

2.4 ECOLOGY

This section describes the terrestrial, wetland, and aquatic ecology of the Clinch River Nuclear (CRN) Site and resources in the vicinity of the CRN Site that could be affected by the construction and operation of two or more small modular reactors (SMRs). Details regarding the locations of proposed facilities on the CRN Site and in offsite areas, construction activities and the areas affected, and the planned operation of facility systems, are provided in Chapter 3. Subsection 2.4.1 describes the potentially affected terrestrial resources, including wetlands, and Subsection 2.4.2 describes the potentially affected aquatic resources. Transmission lines from the facility are expected to be added within existing onsite and offsite transmission line rights-of-way (ROWs) and within a short segment of a new ROW within the CRN Site. ROWs for cooling water intake and discharge pipelines are located within the CRN Site.

2.4.1 Terrestrial Ecology

The construction and operation of two or more SMRs at the CRN Site has the potential to affect terrestrial resources occurring on and within the vicinity of the approximately 935-acre (ac) CRN Site, including upland and wetland habitats and the ecological communities they support. In addition, upland and wetland communities could be affected by construction in two offsite areas: the Barge/Traffic Area immediately northwest of the CRN Site entrance, and the approximately 5-mile (mi) segment of the existing 500-kilovolt (kV) transmission line ROW east of the CRN Site. Improvements to the barge facility, roads, and intersections are planned at the Barge/Traffic Area. Installation of a 69-kV underground transmission line is planned for the existing ROW east of the CRN Site. This subsection describes the ecological characteristics of the terrestrial resources potentially affected by the construction and operation of SMRs at the CRN Site, barge and roadway infrastructure improvements in the Barge/Traffic Area, installation of a 69-kV underground transmission line, and modifications to the existing transmission system.

2.4.1.1 Upland Habitats

2.4.1.1.1 CRN Site

The CRN Site is located within the Ridge and Valley Ecoregion, a relatively low-lying area with roughly parallel ridges and valleys that extends across eastern Tennessee between the Blue Ridge Mountains to the east and the Cumberland Plateau to the west. The CRN Site overlaps two subdivisions of the Ridge and Valley Ecoregion: the Southern Limestone/Dolomite Valleys and Rolling Hills Ecoregion and the Southern Dissected Ridges and Knobs Ecoregion (Figure 2.4.1-1). Over 95 percent of the CRN Site is within the Southern Limestone/Dolomite Valleys and Rolling Hills, a diverse ecoregion with a geology characterized by limestone, cherty dolomite, and mostly undulating landforms of rounded ridges and valleys with many caves and springs. Vegetation land cover includes forests, pasture, and agricultural crops, and development in the ecoregion includes commercial, industrial, and residential land uses. Only the southern tip of the Clinch River Property peninsula is within the Southern Dissected Ridges

and Knobs Ecoregion. The vegetation community within these lower elevations of the Southern Dissected Ridges and Knobs Ecoregion is mainly mixed mesophytic forest dominated by white oak (*Quercus alba*) and tulip poplar (*Liriodendron tulipifera*). (Reference 2.4.1-1)

Field surveys of vegetation on the Clinch River Property, including the CRN Site as well as the adjacent Grassy Creek Habitat Protection Area (HPA), were conducted by Tennessee Valley Authority (TVA) in April and July of 2011 and September of 2013. The surveys were performed to characterize terrestrial vegetation communities, identify invasive plants, and search for listed plant species with the potential to occur in the habitats present (Reference 2.4.1-1). Based on interpretation of aerial photographs and the findings of these field surveys, dominant vegetation communities and other land cover types on the CRN Site were mapped (Figure 2.4.1-1). Over 75 percent of the CRN Site is covered by forest, approximately 22 percent is covered by herbaceous vegetation, and less than 1 percent (approximately 0.3 percent) is covered by small ponds. The remaining 2 percent of the CRN Site is classified as roads and developed areas. Table 2.4.1-1 shows the percentage of the CRN Site covered by each type of vegetation community or land use and the estimated acreage of each type based on a total CRN Site area of approximately 935 ac. Figure 2.4.1-1 depicts land cover types on the CRN Site.

TVA identified the dominant vegetation communities on the CRN Site as mixed evergreen-deciduous forest, deciduous forest, evergreen forest, and herbaceous vegetation. Characteristics of the vegetation communities on the CRN Site are described below, including examples of species generally representative of these community types. Lists of species actually recorded in vegetation surveys of the communities on the Clinch River Property are identified by their common and scientific names in Table 2.4.1-2. (Reference 2.4.1-1)

Mixed evergreen-deciduous forest consists of forest stands in which both evergreen and deciduous species contribute 25 to 75 percent of the total canopy cover. On the CRN Site, this forest occurs mostly as oak-hickory-pine dry forest on ridges. The dominant oaks include black oak (*Quercus velutina*), chestnut oak (*Q. montana*), northern red oak (*Q. rubra*), southern red oak (*Q. falcata*), and white oak. The dominant hickories include mockernut hickory (*Carya tomentosa*), pignut hickory (*C. glabra*), and shagbark hickory (*C. ovata*). The dominant pine is the Virginia pine (*Pinus virginiana*), and scattered eastern red cedars (*Juniperus virginiana*) are also present. Common understory species include black gum (*Nyssa sylvatica*), muscle wood (*Carpinus caroliniana*), and sourwood (*Oxydendrum arboreum*), and the herbaceous layer includes running ground cedar (*Diphasiastrum digitatum*), spotted wintergreen (*Chimaphila maculata*), ebony spleenwort (*Asplenium platyneuron*), black snakeroot (*Cimicifuga racemosa*), Christmas fern (*Polystichum acrostichoides*), little brown jug (*Hexastylis arifolia*), southern wood sorrel (*Oxalis corniculata*), and yellow giant hyssop (*Agastache nepetoides*). (Reference 2.4.1-1)

Deciduous forest, the second most prevalent forest type on the CRN Site, is characterized by trees with overlapping crowns and a canopy of more than 75 percent deciduous species. The deciduous forests on the CRN Site include three subtypes. The most extensive subtype is mixed mesophytic hardwood forest with a canopy that is dominated by tulip poplar and also

includes American beech (*Fagus grandifolia*), white oak, and yellow buckeye (*Aesculus flava*). The understory is varied and includes American holly (*Ilex opaca*), Carolina buckthorn (*Rhamnus caroliniana*), flowering dogwood (*Cornus florida*), maple-leaf viburnum (*Viburnum acerifolium*), pawpaw (*Asimina triloba*), sassafras (*Sassafras albidum*), serviceberry (*Amelanchier arborea*), and wild black cherry (*Prunus serotina*). The diverse herbaceous layer includes bishop's cap (*Mitella diphylla*), blue cohosh (*Caulophyllum thalictroides*), blood root (*Sanguinaria canadensis*), dog-tooth violet (*Erythronium americanum*), foam-flower (*Tiarella cordifolia*), Jack-in-the-pulpit (*Arisaema triphyllum*), maidenhair fern (*Adiantum pedatum*), Solomon's seal (*Polygonatum biflorum*), and many others. (Reference 2.4.1-1)

A second deciduous forest subtype, calcareous forest, occurs in several areas within the CRN Site that are underlain by limestone. The majority of the forested areas underlain by limestone are within the Grassy Creek HPA on the Clinch River Property immediately north of the CRN Site and on a few mesic slopes on the CRN Site adjacent to the Clinch River arm of the Watts Bar Reservoir. Species with affinities for calcareous soils occur in these areas, including eastern red cedar, eastern redbud (*Cercis canadensis*), bladdernut (*Staphylea trifolia*), and herbs such as Appalachian bugbane (*Cimicifuga rubifolia*), glade fern (*Diplazium pycnocarpon*), green violet (*Hybanthus concolor*), Jacob's ladder (*Polemonium reptans*), and walking fern (*Asplenium rhizophyllum*). Two Tennessee species of special concern that occur in this forest are the herbs American ginseng (*Panax quinquefolius*) and spreading false-foxtongue (*Aureolaria patula*). (Reference 2.4.1-1)

A third deciduous forest subtype, wetland forest, occurs near the edge of the Clinch River arm of the Watts Bar Reservoir and in association with the riparian areas of tributaries on the CRN Site. These forests are dominated by American sycamore (*Platanus occidentalis*), black willow, buttonbush (*Cephaelanthus occidentalis*), silky dogwood (*Cornus amomum*), and tag alder (*Alnus serrulata*). Other common trees and shrubs observed include persimmon (*Diospyros virginiana*), box elder (*Acer negundo*), Chinese privet (*Ligustrum sinense*), tall false indigo (*Amorpha fruticosa*), multiflora rose (*Rosa multiflora*), and silver maple (*Acer saccharinum*). Herbaceous species in these wetland forests include netted chain fern (*Woodwardia areolata*), jewelweed (*Impatiens capensis*), lizard tail (*Saururus cernuus*), rose mallow (*Hibiscus* sp.), waterwillow (*Justicia americana*), yellow flag (*Iris pseudacorus*), and several species of grasses, rushes, and sedges. (Reference 2.4.1-1) Each of the wetlands on the CRN Site is described in Subsection 2.4.1.2 and mapped in Figure 2.4.1-1.

Evergreen forest present on the CRN Site consists of remnant areas of loblolly pine (*Pinus taeda*) and white pine (*Pinus strobus*) plantations, which cover a total of approximately 3 percent of the CRN Site (Reference 2.4.1-1).

An herbaceous vegetation community consists of greater than 25 percent grasses and forbs. Herbaceous vegetation is the dominant cover on approximately 22 percent of the CRN Site, largely as a result of historical construction activities during which approximately 240 ac of the CRN Site were cleared (Reference 2.4.1-2). Much of this area was eventually refilled and revegetated with non-native species, such as tall fescue (*Festuca arundinacea*) and sericea

lespedeza (*Lespedeza cuneata*). These areas are undergoing secondary succession, principally by weedy species that include black-eyed Susan (*Rudbeckia hirta*), broom-sedge (*Andropogon virginicus*), Canada goldenrod (*Solidago canadensis*), Johnson grass (*Sorghum halepense*), Queen Anne's lace (*Daucus carota*), tickseed (*Coreopsis grandiflora*), and other common forbs. Eastern red cedar is scattered throughout these areas, resulting in the appearance of a cedar barren or glade. (Reference 2.4.1-1)

One area of herbaceous vegetation differs from that found on the rest of CRN Site in having a predominantly native flora. This small area covers about 1.4 ac in a transmission line ROW and resembles a disturbed cedar glade, which is an area of exposed limestone that supports sparse vegetation dominated by low-growing herbaceous species and eastern red cedar. In addition to red cedar and winged elm, herbs found in the marginal cedar glade area include butterfly weed (*Asclepias tuberosa*), hoary puccoon (*Lithospermum canescens*), false pennyroyal (*Hedeoma pulegioides*), pale spiked lobelia (*Lobelia spicata*), rose pink (*Sabatia angularis*), roundleaf thoroughwort (*Eupatorium rotundifolium*), twining snoutbean (*Rhynchosia tomentosa*), and whorled milkweed (*Asclepias verticillata*). Though the CRN Site contains several native species found in cedar glade habitat, its small size and high level of previous disturbance limits the importance of the CRN Site. (Reference 2.4.1-1) Given its position on the landscape, it is likely the plant community formed as a result of disturbance associated with previous work on the Clinch River Site and construction of the 161-kV Kingston FP – Fort Loudoun HP #1 line. Considered along with the small size and anthropogenic origin of the plant community, the absence of any rare plant species typical of glades further indicates that this area possesses little if any conservation value.

Barge/Traffic Area

In the Barge/Traffic Area, field surveys were conducted in May 2015 to characterize the terrestrial plant communities of the area east of TN 58. Surveys were conducted on the portions of the Barge/Traffic Area (101-ac) with the highest potential for disturbance that had not been previously surveyed. The survey included areas representative of each vegetation type present in the Barge/Traffic Area. Vegetation types found in this area were a combination of deciduous forest and herbaceous vegetation. These plant communities are common and well-represented throughout the region. None of the forest stands had characteristics indicative of old growth forest. (Reference 2.4.1-3)

Deciduous forest covers more than 90 percent of the Barge/Traffic Area. Common overstory species in dry upland forest include American beech, black gum, chestnut oak, mockernut hickory, red maple, scarlet oak (*Quercus coccinea*), sourwood, umbrella magnolia, and white oak. The understory consists of flowering dogwood, lowbush blueberry (*Vaccinium angustifolium*), and mountain laurel (*Kalmia latifolia*). Herbaceous plants are sparse and include Christmas fern, muscadine (*Vitis rotundifolia*), and wild yam (*Dioscorea villosa*). The deciduous forest in the Barge/Traffic Area also includes forested wetlands located in bottomlands associated with the Clinch River arm of the Watts Bar Reservoir. These deciduous forests

contain overstory species that include American sycamore, black willow, green ash, red maple, and sweetgum. (Reference 2.4.1-3)

Herbaceous vegetation occurs on less than 10 percent of the surveyed portion of the Barge/Traffic Area. Fields and maintained power line ROWs account for the vast majority of herbaceous vegetation in the area. Most of these herbaceous communities are dominated by plants indicative of early successional habitats, including many non-native species. Common species in these disturbed areas include Japanese honeysuckle, lobed tickseed (*Coreopsis auriculata*), *sericea* lespezeza, showy goldenrod (*Solidago speciosa*), Small's ragwort (*Packera anonyma*), southern blackberry (*Rubus* sp.), and winged sumac (*Rhus copallina*). Several small, emergent wetlands support a higher proportion of native species including buttonbush, common rush (*Juncus effusus*), groundnut (*Apis americana*), jewelweed, lizard's tail, shallow sedge (*Carex lurida*), silky dogwood, squarrose sedge, and tall false indigo. (Reference 2.4.1-3)

2.4.1.2 Wetland Habitats

Sections 401 and 404 of the Clean Water Act and Executive Order 11990, *Wetlands Protection*, provide regulatory protection for wetlands. Executive Order 11990 requires all federal agencies to minimize the destruction, loss, or degradation of wetlands when carrying out their responsibilities, and to preserve and enhance the natural and beneficial values of wetlands. Before performing certain activities in wetlands, a Section 404 permit from the U.S. Army Corps of Engineers (USACE) may be required, depending on the size of the wetland and its hydrologic connectivity to a navigable waterway. Section 401 provides states with the ability to verify whether activities allowed under Section 404 are compliant with state water quality standards. In Tennessee, the Division of Water Pollution Control of the Tennessee Department of Environment and Conservation (TDEC) is in charge of issuing Section 401 water quality certifications through the Aquatic Resource Alteration Permit. (Reference 2.4.1-4)

2.4.1.2.1 CRN Site Wetlands

Screening of wetland habitats on the CRN Site initially involved a review of National Wetland Inventory (NWI) maps and soil survey maps. Subsequently, field surveys were performed during January, April, and May of 2011, and the boundaries of the 12 wetlands on the CRN Site were delineated. Wetland identifications were performed in accordance with USACE methods, which require documentation of hydrophytic vegetation, hydric soils, and wetland hydrology. Broader definitions of wetlands, such as those provided by Executive Order 11990, the U.S. Fish and Wildlife Service (USFWS), and the TVA Environmental Review Procedures, also were considered in the wetland determinations for the CRN Site.

During a site visit on September 23, 2013, jurisdictional determinations were conducted by staff of the USACE to determine if each wetland meets the criteria for regulation under USACE jurisdiction. The TVA Rapid Assessment Method (RAM) was used to evaluate wetland conditions and identify wetlands with possible ecological significance. The TVA RAM uses six metrics that correspond to wetland indicator functions to differentiate wetlands on the basis of

their condition: wetland area/size; upland buffers and surrounding land use; hydrology; habitat alteration and development; special wetlands (biodiversity); and plant communities, interspersion, and microtopography. Wetlands may be classified into three categories of wetland quality using the TVA RAM. Assignment to categories is based on scoring of wetland characteristics based on the six metrics, with a higher total score generally indicating that a wetland warrants assignment to a higher category. Category 1 includes wetlands that are “limited quality waters,” which are wetlands that have been degraded, have limited potential for restoration, or are of such low functionality that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 includes wetlands of moderate quality as well as wetlands that are degraded but have a reasonable potential for restoration. Category 3 typically includes wetlands of very high quality and wetlands of concern regionally and/or statewide, such as wetlands that provide habitat for threatened or endangered species. (Reference 2.4.1-4)

Characteristics of each of the onsite wetlands, including wetland classification, TVA RAM category and score, acreage, and jurisdictional status, are summarized in Table 2.4.1-3. The locations of the onsite wetlands are shown in Figure 2.4.1-2, and each wetland is described below.

