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BIOLOGICAL RESOURCES SURVEY NAVAL SUPPORT ACTIVITY MIDSOUTH MILLINGTON  
SUPACT TN  
6/12/2006  
ENSAFE INC

**BIOLOGICAL RESOURCES SURVEY**  
**NAVAL SUPPORT ACTIVITY MID-SOUTH**  
**MILLINGTON, TENNESSEE**

**Revision: 0**

**Prepared for:**



**Naval Support Activity Mid-South**  
**5722 Integrity Drive**  
**Millington, Tennessee 38054-5045**

**Prepared by:**

***ENSAFE***

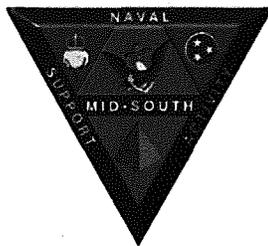
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**June 12, 2006**

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## **1.0 INTRODUCTION**

In 2001, an Integrated Natural Resources Management Plan (INRMP) was developed for Naval Support Activity (NAVSUPPACT) Mid-South installation located in Millington, Tennessee, and the Office of the Chief of Naval Operations. The INRMP was prepared in accordance with the Chief of Naval Operations Instruction (OPNAVINST) 5090.1B Chapter 29, *Natural Resources*, September 1999 and Chief of Naval Operations (CNO) letter 5090 Ser N45D8U589016 September 25, 1998, *Sikes Act Improvement Act (SAIA)*. The INRMP outlines goals, objectives, and actions for the conservation, protection, and management of biological resources located on the 1,600-acre NAVSUPPACT Mid-South installation over a 10-year period. A main goal of the INRMP is to develop functioning, sustainable ecological communities while ensuring the successful accomplishment of the installation's mission.

Specific management goals identified in the INRMP for fish and wildlife resources on NAVSUPPACT Mid-South were to:

- Manage NAVSUPPACT Mid-South on a regional ecosystem based approach that manages sensitive species and their associated ecosystems while protecting the operational functionality of the missions of the installation.
- Continue to remain in compliance with federal, state, and local laws and regulations governing fish and wildlife.
- Manage based on an ecosystem management approach rather than from a single-species paradigm.
- Support multiple, non-consumptive uses of wildlife and provide habitat enhancement for non-game species, including neotropical birds.
- Employ a systematic approach to managing wildlife resources, utilizing a process that includes inventory, monitoring, modeling, management, assessment, and evaluation.
- Minimize wildlife-related health risks, safety risks, and environmental damage.

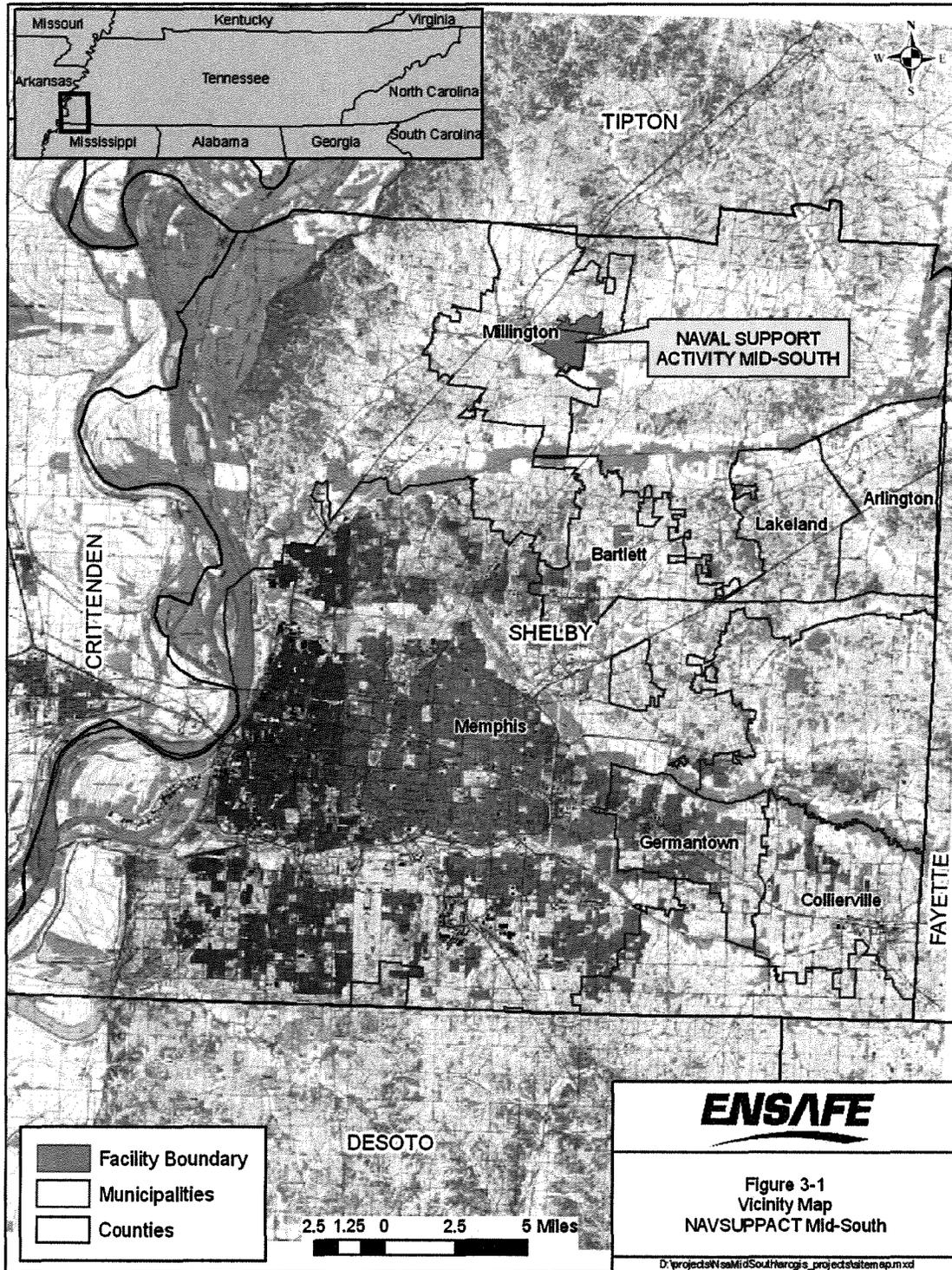
## **2.0 PURPOSE**

The completion of a comprehensive biological survey to update current resources data was identified as a necessary action to meet management goals established for fish and wildlife resources on NAVSUPPACT Mid-South and to ensure that the installation remains in compliance with applicable federal and state laws and regulations (i.e., Endangered Species Act [*16 United States Code (U.S.C.) 1531 and 1536*], Migratory Bird Treaty Act [*16 U.S.C. 703 et. seq.*], and Tennessee Non-Game and Endangered or Threatened Wildlife Species Conservation Act of 1974 [*Tennessee Code Annotated §§70-8-101 et. seq.*]).

In September 2005, NAVSUPPACT Mid-South contracted EnSafe Inc. of Memphis, Tennessee, to complete a comprehensive biological survey to assess mammalian, avian, herptile, and fish species diversity and populations within the forested, wetland, stream/drainage ditch, and urban habitats at the installation. In addition to this, a cursory survey was conducted on aquatic macro-invertebrates within the wetland and stream/drainage ditch habitats. This report documents the findings of the Biological Resource Survey.

### **3.0 SITE DESCRIPTION**

NAVSUPPACT Mid-South is in the northern portion of Shelby County, Tennessee (Figure 3-1). The installation is within the city limits of Millington, and approximately 18 miles north of Memphis, Tennessee (e<sup>2</sup>M, 2001). The size of the installation is 1,600 acres situated in an urban/semi-urban setting. Approximately 87% of the installation is classified as a maintained urban landscape setting and 13% is classified as unimproved/semi-improved forested land. The majority of the forested land defines the southern border of the installation adjacent to Big Creek Drainage Canal. Property surrounding the installation is primarily urban land interspersed with agricultural, commercial, and industrial land uses.



