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RESOURCE MANAGEMENT PLAN
for the
OAK RIDGE RESERVATION

Volume 24: Threatened and Endangered Animal Species

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MARTIN MARIETTA ENERGY SYSTEMS, INC.
operating the
OAK RIDGE NATIONAL LABORATORY OAK RIDGE Y-12 PLANT
OAK RIDGE GASEOUS DIFFUSION PLANT PADUCAH GASEOUS DIFFUSION PLANT
Under Contract No. DE-AC05-84OR21400
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CONTENTS

ACRONYMS

CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
ESD	Environmental Sciences Division
FWS	U.S. Fish and Wildlife Service
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
RMO	Resource Management Organization
T&E	threatened and endangered
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency

ABSTRACT

United States and Tennessee laws provide protection for wildlife species that the U.S. Fish and Wildlife Service (FWS) and the Tennessee Wildlife Resources Agency (TWRA) have determined to be endangered or threatened. These laws and their implications for management of the Oak Ridge Reservation (ORR) are briefly discussed. The historical occurrence, current status, and recommended surveys and management plans for all threatened and endangered (T&E) wildlife species with a reasonable probability of occurring on the ORR are also discussed. Seventeen species of T&E mollusks historically occurred in the Oak Ridge area, but no management action is recommended because reservoir construction and other factors not related to Department of Energy operations have eliminated suitable habitat. Systematic surveys and management actions are also not recommended for three species of T&E fish, one amphibian species, one reptile species, six bird species, and two mammal species because of the very low potential for the occurrence of these species on the ORR. For three T&E bird species on the ORR, no feasible or significantly beneficial management actions could be identified. Surveys and consideration of possible management actions are recommended for three state-listed bird species that occur on or near the ORR and for two federally listed bat species that occur in East Tennessee and may occur on the ORR. This document and future annual reports will be submitted to the TWRA and the FWS for review and comment.

1. INTRODUCTION

The federal government and the state of Tennessee have determined that various wildlife species are threatened or endangered with extinction and have given them legal protection. The U.S. Department of Energy (DOE) and all other federal agencies are required under state and federal laws to avoid impacts on these species and their habitats. The Department of Energy's land holdings, including the Oak Ridge Reservation (ORR) in East Tennessee's Anderson and Roane counties, contain extensive natural areas that provide habitat for numerous wildlife species and some threatened and endangered (T&E) species.

The purpose of this report is to describe the occurrence and status of T&E wildlife species on the ORR and to discuss the management and protection of such species. Only those species that have been recorded on or near the Reservation and those that have a reasonable probability of occurring there in the foreseeable future are considered. State and federal laws, regulations, and programs concerning T&E species are also briefly discussed.

2. LAWS, REGULATIONS, AND PROGRAMS

2.1 FEDERAL

Certain wildlife species have been determined by the U.S. Fish and Wildlife Service (FWS) to be threatened or endangered with extinction. These species are protected under the Endangered Species Act of 1973 (16 U.S.C.A 1531 et seq.) and are listed in 50 CFR Pt. 17.11. Critical habitats, which have been officially designated for some of the species, are listed in 50 CFR Pt. 17.95. Endangered species are defined as those species currently in danger of extinction, whereas threatened species are not currently in such danger but are likely to become so within the foreseeable future without adequate management. As defined by the Endangered Species Act, the term "species" may include subspecies and geographically distinct vertebrate populations as well as entire species. The FWS decides which species should be listed, enforces the Endangered Species Act, and reviews the actions of other federal agencies that may affect listed species. Details of the FWS Endangered Species Program are discussed by Bean.[1]

Each federal agency, including DOE, is required to ensure that any action it authorizes, funds, or carries out does not jeopardize the continued existence of any threatened or endangered species or result in the destruction of designated critical habitat. For assistance in this endeavor, the agency must consult with the FWS.[2] Additional details of required agency compliance with the Endangered Species Act are discussed in ref. 3.

2.2 STATE

The Tennessee Wildlife Resources Agency (TWRA), the responsible agency for wildlife under Tennessee law, has listed certain species as endangered, threatened, or in need of management. These species are protected by law (Tennessee Code Annotated Title 70, Chapter 8) and TWRA regulations, and no agency or individual may knowingly destroy these species or their habitat without a permit from the TWRA. The Tennessee Department of Conservation, Division of Ecological Services, also maintains a listing of T&E species and species of special concern but has no authority to manage these species or to enforce the wildlife laws.

