

Chapter Five: Affected Environment

CHAPTER OVERVIEW

Chapters Five (Affected Environment) and Six (Environmental Consequences) provide the information and rationale for evaluating the fourth criteria for new parklands: whether or not the site requires direct management by the National Park Service instead of protection by another public agency or the private sector.

The descriptions, data, and analysis presented below focus on the general conditions or consequences that may result from implementing each management alternative. Chapter Five begins with a description of how environmental impact topics are addressed in the study. This is then followed by a description of the existing conditions that could be affected by the actions of the alternatives. This is intended to provide the reader a better understanding of the environmental context and to establish a benchmark by which the magnitude of environmental consequences can be developed for each management alternative.

IMPACT TOPICS

Impact topics, simply defined, are the resources and values that could be affected by the actions of the management alternatives considered in the study. They serve to focus the environmental analysis and to ensure the relevance of impact evaluation. Impact topics were identified based on federal laws and other legal requirements, Council on Environmental Quality (CEQ) guidelines, NPS management policies, staff subject-matter expertise, and issues and concerns expressed by the public and other agencies during the study process. This document addresses the impact topics in one of two ways: either a rationale is provided for dismissing the topic from further consideration or the topic is described in more detail under the following existing conditions section and included in

the assessment and analysis described in chapter six.

IMPACT TOPICS DISMISSED

The following mandatory impact topics were dismissed from further consideration and analysis.

Possible Conflicts between the Proposal and Land Use Plans, Policies, or Controls for the Area Concerned

All alternatives include providing preservation of the paleontological resources and providing opportunities for visitor enjoyment, all compatible uses under current zoning and the city of Waco's Brazos River Corridor Overlay District requirements. As there are no anticipated conflicts with any of the actions outlined under each alternative, this impact topic has been dismissed from further consideration.

Environmental Justice

Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions. This is to be done by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. According to the Environmental Protection Agency, environmental justice is the

...fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic,

or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

The goal of 'fair treatment' is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects and mitigate for such impacts.

Waco, Texas, contains both a minority and low-income population; however, environmental justice is dismissed as an impact topic for the following reasons:

- The planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- Implementation of any of the proposed actions would not result in any identifiable adverse human health effects. Therefore, there would be no direct or indirect adverse effects on any minority or low-income population.
- Implementation of any of the proposed actions would not result in any identified effects that would be specific to any minority or low-income community.

Energy Requirements and Conservation Potential

A detailed analysis of energy requirements and potential for energy conservation is not possible at this level of planning as this special resource study presents only conceptual alternatives for managing the special resources of the Waco Mammoth Site. Because energy requirements and conservation potential would be addressed in future environmental compliance documents, as appropriate, this impact topic has been dismissed from further consideration.

Indian Trust Resources

Indian trust assets are owned by American Indians but are held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal-Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." The study area has not been identified as an Indian Trust resource; therefore this impact topic has been dismissed from further consideration.

Indian Sacred Sites

Executive Order 13007, "Indian Sacred Sites," states that those with statutory or administrative responsibilities for the management of federal lands shall accommodate ceremonial use of and access to Indian sacred sites by Indian religious practitioners, as well as avoid affecting the physical integrity of the sacred site. An "Indian Sacred Site" means any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site. The Waco Indian Tribe was contacted during the study process and has provided no notification of any resources or traditional uses associated with the site. As the study area has not been identified as an Indian Sacred Site, this impact topic has been dismissed from further consideration.

Archeological Resources

Currently, there are no known sites with archeological resources within the Waco Mammoth Site. The Waco Mammoth Site itself is listed with a Texas Historical Commission archeological trinomial

(41ML207), perhaps because it at one time was thought to be Paleo-Indian as a possible kill site of mammoths circa 28,000 years ago. However, there have been no cultural materials found in the course of past paleontological excavations. As noted elsewhere in this document, more recent dating places the time of the mammoths' deaths at circa 68,000 years ago, well before the documented first appearance of Paleo-Indians in North America.

In the event that the Waco Mammoth Site should become a unit of the national park system, the National Park Service would conduct a systematic archeological survey within the boundaries of the Waco Mammoth Site on lands under its jurisdiction. Such research would include documenting and inventorying any evidence of archeological sites or other archeological resources such as isolated artifactual finds. The timing of the study would be subject to funding availability and would serve to inform about any prehistoric or historic archeological materials that might be found. Any archeological resources discovered would be evaluated for their eligibility for listing in the National Register of Historic Places.

