 [1936]).

Before an expedition to relieve the missionaries could be mounted, difficulties with the solders left to guard the missionaries began to arise with the Indians. In the early fall of 1693 the heavy church ornaments and the church bell were secretly buried and the mission *San Francisco de los Tejas* was burned to
the ground while Father Massanet and the remaining Spaniards slipped away in
the night (Castañeda 1976a:375-376 [1936]).

The temporary abandonment of the Tejas missions was overshadowed by
the economically devastating French and Spanish wars. Taking advantage of
Spain’s weakened ability to defend her territories; French aggression in lands
east of the Mississippi River occupied Spanish attention (Morfi 1935:155-165). In
1701 the Council of the Indies again became interested in East Texas when they
suggested that the “Viceroy of New Spain should be instructed to send special
envoys to the Tejas Indians, asking them not to allow the English to pass through
their lands while attempting to reach New Spain” (Castañeda 1976b:14 [1936]).

In 1713, Louis Juchereau de St. Denis founded a French settlement at
Natchitoches on the Red River and set out on an expedition to reach the Spanish
settlements at San Juan Bautista on the Rio Grande River. His arrival in 1714
greatly surprised the Viceroy and other Spanish officials who believed that
French designs of trade with the Tejas had ended almost twenty years before.
Arriving in Mexico City in 1715, St. Denis, who believed that Christian missions
among the Tejas would be good for French trade, offered his services in leading
a Spanish entrada to reestablish the missions in East Texas (Castañeda

Domingo Ramón was chosen as leader of the expedition with St. Denis as
Capitan. The expedition consisted of twenty-five soldiers, thirty or so settlers,
and several missionaries along with Father Francisco Hidalgo, who with Father Massanet had established the *San Francisco de los Tejas* mission twenty-five years before. Leaving the mission at *San Juan Bautista* in April 1716, the expedition reached the Tejas by the end of June. The Ramón expedition reestablished the old mission calling it *Nuestro Padre San Francisco de los Tejas* with Father Hidalgo as its missionary.

Ramón continued east, founding mission *La Purísima Concepción* near a Tejas village on the Angelina River, mission *Nuestra Señora de Guadalupe de los Nacogdoches* with Father Fray Antonio Margil de Jesús as missionary (Figure 11), mission *San José de los Nasones* for the Nazoni and Nadaco tribes, and in the fall of 1716, after returning from a visit to Natchitoches, the mission of *San Miguel de los Adaes* near Arroyo Hondo between the Sabine and Red Rivers. The mission *Nuestra Señora de los Dolores de los Ais* was founded in the country of the Ais (in present day San Augustine) halfway between the missions *Nuestra Señora de Guadalupe de los Nacogdoches* and *San Miguel de los Adaes* (Figure 12) (Tous 1991:21-24 [1930]; Morfi 1935:185-188).

Ramón’s visit to Natchitoches in 1716 with St. Denis confirmed that the French were establishing permanent trading posts. Seeing a well built fort on an island in the Red River garrisoned by thirty men did nothing to ease Ramón's mind. He had also seen numerous French trade goods among the Indians near the missions including guns, colored glass beads, knifes, and iron hatchets
leading him to conclude that “proper methods must be adopted if they were to hold the land of the Tejas” (Morfi 1935:186-187).

Archaeological excavations at the site of the mission Nuestra Señora de los Dolores de los Aís in San Augustine uncovered numerous glass trade beads

Figure 11. Father Antonio Margil de Jesús with Caddo. East Texas Research Center.
1716 Spanish Locations in the Eastern Provinces of New Spain
1 - Presidio de los Adaes
2 - Mission San Miguel de los Adaes
3 - Mission Nuestra Senora de los Dolores de los Ais
4 - Mission Nuestra Senora de Guadalupe de los Nacogdoches
5 - Mission San Jose de los Nasonis
6 - Presidio de los Tejas
7 - Mission Nuestra Senora de los Purtisma Concepcion
8 - Mission San Francisco de los Tejas

Figure 12. Locations of Spanish missions and presidios (Williams 2007).
and ceramic and iron goods of both French and Spanish manufacture (Corbin 1977:3-6; Corbin et al. 1984:61-74). Spanish and French trade goods have also been recovered from the site of mission San José de los Nasones on the east fork of the Angelina River and from a Caddo hamlet known as the Deshazo Site (excavated prior to the impoundment of Lake Nacogdoches) where several artifacts of non-native manufacture were found in burials dating from 1650 to 1770 (Figure 13). The Deshazo Site is a few miles east of the hypothesized location of the presidio built to protect mission La Purísima Concepción. The artifacts included iron knives, glass trade beads, European ceramic shards, and a brass hand bell (Story 1982:113-128).

European artifacts have also been found in the surrounding vicinity of the San Pedro Creek valley near the site of mission Nuestro Padre San Francisco de los Tejas yielding trade beads, gun parts, a historic trade pipe, and a breech block from a Spanish vesro [cannon] (Erickson and Corbin 1996:3-5). According to Dr. Tim Perttula, contract archaeologist and author of numerous articles and books related to Caddo archaeology, recent investigations in Mission Tejas State Park, along the San Pedro creek drainage, have identified Caddo structures whose artifacts included Spanish metal and gun parts. Jay Blaine, a foremost early European metal expert, identified the metal gun parts and determined that they may predate 1700. Reworked French gun flints were also recovered in these investigations (Tim Perttula, personal communications 2007).
Figure 13. Locations of Caddo archaeological sites with European trade goods within buffer distance (Williams 2007).
Ramón’s concerns over proper support from the Spanish government were well founded because by early 1719 the missions were no better off than they were when established. Several years before, St. Denis had presented a crude map of his overland route to the Spanish Viceroy, prompting new concerns by Spanish officials that the French knew more about the northern provinces of New Spain than they did. While in Mexico City, St. Denis had been interrogated about French interests in the northern provinces of New Spain.

Renewed threats of French settlement sparked interest in maps of the region, and largely based on St. Denis’ report, Juan Manuel de Oliván Rebolledo, a member of the Royal Audiencia, created several maps of the route across Texas that were kept secret by Spanish officials. The French however, created maps with descriptions of the land in the northern provinces of New Spain that were widely published. A French missionary with a background in geography and cartography, Francois Le Maire, compiled enough information over many years to draft a detailed map showing the overland route from Louisiana across New Spain (Figure 14) (Jackson et al. 1990:8-26).

In the spring of 1719, war again broke out between the French and Spanish, and responding to orders to expel the Spaniards from Texas, St. Denis attacked and captured the mission San Miguel de los Adaes. News of the attack quickly spread fear, and a general panic followed. Withdrawing to the Trinity River, the settlers, solders, and missionaries waited for reinforcements. When
none came, they made their way to the settlements on the San Antonio River.
Once again the missions of eastern Texas were abandoned (Castañeda

Acting under royal orders to use the “greatest application and care” in
supporting the missions as well as the royal order to prepare *presidios* for
denying French passage through the frontier, the Viceroy appointed the Marquis
of San Miguel de Aguayo to lead the expedition to recover the missions
(Castañeda 1976b:121-123 [1936]). Setting out in late 1720, de Aguayo’s
expedition is chronicled by Bachelor Juan Antonio de la Peña. Keeping a diary,
Padre Peña mentioned travel over the road several times. In March of 1721 he stated that they “took a road over clear and level land,” and that they had “left the old road which is rugged and full of thickets” (Peña 1981:45).

The Aguayo expedition reached the Tejas and reoccupied the abandoned missions in late July and early August. In early November of 1721, de Aguayo received a dispatch, dated May 6, 1721, from the King of Spain ordering him not to wage war on the French while securing the province but to establish the capital of the province of Texas at Los Adaes. At the orders of the King, he selected, built, and garrisoned a strong presidio with a stockade of pointed logs one-half league from the mission San Miguel de los Adaes and less than seven leagues from Natchitoches (Figure 15); thereby fortifying the entry way to the provinces of Texas against future French incursions (Castañeda 1976b:143-145).

In 1723 the newly appointed Viceroy of New Spain informed the King that abuses of the management of the presidios were draining the royal treasury. The King ordered the Viceroy to conduct an inspection of the presidios and to make recommendations concerning the protection of the frontier. Brigadier General Pedro de Rivera was assigned this task and starting out in 1724, he completed his inspections of the presidios of New Spain in 1728. Endorsing all of Rivera’s recommendations, the Viceroy ordered a reduction of the military force in East Texas by ordering the abolishment of the presidio of Nuestra Señora de los Dolores de los Tejas on the Angelina River. In a letter to the
Viceroy, General Rivera stated that “since the year 1715 when it was founded, its garrison has not been employed in any action that may justify the object of its erection.” Nevertheless, in 1730 the lack of adequate protection resulted in the permanent removal of three missions from eastern Texas to the San Antonio River (Bolton 1970:5-6 [1915]; Morfi 1967:243-279 [1935]).

Figure 15. Plan and profile view of Presidio Nuestra Senora de Pilar de Los Adaes [Capital of the Province of Texas]. East Texas Research Center.
When compared to other missions established on the San Antonio River, the East Texas missions were very poor and ill attended by the Indians. From this time on, however, the missions enjoyed relative stability, although disagreements over the placement of the border between Spanish and French territories continued to cause minor hostilities. By the time of the French cession of Louisiana to the Spanish in 1763 the boundary question concerned the importation of contraband trade goods. Yet having access to a river port, the French settlements dominated trade with the Indians (Bolton 1970:32-34 [1915]).

Antonio Gil Y’Barbo, a Spaniard born in 1729 at Los Adaes, had established, by 1772, the largest ranch in East Texas along El Camino Real de Los Tejas. As a trader with the Indians, he gained great personal wealth and the support of the Spanish authorities concerned with keeping French traders out of the Tejas provinces. Captain Y’Barbo commanded the respect of the Indians as well as being a leader of his Spanish comrades. Nevertheless, due to the reduced need for frontier defenses, Y’Barbo would lead in 1773, at an order from the King of Spain, the people of Los Adaes back to San Antonio under great personal suffering. East Texas was once again abandoned to French traders. Capitan Y’Barbo would eventually win permission to return to East Texas from the Viceroy in Mexico City and would lead his people back to East Texas in 1779 to continuously occupy the region until the present day (Figure 16) (Jackson 1986:96-97: King 1949:48-50).
Figure 16. 1886 Sanborn Fire Insurance map of downtown Nacogdoches showing the old Stone House [Fort] built by Antonio Gil Y’Barbo (Williams 2007). The Stone Fort was torn down in 1901 and rebuilt as a replica on the grounds of the Stephen F. Austin State Teachers College in 1936 for the Texas Centennial celebration.
Although earlier maps exist showing a road through East Texas, such as Guillaume Délisle’s map published in Paris in 1718 showing the route of la Salle’s expedition with roads linking named settlements, the first cartographically accurate map to record the placement of roads in East Texas comes from Juan Pedro Walker when he accompanied Colonel Simón de Herrera to East Texas in 1806 during a border dispute with the Americans (Figure 17). Defining the roads he traveled in relation to topographic features, Walker drafted a map titled “Route de Nacogdoches au Rio Trinidad” that shows a relatively accurate depiction of two segments El Camino Real de Los Tejas; a northern route and a southern more direct route between Nacogdoches and the crossing of the Neches River near the old mission site of San Francisco de los Tejas.
Walker’s map is remarkably accurate in that it shows physical features as well as places he visited along the road segments. Some of the features include the ranch of Barr and Davenport, Indian traders on the Angelina River near the old site of mission *La Purísima Concepción*, and the ranch of Bernardo D’Ortolan on the old road near Loco Bayou (Corbin 1991:192-196).

According to Dr. Tom Middlebrook, State Archaeological Steward for Nacogdoches County, the D’Ortolan house and an adjacent servant’s house were located, identified, and partially excavated on a low terrace along the eastern shore of Lake Nacogdoches. European ceramics, metal, and glass as
well as Caddoan pottery were recovered and are being analyzed for publication (Tom Middlebrook, personal communication 2005).

As other map makers entered Texas and began to define physical features on maps, the placement and identification of roads became a focal point for immigration, importation, and communications. The formal set of roads established early on the Spanish frontier took on a different role as pioneer settlers from the United States began to immigrate to Spanish Texas.

In the fall of 1821, Mexico won its independence from Spain. The late 1820s and early 1830s were, for the eastern province of Mexico, a period of restless political decisions first encouraging open American settlement and then a tightening of restrictions after a series of attempted rebellions (Welborn 1973:14-24). As Boundary Commissioner for the Mexican government, General Manuel de Mier y Terán was concerned over Mexico’s lack of proper control over the eastern provinces, and on his inspection of the Texas boundary in 1828, wrote in his diary that “great numbers of foreigners who have entered the frontier are vicious and wild men with evil ways” (Jackson 2000:79-80).