3. SPECIES LISTS AND OCCURRENCE

All federal and TWRA T&E animal species known to have occurred on or near the ORR are considered in the text and listed in Table 1. However, detailed consideration of eighty species that were recently (November 1986) designated by the TWRA as "in need of management" is not within the scope of this document. These species are listed in Table 2, and their status on the ORR will be considered in more detail in a future report.

3.1 INVERTEBRATES

In Tennessee, the only invertebrates that are listed as threatened or endangered are a number of mollusk species (Table 1). Tennessee has or has had about 460 species and forms of mollusks including 120 species of mussels (bivalves), 99 species of aquatic snails, and 223 species of terrestrial snails.[4] The populations of aquatic species have been drastically reduced, primarily as a result of dam construction, stream channelization, domestic and agricultural pollution, and effluents from strip mining. About 50 aquatic mollusk species have been listed by the FWS or the state of Tennessee as endangered, threatened, or "in need of management," and several are probably extirpated in the state. No populations of these species inhabit the Clinch River and its reservoirs adjacent to the ORR, according to published descriptions of the current population status of these mollusks.[4] Also, the small streams of the ORR are not likely habitats for these species because, according to Loar,[5] the species require large, free-flowing streams or rivers. Thus, the impoundments on the Clinch River apparently preclude the presence of suitable habitat for these species at the ORR. In 1961, a survey by Van der Schalie and Burch[6] at about 300 locations on and near the ORR failed to find any of these T&E or "in need of management" species.

Construction projects on the ORR and operation of the DOE facilities probably do not affect water quality in the Clinch River and its impoundments to the extent that T&E mussel species are precluded, although potential effects cannot be categorically discounted. Because of the small potential for impacts and because T&E mollusks probably do not occur near the ORR, this document does not discuss these T&E species individually, but only lists them and indicates their status in Table 1.

3.2 FISH

Three T&E fish species have been recorded in Roane and/or Anderson counties but are not known to occur on the ORR or in the Clinch River adjacent to the ORR. These are the blue sucker (recorded in the Emory River), spotfin chub (Emory River), and yellowfin madtom (Clinch River prior to 1900).[7,8] The blue sucker and spotfin chub are not likely to be found in ORR streams

Table 1. Status of threatened and endangered species on the Oak Ridge Reservation (ORR)[a]

Species	Legal status		ORR status	Recommended action
	Federal	State		
Invertebrates				
Birdwing pearly mussel (*Conradilla caelata*)	E	E	County	None
Dromedary pearly mussel (*Dromus dromas*)	E	E	County	None
Yellow-blossom pearly mussel (*Epioblasma florentina*)	E	E	County	None
Tubercled-blossom or green-blossom pearly mussel (*Epioblasma torulosa*)	E	E	County	None
Turgid-blossom pearly mussel (*Epioblasma turgidula*)	E	E	County	None
Tan riffle shell pearly mussel (*Epioblasma walkeri*)	E	E	County	None
Fine-rayed pigtoe pearly mussel (*Fusconaia cuneolus*)	E	E	County	None
Shiny pigtoe pearly mussel (*Fusconaia edgariana*)	E		County	None
Pink mucket pearly mussel (*Lampsilis orbiculata*)	E	E	County	None
Alabama lamp pearly mussel (*Lampsilis virescens*)	E		County	None
White warty back pearly mussel (*Plethobasus cicatricosus*)	E	E	County	None
Orange-footed pearly mussel (*Plethobasus cooperianus*)	E	E	County	None
Rough pigtoe pearly mussel (*Pleurobema plenum*)	E	E	County	None
Cumberland monkeyface pearly mussel (*Quadrula intermedia*)	E	E	Range	None
Appalachian monkeyface pearly mussel (*Quadrula sparsa*)	E	E	Range	None
Pale lilliput pearly mussel (*Taxolasma cylindrellus*)	E	E	Range	None
Cumberland bean pearly mussel (*Villosa trabalis, V. perpurpurea*)	E	E	County	None
Painted snake coiled forest snail (*Anguispira picta*)	T	E	Range	None
Chittenango ovate amber snail (*Succinea chittenangoensis*)	T	T	Range	None
Fish				
Blue sucker (*Cycleptus elongatus*)		T	County	None
Spotfin chub (*Hybopsis monacha*)	T	E	County	None
Yellowfin madtom (*Noturus flavipinnis*)	T	E	County	None
Amphibians and reptiles				
Tennessee cave salamander (*Gyrinophilus palleucus*)		T	County	None
Northern pine snake (*Pituophis melanoleucus*)		T	Range	None

