THE TENNESSEE VALLEY AUTHORITY

Clinch River Small Modular Reactor Site

Terrestrial Animal Survey Report

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This study has been prepared as a supporting document for the Clinch River Nuclear (CRN) Site Early Site Permit Application and is being distributed for project use. The study provides a summary of documented terrestrial habitats and common and protected terrestrial animals present on the 1200-acre Clinch River Property in Roane County, TN.

INTRODUCTION

The Tennessee Valley Authority (TVA) is investigating the feasibility of constructing modular nuclear reactors at the Clinch River Nuclear (CRN) Site, in Roane County, Tennessee. The Site is approximately 5 miles east of the town of Kingston, TN, and approximately four river miles downstream of Melton Hill Dam.

To support this investigation, TVA Biological Permitting and Compliance (BCC) staff examined terrestrial animal resources on the Clinch River Property (which encompasses the CRN Site) during spring and summer 2011, and during all four seasons in 2013, as well as the additional Barge/Traffic Area during all four seasons between 2014 and 2015. TVA staff performed a desktop analysis to identify rare species potentially occurring within the study areas. In 2011, habitats on the Clinch River Property were examined in the late winter and spring with an emphasis on identifying suitable habitat for listed species. Based on habitat surveys, mist net surveys for listed bat species were conducted on Clinch River Property in the summer.

In 2013, in an effort to meet guidelines provided by the Nuclear Regulatory Commission (NRC) for 4 quarters of data, and recognizing the potential benefit of collecting data across four seasons, BCC developed and carried out surveys that utilized several sampling methods to inventory terrestrial zoology resources on the Clinch River Property. Diurnal surveys were conducted by boat along the Clinch River adjacent to the Clinch River Property perimeter, noting any animal heard or seen along the river bank. Diurnal surveys 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 Clinch River Property. Minnow traps, Sherman traps, and cover boards, were set up and monitored to assess amphibian, small mammal, and herpetofauna presence on the Clinch River Property, respectively. Finally, acoustic monitoring equipment was used to detect/collect calls of bats present (spring, summer and fall only). These surveys were repeated in 2014-2015 on the Barge/Traffic Area when this additional footprint was identified for potential use as a barge unloading area and to make improvements to the highway exit ramp (See Addendum - Barge/Traffic Area Terrestrial Animal Survey Report for description of Habitat and Wildlife Surveys performed on this additional footprint).

FIELD OBSERVATIONS

HABITAT

The landscape within which the Clinch River Property occurs is heterogeneous and composed primarily of undulating valleys and rounded ridges, with many caves and springs. Land cover includes forest, pasture, intensive agriculture, and areas of commercial, industrial, and residential development. Habitat across the Clinch River Property is a combination of deciduous forest, evergreen forest, mixed evergreen-deciduous forest, and herbaceous vegetation. The northern half (i.e., property above the transmission line right-of-way corridor that runs east to west) of the Clinch River Property is dominated by a large ridge composed of

deciduous forest. This ridge is located within TVA's Grassy Creek Habitat Protection Area (HPA), which is not within the CRN Site. The southern half of the Clinch River Property, which fully overlaps with the CRN Site, is comprised primarily of herbaceous vegetation and was subject to previous human disturbance. Young wetland forest occurs along the Clinch River, which borders the property on the east, west, and south. Utility corridors cross various portions of the Clinch River Property. See Cox et al. 2015 for further detailed description of habitat present on the Clinch River Property.

WILDLIFE SURVEYS

Visual and aural observations of terrestrial animals on the Clinch River Property were conducted in April, May and July, 2011, and resulted in a catalog comprised of regionally abundant species. While some are found in specific habitat types, many are generalists, found in multiple habitats across the Clinch River Property. Examples of breeding bird species observed included American crow, blue jay, Carolina chickadee, Carolina wren, tufted titmouse, pileated woodpecker, red-bellied woodpecker, hairy woodpecker, wild turkey, barred owl, red-shouldered hawk, Cooper's hawk, ruby-throated hummingbird, yellow-billed cuckoo, red-eyed vireo, yellow-throated vireo, white-eyed vireo, scarlet tanager, chuck-wills-widow, and whip-poor-will. Belted kingfisher, great blue heron, tree swallow and osprey were observed along the riparian corridor. An osprey nest was observed on a transmission line structure along right-of-way corridor that crosses the Clinch River Property. Common amphibians and reptiles likely to occur in these habitats included Cope's gray tree frog, Fowler's toad, American toad, green frog, and eastern narrow-mouthed toad, and eastern box turtle.

Exposed rock features reflect that underground karst features are present in some areas, which may provide habitat for small mammals, green salamanders, and roosting bats. Two previously documented caves (Gage 2011), Rennies Cave and 2-Batteries Cave, are located within Grassy Creek HPA. Three additional caves/karst openings near Grassy Creek were encountered by botanical staff during surveys of the HPA.

Common mammals on Clinch River Property included white-tailed deer, coyote, red fox, gray squirrel, eastern chipmunk, eastern cottontail, raccoon, Virginia opossum, and short-tailed shrew. Roosting bats were observed in Rennies Cave by archaeological surveyors in April, 2011. Photos of 2 individual bats were taken by surveyors and later reviewed by terrestrial zoology staff. One bat was identified as a tricolored bat (*Perimyotis subflavus*); the other bat individual could not be identified based on the photo. Surveys specifically designed for detecting bats also were conducted in 2011. See sections elsewhere in this report entitled FEDERAL AND STATE-LISTED SPECIES, HABITAT SURVEYS FOR LISTED BATS (2011), and MIST NET AND ACOUSTIC SURVEYS FOR LISTED BATS (2011) for further discussion on surveys for bats.

Quarterly (October, August, March, June) visual encounter surveys of wildlife also were conducted in 2011 by TVA Biological and Water Resources staff (TVA 2013) along the Clinch River. Survey points were centered at Clinch River Miles 15.5 and 22, which are 2100 meters

downstream of the proposed discharge location and 2100 meters upstream of the proposed intake location, respectively, at the CRN Site. Birds observed included wading birds (great blue heron, black-crowned night heron), species that nest in the river bank (swallows, kingfishers), raptors that nest and forage in close proximity to rivers (bald eagle, osprey), and diving/dabbling species (wood duck, Canada goose, double-crested cormorant). All these species are typical of riverine habitat. Forest birds (pileated woodpecker, American crow, Carolina wren) were observed in forest habitat adjacent to the River. Turtles basking and foraging in the River also were noted.

Sightings of an elk were reported within the project area the weekend of December 1, 2012, by TVA Energy Delivery staff working on-site over the weekend. The elk was a radio-collared female who migrated from Royal Blue Wildlife Management Area in Campbell County, TN, where an elk restoration program has been underway for several years. Tennessee Wildlife Resources Agency staff also reported presence of a male elk which was observed in the project area a few years ago. There also have been reports of bobcat observations on the Clinch River Property (Jack Brellenthin, personal correspondence, 2013).

WILDLIFE SURVEY METHODOLOGY AND RESULTS (2013)

A more concerted effort to catalog terrestrial animals present on the Clinch River Property was conducted in 2013 during 1 week in each of the 4 seasons (February 25 - March 1, April 22-26, July 15-19, and October 7-11). This was conducted to align with environmental standards as recommended by the NRC. A total of 166 species of animals were visually observed, heard, trapped, noted based on sign (e.g., scat remains), and/or acoustically detected across one or more seasons using multiple detection methods (Table 1, Figure 1). This included documentation of 10 species of anuran (frog or toad), 11 species of bat, 87 species of bird, 3 species of fish (inadvertent captures in minnow traps), 33 species of invertebrate, 12 mammal species (other than bats), 1 salamander species, 2 species of snake, and 7 species of turtle. These detections resulted in a master species list for the Clinch River Property (Table 2).

Seven linear transects were established across the Clinch River Property for use during 2011 surveys (Figure 1). Two transects were sited within the TVA Grassy Creek HPA to sample wildlife within mature upland deciduous forest. These two transects were the only two that were not also within the CRN Site. The remaining five transects were cited in the following habitat types: wetland forest adjacent to the Clinch River (1 transect), edge habitat (forest edge adjacent to herbaceous/young woody vegetation) that parallels a transmission line right-of-way (1 transect), previously cleared, glade-like habitat with exposed rocky soil, few scattered cedars and herbaceous cover (2 transects, center of CNR Site), and a multi-habitat site comprised of forest edge adjacent to a grassy opening, herbaceous vegetation within a transmission line right-of-way, and old roadbed with partial forest cover adjacent to a pond (1 transect). These transects were used to conduct multiple survey types across all four seasons. These included surveys using Sherman traps, cover boards, and visual and aural encounters. These survey types are further described below.

Sherman traps (N=7) were deployed to survey small mammals and were placed along each linear transect. The first trap was placed 100 m from the beginning of each transect, with each

trap approximately 35 m from adjacent traps. Traps were opened on day 1, and checked the following three consecutive mornings. Traps were baited with peanut butter granola bars (Mills et al. 1995) and stuffed with several cotton balls to provide a means of bedding for small mammals. Any animals captured were identified, measured, weighed, photographed and then released. Traps whose contents had been consumed or relocated (i.e., "vandalized" by a raccoon) were restocked and repositioned as necessary. Sherman traps were surveyed during every season.