## **4.0 SURVEY METHODS**

### **4.1 Literature Review**

A review of several literary sources was completed prior to field surveys being performed. Review of the *2001 NAVSUPPACT Mid-South INRMP* (e<sup>2</sup>M, 2001) and the *1997 Endangered Species and Neotropical Bird Survey of the NAVSUPPACT Mid-South* (Merritt and Bingham, 1997) provided previous accounts of communities, habitats, and threatened and endangered species in and around the installation. Sources providing specie geographical range maps were reviewed to determine species that had the potential to occur on the installation (TABS, 2002; Etnier and Starnes, 1993; Conant and Collins, 1991; Page and Burr, 1991; Peterson 1980; Burt and Grossenheider, 1976).

In addition to general literature review, current lists of federal and state threatened and endangered species and species of state concern in Shelby and Tipton Counties were obtained from the Tennessee Division of Natural Heritage Web site (TNDH, 2005). A search of the Tennessee Division of Natural Heritage Inventory Program database was also requested to identify any known occurrences of federal- and state-listed threatened and endangered species and other elements of special concern within the installation's boundary and within a 1-mile radius and a 5-mile radius of the installation.

### **4.2 Survey Areas**

During a vegetative community survey conducted by EnSafe (2006), eight areas classified as unimproved/semi-improved forest habitats were surveyed. In addition to these eight predefined areas, two other areas not defined in the vegetation survey were surveyed under the biological survey effort (Figure 4-1). These two areas encompass the largest portion of the installation's property and include all maintained urban landscape habitats (i.e., office building complexes, parking lots, family housing, industrial building complexes, recreational parks, and a public golf course). General habitat type for each area is determined by associated plant communities and these communities are listed in Table 4.1. Detailed descriptions of the plant communities and locations at NAVSUPPACT Mid-South can be found in the vegetative community survey for Areas 1 through 8 (EnSafe, 2006) and the Integrated Natural Resources Management Plan (e<sup>2</sup>M, 2001) for Areas 9 and 10.



**Table 4-1**  
**Plant Community Types Associated with Survey Areas**

<b>Survey Area</b>	<b>Plant Community Type</b>
Area 1	Sycamore — Green Ash — Cottonwood — Box Elder — Floodplain/riparian forest community with mixed hardwood — Loblolly Pine successional floodplain forest community
Area 2	Mixed Hardwood — Loblolly Pine successional floodplain forest community
Area 3	Sycamore — Eastern Cottonwood — Red Maple — Pawpaw floodplain forest community with freshwater emergent/lacustrine fringe community at wetlands
Area 4	Loblolly Pine — American Elm — Sugarberry — Cottonwood — Oak forest community with mixed hardwood — Loblolly Pine forest community
Area 5	Sycamore — Cottonwood — Oak — Maple — Pawpaw floodplain forest community with freshwater vernal pool
Area 6	Loblolly Pine monoculture
Area 7	Disturbed forest-scrub community
Area 8	Loblolly Pine monoculture
Area 9	Lawn and landscape community
Area 10	Lawn and landscape community

**Note:**  
 (Ref: *Vegetative Community Survey*, EnSafe 2006 and INRMP, e<sup>2</sup>M 2001)

### **4.3 Field Survey and Methods**

Fieldwork for all surveys was completed in all areas over a 16-day period from mid-October 2005 through end of April 2006. The survey period spanned the late fall, winter, and early spring seasons. No fieldwork was conducted during the summer or early fall seasons. Methods used for the various fauna surveys are described below.

#### ***Mammalian Survey***

Habitats for this survey were walked and/or driven and mammals were identified by visual sightings and examination of any skeletal remains, scat, and animal tracks found. Surveys were conducted a various times of the day, which included late afternoons and evenings, in order to observe any mammals more nocturnal in nature. Live traps were not used during the mammalian survey. Species were identified by using references provided by William Burt and R.P. Grossenheider (1976) and O.J. Murie (1974).

### ***Avian Survey***

Capture of birds was also not required and specimens were identified by visual observations and bird call identification only as survey areas were either walked or driven. Species were identified by using a reference provided by T.P. Peterson (1980).

### ***Herptile Survey***

Field investigation included thorough searches during early morning, midday, and late afternoon hours at all major habitat areas. General collecting techniques for terrestrial habitats included lifting logs, rocks, and natural debris and capturing any specimen by hand, setting pitfall and snake traps. Searches in aquatic settings involved setting hoop traps and minnow traps, seining, and dip-netting. Other searches included driving the roads looking for basking snakes along the road edge or amphibians crossing the roadway. Once a specimen was captured, identification was determined and the specimen was released. Species were identified by using a reference provided by R. Conant and J.T. Collins (1991).

### ***Fish Survey***

Fish specimen from onsite streams/drainage ditches, and ponds were collected by use of dip-netting and seining. In larger and deeper water bodies, a 4-foot-diameter cast net was used. Specimen captured were identified onsite and released. Species were identified by using references provided by, D.A. Etnier and W.C. Starnes (1993), L.M. Page and B.M. Burr (1991) and S. Eddy and J.C. Underhill (1978).

### ***Benthic Macro-Invertebrates Survey***

Aquatic macro-invertebrates were collected by using a seine net and kick-net to sample along the bottom and banks of streams and ponds. In addition to this, sediment grab samples from the stream and pond substrate were put through a 500 micrometer screened wash bucket. Macro-invertebrates collected were placed into a container with 70% alcohol and returned to the office for later identification. Species were identified by using references provided by J. Reese Voshell (2002), R.D. Barnes (1986), and D.M. Lehmkuhl (1979).

## 5.0 RESULTS

### 5.1 Mammals

The geographic range maps reviewed on the Tennessee Animal Biogeographic System (TABS, 2002) database document 51 species of mammals occurring in western Tennessee that could potentially occur on or near the NAVSUPPACT Mid-South installation. During the course of this investigation, only 11 mammalian species were actually observed. Table 5-1 details a complete list of the observed species and the survey area in which they were sighted.

**Table 5-1**  
**Mammalian Species Identified in Survey Areas**

Mammalian Species		Location Observed									
Common Name	Genus/Specie Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10
Beaver	<i>Castor canadensis</i>			•	•	•					
Coyote	<i>Canis latrans</i>			•							
Eastern Chipmunk	<i>Tamias striatus</i>									•	•
Eastern Cottontail	<i>Sylvilagus floridanus</i>									•	•
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>	•	•	•	•	•	•	•	•	•	
Mouse	<i>unknown sp.</i>										•
Opossum	<i>Didelphis marsupialis</i>									•	•
Raccoon	<i>Procyon lotor</i>	•		•	•	•		•	•	•	•
Red Fox	<i>Vulpes fulva</i>	•		•	•						•
Short-Tailed Shrew	<i>Blarina brevicauda</i>					•					
White-Tailed Deer	<i>Odocoileus virginianus</i>	•		•		•					
<b>Number of species identified in area</b>		4	1	6	4	5	1	2	2	5	6

**Note:**

- — Denotes species was observed

Evidence of raccoon, beaver, and white-tailed deer were commonly observed in Areas 1, 3, 4, and 5. Raccoon and white-tailed deer tracks were mostly observed near water bodies in these areas, and raccoon tracks were also observed on part of the golf course in Area 9. In addition to observed signs (tracks, scat, etc.) in Areas 1, 3, 4, and 5, the raccoon was actually sighted in Areas 7, 8, and 10. Beaver dams and dens were observed in several locations along the tributary to Big Creek in Areas 4 and 5, and dens were observed in Area 3. The presence of these animals was confirmed with several sightings during one of the late afternoon surveys. Sighting of white-tailed deer was common in Areas 1 and 3, as were various signs such as droppings, tracks, and skeletal remains. A short-tailed shrew was observed in one of the pitfall traps placed in Area 5 (Figure 5-1). Although only one shrew was observed, they are probably present in most survey

areas. Two sightings of opossum were recorded for Areas 9 and 10, along with a carcass sighted in Area 9 along the roadside. Common to the improved landscape areas (Area 9 and 10) of the base were the sighting of eastern gray squirrels and eastern chipmunks. Several eastern cottontail rabbits were observed in Areas 4, 9, and 10. One mouse was spotted as it moved along the edge of and then disappeared into a building in Area 10. This mouse was not identified, but was most likely a house or deer mouse, which are very common to this area.



Figure 5-1 Photographs of mammals observed during survey (from left to right: Short-Tailed Shrew, American Beaver, Gray Squirrel, and Raccoon).

