CHAPTER 3

3 AFFECTED ENVIRONMENT

This chapter describes aspects of the natural environment and human environment that may be affected by the alternatives. Each section in this chapter describes a particular resource. Aspects of the natural environment are described first, followed by aspects of the human environment.

Following the identification of Alternative 1 Corridors B and D as TVA's preferred alternatives for the proposed transmission line, field studies and other detailed analyses of the transmission line routes within each of these corridors, as well as of other potentially affected areas including access roads and construction equipment laydown areas, were conducted. The findings from these studies are described below along with more general descriptions of the study areas and corridors.

3.1 Groundwater

The project area is underlain by the Highland Rim aquifer system which is part of the Interior Low Plateaus Physiographic Province. The Highland Rim aquifer consists of flat lying carbonate rocks of Mississippian age. Locally the formations that make up the Highland Rim aquifer are the Monteagle Limestone, the Ste. Genevieve Limestone, the St. Louis Limestone, the Warsaw Limestone, and the Fort Payne Formation (Lloyd and Lyke 1995). The bedrock formations weather to form a thick chert regolith, which stores and releases groundwater into fractures and solution openings in the bedrock (TDEC 2002a).

The carbonate rocks that form the Highland Rim aquifer are typical of karst systems. The term karst refers to carbonate rocks (limestone and dolostone) in which ground water flows through solution-enlarged channels and bedding planes within the rock. Karsts are characterized by sinkholes, springs, disappearing streams, and caves, as well as by rapid, highly directional groundwater flow in discrete channels or conduits. Because of the connections between surface and underground features, water in karst areas is not distinctly surface water or ground water.

Karst systems are readily susceptible to contamination as the waters can travel long distances through conduits with no chance for natural filtering processes of soil or bacterial action to diminish the contamination. "Mature" or well developed karst is particularly susceptible to contamination, and some karst in the project area is considered to be mature. In unconfined or poorly confined conditions, karst aquifers have very high flow and contaminant transport rates under rapid recharge conditions such as storm events (TDEC 2002a). Consequently, the groundwater sources in karst aquifers considered most vulnerable to contamination are those that are under the direct influence of surface water.

The hydraulic characteristics of the Mississippian aquifers present in much of the project area can vary greatly over short distances. These large differences are reflected in the yield and specific capacity of wells completed in the limestone aquifers and the discharges of springs that issue from these aquifers. The yields of wells completed in the Mississippian aquifers commonly range from 5 to 50 gallons per minute, and maximum yields range from a few hundred to, rarely, several thousands of gallons per minute.

However, such openings constitute only a small part of the rock and might be difficult to locate (Lloyd and Lyke 1995).

The groundwater in the Mississippian aquifers in Tennessee generally contains concentrations of dissolved solids and iron less than secondary maximum contaminant levels for drinking water established by the U.S. Environmental Protection Agency. The water is either a calcium magnesium bicarbonate type or a calcium bicarbonate type and generally of adequate quality, or can be treated and made adequate for most uses (Lloyd and Lyke 1995).

3.1.1 Alternative 1 - Cumberland-Montgomery Study Area

Total fresh groundwater withdrawals in Montgomery and Stewart Counties were very low during 1995. Fresh groundwater withdrawals from Montgomery County were reported to be 0.22 million gallons per day and 0.37 million gallons per day from Stewart County (USGS and TDEC 1995). Out of four public water sources in Montgomery County, only one is a groundwater source and it was found by the Tennessee Division of Water Supply to be of high susceptibility to contamination (TDEC 2003). This public water source is operated by the Fort Campbell Water System and is located within the Red River Watershed. The water source is a spring that discharges from a Mississippian carbonate aquifer which is under the influence of surface water. Within the spring's protection area, the land use is predominantly urban. Solvents were detected in the source and reported to the Tennessee Division of Water Supply (TDEC 2003). In Stewart County four of the six public water sources are from groundwater. None of the four are under the influence of surface water and all are rated as having low to moderate susceptibility to contamination (TDEC 2003).

Large portions of the Cumberland-Montgomery Study Area are located in karst topography and sinkholes are numerous. Sinkholes were mapped along the proposed Corridor B and Corridor D transmission line routes. Although sinkholes were not mapped in Corridors A and C, the numbers are likely similar to those in Corridors B and D.

Corridor B

Twenty sinkholes occur within the 175-foot wide ROW of the proposed Corridor B transmission line route. The greatest concentration is near the eastern end of the route, from northeast of Highway 12 north to the Montgomery substation. Ten sinkholes occur along this stretch of the route south of the Red River. Of the three alternative alignments just north of the Red River, the Industrial Park East alignment crosses the most sinkholes with ten present. The Industrial Park Central alignment crosses two sinkholes and one sinkhole occurs along the Industrial Park West alignment.

Corridor D

Along the Corridor D transmission line route, 31 sinkholes occur within the proposed 175-foot wide ROW. The greatest concentration of these sinkholes is between TN 233/Lylewood Road and about one-half mile west of I-24. One sinkhole occurs along the main route alignment near its east end. Eleven sinkholes occur along the Woodlawn West alternative alignment and 14 occur along the Woodlawn East alignment crosses. Farther to the east, one sinkhole occurs along both the Non-Fort Campbell and the Little West Fork North alternative alignments. Four sinkholes occur along the Spring Creek North alternative alignment; two of these sinkholes also occur along the Spring Creek South alignment.

3.1.2 Alternative 2 - Cumberland-Davidson Study Area

The majority of the Cumberland-Davidson Study Area is underlain by the same Mississippian limestone aquifers as the Cumberland-Montgomery Study Area and groundwater conditions are similar. Portions of the study area in Davidson County are underlain by limestone formations of Ordovician age. These upper Ordovician rocks are normally confining units and are not considered to be a predominant source for groundwater.

3.2 Surface Water

The project area is located within the Cumberland River Basin and extends from about Cumberland River mile 103 to mile 170. Rainfall in the area averages about 47 inches per year with March being the wettest month with 4.9 inches and October the driest with 2.6 inches. The average monthly air temperature ranges from 36°F in January to 79°F in July with a mean for the year of about 59°F. Stream flow varies with rainfall and reservoir operations. The mean annual flow at the U.S. Geological Survey gaging station just below Cheatham Dam is 23,800 cubic feet per second (cfs) or almost 1.7 cfs per square mile for the 14,163 square mile drainage area.

From Cheatham Dam, located at mile 148.7, Cheatham Lake extends 67.5 miles up the Cumberland River to Old Hickory Dam at mile 216.2. At the normal pool elevation of 385 feet (mean sea level-msl), the lake has 320 miles of shoreline and a surface area of 7,450 acres. The lake is 40 feet deep at the dam and provides a navigation channel with a minimum depth of 9 feet. Surface water temperatures range from 36°F in the winter to 84°F in the summer. Lake Barkley is immediately downstream of Cheatham Dam. Lake Barkley is a shallow lake extending 118.1 miles to Barkley Dam at Cumberland River mile 30.6. At the normal summer pool elevation of 359 feet (msl), Barkley has 1,004 miles of shoreline and an area of 74,500 acres.

Some of the larger tributaries of the Cumberland River common to both study areas include Wells Creek, Guices Creek, and Yellow Creek.

3.2.1 Alternative 1 - Cumberland-Montgomery Study Area

Streams in this study area include Blooming Grove Creek, Antioch Creek, Budds Creek, the Red River and its West Fork and Little West Fork tributaries, Big McAdoo Creek, Little McAdoo Creek, Hurricane Creek, and Louise Creek. Several smaller tributaries to these creeks, as well as smaller direct tributaries to the Cumberland River, also occur. The eastern portion of the study area contains several naturally occurring ponds in sinkholes and short stream segments which flow into sinkholes. Other ponds as well as sloughs occur in the Cumberland River floodplain.

Within the proposed project area, the Cumberland River is classified by the Tennessee Department of Environment and Conservation (TDEC) for domestic and industrial water supply, fish and aquatic life, recreation, irrigation, livestock watering and wildlife, and navigation (TDEC 2004a, 2004b). Many of these use classifications also apply to other streams in the project area. Table 3-1 lists the use classifications of streams along the proposed Corridor B and Corridor D routes. No streams in the Cumberland-Montgomery study area are classified as high quality.

Table 3-1. State of Tennessee use classifications for streams along the proposed Corridor B and Corridor D routes in the Cumberland Montgomery study area. Source: TDEC (2004a).

Stream	Use Classification						
	Domestic Water Supply	Industrial Water Supply	Fish and Aquatic Life	Recreation	Livestock Watering and Wildlife	Irrigation	Navigation
Corridor B Route							
Cumberland River (CRM 103)	X	X	X	X	X	X	X
Wells Creek			X	X	X	X	
Guices Creek			X	X	X	X	
Moccasin Branch			X	X	X	X	
Yellow Creek*			X	X	X	X	
East Fork Yellow Creek			X	X	X	X	
Burney Creek			X	X	X	X	
Goldenhorn Creek			X	X	X	X	
Budds Creek			X	X	X	X	
Vernon Creek			X	X	X	X	
Antioch Creek			X	X	X	X	
Hurricane Creek			X	X	X	X	
Cumberland River (CRM 140)	X	X	X	X	X	X	X
Muddy Branch			X	X	X	X	
Big McAdoo Creek			X	X	X	X	
Corridor D Route							
Cumberland River (CRM 103)	X	X	X	X	X	X	X
Wildcat Creek			X	X	X	X	
Marshall Creek			X	X	X	X	
Blooming Grove Creek			X	X	X	X	
Cooper Creek			X	X	X	X	
Bartee Branch/Bartee Fork			X	X	X	X	
Red River, Mile 0 – 2.0		X	X	X	X	X	X
Red River, Mile 2.0 – 15.0	X	X	X	X	X	X	X
West Fork Red River		X	X	X	X		X
Little West Fork		X	X	X	X	X	
Fletchers Fork			X	X	X	X	
Raccoon Branch			X	X	X	X	
Spring Creek			X	X	X	X	

*Yellow Creek is also classified as a trout stream.

Portions of at least 11 streams in this study area are listed on the Clean Water Act 303(d) list as not supporting or partially supporting use classifications (TDEC 2004b). Six of these impaired streams occur along the Corridor B route and four occur along the Corridor D route (Table 3-2). Siltation and other habitat alterations are the most common causes of

impairment of these streams. Two additional 303(d) listed streams, Dunbar Cave Creek and Seven Springs, occur in the Cumberland-Montgomery study area but outside of the potential transmission line corridors.

Table 3-2. State of Tennessee 303(d) listed streams along the proposed Corridor B and Corridor D routes in the Cumberland Montgomery study area. Source: TDEC (2004b).

Stream	Cause	Source
Corridor B Route		
Wells Creek	Pathogens	Undetermined
East Fork Yellow Creek	Pathogens	Pasture grazing
Budds Creek	Siltation, other habitat alterations	Nonirrigated crop production, pasture grazing
Antioch Creek	Siltation, other habitat alterations	Nonirrigated crop production, pasture grazing
Big McAdoo Creek	Siltation, organic enrichment	Nonirrigated crop production, land development
Red River (CRM 125.3)	Siltation, pathogens, other habitat alterations, organic enrichment/low dissolved oxygen, nutrients	Nonirrigated crop production, collection system failure, land development, pasture grazing
Corridor D Route		
Red River (CRM 125.3)	Siltation, pathogens, other habitat alterations, organic enrichment/low DO, nutrients	Nonirrigated crop production, collection system failure, land development, pasture grazing
West Fork Red River	Siltation, other habitat alteration	Land development
Little West Fork	Phosphorus, siltation, organic enrichment/low dissolved oxygen	Major municipal point source, habitat modification
Spring Creek	Siltation, organic enrichment/low dissolved oxygen, other habitat alteration	Nonirrigated crop production, removal of riparian vegetation, sources outside state

3.2.2 Alternative 2 - Cumberland-Davidson Study Area

Streams in this study area include Wells Creek, Yellow Creek, Budds Creek, Little Bartons Creek, Bartons Creek, Johnson Creek, Sams Creek, Pond Creek, and the Harpeth River and its tributaries Jones Creek, Sulphur Creek, Leatherwood Creek, Trace Creek, Turnbull Creek, Brush Creek, and the South Harpeth River.

Because the Harpeth River in Davidson County is designated as a State Scenic River, it is considered a Tier II high quality stream. Its use classification is domestic and industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife.

Yellow Creek from mile 3.4 upstream to Ruskin Cave is classified for fish and aquatic life, recreation, irrigation, livestock watering and wildlife, and a trout stream. The South Fork Harpeth River is also a Tier II stream that is classified for domestic and industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. Jones Creek and Turnbull Creek (tributaries to the Harpeth River) are classified for industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. Turnbull Creek is also classified for domestic water supply. The remaining streams are classified for fish and aquatic life, recreation, irrigation, and livestock watering and wildlife.

Portions of eight streams in this study area are listed on the Clean Water Act 303(d) list as not fully supporting designated use classifications (Table 3-3).

Table 3-3. State of Tennessee 303(d) listed streams in the Cumberland-Davidson Study Area. Source: TDEC (2004a).

Stream Name	County	Cause	Source
Wells Creek	Houston	Pathogens	Undetermined
East Fork Yellow Creek	Montgomery	Pathogens	Pasture grazing
Budds Creek	Montgomery	Siltation, other habitat alterations	Nonirrigated crop production, pasture grazing
Harpeth River	Cheatham, Davidson	Organic enrichment, low dissolved oxygen	Minor and major municipal point sources, urban runoff/storm sewers, discharges from MS4 area
Harpeth River – Trace Creek	Cheatham, Dickson	Escherichia coli, total fecal coliforms	Collection system failure
Jones Creek	Dickson	Organic enrichment, siltation, Escherichia coli, total fecal coliforms	Municipal point source, land development, agriculture, pasture grazing
Spicer Branch	Dickson	Physical substrate habitat alterations, siltation	Channelization, land development
Harpeth River – Flat Rock Branch of Brush Creek	Cheatham, Williamson	Organic enrichment	Municipal point source

3.3 Vegetation

3.3.1 Alternative 1 - Cumberland-Montgomery Study Area

The project area is located within the Interior Low Plateau Physiographic Province as described by Fenneman (1938). Although eroded in some sections, the Interior Low Plateau is a relatively level area extending from the Cumberland Plateau westward to the Coastal Plain Physiographic Province.

In Tennessee, the Interior Low Plateau consists of two sections: the Highland Rim and the Nashville Basin. The Nashville Basin is completely surrounded by the Highland Rim, which is further divided into three subsections: the Eastern Highland Rim, the Western Highland

Rim, and the Pennyroyal Plain. The four study area corridors extend northeastward from Stewart to Montgomery County, and span portions of the Western Highland Rim and the Pennyroyal Plain.

The Western Highland Rim is a dissected rolling plateau with moderate to pronounced topographic relief. Topographic features include karst topography, springs, small streams, ravines with steep slopes, narrow ridges, and perpendicular bluffs (Chester and Ellis 1989). The Pennyroyal Plain consists of a relatively less dissected and primarily karst landscape characterized by sinkhole plains, sinking streams, and extensive level to rolling lands heavily used for agriculture.

Botanically, the Cumberland-Montgomery Study Area occurs in the Mississippian Plateau Section of the Western Mesophytic Forest Region (Braun 1950). Native forests of the region are transitional between the more mesic Mixed Mesophytic Region to the east and the dryer Oak-Hickory Region to the west. The modern landscape is characterized by a mosaic of plant communities, the locations and compositions of which vary greatly in relation to topography, drainage, soil conditions, and land use history. Plant community types ranging from dry, mesic and riparian forests to open, treeless prairies (barrens) are particularly characteristic of the area (Braun 1950; Chester and Ellis 1989; DeSelm 1989, 1990, 1994a, 1994b).

Oaks dominate the forests throughout the study area. White oak, southern red oak, and black oak are often the most abundant, with white oaks occurring both in upland sites as well as in wetter sites than is characteristic for this species elsewhere in the state. Other commonly associated species include shellbark, pignut, and shagbark hickories, sugar maple, beech, tulip tree, sweet gum, and in the understory, red maple, black tupelo, flowering dogwood, and redbud (Braun 1950, Chester and Ellis 1989).

The Tennessee Division of Forestry, in cooperation with the USDA Forest Service, conducts periodic inventories of forest lands in Tennessee (http://ncrs2.fs.fed.us/4801/fiadb/fim17/wcfim17.asp). The extracted data in Table 3-4 show the changes in total timberland in the four study area counties between 1989 and 2002. In three of the four counties, there was more timberland in 2002 than there was in 1999, and in three of the counties there was more timberland in 1999 than there was in 1989. The decreases in timberland which appear in the table occur in two largely rural counties in which forest management is an important industry and in the most populous county in which rapid population growth is occurring.

Table 3-5 summarizes Land Use / Land Cover data for the Cumberland-Montgomery corridors. These data are derived from 1999 1:24,000 scale, 3.5 meter resolution color infrared photography as well as other ancillary data including topography, census, agricultural statistics, soil characteristics, other land cover maps, and wetlands data. Wetlands data are based on the U.S. Fish and Wildlife Service National Wetlands Inventory (Cowardin et al. 1979). This provides a general quantitative description of the study area in terms of the major vegetation types and land uses present. Much of the data in Table 3-5 and elsewhere in this section differs from comparable information presented in the Draft EIS for this project because of the use of updated software and imagery in the current analyses. The data presented in this Final EIS is considered to be more accurate.

Table 3-4. Changes in timberland in Dickson, Houston, Montgomery, and Stewart Counties, Tennessee between 1989 and 2002.

County	1989	1999		2002	
	Acres	Acres	change from 1989	Acres	change from 1999
Dickson	174,261	184,120	+5.7%	197172	+7.1%
Houston	94,159	88,448	-6.1%	89461	+1.1%
Montgomery	136,862	168,117	+22.8%	164,579	-2.1%
Stewart	219,660	217,726	-0.9%	228,473	-4.9%

Table 3-5. Land Use / Land Cover data summarizing major vegetation types within the Cumberland-Montgomery Study Area Corridors.

Land Cover[1] Class	Corridor A		Corridor B		Corridor C		Corridor D	
	Acres	% of corridor	Acres	% of corridor	Acres	% of corridor	Acres	% of corridor
Barren	489	1	517	1	471	1	886	2
Developed	5,623	10	1,420	3	4,881	9	1,596	4
Forested upland	26,898	45	25,316	45	24,588	46	20,755	47
Herbaceous planted/ cultivated	24,497	41	27,047	48	21,544	40	19,593	44
Open water	799	1	1,017	1	1,260	2	742	1
Herbaceous wetlands	228	1	163	1	132	1	149	1
Woody wetlands	375	1	348	1	273	1	364	1
TOTAL	**59,090**	**100.0**	**55,828**	**100.0**	**53,149**	**100.0**	**44,085**	**100.0**

[1] Classes shown correspond to modified Anderson Level 1 classes (Anderson et al. 1976) and NWI classes (Cowardin et al. 1979) and represent aggregates of the following narrower classes: Barren = Bare rock/Sand/Clay, Quarries/Strip Mines/Gravel Pits, Borrow Pits, Disturbed Lands, and Transitional; Developed = Urban, Residential, Commercial, Services, Industrial, and Transportation; Forested Upland = Deciduous Forest, Evergreen Forest, and Mixed Forest and Clear Cut areas; Herbaceous Planted/Cultivated = Pasture/Hay, Row Crops, Urban/Recreational Grasses, Open Lands, Orchards, Vineyards, and Nurseries.
Data source: 1999 1:24,000 scale, 3.5 meter resolution color infrared photography.

Forested uplands constitute the predominant land cover type within Corridors A, C and D of the Cumberland-Montgomery Study Area (Table 3-5). The second-most prevalent cover type within these corridors is Herbaceous Planted/Cultivated vegetation; this includes pastures and other agricultural lands as well as urban or other recreational grasses (such as golf courses; Vogelmann et al. 2001). The order of predominance is reversed in Corridor B. The remaining land cover types do not represent more than 14 percent of any of the four study area corridors. In many cases, these cover types represent less than one percent of the acreage within each corridor.

Relatively intact native plant communities are most likely to occur in the Forested Uplands, Herbaceous Wetlands, and Woody Wetlands land cover classes. The Barren land cover class may also contain native plant communities, as it includes transitional areas between

forest and agricultural lands. Although the Land Use / Land Cover classification used does not recognize separate categories for natural and planted/cultivated herbaceous vegetation, it is possible that areas characterized as Herbaceous Planted/Cultivated contain native herbaceous vegetation. The Western Highland Rim is contains plant communities known as 'barrens' that are characterized by herbaceous vegetation (e.g., the Kentucky-Tennessee Big Barrens, described below and in Table 3-7) and likely classified as Herbaceous – Planted/Cultivated. In addition, a plant species that is currently a candidate for listing under the Endangered Species Act (Short's bladderpod) and another state-listed plant are known to occur in cultivated fields in the region (Section 3.6, Endangered and Threatened Species). Therefore, areas characterized as Herbaceous – Planted/Cultivated have the potential to contain sensitive plant communities as well as rare plant species.

