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Northern Long-Eared Bat Survey Report

NSAHR Northwest Annex, Virginia and North Carolina



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1.0 INTRODUCTION

The objective of this project is to determine the presence or absence of the northern long-eared bat (*Myotis septentrionalis*) (MYSE) at Naval Support Activity Hampton Roads (NSAHR) Northwest Annex (Northwest or Installation). The purpose of this work is to collect information on MYSE in areas of interest (i.e., future developments at the Installation, as identified by the Navy) following protocols established by the United States Fish and Wildlife Service (USFWS) and detailed in the *Northern Long-Eared Bat Interim Conference and Planning Guidance* (USFWS 2014a) and the *2014 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2014b). Information collected will be used by natural resources managers to make informed decisions on the Installation to avoid negative impacts on this vulnerable species.

In July 2011, the USFWS was petitioned to list MYSE and the eastern small-footed bat (*Myotis leibii*) on the federal Endangered Species List as endangered or threatened, and to designate critical habitat under the Endangered Species Act (ESA) of 1973 (76 Federal Register [FR] 125). On 02 October 2013 USFWS released the results of their 12-Month Finding on the 2011 petition, which concluded that listing for the MYSE was warranted, and the species is now proposed for federal listing as endangered (78 FR 191). The USFWS also concluded that critical habitat was not determinable for MYSE. The public comment period on the proposed federal listing was closed on 02 January 2014; however, on 18 November 2014 the USFWS extended the public comment period to 18 December 2014 to allow the opportunity for agencies, groups, and interested people to comment on the proposal and provide them with new information (79 FR 222). USFWS will be making a final determination on the listing of this species no later than 02 April 2015.

MYSE occur throughout forested portions of the northeastern United States and in eastern, central, and northern Canada (79 FR 191). Historically, the species was patchily distributed, and less common in the southern and western portions of its range. The population density seems to have been highest in the northern portion of the species' range, which includes much of the eastern United States.

MYSE are an obligate forest-dwelling species, adapted to gleaning and hawking for insects in northern deciduous and mixed forests, primarily below the canopy in the understory, or in sub-canopy shrub layers. MYSE emerge at dusk to feed on insects that are caught in flight using echolocation or gleaned from vegetation and water surfaces (USFWS 2014a). Foraging occurs entirely within forested areas but is not restricted to mature forests. Foraging is often concentrated in forested upland areas and hillsides rather than in riparian areas, and also may occur in forest clearings, above roadways and trails, or near water (79 FR 191). Habitat requirements and behavioral patterns exhibited by MYSE indicate there is the potential for the Installation to support MYSE given the current land types within the Installation. Information on the structure and composition of forested areas on the Installation is important for determining the suitability of available habitat.

Summer roosts provide MYSE with a thermally stable environment, as well as protection from the elements and predators (Owen et al. 2002). Day roost selection by MYSE is dependent upon the presence of live or dead (snag) trees with cavities, crevices, or exfoliating bark for roosting, although human-made structures and caves also may be used for roosting. Throughout their range MYSE roost in a variety of tree species based on their suitability to retain bark or provide cavities or crevices. Isolated trees also may be utilized as roosts, provided they are within 1,000 feet of another suitable roost tree or forested area (USFWS 2014a).

Two roost studies conducted in West Virginia identified black locust (*Robinia pseudoacacia*) as a roost preference for both male and female MYSE (Ford et al. 2006, Owen et al. 2002). A 2003 study of male MYSE day roost selection in West Virginia identified 13 roosts in black locust (five snags and eight live trees), two roosts in sugar maple (*Acer saccharum*) (live), and one roost in sassafras (*Sassafras albidum*) (snag) (Ford et al. 2006). All of the live tree roosts were medium-large, canopy-dominant trees containing substantial amounts of exfoliating bark and numerous broken limbs and cavities. Live tree roosts tended to be larger than other trees in the vicinity. Roosts located in snags were smaller than the live trees and other snags in the vicinity. It is likely that MYSE exhibit a strong preference for a selection of roosts within older forest stands that contain many large trees and snags with exfoliating or plate-like bark and/or cavities (Ford et al. 2006).

Unlike the true long-distance migratory bats (*Lasiurus* spp. and *Lasionycteris* spp.), MYSE do not undertake long-distance migrations between summer and winter ranges, but do make shorter distance movements between summer roosts and winter hibernacula. MYSE arrive at hibernacula in August or September, begin hibernation in October and November, and leave for summer habitats in March or April (79 FR 191). MYSE hibernate in caves, mines, as well as in human-made structures. The species also has been found in less traditional hibernacula, including dams and dry wells, and may utilize human-made structures more frequently than previously thought, especially in the Northeast. The species prefers large hibernacula with large entrances, and although MYSE are often found with other *Myotis* species, they prefer cooler temperatures and higher humidity than little brown bats (*Myotis lucifugus*). Individuals may hibernate in cracks and crevices in hibernacula walls and, as such, may be overlooked during winter surveys.

Dramatic decreases in populations of MYSE have occurred over the last five years primarily as a result of White-Nose Syndrome (WNS), a fungal pathogen responsible for unprecedented mortality of hibernating bats. An estimated 5.7 million bats have been killed since the February 2006 discovery of WNS in the United States. Since the first detection in eastern New York, WNS has been documented in at least 19 states and at least four Canadian provinces. Over the last three years precipitous declines have been documented for the MYSE and eastern small-footed bat, with an estimated loss greater than 1 million bats. Other threats to MYSE include the loss and fragmentation of forested habitat, alteration to traditional hibernacula, reduced fitness as a result of smaller populations, and anthropogenic sources of mortality including wind energy facilities (USFWS 2014a).

2.0 METHODS

2.1 CAPTURE

Following USFWS protocols, mist-net surveys were conducted within the recommended survey window of 15 May to 15 August 2014, and were completed over five nights at six locations from 08 August 2014 to 12 August 2014, for a total of 42 net nights. Mist-net survey sites (1–6) were located within areas of interest, and selected sites were surrounded by mature trees that would provide good roosting habitat and a clear path to foraging areas for bats leaving their roosts. Mist-nets were positioned across dirt roads and wooded trails considered to be likely corridors for bat movement. Sites 1, 3, and 5 were located in North Carolina and sites 2, 4, and 6 were in Virginia all within the Installation boundary (Figure 2-1). Two two-person teams, each operating two to three nets, conducted the mist-netting survey, and one USFWS-qualified biologist oversaw survey activities.

Mist-nets were positioned to maximize coverage of flight paths of bats (Figure 2-1). Nets were placed in suitable travel corridors, foraging areas, and/or drinking areas. These areas are of interest to the bat crews since they act as corridors and corral the bats to fly into the nets. Bats were live-caught in mist-nets, processed, and released unharmed near the point of capture. Biological and morphometric data were recorded for each individual captured. Representative photographs of various individuals also were taken as per the USFWS guidelines (2014a). Processing was completed within 30 minutes from the time the bat was removed from the net. Time, weather, global positioning system location of each net site, and hourly weather conditions also were documented, and all data were recorded on pre-printed data sheets (see Appendix A: Field Survey Data Forms).

A combination of triple high (three nets stacked upon another, 7.8 meters height), double high (two nets stacked upon another, 5.2 meters height), and single high (2.6 meters height) nets were set up each night. Depending on the site, nets varied in length from 6 to 12 meters. Nets were set at dusk and monitored until at least 00:15 hours for a minimum of 5 hours. If bats were captured, nets were left up until as late as 01:30 hours. Nets were checked at an interval of every 10 minutes. All bats captured were identified to species, banded, and basic biometric measurements (e.g., time of capture, capture net, species, sex, age class, reproductive condition, mass, forearm length) and reproductive status were recorded. Only captured MYSE were fitted with a radio transmitter (Appendix A and Appendix B).

Special caution was taken during mist-net activities to minimize the potential for transmission of WNS by following the most recent decontamination protocols of the USFWS (2008). For example, bats were held in disposable paper bags until processed, and holding bags were disposed of after each use. Bats were evaluated for potential WNS infection following the *Wing-Damage Index*

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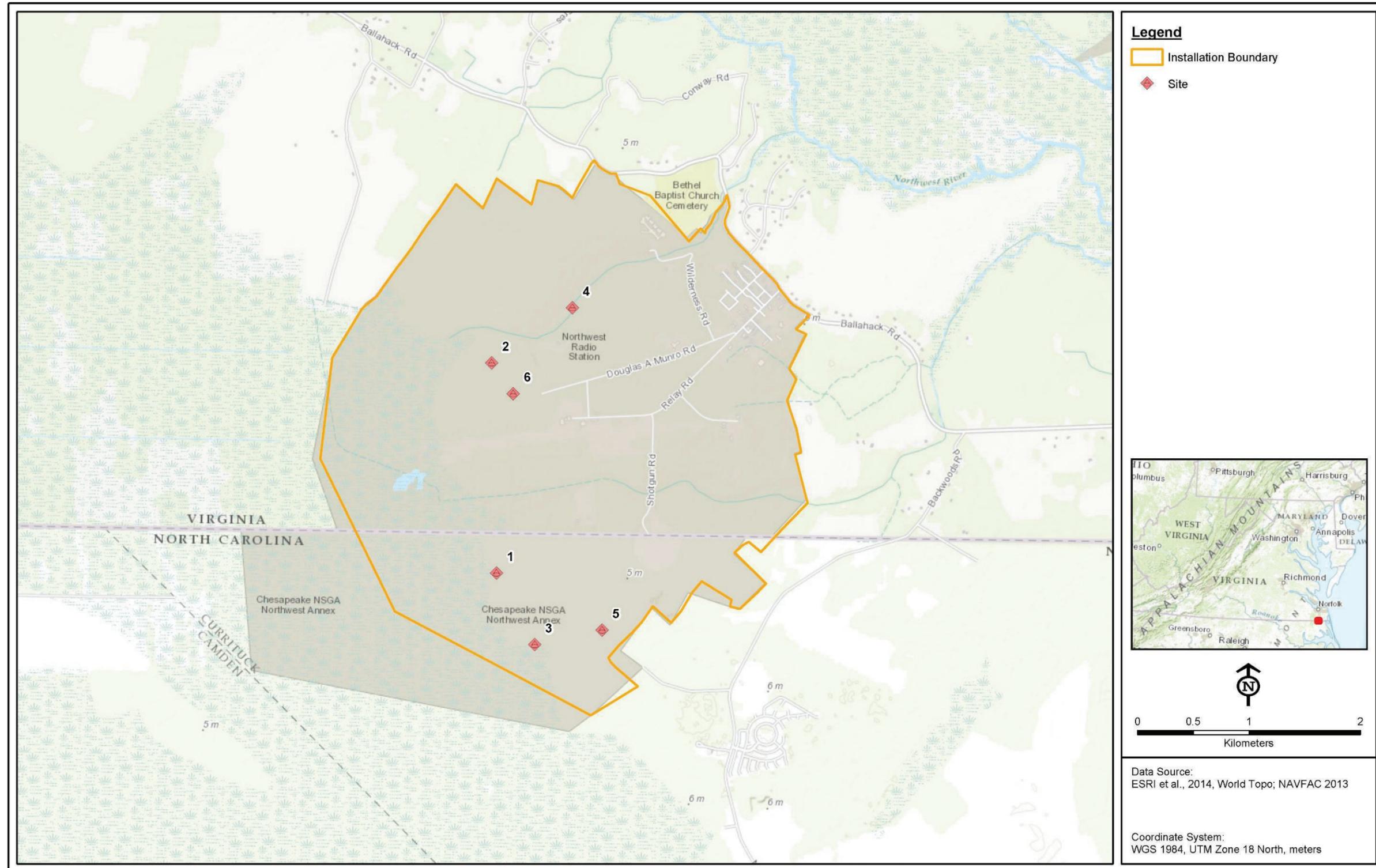


Figure 2-1. General Location, Regional Setting, and Mist-Net Sites at of NSAHR Northwest Annex – 2014.

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Used for Characterizing Wing Condition of Bats Affected by White-nose Syndrome by Reichard (2009).

2.2 RADIO-TELEMETRY ROOSTS

Up to five female MYSE were fitted with Advanced Telemetry Solutions (ATS) radio transmitters and tracked by crews to facilitate collection of data necessary to determine home range as outlined in Appendix C of the USFWS *Northern Long-Eared Bat Interim Conference and Planning Guidance* (USFWS 2014a). The ATS transmitters have about a 300 meter range of detection. Following the night of capture, bat locations were identified using the homing technique specified in White and Garrot (1990). Coordination with installation tenant commands was required to obtain approval for types of transmitters/receivers and ranges of frequencies that could be utilized on the installation due to potential conflicts with military communication requirements. MYSE home ranges were estimated using a 3-mile buffer around a capture site if no other information was available for that species (no radio telemetry). MYSE with known capture and roost site information had a home range buffer of 1.5 miles surrounding the capture and roost site(s) mapped.

ATS receivers and Yagi antennas were used by the field crews during radio tracking efforts. Radio tracking consisted of driving and hiking areas within the Installation using the receivers to pick up pings (signals) from the transmitters. Pings from the transmitters were followed using the homing technique to identify exact roost locations (White and Garrot 1990).

Female MYSE were targeted for attaching transmitters because they form maternity colonies and occur in live and dead trees during the summer months (Menzel et al. 2002). Male MYSE generally roost on their own therefore were not a priority for the USFWS from a radio tracking standpoint. MYSE fitted with radio transmitters were tracked for six consecutive day's post-capture according to the USFWS protocol to identify roosting sites. Once a MYSE roost was found through radio-telemetry, emergence counts were conducted using methods outlined in Section 2.3.

2.3 EMERGENCE COUNTS

Roosting sites identified by radio-telemetry were monitored for emergence counts for a period of time that was in accordance with the USFWS protocol (USFWS 2014b). A total of six evening emergence counts was conducted at all roosts located via radio tracking. A biologist was positioned at the site of the roost tree around dusk each night (about 0.5 hour before sunset) and counted the number of bats emerging from the tree until about 1 hour after sunset or until it was too dark to see emerging bats. The biologist(s) conducting the emergence counts were strategically positioned in a location to enable observation of emerging bats silhouetted against the sky as they exited the roost. Biologists also positioned themselves close enough to the roost to observe emerging bats, but not so close to disturb individuals and influence emergence (5-15 meters). Biologists also minimized noise and use of artificial light sources (i.e., flashlight) when in the vicinity of the roost. If temperatures were below 50 degrees Fahrenheit, precipitation was

occurring for at least 30 minutes or intermittently (including rain or fog), or if wind speeds exceeded 4 meters/second, emergence counts were not conducted due to reduced activity during these conditions.

3.0 RESULTS

3.1 CAPTURE

A total of 93 bats representing seven species was captured from 08 August 2014 to 12 August 2014 during a 42 net night survey conducted within the areas of interest at Northwest (Table 3-1). The majority of bats trapped were big brown bats (*Eptesicus fuscus*) (n = 34) followed by eastern red bats (*Lasiurus borealis*) (n = 19) and southeastern Myotis (*Myotis austroriparius*) (n = 14). Nine tri-colored bats (*Perimyotis subflavus*), eight MYSE, seven evening bats (*Nycticeius humeralis*), and two Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) were captured. Of the 93 bats none of the bats exhibited any noticeable wing damage (all bats were 1 or 0) and no deformities were noted. Sixty seven percent of the bats caught were female and 31% were male. Twenty five percent of the bats caught were juvenile and 72% were adult. The female bats that were caught 1% was lactating, 29% post lactating and 37% were non reproductive. Seventeen percent of the male bats caught were scrotal or reproductively active.

All bats captured were successfully released without injury. One MYSE escaped before measurements could be taken. Site 4 was the most productive capture site (Figure 3-1). Eight MYSE were captured and five were fitted with radio transmitters (Table 3-2). Four of the five MYSE that received transmitters were adult females and one was a juvenile female. MYSE were captured at five of the six trap sites (Figures 3-2 to 3-7). One adult female MYSE was captured at mist-net site 2 on 08 August 2014 at 23:00 hours and was equipped with a radio transmitter (frequency 149.792) for radio tracking. Habitat associated with site 2 included mixed hardwoods (Sweet gum [*Liquidambar styraciflua*], red maple [*Acer rubrum*], and water oak [*Quercus nigra*]), and soft wood species including loblolly pine (*Pinus taeda*). Two individual MYSE were captured at mist-net site 3. One adult male was captured on 10 August 2014 at 22:50 hours and one adult female was captured on 10 August 2014 at 22:51 hours. The female was equipped with a radio transmitter (frequency 149.853). Habitat associated with site 3 included grassy woods and roads within a mature, deciduous, upland forest.

Three MYSE were captured at mist-net site 4. One adult female was captured on 10 August 2014 at 21:30 hours, one juvenile female was captured on 10 August 2014 at 01:12 hours, and one adult female was captured on 11 August 2014 at 23:58 hours. All three individuals were equipped with a radio transmitter (frequencies 149.884, 149.823, and 149.762, respectively). Habitat associated with site 4 included mixed hardwoods (sweet gum, sycamore [*Platanus occidentalis*], American elm, [*Ulmus americana*], and red maple), with an understory of paw paw (*Asimina triloba*) and briar (*Smilax* sp.). The site was located along a two-track road parallel to a 3-meter wide stream corridor near Lunker Lake.

One adult female MYSE was captured at mist-net site 5 on 12 August 2014 at 20:40 hours. This individual was not equipped with a radio transmitter because five MYSE were already tagged and that was the maximum number of transmitters allocated for the study. Habitat associated with

Table 3-1. Nightly Summary of Bats Captured at each Site at NSAHR Northwest Annex – 2014.

Species	Site 1		Site 2		Site 3			Site 4			Site 5		Site 6		Species Total
	8-Aug	9-Aug	8-Aug	9-Aug	8-Aug	10-Aug	11-Aug	8-Aug	10-Aug	11-Aug	8-Aug	12-Aug	8-Aug	12-Aug	
Big-brown bat	1		5	1		1	1		11	11	1		2		34
Eastern red bat			10		1		1		2			1		4	19
Southeastern myotis		1				1			2	6				4	14
Tri-colored bat			2					1	4					2	9
Northern long-eared bat			1			2			2	1		1		1	8
Evening bat							1		3					3	7
Rafinesque's big-eared bat			1						1						2
Night Total	1	1	19	1	1	4	3	1	25	18	1	2	2	14	93
Site Total	2		20		8			44			3		16		93

Table 3-2. Summary of MYSE Captured and Tagged at NSAHR Northwest Annex – 2014.

Number	Date	Time	Radio-frequency	Sex	Age	Site
1	8-Aug	22:50	149.792	Female	Adult	2
2	10-Aug	23:00	149.853	Female	Adult	3
3	10-Aug	22:51	Untagged	Male	Adult	3
4	10-Aug	21:30	149.884	Female	Adult	4
5	10-Aug	1:12	149.823	Female	Juvenile	4
6	11-Aug	23:58	149.762	Female	Adult	4
7	12-Aug	20:40	Untagged	Female	Adult	5
*8	12-Aug	22:37	Untagged/Escaped	n/a	n/a	6

* Bat escaped before measurement could be taken

site 5 included forested grass roads near a lowland wetland. One adult female MYSE was captured at mist-net site 6 on 12 August 2014 at 22:37 hours. This individual was not equipped with a radio transmitter and escaped before measurements could be taken. This site was located along a riparian corridor on Mill Creek, and included a gravel road (Dusty Rd.) and grass trails. Associated vegetative communities included sycamore, sweet gum, red maple, holly (*Ilex opaca*), and sassafras (*Sassafras albidum*).

3.2 RADIO-TELEMETRY HOME RANGE AND ROOSTS

During capture, five MYSE were fitted with an ATS radio transmitter. Prior to release each transmitter was checked to make sure it was sending a signal. Following the initial night of capture, the five radio-tagged bats were tracked for six consecutive days using a homing technique by vehicle and foot. Despite radio tracking efforts within the Installation, only two radio-tagged MYSE were subsequently picked up by the radio telemetry equipment. The first female MYSE captured (frequency 149.792) on 08 August 2014, was picked up foraging near the original capture site (site 2) on 09 August and again on 10 August 2014 for 10 to 15 minutes at around 23:00 hours (Figure 3-2). Subsequent to these events, MYSE (frequency 149.792) was not relocated during daily radio tracking. Even though the roost was not identified, presence near the original capture indicates that MYSE (frequency 149.792) was likely roosting in the vicinity of the capture site on those days but the radio frequency was not picked up during radio tracking.

Out of the five female MYSE fitted with a radio transmitter, only one (frequency 149.853) was tracked to its roost from 11 August through 16 August 2014 (Figure 3-3). This represented the only roost documented during the entire radio tracking effort. The single female MYSE roost consisted of a dead snag cavity in a small red maple 12.2 meters in height, with the roost entrance at 9.8 meters in height. This roost was located approximately 200 meters north of mist-net site 3 (Figure 3-3). Canopy cover associated with the roost was 75%, with 95% bark remaining on the tree. The decay stage (Stage 1–4) for the dead tree utilized was Stage 1, which is the least amount of decay.

