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Survey of Protected Terrestrial Vertebrates on the Oak Ridge Reservation

1995 Annual Progress Report

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Survey of Protected Terrestrial Vertebrates on the Oak Ridge Reservation

1995 Annual Progress Report

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PREFACE

This technical report discussing surveys of threatened and endangered terrestrial vertebrates on the Oak Ridge Reservation was prepared as an annual progress report. This work was performed under Work Breakdown Structure 1.4.12.2.3.04.06 (Activity Sheet 8304) and Milestone Number 8304-03-01, "Issue Progress Report on Environmentally Sensitive Areas Surveys."

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EXECUTIVE SUMMARY

This progress report discusses surveys of protected terrestrial vertebrates on the Oak Ridge Reservation (ORR) from October 1994 through September 1995. These surveys are important to help avoid or minimize potential impacts of projects on the ORR to species listed as threatened, endangered, or in need of management by the U.S. Fish and Wildlife Service and the Tennessee Wildlife Resources Agency.

Currently, there are 69 species of federally or state-listed terrestrial vertebrates (20 reptiles and amphibians, 20 mammals, and 29 birds) that may occur in Tennessee. Not all of these are expected to occur on the ORR, nor do resources permit comprehensive sampling for all of them over the entire ORR. To effectively organize sampling efforts, listed animal species that might be present were targeted using a prioritization system based on historical and recent sightings, species distributions, literature reviews, and personal communications.

Sampling was conducted during the time of the year when each targeted species would most likely be encountered. Several trapping and surveying methods were used, including pitfall traps, Sherman traps, seining, artificial covers, and cave and avian surveys.

Thirty-seven species of reptiles and amphibians were observed or collected from October 1994 through September 1995. The coal skink was the only listed species provisionally found (i.e., independent verification was not available). Particular effort was made to find the listed mole salamander, but none were located.

Fifteen species of mammals were trapped during the reporting year. Of the 13 threatened, endangered, or in-need-of-management species targeted, 2 were located: the federally endangered gray bat (1 verified and 1 unverified sighting) and the state in need of management southeastern shrew (13 trapped).

Fourteen species of listed birds were sighted from October 1994 through September 1995. Multiple sightings were recorded for all species except for the anhinga, the sandhill crane, and the peregrine falcon (one sighting each). The species sighted that are listed as in need of management are sharp-shinned hawk, Cooper's hawk, grasshopper sparrow, anhinga, great egret, northern harrier, olive-sided flycatcher, little blue heron, sandhill crane, double-crested cormorant, and yellow-bellied sapsucker. The species sighted that are federally listed as threatened are the peregrine falcon and bald eagle. The osprey is the only species sighted that is listed as threatened by the state.

Research on this project will continue from October 1995 through May 1996. Sampling plans and other work for this period include surveys for the jumping mouse, southeastern shrew, and Tennessee cave salamander. Habitat analysis will be conducted at all previous and new sampling sites. Active searches will continue at various locations for reptiles and amphibians. Bird surveys will continue with winter point counts, monitoring of the fall and spring migrations, and a bald eagle count. A final report will be prepared at the conclusion of the research.

1. INTRODUCTION

Animal species in Tennessee are protected by both federal and state laws. The federal Endangered Species Act confers protection on species listed as either threatened or endangered; federal agencies may not undertake actions which might harm these species without assessing the impacts of the action on the listed species, and under appropriate circumstances consulting with the U.S. Fish and Wildlife Service. It is also advisable for federal agencies to consider species which are proposed for federal listing or which are candidates for proposal. In addition, the state of Tennessee lists species which are considered threatened, endangered, or in need of management (INM) in Tennessee [Tennessee Wildlife Resources Agency (TWRA) 1994a,b]. The state listing (Appendix A) includes federally listed species and others which are rare or declining in Tennessee. State law prohibits harming these species or their habitats without a permit. Thus, it is important that land managers know which state or federally listed species are present. Collectively, these species are termed threatened and endangered (T&E) species in this report.

Previous studies on the Oak Ridge Reservation (ORR) provide some indication on what currently listed species might occur (Howell and Dunaway 1958, Howell 1958, Johnson 1964, Kitchings and Mann 1976, Kroodsma 1987, Klein 1989, Kroodsma 1993). However, some historical survey areas have been substantially altered since the studies were conducted, and not all currently listed species have been searched for. The objective of the current study, therefore, is to validate and expand on these earlier efforts.

Currently, there are 69 species of federally or state-listed terrestrial vertebrates (20 reptiles and amphibians, 20 mammals, and 29 birds) that may occur in Tennessee. Not all of these would be expected to occur on the ORR, nor did resources permit comprehensive sampling for all of them over the entire ORR. To effectively organize sampling efforts, we designated priorities for listed animal species which might be present based on historical and recent sightings, species distributions, literature reviews, and personal communications (Evans 1995, Klein 1995, Kroodsma 1995). For reptiles, amphibians, and mammals, the priorities were as follows:

Priority 1: species which have a range that extends into the ORR (reptiles and amphibians) or which have been found previously on the ORR (mammals);

Priority 2: species which have been found in counties adjacent to the ORR;

Priority 3: species which have been found in eastern Tennessee within 100 miles of the ORR.

For birds, prioritization was slightly different because these animals are particularly mobile and can be wide ranging (with range changes resulting from human activities) and are frequently migratory over long distances. The two priority categories established for birds are as follows:

Priority 1: species judged likely to be found on the ORR;

Priority 2: species for which adequate habitat exists on the ORR but which are currently uncommon in eastern Tennessee.

Sampling efforts were focused on these species according to priority. Tables 1, 4, and 7 list Priority 1 species; Tables 2, 5, and 8 list Priority 2 species; and Tables 3 and 6 list Priority 3 species

(nonavian species only). Other federally and state-listed species which were not targeted for sampling are listed in Appendix B.

Table 1. Reptile and amphibian species which have a range that extends into the ORR (Priority 1)

Species	Sampling Season	Habitat	Sampling Technique
Tennessee cave salamander	January–December	Cave systems with permanent streams; pools in limestone	Survey cave
Four-toed salamander	September–March	Hardwood forests near sphagnum wetlands	Pitfall traps, active search, artificial cover, seine, bottom nets
Hellbender	January–December	Small rivers, large streams; clear cool running water, usually < 20° C w/ flat rocks	Electroshocking, seining, potato rake, active search
Eastern slender glass lizard	April–September	Dry upland areas, brushy cut-over woodlands, grassy fields	Artificial cover, active search
Coal skink	April–September	Wooded hillsides, creeks, rocky bluffs	Artificial cover, active search, pitfall traps
Northern pine snake	April–September	Sandy pine woods, dry mt. ridges, old fields with loose soils; asphalt	Artificial cover, active search

Table 2. Reptile and amphibian species found in counties adjacent to the ORR (Priority 2)

Species	Sampling Season	Habitat	Sampling Technique
Black mountain dusky salamander	April–October	Under stones in association with mountain brooks with moderate to weak currents	Pitfall traps, funnel traps, active search, artificial cover
Mole salamander	January–March	Moist low-lying woodland areas with ponds; terrestrial adults live in subterranean tunnels, under rotten logs, debris, leaf-litter	Seine, minnow traps, bottom nets, pitfall traps, artificial pools, artificial cover

Table 3. Reptile and amphibian species found in eastern Tennessee (within 100 miles from the ORR) (Priority 3)[1]

Species	Sampling Season	Habitat	Sampling Technique
Bog turtle	May–September	Sphagnum wetlands, swamps, meadows with clear slow-moving streams with muddy bottoms	Turtle traps, seine
Green anole	April–September	Trees, shrubs, vines, low vegetation; nesting occurs in dry rotting wood, leaf litter, sphagnum or trash piles	Pitfall traps, active search

[1] This list excludes species found only in high elevations of the Smoky Mountains.

Table 4. Mammal species which have been historically found on the ORR (Priority 1)

Species	Sampling Season	Habitat	Sampling Technique
Gray bat	January–December	Caves	Survey caves, mist net
Smoky shrew	March–September	Moist woodlands with rocks, decaying logs, leaf-litter	Sample wetlands with pitfall traps
Southeastern shrew	March–September	Flood plains, pine woods with rocks, decaying logs, leaf-litter	Sample wetlands and pines with pitfall traps

Table 5. Mammal species which have been found in counties adjacent to the ORR (Priority 2)

Species	Sampling Season	Habitat	Sampling Technique
Small-footed bat	January–December	Caves	Survey caves, mist net
Indiana bat	January–December	Caves, large trees	Survey caves, mist net
Rafinesque's big-eared bat	January–December	Unoccupied man-made structures, caves	Survey abandon buildings, caves, mist net
Woodland jumping mouse	August–September	Spruce/fir, hemlock hardwood forests, damp, rocky, swampy areas	Sample wetlands with Sherman traps, pitfall traps
Meadow jumping mouse	August–September	Open grassy areas with thick vegetation near ponds, streams, marshes	Sample wetlands with Sherman traps, pitfall traps
Southern bog lemming	January–December	Open grassy areas with thick vegetation near ponds, rocky edges of streams, marshes,	Sample wetlands with Sherman traps, pitfall traps
Eastern wood rat	January–December	Wooded, damp, rocky, swampy areas	Sample wetlands with Sherman traps, pitfall traps
Masked shrew	March–October	Moist woodlands with rocks, decaying logs, leaf-litter	Sample wetlands with pitfall traps

Table 6. Mammal species found in eastern Tennessee (within 100 miles of the ORR) (Priority 3)[1]

Species	Sampling Season	Habitat	Sampling Technique
Water shrew	March–October	Moist woodlands with rocks, decaying logs, leaf-litter, rocky overhangs near streams	Sample wetlands with pitfall traps
Yellow-nosed vole	March–October	Moist woodlands with rocks, decaying logs, leaf-litter	Sample wetlands with Sherman traps and pitfall traps

[1] This list excludes species found only in high elevations of the Smoky Mountains.

Table 7. Selected bird species most likely to be found on the ORR (Priority 1)[1]

Species	Sampling Season	Habitat	Sampling Technique
Yellow-bellied sapsucker	August–May	Open deciduous woods	Locate signs—maple trees
Cooper's hawk	Year around	Mixed or pine woods with openings	Locate nest
Sharp-shinned hawk	Year around	Mixture of woods and open country	Locate nest
Great egret	July–September	Shorelines and wetlands	Locate specific habitat
Northern harrier	Spring and Fall	Marsh, open country and weedy fields	Locate specific habitat
Bald eagle	Late summer and winter	Open water; tall trees	Search Clinch River and Melton Hill Lake
Osprey	May–October	Open water; platforms	Search Clinch River and Melton Hill Lake
Grasshopper sparrow	April–September	Grassy fields, broom sedge	Flushing, song identification

[1] Sampling seasons are taken from Hamel 1992.

Table 8. Bird species for which adequate habitat exist on ORR but are uncommon in eastern Tennessee (Priority 2)[1]

Species	Sampling Season	Habitat	Sampling Technique
Snowy egret	July–September	Marshes, lake margins and wetlands	Locate specific habitat
Vesper sparrow	April–May; Oct–Nov	Pastures, grasslands with rocky hills	Flushing, song identification
Common barn owl	Year around	Open country, marshes, sheltered cavities	Search buildings, use calls
Little blue heron	July–September	Shorelines and wetlands	Locate specific habitat
Double-crested cormorant	May–July	Open water	Search Clinch River and Melton Hill Lake
Olive-sided flycatcher	Spring and Fall	Openings and dead trees	Locate specific habitat
Sandhill crane	Spring and Fall	Open shallow water; fields	Locate specific habitat
King rail	April–October	Marshes	Locate specific habitat
Least bittern	April–October	Marshes with tall cover	Locate specific habitat

[1] Sampling seasons are taken from Hamel 1992

2. MATERIALS AND METHODS

Sampling was conducted during the time of the year that each species would most likely be encountered. The selected sampling techniques were considered the most efficient methods available. Several trapping and surveying methods were used to conduct this survey; these methods are summarized in Tables 1 through 8 and are explained below.

2.1 SELECTION OF SURVEY SITES

To select survey sites for reptiles, amphibians and mammals, the ORR was divided into 10 compartments (Fig. 1). Five wetlands were selected in each compartment from Cunningham and Pounds (1991), based on professional judgement of their suitability (i.e. size and accessibility). Two sites were then chosen at random from the original five. Due to the lack of wetlands within compartments H and F, only 17 sites were chosen (Appendices C and D).

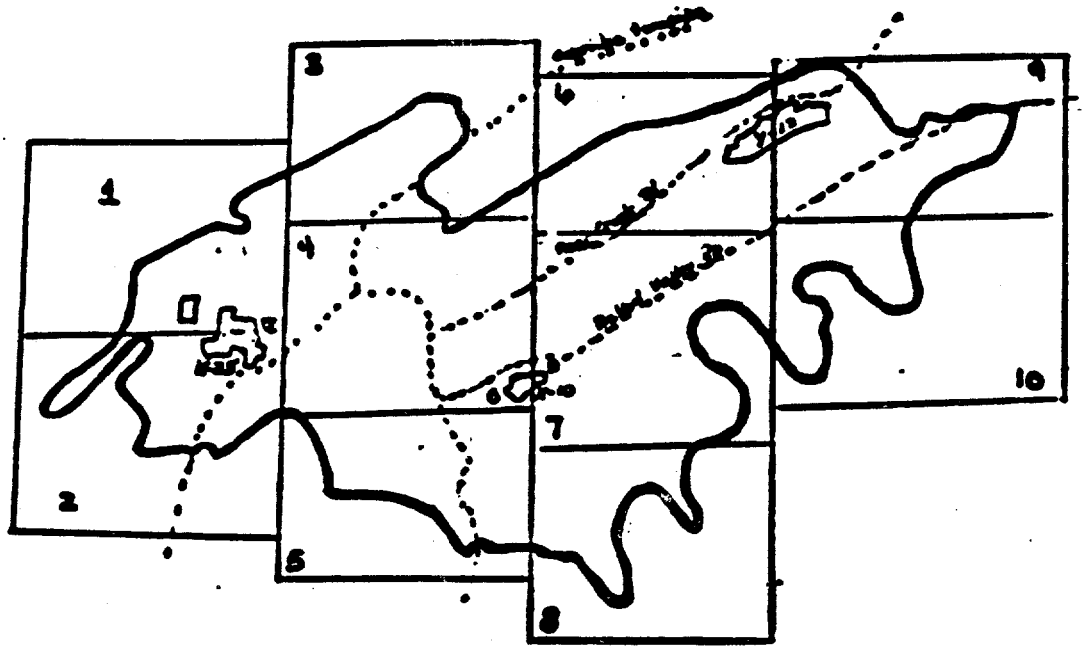

Fig. 1. Sampling compartments for reptiles, amphibians, and mammals on the ORR.

2.2 TRAPPING AND SURVEY METHODS

2.2.1 Pitfall Traps

The most effective way of capturing shrews and many amphibians is with pitfall or can traps (Karns 1986). Pitfall traps were suitable for some amphibian, reptile, and mammal species from all priority groupings; their use focused on the capture of the following animals:

Priority 1: smoky shrew, southeastern shrew, four-toed salamander, coal skink

Priority 2: masked shrew, black mountain dusky salamander, mole salamander

Priority 3: water shrew, green anole

Placement of pitfall traps was in a standard grid pattern, surrounding the wetland with traps at 10-meter intervals (Fig. 2). The traps were #10 cans buried in the ground deep enough for the tops to be flush with the surface (Fig. 3). All cans had holes for drainage; these traps were not baited. The total number of traps at each site varied with wetland size, but did not exceed 50. One week was allowed before trapping began for animals to adjust to habitat disturbances. During the trapping season (April-August), the traps were left open 24 hours a day for 3 consecutive days and were checked daily. When the traps were not in use they were deactivated by placing a stake into the can, thus allowing any captured animals to escape.

