CHAPTER 4

4.0 TRANSMISSION UPGRADES – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter includes a description of the affected environment and expected impacts associated with proposed transmission upgrades described in Section 2.6 and shown in Figure 2-6. 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 transmission lines that would need to be upgraded 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. Two of the 500kV lines need to be connected and energized; ROW vegetation management on those de-energized 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 BLN nuclear plant. Additional description of proposed transmission line upgrades is provided in Section 2.6.

The methods used to manage the infrastructure and maintain ROW for the lines would be unchanged. Prior to these activities, technical specialists in the TVA Regional Natural Heritage Project and TVA Cultural Resources group would conduct a Sensitive Area Review (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 G.

With the exception of possible effects with respect to floodplains, visual quality, and socioeconomic condtions, no impacts are expected from the refurbishment of the BLN switchyard. Potential impacts to these resources are discussed in their respective sections below.

4.1. Groundwater

4.1.1. Affected Environment

The upgrades to the existing transmission lines proposed under 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 (L6068); Widows Creek - Oglethorpe 161kV #2 (L5614); Widows Creek - Oglethorpe 161kV #3 (L5107); Widows Creek - Bellefonte 500-kV #1 (L6100); Widows Creek - Bellefonte 500-kV #2 (L6088); and Widows Creek - Raccoon Mountain 161kV #2

(L5613). 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 (L6068) 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 STR 49 – N. Tullahoma Tap 161-kV (L5829) 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 his 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 ground water 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 (L5054) and Browns Ferry - Athens AL 161-kV (L5055) 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 thick 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[11] 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.

4.1.2. Environmental Consequences

No-Action Alternative
Under the No Action alternative, vegetative maintenance would occur periodically, including the use of herbicides which 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 according to the manufacturer's label. During ROW maintenance, the vegetation management guidelines and procedures as described in Appendix D 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

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

measures, as described in the No Action Altenative, 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.

4.2. Surface Water

4.2.1. 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 (L5054)			
Tennessee River-Wheeler	Ala.	S, F&W	No
Bakers Creek	Ala.	F&W	No
Browns Ferry-Athens 161-kV (L5055)	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 500-kV #1 (L6100); Bellefonte-Madison 500-kV (L6055)			
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 500-kV #2 (L6088); Bellefonte-East Point 500-kV (L6079)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No
Coon Creek	Ala.	S, F&W	No
Widows Creek-Oglethorpe 161-kV #2 (L5614)	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 161-kV #3 (L5107)	Ala.		
Tennessee River-Guntersville	Ala.	PWS, S, F&W	No

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
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 – non-point source pollution
Chattanooga Creek	Ga.	Fishing	Yes – non-point source pollution
Rock Creek	Ga.	Fishing, Trout Stream	No
Dry Creek	Ga.	Fishing	Yes – non-point source pollution
S. Chickamauga Creek	Tenn.	IWS, FAL, REC, LWW, IRR	Yes – *E. coli*, nutrients, other anthropogenic habitat loss
W.Chickamauga Creek	Ga.	Fishing	Yes
Widows Creek-Raccoon Mtn. 161-kV (L5613)			
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 (L6068)			
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

Line/Stream-Reservoir	State	Classification[1]	303(d) Listed/Reason
Tennessee River-Chickamauga	Tenn.	DWS, IWS, FAL, REC, LWW, IRR, NAV	No
STR 49–N. Tullahoma Tap 161-kV (L5829)			
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		DWS, FAL, REC, LWW, IRR, TS	Yes – *E. coli*
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

4.2.2. 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 D 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 D and E(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 H). 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.

4.3. Aquatic Ecology

4.3.1. Affected Environment

As described in Section 4.2 (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 Vital Signs monitoring program, and various water quality initiatives. While not all streams potentially affected by transmission line activities have been assessed, those that have 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 H). 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 current inactive 500-kV transmission lines would be upgraded as described in Section 2.6, and routine vegetation and access maintance would be re-establisted 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 indicates 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 D, E, and H). 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 proposed project is characterized by two main types: herbaceous vegetation (greater than 95 percent) and forest (less than 5 percent).

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, 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 non-native 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 non-native, 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, de-energized lines has not been maintained for some years. In forested areas with steep terrain the conductor is sometimes high enough above canopy trees that regular removal of woody species is not necessary to maintain reliability 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 de-energized transmission lines are typically early successional and usually contain a greater proportion of non-native, invasive species. These areas are typically dominated by saplings and/or small pole-sized trees.

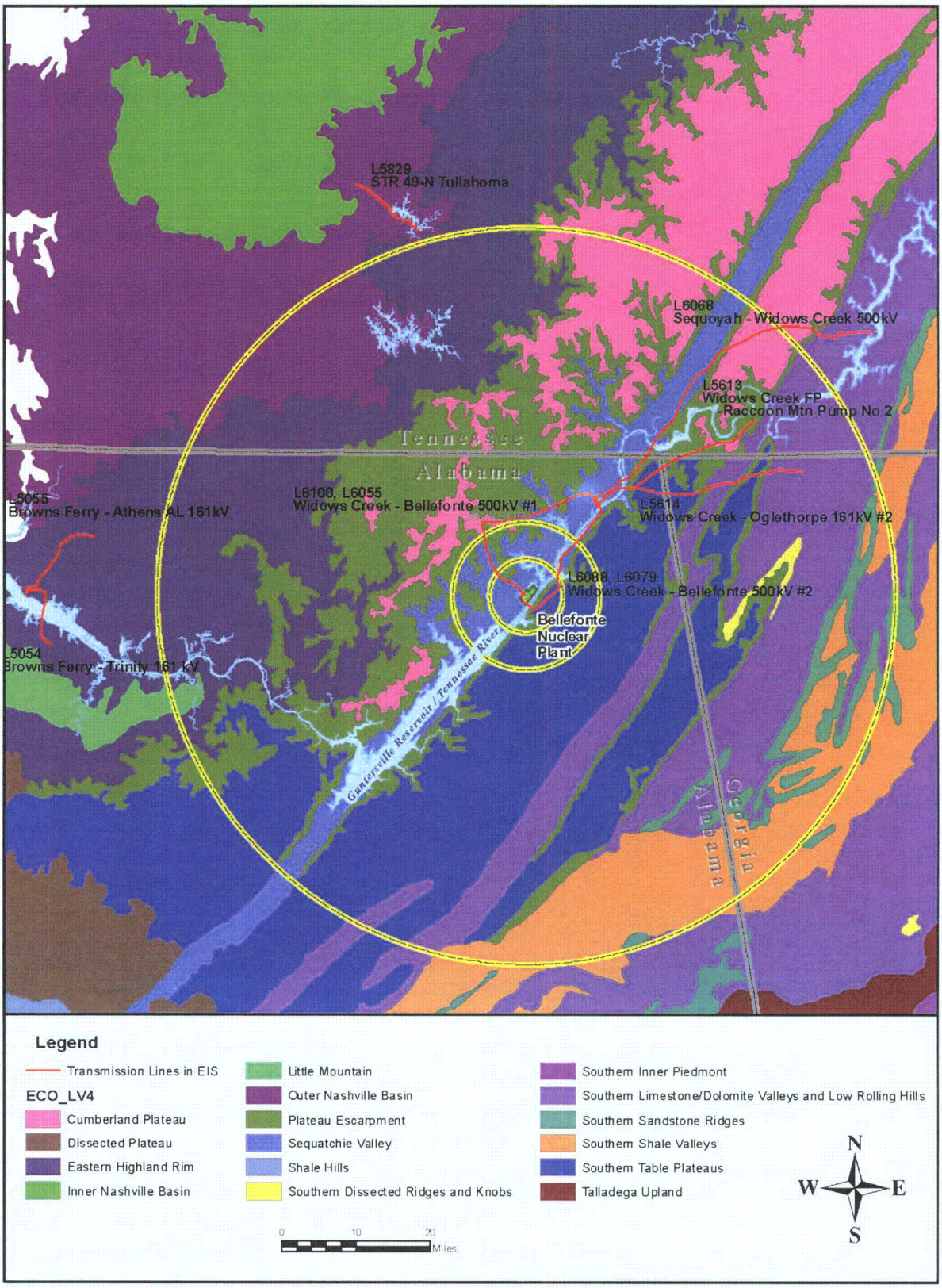

Figure 4-1. Level IV Ecoregions Crossed by Transmission Lines Requiring Upgrades to Support Operation of a Single Nuclear Unit at the Bellefonte Site

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 non-invasive 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 ROW. 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 ROW 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 Section 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 a year after activities cease. TVA standard operating procedure of revegetating with non-invasive species would help prevent introduction and spread of invasive species in the project area (Muncy 1999). Adoption 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 Section 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 ROW 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 transmission line L5613 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 ROW for vegetation maintenance would continue to occur, and portions of the ROW 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 re-cleared 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 re-establising 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 re-clearing of 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 compliance with the Endangered Species Act, TVA has prepared a Biological Assessment (BA) of potential effects to endangered and threatened species of aquatic animals, plants, and terrestrial wildlife from proposed completion/construction and operation of a nuclear plant at BLN, including the subject transmission line upgrades (TVA 2009c). 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. Those findings are described in the sections below. TVA expects to conduct formal consultation with the USFWS in accordance with Section 7 of the Act.

4.6.1. Aquatic Animals

4.6.1.1. Affected Environment

As described in Section 4.2 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 F, Table F-1.

Table 4-2. Federally Listed Aquatic Animal Species Present in Counties Affected by ProposedTransmission 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

Common Name	Scientific Name	Federal Status
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
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 maintenance.

Action Alternative
The current inactive 500-kV transmission lines would be upgraded as described in Secton 2.6; and routine vegetation and access maintenance would be re-establisted 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 H). 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 re-establishing 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. 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 to 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 F, Table F-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 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) of the ROWs Subject to Upgrades 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 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 161-kV #2 and #3 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 161-kV #2 and #3 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 161-kV 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 F, Table F-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 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 any of the subject ROWs (Table 4-4 and Appendix F, Table F-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 Listed (Federal 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 Lines	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
L5829	2	3 (1)	10	0
L5054	0	1 (1)	6	0
L5055	0	0 (0)	0	0
L5107, L5614	2	4 (2)	39	2
L5613	3	7 (3)	27	3
L6055	2	0 (1)	115	2
L6068	3	8 (3)	16	10
L6079	1	3 (0)	11	3
L6088, L6100	1	0 (2)	69	1

[1]Includes federal 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 transmission line L5613. A second population is reported 0.5 mile from transmission line L5829. 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 transmission line L6068. Although no other records of Indiana bats occur in the project area, other caves may provide suitable hibernacula[12], 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 mile from L5107. Suitable habitat does not exist within the transmission line ROWs. The species is thought to be extirpated from the 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 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 (L6068). Emergent wetlands within the ROW way 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 transmission lines L5107, L5614, L5613, L6079 and L6068.

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

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

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 L5829. 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 transmission line L5613. 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.

Osprey 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). Osprey 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 one 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
Under the No Action Alternative, no impacts to federally listed or state-listed terrestrial animal species would occur as a result of the proposed to 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.

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 (e.g., nesting bald eagles or osprey) 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.

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 2-6). 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 5 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, and 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 (Soil Survey Staff 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 ROWs 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 ROW. 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 USEPA 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 *Clean Water Act* 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 about 222 miles of existing transmission lines would take place. This would include some re-establisment 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 potential wetland areas within the ROWs are anticipated from the transmission line upgrade.

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 locatedon the Town Creek Embayment. With respect to Town Creek, the 100-year floodplain is the area lying below elevation 601.4 feet mean sea level (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 upgraded. Therefore, no additional effects to floodplains are likely.

Action Alternatives

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 upgrades associated with operations of the BLN site would cover 11 counties in three states and 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 operations of 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 are listed in Table 4-6 according to the transmission line identification number or grouping of transmission lines identification numbers within nearest proximity.

Table 4-6. Natural Areas within 3.0 miles of the Proposed Upgrades for Transmission Lines Associated with the Action Alternative

Line	Natural Area	Steward	Distance from Line (miles)
L5055, L5054	Mallard Fox Creek State Wildlife Management Area (WMA)	ADCNR	0.7 west
	Swan Creek State WMA	ADCNR	1.7 east
L5614, L6079, L5107	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
L6100, L6088	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
L5613	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

Line	Natural Area	Steward	Distance from Line (miles)
	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
L6068	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

Line	Natural Area	Steward	Distance from Line (miles)
L5829	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 transmission line (L6068) 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 boundaries and is crossed by a segment of the Bellefonte - East Point 500-kV transmission line (L6079). 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 boundaries and is crossed by a segment of the Bellefonte – East Point 500-kV transmission line (L6079). Raccoon Creek WMA comprises approximately 7,080 acres managed by Alabama Department of Conservation and Natural Resources (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 500-kV #1 transmission line (L6100). 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 161-kV transmission line (L5613). 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 161-kV transmission line

(L5613). The protected area of the Tennessee River Gorge consists of 16,777 acres that comprise the total 27,000 acres. This gorge is the fourth largest canyon in the eastern U.S. 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 boundaries of the Tennessee River Gorge. The southern edge of the Grant Property is crossed by a segment of the Widows Creek – Raccoon Mountain transmission line (L5613). 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 Sequoyah Nuclear Plant and is crossed by the Sequoyah-Widows Creek 500-kV transmission line (L6068). 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 and is managed by the Tennessee Department of Environment and Conservation (TDEC) in cooperation with the North Chickamauga Creek Conservancy. This area 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 STR 49 - N. Tullahoma tap (L5829) at the section of Normandy Reservoir Reservation. The mussel sanctuary is managed by TWRA and extends from the section of the Duck River from Kettle Mills Dam (Duck River Mile 105.6) upstream.

The Sequatchie River, a 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 segmented listed on the NRI. This segment is crossed at six locations by the Sequoyah – Widows Creek 500-kV transmission line (L6068) 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 is noted as a clean, pastoral float stream that flows through a narrow scenic valley. The first crossing point of the river north of 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 is 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 transmission line (L6068) 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 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 is a NRI-listed stream located in Marion County,Tennessee from SRM 0 to SRM 25 headwaters west of Palmer is located approximately 1.2 miles west of the Sequoyah – Widows Creek 500-kV transmission line (L6068) proposed for upgrades associated with BLN site operations. The NPS recognizes this 25-mile segment for its scenic, recreational, fish and wildlife values and 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. 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 from 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 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 STR 49 – N. Tullahoma 161-kV 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
Routine maintenance of these transmission lines and ROWs whould 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 refurbishing 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 negligable and no mitigation required.

4.11. Land Use

4.11.1. Affected Environment

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

4.11.2. Environmental Consequences

No Action Alternative
No additional changes in land use would occur under the No Action Alternative because adoption of this alternative would not involve any additional acreage for transmission lines or electrical facilities.

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 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. 4.12.2 Environmental Consequences

No Action Alternative
Under the No Action Alternative, the existing switchyards and transmission line ROWs would not be upgraded. 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 clearing 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. Cultural Resources

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 G). 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 Registar 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 Area of Potential Effect (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 flood plains 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 flood plains 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-km (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 (i.e., the Widows Creek-Oglethorpe #3) 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
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 high potential for the presence of 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 adversely 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 negative visual affect on historic structures eligible for the NRHP within the APE.

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, TVA would consult with the appropriate SHPO(s) regarding a Scope of Work (SOW) for a cultural resources survey to identify and evaluate any cultural resources that

may be affected by the proposed undertaking. TVA would re-examine the state site files for previously recorded sites and conduct a detailed cultural resource investigation of the APE to evaluate any previously recorded cultural resources and for the identification of previously unrecorded cultural resources within the APE. These cultural resources will be evaluated for eligibility for listing in the NRHP and assessed for any adverse affects by the proposed undertaking. If any eligible historic properties are identified within the APE, TVA would consult with the appropriate SHPO(s) and other interested parties, and would develop a Memorandum of Agreement (MOA) for each affected state to address treatment measures for the avoidance or minimization of adverse effects to these properties.

TVA would evaluate the presence of historic structures and archaeological sites. This evaluation would be guided by the MOA(s) that TVA is developing with each of the affected states (Alabama, Tennessee, and Georgia). TVA would use the phased identification and evaluation procedure set forth in those agreements, as well as other federal legislation pertinent to archaeological resources. Site-specific activities proposed in the future would be approved or denied according to the significance of any archaeological resources within the affected ROWs. Archaeological sites in affected areas would be avoided whenever possible. If avoidance is not possible, mitigation may be required. Such mitigation typically calls for additional archaeological investigation and may require data recovery of potentially impacted archaeological resources in the form of removal, cataloging, and archiving, as defined in the MOA(s). Although mitigation documents the site and preserves certain artifacts, under the revised NHPA regulations, excavation and removal of artifacts are considered an adverse impact to an archaeological site.

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 2-6. .

4.14.2. Environmental Consequences

No Action Alternative

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 re-energize the existing 500-kV lines and switchyard are discussed in the CLWR FEIS (DOE 1999), Section 5.2.3.9.1; the Conversion FEIS (TVA 1997); Section 4.2.18.2; and the COLA ER (TVA 2008a), Section 3.7.2.2. The transmission uprates 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 Section 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 re-energizing the 500-kV line and switchyard are discussed in the Tritium FEIS (ibid), Section 5.2.3.9.1, and the Conversion FEIS (ibid) , Section 4.2.18.2. They are also discussed in the COLA ER (ibid), Sections 5.8.1.4 and 5.6.3. Measures would be undertaken (see Section 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

Environmental justice is the fair treatment of all people with respect to the distribution of impacts of projects, programs, and policy. Fair treatment 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 assesses the impact of its actions on minority communities and low-income populations in the NEPA process.

No Action Alternative
Under the No Action Alternative there would be no upgrades to the subject transmission lines. 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

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 recent 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; U.S. Department of Energy 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.

In light of all of the above, the upgrade, re-energizing, and operation of the transmission lines are not anticipated to cause any significant EMF-related impacts.

4.16.2. Lightning Strike Hazard

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.

4.16.3. Noise and Odor

During the proposed upgrade of the transmission lines, equipment would generate noise above ambient levels. Because of the short activity period, noise-related effects are expected to be temporary and insignificant. In the more densely populated areas along the ROW, techniques would be used to limit noise as much as possible. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. In residential areas, the need for periodic ROW vegetation maintenance, i.e., mowing, would be limited or nonexistent. Upgrade, re-energizing, and operation of 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 produce by the lines.

4.16.4. Other Impacts

No significant impacts are expected to result from the relatively short-term activities related to line upgrades. Appendix E , Environmental Quality Protection Specifications for Transmission Line Construction, lists the methods which would used to limit the effects of these activities.

4.16.5. Summary

No Action Alternative

Under the No Action Alternative, no new EMFs, lighting strike hazards, or 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

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 re-energized 500-kV line. 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. Since 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.

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.

During upgrading activities, equipment would generate some noise above ambient levels. 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 activities and operation of the line is not expected to produce any noticeable odors.

CHAPTER 5

5.0 OTHER EFFECTS

5.1. Unavoidable Adverse Environmental Impacts

This section describes principal unavoidable adverse environmental impacts for which mitigation measures are either considered impractical, do not exist, or cannot entirely eliminate the impact. Specifically, this section considers unavoidable adverse impacts that would occur for either of the action alternatives, i.e., constructing and operating one Westinghouse AP1000 reactor, or completing and operating one partially-completed B&W reactor at the BLN in addition to maintaining and operating associated transmission facilities. These unavoidable construction and operational effects are identified in Table 5-1.

Table 5-1. Construction and Operational-Related Unavoidable Adverse Environmental Impacts

Issue - Construction	Unavoidable Adverse Impact
Land Use	The BLN site is approximately 1600 acres in total. Disturbance of approximately 185 additional acres of land within the 1600 acre BLN site would occur for an AP1000 unit and associated infrastructure. No additional area of land disturbance would occur for completion of either of the two partially completed B & W units. Original disturbance for the partially completed units was approximately 400 acres (200 acres each). There would be a long-term commitment of land for the existing transmission corridors. Potential for unanticipated disturbances to historic, cultural, or paleontological resources is mostly or entirely mitigated. Some land would be dedicated to long-term disposal of construction debris and not available for other uses.
Hydrologic & Water Use	A small amount of water is consumed during construction activities. Ground disturbing activities along river banks or stream banks (in the case of the transmission line maintenance) on a short-term basis, introduces minor amounts of sediments and potentially chemicals into water bodies.
Aquatic Ecology	Construction at river's edge may cause direct, short-term and minor loss of some organisms and temporary degradation of habitat. Existing transmission line crossing streams may continue to cause minor disruption of some organisms and degradation of habitat.
Terrestrial Ecology	Operation of the BLN and transmission corridor would continue minor alterations to habitat and the suite of species which inhabit them. Construction, clearing and grading of the BLN site could directly harm or displace a few animals. Construction noises may startle or scare animals. These minor impacts are intermittent and would continue throughout the construction phase.
Socioeconomics and Environmental Justice	Construction workers and local residents would be exposed to elevated levels of traffic through the course of the construction phase. The influx of construction workforce would cause short-term, minor effects on local housing, infrastructure, land use and community services such as fire or police protection. In the short-term, there may be school crowding. Increased tax revenue would mitigate much of this impact. Construction workers and local residents would be exposed to elevated levels of dust, exhaust emissions, and noise from construction and equipment. These constitute minor unavoidable impacts. No unavoidable adverse construction impacts to minority populations are anticipated.

Issue – Operational	Unavoidable Adverse Impact
Land Use	The commitment of land use described above would continue over the operational life of this project. Some of the land would be returned to its former state following the end of construction. The BLN and UFC increases radioactive and nonradioactive wastes that would require land to be dedicated for the long-term disposal of hazardous and nonhazardous materials in permitted disposal facilities or permitted landfills. This land would not be available for most other uses. The viewscape of the BLN site and transmission facilities would continue to be impacted over the operational period, but no more so than at the present.
Hydrologic & Water Use	Normal plant operations result in discharge of small amounts of chemicals and radioactive effluents to Guntersville Reservoir throughout the life of the BLN. Compliance with the NPDES permit , applicable water quality standards; stormwater pollution prevention (SWPPP) and Spill Prevention Countermeasures and Control (SPCC) Plans ; and discharge of radioactive effluents in compliance with applicable regulatory standards, would ensure that the result would be little or no unavoidable adverse impacts. Discharge of cooling water results in a thermal plume in Guntersville Reservoir throughout the operational life of the BLN. The differences between plume temperature and ambient water temperature are maintained within limits set in the NPDES permit. Cooling towers mitigate much of the heat that would otherwise be discharged to the reservoir. Use of closed cycle cooling would result in only minor adverse impacts. Water lost to evaporation represents consumption of water that would not be available for other uses. The maximum consumptive use of surface water, which would continue throughout the operational life of the plant, is less than 1 percent of 7Q10.
Aquatic Ecology	The effects of entrainment or impingement result in a loss of fish and other aquatic species. Because a closed-loop cooling system that substantively reduces the loss of fish and aquatic species is used, the impacts of entrainment or impingement on aquatic species would be minor and insignificant. Routine maintenance activities may result in rare episodic chemical or petroleum spills near water that could, in turn, affect aquatic life. Preparation and adherence to SPCC Plan would avoid/minimize contamination from any such spills. Although within NPDES permit limits, discharge of small amounts of chemicals to Guntersville Reservoir from outine plant operations could result in minor insignificant effects on aquatic life over the operational life of this project.
Terrestrial Ecology	Birds may periodically collide with the cooling towers or the existing transmission lines. Such occurrences are anticipated to be minor. Some minor clearing, maintenance and upgrading of transmission lines could result in short-term disruption of wildlife, but no long-term changes would be expected from existing habitat conditions. Periodic noise, such as maintenance at the site or along the existing transmission line, may cause temporary and minor impacts to nearby wildlife over the operational life of this project.
Socioeconomics and Environmental Justice	Minor unavoidable adverse impacts are expected over the life of operating a unit at BLN. The transmission lines are built in accordance with applicable regulations and codes to minimize the risk of electric shock. However, over the life of the plant, the transmission line has the potential to produce electric shock to people working near the line or from fallen lines. Operation and outages of the BLN would increase traffic on local roads during shift change. Although emissions would be maintained within limits established in permits, air emissions from diesel generators and equipment, and vehicles would have a small impact on workers and local residents over the operational life of this project. Unavoidable adverse operational impacts to minority populations are not expected to occur.

Issue – Operational (continued)	Unavoidable Adverse Impact
Radiological	Small radiological doses to workers and members of the public from releases to air and surface water would occur over the operational life of this project. Releases are well below regulatory limits. Effluents are treated according to applicable regulatory standards before being discharged into Guntersville Reservoir. While employees are potentially exposed over the long term, adherence to applicable regulatory standards, radiological safety procedures, work plans and safety measures reduce this exposure to a negligible impact. High-level radioactive spent fuel is stored and isolated from the biosphere for thousands of years. The impacts of high-level radioactive waste and spent fuel are reduced through specific plant design features in conjunction with a waste minimization program. Impacts are further reduced through employee safety training programs and work procedures, and by strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste in a geological repository, or re-processing. The mitigation measures reduce the risk of radioactive impacts, but there is still some residual risk. Waste disposal constitutes a commitment of land that continues for thousands of years into the future. Low-level radioactive and nonradioactive waste would be stored, treated, and disposed. Disposal of these materials represents a commitment of land for hundreds or thousands of years. The impacts of low-level radioactive and nonradioactive hazardous waste are reduced through waste minimization programs, employee training programs, and strict adherence to work procedures and applicable regulations.
Atmospheric & Meteorological	Diesel generators and equipment would contribute to minor air emissions over the course of this project. Burning of any material associated with maintaining transmission line rights-of ways would contribute to short-term air pollution As described in Chapter 3, minor radioactive emissions would occur from the proposed unit during normal operations. Compliance with permit limits and regulations for installing and operating air emission sources and monitoring of those air emissions would result in little or no adverse impacts. Cooling towers would emit a plume of water vapor resulting in a limited obstructed view of the sky and causing a shadowing effect on the ground that has a small effect on vegetation. The plumes present little environmental effect on humans or biota.

5.2. Relationship Between Short-Term Uses and Long-Term Productivity of the Human Environment

One of NEPA's basic Environmental Impact Statement requirements is to describe "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Unavoidable adverse impacts of construction and operation are discussed in Section 5.1 and the irreversible and irretrievable commitments of resources are discussed in Section 5.3. This section focuses on and compares the significant short-term benefit (e.g., principally generation of electricity) and uses of environmental resources which have long-term consequences on environmental productivity. Table 5-2 summarizes the proposed action's short-term uses and benefits versus the long-term consequences on environmental productivity. For the purposes of this section, the term "short term" represents the period from start of construction to end of plant life, including prompt decommissioning. In contrast, the term "longterm" represents the period extending beyond the end of plant life, including the period up to and beyond that required for delayed plant decommissioning. This discussion applies to the general ramifications of implementing either action alternative.

The short-term beneficial impacts of usage outweigh the adverse impacts on long-term environmental productivity. The principal short-term benefit from the BLN is the production of a

relatively clean and stable form of electrical energy. With respect to long-term benefits, nuclear energy avoids carbon dioxide emissions that may have a significant long-term detrimental effect on global climate. Nuclear energy also reduces the depletion of fossil fuels. Chapter 3 describes effects associated with the uranium fuel cycle (UFC). These impacts include the effects of mining and in-situ leaching, conversion, enrichment of uranium, fabrication of nuclear fuel, use of fuel, and disposal of the used (spent) fuel.

There are two key long-term adverse impacts on productivity. Both of these environmental liabilities are governed by the half-lives of the respective radioisotopes. The first involves long-term radioactive contamination of the reactor vessel, equipment, and other material that are exposed to radioactive isotopes. The second involves irradiated fuel and high-level waste that must be safeguarded and isolated from the biosphere for thousands of years, or reprocessed for use as fuel.

5.2.1. Short-Term Uses and Benefits

There are a number of short-term benefits that are derived from construction and operation of a single nuclear generating unit at BLN. These benefits, as summarized below include:

- Electric generation
- Fuel Diversity
- Avoidance of Air Pollution and Greenhouse Gas Emissions
- Land Use
- Aquatic and Terrestrial Biota, and
- Socioeconomic Changes and Growth

As described in Chapter 1, the principal short-term benefit of BLN is the generation of electricity to meet the growing demand for electricity in TVA's power service area. Energy diversity is also an element fundamental to the objective of achieving a reliable and affordable electrical power supply system. Over-reliance on any one fuel source leaves consumers vulnerable to price spikes and supply disruptions. BLN furthers the goal of creating new nuclear baseload generating capacity. Operation of a reactor at BLN also advances the Congressional goal of obtaining a diversified mix of electrical generating sources. Upgrading of the existing transmission lines would increase the short-term and long-term capacity and reliability of the power supply in TVA's service area.

Natural gas, and in particular, coal-fired electrical generation plants produce substantive amounts of air pollutant emissions. Fossil fuel air emissions, particularly carbon dioxide, are believed by many in the scientific community to contribute to the greenhouse effect and, consequently, global climate change. Beyond steam and water vapor, modern nuclear reactors produce virtually no air emissions during operation, and only very minor levels of radioactive emissions. The generation of significant air emissions is avoided by foregoing construction of a comparably sized coal or gas fired alternative, and instead constructing or completing a single unit at BLN. Even with contributions from the Uranium Fuel Cycle (UFC), the net benefits of reduced emissions from nuclear over those of natural gas or coal-fired facilities are substantive.