Using the USFWS protocol (2014a), the home range of MYSE 149.853 was calculated to be approximately 1.5 miles from its roost, and the home range of MYSE 149.792 was calculated to be approximately 1.5 miles from its capture site. The home ranges of the remaining six captured MYSE were calculated using 3 miles of their respective capture mist-net sites (Figures 3-4 through 3-7).



Mist net woods road



Mist net site over creek



Mist net site woods road



Northern long-eared bat with band and radio transmitter



Rafinesque's big-eared bat



Southeastern myotis

Figure 3-1. Representative mist net sites and bats captured at NSAHR Northwest Annex – 2014.

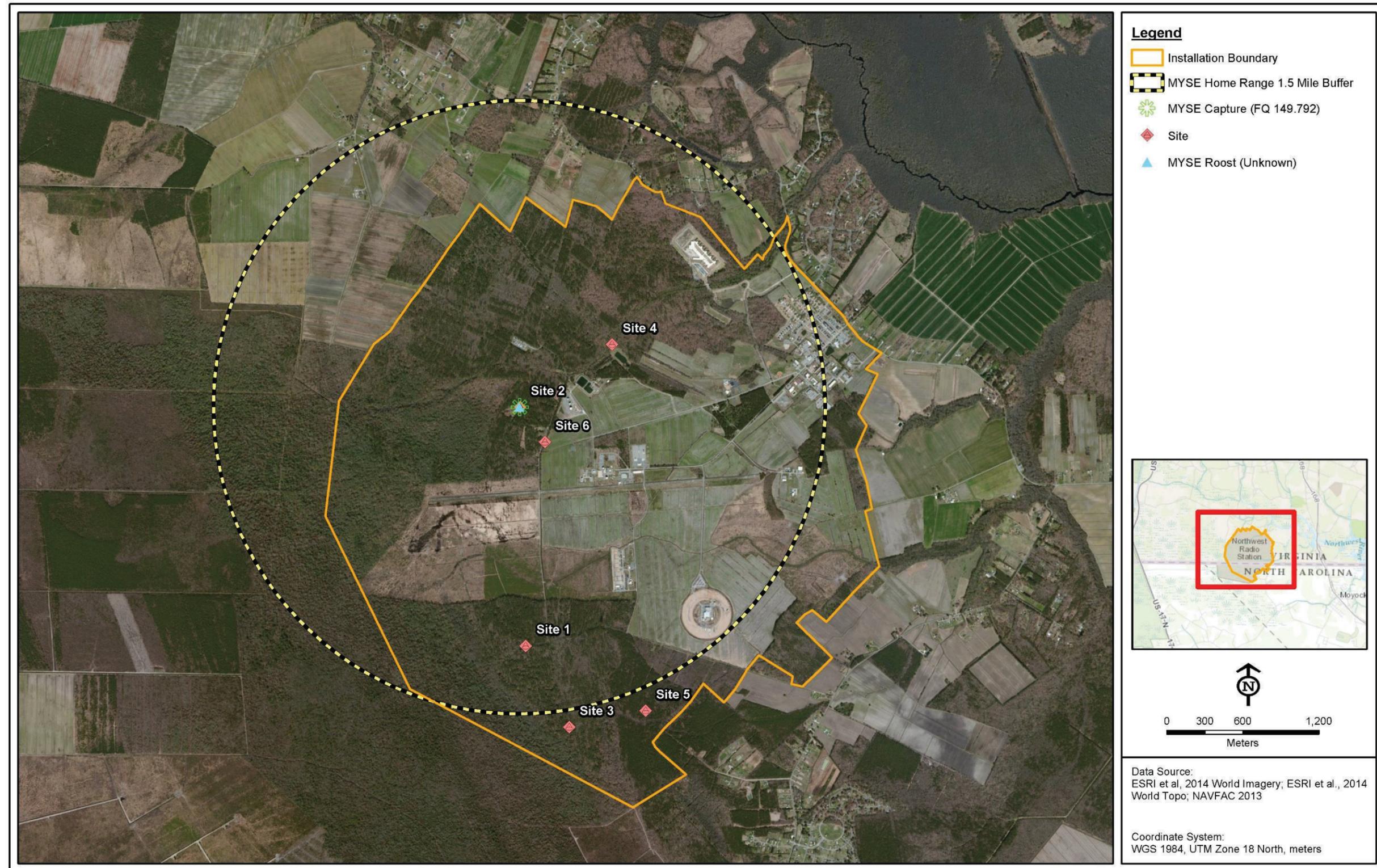


Figure 3-2. Radio-tagged MYSE 149.792 Home Range including Capture Site (2) and Roost Site at NSAHR Northwest Annex – 2014.

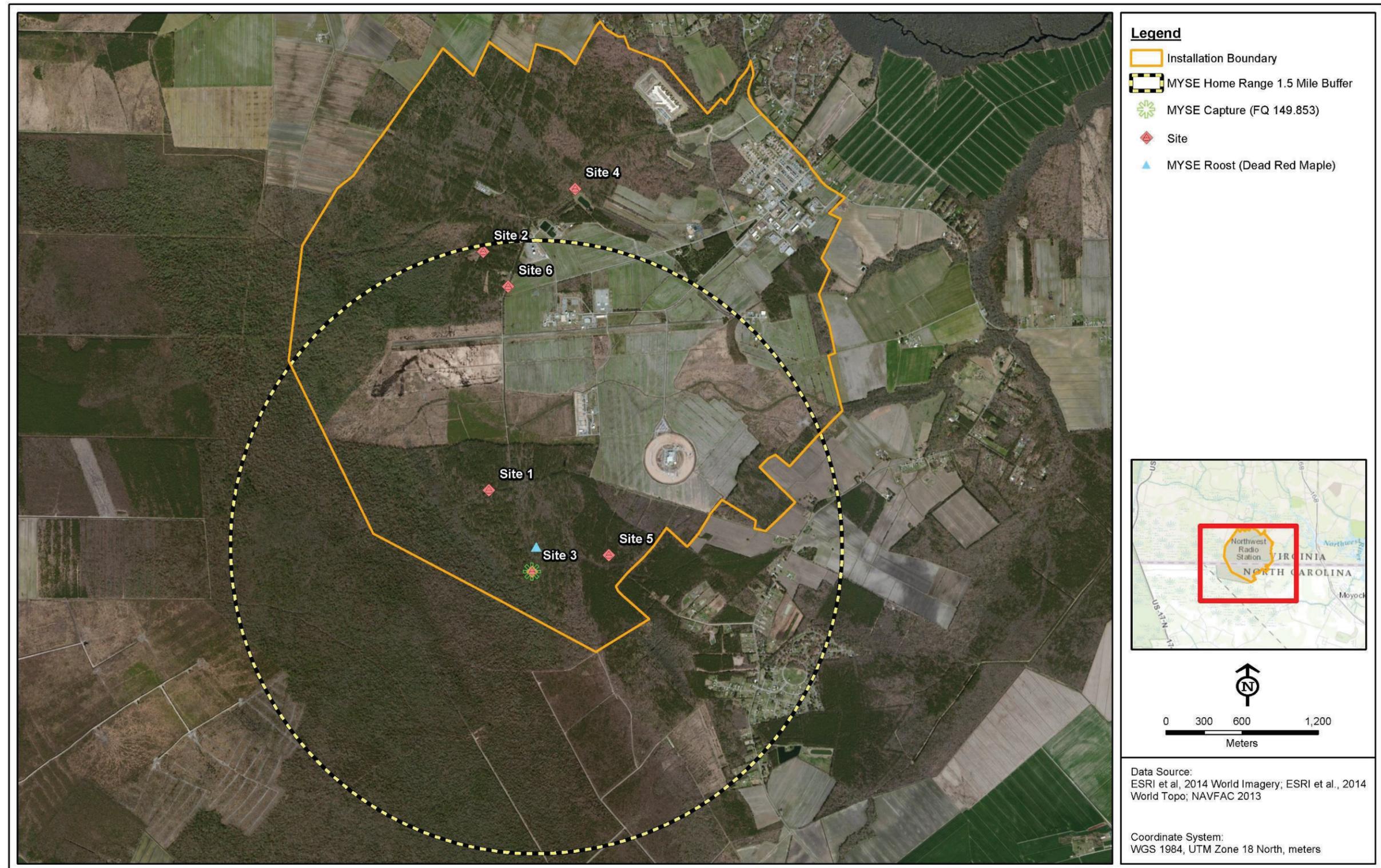


Figure 3-3. Radio-tagged MYSE 149.853 Home Range including Capture Site (3) and Roost Site at NSAHR Northwest Annex – 2014.



Figure 3-4. Radio-tagged MYSE (149.884, 149.823, and 149.762) Home Ranges including Capture Site (4) at NSAHR Northwest Annex – 2014.



Figure 3-5. Untagged #1 MYSE Home Range including Capture Site (3) at NSAHR Northwest Annex – 2014.



Figure 3-6. Untagged #2 MYSE Home Range including Capture Site (5) at NSAHR Northwest Annex – 2014.



Figure 3-7. Untagged #3 MYSE Home Range including Capture Site (6) at NSAHR Northwest Annex – 2014.

3.3 EMERGENCE COUNTS

Two radio-tagged bats were found within the Installation boundary post-capture during night radio-telemetry tracking; but only one roosting bat was observed therefore, emergence counts were only conducted at the single known MYSE (149.853) roost of this individual. Subsequent to capture (10 August), MYSE 149.853 was followed back to its day roost for six days from 11 August to 16 August 2014 (Table 3-3). A single bat observed emerging from the same roost on each of the six days.

Table 3-3. Summary of Emergence Counts at MYSE 149.853 Roost Tree at NSAHR Northwest Annex – 2014.

Bat Frequency Identification	Night	Emergence Count	Time of Emergence	Notes
NLEB 149.853	11 August	1	20:05	Only one bat emerged
NLEB 149.853	12 August	1	20:24	Only one bat emerged
NLEB 149.853	13 August	1	20:08	Only one bat emerged
NLEB 149.853	14 August	1	20:08	Only one bat emerged
NLEB 149.853	15 August	1	20:10	Only one bat emerged
NLEB 149.853	16 August	1	20:09	Only one bat emerged

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4.0 DISCUSSION

Mist-netting surveys conducted from 08 August 2014 to 12 August 2014 (42 net nights) captured 93 bats representing seven species. Mist-net site 4 recorded the greatest number of captures. This site was also located the closest to Lunker Lake, the largest freshwater lake on the property. Almost 10% of the captures at the Installation were MYSE adult females. Five of the female MYSE captured were fitted with radio transmitters and tracked for six consecutive days to identify nearby roost sites and calculate their home range.

Despite efforts to track all five individuals on a daily basis, only one individual (frequency 149.853) was tracked back to its day roost during radio tracking, and another individual (frequency 149.792) signal was picked up foraging near its original capture site. As noted in the methods, these small transmitters have a detection range of 300 meters. It was suspected the frequencies not picked up were in discrete areas of the Installation that were not accessible or roosting outside of the Installation boundary during the radio tracking efforts. An airplane can add to detection and would be recommended for further telemetry studies since areas around the base can be difficult to access (i.e. swamps and bogs).

A single red maple snag roost located above 5 meters in height was used by MYSE 149.853 for all six days of the monitoring period. Roost site selection at the Installation resembles results reported from the central Appalachians (Menzel et al. 2002, Ford et al. 2006). Emergence counts conducted over six consecutive days at the single roost location identified only the tagged individual (149.853) emerging from the roost at around 20:00 hours each night. Many bats are known to use the same roost tree simultaneously or over successive days (Owen et al. 2002) which was the case at the Installation. Menzel et al. (2002) found that lactating females switched among roosts on average every 5 days. Roosts in the central Appalachians were located in nine tree species, with 11 roosts in tree cavities and 1 under exfoliating bark (Menzel et al. 2002). They also found that tree species was an important factor that influenced roost tree selection, with black locusts being used significantly more than expected based on their abundance across the managed forest landscape. All northern long-eared bat roosts were located in or below the forest canopy which suggests that solar exposure may not be as critical for selection of roost trees by maternity colonies of this species as opposed to other species of tree-roosting bat at more northern latitudes in North America (Menzel et al. 2002). Their research indicates that in managed; Allegheny hardwood–northern hardwood forests of the central Appalachians, short-lived, early successional species such as black locust may provide suitable roosting habitat for northern long-eared bats, as well as other species of bats. After emergence, the tagged individual (149.853) would forage within the vicinity of the roost for approximately 15 minutes and then would move out of detection range. With information gained this year about timing of MYSE volancy at the Installation, the survey window should be adjusted somewhat to locate maternity roosts.

Using the USFWS protocol, two of the individual MYSE captured and fitted with radio transmitters were determined to have a home range of approximately 1.5 miles from their roost sites (one

MYSE was tracked to its roost, the other was observed foraging in the vicinity of its capture site for multiple nights). The remaining six captured MYSE were determined to have home ranges of approximately 3 miles from their respective capture sites. The home ranges of the eight MYSE, as calculated using the USFWS protocol, are larger than were reported for female MYSE in the central Appalachians using the 95 percent adaptive kernel method in which the mean home range was 65 acres (Owen et al. 2002). This is likely attributable to the coarse assessment of the home range generalization of the USFWS protocol (USFWS 2014a). Two sampling components have a strong relationship on measurement of space use and home range size: number of radio marked animals and number of locations for each animal (Kernohan et al. 2001). To support a full statistical analysis, a minimum of 30 locations, but preferably, 50 locations would be needed per season per animal to determine accurate home range sizes (Kernohan et al. 2001). A minimum of 30 independent locations are required to estimate a home range using techniques such as adaptive kernel methods (White and Garrot 1990). The home ranges of the eight MYSE collected at Northwest overlap with the area of interests provided by the Navy.

During summer MYSE roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥ 3 inches dbh). Males and non-reproductive females may also roost in cooler places, like caves and mines. MYSE emerge at dusk to forage in upland and lowland woodlots and tree-lined corridors, feeding on insects, which they catch while in flight using echolocation. This species also feeds by gleaning insects from vegetation and water surfaces. Suitable summer habitat for MYSE consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1000 feet of other forested/wooded habitat. MYSE has also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat. MYSE typically occupy their summer habitat from mid-May through mid-August each year and the species may arrive or leave some time before or after this period.

MYSE maternity habitat is defined as suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females according to USFWS. MYSE home ranges, consisting of maternity, foraging, roosting, and commuting habitat, typically occur within three miles of a documented capture record or a positive identification of MYSE from properly deployed acoustic devices, or within 1.5 miles of a known suitable roost tree according to USFWS. Depending on the nature and extent of activities within areas of interest, there is the potential to directly impact MYSE or its summer habitat. Removal of forested habitat may adversely affect MYSE, particularly if activities occur while MYSE are present in the summer months. However, properly designed silviculture practices could serve to improve habitats within a MYSE home

range. Other activities that could negatively influence MYSE include removal of human-made roosting structures, loss of clean water sources, use of pesticides or herbicides, and prescribed burning. The type and timing of projects should be assessed individually to determine the potential to negatively (or positive) impact MYSE or the habitats it relies upon.

5.0 RECCOMENDATIONS

- 1) Make sure snags are left during cutting or if the area is lacking girdle trees to create snags
- 2) Construct or place bat house around facility to create roosting habitat
- 3) Conduct a home range or core utilization study to determine bats use of base

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6.0 REFERENCES

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APPENDIX A
FIELD SURVEY DATA FORMS – MIST-NETTING CAPTURES

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Capture form key

Species:

EPFU=Big Brown

LABO=Red bat

PESU=Tri-colored bat

MYAU=Southeastern myotis

MYSE=Northern long-eared bat

HYNU=Evening bat

CORA= Rafinesque's big-eared bat

Sex:

M=Male

F=Female

Age:

A=Adult

J=Juvenile

Reproductive Status:

P=Pregnant

L=Lactating

PL=Post lactating

NR=Non reproductive

PA=Parous (breed in previous years)

SCR=Scrotal

S=Scrotal

RS (Reichard Wing Index Score):

0-3 see PDF for scoring index

FA=Forearm measurement in millimeters

Bat Capture Form

State: NC ~~VA~~ County: Currituck Town: Moyock Lat.: 36.54733 Long.: -76.27396

Site Name: Northwest Newell Bass Site ID: NWA1 Recorder: CA/LG Datum: WGS 84

Date: 8/8/14 Start Time: 2015 End Time: 0115 % Clouds: 50 Wind: 0 Precip.: 0

Staff: CA/LG Start Temp.: 76° End Temp: 69°F Capture Technique: 1 Single 6 m; Double m

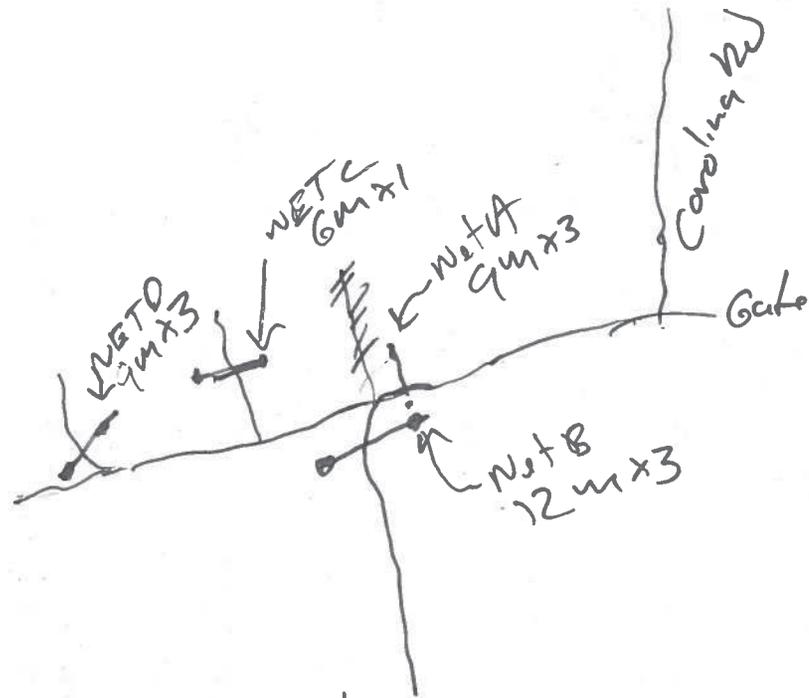
Habitat: Deciduous woods / upland / flat, Red Maple, Tulip Poplar, Sweetgum Triple m; Other 4 Net, 19 43

Set near water: Yes No Notes on Back: Yes No Diagram of Setup on Back: Yes No

1 Triple 12 m
2 Triple 9 m

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRO. (P/L/PL/NR/PA)	RS (0-5)	FA (MM)	WEIGHT (G)	BAND #	SAMPLE ID	SAMP. TYPE (F, B, G, L, Ect..)
1. 2128	EPPU	F	A	NR	0	46.7	18.5	—	—	NET B
2. 2135	EPPU	F	A	NR	1	46.0	17.0	—	—	NET C
3. 2130	LABO	M	A	S	0	38.0	11.3	—	—	Net B
4. 2240	PESU	M	J	NR	0	33.6	6.9	—	—	NET B
5. 2316	EPPU	F	A	PL	0	46.6	18.8	—	—	NET B
6. 2317	EPPU	M	Unk	NR	Unk	Unk	Unk	—	* Note 1	Net A
7. 2355	EPPU	M	A	S	0	43.9	13.3	—	—	Net A
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										

✓ TSD 8-13-14



Net A	36.54726, -76.27411	(9m x 3)
Net B	36.54712, -76.27426	(12m x 3)
Net C	36.54768, -76.27463	(6m x 1)
Net D	36.54694, -76.27514	(9m x 3)

Note 1: EPFU escaped at banding sta.