Wetland 1 (W001) is a forested wetland associated with a floodplain/terrace of the Clinch River. This wetland covers 0.67 ac of the CRN Site and exhibits wetland hydrology and connectivity. Field indicators of hydric soils are absent, possibly due to extensive site disturbance in the 1970s during site preparation for the Clinch River Breeder Reactor project and subsequent sedimentation. Dominant hydrophytic vegetation includes sweetgum (*Liquidambar styraciflua*), slippery elm (*Ulmus rubra*), tulip poplar, silver maple (*Acer saccharinum*), and Chinese privet (*Ligustrum sinense*). Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Wetland 2 (W002) is a small, emergent wetland in the central part of the CRN Site in close proximity to the former Clinch River Breeder Reactor Site. This wetland covers 0.13 ac on the CRN Site and demonstrates strong hydrology indicators but is not connected to any surface water feature, including waters of the United States or the state. The wetland formed in a small depression in a previously graded area. Field indicators of hydric soils are absent, possibly due to widespread site disturbance in the 1970s during site preparation for the Clinch River Breeder Reactor project. The main wetland vegetation includes squarestem spikerush (*Eleocharis quadrangulata*), narrow-leaf cattail (*Typha latifolia*), and softstem bulrush (*Schoenoplectus tabernaemontana*). Based on its TVA RAM score, this wetland is in Category 1, limited quality. (Reference 2.4.1-4)

Wetland 3 (W003) is a small, forested wetland situated on a small embayment on the shoreline of the Clinch River arm of the Watts Bar Reservoir. This wetland covers 0.18 ac of the CRN Site and exhibits wetland hydrology, hydric soils, and connectivity. The main vegetation includes American sycamore (*Platanus occidentalis*), boxelder (*Acer negundo*), creeping Jenny (*Lysimachia nummularia*), and Chinese privet. Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Wetland 4 (W004) is a small, forested wetland associated with a floodplain/terrace of the Clinch River. This wetland covers 0.24 ac of the CRN Site and exhibits wetland hydrology, hydric soils, and connectivity. The main vegetation includes persimmon (*Diospyros virginiana*), boxelder, silky dogwood, and Japanese honeysuckle (*Lonicera japonica*). Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Wetland 5 (W005) is a small, forested wetland situated on a small embayment on the shoreline of the Clinch River arm of the Watts Bar Reservoir and two small intermittent streams. This wetland covers 0.36 ac on the CRN Site and demonstrates wetland hydrology, hydric soils, and connectivity. The main vegetation includes green ash (*Fraxinus pennsylvanica*), American sycamore, buttonbush (*Cephalanthus occidentalis*), silky dogwood, Nepalese browntop (*Microstegium vimineum*), and Japanese honeysuckle. Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Wetland 6 (W006) is a small (0.11 ac), emergent/scrub-shrub wetland situated in the west-central portion of the CRN Site near the reservoir. This wetland has developed in a wide, shallow drainage ditch along the southern edge of the 500-kV TVA transmission line ROW that crosses the CRN Site. The wetland exhibits wetland hydrology, hydric soils, and connectivity. Water from W006 ultimately flows into W001. Dominant vegetation includes black willow (*Salix nigra*), lateflowering thoroughwort (*Eupatorium serotinum*), and tall fescue (*Festuca arundinacea*). Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Wetland 7 (W007) is a small, fringe scrub-shrub/forested wetland located on the same embayment of the reservoir shoreline as W003. W007 and W003 are separated by River Road and a culvert. W007 covers 0.17 ac of the CRN Site and exhibits wetland hydrology, hydric soils, and connectivity. Dominant vegetation includes slippery elm, American sycamore, Chinese privet, smooth alder (*Alnus serrulata*), silky dogwood, rice cutgrass (*Leersia oryzoides*), and Nepalese browntop. Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Wetland 8 (W008) is a small, forested wetland associated with an unnamed, intermittent tributary to the Clinch River that rises below a sediment basin on the east side of the CRN Site. The hydrology of the wetland has been affected by a culvert and River Road as well as water levels on the Clinch River arm of the Watts Bar Reservoir. The wetland is separated from the river by the road and culvert. The wetland covers 0.23 ac and exhibits wetland hydrology, hydric soils, and connectivity. Dominant vegetation includes sycamore, sweetgum, Chinese privet, spicebush (*Lindera benzoin*), American elm (*Ulmus americana*), silky dogwood, an unidentified aster (*Aster* sp.), jewelweed (*Impatiens* sp.), poison ivy (*Toxicodendron radicans*), and trumpet creeper (*Campsis radicans*). Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Wetland 9 (W009) is a large, diverse, wetland complex associated with an unnamed, perennial tributary to the Clinch River close to the eastern boundary of the CRN Site. The hydrology of the

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

wetland has been affected by a beaver dam at its south end and an active groundwater influence, including numerous seeps and springs, in the north end. The wetland includes a diversity of habitats. A semi-permanently flooded, scrub-shrub community in the south portion grades into a seasonally flooded forest in the south-central area, then into a saturated, forested wetland in the north-central area. At the north end is a saturated emergent and scrub-shrub community in the 500-kV TVA transmission line ROW, which is occasionally mowed. The wetland covers 5.66 ac and exhibits wetland hydrology, hydric soils, and connectivity. Dominant vegetation includes green ash, sycamore, buttonbush (*Cephalanthus occidentalis*), silky dogwood, black willow, an unidentified aster, blunt broom sedge (*Carex tribuloides*), fox sedge (*Carex vulpinoidea*), and Frank's sedge (*Carex frankii*). Based on the TVA RAM score for this wetland, which reflects its size and the diversity of its plant communities and habitat, this wetland is in Category 3, high quality. (Reference 2.4.1-4)

Wetland 10 (W010) is a small wetland complex associated with the same unnamed, perennial tributary to the Clinch River that is associated with W009. W010 is located upstream to the north of W009 and is separated from W009 by River Road and a culvert. The south end of the wetland is a combination of emergent and scrub-shrub habitat in the 500-kV TVA transmission line ROW. The northern portion is forested wetland habitat. The wetland hydrology is influenced by the stream and numerous groundwater seeps. The CRN Site appears to have experienced extensive disturbance in the past before acquisition by the U.S. Department of Energy (DOE) and TVA. The wetland covers 1.79 ac and exhibits wetland hydrology, hydric soils, and connectivity. Dominant vegetation includes loblolly pine (*Pinus taeda*), balm-of-Gilead (*Populus x jackii*), green ash, Nepalese browntop, and poison ivy. Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-4)

Wetland 11 (W011) is a large, forested wetland associated with a floodplain/terrace of the Clinch River near the northwestern site boundary. The wetland is situated between the main access road and the river. The hydrology of the wetland has been altered by a road and culvert at its north end. Wetland 11 covers 5.87 ac on the CRN Site and includes an additional 3.2 ac area that extends north beyond the site boundary into the embayment near Grassy Creek. This wetland demonstrates wetland hydrology, hydric soils, and connectivity. Dominant vegetation includes silver maple, green ash, American elm, creeping Jenny (*Lysimachia nummularia*), roundleaf greenbrier (*Smilax rotundifolia*), trumpet creeper, and Japanese honeysuckle. Based on its TVA RAM score, this wetland is in Category 3, high quality. (Reference 2.4.1-4)

Wetland 12 (W012) is a small, emergent wetland that has developed in a wet-weather drainage in the central portion of the CRN Site in a previously graded area near the former Clinch River Breeder Reactor site. This wetland covers 0.13 ac and demonstrates wetland hydrology and connectivity. Field indicators of hydric soils are absent perhaps due to widespread site disturbance in the 1970s during site preparation for the Clinch River Breeder Reactor project. Dominant wetland vegetation includes black willow, tall fescue, and an unidentified rush (*Juncus* sp.). Based on its TVA RAM score, this wetland is in Category 1, limited quality. (Reference 2.4.1-4)

2.4.1.2.2 Barge/Traffic Area Wetlands

Field surveys of wetlands in the Barge/Traffic Area were completed by TVA in April 2015. Wetland determinations and assessments of wetland quality were performed as described above for the CRN Site. (Reference 2.4.1-5) Characteristics of each of the Barge/Traffic Area wetlands, including wetland classification, TVA RAM category and score, acreage, and jurisdictional status, are summarized in Table 2.4.1-3. The locations of the Barge/Traffic Area wetlands are shown in Figure 2.4.1-2, and each wetland is described below.

Wetland 13 (W013) is a scrub-shrub/emergent wetland associated with a channelized, perennial, unnamed tributary to the Clinch River arm of the Watts Bar Reservoir. The wetland is under a transmission line and is maintained as a scrub-shrub/emergent wetland as the result of vegetation maintenance in the ROW. This wetland covers 3.73 ac and exhibits wetland hydrology and connectivity. Field indicators of hydric soils are lacking, possibly due to extensive site disturbance during the 1970s during site preparation for the Clinch River Breeder Reactor project and subsequent sedimentation. Dominant hydrophytic vegetation in the ROW includes green ash, black willow, broom panicgrass (*Dicanthelium scoparium*), silky dogwood, common rush, swamp rose (*Rosa palustris*), southern blackberry (*Rubus argutus*), red maple, and swamp dock (*Rumex verticillatus*). Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-5)

Wetland 14 (W014) lies southeast of Wetland 13, and the two wetlands are separated by the existing road bed from the barge facility. Wetland 14 is similar in type, landscape position, and vegetation to Wetland 13 and is associated with the same unnamed perennial stream. The wetland covers 3.05 ac. Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-5)

Wetland 15 (W015) is a forested wetland located along the southern shoulder of Bear Creek Road. The wetland covers 1.95 ac and exhibits wetland hydrology, hydric soils, and connectivity. Dominant vegetation includes American sycamore, common rush, Virginia creeper, sweetgum, red maple, green ash, Nepalese browntop, poison ivy, river oats (*Chasmanthium latifolium*), and Chinese privet. Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-5)

Wetland 16 (W016) is a small (0.11-ac), emergent wetland associated with the terminus of an intermittent stream. Dominant vegetation includes jewelweed, aster, bedstraw (*Galium* spp.), and false nettle (*Boehmeria cylindrica*). Based on its TVA RAM score, this wetland is in Category 2, moderate quality. (Reference 2.4.1-5)

Wetland 17 (W017) is a scrub-shrub wetland located on a small embayment on the shoreline of Watts Bar Reservoir. The wetland covers 1.33 ac and exhibits wetland hydrology, hydric soils, and connectivity. Dominant vegetation includes green ash, American sycamore, giant river cane (*Arundinaria gigantea*), and common rush. Based on its TVA RAM score, this wetland is in Category 3, high quality. (Reference 2.4.1-5)

2.4.1.3 Important Terrestrial Habitats

U.S. Nuclear Regulatory Commission (NRC) guidance (NUREG 1555, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan*, and Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Stations*) identifies important habitats as the following:

- Wildlife sanctuaries, refuges, and preserves
- Habitats identified by the USFWS or state Natural Heritage Programs as unique, rare, or a priority for protection
- Critical habitats designated by the USFWS to protect listed species
- Wetlands, floodplains, or other resources protected by federal regulations or executive orders or by state regulations (Floodplains are discussed in Section 2.3, Water)

Important terrestrial habitats include natural areas as well as habitats such as these that have been identified by government agencies as unique, rare, or a priority for protection. Natural areas include managed areas and ecologically significant sites. Managed areas include lands held in public ownership that are managed by an agency 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 the TVA's Natural Areas program. (Reference 2.4.1-6)

A 2011 report by the TVA assessed natural areas on, adjacent to, and within 3 mi of the CRN Site. A review of the TVA Natural Heritage Project Database indicates that a number of natural areas are located immediately adjacent to the CRN Site. (Reference 2.4.1-6) These areas are described below:

- The Grassy Creek HPA adjoins the northern boundary of the CRN Site and is located along and south of Grassy Creek (Figure 2.4.1-1). The Grassy Creek HPA includes 265 ac that provide a buffer for sensitive habitat surrounding and immediately south of Grassy Creek and the Grassy Creek embayment of the Clinch River arm of the Watts Bar Reservoir. (Reference 2.4.1-6) A plant species designated as a state species of special concern, spreading false-foxtglove (*Aureolaria patula*), is among the species with habitat protected by the Grassy Creek HPA and was found in the HPA during field surveys (Reference 2.4.1-1).
- The Oak Ridge Reservation (ORR) adjoins the land boundaries of the CRN Site to the east, north, and west. The DOE manages this 34,000-ac reservation, which is used variously for manufacturing, laboratory research, forest management, and ecosystem process research (Reference 2.4.1-6). An analysis by the Oak Ridge National Laboratory (ORNL) of natural areas, managed areas, and other designated areas within the ORR identified the following categories and numbers of terrestrial or wetland areas:

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

- 47 natural areas
- 18 reference areas
- 5 conservation management areas
- 8 habitat areas
- 8 potential habitat areas
- 8 special management zones (Reference 2.4.1-7)

Figure 2.4.1-3 provides a map of these ORR designated areas within approximately 3 mi of the CRN Site. Five of these designated terrestrial or wetland areas on the ORR are immediately adjacent to the CRN Site or in close proximity:

- The East Tennessee Technology Park Filtration Plant Wetland (Natural Area 33) is a 7-ac wetland adjacent to a water filtration lagoon located near the northwest corner of the CRN Site. This area provides habitat for shining ladies'-tresses (*Spiranthes lucida*), a plant species state listed as threatened.
- The Grassy Creek Power Line Area (Cooperative Management Area 1) is a 51-ac linear area extending northeast along Bear Creek Road adjacent to the northern corner of the Grassy Creek HPA.
- The Grassy Creek Security Site (Reference Area 22) includes 43 ac adjoining the northern tip of the CRN Site and the Grassy Creek HPA. Reference areas contain special habitats or features and also may serve as control areas for research, monitoring, or related activities. This area includes limestone outcrops and some plants uncommon on the ORR.
- The Raccoon Creek Barren (Reference Area 8) includes 62 ac located approximately 1500 feet (ft) east of the eastern corner of the CRN Site and extending upland from the shoreline of the Clinch River arm of the Watts Bar Reservoir. It contains a rare community, a cedar-post oak barren-glade on shallow limestone. It has been proposed by TDEC for protection under the Natural Areas Preservation Act.
- The New Zion Boggy Area (Natural Area 42) includes 376 ac located less than 0.5 mi northeast of the CRN Site at its closest point. It contains oak-hickory uplands and a boggy forested wetland that is a rare natural community. It is called “boggy” because the area includes groundwater seeps and a sinking creek in a headwater area with a sphagnum moss/fern wetland and pools. This uncommon habitat and the presence of red chokeberry (*Aronia arbutifolia*) contribute to the conservation value of this area. (Reference 2.4.1-7) This area is located within a small subwatershed of an unnamed tributary of the Clinch River arm of the Watts Bar Reservoir, immediately east of the CRN Site.
- The Oak Ridge State Wildlife Management Area (WMA) is located primarily on the ORR and adjacent to the CRN Site. The WMA is a 37,000-ac area managed by the Tennessee

Wildlife Resources Agency (TWRA) for hunting of small and large game. (Reference 2.4.1-6)

- The Oak Ridge National Environmental Research Park (NERP) includes approximately 20,000 ac within the boundaries of the ORR and adjoining the CRN Site. The NERP is managed by the ORNL for the DOE. It provides protected land for use in education and research in environmental sciences and is used as an outdoor laboratory for studying present and future environmental consequences from energy-related issues. (Reference 2.4.1-6) The NERP was designated as an international biosphere reserve in 1989; it is one of six units of the Southern Appalachian Biosphere Reserve (Reference 2.4.1-8).

Also within the boundaries of the ORR, five proposed state natural areas (SNA) have been nominated for future designation and protection under the Natural Areas Preservation Act. These five areas are considered ecological core areas and contain several smaller natural areas within their boundaries. One proposed SNA, New Zion, is immediately adjacent to the CRN Site. The other four proposed SNAs are within 3 mi of the CRN Site. (Reference 2.4.1-6) These five proposed SNAs on the ORR are described below.

- The New Zion Unit proposed SNA comprises 2891 ac in the western portion of the ORR and immediately east of the CRN Site. It includes portions of the Haw Ridge uplands, including rock outcrops, and the Raccoon Creek Embayment of the Clinch River arm of the Watts Bar Reservoir as well as wetlands. Several rare and uncommon plant species occur in this area. (Reference 2.4.1-6)
- The Copper Ridge Unit proposed SNA comprises 3908 ac in the southern portion of the ORR and is located 2.3 mi southeast of the CRN Site. Prominent features include Copper Ridge, extensive river bluffs along Melton Hill Reservoir, a variety of forest community types, several caves and sink holes, ravines, springs, seeps, and forested wetlands. (Reference 2.4.1-6)
- The Black Oak Ridge Unit proposed SNA comprises 2929 ac in the western part of the ORR northeast of the CRN Site. This natural area includes two sections, East Black Oak Ridge and West Black Oak Ridge, separated by the Poplar Creek water gap and Blair Road. Prominent features are the East Fork Poplar Creek floodplain, Black Oak Ridge and McKinney Ridge, river bluffs, mixed hardwood-native pine forest, and a large forested wetland. (Reference 2.4.1-6)
- The Pine Ridge-Bear Creek Valley Unit proposed SNA comprises 4584 ac adjacent to the northern boundary of the DOE Reservation northeast of the CRN Site. Topographic features of the area include Pine Ridge and the western portion of East Fork Ridge. Also included are an extensive area of unfragmented forest and a variety of wetland habitat types, including headwater wetlands, seeps, marshes, and forested wetlands and sandstone outcrops. (Reference 2.4.1-6)
- The Walker Branch-Three Bend Unit proposed SNA comprises 6059 ac to the east of the CRN Site in the eastern portion of the ORR. It includes the entire Three Bend Scenic and

Wildlife Area and one of the world's largest populations of a rare wildflower species, tall larkspur. (Reference 2.4.1-6)

Outside the ORR, two officially designated SNAs are located within a 3-mi radius of the CRN Site (Reference 2.4.1-6):

- The Campbell Bend Barrens designated SNA is approximately 1.7 mi northwest of and across the Clinch River from the CRN Site. This 35-ac area managed by TDEC consists of small barrens that are a rare community type in a region where much of the land has been developed or converted to agriculture. The barrens community within the natural area covers approximately 4 to 6 ac. Eastern red cedar, white pine, post oak (*Quercus stellata*), dwarf chinquapin oak (*Q. prinoides*), and other hardwoods are scattered throughout the open grassland community of Campbell Bend, and the dominant grasses include little bluestem (*Andropogon scoparius*), big bluestem (*A. gerardii*), and side-oats gramma (*Bouteloua curtipendula*). (Reference 2.4.1-6)
- The Crowder Cemetery Cedar Barrens designated SNA is approximately 1.8 mi west of and across the Clinch River from the CRN Site. This 15-ac area managed by TDEC has grasslands in a matrix of mixed oak-pine with eastern red cedar and hardwoods that are scattered throughout the barrens. Grasses at Crowder Cemetery include little bluestem and side-oats gramma, and rare plants include slender blazing star (*Liatris gracilis*) and prairie dock (*Silphium terebinthinaceum*). Dwarf chinquapin oak, which is uncommon in Tennessee, also is found there. (Reference 2.4.1-6)

2.4.1.4 Wildlife

Terrestrial animal surveys conducted at the CRN Site and other areas of the Clinch River Property and at the Barge/Traffic Area spanned multiple seasons (i.e., spring, summer, fall, and winter), habitat types (e.g., mature forest, herbaceous, riparian), and detection methods (e.g., visual, aural, ultrasonic, traps). The resulting inventory of species documented on the Clinch River Property and the Barge/Traffic Area is therefore believed to represent the majority of species that would occur on or near the CRN Site. Most of the species observed are considered to be regionally abundant and common. (Reference 2.4.1-9) None of the animals observed during terrestrial animal surveys exhibited indicators, morphological or otherwise, that suggested impacts from exposure to an unusual environmental stress (e.g., pollutants). Domestic animals, such as cows or goats, are not present on the CRN Site or the Barge/Traffic Area. (The potential numbers and distribution of domestic animals in areas surrounding the CRN Site are discussed in conjunction with Section 5.4.)