Table 5-2. Summary of the Proposed Action's Principal Short-Term Benefits Versus the Long-Term Impacts on Productivity

Issue	Short-Term Uses and Benefits	Relationship to Maintenance and Enhancement of Long-Term Environmental Productivity
Land Use	Continued commitment of land use at the existing site. Some potential loss in agricultural productivity, or natural habitats and woodlands.	No long-term loss as the land could be released for other uses or returned to its natural state after the reactor is decommissioned.
Terrestrial and Aquatic Ecology	Disrupts or destroys some flora and fauna on and near the BLN, and along the transmission corridor. No significant effect to species or habitats is expected to occur. After construction, some flora and fauna may recover in areas that are no longer affected by construction or plant operations.	No significant long-term detrimental disturbance to biota or their habitats.
Socioeconomic Growth	Injection of tax revenues, plant expenditures, and employee spending contributes to the growth of the local economy. In the short-term, this growth may strain local infrastructure and services.	Tax revenues, plant expenditures, and employee spending leads to some long-term direct and secondary growth in the local economy, infrastructure, and services that may continue after the reactors are decommissioned.
Irradiated Spent Fuel	Provides a short-term supply of relatively clean energy.	Managed as a High-Level Radioactive Waste, and either reprocessed or isolated from the biosphere for thousands or tens of thousands of years. Long-term commitment of the local storage area and the underground geological repository.
Other Radioactive Waste	The radioactively contaminated reactor vessel and equipment are required for the short term production of nuclear energy	Contaminated waste must be managed and isolated from the biosphere for hundreds or thousands of years.
Potential for Accident	Potential security consequences of a reactor accident could range from small to large. However, the probability or likelihood of a severe accident is deemed to be very remote. Because the probability or likelihood of such an event is so small, the overall risk of a nuclear accident is likewise considered to be so small as not to constitute a potentially significant impact upon the human environment.	In the advent of an accident, the impacts could be long-term and substantial.

Issue	Short-Term Uses and Benefits	Relationship to Maintenance and Enhancement of Long-Term Environmental Productivity
Depletion of Uranium	As a reactor fuel, the uranium provides a short-term supply of relatively clean energy.	Construction and operation of the BLN contributes to the long-term cumulative depletion of the global uranium supply.
Offset Usage of Finite Fossil Fuel Supplies	During operation, BLN avoids the consumption of fossil fuels, albeit with some increase in the use of uranium. Consumption of fossil fuels in the UFC are substantively less than would occur for equivalently-sized fossil fuel based generation.	Reduces the cumulative long-term depletion of global fossil fuel supplies.
Materials, Energy and Water	In the short term, the energy used in constructing the reactors results in far more electrical power generation than was used in their construction. The use of materials in constructing the BLN is also critical to the goal of producing a clean and reliable supply of electrical power. A relatively modest quantity of cooling water is lost through evaporation and drift.	Construction and operation of the BLN contributes to the cumulative long-term irretrievable use of materials, energy, and water used in the construction and operation of the reactors. However, the reactor provides far more energy than is consumed in its construction.
Air Pollution	Operation of BLN avoids air pollutants that would likely be produced by fossil fuel plants if the reactor was not constructed.	Operation of the unit results in a long-term cumulative avoidance of greenhouse emissions that would likely be produced by fossil fuel plants if the unit were not constructed.
Social Changes	The project stimulates economic growth and productivity in the local area. In the short-term, however, this growth may strain local infrastructure and services, resulting in problems such as overcrowding of schools, and traffic congestion. However, revenue derived from this project may fund increased infrastructure and social services.	Payments made in lieu of taxes by TVA, and wages spent by the operational staff may inject significant revenues into the local economy that have long-lasting economic growth and development effects, that may continue after the BLN is decommissioned. Socioeconomic changes such as transformation in the nature and character of the community likely continue long after the BLN has been decommissioned.

The construction and operation of a single unit at the BLN would result in the continued commitment of land use at the existing site, as well as for the transmission corridor (i.e., there are not "new" long-term effects on land use within the existing rights-of-way). Land required for the corridor results in the continued loss of some agricultural or pastureland from transmission structures, or undeveloped habitats and woodlands. In the short term, the project results in some potential loss in agricultural productivity, or natural habitats and woodlands. However, this loss does not represent a long-term loss as the land may be released for other uses or returned to its natural state after the BLN has been decommissioned. Construction and operation of a single unit at BLN also disrupts or destroys some flora and fauna on and near the BLN, as does maintenance along the transmission corridor. However, no significant effect to species or habitats is expected to occur. After construction is completed, some flora and fauna may recover in areas that are no longer affected by construction or plant operations.

Construction of a BLN unit is expected to stimulate economic growth and productivity in the local area. Wages spent by workers are expected to provide an economic boost to the region. The construction and operation of the BLN may also spur indirect or secondary socioeconomic growth. In the short-term, however, this growth may strain some local infrastructure and services, resulting in problems such as overcrowding of schools and increased traffic. However, tax revenue derived from this project may fund increased infrastructure and social services. Property taxes paid by BLN and wages spent by the operational staff inject revenues into the local economy that may have long-lasting economic growth and developmental effects. In the long-term, some of this growth may continue even after the unit has been decommissioned. Socioeconomic changes brought about by the operation of the unit may also continue long after the plants have been decommissioned. This increased growth leads to long-term changes in the nature and character of the community that some may regard to be adverse.

5.2.2. Maintenance and Enhancement of Long-Term Environmental Productivity

Potential long-term effects on the productivity of the human environment are described below and summarized in Table 5-2. The assessment of long-term productivity impacts does not include the short-term effects related to construction and operation of a BLN unit.

Some of the adverse environmental impacts may remain after practical measures to avoid or mitigate them have been taken. As described in Chapter 1, the BLN site was originally designated for construction of nuclear reactors, therefore siting and operation of a single nuclear unit at the BLN represents a continuation of the originally planned land use of the site. After the reactor is shutdown, and the BLN unit is decommissioned to NRC standards, this land would be available for other industrial or non-industrial uses. Therefore, land use impacts are not expected to constitute a long-term productivity issue. Similarly, impacts such as air emission, water effluents, and other impacts described in Chapter 3, but not specifically mentioned in this section are insignificant.

Exposure to Hazardous and Radioactive Materials and Waste

Workers may be exposed to low doses of radiation and trace amounts of hazardous materials and waste. Workerplace exposures are carefully monitored to ensure that radioactive exposure is within regulatory limits. Local nonworkers also receive a very small incremental dose of radiation. Radiological monitoring and impacts related to operation of BLN are described in Chapter 3. The persistence of radionuclides depends on the half life of the radionuclides. The doses are in compliance with applicable regulatory standards and permits and do not significantly affect humans, biota, or air or water resources.

Radiological emissions are not expected to contaminate BLN property or the surrounding land. Once the plant ceases to operate and is decommissioned, radiological releases also cease. No future issues associated with the radiological emissions from operation of a nuclear unit are expected to affect the long-term uses of the BLN site.

Potential for Nuclear Accident
The risk of a potential accident is the product of the potential consequences, and the probability or likelihood that an event occurs. The potential consequences of an accident could range between small to large. However, the probability or likelihood of a major accident is very remote. Because the probability or likelihood of such an event is so small, the overall risk of a nuclear accident is likewise so small as not to constitute a potentially significant impact upon the human environment. The results of TVA's analysis in section 3.19 indicate that the environmental risks due to postulated accidents are exceedingly minor.

Uranium Fuel Cycle and Depletion of Uranium
The principal use of uranium is as a fuel for nuclear power plants. With approximately 440 nuclear reactors operating worldwide, these plants currently produce approximately 16 percent of the world's electrical power generation. Global uranium fuel consumption is increasing as nuclear power generation continues to expand worldwide. The BLN contributes to a small incremental increase in the depletion of uranium. The World Nuclear Association studies uranium supply and demand issues and states that there is currently a 50-year supply of relatively low-cost uranium. Higher prices are expected to induce increased uranium exploration and production. A doubling in market price from the 2003 level might increase the supply of this resource tenfold. The introduction of fast breeder reactors and other technologies could further reduce the gap between supply and demand.

Offset Usage of Finite Fossil Fuel Supplies
Fossil fuels represent a finite geological deposit, the use of which constitutes a cumulative irreversible commitment of a natural energy resource. The construction and operation of the BLN helps offset the cumulative depletion of this limited resource.

Use of Materials, Energy, and Water
Construction and operation of the BLN results in the long-term irreversible use of materials and energy for the construction and operation of the reactors. However, in the short-term, the reactors provide far more energy than is consumed in their construction. A small amount of water is consumed in the construction of a BLN unit. A relatively modest quantity of cooling water is also consumed as loss to the atmosphere through evaporation and drift.

5.3. Irreversible and Irretrievable Commitments of Resources

This section describes anticipated Irreversible and Irretrievable (I&I) commitments of environmental resources that would occur in either the construction and operation of the AP1000 advanced reactor, or the completion and operation of the partially–completed B&W reactor at the BLN. The I & I commitments are summarized in Table 5-3 below.

For the purposes of this analysis, the term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term "irretrievable" applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

Table 5-3. Summary of Irreversible and Irretrievable Commitment of Environmental Resources

Environmental and Material Resource Issues	Irreversible	Irretrievable
Socioeconomic Changes	The project results in both short-term and long-term changes in the population and nature and character of the local community, and the local socioeconomic structure. Some impacts on infrastructure and services are temporary, while other changes represent a permanent and irreversible change in socioeconomic infrastructure.	None
Disposal of Hazardous and Radioactivity Contaminated Waste	The generation of radioactive, hazardous, and nonhazardous waste that needs to be disposed. Land committed to the disposal of radioactive and nonradioactive wastes is an irreversible impact because it is committed to that use, and is largely unavailable for other purposes.	None
Commitment of Underground Geological Resources for Disposal of Radioactive Spent Fuel	High-level waste and spent nuclear fuel is isolated from the biosphere for thousands or tens of thousands of years in a deep underground geological repository. This long-term commitment makes the surrounding geological resources unusable for thousands or tens of thousands of years.	None
Destruction of Geological Resources During Uranium Mining and Fuel Cycle	None	Uranium mining can result in contamination and destruction of geological resources, and pollution of lakes, streams, underground aquifers, and the soil.
Contaminated and Irradiated Materials	None	Some of the materials used in the construction of the BLN are contaminated or irradiated over the life of the BLN. Much of this material is not reused or recycled, and must be isolated from the biosphere for hundreds or thousands of years.
Land Use	None	The range of available land uses for the BLN site and existing transmission line ROW are now restricted for the life of the project and transmission lines resulting in irretrievable lost production or use of renewable resources such as timber, agricultural land, or wildlife habitat during the period the land is used.

Environmental and Material Resource Issues	Irreversible	Irretrievable
Water Consumption	None	Relatively small amounts of potable water are used during construction and operation of BLN. A small fraction of the cooling water taken from Guntersville Reservoir is lost through evaporation. The impact to surface water resources is relatively small, but represents a natural resource that is no longer readily available for use.
Consumption of Energy	None	Nonrenewable energy in the form of fuels (gas, oil, and diesel) and electricity is consumed in construction and to a lesser extent, operation of the BLN.
Consumption of Uranium Fuel	None	The BLN reactors contribute a relatively small increase in the depletion of uranium that is used to fuel the reactors.

5.3.1. Irreversible Environmental Commitments

Irreversible environmental commitments resulting from the BLN project would relate primarily to those of the UFC, i.e., 1) land disposal of equipment and materials contaminated by hazardous and low-level radioactive waste; and 2) UFC effects that include commitment of underground geological resources for disposal of high-level radioactive waste and spent fuel and destruction of geological resources during uranium mining. Implementation of either action alternative would also result in both short-term and long-term minor changes in the population, the nature and character of the local community, and the local socioeconomic infrastructure. Once the unit ceases operations, and the BLN is decontaminated and decommissioned in accordance with U.S. Nuclear Regulatory Commission (NRC) requirements, the land that supports the facility may be returned to other industrial or nonindustrial uses. However, the land may continue to be committed to use for other future electrical projects or other purposes.

Uranium Fuel Cycle

The UFC is defined as the total of those options and processes associated with the provision, utilization, and ultimate disposition of fuel for nuclear power reactors. Environmental effects are contributed from uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, use of the fuel, possible future reprocessing of irradiated fuel, transportation of radioactive materials, disposal of used (spent) fuel and management of low-level and high-level wastes.

The BLN unit would generate radioactive, hazardous, and nonhazardous wastes that require disposal. This waste is disposed of in permitted hazardous, mixed, or radioactive landfills or disposal facilities. Land committed to the disposal of radioactive and hazardous wastes represents an irreversible impact because it is committed to that use, and can be used for few other purposes.

Table 5.7-2 of the Environmental Report (ER) submitted to NRC as part of the TVA COL Application for siting two AP1000 units at BLN presents environmental data on the UFC. Those UFC effects noted in Table 5.7-2 as permanent or comprising emissions for fuel production or storage of spent fuel would be considered irreversible. That ER analysis, which is herein incorporated by reference, described the UFC environmental effects from both a single 1000 MW nuclear power reactor and those of two 1150 MWe units operating at the BLN. As described in the ER, the approach taken by NRC in estimating effects was intended to ensure that the actual environmental effects were less than the quantities shown for the 1000 MWe reference plant and to envelope the widest range of operating conditions for light water reactors. That analysis concluded all resource impacts were small (i.e., not detectable or are so minor that they neither destabilize nor noticeably alter any important attribute of the resource). The effects from either of the current action alternatives for constructing and operating a single 1100 MWe unit at BLN are bounded by that analysis. As such, impacts would be even less than the two unit analysis which concluded only small effects.

5.3.2. Irretrievable Environmental Commitments

Irretrievable environmental commitments resulting from the BLN include:

- Construction and irradiated materials.
- Water consumption.
- Consumption of energy.
- Consumption of uranium fuel.

Construction and Irradiated Materials

Common irretrievable commitments of materials used in either new reactor (AP1000) construction or for completion of the partially completed B&W reactors (BLN Unit 1 or Unit 2) include concrete, rebar, structural steel, power cable, small bore piping and large bore piping. A portion of these materials used in the construction of either type of reactor become contaminated or irradiated over the life of BLN operations. Much of this material cannot be reused or recycled, and must be isolated from the biosphere for hundreds or thousands of years. However, because some of this material may be reused (if uncontaminated) or decontaminated for future use, the recycled portion does not constitute an irretrievable commitment of resources. The estimated quantities of materials needed to construct an AP1000 reactor at BLN are concrete (77, 200 cu. yds.), rebar (10,000 T.), structural steel (6,400 T.), power cable(810,000 linear ft.), small bore piping (230,000 linear ft.) and large bore piping (68,000 linear ft.). As these reactors are partially complete, proportionally smaller amounts of materials would be needed to complete them than the Ap1000 alternative. Additionally, smaller amounts of materials would be required to complete Unit 1 than Unit 2.

While the amount of construction materials is large, use of such quantities in large-scale construction projects such as nuclear reactors, hydroelectric and coal-fired plants, and many large industrial facilities (e.g., refineries and manufacturing plants) represents a relatively small incremental increase in the overall use of such materials. Even if this material is eventually disposed of, use of construction materials in such quantities has a small impact with respect to the national or global consumption of these materials. An additional irretrievable commitment of resources includes materials used during normal plant operations, some of which are recovered or recycled.

Irreversible commitments of resources generally occur through the use of nonrenewable resources that have few or no alternative uses at the termination of the proposed action. Transmission line reconductoring and upgrades also would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, lubricants, and other consumables used by construction equipment and by workers commuting to the site. Other materials used for construction of the proposed facilities would be committed for the life of the facilities. Some of these materials, such as ceramic insulators and concrete foundations, may be irretrievably committed, while the metals used in conductors, supporting structures, and other equipment could be and would likely be recycled. The useful life of the transmission structures is expected to be at least 60 years.

Water Consumption
Relatively small amounts of potable water are used during construction and operation of the BLN. Some of the cooling water taken from Guntersville Reservoir is lost through the cooling towers by way of drift and evaporation. The impact to surface water resources is relatively small, but represents a natural resource that may no longer be available for use. However, as part of the natural hydrologic cycle, this water is eventually re-cycled through the ecosystem.

Consumption of Energy Used in Constructing the Reactors
Nonrenewable energy in the form of fuels (gas, oil, and diesel) and electricity are consumed in construction and, to a much smaller extent, in the operation of the BLN. Beyond ancillary (e.g., vehicles, equipment) usage, nuclear reactors do not consume fossil fuels such as petroleum or coal.

The total amount of energy consumed during construction or operation of the BLN is very small in comparison to the total amount consumed within the United States. On net balance, the reactor produces far more energy (as measured in British Thermal Units) than is consumed in its construction and operation. For this reason, one of the key considerations related to the I & I requirement is that operation of the BLN helps conserve or helps avoid the consumption of finite fossil fuels supplies.

Uranium Fuel Cycle and Depletion of Uranium
The principal use of uranium is as a fuel for nuclear power plants. With approximately 440 nuclear reactors operating worldwide, these plants currently produce approximately 16 percent of the world's electrical power generation. Global uranium fuel consumption is increasing, as nuclear power generation continues to expand worldwide. The BLN reactors contribute a relatively small increase in the depletion of uranium. Sources of uranium include primary mine production as well as secondary sources. Nuclear reactor uranium consumption now exceeds the supplies produced through mining. The resulting shortfall has been covered by several secondary sources including excess inventories held by producers, utilities, other fuel cycle participants, reprocessed reactor fuel, and uranium derived from dismantling Russian nuclear weapons.

The limited availability of uranium fuel may affect the future expansion of nuclear power. U.S. Department of Energy uranium estimates indicate that sufficient resources exist in the United States to fuel all operating reactors and reactors being planned for the next ten years at a U3O8 cost (1996 dollars) of $30.00/lb or less. The resource categories designated as reserves and estimated additional resources can supply these quantities of uranium.

The World Nuclear Association studies supply and demand for uranium and states that the world's present measured resources of uranium, in the cost category somewhat above present spot prices and used only in conventional reactors, at current rates of consumption, are sufficient to last for some 70 years. Very little uranium exploration occurred between 1985 and 2005, so the significant increase in exploration that is currently being witnessed might double the known economic reserves. On the basis of analogies with other metal minerals, a doubling in price from present levels could be expected to create about a tenfold increase in measured resources over time. The introduction of fast breeder reactors and other technologies may also reduce the supply-demand gap. The addition of BLN increases consumption of uranium in the United States by approximately 2 percent and increases worldwide consumption of uranium by about 0.5 percent. Thus, the addition of BLN by itself does not create a significant impact on uranium resources.

5.4. Energy Resources and Conservation Potential

The total amount of energy consumed during construction or operation of the BLN is very small in comparison to the total amount consumed within the United States. On net balance, the reactor would produce far more energy (as measured in British Thermal Units) than would be consumed in its construction and operation. For this reason, one of the key considerations related to the I & I requirement is that operation of the BLN helps conserve or helps avoid the consumption of finite fossil fuels supplies.

Nonrenewable energy in the form of fuels (gas, oil, and diesel) and electricity would be, however, consumed in construction and, to a much smaller extent, in the operation of any of the action alternatives for BLN. An AP1000 reactor would require more off-site fabrication of components, transport of components, and on-site construction, and therefore more energy to build, than completing either the partially-built BLN Unit 1 or Unit 2. Because the existing Unit 1 is more complete than Unit 2, of the two units, Unit 1 would require less energy to build.

Beyond ancillary (e.g., vehicles, equipment) usage and that required to support the UFC, nuclear reactors do not consume fossil fuels such as petroleum or coal during operation. Processing of nuclear fuel is, however, an energy-intensive activity. Existing uranium enrichment facilities are large and each facility services several nuclear generating plants. For comparative purposes, the energy required to process or enrich uranium using gaseous diffusion sufficient to fuel a single 1000 MW pressurized boiling water reactor nuclear plant (slightly smaller than the action alternatives for a single BLN unit) would be approximately that of the output from a 50 MW fossil-fueled (coal-fired) facility operating at 75% capacity factor. Newer technologies (e.g., centrifuge or atomic vapor laser isotope separation) currently, or becoming, commercially available for enrichment, utilize only 4-15% as much power as this gaseous diffusion example. As it is anticipated that these new, less energy intensive technologies will eventually become the norm for production of nuclear fuel, the processing portion of the UFC would likely use even less energy and become even more "carbon-friendly" in the future. The DOE has also released the Draft Programmatic EIS for the Global Nuclear Energy Partnership (GNEP) (DOE 2008) with the identified preferred alternative of implementing a "closed" cycle for nuclear fuel management in the United States (i.e., select among nuclear fuel reprocessing alternatives). If selected and implemented by DOE, this approach for GNEP could both expand the availability of nuclear fuel and potentially stabilize or reduce the worldwide GHG releases associated with mining and milling of uranium as a fuel source.

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CHAPTER 6

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CHAPTER 7

7.0 LIST OF AGENCIES TO WHOM COPIES ARE SENT

Federal Agencies

Natural Resources Conservation Service, Alabama State Conservationist
Natural Resources Conservation Service, Georgia State Conservationist
U.S. Army Corps of Engineers, Mobile District
U.S. Army Corps of Engineers, Nashville District
U.S. Army Corps of Engineers, Savannah District
U.S. Department of the Interior
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service, Cookeville Field Office
U.S. Fish and Wildlife Service, Daphne Field Office
U.S. Fish and Wildlife Service, Refuge Office
U.S. Fish and Wildlife Service, Southeast Region Office
U.S. Forest Service, Chattahoochee-Oconee National Forests
U.S. Forest Service, Region 8
U.S. Nuclear Regulatory Commission
National Park Service, Chickamauga-Chattanooga National Military Park National Park Service, Southeast Region Office

State Agencies

Alabama
Alabama Department of Conservation and Natural Resources
Alabama Department of Environmental Management
Alabama Department of Environmental Economic and Community Affairs
Alabama Historical Commission
North-Central Alabama Regional Council of Governments
Top of Alabama Regional Council of Governments

Georgia
Economic Development Administration
Georgia Department of Natural Resources, Environmental Protection Division
Georgia Department of Natural Resources, Historic Preservation Division
Georgia Department of Natural Resources, Wildlife Resources Division
Georgia State Clearing House

Tennessee
Southeast Tennessee Development District
South Central Tennessee Development District
Tennessee Department of Economic and Community Development
Tennessee Department of Environment and Conservation, Division of Air Pollution Control
Tennessee Department of Environment and Conservation, Division of Ground Water Protection

Tennessee Department of Environment and Conservation, Division of Water Supply
Tennessee Department of Environment and Conservation, Resource Management Division
Tennessee Historical Commission
Tennessee Wildlife Resources Agency

Federally Recognized Tribes (E-mail notification of availability)

Eastern Band of Cherokee Indians
United Keetoowah Band of Cherokee Indians in Oklahoma
Cherokee Nation
Chickasaw Nation
Muscogee (Creek) Nation of Oklahoma
Thlopthlocco Tribal Town
Kialegee Tribal Town
Alabama-Quassarte Tribal Town
Alabama-Coushatta Tribe of Texas
Eastern Shawnee Tribe of Oklahoma
Shawnee Tribe
Absentee Shawnee Tribe of Oklahoma
Seminole Tribe of Florida
Jena Band of Choctaw Indians
Poarch Band of Creek Indians

CHAPTER 8

8.0 LITERATURE CITED

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Appendix A – CORMIX Modeling Results

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Table A-1. Summary of CORMIX Model Results

Plant	Case	Month	Ambient River Conditions		Blowdown Conditions		Conditions at Edge of Mixing Zone			
			Flow	Temp	Discharge	Temp	Temp	Temp Rise	Plume Width	Plume Thickness
			(cfs)	(°F)	(cfs)	(°F)	(°F)	(°F)	(feet)	(feet)
36-inch Diameter, 45-foot Long Diffuser Pipe										
B&W	1	March	3130	41.0	50	86.4	43.2	2.2	246	8
B&W	2	April	190	52.0	50	90.4	53.9	1.9	249	8
B&W	3	July	3760	89.5	50	97.7	89.9	0.4	193	10
B&W	4	March	-9160 (1)	41.0	50	86.4	44.4	3.4	343	9
AP 1000	1	March	3130	41.0	18	86.4	43.1	2.1	444	4
AP 1000	2	April	190	52.0	18	90.4	53.9	1.9	424	5
AP 1000	3	July	3760	89.5	18	97.7	89.9	0.4	337	5
AP 1000	4	March	-9160 (1)	41.0	18	86.4	42.4	1.4	348	7
42-inch Diameter, 75-foot Long Diffuser Pipe										
B&W	1	March	3130	41.0	50	86.4	43.6	2.6	368	6
B&W	2	April	190	52.0	50	90.4	54.3	2.3	356	7
B&W	3	July	3760	89.5	50	97.7	90.0	0.5	286	8
B&W	4	March	-9160 (1)	41.0	50	86.4	43.3	2.3	442	10
AP 1000	1	March (2)	3130	41.0	18	86.4	43.5	2.5	758	3
AP 1000	2	April	190	52.0	18	90.4	54.3	2.3	625	4
AP 1000	3	July	3760	89.5	18	97.7	89.8	0.3	632	7
AP 1000	4	March	-9160 (1)	41.0	18	86.4	42.0	1.0	375	10

Notes: (1) Reverse river flow with diffuser ports pointing vertically upward

Table A-2. Summary of 1999 Guntersville Reservoir Model Results[1]

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the entire year

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the entire year

Table A-3. Summary of 2007 Guntersville Reservoir Model Results[1]

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°C)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	86.5	77.0	83.8	86.9	77.4	84.2	87.2	77.5	84.4	88.5	78.4	85.5
Base	86.5	77.0	83.8	88.4	79.0	85.6	88.3	79.0	85.7	88.6	78.5	85.7
B&W	86.5	77.0	83.8	88.4	79.0	85.6	88.3	79.1	85.7	88.7	78.5	85.7
AP 1000	86.5	77.0	83.8	88.4	79.0	85.6	88.3	79.0	85.7	88.7	78.5	85.7
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.5	5.6	7.1	8.9	8.5
Base	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.4	5.5	6.9	8.9	8.5
B&W	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.4	5.5	6.9	8.9	8.5
AP 1000	5.2	6.6	5.8	5.1	6.4	5.6	5.0	6.4	5.5	6.9	8.9	8.5
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.4	0.2	0.1	0.5	0.2	0.2	3.8	2.8	3.1
Base	0.1	0.0	0.0	0.3	0.1	0.1	0.4	0.2	0.2	3.9	2.9	3.1
B&W	0.1	0.0	0.0	0.3	0.1	0.1	0.4	0.2	0.2	3.9	2.9	3.1
AP 1000	0.1	0.0	0.0	0.3	0.1	0.1	0.4	0.2	0.2	3.9	2.9	3.1

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the period April through September

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the period April through September

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the entire year

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the entire year

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the entire year

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the entire year

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the entire year

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the entire year

Parameter (Units)	Upstream of Widow's Creek Intake TRM 409.5 - 410.7			Upstream of Bellefonte Intake TRM 393.0 - 393.9			Downstream of Bellefonte Discharge TRM 389.0 - 390.0			Guntersville Forebay TRM 349.8 - 350.5		
Temperature (°F)[2]	**Max. Day[3]**	**April-Sept. Mean[4]**	**July-Aug. Mean[4]**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	85.4	76.6	83.0	86.5	77.0	83.4	86.5	77.1	83.5	89.4	77.9	85.3
Base	85.4	76.6	83.0	87.9	78.5	84.4	87.6	78.5	84.5	89.5	78.1	85.6
B&W	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
AP 1000	85.4	76.6	83.0	88.0	78.5	84.4	87.6	78.5	84.5	89.6	78.1	85.6
Dissolved Oxygen (mg/L)[2]	**Min. Day[5]**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Min. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	5.3	6.8	6.0	5.2	6.7	5.9	5.2	6.7	5.9	6.5	8.8	8.2
Base	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
B&W	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.5	8.8	8.0
AP 1000	5.3	6.8	6.0	5.2	6.6	5.9	5.2	6.6	5.9	6.4	8.8	8.0
Algae Biomass (mg/L)[2]	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**	**Max. Day**	**April-Sept. Mean**	**July-Aug. Mean**
Reference	0.1	0.0	0.0	0.6	0.1	0.1	0.6	0.1	0.1	3.5	2.2	2.1
Base	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
B&W	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0
AP 1000	0.1	0.0	0.0	0.6	0.1	0.1	0.5	0.1	0.1	3.6	2.1	2.0

[1]All values in table are from model simulation results and are based on the 6-hour model output for the parameter indicated.

[2]All values are based on model results at the 5-foot depth

[3]Max day is the maximum daily value for the entire year

[4]Mean is the average of the 6-hour model outputs over the designated time period

[5]Min. day is the minimum daily value for the entire year

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Appendix B – Wetlands Field Delineation and Habitat Assessment Forms

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TVA Natural Heritage Project Routine Wetland Determination Form

Project: Bellefonte NP REQ 10389	Investigator: J. Groton, H. Hart	Normal Circumstances:	y	Sample ID:	W001
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 6, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Quercus phellos*	Tr	Facw-	9.	*Toxicodendron radicans*	WV	Fac
2.	*Quercus nigra*	Tr	Fac	10.	*Carex tribuloides*	H	Facw
3.	*Quercus pagoda*	Tr	Fac+	11.	*Ulmus americana*	Tr	Facw
4.	*Pinus taeda*	Tr	Fac	12.	*Ulmus thomasii*	Tr, Sh	Fac
5.	*Acer rubrum*	Tr	Fac	13.	*Impatiens sp.*	H	Facw
6.	*Liquidambar styraciflua*	Tr, Sh	Fac+	14.			
7.	*Ilex decidua*	Sh	Facw-	15.			
8.	*Berchemia scandens*	WV	Facw	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water:	0-6	(in.)
Depth to Free Water in Pit:	11	(in.)
Depth to Saturated Soil:	8	(in.)