Although only 11 mammalian species were identified as having a presence on NAVSUPPACT Mid-South installation during this investigation, there is the potential that other mammalian species common to the region do inhabit areas onsite (TABS, 2002; Burt and Grossenheider, 1980). Many of these species may not have been seen due to factors such as season, time of day, size of population, survey methods used, or simply non-presence at the installation. With the construction of a large perimeter security fence around the installation, access for white-tailed deer to most of NAVSUPPACT Mid-South property has been blocked. The white tailed deer population utilizing NAVSUPPACT Mid-South is now limited to Areas 3, 5, and

parts of Areas 1 and 2 along Big Creek, which are all outside the fence line. Smaller mammals such as fox, raccoon, opossum, rabbit, beaver, and coyote may find their way to the interior property inside the fence through small access pathways at places where this fence line crosses ditch and stream courses.

## 5.2 Avian

Review of geographical range maps identified 161 avian species which have summer, winter, or year-round range in this region (Peterson, 1980). Of these species, 53 were observed on the NAVSUPACT Mid-South installation. Table 5-2 list the species observed and areas they were located. Largely due to the ease of movement from one area to another, avian species were observed in a variety of habitats in every surveyed area of the installation. Of the 53 species identified, 34 are considered as residential birds of the region and 19 are migratory (Merritt and Bingham, 1997).

**Table 5-2**  
**Avian Species Identified in Survey Areas**

Avian Species		Location Observed									
Common Name	Genus/Specie Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10
American Coot (M)	<i>Fulica americana</i>			•						•	
American Crow (R)	<i>Corvus brachyrhynchos</i>	•	•		•	•				•	•
American Goldfinch (R)	<i>Carduelis tristis</i>				•					•	
American Kestrel (R)	<i>Falco sparverius</i>									•	
American Robin (R)	<i>Turdus migratorius</i>	•	•	•	•	•		•	•	•	•
Bank Swallow (M)	<i>Riparia riparia</i>			•							
Blue Jay (R)	<i>Cyanocitta cristata</i>	•	•	•	•	•		•	•	•	•
Brown Creeper (M)	<i>Certhia americana</i>				•						
Brown-Headed Cowbird (R)	<i>Molothrus ater</i>									•	•
Bufflehead (M)	<i>Bucephala albeola</i>			•							
Canada Goose (R)	<i>Branta canadensis</i>							•		•	•
Carolina Chickadee (R)	<i>Poecile carolinensis</i>		•		•						•
Carolina Wren (R)	<i>Thryothorus ludovicianus</i>		•		•						•
Common Flicker (R)	<i>Colaptes auratus</i>	•		•	•	•					•
Common Grackle (R)	<i>Quiscalus quiscula</i>									•	•
Common Snipe (M)	<i>Capella gallinago</i>			•							
Downy Woodpecker (R)	<i>Picoides pubescens</i>	•			•	•					
Eastern Bluebird (R)	<i>Sialia sialis</i>				•						•
Eastern Belted Kingfisher (R)	<i>Ceryle alcyon</i>	•	•	•	•	•		•			
Eastern Towhee (M)	<i>Pipilo erythrophthalmus</i>				•	•					
European Starling (M)	<i>Sturnus vulgaris</i>									•	•

**Table 5-2**  
**Avian Species Identified in Survey Areas**

Avian Species		Location Observed									
Common Name	Genus/Species Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10
Golden-Crowned Kinglet (M)	<i>Regulus satrapa</i>				•						
Great Blue Heron (R)	<i>Ardea herodias</i>			•				•			
Great Egret (M)	<i>Ardea alba</i>			•							
Green Heron (M)	<i>Butorides virescens</i>			•							
Hairy Woodpecker (R)	<i>Picoides villosus</i>	•			•	•					
Hooded Merganser (M)	<i>Lophodytes cucullatus</i>			•							
House Sparrow (R)	<i>Passer domesticus</i>									•	•
Killdeer (R)	<i>Charadrius vociferous</i>			•						•	•
Loggerhead Shrike (R)	<i>Lanius ludovicianus</i>									•	
Mallard (R)	<i>Anas platyrhynchos</i>			•				•			
Merlin (M)	<i>Falco columbarius</i>			•							
Mourning Dove (R)	<i>Zenaida macroura</i>				•					•	•
Northern Cardinal (R)	<i>Cardinalis cardinalis</i>	•	•	•	•	•	•	•	•	•	•
Northern Harrier (R)	<i>Circus cyaneus</i>										•
Northern Junco (M)	<i>Junco hyemalis</i>	•		•		•	•			•	•
Northern Mockingbird (R)	<i>Mimus polyglottos</i>	•	•	•	•	•	•	•	•	•	•
Pied-Billed Grebe (M)	<i>Podilymbus podiceps</i>							•		•	
Pileated Woodpecker (R)	<i>Dryocopus pileatus</i>				•	•					
Pine Siskin (M)	<i>Carduelis pinus</i>				•						
Red-Bellied Woodpecker (R)	<i>Melanerpes carolinus</i>	•			•	•					
Red-Shouldered Hawk (R)	<i>Buteo lineatus</i>	•		•							
Red-Tailed Hawk (R)	<i>Buteo jamaicensis</i>	•		•							•
Red-Winged Blackbird (R)	<i>Agelaius phoeniceus</i>			•						•	•
Rock Dove (R)	<i>Columba livia</i>										•
Ruby-Crowned Kinglet (M)	<i>Regulus calendula</i>				•						
Ruddy Duck (M)	<i>Oxyura jamaicensis</i>			•							
Savannah Sparrow (M)	<i>Passerculus sandwichensis</i>				•						
Tufted Titmouse (R)	<i>Baeolophus bicolor</i>	•	•	•	•	•				•	•
Turkey Vulture (R)	<i>Cathartes aura</i>										•
Yellow-Rumped Warbler (M)	<i>Dendroica coronata</i>				•						
Wild Turkey (R)	<i>Meleagris gallopavo</i>	•		•		•					
Wood Duck (R)	<i>Aix sponsa</i>			•				•			
<b>Number of species identified in area</b>		<b>15</b>	<b>9</b>	<b>25</b>	<b>24</b>	<b>15</b>	<b>3</b>	<b>10</b>	<b>4</b>	<b>20</b>	<b>23</b>

**Notes:**

- — Denotes species was observed
- (M) — Denotes species is migratory
- (R) — Denotes species is residential

The most common bird sightings were of the American robin, blue jay, common flicker, eastern belted kingfisher, northern cardinal, northern mockingbird, and the tufted titmouse. Both the northern cardinal and the northern mockingbird were observed utilizing habitat in all 10 areas surveyed on the installation. The American robin and blue jay were observed in nine areas, the tufted titmouse in seven areas, the eastern belted kingfisher in 6 areas along water courses, and the common flicker in five areas. Figure 5-2 shows photographs of two of the most common bird species observed. These species are year-round resident species at the installation. In contrast, species such as the great egret, green heron, hooded merganser, mallard, pied-billed grebe, ruddy duck, and wood duck were only observed in Areas 3 or 7 due to habitat preference of large water bodies. The wood duck and mallard are year-round resident birds to the area while the others were on their migration path through the region.

Area 3 proved to have the most diversity in total number of species observed with 25 species documented. Avian diversity is due to the varied habitat within the Area 3: large water body, forested area, and the edge zone between the forest and water. Twenty-four species were documented in Area 4, which included the installation's forested nature trail area. Most of the avian species observed within Area 4 were utilizing the forested area and belonged to the common groups of warblers, kinglets, woodpeckers, and thrushes. Birds of prey observed year-round on the installation included the red-tailed hawk, red-shouldered hawk, and American kestrel. Scavengers include the turkey vulture and black vulture.

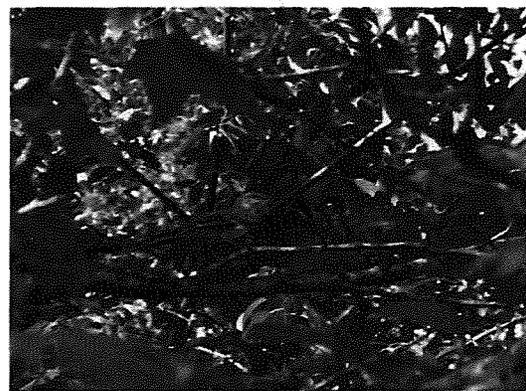
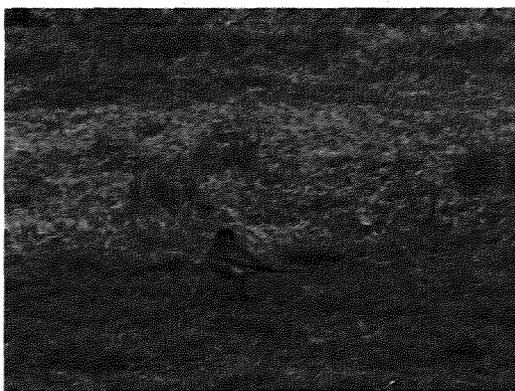


Figure 5-2 Photographs of the American Robin (left) and Northern Mockingbird (right) observed during survey.