Bat Capture Form

5 net weights

State: VA County: Norfolk Town: Moyock, NC Lat.: See back Long.: See back

Site Name: NWA2 Site ID: _____ Recorder: TP Datum: NAD83

Date: 8-8-14 Start Time: 20:15 End Time: 01:1 % Clouds: 1 Wind: — Precip.: —

Staff: TD, CV, RL Start Temp.: 78°F End Temp.: 09°F Capture Technique: 2 Single ^{1x9} 1x6 m; — Double — m

Habitat: old lly pine, Sweet gum, red maple, Water oak, cane, vy, grape ne 3 Triple ^{1x12} 1x9 m; Other _____
2 track roads with standing water

Set near water: Yes / No Notes on Back: Yes / No Diagram of Setup on Back: Yes / No

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRO. (P/L/PL/NR/PA)	RS (0-5)	FA (MM)	WEIGHT (G)	BAND #	SAMPLE ID	SAMP. TYPE (F, B, G, L, Ect..)
1. 2045	LABO	M	J	SCR	0	39.5	9.9	—	—	— Net A 2m
2. 2018	LABO	F	A	PL	1	39.0	14.3	—	—	— Net B 2m
3. 2305	EPRU	M	J	NR	0	46.6	14.9	—	—	— Net E 1.5m
4. 2255	PESU	M	J	NR	0	34.1	6.5	—	—	— Net A 2m
5. 2310	LABO	F	A	PL	0	42.6	13.7	—	—	— Net E
6. 2300	EPRU	F	A	NR	1	46.0	17.8	—	—	— Net B 2m
7. 2300	MYSE	F	A	PL	0	35.6	6.6	Frequency 179.792	—	— Net C 3m
8. 0010	PESU	F	J	NR	0	33.1	6.0	—	—	— Net E 2.5m
9. 0038	LABO	M	J	SCR	0	36.8	8.7	—	—	— Net C 2m
10. 0035	LABO	F	J	NR	0	39.7	12.1	—	—	— Net A 2.5m
11. 0110	LABO	F	A	PL	0	39.0	13.5	—	—	— Net D 1.5m
12.										
13.										
14.										
15.										

TD J 8-13-14

NWA2 185

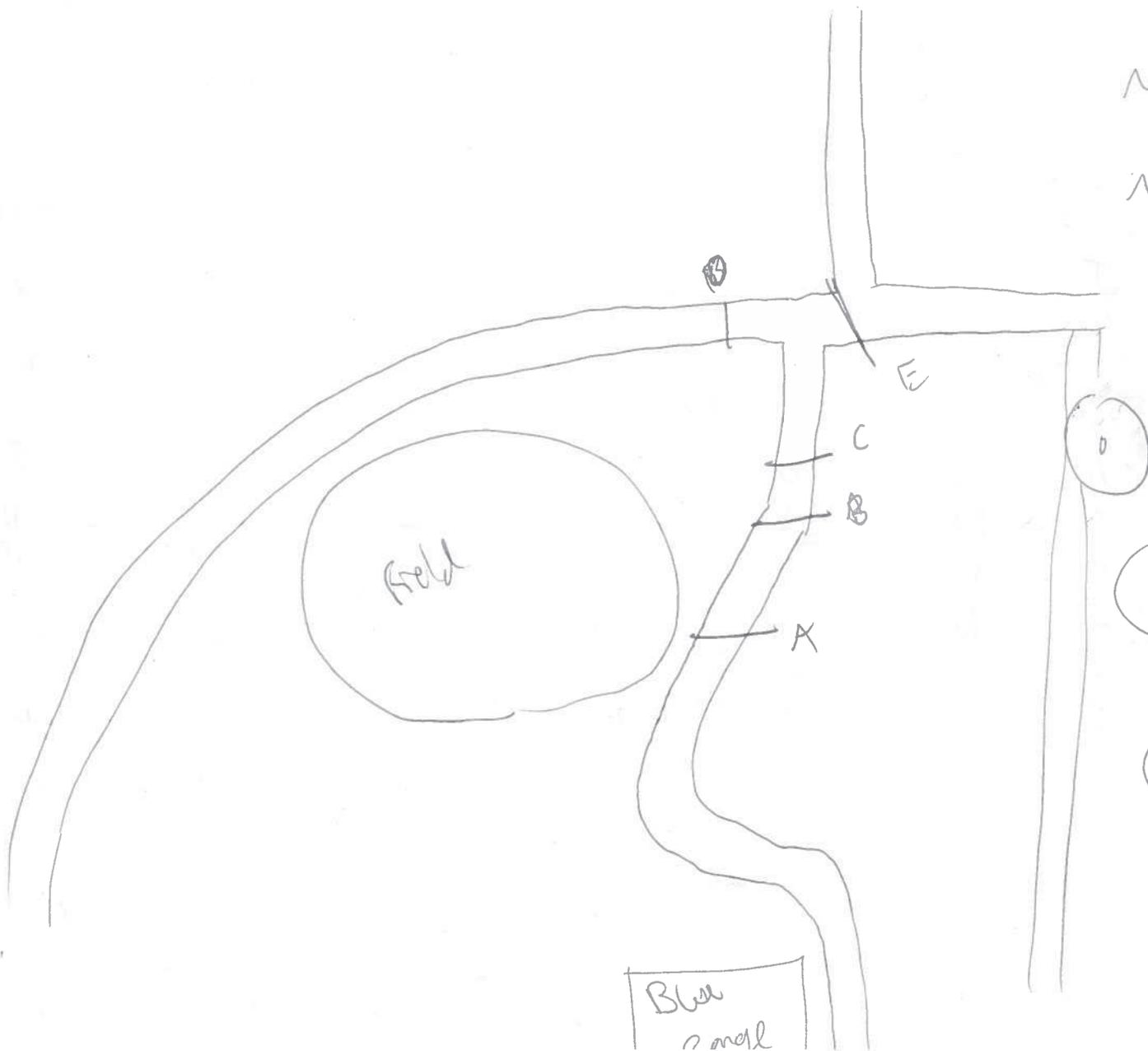
Net A = 0385913
4047284

Net B = 0385930
4047323

Net C = 0385952
4047336

Net D = 0385964
4047360

Net E = 0385974
4047355



adm
cones

Blue
small

Bat Capture Form

State: NC County: Currituck Town: MOYOCK Lat.: * Long.: *

Site Name: NORTHWEST ANNEX Site ID: NWA1 Recorder: CALLG Datum: _____

Date: 8/9/14 Start Time: 2015 End Time: 0120 % Clouds: 75 Wind: 0 Precip.: 0

Staff: CALLG Start Temp.: 80 End Temp.: 72°F Capture Technique: * Single _____ m; Double _____ m

Habitat: * SEE SHEET FROM 8/8 * Triple _____ m; Other 4 net traps

Set near water: Yes No Notes on Back: Yes No Diagram of Setup on Back: Yes No

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRO. (P/L/PL/NR/PA)	RS (0-5)	FA (MM)	WEIGHT (G)	BAND #	SAMPLE ID	SAMP. TYPE (F, B, G, I..Ect..)
1.	2107	MYAU	F	A	PL	0	37.5	7.4	—	NET A
2.	102	EPPU	M	A	S	0	46.1	15.4	—	
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										

2140 - 3 FLYING SQUIRRELS IN NET D

✓ TDD R-13-14

Bat Capture Form

5 net nights

State: VA County: Norfolk Town: Moyock, NC Lat.: See back Long.: See back

Site Name: NWA2 Site ID: _____ Recorder: CV Datum: NAD83

Date: 8-9-14 Start Time: 20:20 End Time: 0125 % Clouds: 30% Wind: 1 Precip.: 0

Staff: TD, CV, RL Start Temp.: 78° End Temp.: 69° Capture Technique: 2 Single ^{1x9}/_{1x6} m; Double m

Habitat: loblolly pine, sweet gum, red maple, oak, cane, ivy, grape vine 3 Triple ^{1x12}/_{1x9} m; Other

Set near water: Yes/No Notes on Back: Yes/No Diagram of Setup on Back: Yes/No

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRO. (P/L/PL/NR/PA)	RS (0-5)	FA (MM)	WEIGHT (G)	BAND #	SAMPLE ID	SAMP. TYPE (F, B, G, L, Ect..)
1. 2133	EPTU	F	J	NR	1	47.4	17.8	-	-	- NEA A 2m
2. 2245	LABO	F	J	NR	0	40.1	14.9	-	-	- NEA A 6m
3. 2244	LABO	F	J	NR	0	39.7	9.3	-	-	- NEA A 3m
4. 2345	LABO	F	A	NR	0	41	14.0	-	-	- NEA E 2.5m
5. 0042	LABO	F	A	NR	1	40.1	16.7	-	-	- NEA E 5m
6. 0040	EPTU	F	A	NR	1	46.4	15.1	-	-	- NEA E 5m
7. 0115	CORA	M	A	SCR	0	42.0	9.3	CC0318	-	- NEA E 1m
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										

✓ TD 8-13-14

NWA2 185

Net A: 0385913
4047284

Net B: 0385936
4047323

Net C: 0385952
4047336

Net D: 0385964
4047360

Net E: 0385974
4047355

Bat Capture Form

State: NC County: Cumtuck Town: Marydel Lat.: 36.54218 Long.: -76.27234

Site Name: NORTHWEST ANNEX Site ID: NWVA3 Recorder: CA/LG Datum: WGS 84

Date: 8/10/2014 Start Time: 2015 End Time: 0115 % Clouds: 0 Wind: 0 Precip.: 0

Staff: CA/LG Start Temp.: 72° End Temp.: 67°F Capture Technique: 1 Single 9 m; 0 Double 0 m

Habitat: Grassy Woods roads in mature deciduous upland forest 1 Triple 9 m; Other 4 net
1 Triple 12 m W: 9 lts
1 Triple 6 m

Set near water: Yes/ No Notes on Back: Yes/No Diagram of Setup on Back: Yes/No

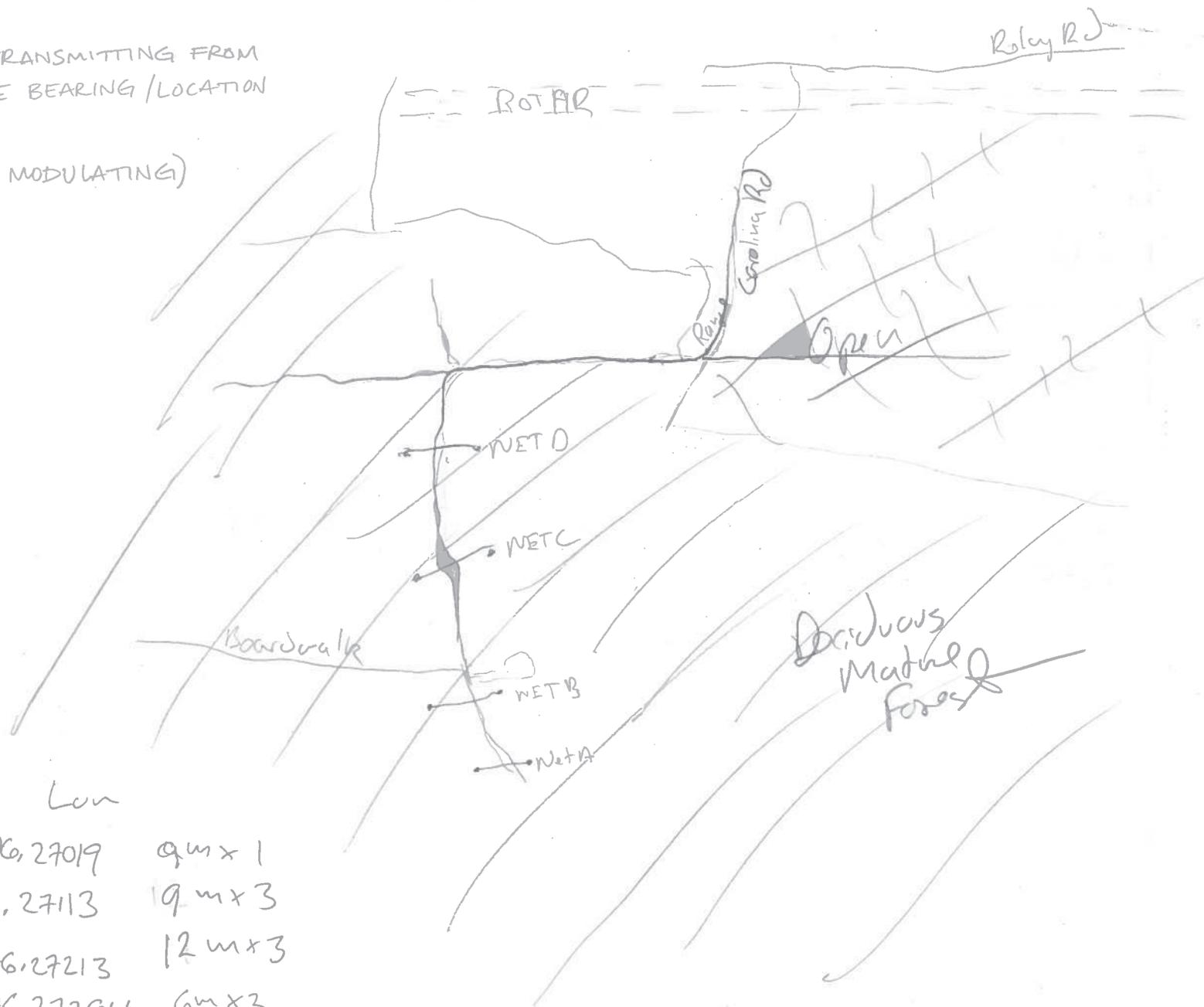
TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRO. (P/L/PL/NR/PA)	RS (0-5)	FA (MM)	WEIGHT (G)	BAND #	SAMPLE ID <i>Freq.</i>	SAMP. TYPE (F, B, G, I, Ect..)
1. 2152	MYAU	F	A	PL	0	37.5	7.9	—	—	NET D
2. 2250	MYSE	F	A	PL	0	35.1	6.8	* NOTE ON BACK	149.853 ✓	NET C <i>Robace 23:35</i>
3. 2251	MYSE	M	A	S	0	34.4	5.7	—	—	NET C
4. 2340	EPPU	M	A	S	0	45.6	18.7	—	—	Net C
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										

✓ TDD 8-13-14

2. ♀ MYSE-0014: 92° FROM BANDING LOCATION
HEARD FORAGING

2. ♀ MYSE-0053: SIGNAL TRANSMITTING FROM
ROUGHLY SAME BEARING/LOCATION
AS AT 0014

0100 - FLYING (SIGNAL MODULATING)



	Lat	Lon	
Net A	36.54153	-76.27019	9m x 1
Net B	36.54145	-76.27113	9m x 3
Net C	36.54148	-76.27213	12m x 3
Net D	36.54288	-76.27204	6m x 3

Bat Capture Form

4 net nights

State: VA County: Norfolk Town: Moyock, NC Lat.: See back Long.: See back

Site Name: NWA4 Site ID: _____ Recorder: CV Datum: NAD83

Date: 8-10-14 Start Time: 2015 End Time: 0120 % Clouds: 0% Wind: 0 Precip.: 0

Staff: TD, CV, RL Start Temp.: 80% End Temp.: 68° Capture Technique: 1 Single 1x6m; Double m

Habitat: Sweet gum, Sycamore, Am. Elm, Paw Paw, red maple, Two track road 3 Triple 1x9 m; Other _____
p6-rallet to creek near pond.

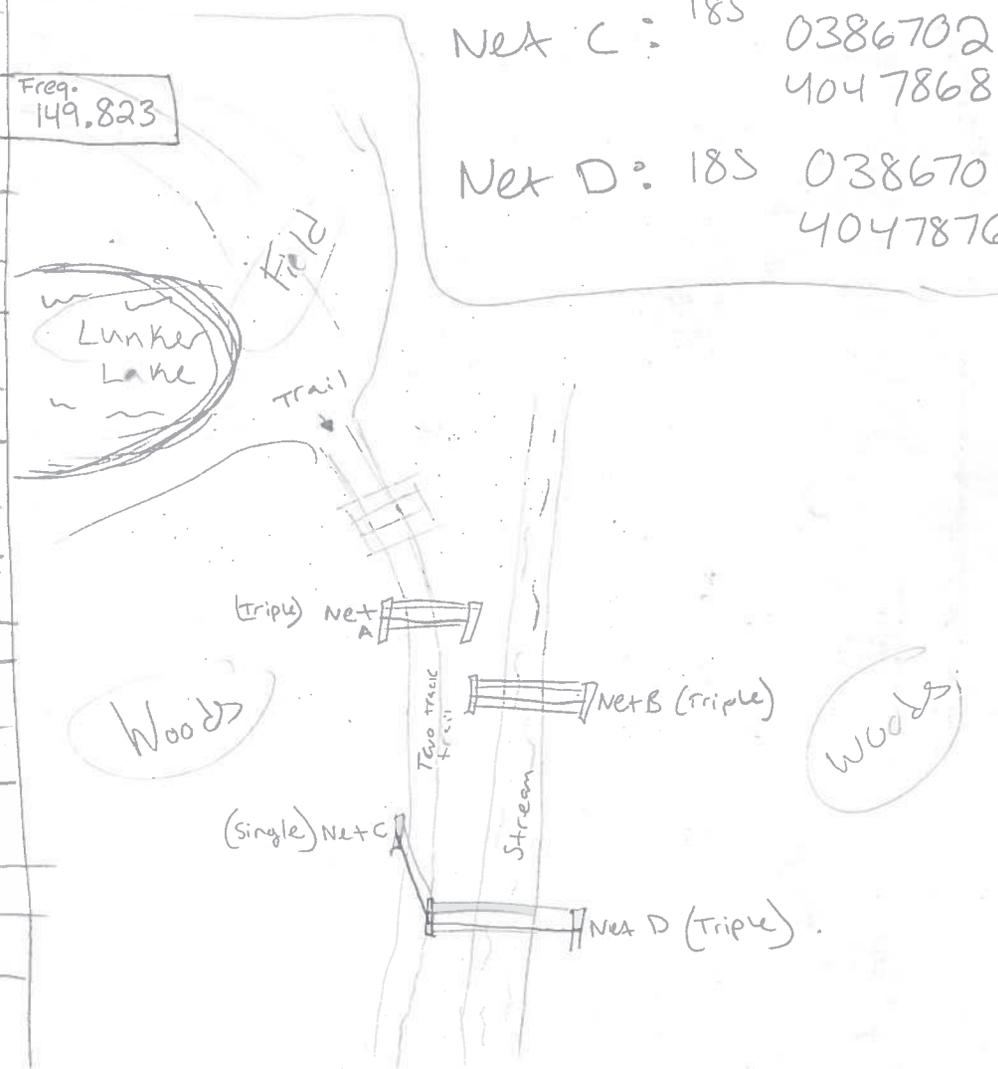
Set near water: Yes/ No Notes on Back: Yes/ No Diagram of Setup on Back: Yes/ No

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRO. (P/L/PL/NR/PA)	RS (0-5)	FA (MM)	WEIGHT (G)	BAND #	SAMPLE ID	SAMP. TYPE (F, B, G, L, Ect..)
1. 2027	LABO	M	J	NR	0	38.9	10.0	—	—	Net D 2m
2. 2028	EPFU	F	J	NR	0	47.8	17.5	—	—	Net D 2m
3. 2042	EPFU	F	A	NR	1	45.0	17.3	—	—	Net D 2m
4. 2044	EPFU	F	A	NR	0	45.8	19.1	—	—	Net D 3m
5. 2100	CORA	F	A	L	1	42.6	10.9	—	—	Net D 1m
6. 2058	EPFU	F	A	PL NR	1	46.4	18.3	—	—	Net B 4m
7. 2122	PESU	F	A	PL	0	33.5	6.9	—	—	Net D 3.5m
8. 2133	NYHU	M	J	SCR	0	35.5	8.4	—	—	Net B 4m
9. 2119	NYHU	M	A	SCR	1	36.1	11.2	—	—	Net B 3m
10. 2140	PESU	F	J	NR	0	30.0	6.6	—	—	Net B 5m
11. 2130	MYSE	F	A	PL	0	34.7	5.8	149.884 Freq.	—	Net D 2.5m
12. 2153	MYAU	M	A	NR	0	37.5	7.2	—	—	Net D 4m
13. 2142	PESU	F	A	PL	0	34.6	9.0	—	—	Net B 6m
14. 2158	MYAU	F	J	NR	0	38.5	7.2	—	—	Net B 1m
15. 2225	NYHU	M	J	Recapture from						Net D 7m

✓ TD 8-13-14

no. (201)	Time	Species	Sex	Age	RL	FA	Weight	Notes
16.	2230	EPFU	F	A	NR 0	46.4	18.8	Net B 3m
17.	2300	EPFU	F	A	NR 0	46.6	17.6	Net B 2m
18.	2345	EPFU	F	J	NR 0	47.0	15.2	Net B 3m
19.	2345	LABO	F	J	NR 0	42.0	13.9	Net B 5m
20.	0016	EPFU	F	J	NR 0	44.9	14.0	Net D 1m
21.	0026	EPFU	F	A	NR 1	46.3	17.4	Net B 4m
22.	0052	EPFU	F	A	NR 1	46.9	17.3	Net D 4m
23.	0055	EPFU	F	A	NR 1	46.3	14.8	Net B 6m
24.	0115	P.ESU	F	A	RL 1	34.7	6.9	Net D 3m
25.	0112	MXSE	F	J	NR 0	35.6	6.0	Net A 1m
26.								
27.								
28.								
29.								
30.								
31.								
32.								
33.								
34.								
35.								
36.								
37.								
38.								
39.								
40.								

