CHAPTER 4

4.0 TRANSMISSION SYSTEM ALTERNATIVES – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter includes a description of the affected environment and expected direct, indirect, and cumulative impacts associated with proposed transmission system improvements described in Section 2.6 and shown in Figure 2-15. Transmission infrastructure, including corridors and switchyards, to support operation of a nuclear plant at the BLN site was identified, reviewed, and evaluated in the earlier environmental review documents prepared by TVA and the AEC for the original facility encompassing BLN 1&2. The AEC subsequently approved and issued a construction license for BLN 1&2 and the supporting transmission infrastructure into and at the site (TVA 2008a). The approved transmission system was constructed before the plant entered deferred status.

The 11 transmission lines that would need to be upgraded or reenergized to support operation of a single nuclear unit at the BLN site are listed in Table 2-1. Nine of the lines need to be reconductored or uprated. Sections of two 500-kV lines need to be connected and energized; ROW vegetation management on those deenergized segments will be brought back to current TVA standards. The Widows Creek-Bellefonte and Bellefonte-Scottsboro 161-kV lines would not need to be changed to support operation of a single nuclear unit at the BLN site. Additional description of proposed transmission line upgrades is provided in Section 2.6. As described in Section 2.6, no new transmission lines would be needed under either Action Alternative, and therefore no additional ROW would be required. In addition, the existing 500-kV switchyard would be refurbished.

The methods used to manage the infrastructure and maintain ROW for the lines would be unchanged. Prior to these activities, TVA archaeologists and biologists would conduct an SAR of the transmission line area (including the ROW) to identify any resource issues that may occur along that transmission line. These reviews are conducted on a recurring basis that coincides with the maintenance cycle, to ensure that the most current information is provided to the organizations conducting maintenance on these transmission lines. A summary of the SAR process is provided in Appendix D.

Only minor editorial changes have been made to Chapter 4 in the FSEIS. There were no comments on the DSEIS related to the proposed transmission system upgrades.

4.1. Surface Water

4.1.1. Affected Environment

The project areas of the proposed transmission line improvements drain to the Tennessee River and its tributaries at the following locations: (1) Guntersville and Wheeler reservoirs in Alabama, (2) at Nickajack and Chickamauga reservoirs in southeast Tennessee and northwest Georgia, and (3) upstream and downstream of Normandy Dam on the Duck River in central Tennessee. Table 4-1 identifies the major streams within the project area and their state designated use classification and 303(d) use impairment listing. Streams on a state 303(d) list do not fully support one or more of their designated uses and are included in a state program to eliminate the water quality impairment.

Table 4-1. State Classification and 303(d) Listing of Major Streams Crossed

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
Browns Ferry-Trinity 161-kV (ID: 10)			
Tennessee River-Wheeler	Ala.	S, F&W	No
Bakers Creek	Ala.	F&W	No
Browns Ferry-Athens 161-kV (ID: 11)	Ala.		
Tennessee River-Wheeler	Ala.	S, F&W	No
Round Island Creek	Ala.	F&W	No
Swan Creek	Ala.	F&W, A&I	Yes - nutrients
Town Creek	Ala.	F&W	No
Widows Creek-Bellefonte #1 500-kV[2] (ID: 6); Bellefonte-Madison 500-kV[2] (ID: 7)			
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Town Creek	Ala.	F&W	No
Mud Creek	Ala.	F&W	No
Crow Creek	Ala.	F&W	No
Big Coon Creek	Ala.	F&W	No
Little Coon Creek	Ala.	F&W	No
Widows Creek	Ala.	S, F&W	No
Widows Creek-Bellefonte #2 500-kV[3] (ID: 8); Bellefonte-East Point 500-kV[3] (ID: 9)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Coon Creek	Ala.	S, F&W	No
Widows Creek-Oglethorpe #2 161-kV[4] (ID: 4)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Widows Creek	Ala.	S, F&W	No
Long Island Creek	Ala.	PWS, S, F&W	No
Widows Creek-Oglethorpe #3 161-kV[4] (ID: 5)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Long Island Creek	Ala.	PWS, S, F&W	No
Guest Creek	Ala.	F&W	No
Tennessee River-Nickajack	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	Yes – dioxins, PCBs
Cole City Creek	Ga.	Fishing	No
Lookout Creek	Ga.	Fishing	Yes – nonpoint source pollution
Chattanooga Creek	Ga.	Fishing	Yes – nonpoint source pollution
Rock Creek	Ga.	Fishing, Trout Stream	No
Dry Creek	Ga.	Fishing	Yes – nonpoint source pollution
S. Chickamauga Creek	Tenn.	IWS, FAL, REC, LWW, IRR	Yes – *E. coli*, nutrients, other anthropogenic habitat loss

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
W. Chickamauga Creek	Ga.	Fishing	Yes – nonpoint source pollution
Widows Creek-Raccoon Mountain #2 161-kV (ID: 3)			
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Long Island Creek	Ala.	PWS, S, F&W	No
Guest Creek	Ala.	F&W	No
Tennessee River-Nickajack	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	Yes – dioxins, PCBs
Cole City Creek	Ga.	Fishing	No
Lookout Creek	Tenn.	IWS, FAL, REC, LWW, IRR	No
Sequoyah-Widows Creek 500-kV (ID: 2)			
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Sequatchie River	Tenn.	DWS, IWS, FAL, REC, LWW, IRR	No
Tennessee River-Nickajack	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	Yes – dioxins, PCBs
Suck Creek	Tenn.	FAL, REC, LWW, IRR	No
South Suck Creek	Tenn.	FAL, REC, LWW, IRR	Yes – loss of biological integrity
North Suck Creek	Tenn.	FAL, REC, LWW, IRR	Yes - pH
N. Chickamauga Creek	Tenn.	FAL, REC, LWW, IRR, TS	Yes – pH, physical substrate habitat problems
Tennessee River-Chickamauga	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	No
Wartrace-N. Tullahoma Tap 161-kV (ID: 1)			
Tennessee River-Kentucky	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	No
Duck River-Normandy	Tenn.	DWS, IWS, FAL, REC, LWW, IRR	No
Carroll Creek	Tenn.	FAL, REC, LWW, IRR	No
Duck River- Below Normandy	Tenn.	DWS, FAL, REC, LWW, IRR, TS	Yes – *E. coli*

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
Doddy Creek	Tenn.	FAL, REC, LWW, IRR	Yes – habitat loss from erosion, flow alteration
Garrison Fork	Tenn.	DWS, IWS, FAL, REC, LWW, IRR	No
Wartrace Creek	Tenn.	FAL, REC, LWW, IRR	Yes – *E. coli*

[1] Abbreviations for designated use classifications for **Alabama**: PWS—Public Water Supply, S—Swimming and Other Whole Body Water-Contact Sports, F&W—Fish and Wildlife. For **Tennessee**: DWS—Domestic Water Supply, IWS—Industrial Water Supply, FAL—Fish and Aquatic Life, REC—Recreation, LWW—Livestock Watering and Wildlife, IRR—Irrigation, NAV—Navigation, TS—Trout Stream

[2] Portions of the Widows Creek-Bellefonte #1 and Bellefonte-Madison 500-kV lines share a common ROW.

[3] Portions of the Widows Creek-Bellefonte #2 and Bellefonte-East Point 500-kV lines share a common ROW.

[4] The Widows Creek-Oglethorpe #2 and #3 161-kV lines are co-located.

4.1.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, because much of the subject lines are located on existing ROW, vegetation maintenance would continue to occur periodically, including the use of herbicides, which could possibly have an impact on groundwater resources. During ROW maintenance, the vegetation management guidelines and procedures as described in Appendix L would be followed. With the implementation of BMPs and routine precautionary measures, no additional impacts to surface water would likely occur related to the ongoing maintenance activities under the No Action Alternative.

Action Alternative
Soil disturbances associated with the use of or maintenance of access roads or transmission line upgrading activities could potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. Continued removal of the tree canopy along stream crossings can increase water temperatures and algal growth, decrease dissolved oxygen levels, and cause adverse impacts to aquatic biota. However, TVA routinely includes precautions in the design of its transmission line projects to minimize these potential impacts (see Appendices L and M [SOPs]). In the unlikely event that any new permanent stream crossings are necessary, these crossings would be designed to avoid impeding runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other upgrading and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all streamside management zones (SMZs) would be left undisturbed unless there were no practicable alternative (see Appendix N). Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. Any cumulative impacts to surface water quality are anticipated to be minor and insignificant.

4.2. Groundwater

4.2.1. Affected Environment

The affected transmission lines for the Action Alternative span several geographical areas. The geology and the groundwater contained within these areas are diverse, and for the purposes of this review, have been broken into geographic sections according to the physiographic province in which the transmission lines occur.

Northeast Alabama, Southeast Tennessee, and Northwest Georgia Sections

The six transmission lines proposed for upgrades in this section are Sequoyah-Widows Creek 500-kV (ID: 2); Widows Creek-Oglethorpe #2 161-kV (ID: 4); Widows Creek-Oglethorpe #3 161-kV (ID: 5); Widows Creek-Bellefonte #1 500-kV (ID: 6); Widows Creek-Bellefonte #2 500-kV (ID: 8); and Widows Creek-Raccoon Mountain #2 161-kV (ID: 3). These transmission lines are located across two physiographic provinces, i.e., the Valley and Ridge, and the Appalachian Plateaus.

The Valley and Ridge aquifer consists of folded and faulted carbonate, sandstone, and shale. Soluble carbonate rocks and some easily eroded shales underlie the valleys in the province, and more erosion-resistant siltstone, sandstone, and cherty dolomite underlie ridges. The arrangement of the northeast-trending valleys and ridges are the result of a combination of folding, thrust faulting, and erosion. Compressive forces from the southeast have caused these rocks to yield, first by folding and subsequently by repeatedly breaking along a series of thrust faults. The result of the faulting is that geologic formations are repeated several times across the region. Carbonate-rock aquifers in the Chickamauga, the Knox, and the Conasauga groups are repeated throughout the Valley and Ridge Physiographic Province (Miller 1990).

Groundwater in the Valley and Ridge aquifers primarily is stored in and moves through fractures, bedding planes, and solution openings in the rocks. These aquifers are typically present in valleys and rarely present on the ridges. Most of the carbonate-rock aquifers are directly connected to sources of recharge, such as rivers or lakes, and solution activity has enlarged the original openings in the carbonate rocks. In the carbonate rocks, the fractures and bedding planes have been enlarged by dissolution of part of the rocks. Slightly acidic water dissolves some of the calcite and dolomite that compose the principal aquifers. Most of this dissolution takes place along fractures and bedding planes where the largest volumes of acidic groundwater flow.

Groundwater movement in the Valley and Ridge Province is localized, restricted by the repeating lithology created by thrust faulting. Older rocks, primarily the Conasauga Group and the Rome Formation, have been displaced upward over the top of younger rocks (the Chickamauga and the Knox groups) along thrust fault planes thus forming a repeating sequence of permeable and less permeable hydrogeologic units. The repeating sequence, coupled with the stream network, divides the area into a series of adjacent, isolated, shallow groundwater flow systems. The water moves from the ridges, where the water levels are high, toward lower water levels adjacent to major streams that flow parallel to the long axes of the valleys. Most of the groundwater is discharged directly to local springs or streams (Miller 1990).

Aquifers of the Appalachian Plateaus Physiographic Province consist of permeable stratigraphic units of Paleozoic sedimentary rocks. Major aquifers in the Appalachian Plateaus Province are in limestone units of Mississippian age covered by sandstone of the Pennsylvanian Pottsville Formation. Flow in the Appalachian Plateaus aquifers is affected

primarily by topography, structure, and the development of solution openings in the rocks. A thick sequence of shale, sandstone, and coal overlies Mississippian limestone. Recharge to the aquifers is by precipitation on the flat, mesa-like plateau tops. Water then percolates downward through the Pennsylvanian sandstone (Pottsville Formation), primarily along steeply inclined joints and fractures. Some water leaks downward across the interbedded shale into the underlying limestone aquifer. Sandstone of the Pottsville Formation varies greatly in its water-producing capabilities. A thick black shale (the Chattanooga Shale) forms a confining unit for the Appalachian Plateaus aquifer (Miller 1990).