Cover boards were used to survey for amphibians and reptiles. Cover boards were wooden one-foot square open-face boxes such that the rim of the box was approximately three inches high. Six cover boards were deployed face-down and spaced apart along each of the seven linear transects, totaling 42 cover boards across the Clinch River Property. Once cover boards were placed in the field in February, they were left in place for the duration of the 2013 survey. Cover boards were checked by lifting an edge of the cover board and looking underneath for the presence of animals. After checking underneath, cover boards were returned to the face-down position. Cover boards were checked for three consecutive days during each of the four seasonal surveys. Any animals observed were identified and recorded and then left in place.

Visual and aural encounter surveys were conducted by walking each transect from beginning to end at a pace that facilitated observations of animal movement, animal sign (e.g., scat, woodpecker holes, herbivory, skeletal remains), and animal calls (e.g., squirrel chatter, territorial defense by birds) or songs (e.g., by breeding birds, crickets, frogs, toads). These were noted throughout the 4-day survey effort (1 day of opening traps along each transect, followed by 3 days of walking each transect to check traps and record observations.

Minnow trap surveys were conducted during each of the four seasonal surveys. These surveys were to inventory frog and salamander presence. Traps were deployed in pairs (i.e., 2 traps per water body) across 6 sites, including Grassy Creek, three ponds, a stream adjacent to a culvert, and a flooded wetland forest site. Minnow traps were partially submerged to prevent any mortality to either fully aquatic species (e.g., fish, newts) or partially aquatic species (e.g., adult frogs). Fluorescent light sticks (Grayson and Roe 2007) were placed in each trap to serve as a non-lethal lure and were replaced each day due to the sticks lasting for less than 24 hours once activated. Any animals captured were removed from the traps, assessed for identification purposes (i.e. measured, examined for field characteristics, photographed) and then released into the water.

Anuran call surveys were conducted in accordance with the North American Amphibian Monitoring program (North American Amphibian Monitoring Program 2012). Surveys were conducted once during each season at each of five aquatic sites located on the Clinch River Property. Surveys began 30 minutes after sunset and constituted listening quietly for five minutes, recording the species of any frog or toad heard calling, and categorizing the level of call (i.e., single individual, several individuals that can be distinguished, chorus).

Boat surveys were conducted each season in the Clinch River adjacent to the Clinch River Property. One person slowly drove a boat as close as possible to the shoreline adjacent to the

Clinch River Property while a biologist recorded any aural or visual detections of wildlife. Surveys began at the northwestern most point and continued to the southeastern most point.

Opportunistic detections were those aural or visual observations made of animals while present on the Clinch River Site that were not associated with any of the survey methods described above (e.g., while walking away from the vehicle or driving along the road). Any observations were recorded and included in the catalog of species reflected in Table 2.

Table 1. Type and timing of wildlife surveys conducted in 2013 on the TVA-Managed Clinch River Property and/or Clinch River Nuclear (CRN) Site, Roane County, TN

Survey Type	Survey Location	Survey Description, Sample Size	Survey Dates[1]				Targeted Animal Groups
			W	S	Su	F	
Visual and aural surveys by boat	Shoreline of Clinch River adjacent to CRN Site	N = 1 survey/season; Boat driven at slow pace, noting aural and visual detections	X	X	X	X	Overwintering and nesting birds, turtle, mammals
Visual and Aural Encounter Surveys (VES) by Foot	Linear transects (N = 7) 500 m) distributed across CRN Site and Clinch River Property	N = 4 surveys/season/transect, walked beginning to end on 4 consecutive days per season, noting aural and visual detections	X	X	X	X	Any species observed, but focused on birds and mammals
Sherman Traps	Placed along same transects used for VES	N = 7 traps/transect/season spaced ~100m from transect endpoints, ~35 m from each other, opened and then checked for3 consecutive days,	X	X	X	X	Small mammals
Cover boards	Placed along same transects used for visual encounter surveys	N = 6 boards/transect/season spaced 100 m apart from transect endpoints and ~50m from each other, checked for 3 consecutive days	X	X	X	X	Amphibians and reptiles
Minnow Traps	Aquatic water bodies (streams and ponds, N = 6)) across CNR Site and	N = 12 traps (2 traps per site)/season, partially submerged; traps set and then checked for 3 consecutive days,	X	X	X	X	Anurans (frogs, toads, salamanders)

	Clinch River Property						
Anuran Call Surveys	Aquatic water bodies across CRN Site and Clinch River Property	N=5 surveys (1/site)/season, post-sunset following a rain event	X	X	X	X	Frogs and toads
Bat Acoustic Surveys	Water crossings and forested corridors	6 acoustic detectors, deployed on day 1 of survey and set collect data for 4 consecutive nights		X	X	X	Bats
Opportunistic Sitings	Wherever present on CNR Site and Clinch River Property	Aural, visual, and sign (e.g., scat) indicating animal presence	X	X	X	X	Any wildlife observed were noted

[1] W = Winter (February - early March); S = Spring (April - May); Su = Summer(July - August); F = Fall (September – November)

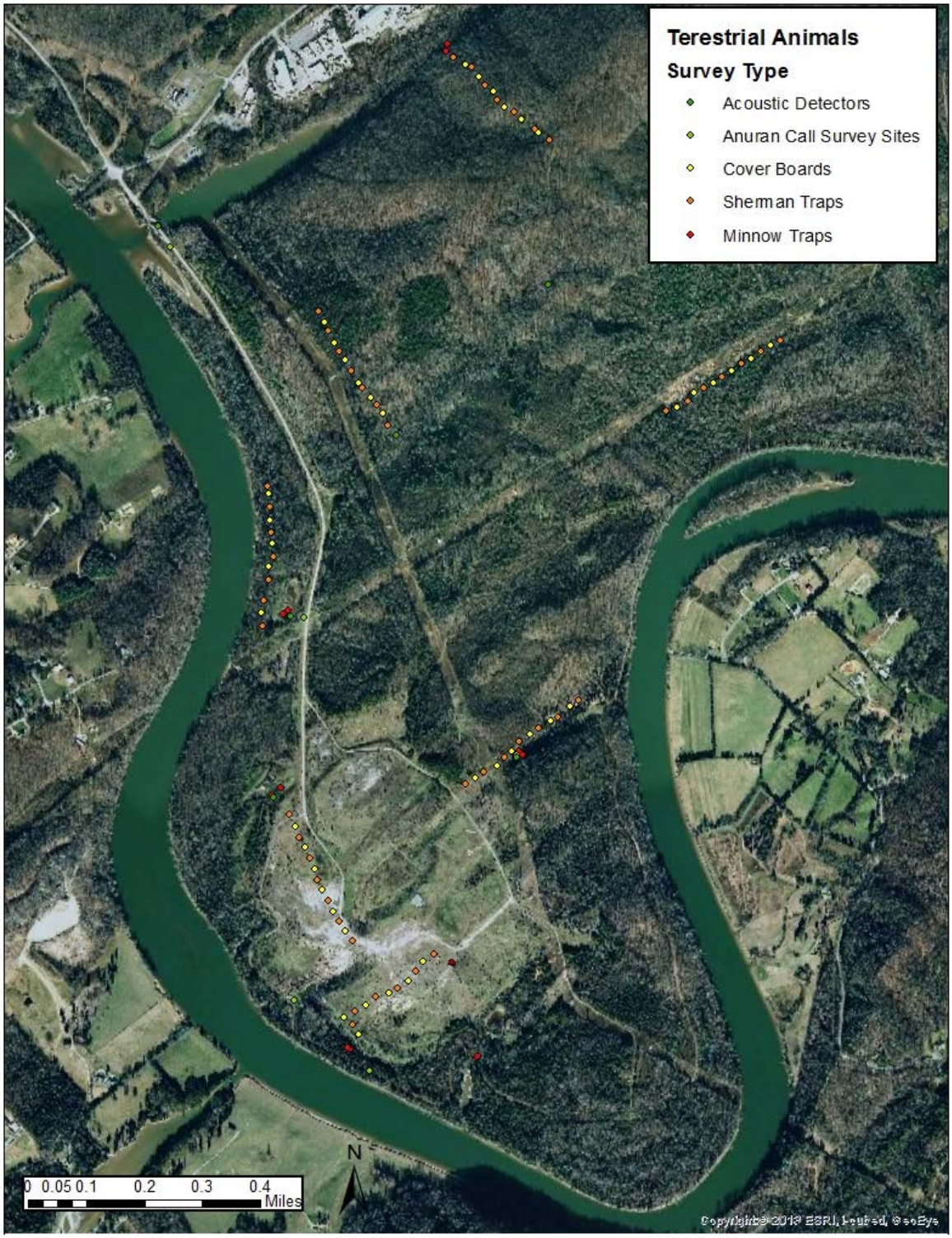

Figure 1. Survey locations in 2013 for terrestrial animals, Clinch River Property, Roane County, TN.