Freq.
149.823



NW4

Net A: 18S, 0386644
4047778

Net B: 18S 0386649
4047799

Net C: 18S 0386702
4047868

Net D: 18S 0386701
4047876

Bat Capture Form

State: NC County: Wayne Town: Wayne Lat.: 36.54218 Long.: -76.27234

Site Name: Northwest Annex Site ID: NWA3 Recorder: A/LG Datum: WGS-84

Date: 8/11/2014 Start Time: 2015 End Time: 0130 % Clouds: 50 Wind: 0 Precip.: 0

Staff: A/LG Start Temp.: 77°F End Temp.: 76°F Capture Technique: 1 Single 6 ^{*nub 1} m; 0 Double 0 m

Habitat: See 8/10/14 data sheet 1 Triple 9 m; Other: 4 met

Set near water: Yes/No Notes on Back: Yes/No Diagram of Setup on Back: Yes/No

1 Triple 12 m
1 Triple 6 m
4 met
nights

TIME	SPECIES	SEX (M/F)	AGE (J/A)	REPRO. (P/L/PL/NR/PA)	RS (0-5)	FA (MM)	WEIGHT (G)	BAND #	SAMPLE ID	SAMP. TYPE (F, B, G, I..Ect..)
1. 0035	LABO	F	A	PL	0	43.6	15.1		netc	
2. 0111	EPPU	M	A	S	0	44.1	15.8		netc	
3. 0125	MYHU	M	J	NR	0	36.9	10.2		notD	
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										

✓ TDD 8-13-14

Note 1: 9m single high from 8/10/14 was changed to a 6m and moved 15m up trail closer to Wet C.

See 8/10/14 datasheet for GPS points on nets

Note 2: 149,853 (MYSE ♀ captured last night was detected ⁰⁰² foraging nearby @ 23:10 tonight 8/11/2014

Bat Capture Form

State: VA County: Norfolk Town: Moyock, NC Lat/Long: See back 4 Net Nights
 Site Name: NWA4 Recorder: a Datum: NAD83 Wind: 0
 Date: 8/11/14 Start Time: 20:15 End Time: 01:15 % Chases: 40% Prec.: 0
 Staff: TD, CV Start Temp: 80° End Temp: 70° Cap. Tech: 1 single 1x6
 Habitat: Sweet gum, Sycamore, Am Elm, Paw paw, red maple. Two track road 3 Triple 1x9
 Sex near water: (Yes) Notes on back: (Yes) 2x6

#	Time	Species	Sex	Age	Repro.	RS	FA _{mm}	Weight _g	F. Foot. #	Notes
1.	2048	MYAU	F	A	PL	0	38.7	8.0	—	Net B
2.	2117	MYAU	F	A	PL	0	38.3	7.1	—	Net C 0.5m Mites present
3.	2117	MYAU	F	A	PL	0	38.7	8.0	—	Net D 4.5m lots of mites
4.	2117	MYAU	M	A	NR	0	36.4	6.7	—	Net D 4m
5.	2117	MYAU	F	A	NR	0	38.1	7.8	—	Net D 2m
6.	2149	MYAU	F	A	PL	0-P	37.9	7.4	—	Net D 4m Mites
7.	2217	EPFU	M	A	SCR	0	43.6	12.7	—	Net D 6m
8.	2400	EPFU	M	A	SCR	0	43.3	15.9	—	Net D 5m
9.	2358	EPFU	M	A	NR	0	45.2	12.3	—	Net B 3m
10.	2358	MYSE	F	A	PL	1	37.7	6.4	149.762	Net D 0.5m
11.	1235	EPFU	F	A	NR	0	45.7	19.0	—	Net D 4m
12.	1224	EPFU	M	A	SCR	0	48.5	15.1	—	Net B
13.	1225	EPFU	F	A	NR PL	1	47.5	19.2	—	Net B
14.	1227	EPFU	F	A	NR	0	17.4 → 45.1	—	—	Net B
15.	1226	EPFU	F	A	NR	0	47.6	19.4	—	Net B
16.	1234	EPFU	F	A	NR	0	46.3	19.9	—	Net B
17.	1237	EPFU	F	A	NR	0	48.1	16.2	—	Net D 4m 7m
18.	1238	EPFU	M	A	NR	1	46.6	14.0	—	Net D

NET D ~~4m~~ 8-13-14

Bat Capture Form

Site Name: NORTHWEST ANNEX

Site ID: NWAS

Recorder: LG/CA

Datum: WGS-84

Date: 8/12/14

Start Time: 2020

End Time: 0230

% Clouds: 50

Wind: 0

Precip.: 0

Staff: CA/LG

Start Temp.: 81°F

End Temp.: 77°F

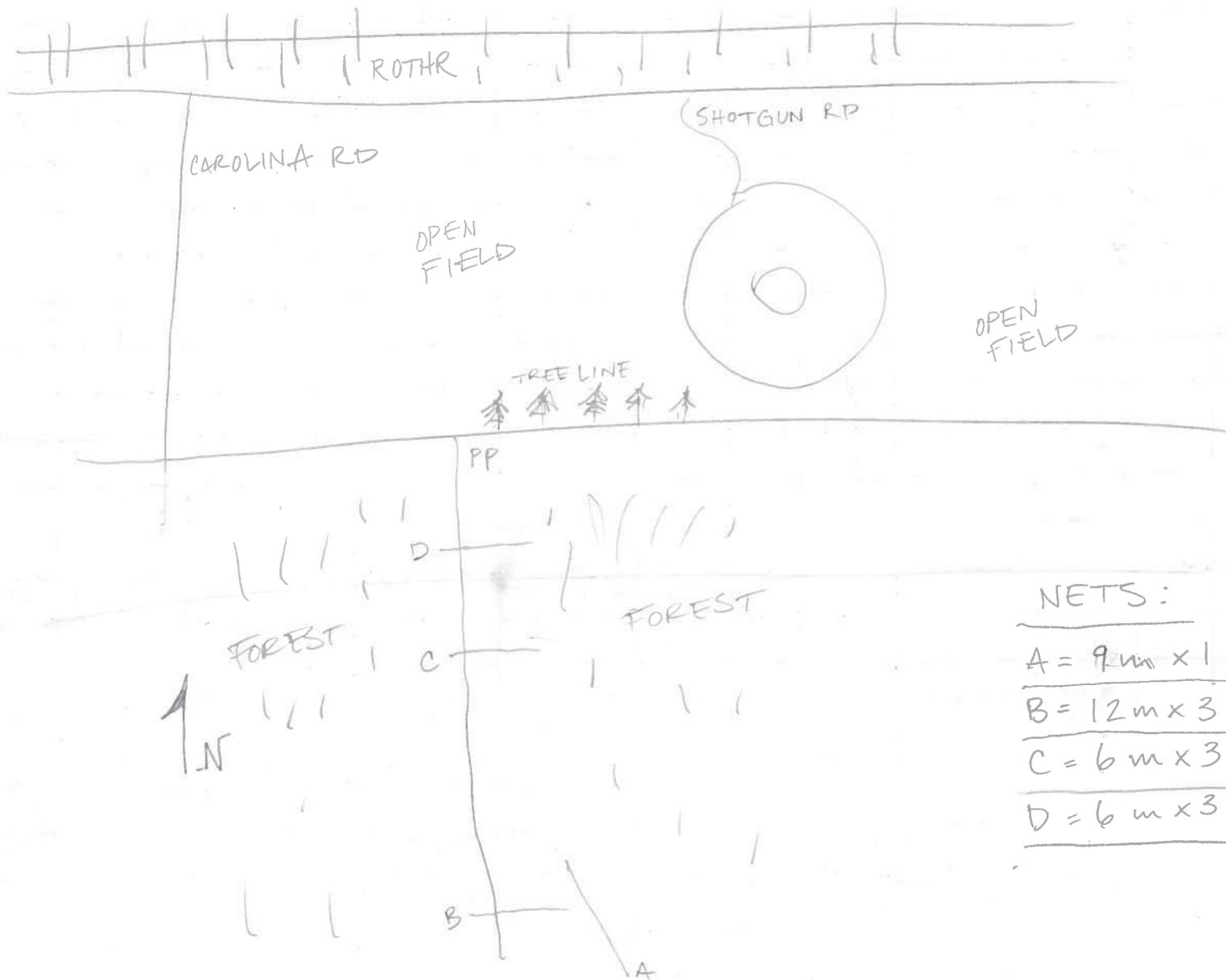
Camera ID ✓

* MAP & COORDS
ON
BACK

Quiet nights

Time	Species	Sex (m/f)	Age (J/A)	Repro (PL/PL/NR/PA)	Ea (mm)	FA (mm)	Trag (mm)	HF (mm)	Wt (g)	RS (0-5)	BAND #	SAMPLE ID	Samp. Type (F, B, G, L, Ect.)	Net #	Photo #s	Note # See back
1	2040	MYSE	F	A	PL	/	36.6	/	/	6.5	0	—	—	—	—	—
2	0227	LABO	F	A	PL	/	42.0	/	/	12.9	0	—	—	—	—	—
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																

VTD-8-13-14



NETS:

A = 9m x 1 N 36.54277°
W 076.26347°

B = 12m x 3 N 36.54276°
W 076.26357°

C = 6m x 3 N 36.54403°
W 076.26367°

D = 6m x 3 N 36.54461°
W 076.26361°

Bat Capture Form

Site Name: NWAG6

Site ID: _____

Recorder: TDDatum: NAD83Date: 8-12-14Start Time: 20:15End Time: 0055% Clouds: 100

Wind: _____

Precip.: drizzle @ 2345
rain @ 0045Staff: TD, RL, CVStart Temp.: 84°FEnd Temp.: 77°F

Camera ID _____

Time	Species	Sex (m/f)	Age (J/A)	Repro (PL/PU/NR/PA)	Ea (mm)	FA (mm)	Trag (mm)	HF (mm)	Wt (g)	RS (0-5)	BAND #	SAMPLE ID	Samp. Type (F, B, G, L, Ect..)	Net #	Photo #s	Note # See back
1	2025 PESU	F	A	PL	-	34.2	-	-	5.7	0	-	-	-	D	-	0.3m
2	2043 LABO	M	J	SCR	-	38.7	-	-	9.4	0	-	-	-	B	-	3.5m
3	2048 MYAU	F	A	PL	-	36.6	-	-	7.8	0	-	-	-	B	-	2m
4	2104 NYHU	F	A	PL	-	36.8	-	-	11.7	0	-	-	-	B	-	5m
5	2100 PESU	F	A	PL	-	34.9	-	-	7.9	0	-	-	-	B	-	4m
6	2105 NYHU	F	A	NR	-	36.5	-	-	10.7	0	-	-	-	B	-	1m
7	2106 NYHU	F	A	NR	-	36.4	-	-	11.8	0	-	-	-	B	-	6m
8	2128 LABO	M	A	SCR	-	37.9	-	-	9.2	1	-	-	-	B	-	2m
9	2120 MYAU	F	A	PL	-	38.9	-	-	7.6	0	-	-	-	B	-	4m
10	2121 MYAU	F	A	PL	-	38.8	-	-	8.3	0	-	-	-	B	-	4m
11	2237 MYSE	U	U	U	-	-	-	-	-	-	-	-	-	B	-	3m
12	2248 LABO	M	A	NR	-	38.0	-	-	12.6	0	-	-	-	D	-	4m
13	2305 LABO	-	-	-	-	-	-	-	-	-	-	-	-	B	-	1m
14	2335 MYAU	M	J	NR	-	36.4	-	-	6.3	0	-	-	-	B	-	7m
15																
16																
17																
18																

ESCAPED BEFORE MEAS

escaped before measure

PAGE 1 OF 1

*closed 20 mins early due to storms

✓ TDD 8-13-14

4 net nights

NET A - 1850386114
4047009

NET B - 1850386088
4046890

NET C - 1850386022
4046828

NET D - 1850386066
4046816



APPENDIX B

**FIELD SURVEY DATA FORMS – RADIO-TELEMETRY, ROOSTS, AND EMERGENCE
COUNTS**

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Distribution Wide Indiana Bat Roost Characteristic Datasheet

Principal Investigator: Dino Evers

Roost Tree ID #: 149.853

PI's Contact Info: BRI
use preferred method (i.e., e-mail or phone)

UTM Coordinates (NAD83) WG584
Zone:

Data Collector: Carl Anderson

Easting: N 36.54321
Northing: W -76.26981

State: NC County: Currituck

1:24K USGS Quad:

Radio-tagged Indiana bats that used roost

	Bat 1 (ID. _____)	Bat 2 (ID. _____)	Bat 3 (ID. _____)	Bat 4 (ID. _____)
Age	<u>A</u>	/	/	/
Sex	<u>F</u>	/	/	/
Repro Stage	<u>PL</u>	/	/	/
Dates of use	<u>8/11/14</u>	/	/	/

Age, sex, and reproductive stage of bats using roost is critical, dates of use and bat IDs are optional

Roost Tree Species: Am Beech
genus species

Tree Height (m): Estimate = 10m

Roost Tree Condition: Live or Dead
circle one

Roost Entrance Height (m): Est 2.5m

Natural Roost Type: Bark or Crevice/cavity
circle one

Roost Entrance Aspect: 0°

Anthropogenic Roost Type: N/A
i.e., barn, attic, bat box, etc.

Tree Roost DBH (cm): 12cm

Dist. to Water Source (m):
please provide if roost coordinates not provided

% Bark Remaining: 80%
based on current tree/snag height

% Roost Canopy Cover: 75%+
averaged over 4 cardinal directions

% Plot Canopy Cover
averaged over 4 cardinal directions 9 meters from roost

Snag Roost Decay Stage (1-4): 2

of Snags in 0.1 ha plot: 1

of Live Trees in 0.1 ha plot: 5

Emergence Counts

Dates	<u>8/11/14</u>						
Total # Bats	<u>1</u>						

Decay Stages for Snags

	1	2	3	4
Branches	80 - 100%	few - no branches	limb stubs to none	none
Bark	80 - 100%	30-80%	w/ most of ht: ≤30% bark w/ <50% ht: >80% bark	<80%
Height	full - broken top	broken top	broke top to <50% ht	<50% ht

Distribution Wide Indiana Bat Roost Characteristic Datasheet

Principal Investigator: T. Divoll

Roost Tree ID #: 149.853, 8-12-14

PI's Contact Info: 508-662-2274
use preferred method (i.e., e-mail or phone)

UTM Coordinates (NAD83)

Zone: 18S

Easting: 62386338

Northing: 4044958

Data Collector: T. Divoll

State: NC County: Cumtuck

1:24K USGS Quad: _____

MYSE

Radio-tagged Indiana bats that used roost

	Bat 1 (ID. _____)	Bat 2 (ID. _____)	Bat 3 (ID. _____)	Bat 4 (ID. _____)
Age	<u>A</u>			
Sex	<u>♀</u>			
Repro Stage	<u>PC</u>			
Dates of use	<u>8-11, 8-12, 8-13,</u>			

Age, sex, and reproductive stage of bats using roost is critical, dates of use and bat IDs are optional

Roost Tree Species: red maple
genus species

Tree Height (m): 40 ft.

Roost Tree Condition: Live or Dead
circle one

Roost Entrance Height (m): 32 ft.

Natural Roost Type: Bark or Crevice/cavity
circle one

Roost Entrance Aspect: 296°

Anthropogenic Roost Type: _____
i.e., barn, attic, bat box, etc.

Tree Roost DBH (cm): 12 cm

Dist. to Water Source (m): _____
please provide if roost coordinates not provided

% Bark Remaining: 95
based on current tree/snag height

% Roost Canopy Cover: 75%
averaged over 4 cardinal directions

% Plot Canopy Cover: -
averaged over 4 cardinal directions 9 meters from roost

Snag Roost Decay Stage (1-4): 1

of Snags in 0.1 ha plot: -

of Live Trees in 0.1 ha plot: -

Emergence Counts

Dates								
Total # Bats								

Decay Stages for Snags

	1	2	3	4
Branches	80 - 100%	few - no branches	limb stubs to none	none
Bark	80 - 100%	30-80%	w/ most of ht: ≤30% bark w/ <50% ht: >80% bark	<80%
Height	full - broken top	broken top	broke top to <50% ht	<50% ht

Emergence Count

Date: 8-12-14

Biologist: Chelsea Vosberg

Frequency: 9.853

Roost #: 149.853, 8-12-14

Start time: 2010

End time:- 2034

First Bat: 2024

Transmitted Bat: 2024

temp: 80°

Last Bat: 2024

clouds: 100

Total # Bats: 1

wind: —

Force	What it looks like	What it's called	Wind speed
0	Smoke rises straight up	Calm	0 mph
1	Smoke drifts, indicating wind direction	Light air	1-3 mph
2	Leaves rustle; weathervanes move	Light breeze	4-7 mph
3	Leaves and twigs move	Gentle breeze	8-12 mph
4	Branches move; flags flap	Moderate breeze	13-18 mph
5	Small trees sway; whitecaps on water	Fresh breeze	19-24 mph
6	Large branches move; flags beat	Strong breeze	25-31 mph
7	Whole trees move; flags extend	Near gale	32-38 mph
8	Twigs break; walking is hard	Fresh gale	39-46 mph
9	Signs blow down; slate blows off roof	Strong gale	47-54 mph
10	Trees uproot	Whole gale	55-63 mph
11	Much general damage	Storm	64-72 mph
12	Widespread destruction	Hurricane	72+ mph

8/13/14

Monitored emergence for 149. 853
Same roost tree as previous 3 nights
watched single bat emerge at 20:08
from loose bark at approx 2.5m height

149. 853 remained in general area of roost
for ± 5 min / and at 20:50 is still detected
foraging near capture area. - moderate signal
strongly

However / 1000 ft (± 300 m north up
road - no detect).

8/14/2014 Thursday

Searched all day on-base for

- 762 - 8/11
- 792
- 823 - 8/12
- 884 - 8/12

Monitored emergence of 9.853

Same roost tree location as previous night - Singlebat emerged at 20:08 from 8ft ± area of loose bark.

8/15/2014 Friday

Same as above

single bat emergence

Emergence time = 20:10

→ 20:20 still foraging in antenna range

20:30 " " " "

20:40 But appears to be many straggling units

(As of 20:47 9.792 is not foraging near leaves)

8/16/14 Saturday

Continued to search for all frequencies

- East of Great Dismal to Cavalier WMA (Ditch roads) to
South end of Base - no detections

149, 853 - Same roost tree as all previously
monitored nights. Single emergence at 20:09

However, transmission signal strength is waning
Unable to detect signal from capture location where
it was heard all previous nights. As I moved 100m into
woods I began to detect signal.

Also signal is much weaker from capture location
as but is fragging in the area.

This may reduce the likelihood of detecting other signals
tomorrow.

8/17/14: Monitored for all frogs on base -
none found. Researched various areas including
Central Western woods Between 11 & 16
Monitored 149-853 from capture location
No longer audible at roost, but heard emerge at
20:08 and fragging in area.

APPENDIX C

RESUMES AND PERMITS FOR FIELD CREWS

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DAVID YATES

719 Moosehead Lake Rd
Greenville, ME 04441
(207) 491-4707

EDUCATION:

Bachelor of Science, Wildlife Biology and Management
Unity College, Unity, ME
Graduated May 1999

M.Sc., Conservation Biology
Antioch University New England
Graduated May 2006

SKILLS:

- Proficient in animal tagging and release methods
- Ability to identify bats of N. and C. America in and QIBS by USFWS and PA State
- HERO training
- Collected and prepared blood samples for contaminant analyses.
- Current DEA drug license
- Analyzed water quality of ponds, rivers and streams
- Experience using tranquilizers/sedatives
- B3 and HUET certificates for low level flights
- HAZWOPR training
- Trained in CPR and First Aid

EXPERIENCE:

- Biodiversity Research Institute – Research Biologist/Mammal Director, Gorham, ME*** January 1998 -present
- Certified Indiana Bat Identifier for the state of PA and USFWS
 - Project Manager for Acadia National Park bat survey and tracking study
 - Project manager and conducted bat surveys for US Navy in VA and NJ
 - Lead Biologist Indiana bat surveys for Gas fracking and pipelines in PA
 - Project Manager/Lead Biologist for Maine IF&W Eco-region Surveys for bats for 5 years
 - Project Manager/Lead Biologists for bat mercury studies at superfund sites from VA to Maine involving U.S.F.&W.S.
 - Project Manager/Lead Biologist at 4 U.S. Fish and Wildlife NRDAR sites for bats and furbearers
 - Project Manager bat surveys at multiple National Wildlife Refuges in the northeast
 - Telemetry Coordinator Gulf Oil Spill Project for USFWS NRDAR bird injury assessment
 - Developed Scope of Work for USFWS NRDAR Gulf Oil Spill bird injury assessment
 - Coordinated aerial and ground tracking of more than 400 birds using multiple airplanes and satellite technology
 - Project Manager/Lead Biologist for FPL Maine Hydro. Beaver, muskrat, otter, and mink telemetry study
 - Project Manager/Lead Biologist for live trapping mink and otter study in Maine for state DEP (Master's thesis)
 - Project Manager/Lead Biologist for live trapping mink and otter study in Massachusetts for EPA and other superfund studies
 - Project Manager for Maine IF&W Ecoregion for three areas in Maine, birds and small mammals
 - Project Manager for common loon monitoring in northern and western Maine
 - Project Manager/Lead Biologist for National Park Service survey of small and large mammals of Appalachian Trail in Maine
 - Winter large carnivore tracking surveys for NPS and private landowner
 - Administered schedule III drugs for mink and otter study (Ketemine & Metetomidine)
 - DEA Schedule II-III license
 - Researched recent trends of mercury and lead contaminants in the North American piscivorous bird's mammals.
 - Captured, banded and gathered mercury and lead level data in piscivorous birds.
 - Entered banding data into database for Biodiversity Research Institute data analysis.
 - Compiled banding data into official banding schedules for U.S. Fish & Wildlife Services.
 - Supervised banding of Common Loons, Eagles, Kingfishers and various other species.
 - Surveyed reservoirs and lakes for Common Loons, Kingfishers and other piscivorous birds.
 - Presented Mammal, Bat and Common Loon slide show to various organizations for educational purposes
 - Wrote reports for Loon productivity on Reservoirs for state and private agencies.
 - Proposed, designed and organized a mink and otter study for Maine Department of Environmental Protection.