Table 1. (continued)

Species	Legal status		ORR status	Recommended action
	Federal	State		
Birds				
Osprey (*Pandion haliaetus*)		E	WV, U	Manage
Bald eagle (*Haliaeetus leucocephalus*)	E	E	V, R	None
Northern harrier (*Circus cyaneus*)		T	WV, R	None
Cooper's hawk (*Accipiter cooperii*)		T	PR, U	None
Sharp-shinned hawk (*Accipiter striatus*)		T	County	None
Peregrine falcon (*Falco peregrinus*)	E	E	County	None
Red-cockaded woodpecker (*Picoides borealis*)	E	E	Range	None
Bewick's wren (*Thryomanes bewickii*)		T	Range	None
Bachman's sparrow (*Aimophila aestivalis*)		E	SR, R	Survey
Grasshopper sparrow (*Ammodramus savannarum*)		T	SR, U	Survey
Mammals				
Gray bat (*Myotis grisescens*)	E	E	County	Survey
Indiana bat (*Myotis sodalis*)	E	E	Range	Survey
River otter (*Lutra canadensis*)		T	Range	None
Eastern cougar (*Felis concolor*)	E	E	V, R	None

[a]Legend:

County—The species has occurred in Anderson or Roane counties, according to the records of the Tennessee Heritage Program.
Range—The ORR lies within the geographic range of the species, but occurrence records on the ORR and in Anderson and Roane counties are lacking.
None—No systematic population surveys are recommended specifically for the species at this time.
Manage—Habitat management to promote the species population is recommended.
Survey—Systematic population surveys are recommended.
E—Endangered
PR—Permanent (year-round) resident
R—Rare
SR—Summer resident (does not occur in winter)
T—Threatened
U—Uncommon (more numerous than rare species)
V—Visitor (nonbreeding individuals occur sporadically or occasionally)
WV—Winter visitor (does not occur in summer)

Sources: References 4, 7, and 24, and personal observations by ORNL staff.

because of their preference for larger streams and rivers.[5] The threatened status of the blue sucker was largely the result of river impoundment, which caused siltation and obstruction of spawning runs. The spotfin chub needs large, clear streams with boulder-strewn areas, gravel substrates, and considerable current.[9] Thus, the occurrence of these species at the ORR is apparently precluded by the impoundment of the Clinch River. The habitat of the yellowfin madtom varies from small, pristine, silt-free trout streams to larger, warm, silty

Table 2. Wildlife in need of management[a]

Fish	
Southern brook lamprey	*Ichthyomyzon pagei*
Silver lamprey	*I. unicuspis*
Pallid sturgeon	*Scaphirhynchus albus*
Alligator gar	*Lepisosteus spatula*
Alabama shad	*Alosa albamae*
Flame chub	*Hemitremia flammea*
Plains minnow	*Hybognathus placitus*
Sturgeon chub	*Hybopsis gelida*
Lined chub	*H. lineapunctata*
Sicklefin chub	*H. meeki*
Blacknose shiner	*Notropis heterolepis*
Roseface shiner	*N. r. rubellus*
Palezone shiner	*N.* sp. *(cf. N. procne)*
Mountain redbelly dace	*Phoxinus oreas*
Highfin carpsucker	*Carpiodes velifer*
Harelip sucker	*Lagochila lacera*
Blackfin sucker	*Moxostoma atripinne*
Southern cavefish	*Typhlichthys subterraneus*
Golden topminnow	*Fundulus chrysotus*
Crystal darter	*Ammocrypta asprella*
Naked sand darter	*A. beani*
Scaly sand darter	*A. vivax*
Sharphead darter	*Etheostoma acuticeps*
Emerald darter	*E. baileyi*
Teardrop darter	*E. barbouri*
Splendid darter	*E. barrenense (Ulocentra* sp.*)*
Orangefin darter	*E. bellum*
Ashy darter	*E. cinereum*
Redband darter	*E. luteovinctum*
Finescale darter	*E. microlepidum*
Arrow darter	*E. sagitta*
Tippecanoe darter	*E. tippecanoe*
Tuscumbia darter	*E. tuscumbia*
Jewell darter	*E. (Doration)* sp.
Striated (Duckriver barcheek) darter	*E. striatulum*
Tangerine darter	*Percina aurantiaca*
Blotchside logperch	*P. burtoni*
Slenderhead darter	*P. phoxocephala*
Blackfin darter	*P. (Odontophilus)* sp.
Amphibians	
Hellbender	*Cryptobranchus a. alleganiensis*
Green salamander	*Aneides aeneus*
Mole salamander	*Ambystoma talpoideum*
Black mountain dusky salamander	*Desmognathus welleri*
Four-toed salamander	*Hemidactylium scutatum*
Barking treefrog	*Hyla gratiosa*