FEDERALLY-LISTED AND STATE-LISTED SPECIES

Review of TVA's Regional Natural Heritage Database in May 2015, indicated that two federally listed and one federally protected species are reported from Roane County. Federally endangered Indiana bat was determined in 2012 to have the potential to occur throughout Tennessee, and indeed, an individual was captured in summer, 2013, on the nearby Oak Ridge]Reservation. Northern long-eared bat was officially listed as federally threatened by the U.S. Fish and Wildlife Service on May 4, 2015. Seven Tennessee state-listed species are reported within 5 miles of the Clinch River Property and Barge/Traffic Area (Table 2).

Table 3. Federally-listed terrestrial animal species documented within Roane County, and documented within five miles of the Clinch River Property and Barge/Traffic Area.[1]

Common Name	Scientific Name	Federal Status[2]	TN State Status (Rank)[3]
Amphibians			
Four-toed Salamander	*Hemidactylium scutatum*	-	NMGT (S3)
Hellbender	*Cryptobranchus alleganiensis*	-	NMGT (S3)
Birds			
Bachman's Sparrow	*Aimophila aestivalis*	-	END (S2)
Bald Eagle	*Haliaeetus leucocephalus*	DM	NMGT (S3)
Sharp-shinned Hawk	*Accipiter striatus*	-	NMGT (S3)
Swainson's Warbler	*Limnothlypis swainsonii*	-	NMGT (S3)
Mammals			
Gray Bat[4]	*Myotis griscesens*	LE	END (S2)
Northern Long-eared Bat[5]	*Myotis septentrionalis*	LT	--
Indiana Bat[6]	*Myotis sodalis*	LE	END (S1)
Meadow Jumping Mouse	*Zapus hudsonius*	PS	NMGT (S4)
Southeastern Shrew	*Sorex longirostris*	-	NMGT (S4)

[1] Source: TVA Natural Heritage Database, queried 11/2013.
[2]Status abbreviations: DM = Recovered, delisted, and being monitored, END = Endangered, LE = Listed Endangered, LT = Listed Threatened; NMGT = In Need of Management; PS = Partial Status.
[3]State Rank Definitions: S1 - critically imperiled; S2 - imperiled; S3 - rare or uncommon; S4 - widespread, abundant and apparently secure, but with cause for long-term concern.
[4]The gray bat was recorded on the CRN site by acoustic surveys performed in spring and summer of 2013.
[5]The northern long-eared bat (*Myotis septentrionalis*) was officially listed as threatened in May 2015. It was recorded on 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.
[6]Although no records of the Indiana bat (*Myotis sodalis*) are known from Roane County, it was recorded on the CRN site by acoustic surveys performed in spring and summer of 2013.

INDIANA BAT

Indiana bat is listed as federally endangered by the U. S. Fish and Wildlife Service (U. S. Fish and Wildlife Service 2011). The species overwinters in large numbers in caves and forms small colonies under loose bark of trees and snags in summer months (Barbour & Davis 1974). Indiana bats disperse from wintering caves to areas throughout the eastern U. S., from New York and New Hampshire in the north to Alabama in the south and as far west as eastern Kansas and Oklahoma (Stone and Wethington 2001). The species favors mature forests interspersed with openings. The presence of snags with sufficient exfoliating bark represent suitable roosting habitat. Use of living trees with suitable roost characteristics in close proximity

to suitable snags also has been documented. Multiple roost sites generally are selected. The availability of trees of a sufficient bark condition, size, and sun exposure is another important limiting factor in how large a population an area can sustain (Whitaker and Hamilton 1979). Numbers of Indiana bat are stable or decreasing throughout portions of their range due to loss of habitat and disease.

The closest summer record of Indiana bat to the Clinch River Property was a mist net capture of an adult male on the Oak Ridge Reservation on June 23, 2013 at Freels Bend Causeway over an inlet of Melton Hill Lake, approximately 9.9 mi away from the proposed CRN Site. Prior to this effort, no acoustic or mist net surveys have been performed on the Oak Ridge Reservation since 2011.

The closest winter record of Indiana bat to the CRN Site is of a hibernaculum (Norris Dam Cave) approximately 27 miles to the northeast in Campbell County, Tennessee. No Indiana bats were observed in this cave, however, during winter surveys conducted in 2002, 2010, and 2011-2015. The closest records of summer roosts for Indiana bat are 27-29 miles to the southeast in the Cherokee National Forest (Monroe County, Tennessee).

To further assess habitat suitability for Indiana bat on the Clinch River Property, habitat surveys specifically designed to identify habitat suitable for summer roosting by Indiana bat were conducted in the spring of 2011 (see HABITAT SURVEYS FOR LISTED BATS (2011) below). Habitat survey results indicated potentially suitable summer roosting habitat within the forested areas in the northern half of the Clinch River Property. TVA Biological Permitting and Compliance staff subsequently conducted mist net and acoustical surveys at the Clinch River Property (2011 and 2013) and acoustical surveys at the Barge/Traffic Area (2015). No Indiana bats were captured or detected in 2011 (See MIST NET AND ANABAT SURVEYS (2011) below), but were detected acoustically in 2013 (see ACOUSTIC SURVEYS FOR BATS (2013)). Indiana bats also were identified by bat acoustic software during 2015 surveys at the Barge/Traffic Area, however when qualitatively assessed by TVA BP&C Staff, these calls did not exhibit characteristics that would definitively indicate these calls belonged to Indiana bat (see ADDENDUM BARGE/TRAFFIC AREA).

NORTHERN LONG-EARED BAT

Northern long-eared bat predominantly overwinters in large hibernacula, such as caves and abandoned mines, with high humidity and no air flow. During the fall, and occasionally in spring, this species utilizes entrances of caves and surrounding forested areas for swarming (mating). In the summer, northern long-eared bats roost singly or in colonies beneath exfoliating bark or in crevices of both live and dead trees. Roost selection by northern long-eared bat is similar to Indiana bat, however it is thought that northern long-eared bats are more opportunistic in roost site selection. This species also is known to roost in abandoned buildings and under bridges. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014).

Northern long-eared bat was proposed for listing as federally endangered under the Endangered Species Act in October 2013. This was based on a determination of significant impacts to the species from white-nose syndrome, which has resulted in substantial mortality to the species during the winter hibernation period in the northeast. Declines of this species were later observed in the southeast in 2014 and 2015. This species was captured on CRN Site during 2011 mist net surveys, on the Oak Ridge Reservation (9.9 mi away) during 2013 mist net surveys on Clinch River Property, and detected during 2011, 2013, and 2015 acoustic surveys on the Clinch River Property and Barge/Traffic Area. TVA biologists identified a hibernaculum for this species in Roane County approximately 9 miles away in January 2014.

GRAY BAT

Gray bat is listed as federally endangered (U.S. Fish and Wildlife Service 1982). The species hibernates in caves in large numbers during winter months and migrates to warmer caves to form summer maternity (comprised of adult females and young) or bachelor (adult males) colonies. This species is closely associated with rivers, lakes, and other large bodies of water over which it forages for aquatic insects (Best et al. 1995; Whitaker and Hamilton 1979). Gray bat numbers are stable and increasing in portions of the species range. The species has responded positively to conservation measures. Gray bats have large foraging areas and forage along the Clinch River.

Summer roosting gray bats have been documented in Marble Bluff Cave, located at Tennessee River Mile 578.3, approximately 9 air miles and 25 river miles from the Site. Gray bats also have been detected on the Oak Ridge Reservation foraging along a pond approximately 2 miles north of the Site (TVA Natural Heritage Database, extracted February 25, 2011). A gray bat was captured in a mist net on the CNR Site during summer 2011 bat surveys, and detected acoustically on the Clinch River Property during both summer 2011 and 2013 acoustic surveys in all three seasons. Acoustic surveys in 2014 and 2015 also detected gray bat at the Barge/Traffic area during all three seasons that bats were acoustically surveyed.

Caves within the Grassy Creek HPA may provide suitable roosting habitat for gray bats. As noted above, a tricolored bat and another bat that could not be identified to species were observed in Rennies Cave. No bats were encountered in two other caves inspected in April 2011. Two additional caves in the Grassy Creek HPA have not been surveyed for bats. Rappelling gear would be required to inspect certain sections of Rennie's Cave . In January 2011, TVA Cultural Permitting and Compliance staff encountered bats in a cave located west of the CRN Site on the Clinch River. Further evaluation of these caves would be necessary to determine presence and identification of bats.

BALD EAGLE

Bald eagles are protected by the Bald and Golden Eagle Protection Act. The species forms large nests in trees near reservoirs and rivers. The species has increased in numbers in east Tennessee in the past decade. Numerous nests occur along nearby Watts Bar Reservoir and the species may reside in nearby forested habitats. The closest documented nest is approximately 8 air miles from the Site on Watts Bar Reservoir. A juvenile bald eagle was

observed flying overhead during field investigations conducted by Biological Permitting and Compliance staff on the Barge/Traffic Area in 2015. Biological and Water Resources staff also observed bald eagles in flight during their quarterly visual encounter surveys along the Clinch River in 2013.

STATE-LISTED SPECIES

Four-toed salamanders have been observed on the Oak Ridge Reservation. Adults live under objects or among mosses in swamps, boggy streams, and wet, wooded or open areas near ponds. Mossy pools or pools with sedges comprise typical larval habitat. Sphagnum moss is commonly abundant in suitable habitat. Lowland/riparian forest along and adjacent to the Clinch River, and along Grassy Creek, in the northwest section of the Clinch River Property provide potentially suitable habitat. Suitable habitat for the four-toed salamander also exists in the Barge/Traffic area along a moss-lined spring and stream in mature forest adjacent to Water Tank Road.