Terán’s concern was correct because by 1832 open rebellion had erupted and by mid-1836, Texas was no longer under control of the Mexican government. With the formation of the new Texas government, the boundary dispute begun with Spain and continuing with Mexico now centered on negotiations between the Republic of Texas and the United States. A joint Texas and American Boundary
Survey Commission would finally determine the exact boundary as being the center of the Sabine River channel when the river was surveyed by the Commission in 1840 (Figure 18) (Welborn 1973:24-25).

As the Anglo-European population pressures of the United States increased, more Anglo-pioneer settlers began to colonize the wilder lands of the East Texas frontier. In the years 1824 to 1833 the rate of Anglo immigration into East Texas was an average of 28 families per year. Dropping slightly in the turbulent years of 1834 and 1835, the rate of Anglo immigration increased to greater than 60 families per year by 1836. In the following years, the rate of immigration into East Texas more than doubled per year. By the time of statehood in 1845 more than 200 families per year were immigrating into East Texas (Lathrop 1949:60).
Figure 18. 1840 boundary survey map between the Republic of Texas and the United States. 
East Texas Research Center.

The Anglo-pioneer settlers brought their large heavy wagons pulled by teams of oxen impacting the early Spanish roads by rutting and clearing wider avenues through the forests (Figure 19). They leveled stream crossing grades and built ferries. They built log roads and temporary bridges in wet areas, and they modified the landscape by the shear passage of their numbers (Figure 20).
The 1835 “Guide to Texas Emigrants,” besides describing the benefits of the natural resources of Texas, also discusses the various roads and river crossings between settlements in Texas. Marilyn Sibley wrote in her book “Travelers in Texas 1761 – 1860” that early roads in Texas were in reality routes that were in a constant state of needed repairs. She stated that many travelers recorded the difficulties of the various routes that, affected by the weather, were impassable because they were wet and soggy. Other travelers had better luck during the dry seasons and described the routes as being “better than any roads found anywhere in the United States” (Sibley 1967:26-30; Woodman 1974:32-33 and 54-55 [1835]).
As Anglo-Americans immigrated to Texas, the main road into Texas (*El Camino Real*) was improved to accommodate heavy wagons by straightening and leveling difficult turns and grades. In 1839, the Congress of the Republic of Texas passed a bill calling for the improvement of the road (Norvell 1945:199). At suitable river crossings, ferries were established providing passage for a fee.
(Figure 21). Along the road early pioneers began to find choice areas with abundant fertile lands to clear and cultivate, resulting in the early road becoming a reference point for land division and ownership (Figure 22).

Established by these early settlers, farms and ranches began to spread out away from the main road resulting in new roads to link the scattered frontier settlements (Crocket 1962:87 and 127).
Geospatial Technology and Archaeology

By managing archaeological data in a landscape level GIS, an analysis and visualization tool is developed for combining disparate historical data with spatial data in a fashion that can be investigated and manipulated to produce useful research products. Current archaeological research theory recognizes the value of GIS for regional and landscape analysis. As an archaeological tool,
the greatest potential use of GIS is as a research oriented landscape visualization system for studying the spatial relationships between humans and their cognitive environments. A GIS can manage archaeological data in a spatially responsive medium allowing for an integrated understanding of the landscape forces influencing the selection of preferred locations (Harris 2002:139-142; Wheatley and Gillings 2002:16-18).

A landscape level GIS can be used effectively with historic documents to create useful research tools for understanding the selection of one location over another based on landscape and cultural opportunities or limitations. The ability to visualize landscape change over time, the ability to visualize the character of the landscape in a 3D-environment, and the ability to incorporate multiple types of data, both historic and current, into a single analysis and visualization tool is a strength that GIS brings to the understanding of archaeology (Harris 2002:139-142; Wheatley and Gillings 2002:16-18).

Although an early limitation, technological advances have overcome some of the early usability issues of an integrated GIS, software advances have eased the strain of managing spatial databases, and state and federal agencies have adopted GIS standards for land use planning and monitoring resulting in volumes of easily accessible spatially enabled environmental data (Allen et al. 1990:382-386). In “The Archaeologist's Workbench: Integrating GIS, Remote Sensing, EDA, and Database Management,” the authors conclude that technology is no
longer the most significant issue but rather it is the possibility of arranging the technology [tools] in a manner that facilitates the exploratory investigation of perceived or unanticipated relationships (Farley et al. 1990:160-164).

In “Landscape: A Unifying Concept in Regional Analysis,” Crumley and Marquardt develop the line of reasoning that landscape is the manifestation of the relationship and interaction of humans with the physical environment. Therefore, landscape is a dynamic spatial unifier where the definition of environmental relationships varies between specific scales and human centers of activity. The authors conclude that landscape provides the foundation for integrating ecology with historical factors, long used by archaeologists, to study and document social and material change (Crumley and Marquardt 1990:73-79).

A landscape level context aware GIS, based on the assumption that humans are closely tied to the natural and cultural environments, can be used to examine the intricacies of the topographic setting with the environmental variables of known archaeological sites yielding quantifiable parameters of choices.

GIS has been used by the Arkansas Historic Preservation Program (AHPP) to integrate historic maps and documents for identifying segments of the Trail of Tears route through Arkansas. In 1830, the Cherokee Indians of the southeastern United States were forcibly marched to the Oklahoma Indian Territory. Resulting in thousands of deaths, the routes followed by the Cherokee became known as the Trail of Tears. Recognized as an important cultural
heritage feature, the routes crossing nine states are administered by the NPS under the Trail of Tears National Historic Trails Act. Using modern geospatial technologies, AHPP has integrated the use of historic maps with remote sensing in a GIS for identifying unclear routes of the Trail of Tears. Once verified by field surveys, the data are submitted to the NPS for inclusion in their Long Distance Trails GIS (Files 2000:online).

Traditionally the integration of historic data from disparate sources, including landscape resource data, has been costly in terms of time and dollars. While GIS provides a cost effective yet simple structure for integrating and accessing data based on spatial location, at its core is the database that, when properly designed, can facilitate exploration of archival or historical data within the geography of its logical relationships. Complex queries of attribute information can be combined with geographical criteria for creation of data that can be geographically visualized; potentially leading to further composite questions. The resultant data can also be added back to the database creating additional complex relationships of behavior and interaction (Church et al. 2000:142-145; Gregory 2003:56-59; Wheatley and Gillings 2002:90-94).

By its very nature, archaeology is spatially oriented and therefore an ideal application for GIS. Nevertheless, the development of an archaeological geodatabase and the cultural observations contained within the datasets is a complex and intricate undertaking that many scholars believe is influenced by
contemporary understanding of the events, and the meaning attached to the event, place, or thing (Kvamme 1989:139-203; Mitchell 1999:11-14; Oliver 2001:175-188).

Robust archaeological geodatabase designs have been developed over specific landscapes for the creation of archaeological site prediction models. The models have shown to be a cost effective method of reducing the area and the time needed for pedestrian archaeological surveys. These sorts of predictive models are based on the assumption that humans are closely tied to the natural and cultural environments, so the creation of an accurate digital representation of the landscape is absolutely necessary to avoid incorrect and ineffective models (Clement et al. 2001:online; Hageman and Bennett 2000:113-127). While predictive models focus on representations of the landscape as a resource to be exploited and utilized; thereby taking on value, they often under represent the value of the features linking the resources.

Therefore, a well thought out and well designed GIS database is a critical component for studying the relationships between spatial features and the attributes that characterize the feature. The Environmental Systems Research Institute (ESRI) geodatabase data model provides this structure in a customizable format that can be manipulated to model real world interactions and relationships. The geodatabase is an object-oriented data model that stores the geometry and attributes of spatial features in a single database. The
Figure 23. Flow of Research Processes.
geodatabase can incorporate general relationships among features along with
the complex natural behaviors of those features in a design that can enforce the
integrity of the behavior or relationship.

ESRI defines a well designed geodatabase data model as having a
comprehensive architecture with all the necessary data to accommodate different
users with similar needs. Thorough documentation of the processes and steps
used to create the data model are considered by ESRI to be a crucial component
of the geodatabase data model design (Zeiler 1999:182-184).

Geodatabase data models provide a template for sharing the “best
practices” scientific methodology of data development and manipulation for a
specific GIS application. Data models allow for better decision making, reduce
costs by sharing successful GIS implementations, and provide a common
framework for data standards (ESRI 2002:online).

Geodatabase Design” sums up the development of a geodatabase data model
by stating that the purpose is to make “GIS datasets smarter by endowing them
with natural behaviors, and to allow any sort of relationship to be defined among
features.” For archaeology, the geodatabase data model facilitates the inclusion
of contextual data in a framework that expands the ability of the researcher to
understand relationships and behaviors of data as it relates to the spatial extent
under study (Zeiler 1999:5-8).
METHODOLOGY

The basic objectives of the research outlined in this document were to demonstrate that a GIS managed archaeological landscape visualization model can be developed using an integrated geodatabase design framework and that this model can be used in an iterative process leading to the discovery and identification of additional remnants of Spanish road features in East Texas. To facilitate these objectives, the research methods were divided into two broad phases. Figure 23 illustrates the flow of the research processes used for this project.

Phase 1

Phase 1 consisted of historic research, selection of a study area, a field survey to locate existing Spanish roads, and the collection of physical landscape data. Historic research into Spanish activities in East Texas provided the archaeological context of the investigation. The examination of historic documents also helped identify travel preferences across the landscape and helped limit a geographical area for study.
Historic Research

Phase 1 included historic research of reputable translations of Spanish, French, and English colonial documents. Legal documents from the Republic and State of Texas pertaining to historic roads in eastern Texas were also examined. Using this information, temporal boundaries were selected and specific Spanish activity areas were targeted for inclusion in this study.

Within the last one-hundred years, many scholarly publications have documented these early accounts of exploration in Texas utilizing a variety of primary documents and period translations from the Latin American collections of the University of Texas, the Spanish archives at the National Library in Mexico City, as well as the Archivo de las Indies in Seville, Spain. These documents have aided in the development of a more complete understanding of the settlement patterns, the kinship associations, and the utilization of the natural landscape for subsistence by the first European explorers.

Although a complete understanding of this period in East Texas does not exist, many scholarly attempts have been made to provide a comprehensive picture of this time period. The one dominant historical premise that these research publications have in common is that they are centered on the exploration of early indigenous trails, later to become roads linking the northern
Spanish empire with its Capital in Mexico City, 2,414 kilometers (1,500 miles) south.

As a place of value, the early road segment of *El Camino Real de los Tejas* known as *El Camino Carretera* (the cart road) is the first road mentioned by the Spanish that links the eastern most Spanish missions and *presidios*. Spanish references to the specific area of *El Camino Carretera* begin in 1727 with Brigadier General Pedro de Rivera’s report to the Spanish Crown. In 1767 both the Marqués de Rubi and Nicolas de la Fora chronicle their trip across this area on their way to the Capital of the Province of Texas at *Los Adaes*. Using historical documents and maps as well as transcripts of oral interviews, this study focused on examining the evidence as it related to physical landscape features.

The Spanish network of roads through the lands of the Caddo was vital for communication with the frontier. Spanish efforts to curtail French interests in trade with Caddo settlements consumed volumes of correspondence that traveled over the roads by countless couriers to Spanish officials in San Antonio and beyond. Dr. James Corbin spent 30-years researching *El Camino de los Tejas* both as actual locations on the landscape and as mentioned in primary Spanish documentation. Dr. Corbin’s notes and files were graciously made available for this research. The volumes of notes referencing specific locations provided an in-depth look at previously located Spanish road features, ranchos, missions, Caddo villages, and other specific locations mentioned in the Spanish
correspondence as well as Spanish motivations for maintaining frontier defenses so far from their base of support.

East Texas road historian and Shelby County Archaeological Steward, Connie Hodges, has conducted many years of research along the old San Antonio road in Sabine County and has contributed to many significant research projects and publications. Her research uncovered historic documentation relating to *El Camino Carretera*, and she has conducted oral interviews and land ownership research in the specific area of *El Camino Carretera*. Her extensive notes and GPS located historic features were also graciously made available to this study. Her research provided the foundation for identification, by Dr. Corbin, of an existing Spanish road system within the study area.

Scanned digital copies of historic maps from the ETRC were incorporated into the GIS as raster data. These historic maps included an 1863 San Augustine and Sabine County land ownership map (Figure 3) showing the surnames of landowners and an 1840 Republic of Texas and United States Boundary Commission map of the Sabine River (Figure 18) showing ferries, road crossings, and river port towns.

By examining historic maps and comparing them to the modern character of the landscape, the shared ideals and values of the countless generations of humans who have developed a sense of place here, is manifested as a distinctive community pattern. Wood and Fels (1992) suggest that, "maps are
embedded in a history they help construct.” They continue with the concept that the historical relationship of humans and the value of place are inherent in maps and that the maps themselves reveal these patterns (Wood and Fels 1992: 28-47).