Corridor D has the highest proportion of the forested upland vegetation type (Table 3-5). The proportion of the total acreage classified as Herbaceous Planted/Cultivated is similar across all four corridors, as is the proportion of the acreage classified as Barren. The Barren class that includes areas characterized by any one of the following cover types: bare rock, sand, or clay; quarries, strip mines, or gravel pits; and transitional areas including forest clearcuts, transitional areas between forest and agricultural lands, and other forms of temporary vegetation removal (Vogelmann et al. 2001).

In order to assess the potential for forest fragmentation, forest patch size was characterized within each of the four corridors (Table 3-6) by using USGS digital line graphs (DLGs) (Anderson et al. 1976). Forest patches less than five acres in size were excluded from these calculations, because these patches were considered too small to possess the biological characteristics of intact native forests and were therefore too small to pose sufficient forest fragmentation concern. Nevertheless, Corridor B currently has 265 tracts which contain less than 5 acres and Corridor D contains 218 such tracts.

The potential for forest fragmentation is roughly similar in all four corridors. Corridor D, the shortest of the four corridors, has the fewest forest patches, the largest single patch, and the smallest average forest tract size. Corridors B and C have similar average forest patch size and proportion of forested land. Corridor C has slightly fewer patches in the small size classes (< 500 acres) and fewer patches in the large size classes (> 1,000 acres) than Corridors A and B.

Limited information is available on the specific location of uncommon plant communities and other sensitive resources in the study area. However, the Managed Areas section of this EIS (Section 3.9) offers some insight into the presence of these resources, because most of these areas have been identified as significant because of the ecological features occurring there. In addition, the Tennessee Division of Natural Heritage maintains a record of plant communities recognized and described by NatureServe (2001), as defined in the International Classification of Ecological Communities (ICEC): Terrestrial Vegetation of the United States (Grossman et al. 1998). Table 3-7 lists the recognized plant communities of conservation concern (defined by NatureServe as those assigned a global rank of G1, G2, or G3) reported from the respective counties within the Cumberland-Montgomery and Cumberland-Davidson Study Areas (TDEC 2002b).

Table 3-6. Forest patch statistics in acres for the Cumberland-Montgomery Study Area. The minimum patch size in this analysis is 5 acres and Total Area is the sum of all patches within each size class.

	Corridor A		Corridor B		Corridor C		Corridor D	
Patch Size Class	**Patches**	**Total Area**	**Patches**	**Total Area**	**Patches**	**Total Area**	**Patches**	**Total Area**
5 to 100	247	4,848	242	4,960	240	5,129	217	4,215
100 to 500	26	6,251	35	7,592	24	5,644	22	5,021
500 to 1,000	1	811	0	0	8	5,630	3	1,799
1,000 to 5,000	7	14,440	7	12,241	5	7,756	1	2,639
≥ 5,000	0	0	0	0	0	0	1	6,653
Total	**281**	**26,351**	**284**	**24,741**	**277**	**24,160**	**244**	**20,329**
Average	**-**	**93**	**-**	**87**	**-**	**87**	**-**	**83**
Maximum	**-**	**3,191**		**2,562**		**2,595**	**-**	**6,653**

Data source: USGS DLGs, 1999 1:24,000 scale, 3.5 meter resolution color infrared photography.

The only one of these communities reported from counties crossed by the Cumberland-Montgomery Alternative is the Kentucky-Tennessee Big Barrens**.** This is an open, prairie-like community dominated by grasses and forbs with scattered shrubby vegetation and, occasionally, trees. It occurs on the northwestern Highland Rim – Pennyroyal Plain of Tennessee and Kentucky (NatureServe 2001). It is dominated by grasses and forbs with scattered shrubby vegetation and the largest extant examples are presently found on Fort Campbell military base. This vegetation was the predominant type in this area in the early 1800s, and probably originated from burning of forests by Native Americans.

The Limestone Cliff/Talus Seep, Little Bluestem–Broomsedge–Grasslands, and Western Highland Rim Escarpment Post Oak Barrens communities may also occur within the Cumberland-Montgomery Study Area. They are described in more detail below in Section 3.3.2.

Following the identification of the preferred transmission line routes in Corridors B and D, botanical surveys were conducted of the proposed rights-of-way and associated areas including access roads and construction equipment laydown areas. These surveys were conducted by walking or driving through the areas and mapping and classifying them into 20 vegetation/land types and 2 non-vegetated categories. These categories were then combined into four broad vegetation types (grass/herb/shrub/vine, deciduous forest, evergreen forest, and mixed deciduous/evergreen forest, and evergreen forest) and a single non-vegetated category. During the field surveys, lists were kept of the various plant species encountered and plant communities of conservation concern were sought (Table 3-7). The field observations were also supplemented by inspection of color orthophotographic maps.

Table 3-7. Plant communities of conservation concern reported from one or more of the counties containing the two study areas[1].

Common Name	Scientific Name	Global Rank[2]	Study Area: Cumberland-Montgomery	Study Area: Cumberland-Davidson
Central Basin Chinquapin Oak Forest	*Quercus muehlenbergii – Quercus (falcata, shumardii, stellata) / Cercis canadensis / Viburnum rufidulum* Forest	G3		X
Kentucky – Tennessee Big Barrens	*Schizachyrium scoparium – (Helianthus mollis, Helianthus occidentalis, Silphium trifoliatum)* Herbaceous Vegetation	G2G3	X	X
Limestone Cliff / Talus Seep	*Impatiens (capensis, pallida) – Heuchera villosa – (Saxifraga virginiensis, Cardamine diphylla)* Herbaceous Vegetation	G3		X
Limestone Glade Streamside Meadow	*Dalea foliosa – Mecardonia acuminata – Mitreola petiolata* Herbaceous Vegetation	G2?		X
Little Bluestem – Broomsedge Grasslands	*Schizachyrium scoparium – Andropogon (gyrans, tenarius, virginicus)* Herbaceous Vegetation	G?		X
Western Highland Rim Escarpment Post Oak Barrens	*Quercus stellata – Viburnum rufidulum / Schizachyrium scoparium – (Sorghastrum nutans, Helianthus eggertii)* Woodland	G2G3		X

[1]Source: Tennessee Department of Environment and Conservation, Division of Natural Heritage, 2002. Only plant communities of conservation concern (global ranks G1, G2, or G3) are given.
[2]Global rank definitions: G1 = globally critically imperiled; G2 = globally imperiled; G3 = globally vulnerable to extirpation or extinction; G? = unranked, global rank not yet assessed.

Corridor B Route

The proportions of the various vegetation/land types along the Corridor B route, its alternative alignments, and associated areas are listed in Table 3-8. The differences between percentages of various categories in Table 3-5 and those in Table 3-8 are attributable to the following: (1) the data in Table 3-5 are derived from analysis of the broader corridors while most of the data in Table 3-8 are derived from areas 175 feet wide or less; (2) the categories of classification are different in the two analyses. In addition, Table 3-5 includes two Land Use Classes for wetlands, whereas Table 3-8 addresses vegetation types (tress, shrubs, herbs, etc.) and not how wet the sites are. In spite of the differences in the sources of the data in the two tables, the two major categories under Corridor B in Table 3-5, the Forested Upland and the Herbaceous Planted/Cultivated are within 10% of the percentages for the most nearly equivalent categories (Grass/Herb/Shrub/Vine and combined Deciduous Forest and Mixed Deciduous/Evergreen Forest) for the 'main' alignment in Table 3-8.

Table 3-8. Proportions of various vegetation types and non-vegetated lands along Route B and associated access roads.

Vegetation / Land Type	Main alignment	Alternative alignments	Access roads
Grass/Herb/Shrub/Vine	48%	62%	82%
Deciduous Forest	39%	33%	14%
Mixed Deciduous/ Evergreen Forest	8%	3%	3%
Non-vegetated	5%	2%	1%
Evergreen Forest	< 1%	0%	0%
Total	100%	100%	100%

Because most proposed access roads go through existing fields, the high percentage of those roads in the grass/herb/shrub/vine vegetation type is to be expected. Approximately 47% of the main alignment is currently forested, whereas 36% of the alternative alignments is forested.

None of the plant communities of conservation concern potentially occurring within the Cumberland-Montgomery study area (Table 3-7) were found along the proposed Corridor B transmission line route, its alternative alignments, access roads, or construction assembly areas.

Corridor D Route

The proportions of the various vegetation/land types along the Corridor D route, its alternative alignments, and associated areas are listed in Table 3-9. The differences in percentages of various categories in Table 3-5 and those in Table 3-9 are attributable to the same factors described above under Corridor B for the differences between Table 3-5 and Table 3-8. As with Corridor B, the differences between the two main categories of Land Use / Land Cover in Corridor D (Forested upland and Herbaceous planted/cultivated) and the most nearly equivalent categories for the Corridor D main transmission line route (Grass/Herb/Shrub/Vine and Deciduous Forest plus Mixed Deciduous/Evergreen Forest), are less than 10%. As with the Corridor B route, the greatest percentage of access roads is currently in grass/herb/shrub/vine vegetation. Approximately 50% of the main alignment is forested, while 46% of the alternative alignments is forested.

Table 3-9. Proportions of various vegetation types and non-vegetated lands along Route D and associated access roads.

Vegetation / Land Type	Main alignment	Alternative alignments	Access roads
Grass/Herb/Shrub/Vine	49%	51%	62%
Deciduous Forest	36%	30%	32%
Mixed Deciduous/ Evergreen Forest	14%	15%	4%
Non-vegetated	< 1%	3%	< 1%
Evergreen Forest	< 1%	1%	1%
Total	100%	100%	100%

None of the plant communities of conservation concern potentially occurring within the Cumberland-Montgomery study area (Table 3-7) were found along the proposed Corridor D transmission line route, its alternative alignments, access roads, or construction assembly areas.

Invasive Plants

The occurrence of invasive plants along each of the proposed transmission line routes is typical and representative of the region. The most frequently encountered invasive exotic plants are Japanese honeysuckle and Japanese woods grass (*Microstegium*). Less frequently encountered are privet and multiflora rose. These and other invasive plants have entered the landscape by way of roadways, utility rights-of-way, farm fields, escaping from residences, and various other disturbance-related activities. Differences between the corridors are minor. Areas which contain the lowest density of invasive terrestrial plant species are typically those containing high quality terrestrial communities, and are the most likely places to contain uncommon and sensitive plant communities and rare species.

3.3.2 Alternative 2 - Cumberland-Davidson Study Area

Like the Cumberland-Montgomery Study Area, the Cumberland-Davidson Study Area is also located in the Interior Low Plateaus Physiographic Province. Most of the study area occurs in the Western Highland Rim Section; only the southeastern end in Davidson County is located in the Outer Nashville Basin Section.

Compared to the corridors in the Cumberland-Montgomery Study Area, the two corridors in the Cumberland-Davidson Study Area have higher proportions of the Forested Upland land cover type and lower proportions of the Herbaceous Planted/Cultivated land cover type (Table 3-10). The Herbaceous Planted/Cultivated type includes pastures and other agricultural lands as well as recreational grass areas such as golf courses. The remaining land cover types make up a very small proportion of the Cumberland-Davidson corridors.

As in the Cumberland-Montgomery Study Area, relatively intact native plant communities are most likely to occur in the Forested Uplands, Herbaceous Wetlands, and Woody Wetlands land cover classes. The Barren land cover class may also contain native plant communities, as it includes transitional areas between forest and agricultural lands. As described in Section 3.3.1, the Herbaceous Planted/Cultivated land cover type also likely contains areas of native herbaceous vegetation, including communities such as the Kentucky-Tennessee Big Barrens that may contain rare and/or endangered plant species.

Forest patch size was characterized as described above in Section 3.3.1. The number of forest patches greater than 5 acres in size and the average forest patch size are similar in Corridors A and B (Table 3-11). The maximum patch size is somewhat larger in Corridor A than in Corridor B. Corridors A and B have similar proportions of forested land (Table 3-10).

Table 3-10. Land Use / Land Cover data summarizing major vegetation types within the Cumberland-Davidson Study Area.

Land Cover[1] Class	Corridor A		Corridor B	
	Acres	% of Corridor	Acres	% of Corridor
Barren	959	1	668	1
Developed	2,748	4	3,233	4
Forested Upland	39,432	60	40,308	60
Herbaceous planted/ cultivated	20,806	32	21,207	32
Open water	931	1	867	1
Herbaceous wetlands	129	1	70	1
Woody wetlands	396	1	355	1
TOTAL	**65,401**	**100.0**	**66,728**	**100.0**

[1] See the footnote to Table 3-5 for an explanation of the land cover classes.
Data source: 1999 1:24,000 scale, 3.5 meter resolution color infrared photography.

Table 3-11. Forest patch statistics in acres for the Cumberland-Davidson Study Area. The minimum patch size in this analysis is 5 acres and total acreage is the sum of all patches within each size class.

Patch Size Class	Corridor A		Corridor B	
	Patches	Total Area	Patches	Total Area
5 to 100	128	2,937	150	2,958
100 to 500	22	5,076	25	5,624
500 to 1,000	9	7,264	4	3,094
1,000 to 5,000	8	17,817	15	28,268
≥ 5,000	1	5,899	0	0
Totals	**168**	**38,993**	**194**	**39,944**
Average	**-**	**232**		**205**
Maximum	**-**	**5,899**	**-**	**4,993**

Data sources: USGS DLGs, 1999 1:24,000 scale, 3.5 meter resolution color infrared photography.

Six plant communities of conservation concern (defined by NatureServe (2001) as those assigned a global rank of G1, G2, or G3) have been reported from the counties within the Cumberland-Davidson Study Area (TDEC 2002b). The Kentucky-Tennessee Big Barrens community is described above in Section 3.3.1 and the other communities are described below. Any of these communities may occur within the Cumberland-Davidson corridors, although the last two are unlikely to be present.

Limestone Cliff-Talus Seep: This community includes forb-dominated seepage vegetation at low to moderate elevations (about 1000-1300 feet msl) in the Highland Rim Section of the Interior Low Plateau. Examples are found on saturated sloping to concave to near vertical exposures of gray calcareous mudstones and/or siltstones of the Fort Payne formation. These exposures vary greatly in size and are typically only a fraction of an acre. The seeps occur where blocky limestones with vertical fissures and joints overlie more flatly bedded strata. They are primarily herbaceous, but may be ringed by shrubs.

Little Bluestem–Broomsedge Grasslands: This mixed-grass association represents a variety of essentially native perennial grasslands which are (or have been) human-maintained to some extent and which contain a variable mix of little bluestem and broomsedge. It may occur on annually mowed powerline rights-of-way, mowed successional or abandoned agricultural fields, and pastures. It occurs in the Eastern and Western Highland Rim of Tennessee, related areas of Kentucky, and possibly Alabama. On the Western Highland Rim, these barrens occur on winter-wet, summer-dry loessal soils, which are generally deep, with chert fragments; rock outcrops are absent.

Western Highland Rim Escarpment Post Oak Barrens: These woodlands are dominated by post oak; a scattered to dense subcanopy of eastern red cedar may also be present. This community occurs as open patches on mid to upper slopes of shaley siltstones of the Fort Payne Formation in the dissected escarpment of the Western Highland Rim of Tennessee. The vegetation most frequently occurs on south- to southwest-facing slopes at an elevation of 500-850 feet msl but may occur on other aspects as well. This community provides habitat for the threatened Eggert's sunflower.

Two additional communities, the Central Basin Chinquapin Oak Forest and the Limestone Glade Streamside Meadow, have been reported from Davidson County. They are both strongly associated with the Inner Nashville Basin area, and therefore unlikely to occur within the Cumberland-Davidson corridors. The endangered leafy prairie clover can occur in the Limestone Glade Streamside Meadow community.

Invasive Plants

No database of invasive plant species is available to compare the occurrences of particular species or their relative frequencies in the Cumberland-Davidson corridors. The occurrence of invasive plants in the proposed corridors is assumed to be typical and representative of the region and not significantly different from those occurring in the Cumberland-Montgomery corridors. The most frequently encountered invasive exotic plants would probably be Japanese honeysuckle and Japanese woods grass. Less frequently encountered would be privet and multiflora rose. These and other invasive plants have entered the landscape by way of roadways, utility rights-of-way, farm fields, escaping from residences, and various other disturbance-related activities. Areas which contain the lowest density of invasive terrestrial plant species are typically those containing high quality terrestrial communities, and are the most likely places to find uncommon and sensitive botanical communities and rare species.

3.4 Wildlife

3.4.1 General Overview of the Study Areas

The diversity and abundance of wildlife reflect the habitat classes occurring within the respective study areas. Common habitat types include riparian forests, mixed deciduous forests, pine woodlands, early successional, and developed areas. Features occurring within these habitats include caves, wetlands, vernal ponds, streams, and seeps. The wildlife species composition and density in terrestrial environments of the study areas varies with habitat type and size, food availability, surrounding land use and other limiting factors. Similar species of wildlife occur in both study areas; however, the diversity and abundance of wildlife varies within and between the two areas.

In locations where two community types join, a greater number and variety of terrestrial animals might be expected. These transition areas often occur at the edges between early and late successional habitats. Amphibians and reptiles which occur in early successional habitats include American toad, upland chorus frog, fence lizard and black racer. Birds found in this type of habitat include eastern meadowlark, red-winged blackbird, barn swallow, prairie warbler, common yellowthroat, white-eyed vireo and field sparrow. Resident mammals include eastern cottontail rabbit, white-tailed deer, coyote, eastern mole and woodchuck.

Riparian forests and other terrestrial habitats associated with aquatic resources, such as ponds, rivers or wetlands, are often the most productive habitats in a given area. These areas are breeding habitats for toads, frogs, and salamanders, and support a variety of other animal life such as turtles, snakes and mammals. Amphibians and reptiles found in riparian forests include bullfrog, green frog, eastern newt, southern two-lined salamander, common snapping turtle, and northern water snake. Birds that nest in riparian forests include wood duck, belted kingfisher, barred owl, American woodcock, Carolina wren, prothonotary warbler and eastern phoebe. Mammals present include muskrat, mink, beaver and raccoon.

Upland and mesic oak forests differ somewhat in the type of habitat that they offer to various species. Areas with greater ambient moisture, such as mesic oak forests, tend to support a greater number of species than dryer forests, such as oak-hickory. Reptiles and amphibians found in these forested habitats include spring peeper, eastern box turtle, worm snake, slimy salamander, ringneck snake and gray rat snake. Birds found in this type of habitat include red-tailed hawk, eastern wild turkey, Acadian flycatcher, Carolina chickadee, eastern tufted titmouse, white-breasted nuthatch, wood thrush, Kentucky warbler, and summer tanager. Mammals common to the area would include eastern gray squirrel, white-footed mouse, eastern chipmunk, eastern pipestrille, red bat, gray fox, and short-tailed shrew.

Although pine woodlands are not known for containing a high diversity of wildlife, they do provide important habitat for several species. Amphibians and reptiles commonly found in pine woodlands include eastern narrowmouth toad, eastern spadefoot toad, and eastern hognose snake. Birds commonly found in this type of habitat include blue jay, eastern towhee, brown thrasher, American crow, pine warbler, and a variety of woodpeckers. Edges along pine woodlands often provide habitat for a variety of mammals including eastern cottontail rabbit, white-tailed deer, white-footed mouse, deer mouse, cotton rat, and their associated predators.

Extensive early successional habitats, especially those with a high percentage of native grasses, are important to a variety of wildlife, especially grassland birds. Birds encountered in this habitat type are northern harrier, northern bobwhite, grasshopper sparrow, savannah sparrow, and horned lark. State-listed birds that may occur in the project area grasslands include the Henslow's sparrow.

Amphibians and reptiles which often occur in developed areas include common garter snake, American toad, gray treefrog and five-lined skink. Birds that often nest in developed areas include eastern bluebird, northern mockingbird, American robin, American goldfinch, and northern cardinal. Common mammals in these environments include gray squirrel, eastern chipmunk, southern flying squirrel, opossum and striped skunk. Invasive terrestrial

animals occurring in developed areas include the rock dove, European starling, house sparrow and house mouse.

Several game animals occur on the study area. White-tailed deer, eastern wild turkeys, and mourning doves are common on the project area. Other game species such as beaver, eastern gray squirrel, eastern cottontail rabbit, American woodcock, and northern bobwhite quail are also found in the area. Ponds and wetlands in the area provide resting and foraging habitat for breeding, migrating and wintering waterfowl such as wood ducks, Canada geese, mallards and hooded mergansers.

Twenty-seven caves are recorded from within the five county area encompassing both study areas. Caves provide important habitat for a variety of wildlife. Amphibians found in caves include slimy salamanders, zigzag salamanders, long-tailed salamanders, cave salamanders and pickerel frogs. Mammals occurring in caves include big brown and small-footed bats, woodrats, and raccoons. Eastern phoebes, cliff and barn swallows sometimes will nest on the outside ledge of a cave. Many protected species also occur in caves.

3.4.2 Indicators for Wildlife Populations

A combination of four factors are used to identify and assess impacts to the terrestrial animals occurring within each study area and corridor: 1) impacts to wildlife management; 2) impacts to plant communities, especially those of conservation concern; 3) the abundance and distribution of vegetative cover types, including wetlands; and 4) the degree of forest fragmentation.

Limited information is available on the specific location of uncommon animal communities in the study areas. However, designated areas that focus on wildlife management (Section 3.9) provide insight into the occurrence of these resources, because these areas typically have been designated due to the importance of their ecological resources. Table 3-7 (Section 3.3.1) lists plant communities of conservation concern reported from the study area counties. Like wildlife management areas, these community types often support rare or uncommon animal species.