### **5.3 Herptiles**

Herptiles is a general term used in reference to the amphibian and reptile groups as a whole. Herptiles include salamanders, frogs, toads, skinks, lizards, snakes, and turtles. Review of geographic range maps (TABS, 2002; Conant and Collins, 1991) indicated 80 species of amphibians and reptiles have a potential of occurring on or near the installation. In addition to the 10 established survey areas, Navy Lake recreational area was also included in the survey for snakes only. Navy Lake recreational area is north by northeast of Area 9 and is not part of the NAVSUPPACT Mid-South installation property. This area is utilized by Navy personnel and the high number of snake sightings around the lake during the summer of 2005 became a concern. The snake survey of Navy Lake recreational area will be discussed in more detail at the end of this section.

Twenty-two species were captured, identified, and released during the survey on NAVSUPPACT Mid-South. During the investigation time period, soil and leaf litter conditions within all surveyed areas was extremely dry. Turtles, frogs, salamanders, and some species of snakes were typically found in habitat areas that were near or contained a water resource, as required by their unique habitat needs. Figure 5-3 shows photographs of a few of the common species captured. Table 5-3 lists species identified during the survey and the areas in which they were captured.

Areas showing the most diversity in species collected were 3, 5, and 7. These areas had more habitat diversity under normal natural conditions, little to no human disturbance or impact, and a water resource (i.e., lake, pond, or stream). Seventeen species were identified in Area 3, which included seven species of frog, five species of snake, three species of turtle, one skink species, and one salamander species. Area 5 was the second-most diversified and had six frog species, three snake species, two turtle species, one skink species, and one salamander species identified. Ranked third in diversity was Area 7 with seven frog, three turtle, and one snake species identified. Areas 4, 9, and 10 also had some water sources located within their areas, but had lower habitat diversity due to human impact, such as landscaping and drainage ditch maintenance. Area 1 was considered to still be under a natural condition since human impact (Solid Waste Management Unit 2 Landfill) had not occurred within the area for many years. This area is a typical forested area with a few wetland areas interspersed throughout. Species diversity was expected to be higher than what was found. During the survey period all wetland areas on the installation were dry. With such dry conditions, fewer species were captured than expected in the

forested sections of Areas 1, 3, 4, 5, and 7. The small pine forest of Areas 6 and 8 had no water sources, and no species were identified within those areas during the survey.

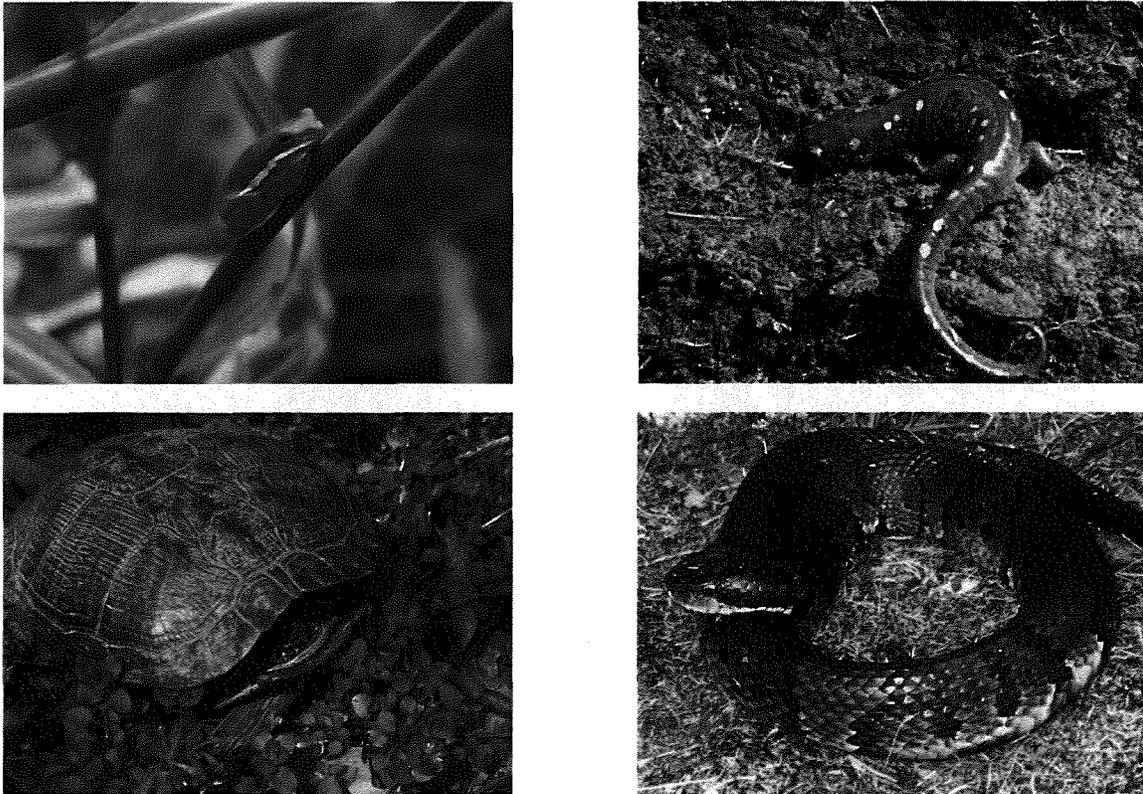


Figure 5-3 Photographs of amphibian and reptile species observed at NAVSUPPACT Mid-South (From left to right: Green Tree Frog, Spotted Salamander, Red-Eared Slider, and Cottonmouth).

**Table 5-3**  
**Herptile Species Identified in Survey Areas**

Herptile Species		Location Observed						
Common Name	Genus/Specie Name	Area 1	Area 3	Area 4	Area 5	Area 7	Area 9	Area 10
American Toad	<i>Bufo americanus</i>							•
Bronze Frog	<i>Rana clamitans clamitans</i>	•	•	•	•	•		•
Bullfrog	<i>Rana catesbeiana</i>		•			•		
Gray Tree frog	<i>Hyla chrysoscelis/versicolor</i>		•			•	•	
Green Tree frog	<i>Hyla cinerea</i>				•			
Pickerel Frog	<i>Rana palustris</i>			•	•			
Spring peepers	<i>Pseudacris crucifer</i>	•	•	•	•	•	•	•
Southern Cricket Frog	<i>Acris gryllus gryllus</i>	•	•	•	•	•	•	•
Southern Leopard Frog	<i>Rana utricularia</i>		•			•		

**Table 5-3**  
**Herptile Species Identified in Survey Areas**

Herptile Species		Location Observed						
Common Name	Genus/Specie Name	Area 1	Area 3	Area 4	Area 5	Area 7	Area 9	Area 10
Northern Cricket Frog	<i>Acris crepitans crepitans</i>	•	•	•	•	•	•	•
Ground Skink	<i>Scincella lateralis</i>	•	•		•			
Spotted Salamander	<i>Ambystoma maculatum</i>		•		•			
Eastern Box Turtle	<i>Terrapene carolina</i>		•		•	•		
Midland Smooth Softshell Turtle	<i>Apalone mutica mutica</i>		•					
Red-Eared Slider Turtle	<i>Trachemys scripta elegans</i>		•	•	•	•	•	•
Snapping Turtle	<i>Chelydra serpentina</i>					•		
Black Rat Snake	<i>Elaphe obsoleta</i>			•	•		•	
Brown Water Snake	<i>Nerodia taxispilota</i>		•	•			•	
Cottonmouth	<i>Agkistrodon piscivorus</i>	•	•		•			
Midland Water Snake	<i>Nerodia sipedon pleuralis</i>		•	•				
Northern Water Snake	<i>Nerodia sipedon sipedon</i>		•		•	•	•	
Yellowbelly Water Snake	<i>Nerodia erythrogaster flavigaster</i>		•				•	
<b>Number of species identified in area</b>		<b>6</b>	<b>17</b>	<b>9</b>	<b>13</b>	<b>11</b>	<b>9</b>	<b>6</b>

**Note:**

- — Denotes species was observed

Due to the time frame and size of the project, only a qualitative estimate of population was attempted for species captured. Populations were considered small if less than 5 individuals were found; moderate if less than 20 individuals were found; and abundant if more than 20 individuals were found. Population of various species of frogs and toads identified during this survey were abundant (>20 individuals). Population of the eastern box turtle was moderate (>5 and <20 individuals) and small for both the midland smooth soft-shell turtle and the snapping turtle (>5 individuals). The red-eared slider turtle was the most common turtle captured and its population is considered abundant. All snake populations were moderate (<20 individuals) except for the brown water snake, which was abundant (>20 individuals).