With over four hundred years of historic documents relating to European travels in East Texas, it is easy to notice that the documents refer to the Tejas as being friendly and welcoming of the Europeans. In almost all cases, pathways or trails are mentioned in relation to traveling in the Tejas provinces, and in many cases the early explorers refer to these Tejas pathways as roads. Some Spanish references to roads of the Tejas refer to other well used roads, differing routes, and forested and open areas. With the Capital of the Province of Texas being at Los Adaes (Robeline, Louisiana), it is not hard to imagine the travel of dozens of couriers, solders, settlers, supply pack trains, and missionaries across the road from San Antonio to the Capital.

**Study Area**

Using the historical research, an area was selected for study. Located in the rolling hills of north-central Sabine County, Texas, it encompassed the general area believed to have been crossed by *El Camino Carretera*. 

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The study area included approximately 40,145 hectares (99,201 acres) and lies at the southern end of a set of rugged hills, identified as the Matlock Hills on the 1:100,000 scale Natchitoches U. S. Geological Survey (USGS) quadrangle. The area is along the southern side of a deeply dissected northwest trending ridge overlooking Patroon Bayou to the northeast (Figure 24). South of the study area, the land slopes more gently to the west and south. In contrast to the deeply dissected north running drainages on the northern side of the study area, the southern side has gently sloping wide flat fingers of land forming ridge extending toward the south and west with wide spring fed creek bottoms spaced at almost regular intervals between them.

The study area is in a region dominated by pine forests interspersed with natural grasslands. The Angelina River to the west and the Sabine River to the east along with their spring fed tributaries provide abundant fresh water to the area. The climate is moderate with a long growing season and abundant rainfall. The soils are fertile and support diverse vegetation and wildlife. These factors, when taken together, provide a rich environment for human occupation.

State Highway 21 runs through the study area and through present day Geneva, Texas. A gravel county road angles northeast out of Geneva, crosses Boregas Creek near its head, and crosses a northwest trending low range of hills before crossing State Highway 87 and the bridge over Patroon Bay [named for the drowned Patroon Creek] on Toledo Bend Reservoir.
The gravel road out of Geneva terminates at the southern end of a peninsula extending into the reservoir opposite Merritt Mountain, Louisiana. As identified by previous owners, the old Carter homestead (owners of the middle and upper ferries of the Sabine River in the 1890s) is located on the southwestern slope of Merritt Mountain (L'Herisson 1981:106-108). A review of modern Sabine County road maps identified the northeast road out of Geneva as the Carter’s Ferry road while a review of Louisiana road maps reveals that there is a Carter’s Ferry road on Merritt Mountain.

Field Survey

The delineation of a specific study area was the first step in locating and identifying existing Spanish road segments. By using historical data combined with archaeological field survey techniques, the actual locations of identified Spanish activities were examined.

Previous archaeological investigations within the study area were compared with 19th century land ownership maps and studied for clues to road features. Custom field maps of the study area were prepared from digital copies of USGS 1:100,000 quadrangle maps obtained from the Texas Natural Resources Information System (TNRIS) and were included as the first raster
datasets of the developing geodatabase model created in ESRI’s ArcGIS 9.1 software (Figure 25).

Following a preliminary examination of the area, Dr. Corbin confirmed the identification of an old road system in the correct alignment with the local geography and in the correct location to be a Spanish road following the routes mentioned by Brigadier General Rivera in 1727, by the Marqués de Rubi in 1767, and again by Nicolas de la Fora in 1767.

Figure 25. Preliminary field map using USGS 1:100,000 topographic quadrangle of study area (Williams 2007).
Recent archaeological surveys of old roads systems have identified early segments of *El Camino Real de Los Tejas*, and techniques have been developed for locating and recording these road networks. As Principal Investigator, Corbin describes the use of multiple routes of *El Camino Real* and writes in an “Archaeological Survey and Cultural Resource Assessment of Mission Tejas State Historical Park, Houston County, Texas,” that a recently located linear depression has been identified as an old road segment that matches the general route shown on Walker’s 1806 map of *El Camino Real* (Erickson and Corbin 1996:3-29).

A portion of a road network discovered during a cultural resource survey of Fort Boggy State Park in Leon County, Texas was potentially identified as a segment of a north-south road linking an upper and lower segment of *El Camino Real*. Eleven road segments located during the survey linked historic house sites and activity areas, and one very deep and wide segment spanned the entire length of the 809 hectare (2,000 acres) park. Specific field survey techniques were developed for locating and mapping road segments during this award winning cultural resource survey (Corbin et al. 1994:78-85).

Following Dr. Corbin’s identification of a road system within the Sabine County study area, a pedestrian survey strategy was prepared and conducted using the cultural resource survey techniques developed by Dr. Corbin for locating and documenting old road networks.
The primary method used for identifying an old road segment was to find, within an undisturbed area of forest, a slight to extreme linear depression approximately 1 to 2 meters (3.3 to 6.6 feet) wide and follow it, looking for a reason or purpose for it being there. If the depression stayed consistent in width, the depth could be explained by the natural wearing of carts or wagons, oxen, mules, and foot traffic versus mechanical modification, and the depression could not be explained by natural processes such as erosion or by modern farming, hunting, logging, or forest management activities, then the depression was considered a historic road segment and was assigned a segment number (Filchner et al. 1957:44-54; Hester et al. 1975:13-36).

The linear integrity of the depression was also important in the selection criteria as an old road segment in that the depression must lead from some apparent specific place of origin in the general direction to be traveling to another specific place. In other words, the individual linear depression segments must connect to form a network leading to or through a previously defined activity space of Spanish origin.

The methods used to identify and survey an old road varied not only with ease of access, but also according to prevailing landscape conditions. In some areas, the steepness or lack of slope would dictate the technique while in other areas, the thickness of vegetation would dictate the techniques used. However once located, the primary method of identifying a linear depression as a road
segment was to walk back and forth, in a zig-zag manner, across the feature in the general direction in which the linear feature is oriented. This method was used not only to define the spatial extent of the feature but also to identify any additional parallel road features. It was common practice to move the road up or down slope creating areas of parallel road segments when a road became impassible from erosion or heavy traffic (Dr. Corbin, personal files 2005).

The technique of documenting a linear road feature was consistent across the landscape surveyed. The most important factor considered, however, was that visibility through forested cover must be at least 20 to 30 meters (66 to 98 feet) to facilitate the identification of the depression as a linear road feature and to be able to see and document the physical characteristics of the depression. The vegetative ground cover of East Texas is at its minimum during the late winter months of January, February, and March; therefore, the optimum field survey time starts after hunting season in mid-January and lasts until the ground cover vegetation begins to leaf out in mid- to late March or early April.

Once a road depression had been identified using the methods previously mentioned, a GPS point was taken at the survey’s arbitrary starting location. The linear feature was then walked in each direction from the starting point using the GPS to capture either line or point features. A sample location was established at every major change in the road depression such as a bend or turn, an obvious change in slope, a width or depth change, a creek crossing, or road intersection
(Figure 26). If long stretches of road depression had similar physical features, the sample locations were also chosen based on the location that best characterizes the physical parameters seen (Hester et al. 1975:13-36).

Detailed descriptions and measurements at each location were recorded with a focus on identifying physical characteristics of the road and landscape features at that location (Figure 27). Each sample location was documented by a globally unique identifier (GUID) number referencing the specific feature’s
location in the database. Each sample location also included attributes that incorporated the road segment and sample number.

Since the direction of survey was based on convenience, the individual sample location numbers were not consecutive; the GUID number, however, remained unique and was associated with the individual road segment number (Figure 28).

At each sample location, data was collected using ESRI’s ArcPad 7.0 field mapping application running on a GPS enabled handheld computer (Figure 29).
A feature class (point, line, or polygon) created for ArcPad included, as attributes, the individual variables of the road depression.

The attributes were captured in customized forms created in ESRI’s ArcPad Application Builder program. This program allowed for creation of easily managed field data entry forms that were constrained within defined data parameters (i.e., slope not to exceed 30 degrees).
In the laboratory, the field collected GPS positions (captured as feature classes) were post-processed using Trimble’s Pathfinder software and the ArcGIS GPSCorrect application. Post-processing was used to differentially correct the GPS data by removing the combination of errors associated with delays of timed radio frequencies and a satellite’s orbit and location in space. This results in greater horizontal positional accuracy. The data collected during the later seasons were collected using H-Star technology allowing for an even greater level of precision (Figure 30). The positional accuracy of features located during the later seasons was considered to be within a radius of 0.50 meters (1.6 feet) from the center of the mapped feature. The positional accuracy of located
features prior to using the H-Star technology was considered to be 2 to 5 meters (6.6 to 16.4 feet) (Trimble 2005:2-9).

In the field, the width and depth of the depression were measured using a steel metric tape, and in certain areas a clinometer was used to determine the local slope or a soil probe was used to determine the surface soil characteristics. In addition to the data collected in the ArcPad application, a metric range pole was digitally photographed in the foreground with pictures looking down both
directions of the depression. Also, a brief characterization of the location including topography, geology, hydrology, soils, vegetation, and landscape position was recorded. When processed, the point, line, or polygon file from each road segment included, in separate attribute fields, the spatial coordinates, the measured variables, the digital photographs, and the descriptive comments collected from the field survey (Figure 31).
Additional cultural features located along the survey route were also recorded and photographed. It was expected that numerous indicators of previous settlement activities would be encountered. Previous historical research, oral histories, and first-hand accounts indicated that many homes were located close to or on the early roads of East Texas. These recorded features included but were not limited to lateral road depressions, the remains of houses or old home sites expressed by foundation stones, farm features such as cattle dip tanks or farm outbuildings, wells or well depressions, springs or other water sources, and cemeteries. Within the surveyed area, any depressions that were considered a road created by modern hunting, forestry, or agricultural activities were also documented by digital photographs creating a dataset of depressions with their physical characteristics considered not being of Spanish origin.

Due to the optimum field survey time for identifying road systems starting after hunting season in mid-January and only lasting until the ground cover vegetation greens up limiting visibility through the forest, the pedestrian survey of the study area was conducted over four field seasons beginning in 2003 and ending in 2006. The multi-year survey allowed for complex road areas to be visited over and over again during various seasons of the year and allowed for iterative development and use of the archaeological geodatabase model.
Landscape Data

Phase 1 also included creation of a GIS application for managing the data collected from the field survey and for inclusion of the physical landscape data of the study area. The GIS was created using, as a spatial reference standard, the Universal Transverse Mercator (UTM) coordinate system for Zone 15 North with the 1983 North American Datum (NAD83).

Several maps of various scales published by the USGS were used to aid in developing a list of landscape variables encompassing the study area. Supplemented with additional ancillary data including map data from the NRCS and the Texas Bureau of Economic Geology (BEG), the comprehensive list of physical landscape data included existing digital data regardless of scale or lineage. Figure 32 shows the list of physical landscape data used in this study. The data was reprojected, with coordinate transformations where necessary, to the spatial reference standard outlined above. The GIS was used to create landscape variables not identified during the field survey or included in the collection of physical landscape data. Examples of GIS data creation include the
derivation of slope and aspect from a Digital Terrain Model (DTM) or the calculation of distance from a cultural feature to perennial water.

Figure 32. Physical landscape data used in study.

Vector data included the National Elevation Dataset (NED) contour lines and elevation points, National Hydrography Dataset (NHD) stream lines and water bodies, NRCS soils data, BEG surface geology, and Texas Department of Transportation (TxDOT) road and street data. Also a dataset of bathymetric contours for Toledo Bend Reservoir was included (Figure 33). The Original Texas Land Survey (OTLS), a vector dataset of original 1836 survey lines, from the Texas General Land Office (GLO) was included in the GIS.
Raster data included a 10 meter (32.8 feet) resolution Digital Elevation Model (DEM) from the USGS and 1 meter (3.3 feet) digital orthophoto quarter quadrangles (DOQQ) flown during the winter of 1996 [leaf-off] from TNRIS, as well as 1 meter (3.3 feet) color infrared (CIR) aerial photography from the U. S. Department of Agriculture’s (USDA) Farm Services Agency (FSA) National Aerial Imagery Program (NAIP) flown in the summer of 2004 [leaf-on]. Seamless Digital Raster Graphics (DRG) of USGS 1:250,000, 1:100,000 and 1:24,000 topographic quadrangles from a database connection with the Forest Resources Institute (FRI) Spatial Data Engine (SDE) were also used.
FRI was instrumental in aiding the search and recovery efforts of the Space Shuttle *Columbia* disaster by providing geospatial (GIS, GPS, and remote sensing) support in early February of 2003. The shuttle’s debris path roughly paralleled Highway 21 across East Texas, and during the shuttle recovery effort, current high-resolution satellite imagery as well as historic aerial photography became available for the region encompassing the study area. High-resolution multispectral satellite imagery from Space Imaging’s IKONOS satellite was
provided to FRI and was panchromatic sharpened (resolution merged) providing a nominal resolution of 0.67 meters (2.2 feet) of the region encompassing the study area. The satellite imagery was obtained and used as a planning aid for the field surveys (Figure 34).