Because animals are linked to specific habitat types, it is useful to know the distribution and abundance of each habitat type within the study areas. The distribution of vegetative cover types within the study area corridors are good indicators of the wildlife species present.

Birds are used as ecological indicators and their population numbers have been used to detect a variety of environmental changes (Furness and Greenwood 1993). Numerous studies have supported the concept that habitat area in combination with isolation of woodland is one of the most important considerations in maintaining natural diversity of breeding bird populations (e.g., Robbins et al. 1989a).

Several species of neotropical migrant birds occur within each of the study areas. Neotropical migrants are those birds that nest in North American and migrate to winter in Central and South America, Mexico or the Caribbean. Studies indicate that many of these species are declining on a continental scale, due to changes associated with their habitat (Robbins et al. 1989b, DeGraaf and Rappole 1995).

Habitat fragmentation affects the distribution, migration and reproduction of wildlife, especially neotropical birds. Habitat fragmentation can result in increased cowbird nest parasitism, the loss of habitat, barriers to dispersal between woodlots, and increased nest

predation (Wilcove 1985). The reproductive performance of some bird species may decrease along edges because edges attract predators and nest parasites such as cowbirds (Wilcove 1985, Small and Hunter 1988, Yahner and Scott 1988, Robinson et al. 1995). Robbins et al. (1989a) found that for the neotropical migrants they studied, the probability of occurrence increased as the area of forest increased. Forest patch statistics can provide insight into the types of animals present and how future activities in those areas could affect wildlife.

Avian breeding success may decrease along edges because edges attract predators and nest parasites such as cowbirds (Patton 1994, Wilcove 1985, Small and Hunter 1988, Yahner and Scott 1988, Robinson et al. 1995). Landscape fragmentation and creation of edge may allow for higher rates of brood parasitism by the brown-headed cowbird (Brittingham and Temple 1983). Cowbirds lay their eggs in the nest of host birds that hatch and rear the parasite's young at the expense of their own young. Areas consisting of lawns, pastures, or bare ground are used by cowbirds as feeding areas, thus attracting this species (Robinson et al. 1993). Predation rates are higher in small woodlots than in large tracts and are especially intense in woodlots near suburban neighborhoods. Forest edges appear to be good habitat for many animals that prey on nests of forest-dwelling songbirds (Wilcove 1985).

3.4.3 Alternative 1 - Cumberland-Montgomery Study Area

One plant community of conservation concern, the Kentucky-Tennessee Big Barrens, occurs within this study area (Section 3.3.1, Table 3-7). This community is important to several uncommon wildlife species, especially grassland birds. Several areas that focus on wildlife management are located within Corridor D (Section 3.9), including a small portion of the Cross Creeks National Wildlife Refuge.

The most common vegetation type in this study area is forested upland, followed by herbaceous planted /cultivated vegetation. White oak, southern red oak, and black oak are common dominant species in the forested uplands. Upland forests comprise between 45 and 47% of the four corridors in this study area, a lower proportion than the 60% forested uplands in the two Cumberland-Davidson Study Area corridors. The proportion of early successional habitat is greater than in the Cumberland-Davidson Study Area, and its wildlife populations are probably somewhat less diverse. Data from the *Tennessee Breeding Bird Atlas* (Nicholson 1997), as well as more recent information, indicate that the Cumberland-Montgomery Corridors, especially C and D, contain a higher number of grassland bird species including the dickcissel, horned lark, Henslow's sparrow and grasshopper sparrow.

The Cumberland-Montgomery Study Area also contains more herbaceous and woody wetlands than the Cumberland-Davidson Study Area. Wetlands and other riparian habitats are valuable to wildlife and serve a variety of functions (Section 3.7). Wildlife species using these wetlands include eastern cottontail rabbit, beaver, great blue heron, red-winged blackbird, brown-headed cowbird, indigo bunting, yellow-breasted chat, eastern wild turkey, bullfrog and cricket frog.

The four Cumberland-Montgomery Study Area corridors have similar proportions of forested uplands. The potential for forest fragmentation is lower in Corridor D than in Corridors A, B or C, as Corridor D is the shortest of the corridors and has the fewest forest patches and smallest average forest patch size (Table 3-6). It does, however, contain the

largest contiguous patch of forest, which is over twice the size of the largest patches in the other Corridors. Corridors A, B and C have similar proportions of forest and similar amounts of large, contiguously forested tracts. The proportion of early successional habitats is greatest in Corridor B and lowest in Corridors A and C.

Corridor B Route

About 47% of the proposed Corridor B transmission line route is forested and the remainder is in early successional or non-vegetated habitats. There are seven forested patches of 1,000 acres or more in size totaling 12,241 acres along the Corridor B route. The largest patches, around 2,500 acres, are of sufficient size to support many, but probably not all, of the forest interior species, including neotropical migratory birds, potentially occurring in the area (Robbins et al. 1989). No caves occur in the immediate vicinity of the Corridor B route. The route also crosses high quality wetlands which provide important habitat for a variety of wildlife.

Corridor D Line Route

The proportions of forested and early successional/non-vegetated habitats along the Corridor D transmission line route are roughly equal. There are two forested patches of 1000 acres or more in size along the Corridor D route. The largest forested patch, at 6,653 acres, is large enough to support almost all of the forest interior species, including neotropical migrant birds, potentially occurring in the area (Robbins et al. 1989a).

At least three caves are within half a mile of the transmission line route. The closest cave, an unnamed cave near Woodlawn found during the field investigations, is within 500 feet of the route. The next closest caves are Bellamy Cave which is 0.2 miles from the line and Bone Cave which is 0.1 miles from the line. The Fossil Plant East alternative alignment crosses a large wetland complex (wetlands DNSW1, DNSW2, and DNSW3 in Section 3.7.1.4) near Cumberland Fossil Plant just north of the Cumberland City Ferry. The other two alternative alignments in this area, Fossil Plant West and Fossil Plant Central, are close to but do not cross this wetland complex. The wetlands are used by a variety of wildlife species and contain a great blue heron colony with at least 30 or more active nests. This heron colony is about 1,000 feet from the edge of the proposed ROW for the Fossil Plant East alternative alignment. Another great blue heron colony occurs along West Fork Creek about 150 feet from the edge of the proposed ROW of the main alignment.

Overall, the wildlife populations along the Corridor B and Corridor D routes are similar. The Corridor B route has a slightly lower proportion of forested habitats than the Corridor D route, and the forests along the route are somewhat less fragmented. The Corridor D route probably has a slightly greater diversity of wildlife requiring forest-interior habitats, as the largest contiguous forested tract along the D route is much greater than the largest tract along the B route. Both routes pass through a few acres of high quality wetland habitats, and two heron colonies occur along the Corridor D route.

3.4.4 Alternative 2 - Cumberland-Davidson Study Area

Six plant communities of conservation concern occur within the counties comprising this study area (Section 3.3.2, Table 3-7). Corridor A passes through the Cheatham WMA (Section 3.9). Three caves are known from the vicinity of Corridor A and one cave is known from the vicinity of Corridor B.

The Cumberland-Davidson Study Area is predominantly comprised of forested upland, followed by herbaceous planted /cultivated vegetation (Table 3-10, Section 3.3.2). This study area contains less herbaceous and woody wetlands than the Cumberland-Montgomery Study Area. Overall, this study area contains a higher proportion of upland forested habitat than the Cumberland-Montgomery Study Area. Therefore, wildlife that prefer upland forested habitat are expected to be more abundant in this study area. The overall wildlife diversity is also likely greater. Data from the *Tennessee Breeding Bird Atlas* (Nicholson 1997) indicate that the two Cumberland-Davidson Corridors have a higher diversity of forest-dwelling species and a higher proportion of neotropical migrant species than do the Cumberland-Montgomery Corridors. Forest-dwelling species that occur in this study area include wood thrush, cerulean warbler, scarlet tanager, hooded warbler, black-and-white warbler, ovenbird and yellow-throated vireo.

There is little variation in the proportions of the various habitat types between Corridors A and B (Table 3-10). The average forest patch size is somewhat greater in Corridor A while the acreage of large forest patches (> 1,000 acres) is somewhat greater in Corridor B (Table 3-11). Because of these relatively small differences in habitats between Corridor A and Corridor B, the wildlife communities of these two corridors are likely to be very similar.

3.5 Aquatic Ecology

Most of the project area is in the Western Highland Rim section of the Interior Low Plateau. Streams of the Highland Rim are characterized by coarse chert gravel and sand substrates interspersed with bedrock areas, moderate gradients, clear waters, and moderate to low productivity, and thus little aquatic vegetation except near springs. The softer limestones of the Highland Rim contain solution channels, and the region is very rich in cave and spring habitat. Much of the section may have a network of caves communicating through the interconnected labyrinth of solution channels, facilitating the dispersal of cave organisms. Due to its geologic complexity, and numerous semi-independent drainage systems, the Highland Rim harbors the most diverse aquatic fauna of any region of comparable size in North America (Etnier and Starnes 1993). Impounded sections of Lake Barkley (Cumberland River) are within the project area, and Cheatham Dam is only a few miles upstream from the project area.

Because of the linear nature of streams and their drainages, many streams are common to two or more of the proposed corridors within each alternative study area. The following narrative identifies larger named streams whose watersheds lie within a study area, and notes results of recent sampling (where available), as well as streams representing unique resources (i.e., trout streams). The study areas and corridors also cross the watersheds of numerous smaller named tributaries of these streams, as well as many unnamed tributaries. Physical and chemical characteristics of some of the named streams are discussed in Section 3.2.

3.5.1 Alternative 1 - Cumberland-Montgomery Study Area

All Alternative 1 corridors cross Lake Barkley in reaches where the reservoir, although impounded, exhibits riverine characteristics of flow and morphology that are typical of large river tailwaters. TVA collections made with electrofishing and gill netting gear in Lake Barkley in 1998 and 1999 collected 59 species of fish. Although these collections were made in the area nearest Barkley Dam, any of these species could occur in the Alternative 1 project area. All smaller streams within the project area are tributaries of the

Cumberland River (Lake Barkley), either directly or to one of its larger tributaries such as the Red River.

3.5.1.1 Corridor A

Larger named streams in Corridor A are Wells Creek, Guices Creek, Yellow Creek, Louise Creek, Cumberland River, Brush Creek, Dawson Creek, Big McAdoo Creek, Little McAdoo Creek, and the Red River. TWRA sampling of Yellow Creek in 1999 collected 34 fish species, and indicated a healthy population (TWRA 2000); Yellow Creek is stocked with trout by TWRA, and is the only such stream in the project area. TWRA sampling of the Red River in 1999 collected 43 fish species; the Red River supports a very good black bass fishery, and an excellent channel and flathead catfish fishery (TWRA 2000). Aquatic animal communities in streams for which sampling results are not available are likely similar to those found in other area streams of similar flow and morphology.

3.5.1.2 Corridor B

Corridor B overlaps Corridor A for much of its length. In addition to the Cumberland River, larger named streams in Corridor B crossed by the proposed route and its alternative alignments are Wells Creek, Guices Creek, Yellow Creek, East Fork Yellow Creek, Burnell Creek, Budds Creek, Vernon Creek, Little McAdoo Creek, Big McAdoo Creek, Hurricane Creek, and the Red River. Several unnamed smaller perennial and intermittent streams also occur along the Corridor B route. Table 3-12 lists the number of perennial streams, intermittent streams, and ponds and flooded quarries along the main route and the various alternative alignments. It also gives the streambank conditions; non-forested streams have few or no trees adjacent to the stream and are typically in pasture or cropland. Partially forested streams typically have trees on one side of the stream.

Fish populations in the Cumberland River, Yellow Creek, and the Red River are described above in Section 3.5.1.1. Aquatic animal communities in streams for which sampling results are not available are likely similar to those found in other area streams of similar flow and morphology. A flooded abandoned quarry and several farm ponds, most of which are surrounded by pasture, also occur along the Corridor B route. Numerous wet weather conveyances are also present.

Substrates in most perennial and intermittent streams are typically cobble, gravel, and sand. A few of these streams also have portions of the substrate made up of boulders. The portions of Wells Creek and Guices Creek crossed by the proposed route are influenced by Lake Barkley and have silt as a major substrate component. Many of the streams along the proposed route exhibit bank degradation, riparian zone removal, nutrient enrichment, and instream habitat degradation as a result of present and past land use practices.

Table 3-12. Streams, ponds, and flooded quarries crossed by the Cumberland-Montgomery Corridor B and Corridor D transmission line routes.

	Perennial				Intermittent				Ponds and Quarries			
	Forested	Partially Forested	Non-Forested	Total	Forested	Partially Forested	Non-Forested	Total	Forested	Partially Forested	Non-Forested	Total
Corridor B												
Main Alignment	14	7	10	31	6	0	2	8	2	1	6	9
Cumberland River North	1	2	2	5	1	1	0	2	0	1	2	3
Cumberland River South	6	0	1	7	0	0	0	0	0	0	3	3
Industrial Park West	0	1	0	1	0	0	0	0	0	0	0	0
Industrial Park Central	0	1	0	1	0	0	0	0	0	0	0	0
Industrial Park East	0	1	0	1	0	0	0	0	0	0	0	0
Corridor D												
Main Alignment	10	6	3	19	4	6	1	11	0	1	5	6
Fossil Plant West	0	1	0	1	0	0	0	0	0	0	0	0
Fossil Plant Central	0	1	0	1	0	0	0	0	0	0	0	0
Fossil Plant East[2]	1	1	3	5	0	0	0	0	2	0	0	2
Woodlawn West	1	3	1	5	1	2	1	4	0	2	4	6
Woodlawn East	2	1	0	3	2	2	3	7	0	1	2	3
Fort Campbell	2	1	0	3	0	0	0	0	0	0	0	0
Non-Fort Campbell	4	1	0	5	0	0	1	1	0	0	0	0
Ringgold North	0	0	0	0	0	0	0	0	0	0	0	0
Ringgold South	0	1	1	2	0	0	0	0	0	0	0	0
Little West Fork North	0	2	0	2	0	0	0	0	0	0	0	0
Little West Fork South	0	0	0	0	0	0	0	0	0	0	0	0
Spring Creek North	0	1	0	1	0	0	0	0	0	0	0	0
Spring Creek South	0	2	1	3	0	0	0	0	0	0	0	0

[1]Includes Cumberland River/Lake Barkley

[2]Includes overlapping portion of Corridor B route and North-South Connector

3.5.1.3 Corridor C

Larger named streams in this corridor (in addition to Yellow Creek, East Fork Yellow Creek, Guices Creek, Cumberland River, and Wells Creek) are Budds Creek, Antioch Creek, West Fork Red River, and Spring Creek. Aquatic animal communities in these streams are likely diverse, and similar to other area streams, as described in Section 3.5.1.1.

3.5.1.4 Corridor D

Corridor D is separated from the other corridors over most of its length. In addition to the Cumberland River, larger named streams in Corridor D crossed by the proposed route and its alternative alignments are Cooper Creek, Wildcat Creek, Marshall Creek, Blooming Grove Creek, Bartee Branch, Fletchers Fork, Little West Fork, West Fork Red River, and Spring Creek. Several unnamed smaller perennial and intermittent streams, as well as springs and numerous wet weather conveyances, also occur along the Corridor D route. Table 3-12 lists the number of perennial streams, intermittent streams, and ponds and flooded quarries along the main route and the various alternative alignments.

Fish populations in the Cumberland River are described above in Section 3.5.1.1. Aquatic animal community sampling results are not available for the other streams along the proposed route and they are assumed to be similar to those found in other area streams of similar flow and morphology. Several farm ponds, most of which are surrounded by pasture, also occur along the Corridor D route. Substrates in most perennial and intermittent streams are typically cobble, gravel, and sand. A few of these streams also have portions of the substrate made up of boulders. Silt is a major component of the substrate of Spring Creek and West Fork Red River. Many of the streams along the proposed route exhibit bank degradation, riparian zone removal, nutrient enrichment, and instream habitat degradation as a result of present and past land use practices.

3.5.2 Alternative 2 - Cumberland-Davidson Study Area

Both Cumberland-Davidson Corridors A and B run south of Lake Barkley toward Nashville. All of the smaller streams within the Alternative 2 Corridors are tributaries of the Cumberland River, either in Lake Barkley or Cheatham Lake.

3.5.2.1 Corridor A

Larger named streams lying within Corridor A are Wells Creek, Guices Creek, Yellow Creek (which is stocked with trout by TWRA), Leatherwood Creek, headwater streams of Furnace Creek and Barton's Creek, Jones Creek, Harpeth River, Turnbull Creek, and South Harpeth River. Some of these streams are characterized above in Section 3.5.1. TWRA sampling of Jones Creek in 1999 collected 31 fish species, and is considered to support a healthy fish population (TWRA 2000). TWRA sampling of Turnbull Creek in 1997 collected 22 fish species, and is considered to support a healthy fish population (TWRA 1998). Etnier and Starnes (1993) identified 62 fish species from the Harpeth River system. Sampling conducted by TWRA in the Harpeth River in 1997 collected 28 species; the fish community was considered healthy (TWRA 1998).

3.5.2.2 Corridor B

Larger named streams lying within Corridor B are Wells Creek, Guices Creek, Yellow Creek, Leatherwood Creek, Little Barton's Creek, Barton's Creek, Johnson Creek, and Harpeth River. The aquatic communities in some of these streams are described above. The other streams likely have similar aquatic communities.

3.6 Endangered and Threatened Species

Six species of plants and seven species of animals listed under the Endangered Species Act as endangered, threatened, or as a candidate for listing, have been reported from the six project area counties (Tables 3-13, 3-14, 3-15). An additional 55 species of plants and 25 species of animals listed by the state of Tennessee as endangered, threatened, or of other conservation concern, have been reported from the project area. These species and their distributions by study area, corridor, and proposed transmission line route are described below. This information is based on records in the TVA Regional Natural Heritage database and supplemented by detailed field investigations of the proposed transmission line routes in Alternative 1 – Cumberland-Montgomery Corridors B and D.

Plants – Table 3-13 contains a list of all federally listed and state-listed plant species reported from the project area, as well brief descriptions of the typical habitat for each species. Three of the six species of federal concern (Braun's rockcress, leafy prairie clover, and Tennessee coneflower) are not known from the study corridors, and suitable habitats for these species were not encountered during field inspections of the two proposed Alternative 1 transmission line routes.

Terrestrial Animals – Listed terrestrial animals reported from the project area are given in Table 3-14. A brief summary of the habitat requirements for each of these species is presented in the following paragraphs.

Terrestrial Invertebrates – The Coleman Cave beetle, a candidate for listing under the Endangered Species Act, occurs in Coleman Cave in Corridor D. This blind, predatory cave beetle is found among logs and other detritus in the dark-zone of caves and is only known from Coleman Cave and one other cave.

Reptiles and Amphibians – Barking treefrogs are often found in association with ponds in pine or hardwood flatwoods. Sandy soils near shallow ponds, low wet woods, or swamps may provide suitable habitat for this frog. Eastern hellbenders inhabit large, clear, fast-flowing streams that contain large flat rocks and logs. Four-toed salamanders are often associated with wetlands that contain abundant moss or sedges and in or near a forested setting. Eastern slender glass lizards can be found in dry grassy fields or forests with loose soils. In forested settings, this species often occurs in pine stands with a fairly open canopy. Northern pine snakes prefer loose sandy soils in open, dry pine or oak woodlands, especially in areas maintained by fire. Western pigmy rattlesnakes can be found in a variety of terrestrial habitats. This snake often inhabits wetlands, swamps, or floodplains where shelter in the form of stumps, dense thickets or logs occurs.

Table 3-13. Federally listed and state-listed plant species reported from the project area. For federally listed species, all species reported from the project area counties are listed. For state-listed species, those known from within five miles of each study area corridor are listed. In the Study Area/Corridor columns, "X" indicates the occurrence of the species in the vicinity of the study area and letter codes denote the presence of the species within the particular corridor or corridor segment.