**Navy Lake Recreational Area**

With the high number of reported snake sightings at the Navy Lake recreational area during the summer of 2005, NAVSUPACT Mid-South asked EnSafe to conduct a survey for snakes only in this area during the performance of the comprehensive biological resource survey. This portion of the survey consisted of setting two snake traps in the wooded area near the edge of the small southern lake and walking the perimeter of the lakes looking for any snakes basking in the

sun, moving over the ground, or swimming along the water edge. Three field days were spent on this survey; one day in the late fall of 2005 and two days in the early spring of 2006.

During the time period spent on this portion of the survey, 10 snakes were identified. Nine were captured by hand and one that was too fast to capture was observed. Six of the snakes were identified as brown water snakes, four as northern water snakes, and one as a black rat snake (observed). No snakes were captured in the snake traps due to the short period they remained open. No venomous snakes (copperhead, cottonmouth) were captured or observed during the survey, but both species do have the potential of occurring in the area. Most people not familiar with various snake species can and will mistake the more common non-venomous water snakes as venomous species.

#### **5.4 Fish**

The survey for this resource was limited to areas that contained permanent water bodies only and excludes Areas 1, 2, 6, and 8. Areas 3, 4, 5, 7, 9, and 10 contained water bodies capable of sustaining aquatic life, such as fish and benthic macro-invertebrates. Macro-invertebrates will be discussed in the next section.

Surface water on most of NAVSUPPACT Mid-South installation ultimately drains into Big Creek Drainage Canal through tributary streams and ditches. The main tributary stream with year-round flow begins in the northern portion of area 10, flows south along Singleton Parkway, then turns west and crosses Areas 4 and 5 before entering Big Creek. From the point of origin (area 10) to the point the tributary enters into area 4, this water course has been highly disturbed by human impact. Impacts include bridge crossings, channel maintenance (clearing), riprap for bank stabilization, and a reduced or nonexistent riparian zone associated with the campus environment landscaping. These types of impact have reduced the diversity of habitats typically found within a stream and reduce the diversity of fish species normally found utilizing them. Area 4 has minimal disturbance along its stream section and the disturbance is associated with the riparian zone and not the channel itself. The stream section in Area 5 is still in a natural state with no human disturbance associated with it. The stream however has a steeper slope and high volumes of water during flood events has scoured the stream bed into a deep narrow channel, thus reducing habitat diversity.

Based on review of geographic range maps (TABS, 2002; Etnier and Starnes, 1993), 66 species of fish have the potential to occur on or near NAVSUPPACT Mid-South. Ten species of fish were

identified on NAVSUPPACT Mid-South property during the survey. Figure 5-4 shows photographs of several fish species observed during the survey. Four species were found to inhabit the upper reaches of the tributary stream (Area 10). The species identified were the mosquitofish, black-spotted topminnow, black-stripe topminnow, and bluegills, which were the most common species found during the survey (Table 5-4). Area 4, where nine species were identified, had the most diversity. Including the four species mentioned above, species in Area 4 also included largemouth bass, green sunfish, yellow bullhead, creek chubsucker, and the red shiner.

**Table 5-4**  
**Fish Species Identified in Survey Areas**

Fish Species		Location Observed					
Common Name	Genus/specie Name	Area 3	Area 4	Area 5	Area 7	Area 9	Area 10
Largemouth Bass	<i>Micropterus salmoides</i>		•				
Bluegill	<i>Lepomis macrochirus</i>	•	•	•	•	•	•
Blackstripe Topminnow	<i>Fundulus notatus</i>	•	•	•	•	•	•
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	•	•	•	•	•	•
Green Sunfish	<i>Lepomis cyanellus</i>		•	•			
Yellow Bullhead	<i>Ameiurus natalis</i>		•	•			
Mosquitofish	<i>Gambusia affinis</i>	•	•	•	•	•	•
Creek Chubsucker	<i>Erimyzon oblongus</i>		•				
Carp	<i>Cyprinus carpio</i>				•	•	
Red Shiner	<i>Cyprinella lutrensis</i>		•	•			
<b>Number of species identified in area</b>		4	9	7	5	5	4

**Note:**

- — Denotes species was observed

Seven species were captured and identified in Area 5. The species were similar to those found in Area 4, except the largemouth bass and creek chubsucker were not found. This may be due to the fact that beaver dams in the Area 4 section portion of the stream have provided deeper pools for these fish to inhabit, which is not the case in the Area 5 section of the stream.

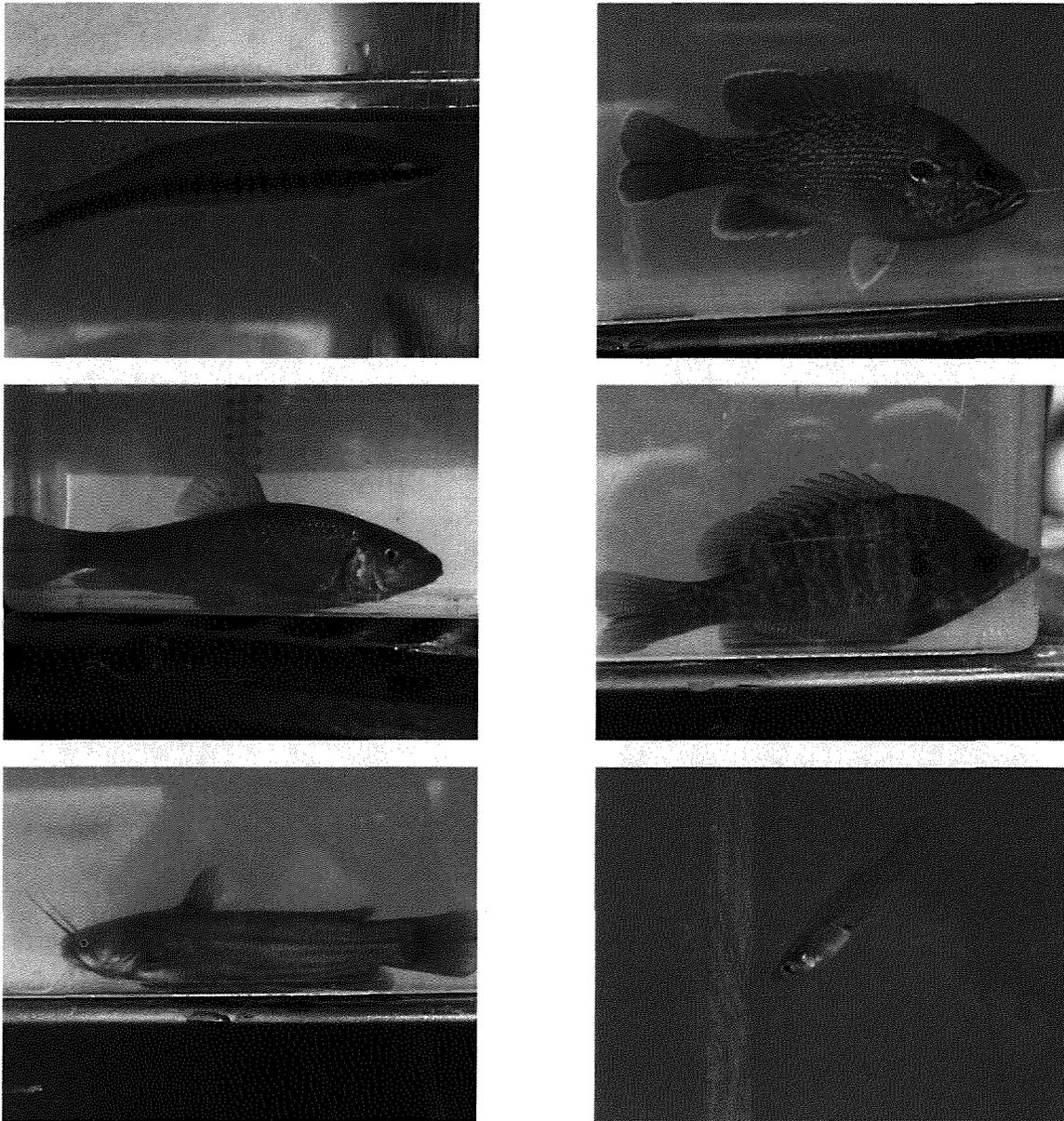


Figure 5-4 Photographs of fish species observed during survey. (from left to right — top row: Black-spotted Topminnow and Green Sunfish; middle row: Creek Chubsucker and Bluegill; bottom row: Yellow Bullhead and Mosquitofish).