Black and white aerial photographs from 1960 and 1968 of the Toledo Bend Reservoir region also became available during the shuttle recovery efforts. The aerial photographs encompass several historic road crossings, ferry locations, and drowned river port towns. TNRIS maintains the Texas State Aerial Photograph Archives which house these photographs. These archives were
searched to determine the years of available coverage. Photographs encompassing the study area were located and digitized by scanning at 600 dpi before being georeferenced to 1996 DOQQs of the area using the Georeferencing application in ArcGIS. Aerial photography of the area encompassing historic ferries and early crossings of the Sabine River from 1936 and 1940 (pre-impoundment Toledo Bend Reservoir) were provided to this study by The University of Texas at Austin’s Center for Space Research (CSR).

The georeferenced historic aerial photography was used to create feature classes within the flooded Sabine River valley of farm locations and connecting roads, logging tramways and river crossings (Figure 35). The vector feature classes were created by “heads-up” digitizing the visible physical features, and the attribute type field was populated with the type of feature created (i.e., road, river or stream crossing, farm, tramway, etc…).

The inclusion of georeferenced historic aerial photography in the GIS aided in the interpretation of the parameters affecting the selection of road or river crossing locations; and in places, the associated impacts of the physical positioning of historic features on the landscape and the resultant settlement patterns along these early roads could easily be seen. The historic photography added a temporal component to the research and contributed to the understanding of why certain areas were chosen over other locations.
Additional raster data consisted of scanned digital copies of historic maps. These maps were used as references for physical features and although not drawn to adequate detail and scale, the maps provided valuable historical information for the study.
Phase 2

Phase 2 began with the creation of an archaeological geodatabase incorporating physical landscape attributes with surveyed road attributes. It also included developing a set of landscape criteria for Spanish road placement, and in addition to constructing the archaeological geodatabase; it included the development and documentation of an iterative process of archaeological landscape visualization and spatial analysis. Using the results of these processes, Phase 2 also included supplementary field surveys for locating additional road segments.

Archaeological Geodatabase

With the completion of Phase 1, the design of an archaeological geodatabase data model proceeded utilizing the information collected on the physical parameters that constitute a Spanish road. Conceptually, the process of creating an archaeological geodatabase design for this research necessitated that the physical variables of a Spanish road and the physical landscape variables crossed by the road be known. Figure 36 illustrates the conceptual progression where data are developed in an archaeological geodatabase, analyzed in a GIS, and returned to the geodatabase framework.
This process created a robust system for handling complex spatial analysis where the resulting data were reintroduced into the archaeological geodatabase creating a dynamic model of archaeological landscape interaction. To accomplish this conceptualized data flow model, the design of the
geodatabase was tested and revised until it met the requirements of the archaeological landscape visualization model.

ESRI’s geodatabase data model is an object-oriented geographic model that represents a geographic feature as a relational object with a discrete spatial location. The relational object is stored in a single row of a table in a relational database management system (RDBMS). The geometry of the feature is stored in a field of type Shape while the attributes of the feature are stored where each field type represents a single attribute of the feature.

This research project originally created a personal geodatabase using ArcGIS 9.1. The personal geodatabase datasets are stored in Microsoft Access data files, but this had serious limitations due to reduced performance when the size exceeded 500 MB. The personal geodatabase has a maximum size limit of 2 GB; therefore, two personal geodatabases were created. One for vector files only and the other for raster files that quickly reached the 2 GB limit.

At the release of ESRI’s ArcGIS 9.2 software, the inefficiency of the personal geodatabase was circumvented by the availability of a file geodatabase system where the datasets are stored as folders in a file system (Figure 37).
There is no limit on the size of the file geodatabase and each dataset can hold up to 1 TB of data. Both the raster and vector personal geodatabases were migrated to a single ArcGIS 9.2 file geodatabase using the Export XML Workspace Document Wizard in ArcCatalog (Figure 38).
Within the geodatabase, feature datasets were created for the grouping of similar feature types sharing a common spatial reference and geographic area. Feature datasets included topography, hydrology, geomorphology, land ownership, political boundaries, and transportation. Within each feature dataset, feature classes were created for each specific data type. Feature classes included soil series and surface geology as polygons under the geomorphology.
feature dataset or rivers and streams as lines, lakes and reservoirs as polygons, and springs as points under the hydrology feature dataset (Figure 39).

![Figure 39. Contour line feature class within hypsography feature dataset.](image)

Raster datasets and raster catalogs were created for the various rasters and were included in the file geodatabase for faster display at all scales. A raster dataset is a mosaic of two or more individual rasters while a raster catalog has a table where each record defines the individual raster dataset that is
included in the catalog. Unlike the raster dataset, the raster catalog is displayed without mosaicing the imagery thereby reducing the computational overhead needed for display. Both the raster dataset and the raster catalog are managed by the geodatabase which means that rasters are stored and wholly contained within the file geodatabase rather than having a pointer to the raster files stored elsewhere (Figure 40).

![Image of ArcCatalog interface showing raster catalogs and raster datasets]

Figure 40. Raster catalogs and raster datasets for the project.
By allowing the geodatabase to manage the raster datasets and raster catalogs, faster display at various scales is achieved, and the geodatabase is more flexible in its portability because it contains all of the data.

Once the feature datasets and feature classes were defined, data collected from the field survey and from the various physical landscape data holders was imported into the feature classes. After the importation, the data was validated by visual inspection for correct alignment with the USGS 1:24,000 or 1:100,000 quadrangles. For the field survey data, validation included scrutinizing the attribute tables for duplicate segment, sample, or GUID numbers. To validate the linear features captured during the field survey, a topology was created with the rule that each line must be covered by a sample point before the line segment could inherit the physical properties collected at the point feature (Figure 41).
Additional data types included in the geodatabase were tables of ancillary data including conversion factors for Spanish length measurements, classification codes, copies of field notes, and previous archaeological surveys of the region. Annotation feature classes were also included in the geodatabase for labeling features. The Geographic Names Information System (GNIS) was used
to extract the annotation feature class for the physical landscape of the study area (Figure 42).

Figure 42. Annotation feature class from the Geographic Names Information System for Sabine County.

A new temporary data type called terrain has been introduced with the ArcGIS 9.2 geodatabase. Terrains are 3D Triangulated Irregular Network (TIN) based surfaces that reside in a feature dataset and reference the feature classes in that dataset. A terrain data type was created for this project in a feature dataset called Topography that included Toledo Bend Reservoir bathymetry, elevation contour lines, and elevation point feature classes (Figure 43).
Terrains can utilize very large point datasets but require the ArcGIS 3D Analyst extension for creation of the terrain surface “on-the-fly” in the geodatabase. Terrains were useful for quickly visualizing the 3D character of the landscape at any scale because they use pyramiding to improve performance. The pyramids only reference the data needed for a specific view and not the entire dataset for “on-the-fly” construction of a surface from feature class measurements.

Using ESRI’s Geodatabase Designer (an add-in for ArcGIS) in ArcCatalog, documenting and exporting the geodatabase design or schema was
easily accomplished. Geodatabase Designer captured the schema without difficulty so that it could be edited and then exported as an xml file (Figure 44).

Figure 44. Exporting geodatabase using Export XML Workspace Document Wizard.

The xml file could be used in Geodatabase Designer or ESRI’s ArcCatalog Geodatabase wizard to export or import the schema into a new geodatabase.

The object-oriented design of the geodatabase supports the definition of custom feature datasets that incorporate feature classes; class attributes, attribute tables, and relationship classes that govern the spatial behaviors of features on
the landscape. The design of a data schema that incorporated these custom properties allowed for repeated iterations of design testing where each iteration was refined for added functionality of the data schema (Figure 45).

Figure 45. Geodatabase schema from ESRI’s Geodatabase Designer.

Data Analysis

Landscape resources that were inherent in the selection and development of Spanish roads can be studied by careful observation of both historic patterns of settlement and road placement. To facilitate the examination of the natural resource influences on the locations of early Spanish roads however, a clear understanding must be developed of the physical properties associated with the
remains of an existing Spanish road. Therefore, a set of criteria for Spanish road placement was created by extracting the physical landscape variables at each sample location of the field survey (Figure 46).

Based on the assumptions that humans prefer certain physical locations for travel and that cultural features do not occur uniformly across the landscape, the arrangement of located Spanish roads was analyzed to help describe the
physical aspects of a Spanish road. The attributes collected at each sample location along with extracted physical landscape variables were investigated, through spatial data analysis, for any hidden trends or patterns that could help define a Spanish road.

At the outset Exploratory Data Analysis (EDA) was used in conjunction with spatial analysis techniques including overlay and proximity relationship analysis. Analysis included using the point locations collected during the field survey to derive slope percent and degree from the DEM raster dataset as well as to extract surface geology and soil series polygon values. Elevation in feet and meters were calculated, topographic position was determined, and distance to perennial water was computed using the ArcGIS Near Tool of the Proximity Toolset.

In order to have a single numerical value of the impact of a Spanish road on the landscape, a simple ratio was calculated using measurements from the field survey. Exploration of the sample data revealed that to define the depth of a road feature at any given location, the depth data measured on both sides of the road depression must be combined for an averaged road depth variable [Intermediate Depth] before being used to calculate a depth-to-width ratio variable. The depth-to-width ratio variable was calculated by dividing the intermediate depth by the width at each sample location as a single measure of that sample point’s archaeological impact on the physical environment at that
location. The higher the depth-to-width ratio number, the greater the impact; and conversely with a lower depth-to-width ratio number, the impact on the archaeological record is much less. For example, a road depression that has a depth of 1 meter (3.3 feet) and a width of 2 meters (6.6 feet) has a depth-to-width ratio value of 0.50, while a road location that has a depth of 0.50 meters (1.6 feet) and a width of 2 meters (6.6 feet) has a depth-to-width ratio value of 0.25 (Figure 47).

The first set of Spanish road placement criteria data from the analysis was visualized in ArcMap and led to the selection of additional areas to be surveyed (Figure 48). For this project it was important that the data be explored freely without assumptions; thereby, allowing for a deeper understanding of the data relationships, data irregularities, and the overall data structure. The data itself revealed its inherent underlying structure through EDA and allowed an insight to develop in how best to approach interpreting the data. For archaeology, this is a method or philosophy as to how data analysis should be conducted by allowing the data to reveal its underlying structure without preconceived assumptions.
Figure 47. Depth-to-width ratio used for calculating impacts on the archaeological record.
Archaeological Landscape Visualization Model

A GIS managed archaeological landscape visualization model was developed for this study and utilized to visualize changing road criteria over time across the landscape as well as to visualize the character of the landscape in a 3D-environment. The ability to incorporate multiple types of data, both historic and current, into a single analysis and visualization tool is a strength that GIS
brings to the understanding of the landscape forces influencing the selection of preferred Spanish road locations.

The archaeological landscape visualization model is a conceptual process model that provided the logical framework for an integrated dynamic flow of data capture, historic research, and spatial data analysis in a geodatabase data model design. Figure 49 illustrates this conceptual model. In the model, historic research, field surveys, and data analysis are happening concurrently. By mapping archaeological evidence in a landscape level GIS, a spatial analysis and integrated visualization tool was created through repeated iterations of refinement and was used to discover regional cultural landscape resources by limiting or confining the potential placement of Spanish road features on the landscape.
Figure 49. Conceptual design of the archaeological visualization model process.
RESULTS

Results of this study include information gained from historic research, the locating of existing Spanish road features, the development of landscape criteria defining what constitutes a Spanish road’s expression in the archaeological record, and the creation of an archaeological geodatabase used as a landscape visualization model in an iterative process for locating additional road segments.

Historic Research

One of the main documents used for this research was a Shelby County court case located in the archives of Robert Bruce Blake housed in the ETRC. In the early 20th century, R. B. Blake, transcribed, translated, and collected documents of Spanish, Mexican, and early Texas history that are available for research. This 1852 Shelby County document is an official courthouse record of a land dispute requiring the empirical knowledge of early Texas settlers. The document, Russell versus Mason, contained a series of depositions pertaining to land ownership between two roads, and the court was attempting to establish which road was called *El Camino Real* in 1824.
Several prominent Texas citizens gave their account of using the roads in the early 1800s. Of the seventeen individuals interviewed in the court case, only those who entered Texas after 1825 remembered that there was only one road that crossed the Sabine River at a place known as Gaines Ferry. The remainder of the early Texas citizens remembered two roads. Before 1818, they used an upper road that crossed the Sabine River near Crow's Ferry a couple of miles upriver from Gaines Ferry (Figure 50).