Wetland Hydrology Indicators:

Primary Indicators			Secondary Indicators		
y	Inundated		Drift Lines	y	Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks	y	Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks: wet weather drainage to Town Creek embayment on Guntersville Reservoir

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-2	10 YR 6/2	-	-	Loam
2-8	10 YR 6/4	-	-	Silt loam
8-12	10/YR 6/4	10 YR 6/2	Common	Silty clay loam

Hydric Soil Indicators:

	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils		Reducing Conditions
y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks: Soil color not quite hydric (chroma is too high); lots of evidence of extensive soil disturbance in past;

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No	N

Estimated size: 2.95 acres

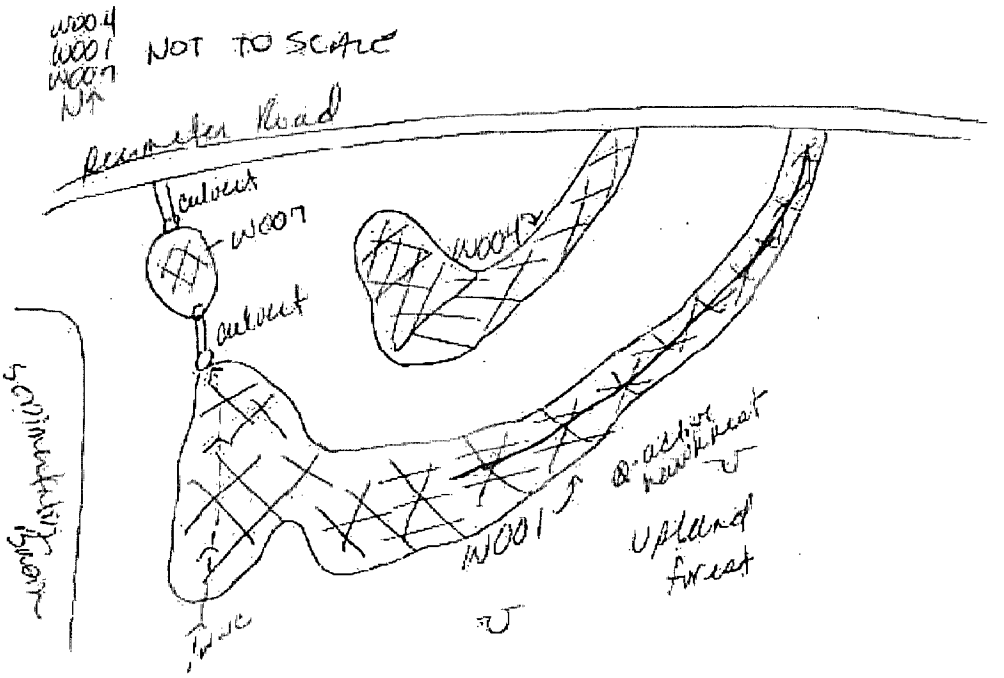
Wetland Descriptors

Sample ID: WW001	Photo ID(s): WW001-1W, WW001-2W, WW001-3W

Flagging Description: 1-29 counterclockwise from NW corner near culvert around to east; 30-70 clockwise from #1 around north side back to #29

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	y	Yes		No	Waterbody/Watershed: Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)										
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking	2	Sheet Flow	3	Groundwater	4	Precipitation		Other			
TVARAM SCORE:	63.5	TVARAM CATEGORY:	Category 3												

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc).**

Flatwood forested wetland
Small perched wetland/vernal pool in center of eastern end; numerous scattered depressions with water-stained leaves
Obvious signs of soil disturbance and earth-moving in past

TVA Natural Heritage Project Routine Wetland Determination Form

Project: Bellefonte NP REO 10389	Investigator: J. Groton, H. Hart	Normal Circumstances:	y	Sample ID:	W002
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 6, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Carpinus caroliniana*	Tr, Sh	Fac	9.	*Toxicodendron radicans*	W	Fac
2.	*Quercus nigra*	Tr	Fac	10.	*Ulmus americana*	Tr	Facw
3.	*Quercus pagoda*	Tr	Fac	11.	*Ulmus thomasii*	Tr, Sh	Fac
4.	*Pinus taeda*	Tr	Fac	12.	*Impatiens sp.*	H	Facw
5.	*Acer rubrum*	Tr	Fac	13.			
6.	*Liquidambar styraciflua*	Tr, Sh	Fac+	14.			
7.	*Ilex decidua*	Sh	Fac	15.			
8.	*Berchemia scandens*	W	Facw	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:			**Wetland Hydrology Indicators:**				
			Primary Indicators			**Secondary Indicators**	
Depth of Surface Water:	0-4	(in.)	y	Inundated		Drift Lines	y	Oxidized Root Channels
Depth to Free Water in Pit:	-	(in.)	y	Saturated in Upper 12 in.		Water Marks	y	Water Stained Leaves
Depth to Saturated Soil:	6	(in.)		Sediment Deposits	y	Drainage Patterns		

Remarks: wet weather drainage to Town Creek embayment on Guntersville Reservoir

Soils

Soil Unit:		**Drainage class:**		**Listed hydric soil?**	**Yes**		**No**	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-2	10 YR 4/2	-	-	Silt loam
2-5	10 YR 5/2	-	-	Silt loam
5-9	10 YR 7/3	10 YR 7/2	Common	Silty clay
9-12	10 YR 7/3	10 YR 7/2	Common	Clay

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
y	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

Estimated size: 4.52 acres

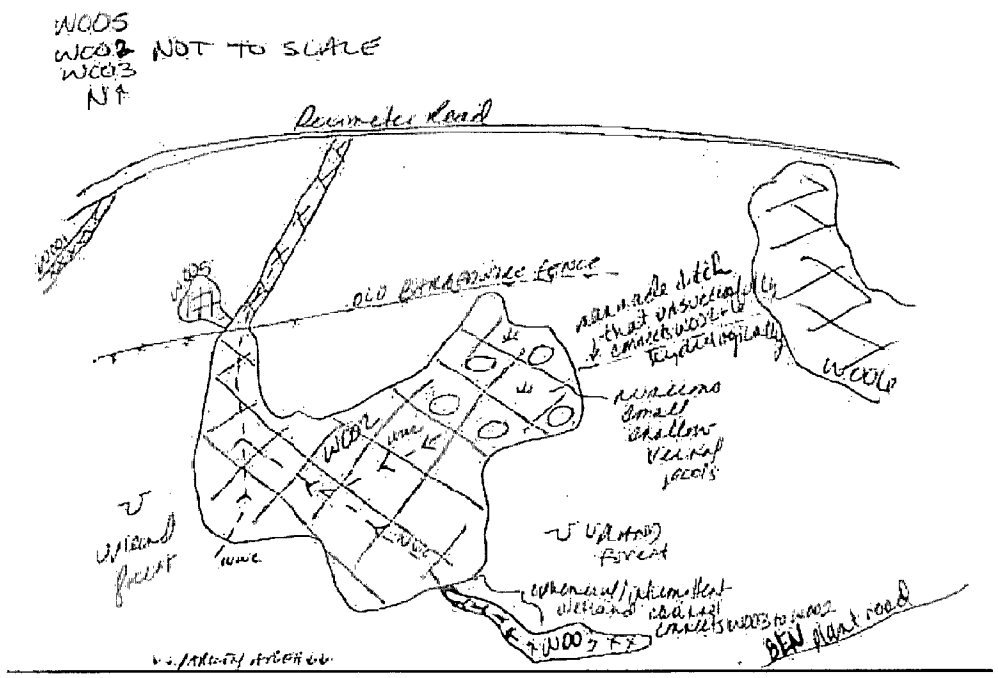
Wetland Descriptors

Sample ID: W002	**Photo ID(s):** W02-1W, W02-2W, W02-3W, W02-4W, W02-5W, W02-6W, W02-7W, W02-8W, W02-9W

Flagging Description: W2-1 to W2-16 clockwise from southern edge around to northwest corner, W2A-1 to W2A-43 clockwise from northeastern corner back to W2-1

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	y	Yes		No	Waterbody/Watershed: Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)												
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking	3	Sheet Flow	2	Groundwater	4	Precipitation		Other					
TVARAM SCORE:	69	**TVARAM CATEGORY:**	Category 3														

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)

Flatwood forested wetland
Wetland will receive stormwater runoff from construction area
Obvious signs of soil disturbance and earth-moving in past
Several perched wetlands/vernal pools scattered about northeastern lobe of wetland
Numerous large trees (18-24+ inches DBH) throughout wetland but especially in northeastern lobe
There is a ditch near the northeast corner that looks like someone attempted (unsuccessfully) to connect W02 to W06, about 100-150 feet to the north

TVA Natural Heritage Project Routine Wetland Determination Form

Project: Bellefonte NP REQ 10389	Investigator: J. Groton, H. Hart	Normal Circumstances:	y	Sample ID:	W003
County: Jackson		Atypical Situation:	y	Station or Structure Number(s):	
State: AL	Date: April 6, 2006	Problem Area:	n	Cowardin Code:	PFO1B

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Ligustrum sinense*	Sh	Fac	9.	*Glyceria striata*	H	Obl
2.	*Celtis laevigata*	Tr	Facw	10.	*Ulmus thomasii*	Tr, Sh	Fac
3.	*Fraxinus pennsylvanica*	Sh, Sap	Facw	11.	*Quercus michauxii*	Tr	Facw-
4.	*Berchemia scandens*	WV	Facw	12.			
5.	*Ulmus alata*	Tr	Facu+	13.			
6.	*Carex cherokeensis*	H	Facw-	14.			
7.	*Nothoscordum bivalve*	H	Fac	15.			
8.	*Sanicula sp.*	H	Fac-Facu	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 82%

Hydrology

Field Observations:			**Wetland Hydrology Indicators:**				
			Primary Indicators			**Secondary Indicators**	
Depth of Surface Water:	0-1	(in.)					
Depth to Free Water in Pit:	-	(in.)	y	Inundated		Drift Lines		Oxidized Root Channels
Depth to Saturated Soil:	7	(in.)	y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
				Sediment Deposits	y	Drainage Patterns		

Remarks: Headwater of unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir); connects by drainage channel to W02

Soils

Soil Unit:		**Drainage class:**		**Listed hydric soil?**	**Yes**		**No**	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-3	10 YR 3/2	-	-	Silt loam
3-6	10 YR 5/3	10 YR 6/2	Common	Silt loam
6-12	10 YR 6/2	10 YR 6/6	Common	Silty clay

Hydric Soil Indicators:

	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils		Reducing Conditions
y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks: Soil color not quite hydric (chroma in second horizon too high); lots of evidence of extensive soil disturbance in past;

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No	N

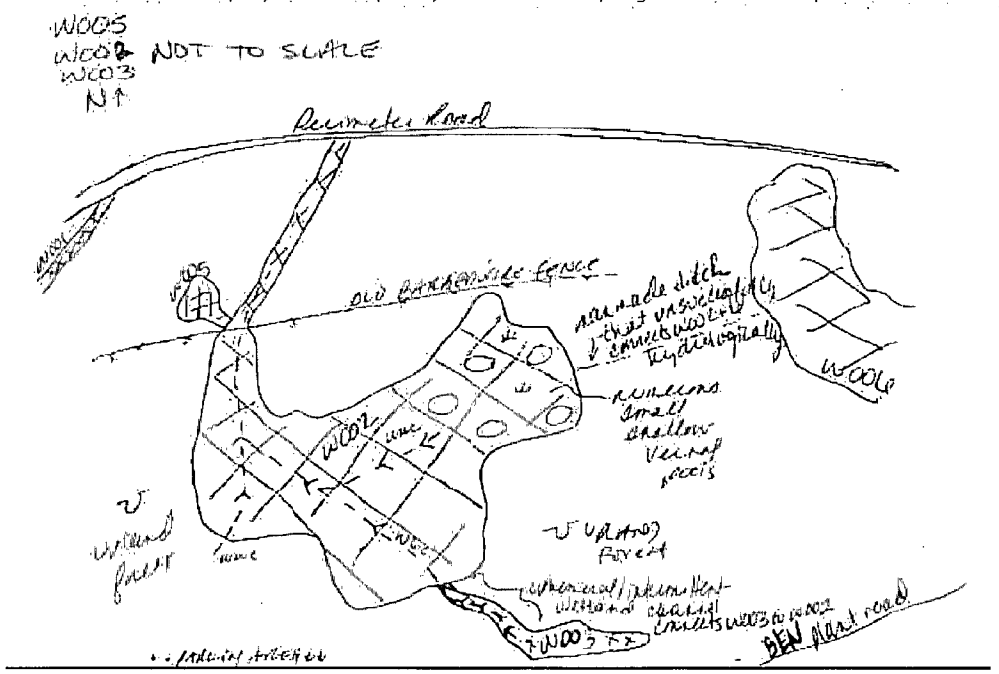
Estimated size: 0.28 acre

Wetland Descriptors

Sample ID: W003	**Photo ID(s)**: W03-1W; W03-2W
Flagging Description: 1-19 counterclockwise from northwest	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?		Yes		No	Waterbody/Watershed: Headwater of unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)									
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking	2	Sheet Flow	1	Groundwater	3	Precipitation		Other		
TVARAM SCORE:	35	**TVARAM CATEGORY:**	Category 2											

Description of Wetland and Other Comments: (ie. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)

Small area of forested wetland; partially intersects potential construction area (~0.25 acre inside construction footprint). It will also be affected by proposed haul road to site and module assembly areas
Wetland is connected to Wetland W02 by wet weather conveyance but higher in watershed
Possible small seep near southern edge

Project: Bellefonte NP REQ 10389	Investigator: J. Groton, B. Dimick	Normal Circumstances:	y	Sample ID:	W004
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 26, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr, Sh, Sap	Facw	9.	*Nothoscordum bivalve*	H	Fac
2.	*Quercus phellos*	Tr, , Sap	Facw-	10.	*Galium aparine*	H	Facu
3.	*Ulmus americana*	Tr, Sh	Facw	11.	*Diospyros virginiana*	Sap	Fac
4.	*Campsis radicans*	Sap	Fac	12.	*Toxicodendron radicans*	WV, Sap	Fac
5.	*Berchemia scandens*	WV	Facw	13.	*Lycopus sp*	H	Obl
6.	*Ampelopsis arborea*	Sap	Fac+	14.	*Glyceria striata*	H	Obl
7.	*Ilex decidua*	Sh	Facw	15.	*Several unidentified Carex species*	H	
8.	*Pinus taeda*	Tr	Fac	16.	*moss*	H	

Percent of Dominant Species That are OBL, FACW, or FAC: 93%

Hydrology

Field Observations:			**Wetland Hydrology Indicators:**				
			Primary Indicators				**Secondary Indicators**
Depth of Surface Water:	0-12	(in.)					
Depth to Free Water in Pit:	3	(in.)	y	Inundated		Drift Lines	Oxidized Root Channels
Depth to Saturated Soil:	0	(in.)	y	Saturated in Upper 12 in.		Water Marks	Water Stained Leaves
				Sediment Deposits	x	Drainage Patterns	

Remarks: Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)

Soils

Soil Unit:		**Drainage class:**		**Listed hydric soil?**	**Yes**		**No**	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-3	10 YR 5/3	10 YR 5/6	Common	Silty clay loam
3-10	10 YR 6/2	10 YR 5/6	Common	Silty clay loam
10-12+	10 YR 6/1	10 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

Y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	Y	Reducing Conditions
Y	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

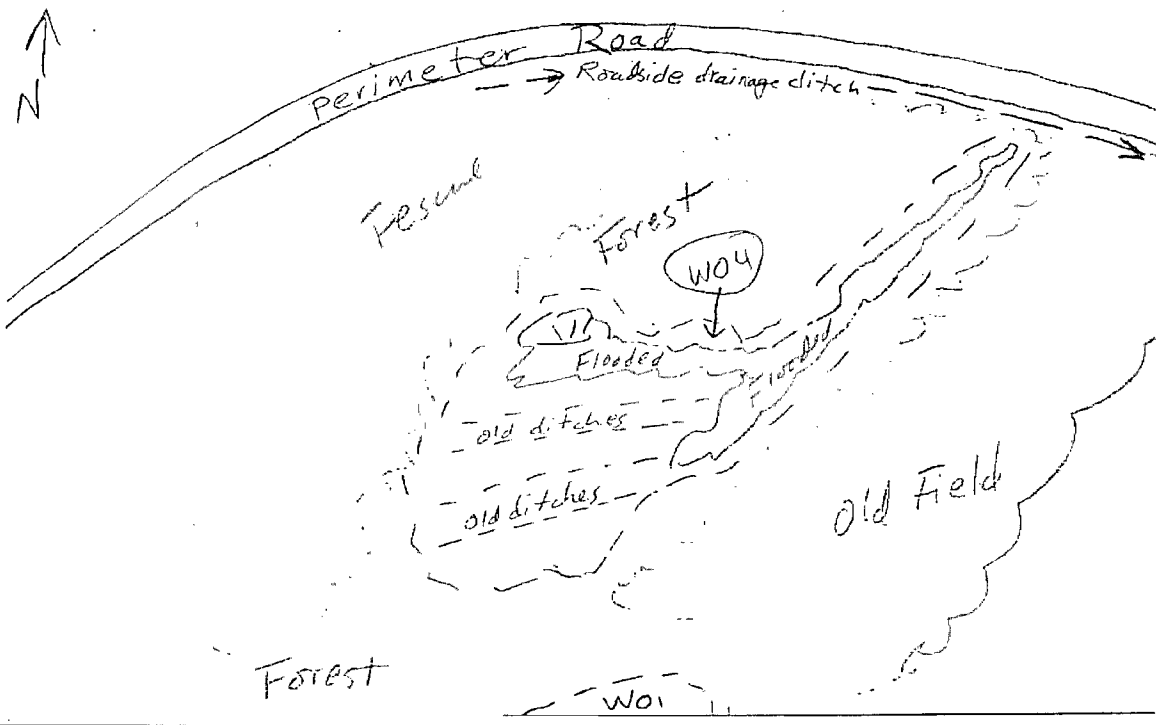
Estimated size: 1.81 acres

Wetland Descriptors

Sample ID: W004	**Photo ID(s)**: W04-1W (northern end); W04-2W (center of wetland), W04-3W (southern end)
Flagging Description: 1-48 clockwise from northeast corner	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	Y	Yes		No	Waterbody/Watershed: Unnamed drainage (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)											
Primary Water Source (If other, note in comments)		Cap. Fringe	2	Overbanking	1	Sheet Flow		Groundwater	3	Precipitation		Other				
TVARAM SCORE:	55	**TVARAM CATEGORY:**	Category 2													

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)

Young forested wetland formed in flooded drainageway
No evidence of beaver
Wetland drains into drainage ditch beside perimeter road
Drainage is impeded where wetland W04 intersects with the roadside drainage ditch – no evidence of plugged culvert
There are several shallow, linear ditches in the upper end of W04 (southern end) that run transverse to main axis of wetland. These appear to be the result of a past attempt to drain part of the wetland?
Gray Tree Frogs

Project: Bellefonte NP REQ 10389	Investigator: J. Groton, B. Dimick	Normal Circumstances:	y	Sample ID:	W005
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 26, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr, Sh, Sap	Facw	9.	*Ulmus alata*	Tr, Sh	Facu+
2.	*Microstegium vimineum*	H	Fac+	10.	*Rumex crispus*	H	Fac
3.	*Toxicodendron radicans*	WV, Sap	Fac	11.	*Ilex decidua*	Sh	Facw
4.	*Ulmus thomasii*	Tr, Sh	Fac	12.	*Populus deltoides*	Tr	Fac+
5.	*Carex cherokeensis*	H	Facw-	13.	*Berchemia scandens*	Sap	Facw
6.	*Senecio sp.*	H	-	14.			
7.	*Salix*	Tr, Sh	Obl	15.			
8.	*Lonicera japonica*	WV, Sap	Fac-	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 77%

Hydrology

Field Observations:

Depth of Surface Water:	0-4	(in.)
Depth to Free Water in Pit:	>12	(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators			Secondary Indicators
y	Inundated	Drift Lines	Oxidized Root Channels
y	Saturated in Upper 12 in.	Water Marks	Water Stained Leaves
	Sediment Deposits	Drainage Patterns	

Remarks: Isolated, perched wetland on terrace of WWC draining W02; ~25 feet from channel but no obvious connection to stream channel

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-12+	10 YR 4/2	7.5 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

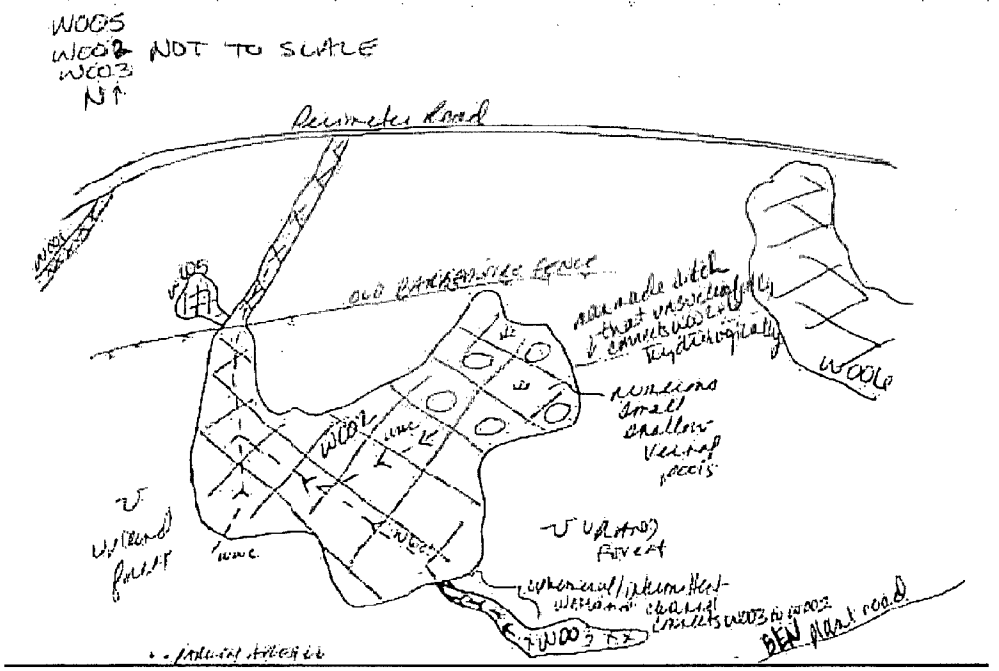
Estimated size: 0.26 acre

Wetland Descriptors

Sample ID: W005	**Photo ID(s):** W05-1W; W05-2W; W05-3W, W05-4W
Flagging Description: 1-17 clockwise from southern tip of wetland	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?		Yes	x	No	Waterbody/Watershed:										
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking	2	Sheet Flow		Groundwater	1	Precipitation		Other			
TVARAM SCORE:	60	**TVARAM CATEGORY:**	Category 3												

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)

Shallow, perched wetland or vernal pool on terrace of wet weather conveyance draining Wetland W02
Wetland W05 is about 25 feet from conveyance channel with no obvious signs of a direct hydrologic connection to the stream channel, even during high flows

Project: Bellefonte NP REQ 10389	Investigator: J. Groton, B. Dimick	Normal Circumstances:	y	Sample ID:	W006
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: April 26, 2006	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr	Facw	9.	*Glyceria striata*	H	Obl
2.	*Liquidambar styraciflua*	Tr	Fac+	10.	*Polygonum sp.*	H	-
3.	*Quercus phellos*	Tr	Facw-	11.	*Gratiola neglecta*	H	Obl
4.	*Ilex decidua*	Sh	Facw	12.	*Ligustrum sinense*	Sh	Fac
5.	*Berchemia scandens*	WV	Facw	13.	*Impatiens sp.*	H	Facw
6.	*Smilax glauca*	WV	Fac	14.	*Carpinus caroliniana*	Tr, Sh	Fac
7.	*Galium aperine*	H	Facu	15.	*Campsis radicans*	Sap	Fac
8.	*Celtis laevigata*	Tr	Facw	16.	*Moss*	H	-

Percent of Dominant Species That are OBL, FACW, or FAC: 88%

Hydrology

Field Observations:

Depth of Surface Water:	0-12	(in.)
Depth to Free Water in Pit:	3	(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators			Secondary Indicators	
y	Inundated		Drift Lines		Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns	

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 3/2	-	-	Silty clay loam
4-12+	10 YR 5/2	10 YR 5.6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

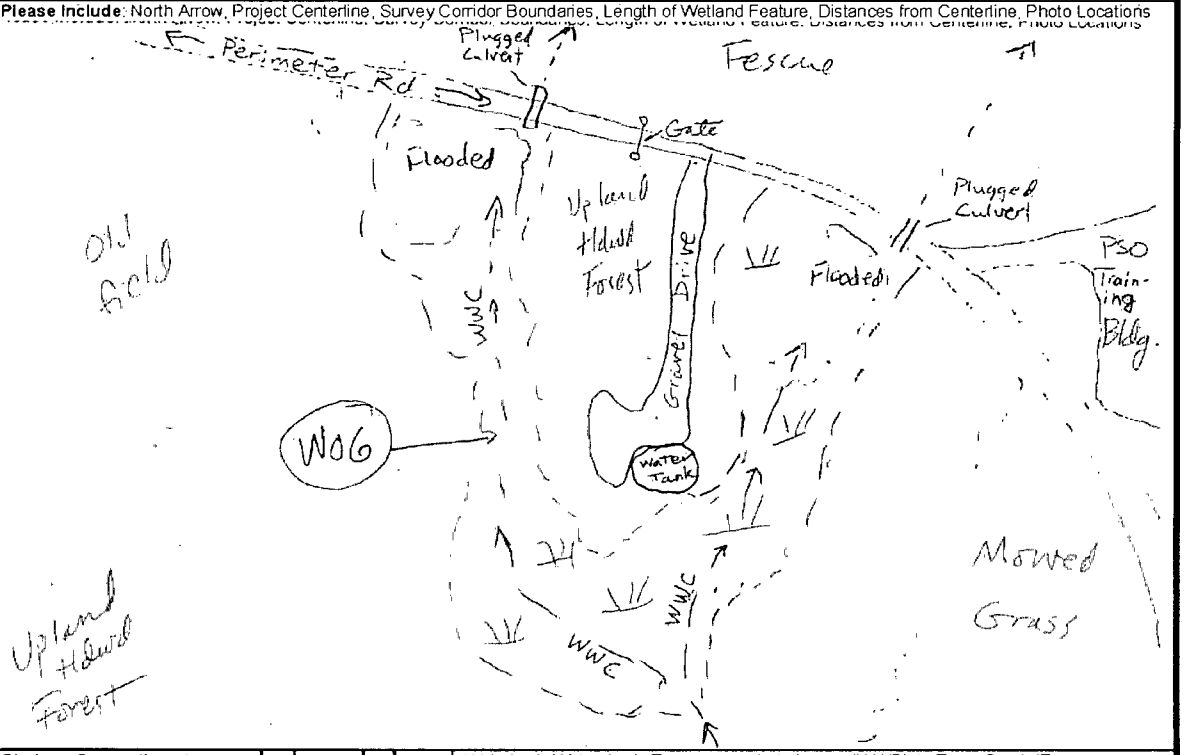
Estimated size: 2.36 acres

Wetland Descriptors

Sample ID: W006	**Photo ID(s):** W06-1W (northeastern end), W06-2W (center of wetland), W06-3W (northwestern end)
Flagging Description: 1-75 clockwise from the northwest corner	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Two unnamed drainages (WWC) to Town Creek (Tennessee River-Guntersville Reservoir)														
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking		Sheet Flow	2	Groundwater	3	Precipitation		Other							
TVARAM SCORE:			**TVARAM CATEGORY:**																

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)
There is a ditch near the northeast corner that looks like someone attempted (unsuccessfully) to connect W06 to W02, about 100-150 feet to the south

Wetland W06 is fed by a wet weather conveyance that enters the wetland from the south and splits into two channels, one that flows northeast and a second that flows northwest. Both channels exit through culverts under the perimeter road. Both culverts are plugged with debris and water has ponded up at both culverts south of the perimeter road.

There appears to be some local groundwater influence (high water table) although no seeps or springs were observed

Grey tree frog, cricket frog, crayfish middens

Project: Bellefonte NP REQ 10389	Investigator: B. Dimick, K. Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W007
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: September 1,2009	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr	Facw	9.			
2.	*Celtis laevigata*	Tr	Facw	10.			
3.	*Berchemia scandens*	Vv	Facw	11.			
4.	*Populus deltoides*	Tr	Fac	12.			
5.	*Ligustrum sinense*	Sh	Fac	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	0	(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
n	Inundated		Drift Lines	y	Oxidized Root Channels
n	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks: small drainage feature between 2 culverts

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 3/2	-	-	Silty clay loam
4-12+	10 YR 5/2	10 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

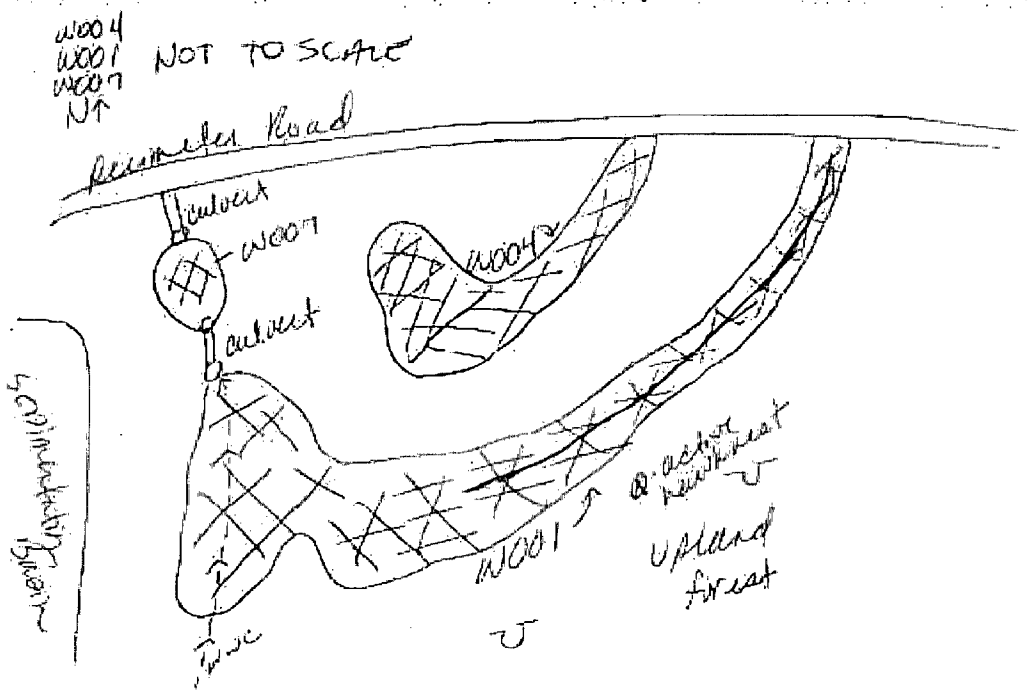
Estimated size: 0.02 acres

Wetland Descriptors

Sample ID: W007	Photo ID(s): 60-64
Flagging Description: 4 tags	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: culverted drainage to Towns Creek										
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking		Sheet Flow		Groundwater	3	Precipitation		Other			
TVARAM SCORE:	34	TVARAM CATEGORY:	2												

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)**

Crawfish burrows.