2.4.1.4.1 Clinch River Property

TVA environmental staff performed field surveys to observe terrestrial animals on the Clinch River Property during spring and summer of 2011 (April, May, and July) and during all four seasons in 2013 (February, April, July, and October). Diurnal surveys were conducted by boat along the Clinch River arm of the Watts Bar Reservoir adjacent to the CRN Site perimeter,

noting any animal heard or seen along the bank. Diurnal surveys of the Clinch River Property also were conducted along multiple linear land transects distributed across the landscape in a manner that maximized sampling of habitat types present across the Clinch River Property. Nocturnal surveys for singing frogs were conducted in close proximity to select water features on the CRN Site. Minnow traps, small mammal traps, and cover boards were set up and monitored to assess the presence of amphibians, small mammals, and herpetofauna, respectively. Bats were collected in mist nets at eight locations in July 2011. Acoustic monitoring equipment was used to detect and collect the calls of bats in July of 2011 and spring, summer, and fall of 2013. (Reference 2.4.1-9)

In addition to the terrestrial wildlife surveys described above, wildlife visual encounter surveys also were conducted quarterly along the Clinch River arm of the Watts Bar Reservoir in March, June, August, and October 2011 by TVA environmental staff. Surveys were centered at Clinch River mile (CRM) 15, downstream of the potential discharge location, and CRM 18.5, upstream of the potential intake location. (Reference 2.4.1-9) Transects approximately 2100 meters (m) in length were centered at each of these locations parallel to the shoreline along each bank. For each observation period, an area along each transect approximately 60 m in width (30 m inshore to 30 m offshore) was surveyed. Observed species were identified to general categories and by common name when possible, and their numbers were estimated. (Reference 2.4.1-10)

Species observed on the Clinch River Property using this combination of survey methods are identified by their common and scientific names in Table 2.4.1-4. Most of these species are regionally abundant. Although some of the observed species prefer specific habitat types, many are generalists and may occur in all habitat types on the CRN Site. Mammals observed on the Clinch River Property include the white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), eastern gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), eastern cottontail (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and short-tailed shrew (*Blarina brevicauda*). In April 2011, roosting bats were observed in Rennies Cave, which is north of the CRN Site within the Grassy Creek HPA. Two individual bats were photographed: one was identified as a tricolored bat (*Perimyotis subflavus*) and the other could not be identified. Sightings of an elk (*Cervus elaphus*) were reported within the Clinch River Property in December 2012. The elk was a radio-collared female that migrated from Royal Blue Wildlife Management Area in Campbell County, Tennessee, where an elk restoration program has been underway for several years. A few years earlier, TWRA staff reported that a male elk was observed on the Clinch River Property. Bobcat sightings also have been reported from the Clinch River Property. (Reference 2.4.1-9)

Breeding birds observed in the wildlife surveys include the American crow (*Corvus brachyrhynchos*), blue jay (*Cyanocitta cristata*), Carolina chickadee (*Poecile carolinensis*), Carolina wren (*Thryothorus ludovicianus*), tufted titmouse (*Baeolophus bicolor*), pileated woodpecker (*Dryocopus pileatus*), red-bellied woodpecker (*Melanerpes carolinus*), hairy woodpecker (*Picoides villosus*), wild turkey (*Meleagris gallopavo*), barred owl (*Strix varia*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), ruby-throated

hummingbird (*Archilochus colubris*), yellow-billed cuckoo (*Coccyzus americanus*), red-eyed vireo (*Vireo olivaceus*), yellow-throated vireo (*Vireo flavifrons*), white-eyed vireo (*Vireo griseus*), scarlet tanager (*Piranga olivacea*), chuck-wills-widow (*Caprimulgus carolinensis*), and whip-poor-will (*Caprimulgus vociferus*). Birds observed along the riparian zone include the belted kingfisher (*Megaceryle alcyon*), great blue heron (*Ardea herodias*), tree swallow (*Tachycineta bicolor*), and osprey (*Pandion haliaetus*). An osprey nest was observed on the CRN Site on a transmission line structure within a corridor that crosses the CRN Site. (Reference 2.4.1-9) Birds observed that typically occur in riverine habitat include the great blue heron, black-crowned night heron (*Nycticorax nycticorax*), belted kingfisher, bald eagle (*Haliaeetus leucocephalus*), osprey, wood duck (*Aix sponsa*), Canada goose (*Branta canadensis*), double-crested cormorant (*Phalacrocorax auritus*), and swallows (Reference 2.4.1-10).

Amphibians observed on the Clinch River Property include the gray treefrog (*Hyla versicolor*), American toad (*Bufo americanus*), green frog (*Rana clamitans*), and eastern narrow-mouthed toad (*Gastrophryne carolinensis*). Reptiles observed were the black rat snake (*Elaphe obsoleta obsoleta*), corn snake (*Elaphe guttata guttata*), and aquatic turtles, including the common snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), river cooter (*Pseudemys concinna*), and Cumberland slider (*Trachemys scripta troostii*). (Reference 2.4.1-9)

2.4.1.4.2 Barge/Traffic Area

TVA environmental staff performed field surveys to observe terrestrial animals on the Barge/Traffic Area during November 2014 and January, April, and June 2015 using methods that were essentially the same as those used on the Clinch River Property but were modified for the smaller area. Wildlife surveys were conducted for approximately one week in each of the four seasons. (Reference 2.4.1-11)

Four linear transects for wildlife surveys were established across the Barge/Traffic Area. Two transects were established within upland mature deciduous forest, one in edge habitat between wetland forest along the reservoir and an upland pine forest fragment, and one through a stand of pine trees adjacent to a transmission line ROW and large wetland. Survey techniques included Sherman traps, cover boards, and visual and aural encounters. A total of 20 Sherman traps and 16 cover boards were deployed along the four transects to survey small mammals and herpetofauna, respectively. Four minnow traps were deployed within the Barge/Traffic Area to inventory frogs and salamanders: two traps in an inlet of the reservoir in a transmission line ROW and two traps in an emergent wetland along Bear Creek Road. Anuran call surveys were conducted adjacent to two aquatic sites on the Barge/Traffic Area. Techniques for baiting and checking traps, visual and aural encounter surveys, anuran surveys, and opportunistic detections were identical to those used for terrestrial animal surveys of the Clinch River Property. Boat surveys along the Clinch River arm of the Watts Bar Reservoir previously were conducted in the vicinity of the CRN Site, including the Barge/Traffic Area, and were not repeated. Species observed on the Barge/Traffic Area using this combination of survey methods are identified by their common and scientific names in Table 2.4.1-4. (Reference 2.4.1-11)

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Visual and aural observations of terrestrial animals on the Barge/Traffic Area were very similar to terrestrial animal observations on the Clinch River Property. Most species observed are generalists and found in multiple habitats across the Barge/Traffic Area, though some are habitat specialists and observed only in specific habitat types. Examples of bird species observed included the American goldfinch (*Spinus tristis*), barred owl, blue jay, Carolina chickadee, Carolina wren, cedar waxwing (*Bombycilla cedrorum*), downy woodpecker (*Picoides pubescens*), eastern phoebe, eastern towhee (*Pipilo erythrophthalmus*), field sparrow (*Spizella pusilla*), golden-crowned kinglet (*Regulus satrapa*), hermit thrush (*Catharus guttatus*), northern cardinal (*Cardinalis cardinalis*), northern flicker (*Colaptes auratus*), pine warbler (*Setophaga pinus*), prairie warbler (*Setophaga discolor*), red-bellied woodpecker, red-eyed vireo, red-tailed hawk (*Buteo jamaicensis*), red-winged blackbird (*Agelaius phoeniceus*), ruby-throated hummingbird, song sparrow (*Melospiza melodia*), tufted titmouse, yellow-rumped warbler (*Setophaga coronata*), and white-eyed vireo. The belted kingfisher, great blue heron, and tree swallow were observed along the riparian corridor. A juvenile bald eagle and several ospreys were observed flying over the area. Common amphibians and reptiles observed were the American toad, southern leopard frog (*Rana utricularia*), pickerel frog (*Rana palustris*), spring peeper (*Pseudacris crucifer*), northern water snake (*Nerodia sipedon*), red-eared slider (*Trachemys scripta elegans*), and box turtle (*Terrapene carolina carolina*). Tadpoles of the upland chorus frog (*Pseudacris triseriata feriarum*) were observed in a wet depression of a mowed area at the northwestern corner of the Barge/Traffic Area. (Reference 2.4.1-11)

Common mammals observed in the Barge/Traffic Area included the American beaver (*Castor canadensis*), white-tailed deer, coyote, eastern gray squirrel, eastern chipmunk, eastern cottontail, raccoon, and Virginia opossum. Surveys specifically designed for detecting bats also were conducted in 2014 and 2015. Acoustic monitors for bats in the Barge/Traffic Area were directed at two locations on a rarely used, forested road corridor (Water Tank Road) located east of the proposed location of the eastern highway access ramp (Figure 2.1-3); across an inlet of the reservoir; and across a large wetland. (Reference 2.4.1-11) Acoustic monitor placement and acoustic analysis for these surveys followed the most current USFWS Indiana bat survey guidelines. Forest-dwelling bats and those that forage and travel in and along forests are likely to be recorded along forest corridors such as Water Tank Road, while the wetland and inlet are likely used by multiple bats for drinking and foraging. It also is likely that individual bats were detected and recorded multiple times due to repeated visits to these aquatic features. Individual bats likely visited these sites multiple times, perhaps making multiple passes in front of the monitor during a single visit, thus resulting in multiple recordings. (Reference 2.4.1-11)

The acoustic monitors detected 10 species across the Barge/Traffic Area. The most prevalent species detected were the tricolored bat, red bat (*Lasiusurus borealis*), evening bat (*Nycticeius humeralis*), gray bat (*Myotis grisescens*), big brown bat (*Eptesicus fuscus*), and silver-haired bat (*Lasionycteris noctivagans*). Other species recorded were the hoary bat (*Lasiusurus cinereus*), little brown bat (*Myotis lucifugus*), and northern long-eared bat (*Myotis septentrionalis*). Recordings that were identified by acoustic software as the Indiana bat (*Myotis sodalis*) suggest this species may be present in the Barge/Traffic Area; however, visual assessment of these

calls determined that identification of the species based on these recordings is not definitive. (Reference 2.4.1-11)

Terrestrial animal surveys on the Barge/Traffic Area observed a total of 117 terrestrial animal species, 13 of which were not observed on the Clinch River Property. These species were observed visually, heard, trapped, noted based on sign (e.g., scat remains), and/or acoustically detected across one or more seasons using multiple detection methods. A combined total of 190 terrestrial animal species were observed across both the Clinch River Property and the Barge/Traffic Area over the course of all terrestrial animal studies from 2011-2015. (Reference 2.4.1-11) Table 2.4.1-4 provides a master list of species for the Clinch River Property and Barge/Traffic Area.

2.4.1.5 Important Terrestrial Species

According to NUREG-1555, important species include species that are federally listed as threatened or endangered, as well as species that are proposed for or candidates for federal listing. Also important are species with a state listing status or other state status due to rarity. In conjunction with agency coordination regarding listed species, TVA sent letters to the USFWS and TDEC in September 2016 requesting their concurrence with the listed species identified as important species for the site. These letters are included in Appendix A. Information provided in the consultation responses from USFWS and TDEC will be incorporated when received, and the responses will be included in Appendix A.

In addition to listed species, commercially or recreationally valuable species could be important, and nuisance species could be important, particularly if they may cause problems for operation of two or more SMRs at the CRN Site. Species also may be important if they are critical to the survival of a rare species or to the local ecosystem, or if they are indicators of potential biological effects; however, such species were not identified for the CRN Site or the Barge/Traffic Area. Thus, the important terrestrial species to be discussed below for the CRN Site and the Barge/Traffic Area include federally and state-listed species, commercially or recreationally valuable species, and nuisance species.

Field surveys of the Clinch River Property to observe and identify important plant species were conducted in 2011 and 2013 as described in Subsection 2.4.1.1.1. Field surveys of the Clinch River Property to observe and identify important animal species were conducted in 2011 and 2013 as described in Subsections 2.4.1.4 and 2.4.1.5.1. Field surveys of the Barge/Traffic Area to identify important plant species were conducted in 2015 as described in Subsection 2.4.1.1.1. Field surveys to identify important animal species in the Barge/Traffic Area were conducted in 2014 and 2015 as described in Subsection 2.4.1.4.2. The design and extent of surveys conducted on the CRN Site, other areas of the Clinch River Property, and the Barge/Traffic Area provide approximate estimates of the numbers of these species that may occur on the CRN Site or in the Barge/Traffic Area.

2.4.1.5.1 Federally Listed Species

Terrestrial and wetland species with federal listing status (currently listed, proposed for listing, or candidates for listing) and recorded occurrences in Roane County, Tennessee are identified in Table 2.4.1-5. Based on a review of the TVA Regional Natural Heritage Database in November 2013, rare species potentially occur in the vicinity (i.e., within 3 to 5 mi) of the CRN Site. (Reference 2.4.1-9) Five federally-listed threatened or endangered species and one proposed threatened species have documented occurrences in Roane County. These include two bats that are listed as endangered, one bat that is listed as threatened, two plants that are listed as threatened, and one plant that has a status of proposed threatened (Reference 2.4.1-12; Reference 2.4.1-13). None of these species have designated critical habitat in the vicinity of the CRN Site.

The two bats in Roane County that are federally listed as endangered are the gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*). The bat listed as threatened is the northern long-eared bat. In 2011, habitats on the Clinch River Property were surveyed in late winter and spring to identify suitable habitat for listed bat species. Based on results of the habitat surveys, mist net surveys for listed bat species were conducted in July 2011 at eight locations throughout the Clinch River Property. In addition, acoustic monitoring using Anabat™ technology also was performed concurrent with mist net sampling at locations in close proximity to the mist net survey locations. Additional acoustic monitoring was performed at six locations on the Clinch River Property in spring, summer, and fall of 2013. (Reference 2.4.1-9) As discussed in Subsection 2.4.1.4.2, acoustic surveys for bats also were conducted in the Barge/Traffic Area in 2014 and 2015. These three bat species and the survey results for each species are discussed below.

The two plant species in Roane County that are federally-listed as threatened are American Hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) and Virginia spiraea (*Spiraea virginiana*). The candidate for listing is the white fringeless orchid (*Platanthera integrilabia*). Field surveys for listed plant species on the CRN Site were performed by TVA in April and July 2011 and September 2013. Habitat suitable for these plants was not found on the Clinch River Property. (Reference 2.4.1-1) Brief descriptions of these species are provided below.

Gray Bat (Myotis grisescens)

The endangered gray bat hibernates in caves in large numbers during winter months and migrates to warmer caves to form summer maternity colonies (composed of adult females and young) or bachelor colonies (composed of adult males). The gray bat is closely associated with rivers, lakes, and other large bodies of water over which it forages for mainly aquatic insects. The gray bat has responded positively to conservation measures, and the majority of its populations are stable or increasing. The gray bat forages over large areas, and it is known to forage along the Clinch River. Gray bats also have been detected foraging along a pond on the ORR approximately 2 mi north of the CRN Site. Summer roosting gray bats have been

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

documented in Marble Bluff Cave, located at Tennessee River Mile 578.3, approximately 9 mi (25 river mi) from the CRN Site. (Reference 2.4.1-9)

The gray bat has been reported to occur in Roane County, and it was recorded on the Clinch River Property by surveys performed by TVA in 2011 and 2013. One gray bat was captured in 2011 at a mist net location in the southwest area of the Clinch River Property, and gray bats were detected acoustically in 2011 at three other Clinch River Property locations. In 2013, gray bats were detected at all six acoustic survey locations on the Clinch River Property and were detected during every monitoring season (spring, summer, and fall), which suggest that winter and summer cave habitat exists for this species nearby. The gray bat is likely to use the area near the reservoir for foraging. (Reference 2.4.1-9) Although studies have shown that gray bats forage primarily over aquatic systems, they also would venture short distances into adjacent terrestrial habitat to forage, or they would cross terrestrial habitats to access streams, rivers, and reservoirs. (Reference 2.4.1-14)

The gray bat has been found to forage on the Clinch River Property, as documented in both mist nest and acoustic surveys. Its foraging activities are likely to occur primarily over the nearby reservoir and other riparian areas on or near the CRN Site. The gray bat may roost on the Clinch River Property; however, this has not been confirmed. All five documented caves on the Clinch River Property are located within the Grassy Creek TVA Habitat Protection Area. It is likely that the presence of the gray bat is seasonal and restricted to summer, when this species is roosting in nearby caves. Gray bats were detected at all acoustic survey locations during 2013 acoustic surveys, which suggest a minimum of six bats potentially simultaneously foraging across the Clinch River Property during the survey. Potential numbers of gray bats on the Clinch River Property during the summer may reflect a proportion of the number of roosting bats in caves in the vicinity, such as Marble Bluff Cave (approximately 9 mi away), with numbers of emerging gray bats ranging from 0 to greater than 200 across past summer surveys. Gray bats may travel as much as 80 kilometers (50 mi) of river or lake shore to forage. This suggests that gray bats foraging on the Clinch River Property may originate from multiple caves. Approximating the number of gray bats that may be present on the CRN Site on a given night during the summer is therefore challenging. (Reference 2.4.1-9) Acoustic surveys of the Barge/Traffic Area identified gray bats foraging in that area as well (Reference 2.4.1-11).