		Status[1]		Study Area/Corridor		
Common Name	**Scientific Name**	**Federal**	**State**	**Cumberland-Montgomery**	**Cumberland-Davidson**	**Habitat[2]**
A bluestar[3]	*Amsonia tabernaemontana* var. *gattingeri*		SPCO	C		Glades, barrens, rocky gravel bars
A sedge[3]	*Carex oxylepis* var. *pubescens*		SPCO	X	X	Wooded bluffs, floodplains
American ginseng	*Panax quinquefolius*		S-CE	D	X	Rich woods
Appalachian bugbane	*Cimicifuga rubifolia*		THR	X	X	Rich woods
Barbed rattlesnake-root	*Prenanthes barbata*		SPCO	X	X	Barrens, dry woodlands
Blue scorpion-weed	*Phacelia ranunculacea*		SPCO	C, D, CD		Alluvial woods
Braun's rockcress	*Arabis perstellata*	END	END		X	Limestone bluffs
Bristly sedge	*Carex comosa*		THR	AB		Swamps
Buffalo clover	*Trifolium reflexum*		END	C		Rocky open woods
Butternut	*Juglans cinerea*		THR		X	Rich woods, hollows
Canada lily	*Lilium canadense*		THR		X	Rich woods, seeps
Clebsch's pocket moss	*Fissidens clebschii*		SPCO	X		Mesic forest river bluffs
Compass-plant	*Silphium laciniatum*		THR	X		Barrens
Creamflower tick-trefoil	*Desmodium ochroleucum*		END	X		Sandy dry woods
Davis' sedge	*Carex davisii*		SPCO		X	Bottomlands, riparian soils
Duck river bladderpod	*Lesquerella densipila*		THR		B	Cultivated fields

		Status[1]		Study Area/Corridor		
Common Name	**Scientific Name**	**Federal**	**State**	**Cumberland-Montgomery**	**Cumberland-Davidson**	**Habitat[2]**
Earleaf foxglove	*Agalinis auriculata*		END	X		Barrens
Eastern white water-crowfoot	*Ranunculus longirostris*		END	X		Ponds, wet streams
Eggert's sunflower	*Helianthus eggertii*	THR	THR	X	A, B	Barrens, roadsides
Featherfoil	*Hottonia inflata*		SPCO	C		Wet sloughs, ditches
Goldenseal	*Hydrastis canadensis*		S-CE	C, D	X	Rich woods
Grassleaf arrowhead	*Sagittaria graminea*		THR		X	Ponds, stream margins
Hairy hawkweed	*Hieracium longipilum*		SPCO	X		Dry fields, sandy road banks
Heavy-fruited sedge	*Carex gravida*		SPCO	X	X	Rocky river bluffs
Lake-bank sedge	*Carex lacustris*		THR	AB		Alluvial woods
Lake-cress	*Neobeckia aquatica*		SPCO	AB		Gum or cypress swamps
Lance-like spikerush	*Eleocharis lanceolata*		SPCO	D		Wet areas
Large-leaved grass-of-parnassus	*Parnassia grandifolia*		SPCO		X	Calcareous seeps
Large-tooth aspen	*Populus grandidentata*		SPCO	X	X	Dry woodlands
Leafy prairie-clover	*Dalea foliosa*	END	END		X	Ephemeral streams associated with cedar glades
Maryland milkwort	*Polygala mariana*		SPCO	AB		Sandy alluvial woods, disturbed areas
Michigan lily	*Lilium michiganense*		THR	D	X	Swamps, open wet woods
Muskingum sedge	*Carex muskingumensis*		E-P	AB		Wet woods
Naked-stem sunflower	*Helianthus occidentalis*		SPCO	D		Limestone glades and barrens; roadsides
Nodding rattlesnake-root	*Prenanthes crepidinea*		END	AB		Rich bottomlands
Northern bush-	*Diervilla lonicera*		THR		X	Rocky woodlands, bluffs

Common Name	Scientific Name	Status[1] Federal	Status[1] State	Study Area/Corridor Cumberland-Montgomery	Study Area/Corridor Cumberland-Davidson	Habitat[2]
honeysuckle						
Nuttall's waterweed	*Elodea nuttallii*		SPCO	AB		Aquatic: streams and ponds
Ovate-leaved arrowhead	*Sagittaria platyphylla*		SPCO	A, B		Marshes, sloughs
Pale-purple coneflower	*Echinacea pallida*		THR	X		Barrens, dry openings
Prairie parsley	*Polytaenia nuttallii*		THR		X	Prairies, dry open areas
Prairie-dock	*Silphium pinnatifidum*		THR	X		Barrens
Price's potato-bean	*Apios priceana*	THR	END	D		Openings in rich limestone woods, often near streams
Pubescent sedge	*Carex hirtifolia*		SPCO		X	Dry woods
Purple milkweed	*Asclepias purpurascens*		SPCO	B, C, D		Barrens
Rock goldenrod	*Solidago rupestris*		END	C		Limestone riverbanks, bluffs
Rock grape	*Vitis rupestris*		S-PE	X	B	Sandy, rocky riverbanks
Running strawberry-bush	*Euonymus obovatus*		SPCO	D		High elevation woods
Sessile-fruited arrowhead	*Sagittaria rigida*		SPCO	A, B		Ponds, marshes
Shinners' false foxglove	*Agalinis pseudaphylla*		END		X	Barrens
Short-beaked arrowhead	*Sagittaria brevirostra*		THR	C		Swamps, floodplains
Short's bladderpod	*Lesquerella globosa*	CAN	END	A, B	X	Shale slopes, cultivated fields
Short's rock-cress	*Arabis shortii*		SPCO	C		Wooded bluffs, floodplains
Small-head rush	*Juncus brachycephalus*		SPCO		X	Seeps, wet bluffs
Smaller mud-plantain	*Heteranthera limosa*		THR	C, D		Mud flats
Southern rein orchid	*Platanthera flava* var.		SPCO		X	Floodplain woods, marshes

Common Name	Scientific Name	Status[1]		Study Area/Corridor		Habitat[2]
		Federal	State	Cumberland-Montgomery	Cumberland-Davidson	
	flava					
Spreading false-foxglove	*Aureolaria patula*		THR	X		Oak woods, edges
Sweet-scented Indian-plantain	*Synosma suaveolens*		THR		A	Alluvial woods, moist slopes
Tennessee coneflower	*Echinacea tennesseensis*	END	END		X	Glades
Tennessee milk-vetch	*Astragalus tennesseensis*		SPCO		X	Glades
Water stitchwort	*Arenaria fontinalis*		THR		B	Seeps, limestone creek beds
White prairie-clover	*Dalea candida*		END		X	Barrens

[1] Status codes: END = endangered; THR = threatened; CAN = candidate for federal listing; E-P = endangered, possibly extirpated; SPCO = special concern; S-CE = special concern, commercially exploited; S-PE = special concern, proposed endangered.

[2] Source: Tennessee Department of Environment and Conservation, 2003.

[3] Name listed is not unique for this species, and is routinely applied to more than one member of this genus.

Table 3-14. Federally listed and state-listed terrestrial animal species reported from the project area. For federally listed species, all species reported from the project area counties are listed. For state-listed species, those known from within three miles of each study area are listed. In the Study Area/Corridor columns, X denotes the occurrence of a species in the vicinity of the study area and letter codes denote the presence of a species within the particular corridor or corridor segment.

		Status[1]		Study Area/Corridor	
Common Name	**Scientific Name**	**Federal**	**State**	**Cumberland-Montgomery**	**Cumberland-Davidson**
Invertebrates					
Coleman cave beetle	*Pseudanophthalmus colemanensis*	CAN		D	
Amphibians					
Barking treefrog	*Hyla gratiosa*		NMGT	AB, CD	
Eastern hellbender	*Cryptobranchus alleganiensis alleganiensis*		NMGT	D	
Four-toed salamander	*Hemidactylium scutatum*		NMGT		A
Reptiles					
Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*		NMGT	X	
Northern pine snake	*Pituophis melanoleucus melanoleucus*		THR	C	A
Western pigmy rattlesnake	*Sistrurus miliarius streckeri*		THR	X	
Birds					
Bald Eagle	*Haliaeetus leucocephalus*	THR	NMGT	X	X
Bewick's wren	*Thryomanes bewickii bewickii*		END	C	X
Cerulean warbler	*Dendroica cerulea*		NMGT		A, B
Henslow's sparrow	*Ammodramus henslowii*		NMGT	X	
Lark sparrow	*Chondestes grammacus*		THR	X	
Sharp-shinned hawk	*Accipiter striatus*		NMGT		A
Swainson's warbler	*Limnothlyopis swainsonii*		NMGT	AB	
Mammals					

		Status[1]		Study Area/Corridor	
Common Name	**Scientific Name**	**Federal**	**State**	**Cumberland-Montgomery**	**Cumberland-Davidson**
Common shrew	*Sorex cinereus*		NMGT	X	
Eastern small-footed bat	*Myotis leibii*		NMGT	D	
Gray bat	*Myotis grisescens*	END	END	D	X
Indiana bat	*Myotis sodalis*	END	END	D, AB	X
Meadow jumping mouse	*Zapus hudsonius*		NMGT	X	X
Southeastern shrew	*Sorex longirostris*		NMGT	D	X
Southern bog lemming	*Synaptomys cooperi*		NMGT	ABCD	

[1] Status codes: END = endangered; THR = threatened; CAN = candidate for federal listing; NMGT = in need of management.

Birds – Bald eagles typically nest in mature trees near or adjacent to large rivers or reservoirs where they forage. Several pairs of bald eagles nest along the lower Cumberland River and the nest site closest to the project area is about 5 miles downstream of Cumberland Fossil Plant. Bald eagles regularly occur along the Cumberland River within the project area during the winter. Bewick's wrens may occur in open, brushy fields or riparian woodlands, especially where suitable artificial nest sites in the form of outbuildings, machinery, woodpiles, or nest boxes are found nearby. This species is rare in the project area. Cerulean warblers nest in mature, moist deciduous forests. Habitat for this bird includes hilly, steep slopes characterized by a sparse understory and extensive bottomland hardwood forests (Nicholson 1997). Most of the recent records of this species in the project area are from Cheatham County.

Henslow's sparrows are found in grassland habitats where thick, grassy vegetation that contains dead plant material occurs, especially in damp conditions. Within the project area, this species occurs on Fort Campbell and has been reported from Cheatham County; both of these locations are outside of any of the study area corridors. Lark sparrows are found in semi-open habitats with sparse ground cover. Suitable habitats may include natural cedar glades and prairie openings, and rural farmland that contains well grazed pastures with patches of bare ground or rock and scattered trees. No extant populations of this species are presently known from the study areas. Sharp-shinned hawks prefer pine forests for nesting and may be found in mixed or deciduous woodlands. This species is uncommon to rare during the nesting season and somewhat more numerous during the winter. Swainson's warblers nest in bottomland forests where canopy openings and dense woody undergrowth in the form of cane or dense shrubs or deciduous saplings are found (Nicholson 1997). This species is very rare in the project area.

Mammals – Common shrews occur in a variety of habitats including among rocks and logs in moist woodlands, marshy areas, bogs, and open fields. Eastern small-footed bats can be found hibernating in caves or mines and may be found in buildings during summer months. Gray bats are colonial bats which roost and form maternity colonies in caves located along rivers and reservoirs over which they feed. In the winter, gray bats congregate and hibernate in a limited number of caves across the southeast. Indiana bats are colonial bats that hibernate in caves during winter months, and can be found in hollow

trees and under loose tree bark during the summer, where they form small maternity colonies. Indiana bats forage for insects primarily in riparian and upland forests. All three species of bats have been reported from Bellamy Cave in the Cumberland-Montgomery Alternative Corridor D, and gray and Indiana bats have been reported from Coleman Cave in this corridor. Meadow jumping mice are found in open grassy fields and in grassy vegetation near ponds, streams, marshes, and woodlands. Southeastern shrews occur in a variety of habitats, but are typically associated with moist woodlands or wetlands where rotting logs and leaf litter occur. Southern bog lemmings occur in low moist areas such as bogs, swamps, and damp woods.

Although specific information is limited, there is potential for other state-listed terrestrial animals to occur within the study areas. Allegheny woodrats (*Neotoma magister*), listed as In Need of Management in Tennessee, may occur in both study areas. This mammal is typically found in caves or among rocky or bluff habitats. Additionally, sharp-shinned hawks, lark sparrows, and Bewick's wren may occur in both study areas.

Aquatic Species – Three federally listed aquatic species have been reported from the project area counties and eight state-listed aquatic species and have been reported from the project area (Table 3-15).

The only known populations of the Nashville crayfish are in the Mill Creek drainage in Davidson and Williamson Counties, outside of the project area. The tan riffleshell occurs in riffles and shoals in small rivers, and historically occurred in the Harpeth River and Red River drainages (Parmalee and Bogan 1998). The birdwing pearlymussel occurs in clear, cool high gradient streams and historically occurred in the Red River drainage. Both of these species are considered extirpated from the project area.

The lake sturgeon occurs in large rivers and lakes, and has been reported from the Cumberland River. It is not known to presently occur in the project area. The blue sucker inhabits swift waters over firm substrates in big rivers. The ashy darter occurs in small to medium upland rivers in areas of bedrock or gravel and boulders. The smallscale darter occupies areas of deep, swift riffles with boulder and course rubble substrates in large streams and small to medium rivers. The Tippecanoe darter occurs in medium to large rivers in areas of shallow, find gravel riffles. The silver lamprey occurs in medium to large rivers. The slenderhead darter occurs in small to large rivers of moderate gradient with gravel shoals. The southern cavefish occurs in streams or pools in caves (Etnier and Starnes 1993).

3.6.1 Alternative 1 - Cumberland-Montgomery Study Area

Plants – Prior to the initiation of fieldwork for this study, two federally listed plant species, Eggert's sunflower and Price's potato-bean, a candidate for federal listing, Short's bladderpod, and 39 state-listed species were known from the Cumberland-Montgomery study area (Table 3-13). Price's potato-bean, Short's bladderpod, and 26 of the state-listed species had been reported from at least one of the four study area corridors.

Table 3-15. Federally listed and state-listed aquatic animal species reported from the project area. For federally listed species, all species reported from the project area counties are listed. For state-listed species, those known from potentially affected streams are listed. In the Study Area/Corridor columns, X denotes the occurrence of a species in the vicinity of the study area and letter codes denote corridors containing streams from which a species has been reported.

		Status[1]		Study Area/Corridors	
Common Name	**Scientific Name**	**Federal**	**State**	**Cumberland-Montgomery**	**Cumberland-Davidson**
Crayfish					
Nashville crayfish	*Orconectes shoupi*	END	END		X
Mussels					
Tan riffleshell	*Epioblasma florentina walkeri*	END	END	X	X
Birdwing pearlymussel	*Pegias fabula*	END	END	X	
Fish					
Lake sturgeon	*Acipenser fulvescens*	-	END	X	X
Blue sucker	*Cycleptus elongates*	-	THR	A, B, C, D	A, B
Ashy darter	*Etheostoma cinereum*	-	THR	A, B, C	
Smallscale darter	*Etheostoma microlepidum*	-	NGMT	A, B, C	A, B
Tippecanoe darter	*Etheostoma Tippecanoe*	-	NGMT	A, B, C	A, B
Silver lamprey	*Ichthyomyzon unicuspis*	-	NMGT	X	X
Slenderhead darter	*Percina phoxocephala*	-	NMGT	A, B, C	A, B
Southern cavefish	*Typhlichthys subterraneus*	-	NMGT	A, B, C, D	

[1] Status codes: END = endangered; THR = threatened; NMGT = in need of management.

Price's potato bean, previously known from one location in Corridor D, occurs along forest edges and in some openings of rich woods. Short's bladderpod was reported from five locations in corridor segment AB. This species occurs on shale slopes and cultivated fields. Both of these species could occur elsewhere within the Cumberland-Montgomery Study Area. The state-listed plant species known from the study area occupy a variety of habitats including barrens, cedar glades, roadsides, cultivated fields, rocky (and occasionally wooded) river banks and bluffs, floodplains, swamps, and mesic, rich wooded slopes. Many of these species could occur in corridors other than those listed in Table 3-13. Several of the species known from the study area but not from within a corridor could also occur in one or more corridors.

Once the proposed transmission line routes in Corridors B and D were identified, detailed field investigations of the routes and associated areas including access roads and construction staging areas were conducted during the growing season of 2004. The

following subsections describe the listed plants on or near each of the proposed routes and associated areas.

Corridor B Route - Two populations of blue scorpion-weed, state listed as of special concern, were found along the route in the vicinity of Yellow Creek. Several state-listed plants including the endangered nodding rattlesnakeroot had previously been reported from near the inner edge of the Cumberland River floodplain and on adjacent bluffs on the east side of the route's crossing of the Cumberland River near Marks Slough. A candidate for federal listing, Short's bladderpod, had also been reported from bluffs and an abandoned railroad grade in this area. None of these species were seen during field surveys of the alternative route alignments in this area. No listed plants were previously known from near the proposed route east and north of the Mark Slough area and none were observed during the field surveys of this portion of the route. None of the construction laydown areas or access roads associated with Corridor B contains state- or federally listed plants.

Corridor D Route – A population of Price's potato bean, federally listed as threatened, is known from one location in Corridor D. The proposed route in this area was moved about ¼ mile to avoid impacting this population. No other populations of Price's potato bean or other listed plants were found during surveys of the relocated route or its alternative alignments, access roads, or laydown areas.

Terrestrial Animals – Two federally listed terrestrial animals, the gray bat and Indiana bat, and one candidate for federal listing, the Coleman Cave beetle, have been reported from Cumberland-Montgomery Study Area corridors. The bald eagle is also known from the vicinity of the study area. An additional 8 state-listed terrestrial animals have been reported from within the study area boundaries (Table 3-14). As described above, these species occupy a variety of habitats including caves, reservoir shorelines, woodland ponds, and mature forests.

Once the proposed transmission line routes in Corridors B and D were identified, detailed field investigations of the routes and associated areas including access roads and construction staging areas were conducted during the spring, summer, and early fall of 2004. The following subsections describe the listed terrestrial animals on or near each of the proposed routes and associated areas.

Corridor B Route – A large wetland along the route in the vicinity of Yellow Creek and riparian forest at Guices Creek provide suitable habitat for the barking treefrog, four-toed salamander and western pigmy rattlesnake. Dry grassland and open woodlands suitable for the eastern glass lizard occurs in several places along the route while pine and mixed pine woodlands suitable for northern pine snakes are rare. None of these species, which are often cryptic, were observed during field surveys of the Corridor B route. Eastern hellbenders could occur in the Cumberland River and the Red River in the vicinity of the proposed transmission line crossings.

Suitable habitat for the Swainson's warbler occurs at Guices Creek and forested habitat immediately east of the Yellow Creek wetland provides suitable habitat for common shrews, southeastern shrews, and southern bog lemmings. Additional suitable habitat for these three small mammals, as well as the meadow jumping mouse, is scattered along other portions of the Corridor B route.

Although bald eagles likely occasionally occur at the proposed Corridor B route crossing of the Cumberland River, little suitable nest or winter roost habitat is present there. Suitable habitat for Bewick's wrens is scattered along the route, while little to no suitable habitat for Henslow's sparrows and lark sparrows is present.

The closest cave known to be used by wintering Indiana bats is about 6 miles from the Corridor B route. Indiana bats, particularly males, often form small summer roosts in close proximity to as their winter roost caves. The quality of forested habitats along the Corridor B route, as well as the Corridor D route, was assessed using a modified version of the Indiana Bat Habitat Suitability Index Model (Romme et al. 1995). Very little of the Corridor B route was classified as high or medium quality Indiana bat habitat (Table 3-16).

Table 3-16. Percentage of High, Medium, and Low Quality Indiana Bat Habitat Along the Forested Sections of the Alternative 1 – Cumberland-Montgomery Corridor B and Corridor D Transmission Line Routes.

Route	High	Medium	Low
Corridor B	0.4%	1.0%	98.6%
Corridor D	0.5%	3.0%	96.5%

Corridor D Route – The proposed transmission line route is about 0.7 miles from Coleman Cave, one of two known locations for the Coleman Cave beetle. Gray bats and Indiana bats are also known from this cave although gray bats have not been observed there during recent surveys (Harvey and Britzke 2002). These two species of bats, as well as the eastern small-footed bat, have also been reported from Bellamy Cave, which is about 0.2 miles from the Corridor D route. Harvey and Britzke (2002) reported that the gray bat colony is still active at the cave; Indiana bats, however, have not been observed there recently.

Forested habitats near these caves ranked as having low quality Indiana bat habitat, largely due to the forested habitats having a dense understory and a lack of suitable roost trees. Only about 4% of the forests along the rest of the Corridor D route ranked as high or medium quality Indiana bat habitat (Table 3-16).

Other listed species potentially occurring along the Corridor D route, based on the presence of suitable habitat, include the barking treefrog, eastern hellbender, eastern glass lizard, western pigmy rattlesnake, bald eagle, Bewick's wren, Swainson's warbler, common shrew, southeastern shrew, meadow jumping mouse, and southern bog lemming. Bald eagle use of the proposed route is likely limited to occasional foraging along the Cumberland River near Cumberland Fossil Plant; suitable nest and winter roost habitat does not occur in the immediate area. Eastern hellbenders have previously been reported from the Cumberland River and Little West Fork Creek, and could occur where the proposed route crosses these two streams, as well as in West Fork Red River and Spring Creek. Little to no suitable habitat for the northern pine snake, Henslow's sparrow, and lark sparrow occurs along the proposed route.

Aquatic Animals – No federally listed aquatic animals are likely to occur within the Cumberland-Montgomery Study Area. The state-listed blue sucker is known from the main channel of the Cumberland River and is likely to occur within all of the proposed

Cumberland-Montgomery corridors (Table 3-15). Three other state-listed fish, the ashy darter, smallscale darter, and slenderhead darter, are reported from the Red River system and are potentially present in Corridors A, B, and C. The southern cavefish is widespread in cave and karst areas north of the Cumberland River, and known from within all four corridors.

3.6.2 Alternative 2 - Cumberland-Davidson Study Area

Plants – One federally listed plant species, Eggert's sunflower, has been reported from this study area (Table 3-13). Five occurrences of this species are known from within Corridor A, and four are known from Corridor B. This species occurs in a variety of habitats ranging from barrens and roadsides to transmission line and pipeline ROWs. Additional areas containing suitable habitat for, and occurrences of, this species are possible within both corridors under consideration for this alternative.