Culvert connects W007 to W001 and another culvert leaves W007 and goes beneath road towards Towns Creek.

Project: Bellefonte NP	Investigator: B. Dimick, K.Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W008
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: Sept. 1,2009	Problem Area:	n	Cowardin Code:	PSS1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Salix nigra*	Sapling	OBL	9.			
2.	*Juncus effusus*	Herb	FACW	10.			
3.	*Festuca arundinacea*	Herb	FAC	11.			
4.	*Eupatorium serotinum*	Herb	FAC	12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:		(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators			Secondary Indicators
	Inundated		Drift Lines		Oxidized Root Channels
	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 4/4	-	-	Silt loam
4-12+	10 YR 4/3			Silt Loam

Hydric Soil Indicators:

N	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils		Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks: Hydric soils not present

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	N	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes	Y	No	
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No	N

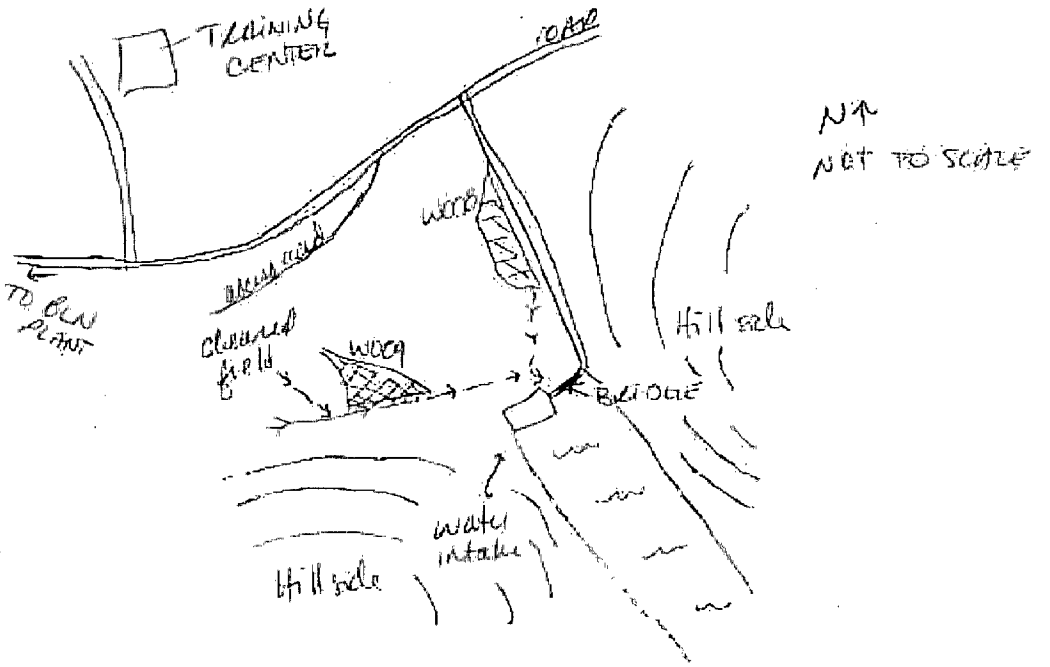
Estimated size: 0.43

Wetland Descriptors

Sample ID: WD08	Photo ID(s): 38,39
Flagging Description:	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Ephemeral conveyance to Guntersville Reservoir										
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking		Sheet Flow		Groundwater	3	Precipitation		Other			
TVARAM SCORE:	31	TVARAM CATEGORY:	2												

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations; station numbers, lat-long, etc)**

This wetland likely formed as a result of grading nearby that created a depression near a road. This wetland does not meet the jurisdictional wetland criteria as defined by the USACE. It meest USFWS wetland definition and should be considered for impacts under NEPA and Executive Order 11990.

Project: Bellefonte NP	Investigator: B. Dimick, K.Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W009
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: Sept. 1,2009	Problem Area:	n	Cowardin Code:	PSS1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Salix nigra*	Sapling	OBL	9.			
2.	*Juncus effusus*	Herb	FACW	10.			
3.	*Festuca arundinacea*	Herb	FAC	11.			
4.	*Cephalanthus occidentalis*	Shrub	OBL	12.			
5.	*Eupatorium serotinum*	Herb	FAC	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100%

Hydrology

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:		(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators			Secondary Indicators
	Inundated		Drift Lines		Oxidized Root Channels
	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 4/4	-	-	Silt loam
4-12+	10 YR 4/3			Silt Loam

Hydric Soil Indicators:

N	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils		Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks: Hydric soils not present

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	N	No
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes	Y	No
Hydric Soils Present?	Yes		No	N	Is wetland mapped on NWI?	Yes		No N

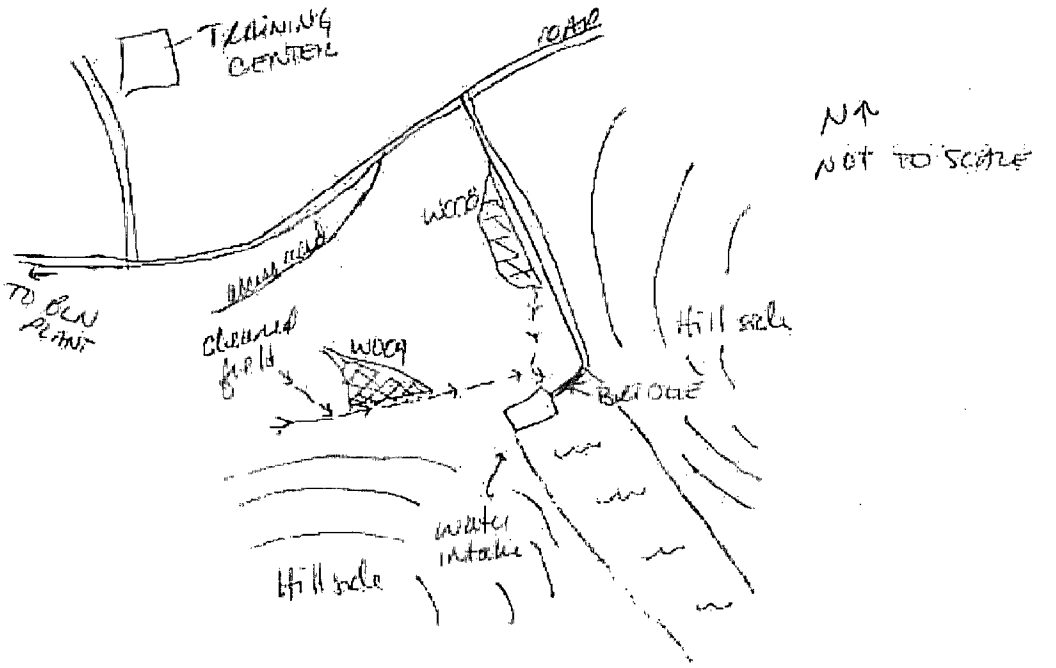
Estimated size: 0.61

Wetland Descriptors

Sample ID: W009	Photo ID(s): no photos
Flagging Description:	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Ephemeral conveyance to Guntersville Reservoir										
Primary Water Source (If other, note in comments)		Cap. Fringe		Overbanking		Sheet Flow		Groundwater	3	Precipitation		Other			
TVARAM SCORE:	31	TVARAM CATEGORY:	2												

Description of Wetland and Other Comments: **(i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)**.

Does not have soils to meet jurisdictional wetland criteria as defined by the USACE. This wetland likely developed in a low spot let over after grading occurred. It meest USFWS wetland definition and should be considered for impacts under NEPA and Executive Order 11990.

Project: Bellefonte	Investigator: B. Dimick, K.Pilarski, L.Burton	Normal Circumstances:	y	Sample ID:	W010
County: Jackson		Atypical Situation:	n	Station or Structure Number(s):	
State: AL	Date: September 1, 2009	Problem Area:	n	Cowardin Code:	PFO1E

Vegetation

	Plant Species	Stratum	Indicator		Plant Species	Stratum	Indicator
1.	*Fraxinus pennsylvanica*	Tr	Facw	9.	*Glyceria striata*	H	Obl
2.	*Liquidambar styraciflua*	Tr	Fac+	10.	*Polygonum sp.*	H	-
3.	*Quercus phellos*	Tr	Facw-	11.	*Salix nigra*	Tr	OBL
4.	*Ilex decidua*	Sh	Facw	12.	*Ligustrum sinense*	Sh	Fac
5.	*Berchemia scandens*	WV	Facw	13.	*Saururus cernuum*	Herb	OBL
6.	*Smilax glauca*	WV	Fac	14.	*Carpinus caroliniana*	Tr, Sh	Fac
7.	*Populus deltoides*	Tr	Fac	15.	*Campsis radicans*	Sap	Fac
8.	*Celtis laevigata*	Tr	Facw	16.			

Percent of Dominant Species That are OBL, FACW, or FAC: 100

Hydrology

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	0	(in.)
Depth to Saturated Soil:	0	(in.)

Wetland Hydrology Indicators:

Primary Indicators				Secondary Indicators	
	Inundated		Drift Lines	Y	Oxidized Root Channels
y	Saturated in Upper 12 in.		Water Marks		Water Stained Leaves
	Sediment Deposits	y	Drainage Patterns		

Remarks:

Soils

Soil Unit:		Drainage class:		Listed hydric soil?	Yes		No	

Profile Description:

Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture
0-4	10 YR 3/1	-	-	Silty clay loam
4-12+	10 YR 5/2	10 YR 5/6	Common	Silty clay loam

Hydric Soil Indicators:

y	Gleyed or Low Chroma Colors		Histic Epipedon		Aquic Moisture Regime
	Sulfidic Odor		High Organic Cont. Surf. Layer Sandy Soils	y	Reducing Conditions
	Concretions		Organic Streaking in Sandy Soils		Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes	Y	No		Is this Sampling Point Within a USACE Wetland?	Yes	Y	No	
Wetland Hydrology Present?	Yes	Y	No		Does area only meet USFWS wetland definition?	Yes		No	N
Hydric Soils Present?	Yes	Y	No		Is wetland mapped on NWI?	Yes		No	N

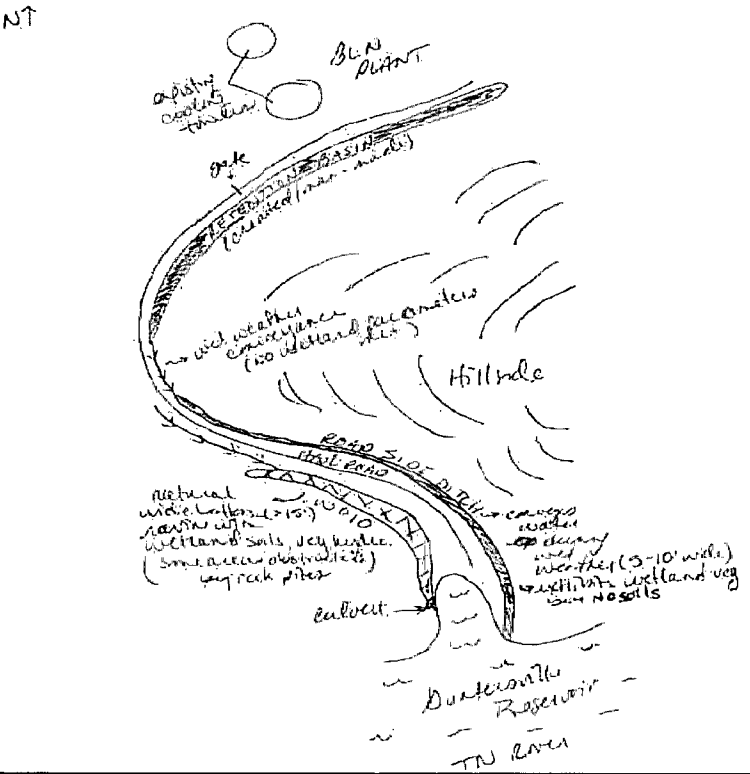
Estimated size: 0.96 acres

Wetland Descriptors

Sample ID: W010	**Photo ID(s)**: 16-18,24,26,153-165
Flagging Description:	

Drawing

Please Include: North Arrow, Project Centerline, Survey Corridor Boundaries, Length of Wetland Feature, Distances from Centerline, Photo Locations



Obvious Connections to Waters of the US/State?	x	Yes		No	Waterbody/Watershed: Drains directly into Guntersville Resevoir via a culvert										
Primary Water Source (If other, note in comments)		Cap. Fringe	1	Overbanking		Sheet Flow	2	Groundwater	3	Precipitation		Other			
TVARAM SCORE:	50	**TVARAM CATEGORY:**	2												

Description of Wetland and Other Comments: (i.e. forest age class; habitat features; hydrologic regime; description of the wetland outside of or adjacent to ROW; erosion potential, existing disturbances, adjacent land use, wildlife observations, station numbers, lat-long, etc)

This drainage feature is a wide bottom, natural ravine with large wetland trees and wetland soils (although some places are rocky). The majority of the ravine contains at least minimal vegetation. The ravine empties into Guntersville Resevoir via a culvert near the shoreline.

TVARAM Field Form Quantitative Rating

Site: Bellefonte W001	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

Metric 1. Wetland Area (size)

3 (max 6 pts.) | 3 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [3] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

7 (max 14 pts.) | 10 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [4] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [3] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

21 (max 30 pts.) | 31 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [3] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [2] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] ditch	[ ] point source (nonstormwater)
[x] tile (including culvert)	[x] filling/grading
[x] dike	[ ] road bed/RR track
[ ] weir	[ ] dredging
[x] stormwater input	[ ] other _____

Metric 4. Habitat Alteration and Development

13.5 (max 20 pts.) | 44.5 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [3] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [5] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] mowing	[ ] shrub/sapling removal
[ ] grazing	[ ] herbaceous/aquatic bed removal
[ ] clearcutting	[ ] woody debris removal
[ ] selective cutting	[ ] sedimentation
[ ] farming	[ ] dredging
[ ] toxic pollutants	[ ] nutrient enrichment

44.5
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W001	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

44.5 subtotal previous page

10 max 10 pts. | **54.5** subtotal

Metric 5. Special Wetlands

10 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m, sphagnum or other moss (5); muck, organic soil layer (3)
- [5] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [5] **Vernal pool (5);** isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

9 max 20 pts. | **63.5** subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities. Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [2] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other _____

6b. Horizontal (plan view) interspersion. Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [2] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [ ] None (0)

6c. Coverage of invasive plants. Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks.
- [2] Coarse woody debris >15 cm (6 in.)
- [2] Standing dead >25 cm (10 in.) dbh
- [2] Amphibian breeding pools

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]

1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality

2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality

3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species

mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species

high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

Mudflat and Open Water Class Quality

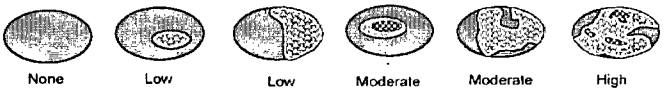
0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]

1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]

2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acre)]

3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

Hypothetical Wetland for Estimating Degree of Interspersion



None | Low | Low | Moderate | Moderate | High

Microtopography Cover Scale

0 = Absent

1 = Present in very small amounts or if more common of marginal quality

2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality

3 = Present in moderate or greater amounts and of highest quality

63.5 Category 3 **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W002	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

Metric 1. Wetland Area (size)

3 (max 6 pts.) | 3 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [3] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

11 (max 14 pts.) | 14 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [7] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [7] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

23 (max 30 pts.) | 37 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater.(5)
- [3] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [x] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [x] road bed/RR track
- [ ] dredging
- [ ] other _____

Metric 4. Habitat Alteration and Development

14 (max 20 pts.) | 51 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [3] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [4] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [9] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [x] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

51
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W002	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

51 subtotal previous page

Metric 5. Special Wetlands

10 max 10 pts. **61** subtotal

20 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [5] Bog, fen, wet prairie (10); acidophilic veg., **mossy substrate** >10 sq.m; sphagnum or **other moss** (5); muck, organic soil layer (3)
- [5] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); **mature > 18 in. (45 cm) dbh (5)** [exclude pine plantation]
- [5] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [5] **Vernal pool (5)**; isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

8 max 20 pts. **69** Subtotal

6a. Wetland vegetation communities. Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [2] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other _____

6b. Horizontal (plan view) interspersion. Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [3] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [ ] None (0)

6c. Coverage of invasive plants. Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks.
- [1] Coarse woody debris >15 cm (6 in.)
- [1] Standing dead >25 cm (10 in.) dbh
- [2] Amphibian breeding pools

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]

1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality

2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality

3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

Low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species

mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species

high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rate, threatened, or endangered species

Mudflat and Open Water Class Quality

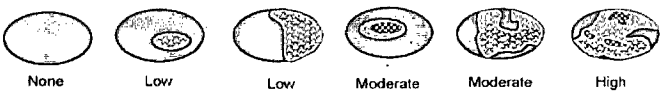
0 = Absent <0.1 ha (0.25 acres) [For BR/CM: <0.04 ha (0.1 acre)]

1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]

2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acre)]

3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

Hypothetical Wetland for Estimating Degree of Interspersion



None Low Low Moderate Moderate High

Microtopography Cover Scale

0 = Absent

1 = Present in very small amounts or if more common of marginal quality

2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality

3 = Present in moderate or greater amounts and of highest quality

69 Category 3 **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W003	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

Metric 1. Wetland Area (size)

2 (max 6 pts.) | 2 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- ☐ >50 acres (>20.2 ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- ☐ 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- ☐ 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- 2 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- ☐ 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- ☐ <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

4 (max 14 pts.) | 6 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☐ WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- ☐ MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- 1 NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- 3 LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- ☐ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- 1 High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

14 (max 30 pts.) | 20 (subtotal)

3a. Sources of water. Score all that apply.

- ☐ High pH groundwater (5)
- 3 Other groundwater (3) [BR/CM (5)]
- 1 Precipitation (1) [unless BR/CM primary source (5)]
- ☐ Seasonal/intermittent surface water (3)
- ☐ Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- ☐ 100-year floodplain (1)
- 1 Between stream/lake and other human use (1)
- 1 Part of wetland/upland (e.g., forest), complex (1)
- 1 Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 m (27.6 in.) (3)
- ☐ 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- 1 <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- ☐ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3) [BR/CM (4)]
- ☐ Seasonally inundated (2) [BR/CM (4)]
- 1 Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☐ None or none apparent (12)
- 7 Recovered (7)
- 3 Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

☐ ditch	☐ point source (nonstormwater)
☐ tile (including culvert)	☒ filling/grading
☐ dike	☒ road bed/RR track
☐ weir	☐ dredging
☐ stormwater input	☐ other _____

Metric 4. Habitat Alteration and Development

9 (max 20 pts.) | 29 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- ☐ None or none apparent (4)
- 3 Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- ☐ Moderately good (4)
- 3 Fair (3)
- ☐ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- 3 Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

☐ mowing	☐ shrub/sapling removal
☐ grazing	☐ herbaceous/aquatic bed removal
☐ clearcutting	☐ woody debris removal
☐ selective cutting	☐ sedimentation
☐ farming	☐ dredging
☐ toxic pollutants	☐ nutrient enrichment

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subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W003	Rater(s): J. Groton, H. Hart	Date: April 6, 2006

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Metric 5. Special Wetlands

4 max 10 pts. | 33 subtotal

4 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos; checklists, maps; resource specialist concurrence; data sources; references, etc).

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m. sphagnum or other moss (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [4] Vernal pool (5); **isolated, perched, or slope wetland (4)**; headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

2 max 20 pts. | 35 subtotal

6a. Wetland vegetation communities. Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [2] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other _____

6b. Horizontal (plan view) interspersion. Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [1] Low (1) [BR/CM (2)]
- [ ] None (0)

6c. Coverage of invasive plants. Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

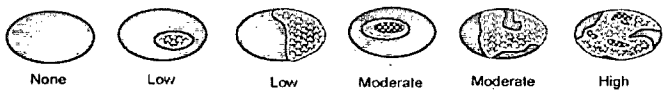
Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <02 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

Hypothetical Wetland for Estimating Degree of Interspersion



None | Low | Low | Moderate | Moderate | High

Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

35 Category 2 **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W004	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

Metric 1. Wetland Area (size)

2 (max 6 pts.) | 2 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

5 (max 14 pts.) | 8 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [3] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [3] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [ ] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

15 (max 30 pts.) | 23 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [2] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [3] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] ditch	[ ] point source (nonstormwater)
[X] tile (including culvert)	[X] filling/grading
[X] dike	[ ] road bed/RR track
[ ] weir	[ ] dredging
[X] stormwater input	[ ] other _____

Metric 4. Habitat Alteration and Development

11 (max 20 pts) | 34 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [3] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [4] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [3] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] mowing	[ ] shrub/sapling removal
[ ] grazing	[ ] herbaceous/aquatic bed removal
[ ] clearcutting	[ ] woody debris removal
[ ] selective cutting	[ ] sedimentation
[ ] farming	[ ] dredging
[ ] toxic pollutants	[ ] nutrient enrichment

34
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W004	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

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subtotal previous page

Metric 5. Special Wetlands

8 max 10 pts. | 42 subtotal

8 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [5] Bog, fen, wet prairie (10); acidophilic veg., mossy **substrate >10 sq.m.** sphagnum or **other moss** (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl >0.25 acre (0.1 ha); old growth (10); **mature >18 in. (45 cm) dbh (5)** [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] **Vernal pool (5);** isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [3] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

13 max 20 pts. | 55 subtotal

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [2] Shrub
- [2] Forest
- [ ] Mudflats
- [2] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other _____

6b. Horizontal (plan view) interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [3] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [ ] None (0)

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks
- [2] Coarse woody debris >15 cm (6 in.)
- [1] Standing dead >25 cm (10 in.) dbh
- [2] Amphibian breeding pools

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

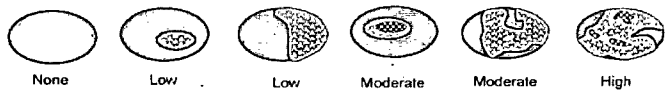
Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <02 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

Hypothetical Wetland for Estimating Degree of Interspersion



Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

55 Category 2 **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W005	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

Metric 1. Wetland Area (size)

2 (max 6 pts.) | 2 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- ☐ >50 acres (>20.2 ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- ☐ 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- ☐ 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- ☒ 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- ☐ 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- ☐ <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

13 (max 14 pts.) | 15 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☒ WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- ☐ MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- ☐ NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☒ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☒ LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- ☐ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- ☐ High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

19 (max 30 pts.) | 34 (subtotal)

3a. Sources of water. Score all that apply.

- ☐ High pH groundwater (5)
- ☐ Other groundwater (3) [BR/CM (5)]
- ☒ Precipitation (1) [unless BR/CM primary source (5)]
- ☐ Seasonal/intermittent surface water (3)
- ☐ Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- ☐ 100-year floodplain (1)
- ☒ Between stream/lake and other human use (1)
- ☒ Part of wetland/upland (e.g., forest), complex (1)
- ☒ Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 m (27.6 in.) (3)
- ☐ 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- ☒ <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- ☐ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3) [BR/CM (4)]
- ☒ Seasonally inundated (2) [BR/CM (4)]
- ☐ Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☒ 12 None or none apparent (12)
- ☐ Recovered (7)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

☐ ditch	☐ point source (nonstormwater)
☐ tile (including culvert)	☐ filling/grading
☐ dike	☐ road bed/RR track
☐ weir	☐ dredging
☐ stormwater input	☐ other _____

Metric 4. Habitat Alteration and Development

14 (max 20 pts.) | 48 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- ☒ 4 None or none apparent (4)
- ☐ Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- ☒ 4 Moderately good (4)
- ☐ Fair (3)
- ☐ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☒ 6 Recovered (6)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

☐ mowing	☐ shrub/sapling removal
☐ grazing	☐ herbaceous/aquatic bed removal
☐ clearcutting	☐ woody debris removal
☐ selective cutting	☒ sedimentation
☐ farming	☐ dredging
☐ toxic pollutants	☐ nutrient enrichment

48
subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W005	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

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Metric 5. Special Wetlands

4 max 10 pts | **52** subtotal

4 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps; resource specialist concurrence, data sources; references, etc).