Publications and Reports:

- Yates, David E., Evan M. Adams, Sofia E. Angelo, David C. Evers, John Schmerfeld, Marianne S. Moore, Thomas H. Kunz et al. Mercury in bats from the northeastern United States. *Ecotoxicology* 23, no. 1 (2014): 45-55.
- Nam, D.-H., Yates, D., Ardapple, P., Evers, D. C., Schmerfeld, J., & Basu, N. 2012. Elevated mercury exposure and neurochemical alterations in little brown bats (*Myotis lucifugus*) from a site with historical mercury contamination. *Ecotoxicology*, 12(4), 1094–1101
- Yates, D., K. Taylor, and C. Niven. 2008. Effects of Water Levels on Muskrat (*Ondatra zibethicus*) Populations within the West Grand Lake Project, Maine. Report BRI 2008-25 submitted to BIA and OA System Corporation, Amarillo, Texas. BioDiversity Research Institute, Gorham, Maine.
- Wada, H., D. Yates, D. Evers, R. Taylor, W. Hopkins. 2010. Tissue mercury concentrations and adrenocortical responses of female big brown bats (*Eptesicus fuscus*) near a contaminated river. *Ecotox.* 19:7 1277-84.
- Yates, D., S. Angelo, T. Divoll and D.C. Evers, 2009. Assessment of mercury exposure to bats at Onondaga Lake, New York. Report BRI 2010-11 submitted to U.S. Fish and Wildlife Service, Cortland, NY. BioDiversity Research Institute, Gorham, Maine, 44 pp.
- T. Divoll, D. Yates, D.C. Evers, 2008. Pilot assessment of mercury exposure to bats at Onondaga Lake, New York. Report BRI 2009-10 submitted to U.S. Fish and Wildlife Service, Cortland, NY. BioDiversity Research Institute, Gorham, Maine, 44 pp.
- Yates, D., S.E. Angelo, M.W. Goodale and D.C. Evers. 2011. Bat Mercury Study Examining Footprint Area and Downstream: South River, Virginia - 2009. Report BRI 2009-10 submitted to DuPont Corporate Remediation Group, Newark, Delaware and the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME. 57pp.
- Yates, D., M. Moore, T. Kunz, and D.C. Evers 2008. Pilot assessment of methylmercury availability to bats on the South River, Virginia - 2008. Report BRI 2009-16 submitted to DuPont Corporate Remediation Group, Newark, Delaware and the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME. 47pp.
- Yates, D., D.C. Evers, and D. Meattley. 2008. Pilot assessment of methylmercury availability to muskrat and shrews on the South Fork River, Virginia - 2008. Report BRI 2009-21 submitted to the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME.
- Yates, D., W. Goodale, M. Holden, and D. Evers. 2008. Home ranges size in relation to water level fluctuations in river otter, muskrat, mink and beaver on Brassua Lake and surrounding waterbodies. Report BRI 2008-18 submitted to FPL Energy Maine Hydro. BioDiversity Research Institute, Gorham, Maine.
- Yates, D. and D.C. Evers. 2007-6. Small Mammals and Bat Inventory of the Appalachian Trail in Maine-2006. Report BRI 2007-6 submitted to the Maine Natural Areas Program and NPS. BioDiversity Research Institute, Gorham, ME.
- Yates, D., H. Wada, M. Moore, B. Hopkins, T. Kunz, and D.C. Evers 2007. Pilot assessment of methylmercury availability to bats on the South River, Virginia - 2007. Report BRI 2008-08 submitted to DuPont Corporate Remediation Group, Newark, Delaware and the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME. 42pp.
- Yates, D., D.C. Evers, and L. Savoy. 2004. Developing a mercury exposure profile for mink and river otter in Maine. Report BRI 2004-09 submitted to Maine Department of Environmental Protection and Maine Inland Fisheries and Wildlife. BioDiversity Research Institute, Gorham, Maine.
- Yates, D. E., D.T. Mayack, K. Munney, D.C. Evers, A. Major, T. Kaur, and R.J. Taylor. 2005. Mercury levels in mink (*Mustela vison*) and river otter (*Lontra canadensis*) from northeastern North America. *Ecotoxicology* 14:263-274.
- Yates and D.C. Evers. 2007. Pilot assessment of methylmercury availability to furbearers on the North Fork of the Holston River, Virginia - 2005. Report BRI 2007-10 submitted to the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME.
- Yates, D., and D.C. Evers. 2006. Assessment of bats for mercury contamination on the North Fork of the Holston River, VA- 2005. Report BRI 2006-9. BioDiversity Research Institute, Gorham, ME.
- Yates, D.E. and D. Evers. 2005. An overall assessment of the loon population at Lake Umbagog National Wildlife Refuge: Investigations into individual-specific demographics and assessment of individual and population health. Report BRI 2004-13 BioDiversity Research Institute, Gorham, Maine. 17pp.
- Yates, D., D.C. Evers, and W. Goodale. 2006. Monitoring of breeding Common Loons: West Branch of the Penobscot River area - 2005. Report BRI 2006-05. BioDiversity Research Institute, Gorham, ME. pp.30
- Yates, D., D.C. Evers, W. Goodale, and W. MacCabe. 2005. Monitoring of breeding Common Loons: West Branch of the Penobscot River area - 2004. Report BRI 2005-10. BioDiversity Research Institute, Gorham, ME. 27 pp.
- Yates, D., L. Savoy, D. Evers, C. DeSorbo, W. Goodale, L. Attix, A. Paul, C. Niven, E. Saxson, and M. Nelson. 2005. Documentation of the reproductive success of the Common Loon on selected lakes in the Rangeley Lakes and Eagle Lake Regions in 2004. Report BRI 2005-06 submitted to the New England Forestry Foundation. BioDiversity Research Institute, Gorham, ME. 60p.

Carl J. Anderson
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Westford, VT 05494
802-324-5219

Experience

Associate Wildlife Biologist/Field Crew Leader/Ecological Analyst: Oversee field operations for aerial and ground telemetry crews, and various mammalian/ avian research projects. Participate in bat capture and monitoring efforts, including Indiana and Eastern small-footed bats, as well as avian capture of loons, sea birds, sea ducks, and songbirds. Perform bat exit roost counts and roost location/ habitat telemetry tracking. Identify bat calls to species using Sonobat and similar autoclassification software. Coordinate recovery efforts for radioed bird mortalities, and oversee elementary transmitter and remains forensics. Analyze field capture and acoustic data, generate reports, and write grant proposals for mammalian research projects; Biodiversity Research Institute. (7/2010 to present)

Wildlife Biologist/Consultant: Consulting for Vermont Wind Power project censusing threatened, endangered, and breeding bird species. Performed bird population studies, (avian diversity in Vermont Important Bird Areas, American Woodcock singing ground surveys). GIS consulting (Wildlife Management Area mapping, American Woodcock survey route characterization). Songbird banding for Green Mountain Audubon, Great Blue Heron nest censusing and grassland bird surveys at Missisquoi National Wildlife Refuge. Self-employed (6/03-6/2010. Part time after 10/04)

GIS Research Technician: Performed variety of spatial analysis techniques on several projects, using ESRI ArcInfo, ArcView, ERDAS Imagine, and other software for University of Vermont's Spatial Analysis Lab. (6/00-6/03)

Field Research Assistant: Performed radio telemetry tracking on Double-crested cormorants. Trapped, banded, and monitored birds, recorded behavioral observations for U. S. Fish and Wildlife Cooperative at University of Vermont. (6/01-7/01)

Lead Field Technician, American Woodcock mortality study: Supervised capture/ banding and telemetry crews. Mist-netted and live-trapped American Woodcock, applied transmitters, tracked and managed data for Vermont portion of multi-state study for Wildlife Management Institute/ Patuxent Wildlife Research Center. (8/98- 12/00)

Field Assistant, Painted Bunting study: Mist-netted and banded shrub-nesting songbirds. Nest searched, radio tracked, and characterized nesting habitat for University of Georgia/ Patuxent Wildlife Research Center. (3/98-7/98)

Field Technician, vernal pool study: Recorded GPS locations of all major vernal pools on Vermont Military installation, and sampled pools for invertebrates. Assisted with invertebrate ID for University of Vermont. (Summer 2003)

Lab Technician, Red Spruce study: Prepared assays and digests for genetic testing of red spruce foliar samples. Performed gas chromatography testing on soil and foliar samples for University of Vermont. (9/97-2/98)

Environmental Technician, Air Pollution Control Division: Installation, modification, upkeep and operation of air pollution monitoring equipment network for State of Vermont. (10/04-6/2010)

Education

Master of Science, Wildlife and Fisheries Biology, University of Vermont, Burlington, VT. Focus: Applied Avian Ecology. (February, 2004)

Bachelor of Science, Integrated Natural Resources, University of Vermont, Burlington, Vermont. Summa Cum Laude. (May, 1997)

Additional Skills/ Training

State of Pennsylvania Bat Investigator status, 2013. Indiana bat ID/trapping/tracking experience. Hibernacula census survey experience, including Indiana Bat and Virginia Long-eared Bat hibernacula. Co-designed and led training webinar using Sonobat autclassification software for federal biologists/scientists. OSHA compliant Hazwoper training for Mississippi Canyon 252 oil spill. Mississippi boater safety course, and captian's permit. Boater safety course (U.S. Fish and Wildlife Cooperative, University of Vermont). HUET helicopter underwater egress and Offshore water survival training. Red Cross standard first aid, cpr, and SOLO backcountry medical training. Map and compass/ GPS orienteering training and experience. SAS statistical and FRAGSTATS landscape analysis software experience. Forestry sampling and habitat characterization experience. AAS in Electronics Technology. Proficiency with small boats, ATV's, snowmobiles and 4WD's. Small engine, vehicle repair, and building trades skills.

Volunteer Experience

VCE/Vermont Institute of Natural Science: Forest Bird Monitoring Program volunteer, avian point counts. Nature Conservancy: Natural Communities ground-truthing/ Vermont. Green Mountain Audubon: 'MAPS' station bird banding volunteer/Vermont. Hinesburg Conservation Committee member 1999-2000/ Vermont.

Dustin Meattley
652 Main Street Gorham, ME 04038
Cell: (207) 650 – 8903 Office: (207) 839 – 7600 ext. 112
dustin.meattley@briloon.org

Education

Unity College Unity, ME

- B.S. Wildlife
- Graduated May 2008
- GPA: 3.54

Galápagos Academic Institute for the Arts and Sciences (GAIAS) Galápagos Islands/Ecuador

- Spring 2007
- Ecology, Evolution, and Conservation Program

Professional Experience

Biodiversity Research Institute Gorham, ME

- Position: **Associate Wildlife Biologist/Waterfowl Program Specialist** --- 2007 - Present
- Monitored populations of common loons in ME and NH
- Banded loons and collected blood and feather samples for an ongoing mercury contamination research project.
- Captured (via mist net and harp trap) and sampled various bat species for ongoing mercury contamination research projects.
- Captured, sampled, and radio-tracked Indiana bats to locate bachelor and maternity roosts.
- Performed Avian Influenza screening on wintering sea duck species.
- Captured wintering white winged scoters, surf scoters, long-tailed ducks, and common eiders for satellite PTT implantation to determine migratory pathways and offshore habitat use.
- Captured and radio-tracked breeding mallards.
- Live-captured and sampled double-crested cormorants as part of a mercury contamination study on the coast of Maine.
- Conducted a small mammal species survey in the central and Western mountains of Maine.
- Live-trapped and sampled muskrat for a mercury contamination and human health study.
- Live-captured and conducted a radio-telemetry study on Clapper rails in the Gulf of Mexico to determine adult survivorship after the 2010 Deepwater Horizon oil spill.
- Live-captured and conducted a satellite-telemetry study on adult brown pelicans in the Gulf of Mexico and South Atlantic Bight to determine adult survivorship after the 2010 Deepwater Horizon oil spill.
- Species experience also includes: eagles, osprey, white pelicans, and songbirds.

Loon Preservation Committee Moultonborough, NH

- Position: Field Biologist --- May 2004 - September 2006
- Monitored common loon populations in the Monadnock region and Lake Umbagog
- Banded birds in cooperation with Biodiversity Research Institute

Publications/Presentations

- Savoy, L., W. Goodale, B. Allen, D. Heard, **D. Meattley**, I. Johnson, POSTER. Common eider seasonal movements in proposed offshore wind power test sites. Presented at 4th International Sea Duck Conference, Seward, AK. September 2011.

- Savoy, L., T. Bowman, **D. Meattey**, O. Lane, J. Osenkowski, S. Gilliland, G. Olsen, N. Pau, K. O'Brien, A. Berlin, P. Wilson, S. Badzinski, S. Meyer, POSTER. Mercury concentrations in blood of migratory and wintering sea ducks from the Atlantic and Great Lakes regions. Presented at 4th International Sea Duck Conference, Seward, AK. September 2011.
- **Meattey, D.** and L. Savoy. 2011. Onondaga Lake migratory and winter waterfowl pilot contaminant assessment 2009-2010. Report BRI 2011-13 submitted to U.S. Fish and Wildlife Service, Cortland, NY. Biodiversity Research Institute, Gorham, Maine. pp 1-50.
- **Meattey, D.** and L. Savoy. 2011. Assessing mercury accumulation in wintering sea ducks at Parker River National Wildlife Refuge 2009-2010. Report BRI 2011-12 submitted to Parker River National Wildlife Refuge, Newburyport, MA. Biodiversity Research Institute, Gorham, Maine. pp 1-26.
- **Meattey, D.** and L. Savoy. 2010. Assessing mercury accumulation in wintering sea ducks and Atlantic brant at Parker River National Wildlife Refuge, 2009. Report BRI 2010-08. Biodiversity Research Institute, Gorham, ME. 17 pages.
- Taylor, K., D. Pepin, **D. Meattey**, D. Yates and D.C. Evers. 2008. Flagstaff Lake Common Loon Population Survey and Management Report, 2007. BRI Report 2008-02, submitted to FPL Energy Maine Hydro. Biodiversity Research Institute, Gorham, ME.

Certifications

- Qualified Indiana Bat Surveyor (QIBS)
- 24 Hr. HAZWOPER Training
- NRDA Cold Water Safety Training
- Offshore Water Survival
- Helicopter Underwater Egress Training (HUET)
- Personnel Transfer Basket/Swing Rope Training
- B3 Combination Helicopter/Airplane Safety Training
- Rabies vaccination
- First Aid

Timothy J. Divoll

Objective

To work as part of a team, using my experience and knowledge of the natural world to help conserve balanced ecosystems.

Education

University of Southern Maine

Portland, ME

- M.S. in Biology; GPA 3.469
- Teaching Assistantship in Practical Anatomy
- Research: Mist-netting, passive ultrasonic detection and stable isotopes determine community structure and temporal variation in bats (Chiroptera) at Acadia National Park, Maine

Worcester State College

Worcester, MA

- B.S. in Biology; minor in Chemistry; GPA 3.459
- Honors: Vice President of TriBeta Biological Honor Society; Dean's List
- Student Mentor: Helped freshman adjust to college life and think about various career options
- Relevant Courses: Animal Behavior, Soil Biology, Marine Biology, Microbiology, Statistics, Calculus, Organic Chemistry I + II, Ecology, Cell Biology, Genetics, Comparative Physiology

Experience

Spring 2014

University of Maine – Orono

Orono, ME

Mammalogy Instructor

Teaching a 4 cr. lecture and lab to include live trapping exercises and radio telemetry

August 2006-present

Biodiversity Research Institute

Gorham, ME

Tropical Bat Project Leader/ Field Biologist / Field Crew Leader

- Assisted in Design, planning, and conducting a bat Hg project sampling within gold mining areas of the Peruvian Amazon as well as at a pristine site, Cocha Cashu for comparison.
- Taught a week-long tropical bat course through the Organization for Tropical Studies at Monteverde, Costa Rica (2012). Student group paper: Bat diversity and ecology in Monteverde, Costa Rica. The 2013 course was taught at Las Cruces and Las Alturas, Costa Rica (2 weeks) and focused on bat-plant interactions.
- Captured and sampled fish, birds, and bats in Belize, Costa Rica, and Honduras for mercury contamination projects in tropical ecosystem watersheds while building capacity in this area with local naturalists
- Worked on a variety of bat projects in many states throughout the Northeast sampling bats for mercury, assessing for White-nose syndrome, acoustically surveying, radio tracking, and taking stable isotope samples, Indiana bat hibernacula surveys (NY)
- Worked on an Indiana bat migration study in Illinois, overseeing a telemetry crew to track 50 animals leaving hibernation
- Sampled (28) and tracked 13 Indiana bats around Syracuse, NY during breeding season to perform maternity roost exit counts
- Worked with local Belizean technicians to build capacity for scientific monitoring of fish and sharks in Southern Belize
- Surveyed for Northern bog lemmings and Rock voles on numerous peaks in

the western mountains of Maine using Sherman live traps; targeted shrews in the Sudbury River watershed for mercury analysis/genotox

- Trapped otter and mink in the Penobscot River watershed, ME using foothold live traps to take blood and fur samples for contaminant analysis
- Caught Common Eider, Scoter, and Long-Tailed duck using floating mist nets to band and collected specimens from the Penobscot River watershed, ME for contaminant analysis
- Tracked Canada Lynx along the AT in Maine; collected distribution and habitat data on Lynx and other mammals through their tracks
- Captured nesting Mallard ducks in Virginia using live decoy traps, snap traps, walk-in traps; performed radio transmitter surgery on hens and tracked them to the nest to collect eggs for mercury sampling while banding, taking blood and feathers from all ducks caught
- Trapped multiple species of bats on the South River and Holston River in VA using mist nets and harp trap for contaminant analysis. Used radio transmitters to track bats to their roosts and collect individuals for several different immunoassays for ongoing projects at Boston University and Virginia Tech.
- Trapped otter, beaver, mink, muskrat using foothold, Hancock, box traps for a radio telemetry study on Brassua Lake, ME and its surrounding water bodies to look at the effects of water levels in man-made reservoirs on mammalian movements.
- Preparing and shipping samples, compiling data, preparing maps and aerial photos

Summer 2009-2011 National Park Service Acadia National Park, ME

Field Researcher

- Captured 1037 bats of six species, all banded, sampled, and released unharmed at 13 sites within the park and collected acoustic data using new passive technologies

January - March 2008 Wildlife Conservation Society Punta Gorda, Belize

Field Biologist

- Volunteered on a Goliath grouper acoustic tagging project in the mangroves of southern Belize
- Dove to change out acoustic receivers on the reef for an ongoing Whale shark project
- Sampled various shark species for stable isotope and mercury analysis from southern Belize by obtaining samples at markets and meeting up with fishermen on the reef and working with them to obtain samples from sharks they had caught with gill nets and longlines
- Opportunistically sampled various fish species in southern Belize from the rivers to the reef for stable isotope and mercury analysis

Summer 2005+2006 Loon Preservation Committee Moultonborough, NH

Field Biologist

- Surveyed Common loons on numerous lakes in NH to determine abundance, fecundity, and site fidelity
- Led crews in night lighting loons for live capture to take blood and feathers for contaminant analysis and genetics
- Banded bald eagles and waterfowl, conducted waterfowl brood surveys and osprey nest surveys on Lake Umbagog with BRI
- Assisted in catching and putting radio transmitters in brook trout on the Moose River in Maine with biologists from FPL and ME IF&W
- Assisted in mist netting bats in Grafton Notch, ME with biologists from BRI
- Contacted, met and worked with numerous volunteers to ensure the safety of

loon populations in NH

Volunteer

Assisted the Belize River East Archaeology team with systematic surface collection, soil test pits, and excavation of a Mayan E Group site for 2 weeks. Trained for 8 weeks at Harvard MCZ on large and small bird and mammal study skin preparation; Set up hair snare traps for Grizzlies in Yellowstone NP and conducted stream surveys for spawning Yellowstone Cutthroat trout; Northern Harrier behavioral and nesting surveys on Block Island and Cape Cod; Eastern Spotted turtle surveys at Broad Meadow Brook, Worcester, MA; educated people and worked with children to learn about the animals of Massachusetts at the New England Flower Show with biologists from MA Fish and Wildlife; Catching sharks in RI for a Mako tagging program

Interests

Physical activities including: mountain biking, snowshoeing, cross country skiing, snowboarding, fishing (freshwater, saltwater, and ice), hunting, hiking, camping, rugby, canoeing/kayaking, boating, SCUBA and free diving, conservation

Skills

International Bat Course 2012 Peru, Qualified Indiana Bat Surveyor (QIBS) in Pennsylvania and Federally, NorthEast Bat Working Group, Program R, MS Word, PowerPoint, Excel, Alpha5 database, Debra 5 database, CAD, Bandit, PADI Advanced Open Water Diver, good sense of direction, map and compass, knowledge of ice and water safety, NH boating license, hunter and trapper safety courses, firearms safety course, physical stamina, ME driver's license, towing, 4x4 vehicle, snowmobile, radio transmitter surgery, large and small bird and mammal study skin preparation.