Public drinking water is supplied by both groundwater and surface water sources for the counties in which the ROWs are located (EPA 2009). Sequoyah-Widows Creek 500-kV (ID: 2) intersects a State Designated Source Water Protection Area, which is the recharge area for the Hixson, Tennessee, Utility District in Hamilton County; other State Designated Source Water Protection Areas may occur. Private wells occur throughout the area.

Middle Tennessee Section

The ROW of the Wartrace-N. Tullahoma Tap 161-kV (ID: 1) transmission line proposed for upgrading in this section is underlain by aquifers, from the Ordovician and Mississippian Periods, in the Interior Low Plateaus Physiographic Province. These aquifers are separated by a confining unit. These carbonate rocks are the principal aquifers in large areas of central Tennessee and are part of the Central Basin aquifer system. The carbonate rock aquifers consist of almost pure limestone and minor dolostone and are interlayered with confining units of shale and shaly limestone. Limestone is susceptible to erosion, which produces fissures, sinkholes, underground streams, and caverns forming vast karst areas.

The middle Ordovician, Stones River Group contains the most important carbonate-rock aquifers in the project area. The calcareous siltstones of the middle Ordovician Nashville Group yield small volumes of water, but these units are not considered to be principal aquifers. The lower Ordovician Knox Group is a major aquifer where dolostone contains freshwater (Lloyd and Lyke 1995).

Highland Rim aquifer system from the Mississippian Period consists of flat-lying carbonate rocks. The formations that make up the Highland Rim aquifer within this section of the project area are the Monteagle Limestone, the St. 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 2002).

Precipitation is the primary source of recharge in the Interior Low Plateaus Province. Most of the precipitation becomes overland runoff to streams, but some percolates downward through soil to the underlying bedrock. In the consolidated rocks, however, most of the water moves through and is discharged from secondary openings, such as joints, fractures, bedding planes, and solution openings. As a result, groundwater discharge from springs is common throughout the Interior Low Plateaus Province (Lloyd and Lyke 1995).

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 groundwater flows through solution-enlarged channels and bedding planes within the rock. Karst topography is 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 groundwater.

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. Consequently, the groundwater sources in karst aquifers considered most vulnerable to contamination are those that are under the direct influence of surface water.

Public drinking water for Coffee and Bedford counties in Tennessee is supplied by both surface water and groundwater sources (EPA 2009). Privately owned wells supply water to area restaurants, schools, and marinas in the county. Residential wells are likely to occur near the subject ROWs.

North Alabama Section

The Browns Ferry-Trinity 161-kV (ID: 10) and Browns Ferry-Athens Alabama, 161-kV (ID: 11) transmission lines proposed for upgrading are also underlain by the Highland Rim aquifer system, which is part of the Interior Low Plateaus Physiographic Province. However, the aquifer is known locally as the Tuscumbia-Fort Payne aquifer. The formations that make up this aquifer are the Fort Payne Chert, the Tuscumbia Limestone, and the Monteagle Limestone. The Chattanooga Shale is at the base of the Tuscumbia-Fort Payne aquifer and acts as a confining unit. The upper bedrock formations weather to form a thick regolith that covers the surface of the Fort Payne. The regolith may be as thick as 100 feet and is mostly clay, but may contain significant layers of chert rubble.

Like the rest of the Mississippian Highland Rim aquifer, fractures and solution openings have formed a network of interconnected caves, sinkholes, and springs throughout these formations.

The regolith[7] and underlying bedrock are hydrologically connected. Recharge to the aquifer is largely from precipitation infiltrating and moving through the regolith. Focused recharge also occurs from surface drainage into sinkholes or losing stream reaches that intersect the aquifer (Kingsbury 2003). Like the rest of the Highland Rim aquifer system, the aquifer is readily susceptible to contamination and is considered vulnerable to contamination.

Public drinking water for Limestone County, Alabama, is supplied by both surface water and groundwater sources. Public water for Morgan County, Alabama, is supplied by surface water (EPA 2009). Privately owned wells supply water to area restaurants, schools, and marinas in the county. Residential wells likely occur near the subject ROW.

4.2.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, vegetative maintenance would occur periodically, including the use of herbicides that could possibly have an impact on groundwater resources. During future revegetation and maintenance activities, application of herbicides and fertilizers would be avoided in the areas along the ROWs where sinkholes, caves, and State Designated Source Water Protection Areas occur to prevent groundwater contamination. Any herbicides applied to the ROWs during periodic maintenance would be applied

[7] Regolith refers to the layer of loose rock resting on bedrock, constituting the surface of most land.

according to the manufacturer's label. During ROW maintenance, the vegetation management guidelines and procedures as described in Appendix L would be followed. With the implementation of BMPs (Muncy 1999) and routine precautionary measures, potential impacts to groundwater under the No Action Alternative would be insignificant.

Action Alternative
Under the Action Alternative, anticipated impacts on existing ROWs from maintenance would be similar to those occurring under the No Action Alternative. Potential impacts to groundwater from upgrades of the transmission lines could result if sediments from disturbed soil enter or clog karst features, or from the transport of herbicides and fertilizers or other contaminants into sinkholes and caves. BMPs and routine precautionary measures, as described in the No Action Alternative, would be used during ROW maintenance and transmission line upgrades to control sediment infiltration from storm water runoff and to avoid contamination of groundwater in the project areas. Therefore, potential impacts to groundwater from the Action Alternative would be insignificant.

4.3. Aquatic Ecology

4.3.1. Affected Environment

As described in Section 4.1 (Surface Water) above, the surface water drainage from the proposed transmission line improvements drain to the Tennessee River and its tributaries at the following locations: (1) Guntersville and Wheeler Reservoirs (Jackson, Limestone, and Morgan counties in Alabama); (2) at Nickajack and Chickamauga Reservoirs in southeast Tennessee (Hamilton, Marion, and Sequatchie counties) and northwest Georgia (Catoosa, Dade, and Walker counties); and (3) upstream and downstream of Normandy Dam on the Duck River in central Tennessee (Bedford and Coffee counties).

TVA routinely monitors streams and reservoirs in the Tennessee River drainage as part of its Reservoir VS monitoring program, and various water quality initiatives. While not all streams potentially affected by transmission line activities have been assessed, those that have been assessed contain diverse aquatic communities (i.e., fish and invertebrates) representative of streams and reservoirs in the Cumberland Plateau, Eastern Highland Rim, Outer Nashville Basin, Plateau Escarpment, Sequatchie Valley, Southern Table Plateaus and Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregions.

4.3.2. Environmental Consequences

No Action Alternative
Routine maintenance (including vegetative maintenance) is ongoing on the ROWs of the transmission lines currently in service. Maintenance of access roads and transmission facilities can potentially expose soil and increase erosion that can lead to adverse impacts to water quality and aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts. TVA routinely includes precautions in maintenance of its transmission line projects to minimize these potential impacts (Muncy 1999).

ROW maintenance employs manual and low impact methods within SMZs wherever possible, and these practices would continue (see Appendix N). In areas requiring chemical treatment, only EPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is

expected to result in only minor direct and indirect impacts to surface waters or aquatic habitats and the aquatic communities they support. No cumulative impacts are expected.

Action Alternative
The currently inactive 500-kV transmission lines would be reenergized as described in Section 2.6, and routine vegetation and access maintenance would be reestablished for their ROWs. The other transmission lines that would be upgraded are already in service. These lines undergo environmental review as part of TVA's vegetation maintenance program. Because these transmission lines are already in service and being maintained, upgrades associated with operation of a single unit at BLN would have no additional effects above those presently seen on these transmission ROWs. Existing data indicate that no important aquatic resources would be affected by reestablishing maintenance activities of the 500-kV lines or upgrading the other transmission lines currently in service. Field reviews will be conducted prior to vegetation clearing or line upgrade activities to confirm these findings. Appropriate SMZs would be established and maintained per TVA guidelines (Muncy 1999) (also see Appendices L, M, and N). Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No direct, indirect, or cumulative impacts to aquatic communities or instream habitat are anticipated.

4.4. Vegetation

4.4.1. Affected Environment

The proposed transmission line upgrades would occur across seven Level IV Ecoregions including the Cumberland Plateau, Eastern Highland Rim, Outer Nashville Basin, Plateau Escarpment, Sequatchie Valley, Southern Table Plateaus and Southern Limestone/Dolomite Valleys and Low Rolling Hills (Figure 4-1). The natural vegetation, along with geologic strata and predominant land use, varies considerably across the project area (Griffith et al. 1998; Griffith et al. 2001). Vegetation in the subject transmission line ROWs included in the proposed project is characterized by two main types: herbaceous vegetation and forest.

Herbaceous vegetation occurs on about 95 percent of the subject transmission line ROWs. Herbaceous vegetation is characterized by greater than 75 percent cover of forbs and grasses and less than 25 percent cover of other types of vegetation, and it is typical of existing transmission line ROWs due to the repeated treatment of woody vegetation to maintain reliability of the transmission system. The type of herbaceous vegetation found in transmission line ROWs can vary, ranging from heavily disturbed areas with high cover of nonnative plants to dry sites dominated by native species that resemble prairie remnants. Some sections of transmission line occurring in areas with low relief likely contain wetland vegetation. Although the percent cover of native species varies considerably across the project area, the high level of disturbance typical of ROWs suggests many areas likely contain a large proportion of nonnative, invasive species.

Forest cover, which occupies 5 percent or less of the subject ROWs is likely deciduous in composition. Deciduous forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. Deciduous forest occurs only in areas of ROW where the transmission line crosses very steep terrain and in areas where vegetation on existing, deenergized lines has not been maintained for some years. In forested areas with steep terrain the conductor is sometimes high enough above canopy trees such that regular removal of woody species is not necessary to maintain reliability