For future paleontological excavations and ground disturbances of development under construction, known archeological resources would be avoided to the greatest extent possible or archeological monitoring procedures would be put into place to deal with any inadvertent discoveries of cultural artifacts. If discoveries were made, construction underway would be stopped immediately, the superintendent of the Waco Mammoth Site would be notified, and proper consultation would be initiated with the Texas Historical Commission's historic preservation officer (SHPO) and the Waco Indian Tribe in Oklahoma, which is traditionally associated with lands of the Waco area. Because (1) there is a dearth of known archeological resources, (2) such resources would be avoided in the future if they become known through archeological survey, and (3) monitoring and

mitigation would continue through SHPO and tribal consultation, if necessary, archeological resources is dismissed as an impact topic for further consideration and analysis.

Cultural Landscapes

According to the National Park Service's *Cultural Resource Management Guideline* (DO-28), a cultural landscape is

...a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.

The subject of cultural landscapes is dismissed as an impact topic for further consideration and analysis because none apply to the site and mammoth herd. A cultural landscape reflects human adaptation to the environment and the use of its natural resources. Such a landscape develops from inter-relationships among human-modified features and natural features and results in particular land-use patterns characteristic of certain activities. At the time of the life and death of the mammoth herd, no humans were there because the mammoth period at Waco occurred well before humans had entered the New World and migrated to the area. Thus, there can be no cultural landscapes associated with the site and the mammoth herd.

For interpretation to visitors, what might be termed a *Pleistocene landscape* for the propagation of Pleistocene plants could be inventoried, protected, and preserved to give visitors an idea of what the mammoths might have seen. However, such details would be part of a comprehensive interpretive plan for later development if the site should come into the national park system.

The remnant ranching structures mentioned below under historic structures could comprise a land-use pattern reminiscent of a ranching historic cultural landscape. However, as discussed below in the section on historic structures, the structures themselves lack significance related to the mammoth fossils and lack integrity in their own right as historic resources.

Historic Structures

The subject of historic structures is dismissed as an impact topic for further consideration and analysis because the remnant ranching structures are neither significant as contributing components to the paleontological resources constituting the purpose of the Waco Mammoth Site, nor do the remnant ranching structures possess integrity as historic resources due to their physical deterioration. Examples of the few outbuildings extant include a pump house to pump water to livestock, corrugated metal tubs and cement tubs to water livestock, and a pole barn and corral to hold cattle after a round-up. Eligibility for listing in the National Register of Historic Places would be very unlikely because of their lack of significance and integrity. In the event that the Waco Mammoth Site should become a unit of the national park system, the National Park Service would conduct a historic resource study. The research would include documenting the history of ranching on the site. The timing of the study would be subject to funding availability and would serve to inform and likely formally verify the initial NPS evaluation of national register ineligibility for the remnant ranching structures.

Ethnographic Resources

Ethnographic resources are defined by the National Park Service as any “site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it” (Director’s Order 28: *Cultural Resource Management Guideline*).

The National Park Service recognizes that the Waco Indian Tribe once lived in the Waco area where the land was part of the tribe’s traditional territory and that the Waco Indians in historic times lent their name to the European American settlement, town, and eventual city that grew up there. A written invitation to participate in the special resource study along with copies of the scoping summary and preliminary alternatives newsletters were sent October 4, 2007, to Mr. Gary McAdams, president of the Wichita and Affiliated Tribes in Oklahoma, of which the Waco Tribe is one of the affiliated tribes. The letter was seeking to inquire if he or other members of the tribal government would like to consult about the special resource study for the Waco Mammoth Site and any possible traditional uses associated with the site. There has been no response to date.

Cattle ranching occurred in recent times in relation to the land surrounding the core paleontological site. However, no ranchers and no ranching families have been identified whose use of Waco Mammoth Site lands might be traditional and pertinent to their cultural heritage.

Thus, neither with the Waco Indians nor with European American cattle ranchers has the National Park Service been able to identify any contemporary uses of the Waco Mammoth Site lands as ethnographic resources, or ethnographic resources eligible for listing in the National Register of Historic Places as traditional cultural properties. Therefore, the subject of ethnographic resources is dismissed from further consideration as an impact topic because none are known to exist at the site.

Hazardous Materials

Correspondence with the city of Waco’s director of environmental services indicates that there are no known brownfield sites in the vicinity of the study area. However, the city is aware of an existing plating business approximately 1.29 miles west of the study area that is currently under orders from the Texas Commission on Environmental Quality

(TCEQ), the state environmental agency, to clean up chromium, which has leached into the groundwater around its facility. The business is currently conducting remediation activities, and the city does not anticipate any adverse effects on the study area. The remediation work is being constantly monitored by the city, groundwater retrieved is below hazardous levels and is pretreated before allowed to discharge into the sanitary sewer system, and the study area is not down gradient of the plating business. The two sites drain in parallel directions towards the Bosque River.

There has not been an onsite survey of the study area for hazardous materials. If the study area were to become a new unit of the national park system, this would need to be undertaken and mitigation completed before any land transfers could be accepted by the federal government.