Publications

Divoll, T., B. Connery, D.C. Evers, B. Wheeler. (In prep) 2013. Temporal monitoring of mercury in *Vespertilionid* bat hair from Acadia National Park, Maine. *Acta Chiropterologica*.

Hatch, S. K., Connelly, E., Divoll, T. J., Steinhouse, I., Williams, K. A. 2013. Offshore observations of eastern red bats (*Lasiurus borealis*) in the Mid-Atlantic United States using multiple survey methods. *PLOS ONE*.

Yates, D. E., Angelo, S. E., Evers, D. C., Schmerfeld, J., Moore, M. S., Kunz, T. H., Divoll, T., Edmonds, S. T., Perkins, C., Taylor, R., Driscoll, C. 2013. Mercury in bats from the northeastern United States. *Ecotoxicology*.

Divoll, T. and D.G. Buck. 2013. Noteworthy field observations of cave roosting bats in Honduras. *Mastozoología Neotropical* 20(1):149-151..

Divoll, Timothy James. 2013. *Mist-netting, passive ultrasonic detection, and stable isotopes determine community structure and temporal variation in bats (Chiroptera) at Acadia National Park, Maine*. MS thesis. University of Southern Maine, Portland, 2013.

Evers D.C.,Graham R.T., Perkins C., Michener R., Divoll T. 2008. Mercury concentrations in the goliath grouper of Belize: an anthropogenic stressor of concern. *Endangered Species Research* DOI: 10.3354/esr00158

Reports

Divoll, T. J. 2013. Effects of white-nose syndrome on the bats of Acadia National Park. Report to National Park Service. BRI Report 2013-05. Biodiversity Research Institute, Gorham, Maine.

Goodale W. and T. Divoll. 2009. Birds, Bats and Coastal Wind Farm Development in Maine: A Literature Review. Report BRI 2009-18. Biodiversity

Research Institute, Gorham, Maine.

D. Yates, T. Divoll, S. Angelo and D.C. Evers, 2009. Assessment of mercury exposure to bats at Onondaga Lake, New York. Report BRI 2010-11 submitted to U.S. Fish and Wildlife Service, Cortland, NY. Biodiversity Research Institute, Gorham, Maine, 24 pp.

T. Divoll, D. Yates, D. Evers, 2008. Pilot assessment of mercury exposure to bats at Onondaga Lake, New York. Report BRI 2009-10 submitted to U.S. Fish and Wildlife Service, Cortland, NY. Biodiversity Research Institute, Gorham, Maine.

Presentations

2013. Divoll, T.J., B.C. Connery, B. Wheeler, D. G. Buck, J.L. Fiely, C.J. Anderson, & D.E. Yates. Eastern small-footed bat (*Myotis leibii*) ecology at Acadia National Park, Maine. Presented at the NorthEast Bat Working Group, 9-11 January 2013, Albany, New York & Southeastern Bat Diversity Network, Falls Creek Falls, Tennessee, 13-15 February 2013.

2012. Divoll, T., D.G. Buck, D.C. Evers, and D. Yates. Murciélagos como indicadores de contaminación ambiental en Mesoamérica. Presented at the Simposia Peruano de Murcielagos, 13-14 January 2012, Lima, Peru.

2011. Buck, D.G., D.C. Evers, T. Divoll, R. Graham, D. Castellanos, C. Barrientos, D. Medina, C. Chen, and F. Elvir., POSTER. Distribución de mercurio en las cuencas hidrográficas que desembocan al arrecife mesoamericano. Presented at the 15th Congress of the Mesoamerican Society for Biology and Conservation, 24-28 October 2011, Mérida, Mexico.

2011. Divoll, T., D.G. Buck, D.C. Evers, and D. Yates. Murciélagos como indicadores de contaminación ambiental en Mesoamérica. Presented at the 15th Congress of the Mesoamerican Society for Biology and Conservation, 24-28 October 2011, Mérida, Mexico.

2011. Divoll, T., R. T. Graham, N. Hammerschlagg, C. Hammerschmidt, D.C. Evers, POSTER. Bioaccumulation of methylmercury in sharks from Florida and Belize: an international comparison of marine apex predators. Presented at the International Conference on Mercury as a Global Pollutant, 24-29 July, 2011, Halifax, Nova Scotia.

2011. Divoll, T. Mercury contamination of bats. Presented at the Schoodic Education and Research Center, Winter Harbor, ME, April 2011.

2011. Divoll, T., POSTER. Using Stable Isotopes to Assess Population Dynamics at Acadia National Park, Maine – A Preliminary Analysis. Presented at the Northeast Natural History Conference, Albany, NY.

2011. Divoll, T., POSTER. Using Stable Isotopes to Assess Population Dynamics at Acadia National Park, Maine – A Preliminary Analysis. Presented at the Northeast Bat Working Group, Midwest Bat Working Group, Southern

Bat Diversity Network Joint Meeting, Louisville, KY.

2010. Buck, D.G., Divoll, T., Evers, D.C., POSTER. La Bioacumulación del Mercurio en Redes Tróficas de Embalses Hidroeléctricos. Sociedad MesoAmericana para la Biología y la Conservación, XIV Congreso, San José, Costa Rica.

2009. Divoll, T., Evers, D.C., Graham, R., Castellanos, D., Buck, D., POSTER. Mercury level exploration of marine food fish species in Belize. MesoAmerican Society for Biology and Conservation, XIII Congress, Belize City, BZ.

2008. Evers, D.C., Graham, R., Hammerschlag, N., Perkins, C., Michner, R. and Divoll, T., POSTER. Elevated mercury levels in Sharks of Belize. American Society of Limnologists and Oceanographers. Orlando, FL.

Grants received

\$15,000 from L.L. Bean Acadia Research Fellowship in 2010

\$1,000 from the University of Southern Maine Research Fund in 2010

\$2,000 from the John Sage Foundation in 2012

\$2,500 from the Stifler Family Foundation in 2013



Wildlife Collection License

Phone: (919) 707-0060
Fax: (919) 707-0067

North Carolina Wildlife Resources Commission
Division of Wildlife Management
MSC 1722
Raleigh, NC 27699-1722

AUTHORITY
STATUTES
GS 113-261 & GS 113-272.4
RULES
15A NCAC 10B .0119

PERMITTEE/LICENSEE

DAVID YATES
19 FLAGGY MEADOW RD
GORHAM, ME 04038

PERMIT NUMBER

14-SC00949

EFFECTIVE

07/22/2014

EXPIRES

12/31/2014

COUNTY

DISTRICT

CONDITIONS AND AUTHORIZATIONS

Print Date: **07/24/2014**

This license authorizes the capture and temporary possession of the listed species.

Methods Authorized: Mist Netting

All species captured must be immediately released unharmed at the site of capture upon completion of data collection.

Must follow all current USFWS white-nose syndrome decontamination protocols and advisories and adhere to the North Carolina White-Nose Syndrome Surveillance and Response Plan.

Must coordinate with the appropriate Wildlife Diversity Biologist at least 48 hours prior to collecting activity commencing.

The licensee must maintain a copy of this license in their possession at all times during authorized collection activities.

Issuance of this license does not constitute permission to conduct collection activities on any public or private lands; such permission must be obtained separately from the appropriate landowner or land manager before beginning authorized collection activities.

This license neither directly nor by implication grants right of trespass.

A complete report is due at the time of renewal to be eligible for renewal. The report must be submitted through the online reporting system (<https://ncpaws.org/paws/>). Failure to submit the report may result in the license not being renewed.

This license authorizes the collection of the following species:

-Bats

Collection Location Authorized: STATEWIDE

This permit/license is non-transferable and expires at midnight on the above specified expiration date.

ISSUED BY:

TITLE:

Permits Supervisor



DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

FEDERAL FISH AND WILDLIFE PERMIT

I. PERMITTEE

BIODIVERSITY RESEARCH INSTITUTE
652 MAIN STREET
GORHAM, ME 04038
U.S.A.

2. AUTHORITY-STATUTES
16 USC 1539(a)

REGULATIONS
50 CFR 17.22

50 CFR 13

3. NUMBER
TE63633A-2 AMENDMENT

4. RENEWABLE
 YES
 NO

5. MAY COPY
 YES
 NO

6. EFFECTIVE
07/12/2013

7. EXPIRES
07/31/2015

8. NAME AND TITLE OF PRINCIPAL OFFICER *(If #1 is a business)*
DAVID C EVERS
EXECUTIVE DIRECTOR

9. TYPE OF PERMIT
NATIVE ENDANGERED SP. RECOVERY - E WILDLIFE

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
OHIO, GEORGIA, ALABAMA, LOUISIANA, MISSISSIPPI, KENTUCKY, TENNESSEE, NEW YORK AND NEW JERSEY

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL, TRIBAL, OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

C. CONTINUED: THE FOLLOWING INDIVIDUALS ARE AUTHORIZED TO CONDUCT ACTIVITIES AS AUTHORIZED BY THIS PERMIT: TIMOTHY DIVOLL, DAVID YATES, DUSTIN MEATTEY, CARL ANDERSON AND FOR INDIANA BATS ONLY: JONATHAN FIELY.

TRAINED ASSISTANTS NOT NAMED ON THIS PERMIT MAY WORK ON PERMITTED BAT ACTIVITIES UNDER THE DIRECT AND ON-SITE SUPERVISION OF THE INDIVIDUALS NAMED ABOVE. HOWEVER, TRAINED ASSISTANTS MAY NOT WORK INDEPENDENTLY AT A SITE. TRAINED ASSISTANTS ARE INDIVIDUALS WHO ARE CONSIDERED QUALIFIED BY THE PERMITTED BIOLOGIST(S) TO SELECT SAMPLING SITES, DEPLOY SAMPLING EQUIPMENT AND NETS, AND HANDLE BATS IN THE FIELD AS STATED IN CONDITION F, BELOW.

D. THE FOLLOWING CONDITIONS APPLY WHEN WORKING IN THE FOLLOWING STATES; TENNESSEE, GEORGIA, ALABAMA, LOUISIANA, MISSISSIPPI AND KENTUCKY :

PERMITTEE IS AUTHORIZED TO TAKE (ACOUSTICAL MONITORING, ENTER HIBERNACULA OR MATERNITY ROOST CAVES, SALVAGE DEAD BATS, CAPTURE WITH MIST NETS OR HARP TRAPS, HANDLE, IDENTIFY, COLLECT HAIR SAMPLES, BAND, TRANSMITTER, LIGHT-TAG, WING-PUNCH, AND SELECTIVELY EUTHANIZE FOR WHITE NOSE SYNDROME TESTING) INDIANA BATS (MYOTIS SODALIS) AND GRAY BATS (MYOTIS GRISESCENS) WHILE CONDUCTING PRESENCE/ABSENCE SURVEYS, STUDIES TO DOCUMENT HABITAT USE, AND POPULATION

ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS

REPORTS WILL BE PROVIDED TO THE U.S. FISH AND WILDLIFE SERVICE OFFICES APPEARING IN CONDITIONS L, M AND N OF THIS PERMIT. REPORTING CONTENT, FORMAT, SUFFICIENCY AND FREQUENCY ARE OUTLINED IN CONDITION K OF THIS PERMIT.

ISSUED BY

TITLE *Acting*
CHIEF, DIVISION OF ENDANGERED SPECIES

DATE

07/12/2013

MONITORING, AS CONDITIONED BELOW.

1. FOR ALL ACTIVITIES CONSIDERED WITHIN THIS PERMIT, THE **DISINFECTION PROTOCOL FOR BAT FIELD STUDIES** SHALL BE FOLLOWED. YOU ARE REQUIRED TO USE THE MOST RECENT PROTOCOLS AVAILABLE. YOU SHALL CONTACT THE SERVICE'S OFFICE LISTED IN M., BELOW FOR A COPY OF THE PROTOCOL EACH YEAR AND TO DETERMINE IF ANY SITE SPECIFIC MODIFICATIONS ARE REQUIRED.
2. UPON DETERMINATION THAT ENDANGERED BATS ARE PRESENT, THE PERMITEE SHALL NOTIFY THE SERVICE FIELD OFFICE IN THE STATE IN WHICH THE SITE IS LOCATED AND THE CORRESPONDING REGIONAL OFFICE.
3. DEAD BATS MAY BE SALVAGED AND IDENTIFIED (INCLUDING PHOTOGRAPHIC DOCUMENTATION), AND SENT TO THE APPROPRIATE LAB FACILITIES FOR THE PURPOSES OF EVALUATING IMPACTS FROM THE CAUSE OF DEATH (WHITE-NOSE SYNDROME, WIND ENERGY OPERATIONS, ETC.). ANY DISCOVERY OF FEDERALLY LISTED SPECIMENS SHALL BE REPORTED, WITHIN 48 HOURS OF DISCOVERY, TO THE USFWS FIELD SUPERVISOR IN THE STATE IN WHICH THE SALVAGE OCCURS. YOUR REPORT MUST BE IN WRITING AND MUST INCLUDE INFORMATION ON THE SPECIES, SEX, LOCATION, DATE, TIME, AND ANY OBSERVATIONS ON THE CONDITION OF THE SPECIMEN. SPECIMENS MUST BE CHILLED AND SURRENDERED TO THE OFFICE IN CONDITION M., BELOW, UNLESS OTHERWISE INSTRUCTED BY THAT OFFICE.
4. BATS MAY BE CAPTURED WITH MIST NETS AND HARP TRAPS. THE MONITORING INTERVAL FOR MIST NETS MAY NOT EXCEED 10 MINUTES. BATS MAY BE CAPTURED WITH HARP TRAPS ONLY WITH WRITTEN CONCURRENCE FROM THE FIELD SUPERVISOR IN THE STATE IN WHICH TRAPPING IS PROPOSED. HARP TRAPS MUST BE CONTINUALLY MONITORED. CAPTURED BATS MAY NOT BE HELD FOR MORE THAN 30 MINUTES, UNLESS INJURED. FOR ESA COMPLIANCE PROJECTS INVOLVING SURVEY WORK FOR THE INDIANA BAT IN KENTUCKY, INDIVIDUALS REFERENCED IN CONDITION C. ABOVE MUST FOLLOW THE INDIANA BAT SURVEY GUIDANCE ISSUED BY THE U.S. FISH AND WILDLIFE SERVICE, KENTUCKY FIELD OFFICE AND KENTUCKY DEPARTMENT OF FISH AND WILDLIFE RESOURCES (ATTACHED). FOR INDIANA BAT SURVEY WORK CONDUCTED IN KENTUCKY, THIS GUIDANCE SUPERCEDES OTHER CONDITIONS LISTED IN THIS PERMIT; THE GUIDANCE MUST BE CURRENT FOR THE YEAR IN WHICH THE SURVEY IS CONDUCTED/REQUIRED.
5. PERMITEES MAY CARRY OUT NON-INTRUSIVE MEASUREMENTS ON CAPTURED BATS.
6. UNIQUELY NUMBERED, MODERN, LIPPED, CORRECTLY SIZED ALUMINUM BAT BANDS SHALL BE USED. SPLIT-RING, PLASTIC BANDS SHALL BE AVOIDED.
7. PRIOR TO CONDUCTING ACTIVITIES WRITTEN APPROVAL SHALL BE RECEIVED FROM THE PERMIT COORDINATOR AND/OR APPROPRIATE FIELD OFFICE LISTED IN CONDITION M AND N., BELOW.
8. COPIES OF ALL REQUEST AND APPROVAL LETTERS, WITH THE PERMIT NUMBER INCLUDED, SHALL BE FORWARDED TO THE PERMITS COORDINATOR LISTED IN CONDITION L, M AND N., BELOW.
9. RADIO TRANSMITTERS (TOTAL PACKAGE WEIGHT NOT TO EXCEED 7.5 PERCENT (5 PERCENT RECOMMENDED) OF BODY WEIGHT OR 0.45 GRAM, WHICHEVER IS LESS) MAY BE ATTACHED TO BATS DURING THE SPRING, SUMMER, AND FALL ROOSTING PERIODS BY NONTOXIC SKIN BOND ADHESIVE. BATS CARRYING TRANSMITTERS SHOULD BE MONITORED DAILY FOR AT LEAST FIVE DAYS, OR UNTIL THE TRANSMITTER FALLS OFF, WHICHEVER OCCURS FIRST. RADIO TRANSMITTERS SHALL NOT BE PLACED ON NEWLY VOLANT JUVENILES WITHOUT PRIOR APPROVAL OF THE APPROPRIATE FIELD OFFICE.
10. SURVEYS OF GRAY BAT MATERNITY ROOSTS AND THEIR OTHER KNOWN SUMMER ROOST SITES SHALL BE CONDUCTED BY OBSERVING THE BATS WITH NIGHT VISION EQUIPMENT AND INFRARED LIGHT SOURCE AS THEY EMERGE FROM THEIR CAVES AND MINE ROOSTS. AT SITES THAT ARE NOT CURRENTLY KNOWN TO SUPPORT THESE SPECIES THE ACCEPTED METHOD TO DETERMINE IF THEY ARE PRESENT IS TO CAREFULLY AND SLOWLY ENTER THE POTENTIAL ROOST SITE AND VISUALLY CHECK FOR EVIDENCE OF THE PRESENCE OF BATS, SUCH AS SIGNIFICANT QUANTITIES OF GUANO, A STRONG SMELL OF GUANO OR THE AUDIBLE SOUNDS PRODUCED BY BATS ROOSTING AT THE SITE. ONCE ANY OF THE INDICATORS ARE OBSERVED, SURVEY TEAM MEMBERS SHALL EXIT THE ROOST SITE AND MAKE FURTHER OBSERVATIONS FROM OUTSIDE THE ENTRANCE TO THE ROOST. ALL FURTHER OBSERVATIONS (WITH AQUOSTICS AND/OR NIGHT VISION EQUIPMENT AND A SUPPLEMENTAL INFRARED LIGHT SOURCE) SHALL BE MADE FROM THE CAVE OR MINE ENTRANCE DURING THE EVENING EMERGENCE. FOR CAVE ENTRY ACTIVITIES, WRITTEN

APPROVAL IS REQUIRED FROM THE U.S. FISH AND WILDLIFE SERVICE FIELD SUPERVISOR FOR THE STATE IN WHICH THE ACTIVITIES ARE PROPOSED.