Bluegill and black-stripe topminnows were the dominant species in each of the areas surveyed regardless of the survey method used. These species inhabit streams and lakes of all dimensions and utilized all available aquatic habitats at the installation. According to Paul Wargo (Glenn Eagle Golf Course Superintendent, interview), the lakes associated with Areas 7 and 9 (golf course lakes) reportedly contain several fish species such as carp, bass, bluegill, and sunfishes. The bass and

sunfishes, except for bluegill, were not observed in these ponds during this investigation. Although Big Creek Drainage Canal borders most of the southern edge of the installation, this water course was not included in this survey. Do to the size of Big Creek and the various habitats within the channel, the fish community is expected to have a much higher diversity in than what was found to occur onsite at NAVSUPPACT Mid-South.

### 5.5 Benthic Macro-Invertebrates

The benthic macro-invertebrate survey is a cursory look at the types of aquatic invertebrate found to occur within the streams, ditches, lakes, and wetlands located on the NAVSUPPACT Mid-South installation. The depth and degree of effort it takes to identify invertebrates to a genus/species level is beyond the scope of this survey project. Therefore specimens collected were identified only to family level where possible. Invertebrates were collected from several locations at each stream, ditch, and lake where fish were surveyed. Identification of these invertebrates will begin to establish baseline data of the organisms that form part of the food web for various mammals, birds, amphibians, reptiles, and fish that utilize the aquatic habitat on the installation. Table 5-5 lists the 20 invertebrates identified during this survey.

**Table 5-5  
 Macro-Invertebrate Species Identified in Survey Areas**

Common Name	Phylum\Class\Order\Family	Location Observed					
		Area 3	Area 4	Area 5	Area 7	Area 9	Area 10
Aquatic Worms	<i>Annelida\Oligochaeta</i>	•	•	•	•	•	•
Leeches	<i>Annelida\Hirudinea</i>	•	•	•			•
Spreadwinged Damselflies	<i>Arthropoda\Insecta\Odonata\Zygoptera\Lestidae</i>	•	•	•	•		
Skimmer Dragonflies	<i>Arthropoda\Insecta\Odonata\Anisoptera\Libellulidae</i>	•	•	•	•		
Crawling Water Beetles	<i>Arthropoda\Insecta\Coleoptera\Haliplidae</i>	•	•	•	•		•
Predaceous Diving Beetles	<i>Arthropoda\Insecta\Coleoptera\Dytiscidae</i>		•	•	•		•
Water Boatmen	<i>Arthropoda\Insecta\Hemiptera\Corixidae</i>	•	•	•	•	•	•
Water Striders	<i>Arthropoda\Insecta\Hemiptera\Gerridae</i>	•	•	•	•	•	•
Caddisflies	<i>Arthropoda\Insecta\Trichoptera\</i>		•	•	•	•	•
Small Squaregill Mayflies	<i>Arthropoda\Insecta\Ephemeroptera\Caenidae</i>		•	•	•		
Little Stout Crawler Mayflies	<i>Arthropoda\Insecta\Ephemeroptera\Leptohiphidae</i>		•	•	•		
Non-Biting Midges	<i>Arthropoda\Insecta\Diptera\Chironomidae</i>		•	•	•		•
Crayfishes	<i>Crustacea\Decapoda\</i>	•	•		•	•	•
Shrimp	<i>Crustacea\Malacostraca\Decapoda</i>		•	•			
Aquatic Sowbugs	<i>Crustacea\Malacostraca\Isopoda\Asellidae</i>		•	•	•		•
Planorbid Snail	<i>Mollusca\Gastropoda\Pulmonata\Planorbidae</i>		•	•		•	
Physid Snail	<i>Mollusca\Gastropoda\Pulmonata\Physidae</i>		•	•		•	

**Table 5-5  
 Macro-Invertebrate Species Identified in Survey Areas**

Common Name	Phylum\Class\Order\Family	Location Observed					
		Area 3	Area 4	Area 5	Area 7	Area 9	Area 10
Pleurocerid Snail	<i>Mollusca\Gastropoda\Prosobranchia\Pleuroceridae</i>		•	•			
Asian Clams	<i>Mollusca\Bivalvia\Veneroidea\Corbiculidae</i>		•	•			
Fingernail Clams	<i>Mollusca\Bivalvia\Veneroidea\Sphaeriidae</i>		•	•			
<b>Number of species identified in area</b>		8	20	19	13	7	10

**Note:**

- — Denotes species was observed

During this survey, samples were collected and identified from the stream running through Areas 4, 5, and 10, the golf course lakes in Areas 7 and 9, and Wetlands 7 and 8 in Area 3. Due to dry conditions during the sampling event, wetlands associated with Areas 2 and 5 were not sampled for invertebrates. Water depth at the golf course lakes ranged from 6 inches along the fringe to 12 feet in the center. The lake bottom substrate in Area 7 consisted of silt, sand, and clay for the most part, with high organic material being deposited near the shoreline and inflow area from the surrounding forested area. The substrates for the lakes in Area 9 were silt, sand, and clay. Thirteen species were collected and identified from the fringe zone of the lake in Area 7 and seven from one golf course lake in Area 9.

Along the tributary stream running through Areas 4, 5, and 10, invertebrates were collected from three locations. Water depth ranged from 3 to 6 inches in the Area 10 section, 2 to 3 feet in the Area 4 section, and 8 to 12 inches in the Area 5 section. Substrate for the stream consisted of silt, sand, clay, and aquatic vegetation root mats in some areas. The Area 10 sample location had the fewest number of invertebrates collected and identified due to a disturbance of the area by ditch maintenance activities. Areas 4 and 5 had the highest number of invertebrates collected. The stream in these areas is still in a natural to semi-natural condition with little to no human impact.

At Wetlands 7 and 8, invertebrates were collected from along the edges of each lagoon. Water depth for both lagoons ranged from 0 inches at the edge to 2 feet across the majority of the water body. Substrate for Wetland 8 consisted of what appeared to be light grey silty clay. No organic material or aquatic vegetation was present in the water body. In Wetland 7, the substrate was a thick black organic muck, with little rooted aquatic vegetation present within the

water body. Except for the one golf course lake, these lagoons held the fewest number of invertebrates collected.