Table 2. (continued)

Reptiles	
Alligator snapping turtle	*Macroclemys temmincki*
Bog turtle	*Clemmys muhlenbergi*
Cumberland slider	*Pseudemys scripta troosti*
Green anole	*Anolis carolinensis*
Six-lined racerunner	*Cnemidophorus sexlineatus*
Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*
Green water snake	*Natrix cyclopion*
Birds	
Double-crested cormorant	*Phalacrocorax auritus*
Anhinga	*Anhinga anhinga*
Least bittern	*Ixobrychus exilis*
Great egret	*Casmerodium albus*
Black-crowned night heron	*Nycticorax nycticorax*
Black vulture	*Coragyps atratus*
Red-shouldered hawk	*Buteo lineatus*
Sandhill crane	*Grus canadensis*
Common barn owl	*Tyto alba*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Swainson's warbler	*Limnothlypis swainsonii*
Vesper sparrow	*Pooecetes gramineus*
Lark sparrow	*Chodestes grammacus*
Mammals	
Masked shrew	*Sorex cinereus*
Smoky shrew	*S. fumeus*
Southeastern shrew	*S. longirostris*
Longtail shrew	*S. dispar*
Water shrew	*S. palustris*
Star-nosed mole	*Condylura cristata*
Hairy-tailed mole	*Parascalops breweri*
Small-footed bat	*Myotis leibii*
Rafinesque's (Eastern) big-eared bat	*Plecotus rafinesquii*
Eastern woodrat	*Neotoma floridana*
Southern bog lemming	*Synaptomys cooperi*
Meadow jumping mouse	*Zapus hudsonius*
Woodland jumping mouse	*Napaeozapus insignis*

[a]As designated by the Tennessee Wildlife Resources Agency, November 1986.

rivers. The decline of this species is difficult to explain but may have resulted from "olfactory noise"[9] or river impoundment.[7] No T&E fish have been located in ongoing systematic surveys of ORR streams.[10]

3.3 REPTILES AND AMPHIBIANS

In Tennessee, the northern pine snake is listed as threatened and occurs locally in sandy pine woods or dry mountain ridges in the eastern two-thirds of the

state. Elevations below 500 ft are preferred, although the snake has been found up to 2000 ft.[7] An organized search for herpetofauna on the ORR[11] and casual field visits since then have failed to record this species. According to Jerry Klein of ORNL's Chemical Technology Division, who is an expert on snake distribution in the Oak Ridge area, the nearest record for the pine snake is of one at Catoosa Wildlife Management Area.[12] Apparently, no local populations of this snake are present near Oak Ridge.

The Tennessee cave salamander inhabits caves with streams and pools in the Ridge and Valley Province, including Roane and Anderson counties, but has not been recorded on the ORR. Whether ORR caves provide suitable habitat for this species is unknown, and surveys have not been conducted.

3.4 BIRDS

3.4.1 Endangered in the United States and Tennessee

The bald eagle occurs fairly regularly in East Tennessee, primarily on the numerous reservoirs of the Tennessee River system. The eagles are more frequent during the winter than during the summer. The winter eagles are probably mostly of the northern race, originating from several northern states and Canada. Eagles occurring in the summer may originate from the endangered breeding population in Florida and other southern states where nesting occurs in the winter.[13] No eagles are known to nest in the area around the ORR, although the large lakes in the area apparently provide suitable habitat. An attempt is currently being made to develop a breeding population of eagles in western Tennessee in the Reelfoot Lake and Land-Between-The-Lakes areas. Tentative plans for East Tennessee are to begin reintroduction in a few years, concentrating on the larger reservoirs such as Chickamauga and Norris lakes.[14,15]

The peregrine falcon has not been recorded on the ORR. However, it may occur in the area as an extremely rare migrant or winter visitor. Peregrine falcons are not known to have bred in Tennessee during the last 30 years. Historical nesting records include Roane and Knox counties.