Hellbender has been encountered in the tail water below Melton Hill Dam. Hellbenders are completely aquatic, large-bodied salamanders that can reach a length of up to 29 inches. Hellbenders are brown to grayish in color with irregular dark blotches. The body is flattened horizontally, and the tail is flattened vertically. Hellbenders have four short legs with four toes on the front feet and five toes on the rear feet. They have skin folds used for respiration along the sides of their bodies, between the front and hind legs. Larval hellbenders have external gills, but at 18 months of age, a metamorphosis results in the loss of these gills. The hellbender breeding season occurs between September and early November. During this season, males dig shallow depressions under a rock or log in which females deposit two long strings of eggs, which are fertilized by the male as they are laid. The males brood the eggs in the nest for 2 to 4 months. Hellbenders become sexually mature at 5 to 7 years old and can live up to 30 years. Lack of suitable large objects in rivers/creeks has been proposed as a population-limiting factor for the hellbender. The hellbender usually is found in medium to large streams and rivers with fast flowing water and rocky substrates (Eakes 2005). The Clinch River adjacent to the CRN Site provides potentially suitable habitat for hellbender, however the last known record of this species in the Clinch River occurred in 1989.

Sharp-shinned hawks have also been observed on the Oak Ridge Reservation during their breeding season (April 15-July 15). This species inhabits forest and open woodland. Primary habitat is boreal forest, with the greatest nesting densities occurring in eastern Canada. Young, dense, mixed or coniferous woodlands are preferred for nesting. Nests generally seem to be in a stand of dense conifers near a forest opening, though this may reflect observer bias (Nature Serve 2009). 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. Suitable nesting habitat for this species exists in three locations on the Barge/Traffic Area: in pines along the edge of the ROW near the transect closest to the Clinch River, along the pine forest transect furthest east next to the large wetland, and at the begging of the transect in the northwestern section of the barge/traffic area in an area of dense pines.

Bachman's sparrow has been recorded during summer months within 3 miles of the site. This species typically inhabits mature to old growth southern pine woodland subject to frequent growing-season fires, and requires a well-developed grass and herb layer with limited shrub and hardwood midstory components. Bachman's sparrow is able to colonize recent clear cuts and early seral stages of old field succession but such habitat remains suitable only for a short time. Habitats include dry open pine with an undercover of grasses and shrubs, hillsides with patchy brushy areas, overgrown fields with thickets and brambles, grassy orchards, and large clear-cuts. In this region, breeding habitat usually is in overgrown fields with scattered saplings, and occasionally in open woods with thick grass cover. Early-successional habitat in the southern half of the Clinch River Property, as well as transmission line rights-of-way across the Clinch River Property and Barge/Traffic Area, provide suitable habitat for Bachman's sparrow.

Swainson's Warblers breed in deciduous floodplains, and rich, forested wetlands with deep shade from both the mid-story and canopy. Nests are made in understory shrubs, vines and thickets. This species forages on the ground in areas with little to no ground cover. This species has been reported on the Oak Ridge Reservation approximately 3.5 miles from the project site. Suitable habitat for this species exists on both the Clinch River Property and Barge/Traffic Area in forested wetlands along the Clinch River.

Throughout its range, southeastern shrew is found primarily in bogs, marshy/swampy areas, dense ground cover in wooded areas, and occasionally in upland fields some distance from water. This species lives underground, coming above after a rain event or on dewy nights. Both early-successional habitat in the southern half and riparian forest in the northwestern half provide potentially suitable habitat for southeastern shrew.

The meadow jumping mouse inhabits wet, lowland areas with thick vegetation often near marshes, swamps, and stream sides. During periods of inactivity, meadow jumping mouse occupies burrows underground beneath logs or in clumps of grass. This species has been reported on the Oak Ridge Reservation approximately 3.5 miles from the project site. Suitable habitat for this species exists on both the Clinch River Property and Barge/Traffic Area in forested wetlands and emergent vegetation along the Clinch River and around wetlands.

HABITAT SURVEYS FOR LISTED BATS (2011)

TVA biologists conducted habitat assessment surveys for suitable summer roosting habitat for Indiana bat at 6 points across the forested habitat surrounding the previously cleared area in the southern half of the Site, and along 11 linear transects established across the rest of the Clinch River Property (Figure 2). Survey points were based on previously established Habitat Suitability Index survey protocols (Romme et al. 1995). After conducting surveys using this approach in the southern half of the Clinch River Property, it was determined that conducting surveys along linear transects in the northern half of the Clinch River Property would result in data that better reflected habitat present. Surveys at the 6 points were conducted in January, 2011. Transect surveys were conducted in April and May, 2011. Trees within 20 meters (m) of each survey point (10 m radius circular plot), and within each transect band (30 m wide x 500 m long) were assessed based on diameter at breast height (dbh), whether alive or dead, and

presence of sloughing bark or large cavities. Trees greater than or equal to 5 inches dbh and with sloughing bark and/or cracks or crevices were enumerated and further assessed to determine percentage of sloughing bark, percentage overstory closure, height, and location of crown relative to forest canopy (above, below, same). Landscape features (e.g., location in landscape, terrain, slope, aspect) also were noted. Although presence of live trees exhibiting characteristics of suitable roost trees was noted, the focus was on snag presence, since studies of summer roosting Indiana bat suggest that use of live trees typically does not occur in the absence of snags (O'Keefe, personal communication). High quality trees exhibited > 25% of the remaining bark exfoliating and were greater than 16 inches dbh, moderate quality trees had 11-25% of remaining bark exfoliating and 9-16 inches dbh, and low quality trees retained < 10% of the remaining bark exfoliating and were 5-8 inches dbh (Table 3). Data was used to characterize suitability of habitat in these locations as having low, moderate, or high potential for roost suitability.

Although Indiana bats have been documented on occasion in isolated trees outside of forested habitat, the assumption was made that early-successional habitat at the Clinch River Property was young enough that the presence of snags within field settings would be minimal to zero. Therefore, survey transects and points were only established in areas where aerial photographs depicted forest cover. In general, the southern half of the Clinch River Property does not provide potentially suitable summer roosting habitat for Indiana bats, and particularly for Indiana bat maternity colonies, for which trees greater than 16 inches in diameter are considered optimal. Male Indiana bats and non-reproductive female Indiana bats are thought to be more opportunistic in selection of habitat (U.S. Fish and Wildlife Service 2011). The northern half of the Clinch River Property provides habitat that ranges from low to high, with high quality habitat

occurring along the ridge top and north facing slope of Chestnut Ridge.