Since there are no known onsite contaminants that would meet current state or federal requirements for remediation, this impact topic has been dismissed from further consideration.

IMPACT TOPICS CONSIDERED

Potential impacts to the special resources of the Waco Mammoth Site are a primary concern of this study and therefore merit their own impact category. They will be assessed under the category “Fundamental Resources of the Waco Mammoth Site.” The existing conditions of the fundamental components (geological context of the discovery site, the *in situ* specimens, the collected specimens, and archival records) have already been described in “Chapter Two: Resource Description” and therefore will not be repeated under the existing conditions section that follows. This category also addresses the mandatory impact topics of “unique natural resources” and “important scientific resources,” and the discretionary impact topic of “paleontological collections and archives” (typically referred to as museum collections).

A number of other mandatory impact topics will be addressed under the category “Other Resources” and include:

- Soils including Prime Farmlands
- Floodplains and Wetlands
- Vegetation, Wildlife, Habitat, and Special Status Species

In addition, the following topics were identified through public and agency scoping and therefore will be described as part of the existing conditions as well as included in the impacts analyzed under “Chapter Six: Environmental Consequences”:

- Visitor Experience
- Management and Operations
- Socioeconomic Environment

For easier cross-referencing and to help simplify the presentation of the information and the analysis, the description of the existing conditions that follows is organized by the impact categories listed above. This organization was replicated in “Chapter Six: Environmental Consequences” to present the analysis and assumptions of impacts for each alternative under consideration.

DESCRIPTION OF EXISTING CONDITIONS

Regional Context

The Waco Mammoth Site is within McLennan County, in east central Texas, 230 miles inland from the Gulf of Mexico. The city of Waco, the county seat, is located at the confluence of the Bosque and Brazos rivers and at the intersection of Interstate Highway 35 and U.S. Highway 84, 90 miles south of Dallas and 90 miles north of Austin. Situated partially in the Grand Prairie and partially in the Blackland Prairie, McLennan County comprises 1,031 square miles of flat to rolling terrain at elevations ranging from 400 to 850 feet above sea level. The land in the western section of the county has varied terrain surfaced by

shallow, stony soils that support mountain cedar and oak. The eastern section is generally low rolling to flat, with black, waxy soils made up of clay and sand loams that support mesquite, scrub brush, and grasses. The county is bisected from southwest to northeast by the Balcones Fault, and the rolling prairie along the fault line is broken by locally steep slopes. The county lies entirely within the Brazos River basin and is drained primarily by the South and Middle Bosque rivers in the west and by the Tehuacana and Aquilla creeks in the east; the Brazos River crosses the county from northwest to southeast. (*The Handbook of Texas Online*)

McLennan County and Waco are located on the west boundary of the Gulf Coastal Plain, which experiences both a humid coastal climate and continental climate. The most commonly used climatic classification is humid subtropical. The southeastern breezes are usually moist and warm while the northern breezes are dry and cool. The continental features are most dramatic in the winter when polar air moves into the area and causes rapid changes in temperature, large variations in temperatures, and low temperatures extremes. The coastal climate is most evident in the spring when moist, warm air from the Gulf of Mexico brings humidity and precipitation to the area (*Environmental Atlas of McLennan County*). The temperature and humidity extremes typical of this climate pose a risk to the *in situ* specimens. Drastic fluctuations may cause the bones to expand and contract leading to fracturing, crushing, and/or delamination of the bone.

The Gulf of Mexico is the primary source of moisture for the area. The major topographic high, the Bosque Escarpment, trends NE-SW and influences local climate by forcing warm, moist air to rise and cool, thus producing precipitation. This feature parallels the west bank of the Bosque River near the study area. Approximately 75% of the total precipitation is caused by thunderstorms and frontal storms (*Environmental Atlas of McLennan County*). Major rainfall events over the past 30 years have repeatedly uncovered additional

paleontological material within the excavation area. The erosion potential from these storm events continually poses a threat to the *in situ* specimens.

Soils, Including Prime Farmlands

Most of the soils in the McLennan County are formed under prairie vegetation and are dark colored clays, silty clays, or clay loams. In some areas on terraces along the Brazos River, the soils formed under post oak-savannah vegetation. These soils are mostly light colored sandy loams or loamy fine sands. (*McLennan County Soil Survey*)

Based on correspondence with the United States Department of Agriculture, Natural Resources Conservation Service, McLennan County Soil and Water Conservation District, nearly 47% of the soils (over 300,000 acres) found in McLennan County meet the requirements for prime farmland. Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. This category requires that the land is available for farming uses. Over three-quarters of the study area (over 80 acres) is designated prime farmland. Of the five soil types found there, the following four soil types are designated as prime farmland:

Bastil Fine Sandy Loam (BaA): This deep, well-drained soil is found on slopes ranging from 0% – 2% on the upper terrace area of the site. The soil is well drained and the shrink-swell potential is low. Major limitations for development include the potential for seepage of effluent into groundwater in areas used for septic tank absorption fields as many areas are underlain by beds of sand and gravel. This soil type covers almost 35 acres or 31% of the study area and is found in four pockets surrounding almost 26 acres of *Wilson Clay Loam (WnA)*, a claypan prairie soil, which is not considered prime farmland. This soil has a very slow permeability with a high shrink-swell potential. Major limitations to development include potential for septic systems to fail because of very slow

permeability and shrink-swell characteristics may cause infrastructure to crack or buckle.