The red-cockaded woodpecker is a resident species of pine forests in the southeastern United States. It nests in mature to old-age pine trees infected with the fungal red heart disease.[16,17] In Tennessee the population is at the northern limits of its range and as of 1977 may have numbered from 6 to 25 birds.[17] Since 1971, red-cockaded woodpecker colonies have been found at five separate locations in Tennessee, all in eastern Tennessee. These are Pickett State Park in Pickett County, Cherokee National Forest in Polk County, Great Smoky Mountains National Park in Blount County, private land in Campbell County, and Catoosa Wildlife Management Area in Cumberland and Morgan counties. The ORR is centrally located with respect to these areas and is only about 25 km (15 miles) from the Catoosa Wildlife Management Area. Therefore, the ORR is located in an area that could potentially be colonized by these East Tennessee birds. The future of the red-cockaded woodpecker in Tennessee, however, is bleak, because the Campbell County, Blount County, and Catoosa colonies have recently disappeared or decreased drastically.[15] Mature or old growth pine habitat for the woodpecker is

currently lacking on the ORR. With time and proper management, however, the ORR's numerous pine plantations could develop into suitable habitat.

3.4.2 Endangered Only in Tennessee

The osprey population declined to only two breeding pairs in the state prior to 1978 as a result of DDT poisoning. Since then the number of breeding pairs has increased, aided by a reintroduction and management program in the Tennessee River Valley.[18] Seventeen active nests are now located on Watts Bar Lake in Rhea, Meigs, and Roane counties downstream from the ORR.[14] Those nearest the Reservation include a few at Paint Rock Refuge about 13 miles west-southwest of Melton Hill Dam. Ospreys frequent Melton Hill Lake during winter, spring, and fall and may eventually attempt to nest there. Nest platforms over water or in ORR pastures near the lake might attract this species.

The Bachman's sparrow typically occurs in open pine woods with a heavy ground cover of grasses, shrubs, and brush; in weedy abandoned fields; in open wooded pastures; and in very young pine plantations.[19] This species formerly occurred throughout Tennessee but recently has been very rare and locally distributed. Because apparently suitable habitat is plentiful, the reasons for this species' decline are unknown. As of 1976, evidence of breeding (i.e., nests or juvenile birds) in Tennessee had been recorded on only four occasions during the previous 30 years. Prior to 1982, the last record in the Oak Ridge area was of a pair of adult birds on the ORR at Bear Creek Road and Highway 95 on June 20, 1975.[19] In late May 1982, two singing territorial males were observed several times over a two-week period 1 km (0.6 mile) northwest of the ORNL central facilities area (observation by the author). Both were in very young pine plantations with a dense growth of tall grasses. By 1986, the pine canopy had closed and the birds were absent. Habitats that appear to be suitable for this species occur in several areas on the ORR.

3.4.3 Threatened Only in Tennessee

The northern harrier (marsh hawk) in Tennessee is an uncommon-to-rare migrant and winter resident that frequents weedy or grassy open fields or very young pine plantations throughout the state. On the ORR, no particularly attractive areas of sufficient size are present for this species, although it has been seen flying over young pine plantations (observation by the author).

The Cooper's hawk is a very secretive permanent resident of dense forest in Tennessee and, in contrast to other hawks (such as the red-tailed, broad-winged, and red-shouldered), is seldom seen in open areas. As a breeding bird, it is uncommon to rare in Tennessee but may be expected in every county.[7] It feeds primarily on other birds, and, being located near the top of the food chain, its populations may have declined from ingesting the DDT that accumulated in its prey. Since 1975, this hawk has been seen several times during the breeding season on the ORR (observations by the author), where it probably nests. In Tennessee, the nest is usually in a deciduous tree, rarely in a conifer, and is often 12 m (40 ft) or more above the ground.

The sharp-shinned hawk is similar ecologically to the Cooper's hawk but prefers dense coniferous forest for nesting in Tennessee. It is a rare permanent resident that may be expected in every county of the state.[7] This species has not been

recorded on the ORR during the breeding season.

The Bewick's wren is a permanent resident throughout Tennessee. The wren was formerly very common, but it suffered drastic population declines for unknown reasons and today is locally uncommon to rare. It occurs most frequently in rural areas, often near old homesites, farmsites, or residences having nearby grassy areas, gardens, hedgerows, brush piles, thickets, and weedy fence rows. This wren has not been recorded in recent years on the ORR, where there is probably little or no suitable habitat.