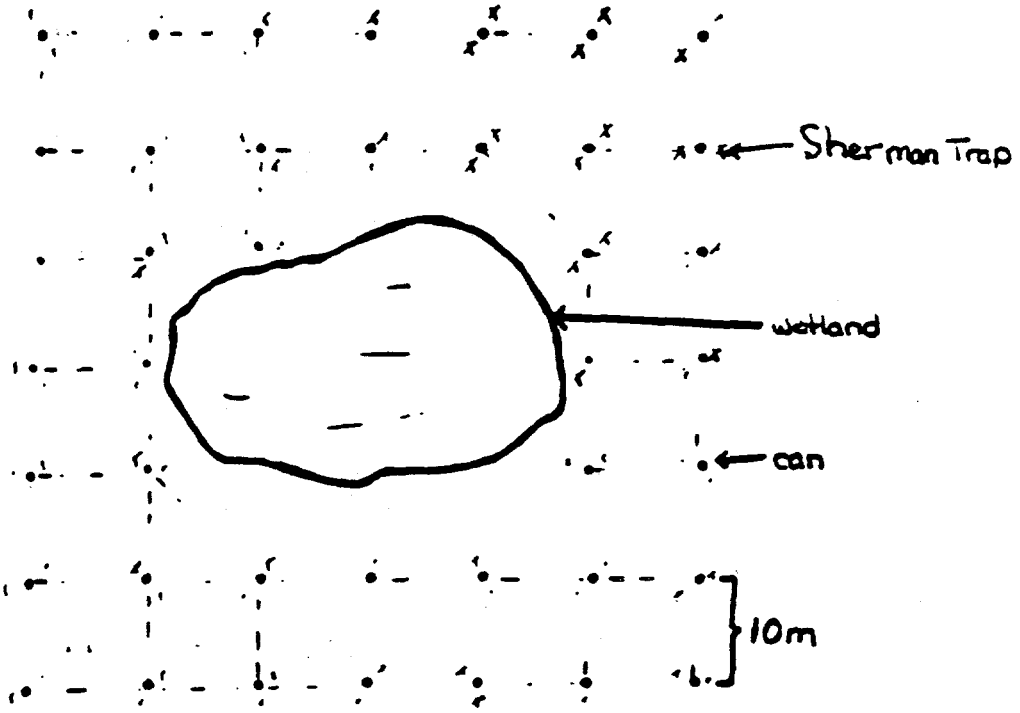

Fig. 2. Pitfall and Sherman trap grid placement.

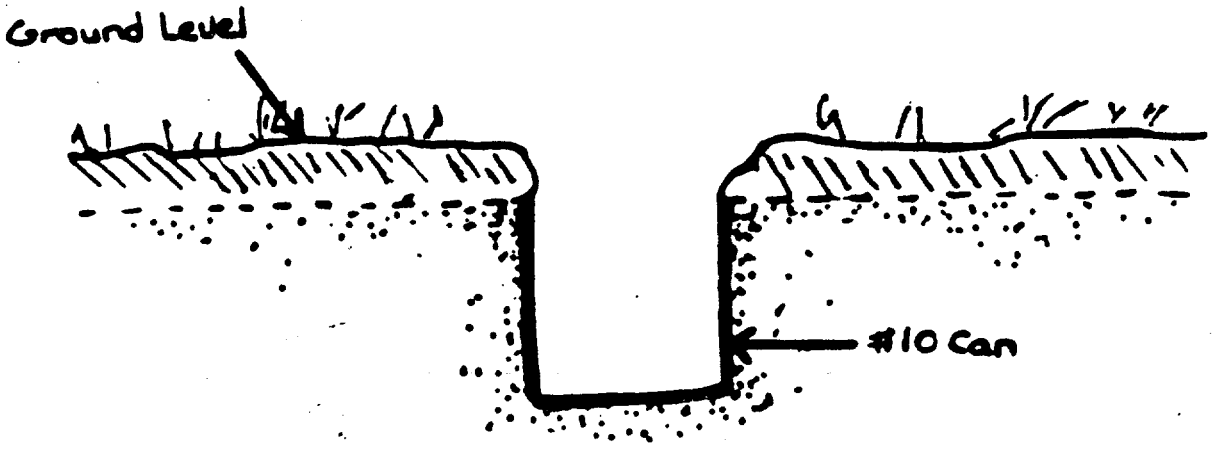

Fig. 3. Pitfall trap placement within the surface.

2.2.2 Sherman Traps

Sherman traps were suitable for Priority 2 and 3 mammal species; their use focused on the capture of the following mammals:

Priority 2: southern bog lemming, eastern wood rat, meadow jumping mouse and woodland jumping mouse

Priority 3: yellow-nosed vole

The habitat requirements of these animals are very similar to the "pitfall" group; therefore, Sherman traps were placed in the previously established pitfall sites. Three to five sites were trapped per week. The trapping was timed with increased species activity (e.g., breeding season). One trap was placed within 2 meters of each pitfall trap (Fig. 2). The traps were placed near rocks, fallen logs, and animal runways. The total number of traps varied with wetland size but did not exceed 50. The traps were baited with peanut butter and rolled oats. The traps were set in the afternoon of the first day, checked for 3 consecutive days, and then closed.

2.2.3 Seining

Seining is a quick and effective method of surveying amphibians in small ponds, wetlands and streams (Heyer et al. 1994). Semipermanent to permanent ponds within or near hardwood forests on the ORR were selected (Cunningham and Pounds 1991). This method was used to search for the mole salamander, a Priority 2 species.

A 4' × 8' seine with a 1/8" mesh net was used. Transects were established in ponds out to a depth of 4' and parallel to the shoreline (Fig. 4) (Copperrider, Boyd, and Stuart 1986). Information collected at each pond was the seine width, transect length, water and air temperature, local weather condition, gender, and total number of each species collected.

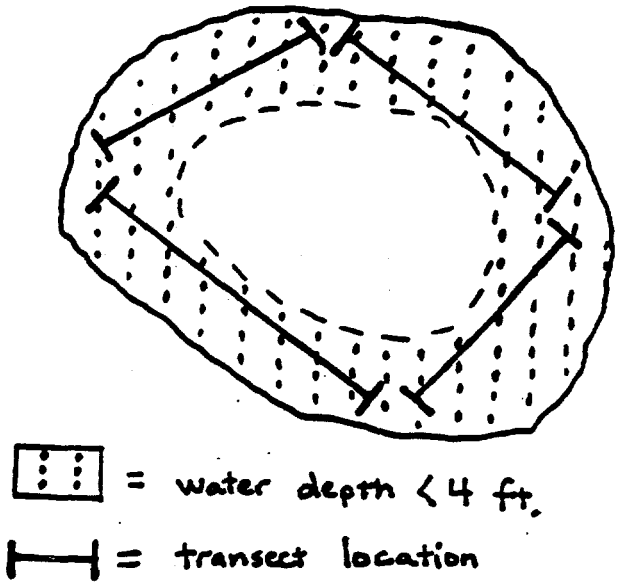

Fig. 4. Sampling design for pond seining.

2.2.4 Artificial Covers (Boards)

Artificial covers provide micro-habitats for a variety of animals from which they may be subsequently captured or identified. Covers are particularly suitable for encountering the following species:

Priority 1: eastern slender glass lizard and northern pine snake

Dry upland brushy habitats (e.g., power line rights-of-way, old fields) were selected to sample for the eastern slender glass lizard. Areas with pine stands or dry mountain ridges were selected for the northern pine snake. Artificial covers were constructed from scrap wood, approximately 3' × 3'. The wood was labeled, numbered, and monitored bimonthly during the appropriate sampling seasons (April-September). The artificial covers sites were located at Freels Bend, Bull Bluff, Gas Line Road, and McCoy Branch (Appendices C and D). Artificial covers were placed in appropriate sites in groups of 20.

2.2.5 Cave Entry

Cave entry was necessary to conduct surveys for the following species:

Priority 1: gray bat, Tennessee cave salamander

Priority 2: small-footed bat, Indiana bat, Rafinesque's big-eared bat

Currently 32 caves have been located on the reservation (Appendices E and F). Time restrictions only allowed for entry into five caves. Active searching was the sampling method.

2.2.6 Avian Survey

Most bird surveys used an active search approach, whereby the preferred habitat of each species is searched visually (using binoculars or spotting scope) and auditorially for their presence. In addition, some point counts were conducted in varied habitats across the reservation. The counts were conducted along old roads, trails, or in the middle of a specified habitat. As many habitat types as possible were covered. Thirteen routes were chosen across the reservation, each 2 to 4 miles long. Stopping points were located every 1/6 mile. At these points, all birds seen or heard were recorded (Hamel et al. 1994). The routes were surveyed in June, the prime nesting season for many species.

2.3 HABITAT ANALYSIS

Habitat analysis will be conducted at each of the 17 survey sites for reptiles, amphibians, and mammals. Variables to be recorded are given in Appendices G and H. This analysis will be taken to document changes over time in the event that future surveys are conducted. This general information will provide some habitat characteristics for areas where T&E species are located.

2.4 DOCUMENTATION

Information on captured animals was recorded on data sheets (Appendix H). In cases where identification could not be made in the field, the specimen was taken to the laboratory for further study. A photograph of each specimen was taken to document identification. Records, photos and identifications were also kept for nontargeted and unlisted species.

3. RESULTS

3.1 RESULTS FOR 1994

Appendix I lists the seven protected species located on the reservation during the 1994 sampling season, and Appendix J lists previous listed species (subsequently delisted) located in 1994.

Fiscal year 1994 results are published in *Environmentally Sensitive Areas Surveys Program, Threatened and Endangered Species Survey Progress Report*, ES/ER/TM-130 (Martin Marietta Energy Systems, Inc. 1994).

3.2 RESULTS FOR 1995

3.2.1 Reptiles and Amphibians

Thirty-seven species were observed/collected from October 1994 through September 1995. The coal skink (*Eumeces anthracinus*) was the only T&E species provisionally collected (Table 9). (A record is considered provisional when it cannot be independently verified by photograph or specimen). The coal skink feeds primarily upon insects; its habitat includes creeks, wooded hillsides, and rocky outcrops. Five different observation/collection methods were used: seining ponds, active searching, boards, pitfall traps, and Sherman traps (Table 9).

A particular effort was made to locate the listed and targeted mole salamander (Priority 1). Twenty ponds across the reservation were seined to sample for adult mole salamanders during the months of January–March 1995. Most ponds were abandoned cattle ponds surrounded by mixed pine/hardwood forest and old fields. Due to icing of the ponds it was not possible to revisit any sites. No mole salamanders were recovered, possibly also due to unfavorable weather.

Table 9. Reptiles and amphibians observed/collected on the ORR from October 1994 to September 1995. Bold entries indicate a listed species; a "?" indicates a provisional (unverified) record

Common Name	Genus Species	Site Location	Collection Method	Date Observed
Red-spotted newt	*Notophthalmus viridescens viridescens*	McCoy Branch, Freels Bend, Bethel Valley, Y-12 Burial Grounds, Y-12 Sludge Field, Meteorological Tower	Seining	January–March 1995
S. Mountain dusky	*Desmognathus ochrophaeus*	Melton Valley, E. Fork Poplar Cr.	Active Search	May, July 1995
N. Red salamander	*Psedotritonruber ruber* ssp.	Melton Valley, E. Fork Poplar Cr.	Active Search	May–August 1995
N. Dusky salamander	*Desmognathusfuscus* ssp.	Melton Valley, E. Fork Poplar Cr.	Active Search	May, August 1995
S. Two-lined salamander	*Euyce cirrigera*	Muskrat Marsh, Melton Valley	Active Search	November 1994, May 1995
N. Spring salamander	*Gyrinophilus porphyriticus porphyriticus* ssp.	Cooper Ridge Cave	Active Search	April 1995
N. Slimy salamander	*Plethodon glutinosus*	Cooper Ridge Cave, Flash Light Heaven Cave, Pinnacle Cave	Active Search	January, June 1995
Cave salamander	*Eurycea lucifuga*	Copper Ridge Cave, Flash Light Heaven Cave, Pinnacle Cave, Melton Valley, E. Fork Poplar Cr.	Active Search	January, June 1995
Six-lined racer	*Cnemidophorus sexlineatus sexlineatus*	E. Fork Poplar Cr.	Active Search	August 1995
S. Five-lined skink	*Eumeces inexpectatus*	Muskrat Marsh, Freels Bend , Walker Branch	Active Search	October 1994, May-September 1995
?Coal skink[1]	***Eumeces anthracinus ssp.***	**Freels Bend**	**Pitfall Traps**	**August 1995**
Ground skink	*Scinella lateralis*	Melton Valley, Freels Bend	Pitfall Traps	May–July 1995
Fence lizard	*Sceloporus undulatus hyacinthinus ssp.*	Freels Bend	Active Search	July–August 1995
Black rat snake	*Elaphe obsoleta obsoleta*	Shepherd's Cem., Gasline Rd., Freels Bend	Boards	June–July 1995
N. Copperhead	*Aglcistrodon contortix mokasen*	Freels Bend, Walker Branch	Active Search	July–August 1995

Table 9 cont.

Common Name	Genus Species	Site Location	Collection Method	Date Observed
Black king snake	*Lampropeltis getula nigra*	Freels Bend, McCoy Branch, Bull Bluff	Boards	June-September 1995
E. Worm snake	*Carphophis amoneus amoneus* ssp.	Shepherd's Cem., Muskrat Marsh, McNew Hollow, Bear Cr.	Boards	May–August 1995
N. Water snake	*Nerodia sipedon sipedon* ssp.	McCoy Branch, Bull Bluff	Boards, Active Search	June-September 1995
N. Brown snake	*Storeria dekayi dekayi* ssp.	Gasline Rd. E. Fork Poplar Cr.	Boards	May, July 1995
S. Ringneck snake	*Diadophis punctatus punctatus* ssp.	McNew Hollow, Bull Bluff	Boards	October 1994, September 1995
Corn snake	*Elaphe guttata guttata*	Freels Bend	Active Search	September 1995
N. Black racer	*Coluber constrictor constricor* ssp.	Gasline Rd.	Boards	May–August 1995
E. Garter snake	*Thamnophis sirtalis sirtalis* ssp.	McCoy Branch, Bull Bluff	Boards	June–August 1995
S. Leopard frog	*Rana utricularia*	Freels bend, Y-12 Burial Grounds, Meteorological Tower, Flashlight Heaven Cave, Perimeter Rd.	Pitfall Traps, Sherman Traps	March, June, August 1995 May–August 1995
Bull frog	*Rana catesbeiana*	Muskrat Marsh, Burns Cem., Freels Bend, Check Station	Pitfall Traps, Active Search, Seining	October–November 1994, April, August 1995
Gray tree frog	*Hyla versicolor*	0800	Active Search	April 1995
Spring peeper	*Pseudacris crucifer* ssp.	McCoy Branch	Active Search	April 1995
Green tree frog	*Hyla cinerea*	Freels Bend	Seining	January 1995
Upland chorus frog	*Pseudacris triseriata feriarum*	McNew Hollow	Active Search	March 1995
American toad	*Bufo americanus* ssp.	Meteorological Tower, McNew Hollow, Perimeter Rd.	Active Search, Pitfall Traps	March–June 1995
E. Narrow-mouthed toad	*Gastrophryne carolinensis*	Roger's Quarry, Freels Bend	Boards	June 1995
Snapping turtle	*Chelydra serpentina* ssp.	Freels Bend, Wood Duck Pond	Active Search	January, August 1995
Spiny softshell turtle	*Abalone spinifera spinifera*	K-25, Freels Bend	Active Search	May-September 1995
Red-eared slider	*Trachemys scripta elegans* ssp.	Freels Bend	Active Search	July 1995

Table 9 cont.