Figure 50. Historic crossings over the Sabine River (Williams 2007).
Almost all of those who used the upper road referred to it as Camino Carretera. The early Texans all agreed that Camino Carretera forked from the main road “near where Juan Maximillian lived” and “crossed Boregas Creek at the Jack Cedar place” before traveling through a row of steep hills and crossing Patroon Bayou about six miles from the Sabine River at Crow’s Ferry (Shelby County District Court Clerk 1852:87-118).

Eighty year old David Watman testified that when he first came to Texas in 1797, at the age of 18, there was only one road known as the King’s Highway or the cart road. James Gaines, who built Gaines Ferry in 1819, testified that, when he first came to Texas in 1812, Camino Carretera crossed the Sabine River at Crow’s near a saline [presumably a salt lick], called by the Spanish salinilla. All of the depositions generally agreed that after Gaines established a ferry across the Sabine in 1819 [near the present site of the Highway 21 Bridge]; this newer road took on the name of El Camino Real and was sometimes mistakenly referred to as Camino Carretera (Shelby County District Court Clerk 1852:105-108).

In the 1852 deposition of Stephen Mora, he stated that in 1812 he “frequently traveled the Camino Carretera driving carts for Davenport,” an Indian trader licensed by the Spanish (Figure 51). He continued his statement saying that “all the people called the Camino Carretera because it was a big road. People in traveling would sometimes say, I will go Camino Chabinan and some
say *Camino Carretera,*” and that “the upper road was called *Camino Carretera,* and the road by Milam was called *Camino Chabinan.* The *Camino Carretera* and *Camino Chabinan* forked this side of the Palo Gaucho and east of Earl’s” (Shelby County District Court Clerk 1852:108-109).

![Figure 51. Spanish carretera [wooden two wheeled cart] in Gruene, Texas.](image)

Burrell Thompson also stated in his 1852 deposition that the “main road from Nacogdoches to Natchitoches led by San Augustine and crossed the Palo Gaucho at Sneed’s and the Lobanillo where Earl now lives, and went by Strother’s farm, where Maximillian formerly lived. There the road forked; the right hand went to Gaines Ferry…,” and “the other road turned off at Maximillian’s…” and crossed “…the Sabine River at Crow’s Ferry” (Shelby County District Court Clerk 1852:93-94).
There are many clues to the location of this early road in the court case. First, the road forked at Maximillian’s with Camino Carretera continuing to the north. Historic research of land ownership indicated that in 1796 Juan Ignacio Pifermo was granted land along El Camino Real that he willed, after his death, to his nephew Juan Maximillian. At the time of the court case, Maximillian was living on Rio de Agua [Waters Creek] whose name later changed to Maddox Creek.

The next clue is that Camino Carretera crossed a low range of steep hills and continued to the crossing of Patroon Creek about six miles northwest of Crow’s Ferry. The locations of Gaines Ferry, Crow’s Ferry, and Patterson’s Ferry were shown on an 1840 Republic of Texas and United States Boundary Commission map (Figure 18). This map was relatively accurate in its representation of the Sabine River channel. Gaines Ferry has retained its name into the present and its location is known [Pendleton Bridge area of Hwy 21] (Figure 52).
In the 1852 court depositions, Juan Maximillian testified that he and his uncle “hacked a bridle path” across their property starting from the *El Camino Real* to the location of Chabinan’s crossing, later to become Gaines Ferry. After Chabinan built a chalan, or flat boat, at this crossing, the road became known as *Camino Chabinan* or the Chabinan Road [presumably an earlier pathway that Maximillian and his uncle widened]. Chabinan was killed when a mule kicked him into the river, but the *Paso de Chalan*, or pass of the flat boat, continued to
be operated for several years after Miquel Crow married Chabinan’s widow (Shelby County District Court Clerk 1852:87-118).

In 1797 Vincenti Micheli was granted land on both sides of the Sabine River where he intended to build a ferry at the Salinas Crossing, but when he got to the location, he found Miquel Crow operating a chalan and claiming the east bank as a right-of-inheritance. After receiving permission from the Spanish Government, Crow was allowed to continue operating a ferry at this location for several more years. Eventually moving his ferry nearer the mouth of Patroon Bayou, Crow’s Ferry became a well known and heavily used crossing (Dr. Corbin, personal files 2005).

W. T. Block, in the Texas Gulf Historical and Biographical Record (1991), wrote that Mary Sabinal [Chabinan] Campbell, born at Crow’s Ferry in 1795, told the story of her life to the Galveston Daily News in 1879. He wrote that Mary’s father was Chabinan, but she took her step-father’s name and appeared as “Mary Crow, wife of James Campbell” in the 1826 Atascosita Census. Mary had met and married James Campbell at Crow’s Ferry in 1816. James Campbell, a distinguished sailor who served with Commodore Perry on Lake Erie and on the U.S.S. Constitution during the War of 1812, was a privateer smuggling trade goods into Spanish Texas. Leaving Crow’s Ferry in 1817, Mary moved with her husband to the infamous pirate town of Campeachy on Galveston Island where
James Campbell soon became one of Jean Lafitte's most trusted captains (Block 1991: 2-17).

In the 1852 Shelby County District Court case, the deposition of Sarah Mitchell also stated that she lived at Crow's Ferry from 1812 through 1814. Her name was Sarah Evens at the time and her husband, John Evens, operated the ferry for Peggy Crow at the crossing of *Camino Carretera*. Donald McDonald, in his 1852 sworn deposition, stated that when he came to Texas in 1824, there were two roads with one leading to Gaines Ferry and one leading to Crow's Ferry. He stated that the upper road crossed at Crow’s and “was called the King’s Highway or sometimes the *Camino Carretera*” (Figure 53). He also stated that the “Crow’s Ferry Road looked to be an old road and how long it had been used I cannot say” (Shelby County District Court Clerk 1852:87-118).
Crow’s Ferry [the middle ferry] became Thompson’s Ferry in 1850 and finally Carter’s Ferry in the 1890s. The upper ferry was first known as McGuffin’s then Patterson’s Ferry. It also became known as Carter’s Ferry in the late 1890s after Carter bought the crossing.

According to the court case, the Spanish ford was at a shallow crossing upriver from Crow’s Ferry at a place known as the Salstre Prairie. Samuel Davenport, an early Spanish and Indian trader, in another court case in 1823
called this the Pass of Salines or the pass of the *Arroyo de las Boregas* (Shelby County District Court Clerk 1852:87-118) (Figure 54).

With an overlay of the OTLS, the GIS allowed for a very quick assessment of the location of the Pifermo grant, Maddox Creek (*Rio de Agua*), and the general locations of Juan Maximillian’s residence and Jack Cedar’s place on the Boregas creek. An unpublished thesis from Louisiana State University identified the location of the Crow grant on the east side of the Sabine, and the OTLS
identified land on the west side of the Sabine as belonging to James Mason (Figure 55). An 1863 Sabine County ownership map clearly showed a segment of road across the upper portion of the Mason grant that aligns with the general location of the road to Jack Cedar’s place and the crossing on Boregas Creek.

A review of a modern Sabine County road map identified the northeast road out of Geneva as the Carter’s Ferry Road while a review of Louisiana roads revealed that there is a Carter’s Ferry Road on Merritt Mountain. Using the DEM overlaid with a vector road layer in a 3D-environment showed that after Carter’s Ferry Road crossed the Boregas Creek, it crossed through a set of rugged
northwest trending hills. The hills are a high place above the Sabine River valley, and they have typical questa topography of gentle to rolling southwestern slopes and a steep eastern drop off with steeply dissected and eroded streams.

Spanish references to this specific area began in 1727 with Pedro de Rivera’s report to the Spanish crown of Presidio de las Tejas where he mentioned crossing some sizable hills and camping at “an uninhabited location on the east side of a creek called El Patrón” [Patroon Bayou] a day before crossing El Rio de San Francisco de las Sabinas on the way to the mission San Miguel de los Adeas (Jackson 1995:37).

In 1767 Marqués de Rubi documents crossing high hills of oak and pine before reaching the steep Arroyo del Patrón. Crossing through dense forests, Rubi wrote that “the travel was step-by-step,” and that “we took the Camino Real ....” and followed it “to the Sabinas [Sabine] River, which flows toward the east-southeast at the place where we forded. Two leagues before this river, we came to the large Arroyo del Patrón, whose deep channel makes it uncrossable during floods. Its overflow sometimes reaches the Sabinas River, creating a sea that covers the tall trees along this road” (Jackson 1995:128-129).

Nicolas de la Fora, in his 1767 trip to the mission at San Miguel, wrote that they came to the site of La Questa Alta [high hills] before arriving at El Patrón arroyo and that “to the east-south-east is the Sabinas river which we forded in shallow water” (Kinnaird 1958:167). From this time on, Spanish travelers
referred to *La Questa Alta, Arroyo del Patrón*, and *El Patrón* or *Puerto de Patrón* as physical features of note before arriving at the shallow fords of the Sabine River. *La Questa Alta* mentioned by the early Spanish travelers matches the description of the low range of steep hills mentioned in the 1852 Shelby County court document (Figure 56).

Figure 56. High hills known to the Spanish as *La Questa Alta* (Williams 2007).

Another clue to the location of *El Camino Carretera*, using the court depositions, is that the road crossed Boregas Creek at a rock crossing on Jack
Cedar’s place. Current research has shown that Jack Cedar was known to have settled on land at the northeast end of Piñermo’s grant along Boregas Creek before 1800 and to have married the daughter of the commander of the small Spanish military post on Boregas Creek guarding *El Camino Carretera* (Dr. Corbin, personal files 2004).

At most major creeks and rivers flowing through East Texas, evidence exists to support a correlation in the placement of early Spanish road crossings with exposures of the Weches geologic formation. The choice of rock crossings would have undoubtedly dictated road selection and placement. Corbin (1991) in “Retracing the *Camino De Los Tejas* from the Trinity River to Los Adaes: New Insights in East Texas History,” has identified Weches outcrops at locations on the Trinity, Neches, and Angelina rivers that occur at locations documented by several different travelers during the early 18th century.

Although only briefly mentioned in documents of the journey across *El Camino Real de Los Tejas*, in each case the crossings were identified as being significant enough to be reported as events requiring the attention of the entire party (Corbin 1991:191–219). While at the Neches River, Padre Peña writes in July of 1721 that the Marquis de Aguayo “ordered the construction of a bridge because the river was very flooded. Its construction took six days. It was 32 varas [27 meters] long and four and a half [3.8 meters] wide. It was so well done and so stable that it was given the blessings of the Church” (Peña 1981:56).
Remote Sensing

Historic research continued when not conducting field surveys, and between the first and second field seasons, the collected aerial photography was analyzed to aid in outlining the following field season. The analysis also aided in interpreting where on the landscape to anticipate encountering this old road feature. The 1996 DOQQs showed that most of this road had been covered by construction of FM 276 east of State Hwy 87, yet the old bridge over Patroon Bayou can still be seen at low water times of the year.

Historic aerial photography was combined with current imagery and used as a valuable tool in understanding change over time. To be able to look at the Carter’s Ferry Road area within the current impoundment of Toledo Bend Reservoir, the 1936, the 1940, the 1960, and the 1968 black and white aerial photographs were imported into the GIS and combined with high-resolution imagery from Space Imaging’s IKONOS satellite. On the 1936 photographs, Carter’s Ferry Road was seen crossing a small bridge over Patroon Creek and angling southeast past several farms (Figure 57). Burrell Thompson testified in the 1852 court case that he built the first two bridges over Patroon Creek in 1832 while he was operating the ferry at Crow’s (Shelby County District Court Clerk 1852: 93).
Figure 57. Old Carter’s Ferry Road Bridge over Patroon Bayou (Williams 2007).

Bathymetric contours for this area of Toledo Bend showed that Carter’s Ferry Road continued south down a low ridge above the Sabine River channel for almost seven miles and almost all the way to Merritt Mountain (Figure 58). Current satellite imagery showed the old Carter’s Ferry Road joining a new road just before the long bridge over Patroon Bay and running down the peninsula to dead-end at the lake.
After digitizing the features into the GIS, the farms and the interconnecting farm roads, visible on the 1936 photographs, showed a pattern of main roads, logging tramways, and numerous less traveled outlier roads for the area submerged by Toledo Bend. Louisiana State Highway 6/Texas State Highway 21 is the only paved road visible as it crossed the Sabine River at the newly constructed Pendleton Bridge [built in the 1933 with the discontinuation of Pendleton (Gaines) Ferry] (Figure 59).
Farther to the northeast, a heavily used road coming down to the river from the east (Louisiana side) was clearly seen, and a heavily used connecting road on the Texas side was also seen running northwest along the ridge above the river. This location was presumed to be upper crossing known as Patterson’s then finally Carter’s Ferry. Although no flat boat or ferry was seen at the crossing, it appeared to still have heavy use in 1936 (Figure 60).
Oral histories documented the use of this location, by Chabinan/Crow descendents, to “walk” across the Sabine River as late as the early 1960s. Known by the locals as the easiest passage across the Sabine River, this crossing was used until the impoundment of Toledo Bend Reservoir (Connie Hodges, oral interviews 2007). For the Spanish, getting on to the northeast running ridge just east of the crossing, between Bayou San Miguel and Bayou La Nana, would have been the fastest route to reach the Spanish settlements on Bayou Scie [See].