The entire Clinch River Property was investigated for the presence of caves. Two previously documented caves, Rennies Cave and 2-Batteries Cave, are located within the Grassy Creek HPA. Two individual bats were observed roosting in Rennies Cave by archaeological surveyors in April 2011. One of these bats was identified from photos as a tricolored bat and the other bat could not be identified. TVA environmental staff have determined that neither Rennies Cave nor 2-Batteries Cave contains suitable habitat for maternity or hibernaculum use by the gray bat (or the Indiana bat or northern long-eared bat). Three additional caves near Grassy Creek were found by TVA environmental staff during surveys of the HPA. One of these features was a rock shelter, a shallow cave feature unsuitable for these species. The other two features were shallow "pit" caves with no obvious chamber suitable for bat roosting. All caves were located within the Grassy Creek HPA (Reference 2.4.1-9).

Indiana bat (Myotis sodalis)

The endangered Indiana bat hibernates in caves and mines in winter and migrates to summer habitats in wooded areas. The large winter colonies disperse in spring, and reproductive females form smaller maternity colonies in wooded areas. Males and nonreproductive females roost in trees but typically do not roost in colonies. The range of the Indiana bat extends from the northeast through the east-central United States. The Indiana bat typically forages in semi-open forested habitats and forest edges as well as riparian areas. Suitable summer roosting habitat requires dead, dying, or living trees of sufficient size with sufficient exfoliating bark. Multiple roost sites generally are used. Primary summer roosts typically are behind the bark of large, dead trees, particularly those that are in gaps in the forest canopy or along forest edges so that they receive sufficient sun exposure. (Reference 2.4.1-15) Indiana bats have smaller summer home ranges than gray bats and forage within 2.5 mi of roost trees. Numbers of the Indiana bat are stable or decreasing throughout portions of its range due to disease (white-nose syndrome) and loss of habitat. (Reference 2.4.1-9)

The closest record of the Indiana bat to the CRN Site in the summer was a mist net capture of an adult male on the ORR in June 2013 over an inlet of Melton Hill Lake, approximately 10 mi from the CRN Site. The closest record of the Indiana bat to the CRN Site in winter was from a hibernaculum at Norris Dam Cave, approximately 27 mi to the northeast in Campbell County, Tennessee. However, no Indiana bats were observed in this cave during more recent winter surveys conducted in 2002, 2010, and 2011 to 2013. The closest records of summer roosting of the Indiana bat are from 27 to 29 mi to the southeast in the Cherokee National Forest (Monroe County, Tennessee). Cave surveys of the Clinch River Property by TVA environmental staff did not find caves that contain suitable habitat for hibernaculum use by the Indiana bat. (Reference 2.4.1-9)

Although the Indiana bat has not been previously reported to occur in Roane County, it was recorded on the Clinch River Property by acoustic surveys performed in the spring and summer of 2013. To assess the presence of suitable habitat for the Indiana bat on the Clinch River Property, surveys specifically designed to identify habitat suitable for summer roosting by the Indiana bat were conducted in the spring of 2011. Habitat survey results indicated potentially suitable summer roosting habitat within the forested areas in the northern half of the Clinch River Property. TVA environmental staff subsequently conducted mist net and acoustical surveys of the Clinch River Property. Although no Indiana bats were captured or detected on the Clinch River Property in 2011, they were detected acoustically in 2013 at five of six locations. The mist net capture of an Indiana bat in June 2013 on the ORR and the 2013 acoustic detections on the Clinch River Property support the potential presence of the Indiana bat at the Clinch River Property during spring and summer months (April-August). Moderate to high quality roosting habitat for the Indiana bat occurs on the northern half of the Clinch River Property. However, no roost trees have been documented on the Clinch River Property, which makes it difficult to estimate numbers of this species on the Clinch River Property or the CRN Site. Given the rarity of the Indiana bat, numbers would be expected to be low to none in any given year during the warm, non-hibernating season. (Reference 2.4.1-9) Acoustic surveys of the

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Barge/Traffic Area potentially identified Indiana bats foraging in that area as well. However, visual assessment of the acoustic recordings determined that the identification of the Indiana bat based on software analysis of the recordings is not definitive. (Reference 2.4.1-11)

*Northern Long-eared Bat (*Myotis septentrionalis*)*

The northern long-eared bat was listed by the USFWS as threatened in May 2015 (Reference 2.4.1-16). The decision to list the northern long-eared bat as federally threatened was primarily due to the threat posed to the species by white-nose syndrome, a fungal disease that has resulted in substantial mortality to the species, particularly in the northeastern United States. Although declines in populations of this species have been observed in the southeast region, the declines have not been as dramatic as those in the northeast. (Reference 2.4.1-9)

One northern long-eared bat was captured by mist net in the southern half of the Clinch River Property in summer of 2011. This species was detected acoustically at three locations in the northern half of the Clinch River Property in spring and summer of 2013. It also was captured on the ORR (10 mi from the CRN Site) during mist net surveys in 2013. These detections and their locations indicate the presence of the northern long-eared bat in association with forested areas and aquatic features on the Clinch River Property. The northern long-eared bat hibernates in caves during winter and migrates to roost on the landscape during summer. Although studies of their use of habitat during summer are few or ongoing, available data suggest that summer habitat use by the northern long-eared bat is probably similar to that of the Indiana bat. (Reference 2.4.1-9) Cave surveys of the Clinch River Property by TVA environmental staff did not find caves that contain suitable habitat for hibernaculum use by the northern long-eared bat.

Northern long-eared bats have smaller summer home ranges than gray bats and forage within 1.5 mi of roost trees. No occupied roost trees have been documented on Clinch River Property, which makes an estimate of numbers of this species on Clinch River Property difficult. Although southeastern populations have declined, the northern long-eared bat is a relatively common species in this region, and its presence at the Clinch River Property would be expected during the warm, non-hibernating season. Populations of the northern long-eared bat in this region are likely to be larger than those of the Indiana bat. These regional population relationships are likely to be reflected in the numbers of individual bats that occur on the Clinch River Property (i.e., numbers of individuals of the northern long-eared bat are likely greater than those of the Indiana bat). (Reference 2.4.1-9) Acoustic surveys of the Barge/Traffic Area identified northern long-eared bats foraging in that area as well (Reference 2.4.1-11).

*American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*)*

American Hart's-tongue fern, which is federally listed as threatened, has large, glossy, unserrated fronds from 20 centimeters (cm) to 40 cm long. The typical habitat of American Hart's-tongue fern is shaded, moist, deciduous forests where the fern grows from small cracks in limestone boulders and ledges, which provide the high magnesium levels it requires. (Reference 2.4.1-17) This fern usually is found in areas with outcrops of dolomitic limestone,

including gorges and limestone sinkholes in mature hardwood forests. It needs the high humidity and deep shade provided by mature forest canopies or overhanging rock cliffs. Its range extends from Alabama to Canada; however, its distribution within this range is discrete and very limited. Populations usually are small due to its specific habitat requirements.

American Hart's-tongue fern is threatened by logging, which reduces shade and humidity, and also by quarrying, recreation, and residential development. (Reference 2.4.1-18) The report of American Hart's-tongue fern in Roane County is a historical record and the population is thought to be extirpated at the Roane County location where it was previously recorded. The nearest known extant population is found in a sinkhole near South Pittsburg, Tennessee. (Reference 2.4.1-19) American Hart's-tongue fern was not observed in field surveys of the Clinch River Property, and its preferred habitat was not found to be present (Reference 2.4.1-1).

Virginia Spiraea (Spiraea virginiana)

Virginia spiraea, which is federally listed as threatened, is a perennial shrub of the rose family that has dark gray mature stems with creamy white flowers in closely packed bunches. The majority of the current populations of this shrub contain only a small number of clumps. The typical habitat of Virginia spiraea is on the scoured banks of high-gradient streams or on meanders, point bars, natural levees, and braided features of lower-gradient stream segments. The soils in which Virginia spirea is found typically are sandy, silty, or clayey, and it occurs at elevations ranging from 1000 to 2400 ft. The range of Virginia spiraea is the southern Blue Ridge Mountains or Appalachian plateau in Alabama, Tennessee, Kentucky, Ohio, West Virginia, Virginia, North Carolina, and Georgia. A critical requirement for sustaining this plant seems to be removal of woody competition by erosion. Virginia spiraea is threatened by factors such as impoundments, road maintenance, beaver damage, off-road vehicle use, deer browse, non-native plant species, and pollution. (Reference 2.4.1-20) Virginia spiraea was not observed in field surveys of the Clinch River Property, and its preferred habitat was not found to be present (Reference 2.4.1-21; Reference 2.4.1-1).

White Fringeless Orchid (Platanthera integrilabia)

The status of white fringeless orchid (also known as monkey-face orchid) was changed from a candidate for federal listing to proposed for listing as threatened in September 2015 (Federal Register [Vol 80, No 178, 9/15/15]). White fringeless orchid is a perennial herb that blooms from late July to early September. The typical habitat of white fringeless orchid is partially shaded, flat, boggy areas at the heads of streams or seepage slopes. This orchid is usually found in acidic muck or sand in association with sphagnum moss and cinnamon fern, netted chain fern, and New York fern. The white fringeless orchid is uncommon throughout its range in the southeastern and south central United States. It is threatened by habitat modification, mainly alteration of hydrology. (Reference 2.4.1-22) White fringeless orchid was not observed in field surveys of the Clinch River Property, and its preferred habitat was not found to be present (Reference 2.4.1-1; Reference 2.4.1-21).

2.4.1.5.2 State-Listed Species

Forty-eight terrestrial or wetland species with a state listing status or other state protected status have recorded occurrences in Roane County (Table 2.4.1-5). The animal species with state status include four birds, nine mammals, two reptiles, and one amphibian that are state-listed as threatened or endangered or are deemed in need of management. The plant species with state status include 30 species that are state-listed as endangered, threatened, or of special concern; one species of special concern due to commercial exploitation; and one species that is of special concern and possibly extirpated. (Reference 2.4.1-12) Four of these state-listed animals and plants also are federally listed, and one is proposed for federal listing as threatened. In Subsection 2.4.1.5.1, the animals with federal listing status were discussed and found to have the potential to occur on the Clinch River Property, and the plants with federal listing status were eliminated from further evaluation because field surveys did not find them on the Clinch River Property and suitable habitat was not present on the Clinch River Property.

The remaining species that have a state listing status or other protective status were further considered with regard to their potential to occur on the CRN Site given the proximity of their recorded occurrences and their habitat requirements. Table 2.4.1-6 identifies the species with state status and recorded occurrences in Roane County, briefly describes their characteristic habitats, and denotes the subset of species that have recorded occurrences within 6 mi of the CRN Site. Based on a review of the TVA Regional Natural Heritage Database in November 2013 and observation of Indiana bats and bald eagles during wildlife surveys at the CRN Site, occurrences of 27 species with a state listing status or other state protected status have been recorded within 6 mi of the CRN Site. Two of these animal species, the gray bat and Indiana bat, are federally listed and were discussed in Subsection 2.4.1.5.1. One of these plant species is of concern because it is commercially exploited. Of the remaining 24 species with state status and recorded occurrences within 6 mi, seven are animals and 17 are plants.

Four state-status animal species were observed at the CRN Site during wildlife surveys: the gray bat, Indiana bat, sharp-shinned hawk (*Accipiter striatus*), and bald eagle (*Haliaeetus leucocephalus*) (Reference 2.4.1-9). Field surveys of the CRN Site to search for possible rare plant species found that no state-status plant species occur on the CRN Site. Two state-status plant species were observed during field surveys on the Clinch River Property within the Grassy Creek HPA: spreading false foxglove (*Aureolaria patula*) and American ginseng (*Panax quinquefolius*) (Reference 2.4.1-1). Although the Clinch River Property potentially could provide suitable habitat for many of the terrestrial and wetland species with state status included in Table 2.4.1-6, only these four animal species and two plant species were observed during recent or earlier surveys of the Clinch River Property (Reference 2.4.1-1; Reference 2.4.1-9).

In the Barge/Traffic Area, state-status animal species observed include the gray bat (endangered), Indiana bat (endangered), and bald eagle (in need of management) (Reference 2.4.1-11). Two state-status plants have been previously reported to occur (most recently in 2000) in a small portion of the southern part of the Barge/Traffic Area: spreading false foxglove

and shining ladies'-tresses (*Spiranthes lucida*). However, field surveys of the Barge/Traffic Area in 2015 did not find these plants to be present. (Reference 2.4.1-3)

Of the four state-status animal species observed on the Clinch River Property, the two species not discussed as federally listed species in Subsection 2.4.1.5.1 are the sharp-shinned hawk and bald eagle. These two birds and the two plants are briefly discussed below.

Sharp-Shinned Hawk (Accipiter striatus)

The sharp-shinned hawk has a state status of in need of management. This small hawk inhabits forest and open woodland where it preys mainly on small birds. In eastern North America, its breeding habitat extends from eastern Canada south to northern Alabama, with the greatest nesting densities occurring in eastern Canada. Young, dense, mixed or coniferous woodlands are preferred for nesting. (Reference 2.4.1-23) The sharp-shinned hawk has been observed on the ORR during its breeding season. Marginally suitable habitat is available for this species within the upland ridge and valley forest habitat in the northern half of the Clinch River Property. A sharp-shinned hawk was observed at the CRN Site in winter during a 2011 wildlife survey along the Clinch River arm of Watts Bar Reservoir. (Reference 2.4.1-9)

Bald Eagle (Haliaeetus leucocephalus)

Although no longer federally listed, the bald eagle remains federally protected by the Bald and Golden Eagle Protection Act, and it is designated by the State of Tennessee as in need of management. The bald eagle has increased in numbers in east Tennessee in the past decade. It builds large nests in trees near reservoirs and rivers, and numerous nests are present along Watts Bar Reservoir. The bald eagle also may occur in nearby forested habitats. The closest documented nest is approximately 8 mi from the CRN Site on Watts Bar Reservoir. Bald eagles were not observed during any of the field investigations conducted by TVA environmental staff on the CRN Site in 2011 or 2013. However, TVA environmental staff did observe bald eagles in flight in 2013 during their quarterly visual encounter surveys along the Clinch River at the CRN Site. (Reference 2.4.1-9) Also, a juvenile bald eagle was observed flying over the Barge/Traffic Area during wildlife surveys (Reference 2.4.1-11).

Spreading False-Foxglove (Aureolaria patula)

Spreading false-foxglove has a state status of special concern. It is a perennial member of the figwort family that is parasitic on the roots of oaks. It grows on steep, partially shaded, calcareous slopes above rivers and large streams, often within a few feet of the water. It flowers from August through the first frost. (Reference 2.4.1-1)

American Ginseng (Panax quinquefolius)

American ginseng has a state status of special concern – commercially exploited. This herb is commercially exploited for the purported medicinal value of its roots. Collection of ginseng is regulated by the State of Tennessee through the Ginseng Dealer Registration Act of 1983 and

the Ginseng Harvest Season Act of 1985. Ginseng prefers mesic habitats and flowers from May to July, with fruits ripening later in summer. (Reference 2.4.1-1)

2.4.1.5.3 Species of Commercial or Recreational Value

As discussed in Subsection 2.4.1.5.2, American ginseng is a plant species of commercial value that occurs on the Clinch River Property. The populations of American ginseng on the Clinch River Property are within the Grassy Creek HPA and are not available for commercial harvesting (Reference 2.4.1-1).

Terrestrial wildlife species that are hunted recreationally in the vicinity occur on the Clinch River Property and the Barge/Traffic Area, including the white-tailed deer, gray squirrel, eastern cottontail, raccoon, Canada goose, wood duck, and wild turkey. The Oak Ridge State WMA is located primarily on the ORR and is managed by the TWRA for hunting of small and large game. The Clinch River Property is adjacent to the WMA but is not within the area, and hunting is not allowed on the Clinch River Property. The Barge/Traffic Area is within the WMA and hunting is allowed in the area.