Common Name	Genus Species	Site Location	Collection Method	Date Observed
Midland painted turtle	Chrysemys picta marginata	Freels Bend	Active Search	July 1995
E. Box turtle	*Terrapene carolina carolina* ssp.	Walker Branch, E. Fork Poplar Cr., Freels Bend, Bull Bluff, Shepherd's Cem., McNew Hollow, Perimeter Rd., Burns Cem.	Active Search	July–August 1995

[1]In need of management species.

3.2.2 Mammals

The following 15 species were collected during October 1994 through September 1995: white-footed mouse, deer mouse, eastern harvest mouse, golden mouse, southeastern shrew, least shrew, short-tailed shrew, eastern chipmunk, pine vole, meadow vole, hispid cotton rat, gray bat, raccoon, eastern cottontail rabbit, and opossum. Of the 13 T&E and in-need-of-management species targeted in this plan, 2 were located.

A gray bat (*Mytosis grisescens*, federally endangered) was collected from the Oak Ridge Y-12 Plant on October 31, 1994. A second possible (unverified) gray bat was collected from the Y-12 Plant on August 1, 1995. Gray bats roost in caves with vertical openings and feed mainly on night-flying insects (Harvey 1992).

The southeastern shrew (*Sorex longirostris*, state in need of management) was collected from eight locations from May through July 1994 (Table 10). Southeastern shrews are insectivores, living mainly in wetland habitats (Eagar and Hatcher 1980). They had been historically documented on the ORR by Howell and Dunaway (1958), captured in jar traps along White Oak Lake.

Table 10. Southeastern shrews (*Sorex longirostris*) captured in pitfall traps on the ORR from February through September 1995, by collection site

Collection Site	Date	No. Collected
Muskrat Marsh	May 10, 1995	2
Melton Valley	May 10, 1995	1
Wood Duck Pond	May 10, 1995	1
Wood Duck Pond	May 12, 1995	2
Check Station	June 6, 1995	1
Check Station	June 28, 1995	1
ORNL	July 12, 1995	1
E. Fork Poplar Cr.	July 20, 1995	1
Check Station	July 31, 1995	1
Bear Creek	September 26, 1995	1
Mc New Hollow	September 26, 1995	1

3.2.3 Cave Entry

Surveying 5 of the 32 caves on the reservation occurred from February through September 1995 (Appendices E and F). The cave salamander, slimy salamander, eastern pipistrel, big brown bat, and southern leopard frog were observed in the caves.

3.2.4 Avian Surveys

All bird species recorded during the breeding bird census are listed in Table 11. Records of T&E birds that have been found on the ORR are listed below. The header contains the following information: species' common name, scientific name, state or federal status, and four-letter species code. Several species have multiple sightings. Included in the sighting report is the date of observation, location of observation, number and gender observed, and observer's name(s). Appendix K lists affiliations of observers.

Below the sightings records, accounts are given for each species. The accounts include how commonly the species occurs on the ORR, nesting records, state distributions, and any conclusive historical records.

Table 11. Birds observed during 1995 breeding census on the ORR

Great blue heron	Downy woodpecker	Northern parula
Great egret*	Hairy woodpecker	Yellow-throated warbler
Little blue heron*	Northern (yellow-shafted) flicker	Pine warbler
Green-backed heron	Pileated woodpecker	Prairie warbler
Black-crowned night heron	Eastern wood-peewee	Black-and-white warbler
Canada goose	Acadian flycatcher	Ovenbird
Wood duck	Eastern phoebe	Kentucky warbler
Black vulture	Great crested flycatcher	Common yellowthroat
Osprey*	Eastern kingbird	Hooded warbler
Sharp-shinned hawk*	Tree swallow	Yellow-breasted chat
Red-shouldered hawk	Northern rough-winged swallow	Summer tananger
Red-tailed hawk	Cliff swallow	Scarlet tananger
American kestrel	Barn swallow	Northern cardinal
Wild turkey	Blue jay	Blue grosbeak
Northern bobwhite	American crow	Indigo bunting
Killdeer	Carolina chickadee	Rufous-sided towhee
American woodcock	Tufted titmouse	Chipping sparrow
Rock dove	White-breasted nuthatch	Field sparrow
Mourning dove	Carolina wren	Grasshopper sparrow*
Yellow-billed cuckoo	Blue-gray gnatcatcher	Song sparrow
Great horned owl	Eastern bluebird	Red-winged blackbird
Barred owl	Wood thrust	Eastern meadowlark
Chuck-will's-widow	American robin	Common grackle
Whippoorwill	Brown thrasher	Brown-headed cowbird
Chimney swift	Cedar waxwing	Orchard oriole
Ruby-throated hummingbird	European starling	House finch
Belted kingfisher	White-eyed vireo	American goldfinch
Red-bellied woodpecker	Red-eyed vireo	

*Listed species

Sharp-shinned hawk (*Accipiter striatus*) INM, SSHA

5/25/95 K-25 Site Visitor Overlook, 1 female, Blymiller
6/13/95 East Fork Poplar Creek (Duck Island), 1 male, Evans/Mitchell
6/16/95 East Fork Area (Herrell Road), 1 male, Evans/Mitchell
6/19/95 Bull Bluff Road, 1 male (carcass), Evans/Mitchell
6/19/95 K-25 Site Visitor Overlook, 1 male, Blymiller
6/29/95 East Fork Area (Herrell Road), 1 male, Mitchell
8/14/95 Freels Bend, 1 male, Mitchell/Evans
8/15/95 Walker Branch Road, 1 male, Evans
8/29/95 East Fork Poplar Creek (Gallaher Cemetery), 1 female, Mitchell/Vail
9/05/95 Freels Bend, 1 male, Evans

Common. The SSHA is a known permanent resident of the ORR. Male and female birds were sighted reservation-wide during the 1995 breeding season. **Record**: One previous nest location was reported in 1994 near the Jones Island area of Clinch River. The nest was located near Raccoon Creek on the TVA boundary line/gas line (Kroodsma 1995).

Cooper's hawk (*Accipiter cooperii*) INM, COHA

8/22/94 K-25 Site Portal 4, 1 juvenile, Evans/Blymiller
2/22/95 Bethel Valley Road, 1 male, Vail/Mitchell
3/12/95 Gasline Road, 1 individual, Evans/Mitchell
5/19/95 K-25 Site Area Grounds, 1 individual, Blymiller
3/07/95 K-25 Site 1330 Area, 1 individual, Blymiller
8/08/95 K-25 Site 1330 Area, 1 individual, Blymiller
8/11/95 Y-12 Lake Reality, 1 individual (immature), Evans/Roy

Common. The COHA is a known permanent resident of the reservation. Juvenile birds were sighted during the 1994 and 1995 breeding seasons.

Grasshopper sparrow (*Ammodramus savannarum*) INM, GRSP

5/08/95 Freels Bend-Clinch River, 1 individual, Mitchell
5/12/95 Freels Bend-Clinch River, 2 individuals, Ryon/Schilling/Carricco/Roy/Webb/Mitchell
5/8-8/30/95 Freels Bend-Clinch River, 2–10 individuals, Mitchell/Vail

Uncommon to rare on the ORR. Common in the region. The GRSP was found in one location on the ORR. Eight to ten birds were observed nesting in the Freels Bend area. This bird is likely to be found in other areas of the reservation where suitable habitat is maintained. **Record:** This species was reported during the breeding season in the area between the Y-12 Plant and Bethel Valley Road (Kroodsma 1987).

Anhinga (*Anhinga anhinga*) INM, ANHI

6/20/94 ORNL Swan Pond, 1 individual, Lane/O'Neil/Wojtowicz/Wilkerson

Rare transient. One recent record is known for the ANHI on the ORR. This bird was observed at the ORNL Swan Pond. This species is more often found in west Tennessee (Robinson 1990).

Great egret (*Casmerodius albus*) INM, GREG

6/11/94 Poplar Creek (near water tower), 1 individual, Evans/Mitchell
6/28/95 Poplar Creek (near boat launch), 1 individual, Evans/Herd
7/06/95 K-25 Site Beaver Ponds (near old salvage buildings), 1 individual, Evans/Mitchell
7/10-8/17/95 ORNL Swan Pond, 1–5 individuals, Evans, Roy, Mitchell
7/26/95 ORNL Swan Pond, 5 individuals, Webb/Mitchell
7/29/95 White Oak Lake Embayment, 2 individuals, Gehl, Evans, Mitchell
7/31/95 Freels Bend Land Bridge, 1 individual, Vail/Gehl
8/01/95 Freels Bend Land Bridge, 1 individual, Evans/Gehl
8/07/95 Freels Bend Land Bridge, 1 individual, Mitchell/Vail/Webb
8/11/95 K-25 Site K-901A Pond, 1 individual, Evans/Roy
8/14/95 Freels Bend Land Bridge, 1 individual, Evans/Mitchell
8/15/95 K-25 Site K-901A Pond, 1 individual, Mitchell
9/05/95 ORNL Swan Pond, 1 individual, Mitchell/Evans/Vail

Common migrant. The GREG can be found in several areas across the reservation during post-breeding dispersal.

Northern harrier (*Circus Cyanus*) INM, NOHA

9/7/94 McNew Hollow/Hembree Marsh, 1 individual, Mitchell
9/9/94 Raccoon Creek, 1 individual, Vail/Mitchell
9/20/94 0800 Area (along Clinch River), 1 male and 1 female, Vail/Mitchell

Common migrant. The NOHA has been sighted in three locations on the ORR. This secretive hawk is probably more common than records suggest. This species is not known to nest in this area and is considered a spring and fall migrant.

Olive-sided flycatcher (*Contopus borealis*) INM, OSFL

5/12/95, Freels Bend Road, 1 individual, Ryon/Roy/Schilling/Carricco
5/15/95, Freels Bend Road, 1 individual, Mitchell

Rare spring and fall migrant. Two sightings of the same bird exist for the OSFL. This species uses the ORR as a "stopover" as it travels to and from its nesting grounds in the boreal forest. Summer records have been reported from the Great Smoky Mountains National Park (Robinson 1990).

Little blue heron (*Egretta caerulea*) INM, LBHE

7/06/95 K-25 Site Beaver Pond (near old salvage buildings), 1 individual (immature), Evans/Mitchell
7/17/95 K-25 Site-K-901A Pond, 1 individual (immature), Gehl/Mitchell/Evans
7/18/95 K-25 Site-K-901A Pond, 1 individual (immature), Roy/Schilling/McCracken/Gehl/Mitchell
7/29/95 White Oak Lake Embayment, 1 individual (immature), Evans/Gehl/Mitchell
8/11/95 White Oak Lake Embayment, 1 individual (immature), Evans/Roy
8/31/95 White Oak Lake Embayment, 1 individual (immature), Evans/Roy

Uncommon to rare. Late summer visitor. Several sightings of what appeared to be only one LBHE were record in 1995. This bird was spotted in several wetlands across the ORR.

Sandhill crane (*Grus candensis*) INM, SACR

3/05/95 East Fork-K-25 Site Overlook, 1 individual, Evans/Mitchell

Uncommon spring and fall migrant. One current record exist for the SACR on the ORR. The bird landed in Poplar Creek, probably migrating north. Each year, reports are given on numbers of SACR observed flying over the ORR.

Double-crested cormorant (*Phalacrocorax auritus*) INM, DCCO

6/94 ORNL Swan Pond, 1 individual, Mitchell
5/05/95 Melton Hill Lake (near Consolidated Fuel Recycling Facility), 20–25 individuals, Brewer
5/12/95 Melton Hill Lake (near Consolidated Fuel Recycling Facility), 20–25 individuals, Brewer
7/05/95 Clinch River (near K-25 Site powerhouse), 1 individual, Brewer/Mitchell
8/31/95 Poplar Creek (west end), 2 individuals (immature), Evans/Roy

Common migrant. The DCCO has been observed using the Melton Hill Lake area. A group of 20–25 individuals used the islands around the Consolidated Fuel Recycling Facility for several weeks. This species may soon be observed more often as nesting success increases over the next few years. One juvenile was observed on Clinch River near the K-25 Site.

Yellow-bellied sapsucker (*Sphyrapicus varius*) INM, YBSA

2/23/95 Walker Branch, 1 individual, Mitchell
3/27/95 Walker Branch Road, 1 individual, Mitchell/Rathmell/Vail

Common winter resident. The YBSA is a winter resident of the ORR. Two records were taken during the 1995 survey. Ample habitat exist for this species on the reservation and "sapsucker holes" can be observed in many locations across the ORR.

Peregrine falcon (*Falco peregrinus*) FT, PEFA

5/15/95 Flyover ORR (west end), 1 individual, Kroodsma

Rare migrant. One sighting exists for this species. A bird was observed flying over the ORR.

Bald eagle (*Haliaeetus leucocephalus*) FT, BAEA

8/09/94 Jones Island Road-Clinch River, 1 adult, Combs/Gehl/Osburn
8/11/94 Jones Island Road-Clinch River, 1 adult, Combs/Gehl/Osburn

Uncommon migrant. The BAEA has been documented using the ORR. Suitable habitat exists on the ORR side of Clinch River for this species. Given the expansion of the eagle breeding population in Tennessee and the introduction efforts in eastern Tennessee, establishment of a breeding population may occur on the ORR without proactive management (Buehler 1994).

Osprey (*Pandion haliaetus*) ST, OSPR

6/07/94 K-25 Site Lagoon 1505, 1 individual, Mitchell
6/11/94 Poplar Creek (East), 1 individual, Evans/Mitchell
5/24/95 White Oak Lake Embayment, 1 individual, Evans/Roy

5/31/95 Freels Bend (South), 1 individual, Mitchell
6/27/95 Freels Bend (South), 1 individual, Mitchell
6/29/95 Poplar Creek (East), 2 adults-2 chicks, Mitchell
7/18/95 Poplar Creek (East), 2 adults-2 chicks, Mitchell

Common nester. OSPR nesting records have existed on the ORR for several years. The establishment of platforms in the Clinch River and Melton Hill Lake areas have been successful in providing nesting sites.

4. FUTURE WORK

Research will continue from October 1995 to May 1996. Sampling plans and other work for this period are given below.

- To survey for the woodland and meadow jumping mice, sites will be selected in large open fields. Sites will be located at Freels Bend (2 sites), Wood Duck Pond (1 site), 0800 Area (2 sites) and K-25 Site Salvage (2 sites). Sherman traps will be placed in transects within each area, with no more than 50 traps per site. The traps will be monitored as during the previous season.
- Pitfall and Sherman trap surveys will continue in sites where the southeastern shrew or the masked shrew have not yet been captured.
- Cave surveys will continue for the Tennessee cave salamander.
- Habitat analysis will be conducted at all previous and new sites. This will include GPS information and the mapping of the sites.
- Active searches will continue at various locations for reptiles and amphibians on the ORR.
- Bird surveys will continue with winter point counts, monitoring of the fall and spring migration, and a bald eagle count.
- A final report will be prepared.

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TWRA 1994b. "Wildlife in Need of Management," Tennessee Wildlife Resources Commission Proclamation 94-16, as amended on September 27, 1994, Nashville, Tenn.