- [ ] Bog, fen, wet prairie (10); acidophilic veg., **mossy substrate** >10 sq m, sphagnum or **other moss** (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [4] **Vernal pool (5)**; isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water; >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up; or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

8 max 20 pts | **60** Subtotal

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [2] Forest
- [ ] Mudflats
- [1] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other _____

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [3] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

Low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

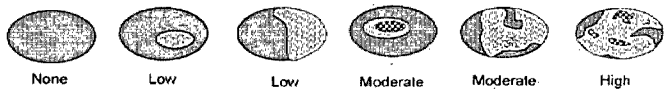
Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks.
- [1] Coarse woody debris >15 cm (6 in.)
- [1] Standing dead >25 cm (10 in.) dbh
- [1] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion



Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

60Category 3 **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte W006	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

Metric 1. Wetland Area (size)

2 (max 6 pts.) | 2 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):
Aerial Photos
Field Survey

Metric 2. Upland Buffers and Surrounding Land Use

9 (max 14 pts.) | 11 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [4] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [7] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [3] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [ ] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

20 (max 30 pts.) | 31 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [3] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [2] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [1] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] ditch	[ ] point source (nonstormwater)
[x] tile (including culvert)	[x] filling/grading
[ ] dike	[x] road bed/RR track
[ ] weir	[ ] dredging
[ ] stormwater input	[ ] other _____

Metric 4. Habitat Alteration and Development

12.5 (max 20 pts.) | 43.5 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [3] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [5] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [3] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] mowing	[ ] shrub/sapling removal
[ ] grazing	[ ] herbaceous/aquatic bed removal
[ ] clearcutting	[ ] woody debris removal
[ ] selective cutting	[ ] sedimentation
[ ] farming	[ ] dredging
[ ] toxic pollutants	[ ] nutrient enrichment

43.5
subtotal this page

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TVARAM Field Form Quantitative Rating

Site: Bellefonte W006	Rater(s): J. Groton, B. Dimick	Date: April 26, 2006

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Metric 5. Special Wetlands

8 max 10 pts | **51.5** subtotal

8 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [5] Bog, fen, wet prairie (10); acidophilic veg., **mossy substrate >10 sq.m.** sphagnum or **other moss** (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); **isolated, perched, or slope wetland (4)**; headwater wetland (1st order perennial or above) (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [3] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe) G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

12 max 20 pts | **63.5** subtotal

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [1] Emergent
- [ ] Shrub
- [2] Forest
- [ ] Mudflats
- [1] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other _____

6b. Horizontal (plan view) interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [3] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [ ] None (0)

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [-1] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [1] Vegetated hummocks/tussocks
- [2] Coarse woody debris >15 cm (6 in.)
- [1] Standing dead >25 cm (10 in.) dbh
- [2] Amphibian breeding pools

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <02 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

Hypothetical Wetland for Estimating Degree of Interspersion

None | Low | Low | Moderate | Moderate | High

Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

63.5 Category 3 **GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W007	Rater(s): Britta Dimick	Date: 9/1/09

Metric 1. Wetland Area (size)

1 (max 6 pts.) | 1 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [1] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

Metric 2. Upland Buffers and Surrounding Land Use

4 (max 14 pts.) | 5 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [7] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

17 (max 30 pts.) | 22 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] ditch	[ ] point source (nonstormwater)
[x] tile (including culvert)	[ ] filling/grading
[ ] dike	[ ] road bed/RR track
[ ] weir	[ ] dredging
[ ] stormwater input	[ ] other _____

Metric 4. Habitat Alteration and Development

9 (max 20 pts.) | 31 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [1] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] mowing	[ ] shrub/sapling removal
[ ] grazing	[ ] herbaceous/aquatic bed removal
[ ] clearcutting	[ ] woody debris removal
[ ] selective cutting	[ ] sedimentation
[ ] farming	[ ] dredging
[ ] toxic pollutants	[ ] nutrient enrichment

31 subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W007	Rater(s): Britta Dimick	Date: 9/01/09

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subtotal previous page

Metric 5. Special Wetlands

0 (max 10 pts) | 31 (subtotal)

0
raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- ☐ Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m. sphagnum or other moss (5); muck, organic soil layer (3)
- ☐ Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- ☐ Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- ☐ Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- ☐ Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- ☐ Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- ☐ Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- ☐ Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- ☐ Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- ☐ Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- ☐ Cat. 1 (very low quality): <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

3 (max 20 pts.) | 34 (subtotal)

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- ☐ Aquatic bed
- 1 Emergent
- 1 Shrub
- 1 Forest
- ☐ Mudflats
- ☐ Open water <20 acres (8 ha)
- ☐ Moss/lichen. Other _____

Vegetation Community Cover Scale

0 =	Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 =	Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 =	Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 =	Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- ☐ High (5)
- ☐ Moderately high (4) [BR/CM (5)]
- ☐ Moderate (3) [BR/CM (5)]
- ☐ Moderately low (2) [BR/CM (3)]
- 1 Low (1) [BR/CM (2)]
- ☐ None (0)

Narrative Description of Vegetation Quality

low =	Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod =	Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high =	A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- ☐ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- -1 Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

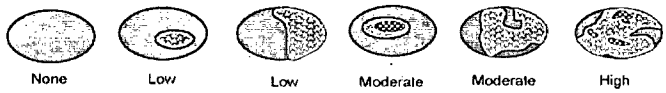
Mudflat and Open Water Class Quality

0 =	Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 =	Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 =	Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acre)]
3 =	High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- ☐ Vegetated hummocks/tussocks.
- ☐ Coarse woody debris >15 cm (6 in.)
- ☐ Standing dead >25 cm (10 in.) dbh
- ☐ Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion



Microtopography Cover Scale

0 =	Absent
1 =	Present in very small amounts or if more common of marginal quality
2 =	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 =	Present in moderate or greater amounts and of highest quality

34=Category 2 **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality; 30-59 = Category 2, moderage quality; 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W008	Rater(s): Britta Dimick	Date: 9/1/09

Metric 1. Wetland Area (size)

2 (max 6 pts.) | 2 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

Metric 2. Upland Buffers and Surrounding Land Use

2 (max 14 pts.) | 2 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

17 (max 30 pts.) | 19 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] ditch	[ ] point source (nonstormwater)
[ ] tile (including culvert)	[ ] filling/grading
[ ] dike	[X] road bed/RR track
[ ] weir	[ ] dredging
[ ] stormwater input	[ ] other _____

Metric 4. Habitat Alteration and Development

11 (max 20 pts.) | 30 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [3] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] mowing	[ ] shrub/sapling removal
[ ] grazing	[ ] herbaceous/aquatic bed removal
[ ] clearcutting	[ ] woody debris removal
[ ] selective cutting	[ ] sedimentation
[ ] farming	[ ] dredging
[ ] toxic pollutants	[ ] nutrient enrichment

30 subtotal this page

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W008	Rater(s): Britta Dimick	Date: 9/01/09

30
subtotal previous page

Metric 5. Special Wetlands

0 (max 10 pts) | 30 (subtotal)

0
raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- ☐ Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m. sphagnum or other moss (5); muck, organic soil layer (3)
- ☐ Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- ☐ Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- ☐ Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- ☐ Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- ☐ Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- ☐ Gross morph. adapt. in ≥5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- ☐ Ecological community with global rank (NatureServe) G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- ☐ Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- ☐ Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- ☐ Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

1 (max 20 pts.) | 31 (subtotal)

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- ☐ Aquatic bed
- 1 Emergent
- 1 Shrub
- ☐ Forest
- ☐ Mudflats
- ☐ Open water <20 acres (8 ha)
- ☐ Moss/lichen Other _____

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- ☐ High (5)
- ☐ Moderately high (4) [BR/CM (5)]
- ☐ Moderate (3) [BR/CM (5)]
- ☐ Moderately low (2) [BR/CM (3)]
- 1 Low (1) [BR/CM (2)]
- ☐ None (0)

Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rate, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- ☐ Extensive >75% cover (-5)
- -3 Moderate 25-75% cover (-3)
- ☐ Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

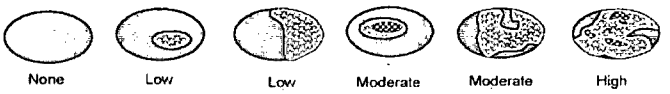
Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- 1 Vegetated hummocks/tussocks
- ☐ Coarse woody debris >15 cm (6 in.)
- ☐ Standing dead >25 cm (10 in.) dbh
- ☐ Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion



None | Low | Low | Moderate | Moderate | High

Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

31=Category 2 **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality; 30-59 = Category 2, moderage quality; 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W009	Rater(s): Britta Dimick	Date: 9/1/09

Metric 1. Wetland Area (size)

2 (max 6 pts.) | 2 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

Metric 2. Upland Buffers and Surrounding Land Use

2 (max 14 pts.) | 2 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [1] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

17 (max 30 pts.) | 19 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[X] ditch	[ ] point source (nonstormwater)
[ ] tile (including culvert)	[ ] filling/grading
[ ] dike	[ ] road bed/RR track
[ ] weir	[ ] dredging
[ ] stormwater input	[ ] other _____

Metric 4. Habitat Alteration and Development

11 (max 20 pts.) | 30 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [3] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [6] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

[ ] mowing	[ ] shrub/sapling removal
[ ] grazing	[ ] herbaceous/aquatic bed removal
[ ] clearcutting	[ ] woody debris removal
[ ] selective cutting	[ ] sedimentation
[ ] farming	[ ] dredging
[ ] toxic pollutants	[ ] nutrient enrichment

30 (subtotal this page)

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W009	Rater(s): Britta Dimick	Date: 9/01/09

30
subtotal previous page

Metric 5. Special Wetlands

0 (max 10 pts.) | 30 (subtotal)

0
raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m, sphagnum or other moss (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe) G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

1 (max 20 pts.) | 31 (subtotal)

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [1] Emergent
- [1] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other _____

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3) [BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [1] Low (1) [BR/CM (2)]
- [ ] None (0)

Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [-3] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <02 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- [1] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

31=Category 2 **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality; 30-59 = Category 2, moderage quality; 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W010	Rater(s): Britta Dimick	Date: 9/1/09

Metric 1. Wetland Area (size)

2 (max 6 pts.) | 2 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [2] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS data

Metric 2. Upland Buffers and Surrounding Land Use

7 (max 14 pts.) | 9 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [4] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [3] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

17 (max 30 pts) | 26 (subtotal)

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [1] 100-year floodplain (1)
- [1] Between stream/lake and other human use (1)
- [1] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3) [BR/CM (4)]
- [2] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [7] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [x] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [x] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [x] road bed/RR track
- [ ] dredging
- [ ] other _____

Metric 4. Habitat Alteration and Development

18 (max 20 pts.) | 44 (subtotal)

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [2] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [4] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [12] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [x] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

44 (subtotal this page)

Last revised 2005-04-29

TVARAM Field Form Quantitative Rating

Site: Bellefonte; W0010	Rater(s): Britta Dimick	Date: 9/01/09

44
subtotal previous page

Metric 5. Special Wetlands

0 (max 10 pts.) | 44 (subtotal)

0
raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos; checklists, maps, resource specialist concurrence, data sources; references, etc).

- ☐ Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m. sphagnum or other moss (5); muck, organic soil layer (3)
- ☐ Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- ☐ Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- ☐ Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- ☐ Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- ☐ Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- ☐ Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- ☐ Ecological community with global rank (NatureServe) G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- ☐ Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- ☐ Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- ☐ Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

Metric 6. Plant Communities, Interspersion, Microtopography

6 (max 20 pts.) | 50 (subtotal)

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- ☐ Aquatic bed
- 1 Emergent
- 2 Shrub
- 2 Forest
- ☐ Mudflats
- ☐ Open water <20 acres (8 ha)
- ☐ Moss/lichen Other _____

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- ☐ High (5)
- ☐ Moderately high (4) [BR/CM (5)]
- ☐ Moderate (3) [BR/CM (5)]
- ☐ Moderately low (2) [BR/CM (3)]
- 1 Low (1) [BR/CM (2)]
- ☐ None (0)

Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rare, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- ☐ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- -1 Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

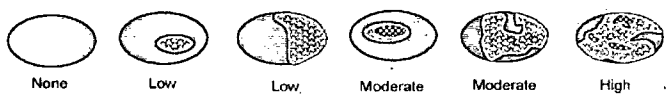
Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <0.2 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- 1 Vegetated hummocks/tussocks
- ☐ Coarse woody debris >15 cm (6 in.)
- ☐ Standing dead >25 cm (10 in.) dbh
- ☐ Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion



Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

50=Category 2 **GRAND TOTAL (max 100 pts)**

[0-29 = Category 1, low quality; 30-59 = Category 2, moderage quality; 60-100 = Category 3, superior quality]

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

Last revised 2005-04-29

Appendix C – Vital Signs Reservoir Fish Assemblage Index (RFAI) Scores

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Table C-1. Individual Metric Scores and the Overall RFAI Scores Downstream (TRM 390.0) and Upstream (TRM 393.0) of Bellefonte Nuclear Plant, Spring 2009

Spring 2009		TRM 390.0		TRM 393.0	
Metric	**Gear Type**	**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		**21 Species**	3	**26 Species**	3
2. Number of centrarchid species (less micropterus)		**6 Species** Black Crappie Bluegill Green Sunfish Redbreast Sunfish Redear Sunfish Warmouth	5	**6 Species** Black Crappie Bluegill Longear Sunfish Redbreast Sunfish Redear Sunfish Warmouth	5
3. Number of benthic invertivore species		**2 Species** Freshwater drum Logperch	1	**1 Species** Freshwater drum	1
4. Number of intolerant species		**0 Species**	1	**2 Species** Skipjack Herring Longear Sunfish	1
5. Percent tolerant individuals	Electrofishing	**72.7%** Bluegill 51.5% Largemouth Bass 13.3% Spotfin Shiner 2.2% Gizzard Shad 2.0% Redbreast Sunfish 2.0% Bluntnose Minnow 1.1% Common Carp 0.4% Green Sunfish 0.2%	0.5	**73.6 %** Bluegill 54.5% Largemouth Bass 8.9% Gizzard Shad 3.4% Common Carp 3.2% Spotfin Shiner 2.8% Redbreast Sunfish 0.3% Western Mosquitofish 0.3% Bluntnose Minnow 0.1% Yellow Bullhead 0.1%	0.5
	Gill Netting	**41.0%** Longnose Gar 19.4% Common Carp 11.2% Largemouth Bass 5.2% Bluegill 4.5% Gizzard Shad 0.7%	0.5	**17.2%** Gizzard Shad 7.0% Longnose Gar 5.7% Common Carp 1.9% Largemouth Bass 1.4% Bluegill 0.6% Brown Bullhead 0.6%	1.5
6. Percent dominance by one species	Electrofishing	**51.5%** Bluegill	1.5	**54.5%** Bluegill	1.5
	Gill Netting	**22.4%** Yellow Bass	1.5	**49.0%** Yellow Bass	0.5
7. Percent non-native species	Electrofishing	**12.4%** Inland Silverside 11.6% Common Carp 0.4% Yellow Perch 0.4%	0.5	**3.5%** Common Carp 3.2% Yellow Perch 0.3%	0.5
	Gill Netting	**11.2%** Common Carp 11.2%	0.5	**2.5%** Common Carp 1.9% Grass Carp 0.6%	0.5

Table C-1 (Continued)

Spring 2009		TRM 390.0		TRM 393.0	
Metric	**Gear Type**	**Obs**	**Score**	**Obs**	**Score**
8. Number of top carnivore species		**8 Species** Black Crappie Flathead Catfish Largemouth Bass Longnose Gar Spotted Bass Spotted Gar White Bass Yellow Bass	**5**	**9 Species** Black Crappie Flathead Catfish Largemouth Bass Longnose Gar Skipjack Herring Spotted Bass Spotted Gar White Bass Yellow Bass	**5**
B. Trophic composition					
9. Percent top carnivores	Electrofishing	**15.7%** Largemouth Bass 13.2% Yellow Bass 1.5% Spotted Gar 0.6% Spotted Bass 0.4%	**2.5**	**11.7%** Largemouth Bass 8.9% Spotted Bass 1.4% Yellow Bass 1.0% White Bass 0.3% Black Crappie 0.1%	**2.5**
	Gill Netting	**64.2%** Yellow Bass 22.5% Longnose Gar 19.3% White Bass 6.1% Largemouth Bass 5.2% Spotted Bass 4.5% Black Crappie 3.6% Flathead Catfish 3.0%	**2.5**	**73.9%** Yellow Bass 49.0% Spotted Bass 8.4% Longnose Gar 5.7% White Bass 4.5% Flathead Catfish 2.5% Black Crappie 1.3% Largemouth Bass 1.3% Skipjack Herring 0.6% Spotted Gar 0.6%	**2.5**
10. Percent omnivores	Electrofishing	**9.0%** Channel Catfish 5.5% Gizzard Shad 2.0% Bluntnose Minnow 1.1% Common Carp 0.4%	**2.5**	**12.3%** Channel Catfish 5.4% Gizzard Shad 3.3% Common Carp 3.2% Bluntnose Minnow 0.1% Yellow Bullhead 0.1%	**2.5**
	Gill Netting	**23.9%** Common Carp 11.2% Blue Catfish 7.5% Channel Catfish 4.5% Gizzard Shad 0.7%	**1.5**	**20.4%** Blue Catfish 7.6% Gizzard Shad 7.0% Channel Catfish 3.2% Common Carp 1.9% Brown Bullhead 0.6%	**1.5**
C. **Fish abundance and health**					
11. Average number per run	Electrofishing	**36.1**	**0.5**	**47.8**	**0.5**
	Gill Netting	**13.4**	**1.5**	**15.7**	**1.5**
12. Percent anomalies	Electrofishing	**4.1%**	**1.5**	**8.1%**	**0.5**
	Gill Netting	**0.0%**	**2.5**	**1.3%**	**2.5**
Overall RFAI Score			**35** **Fair**		**34** **Fair**

Table C-2. Individual Metric Scores and the Overall RFAI Scores Downstream (TRM 390.0) and Upstream (TRM 393.0) of Bellefonte Nuclear Plant, Summer 2009

Summer 2009		TRM 390.0		TRM 393.0	
Metric	**Gear Type**	**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		**20 Species**	**3**	**23 Species**	**3**
2. Number of centrarchid species (less micropterus)		**7 Species** Black Crappie Bluegill Longear Sunfish Redbreast Sunfish Redear Sunfish Warmouth White Crappie	**5**	**7 Species** Black Crappie Bluegill Green Sunfish Longear Sunfish Redbreast Sunfish Redear Sunfish Warmouth	**5**
3. Number of benthic invertivore species		**1 Species** Freshwater drum	**1**	**1 Species** Freshwater drum	**1**
4. Number of intolerant species		**1 Species** Longear Sunfish	**1**	**2 Species** Skipjack Herring Longear Sunfish	**1**
5. Percent tolerant individuals	Electrofishing	**59.7%** Largemouth Bass 20.6% Bluegill 14.7% Western mosquitofish 10.0% Gizzard Shad 5.7% Spotfin Shiner 4.1% Golden Shiner 2.3% Common Carp 1.4% Redbreast Sunfish 0.6% White Crappie 0.3%	**0.5**	**63.3 %** Bluegill 22.2% Largemouth Bass 11.8% Gizzard Shad 11.7% Spotfin Shiner 8.9% Golden Shiner 7.4% Longnose Gar 0.7% Yellow bullhead 0.2% Redbreast Sunfish 0.2% Green Sunfish 0.2%	**0.5**
	Gill Netting	**41.0%** Longnose gar 14.0% Common Carp 13.0% Gizzard Shad 9.0% Largemouth Bass 3.0% Bluegill 2.0%	**0.5**	**38.4%** Longnose Gar 17.4% Gizzard Shad 10.5% Largemouth Bass 8.1% Common Carp 2.3%	**0.5**
6. Percent dominance by one species	Electrofishing	**20.5%** Largemouth Bass	**2.5**	**25.4%** Spotted Gar	**2.5**
	Gill Netting	**17.0%** Channel Catfish	**1.5**	**26.7%** Channel Catfish	**1.5**
7. Percent non-native species	Electrofishing	**3.1%** Inland Silverside 1.7% Common Carp 1.4%	**0.5**	**2.0%** Inland Silverside 2.0%	**1.5**
	Gill Netting	**13.0%** Common Carp 13.0%	**0.5**	**3.5%** Common Carp 2.3% Yellow Perch 1.2%	**0.5**

Table C-2 (Continued)

Summer 2009		TRM 390.0		TRM 393.0	
Metric	**Gear Type**	**Obs**	**Score**	**Obs**	**Score**
8. Number of top carnivore species		**7 Species** Black Crappie Flathead Catfish Largemouth Bass Longnose Gar Spotted Bass Spotted Gar White Crappie	**3**	**8 Species** Black Crappie Flathead Catfish Largemouth Bass Longnose Gar Spotted bass Skipjack Herring Spotted Gar Yellow Bass	**5**
B. Trophic composition					
9. Percent top carnivores	Electrofishing	**42.0%** Largemouth Bass 20.9% Spotted Gar 19.5% Black Crappie 0.8% Flathead Catfish 0.4% White Crappie 0.4%	**2.5**	**38.5%** Spotted Gar 25.4% Largemouth Bass 11.8% Longnose Gar 0.7% Black Crappie 0.4% Flathead Catfish 0.2%	**2.5**
	Gill Netting	**45.0%** Flathead Catfish 15.0% Longnose Gar 14.0% Spotted Bass 7.0% Spotted Gar 4.0% Largemouth Bass 3.0% Black Crappie 2.0%	**2.5**	**48.8%** Longnose Gar 17.4% Flathead Catfish 10.4% Spotted Bass 9.3% Largemouth Bass 8.1% Black Crappie 1.2% Skipjack Herring 1.2% Yellow Bass 1.2%	**2.5**
10. Percent omnivores	Electrofishing	**12.6%** Gizzard Shad 5.8% Channel Catfish 3.1% Golden Shiner 2.3% Common Carp 1.4%	**2.5**	**20.5%** Gizzard Shad 11.6% Golden Shiner 7.4% Channel Catfish 1.3% Yellow Bullhead 0.2%	**2.5**
	Gill Netting	**41.0%** Channel Catfish 17.0% Common Carp 13.0% Gizzard Shad 9.0% Blue Catfish 2.0%	**0.5**	**41.9%** Channel Catfish 26.7% Gizzard Shad 10.6% Blue Catfish 2.3% Common Carp 2.3%	**0.5**
C. **Fish abundance and health**					
11. Average number per run	Electrofishing	**19.5**	**0.5**	**29.9**	**0.5**
	Gill Netting	**10.0**	**0.5**	**8.6**	**0.5**
12. Percent anomalies	Electrofishing	**2.4%**	**1.5**	**1.3%**	**2.5**
	Gill Netting	**6.0%**	**0.5**	**3.5%**	**1.5**
Overall RFAI Score			**30** **Poor**		**35** **Fair**

Table C-3. Comparison of RFAI Scores From Autumn Sampling Conducted During 1993-2008 as Part of the Vital Signs Monitoring Program in Guntersville Reservoir

Location	Site	1993	1994	1996	1998	2000	2001	2002	2004	2005	2006	2007	2008	Average
Inflow	TRM 424	36	46	42	34	28	---	46	42	---	38	---	34	38
Inflow	TRM 410	---	---	---	---	34	32	34	---	32	38	30	28	33
Inflow	TRM 405	---	---	---	---	38	40	32	---	36	34	32	24	35
Transition	TRM 375.2	42	35	38	32	41	---	34	33	---	36	---	37	36
Forebay	TRM 350	45	38	48	41	42	---	36	41	---	44	---	35	41
Downstream of BLN														
Transition	TRM 390	Spring 2009					Summer 2009							
		35					30							
Upstream of BLN														
Transition	TRM 393	Spring 2009					Summer 2009							
		34					35							

Note: Spring and summer 2009 RFAI scores from sites located upstream and downstream of BLN are also included for comparison. RFAI Scores: 12-21 (Very Poor); 22-31 (Poor); 32-40 (Fair); 41-50 (Good); or 51-60 (Excellent)

Table C-4. Individual Metric Ratings and Overall RBI Scores for Upstream and Downstream Sampling Sites Near Bellefonte Nuclear Plant, Guntersville Reservoir, Spring 2009

Spring 2009	Downstream TRM 389		Upstream TRM 393.7	
Metric	**Obs**	**Rating**	**Obs**	**Rating**
1. Average number of taxa	10.4	5	8.3	3
2. Proportion of samples with long-lived organisms	1	5	0.9	5
3. Average number of EPT taxa	1	3	0.9	3
4. Average proportion of oligochaete individuals	12.7	3	9.1	5
5. Average proportion of total abundance comprised by the two most abundant taxa	76.5	3	76	3
6. Average density excluding chironomids and oligochaetes	250.9	1	214.1	1
7. Zero-samples - proportion of samples containing no organisms	0	5	0	5
Reservoir Benthic Index Score		**25 Good**		**25 Good**

Table C-5. Average Mean Density per Square Meter of Benthic Taxa Collected at Upstream and Downstream Sampling Sites Near Bellefonte Nuclear Plant, Guntersville Reservoir, Spring 2009

Taxa	Downstream TRM 389 Mean Density	Upstream TRM 393.7 Mean Density
Turbellaria		
Tricladida		
Planariidae		
Dugesia tigrina	2	2
Annelida		
Oligocheata		
Lumbriculidae	1	---
Naididae	2	---
Ophidonais serpentina	---	1
Tubificidae	112	111
Limnodrilus hoffmeisteri	14	2
Branchiura sowerbyi	---	1
Hirudinea		
Rhynchobdellida		
Glossiphoniidae		
Helobdella stagnalis	2	---
Crustacea		
Amphipoda		
Corophiidae		
Apocorophium lacustre	---	5
Crangonyctidae		
Crangonyx sp.	5	8
Gammaridae		
Gammarus sp.	31	63
Talitridae		
Hyalella azteca	---	2
Insecta		
Odonata		
Anisoptera		
Gomphidae		
Gomphus sp.	---	1
Libellulidae	---	1
Ephemeroptera		
Caenidae		
Caenis sp.	---	5
Ephemeridae		
Hexagenia limbata <10mm	8	1
Hexagenia limbata >10mm	101	47
Trichoptera		
Leptoceridae	3	1
Oecetis sp.	---	3

Table C-5. (Continued)

Taxa	Downstream TRM 389 Mean Density	Upstream TRM 393.7 Mean Density
Diptera		
Chironomidae		
Ablabesmyia annulata	9	3
Ablabesmyia rhamphe	---	1
Axarus sp.	---	3
Chironomus sp.	15	9
Coelotanypus sp.	233	64
Cricotopus sp.	---	1
Cryptochironomus sp.	3	5
Dicrotendipes neomodestus	2	1
Epoicocladius sp.	4	2
Paracladopelma sp.	4	2
Polypedilum halterale sp.	27	28
Procladius sp.	5	3
Stictochironomus caffrarius	124	77
Tanytarsus sp.	2	---
Coleoptera		
Elmidae		
Dubiraphia sp.	---	1
Hydrophilidae		
Berosus gp.	1	---
Mollusca		
Gastropoda		
Lymnophila		
Ancylidae		
Ferrissia rivularis	1	---
Mesogastropoda		
Hydrobiidae		
Amnicola sp.	---	1
Birgella subglobosa	2	1
Pleuroceridae		
Pleurocera canaliculata	3	16
Viviparidae		
Campeloma decisum	4	---
Bivalvia		
Veneroida		
Corbiculidae		
Corbicula fluminea <10 mm	15	29
Corbicula fluminea >10 mm	72	25
Sphaeriidae		
Pisidium sp.	---	2
Unionoida		
Unionidae		
Potamilus alatus	1	---
Density of organisms per m²	**804**	**525**
Number of samples	**10**	**10**
Total area sampled (m²)	**1.05**	**1.1**

Table C-6. Comparison of RBI Scores from Autumn Sampling Conducted During 1994-2008 as Part of the Vital Signs Monitoring Program in Guntersville Reservoir

Location	Site	1994	1996	1998	2000	2001	2002	2004	2005	2006	2007	2008	Average
Inflow	TRM 420	21	27	23	25	---	25	21	---	23	---	29	24
Inflow	TRM 408	---	---	---	23	21	21	---	19	29	25	27	24
Inflow	TRM 406.7	---	---	---	23	23	23	---	27	27	27	27	25
Transition	TRM 375.2	33	33	33	31	---	31	29	---	29	---	25	31
Forebay	TRM 350	27	35	35	23	---	25	35	---	23	---	17	28
Downstream of BLN													
Transition	TRM 389	Spring 2009											
		25											
Upstream of BLN													
Transition	TRM 393.7	Spring 2009											
		25											

Note: Spring 2009 RBI scores from sites located upstream and downstream of BLN are also included for comparison.
RBI Scores: 7-12 (Very Poor); 13-18 (Poor); 19-23 (Fair); 24-29 (Good); or 30-35 (Excellent)

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Appendix D – Power System Operations
Environmental Protection Procedures
Right-of-Way Vegetation Management Guidelines

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Tennessee Valley Authority
Environmental Protection Procedures
Right-of-Way Vegetation Management Guidelines

1.0 Overview

A. The Tennessee Valley Authority (TVA) must manage the vegetation on its rights-of-way and easements to ensure emergency maintenance access and routine access to structures, switches, conductors, and communications equipment. In addition, TVA must maintain adequate clearance, as specified by the National Electrical Safety Code, between conductors and tall-growing vegetation and other objects. This requirement applies to vegetation within the right-of-way as well as to trees located off the right-of-way.

B. Each year TVA assesses the conditions of the vegetation on and along its rights-of-way. This is accomplished by aerial inspections, periodic field inspections, aerial photography, and information from TVA personnel, property owners, and the general public. Important information gathered during these assessments includes the coverage by various vegetation types, the mix of plant species, the observed growth, the seasonal growing conditions, and the density of the tall vegetation. TVA also evaluates the proximity, height, and growth rate of trees adjacent to the right-of-way that may be a danger to the line or structures.

C. TVA right-of-way specialists develop a vegetation reclearing plan that is specific to each line segment and is based on terrain conditions, species mix, growth, and density.

2.0 Right-of-Way Management Options

A. TVA uses an integrated vegetation management approach. In farming areas, TVA encourages property owner management of the right-of-way using low-growing crops. In dissected terrain with rolling hills and interspersed woodlands, TVA uses mechanical mowing to a large extent.

B. When slopes become hazardous to farm tractors and rotary mowers, TVA may use a variety of herbicides specific to the species present with a variety of possible application techniques. When scattered small stands of tall-growing vegetation are present and access along the right-of-way is difficult or the path to such stands is very long, herbicides may be used.

C. In very steep terrain, in sensitive environmental areas, in extensive wetlands, at stream banks, and in sensitive property owner land use areas, hand clearing may be utilized. Hand clearing is recognized as one of the most hazardous occupations documented by the Occupational Safety and Health Administration. For that reason, TVA is actively looking at better control methods, including use of low-volume herbicide applications, occasional single tree injections, and tree growth regulators (TGRs).

D. TVA does not encourage tree reclearing by individual property owners because of the high hazard potential of hand clearing, possible interruptions of the line, and electrical safety considerations for untrained personnel that might do the work. Private property owners may reclear the right-of-way with trained reclearing professionals.

E. Mechanical mowers not only cut the tall saplings and seedlings on the right-of-way, they also shatter the stump and the supporting near-surface root crown. The tendency of resistant species is to resprout from the root crown, and shattered stumps can produce a multistem dense stand in the immediate area. Repeated use of mowers on short cycle reclearing with many original stumps regrowing in the above manner can create a single species thicket or monoculture. With the original large root system and multiple stems, the resistant species can produce regrowth at the rate of 5-10 feet in a year. In years with high rainfall, the growth can reach 12-15 feet in a single year. These dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity and little wildlife food or nesting potential and become a property owner's concern. Selective herbicide application may be used to control monoculture stands.

F. TVA encourages property owners to sign an agreement to manage rights-of-way on their land for wildlife under the auspices of "Project Habitat," a joint project by TVA, BASF, and wildlife organizations, e.g., National Wild Turkey Federation, Quail Unlimited, and Buckmasters. The property owner maintains the right-of-way in wildlife food and cover with emphasis on quail, turkey, deer, or other wildlife. A variation used in or adjacent to developing suburban areas is to sign agreements with the developer and residents to plant and maintain wildflowers on the right-of-way.

G. TVA places strong emphasis on managing rights-of-way in the above manner. When the property owners do not agree to these opportunities, TVA must maintain the right-of-way in the most environmentally acceptable, cost-effective, and efficient manner possible.

3.0 Herbicide Program

A. TVA has worked with universities (such as Mississippi State University, University of Tennessee, Purdue University, and others), chemical manufacturers, other utilities, U.S. Department of Transportation, U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS) personnel to explore options for vegetation control. The results have been strong recommendations to use species-specific, low-volume herbicide applications in more situations. Research, demonstrations, and other right-of-way programs show a definite improvement of rights-of-way treated with selective low-volume applications of new herbicides using a variety of application techniques and timing. Table 1 below identifies herbicides currently used on bare ground areas on TVA rights-of-way and in substations. Table 3 identifies TGRs that may be used on tall trees that have special circumstances that require trimming on a regular cycle. The rates of application utilized are those listed on the USEPA-approved label and consistent with utility standard practice throughout the Southeast.

Table 1 - Herbicides Currently Used on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Accord	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Chopper	Imazapyr/RTU	Caution
Escort	Metsulfuron Methyl/Dry Flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Krenite S	Fosamine Ammonium	Caution
Pathfinder II	Triclopyr/RTU	Caution
Roundup	Glyphosate/Liquid	Caution
Roundup Pro	Glyphosate	Caution
Spike 20P	Tebuthiuron	Caution
Transline	Clopyralid/Liquid	Caution

Table 2 - Preemergent Herbicides Currently Used for Bare Ground Areas on TVA Rights-of-Way and Substations

Trade Name	Active Ingredients	Label Signal Word
Sahara	Diuron/Imazapyr	Caution
SpraKil SK-26	Tebuthiuron and Diuron	Caution
Topsite	Diuron/Imazapyr	Caution

Table 3 - Tree Growth Regulators (TGRs) Currently Used on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Profile 2SC	TGR-paclobutrazol	Caution
TGR	Flurprimidol	Caution

B. The herbicides listed in Tables 1 and 2 and TGRs listed in Table 3 have been evaluated in extensive studies in support of registration applications and label requirements. Many have been reviewed in the USFS vegetation management environmental impact statements (EISs), and those evaluations are incorporated here by reference (USFS 1989a, 1989b, 2002a, and 2002b). Electronic copies can be accessed at http://www.fs.fed.us/r8/planning/documents/vegmgmt/. The result of these reviews has been a consistent finding of limited environmental impact beyond that of control of the target vegetation. All the listed herbicides have been found to be of low environmental toxicity when applied by trained applicators following the label and registration procedures, including prescribed measures, such as buffer zones, to protect threatened and endangered species.