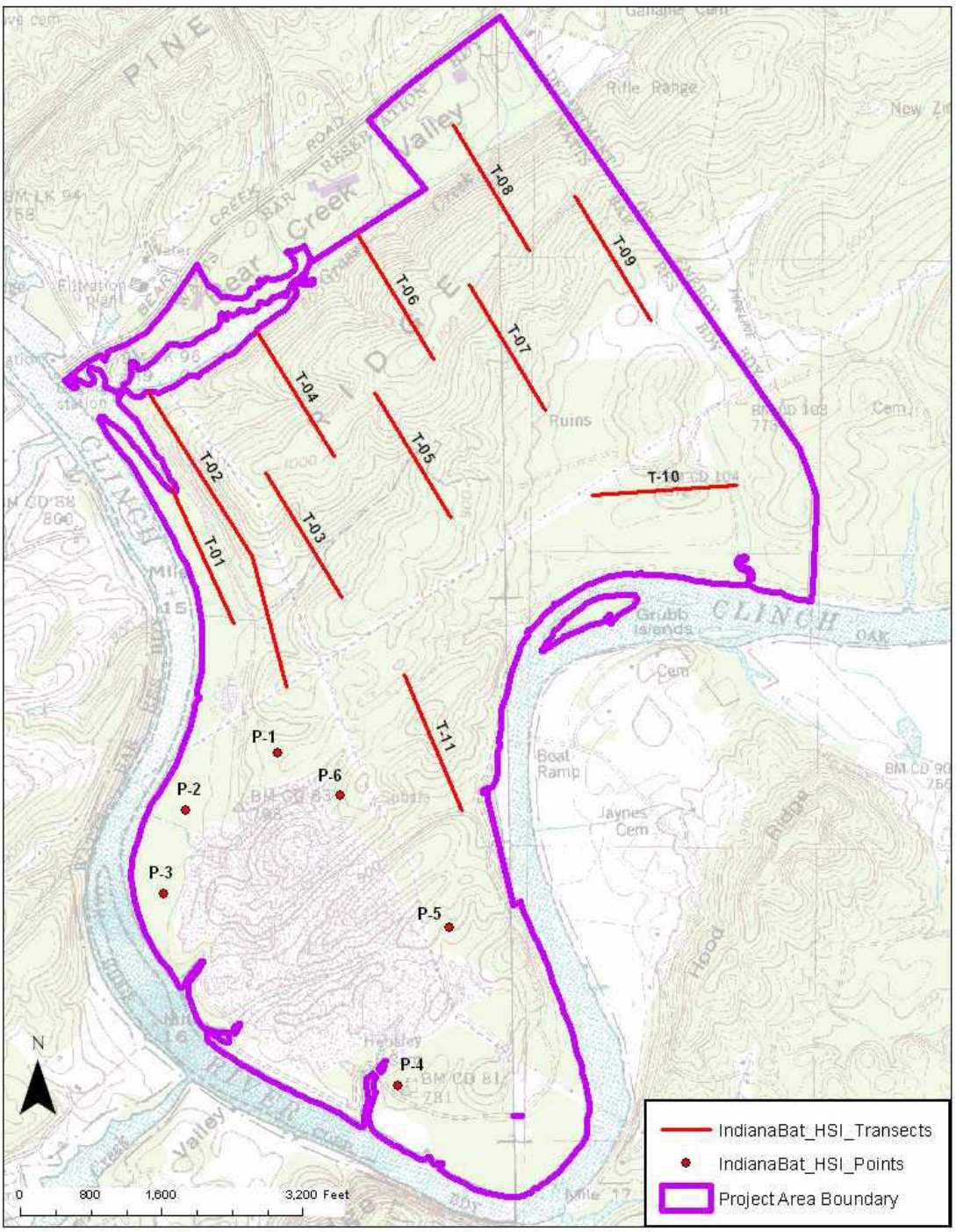

Figure 2. Indiana bat habitat suitability index (HSI) points and transects surveyed in 2011 on the Clinch River Property, Roane County, TN.

Table 4. Habitat Suitability Index for determining quality of snag to serve as potential summer roost tree by Indiana bat maternity colonies. Based on Romme et al., 1995, Revised Indiana Bat Mitigation Guidance for the Commonwealth of Kentucky (2011) and personal communication with Joy O'Keefe, Indiana State University.

Snag >16 in DBH	MODERATE QUALITY	HIGH QUALITY	HIGH QUALITY	snag above canopy (gap) of mature forest, or <15 from edge
Snag 9-16 in DBH	LOW QUALITY	MODERATE QUALITY	HIGH QUALITY	
Snag 5-9 in DBH	LOW QUALITY	LOW QUALITY	MODERATE QUALITY	undeveloped forest, snag below canopy of mature forest or >15 m from edge
	≤10% remaining bark exfoliating	11-24% remaining bark exfoliating	≥25% remaining bark exfoliating	

Table 5. Determination of potential for roosting habitat suitability for Indiana bat maternity colonies at survey points (e.g., P-1, 20 m radius) and transects (e.g., T-01, 30 m x 500 m) on the Clinch River Property, Roane County, TN.

Point or Transect No.	# Low Quality Trees	# Moderate Quality Trees	# High Quality Trees	Site description	Roosting Habitat Suitability
P-1	0	0	0	holly and red maple, sloped, dense, viney	Low
P-2	0	0	0	regenerating bottomland hardwood forest	Low
P-3	0	0	0	bottomland hardwood forest with dense privet/honeysuckle understory	Low
P-4	0	0	0	dense stand, eastern white pine dominant	Low
P-5	0	0	0	eastern red cedar dominant	Low
P-6	0	0	0	eastern red cedar dominant	Low
T-01	4	6	6	forested wetland dominated by privet, snag height same or below canopy	Mod-High
T-02	14	18	8	mature deciduous forest, open under and mid-story, 9 snags above canopy	High
T-03	4	2	1	dense young mixed pine hardwood forest, crosses 2 steep ravines, snag height same or below canopy	Low-Mod
T-04	6	3	3	cedar stand/ ridge top mature deciduous forest	Moderate
T-05	16	6	5	ridge top, mature deciduous forest, snag height same or below canopy	Mod - High

Point or Transect No.	# Low Quality Trees	# Moderate Quality Trees	# High Quality Trees	Site Description	Roosting Habitat Suitability
T-06	14	5	1	steep mature deciduous, open understory, snag height same or below canopy	Low-Mod
T-07	3	1	2	dense young mixed stand/mid-aged deciduous stand; scrub-shrub	Low
T-08	5	6	6	dense pine stand/young deciduous woodland w/ dense scrub-shrub understory; snag height same/below canopy	Moderate
T-09	3	1	1	loblolly pine plantation/mid-successional deciduous	Low
T-10	1	2	3	wetland/steep dense woodland/dense cedar-understory/older deciduous forest	Low - Mod
T-11	4	3	1	dense young deciduous forest	Low

MIST NET AND ACOUSTIC SURVEYS FOR LISTED BATS (2011)

Gray bats occur in the area and the Clinch River Property contains suitable habitat for Indiana bats. Therefore, TVA Biological Permitting and Compliance staff conducted mist-net surveys in 2011 for rare bats. Staff also conducted acoustical monitoring of bats using Anabat technology, in accordance with U. S. Fish and Wildlife Service guidelines (USFWS 2011). White-nose syndrome decontamination, disinfection and bat handling protocols outlined by the U. S. Fish and Wildlife Service (March, 2011) also were followed. Surveys were performed at eight locations throughout the Clinch River Property during July 11-21, 2011.

Mist net survey locations were selected near ideal foraging, commuting, or roosting habitat favored by bats. Features such as presence of exfoliating trees, proximity to water, proximity to open edge, or closed canopy forest with open understory beneath were important site selection criteria. Furthermore, locations also were chosen for physical properties that made them ideal for the collection of data. Open areas not ideal for net placement, but potentially used by foraging bats, were selected for placement of Anabats (USFWS 2011).

Survey locations were placed at a distance greater than 200 meters from each other. Each station was composed of one Anabat recording device and two mist nets. Mist nets were placed at least 30 meters from each other and at least 100 meters from the Anabat recording station. Anabats were placed in a clear plastic case to protect them from moisture and to ensure quality and continuity of recording. Mist nets were either 6 or 9 meters wide and were double stacked on poles to a height of at least 7 meters (USFWS 1999 and 2011).

Anabat data was gathered from sundown (20:45) to sunup (06:30) and mist nets were open for data collection five hours each night from approximately 20:45 until 01:45. Nets were checked

every 10 minutes to minimize escapes and stress to animals captured. Data was collected at each location on two consecutive nights. Anabat data was processed and run through two audio filters that analyzed all recorded sound files (USFWS 2011). The first filter identified bat calls from other noise (i.e., power lines, precipitation). The second filter screened for potential Indiana bat calls among the bat calls. Although the focus was on whether or not Indiana bats were detected, some of the call signatures allowed for identification of calls to species. Many species of bat create a graphic acoustic signature with characteristics that facilitate identification to species, subject to the quality of the call that is collected during surveys. Gay bats, for example, have a unique call signature that enables identification to species based on how the call is graphed. Calls were compared to a call reference library compiled by a leading expert in analysis of acoustic monitoring (Chris Corben, Anabat Techniques Course, 2011).

Locations 1,2,3, and 5 (see Figure 2) were distributed throughout the northern half of the Clinch River Property with location 9 in the southern half along the Clinch River. These locations were selected in an attempt to evenly sample the whole property, including upland habitats in the north where the least disturbed habitat remains. A final location in the eastern side of the northern half of the Clinch River Property, known as “Location 4” (not shown on map), was initially selected but rejected due to the low probability of the habitat being used by bats.

Locations 5-7 were located within the southern half of the Clinch River Property and were placed adjacent to the Clinch River where bat activity was assumed to be greatest. Location 8 was placed at a more central location within the southern half of the Clinch River Property. Because the majority of this area is dominated by herbaceous vegetation and is relatively homogenous, this location was presumed to be representative of the southern half of the Clinch River Property as a whole, where proposed activities currently are anticipated to the most intensive.

See data sheets for further description of habitat at location of mist nets.