Appendix A

TWRA 1994A AND TWRA 1994B: SPECIES LISTED AS THREATENED, ENDANGERED, OR IN NEED OF MANAGEMENT

SUMMARY OF PROCLAMATION 94-16

Robert M. Hatcher, Endangered Species Coordinator
Tennessee Wildlife Resources Agency
September 27, 1994 (approved by Commission today)

Proc. 94-16 repeals and supplants Proc. 86-29 by deleting all previously-listed "Wildlife In Need of Management" and replacing them. A total of 36 changes are shown below:

No. By:	Fish	Amphi	Reptile	Birds	Mam	Tot
Former Sp.	38	6	6	14	13	77
Pro-posed	40	11	5	19	14	89
Retained	36	5	4	9	13	67
Delisted	0	1 Green Salam.	2 Cumb. slider; 6-Lined Race'r	4 Red-sh'ldered Hk; Black Vulture; Red-headed Woodpecker; Bl-Cr Night Heron	0	7
Uplisted (to T or E)	2 Bluemask; Palezone	0	0	1 Lark Sparrow	0	3
Downlist (to this level)	0	0	0	5 Sharp-shinned Hk; Cooper's Hawk; Grasshopper Sp.; Northern Harrier; Miss. Kite	0	5
New Listings	4 Smoky Dace, Firebelly Darter, Bigmouth Shiner, N Madtom	6 Seepage Salam., Bl'kbelly Salam., Pygmy S, Junaluska, Weller's S.; Wehrle's	1 Coal Skink	5 N. Saw-whet Owl Olive-sided Flycatcher Little Blue Heron Snowy Egret King Rail	1 Rock Vole	17
Name Change	4	0	0	0	0	4

RMH:bh01066/data/wildlife/hatcher/list/94-16Sum.wp

TENNESSEE WILDLIFE RESOURCES COMMISSION
PROCLAMATION
WILDLIFE IN NEED OF MANAGEMENT

Pursuant to the authority granted by Tennessee Code Annotated, Sections 70-8-104 and 70-8-107, the Tennessee Wildlife Resources Commission does hereby declare the following species to be wildlife in need of management.

SECTION I. SPECIES

FISH

Alabama Shad	*Alosa alabamae*
Crystal Darter	*Ammocrypta asprella*
Naked Sand Darter	*A. beani*
Scaly Sand Darter	*A. vivax*
Highfin Carpsucker	*Carpiodes velifer*
Smoky Dace	*Clinostomus* sp. cf. *funduloides*
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*
Firebellly Darter (=Red Snubnose Darter	*E. pyrrhogaster [=E. (Ulocentra)]*
Arrow Darter	*E. sagitta*
Striated (Duckriver Barcheek) Darter	*E. striatulum*
Tippecanoe Darter	*E. tippecanoe*

Tuscumbia Darter	*E. tuscumbia*
Golden Topminnow	*Fundulus chrysotus*
Flame Chub	*Hemitremia flammea*
Plains Minnow	*Hybognathus placitus*
Southern Brook Lamprey	*Ichthyomyzon gagei*
Silver Lamprey	*I. unicuspis*
Lined Chub	*Notropis lineapunctatus*
Harelip Sucker	*Lagochila lacera*
Alligator Gar	*Lepisosteus spatula*
Sturgeon Chub	*Macrohybopsis gelida*
Sicklefin Chub	*M. meeki*
Blackfin Sucker	*Moxostoma atripinne*
Bigmouth Shiner	*Notropis dorsalis*
Roseface Shiner	*N. r. rubellus*
Bedrock Shiner	*N. rupestris*
Northern Madtom	*Noturus stigmosus*
Tangerine Darter	*Percina aurantiaca*
Blotchside Logperch	*P. burtoni*
Blackfin Darter	*P. (Odontophilus)* sp.
Slenderhead Darter	*P. phoxocephala*
Tennessee (=Mountain Redbelly) Dace	*Phoxinus tennesseensis*
Southern Cavefish	*Typhlichthys subterraneus*

AMPHIBIANS

Mole Salamander	*Ambystoma talpoideum*
Hellbender	*Cryptobranchus a. alleganiensis*

Seepage Salamander	*Desmognathus aeneus*
Black-bellied Salamander	*D. quadramaculatus*
Black Mountain Dusky Salamander	*D. welteri*
Pygmy Salamander	*D. wrighti*
Junaluska Salamander	*Eurycea junaluska*
Four Toed Salamander	*Hemidactylium scutatum*
Barking Treefrog	*Hyla gratiosa*
Weller's Salamander	*Plethodon welleri*
Wehrle's Salamander	*P. wehrlei*

REPTILES

Green Anole	*Anolis carolinensis*
Coal Skink	*Eumeces anthracinus*
Alligator Snapping Turtle	*Macroclemys temminckii*
Green Water Snake	*Nerodia (Natrix) cyclopion*
Eastern Slender Glass Lizard	*Ophisaurus attenuatus longicaudus*

BIRDS

Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*A. cooperii*
Northern Saw-Whet Owl	*Aegolius acadicus*
Grasshopper Sparrow	*Ammodramus savannarum*
Anhinga	*Anhinga anhinga*
Great Egret	*Casmerodius albus*
Northern Harrier	*Circus cyaneus*
Olive-sided Flycatcher	*Contopus borealis*
Little Blue Heron	*Egretta caerulea*

Snowy Egret	*E. thula*
Sandhill Crane	*Grus candensis*
Mississippi Kite	*Ictinia mississippiensis*
Least Bittern	*Ixobrychus exilis*
Swainson's Warbler	*Limnothlypis swainsonii*
Double-crested Cormorant	*Phalacrocorax auritus*
Vesper Sparrow	*Pooecetes gramineus*
King Rail	*Rallus elegans*
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Common Barn-Owl	*Tyto alba*

MAMMALS

Star-nosed Mole	*Condylura cristata*
Yellownose (=Rock) Vole	*Microtus chrotorrhinus*
Woodland Jumping Mouse	*Napaeozapus insignis*
Small-footed Bat	Myotis leibii
Eastern Woodrat	*Neotoma floridana*
Hairy-tailed Mole	*Parascalops breweri*
Rafineque's (=Eastern) Big-eared Bat	*Plecotus rafinesquii*
Masked Shrew	*Sorex cinereus*
Longtail Shrew	*S. dispar*
Smoky Shrew	*S. fumeus*
Southeastern Shrew	*S. longirostris*
Water Shrew	*S. palustris*
Southern Bog Lemming	*Synaptomys cooperi*
Meadow Jumping Mouse	*Zapus hudsonius*

SUMMARY OF PROCLAMATION 94-17

Robert M. Hatcher, Endangered Species Coordinator
Tennessee Wildlife Resources Agency
September 27, 1994 (Approved by Commission today)

Proc. 94-17 repeals and supplants Proc. 86-30 by deleting all previously-listed "Endangered & Threatened Wildlife" and replaces them. A total of 52 changes are made. Highlights include:

- revision of 11 species' names due to official nationwide name changes,
- addition of 15 new mollusk species due to prior Federal listings,
- delisting of Chittenango ovate amber snail due to change in its taxonomic classification,
- uplisting from "In Need of Management" or T to E status the: bluemask darter and palezone shiner, and duskytail darter,
- addition of 6 fish species due to prior Federal listing (4) and expert recommendations,
- downlisting of Mississippi Kite from Endangered to "In Need of Management",
- downlisting from Threatened to "In Need of Management" the: Sharp-shinned Hawk, Cooper's Hawk, Grassnopper Sparrow, and Northern Harrier; and
- downlisting from Endangered to Threatened the: the Bald Eagle, Golden Eagle, Common Raven, and Osprey.
- addition of the Red Wolf as Endangered, as limited to its experimental range in GSMNP.

Changes by wildlife class are:

	Mollusk		Fish		Amphib.		Reptile		Birds		Mam.		Crus.		Total	
Nos. By:	E	T	E	T	E	T	E	T	E	T	E	T	E	T	E	T
Former	24	1	10	14	0	1	0	3	9	5	4	1	1	0	48	25
Proposed	37	2	17	15	0	1	0	3	4	6	5	1	1	0	64	28
Retained	24	0	10	13		1		3	4	1	4	1	1		43	19
Delisted	0	1	0	0		0		0	0	0	0	0	0		0	1
Downlisted*	0	0	0	0		0		0	5	8	0	0	0		5	8
Uplisted*	0	0	3	1		0		0	0	1	0	0	0		3	2
New Listings	13	2	4	2		0		0	0	0	1	0	0		18	4
Name Chang	8	0	0	1		0		1	1	0	0	0	0		9	2
Fed. Status	36	1 2- C1	10	3	0	0 1- C2	0	0 2 - C2	4	1	4	0	1	0	55 2- c1	7 3- c2

*Uplistings and downlistings may be counted twice, one at T status and one at E status; or they may involve similar pairing (uplisting or downlisting) with "In Need of Mgt." status.

TENNESSEE WILDLIFE RESOURCES COMMISSION
PROCLAMATION
ENDANGERED OR THREATENED SPECIES

Pursuant to the authority granted by Tennessee Code Annotated, Sections 70-8-105 and 70-8-107, the Tennessee Wildlife Resources Commission does hereby declare the following species to be endangered or threatened subject to the regulations as herein provided.

SECTION I*. ENDANGERED OR THREATENED SPECIES

MOLLUSCS

ENDANGERED

Common Name	Scientific Name	Fed**
Appalachian elktoe	*Alasmidonta raveneliana*	C1
Birdwing pearly mussel	*Conradilla caelata (=Limiox rimosus)*	E
Fanshell Mussel	*Cyprogania stegaria (=irrorata)*	E
Dromedary pearly mussel	*Dromus dromas*	E
Yellow-blossom pearly mussel	*Epioblasma (=Dysnomia) florentina florentina*	E
Upland combshell	*E. metastriata*	E
Southern acornshell	*E. othcaloogensis*	E
Green-blossom pearly mussel	*E. (=Dysnomia) torulosa gubernaculum*	E
Tuberculed-blossom pearly mussel	*E. (=Dysnomia) torulosa torulosa*	E
Turgid-blossom pearly mussel	*E. (=Dysnomia) turgidula*	E
Tan riffleshell	E. (=Dysnomia) walkeri	E
Purple Cat's Paw Pearlymussel	*E. (=Dysnomia) obliquata obliquata (=E. sulcata sulcata)*	E
Fine-rayed pigtoe	*Fusconaia cuneolus*	E
Shiny pigtoe	*F. cor (=edgariana)*	E
Cracking pearly mussel	*Hemistena (=Lastena) lata*	E
Pink mucket pearly mussel	*Lampsilis abrupta (=orbiculata)*	E

FISH

ENDANGERED

Common Name	Scientific Name	Fed**
Lake Sturgeon	*Acipenser fulvescens*	C2
Tuckasegee Darter	*Etheostoma blenniodes gutselli*	--
Bluemask (=jewel) Darter	*E. (Doration) sp*	E
Duskytail Darter	*E. (=Catonotus sp.)*	E
Crown Darter	*E. (=Catonotus sp.) corona*	--
Barrens Darter	*E. (=Catonotus sp.) forbesi*	--
Egg-mimic Darter	*E. (=Catonotus) pseudovulatum--*	E
Boulder Darter	*E. (Nothonotus) wapiti*	E
Spotfin Chub	*Cyprinella (=Hybopsis) monacha*	T
Blue Shiner	*Cyprinella (=Notropis) caerulea* (=caeruleus)	T
Palezone Shiner	*Notropis sp. (cf. N. procne)*	E
Smoky Madtom	*Noturus baileyi*	E
Yellowfin Madtom	*Noturus flavipinnis*	T
Pygmy Madtom	*Noturus stanauli*	E
Amber Darter	*Percina antesella*	E
Conasauga (=Reticulate) Logperch	P. jenkinsi	E
Pallid Sturgeon	*Scaphirhynchus albus*	E

THREATENED (Fishes, Continued)

Common Name	Scientific Name	Fed**
Western Sand Darter	*Ammocrpta clara*	--
Blue Sucker	*Cycleptus elongatus*	C2
Slender Chub	*Erimystax (=Hybopsis) cahni*	T
Slackwater Darter	*Etheostoma boschungi*	T
Coldwater Darter	E. ditrema	C2
Trispot Darter	E. trisella	C2

Alabama lamp pearly mussel	*L. virescens*	E
Coosa moccasinshell	*Medionidus parvulus*	E
Ring pink mussel	*Obovaria retusa*	E
Little-wing pearly mussel	*Pegias fabula*	E
White warty-back pearly mussel	*Plethobasus cicatricosus*	E
Orange-footed (=pimpleback) pearly mussel	*P. cooperianus*	E
Clubshell	*Pleurobema clava*	E
Southern clubshell	*P. decisum*	E
Southern pigtoe	*P. georgianum*	E
Cumberland pigtoe (=Cumberland pigtoe mussel)	*P. gibberum*	E
Ovate clubshell	*P. perovatum*	E
Rough pigtoe pearly mussel	*P. plenum*	E
Triangular kidneyshell	*Ptychobranchus greeni*	E
Cumberland monkeyface pearly mussel	*Quadrula intermedia*	E
Winged mapleleaf mussel	*Q. fragosa*	E
Appalachian monkeyface pearly mussel	*Q. sparsa*	E
Pale lilliput pearly mussel	*Toxolasma* (=Carunculina) *cylindrella*	E
Cumberland bean pearly mussel	*Villosa* (=*Micromya*) *trabalis*	E
Painted snake coiled forest snail	*Anguispira picta*	T
Anthony's riversnail	*Athearnia anthonyi*	E
Royal Snail	*Pyrgulopsis* (=Marstonia) *ogmorhaphe*	E

THREATENED (Molluska, Continued)

Common Name	Scientific Name	Fed**
Alabama moccasinshell	*Medionidus acutissimus*	T
Fine-lined pocketbook	*Lampsilis altilis*	T

Coppercheek Darter	*E. aquali (cf. E.maculatum)*	C2
Holliday (=Ellijay) Darter	*E. (=Ulocentra) sp.*	--
Barrens Topminnow	*Fundulus julisia (cf. F. albolineatus)*	C2
Silverjaw Minnow	*Notropis (=Ericymba) buccata*	--
Frecklebelly Madtom	*Noturus munitus*	C2
Duck River Saddled Madtom	*Noturus sp. (=elegans)*	C2
Longhead Darter	*Percina macrocephala*	C2
Snail Darter	*P. tanasi*	T
Blackside Dace	*Phoxinus cumberlandensis*	T

AMPHIBIANS

THREATENED

Common Name	Scientific Name	Fed**
Tennessee Cave Salamander	*Gyrinophilus palleucus*	C2

REPTILES

THREATENED

Common Name	Scientific Name	Fed**
Bog Turtle	*Clemmys muhlenbergi*	C2
Northern Pine Snake	*Pituophis m. melanoleucus*	C2
Western Pigmy Rattlesnake	*Sistrurus miliarius streckeri*	--

BIRDS

ENDANGERED

Common Name	Scientific Name	Fed**
Bachman's Sparrow	*Aimophila aestivalis*	C2
Peregrine Falcon	*Falco peregrinus*	T
Red-cockaded Woodpecker	*Picoides (=Dendrocopos) borealis*	E
Least Tern	*Sterna antillarum*	E

THREATENED (Birds, Continued)

Common Name	Scientific Name	Fed**
Golden Eagle	*Aquila chrysaetos*	--
Lark Sparrow	*Chondestes grammacus*	--
Common Raven	*Corvus corax*	--
Bald Eagle	*Haliaeetus leucocephalus*	T
Osprey	*Pandion haliaetus*	--
Bewick's Wren	*Thryomanes bewickii*	C2

MAMMALS

ENDANGERED

Common Name	Scientific Name	Fed**
Red Wolf (Where listed as "Experimental population" in Tennessee)	*Canis rufus*	E
Eastern Cougar	*Felis concolor cougar*	E
Carolina Northern Flying Squirrel	*Glaucomys sabrinus coloratus*	E
Gray Myotis	*Myotis grisescens*	E
Indiana Myotis	*M. sodalis*	E

THREATENED

Common Name	Scientific Name	Fed**
River Otter (Except west of Kentucky & Pickwick Lakes)	*Lutra canadensis*	--

CRUSTACEANS

ENDANGERED

Common Name	Scientific Name	Fed**
Nashville Crayfish	*Orconectes shoupi*	E

**Fed: E = Fed. End., T = Fed. Threat., C1 = Candidate for Likely Federal Listing; C2 = Candidate for Possible Fed. Listing.