C. Low-volume herbicide applications are recommended since research demonstrates much wider plant diversity after such applications. There is better ground erosion protection, and more wildlife food plants and cover plants develop. In most situations, there is increased development of wild flowering plants and shrubs. In conjunction with

herbicides, the diversity and density of low-growing plants provide control of tall-growing species through competition.

D. Wildlife managers often request the use of herbicides in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains ground cover year-round with a better mix of food species and associated high-protein insect populations for birds in the right seasons. Most also report less damage to soils (even when compared with rubber-tired equipment).

E. Property owners interested in tree production often request the use of low-volume applications rather than hand- or mechanical clearing because of the insect and fungus problems in damaged vegetation and debris left on the right-of-way. The insect and fungus invasions, such as pine tip moth, oak leaf blight, sycamore and dogwood blight, etc., are becoming widespread across the nation.

F. Best management practices (BMPs) governing application of herbicides are contained within *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 1999), which is incorporated by reference. Herbicides can be liquid, granular, or powder and can be applied aerially or by ground equipment and may be selectively applied or broadcast, depending on the site requirements, species present, and condition of the vegetation. Water quality considerations include measures taken to keep herbicides from reaching streams whether by direct application or through runoff of or flooding by surface water. "Applicators" must be trained, licensed, and follow manufacturers' label instructions, U.S. Environmental Protection Agency (USEPA) guidelines, and respective state regulations and laws.

G. When herbicides are used, their potential adverse impacts are considered in selecting the compound, formulation, and application method. Herbicides that are designated "Restricted Use" by USEPA require application by or under the supervision of applicators certified by the respective state control board. Aerial and ground applications are either done by TVA or by contractors in accordance with the following guidelines identified in TVA's BMPs manual (Muncy 1999):

1. The sites to be treated are selected and application directed by the appropriate TVA official.

2. A preflight walking or flying inspection is made within 72 hours prior to applying herbicides aerially. This inspection ensures that no land use changes have occurred, that sensitive areas are clearly identified to the pilot, and that buffer zones are maintained.

3. Aerial application of liquid herbicides will normally not be made when surface wind speeds exceed 5 miles per hour, in areas of fog, or during periods of temperature inversion.

4. Pellet application will normally not be made when the surface wind speeds exceed 10 miles per hour or on frozen or water-saturated soils.

5. Liquid application is not performed when the temperature reaches 95 degrees Fahrenheit or above.

6. Application during unstable, unpredictable, or changing weather patterns is avoided.

7. Equipment and techniques are used that are designed to ensure maximum control of the spray swath with minimum drift.

8. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements. The use of aerial or broadcast application of herbicides is not allowed within a streamside management zone (SMZs) (200 feet minimum width) adjacent to perennial streams, ponds, and other water sources. Hand application of certain herbicides labeled for use within SMZs is used only selectively.

9. Buffers and filter strips (200 feet minimum width) are maintained next to agricultural crops, gardens, farm animals, orchards, apiaries, horticultural crops, and other valuable vegetation.

10. Herbicides are not applied in the following areas or times: (a) in city, state, and national parks or forests or other special areas without written permission and/or required permits, (b) off the right-of-way, and (c) during rainy periods or during the 48-hour interval prior to rainfall predicted with a 20 percent or greater probability by local forecasters, when soil active herbicides are used.

H TVA currently utilizes Activate Plus, manufactured by Terra, as an adjuvant to herbicides to improve the performance of the spray mixture. Application rates are consistent with the USEPA-approved label. The USFWS has expressed some concern on toxicity effects of surfactants on aquatic species. TVA is working in coordination with Mississippi State University and chemical companies to evaluate efficacy of additional low-toxicity surfactants, including LI700 as manufactured by Loveland Industries, through side-by-side test plots in the SMZs of area transmission lines.

I. TVA currently uses primarily low-volume applications of foliar and basal applications of Accord (glyphosate) and Accord- (glyphosate) Arsenal (imazapyr) tank mixes. Glyphosate is one of the most widely used herbicidal active ingredients in the world and has been continuously the subject of numerous exhaustive studies and scrutiny to determine its potential impacts on humans, animals, and the environment.

4.0 References

Muncy, J. A. 1999. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities,* revised edition. Edited by C. Austin, C. Brewster, A. Lewis, K. Smithson, T. Broyles, and T. Wojtalik. Norris: Tennessee Valley Authority, Technical Note TVA/LR/NRM 92/1.

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Appendix E – Tennessee Valley Authority Environmental Quality Protection Specifications for Transmission Line Construction

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Tennessee Valley Authority
Environmental Quality Protection Specifications
for Transmission Line Construction

1. General – Tennessee Valley Authority (TVA) and/or the assigned contractor shall plan, coordinate, and conduct operations in a manner that protects the quality of the environment and complies with TVA's environmental expectations discussed in the preconstruction meeting. This specification contains provisions that shall be considered in all TVA and contract construction operations. If the contractor fails to operate within the intent of these requirements, TVA will direct changes to operating procedures. Continued violation will result in a work suspension until correction or remedial action is taken by the contractor. Penalties and contract termination will be used as appropriate. The costs of complying with the Environmental Quality Protection Specifications are incidental to the contract work, and no additional compensation will be allowed. At all structure and conductor pulling sites, protective measures to prevent erosion will be taken immediately upon the end of each step in a construction sequence, and those protective measures will be inspected and maintained throughout the construction and right-of-way rehabilitation period.

2. Regulations - TVA and/or the assigned contractor shall comply with all applicable federal, state, and local environmental and antipollution laws, regulations, and ordinances related to environmental protection and prevention, control, and abatement of all forms of pollution.

3. Use Areas - TVA and/or the assigned contractor's use areas include but are not limited to site office, shop, maintenance, parking, storage, staging, assembly areas, utility services, and access roads to the use areas. The construction contractor shall submit plans and drawings for their location and development to the TVA engineer and project manager for approval. Secondary containment will be provided for fuel and petroleum product storage pursuant to 29CFR1910.106(D)(6)(iii)(OSHA).

4. Equipment - All major equipment and proposed methods of operation shall be subject to the approval of TVA. The use or operation of heavy equipment in areas outside the right-of-way, access routes, or structure, pole, or tower sites will not be permitted without permission of the TVA inspector or field engineer. Heavy equipment use on steep slopes (greater than 20 percent) and in wet areas will be held to the minimum necessary to construct the transmission line. Steps will be taken to limit ground disturbance caused by heavy equipment usage, and erosion and sediment controls will be instituted on disturbed areas in accordance with state requirements.

   No subsurface ground-disturbing equipment or stump-removal equipment will be used by construction forces except on access roads or at the actual structure, pole, or tower sites, where only footing locations and controlled runoff diversions shall be created that disturb the soil. All other areas of ground cover or in-place stumps and roots shall remain in place. (Note: Tracked vehicles disturb surface layer of the ground due to size and function.) Some disking of the right-of-way may occur for proper seedbed preparation.

   Unless ponding previously occurred (i.e., existing low-lying areas), water should not be allowed to pond on the structure sites except around foundation holes; the water must

be directed away from the site in as dispersed a manner as possible. At tower or structure sites, some means of upslope interruption of potential overland flow and diversion around the footings should be provided as the first step in construction-site preparation. If leveling is necessary, it must be implemented by means that provide for continuous gentle, controlled, overland flow or percolation. A good grass cover, straw, gravel, or other protection of the surface must be maintained. Steps taken to prevent increases in the moisture content of the in-situ soils will be beneficial both during construction and over the service life of any structure.

5. Sanitation - A designated TVA or contractor representative shall contact a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.

6. Refuse Disposal - Designated TVA and/or contractor personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced by his operations and by his employees. Suitable refuse collecting facilities will be required. Only state-approved disposal areas shall be used. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Solid, special, construction/demolition, and hazardous wastes as well as scrap are part of the potential refuse generated and must be properly managed with emphasis on reuse, recycle, or possible give away, as appropriate, before they are handled as waste. Contractors must meet similar provisions on any project contracted by TVA.

7. Landscape Preservation - TVA and its contractors shall exercise care to preserve the natural landscape in the entire construction area as well as use areas, in or outside the right-of-way, and on or adjacent to access roads. Construction operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the natural vegetation and surroundings in the vicinity of the work.

8. Sensitive Areas Preservation - Certain areas on site and along the right-of-way may be designated by the specifications or the TVA engineer as environmentally sensitive. These areas include but are not limited to areas classified as erodible, geologically sensitive, scenic, historical and archaeological, fish and wildlife refuges, water supply watersheds, and public recreational areas such as parks and monuments. Contractors and TVA construction crews shall take all necessary actions to avoid adverse impacts to these sensitive areas and their adjacent buffer zones. These actions may include suspension of work or change of operations during periods of rain or heavy public use; hours may be restricted or concentrations of noisy equipment may have to be dispersed. If prehistoric or historic artifacts or features are encountered during clearing or construction operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's right-of-way inspector or construction superintendent and Cultural Resources Program shall be notified. The site shall be left as found until a significance determination is made. Work may continue elsewhere beyond the 100-foot perimeter.

9. Water Quality Control - TVA and contractor construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes into flowing caves, sinkholes, streams, dry watercourses, lakes, ponds, and underground water sources.

   The clearing contractor will erect and (when TVA or contract construction personnel are unable) maintain best management practices (BMPs) such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. Additional BMPs may be required for areas of disturbance created by construction activities. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections will be conducted in accordance with permit requirements. Records of all inspections will be maintained on site, and copies of inspection forms will be forwarded to the TVA construction environmental engineer.

   Acceptable measures for disposal of waste oil from vehicles and equipment shall be followed. No waste oil shall be disposed of within the right-of-way, on a construction site, or on access roads.

10. Turbidity and Blocking of Streams - Construction activities in or near SMZs or other bodies of water shall be controlled to prevent the water turbidity from exceeding state or local water quality standards for that stream. All conditions of a general storm water permit, aquatic resource alteration permit, or a site-specific permit shall be met including monitoring of turbidity in receiving streams and/or storm water discharges and implementation of appropriate erosion and sediment control measures.

    Appropriate drainage facilities for temporary construction activities interrupting natural site drainage shall be provided to avoid erosion. Watercourses shall not be blocked or diverted unless required by the specifications or the TVA engineer. Diversions shall be made in accordance with TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities.*

    Mechanized equipment shall not be operated in flowing water except when approved and, then, only to construct crossings or to perform required construction under direct guidance of TVA. Construction of stream fords or other crossings will only be permitted at approved locations and to current TVA construction access road standards. Material shall not be deposited in watercourses or within stream bank areas where it could be washed away by high stream flows. Appropriate U.S. Army Corps of Engineers and state permits shall be obtained.

    Wastewater from construction or dewatering operations shall be controlled to prevent excessive erosion or turbidity in a stream, wetland, lake, or pond. Any work or placing of equipment within a flowing or dry watercourse requires the prior approval of TVA.

11. Clearing - No construction activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure sites and conductor setup areas. TVA and the construction contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed that have previously been restabilized after clearing operations. Control measures shall be

implemented as soon as practicable after disturbance in accordance with applicable federal, state, and/or local storm water regulations.

12. Restoration of Site - All construction disturbed areas, with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications, shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:

    A. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.

    B. If needed, appropriate soil amendments will be added.

    C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities*. Exceptions would include those areas designated as native grass planting areas. Initial and final restoration will be performed by the clearing contractor.

    D. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.

13. Air Quality Control - Construction crews shall take appropriate actions to minimize the amount of air pollution created by their construction operations. All operations must be conducted in a manner that avoids creating a nuisance and prevents damage to lands, crops, dwellings, or persons.

14. Burning - Before conducting any open burning operations, the contractor shall obtain permits or provide notifications as required to state forestry offices and/or local fire departments. Burning operations must comply with the requirements of state and local air pollution control and fire authorities and will only be allowed in approved locations and during appropriate hours and weather conditions. If weather conditions such as wind direction or speed change rapidly, the contractor's burning operations may be temporarily stopped by the TVA field engineer. The debris for burning shall be piled and shall be kept as clean and as dry as possible, then burned in such a manner as to reduce smoke. No materials other than dry wood shall be open burned. The ash and debris shall be buried away from streams or other water sources and shall be in areas coordinated with the property owner.

15. Dust and Mud Control - Construction activities shall be conducted to minimize the creation of dust. This may require limitations as to types of equipment, allowable speeds, and routes utilized. Water, straw, wood chips, dust palliative, gravel, combinations of these, or similar control measures may be used subject to TVA's approval. On new construction sites and easements, the last 100 feet before an access

road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

16. Vehicle Exhaust Emissions - TVA and/or the contractors shall maintain and operate equipment to limit vehicle exhaust emissions. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions shall not be operated until corrective repairs or adjustments are made.

17. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the right-of-way except in designated sensitive areas. The Heavy Equipment Department within TVA or the construction contractor will properly maintain these vehicles with approved spill prevention controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.

18. Smoke and Odors - TVA and/or the contractors shall properly store and handle combustible material that could create objectionable smoke, odors, or fumes. The contractor shall not burn refuse such as trash, rags, tires, plastics, or other debris.

19. Noise Control - TVA and/or the contractor shall take measures to avoid the creation of noise levels that are considered nuisances, safety, or health hazards. Critical areas including but not limited to residential areas, parks, public use areas, and some ranching operations will require special considerations. TVA's criteria for determining corrective measures shall be determined by comparing the noise level of the construction operation to the background noise levels. In addition, especially noisy equipment such as helicopters, pile drivers, air hammers, chippers, chain saws, or areas for machine shops, staging, assembly, or blasting may require corrective actions when required by TVA.

20. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers as required by the Department of Labor's *Safety and Health Regulations for Construction*. TVA may require spark arresters in addition to mufflers on some engines. Air compressors and other noisy equipment may require sound-reducing enclosures in some circumstances.

21. Damages - The movement of construction crews and equipment shall be conducted in a manner that causes as little intrusion and damage as possible to crops, orchards, woods, wetlands, and other property features and vegetation. The contractor will be responsible for erosion damage caused by his actions and especially for creating conditions that would threaten the stability of the right-of-way or site soil, the structures, or access to either. When property owners prefer the correction of ground cover condition or soil and subsoil problems themselves, the section of the contract dealing with damages will apply.

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Appendix F – State-Listed Animal and Plant Species Present in Areas Affected by Transmission Line Work

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Table F-1. State-Listed Aquatic Animal Species Present in Counties Affected Transmission Line Upgrades

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Insects				
A caddisfly	*Hydropsyche rotosa*	RARE, S1	-	-
A caddisfly	*Hydropsyche simulans*	RARE, S1	-	-
A caddisfly	*Rhyacophila alabama*	POTL, S1	-	-
A caddisfly	*Rhyacophila fenestra*	RARE, S1	-	-
A glossosomatid caddisfly	*Agapetus hessi*	TRKD, S1	-	-
Tennessee clubtail dragonfly	*Gomphus sandrius*	-	-	TRKD, S1
Snails				
Anthony's river snail*#	*Athearnia anthonyi*	PROT, S1	-	END, S1
Armored rocksnail*	*Lithasia armigera*	-	-	TRKD, S1S2
Armored snail	*Pyrgulopsis pachyta*	PROT, S1	-	-
Corpulent hornsnail*	*Pleurocera corpulenta*	TRKD, S1	-	TRKD, S1
Helmet rock snail*	*Lithasia duttoniana*	-	-	TRKD, S2
Ornate rocksnail*	*Lithasia geniculata*	-	-	TRKD, S3
Owen spring limnephilid caddisfly	*Glyphopsyche sequatchie*	-	-	POTL, -
Royal marstonia	*Pyrgulopsis ogmorhaphe*	-	-	END, S1
Rugose rocksnail	*Lithasia jayana*	-	-	TRKD, S2
Skirted hornsnail*	*Pleurocera pyrenella*	TRKD, S2	-	-
Slabside pearlymussel	*Lexingtonia dolabelloides*	PROT, S1	-	TRKD, S2
Slender campeloma*	*Campeloma decampi*	PROT, S1	-	-
Smooth mudalia*	*Leptoxis virgata*	-	-	TRKD, S1
Spiny riversnail*	*Io fluvialis*	EXTI, SX	-	TRKD, S2
Spiral hornsnail	*Pleurocera brumbyi*	TRKD, S2	-	-
Umbilicate river snail	*Leptoxis subglobosa umbilicata*	-	-	TRKD, S1
Varicose rocksnail*	*Lithasia verrucosa*	TRKD, S3	-	-
Warty rocksnail*	*Lithasia lima*	HIST, SH	-	TRKD, S2
Mussels				
Acornshell	*Epioblasma haysiana*	EXTI?, SH	-	-
Alabama lampmussel#	*Lampsilis virescens*	PROT, S1	-	-
Alabama moccasinshell	*Medionidus acutissimus*	-	THR, S1	-
Angled riffleshell	*Epioblasma biemarginata*	EXTI?, SX	-	-
Birdwing pearlymussel	*Lemiox rimosus*	PROT, SX	-	-
Butterfly*	*Ellipsaria lineolata*	TRKD, S3	-	-
Cracking pearlymussel	*Hemistena lata*	PROT, SX	-	-
Cumberland bean	*Villosa trabalis*	PROT, SX	HIST, SH	-

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Cumberland combshell	*Epioblasma brevidens*	PROT, S1	-	-
Cumberland moccasinshell	*Medionidus conradicus*	PROT, S1	-	-
Cumberland monkeyface	*Quadrula intermedia*	PROT, S1	-	END, S1
Cumberland pigtoe	*Pleurobema gibberum*	-	-	END, S1
Deertoe	*Truncilla truncata*	TRKD, S1	-	-
Dromedary pearlymussel	*Dromus dromas*	PROT, S1	-	END, S1
Elktoe	*Alasmidonta marginata*	EXTI, SX	-	-
Fine-lined Pocketbook	*Lampsilis altilis*	-	THR, S2	-
Fine-rayed Pigtoe#	*Fusconaia cuneolus*	PROT, S1	-	-
Fluted kidneyshell	*Ptychobranchus subtentum*	PROT, SX	-	TRKD, S2S3
Hickorynut	*Obovaria olivaria*	EXTI, SX	-	-
Kidneyshell	*Ptychobranchus fasciolaris*	TRKD, S1	-	-
Monkeyface*	*Quadrula metanevra*	TRKD, S3	-	-
Mucket*	*Actinonaias ligamentina*	TRKD, S2	-	-
Narrow catspaw	*Epioblasma lenior*	EXTI?, SX	-	-
Ohio pigtoe	*Pleurobema cordatum*	TRKD, S2	-	-
Orange-foot Pimpleback	*Plethobasus cooperianus*	PROT, S1	-	END, S1
Painted creekshell	*Villosa taeniata*	TRKD, S3	-	-
Pale lilliput#	*Toxolasma cylindrellus*	PROT, S1	-	END, S1
Pheasantshell	*Actinonaias pectorosa*	TRKD, S1	-	-
Pink mucket*#	*Lampsilis abrupta*	PROT, S1	-	END, S2
Pink papershell*	*Potamilus ohiensis*	TRKD, S3	-	-
Purple lilliput	*Toxolasma lividus*	TRKD, S2	-	-
Rabbitsfoot	*Quadrula cylindrica cylindrica*	PROT, S1	-	TRKD, S3
Rainbow	*Villosa iris*	TRKD, S3	-	-
Ring pink	*Obovaria retusa*	PROT, S1	-	-
Rough pigtoe*	*Pleurobema plenum*	PROT, S1	-	END, S1
Round hickorynut	*Obovaria subrotunda*	TRKD, S2	-	TRKD, S3
Sheepnose	*Plethobasus cyphyus*	PROT, S1	-	-
Shiny pigtoe pearlymussel#	*Fusconaia cor*	PROT, S1	-	-
Slabside pearlymussel*	*Lexingtonia dolabelloides*	PROT, S1	-	TRKD, S1
Slippershell mussel	*Alasmidonta viridis*	PROT, S1	-	-
Snuffbox	*Epioblasma triquetra*	TRKD, S1	-	-
Southern pigtoe	*Pleurobema georgianum*	-	END, S1	-
Spectaclecase	*Cumberlandia monodonta*	PROT, S1	-	TRKD, S2S3
Spike	*Elliptio dilatata*	TRKD, S1	-	-

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Tan riffleshell	*Epioblasma florentina walkeri*	PROT, SX	-	END, S1
Tennessee clubshell	*Pleurobema oviforme*	TRKD, S1	-	TRKD, S2S3
Tennessee heelsplitter	*Lasmigona holstonia*	TRKD, S1S2	-	TRKD, S2
Tennessee pigtoe*	*Fusconaia barnesiana*	TRKD, S1	-	-
Tuberculed blossom pearlymussel	*Epioblasma torulosa torulosa*	PROT, SX	-	EXTI, SX
Turgid blossom pearlymussel	*Epioblasma turgidula*	-	-	EXTI, SX
Wavy-rayed Lampmussel	*Lampsilis fasciola*	TRKD, S1S2	-	-
White heelsplitter	*Lasmigona complanata*	TRKD, S2S3	-	-
Crayfish				
A troglobitic crayfish*	*Cambarus veitchorum*	TRKD, S1	-	-
Chickamauga crayfish	*Cambarus extraneus*	-	-	THR, S1;S2
Troglobitic crayfish*	*Cambarus jonesi*	SPCO, S2	-	-
Troglobitic crayfish	*Procambarus pecki*	TRKD, S2?	-	-
Fish				
Ashy darter	*Etheostoma cinereum*	-	TRKD, S1	THR, S2S3
Barrens darter	*Etheostoma forbesi*	-	-	END, S1
Barrens topminnow	*Fundulus julisia*	-	-	END, S1
Bedrock shiner	*Notropis rupestris*	-	-	NMGT, S2
Bigeye chub	*Hybopsis amblops*	TRKD, S3	RARE, S1S2	-
Blotched chub	*Erimystax insignis*	TRKD, S2	-	-
Blotchside logperch	*Percina burtoni*	TRKD, S1	-	NMGT, S2
Bluebreast darter	*Etheostoma camurum*	TRKD, S1	-	-
Blueside darter	*Etheostoma jessiae*	TRKD, S3	-	-
Boulder darter	*Etheostoma wapiti*	PROT, S1	-	-
Chestnut lamprey	*Ichthyomyzon castaneus*	TRKD, S2	-	-
Coppercheek darter	*Etheostoma aquali*	-	-	THR, S2S3
Dusky darter	*Percina sciera*	-	RARE, S1	-
Fantail darter	*Etheostoma flabellare*	TRKD, S3	-	-
Flame chub	*Hemitremia flammea*	TRKD, S3	END, S1	NMGT, S3
Gilt darter	*Percina evides*	TRKD, S2	-	-
Golden darter	*Etheostoma denoncourti*	-	-	NMGT, S2
Highfin carpsucker	*Carpiodes velifer*	-	-	NMGT, S2S3
Longhead darter	*Percina macrocephala*	-	-	THR, S2
Mountain madtom	*Noturus eleutherus*	TRKD, S1	-	-
Northern studfish	*Fundulus catenatus*	-	THR, S1	-
Ohio lamprey	*Ichthyomyzon bdellium*	-	RARE, S3?	-
Paddlefish	*Polyodon spathula*	PROT, S3	-	-

Common Name	Scientific Name	Alabama State Status, Rank	Georgia State Status, Rank	Tennessee State Status, Rank
Palezone shiner#	*Notropis albizonatus*	PROT, S1	-	-
Popeye shiner	*Notropis ariommus*	-	THR, S1	-
Redband darter	*Etheostoma luteovinctum*	-	-	NMGT, S4
Redline darter	*Etheostoma rufilineatum*	TRKD, S3	-	-
River carpsucker	*Carpiodes carpio*	TRKD, S2	-	-
River darter	*Percina shumardi*	TRKD, S3	-	-
Rosyface shiner	*Notropis micropteryx*	TRKD, S2	-	-
Saddled madtom	*Noturus fasciatus*	-	-	THR, S2
Silver redhorse	*Moxostoma anisurum*	TRKD, S2	-	-
Silver shiner	*Notropis photogenis*	TRKD, S1	-	-
Slackwater darter	*Etheostoma boschungi*	PROT, S1	-	-
Slender madtom	*Noturus exilis*	TRKD, S3	-	-
Slenderhead darter	*Percina phoxocephala*	-	-	NMGT, S3
Snail darter	*Percina tanasi*	-	THR, S1	THR, S2S3
Snubnose darter	*Etheostoma simoterum*	TRKD, S3	-	-
Southern cavefish	*Typhlichthys subterraneus*	PROT, S3	RARE, S1	NMGT, S3
Southern redbelly dace	*Phoxinus erythrogaster*	TRKD, S3	-	-
Spotfin chub	*Cyprinella monacha*	-	EXTI, SH	-
Spring pygmy sunfish	*Elassoma alabamae*	PROT, S1	-	-
Stargazing minnow	*Phenacobius uranops*	TRKD, S1	THR, S1	-
Stonecat	*Noturus flavus*	TRKD, S1	-	-
Striated darter	*Etheostoma striatulum*	-	-	THR, S1
Stripetail darter	*Etheostoma kennicotti*	TRKD, S3	-	-
Tennessee dace	*Phoxinus tennesseensis*	-	-	NMGT, S3
Tuscumbia darter	*Etheostoma tuscumbia*	PROT, S2	-	-
Yellowfin madtom	*Noturus flavipinnis*	-	EXTI, SH	-

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: **THR** = Threatened; **TRKD** = Tracked by state Natural Heritage program; **RARE** = Listed Rare by the state; **NMGT** = In Need of Management; **PROT** = State Protected; **SPCO** = Listed Special Concern; **EXTI** = Listed Extirpated or Extinct

State Ranks: **S1** = Critically Imperiled; **S2** = Imperiled; **S3** = Vulnerable; **SH** = Historic; **?** = Inexact or Uncertain; **SX** = Presumed Extirpated

Table F-2. State-Listed Terrestrial Plant Species Known From Within a 5-Mile Vicinity of the Transmission Line Upgrades

Common Name	Scientific Name	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
Chalk Maple	*Acer leucoderme*	-	-	SPCO(S3)
Sweetflag	*Acorus calamus*	SLNS(S1)	-	-
Yellow Giant-hyssop[1]	*Agastache nepetoides*	SLNS(S1)	SPCO(S1)	-
Roundleaf Serviceberry	*Amelanchier sanguinea*	THR(S2)	-	-
Price's Potato-bean	*Apios priceana*	SLNS(S2)	-	END(S2)
Spreading Rockcress	*Arabis patens*	-	-	END(S1)
American Spikenard	*Aralia racemosa*	SLNS(S1)	-	-
Bradley's Spleenwort	*Asplenium bradleyi*	SLNS(S2)	-	-
Wall-rue Spleenwort	*Asplenium ruta-muraria*	SLNS(S2)	-	-
American Hart's-tongue Fern[2]	*Asplenium scolopendrium* var. *americanum*	SLNS(S1)	-	END(S1)
Maidenhair Spleenwort	*Asplenium trichomanes*	SLNS(S2S3)	-	-
Spreading False-foxglove	*Aureolaria patula*	-	-	SPCO(S3)
Nuttall's Rayless Golden-rod	*Bigelowia nuttallii*	SLNS(S3)	-	-
Mountain Bitter Cress	*Cardamine clematitis*	-	-	THR(S2)
Sedge	*Carex hirtifolia*	-	-	SPCO(S1S2)
Sedge	*Carex purpurifera*	SLNS(S2)	-	-
Alabama Lipfern	*Cheilanthes alabamensis*	SLNS(S3)	-	-
Pink Turtlehead	*Chelone lyonii*	SLNS(S1)	-	-
Yellowwood	*Cladrastis kentukea*	SLNS(S3)	-	-
Leather-flower	*Clematis glaucophylla*	-	-	END(S1)
Morefield's Leather-flower[2]	*Clematis morefieldii*	SLNS(S1)	-	-
Wister Coral-root	*Corallorhiza wisteriana*	SLNS(S2)	-	-
Woodland Tickseed	*Coreopsis pulchra*	SLNS(S2)	-	-
American Smoke-tree	*Cotinus obovatus*	SLNS(S2)	-	SPCO(S2)
Harper's Dodder	*Cuscuta harperi*	SLNS(S2)	-	-
Pink Lady-slipper	*Cypripedium acaule*	SLNS(S3)	-	S-CE(S4)
Large Yellow Lady's-slipper	*Cypripedium pubescens*	SLNS(S3)	-	-
Tennessee Bladderfern	*Cystopteris tennesseensis*	SLNS(S2)	-	-
Leafy Prairie-clover[2]	*Dalea foliosa*	SLNS(S1)	-	END(S2S3)
Bog Oat-grass	*Danthonia epilis*	-	-	SPCO(S1S2)
Tall Larkspur	*Delphinium exaltatum*	-	-	END(S2)
Dwarf Larkspur[1]	*Delphinium tricorne*	-	SPCO(S2?)	-
Small's Stonecrop[1]	*Diamorpha smallii*	SLNS(S3)	-	END(S1S2)
American Beakgrain	*Diarrhena americana*	SLNS(S2)	-	-
Dutchman's Breeches[1]	*Dicentra cucullaria*	SLNS(S2)	-	-
Panic-grass	*Dichanthelium acuminatum ssp leucothrix*	-	-	SPCO(S1)
Northern Bush-honeysuckle	*Diervilla lonicera*	-	-	THR(S2)
Mountain Bush-honeysuckle	*Diervilla sessilifolia* var. *rivularis*	-	-	THR(S2)
Spotted Mandarin	*Disporum maculatum*	SLNS(S1)	-	-
Wolf Spikerush	*Eleocharis wolfii*	-	-	END(S1)
Common Horsetail	*Equisetum arvense*	SLNS(S2)	-	-
Wahoo	*Euonymus atropurpureus*	SLNS(S3)	-	-
Creeping Aster	*Eurybia surculosa*	SLNS(S1)	-	-