11. AT SOME SITES, ESPECIALLY ABANDONED MINES, IT IS NOT ADVISABLE TO ENTER A POTENTIAL ROOST BECAUSE OF THE PHYSICAL HAZARDS PRESENT IN THE SITE. ACOUSTICAL MONITORING, MIST NETS, OR HARP TRAPS MAY BE USED OUTSIDE THE ENTRANCE OF THESE SITES TO DETERMINE THE IDENTITY, SEX AND REPRODUCTIVE CONDITION OF BATS USING THE SITE. NETS AND HARP TRAPS SHALL BE CHECKED REGULARLY AND THE MONITORING INTERVAL FOR MIST NETS MAY NOT EXCEED 10 MINUTES. CAPTURED BATS SHALL NOT BE HELD FOR MORE THAN 30 MINUTES, UNLESS INJURED. DATA SHALL BE RECORDED FOR ALL BATS REMOVED FROM THE NET AND/OR TRAP. THESE DATA SHALL INCLUDE SPECIES, SEX, REPRODUCTIVE CONDITION, AND PHYSICAL MEASUREMENTS SUCH AS FOREARM LENGTH, FOOT LENGTH, PRESENCE/ABSENCE OF A KEEL ON THE CALCAR, ETC. BATS MAY BE PHOTOGRAPHED BEFORE RELEASE TO DOCUMENT THEIR PRESENCE AT THE ROOST SITE.
12. IF IT IS DETERMINED TO BE NECESSARY TO DOCUMENT REPRODUCTIVE LEVELS WITHIN A GRAY BAT MATERNITY ROOST THE ROOST MAY BE ENTERED AFTER THE EVENING EMERGENCE OF ADULTS HAS BEEN COMPLETED. ENTRY SHALL BE LIMITED TO SMALLEST NUMBER OF PEOPLE THAT CAN SAFELY ACCOMPLISH THE SURVEY AND ALL SURVEY TEAM MEMBERS WILL EXIT THE ROOST SITE PRIOR TO THE RETURN OF ADULTS TO THE ROOST. THIS ACTIVITY REQUIRES WRITTEN APPROVAL FROM THE U.S. FISH AND WILDLIFE SERVICE FIELD SUPERVISOR FOR THE STATE IN WHICH ACTIVITIES ARE PROPOSED.
13. SURVEYS CONDUCTED DURING THE WINTER HIBERNATION SEASON SHALL FOLLOW THE GUIDELINES ESTABLISHED IN THE RECOVERY PLANS FOR THESE SPECIES. BATS MAY BE HANDLED DURING WINTER SURVEYS IN ORDER TO COLLECT BAND INFORMATION AND CONFIRM THE IDENTIFICATION OF LISTED SPECIES. DETAILED PHOTOGRAPHS MAY BE TAKEN TO DOCUMENT THE PRESENCE OF LISTED SPECIES. ONLY ONE TRIP TO THE HIBERNATION AREA OF EACH CAVE OR ABANDONED MINE IS AUTHORIZED DURING THE HIBERNATION SEASON. INDIANA BAT AND GRAY BAT HIBERNATION SITES SHALL ONLY BE SURVEYED ONCE EVERY TWO YEARS. THIS ACTIVITY REQUIRES WRITTEN APPROVAL FROM THE U.S. FISH AND WILDLIFE SERVICE FIELD SUPERVISOR FOR THE STATE IN WHICH ACTIVITIES ARE PROPOSED.
14. WHEN CONDUCTING INDIANA BAT SURVEYS, THE CURRENT MINIMUM SURVEY GUIDANCE CONTAINED IN THE 2007 DRAFT INDIANA BAT RECOVERY PLAN SHALL BE FOLLOWED; HOWEVER, THE PERMITTEE MUST ADHERE TO ANY ADDITIONAL, SPECIFIC GUIDANCE DEVELOPED FOR THE STATE IN WHICH THEIR PROJECT IS LOCATED. DEVIATION FROM THESE GUIDELINES IS NOT AUTHORIZED VIA THIS PERMIT AUTHORIZATION. HOWEVER, IT IS ENCOURAGED THAT ECHOLOCATION DETECTION EQUIPMENT BE USED TO SUPPLEMENT THE INFORMATION GAINED DURING MIST NET SURVEYS. AT THIS TIME ECHOLOCATION DETECTION CAN NOT BE USED TO POSITIVELY IDENTIFY ALL SPECIES OF BATS THAT MAY BE ENCOUNTERED DURING SUMMER SURVEYS AND THEREFORE IT CAN NOT BE USED TO POSITIVELY ESTABLISH PRESENCE WITHIN THE SURVEY AREA. NO TRAPPING ACTIVITIES SHALL OCCUR WITHIN 20 METERS OF AN INDIANA BAT MATERNITY ROOST SITE, UNLESS PERMITTEE RECEIVES WRITTEN APPROVAL FROM THE U.S. FISH AND WILDLIFE SERVICE FIELD SUPERVISOR FOR THE STATE IN WHICH ACTIVITIES ARE PROPOSED.
15. FECAL MATERIAL MAY BE COLLECTED AFTER A BAT IS CAPTURED BY PLACING IT IN A CLOTH BAG FOR A SHORT TIME (NOT TO EXCEED 30 MINUTES) BEFORE IT IS CAREFULLY EXAMINED AND KEY PHYSICAL CHARACTERS DOCUMENTED. FECAL MATERIAL CAN THEN BE REMOVED FROM THE BAG OR COLLECTED OFF THE FUR OF THE BAT.
16. LIGHT TAGS MAY BE ATTACHED TO THE DORSAL FUR OF A BAT WITH A NONTOXIC ADHESIVE THAT WILL QUICKLY DEGRADE AND LOOSE ITS ADHESIVE QUALITIES. THE SMALLEST AND LIGHTEST CYALUME CAPSULES THAT WILL MEET THE PROJECT OBJECTIVES SHALL BE USED.
17. WING PUNCHES MAY BE TAKEN IN SPRING/SUMMER BY PUNCHING A HOLE IN THE WING MEMBRANE, AVOIDING BONES AND MAJOR BLOOD VESSELS. A SEPARATE BIOPSY TOOL MUST BE USED FOR EACH INDIVIDUAL LISTED BAT.
18. UNDER THE FOLLOWING SPECIFIC CONDITIONS RELATED TO WHITE-NOSE SYNDROME, LISTED BATS MAY BE EUTHANIZED: (A) THE SITE OF COLLECTION HAS NOT BEEN PREVIOUSLY DEMONSTRATED TO CONTAIN WNS-INFECTION OR WNS-INFECTED BATS (LISTED AND/OR NON-LISTED), (B) NO OTHER NON-LISTED BATS ARE PRESENT THAT ALSO SHOW SYMPTOMS OF WNS, AND (C) NO OTHER METHOD OF WNS SAMPLE COLLECTION IS POSSIBLE. IN ADDITION, ONLY ONE LISTED BAT OF ANY SPECIES WILL BE COLLECTED AT A SINGLE ROOST SITE AND ONLY IF CRITERIA (A), (B), AND (C) ARE MET AND THOSE CIRCUMSTANCES

DOCUMENTED BY THE PERMITTEE IN WRITING TO THE SERVICE.

WHEN MORE THAN ONE LISTED BAT SPECIES IS PRESENT WITHIN A SITE AND SHOWING SYMPTOMS OF WNS, THE FOLLOWING ORDER SHOULD BE USED IN SELECTING WHICH INDIVIDUAL TO SELECTIVELY EUTHANIZE FOR WNS TESTING: GRAY BAT BEFORE INDIANA BAT.

19. THE ATTACHED LETTER OF INSTRUCTION, BAT CAVE ADVISORY, AND DISINFECTION PROTOCOL - AND ANY SUBSEQUENT VERSIONS OF THESE ATTACHMENTS SHALL BE FOLLOWED.

D. THE FOLLOWING CONDITIONS APPLY WHEN WORKING IN OHIO, NEW JERSEY AND NEW YORK:

PERMITTEE IS AUTHORIZED TO TAKE (CAPTURE, HANDLE, RADIO-TAG, AND RELEASE) THE INDIANA BAT (*MYOTIS SODALIS*) AND GRAY BAT (*M. GRISESCENS*) FOR SCIENTIFIC RESEARCH AIMED AT RECOVERY OF THE SPECIES: PRESENCE/ABSENCE SURVEYS, STUDIES TO DOCUMENT HABITAT USE, POPULATION MONITORING, AND TO EVALUATE POTENTIAL IMPACTS. THIS PERMIT DOES NOT AUTHORIZE THE COLLECTION OF VOUCHER SPECIMENS.

1. PERMITTEE SHALL NOTIFY THE USFWS FIELD SUPERVISOR FOR THE STATE IN WHICH ACTIVITIES ARE PROPOSED TO OCCUR AT LEAST 15 DAYS PRIOR TO CONDUCTING ANY ACTIVITIES. CONTACT INFORMATION IS CONDITION N., BELOW. YOUR REQUEST MUST BE IN WRITING AND MUST INDICATE:

LOCATION OF PROPOSED ACTIVITIES, INCLUDING PROJECT SITE, COUNTY, AND STATE.

A DESCRIPTION OF THE ACTIVITIES (I.E., SURVEYS, RADIO-TELEMETRY STUDIES, ETC.).

DATES WHEN THE PROJECT IS PROPOSED TO TAKE PLACE.

EVIDENCE THAT PERMITTEE HAS RECEIVED ANY REQUIRED CONTRACTS TO COMPLETE THE ACTIVITIES.

YOU MAY PROCEED WITH ACTIVITIES ONLY UPON RECEIPT OF WRITTEN CONCURRENCE FROM THE APPLICABLE USFWS FIELD SUPERVISOR. *YOUR CONCURRENCE LETTER MUST BE CARRIED WITH THIS PERMIT TO AUTHORIZE SITE-SPECIFIC ACTIVITIES.*

2. PERMITTEE SHALL ADHERE TO THE FOLLOWING CONDITIONS INVOLVING CAPTURE AND HANDLING OF BATS:

A. BATS MAY BE CAPTURED WITH MIST NETS FOLLOWING THE PROTOCOL "INDIANA BAT MIST-NETTING GUIDELINES" (USFWS 2007 DRAFT INDIANA BAT RECOVERY PLAN). THE MONITORING INTERVAL FOR MIST NETS MAY NOT EXCEED 15 MINUTES. CAPTURED BATS MAY BE HELD FOR A MAXIMUM OF 30 MINUTES, UNLESS INJURED. IN EXTENUATING CIRCUMSTANCES, BATS SHALL BE HELD FOR NO LONGER THAN 45 MINUTES.

B. BATS MAY BE CAPTURED WITH HARP TRAPS WITH WRITTEN CONCURRENCE FROM THE FIELD SUPERVISOR IN THE STATE IN WHICH TRAPPING IS PROPOSED. HARP TRAPS MUST BE CONTINUALLY MONITORED. CAPTURED BATS MAY BE HELD FOR A MAXIMUM OF 30 MINUTES, UNLESS INJURED. IN EXTENUATING CIRCUMSTANCES, BATS SHALL BE HELD FOR NO LONGER THAN 45 MINUTES.

C. PERMITTEES MAY CARRY OUT NON-INTRUSIVE MEASUREMENTS ON CAPTURED BATS. LIPPED METAL BANDS HAVING A UNIQUE IDENTIFIER MAY BE APPLIED TO THE FOREARM OF CAPTURED BATS PRIOR TO RELEASE. NO MORE THAN ONE BAND PER BAT MAY BE USED.

D. RADIO TRANSMITTERS MAY BE APPLIED DURING SUMMER ROOSTING PERIOD VIA NONTOXIC SKIN BOND ADHESIVE SUCH AS COLOSTOMY GLUE. THE TOTAL WEIGHT OF THE TRANSMITTER MAY NOT EXCEED 5% OF THE BAT'S BODY WEIGHT AND THE TOTAL WEIGHT OF THE PACKAGE (TRANSMITTER AND ADHESIVE) MAY NOT EXCEED 6% OF THE BAT'S BODY WEIGHT. THE LIGHTEST PACKAGE (BOTH TRANSMITTER AND ADHESIVE) CAPABLE OF ACCOMPLISHING THE REQUIRED TASK SHOULD BE USED, ESPECIALLY WITH PREGNANT FEMALES AND NEWLY VOLANT JUVENILES. BATS CARRYING TRANSMITTERS MUST BE MONITORED DAILY FOR AT LEAST THREE DAYS, OR UNTIL THE TRANSMITTER FALLS OFF, WHICHEVER OCCURS FIRST.

- E. NO TRAPPING ACTIVITIES SHALL OCCUR WITHIN 20 METERS OF A KNOWN INDIANA BAT MATERNITY ROOST SITE, EITHER NATURAL OR ARTIFICIAL ROOSTS, UNLESS PERMITTEE RECEIVES PRIOR WRITTEN APPROVAL FROM THE U.S. FISH AND WILDLIFE SERVICE FIELD SUPERVISOR FOR THE STATE IN WHICH THE ACTIVITIES ARE PROPOSED TO OCCUR.
- F. PERMITTEE MAY COLLECT DORSAL HAIR SAMPLES, WING BIOPSY TISSUE SAMPLES, FUNGAL LIFT TAPE AND SWAB SAMPLES FROM CAPTURED BATS FOR SCIENTIFIC STUDY. HAIR SAMPLES SHALL BE OBTAINED VIA CLIPPING FUR FROM BETWEEN SCAPULA FROM FEMALES AND JUVENILE MALES. THE CLIPPED AREA IS THE SAME AREA FREQUENTLY CLIPPED FOR RADIO TRANSMITTER ATTACHMENT. WING TISSUE SAMPLES MAY BE TAKEN USING A NEW, STERILE BIOPSY PUNCH (2MM) FOR EACH ENDANGERED BAT SAMPLED. NO MORE THAN TWO SAMPLES, ONE FROM EACH WING, MAY BE OBTAINED PER INDIVIDUAL. ALL BOARDS AND EQUIPMENT USED TO OBTAIN SAMPLES MUST BE DISINFECTED ACCORDING TO THE PROTOCOL CITED IN CONDITION H.8.
- G. CYALUME LIGHT TAGS MAY BE AFFIXED TO THE BACK OF UNMARKED BATS DURING SUMMER ROOSTING PERIOD VIA NON-TOXIC SKIN BOND ADHESIVE TO AID IN IDENTIFICATION OF INDIVIDUALS FOR ECHOLOCATION RECORDINGS. LIGHT TAGS SHALL **NOT** BE AFFIXED TO BATS CARRYING RADIO TRANSMITTERS. LIGHT TAG CANNOT EXCEED 2 CM IN LENGTH OR 0.15 G IN WEIGHT. ANY TAG THAT HAS THE POTENTIAL TO EXPOSE BATS TO THE CYALUME COMPOUND IS PROHIBITED. THE LIGHT TAG MUST BE RESISTANT TO TOOTH PUNCTURE AND SEALED TO PREVENT BAT FROM INGESTING CYALUME COMPOUND.
- H. EQUIPMENT USED TO CAPTURE AND HANDLE BATS SHALL BE CLEANED AND DECONTAMINATED ACCORDING TO THE MOST RECENT USFWS APPROVED DECONTAMINATION PROTOCOL AVAILABLE ON THE USFWS WEBSITE AT: [HTTP://WWW.FWS.GOV/WHITENOSESYNDROME/RESEARCH.HTML](http://www.fws.gov/whitenosesyndrome/research.html).
- I. CAVES, MINES, OR OTHER SUITABLE HIBERNATION SITES MAY BE QUIETLY SEARCHED IN A MANNER THAT MINIMIZES DISTURBANCE BY UTILIZING THE MINIMUM NUMBER OF PEOPLE AND TIME REQUIRED TO COMPLETE THE SURVEY. SURVEYS SHOULD NOT BE REPEATED MORE OFTEN THAN ONCE EVERY OTHER YEAR IN ANY GIVEN HIBERNACULUM THAT IS OCCUPIED BY INDIANA BATS. WHERE HIBERNACULA AREA AND SAFETY CONDITIONS ALLOW, INDIVIDUALS ENTERING CAVES ARE RECOMMENDED TO UTILIZE NIGHT VISION GOGGLES OR RED-FILTERED LIGHT AND TO REMAIN IN THE CAVE NO MORE THAN 90 MINUTES TO COMPLETE THE WORK.

3. UPON DETERMINATION THAT ENDANGERED BATS ARE PRESENT AT PREVIOUSLY UNDOCUMENTED SITES, PERMITTEE SHALL NOTIFY THE FOLLOWING OFFICES WITHIN 48 HOURS: THE U.S. FISH AND WILDLIFE SERVICE REGION 3 OFFICE (CONDITION L.), AND THE U.S. FISH AND WILDLIFE SERVICE FIELD OFFICE WITHIN THE GEOGRAPHIC LOCATION OF STUDY AREAS (CONDITION M.).
4. ACCIDENTAL MORTALITY MAY NOT EXCEED TWO SPECIMENS. IN THE EVENT THAT THIS NUMBER IS MET, ALL ACTIVITIES MUST CEASE. ANY BAT MORTALITY OR SERIOUS INJURY MUST BE REPORTED WITHIN 5 CALENDAR DAYS TO THE APPLICABLE OFFICE LISTED IN CONDITION M. AND TO THE NEAREST U.S. FISH AND WILDLIFE SERVICE LAW ENFORCEMENT OFFICE ([HTTP://WWW.FWS.GOV/OFFICES/DIRECTORY](http://www.fws.gov/offices/directory)). DEAD OR MORIBUND BATS MAY BE RETAINED FOR FURTHER STUDY ONLY WITH THE WRITTEN PERMISSION OF THE U.S. FISH AND WILDLIFE SERVICE. ANY BATS THAT ARE NOT AUTHORIZED FOR RETENTION ARE TO BE CHILLED AND PROMPTLY TRANSFERRED TO THE U.S. FISH AND WILDLIFE SERVICE FOR POTENTIAL NECROPSY AND/OR CONTAMINANTS ANALYSIS (CONDITION L.6.).

E. NO BAT INJURY OR MORTALITY IS ANTICIPATED AS A RESULT OF THE IMPLEMENTATION OF THE AUTHORIZED ACTIVITIES, EXCEPT AS EXPLICITLY STATED IN CONDITION D22 ABOVE. IF ANY INJURY OR MORTALITY DOES OCCUR, THE PERMITTEE SHALL IMMEDIATELY NOTIFY THE APPROPRIATE U.S. FISH AND WILDLIFE SERVICE OFFICES NOTED IN CONDITION M., BELOW. NOTIFICATION SHALL ALSO BE MADE WITHIN 24 HOURS TO THE REGIONAL PERMITS BIOLOGIST, AT THE ADDRESS AND TELEPHONE NUMBER NOTED IN CONDITION L., BELOW. BASED ON DISCUSSIONS WITH THESE OFFICES, A DECISION WILL BE MADE AS TO WHETHER ANY OF THE AUTHORIZED ACTIVITIES CAN CONTINUE. DECISIONS WILL ALSO BE MADE CONCERNING THE DISPOSITION OF ANY DEAD OR INJURED BATS. THE PERMITTEE SHALL PROVIDE A WRITTEN STATEMENT TO THE U.S. FISH AND WILDLIFE SERVICE OFFICES NOTED IN CONDITIONS L. AND M., BELOW, WHICH DOCUMENTS THE CAUSE OF THE INJURY/MORTALITY, AND IDENTIFIES THE REMEDIAL MEASURES EMPLOYED BY THE PERMITTEE TO ELIMINATE FUTURE MORTALITY/INJURY EVENTS. THE FINAL DECISION ON REMEDIAL MEASURES RESTS WITH THE U.S. FISH AND WILDLIFE SERVICE.

F. THIS PERMIT IS NON-TRANSFERABLE, BUT OTHER QUALIFIED PERSONNEL MAY ASSIST IN THE AUTHORIZED

ACTIVITIES, SUBJECT TO THE REQUIREMENTS OF §13.25. WHEN ANY SUCH ASSISTANCE IS TO BE PROVIDED, THOSE DESIGNATIONS ARE TO BE MADE BY LETTER FROM THE PERMITTEE TO EACH AGENT. THE LETTER(S) MUST IDENTIFY THE SCOPE AND DURATION OF THE ASSISTANCE TO THE PERMITTEE. COPIES OF SUCH LETTERS WILL BE PROVIDED IMMEDIATELY TO THE U.S. FISH AND WILDLIFE SERVICE'S REPORTING ADDRESSES LISTED IN CONDITIONS L, M, AND N., BELOW, AS APPROPRIATE. THE PERMITTEE MUST BE PRESENT ON SITE AT ALL TIMES WHILE ACTIVITIES AUTHORIZED UNDER THIS PERMIT ARE BEING CARRIED OUT.

G. PERMITTEE MUST CARRY A COPY OF THIS PERMIT AT ALL TIMES WHEN CONDUCTING THE AUTHORIZED ACTIVITIES. SHIPMENTS OF COLLECTED BIOLOGICAL MATERIALS SHOULD ALSO BE ACCOMPANIED BY A COPY OF THIS PERMIT. NOTE THAT THIS PERMIT IS LIMITED TO THE ABOVE ACTIVITIES AND IDENTIFIED SPECIES.

H. ISSUANCE OF THIS PERMIT DOES NOT CONSTITUTE PERMISSION TO CONDUCT THESE ACTIVITIES ON NATIONAL WILDLIFE REFUGES OR ANY OTHER PUBLIC OR PRIVATE LANDS; SUCH PERMISSION MUST BE OBTAINED SEPARATELY FROM THE APPROPRIATE LANDOWNER OR LAND MANAGER BEFORE BEGINNING THESE AUTHORIZED ACTIVITIES. THIS PERMIT, NEITHER DIRECTLY OR BY IMPLICATION, GRANTS THE RIGHT OF TRESPASS.