Appendix B

TWENTY-NINE NONTARGETED SPECIES

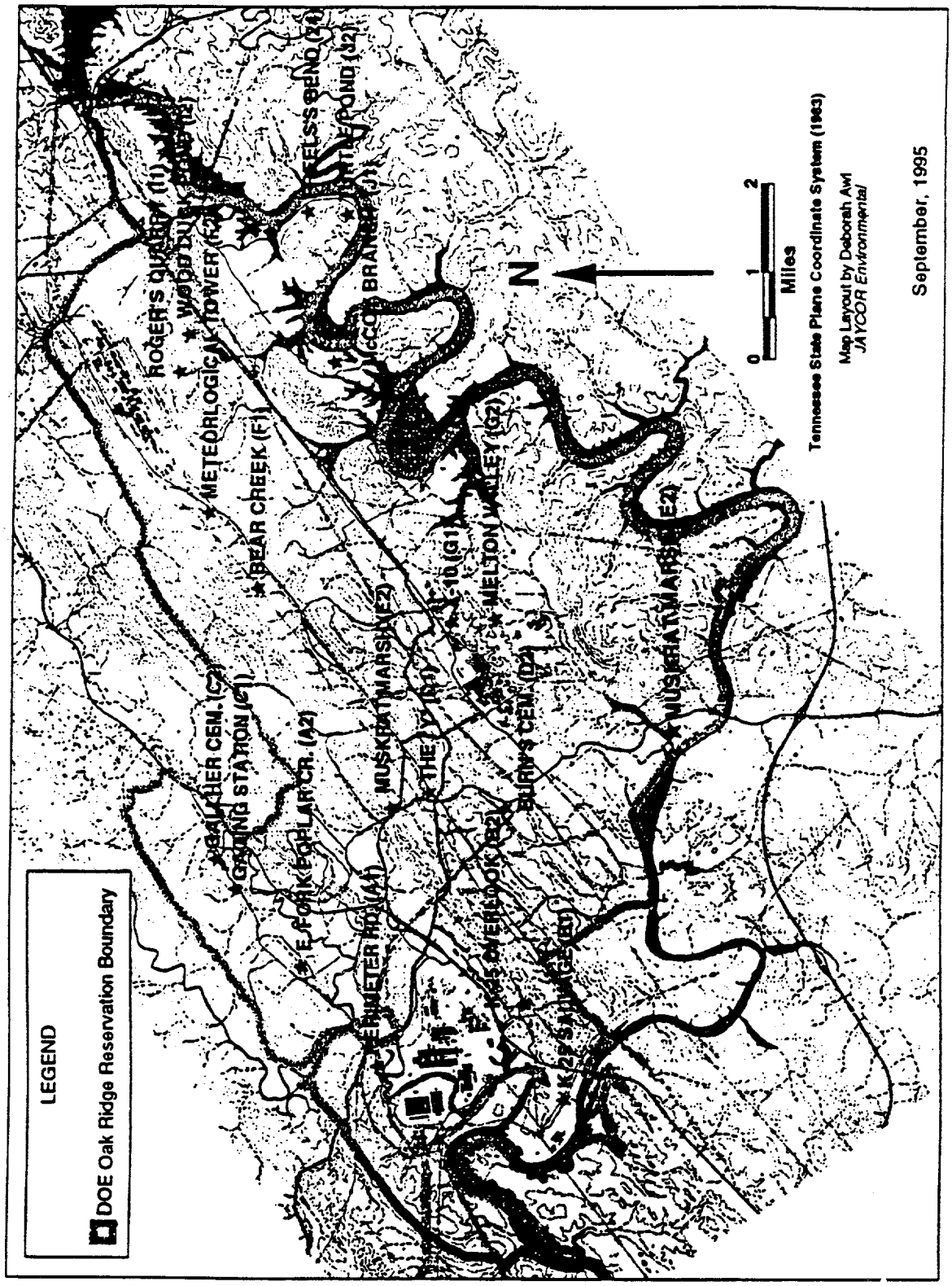
Birds
Northern saw-whet owl
Anhinga
Golden eagle
Lark sparrow
Common raven
Mississippi kite
Bewick's wren
Swainson's warbler
Bachman's sparrow
Peregrine falcon
Red-cockaded woodpecker
Least tern

Reptiles and Amphibians
Seepage salamander
Black-bellied salamander
Pygmy salamander
Weller's salamander
Junaluska salamander
Barking tree frog
Alligator snapping turtle
Wehrle's salamander
Western pygmy rattlesnake

Mammals
Star-nosed mole
Hairy-tailed mole
Long-tailed shrew
Red wolf
Eastern cougar
Carolina northern flying squirrel
River otter

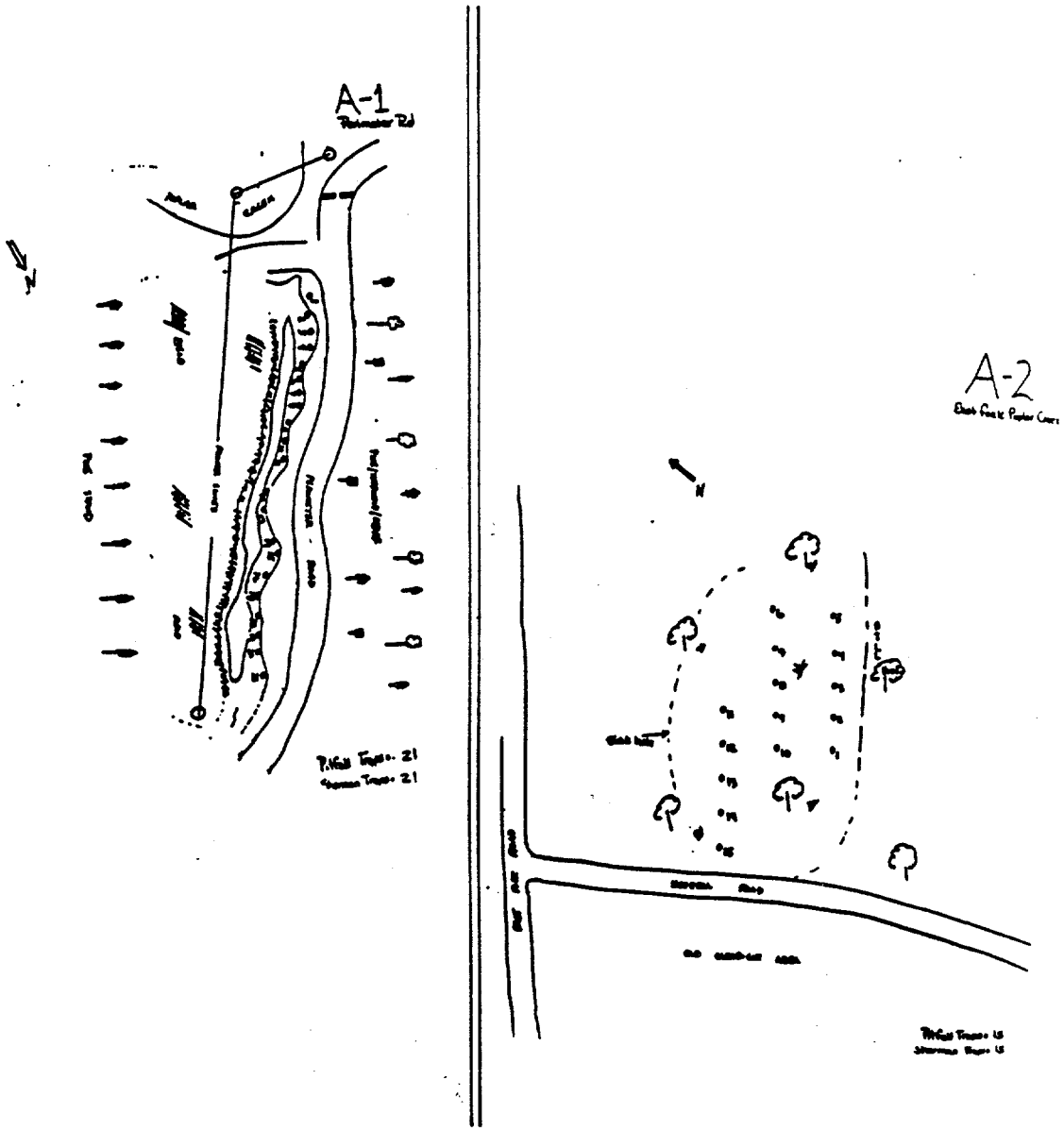
Appendix C

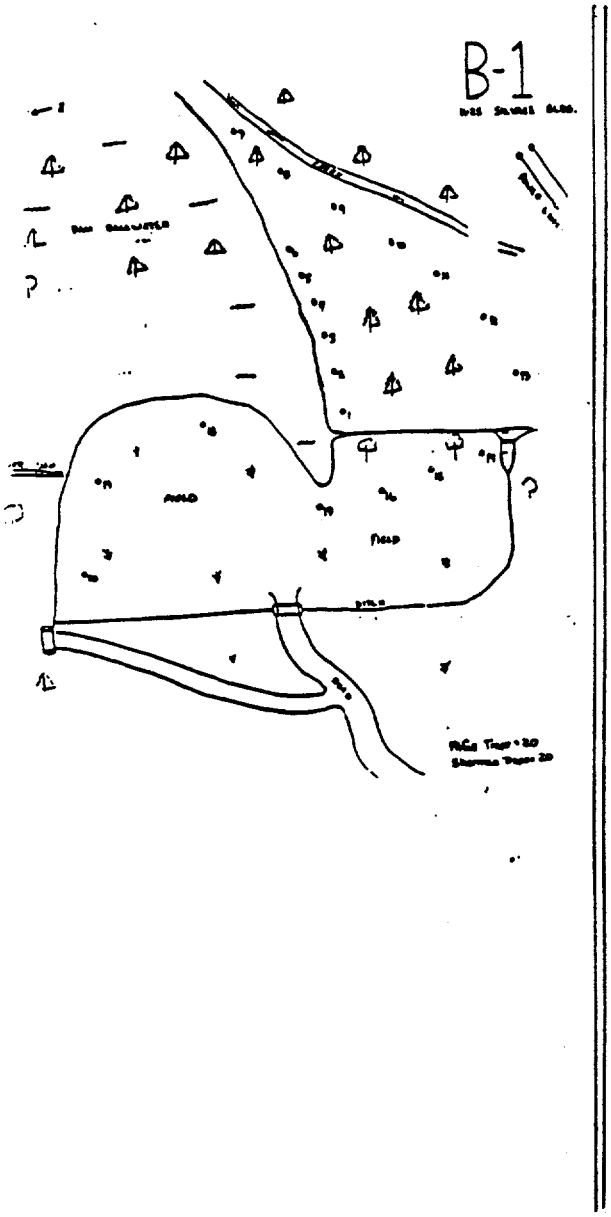
NONAVIAN SITE LOCATIONS ON THE ORR

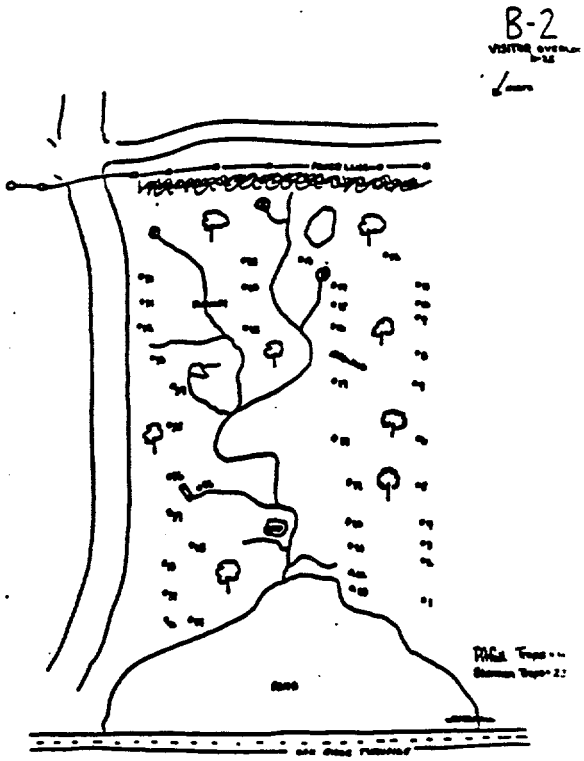

LEGEND
DOE Oak Ridge Reservation Boundary
ROGER'S QUARRY (I1)
METEORLOGICAL TOWER (K2)
BEAR CREEK (F1)
GAUGING STATION (C1)
E. FORK POPLAR CR. (A2)
PERIMETER RD. (A1)
MUSKRAT MARSH (E2)
THE Y (D1)
MELTON VALLEY (G2)
BLUFFS CEN. (D2)
MUSKRAT MARSH (E2)
0
1
2
Miles
Tennessee State Plane Coordinate System (1983)
Map Layout by Deborah Awl
JAYCOR Environmental
September, 1995

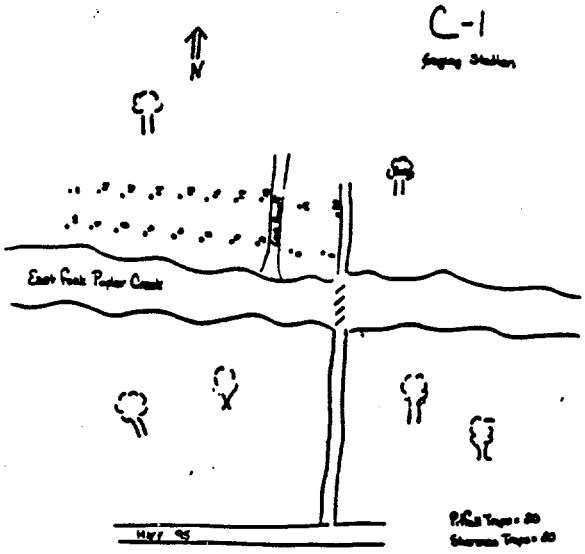
Appendix D

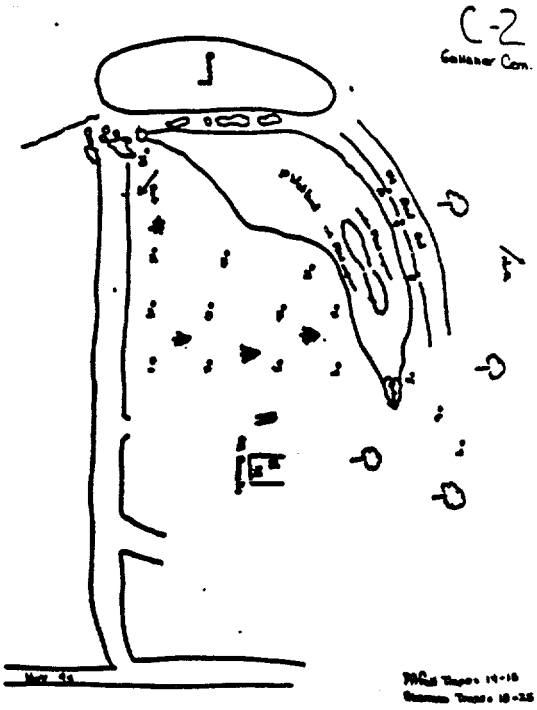
SITE MAPS FOR PITFALL AND SHERMAN TRAP PLACEMENT ON THE ORR, FEBRUARY–SEPTEMBER 1995