Four other state-listed plant species have also been reported from the within the two Cumberland-Davidson corridors. Suitable habitats for these species include glades, cultivated fields, alluvial woods and moist slopes, seeps, and limestone creek beds. Additional areas containing suitable habitat for, and occurrences of, these species are possible within both corridors under consideration for this alternative.

In addition to these species, five federally listed plant species and 23 other state-listed plant species have been reported from the Cumberland-Davidson Study Area but outside of the two study corridors (Table 3-13). Suitable habitats for the listed plant species reported from the project area are similar to those described above for the Cumberland-Montgomery Study Area. The presence of one or more of these species is possible within both Cumberland-Montgomery corridors.

Terrestrial Animals – No federally listed terrestrial animals have been reported from the Cumberland-Davidson Study Area. However, the endangered gray bat and the threatened bald eagle have been reported from within three miles of the study area. The endangered Indiana bat has been also reported from the project area counties outside of the study area. Three state-listed terrestrial animals have been reported from within the study area boundaries (Table 3-14).

Aquatic Animals – The state-threatened blue sucker is known from the main channel of the Cumberland River and is likely to occur near the western end of both Cumberland-Davidson corridors (Table 3-15). The smallscale darter and slenderhead darter are known from the Harpeth River system and are potentially present in both proposed corridors.

3.7 Wetlands

Wetlands are areas inundated by surface or groundwater often enough to support vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, mud flats, and natural ponds.

Activities in certain wetlands are regulated under Section 404 of the Clean Water Act and the Tennessee Water Quality Control Act (TWQCA) of 1977. Executive Order (E.O.) 11990 also directs federal agencies to protect wetlands. Under Section 404 of the CWA, the U.S. Army Corps of Engineers (USACE) established a permit system to regulate activities in

"waters" of the United States, including some wetlands. In order to conduct specific activities in wetlands authorization under either a Nationwide General Permit or an Individual Permit from the USACE is required. Section 401 water quality certification issued by the Tennessee Department of Environment and Conservation is also required. E.O. 11990 requires all federal agencies to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.

Early in the planning of this project, USFWS National Wetland Inventory (NWI) data were reviewed to identify potential locations of wetlands within the project area. Limited ground-truthing of the NWI data was conducted in several areas visible from public roads. The wetlands identified through this process were described in the DEIS for each study area and corridor and are briefly described below.

Following the identification of the proposed transmission line routes in Cumberland-Montgomery study area Corridors B and D, onsite wetland determinations were conducted of the proposed ROWs and associated areas including access roads and construction assembly areas. These determinations were performed according to USACE standards (Environmental Laboratory 1987) for federal Jurisdictional Wetlands which are regulated under the Clean Water Act. The USACE wetland standards require documentation of hydrophytic vegetation (Reed 1997), hydric soil, and wetland hydrology. Broader definitions of wetlands, such as the one used by the USFWS (Cowardin et al. 1979), were also considered in this review. Wetlands were classified according to the Cowardin system (Cowardin et al. 1979) and a routine wetland determination form was completed for each wetland. When a wetland was crossed more than once by a proposed transmission line route or access road, a separate determination form was completed for each crossing. These forms are archived in the project administrative record.

The wetlands were categorized by their functions, sensitivity to disturbance, rarity and irreplaceability using a TVA-developed modification (TVARAM) of the Ohio Rapid Assessment Method (ORAM v. 5.0, Mack 2001) specific to the TVA region. The categorization was used to compare impacts between proposed routes and alternative alignments and to determine potential mitigation for wetland impacts. A copy of the TVARAM data form is presented in Appendix G. When a wetland was crossed more than once by a proposed transmission line route or access road, a single TVARAM categorization was completed for the wetland. The rapid assessment method is designed to distinguish between three categories of wetlands.

Category 1 wetlands are "limited quality waters." They are considered to be a resource that has been degraded, has limited potential for restoration, or is of such low functionality that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 includes wetlands of moderate quality and wetlands that are degraded but could be restored. Category 3 generally includes wetlands of very high quality and wetlands which are of concern regionally and/or statewide, such as wetlands which provide habitat for threatened or endangered species.

Wetlands within the project area study areas provide a number of important functions. These functions include provision of fish and wildlife habitat; support of plant species and landscape diversity; stream and shoreline stabilization; flood flow alterations; retention of sediments; removal or transformation of contaminants; and nutrient cycling. A brief description of wetland functions is as follows:

Provision of fish and wildlife habitat – Wetlands provide habitat for a large number of mammal, bird, amphibian, reptile, fish, and invertebrate species (see Sections 3.4 and 3.5). Wetlands are essential habitat for many amphibians, migratory and nesting waterfowl, and many shorebird and songbird species. Many species are wetland-dependent for part or all of their life-cycle. Other species may not use the wetlands directly, but are dependent on wetlands as a source of food, such as aquatic invertebrates that use the organic material exported from wetlands.

Support of plant species and landscape diversity – Wetland plant communities consist primarily of species that can grow under low-oxygen, saturated soil conditions. Although some of the species can grow outside of wetland, most cannot grow in dry situations. Landscape diversity may be simply defined as the number and interspersion of different habitat types in a given area. Species diversity is a measure of the total number of plant and/or animal species in a given area. Landscape and species diversity can be substantially reduced when specific habitat types are altered, removed, or fragmented. The loss of wetlands can result in local extirpation of plant and animal species, and thus, over time, can lead to a reduction in biological diversity in the local area and region.

Stream and shoreline stabilization – The roots of shrubs and herbaceous vegetation help to stabilize streambanks and shorelines against erosion.

Floodflow alterations – Some wetlands, especially those in riparian zones and floodplains, intercept storm runoff and store storm waters, thereby moderating the sharp runoff peaks and high volumes that can cause downstream flooding.

Retention of sediments – Vegetation and litter layers in wetlands aid in the removal and retention of eroded soil and particulates that wash toward streams, rivers, and lakes from adjacent upland areas and tributary streams. This function is particularly important to preserve in those areas in which surrounding land uses, such as agricultural operations and land development, could result in increased erosion and runoff.

Retention and transformation of contaminants and nutrients – Contaminants and nutrients in dissolved and particulate forms can be carried into wetlands in storm runoff and groundwater. Potential contaminants include fertilizers and pesticides, excess nutrients and pathogenic bacteria from animal waste and septic system leachate, as well as heavy metals, oil and grease from impervious surfaces Through various chemical, biological, and physical means in wetland soils, these contaminants and nutrients can be sequestered, transformed into less toxic forms, and assimilated by plants.

Nutrient cycling – Nutrients are contributed to the wetland ecosystem internally in leaf litter, plant debris, and animal waste and remains. These nutrients are cycled internally and are both taken up by plants in the wetland and exported out of the wetland area. Nutrient export supports downstream aquatic and riparian communities.

3.7.1 Alternative 1 - Cumberland-Montgomery Study Area

3.7.1.1 Corridor A

Two sections of Corridor A overlap sections of Corridors B, C, and D. In this overlapping ABCD corridor in the Cumberland Fossil Plant vicinity, the NWI indicates relatively small (<10 acres) forested wetlands along Wells Creek, Booster Branch, and tributary streams. A

larger area of forested and scrub-shrub wetlands occurs where these streams converge and enter Lake Barkley and at the Wells Creek embayment. In the overlapping ABCD section in the vicinity of the Montgomery Substation, there are large (10 to 20+ acres) forested, scrub-shrub, and emergent wetlands indicated north and east of the substation, and several smaller wetland areas scattered between the substation and I-24.

A section of Corridor A that lies a short distance east of Cumberland Fossil Plant overlaps sections of corridors B and C. In this overlapping ABC section, the NWI data indicates wetlands in association with the Yellow Creek and Guices Creek embayments. Wetlands are also indicated in the riparian zones of Lickskillet Branch, Moccasin Branch, and Yellow Creek, and their tributaries.

Much of the eastern half of Corridor A overlaps Corridor B. In this overlapping AB section, the NWI data indicates wetlands in the Cumberland River floodplain, a large forested wetland in the Big McAdoo Creek floodplain, and narrow riparian zone wetlands along Passenger Creek and other small tributaries. The wetlands in the Cumberland River floodplain are part of the Shelton Ferry Wetland and Marks Slough, both of which are described below in Section 3.9. More detailed survey information about some of the wetlands within the overlapping corridor sections is presented below in Sections 3.7.1.2 and 3.7.1.4.

In the section of Corridor A that is not shared by any of the other corridors, the NWI data indicates forested wetlands are present in the riparian zones and floodplains of numerous second-order and third-order streams and their tributaries. These include Baggett Branch, Bryant Branch, Sullivan Branch, Indian Creek, Louise Creek, and Sulphur Spring Branch.

The limited ground-truthing of NWI data in Corridor A confirmed the presence of small areas of scrub-shrub and emergent wetland associated with Wells Creek in the overlapping ABCD corridor near Cumberland Fossil Plant. Emergent wetlands dominated by water-willow (*Justicia americana*) were observed on gravel shoals in Yellow Creek and a scrub-shrub wetland in and adjacent to Yellow Creek was observed at Ellis Mill Road. Both of these areas are within the overlapping ABC corridor.

3.7.1.2 Corridor B

Corridor B overlaps with Corridors A, C, and D in the vicinity of the Cumberland Fossil Plant and the Montgomery Substation. A separate section of Corridor B also overlaps Corridor A. The wetlands in these shared areas are described in Section 3.7.1.1.

In the section of Corridor B that overlaps with Corridor C, the NWI data indicates relatively small areas of riparian forested wetlands associated with Burney Creek and three unnamed streams. Very few wetland areas are shown on NWI maps of the unique portion of Corridor B. The NWI shows forested wetlands in the riparian zone of Antioch and Hurricane Creeks and their tributaries.

Corridor B Route - Field surveys were conducted of the proposed Corridor B transmission line route, its alternative alignments, and associated areas. Sixteen wetlands were identified in the proposed Corridor B ROW and associated areas; some of these wetlands are crossed more than once by the ROW (Table 3-17). None of these wetlands are in or adjacent to the Cumberland River Central, Industrial Park East, Industrial Park Central, and Industrial Park West Alternate routes, or in or adjacent to the construction assembly areas.

The approximate total wetland acreages, excluding access roads, are 23.2 acres in the Corridor B route with the Cumberland River South alternative alignment and 21.6 acres in the route with the Cumberland River North alternative alignment. Both of these totals include 20.6 acres that are in the main Corridor B route alignment.

The main Corridor B route alignment would cross wetlands ten times. Of the ten crossings, two (BW2 and BW3) are part of the same wetland located in and adjacent to the Wells Creek embayment. There are three wetland area crossings in the Cumberland River North alignment and four wetland crossings in the Cumberland River South alignment, representing a total of six different wetlands. Of the seven crossings in these alternative alignments, two (BCNW3 and BCSW4) cross a single, small, wetland in the eastern floodplain of the Cumberland River within the Marks Slough site (see Section 3.9.1.2). Wetland BCSW3 is also partially within the Marks Slough site. The SSAR2 access road on the southwest side of Cumberland Fossil Plant is flanked on both sides by a grazed wetland (SSAR2W1 and SSAR2W2) that is part of the BW2 and BW3 Wells Creek embayment wetland. This existing road may be under water during high water events, but is at a slightly higher elevation most likely due to the placement of fill material. It is nonvegetated and therefore not part of the vegetated wetland.

Of the sixteen wetland crossings, five are palustrine forested wetlands (PFO1), three are palustrine emergent wetlands (PEM1; i.e., marshes, wet meadows), three are PFO1 wetlands combined with palustrine scrub-shrub (PSS1) and other wetland types, and five are complexes of PSS1, PEM1, palustrine unconsolidated bottom (PUB), and palustrine unconsolidated shore wetlands (PUS; mudflats). The areas of these various types within the proposed ROW are, respectively, 5.8, 1.1, 8.6, and 8.7 acres. Of the 8.6 acres of PFO1 wetlands combined with other types, about 3.9 acres are forested.

All wetlandswithin the proposed ROW were assigned TVARAM scores (Table 3-17). Of the total of approximately 24.2 acres of wetlands within the proposed ROW, including alternative alignments, 0.2 acres are Category 1 wetlands, 12.9 acres are Category 2 wetlands, and 11.1 acres are Category 3 wetlands (Table 3-18). Forested wetlands comprise 2.7 and 7.0 acres of the Category 2 and Category 3 wetlands, respectively. All of the Category 3 forested wetlands (7.0 acres) and 0.4 acres of the Category 2 wetlands are in the main Corridor B alignment. The Cumberland River North alignment and Cumberland River South alignment contain 0.3 and 2.0 acres of Category 2 forested wetlands, respectively. The remaining alternative alignments do not cross any wetlands.

Table 3-17. Wetlands in the proposed Cumberland Montgomery Corridor B transmission line right-of-way and access roads.

Wetland ID	Location[a]	Wetland Type[b]	Wetland acreage in ROW[c]	Estimated total wetland acreage[c]	TVARAM[d]	
					Score	Category
BW1	B	PFO1A	2.4	275	76	3
BW2[e]	B	PEM1A/PSS1E/ PUSFh/PUBHh	8.0	275	54.5	2
BW3[e]	B	PEM1A/PSS1E/ PUSFh/PUBHh	See BW2	275	54.5	2
BW4	B	PFO1C	0.8	3.4	77	3
BW5	B	PFO1E	0.3	72.0	46.5	2
BW6	B	PFO1E/PSS1F/ PEM1F/PUSF/ PUBH	3.2 (PFO1) 1.6 (PSS/EM/US/UB)		82	3
BW7	B	PEM1F/PSS1E	0.5	4.6	54.5	2
BW8	B	PSS1F/PFO1E	0.6 (PFO1) 2.5 (PSS1)	33.0	76.5	3
BW9	B	PSS1F/PUBHh	0.05	0.05	46	1
BW10	B	PFO1A/PEM1F/ PUBHh	0.1 (PFO1) 0.6 (PEM1/PUB)	0.7	51.5	2
BCNW1	CRN	PFO1B	0.3	0.3	40	2
BCNW2	CRN	PEM1E	0.2	0.2	44	2
BCNW3[f]	CRN	PEM1A	0.5	1.1	30[e]	2
BCSW1	CRS	PEM1F/PUBHh	0.1	0.1	21.5	1
BCSW3	CRS	PFO1C	2.0	11.5	37	2
BCSW4[f]	CRS	PEM1A	0.4	1.1	30	2
SSAR2W1[e]	Access Road 2	PFO1F/PSS1E/ PEM1E	0	275	60[d]	2
SSAR2W2[e]	Access Road 2	PSS1E/PEM1B	0	275	60[d]	2

[a] B – Main Corridor B route; CRN – Cumberland River North alternative alignment; CRS – Cumberland River South alternative alignment
[b] From Cowardin et al. (1979): PFO1 = Palustrine forested; PEM1 = Palustrine emergent; PSS1 = Palustrine scrub-shrub; PUSF = Palustrine unconsolidated shore; PUBH – Palustrine unconsolidated bottom.
[c] From TVA civil survey.
[d] TVA Rapid Assessment Method (modified Ohio Rapid Assessment Methodology)
[e] BW2, BW3, SSAR2W1 and SSAR2W2 are in the same wetland system and were assessed as single wetland unit.
[f] BCNW3 and BCSW4 are two crossings of the same wetland and were assessed as a single wetland unit.

Table 3-18. Total acreage of wetlands by wetland class and TVARAM Category in Corridor B alignments.

	TVA Rapid Assessment Method Category		
Wetland Class	1	2	3
PFO1	0	2.7	7.0
PSS1, PEM1, PUS, and PUB (combined acreages)	0.2	10.2	4.1
Total (all classes)	0.2	12.9	11.1

3.7.1.3 Corridor C

Corridor C overlaps Corridors A, B, and D in the vicinity of the Cumberland Fossil Plant and the Montgomery Substation. It also overlaps a portion of Corridor B between the fossil plant and Budds Creek, west of Cunningham. The wetlands in these overlapping areas are described in Section 3.7.1.1 and 3.7.1.2.

Corridor C overlaps Corridor D north of Clarksville. In this area the NWI data indicates a forested wetland along a tributary to the Red River, and two separate forested wetlands of less than 10 acres each in the Red River floodplain. No wetlands were identified during ground surveys of the Corridor D route in the overlapping CD section. This suggests a lower probability of encountering wetlands in this section of Corridor C.

In the stand-alone section of Corridor C, the NWI data indicates 5 acre to 20+ acre wetlands in the floodplains of the Cumberland River and its tributaries, and in the floodplain of a Red River tributary. Field surveys of these wetlands were not conducted.

3.7.1.4 Corridor D

Corridor D overlaps Corridors A, B, and C in the vicinity of the Cumberland Fossil Plant and the Montgomery Substation, and overlaps Corridor C north of Clarksville. The wetland locations in these overlapping areas, as shown on NWI maps, are briefly described in Sections 3.7.1.1 and 3.7.1.3.

In Corridor D, the NWI data indicates wetlands in the riparian zones of Spring Creek and tributaries, Big and Little McAdoo Creeks, Fletchers Fork, Baxter Branch, Blooming Grove Creek, Bartee Branch, Dry Branch, and the Cumberland River. Two forested wetlands (<5 acres each) are indicated in the Bartee Branch floodplain. In addition, large (>20 acres) forested wetland areas are indicated in the Spring Creek and Cumberland River floodplains.

Corridor D Route - Field surveys were conducted of the proposed Corridor D transmission line route, its alternative alignments, and associated areas. Fourteen wetlands were identified in the proposed Corridor D ROW; some of these wetlands are crossed more than once by the ROW (Table 3-19). No wetlands are in or adjacent to the proposed access roads and construction assembly areas. The approximate total wetland acreage in the main Corridor D alignment is 4.3 acres, in four wetland crossings. The Woodlawn West

alternative alignment would cross an additional 1.3 acres in three crossings, and the Woodlawn East alternative alignment would cross an additional totaling 3.7 acres in eight crossings. The Fossil Plant East alignment would have three wetland crossings, totaling approximately 3.0 acres.

Table 3-19. Wetlands in the proposed Corridor D Cumberland Montgomery 500-kV transmission line right-of-way.

Wetland ID	Location[a]	Wetland Type[b]	Wetland acreage in ROW[c]	Estimated total wetland acreage[c]	TVARAM[d]	
					Score	Category
DW1	D	PEM1F / PUBHh	0.3	8.6	73	3
DW2	D	PFO1E	1.0	2.9	60	3
DW3	D	PFO1A/PFO1C	1.5	4.3	56.5	2
DW4	D	PFO1A	1.5	41.0	77	3
DWW1	WW	PEM1	0.1	0.1	22.5	1
DWW2	WW	PFO1	1.1	Unknown	53.5	2
DWW3	WW	PEM1A / PUBHh	0.05	0.05	30.5	1
DWE1	WE	PFO1A	0.1	0.25	52	2
DWE2[e]	WE	PSS1E	0.02	2.0	39.5	2
DWE3[e]	WE	PEM1A	0.7	2.0	39.5	2
DWE4[e]	WE	PFO1E	0.2	2.0	39.5	2
DWE5	WE	PFO1E	0.1	0.1	47	2
DWE6	WE	PFO1A / PEM1A	0.05 (PFO1) 0.2 (PEM1)	0.5	1	1
DWE7[f]	WE	PEM1E	1.6	275	54.5[f]	2
DWE8[f]	WE	PFO1E	0.8	275	54.5[f]	2
DNSW1[g]	FPE	PEM1H	0.03	32.0	66.5[g]	3
DNSW2[g]	FPE	PSS1E / PEM1F / PUSFh/PUBHh	1.0	32.0	66.5[g]	3
DNSW3	FPE	PEM1E	2.0	11.5	39	2

[a] D – Main Corridor D; WW – Woodlawn West alternative alignment; WE – Woodlawn East alternative alignment; FPE – Fossil Plant East alternative alignment.
[b] from Cowardin et al. (1979): PFO1 = Palustrine forested; PEM1 = Palustrine emergent; PSS1 = Palustrine scrub-shrub; PUSF = Palustrine unconsolidated shore; PUBH – Palustrine unconsolidated bottom.
[c] From TVA civil survey.
[d] TVA Rapid Assessment Method (modified Ohio Rapid Assessment Methodology).
[e] DWE2, DWE3, and DWE4 are in close proximity, are three crossings of the same wetland system and were assessed as single wetland unit.
[f] DWE7 and DWE8 are two crossings of the same wetland system and were assessed as a single wetland unit.
[g] DNSW1 and DNSW2 are two crossings of the same wetland and were assessed as a single wetland unit.

Of the eight wetland crossings in the Woodlawn East alternative alignment, three (DWE2, DWE3, DWE4) are connected offsite and are part of a single wetland. Similarly, wetland

crossings DWE7 and DWE8 on the Woodlawn West alternative alignment are connected offsite and are part of an extensive wetland area dominated by forested wetlands. In addition, wetland crossings DNSW1 and DNSW2 on the Fossil Plant East alternative alignment are part of a single wetland system associated with a large pond.

Of the eighteen wetland crossings associated with the Corridor D route, eight are forested (PFO1), totaling 6.3 acres. The one scrub-shrub (PSS1) wetland is 0.02 acres. Five wetlands are emergent (PEM1), totaling 4.4 acres. The one forested/emergent complex (PFO1/PEM1) is 0.25 acres. Three wetlands are scrub-shrub/emergent/unconsolidated bottom and mudflat (PSS1/PEM1/PUB/PUS) complexes totaling 1.4 acres.

