2.2.3 Study Area Delineation

The first step in the selection of alternative routes was to establish a study area within which the alternative routes for each segment would be located. The boundaries of the study area encompass both termination points for the project and include an area large enough to assess potential impacts as well as to allow for possible alternative routes. As shown on Figure 2-1, the roughly square-shaped study area is approximately 1.9 x 2.1 miles and encompasses approximately 2,500 acres (ac).

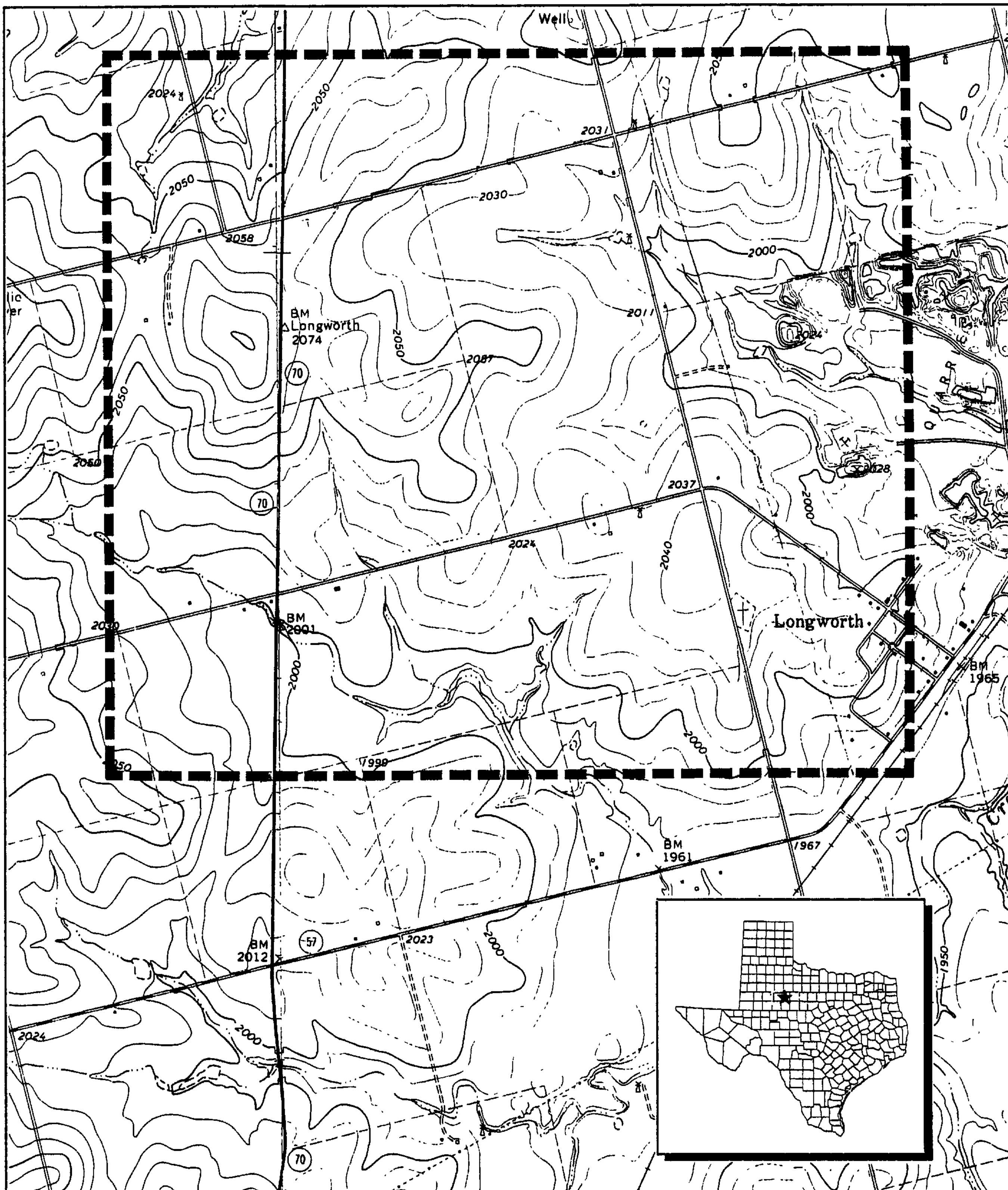
2.2.4 Constraints Mapping

Following the delineation of study area boundaries, EH&A performed an environmental constraints mapping analysis. Through a review of published literature, topographic maps, site visits, and some agency contacts, features or areas that could present some degree of constraint in locating the proposed facilities within the study area were identified.

2.2.5 Alternative Route and Substation Site Selection

Factors considered during the selection of alternative routes for the proposed transmission lines and alternative substation sites included the following:

- utilizing existing transmission line ROW, if feasible
- paralleling existing ROW (transmission lines, pipelines, roads, highways, etc.)
- paralleling existing property lines and/or fencelines
- minimizing potential impacts to communities, rural residential subdivisions or other development
- minimizing proximity to individual residences and businesses
- minimizing potential impacts to cultivated cropland and above-ground irrigation systems
- locating the new Longworth substation site near MWEC's existing distribution facilities and load center
- locating the new Longworth substation at a site which provides good access for construction and maintenance
- overall length.



north

0 2000 4000 feet

Base Map: USGS 7.5' Quadrangles; Longworth and Roby, Texas

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Figure 2-1

STUDY AREA LOCATION

LONGWORTH 69-KV PROJECT

WTU selected two alternative routes to connect their existing Roby to Eskota 69-kV transmission line with a new Longworth Substation. Alternative Route 1 is approximately 0.95 mile in length and parallels the south side of CR 118 for its entire length (Figure 2-2). Alternative Route 2 is approximately 1.21 miles long and parallels the north side of CR 120 for almost its entire length.

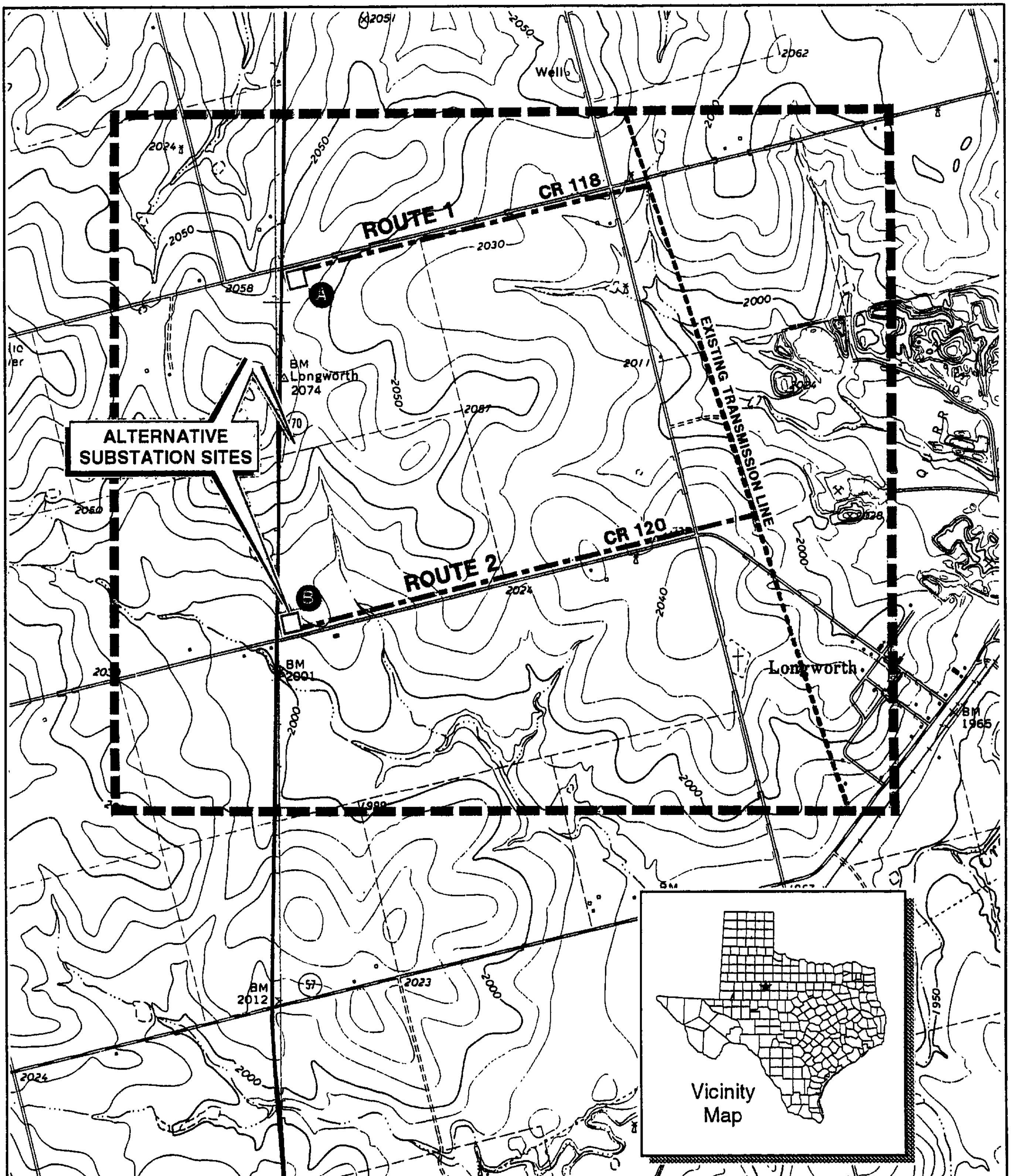
WTU selected two alternative substation sites for the new Longworth substation. These are labeled alternative substation sites A and B on Figure 2-2. Alternative substation site A is located in cropland at the southeast corner of the intersection of Highway 70 and County Road (CR) 118. Alternative substation site B is located in a wooded area at the northeast corner of the intersection of Highway 70 and CR 120. Both of these substation sites would provide all-weather access and are located in close proximity to MWEC's load center.

Each of the alternative routes was examined in detail in the field in August, September, and October 1996. In evaluating these routes, a variety of environmental criteria were considered. These criteria are listed in Table 2-1. The analysis of each route involved inventorying and tabulating the number or quantity of each criterion located along each route (e.g., number of creek crossings, length across cropland, etc.). The number or amount for each factor was obtained from maps and aerial photographs and verified, where possible, in the field.

2.2.6 Public Open House Meetings

WTU and MWEC held two public open-house meetings for the project on October 14 and 15, 1996. These meetings were intended to solicit comments from citizens, landowners and public officials concerning the proposed project. Specifically, these meetings had the following objectives:

- Promote a better understanding of the proposed project including the purpose, need, and potential benefits and impacts
- Inform and educate the public with regard to the routing procedure, schedule, and decision process
- Ensure that the decision-making process accurately identifies and considers the values and concerns of the public and community leaders.



north

0 2000 4000 feet

Base Map: USGS 7.5' Quadrangles; Longworth and Roby, Texas

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Figure 2-2

PRIMARY ALTERNATIVE
TRANSMISSION LINE ROUTES
AND SUBSTATION SITES

LONGWORTH 69-KV PROJECT

TABLE 2-1

ENVIRONMENTAL CRITERIA FOR
TRANSMISSION LINE EVALUATION
LONGWORTH 69-KV PROJECT

LAND USE	
	Length of ROW parallel to existing ROW (transmission lines, pipelines, roads, etc.)
	Number of habitable structures[1] within 200 ft of ROW centerline
	Length of alternative route
	Length of ROW through recreational areas
	Number of parks and/or recreational areas within 1,000 ft of ROW centerline
	Length of ROW through cropland
	Length of ROW through grazingland/rangeland
	Length of ROW through irrigated pasture or cropland
	Length of ROW across prime farmland soils
	Length of ROW across gravel pits, mines, or quarries
	Number of pipeline crossings
	Number of transmission line crossings
	Number of U.S. and State highway crossings
	Number of FM and county road crossings
	Number of FAA-listed airfields within 10,000 ft of ROW centerline
	Number of commercial AM radio transmitters within 10,000 ft of ROW centerline
	Number of FM radio transmitters, microwave towers, etc. within 2,000 ft of ROW centerline
AESTHETICS	
	Estimated length of ROW within foreground visual zone[2] of U.S. and State highways
	Estimated length of ROW within foreground visual zone[2] of recreational or park areas
	Estimated length of ROW within foreground visual zone[2] of churches, schools, hospitals, and cemeteries

TABLE 2-1 (Concluded)

ECOLOGY
Length of ROW through upland brushland/woodland
Length of ROW through bottomland/riparian woodland
Length of ROW across wetlands
Length across known habitat of endangered/threatened species
Length of ROW across open water (lakes, ponds)
Number of stream crossings
Number of river crossings
Length of ROW parallel (within 100 ft) to streams
CULTURAL RESOURCES
Number of recorded historic or prehistoric sites crossed
Number of recorded historic or prehistoric sites within 1,000 ft of ROW centerline
Number of National Register listed or determined eligible sites crossed
Number of National Register listed or determined eligible sites within 1,000 ft of ROW centerline
Length of ROW through areas of high archaeological/historic site potential

[1] Residences, businesses, schools, churches, cemeteries, hospitals, nursing homes, etc.
[2] One-half mile, unobstructed

Public involvement contributed both to the evaluation of issues and concerns by WTU/MWEC and EH&A, and to the selection of a preferred route for the project. The first meeting (October 14) was held at the Roby Community Center and the second (October 15) at the Northeast Scurry County Community Center, located at the intersection of Camp Springs Road and CR 1105, east of Snyder. WTU/MWEC sent written notice of the meetings to all potentially-affected landowners along the alternative routes and to local public officials. In addition, advertisements were run in local newspapers (the Rotan Advance-Star Record and the Snyder Daily News) announcing the location, time, and purpose of the meetings. Copies of these letters and the advertisement are included in Appendix B.