Common Name	Scientific Name	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
American Columbo[1]	*Frasera caroliniensis*	SLNS(S2)	-	-
Fragrant Bedstraw	*Galium uniflorum*	-	-	SPCO(S1)
Dwarf Huckleberry	*Gaylussacia dumosa*	-	-	THR(S3)
Yellow Jessamine	*Gelsemium sempervirens*	-	-	SPCO(S1S2)
Pale Avens	*Geum virginianum*	SLNS(S1)	-	-
Manna-grass	*Glyceria acutiflora*	-	-	SPCO(S2)
Florida Hedge-hyssop	*Gratiola floridana*	-	-	END(S1)
Carolina Silverbell	*Halesia carolina*	SLNS(S2)	-	-
Eggert's Sunflower	*Helianthus eggertii*	-	-	SPCO(S3)
White-leaved Sunflower	*Helianthus glaucophyllus*	SLNS(SH)	-	-
Featherfoil	*Hottonia inflata*	-	-	SPCO(S2)
Goldenseal	*Hydrastis canadensis*	SLNS(S2)	-	S-CE(S3)
Creeping St. John's-wort	*Hypericum adpressum*	-	-	END(S1)
Barrens St. Johnswort[1]	*Hypericum sphaerocarpum*	-	SPCO(S1)	-
Narrow Blue Flag	*Iris prismatica*	-	-	THR(S2S3)
Butler's Quillwort	*Isoetes butleri*	SLNS(S2)	-	-
Appalachian Quillwort	*Isoetes engelmannii*	SLNS(S3)	-	-
Small Whorled Pogonia	*Isotria medeoloides*	-	-	END(S1)
Large Whorled Pogonia	*Isotria verticillata*	SLNS(S2)	-	-
Twinleaf	*Jeffersonia diphylla*	SLNS(S2)	-	-
Butternut	*Juglans cinerea*	-	-	THR(S3)
Fleshy-fruit Gladecress[2]	*Leavenworthia crassa*	SLNS(S1)	-	-
Glade Cress	*Leavenworthia exigua* var. *exigua*	-	THR(S2)	SPCO(S3)
Michaux Leavenworthia	*Leavenworthia uniflora*	SLNS(S2)	-	-
Slender Blazing-star	*Liatris cylindracea*	-	-	THR(S2)
Canada Lily	*Lilium canadense*	-	-	THR(S3)
Michigan Lily	*Lilium michiganense*	-	-	THR(S3)
Wood Lily	*Lilium philadelphicum*	-	-	END(S1)
Mountain Honeysuckle	*Lonicera dioica*	-	-	SPCO(S2)
Yellow Honeysuckle	*Lonicera flava*	-	-	THR(S1)
Fraser Loosestrife	*Lysimachia fraseri*	-	-	END(S2)
Mohr's Barbara's Buttons	*Marshallia mohrii*	-	THR(S2)	-
Broadleaf Barbara's-buttons	*Marshallia trinervia*	-	-	THR(S2S3)
Broadleaf Bunchflower	*Melanthium latifolium*	-	-	END(S1S2)
False Helleborne	*Melanthium parviflorum*	SLNS(S1S2)	-	-
American Pinesap	*Monotropa hypopithys*	SLNS(S2)	-	-
Nestronia	*Nestronia umbellula*		-	END(S1)
Alabama Snow-wreath	*Neviusia alabamensis*	SLNS(S2)	-	-
Hairy False Gromwell	*Onosmodium hispidissimum*	-	-	END(S1)
One-flowered Broomrape	*Orobanche uniflora*	SLNS(S2)	-	-
Great Yellow Wood-sorrel	*Oxalis grandis*	SLNS(S1)	-	-
American Ginseng	*Panax quinquefolius*	-	-	S-CE(S3S4)
Large-leaved Grass-of-parnassus	*Parnassia grandifolia*	-	-	SPCO(S3)
Monkey-face Orchid	*Platanthera integrilabia*	SLNS(S2)	-	END(S2S3)
Greek Valerian	*Polemonium reptans*	-	SPCO(S1)	-
Tennessee Leafcup	*Polymnia laevigata*	SLNS(S2S3)	-	-
Carolina Rhododendron	*Rhododendron minus*	SLNS(S2)	-	-

Common Name	Scientific Name	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
Granite Gooseberry	*Ribes curvatum*	SLNS(S2)	-	THR(S1)
Prickly Gooseberry	*Ribes cynosbati*	SLNS(S1S2)	-	-
Rose-gentian[1]	*Sabatia capitata*	END(S2)	-	-
Gibbous Panic-grass	*Sacciolepis striata*	SPCO(S1)	-	-
Pussy Willow	*Salix humilis*	SLNS(S2S3)	-	-
Green Pitcher Plant[2]	*Sarracenia oreophila*	SLNS(S2)	-	-
Sunnybell	*Schoenolirion croceum*	SLNS(S2)	-	-
Large-flowered Skullcap[1]	*Scutellaria montana*	THR(S2)	THR(S2)	-
Chaffseed[2]	*Schwalbea americana*	-	-	E-P(SX)
Nevius' Stonecrop	*Sedum nevii*	SLNS(S3)	-	END(S1)
Ovate Catchfly	*Silene ovata*	END(S2)	-	-
Cumberland Rosinweed	*Silphium brachiatum*	SLNS(S2)	-	-
Compass-plant	*Silphium laciniatum*	THR(S2)	-	-
Bog Goldenrod	*Solidago uliginosa*	SLNS(SH)	-	-
Virginia Spiraea	*Spiraea virginiana*	END(S2)	THR(S1)	-
Great Plains Ladies'-tresses	*Spiranthes magnicamporum*	-	END(S1)	SPCO(S1)
Mountain Camellia	*Stewartia ovata*	SLNS(S2S3)	-	-
Southern Morning-glory	*Stylisma humistrata*	-	-	THR(S1)
Smooth Blue Aster	*Symphyotrichum laeve* var. *concinnum*	SLNS(S1)	-	-
Limestone Fame-flower	*Talinum calcaricum*	-	-	SPCO(S3)
Fame-flower[1]	*Talinum mengesii*		-	THR(S2)
Appalachian Bristle Fern	*Trichomanes boschianum*		-	THR(S1S2)
Lance-leaf Trillium	*Trillium lancifolium*		-	END(S1)
Southern Red Trillium	*Trillium sulcatum*	SLNS(S1)	-	-
Horse-gentian	*Triosteum angustifolium*	SLNS(S1)	-	-
Canada Violet	*Viola canadensis*	SLNS(S2)	-	-
Eggleston's Violet[1]	*Viola egglestonii*	-	SPCO(S2)	-
Three-parted Violet	*Viola tripartita* var. *tripartita*	-	-	SPCO(S2S3)
Virginia Chainfern	*Woodwardia virginica*	-	-	SPCO(S2)
Death-camas	*Zigadenus leimanthoides*	-	-	THR(S2)

Status Codes: **END** = Endangered; **E-P** = Endangered – Possibly Extirpated; **THR** = Threatened; **RARE** = Rare; **SLNS** = Listed by the state of Alabama, but not assigned a status; **SPCO** = Special Concern; **S-CE** =Special Concern-Commercially Exploited

Rank Codes: **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; **S4** = Apparently secure; **SX** = Presumed extirpated; **S#S#** = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); **? =** Denotes uncertainty in exact rarity of the element.

Table F-3. State-Listed Terrestrial Animal Species 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	Alabama State Status (Rank)	Georgia State Status (Rank)	Tennessee State Status (Rank)
Amphibians				
Barking treefrog	*Hyla gratiosa*	-	-	NMGT[1] (S3)[2]
Green salamander	*Aneides aeneus*	PROT (S3)	RARE (S2)	
Hellbender	*Cryptobranchus alleganiensis*	PROT (S2)	RARE (S2)	NMGT (S3)
Tennessee cave salamander	*Gyrinophilus palleucus*	PROT (S2)	TRKD(S1)	THR (S2)
Reptiles				
Eastern milk snake	*Lampropeltis triangulum triangulum*	TRKD (S2)	TRKD (S2)	-
Birds				
Bachman's sparrow	*Aimophila aestivalis*	TRKD (S3)	RARE(S3)	END (S2)
Bald eagle	*Haliaeetus leucocephalus*	PROT (S3)	-	NMGT (S3)
Cerulean warbler	*Dendroica cerulea*	TRKD(S1)	TRKD(S3)	NMGT (S3)
Osprey	*Pandion haliaetus*	PROT (S5)	-	-
Peregrine falcon	*Falco peregrinus*	PROT(SH)	END (S1)	END(S1)
Red-cockaded woodpecker	*Picoides borealis*	PROT (S2)	END (S2)	-
Swainson's warbler	*Limnothlypis swainsonii*	TRKD (S3)	TRKD (S3)	NMGT (S3)
Mammals				
Allegheny woodrat	*Neotoma magister*	TRKD (S3)	-	NMGT (S3)
Common shrew	*Sorex cinereus*	-	TRKD(S2)	NMGT (S4)
Eastern big-eared bat	*Corynorhinus rafinesquii*	PROT(S2)	RARE(S3)	NMGT (S3)
Eastern small-footed bat	*Myotis leibii*	TRKD(S1)	TRKD(S2)	NMGT (S2S3)
Gray bat	*Myotis grisescens*	PROT (S2)	END (S1)	END (S2)
Indiana bat	*Myotis sodalis*	PROT (S2)	END (S1)	END (S1)
Invertebrates				
Beetle	*Batriasymmodes spelaeus*	-	-	TRKD (S3)
Blowing cave beetle	*Pseudanophthalmus ventus*	-	-	TRKD (S1)
Nickajack cave beetle	*Pseudanophthalmus nickajackensis*	-	-	TRKD (S1)
Duck River cave beetle	*Pseudanophthalmus tullahoma*	-	-	TRKD (S1)
Nickajack cave isopod	*Caecidotea nickajackensis*	-	-	TRKD (S1)
Spider, a cave-obligate	*Nesticus barri*	TRKD (S3)	-	-

[1]State status: **END** = Endangered; **THR** = Threatened; **TRKD** = Tracked by state Natural Heritage program; **RARE** = Listed Rare by the state; **NMGT** = In Need of Management; **PROT** = State Protected

[2]State ranks: **S1** - critically imperiled; **S2** - imperiled; **S3** - rare or uncommon; **S4** - widespread, abundant and apparently secure; and **S5** - demonstrably widespread, abundant, and secure. **SH**=of historical occurrence, i.e., known to occur in the past, with the expectation that it may be rediscovered.

Appendix G – Sensitive Area Review Process

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Sensitive Area Review (SAR) Process

This attachment briefly summarizes the environmental compliance review process TVA uses for maintenance and modifications of transmission lines and presents the results of this process, by subject matter area.

Overview of Environmental Compliance Process for Transmission Line Maintenance and Modifications

The TVA-Transmission and Power Supply – Transmission Operations and Maintenance (TPS-TOM) organization routinely conducts maintenance activities on transmission lines in the TVA system (TVA Power Service Area). These activities include, but are not restricted to, right-of-way reclearing (removal of vegetation), pole replacements, installation of lightning arrestors and counterpoise, and upgrading of existing equipment. Regular maintenance activities are conducted on a cycle of 3-5 years.

Prior to these activities, the transmission line area (including the right-of-way) is reviewed by technical specialists in the TVA Regional Natural Heritage Project, and TVA Cultural Resources group, 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.

The TVA Regional Natural Heritage Project maintains a database of some 30,000+ occurrence records for protected plants, animals, caves, heronries, eagle nests, and natural areas for the entire TVA Power Service Area (PSA), including all 201 counties. All records that are present, or are potentially present, in transmission line right-of-ways are taken into consideration when conducting these transmission line reviews. Wetland information is maintained by TVA Resource Services and includes NWI wetland maps for the entire TVA Power Service Area (PSA). Soil survey maps are also used to identify potential wetland areas. The TVA Cultural Resources group maintains records of known archaeological sites, and routinely gathers information from the seven-state TVA Power Service Area.

Also included in this document is the explanation of Sensitive Area Review (SAR) Class Definitions and associated table of mapping polygon colors, and the restrictions indicated by those designations.

(Managed Areas) - Managed Areas, Ecologically Significant Sites, and National Rivers Inventory for Maintenance Activities in TVA Transmission Line Rights-of-Way

Managed Areas (MA) are lands held in public ownership that are managed to protect and maintain certain ecological features. Ecologically Significant Sites (ESS) are tracts of privately owned land that are identified by resource biologists as containing significant environmental resources. National River Inventory (NRI) streams are free-flowing river segments that are recognized by the National Park Service as possessing remarkable natural or cultural values. The

TVA Natural Heritage Project maintains a database of all such lands and streams occurring within the seven state TVA power service area.

Sensitive area reviews for MA's, ESS's, and NRI streams are completed by utilizing computerized mapping graphics software known as ArcMap. If a MA, ESS, and/or NRI stream is located within the 0.5-mile buffer of the subject transmission line, a polygon is drawn that represents the area's boundaries within the buffer. A description of the area that includes contact information, restrictions, and the subject transmission line name is listed in the corresponding attribute table.

Right-of-way (ROW) maintenance and/or clearing and pole replacement activities are the two areas that are reviewed for the presence of sensitive resources in SARs. If all or any portion of a MA, ESS, and/or NRI stream lies within the buffer of the subject transmission line, a polygon is drawn depicting the boundary of such areas. Restrictions on proposed activities (Class 0, 1 2, or 3 below) are determined by the type and location of the MA, ESS, and/or NRI streams as well as consultation with the area manager or resource specialist. The class and contact restrictions, definitions, and polygon color for both activities are listed in the included table.

After determining the particular class restriction associated with the area, special instructions or comments are added to indicate the importance of the restriction and why it was assigned. For example, when a portion of a national forest is within the 0.5-mile buffer or crossed by the subject transmission line, a Class 3 restriction is assigned and a comment is added indicating the area manager must be contacted and herbicide use is restricted.

Under Categorical Exclusions, transmission line projects such as lightning mitigation, counterpoise activities, conveyances, line relocations for state highway department work, and providing delivery points and switches for substations are reviewed for potential impacts to MA's, ESS's, and NRI streams. A three mile radius of the project site(s) is reviewed for MA's, ESS's, and NRI streams that might be affected by the proposed activity.

(Botany) - State and Federal listed plant restrictions for Maintenance Activities in TVA Transmission Line Rights-of-Way

Botanical assessments are completed for Sensitive Area Reviews (SARs) in order to identify state and federally listed plants that occur within a five mile radius of the transmission line. Identifying the occurrences gives us the ability to identify habitats within a proposed project area that are sensitive and potentially require restrictions from activities. To identify rare plant and sensitive habitat locations we utilize the TVA Natural Heritage database, aerial photographs and USGS topographical maps.

Transmission line SAR activities include right-of-way (ROW) maintenance/re-clearing and pole replacements. The review process for the two activities is different since they potentially impact vegetation in different ways. ROW maintenance consists of vegetation clearing with herbicides unless otherwise specified. Herbicides kill all vegetation that is sprayed. Mechanical clearing has less of an impact since many plants can tolerate being cut. Pole replacements potentially impact vegetation when vehicles and equipment drive on and in the vicinity of the ROW and the

soil and the vegetation are disturbed. If there are sensitive plants in the vicinity we recommend different access routes to be taken and we notify individuals of sensitive areas to avoid. Restrictions are determined by our knowledge of the habitat requirements for rare plants and rare plant communities that occur within the vicinity of the ROW. Once a sensitive area is located a polygon designating the known or likely extent of that occurrence is drawn on an ArcMap electronic topographic map, and appropriate class restrictions are applied (see table of Class Definitions and Associated Polygon Colors of Sensitive Areas).

(Terrestrial Animals) - State and Federal Protected Terrestrial Animal restrictions for Sensitive Area Reviews (SARs) conducted in support of Maintenance Activities in TVA Transmission Line Rights-of-Way

The TVA Regional Natural Heritage Program keeps track of state and federal protected species reported from the seven-state region. The terrestrial animal portion of the data base includes all listed birds (breeding and large wintering aggregations), mammals, reptiles, and amphibians. In addition to specific species of animals, the terrestrial portion of the database also includes records of heronries and caves as they often are used by multiple species.

Each SAR project is reviewed for the presence of protected terrestrial animals. A 1-mile radius of the project site(s) is typically reviewed for each proposed activity along transmission lines. Once an occurrence is located a polygon designating the known or likely extent of that occurrence is drawn on an ArcMap electronic topographic map (see included maps), and appropriate class restrictions are applied (see included table of Class Definitions and Associated Polygon Colors of Sensitive Areas). Special comments or instructions accompany each entry as appropriate. For instance, if a cave is located along a powerline corridor schedule for vegetative maintenance, a 200-foot buffer is indicated around the opening of the cave and a "Hand Clearing Only" restriction is applied within the buffer. If the cave is used by a summer or hibernating colony of bats, appropriate time restrictions, as designated in specific recovery plans for each species, are also applied.

(Aquatic Animals) - State and Federal Protected Aquatic Animal restrictions for Maintenance Activities in TVA Transmission Line Rights-of-Way

The TVA Regional Natural Heritage Program keeps track of state and federal protected species reported from the seven-state region. Aquatic animal occurrence records are maintained and updated by TVA Heritage staff on a regular basis.

Each SAR project is reviewed for the known or likely occurrence of protected aquatic animals in streams in or adjacent to the transmission line right-of-way. A 10 mile buffer around the transmission line being reviewed is examined to determine the likely occurrence of protected aquatic animals. Once an occurrence is located, appropriate class restrictions are applied and the appropriate colored polygon is drawn around the resource area on an ArcMap electronic topographic map (see included maps and table of Class Definitions and Associated Polygon Colors of Sensitive Areas). All transmission line maintenance activities are currently conducted using Best Management Practices as outlined in Muncy (1999). Special comments or

instructions (including designation of specific Streamside Management Zones) accompany each entry as appropriate.

(Wetlands) - Wetlands Review for Maintenance Activities in TVA Transmission Line Rights-of-Way

Prior to the performance of any maintenance activities in TVA transmission line ROWs, office-level reviews are conducted by Natural Heritage wetland biologists. This review includes review of the National Wetland Inventory (NWI) map, county soil surveys, and TVA photos of transmission line structures. Potential wetland areas, not indicated on the NWI map, are identified based on interpretation of topographic features, water bodies, soils information, TVA photos and proximity to NWI features. All NWI wetlands or potential wetland areas are superimposed as layers on an ArcMap electronic topographic map (see included maps). These ArcMap images are sent to the client accompanied by the Wetlands ROW and Pole Replacement Guidelines and an Excel spread sheet which lists areas that have been included with the NWI data as areas of potential wetlands and what guidelines are to be used.

The NWI wetlands are indicated (in dark blue outline) on the ArcMap drawings for both the ROW and a 1-mile diameter buffer area around the ROW. Potential wetland areas are identified (in dark pink outline) in the ROW, but are not identified in the buffer area, parts of which may be used for ROW access. If the access route follows an existing road that does not require any repair or upgrading, no further wetland reviews are needed. Repair and upgrading includes, but is not limited to grading, fill addition, new or upgraded stream crossings, and vegetation removal. If a new or upgraded access route is necessary, environmental reviews of those particular access areas are conducted as required by the National Environmental Policy Act (NEPA).

The National Wetland Inventory (NWI) data was compiled using high-altitude aerial photography, some of which is now over 15 years old, with very limited field verification. Because of this, some of the NWI data may be inaccurate. The limitations of the NWI data are considered in the performance of ROW maintenance and pole replacement to avoid accidental wetland impacts. Since there could be wetlands present for which no map evidence or other data currently exists, maintenance crews remain alert to such things as water on the surface of the ground, soil saturation, the type of vegetation growing in an area, and evidence of present, seasonal or temporary flooding.

In the absence of a ground survey by a wetlands specialist to determine wetland presence and location for ROW reclearing or pole replacements, Best Management Practices, as described in Muncy (1999), and TPS Environmental Quality Specifications for ROW Construction and Maintenance are implemented to avoid and minimize potential impacts (see attached Wetlands Guidelines for ROW and Pole Replacement). These techniques would be implemented in all locations where NWI wetlands and potential wetland areas are indicated on the project maps submitted by the TVA Natural Heritage staff.

Site-specific recommendations for ROW reclearing include the following:

- Depending on site conditions, Level B tree-cutting guidelines, or methods CM-2, CM-3, CM-4, or CM-5 may be used for tree clearing (Muncy 1999). These methods specify techniques for tree clearing and removal that are selected based on wetland hydrology and condition in order to avoid and minimize wetland impacts.
- According to method CM-6 (Muncy 1999), if the wetland is a scrub-shrub, emergent, or grazed wetland, there should be no equipment entry, and minimal intrusion by all mechanized equipment.
- For aerial or ground herbicide application, use is restricted to those herbicides that are EPA-approved for use in aquatic areas.
- If possible, mechanical clearing should be conducted when the ground is dry or minimally saturated. Ruts should be minimized to avoid altered hydrologic patterns, soil compaction, and disruptions in vegetation regeneration.

Specific recommendations for pole replacement activities include the following:

- Entry of vehicles or heavy equipment in wetlands should be avoided when possible.
- If entry is unavoidable, appropriate measures such as mats and low-ground pressure equipment should be used.
- Impacts to vegetation should be avoided or minimized.

In addition, certain activities that may occur during pole replacement in wetlands are regulated under Sections 404 and 401 of the Clean Water Act. U.S. Army Corps of Engineers (USACE) Nationwide General Permit (NWP) #12 authorizes certain activities related to utility line construction and contains conditions to ensure that impacts to wetlands are minimal. Section 401 gives states the authority to certify whether activities permitted under Section 404 are in accordance with state water quality standards (Strand, 1997). A qualified TVA or TVA contract wetlands specialist would be required to delineate the wetland(s) and provide the wetland determination data forms which are required for inclusion in the permit application. TVA also follows Executive Order 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 the agency's responsibilities.

Potential impacts to wetlands resulting from right-of-way maintenance activities include vegetation damage, soil compaction and erosion, sedimentation, and hydrologic alterations. These impacts are avoided or minimized during TVA maintenance operations by following the recommendations of the guidelines presented above and implementing all relevant Best Management Practices. In addition, the appropriate permits are obtained if required for the specific activity.

(Cultural) - Cultural Resource Reviews Related to Operations and Maintenance Activities in TVA Transmission Line Rights-of-Way

Regulatory Background

The National Historic Preservation Act of 1979 (NHPA) made historic preservation a statutory and regulatory responsibility of federal government agencies and established procedures to be followed for historic preservation. Generally speaking, any TVA action involving construction and/or ground disturbing activity is subject to NHPA. The concepts "historic property" and "undertaking" are critical underpinnings of the Act. The NHPA defines historic property as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places." The Secretary of the Interior is the Keeper of the National Register of Historic Places ("the National Register"), which is maintained by the National Park Service. Much of the regulatory language of the Act describes the processes by which districts, sites, buildings, or structures are assessed for listing in the National Register. An undertaking is "a project, activity, or program funded in whole or in part under the direst or indirect jurisdiction of a Federal Agency."

Section 106 of the NHPA requires TVA to 1) consider the effect of its actions on historic properties and 2) allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: 1) initiate the process; 2) identify historic properties; 3) assess adverse effects; and 4) resolve adverse effects. One of the main responsibilities of TVA Cultural Resources is to carry out these four steps. In a nutshell, the process involves documentary research and field reconnaissance for identifying cultural resources (such as artifacts, sites, or historic structures); determining whether any identified cultural resources are eligible for listing on the National Register, and therefore should be considered "historic properties"; assessing whether a proposed undertaking will cause adverse affects to any historic properties; and recommending ways to resolve adverse effects, namely avoidance or mitigation. This process is carried out in consultation with the State Historic Preservation Officer of the state in which the undertaking takes place and with any other interested consulting parties including federally recognized Indian tribes.

The construction, maintenance, and operation of TVA transmission lines all constitute undertakings and as such are subject to the NHPA and its implementing regulations at 36CFR800. Examples of maintenance activities associated with transmission lines are spraying herbicides and replacing individual poles. Such activities are reviewed by TVA Cultural Resources staff on a case-by-case basis using the Sensitive Area Review (SAR) procedure. The purpose of an SAR Cultural Resources review is to identify whether the undertaking has any potential for adverse effects on cultural resources such as historic structures or buried prehistoric sites. If the undertaking does have potential for adverse effects, then procedures for avoidance or mitigation of the effects are put into place.

How TVA Cultural Resources Conducts SARs for Transmission Operations and Maintenance Projects

TVA Cultural Resources staff examine topographic maps of the project site for (a) previously recorded archaeological sites in the vicinity of the transmission line corridor; and (b) conditions that suggest high potential for archaeological sites including low slope (< 10%), proximity to major water sources, and lack of modern disturbance. ArcView GIS is used to identify areas with potential for cultural resources. For example, Exhibit 1 is a map generated with this software, which shows areas with slope < 10% (peach) and the distribution of streams (blue). The decision to do a field review is based on such information along with any information the staff can glean from videos of the transmission line corridors and from still photographs of the project site.

Field reviews are conducted by Cultural Resources staff or by consulting archaeologists, who look for signs of intact, buried prehistoric deposits using surface survey and sub-surface probes (when appropriate). The project is cleared if no artifacts or features identified and if the project site appears to have a low potential for cultural resources. If intact buried deposits containing cultural resources are discovered, an attempt is made to discern whether the site may be potentially eligible for the National Register. A formal assessment of eligibility would not be undertaken during a field review, however. If the site may be eligible, then a Phase I investigation is called for. A Phase I might also be called for there is a high potential for intact buried deposits, even if no artifacts or features were identified during field review. The purposes of a Phase I investigation are to delimit the boundaries of a site, gather additional information relating to the site's eligibility (such as integrity), and assess possible effects to the site from the undertaking.

Avoidance is generally feasible for transmission line maintenance projects when cultural resources are present. ArcView GIS is used to generate a map showing polygons around those cultural resources, representing sensitive areas. Areas that are sensitive from the standpoint of cultural resources are coded Level 2, which indicates restrictions on methods of clearing (no mechanized equipment). These maps are provided to TPS prior to any maintenance activities on the line, so that crew supervisors will be aware of the necessary restrictions. Restrictions are typically called for when a previously recorded cemetery, prehistoric mound, or earthwork occurs within 0.25 miles of the transmission line.

Class Definitions and Associated Polygon Colors of Sensitive Areas for RIGHT-OF-WAY RECLEARING Sensitive Area Reviews

Terrestrial Plants (A), Terrestrial Animals (D), and Aquatic Animals (E)			
Class	**Restriction if Sensitive area in ROW**	**Restriction for Sensitive Areas Potentially Affected when Accessing ROW**	**Polygon Color**
1	No broadcast spraying. Use one of the three following alternatives: 1) Hand or mechanical clearing, 2) Request field surveys by TVA Heritage staff to determine if suitable habitat for these species exists in the subject area, 3) Selective spraying of herbicides to shrubs or tree saplings less than 12 feet in height.	Not Applicable	Yellow
2	Hand-clearing only. Vehicles and equipment restricted from area unless confined to existing access road.	Vehicles and equipment restricted from area unless confined to existing access road.	Red
0	Special circumstance.		Green
Wetlands* (C)			
-	Wetlands obtained from National Wetland Inventory data. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.		Blue Outline
1	Potential wetlands identified by Natural Heritage wetland biologists based on interpretation of topographic features, water bodies, soil surveys and proximity to NWI features. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.		Pink Outline

Natural Areas (B)			
Class	**Call****	**Definition**	**Color**
1	No	Same as Class 1 definition above.	Yellow
2	No	Same as Class 2 definition above.	Red
1	Yes	Same as Class 1 definition above, and **must contact area manager** prior to entering or conducting maintenance in subject area	Yellow hatching
2	Yes	Same as Class 2 definition above, and **must contact area manager** prior to entering or conducting maintenance in subject area.	Red hatching
3	Yes	**Must contact area manager** prior to entering or conducting maintenance in subject area.	Neon Green
none		Special circumstance.	Green

Archaeology (F)			
Class	**Restriction if Sensitive area in ROW**	**Restriction for Sensitive Areas Potentially Affected when Accessing ROW**	**Color**
1	Mechanical clearing must be conducted when the ground is dry and firm. If bulldozer is used, blade must be kept above ground surface to avoid ground disturbance. Material from clearing (timber, brush, and large debris) must be removed from sensitive area.	Vehicles and equipment must be confined to existing access road.	Yellow
2	No mechanical clearing. Hand-clearing only (chainsaws may be used but not heavy equipment). Debris from clearing must be hand-carried out of sensitive area.	All vehicles must be low-pressured tire equipment and must be confined to existing access road.	Red

* Refer to Wetlands Statement included in this package.

** The "Call" column on the accompanying datasheets is used by Natural Area specialists only. A blank in the column indicates no call is necessary.