2.4.1.5.4 Nuisance Species

Terrestrial nuisance species typically are invasive species that are non-native and likely to cause economic and/or environmental harm. These species also are described as alien, non-indigenous, exotic, or undesirable species. (474 Tennessee Wildlife Resources Agency 2008)

Nuisance animal species observed on the Clinch River Property during wildlife surveys conducted in 2011 and 2013 were the European starling (*Sturnus vulgaris*) and rock pigeon (*Columba livia*). The American beaver (*Castor canadensis*), which is native but also can be a nuisance species if it destroys trees or causes flooding, also was observed on the Clinch River Property. (Reference 2.4.1-9) Nuisance plant species are much more numerous on the Clinch River Property and include trees, shrubs, vines, grasses, and forbs. Much of the Clinch River Property was extensively altered during site preparation for the CRBRP, resulting in the introduction and spread of invasive, non-native plant species on the Clinch River Property. (Reference 2.4.1-1) Executive Order 13112, issued in 1999, defines an invasive species as an alien species (not native to the region or area) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. (Reference 2.4.1-24) Invasive plants are robust and lack the natural predators and diseases that tend to keep native plants in natural balance. Invasive plants can reduce forest productivity, hinder forest use and management activities, and degrade diversity and wildlife habitat. Some invasive plants have been introduced into this country accidentally, but most were brought here as ornamentals or for livestock forage. (Reference 2.4.1-1) Common nuisance species of plants occurring on the Clinch River Property include the following:

- Japanese honeysuckle (*Lonicera japonica*)

- Chinese privet (*Ligustrum sinense*)
- Johnson's grass (*Sorghum halepense*)
- Multiflora rose (*Rosa multiflora*)
- Autumn olive (*Elaeagnus umbellata*)
- Chinese (sericea) lespedeza (*Lespedeza cuneata*)
- Japanese stilt grass (Nepalese browntop) (*Microstegium vimineum*)
- Mimosa (*Albizia julibrissin*) (Reference 2.4.1-1)

Japanese honeysuckle, Chinese privet, Chinese lespedeza, and Japanese stilt grass also were observed on the Barge/Traffic Area (Reference 2.4.1-3). These nuisance species have the potential to spread rapidly and displace native vegetation, and they are considered a severe threat in Tennessee. No federal noxious weeds (plants designated by the United States Department of Agriculture as potentially damaging to agriculture, natural resources, public health, or the environment [7 USC 7701 et seq.]) were observed during field surveys of the Clinch River Property. (Reference 2.4.1-1)

2.4.1.6 Transmission Corridor Habitats and Species

Two transmission line corridors currently traverse the CRN Site: a 161-kV line that crosses the reservoir at the southeastern tip of the peninsula and extends to the northwestern corner of the CRN Site, and a 500-kV line that crosses the reservoir and the western boundary of the CRN Site and extends northeast across the widest part of the CRN Site (Figure 2.2-1). The 500-kV line continues approximately 5 mi northeast to the Bethel Valley substation. The only new transmission line proposed for construction at a location off the CRN Site is a 69-kV underground line to be installed within the existing 500-kV ROW between the CRN Site and the Bethel Valley substation. Within the CRN Site, an approximately 1.2-mi segment of the 161-kV line is to be re-routed from its current alignment. The new 161-kV ROW extends north from the reservoir parallel to the shoreline before turning northwest and connecting to the existing ROW slightly northwest of where it crosses the 500-kV ROW. The new 161-kV ROW overlaps areas to be cleared for facility construction except for approximately 1200 ft at the southern end of the new ROW. Subsection 2.4.1.1 describes the vegetation typical of the herbaceous/grassland community on the CRN Site, which is maintained within the ROWs by control of woody vegetation under the transmission lines. A similar herbaceous community is maintained within the 5-mi segment of the 500-kV ROW in which the installation of a 69-kV underground transmission is planned. The terrestrial habitats within this ROW are not known to include wetlands or occurrences of federally or state-listed species.

Installation of a 69-kV underground transmission line is planned within the approximately 5-mi segment of the existing 500-kV ROW that extends northeast from the CRN Site to the Bethel Valley substation. Installation of the proposed underground transmission line potentially could affect terrestrial plants within the existing ROW. The vegetation within the ROW is actively

maintained by TVA as an herbaceous community, which includes plant species and habitat for animal species such as those described above for the CRN Site and Barge/Traffic Area.

Federally or state-listed plant species are not known to occur in the terrestrial communities within this ROW. Listed animal species, such as bats, potentially could forage in these open corridor habitats within the ROWs.

As discussed in Subsections 2.2.3 and 3.7.3.8, segments of the transmission system outside the CRN Site (other than the segment containing the 69-kV underground line discussed above) would require modifications involving uprating, reconductoring, or rebuilding. However, additional ROWs would not be established, cleared, or developed. The lines that include segments or structures that may need to be modified are overlaid on a map of regional land cover types in Figure 2.2-7. The vegetation communities within the ROWs for these lines are actively maintained by TVA as predominantly herbaceous communities consisting of plant and animal species such as those described above for such communities on the CRN Site and the Barge/Traffic Area. Based on TVA's Natural Heritage database, Table 2.4.1-7 identifies the biological resources that have been identified as potentially occurring on or near the ROWs for these lines. These resources include important terrestrial habitats such as state parks, state forests, and wildlife management areas; wetlands; and federal and state listed terrestrial species (Indiana bat, northern long-eared bat, and plants).

2.4.1.7 References

Reference 2.4.1-1. Cox, Patricia B., Dattilo, Adam J., and Baxter, Jr. J. T., "Clinch River Small Modular Reactor Site - Terrestrial Plant Communities and Botanical Resources Survey Report - Revision 5," Tennessee Valley Authority, October 28, 2015.

Reference 2.4.1-2. U.S. Department of Energy, "Clinch River Breeder Reactor Plant Project Site Redress Plan," March, 1984.

Reference 2.4.1-3. Dattilo, Adam J., "Clinch River Barge/Traffic Area - Terrestrial Plant Communities and Botanical Resources Survey Report," Tennessee Valley Authority, June 18, 2015.

Reference 2.4.1-4. Pilarski-Hall, Kim and Lees, Britta P., "Clinch River Small Modular Reactor Site - Wetland Survey Report - Revision 4," November 19, 2015.

Reference 2.4.1-5. Pilarski-Hall, Kim and Kennon, R. A., "Clinch River Small Modular Reactor Site - Supplemental Wetland Survey Report Barge/Traffic Area - Revision 1," Tennessee Valley Authority, June 17, 2015.

Reference 2.4.1-6. Pilarski-Hall, Kim, "Clinch River Small Modular Reactor Site - Technical Report Natural Areas (Managed Areas & Sites) - Revision 2," Tennessee Valley Authority, November 19, 2015.

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Reference 2.4.1-7. Baranski, Michael J., "Natural Areas Analysis and Evaluation, Oak Ridge Reservation," ORNL/TM-2009/201, Oak Ridge National Laboratory, U.S. Department of Energy, November, 2009.

Reference 2.4.1-8. Oak Ridge National Environmental Research Park, Welcome to the Oak Ridge National Environmental Research Park, Website: <http://www.esd.ornl.gov/facilities/herp/>, January 19, 2011.

Reference 2.4.1-9. LeGrand, Holly, Hamrick, Elizabeth B., and Baxter, Jr. J. T., "Clinch River Small Modular Reactor Site - Terrestrial Animal Survey Report - Revision 7," Tennessee Valley Authority, November 20, 2015.

Reference 2.4.1-10. Tennessee Valley Authority, "Biological Monitoring to Characterize the Aquatic Community near the Site of the Proposed Clinch River Small Modular Reactor 2011," Tennessee Valley Authority Biological and Water Resources, Chattanooga, Tennessee, January, 2013.

Reference 2.4.1-11. Hamrick, Elizabeth B., "Clinch River - Addendum Barge/Traffic Area Terrestrial Animal Survey Report - Revision 1," Tennessee Valley Authority, July 1, 2015.

Reference 2.4.1-12. Tennessee Department of Environment and Conservation, Rare Species by County - Listing for Roane County, TN, Website: http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3:6699189149038::::: 2015.

Reference 2.4.1-13. U.S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Threatened Species Status for *Platanthera integrilabia* (White Fringeless Orchid)," FWS-R4-ES-2015-0129; FR Vol. 80, No. 178, September 15, 2015.

Reference 2.4.1-14. U.S. Fish and Wildlife Service, Gray Bat (*Myotis grisescens*) 5-Year Review: Summary and Evaluation, Website: http://www.fws.gov/ecos/ajax/docs/five_year_review/doc2625.pdf, 2009.

Reference 2.4.1-15. U.S. Fish and Wildlife Service, U.S. Department of the Interior, Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision, Website: <http://www.mcrcc.osmre.gov/MCR/Resources/bats/pdf/IN%20BAT%20DRAFT%20PLAN%20apr07.pdf>, April, 2007.

Reference 2.4.1-16. U.S. Fish and Wildlife Service, FAQs about Listing Northern Long-eared Bat as Threatened, Website: <http://www.fws.gov/midwest/endangered/mammals/nleb/FAQsFinalListNLEB.html>, April 14, 2015.

Reference 2.4.1-17. U.S. Forest Service, U.S. Department of Agriculture, Plant of the Week American Hart's Tongue Fern, Website: http://www.fs.fed.us/wildflowers/plant-of-the-week/asplenium_scolopendrium_americanaum.shtml, October 13, 2010.

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Reference 2.4.1-18. U.S. Fish and Wildlife Service, U.S. Department of the Interior, American Hart's Tongue Fern, Website: <http://www.fws.gov/midwest/endangered/plants/pdf/ahtf-fctsht.pdf>, 1997.

Reference 2.4.1-19. Center for Biological Diversity, "Measuring the Success of the Endangered Species Act: Recovery Trends in the Northeastern United States," February, 2006.

Reference 2.4.1-20. U.S. Fish and Wildlife Service, Virginia Spiraea, Website: http://www.fws.gov/northeast/virginiafield/pdf/endspecies/fact_sheets/va%20spiraea.pdf, August, 1999.

Reference 2.4.1-21. Cox, Patricia B. and Nestor, David, "Botany Fall 2013 Plant Survey," Tennessee Valley Authority, 2013.

Reference 2.4.1-22. U.S. Forest Service, U.S. Department of Agriculture, Plant of the Week White Fringeless Orchid, Website: http://www.fs.fed.us/wildflowers/plant-of-the-week/platanthera_integrilabia.shtml, October 13, 2010.

Reference 2.4.1-23. Natureserve, Sharp-shinned Hawk, Website: <http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Accipiter+striatus>, July, 2013.

Reference 2.4.1-24. U.S. Department of Agriculture, Federal Laws and Regulations Executive Order 13112, Website: <http://www.invasivespeciesinfo.gov/laws/execorder.shtml>, November 26, 2013.

Reference 2.4.1-25. Pilarski-Hall, Kim and Kennon, R. A., "Clinch River Small Modular Reactor Site - Supplemental Wetland Survey Report Barge/Traffic Area - Revision 1," Tennessee Valley Authority,

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-1
Vegetation/Land Cover Types, Percent Coverage, and Acreage on the CRN Site¹

Vegetation/Land Cover Type	Approximate Acreage	Percent Site Coverage
Mixed evergreen-deciduous forest ²	390	42
Deciduous forest ³	292	31
Herbaceous vegetation ⁴	204	22
Evergreen forest	32	3
Roads/developed areas	14	2
Ponds	3	<1
Total	935	100

¹ Table 2.4.1-1 presents a more refined representation of vegetation/land cover types on the CRN Site than the data presented in Section 2.2, Table 2.2-1. Dominant vegetation communities and other land cover types on the CRN Site were drawn in GIS based on aerial photographs and information from TVA field surveys.

² Includes 1.0 ac of wetlands

³ Includes 12.72 ac of wetlands

⁴ Includes 1.82 ac of wetlands

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-2 (Sheet 1 of 6)
Plants Observed on the Clinch River Property (2011 and 2013)
and Barge/Traffic Area (2015)

Common Name	Scientific Name
American beech ¹	<i>Fagus grandifolia</i>
American ginseng	<i>Panax quinquefolius</i>
American holly	<i>Ilex opaca</i>
American sycamore ¹	<i>Platanus occidentalis</i>
Amur honeysuckle	<i>Lonicera maackii</i>
Angularfruit milkvine	<i>Matelea gonocarpos</i>
Appalachian bugbane	<i>Cimicifuga rubifolia</i>
Autumn olive	<i>Elaeagnus umbellata</i>
Axilflower	<i>Mecardonia acuminata</i>
Balm of Gilead	<i>Populus X jackii</i>
Beaked panic grass	<i>Panicum anceps</i>
Beech drops	<i>Epifagus virginiana</i>
Big bluestem	<i>Andropogon gerardii</i>
Bishop's cap	<i>Mitella diphylla</i>
Black oak	<i>Quercus velutina</i>
Black snakeroot	<i>Cimicifuga racemosa</i>
Black walnut	<i>Juglans nigra</i>
Black willow ¹	<i>Salix nigra</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Black gum ¹	<i>Nyssa sylvatica</i>
Bladdernut	<i>Staphylea trifolia</i>
Bloodroot	<i>Sanguinaria canadensis</i>
Blue cohosh	<i>Caulophyllum thalictroides</i>
Blue phlox	<i>Phlox divaricata</i>
Box elder	<i>Acer negundo</i>
Bradford pear	<i>Pyrus calleryana</i>
Broad beech fern	<i>Phegopteris hexagonoptera</i>
Bulbous lip fern	<i>Cystopteris bulbifera</i>
Butterfly weed	<i>Asclepias tuberosa</i>
Buttonbush ¹	<i>Cephalanthus occidentalis</i>
Canada violet	<i>Viola canadensis</i>
Carolina buckthorn	<i>Rhamnus caroliniana</i>
Carolina coralbeads	<i>Cocculus carolinus</i>
Cattail	<i>Typha latifolia</i>
Chestnut oak ¹	<i>Quercus montana</i>

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-2 (Sheet 2 of 6)
Plants Observed on the Clinch River Property (2011 and 2013)
and Barge/Traffic Area (2015)

Common Name	Scientific Name
Chinese (sericea) lespedeza ¹	<i>Lespedeza cuneata</i>
Chinese privet ¹	<i>Ligustrum sinense</i>
Christmas fern ¹	<i>Polystichum acrostichoides</i>
Common adder's tongue fern	<i>Ophioglossum vulgatum</i>
Common rush ²	<i>Juncus effusus</i>
Common threesquare	<i>Schoenoplectus pungens</i>
Creeping jenny	<i>Lysimachia nummularia</i>
Crownbeard	<i>Verbesina alternifolia</i>
Crownbeard	<i>Verbesina occidentalis</i>
Cucumber magnolia	<i>Magnolia acuminata</i>
Dog-tooth violet	<i>Erythronium americanum</i>
Doll's eyes	<i>Actaea pachypoda</i>
Dutchman's breeches	<i>Dicentra cucullaria</i>
Dwarf larkspur	<i>Delphinium tricorne</i>
Eastern red bud	<i>Cercis canadensis</i>
Eastern red cedar	<i>Juniperus virginiana</i>
Ebony spleenwort	<i>Asplenium platyneuron</i>
Fall bentgrass	<i>Agrostis perennans</i>
Field thistle	<i>Cirsium discolor</i>
Flowering dogwood ¹	<i>Cornus florida</i>
Fluxweed	<i>Isanthus brachiatus</i>
Foam flower	<i>Tiarella cordifolia</i>
Frank's sedge	<i>Carex frankii</i>
Fringeleaf wild petunia	<i>Ruellia humilis</i>
Frost weed	<i>Verbesina virginica</i>
Giant chickweed	<i>Stellaria pubera</i>
Giant sedge	<i>Carex gigantea</i>
Glade fern	<i>Diplazium pycnocarpon</i>
Golden eye saxifrage	<i>Saxifraga careyana</i>
Green ash ¹	<i>Fraxinus pennsylvanica</i>
Green violet	<i>Hybanthus concolor</i>
Grooved flax	<i>Linum sulcatum</i>
Groundnut ²	<i>Arios americana</i>
Hairy small-leaf tick trefoil	<i>Desmodium ciliare</i>
Harbinger of spring	<i>Erigenia bulbosa</i>

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-2 (Sheet 3 of 6)
Plants Observed on the Clinch River Property (2011 and 2013)
and Barge/Traffic Area (2015)

Common Name	Scientific Name
Harper's triparted violet	<i>Viola tripartita</i> var. <i>glaberrima</i>
Hoary puccoon	<i>Lithospermum canescens</i>
Hyssopleaf thoroughwort	<i>Eupatorium hyssopifolium</i>
Indian pink	<i>Spigelia marilandica</i>
Jack in the pulpit	<i>Arisaema triphyllum</i>
Jacob's ladder	<i>Polemonium reptans</i>
Japanese honeysuckle ¹	<i>Lonicera japonica</i>
Japanese stiltgrass (Nepalese browntop) ¹	<i>Microstegium vimineum</i>
Jewel weed ¹	<i>Impatiens capensis</i>
Johnson's grass	<i>Sorghum halepense</i>
Kudzu	<i>Pueraria montana</i> var. <i>lobata</i>
Largeleaf waterleaf	<i>Hydrophyllum macrophyllum</i>
Leafy bulrush	<i>Scirpus polyphyllus</i>
Little brown jug	<i>Hexastylis arifolia</i>
Lizard tail ¹	<i>Saururus cernuus</i>
Lobed tickseed ²	<i>Coreopsis auriculata</i>
Loblolly pine	<i>Pinus taeda</i>
Longleaf summer bluet	<i>Houstonia longifolia</i>
Lowbush blueberry ²	<i>Vaccinium angustifolium</i>
Maiden hair fern	<i>Adiantum pedatum</i>
Maple-leaf viburnum	<i>Viburnum acerifolium</i>
Maryland senna	<i>Senna marilandica</i>
Mockernut hickory ¹	<i>Carya tomentosa</i>
Monkey flower	<i>Mimulus alatus</i>
Mountain laurel ²	<i>Kalmia latifolia</i>
Multiflora rose	<i>Rosa multiflora</i>
Muscadine ²	<i>Vitis rotundifolia</i>
Muscle wood	<i>Carpinus caroliniana</i>
Narrowleaf vervain	<i>Verbena simplex</i>
Netted chain fern	<i>Woodwardia areolata</i>
Nettleleaf sage	<i>Salvia urticifolia</i>
Northern red oak	<i>Quercus rubra</i>
Orange coneflower	<i>Rudbeckia fulgida</i>
Oriental bittersweet	<i>Celastrus orbiculatus</i>
Pale spike lobelia	<i>Lobelia spicata</i>