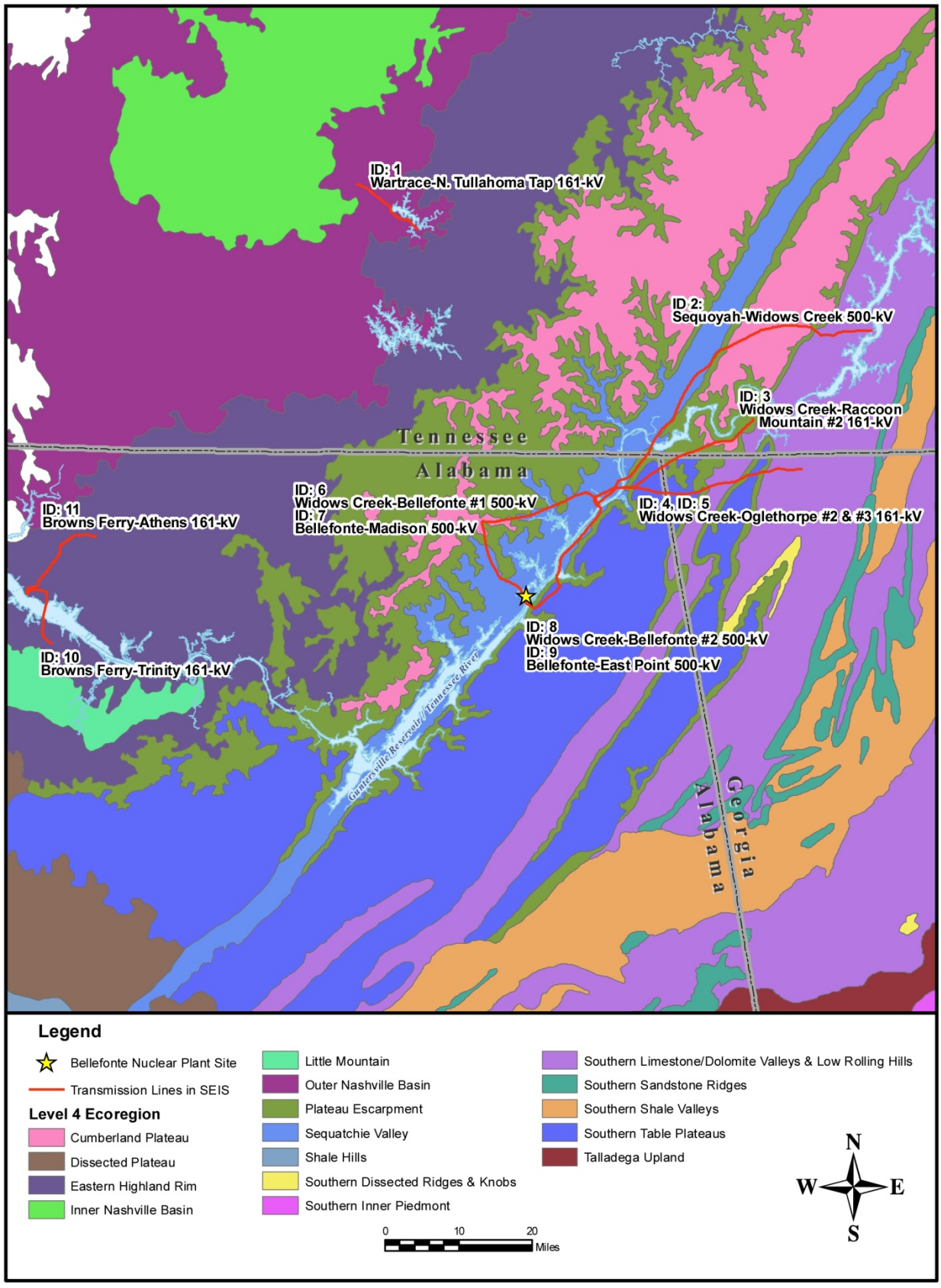

Figure 4-1. Level IV Ecoregions Crossed by Transmission Lines Requiring Upgrades or Actions to Support Operation of a Single Nuclear Unit at the BLN Site

of the transmission system. Because these spanned areas (i.e., those areas of high relief where the transmission is high above the canopy such that ROW clearing is not necessary) often contain relatively undisturbed forest, they are typically dominated by native species indicative of the region. Conversely, those forested areas within unmaintained ROWs along deenergized transmission lines are typically early successional and usually contain a greater proportion of nonnative, invasive species. These areas are typically dominated by saplings and/or small pole-sized trees.

4.4.2. Environmental Consequences

No Action Alternative
Under this alternative, the existing transmission lines would not be upgraded and the area within the ROWs would remain in its current condition. Methods used to manage vegetation along the ROW and maintain transmission infrastructure would be unchanged. Vegetation maintenance of the ROWs would continue, and portions of the ROW could be periodically disturbed by minor activities related to maintaining transmission infrastructure. TVA standard operating procedure of revegetating any disturbed areas with noninvasive species would help prevent introduction and spread of invasive species in the project area (Muncy 1999). Thus, adoption of the No Action Alternative would not affect plant life in the area of the proposed ROWs. The structure and composition of the vegetation would not be appreciably altered, under the No Action Alternative.

Action Alternative
Under this alternative, the existing transmission lines would be upgraded, and the methods used to manage vegetation along the ROWs and to maintain transmission infrastructure would be comparable to what currently occurs. However, botanical surveys of the ROWs that would occur as part of the process (see Subsection 2.6.4) could identify more federally listed or state-listed plants along those ROWs. If rare plants are observed, no aerial application of herbicide would take place along parts of the ROW inhabited by listed species. In areas that currently receive aerial applications of herbicides, local changes to vegetation structure and composition would likely occur if the application was suspended. These changes would have little ecological impact because any shifts in species composition would not change the early successional nature of the plant community.

Adoption of this alternative would not require new clearing of forest, although areas of herbaceous vegetation may need to be cleared to facilitate upgrading activities. Effects to herbaceous vegetation in the existing ROWs would be temporary and would not likely persist for more than approximately one year after activities cease. TVA standard operating procedure of revegetating with noninvasive species would help prevent introduction and spread of invasive species in the project area (Muncy 1999). Adoption of the Action Alternative would not significantly affect the botanical characteristics of the area in which the subject ROWs are located.

4.5. Wildlife

4.5.1. Affected Environment

Two types of terrestrial habitat occur in the transmission line ROWs associated with proposed generation at BLN. These include early-successional, i.e., herbaceous habitat, which occupies about 95 percent of the subject ROWs and forested habitat, which occupies the remaining 5 percent. A more detailed description of vegetation is provided in Subsection 4.4.1.

Early successional habitat occurs along most of the existing transmission line ROWs. Within this habitat type, the ROWs cross agricultural fields (occupying about 40 percent of the coverage), herbaceous or scrub-shrub (about 40 percent of the coverage), and maintained lawns or fields (approximately10 percent of the coverage). Some sections of the subject transmission line ROWs occur in areas with minor topographical relief. Such areas likely contain early successional emergent wetland habitat.

Birds commonly observed in early successional habitat include the Carolina wren, American robin, northern mockingbird, northern cardinal, eastern towhee, eastern bluebird, brown thrasher, field sparrow, eastern meadowlark, and European starling. Red-tailed hawk and American kestrel also forage along ROWs. Mammals frequently observed in this type of habitat include Virginia opossum, eastern cottontail, striped skunk, white-tailed deer, eastern mole, woodchuck, white-footed mouse, and hispid cotton rat. Coyote, bobcat, red fox, and gray fox also use ROWs that cross forest as corridors for travel and foraging. Common reptiles found along ROWs include black racer, black rat snake, milk snake, and garter snake. Wetlands within early successional habitats provide habitat for amphibians such as American toad, green frog, northern cricket frog, upland chorus frog, and red-spotted newt.

Forested habitat present within the existing ROWs is likely upland deciduous forest. Deciduous forest occurs only in areas where the transmission line crosses very steep terrain. In these spanned areas, the conductor is high enough above canopy trees that regular removal of woody species is not necessary to maintain reliability of the transmission system.

Deciduous forests provide habitat for wild turkey, downy woodpecker, pileated woodpecker, white-breasted nuthatch, and American crow, as well as neotropical songbirds such as wood thrush, blue-gray gnatcatcher, red-eyed vireo, and ovenbird. White-tailed deer and gray squirrel are frequently found in deciduous forests, and scattered rock outcrops within these forests provide habitat for a variety of small mammals. Northern zigzag salamander and slimy salamander also inhabit the forest floor of deciduous forests. Common reptiles include eastern box turtle, northern ringneck snake, black rat snake, and northern copperhead.

Unique and important terrestrial habitats, such as caves, occur near the corridors. The TVA Natural Heritage database contains records of 215 caves within 3 miles of the existing transmission line ROWs. The closest cave records are approximately 0.25 mile from the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line in Marion County, Tennessee. All other known cave locations are greater than 0.5 mile from the ROWs.

Twelve heron colonies are reported within 3 miles of, but greater than 0.25 mile from, the subject ROWs. Except for seasonal aggregations of waterfowl along the Tennessee River, no other aggregations of migratory birds occur in the project area.

4.5.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, early-successional and forested habitat within the ROWs would be maintained at current proportions and thus would not result in changes to wildlife habitat. Methods used to manage vegetation along the ROW and maintain transmission infrastructure would be unchanged. Clearing of the ROWs for vegetation maintenance would continue to occur, and portions of the ROWs would be periodically disturbed by minor activities related to maintaining transmission infrastructure. Selection of the No Action Alternative would not result in adverse direct, indirect, or cumulative impacts to terrestrial animals.

Action Alternative
Adoption of the Action Alternative would not require new clearing of forest, although areas of vegetation within some ROWs may need to be recleared to facilitate maintenance activities. Some ROWs likely have undergone secondary succession, resulting in establishment of young trees. The removal of the taller vegetation within these areas may temporarily displace larger animals. Some smaller animals occupying the areas, such as mice, shrews, frogs, and salamanders, also may move into adjacent areas during upgrading and maintenance activities. Following the upgrading and reestablishing maintenance activities of any sites, wildlife favoring edge and early successional habitats would reoccupy these areas.

There are records of 215 caves and 12 heron colonies within 3 miles of the ROWs. However, because caves and heronries are greater than 0.25 mile from the ROWs, adoption of the Action Alternative would not result in adverse impacts to these resources. TVA biologists would perform field surveys to confirm these findings prior to reclearing the ROWs for the 500-kV lines and upgrading the transmission lines currently in service. If previously undocumented resources are identified within these ROWs during the surveys, appropriate protective buffers would be placed around those resources. Most work would be restricted to areas immediately surrounding existing ROWs. Because known terrestrial animal resources within the ROWs are regionally abundant and protective measures would be taken to protect newly discovered sensitive resources, selection of the Action Alternative would not result in adverse direct, indirect, or cumulative impacts to terrestrial animals.

4.6. Endangered and Threatened Species

In accordance with Section 7 of the ESA, TVA has prepared a BA of potential effects to federally listed animals and plants from proposed completion/construction and operation of a nuclear plant at the BLN site, including the proposed transmission system improvements (TVA 2009d). Fifty-two plants and animals federally listed as endangered, threatened, candidate for listing, or protected under the Bald and Golden Eagle Protection Act potentially occur in potentially affected areas. Results of the analysis prepared for the BA indicate proposed actions along transmission lines are not likely to adversely affect any federally listed species or adversely modify critical habitat. TVA received concurrence with these determinations from the USFWS in a letter dated December 7, 2009 (See Appendix H).

4.6.1. Aquatic Animals

4.6.1.1. Affected Environment

As described in Section 4.1 of this document, the project areas of the proposed transmission line improvements drain to the Tennessee River and its tributaries at the following locations: (1) Guntersville and Wheeler Reservoirs (Jackson, Limestone, and Morgan counties in Alabama); (2) at Nickajack and Chickamauga Reservoirs in southeast Tennessee (Hamilton, Marion, and Sequatchie counties) and northwest Georgia (Catoosa, Dade, and Walker counties); and (3) upstream and downstream of Normandy Dam on the Duck River in central Tennessee (Bedford and Coffee counties).

Federally listed aquatic species known to be present in streams in counties in the areas crossed by one or more of these transmission lines are listed in Table 4-2. State-listed animal species are provided in Appendix O, Table O-1.

Table 4-2. Federally Listed Aquatic Animal Species Present in Counties Affected by Proposed Transmission Line Upgrades

Common Name	Scientific Name	Federal Status
Snails		
Anthony's river snail*#	*Athearnia anthonyi*	LE
Armored snail	*Pyrgulopsis pachyta*	LE
Owen spring limnephilid caddisfly	*Glyphopsyche sequatchie*	C
Royal marstonia	*Pyrgulopsis ogmorhaphe*	LE
Slabside pearlymussel	*Lexingtonia dolabelloides*	C
Slender campeloma*	*Campeloma decampi*	LE
Mussels		
Alabama lampmussel#	*Lampsilis virescens*	LE
Alabama moccasinshell	*Medionidus acutissimus*	LT
Birdwing pearlymussel	*Lemiox rimosus*	LE
Cracking pearlymussel	*Hemistena lata*	LE
Cumberland bean	*Villosa trabalis*	LE
Cumberland combshell	*Epioblasma brevidens*	LE
Cumberland monkeyface	*Quadrula intermedia*	LE
Cumberland pigtoe	*Pleurobema gibberum*	LE
Dromedary pearlymussel	*Dromus dromas*	LE
Fine-lined Pocketbook	*Lampsilis altilis*	LT
Fine-rayed Pigtoe#	*Fusconaia cuneolus*	LE
Fluted kidneyshell	*Ptychobranchus subtentum*	C
Orange-foot Pimpleback	*Plethobasus cooperianus*	LE
Pale lilliput#	*Toxolasma cylindrellus*	LE
Pink mucket*#	*Lampsilis abrupta*	LE
Ring pink	*Obovaria retusa*	LE
Rough pigtoe*	*Pleurobema plenum*	LE
Sheepnose	*Plethobasus cyphyus*	C
Shiny pigtoe pearlymussel#	*Fusconaia cor*	LE
Slabside pearlymussel*	*Lexingtonia dolabelloides*	C
Southern pigtoe	*Pleurobema georgianum*	LE
Spectaclecase	*Cumberlandia monodonta*	C
Tan riffleshell	*Epioblasma florentina walkeri*	LE
Tuberculed blossom pearlymussel	*Epioblasma torulosa torulosa*	LE
Turgid blossom pearlymussel	*Epioblasma turgidula*	LE
Fish		
Boulder darter	*Etheostoma wapiti*	LE
Palezone shiner#	*Notropis albizonatus*	LE
Slackwater darter	*Etheostoma boschungi*	LT

Common Name	Scientific Name	Federal Status
Snail darter	*Percina tanasi*	LT
Spotfin chub	*Cyprinella monacha*	LT
Yellowfin madtom	*Noturus flavipinnis*	LT

Species that are known to occur in watersheds directly affected by construction activities are indicated by (*).