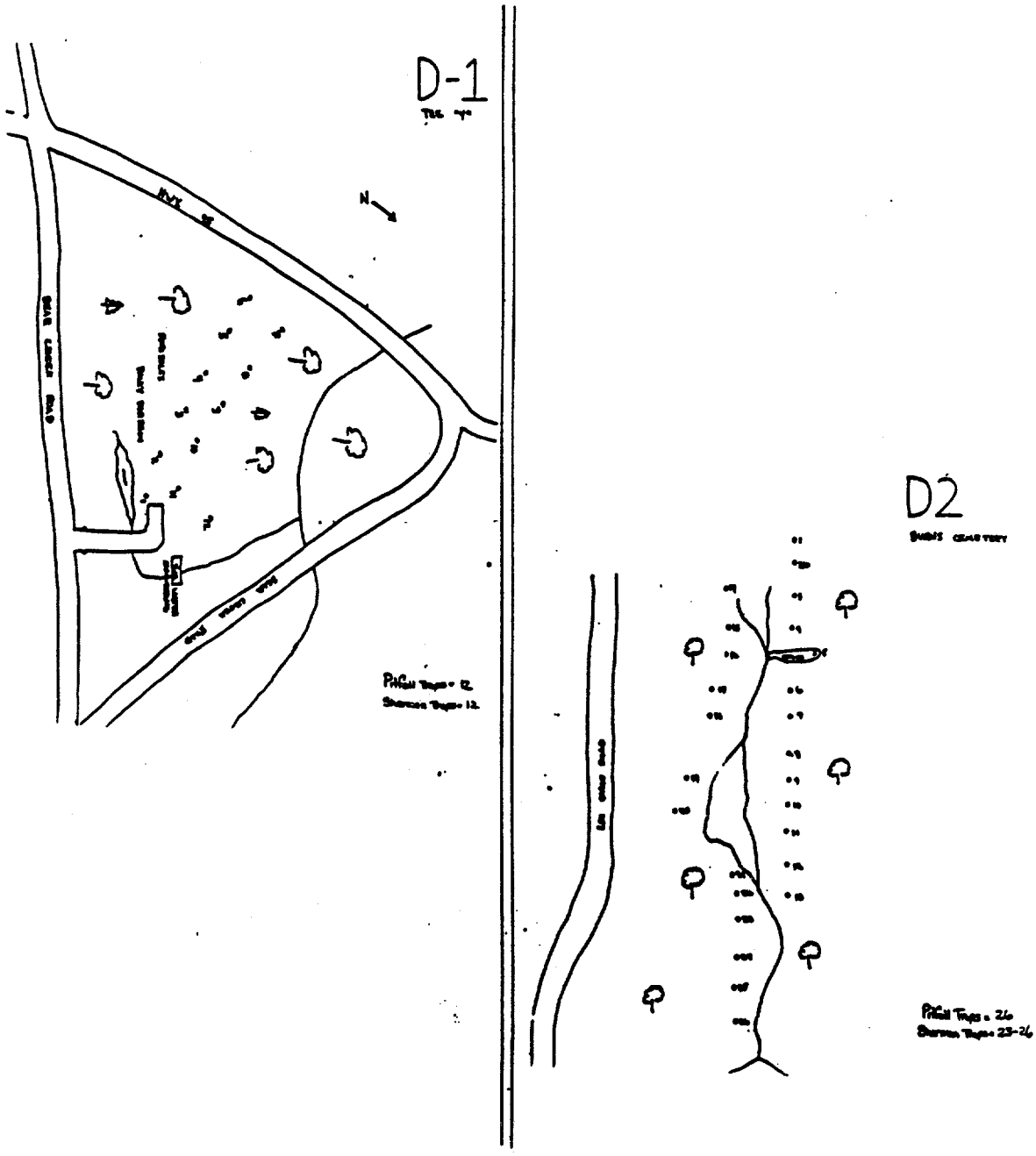

A-1
A-2


B-1

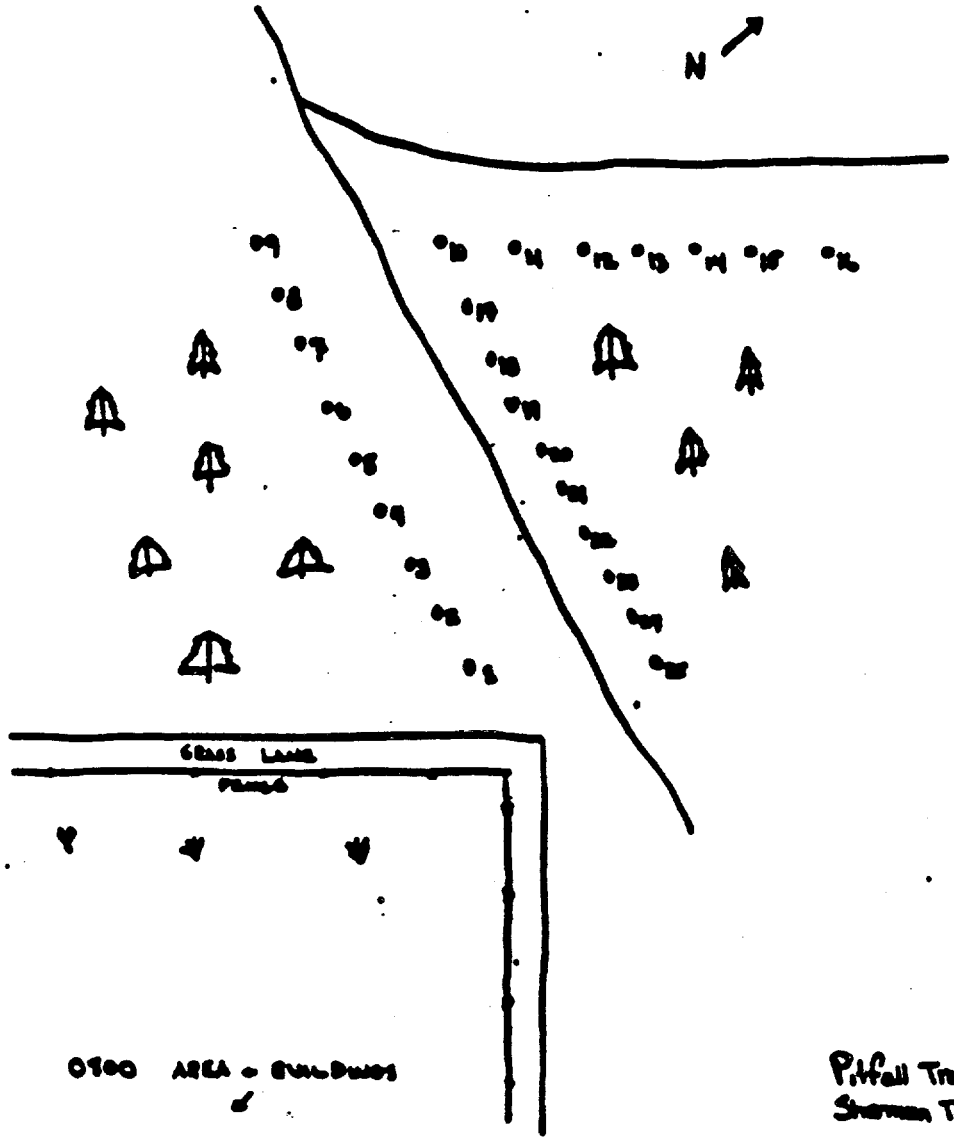

B-2


C-1
N
East Fork Poplar Creek
Hwy 95


C-2

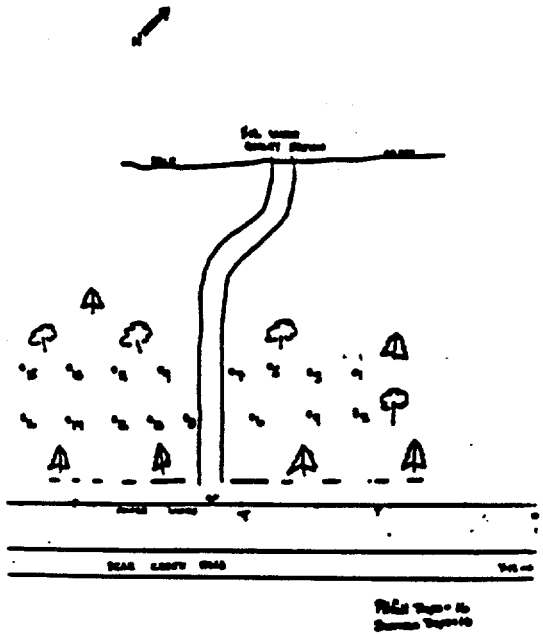

D-1
N
D2

E-2
MUSKRAT MARSH

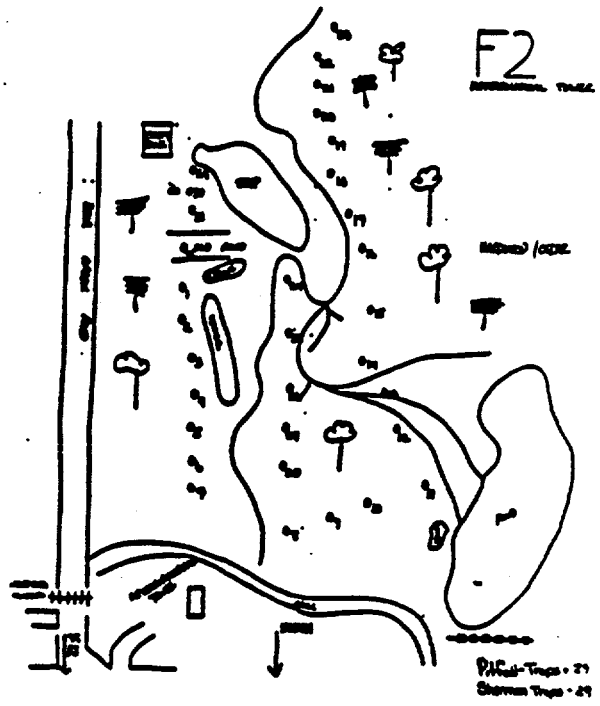


Pitfall Traps 25
Sherman Traps 23-25

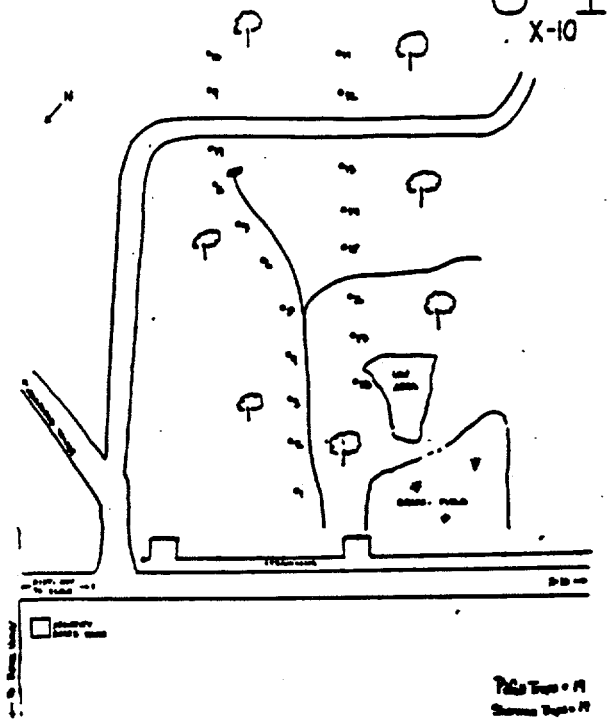
F-1



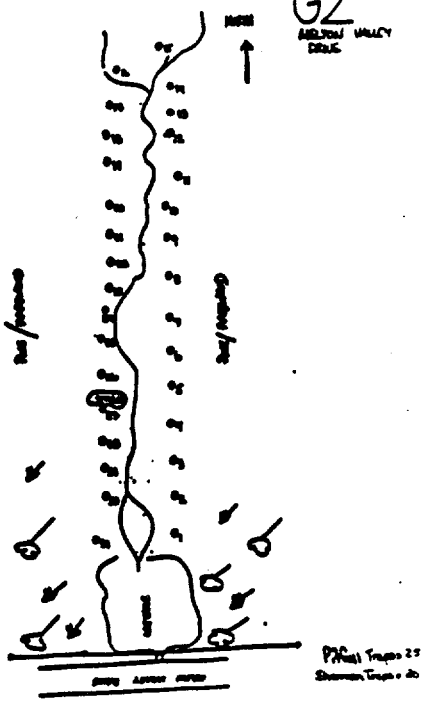
F2



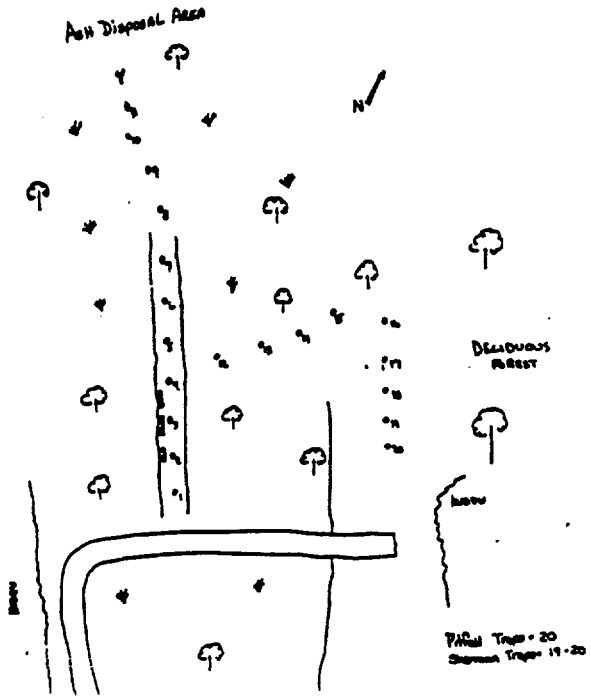
G-1
X-10



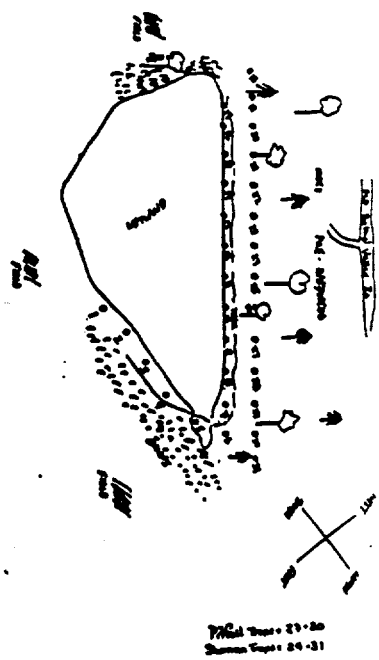
G2

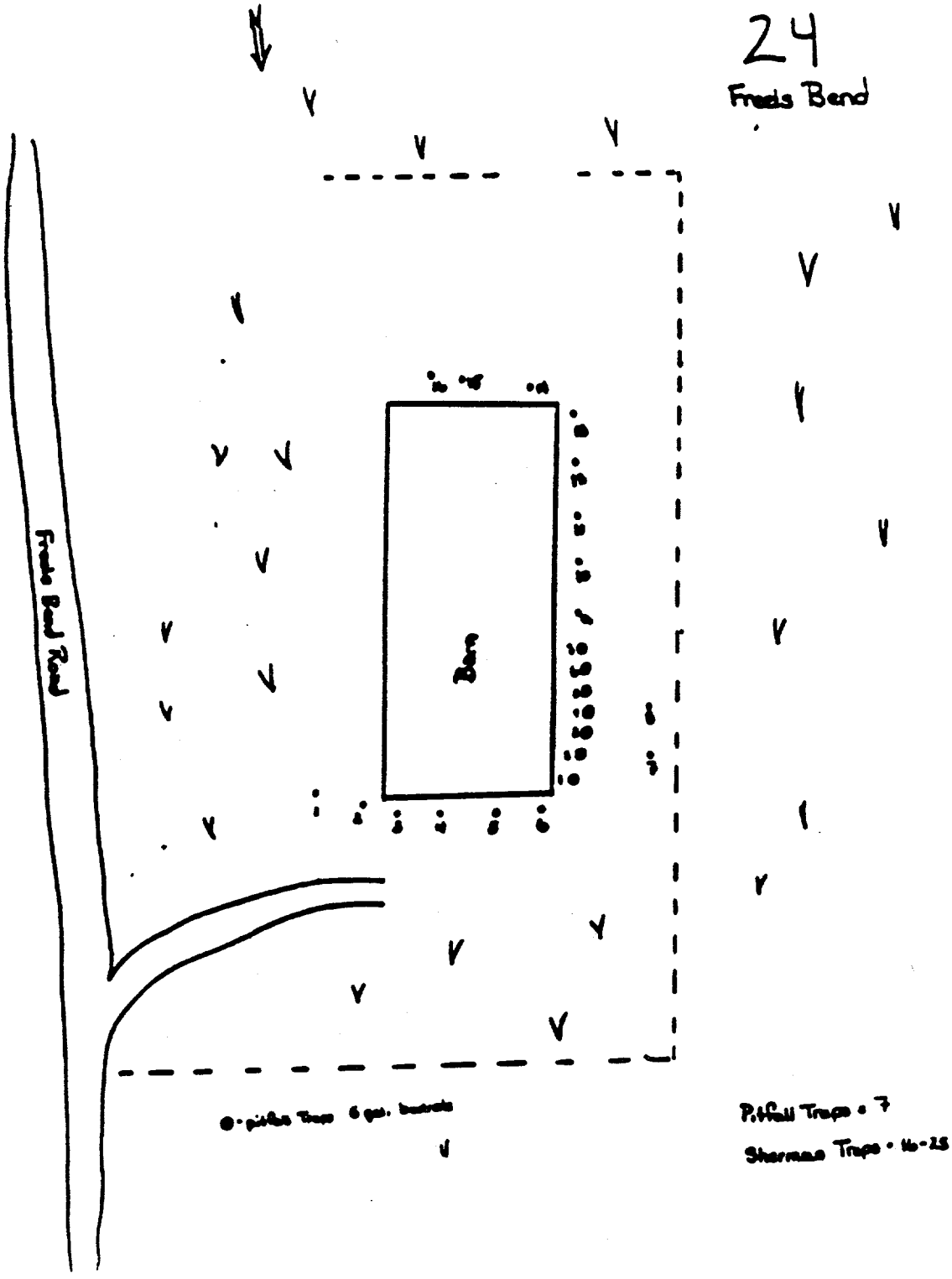


I-1



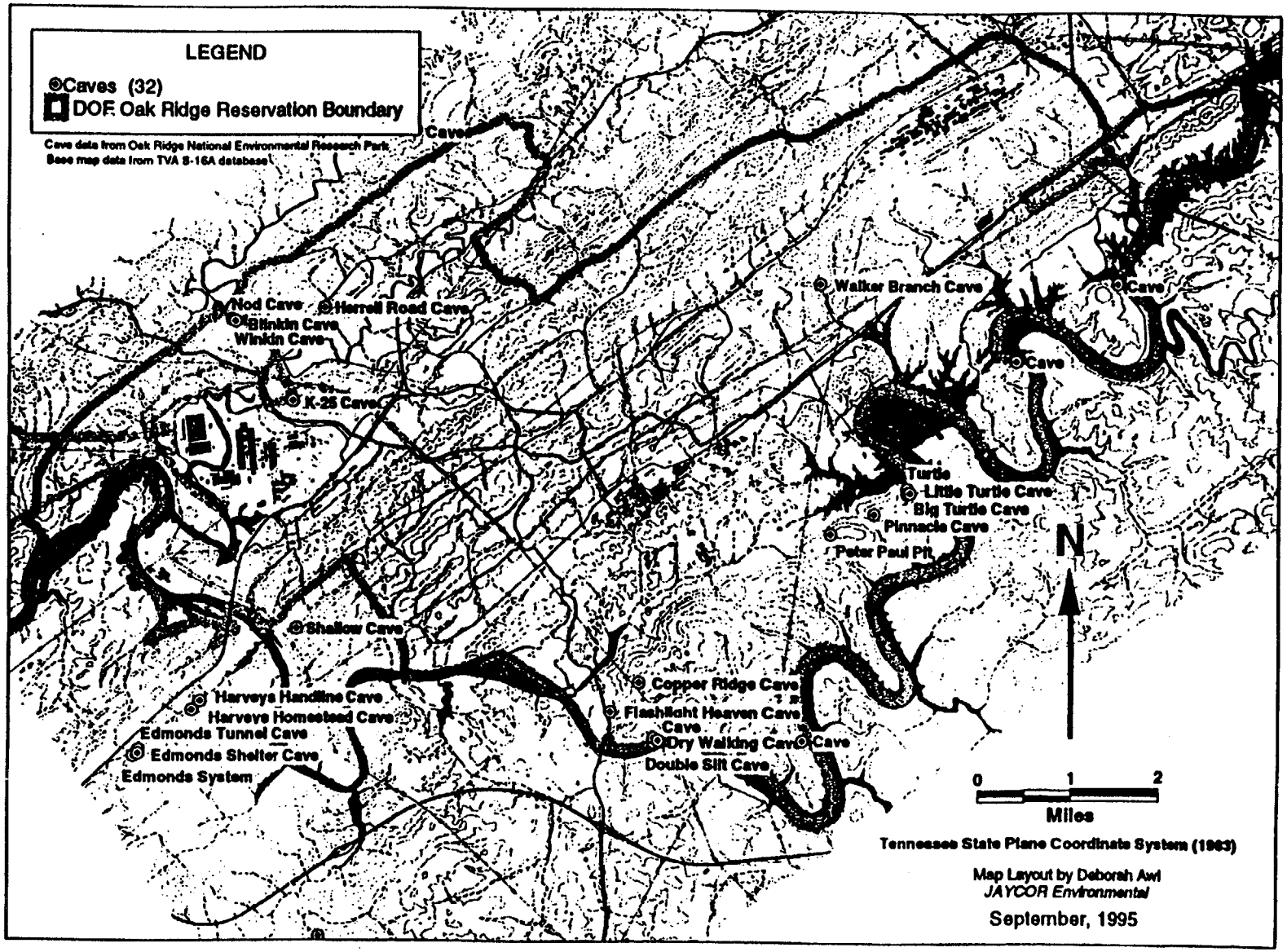
I-2

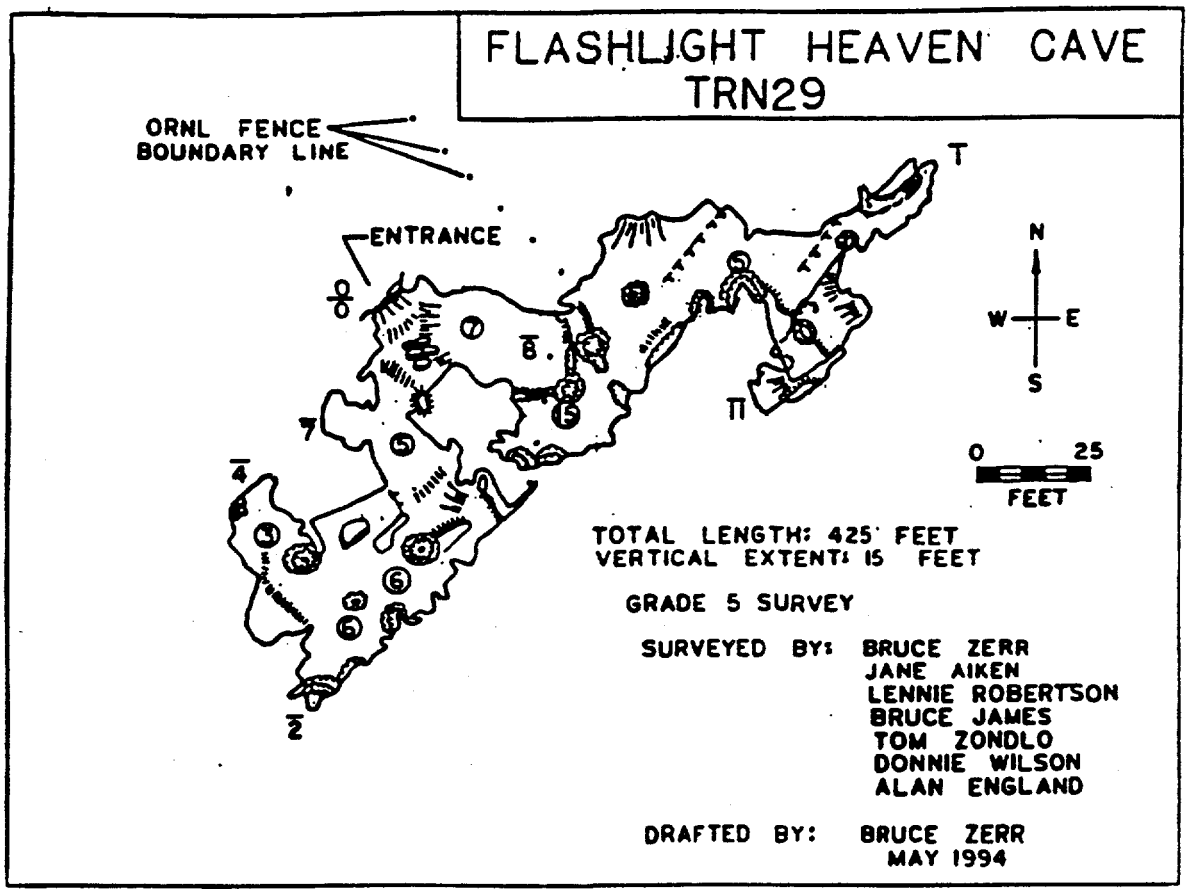



24
Freels Bend
Freels Bend Road
Barn
Pitfall Traps • 7
Sherman Traps • 16-25

Appendix E

CAVE LOCATIONS ON THE ORR


LEGEND
Caves (32)
DOE Oak Ridge Reservation Boundary
Cave data from Oak Ridge National Environmental Research Park
Base map data from TVA 8-16A database