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-2 (Sheet 4 of 6)
Plants Observed on the Clinch River Property (2011 and 2013)
and Barge/Traffic Area (2015)

Common Name	Scientific Name
Pawpaw	<i>Asimina triloba</i>
Persimmon	<i>Diospyros virginiana</i>
Pignut hickory	<i>Carya glabra</i>
Poison hemlock	<i>Conium maculatum</i>
Poison ivy	<i>Toxicodendron radicans</i>
Princess tree	<i>Paulownia tomentosa</i>
Prostrate ground tick trefoil	<i>Desmodium rotundifolium</i>
Rattlesnake plantain	<i>Goodyera pubescens</i>
Red maple ¹	<i>Acer rubrum</i>
Red mulberry	<i>Morus rubra</i>
Red trillium	<i>Trillium erectum</i>
Resurrection fern	<i>Pleopeltis polypodioides</i>
Rose mallow	<i>Hibiscus moscheutos</i>
Rose pink	<i>Sabatia angularis</i>
Roughseed St. John's wort	<i>Hypericum sphaerocarpum</i>
Roundhead lespedeza	<i>Lespedeza capitata</i>
Roundleaf thoroughwort	<i>Eupatorium rotundifolium</i>
Running ground pine	<i>Diphasiastrum digitatum</i>
Rusty blackhaw	<i>Viburnum rufidulum</i>
Sassafras	<i>Sassafras albidum</i>
Scarlet oak ²	<i>Quercus coccinea</i>
Serviceberry	<i>Amelanchier</i> sp.
Shallow sedge ²	<i>Carex lurida</i>
Showy goldenrod ²	<i>Solidago speciosa</i>
Showy orchis	<i>Gaelearis spectabilis</i>
Silky dogwood ¹	<i>Cornus amomum</i>
Silver plume grass	<i>Saccharum alopecuroides</i>
Silver maple	<i>Acer saccharinum</i>
Small's ragwort ²	<i>Packera anonyma</i>
Solomon's plume	<i>Maianthemum canadense</i>
Solomon's seal	<i>Polygonatum biflorum</i>
Sourwood ¹	<i>Oxydendrum arboreum</i>
Southern blackberry ²	<i>Rubus</i> sp.
Spicebush	<i>Lindera benzoin</i>
Spiked-flowered lobelia	<i>Lobelia spicata</i>

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-2 (Sheet 5 of 6)
Plants Observed on the Clinch River Property (2011 and 2013)
and Barge/Traffic Area (2015)

Common Name	Scientific Name
Spotted wintergreen	<i>Chimaphila maculata</i>
Sprangle-top	<i>Tridens flavus</i>
Spreading false foxglove	<i>Aureolaria patula</i>
Squarestem spike rush	<i>Eleocharis quadrangulata</i>
Squarrose sedge ¹	<i>Carex squarrosa</i>
Sugar maple	<i>Acer saccharum</i>
Sugarberry	<i>Celtis laevigata</i>
Swamp milkweed	<i>Asclepias incarnata</i>
Sweetgum ¹	<i>Liquidambar styraciflua</i>
Tag alder	<i>Alnus serrulata</i>
Tall false indigo ¹	<i>Amorpha fruticosa</i>
Tall thoroughwort	<i>Eupatorium altissimum</i>
Trailing lespedeza	<i>Lespedeza procumbens</i>
Tree-of-Heaven	<i>Ailanthus altissima</i>
Trumpet creeper	<i>Campsis radicans</i>
Tulip poplar	<i>Liriodendron tulipifera</i>
Twining snoutbean	<i>Rhynchosia tomentosa</i>
Twinleaf	<i>Jeffersonia diphylla</i>
Umbrella magnolia ¹	<i>Magnolia tripetala</i>
Vasey's trillium	<i>Trillium vaseyi</i>
Virginia dayflower	<i>Commelina virginica</i>
Virginia pine	<i>Pinus virginiana</i>
Walking fern	<i>Asplenium rhizophyllum</i>
Water willow	<i>Decodon verticillatus</i>
White grass	<i>Leersia virginica</i>
White oak ¹	<i>Quercus alba</i>
White pine	<i>Pinus strobus</i>
White-blue-eyed grass	<i>Sisyrinchium albidum</i>
Whorled milkweed	<i>Asclepias verticillata</i>
Wild basil	<i>Satureja vulgaris</i>
Wild black cherry	<i>Prunus serotina</i>
Wild geranium	<i>Geranium maculatum</i>
Wild ginger	<i>Asarum canadensis</i>
Wild yam ²	<i>Dioscorea villosa</i>
Winged elm	<i>Ulmus alata</i>

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-2 (Sheet 6 of 6)
Plants Observed on the Clinch River Property (2011 and 2013)
and Barge/Traffic Area (2015)

Common Name	Scientific Name
Winged sumac ²	<i>Rhus copallinaum</i>
Wood sorrel	<i>Oxalis</i> sp.
Wool grass	<i>Scirpus cyperinus</i>
Wooly mallow	<i>Hibiscus moscheutos</i>
Yellow buckeye	<i>Aesculus flava</i>
Yellow flag	<i>Iris pseudacorus</i>
Yellow giant hyssop	<i>Agastache nepetoides</i>
Yellow trillium	<i>Trillium luteum</i>

Notes:

This is a list of plants observed on the Clinch River Property and Barge/Traffic Area by TVA botanists. It is not a complete list of plant species that occur in these areas. Plant field surveys were conducted in April 2011, July 2011, and September 2013 on the Clinch River Property and in May 2015 on the Barge/Traffic Area.

Area where observed is the Clinch River Property unless otherwise noted:

¹ Both Clinch River Property and Barge/Traffic Area

² Barge/Traffic Area only

Sources: (Reference 2.4.1-3; Reference 2.4.1-1)

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-3 (Sheet 1 of 2)
Wetlands on the CRN Site and Barge/Traffic Area

Wetland ID	Wetland Classification¹	TVARAM² Category (Score)	Wetland Acreage on CRN Site	Jurisdictional Status³
CRN Site				
W001	PFO1E	2 (54)	0.67	jurisdictional wetland
W002	PEM1E	1 (22)	0.13	TDEC jurisdiction
W003	PFO1E	2 (46)	0.18	jurisdictional wetland
W004	PFO1E	2 (49)	0.24	jurisdictional wetland
W005	PFO1E	2 (57)	0.36	jurisdictional wetland
W006	PEM1E/PSS1E	2 (42)	0.11	jurisdictional wetland
W007	PSS1E/PFO1E	2 (57)	0.17	jurisdictional wetland
W008	PFO1E	2 (43)	0.23	jurisdictional wetland
W009	PEM1E/PSS1E/PFO1E	3 (90)	5.66	jurisdictional wetland
W010	PEM1E/PSS1E/PFO1E	2 (46)	1.79	jurisdictional wetland
W011	PFO1E	3 (62)	5.87	jurisdictional wetland
W012	PEM1E	1 (20)	0.13	to be determined ⁴
Total CRN Site			15.54	
Barge/Traffic Area				
W013	PSS1E/PEM1E	2 (41)	3.73	to be determined
W014	PSS1E/PEM1E	2 (41)	3.05	to be determined
W015	PFO1E	2 (55)	1.95	to be determined
W016	PEM1F	2 (53)	0.11	to be determined
W017	PSS1Hh	3 (68)	1.33	to be determined
Total Barge/Traffic Area			10.17	
Total Wetland Acreage of CRN Site and Barge/Traffic Area			25.71	

Notes:

CRN Site:

¹ Classification codes: PEM1E – Palustrine emergent, persistent vegetation, seasonally flooded/saturated; PSS1E – Palustrine scrub-shrub, broad-leaved deciduous vegetation, seasonally flooded/saturated; PFO1E – Palustrine forested, broad-leaved deciduous vegetation, seasonally flooded/saturated.

² TVARAM = TVA Rapid Assessment Method

Category 3 indicates wetlands of high quality

Category 2 indicates wetlands of moderate quality

Category 1 indicates wetlands of limited quality

Score is based on values assigned for six metrics (described in Subsection 2.4.1.2)

³ Jurisdictional status as determined by USACE during CRN Site visit on September 23, 2013, or to be determined in future site visit.

⁴ W012 may be associated with historic grading activities.

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-3 (Sheet 2 of 2)
Wetlands on the CRN Site and Barge/Traffic Area

Notes (continued):

Barge/Traffic Area:

¹ Classification codes as defined in Cowardin et al. 1979: PSS1E - Palustrine scrub-shrub, persistent vegetation, seasonally flooded/saturated; PEM1E - Palustrine emergent, persistent vegetation, seasonally flooded/saturated; PFO1E - Palustrine forested, broad-leaved deciduous vegetation, seasonally flooded/saturated; PEM1F - Palustrine emergent, persistent vegetation, semi-permanently flooded; PSS1Hh - Palustrine scrub-shrub, broad-leaved deciduous vegetation, permanently flooded, diked/impounded.

² TVARAM = TVA Rapid Assessment Method

Category 3 indicates wetlands of high quality

Category 2 indicates wetlands of moderate quality

Category 1 indicates wetlands of limited quality

³ Jurisdictional status to be determined by USACE personnel during future site visit.

Source: (Reference 2.4.1-25; Reference 2.4.1-4)

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-4 (Sheet 1 of 6)
Animals Observed on the Clinch River Property (2011 to 2013)
and Barge/Traffic Area (2014 to 2015)

Common Name	Scientific Name
Mammals	
American beaver	<i>Castor canadensis</i>
big brown bat	<i>Eptesicus fuscus</i>
coyote	<i>Canis latrans</i>
eastern chipmunk	<i>Tamias striatus</i>
eastern cottontail	<i>Sylvilagus floridanus</i>
eastern gray squirrel	<i>Sciurus carolinensis</i>
elk	<i>Cervus elaphus</i>
evening bat	<i>Nycticeius humeralis</i>
gray bat	<i>Myotis grisescens</i>
hispid cotton rat	<i>Sigmodon hispidus</i>
hoary bat	<i>Lasiurus cinereus</i>
Indiana bat	<i>Myotis sodalis</i>
little brown bat	<i>Myotis lucifugus</i>
muskrat	<i>Ondatra zibethicus</i>
deer mouse	<i>Peromyscus maniculatus</i>
northern long-eared bat	<i>Myotis septentrionalis</i>
opossum	<i>Didelphis virginiana</i>
raccoon	<i>Procyon lotor</i>
red bat	<i>Lasiurus borealis</i>
red fox	<i>Vulpes vulpes</i>
short-tailed shrew	<i>Blarina brevicauda</i>
silver-haired bat	<i>Lasionycteris noctivagans</i>
small-footed bat	<i>Myotis leibii</i>
striped skunk	<i>Mephitis mephitis</i>
tricolored bat	<i>Perimyotis subflavus</i>
white-footed mouse	<i>Peromyscus leucopus</i>
white-tailed deer	<i>Odocoileus virginianus</i>
Birds	
Acadian flycatcher	<i>Empidonax virescens</i>
American crow	<i>Corvus brachyrhynchos</i>
American goldfinch	<i>Spinus tristis</i>
American robin	<i>Turdus migratorius</i>
American tree sparrow	<i>Spizella arborea</i>
bald eagle	<i>Haliaeetus leucocephalus</i>
bank swallow	<i>Riparia riparia</i>
barn swallow	<i>Hirundo rustica</i>

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-4 (Sheet 2 of 6)
Animals Observed on the Clinch River Property (2011 to 2013)
and Barge/Traffic Area (2014 to 2015)

Common Name	Scientific Name
Birds (continued)	
barred owl	<i>Strix varia</i>
bay-breasted warbler	<i>Setophaga castanea</i>
belted kingfisher	<i>Megaceryle alcyon</i>
black-crowned night heron	<i>Nycticorax nycticorax</i>
black-and-white warbler	<i>Mniotilla varia</i>
blackpoll warbler	<i>Setophaga striata</i>
black vulture	<i>Coragyps atratus</i>
blue-gray gnatcatcher	<i>Polioptila caerulea</i>
blue jay	<i>Cyanocitta cristata</i>
blue-winged warbler	<i>Vermivora cyanoptera</i>
brown-headed cowbird	<i>Molothrus ater</i>
brown thrasher	<i>Toxostoma rufum</i>
Canada goose	<i>Branta canadensis</i>
Canada warbler	<i>Cardellina canadensis</i>
Carolina chickadee	<i>Poecile carolinensis</i>
Carolina wren	<i>Thryothorus ludovicianus</i>
cedar waxwing	<i>Bombycilla cedrorum</i>
chestnut-sided warbler	<i>Setophaga pensylvanica</i>
chimney swift	<i>Chaetura pelagica</i>
chuck-will's-widow	<i>Antrostomus carolinensis</i>
common grackle	<i>Quiscalus quiscula</i>
common yellowthroat	<i>Geothlypis trichas</i>
Cooper's hawk	<i>Accipiter cooperii</i>
blue-headed vireo	<i>Vireo solitarius</i>
double-crested cormorant	<i>Phalacrocorax auritus</i>
downy woodpecker	<i>Picoides pubescens</i>
eastern bluebird	<i>Sialia sialis</i>
eastern kingbird	<i>Tyrannus tyrannus</i>
eastern meadowlark	<i>Sturnella magna</i>
eastern towhee	<i>Pipilo erythrrophthalmus</i>
eastern phoebe	<i>Sayornis phoebe</i>
European starling	<i>Sturnus vulgaris</i>
field sparrow	<i>Spizella pusilla</i>
golden-crowned kinglet	<i>Regulus satrapa</i>
gray catbird	<i>Dumetella carolinensis</i>
great blue heron	<i>Ardea herodias</i>
hairy woodpecker	<i>Picoides villosus</i>

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-4 (Sheet 3 of 6)
Animals Observed on the Clinch River Property (2011 to 2013)
and Barge/Traffic Area (2014 to 2015)

Common Name	Scientific Name
Birds (continued)	
hermit thrush	<i>Catharus guttatus</i>
hooded warbler	<i>Setophaga citrina</i>
indigo bunting	<i>Passerina cyanea</i>
Kentucky warbler	<i>Geothlypis formosa</i>
killdeer	<i>Charadrius vociferus</i>
palm warbler	<i>Setophaga palmarum</i>
Louisiana waterthrush	<i>Parkesia motacilla</i>
mallard	<i>Anas platyrhynchos</i>
mourning dove	<i>Zenaida macroura</i>
Nashville warbler	<i>Oreothlypis ruficapilla</i>
northern cardinal	<i>Cardinalis cardinalis</i>
northern flicker	<i>Colaptes auratus</i>
northern mockingbird	<i>Mimus polyglottos</i>
northern parula warbler	<i>Setophaga americana</i>
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
osprey	<i>Pandion haliaetus</i>
Philadelphia vireo	<i>Vireo philadelphicus</i>
pileated woodpecker	<i>Dryocopus pileatus</i>
pine warbler	<i>Setophaga pinus</i>
prairie warbler	<i>Setophaga discolor</i>
prothonotary warbler	<i>Protonotaria citrea</i>
purple martin	<i>Progne subis</i>
red-bellied woodpecker	<i>Melanerpes carolinus</i>
red-eyed vireo	<i>Vireo olivaceus</i>
red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
red-shouldered hawk	<i>Buteo lineatus</i>
red-tailed hawk	<i>Buteo jamaicensis</i>
red-winged blackbird	<i>Agelaius phoeniceus</i>
ruby-throated hummingbird	<i>Archilochus colubris</i>
rock pigeon	<i>Columba livia</i>
savannah sparrow	<i>Passerculus sandwichensis</i>
scarlet tanager	<i>Piranga olivacea</i>
sharp-shinned hawk	<i>Accipiter striatus</i>
song sparrow	<i>Melospiza melodia</i>
spotted sandpiper	<i>Actitis macularius</i>
summer tanager	<i>Piranga rubra</i>
Tennessee warbler	<i>Oreothlypis peregrina</i>

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-4 (Sheet 4 of 6)
Animals Observed on the Clinch River Property (2011 to 2013)
and Barge/Traffic Area (2014 to 2015)