Species reported from Jackson County, Alabama are indicated by (#)

Status Codes: LE = Listed endangered; LT = Listed threatened; C = Candidate for Federal Listing

4.6.1.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, because the proposed project is on existing ROW, no impacts to federally listed or state-listed aquatic organisms would result from transmission infrastructure upgrades or ongoing routine maintenance that would continue.

Action Alternative
The currently inactive 500-kV transmission lines would be reenergized as described in Section 2.6, and routine vegetation and access maintenance would be reestablished for their ROWs. The other transmission lines that would be upgraded are already in service. These lines undergo environmental review as part of TVA's vegetation maintenance program. Because these transmission lines are already in service and being maintained, upgrades associated with operation of a single unit at BLN would have no additional effects above those presently seen on these transmission ROWs.

Routine maintenance of access roads and transmission facilities can potentially expose soil and increase erosion that could lead to adverse impacts to water quality, thereby affecting aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts. TVA routinely includes precautions in maintenance of its transmission line projects to minimize these potential impacts (Muncy 1999).

ROW maintenance would employ manual and low-impact methods within SMZs wherever possible (see Appendix N). In areas requiring chemical treatment, only EPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable impacts to aquatic life impacts. Broadcast aerial application of herbicides adjacent to streams containing federally listed species would be prohibited.

Existing data indicate that no important aquatic species would be affected by reestablishing maintenance of the 500-kV lines or upgrading the other transmission lines currently in service. Field reviews will be conducted prior to vegetation clearing or line upgrade activities to confirm these findings. If habitats for any federally or state-listed animal species occur, measures to avoid and/or minimize impacts would be taken such that no significant impacts to sensitive aquatic species or their habitats occur. With the proper implementation of these controls no direct, indirect, or cumulative impacts on federally or state-listed aquatic species or their habitats are anticipated.

4.6.2. Plants

4.6.2.1. Affected Environment

Review of the TVA Natural Heritage database (queried September 2009) indicates that 12 occurrences of nine state-listed species and one occurrence of one federally listed species have been documented within the transmission ROWs subject to proposed upgrades (see Table 4.3 and Appendix O, Table O-2). Additionally, five federally listed, one candidate for federal listing, and 108 state-listed plant species occur within 5 miles of the proposed transmission line upgrades. Five other federally listed and one other candidate for federal listing are known from counties where the transmission line upgrades would occur, but are greater than 5 miles away from the ROWs. No designated Critical Habitat for plant species occurs in the project area.

Table 4-3. Federally Listed Terrestrial Plant Species Known Within and Near (Within 5 Miles) the ROWs Subject to Upgrades/Actions and From the Counties Where Work Would Occur

Common Name	Scientific Name	Federal Status
Price's potato-bean	*Apios priceana*	THR
American Hart's-tongue fern[2]	*Asplenium scolopendrium* var. *americanum*	THR
Morefield's leather-flower[2]	*Clematis morefieldii*	END
Leafy prairie-clover[2]	*Dalea foliosa*	END
Small whorled pogonia	*Isotria medeoloides*	THR
Fleshy-fruit gladecress[2]	*Leavenworthia crassa*	C
Mohr's Barbara's Buttons	*Marshallia mohrii*	THR
Monkey-face orchid	*Platanthera integrilabia*	C
Green pitcher plant[2]	*Sarracenia oreophila*	END
Large-flowered skullcap[1]	*Scutellaria montana*	THR
Chaffseed[2]	*Schwalbea americana*	END
Virginia spiraea	*Spiraea virginiana*	THR

Status codes: C = Candidate; END = Endangered; THR = Threatened.

[1]Federally listed plant species documented from the ROWs where work would occur.

[2]Federally listed species occurring within the county where work would occur, but not within 5 miles of the project area.

The federally listed large-flowered skullcap has been documented from the ROW of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line and the surrounding forests. According to the TVA Natural Heritage database, the most recent survey of the site was a 2002 visit when one individual plant was observed in the transmission line ROW. The large-flowered skullcap plant documented from the ROW is likely an aberrant and ephemeral individual; it is widely accepted that the preferred habitat for the species is forest (NatureServe 2009; USFWS 2002; Bridges1984). The state-listed rose-gentian and fame-flower have also been observed along the Sequoyah-Widows Creek 500-kV ROW. Two separate occurrences of rose-gentian have been documented along the transmission line. The species preference for open areas suggests that more occurrences of the species likely occur along the ROW, which provides one of the largest sources of consistently open habitat in that section of the Cumberland Plateau. Rose-gentian is endemic to the Cumberland Plateau and adjacent foothills of the Ridge and Valley physiographic province and is considered rare and imperiled across its range (NatureServe 2009).

During a 2008 botanical survey of the Widows Creek-Oglethorpe #2 and #3 161-kV (ID: 4 and ID: 5) transmission line ROWs, TVA botanists observed multiple, previously unreported occurrences of state-listed species. Yellow giant-hyssop (two occurrences), dwarf larkspur, Dutchman's breeches, American columbo, Barrens St. Johnswort, and Eggleston's violet were all observed in portions of the ROW underlain by limestone-derived soils. With exception of Dutchman's breeches, which was found in a spanned section of ROW with a forest overstory, all species occurred in open parts of the ROW dominated by herbaceous species. Between 500 and 1000 Small's stonecrop were estimated to occur in an area of exposed sandstone along the ROW. All occurrences of state-listed species observed along the Widows Creek-Oglethorpe #2 and #3 161-kV transmission lines appeared healthy and viable, and all have been exposed to periodic vegetation clearing associated with ROW maintenance.

One population of fame-flower was also observed along the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line ROW. This occurrence contained about 100 plants and was last observed in 2004.

Habitat for the majority of the species listed in Table 4-3 and Appendix O (Table O-2) potentially occurs in the subject transmission line ROWs. Rare plant species that inhabit forested areas may occur in the spanned sections of ROW where woody vegetation has not been removed and species capable of occupying open areas with higher light conditions could inhabit multiple locations along the ROW. TVA botanists would perform appropriately timed field surveys for federally and state-listed plant species along the affected ROWs before any upgrading or maintenance activities begin.

4.6.2.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the existing transmission lines would not be reenergized or upgraded, and methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged. Aerial application of herbicide would continue to be prohibited in areas where federally listed and state-listed species occur or potentially occur in existing ROWs. Known locations of rare plants would also continue to be avoided during routine maintenance of transmission infrastructure. Therefore, adoption of the No Action Alternative would have no significant impacts on endangered, threatened, and rare plant species.

Action Alternative

Under the Action Alternative, the proposed upgrades to the transmission lines would require some level of vegetation disturbance on existing ROWs. Federally listed and state-listed species have been previously documented along small portions of these ROWs. It is reasonably likely that additional listed species would be identified in the project area during the appropriately timed botanical surveys that would be conducted prior to any ground-disturbing work. During these surveys, all sites where species have been previously reported would be resurveyed to determine if the rare species are still present and the full extent of the plants in the ROW. If, after botanical surveys, rare plants are identified in the project area, the following mitigation measures would be used to reduce or eliminate impacts to the species:

- Areas with federally listed plant species would be included in the transmission line and access road engineering design specification drawings used during the planning and implementation of the upgrades. TVA botanists would help fence these areas to ensure construction crews would avoid the sites. Depending on the species present,

construction may be timed so work takes place during the dormant season when plants are less likely to be harmed by construction. Any new structures would be placed to avoid impacting these areas. Additionally, access roads and the associated vehicle traffic would be excluded from these areas.

- Areas where state-listed species occur in the project area would be avoided unless there is no practical alternative. Avoidance measures would be comparable to those used for federally listed plants.

Any federally listed or state-listed plant species observed during field surveys most likely occupy either relatively undisturbed, spanned portions of ROW where woody vegetation has not been cleared, or areas where vegetation is maintained regularly to ensure that woody species do not interfere with the transmission lines. The proposed actions would not require clearing in areas that are currently spanned. Thus, with the implementation of the above mitigation measures, the habitat where listed species occur would not be appreciably different under the Action Alternative. Therefore, the proposed actions under the Action Alternative are not likely to adversely affect federally listed species and would not significantly impact state-listed species.

4.6.3. Wildlife

4.6.3.1. Affected Environment

The TVA Natural Heritage database indicated that three federally listed terrestrial animal species (gray bat, Indiana bat, red-cockaded woodpecker), one federally protected bird (bald eagle), and 14 state-listed terrestrial animal species have been reported within 3 miles of the subject ROWs (Table 4-4 and Appendix O, Table O-3). Populations of six uncommon species tracked by the Alabama or Tennessee Natural Heritage Programs were also reported (Table 4-5). No designated Critical Habitat for terrestrial animals occurs within the ROWs of the subject transmission lines.

Table 4-4. Federally Listed Terrestrial Animals Reported From Jackson, Limestone, and Morgan Counties, Alabama; Dade, Catoosa, and Walker Counties, Georgia; and Bedford, Coffee, Hamilton, Marion, and Sequatchie Counties, Tennessee

Common Name	Scientific Name	Federal Status
Birds		
Bald eagle	*Haliaeetus leucocephalus*	-[1]
Red-cockaded woodpecker	*Picoides borealis*	LE
Mammals		
Gray bat	*Myotis grisescens*	LE
Indiana bat	*Myotis sodalis*	LE

Status abbreviation: LE = Listed Endangered

[1]Federally protected by the *Bald and Golden Eagle Protection Act*

Table 4-5. Number of Federally Listed or State-Listed Species of Terrestrial Animals, Caves, and Migratory Bird Aggregations Within 3 Miles of Each Transmission Line Associated With the Action Alternative

Transmission Line Identification Number	Number of Federal Species[1]	Number of State Species (Tracked Species[2])	Number of Caves Within 3 Miles	Number of Migratory Bird Aggregations Within 3 Miles
1	2	3 (1)	10	0
10	0	1 (1)	6	0
11	0	0 (0)	0	0
4, 5	2	4 (2)	39	2
3	3	7 (3)	27	3
7	2	0 (1)	115	2
2	3	8 (3)	16	10
9	1	3 (0)	11	3
6, 8	1	0 (2)	69	1

[1]Includes federally protected species (i.e., bald eagle)

[2]Species tracked by Alabama, Georgia, or Tennessee State Natural Heritage Programs

Gray bats roost in caves year-round and typically forage over streams, rivers, and reservoirs. Foraging habitat exists along the Tennessee River and associated riparian corridors throughout the project area. Numerous populations of gray bats exist throughout the region. The closest known occurrence of gray bats is approximately 0.25 mile from the Widows Creek-Raccoon Mountain #2 161-kv (ID: 3) transmission line. A second population is reported 0.5 mile from the Wartrace-N. Tullahoma Tap 161-kV (ID: 1) transmission line. Numerous caves occur in the vicinity of the existing transmission line corridors and offer potential gray bat roosting habitat (Table 4-5). However, gray bats have not been reported from these caves.