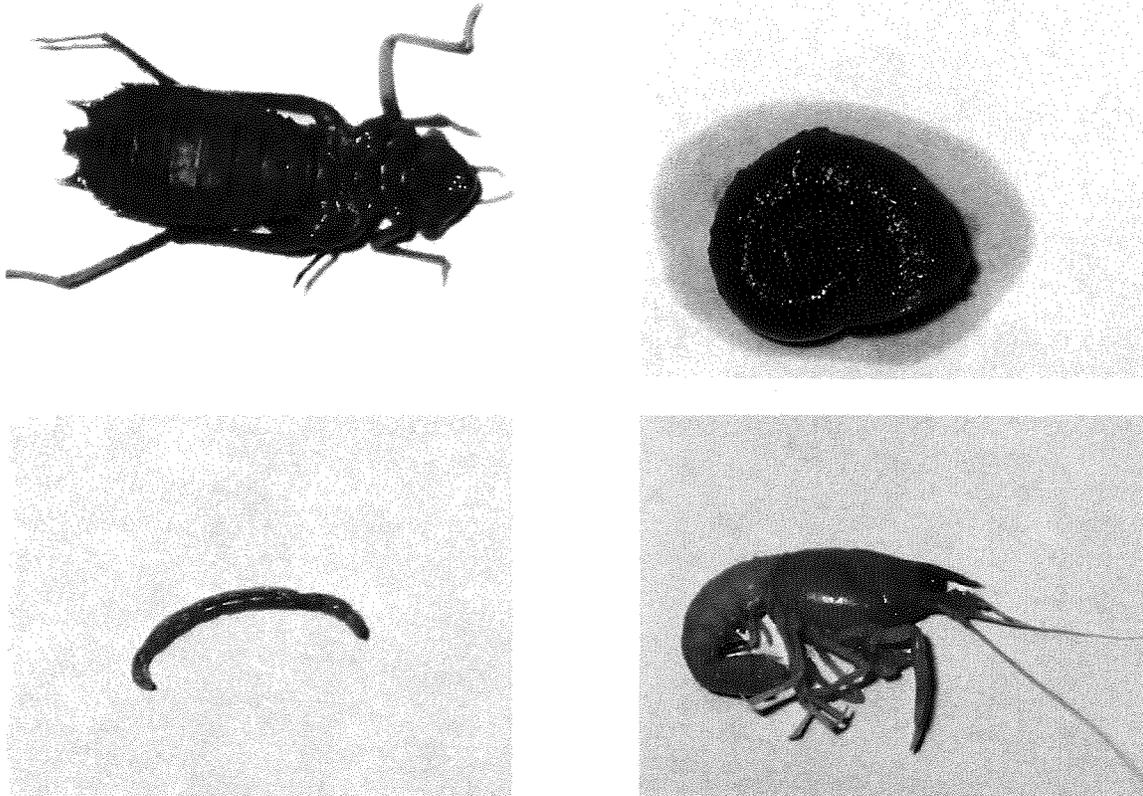


Figure 5-5 Photographs of several macro-invertebrates collected during survey (from left to right: Skimmer Dragonfly Larvae, Planorbis Snail, Midge Larvae, and Shrimp).

## **5.6 Threatened and Endangered Species**

Review of the Tennessee Division of Natural Heritage (TDNH, 2005) database for state-listed threatened and endangered species of Shelby County and Tipton County indicated that four invertebrate species and 24 vertebrate state-listed species have been identified as potentially occurring on or near the NAVSUPPACT Mid-South installation (Appendix A). An inventory record search of confirmed sightings within a 1-mile and 5-mile radius of the installation was performed by Tennessee Division of Natural Heritage staff in January 2006, and showed that the northern pine snake was the only state-listed threatened or endangered species to have been reported within a 5-mile radius of the installation. Of the potential species listed for this area, no threatened or endangered species were observed on the installation during the survey.

## **6.0 CONCLUSIONS**

The following are the major findings from the 2005–2006 biological resource survey completed at NAVSUPPACT Mid-South.

### ***Mammals***

- Diversity of mammals is low with only 11 species observed on NAVSUPPACT Mid-South installation property.
- Perimeter fencing has limited mammal access to most of the installation and restricted larger mammals to habitats in smaller areas of the property located outside the fence line.
- Habitats inside fencing (lawn and landscape) are considered optimal to marginal for small mammals such as squirrel, mice, chipmunks, and rabbit for most areas on the installation, and considered marginal to poor for the medium and larger size mammals such as coyote, fox, and white tailed deer. Size of property still owned by NAVSUPPACT Mid-South outside the fence is extremely small compared to overall size of the installation, but provides ample habitat for white tailed deer, beaver, coyote, fox, and rabbit. Since the transfer of property surrounding the airfield to the city of Millington, old fields and agricultural fields that provided additional habitats to mammal and bird species are no longer part of NAVSUPPACT Mid-South.
- Mammal populations for game species such as white tailed deer, rabbit, and beaver are moderate to small on the installation property due to human presence and activities within the area. The squirrel population is considered to be moderate.

### ***Avian***

- Fifty-three species of birds were observed on the NAVSUPPACT Mid-South installation. Thirty-four are year-round residents to the area, and 19 are migratory.
- Areas 3, 4, and 5 provided a variety of habitats such as forested areas, forest edge, and water sources, which accounts for the higher diversity of bird species observed in these areas.

### ***Herptiles***

- Twenty-two species of amphibians and reptiles were observed on NAVSUPPACT Mid-South.
- Areas providing habitat near water sources (i.e., lakes, streams, wetlands) had a higher diversity of species. Some areas that usually contained wetlands were completely dry during this survey, and species that typically inhabit these areas were absent.
- Most populations of amphibians encountered were considered to be abundant. Turtle populations varied with red-eared sliders abundant, eastern box turtles moderate, and the midland smooth softshell and snapping turtle populations small. Snake populations were moderate for species encountered except for the brown water snake, which was abundant.
- Snake species identified at the Navy Lake recreational area were non-venomous brown water snakes, northern water snakes, and black rat snakes. Both the brown water snake and northern water snake populations are abundant in this area.

### ***Fish***

- Ten species of fish were identified within the streams and lakes at NAVSUPPACT Mid-South.
- Populations of bluegill, black-striped topminnow, and black-spotted topminnow were abundant and populations of all other identified species were small. Most aquatic systems associated with NAVSUPPACT Mid-South have been disturbed due to human activities and have reduced habitats typically utilized by fish.

### ***Macro-Invertebrates***

- Twenty families of aquatic macro-invertebrates were identified within the streams and lakes at NAVSUPPACT Mid-South.
- Populations of invertebrates observed were considered moderated to small. As with fish habitat, most aquatic systems have been disturbed by human activities, which have reduced available habitat for invertebrates.

### ***Threatened and Endangered Species***

- No federal- or state-listed species were observed on NAVSUPPACT Mid-South installation during the survey.

## **7.0 RECOMMENDATIONS**

Based on the findings of 2005-2006 Biological Resource Survey, the following are recommendations to meet management goals established for fish and wildlife resources on NAVSUPPACT Mid-South and to ensure that the installation remains in compliance with applicable federal and state laws and regulations.

- Populations of individual species of mammals do not appear to be abundant due to the campus environment (lawn and landscape) across most of the installation and the reduction and fragmentation of suitable habitat outside the installation. Habitat enhancement should be considered for areas no longer being utilized and that have no conflict with the installation's mission to restore wildlife diversity. For NAVSUPPACT Mid-South property areas located outside the perimeter fence, various types of food plots could be established across the fragmented areas to attract and increase species diversity.
- Improve aquatic habitat conditions for aquatic communities. Consideration should be given to increasing vegetative buffers at water bodies and stream corridors. Increased vegetation along and within the water source will provide shelter and nesting sites for aquatic wildlife, but most importantly, will reduce high water temperatures, which stress aquatic species, during summer months. Vegetation will also provide additional organic material for the aquatic ecosystem, which will be utilized by invertebrates that are the base of the food-web for upper-level wildlife species.
- Continue to assess species populations through additional observation surveys within the next five years. Surveys should be conducted over a 12-month period in order to assess species utilizing the installation over the various seasons. Although no listed threatened and endangered species are known to occur at NAVSUPPACT Mid-South, monitoring will ensure that the installation remains in compliance with all applicable laws and regulations concerning threatened and endangered species protection.

## 8.0 REFERENCES

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**Appendix A**  
**Tennessee Department of Environment and Conservation**  
**Division of Natural Heritage**  
**Database for State-Listed Threatened and Endangered Species**



STATE OF TENNESSEE  
**DEPARTMENT OF ENVIRONMENT AND CONSERVATION**

Division of Natural Heritage  
 7th Floor L&C Annex  
 401 Church Street  
 Nashville, Tennessee 37243  
 Phone 615/532-0431 Fax 615/532-0046

January 19, 2006

Lisa C. Gandy  
 Whitemont Group, Inc. Environmental Consultants  
 13280 Rivercrest Drive  
 Little Rock, AR 72212

Subject: Project Review: DNH 2006-001; NAVSUPACT Mid-South Vegetation Survey

Dear Ms. Gandy:

Thank you for your letter and enclosures regarding the above mentioned project in Shelby County. We have reviewed the information submitted and find that rare species have been documented within a 1-mile radius of the project area. These species are listed below and correspond with the locations of the records documented on the attached map (reference 'Species\_ID').

Species_ID	Scientific Name	Common Name	Federal Status	State Status	Global Rank	State Rank
<b>Vertebrate Animal</b>						
7837	<i>Pituophis melanoleucus melanoleucu</i>	Northern Pine Snake		T	G4T4	S3

No rare plant species have been documented within a 1-mile radius of the site. However, rare plants have been documented in the surrounding area. I have attached a separate list of rare species that have been documented within a 4-mile radius of the project area. Consideration for these species should be given, if suitable habitat exists in the project area for these species.