At the meeting, rather than a formal presentation in a speaker-to-audience format, WTU, MWEC, and EH&A staff utilized space in the community centers by setting up several information stations. Each station was devoted to a particular aspect of the routing study and was manned by WTU, MWEC, and/or EH&A staff. Each station had maps, illustrations, photographs and text explaining each particular topic. Interested citizens and property owners were encouraged to visit each station in order, so that the entire process could be explained in the general sequence of project development. The information station format is advantageous because it allows attendees to process information in a more relaxed manner and also allows them to focus on their particular area of interest and ask specific questions. More importantly, the one-to-one discussions with WTU/MWEC/EH&A staff encourage more interaction from those citizens who might be hesitant to participate in a speaker-audience format.

WTU/MWEC staff at the first station signed visitors in and handed out a project summary sheet and questionnaire. The questionnaire solicited comments on citizen concerns as well as an evaluation of the information presented at the open house. Copies of the questionnaire and handout can be found in Appendix B.

The two open house meetings for the Longworth Project were held in conjunction with a related transmission line project approximately 30 miles in length between Snyder and Roby. Twelve people attended the first open house at the Roby Community Center on October 14. When asked what areas should be considered of greatest concern during the routing process, the highest ranking was given to residential areas/residences, followed by cultivated land. Seventeen people attended the second open house at the Northeast Scurry County Community Center on October 15. Areas of greatest concern followed the previous night's results: residential areas/residences was the top-ranked category, followed by cultivated land. None of the people attending the open house meetings provided written comments concerning the Longworth Project. In addition to the public participation in this project, WTU and MWEC representatives have met with landowners, public officials, and other interested parties.

2.3 PREFERRED ROUTE SELECTION

The selection of the preferred route for the Longworth Project involved both environmental and engineering evaluations of the alternative routes and substation sites. A final preferred route and substation site were selected based upon a combination of these evaluations. As mentioned previously, EH&A made its recommendation based only upon environmental considerations; WTU and MWEC also took into consideration cost and engineering factors in its evaluation. The results of the overall environmental evaluation and selection of the preferred alternatives are presented in Section 7.0 of this document.

3.0 EXISTING ENVIRONMENT

3.0 EXISTING ENVIRONMENT

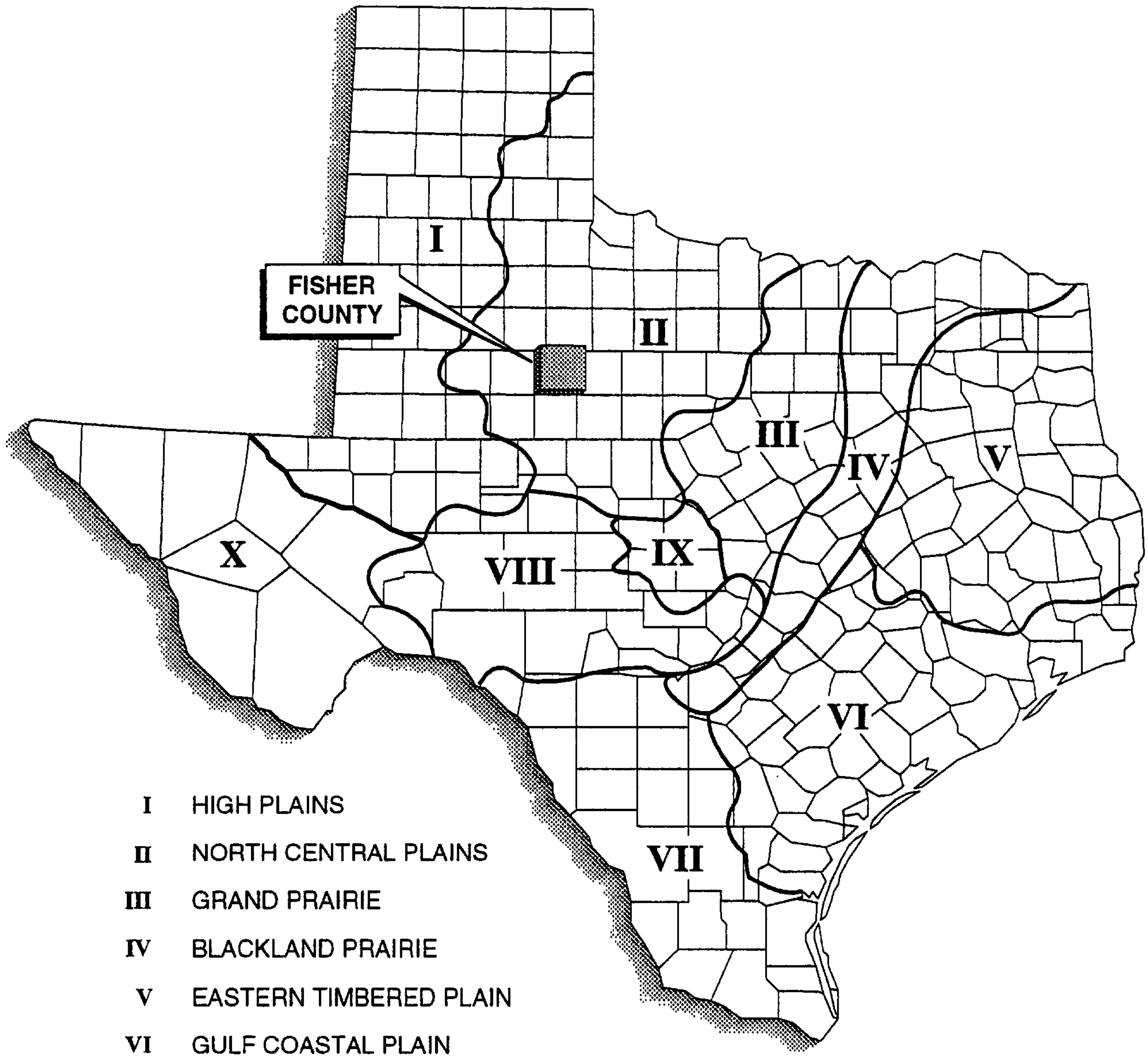
3.1 PHYSIOGRAPHY AND GEOLOGY

The study area lies within the Northwestern Texas Lowland Geographic Region of Texas (Chambers, 1948). The Northwestern Texas Lowlands are the eroded margin of the Great Plains east of the Llano Estacado district of the High Plains and are part of the larger North Central Plains Physiographic Province of Texas (Atwood, 1940; Bureau of Economic Geology (BEG), 1977; Hunt, 1967) (Figure 3-1).

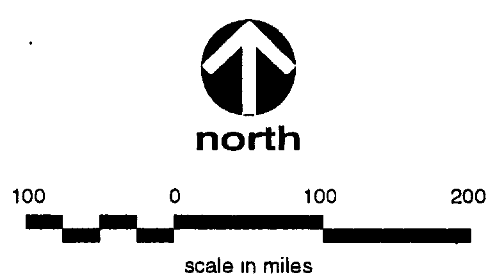
The North Central Plains Physiographic Province is a southwestern extension of the North American Interior Lowlands. It is characterized by low local relief and is surrounded by regions of greater altitude and by regions not affected by glaciation (Fenneman, 1917). The boundary in Texas between the Interior Lowlands and the High Plains Section of the Great Plains is generally an east-facing escarpment several hundred feet high. The eastern flowing streams of this region form wide valleys of Quaternary alluvium and fluviatile terrace deposits by deeply cutting the escarpment and exposing the underlying structural geology composed of the Triassic and Permian formations (Fenneman, 1938).

The North Central Plains Physiographic Province of Texas has had many localized physiographic designations: the Abilene-Haskell Plains, the Gypsum Plains, the Osage Plains, the Red Bed Plains, and most recently the West Texas Rolling Plains (Johnson, 1931; Swanson, 1995). Each of these designations are based on major landscape differences. To better understand the landscape of the study area, the major physiographic differences have been grouped into the common characteristics of the Northwestern Texas Lowland Geographic Region.

The Northwestern Texas Lowland is generally characterized by an eastward-sloping plain with level to rolling land on stream divides. A few flat-topped uplands (the remnants of a former high plain) are scattered throughout the region, and in some areas the severely dissected Permian Red Beds have a badlands topography. This region is bounded by the Red River on the north, the Western Cross Timbers on the east, the Edwards Plateau on the south, and the Llano Estacado on the west (BEG, 1977; Chambers, 1948). The elevation rises from an altitude of about 750 ft along the eastern edge bordering the Cross Timbers/Blackland region to about 2,000 ft along the western edge at the base of the Caprock Escarpment of the Llano Estacado. The strata underlying this region generally dip northwestward at a



I	HIGH PLAINS
II	NORTH CENTRAL PLAINS
III	GRAND PRAIRIE
IV	BLACKLAND PRAIRIE
V	EASTERN TIMBERED PLAIN
VI	GULF COASTAL PLAIN
VII	RIO GRANDE PLAIN
VIII	EDWARDS PLATEAU
IX	LLANO BASIN
X	TRANSPECOS BASIN & RANGE



Source: BEG, 1970/1977

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Figure 3-1

LOCATION OF FISHER COUNTY
IN RELATION TO THE
PHYSIOGRAPHIC REGIONS OF TEXAS

LONGWORTH 69-kV PROJECT

low angle so that the out-cropping margins form east-facing escarpments along narrow belts that run north to south (BEG, 1932).

The surface geologic units within the study area include the most recent alluvium deposits and the Whitehorse group. The recent alluvium is composed of sedimentary rocks created by the dissection of Pennsylvanian and Permian sediments and by floodplain deposition within the Quaternary period (BEG, 1986).

The Whitehorse group consists of thin outcrops of sandstone, dolomite, non-marine red shales (red beds), and gypsum. This surface geologic unit represents the deep bedrock stratigraphy of the Pennsylvanian and Permian periods. The Bend Arch and the Eastern Shelf, large buried structural features of these periods, underlie extensive and prolific oil and gas fields. In western Fisher County, there is a thin outcrop of gypsum near the deeply dissected headwaters of the Clear Fork of the Brazos River. Several companies actively mine these outcrops due to the commercial value of gypsum in the manufacture of wall board and other products (BEG, 1974; Sellards and Baker, 1934).

3.2 SOILS

The soil survey for Fisher County (Soil Conservation Service (SCS), 1992) was used to describe the soil associations found in the study area. The SCS is now known as the Natural Resources Conservation Service (NRCS).

3.2.1 Soil Associations

The study area contains one soil association: the Carey-Woodward Association. This association consists of gently sloping to moderately sloping loamy soils and occurs on uplands that are cut by well or moderately defined drainageways. The Carey soils are on nearly level to strongly rolling uplands, have a reddish-brown loamy surface layer, and a subsoil of reddish-brown friable sandy clay loam. The Carey soils occupy about 54% of the association, and about two-thirds of their acreage is cultivated. The surface layer of the Woodward soils is slightly more sandy and calcareous than the surface layer of the Carey soils. The subsoil is a layer of yellowish red loam. The Woodward soils developed over red bed materials. These soils make up about 25% of the association, and about one-half of their acreage is cultivated. The Carey-Woodward Association is the most extensive association in the county, and about half of this association is under cultivation for cotton and grain sorghum.

3.2.2 Prime Farmland

Prime farmland is defined by the Secretary of Agriculture in 7 CFR 657 (Federal Register, Vol. 43, No. 21) as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, or oilseed and is also available for these uses (i.e., the land could be used as cropland, pastureland, rangeland, forestland, but not land that is developed or under water). It has the soil quality, growing season, and moisture supply needed to economically sustain high yields of crops when treated and managed properly. Some soils are considered prime farmland in their native state and others are considered prime farmland only if they are drained well enough to grow the main crops in the area, or irrigated. In Fisher County, prime farmlands make up 51.2% of the total county land area while potential prime farmland makes up an additional 24.4%. Within the study area, the Carey-Woodward Association contains soils that are considered prime farmland soils (SCS, 1992).

3.3 WATER RESOURCES

3.3.1 Surface Water

The study area is located within the Brazos River Basin. The headwaters of the Clear Fork of the Brazos River are located northwest of Longworth and the river flows eastward through Fisher County. Two unnamed tributaries of Plum Creek drain the southeastern portion of the study area. Plum Creek joins the Clear Fork of the Brazos River northeast of the study area and contributes, along with several other creeks and their tributaries, to the draining of the southern half of Fisher County (SCS, 1992; USGS, 1994; Texas Water Development Board (TWDB), 1990).