Common Name	Scientific Name
Birds (continued)	
tree swallow	<i>Tachycineta bicolor</i>
tufted titmouse	<i>Baeolophus bicolor</i>
turkey vulture	<i>Cathartes aura</i>
whip-poor-will	<i>Caprimulgus vociferous</i>
white-breasted nuthatch	<i>Sitta carolinensis</i>
white-eyed vireo	<i>Vireo griseus</i>
white-throated sparrow	<i>Zonotrichia albicollis</i>
wild turkey	<i>Meleagris gallopavo</i>
wood duck	<i>Aix sponsa</i>
wood thrush	<i>Hylocichla mustelina</i>
worm-eating warbler	<i>Helmitheros vermivorum</i>
yellow-bellied sapsucker	<i>Sphyrapicus varius</i>
yellow-billed cuckoo	<i>Coccyzus americanus</i>
yellow-breasted chat	<i>Icteria virens</i>
yellow-rumped warbler	<i>Setophaga coronata</i>
yellow-shafted flicker	<i>Colaptes auratus</i>
yellow-throated vireo	<i>Vireo flavifrons</i>
yellow-throated warbler	<i>Setophaga dominica</i>
Reptiles & Amphibians	
American bullfrog	<i>Rana catesbeiana</i>
American toad	<i>Bufo americanus</i>
black rat snake	<i>Elaphe obsoleta obsoleta</i>
box turtle	<i>Terrapene carolina carolina</i>
common map turtle	<i>Graptemys geographica</i>
common snapping turtle	<i>Chelydra serpentina</i>
corn snake	<i>Elaphe guttata guttata</i>
Cumberland slider	<i>Trachemys scripta troostii</i>
eastern red-spotted newt	<i>Notophthalmus viridescens</i>
eastern worm snake	<i>Carpophis amoenus amoenus</i>
gray treefrog	<i>Hyla versicolor</i>
green frog	<i>Rana clamitans</i>
narrowmouth toad	<i>Gastrophryne carolinensis</i>
northern water snake	<i>Nerodia sipedon</i>
Ouachita map turtle	<i>Graptemys ouachitensis</i>
painted turtle	<i>Chrysemys picta</i>
pickerel frog	<i>Rana palustris</i>

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-4 (Sheet 5 of 6)
Animals Observed on the Clinch River Property (2011 to 2013)
and Barge/Traffic Area (2014 to 2015)

Common Name	Scientific Name
Reptiles & Amphibians (continued)	
red-eared slider	<i>Trachemys scripta elegans</i>
river cooter	<i>Pseudemys concinna</i>
southern leopard frog	<i>Rana utricularia</i>
spiny softshell turtle	<i>Apalone spinifera</i>
spring peeper	<i>Pseudacris crucifer</i>
upland chorus frog	<i>Pseudacris triseriata feriarum</i>
Invertebrates	
ashy clubtail	<i>Gomphus lividus</i>
black-and-yellow orb-weaving spider	<i>Argiope aurantia</i>
black ants	Formicidae
cave cricket	<i>Ceuthophilus maculatus</i>
cicada	Cicadidae
red admiral butterfly	<i>Vanessa atalanta</i>
clouded sulfur butterfly	<i>Colias philodice</i>
crayfish	Cambaridae
dragonfly nymph	Odonata
duskywing butterfly	<i>Erynnis</i> sp.
eastern pondhawk	<i>Erythemis simplicicollis</i>
eastern tailed blue butterfly	<i>Cupido comyntas</i>
eastern tiger swallowtail	<i>Papilio glaucus</i>
honey bee	<i>Apis mellifera</i>
Horace's duskywing butterfly	<i>Erynnis horatius</i>
juniper hairstreak	<i>Callophrys gryneus</i>
mourning cloak butterfly	<i>Nymphalis antiopa</i>
pearl crescent butterfly	<i>Phyciodes tharos</i>
pipevine swallowtail butterfly	<i>Battus philenor</i>
prawn	<i>Penaeus</i> sp.
red-banded hairstreak	<i>Calycopis cecrops</i>
silver spotted skipper	<i>Epargyreus clarus</i>
spicebush swallowtail	<i>Papilio troilus</i>
tiger swallowtail butterfly	<i>Papilio glaucus</i>
terrestrial snails	Pulmonata
tiger moth	Arctiidae
walking stick	Phasmidae
wasp species	Vespidae
water boatman	<i>Corixa</i> sp.

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-4 (Sheet 6 of 6)
Animals Observed on the Clinch River Property (2011 to 2013)
and Barge/Traffic Area (2014 to 2015)

Common Name	Scientific Name
Invertebrates (continued)	
West Virginia white	<i>Pieris virginiensis</i>
white-marked tussock moth	<i>Orgyia leucostigma</i>
widow skimmer	<i>Libellula luctuosa</i>
wild indigo duskywing	<i>Erynnis baptisiae</i>
black and yellow centipede	<i>Apheloria virginensis</i>
zebra swallowtail butterfly	<i>Eurytides marcellus</i>
Fish	
green sunfish	<i>Lepomis cyanellus</i>
red-breasted sunfish	<i>Lepomis auritus</i>
warmouth	<i>Lepomis gulosus</i>

Source: (Reference 2.4.1-9)

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-5 (Sheet 1 of 3)
Terrestrial and Wetland Species with Federal or State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name	Common Name	Federal Status	State Status
Birds			
<i>Accipiter striatus</i>	sharp-shinned hawk	—	NMGT
<i>Aimophila aestivalis</i>	Bachman's sparrow	—	E
<i>Haliaeetus leucocephalus</i>	bald eagle	—	NMGT
<i>Limnothlypis swainsonii</i>	Swainson's warbler	—	NMGT
Mammals			
<i>Myotis grisescens</i> ¹	gray bat	E	E
<i>Myotis septentrionalis</i> ²	northern long-eared bat	T	—
<i>Myotis sodalis</i> ³	Indiana bat	E	E
<i>Napaeozapus insignis</i>	woodland jumping mouse	—	NMGT
<i>Sorex cinereus</i>	cinereus shrew	—	NMGT
<i>Sorex dispar</i>	long-tailed shrew	—	NMGT
<i>Sorex fumeus</i>	smoky shrew	—	NMGT
<i>Sorex longirostris</i>	southeastern shrew	—	NMGT
<i>Synaptomys cooperi</i>	southern bog lemming	—	NMGT
<i>Zapus hudsonius</i>	meadow jumping mouse	—	NMGT
Reptiles			
<i>Ophisaurus attenuatus longicaudus</i>	eastern slender glass lizard	—	NMGT
<i>Pituophis melanoleucus melanoleucus</i>	northern pinesnake	—	T
Amphibians			
<i>Hemidactylum scutatum</i>	four-toed salamander	—	NMGT
Vascular Plants			
<i>Agalinis auriculata</i>	earleaved false-foxtglove	—	E
<i>Asplenium scolopendrium</i> var. <i>americanum</i>	Hart's-tongue fern	T	E
<i>Aureolaria patula</i> ⁴	spreading false-foxtglove	—	S
<i>Bolboschoenus fluvialis</i>	river bulrush	—	S
<i>Delphinium exaltatum</i>	tall larkspur	—	E
<i>Diervilla lonicera</i>	northern bush-honeysuckle	—	T
<i>Diervilla sessilifolia</i> var. <i>rivularis</i>	mountain bush-honeysuckle	—	T
<i>Draba ramosissima</i>	branching Whitlow-grass	—	S
<i>Erysimum capitatum</i>	western wallflower	—	E
<i>Eurybia schreberi</i>	Schreber's aster	—	S
<i>Helianthus occidentalis</i>	naked-stem sunflower	—	S
<i>Juglans cinerea</i>	butternut	—	T

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-5 (Sheet 2 of 3)
Terrestrial and Wetland Species with Federal or State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name	Common Name	Federal Status	State Status
Vascular Plants (continued)			
<i>Juncus brachycephalus</i>	small-headed rush	—	S
<i>Leucothoe racemosa</i>	fetter-bush	—	T
<i>Liatris cylindracea</i>	slender blazing-star	—	T
<i>Liparis loeselii</i>	fen orchis	—	T
<i>Lonicera dioica</i>	mountain honeysuckle	—	S
<i>Marshallia grandiflora</i>	large-flowered Barbara's-buttons	—	E
<i>Panax quinquefolius</i>	American ginseng	—	S-CE
<i>Pedicularis lanceolata</i>	swamp lousewort	—	S
<i>Platanthera flava</i> var. <i>herbiola</i>	tuberclped rein-orchid	—	T
<i>Platanthera integrilabia</i>	white fringeless orchid	PT	E
<i>Pseudognaphalium helleri</i>	Heller's catfoot	—	S
<i>Ribes missouriense</i>	Missouri gooseberry	—	S
<i>Solidago ptarmicoides</i>	prairie goldenrod	—	E
<i>Spiraea virginiana</i>	Virginia spiraea	T	E
<i>Spiranthes lucida</i>	shining ladies'-tresses	—	T
<i>Symphyotrichum pratense</i>	barrens silky aster	—	E
<i>Thuja occidentalis</i>	northern white cedar	—	S
<i>Viola tripartita</i> var. <i>tripartita</i>	three-parted violet	—	S
Non-Vascular Plants			
<i>Myurella julacea</i>	a moss	—	S-P
<i>Preissia quadrata</i>	a liverwort	—	T

¹ The gray bat was recorded on the Site by acoustic surveys performed in spring and summer of 2013.(Reference 2.4.1-9)

² The northern long-eared bat (*Myotis septentrionalis*) was officially listed as threatened in May 2015. It was recorded on the CRN Site in 2011 by mist net surveys and in 2011 and 2013 by acoustic surveys; Records of this species in Roane County were unknown prior to these surveys. (Reference 2.4.1-9)

³ Although no records of the Indiana bat (*Myotis sodalis*) are known from Roane County, it was recorded on the Site by acoustic surveys performed in spring and summer of 2013. (Reference 2.4.1-9)

⁴ Spreading false-foxglove was found growing on the Grassy Creek HPA during field visits in April and July 2011. (Reference 2.4.1-1)

Notes:

Federal status definitions:

E = Endangered

T = Threatened

C = Candidate for listing

PE = Proposed for listing as endangered

PT = Proposed for listing as threatened

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-5 (Sheet 3 of 3)
Terrestrial and Wetland Species with Federal or State Status and Recorded
Occurrences in Roane County, Tennessee

Notes (continued):

State status definitions:

E = Endangered

T = Threatened

NMGT = In need of management (nongame wildlife)

S = Special concern (plants)

S-CE = Special concern (plants) – commercially exploited

S-P = Special concern (plants) – possibly extirpated

Source of species status and occurrences: (Reference 2.4.1-12) (Federal Register [Vol 80, No 178, 9/15/15])

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-6 (Sheet 1 of 3)

Habitats of Terrestrial and Wetland Species with State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name ¹	Common Name	State Status	Habitat
Animals			
<i>Accipiter striatus</i>	sharp-shinned hawk	NMGT	Forests and open woodlands
<i>Aimophila aestivalis</i>	Bachman's sparrow	E	Dry open pine or oak woods; nests on the ground in dense cover
<i>Haliaeetus leucocephalus</i>	bald eagle ²	NMGT	Areas close to large bodies of water; roosts in sheltered sites in winter; communal roost sites common
<i>Limnothlypis swainsonii</i>	Swainson's warbler	NMGT	Mature, rich, damp, deciduous floodplain and swamp forests
<i>Myotis grisescens</i>	gray bat	E	Cave obligate year-round; frequents forested areas; migratory
<i>Myotis sodalis</i>	Indiana bat ²	E	Hibernates in caves; spring/summer maternity roosts are normally under the bark of standing trees
<i>Napaeozapus insignis</i>	woodland jumping mouse	NMGT	Deciduous and coniferous forests with herbaceous groundcover; middle and east Tennessee
<i>Sorex cinereus</i>	cinereus shrew	NMGT	Rich woodlands of many types; open fields; middle and east Tennessee
<i>Sorex dispar</i>	long-tailed shrew	NMGT	Mountainous, forested areas with loose talus; east Tennessee
<i>Sorex fumeus</i>	smoky shrew	NMGT	Damp wooded areas including coniferous or mixed forests; middle and east Tennessee
<i>Sorex longirostris</i>	southeastern shrew	NMGT	Various habitats including wet meadows, damp woods, and uplands; statewide
<i>Synaptomys cooperi</i>	southern bog lemming	NMGT	Marshy meadows, wet balds, rich upland forests
<i>Zapus hudsonius</i>	meadow jumping mouse	NMGT	Open grassy fields; often abundant in thick vegetation near water bodies; statewide
<i>Ophisaurus attenuatus longicaudus</i>	eastern slender glass lizard	NMGT	Dry upland areas including brushy, cut-over woodlands and grassy fields; fossorial; nearly statewide but obscure
<i>Pituophis melanoleucus melanoleucus</i>	northern pinesnake	T	Well-drained sandy soils in pine/pine-oak woods; dry mountain ridges; E portions of west TN, E to lower elevations of the Appalachians
<i>Hemidactylum scutatum</i>	four-toed salamander	NMGT	Woodland swamps, shallow depressions, sphagnum mats on acidic soils; middle and east Tennessee

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-6 (Sheet 2 of 3)

Habitats of Terrestrial and Wetland Species with State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name ¹	Common Name	State Status	Habitat
Plants			
<i>Agalinis auriculata</i>	earleaved false-foxfoglove	E	Barrens
<i>Asplenium scolopendrium</i> var. <i>americanum</i>	Hart's-tongue fern	E	Sinks
<i>Aureolaria patula</i>	spreading false-foxfoglove	S	Oak woods and edges
<i>Bolboschoenus fluviatilis</i>	river bulrush	S	Marshes
<i>Delphinium exaltatum</i>	tall larkspur	E	Glades and barrens
<i>Diervilla lonicera</i>	northern bush-honeysuckle	T	Rocky woodlands and bluffs
<i>Diervilla sessilifolia</i> var. <i>rivularis</i>	mountain bush-honeysuckle	T	Dry cliffs and bluffs
<i>Draba ramosissima</i>	branching Whitlow-grass	S	Calcareous bluffs
<i>Erysimum capitatum</i>	western wallflower	E	Rocky bluffs
<i>Eurybia schreberi</i>	Schreber's aster	S	Mesic woods and seepage slopes
<i>Helianthus occidentalis</i>	naked-stem sunflower	S	Limestone glades and barrens
<i>Juglans cinerea</i>	butternut	T	Rich woods and hollows
<i>Juncus brachycephalus</i>	small-headed rush	S	Seeps and wet bluffs
<i>Leucothoe racemosa</i>	fetter-bush	T	Acidic wetlands and swamps
<i>Liatris cylindracea</i>	slender blazing-star	T	Barrens
<i>Liparis loeselii</i>	fen orchis	T	Calcareous seeps
<i>Lonicera dioica</i>	mountain honeysuckle	S	Mountain woods and thickets
<i>Marshallia grandiflora</i>	large-flowered Barbara's-buttons	E	Rocky river bars
<i>Myurella julacea</i>	a moss	S-P	Shale bluffs

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-6 (Sheet 3 of 3)

Habitats of Terrestrial and Wetland Species with State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name ¹	Common Name	State Status	Habitat
Plants (continued)			
<i>Panax quinquefolius</i>	American ginseng	S-CE	Rich woods
<i>Pedicularis lanceolata</i>	swamp lousewort	S	Wet acidic barrens and seeps
<i>Platanthera flava var. herbiola</i>	tuberclped rein-orhcid	T	Swamps and floodplains
<i>Platanthera integrilabia</i>	white fringeless orchid	E	Acidic seeps and stream heads
<i>Preissia quadrata</i>	a liverwort	T	Seepy limestone cliffs and bluffs
<i>Pseudognaphalium helleri</i>	Heller's catfoot	S	Dry sandy woods
<i>Ribes missouriense</i>	Missouri gooseberry	S	Rocky woods
<i>Solidago ptarmicoides</i>	prairie goldenrod	E	Barrens
<i>Spiraea virginiana</i>	Virginia spiraea	E	Stream bars and ledges
<i>Spiranthes lucida</i>	shining ladies'-tresses	T	Alluvial woods and moist slopes
<i>Symphyotrichum pratense</i>	barrens silky aster	E	Barrens
<i>Thuja occidentalis</i>	northern white cedar	S	Calcareous rocky seeps, cliffs

¹ Scientific names in bold indicate that the species has a recorded occurrence within 6 mi of the Site.

² The bald eagle and Indiana bat were observed during wildlife surveys at the Clinch River Property but were not previously recorded as occurring in Roane County according to the TDEC county list.