Figure 60. 1936 aerial photograph draped over a 10-meter Digital Terrain Model (DTM), created from bathymetric contours, showing the used Patterson’s Ferry crossing (Williams 2007).
On the Louisiana side a heavily used road can be seen running down to a bluff over the river on the north side of Merritt Mountain. This road is the current Carter’s Ferry Road seen on the modern Louisiana road map. A large area of cleared fields was located here which corresponded with the Carter homestead at the old Crow place (Figure 61).

![Figure 61. Location of Crow’s and Patterson’s ferries with old road system. Logging tramways are in light blue (Williams 2007).]

On the Texas side of this crossing a possible road at this location was obscured by a tramway. This particular tram was joined by a similar tramway...
running down the tip of the low ridge all the way to the river. There appeared to be an area cut out of a bluff at the end of the road. Four historic salt works are known to have existed in this general area, and this is roughly where the early Texans in the Shelby County court case identified a Spanish crossing called *Paso de los Salinas*. Immediately south of this crossing on the high ground east of Merritt Mountain is the headwaters of Salter Creek whose name possibly indicates a salt intrusion or other geologic feature exposed at the *Salinas*.

Ripples in the river at this location indicated a shallow rock crossing on the river just below the confluence of Bayou La Nana and the river. By turning east immediately after crossing at this ford, the Spanish could have easily crossed the narrow Bayou La Nana and climbed the ridge above Patterson’s/Carter’s Ferry on the way to *San Miguel de los Adaes* (Figure 62).
Field Survey

Following the research of historic accounts, a pedestrian field survey was conducted with the collected sample data being used for determining landscape variables associated with early Spanish road placement. The linear distance covered during the field survey was just over 7.9 kilometers (4.9 miles) while the total area surveyed was 162.0 hectares (400.3 acres) with 4.6 kilometers (2.9 miles) of old road features being located and recorded (Figure 63).
The first segment identified was parallel to the existing Carter’s Ferry Road along the eastern side of steep hills [*La Questa Alta*] east of Boregas Creek. Georeferenced in the GIS, a 1940 USGS 15-minute quadrangle map of this area along with the 1936 aerial photographs showed that the present alignment of Carter’s Ferry Road had not changed indicating the road depressions were of an older origin. The depth of the old road cuts [depressions] indicated extremely heavy and repeated use over time (Figure 64).
Beginning at this location and preceding west, the old road utilized the north facing side slope of a dissected stream drainage [headwaters of Dorsey Creek] between two peaks rising 15 to 20 meters (49 to 66 feet) above the road (Figure 65).
The difficulty of the terrain crossed in this area was noteworthy because of the steepness of the slopes on both sides of the drainage. To ease the grade, the old road winds around the contour of the landscape with the road depression basically on the surface rather than cut directly through the slope as the current road does. In one area, the old road cut makes a wide flat S turn in an attempt to ease the grade of the slope even more (Figure 66).
Figure 66. Close up of old road segment winding around the contours of the land to lessen the grade (Williams 2007).

The old road crisscrosses Carter’s Ferry Road several times finally ending up above the current road where it straightened out toward the west. In this location the old road is 2 meters (6.6 feet) wide, and ranges from 1.5 to 3 meters (4.9 to 9.8 feet) deep. At the top of the slope, the road cut takes on a noticeably wide V shape approximately 2 meters (6.6 feet) wide (Figure 67). At the steepest point of the grade, the road was moved down slope twice as it became too rutted to use, creating parallel road depressions. They appeared to be temporarily or
lightly used because they ranged from 0.5 to 1 meter (1.6 to 3.3 feet) deep and were only about 40 meters (131.2 feet) long before they rejoined the main road cut.

Figure 67. Looking east at road cut through La Questa Alta area.

After recording this first road segment, additional road depressions were located parallel to Carter’s Ferry Road on both the north and south sides. Some segments would wind several dozen meters away from Carter’s Ferry Road while others would be adjacent to the drainage (bar) ditch of the modern road. The old road depressions cross back and forth across Carter’s Ferry Road, and in many
places the old road would have been in the same alignment as the modern road (Figure 68). Many years of county road maintenance have removed most indications of this old road.

Figure 68. The modern Carter’s Ferry Road crossing *La Questa Alta* (Williams 2007).

Rising out of the Sabine River valley after crossing Patroon Bayou, this old road system heads west and passes between two isolated peaks (Figure 69).
Figure 69. Old road segments [in red] passing through Puerto de Patrón (Williams 2007).

These two peaks are over 150 meters (492 feet) tall and rise well above the surrounding topography. They are major features on the landscape, and when viewed in ArcScene, ESRI’s ArcGIS 3D-visualization application, their prominence is easy to perceive. When viewed from the Louisiana side, looking toward the west, these peaks provide a clear landmark for identifying the location of the road going between them to the interior provinces of New Spain and support of the Patrón [Spanish Crown] (Figure 70). In 1767 Father Gaspár José
*de Solis*, on his inspections of the Texas missions, wrote in his diary that they went through *Puerto de Patrón* or Patrón Gap before coming to the Sabine River, which indicated that these peaks were known as places of importance because they identified the location of the road to “civilization” from the frontier.

As the old road reached the top of the dissected drainage, it leveled out affording a much easier passage as it followed the crest of a wide ridge toward the west. Through this area nineteen old road segments totaling 1,128 meters
(3,701 feet) were located creating an older road system paralleling Carter’s Ferry Road sometimes on the south side and sometimes on the north (Figure 71).

In many places the old road depressions are visible from the modern road. Sometimes the old road cut was crosscut by the modern road and in places the road depressions became very faint. The average width of these road segments was 2.6 meters (8.5 feet) and they averaged 1.2 meters (3.9 feet) in depth.
There is a clear flowing spring 100 meters (328 feet) north of Carter’s Ferry Road approximately 3.2 kilometers (2 miles) east of Boregas Creek. A spring is mentioned at this approximate location in the 1852 Shelby County court case as being a landmark on the road identified as *EL Camino Carretera*. This would have been the first water available after climbing the steep grade out of the Sabine River valley and would have been looked for by those traveling the road (Figure 72).

Figure 72. Historic springs in *La Questa Alta*. 
The springs of Sabine County are well documented as being fresh and soft, but with high iron and sulfates. A number of the historic documents related to travel on *El Camino Real* list springs as points of reference or as destinations (Brunne 1975:5-9). Many important springs are within the study area, and several of these are noted in historic references. South of Highway 21, McMahan Chapel utilized nearby springs for religious gatherings, and Sulphur Springs, also south of Highway 21, was a gathering spot for early travelers seeking the healing properties of the water.

Many water features were mapped while surveying the old road system. These included intermittent and perennial streams, five springs or seeps, and ten abandoned wells or well depressions (Appendix A). In numerous locations, lateral depressions were also mapped to the extent that it became obvious that they were secondary roads. Theses included a section of an old railroad grade, old logging tramways, forest silviculture activities, old community roads, and old agricultural roads such as linear depressions leading to farm features such as an old corral or barn sites.

Many false leads were also followed while trying to connect road segments into the overall road system. Most led to nowhere, yet each feature encountered was mapped with the GPS and photographed for comparison with the heavily used old road system. Each of these was considered a non-Spanish road feature (Appendix B). By investigating all of the road features encountered
during the survey, it became obvious that some of the additional roads features were secondary roads; that is that they exhibited characteristics that were in high contrast with the older road system. While some were erosional features and some were made by livestock, presumably cattle, quite a few were old road cuts leading to homes sites (Figure 73).

![Figure 73. Road cut to old home site adjacent to Carter’s Ferry Road.](image)

A total of sixteen house or old home sites were located during the survey. Most were easily identified because of a standing structure; however, some were identified as home sites only by a well or well depression or by the linear
arrangement, in a rectangular pattern, of Weches rock placed on the ground for foundation piers. Besides an old road cut leading to the location, almost all of the sites were also identified by the surround vegetation. Large very old oak, hickory, or elm trees surrounding a house site were the most common visual indicator; yet in some cases, fruit trees such as pear, persimmon, or peach were visible. Flowering yard ornamental plants were also visible, such as iris or rain-lily. Often wisteria vines were climbing every available surface (Figure 74).
During the spring survey of 2004, Dr. Corbin identified a house site just west of the Boregas Creek rock crossing and south of the old road that yielded ceramics, glass, and metal from the early 1800s. The house site was located in an area of recently cut forest (Figure 75). The ground visibility was very good and artifacts and foundation stones were easily seen.

Figure 75. Connie Hodges [left] and Dr. Jim Corbin [right] survey old home site adjacent to identified old road system. Well depression is in the notch of the bushes at the right rear.
Just west of the house site was a 2 meter (6.6 feet) diameter well depression approximately 1.5 meters (4.9 feet) deep. The well was between the house and the old road, possibly offering refreshment to passersbys. Land ownership records showed that this property was on the northeast corner of the Pifermo Grant mentioned in the 1852 court case. All of the house sites and abandoned homes encountered during the survey were mapped and photographed (Appendix C).

Numerous cemeteries are within the study area, but only six were in the surveyed area. The cemeteries were mapped and recorded adding to the overall inventory of human activity within the study area. Mason Cemetery is east of Highway 87, and is where James Mason (the defendant in the 1852 Shelby County District Court case) is buried. Buckley, a 20\textsuperscript{th} century African-American cemetery, is adjacent to Carter’s Ferry Road and was built over a segment of the old road. Closer to Boregas Creek is King Cemetery approximately 135 meters (443 feet) north of the modern road. King Cemetery has several exceptional Woodman-of-the-World headstones from the early 20\textsuperscript{th} century as well as several older Weches cut rock crypts.

South of Highway 21 is the Gasby-New Zion Cemetery. The Gasby-New Zion Cemetery has a long and distinguished history because of the many prominent pioneer African-Americans who settled in the region and who are interred here. Farther west near Lobanillo Creek, the first African-American
Baptist Church in Texas was formed in 1868 as the County Line Missionary Baptist Church. Southwest of Lobanillo Creek is McMahan’s Chapel Cemetery. McMahan’s Chapel was established in 1833 as the first protestant church in Texas. The first church built was an oak log building near well known springs. Many renowned pioneer Texans are buried in McMahan Chapel Cemetery.

Near the end of the surveyed area, in western Sabine County, is the Scurlock Cemetery. The Scurlock families were distinguished early Texas pioneers who fought in the Texas revolution against Mexico. William Scurlock fought at both the battles of Goliad and San Jacinto. He later served in the Republic of Texas Congress, and he fought in the Mexican War of 1845. William’s brother Mial was killed during the fall of the Alamo. Several Weches cut rock crypts were also seen in this cemetery (Appendix D).

The field survey was concluded upon reaching the community of Geneva. The entire length of Carter’s Ferry Road was surveyed starting just east of Highway 87 and extending southwest to its intersection with FM 330 in Geneva for a total length of 7.9 kilometers (4.9 miles). Across this stretch of survey, thirty-nine additional segments of old road depressions were mapped (Figure 76).
The entire survey recorded a total of fifty-eight individual road segments with a linear total of 4.6 kilometers (2.9 miles) of road features making up the old road system. The average depth was just over 2 meters (6.6 feet), and they had an average width of 2.7 meters (8.9 feet) (Figure 77).
Data Analysis

The result of repeated heavy travel across the Spanish roads from countless pack trains, 2 wheeled carts, and later 4 wheeled wagons has left its imprint in the archaeological record. Using the data collected during the field survey, a careful investigation of the physical setting crossed by the recorded road system was conducted in order to develop a set of landscape criteria for
defining what constitutes a Spanish road’s expression in the archaeological record.

The appearance of an old road feature in the forest ranged from a wide V to a flat bottomed U extending through the forest as a linear depression or cut in the landscape. Four basic shapes were identified with many of the road segments exhibiting more than one shape across its length (Figure 78). All of the located road cuts fit into the four categories, yet each of the four categories had wide ranges of depths and widths across their lengths.

Although the individual road segments had greater variability, the average depth-to-width ratio across the entire road system was 0.98 indicating that the combined impact of each of the four categories on the surface of the ground was severe. The combined segments had an average impact on the surface of approximately 2 meters (6.6 feet) in depth and 2 meters (6.6 feet) in width across the entire road system length.