During the late spring and summer months, severe thunderstorms produce very heavy rainfall in short periods of time. The well developed surface drainages channel most of the floodwater, and only minor flooding occurs. The last major flooding in this region was in 1955. Most of the smaller tributary streams do not carry water during the entire year (SCS, 1992).

The Texas Water Commission (TWC) [which has merged with the Texas Air Control Board to form the Texas Natural Resource Conservation Commission (TNRCC)], has developed water quality standards for waters in Texas from criteria developed to protect designated uses (TWC, 1992). According to the TWC, the portion of the Brazos River Basin within the study area is in a segment of the river generally considered to be unsuitable for municipal water supplies due to high levels of salinity. Large quantities of naturally occurring sodium chloride from salt springs and seeps and large quantities of calcium and sulfates from the cross cutting of gypsum formations contribute to the heavily mineralized water (BEG, 1986). The quality of the river improves downstream due to dilution by good quality water (TWC, 1992).

The 100-year flood zone boundaries for Fisher County are not available since no floodplain mapping has been published for this county.

3.3.2 Ground Water

Ground water provides an estimated 61% of the total water used in Texas for domestic, municipal, industrial, and agricultural purposes. Major aquifers produce large quantities of water over broad geographical areas of the state while minor aquifers constitute the only significant source of water for smaller regions. The major aquifers crossed by the Brazos River Basin include: the Ogallala, the Seymour, the Trinity, the Edwards, the Carrizo-Wilcox, and the Gulf Coast aquifers. The minor aquifers crossed by the Brazos River Basin include the Dockum Aquifer and the Brazos River Alluvium Aquifer (Texas Department of Water Resources (TDWR), 1979).

Supplying water to most of the upper part of the Brazos River Basin, the Ogallala Aquifer is composed of interbedded sand, clay, silt, gravel, and caliche. Sand makes up about 70% of the total thickness. This aquifer produces large capacity wells that yield between 500 and 1,000 gallons per minute (gpm) with less than 1,000 milligrams per liter (mg/L) dissolved solids (TWDB, 1971; TWC, 1992). The Ogallala Aquifer is being severely depleted by pumping for irrigation, yet it is the main water source for the High Plains of Texas and New Mexico. It also has the potential for severe contamination from evaporating saline lakes, salt springs, agricultural fertilizers and chemicals, and oil field salt brines (BEG, 1988).

The Seymour Aquifer is an important aquifer in isolated areas within the Brazos River Basin. It consists of interbedded deposits of coarse grained quartz sand, silt, clay, and gravel. Large capacity wells yield between 300 and 1,000 gpm with the quality of the water ranging from 500 to more than 3,000 mg/L dissolved solids (TWDB, 1971; TWC, 1992). The Seymour Aquifer supplies well water for portions of Fisher County. The chemical quality of the water varies from place to place, and water from many of the wells, although unfit for household use, can be used for watering livestock. Municipal water is brought by pipeline from the Colorado River or from manmade lakes in other counties (SCS, 1992).

Supplying water to the central part of the Brazos River Basin, the Trinity Aquifer consists of fine grained sand interbedded with shale and clay. Wells yield between 200 and 1,000 gpm of fresh water that deteriorates gradually downdip. The Edwards Aquifer also supplies water to the central part of the Brazos River Basin. It consists of hard massive limestone that has extensive solution porosity. Wells produce up to 2,000 gpm of water that is relatively hard, yet contains less than 500 mg/L dissolved solids.

The Carrizo-Wilcox and the Gulf Coast aquifers consist of interbedded sand and clay with layers of silt. Yields of large capacity wells range from 300 to 3,400 gpm with less than 1,000 mg/L dissolved solids. The water quality deteriorates rapidly with depth near the Gulf Coast (TWDB, 1971; TWC, 1992).

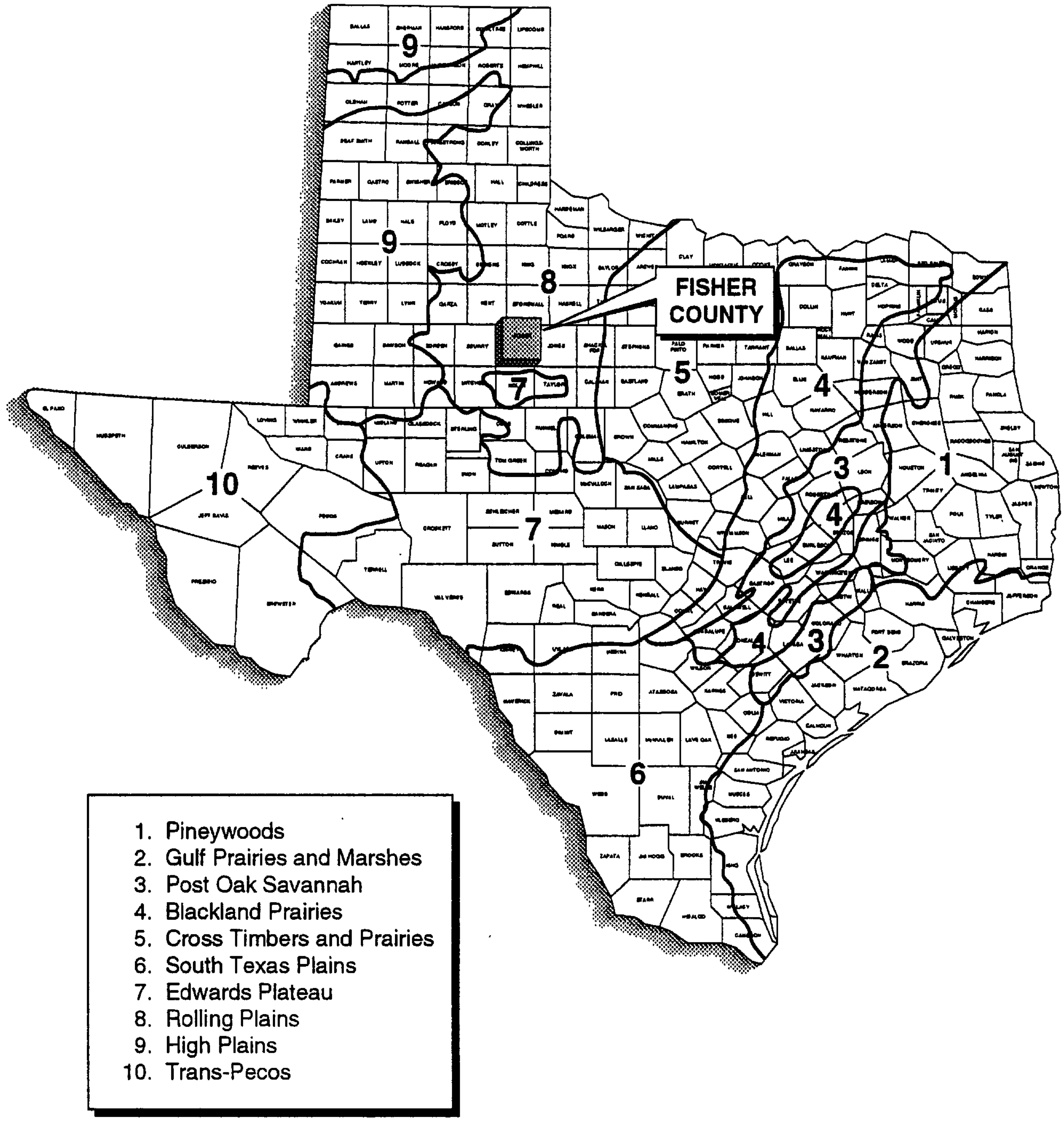
Minor aquifers produce significant quantities of water within smaller geographical areas and may provide the only source of water in some regions of the state. The Dockum Aquifer constitutes one such aquifer that occurs in the western part of the Brazos River Basin. The Dockum Aquifer consists of interbedded lenses of sand, sandstone, gravel, and shale. Wells drilled into this aquifer yield from 50 to 100 gpm of fresh water with less than 500 mg/L dissolved solids. Occurring in a narrow band along the Brazos River, the Brazos River Alluvium Aquifer consists of beds of sand, gravel, silt, and clay. Wells yield between 500 and 1,400 gpm with dissolved solids ranging from 1,000 mg/L to 2,700 mg/L (TWDB, 1971; TWC, 1992, TDWR, 1984).

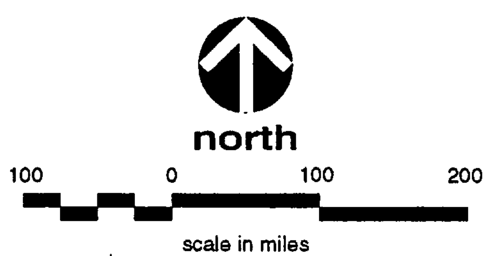
3.4 VEGETATION

3.4.1 Regional Vegetation

As seen in Figure 3-2, the study area lies within the Rolling Plains vegetational region of Texas (Hatch et al., 1990). It had previously been classified by Tharp (1939) as the Mesquite-Grassland region and was described at the time to be an open stand of mesquite upon a rich grassland in the gently rolling areas. The rough, dissected portions contain shrub communities consisting of scrub-oaks, cedars, mimosas, acacias, and other woody brush. The vegetation of this region has changed from a tall- and mid-grass dominated community to a community of shortgrasses, shrubs and annuals. Overgrazing and suppression of fire have been the primary causes of this historical vegetation change (Hatch et al., 1990).

Generally, the topography within this region is nearly level to gently rolling with a range of elevation between 1,000 and 3,000 ft above mean sea level (msl). Upland soils are typically pale to





Source: Hatch et al., 1990

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Figure 3-2

LOCATION OF FISHER COUNTY
IN RELATION TO THE
VEGETATIONAL REGIONS OF TEXAS

LONGWORTH 69-kV PROJECT

reddish or dark-grayish brown sandy or clay loams and clays. They are neutral to calcareous and commonly saline, shallow and stony with pockets of deep sand. Loamy to clayey, reddish-brown, calcareous alluvial soils are found in small bottomland areas (Hatch et al., 1990).

The rainfall in this region is sporadic, mostly occurring between April and September (SCS, 1992). The summer months are very dry, often resulting in droughts. Typically, rainfall is of high intensity and short duration, causing a problem with erosion in areas with little or no vegetative cover. Most soils, however, are generally porous and well drained.

3.4.2 Vegetation Community Types in the Study Area

Vegetation community types occurring in the study area include mesquite woodland/brushland, riparian woodland, grassland, cropland, and hydric and aquatic habitats. A brief description of the vegetation communities found within the study area, based largely upon the results of a field trip on 19 August 1996, is presented below. The dominant vegetation types are the mesquite woodland/brushland, grassland, and cropland. The woodland/brushland and grassland community types in the study area show a lot of overlap and gradation from one type to the other. Usually the same species occur, but they differ in their relative abundance.

The mesquite woodland/brushland community type varies in age and density in the study area. In many places the mesquite is more shrublike and the herbaceous layer more dense. Because there is a gradation from woodland through brush and shrub, all mesquite communities are referred to as mesquite woodland/brushland. This community consists of honey mesquite (*Prosopis glandulosa*), lotebush (*Zizyphus obtusifolia*), catclaw acacia (*Acacia greggii*), elbowbush (*Forestiera pubescens*), javelina bush (*Condalia ericoides*), mimosas (*Mimosa* spp.), fragrant sumac (*Rhus aromatica*), junipers (*Juniperus* spp.), mormon tea (*Ephedra* sp.), agarito (*Mahonia trifoliata*), baccharis (*Baccharis* sp.), narrow-leaf yucca (*Yucca glauca*), and pricklypears (*Opuntia* spp.). The herbaceous layer within this community type varies from sparse to well-developed throughout the study area. Typical species include little bluestem (*Schizachyrium scoparium*), silver bluestem (*Bothriochloa saccharoides*), King Ranch bluestem (*Bothriochloa ischaemum*), buffalograss (*Buchloe dactyloides*), switchgrass (*Panicum virgatum*), Texas wintergrass (*Stipa leuchotricha*), Texas grama (*Bouteloua rigidiseta*), sideoats grama (*Bouteloua curtipendula*), red grama (*Bouteloua trifida*), threeawns (*Aristida* spp.), lovegrasses (*Eragrostis* spp.), windmillgrass (*Chloris virgata*), green bristlegrass (*Setaria viridis*), sand dropseed (*Sporobolus cryptandrus*), johnsongrass (*Sorghum halepense*), puncture vine (*Tribulus terrestris*), snakeweed

(*Gutierrezia sarothrae*), sunflowers (*Helianthus* spp.), late eupatorium (*Eupatorium serotinum*), plantains (*Plantago* spp.), and crotons (*Croton* spp.).