No other natural areas, scenic rivers or ecologically sensitive sites were found to be within the project area. Please keep in mind, however, that not all areas of Tennessee have been surveyed and that a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. For additional information regarding Tennessee's rare and endangered species or interpretation of Status or Ranks, please visit our website at <http://www.state.tn.us/environment/nh/>.

Thank you for the opportunity to comment on the subject proposal and for considering Tennessee's rare species throughout the planning of this project. Should you have any questions, please do not hesitate to contact me at (615) 532-0440.

Sincerely,  
 Kirstin Condict, Data Manager



**Rare Species Documented Within 4-Mile Radius  
NAVSUPACT Mid-South Vegetation Survey Site**

Tennessee Division of Natural Heritage  
[www.state.tn.us/environment/nh/](http://www.state.tn.us/environment/nh/)

<b>Vascular Plant</b>		<b>Federal Status</b>	<b>State Status</b>	<b>Global Rank</b>	<b>State Rank</b>
<i>Panax quinquefolius</i>	American Ginseng		S-CE	G3G4	S3S4
<i>Phacelia ranunculacea</i>	Blue Scorpion-weed		S	G4	S2S3
<i>Prenanthes crepidinea</i>	Nodding Rattlesnake-root		E	G3G4	S2
<b>Vertebrate Animal</b>					
<i>Ictinia mississippiensis</i>	Mississippi Kite		D	G5	S2S3
<i>Limnothlypis swainsonii</i>	Swainson's Warbler		D	G4	S3
<i>Pituophis melanoleucus melanoleucus</i>	Northern Pine Snake		T	G4T4	S3

Project Name: NAVSUPPACT Mid-South Vegetation Survey



- Project Location
- Rare Species

### TENNESSEE DIVISION OF NATURAL HERITAGE

14th Floor L&C Tower  
401 Church Street  
Nashville, TN 37243  
Phone: 615.532.0440  
[www.state.tn.us/environment/nh](http://www.state.tn.us/environment/nh)

Date Reviewed: 1/19/2006



## Tennessee List of Rare Species by County

May 2006

Tennessee Division of Natural Heritage  
www.state.tn.us/environment/nh/

### Shelby

Vascular Plant		Federal Status	State Status	Global Rank	State Rank
<i>Acmella oppositifolia</i>	Creeping Spot-flower		S	G5	S2
<i>Aster praealtus</i>	Willow Aster		E	G5	S1
<i>Crataegus harbisonii</i>	Harbison's Hawthorn		E	G1	S1
<i>Hydrastis canadensis</i>	Goldenseal		S-CE	G4	S3
<i>Iris fulva</i>	Copper Iris		T	G5	S2
<i>Ophioglossum crotalophoroides</i>	Bulbous Adder's-tongue		S	G5	SH
<i>Panax quinquefolius</i>	American Ginseng		S-CE	G3G4	S3S4
<i>Penstemon tubiflorus</i>	Small-flowered Beardtongue		S	G5	S1
<i>Phacelia ranunculacea</i>	Blue Scorpion-weed		S	G4	S2S3
<i>Prenanthes crepidinea</i>	Nodding Rattlesnake-root		E	G4	S2
<i>Schisandra glabra</i>	Red Starvine		T	G3	S2
<i>Silene ovata</i>	Ovate Catchfly		E	G3	S2
<i>Ulmus crassifolia</i>	Cedar Elm		S	G5	S2
Invertebrate Animal		Federal Status	State Status	Global Rank	State Rank
<i>Lampsilis siliquoidea</i>	Fatmucket			G5	S2
<i>Obovaria jacksoniana</i>	Southern Hickorynut			G2	S1
<i>Triodopsis multilineata</i>	Striped Whitelip (=t. Webbhelix)			G5	S1
Vertebrate Animal		Federal Status	State Status	Global Rank	State Rank
<i>Ammocrypta beani</i>	Naked Sand Darter		D	G5	S2
<i>Chondestes grammacus</i>	Lark Sparrow		T	G5	S1B
<i>Corynorhinus rafinesquii</i>	Eastern Big-eared Bat		D	G3G4	S3
<i>Cycleptus elongatus</i>	Blue Sucker		T	G3G4	S2
<i>Dendroica cerulea</i>	Cerulean Warbler		D	G4	S3B
<i>Haliaeetus leucocephalus</i>	Bald Eagle	LT,PDL	D	G5	S3
<i>Hyla gratiosa</i>	Barking Treefrog		D	G5	S3
<i>Ictinia mississippiensis</i>	Mississippi Kite		D	G5	S2S3
<i>Limnothlypis swainsonii</i>	Swainson's Warbler		D	G4	S3
<i>Macroclermys temminckii</i>	Alligator Snapping Turtle		D	G3G4	S2S3
<i>Myotis sodalis</i>	Indiana Bat	LE	E	G2	S1
<i>Neotoma floridana illinoensis</i>	Eastern Woodrat		D	G5T5	S3
<i>Noturus stigmosus</i>	Northern Madtom		D	G3	S3
<i>Ophisaurus attenuatus longicaudus</i>	Eastern Slender Glass Lizard		D	G5T5	S3
<i>Pituophis melanoleucus melanoleucus</i>	Northern Pine Snake		T	G4T4	S3
<i>Sorex longirostris</i>	Southeastern Shrew		D	G5	S4
<i>Sterna antillarum athalassos</i>	Interior Least Tern	LE	E	G4T2Q	S2S3B
<i>Thryomanes bewickii</i>	Bewick's Wren		E	G5	S1
<i>Tyto alba</i>	Common Barn-owl		D	G5	S3
<i>Vireo bellii</i>	Bell's Vireo	No Status		G5	SHB



## Tennessee List of Rare Species by County

May 2006

Tennessee Division of Natural Heritage  
[www.state.tn.us/environment/nh/](http://www.state.tn.us/environment/nh/)

### Tipton

Vascular Plant		Federal Status	State Status	Global Rank	State Rank
<i>Acmella oppositifolia</i>	Creeping Spot-flower		S	G5	S2
<i>Agalinis auriculata</i>	Earleaved False-foxglove		E	G3	S2
<i>Carex gravida</i>	Heavy Sedge		S	G5	S1
<i>Carex oxylepis var. pubescens</i>	Hairy Sharp-scaled Sedge		S	G5?T3	S1
<i>Carex reniformis</i>	Reniform Sedge		S	G4?	S1
<i>Hydrastis canadensis</i>	Goldenseal		S-CE	G4	S3
<i>Panax quinquefolius</i>	American Ginseng		S-CE	G3G4	S3S4
<i>Panicum ensifolium</i>	Small-leaved Panicgrass		S	G4	S2
<i>Phacelia ranunculacea</i>	Blue Scorpion-weed		S	G4	S2S3
<i>Prenanthes crepidinea</i>	Nodding Rattlesnake-root		E	G4	S2
<i>Schisandra glabra</i>	Red Starvine		T	G3	S2

Invertebrate Animal		Federal Status	State Status	Global Rank	State Rank
<i>Obovaria jacksoniana</i>	Southern Hickorynut			G2	S1
<i>Villosa vibex</i>	Southern Rainbow			G4Q	S2

Vertebrate Animal		Federal Status	State Status	Global Rank	State Rank
<i>Ammocrypta beani</i>	Naked Sand Darter		D	G5	S2
<i>Ammocrypta vivax</i>	Scaly Sand Darter		D	G5	S2
<i>Cycleptus elongatus</i>	Blue Sucker		T	G3G4	S2
<i>Ictinia mississippiensis</i>	Mississippi Kite		D	G5	S2S3
<i>Macrhybopsis gelida</i>	Sturgeon Chub		D	G3	S1
<i>Macrolemys temminckii</i>	Alligator Snapping Turtle		D	G3G4	S2S3
<i>Notropis dorsalis</i>	Bigmouth Shiner		D	G5	S1
<i>Noturus stigmosus</i>	Northern Madtom		D	G3	S3
<i>Sistrurus miliarius streckeri</i>	Western Pigmy Rattlesnake		T	G5T5	S2S3
<i>Sterna antillarum athalassos</i>	Interior Least Tern	LE	E	G4T2Q	S2S3B