The grasshopper sparrow was formerly a fairly common summer resident in grassy or weedy fields throughout the state. Its populations are now much reduced and are extirpated from some former breeding areas, even though apparently suitable habitat is still abundant. On the ORR, this species has been recorded during the breeding season in idle pasture with tall grasses between Y-12 and Bethel Valley Road (observations by the author).

3.5 MAMMALS

The gray bat hibernates and raises its young in caves and is almost unknown outside of caves except for nightly foraging flights.[20,21] Although highly selective in their choice of caves, these bats occur in a large number of counties in Tennessee, where they are not considered rare.[7] Nearly the entire species population (90 to 95%) hibernates in only a few caves, which makes the bat particularly susceptible to disturbance and extinction. In Tennessee, gray bats have been recorded primarily in Middle Tennessee and in an area east-northeast of Knox, Anderson, and Campbell counties. There are no records for Roane County.

The Indiana bat has been recorded in several areas in Tennessee, but not in Anderson, Roane, or adjacent counties other than Campbell County. It hibernates in caves during the winter and raises its young in maternal colonies located primarily in floodplain hardwood forests along streams.[7,22] Several caves have been designated as critical habitat for Indiana bats. One such cave is in Tennessee's Blount County (50 CFR Part 17.95), which lies about 16 km (10 miles) southeast of the ORR. Although no surveys have been conducted to locate Indiana bats on the ORR during the spring and summer, it is possible that maternity colonies are located in the area.

The eastern cougar, which was probably once common in many parts of Tennessee, no longer is known to have a surviving population in the state or anywhere in the eastern United States other than Florida. A concerted search for cougars by several state and federal agencies in the eastern United States did not obtain conclusive evidence of a cougar population.[23] Although many possible cougar sightings have been reported in recent years, these may represent individuals of the western race that were in captivity but escaped or were released.[23] The ORR may provide suitable habitat for cougars because of the lack of human disturbance and the presence of a growing deer herd that could provide suitable prey.

The river otter, threatened in the state of Tennessee, has been recorded in Anderson, Morgan, and Cumberland counties but not in adjacent counties to the south, including Roane County.[7] It inhabits streams, rivers, and lakes, usually bordered by forest. Otters have not been recorded on or near the ORR and would probably not find particularly suitable habitat here.

4. SURVEYS AND MANAGEMENT PLANS

4.1 PAST SURVEYS AND GENERAL APPROACH

Many animal population surveys have been performed on the ORR, but these were typically limited in scope to small study sites and to certain taxonomic or ecologic groups of species and provided little information on T&E species. Summaries or general overviews of these past surveys are presented in refs. 5 and 24–31. Specific research projects involving animal surveys have been reported for mussels and other macroinvertebrates,[6] macroinvertebrates and fish,[5,32–34] fish,[35,36] amphibians and reptiles,[11] and birds.[37–42] Long-term studies of fish and macroinvertebrates of various ORR streams are currently under way, and the results will be published periodically.

T&E animal species that occur on the ORR or that have a high probability of immigrating to the Reservation should be considered in land use planning and Reservation management. Because data are limited, the most immediate management goal is to perform population surveys to obtain information on the ORR occurrence and immigration potential of these species. A management program also requires accurate information on the species' habitat requirements. This information may be obtained by studies of vegetation and other habitat features where these species are known to occur in the Oak Ridge area.

The following sections discuss the need for population surveys, habitat studies, and management plans for T&E species, with regard to their known or potential occurrence on the ORR. ORNL's Environmental Sciences Division (ESD) will periodically contact the TWRA and perform surveys to obtain new information on the occurrence of these species in the Oak Ridge area. An annual report of surveys, results obtained, and plans for the following year will be submitted to the Resource Management Organization (RMO). This document and the annual reports will also be submitted to the TWRA and FWS for review and comment.

4.2 MOLLUSKS AND FISH

Because T&E mollusks and fish probably do not occur on or near the ORR and suitable habitat is absent at least for bivalve mollusks (Sect. 3.1), management plans for these species are not needed at this time. ESD is currently conducting long-term surveys of the fish and macroinvertebrate communities in many ORR streams. Reports of these surveys are published periodically. If any T&E species is found, surveys and management plans will be developed accordingly.