The grassland community type consists of pastureland (improved and unimproved), oldfields and cleared ROWs. The most common grassland type in the study area is pastureland (both improved and unimproved), which is dominated by a variety of grasses, forbs and woody species. Common grasses found in this habitat throughout the study area include little bluestem, silver bluestem, King Ranch bluestem, gramas, switchgrass, johnsongrass, windmillgrass, threeawns, sand dropseed, and Texas wintergrass, among others. Brush species such as honey mesquite, agarito, and pricklypears also occur in the unimproved grasslands. Improved or managed pastureland in the study area is typically dominated by improved varieties of bermudagrass (*Cynodon dactylon*) and bahiagrass (*Paspalum notatum*). Cotton was the most commonly encountered crop in the extensive croplands of the study area.

The riparian and hydric habitats within the study area occur primarily along the banks and edges of streams, stock ponds, playa lakes, and springs. Riparian habitat (narrow bands of woody vegetation occurring immediately adjacent to streams or within the channel of a relatively narrow floodplain), is of minor extent within the study area. Black willow (*Salix nigra*), hackberries (*Celtis* spp.), cottonwood (*Populus deltoides*), French tamarisk (*Tamarix gallica*), soapberry (*Sapindus saponaria*), and creek plum (*Prunus rivularis*) were encountered.

Hydric habitat typically includes herbaceous wetland plant species associated with streams, impoundments, and areas of low topography. Hydric habitats in the region of interest may be defined as jurisdictional wetlands by the U.S. Army Corps of Engineers (USCE). If these areas meet the criteria necessary to define them as jurisdictional wetlands pursuant to Section 404 of the Clean Water Act, certain activities (e.g., placement of fill) within these habitats are subject to regulation. Spikerushes (*Eleocharis* spp.), sedges (*Carex* spp.), bushy bluestem (*Andropogon glomeratus*), and cocklebur (*Xanthium* sp.) are typical species occurring within the floodplains of the creeks and along the edges of the ponds, springs, and playa lakes.

Aquatic habitat includes those areas that are predominantly water-covered (e.g., lakes, rivers, ponds, and major streams). The vegetation associated with these water bodies is minor within the study area. Species found occasionally within this habitat include pondweeds (*Potamogeton* spp.) and cattail (*Typha* sp.), along with black willow, spikerushes, and sedges. A playa lake's vegetational community varies with land use practices (livestock grazing and cultivation) and natural factors. Common vegetation species found in and around playas include dock (*Rumex* sp.), curltop smartweed (*Polygonum* *bicorne*), Johnsongrass, barnyardgrass (*Echinochloa crusgalli*), bulrushes (*Scirpus* spp.), devilweed (*Aster spinosus*), camphorweeds (*Heterotheca* spp.), cattail, Chinese elm (*Ulmus pumila*), and black willow.

3.4.3 Commercially Important Plant Species

Important species are those which (a) are commercially or recreational valuable; (b) are endangered or threatened; (c) affect the well-being of some important species within criterion (a) or criterion (b); or (d) are critical to the structure and function of the ecological system or are biological indicators. Forage crops are commercially important plant species within the study area due to the large extent of grazing land. Dryland and irrigated sorghum, small grains, and cotton are also readily grown in the area. The croplands, because they are intermingled with rangeland, may supplement native wildlife habitat and increase recreational hunting opportunities (Hatch et al., 1990).

3.4.4 Endangered and Threatened Plant Species

The U.S. Fish and Wildlife Service (FWS), the Texas Parks and Wildlife Department (TPWD) and the Texas Biological and Conservation Data System (BCD), formerly known as the Texas Natural Heritage Program (TXNHP), were contacted for information concerning the location of state- and federally listed plant species within the study area and vicinity. According to these resources (see letters in Appendix A), no endangered or threatened plant species or plant species of concern (SOC) occur within the study area or within Fisher County.

The TPWD mentioned that the Texas poppy-mallow (*Callirhoe scabriuscula*), listed by the FWS and TPWD as endangered, is of potential occurrence in the study area. It has been recorded within the Rolling Plains region of Texas from nearby Coke, Mitchell, and Runnels counties (Poole and Riskind, 1987; BCD, 1995). This erect, perennial plant with red to purple flowers blooms from late April to June and may grow to a height of 4 ft. Preferred habitat for this species includes deep alluvial sands found near the Colorado River. The mapping unit designation used by the SCS which identifies the preferred soil type is the hummocky Tivoli fine sand. Plant species typically associated with Texas poppy-mallow include shinnery oak (*Quercus havardii*), bullnettle (*Cnidoscolus* sp.), spiderwort (*Tradescantia* sp.), Indian blanket (*Gaillardia* sp.) and grasses such as threeawn and dropseed (Poole and Riskind, 1987). This endangered plant could potentially occur within the study area where Tivoli fine sands are found.

3.4.5 Ecologically Sensitive Areas

In general, any area may be considered ecologically sensitive if: 1) it supports a rare plant or animal community; 2) it is valuable due to its maturity and the density and diversity of plants and animals it contains; or 3) it supports a community of plants adapted to flooding and/or saturated soil conditions and dominated by species considered to be wetland indicators by a regulatory agency (e.g., the USCE).

According to BCD data files (see letter, Appendix A), no potentially sensitive plant communities have been identified within or near the study area. Within the study area, ecologically sensitive areas are most likely limited to stands of native vegetation, wooded riparian areas, upland woods or brush and potential jurisdictional wetlands as defined by the USCE (1987).

3.4.6 Regulatory Wetlands

Plant communities adapted to flooding and saturated soil conditions and dominated by species considered to be wetland indicators by a regulatory agency (i.e., the USCE) may be considered ecologically sensitive. Characteristics of these hydric habitats that contribute to their ecological value include high levels of productivity and species diversity, utilization by numerous wildlife species, dependence upon and functional values of particular hydrologic factors, and high or predominant occurrence of species considered to be wetland indicators.

The National Wetland Inventory (NWI) mapping on 1:24,000 topographic quadrangle maps prepared by the FWS indicates potential wetlands throughout the study area, including hydric categories such as open water, emergent wetlands (both farmed and non-farmed), scrub-shrub wetlands, and riverine areas, as described by Cowardin et al. (1979).

Certain construction activities involving the placement of fill material within waterways, impoundments or wetlands are authorized under Nationwide Permit No. 26. This permit allows for the discharge of fill material into headwaters and isolated waters of the U.S. If the loss of waters of the U.S. is less than 1 ac, notification of the USCE is not required. This permit does not authorize the construction of permanent elevated access and maintenance roads beyond the nationwide permit for minor road crossings (33 CFR Part 330.5(a)(14)). Construction of the project may commence without notification to the district engineer as long as the project meets the conditions and provisions of the nationwide permit (see copy in Appendix A).

3.5 WILDLIFE

3.5.1 Wildlife Habitats and Species

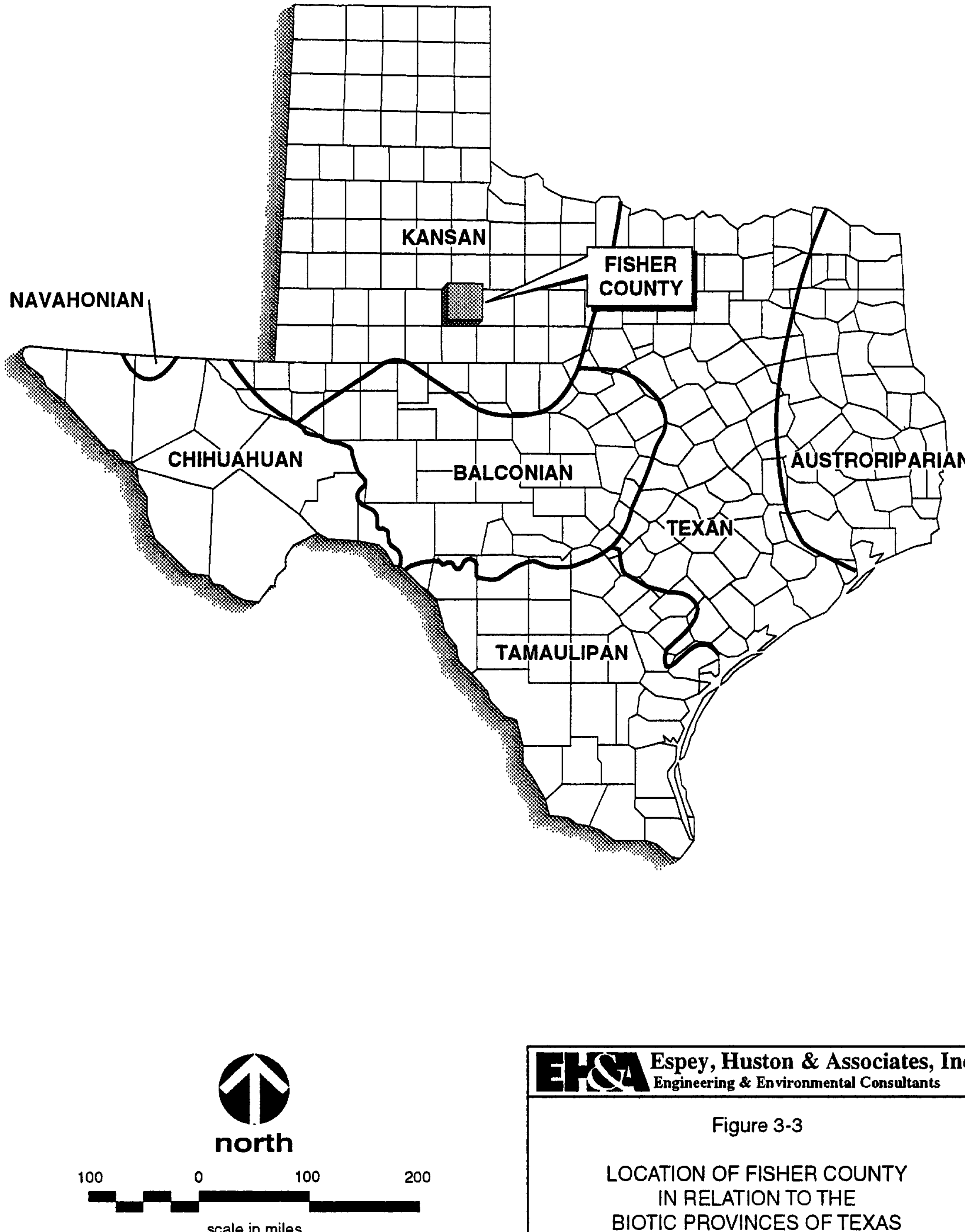
The study area lies within the Kansan Biotic Province (Blair, 1950) (Figure 3-3), and faunal communities of this province are a mix of eastern forest species and western grassland species. The Kansan Biotic Province closely coincides with the Rolling Plains and High Plains as described by Hatch et al. (1990). The Kansan Biotic Province contains over 59 species of mammals, 5 of which are restricted to this province in Texas. Other vertebrate fauna found within this province include 31 species of snakes (including 2 endemics), 14 anurans (frogs and toads) and 1 urodele (salamanders and newts) (Blair, 1950).

Wildlife habitats in the study area correspond to the vegetation types described in Section 3.4.2, which are representative of the ecological zones mentioned. These habitats include mesquite woodland/brushland, grassland, cropland, and hydric and aquatic habitats.

Aquatic habitats in the study area are dominated by small perennial streams, intermittent streams, diked impoundments (stock ponds), and playa lakes. The ephemeral aquatic habitats in the study area are dry much of the year and do not support a significant fish fauna. While spring-fed creeks or portions of spring-fed creeks contained water, many of the creeks were dry during EH&A's August 1996 field visit.

The streams of the study area support aquatic species primarily adapted to ephemeral pool habitats. Because they consist of small headwater drainages in a predominantly rocky to sandy clay substrate, flow is unlikely to be sufficiently persistent to support any substantial lotic assemblage. Stream inhabitants will, instead, be species adapted to rapid dispersal and completion of life cycles in pool habitats having fine-grained substrates.

The manmade pond habitats located in the study area exhibit variability in terms of their age, drainage, use by cattle, past stocking, and fertilization history. Unlike the creeks and streams of the area, these aquatic habitats are almost always exposed to full sunlight and do not experience the large fluctuations in water level and flow associated with streams during heavy precipitation. Bottom materials in these ponds are universally silt-sized to clay-sized particles, either naturally occurring where the pond was built or added as a liner to prevent leaking.



Source: Blair, 1950

Espey, Huston & Associates, Inc.
Engineering & Environmental Consultants

Figure 3-3

LOCATION OF FISHER COUNTY
IN RELATION TO THE
BIOTIC PROVINCES OF TEXAS
LONGWORTH 69-kV PROJECT

Playa lakes are shallow wetland areas that formed during the Pleistocene Era. There are more than 19,000 playa basins in the adjacent High Plains vegetational region of Texas, providing an estimated 229,957 to 249,964 ac of potential aquatic habitat. Playas occur, to a lesser extent, in the Rolling Plains as well. Playas are typically lined with Randall clay and are visibly different from the surrounding soils. There is no evidence of naturally occurring fish populations in playa lakes; however, some may be stocked with species such as channel catfish (*Ictalurus punctatus*). About 30% of all waterfowl wintering in Texas depend on playa environments, but this varies with adequacy of rainfall (Bolen et al., 1989).