All wetlands within the proposed ROW were assigned TVARAM scores (Table 3-19). Of the total of approximately 12.3 acres of wetlands within the proposed ROW, including alternative alignments, 0.4 acres are Category 1 wetlands, 8.1 acres are Category 2 wetlands, and 3.8 acres are Category 3 wetlands (Table 3-20). Forested wetlands comprise 3.8 and 2.5 acres of the Category 2 and Category 3 wetlands, respectively. All of the Category 3 forested wetlands and once Category 2 forested wetland (1.5 acres) are in the main Corridor B alignment. The Woodlawn West alignment crosses one Category 2 forested wetland (1.1 acres). The Woodlawn East alignment crosses four Category 2 forested wetlands (1.2 acres). The Fossil Plant East alignment does not cross forested wetlands and the other alternative alignments do not cross any wetlands.

Table 3-20. Total acreage of wetlands by wetland class and TVARAM Category in Corridor D alignments.

	TVA Rapid Assessment Method Category		
Wetland Class	1	2	3
PFO1	0.05	3.8	2.5
PSS1, PEM1, PUS, and PUB (combined acreages)	0.35	4.3	1.3
Total (all classes)	0.40	8.1	3.8

3.7.2 Alternative 2 - Cumberland-Davidson Study Area

3.7.2.1 Corridor A

Corridor A overlaps Corridor B in the vicinity of the Cumberland Fossil Plant and with the Davidson Substation at their west and east ends, respectively. In the Cumberland Fossil Plant vicinity, the NWI data indicates small and large areas of wetlands in the riparian zone of Wells Creek and its tributaries, and wetlands in the riparian zones of Guices Creek and its tributaries. The NWI data does not indicate any wetlands in the overlapping A-B corridor in the Davidson Substation vicinity.

In Corridor A, the NWI data indicates many small and large (1 to 20 acres) wetlands and wetland complexes in the riparian zones and floodplains of Yellow Creek, Bartons Creek, Jones Creek, Brush Creek, Turnbull Creek, and the Harpeth River. Although some of these wetlands are relatively large, they do not fill the entire floodplain area, but instead are

scattered across the floodplain or concentrated in certain areas. A portion of the Brush Creek floodplain was observed from the South Harpeth Road bridge. This area appears to be forested wetland, as indicated in the NWI data. This area is dominated by green ash, box elder, sycamore, American elm, stinging nettle, *Microstegium*, and river oats. Hydrologic indicators (drift and wrack lines; drainage patterns) were also visible.

3.7.2.2 Corridor B

The description of wetland locations for the overlapping portions of Corridors A and B are described in Section 3.7.2.1.

In Corridor B, the NWI data indicates wetlands in the riparian zones of the Harpeth River and tributaries of the Harpeth River, Barton Creek, Little Barton Creek, and headwater tributaries. Larger (1 to 20+ acres) wetlands are indicated in the floodplains of the Harpeth River, South Harpeth River, Johnson Creek, Bartons Creek, Little Barton Creek, Sullivan Branch, and Yellow Creek. Similar to the wetlands in Corridor A, the wetlands do not fill the entire floodplain areas, but instead are scattered across the floodplains or concentrated in certain areas.

3.8 Floodplains

The proposed transmission line corridors for Alternative 1 would cross several identified floodplain areas and numerous minor floodplains in Stewart, Montgomery, Houston and Dickson counties in Tennessee. The proposed transmission line corridors for Alternative 2 would cross several identified floodplain areas and numerous minor floodplains in Stewart, Houston, Dickson, Cheatham, and Davidson counties in Tennessee. The Cumberland Fossil Plant switchyard, the Montgomery 500-kV Substation, and the Davidson 500-kV Substation are located outside the limits of the 100-year floodplain.

3.9 Managed Areas

The project area contains several areas owned and managed by various agencies for the conservation and/or preservation of natural resources. It also contains several sites identified by various entities as containing ecologically significant resources. These managed areas and ecologically significant sites are typically recognized and/or managed because of their importance in the conservation of endangered and threatened species and important habitats, for providing recreation opportunities, for natural resource production, and for their scientific, educational, cultural, and visual/aesthetic resources. The management objectives of these areas typically address several of these resources.

3.9.1 Alternative 1 - Cumberland-Montgomery Study Area

All four Alternative 1 corridors cross the Lake Barkley Reservation at Cumberland Fossil Plant. Lake Barkley extends 118.1 miles along the Cumberland River from Barkley Dam upstream to Cheatham Dam. The multiple-purpose project, operated by the USACE, provides navigation benefits, flood control, and power generation. The reservoir is located in an area of gentle to moderately rolling hills with picturesque bluffs and offers numerous recreational opportunities. Lake Barkley is renowned for its fishing and duck hunting. Visitors also enjoy camping and hiking along the lakeshore and through the bordering forest. The many species of wildlife present make bird watching and nature photography popular activities.

The western end of all four Alternative 1 corridors is within the Wells Creek Cryptoexplosive Structure Potential National Natural Landmark (PNNL), a geologic feature consisting of a circular series of fault blocks about 8.5 miles in diameter, the largest such structure in the United States. It may have been formed by meteorite impact, but such structures are referred to as cryptoexplosive because their origins are uncertain. The National Natural Landmark (NNL) program was established in the 1970s by the National Park Service to identify nationally significant examples of ecologically pristine or near pristine landscapes or other unique natural features. This tract, while meeting the criteria for listing, has not to date been registered as a NNL.

The western end of the four Alternative 1 corridors includes a portion of Cross Creeks National Wildlife Refuge (NWR). This refuge stretches along the Cumberland River downstream from Cumberland Fossil Plant. Its open water, marshes, croplands and deciduous woodlands support a diverse and abundant wildlife population. The USFWS manages the area for a full spectrum of wildlife, including rare species and upwards of 75,000 ducks and 15,000 Canada geese. Other USFWS objectives include providing wildlife interpretation and environmental education, using the refuge as an outdoor classroom and a demonstration area for habitat management, and providing wildlife-oriented recreation such as sport fishing, hiking, and photography. Cross Creeks NWR has been recognized as a State Wildlife Observation Area by the Tennessee Wildlife Resources Agency (TWRA).

3.9.1.1 Corridor A

Corridor A contains five managed areas and/or ecologically significant sites and two streams listed on the Nationwide Rivers Inventory (NRI). Three of these areas, Lake Barkley Reservation, Wells Creek Cryptoexplosive Structure PNNL, and Cross Creeks NWR, are described above. The others are described below.

- Shelton Ferry Wetland is a high quality state-managed wetlands complex consisting of four disjunct tracts along the western bank of the Cumberland River. These tracts were purchased by the State of Tennessee using the Wetlands Acquisition Fund, administered by TWRA, and managed for conservation purposes.

- The eastern floodplains on this stretch of the Cumberland River contain Marks Slough, once a system of wetlands that extended for nearly three miles along the river's right descending bank. This site once provided habitat for several state-listed species. Most of the area has been drained for agricultural use and two small wetland areas remain.

- Portions of the Red River and Yellow Creek are both listed on the NRI. The Red River (river mile (RM) 9 to RM 50) is a pastoral stream featuring numerous sinkholes and caves. The shoreline is characterized by heavily wooded bluffs with limestone outcroppings. Yellow Creek (RM 5 to RM 13) is a scenic stream that supports a recreational fishery.

3.9.1.2 Corridor B

Corridor B contains six managed areas and/or ecologically significant sites and two streams listed on the NRI. Three of these—Lake Barkley Reservation, Wells Creek Cryptoexplosive Structure PNNL, and Cross Creeks NWR—are described above in Section 3.9.1. Four

others, Sheltons Ferry Wetland, Marks Slough, and the NRI streams, are described above in Section 3.9.1.1.

Corridor B Route - At Cumberland Fossil Plant, the proposed Corridor B transmission line route would be adjacent to, but would not cross, Lake Barkley Reservation. The route, however, would cross the main stem of Lake Barkley farther to the east. At Cumberland Fossil Plant, the route would be approximately 0.5 mile from the boundary of Cross Creeks NWR. As the Corridor B route leaves the plant, it would cross the Wells Creek PNNL.

About two miles east of Cumberland Fossil Plant, the Corridor B route would cross Barkley Wildlife Management Area (WMA), Unit 2 - Guices Creek. This area is managed by TWRA for public hunting of waterfowl and small game. A few miles farther to the east, the proposed route crosses Yellow Creek about 0.9 miles downstream from the segment listed on the NRI.

Farther east, the Corridor B route would pass about 1.5 miles north of the northernmost tract of Shelton Ferry Wetland. After crossing the Cumberland River, it crosses the Marks Slough site. The Cumberland River North alternative alignment crosses one emergent wetland (wetland BCNW3, see Table 3-17) in this area. The Cumberland River South alignment would crosses one wetland within the site boundary (wetland BCSW4, the same wetland as BCNW3; see Table 3-19) and one forested wetland partially within the site boundary (wetland BCSW3, see Table 3-19). Near its eastern end, the Corridor B route would cross the NRI-listed Red River.

3.9.1.3 Corridor C

Corridor C contains seven managed areas and/or ecologically significant sites and one streams listed on the NRI. These include the Lake Barkley Reservation, Cross Creeks NWR, the Wells Creek Cryptoexplosive Structure (PNNL), and Barkley WMA, all of which are described above. The other areas are described below.

- The Long Pond Slough Protection Planning Site is a natural swamp fed by underground springs on an alluvial terrace of the Cumberland River. An area of open water is surrounded by swamp forest dominated by black willow and silver maple, which is in turn surrounded by mixed bottomland hardwood forest. The site represents one of the very few remaining lowland swamps on the northwest Highland Rim. The lower portion of the 24-acre site was purchased by TWRA in 1993 for use as a Wildlife Management Area. Protection Planning Sites are compiled by the Tennessee Protection Planning Committee, a cooperative effort of federal, state and private land managers and individuals knowledgeable about the biota of the state. This site has also been recognized as a PNNL but has not to date been registered as an NNL.

- Wooten's Bluff is a low limestone bluff along the Cumberland River which separates wooded uplands from an agricultural bottomland. Immediately adjacent to the bottom of the bluff is a wetland slough. Populations of the state-listed blue scorpion-weed occur on the area. This tract is privately owned.

- Originally a demonstration farm, the Austin Peay State University Environmental Education Center is about half in natural cover and forest and attracts a diverse array of wildlife. The remainder of the 476-acre area is farmed. Along the area's western boundary with the West Fork of the Red River is a cave inhabited by the state-listed

southern cavefish. Several other significant species have been reported from the farm, including the Bachman's sparrow and blue scorpion-weed. This area has been recognized by the Tennessee Protection Planning Committee as a Protection Planning Site.

- The West Fork of the Red River from its mouth to RM 14 is listed on the NRI. This stretch of river is noted for its high recreational and aesthetic potential.

3.9.1.4 Corridor D

Corridor D contains seven managed areas and/or ecologically significant sites and one stream listed on the NRI. These include Lake Barkley Reservation, Cross Creeks NWR, and the Wells Creek Cryptoexplosive Structure PNNL, which are described above in Section 3.9.1, and the West Fork of the Red River, described in Section 3.9.1.3. The other areas in Corridor D are the Coleman Cave and Bellamy Cave Protection Planning Sites, Barnett Woods Preserve, and Fort Campbell Military Reservation.

Corridor D Route - The proposed Corridor D transmission line route would cross the Lake Barkley Reservation at Cumberland Fossil Plant. At this point, the proposed line would be approximately 0.6 miles east of the boundary of Cross Creeks NWR. Farther to the east, the Corridor D route passes about 0.5 miles east of the Coleman Cave Protection Planning Site. Coleman Cave has been intermittently used by the endangered Indiana and gray bats over the last 25 years. The edge of the proposed ROW is also about 200 feet from the Bellamy Cave Protection Planning Site. Bellamy Cave has been a winter roosting site for the Indiana bat and a maternity site for the gray bat. The eastern small-footed bat and the southern cavefish, both state-listed, have also been recorded in Bellamy Cave.

Barnett Woods Preserve is 0.6 miles west of proposed Route D. The 40-acre preserve is comprised of stream bank forests, caves, springs, bluffs, and a few successional fields. The area provides habitat for at least 16 species of ferns and several state-listed plants. Most notable is the presence of the threatened Price's potato bean. The endangered Indiana bat has used caves in the area as a stop-over point. The area is owned by The Nature Conservancy (TNC) and managed in cooperation with the Tennessee Department of Environment and Conservation (TDEC). TDEC has classified the area as a Class II Designated State Natural Area because of its natural and scientific values.

Corridor D includes a portion of Fort Campbell Military Reservation, a 105,068-acre military installation located on the Tennessee-Kentucky border. Over 800 species of flora and fauna have been recorded on the reservation through various inventories undertaken in support of the Legacy Resource Management Program. Several unusual ecosystems also occur here, most notably remnant tall grass prairies or barrens. Fort Campbell has the largest contiguous barrens system known within the states of Tennessee and Kentucky. The Environmental Division of Fort Campbell is responsible for programs on the reservation which help protect the diverse resources found there. The entire reservation is considered part of the Fort Campbell WMA, also managed within the Environmental Division. Hunting for deer, turkey, quail and other big and small game occurs on parts of the area.

An alternative alignment of the Corridor D route would cross two small portions of the southeastern corner of the Fort Campbell reservation adjacent to Fletcher Fork and a short distance northwest of the community of Ringgold. About 3,600 feet of the northern Route D alignment under consideration in this area would cross be on the reservation and about

2,800 feet of the southern Route D alignment would be on the reservation. These areas of the reservation are forested.

The Corridor D route would cross the West Fork of the Red River north of Clarksville at RM 8; as described above, this portion of the river is listed on the NRI.

3.9.2 Alternative 2 - Cumberland-Davidson Study Area

3.9.2.1 Corridor A

Corridor A contains eight managed areas and/or ecologically significant sites and three streams listed on the NRI. These include Cross Creeks NWR, the Wells Creek Cryptoexplosive Structure PNNL, and Yellow Creek, all of which are all described above in Section 3.9.1.1. The remaining features are described below.

- The Cheatham Lake Reservation is a USACE project covering 67.5 miles on the Cumberland River. The reservoir is used for flood control, navigation, and power production, and provides recreational opportunities. The Cheatham Lake WMA lies on 5,152-acres of the reservation. TWRA manages this area for waterfowl and small game hunting.

- The Cheatham WMA is a 20,810-acre upland area owned and managed by the TWRA for small and big game, as well as non-game resources.

- Hidden Lakes is a day park managed as a satellite of Montgomery Bell State Resort Park. The property has been used as a pre-Civil War rock quarry and a resort club and is an important archaeological site. In 1995, the tract was purchased by the state of Tennessee and transferred to TDEC to serve as scenic buffer for the Harpeth River. The site is dominated by successional vegetation. Fescue fields, stands of red cedar, mulberry and honey locust, and large oaks and hackberries characterize the vegetation.

- The Harpeth River within Corridor A has been designated a State Scenic River and rated a Class III Developed River by TDEC. The State Division of Natural Heritage actively attempts to prevent further loss of the river's scenic values, to improve the scenic aspects of its surroundings, and to restore the quality of its waters through zoning, tax incentives, acquisition of conservation easements and other similar means.

- There are two streams in addition to Yellow Creek within Corridor A that are listed on the NRI. The Harpeth River (RM 6 to RM 121) is rich in cultural history and is of archaeological significance. Evidence of aboriginal towns, carved bluffs and petroglyphs line its shores. Jones Creek (RM 0 to RM 16) is a narrow stream with frequent gravel bars. It winds through a scenic valley, at places bordered by high limestone bluffs.

3.9.2.2 Corridor B

Corridor B contains six Managed Areas and/or Ecologically Significant Sites and four streams listed on the NRI. These features include the Lake Barkley Reservation, Cross Creeks NWR, and the Wells Creek Cryptoexplosive Structure PNNL, which are described above in Section 3.9.1.1. Portions of the Harpeth River and Jones Creek, described in Section 3.9.2.1, are also within Corridor B. The additional features are described below.

- Hava-Lakatu is the family name given a privately-owned tract centered on a series of man-made lakes on a branch of Jones Creek. The 730-acre tract of rolling countryside represents typical Western Highland Rim dissected hill country. Over one-half of the property is forested with white oak frequently being dominant. This site is primarily noteworthy because it is a large undivided parcel of land with relatively pristine natural features including a diverse assemblage of native species.

- Svenson's Bluff Protection Planning Site is a remote and rugged bluff above Turnbull Creek in Cheatham County. The bluff contains one of only two Middle Tennessee populations of white pine. The bluff face is permeated with seeps and the crest supports a scattered mesic forest of beech, eastern red-cedar, mountain laurel, tulip poplar, white pine and oaks. The 17-acre site has been monitored recently by the State Division of Natural Heritage. The principal portion of the tract is currently under a Conservation Easement between the private owner and the Tennessee Conservation League.

- Two streams within Corridor B besides the Harpeth River and Jones Creek have been listed on the NRI. Big Turnbull Creek (RM 0 to RM 16) is a small, clear stream with forested banks and numerous bluffs, featuring a 40-foot waterfall. The South Harpeth River (RM 0 to RM 25) is marked by high bluffs with extensive adjacent forested areas.

3.10 Recreation

3.10.1 Alternative 1 - Cumberland-Montgomery Study Area

This study area includes three wildlife management areas (WMAs), Barkley WMA, Fort Campbell WMA and Haynes Bottom WMA. A portion of Cross Creeks NWR is also located within the project area. Activities in these areas include hunting, fishing, informal camping, horseback riding and wildlife observation. Dunbar Cave State Natural Area lies within the study area but outside of any of the potential corridors.

Other than the wildlife management areas and the Cross Creeks refuge, predominant recreation activities in and around the proposed corridors are primarily unorganized activities on private land and include hunting, fishing, wildlife observation, horseback riding and off-road vehicle use. Most developed recreation facilities are located in municipal areas in association with municipal parks or schools. Guices Creek Recreation Area is located near the proposed Corridor B route and River Bend Recreation Area is located near the Corridor D route. Both of these areas are on Lake Barkley and owned by the USACE.

Also located within the Alternative 1 study area are Lake Barkley, Red River and numerous smaller tributaries. Portions of the Red River and its tributaries are listed on the National River Inventory and have significant recreational and scenic qualities. These areas are favorite recreation spots for boating, fishing, wildlife observation, hunting and other water-related activities.

3.10.2 Alternative 2 - Cumberland-Davidson Study Area

Adjacent to or within the proposed study area are three WMAs. These include Barkley WMA, Cheatham WMA, and Cheatham Lake WMA. Stewart State Forest is also located within the study area. Activities in these areas include hunting, fishing, informal camping, horseback riding and wildlife observation.

Other than the wildlife management areas and Cheatham State Forest, predominant recreation activities in and around the proposed corridors are primarily unorganized activities on private land and include hunting, fishing, wildlife observation, horseback riding and off-road vehicle use. Developed recreation facilities are located in municipal areas in association with municipal parks or schools.

Also located in this alternative study area are Harpeth River, South Harpeth River and numerous smaller tributaries. Portions of the Harpeth River are designated a State Scenic River and used for boating, fishing, wildlife observation, hunting and other water-related activities. Canoeing is very popular on the Harpeth, with 300 or more canoes per day floating some stretches on summer weekends. Commercial canoe liveries operate in the area.

3.11 Land Use and Prime Farmland

3.11.1 Alternative 1 - Cumberland-Montgomery Study Area

The primary land uses in the Cumberland-Montgomery study area are agriculture and forest management. The proportion of land devoted to these uses varies across the four corridors, with agricultural lands making up 40 to 48% of the land area and forests (including forested wetlands) making up 46 to 49% of the land area (Table 3-5). Most of the other land in the four corridors is developed; the proportion of developed land ranges from 3% in Corridor B to 10% in Corridor A.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, livestock, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and/or labor. Prime farmland does not include land that is already in or committed to urban development (through, for example, zoning) or to water storage. The Farmland Protection Policy Act of 1981 directs federal agencies to evaluate land use prior to permanently converting an area to a non-agricultural land use. The Act and its implementing regulations require agencies considering such a conversion to complete Form AD 1006, “Farmland Conversion Impact Rating” for areas larger than a 10-acre threshold.

Due in part to previous modifications, no prime farmland occurs on the site of the proposed activities at Cumberland Fossil Plant or the Montgomery 500-kV Substation. Additional information on prime farmland along the proposed Corridor B and Corridor D transmission line routes is presented below.

3.11.1.1 Corridor B

Table 3-21 lists the soils within the proposed Corridor B and Corridor D transmission line ROWs which are classified as prime farmland. Most of these prime farmland soils occur in bottomlands and terraces along rivers and streams, and on flat to gently sloping upland areas near Clarksville. Table 3-22 gives the acreage of prime farmland present within the proposed 175-foot ROW of the Corridor B main alignment and its alternative alignments.

Table 3-21. Soils within the proposed Cumberland-Montgomery Corridor B and Corridor D transmission line ROWs classified as prime farmland.