Notes:

State status definitions:

E = Endangered

T = Threatened

NMGT = In need of management (nongame wildlife)

S = Special concern (plants)

S-CE = Special concern (plants) – commercially exploited

S-P = Special concern (plants) – possibly extirpated

Source: (Reference 2.4.1-12)

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-7 (Sheet 1 of 4)
Biological Resources in ROWs of Transmission System Line Segments to be Modified

Line Modification	Line Number/Name	Resource Type	Resource Description ¹
Rebuild	L5092 Volunteer-N Knoxville No 1	Wetland	Wetlands (potential, and field verified)
Reconductor	L5125 Norris HP-Lafollette-Pineville (Incl Sweet Gum Flats)	Terrestrial	Indiana bat and northern long-eared bat
		Botany	State listed species in vicinity
		Wetland	Wetlands (potential)
		Aquatic	Sensitive aquatic species in the vicinity
		Natural	Cumberland Trail State Park, north
		Natural	North Cumberland State WMA
		Natural	Chimney Rock, unique geologic feature
		Natural	Corrigan Wildlife Management Area, KY
		Natural	Kentucky Ridge Forest WMA
Upate	L5167 Winchester-Smith Mountain SW STA (Incl Pelham, Coalmont)	Botany	Federal and state listed species in vicinity
		Wetland	Wetlands (potential, ponds)
		Aquatic	Sensitive aquatic species in the vicinity
		Natural	Collins River
Upate	L5173 Watts Bar HP-Great Falls HP (Incl Pikeville)	Terrestrial	Indiana bat and northern long-eared bat
		Botany	Special circumstance
		Botany	Federal and state listed species in vicinity
		Wetland	Wetlands (potential)
		Aquatic	Sensitive aquatic species in the vicinity
		Natural	Piney River Tree Farm
		Natural	Slabside pearlymussel designated critical habitat
		Natural	Bledsoe State Forest
Upate	L5173 Watts Bar HP-Great Falls HP (Incl Pikeville) (continued)	Natural	Fall Creek Falls State Park
		Natural	Great Falls Reservoir reservation
		Natural	Center Hill Lake - USACE
		Natural	Center Hill Reservoir reservation
		Natural	Rock Island State Park

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

Table 2.4.1-7 (Sheet 2 of 4)
Biological Resources in ROWs of Transmission System Line Segments to be Modified

Line Modification	Line Number/ Name	Resource Type	Resource Description ¹
Uprate	L5186 John Sevier FP - Cherokee HP No 1	Terrestrial	Indiana bat and northern long-eared bat
		Botany	State listed species in vicinity
		Wetland	Wetlands (potential, field verified 2013, ponds)
		Aquatic	Sensitive aquatic species in the ROW and vicinity
		Natural	Cherokee Reservoir Reservation
		Natural	Grainger County Park
		Natural	Fluted kidneyshell designated critical habitat
		Natural	Lower French Broad and Lower Holston nonessential experimental population status
		Natural	National Rivers Inventory - Holston River
Reconductor	L5204 Monterey - Peavine SW STA 161 KV (Incl Campbell Junction, Fredonia, Crossville, W Crossville)	Terrestrial	Indiana bat and northern long-eared bat
		Botany	Federal and state listed species in vicinity
		Wetland	Wetlands (potential, ponds)
		Aquatic	Sensitive aquatic species in the vicinity
Uprate	L5205 Rockwood - Peavine SW STA (Incl Crossville)	Terrestrial	Indiana bat and northern long-eared bat
		Botany	Federal and state listed species in the ROW and vicinity
		Wetland	Wetlands (potential, ponds)
Uprate	L5205 Rockwood - Peavine SW STA (Incl Crossville) (continued)	Natural	Cumberland Trail
		Natural	Cumberland Trail State Park
Reconductor	L5235 Elza - Spallation Neutron Source	Terrestrial	Indiana bat and northern long-eared bat
		Botany	State listed species in the ROW and vicinity
		Wetland	Wetlands (potential)
		Natural	Oak Ridge National Laboratory and ORR
Reconductor	L5280 Oak Ridge National Laboratory - Spallation Neutron Source 161 KV	Terrestrial	Indiana bat and northern long-eared bat
		Botany	State listed species in the ROW and vicinity
		Wetland	Wetland (jurisdictional - field delineation)
		Wetland	Wetlands (potential)
		Natural	Oak Ridge National Laboratory and ORR

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-7 (Sheet 3 of 4)
Biological Resources in ROWs of Transmission System Line Segments to be Modified

Line Modification	Line Number/ Name	Resource Type	Resource Description ¹
Uprate	L5624 John Sevier FP-White Pine No 2 (Incl Greenville)	Botany	State listed species in vicinity
		Wetland	Wetlands (potential, pond)
		Wetland	Wetlands (field verified 2013)
		Aquatic	Sensitive aquatic species in the ROW and vicinity
		Natural	Cherokee Reservoir Reservation
Reconductor	L5659 Bull Run FP- N Knoxville No 1	Terrestrial	Indiana bat and northern long-eared bat
		Botany	State listed species in vicinity
		Wetland	Wetlands (potential, pond)
		Natural	Brushy Valley Park
		Natural	Upper Bull Run Bluffs TVA Habitat Protection Area
Reconductor	L5697 Oglethorpe - Concord (Incl Cloud Springs)	Botany	State listed species in vicinity
		Wetland	Wetlands (potential)
		Aquatic	Sensitive aquatic species in the vicinity
Reconductor	L5702 FRANKLIN- WINCHESTER	Terrestrial	Indiana bat and northern long-eared bat
		Botany	State listed species in vicinity
		Wetland	Wetlands (potential)
		Natural	AEDC and Woods State Wildlife Management Area
		Natural	AEDC Military Reservation
		Natural	AEDC Wildlife Management Area and Woods Reservoir
		Natural	Arnold Engineering Development Center (AEDC)
		Natural	AEDC Double Powerline Barrens
Reconductor	L5743 Kingston FP-Rockwood- Roane No 1 (Incl Harriman, K33)	Terrestrial	Indiana bat and northern long-eared bat
		Terrestrial	Heronry
		Botany	Federal and state listed species in vicinity
		Wetland	Wetlands (potential, ponds)
		Aquatic	Sensitive aquatic species in the vicinity
		Natural	Oak Ridge National Laboratory and ORR
		Natural	Watts Bar Reservoir Reservation

Clinch River Nuclear Site
 Early Site Permit Application
 Part 3, Environmental Report

Table 2.4.1-7 (Sheet 4 of 4)
Biological Resources in ROWs of Transmission System Line Segments to be Modified

Line Modification	Line Number/Name	Resource Type	Resource Description ¹
Upate/ Reconductor	L5882 Elza-Huntsville (Incl Braytown, Windrock)	Terrestrial	Indiana bat and northern long-eared bat
		Botany	Federal and state listed species in vicinity
		Wetland	Wetlands (potential, pond)
		Natural	Big South Fork National River and Recreation Area, National Park Service
		Natural	North Cumberland State WMA
		Natural	East Fork Ridge State Protection Planning Site
		Natural	Oak Ridge National Laboratory and ORR
Upate	L5940 White Pine-Dumplin Valley	Terrestrial	Indiana bat and northern long-eared bat
		Wetland	Wetlands (potential, pond)
Upate/ Reconductor	L5957 Douglas HP - White Pine (Incl Newport)	Terrestrial	Bald eagle
		Wetland	Wetlands (pond/potential wetland, lake)
		Natural	Rankin Bottoms State WMA & Wildlife Observation Area

¹ Summary of resources identified as occurring in one or more of the affected segments of each line based on data from the TVA Natural Heritage database. Line segments affected and the lengths and acreage of the lines are included in Table 3.7-1.

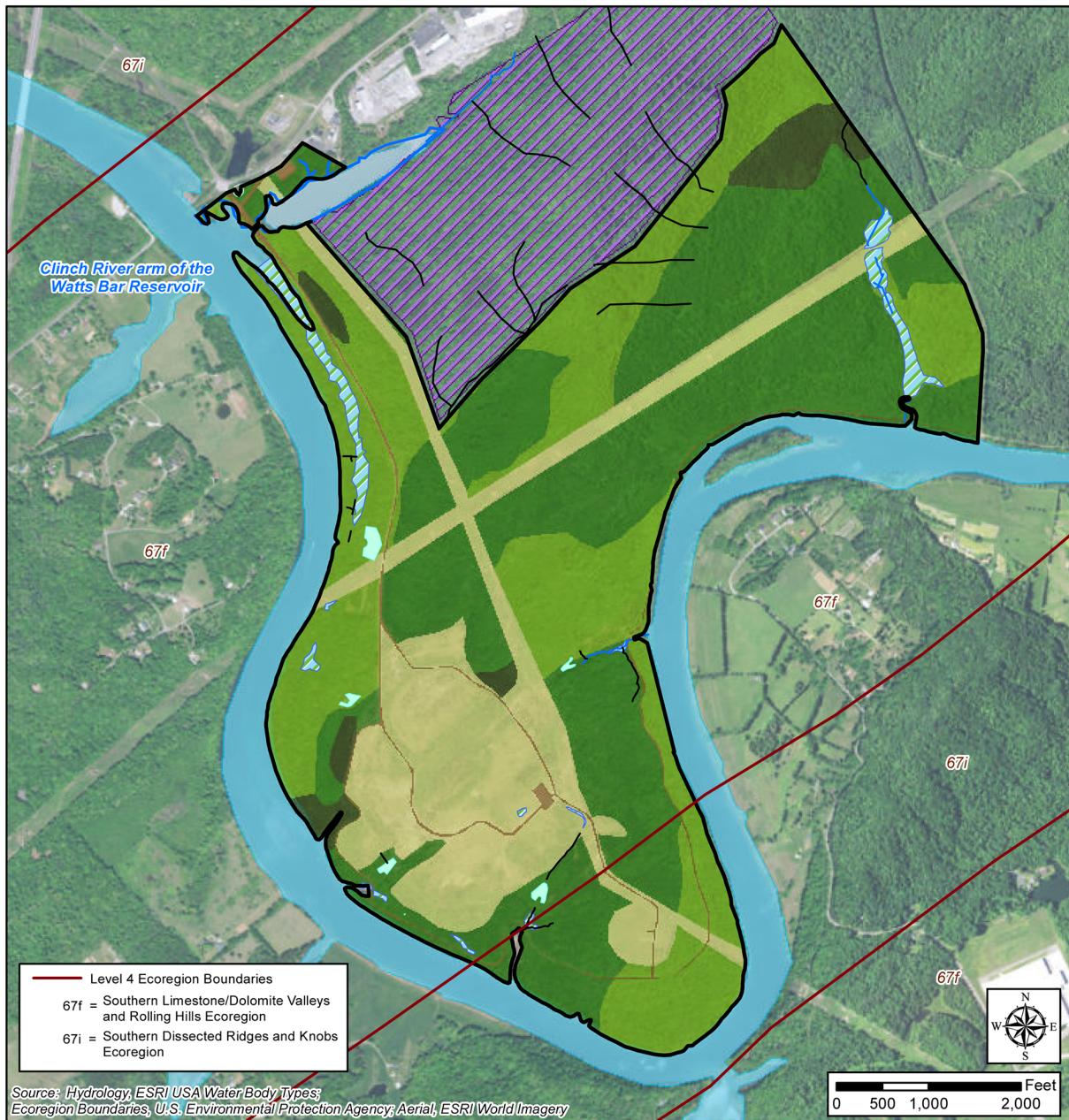
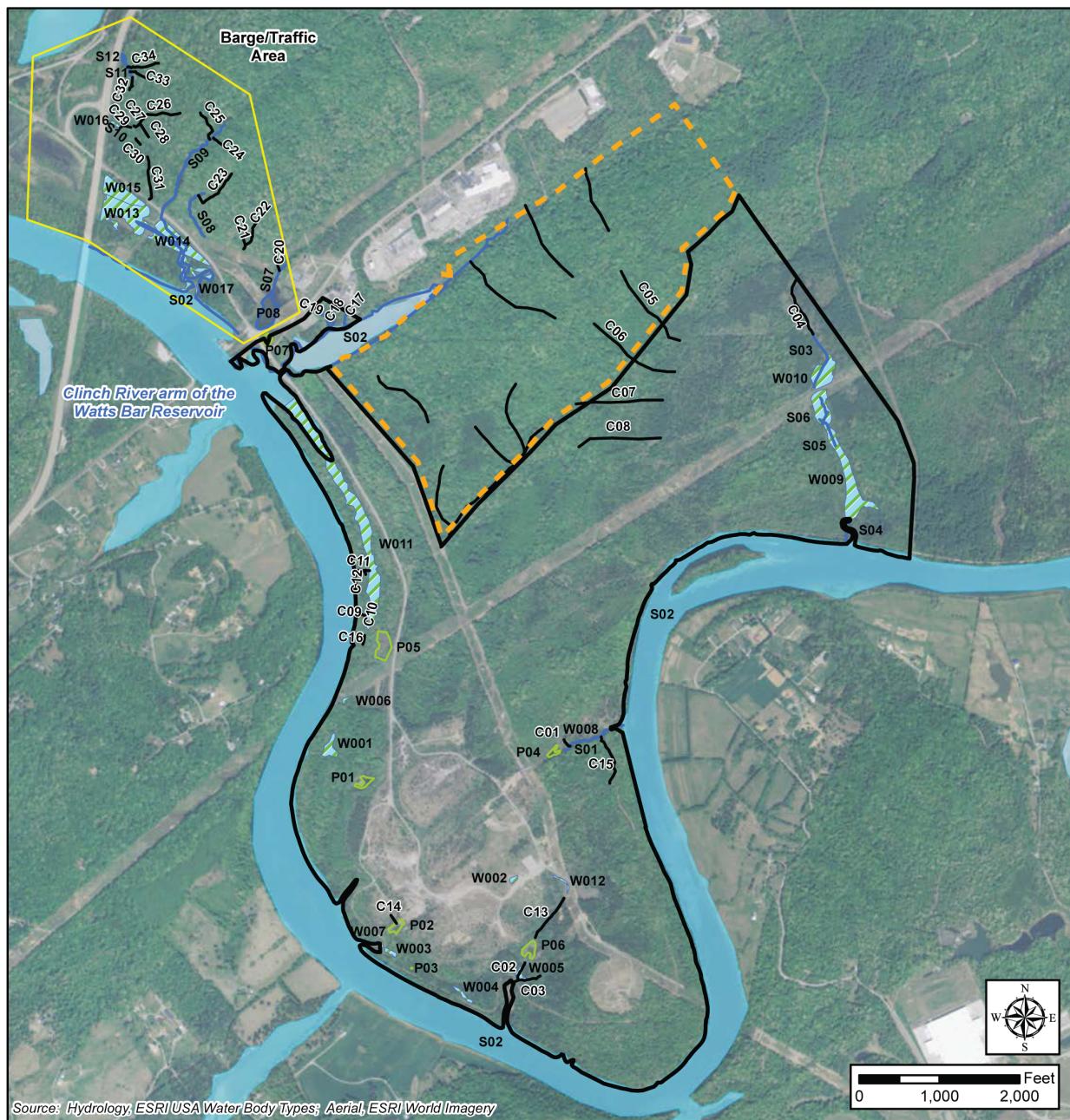


Figure 2.4.1-1. Land Cover Types on the CRN Site

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report



Legend

 CRN Site	 Ponds (P)	 Grassy Creek Habitat Protection Area
— Perennial and Intermittent Streams (S)	 Wetlands (W)	 Rivers and Lakes
— Ephemeral Streams/Wet-Weather Conveyances (C)	 Barge/Traffic Area	

Figure 2.4.1-2. Streams, Ponds, and Wetlands on the CRN Site and Barge/Traffic Area

Clinch River Nuclear Site
Early Site Permit Application
Part 3, Environmental Report

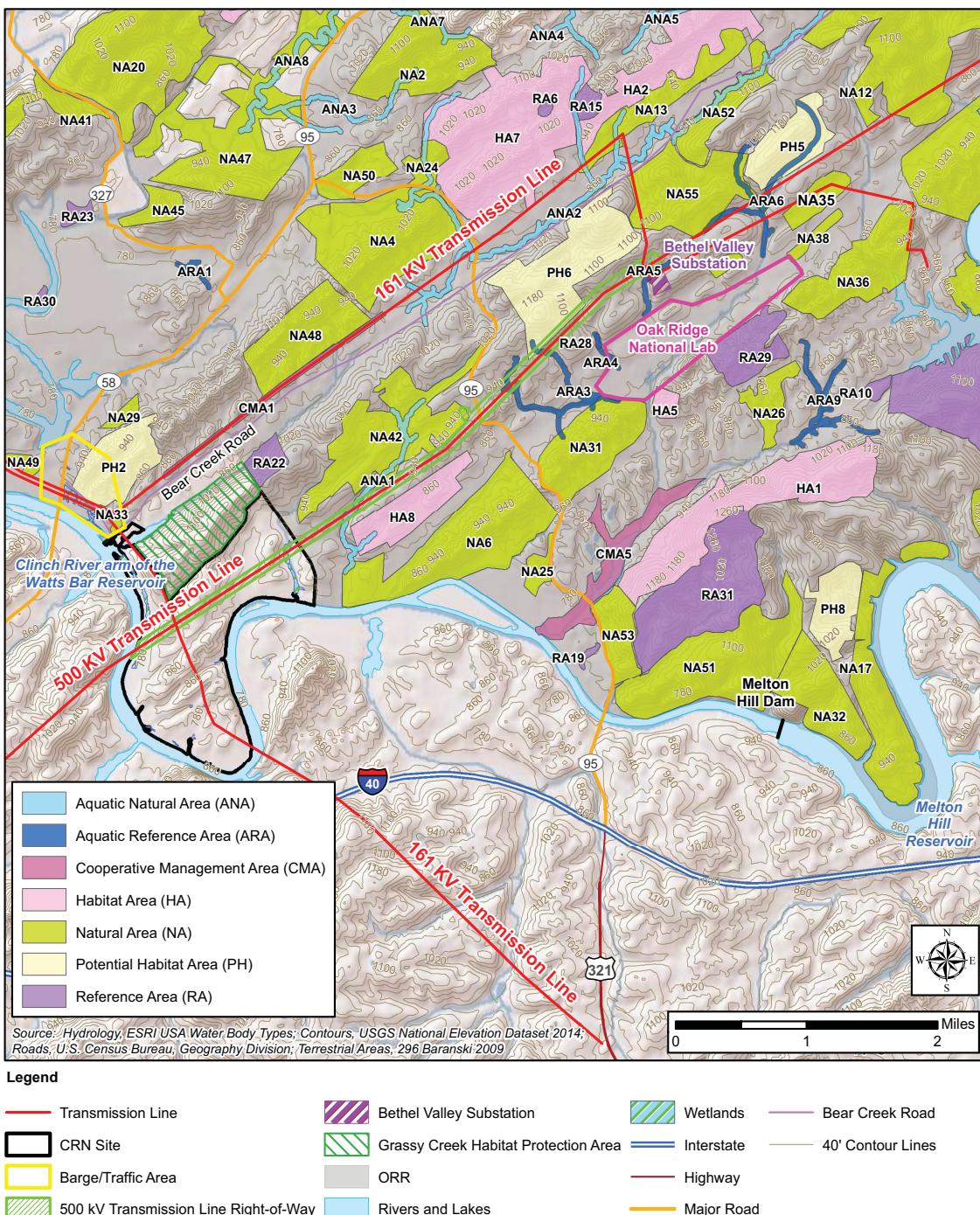


Figure 2.4.1-3. ORR Designated Areas in the Vicinity of the CRN Site