According to Blair (1950), only one urodele (salamanders and newts), the tiger salamander (*Ambystoma tigrinum*) is of potential occurrence within the study area. Anuran species (frogs and toads) expected to occur within the study area include Couch's spadefoot toad (*Scaphiopus couchii*), red-spotted toad (*Bufo punctatus*), Blanchard's cricket frog (*Acris crepitans blanchardi*), and the plains leopard frog (*Rana blairi*) (Dixon, 1987; Conant and Collins, 1991).

Reptiles expected to occur in the study area include the ornate box turtle (*Terrapene ornata ornata*), northern earless lizard (*Holbrookia maculata maculata*), Texas spiny lizard (*Scleoporus olivaceus*), eastern collared lizard (*Crotaphytus collaris collaris*), great plains rat snake (*Elaphe guttata emoryi*), desert kingsnake (*Lampropeltis getulus splendida*), western coachwhip (*Masticophis flagellum testaceus*), and western diamondback rattlesnake (*Crotalus atrox*) (Dixon, 1987; Conant and Collins, 1991).

Birds observed by EH&A personnel during a field reconnaissance on 19-21 August 1996 include such year-round residents as the turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), greater roadrunner (*Geococcyx californianus*), American crow (*Corvus brachyrhynchos*), Carolina wren (*Thryothorus ludovicianus*), northern mockingbird (*Mimus polyglottos*), loggerhead shrike (*Lanius ludovicianus*), lark sparrow (*Chondestes grammacus*), meadowlark (*Sturnella* sp.), and house sparrow (*Passer domesticus*). The Mississippi kite (*Ictinia mississippiensis*), scissor-tailed flycatcher (*Tyrannus forficatus*) and barn swallow (*Hirundo rustico*), all summer residents, were also observed in the study area.

Many other species of birds migrate through the study area in the spring and fall. Migrants/winter residents and/or species expected to occur in the study area during the spring/fall and/or winter include the northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), tree swallow

(*Tachycineta bicolor*), house wren (*Troglodytes aedon*), ruby-crowned kinglet (*Regulus calendula*), hermit thrush (*Catharus guttatus*), cedar waxwing (*Bombycilla cedrorum*), orange-crowned warbler (*Vermivora celata*), yellow-rumped warbler (*Dendroica coronata*), and white-throated sparrow (*Zonotrichia albicollis*) (Scott, 1987; Texas Ornithological Society (TOS), 1995).

Mammals of potential occurrence in the study area include the western pipistrelle (*Pipistrellus subflavus*), nine-banded armadillo (*Dasypus novemcinctus*), desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), mexican ground squirrel (*Spermophilus mexicanus*), hispid pocket mouse (*Chaetodipus hispidus*), white footed mouse (*Peromyscus leucopus*), coyote (*Canis latrans*), common raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), bobcat (*Lynx rufus*), and white-tailed deer (*Odocoileus virginianus*) (Davis and Schmidly, 1994).

3.5.2 Recreationally and Commercially Important Wildlife

As stated in Section 3.4.3, a species is considered important if one or more of the following criteria applies: (a) the species is commercially or recreationally valuable; (b) the species is endangered or threatened; (c) the species affects the well-being of some important species within criterion (a) or criterion (b); or (d) the species is critical to the structure and function of the ecological system or is a biological indicator.

Numerous species of wildlife within the study area provide human benefits. These benefits result from both consumptive and non-consumptive uses of the wildlife resources. Non-consumptive uses include activities such as observing and photographing wildlife, birdwatching, etc. These uses, although difficult to quantify, deserve consideration in the evaluation of the wildlife resources of the study area. Consumptive uses of wildlife species, such as hunting and trapping, are easier to quantify. Consumptive and non-consumptive uses of wildlife are often enjoyed contemporaneously, and are generally compatible. Many species occurring in the study area provide opportunities for consumptive uses, and all provide the potential for non-consumptive benefits.

The white-tailed deer is the most important big game animal in the state. Its populations are, however, relatively low in the Rolling Plains (5.3% of state total in 1995). Where suitable habitat exists, huntable populations of white-tailed deer may be found. The 1994 white-tailed deer population estimate for Fisher County is 229 (Young and Richards, 1996). During the 1994-95 hunting season, no deer were reported harvested in Fisher County (Boydston, 1996).

Other game species regularly hunted within the Rolling Plains include the northern bobwhite, mourning dove, rabbits, and various species of migratory waterfowl (Roberson, 1995; Sullivan, 1995).

Furbearers (e.g., common raccoon, Virginia opossum (*Didelphis virginiana*), bobcat, gray fox (*Urocyon cinereoargenteus*), striped skunk, and mink (*Mustela vison*)) are of considerable economic and recreational importance in Texas. On a statewide basis, furbearers harvested during the trapping seasons from 1984-1985 to 1994-1995 had an average annual value to Texas trappers of approximately $3.3 million. During the 1994-1995 season the value of the annual fur harvest was approximately $958,000, an increase of 33% compared to the 1993-1994 season. During the 1994-1995 season, the common raccoon harvest was the most at approximately $540,000, followed by the coyote harvest ($106,733) and the bobcat harvest ($99,458). TPWD data show the common raccoon to be the most commonly observed furbearer species in the Rolling Plains region (Del Monte, 1996).

3.5.3 Endangered and Threatened Wildlife

Table 3-1 lists wildlife taxa that have a geographic range including Fisher County and that are considered by FWS, TPWD, or the Texas Organization for Endangered Species (TOES) to be endangered, threatened or candidate species. Numerous sources were reviewed to develop the list, including FWS (1992, 1994, 1996), TPWD (1995, 1996), TOES (1995), and BCD (1996). It should be noted that inclusion in this list does not imply that a species is known to occur in the study area but only acknowledges the potential for occurrence. In fact, many species are unlikely to be present. The following paragraphs present distributional data concerning each federally or state-listed species and a brief evaluation of the potential for the species to occur within the study area.

Three taxa listed in Table 3-1 are considered by both the FWS and TPWD as endangered. These are the brown pelican (*Pelecanus occidentalis*), American peregrine falcon (*Falco peregrinus anatum*), and interior least tern (*Sterna antillarum athalassos*). The arctic peregrine falcon (*Falco peregrinus tundrius*) is listed by TPWD as threatened. The FWS, however, no longer considers this species to be threatened, but lists it instead as endangered due to similarity of appearance (E/SA) to the endangered American peregrine falcon. The mountain plover (*Charadrius montanus*), while not currently listed by FWS or TPWD, is an FWS candidate species for listing as endangered or threatened. Candidate species are those where enough information about their vulnerability and threat(s) is available to propose them for listing as endangered or threatened. TPWD lists the white-faced ibis (*Plegadis chihi*) and Texas horned lizard (*Phrynosoma cornutum*) as threatened; neither is listed by FWS although the FWS considers

TABLE 3-1

ENDANGERED, THREATENED, OR CANDIDATE WILDLIFE OF POTENTIAL OCCURRENCE IN THE LONGWORTH STUDY AREA[1]

Common Name[2]	Scientific Name[2]	Status[3]		
		FWS	TPWD	TOES
Texas horned lizard	*Phrynosoma cornutum*	--	T	T
Brown pelican	*Pelecanus occidentalis*	E	E	E
White-faced ibis	*Plegadis chihi*	--	T	T
American peregrine falcon	*Falco peregrinus anatum*	E	E	E
Arctic peregrine falcon	*Falco peregrinus tundrius*	E/SA	T	T
Mountain plover	*Charadrius montanus*	C	--	--
Interior least tern	*Sterna antillarum athalassos*	E	E	E

1 According to Raun and Gehlbach (1972), Oberholser (1974), Burt and Grossenheider (1976), Smith (1978), Peterson (1980), Smith and Brodie (1982), Robbins et al. (1983), Schmidly (1983), Tennant (1984, 1985), Scott (1987), Dixon (1987), Garrett and Barker (1987), Conant and Collins (1991), FWS (1992, 1994, 1996), Davis and Schmidly (1994), Rappole and Blacklock (1994), TOES (1995), TOS (1995), TPWD (1995, 1996), and BCD (1996)

2 Nomenclature follows AOU (1983, 1985, 1987, 1989, 1991, 1993, 1995), Collins (1990), and Jones et al. (1992)

3 FWS - Fish and Wildlife Service
TPWD - Texas Parks and Wildlife Department
TOES - Texas Organization for Endangered Species
C - Federal candidate species; enough information about its vulnerability and threat(s) is available to propose it for listing as endangered or threatened.
E - Endangered; in danger of extinction
T - Threatened; severely depleted or impacted by man
E/SA - Endangered due to similarity of appearance. No longer biologically threatened or endangered, but is similar to a listed endangered species.
-- - Not listed

them SOC. SOC are species for which some evidence of vulnerability exists, but not enough to support listing at this time. These species (SOC) have no legal protection under the Endangered Species Act.

The brown pelican is primarily a coastal species that rarely ventures very far out to sea or inland. In Texas, it occurs primarily along the lower and middle coasts, but occasional sightings are reported on the upper coast and inland to central, north-central and eastern Texas (TOS, 1995), usually on large freshwater lakes. Such occurrences are relatively uncommon. This species has not been reported from either Scurry County or Fisher County (FWS, 1992; TPWD, 1995; see also agency letters in Appendix A) and the likelihood of brown pelicans visiting the study area, even as occasional vagrant individuals, is considered remote.

Both the American peregrine falcon and arctic peregrine falcon are statewide migrants in Texas (FWS, 1992; TOS, 1995) and thus could occur in the study area during the spring and fall migrations. The National Fish and Wildlife Laboratory (NFWL, 1980), however, does not include Fisher County as within the breeding range or main migration range of these falcons. Their occurrence in the study area is unlikely other than as rare migrants.

The interior least tern is a potential migrant through the study area. This bird winters primarily along the Texas coast and breeds along inland river systems (TPWD, 1995). Its presence in the study area is possible; however, this species has not been reported from Fisher County (Oberholser, 1974; FWS, 1992; TPWD, 1995; see also agency letters in Appendix A).

The mountain plover is a migrant that is known to winter in south Texas and summer in the panhandle in northwest Texas. It is reported as a migrant throughout Texas (TOS, 1995) and is of possible occurrence in the study area as a migrant.

The white-faced ibis, an inhabitant of marshes, is a rare to uncommon spring and fall migrant throughout Texas and Louisiana (TOS, 1995). It may occur as a migrant in the study area.

TPWD (see letter in Appendix A) mentions one other SOC as being of potential occurrence in the study area: the burrowing owl (*Speotyto cunicularia hypugaea*). This species is an inhabitant of open grasslands and is often seen in prairie dog towns. A spring record exists for neighboring Scurry County (Oberholser, 1974).

The Texas horned lizard occurs throughout the state, typically in areas of flat, open terrain with sparse vegetative cover on sandy or loamy soil. It has been recorded from Fisher County (Dixon, 1987) and thus may occur within the study area.

3.6 SOCIOECONOMICS

This section presents a summary of the social, economic and demographic characteristics of Fisher County. Reviewed literature sources include publications of the Texas Employment Commission (TEC) (now known as the Texas Work Force Commission), the Texas State Data Center (TSDC), the Texas Comptroller of Public Accounts (TCPA), the Texas Almanac and State Industrial Guide (1993, 1994 and 1995), and the U.S. Bureau of the Census.

Fisher County is located in west central Texas, an area that is heavily dependent upon land and natural resources, particularly oil, gas, and gypsum. The county was created from Bexar District in the late 1870s - early 1880s.

3.6.1 Population Trends

Roby, which had an estimated population of 593 in 1993, is the county seat in Fisher County. Other communities in the county (but outside the study area) include Rotan (population 1,829), Royston and numerous small communities. Rotan, approximately 10 miles northwest of Roby, houses a gypsum plant and oil mill. Fisher County has experienced population losses for each decade between 1970 and 1990 (Table 3-2), with an overall drop of 24% (an average annual growth rate of -1.2%). The county population density (based on 1991 population estimates) is 5 persons per square mile (ppsqm). Recent estimates by the TSDC place Fisher County's population at 4,646 as of 1 July 1994 (TSDC, 1995). This recent decrease of 196 persons represents a 4% loss since 1990.

TSDC population projections for Fisher County forecast a gradual decline in already low or non-existent growth rates through 2030. As shown in Table 3-2, keeping with historical trends, county population growth trends are projected to remain below the state annual average of 2.5%.

3.6.2 Employment

As shown in Table 3-3, the civilian labor force (which includes both the employed and those actively seeking work) increased between 1980 and 1990. Fisher County had a minimal increase

TABLE 3-2

POPULATION TRENDS FOR FISHER COUNTY
AND THE STATE OF TEXAS

A. POPULATION 1970 -1990

	Population			Percent Change			
Place	1970	1980	1990	1970-80	1980-90	1970-90	Average Annual 1970-90
Fisher County	6,344	5,891	4,842	-7.1	-17.8	-23.7	-1.2
State of Texas	11,196,730	14,229,191	16,986,510	27.1	19.4	51.7	2.6

B. POPULATION PROJECTIONS 1990-2030

	Population	Projected				Percent Change				
Place	1990	2000	2010	2020	2030	1990-2000	2000-10	2010-20	2020-30	Average Annual 1990-2030
Fisher County	4,842	4,625	4,417	4,178	3,907	-4.5	-4.5	-5.4	-6.5	-0.5
State of Texas	16,986,510	20,344,813	24,128,848	28,684,923	33,912,478	19.8	19.8	18.9	18.2	2.5

Source: TSDC, 1996, 1980-90 Migration Series (1.0 Scenario); Texas Almanac, 1993.