Cave
Walker Branch Cave
Cave
Nod Cave
Herrell Road Cave
Blinkin Cave
Winkin Cave
Cave
K-25 Cave
Turtle
Little Turtle Cave
Big Turtle Cave
Pinnacle Cave
Peter Paul Pit
N
Shallow Cave
Copper Ridge Cave
Harveys Handline Cave
Harveys Homestead Cave
Edmonds Tunnel Cave
Flashlight Heaven Cave
Dry Walking Cave
Cave
Edmonds Shelter Cave
Edmonds System
Double Slit Cave
0
1
2
Miles
Tennessee State Plane Coordinate System (1983)
Map Layout by Deborah Awl
JAYCOR Environmental
September, 1995


FLASHLIGHT HEAVEN CAVE
TRN29
ORNL FENCE
BOUNDARY LINE
ENTRANCE
T
N
W
E
S
0
25
FEET
TOTAL LENGTH: 425' FEET
VERTICAL EXTENT: 15 FEET
GRADE 5 SURVEY
SURVEYED BY: BRUCE ZERR
JANE AIKEN
LENNIE ROBERTSON
BRUCE JAMES
TOM ZONDLO
DONNIE WILSON
ALAN ENGLAND
DRAFTED BY: BRUCE ZERR
MAY 1994

Appendix F

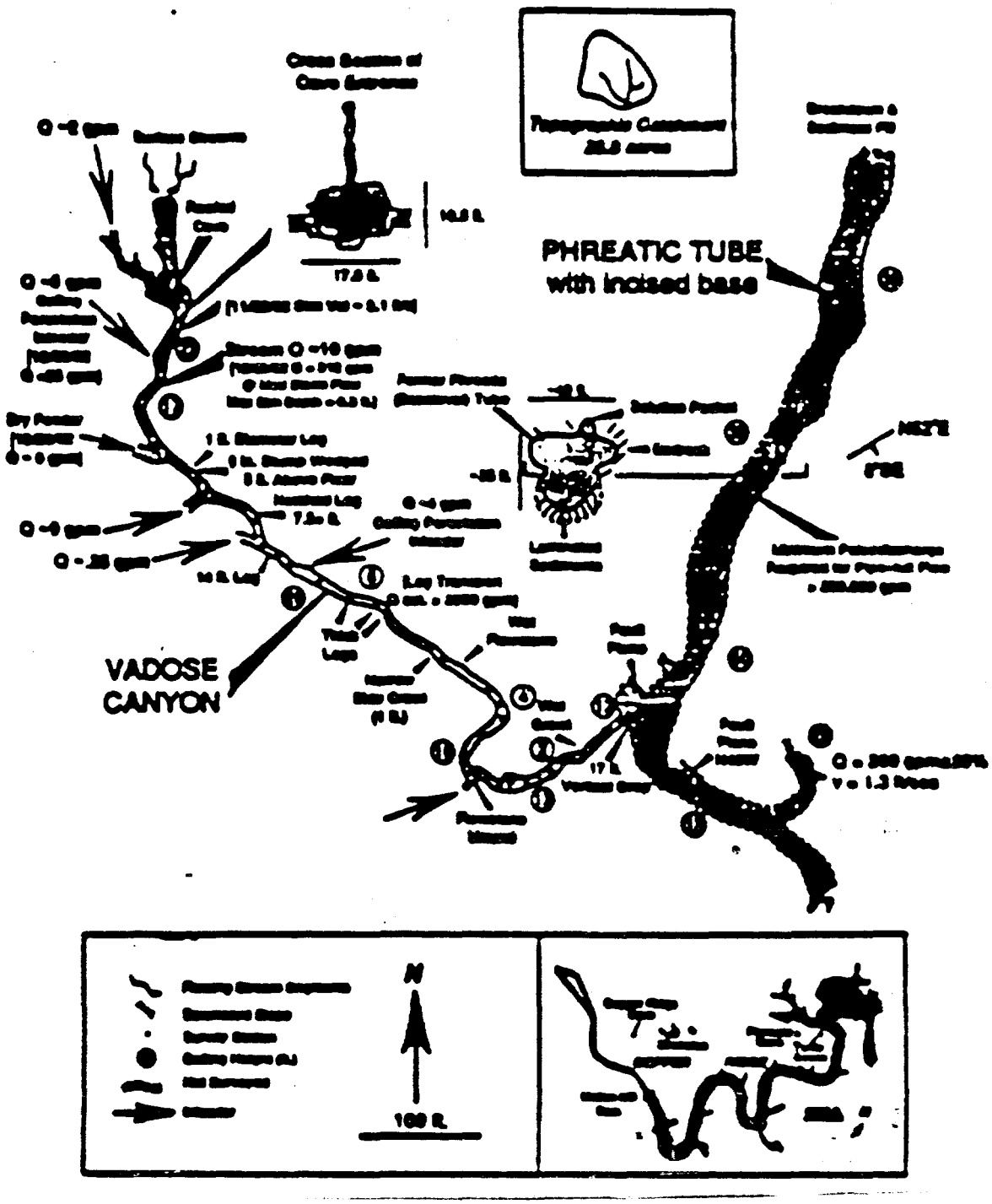
MAPS OF SURVEYED CAVES ON THE ORR, FEBRUARY–SEPTEMBER 1995