Burleson Clay (BuA): This is a deep, fertile blackland clay soil, found in an isolated, upland 3-acre pocket in the west central portion of the site. The soil has a very slow permeability with a very high shrink-swell potential. Limitations for development are similar to the Wilson Clay described.

Frio Silt Clay (Fr): This is a deep, well-drained, fertile clay loam and loam alluvial soil found along the lower terrace floodplain area bordering the Bosque River. This soil type covers almost 8 acres or 7% of the site.

Sunev Clay Loam (SzB): This is a nearly level to rolling upland clayey soil found over 36% of the site between the Bastil and Frio soils. The soil has a moderately slow permeability, moderate shrink-swell, and experiences occasional flooding. The major limitation to development is the severe hazard from flooding.

The study area is not currently under active cultivation; although previously the site has been actively grazed and was used for cattle ranching and/or dairy farming.

Floodplains and Wetlands

Executive Orders 11988 and 11990, “Floodplain Management” and “Wetlands,” respectively, require analysis of impacts on floodplains and regulated wetlands. Based upon an examination of the FEMA Flood Insurance Rate Map (dated 1988) for the Waco area, the 100-year and 500-year floodplain both exist within the study area. The 100-year floodplain occurs along the lower terrace area of the site where the Frio silt clay soils border the Bosque River. The 500-year floodplain extends upslope within portions of the same drainage swale where the mammoths were first discovered. It appears that the upper fringe of the 500-year floodplain terminates at or just prior to the excavation area.

The Army Corp of Engineers does not have any records of a wetland delineation being prepared for the site. It is assumed that a wetland fringe exists along the lower terrace area of the site containing Frio silt clay soils bordering the Bosque River.

Vegetation, Wildlife, Habitat, and Special Status Species

Onsite surveys of vegetation were not conducted as a part of this study. The vegetation mapping provided by the Environmental Atlas of McLennan County was consulted as the primary reference for this section.

Along the Brazos terrace areas, the major vegetation type is dominated by post oak and blackjack oak in canopy and prairie species such as little false bluestem in the understory. Much of the terrace area has been grazed and the post oaks are found as isolated patches protected by fences. Where cattle have been allowed to graze, the trees are in savannah, and where the trees are protected from grazing they are in thicket. Mesquite is an invader that is often enhanced with overgrazing. Grazing also encourages increased amounts of short grasses, annuals, pricklypear, elm, and juniper.

Along the Bosque riverfront alluvium, large deciduous trees such as pecan, cottonwood, willow, and elm are typical. Grassland appears between these large deciduous trees and the terrace scarps. Other floodplain trees include bur oak, live oak, hackberry, and sycamore. The deep alluvial soils and the abundance of water allow these trees to become very large.

Onsite surveys of wildlife and special status species were not conducted as a part of this special resource study. However, according to the Handbook of Texas Online and other published accounts, some of the more common wildlife species found in McLennan County include whitetailed deer (*Odocoileus virginiana*), beavers (*Castor Canadensis*), bobcat (*Lynx rufus*), fox (*Vulpes vulpes*) coyote (*Canis latrans*), raccoon (*Procyon lotor*),

striped skunk (*Mephitis mephitis*), eastern spotted skunk (*Spilogale putorius*), opossum (*Didelphis virginiana*), cotton tail rabbit (*Sylvilagus floridana*), fox squirrel (*Sciurus niger*), turkey (*Meleagris gallopavo*), bobwhite quail (*Colinus virginianus*), and mourning dove (*Zenaida macroura*). Prior to extensive settlement, the county's wildlife also included antelope, bison, bear, and javelina.

Consultation with the U.S. Fish and Wildlife Service, Austin Ecological Service Office, as of August 11, 2005 and the Texas Parks and Wildlife Department, Wildlife Division, Non-game and Rare Species and Habitat Assessment programs, County Lists of Texas' Special Species, McLennan County revised June 2, 2005 revealed the following list of special status species with confirmed sightings and/or are known to migrate through McLennan County. A review of the federal and state lists published online was conducted February 12, 2008. Changes noted include the federal delisting of the bald eagle, the addition of two more state listed endangered species: the American peregrine falcon and the red wolf, and one more state listed rare species: the western burrowing owl. Based on the site conditions of the Waco Mammoth Site, the following special status species could potentially inhabit or utilize the study area as stop-over habitat:

Federally listed endangered species

Black-capped vireo (*Vireo atricapilla*) prefer habitat that is low brush on steep slopes in the vicinity of dry streambeds.