TABLE 3-3

CIVILIAN LABOR FORCE AND UNEMPLOYMENT RATE FOR
FISHER COUNTY AND THE STATE OF TEXAS

A. CIVILIAN LABOR FORCE 1980-1994

	Civilian Labor Force										
	Employment		*Avg.Yrly. Chg.*	*Employment*				*Annual Change*			*Avg. Yrly. Chg.*
Place	1980	1990	1980-90	1992	1993	1994	1995	1992-93	1993-94	1994-95	1992-95
Fisher County	2,357	2,437	0.3	2,413	2,003	1,970	1,920	-17.0	-1.6	-2.5	-6.8
Texas *(in 1000s)*	6,737	8,597	2.8	8,973	9,140	9,384	9,568	1.9	2.7	2.0	2.2

B. ANNUAL AVERAGE UNEMPLOYMENT RATE 1980 - 1994

Place	1980	1990	1991	1992	1993	1994	1995
Fisher County	3.1	6.4	6.1	6.8	6.8	8.4	5.6
Texas	5.2	6.2	6.6	7.5	7.0	6.4	5.6

Source: TEC, 1980, 1990a, 1991, 1992a, 1993, 1994, 1995a.

of 0.3% from 2,357 to 2,437. The labor force in the county suffered dramatic losses from 1992 to 1993, dropping by 17%. Despite a decrease in the unemployment rate in 1995, annual employment for Fisher County continued to drop, resulting in a 6.8% average annual change in employment for the years 1992 through 1995.

As shown in Table 3-4, a comparison of fourth-quarter TEC employment figures for 1990 and 1995 show that the change in covered employment did not meet the 13% gain witnessed by the state. In fact, total covered employment in Fisher County decreased by 5.7%. Covered employment data incorporate jobs that are located in the county and include workers covered by state unemployment insurance and most agricultural employees. The data exclude self-employed persons and federal employees. As shown in Table 3-4(A), the state/local government sector in Fisher County experienced growth (25%) that greatly exceeded that within the same sector at the state level (14%). Service employment remained steady during the five-year period, though growth at the state level in this sector was three times as much despite the fact that manufacturing employment is also included in the service sector. Because manufacturing employment in Fisher County is accounted for by one or two employers, employment numbers for these establishments are included in the service sector. The National Gypsum Company, the holding company for Gold Bard Building Products, provides approximately 100-249 jobs (Directory of Texas Manufacturers, 1991). Agriculture remained one of the four major employment sectors in the county despite an 11% drop in employment.

Per capita income in Fisher County increased by 94% from $7,752 in 1980 to $15,048 in 1990. Despite the increase, the 1990 per capita income of the county was almost $1,669 less than the overall state average of $16,717; however, it matches the per capita regional average of $15,045 (TCPA, 1992).

3.6.3 Leading Economic Sectors

As shown in Table 3-4, a comparison of TEC fourth quarter 1990 and 1995 employment figures shows that employment trends in the major employment sectors in Fisher County varied only slightly over the years and remained consistently behind state trends (TEC, 1990b; 1995b). Leading covered employment sectors in Fisher County for fourth quarter 1990 were government, service, transportation & public utilities, and agriculture. These accounted for 94% of total employment. In 1995 trade surpassed agriculture as a leading employer, and transportation, communications & public utilities suffered a dramatic loss of 93 employees, pushing it back to fifth. The top four employment sectors in

TABLE 3-4

COVERED EMPLOYMENT AND MAJOR EMPLOYMENT SECTORS
FOURTH QUARTER 1990 AND 1995: FISHER COUNTY
AND THE STATE OF TEXAS

A. FISHER COUNTY - MAJOR COVERED EMPLOYMENT SECTORS

Employment Sector	Fourth Quarter Employment		Percent Total Employment		% Change
	1990	1995	1990	1995	1990-95
Service	286	306	26.1	29.7	7.0
Trade	139	155	12.7	15.0	11.5
Government	304	380	27.8	36.8	25.0
Agriculure	142	126	13.0	12.2	-11.3
Subtotal	871	967	79.6	93.7	11.0
TOTAL EMPLOYMENT	1,094	1,032	-	-	-5.7

B. STATE OF TEXAS - MAJOR COVERED EMPLOYMENT SECTORS

Employment Sector *(in 1000s)*	Fourth Quarter Employment		Percent Total Employment		% Change
	1990	1995	1990	1995	1990-95
Service	1,638	1,985	23.0	24.7	21.2
Trade	1,759	1,990	24.7	24.8	13.1
Government	1,272	1,451	17.9	18.0	14.0
Manufacturing	999	1,039	14.0	12.9	4.0
Subtotal	5,667	6,465	79.7	80.4	14.1
TOTAL EMPLOYMENT	7,112	8,037	-	-	13.0

Source: TEC, 1990b; 1995b.

1995 were state/local government, service, trade and agriculture, accounting for nearly 94% of total employment (TEC, 1995a).

Oil and gas production are important industries in Fisher County. Gypsum production is also important in Fisher County (Texas Almanac, 1995).

3.6.4 Community Values

The term "community values" is included as a factor for the consideration of electric facilities certification under Section 2.255.(c) of the Public Utility Regulatory Act of 1995, although the term has not been specifically defined for regulatory purposes by the PUC. However, in the CCN application for transmission lines and substations, the PUC requests information concerning the following items under the heading "Community Values".

- approvals or permits required from other governmental agencies
- general description of the area
- residences, businesses, schools, churches, cemeteries, hospitals, nursing homes or other habitable structures within 200 ft of the centerline of the proposed project
- AM, FM, microwave and other electronic installations in the area
- FAA-registered airstrips located in the area
- irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems

Each of the above items, insofar as it affects community values, is discussed in the appropriate section of this document.

For the purposes of evaluating the effects of the proposed transmission line, EH&A has defined the term community values as a "shared appreciation of an area or other natural or human resource by a national, regional or local community". Adverse effects upon community values are defined as aspects of the proposed project which would significantly and negatively alter the use, enjoyment or intrinsic value attached to an important area or resource by a community. This definition assumes that community concerns are identified with the location and specific characteristics of the proposed transmission line and do not include possible objections to electric facilities per se.

3.7 LAND USE AND AESTHETICS

3.7.1 Land Use

The study area lies within Fisher County in the southern panhandle of west Texas. Roby, the Fisher County seat, is located approximately 5 miles north of the study area. No incorporated cities are located in the study area, but the community of Longworth is located in the southeast corner. The study area is located in State Planning District No. 7 and the planning and advisory board for the region is the West Central Texas Council of Governments, with headquarters in Abilene.

Land use in Fisher County is predominantly agricultural, and ranching constitutes the largest percentage of this use. Land use estimates from 1987 indicate that approximately 54% of the total county area is classified as rangeland and 1% as pasture (SCS, 1990). Livestock raised are mainly beef cattle, and some hogs. The next category in terms of total acres is cropland, which makes up approximately 44% of the county. Major crops include cotton, wheat, grain sorghum, and hay. Most of these crops are raised by dryland farming, but there is some row irrigation along the Clear Fork of the Brazos River, north of Roby, and some circle-pivot irrigation. Remaining land uses include urban areas, lakes and ponds, and miscellaneous uses (SCS, 1990). Mineral production in Fisher County includes oil, gas, and gypsum.

Land use within the study area largely mimics the pattern of the county as a whole, with cropland being the primary use. Abandoned cropland, tracts enrolled in the Conservation Reserve Program (CRP) and mesquite brushland make up the remainder of the study area. EH&A did not find any irrigated cropland in the study area during their August 1996 field reconnaissance. A portion of a gypsum quarry is located in the extreme eastern end of the study area, north of Longworth. Residential land use within the study area is concentrated in and around the community of Longworth. Rural areas are very sparsely populated, with individual residences scattered among local farms and ranches and along SH 70.

3.7.2 Recreation

A review of the Texas Outdoor Recreation Inventory (TORI), USGS topographic maps, TxDOT county highway maps, and a field reconnaissance of the study area revealed no parks/recreation areas within the study area. Many private landowners in the county lease their lands for hunting in the appropriate season. Primary game species are quail, dove, and turkey.

3.7.3 Transportation/Aviation

The main transportation artery in the study area is U.S. 70, which runs between Roby and Sweetwater, and also connects these cities with other communities to the north and south. A network of state highways, FM roads, and county roads further connects the study area and its residents with the rest of the region.

A review of the Dallas-Fort Worth Sectional Aeronautical Chart (National Oceanic and Atmospheric Administration (NOAA), 1996a), the Airport/Facility Directory for the South Central U.S. (NOAA, 1996b), the Texas Airport Directory (TxDOT, 1994), other federal, state, and local maps, as well as a field reconnaissance, found no public or military airports within the study area boundaries. The county airport is located north of the study area between Roby and Rotan on SH 70. The airport's main runway (RWY 16-34) is 3,300 ft long. All of the study area is also within the Roby military operations area (MOA). This MOA is used for military flight training between sunrise and sunset from Monday through Friday at elevations above 12,000 ft mean sea level (msl) (NOAA, 1996a).

3.7.4 Aesthetics

Aesthetics is included as a factor for consideration in the evaluation of transmission facilities in Section 2.255.(c) of the Public Utility Regulatory Act of 1995. The term aesthetics refers to the subjective perception of natural beauty in a landscape by attempting to define and measure an area's scenic qualities.

Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a transmission line could potentially affect the scenic enjoyment of the area). Aesthetic values considered in this analysis, which combine to give an area its aesthetic identity, include:

- topographical variation (hills, valleys, etc.)
- prominence of water in the landscape
- vegetation variety (forests, pasture, etc.)
- color
- diversity of scenic elements
- degree of human development or alteration
- overall uniqueness of the scenic environment compared to the larger region

Overall, the study area exhibits a low-to-medium level of aesthetic quality. The topography is relatively flat to rolling, with elevations ranging from 1,970 ft above msl in the southeast corner of the study area in Longworth to approximately 2,100 ft msl in the western portion of the study area, between the two alternative substation sites. Most of the tributary streams in the study area are intermittent. Much of the study area has been cleared of its native vegetation for agricultural uses, especially farming. Remaining areas, often used for grazing cattle, range from brushland to more heavily wooded tracts, primarily mesquite. With the exception of the developed areas around Longworth, there is very little non-agricultural development in the study area.

EH&A's aesthetic survey found no outstanding scenic resources, designated scenic views, or unique visual elements within the study area. Overall, little distinguishes the scenic quality of the study area from that of other adjacent areas in the region.

3.8 CULTURAL RESOURCES

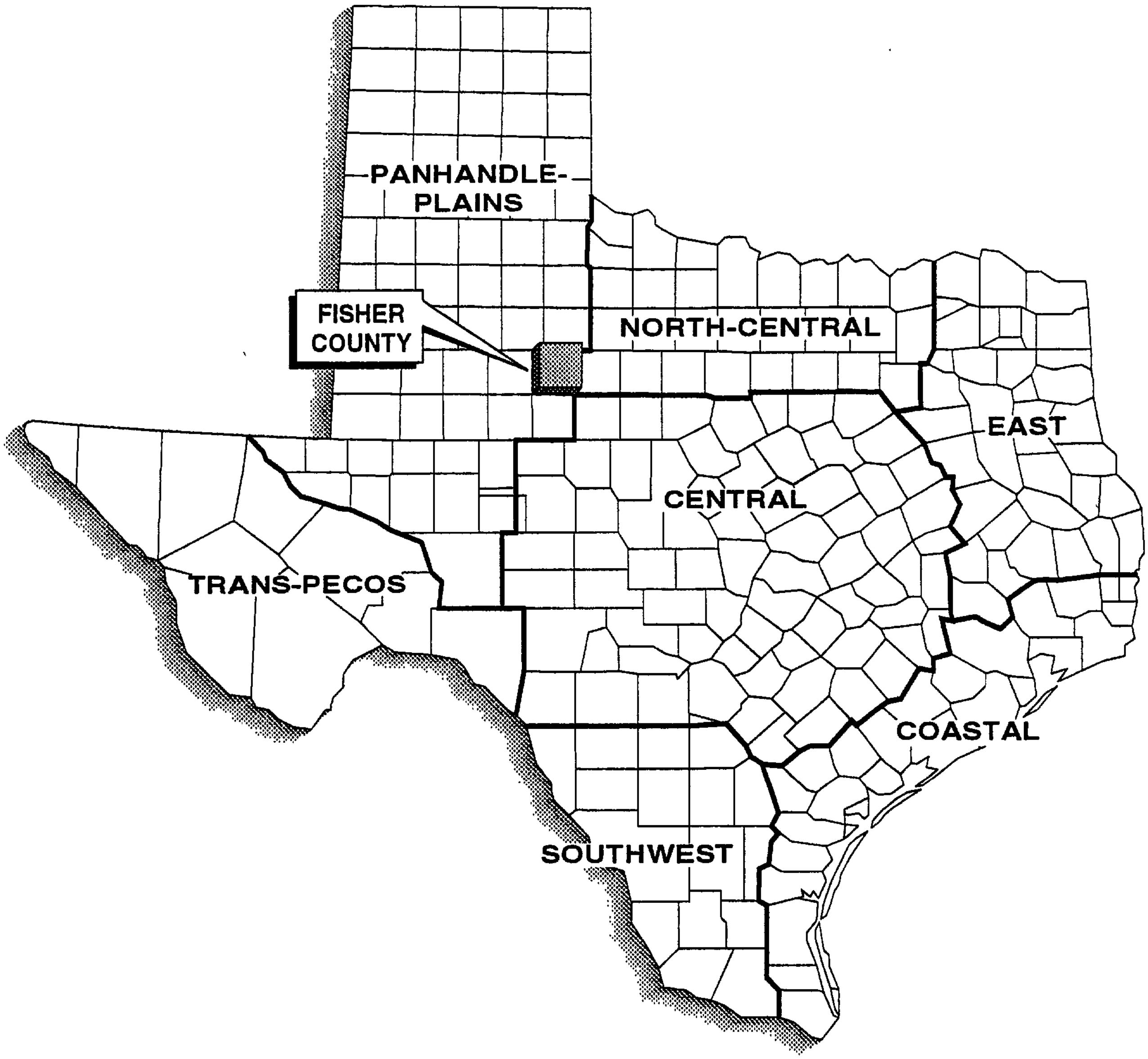
The following presents the cultural setting of the study area. A discussion of the prehistory and history of the region is presented, followed by a summary of the previous archaeological investigations conducted in Fisher and the surrounding counties. Finally, the results of the records review is presented.