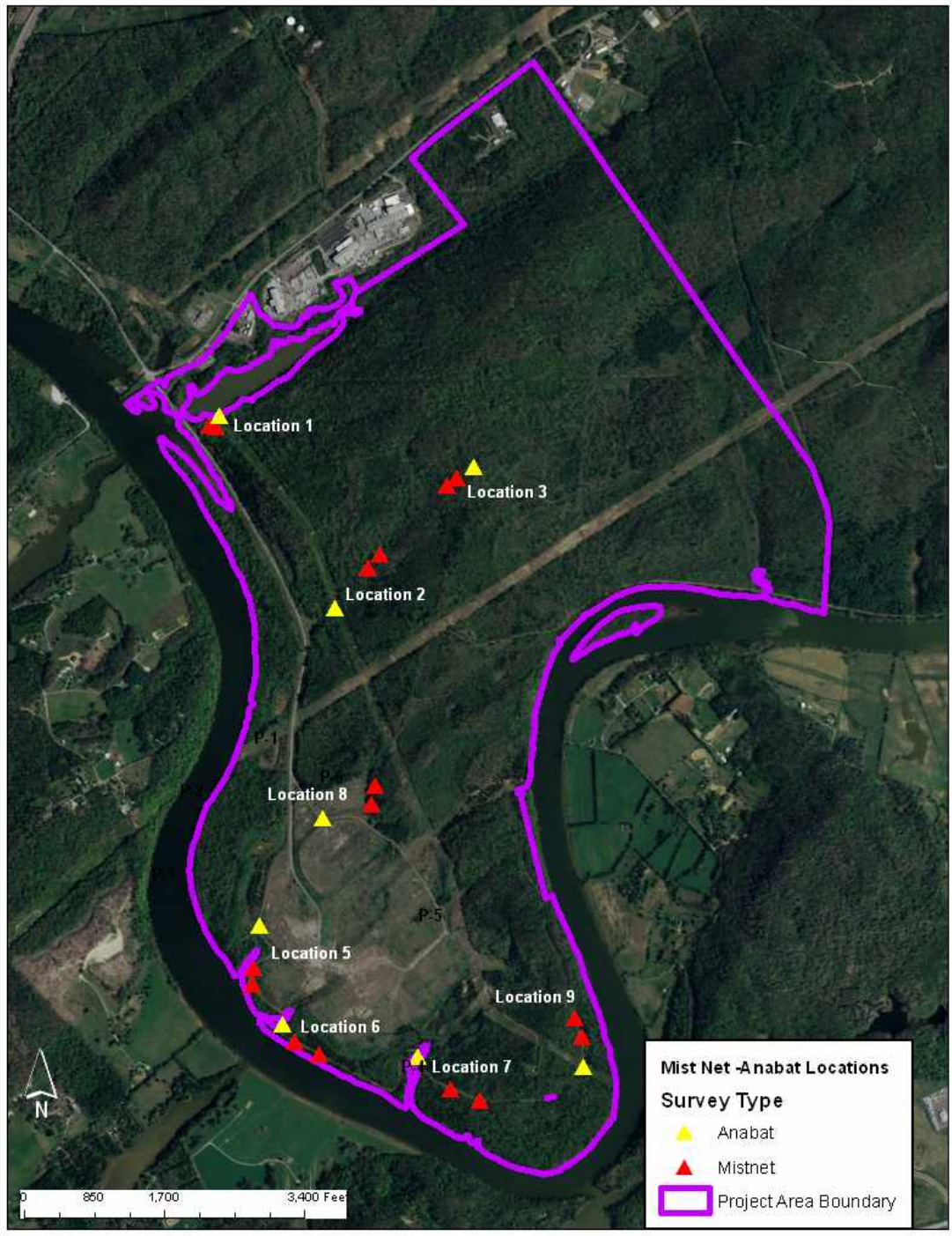

Figure 3. Mist net and Acoustic monitoring (Anabat) sites surveyed on the Clinch River Property, Roane County, TN, 11-21 July, 2011.

Table 6. Summary of results of detection of Indiana bat by acoustical (Anabat) monitoring on the Clinch River Property, Roane County, Tennessee, 11-21 July, 2011.

Anabat Location*	Location**	Date	Start Time (EST)	Stop Time (EST)	Bat Calls***	Automated Filter Results for Indiana Bat****
1	Grassy Creek	07/18/2011	20:45	06:30	1,168	0
		07/19/2011	21:45	06:30	862	0
2	TL ROW (herbaceous habitat)	07/20/2011	20:45	06:30	783	0
		07/21/2011	20:45	06:30	715	0
3	gap in closed canopy forest	07/20/2011	20:45	06:30	697	0
		07/21/2011	20:45	06:30	622	0
5	glade/grassy meadow with scattered trees	07/11/2011	20:45	06:30	147	0
		07/12/2011	20:45	06:30	58	0
6	wetland/embayment of Clinch River	07/11/2011	20:45	06:30	1,173	0
		07/12/2011	20:45	06:30	1,260	0
7	wetland/embayment of Clinch River	07/13/2011	20:45	06:30	143	0
		07/14/2011	20:45	06:30	416	0
8	herbaceous field with scattered trees	07/18/2011	21:45	06:30	83	0
		07/19/2011	21:45	06:30	152	0
9	TL ROW towards Clinch River	07/13/2011	20:45	06:30	22	0
		07/14/2011	20:45	06:30	64	0
Total					**8,365**	**0**

***Site 4 not used in this survey**
****See data sheets for further description of location.**
*****The number of files that passed the 'NOISE' filter provided by USFWS, indicating these were bat calls**
******A result of 2 or 3 indicates high probability that an Indiana bat is present and triggers the need for a mist net at/near the Anabat location**

MIST NET AND ACOUSTIC SURVEY RESULTS (2011 and 2013)

Seventeen bats of 5 species were captured during 2011 mist net surveys (Table 7). The most prevalent species were big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), and tricolored bat (*Perimyotis subflavus*). These species are common throughout the southeast. These species, along with northern longeared bat, which was captured a single time, likely utilize the site while foraging along woodland edges, early successional habitats and the river corridor. Indiana bat was not captured during mist net surveys. Species not captured but detected acoustically included hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*) , and evening bat (*Nycticeius humeralis*). Number of bat calls was greatest at locations 1 and 6. The Anabats at these locations were directed across Grassy Creek at location 1 and across an embayment of Clinch River at location 6. Grassy Creek and Clinch

River is likely used by multiple bats for drinking, foraging, and/or as a travel corridor, which may explain why numbers at these locations are higher. 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 Anabat during a single visit, thus resulting in multiple recordings.

Table 7. Summary of results of mist net surveys at the Clinch River Property, Roane County, Tennessee, 11-21 July, 2011.

Mist Net Site	Number of Individuals						
	Eptesicus fuscus (Big Brown Bat)	*Perimyotis subflavus* (Tricolored Bat)	*Myotis grisescens* (Gray Bat)	*Myotis septentrionalis* (Northern Long-eared Myotis)	*Lasiurus borealis* (Eastern Red Bat)	Unknown species*	Total
Site 1	0	2	0	0	0	**0**	**2**
Site 2	0	0	0	0	0	**0**	**0**
Site 3	1	1	0	0	0	**0**	**2**
Site 5	2	0	1	0	2	**1**	**6**
Site 6	4	0	0	0	0	**0**	**4**
Site 7	0	0	0	0	0	**0**	**0**
Site 8	0	0	0	1	1	**0**	**2**
Site 9	1	0	0	0	0	**0**	**1**
Total	**8**	**3**	**1**	**1**	**3**	**1**	**17**

***Total includes one unknown bat that escaped**

In 2013 acoustic monitors detected 11 species across the Clinch River Property (Figure 4, Table 8). Acoustic monitor placement and acoustic analysis for these surveys followed the most current Indiana bat survey guidelines (USFWS 2013a and 2013b). The most prevalent species detected were tricolored bat (*Perimyotis subflavus*),evening bat (*Nycticeius humeralis*), gray bat (*Myotis grisescens*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*). Other species recorded were big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), Indiana bat (*Myotis sodalis*), eastern small-footed bat (*Myotis leibii*), little brown bat (*Myotis lucifugus*), and northern long-eared bat (*Myotis septentrionalis*). At least seven of these eleven species were heard each season with the greatest number of calls and species diversity occurring during summer. This reflects movement of bats from winter hibernacula to summer roosting habitats. Federally endangered gray bats were recorded in every monitoring season, suggesting winter and summer cave habitat exists for this species nearby. Federally endangered Indiana bat and the proposed endangered northern long-eared bat were recorded during spring and summer monitoring seasons. Bat activity as determined by number of recorded bat calls remained consistent between sites throughout each season (Table 7). Similar to 2011 acoustic monitoring results, in 2013 the greatest number of bat calls was recorded at Grassy Creek (Location 1) where multiple species likely come to forage and drink. The next largest number of bat recordings came from an opening within a closed canopy, mixed hardwood forest (Location 3). This area is adjacent to the HCP area along the forested ridge top. Bats recorded here were likely foraging for insects above and under the forest canopy or traveling though forest corridors. Aquatic features (e.g., ponds) throughout the site also provided habitat for bats as was evident by numerous acoustic monitoring detections at

locations 8 and 5. Similar to Grassy creek, bodies of water provide areas for foraging and drinking. The two areas with the smallest amount of recorded calls were the glade area (Location 6) and another opening under the closed forest canopy (Location 2). The glade area experienced the greatest amount of disturbance throughout the 2013 studies. Active drilling and construction may have deterred bats from utilizing this area. However, lack of bat activity is most likely due to the lack of suitable foraging habitat here. This area has no associated body of water, and the least amount of forest cover. Prey was likely more scarce here than in other monitoring locations. The forested gap (Location 2) was at the convergence of an ATV road and a small valley between hillsides. Our results suggest habitat here was less suitable for foraging bats than higher up on the ridge top.

One gray bat was captured in 2011 at Location 5 and detected acoustically in 2011 at Locations 1, 7, and 9. In 2013, gray bat was detected at all locations and in every monitoring season, suggesting winter and summer cave habitat exists for this species nearby. Gray bat is likely utilizing the area near the river for foraging. Studies have shown that while gray bats forage primarily over aquatic systems, they will venture short distances into adjacent terrestrial habitat to forage, or will cross terrestrial habitats to access streams, rivers and reservoirs (Best et al. 1995). Gray bats are present, and may be roosting at the site, although this has not been confirmed. All documented caves on site are located within the TVA HPA, and gray bat foraging activities are likely primarily occurring over the nearby Clinch River and other riparian areas in the project area.