Class Definitions and Associated Polygon Colors of Sensitive Areas for POLE REPLACEMENT Sensitive Area Reviews

All Resources Areas (Plants, Natural Areas, Wetlands, Terrestrial Animals, and Aquatic Animals)		
Class	**Restriction**	**Color**
1	**Botany**: Sensitive Botanical resources are known from the area. Details of proposed activities should be submitted to TVA Heritage staff to determine if the proposed activities require restrictions. **Natural Areas**: Refer to table accompanying project for restrictions. **Wetlands**: Potential wetlands identified by Natural Heritage wetland biologists based on interpretation of topographic features, water bodies, soil surveys and proximity to NWI features. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions. **Terrestrial Animals**: Refer to table accompanying project for restrictions. **Aquatic Animals**: Refer to table accompanying project for restrictions.	Pink
Wetlands		
-	Wetlands obtained from National Wetland Inventory data. Refer to "Wetlands ROW and Pole Replacement Guidelines" for restrictions.	Blue Outline
Archaeology		**Color**
Class	**Restriction**	
1	Presence of significant below-ground cultural resources is highly likely. Work must be scheduled when ground is dry and firm. Only vehicles with low-pressured tires may be used within sensitive area. If structure is a pole, new poles must be placed in existing holes; if structure is a tower, existing footings must be used for new tower. If guy wires are used, existing guy wire anchors must be used for new structure. If any of these conditions can not be met, then details of proposed activities (nature of work, date work is to take place) must be submitted to TVA Cultural Resources staff so that a field review can be scheduled.	Yellow
2	Presence of significant cultural resources is known. Work schedule must be submitted to TVA Cultural Resources staff so that a field review can be scheduled.	Red

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Appendix H – Tennessee Valley Authority Transmission Construction Guidelines Near Streams

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Tennessee Valley Authority
Transmission Construction Guidelines Near Streams

Even the most carefully designed transmission line project eventually will affect one or more creeks, rivers, or other type of water body. These streams and other water areas are protected by state and federal law, generally support some amount of fishing and recreation, and, occasionally, are homes for important and/or endangered species. These habitats occur in the stream and on strips of land along both sides (the streamside management zone [SMZ]) where disturbance of the water, land, or vegetation could have an adverse effect on the water or stream life. The following guidelines have been prepared to help Tennessee Valley Authority (TVA) Transmission Construction staff and their contractors avoid impacts to streams and stream life as they work in and near SMZs. These guidelines expand on information presented in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities.*

Three Levels of Protection

During the preconstruction review of a proposed transmission line, TVA Environmental Stewardship and Policy staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard stream protection, (B) protection of important permanent streams, or (C) protection of unique habitats. These category designations are based on the variety of species and habitats that exist in the stream as well as state and federal requirements to avoid harming certain species. The category designation for each site will be marked on the plan and profile sheets. Construction crews are required to protect streams and other identified water habitats using the following pertinent set(s) of guidelines:

(A) Standard Stream Protection

This is the standard (basic) level of protection for streams and the habitats around them. The purpose of the following guidelines is to minimize the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work.

Guidelines:

1. All construction work around streams will be done using pertinent best management practices (BMPs) such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "Standards and Specifications."

2. All equipment crossings of streams must comply with appropriate state permitting requirements. Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to

minimize soil disturbance and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as feasible.

(B) Protection of Important Permanent Streams

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include the presence of important sports fish (trout, for example) and habitats for federal endangered species. The purpose of the following guidelines is to minimize the disturbance of the banks and water in the flowing stream(s) where this level of protection is required.

Guidelines:

1. Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "Standards and Specifications."

2. All equipment crossings of streams must comply with appropriate state (and, at times, federal) permitting requirements. Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Cutting of trees near permanent streams must be limited to those required to meet National Electric Safety Code and danger tree requirements. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

(C) Protection of Unique Habitats

This category will be used when, for one or more specific reasons, a temporary or permanent aquatic habitat requires special protection. This relatively uncommon level of protection will be appropriate and required when a unique habitat (for example, a particular spring run) or protected species (for example, one that breeds in a wet-weather ditch) is known to occur on or adjacent to the construction corridor. The purpose of the following guidelines is to avoid or minimize any disturbance of the unique aquatic habitat.

Guidelines:

1. Except as modified by Guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "Standards and Specifications."

2. All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Environmental Stewardship and Policy staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat. All crossings of streams also must comply with appropriate state (and, at times, federal) permitting requirements.

3. Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Environmental Stewardship and Policy staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. Stumps must not be removed, uprooted, or cut shorter than 0.30 meter (1 foot) above the ground line.

4. Other vegetation near the unique habitat must be disturbed as little as possible during construction. The soil must not be disturbed by plowing, disking, blading, or grading. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Environmental Stewardship and Policy staff.

Additional Help

If you have questions about the purpose or application of these guidelines, please contact your supervisor or the environmental coordinator in the local Transmission Service Center.

Revision April 2007

Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 1)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
1. Reference	☐ All TVA construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."	☐ Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."	☐ Except as modified by guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."
2. Equipment Crossings	☐ All crossings of streams must comply with appropriate state and federal permitting requirements. ☐ Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. ☐ Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.	☐ All crossings of streams must comply with appropriate state and federal permitting requirements. ☐ Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. ☐ Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.	☐ All crossings of streams also must comply with appropriate state and federal permitting requirements. ☐ All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Environmental Stewardship and Policy staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat.

Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 2)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
3. Cutting Trees	☐ Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. ☐ Stumps can be cut close to ground level but must not be removed or uprooted.	☐ Cutting of trees with SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. ☐ Cutting of trees near permanent streams must be limited to those meeting National Electric Safety Code and danger tree requirements. ☐ Stumps can be cut close to ground level but must not be removed or uprooted.	☐ Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Environmental Stewardship and Policy staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. ☐ Stumps must not be removed, uprooted, or cut shorter than 1 foot above the ground line.
4. Other Vegetation	☐ Other vegetation near streams must be disturbed as little as possible during construction. ☐ Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. ☐ Shorelines that have to be disturbed must be stabilized as soon as feasible.	☐ Other vegetation near streams must be disturbed as little as possible during construction. ☐ Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. ☐ Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.	☐ Other vegetation near the unique habitat must be disturbed as little as possible during construction. ☐ The soil must not be disturbed by plowing, disking, blading, or grading. ☐ Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Environmental Stewardship and Policy staff.

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GLOSSARY

A-weighted decibel (dBA) - A unit of weighted sound pressure level, measured by the use of a metering characteristic and the "A" weighting specified by American National Standard Institute SI.4-1971(R176). (See decibel).

Accident - One or more unplanned events involving materials that have the potential to endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent adverse health effects.

Accident sequence - With regard to nuclear facilities, an initiating event followed by system failures or operator errors, which can result in significant core damage, confinement system failure, and/or radionuclide releases.

Ambient air - The surrounding atmosphere as it exists around people, plants, and structures. Air quality standards are used to provide a measure of the health-related and visual characteristics of the air.

Archaeological sites (resources) - Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

Artifact - An object produced or shaped by human workmanship of archaeological or historical interest.

As Low as Reasonably Achievable (ALARA) - A concept applied to ensure the quantity of radioactivity released to the environment and the radiation exposure of onsite workers in routine operations, including "anticipated operational occurrences," is maintained as low as reasonably achievable. It takes into account the state of technology, economics of improvements in relation to benefits to public health and safety, and other societal and economic considerations in relation to the use of nuclear energy in the public interest.

Background radiation - Ionizing radiation present in the environment from cosmic rays and natural sources in the Earth; background radiation varies considerably with location.

Baseline - A quantitative expression of conditions, costs, schedule, or technical progress to serve as a base or standard for measurement during the performance of an effort; the established plan against which the status of resources and progress of a project can be measured. For this environmental impact statement, the environmental baseline is the site environmental conditions as they exist or have been estimated to exist in the absence of the proposed action.

Baseload - The minimum amount of electric power or natural gas delivered or required over a given period of time at a steady rate. The minimum continuous load or demand in a power system over a given period of time usually not temperature sensitive.

Baseload capacity - The generating equipment normally operated to serve loads on an around-the-clock basis.

Basemat - Reinforced concrete foundation. The AP1000 basemat meets the functional requirements of a building foundation by providing the strength and stability necessary for design loads to transmit safely from the structure onto the underlying rock and soil substrata.

Benthic - Plants and animals dwelling at the bottom of oceans, lakes, rivers, and other surface waters.

Benthic macroinvertebrate - Organisms that are large enough to be seen without the aid of magnification and that live in close association with bottom of flowing and nonflowing bodies of water.

Best Management Practices (BMP) - A practice or combination or practices that is determined by a state (or other planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with air or water quality goals.

Beta particle - A charged particle emitted from the nucleus of an atom during radioactive decay. A negatively charged beta particle is identical to an electron; a positively charged beta particle is called a "positron."

Beta radiation - Consists of an elementary particle emitted from a nucleus during radioactive decay; it is negatively charged, is identical to an electron, and is easily stopped by a thin sheet of metal.

Block groups - U.S. Bureau of the Census term describing a cluster of blocks generally selected to include 250 to 550 housing units.

Blowdown - A maintenance procedure to remove sediment in power plant components.

Burnup - The total energy released through fission by a given amount of nuclear fuel; generally measured in megawatt-days.

CE-QUAL-W2 - Two-dimensional, laterally averaged, hydrodynamic and water quality model for reservoirs

Cancer - The name given to a group of diseases characterized by uncontrolled cellular growth with cells having invasive characteristics such that the disease can transfer from one organ to another.

Capacity factor - The ratio of the annual average power production of a power plant to its rated capacity.

Canister - A stainless-steel container in which nuclear material is sealed.

Cladding - The metal tube that forms the outer jacket of a nuclear fuel rod or burnable absorber rod. It prevents the release of radioactive material into the coolant. Stainless steel and zirconium alloys *are* common cladding materials.

Consumptive water use - The difference in the volume of water withdrawn from a body of water and the amount released back into the body of water.

Container - With regard to radioactive wastes, the metal envelope in the waste package that provides the primary containment function of the waste package and is designed to meet the containment requirements of 10 CFR Part 60.

Containment Structure- A gas-tight shell or other enclosure around a nuclear reactor to confine fission that otherwise might be released to the atmosphere in the event of an accident. Such enclosures are usually dome-shaped and made of steel-reinforced concrete.

Containment design-basis - For a nuclear reactor, those bounding conditions for the design of the containment, including temperature, pressure, and leakage rate. Because the containment is provided as an additional barrier to mitigate the consequences of accidents involving the release of radioactive materials, the containment design-basis may include an additional specified margin above those conditions expected to result from the plant design-basis accidents to ensure that the containment design can mitigate unlikely or unforeseen events.

Conductors - A wire or combination of wires not insulated from one another, suitable for carrying electric current.

Cooling water - Water pumped into a nuclear reactor or accelerator to cool components and prevent damage from the intense heat generated when the reactor or accelerator is operating.

CORMIX – Cornell Mixing Zone Expert System (CORMIX), an EPA-supported mixing zone model for assessment of regulatory mixing zones resulting from steady, continuous point source discharges.

Cultural resources - Archaeological sites, historical sites, architectural features, traditional use areas, and Native American sacred sites.

Cumulative impacts/effects - In an environmental impact statement, the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or nonfederal), private industry, or individual(s) undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7).

Current - The movement of electrons in the conductors or transmission lines.

Decay heat (radioactivity) - The heat produced by the decay of certain radionuclides.

Decay (radioactive) - The decrease in the amount of any radioactive material with the passage of time due to the spontaneous transformation of an unstable nuclide into a different nuclide or into a different energy state of the same nuclide; the emission of nuclear radiation (alpha, beta, or gamma radiation) is part of the process.

Decibel (dB) - A logarithmic unit of sound measurement which describes the magnitude of a particular quantity of sound pressure power with respect to a standard reference value, in general, a sound doubles in loudness for every increase of 10 decibels.

Decibel, A-weighted (dBA) - A unit of frequency-weighted sound pressure level, measured by the use of a metering characteristic and the "A" weighting specified by the American National

Standards Institute ANSI Si .4-1983 (RI 594), that accounts for the frequency response of the human ear.

Decommissioning - The removal from service of facilities such as processing plants, waste tanks, and burial grounds, and the reduction or stabilization of radioactive contamination. Decommissioning includes decontamination, dismantling, and return of the area to original condition without restrictions or partial decontamination, isolation of remaining residues, and continuation of surveillance and restrictions.

Decontamination - The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

Depleted uranium - A mixture of uranium isotopes where uranium-235 represents less than 0.7 percent of the uranium by mass.

Derate - Reduction in operating power production level.

Design-basis accident - For nuclear facilities, information that identifies the specific functions to be performed by a structure, system, or component and the specific values (or ranges of values) chosen for controlling parameters for reference bounds for design. These values may be (I) restraints derived from generally accepted state-of-the-art practices for achieving functional goals; (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals; or (3) requirements derived from Federal safety objectives, principles, goals, or requirements.

Design-basis events - Postulated disturbances in process variables that can potentially lead to design-basis accidents.

Distribution (electrical) - The system of lines, transformers, and switches that connect the transmission network and customer load. The transport of electricity to ultimate use points such as homes and businesses. The portion of an electric system that is dedicated to delivering electric energy to an end user at relatively low voltages.

Dose - The energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad.

Dose equivalent - The product of absorbed dose in rad (or Gray) and a quality factor, which quantifies the effect of this type of radiation in fissue. Dose equivalent is expressed in units of rem or Sievert, where 1 rem equals 0.01 Sievert.

Dose rate - The radiation dose delivered per unit time (e.g., rem per year).

Dosimeter - A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (e.g., film badge or ionization chamber).

Drift - Effluent mist or spray carried into the atmosphere from cooling towers.

Drinking water standards - The level of constituents or characteristics in a drinking water supply specified in regulations under the Safe Drinking Water Act as the maximum permissible.

Effective dose equivalent - The sum of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighting factor. This sum is a risk-equivalent value and can be used to estimate the health effects risk to the exposed individual. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body irradiation that would be contributed by that particular tissue. The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides, and the effective dose equivalent due to penetrating radiation from sources external to the body. Effective dose equivalent is expressed in units of rem or Sievert.

Effluent - A gas or fluid discharged into the environment.

Endangered species - Any species which is in danger of extinction throughout all or significant portions of its range. The Endangered Species Act of 1973, as amended, establishes procedures for placing species on the Federal lists of endangered or threatened species.

Endangered Species Act of 1973 - The Act requires Federal agencies, with the consultation and assistance of the Secretaries of the Interior and Commerce, to ensure that their actions likely will not jeopardize the continued existence of any endangered or threatened species, or adversely affect the habitat of such species.

Engineered safety features - For a nuclear facility, features that prevent, limit, or mitigate the release of radioactive material from its primary containment.

Entrainment - The involuntary capture and inclusion of organisms in streams of flowing water; a term often applied to the cooling water systems of power plants/reactors. The organisms involved may include phyto-and zooplankton, fish eggs and larvae (ichthyoplankton), shellfish larvae, and other forms of aquatic life.

Environment - The sum of all external conditions and influences affecting the life, development, and ultimately the survival of an organism.

Environmental justice - The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no population of people should be forced to shoulder a disproportionate share of the negative environmental impacts of pollution or environmental hazards due to a lack of political or economic influence.

Exposure to radiation - The incidence of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background ionizing radiation. Occupational exposure is the exposure to ionizing radiation that occurs at a person's workplace. Population exposure is the exposure to a number of persons who inhabit an area.

Exposure pathway - The course a chemical or physical agent takes from the source to the exposed organism. The pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at or originating from the site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium (e.g., air) is included.

Fission (fissioning) - The splitting of a nucleus into at least two other nuclei and the release of a relatively large amount of energy. Two or three neutrons are usually released during this type of transformation.

Fission products - Nuclei formed by the fission of heavy elements (primary fission products); also, the nuclei formed by the decay of the primary fission products, many of which are radioactive.

Floodplain - The lowlands adjoining inland and coastal waters and relatively flat areas.

Fuel assembly - A cluster of fuel rods (or plates). Also called a fuel element. Approximately 200 fuel assemblies make up a reactor core.

Fuel rod - Nuclear reactor component that includes the fissile material.

Gamma rays - High-energy, short-wavelength, electromagnetic radiation accompanying fission and either emitted from the nucleus of an atom or emitted by some radionuclide or fission product. Gamma rays are very penetrating and can be stopped only by dense materials (such as lead) or a thick layer of shielding materials.

Habitat - The environment occupied by individuals of a particular species, population, or community.

Hazardous material - A material, including a hazardous substance, as defined by 49 CFR §171.8, which poses a risk to health, safety, and property when transported or handled.

Hazardous/toxic air pollutants - Air pollutants known or suspected to cause serious health problems such as cancer, poisoning, or sickness, and may have immunological, neurological, reproductive, developmental, or respiratory effects.

Hazardous waste - Any solid waste (can also be semisolid or liquid, or contain gaseous material) having the characteristics of ignitability, corrosivity, toxicity, or reactivity, defined by the Resource Conservation and Recovery Act, and identified or listed in 40 CFR Part 261 or by the Toxic Substances Control Act.

Heat exchanger - A device that transfers heat from one fluid (liquid or gas) to another.

High Efficiency Particulate Air Filter (HEPA) - A filter used to remove very small particulates from dry gaseous effluent streams.

High(ly) enriched uranium - Uranium that is equal to or greater than 20 percent uranium-235 weight. Many of the fuels discussed in this EIS are based primarily on highly enriched uranium.

Historic resources - Archaeological sites, architectural structures, and objects produced after the advent of written history dating to the time of the first Euro-American contact in an area.

Hybernacula - Places, e.g., caves or other protected areas, where bats hibernate during the winter.

Icthyoplankton - The early life stages offish (eggs and larvae) that spend part of their life cycle as free-floating plankton.

Impingement - The process by which aquatic organisms too large to pass through the screens of a water intake structure become caught on the screens and are unable to escape.

Interim storage - Safe and secure storage for spent nuclear fuel and radioactive wastes until the materials are treated and/or disposed of).

Ion - An atom that has too many or too few electrons, causing it to be electrically charged; an electron that is not associated (in orbit) with a nucleus.

Ion exchange - A unit physiochemical process that removes anions and cations, including radionuclides, from liquid streams (usually water) for the purpose of purification or decontamination.

Ionizing radiation - Alpha particles, beta particles, gamma rays, neutrons, high-speed electrons, high-speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions.

Irradiation - Exposure to radiation.

Isotope - An atom of a chemical element with a specific atomic number and atomic mass. Isotopes of the same element have the same number of protons, but different numbers of neutrons and 'different atomic masses. Isotopes are identified by the name of the element and the total number of protons and neutrons in the nucleus. For example, plutonium-239 is a plutonium atom with 239 protons and neutrons.

Laydown - Area of construction site used to sort and store construction materials.

Licensee amendment - Changes to an existing reactor's operating license that are approved by the U.S. Nuclear Regulatory Commission.

Light water - The common form of water (a molecule with two hydrogen atoms and one oxygen atom, H20) in which the hydrogen atom consists completely of the normal hydrogen isotope (one proton).

Light water reactor - A nuclear reactor in which circulating light water is used to cool the reactor core and to moderate (reduce the energy of) the neutrons created in the core by the fission reactions.

Low-level waste - Waste that contains radioactivity, but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or by-product material as defined by Section lie (2) of the Atomic Energy Act of 1954, as amended. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic waste is less than IOO nanocuries per gram. Some low-level waste is considered classified because of the nature of the generating process and/or constituents, because the waste would tell too much about the process.

Macrophyte – An aquatic plant that grows in or near water and is emergent, submergent, or floating.

Makeup water - Replacement for water lost through drift, blowdown, or evaporation (as in a cooling tower).

Man-rem - Unit of radiation dose to an individual.

Maximally exposed individual - A hypothetical person who could potentially receive the maximum dose of radiation or hazardous chemicals.

Megawatt (MW) - A unit of power equal to 1 million watts. "Megawatt-thermal" is commonly used to define heat produced, while "megawatt-electric" defines electricity produced.

Millirem - One thousandth of a rem. (See rem)

Minority population - A population classified by the Bureau of the Census as Black, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut, and other nonwhite persons, the composition of which is at least equal to or greater than the state minority average of a defined area of jurisdiction.

National Ambient Air Quality Standards (NAAQS) - Uniform, national air quality standards established by the Environmental Protection Agency under the authority of the Clean Air Act that restrict ambient levels of criteria pollutants to protect public health (primary standards) or public welfare (secondary standards), including plant and animal life, visibility, and materials. Standards have been set for ozone, carbon monoxide, particulates, sulfur dioxide, nitrogen dioxide, and lead.

National Historic Preservation Act (NHPA) - This Act provides that property resources with significant national historic value be placed on the national Register of Historic Places. It does not require any permits, but, pursuant to Federal code, if a proposed action might impact an historic property resource, it mandates consultation with the proper agencies.

National Pollutant Discharge Elimination System (NPDES) - Federal permitting system required for water pollution effluents under the Clean Water Act, as amended.

National Register of Historic Places (NRHP) - A list maintained by the Secretary of the Interior of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance under Section 2(b) of the Historic Sites Act of 1935(16 U.S.C. 462) and Section lOl(a) (1) (A) of the National Historic Preservation Act of 1966, as amended.

Nuclear reactor - A device that sustains a controlled nuclear fission chain reaction that releases energy in the form of heat.

Nuclear Regulatory Commission (NRC) - The Federal agency that regulates the civilian nuclear power industry in the United States.

Nuclide - A species of atom characterized by the constitution of its nucleus and, hence, by the number of protons, the number of neutrons, and the energy content.

Outfall- The discharge point of a drain, sewer, or pipe as it empties into a body of water.

Peaking capacity - The capacity of facilities or equipment normally used to supply incremental gas or electricity under extreme demand conditions. Peaking capacity is generally available for a limited number of days at a maximum rate.

Peak load - The maximum load consumed or produced by a unit or group of units in a stated period of time.

Pellets - One configuration of the reactive material in a target rod.

Person-rem - The unit of collective radiation dose to a given population; the sum of the individual doses received by a population segment.

Plume - A flowing, often somewhat conical, trail of emissions from a continuous point source.

Plume immersion - With regard to radiation, the situation in which an individual is enveloped by a cloud of radiation gaseous effluent and receives an external radiation dose.

Pressurized water reactor - A light water reactor in which heat is transferred from the core to an exchanger by water kept under pressure in the primary system. Steam is generated in a secondary circuit. Many reactors producing electric power are pressurized water reactors.

Primary system - With regard to nuclear reactors, the system that circulates a coolant (e.g., water) through the reactor core to remove the heat of reaction.

Probabilistic risk assessment - A comprehensive, logical, and structured methodology to identify and quantitatively evaluate significant accident sequences and their consequences.

Probabilistic safety assessment - A systematic and comprehensive methodology of determining the risks associated with the operation of a nuclear plant.

Probable maximum flood - The hypothetical flood (peak discharge, volume, and hydrograph shape) that is considered to be the most severe reasonably possible, based on comprehensive hydrometeorological application of Probable Maximum Precipitation, and other hydrologic factors favorable for maximum flood runoff, such as sequential storms and snowmelt.

Probable Maximum Precipitation - The theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of year. (Reference: American Meteorological Society, 1959)

Processing (of spent nuclear fuel) - Applying a chemical or physical process designed to alter the characteristics of the spent fuel matrix.

Radiation - The emitted particles or photons from the nuclei of radioactive atoms. Some elements are naturally radioactive; others are induced to become radioactive by bombardment in a reactor. Naturally occurring radiation is indistinguishable from induced radiation.

Radiation shielding - Radiation-absorbing material that is interposed between a source of radiation and organisms that would be harmed by the radiation (e.g., people).

Radioactive waste - Materials from nuclear operations that are radioactive or are contaminated with radioactive materials, and for which use, reuse, or recovery are impractical.

Radioactivity - The spontaneous decay or disintegration of unstable atomic nuclei, accompanied by the emission of radiation.

Radiological - Related to radiology, the science that deals with the use of ionizing radiation to diagnose and treat disease.

Radwaste – Radioactive materials at the end of their useful life or in a product that is no longer useful and requires proper disposal

Raw Water – Untreated water from the plant intake supplied to the circulating water system and the service water system to make up for water which has been consumed and discharged as part of the system operations.

Reactor - A device or apparatus in which a chain reactor of fissionable material is initiated and controlled; a nuclear reactor.

Reactor accident - See "design basis accident; severe accident."

Reactor coolant system - The system used to transfer energy from the reactor core either directly or indirectly to the heat rejection system.

Reactor core - In a heavy water reactor: the fuel assemblies including the fuel and target rods, control assemblies, blanket assemblies, safety rods, and coolant/moderator. In a light water reactor: the fuel assemblies including the fuel and target rods, control rods, and coolant/moderator. In a modular high-temperature gas-cooled reactor: the graphite elements including the fuel and target elements, control rods, and other reactor shutdown mechanisms, and the graphite reflectors.

Reactor facility - Unless it is modified by words such as containment, vessel, or core, the term reactor facility includes the housing, equipment, and associated areas devoted to the operation and maintenance of one or more reactor cones. Any apparatus that is designed or used to sustain nuclear chain reactions in a controlled manner, including critical and pulsed assemblies and research, tests, and power reactors, is defined as a reactor. All assemblies designed to perform subcritical experiments that could potentially reach criticality are also to be considered reactors.

Record of Decision (ROD) - A document prepared in accordance with the requirements of the Council on Environmental Quality and National Environmental Policy Act regulations 40 CFR §1505.2, that provides a concise public record of the decision on a proposed Federal action for which an environmental impact statement was prepared. A Record of Decision identifies the alternatives considered in reaching the decision, the environmentally preferable alternative(s), factors balanced in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not.

Regolith – A layer of loose, heterogeneous material covering solid rock.

Repository - A place for the disposal of immobilized high-level waste and spent nuclear fuel in isolation from the environment.

Reprocessing (of spent nuclear fuel) - Processing of reactor-irradiated nuclear material (primarily spent nuclear fuel) to recover fissile and fertile material, in order to recycle such

materials primarily for defense programs or generation of electricity. Historically, reprocessing has involved aqueous chemical separations of elements (typically uranium or plutonium) from undesired elements in the fuel.

Resin - An ion-exchange medium; organic polymer used for the preferential removal of certain ions from a solution.

Risk - In accident analysis, the probability-weighted consequence of an accident, defined as the accident frequently per year multiplied by the dose. The term "risk" also is used commonly in other applications to describe the probability of an event occurring.

Risk assessment (chemical or radiological) - The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

Runoff- The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

Safety Analysis Report (SAR) - A safety document that provides a complete description and safety analysis of a reactor design, normal and emergency operations, hypothetical accidents and their predicted consequences, and the means proposed to prevent such accidents or mitigate their consequences.

Safety Evaluation Report (SER)- A document prepared by the U.S. Nuclear Regulatory Commission that evaluates documentation (i.e., technical specifications, safety analysis reports, and special safety reviews and studies) submitted by a reactor licensee for its approval. This ensures that all of the safety aspects of part or all of the activities conducted at a reactor are formally and thoroughly analyzed, evaluated, and recorded.

Seismic Category 1 – Structures, systems, and components that are designed and built to withstand the maximum potential earthquake stresses for the particular region where a nuclear plant is sited.

Scoping - The solicitation of comments from interested persons, groups, and agencies at public meetings, public workshops, in writing, electronically, or via fax to assist in defining the proposed action, identifying alternatives, and developing preliminary issues to be addressed in an environmental impact statement.

Secondary system - The system that circulates a coolant (water) through a heat exchanger to remove heat from the primary system.

Seismicity - The tendency for earthquakes to occur.

Severe accident - An accident with a frequency rate of less than 106 per year that would have more severe consequences than a design-basis accident, in terms of damage to the facility, offsite consequences, or both. Also called "beyond design-basis reactor accidents" for this environmental impact statement.

Shutdown - For a U.S. Department of Energy (DOE) reactor, that condition in which the reactor has ceased operation and DOE has declared officially that it does not intend to operate it further (see DOE Order 5480.6, - Safely of Department of Energy-Owned Nuclear Reactors).

Source term - The estimated quantities of radionuclides or chemical pollutants released to the environment.

Spanned - Those areas of high relief where the transmission is high above the canopy such that ROW clearing is not necessary.

Spent nuclear fuel - Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not be separated.

Threatened species - Any species designated under the Endangered Species Act as likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Tier - To link to another in a hierarchical chain. An upper-tier document might be programmatic to the entire DOE complex of sites; a lower-tier document might be specific to one site or process.

Transient - A change in the reactor coolant system temperature, pressure, or both, attributed to a change in the reactor's power output. Transients can be caused by (1) adding or removing neutron poisons, (2) increasing or decreasing electrical load on the turbine generator, or (3) accident conditions

Tritium - A radioactive isotope of the element hydrogen with two neutrons and one proton. Common symbols for the isotope are "H-3" and "T." Tritium has a half-life of 12.3 years.

Underbuilt – When one or more lines are strung on an existing transmission structure.

Uprate – The process of increasing the maximum power level a commercial nuclear power plant may operate.

Uranium - A heavy, silvery-white metallic element (atomic number 92) with several radioactive isotopes that is used as fuel in nuclear reactors.

Vault - A reinforced concrete structure for storing strategic nuclear materials used in national defense or other programmatic purposes, or for disposing of radioactive or hazardous waste.

Wetlands - Land or areas exhibiting the following: hydric soil conditions, saturated or inundated soil during some portion of the year, and plant species tolerant of such conditions; also, areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole-body dose - With regard to radiation, the dose resulting from the uniform exposure of all organs and tissues in a human body. (Also see effective dose equivalent.)

X/Q (Chi/Q) - The relative calculated air concentration due to a specific air release and atmospheric dispersion; units are (seconds per cubic meter). For example (Curies per cubic meter)/(Curies per second)= (seconds per cubic meter) or (grams per cubic meter)/(grams per second) = (seconds per cubic meter).

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