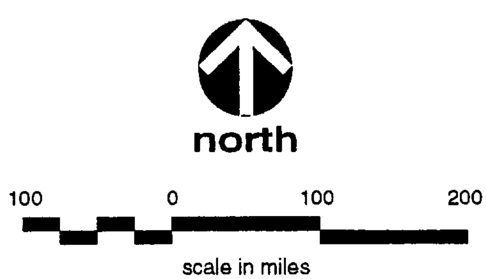
3.8.1 Cultural Setting

The study area is part of the Panhandle-Plains cultural region (Figure 3-4). For this region, archaeologists have recognized four distinct cultural stages: three prehistoric stages (Paleo-Indian, Archaic, and Late Prehistoric or Neo-Indian) and one historic stage. Each of the prehistoric stages has been defined on the basis of ecological adaptation and specific diagnostic materials. The historic period reflects both the effect of European in-migration on the native populations and the actual settlement of the region by Europeans and Americans. Each of the cultural stages is briefly described below.

Paleo-Indian (10,000 B.C. - 5,000 B.C.)

The late Pleistocene and early Holocene Paleo-Indian stage is characterized by hunting of extinct and modern megafauna. There is also good evidence for the use of smaller animals (Hester, 1972; Johnson, 1987). The climate of the region was cooler and moister than today and had minimal





Source: Texas Archeological Society, 1954

EH&A Espey, Huston & Associates, Inc.
Engineering & Environmental Consultants

Figure 3-4

LOCATION OF FISHER COUNTY
IN RELATION TO THE
CULTURAL RESOURCES AREAS OF TEXAS
LONGWORTH 69-kV PROJECT

seasonality. These conditions resulted in a high diversity of plants and animals available to Paleo-Indian groups (Graham and Lundelius, 1984).

Although the subject of intense archaeological interest for many years, the lifeways of Paleo-Indians are still poorly known. Most of the sites are kills rather than camps. The available information about cultural patterns is incomplete.

The Paleo-Indian stage on the Panhandle-Plains and the surrounding region is subdivided into a sequence of four main cultures (Holliday, 1987:22). From earliest to latest these are Clovis, Folsom, Plainview, and Firstview. Distinctive projectile points and economic activities differentiate the Paleo-Indian cultures.

The primary marker of the Clovis culture is the Clovis fluted point. Clovis hunters commonly attacked now-extinct megafauna such as mammoths. A number of Clovis sites occur in the region. These include the Clovis type site at Blackwater Draw Locality #1 near Clovis, New Mexico (Hester, 1972) and the Roberts County Miami site on the northern edge of the Llano Estacado (Sellards, 1938). Johnson and Holliday (1985) report Clovis material at the Lubbock Lake Site in Lubbock County.

The Folsom culture is characterized by the hunting of now extinct species of bison using a more refined fluted point than Clovis. Regional Folsom sites include the type site near Folsom, New Mexico (Figgins, 1927), the Lipscomb sites in Lipscomb County (Wormington, 1957), the Lubbock Lake site in Lubbock County, the Adair-Steadman site in Fisher County (Tunnell, 1977), and the Briscoe County Lake Theo site (Harrison and Smith, 1975).

The Plainview culture was similar to the Folsom culture in its use of bison. The Plainview point, however, was unfluted and parallel-flaked. Sites of this culture include the Plainview Site in Hale County (Sellards et al., 1947).

The terminal Paleo-Indian Firstview culture hunted both extinct and modern bison with unfluted, parallel-flaked points similar to Plainview. Sites in the region with Firstview components include Blackwater Draw Locality #1 and Lubbock Lake.

Environmental changes and the resultant adaptation by later cultural groups defines the end of the Paleo-Indian stage. By about 5,000 B.C. the wet and cool conditions of the Anathermal gave way to much warmer and drier conditions. Most megafauna species, including mammoth, mastodon, and some bison species, as well as Anathermal plants became extinct.

Archaic (5,000 B.C. - A.D. 1)

The beginning of the Archaic stage coincides with the onset of the more xeric climate of the Altithermal (Johnson and Holliday, 1986). The warmer and drier Altithermal climate purportedly diminished vegetation cover and exposed the ground surface to erosion. Streams and ponds were dry. Hughes (1991:8) believes that poor grazing and scarce water drove bison and other game animals from this region to seek more favorable conditions elsewhere.

In contrast to the Paleo-Indian stage, the Archaic is characterized by hunting modern animals with a variety of dart points. There is also heavy use of grinding implements and boiling pebbles throughout the Archaic (Hughes and Willey, 1978). The material remains show more reliance on small game and wild plant foods than during the Paleo-Indian stage.

We have less archaeological information about the Archaic stage than about any other cultural stage in this region. In general, Archaic stage sites are very scarce in this area. Johnson and Holliday (1986) suggest that the lack of Archaic sites, in part, may be due to conditions during that period that were less conducive to site preservation than conditions at other times.

Hughes (1991:38), however, believes that the scarcity reflects actual abandonment. He argues that as the animals left the Altithermal Panhandle-Plains and surrounding regions so did the Archaic hunters. In contrast, sites like Lubbock Lake seem to show that the area was not totally abandoned during the Archaic stage. Occupation throughout the Archaic stage occurs there (Johnson and Holliday, 1986).

Altithermal climatic conditions changed to Medithermal conditions about 2000 B.C. The more mesic conditions of the Medithermal allowed the return of the bison. With the bison came Late Archaic hunters (Hughes and Willey, 1978). These hunters left more frequent evidence of their presence in the area. Late Archaic sites usually contain many bison-processing tools such as trianguloid knives and large end scrapers. Milling stones and other food grinding implements are also abundant on Late Archaic sites (Hughes, 1991), suggesting some economic diversification.

Sites of this time period are usually identified on the basis of dart points which exhibit a general evolution during the Archaic from basal- and corner-notched to side-notched styles. Overall population was increasing, and small migratory bands hunted deer and smaller animals and gathered wild plants within territorial ranges. Sites of this time period are large to small open camps in the bottoms of the stream-fed canyons and below pour-offs on tributaries where natural water pools are formed. Some sites contain mortar holes; the sites with holes may be permanent camps and those without may be hunting camps (BEG, 1986).

Archaic materials have been recovered from very few excavated sites in the Panhandle-Plains. Archaic projectile points have been recovered from the Floydada Country Club site (Word, 1963), the Pete Creek site (Parsons, 1967) and from a transitional Archaic/Late Prehistoric component at the County Line and Blue Clay sites in the MacKenzie Reservoir area (Hughes and Willey, 1978). Several Archaic period sites were discovered in Scurry County by Jelks (1952) during the survey conducted for the Colorado City Reservoir.

Late Prehistoric (A.D. 1 - A.D. 1540)

The Late Prehistoric stage is characterized by the use of ceramic technology and the bow and arrow. Subsistence continued as hunting and gathering probably supplemented by horticulture. The Medithermal climate was essentially that of modern times. During the early part of the Medithermal, however, conditions apparently were somewhat wetter and cooler than present. Bison may have been scarce in the region, but deer and smaller animals remained abundant. By about A.D. 1100 the climate had returned to warmer and drier conditions. Bison increased and were again a staple for prehistoric groups (Hughes and Willey, 1978; Johnson, 1987; Hughes, 1991).

Based on work at Justiceburg Reservoir in Garza and Kent counties north of the project area Boyd et al. (1990) divide the Late Prehistoric stage into early and late substages. They call the former Late Prehistoric I and the latter Late Prehistoric II. Hughes (1991:10) refers to the Late Prehistoric stage as the NeoIndian stage. He also subdivides this stage into early and late periods which correlate to Boyd et al.'s (1990) Late Prehistoric I and II.

Three Late Prehistoric I cultures occur near the project area: Lake Creek, Palo Duro and Eastern Jornada. The latter consists of Querecho and Maljamar phases.

Hughes (1962) characterized the Lake Creek culture on the basis of Woodland cordmarked pottery found with Scallorn-like arrowpoints. Mogollon brownwares in small numbers are also often found at Lake Creek sites (Hughes, 1962). Dwelling types for the culture are unknown. Radiocarbon dates range from about A.D. 200 to A.D. 900 (Hughes, 1991).

Palo Duro sites are most common in the Red River drainage. However, Boyd et al. (1990) assigns some sites on the southeastern Llano Estacado in the Brazos River drainage to the Palo Duro culture. Palo Duro sites typically yield Mogollon plain brown pottery and Deadman and Scallorn arrowpoints. Cruse (1992) reported Mogollon-style pithouses at the Kent Creek site in Hall County. Radiocarbon dates range from A.D. 120 to A.D. 1110 (Hughes, 1991)

Based on test excavations west of the project area in the southwestern Llano Estacado in New Mexico, Corley (1965) proposed an eastern extension of the Jornada branch of the Mogollon culture with a sequence of Querecho and Maljamar phases. Since 1965 Collins (1966, 1968) reported components of the Eastern Jornada phases at several other sites in southeastern New Mexico and Texas.

The Late Prehistoric II is identified by the appearance of side-notched triangular arrowpoints. Subsistence regimes included heavy reliance on bison as well as seasonal gathering and limited but increasing reliance on horticulture.

Historic

Historically, the project area lies in the eighteenth and nineteenth century Comancheria (Thurmond et al., 1981). European intrusions into the area may have begun as early as 1787 of Pedro Vial's trip from San Antonio de Bexar to Santa Fe probably led him through north Texas and the Panhandle. In the following year, Jose Mares, returning from Santa Fe, probably traveled through the Croton Breaks between Aspermont and Guthrie (Thurmond et al., 1981).

Other expeditions which may have crossed through or near the area include those of Albert Pike (1832), George Wilkens Kendall (1841), Randolph B. Marcy (1849, 1854), and General Ranald Slidell MacKenzie (1871). These explorers met and occasionally clashed with both the Apaches and Comanches who inhabited the area (Newcomb, 1975).

By 1880, both the Native Americans and the buffalo had been either forcibly removed from the area or killed and the land divided into huge ranches. The traditional land use of the project area has remained deeply rooted in cattle ranching.

Fisher County was established in 1886, ten years after Anglo-Americans first began settling in the area. Roby was soon after selected as the county seat. Since the first census in 1800, the livestock industry, supplemented by farming, has been the chief source of rural income. Oil and gas production, gypsum plants and the railroad have encouraged economic development in the county (Webb, 1952).

3.8.2 Previous Investigations

The earliest investigations in the area were conducted in the 1920s and 1930s for the University of Texas by A.T. Jackson, G.E. Arnold and J.E. Pearce in Jones, Nolan, Shackelford, Taylor and Young counties. Cyrus N. Ray also did extensive work in these counties, most notably in the Abilene vicinity. Many of these early studies concentrated specifically on Paleo-Indian studies rather than on more general investigations of the area including sites dating to Archaic and post-Archaic cultural occupations.

Investigations by avocational and professional archaeologists during the 1960s began to provide a solid body of data upon which a more accurate picture of the region's prehistory could be based. Activities of the South Plains Archaeological Society were particularly useful in this respect. These include excavations in Floyd County at the Floydada Country Club site (Word, 1963) and at the Montgomery site (Word, 1965) and in Garza County at the Garza site (Runkles, 1964). All three of these sites produced Late Prehistoric and Historic aboriginal occupation debris, as did the Pete Creek and Morgan Jones sites in Crosby County (Parsons, 1967).