Golden-cheeked warbler (*Dendroica chrysoparia*), which is also listed as state endangered, require juniper-oak woodlands; dependent on juniper (also known as cedar) for long bark strips that are only available from mature trees for nest construction. Nests are built in trees other than juniper. Forage for insects in broad-leaved trees and shrubs.

Interior Least Tern (*Sterna antillarum athalassos*), which is also listed as state endangered, is a potential migratory species that nests along sand and gravel

bars within braided streams/rivers. Also known to nest on manmade structures such as inland beaches, wastewater treatment plants, gravel mines.

Whooping Crane (*Grus americana*), which is also listed as state endangered, is a potential migratory species with a preferred habitat that includes large wetland areas.

Piping plover (*Charadrius melodus*) is a potential migratory species with a preferred habitat of sandy beaches and lakeshores.

Texas-listed endangered species

American Peregrine Falcon (*Falco peregrines antum*) is a year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along the coast and farther south; occupies wide range of habitats during migration.

Golden-cheeked Warbler

Interior Least Tern

Whooping Crane

Red wolf (*Canis rufus*) is an extirpated species, formerly known throughout the eastern half of Texas in brushy and forested areas, as well as coastal prairies.

Texas-listed threatened species

Artic Peregrine Falcon (*Falco peregrinus tundris*), federally delisted, is a potential migratory species that prefer meadows, mudflats, beaches, marshes, and lakes where birds are abundant. They nest on cliff edges.

Bald Eagle (*Haliaeetus leucocephalus*), a recently federally delisted threatened species, is typically found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water.

Timber/Canebrake Rattlesnake (*Crotalus horridus*) is found in swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland,

limestone bluffs. Soils may be sandy or dense clay and prefers dense ground cover.

Texas listed rare species

Henslow's Sparrow (*Ammodramus henslowii*) Wintering individuals are found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles. A key component is bare ground for running/walking.

Plains Spotted Skunk (*Spilogale putorius interrupta*) is found in a variety of habitats: open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands although it prefers wooded brushy areas with tall grass prairie.

Texas garter snake (*Thamnophis sirtalis annectens*) is a terrestrial species, generally found in dry, lightly wooded areas.

Western Burrowing Owl (*Athene cunicularia hypugaea*) prefers open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows.

Visitor Experience

During the study scoping process, the public expressed great concern with the lack of access to this remarkable resource. At present, interpretation of the Waco Mammoth Site is currently provided off-site within Baylor University's Mayborn Museum Complex. A full room interpretive exhibit of the Waco Mammoth Site is presented in the Hall of Natural History. A dynamic walk-in diorama featuring a cast of the skeletal remains of the herd's bull with a juvenile cradled in its tusks can be viewed through a thick glass floor over the exhibit. A continuous loop film depicts what is believed to be the last moments of the herd's survival before they perished. Static and interactive interpretive displays on mammoths are presented as well.

The site remains essentially undeveloped for visitor use. However, as described under the elements common to all alternatives

contained in chapter four, efforts by the Waco community are underway to erect a protective shelter over the excavation area and *in situ* specimens as well as developing the site to accommodate visitor use. It is anticipated that these improvements will be completed by 2009.

Management and Operations

The management and operations of the city of Waco, Baylor University, and the National Park Service could potentially be affected by the actions outlined in the four management alternatives. A brief description of each entity is provided below.

City of Waco

The city of Waco is composed of a number of departments that manage a variety of city services. The Parks and Recreation Department manages the city's park system, which consists of more than 60 facilities and open spaces including a zoo, 19 neighborhood parks, 4 community parks, 7 regional parks, a regional tennis center, golf course, and three recreation centers.

The city manager, with support from the city's Parks and Recreation Department, provides for the maintenance and security of the Waco Mammoth Site.

Baylor University

Baylor University, founded in 1845, is a private, Baptist-affiliated, research university located in Waco, Texas. It is the largest Baptist university in the world by enrollment. In 2006, the university had 11,800 undergraduate and 2,200 graduate and professional students in 145 baccalaureate programs, 76 masters, and 22 doctoral programs. Enrollment includes students from all 50 states and 90 foreign countries. There are 804 full-time faculty members, of which 50% are tenured. The campus is located just southeast of downtown Waco.

Baylor is one of the few universities in the United States to offer both undergraduate and graduate degrees in Museum Studies.

The director of Baylor University's Mayborn Museum Complex and her staff provide stewardship for the collected and *in situ* paleontological specimens of the Waco Mammoth Site. Collected specimens and archives are currently housed in a collection storage room in the Mayborn Museum Complex.