Elevation of the individual road segments was extracted from the DTM resulting in a range of values that increased toward the east with lower elevations to the west as the crest of theuesta gently gives way to the southwestern facing backslopes. The elevation across the roads ranged from 78 meters (226 feet) to 160 meters (525 feet).
Figure 78. Four basic road shapes identified from field survey data. J.M. Williams sketch from field surveys.
Slope and aspect were also calculated in the GIS from the DTM. Slope is a measure of gradient or the maximum spatial change across a surface and was expressed as a percent. The average slope across the entire road system was 7.9 percent; however, the greatest change in gradient was along the eastern section of the study area where the old road climbed out of the Sabine River valley (Figure 79). As the old road climbed through *La Questa Alta*, it was on a 12.4 percent slope that gradually gave way to the crest with a much gentler slope of 6.3 percent.

![Figure 79. Slope percent derived from 10-meter DTM. The questa front is facing east (Williams 2007).](image-url)
Aspect calculates the direction a slope faces and is expressed by a cardinal direction such as NNW or ESE. The majority of road segments located during the survey crossed southwest facing slopes that may have been selected for because of their more gentle nature (Figure 80).

Figure 80. Aspect derived from DTM showing a preference for southwest facing slopes (Williams 2007).
The located road segments occurred more often in forested areas than in clearings like open pasture. The major forest cover type was pine-hardwood. Topographic position on the landscape was determined in the field using a scale of 1 to 5, where 1 is a flat creek bottom and 5 is a ridge. The mid-values are the description of slope such as toe of the slope [2], side slope [3], or crest of the slope [4]. The majority of road features identified were on a forested side slope with a predominance of pine and hardwood trees.

The Reklaw and Weches formations are the primary surface geology crossed by the old road system. The Weches Formation overlies the Reklaw Formation and at the contact of the two, low scarps form from the more resistant strata of clay-ironstone. In many places this forms a gravelly surface of reddish brown ironstone with shallow quartz sandstone deposits. The contact of the two formations was utilized as a hard rock crossing over Boregas Creek (Figure 81).
Published soils for this area are incomplete. Enough information exists, however, to characterize the soils crossed by the old road system. The majority of road segments crossed various soils types of fine sand and clay loam, yet approximately 14 percent of the road segments crossed Cuthbert Gravelly Fine Sandy Loam while both Kirvin Fine Sandy Loam and Trawick Clay Loam were each crossed by 12 percent of the recorded road segments (Figure 82).
Cuthbert Gravelly Fine Sandy Loam was a moderately deep upland soil in areas leading into major drainages. It overlaid yellowish red clay subsoil and was found along the eastern end of the surveyed roads in the area of La Questa Alta. Kirvin Fine Sandy Loam was found along the mid-section of the roads surveyed. It was a deep soil with about 15 percent gravel that was found on ridges and interstream divides. Trawick Clay Loam was found on the side slopes above drainages and was a dark red deep soil that is well drained. Soil
compaction was very noticeable in the road cuts, and in certain areas, erosion or deflation had impacted the profile of the road (Figure 83).

![Figure 83. Erosion impacting an old road cut.](image)

Using the Spatial Analyst Near Tool of the Proximity Toolbox in ArcGIS, the final parameter measured was distance to perennial water. The distance-to-water class was considered Near because in all cases, the distance from any road segment to water, either as a spring or seep, a stream, or a well, was less than 500 meters (1,640 feet). The distance-to-water class indicated that this
route may have been selected for because of the proximity of available water (Figure 84).

![Figure 84. Distance to perennial water demonstrated that the identified old road system was a well watered route (Williams 2007).](Image)

**Definition of a Spanish Road**

Determining the physical properties of an early Spanish road and the relationships that these properties had with the landscape helped to develop a
definition of an early Spanish road’s expression in the archaeological record. The definition developed from these parameters was specific to the landscape crossed by the old road system within Sabine County.

The Spanish road was characterized by deep imprints on the landscape from many years of heavy and repeated traffic across the road. In many places this imprint was seen as discontinuous segments of a wide shallow V or a flat bottomed U shaped depression extending in a linear fashion through the forest. Many of the discontinuous road segments were separated by more than the visual range through the forest; yet by following the general compass direction from the last identified road segment, a new road segment was found. The discontinuous road segments aligned with each other to form a road system with an apparent direction conforming to historical records of Spanish activity locations. The depressions were combined into one or more four basic shapes with many variations in depth, width, and shape across each road segment length. The narrow and rounded, very narrow and rounded, and the wide and rounded were the most common shapes.

The greatest changes in elevations were a factor of climbing out of or into the Sabine River valley while attempting to reach the easy passage of a ridge or a suitable crossing of Patroon Bayou. In trying to reduce the effort of crossing steep grades, the road utilized side slopes as it wound around the contours of the landscape. To lessen the need to cross streams, the road used wide somewhat
level ridges where possible. Southwestern facing backslopes were also used and afforded a much easier grade and may have been selected for this attribute.

The Spanish road segments occurred more often in pine-hardwood forested areas suggesting preservation due to fewer landscape alterations. The gravelly surface deposits of the Reklaw and Weches formations, and the gravelly soils that formed over them, appear to have been sought out for better compaction and traction. Hard rock crossings at the contact of the Weches Formation and the underlying Reklaw Formation were utilized for easy passage over major streams, and the proximity to water either as a spring, seep, or stream indicated that the selection of a route with abundant available water was preferred.

**Archaeological Landscape Visualization Model**

The GIS managed archaeological landscape visualization model was used to combine historic research and spatial data analysis with the field survey data as an aid in visualizing the located road segments across the surveyed area. As they were recorded, the road segments were viewed in a 3D-environment to help in understanding the direction and the position the specific route took across the landscape (Figure 85).
As new road segments were located, their changing physical parameters were incorporated into the model. The model was then used, in a dynamic and concurrent process, as a single analysis and visualization tool for understanding the landscape crossed by the specific road segments. To aid in comprehension of the road system, records acquired from historic research were combined with the Spanish road characterization. Along with this information, other road segments previously located near or parallel to existing Sabine County roads
were used to aid in locating additional road features resulting in a complete Spanish road system across Sabine County.

Along Highway 21 in western Sabine County, several segments of the old road can be seen as the modern highway right-of-way (ROW) cuts across the road system (Figure 86). Many years of improvements, along with the widening and straightening of Highway 21, has obliterated most of the old road, yet it was possible to locate and map enough segments to develop a strategy for filling in the missing pieces.

Figure 86. Parallel old road cuts visible from State Highway 21.
Using the archaeological landscape visualization model, suitable landscape areas were quickly identified that conformed to the Spanish road characterization and that fit historic references. Most of the identified areas were parallel to and could be viewed from the modern roads; however, a pedestrian survey was required to cover thickly forested areas (Figure 87).

During the late spring, the field survey continued across the newly identified areas. The survey used the same techniques previously mentioned to
locate and record old road segments; however, this was a much larger area and required more interaction with the archaeological landscape visualization model to isolate potential road locations. As old road segments were located, the archaeological landscape visualization model was updated to incorporate the latest findings. This provided an efficient method of evaluating specific areas for possible routes, and when combined with knowledge acquired from the previous field surveys, it was instrumental in locating additional road segments.

Results of this continued research included the surveying of an additional 452.4 hectares (1,117.9 acres) for an additional linear total of 26 kilometers (16.2 miles). This supplementary survey resulted in locating and recording one hundred and seven old road segments totaling 9.7 kilometers (6.0 miles) of which only 5.3 kilometers (3.3 miles) are considered of Spanish origin (Figure 88).
The additional field survey continued past Geneva and included areas parallel to Highway 21 as well as areas parallel to Sabine County roads in the vicinity of Geneva. The town of Geneva, first known as Jimtown, was established in the 1850s on the Old San Antonio Road in an area with abundant spring water. Within Geneva, east of and adjacent to the old Post Office, a portion of the old road can be seen (Figure 89).
Farther west along Highway 21, before reaching the San Augustine County line, several additional old road segments can also be seen from the highway. Highway 21 cuts into the old road in many places removing all traces except for a few segments of old road that veer away from the highway ROW or in places an occasional cut bank not associated with the modern highway (Figure 90).
West of Lobanillo Creek and north of Highway 21 are a set of springs known as Lobanillo Springs. These springs were once on land owned by Antonio Gil Y’Barbo and were a part of his Lobanillo rancho. The springs are known to have been used by a nearby wayside inn during the 1820s, and for early travelers, these springs were a welcome destination. In 1976 these springs were surveyed where it was learned that immediately south of the springs is a deeply eroded segment of El Camino Real known locally as the “Dugout” (Brunne 1981:394).
The “Dugout” is an eroded trench cut into the hillside rising out of the western side of the Lobanillo Creek bottom. It is west of and immediately adjacent to an occupied house. This extreme road feature is approximately 5 meters (16.4 feet) deep and 4 meters (13.1 feet) wide and filled with household trash (Figure 91). The springs were almost completely covered by erosion from the hillside.

South of Geneva opposite FM 330, a faint road depression split into two segments as they spread out along south facing ridges. These depressions were
very shallow and in places were lost in the undergrowth only to be seen again farther on down slope as faint traces. They did not conform to the Spanish road characterization and all signs of them were lost approximately 1 kilometer (0.62 miles) south of Highway 21 (Figure 92).

![Figure 92. Surveyed old road segments south of Geneva (Williams 2007).](image)

An old community road system was identified from property ownership maps. This road system was the route identified in western Sabine County by Major V. N. Zively in 1915 as being the King’s Highway. It had many segments coming from the north and east that connected together before crossing
Lobanillo Creek. It has sections that are still in use, but it also has many segments that are no longer used (Figure 93).

Figure 93. Portion of old road system west of McMahan’s Chapel.

This road system was surveyed as it runs southwest from Geneva crossing first Maddox and then Lobanillo creeks before it connected with the road to McMahan’s Chapel. There are many farms with houses along this road. After
passing McMahan’s Chapel Cemetery, the old road swung west and crossed Palo Gaucho Bayou before creating deep parallel cuts on the west side of the bayou as it climbed out of the bottomlands onto the crest of a southeast running ridge.

King’s Road, an east to west road, cuts off the bend of Highway 21 through Geneva joining Highway 21 approximately 3 kilometers (1.8 miles) west and east of Geneva. Along the south side of King’s Road east of Maddox Creek, is a singular road cut that is 152 meters (499 feet) long, 3 meters (9.8 feet) deep, and 2.5 meters (8.2 feet) wide. On the north side of the road is a much shallower road cut. Along King’s Road, fourteen discontinuous old road segments were located and recorded for a total of 1.1 kilometers (0.68 miles) of old road features. The old road segments conform to the Spanish road characterization as they parallel King’s Road sometimes on one side of the road and sometimes on the other (Figure 94).
By using the archaeological landscape visualization model to evaluate landscape choices that fit historic references and that conformed to the definition of a Spanish road, it became obvious that the fork of the roads mentioned in the depositions of the 1852 Shelby County Court case was in the vicinity of the intersection of King’s Road and Highway 21 west of Geneva.

On the west end, King’s Road swings due north about 350 meters (1,148.3 feet) south of the Highway 21 intersection. By taking into account a Spanish roads expression in the archaeological record, a large area comprised of
25 hectares (62 acres) was selected for additional pedestrian surveys. Within this area, forty-nine old road segments were located in a complex of parallel roads curving down across a north facing side slope of a ridge extending west into the Lobanillo Creek bottom (Figure 95).

![Figure 95. Located road segments at Lobanillo Cuts (Williams 2007).](image)

The Lobanillo Cuts are made up of forty-nine individual road segments that have a combined length of 1.9 kilometers (1.2 miles) with the largest and deepest road cut being 3.5 meters (11.5 feet) deep and 6 meters (19.7 feet) wide. The most common of the four basic road shapes in the Lobanillo Cuts was
wide and flat, and the average depth was 1.6 meters (5.3 feet) with the average width being 3.8 meters (12.5 feet). The greatest concentration of road cuts was composed of seven parallel roads features (Figure 96). Another concentration was composed of four parallel road features each 3 meters (9.8 feet) deep and 3 meters (9.8 feet) wide (Figure 97).

Figure 96. Parallel old road segments crossing the Lobanillo Cuts area (Williams 2007).
This area has an 8 percent grade and is crossed by the deep fine grained sands and sandstones of the Carrizo Sands geologic formation and the Darco Loamy Fine Sand soil series. The deep parallel road cuts indicated that the soil and underlying geologic formation could not support the volume of traffic using the roads resulting in the parallel road complexes (Figure 98).

Figure 97. Two complexes of parallel road segments in the Lobanillo Cuts area (Williams 2007).
Figure 98. Looking east at deep parallel old road depressions in the Lobanillo Cuts area. In contrast to built up logging tramways, these depression features joins together just out of view toward the east and approximately 60 meters (197 feet) to the west.