Indiana bats roost in caves during the winter and typically roost under the bark of dead or dying trees during the summer (Menzel et al. 2001). Optimal summer roosts occur in forests with an open understory and available roost trees, usually near water (Romme et al. 1995). Indiana bats forage primarily in forested habitats. The closest record of Indiana bats occurs in a cave approximately 1.1 mile from Sequoyah-Widows Creek 500-kV (ID: 2) transmission line. Although no other records of Indiana bats occur in the project area, other caves may provide suitable hibernacula[8], and mature forested habitat in the area provides suitable summer habitat for this species.

Habitat for red-cockaded woodpecker consists of open, mature pine woodlands, and rarely deciduous or mixed pine-hardwoods located near pine woodlands. Optimal habitat is characterized as a broad savanna with a scattered canopy of large pines and a dense groundcover containing a diversity of grass, forb, and shrub species, historically maintained by fire. Nesting and roosting occur in tree cavities (USFWS 1980). Historical records for red-cockaded woodpecker exist in Walker County, Georgia, approximately 1.8 miles from the Widows Creek-Oglethorpe #3 161-kV (ID: 5) transmission line. Suitable habitat does not exist within the transmission line ROWs. The species is thought to be extirpated from Walker County, and does not exist in the ROWs.

Bald eagles were removed from the endangered species list in June 2007, but are still protected by *Migratory Bird Treaty Act* and the *Bald and Golden Eagle Protection Act*. This species

[8] Hibernacula are places, e.g., caves or other protected areas, where bats hibernate during the winter.

typically nests near large bodies of waters including lakes, rivers, and riparian wetlands. Bald eagles are fairly common within the region, especially near the Tennessee River. Bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. The closest active bald eagle nest is located at Raccoon Mountain Pumped Storage Facility, less than 0.12 mile from a transmission line ROW. Nesting and foraging habitat exists near (less than 0.5 mile) portions of the existing ROWs.

Barking tree frogs occur in wetlands, and a population is known from New Hope, Tennessee. This record is approximately 2 miles northwest of the closest associated transmission line ROW for Sequoyah-Widows Creek 500-kV (ID: 2) transmission line. Emergent wetlands within the ROW may offer moderately suitable habitat for this species.

Green salamanders primarily inhabit shaded rock outcrops in moist forests between 500 and 1,300 meters in elevation. Breeding females require cool, clean, and moist horizontal crevices or narrow chambers in which to suspend their eggs from an overhead substrate (NatureServe 2009). This habitat is abundant along the numerous stretches of escarpment along the Cumberland Plateau and Sand and Lookout mountains in the area. Records for green salamander exist within 3 miles of five different transmission lines: Widows Creek-Raccoon Mountain #2 161-kV (ID: 3); Widows Creek-Oglethorpe #2 161-kV (ID: 4); Widows Creek-Oglethorpe #3 161-kV (ID: 5); Widows Creek-Bellefonte #2 500-kV (ID: 8); and Bellefonte-East Point 500-kV (ID: 9).

Hellbenders inhabit medium-sized to large free-flowing streams in the Tennessee and Cumberland River drainages. Inhabited streams possess large rocks or logs that provide shelter and breeding sites. Records for hellbender are located in Morgan County, Alabama, and Bedford and Marion counties, Tennessee. Limited suitable habitat exists within the project area.

Tennessee cave salamanders occur in caves with streams free of sedimentation (Cooper 1968). One known locality exists approximately 0.5 mile away from the closest transmission line, the Wartrace-N. Tullahoma Tap 161-kV (ID: 1). There also are historical records of this salamander from Nickajack Cave before it was flooded by Nickajack Reservoir. Suitable habitat still exists in portions of Nickajack Cave beyond the influence of the reservoir. Suitable habitat for this species does not exist within the power line corridors.

Bachman's sparrows inhabit early successional, old field habitat that contains a high density of grasses and forbs, scattered trees and shrubs with an open understory (Dunning and Watts 1990). Although this species uses the beginning stages of early successional habitat, this habitat only remains suitable for a short time. The species may temporarily use early successional habitats along the existing transmission line ROWs within the project area as they are periodically cleared.

Cerulean warblers have been reported from Marion County, Tennessee, within 3 miles of the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line. The species occurs largely in contiguous, mature deciduous forests, particularly along floodplains or along moist ridge tops. Mature forest adjacent to existing ROWs within the project area may provide habitat for this species. With the possible exception of the forested portions of ROWs on steep hillsides, suitable habitat for this species does not exist within project ROWs.

Ospreys typically nest along rivers, lakes, and reservoirs. The species nests in trees or on man-made structures (i.e., transmission towers, channel markers, bridges, mooring cells) within or

over water (NatureServe 2009). Ospreys nest throughout the study area, primarily along the Tennessee River.

Peregrine falcons have been reported from the ROWs of the subject transmission lines area. The species typically nests on exposed cliffs in undisturbed areas, near water, and close to plentiful prey (Burleigh 1958). Suitable habitat for peregrine falcons exists along exposed escarpment on Sand, Lookout, and Cumberland mountains.

The subject ROWs are located within the northern edge of the breeding range of Swainson's warbler, a neotropical songbird. Breeding habitat for this species ranges from deciduous floodplain and swamp forests to moist lower slopes of mountain ravines at elevations to 900 meters. Swainson's warblers typically require areas with deep shade from both canopy and understory cover (NatureServe 2009). The species has been reported along Lookout Creek, near Chattanooga, Tennessee. Suitable habitat for this species within the existing ROWs is unlikely.

Allegheny woodrats occur in rocky bluffs, caves, and other rocky habitats (Whitaker and Hamilton 1998). Numerous caves and small rock outcrops within the project area provide suitable habitat for this species.

Common shrews occupy most terrestrial habitats excluding areas with very little or no vegetation. Thick leaf litter in damp forests may represent favored habitat, although this species appears adaptable to major successional disturbances. Suitable habitat is abundant both within the project area and throughout the region.

Eastern big-eared bats roost in caves, abandoned buildings, or in hollow trees. The species has been reported from a cave in Marion County, Tennessee, that is greater than 1 mile from a ROW. Other caves in the project area offer suitable habitat for big-eared bats.

Eastern small-footed bats roost in rock crevices, caves, bridges, and other rocky habitats. The species has been reported from Nickajack Cave in Marion, Tennessee. Although no other records of eastern small-footed bats occur in the project area, caves in the project area provide suitable habitat for the species.

4.6.3.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, no impacts to federally listed or state-listed terrestrial animal species would occur as a result of the proposed transmission infrastructure upgrades. Under this alternative, the existing transmission lines would not be upgraded, and the methods used to manage vegetation along the ROW and maintain transmission infrastructure would be unchanged. Routine maintenance would continue.

Action Alternative
Under the Action Alternative, the proposed upgrades to the transmission lines would require some level of disturbance on existing ROWs. Federally listed and state-listed species and their habitat have been previously documented near some ROWs. Listed terrestrial animal species could be identified in the project area during field surveys associated with future maintenance and upgrading activities. If listed terrestrial animals or their associated habitat are observed in the existing ROWs, the following mitigation measures would be used to reduce or eliminate impacts to listed species:

- Depending on the species present, timing restrictions on construction may be implemented. For example, work may be timed to take place outside of the breeding season (such as for nesting bald eagles or ospreys) when species are less likely disturbed by the activity.

- Buffers may be placed around suitable habitat restricting clearing activities within a protective radius (e.g., a 200-foot radius around cave openings, hand clearing only).

The proposed project would not require clearing in areas that are currently spanned. Any listed terrestrial animal species identified within these forested ROWs would not be impacted. With implementation of the above mitigation measures, the habitat where listed species occur would not be appreciably different after upgrading takes place. Therefore, the proposed actions under the Action Alternative are not likely to adversely affect federally or state-listed species.

Prior to energizing the transmission lines associated with BLN, TVA will investigate presence of osprey nests on substation and transmission line structures in the BLN project area. Should nests exist, they would be removed to insure that ospreys are not harmed when the transmission lines are energized. Removal of these nests would be coordinated with the USFWS and/or the U.S. Department of Agriculture, Animal and Plant Health Information Service (APHIS). Removal would be conducted outside the breeding/nesting periods (March – July). Impacts to ospreys are considered insignificant given the abundance of nesting habitat around the BLN site.

4.7. Wetlands

4.7.1. Affected Environment

Wetland areas are likely located within the length of the transmission line corridors proposed to transmit power from the BLN site (Figure 2-15). These corridors cross a landscape dominated by agricultural fields and scattered residential, commercial, and industrial properties between prominent ridge lines, river valleys, associated tributaries, and wetland floodplain complexes. These corridors cross five large-scale watersheds (Guntersville Reservoir, Chickamauga Reservoir, Duck River, Sequatchie River, and Wheeler Reservoir) and 37 local watersheds, all within the Tennessee River Basin. The wetland areas located within these watersheds provide necessary wetland functions for flood abatement, sediment retention, pollutant absorption, and wildlife habitat. The transmission lines proposed for upgrade cross the following significant wetland floodplain complexes: Round Island Creek and associated tributaries, Poe Branch, Chickamauga Creek, Raccoon Creek, Glover Creek, Mud Creek, and Robinson Creek. Based on NWI Data, Soil Survey Geographic Data (USDA-NRCS 2009), USGS topographic maps, and aerial photography, a conservative estimate of 150 acres of potential wetland area occurs on the ROWs proposed for upgrade activities. Because of previous and ongoing ROW maintenance, the majority of wetland habitat within the transmission line corridor, previously mapped or unmapped, would be comprised of emergent or scrub-shrub habitat. Forested wetlands potentially occur along the edges of the ROWs.

Actual wetland acreage within the ROWs will be confirmed and delineated by field surveys prior to upgrades that have the potential to impact wetlands within the ROWs. Wetland delineations would be performed according to USACE standards (Environmental Laboratory 1987), which require documentation of hydrophytic (i.e., wet site) vegetation (USFWS 1996), hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997; U.S. Department of Defense and EPA 2003). Broader definitions of wetlands, such as provided in EO 11990 (Protection of Wetlands), Alabama state regulations, the USFWS (Cowardin et al. 1979), and the TVA

Environmental Review Procedures (TVA 1983b) would also be considered in making the delineations.

4.7.2. Environmental Consequences

Activities in wetlands are regulated under Sections 401 and 404 of the CWA and are addressed by EO 11990. In order to conduct specific activities in jurisdictional wetlands, authorization would be obtained under a Section 404 Permit from the USACE and under Section 401 from the respective state regulatory agency. In addition, proposed activities would comply with EO 11990, which 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 their responsibilities.

No Action Alternative

Under the No Action alternative, current ROW maintenance and operations of the subject transmission lines would continue. However, no alterations or improvements would be made to the existing transmission lines for the purpose of transmitting power generated from BLN. Therefore, no additional direct, indirect, or cumulative effects to wetlands would occur under this alternative.

Action Alternative

Under the Action Alternative, initial improvements to upgrade approximately 222 miles of existing transmission lines would take place. This would include some reestablishment of ROW vegetation management, filling associated with structure replacement, and vehicular access along the ROWs. Any improvement activities conducted within a wetland would be performed under specific wetland BMPs (TVA 1992) to minimize wetland impacts. This includes conducting work in dry conditions, use of low ground pressure equipment or ground mats, broadcast spray of herbicides approved for aquatic environments, installation of silt fence as needed, and reseeding disturbed areas with native wetland species. Ongoing maintenance would be conducted using similar BMPs and measures to protect wetlands and conserve wetland functions.