No Indiana bats were detected by Anabat units or captured with mist nets in 2011. Indiana bat was detected acoustically in 2013, however, at all but one location (Location 5). Based on close proximity of a mist net capture of Indiana bat on June 23, 2013, on the Oak Ridge Reservation, and 2013 acoustic data of Indiana bat presence, there is data to support the potential presence of Indiana bat during spring and summer months (April-August).

Northern long-eared bat was captured via mist net in summer 2011 along a forested road in the southern half of the Site, just north of the proposed intake (i.e., just north of 2013 survey transect 8). This species was detected acoustically in the northern half of the Site (Locations 1-3) in 2013 during spring and summer seasons. These detections support presence of northern long-eared bat in association with forested areas and aquatic features. Northern long-eared bats hibernate in caves during winter and migrate to roost on the landscape during summer. Although studies on use of habitat during summer are few (but currently underway), available data suggests that summer habitat use by northern long-eared bat is probably similar to Indiana bat.

It is important to note that results of bat surveys for federally listed species are recognized by the U. S. Fish and Wildlife Service to be valid for 2 years. Thus, additional surveys may be warranted in the future as moderate to high quality roosting habitat for the Indiana bat occurs on the northern half of the property.

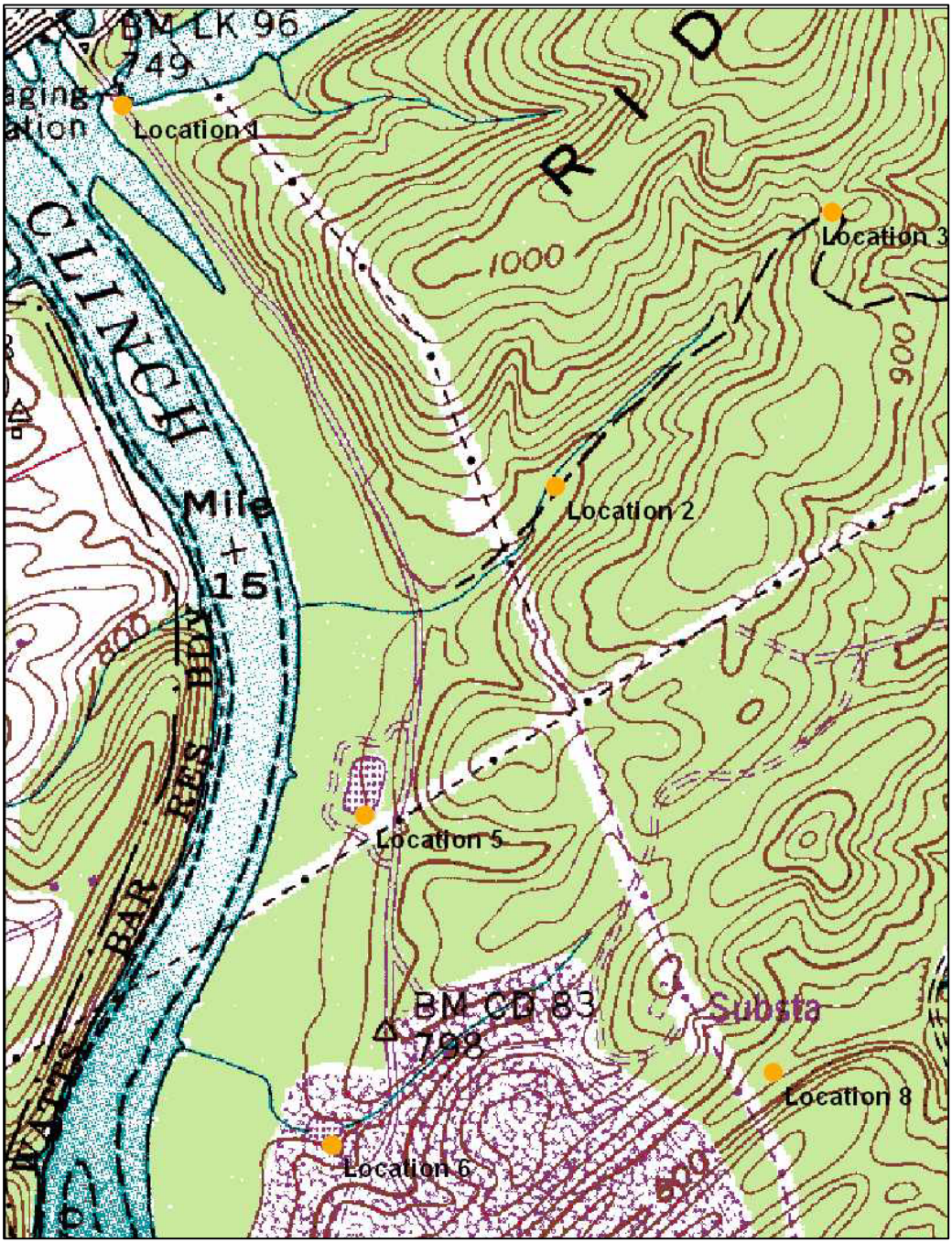

Figure 4. Locations of acoustical (Anabat) monitoring equipment on Clinch River Property, Roane County, TN, 2013.

Table 8 Summary of seasonal results of federally listed bat species by acoustical (Anabat) monitoring at the Clinch River Property, Roane County, Tennessee, 2013.

Anabat Location[1]	Location[1]	Survey Season[2]	Bat Calls[3]	# Identified as MYSO[4]	# Identified as MYGR[5]	# Identified as MYSE[6]
1	Grassy Creek	Spring	699	2	48	1
		Summer	3272	5	151	0
		Fall	59	0	8	0
2	gap in closed canopy forest	Spring	16	2	4	2
		Summer	77	0	2	2
		Fall	1	0	1	0
3	gap in closed canopy forest	Spring	328	0	23	0
		Summer	1113	5	25	5
		Fall	8	0	0	0
5	wetland surrounded by emergent vegetation	Spring	25	0	0	0
		Summer	1302	0	4	0
		Fall	29	0	5	0
6	glade/grassy meadow with scattered trees	Spring	16	1	0	0
		Summer	372	1	2	0
		Fall	0	0	0	0
8	wetland surrounded by emergent vegetation	Spring	38	0	2	0
		Summer	393	1	1	0
		Fall	18	0	3	0
Total			**7,766**	**17**	**279**	**10**

[1]See Figure 4 for 2013 acoustic monitoring locations.
[2]Spring Surveys occurred 04/22/13-04/25/13; Summer Surveys occurred 07/15/13-07/19/13; Fall Surveys occurred 10/07/13-10-11/13.[3]The number of files that passed the 'NOISE' filter indicating these were bat calls using Bat Call Identification (BCID) software.
[4]MYSO = *Myotis sodalis* (Indiana bat).
[5]MYGR = *Myotis grisescens* (gray bat).
[6]MYSE = *Myotis septentrionalis* (northern long-eared bat).

SPECIES OF INTEREST RESULTS SUMMMARY

Terrestrial animal surveys conducted at the Site spanned across multiple seasons (spring, summer, winter, fall), habitats types (e.g., streams, mature forest, early-successional cedar glades), and detection methods (e.g., aural, visual, traps, ultrasonic). The resulting inventory of species documented on site is therefore believed to represent the majority of species that would occur on or near the Site. Most of the species observed are considered to be regionally abundant and common. Important species detected on the site include gray bat and Indiana

bat, which are federally endangered, northern long-eared bat, which is federally threatened, and bald eagle which has been removed from the Endangered Species List but is still federally protected. These species are defined as "important" species because they currently have or have been determined to warrant federal protection due to population declines (USNRC 1976). Although bald eagle was observed flying over the barge/traffic area, no bald eagle nests were observed within the Clinch River Property or Barge/Traffic Area. Thus no bald eagles are known to use the project footprints. On the other hand, the design and extent of bat surveys conducted on Site do not allow for a confident quantitative estimate of these species.

Gray bats inhabit nearby caves and forage across the site, as documented in both mist nest and acoustic surveys. It is likely that presence of gray bat would be seasonal and restricted to spring, summer, and fall months when this species is roosting, swarming, and staging in and around nearby caves. Gray bats were detected at all acoustic survey locations during 2013 and 2015 acoustic surveys, which suggests a minimum of 6 bats potentially simultaneously foraging across the site during the survey. Potential numbers of gray bats on the Site during the summer may reflect a proportion of the number of roosting bats in nearby caves, such as Marble Bluff Cave, 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 km (50mi) of river or lake shore to forage (Harvey 1992). This suggests that gray bats foraging on the Site may originate from multiple caves. Approximating number of gray bats on site on a given night during the summer is therefore challenging.

One northern long-eared bat was captured by mist net. Both northern long-eared and Indiana bat were detected acoustically. Indiana bat also has been captured nearby at Oak Ridge. Both species have smaller summer home ranges compared to gray bat. Northern long-eared bats forage within 1.5 miles of roost trees and Indiana bats forage within 2.5 miles of roost trees. No occupied roost trees have been documented on site, which makes an estimate of numbers of these species on site difficult. Given the rarity of Indiana bat, numbers would be expected to be low to none in any given year during the warm, non-hibernating season. Northern long-eared bat is a relatively common species in this region and its presence at the Site would be expected during the warm, non-hibernating season. This species has recently been listed as federally threatened due to mortality events caused by white-nose syndrome on a large portion of the population of this species in the northeast. Although declines of this species have been observed in the southeast, the mortality in the southeast does not appear to be as dramatic as that observed in the northeast. Indiana bat populations are still likely to be smaller than those of northern long-eared bats in the region. These regional population trends are likely reflected in the number of bats observed on the Site.