The Mayborn Museum has a collections manager on staff who has specific training in the preparation of fossils and their curation. She is also the only person who has done research specifically on the care of *in situ* fossils.

Baylor University has a vertebrate paleontologist on staff whose primary research is on Pleistocene mammals.

National Park Service

The National Park Service (NPS) is an agency within the United States Department of the Interior. It is headed by a director, and the organization consists of a headquarters office based in Washington, D.C., seven regional offices and multiple park and support units. The National Park Service provides stewardship for nearly 400 units of the national park system representing natural, cultural, and recreational sites across the nation.

Beyond national parks, the National Park Service helps communities across America preserve and enhance important local heritage and close-to-home recreational opportunities. Grants and assistance are offered to register, record, and save historic places; create community parks and local recreation facilities; conserve rivers and streams, and develop trails and greenways.

The state of Texas lies within the geographic range of the National Park Service's Intermountain Region. The region covers eight states (Montana, Wyoming, Colorado,

Oklahoma, Utah, New Mexico, Arizona, and Texas) and includes 91 units of the national park system from Glacier National Park located in Northern Montana to Palo Alto Battlefield National Historic Park in Brownsville, Texas. The regional office is headquartered in Denver, Colorado. The closest national park unit to the Waco Mammoth Site is the 647 acre Lyndon B. Johnson National Historical Park located in Johnson City, 120 miles southwest of Waco. The park was established by Congress in 1969 for two main purposes:

- To research, preserve, and interpret significant resources and influences associated with the life and heritage of Lyndon B. Johnson.
- To provide a variety of opportunities to experience the local and regional context that shaped the last frontier president, informed his policies and programs, and defined his legacy.

The park has provided logistical support for the special resource study effort, and could potentially provide management support for the Waco Mammoth Site if it were designated a new unit of the national park system.

Socioeconomic Environment

For purposes of this socioeconomic analysis, it is assumed that the primary area of influence encompasses all inhabitants and related economic activity within the Waco, Texas, Metropolitan Statistical Area (MSA) that is also coincident with McLennan County, Texas.

Based on the Texas Comptroller's 13-region economic model of Texas, the Waco MSA is a part of the central Texas region, a 20-county area that also includes Temple-Killeen and Bryan-College Station metropolitan areas. Located halfway between Dallas and Austin on Interstate 35, the region is central to all major Texas markets.

Central Texas Regional Trends

In 2002, the comptroller issued a report outlining economic conditions and forecasts

for the state as a whole as well as for each of the state's thirteen regions. The following excerpts highlight some of the major findings for the central Texas region.

Table 6: Central Texas Region Employment

Employment Area	1980	1990	2000
Wholesale/Retail Trade	47,173	54,793	71,035
Local Government	26,308	35,958	47,811
Agriculture	35,813	39,353	44,981
Tourism	18,326	27,605	39,162
Healthcare	20,336	29,413	38,233
Construction	25,405	21,942	37,589
Finance, Insurance and Real Estate	19,772	23,824	34,379
State Government	19,409	28,204	33,552
Services to Business	6,474	14,406	29,234
Personal Services	12,157	17,165	23,736
Other Services	12,775	15,261	19,608
Other Durable Goods Manufacturing	12,470	12,466	15,107
High Tech, Communications, Aviation and Electronics	8,154	12,067	14,203
Federal Government	12,363	14,086	13,020
Other Non-Durable Goods Manufacturing	11,636	12,426	11,423
Other Transportation and Public Utilities	9,217	7,826	10,784
Other	3,396	4,183	3,961
Oil and Gas Production, Refining and Petrochemicals	2,981	2,876	3,356

Sources: Carole Keeton Rylander, Texas State Comptroller of Public Accounts; and Regional Economic Modules, Inc.

The region saw astounding growth during the last 30 years of the 20th century. In real terms (1992 dollars), gross regional product in this region—the sum total of all value added within the region—increased nearly three-fold, rising from \$7.9 billion in 1970 to \$21.8 billion in 2000. This is an average annual growth rate of 3.4 percent.

In terms of jobs, growth in this region was very strong during much of the 1970s and 1980s. The average annual growth rate in regional employment between 1980 through 2000 reflects a 7.8% increase in services to

business, followed by a half as robust 3.9% increase in tourism and entertainment. Personal services; healthcare; local government; high tech, communications, aviation and electronics; and finance also experienced a range of increases from 2.8% to 3.4%.

During this time, the population of the central Texas region increased more than 62 percent, rising from 564,300 to 916,300. As a result of strong growth in the value of production in the region and somewhat slower population growth, per capita real incomes rose dramatically over the last 30 years from \$11,050 in 1970 to \$19,400 in 2000.