COPPER RIDGE CAVE

BRUNTON AND TAPE SURVEY (TRH21)

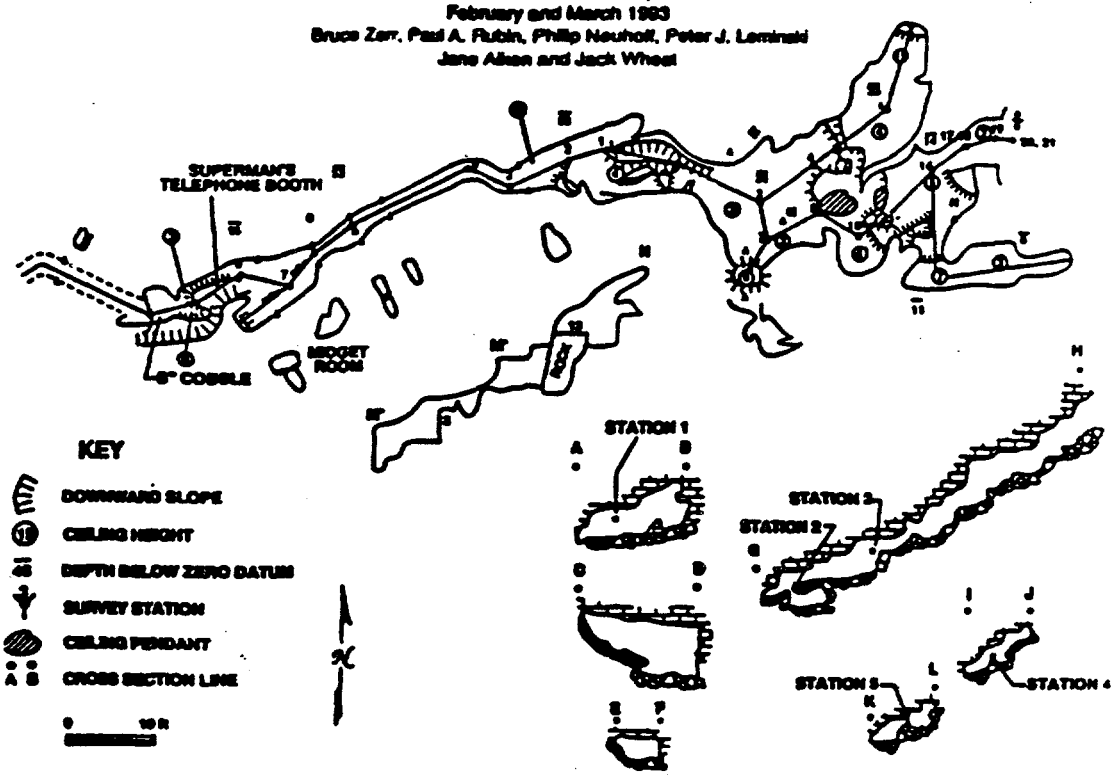
Paul A. Rubin, Bruce Zerr, Gareth Davies

Low Flow Conditions 12/18/92



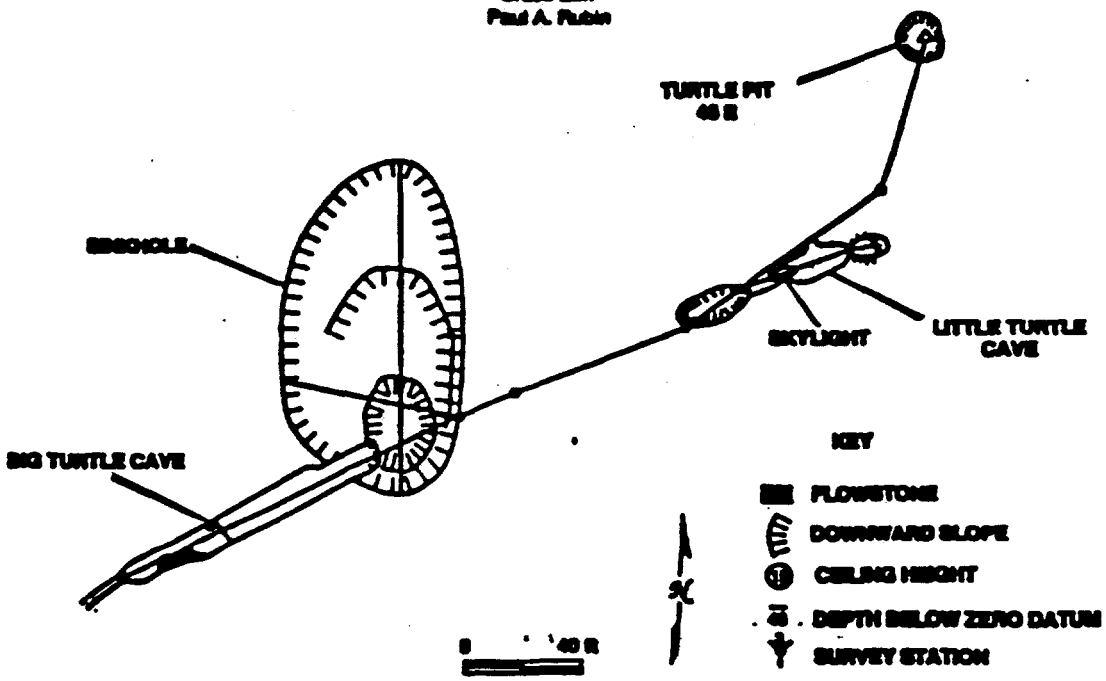
PINNACLE CAVE

Grade 5 Sunto Survey
February and March 1993
Bruce Zarr, Paul A. Rubin, Philip Nauholt, Peter J. Lominski
Jane Allaire and Jack Wheat



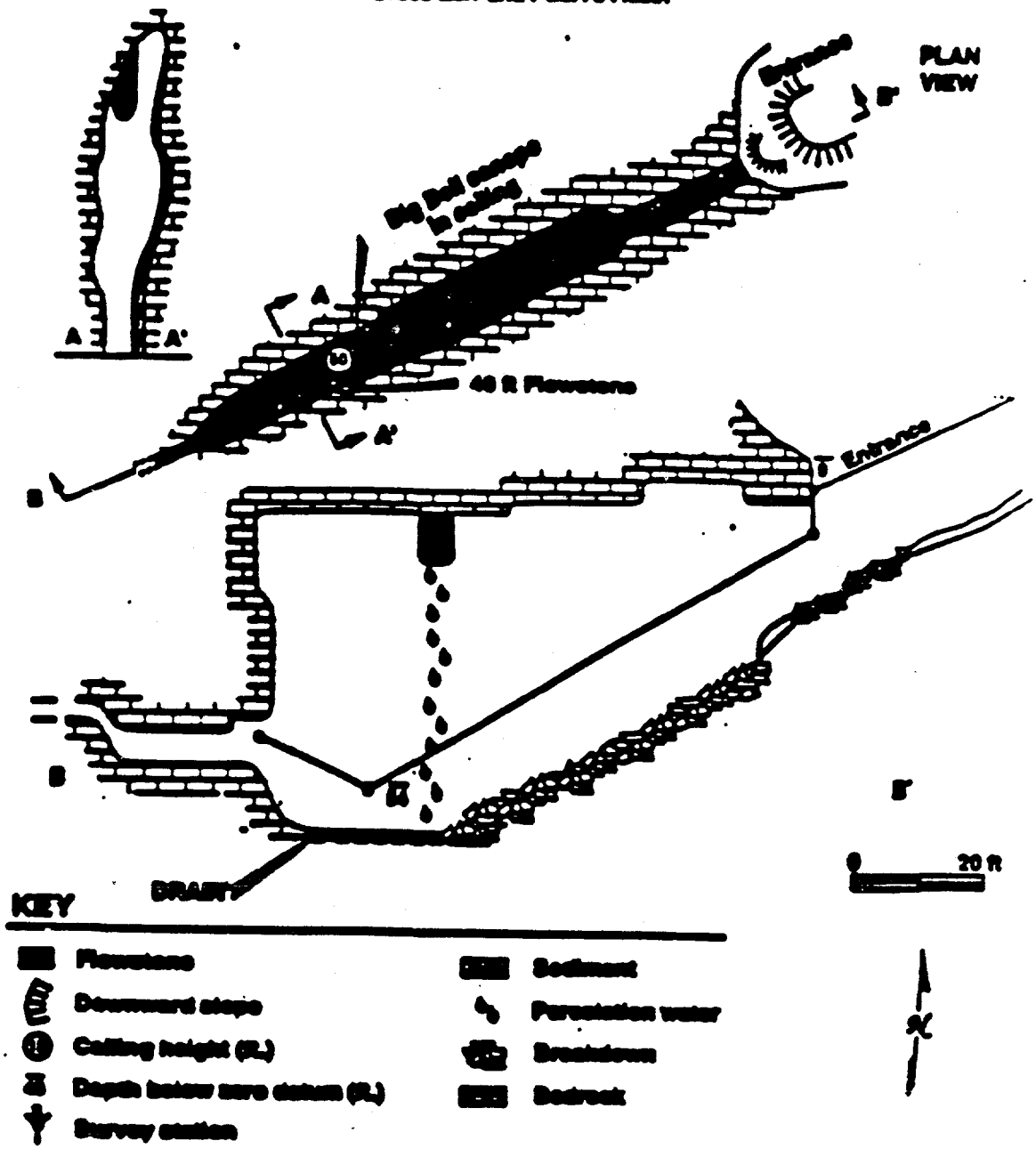
TURTLE CAVES (Aerial View)

Grade 5 Sunto Survey
February 1993
Bruce Zarr
Paul A. Rubin



BIG TURTLE CAVE

Grade 5 Survey: TAH-16
February 1998
Bruce Zerr and Paul A. Rubin



Appendix G

PROTOCOL FOR HABITAT SAMPLING

Site Name: The name and/or code assigned to the site.

Map: Any maps attached (e.g., S-16A, pitfall maps) should be noted.

Location: Directions to the location of the site. Include nearby roads, cemeteries, buildings, streams, power or gas lines, etc.

Latitude and Longitude: The coordinates of the site taken by the GPS.

Cover Type: The dominant cover type of the site (e.g., oak/hickory, pine/hardwood, pine, cedar, old field, etc.).

Basal Area: Measured in m^2/ha. Estimate the cross-sectional area of a tree at breast height by using a curz-all. The location for this measurement should be near the center of the site.

Litter Depth: The depth of the organic matter recorded in centimeters. Use a stick to measure depth, then measure the stick on a tape measure. The measurement should be taken at four random locations on the site, then averaged.

Average DBH (diameter at breast height): The diameter of at least four trees should be measured at breast height (4.5 ft.). The trees should be representative of the site. Using a diameter tape, the result should be expressed in centimeters.

Dominant Plants: Record dominant plant species in each of the ground, understory, and canopy layers. Five to ten species should be listed in each category. Estimate vegetation height in meters in each of the stages.

General description: A subjective description of the presence of log debris, cavities, rock outcrops, bare ground, canopy gaps, soil disturbance, hard or soft edge, location of a natural area, etc.

General Topography: Record land features, general size of the area surveyed, presence of water, springs, slope of the site, aspect, etc.

Number of Traps: The number of Sherman traps used at the site should be recorded.

Number of Pitfalls: The number of functional pitfalls placed a the site should be recorded.

Appendix H

DATA SHEETS USED FOR 1995

HABITAT DESCRIPTION

Site Name:_____ Map:_____

Location:_____

Latitude: _____ Longitude:_____

Cover type:_____ Basal Area: (m^2/ha_____

Litter Depth (cm):_____ Average dbh (cm):_____

Dominant plants and estimated height of each stage:

Ground:_____
height (m):_____
Understory:_____
height (m):_____
Canopy:_____
height (m):_____

General Description: (log debris, cavities, rock outcrops, bare ground, canopy gaps, soil, disturbance, edge, natural area):_____

General Topography: (slope, aspect, water, land features, size of area)

Number of traps:_____ Number of pitfalls:_____

MAMMAL TRAPPING

Date:_____ Site:_____
Time:_____ _____

Sherman traps out: _____ Pitfall traps out: _____
Disturbed: - # inoperable: -
Total trap nights: [ ] Total Pitfalls: [ ]

SPECIES	Trap #	Pitfall #	Mark #	Recapt.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
Total Captures :				

Comments:_____

Recorded by:_____ Date:_____

Witnessed by:_____ Date:_____

CAVING DATA SHEET

Date:_____ Cave Name:_____

Cave Temp. (C):_____ Water Temp. (C): _____

Inflow/Outflow Cave:_____

Species	Total Length (cm)	Snout-Ant. Vent Length (cm)	Snout-Post. Vent Length (cm)	Total Individuals
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Total No. Bats:_____

Comments:_____

Recorded By:_____ Date:_____

Witnessed By:_____ Date:_____

Data Sheet: Pond Survey

Date:_____ Site #/Pond#:_____
Time:_____ Field Temp. (F):_____ Water Temp. (F): _____
Fog:_____ Wind:_____ Precip._____
Cloudcover (%):_____ Open/Forest:_____ Seine/Other:_____

Species	Drag #	Seine Width	Drag Length	Sex	Total Individuals
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Comments:_____

Recorded By:_____ Date:_____
Witnessed By:_____ Date:

Appendix I

LISTED SPECIES OBSERVED ON THE ORR DURING 1994

Species	Status	Date Found
Double-crested cormorant	In need of management (state)	June 1994
Osprey	Threatened (state)	June 1994
Bald eagle	Threatened (federal)	August 1994
Cooper's hawk	In need of management (state)	August 1994
Northern harrier	In need of management (state)	September 1994
Great egret	In need of management (state)	June 1994

Appendix J

SPECIES OBSERVED ON THE ORR DURING 1994 BUT SUBSEQUENTLY DELISTED

Species	Previous Status	Date Found
Red-headed woodpecker	In need of management	June 1994
Black-crowned night heron	In need of management	June 1994
Red-shouldered hawk	In need of management	May 1994
Black vulture	In need of management	Common
Cumberland slider	In need of management	Common

Appendix K

INDIVIDUALS WHO HAVE IDENTIFIED T&E BIRD SPECIES ON THE ORR

Brewer, Robert	Master's student, University of Tennessee (U.T.)
Bymiller, Robert	Falconer, Lockheed Martin Energy Systems, Inc. (LMES)
Carricco, Brian	Fisheries biologist, Jaycor Corporation
Combs, Melissa	Summer intern, U.T.-Chattanooga
Evans, Jim. W.	Wildlife manager, TWRA
Gehl, Ronald	Summer intern, Purdue University
Herd, Dick	Wildlife biologist, TWRA
Kroodsma, Roger	Ornithologist, LMES
Lane, Jim	Wildlife biologist, U.T.
McCracken, Kitty	Aquatic ecologist, LMES
Mitchell, Jason M.	Wildlife biologist, Jaycor Corporation
O'Neil, Brenda	Wildlife biologist, LMES
Osburn, Keith	Summer intern, LMES
Rathmell, Lon	Wildlife biologist, U.T.
Roy, Kelly W.	Fisheries biologist, LMES
Ryon, Mike	Fisheries biologist, LMES
Schilling, Elizabeth	Fisheries biologist, LMES
Vail, Elizabeth R.	Environmental biologist, Jaycor Corporation
Webb, J. Warren	Terrestrial ecologist, LMES
Wilkerson, Stanley	Entomologist, Jaycor Corporation
Wojtowicz, John	Entomologist, Jaycor Corporation

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48. J. M. Mitchell, 60 Scarboro Road, Suite D, Oak Ridge, TN 37831
49. E. R. Vail, 60 Scarboro Road, Suite D, Oak Ridge, TN 37831