Prior to all proposed upgrade activities, TVA would conduct a ground survey to determine the exact extent of any wetland areas located within the corridors proposed for upgrade. Based on this review, specific measures may be implemented to ensure no significant impacts or loss of wetland function occurs as a result of the transmission line upgrade activities. These commitments would result in avoidance strategies, minimization measures, or mitigation should wetland functions be compromised. Mitigation would be provided if substantial quality and quantity of forested wetland would be cleared to accommodate a wider ROW, if fill is proposed for switching-station construction, or for any other activity that reduces the functional capacity of a specific wetland. BMPs would be in place for upgrade activities, and ground surveys would take place to identify wetland areas where avoidance, minimization, or mitigation measures would be required. Therefore, no significant impacts to potentially affected wetland areas within the ROWs are anticipated from the transmission line upgrades.

4.8. Floodplains

4.8.1. Affected Environment

The transmission line routes cross numerous 100-year floodplain areas in several counties in Alabama, Tennessee, and Georgia. The 161-kV and 500-kV switchyards existing on the BLN site are located on the Town Creek embayment side. With respect to Town Creek, the 100-year floodplain is the area lying below elevation 601.4 feet msl. The Flood Risk Profile (FRP)

elevation is 603.1 feet msl. The FRP is used to control flood damageable development for TVA projects, and residential and commercial development on TVA lands. At this location, the FRP elevation is equal to the 500-year flood elevation. The existing switchyards are located outside of the 100-year floodplain and above the FRP elevation.

4.8.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, the proposed switchyards and transmission lines would not be reenergized or upgraded. Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Therefore, no additional effects to floodplains are likely.

Action Alternative
Consistent with EO 11988, an overhead transmission line and related support structures are considered to be a repetitive action in the 100-year floodplain. Activities conducted within existing switchyards would occur outside the 100-year floodplain. If any new substations, switchyards, or other support facilities need to be constructed to support these transmission lines they would be evaluated prior to construction to ensure compliance with EO 11988. Therefore, any activities occurring in the substations would be consistent with EO 11988 and floodplains would not be affected.

4.9. Natural Areas

4.9.1. Affected Environment

A review of the TVA Natural Heritage database indicated that the transmission lines proposed for reenergizing or upgrading would cover 11 counties in three states, and the lines are within 3 miles of, or cross, 68 natural areas and three Nationwide Rivers Inventory (NRI) streams.

This section addresses natural areas that are crossed by, immediately adjacent to, or within 3 miles of BLN associated transmission line upgrades. Natural areas include managed areas, ecologically significant sites, and streams listed on the NRI.

- Managed areas include lands held in public ownership that are managed by an entity (e.g., TVA, U.S. Department of Agriculture Forest Service (USFS), State of Tennessee, Jackson County) to protect and maintain certain ecological and/or recreational features.
- Ecologically significant sites are either tracts of privately owned land that are recognized by resource biologists as having significant environmental resources or identified tracts on TVA lands that are ecologically significant but not specifically managed by TVA's Natural Areas Program.
- Streams listed on the NRI are free-flowing segments of rivers recognized by the National Park Service (NPS) as possessing remarkable natural or cultural values.

Nine managed areas and ecologically significant sites and two NRI-listed streams are crossed by the existing transmission lines proposed for upgrades associated with operation of a single nuclear unit at the BLN site and are described below. Two NRI-listed streams are within 3 miles of the proposed transmission line upgrades and are described below. The remaining 58 natural areas located within 3 miles of the proposed transmission line upgrades/actions are listed in Table 4-6 by transmission line ID number or grouping of transmission line ID numbers within nearest proximity.

Table 4-6. Natural Areas Within 3.0 Miles of the Transmission Lines Proposed for Reenergizing or Upgrade

Line ID Number	Natural Area	Steward	Distance from Line (miles)
10, 11	Mallard Fox Creek State Wildlife Management Area (WMA)	ADCNR	0.7 west
	Swan Creek State WMA	ADCNR	1.7 east
4, 5, 9	Bellefonte Island TVA Small Wild Area (SWA)	TVA	1.2 west
	Mud Creek State WMA	ADCNR	1.6 west
	Crow Creek Refuge State WMA	ADCNR	0.4 west
	Chickamauga and Chattanooga National Military Park	NPS	0.6 southeast and northeast
	Glades and Barrens of Chickamauga Battlefield	NPS	2.1 southeast
	Lulu Falls/Eagle Cliff Potential National Natural Landmark (PNNL)	NPS	0.57 south
6, 8	Neversink Pit PNNL	NPS	0.5 east
	Robinson Spring PNNL	NPS	1.1 west
	Section Bluff TVA SWA	TVA	2.6 south
	Tumbling Rock Cave PNNL	NPS	2.4 west
3	Bill McNabb Gulf	Ecologically significant site on Tennessee River Gorge Lands*	2.5 northwest
	Blowing Springs Branch. Chesnutt Bridge Protection Planning Site (PPS)	Ecologically significant site on Tennessee River Gorge Lands*	2.2 northwest
	Bluff Point /Hicks Mountain	Ecologically significant site on Tennessee River Gorge Lands*	0.62 north
	Cummings Lake	Ecologically significant site on Tennessee River Gorge Lands*	1.05 north
	Ellis Spring	Ecologically significant site on Tennessee River Gorge Lands*	2.1 north
	Hicks Gap Designated State Natural Area (SNA)	TDEC	1.1 west
	Huff Branch TVA Habitat Protection Area (HPA)	TVA	0.74 north
	Kelly's Ferry Slopes	Tennessee River Gorge Trust	1.06 west
	Lassiter Property	Tennessee River Gorge Trust	1.5 north
	Nickajack River State Mussel Sanctuary	TWRA	1.9 northwest
	Parker Gap Cove	Ecologically significant site on Tennessee River Gorge Lands*	2.6 north
	Piney Branch Bottomland	Ecologically significant site on Tennessee River Gorge Lands*	1.4 northwest
	Pot Point	Tennessee River Gorge Trust	1.1 north
	Renfro Property	Tennessee River Gorge Trust	0.4 north
	Shortleaf Pine Flat PPS	Ecologically significant site on USFS lands*	1.55 northwest

Line ID Number	Natural Area	Steward	Distance from Line (miles)
2	Chickamauga State WMA	TWRA	2.1 north
	Chigger Point TVA HPA	TVA	1.18 east
	Cumberland Trail State Park	Tennessee State Parks	3.0 east, 0.1 north
	Dry Creek Ravine	Ecologically significant site on Tennessee River Gorge Lands*	2.6 east
	Hamilton County Park	Hamilton County	2.3 south
	Harrison Bay State Recreation Park	TDEC	1.44 south
	Little Cedar Mountain TVA SWA/HPA	TVA	1.14 east
	Marion Bridge TVA HPA	TVA	1.9 west
	Marion County Park	Marion County	1.4 southeast
	Mile 434 Oaks	Ecologically significant site on Tennessee River Gorge Lands*	2.7 east
	Montlake/Walden Ridge PNNL	NPS	0.2 northeast
	Nickajack Cave TVA HPA	TVA	0.1 east
	Nickajack Cave State Wildlife Observation Area (WOA)	TVA/TWRA	0.1 east
	Nickajack Oak Wetland and TVA HPA	TVA	0.1 west
	North Chickamauga Creek Pocket Wilderness	Bowaters Paper Company Southern	0.2 north
	Prentice Cooper State Forest	USFS	0.8 east
	Pryor Property	Tennessee River Gorge Trust	1.2 east
	Sequatchie Cave Designated SNA	TDEC	2.5 west
	Shellmound Road Bluff TVA HPA	TVA	1.7 south
	Smith Property	Tennessee River Gorge Trust	0.6 east
	Soddy Creek and TVA HPA	TVA	1.8 north
	Tennessee River Blueway	TVA	0.3 east
	Ware Branch Bend TVA HPA	TVA	2.4 north
	University of Tennessee Friendship Forest	University of Tennessee Forestry Experiment Station	1.4 east
1	Normandy State WMA	TWRA	0.4 northeast
	Bedford State Fishing Lake	TWRA	1.4 northeast
	Rutledge Falls	Tennessee River Gorge Trust	2.4 east
	Short Springs Designated SNA	TDEC	0.5 south
	Short Springs TVA SWA	TVA	0.65 southeast
	Yell Cave	Ecologically significant site on private land*	0.36 northeast

*ESS sites occur on the lands identified but are not managed by these entities.

Guntersville Reservoir State Mussel Sanctuary is crossed by a segment of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line at the section of the reservoir located in Marion County, Tennessee. The mussel sanctuary extends from the section of the Tennessee River from Nickajack Dam (TRM 424.7) downstream to the Tennessee-Alabama state line (TRM 416.5) and is designated as a sanctuary in which the taking of aquatic mollusks by any means,

and/or the destruction of their habitat is prohibited at all times. This mussel sanctuary is managed by the Tennessee Wildlife Resources Agency (TWRA) Region III office.

Coon Gulf TVA Small Wild Area (SWA) is located in Jackson County, Alabama, approximately 1.0 mile northeast of BLN property boundary and is crossed by a segment of the Bellefonte-East Point 500-kV (ID: 9) transmission line. Coon Gulf SWA comprises approximately 2,366 acres managed by TVA and features a forested cove on Guntersville Reservoir. Coon Gulf provides habitat for federally listed and state-listed endangered species.

Raccoon Creek State Wildlife Management Area (WMA) is located in Jackson County, Alabama, approximately 3.0 miles northeast of BLN property boundary and is crossed by a segment of the Bellefonte-East Point 500-kV (ID: 9) transmission line. Raccoon Creek WMA comprises approximately 7,080 acres managed by ADCNR Division of Wildlife and Freshwater Fisheries for waterfowl and small game hunting.

Crow Creek State WMA is located in Jackson County, Alabama, approximately 1.8 miles north of Cedar Grove and is crossed by a segment of the Widows Creek-Bellefonte #1 500-kV (ID: 6) transmission line. Crow Creek WMA comprises 2,161 acres managed by ADCNR Division of Wildlife and Freshwater Fisheries for waterfowl and small game hunting.

Raccoon Mountain Pumped Storage State Wildlife Observation Area (WOA) is located in Marion County, Tennessee, approximately 3.0 miles west of Chattanooga and is crossed by a segment of the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line. Raccoon Mountain WOA comprises approximately 860 acres managed by TVA in cooperation with TWRA. This large pumped-storage lake on top of Raccoon Mountain is surrounded by mature forests and open areas and provides habitat for many bird species, including wintering bald eagles, hawks, falcons, common loons, and vultures.

Tennessee River Gorge is located in Marion and Hamilton counties, Tennessee, approximately 5.0 miles west of Chattanooga. The southern edge of the Tennessee River Gorge boundary is crossed by a segment of the Widows Creek-Raccoon Mountain #2 161-kV (ID: 3) transmission line. The protected area of the Tennessee River Gorge comprises 16,777 acres of the total 27,000-acre gorge. This gorge is the fourth largest canyon in the eastern United States. This ecologically significant site is managed by The Tennessee River Gorge Trust and has an unusually concentrated diversity of land forms and provides habitat for several varieties of plants, ferns, trees, grasses, and flowers, as well as a rich wildlife population. There are federally listed plant and animal species located throughout the gorge.

Grant Property is located in Marion County, Tennessee, approximately 5.0 miles southwest of Chattanooga within the boundary of the Tennessee River Gorge. The southern edge of the Grant Property is crossed by a segment of the Widows Creek-Raccoon Mountain #2 (ID: 3) transmission line. This area is owned in fee by the Tennessee River Gorge Trust in cooperation with the University of Tennessee-Chattanooga for research purposes. The Grant Property comprises approximately 888 acres and contains wooded slopes, mixed mesophytic forest and cove hardwood forest, with land forms characterized by karst topography exhibiting numerous sinkholes and caves. There are federally listed plant and animal species located on the property.