Waco MSA Demographics

Looking more specifically at the community surrounding the study area, the Waco MSA has also experienced considerable growth over the past decades. The areas in the city that are experiencing growth are north and considerably west of the study area. McLennan County has a population of 213,726, reflecting a racial makeup of 72% White, 18% Hispanic, and 15% African American. (2000 U.S. Census) It is estimate that the current total work force is approximately 102,000. (Wikipedia)

There are 78,859 households, 67% of which are family households. One third of these families have children under the age of 18 living with them. Almost 50% are married couples living together, 14% have a female householder with no husband present. Nonfamily households make up the remaining 33%, with 26% percent of the householder living alone, of which 10% are 65 years of age or older. The average household size is 2.6 and the average family size is 3.2. (2000 U.S. Census)

The city of Waco, the centrally located county seat of McLennan County, has a population of 113,726. The city has 42,279 households representing over 50% of the total households in McLennan County. The median household

income is \$26,264, with the per capita income at \$14,584. (2000 U.S. Census)

Downtown Waco is small compared to most other cities, such as Dallas or Houston, however, each day 17,000 people commute into downtown for work. Downtown Waco was built around the Waco Suspension Bridge, which was a crucial crossing of the Brazos River. In May 1953, the worst tornado in Texas history struck downtown Waco killing 114, and injuring hundreds. It caused millions of dollars in damage, and for decades since growth focused on other areas west of downtown. Recent efforts by the community have initiated a number of major redevelopment projects within the downtown Waco area that are helping to re-establish the city center. (Wikipedia)

Employment

Waco is characterized by a large number of education and health care employees due to the presence of Baylor University, Texas State Technical College, McLennan Community College, two full service hospitals, and several clinics and medical offices. (Kelley 2005 *Economic Forecast for Central Texas*)

Waco's hospitality industry is becoming one of its most important components, reaching over 9 thousand jobs. The outlook for the hospitality and leisure industry in Waco is increasingly positive with the Cameron Park Zoo addition, the potential addition of a four-star hotel and conference center, Waco Convention Center renovations, and development of activities and properties in Downtown Waco and the Brazos River Corridor. Waco is developing sufficient family based tourist attractions to encourage more overnight stays at local hotels. (Kelley 2005 *Economic Forecast for Central Texas*)

Manufacturing income remains an important contributor to basic income in the Waco MSA, but other important sectors contribute basic income. The export of higher education services (spending by students from households outside the county), regional health care services provided by our area hospitals that

reach beyond the county, tourist and convention spending by out-of-county visitors, regional shopping facilities that attract out-of-county visitors, and business and professional services that extend beyond the immediate area. (Kelley 2007 *Central Texas Forecasts*)

Local Planning and Zoning

The Waco Mammoth Site and the lands surrounding the site lie with the R-1B Zone that allows for single-family residential development, agriculture use, and public uses such as parks. It is anticipated that existing land use patterns surrounding the site would remain fairly stable.

The site is also within the Brazos River Corridor overlay district. In 2000, the *City Comprehensive Plan* designated the Brazos River Corridor as an overlay district, which takes precedence over the underlying zoning. The purpose of the overlay district is to ensure the development of the Brazos River Corridor as a center for quality recreation, convention, tourism, housing, commercial, retail, and office facilities. The regulations are designed to protect the special environmental character of the corridor and to promote continued private and public investment. Some of the goals contained in the mission statement for the corridor include the following:

- Preserve, protect, and enhance the historically, culturally, architecturally, and archeologically significant sites and structures which impact a distinct aspect of the city and serve as visible reminders of the city's culture and history.
- Recognize and protect the special distinctive qualities and ecosystems of both the Brazos River and the Bosque River and their tributaries.
- Encourage developments that interconnect for pedestrian access and circulation.

The city of Waco has recognized the significance of the Waco Mammoth Site by including the site within the boundaries of the Brazos River Corridor overlay district. By connecting the Waco Mammoth Site to the

rest of the corridor, the city has made a commitment to encouraging compatible land uses in the vicinity of the site. In addition, the city owns the parcel to the south east of the Waco Mammoth Site as well as parcels south of West Lake Shore Drive. It is the intent of the city to provide continuous access through these parcels to the Waco Mammoth Site.

Transportation

The Waco Mammoth Site is centrally located within the state of Texas, with a travel distance of 90 miles south of Dallas/Fort Worth, 90 miles north of Austin, 180 miles northwest of Houston, and within 200 miles of 80% of the state's population. The total population for the state of Texas in 2000 was almost 21 million people. The study area is located less than 12 miles from Interstate 35, a well traveled, primary north/south transportation corridor traversing the Midwest section of the country. Annual average daily traffic recorded in 2003 was 46,512. The study area has almost 1,000 feet of frontage along New Steinbeck Bend Road, a local arterial collector road that currently experiences low volume traffic, as the surrounding areas are mostly undeveloped.