County	Soil Symbol	Description
Montgomery	Ar	Arrington silt loam
Montgomery	Bm	Beason silt loam
Montgomery	BnB	Bedford silt loam, 2 to 5 percent slopes
Montgomery	BrB	Brandon silt loam, 2 to 5 percent slopes
Montgomery	Ca	Cannon cherty silt loam
Montgomery	CrB	Crider silt loam, 2 to 8 percent slopes
Montgomery	DsB	Dickson silt loam, 1 to 4 percent slopes
Montgomery	Eg	Egam silt loam
Montgomery	Fo	Forestdale silt loam
Montgomery	HuB	Humphreys cherty silt loam, 3 to 10 percent slopes
Montgomery	LaB	Lax silt loam, 1 to 4 percent slopes
Montgomery	Ld	Lindside silt loam
Montgomery	Lo	Lobelville cherty silt loam
Montgomery	MoB	Mountview silt loam, 2 to 5 percent slopes
Montgomery	Ne	Newark silt loam
Montgomery	PeB	Pembroke silt loam, 2 to 5 percent slopes
Montgomery	PkB	Pickwick silt loam, 2 to 5 percent slopes
Montgomery	StB	Statler silt loam, 2 to 5 percent slopes
Montgomery	Ta	Taft silt loam
Stewart	Aa	Nolin silt loam, occasionally flooded
Stewart	Ea	Egam silty clay loam, occasionally flooded
Stewart	Ga	Humphreys gravelly silt loam, 2 to 5 percent slopes
Stewart	Gb	Lobelville gravelly silt loam, occasionally flooded
Stewart	Lf	Newark silt loam, occasionally flooded
Stewart	Lg	Lindside silt loam, occasionally flooded
Stewart	Pb	Paden silt loam, 2 to 5 percent slopes, eroded
Stewart	Sd	Staser fine sandy loam, occasionally flooded
Stewart	Wa	Wolftever silt loam, 2 to 5 percent slopes, occasionally flooded

Source: USDA-SCS 1953; USDA-SCS 1975.

3.11.1.2 Corridor D

Soils classified as prime farmland within the proposed Corridor D transmission line ROW are listed in Table 3-21. Table 3-23 gives the acreage of prime farmland present within the proposed 175-foot ROW of the Corridor D main alignment and its alternative alignments.

Table 3-22. Acreage of prime farmland within the proposed ROW of Cumberland-Montgomery Route B.

Route Segment	ROW Length (miles)	Acres of Prime Farmland
Main alignment	29.97	122.2
Cumberland River North	4.75	34.3
Cumberland River South	4.79	27.1
Industrial Park East	4.35	30.8
Industrial Park Central	3.8	34.4
Industrial Park West	4.18	44.8

Table 3-23. Acreage of prime farmland within the proposed ROW of Cumberland-Montgomery Route D.

Route Segment	ROW Length (miles)	Acres of Prime Farmland
Main alignment	14.67	110.6
Fossil Plant West	1.38	6.2
Fossil Plant Central	1.03	6.8
Fossil Plant East	5.31	22.0
Woodlawn East	8.31	61.0
Woodlawn West	7.21	45.8
Fort Campbell North	4.77	40.2
Fort Campbell South	4.46	33.3
Ringgold North	0.69	5.1
Ringgold South	0.59	4.2
Little West Fork North	1.22	6.2
Little West Fork South	1.23	5.9
Spring Creek North	2.63	13.0
Spring Creek South	2.64	27.3

3.11.2 Alternative 2 - Cumberland-Davidson Study Area

The two Cumberland-Davidson study area corridors are similar length, and a transmission ROW in them would require at least 1,060 acres in Corridor A and 1,082 acres in Corridor B. The primary land uses in the two corridors are very similar, with forest management making up 61% and agricultural lands making up 32% of each corridor. About 4% of each corridor is developed land. About 3,015 buildings occur in Corridor A, and the density of buildings is about a third higher in Corridor B with about 4,160 present. The proportion of publicly owned land is somewhat higher in Corridor A due to the presence of Cheatham Wildlife Management Area.

Due in part to previous modifications, no prime farmland occurs on the site of the proposed activities at Cumberland Fossil Plant or the Davidson 500-kV Substation. The proportion of prime farmland in the two study area corridors is similar and lower than the Cumberland-Montgomery study area corridors.

3.12 Visual Resources

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Scenic visibility is a measure of scenic importance based on several essential interrelated considerations which include viewer context and sensitivity, number of viewers, frequency and duration of view, level of detail seen, and seasonal variation. Where and how the landscape is viewed affects the more subjective perceptions of its aesthetic quality and sense of place.

Views of a landscape are described in terms of what is seen at foreground, middleground, and background distances. In the foreground, the area within one half mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between half a mile and four miles from the observer, objects may be distinguishable but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used.

The following paragraphs describe the existing visual environment of the alternative study areas, corridors, and identified transmission line routes.

3.12.1 Alternative 1 - Cumberland-Montgomery Study Area

3.12.1.1 Corridor A

Corridor A begins just west of the Cumberland Fossil Plant near Cumberland City. The corridor extends east across the Cumberland River and turns north to the Montgomery substation. The area along this corridor is mostly rural with sparse traffic along main state routes. Terrain ranges from gently rolling in the lower valleys, generally along major roadways, to steeper terrain in hilly areas in the middleground and foreground beyond these areas.

The visual character within the Cumberland Fossil Plant is predominately industrial. The smokestacks are seen high above the tree line from all directions outside the plant site. Within the plant site, topography is mainly flat with open grasslands and a mixture of shrub and deciduous vegetation seen in the foreground along the perimeter near TN 149. The west side of the plant provides the greatest discordant contrast with the surrounding area due to the number of existing high voltage transmission lines and associated laced-steel structures that enter the switchyard. Scenic integrity is low. Scenic attractiveness is minimal.

Areas farther east of the Cumberland Fossil Plant along this corridor are comprised of open pastureland near major thoroughfares and woodland forest farther away. Traffic is sparse

along major and minor roadways. Residential density is moderate to low among the sprawling countryside.

The corridor turns in a northeastern direction near the Cumberland River a few miles north of Cheatham Dam. The Cumberland River along this reach (vicinity of river mile 141) is a scenic expanse of undisturbed shoreline, offering middleground views of higher ridges to the north and south. Traffic along local minor roads is light. There are few homes in the area. Most of the river and shoreline is viewed by recreational boaters.

As it continues north towards the Montgomery 500-kV Substation, Corridor A passes through a variety of countryside. Characterized by mainly low-lying pastures, the area ranges from open farm land to heavily-populated communities. Closer to the Montgomery Substation near I-24 and US 79, visual congestion is more evident. A large portion of the corridor east of I-24 and north of Rossview Road is occupied by the partially developed Clarksville-Montgomery Corporate Business Park. Traffic is heavy on major roads northeast of Clarksville. Most views from these roads include foreground views of utility lines and streetlights.

3.12.1.2 Corridor B

Corridor B overlaps Corridor A along its western end near the Cumberland Fossil Plant and along much of its length east of the Cumberland River. Both of these areas are described above in Section 3.12.1.1. Terrain along the remaining section of Corridor B varies from low-lying valleys near larger perennial streams to prominent ridges. Commercial and residential development is generally sparse except in the vicinity of TN 13 and the community of Cunningham. Traffic is light to moderate along most main roads.

Corridor B Route – The Corridor B route begins at Cumberland Fossil Plant, described above in Section 3.12.1.1. It crosses ash disposal areas on the west side of the plant and turns south after crossing Wells Creek. The route turns east just south of Graveyard Hill Cemetery and crosses TN 149. This area is characterized by open farmland with several homes within the viewshed of Cumberland Fossil Plant. Traffic is light on TN 149 except during plant shift changes. Scenic attractiveness is common. Scenic integrity is low.

To the east, the proposed route crosses Guices Creek near the upper end of its embayment. Guices Creek is an open expanse of waterway visited by recreation users year-around, particularly by boat. Vegetation in the area is mostly hardwoods with native and non-native understory shrubs. Views from this area include higher ridges to the east and middleground views of the smoke stacks at Cumberland Fossil Plant to the northwest.

To the east of Guices Creek, the proposed line route would traverse dense forest across rolling topography. It would cross Gunson Ridge Road, Old Hwy 13, and Weetze Road before crossing Yellow Creek to the east. This area is heavily wooded with few homes along local roads. At Yellow Creek, the terrain ranges from very steep with panoramic views of adjacent countryside to low bottomland along the creek channel. There are few homes near Yellow Creek and vegetation is dense except along floodplain areas.

East of Yellow Creek, the proposed Corridor B route crosses East Fork and turns northeast towards Burney Creek. This area is mostly rural countryside with a low density of homes. Dense forest opens to agricultural land intermittently and traffic is light along local roads. Scenic attractiveness is common. Scenic integrity is moderate.

Passing over Canaan Road to the east, the proposed route crosses an existing major transmission line ROW. The existing transmission line is seen in the foreground by a few residents in the area, as well as motorists. To the east, the route crosses Budds Creek Road and Budds Creek, a small perennial stream. From this area, residents have middleground views of existing cell towers along ridgelines to the north, and wood pole structures along roadsides in the foreground.

The route would continue across Vernon Creek, a minor tributary to the east and Vernon Creek Road. This area is characterized by rock outcroppings along the roadside and dense forest. There are numerous utility poles in the area and views are limited for motorists due to the horizontal alignment of the roadway. Farther east, at Attaway Road, dense forest opens to pasture land. Topography is slightly rolling nearest the roadside to more severe along adjacent ridgelines. There are several homes in the area with foreground views of the proposed route.

Crossing TN 48 to the east, a major thoroughfare between Clarksville and Dickson, the proposed route would be in the foreground of numerous homes. The new lines and structures would be seen by motorists and from commercial establishments in the area. There are numerous existing utility poles and structures along TN 48, including billboards and directional signage. Scenic attractiveness is minimal. Scenic integrity is low.

Approximately ¾ miles east of TN 48, the proposed route splits into two alternative alignments. The Cumberland River North alignment would continue northeast towards Marthas Chapel Road. The area is mostly open pasture land with long, background views of objects farther than four miles away due to terrain differences. Scenic attractiveness is common. Scenic integrity is moderate.

The Cumberland River North alignment would continue east across Old Hwy 13 and would turn southeast near Chapel Hill Road just west of the Cumberland River. This area is mainly pasture land with undulating terrain that would focus views in foreground and middleground distances. There are several existing homes in the area and a small pond at the proposed line crossing on the east side of Chapel Hill Road. The Cumberland River North alignment would terminate just east of the Cumberland River. Views from local roads are mostly of farmland within the Cumberland River floodplain. Heavier native vegetation follows the steeper slopes of the river bank, contrasting with views of adjacent crop land.

Most of the Cumberland River South alignment follows a route about half a mile south of the Cumberland River North alignment. The visual environment for the south alignment is similar to the setting described for the north alignment.

The Corridor B route continues east of the Cumberland River, across Muddy Branch and over Muddy Branch Road north of Lock B Road. Access roads in this area are generally narrow and roadsides are heavily vegetated. There are few homes with views of the proposed transmission line route. The route turns northeast near Hickory Point and travels across a mixture of pasture lands and dense woodlands towards TN 12. The line crosses TN 12 just west of Stewart-Reinhart Cemetery. TN 12 is heavily traveled by motorists and is characterized by typical urban development comprised mainly of homes and associated infrastructure.

Near Pace Road to the northeast, the proposed route crosses the ROW of an existing transmission line. Views in this area are beyond the foreground in most directions and are

of rural, open pasture land. Homes are sparsely located along local roads. The route would continue to the northeast, and the visual character of the land along the proposed route consists of alternating agricultural lands and tracts of native vegetation. Turning north at Shady Grove Road, the route crosses McAdoo Creek and US 41A, a major thoroughfare. Traffic is heavy in this area, particularly during shift changes at local businesses.

Farther north the proposed route would cross Sango Road at about the same location as an existing transmission line. There are several homes in the area that have middleground views of the line route that are mostly obscured by vegetation. There are numerous wood-pole structures within the existing road ROW. Areas outside the ROW are mostly open pastoral with foreground views in all directions.

The transmission line route would cross I-24 at North Woodson Road. There are no homes in the immediate foreground of the proposed route and numerous wood and steel pole structures can be seen by motorists along North Woodson Road. The route would turn northwest at this point, cross Trough Spring Road, and continue to parallel I-24 to the intersection of TN 76. At TN 76, the route would turn slightly to the north, farther from I-24. About half a mile from Trough Spring Road, the route would cross an existing transmission line running in an east-west direction, and would continue one-third mile to the north. It then splits into three alternative alignments.

The Industrial Park West alignment would begin at this point, cross the Red River to the northwest and turn to the west, closer to I-24 at Rossview Road. This area is characterized by steep topography near the ridgelines and flat floodplain near the Red River. Scenic attractiveness is common, scenic integrity is low. The west alignment would continue to parallel I-24 for about 1.5 miles along the western edge of the Cumberland-Montgomery County Corporate Business Park and would turn north near Dunlop Lane. This area is mostly light commercial with numerous transmission lines and structures visible in the landscape. Continuing north for about a mile, the Industrial Park West alignment would enter the existing Montgomery 500-kV substation. This area is described in greater detail in Section 3.12.1.1.

The Industrial Park Center alignment begins at the point described previously for the Industrial Park West alignment. This alignment crosses the Red River to the west and continues northwest to Rossview Road, Dunlop Lane, and to the Montgomery 500-kV substation. The visual environment for this alignment would be similar to the description provided for the Industrial Park West alignment.

The Industrial Park East alignment begins about a mile north of Trough Springs Road, crosses Rossview Road near Whites Chapel, and turns west at Dunlop Lane. The alignment terminates at the Montgomery 500-kV substation. The visual environment for this alignment would be similar to the description provided for the Industrial Park West alignment. A description of the area adjacent to the Montgomery Substation is described in Section 3.12.1.1.

3.12.1.3 Corridor C

Corridor C begins at the Cumberland Fossil Plant and extends northeast across the Cumberland River to the Montgomery 500-kV Substation. A description of the area adjacent to the Cumberland Fossil Plant and the area surrounding the Montgomery Substation is described in Sections 3.12.1.1 and 3.12.1.2.

The southern section of Corridor C is characterized by open valleys along major roads with steeper ridgelines in all directions in the middleground and background. There are a few scattered residences along major and minor roads, and small communities with commercial districts. Scenic attractiveness is common. Scenic integrity is moderate.

Farther north the corridor crosses the Cumberland River and passes along the west side of the Clarksville River District. This expanse of river is viewed in the foreground and middleground by recreational users on the water, visitors on the Cumberland RiverWalk and in McGregor Park, and pedestrians and motorists along TN 76/US 79. Although there are several existing communication towers on the southeast bank as viewed from McGregor Park, there are no existing transmission lines or associated structures in the immediate area. The visual setting is distinguished by an open expanse of river, bordered to the east by natural deciduous forest and to the northwest by downtown urban development. Views across the river to the ridges beyond from McGregor Park provide high scenic attractiveness.

3.12.1.4 Corridor D

Corridor D begins at the Cumberland Fossil Plant and extends northeast to the Montgomery 500-kV Substation. A description of the area adjacent to the Cumberland Fossil Plant and the area surrounding the Montgomery Substation is described in Section 3.12.1.1.

The stretch of Corridor D from the northeast side of Cumberland Fossil Plant to the western side of the Montgomery Substation ranges from sparse residential to moderate commercial. Most of the corridor on the southern end consists of small farms along main routes with light to moderate traffic. Closer to the Montgomery Substation and on the south side of Fort Campbell Military Reservation, traffic becomes heavy along US 41A and Highway 374, with intensive commercial developments occupying the foreground of motorists and pedestrians. There are several distribution and transmission lines, ranging from wood-pole structures to laced-steel towers, within the proposed corridor boundaries.

The proposed corridor passes over I-24 and several major thoroughfares near the Tennessee-Kentucky border and turns south towards the Montgomery Substation. Residential development is sparse to moderate in the vicinity of the substation.

Corridor D Route - The Corridor D route begins at Cumberland Fossil Plant, described above in Section 3.12.1.1. The stretch of Corridor D from the north side of Cumberland Fossil Plant to the western side of the Montgomery Substation ranges from sparse residential to moderate commercial. The two alternative alignments in this area, Fossil Plant West and Fossil Plant East, are visually similar as each crosses the Cumberland River north of the plant site. Each alignment follows low-lying countryside that would be viewed in the foreground by recreation-users along the river, motorists along local roads, and visitors to the River Bend Recreation Area and Barkley WMA to the east. Scenic attractiveness is common. Scenic integrity is moderate.

The Corridor D route continues just south of River Bend Road and crosses TN 46 to the northeast. The area southwest of TN 46 is mostly open agricultural land, quickly becoming heavily vegetated to the northeast. Near Wildcat Creek Road, there are few homes and noticeable elevation changes as the route continues away from the Cumberland River. From Bartee Road, an unimproved road north of Wildcat Creek that provides access to

mostly agricultural land, background views of the smokestacks at Cumberland Fossil Plant can be observed through openings in dense vegetation.

The route continues to the northeast, passing over the headwaters of Marshall Creek. Along Cumberland City Road (TN 233), numerous utility lines with wood pole structures are visible. Traffic is light to moderate. Vegetation includes dense hardwoods with occasional agricultural openings. There are few homes in the area.

Near Blooming Grove Creek the line would cross Blooming Grove Road. Topography ranges from gently rolling near Blooming Grove Creek to rugged to the north and south. Residential development is sparse and traffic is light. Vegetation is dense outside of road ROWs, and is a mixture of deciduous and evergreen species. The route would pass over Cooper Creek and turn east as it crosses TN 233 for a second time. Wood pole utility lines along TN 233 provide electric and phone service to numerous homes in the area.

The Woodlawn West alternative alignment turns to the north just east of Barlee Branch and crosses Lake Drive to the west. This area is characterized by open fields and numerous existing service lines and pole structures. There are several homes in the foreground and a microwave repeater tower is visible to the south. Farther north, the Woodlawn West alignment would cross Old Dover Road and US 79, an area comprised of rural countryside and open fields. Traffic is light in this area and numerous homes are in the foreground. A water tower can be seen to the northwest from the proposed route crossing at Old Dover Road.

The Woodlawn West alignment would continue north, crossing a tributary of Raccoon Branch and La Fayette Road, a major thoroughfare with moderate to heavy traffic. The land adjacent to the proposed transmission line is mostly open agricultural. There are numerous visually-disruptive elements in the landscape in this area, including billboards, utility lines, and higher structures seen in the middleground to the west. The Woodlawn West alignment ends just north of La Fayette Road.

The Woodlawn East alignment begins east of Barlee Branch and continues east across Lake Drive and Ogburn Chapel Road. The alignment turns north near C. Booth Road and then crosses York Road. Topography is slightly rolling in this area and there are several homes in the foreground. To the north, the route would cross US 79, a major highway and then pass over open pasture land and several heavily-vegetated areas to the north side of La Fayette Road.

The Corridor D route continues from La Fayette Road, turning east just west of Ringgold. A National Historic District is located on the Little West Fork and includes the Ringgold Mill Complex (see Section 3-13.1). The Ringgold Creek North alignment begins about 1.25 miles west of US 41A and crosses over US 41A just east of the Little West Fork. Traffic is heavy and the area is characterized by numerous commercial establishments, utility lines, and billboards. Roadside vegetation is dense near the Little West Fork. The alignment ends about half a mile west of US 41A.

The Ringgold Creek South alignment is about one-tenth of a mile south of the Ringgold Creek North alignment. The visual environment along the proposed alignment is similar to that of the Ringgold Creek North alignment.

The Corridor D route continues to the west, crossing the Little West Fork five times. Scenic attractiveness is common. Scenic integrity is moderate. The Little West Fork North alignment begins just east of Needmore Road, a major thoroughfare. The alignment crosses Spring Creek to the east and traverses a variety of open and wooded settings before crossing TN 48 and ending half a mile to the west. The proposed Little West Fork South alignment travels along a proposed route just south of the Little West Fork North alignment under similar physical conditions.

The Corridor D route would resume about a mile west of I-24, crossing Interstate 24 and then Spring Creek twice to the east. Near the last Spring Creek crossing, the route turns south and crosses TN 79 before entering the Montgomery substation in the Cumberland-Montgomery County Corporate Business Park. There are numerous transmission lines in the industrial park landscape. Residential development is sparse to moderate in the vicinity of the existing substation. Scenic attractiveness is common. Scenic integrity is low. A description of the area adjacent to the Montgomery Substation is described in Section 3.12.1.1.

3.12.2 Alternative 2 - Cumberland-Davidson Study Area

3.12.2.1 Corridor A

Corridor A begins at the Cumberland Fossil Plant and extends southeast to the Davidson Substation. A description of the area adjacent to the Cumberland Fossil Plant is described in Section 3.12.1.1.

The area southeast of Cumberland Fossil Plant near Childress Branch is predominantly cropland and pasture land. Houses are concentrated along major routes in the rural countryside. Visual clutter includes many existing transmission lines and communication towers that can be seen along ridgelines in the middleground and background. Most ridgelines are heavily vegetated, and there are lengthy, undeveloped scenic stretches in eastern Dickson and Cheatham Counties.

The Davidson Substation is situated in a scenic valley with several homes in the foreground. There are many transmission lines and associated structures in the area and extending to the north of the substation. Within a one-mile radius of the substation many new residential subdivisions are under construction, and are visible in the middleground from I-40 and in the foreground from local minor roads. Terrain ranges from moderately- to steeply-sloping.