North Chickamauga Creek Gorge and Designated State Natural Area is located in Hamilton County, Tennessee, approximately 7.0 miles west of SQN and is crossed by the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line. The North Chickamauga Creek Gorge consists

of approximately 39,000 acres, and the Designated State Natural Area comprises approximately 3,700 acres of the total acreage. This area is managed by the Tennessee Department of Environment and Conservation (TDEC) in cooperation with the North Chickamauga Creek Conservancy, and includes a rugged steep gorge cut by Chickamauga Creek into a sandstone plateau. River-side shoals and stream bars provide habitat for several listed plants.

Duck River State Mussel Sanctuary is located in Bedford and Coffee counties, Tennessee, and is crossed by the Wartrace-N. Tullahoma tap (ID: 1) at the section of Normandy Reservoir Reservation. The mussel sanctuary, managed by TWRA, extends from Kettle Mills Dam (Duck River Mile 105.6) upstream to the headwaters of the Duck River, including the section impounded by Normandy Dam

The Sequatchie River, an NRI-listed stream, is located in Marion and Sequatchie counties, Tennessee. The Sequatchie River Mile (SRM) 0, its confluence with Tennessee River, to SRM 109 in its headwaters approximately 10 miles south of Homestead is the segment listed on the NRI. This segment is crossed at six locations by the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line proposed for upgrades associated with BLN site operations. The NPS recognizes this 109-mile segment for its scenic, recreational, geologic, fish, and wildlife values, and it is noted as a clean, pastoral float stream that flows through a narrow scenic valley. The first crossing point of the river north of the BLN site is located approximately 0.4 miles north of the town of Ebenezer and west of State Route 27. The second stream crossing occurs 2.07 miles east of Nickletown and west of State Route 27. The third stream crossing occurs at 1.8 miles northeast of Nickletown and west of State Route 27. The fourth, fifth, and sixth stream crossings occur north of the town of Oak Grove at 0.4 mile, 0.8 mile, and 1.6 miles, respectively.

The segment of the North Chickamauga River located in Hamilton and Sequatchie counties, Tennessee, from SRM 13 (its confluence with Falling Water Creek southeast of Falling Water) to SRM 31 (the headwaters north of Lone Oak) is listed on the NRI. This river is crossed at two locations by the existing Sequoyah-Widows Creek 500-kV (ID: 2) transmission line proposed for upgrades associated with BLN site operations. The NPS recognizes this 18-mile segment for its scenic, recreational, geologic, fish, wildlife, historical, and cultural values, and it is noted as a spring-fed, crystal clear mountain stream featuring a variety of flora and an abundance of wildlife. The first crossing point of the river north of the BLN site is located approximately 3.7 miles north of the town of Fairmont on the Sequatchie and Hamilton county line. The second stream crossing occurs approximately 0.5 mile northeast of the town of Mile Straight at Dayton Pike Road.

Little Sequatchie River, located in Marion County, Tennessee, is designated as an NRI-listed stream from river mile 0, at the confluence with the Sequatchie River, to river mile 25 near the headwaters west of Palmer. This stream is located approximately 1.2 miles west of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line proposed for upgrades associated with BLN site operations. The NPS recognizes this 25-mile segment for its scenic, recreational, fish, and wildlife values, and it is noted as a scenic stream that supports game fishery.

4.9.2. Environmental Consequences

No Action Alternative

Under the No Action Alternative, no alterations or improvements would be made to existing facilities for the purpose of nuclear power generation including associated upgrades of transmission lines. Methods used to manage vegetation along the ROWs and maintain

transmission infrastructure would be unchanged, and routine maintenance would continue. Therefore, there would be no additional effects to natural areas under this alternative.

Action Alternative
Nine natural areas and two NRI streams crossed by the transmission lines would be directly affected by disturbance of vegetation within the area and at stream crossings from heavy equipment associated with the upgrades. Activities necessary to upgrade transmission lines are short term and occur on existing ROW with no new clearing beyond the ROW. BMPs and other routine measures would be implemented to mitigate impacts. Managers of the natural areas crossed by the transmission lines would be notified prior to beginning proposed work. Because the proposed work is confined to existing ROW and because appropriate BMPs would be implemented, direct impacts to natural areas crossed by the transmission lines would be minor. The other natural areas listed in Table 4-6 would not be directly or indirectly affected. Impacts associated with implementation of this alternative would not result in cumulative adverse impacts to natural areas.

4.10. Recreation

4.10.1. Affected Environment

Some low-density dispersed recreation activity such as hunting or wildlife observation may currently take place within these existing transmission line corridors. Two developed recreation areas occur adjacent to the transmission line corridors. A segment of the Sequoyah-Widows Creek 500-kV (ID: 2) transmission line crosses Nickajack Dam Reservation and passes within a few hundred feet of a boat ramp and fishing berm on the right bank and a fishing pier on the left bank below the dam. The Wartrace-N. Tullahoma 161-kV (ID: 1) transmission line crosses Normandy Dam Reservation and passes within 200 feet of Duck River access facilities maintained by TVA as part of the reservation.

4.10.2. Environmental Consequences

No Action Alternative
Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Routine maintenance of these transmission lines and ROWs would have minor impacts on any informal recreation use or developed recreation within the area, and no mitigation would be required.

Action Alternative
Minor impacts on informal and developed recreation could occur during routine maintenance of lines and ROWs, as described in the No Action Alternative. Actions related to upgrading these transmission lines and ROWs could have a minor affect on any informal recreation use that currently occurs. Because these lines already exist and do not directly cross over developed recreation facilities on Nickajack and Normandy Reservations, any impacts on developed recreation facilities should be minor. Further, any impacts on dispersed recreation should be negligible and no mitigation required.

4.11. Land Use

4.11.1. Affected Environment

The transmission lines that would be upgraded cross land with a wide variety of land uses: agriculture, residential, commercial, and forest.

4.11.2. Environmental Consequences

No Action Alternative
Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. However, no additional changes in land use would occur under the No Action Alternative.

Action Alternative
Some temporary disruption of some land uses particularly agriculture could occur during upgrade activities. TVA would appropriately compensate land owners for any damage including damage to growing crops. Under this alternative, upgrades to transmission lines in the existing ROWs would not change any existing land use.

4.12. Visual Resources

4.12.1. Affected Environment

The physical, biological, and man-made features seen in the landscape provide any selected geographic area with particular visual qualities and aesthetic character. The varied combinations of natural features and human alterations that shape landscape character also help define their scenic importance. The presence or absence of these features along with aesthetic attributes such as uniqueness, variety, pattern, vividness, and contrast make the visual resources of an area identifiable and distinct. The scenic value of these resources is based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures, and visual composition seen in each landscape.

The existing transmission line routes traverse a variety of topography through several counties in Alabama, Tennessee, and Georgia. The existing 161-kV and 500-kV switchyards are located on the BLN site. The existing transmission lines and associated structures can be seen in the foreground distance (within 0.5 mile of the observer), middleground distance (between 0.5 and 4 miles), and background distance (4 miles to the horizon) by area residents and motorists along local roads. In some areas, views of the transmission lines and structures provide discordant contrast when seen as a focal point and standing alone. In other areas, the line route is visually similar to other transmission structures seen in the landscape.

4.12.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, the existing switchyards and transmission line ROWs would not be upgraded. Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Thus, there would be no change in visual character, and visual resources would not be affected.

Action Alternative
Under the Action Alternative, the existing switchyards and transmission lines would be upgraded. For residents along Town Creek near BLN, upgrade of the existing switchyards and transmission lines would be visually insignificant. Views of the upgrades would be visually similar to existing views residents now have from foreground distances.

For residents, motorists, and lake-users along the existing line routes, most visual impacts would be temporary and minor. These groups would likely notice an increase in traffic and personnel along local roads and access roads. New conductors, structures, and height

extensions would add to the number of discordantly contrasting elements seen in the landscape. Visual impacts would likely decrease as viewing positions increase, in distance, from the transmission line upgrades. Details of views from background distances tend to merge into broader patterns and details become weak.

Upgrades to the transmission line route would require some limited reclearing of vegetation. These activities could include the use of heavy machinery and would increase the number of personnel seen in the area. These minor visual obtrusions would be temporary until the existing ROW and laydown areas have been restored through the use of TVA standard BMPs (Muncy 1999). Any nighttime lighting required would be temporary during the upgrade period and would be insignificant. There may be some minor visual discord during the upgrade period due to an increase in personnel and equipment and the use of laydown and materials storage areas. This would be temporary until all activities are complete.

4.13. Archaeological Resources and Historic Structures

4.13.1. Affected Environment

TVA's procedure for reviewing the operations and maintenance of transmission lines is called a Sensitive Area Review (SAR) (see Appendix D). Under this review procedure, all transmission line corridors, where routine operation and maintenance occur, are reviewed by TVA Cultural Resource staff for the potential to effect historic properties on or eligible for the National Register of Historic Places (NRHP). The regulatory guidance for the SAR concerning cultural resources is the same guidance for all cultural resource assessments: 36 CFR Part 800. Prior to conducting specific upgrades and other activities along the ROWs, TVA would determine the need for consultation with the respective State Historical Preservation Officer (SHPO) and, if needed, define an APE in coordination with the SHPO. That requirement would range from no investigations (area already surveyed) to resurvey (if past surveys were not deemed sufficient) to site avoidance, data recovery, or monitoring if a previously or newly identified cultural resource within the APE was determined eligible or potentially eligible for inclusion in the NRHP.

The archaeological record of the Tennessee River valley has documented five major prehistoric occupational periods that began with the Paleo-Indian (14,000 to 8000 B.C.); the Archaic (8000 to 900 B.C.); the Woodland (900 B.C to A.D. 1000); the Mississippian (A.D. 1000 to 1630); and Historic (1630 to present) periods. Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. European interactions with Native Americans in this area began in the 17th and 18th centuries. European settlements vary throughout the regions in this study, but in general, Euro-American settlement increased in the early 19th century as the Historic tribes were forced to give up their land. Sites belonging to each period are differently distributed in the landscape of Tennessee, Alabama, and Georgia, but generally, habitation sites are found on floodplains and alluvial terraces along rivers and tributaries, while specialized campsites tend to be found on older alluvial terraces and in the uplands.

For the proposed transmission line upgrades associated with construction of a single BLN unit, the archaeological APE is all lands upon which the existing transmission line would be upgraded and includes all associated infrastructure, including the transmission line ROW, access roads, and staging areas. The APE for architectural studies includes a 0.8-kilometer (0.5-mile) buffer surrounding the subject transmission line ROWs.

Based on available data of previously recorded cultural resources, 25 archaeological sites are located within the APE. One of these sites located in Alabama (1MG785) is no longer extant. Seven sites, all located in Alabama (1MG116, 1MG115, 1MG667, 1MG758, 1MG757, 1JA304, 1JA694), were previously determined not eligible for inclusion on the NRHP. Two sites, one in Alabama (1MG735) and one in Georgia (9WA164) have been previously determined potentially eligible for the NRHP. The remaining 15 sites in Alabama (1JA637, 1JA650, 1JA453, 1JA452, 1JA304, 1JA377, 1JA518, 1JA532, 1JA524, 1JA617, 1JA558) and Tennessee (40MI246, 40MI247, 40HA0089, 40MI248) have not been assessed for NRHP eligibility. In Alabama, one previously recorded historic district (the City of Bridgeport) falls within the architectural APE. A portion (8 percent, 2.5 miles) of one transmission line proposed for upgrading, the Widows Creek-Oglethorpe #3 161-kV (ID: 5), has been subjected to a systematic cultural resources survey (Cleveland et al. 1995). This cultural resource survey identified one NRHP-eligible historic archaeological site (9WA164), one eligible Historic District (Happy Valley Farms in Walker County, Georgia) and two eligible historic structures (WA-WA-114 and WA-WA-642).

4.13.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, the transmission line upgrades would not take place, and there would be no additional impacts to cultural resources from ongoing maintenance of existing transmission lines and ROWs.