The 1960s and 1970s saw the initiation of numerous reservoir surveys within the region. These include Tunnell's (1960) survey of the Champion Creek Reservoir in Mitchell County, Malone and Briggs' (1970) survey of Miller Creek Reservoir in Baylor and Throckmorton counties, and Malone's (1970) and Hughes and Willey's (1978) surveys of the MacKenzie Reservoir in Swisher and Briscoe counties. Additional surveys include Hughes' (1972) survey of portions of the Wichita River drainage in Cottle, Foard, King and Knox counties as part of the Wichita River Chloride Control Project, the preliminary survey of proposed dam site areas for the Brazos Natural Salt Pollution control Project in Kent, King and Stonewall counties (Skinner, 1973) and a survey in the lower Tule Canyon area in Briscoe County (Katz and Katz, 1976).

Continuing investigations of the Wichita River Chloride Control Project area led to survey and limited testing at the Truscott Reservoir in King and Knox counties (Etchieson et al., 1979) and Crowell Reservoir and associated facilities in Cottle, Foard, King and Knox counties (Etchieson et al., 1979). One of the more important archaeological projects of the 1970s in the Panhandle-Plains region was the testing conducted in the MacKenzie Reservoir by West Texas State University (Hughes and Willey, 1978).

Several major surveys have been conducted in the region during the 1980s including Thurmond, Freeman and Andrews' (1981) survey of additional areas associated with the Brazos Natural Salt Pollution Control Project in Kent, King and Stonewall counties and a survey of the Justiceburg Reservoir by Prewitt and Associates, Inc. (Boyd et al., 1990).

3.8.3 Results of the Literature/Records Review

A literature and records review was conducted for the proposed Longworth Transmission Line Project located in Fisher County, Texas. The purpose of this investigation was to locate previously recorded cultural resource sites within the study area.

The NRHP and the records of the THC were reviewed for the identification of recorded sites or sites determined eligible for inclusion on the NRHP. Research of available records and literature was also conducted at the Texas Archeological Research Laboratory, J.J. Pickle Research Center, the University of Texas at Austin. The Guide to Official Texas Historical Markers was also consulted.

Current records at TARL indicate that no archaeological sites have been officially recorded within 1,000 ft of either of the alternative routes.

4.0 ENVIRONMENTAL IMPACTS

4.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVE ROUTES

4.1 IMPACTS ON PHYSIOGRAPHY/GEOLOGY/SOILS

Construction of the proposed transmission line will have no significant impact on the geological resources of the study area. The construction of the structures will require the removal and minor disturbance of small amounts of surface material, but will have no measurable impact on the geological features or resources that occur along the proposed route options. Some economically valuable resources may occur in the study area, but this project will have no significant impacts associated with the potential loss of these resources. None of the alternative routes crosses any significant or unique geologic features.

During the construction and operation of the transmission line, very few long-term adverse effects on the region's soils will occur. The major impacts to soils are primarily erosion and compaction associated with construction of the line. Soil erosion is potentially greatest during the initial clearing of the ROW, especially at stream crossings. Portions of the ROW that are utilized for farming or grazing livestock would not need to be cleared by heavy equipment; therefore, soil compaction and erosion impacts in these areas would be minimal.

Natural succession should quickly revegetate the majority of the ROW. To maximize the protection of both land and water resources, special care should be taken when clearing near waterways. Vegetation on the stream banks should be left intact to the greatest extent practical. Revegetation of these areas, where necessary, should take priority over less-critical areas.

Prime farmlands occur within the study area. Other than potential construction-related erosion, impacts to prime farmland soils are expected to be insignificant and limited to the physical occupation of small areas at the base of support structures. These areas are very small in comparison to the total amount of prime farmlands found within the study area.

4.2 IMPACTS ON WATER RESOURCES

4.2.1 Surface Water

The construction and operation of the proposed transmission line should have little adverse impact on the water resources of the area. The main potential impacts on water resources from any major construction activity are pollution resulting from erosion, and spillage of petroleum and other chemical products. Soil erosion control measures should minimize erosion and the resultant siltation, as well as any minor nutrient loading of the water resources. Extreme care should be exercised in the storage and handling of petroleum products, especially near the waterways.

If flowing water is present in any of the creeks to be spanned, construction machinery and equipment should be transported around via existing roads to avoid direct crossing of the streams. This would eliminate the necessity of constructing temporary low-water crossings that would result in erosion, siltation and disturbance of the stream and its biota. However, if a stream to be spanned is dry at the time of construction and some earth moving is necessary to facilitate crossing, to the extent practical, the area should be restored to pre-construction conditions. Selective clearing (i.e., use of chainsaws versus bulldozers) at stream crossings should be undertaken to minimize erosion problems. Highly erodible areas adjacent to the stream, such as stream banks, should not be cleared unless necessary. In any event, construction of the transmission line over a stream would result in some temporary erosion and siltation and short-term disturbance, but impacts would be minimal and localized because of the intermittent nature of most streams crossed by the alternative routes. No long-term adverse effects are anticipated.

4.2.2 Ground Water

The construction, operation and maintenance of the proposed transmission line is not expected to adversely affect ground water resources in the study area or its vicinity. The amount of recharge area disturbed by construction is insignificant compared to the total amount of recharge area available for the aquatic systems in the region. No measurable alteration of aquifer recharge capacity should occur, and the likelihood of ground water contamination is not significant.

The main potential impact on ground water resources from any construction project is pollution resulting from spillage of petroleum or other chemical products. The effect of the proposed transmission line on ground water resources will be negligible. Only the poles will be buried. Efforts should be made during construction for proper control and handling of any petroleum or other chemical products used.

4.3 IMPACTS ON ECOLOGICAL RESOURCES

4.3.1 Vegetation

The primary impact to vegetation that would result from construction of the proposed transmission line is the removal of existing vegetation from the areas required for the ROW. The length of each alternative route through various habitats is generally an important consideration in the impacts analysis. The greatest amount of vegetation clearing would be required in densely vegetated habitats, which are identified in Table 6-1 as upland woodland/brushland (mainly mesquite) and bottomland/riparian woodland. These areas are restricted within the study area, which is predominantly cropland or open pastureland that is sparsely vegetated to a varying extent with grasses, cacti, yuccas, and shrubs. The vegetation types represented within the riparian woodland category are relatively open woodlands that could easily be spanned or avoided in many cases, due to their limited areal extent. Within cropland and pastureland, the ROW might be temporarily unavailable for grazing or agricultural purposes during construction. Once construction is complete, the ROW could be used as the landowner desires. The only land lost to grazing/agriculture would be that occurring beneath the structures.

The greatest potential for the occurrence of wetland habitats along any of the alternative routes is in association with stream crossings and playa lakes. Within the study area, wetland habitats may easily be spanned by the proposed transmission line; thus, structures would not be located within these sensitive areas.

The approximate extent of the vegetation communities occurring along the alternative routes was determined in the field. Potential bottomland/riparian woodland impacts were based on NWI mapping in addition to the field survey. The results of these measurements are presented in Table 7-1 and discussed below.

Of the two proposed alternative routes, Route 1 represents the least potential impact to vegetation. This is because the entire route is within cropland, paralleling a road ROW. Route 2 crosses approximately 800 ft of mesquite woodland/brushland and thus would require more vegetation clearing. Neither of the routes parallels any streams.

4.3.2 Endangered and Threatened Plant Species

No endangered or threatened plant species are known from the study area or Fisher County. Therefore, no impacts to listed plant species are anticipated.

4.3.3 Wildlife

The impacts of transmission lines on wildlife can be divided into short-term effects resulting from physical disturbance during construction and long-term effects resulting from habitat modification. The net effect on local wildlife of these two types of impacts is usually minor. A general discussion of the impacts of transmission line construction and operation on terrestrial wildlife is presented below.

Any required clearing and other construction-related activities will directly and/or indirectly affect most animals that reside or wander within the transmission line ROW. Some small, low-mobility forms may be killed by the heavy machinery. These include several species of amphibians, reptiles, mammals and, if construction occurs during the breeding season, the young of many species including nestling and fledgling birds. Fossorial animals (i.e., those that live underground) such as mice and shrews may similarly be negatively impacted as a result of soil compaction caused by heavy machinery. Larger, more-mobile species such as birds, deer, jackrabbits and coyotes may avoid the initial clearing and construction activities and move into adjacent areas outside the ROW. Maintenance clearing activities during the breeding season may destroy some nests and broods. Wildlife in the immediate area may experience a slight loss of browse or forage material during construction; however, the prevalence of similar habitats in adjacent areas and re-growth of vegetation in the ROW following construction will minimize the effects of this loss.

The increased noise and activity levels during construction could potentially disturb breeding or other activities of species inhabiting the areas adjacent to the ROW. These impacts are expected in most cases, however, to be temporary. Thus, although the normal behavior of many wildlife species will be disturbed during construction, little permanent impact to their populations will result.

Transmission line structures could benefit some bird species, particularly raptors, by providing nest sites and hunting perches. One of the more common species that uses such structures for nesting is the red-tailed hawk. The greatest use, however, is for hunting perches (Olendorff, et al., 1981). The wires and structures will increase the number of roosting sites over parts of the transmission line route for such species as the red-tailed hawk, American kestrel, mourning dove, loggerhead shrike, and meadowlarks. Raptors may utilize the support structures as nesting sites. The danger of electrocution to birds will be insignificant since the distance between conductors or conductor and structure or ground wire on 69-kV transmission lines is usually greater than the wingspan of any bird in the area (i.e., greater than 8 ft).

The transmission line (both structures and wires) could present a hazard to flying birds, particularly migrants. Collisions tend to increase in frequency during the fall when migrating flocks are denser and flight altitudes are lower in association with cold air masses, fog and inclement weather. The greatest danger of mortality exists during periods of low ceiling, poor visibility, and drizzle when birds are flying low, perhaps commencing or terminating a flight, when they may have difficulty seeing obstructions (Electric Power Research Institute (EPRI), 1993). Migrant species, however, including passerines, should be minimally affected during migration since their normal flying altitudes are greater than the heights of the proposed transmission structures (Willard, 1978; Gauthreaux, 1978). For resident birds or for birds during periods of non-migration, those most prone to collision are often the largest and most common in a given area (Rusz et al., 1986; Avian Power Line Interaction Committee (APLIC), 1994). Resident birds, or those in an area for an extended period, learn the location of power lines and become less susceptible to wire strikes (Avery, 1978). Raptors, typically, are uncommon victims of transmission line collisions due to their great visual acuity (Thompson, 1978). In addition, many raptors only become active after sufficient thermal currents develop, which is usually late in the morning when poor light is typically not a factor (Avery, 1978).

Potential impacts upon aquatic systems by a project of this nature involve mainly the effects of increased erosion and sedimentation. Land clearing and/or construction may result in increased suspended solids entering streams/creeks traversed by the transmission line, which in turn may negatively affect many aquatic organisms, which require relatively clear water for feeding and reproduction. However, because the creeks are largely intermittent and, therefore, dry except during high rainfall periods; because the transmission line will span the intermittent creeks; and because erosion controls will be utilized, few impacts, if any, are anticipated.

Of the two proposed alternative routes, Route 1 represents the least potential impact to wildlife habitat. This is because the entire route is within cropland, paralleling a road ROW. Route 2 crosses approximately 800 ft of mesquite woodland/brushland and thus would require more vegetation clearing. Route 2 also crosses a small creek.

4.3.4 Endangered and Threatened Wildlife

No federally listed endangered or threatened wildlife species are expected to be adversely affected by the proposed project.

No adverse impacts to any of the endangered or threatened wildlife species addressed in Section 3.5.3 are anticipated. Any listed fish occurring near the proposed project may be subjected initially to disturbance and increased siltation during construction, but such disturbances will be minimal and of short duration. The Texas horned lizard, if it occurs in the vicinity of the proposed project, may be impacted to some extent during the initial construction phases of the project. These impacts would be short term in nature, however, and not expected to be significant. Most listed avian species are unlikely to occur in the study area, and those that do would typically be passing through only during migration.

4.3.5 Summary of Natural Resources Impacts

Among the most significant factors considered in the evaluation of impacts to natural resources are those concerning the length of ROW through woodlands, endangered and threatened species, stream crossings, general proximity to waterways, and the distance across floodplains, potential wetlands and open water. The primary impact on vegetation from this project is the removal of existing vegetation from the areas required for the ROW. However, since the study area is predominantly cropland and open, heavily grazed rangeland that is sparsely vegetated to a varying extent with grasses, cacti, yuccas and shrubs, vegetation clearing will be minimal. Wetland habitats are limited in the study area. A summary of the primary natural resources data used in the alternative route evaluation is shown in Table 6-1.

Of the two primary alternative routes considered for this project, Route 1 is the preferred choice from an overall ecological perspective. It represents the least potential impact to vegetation and wildlife.