3.12.2.2 Corridor B

Corridor B begins at the Cumberland Fossil Plant and extends southeast to the Davidson Substation. The area adjacent to the Cumberland Fossil Plant is described in Section 3.12.1.1, and the area adjacent to the Davidson Substation is described in Section 3.12.2.1.

Corridor B is a predominately residential expanse of land with few thoroughfares. The areas closest to the Harpeth River are characterized by scenic views from local roads, river access areas, and sparse residential developments. Major developments along and near the Harpeth River include views of existing transmission lines, mainly wood-pole structures as seen from TN 49. The majority of the river, however, remains undeveloped and scenic.

3.13 Cultural Resources

Cultural resources include, but are not limited to: prehistoric and historic archaeological sites; historic structures; and historic sites that were the location of important events but that lack material remains. Cultural resources are finite, non-renewable, and often fragile. They provide a window into the past that is not often found in written documents; therefore, preservation and management of these resources are critical.

Middle Tennessee has been an area of human occupation for more than 13,000 years. In this area, prehistoric chronology is generally broken into five broad time periods: Paleo-Indian (13,500 -11,000 calendar years before present, or "bp"), Archaic (11,000 - 3,000 bp), Woodland (3,000 – 1,100 bp), and Mississippian (1,100 bp – 500 bp) (Anderson and Mainfort 2002; Anderson and Sassaman 1996). The protohistoric period (AD 1539-1700) witnessed the end of the elaborate ceremonialism of the Mississippian cultures and a crash in the aboriginal population. In the 17th and 18th centuries the Shawnee had settlements in the area, but they were repeatedly ousted by the Creeks and Cherokee who claimed Middle Tennessee as hunting territory. The first permanent occupation of the area by Europeans, Euro-Americans, and African-Americans occurred in the 18th century and marks the beginning of the historic period

Transitions between these periods are marked by significant changes in technology, land use patterns, settlement patterns, subsistence, population size, and environment. Each time period is characterized by a suite of diagnostic artifacts types such as stone projectile points, pottery types, iron objects, and trade beads. Such diagnostic finds allow archaeologists to assign an approximate age to each site. Sites belonging to each period are differently distributed in the landscape of Tennessee, but generally speaking, habitation sites are found on flood plains and alluvial terraces along rivers and tributaries, while specialized campsites tend to be found on older alluvial terraces and in the uplands.

Prehistoric archaeological sites tend to occur in locations with less than 10% slope that are within 1000 feet of a water source. This likelihood is higher on levees and riverbanks, at the confluences of streams, in caves and rockshelters, and on the level tops of ridges and knolls overlooking major streams. Nevertheless, any undisturbed piece of ground has some chance of containing prehistoric remains.

Some cultural resources are identified as "historic properties." A historic property, as defined by federal regulations (36 CFR § 800.16), is "any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the NRHP [National Register of Historic Places]." The NRHP was established under the National Historic Preservation Act (NHPA) as a means to identify, evaluate and protect the historic properties of the nation. Properties that meet one or more of the following criteria in 36 CFR § 63 may be eligible for listing in the NRHP:

- Associated with events that have made a significant contribution to the broad patterns of our history;
- Associated with the lives of significant persons in our past;
- Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;

- Have yielded or may be likely to yield, information important in history or prehistory.

The Archaeological Resources Protection Act (ARPA) of 1979 provides civil and criminal penalties for anyone who deliberately damages or destroys historic properties without a permit from the lead federal agency. Under Section 106 of the NHPA, before any federal undertaking, the lead agency must follow a formal process by which the agency shall fully consider the potential effects of the undertaking on historic properties and NRHP-eligible cultural resources. The prescribed process is described in 36 CFR 800. By carrying out the Section 106 process, an agency may simultaneously satisfy its obligations under Section 106 to fully consider the undertaking's potential effects on historic properties and its obligation under NEPA to determine whether historic resources will be adversely affected, and if so, whether measures can be implemented that will reduce adverse effects to a level that is insignificant.

NHPA requires the lead agency in an undertaking to identify an Area of Potential Effects (APE) for resources that may be affected by the undertaking. The Advisory Council on Historic Preservation defines APE as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist". For the action proposed in this EIS, and for cultural resources, TVA determined the APE for each of the two action alternatives (Cumberland-Montgomery and Cumberland-Davidson) to be those lands upon which the proposed line would be placed, including all study corridors and all associated alignments. For archaeological resources, this would include the transmission line right-of-way (ROW), affected portions of Cumberland Fossil Plant and Montgomery and Davidson substations, access roads, and construction assembly areas. For historic architecture/structures, the APE includes a one-half mile radius surrounding the ROW, but excludes access roads and laydown areas.

For management purposes, cultural resources are divided into two broad categories: archeological resources and historic architecture. The state of Tennessee (TDOA 1997) defines an archaeological resource as an area with eight or more associated, non-modern historic or prehistoric artifacts that have the potential to provide scientific or humanistic understanding of past human behavior and cultural adaptation. Some examples of archaeological resources are: earthworks; fortifications; shipwrecks; whole or broken tools, weapons and projectiles; containers made of ceramics, wood, or basketry; human remains; rock carvings and rock paintings; remains of subsurface structures such as domestic fire pits; and remains of above-ground structures such as houses and barns. Examples of historic architecture with potential for listing on the National Register include: early farms, houses, and churches; historic cemeteries; and statues and monuments. In addition to meeting one or more of the criteria of Section 106 described above, archaeological resources and historic architecture must retain their integrity in order to be eligible for the National Register. Integrity can be related to any or all of the following: location, design, setting, materials, workmanship, feeling, and association (36 CFR § 60.4).

The evaluation of the cultural resources potentially affected by the alternative actions began with a records search at the Tennessee Historical Commission (THC) and the Tennessee Division of Archaeology. This records search identified a total of 284 archaeological sites and 622 architectural or historical resources located within the APE of the two action alternatives. Many of these historic properties are within the APE of more than one corridor. The sites were mapped to assist in identifying concentrations of cultural resources; this information was later used in designing potential transmission line routes. Detailed field investigations of these routes were then conducted to determine the presence

of potentially affected cultural resources and the eligibility of those resources for listing in the NRHP.

3.13.1 Alternative 1 - Cumberland-Montgomery Study Area

3.13.1.1 Corridor A

A review of the records of the THC identified a total of 310 historic properties within Corridor A (Table 3-24). Eight of these properties are currently listed in the NRHP. These listed properties include MT1100, MT1101, MT1102, and MT1103, all components of the McCauley Hill Farm and significant for their historic architecture. The McCauley Hill Farm is also a Tennessee Century Farm. The Tennessee Century Farms Program identifies, documents, and recognizes farms owned by the same family for at least 100 years and is sponsored by the Center for Historic Preservation, Middle Tennessee State University. The remaining four properties are the Yellow Creek Furnace and Forge (40MT371), Lafayette Furnace (40MT372), Sailor's Rest Furnace (40MT375), and Brunsoni Furnace (40SW219).

3.13.1.2 Corridor B

The records review identified 311 historic properties within Corridor B (Table 3-24). Of the 230 architectural/historical resources within Corridor B, 226 are also located within one of the three other Cumberland-Montgomery corridors. Of the 81 archaeological resources within Corridor B, 72 are also located within Corridor A. NRHP listed properties that are located within Corridor B are MT1100, MT1101, MT1102, MT1103, components of the McCauley Hill Farm, Yellow Creek Furnace and Forge (40MT371), Sailor's Rest Furnace (40MT375), Washington Furnace and Forge (40MT382), Brunsoni Furnace (40SW219), Bethlehem United Methodist Church and White Chapel.

Corridor B Route - Following the identification of the proposed transmission line route and its alternative alignments within Corridor B, a detailed survey of its architectural/historical resources was conducted (Nichols and Karpynec 2004). This survey identified 65 aboveground properties within the APE (Table 3-25). Four of these properties, MT122, SW-745, Brunsoni Furnace (40SW219), and Yellow Creek Furnace and Forge (40MT371), are listed in the NRHP. Site MT122, Whites Chapel, is a one-story gable-front church located 0.2 miles east of the Industrial Park East alternative alignment on the south side of Rossview Road. The Henry Hollister House, SW745, is a two-story brick I-house with a

Table 3-24. Historic properties in the Alternative 1 - Cumberland-Montgomery Study Area, as reported in available records. The status column describes the eligibility of the properties for listing on the National Register of Historic Places.

	Corridor A		Corridor B		Corridor C		Corridor D	
Status	Architectural/ Historical	Archaeological	Architectural/ Historical	Archaeological	Architectural/ Historical	Archaeological	Architectural/ Historical	Archaeological
Not Eligible	140	21	146	23	122	41	40	77
Pot. Eligible	72	48	72	50	59	26	53	24
Eligible	0	3	0	3	0	4	0	3
Listed	4	4	4	4	4	5	4	3
Undetermined	8	1	8	1	6	1	6	2
Total	**233**	**77**	**230**	**81**	**191**	**77**	**103**	**109**

Table 3-25. Cultural resources present within the Area of Potential Effect of Cumberland-Montgomery Routes B and D as determined by field investigations. The status column describes the eligibility of the properties for listing on the National Register of Historic Places.

	Route B		Route D	
Status	Architectural/ Historical	Archaeological	Architectural/ Historical	Archaeological
Not Eligible	59	9	42	15
Pot. Eligible	1	1	9	0
Eligible	1	0	0	0
Listed	4	0	3	0
Total	**65**	**10**	**54**	**15**

historic wing extension. It is located 0.23 miles southwest of the main Corridor B route on the east side of Chapel Ridge Road. Site SW219, the Brunsoni Furnace, is one of three archaeological sites within the region associated with the Ashland Iron Works and is located 0.4 miles west of the main Corridor B route on the south side of Chapel Ridge Road. The Yellow Creek Furnace and Forge, site MT371, represents an early 19th century ironworks in Montgomery County and is located 0.3 miles south of the main Corridor B route on the north side of McFall Road. One additional property, Wickham Statues, had been previously determined eligible for the NRHP. The statues were designed and built by local folk artist E. T. Wickham during the 1960s. They are located 0.4 miles north of the main Corridor B route on the north side of Canaan Road near Palmyra.

The Murphy House, HS-34, was identified during the surveys of the APE as potentially eligible for listing in the NRHP. The house is a one-and-one-half-story, gable-front-and-wing, bungalow influenced dwelling that is located 0.45 miles north of the main Corridor B route on Hickory Point Road near the junction with Johnson Road. Another potentially eligible historic property identified during these surveys, a two-story brick I-house built in 1781 (SW-745), was subsequently determined to be outside the APE.

A Phase I archaeological survey was conducted of the proposed Corridor B route and its alternative alignments (Deter-Wolf and Karpynec 2004). Four previously unrecorded archaeological sites, 40SW614, 40SW615, 40MT960, and 40MT961, were identified. Seven previously recorded archaeological sites, 40SW63, 40SW225, 40MT101, 40MT102, 40MT195, 40MT377, and 40MT879, were reinvestigated. Of these eleven sites, only 40SW614 is potentially eligible for listing in the NRHP. Testing of this prehistoric site indicated that its intact archaeological deposits are located outside the APE and no additional testing is recommended for the portion located within the APE. All of the portions of the four newly recorded sites and the seven previously recorded sites that are situated within the APE are heavily disturbed and unlikely to yield additional significant archaeological data. TVA has therefore concluded that they are not eligible for listing in the NRHP.

3.13.1.3 Corridor C

There are a total of 268 historic properties located within Corridor C (Table 3-24). Of these properties, 89 Architectural/Historical resources and 39 archaeological sites are also located within other corridors. Properties listed in the NRHP within Corridor C include the following: Emerald Hill, Minglewood Farm, Valentine Sevier Station, Fort Defiance/Fort Bruce (40MT287), Yellow Creek Furnace and Forge (40MT371), Sailor's Rest Furnace (40MT375), and Brunsoni Furnace (40SW219). Emerald Hill is an historic building on the Austin Peay State University campus in downtown Clarksville and Minglewood Farm is located northwest of Clarksville near US 41A.

3.13.1.4 Corridor D

The records review identified 212 historic properties located within Corridor D (Table 3-24). Of these properties, 69 architectural/historical resources and 16 archaeological sites are also located within other corridors. NRHP listed properties located within Corridor D are the Allen House, Minglewood Farm, Ringgold Mill Complex, Smith Hoffman House, Whitehall, Poplar Springs Furnace (40MT376) and Brunsoni Furnace (40SW219). The Ringgold Mill Complex, a National Historic District, is located on the Little West Fork Red River north of Clarksville and the Smith Hoffman property, an historic house, is located in downtown Clarksville. The Allen House, an antebellum Federal style house, is located near the West Fork Red River north of Clarksville. Whitehall is located northwest of Clarksville near US 41A and the Ringgold Mill Complex.

Corridor D Route - A subsequent detailed survey of architectural/historical resources along the proposed Corridor D transmission line route and its sub-alternatives (Nichols and Karpynec 2004) identified 51 properties within the APE (Table 3-25). Three of these properties are listed on the National Register: the Ringgold Mill Complex, Whitehall, and the Allen House.

Eight additional properties, HS-46, HS-54, HS-65, SW-719, SW795, MT-1406, MT-1408, MT-1409, and MT1435, are potentially eligible for listing. HS-46, the Morrow-Kirk House, is located south of Blooming Grove Road, approximately 0.35 miles west of the main Corridor D route. The Cecil Hill Lodge, site HS-54, is located at the terminus of Happy Hills Acres Road along the east bank of Cunningham Broadbent Lake, approximately 0.6 miles south of the Woodlawn East alternative alignment. HS-65, the Little West Fork Baptist Church, is situated at the southwest corner of the Ringgold Road/Highway 41A intersection, approximately 0.45 miles south of the Ringgold Creek South alternative alignment. The Little West Fork Baptist Church, HS-65, is located at the southwest corner of the Ringgold Road/Highway 41A intersection, approximately 0.45 miles south of the Ringgold South alternative alignment. The Dickson-Lewis House, SW719, is located along the north side of Camp Lylewood Road and the north bank of the Cumberland River, about one mile west of the main Corridor D route. SW795, a 19th century Italianate dwelling, is located 0.1 mile east of the Fossil Plant East alternative alignment. Site MT1406, Idlewild, is located along the north side of Highway 79, approximately 0.2 miles east of the main Corridor D route. The Ross Morrison Cemetery, MT1408, is located north of Current Road, approximately 0.45 miles north of main Corridor D route. Site MT1409, Eupedon Farm, is located along the south side of Meriwether Road, approximately 0.6 miles north of the Spring Creek North alternative alignment. The Meriwether Farm, MT1435, is located along the west side of Trenton Road; approximately 0.2 miles north of the Spring Creek North alternative alignment.

One previously unrecorded historic structure, HS75, was also identified within the APE near the Fossil Plant East alternative alignment. This one-story gable-front-and-wing dwelling is recommended ineligible for listing on the NRHP. Previously recorded historic structures HS-1, HS-59, HS-60, HS-63, HS-64, and SW796 are considered ineligible for listing on the NRHP. Because of its architectural significance, SW795 and its 12-acre lot are recommended as eligible for listing on the NRHP.

Phase I archaeological surveys were conducted of the proposed Corridor D route and its alternative alignments (Deter-Wolf and Karpynec 2004, Deter-Wolf and Wampler 2004). Twelve previously unrecorded sites, 40SW615, 40SW597, and 40MT945-40MT954, were identified. Three previously recorded sites, 40SW47, 40MT9, and 40MT368, were reinvestigated. The portions of all of these sites that are situated within the APE are heavily disturbed and unlikely to yield additional significant archaeological data. TVA has determined that the portions of these sites within the APE are not eligible for inclusion in the NRHP.

3.13.2 Alternative 1 - Cumberland-Davidson Study Area

3.13.2.1 Corridor A

A review of the records of the THC identified a total of 307 historic properties within Corridor A. Table 3-26 summarizes the number of properties that fall within each eligibility category. Corridor A has 11 properties that are currently listed in the NRHP: Courthouse Square, Newsom's Mill (DV-9640), V.R. Harris House., Kingston Springs Hotel, Leech Larkins Farm, Smith Farmhouse, 40CH97, 40DS23, 40DS28, 40DV499, and 40SW219. Courthouse Square is in Charlotte and the Leech Larkins Farm is located on TN 47 on the south side of Charlotte. The V.R. Harris House is located in Erin and the Smith Farmhouse is located along TN 100 near Pasquo in southwest Davidson County. Newsom's Mill is along the Harpeth River about a mile from the Davidson 500-kV Substation and is owned by the state of Tennessee. Four of the other properties are historic iron furnaces.

Table 3-26. Historic properties in the Alternative 2 - Cumberland-Davidson Study Area, as reported in available records. The status column describes the eligibility of the properties for listing on the National Register of Historic Places.

	Corridor A		Corridor B	
Status	Architectural/ Historical	Archaeological	Architectural/ Historical	Archaeological
Not Eligible	159	19	156	25
Pot. Eligible	73	32	65	42
Eligible	0	3	0	3
Listed	6	5	3	5
Undetermined	9	1	8	1
Total	**247**	**60**	**232**	**76**

3.13.2.2 Corridor B

There are a total of 308 historic properties within Corridor B (Table 3-26). Of the 232 architectural/historical resources in Corridor B, 111 are also located within Corridor A. Of the 76 archaeological resources within Corridor B, 42 are also located within Corridor A.

Properties currently listed in the NRHP include the following: Newsom's Mill (DV-9640), V.R. Harris House, Smith Farmhouse, 40DS30, 40DS32, 40DV62, 40DV499, and 40SW219. Three of the properties unique to this corridor are historic iron furnaces.

3.14 Socioeconomics

3.14.1 Alternative 1 – Cumberland-Montgomery Study Area

Under this alternative, the project area would include parts of up to four counties. These counties vary greatly in several socioeconomic characteristics (Table 3-27). The most urban county, Montgomery, has the highest minority population, the lowest poverty rate, and a relatively low unemployment rate. The two most rural and least populous counties, Houston and Stewart, have high unemployment rates, low median household income, and low minority populations compared to the study area and state averages.

3.14.2 Alternative 2 – Cumberland-Davidson Study Area

Under this alternative, the project area would include parts of up to 5 counties. These counties vary greatly in several socioeconomic characteristics (Table 3-28). The most urban county, Davidson, has the highest minority population and a relatively low unemployment rate. The two most rural and least populous counties, Houston and Stewart, have high unemployment rates, low median household income, and low minority populations compared to the study area and state averages.

Table 3-27. Socioeconomic characteristics of the four counties in the Alternative 1 Cumberland-Montgomery project area.

County	Total Population 2002	Population Growth, % 1990-	Density, #/sq. mile 2002	% Minority Population 2000	% Population Below Poverty Level 1999	Median Household Income 1999	Civilian Labor Force 2003	Number Unemployed 2003	% Unemployed 2003
Dickson	44,251	26.2	90.3	7.3	10.2	39,056	21,710	1,150	5.3
Houston	8,014	14.2	40.4	5.9	18.1	29,968	2,690	310	11.5
Montgomery	138,132	37.4	256.1	29.1	10.0	38,981	63,320	3,000	4.7
Stewart	12.782	34.8	27.9	5.4	12.4	32,316	4,260	400	9.4
Study Area Total	203,179	33.6	120.4	21.9	10.5	n.a.	91.980	4,860	5.3
Tennessee	5,789,796	18.7	140.5	20.8	13.5	36,360	2,909,500	169,000	5.8
United States	287,973,924	15.8	81.4	30.9	12.4	41,994	146,510,000	8,774,000	6.0

n.a. – not available.

Source: U.S. Census Bureau, *Population Estimates for Counties, 2001, 2002, and 2003;* U.S. Census Bureau, *Census of Population, 1990* and *2000*; Tennessee Division of Employment Security, 2004

Table 3-28. Socioeconomic characteristics of the five counties in the Alternative 2 Cumberland-Davidson project area.

	Total Population	Population Growth, %	Density, #/sq. mile	% Minority Population	% Population Below Poverty Level	Median Household Income	Civilian Labor Force	Number Unemployed	% Unemployed
County	2002	1990-	2002	2000	1999	1999	2003	2003	2003
Cheatham	37,054	36.5	122.4	3.9	7.4	45,836	19,410	800	4.1
Davidson	569,439	11.5	1133.8	34.9	13.0	39,797	314,430	14,050	4.5
Dickson	44,251	26.2	90.3	7.3	10.2	39,056	21,710	1,150	5.3
Houston	8,014	14.2	40.0	5.9	18.1	29,968	2,690	310	11.5
Stewart	12,782	34.8	27.9	5.4	12.4	32,316	4,260	400	9.4
Study Area Total	671,540	13.9	343.8	30.5	12.6	n.a.	362.500	16.710	4.6
Tennessee	5,789,796	18.7	140.5	20.8	13.5	36,360	2,909,500	169,000	5.8
United States	287,973,924	15.8	81.4	30.9	12.4	41,994	146,510,000	8,774,000	6.0

n.a. – not available

Source: U.S. Census Bureau, *Population Estimates for Counties, 2001, 2002, and 2003;* U. S. Census Bureau, *Census of Population, 1990* and *2000*; Tennessee Division of Employment Security, 2004.