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Table 2. Species observed or collected during seasonal (Win - Winter, Spr - Spring, Sum - Summer, Fall) Surveys for Terrestrial Animal Species on the Clinch River Nuclear Site and Barge/traffic Area (2011 - 2015)

Species	Boat				Transect/VES				Minnow Trap				AnuranCallSurvey				Opportunistic Sitings				Anabat Detectors		
	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	W	Spr	Sum	Fall	Win	Spr	Sum	Fall	Spr	Sum	Fall
Acadian flycatcher							x																
American beaver	x				x		x										x						
American black duck (ABDU)					x																		
American bullfrog								x				x			X			x					
American crow (AMCR)	x	x	x		x	x	x	x		x							X						
American goldfinch (AMGO)	x	x	x		x	x	x																
American robin (AMRO)		x	x			x	x																
American toad						X								x									
American tree sparrow					x																		
ashy clubtail		x																					
bald eagle						x	X													x			
bank swallow		x																					
barn swallow		x	x																				
barred owl (BAOW)															x			x	x				
bay-breasted warbler										x													
belted kingfisher (BEKI)	x		x	x	x		x	x									x						
big brown bat (EPFU)																					x	x	x
black-and-white warbler							x																
black-crowned night heron																				x			
black-throated green warbler						x																	
black ants						x	x																
blackpoll warbler (BLWA)		x								x													
black ratsnake										x													

black vulture (BLVU)	x	x			x	x	x	x														
blue-gray gnatcatcher		x				x	x			x												
blue-headed vireo						x																
blue jay (BLJA)	x	x	x		x	x	x	x														
blue-winged warbler										x												
Bonepart's gull						x												x				
brown-headed cowbird		x				x	x															
brown thrasher (BRTH)						x	x											x				
Canada goose (CAGO)	x	x			x	x		x		x				x			x	x	x			
Canada warbler (CAWA)										x												
Carolina chickadee (CACH)	x	x	x		x	x	x	x		x												
Carolina wren (CAWR)	x	x	x		x	x	x	x		x								x				
cave cricket						x	x															
cedar waxwing (CEWA)					x			x														
chestnut sided warbler		x					x			x												
chimney swift (CHSW)		x																				
Chipping sparrow (CHSP)						x																
Chuck-wills-widow																			x			
Cicada species							x	x														
clouded sulphur butterfly						x				x												
common grackle (COGR)		x																				
common map turtle			x																			
Common nighthawk (CONI)																x						
common snapping turtle							x															
common yellowthroat (COYE)						x	x			x								x				
Cooper's hawk																			x			

corn snake						x																
coyote					x	x	x								x				x			
crayfish									x	x												
Cumberland slider		x	x																			
double-crested cormorant (DCCO)		x	x			x	x															
downy woodpecker (DOWO)	x	x			x	x	x															
dragonfly nymph											x	x										
duskywing butterfly						x				x												
eastern bluebird (EABL)		x				x		x														
eastern box turtle							x	x														
eastern chipmunk						x	x	x										x	x	x		
eastern cottontail					x		x								x		x		x			
eastern gray squirrel						x	x												x			
eastern kingbird (EAKI)		x	x				x															
eastern meadowlark (EAME)					x									x								
eastern phoebe (EAPH)	x	x	x		x	x	x	x														
eastern pondhawk																			x			
eastern red spotted newt (NOVI)									x	x	x	x										
eastern tailed blue butterfly						x																
eastern tiger swallowtail		x																				
eastern towhee (EATO)		x	x			x	x	x		x				x								
eastern worm snake							x															
elk																	x					
Eurasian collard dove						x																
European starling (EUST)		x				x		x														
evening bat (NYHU)																					x	x	x

field sparrow (FISP)			x		x	x	x	x		x												
fire ants																	x					
golden-crowned kinglet					x			x														
gray bat (MYGR)																					x	x	x
gray catbird							x																
gray treefrog		x				x	x								x								
great blue heron (GBHE)	x	x	x		x	x	x																
green frog (RACL)						x	x				x				x								
green sunfish										x													
hairy woodpecker (HAWO)					x	x	x	x															
hermit thrush (HETH)					x	x		x		x													
hispid cotton rat							x	x															
hoary bat (LACI)																					x	x	
honey bees							x	x															
hooded warbler (HOWA)							x																
Horace's duskywing butterfly						x				x													
Indiana bat (MYSO)																					x	x	
indigo bunting (INBU)		x	x			x	x			x													
juniper hairstreak						x																	
Kentucky warbler						x																	
killdeer					x																		
little brown bat (MYLU)																					x	x	x
Louisiana waterthrush (LOWA)						x																	
mallard		x																					
mourning cloak butterfly										x													
mosquito fish									x	x		x											

mourning dove (MODO)						x	x											x					
muskrat		x																					
narrow-mouthed toad						x																	
Nashville warbler (NAWA)						x																	
North American deermouse							x	x															
North American leopard slug								x															
northern cardinal (NOCA)	x	x	x		x	x	x	x		x								x					
northern flicker (NOFL)					x	x	x	x		x													
northern long-eared bat (MYSE)																					x	x	x
northern mockingbird (NOMO)					x	x	x	x															
northern parula (NOPA)						x	x			x													
northern rough-winged swallow																							
Northern watersnake						x												x					
opossum								x						x			x			x			
osprey	x	x	x			x	x			x													
Ouachita map turtle		x																					
painted turtle		x																					
palm warbler (PAWA)		x					x			x													
pearl crescent butterfly						x																	
Philadelphia vireo (PHVI)						x																	
pickerel frog (RAPA)						x			x	x				x									
pileated woodpecker (PIWO)					x	x	x																
pine warbler (PIWA)		x				x	x			x													
pipevine swallowtail butterfly								x															
prairie warbler (PRWA)		x				x	x			x								x					
prawn										x													

prothonotary warbler (PRWA)		x	x			x	x			x												
purple martin (PUMA)		x																				
raccoon					x	x		x										x				
red admiral butterfly						x				x												
red-banded hairstreak						x				x												
red bat(LABO)																				x	x	x
red-bellied woodpecker (RBWO)		x			x	x	x	x		x												
red-breasted sunfish								x														
red-eared slider						x		x														
red-eyed vireo (REVI)		x	x			x	x			x								x				
red-headed woodpecker							x															
red-shouldered hawk			x		x	x																
red-tailed hawk	x				x	x	x			x												
red-winged blackbird		x				x	x	x		x			x									
red fox																			x			
river cooter			x																			
Ruby-crowned kinglet								x														
ruby-throated hummingbird							x															
rock pigeon (ROPI)	x					x	x	x														
savannah sparrow (SASP)					x	x																
scarlet tanager (SCTA)		x				x				x			x									
sculpin										x												
sharp-shinned hawk	x																					
short-tailed shrew																			x			
silver-haired bat (LANO)																				x	x	x
silver spotted skipper						x	x															

small-footed bat (MYLE)																					x	x	
song sparrow (SOSP)	x	x			x	x	x	x															
southern leopard frog						x	x							x									
spicebush swallowtail							x																
spiny softshell turtle		x																					
spotted sandpiper		x																					
spring peeper (PSCR)					x	x	x	x	x				x	x									
striped skunk					x																		
summer tanager							x																
sunfish species										x	x												
tiger swallowtail butterfly						x	x			x													
Tennessee warbler (TEWA)						x																	
terrestrial snails					x	x	x																
tiger moth								x															
tree swallow (TRSW)		x				x	x																
tricolored bat (PESU)																					x	x	x
tufted titmouse (TUTI)	x	x			x	x	x	x															
turkey vulture (TUVU)	x	x			x	x	X	x		x													
upland chorus frog (PSTR)	x				x	x		x	x				x	x			x						
walking stick							x																
warmouth										x	x	x											
wasp species						x																	
water boatman											x												
West Virginia white						x																	
whip-poor-will																				x			
white-breasted nuthatch							x																

white-eyed vireo (WEVI)		x	x			x	x			x												
white-footed mouse					x	x	x															
white-marked tussock moth																			x			
white-tailed deer					x	x	x	x									x	x				
white-throated sparrow	x	x			x	x	x	x		x							x					
wild indigo duskywing						x				x												
wild turkey (WITU)						x							x					x				
window skimmer																			x			
wood duck		x						x														
wood thrush (WOTH)			x				x															
worm-eating warbler						x	x															
yellow-bellied sapsucker					x			x														
Yellow-billed cuckoo																			x			
yellow-breasted chat			x			x	x			x								x				
yellow-rumped warbler	x	x			x	x		x														
yellow-shafted flicker		x	x																			
yellow-throated vireo						x													x			
yellow-throated warbler		x	x			x	x															
Yellow warbler						x	x															
Apheloria virginiensis (black and yellow centipede)							x															
zebra swallowtail butterfly						x				x												