Action Alternative
Portions of the transmission line ROWs proposed for upgrading are located in areas having a potential for archaeological resources. In addition, 17 previously recorded archaeological sites have been determined eligible or have not been assessed for eligibility for the NRHP. Under the Action Alternative, the upgrade of the existing transmission lines and the construction and/or use of associated infrastructure (e.g., access roads, laydown areas) have the potential to affect archaeological resources located within the APE that may be eligible for the NRHP. The placement of new structures or project-related clearing within the existing transmission line ROW could potentially have a visual effect on historic structures eligible for the NRHP.

In letters dated September 10, 2009, TVA initiated consultation with the Tennessee, Alabama, and Georgia SHPOs regarding the proposed transmission line upgrades. Should the Action Alternative be selected, pursuant to Section 106 of the NHPA and its implementing regulations at 36 CFR Part 800 TVA would conduct surveys to better identify and evaluate historic properties (archaeological sites, historic structures, and historic sites) eligible for listing in the NRHP. The cultural resources investigations would be guided by MOAs with Georgia SHPO (executed April 29, 2010) and Alabama SHPO (pending). Instead of an entering into an MOA, the Tennessee SHPO has requested that TVA follow procedures to conduct a phased identification and evaluation of historic properties pursuant to 36 CFR Part 800.4(b)(2).

4.14. Socioeconomics

Socioeconomics is the combination of social and economic factors related to the proposed action. Socioeconomic impacts may be positive, such as increased income, or negative, such as traffic congestion or temporary increases in demand for medical services.

4.14.1. Affected Environment

The transmission lines proposed for upgrades associated with operations of the BLN site would cover 11 counties in three states, as shown in Figure 2-15.

4.14.2. Environmental Consequences

No Action Alternative
Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. Selection of the No Action Alternative would not affect local socioeconomic conditions because there would be essentially no change in current conditions.

Action Alternative
The actions required to reenergize the existing 500-kV lines and switchyard are discussed in the CLWR FEIS (DOE 1999), Subsection 5.2.3.9.1; the Conversion FEIS (TVA 1997); Subsection 4.2.18.2; and the COLA ER (TVA 2008a), Subsection 3.7.2.2. The transmission upgrades and refurbishments would be a small piece of the total construction effort for BLN, accounting for only a small share of expenditures and employment. In addition, as discussed in Subsection 2.6.2, these activities would be confined to the existing transmission line ROWs. Therefore, these impacts are considered to be minor.

Post-construction effects of reenergizing the 500-kV line and switchyard are discussed in the CLWR FEIS (DOE 1999), Subsection 5.2.3.9.1, and the Conversion FEIS (TVA 1997), Subsection 4.2.18.2. They are also discussed in the COLA ER (TVA 2008a), Subsections 5.8.1.4 and 5.6.3. Measures would be undertaken (see Subsection 2.6.2) to prevent or mitigate induced electric current and noise impacts, and to minimize public exposure to electric and magnetic fields. Therefore, these potential impacts are considered to be minor and insignificant.

4.15. Environmental Justice

4.15.1. Affected Environment

Environmental justice implies that low-income or minority populations will not incur a disproportionate share of adverse effects. Environmental justice analysis is mandated by EO 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. TVA is not subject to this EO, but it assesses the impact of its actions on minority communities and low-income populations in the NEPA process as a matter of policy.

4.15.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative there would be no upgrades to the subject transmission lines. Methods used to manage vegetation along the ROWs and maintain transmission infrastructure would be unchanged, and routine maintenance would continue. There would be no impacts on businesses, industries, and residences in the area. Therefore, no significant disproportionate impacts to low-income or minority populations would occur under this alternative.

Action Alternative
All work would involve existing facilities and ROWs. No businesses, industries, and residences in the area not already affected by the existing transmission system would be affected beyond the minor and temporary effects. Therefore, no significant disproportionate impacts to low-income or minority populations would occur should the Action Alternative be implemented.

4.16. Operational Impacts

4.16.1. Electric and Magnetic Fields

4.16.1.1. Affected Environment

Transmission lines, like all other types of electrical wiring, generate both electric and magnetic fields (EMF). The voltage on the conductors of the transmission line generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, transmission line structures, or vegetation. A magnetic field is generated by the current (i.e., the movement of electrons) in the conductors. The strength of the magnetic field depends on the current, design of the line, and distance from the line.

The fields from a transmission line are reduced by mutual interference of the electrons that flow around and along the conductors and between the conductors. The result is dissipation of the already low energy. Most of this energy is dissipated on the ROW, and the residual very low amount is reduced to background levels near the ROW or energized equipment.

Magnetic fields can induce currents in conducting objects. Electric fields can create static charges in ungrounded, conducting materials. The strength of the induced current or charge under a transmission line varies with (1) the strength of the electric or magnetic field, (2) the size and shape of the conducting object, and (3) whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field.

The transmission lines subject to upgrades, like other transmission lines, have been designed to minimize the potential for such shocks. This is done, in part, by maintaining sufficient clearance between the conductors and objects on the ground. Stationary conducting objects, such as metal fences, pipelines, and highway guard rails that are near enough to the transmission line to develop a charge would be grounded by TVA to prevent them from being a source of shocks.

Under certain weather conditions, high-voltage transmission lines, such as 500-kV and 161-kV lines, may produce an audible low-volume hissing or crackling noise. This noise is generated by the corona resulting from the dissipation of energy and heat as high voltage is applied to a small area. Under normal conditions, corona-generated noise is not audible. The noise may be audible under some wet conditions, and the resulting noise level off the ROW would be well below the levels that can produce interference with speech. Corona is not associated with any adverse health effects in humans or livestock.

Other public interests and concerns have included potential interference with AM radio reception, television reception, satellite television, and implanted medical devices. If interference occurs with radio or television reception, it would be due to unusual failures of power line insulators or a poor alignment of the radio or television antenna and the signal source. Both conditions are correctable and would be repaired if reported to TVA.

Implanted medical devices historically had a potential for power equipment strong-field interference when they came within the influence of low-frequency, high-energy workplace exposure. However, the older devices and designs (i.e., more than five to 10 years old) have been replaced with different designs and different shielding that eliminate the potential for interference from external field sources up to and including the most powerful magnetic resonance imaging medical scanners. Unlike high-energy radio frequency devices that can still interfere with implanted medical devices, low-frequency, and low-energy powered electric or

magnetic devices no longer potentially interfere (Journal of the American Medical Association 2007).

Research has been done on the effects of EMF on animal and plant behavior, growth, breeding, development, reproduction, and production. This research has been conducted in the laboratory and under environmental conditions, and no adverse effects on health or the above considerations have been reported for the low-energy power frequency fields (World Health Organization [WHO] 2007a). Effects associated with ungrounded, metallic objects and static charge accumulation and discharge in dairy facilities have been found when the connections from a distribution line meter have not been properly installed on the farm side of a distribution circuit.

There is some public concern as to the potential for adverse health effects that may be related to long-term exposure to EMF. A few studies of this topic have raised questions about cancer and reproductive effects on the basis of biological responses observed in cells or in animals or on associations between surrogate measures of power line fields and certain types of cancer. Research has been ongoing for several decades.

The consensus of scientific panels reviewing this research is that the evidence does not support a cause-and-effect relationship between EMF and any adverse health outcomes (e.g., American Medical Association [AMA] 1994; National Research Council 1997; National Institute of Environmental Health Sciences [NIEHS] 2002). Some research continues of the statistical association between magnetic field exposure and a rare form of childhood leukemia known as acute lymphocytic leukemia. A review of this topic by the WHO (International Association for Research on Cancer 2002) concluded that this association is very weak, and there is inadequate evidence to support any other type of excess cancer risk associated with exposure to EMF.

TVA follows medical and health research related to EMF, along with media coverage and reports that may not have been peer-reviewed by scientists or medical personnel. No controlled laboratory research has demonstrated a cause-and-effect relationship between low-frequency electric or magnetic fields and health effects or adverse health effects even when using field strengths many times higher than those generated by power transmission lines. Statistical studies of overall populations and increased use of low-frequency electric power have found no associations (WHO 2007b).

Neither medical specialists nor physicists have been able to form a testable concept of how these low-frequency, low-energy power fields could cause health effects in the human body where natural processes produce much higher fields. To date, there is no agreement in the scientific or medical research communities as to what, if any, electric or magnetic field parameters might be associated with a potential health effect in a human or animal. There are no scientifically or medically defined safe or unsafe field strengths for low-frequency, low-energy power substation or line fields.

The current and continuing scientific and medical communities' position regarding the research and any potential for health effects from low-frequency power equipment or line fields is that there are no reproducible or conclusive data demonstrating an effect or an adverse health effect from such fields (WHO 2007c). In the United States, national organizations of scientists and medical personnel have recommended no further research on the potential for adverse health effects from such fields (AMA 1994; DOE 1996; NIEHS 1998).

Although no federal standards exist for maximum EMF strengths for transmission lines, two states (New York and Florida) have promulgated EMF regulations. Florida's regulation is the more restrictive of the two, with field levels being limited to 150 milligauss (mG) at the edge of the ROW for lines of 230-kV and less. The expected magnetic field strengths at the edge of the proposed ROW would fall well within these standards.

4.16.1.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, no new EMFs would be created from the proposed upgrading of the transmission lines; therefore, there would be no impacts to the environment.

Action Alternative
Magnetic fields would continue be produced along the length of the existing 161-kV transmission lines and new magnetic fields would be produced along the length of the reenergized 500-kV lines. The proposed transmission line upgrades would allow the subject line to carry higher current levels as system conditions require. The strength of the magnetic fields within and near the ROW would vary with the electric load on the line as well as with the terrain. Because line voltages would not change, there would be no increase in electric field strength. Some of the proposed upgrades would result in increased line height above ground during most system conditions, thus reducing the electric field levels. Public exposure to EMF would change over time after the line work is completed as adjacent land uses change. No significant impacts from EMF are anticipated from the upgrade, reenergizing, and operation of the transmission lines.

4.16.2. Lightning Strike Hazard

4.16.2.1. Affected Environment

TVA transmission lines are built with overhead ground wires that lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along the line for at least the width of the ROW. The National Electrical Safety Code is strictly followed when installing, repairing, or upgrading TVA lines or equipment. Transmission line structures are well grounded, and the conductors are insulated from the structure. Therefore, touching a structure supporting a transmission line poses no inherent shock hazard.

4.16.2.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, no new lighting strike hazards would be created from the proposed upgrading of the transmission lines; therefore, there would be no impacts to the environment.

Action Alternative
Transmission line structures are well grounded, and the conductors are insulated from ground. Therefore, touching a structure supporting a 161-kV transmission line poses no inherent shock hazard. Additionally, TVA transmission lines are built with overhead ground wires that would lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along a line for at least the width of the ROW. The National Electrical Safety Code is strictly followed when installing, repairing, or upgrading TVA

lines or equipment. None of the proposed actions would alter line grounding. Therefore, there would be no additional hazards from lightning strikes.

4.16.3. Noise and Odor

4.16.3.1. Affected Environment

During the proposed upgrade of the transmission lines, equipment would generate noise above ambient levels, for short periods of time. In the more densely populated areas along the ROW, techniques would be used to limit noise as much as possible. In residential areas, the need for periodic ROW vegetation maintenance, i.e., mowing, would be limited or nonexistent.

4.16.3.2. Environmental Consequences

No Action Alternative
Under the No Action Alternative, no new noise and odors would be created from the proposed upgrading of the transmission lines; therefore, there would be no impacts to the environment.

Action Alternative
Because of the general lack of nearby sensitive receptors and the short work period, noise-related effects are expected to be temporary and insignificant. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. Upgrading, reenergizing, and operating the lines are not expected to produce any noticeable odors.

Additionally, no significant long-term impacts related to noise are expected as a result of the operation of the transmission lines. None of the proposed upgrades would result in any increase in the potential for noise produced by the lines.

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