4.3 REPTILES AND AMPHIBIANS

Because no T&E reptiles and amphibians are known to occur on or near the ORR or would occur in limited habitats

subject to development, no surveys or management actions are needed immediately. A survey of caves should be conducted at some time to determine the status of the Tennessee cave salamander on the ORR.

4.4 BIRDS

Suitable habitat for a few nesting pairs of ospreys and bald eagles is present at Melton Hill Lake. Although there appears to be little chance for eagles to begin nesting here in the near future, ospreys already nest on Watts Bar Lake and could easily disperse to Melton Hill Lake (Sect. 3.4). Ospreys generally nest in large trees, on the cross beams of electrical poles, on large buoys in lakes and bays, and on artificial nesting platforms. They prefer platforms above water rather than land[14] and have had very high nesting success on such platforms.[43,44] To aid osprey population growth in the Oak Ridge area, the TWRA plans to erect several osprey nest platforms on Melton Hill Lake and on the Clinch River below Melton Hill Dam in 1987.[45]

The chance of attracting peregrine falcons to this area is extremely remote without an organized program to reestablish peregrines in the East Tennessee region. Such programs have been successful in several areas of the United States.[46] Peregrines nest on high cliffs near water, on bridge abutments, and recently on office towers. They forage in nonforested areas, where they feed almost exclusively on small birds, including pigeons, shorebirds, robins, flickers, and swallows. The most likely nest sites at the ORR are probably not very suitable or attractive to this species because they are not very high and are quite susceptible to human disturbance. Bull Bluff, a small rock cliff over water near Clark Center Recreational Area, is one possible nest site that could be managed to make it more suitable for peregrines. With the absence of peregrines at this time, however, no management plans are needed.

Populations of the red-cockaded woodpecker in East Tennessee have dwindled drastically during the last several years to a small number of birds that probably represents a nonviable population. Therefore, the future immigration of this species to the ORR appears highly unlikely, and habitat management plans are not needed immediately. Nevertheless, the possibility of developing suitable habitat on the Reservation for a red-cockaded woodpecker population of viable size will be investigated. This investigation may result in a recommendation to allow some of the ORR's pine plantations to grow to old age.

The Bachman's sparrow, one of the rarest nesting songbirds in Tennessee,[7] occurred on the ORR several years ago in a habitat that was suitable at that time but is not now (Sect. 3.4). Nevertheless, this species may be present in other areas, which will be surveyed during future breeding seasons. If this sparrow occurs on the Reservation or in nearby areas, consideration will be given to conducting habitat studies and developing management plans to promote the species. Although a variety of habitats may be suitable, the specific habitat type that would be promoted through management would be similar to that in which the sparrow occurs or has occurred in the Oak Ridge area. The most likely form of management would be to thin out young pine plantations to allow extensive grassy areas to develop among the pines.

The northern harrier occurs strictly as a migrant or winter visitor on the ORR,

where habitats will probably never be important to this species. Management plans are therefore not recommended.

Forested habitats present throughout the ORR as well as in surrounding areas appear well suited to Cooper's and sharp-shinned hawks. Therefore, management to promote these species would probably not be practical.

Although ORR habitats are probably not suitable for Bewick's wrens, apparently suitable habitat occurs extensively in areas surrounding the Reservation as well as throughout most of Tennessee. Management of habitats on the ORR is therefore not recommended.

The grasshopper sparrow is another species for which apparently suitable habitats are present in the Oak Ridge area and much of Tennessee as well as on the ORR. Weedy pastures and other grassland habitats on the ORR will be surveyed in future breeding seasons to determine the presence and distribution of this species and the need for vegetation surveys and management plans.

4.5 MAMMALS

The gray bat and the Indiana bat occur in East Tennessee and may occur on the ORR. Systematic field surveys are needed for these species and should be conducted by researchers who are expert at such surveys (which require mist netting) and at bat species identification. ESD plans to explore the possibility of contracting with recognized experts to perform this work. Survey sites would include caves for the gray bat and woodland streams (e.g., East Fork Poplar Creek and Bear Creek) for Indiana bat maternity colonies. If either species is found, the specific site(s) of occurrence could be protected from disturbance.

The eastern cougar and river otter probably do not occur on or near the ORR. Because individuals of these species range over large areas and a wide variety of habitats, they are not easily managed or protected. Systematic surveys and management plans are not recommended at this time.

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