The number of very deep road cuts as well as the average width of 3.8 meters (12.5 feet) also indicated that this route was used by heavy Anglo-American wagons rather than the two wheeled carts of the Spanish (Figure 99). All four of the previously identified basic road shapes are expressed in this complex of interconnecting road segments.
The value of using a GIS managed archaeological landscape visualization model was demonstrated with the identification of these large road complexes. The model allowed the archaeological evidence to be viewed in such a way that an understanding was gained for the placement of the roads in relation to the physical landscape. Used in a dynamic iterative process of historic research, field surveys, and data analysis, this model allowed for comparing the changing road parameters with possible landscape choices and helped to gain a deeper understanding of the forces influencing the travel of those who followed the road.
DISCUSSION

The deep and narrow nature of many of the located road segments of *El Camino Real* and *El Camino Carretera* can be explained by the repeated use of supply pack trains or carts traveling in single file across the same route over and over again.

In December of 1721, after leaving Los Adaes on their return trip to Mexico, the Aguayo expedition came upon its second convoy of supplies on the road. Padre Peña wrote that “His Lordship [the Marquis de Aguayo] encountered the awaited second convoy from La Bahía. On that same day he sent to Los Adaes 100 of its loads of flour and other provisions. The rest was kept for maintenance during the journey” (Peña 1981:73). Peña does not mention the animals used to carry the loads nor does he mention the size of the first or the second convoys, but presumably the pack trains must have been large enough that sending 100 of its loads to Los Adaes was just a small portion of the much larger second convoy. This reference indicated that it was not uncommon for very large pack trains or convoys of two-wheeled carts to cross the roads while supplying the missions and *presidios*.

Not wanting to get off of the roads for fear of getting lost or losing the road, the early Spanish explorers stayed on the same road over and over again.
creating the depressions seen today. According to the 1557 account of De Soto’s expedition, Moscoso’s army appeared to have been staying on the road to the Caddo as “they feared lest they get lost in some unpeopled region,” so that when a guide led them “off the road for two days,” Moscoso had him put to death before returning to the roadway (Swanton 1985:262 [1939]).

The landscape influences affecting road placement were studied by careful observation of these early roads. The influence of the physical landscape on the selection of one place over another was of special interest to this archaeological research, as was the historical context in which events creating the old road system occurred. The development of a GIS for inclusion of linear features, as expressed in the archaeological record, posed unique challenges in mapping the remains of physical features because the features were often incomplete; having been destroyed, buried, or otherwise obscured as in a forested environment. Nevertheless, the ability to visualize the character of the physical landscape while incorporating both historic and field research into a single analysis tool is a strength that GIS brought to this research.

The development and use of a GIS geodatabase model as an integrated research oriented archaeological landscape visualization system demonstrated that a landscape level GIS can be used effectively to examine archaeological evidence as it relates to physical landscape features influencing the selection of preferred locations for Spanish road placement. The archaeological landscape
visualization model was designed and used as a dynamic process of landscape resource visualization and spatial analysis. An understanding of the landscape position of a road segment and the landscape forces influencing the selection of that location were refined through repeated iterations of analysis that allowed for determination of limiting or enhancing landscape factors that when combined with field survey data and a Spanish road’s definition were used for locating additional road segments.

Dr. James Bruseth, Deputy State Historic Preservation Officer and Director of the Archaeology Division of the Texas Historical Commission, stated that the ability to have iterative processes in archaeological investigations provides an invaluable tool for investigating the associations and relationships of discovered archaeological features and the artifacts recovered with the features (Jim Bruseth, personal communication 2007).

By its very nature, archaeology is a spatially oriented science and therefore an ideal geospatial application. In the research presented here, the use of a GIS managed archaeological landscape visualization model was essential for understanding the selection of one location over another. Based on landscape opportunities or limitations, the model was used within the constraints of the archaeological attributes and parameters associated with located road segments. The interactive and iterative design process continually redefined the data model as the GIS application was developed. This led to the identification
of locations to be looked at, and through continued field surveys, to the
development of major road complexes at Lobanillo Cuts meeting the historic
description of the lower *El Camino Real* to the Sabine River crossing at Gaines
Ferry.

Historic research showed that Juan Maximillan and his uncle cut a bridle
path across their property from *El Camino Real* to what became, after 1818, the
road to Gaines Ferry. Due to the overwhelming archaeological evidence of the
large road complexes curving east from Lobanillo Cuts, the deep old road cuts
paralleling King’s Road toward the east, and historical documents providing oral
history of the roads location, it was determined that the Lobanillo Cuts are the
lower road to the Sabine River sometimes known as *Camino Chabinan, El
Camino Real*, The King’s Highway, Gaines Ferry Road, or the Old San Antonio
Road.

From this location, the old road system paralleling Highway 21 to Geneva
and then northeast along Carter’s Ferry Road, is *El Camino Carretera* mentioned
in the historic documents. Physical features of note mentioned in General Pedro
de Rivera’s 1727 report to the Spanish Crown such as crossing *La Quest Alta*,
going past the steep *Arroyo del Patrón*, and crossing over *El Patrón* or *Puerto de
Patrón* before arriving at the shallow fords of *El Rio de San Francisco de las
Sabinas* have been identified along this route. The physical landscape features
given names and mentioned by early travelers of these roads had meaning and
conveyed meaning to others intent on traveling to these outposts. *La Questa Alta* or *Puerto de Patrón* are but a couple mentioned frequently by the early travelers. Whether they were names of prominent features easily recognized, or they described some feature to be overcome or even if they describe a destination, these places were important enough to be used and reused. As a place of value, *El Camino Carretera* is the first road mentioned by the Spanish linking the eastern most Spanish missions with the avenue of their support hundreds of kilometers to the south. Isolated on the Spanish frontier, the outposts of the Texas Province of New Spain relied on and heavily used *El Camino Carretera*.

Determining the physical landscape parameters crossed by the located road segments, along with the development of a definition of a Spanish road’s archaeological expression, made it possible to understand the nature of the road’s appearance through the forest. The calculation of a single numerical value [depth-to-width ratio] representing the impact of a Spanish road on the landscape also made it possible to gage potential affects on additional areas of interest that had similar landscape characteristics. When used in an integrated GIS archaeological landscape visualization model, repeated iterations of historic research, field surveys, and spatial data analysis have demonstrated that landscape resources can be determined and used effectively to locate Spanish road features on the landscape.
CONCLUSION

By the late 17th century the earliest European explorations into East Texas were utilizing the many trails, traces, or pathways that linked long established Caddo villages. Coming to East Texas to curb French interests in trade with the Indians, the Spanish established missions and presidios along the trails near Caddo settlements. To supply and communicate with these frontier outposts, the Spanish cleared and widened the existing trails, creating a network of roads that linked the series of missions and presidios. Established by Governor Alonso de Léon’s 1690 expedition, El Camino Real de los Tejas or The King’s Highway provided a lifeline of support that existed for over one hundred years.

Used as a corridor of immigration in the 19th century, Anglo-Americans traveled The King’s Highway or the Old San Antonio Road in ever increasing numbers. Road improvements and ferry crossings became common, and the road became a formal and well known entry way into Texas. Persisting into the 20th century, the Old San Antonio Road or El Camino Real was memorialized by the creation of Texas State Highway 21 following the route of the old road. The locations of the old road, first identified by Major Zivley in 1915, have been commemorated by the erection of State Historical Markers (Figure 100).
El Camino Carretera is an early segment of El Camino Real de los Tejas that has been documented in numerous historic references. El Camino Carretera crossed the Sabine River at a well known ford in eastern Sabine County, Texas. Pedestrian archaeological surveys were conducted over a defined study area in north central Sabine County and resulted in the location
and identification of existing portions of *El Camino Carretera*. Using historical research with the data collected from archaeological field surveys, spatial data analysis was conducted in a GIS managed archaeological landscape visualization system specifically developed for managing archaeological evidence with physical landscape data.

Remote sensing using historic aerial photography identified flooded ferry crossing locations mentioned in the historic literature and provided a way of visualizing and analyzing landscapes of the past that can not be visited in the present (Figure 101). Road networks, farms, and forestry related activities were identified from the historic aerial photographs which helped to locate areas where connecting road segments might be located.
Additionally, individual road segments, located during the initial field survey, were used for determining physical landscape variables associated with road placement. The resulting set of landscape criteria supported the development of a definition for what constitutes a Spanish road’s expression in the archaeological record. Using this information, the archaeological landscape visualization model aided in the discovery and identification of additional existing remnants of 17th and 18th century road features.
A Spanish road in East Texas is characterized by deep imprints on the landscape from many years of heavy and repeated traffic across the road (Figure 102). Deep linear depressions were the most common expression of an old road segment. Discontinuous road segments formed a wide shallow V or a flat bottomed U shaped depression extending linearly through the forest. Although discontinuous, the individual road segments were aligned with each other to form a singular road system. Even with great variation in depth, width, and shape across each road segment length, the linear depressions conformed to one or more four basic shapes of rounded and narrow, very narrow and rounded, wide and rounded, or flat and wide (Figure 103).

Elevation, slope, and aspect crossed by the roads were selected for in an attempt to reduce the effort required to cross steep grades and to lessen the need to cross difficult areas such as streams or wet bottomlands. Gravelly soils were crossed more often suggesting that these areas were sought out for better compaction and traction.
The contact zones of the Weches and Reklaw geologic formations were used for easy passage over major streams because of the hard rock exposed at accessible crossings. The location of existing old road segments also suggested that a route with abundant available water was preferred. Occurring more often in heavily forested areas, existing road remnants may have been preserved because of fewer landscape alterations.
Figure 103. Four basic road types identified from the field survey.
The research results presented here contributed to the identification of existing road features associated with *El Camino Carretera* and *El Camino Real de Los Tejas*. The total linear distance covered during the entire four season survey was just over 33.9 kilometers (21.1 miles), and the total area covered was 614.4 hectares (1,518.2 acres). A summary of the findings are as follows:

<table>
<thead>
<tr>
<th>ROAD NAME</th>
<th># OF SEGMENTS</th>
<th>TOTAL LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Camino Carretera</em></td>
<td>62</td>
<td>4.9 kilometers (3.0 miles)</td>
</tr>
<tr>
<td><em>Camino Chabinan</em> [Gaines Ferry Road]</td>
<td>82</td>
<td>5.3 kilometers (3.3 miles)</td>
</tr>
<tr>
<td>Other old road segments</td>
<td>21</td>
<td>4.0 kilometers (2.5 miles)</td>
</tr>
<tr>
<td><em>El Camino Real de los Tejas</em></td>
<td>165</td>
<td>14.2 kilometers (8.8 miles)</td>
</tr>
</tbody>
</table>

Of the one hundred and sixty-five located old road segments, approximately one hundred and forty-four, totaling 10.2 kilometers (6.3 miles), are considered to be portions the two roads known as *El Camino Real* discussed in the 1852 Shelby County Court case (Figure 104).

The cultural inventory outlined in this document adds to the historical knowledge of the East Texas region by providing an inventory of existing Spanish road features following routes first serving as corridors of communication and trade between Caddo villages, then as avenues supporting colonial interests, and finally as major entry ways for Anglo-American colonization of Texas. Adding to
archaeological GIS theory as well, this research documented the development and use of a geodatabase design framework for creation of an archaeological landscape visualization model used to locate and identify existing but not recognized segments of *El Camino Real de Los Tejas*.

The King’s Highway continues to be an important component of Texas history. Texas State Highway 21 was designated as a National Historic Trail administered by the National Park Service because it approximates the original
*El Camino Real de Los Tejas* route through Texas. The importance of this National Trail has been deemed worthy enough by the United States government to be protected and preserved in perpetuity as a historically significant resource of our national legacy.
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APPENDIX A

Water Sources

Spring at Lobanillo Cuts

Stream

Well depression

Spring

Boregas Creek

Brick well
APPENDIX B

Spanish Road versus Non-Spanish Road
APPENDIX C

Old Home Sites
APPENDIX D

Cemeteries

King’s Cemetery

McMahan Chapel Cemetery

Scurlock Cemetery

Gasby-New Zion Cemetery

Buckley Cemetery

Mason Cemetery
VITA

Jeff Williams graduated *summa cum laude* from Stephen F. Austin State University in 1995 with a Bachelor of Science degree in Geography with a minor in Anthropology. After college, Jeff worked for several years providing GIS and remote sensing services for a nationwide environmental consulting firm. Leaving the private sector, Jeff entered public service at the state level as a GIS Project Manager for the Resource Protection Division of Texas Parks and Wildlife Department. At the national level, Jeff served as Geospatial Project Manager for creation of the National Biological Information Infrastructure housed at the Houston Advanced Research Center. After returning to Nacogdoches, Jeff participated as a geospatial first responder during the Space Shuttle *Columbia* search and recovery. Jeff is currently employed as the GIS Systems Administrator for the Arthur Temple College of Forestry and Agriculture at Stephen F. Austin State University where he maintains the GIS laboratories while working with students applying geospatial technologies to ecological research.


This manuscript was prepared and typed by J.M. Williams.