I. ACCEPTANCE OF THIS PERMIT SERVES AS EVIDENCE THAT THE PERMITTEE AND ITS AUTHORIZED AGENTS UNDERSTAND AND AGREE TO ABIDE BY THE TERMS OF THIS PERMIT AND ALL SECTIONS OF TITLE 50 CODE OF FEDERAL REGULATIONS, PARTS 13 AND 17, PERTINENT TO ISSUED PERMITS. SECTION 11 OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED, PROVIDES FOR CIVIL AND CRIMINAL PENALTIES FOR FAILURE TO COMPLY WITH PERMIT CONDITIONS.

J. UPON LOCATING A DEAD, INJURED, OR SICK BAT, OR ANY OTHER THREATENED OR ENDANGERED SPECIES, UNDER CIRCUMSTANCES NOT ADDRESSED IN THIS AUTHORIZATION, INITIAL NOTIFICATION MUST BE MADE IMMEDIATELY TO THE U.S. FISH AND WILDLIFE SERVICE FIELD OFFICE IDENTIFIED IN CONDITION N., BELOW. NOTIFICATION SHOULD ALSO BE MADE BY THE NEXT WORK DAY TO THE U.S. FISH AND WILDLIFE SERVICE OFFICE IDENTIFIED IN CONDITION L., BELOW. CARE SHOULD BE TAKEN IN HANDLING SICK, INJURED, OR DEAD SPECIMENS TO ENSURE EFFECTIVE TREATMENT OR TO PRESERVE BIOLOGICAL MATERIALS FOR LATER ANALYSIS. IN CONJUNCTION WITH THE CARE OF SICK OR INJURED ENDANGERED OR THREATENED SPECIES, AND THE PRESERVATION OF BIOLOGICAL MATERIALS FROM A DEAD ANIMAL, THE FINDER SHOULD TAKE RESPONSIBLE STEPS TO ENSURE THAT THE SITE IS NOT UNNECESSARILY DISTURBED.

K. AN ANNUAL REPORT SUMMARIZING AUTHORIZED ACTIVITIES MUST BE SUBMITTED BY DECEMBER 31 OF EACH YEAR THIS PERMIT IS VALID. EACH REPORT SHOULD INCLUDE, AT A MINIMUM, THE FOLLOWING INFORMATION:

1. TOTAL NUMBER OF SURVEYS CONDUCTED AND LOCATIONS OF THE TRAPPING AND SURVEY SITES. LOCATIONS SHALL BE NOTED USING FIGURES, MAPS, AND BY REFERENCING THE NAD83 COORDINATE SYSTEM (E.G., DEGREES, MINUTES, SECONDS).
2. A DESCRIPTION OF SAMPLING METHODS, INCLUDING A DESCRIPTION OF AREA SAMPLED AND NOTES ON BIOTIC AND ABIOTIC FEATURES THAT MIGHT INFLUENCE SAMPLE COMPOSITION.
3. A SPECIES LIST FROM EACH COLLECTION SITE, INCLUDING SPECIES ABUNDANCE AND RICHNESS, CONDITION, AGE, AND SEX OF CAPTURED BATS.
4. THE RESULTS OF THE SURVEYS AND RESEARCH, WITH DISCUSSIONS AND INTERPRETATIONS OF THE DATA IN CONTEXT TO RECOVERY OF THE SPECIES.
5. INFORMATION ON INJURIES AND/OR MORTALITIES AND DISPOSITION OF SPECIMENS.
6. LOCATION AND CHARACTERISTICS OF ROOST TREES AND BAT COLONIES.
7. COPIES OF ALL PUBLISHED PAPERS AND REPORTS.

L. FOR PURPOSES OF MONITORING COMPLIANCE AND ADMINISTRATION OF THE TERMS AND CONDITIONS OF THIS PERMIT, THE CONTACT OFFICE OF THE U.S. FISH AND WILDLIFE SERVICE IS:

U.S. FISH AND WILDLIFE SERVICE
ATTN: PERMIT COORDINATOR
1875 CENTURY BOULEVARD, SUITE 200
ATLANTA, GEORGIA 30345-3301

TELEPHONE: 904/731-3191
FACSIMILE: 904/731-3045
PERMITSR4ES@FWS.GOV

ALEX HOAR
U.S. FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES DIVISION
300 WESTGATE CENTER DRIVE
HADLEY, MASSACHUSETTS 01035-9589
(413/253-8631; FAX 413/253-8482)
PERMITSR5ES@FWS.GOV

LISA MANDELL
U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES - ENDANGERED SPECIES
5600 AMERICAN BLVD. W.
SUITE 990
BLOOMINGTON, MINNESOTA 55437-1458
(612/713-5343; FAX 612/713-5292)
PERMITSR3ES@FWS.GOV

M. COPIES OF ANNUAL REPORTS SHALL ALSO BE SENT TO THE FOLLOWING:

FIELD SUPERVISOR
U.S. FISH AND WILDLIFE SERVICE
J.C. WATTS FEDERAL BUILDING
330 WEST BROADWAY STREET ROOM 265
FRANKFORT, KENTUCKY 40601
TELEPHONE: 502/695-0468
FACSIMILE: 502/695-1024

N. CONTACT INFORMATION FOR U.S. FISH AND WILDLIFE SERVICE STATE FIELD OFFICES AND REGIONS
REQUIRING PRIOR APPROVAL;

FOR STUDIES CONDUCTED IN NEW JERSEY:

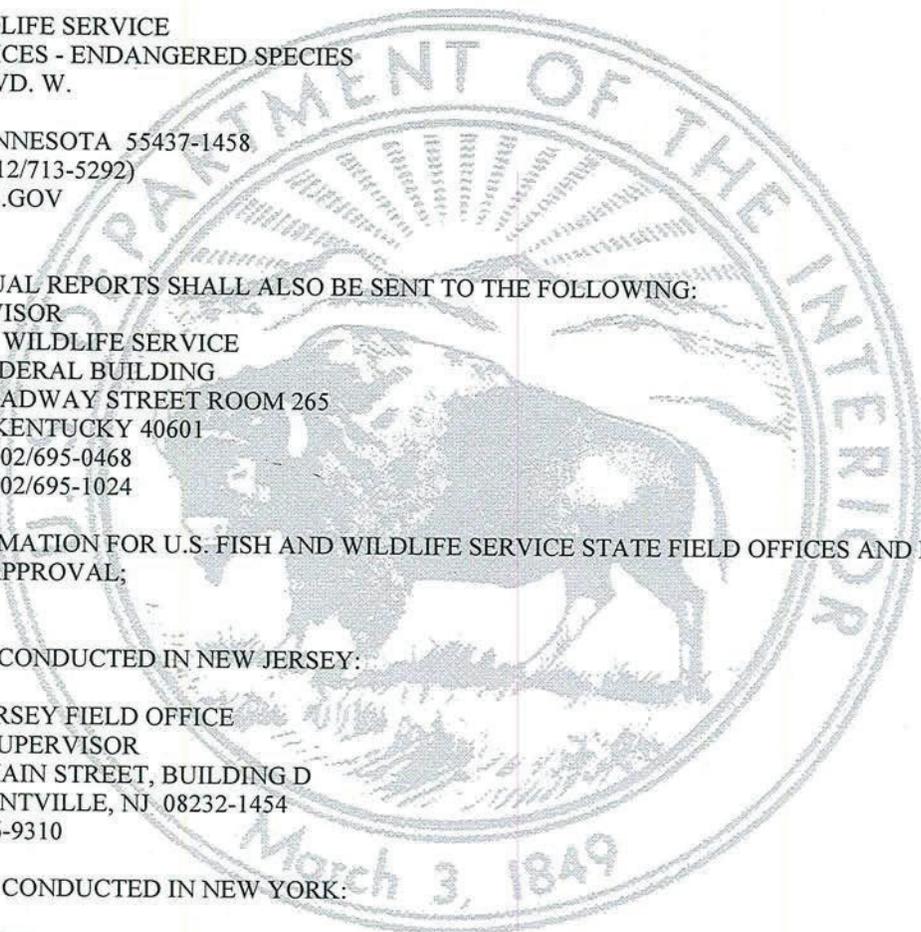
NEW JERSEY FIELD OFFICE
FIELD SUPERVISOR
927 N. MAIN STREET, BUILDING D
PLEASANTVILLE, NJ 08232-1454
(609) 646-9310

FOR STUDIES CONDUCTED IN NEW YORK:

NEW YORK FIELD OFFICE
FIELD SUPERVISOR
3817 LUKER ROAD
CORTLAND, NY 13045
(607) 753-9334

FOR STUDIES CONDUCTED IN TENNESSEE:

COOKEVILLE FIELD OFFICE
FIELD SUPERVISOR
U.S. FISH AND WILDLIFE SERVICE
446 NEAL STREET
COOKEVILLE, TN 38501-4027
(931) 528-6481



FOR STUDIES CONDUCTED IN OHIO:

ENDANGERED SPECIES COORDINATOR FOR OHIO
U.S. FISH AND WILDLIFE SERVICE
OHIO ECOLOGICAL SERVICES FIELD OFFICE
4625 MORSE ROAD, SUITE 104
COLUMBUS, OHIO 43230
(614/416-8993, X22; FAX 614/416-8994)

ENDANGERED SPECIES COORDINATOR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
2045 MORSE ROAD, BUILDING G
COLUMBUS, OHIO 43229-6693
(614-265-6329)

FOR STUDIES CONDUCTED IN GEORGIA:

GEORGIA FIELD OFFICE
FIELD SUPERVISOR
105 WESTPARK DRIVE, SUITE D
ATHENS, GA 30606-3175
(706) 613-9493; FAX 706/613-6059

FOR STUDIES CONDUCTED IN KENTUCKY:

FRANKFORT FIELD OFFICE
FIELD SUPERVISOR
J C WATTS FEDERAL BLDG., RM 265
330 WEST BROADWAY
FRANKFORT, KY 40601-8670
(502) 695-0468

FOR STUDIES CONDUCTED IN MISSISSIPPI:

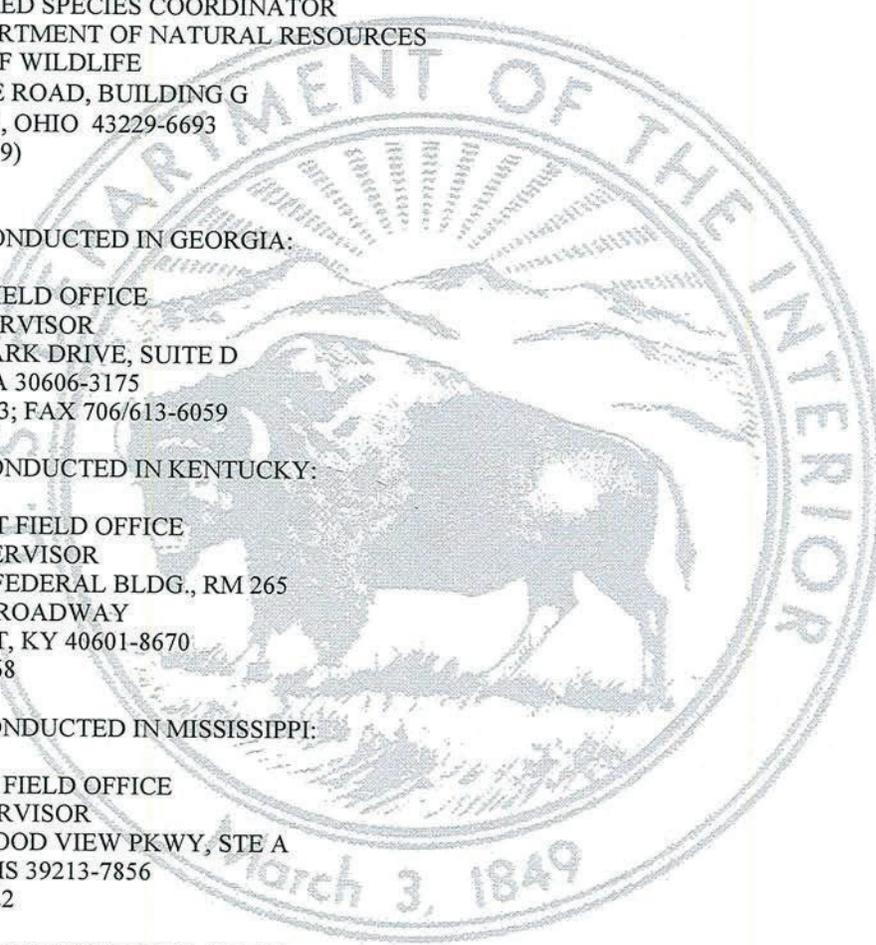
MISSISSIPPI FIELD OFFICE
FIELD SUPERVISOR
6578 DOGWOOD VIEW PKWY, STE A
JACKSON, MS 39213-7856
(601) 321-1122

FOR STUDIES CONDUCTED IN ALABAMA:

DAPHNE FIELD OFFICE
FIELD SUPERVISOR
1208-B MAIN STREET
DAPHNE, ALABAMA 36526
(251) 441-5181

FOR STUDIES CONDUCTED IN LOUISIANA:

LAFAYETTE FIELD OFFICE
FIELD SUPERVISOR
U.S. FISH AND WILDLIFE SERVICE
646 CAJUNDOME BOULEVARD
SUITE 400
LAFAYETTE, LOUISIANA 70506



APPENDIX D

RECEIVER AND TRANSMITTER SPECIFICATIONS

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ATS R2000 / R4000 Scientific Receivers

Finding Solutions. Delivering Results.



With performance features and proven reliability, these receivers are an exceptional value.

ATS models R2000 and R4000 are excellent receivers for most aerial, terrestrial and aquatic studies. They offer leading edge technology and outstanding performance.

Both models feature programmable, automatic or manual scanning over a 2 MHz or 4 MHz frequency range. Their 1 kHz channel spacing tracks up to 200 or 400 targets. The user-friendly front panel gives the operator full control over all functions including scan rate, add/delete frequencies, RF gain, audio level, tone decoder threshold, and more. Both units feature state-of-the-art circuitry for exceptional sensitivity, frequency stability, and low noise.

Both receivers are designed for easy field operation. Their large 1/2" LCD display is backlit for night use. A padded Nylon case, battery charger, power cord and detailed operation manual are included with each receiver.

The R2000 and R4000 are lightweight, compact and ruggedly built to withstand heavy field use and extreme environmental conditions. Each can be powered by an external 12 volt DC battery or its own built-in NiCad battery pack for up to 8 hours of use.

ATS R2000 and R4000 receivers offer high performance with high value.

- 2 or 4 MHz Frequency Range
- 1 kHz Channel Spacing
- Improved RF Gain Control For More Precise Direction Finding
- Excellent Frequency Stability
- High Sensitivity/Low Noise
- Sensitive Signal Meter
- Ruggedly Built For Field Use
- Easy Operation
- 4 Distinct Memory Banks (R4000)
- Built-in Computer Interface (R4000)
- Delta Tune Drift Compensation
- Rechargeable NiCad Batteries
- Separate RF Gain And Audio Level Controls
- Battery-Backed Memory
- Auto-Shut Off On Low Battery For Longer Battery Life

TRANSMITTERS
RECEIVERS
GPS SYSTEMS


ADVANCED TELEMETRY SYSTEMS

ANTENNA SYSTEMS
CODED ID SYSTEMS
CONSULTING

Finding Solutions.
Delivering Results.



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ADVANCED TELEMETRY SYSTEMS

470 FIRST AVE N • BOX 398 • ISANTI, MN 55040

763-444-9267 • 763-444-9384 fax

email:sales@atstrack.com • www.atstrack.com

ATS R2000 / R4000 Scientific Receivers

GENERAL

- Frequency range: R2000 Any Specified 2 MHz range from 30 to 220 MHz
R4000 Any Specified 4 MHz range from 140 to 220 MHz
- Channel spacing: 1 kHz
- Input impedance: 50 ohms
- Minimum discernible signal (MDS): -150 dBm (0.007 uv into 50 ohms)
- Noise figure: 3 dB maximum
- Speaker: 8 ohms
- Tone decoder detection range: ± 2 kHz (Model R4000)
- Tone decoder detection level: -120 dBm minimum (Model R4000)
- Frequency stability: ± 1 kHz -20°C to +50°C
- Delta tune: +4 kHz; -4 kHz
- IF frequency: 10.7 MHz
- IF bandwidth: 6 dB ± 2 kHz; 80 dB ± 7 kHz
- Image rejection: >150 dB
- RF gain control range: >130 dB
- Operating voltage range: 9 to 18 volts DC
- Dwell time (scan rate): Selectable, 2 sec. to 16 min. (10 positions)

CONTROLS

- Frequency selectors (4)
- Audio level
- Delta tune
- RF gain
- Increment frequency up/down
- Tone decoder threshold (R4000)
- Memory bank select (R4000)
- Auto scan/memory bypass
- Receiver on/off
- Dwell time (scan rate)
- Add-delete to memory
- Stop scan

MEMORY

- All frequencies programmable in each bank
- Four distinct banks (R4000)
- Sequentially scanned
- Battery backed
- Delete all frequencies in each bank
- Delete frequencies individually with single switch while scanning or on standby

DISPLAYS

- Selected frequency: LCD (0.5" digits) with backlight for night use
- Memory status: Colon in display indicates frequency stored in memory
- Battery status: "Lo Bat" indicator flashes when battery voltage is low
- Signal detection: "+" present in display indicates detection by tone decoder (R4000)
- Signal level: 0-1 mA meter

CONNECTIONS

- Antenna: BNC - female
- Headset: Receptacle for 0.25" phone plug
- Signal level: 0.125" phone receptacle for external 0.1 mA current meter
- External power/recharge receptacle: 5-pin DIN
- Computer interface (R4000): 25-pin D-sub filtered connection (socket)

POWER

- 12 volts DC nominal: 130 mA drain nominal
- Internal: 1.2 amp-hour NiCad battery pack; 8-hour nominal operating time
- External: 9 to 18 volts, negative ground; switches automatically to external power

COMPUTER INTERFACE (R4000)

- 4 digits BCD (active high)
- Computer control select
- 5 volt DC regulated (5 mA max.)
- 12 volt DC unregulated
- Tone decoder output (active low)
- Signal strength

PHYSICAL

- Size: 11 cm wide x 21 cm long x 18 cm high (4.3" x 8.3" x 7")
- Weight: 2.3 kg (5 lbs)
- Accessories (included): External power cord, battery charger, padded nylon case, instruction manual
- Accessories (optional): David Clark aviation-grade headset, DC-DC charger, external battery pack

ENVIRONMENTAL

- Operating temperature: -20°C to +50°C
- Storage temperature: -70°C to +60°C
- Humidity: 95% non-condensing

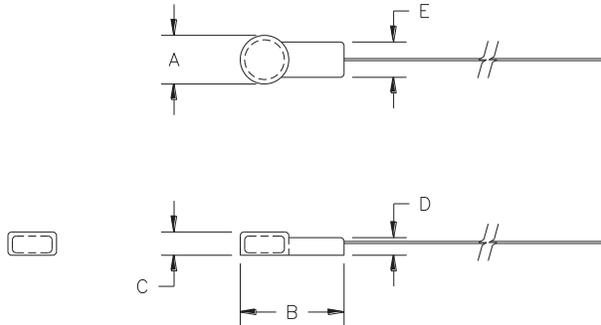
WARRANTY

- One year parts and labor on materials and workmanship

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AVIAN GLUE ON

Series A2405



Technical Specifications

Transmitter type:	Crystal controlled 2-stage
Calibration tolerance:	±2.5kHz
Frequency stability:	±2.5kHz, -20°C to 40°C
Pulse rate and width:	Typical on time 15ms, off time 1.5-4.0sec (controlled by astable circuit)
Pulse rate variation:	5%/volt, ± 20% for temperatures -20°C to +40°C
Battery:	Silver Oxide
Activation:	By removing magnet
Encapsulation:	Electrical resin, water-proof, specific gravity: 1.12

MODEL	BATTERY	BATTERY CAPACITY (days)				DIMENSIONS (mm)					WEIGHT (grams)	PRICE GROUP
		15 ppm	24 ppm	30 ppm	40 ppm	A	B	C	D	E		
A2412	410	22	15	12	9	5	12	1.5	2.5	4	0.20	F
A2414	337	45	30	24	18	5	12	3	2.5	4	0.30	C
A2415	337	45	30	24	18	5	13	3	4	5	0.50	A
A2426	317	68	45	36	28	6	14	3	4	5	0.65	A
A2435	319	90	60	48	37	6	14	4	4	5	0.75	A
A2445	377	135	89	72	55	7	15	4	4	5	0.90	A
A2455	392	216	143	116	88	8	16	5	4	5	1.20	A

Above models available only in 48.00-50.66MHz, 144.06-151.98MHz, and 164.00-167.99MHz ranges.

Warranty life is 50% of battery capacity.

470 First Ave. No., Box 398 • Isanti, MN 55040
763.444.9267 • fax:763.444.9384 • sales@atstrack.com • www.atstrack.com