The Waco transit system provides safe and reliable public transportation to the citizens of Waco and the surrounding communities. Services include a fixed route bus service within the city of Waco, the Baylor University Shuttle (BUS), and the Para Transit van service for individuals with special transportation needs.

The study area is also located within a few miles of the Waco Regional Airport, which primarily provides commuter service to the Dallas-Fort Worth Airport and Houston-Bush International Airport.

An industrial airport is located at Texas State Technical College which accommodates Air Force One when President George W. Bush visits his Prairie Chapel Ranch, also known as the Western White House, in Crawford,

Texas. The ranch is located just 10 miles west of the city of Waco.

Tourism

A majority of Waco's tourist destinations are within the Brazos River Corridor, or near enough to the corridor to be influenced by it. For many who visit Waco, the corridor represents an important first impression of the community. Some of Waco's major attractions include the following:

Baylor University's **Mayborn Museum Complex** opened in May 2004; it is a natural science and cultural history museum. The 143,000-square-foot building includes the collection from university's former Strecker Museum, the Jeanes Discovery Center, a 5,000-square-foot traveling exhibit hall, 178-tiered-seat theater, museum store, and café.

The complex also includes the faculty and administration offices for Baylor University's Department of Museum Studies, as well as collections storage and preparation areas. The collected specimens from the Waco Mammoth Site are currently being housed in one of the collections storage rooms.

Within the Waco at the Crossroads of Texas Natural History Exhibits are four exploration stations focusing on geology, paleontology, natural history, and archaeology and three walk-in dioramas showcasing a limestone cave, a Texas forest, and the Waco Mammoth site. Within the mammoth exhibit, visitors can walk over a transparent floor and look down upon a cast of the bones of the Columbian mammoth bull with the juvenile laying over his tusks displayed exactly as they were unearthed at the Waco Mammoth Site.

There are sixteen discovery rooms in the Jeanes Discovery Center with themes from vertebrates to weather designed to provide hands-on, interactive learning.

Outside the museum, a number of vintage wooden structures have been assembled into the 13-acre Governor Bill & Vara Daniel

Historic Village, giving visitors a visual sample of Texan community life from the latter part of the 19th century into the early 20th century.

Located just over 2 miles from downtown Waco and I-35, **Cameron Park** is a 416-acre municipal park that includes a series of bluffs and gullies along the banks and confluence of the Brazos and Bosque rivers. It is one of the largest municipal parks in the state. Fishing, canoeing, or kayaking on both rivers is made possible by easily accessible boat ramps. Mountain-biking trails, bridle paths, volleyball, disc golf courses, and picnic facilities are provided along almost 2.5 miles of parkland adjacent to the rivers.

Located within the southeast end of Cameron Park, the **Cameron Park Zoo** is a 52-acre natural habitat zoo that shares with the Waco Mammoth Site a similar history of community initiative and support for its establishment. This zoo was originally established by local citizens to create recreation and educational opportunities for central Texas residents. In 1981, a master plan was prepared to build a new zoological park and a countywide bond issue was passed to fund the development. Subsequent gifts from the community as well as approved bond requests have continued to provide an expanded menu of exhibit opportunities at the zoo. This history of exceptional public support and positive growth is possible due to the cooperative working relationship between the Zoological Society, the city of Waco, and McLennan County. The county has supported a number of bond elections while the city is responsible for the operation and maintenance of the zoo. The Zoological Society manages and handles capital fundraising for the zoo, along with all

special events, development projects, and guest service arrangements.

Lake Waco is a manmade reservoir located 3 miles upstream from the Waco Mammoth Site. The lake was created by the construction of an earthen embankment and concrete dam on the Bosque River. The work was completed by the U.S. Army Corps of Engineers, Fort Worth District, in 1965 for the purposes of flood control, water supply, and recreation. There a number of developed parks around the perimeter of the lake that provide for boat access, marina services, fishing, trailer camping, swim beach areas, picnic areas, recreational fields, playgrounds, and hiking trails. There is also a wetland restoration area along the northwest inlet.

Located within downtown Waco, the **Dr Pepper Museum** commemorates the soft drink's history and includes the original 1906 bottling plant and spring source. Dr. Pepper was originally developed in 1885 by Dr. Charles Alderton in his Waco drugstore for medicinal purposes. The museum holds an impressive collection of soft drink memorabilia and provides drink service from a reconstructed old-style soda fountain.

The **Texas Ranger Hall of Fame and Museum**, located adjacent to I-35 and the Brazos River in Waco provides exhibits and information on the history of the Texas Rangers, a legendary symbol of Texas and the American West. It also serves as the principal repository for artifacts and archives relating to the Texas Rangers. The museum is one of the better attended venues in the city.